Level control
Limit switches
Leakage detection
Detection of moisture

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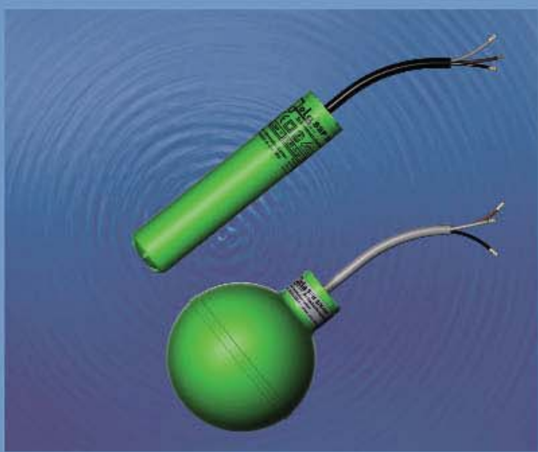
May 2018 - Technical changes reserved.

Mercury-free floating switches and immersion probes

Controlling devices with potential-free microswitch, for automatic control, regulation and signalling of liquid levels



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The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Contents

Floating switches:

Types	Housing material	Dimensions approx.	Special features	Pages
SSP...	PP	Ø 29 x 133 mm	---	1-1-3, 1-1-4 and 1-1-13
SPH...	PP	Ø 86 mm	---	1-1-5, 1-1-6 and 1-1-13
SSX...	PP	Ø 98 x 165 mm	optionally with internal fixing weight	1-1-7, 1-1-8 and 1-1-14
FS...	PP	46 x 74 x 110 mm	with internal fixing weight	1-1-9, 1-1-10 and 1-1-14
SSR...	stainless steel 316 Ti	Ø 147 x 445 mm	with protective bellows made of stainless steel	1-1-11, 1-1-12 and 1-1-14
SS/PTFE 55/A ./K	PTFE	Ø 55 x 145 mm	---	1-1-15 and 1-1-16
SS/PTFE 55/./K	PTFE	Ø 55 x 230 mm	with protective bellows made of PTFE	1-1-17 and 1-1-18

SSP... floating switches

These floating switches are designed for mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height using a stuffing gland, for example, in the case of mounting from the side or using a fixing weight, for example, in case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:

The floating switch SSP 1/K/... or SSP/S1/K/... is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

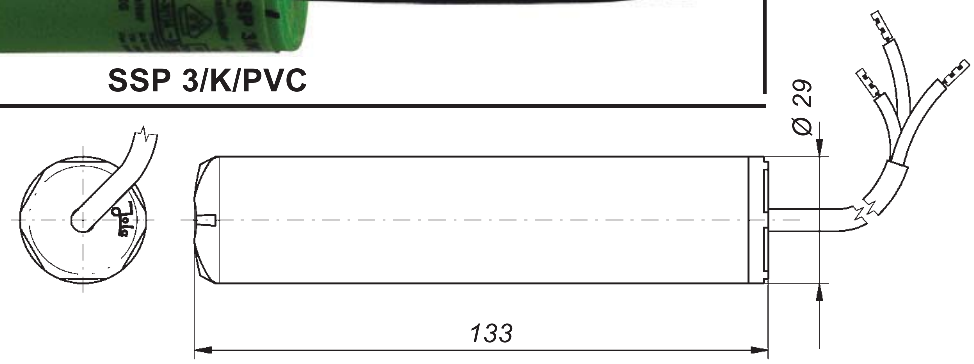
- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SSP 1/K/... or SSP/S1/K/... with gold-plated contact and an SSP 3/K/... or SSP/S3/K/... with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

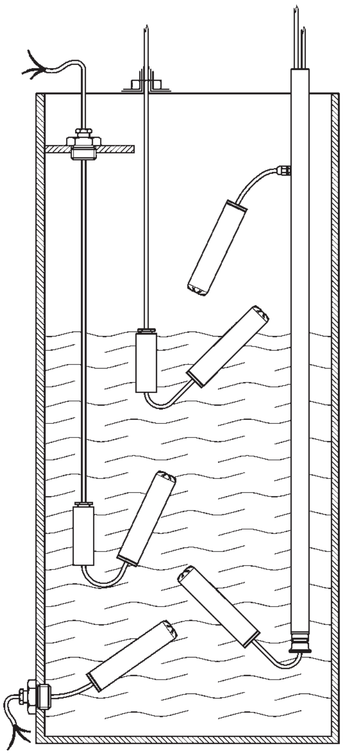
- Floating switch is seldom in operation but should continue to work reliably even after years: SSP 1/K/... or SSP/S1/K/... .
- Floating switch is frequently in operation, is permanently in action: SSP 3/K/... or SSP/S3/K/... .

Technical data	**SSP 3/K/... / SSP/S3/K/...**	**SSP 1/K/... / SSP/S1/K/...**
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PP	
Seal material	FPM; on request: EPDM	
Float protection class	IP 68	
Temperature appl. range	see chart on page 1-1- 13	
Max. immersion depth of the float	max. 10 metres head of water at + 20°C	
Connecting cables	see chart on page 1-1- 13	
Application range of the connecting cables	• **black PVC cable:** water, used water, slightly aggressive liquids, oils without aromatic additives, fuel oil and diesel fuel with a specific gravity ≥ 0.82 g/cm³ • **grey A05RN-F cable:** water, used water, slightly aggressive liquids with a specific gravity ≥ 0.82 g/cm³ • **red-brown silicone cable:** water and certain other liquids with a specific gravity ≥ 0.82 g/cm³, with low mechanical strength • **green halogen-free PUR cable:** water, used water, slightly aggressive liquids and some oils without aromatic additives with a specific gravity ≥ 0.82 g/cm³ • **black CM cable:** water and certain acids and lyes with a specific gravity ≥ 1 g/cm³	
Connecting cable length	1 metre, other cable lengths on request. **When ordering, please always state the desired cable type and cable length.**	
Optional extras	**stuffing glands and fixing weights made of brass, stainless steel 316 Ti or PP**	

SSP 3/K/PVC



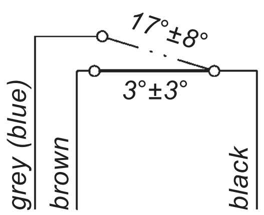
Application examples

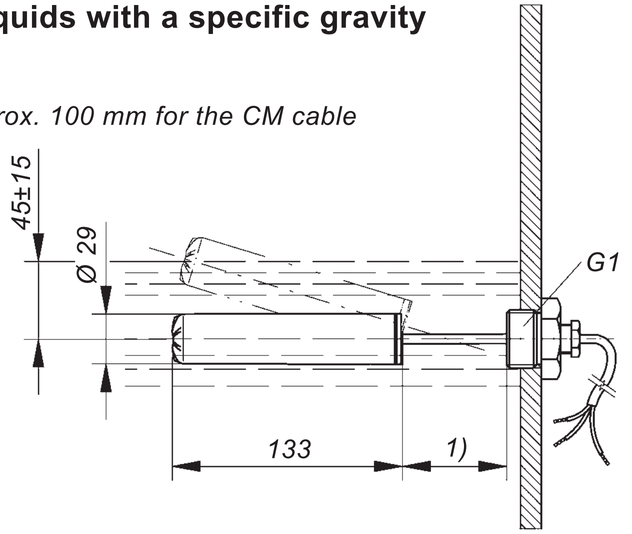


Switching action in liquids with a specific gravity of 1 g/cm³

1) approx. 60 mm, but approx. 100 mm for the CM cable

Contact switches over at

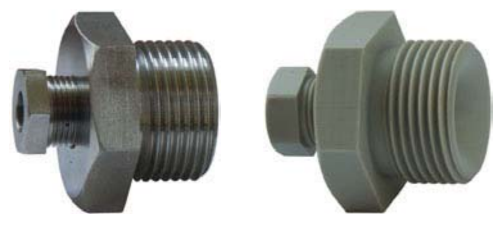




Optional extras:
Floating switch mounting only possible **from the inside**:
- stuffing gland G3/8, brass
- stuffing gland G1/2, brass
- stuffing gland G1/2, stainless steel 316 Ti
- stuffing gland G1/2, PP

Floating switch mounting possible **from the outside**:
- stuffing gland G1, brass
- stuffing gland G1, stainless steel 316 Ti
- stuffing gland G1, PP

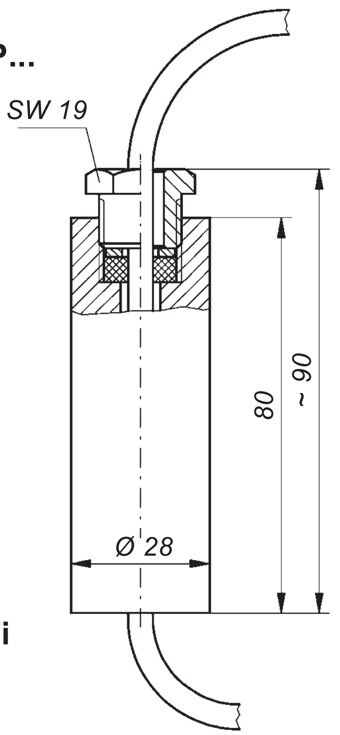
Stuffing gland G1



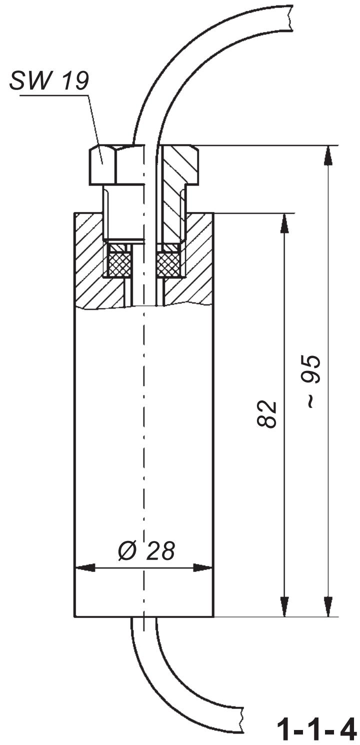
stainless steel **PP**

Optional extras:
fixing weight for SSP...

stainless steel 316 Ti or brass



PP



Jola SPH... floating switches

These floating switches are designed for mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height using a stuffing gland, for example, in the case of mounting from the side or using a fixing weight, for example, in case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:

The floating switch SPH 1/K/... or SPH/S1/K/... is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

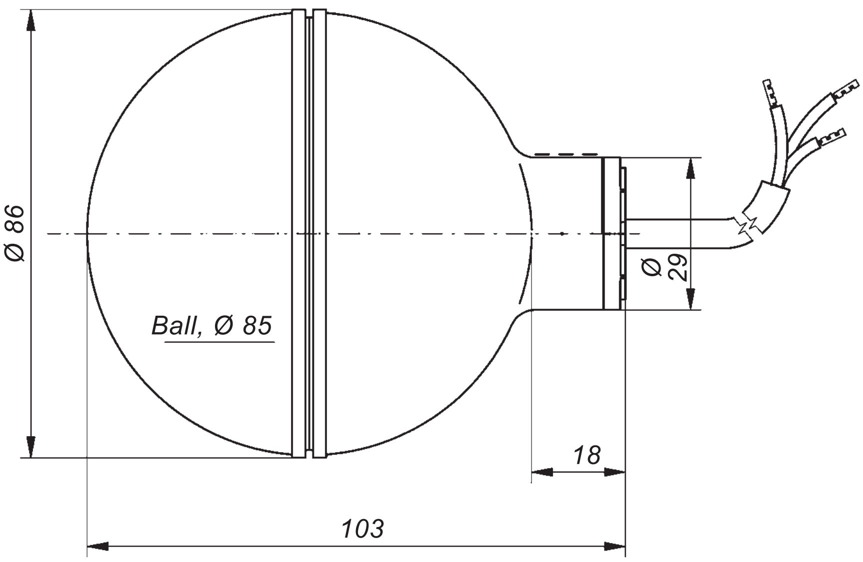
- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SPH 1/K/... or SPH/S1/K/... with gold-plated contact and an SPH 3/K/... or SPH/S3/K/... with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

- Floating switch is seldom in operation but should continue to work reliably even after years: SPH 1/K/... or SPH/S1/K/... .
- Floating switch is frequently in operation, is permanently in action: SPH 3/K/... or SPH/S3/K/... .

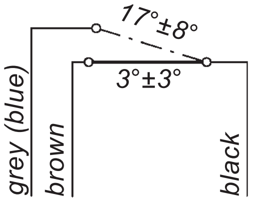
Technical data	**SPH 3/K/... / SPH/S3/K/...**	**SPH 1/K/... / SPH/S1/K/...**
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PP	
Seal material	FPM; on request: EPDM	
Float protection class	IP 68	
Temperature appl. range	see chart on page 1-1- 13	
Max. immersion depth of the float	max. 10 metres head of water at + 20°C	
Connecting cables	see chart on page 1-1- 13	
Application range of the connecting cables	• **black PVC cable:** water, used water, slightly aggressive liquids, oils without aromatic additives, fuel oil and diesel fuel with a specific gravity ≥ 0.7 g/cm³ • **grey A05RN-F cable:** water, used water, slightly aggressive liquids with a specific gravity ≥ 0.7 g/cm³ • **red-brown silicone cable:** water and certain other liquids with a specific gravity ≥ 0.7 g/cm³, with low mechanical strength • **green halogen-free PUR cable:** water, used water, slightly aggressive liquids and some oils without aromatic additives with a specific gravity ≥ 0.7 g/cm³ • **black CM cable:** water and certain acids and lyes with a specific gravity ≥ 0.8 g/cm³ • **white PTFE cable:** suitable for all liquids in which the float material PP and the seal material FPM or EPDM are also resistant with a specific gravity ≥ 0.8 g/cm³	
Connecting cable length	1 metre, other cable lengths on request. **When ordering, please always state the desired cable type and cable length.**	
Optional extras	**stuffing glands and fixing weights made of brass, stainless steel 316 Ti or PP**	

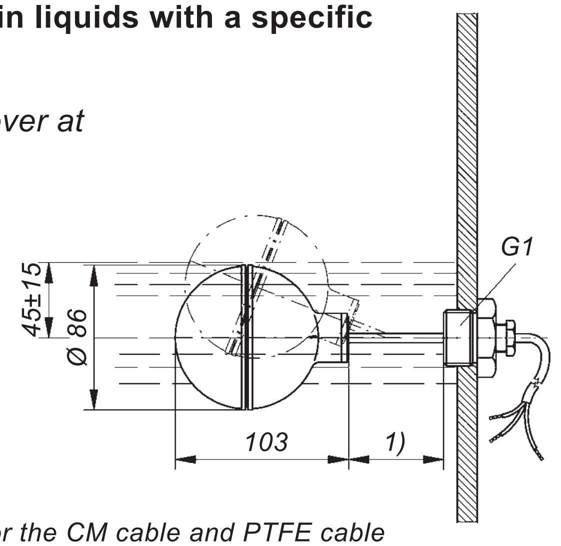
SPH 3/K/PVC



Switching action in liquids with a specific gravity of 1 g/cm³

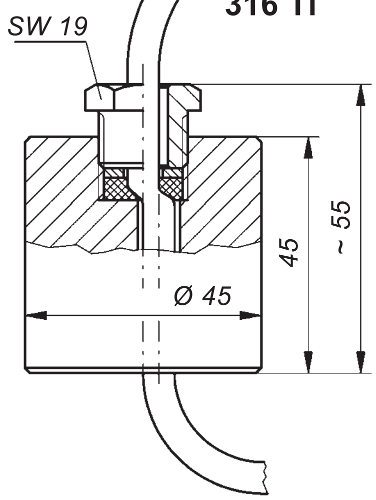
Contact switches over at



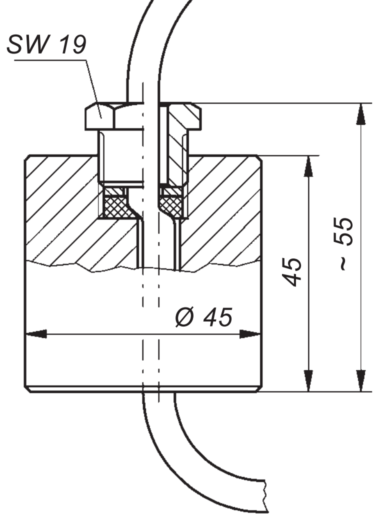


1) approx. 60 mm,
but approx. 100 mm for the CM cable and PTFE cable

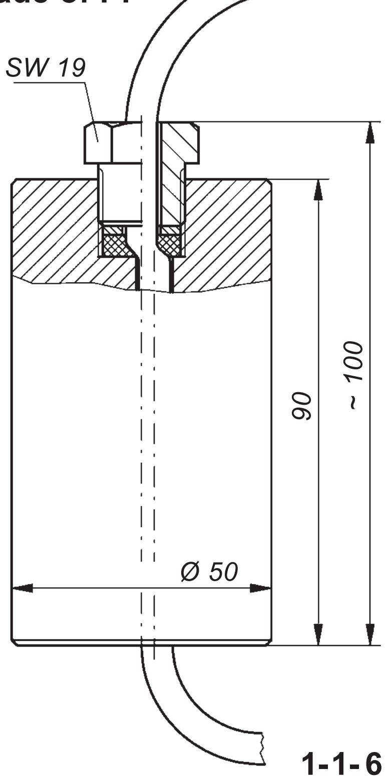
Fixing weight made of stainless steel 316 Ti



Fixing weight made of brass



Fixing weight made of PP



SSX... floating switches

These floating switches are designed for mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height using a stuffing gland, for example, in the case of mounting from the side or using a fixing weight, for example, in case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:

The floating switch SSX 1/K/... or SSX/S1/K/... is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SSX 1/K/... or SSX/S1/K/... with gold-plated contact and an SSX 3/K/... or SSX/S3/K/... with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

- Floating switch is seldom in operation but should continue to work reliably even after years: SSX 1/K/... or SSX/S1/K/... .
- Floating switch is frequently in operation, is permanently in action: SSX 3/K/... or SSX/S3/K/... .

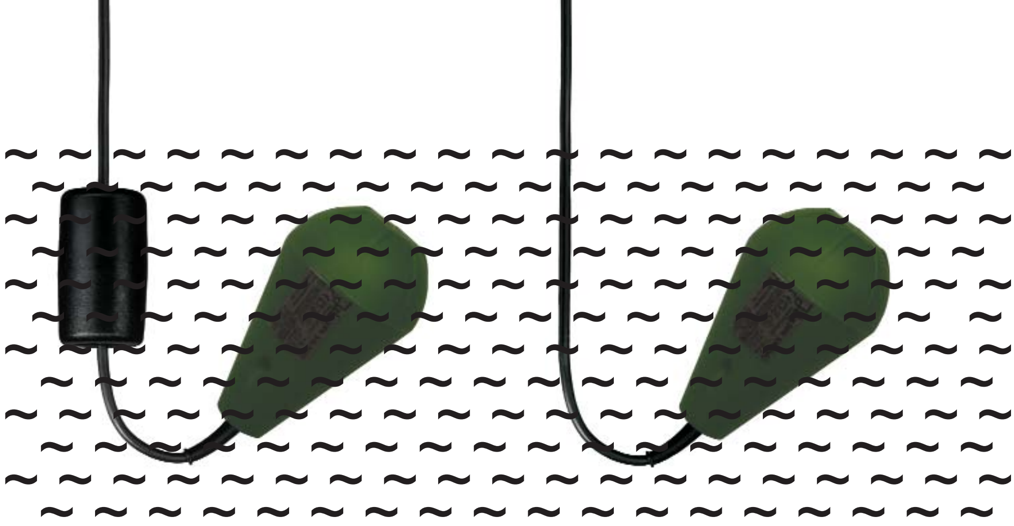
Technical data	SSX 3/K/... / SSX/S3/K/...	SSX 1/K/... / SSX/S1/K/...
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PP	
Seal material	FPM; on request: EPDM	
Float protection class	IP 68	
Temperature appl. range	see chart on page 1-1- 14	
Max. immersion depth of the float	max. 10 metres head of water at + 20°C	
Connecting cables	see chart on page 1-1- 14	
Application range of the connecting cables	• **black PVC cable:** water, used water, slightly aggressive liquids, oils without aromatic additives, fuel oil and diesel fuel with a specific gravity ≥ 0.7 g/cm³ • **grey A05RN-F cable:** water, used water, slightly aggressive liquids with a specific gravity ≥ 0.7 g/cm³ • **black CM cable:** water and certain acids and lyes with a specific gravity ≥ 0.8 g/cm³ • **white PTFE cable:** suitable for all liquids in which the float material PP and the seal material FPM or EPDM are also resistant, with a specific gravity ≥ 0.8 g/cm³	
Connecting cable length	2 metres, other cable lengths on request. **When ordering, please always state the desired cable type and cable length.**	
Optional extras	• **external fixing weight made of cast steel** for liquids with a specific gravity ≥ 0.7 g/cm³ (**not** suitable for the **PTFE** cable) • **external fixing weight made of stainless steel 316 Ti** for liquids with a specific gravity ≥ 0.7 g/cm³ • **internal fixing weight (integrated in the float) - additional reference /IG -** for liquids with a specific gravity between 0.95 and 1.05 g/cm³	

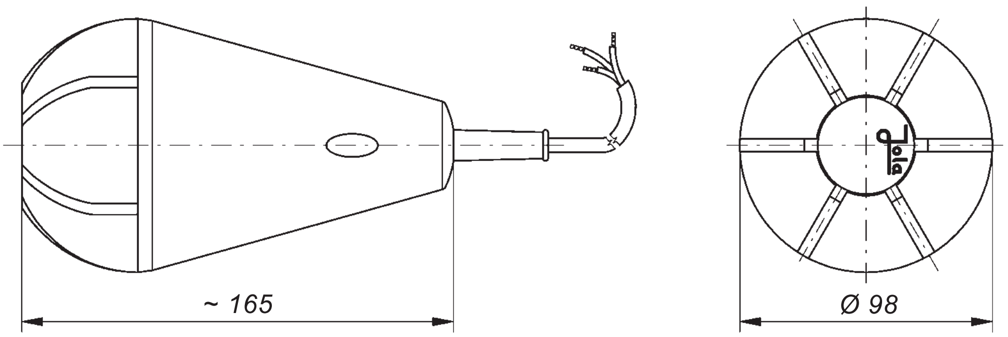
Switching action of the SSX... with e x t e r n a l fixing weight (optional)

(idealized representation)

Switching action of the SSX... with i n t e r n a l fixing weight (optional)

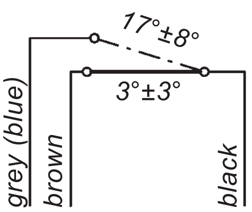
(idealized representation)

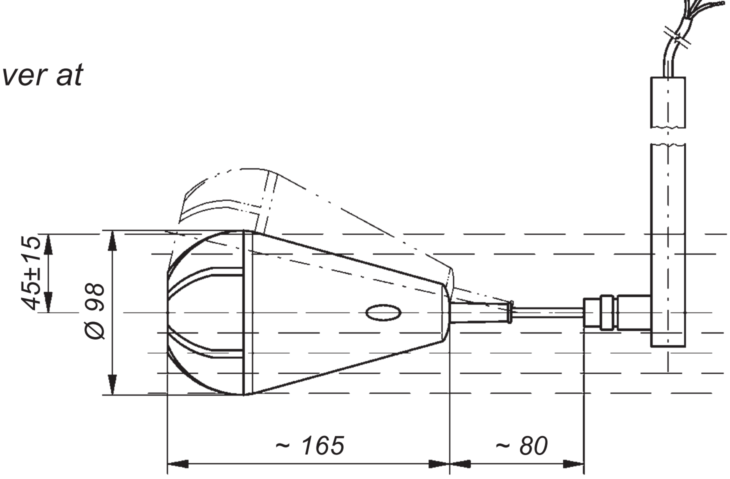




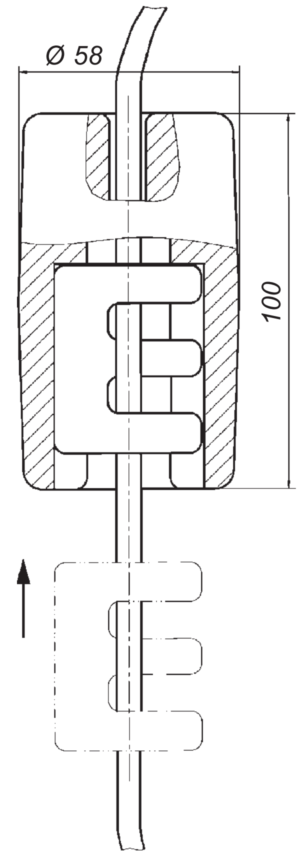
Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at

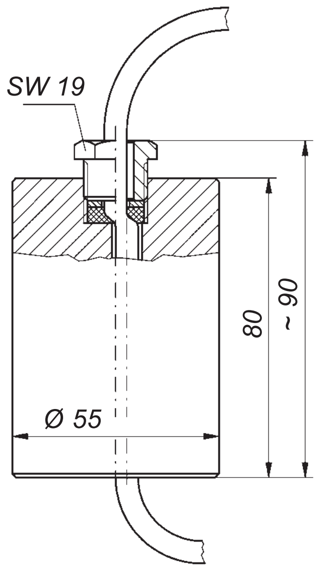




Optional extras



External fixing weight made of cast steel



External fixing weight made of stainless steel 316 Ti

FS... floating switches

with built-in weight for fixing of switching point

These floating switches are designed for mounting **from the top.**

They are fitted with a **built-in weight for fixing the switching point** at the desired height; this renders **additional fastening** of the switch at the height of the switching point **unnecessary**. This weight is dimensioned in such a way that the switch tilts around its own axis when the liquid level rises and then follows the rising liquid level (see function diagram on page 1-1-10). This tilting action of the float activates the switching process.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:

The floating switch FS 1/K/... or FS/S1/K/... is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

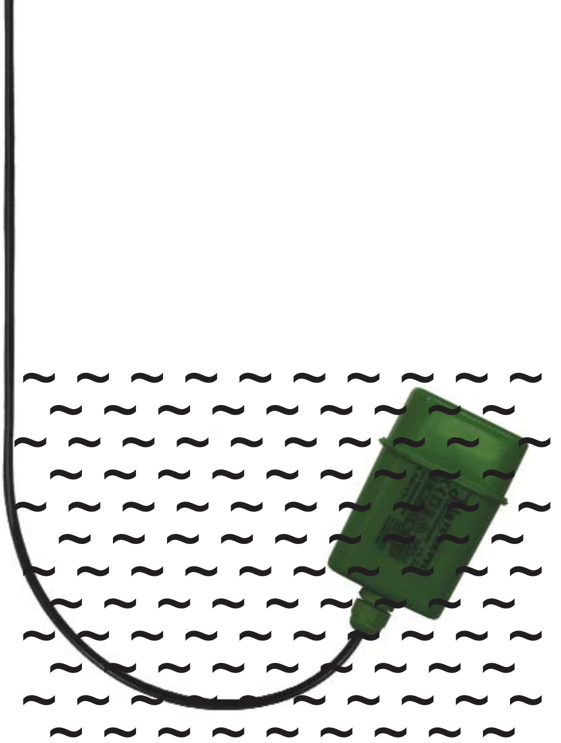
If you need to choose between an FS 1/K/... or FS/S1/K/... with gold-plated contact and an FS 3/K/... or FS/S3/K/... with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

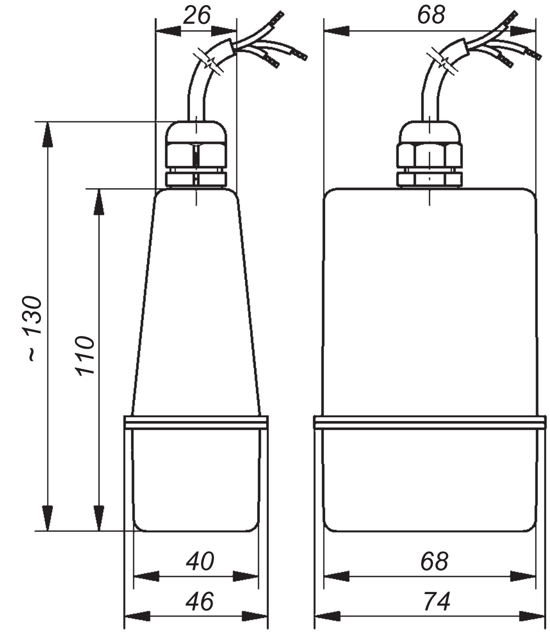
- Floating switch is seldom in operation but should continue to work reliably even after years: FS 1/K/... or FS/S1/K/... .
- Floating switch is frequently in operation, is permanently in action: FS 3/K/... or FS/S3/K/... .

Technical data	**FS 3/K/... / FS/S3/K/...**	**FS 1/K/... / FS/S1/K/...**
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PP	
Seal material	FPM; on request: EPDM	
Float protection class	IP 68	
Temperature appl. range	see chart on page 1-1-14	
Max. immersion depth of the float	max. 10 metres head of water at + 20°C	
Application range	**in liquids with a specific gravity between 0.95 and 1.05 g/cm³**	
Connecting cables	see chart on page 1-1-14	
Application range of the connecting cables	**• black PVC cable:** water, used water and slightly aggressive liquids **• grey A05RN-F cable:** water, used water and slightly aggressive liquids **• red-brown silicone cable:** water and certain other liquids, with low mechanical strength **• green halogen-free PUR cable** water, used water and slightly aggressive liquids **• black CM cable:** water and certain acids and lyes	
Connecting cable length	1 metre, other cable lengths on request. **When ordering, please always state the desired cable type and cable length.**	

FS 3/K/PVC
floating switch

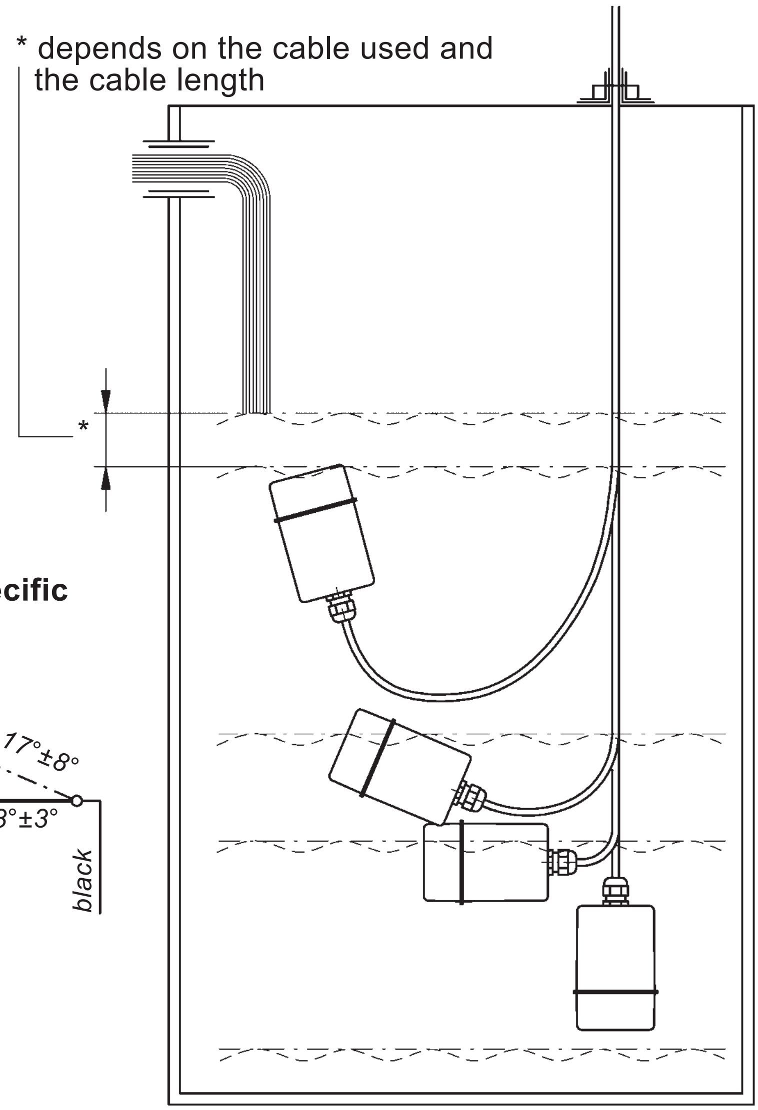
(idealized representation)





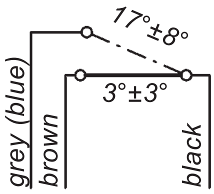
Function diagram of the FS...

(idealized representation)



Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at



SSR... floating switches

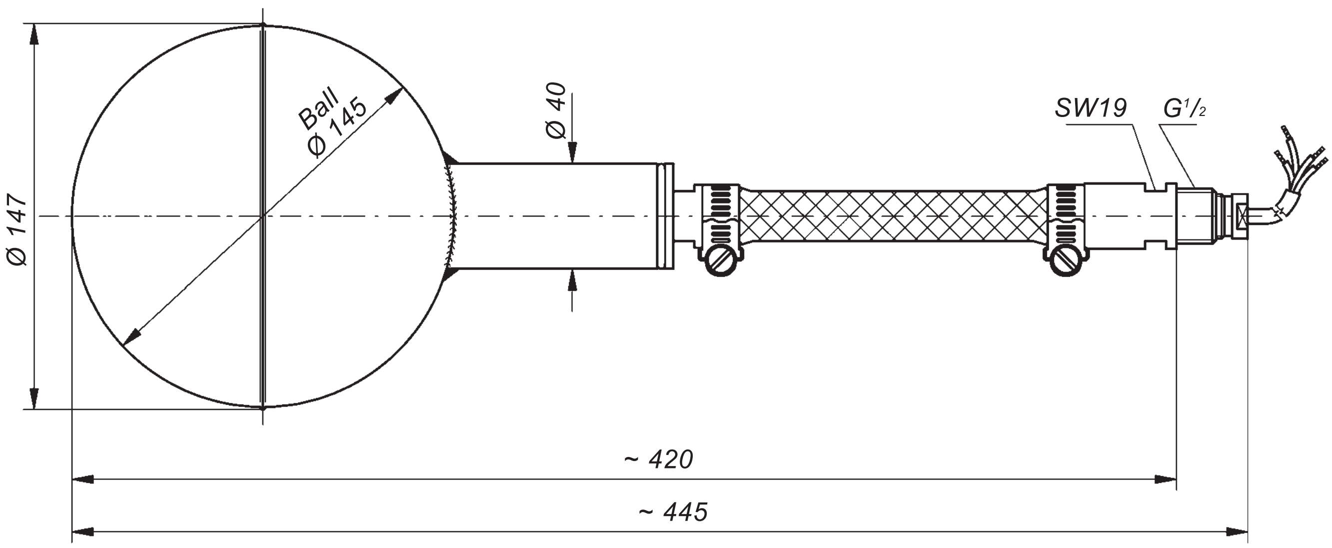
These floating switches are designed for mounting **from the side.**
To ensure a correct switching the G½ screw-in nipple must be screwed in a horizontal G½ sleeve.
These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:
The floating switch SSR 1/K/... or SSR/S1/K/... is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.
These gold-plated contacts have the following unfavourable properties:
- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SSR 1/K/... or SSR/S1/K/... with gold-plated contact and an SSR 3/K/... or SSR/S3/K/... with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:
- Floating switch is seldom in operation but should continue to work reliably even after years: SSR 1/K/... or SSR/S1/K/... .
- Floating switch is frequently in operation, is permanently in action: SSR 3/K/... or SSR/S3/K/... .

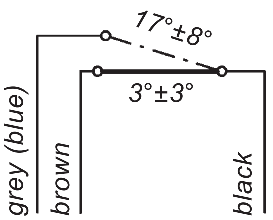
Technical data	**SSR 3/K/... SSR/S3/K/...**	**SSR 1/K/... SSR/S1/K/...**
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	stainless steel 316 Ti	
Seal material	PTFE	
Appliance protection class	in installed condition inside the tank: IP 68, on the stuffing gland screw fitting outside the tank: IP 54	
Temperature appl. range	see chart on page 1-1-14	
Max. immersion depth of the float	max. 30 metres head of water at + 20°C	
Connecting cables	see chart on page 1-1-14	
Application range of the connecting cables	**• black A05RN-F cable** **• red-brown silicone cable** **The selected connecting cable is routed through a protective bellows made of stainless steel 316 Ti to which a G½ screw-in nipple is fastened.** The selected connecting cable under the protective bellows is suitable for all liquids in which the stainless steel bellows is resistant, with a specific gravity ≥ 0.7 g/cm³	
Connecting cable length	2 metres from screw-in nipple, other cable lengths on request. **When ordering, please always state the desired cable type and cable length.**	
Optional extra	**stainless steel stirrup to limit the movement of the float**	

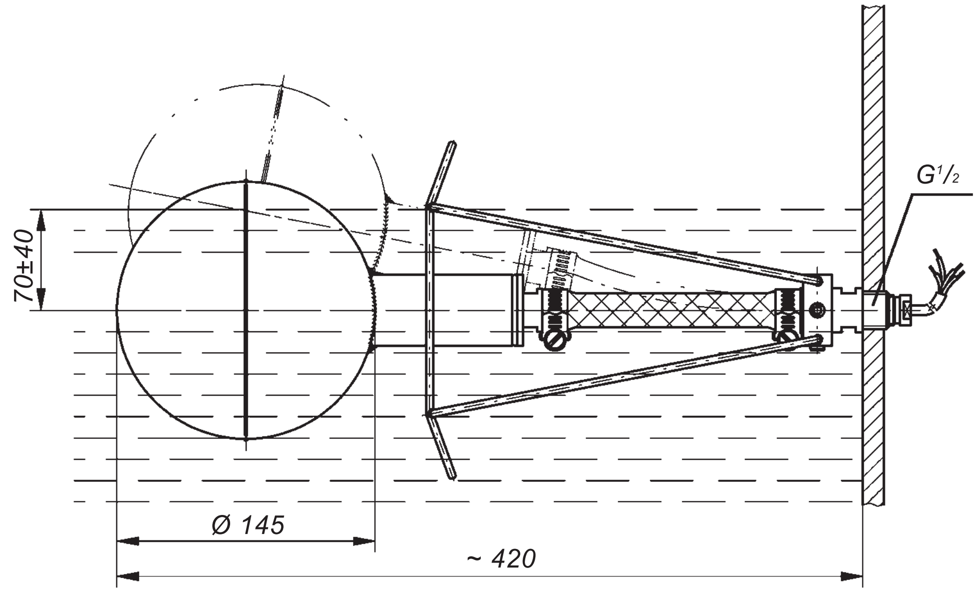
SSR 3/K/RN



Switching action in liquids with a specific gravity of 1 g/cm³ –
Diagram of SSR... with stainless steel stirrup (optional)

Contact switches over at





Types	Application	Cable	Temperature application range	VDE mark	EMC certifi-cate
List of the available SSP... floating switches					
SSP **3**/K/PVC	Application up to max. 250 V	PVC, black, 3 x 0.75	+ 8°C to + 60°C	X	X
SSP **1**/K/PVC	Light current application				X
SSP **3**/K/RN	Application up to max. 250 V	A05RN-F, grey, 3 x 0.75	0°C to + 60°C	X	X
SSP **1**/K/RN	Light current application				X
SSP/**S3**/K/SIL	Application up to max. 250 V	silicone, red-brown, 3 x 0.75	0°C to + 85°C		X
SSP/**S1**/K/SIL	Light current application				X
SSP/**S3**/K/PUR	Application up to max. 250 V	PUR, green, halogen-free, 3 x 0.5	0°C to + 85°C		X
SSP/**S1**/K/PUR	Light current application				X
SSP/**S3**/K/CM	Application up to max. 250 V	CM, black, 3 x 0.75	0°C to + 85°C		X
SSP/**S1**/K/CM	Light current application				X
List of the available SPH... floating switches					
SPH **3**/K/PVC	Application up to max. 250 V	PVC, black, 3 x 0.75	+ 8°C to + 60°C		
SPH **1**/K/PVC	Light current application				
SPH **3**/K/RN	Application up to max. 250 V	A05RN-F, grey, 3 x 0.75	0°C to + 60°C		
SPH **1**/K/RN	Light current application				
SPH/**S3**/K/SIL	Application up to max. 250 V	silicone, red-brown, 3 x 0.75	0°C to + 85°C		
SPH/**S1**/K/SIL	Light current application				
SPH/**S3**/K/PUR	Application up to max. 250 V	PUR, green, halogen-free, 3 x 0.5	0°C to + 85°C		
SPH/**S1**/K/PUR	Light current application				
SPH/**S3**/K/CM	Application up to max. 250 V	CM, black, 3 x 0.75	0°C to + 85°C		
SPH/**S1**/K/CM	Light current application				
SPH/**S3**/K/PTFE	Application up to max. 250 V	PTFE, white, 3 x 0.75	0°C to + 85°C		
SPH/**S1**/K/PTFE	Light current application				

Types	Application	Cable	Temperature application range	VDE mark	EMC certifi-cate
List of the available SSX... floating switches					
SSX **3**/K/PVC	Application up to max. 250 V	PVC, black, 3 x 0.75	+ 8°C to + 60°C	X	X
SSX **1**/K/PVC	Light current application				X
SSX **3**/K/RN	Application up to max. 250 V	A05RN-F, grey, 3 x 0.75	0°C to + 60°C	X	X
SSX **1**/K/RN	Light current application				X
SSX/**S3**/K/CM	Application up to max. 250 V	CM, black, 3 x 0.75	0°C to + 85°C		X
SSX/**S1**/K/CM	Light current application				X
SSX/**S3**/K/PTFE	Application up to max. 250 V	PTFE, white, 3 x 0.75	0°C to + 85°C		X
SSX/**S1**/K/PTFE	Light current application				X
List of the available FS... floating switches					
FS **3**/K/PVC	Application up to max. 250 V	PVC, black, 3 x 0.75	+ 8°C to + 60°C	X	X
FS **1**/K/PVC	Light current application				X
FS **3**/K/RN	Application up to max. 250 V	A05RN-F, grey, 3 x 0.75	0°C to + 60°C	X	X
FS **1**/K/RN	Light current application				X
FS/**S3**/K/SIL	Application up to max. 250 V	silicone, red-brown, 3 x 0.75	0°C to + 85°C		X
FS/**S1**/K/SIL	Light current application				X
FS/**S3**/K/PUR	Application up to max. 250 V	PUR, green, halogen-free, 3 x 0.5	0°C to + 85°C		X
FS/**S1**/K/PUR	Light current application				X
FS/**S3**/K/CM	Application up to max. 250 V	CM, black, 3 x 0.75	0°C to + 85°C		X
FS/**S1**/K/CM	Light current application				X
List of the available SSR... floating switches					
SSR **3**/K/RN	Application up to max. 250 V	A05RN-F, black, 4 G 0.75	0°C to + 70°C	X	X
SSR **1**/K/RN	Light current application				X
SSR/**S3**/K/SIL	Application up to max. 250 V	silicone, red-brown, 4 G 0.75	0°C to + 85°C		X
SSR/**S1**/K/SIL	Light current application				X

SS/PTFE 55/A ./K floating switches

These floating switches are designed for mounting **from the top.**

To ensure a correct switching the cable must be fixed at the required height using for example a fixing weight or a mounting pipe.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Please note the following:

The floating switch SS/PTFE 55/A 1/K is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

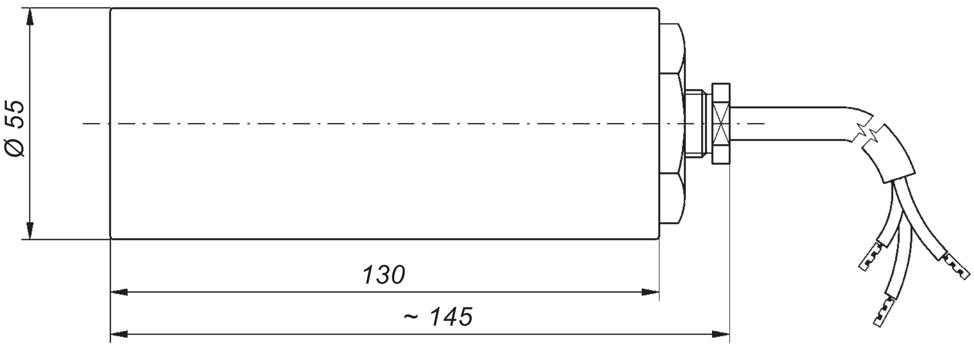
- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SS/PTFE 55/A 1/K with gold-plated contact and an SS/PTFE 55/A 3/K with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

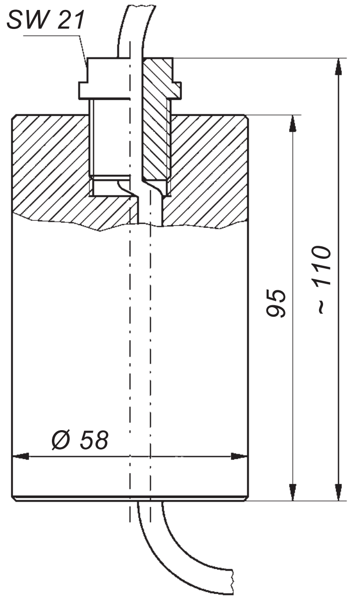
- Floating switch is seldom in operation but should continue to work reliably even after years: SS/PTFE 55/A 1/K.
- Floating switch is frequently in operation, is permanently in action: SS/PTFE 55/A 3/K.

Technical data	SS/PTFE 55/A 3/K	SS/PTFE 55/A 1/K
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PTFE	
Seal material	FPM	
Float protection class	IP 68	
Temperature appl. range	0°C to + 85°C	
Max. immersion depth of the float	max. 3 metres head of water at + 20°C	
Application range	in liquids with a specific gravity ≥ 1.0 g/cm³	
Connecting cable	white PTFE cable, 3 x 0.75	
Connecting cable length	2 metres, other cable lengths on request. **When ordering, please always state the desired cable length.**	
Optional extra	**fixing weight made of PTFE**	

SS/PTFE 55/A ./K

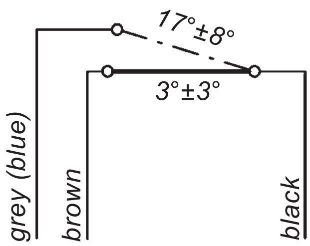


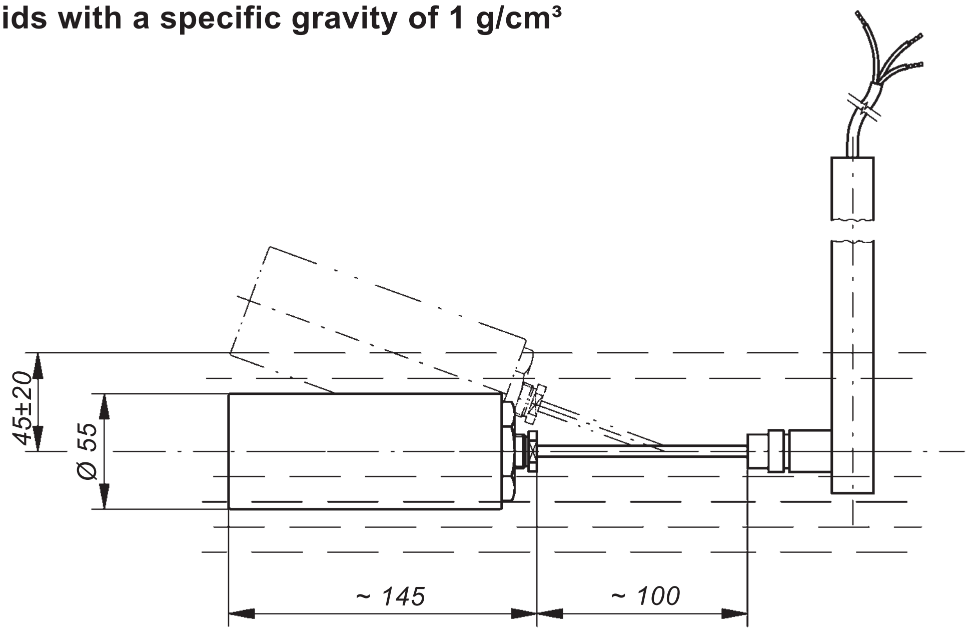
Optional extra: fixing weight made of PTFE



Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at





SS/PTFE 55/./K floating switches

These floating switches are designed for mounting **from the side.**

To ensure a correct switching the G½ (G2) screw-in nipple must be screwed in a horizontal G½ (G2) sleeve.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

<u>Please note the following:</u>

The floating switch SS/PTFE 55/1/K is equipped with a gold-plated crosspoint contact. One of the characteristic properties of gold-plated contacts is that they can reliably switch the smallest voltages and smallest currents, even after extremely long standstill times.

These gold-plated contacts have the following unfavourable properties:

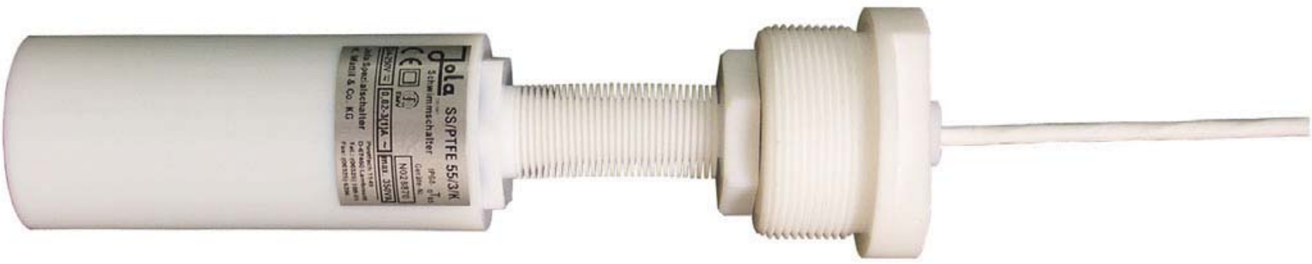
- The gold layer may become burnt off even after just one-off overload. If this happens, the contact loses its ability to reliably switch the smallest voltages and smallest currents.
- Extremely frequent switching actions can also impair or destroy the gold layer, leading to the same effects as outlined above.

If you need to choose between an SS/PTFE 55/1/K with gold-plated contact and an SS/PTFE 55/3/K with AgNi contact for an AC/DC 24 V application, your choice should be based on the following criteria:

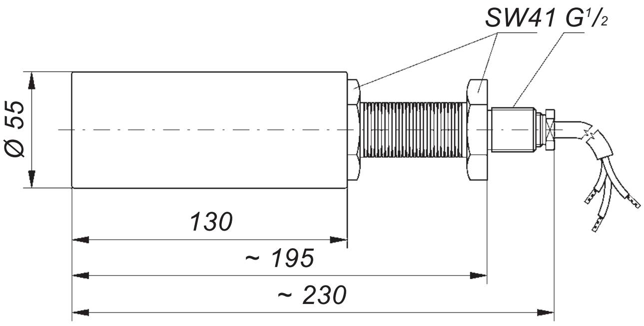
- Floating switch is seldom in operation but should continue to work reliably even after years: SS/PTFE 55/1/K.
- Floating switch is frequently in operation, is permanently in action: SS/PTFE 55/3/K.

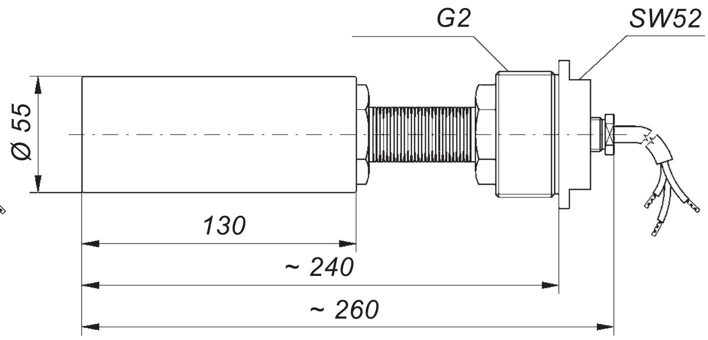
Technical data	**SS/PTFE 55/3/K**	**SS/PTFE 55/1/K**
Application	standard application	light current application
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 350 VA	max. 4 VA
Operating principle	ball-operated microswitch, potential-free changeover contact	
Options for safety appl.	——	see page 1-1-27
Recommended appl.	——	via Jola protection relay KR ..
Float material	PTFE	
Seal material	FPM	
Appliance protection class	in installed condition inside the tank: IP 68, on the stuffing gland screw fitting outside the tank: IP 54	
Temperature appl. range	0°C to + 85°C	
Max. immersion depth of the float	max. 1 metre head of water at + 20°C	
Application range	in liquids with a specific gravity ≥ 1.0 g/cm³	
Connecting cable	white PTFE cable, 3 x 0.75 **The connecting cable is routed through a protective bellows made of PTFE to which a G½ screw-in nipple made of PTFE is fastened.**	
Connecting cable length	2 metres from screw-in nipple, other cable lengths on request. **When ordering, please always state the desired cable length.**	
Optional extra	**G2 screw-in nipple in place of G½ nipple for installation from the outside through the tank wall**	

SS/PTFE 55/./K



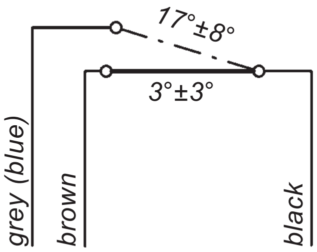
SS/PTFE 55/./K
with G2 screw-in nipple (optional)

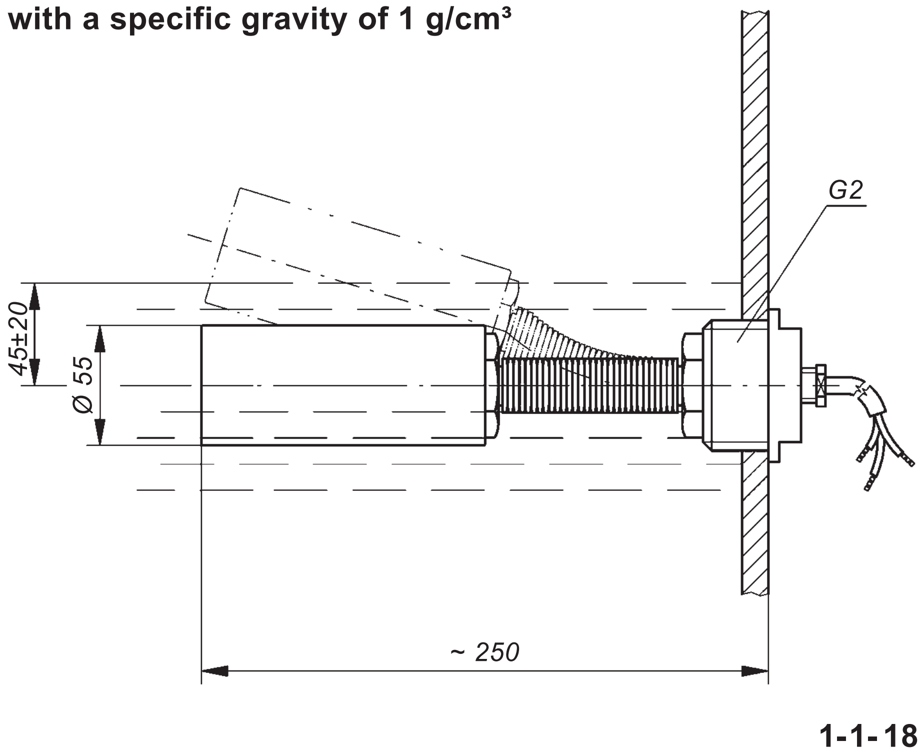




Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at

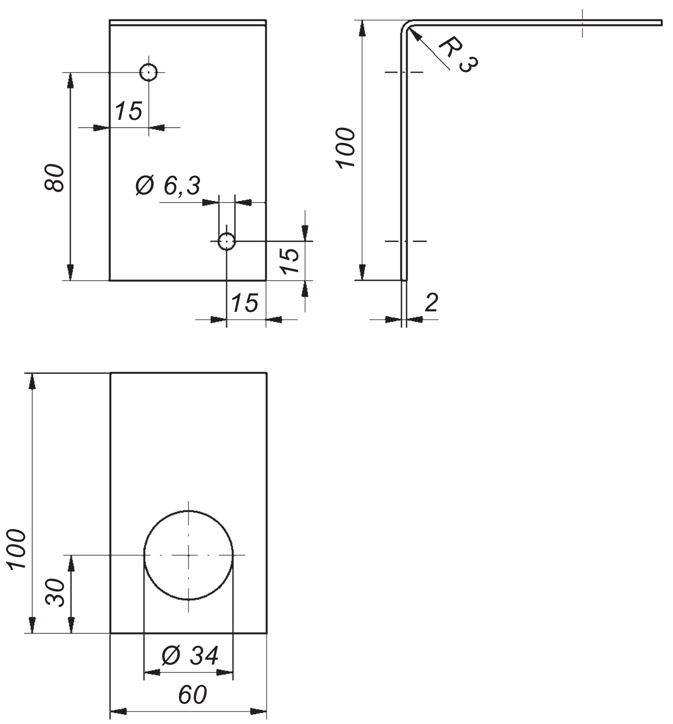




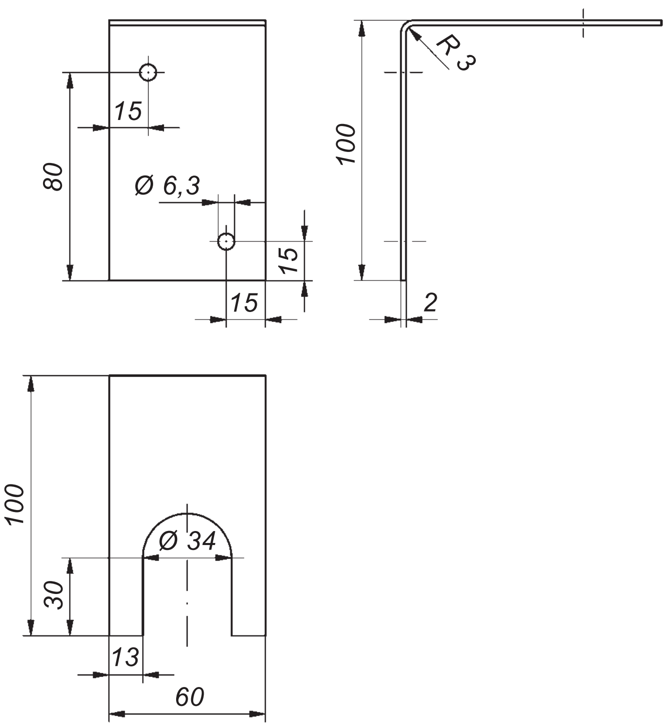
Further mounting accessories

Mounting bracket made of stainless steel 316 Ti for G1 stuffing gland (fixing of the G1 stuffing gland via G1 counternut)

MW 100x100x60/G1/B

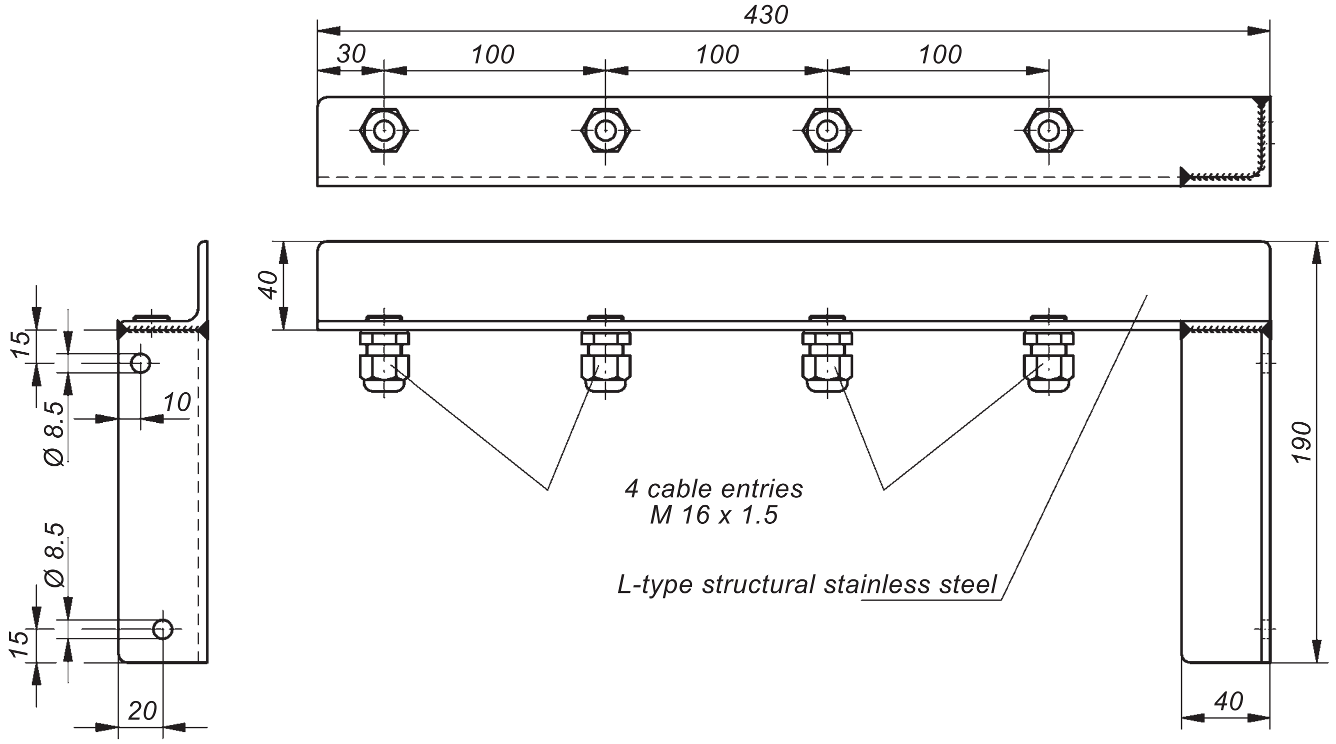


MW 100x100x60/G1/L



Mounting bracket with 4 cable entries made of nickel-plated brass (on request made of PP or stainless steel) suitable for 4 floating switches

MW 190x430x40/4xM16-Ms



Further mounting brackets see page 16-1-0 ff.

MW 190x430x40/4xM16-PP
with 4 cable entries made of PP and
with 4 SSX-type floating switches
with internal fixing weight

TSV/... level monitors

with mounted floating switch SSP...

Probe tube in terminal box / screw-in nipple adjustable

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**TSV/PP/SSP ./K/...**	**TSV/E/SSP ./K/...**
Probe tube material	PP	stainless steel 316 Ti
Probe tube diameter	12 mm	12 mm
Probe tube length	approx. 500 mm, longer on request	
Screw-in nipple	PP, G1	stainless steel 316 Ti, G1
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP 54	
Mounting orientation	vertical	
Temperature appl. range	depends on the type of cable used, see chart on page 1-1-13	
Pressure resistance	for pressureless applications only	
Mounted floating switch	**SSP••• (see pages 1-1-3, 1-1-4 and 1-1-13)**	
Electrical data	see technical data on pages 1-1-3, 1-1-4 and 1-1-13	

. = to be specified: 3 or 1 (for type SSP 3/K/... or SSP 1/K/...); see page 1-1-3
... = to be specified according to the list of types on page 1-1-13

TS/O/... immersion probes

with mounted floating switches SSP...

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Functional description based on a switching example:

Automatic filling of a tank

The bottom floating switch falls together with the liquid to a minimum level and acts on the contactor coil winding when it falls below the horizontal. Liquid is then pumped into the tank. When the maximum level is reached, the top floating switch rises above the horizontal, the contactor holding circuit is interrupted, and the filling process is stopped.

Technical data	TS/O/...
Probe tube material	PP
Probe tube diameter	depends on the type and number of switches
Probe tube length	according to customer's specifications
Screw-in nipple (on request)	PP; flange on request
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP 65, for max. 12 terminals; for more than 12 terminals: polyester, A 113, 160 x 160 x 90 mm, protection class IP 65
Mounting orientation	vertical
Temperature appl. range	from 0°C or + 8°C to + 60°C or + 85°C (depends on the type of cable used, see page 1-1- 13)
Pressure resistance	for pressureless applications only
Mounted floating switches	**SSP••• (please always state when ordering)**
Electrical data	see technical data on pages 1-1- 3 ff.

Type designation	No. of mounted floating switches	Type of mounted floating switches	Probe tube diameter	Screw-in nipple (on request)
TS/O/1 x SSP•••	1	SSP••• **(please always state when ordering)**	16 mm	G1 1/2 or G2
TS/O/2 x SSP•••	2		20 mm	G2
TS/O/3 x SSP•••	3		25 mm	G2
TS/O/4 x SSP•••	4		25 mm	G2
TS/O/5 x SSP•••	5		25 mm	G2

••• = to be specified, see chart on page 1-1-13

On request:
- **with more than 5 mounted floating switches**
- **with adjustable screw-in nipple**

The above equipment will be manufactured in accordance with customer's specifications.

For enquiries or orders, please complete the questionnaire on page 1-1-25 or 1-1-26 (as applicable).

TS/... immersion probes

with mounted floating switches SSX..., SSR... or SS/PTFE 55/./K

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Mode of operation:
see example on page 1-1-22.

TS/E/1 x SSR …
with stainless steel stirrup to limit float movement and with cable in place of terminal box

Technical data	**TS/PP/...**	**TS/G/...**	**TS/E/...**	**TS/PTFE/...**
Probe tube material	PP	stainless steel 316 Ti		PTFE
Probe tube dia.	see chart on page 1-1-24			
Probe tube length	according to customer's specifications			
Option: flange	on request, but making allowance for the installation dimensions of the mounted floating switches			
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP 65, for max. 9 terminals	cast aluminium, A 119, 125 x 80 x 60 mm, protection class IP 65, for max. 12 terminals		PP, A 307, 120 x 80 x 55 mm, protection class IP 65, for max. 9 terminals
	for more than 9 or 12 terminals: polyester, A 113, or cast aluminium, A 113b, each 160 x 160 x 90 mm, protection class IP 65; on request: with free connecting cable			
Mounting orientation	vertical			
Temperature application range	depends on the type of cable used, see page			
	1-1-14	1-1-14	1-1-14	1-1-17
Pressure resistance	for pressureless applications only			
Mounted floating switches	**SSX•••**	**SSX•••**	**SSR•••**	**SS/PTFE 55/•/K**
Electrical data	see technical data on page			
	1-1-7	1-1-7	1-1-11	1-1-17

Suitable for types on pages 1-1-23 and 1-1-24:
••• = to be specified according to the list of types on page 1-1-14
• = to be specified: 3 or 1 (for type ... 3/K or ... 1/K); see page 1-1-17

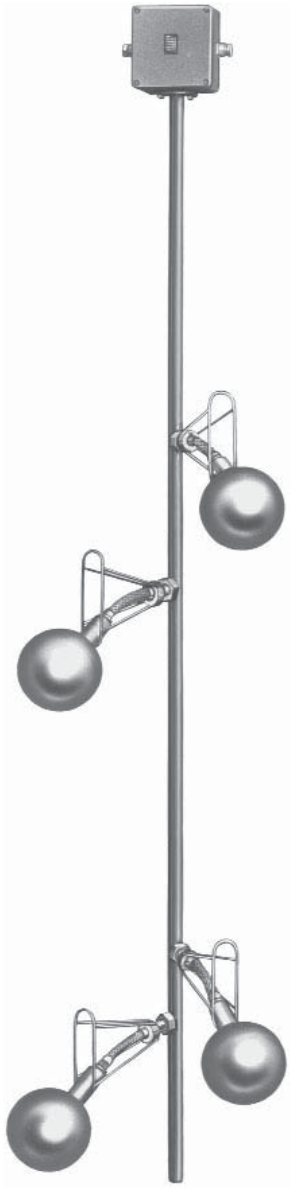
On request **TS/PTFE/... with screw-in nipple G2 for mounting from inside the container** (the terminal box has to be removed prior to mounting and then fixed back in place).

The above equipment will be manufactured in accordance with customer's specifications.

For enquiries or orders, please complete the questionnaire on page 1-1-25 or 1-1-26 (as applicable).

Type designation	No of mounted floating switches	Type of mounted floating switches	Probe tube diameter
TS/PP/1 x SSX••• TS/PP/2 x SSX••• TS/PP/3 x SSX••• TS/PP/4 x SSX••• TS/PP/5 x SSX•••	1 2 3 4 5	SSX••• **(please always state when ordering)**	32 mm
TS/G/1 x SSX••• TS/G/2 x SSX••• TS/G/3 x SSX••• TS/G/4 x SSX••• TS/G/5 x SSX•••	1 2 3 4 5	SSX••• **(please always state when ordering)**	28 mm 28 mm 34 mm 34 mm 34 mm
TS/E/1 x SSR••• TS/E/2 x SSR••• TS/E/3 x SSR••• TS/E/4 x SSR••• TS/E/5 x SSR•••	1 2 3 4 5	SSR••• with stirrup **(please always state when ordering)**	28 mm 28 mm 34 mm 34 mm 34 mm
TS/PTFE/1 x SS/PTFE 55/•/K TS/PTFE/2 x SS/PTFE 55/•/K TS/PTFE/3 x SS/PTFE 55/•/K TS/PTFE/4 x SS/PTFE 55/•/K TS/PTFE/5 x SS/PTFE 55/•/K	1 2 3 4 5	SS/PTFE 55/•/K **(please always state when ordering)**	27 mm

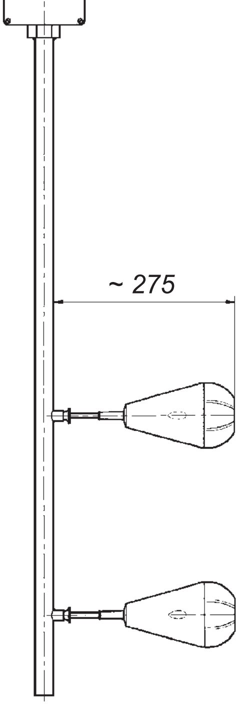
On request also with more than 5 mounted floating switches.



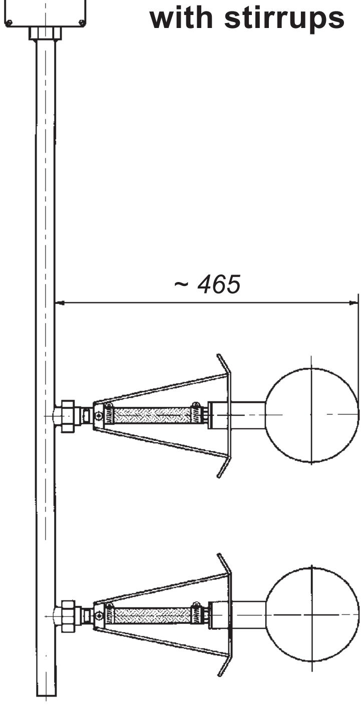
TS/E/4 x SSR...
with stirrups

Design examples

TS/G/2 x SSX...



TS/E/2 x SSR...
with stirrups



TS/PTFE/2 x SS/PTFE 55/./K
with mounting flange

Questionnaire for enquiries and orders
for immersion probes with screw-in nipple or flange

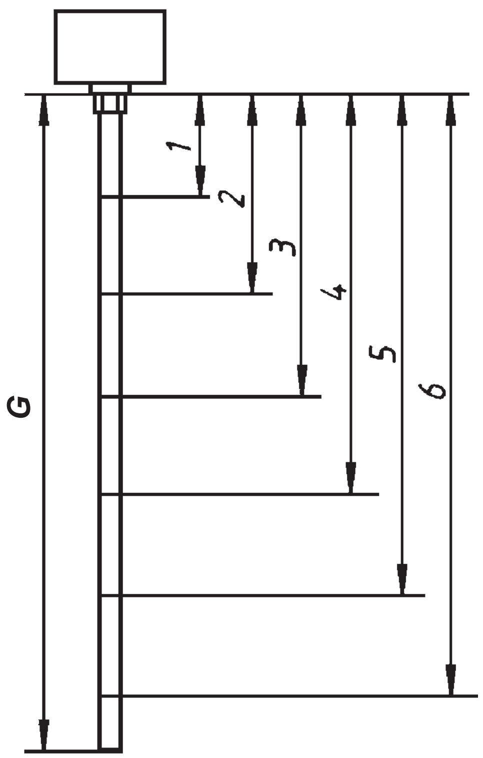
Desired switching functions (indication max., min., pump or valve ON – OFF, filling or emptying, dry-run or overflow protection): ______________________

Tank dimensions and installation conditions (sketch if applicable): ______________________

Type of liquid: ______________________ Specific gravity: __________

Viscosity: __________ Temperature: __________ Operating pressure: __________

Desired immersion probe type: TS/



When planning the design of the immersion probes, please consider that **when the liquid level rises,** the contact of the floating switches is not activated when the floating switches reach the horizontal position, but is activated as depicted in the diagrams of the various floating switches on pages 1-1-3 and following.
When the liquid level sinks, the contact of the floating switches is activated **shortly below their horizontal position.**

	Desired floating switch type	*Distance from sealing surface of screw-in nipple or flange in mm*	*Switching function (e.g. high alarm, pump ON, pump OFF etc.)*	*Working direction of the floating switch: rising = ↑ falling = ↓*
1				
2				
3				
4				
5				
6				

Desired options:

Questionnaire for enquiries and orders
for immersion probes w i t h o u t screw-in nipple or flange

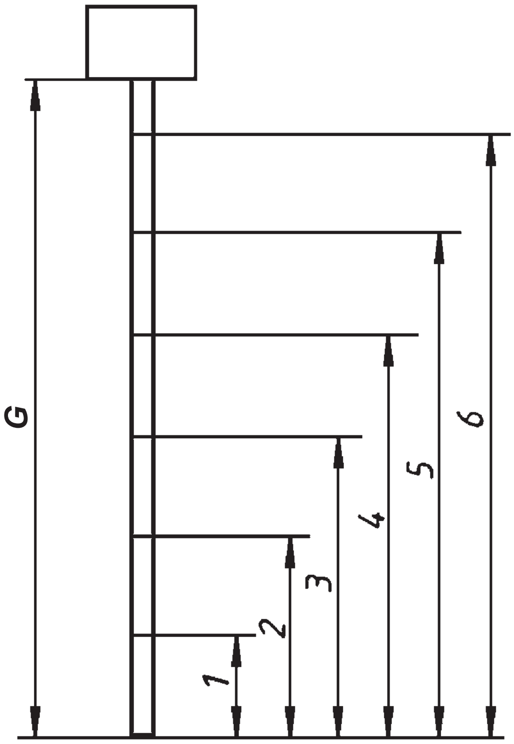
Desired switching functions (indication max., min., pump or valve ON – OFF, filling or emptying, dry-run or overflow protection): ______________________

Tank dimensions and installation conditions (sketch if applicable): ______________________

Type of liquid: ______________________ Specific gravity: __________

Viscosity: __________ Temperature: __________ Operating pressure: __________

Desired immersion probe type: TS/...



When planning the design of the immersion probes, please consider that **when the liquid level rises,** the contact of the floating switches is not activated when the floating switches reach the horizontal position, but is activated as depicted in the diagrams of the various floating switches on pages 1-1-3 and following.
When the liquid level sinks, the contact of the floating switches is activated **shortly below their horizontal position.**

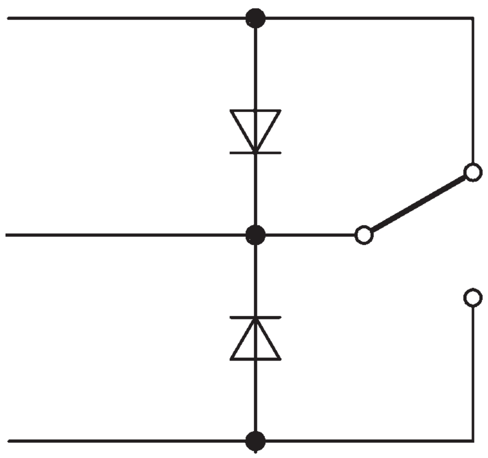
	Desired floating switch type	*Distance from end of probe tube in mm*	*Switching function (e.g. high alarm, pump ON, pump OFF etc.)*	*Working direction of the floating switch: rising = ↑ falling = ↓*
1				
2				
3				
4				
5				
6				

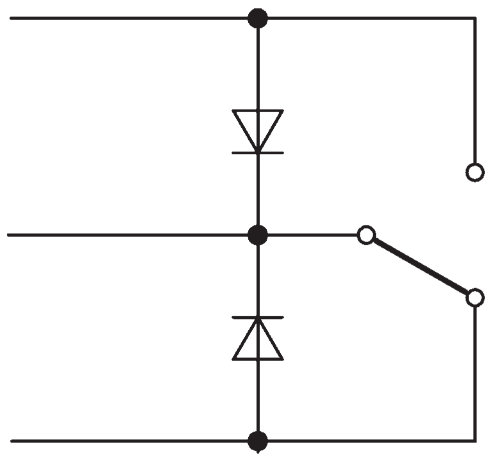
Desired options:

Options for safety applications suitable for ..... 1/K/... floating switches

Variant 1:

Two (2) diodes of the type 1N4004 or equivalent



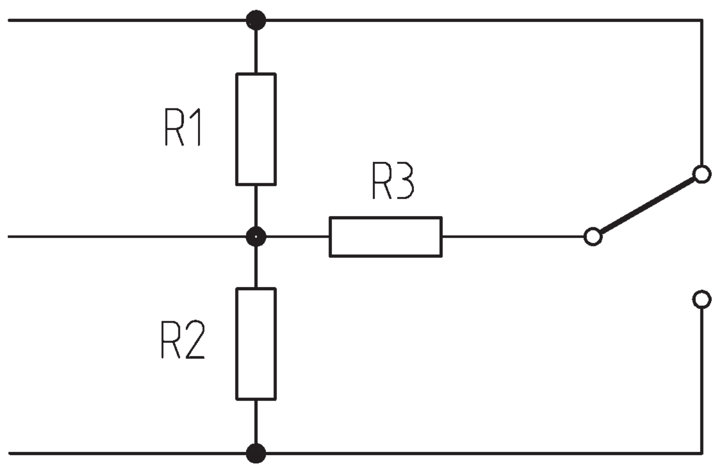


Variant 2:

Two (2) metal film resistors or carbon film resistors R 1, R 2,
each greater than or equal to 2 kΩ,
each P greater than or equal to 1/4 W

and

one (1) metal film resistor or carbon film resistor R 3
greater than or equal to 330 Ω,
P greater than or equal to 1 W



Ex floating switches
and
Ex immersion probes

Controlling devices with ball-operated microswitch, for signalling or regulation of liquid levels

Jola Spezialschalter GmbH & Co. KG
Klostergartenstr. 11 • 67466 Lambrecht (Germany)
Tel. +49 6325 188-01 • Fax +49 6325 6396
contact@jola-info.de • www.jola-info.de

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Contents

Floating switches :

Type	Housing material	Dimensions approx.	Special feature	Page
SI/SSP/NL/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb	PP	Ø 29 x 133 mm	---	1-2-3
SI/SPH/NL/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb	PP	Ø 86 mm	---	1-2-5
SI/SSX/LF/20/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb	antistatic (conductive) PP	Ø 98 x 165 mm	optionally with internal fixing weight	1-2-7
SI/SSX/LF/4/1/K/PURLF/ Variant 0 ⟨Ex⟩ I M2 / II 1 G Ex ia I Mb / Ex ia IIC T6 Ga	antistatic (conductive) PP	Ø 98 x 165 mm	optionally with internal fixing weight	1-2-9
SI/FS/NL/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIA T6 Gb	PP	46 x 74 x 110 mm	with internal fixing weight	1-2-11
SI/SSR/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb	stainless steel 316 Ti	Ø 147 x 445 mm	with protective bellows made of stainless steel 316 L	1-2-13

SI/SSP/NL/1/K/.../Variant 0
Ⓔx I M2 / II 2 G
Ex ia I Mb / Ex ia IIB T6 Gb
floating switches

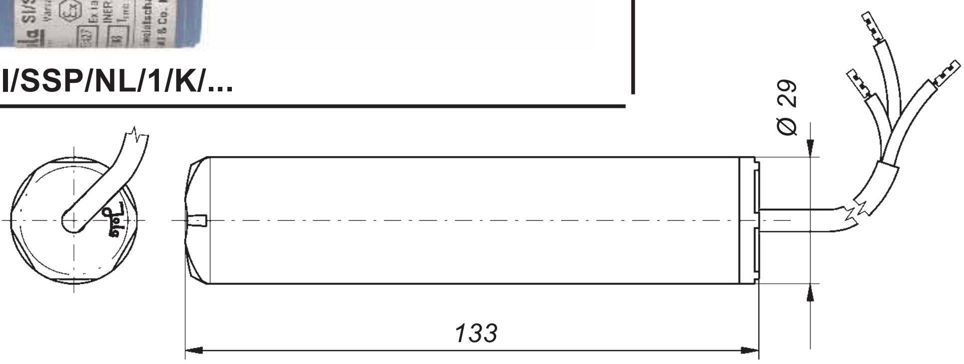
For mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height:
- using a stuffing gland, for example, in the case of mounting from the side or
- using a fixing weight, for example, in the case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SI/SSP/NL/1/K/.../Variant 0 Ⓔx I M2 / II 2 G ...**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	PP
Seal material	FPM; on request: EPDM
Float protection class	IP68
Max. immersion depth of the float	max. 10 metres head of water at + 20°C
Connecting cable / application range / temperature range	• **black PVC cable, 3 x 0.75 (SI/SSP/NL/1/K/PVC/...):** for use in: water / used water / slightly aggressive liquids / oils without aromatic additives / fuel oil and diesel fuel, specific gravity: ≥ 0.82 g/cm³, T: between + 8°C and + 60°C • **grey A05RN-F cable, 3 x 0.75 (SI/SSP/NL/1/K/RN/...):** for use in: water / used water / slightly aggressive liquids, specific gravity: ≥ 0.82 g/cm³, T: between 0°C and + 60°C • **red-brown silicone cable** (with low mechanical strength), **3 x 0.75 (SI/SSP/NL/1/K/SIL/...):** for use in: water / certain other liquids, specific gravity: ≥ 0.82 g/cm³, T: between 0°C and + 60°C • **green halogen-free PUR cable, 3 x 0.5 (SI/SSP/NL/1/K/PUR/...):** for use in: water / used water / slightly aggressive liquids / some oils without aromatic additives, specific gravity: ≥ 0.82 g/cm³, T: between 0°C and + 60°C • **black CM cable, 3 x 0.75 (SI/SSP/NL/1/K/CM/...):** for use in: water / certain acids / certain lyes, specific gravity: ≥ 1 g/cm³, T: between 0°C and + 60°C
Connecting cable length	1 metre, other cable lengths on request **When ordering, please state cable type and length.**

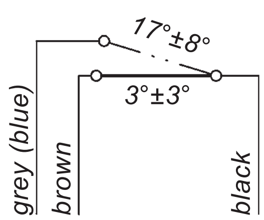
SI/SSP/NL/1/K/...

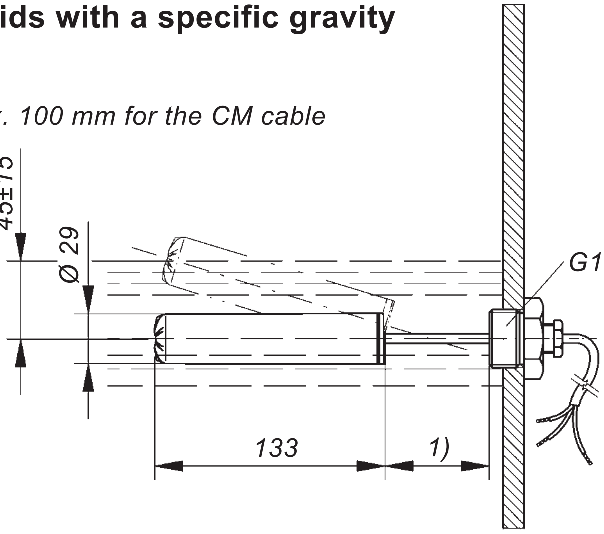


Switching action in liquids with a specific gravity of 1 g/cm³

1) approx. 60 mm, but approx. 100 mm for the CM cable

Contact switches over at





Mounting accessories (option)

Stuffing gland <u>without</u> potential equalisation terminal

Mounting possible only **from the inside of a tank**:
- G1/2 stuffing gland made of PP

Mounting possible **from the outside of a tank**:
- G1 stuffing gland made of PP

Stuffing gland <u>with</u> potential equalisation terminal

Mounting possible only **from the inside of a tank**:
- G1/2 stuffing gland made of stainless steel 316 Ti

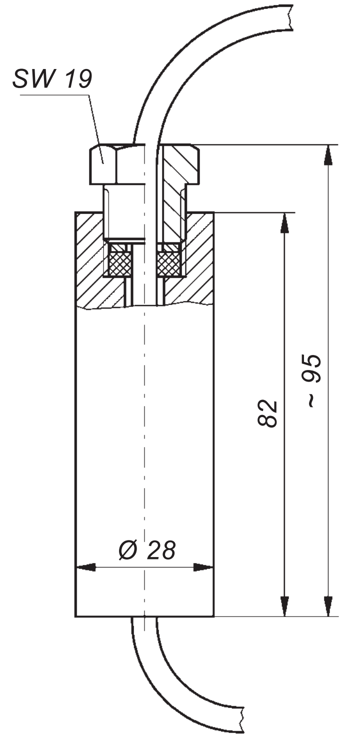
Mounting possible **from the outside of a tank**:
- G1 stuffing gland made of stainless steel 316 Ti

Stuffing gland G1 made of

PP

stainless steel

FG 28x82/Ex or FG 28x82/PP/Ex fixing weight made of PP, only for use in the potentially explosive atmospheres zone 1 and 2 with gases of groups IIA and IIB, without potential equalisation terminal



SI/SPH/NL/1/K/.../Variant 0
Ⓔx I M2 / II 2 G
Ex ia I Mb / Ex ia IIB T6 Gb
floating switches

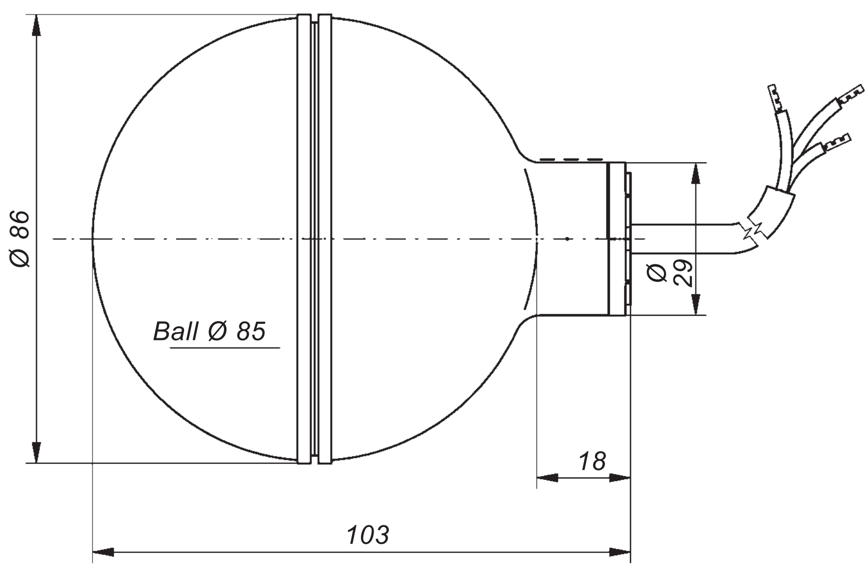
For mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height:
- using a stuffing gland, for example, in the case of mounting from the side or
- using a fixing weight, for example, in the case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

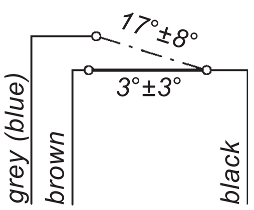
Technical data	**SI/SPH/NL/1/K/.../Variant 0 Ⓔx I M2 / II 2 G ...**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	PP
Seal material	FPM; on request: EPDM
Float protection class	IP68
Max. immersion depth of the float	max. 10 metres head of water at + 20°C
Connecting cable / application range / temperature range	• **black PVC cable, 3 x 0.75 (SI/SPH/NL/1/K/PVC/...):** for use in: water / used water / slightly aggressive liquids / oils without aromatic additives / fuel oil and diesel fuel, specific gravity: ≥ 0.7 g/cm³, T: between + 8°C and + 60°C • **grey A05RN-F cable, 3 x 0.75 (SI/SPH/NL/1/K/RN/...):** for use in: water / used water / slightly aggressive liquids, specific gravity: ≥ 0.7 g/cm³, T: between 0°C and + 60°C • **red-brown silicone cable** (with low mechanical strength), **3 x 0.75 SI/SPH/NL/1/K/SIL/...):** for use in: water / certain other liquids, specific gravity: ≥ 0.7 g/cm³, T: between 0°C and + 60°C • **green halogen-free PUR cable, 3 x 0.5 (SI/SPH/NL/1/K/PUR/...):** for use in: water / used water / slightly aggressive liquids / certaines oils without aromatic additives, specific gravity: ≥ 0.7 g/cm³, T: between 0°C and + 60°C • **black CM cable, 3 x 0.75 (SI/SPH/NL/1/K/CM/...):** for use in: water / certain acids / certain lyes, specific gravity: ≥ 0.8 g/cm³, T: between 0°C and + 60°C • **white PTFE cable, 3 x 0.75 (SI/SPH/NL/1/K/PTFE/...):** for use in: suitable for all liquids in which the float material PP and the seal material FPM or EPDM are also resistant, specific gravity: ≥ 0.8 g/cm³, T: between 0°C and + 60°C
Connecting cable length	1 metre, other cable lengths on request **When ordering, please state cable type and length.**

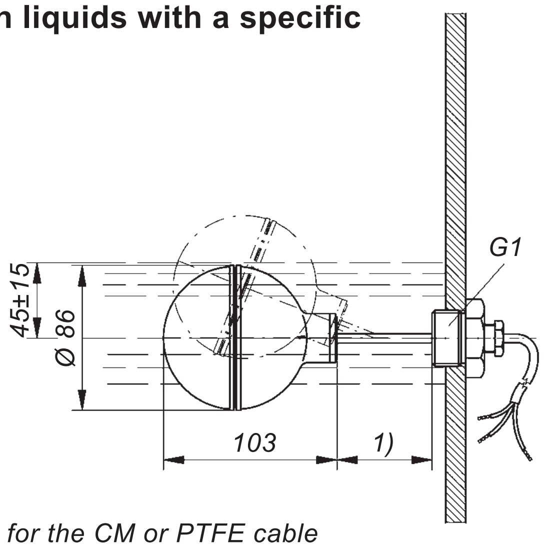
SI/SPH/NL/1/K/...



Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at

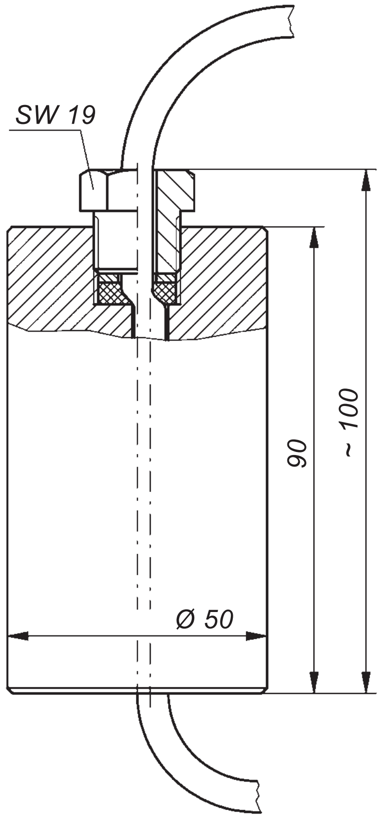




*1) approx. 60 mm,
but approx. 100 mm for the CM or PTFE cable*

Mounting accessory part (option):

**FG 50x90/Ex or
FG 50x90/PP/Ex
fixing weight
made of PP,
only for use in the
potentially explosive
atmospheres
zone 1 and 2
with gases of group IIA,
without potential
equalisation terminal**



SI/SSX/LF/20/1/K/.../Variant 0
Ex I M2 / II 2 G
Ex ia I Mb / Ex ia IIC T6 Gb
floating switches

For mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height:
• using a stuffing gland, for example, in the case of mounting from the side or
• using a fixing weight, for example, in the case of mounting from the top.

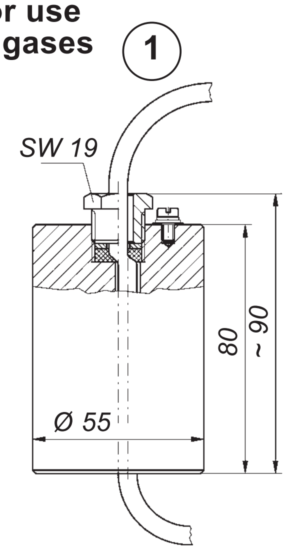
These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SI/SSX/LF/20/1/K/.../Variant 0 Ex I M2 / II 2 G ...**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	antistatic (conductive) PP
Seal material	FPM; on request: EPDM
Float protection class	IP68
Max. immersion depth of the float	max. 10 metres head of water at + 20°C
Connecting cable / application range / temperature range	• **black TPK cable, 4 G 0.75 (SI/SSX/LF/20/1/K/TPK/...):** for use in: water / used water / slightly aggressive liquids, specific gravity: ≥ 0.7 g/cm³, T: between 0°C and + 60°C • **black CM cable, 4 G 0.75 (SI/SSX/LF/20/1/K/CM/...):** for use in: water / certain acids / certain lyes, specific gravity: ≥ 0.8 g/cm³, T: between 0°C and + 60°C • **white PTFE cable, 4 G 0.75 (SI/SSX/LF/20/1/K/PTFE/...):** for use in: all liquids in which the float material PP and the seal material FPM or EPDM are also resistant, specific gravity: ≥ 0.8 g/cm³, T: between 0°C and + 60°C
Connecting cable length	2 metres, other cable lengths on request **When ordering, please state cable type and length.**
Mounting accessories (option)	• **external fixing weights** for liquids with a specific gravity ≥ 0.7 g/cm³: see page 1-2-8 • **IG internal fixing weight (integrated in the float)** for liquids with a specific gravity between 0.95 and 1.05 g/cm³

Mounting accessories (option)

1 **FG 55x80/Ex or FG 55x80/E/Ex external fixing weight made of stainless steel 316 Ti, for use in the potentially explosive atmospheres zone 1 and 2 with gases of groups IIA, IIB and IIC, with potential equalisation terminal**

2 **FG 71x104/PP/Ex external fixing weight made of PP, only for use in the potentially explosive atmospheres zone 1 and 2 with gases of group IIA, without potential equalisation terminal**

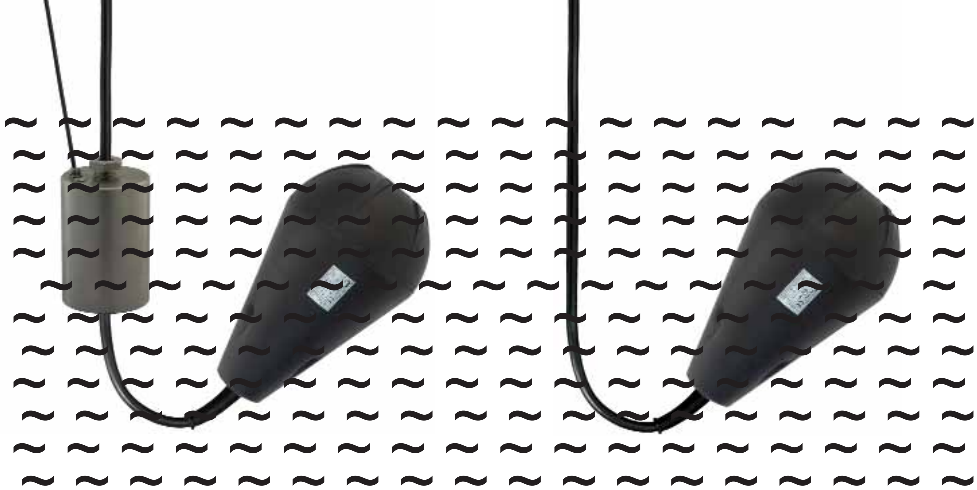


Switching action of the SI/SSX/LF/20/1/K/... with external fixing weight made of stainless steel (optional)

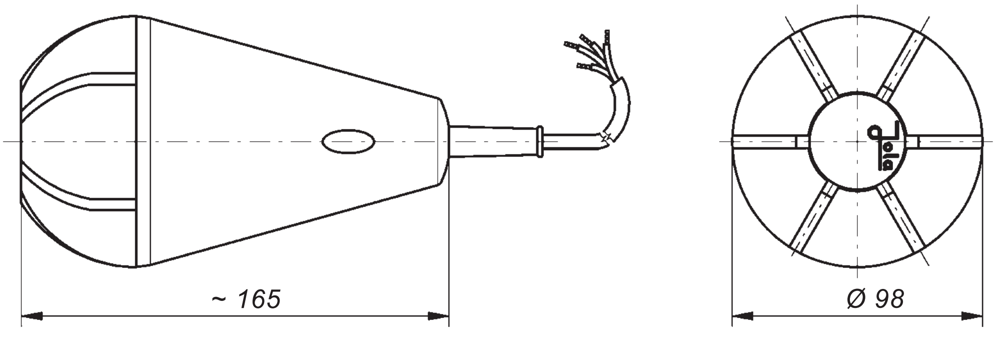
(idealized representation)

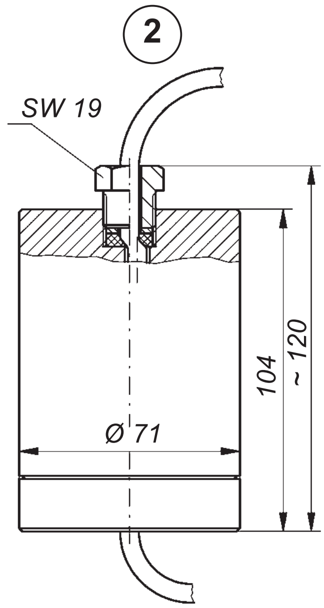
Switching action of the SI/SSX/LF/20/1/K/... with internal fixing weight (optional)

(idealized representation)



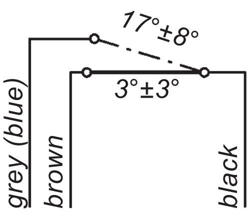
***) potential equalisation cable**

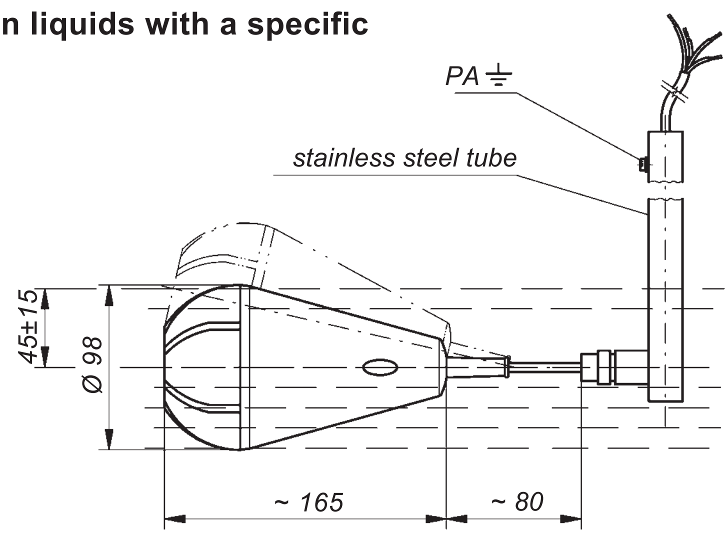




Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at





SI/SSX/LF/4/1/K/PURLF/Variant 0
Ex I M2 / II 1 G
Ex ia I Mb / Ex ia IIC T6 Ga
floating switch

For mounting **from the side or from the top.**

To ensure a correct switching the cable must be fixed at the required height:
• using a stuffing gland, for example, in the case of mounting from the side or
• using a fixing weight, for example, in the case of mounting from the top.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	SI/SSX/LF/4/1/K/PURLF/Variant 0 Ex I M2 / II 1 G ...
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 0, 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	antistatic (conductive) PP
Seal material	FPM; on request: EPDM
Float protection class	IP68
Max. immersion depth of the float	max. 10 metres head of water at + 20°C
Connecting cable / application range / temperature range	**• black antistatic PURLF cable (with external conductive PUR sheath) 4 G 0.75 (with 3 wires for the changeover contact and 3 drain wires which are twisted together for use as potential equalisation cable):** for use in: water / used water / slightly aggressive liquids, specific gravity: ≥ 0.7 g/cm³, T: between 0°C and + 60°C
Connecting cable length	2 metres, other cable lengths on request **When ordering, please state the desired length.**
Mounting accessories (option)	**• FG 55x93/Ex/KLF or FG 55x93/E/KLF/Ex external fixing weight made of stainless steel 316 Ti** for liquids with a specific gravity ≥ 0.7 g/cm³ **• IG internal fixing weight (integrated in the float)** for liquids with a specific gravity between 0.95 and 1.05 g/cm³

Mounting accessory part (option):
FG 55x93/Ex/KLF or FG 55x93/E/KLF/Ex external fixing weight made of stainless steel 316 Ti, for use in the potentially explosive atmospheres zone 0, 1 and 2 with gases of groups IIA, IIB and IIC, without potential equalisation terminal

When using the SI/SSX/LF/4/1/K/PURLF/... floating switch fitted with antistatic cable (with external conductive sheath) with a FG 55x93/Ex/KLF or FG 55x93/E/KLF/Ex fixing weight, the antistatic cable is sufficient to shunt the electrostatic charge.

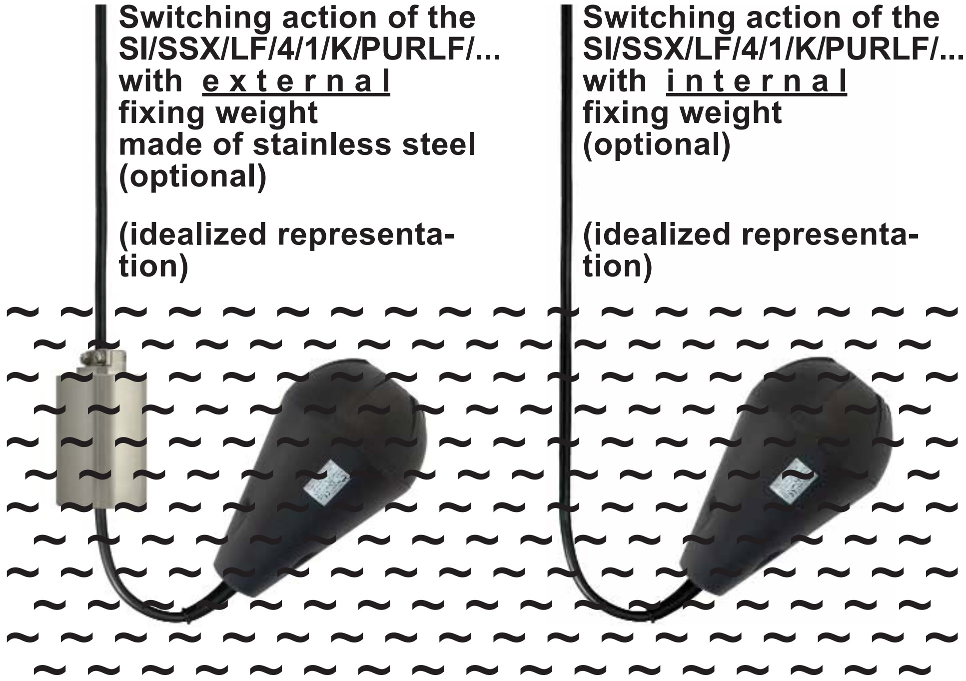
The fixing element of the FG 55x93/Ex/KLF or FG 55x93/E/KLF/Ex fixing weight which is specially designed to be used with a SI/SSX/LF/4/1/K/PURLF/... floating switch with antistatic cable (with external conductive sheath) must be set using the two screws in such a way that the fixing weight keeps perfectly its position.

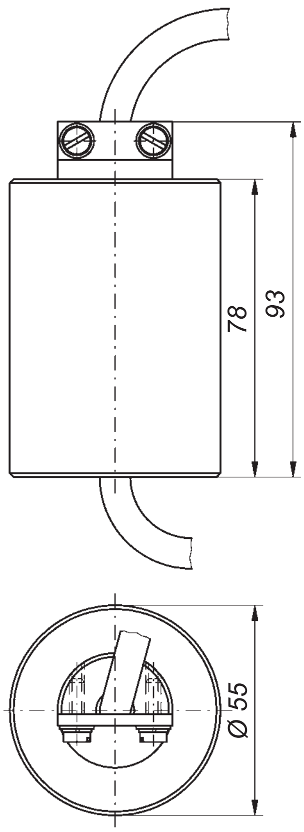
Switching action of the SI/SSX/LF/4/1/K/PURLF/... with external fixing weight made of stainless steel (optional)

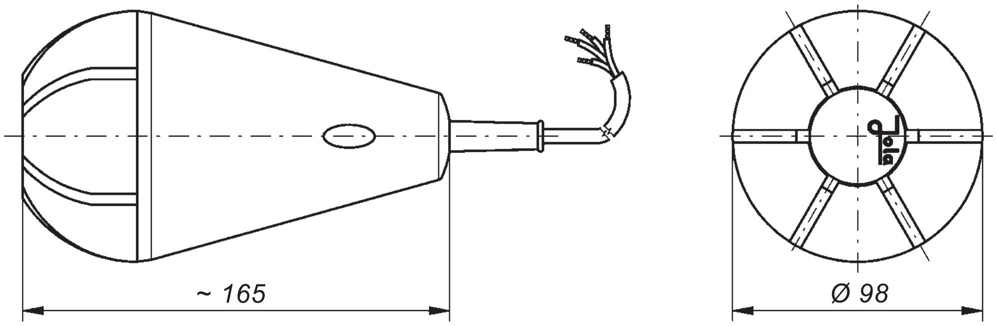
(idealized representation)

Switching action of the SI/SSX/LF/4/1/K/PURLF/... with internal fixing weight (optional)

(idealized representation)

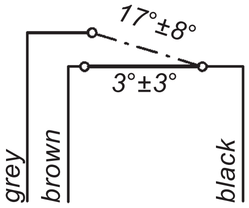


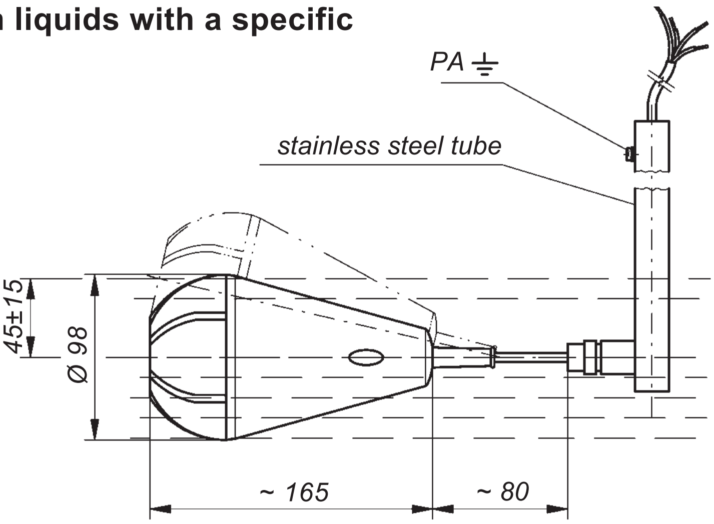




Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at





SI/FS/NL/1/K/.../Variant 0
⟨Ex⟩ I M2 / II 2 G
Ex ia I Mb / Ex ia IIA T6 Gb
floating switches

with built-in weight for fixing of switching point

These floating switches are designed for mounting **from the top.**

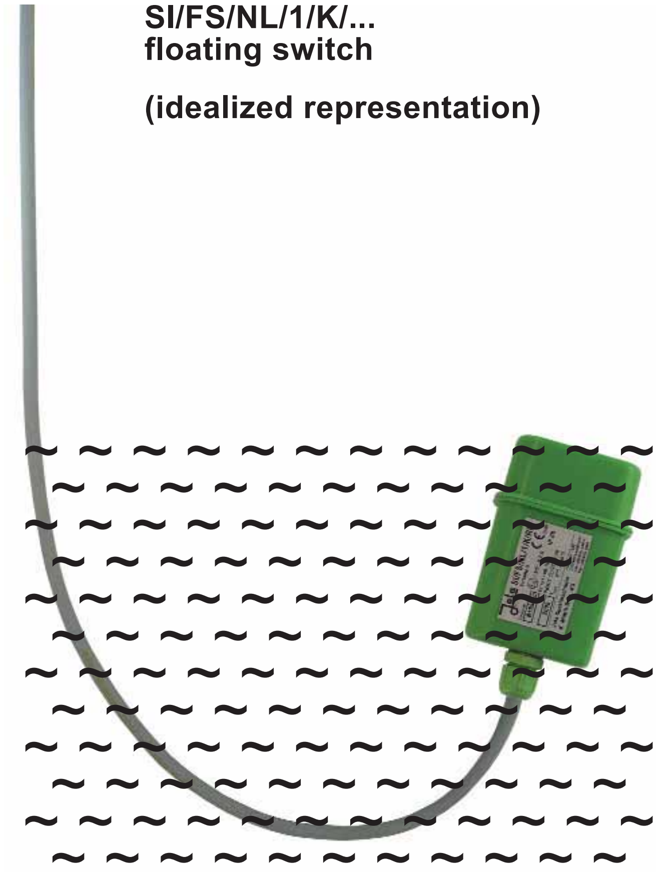
They are fitted with a **built-in weight for fixing the switching point** at the desired height; this renders **additional fastening** of the switch at the height of the switching point **unnecessary**. This weight is dimensioned in such a way that the switch tilts around its own axis when the liquid level rises and then follows the rising liquid level (see function diagram on page 1-2-12). This tilting action of the float activates the switching process.

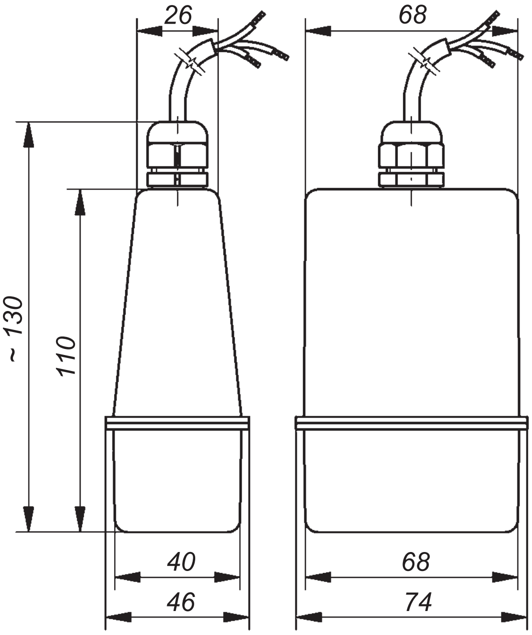
These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SI/FS/NL/1/K/.../Variant 0 ⟨Ex⟩ I M2 / II 2 G ...**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	PP
Seal material	FPM; on request: EPDM
Float protection class	IP68
Max. immersion depth of the float	max. 10 metres head of water at + 20°C
Application range	in liquids with a specific gravity between 0.95 and 1.05 g/cm³
Connecting cable / application range / temperature range	• **black PVC cable, 3 x 0.75 (SI/FS/NL/1/K/PVC/...):** for use in: water / used water / slightly aggressive liquids, T: between + 8°C and + 60°C • **grey A05RN-F cable 3 x 0.75 (SI/FS/NL/1/K/RN/...):** for use in: water / used water / slightly aggressive liquids, T: between 0°C and + 60°C • **red-brown silicone cable** (with low mechanical strength), **3 x 0.75 (SI/FS/NL/1/K/SIL/...):** for use in: water / certain other liquids, T: between 0°C and + 60°C • **green halogen-free PUR cable, 3 x 0.5 (SI/FS/NL/1/K/PUR/...):** for use in: water / used water / slightly aggressive liquids, T: between 0°C and + 60°C • **black CM cable, 3 x 0.75 (SI/FS/NL/1/K/CM/...):** for use in: water / certain acids / certain lyes, T: between 0°C and + 60°C
Connecting cable length	1 metre, other cable lengths on request **When ordering, please state cable type and length.**

SI/FS/NL/1/K/...
floating switch

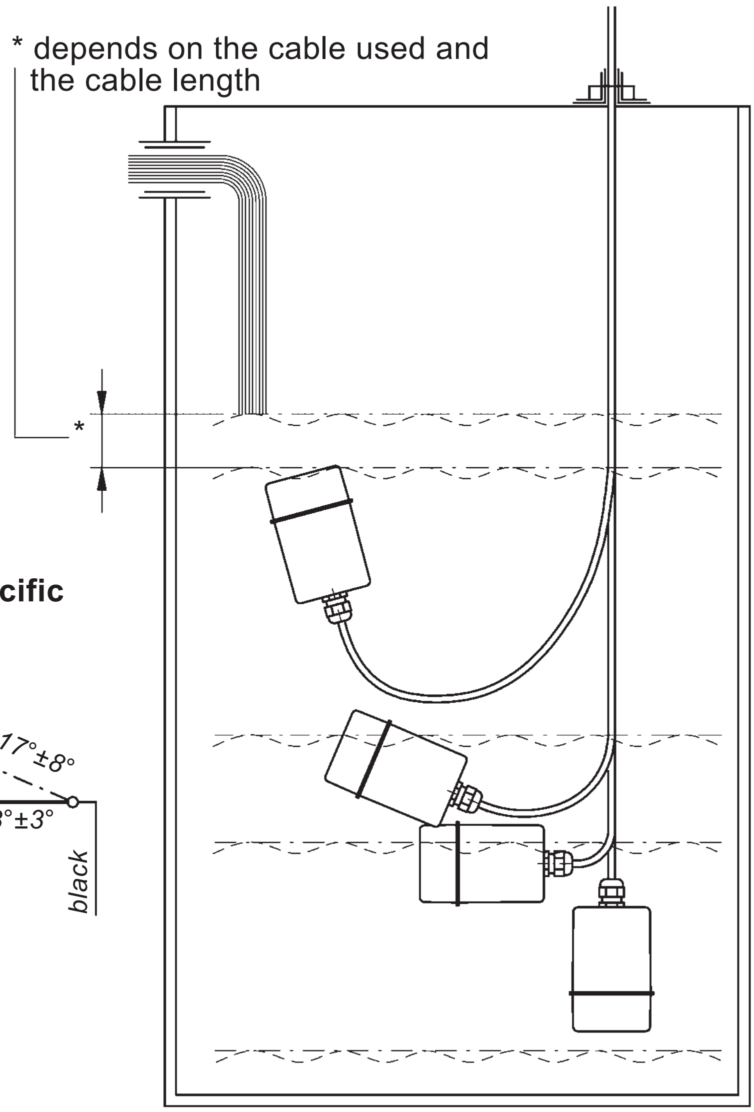
(idealized representation)





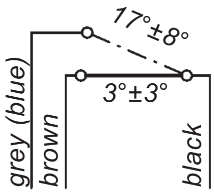
Function diagram of the SI/FS/NL/1/K/... floating switch

(idealized representation)



Switching action in liquids with a specific gravity of 1 g/cm³

Contact switches over at



SI/SSR/1/K/.../Variant 0
Ⓔx I M2 / II 2 G
Ex ia I Mb / Ex ia IIC T6 Gb
floating switches

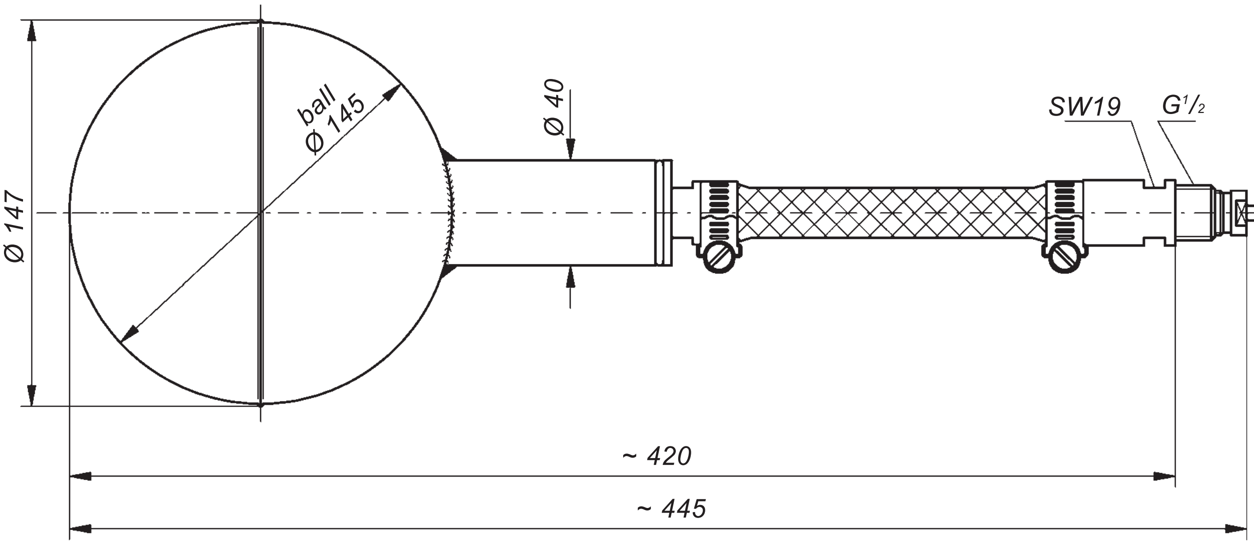
These floating switches are designed for mounting **from the side.**

To ensure a correct switching the G½ screw-in nipple must be screwed in a horizontal G½ sleeve.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

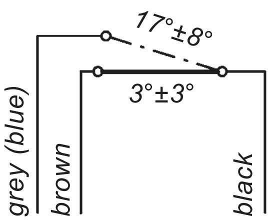
Technical data	**SI/SSR/1/K/.../Variant 0 Ⓔx I M2 / II 2 G ...**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149
Operating principle	ball-operated microswitch, potential-free changeover contact
Options for safety appl.	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17
Recommended appl.	via Jola Ex protection relay
Float material	stainless steel 316 Ti
Seal material	PTFE
Appliance protection class	in installed condition inside the tank: IP68, on the stuffing gland screw fitting outside the tank: IP54
Max. immersion depth of the float	max. 30 metres head of water at + 20°C
Application range	in liquids with a specific gravity ≥ 0.7 g/cm³
Connecting cable / temperature range	• **black H05RN-F cable, 4 G 0.75 (SI/SSR/1/K/RN/...):** T: between 0°C and + 60°C • **red-brown silicone cable, 4 G 0.75 (SI/SSR/1/K/SIL/...):** T: between 0°C and + 60°C **The connecting cable is routed through a protective bellows made of stainless steel 316 L to which a G½ screw-in nipple is fastened.**
Connecting cable length	2 metres from screw-in nipple, other cable lengths on request **When ordering, please state cable type and length.**
Option	**stainless steel 316 Ti stirrup to limit the movement of the float**

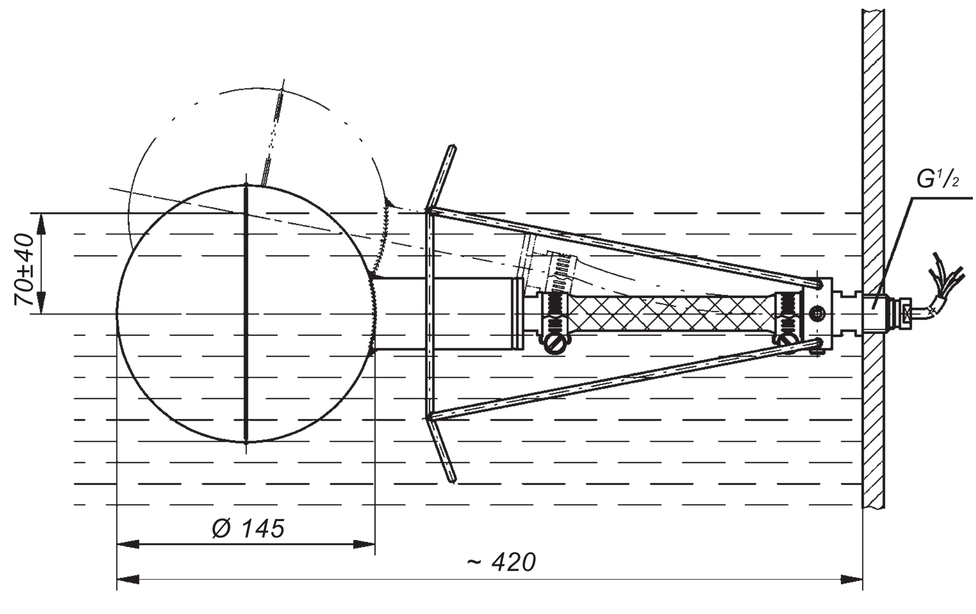
SI/SSR/1/K/...



Switching action in liquids with a specific gravity of 1 g/cm³ –
Diagram of SI/SSR/1/K/... with stainless steel stirrup (optional)

Contact switches
over at



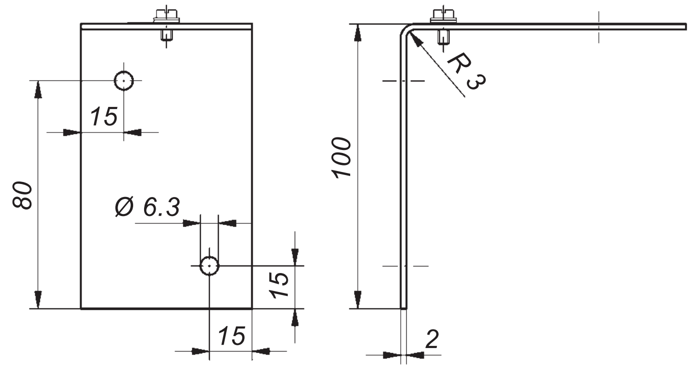


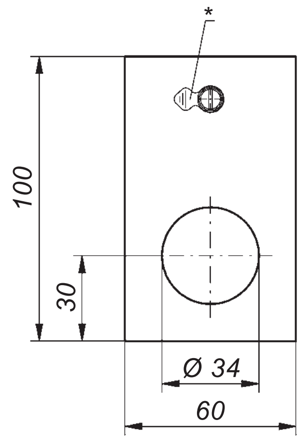
Mounting bracket

made of stainless steel 316 Ti

with lateral hole

- **MW 100x100x60/G1/B/Ex**
  for G1 stuffing gland
  (fixing of the stuffing gland
  via G1 counternut)





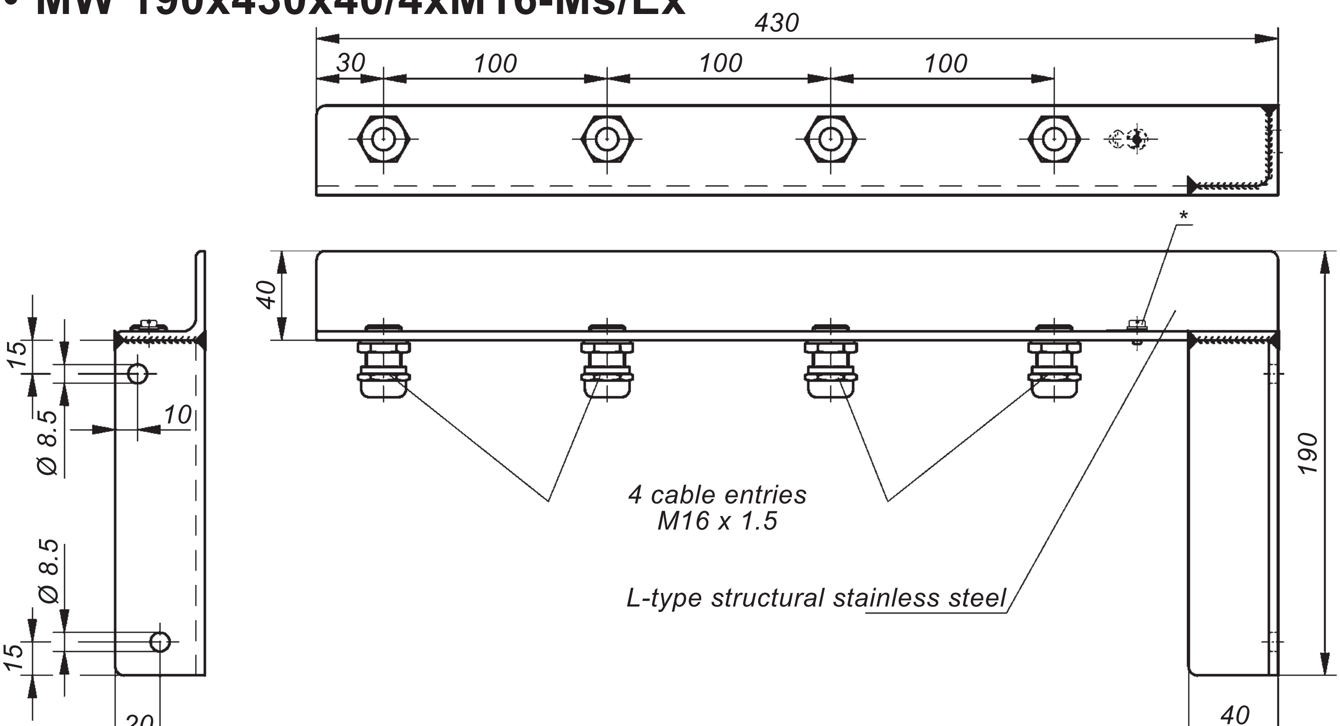
* terminal for connection of the potential equalization cable

Mounting bracket

made of stainless steel 316 Ti

with 4 cable entries made of nickel-plated brass (on request made of stainless steel) suitable for 4 floating switches

- **MW 190x430x40/4xM16-Ms/Ex**



* terminal for connection of the potential equalization cable

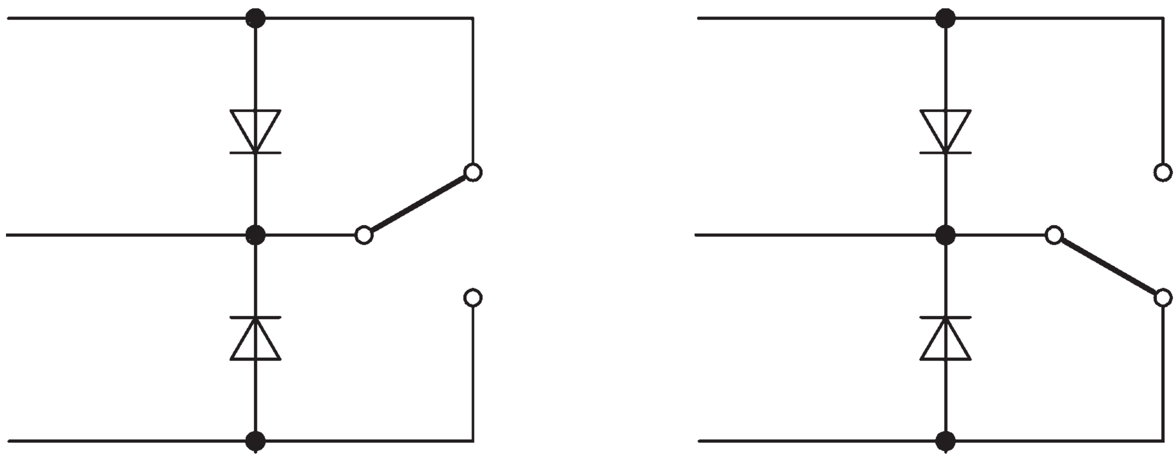
Application example:

MW 190x430x40/4xM16-Ms/Ex mounting bracket fitted with 4 SI/SSX/LF/4/1/K/PURLF/Variante 0/IG floating switches (with internal fixing weight)

Options for SI/... 1/K/... floating switches:

Variant 1:

Two (2) diodes of the type 1N4004 or equivalent

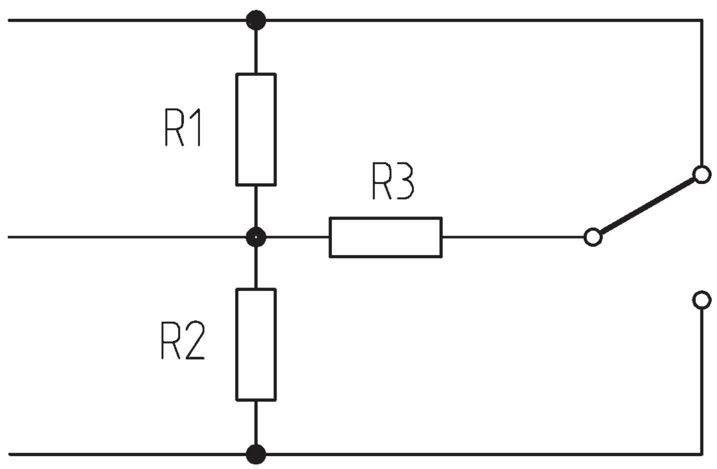


Variant 2:

Two (2) metal film resistors or carbon film resistors R 1, R 2,
each greater than or equal to 2 kOhm,
each P greater than or equal to ¹/₄ W

and

one (1) metal film resistor or carbon film resistor R 3
greater than or equal to 330 Ohm,
P greater than or equal to 1 W.



• TS/E../. x SI/SSP/NL/1/K/.../Variant 0
Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb
• TS/E../. x SI/SSX/LF/20/1/K/.../Variant 0
Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb
• TS/E../. x SI/SSR/1/K/.../Variant 0
Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb
immersion probes

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**TS/E../. x SI/SSP/NL/1/K/.../ Variant 0 Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb**	**TS/E../. x SI/SSX/LF/20/1/K/.../ Variant 0 Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb**	**TS/E../. x SI/SSR/1/K/.../ Variant 0 Ex I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb**
Application	for use in intrinsically safe circuits in mines susceptible to firedamp or in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0149		
Probe tube material	stainless steel 316 Ti		
Probe tube diameter	see chart on page 1-2-19		
Probe tune length	according to customer's specifications, but max. 6,000 mm		
Screw-in nipple	without		
	for the type TS/E20/. x SI/SSP/NL/1/K/... : G2 on request	—	—
Flange	without, flange made of stainless steel 316 Ti on request		
Terminal box	see chart on page 1-2-19, material: glass fibre and graphite reinforced polyester, IP65 protection class, dimensions: A 301: 110 x 75 x 55 mm, A 120: 160 x 75 x 55 mm, A 113a: 160 x 160 x 90 mm		
Mounting orientation	vertical		
Temperature range	see technical data of the Ex floating switches used		
Pressure resistance	for pressureless applications only		
Mounted Ex floating switches	**SI/SSP/NL/1/K/•••/ Variant 0 ...**	**SI/SSX/LF/20/1/K/•••/ Variant 0 ...**	**SI/SSR/1/K/•••/ Variant 0 ...**
	(••• = to be specified, see chart on page 1-2-3, 1-2-7 or 1-2-13)		
Technical data of the mounted Ex floating swit.	see pages 1-2-3 ...	see pages 1-2-7 ...	see pages 1-2-13 ...
Option	diodes (= variant 1) or resistors (= variant 2), see page 1-2-17		

For enquiries or orders, please complete the questionnaire on page 1-2-21 or 1-2-22.

Model overview and technical data

Type designation	No of mounted Ex floating switches	Type of mounted Ex floating switches	Probe tube dia.	Termi-nal box	Design example see page 1-2-20
TS/E../. x SI/SSP/NL/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb		SI/SSP/NL/1/K/ •••/Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb/ Ex ia IIB T6 Gb	20 mm		1
TS/E20/1 x SI/SSP/...	1			A 301	
TS/E20/2 x SI/SSP/...	2			A 301	
TS/E20/3 x SI/SSP/...	3			A 120	
TS/E../. x SI/SSP/NL/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb		SI/SSP/NL/1/K/ •••/Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb/ Ex ia IIB T6 Gb	28 mm		as 1, but probe tube dia. 28 mm Ø instead of 20 mm Ø
TS/E28/1 x SI/SSP/...	1			A 301	
TS/E28/2 x SI/SSP/...	2			A 301	
TS/E28/3 x SI/SSP/...	3			A 120	
TS/E28/4 x SI/SSP/...	4			A 120	
TS/E28/5 x SI/SSP/...	5			A 113a	
TS/E28/6 x SI/SSP/...	6			A 113a	
TS/E../. x SI/SSX/LF/20/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb		SI/SSX/LF/20/1/K/ •••/Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb/ Ex ia IIC T6 Gb			2
TS/E28/1 x SI/SSX/...	1		28 mm	A 301	
TS/E28/2 x SI/SSX/...	2		28 mm	A 301	
TS/E34/3 x SI/SSX/...	3		34 mm	A 120	
TS/E34/4 x SI/SSX/...	4		34 mm	A 120	
TS/E34/5 x SI/SSX/...	5		34 mm	A 113a	
TS/E34/6 x SI/SSX/...	6		34 mm	A 113a	
TS/E../. x SI/SSR/1/K/.../ Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIC T6 Gb		SI/SSR/1/K/ •••/Variant 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb/ Ex ia IIC T6 Gb, each with stirrup			3
TS/E28/1 x SI/SSR/...	1		28 mm	A 301	
TS/E28/2 x SI/SSR/...	2		28 mm	A 301	
TS/E34/3 x SI/SSR/...	3		34 mm	A 120	
TS/E34/4 x SI/SSR/...	4		34 mm	A 120	
TS/E34/5 x SI/SSR/...	5		34 mm	A 113a	
TS/E34/6 x SI/SSR/...	6		34 mm	A 113a	

••• = to be specified according to the list of cable types on page 1-2-3 or 1-2-7 or 1-2-13

Design examples

1

TS/E20/3 x SI/SSP/NL/1/K/...
with G2 screw-in nipple (optional) and with A 120 terminal box

2

TS/E34/4 x SI/SSX/LF/20/1/K/...
with mounting flange (optional) and with A 113 a terminal box instead of A 120 (optional)

3

TS/E28/2 x SI/SSR/1/K/...
with A 301 terminal box

Questionnaire for enquiries and orders for immersion probes <u>with</u> screw-in nipple or flange

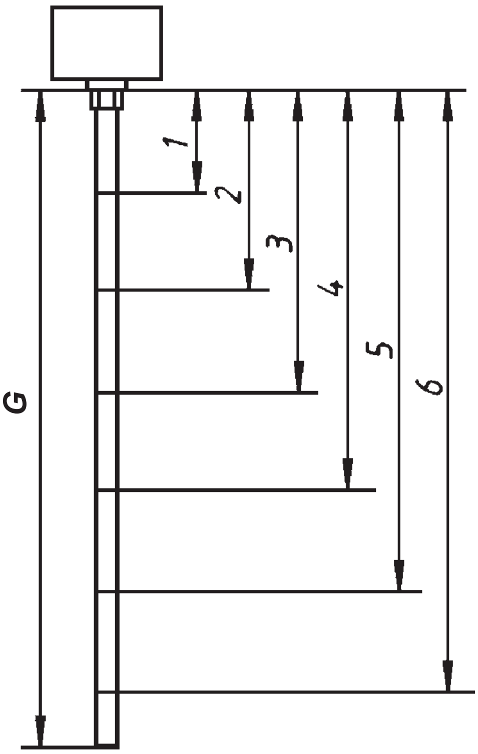
Desired switching functions (indication max., min., pump or valve ON – OFF, filling or emptying, dry-run or overflow protection): ________________

Tank dimensions and installation conditions (sketch if applicable): ________________

Type of liquid: ________________ Specific gravity: ________

Viscosity: ________ Temperature: ________ Operating pressure: ________

Desired immersion probe type: TS/...



When planning the design of the immersion probes, please consider that **when the liquid level rises,** the contact of the floating switches is not activated when the floating switches reach the horizontal position, but is activated as depicted in the diagrams of the various floating switches on pages 1-2-3 and following.
When the liquid level sinks, the contact of the floating switches is activated **shortly below their horizontal position.**

	Desired Ex floating switch type	*Distance from sealing surface of screw-in nipple or flange in mm*	*Switching function (e.g. high alarm, pump ON, pump OFF etc.)*	*Working direction of the float: rising = ↑ falling = ↓*
1				
2				
3				
4				
5				
6				

Desired options:

Questionnaire for enquiries and orders
for immersion probes without screw-in nipple or flange

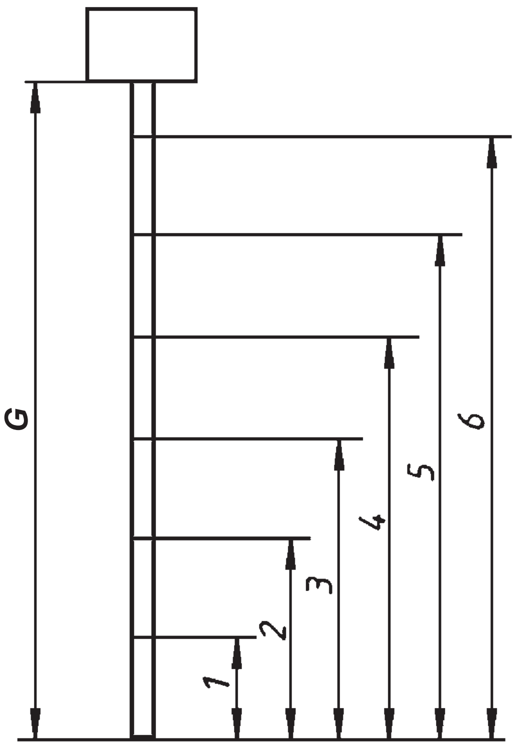
Desired switching functions (indication max., min., pump or valve ON – OFF, filling or emptying, dry-run or overflow protection): ______________________

Tank dimensions and installation conditions (sketch if applicable): ______________________

Type of liquid: ______________________ Specific gravity: __________

Viscosity: __________ Temperature: __________ Operating pressure: __________

Desired immersion probe type: TS/...



When planning the design of the immersion probes, please consider that **when the liquid level rises,** the contact of the floating switches is not activated when the floating switches reach the horizontal position, but is activated as depicted in the diagrams of the various floating switches on pages 1-2-3 and following.
When the liquid level sinks, the contact of the floating switches is activated **shortly below their horizontal position.**

	Desired Ex floating switch type	*Distance from end of probe tube in mm*	*Switching function (e.g. high alarm, pump ON, pump OFF etc.)*	*Working direction of the float: rising = ↑ falling = ↓*
1				
2				
3				
4				
5				
6				

Desired options:

SM
float switches

Controlling devices with potential-free microswitch, for automatic control, regulation and signalling of liquid levels

Jola Spezialschalter GmbH & Co. KG
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contact@jola-info.de • www.jola-info.de

SM… float switches

Contents **Pages**

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

SM… float switches for electrical systems • for mounting from the side • with microswitch

Technical data	SM.../3	SM.../1
Application	for applications up to max. 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
VDE marks licence	+	—

Mode of operation

The rising or falling liquid level causes the float to move marginally up or down. When the float rises, it activates a microswitch in the form of a changeover switch.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

The following types are available:

Types	Bellows material	Float material	Float dimensions	Page
SM/P/. SMG/P/.	PP	PP	Ø 29 x 133 mm Ø 63 x 140 mm	2-1-3 2-1-4
SMG/PVDF/. SM/PTFE/.	PVDF PTFE	PVDF PTFE	Ø 63 x 140 mm Ø 59 x 155 mm	2-1-5 2-1-6
SM/E/. SMG/E/.	stainless steel 316 Ti	stainless steel 316 Ti	Ø 28 x 120 mm Ø 63 x 140 mm	2-1-7 2-1-8

SM/P/. float switches made of PP

Installation of the float possible through hole accepting G1 thread

SM/P/.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

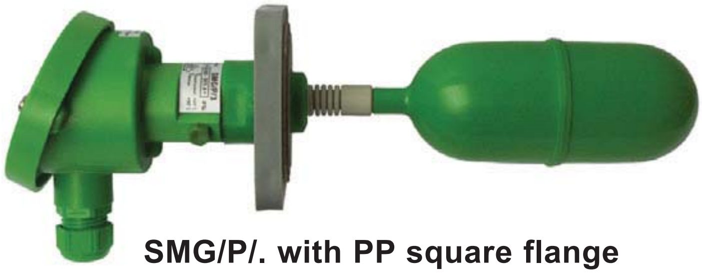
Technical data	SM/P/3	SM/P/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	PP, 29 mm Ø x 133 mm long	
Bellows	PP	
Screw-in nipple	PP, G1	
On request: flange	square blind flange with G1 threaded hole made of PP, PVDF or stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 90°C (inside the connection head: 0°C to + 60°C)	
Pressure resistance	for pressureless applications	
Test pressure	max. 2 bar at + 20°C (without flange or with flange made of stainless steel; with square flange made of PP or PVDF: 0 bar)	
Application	only for use in liquids with a specific gravity ≥ 0.82 g/cm³	

Further technical data on pages 2-1-9 and following

Mounting instructions see page 2-1-23

SMG/P/. float switches made of PP

SMG/P/.



SMG/P/. with PP square flange

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

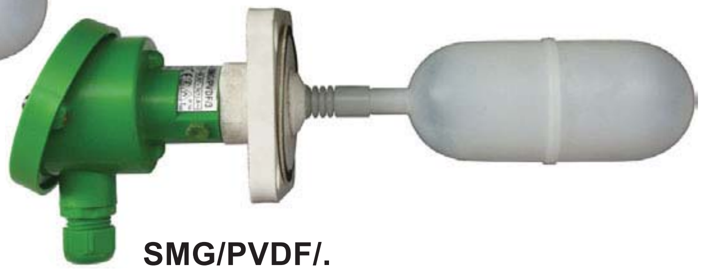
Technical data	SMG/P/3	SMG/P/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	PP, 63 mm Ø x 140 mm long; on request: ball float 85 mm Ø (reference: SMH/P/.)	
Bellows	PP	
Screw-in nipple	PP, G1	
On request: flange	square blind flange with G1 threaded hole made of PP, PVDF or stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 90°C (inside the connection head: 0°C to + 60°C)	
Pressure resistance	for pressureless applications	
Test pressure	max. 2 bar to + 20°C (without flange or with flange made of stainless steel; with square flange made of PP or PVDF: 0 bar)	
Application	only for use in liquids with a specific gravity ≥ 0.7 g/cm³	

Further technical data on pages 2-1-9 and following

Mounting instructions see page 2-1-23

SMG/PVDF/. float switches made of PVDF

SMG/PVDF/.



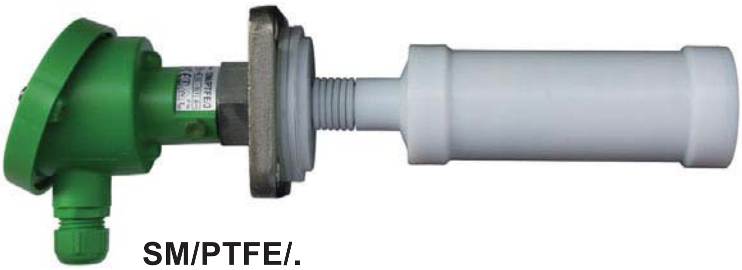
SMG/PVDF/.
with PVDF square flange

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SMG/PVDF/3**	**SMG/PVDF/1**
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	PVDF, 63 mm Ø x 140 mm long	
Bellows	PVDF	
Screw-in nipple	PVDF, G1	
On request: flange	square blind flange with G1 threaded hole made of PP, PVDF or stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C);	
	on request, however without VDE marks licence: 0°C to + 135°C (inside the connection head: 0°C to + 100°C)	——
Pressure resistance	for pressureless applications	
Test pressure	max. 2 bar at + 20°C (without flange or with flange made of stainless steel; with square flange made of PP or PVDF: 0 bar)	
Application	only for use in liquids with a specific gravity ≥ 0.8 g/cm³	

Further technical data on pages 2-1-9 and following
Mounting instructions see page 2-1-23

SM/PTFE/. float switches made of PTFE



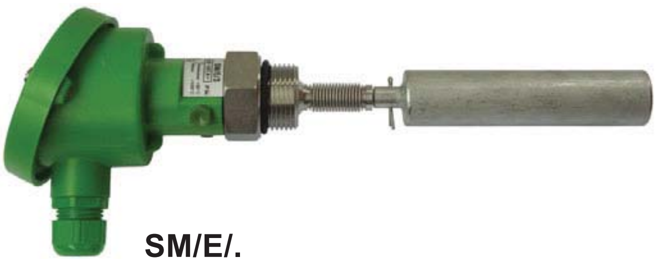
SM/PTFE/.
with square flange made of stainless steel with PTFE lining on the surface in contact with the liquid

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SM/PTFE/3**	**SM/PTFE/1**
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	PTFE, 59 mm Ø x 155 mm long	
Bellows	PTFE	
Flange	square flange made of stainless steel 316 Ti, (dimensions see page 2-1-12) with PTFE lining on the surface in contact with the liquid or other flanges with any desired dimensions with PTFE lining on the surface in contact with the liquid	
Protection class of float and bellows	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C); on request, however <u>without</u> VDE marks licence: 0°C to + 180°C (inside the connection head: 0°C to + 100°C)	0°C to + 100°C (inside the connection head: 0°C to + 60°C); ——
Pressure resistance	for pressureless applications	
Test pressure	max. 2 bar at + 20°C	
Application	only for use in liquids with a specific gravity ≥ 1.0 g/cm³	

Further technical data on pages 2-1-9 and following
Mounting instructions see page 2-1-23

SM/E/. float switches made of stainless steel



SM/E/.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	SM/E/3	SM/E/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	stainless steel 316 Ti, 28 mm Ø x 120 mm long	
Bellows	stainless steel 316 Ti	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	square blind flange with G1 threaded hole made of stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C)	
Pressure resistance	for pressureless applications	
Test pressure	max. 2 bar at + 20°C	
Application	only for use in liquids with a specific gravity ≥ 1.0 g/cm³	

Further technical data on pages 2-1-9 and following
Mounting instructions see page 2-1-23

SMG/E/. float switches made of stainless steel

SMG/E/.

SMG/E/.
with square flange made of stainless steel and horizontal extension piece for the float

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	SMG/E/3	SMG/E/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm long; on request: ball float 95 mm Ø (reference: SMH/E/.)	
On request: extension piece for float	horizontal or vertical, as desired	
Bellows	stainless steel 316 Ti	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	square blind flange with G1 threaded hole made of stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the side	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C); on request, however <u>without</u> VDE marks licence: 0°C to + 250°C (inside the connection head: 0°C to + 100°C)	0°C to + 100°C (inside the connection head: 0°C to + 60°C); ——
Pressure resistance/ test pressure	for pressureless applications (test pressure: max. 2 bar at + 20°C) on request: pressure resistance up to 4 bar at + 20°C/ g ≥ 1.0 g/cm³ (test pressure max. 6 bar at + 20°C)	
Application	only for use in liquids with a specific gravity ≥ 0.7 g/cm³ (specification <u>without</u> the optional extension piece for the float)	

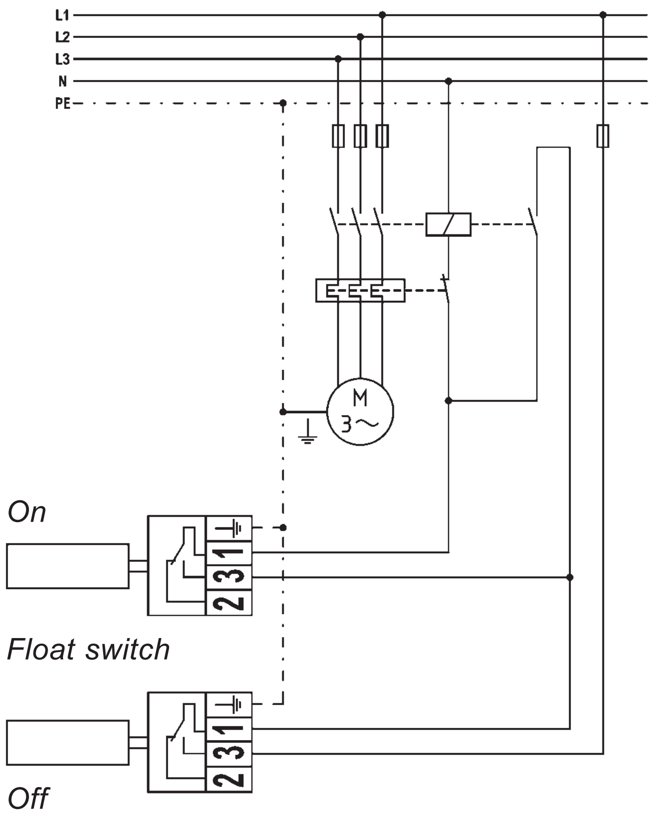
Further technical data on pages 2-1-9 and following
Mounting instructions see page 2-1-23

Connection diagrams

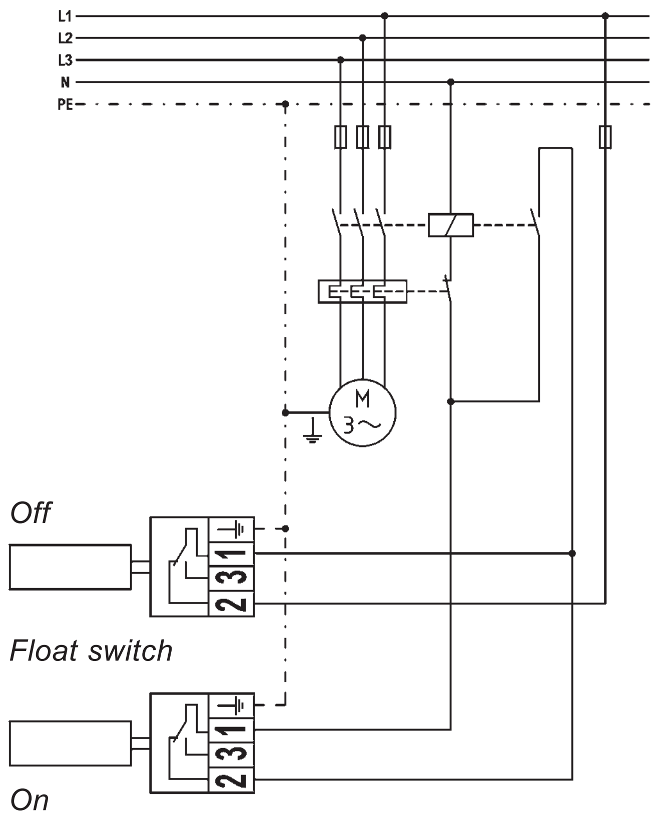
Function of the microswitch in the connection head of the float switch:

Switches over on passage through the horizontal. When the float rises, terminals 1 and 3 connect and open terminals 1 and 2.

Connection diagram 1:
automatic control of
a pump motor or electrovalve -
switching mode: **emptying**



Connection diagram 2:
automatic control of
a pump motor or electrovalve -
switching mode: **filling**



Contact position with empty container

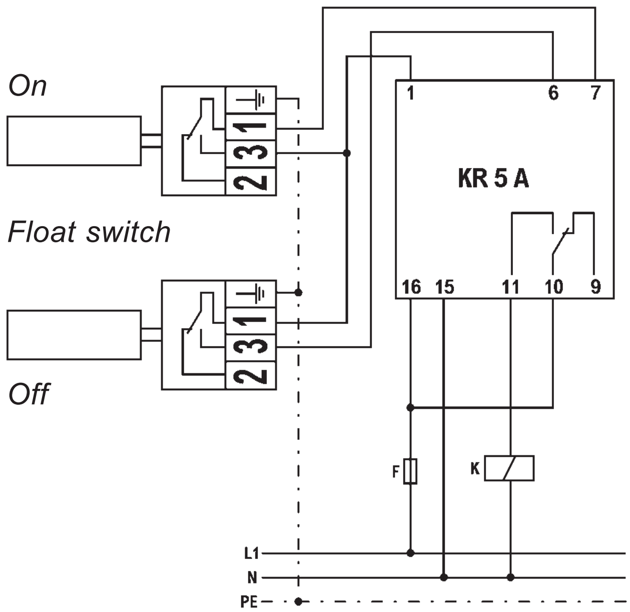
To protect the user and the contacts of our apparatus we recommend the use of our KR .. protection relays (see pages 12-1-0 and following).

- **For full alarm, empty alarm or run dry protection: 1 relay per float switch**
- **For on/off control (with self-hold): 1 relay for 2 float switches**

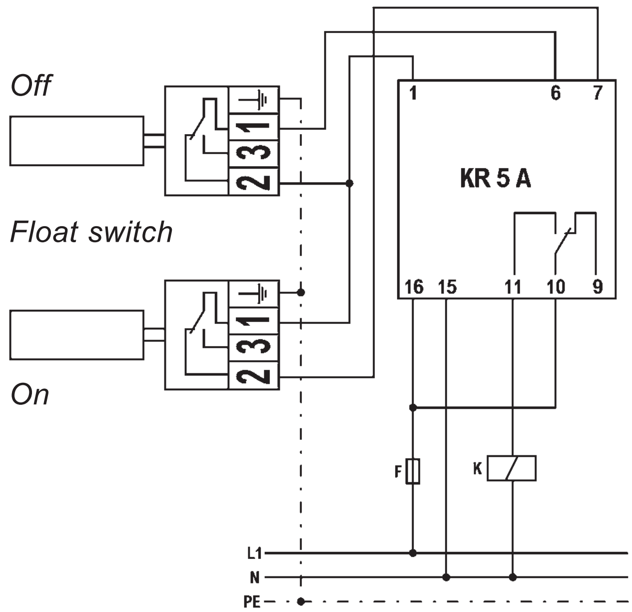
In combinaison with our KR .. protection relays our float switches SM .../1 are to be used.

Two-point control with a KR 5 protection relay

Switching mode: **emptying**



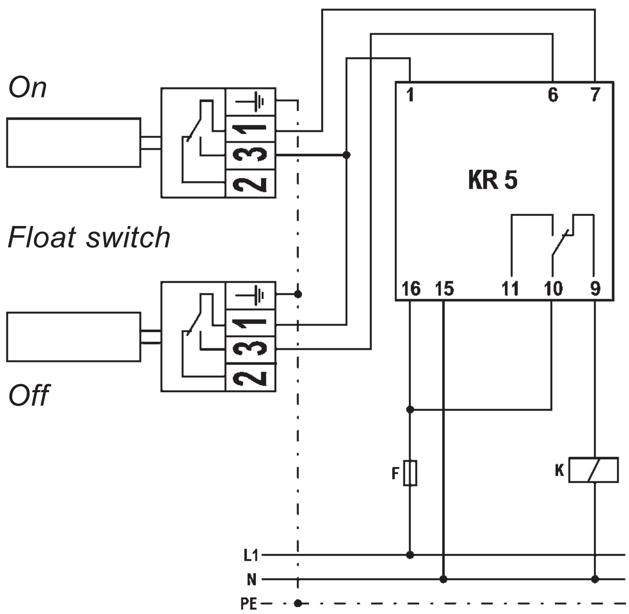
Switching mode: **filling**



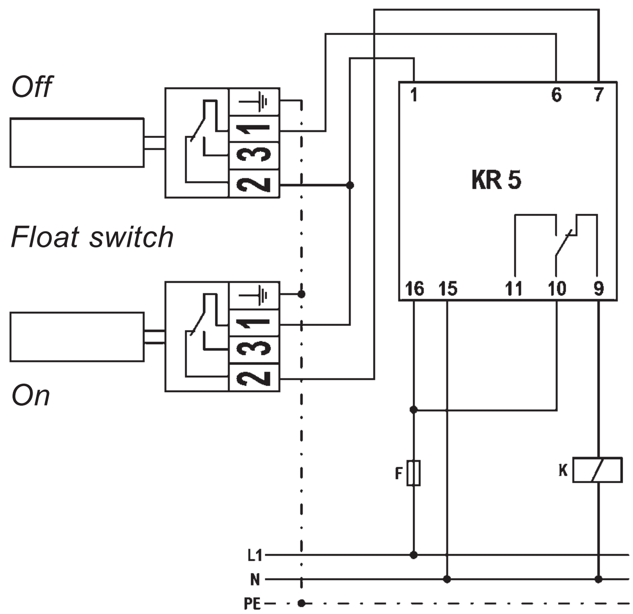
Contact position with empty container - KR 5 without voltage

Two-point control with a KR 5 A protection relay

Switching mode: **emptying**



Switching mode: **filling**



Contact position with empty container - KR 5 A without voltage

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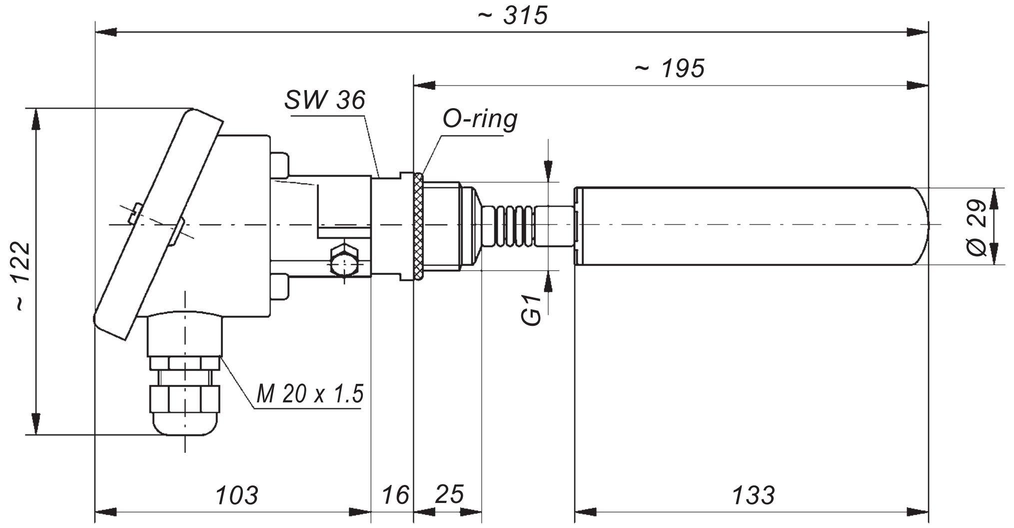
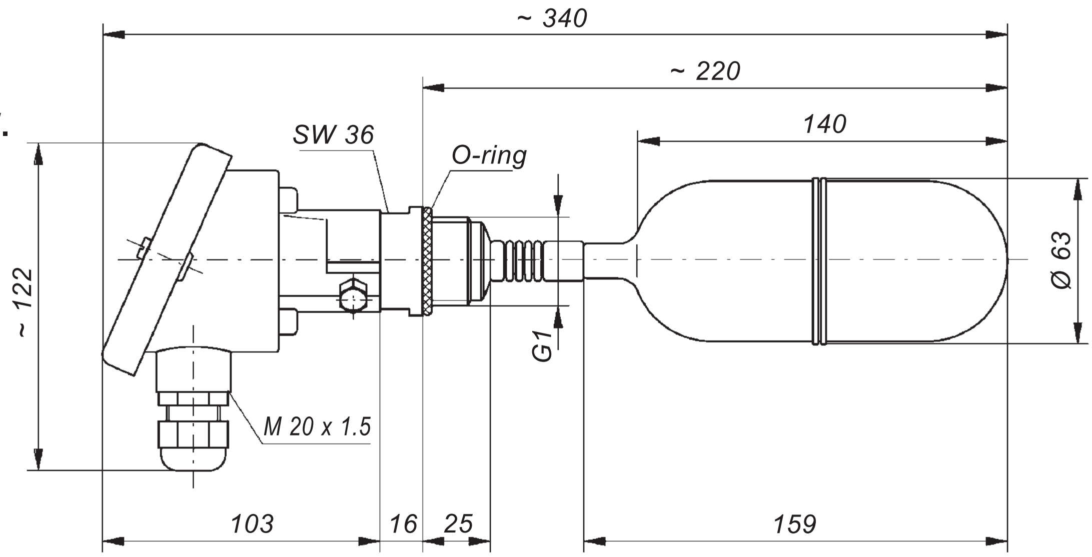
The above details do not apply to the float switch SMG/E -D- (see pages 2-1-13 and 2-1-14).

Dimensional drawings

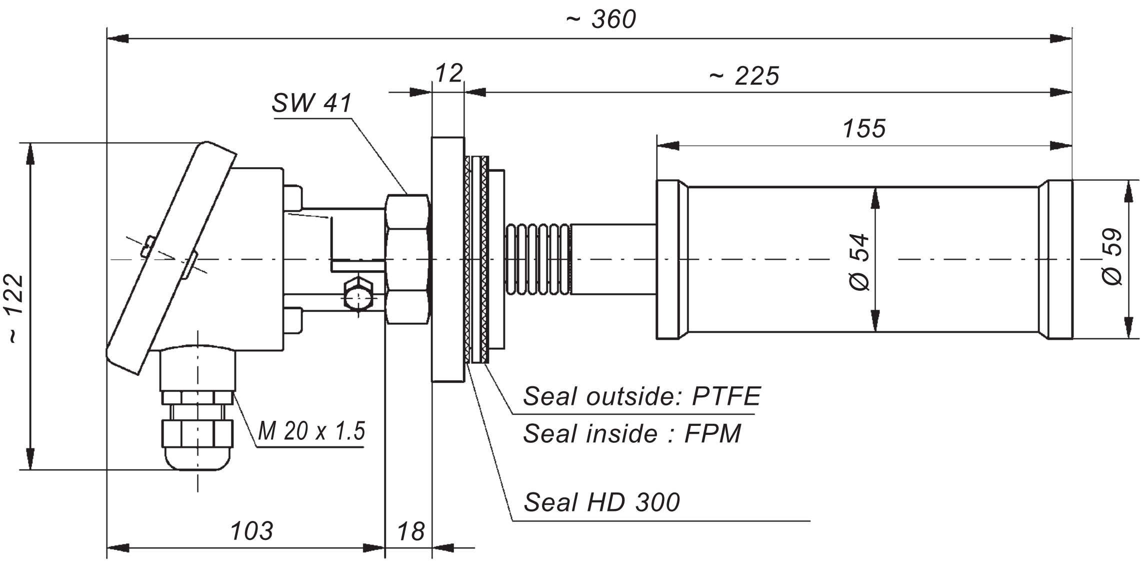
SM/P/.



SMG/P/.
and
SMG/PVDF/.

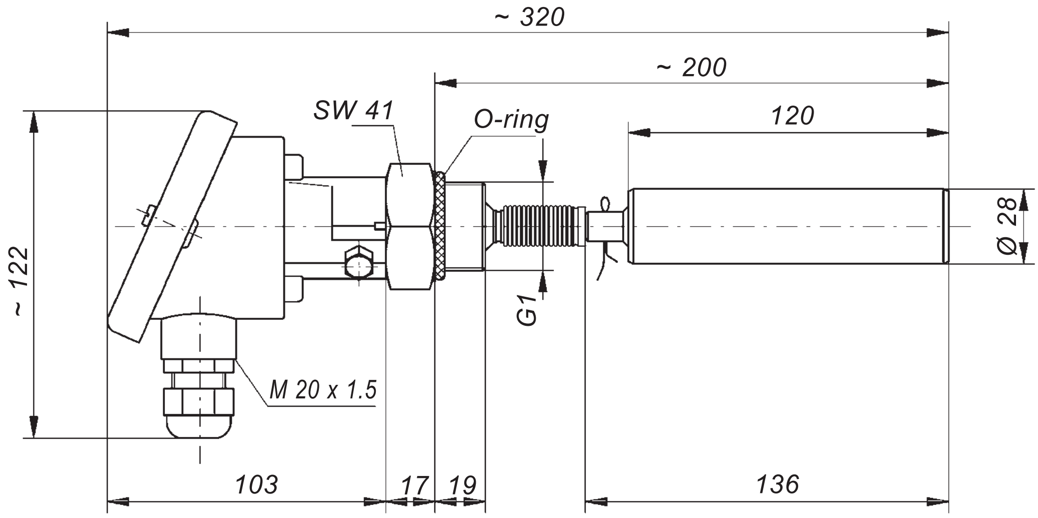


SM/PTFE/.

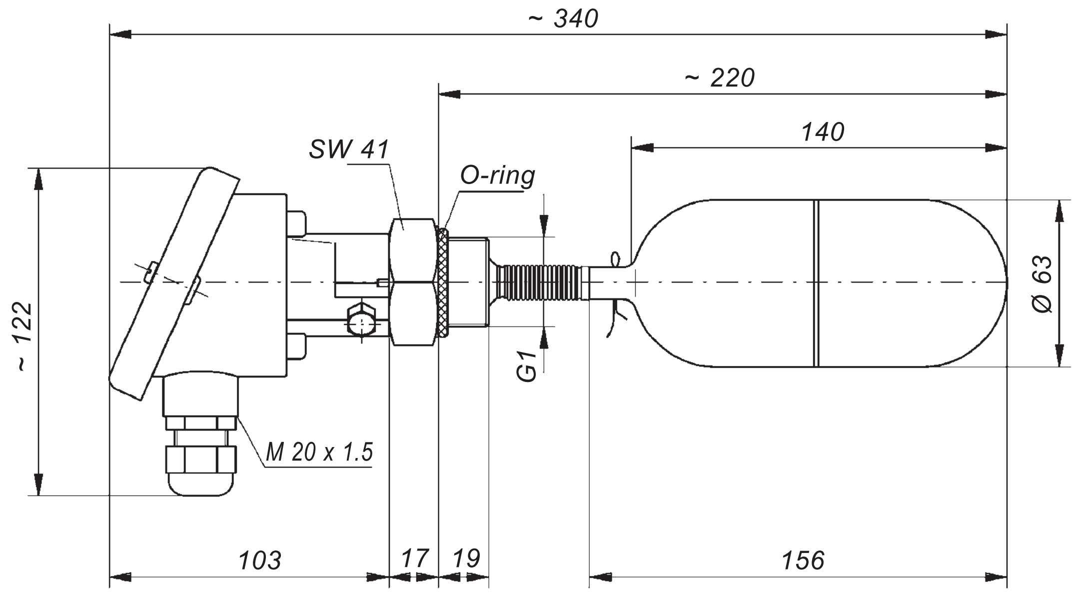


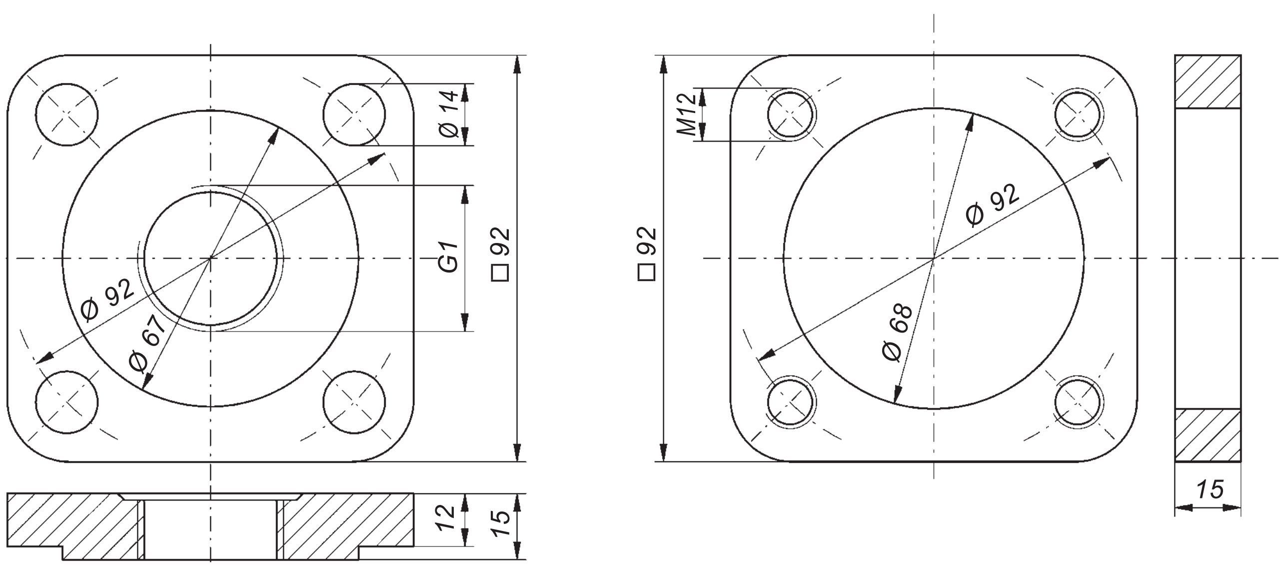
Dimensional drawings

SM/E/.



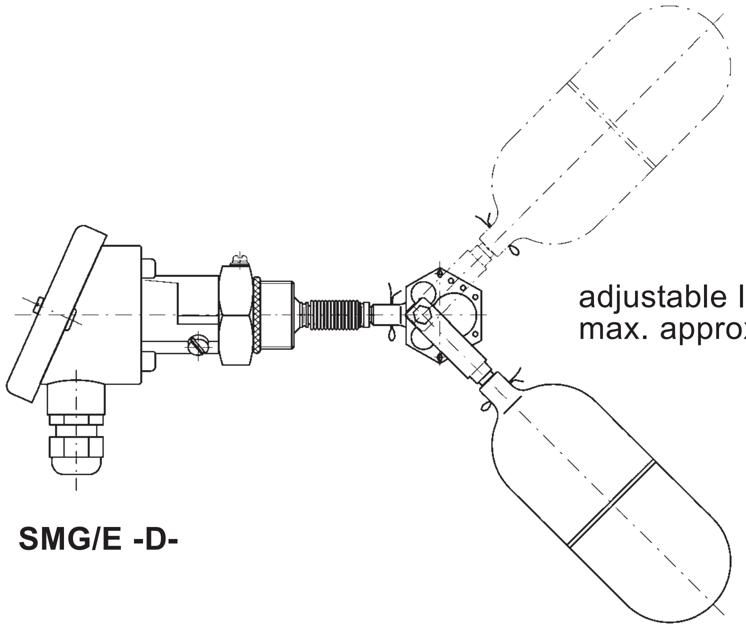
SMG/E/.





Square blind flange with G1 threaded hole for <u>all SM models</u>
and corresponding counter flange

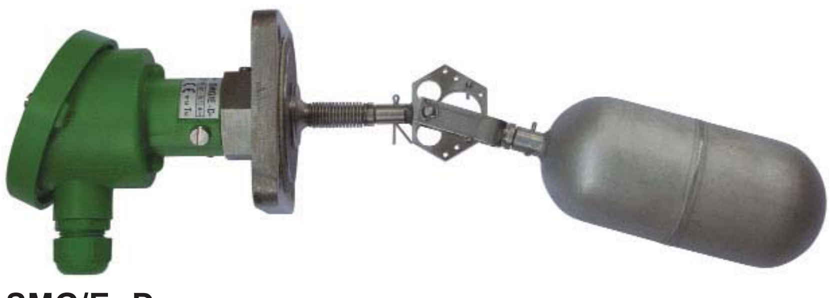
SMG/E -D- float switch
for electrical systems
• for mounting <u>from the side</u>
• with microswitch
with switching differential



adjustable liquid level differential
max. approx. 250 mm

SMG/E -D-

SMG/E -D-



SMG/E -D-
with square flange made of stainless steel

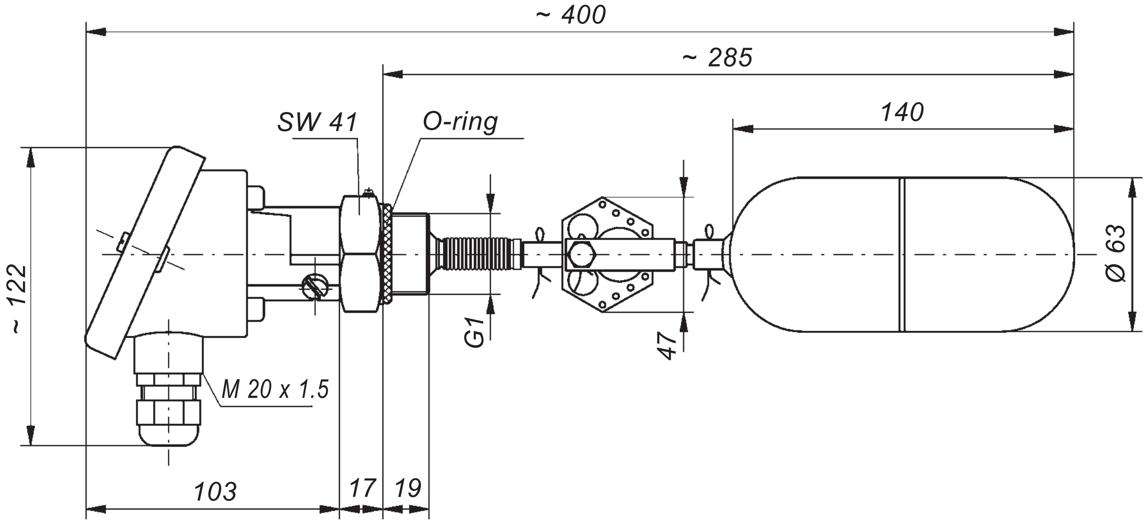
SMG/E -D- float switch made of stainless steel

This unit is not suitable for use by collateral flows and in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SMG/E -D-**
Application Switching voltage Switching current Switching capacity	for applications up to 250 V between AC/DC 24 V and AC/DC 250 V between AC 20 mA and AC 5 (1) A max. 500 VA
Operating principle	microswitch, changeover contact with switching differential
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm long; on request: ball float 95 mm Ø (reference: SMH/E -D-)
Bellows	stainless steel 316 Ti
Screw-in nipple	stainless steel 316 Ti, G1
On request: flange	square blind flange with G1 threaded hole made of stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions
Protection class of float, bellows and nipple	IP 68
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54
Mounting	from the side
Temperature application range	0°C to + 80°C (inside the connection head: 0°C to + 60°C)
Pressure resistance	for pressureless applications
Test pressure	max. 2 bar at + 20°C
Application	only for use in liquids with a specific gravity ≥ 0.95 g/cm³

Mounting instructions see page 2-1-23

SMG/E -D-



SM… float switches for electrical systems
• for mounting <u>from the top</u>
• with microswitch

Technical Data	SM.../3	SM.../1
Application	applications up to max. 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
VDE marks licence	DVE + VDE EMC	— VDE EMC

Mode of operation

The rising or falling liquid level causes the float to move marginally up or down. When the float rises, it activates a microswitch in the form of a changeover switch.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

The following types are available:

Types	All parts in contact with the liquid inside the tank	Page
SMG/VE/. SMV/E/.	stainless steel 316 Ti	2-1-16 2-1-17

SMG/VE/. float switches made of stainless steel

SMG/VE/.

SMG/VE/.
with square flange
made of stainless steel

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	SMG/VE/3	SMG/VE/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm long	
Bellows	stainless steel 316 Ti	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	square blind flange with G1 threaded hole made of stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions	
Protection class of float, bellows and nipple	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the top	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C)	
	on request, however <u>without</u> VDE marks licence: 0°C to + 250°C (inside the connection head: 0°C to + 100°C)	——
Pressure resistance/ test pressure	for pressureless applications (test pressure: max. 2 bar at + 20°C) on request: pressure resistance up to 4 bar at + 20°C/ g ≥ 1.0 g/cm³ (test pressure max. 6 bar at + 20°C)	
Application	only for use in liquids with a specific gravity ≥ 0.82 g/cm³	

Further technical data on pages 2-1-9 and following
Mounting instructions see page 2-1-23

SMV/E/. float switches made of stainless steel

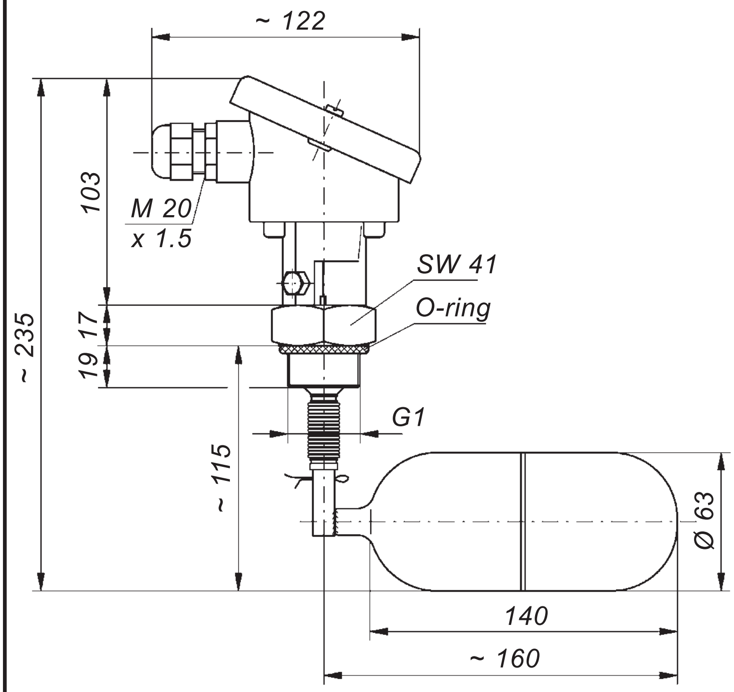
These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	SMV/E/3	SMV/E/1
Application	for applications up to 250 V	for light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 5 A or between DC 20 mA and DC 100 mA	between AC 0.1 mA and AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 1,000 VA	max. 4 VA
Operating principle	microswitch, changeover contact	
Recommended application	——	via Jola KR .. protection relay (see pages 12-1-0 and follow.)
All parts in contact with the liquid inside the tank	stainless steel 316 Ti	
Float dimensions	ball float 130 mm Ø; on request: ball float 148 mm Ø, 180 mm Ø or 200 mm Ø and special floats with other dimensions	
Length of the float rod less float (measured from sealing surface of screw-in nipple)	as desired, 200 mm if not otherwise specified; guide tube for the float rod for rod length over 500 mm included (for rod lengths under 500 mm on request)	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	blind flange with any desired dimensions with G1 threaded hole	
On request: function test button	to test the mechanical and electrical function of the float switch	
Protection class of all parts in contact with the liquid inside the tank	IP 68	
Connection head	PP with M 20 x 1.5 cable entry, protection class IP 54; on request: connection head made of cast aluminium, protection class IP 54	
Mounting	from the top	
Temperature application range	0°C to + 100°C (inside the connection head: 0°C to + 60°C);	
	on request, however <u>without</u> VDE marks licence: 0°C to + 250°C (inside the connection head: 0°C to + 100°C)	——
Pressure resistance/ test pressure	for pressureless applications (test pressure: max. 2 bar at + 20°C); on request: pressure resistance up to 4 bar at + 20°C / $g \geq 1.0$ g/cm³ (test pressure: max. 6 bar at + 20°C)	
Application	for various liquids, depending on the length of the float rod and the type of float used – please contact us for information on different options	

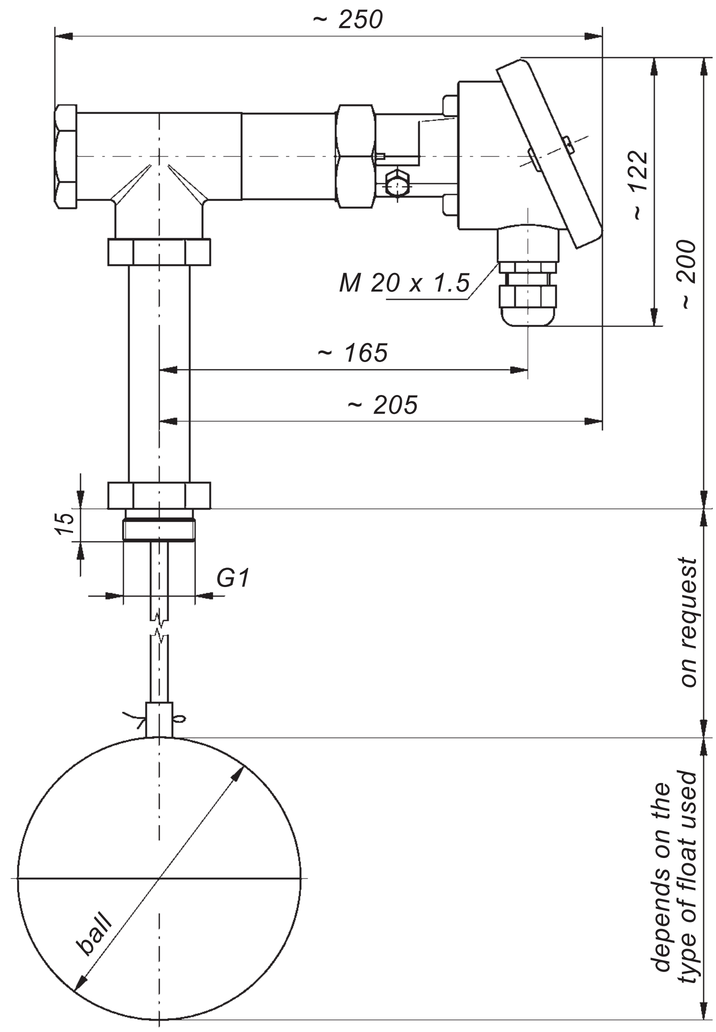
Mounting instructions see page page 2-1-23

SMV/E/.

Dimensional drawnings



SMG/VE/.



SMV/E/.

SM… float switches for pneumatic systems • for mounting from the side or • for mounting from the top • with pneumatic $^3/_2$-way valve

Technical Data	SM./Pn
Valve	pneumatic $^3/_2$-way valve
Pressure range	1.5 to max. 6 bar
Operation	**“UP” operation:** float in “max. position”: air is able to flow; float in “min. position”: air passage is blocked on request: **“DOWN” operation:** float in “max. position”: air passage is blocked; float in “min. position”: air is able to flow

Mode of operation

The rising or falling liquid level causes the float to move marginally up or down. When the float rises, it activates a pneumatic $^3/_2$ -way valve.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

The following types are available:

Types	Mounting	Page
SMG/Pn	for mounting from the side	2-1-21
SMV/Pn	for mounting from the top	2-1-22

SMG/Pn float switch made of stainless steel

SMG/Pn with square flange made of stainless steel

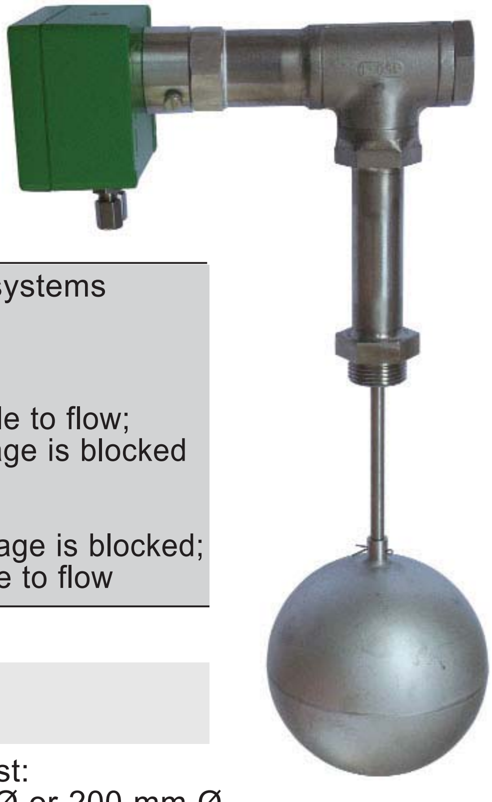
These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).

Technical data	**SMG/Pn**
Application	for applications in pneumatic systems
Pressure range	1.5 to max. 6 bar
Operation	**"UP" operation:** float in "max. position": air is able to flow; float in "min. position": air passage is blocked on request: **"DOWN" operation:** float in "max. position": air passage is blocked; float in "min. position": air is able to flow
Operating principle	pneumatic $^3/_2$-way valve
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm long; on request: ball float 95 mm Ø (reference: SMH/Pn)
On request: extension piece for float	horizontal or vertical, as desired
Bellows	stainless steel 316 Ti
Screw-in nipple	stainless steel 316 Ti, G1
On request: flange	square blind flange with G1 threaded hole made of stainless steel 316 Ti (dimensions see page 2-1-12) or other flanges with any desired dimensions
Protection class of float, bellows and nipple	IP 68
Terminal box	cast aluminium with protective coating, approx. 125 x 80 x 58 mm, with 2 connections for air hoses DN 4
Mounting	from the side
Temperature application range	0°C to + 60°C
Pressure resistance/ test pressure	for pressureless applications (test pressure: max. 2 bar at + 20°C); on request: pressure resistance up to 4 bar at + 20°C / g ≥ 1.0 g/cm³ (test pressure: max. 6 bar at + 20°C)
Application	for various liquids, depending on the pressure at the valve - please contact us for information on different options

Mounting instructions see page 2-1-23

SMV/Pn float switch made of stainless steel

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).



SMV/E/.

Technical data	**SMV/Pn**
Application	for applications in pneumatic systems
Pressure range	1.5 to max. 6 bar
Operation	**“UP” operation:** float in “max. position”: air is able to flow; float in “min. position”: air passage is blocked on request: **“DOWN” operation:** float in “max. position”: air passage is blocked; float in “min. position”: air is able to flow
Operating principle	pneumatic $^{3}/_{2}$-way valve
All parts in contact with the liquid inside the tank	stainless steel 316 Ti
Float dimensions	ball float 130 mm Ø; on request: ball float 148 mm Ø, 180 mm Ø or 200 mm Ø and special floats with other dimensions
Length of the float rod less float (measured from sealing surface of screw-in nipple)	as desired; 200 mm if not otherwise specified; guide tube for the float rod for rod length over 500 mm included (for rod lengths under 500 mm on request)
Screw-in nipple	stainless steel 316 Ti, G1
On request: flange	blind flange with any desired dimensions with G1 threaded hole
Protection class of all parts in contact with the liquid inside the tank	IP 68
Terminal box	cast aluminium with protective coating, approx. 125 x 80 x 58 mm, with 2 connections for air hoses DN 4
Mounting	from the top
Temperature application range	0°C to + 60°C
Pressure resistance/ test pressure	for pressureless applications (test pressure: max. 2 bar at + 20°C); on request: pressure resistance up to 4 bar at + 20°C / g ≥ 1.0 g/cm³ (test pressure: max. 6 bar at + 20°C)
Application	for various liquids, depending on the length of the float rod, the type of float used and the pressure at the valve - please contact us for information on different options

Mounting instructions see page 2-1-23

Mounting instructions:

SM/P/. and SM/E/. float switches:

These float switches must be mounted **horizontally**.
• screw the float switch with its seal into the G1 tank socket or flange borehole,
• seal in place,
• loose the two cheese head screws on the side – but do not remove –,
• set the connection head in such a way that the label “TOP” is at the top and the cable entry at the bottom,
• retighten the two cheese head screws.

SMG/P/., SMH/P/. and SMG/PVDF/. float switches:

These float switches must be mounted **horizontally**.
• unscrew the float,
• screw the float switch with its seal into the G1 tank socket or flange borehole,
• seal in place,
• loose the two cheese head screws on the side – but do not remove –,
• set the connection head in such a way that the label “TOP” is at the top and the cable entry at the bottom,
• retighten the two cheese head screws,
• screw back in place the float.

SMG/E/., SMH/E/., SMG/Pn and SMH/Pn float switches:

These float switches must be mounted **horizontally**.
• remove the pin,
• unscrew the float,
• screw the float switch with its seal into the G1 tank socket or flange borehole,
• seal in place,
• loose the two cheese head screws on the side – but do not remove –,
• set the connection head in such a way that the label “TOP” is at the top and the cable entry at the bottom,
• retighten the two cheese head screws,
• screw back in place the float,
• secure the float using the pin.

SM/PTFE/. float switches:

These float switches must be mounted **horizontally**.
• seal and mount the float switch in the corresponding counter flange,
• loose the two cheese head screws on the side – but do not remove –,
• set the connection head in such a way that the label “TOP” is at the top and the cable entry at the bottom,
• retighten the two cheese head screws.

SMG/E -D- float switch:

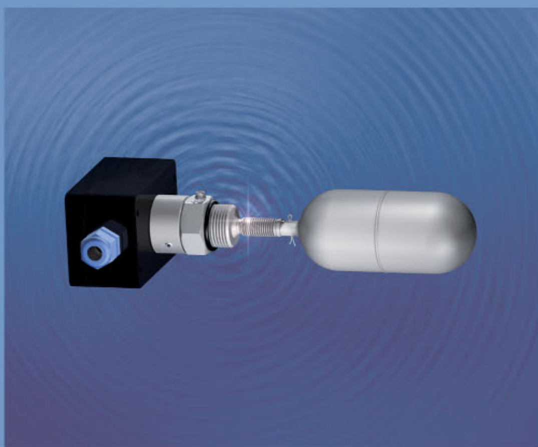
This float switch must be mounted **horizontally**.
• remove the pin,
• unscrew the float together with its stirrup,
• screw the float switch with its seal into the G1 tank socket or flange borehole and seal in place so that the connection head is set in such a way that the label “TOP” is at the top and the cable entry at the bottom,
• screw back in place the float together with its stirrup,
• secure using the pin.

SMG/VE/., SMV/E/. and SMV/Pn float switches:

These float switches must be mounted **vertically**.
• remove the pin,
• unscrew the float,
• screw the float switch with its seal into the G1 tank socket or flange borehole,
• seal in place,
• screw back in place the float,
• secure the float using the pin.

SM Ex
float switches

**Controlling devices with
rod operated microswitch,
for signalling or regulation
of liquid levels**



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contact@jola-info.de • www.jola-info.de

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

SM Ex float switches

Contents **Pages**

Electrical Ex float switches SM/./E/EL/Ex-0G ⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb, with microswitch

Mode of operation

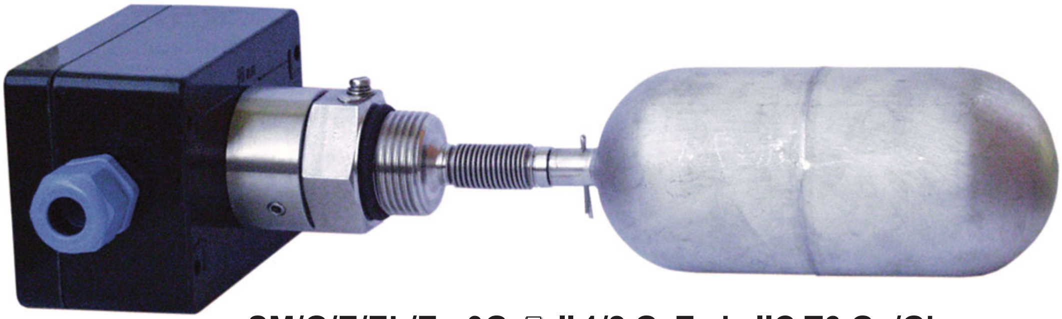
The rising or falling liquid level causes the float to move marginally up or down.
When the float rises, it activates a microswitch in the form of a changeover contact.

Special precondition for safe use of the float switches

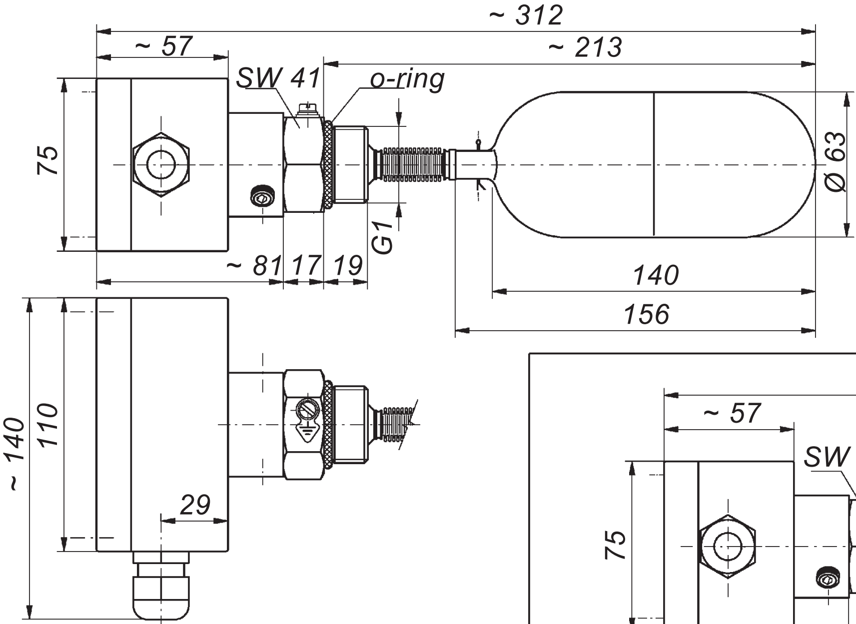
The thickness of the bellow of the float switch is only 0.2 mm. The float switch has therefore only to be installed in a non-corrosive environment in order to grant the separation of the zones. Precautions have to be taken for the same reason before or during the installation of the float switch in order to protect the float switch efficiently against mechanic damages which may for example be caused by turbulences or heavy wave movements of the liquid to be monitored.

Technical data	**SM/G/E/EL/Ex-0G** ⟨Ex⟩ **II 1/2 G Ex ia IIC T6 Ga/Gb**	**SM/H/E/EL/Ex-0G** ⟨Ex⟩ **II 1/2 G Ex ia IIC T6 Ga/Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres • float side: zone 0, 1 or 2, • terminal box: zone 1 or 2; EC type examination certificate INERIS 03ATEX0224X**	
Operating principle	rod operated microswitch, potential-free changeover contact	
Recommended application	via Jola Ex protection relay	
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm	stainless steel 316 Ti, 95 mm Ø
On request: extension piece for float	horizontal or vertical, as desired	
Bellow	stainless steel 316 Ti, 15 mm Ø x 38 mm, wall thickness 0.2 mm	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	square blind flange with G1 thread made of stainless steel 316 Ti (dimensions see page 2-2-4) or other flanges with any desired dimensions	blind flange DN 100 with G1 thread made of stainless steel 316 Ti
Protection class of float, bellow and screw-in nipple	IP68	
Terminal box	made of glass fibre and graphite reinforced polyester, A 301, 110 x 75 x 55 mm, protection class IP65	
Mounting orientation	horizontal	
Temperature range	0°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Application	only for use in liquids with a specific gravity ≥ 0.7 g/cm³ (specification without the optional extension piece for the float)	

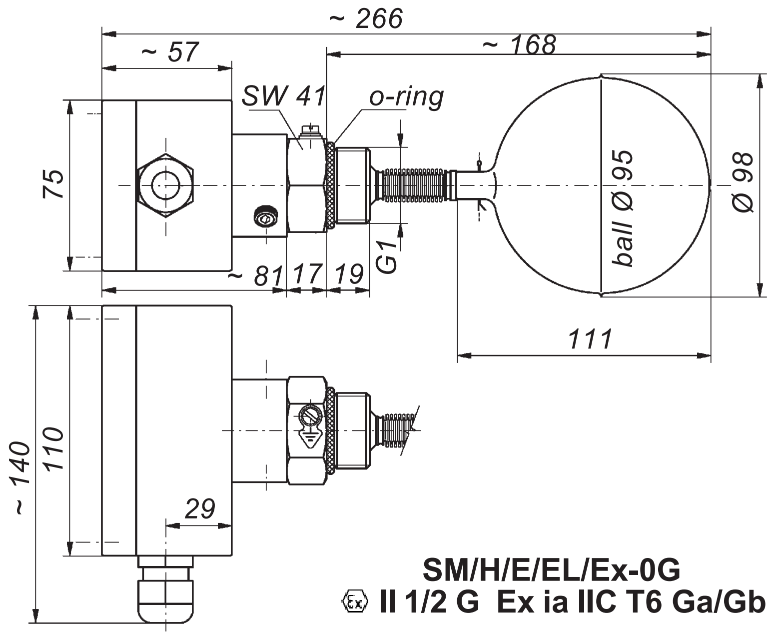
Versions for use in mines susceptible to firedamp with a ⟨Ex⟩ I M2 Ex ia I Mb protection level on request.



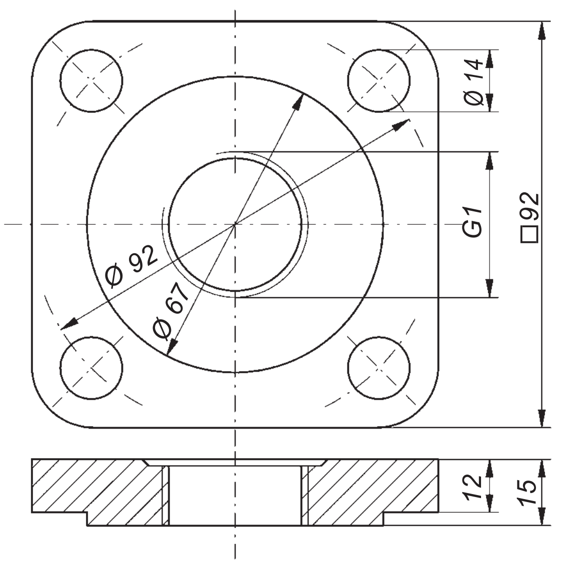
SM/G/E/EL/Ex-0G ⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb

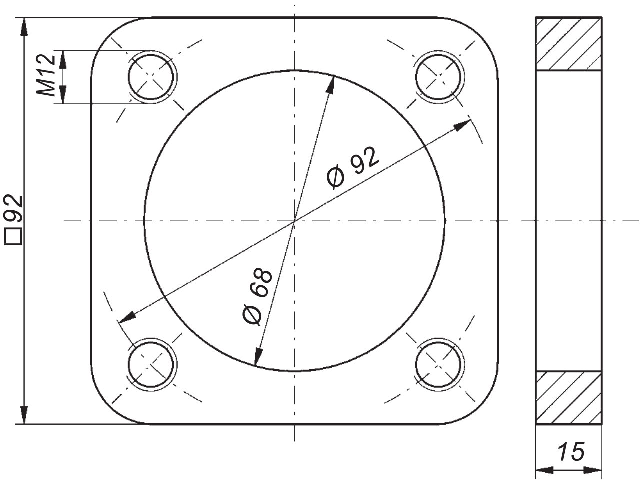


These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).



SM/H/E/EL/Ex-0G
⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb





Electrical Ex float switches SM/V.../E/EL/Ex-0G ⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb, with microswitch

Mode of operation

The rising or falling liquid level causes the float to move marginally up or down.
When the float rises, it activates a microswitch in the form of a changeover contact.

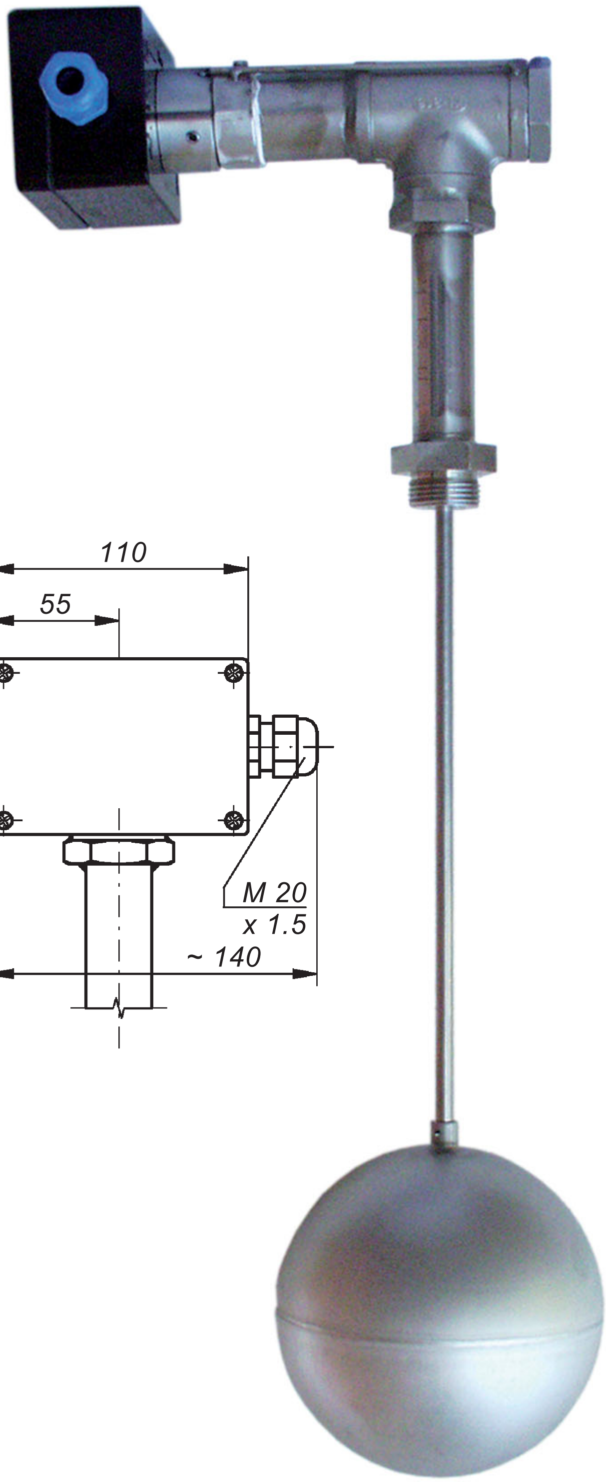
Special precondition for safe use of the float switches

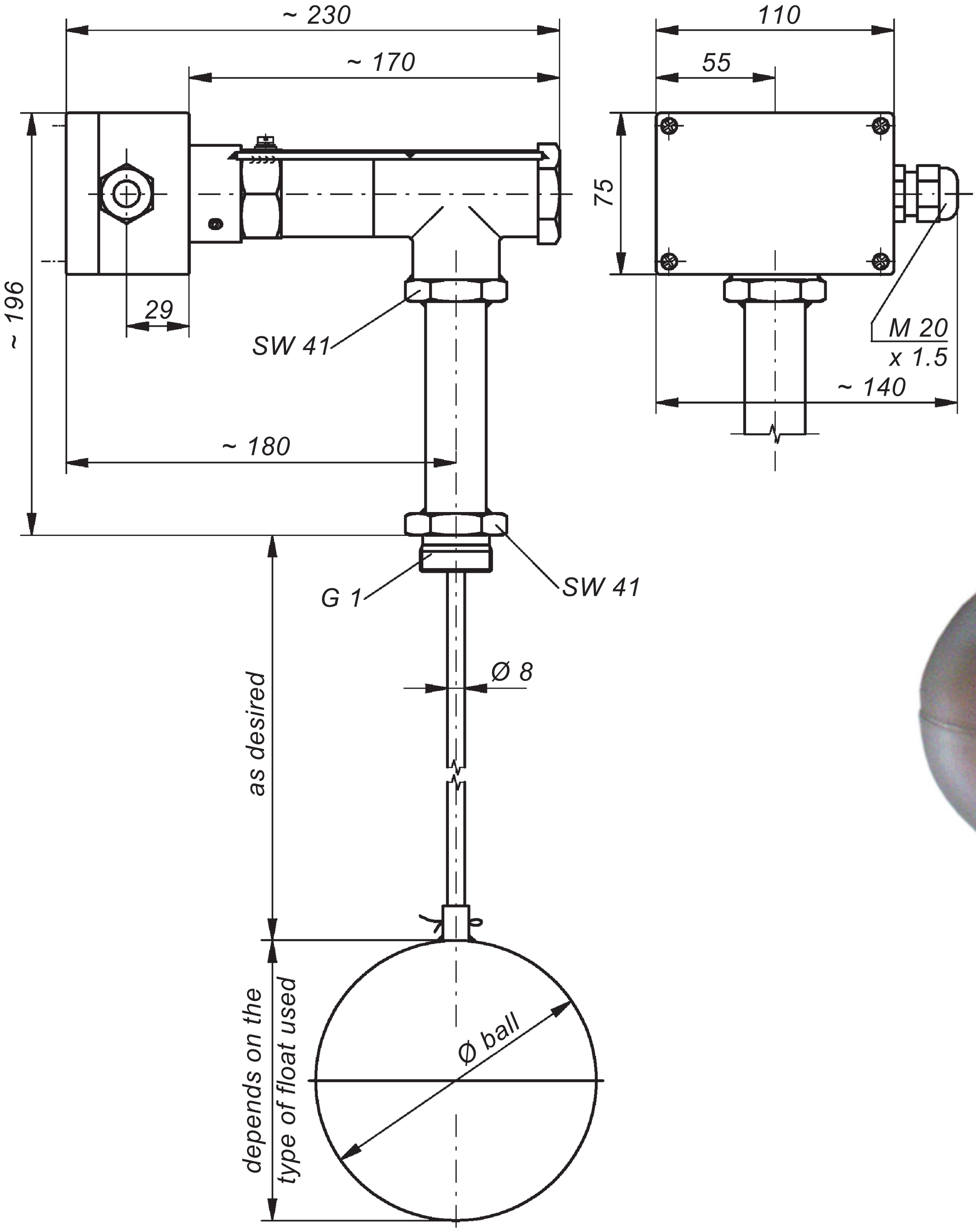
The thickness of the bellow of the float switch is only 0.2 mm. The float switch has therefore only to be installed in a non-corrosive environment in order to grant the separation of the zones. Precautions have to be taken for the same reason before or during the installation of the float switch in order to protect the float switch efficiently against mechanic damages which may for example be caused by turbulences or heavy wave movements of the liquid to be monitored.

Technical data	**SM/V130/E/**	**SM/V148/E/**	**SM/V180/E/**	**SM/V200/E/**
	EL/Ex-0G ⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb			
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres • float side: zone 0, 1 or 2, • terminal box: zone 1 or 2; EC type examination certificate INERIS 03ATEX0224X**			
Operating principle	rod operated microswitch, potential-free changeover contact			
Recommended application	via Jola Ex protection relay			
All parts in contact with the liquid	stainless steel 316 Ti			
Float dimensions	130 mm Ø	148 mm Ø	180 mm Ø	200 mm Ø
Length of the float rod less float (measured from sealing surface of screw-in nipple)	as desired, 200 mm if not otherwise specified; guide tube for the float rod for rod length over 500 mm included (for rod lengths under 500 mm on request)			
Screw-in nipple	stainless steel 316 Ti, G1			
On request: flange	blind flange with any desired dimensions tapped with G1 thread			
Protection class of all parts in contact with the liquid	IP68			
Terminal box	made of glass fibre and graphite reinforced polyester, A 301, 110 x 75 x 55 mm, protection class IP65			
Mounting orientation	vertical			
Temperature range	0°C to + 60°C			
Pressure resistance	for pressureless applications only, use only under atmospheric conditions			
Application	for various liquids, depending on the length of the float rod and the type of float used – please contact us for information on different options			

Versions for use in mines susceptible to firedamp with a ⟨Ex⟩ I M2 Ex ia I Mb protection level on request.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).





SM/V.../E/EL/Ex-0G ⟨Ex⟩ II 1/2 G Ex ia IIC T6 Ga/Gb

Pneumatic Ex float switches SM/./E/PN/Ex-0G Ex II 1/2 G c IIC $\Delta T = 0$, with pneumatic 3/2-way valve

Mode of operation

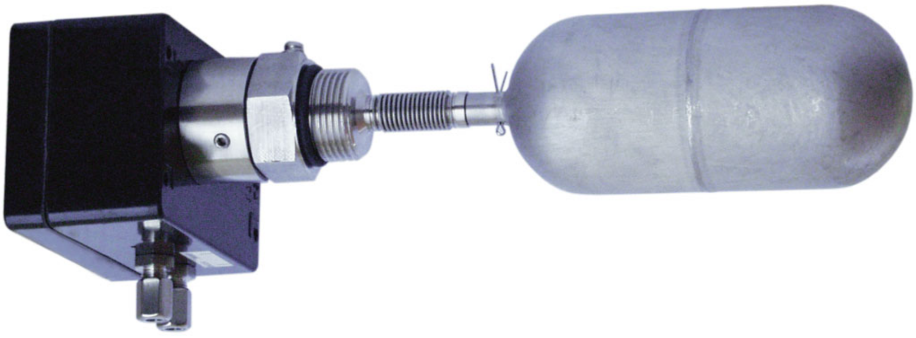
The rising or falling liquid level causes the float to move marginally up or down. When the float rises, it activates a pneumatic 3/2-way valve.

Special precondition for safe use of the float switches

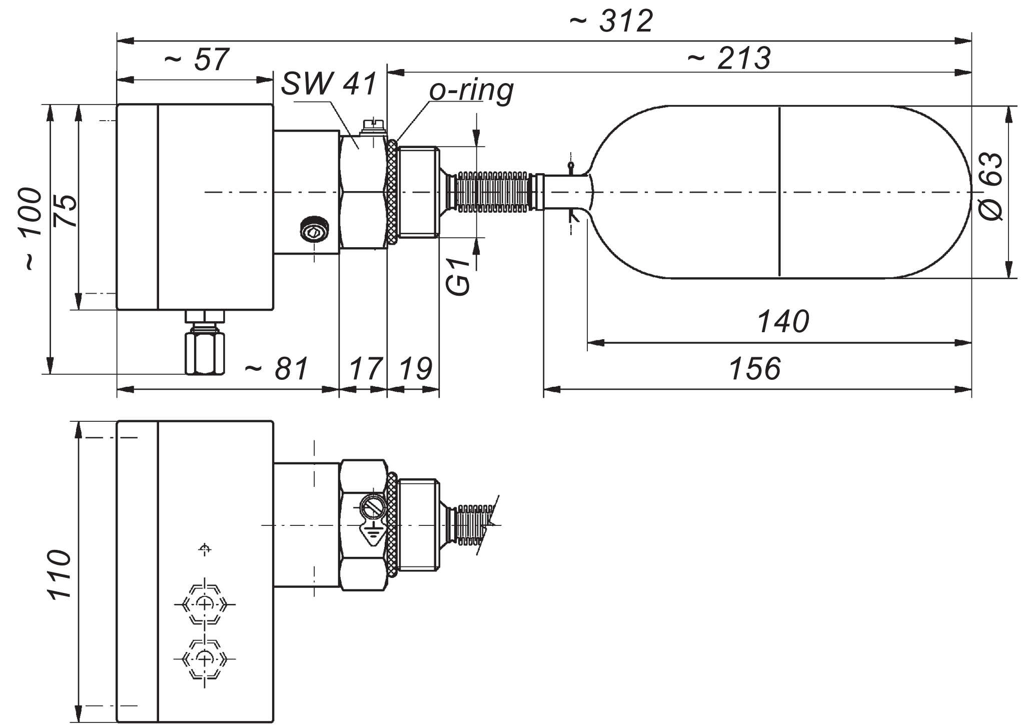
The thickness of the bellow of the float switch is only 0.2 mm. The float switch has therefore only to be installed in a non-corrosive environment in order to grant the separation of the zones. Precautions have to be taken for the same reason before or during the installation of the float switch in order to protect the float switch efficiently against mechanic damages which may for example be caused by turbulences or heavy wave movements of the liquid to be monitored.

Technical data	**SM/G/E/PN/Ex-0G** **Ex II 1/2 G c IIC $\Delta T = 0$**	**SM/H/E/PN/Ex-0G** **Ex II 1/2 G c IIC $\Delta T = 0$**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres** **• float side: zone 0, 1 or 2,** **• terminal box: zone 1 or 2;** **EC type examination certificate INERIS 03ATEX0224X**	
Operating principle	pneumatic 3/2-way valve	
Pressure range	1.5 bar to max. 6 bar	
Operation	**"UP" operation:** float in "max. position": air is able to flow; float in "min. position": air passage is blocked on request: **"DOWN" operation:** float in "max. position": air passage is blocked; float in "min. position": air is able to flow	
Float	stainless steel 316 Ti, 63 mm Ø x 140 mm	stainless steel 316 Ti, 95 mm Ø
On request: extension piece for float	horizontal or vertical, as desired	
Bellow	stainless steel 316 Ti, 15 mm Ø x 38 mm, wall thickness 0.2 mm	
Screw-in nipple	stainless steel 316 Ti, G1	
On request: flange	square blind flange with G1 thread made of stainless steel 316 Ti (dimensions see page 2-2-4) or other flanges with any desired dimensions	blind flange DN 100 with G1 thread made of stainless steel 316 Ti
Protection class of float, bellow and screw-in nipple	IP68	
Terminal box	made of glass fibre and graphite reinforced polyester, A 301, 110 x 75 x 55 mm, with 2 connections for air hoses DN 6	
Mounting orientation	horizontal	
Temperature range	0°C to + 40°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Application	for various liquids, depending on the pressure at the valve - please contact us for information on different options	

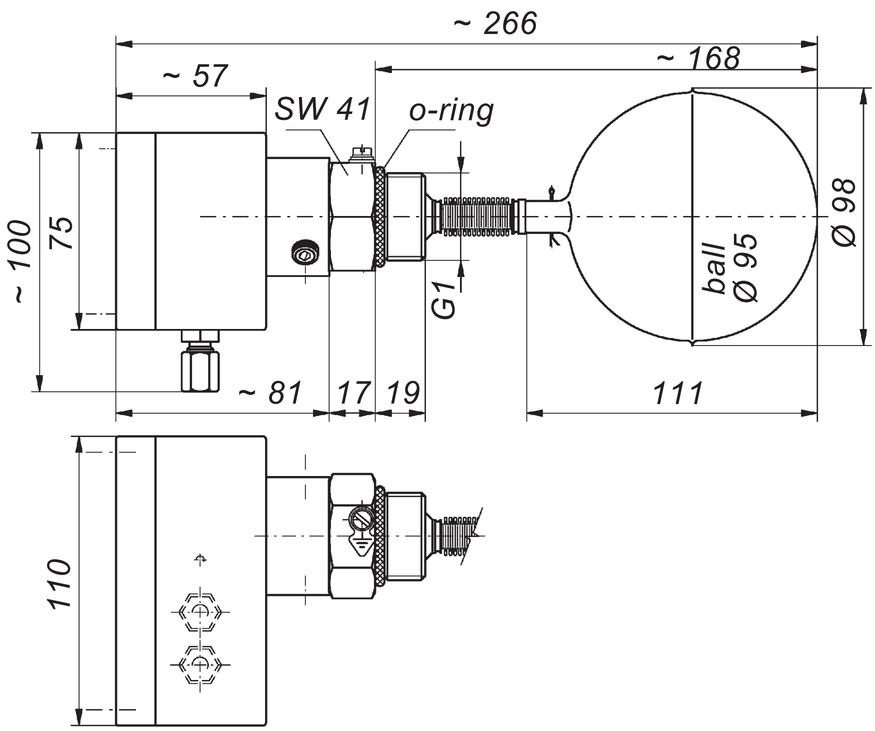
Versions for use in mines susceptible to firedamp with a Ex I M2 c IIC $\Delta T = 0$ protection level on request.



SM/G/E/PN/Ex-0G ⓔ II 1/2 G c IIC ΔT = 0



These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).



SM/H/E/PN/Ex-0G ⓔ II 1/2 G c IIC ΔT = 0

Pneumatic Ex float switches SM/V.../E/PN/Ex-0G Ex II 1/2 G c IIC ΔT = 0, with pneumatic 3/2-way valve

Mode of operation

The rising or falling liquid level causes the float to move marginally up or down. When the float rises, it activates a pneumatic 3/2-way valve.

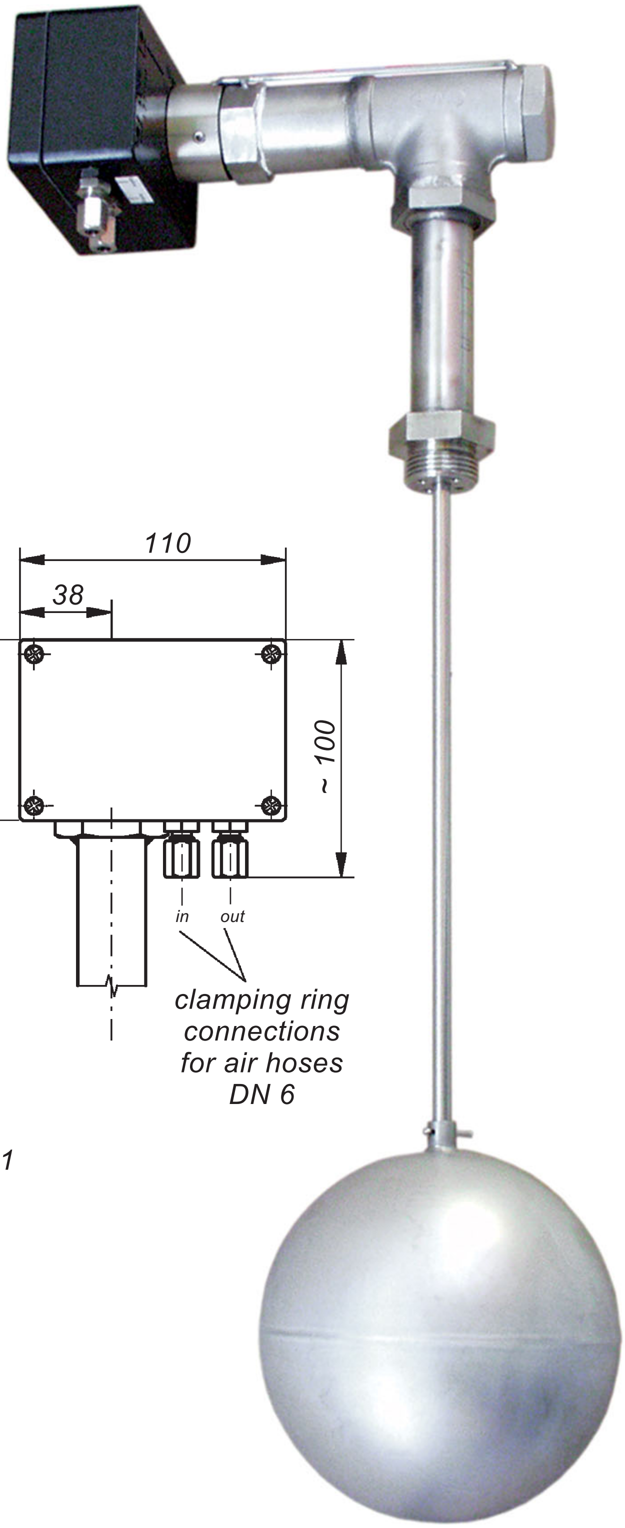
Special precondition for safe use of the float switches

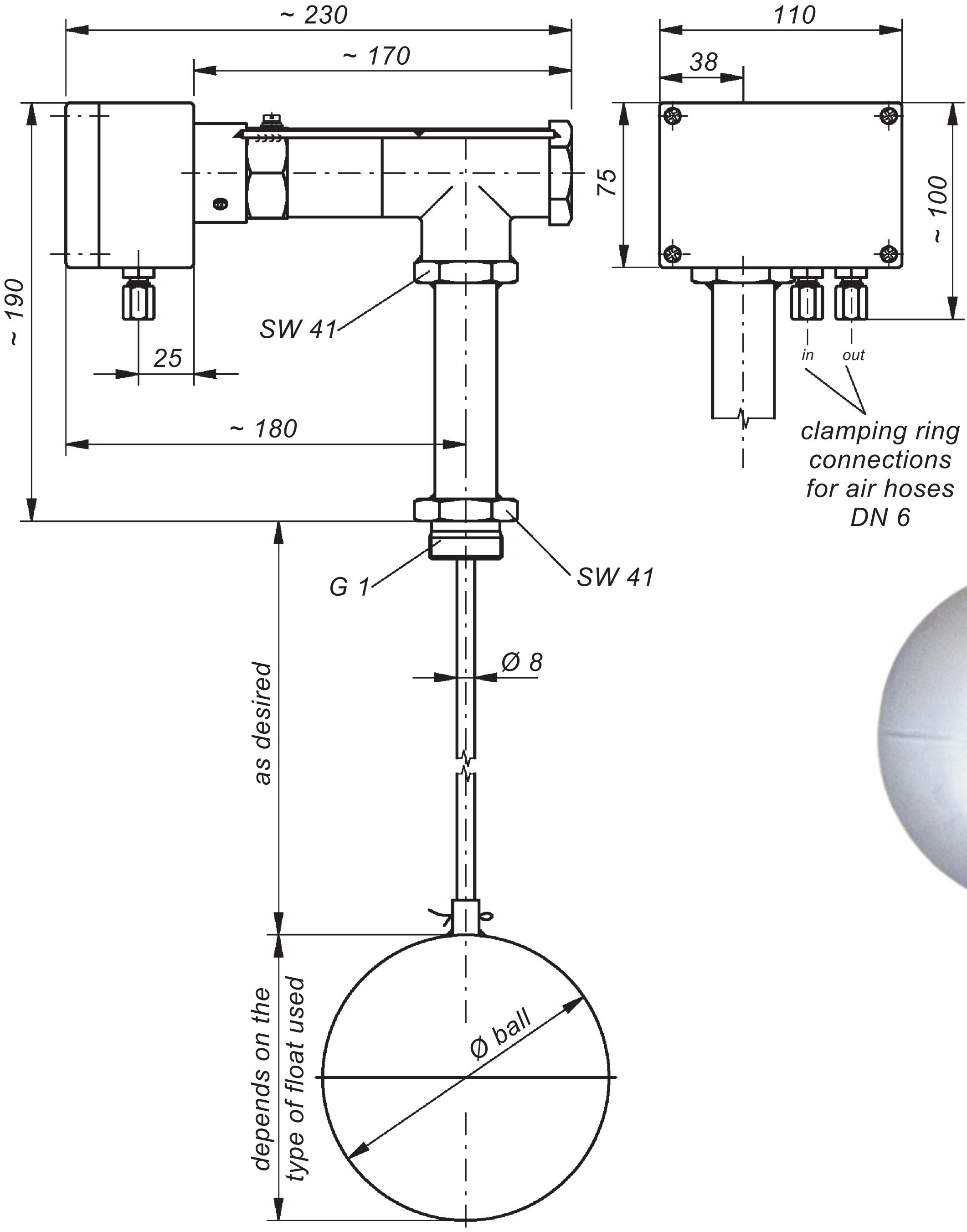
The thickness of the bellow of the float switch is only 0.2 mm. The float switch has therefore only to be installed in a non-corrosive environment in order to grant the separation of the zones. Precautions have to be taken for the same reason before or during the installation of the float switch in order to protect the float switch efficiently against mechanic damages which may for example be caused by turbulences or heavy wave movements of the liquid to be monitored.

Technical data	**SM/V130/E/ ǀ SM/V148/E/ ǀ SM/V180/E/ ǀ SM/V200/E/ PN/Ex-0G Ex II 1/2 G c IIC ΔT = 0**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres • float side: zone 0, 1 or 2, • terminal box: zone 1 or 2; EC type examination certificate INERIS 03ATEX0224X**
Operating principle	pneumatic 3/2-way valve
Pressure range	1.5 bar to max. 6 bar
Operation	**“UP” operation:** float in “max. position”: air is able to flow; float in “min. position”: air passage is blocked on request: **“DOWN” operation:** float in “max. position”: air passage is blocked; float in “min. position”: air is able to flow
All parts in contact with the liquid	stainless steel 316 Ti
Float dimensions	130 mm Ø ǀ 148 mm Ø ǀ 180 mm Ø ǀ 200 mm Ø
Length of the float rod less float (measured from sealing surface of screw-in nipple)	as desired, 200 mm if not otherwise specified; guide tube for the float rod for rod length over 500 mm included (for rod lengths under 500 mm on request)
Screw-in nipple	stainless steel 316 Ti, G1
On request: flange	blind flange with any desired dimensions tapped with G1 thread
Protection class of all parts in contact with the liquid	IP68
Terminal box	made of glass fibre and graphite reinforced polyester, A 301, 110 x 75 x 55 mm, protection class IP65
Mounting orientation	vertical
Temperature range	0°C to + 40°C
Pressure resistance	for pressureless applications only, use only under atmospheric conditions
Application	for various liquids, depending on the length of the float rod, the type of float used and the pressure at the valve – please contact us for information on different options

Versions for use in mines susceptible to firedamp with a Ex I M2 c IIC ΔT = 0 protection level on request.

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks).





SM/V.../E/PN/Ex-0G ⟨Ex⟩ II 1/2 G c IIC ΔT = 0

MK
float switch

**Controlling device
with microswitches activated by a rod,
for automatic control,
regulation and signalling of a liquid level
in a pressureless tank**

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The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

MK 2/E float switch

Controlling device
with microswitches activated by a rod,
for automatic control, regulation and signalling
of a liquid level in a pressureless tank

Principle

A float rises and falls with the liquid level, travelling up and down a float rod between two collars. This float has been weighted in our workshop with sand through a closable filling hole.

If the liquid rises above the level of the upper collar, or falls below that of the lower collar, the movable float rod is moved upwards or downwards respectively by buoyancy or weight of the float. This trips the microswitch. This switch can be used for the function “filling” or “emptying” according to the choice of connection terminals.

In the case of “emptying” the rod pushes upwards when the upper collar is reached by the float. This trips the microswitch, which can, for instance, switch a pump. Liquid is pumped off. The float falls with the liquid level and pulls the float rod down again when it reaches the lower collar. This breaks the contact and the pump is switched off.

In the “filling” mode, the action is the other way round.

An additional contact is placed at approx. 15 mm above the upper pump control switch. This contact serves as high level alarm.

The level differential between the "ON"-position and the "OFF"-position can be adjusted on the float rod by means of the two collars.

This unit is not suitable for use in turbulent liquids (e.g. in stirrer tanks).

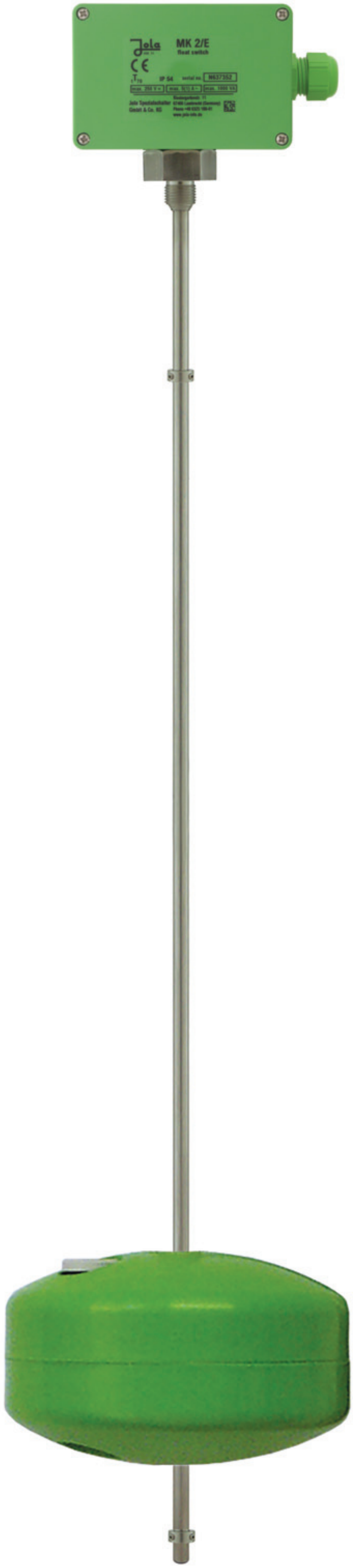
Mounting

Remove float and collars from float rod.

Insert rod with screw-in nipple from above in a G$^{1}/_{2}$ hole or socket and screw up.

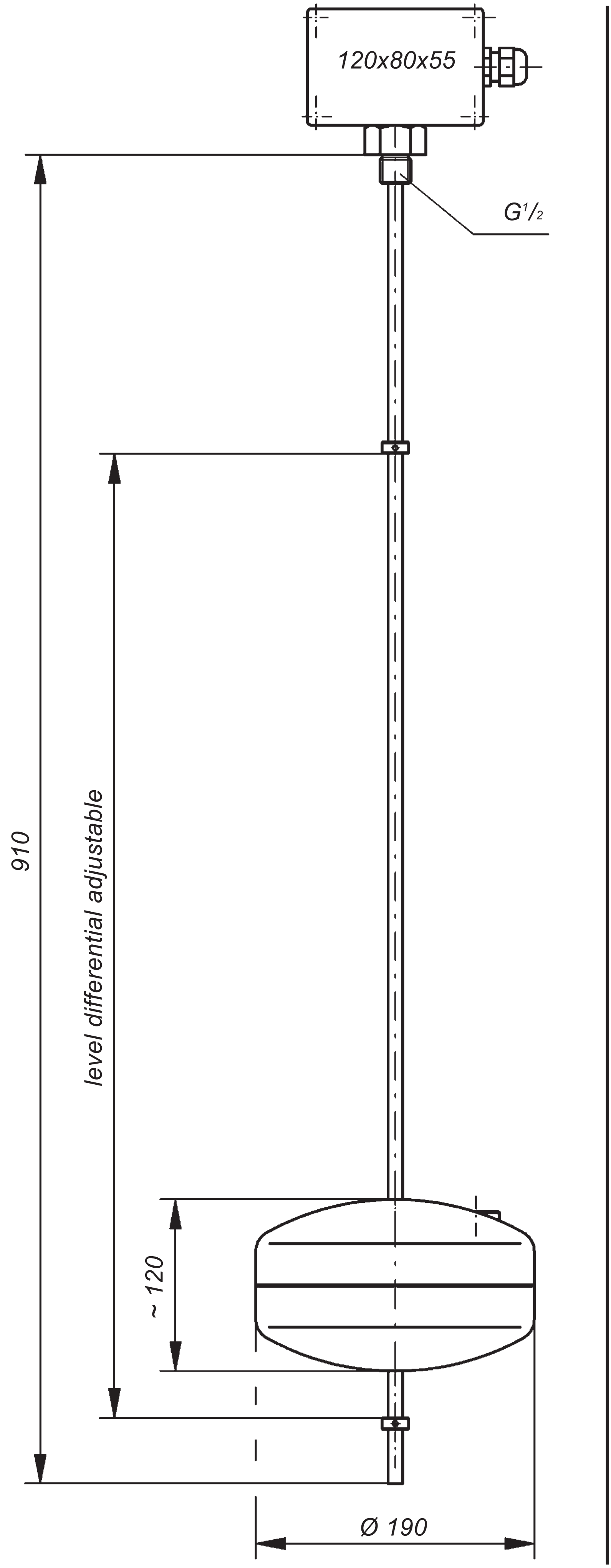
Fit the 2 collars and the float on rod and set up the level differential by fixing the collars at the appropriate heights.

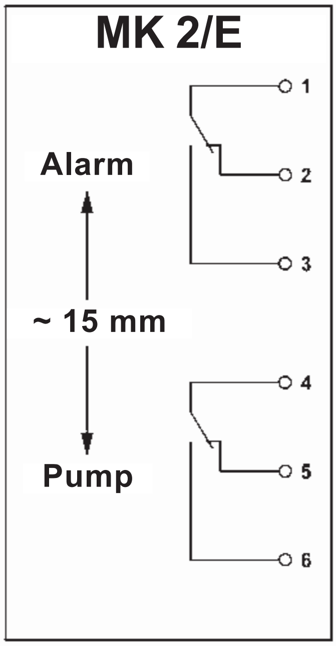
Set the float in place in such a way that the filling hole is <u>at the top</u> and tighten the screw properly, so that no liquid can penetrate the float.


Jola
MK 2/E
float switch
IP 54
serial no.
N637352

MK 2/E float switch

Technical data	MK 2/E
Application	for applications up to max. 250 V
Switching voltage	between AC/DC 24 V and AC/DC 250 V
Switching current	between AC 20 mA and AC 5 (1) A or between DC 20 mA and DC 100 mA
Switching capacity	max. 1,000 VA
Operating principle	2 microswitches, 2 potential-free changeover contacts
Rod	stainless steel 316 Ti, 10 mm Ø, length: 910 mm; level differential adjustable by means of two collars
Screw-in nipple	stainless steel 316 Ti, G$^1/_2$
Float	PP, 190 mm Ø x approx. 120 mm, on request: stainless steel 316 Ti, approx. 165 mm Ø x 120 mm
Connection box	PP, A 307, 120 x 80 x 55 mm, protection class IP54
Mounting orientation	vertical
Temperature range	+ 1°C to + 70°C
Pressure resistance	for pressureless applications
Application	only for use in liquids with a specific gravity ≥ 1 g/cm³



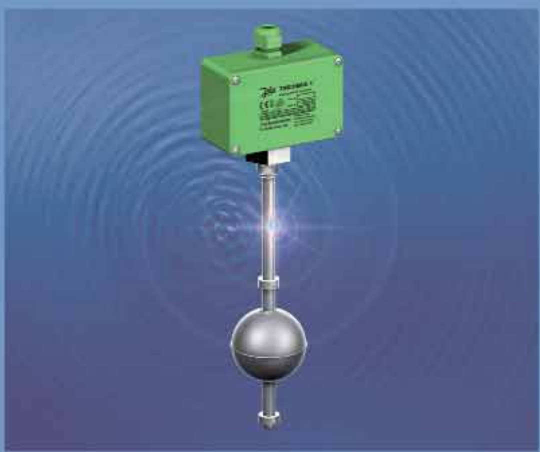


contact position when tank is empty

Dimensions in mm

TSR
immersion probes

Controlling devices with magnetically operated reed contacts, for automatic control, regulation and signalling of liquid levels



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TSR immersion probes

Contents					Page

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TSR immersion probes

Magnetically operated automatic liquid level controls

Construction and operating principle of TSR immersion probes

The TSR immersion probes have a probe tube with built-in reed contacts. The float is fitted with a permanent magnet and moves freely up and down the probe tube, activating the reed contacts as it rises and falls.

It should be noted that reed contacts do **not** lock but that they switch only for as long as they are influenced by the magnetic field. Once the float passes beyond a contact upwards or downwards, the latter returns to its original position. However, the contacts can be made to hold by using collars to limit the motion of the float.

For use outside potentially explosive atmospheres, the costumer can choose the model TSR/3/... or TSR/1/... (not suitable for the type TSR/0/ED/E6, see page 3-1-17):

Type	TSR/3/...	TSR/1/...
Application	for applications up to max. 250 V	for light current applications
Switching voltage	AC/DC 24 V – 250 V	AC/DC 1 V – 42 V
Switching current	AC 100 mA – 2 A (0.4 A)	AC 1 mA – 500 mA
Switching capacity	max. 100 VA	max. 20 VA
VDE marks licences	DVE + VDE EMC	— VDE EMC
Instruction for working with inductive loads: When using the TSR types with inductive loads, a RC combination of 0.22 µF + 220 Ω must be connected in parallel to the magnetic coil of the contactor.		

Caution!

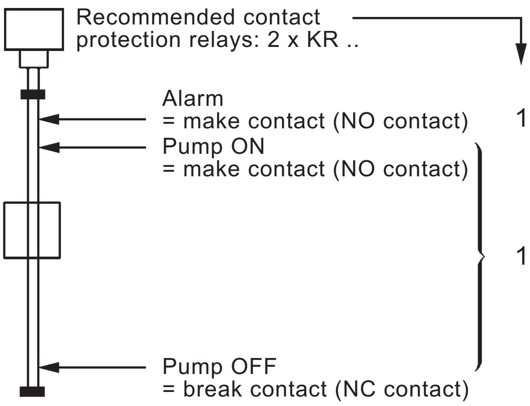
If a TSR immersion probe is to be used with a KR protection relay, you must choose the model TSR/1/... .

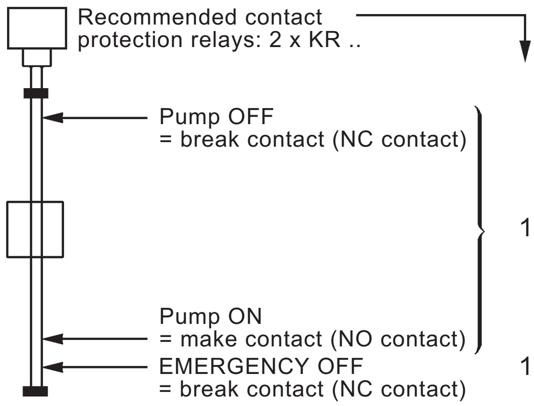
We recommend this apparatus combination.

Specimen application 1: Automatic emptying of a tank
The float rises with the liquid to the maximum level and trips the “make” (= normally open) contact which in turn activates the contactor solenoid, serving, for example, to set a pump in operation. Liquid is pumped out. When the minimum level is reached, the “break” (= normally closed) contact at the bottom is activated, thus interrupting the contactor holding circuit. The arrangement is therefore exactly the same as with ON-OFF pushbuttons.

Specimen application 2: Automatic filling of a tank
The float falls with the liquid to the minimum level and trips the “make” (= normally open) contact which in turn activates the contactor solenoid, serving, for example, to set a pump in operation. Liquid is then pumped in. When the maximum level is reached, the upper “break” (= normally closed) contact is activated, thus interrupting the contactor holding circuit. The arrangement is therefore exactly the same as with ON-OFF pushbuttons.

Examples of standard operation
Standard operations with 1 float and a collar fitted above the upper contact.

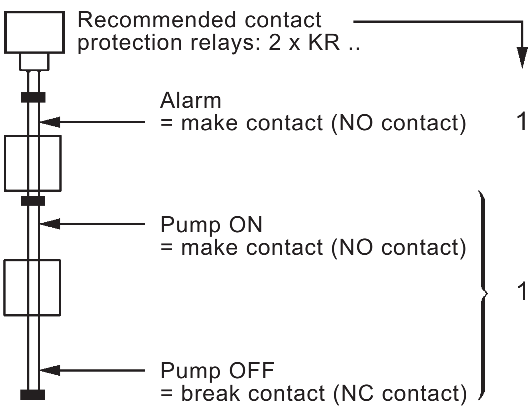


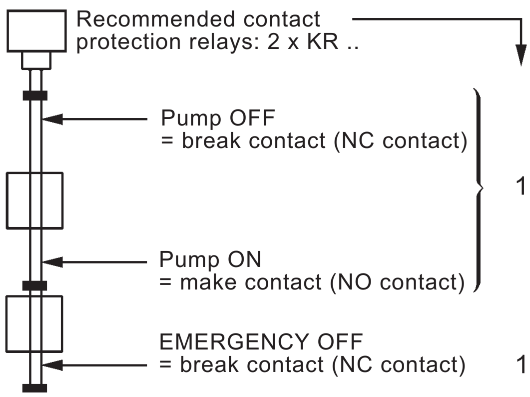


The collar fitted at the top stops the float at the upper contact, so that the latter cannot be overrun. If this collar was not fitted, it is conceivable that, in the case of a short power failure and freely entering liquid, for example, the contact for “Pump ON” or the alarm contact would be overrun during the short power failure without the pump being switched on or an alarm signal being given. This could then lead to an overflow.

For the same reasons, the probe tube should be of such a length that when the float reaches the lower contact, it rests on the lower holding washer or collar (For information on the recommended distances between contact and end of probe tube, see the technical data of the individual TSR models under “Minimum distances”).

Standard operations with 2 or more floats



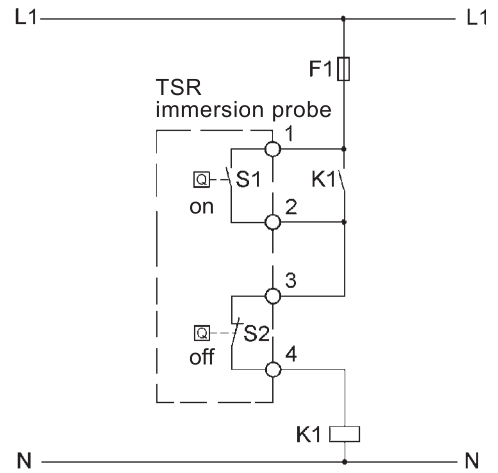


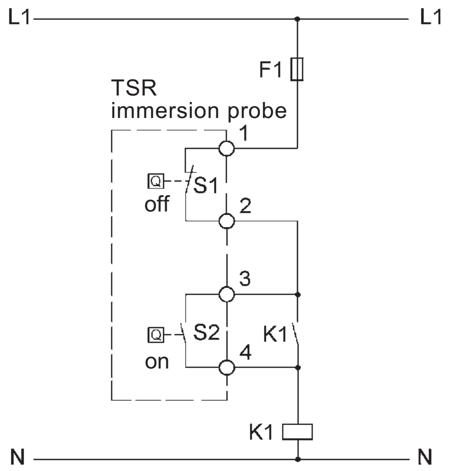
The use of an additional float together with the corresponding collar ensures that not only the uppermost and lowest but also another important contact is held when the liquid level rises above or falls below the level at which the contact is set. Depending on the desired switching function, it is possible to use several floats together with the corresponding collars.

When fixing the levels at which the contacts are to be set, care should be taken to ensure that wherever a float is stopped at a contact by a collar, the minimum distance to an adjacent contact activated by another, separate float should be increased in varying degrees, depending on the model of floats planned. Please consult us regarding exact spacing!

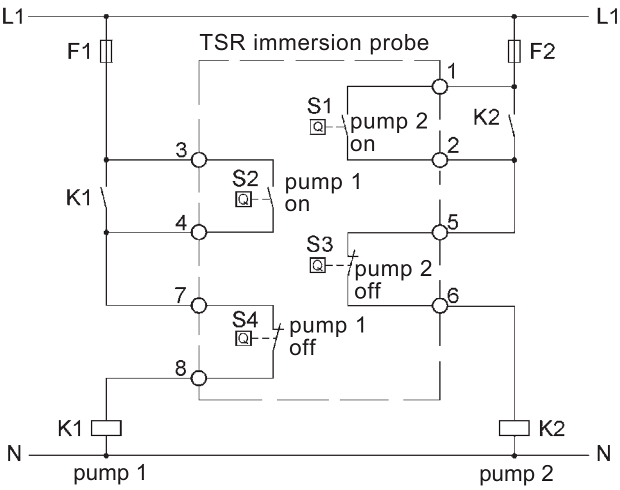
Basic circuit diagram for emptying	Basic circuit diagram for filling

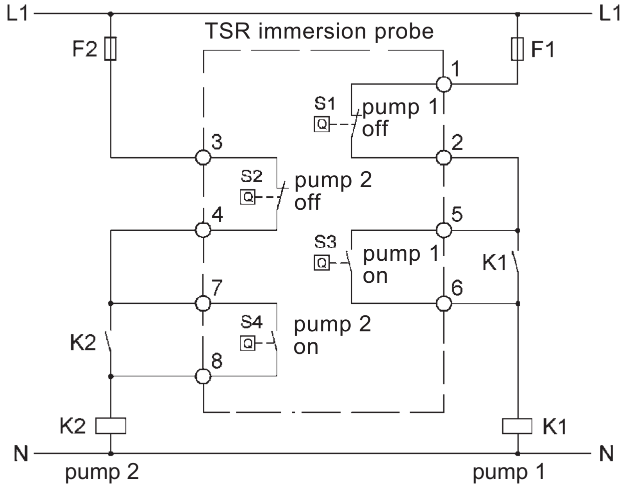
using a TSR



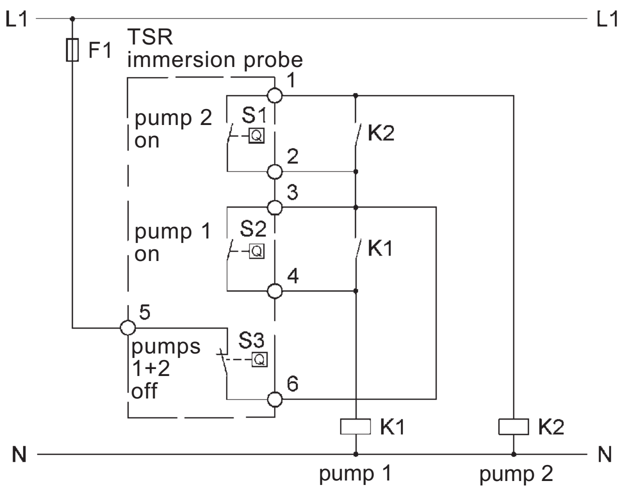


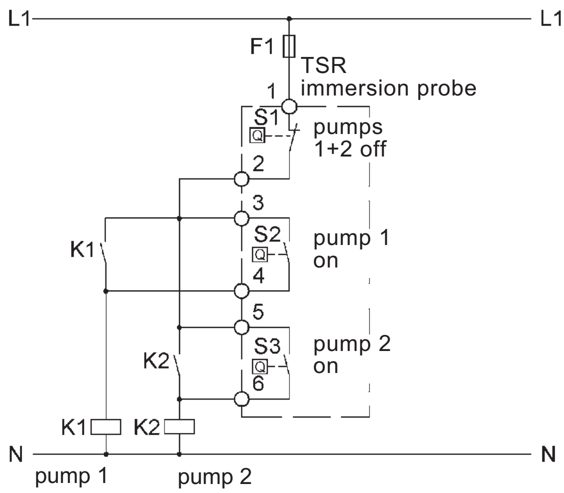
using a TSR for 2 pumps





using a TSR for 2 pumps with a common switch-off contact





The above contact positions correspond to a liquid level situated between the respective switch-on and switch-off points.

TSR/... immersion probes with
• probe tube made of stainless steel
• float made of PP

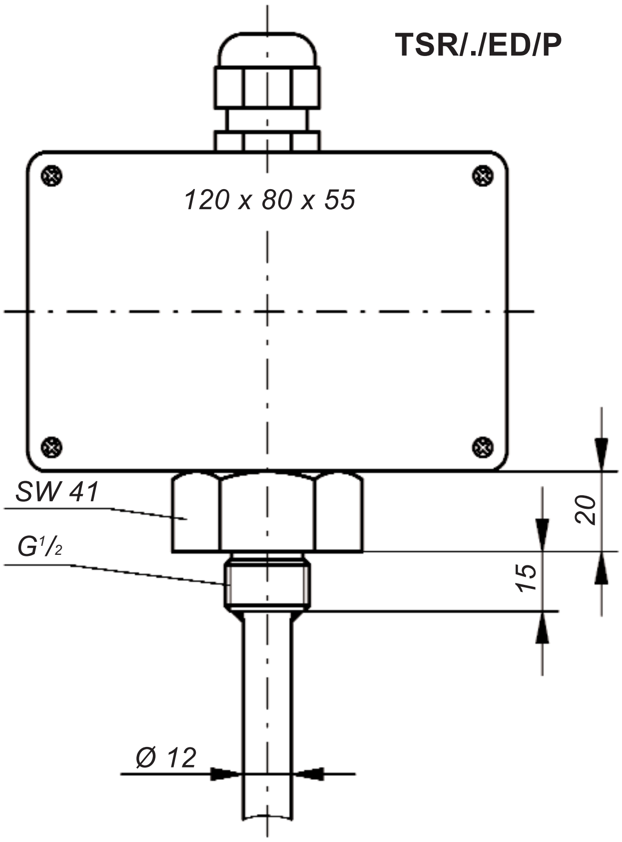
Type	TSR/3/ED/..	TSR/1/ED/..
Application	**for applications up to max. 250 V**	**for light current applications**
Switching voltage	**AC/DC 24 V – 250 V**	**AC/DC 1 V – 42 V**
Switching current	**AC 100 mA – 2 A (0.4 A)**	**AC 1 mA – 500 mA**
Switching capacity	**max. 100 VA**	**max. 20 VA**

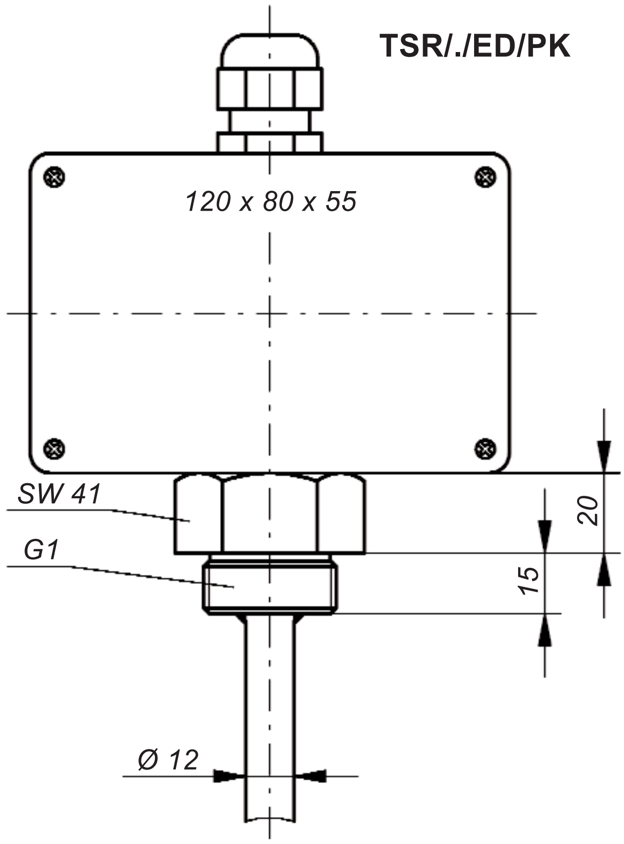
Technical data	**TSR/3/ED/P TSR/1/ED/P**	**TSR/3/ED/PK TSR/1/ED/PK**
Probe tube: material **diameter** length	stainless steel 316 Ti **12 mm** acc. to customer's specification, however max. 3,000 mm	
Screw-in nipple	G1/2, on request G1,	G1, on request G1/2,
	on request G1 1/2 or G2; on request with reducing nipple made of malleable cast iron R1 1/2 or R2 conical	
Float	PP, 53 mm Ø x 50 mm (mounting possible through a G/R2 socket)	PP, 29 mm Ø x 50 mm (mounting possible through a G1 socket)
Float suitable for use in media with a specific gravity	≥ 0.8 g/cm³	≥ 0.85 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request	
Mounting orientation	vertical	
Temperature range	– 20°C to + 80°C	
Pressure resistance at + 20° C	max. 2 bar	
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)	
Max. number of contacts	3	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):		
• from the nipple sealing surface to the upper contact	approx. 70 mm	approx. 70 mm
• between contacts	approx. 80 mm	approx. 80 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 40 mm	approx. 50 mm
Also available with angled probe tube for mounting from the side		

The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

Option for TSR/1/... immersion probes: diodes or resistors

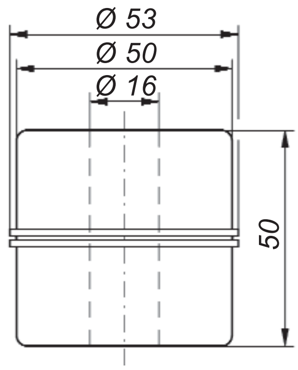




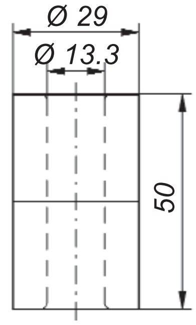
TSR/3/ED/P

TSR/3/ED/PK

Float for TSR/./ED/P



Float for TSR/./ED/PK



Mounting accessories:

Square flange made of stainless steel 316 Ti, PP or PVDF for immersion probes with G1 screw-in nipple, counterflange on request

TSR/... immersion probes with
• probe tube made of stainless steel
• float made of stainless steel

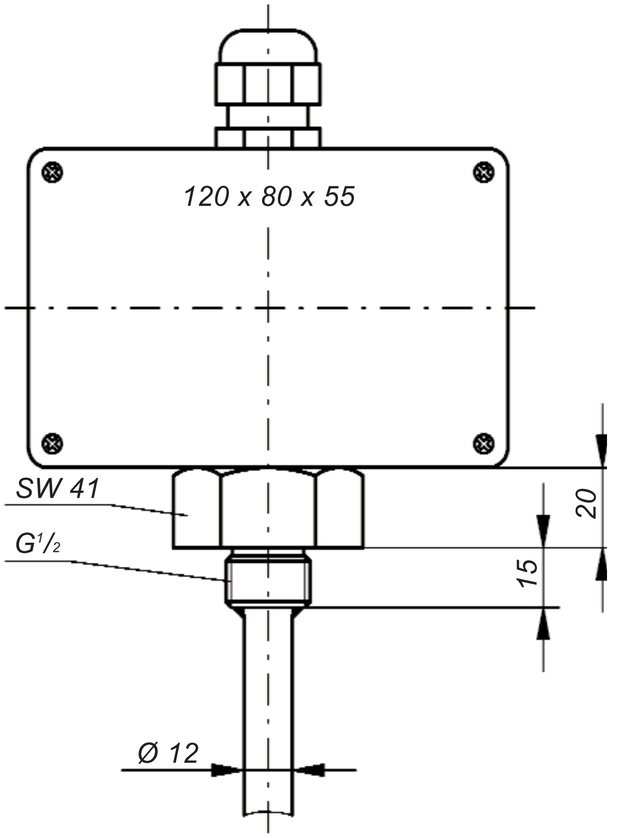
Type	TSR/3/ED/E.	TSR/1/ED/E.
Application **Switching voltage** **Switching current** **Switching capacity**	**for applications up to max. 250 V** **AC/DC 24 V – 250 V** **AC 100 mA – 2 A (0.4 A)** **max. 100 VA**	**for light current applications** **AC/DC 1 V – 42 V** **AC 1 mA – 500 mA** **max. 20 VA**

Technical data	**TSR/3/ED/E8** **TSR/1/ED/E8**	**TSR/3/ED/E2** **TSR/1/ED/E2**	**TSR/3/ED/E7** **TSR/1/ED/E7**
Probe tube: material **diameter** length	stainless steel 316 Ti **12 mm** acc. to customer's specification, however max. 3,000 mm		
Screw-in nipple	G1/2, on request G1, G1 1/2 or G2;		
	——	on request with reducing nipple made of malleable cast iron R1 1/2 conical	R2 conical
Float	stainless steel 316 Ti,		
	72 mm Ø	44.5 mm Ø x 52 mm	52 mm Ø x 88 mm
		mounting possible through a G/R1 1/2 socket	G/R2 socket
Float suitable for use in media with a specific gravity	≥ 0.7 g/cm³	≥ 0.95 g/cm³	≥ 0.7 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, for max. 12 terminals; other terminal boxes on request; with free connecting cable on request		
Mounting orientation	vertical		
Temperature range	– 20°C to + 100°C; on request: – 20°C to + 130°C		
Pressure resistance at + 20°C	max. 12 bar, higher pressure resistance on request		
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)		
Max. number of contacts	3		
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):			
• from the nipple sealing surface to the upper contact	approx. 80 mm	approx. 70 mm	approx. 80 mm
• between contacts	approx. 80 mm	approx. 80 mm	approx. 80 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 60 mm	approx. 60 mm	approx. 70 mm
Also available with angled probe tube for mounting from the side			

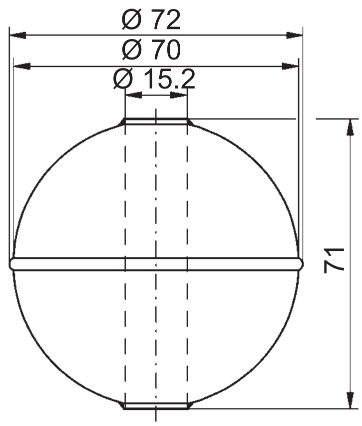
The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

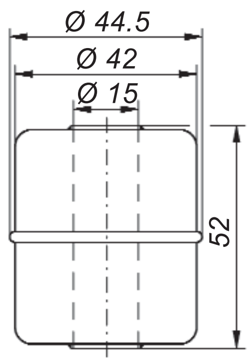
Option for TSR/1/... immersion probes: diodes or resistors



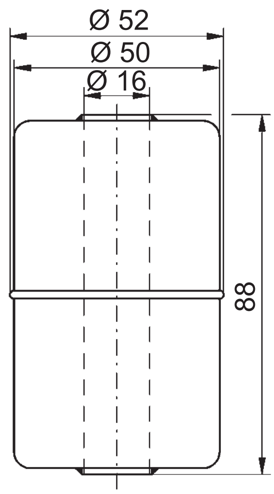
Float for TSR/./ED/E8



Float for TSR/./ED/E2



Float for TSR/./ED/E7



TSR/3/ED/E8 **TSR/3/ED/E2** **TSR/3/ED/E7**

Mounting accessories:

Square flange made of stainless steel 316 Ti, PP or PVDF for immersion probes with G1 screw-in nipple, counterflange on request

TSR/... immersion probes with
• probe tube made of stainless steel
• float made of stainless steel

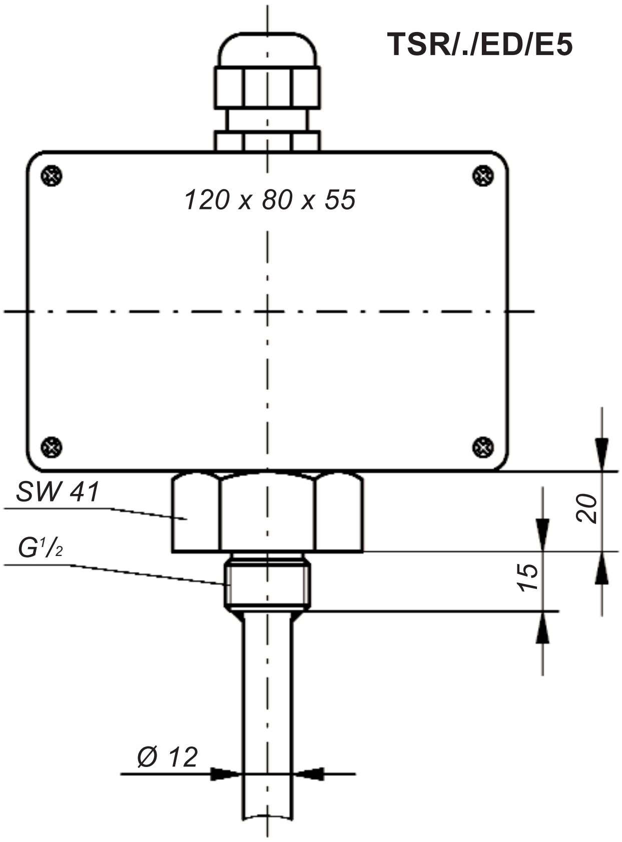
Type	**TSR/3/E./E5**	**TSR/1/E./E5**
Application	**for applications up to max. 250 V**	**for light current applications**
Switching voltage	**AC/DC 24 V – 250 V**	**AC/DC 1 V – 42 V**
Switching current	**AC 100 mA – 2 A (0.4 A)**	**AC 1 mA – 500 mA**
Switching capacity	**max. 100 VA**	**max. 20 VA**

Technical data	**TSR/3/ED/E5** **TSR/1/ED/E5**	**TSR/3/EW/E5** **TSR/1/EW/E5**
Probe tube: material	stainless steel 316 Ti	
diameter	**12 mm**	**20 mm**
length	acc. to customer's specification, however max. 3,000 mm	max. 6,000 mm
Screw-in nipple	$G^{1}/_{2}$, on request G1,	G1,
	on request $G1^{1}/_{2}$ or G2; on request with reducing nipple made of malleable cast iron $R1^{1}/_{2}$ or R2 conical	
Float	stainless steel 316 Ti, 98 Ø mm	98 Ø mm or 97 mm Ø x 80 mm (heat-resistant version with float E4)
Float suitable for use in media with a specific gravity	≥ 0.7 g/cm³	
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connection cable on request	
Mounting orientation	vertical	
Temperature range	– 20°C to + 100°C	– 20°C to + 100°C ; on request: – 20°C to + 130°C
Pressure resistance at + 20°C	max. 12 bar,	max. 12 bar (heat-resistant version: max. 3 bar),
	higher pressure resistance on request	
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)	
Max. number of contacts	3	6, more on request
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):		
• from the nipple sealing surface to the upper contact	approx. 90 mm	approx. 90 mm
• between contacts	approx. 80 mm	approx. 80 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 60 mm	approx. 70 mm
Also available with angled probe tube for mounting from the side		

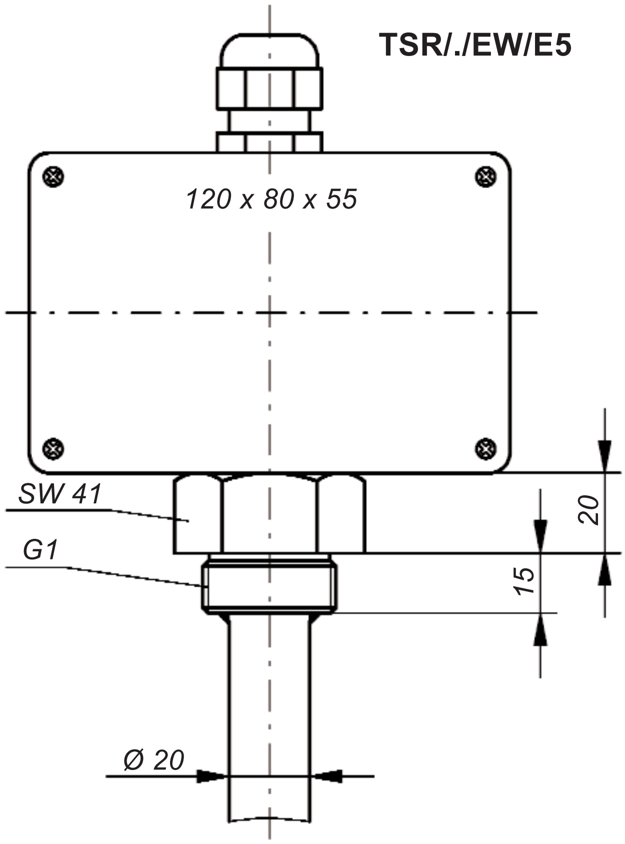
The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

TSR/./ED/E5



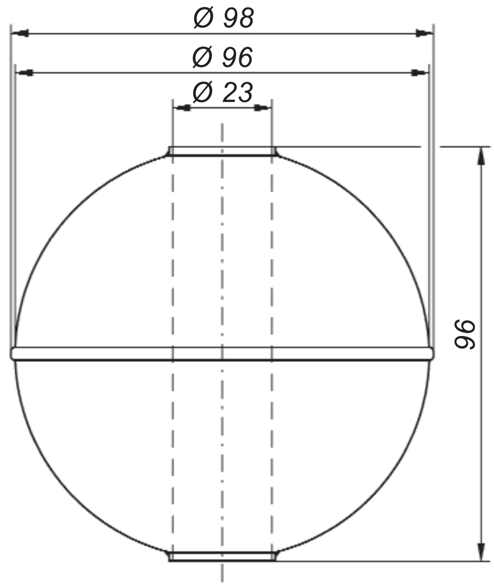
TSR/./EW/E5



TSR/3/ED/E5

TSR/3/EW/E5

Float for TSR/./ED/E5 and TSR/./EW/E5



TSR/... immersion probes with
• probe tube made of PP
• float made of PP

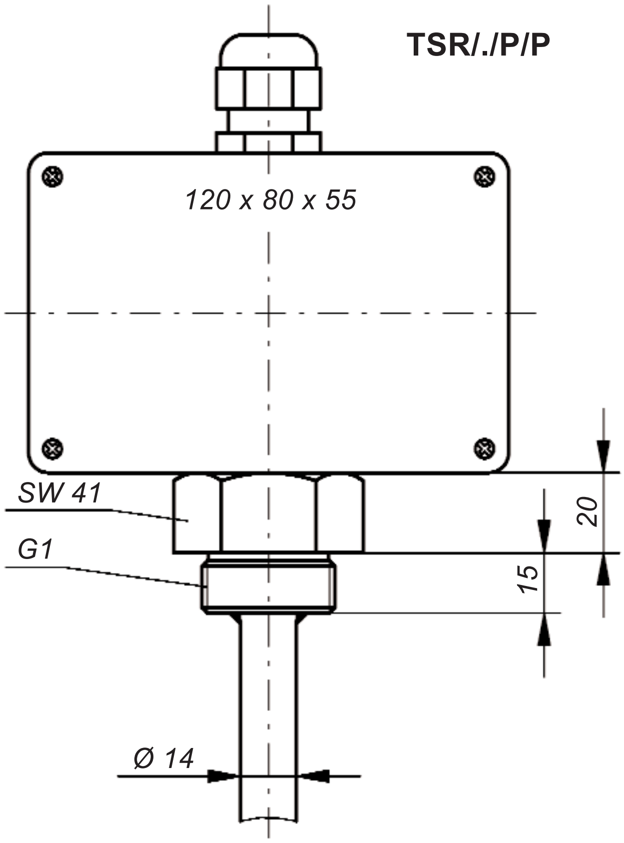
Type	TSR/3/P/P	TSR/1/P/PG
Application	**for applications up to max. 250 V**	**for light current applications**
Switching voltage	**AC/DC 24 V – 250 V**	**AC/DC 1 V – 42 V**
Switching current	**AC 100 mA – 2 A (0.4 A)**	**AC 1 mA – 500 mA**
Switching capacity	**max. 100 VA**	**max. 20 VA**

<table>
<tr><th>Technical data</th><th>TSR/3/P/P
TSR/1/P/P</th><th>TSR/3/P/PG
TSR/1/P/PG</th></tr>
<tr><td>Probe tube: material</td><td colspan="2">PP,</td></tr>
<tr><td></td><td>—</td><td>on request, with metal inner tube to strengthen the plastic probe tube</td></tr>
<tr><td>diameter</td><td>14 mm</td><td>16 mm</td></tr>
<tr><td>length</td><td colspan="2">according to customer’s specifications, however</td></tr>
<tr><td></td><td>max. 1,000 mm,</td><td>max. 2,000 mm,</td></tr>
<tr><td></td><td colspan="2">taking into account the max. temperature in the tank and possible liquid turbulences</td></tr>
<tr><td>Screw-in nipple</td><td>G1,</td><td>G1,</td></tr>
<tr><td></td><td colspan="2">on request: G2</td></tr>
<tr><td>Float</td><td colspan="2">PP,</td></tr>
<tr><td></td><td>53 mm Ø x 50 mm
(mounting possible through a G2 socket)</td><td>89 mm Ø x 60 mm</td></tr>
<tr><td>Float suitable for use in media with a specific gravity</td><td colspan="2">≥ 0.8 g/cm³</td></tr>
<tr><td>Terminal box</td><td colspan="2">PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request</td></tr>
<tr><td>Mounting orientation</td><td colspan="2">vertical</td></tr>
<tr><td>Temperature range taking into account the probe tube length:</td><td></td><td></td></tr>
<tr><td>– max. 2,000 mm</td><td>—</td><td>0°C to + 35°C</td></tr>
<tr><td>– max. 1,500 mm</td><td>—</td><td>0°C to + 40°C</td></tr>
<tr><td>– max. 1,000 mm</td><td colspan="2">0°C to + 50°C</td></tr>
<tr><td>– max. 750 mm</td><td colspan="2">0°C to + 60°C</td></tr>
<tr><td>– max. 500 mm</td><td colspan="2">0°C to + 75°C</td></tr>
<tr><td>– max. 400 mm</td><td colspan="2">0°C to + 80°C</td></tr>
<tr><td>Pressure resistance at + 20°C</td><td colspan="2">max. 2 bar</td></tr>
<tr><td>Contacts</td><td colspan="2">reed contacts: make (NO), break (NC) or changeover (OC)</td></tr>
<tr><td>Max. number of contacts:</td><td></td><td></td></tr>
<tr><td>• without inner tube</td><td>3</td><td>6</td></tr>
<tr><td>• with inner tube</td><td>—</td><td>3</td></tr>
<tr><td>Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):</td><td></td><td></td></tr>
<tr><td>• from the nipple sealing surface to the upper contact</td><td>approx. 70 mm</td><td>approx. 80 mm</td></tr>
<tr><td>• between contacts</td><td>approx. 80 mm</td><td>approx. 80 mm</td></tr>
<tr><td>• from the lower contact to the end of the probe tube (when float is falling)</td><td>approx. 60 mm</td><td>approx. 50 mm</td></tr>
</table>

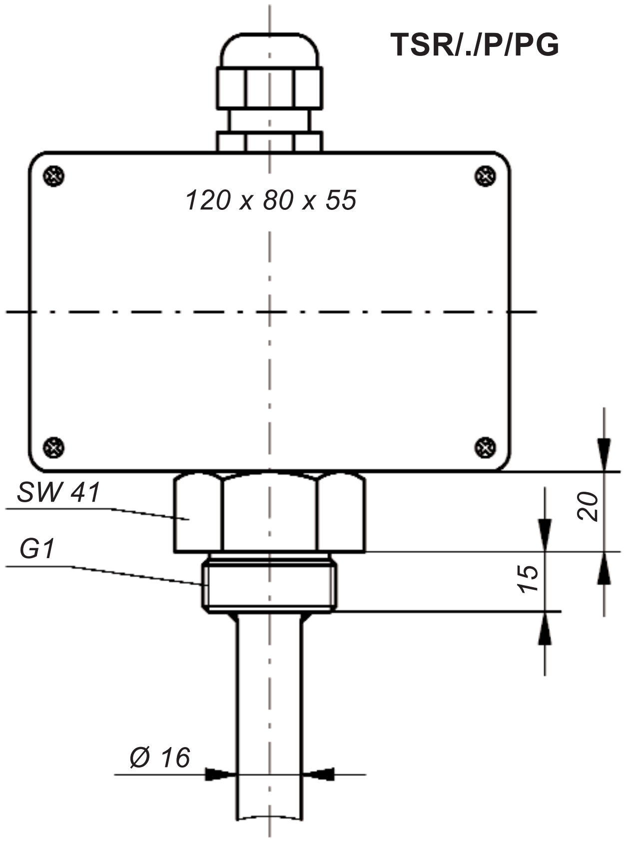
The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

TSR/./P/P



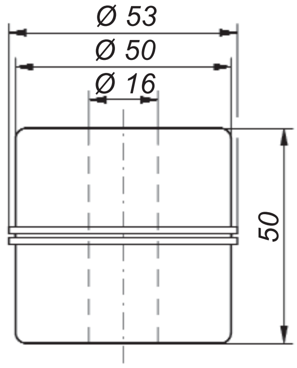
TSR/./P/PG



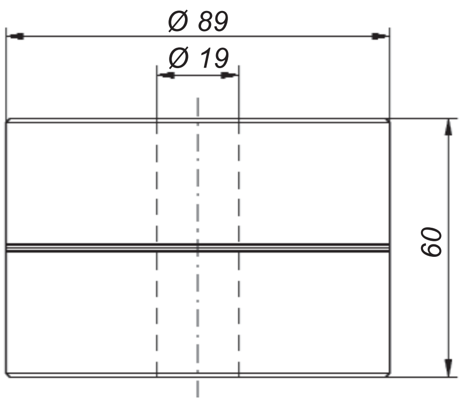
TSR/3/P/P

TSR/3/P/PG

Float for TSR/./P/P



Float for TSR/./P/PG



Mounting accessories:

Square flange made of PP for immersion probes with G1 screw-in nipple, counterflange on request

TSR/... immersion probes with
• probe tube made of PVDF
• float made of PVDF

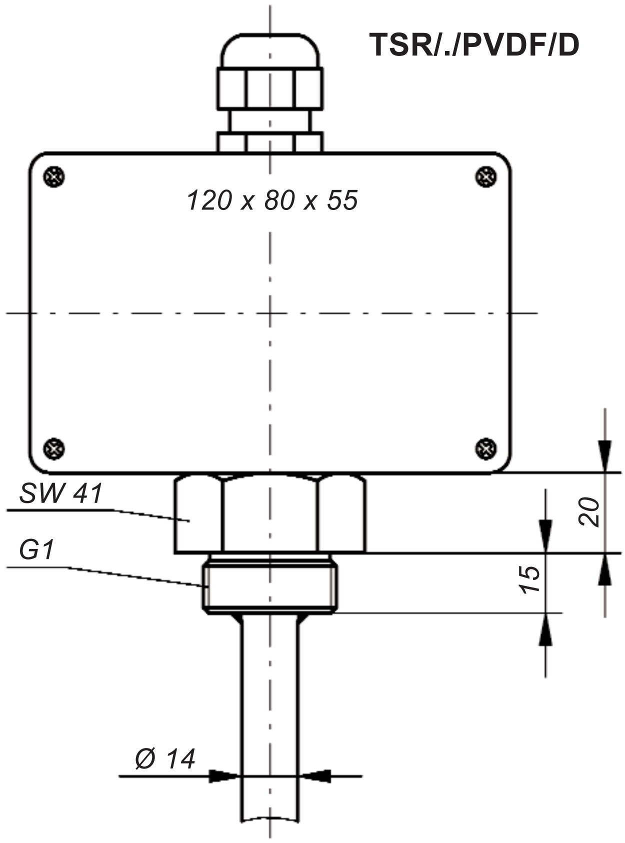
Type	TSR/3/PVDF/.	TSR/1/PVDF/.
Application	**for applications up to max. 250 V**	**for light current applications**
Switching voltage	**AC/DC 24 V – 250 V**	**AC/DC 1 V – 42 V**
Switching current	**AC 100 mA – 2 A (0.4 A)**	**AC 1 mA – 500 mA**
Switching capacity	**max. 100 VA**	**max. 20 VA**

Technical data	**TSR/3/PVDF/D** **TSR/1/PVDF/D**	**TSR/3/PVDF/W** **TSR/1/PVDF/W**
Probe tube: material	PVDF, ——	PVDF, **on request, with metal inner tube to strengthen the plastic probe tube**
diameter	**14 mm**	**16 mm**
length	according to customer's specifications, however max. 1,000 mm, taking into account the max. temperature in the tank and possible liquid turbulences	according to customer's specifications, however max. 2,000 mm, taking into account the max. temperature in the tank and possible liquid turbulences
Screw-in nipple	G1, on request: G2	G1, on request: G2
Float	PVDF, 53 mm Ø x 50 mm (mounting possible through a G2 socket)	PVDF, 89 mm Ø x 60 mm
Float suitable for use in media with a specific gravity	≥ 1 g/cm³	≥ 1 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request
Mounting orientation	vertical	vertical
Temperature range taking into account the probe tube length:		
– max. 2,000 mm	——	0°C to + 40°C
– max. 1,500 mm	——	0°C to + 45°C
– max. 1,000 mm	0°C to + 55°C	0°C to + 55°C
– max. 750 mm	0°C to + 70°C	0°C to + 70°C
– max. 500 mm	0°C to + 80°C	0°C to + 80°C
Pressure resistance at + 20°C	max. 2 bar	max. 2 bar
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)	reed contacts: make (NO), break (NC) or changeover (OC)
Max. number of contacts:		
• without inner tube	3	6
• with inner tube	——	3
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):		
• from the nipple sealing surface to the upper contact	approx. 80 mm	approx. 80 mm
• between contacts	approx. 80 mm	approx. 80 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 70 mm	approx. 65 mm

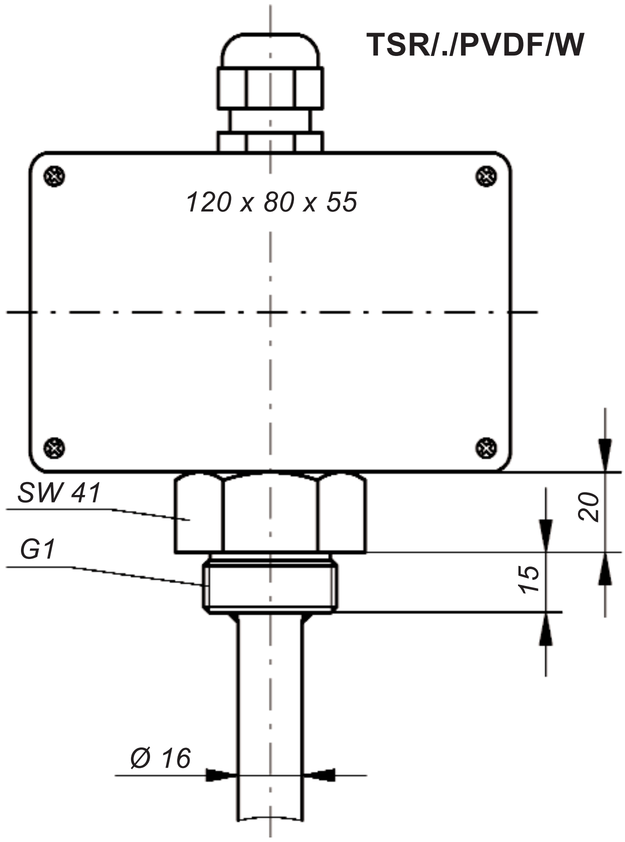
The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

TSR/./PVDF/D



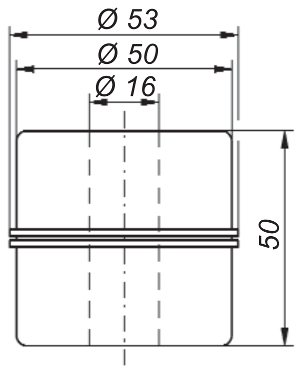
TSR/./PVDF/W



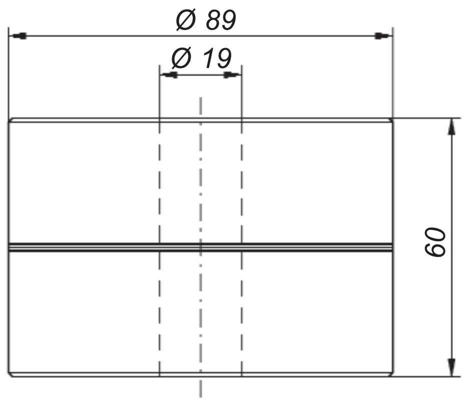
TSR/3/PVDF/D

TSR/3/PVDF/W

Float for TSR/./PVDF/D



Float for TSR/./PVDF/W



Mounting accessories:

Square flange made of PVDF for immersion probes with G1 screw-in nipple, counterflange on request

TSR/... immersion probes with
• probe tube made of titanium
• float made of titanium

Type	TSR/3/Ti./Ti.	TSR/1/Ti./Ti.
Application	**for applications up to max. 250 V**	**for light current applications**
Switching voltage	**AC/DC 24 V – 250 V**	**AC/DC 1 V – 42 V**
Switching current	**AC 100 mA – 2 A (0.4 A)**	**AC 1 mA – 500 mA**
Switching capacity	**max. 100 VA**	**max. 20 VA**

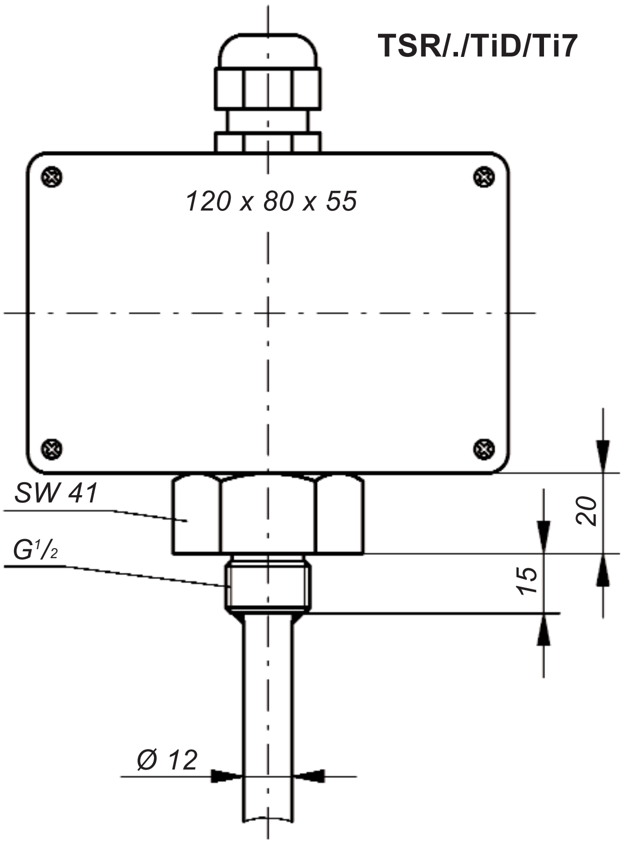
Technical data	**TSR/3/TiD/Ti7** **TSR/1/TiD/Ti7**	**TSR/3/TiW/Ti4** **TSR/1/TiW/Ti4**
Probe tube: material	titanium	titanium
diameter	**12 mm**	**19 or 20 mm**
length	according to customer's specifications, however max. 3,000 mm	according to customer's specifications, however max. 6,000 mm
Screw-in nipple	G1/2	G1
Float	titanium, 44.5 mm Ø x 52 mm	titanium, 79 mm Ø x 95 mm
Float suitable for use in media with a specific gravity	≥ 0.95 g/cm³	≥ 0.7 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other terminal boxes on request; with free connecting cable on request
Mounting orientation	vertical	vertical
Temperature range	– 20°C to + 100°C	– 20°C to + 100°C
Pressure resistance at + 20°C	max. 10 bar, higher pressure resistance on request	max. 7 bar, higher pressure resistance on request
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)	reed contacts: make (NO), break (NC) or changeover (OC)
Max. number of contacts	3	6, more on request
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):		
• from the nipple sealing surface to the upper contact	approx. 70 mm	approx. 90 mm
• between contacts	approx. 80 mm	approx. 80 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 60 mm	approx. 75 mm
Also available with angled probe tube for mounting from the side		

The above equipment will be manufactured in accordance with your specifications

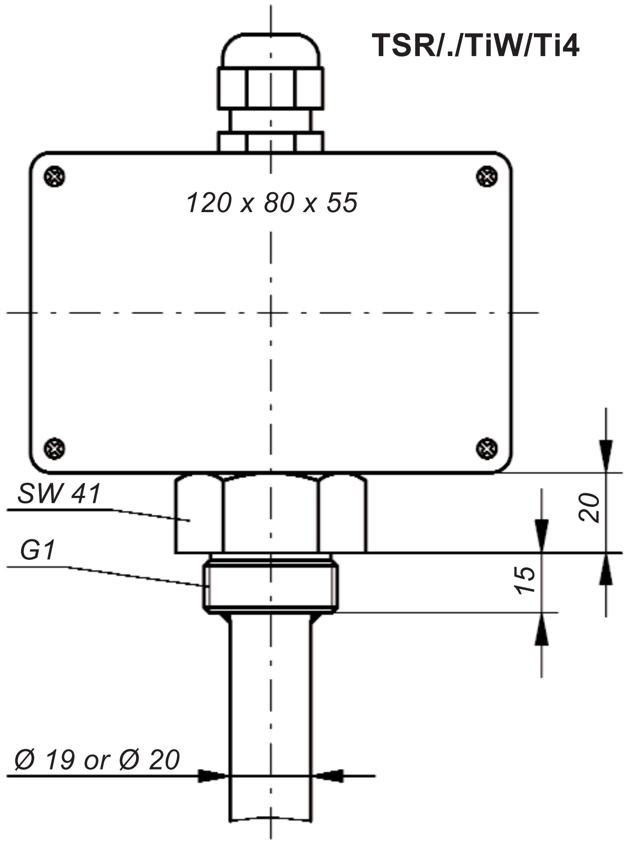
For inquiries or orders, please complete the questionnaire on page 3-1-19

Option for TSR/1/... immersion probes: diodes or resistors

TSR/./TiD/Ti7

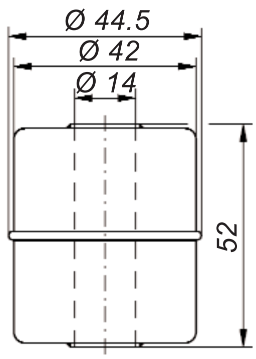


TSR/./TiW/Ti4

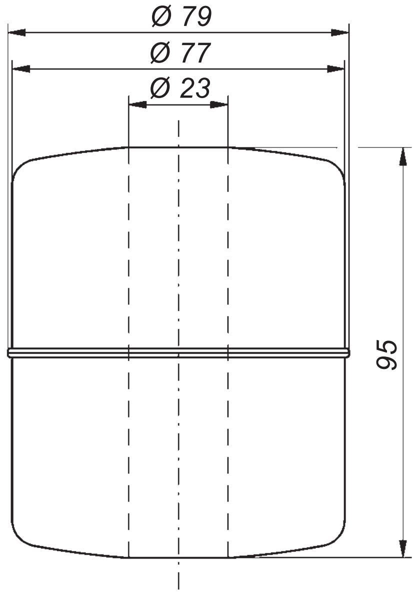


TSR/1/TiD/Ti7 TSR/1/TiW/Ti4

Float for TSR/./TiD/Ti7



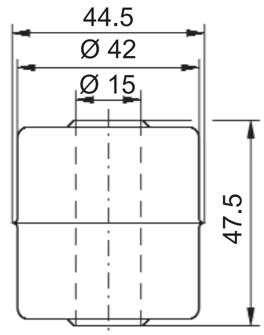
Float for TSR/./TiW/Ti4



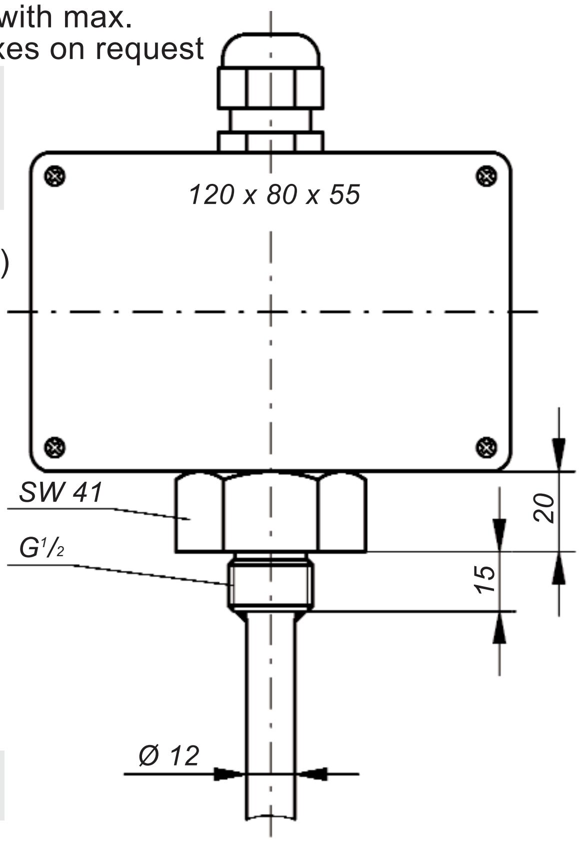
TSR/0/ED/E6 immersion probe with
• probe tube made of stainless steel
• float made of stainless steel
with mini-contacts for small contact distances and/or a higher number of contacts

Types	TSR/0/ED/E6
Application Switching voltage Switching current Switching capacity	for light current applications AC/DC 1 V - 42 V AC 1 mA - 100 mA max. 2 VA

Technical data	TSR/0/ED/E6
Probe tube: material **diameter** length	stainless steel Ti **12 mm** acc. to customer's specifications, however max. 3,000 mm
Screw-in nipple	G½, on request G1, G1½ or G2; on request with reducing nipple made of malleable cast iron R1½ or R2 conical
Float	stainless steel 316 Ti, 44.5 mm Ø x 47.5 mm (mounting possible through a G/R1½ socket)
Float suitable for use in media with a specific gravity	≥ 0.95 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65, with max. 12 terminals; other boxes on request
Mounting orientation	vertical
Temperature range	– 20°C to + 100°C
Pressure resistance to + 20°C	max. 12 bar
Contacts	reed contacts: make (NO), break (NC) or changeover (OC)
Max. number of contacts	6
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):	
• from the nipple sealing surface to the upper contact	approx. 50 mm
• between contacts	approx. 20 mm
• from the lower contact to the end of the probe tube (when float is falling)	approx. 50 mm
Also available with angled probe tube for mounting from the side	



Float for TSR/0/ED/E6



The above equipment will be manufactured in accordance with your specifications

For inquiries or orders, please complete the questionnaire on page 3-1-19

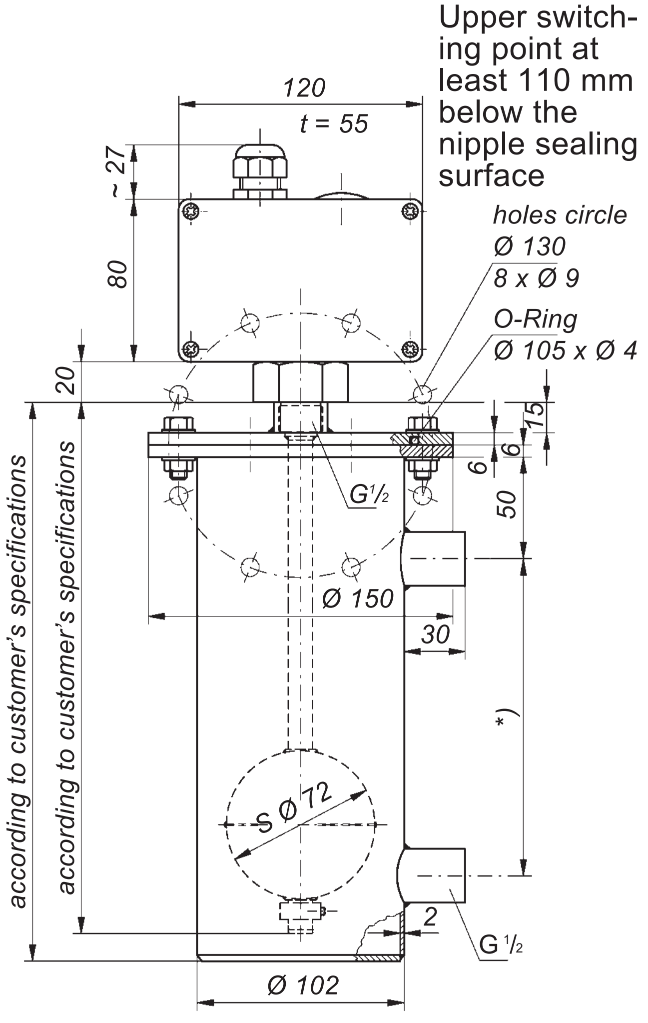
DK 3 switching bowls

For lateral mounting on tanks or pipelines, suitable for TSR immersion probes.

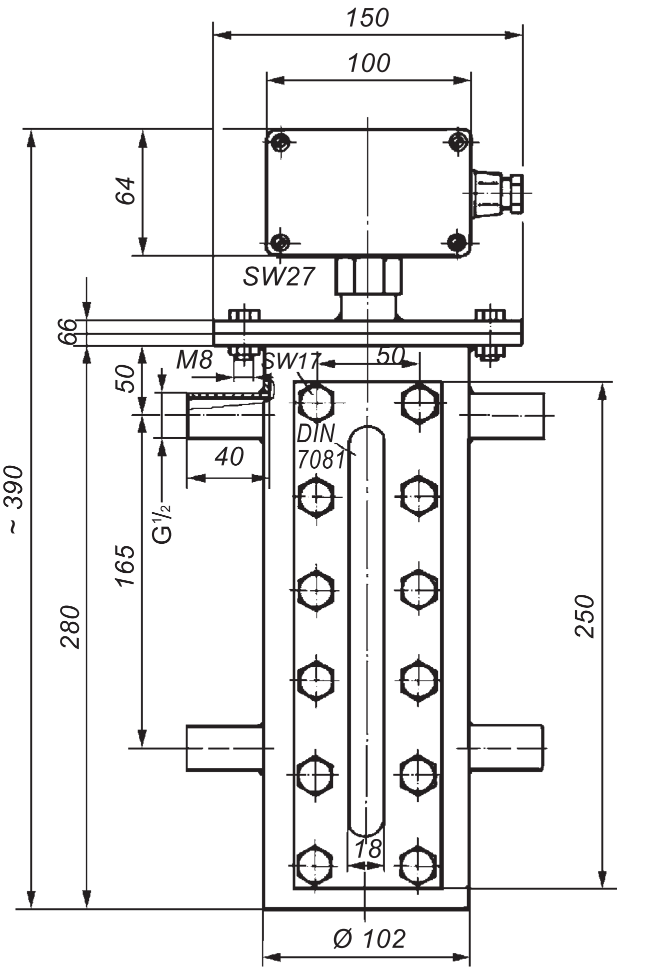
The use of a switching bowl is necessary wherever heavy turbulences would impede or prevent the operation of an immersion probe inside a tank or where these units cannot be installed for reasons of space.

Technical data	DK 3
Material	stainless steel 316 Ti; other materials on request
Diameter	102 mm
Height	according to customer’s specifications
Socket size	according to customer’s specifications; on request: flanges of any dimensions
Distance between sockets (or flanges)	according to customer’s specifications

DK 3 switching bowl:
standard model



DK 3 switching bowl:
special design with gauge glass and 4 sockets



*) according to customer’s specifications

Other dimensions on request.

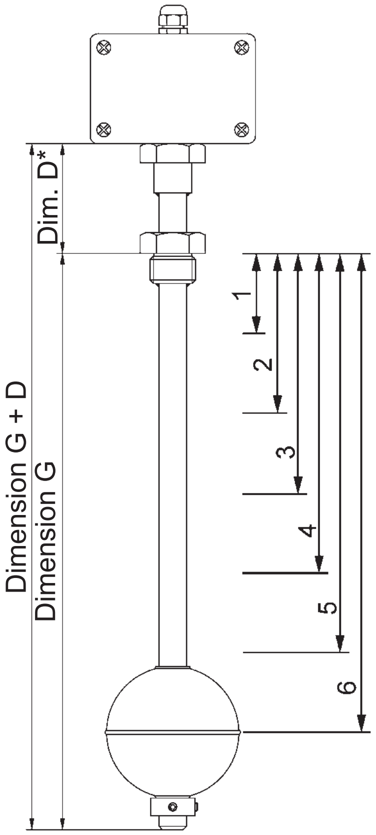
For inquiries or orders, please complete the following questionnaire:

Desired switching functions (max./min. indication, pump or valve ON/OFF, filling or emptying, run-dry or overflow protection): ______________________

Tank dimensions and installation conditions (attach sketch if necessary): ______________________

Type of liquid: ______________________ Specific gravity: __________

Viscosity: __________ Temperature: __________ Working pressure: __________



Desired type of immersion probe: TSR/.................

Desired probe tube length (dimension G):

Please mark desired floats and collars on the probe tube!
* = specify dimension D, otherwise 20 mm.

Desired version (please tick off):

	○ **TSR/3/...**	○ **TSR/1/...**
Switching voltage Switching current Switching capacity	AC/DC 24 V – 250 V AC 100 mA – 2 A (0.4 A) max. 100 VA	AC/DC 1 V – 42 V AC 1 mA – 500 mA max. 20 VA

○ **TSR/0/ED/E 6**

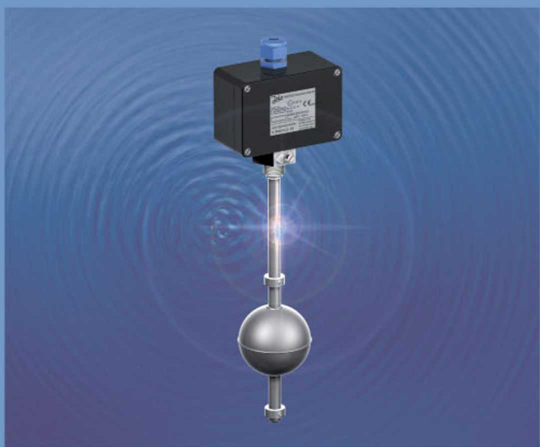
Desired options:

	Contact type: make = NO break = NC changeover = OC	Distance from the sealing surface of the screw-in nipple in mm	Switching function (e.g. high alarm, pump ON, pump OFF etc.)	If float has a working direction: rising = ↑ falling = ↓
1				
2				
3				
4				
5				
6				

Immersion probes will be manufactured according to customer's specifications. It is therefore not possible to return these special designs.

TSR Ex
immersion probes

Controlling devices with magnetically operated reed contacts, for signalling or regulation of liquid levels



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Contents

Pages

Construction and operating principle of TSR Ex immersion probes

The TSR Ex immersion probes have a probe tube with built-in reed contacts. The float is fitted with a permanent magnet and moves freely up and down the probe tube, activating the reed contacts as it rises and falls.

It should be noted that reed contacts do **not** lock but that they switch only for as long as they are influenced by the magnetic field. Once the float passes beyond a contact upwards or downwards, the latter returns to its original position. However, the contacts can be made to hold by using collars to limit the motion of the float.

Types overview

Types	Probe tube made of stainless steel Connection	 Ext. Ø	Float made of stainless steel Dimensions	Page
TSR/ED/E./Variant 0/Ex-0G **⟨Ex⟩ II 2/1 G Ex ia IIC T6 Ga/Gb**	Terminal box	14 mm	E8: 72 mm Ø E2: 44,5 mm Ø x 52 mm E7: 52 mm Ø x 88 mm E5: 98 mm Ø	3-2-3
TSR/EW/E5/Variant 0/Ex-0G **⟨Ex⟩ II 2/1 G Ex ia IIC T6 Ga/Gb**	Terminal box	20 mm	98 mm Ø	3-2-3
TSR/FED/E./Variant 0/Ex-0G **⟨Ex⟩ II 1 G Ex ia IIC T6 Ga**	Connecting cable	14 mm	E8: 72 mm Ø E2: 44,5 mm Ø x 52 mm E7: 52 mm Ø x 88 mm E5: 98 mm Ø	3-2-5
TSR/FEW/E5/Variant 0/Ex-0G **⟨Ex⟩ II 1 G Ex ia IIC T6 Ga**	Connecting cable	20 mm	E5: 98 mm Ø	3-2-5
TSR/FED/E./Variant 0/Ex-1G **⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**	Connecting cable	14 mm	E8: 72 mm Ø E2: 44,5 mm Ø x 52 mm E7: 52 mm Ø x 88 mm E5: 98 mm Ø	3-2-7
TSR/FEW/E5/Variant 0/Ex-1G **⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**	Connecting cable	20 mm	E5: 98 mm Ø	3-2-7
TSR/FHED/E4/Variant 0/Ex-1G **⟨Ex⟩ II 2 G Ex ia IIC T4 or T3 Gb**	Connecting cable	14 mm	E4: 97 mm Ø x 80 mm	3-2-9
TSR/FHEW/E4/Variant 0/Ex-1G **⟨Ex⟩ II 2 G Ex ia IIC T4 or T3 Gb**	Connecting cable	20 mm	E4: 97 mm Ø x 80 mm	3-2-9
TSR/FED/E./Ex d/Ex-1G **⟨Ex⟩ II 2 G Ex d IIB T6 Gb**	Connecting cable	14 mm	E8: 72 mm Ø E2: 44,5 mm Ø x 52 mm E7: 52 mm Ø x 88 mm E5: 98 mm Ø	3-2-11
TSR/FEW/E5/Ex d/Ex-1G **⟨Ex⟩ II 2 G Ex d IIB T6 Gb**	Connecting cable	20 mm	E5: 98 mm Ø	3-2-11
TSR/FHED/E4/Ex d/Ex-1G **⟨Ex⟩ II 2 G Ex d IIB T4 or T3 Gb**	Connecting cable	14 mm	E4: 97 mm Ø x 80 mm	3-2-13
TSR/FHEW/E4/Ex d/Ex-1G **⟨Ex⟩ II 2 G Ex d IIB T4 or T3 Gb**	Connecting cable	20 mm	E4: 97 mm Ø x 80 mm	3-2-13

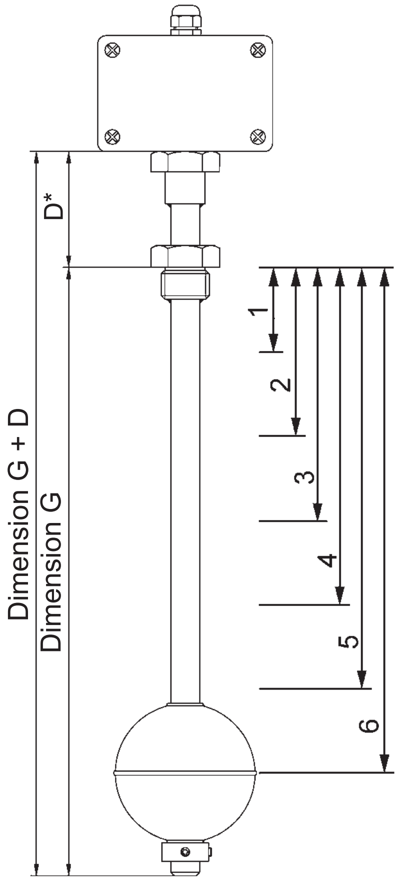
For inquiries or orders, please complete the following questionnaire

Desired switching functions (max./min. indication, pump or valve ON/OFF, filling or emptying, run-dry or overflow protection): ______________________

Tank dimensions and installation conditions (attach sketch if necessary): ______________________

Type of liquid: ______________________ Specific gravity: __________

Viscosity: __________ Temperature: __________ Working pressure: __________



Desired version:

TSR/ ______________________

Desired probe tube length (dimension G):

Please mark desired floats and collars on the probe tube!
* = dimension D: 20 mm or, but only for the Ex ia versions, other value to be specified.

Desired options:

	Contact type: make = NO break = NC changeover = OC	Distance from the sealing surface of the screw-in nipple, mm	Switching function (e.g. high alarm, pump ON, pump OFF etc.)	If float has a working direction: rising = ↑ falling = ↓
1				
2				
3				
4				
5				
6				

Immersion probes will be manufactured according to customer's specifications. It is therefore not possible to return these special designs.

TSR/ED/E./Variant 0/Ex-0G and TSR/EW/E5/Variant 0/Ex-0G Ⓔx II 2/1 G Ex ia IIC T6 Ga/Gb immersion probes

with connection box

Technical data	TSR/ED/E./Variant 0/Ex-0G Ⓔx II 2/1 G Ex ia IIC T6 Ga/Gb	TSR/EW/E5/Variant 0/Ex-0G Ⓔx II 2/1 G Ex ia IIC T6 Ga/Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres • probe tube and float: zone 0, 1 or 2, • terminal box: zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Probe tube: • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 3,000 mm	max. 6,000 mm
Screw-in nipple	G½, on request: G¾, G1, G1½ or G2	G1, on request: G1½ or G2
Float (E.)	stainless steel 316 Ti; on request: hastelloy B or C • E8: 72 mm Ø • E2: 44.5 mm Ø x 52 mm • E7: 52 mm Ø x 88 mm • E5: 98 mm Ø	• E5: 98 mm Ø
Float suitable for use in media with a specific gravity	• E8: ≥ 0.70 g/cm³ • E2: ≥ 0.95 g/cm³ • E7: ≥ 0.70 g/cm³ • E5: ≥ 0.70 g/cm³	• E5: ≥ 0.70 g/cm³
Terminal box	protection class IP65, acc. to the number of terminals: • A 308, 120 x 80 x 55 mm, with max. 12 terminals, made of antistatic PP (conductive), • A 113a, 160 x 160 x 90 mm, with max. 18 terminals, made of glass fibre reinforced antistatic polyester (conductive)	
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts		
• OC	3	5
• NO or NC	3	6
Option	diodes or resistors on request	

Also available with angled probe tube for mounting from the side.

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):			
	from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E8	80 mm	80 mm	100 mm	60 mm
E2	70 mm	80 mm	80 mm	60 mm
E7	80 mm	80 mm	120 mm	70 mm
E5	90 mm	80 mm	125 mm	70 mm

The above equipment will be manufactured in accordance with your specifications.

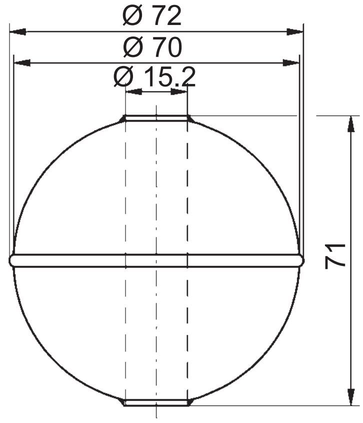
TSR/ED/E8/
Variant 0/Ex-0G
Ex II 2/1 G
Ex ia IIC T6 Ga/Gb,
with supplementary collar

TSR/EW/E5/
Variant 0/Ex-0G
Ex II 2/1 G
Ex ia IIC T6 Ga/Gb,
with supplementary collar

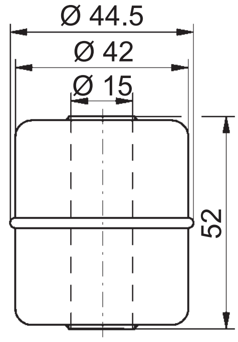
The use of this equipment requires a connection to certified intrinsically safe circuits.
We can supply appropriate protection relays suitable to produce these currents.

For inquiries or orders, please complete the questionnaire on page 3-2-2.

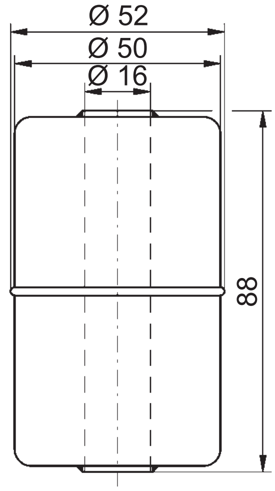
Float E8



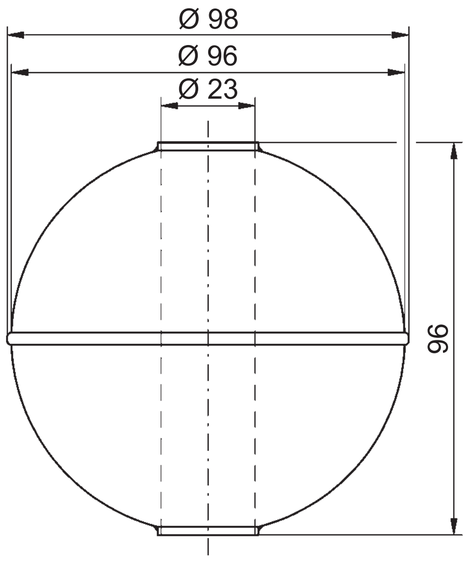
Float E2



Float E7



Float E5



TSR/FED/E./Variant 0/Ex-0G and TSR/FEW/E5/Variant 0/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga immersion probes

with free connecting cable

Technical data	TSR/FED/E./Variant 0/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga	TSR/FEW/E5/Variant 0/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres explosives zone 0, 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Probe tube : • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 3,000 mm	according to customer's specifications, however max. 6,000 mm
Screw-in nipple	G½, on request: G¾, G1, G1½ or G2	G1, on request: G1½ or G2
Float (E.)	stainless steel 316 Ti; on request: hastelloy B or C • E8: 72 mm Ø • E2: 44.5 mm Ø x 52 mm • E7: 52 mm Ø x 88 mm • E5: 98 mm Ø	• E5: 98 mm Ø
Float suitable for use in media with a specific gravity	• E8: ≥ 0.70 g/cm³ • E2: ≥ 0.95 g/cm³ • E7: ≥ 0.70 g/cm³ • E5: ≥ 0.70 g/cm³	• E5: ≥ 0.70 g/cm³
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	antistatic PURLF cable (with external conductive PUR sheath)	
Connecting cable length	1.5 m, other cable length on request (max. 10 m)	
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts		
• OC	3	3
• NO or NC	3	4
Option	diodes or resistors on request	
Also available with angled probe tube for mounting from the side.		

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

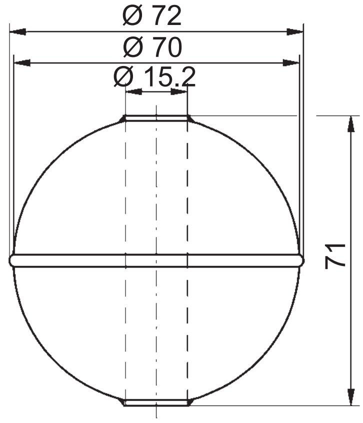
Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):			
	from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E8	80 mm	80 mm	100 mm	60 mm
E2	70 mm	80 mm	80 mm	60 mm
E7	80 mm	80 mm	120 mm	70 mm
E5	90 mm	80 mm	125 mm	70 mm

The above equipment will be manufactured in accordance with your specifications.

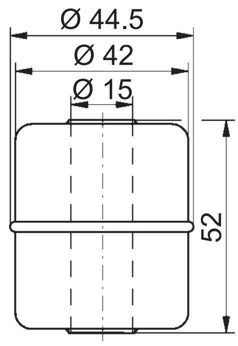
TSR/FED/E8/
Variant 0/Ex-0G
Ⓔx II 1 G
Ex ia IIC T6 Ga,
with G1 screw-in nipple
in place of G½ and with
supplementary collar

TSR/FEW/E5/
Variant 0/Ex-0G
Ⓔx II 1 G
Ex ia IIC T6 Ga,
with
supplementary collar

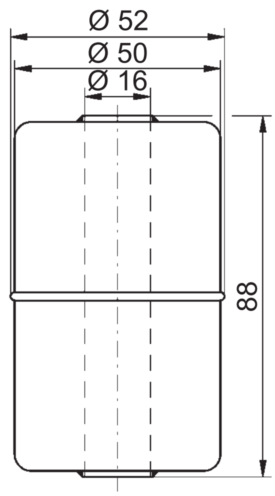
Float E8



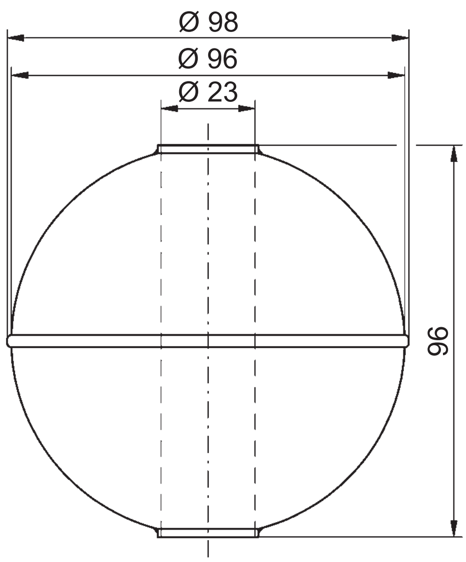
Float E2



Float E7



Float E5



The use of this equipment requires a connection to certified intrinsically safe circuits.
We can supply appropriate protection relays suitable to produce these currents.

For inquiries or orders, please complete the questionnaire on page 3-2-2.

TSR/FED/E./Variant 0/Ex-1G and TSR/FEW/E5/Variant 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb immersion probes

with free connecting cable

Technical data	TSR/FED/E./Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb	TSR/FEW/E5/Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Probe tube : • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 3,000 mm	according to customer's specifications, however max. 6,000 mm
Screw-in nipple	G½, on request: G¾, G1, G1½ or G2	G1, on request: G1½ or G2
Float (E.)	stainless steel 316 Ti; on request: hastelloy B or C • E8: 72 mm Ø • E2: 44.5 mm Ø x 52 mm • E7: 52 mm Ø x 88 mm • E5: 98 mm Ø	• E5: 98 mm Ø
Float suitable for use in media with a specific gravity	• E8: ≥ 0.70 g/cm³ • E2: ≥ 0.95 g/cm³ • E7: ≥ 0.70 g/cm³ • E5: ≥ 0.70 g/cm³	• E5: ≥ 0.70 g/cm³
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	PVC cable, other cable type on request	
Connecting cable length	1.5 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts		
• OC	3	3
• NO or NC	3	4
Option	diodes or resistors on request	

Also available with angled probe tube for mounting from the side.

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

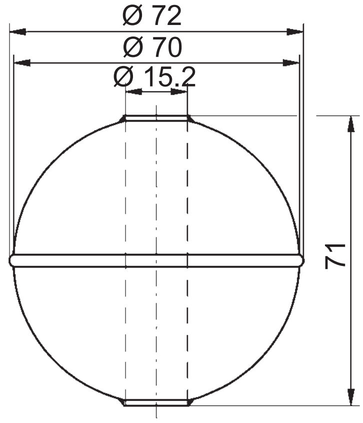
Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):			
	from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E8	80 mm	80 mm	100 mm	60 mm
E2	70 mm	80 mm	80 mm	60 mm
E7	80 mm	80 mm	120 mm	70 mm
E5	90 mm	80 mm	125 mm	70 mm

The above equipment will be manufactured in accordance with your specifications.

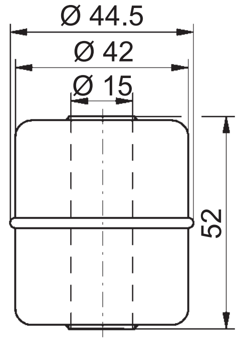
**TSR/FED/E8/
Variant 0/Ex-1G
⟨Ex⟩ II 2 G
Ex ia IIC T6 Gb,
with G1 screw-in nipple
in place of G½ and with
supplementary collar**

**TSR/FEW/E5/
Variant 0/Ex-1G
⟨Ex⟩ II 2 G
Ex ia IIC T6 Gb,
with
supplementary collar**

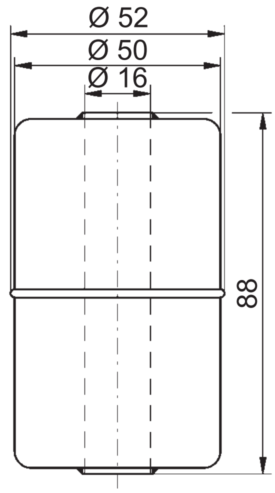
Float E8



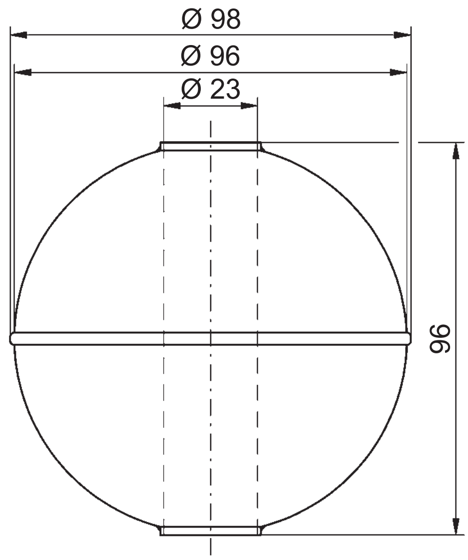
Float E2



Float E7



Float E5



The use of this equipment requires a connection to certified intrinsically safe circuits.
We can supply appropriate protection relays suitable to produce these currents.

For inquiries or orders, please complete the questionnaire on page 3-2-2.

TSR/FHED/E4/Variant 0/Ex-1G and TSR/FHEW/E4/Variant 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T4 or T3 Gb
immersion probes

with free connecting cable

Technical data	TSR/FHED/E4/Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T. Gb	TSR/FHEW/E4/Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T. Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Probe tube : • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 3,000 mm	max. 6,000 mm
Screw-in nipple	G¾, on request: G½, G1, G1½ or G2	G1, on request: G1½ or G2
Float (E4)	stainless steel 316 Ti; on request: hastelloy B or C, E4: 97 mm Ø x 80 mm	
Float suitable for use in media with a specific gravity	≥ 0.7 g/cm³	
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	silicone cable, PTFE cable on request	
Connecting cable length	1.5 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	T4: – 20°C to + 110°C T3: – 20°C to + 125°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 3 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts • OC	2	2
• NO or NC	2	3
Option	diodes or resistors on request	
Also available with angled probe tube for mounting from the side.		

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

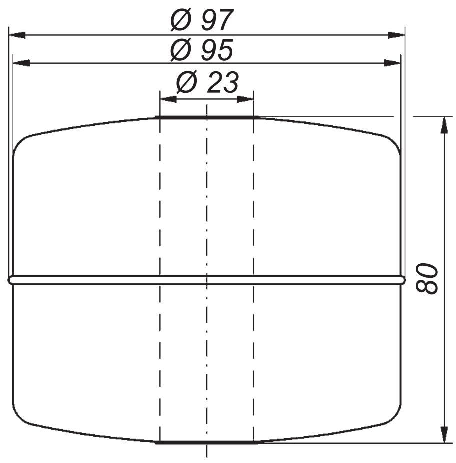
Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):			
	from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E4	90 mm	110 mm	110 mm	60 mm

The above equipment will be manufactured in accordance with your specifications.

TSR/FHED/E4/
Variant 0/Ex-1G
⟨Ex⟩ II 2 G
Ex ia IIC T4 or T3 Gb,
with G1 screw-in nipple
instead of G¾ and
with supplementary
collar

TSR/FHEW/E4/
Variant 0/Ex-1G
⟨Ex⟩ II 2 G
Ex ia IIC T4 or T3 Gb,
with supplementary
collar

Float E4



The use of this equipment requires a connection to certified intrinsically safe circuits.
We can supply appropriate protection relays suitable to produce these currents.

For inquiries or orders, please complete the questionnaire on page 3-2-2.

TSR/FED/E./Ex d/Ex-1G and TSR/FEW/E5/Ex d/Ex-1G Ⓔx II 2 G Ex d IIB T6 Gb immersion probes

with free connecting cable

Technical data	TSR/FED/E./Ex d/Ex-1G Ⓔx II 2 G Ex d IIB T6 Gb	TSR/FEW/E5/Ex d/Ex-1G Ⓔx II 2 G Ex d IIB T6 Gb
Application	**for use in potentially explosive atmospheres zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Switching voltage	**AC/DC 24 V – 250 V**	
Switching current	**AC 100 mA – 2 A (0.4 A)**	
Switching capacity	**max. 100 VA**	
Probe tube: • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 1,500 mm	according to customer's specifications, however max. 3,000 mm
Screw-in nipple	G¾, on request: G1, G1½ or G2	G1, on request: G1½ or G2
Float (E.)	stainless steel 316 Ti; on request: hastelloy B or C • E8: 72 mm Ø • E2: 44.5 mm Ø x 52 mm • E7: 52 mm Ø x 88 mm • E5: 98 mm Ø	• E5: 98 mm Ø
Float suitable for use in media with a specific gravity	• E8: ≥ 0.70 g/cm³ • E2: ≥ 0.95 g/cm³ • E7: ≥ 0.70 g/cm³ • E5: ≥ 0.70 g/cm³	• E5: ≥ 0.70 g/cm³
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	PUR cable, other cable type on request	
Connecting cable length	1.5 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts		
• OC	2	2
• NO or NC	3	3

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

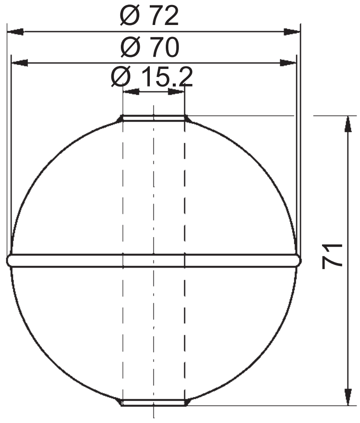
Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E8	80 mm	80 mm	100 mm	60 mm
E2	70 mm	80 mm	80 mm	60 mm
E7	80 mm	80 mm	120 mm	70 mm
E5	90 mm	80 mm	125 mm	70 mm

The above equipment will be manufactured in accordance with your specifications.

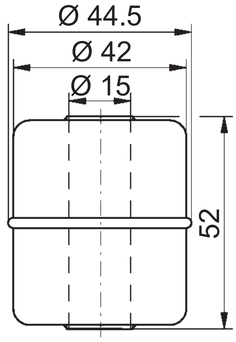
**TSR/FED/E8/
Ex d/Ex-1G
⟨Ex⟩ II 2 G
Ex d IIB T6 Gb,
with G1 screw-in nipple
instead of G¾ and
with supplementary
collar**

**TSR/FEW/E5/
Ex d/Ex-1G
⟨Ex⟩ II 2 G
Ex d IIB T6 Gb,
with
supplementary collar**

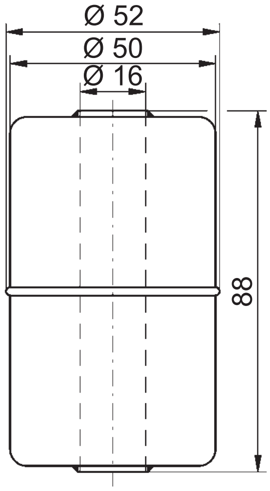
Float E8



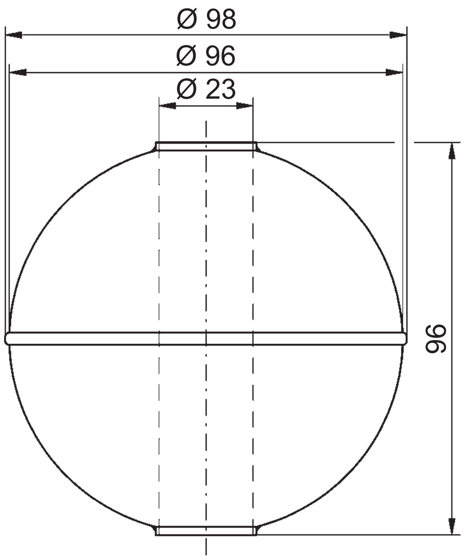
Float E2



Float E7



Float E5



For inquiries or orders, please complete the questionnaire on page 3-2-2.

TSR/FHED/E4/Ex d/Ex-1G and TSR/FHEW/E4/Ex d/Ex-1G ⟨Ex⟩ II 2 G Ex d IIB T4 or T3 Gb immersion probes

with free connecting cable

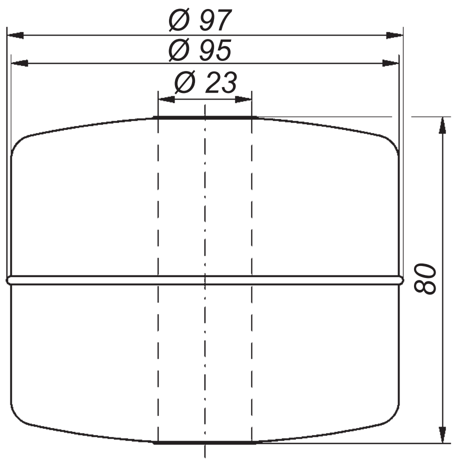
Technical data	**TSR/FHED/E4/Ex d/Ex-1G ⟨Ex⟩ II 2 G Ex d IIB T. Gb**	**TSR/FHEW/E4/Ex d/Ex-1G ⟨Ex⟩ II 2 G Ex d IIB T. Gb**
Application	**for use in potentially explosive atmospheres zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Switching voltage	**AC/DC 24 V – 250 V**	
Switching current	**AC 100 mA – 2 A (0.4 A)**	
Switching capacity	**max. 100 VA**	
Probe tube : • material	stainless steel 316 Ti; on request: hastelloy B or C	
• **diameter**	**14 mm**	**20 mm**
• length	according to customer's specifications, however max. 1,500 mm	according to customer's specifications, however max. 3,000 mm
Screw-in nipple	G¾, on request: G1, G1½ or G2	G1, on request: G1½ or G2
Float (E4)	stainless steel 316 Ti; on request: hastelloy B or C, E4: 97 mm Ø x 80 mm	
Float suitable for use in media with a specific gravity	≥ 0.7 g/cm³	
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	cable based on a polyolefin copolymer	
Connecting cable length	1.5 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	T4: – 20°C to + 110°C T3: – 20°C to + 125°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 3 bar on request	
Contacts	reed contacts: potential-free make (NO), break (NC) or changeover (OC) contacts	
Max. number of contacts • OC	2	2
• NO or NC	2	3

Versions for use in mines susceptible to firedamp with a ⟨Ex⟩ I M2 Ex d I Mb protection level on request.

Float	Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): from the nipple sealing surface to the upper contact	between contacts when using 1 float	between contacts when using 2 floats	from the lower contact to the end of the probe tube (when float is falling)
E4	90 mm	110 mm	110 mm	60 mm

The above equipment will be manufactured in accordance with your specifications.

Float E4



TSR/FHED/E4/
Ex d/Ex-1G
Ⓔx II 2 G
Ex d IIB T4 or T3 Gb,
with G1 screw-in nipple
instead of G¾ and
with supplementary
collar

TSR/FHEW/E4/
Ex d/Ex-1G
Ⓔx II 2 G
Ex d IIB T4 or T3 Gb,
with
supplementary collar

For inquiries or orders, please complete the questionnaire on page 3-2-2.

Option:
mounting brackets,
see pages 16-2-0 and following

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

NTR
small
immersion probes

Controlling devices with magnetically operated reed contact, for signalling or regulation of liquid levels

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NTR small immersion probes

Contents						Page
Types	Probe tube		Float		Screw-in nipple	
	Material	Out. Ø	Material	Outer dimensions		
NTR/S3/ ED/E2/B/PVC	stainless steel 316 Ti	14 mm	stainless steel 316 Ti	44.5 mm Ø x 52 mm	G½ upwards	3-3-3
NTR/S3/ ED/E2/B/SIL						
NTR/S3/ ED/E2/C/PVC					G½ downwards	3-3-5
NTR/S3/ ED/E2/C/SIL						
NTR/S3/ P/P/B/PVC	PP	14 mm	PP	53 mm Ø x 50 mm	G½ upwards	3-3-7
NTR/S3/ P/P/C/PVC					G1 downwards	
Dimensional drawings						3-3-9

Order reference

NTR / S3 / . / . / . / .

Cable
PVC: PVC cable 4G0.5
SIL: silicone cable 4G0.75

Screw-in nipple
B: upwards
C: downwards

Float
E2: stainless steel 316 Ti, 44.5 mm Ø x 52 mm
P: PP, 53 mm Ø x 50 mm

Probe tube
ED: stainless steel 316 Ti, 14 mm Ø
P: PP, 14 mm Ø

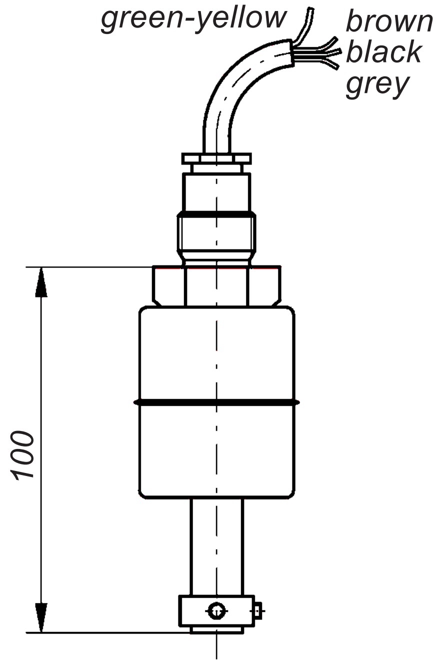
Version for standard applications
(AC/DC 24 V - 250 V)

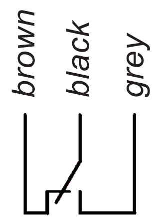
Immersion probe with free connecting cable

NTR/S3/ED/E2/B/...
small immersion probes with
• probe tube made of stainless steel
• float made of stainless steel

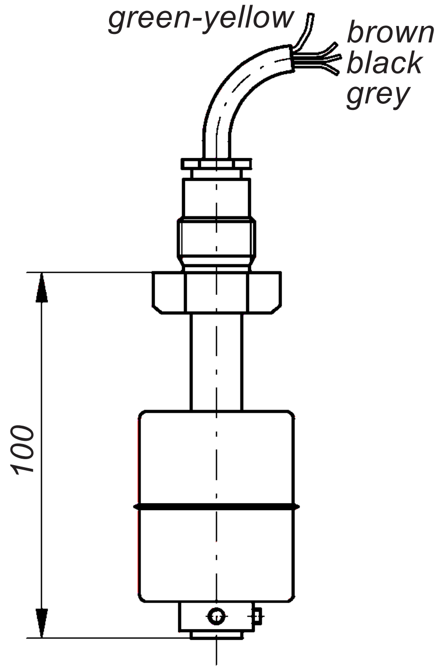
Models	NTR/S3/ED/E2/B/...
Application Switching voltage Switching current Switching capacity	standard applications AC/DC 24 V - 250 V AC 100 mA - 2 A (0.4 A) max. 100 VA

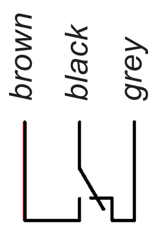
Technical data	NTR/S3/ED/E2/B/PVC with G½ nipple – upwards	NTR/S3/ED/E2/B/SIL with G½ nipple – upwards
Probe tube: • material • diameter • length	stainless steel 316 Ti 14 mm 100 mm, measured from the nipple sealing surface, other length on request	
Screw-in nipple	G½ upwards	
Float	stainless steel 316 Ti, 44.5 mm Ø x 52 mm	
Float suitable for use in media with a specific gravity	≥ 0.95 g/cm³	
Cable entry	nickel-plated brass, protection class IP54	
Connecting cable	PVC, 4G0.5 mm²	silicone, 4G0.75 mm²
Length of connecting cable	3 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	0°C to + 60°C	– 20°C to + 100°C
Pressure resistance at + 20°C	max. 12 bar, higher pressure resistance on request	
Contact	reed contact: potential-free changeover contact (OC)	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): • from the nipple sealing surface to the upper contact • from the lower contact to to the end of the probe tube	 approx. 50 mm approx. 50 mm	
Option	G½ counter nut made of stainless steel 316 Ti	





Contact position with full container





NTR/S3/ED/E2/B/PVC

Contact position with empty container

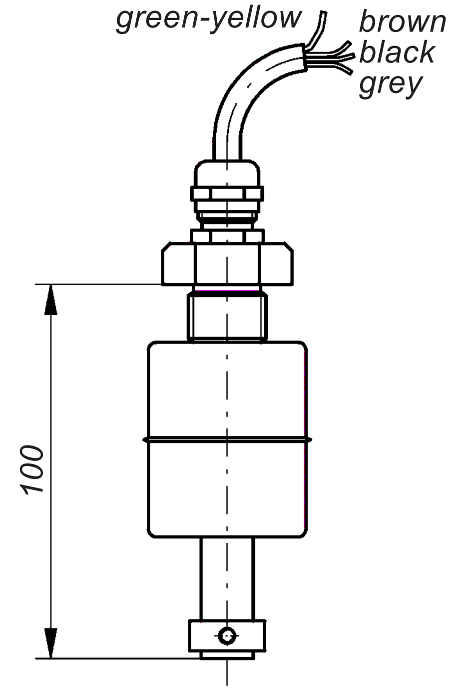
NTR/S3/ED/E2/B/SIL

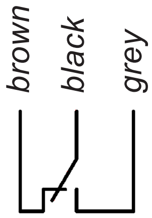
NTR/S3/ED/E2/C/...
small immersion probes with
• probe tube made of stainless steel
• float made of stainless steel

Models	NTR/S3/ED/E2/C/...
Application **Switching voltage** **Switching current** **Switching capacity**	**standard applications** **AC/DC 24 V - 250 V** **AC 100 mA - 2 A (0.4 A)** **max. 100 VA**

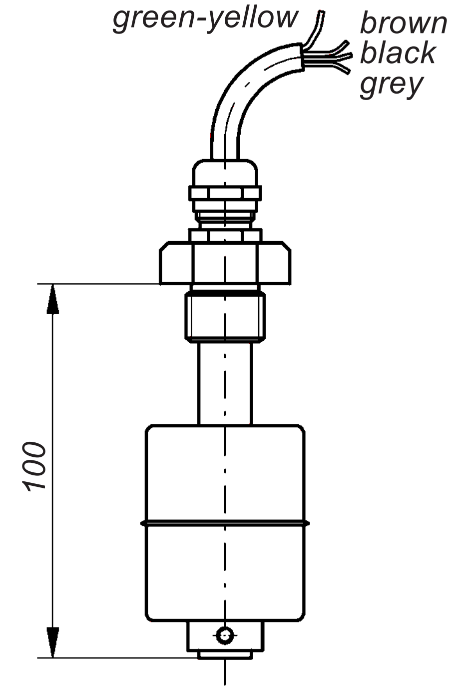
Technical data	**NTR/S3/ED/E2/C/PVC with G½ nipple – downwards**	**NTR/S3/ED/E2/C/SIL with G½ nipple – downwards**
Probe tube: • material • diameter • length	stainless steel 316 Ti 14 mm 100 mm, measured from the nipple sealing surface, other length on request	
Screw-in nipple	G½ downwards	
Float	stainless steel 316 Ti, 44.5 mm Ø x 52 mm	
Float suitable for use in media with a specific gravity	≥ 0.95 g/cm³	
Cable entry	nickel-plated brass, protection class IP54	
Connecting cable	PVC, 4G0.5 mm²	silicone, 4G0.75 mm²
Length of connecting cable	3 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	0°C to + 60°C	– 20°C to + 100°C
Pressure resistance at + 20°C	max. 12 bar, higher pressure resistance on request	
Contact	reed contact: potential-free changeover contact (OC)	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): • from the nipple sealing surface to the upper contact • from the lower contact to to the end of the probe tube	 approx. 50 mm approx. 50 mm	
Option	G½ counter nut made of stainless steel 316 Ti	

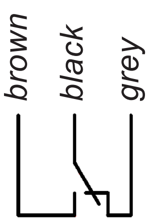
NTR/S3/ED/E2/C/PVC





Contact position with full container





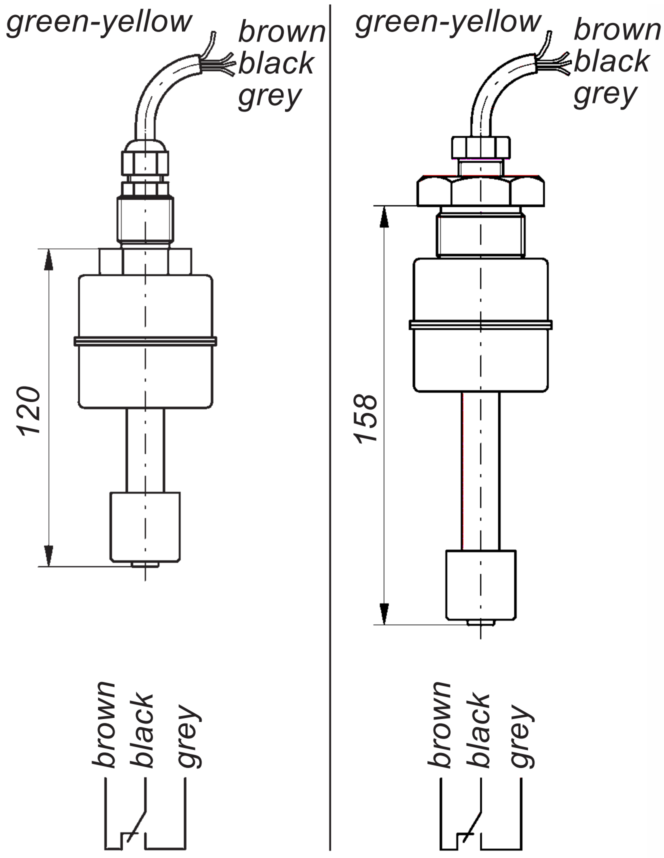
Contact position with empty container

NTR/S3/ED/E2/C/SIL

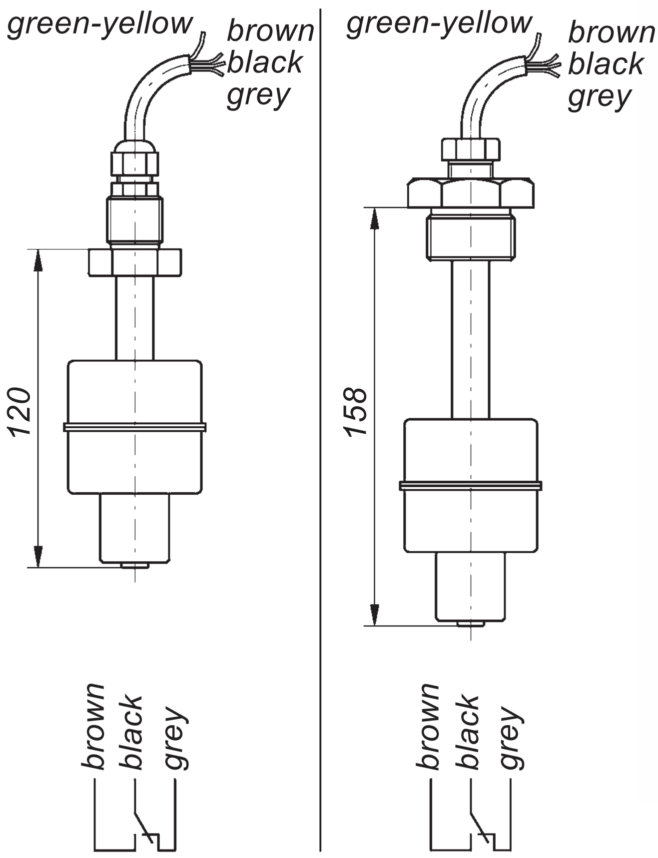
NTR/S3/P/P/...
small immersion probes with
• probe tube made of PP
• float made of PP

Models	**NTR/S3/P/P/...**
Application **Switching voltage** **Switching current** **Switching capacity**	**standard applications** **AC/DC 24 V - 250 V** **AC 100 mA - 2 A (0.4 A)** **max. 100 VA**

Technical data	**NTR/S3/P/P/B/PVC with G½ nipple – upwards**	**NTR/S3/P/P/C/PVC with G1 nipple – downwards**
Probe tube: • material • diameter • length	PP 14 mm measured from the nipple sealing surface • without reducing nipple:	
	120 mm,	approx. 158 mm,
	other length on request • with reducing nipple:	
	—	150 mm, other length on request
Screw-in nipple	G½ upwards	G1 downwards
Float	PP, 53 mm Ø x 50 mm	
Float suitable for use in media with a specific gravity	≥ 0.80 g/cm³	
Cable entry	PP, protection class IP54	
Connecting cable	PVC, 4G0.5 mm²	
Length of connecting cable	3 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	0°C to + 60°C	
Pressure resistance at + 20°C	max. 2 bar	
Contact	reed contact: potential-free changeover contact (OC)	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³):		
• from the nipple sealing surface to the upper contact	approx. 60 mm	approx. 98 (90) mm
• from the lower contact to to the end of the probe tube	approx. 60 mm	approx. 60 mm
Option	G½ counter nut made of PP	G2 reducing nipple made of PP



Contact position with full container



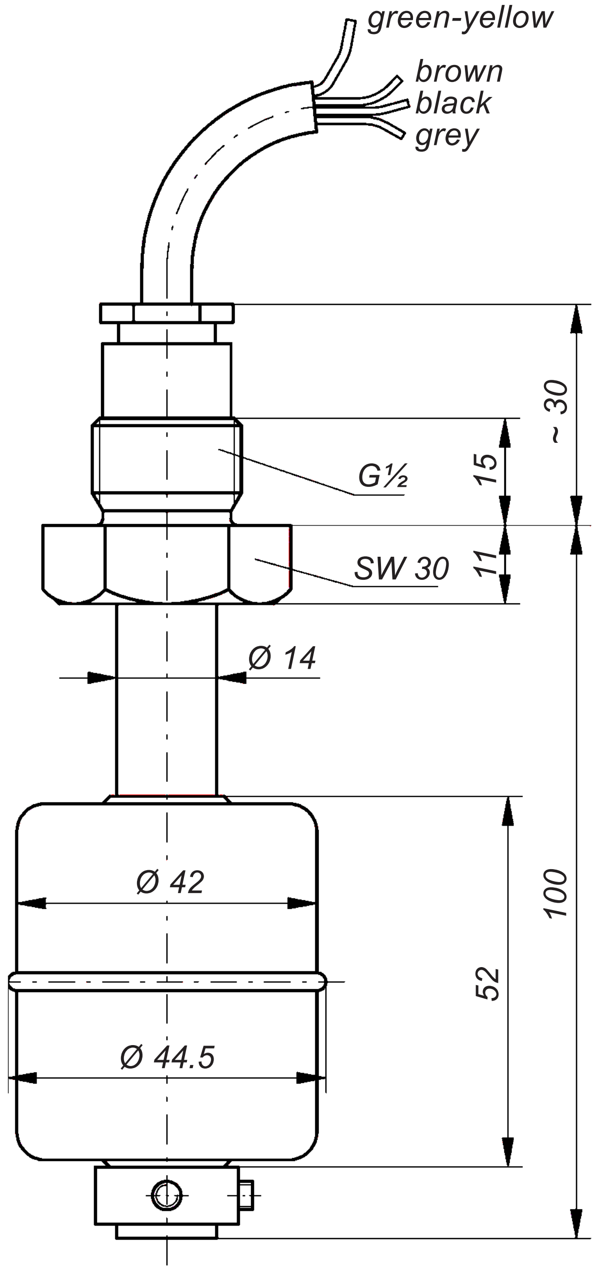
NTR/S3/P/P/B/PVC

Contact position with empty container

NTR/S3/P/P/C/PVC
with G2 reducing nipple
made of PP (option)

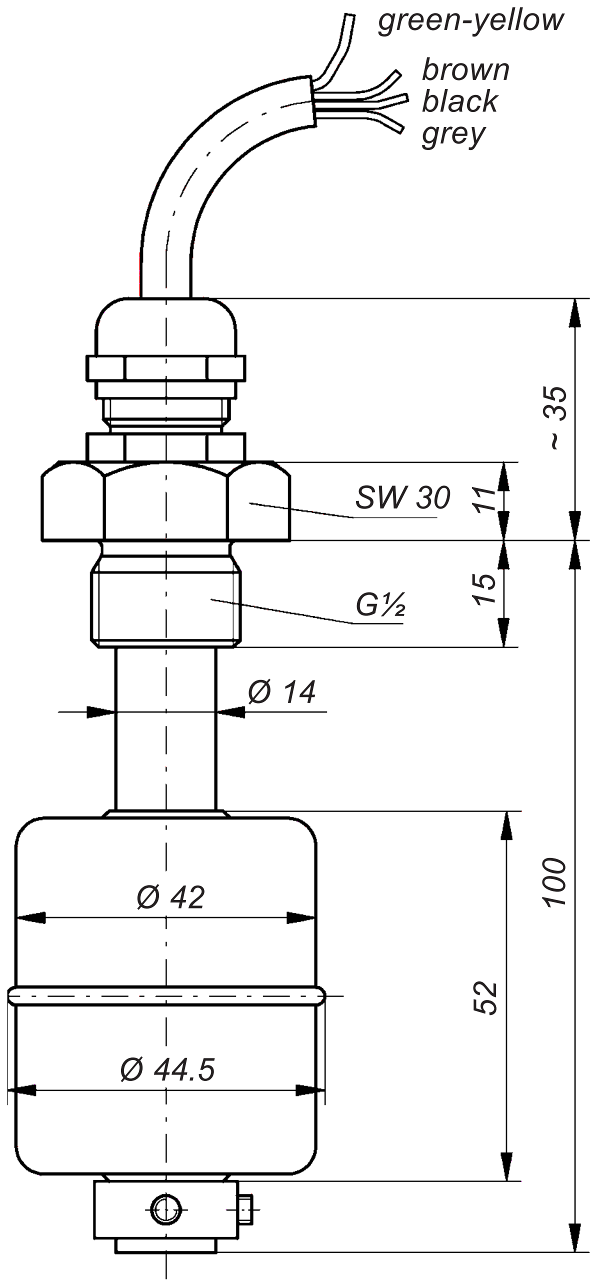
Dimensional drawings

NTR/S3/ED/E2/B/...



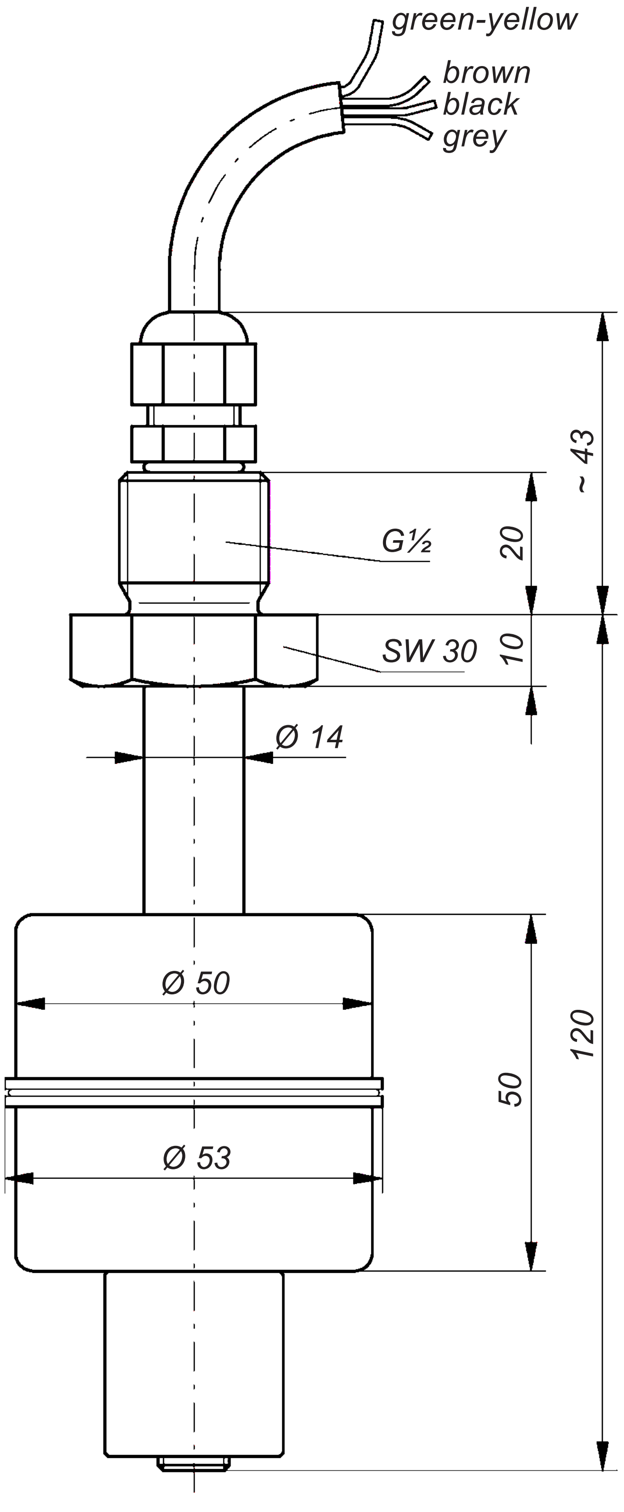
Dimensions in mm

NTR/S3/ED/E2/C/...



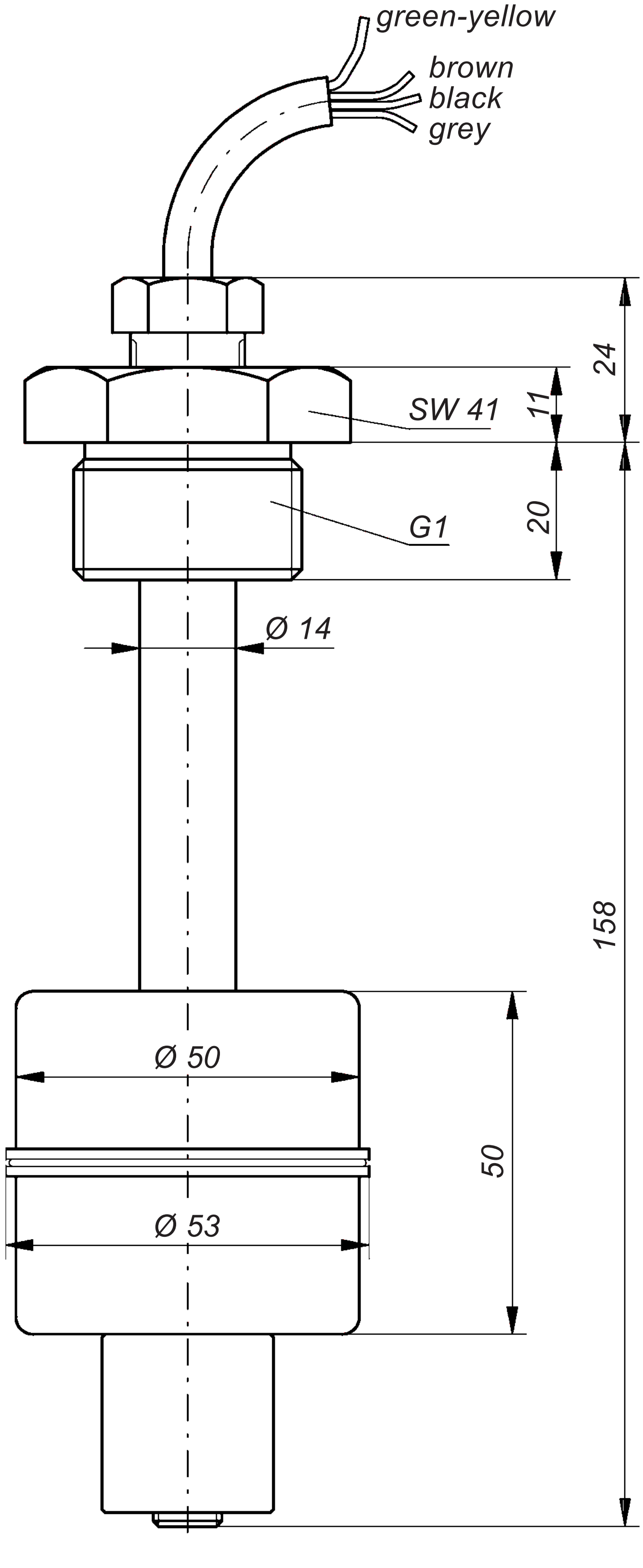
Dimensional drawings

NTR/S3/P/P/B/...



Dimensions in mm

NTR/S3/P/P/C/...

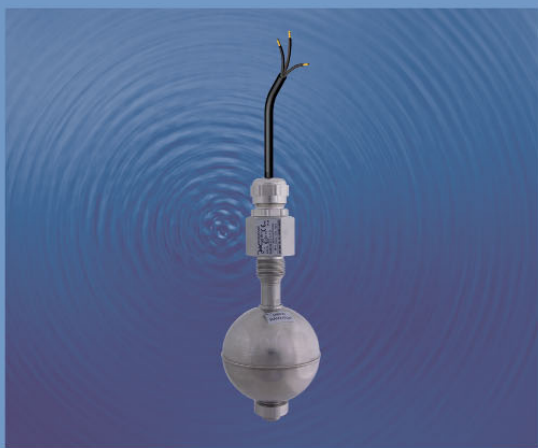


Other versions on request:
- **angled version for mounting from the side**
- **NTR/S1/... version for light current applications**

Models	NTR/S1/...
Application Switching voltage Switching current Switching capacity	light current applications AC/DC 1 V - 42 V AC 1 mA - 500 mA max. 20 VA

NTR Ex
small
immersion probes

Controlling devices with magnetically operated reed contact, for signalling or regulation of liquid levels



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Option:
mounting brackets,
see pages 16-2-0 and following

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Contents | **Page**

Construction and operating principle of the NTR Ex small immersion probes

The NTR Ex small immersion probes have a probe tube with a built-in reed contact. The float is fitted with a permanent magnet and moves freely up and down the probe tube, activating the reed contact as it rises and falls.

It should be noted that the reed contact does **not** lock but that it switches only for as long as it is influenced by the magnetic field. Once the float passes beyond the contact upwards or downwards, the latter returns to its original position.

Types overview

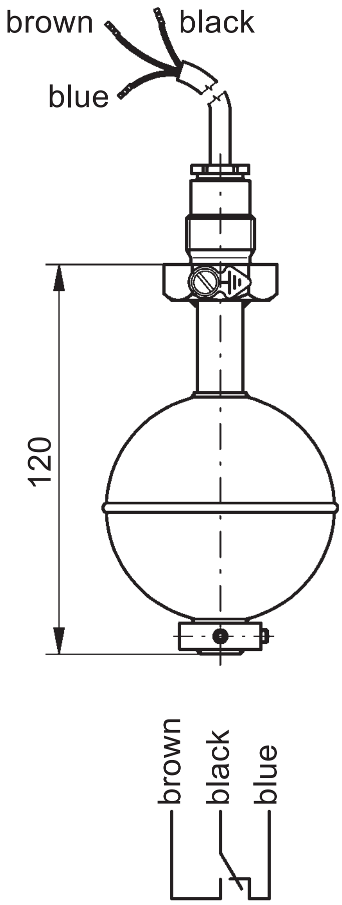
Following types are available:	Screw-in nipple	Protection class	Connecting cable	Page
NTR/FED/E8/B/PVC/ Variant 0/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb	G½ upwards	IP54	PVC cable	3-4-3
NTR/FED/E8/C/PVC/ Variant 0/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb	G½ downwards	IP65		3-4-3
NTR/FED/E8/C/PVC/ Variant 0/Ex-0G ⟨Ex⟩ II 2/1 G Ex ia IIC T6 Ga/Gb				3-4-5
NTR/FED/E8/C/PURLF/ Variant 0/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIC T6 Ga			antistatic PURLF cable (with external conductive PUR sheath)	3-4-5

NTR/FED/E8/./PVC/Variant 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
small immersion probes

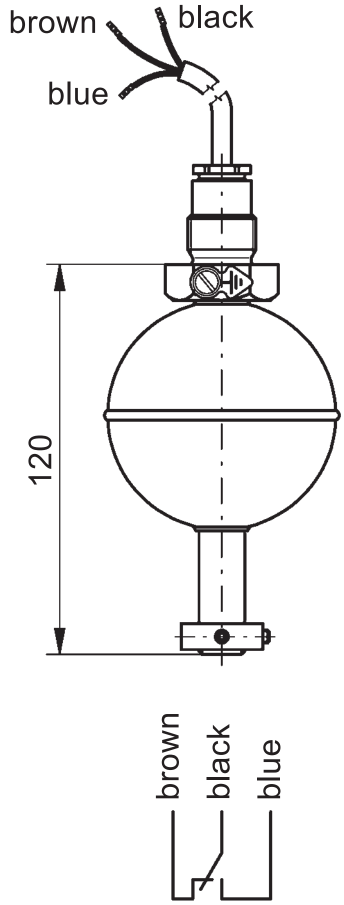
Technical data	NTR/FED/E8/B/PVC/ Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb with G½ nipple – upwards	NTR/FED/E8/C/PVC/ Variant 0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb with G½ nipple – downwards
Application	**for use in instrinsically safe circuits in potentially explosive atmospheres zone 1 or 2; EC type examination certificate INERIS 03ATEX0163X**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	14 mm	
• length	120 mm, measured from the nipple sealing surface; other length on request	
Screw-in nipple	G½ **upwards**	G½ **downwards**
	(see opposite page)	
Float	stainless steel 316 Ti, 72 mm Ø	
Float suitable for use in media with a specific gravity	≥ 0.70 g/cm³	
Cable entry	nickel-plated brass, protection class IP54	nickel-plated brass, on request: stainless steel, protection class IP65
Connecting cable	PVC cable, other cable type on request	
Connecting cable length	3 m, other cable length on request	
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contact	reed contact: potential-free changeover contact	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): • from the nipple sealing surface to the contact	approx. 60 mm	
• from the contact to the end of the probe tube (when float is falling)	approx. 60 mm	
Option	G½ counter nut made of stainless steel 316 Ti	

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

NTR/FED/E8/B/PVC/
Variant 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb

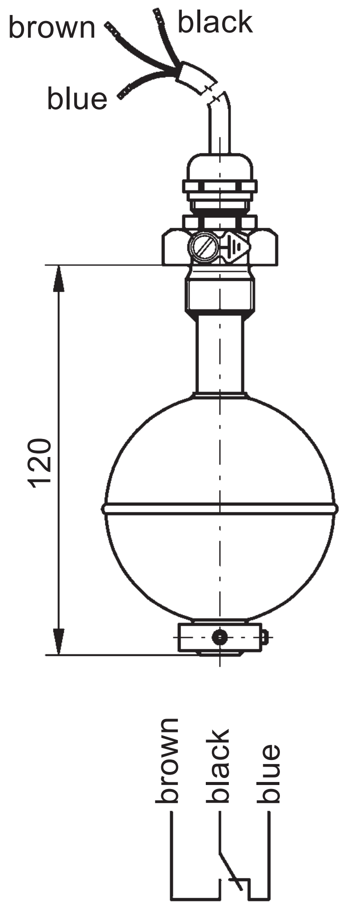


Contact position with
empty container

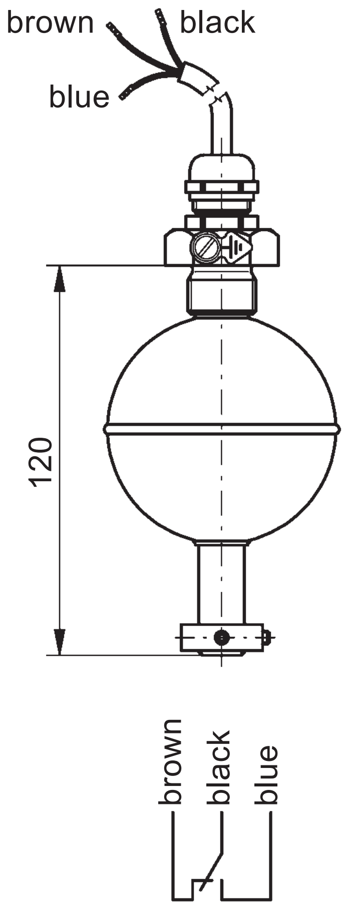


Contact position with
full container

NTR/FED/E8/C/PVC/
Variant 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb



Contact position with
empty container

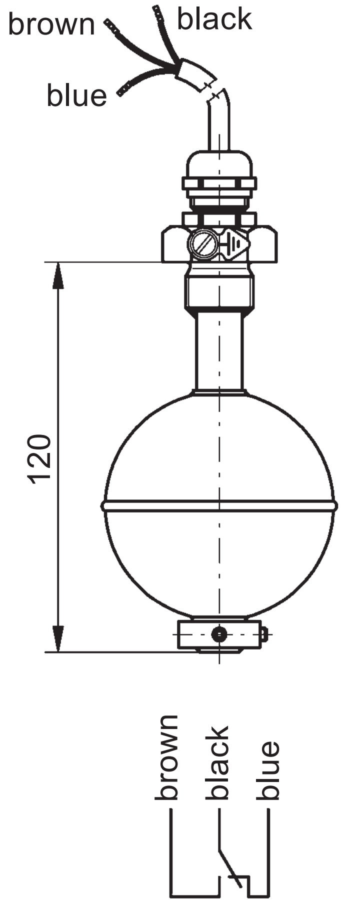


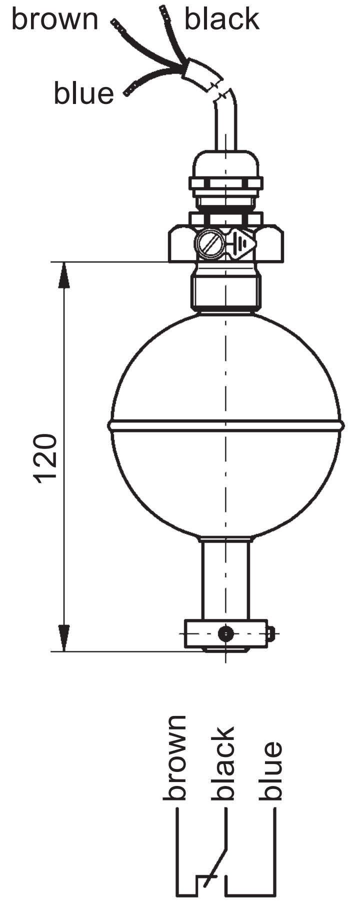
Contact position with
full container

NTR/FED/E8/C/PVC/Variant 0/Ex-0G Ⓔx II 2/1 G Ex ia IIC T6 Ga/Gb and NTR/FED/E8/C/PURLF/Variant 0/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga small immersion probes

Technical data	**NTR/FED/E8/C/PVC/ Variant 0/Ex-0G Ⓔx II 2/1 G Ex ia IIC T6 Ga/Gb with G½ nipple – downwards**	**NTR/FED/E8/C/PURLF/ Variant 0/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga with G½ nipple – downwards**
Application	**for use in instrinsically safe circuits in potentially explosive atmospheres**	
	• probe tube and float: zone 0, 1 or 2, • cable entry and cable: zone 1 or 2;	**zone 0, 1 or 2;**
	EC type examination certificate INERIS 03ATEX0163X	
Probe tube: • material	stainless steel 316 Ti	
• diameter	14 mm	
• length	120 mm, measured from the nipple sealing surface; other length on request	
Screw-in nipple	G½ **downwards** (see opposite page)	
Float	stainless steel 316 Ti, 72 mm Ø	
Float suitable for use in media with a specific gravity	≥ 0.70 g/cm³	
Cable entry	nickel-plated brass, on request: stainless steel, protection class IP65	
Connecting cable	PVC cable, other cable type on request	antistatic PURLF cable (with external conductive PUR sheath)
Connecting cable length	3 m, other cable length on request	3 m, other cable length on request (max. 10 m)
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions; pressure resistance up to max. 10 bar on request	
Contact	reed contact: potential-free changeover contact	
Min. distances to be observed (based on liquids with a specific gravity of 1 g/cm³): • from the nipple sealing surface to the contact • from the contact to the end of the probe tube (when float is falling)	 approx. 60 mm approx. 60 mm	
Option	G½ counter nut made of stainless steel 316 Ti	

Versions for use in mines susceptible to firedamp with a Ⓔx I M2 Ex ia I Mb protection level on request.

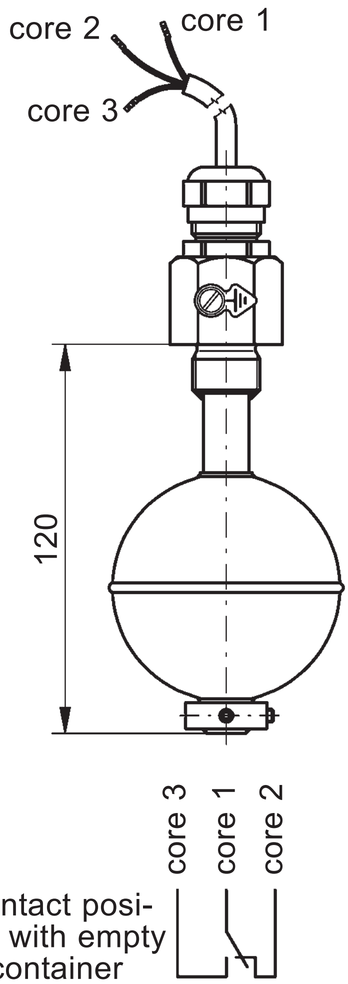


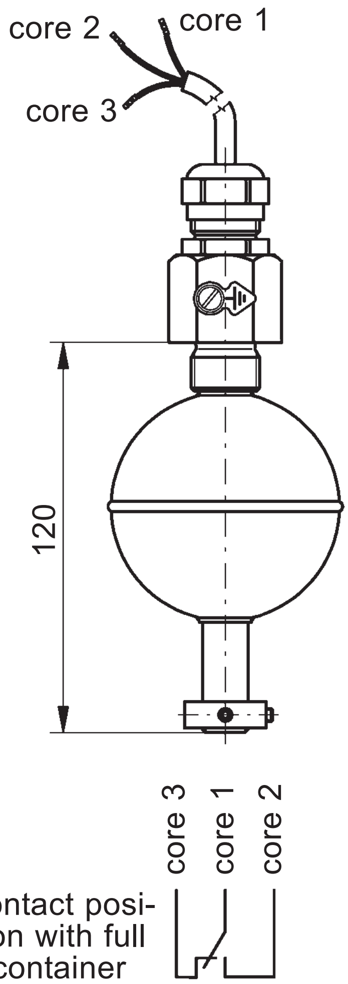


NTR/FED/E8/C/PVC/
Variant 0/Ex-0G
⟨Ex⟩ II 2/1 G Ex ia IIC T6 Ga/Gb

Contact position with empty container

Contact position with full container





NTR/FED/E8/C/PURLF/
Variant 0/Ex-0G
⟨Ex⟩ II 1 G Ex ia IIC T6 Ga

Contact position with empty container

Contact position with full container

Level controllers with magnetic switches and level indicators with taps

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HMW/3/.. and HMW/1/.. magnetic switches

Mounting and mode of operation of the magnetic switches

The **HMW/3/..** and **HMW/1/..** magnetic switches are accommodated in a housing, which can be fastened to a pipe by means of a tube clamp which is attached to the housing. The housing contains a connection terminal and a microswitch; a magnet is fixed to the lever of the latter. When the magnetic switch is installed and the magnet on the microswitch lever is activated by a magnet moving up and down in the tube, this changes the position of the microswitch lever and an electrical circuit is created.

The magnetic switches have so-called bistable characteristics; i.e. they remain in the switching status caused by the influence of the passing magnet and only switch over when the magnet passes by in the opposite direction.

HMW/1/32
magnetic switch
attached to a transparent tube made of PVC
containing the float SW 25x142/PP

HMW/3/.. and HMW/1/.. magnetic switches

These units are not suitable for use on vibrating machines or in places at risk from shock or vibration.

Technical data	HMW/3/..	HMW/1/..
Application	standard applications	light current applications
Switching voltage	between AC/DC 24 V and AC/DC 250 V	between AC/DC 1 V and AC/DC 42 V
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	between AC 0.1 mA a. AC 100 (50) mA or between DC 0.1 mA and DC 10 mA
Switching capacity	max. 500 VA or 10 W	max. 4 VA or 0.4 W
Operating principle	magnetically activated **bistable** microswitch, potential-free changeover contact	
Housing	PP, approx. 65 x 50 x 35 mm	
Protection class	IP 65	
Pipe clip material and pipe clip diameter (supplement of the type designation)	• 28 = with stainless steel pipe clip, for a tube with an outer Ø of 28 mm • 32 = with PP pipe clip, on request with stainless steel pipe clip, for a tube with an outer Ø of 30-32 mm • 40 = with stainless steel pipe clip, for a tube with an outer Ø of 35-40 mm • 60 = with stainless steel pipe clip, for a tube with an outer Ø of 50-70 mm	
Mounting orientation	vertical (cable entry must point downwards)	
Temperature application range	+ 1°C to + 60°C	
VDE-mark licences	DVE, VDE EMV	VDE EMV

Mounting instructions for HMW/...

To avoid damage to the pipe clip of the HMW/... magnetic switch, it is important that you open the clip carefully, never abruptly, and never using force.

Thies applies in particular to the pipe clip made of PP for outer pipe diameters from 30 - 32 mm.

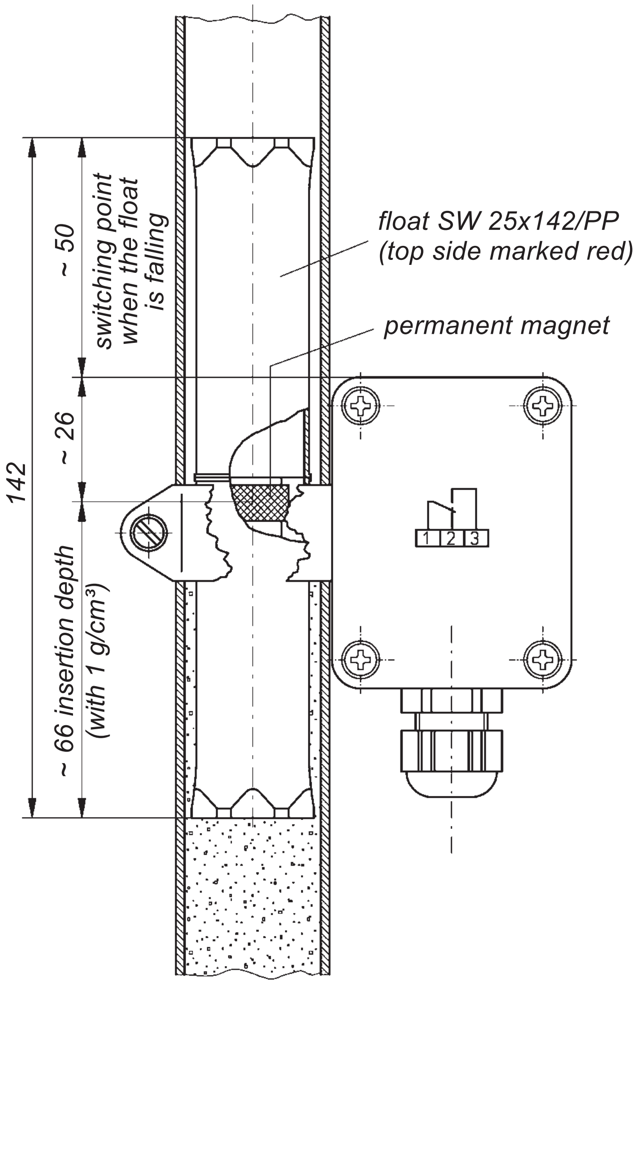
We recommend that the pipe clip ends should only be opened just enough to accommodate the pipe diameter in question.

The best way to mount the clip is to lightly press the slightly opened pipe clip ends against the pipe.

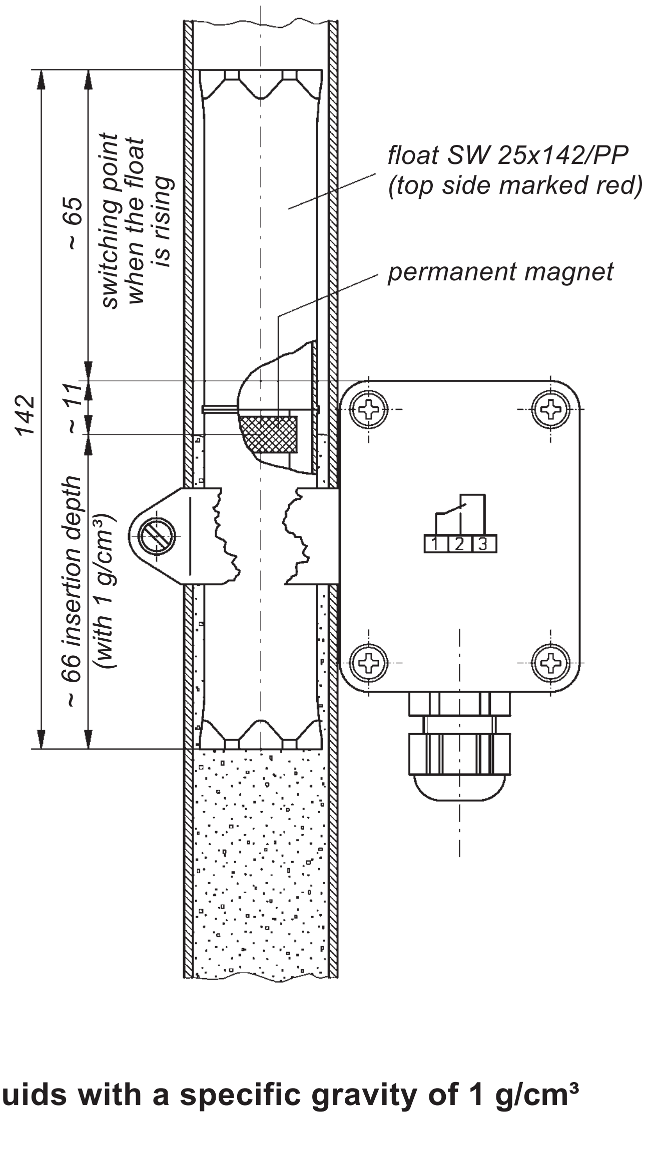
HMW/3/.. and HMW/1/.. magnetic switches

Functional diagrams

Representation of the switching point and the switching position when the float has moved past the magnetic switch <u>from “top” to “bottom”</u>



Representation of the switching point and the switching position when the float has moved past the magnetic switch <u>from “bottom” to “top”</u>

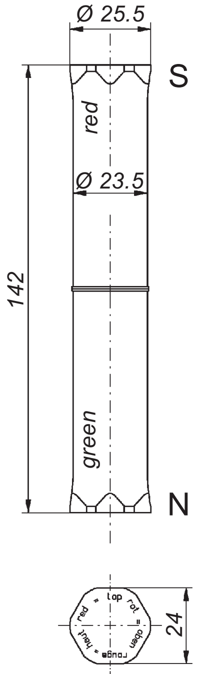


Dimensions when the float is used in liquids with a specific gravity of 1 g/cm³

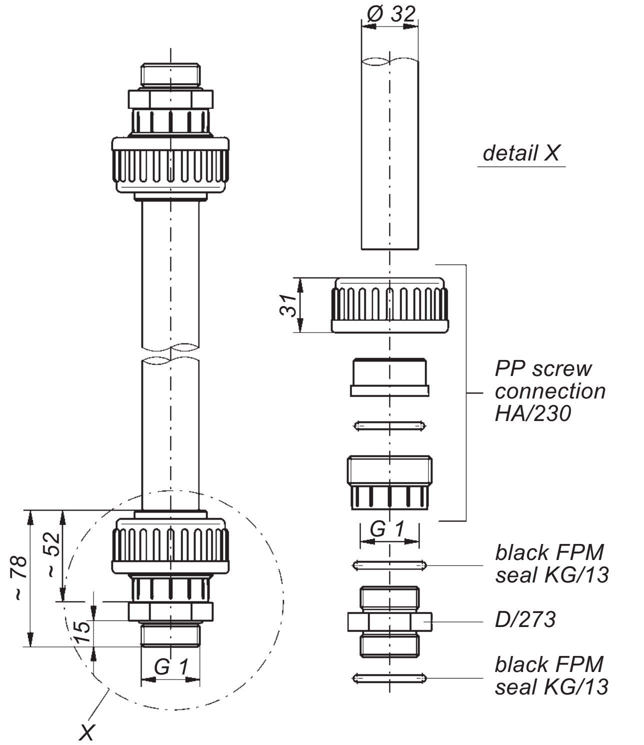
Accessories for HMW/...

for applications like those described on page 4-1-6 and foll.

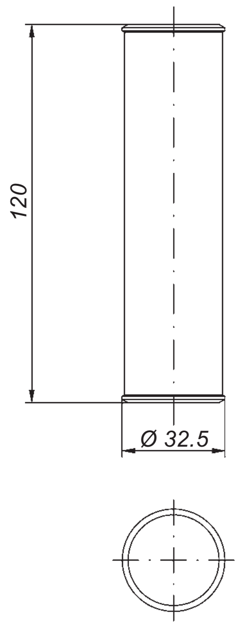
Float SW 25x142/PP
(small PP float with built-in magnet)



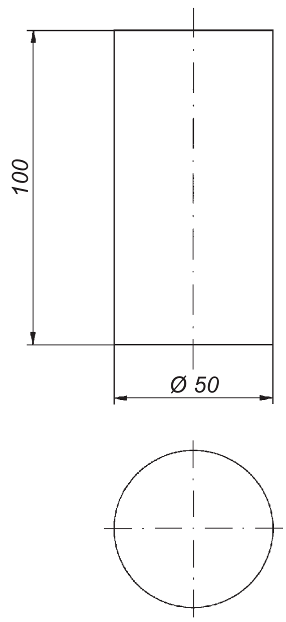
Mounting bracket for glass tube or transparent PVC tube of 32 mm Ø
(diagram with smaller scale compared to adjacent drawings)



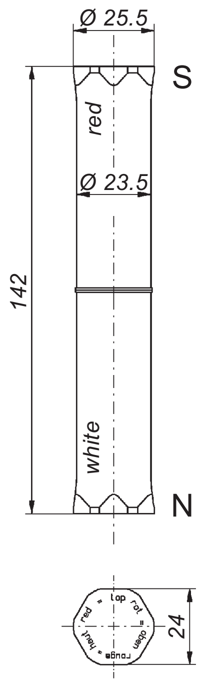
Float SW 32x120/PP
(middle PP float with built-in magnet)



Float SW 50x100/PP
(big PP float with built-in magnet)



Float SW 25x142/PVDF
(small PVDF float with built-in magnet)

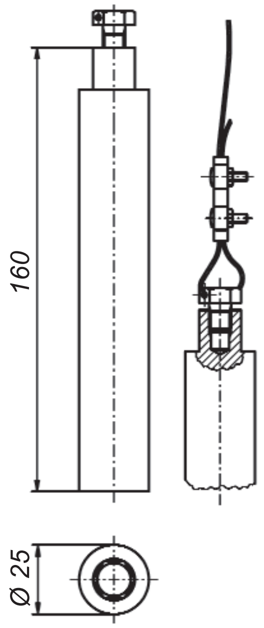


Accessories for HMW/...

for applications like those described on page 4-1-15 and foll.

Counterweight GG 25x160/PP/E

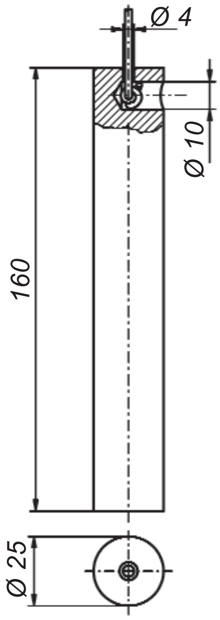
(small PP counterweight with built-in magnet, for stainless steel rope Ø 1.5 mm, for ENVM/E)



weight: ~ 330 g

Counterweight GG 25x160/PP/PP

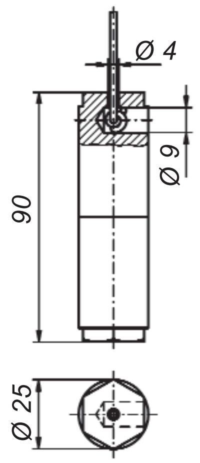
(small PP counterweight with built-in magnet, for PP rope Ø 3 mm, for ENVM/PP)



weight: ~ 330 g

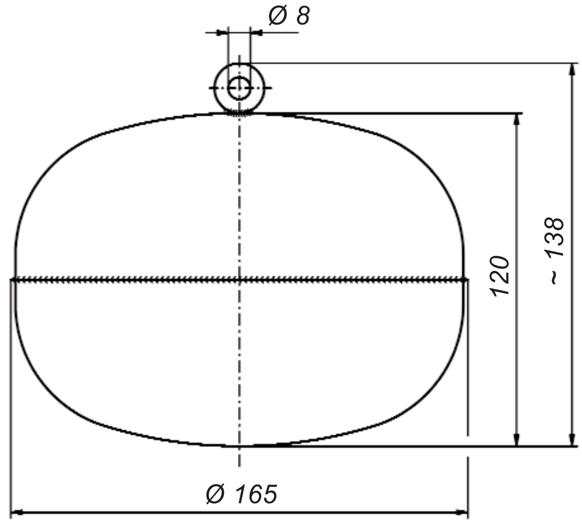
Counterweight GG 25x90/PP/PP

(small PP counterweight with built-in magnet, for PP rope Ø 3 mm, for ENVM/PP/PVC)



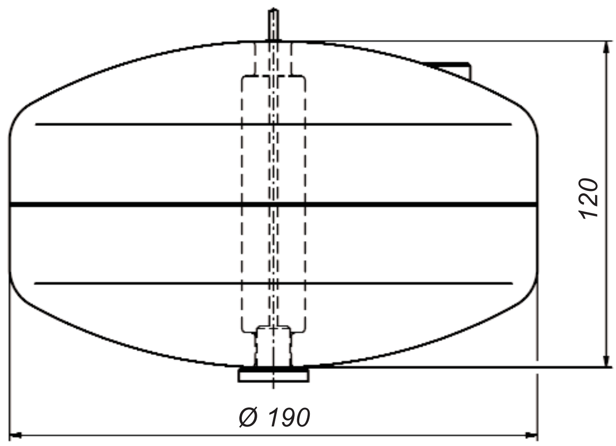
weight: ~ 160 g

Float SWS 165x120/E made of stainless steel 316 Ti, filled with sand



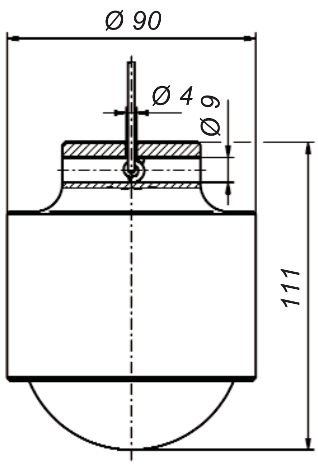
weight: ~ 730 g

Float SWS 190x120/PP made of PP, filled with sand



weight: ~ 800 g

Float SWS 90x111/PP/HK made of massive PP



weight: ~ 490 g

HA/... and HAM/... level indicators with taps

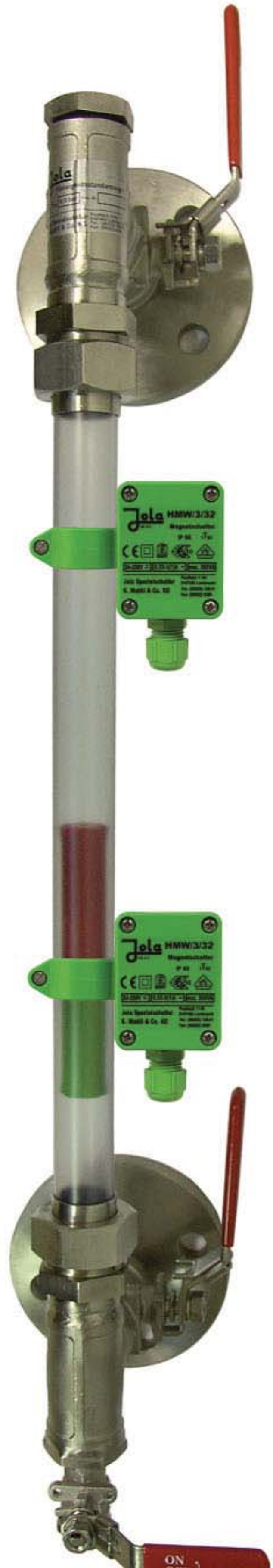
Type HA/...

The HA/... level indicator with taps provides a **direct visual reading** of the liquid level. This is effected by the system of communicating tubes in the sightglass of the unit.

Type HAM/...

The HAM/... level indicator with taps consists of an HA/... unit, which **is additionally equipped with a float with built-in permanent magnet and with bistable magnetic switches** to signal the liquid level or to control pumps or electrovalves.

The magnetic switches have so-called bistable characteristics; i.e. they remain in the switching status caused by the influence of the passing magnet and only switch over when the magnet passes by in the opposite direction.



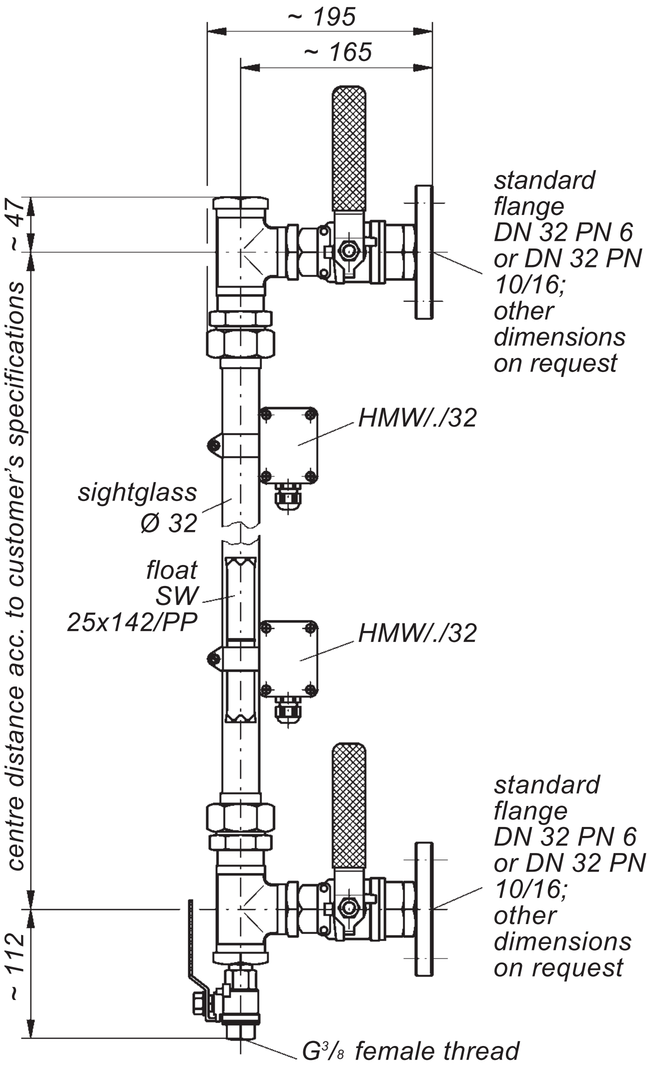
HAM/E 32 with float SW 25x142/PP and with 2 magnetic switches HMW/3/32

These units are not suitable for use on vibrating machines or in places at risk from shock or vibration.

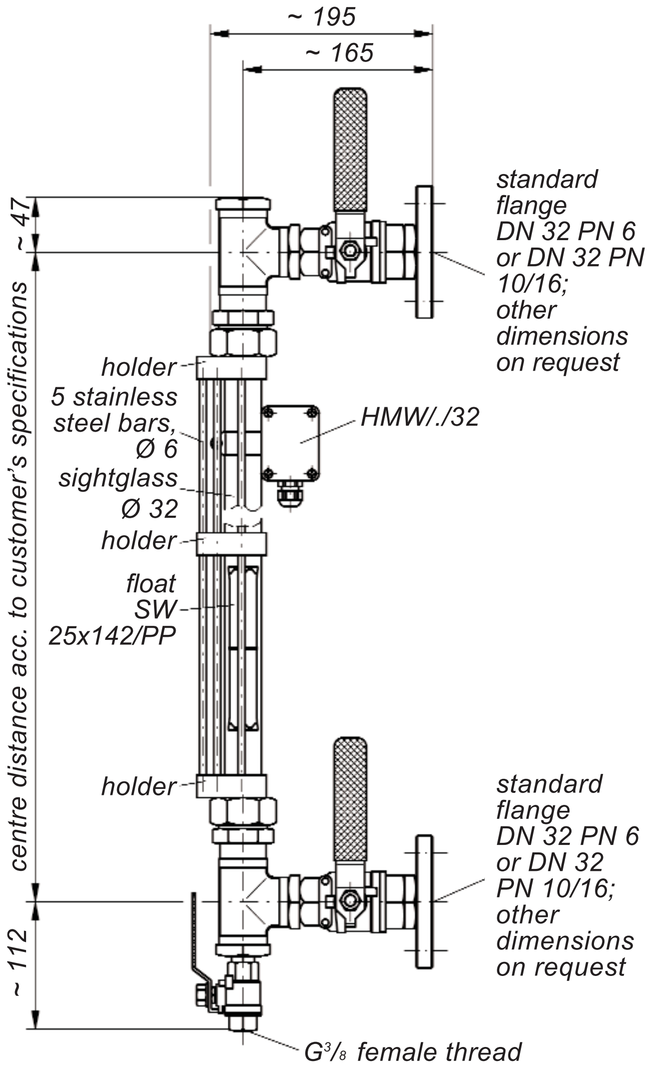
Technical data	HA/E 32
Valve material	stainless steel 316 or 316 Ti
Dimensions of the connecting flanges	DN 32 PN 6 or DN 32 PN 10/16, other dimensions and thread connections in place of the flanges on request
Discharge port	$^3/_8$”
Sightglass material	Borosilicate glass; on request: transparent PVC
Centre distance (see page 4-1-8)	as required, up to max. 1,500 mm, longer on request
Outer diameter of the sightglass	32 mm
Mounting orientation	vertical
Temperature application range	+ 1°C to + 60°C, other temperature application range on request
Pressure resistance	for pressureless applications

Technical data	HAM/E 32
Basic technical data	see above
Float with built-in magnet	• SW 25x142/PP for liquids with a specific gravity ≥ 0.8 g/cm³ or • SW 25x142/PVDF for liquids with a specific gravity ≥ 1 g/cm³
Magnetic switches	HMW/3/32 or HMW/1/32 (see page 4-1-1 and following)
Switching voltage / Switching current / Switching capacity	see technical data of the individual magnetic switches
Max. number of magnetic switches	as requested and according to the sightglass length

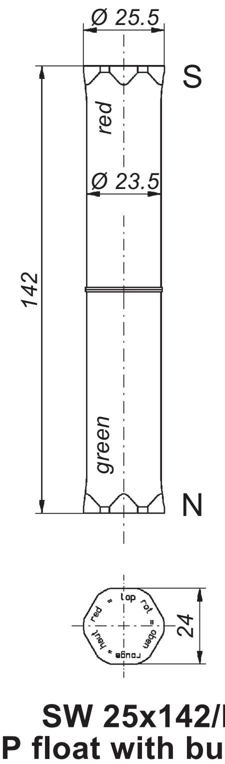
Dimensional drawing HAM/E 32



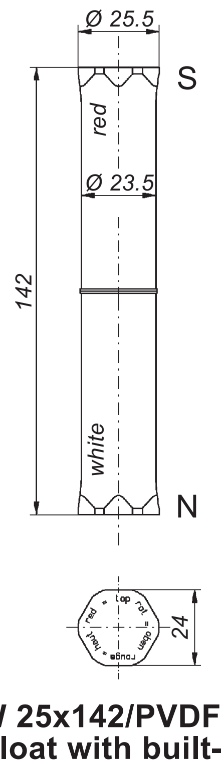
Dimensional drawing HAM/E 32 with protective stainless steel bars



Floats



SW 25x142/PP
(small PP float with built-in magnet)

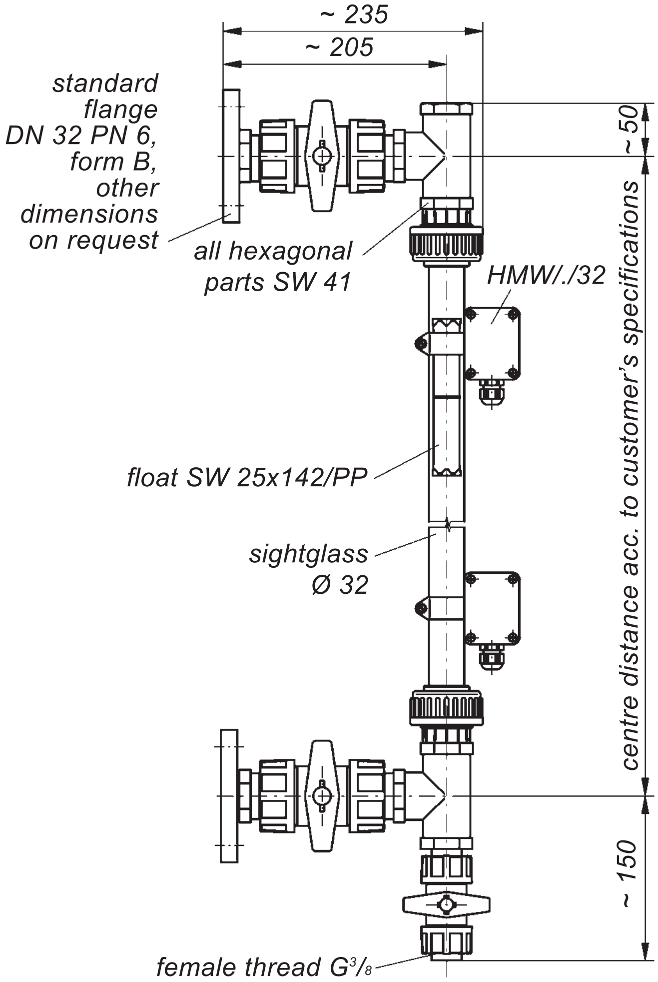


SW 25x142/PVDF
(small PVDF float with built-in magnet)

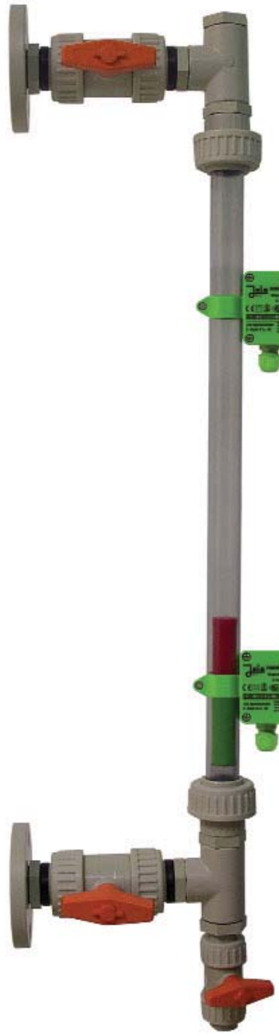
Technical data	HA/PP	HA/PVDF
Valve material	PP	PVDF
Dimensions of the connecting flanges	DN 32 PN 6, other dimensions and thread connections in place of the flanges on request	
Discharge port	3/8”	
Sightglass material	borosilicate glass; on request: transparent PVC	
Centre distance (see page 4-1-10)	as required, up to max. 1,500 mm, longer on request	
Outer diameter of the sightglass	32 mm	
Mounting orientation	vertical	
Temperature application range	+ 1°C to + 60°C, other temperature application range on request	
Pressure resistance	for pressureless applications	

Technical data	HAM/PP	HAM/PVDF
Basic technical data	see above	
Float with built-in magnet	SW 25x142/PP for liquids with a specific gravity ≥ 0.8 g/cm³	SW 25x142/PVDF for liquids with a specific gravity ≥ 1 g/cm³
Magnetic switches	HMW/3/32 or HMW/1/32 (see page 4-1-1 and following)	
Switching voltage / Switching current / Switching capacity	see technical data of the individual magnetic switches	
Max. number of magnetic switches	as requested and according to the sightglass length	

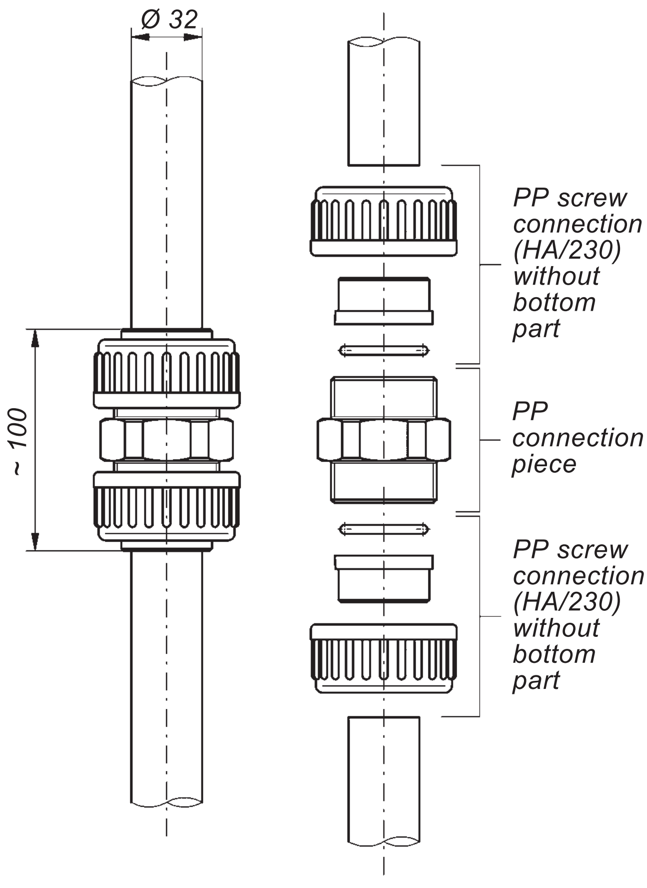
Dimensional drawings HAM/PP or HAM/PVDF



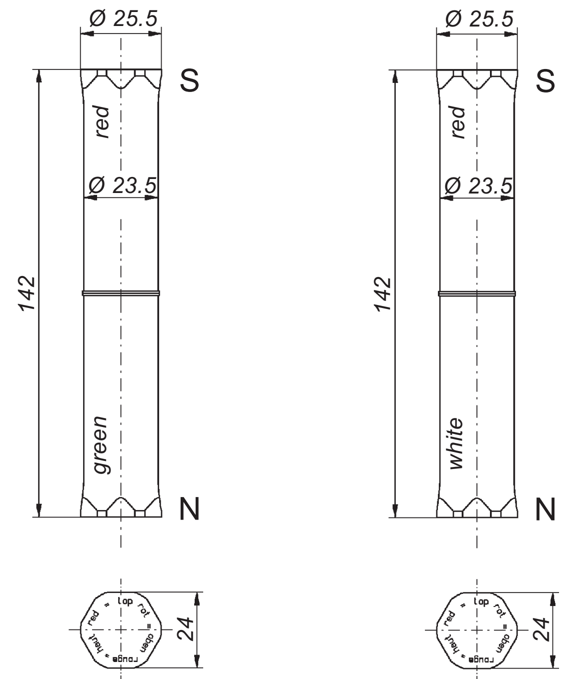
HAM/PP with float SW 25x142/PP and with 2 magnetic switches HMW/3/32



Option: tube connection piece for HA/PP or HAM/PP with parted sightglass



Floats



SW 25x142/PP (small PP float with built-in magnet)

SW 25x142/PVDF (small PVDF float with built-in magnet)

NVM/... and NEM/... level controllers

Controlling devices with magnetic switches, for signalling or regulation of liquid levels

Mounting and mode of operation of the NVM/... and NEM/... level controllers

The NVM/... and NEM/... level controllers are fitted with a float and a float rod to which a magnet is attached to the opposite end from the float.

The float follows the level of the liquid and moves the float rod inserted through the screw-in threaded nipple of the unit up or down. Above the nipple a guide tube is attached for the float rod and the magnet, and adjustable magnetic switches are mounted on the outside of the tube. These magnetic switches have so called bistable characteristics; i.e. they remain in the switching status caused by the influence of the passing magnet and only switch over when the magnet passes by in the opposite direction.

With the types NVM/... the guide tube is made of transparent PVC, which permits direct visible indication of the liquid level. With the types NEM/... it is made of stainless steel.

NVM/E/B with 4 magnetic switches HMW/3/32

NEM 148 with 3 magnetic switches HMW/3/28

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks) nor for use on vibrating machines or in places at risk from shock or vibration.

NVM/... level controllers

with guide tube made of transparent PVC

Technical data	NVM/PP/C	NVM/PP/B	NVM/E/C	NVM/E/B
Float material	PP		stainless steel 316 Ti	
Float dimensions	63 mm Ø x 140 mm high	85 mm Ø	63 mm Ø x 140 mm high	97 mm Ø; on request: 130 mm Ø, 148 mm Ø, 180 mm Ø and 200 mm Ø
Float rod material	stainless steel 316 Ti or titanium			
Float rod diameter	6 mm			
Float rod length	as required, **measured from the nipple sealing surface and without float (dimension L, see page 4-1-14)**			
Max. length of the float rod in liquids with a specific gravity of 1 g/cm³ (dimension L)				
• stainless steel 316 Ti rod	700 mm	800 mm	200 mm	900 mm
• titanium rod	1,200 mm	1,200 mm	450 mm	1,200 mm
	max. lengths with other specific gravities on request			
Magnet capsule material	PP			
Screw-in nipple	PP, G1		stainless steel 316 Ti, G1	
Option: installation flange for mounting of the unit from the outside	• for types NVM/PP/C and NVM/E/C: square flange made of stainless steel, PP or PVDF • for types NVM/PP/B and NVM/E/B: flange DN 100 or bigger made of any material			
Float rod guiding piece material	POM; on request: PTFE			
Guide tube	**transparent PVC,** 32 mm Ø x the height based on the float rod length (see page 4-1-14)			
Magnetic switches	HMW/3/32 or HMW/1/32 (see page 4-1-1 and following)			
Max. number of magnetic switches	as required and according to the guide tube length			
Mounting orientation	vertical			
Temperature application range	+ 1°C to + 60°C			
Pressure resistance	for pressureless applications			
Option	chemical protection, composed of: • shrinkdown tubing made of PVDF covering the float rod, • transition piece made of PP between rod and float, • guiding piece for the float rod made of PTFE instead of POM		—	

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks) nor for use on vibrating machines or in places at risk from shock or vibration.

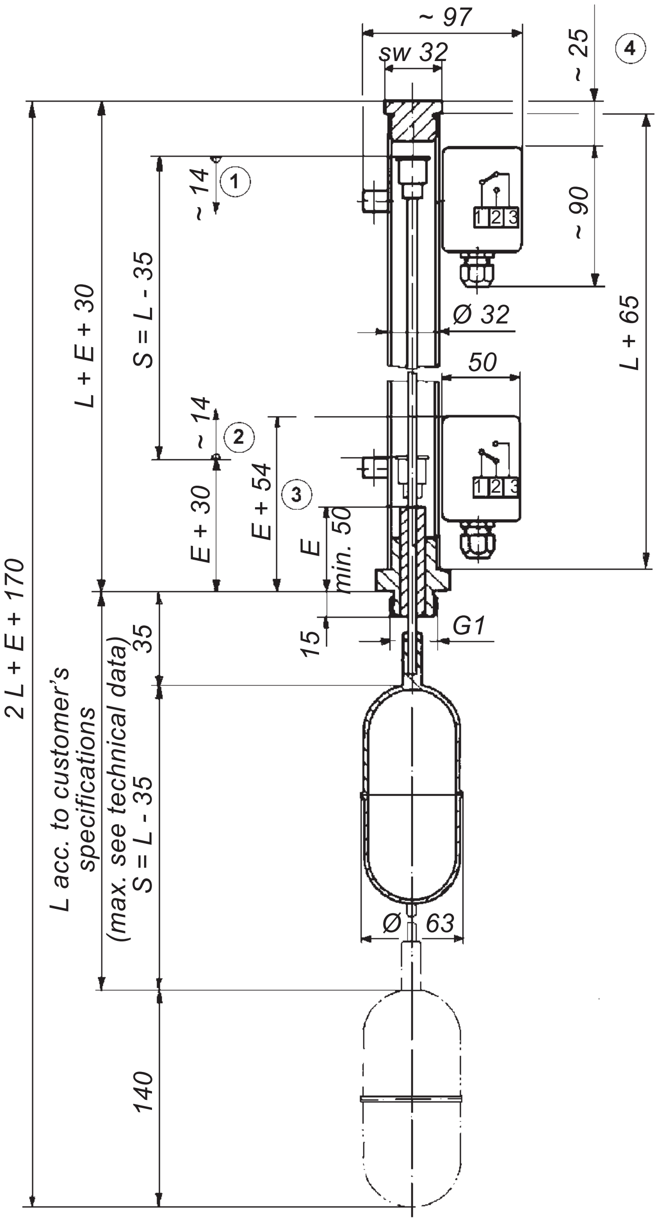
NEM/... level controllers

with guide tube made of stainless steel 316 Ti

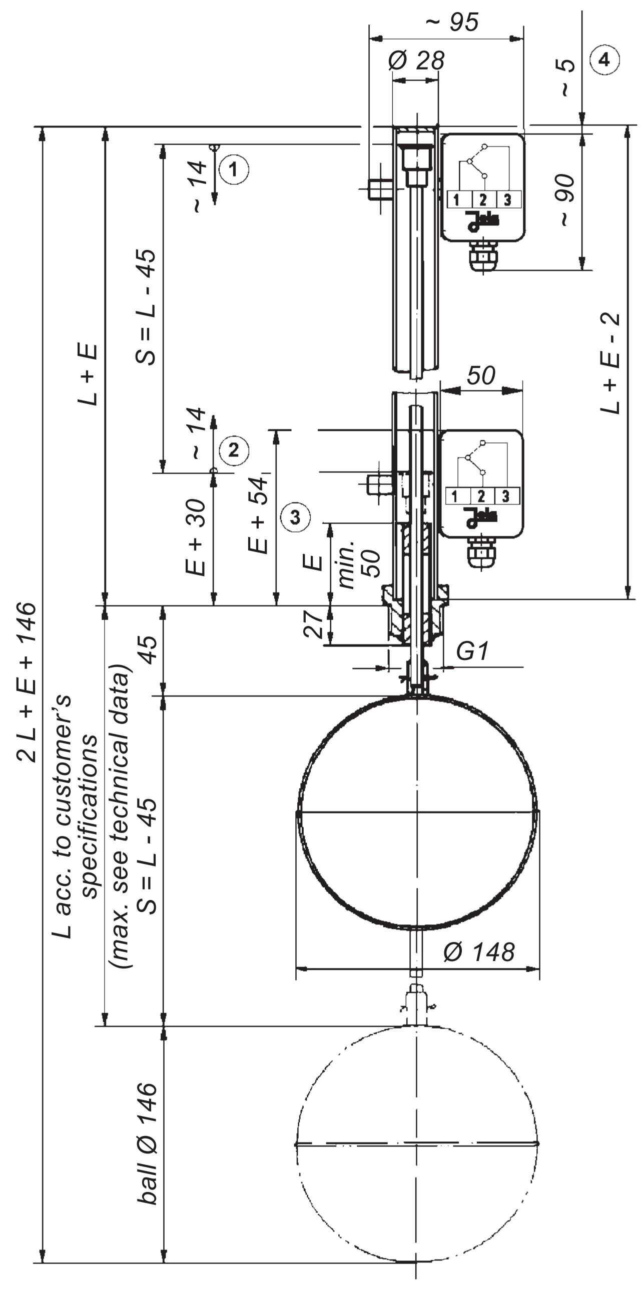
Technical data	NEM 63	NEM 97	NEM 130 NEM 148 NEM 180 NEM 200
Float material	stainless steel 316 Ti		
Float dimensions	63 mm Ø x 140 mm high	97 mm Ø	NEM 130: 130 mm Ø NEM 148: 148 mm Ø NEM 180: 180 mm Ø NEM 200: 200 mm Ø
Float rod material	stainless steel 316 Ti or titanium		
Float rod diameter	6 mm		
Float rod length	as required, **measured from the nipple sealing surface and without float (dimension L, see page 4-1-14)**		
Max. length of the float rod in liquids with a specific gravity of 1 g/cm³ (dimension L) • stainless steel 316 Ti rod • titanium rod	 200 mm 450 mm	 900 mm 1,200 mm	 1,200 mm 1,200 mm
	max. lengths with other specific gravities on request		
Magnet capsule material	PP		
Screw-in nipple	stainless steel 316 Ti, G1		
Option: installation flange for mounting of the unit from the outside	square flange made of stainless steel, PP or PVDF	flange DN 100 or bigger made of any material	on request
Float rod guiding piece material	POM; on request: PTFE		
Guide tube	**stainless steel 316 Ti,** 28 mm Ø x the height based on the float rod length (see page 4-1-14)		
Magnetic switches	HMW/3/28 or HMW/1/28 (see page 4-1-1 and following)		
Max. number of magnetic switches	as required and according to the guide tube length		
Mounting orientation	vertical		
Temperature application range	+ 1°C to + 60°C; other temperature application range on request		
Pressure resistance	for pressureless applications		

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks) nor for use on vibrating machines or in places at risk from shock or vibration.

NVM/PP/C functional diagram



NEM 148 functional diagram

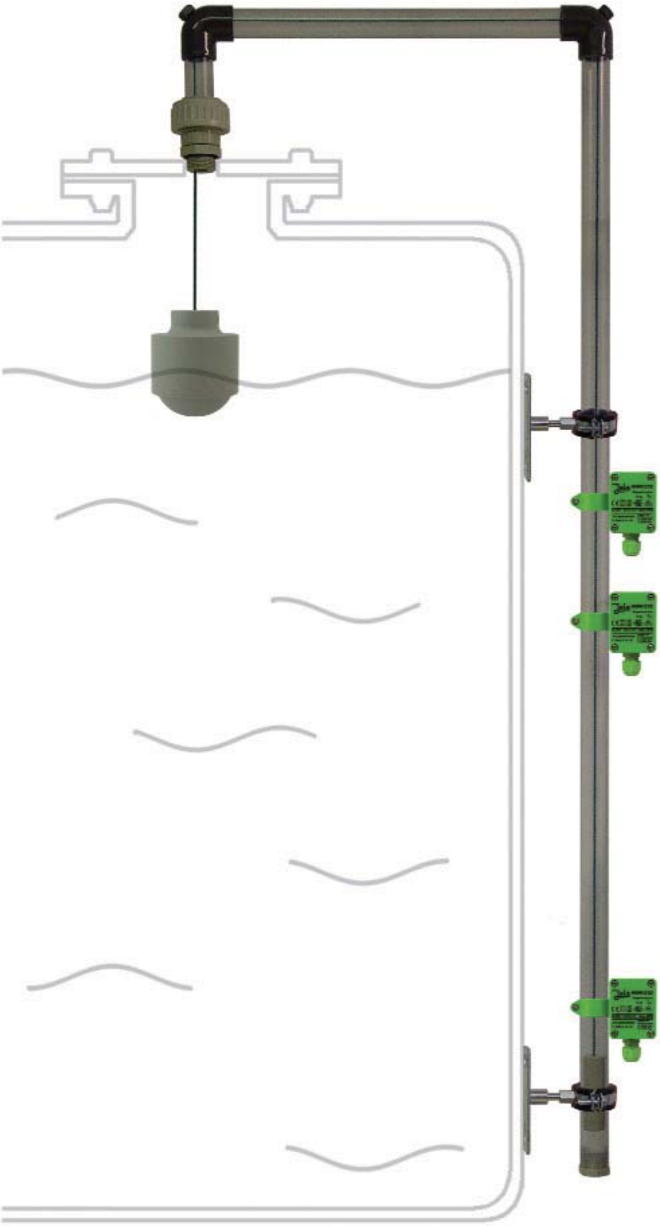


1 return switching when magnet is falling
2 return switching when magnet is rising
3 min. switching point when magnet is falling
4 max. switching point when magnet is rising

ENVM/... level controllers

Controlling devices with magnetic switches, for signalling or regulation of liquid levels

ENVM/E
with 4 magnetic switches HMW/3/32



ENVM/PP/PVC
with 3 magnetic switches HMW/3/32

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks) nor for use on vibrating machines or in places at risk from shock or vibration.

ENVM/... level controllers

Composition of the ENVM/.. level controllers

The ENVM/.. level controllers consist of:

- a float suspended in the tank,
- a fixed roller to be fastened above the tank in such a way that the float is able to move freely up or down,
- a guide tube (to be fastened outside the tank) with a top-mounted fixed roller, internal counterweight with built-in magnet and with wall brackets,
- a rope tensed between the float and the counterweight,
- adjustable bistable magnetic switches of the type HMW/3/32 or HMW/1/32 mounted on the transparent PVC tube.

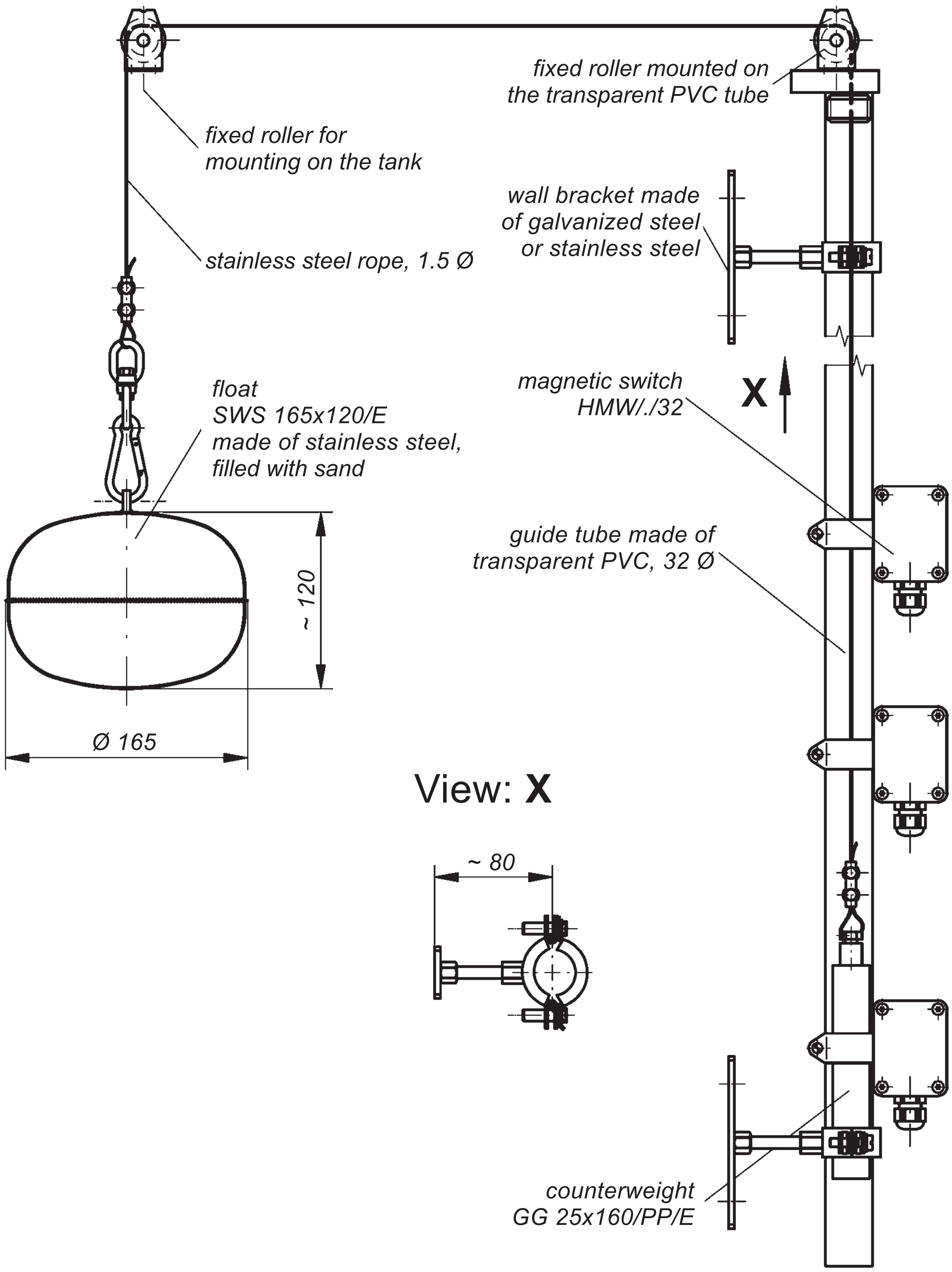
Mode of operation of the ENVM/.. level controllers

The rising or falling liquid level in the tank causes the float to move up and down. As the liquid level in the tank changes, the magnetic switches mounted on the external guide tube are influenced by the magnet of the counterweight, which is connected to the float by the rope.

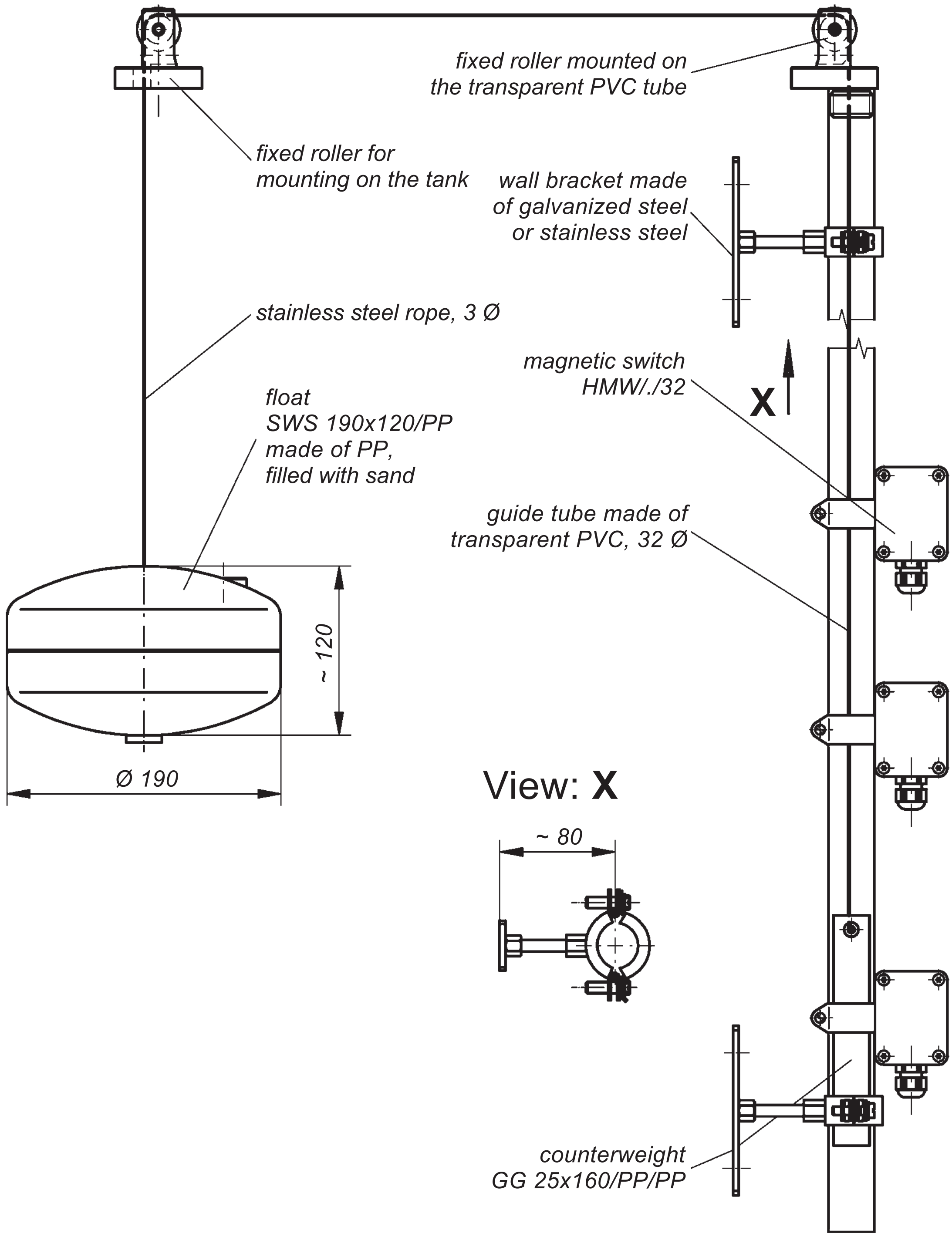
Due to their bistable characteristics, the magnetic switches remain in the position to which they were set by the passing magnet and do not switch back over until the magnet passes again in the other direction.

Technical data	ENVM/E	ENVM/PP	ENVM/PP/PVC
Float	SWS 165x120/E	SWS 190x120/PP	SWS 90x111/PP/HK
Float material	stainless steel 316 Ti	PP	
Float dimensions	see page 4-1-5		
Rope material	stainless steel 316 or 316 Ti	PP; on request: PTFE	
Rope dimensions	1.5 mm Ø x 2.5 m,	3 mm Ø x 2.5 m,	3 mm Ø x 3 m,
	other length on request		
Guide tube material	transparent PVC		
Guide tube dimensions	32 mm Ø x 1,500 mm (measured from the lower surface of the fixed roller fastening block), longer on request		32 mm Ø x dimensions (A + B + C) (see drawing page 4-1-19)
Fixed roller material	nickel-plated brass	POM	PP
Wall bracket material	galvanised steel; on request: stainless steel or plastic		
Counterweight with built-in magnet	GG 25x160/PP/E	GG 25x160/PP/PP	GG 25x90/PP/PP
	material and dimensions see page 4-1-5		
Magnetic switches	HMW/3/32 or HMW/1/32 (see page 4-1-1 and following)		
Max. number of magnetic switches	as required and according to the guide tube length		
Mounting orientation	vertical		
Temperature application range	+ 1°C to + 60°C, higher temperature on request		—
Pressure resistance	for pressureless applications		

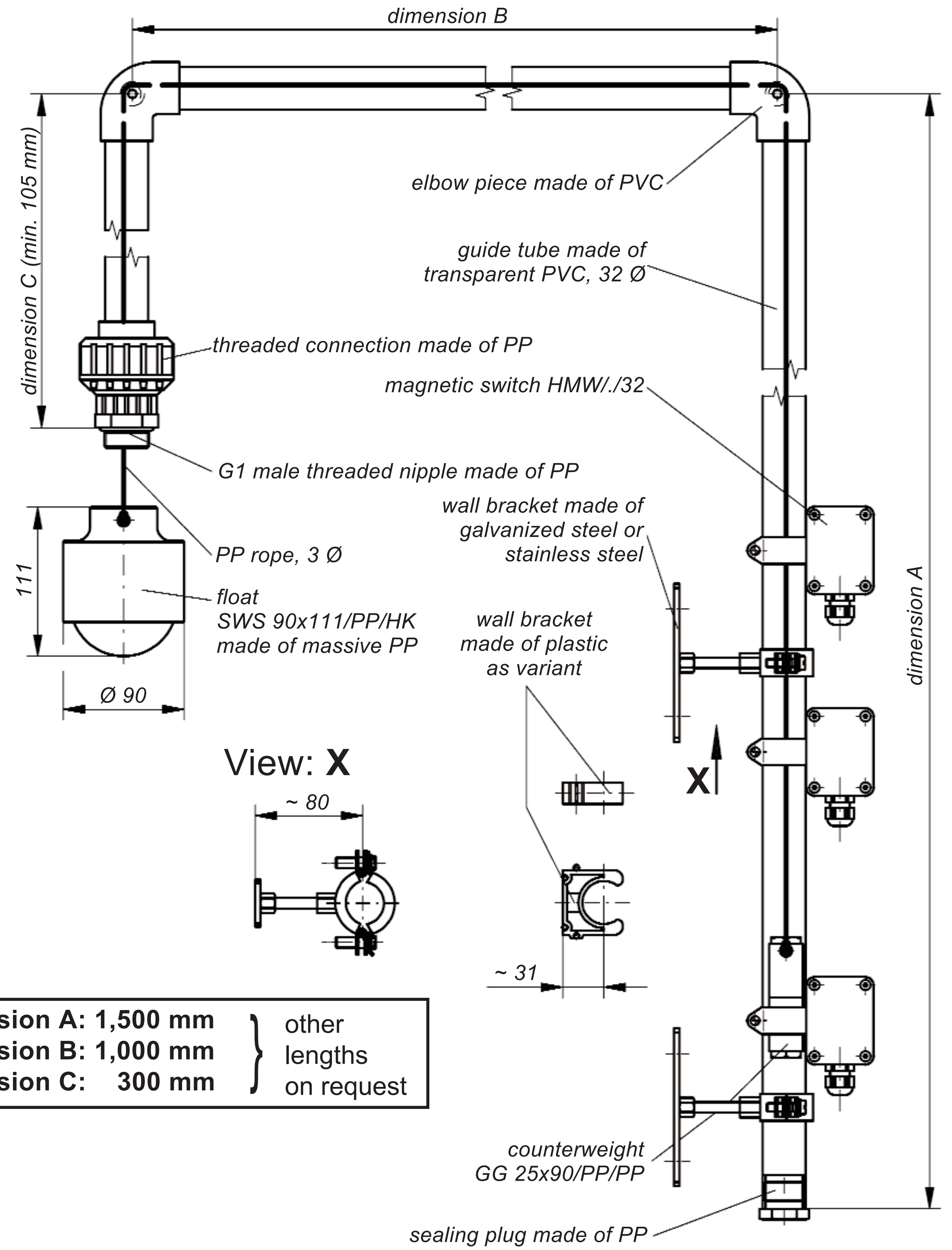
Dimensional drawing ENVM/E



Dimensional drawing ENVM/PP



Dimensional drawing ENVM/PP/PVC



Dimension A:	**1,500 mm**	other lengths on request
Dimension B:	**1,000 mm**	
Dimension C:	**300 mm**	

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Ex level controllers with magnetic switches

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contact@jola-info.de • www.jola-info.de

IRN/HMW/../Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
magnetic switches

Mounting and mode of operation of the Ex magnetic switches

The **IRN/HMW/../Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb** magnetic switches are accommodated in a housing, which can be fastened to a pipe by means of a tube clamp which is attached to the housing. The housing contains a connection terminal and a microswitch. A magnet is fixed to the lever of the latter. When the Ex magnetic switch is installed and the magnet on the microswitch lever is activated by a magnet moving up and down in the tube, this changes the position of the microswitch lever and an electrical circuit is created.

The Ex magnetic switches have so-called bistable characteristics; i.e. they remain in the switching status caused by the influence of the passing magnet and only switch over when the magnet passes by in the opposite direction.

IRN/HMW/32/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb magnetic switch
attached to a tube made of glas
containing the float SW 25x140/Glas

IRN/HMW/../Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
magnetic switches

These units are not suitable for use on vibrating machines or in places at risk from shock or vibration.

Technical data	**IRN/HMW/../Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb**
Application	for use in intrinsically safe circuits in potentially explosive atmospheres in categories zone 1 and zone 2. Version for use in mines susceptible to firedamp on request. EC type examination certificate INERIS 03ATEX0164
Operating principle	magnetically activated **bistable** microswitch, potential-free changeover contact
Housing	antistatic (conductive) PP, approx. 65 x 50 x 35 mm
Protection class	IP65
Pipe clip material and pipe clip diameter (supplement of the type designation)	• 28 = with stainless steel pipe clip, for a tube with an outer Ø of 28 mm • 32 = with stainless steel pipe clip, for a tube with an outer Ø of 30-32 mm • 40 = with stainless steel pipe clip, for a tube with an outer Ø of 35-40 mm • 60 = with stainless steel pipe clip, for a tube with an outer Ø of 50-70 mm
Mounting orientation	vertical (cable entry must point downwards)
Temperature range	+ 1°C to + 60°C
VDE-mark licence	VDE EMC

Mounting instructions for Ex magnetic switches

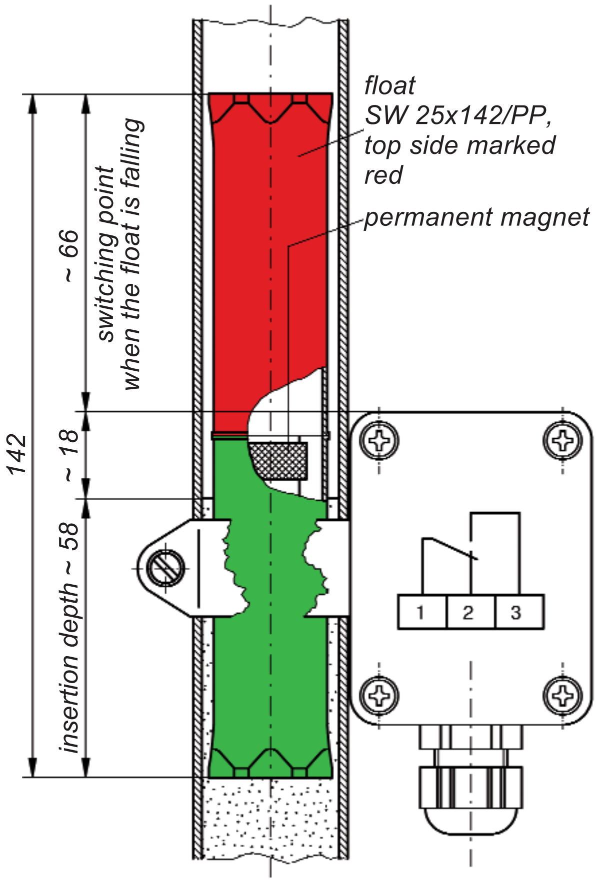
To avoid damage to the pipe clip of the IRN/HMW/../Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb magnetic switch, it is important that you open the clip carefully, never abruptly, and never using force.

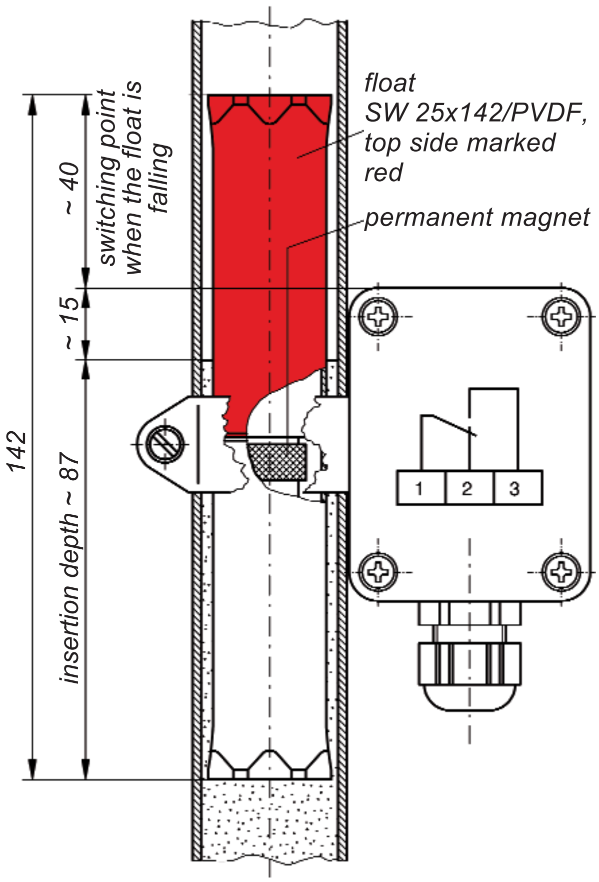
We recommend that the pipe clip ends should only be opened just enough to accommodate the pipe diameter in question.

The best way to mount the clip is to lightly press the slightly opened pipe clip ends against the pipe.

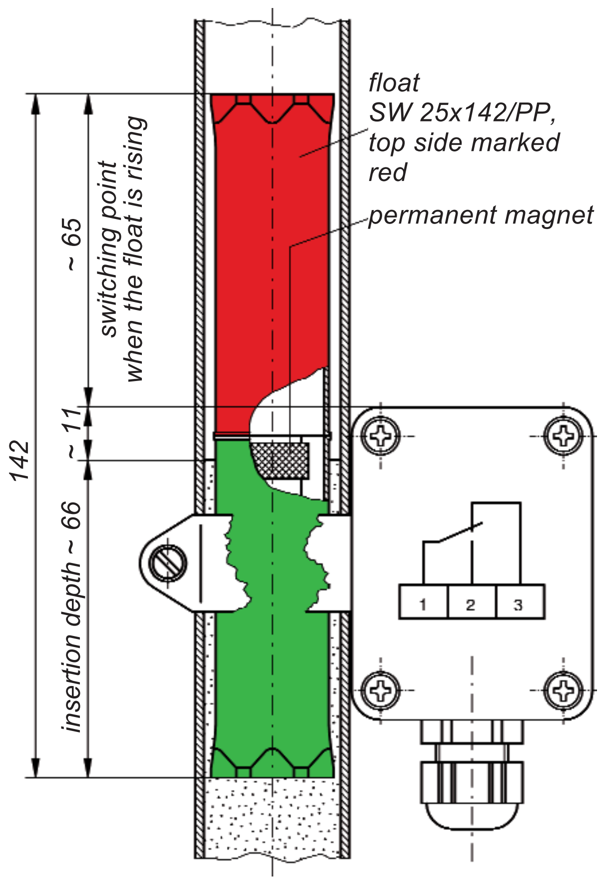
Functional diagrams: Representation of the switching point and the switching position when the float has moved past the Ex magnetic switch

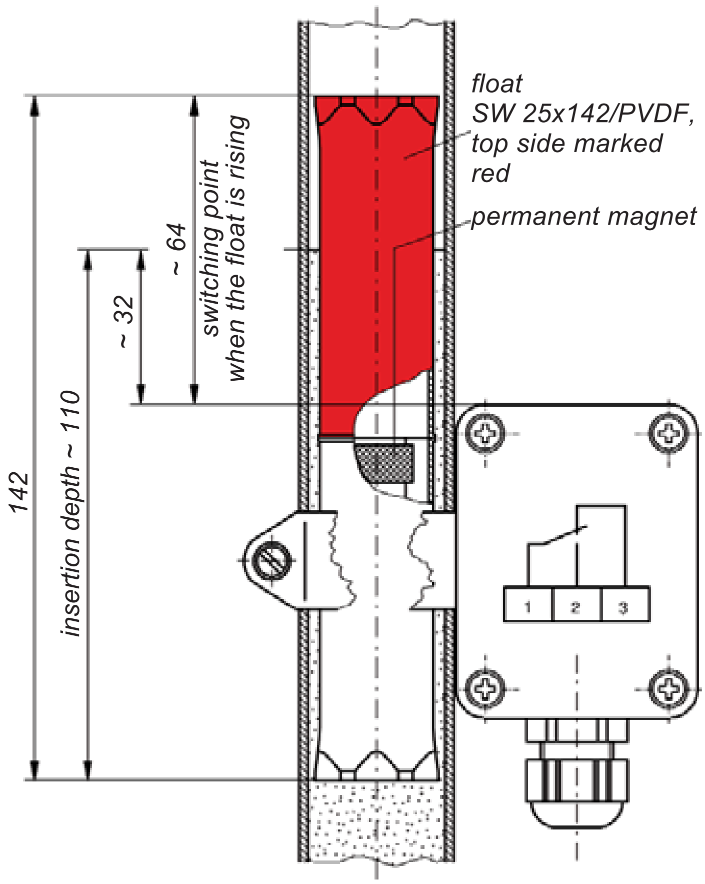
from "top" to "bottom"





from "bottom" to "top"

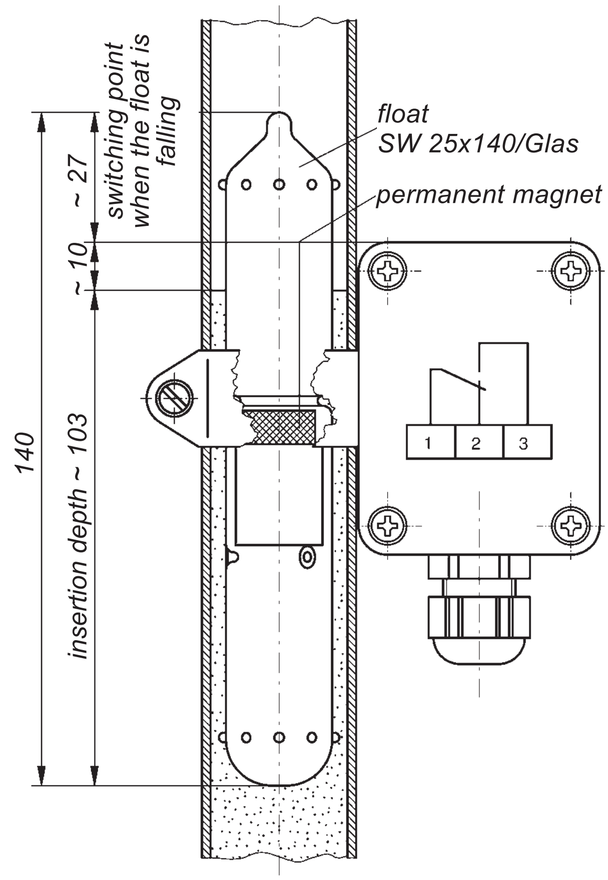




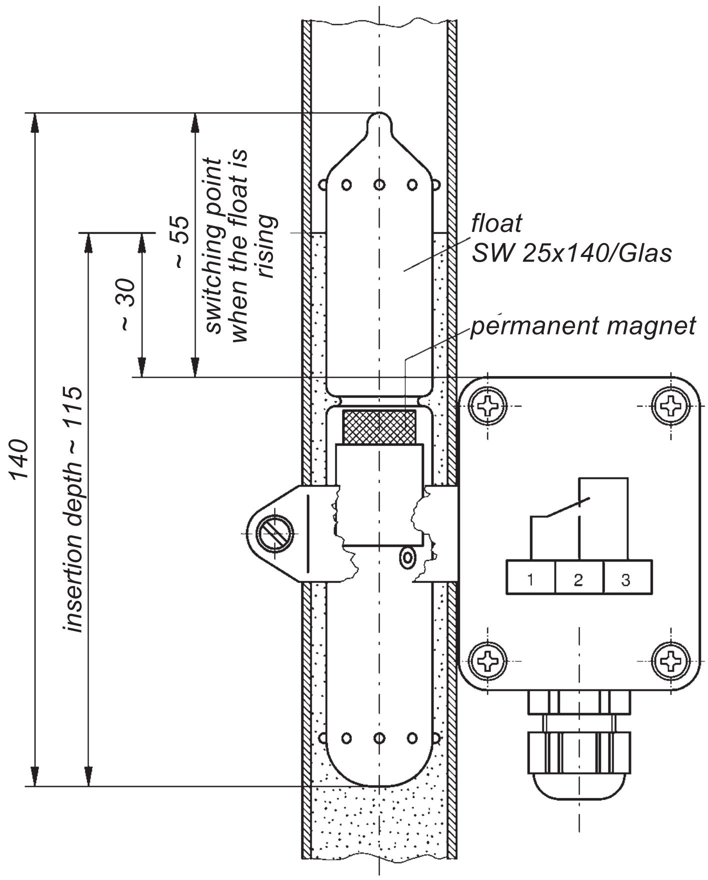
Dimensions when the float is used in liquids with a specific gravity of 1 g/cm³

Functional diagrams: Representation of the switching point and the switching position when the float has moved past the Ex magnetic switch

from “top” to “bottom”



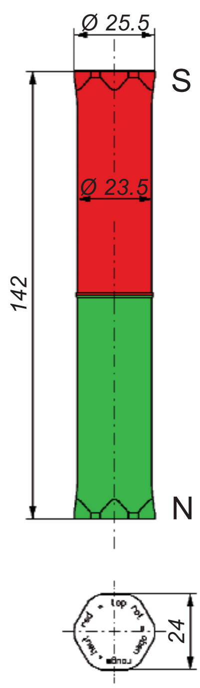
from “bottom” to “top”



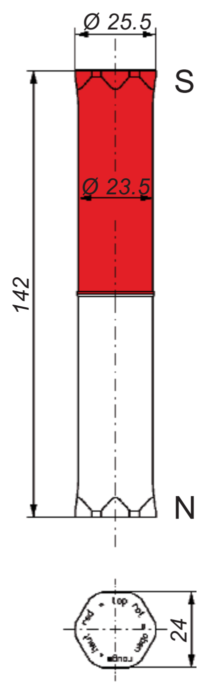
Dimensions when the float is used in liquids with a specific gravity of 1 g/cm³

Accessories

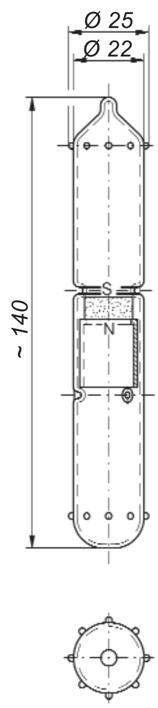
SW 25x142/PP
(small PP float
with built-in magnet)



SW 25x142/PVDF
(small PVDF float
with built-in magnet)



SW 25x140/Glas
(small glas float
with built-in magnet)



These floats are suitable for installation in the potentially explosive atmospheres zone 1 and zone 2 with gaz groups IIA and IIB.

IRN/NEM/.../Ex-0G
Ⓔx II 1/2 G c IIC ΔT=0
level controllers

Ex controlling devices with magnetic switches, for signalling or regulation of liquid levels

Mounting and mode of operation

The IRN/NEM/.../Ex-0G Ⓔx II 1/2 G c IIC ΔT=0 level controllers are fitted with a float and a float rod to which a magnet is attached to the opposite end from the float.

The float follows the level of the liquid and moves the float rod inserted through the screw-in threaded nipple of the unit up or down. Above the nipple a guide tube is attached for the float rod and the magnet, and adjustable IRN/HMW/28/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb magnetic switches are mounted on the outside of the tube. These magnetic switches have so-called bistable characteristics; i.e. they remain in the switching status caused by the influence of the passing magnet and only switch over when the magnet passes by in the opposite direction.

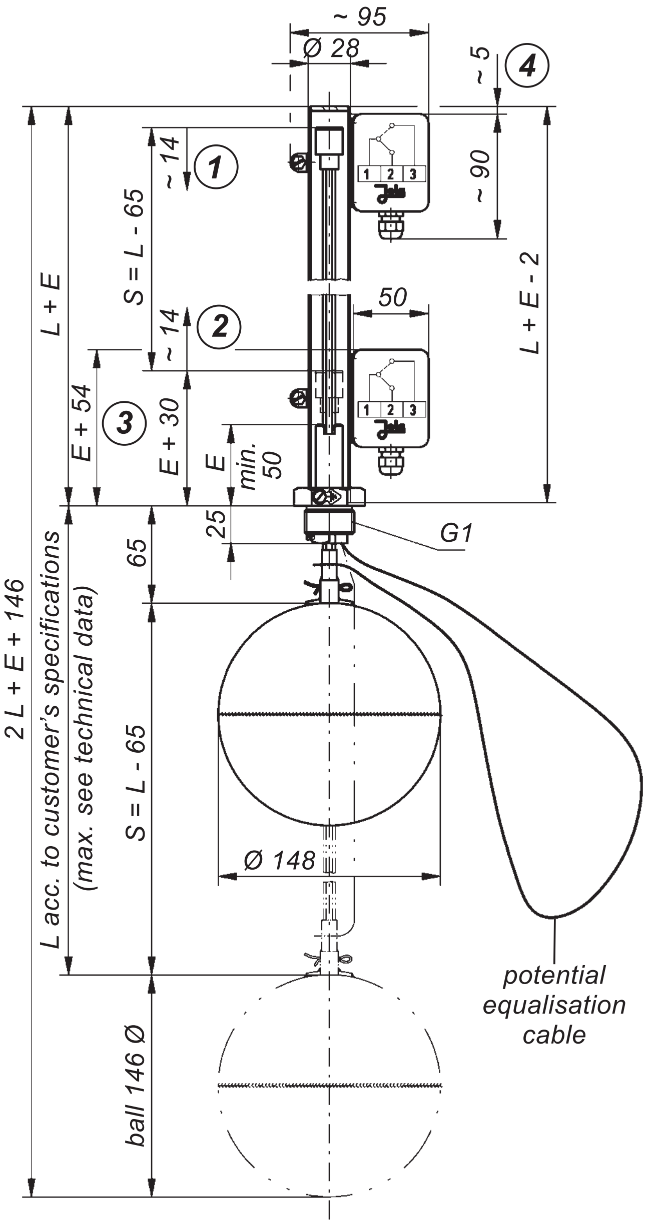
IRN/NEM/148/Ex-0G
with 2 magnetic switches
IRN/HMW/28/Ex-1G

These units are not suitable for use in turbulent liquids (e.g. in stirrer tanks) nor for use on vibrating machines or in places at risk from shock or vibration.

IRN/NEM/.../Ex-0G
⟨Ex⟩ II 1/2 G c IIC ΔT=0
level controllers

Technical data	**IRN/NEM/148/...**	**IRN/NEM/180/...**	**IRN/NEM/200/...**
Application	for use in intrinsically safe circuits in potentially explosive atmospheres • float and float rod: in categories zone 0, 1 or 2, • guide tube fitted with magnetic switches IRN/HMW/28/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb: in categories zone 1 or 2. Version for use in mines susceptible to firedamp on request. EC type examination certificate INERIS 03ATEX0164		
Float material	stainless steel 316 Ti		
Float dimensions	148 mm Ø	180 mm Ø	200 mm Ø
Float rod diameter	6 mm		
Float rod material	stainless steel 316 Ti		
Float rod length	as required, **measured from the nipple sealing surface and without float (dimension L, see page 4-2-7)**		
Max. length of the float rod in liquids with a specific gravity of 1 g/cm³ (dimension L)	1,200 mm, max. lengths with other specific gravities on request		
Magnet capsule material	antistatic (conductive) PP		
Screw-in nipple	stainless steel 316 Ti, G1		
Option: installation flange for mounting of the unit from the outside	on request		
Float rod guiding piece material	stainless steel 316 Ti		
Guide tube	stainless steel 316 Ti, 28 mm Ø x the height based on the float rod length (see page 4-2-7)		
Mounted Ex magnetic switches	IRN/HMW/28/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb (see page 4-2-1 and following)		
Max. number of Ex magnetic switches	as required and according to the guide tube length		
Mounting orientation	vertical		
Temperature range	+ 1°C to + 60°C		
Pressure resistance	for pressureless application		

Functional diagram: IRN/NEM/148/Ex-0G ⟨Ex⟩ II 1/2 G c IIC ΔT=0 level controller with 2 magnetic switches IRN/HMW/28/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb



1 *return switching when magnet is falling*
2 *return switching when magnet is rising*
3 *min. switching point when magnet is falling*
4 *max. switching point when magnet is rising*

The mounting, operating and maintenance instructions joined with each delivered apparatus must be read and followed out.

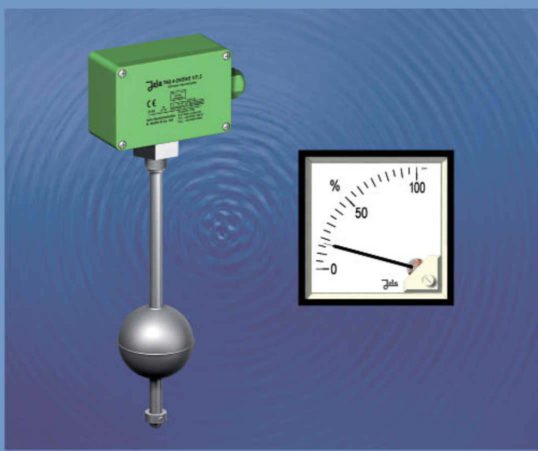
The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Continuous level measurement TSQ and TSK

using the float method



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Continuous level measurement

Contents **Pages**

TSQ 4-20/... level indicator

Consisting of

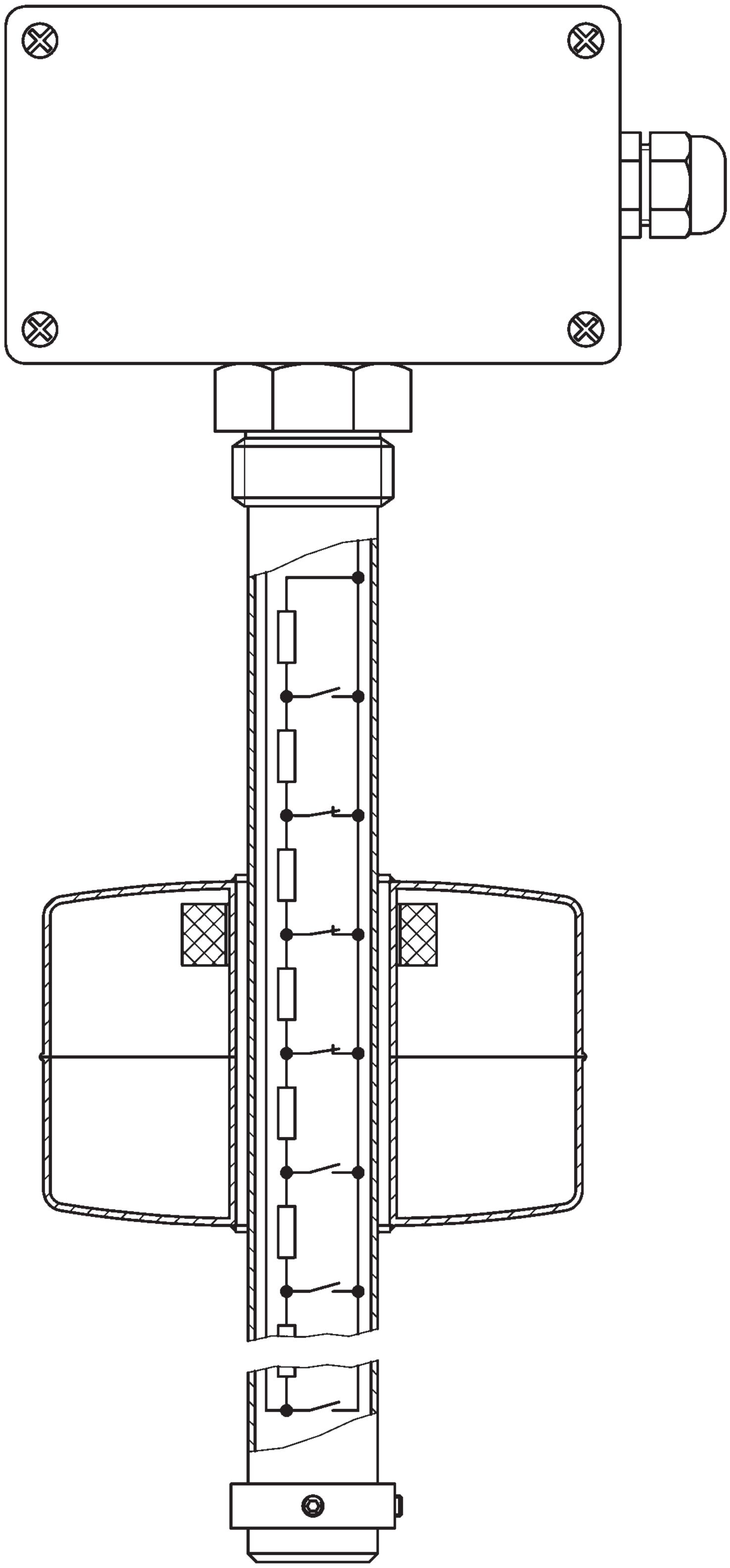
- **sensor:**
  Switchable resistances activated by float via reed contacts
- **transmitter:**
  A 2-wire module in the terminal box of the level indicator converts the resistance values into a load-independent current signal 4 ... 20 mA.

Working principle

A float with built-in permanent magnet moves up and down with the liquid level on the probe tube of the TSQ 4-20/... level indicator.

Inside the probe tube, there is a chain made up of reed contacts and series-connected resistors. The magnet in the float switches the reed contact(s) which are at the same position as the float. This results in a quasi-continuous height-proportional resistance measurement.

The change in resistance resulting from the upward and downward motion of the float is recorded via a current loop transmitter in the terminal box of the TSQ 4-20/... level indicator and is converted into a load-independent current 4 ... 20 mA.



Area of application

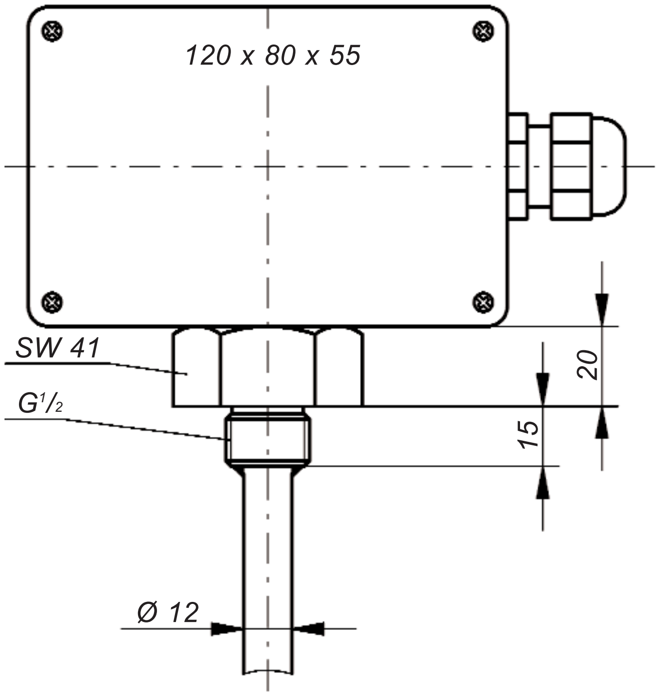
The TSQ 4-20/... level indicator is designed for use in low-viscosity liquids or liquids with only low solid content in open or closed tanks. It is not suitable for use in liquids that are prone to deposit formation, adhesion or crystallisation which might hinder the movement of the float on the probe tube. It is also not suitable for use in liquids with **permanently** moving surface and/or on vibrating machines.

Following types are available:

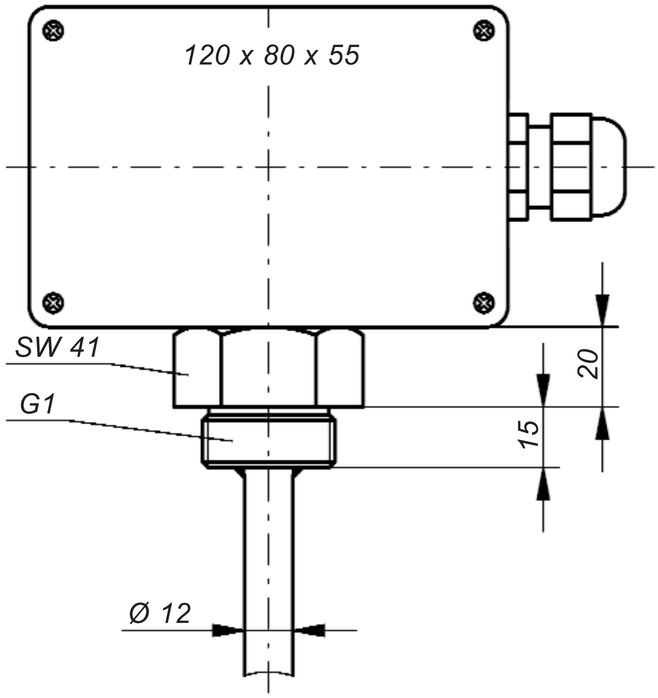
Types	Distance between 2 reed contacts						Max. length of probe tube	
	3.75	7.5	15	22.5	30	37.5		
TSQ 4-20/ED/P/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/ED/PK/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/ED/E8/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/ED/E2/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/ED/E7/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/ED/E5/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/EW/E5/...	●	●	—	—	—	—	1,500 mm	
TSQ 4-20/EW/E9/...	—	—	●	●	●	●	4,000 mm	
TSQ 4-20/P/P/...	—	●	—	—	—	—	750 mm	
TSQ 4-20/P/PG/...	—	●	—	—	—	—	1,500 mm	
TSQ 4-20/PVDF/D/...	—	●	—	—	—	—	750 mm	
TSQ 4-20/PVDF/W/...	—	●	—	—	—	—	1,500 mm	

	Probe tube		Float		Page
	Material	Ext. Ø	Material	Dimensions	
	stainless steel 316 Ti	12 mm	PP	53 mm Ø x 50 mm	5-1-5
	stainless steel 316 Ti	12 mm	PP	29 mm Ø x 50 mm	5-1-5
	stainless steel 316 Ti	12 mm	stainless steel 316 Ti	72 mm Ø	5-1-7
	stainless steel 316 Ti	12 mm	stainless steel 316 Ti	44.5 mm Ø x 52 mm	5-1-7
	stainless steel 316 Ti	12 mm	stainless steel 316 Ti	52 mm Ø x 88 mm	5-1-9
	stainless steel 316 Ti	12 mm	stainless steel 316 Ti	98 mm Ø	5-1-9
	stainless steel 316 Ti	20 mm	stainless steel 316 Ti	98 mm Ø	5-1-11
	stainless steel 316 Ti	20 mm	stainless steel 316 Ti	97 mm Ø x 100 mm	5-1-11
	PP	14 mm	PP	53 mm Ø x 50 mm	5-1-13
	PP	16 mm	PP	89 mm Ø x 60 mm	5-1-13
	PVDF	14 mm	PVDF	53 mm Ø x 50 mm	5-1-15
	PVDF	16 mm	PVDF	89 mm Ø x 60 mm	5-1-15

Technical data	TSQ 4-20/ED/P/7.5	TSQ 4-20/ED/PK/7.5
Level indicator part 1	**Sensor**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	12 mm	
• length	according to customer's specification taking into account the max. length of the probe tube	
• max. length	1,500 mm	
Screw-in nipple	G½, on request G1, G1½ or G2;	G1, on request G½, G1½ or G2;
	on request with reducing nipple made of cast iron R1½ or R2 conical	
Float	PP, 53 mm Ø x 50 mm (mounting through a R2 or G2 socket possible)	PP, 29 mm Ø x 50 mm (mounting through a G1 socket possible)
Float suitable for use in liquids with a specific gravity	≥ 0.8 g/cm³	≥ 0.85 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range	– 20°C to + 80°C	
Pressure resistance at + 20°C	max. 2 bar	
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	distance between 2 reed contacts: 7.5 mm, therefore, additional type designation: 7.5	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	

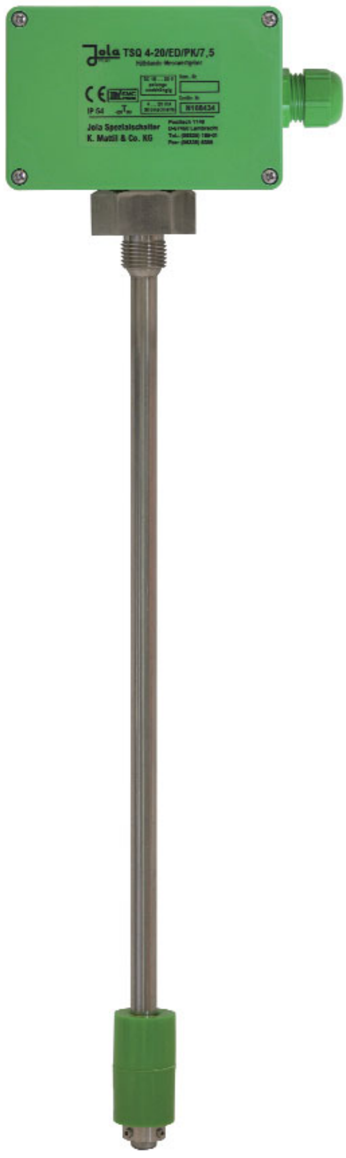


TSQ 4-20/ED/P/7.5



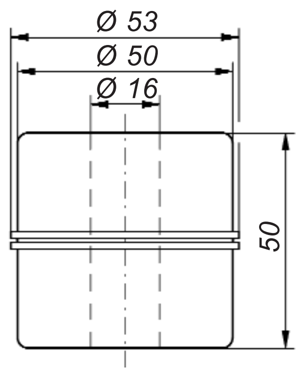
TSQ 4-20/ED/PK/7.5

TSQ 4-20/ED/P/7.5

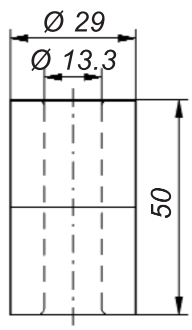


TSQ 4-20/ED/PK/7.5
with G1/2 screw-in nipple

Float for TSQ 4-20/ED/P/7.5

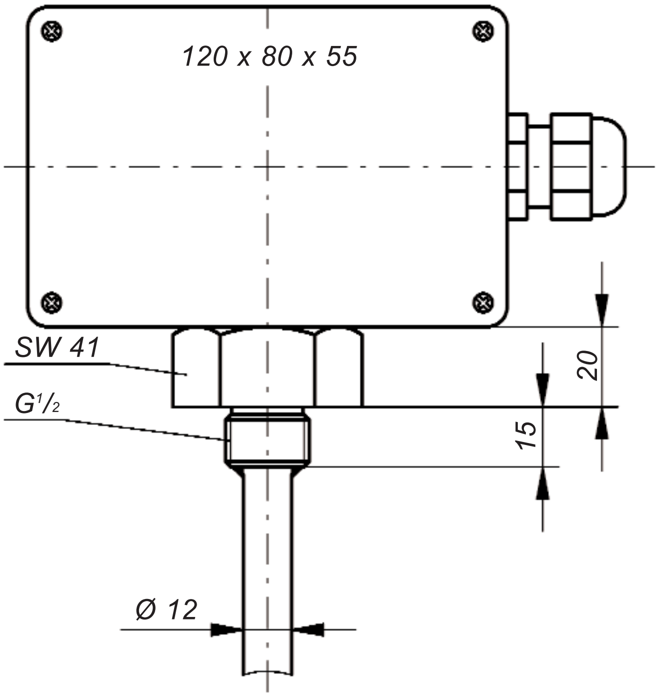


Float for TSQ 4-20/ED/PK/7.5



Mounting accessories:
Square flange made of stainless steel 316 Ti, PP or PVDF for level indicator with G1 screw-in nipple. Counter flange on request.

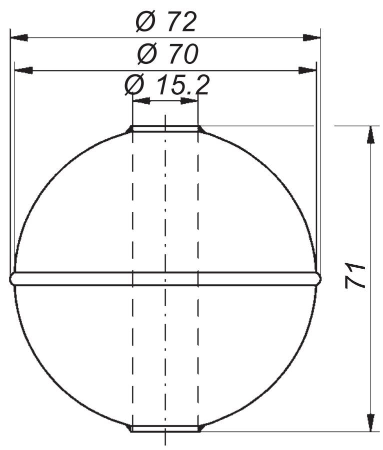
Technical data	TSQ 4-20/ED/E8/7.5	TSQ 4-20/ED/E2/7.5
Level indicator part 1	**Sensor**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	12 mm	
• length	according to customer's specification taking into account the max. length of the probe tube	
• max. length	1,500 mm	
Screw-in nipple	G½, on request G1, G1½ or G2; on request with reducing nipple made of cast iron R1½ or R2 conical	
Float	stainless steel 316 Ti, 72 mm Ø	stainless steel 316 Ti, 44.5 mm Ø x 52 mm (mounting through a R1½ or G1½ socket possible)
Float suitable for use in liquids with a specific gravity	≥ 0.7 g/cm³	≥ 0.95 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range	– 20°C to + 80°C	
Pressure resistance at + 20°C	max. 12 bar	
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	distance between 2 reed contacts: 7.5 mm, therefore, additional type designation: 7.5	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



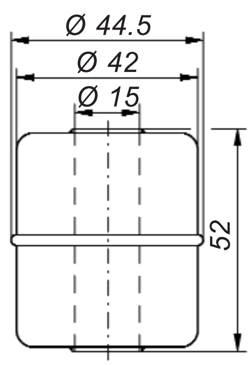
TSQ 4-20/ED/E8/7.5

TSQ 4-20/ED/E2/7.5

Float for TSQ 4-20/ED/E8/7.5

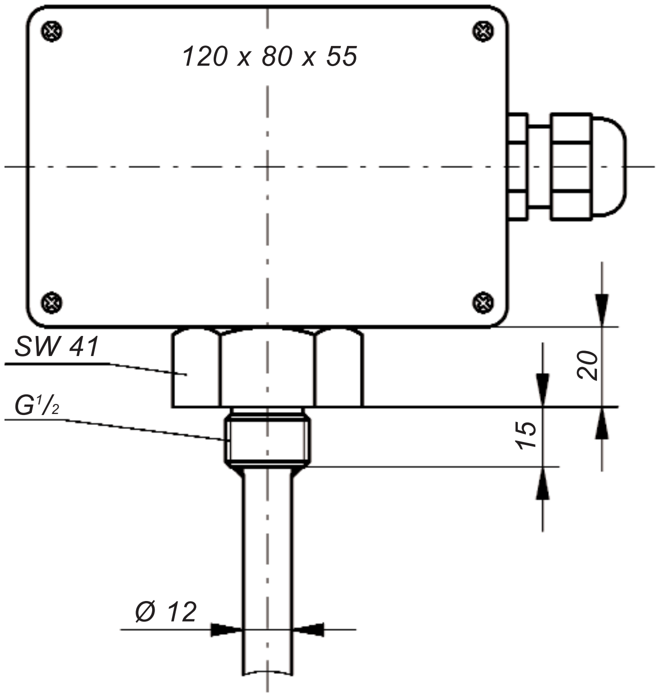


Float for TSQ 4-20/ED/E2/7.5



Mounting accessories:
Square flange made of stainless steel 316 Ti, PP or PVDF for level indicator with G1 screw-in nipple. Counter flange on request.

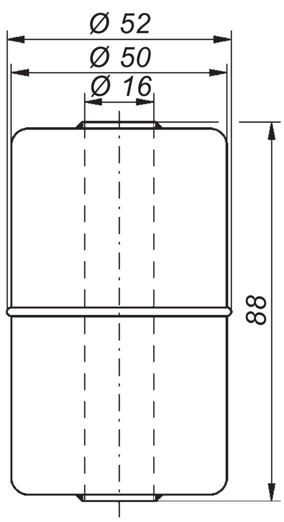
Technical data	TSQ 4-20/ED/E7/7,5	TSQ 4-20/ED/E5/7,5
Level indicator part 1	**Sensor**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	12 mm	
• length	according to customer's specification taking into account the max. length of the probe tube	
• max. length	1,500 mm	
Screw-in nipple	G½, on request G1, G1½ or G2; on request with reducing nipple made of cast iron R1½ or R2 conical	
Float	stainless steel 316 Ti, 52 mm Ø x 88 mm (mounting through a R2 or G2 socket possible)	stainless steel 316 Ti, 98 mm Ø
Float suitable for use in liquids with a specific gravity	≥ 0.7 g/cm³	
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range	– 20°C to + 80°C	
Pressure resistance at + 20°C	max. 12 bar	
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	distance between 2 reed contacts: 7.5 mm, therefore, additional type designation: 7.5	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



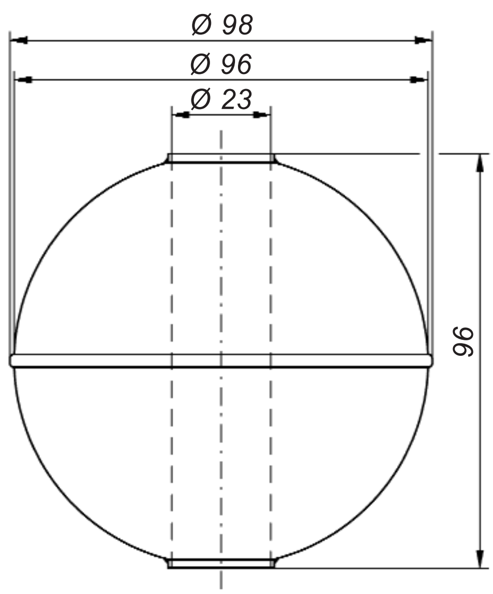
TSQ 4-20/ED/E7/7.5

TSQ 4-20/ED/E5/7.5

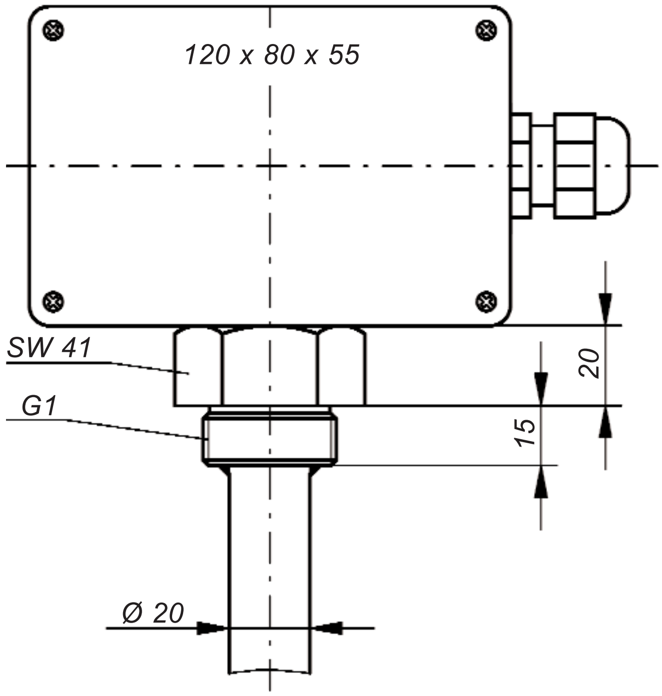
Float for TSQ 4-20/ED/E7/7.5



Float for TSQ 4-20/ED/E5/7.5



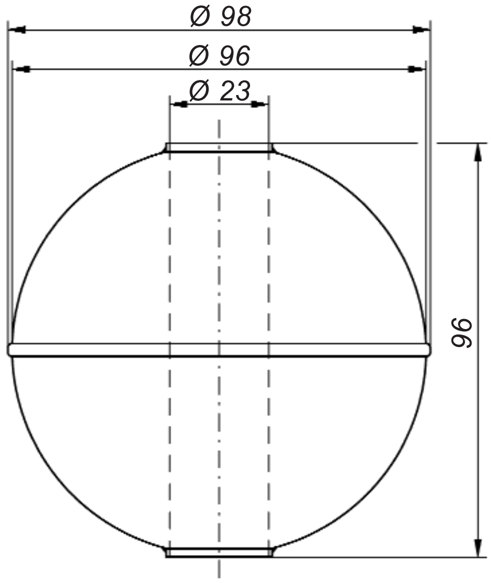
Technical data	TSQ 4-20/EW/E5/...	TSQ 4-20/EW/E9/...
Level indicator part 1	**Sensor**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	12 mm	
• length	according to customer's specification taking into account the max. length of the probe tube	
• max. length	1,500 mm	4,000 mm
Screw-in nipple	G1, on request G1½ or G2; on request with reducing nipple made of cast iron R1½ or R2 conical	
Float	stainless steel 316 Ti, 98 mm Ø	stainless steel 316 Ti, 97 mm Ø x 100 mm
Float suitable for use in liquids with a specific gravity	≥ 0.7 g/cm³	≥ 0.8 g/cm³
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range	– 20°C to + 80°C	
Pressure resistance at + 20°C	max. 12 bar	max. 8 bar
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	to be specified **...** mm distance between 2 reed contacts (additional type designation):	
	3.75 7.5	15 22.5 30 37.5
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



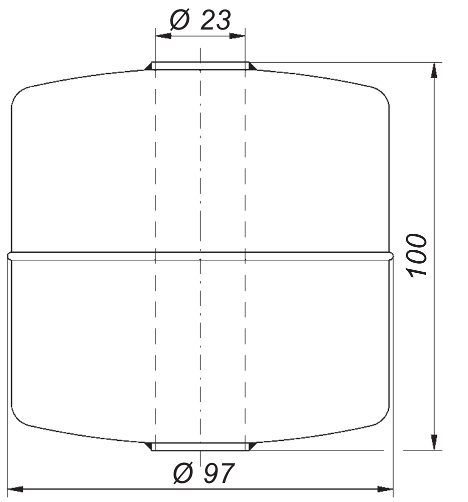
TSQ 4-20/EW/E5/7.5

TSQ 4-20/EW/E9/15

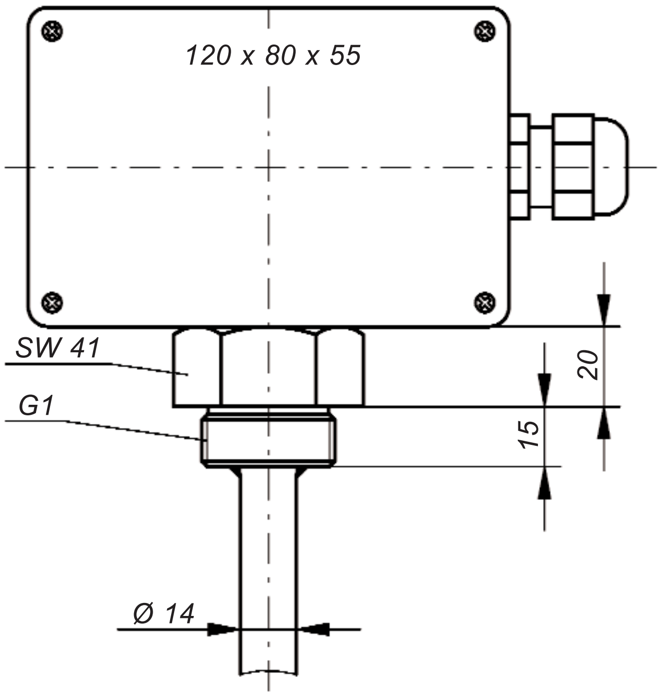
Float for TSQ 4-20/EW/E5/...



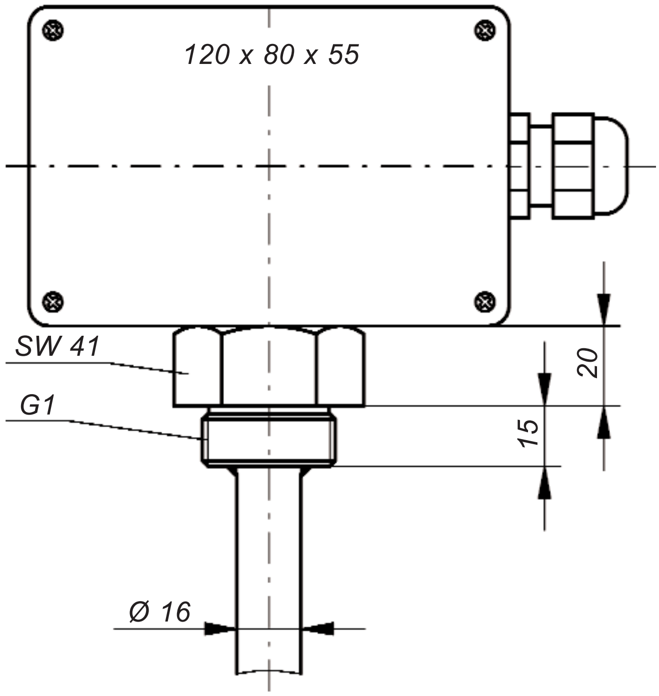
Float for TSQ 4-20/EW/E9/...



Technical data	TSQ 4-20/P/P/7.5	TSQ 4-20/P/PG/7.5
Level indicator part 1	**Sensor**	
Probe tube: • material	PP	
• diameter	14 mm	16 mm
• length	according to customer's specification taking into account the max. temperature in the tank and the max. length of the probe tube (see below)	
• max. length	750 mm	1,500 mm
Screw-in nipple	G1, on request G2; on request with reducing nipple made of PP G2	
Float	PP, 53 mm Ø x 50 mm (mounting through a G2 socket possible)	PP, 89 mm Ø x 60 mm
Float suitable for use in liquids with a specific gravity	≥ 0.8 g/cm³	
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range taking into account the probe tube length:		
• up to max. 1,500 mm	—	0°C to + 40°C
• up to max. 1,000 mm	—	0°C to + 50°C
• up to max. 750 mm	0°C to + 60°C	0°C to + 60°C
• up to max. 500 mm	0°C to + 75°C	0°C to + 75°C
• up to max. 400 mm	0°C to + 80°C	0°C to + 80°C
Pressure resistance at + 20°C	max. 2 bar	
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	distance between 2 reed contacts: 7.5 mm, therefore, the additional type designation: 7.5	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



TSQ 4-20/P/P/7.5

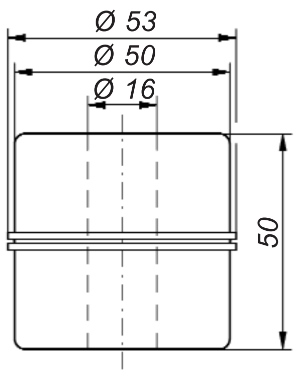


TSQ 4-20/P/PG/7.5

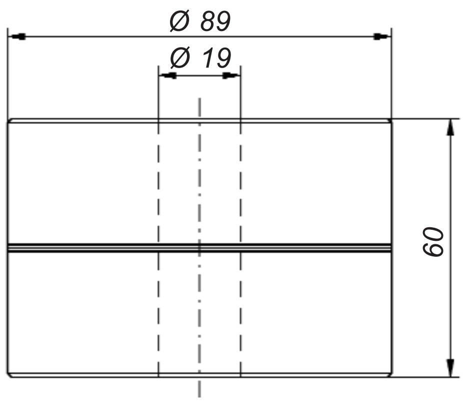
TSQ 4-20/P/P/7.5

TSQ 4-20/P/PG/7.5

Float for TSQ 4-20/P/P/7.5

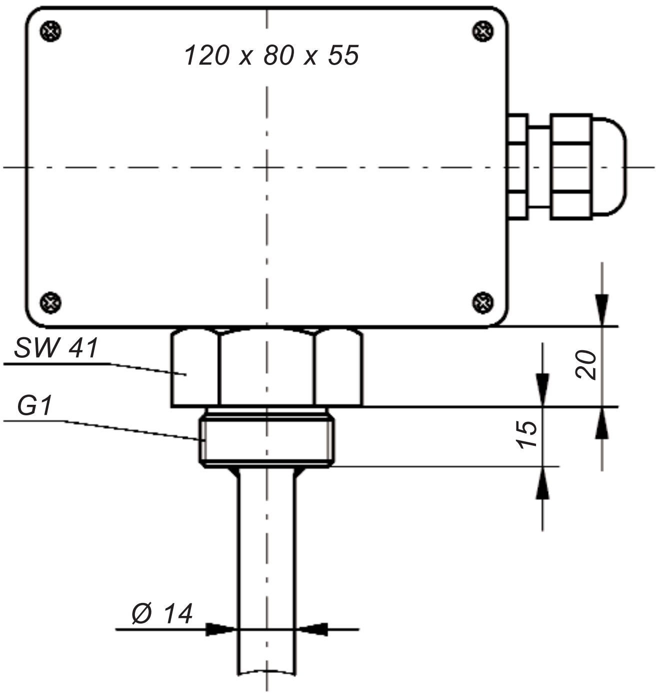


Float for TSQ 4-20/P/PG/7.5

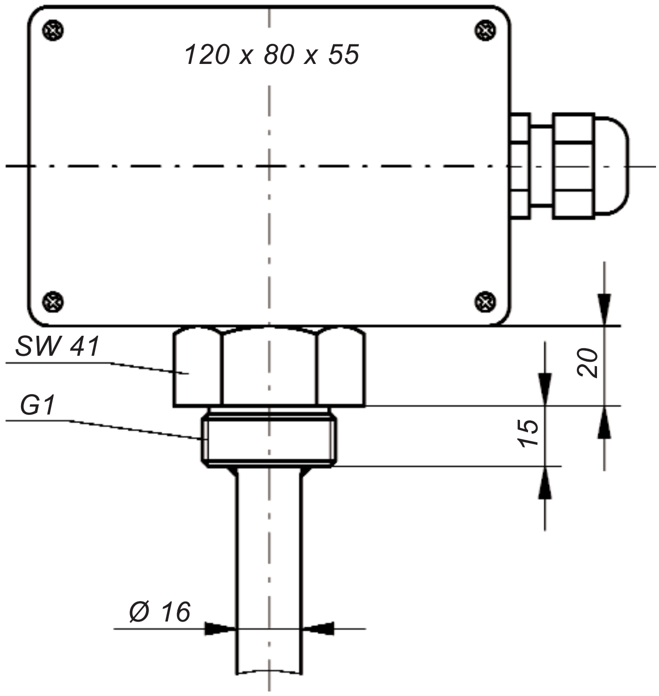


Mounting accessories:
Square flange made of PP
for level indicator with G1 screw-in
nipple. Counter flange on request.

Technical data	TSQ 4-20/PVDF/D/7.5	TSQ 4-20/PVDF/W/7.5
Level indicator part 1	**Sensor**	
Probe tube: • material	PVDF	
• diameter	14 mm	16 mm
• length	according to customer's specification taking into account the max. temperature in the tank and the max. length of the probe tube (see below)	
• max. length	750 mm	1,500 mm
Screw-in nipple	G1, on request G2	
Float	PVDF, 53 mm Ø x 50 mm (mounting through a G2 socket possible)	PVDF, 89 mm Ø x 60 mm
Float suitable for use in liquids with a specific gravity	≥ 1 g/cm³	
Terminal box	PP, A 307, 120 x 80 x 55 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range taking into account the probe tube length:		
• up to max. 1,500 mm	––	0°C to + 45°C
• up to max. 1,000 mm	––	0°C to + 55°C
• up to max. 750 mm	0°C to + 70°C	0°C to + 70°C
• up to max. 500 mm	0°C to + 80°C	0°C to + 80°C
Pressure resistance at + 20°C	max. 2 bar	
Measuring principle	The magnet of the float activates switchable series-connected resistances via reed contacts. This provides a quasi-continuous height-proportional measuring signal.	
Measuring precision	distance between 2 reed contacts: 7.5 mm, therefore, the additional type designation: 7.5	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



TSQ 4-20/PVDF/D/7.5

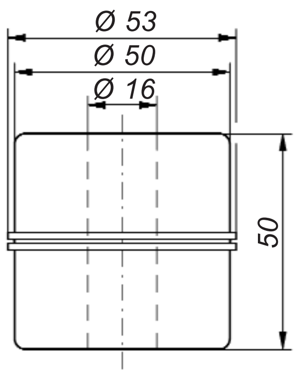


TSQ 4-20/PVDF/W/7.5

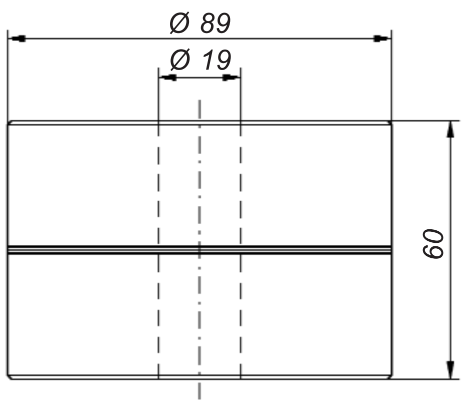
TSQ 4-20/PVDF/D/7.5

TSQ 4-20/PVDF/W/7.5

Float for TSQ 4-20/PVDF/D/7.5

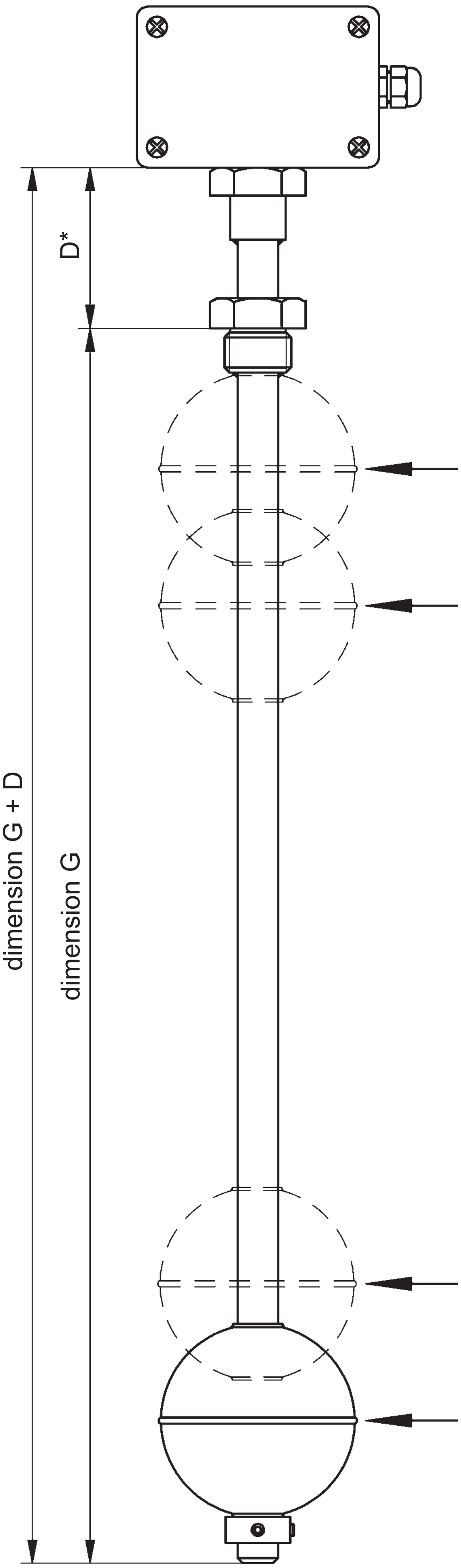


Float for TSQ 4-20/PVDF/W/7.5



Mounting accessories:
Square flange made of PVDF for level indicator with G1 screw-in nipple. Counter flange on request.

Questionnaire for the customised design of the level indicator TSQ 4-20/...
(please cross as applicable)



Signal evaluation

Desired probe tube length (dimension G):

* = Please specify dimension D if explicitly desired, otherwise 20 mm

❑ 100 % set to maximum filling level that can be evaluated

or

❑ 100 % set to desired filling level; the 100 % value is retained if this level is exceeded

or

❑ 100 % set to desired filling level; if exceeded, the value jumps to a higher value, e.g. 120 %, and remains there

or

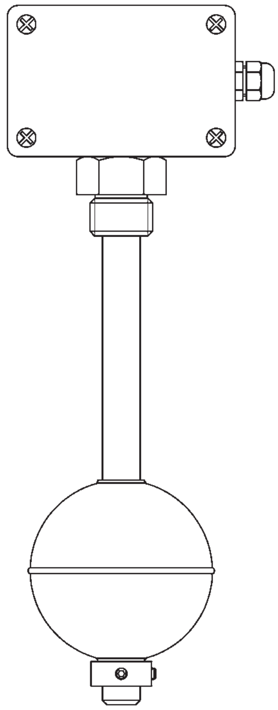
❑ 100 % set to maximum filling level that can be evaluated; adjusted to the desired 100 % filling level via multi-turn trim pot; if this level is exceeded, the signal continuously increases to above 100 %

❑ Measurement begins at 0 % at specified dimension above bottom edge of probe; below this level, the signal remains at 0 %, "negative" filling level is not possible

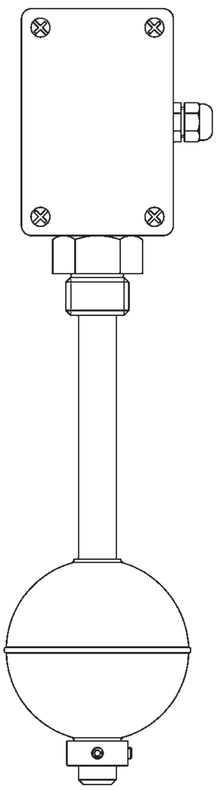
or

❑ Measurement begins at 0 % where filling level from bottom edge of probe = immersion depth of the float

Position of terminal box:



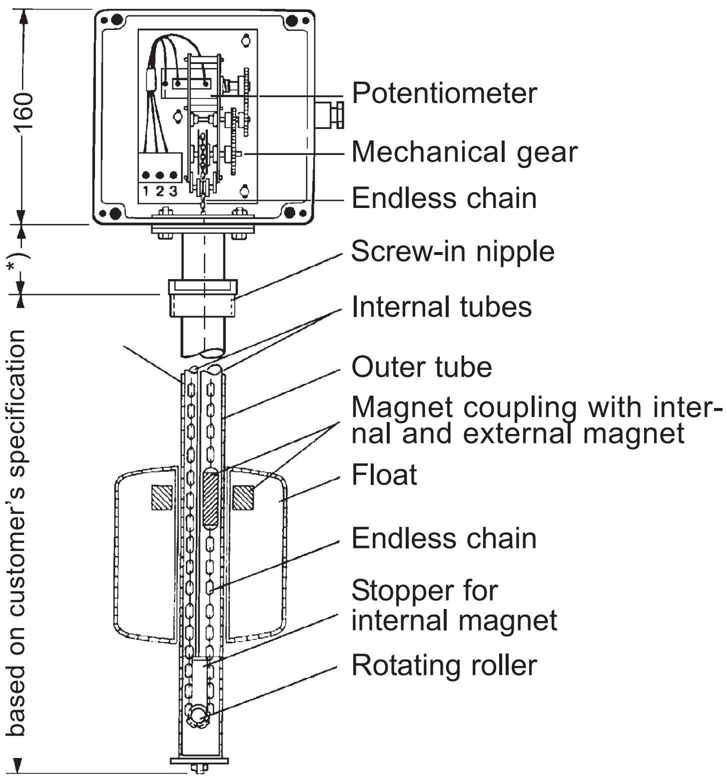
❑ horizontal (standard)



❑ vertical

TSK 4-20/... level indicator

Consisting of
- **sensor:**
  Potentiometer adjusted by float via a transmission chain.
- **transmitter:**
  A 2-wire module in the terminal box of the level indicator converts the potentiometer position into a load-independent current signal 4...20 mA.



*) approx. 60 mm with Type TSK 4-20/E,
approx. 50 mm with Type TSK 4-20/EW,
bigger distance on request

Mode of operation

A float with built-in permanent magnet moves up and down on the probe tube of the TSK 4-20/... level indicator with the liquid level. Inside the probe tube, there is a second magnet integrated in a circulating endless chain inside the bigger of the two guide tubes. The magnet follows the float magnet and therefore the liquid level. This in turn moves the endless chain, which then acts on a potentiometer via a gear in the terminal box of the TSK 4-20/... level indicator. This results in continuous height-proportional resistance measurement.

The change in resistance resulting from the upward and downward motion of the float is recorded via a transmitter in the terminal box of the TSK 4-20/... level indicator and converted into a load-independent current 4 ... 20 mA.

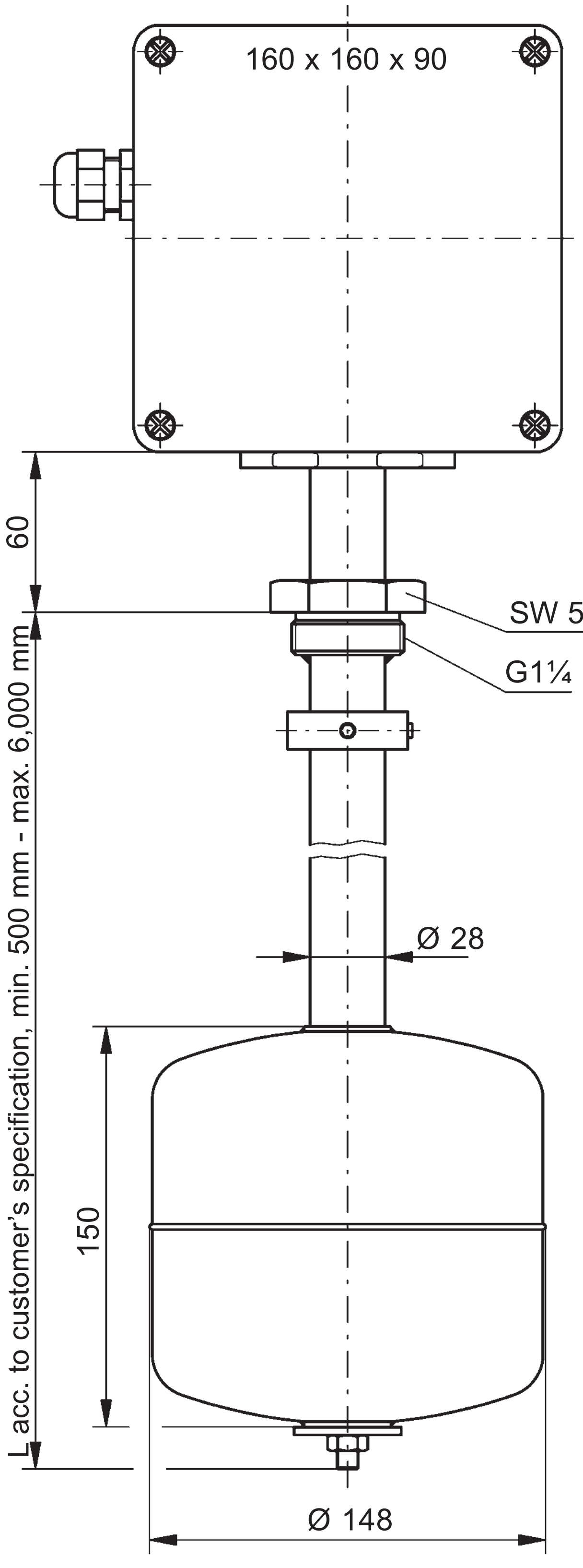
Area of application

The TSK 4-20/... level indicator is designed for use in low-viscosity liquids or liquids with only low solid content in open or closed tanks. It is not suitable for use in liquids that are prone to deposit formation, adhesion or crystallisation which might hinder the movement of the float on the probe tube. It is also not suitable for use in liquids with permanently moving surface and/or on vibrating machines.

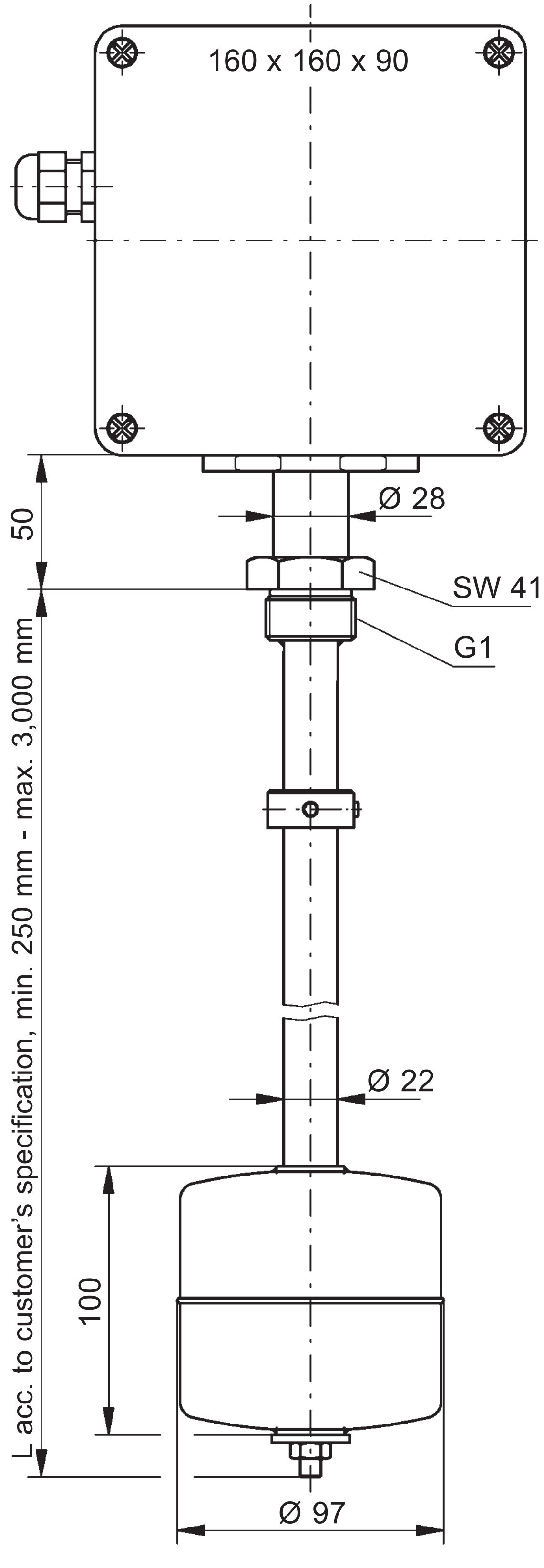
Following types are available

Types	Probe tube		Float		Page
	Material	Ext. Ø	Material	Dimensions	
TSK 4-20/E	Stainless steel 316 Ti	28 mm	Stainless steel 316 Ti	148 mm Ø x 150 mm	5-1-19
TSK 4-20/EW	Stainless steel 316 Ti	22 mm	Stainless steel 316 Ti	97 mm Ø x 100 mm	5-1-19

Technical data	TSK 4-20/E	TSK 4-20/EW
Level indicator part 1	**Sensor**	
Probe tube: • material	stainless steel 316 Ti	
• diameter	28 mm	22 mm
• length	according to customer's specification taking into account the max. length of the probe tube	
• max. length	6,000 mm	3,000 mm
Screw-in nipple	stainless steel 316 Ti, G1¼	stainless steel 316 Ti, G1
Float	stainless steel 316 Ti, 148 mm Ø x 150 mm	stainless steel 316 Ti, 97 mm Ø x 100 mm
Float suitable for use in liquids with a specific gravity	≥ 0.7 g/cm³	≥ 0.8 g/cm³
Terminal box	A 113, glass fibre reinforced polyester, 160 x 160 x 90 mm, protection class IP65	
Mounting orientation	vertical	
Temperature range	0°C to + 100°C (inside the connection head: 0°C to + 60°C), other temperature range on request	
Pressure resistance at + 20°C	max. 10 bar	max. 8 bar
Measuring principle	The magnet of the float leads to a change in resistance via a second magnet, a transmission chain, a gear and a potentiometer. This provides a continuous height-proportional measuring signal.	
Measuring precision	continuous depending on the position of the potentiometer	
Level indicator part 2	**Transmitter**	
Measuring electronics	2 wires (independent of polarity)	
Setting possibility	potentiometer for 0 % = 4 mA and potentiometer for 100 % = 20 mA The 0 % point of the level indicator has to be set to 4 mA, then a fine adjustment is possible at the upper end of the measuring range (100 % = 20 mA).	
Power supply	DC 15 - 30 V (independent of polarity)	
Measuring signal	with rising float: 0 ... 100 % = 4 ... 20 mA When the float has got lost, the measuring signal is at the maximum and corresponds to the measuring signal given when the float has reached the upper end of the measuring range of the level indicator.	
Admissible load in the current loop	max. 200 Ohm at 15 V; max. 900 Ohm at 30 V	
Connecting terminals	for max. 2.5 mm² solid cable or max. 1.5 mm² flexible cable	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	



TSK 4-20/E

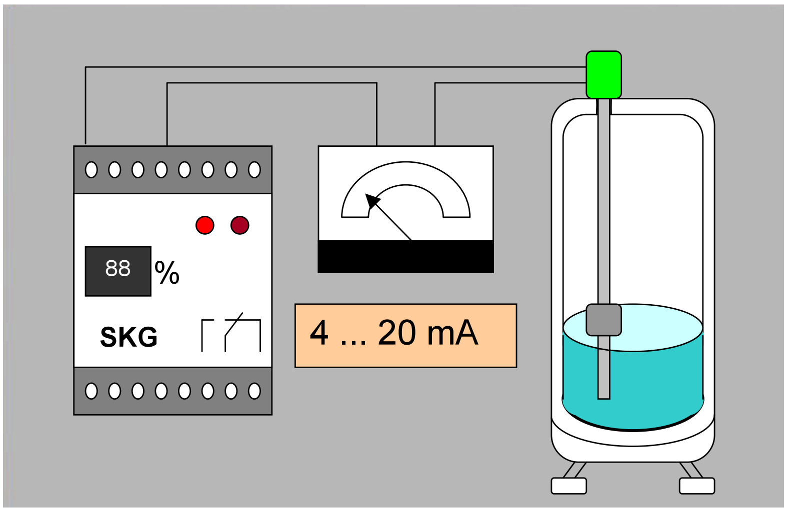


TSK 4-20/EW

SKG 420 switching unit for signalling 1 limit level, with integrated level indicator feed, for analogue current loop signal 4 ... 20 mA

Application example

The SKG 420 switching unit feeds the level indicator in 2-wire design for a current loop signal 4 ... 20 mA. The liquid level-proportional current signal (4 ... 20 mA) of the level indicator can be displayed via an ammeter if desired. The SKG 420 switching unit changes its switching status if the actual value rises above or falls below the set minimum or maximum value.



Switching unit for U-bar or surface mounting, with connection terminals on top, 1 encoder switch and integrated level indicator feed.

This switching unit is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Mode of operation:

The SKG 420 is suitable for feeding a 2-wire level indicator for a current loop signal 4 ... 20 mA. The level indicator is connected to terminals + 24 V and I of the SKG 420.

Additional SKG 420, ZKG 420 or VKG 420-1020 switching units can be integrated in the current loop (terminals I and GND).

The encoder switch can be used to set a limit value in the range from 0 to 99%.

If the input value is below the set limit value, the output relay is energised.

If the input value is above the set limit value, the output relay is not energised (quiescent current principle).

The switching status of the output relay is indicated by LEDs.

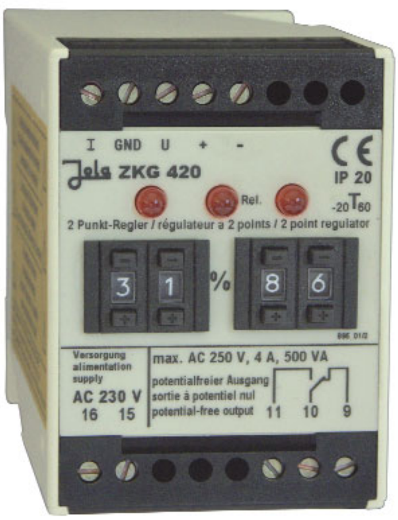
Technical data	SKG 420 for current input 4 ... 20 mA or for voltage input 2 ... 10 V
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or, DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application further supply voltages on request
Power input	approx. 3 VA
Level indicator feed (terminals 4+ and 5–)	DC 24 V, current rating max. 25 mA, short-term short circuit protected
Input signal (terminals 1, 2, 3)	4 ... 20 mA or 2 ... 10 V terminal 1 = I = + input current terminal 2 = GND = – input terminal 3 = U = + input voltage
Input resistance	current input 50 Ω, voltage input 200 kΩ
Switching point setting	via 1 encoder switch in the range from von 0 ... 99 %
Switching status indicators	2 red LED to indicate if the limit value is exceeded or not achieved
Reproducibility	approx. 1 %
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle; working current principle on request The output relay is energised if the input value is lower than the set limit value. The output relay is not energised if the input value is higher than the set limit value.
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and DIN EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

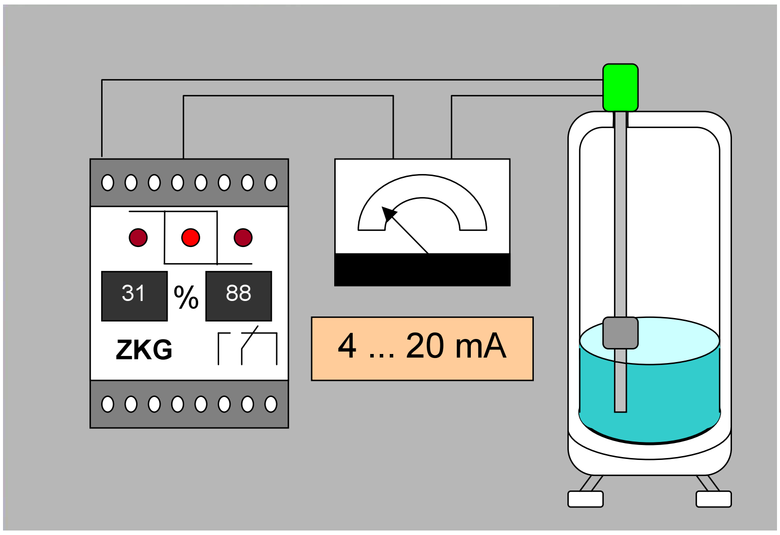
Other versions on request.

ZKG 420 switching unit for level regulation between 2 limit levels, with integrated level indicator feed, for analogue current loop signal 4 ... 20 mA

Application example

The ZKG 420 switching unit feeds the level indicator in 2-wire design for a current loop signal 4 ... 20 mA. The liquid level-proportional current signal (4 ... 20 mA) of the level indicator can be displayed via an ammeter if desired. The ZKG 420 switching unit serves as a two-point control device between two set limit values. One possible application is a level regulation between 2 limit levels for a rainwater tank to secure water reserves by feeding in fresh water.





Switching unit for U-bar or surface mounting, with connection terminals on top, 2 encoder switches and integrated level indicator feed.

This switching unit is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Mode of operation:

The ZKG 420 is suitable for feeding a 2-wire level indicator for a current loop signal 4 ... 20 mA. The level indicator is connected to terminals + 24 V and I of the ZKG 420.

Additional SKG 420, ZKG 420 or VKG 420-1020 switching units can be integrated in the current loop (terminals I and GND).

The 2 encoder switches can be used to set a limit value for the switch-on point as well as a limit value for the switch-off point in the range from 0 to 99% (two-point control).

If the input value is below the set lower limit value, the output relay is energised.

If the input value is above the set top limit value, the output relay is not energised (quiescent current principle).

Values above the two switching points and energisation of the output relay are indicated by three LEDs.

Technical data	ZKG 420 for current input 4 ... 20 mA or for voltage input 2 ... 10 V
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application further supply voltages on request
Power input	approx. 3 VA
Level indicator feed (terminals 4+ and 5–)	DC 24 V, current rating max. 25 mA, short-term short circuit protected
Input signal (terminals 1, 2, 3)	4 ... 20 mA or 2 ... 10 V terminal 1 = I = + input current terminal 2 = GND = – input terminal 3 = U = + input voltage
Input resistance	current input 50 Ω, voltage input 200 kΩ
Switching point setting	per limit value via 1 encoder switch in the range from von 0 ... 99 %
Switching status indicators	left LED: lit when input value is higher than limit value set on the left middle LED: lit when output relay is in self-hold (not energised) right LED: lit when input value is higher than limit value set on right
Level regulation between 2 limit levels	between set lower and upper limit value (both encoding switches can be set either as lower or upper limit value) The difference between lower and upper limit value must be at least 1 %. The input signal must be able to fall below the lower limit value by at least 1 % and exceed the upper limit value by at least 1 %.
Reproducibility	approx. 1 %
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle; working current principle on request The output relay is energised if the input value is lower than the set lower limit value. The output relay is not energised if the input value is higher than the set top limit value.
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and DIN EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

VKG 420-1020 switching unit for comparison of 2 signals, with integrated level indicator feed, for analogue standard signals 0 ... 20 mA, 4 ... 20 mA or 0 ... 10 V, 2 ... 10 V

Switching unit for U-bar or surface mounting, with connection terminals on top, 1 encoder switch and integrated feed of 2 level indicators.

This switching unit is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Mode of operation

The VKG 420-1020 is suitable for feeding two 2-wire level indicators for a current loop signal 4 ... 20 mA. The level indicators are connected to terminals + 24 V and I1 resp. I2 of the VKG 420-1020. Additional SKG 420, ZKG 420 or VKG 420-1020 switching units can be integrated in the current loop (terminals I and GND).

If the input value is a current 0 ... 20 mA or 4 ... 20 mA, the input terminals I and GND are to be used.

If the input value is a voltage 0 ... 10 V or 2 ... 10 V, the input terminals U and GND are to be used.

Two input channels, A and B, are available for comparison of the magnitude of two measuring signals.

Either current or voltage signals can be fed into the two input channels independently of one another.

Both input channels have the same reference ground (GND).

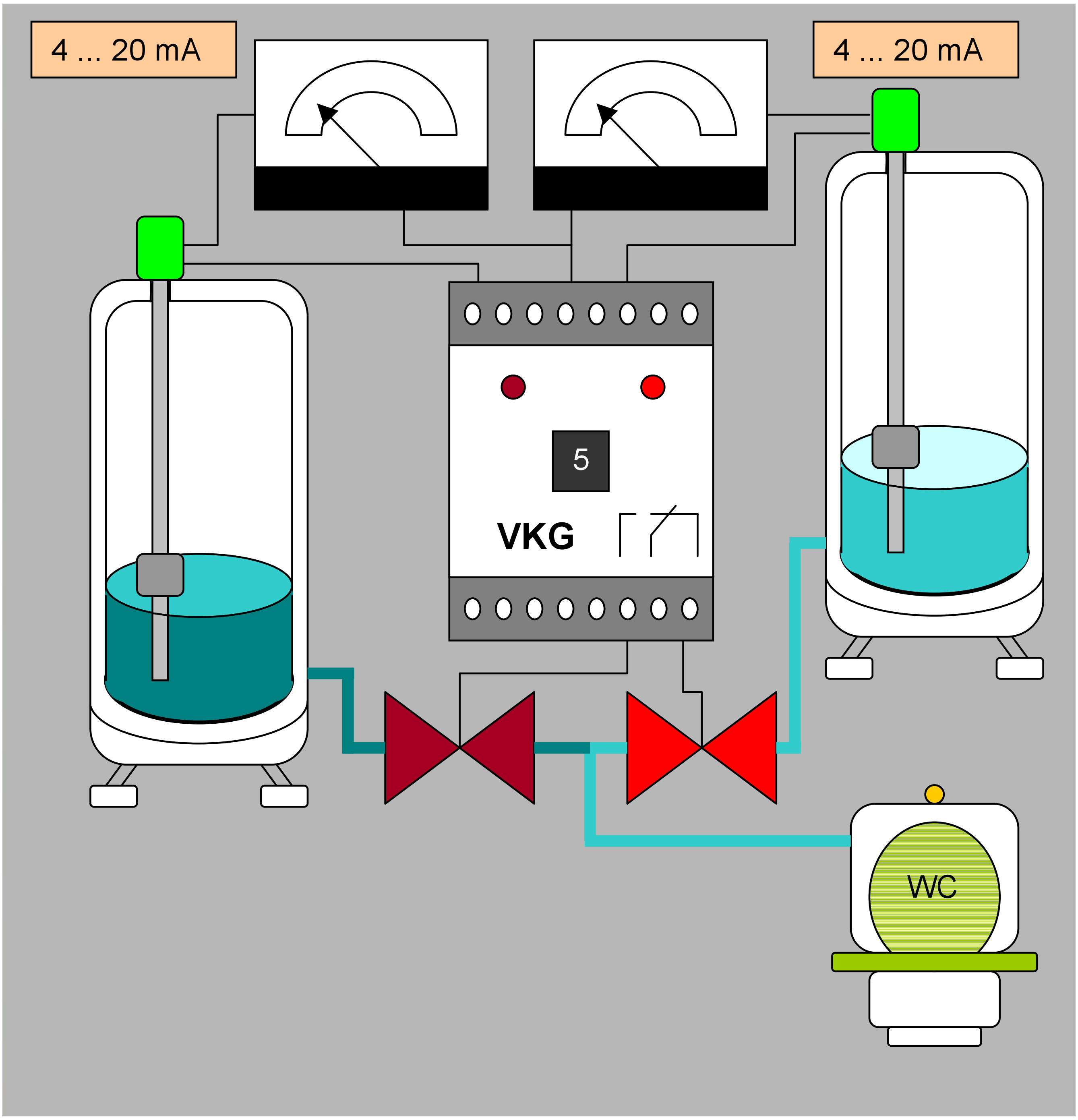
The encoder switch (digits 0 to 9) on the front can be used to adjust the hysteresis from +/– 1% to +/– 10% of the signal range width (0 ... 10 V or 0 ... 20 mA) or from 1.25 % to 12.5 % of the signal range width (2 ... 10 V or 4 ... 20 mA).

If the input value at input channel A is higher than the input value at input channel B, the output relay is energised (A > B) and the left-hand red LED lights up.

If the input value at input channel A is lower than the input value at input channel B, the output relay is not energised (A < B) and the right-hand red LED lights up. In other words, it is always the LED of the channel with the larger input signal that lights up.

Application example

The VKG 420-1020 switching unit feeds 2 level indicators in 2-wire design for a current loop signal 4 ... 20 mA. The filling level-proportional current signals (4 ... 20 mA) of the level indicators can be displayed on 2 ammeters if desired. The VKG 420-1020 switching unit serves to compare two analogue standard signals. One possible application would be the evenly balanced emptying of two rainwater tanks with at the beginning different levels.



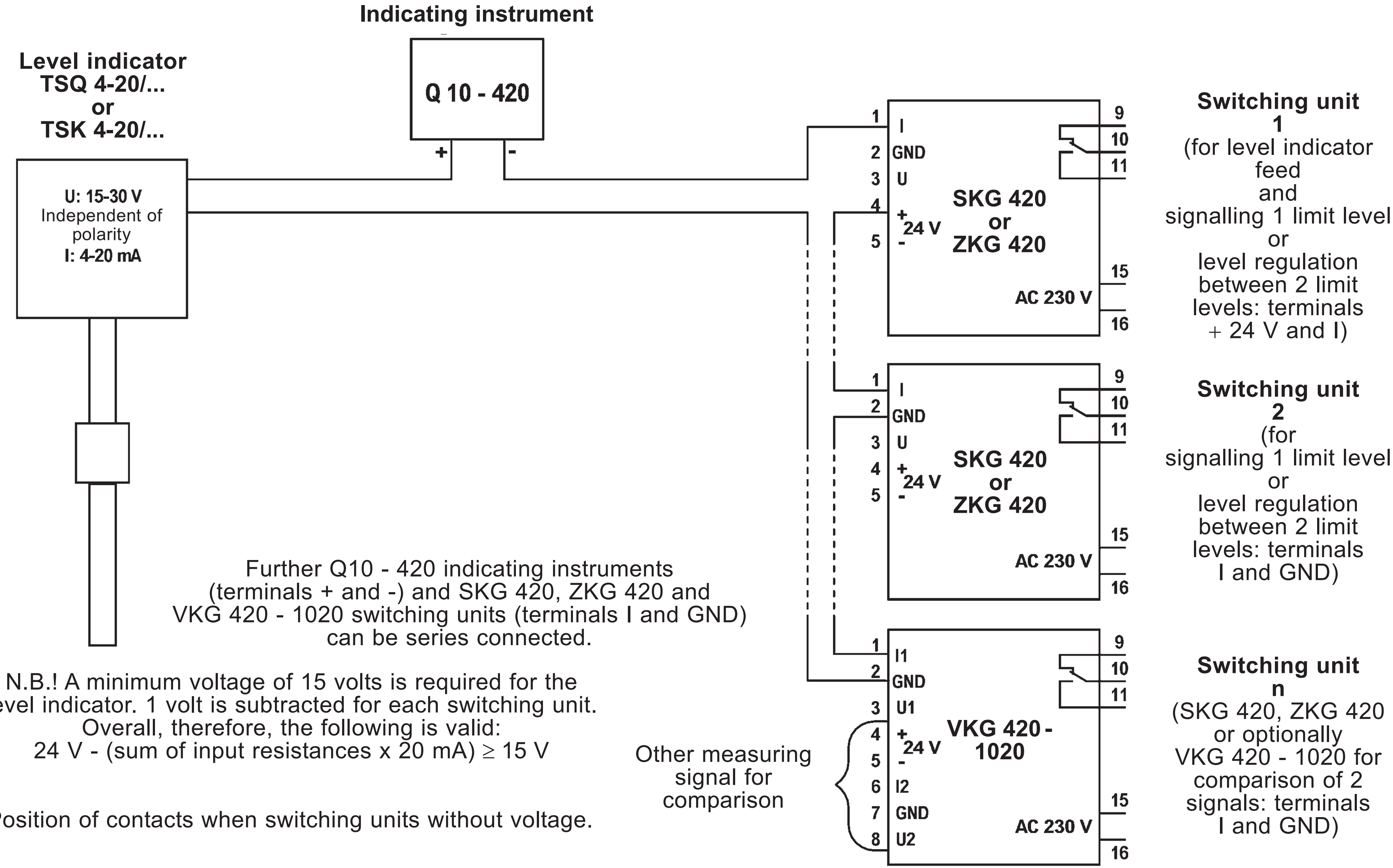
Technical data	VKG 420-1020
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application further supply voltages on request
Power input	approx. 3 VA
Level indicator feed (terminals 4+ and 5–)	DC 24 V, current rating max. 25 mA, short-term short circuit protected
Input signals • chanel A: terminals 1, 2, 3 • chanel B: terminals 6, 7, 8	0 ... 20 mA or 4 ... 20 mA or 0 ... 10 V or 2 ... 10 V terminals 1, 6 = I = + input current terminals 2, 7 = GND = – input terminals 3, 8 = U = + input voltage
Input resistance	current input 50 Ω, voltage input 200 kΩ
Switching hysteresis setting	via encoder switch in the range `• from +/– 1 % to +/– 10 % of the signal range width 0 ... 10 V or 0 ... 20 mA • from 1.25 % to 12.5 % of the signal range width 2 ... 10 V or 4 ... 20 mA
Switching status indicators	left LED: lit when input value A is higher than input value B right LED: lit when input value A is lower than input value B
Signal comparison	the difference between the two signal values must at least correspond to the hysteresis width set via the encoder switch to ensure that the output relay switches over
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact The output relay is energised if input value A is higher than input value B. The output relay is not energised if input value A is lower than input value B.
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and DIN EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Indicating instrument for current 4 ... 20 mA

This indicating instrument is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Technical data	Q 10 - 420
Input signal	4 ... 20 mA
Scale	0 - 100 %
Front dimensions	96 x 96 mm
Cutout dimensions	92 x 92 mm
Installation depth	61 mm
Indicating accuracy	class 1.5
Temperature range	– 15°C to + 40°C

Connecting diagram for TSQ 4-20/... or TSK 4-20/... with Q10-420 and SKG 420 or ZKG 420 and VKG 420-1020



Further Q10 - 420 indicating instruments (terminals + and -) and SKG 420, ZKG 420 and VKG 420 - 1020 switching units (terminals I and GND) can be series connected.

N.B.! A minimum voltage of 15 volts is required for the level indicator. 1 volt is subtracted for each switching unit. Overall, therefore, the following is valid:
24 V - (sum of input resistances x 20 mA) $\geq$ 15 V

Position of contacts when switching units without voltage.

Electrode controls

Conductive controlling devices, for automatic control, regulation and signalling of liquid levels

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Electrode controls

Table of contents | Pages

General information on electrode controls

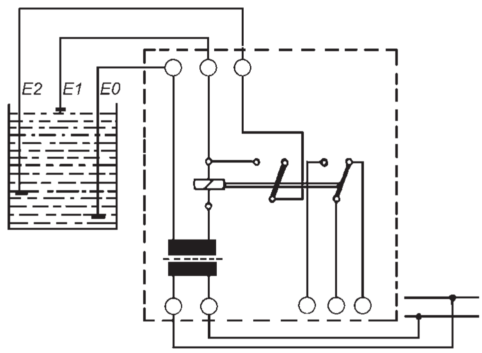
1. Operating principle

Electrode controls are used for the automatic control of pumps or electromagnetic valves as well as overflow or run-dry protection in wells or tanks with conductive liquids.

The liquid levels are monitored by electrodes which give switching commands to the electronic relay if they come into contact with the liquid.

For a two-point control system, you require two control electrodes and one earth electrode. If you only wish to signal a liquid level, the control electrode E1 and the earth electrode will suffice. You can also use a metallic, conductive tank wall as an earth connection in place of the earth electrode.

However, we recommend the use of a separate earth electrode in all cases.



Circuit diagram of an electrode control
E0 = earth electrode
E1 and E2 = control electrodes

2. Recommendations for the use of control electrodes

The conductive liquid to be controlled should have a specific conductivity of min. 50 µS/cm. The specific conductivity of tap water is usually set in a range from 100 µS/cm to 1,000 µS/cm.

3. Recommendations for the design of the electrodes

a) **Highly conductive liquids:** if there is sufficient space, we advise you to use **several single electrodes** at a spacing of approx. 100 mm instead of a multiple electrode.

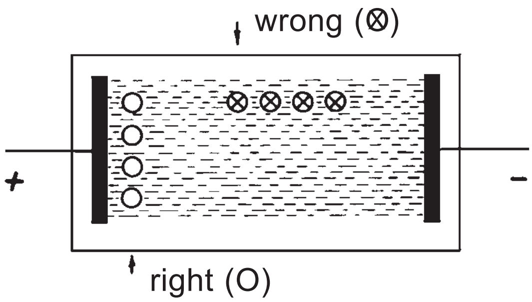
b) **Poorly conductive liquids:** if electrodes are used in poorly conductive liquids, the electrode rods should be mounted as close as possible to one another. For these applications, we recommend the use of a **multiple electrode** in place of several single electrodes.

c) **All liquids:** wherever possible, we recommend the use of an **electrode with plastic threaded nipple**, as the plastic acts as an insulator and therefore increases the insulation distance between the electrode rod and the conductive tank. If you use an electrode with metallic threaded nipple, this nipple will take same tank potential (= earth electrode E0). The insulation distance between electrode rod(s) and tank will then be limited to the insulators used in the electrode.

4. **Recommendations for special cases – the use of electrode controls in electrolysis baths**

When installing electrodes in electrolysis baths, it is always necessary to mount the electrodes **across** the voltage path. They must **not** be mounted **along** the voltage path.

It should be noted that in the case of movable poles (the object to be galvanised itself constitutes a pole) the voltage path can change and therefore cause false alarms.



5. **Electrode controls can or should not be used:**

a) in non-conductive liquids (e.g. in mineral oils);

b) in mushy or viscous liquids;

c) in liquids with a tendency to foam (e.g. possibly beer, washing sodas etc.);

d) in liquids with a high level of steam generation and condensate (e.g. at higher temperatures);

e) in liquids with a tendency to form deposits (e.g. in limestone milk, oily waste water etc.);

f) in liquids with solid particles (e.g. pieces of wood, remnant etc.).

6. **Electrical connection**

For the connection of electrode to electrode relay, we recommend the use of standard installation cables (e.g. NYM 2 x 1.5 mm^2 or 3 x 1.5 mm^2). Telephone cables or heavily twisted bell wires should **not** be used.

7. **Emptying and filling of a tank via an electrode control**

Before you connect up the electrode relay, you must check whether the mains voltage to be connected to the mains terminals is the same as that specified on the rating plate. The built-in transformer steps down the mains voltage to a safe low voltage and forwards it to the electronics of the relay via the connected electrodes.

As soon as the upper electrode E1 comes into contact with the liquid, the energising current flows through the liquid between E1 and E0, and the relay attracts with the electrode relay types NR 5 A, NR 3 A and ES 5/G or drops off with the electrode relay types NR 5, NR 3 or NR 5/G. At the same time, the electrode current between the electrode mounted at the bottom (E2) and the earth electrode (E0) ensures that the switching status is retained until the falling liquid level releases the electrode E2.

The output relay is therefore switched on by E1 at the maximum liquid level and switched off by E2 at the minimum level. The potential-free output contact is suitable for controlling pumps etc. It is designed for max. AC 4 A. The maximum voltage must not exceed AC 250 V and the permanent load of the contacts must not exceed 500 VA (ohmic load).

For the “pumping empty” function, in which the pump pumps a full tank empty, the contactor for the pump motor should be connected in accordance with the diagrams on pages 7-1-17, 7-1-23, 7-1-31 and 7-1-35. In these cases, control is effected by the normally open contact of the electrode relay NR 5 A, NR 3 A und ES 5/G or by the normally closed contact of the types NR 5, NR 3 or NR 5/G. The pump is switched on when the tank is full and switched off when the tank is empty.

For the “pumping full” function, in which the pump pumps an empty tank full, the contactor for the pump motor should be connected in accordance with the diagrams on pages 7-1-18, 7-1-24, 7-1-32 and 7-1-36. In these cases, control is effected by the normally closed contact of the electrode relays NR 5 A, NR 3 A and ES 5/G or by the normally open contact of the types NR 5, NR 3 and NR 5/G. The pump is switched on when the tank is at the minimum liquid level and the electrodes are not in contact with the liquid and switched off when the top electrode comes into contact with the liquid and causes the output relay to attract in the types NR 5 A, NR 3 A and ES 5/G or to drop off with the types NR 5, NR 3 and NR 5/G.

Suspension electrodes

Technical data	EH	EHK	LWZ	EHE
Design	**1 control electrode or 1 earth electrode**		**1 control electrode and 1 earth electrode**	
Electrode rods	stainless steel 316 Ti			
Housing	PP 27 mm Ø x ~ 145 mm long	PP 27 mm Ø x ~ 145 mm long	PP and Duroplast 2 x 27 mm Ø x ~ 210 mm long	stainless steel 316 Ti 28 mm Ø x ~ 70 mm long
Insulators	PP and cast resin			PTFE and cast resin
Electrical connection	without, but with connection terminal	1 x 1.5 cable	2 x 0.75 cable	2 x 0.75 cable
	1 metre, longer on request			
Mounting orient.	vertical			
Temperature application range	**max. + 60° C**			
Pressure resistance	for pressureless applications			

Suspension electrodes

with adjustable cable lengths

Technical data	EHK 2	EHK 3	EHK 4	EHK 5
Design	**2**	**3**	**4**	**5**
	EHK electrodes (technical data, see above)			
Screw-in nipple	PP, G2, with cable screw connections			
Pressure resistance	for pressureless applications			

EHK 5

Please note that the distance between a control electrode and the earth electrode should not exceed 3 metres. If the distance is higher than 3 metres, we recommend the use of a supplementary earth electrode, which has to be installed just below the control electrode.

Rod electrodes

with G½ screw-in nipple

Technical data	SE 1 A	½”-15-30
Design	**1 control electrode or earth electrode**	
Electrode rod	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**	
Length	as desired (measured from nipple sealing surface)	
Min. length	—	30 mm
Max. length	approx. 2,500 mm	
Insulators	cast resin	aluminium oxide
	and polyolefin shrinkdown tubing	
Screw-in nipple	**stainless steel 316 Ti, G½**	**galvanized steel, G½**
Electrical connection	special angled plug for H07RN-F 1 x 1 mm², protection class IP 34	
Mounting orient.	vertical	
Temperature application range	**max. + 80°C**	**max. + 80°C**
Pressure resistance	max. 10 bar at + 20°C	max. 15 bar at + 20°C

½”-15-30 with electrode rod > 30 mm

SE 1 A

Rod electrodes

with screw-in nipple made of PP

Technical data	SE 1/M 8	SE 1/¼”	SE 1/½”	SE 2/¾”	SE 2/¾” M
Design	**1 control electrode or earth electrode**			**2 control electrodes**	**1 control electrode and 1 earth electrode**
Electrode rods	stainless steel 316 Ti,				
	3 mm Ø	4 mm Ø	4 mm Ø	4 mm Ø	4 mm Ø
	—	covered with **polyolefin shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	~ 500 mm		~ 1,500 mm	~ 1,000 mm	
Insulators	PP and cast resin	PP,	PP,	PP,	PP,
		polyolefin shrinkdown tubing and cast resin			
Screw-in nipple	**PP, M 8**	**PP, G¼**	**PP, G½**	**PP, G¾**	**PP, G¾**
Electrical connection	nut and counternut, protection class IP 00		angled plug for H07RN-F 1 x 1 mm², protection class IP 34	PP connection head with M 16 x 1.5 cable entry, protection class IP 55	
Mounting orient.	vertical				
Temperature application range	**max. + 60°C**				
Pressure resistance	max. 2 bar at + 20°C				

SE 1/M 8

SE 1/¼”

SE 1/½” SE 2/¾” M

Rod electrodes

with G1 screw-in nipple made of PP

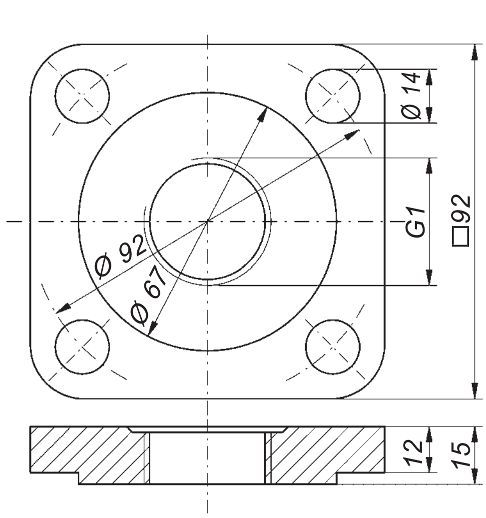
Technical data	S 1/PP	S 2/PP	S 2 M/PP	S 3 M/PP
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 2,500 mm			
Insulators	PP, polyolefin shrinkdown tubing and cast resin			
Screw-in nipple	**PP, G1**			
Electrical connection	PP connection head with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54			
Mounting orientation	vertical			
Temperature application range	**max. + 80°C**			
Pressure resistance	max. 2 bar at + 20°C			

S 1/PP

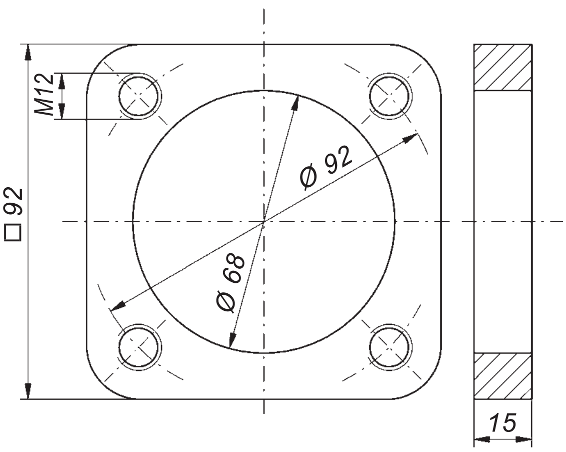
S 3 M/PP

Mounting accessories:

Square flange made of PP for electrodes with G1 screw-in nipple.
Counterflange on request.



Square flange



Counterflange

Rod electrodes

with G1 screw-in nipple made of PVDF

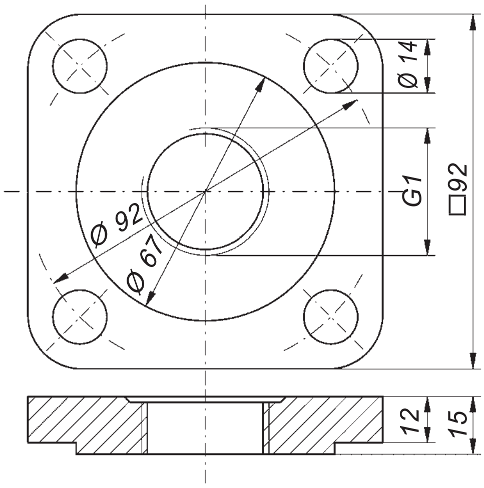
Technical data	S 1/PVDF	S 2/PVDF	S 2 M/PVDF	S 3 M/PVDF
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **PVDF shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 2,500 mm			
Insulators	PVDF, PVDF shrinkdown tubing and cast resin			
Screw-in nipple	**PVDF, G1**			
Electrical connection	PP connection head with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54			
Mounting orientation	vertical			
Temperature application range	**max. + 80°C**			
Pressure resistance	max. 2 bar at + 20°C			

S 1/PVDF

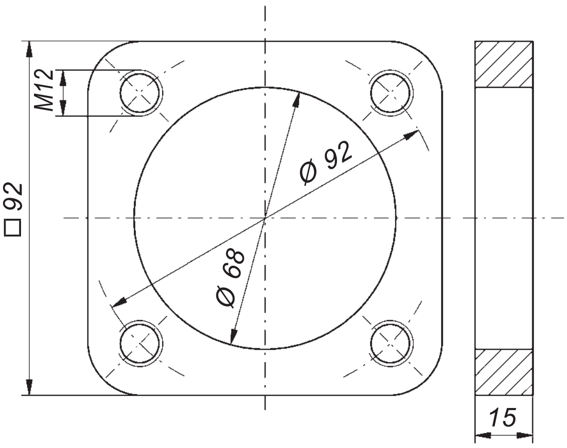
S 3 M/PVDF

Mounting accessories:

Square flange made of PVDF for electrodes with G1 screw-in nipple.
Counterflange on request.



Square flange



Counterflange

Rod electrodes

with G1 screw-in nipple made of stainless steel 316 Ti

S 2 AM

Technical data	S 2 A	S 2 AM	S 3 AM	S 4 AM	S 5 AM
Design	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**	**3 control electrodes and 1 earth electrode**	**4 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	approx. 2,500 mm				
Insulators	polyolefin shrinkdown tubing and cast resin				
Screw-in nipple	**stainless steel 316 Ti, G1**				
Electrical connection	**PP connection head** with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54				
Mounting orient.	vertical				
Temperature application range	**max. + 80°C**				
Pressure resistance	max. 10 bar at + 20°C				

Rod electrodes

with G1 screw-in nipple made of stainless steel 316 Ti

S 3 BM

Technical data	S 2 B	S 2 BM	S 3 BM	S 4 BM
Design	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**	**3 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **PVDF shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 1,500 mm			
Insulators	PVDF shrinkdown tubing and cast resin			
Screw-in nipple	**stainless steel 316 Ti, G1**			
Electrical connection	**aluminium connection head** with M 20 x 1.5 cable entry, protection class IP 54			
Mounting orient.	vertical			
Temperature application range	**max. + 100°C**			
Pressure resistance	max. 10 bar at + 20°C			

Rod electrodes, pressure-resistant

with G1 screw-in nipple made of stainless steel 316 Ti and PEEK or PVDF

S 2 AM/D

Technical data	S 2 A/D	S 2 AM/D	S 3 AM/D
Design	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**		
Lengths	as desired (measured from nipple sealing surface)		
Max. lengths	approx. 2,500 mm		
Insulators	polyolefin shrinkdown tubing, PEEK or PVDF and cast resin		
Screw-in nipple	**stainless steel 316 Ti and PEEK or PVDF, G1**		
Electrical connection	**PP connection head** with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54		
Mounting orient.	vertical		
Temperature application range	**max. + 80°C**		
Pressure resistance	max. 15 bar at + 20°C		

Rod electrodes, pressure-resistant

with G1 screw-in nipple made of stainless-steel 316 Ti and PEEK or PVDF

S 3 BM/D

Technical data	S 2 B/D	S 2 BM/D	S 3 BM/D
Design	**2 control electrodes**	**1 control electrode und 1 earth electrode**	**2 control electrodes und 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **PVDF shrinkdown tubing**		
Lengths	as desired (measured from nipple sealing surface)		
Max. lengths	approx. 1,500 mm		
Insulators	PVDF schrinkdown tubing, PEEK or PVDF and cast resin		
Screw-in nipple	**stainless steel 316 Ti and PEEK or PVDF, G1**		
Electrical connection	**aluminium connection head** with M 20 x 1.5 cable entry, protection class IP 54		
Mounting orient.	vertical		
Temperature application range	**max. + 100° C**		
Pressure resistance	max. 15 bar at + 20° C		

Rod electrodes

with G1 screw-in nipple made of PP

Technical data	SE 1	SE 2	SE 2 M	SE 3 M	SE 4 M
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**	**3 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	approx. 2,500 mm				
Insulators	PP, polyolefin shrinkdown tubing and cast resin				
Screw-in nipple	**PP, G1**				
Electrical connection	PP connection head with M 16 x 1.5 cable entry, protection class IP 55, PTFE connection head on request				
Mounting orient.	vertical				
Temperature application range	**max. + 80°C**				
Pressure resistance	max. 2 bar at + 20°C				

SE 2 M **SE 3 M**

Rod electrodes

with adjustable electrode rods

Technical data	SEV	SEV/T 1	SEV/T 2	SEV/T 3
Design	**1 control electrode or earth electrode**	**1 control electrode or earth electrode**	**2 control electrodes or 1 control electrode and 1 earth electrode**	**3 control electrodes or 2 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 4 mm Ø, adjustable, covered with **polyolefin shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 1,000 mm			
Insulators	PTFE and polyolefin schrinkdown tubing	PP and polyolefin shrinkdown tubing		
Screw-in nipple	**stainless steel 316 Ti, G½, on request G1 or G1¼**	**PP, G1**		
Electrical connection	special angled plug for H07RN-F 1 x 1 mm², protection class IP 34			
Mounting orient.	vertical			
Temperature application range	**max. + 80°C**	**max. + 60°C**		
Pressure resistance	for pressureless applications			

SEV/T 3

SEV, G1

Rod electrodes with more than 3 adjustable electrode rods and G2 screw-in nipple on request.

Rod electrodes

with G2 screw-in nipple made of PP

Technical data	SR 1/ PP	SR 2/ PP	SR 2 M/ PP	SR 3 M/ PP	SR 4 M/ PP	SR 5 M/ PP
Design						
- control electrodes	**1**	**2**	**1**	**2**	**3**	**4**
- earth electrode	—	—	**1**	**1**	**1**	**1**
Electrode rods	stainless steel 316 Ti, **6 mm Ø**, covered with **polyolefin shrinkdown tubing**					
Lengths	as desired (measured from nipple sealing surface)					
Max. lengths	approx. 3,000 mm					
Insulators	PP, polyolefin shrinkdown tubing and cast resin					
Screw-in nipple	**PP, G2**					
Electrical connection	PP connection head with M 20 x 1.5 cable entry, protection class IP 55					
Mounting orient.	vertical					
Temperature application range	**max. + 80°C**					
Pressure resistance	max. 2 bar at + 20°C					

Rod electrodes

with G2 screw-in nipple made of PVDF

Technical data	SR 1/ PVDF	SR 2/ PVDF	SR 2 M/ PVDF	SR 3 M/ PVDF	SR 4 M/ PVDF	SR 5 M/ PVDF
Design						
- control electrodes	**1**	**2**	**1**	**2**	**3**	**4**
- earth electrode	—	—	**1**	**1**	**1**	**1**
Electrode rods	stainless steel 316 Ti, **6 mm Ø**, covered with **PVDF shrinkdown tubing**					
Lengths	as desired (measured from nipple sealing surface)					
Max. lengths	approx. 3,000 mm					
Insulators	PVDF, PVDF shrinkdown tubing and cast resin					
Screw-in nipple	**PVDF, G2**					
Electrical connection	PVDF connection head with M 20 x 1.5 cable entry, protection class IP 55					
Mounting orient.	vertical					
Temperature application range	**max. + 80°C**					
Pressure resistance	max. 2 bar at + 20°C					

Electrode rods made of titanium, Hastelloy C, Hastelloy B or monel and screw-in nipple made of PVC or PTFE on request.

SR 5 M/PP or SR 5 M/PVDF

Rod electrodes made of special materials

Rod electrodes made of titanium

with G1 screw-in nipple made of PVDF

Technical data	STI 1	STI 2	STI 2 M	STI 3 M
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	titanium, ≤ 4 mm Ø, covered with **PVDF shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 2,500 mm			
Insulators	PVDF, PVDF shrinkdown tubing and cast resin			
Screw-in nipple	**PVDF, G1**			
Electrical connection	PP connection head with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54			
Mounting orient.	vertical			
Temperature application range	**max. + 80°C**			
Pressure resistance	max. 2 bar at + 20°C			

Version with screw-in nipple made of PTFE and/or shrinkdown tubing made of PTFE available on request.

STI or SHC 1

Rod electrodes made of Hastelloy C

with G1 screw-in nipple made of PVDF

Technical data	SHC 1	SHC 2	SHC 2 M	SHC 3 M
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	Hastelloy C, ≤ 4 mm Ø, covered with **PVDF shrinkdown tubing**			

All other technical data as for rod electrodes described above.

Version with screw-in nipple made of PTFE and/or shrinkdown tubing made of PTFE available on request.

STI 3 M or SHC 3 M

Rod electrodes made of Hastelloy B

with G1 screw-in nipple made of PVDF

Technical data	SHB 1	SHB 2	SHB 2 M	SHB 3 M
Design	**1 control electrode or earth electrode**	**2 control electrodes**	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	Hastelloy B, ≤ 4 mm Ø, covered with **PVDF shrinkdown tubing**			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	approx. 2,500 mm			
Insulators	PVDF, PVDF shrinkdown tubing and cast resin			
Screw-in nipple	**PVDF, G1**			
Electrical connection	PP connection head with M 20 x 1.5 cable entry, protection class IP 54; on request: aluminium connection head, protection class IP 54			
Mounting orient.	vertical			
Temperature application range	**max. + 80°C**			
Pressure resistance	max. 2 bar at + 20°C			

Version with screw-in nipple made of PTFE and/or shrinkdown tubing made of PTFE available on request.

SHB 1, SMO 1 or STA 1

Rod electrodes made of monel

with G1 screw-in nipple made of PVDF

Technical data	SMO 1	SMO 2	SMO 2 M	SMO 3 M
Design	**see above**			
Electrode rods	monel, ≤ 4 mm Ø, covered with **PVDF shrinkdown tubing**			

All other technical data as for rod electrodes described above.

Version with screw-in nipple made of PTFE and/or shrinkdown tubing made of PTFE available on request.

SHB 3 M, SMO 3 M or STA 3 M

Rod electrodes made of tantalum

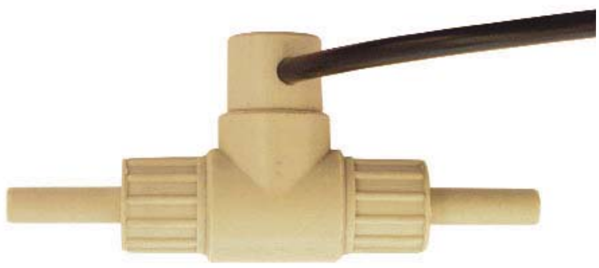
with G1 screw-in nipple made of PVDF

Technical data	STA 1	STA 2	STA 2 M	STA 3 M
Design	**see above**			
Electrode rods	tantalum, ≤ 4 mm Ø, covered with **PVDF shrinkdown tubing**			

All other technical data as for rod electrodes described above.

Electrodes for special applications

WME electrode for indication of the lack of water in a hose
• for installation in a hose



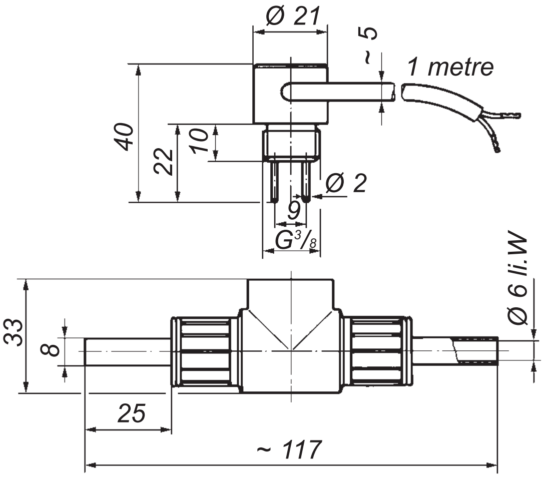
WME

Rod electrode without screw-in nipple, with mounting stand
• for installation in shallow collection tubs

Picture with smaller scale compared to adjacent picture

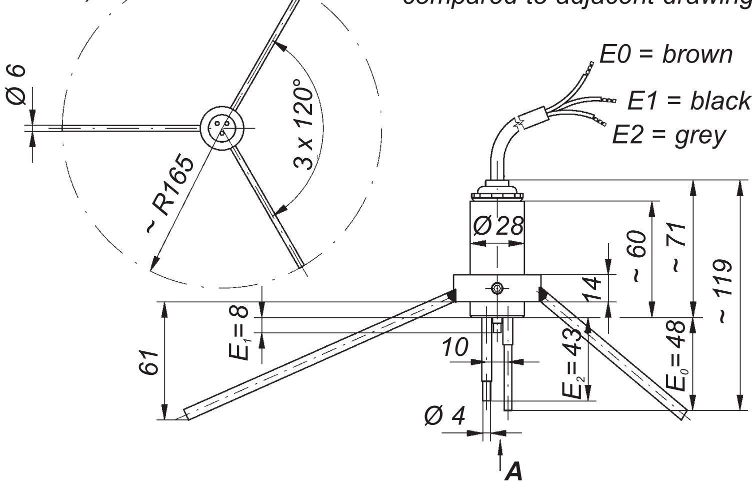
SON 3 M/ST

Technical data	WME	SON 3 M/ST
Design	**1 control electrode and 1 earth electrode**	**2 control electrodes and 1 earth electrode**
Electrode rods	stainless steel 316 Ti, 2 mm Ø	stainless steel 316 Ti, 4 mm Ø, covered with **polyolefin shrinkdown tubing**
Lengths	approx. 22 mm (measured from nipple sealing surface)	acc. to drawing below, other lengths on request
Insulators	PP and cast resin	PP, polyolefin shrinkdown tubing and cast resin
Screw-in nipple	**PP, G$^3/_8$**	—
Electrical connection	PVC cable 2 x 0.75;	PVC cable 3 x 0.75;
	1 metre, longer on request; other cable on request	
Mounting	using the T-piece made of PP, dimensions see drawing below	using the mounting stand made of stainless steel 316 Ti, dimensions see drawing below
Mounting orientation	depending on the application	vertical
Temperature appl. range	**max. + 60°C**	**max. + 80°C**
Pressure resistance	for pressureless applications	



*View **A** (reduced)*

Diagram with smaller scale compared to adjacent drawing



Electrode relays

for automatic level control or signalling with conductive liquids

Jola electrode relays are used for the automatic control of pumps or electromagnetic valves as well as overflow or run-dry protection in wells or tanks with conductive liquids.

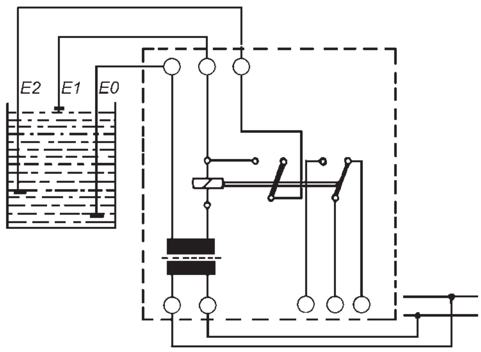
The liquid levels are monitored by electrodes which give switching commands to the electronic relay if they come into contact with the liquid.

For a two-point control system, you require two control electrodes and one earth electrode.

If you only wish to signal a liquid level, the control electrode E1 and the earth electrode will suffice.

You can also use a metallic, conductive tank wall as an earth connection in place of the earth electrode.

However, we recommend the use of a separate earth electrode in all cases.



Circuit diagram of an electrode control E0 = earth electrode, E1 and E2 = control electrodes

Function	Type designation	Page	Output	Self-hold
Relay for **signalling 1 limit level** or for **1 two-point control**	**NR 5** **NR 5 A**	7-1-15	1 potential-free changeover contact based on **quiescent current principle** based on **working current principle**	with
	NR 3 **NR 3 A**	7-1-21	1 potential-free changeover contact based on **quiescent current principle** based on **working current principle**	with
	NR 5/G	7-1-29	1 potential-free changeover contact based on **quiescent current principle**	with
	ES 5/G	7-1-33	1 potential-free changeover contact based on **working current principle**	with
Relay for **signalling 3 limit levels**	**ER 53**	7-1-37	2 make contacts and 1 break contact based on working current principle with common Wurzelkontakt	without

A switch-on and switch-off delay of between 0.5 and 3 seconds depending on the conductivity of the medium renders the units insensitive to short-term contacting (e.g. due to splashes) and short contact interruptions.

NR 5 and NR 5 A electrode relays

for signalling a limit level or for level control

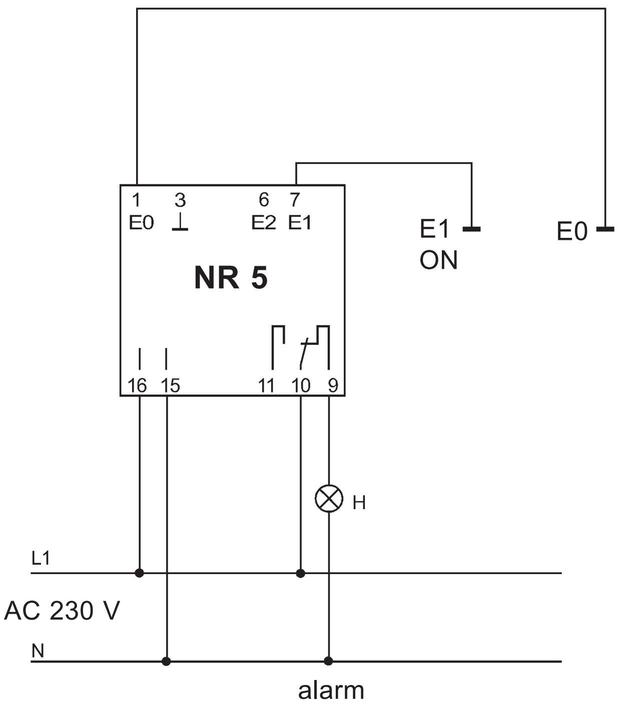
Electrode relay for U-bar mounting or surface mounting, with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

The units are designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. They are suitable for use in clean environments only.

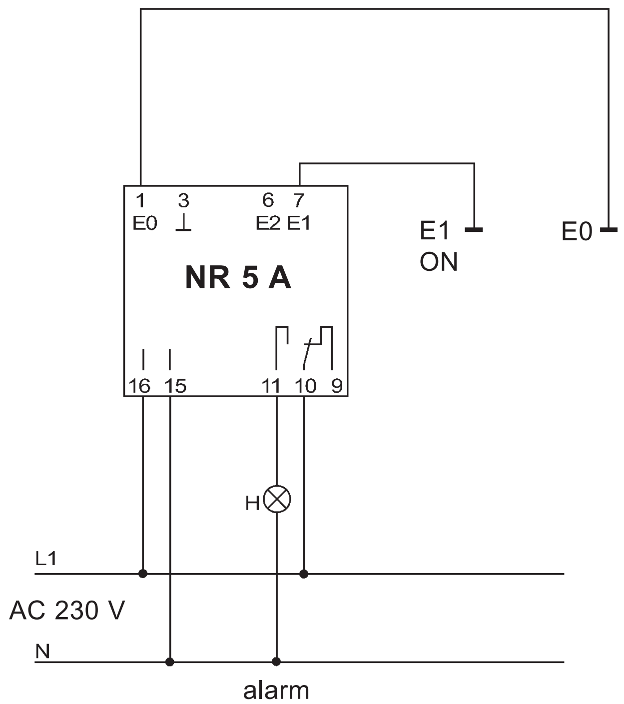
Technical data	NR 5	NR 5 A
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: –, - terminal 16: +)	- AC 230 V (supplied if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or (DC 24 V / DC 12 V:) in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request	
Power input	approx. 3 VA	
Electrode circuit (terminals 1, 6, 7)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold	
- no-load voltage	9 V_{eff} 10 Hz (safety extra low voltage SELV)	
- short-circuit current	max. 0.5 mA_{eff}	
- response sensitivity	approx. 30 kOhm or approx. 33 µS (electric conductance)	
Controlled circuit (terminals 9, 10, 11)	**1 single-pole potential-free changeover contact with self-hold**	
Functioning	**based on the quiescent current principle**	**based on the working current principle**
Switching status indicators	1 green LED, lights when output relay is energised 1 red LED, lights when output relay is not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 55 x 110 mm	
Connection	terminals on top of housing	
Protection class	IP 20	
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022 or fastening via 2 boreholes	
Mounting orientation	any	
Temperature application range	from - 20°C to + 60°C	
Max. cable length between electrode relay and electrode(s)	**1,000 metres**	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Connection diagrams

NR 5

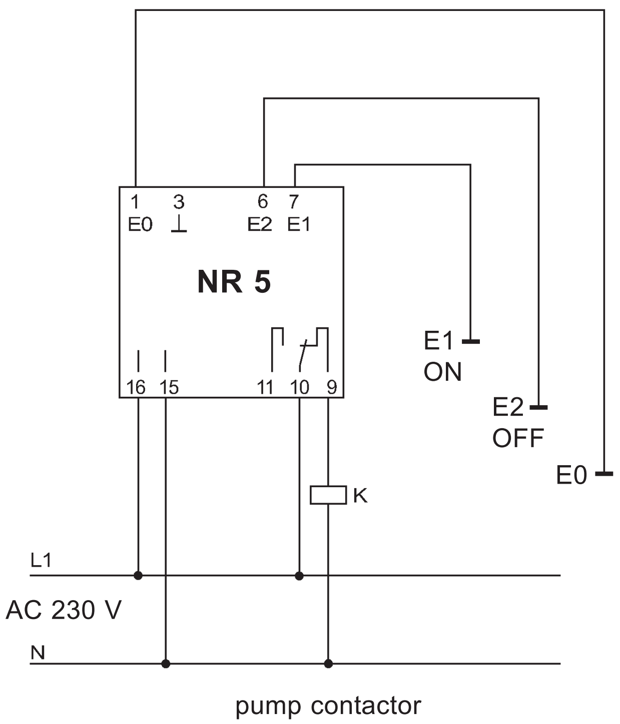


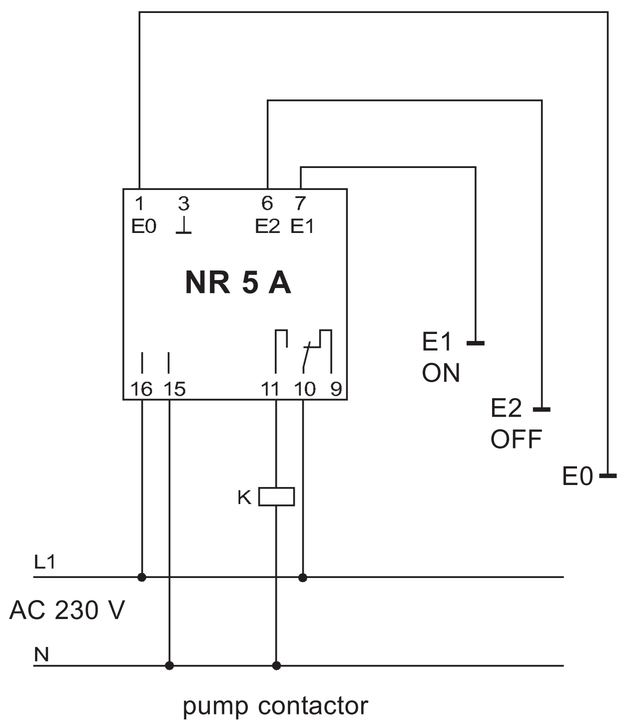
NR 5 A



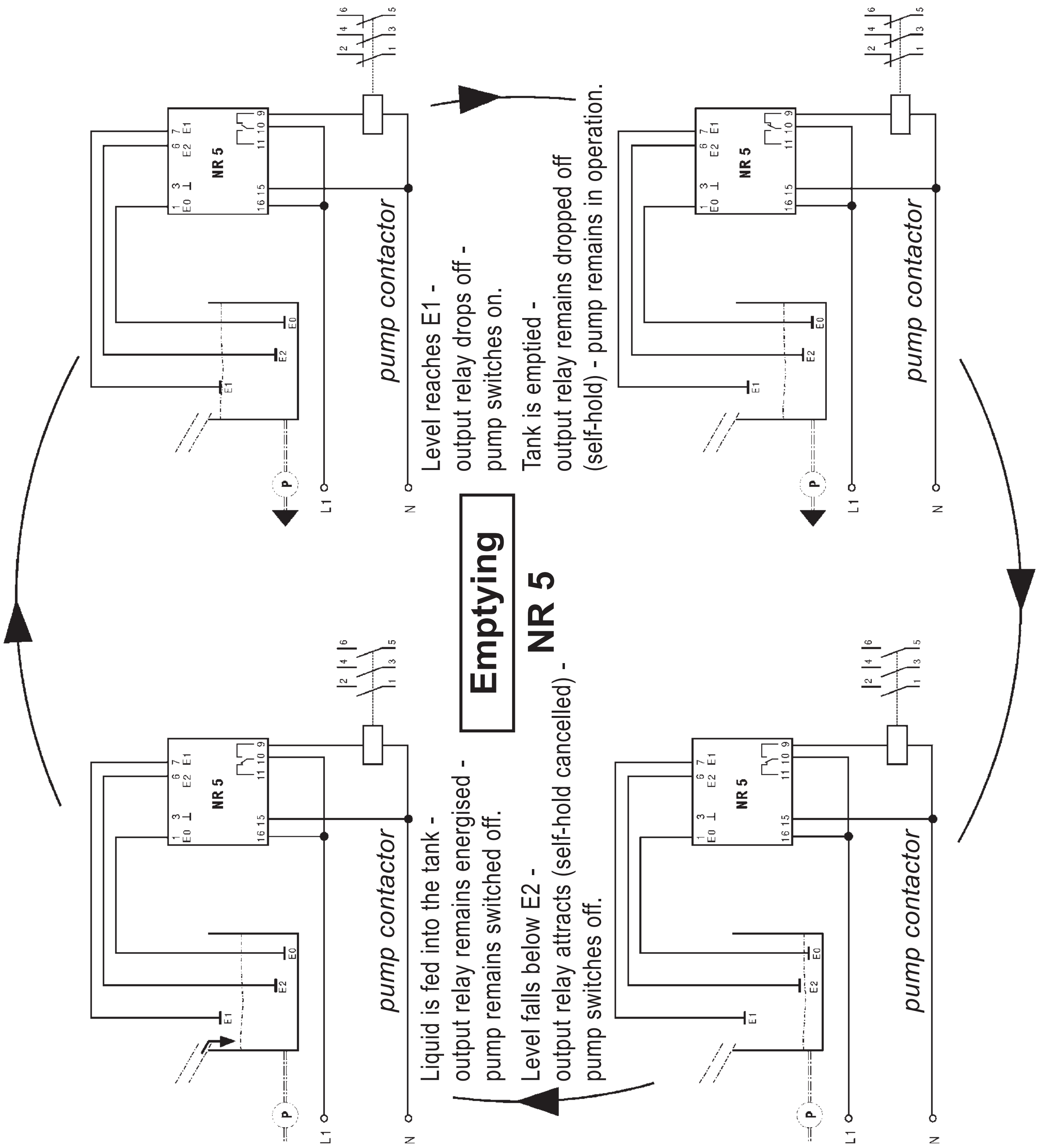
Attention! When several NR 5 or NR 5 A electrode relays are used for automatic level control or signalling in the same tank, the **terminal 3 serves** to connect the earth of each NR 5 or NR 5 A electrode relay.

<u>The protective ground must never be connected to terminal 3!</u>



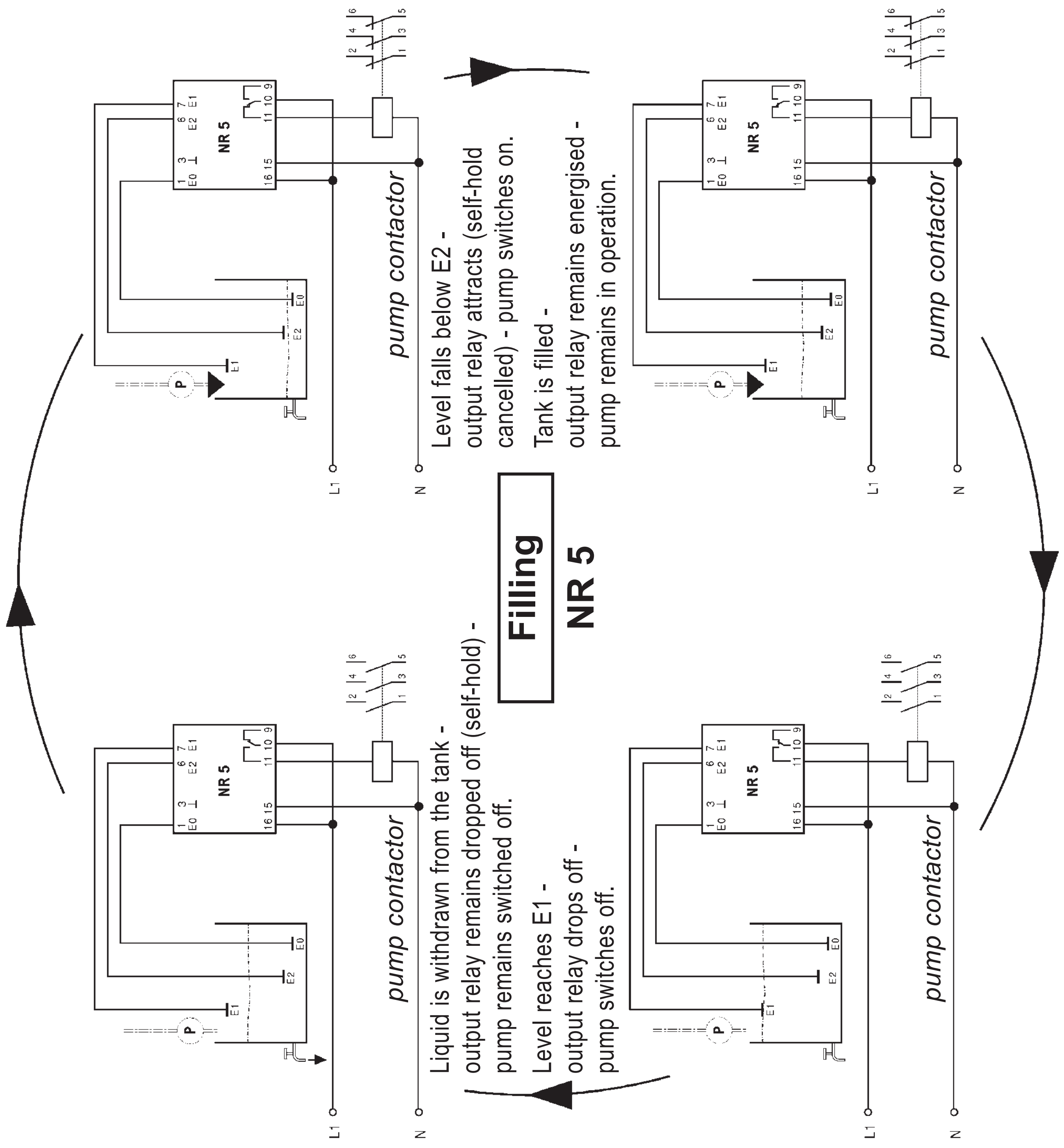


Output contact shown in no-current condition of the relay



N.B.

The connection of electrodes E0, E1 and E2 to the NR 5 electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.



N.B.

The connection of electrodes E0, E1 and E2 to the NR 5 electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.

Instructions and notice for the use of one or several NR 5 or NR 5 A electrode relays

- **When using several electrode relays for automatic level control or signalling in the same tank, the earth electrode E0 may only be connected to <u>one</u> electrode relay. The other electrode relays must be connected to each other via their earth terminal (terminal 3). It is important to note that only a maximum of 8 inputs can be used. <u>The protective ground must never be connected to terminal 3!</u>**

- **Max. connecting cable length between electrode relay(s) and electrodes:**

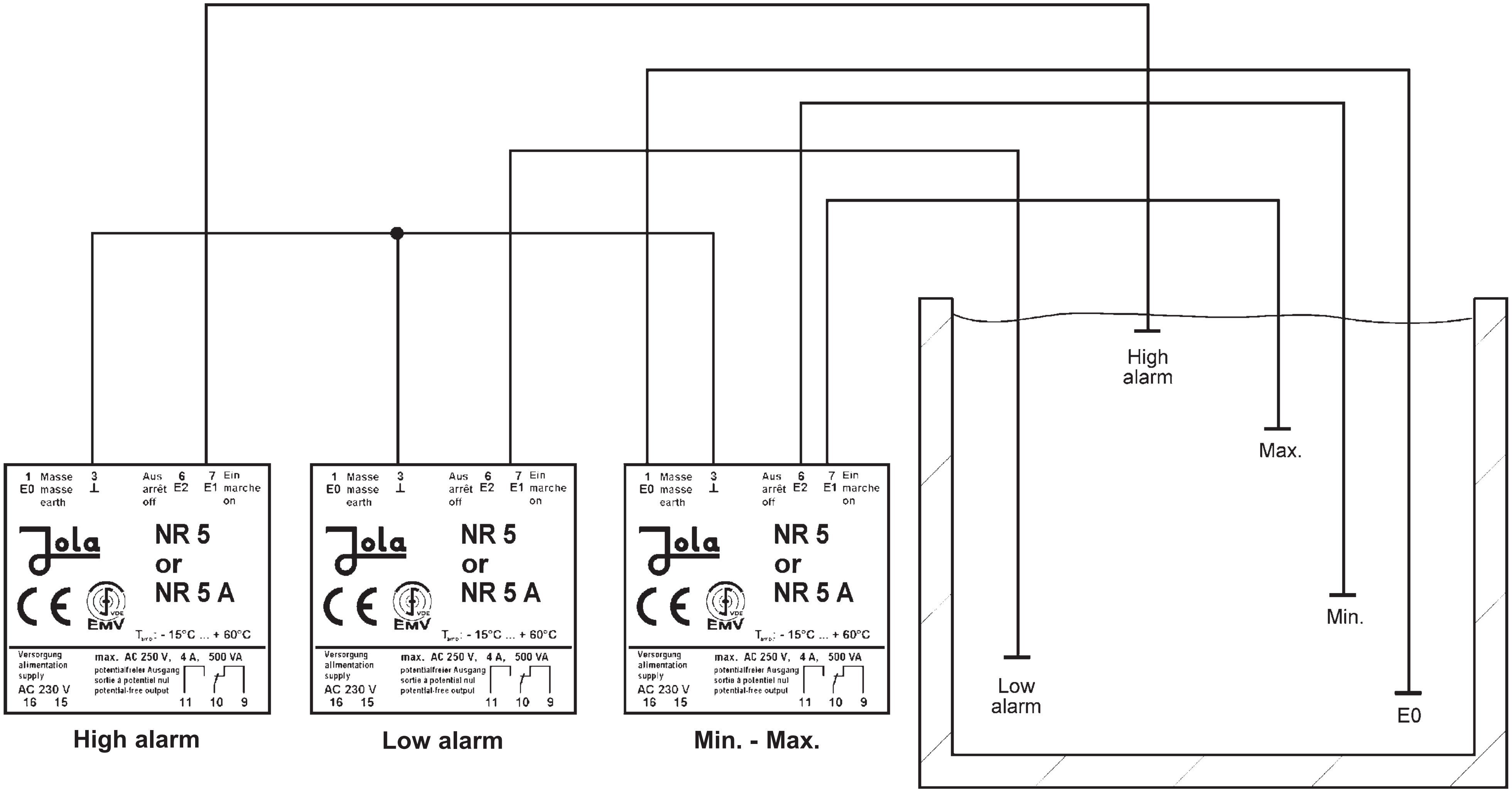
connection of one electrode relay:
- electrode conductors are laid together in a common cable: 1,000 metres
- each conductor is laid separately: 1,000 metres

connection of several electrode relays (max. 4):
- electrode conductors are laid together in a common cable: 1,000 metres
- each conductor is laid separately: 1,000 metres
- **Relevant information for a safe functioning:**
  If the conductor for the earth electrode E0 is laid separately and the conductors for the other electrodes are laid together in a common cable, the response sensitivity of the electrode control might be reduced compared to the normal, and that especially with very long cables.

- **Connection of one control electrode to several electrode relays (see pages 7-1-27 and 7-1-28):**

If a control electrode is connected to the inputs (E1 or E2) of several electrode relays, the response sensitivity of these inputs is reduced depending on their number.

- when connecting to 1 input: response sensitivity 30 kOhm
- when connecting to 2 inputs: response sensitivity 15 kOhm
- when connecting to 3 inputs: response sensitivity 10 kOhm
- when connecting to 4 inputs: response sensitivity 7.5 kOhm



Output contact shown in no-current condition of the relays

Exemple for the input assignment for high alarm + low alarm + level control (min. - max.)

NR 5 (quiescent current principle): the output relay is energised, when the input is <u>not</u> activated (e.g. no water in the tank).

NR 5 A (working current principle): the output relay is energised, when the input is activated (e.g. water in the tank).

NR 3 and NR 3 A electrode relays

for signalling a limit level
or for level control

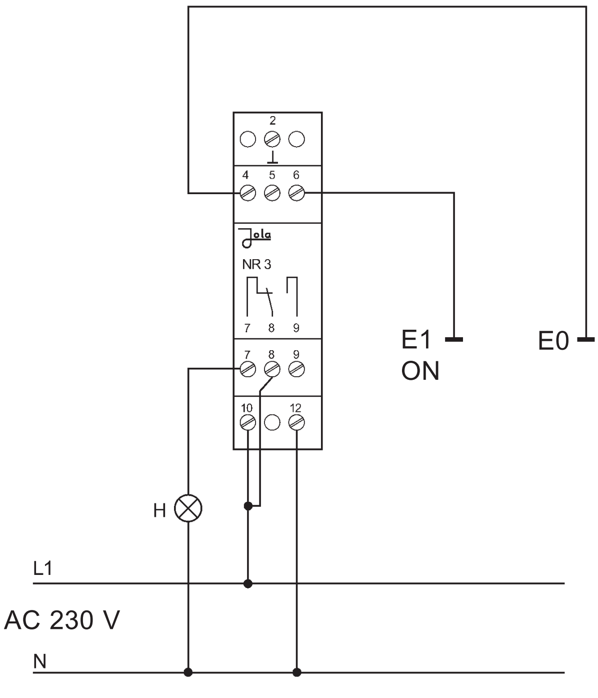
Electrode relay for U-bar mounting, with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

The units are designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. They are suitable for use in clean environments only.

Technical data	NR 3	NR 3 A
Alternative supply voltages (AC versions: terminals 10 and 12; DC versions: - terminal 10: –, - terminal 12: +)	- AC 230 V (supplied if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } in these two cases, the unit must only be - DC 12 V or } connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request	
Power input	approx. 3 VA	
Electrode circuit (terminals 4, 5, 6)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold	
- no-load voltage	9 V_{eff} 10 Hz (safety extra low voltage SELV)	
- short-circuit current	max. 0.5 mA_{eff}	
- response sensitivity	approx. 30 kOhm or approx. 33 µS (electric conductance)	
Controlled circuit (terminals 7, 8, 9)	**1 single-pole potential-free changeover contact with self-hold**	
Functioning	**based on the quiescent current principle**	**based on the working current principle**
Switching status indicators	1 green LED, lights when output relay is energised 1 red LED, lights when output relay is not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 22.5 x 100 mm	
Connection	terminals on top of housing	
Protection class	IP 20	
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022	
Mounting orientation	any	
Temperature application range	from - 20°C to + 60°C	
Max. cable length between electrode relay and electrode(s)	**1,000 metres**	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

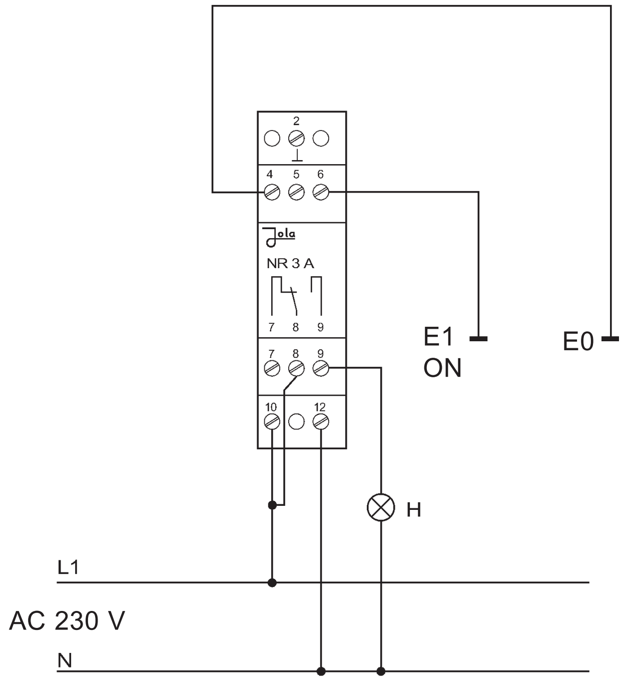
Connection diagrams

NR 3



alarm

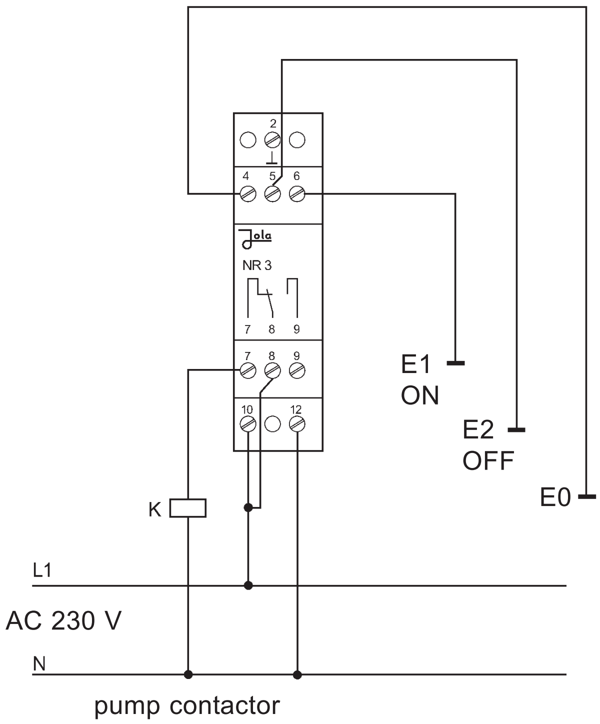
NR 3 A



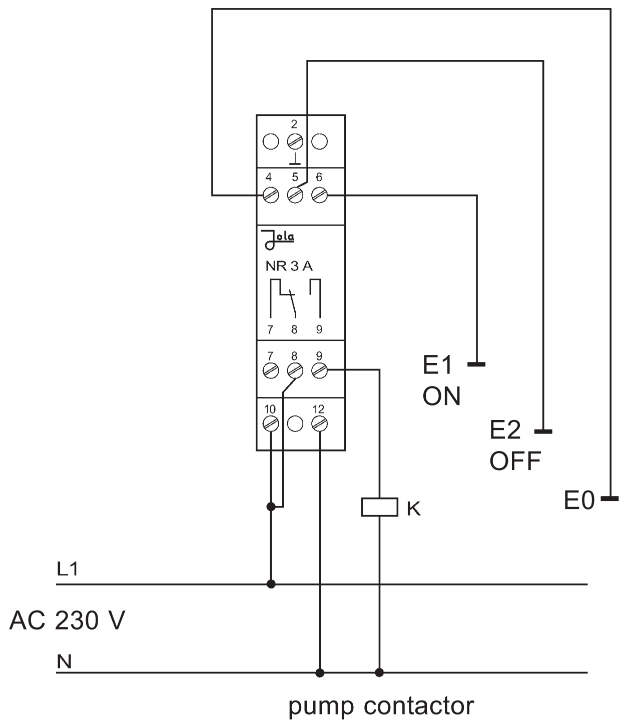
alarm

Attention! When several NR 3 or NR 3 A electrode relays are used for automatic level control or signalling in the same tank, the **terminal 2 serves** to connect the earth of each NR 3 or NR 3 A electrode relay.

<u>The protective ground must never be connected to terminal 2!</u>

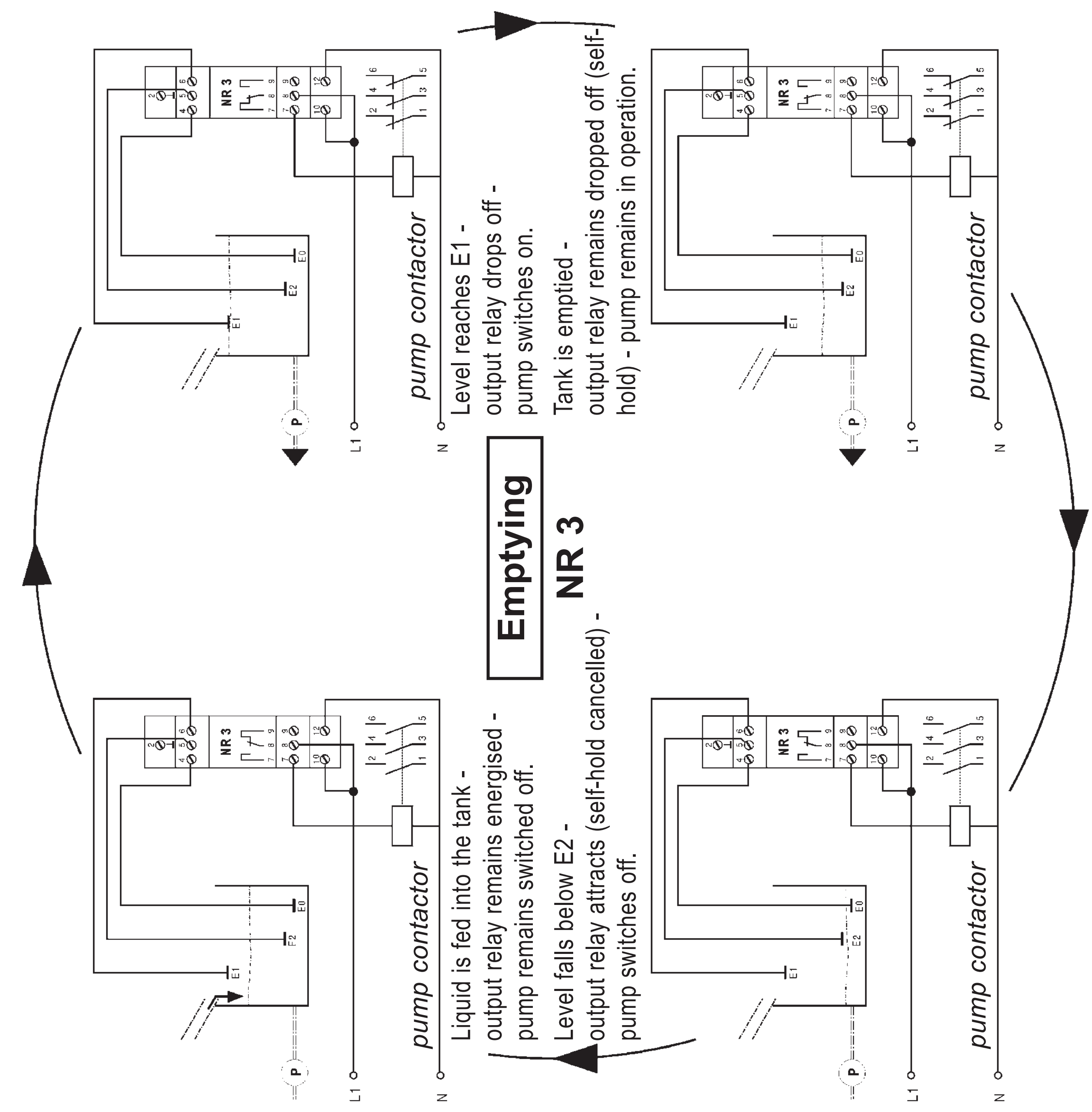


pump contactor



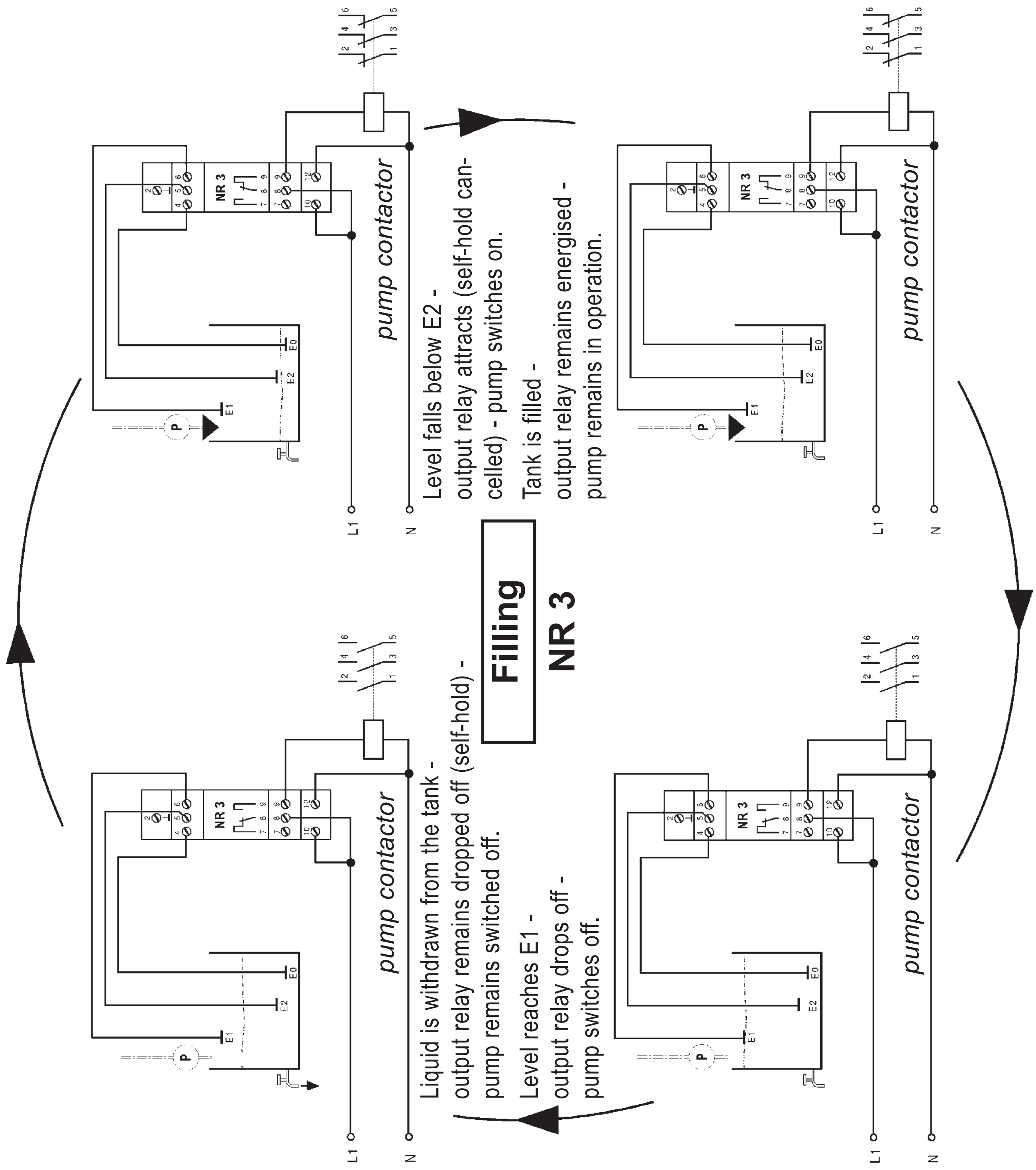
pump contactor

Output contact shown in no-current condition of the relay



N.B.

The connection of electrodes E0, E1 and E2 to the NR 3 electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.



N.B.

The connection of electrodes E0, E1 and E2 to the NR 3 electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.

Instructions and notice for the use of one or several NR 3 or NR 3 A electrode relays

- **When using several electrode relays for automatic level control or signalling in the same tank, the earth electrode E0 may only be connected to one electrode relay. The other electrode relays must be connected to each other via their earth terminal (terminal 2). It is important to note that only a maximum of 8 inputs can be used. The protective ground must never be connected to terminal 2!**

- **Max. connecting cable length between electrode relay(s) and electrodes:**

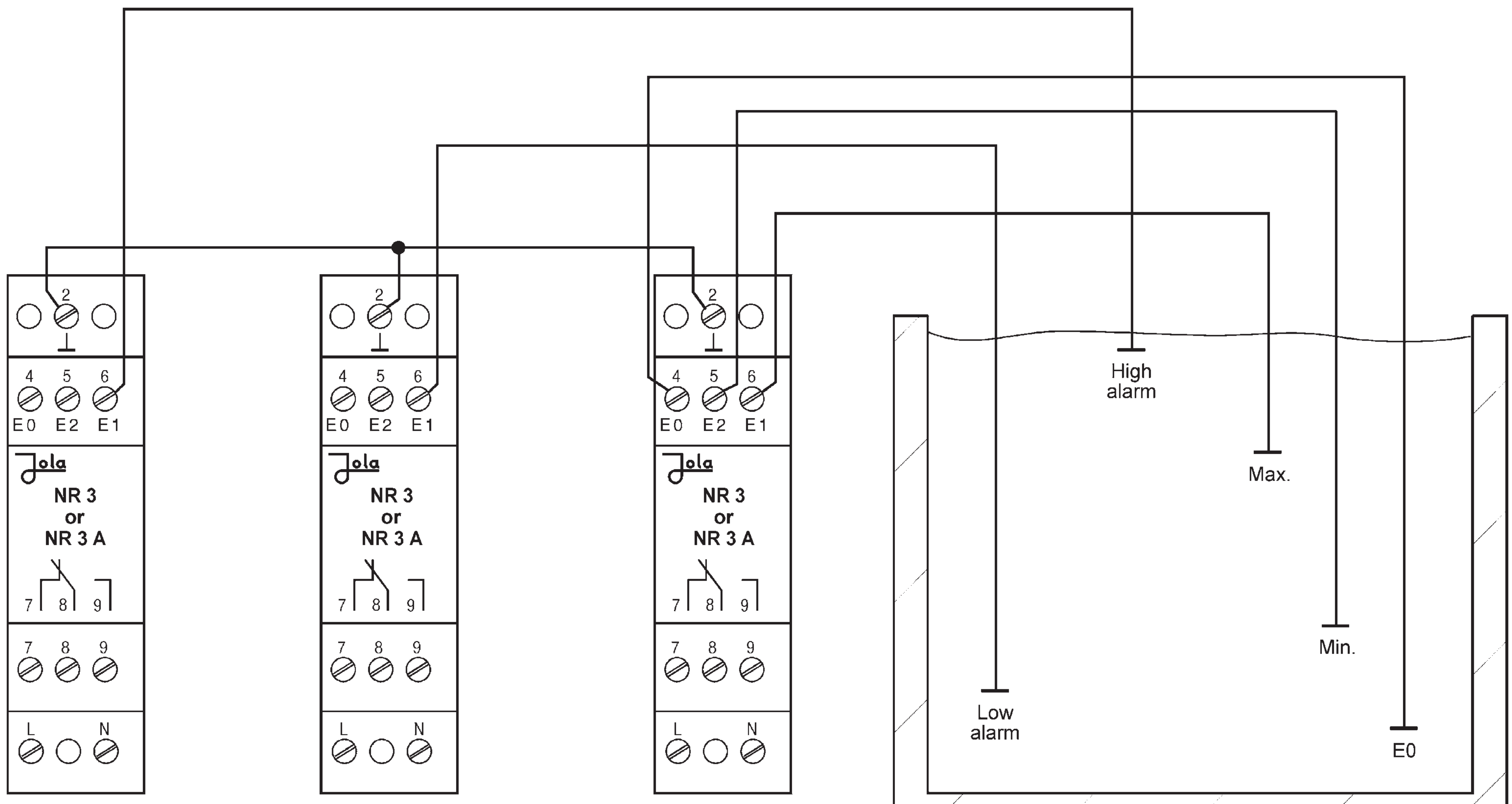
  connection of one electrode relay:
  - electrode conductors are laid together in a common cable: 1,000 metres
  - each conductor is laid separately: 1,000 metres

  connection of several electrode relays (max. 4):
  - electrode conductors are laid together in a common cable: 1,000 metres
  - each conductor is laid separately: 1,000 metres
  - **Relevant information for a safe functioning:**
    If the conductor for the earth electrode E0 is laid separately and the conductors for the other electrodes are laid together in a common cable, the response sensitivity of the electrode control might be reduced compared to the normal, and that especially with very long cables.

- **Connection of one control electrode to several electrode relays (see pages 7-1-27 and 7-1-28):**

  If a control electrode is connected to the inputs (E1 or E2) of several electrode relays, the response sensitivity of these inputs is reduced depending on their number.

  - when connecting to 1 input: response sensitivity 30 kOhm
  - when connecting to 2 inputs: response sensitivity 15 kOhm
  - when connecting to 3 inputs: response sensitivity 10 kOhm
  - when connecting to 4 inputs: response sensitivity 7.5 kOhm



High alarm **Low alarm** **Min. - Max.**

Output contact shown in no-current condition of the relays

Exemple for the input assignment for high alarm + low alarm + level control (min. - max.)

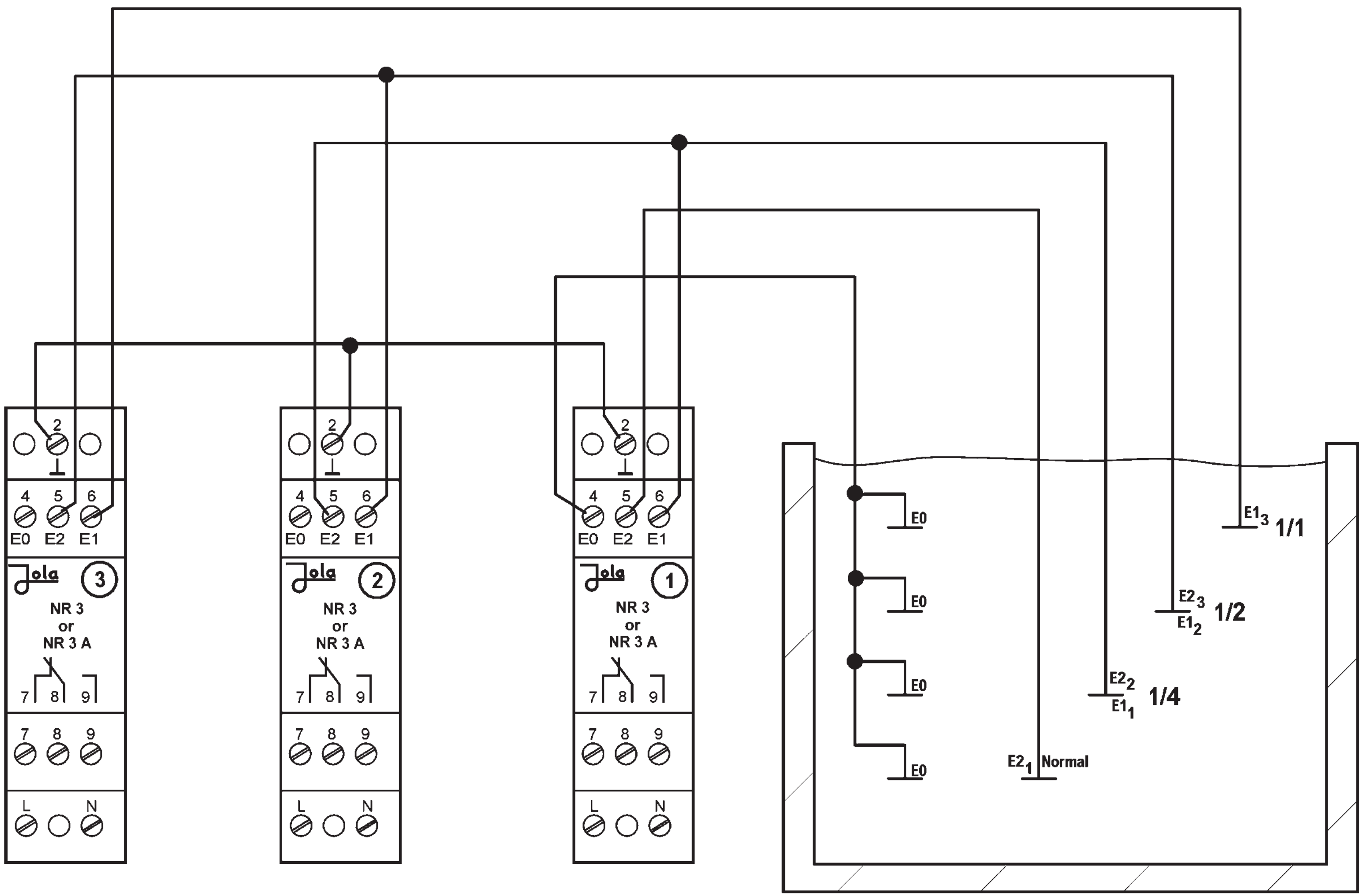
NR 3 (quiescent current principle): the output relay is energised, when the input is <u>not</u> activated (e.g. no water in the tank).

NR 3 A (working current principle): the output relay is energised, when the input is activated (e.g. water in the tank).

• Connection of one control electrode to several electrode relays:

If a control electrode is connected to the inputs (E1 or E2) of several electrode relays, the response sensitivity of these inputs is reduced depending on their number.

- when connecting to 1 input: response sensitivity 30 kOhm
- when connecting to 2 inputs: response sensitivity 15 kOhm
- when connecting to 3 inputs: response sensitivity 10 kOhm
- when connecting to 4 inputs: response sensitivity 7.5 kOhm



Output contact shown in no-current condition of the relays

Multiple using of control electrodes inputs:

If a control electrode is connected to the inputs (E1 or E2) of several electrode relays, the response sensitivity of these inputs is reduced.

The control electrodes for 1/4 and 1/2 act simultaneously on inputs (E1 or E2) of 2 electrode relays. So the response sensitivity of these inputs is reduced to 15 kOhm.

NR 3 (quiescent current principle): the output relay is energised, when the input is <u>not</u> activated (e.g. no water in the tank).

NR 3 A (working current principle): the output relay is energised, when the input is activated (e.g. water in the tank).

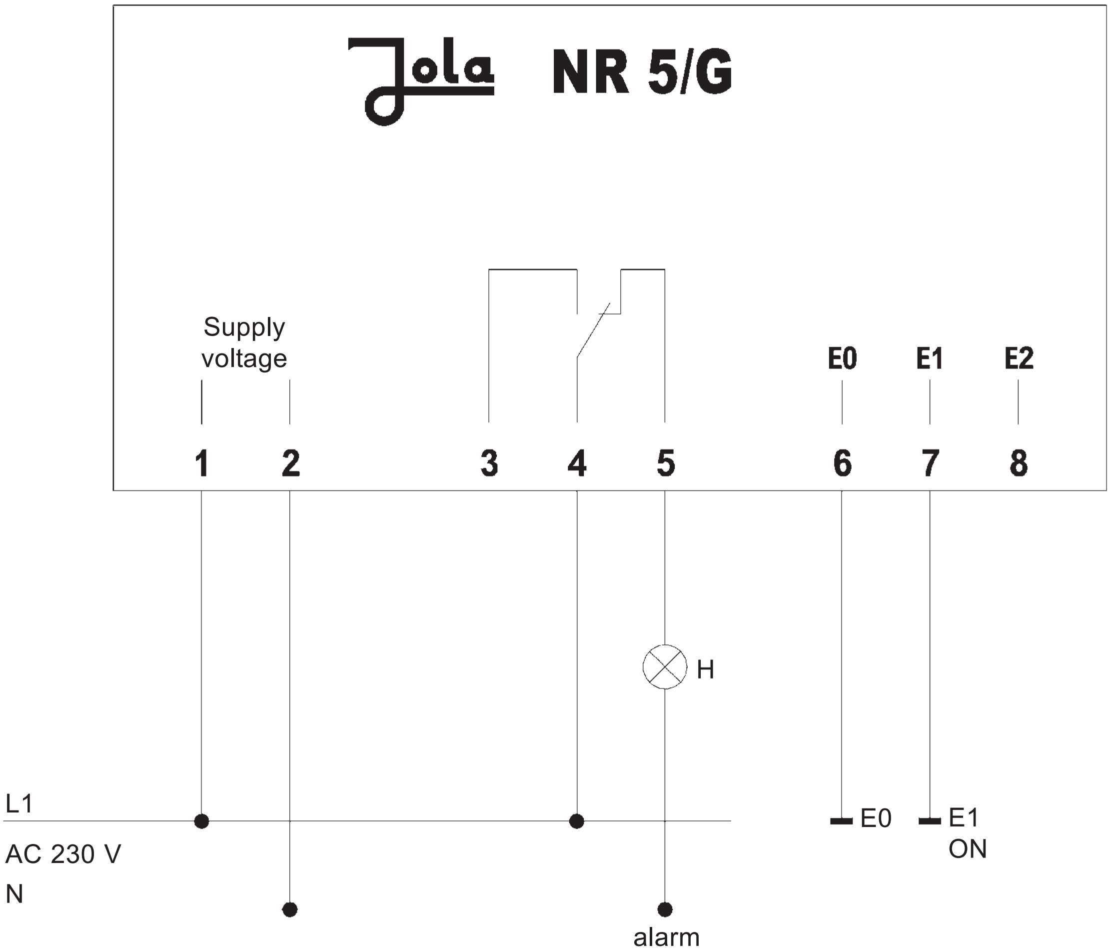
NR 5/G electrode relay

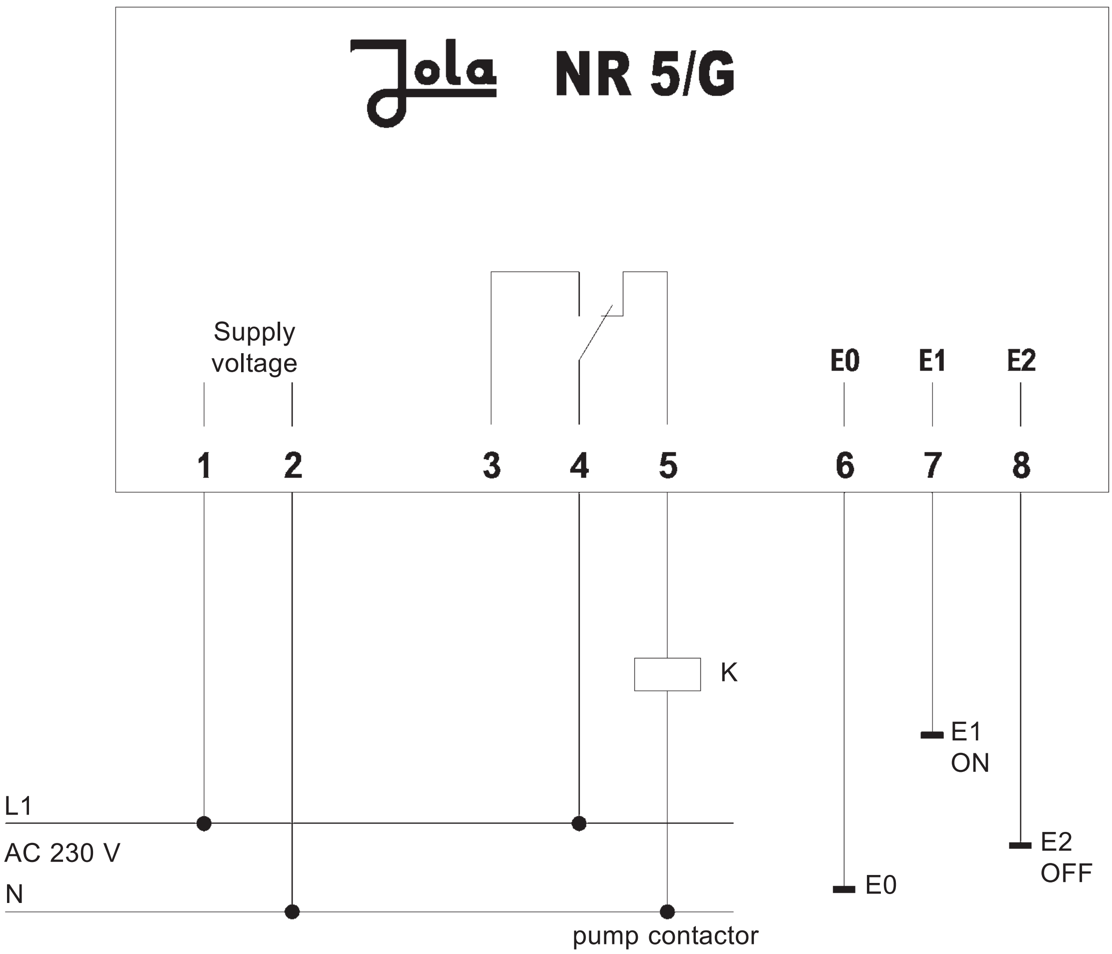
for signalling a limit level or for level control

Electrode relay in surface-mount housing, with transparent cover and with 2 built-in LEDs (inside the housing) for signalling the respective switching status

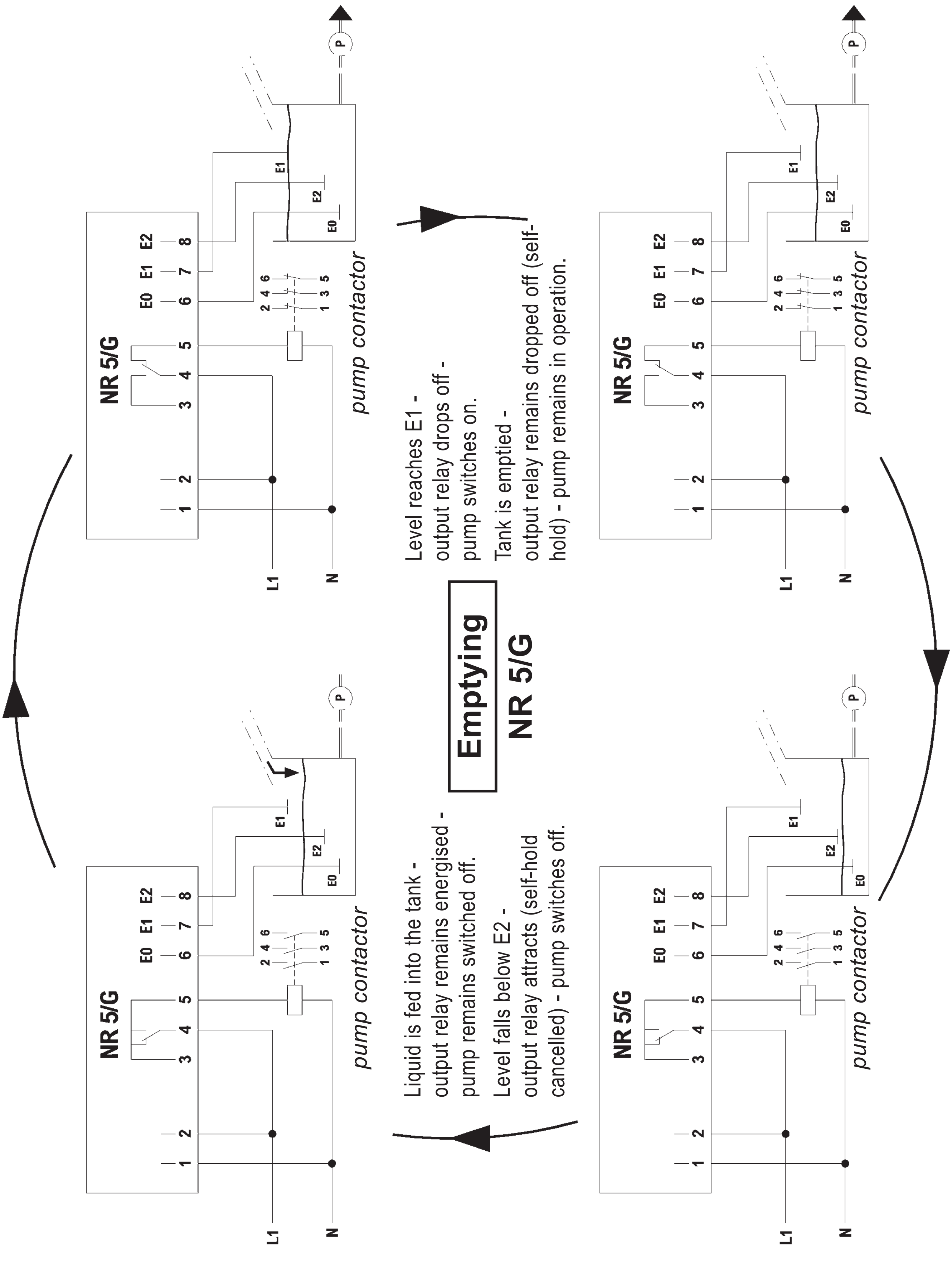
Technical data	**NR 5/G**
Alternative supply voltages: (AC versions: terminals 1 and 2; DC versions: - terminal 1: –, - terminal 2: +)	- AC 230 V (supplied if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Electrode circuit (terminals 6, 7, 8)	3 terminals (with safety extra low voltage SELV), acting on 1 output relay with self-hold
- no-load voltage	9 V_{eff} 10 Hz (safety extra low voltage SELV)
- short-circuit current	max. 0.5 mA_{eff}
- response sensitivity	approx. 30 kOhm or approx. 33 µS (electric conductance)
Controlled circuit (terminals 3, 4, 5)	**1 single-pole potential-free changeover contact with self-hold**
Functioning	**based on the quiescent current principle**
Switching status indicators	1 green LED, lights when output relay is energised 1 red LED, lights when output relay is not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 screw connections
Connection	internal terminals
Protection class	IP 54
Mounting	using 4 screws
Mounting orientation	any
Temperature application range	from - 20°C to + 60°C
Max. cable length between electrode relay and electrode(s)	**1,000 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.

Connection diagrams



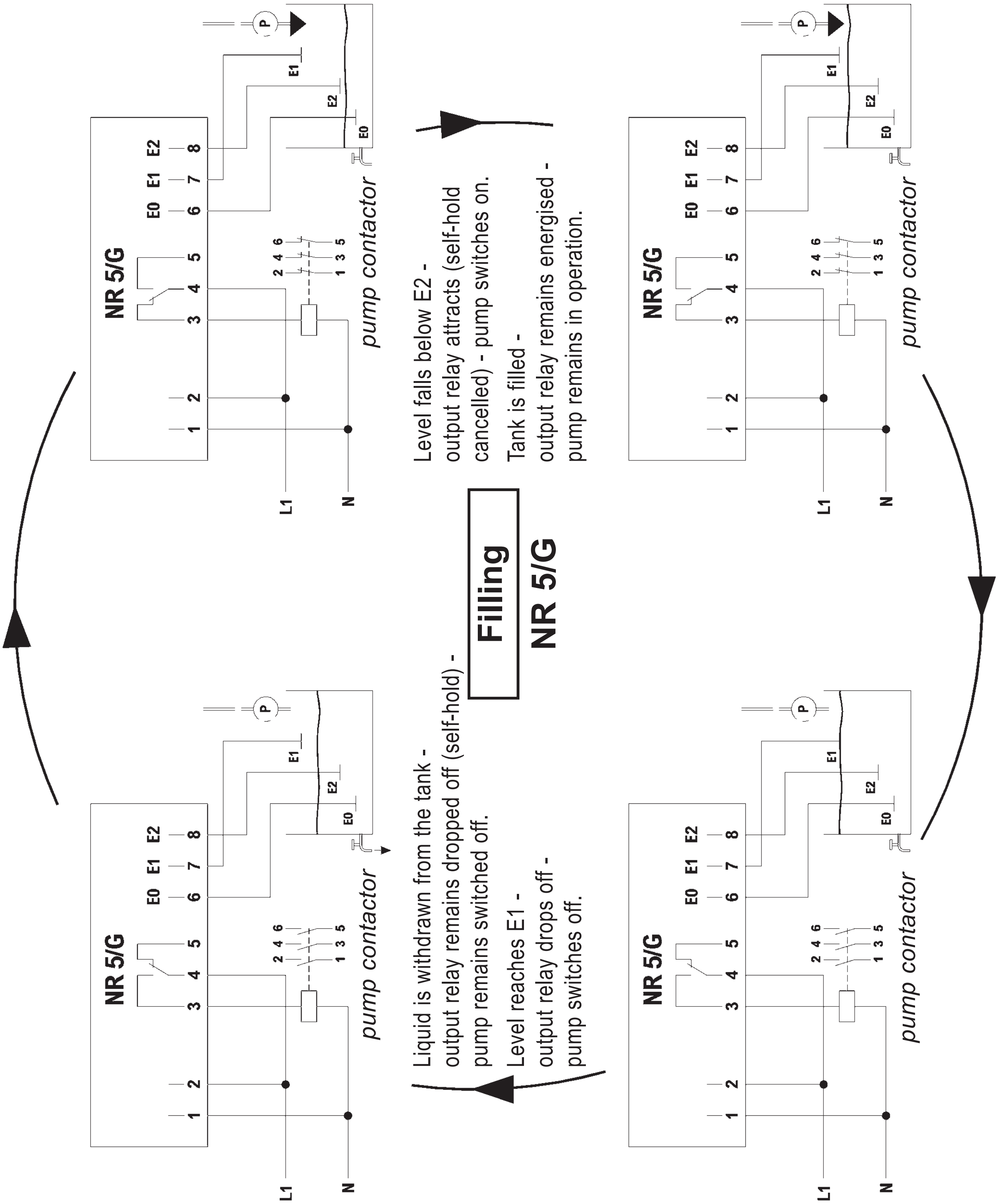


Output contact shown in no-current condition of the relay



N.B.

The connection of electrodes E0, E1 and E2 to the NR 5/G electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.



N.B.

The connection of electrodes E0, E1 and E2 to the NR 5/G electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.

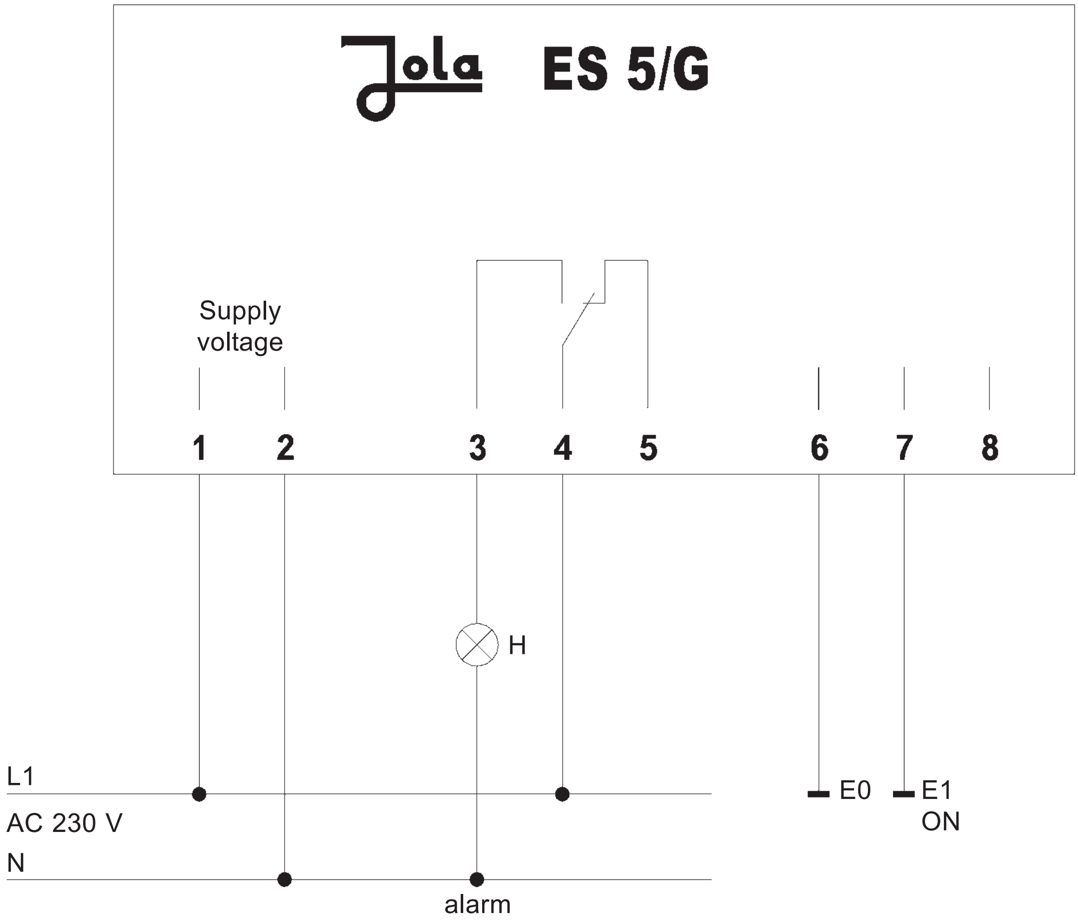
ES 5/G electrode relay

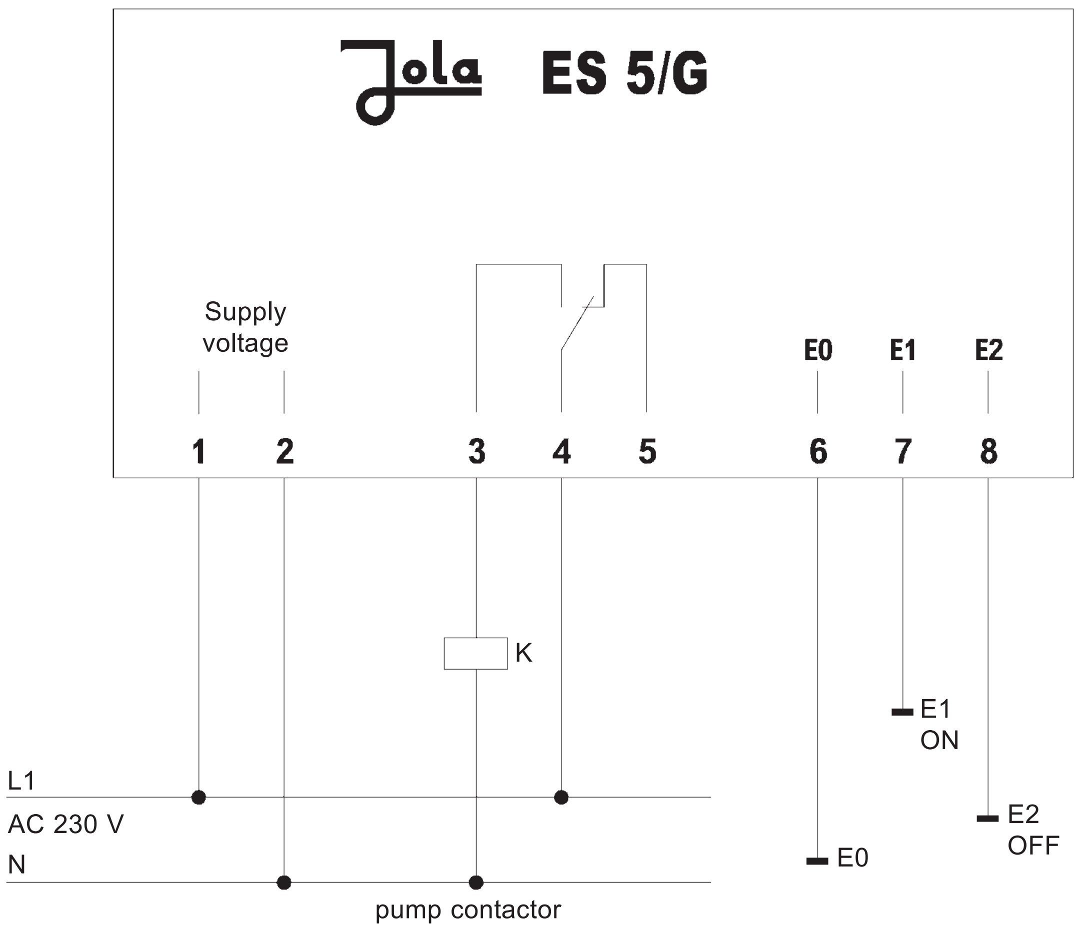
for signalling a limit level or for level control

Electrode relay in surface-mount housing, with transparent cover, mains monitoring indicator and switching status indicator inside the housing

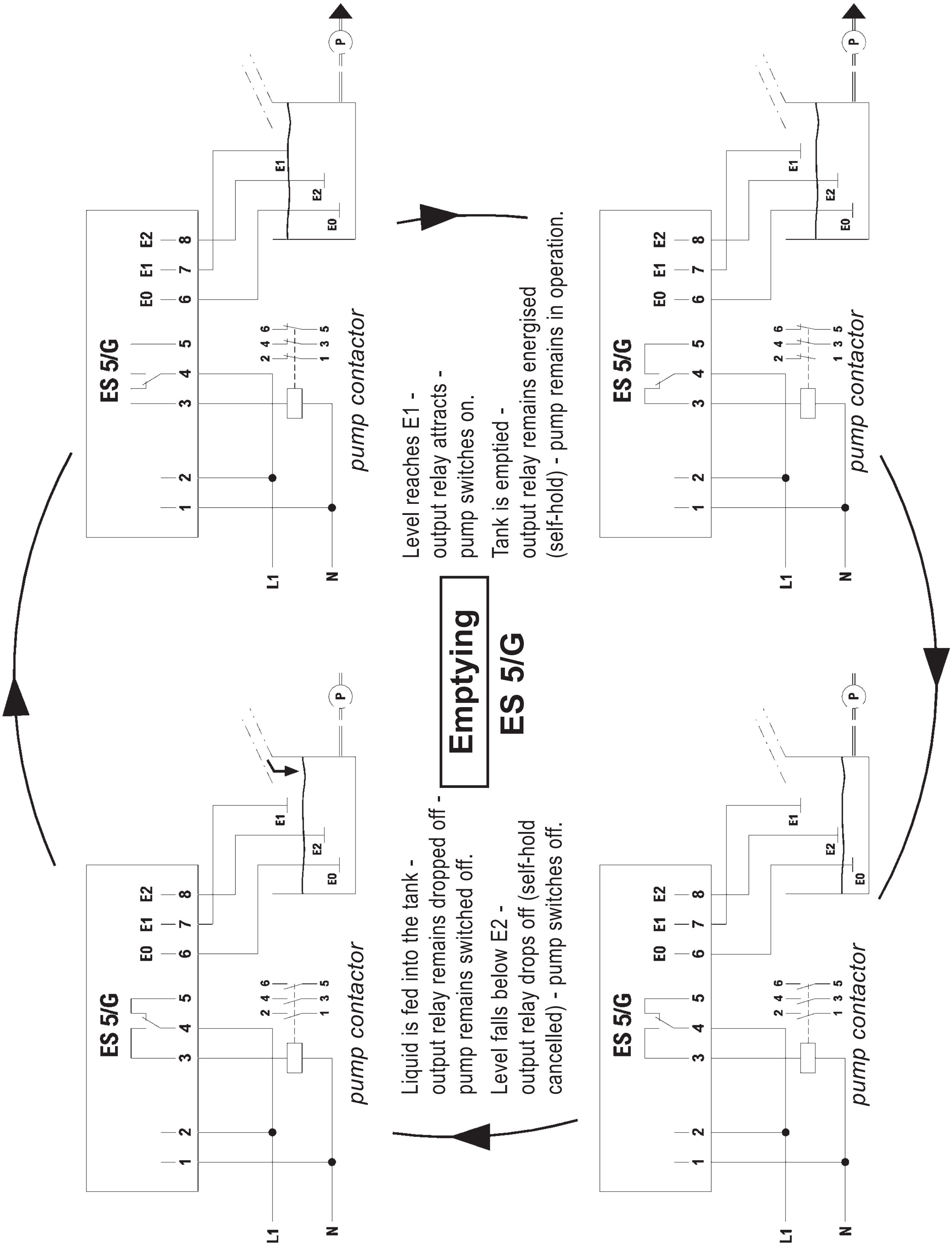
Technical data	**ES 5/G**
Alternative supply voltages (terminals 1 and 2)	- AC 230 V (supplied if no other supply voltage is specified in the order) - AC 240 V or - AC 115 V or - AC 24 V or - further AC supply voltages on request
Mains monitoring indicator	1 green LED
Power input	approx. 3 VA
Electrode circuit (terminals 6, 7, 8)	3 terminals (with safety extra low voltage SELV), acting on 1 output relay with self-hold
- no-load voltage - short-circuit current - response sensitivity	approx. AC 22 V (safety extra low voltage SELV) approx. 2 mA approx. 30 kOhm or approx. 33 µS (electric conductance)
Controlled circuit (terminals 3, 4, 5)	**1 single-pole potential-free changeover contact with self-hold**
Functioning	**based on the working current principle**
Switching status indicator	1 red LED, lights when output relay is energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 screw connections
Connection	internal terminals
Protection class	IP 54
Mounting	using 4 screws
Mounting orientation	any
Temperature application range	from - 20°C to + 60°C
Max. cable length between electrode relay and electrode(s)	**100 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.

Connection diagrams



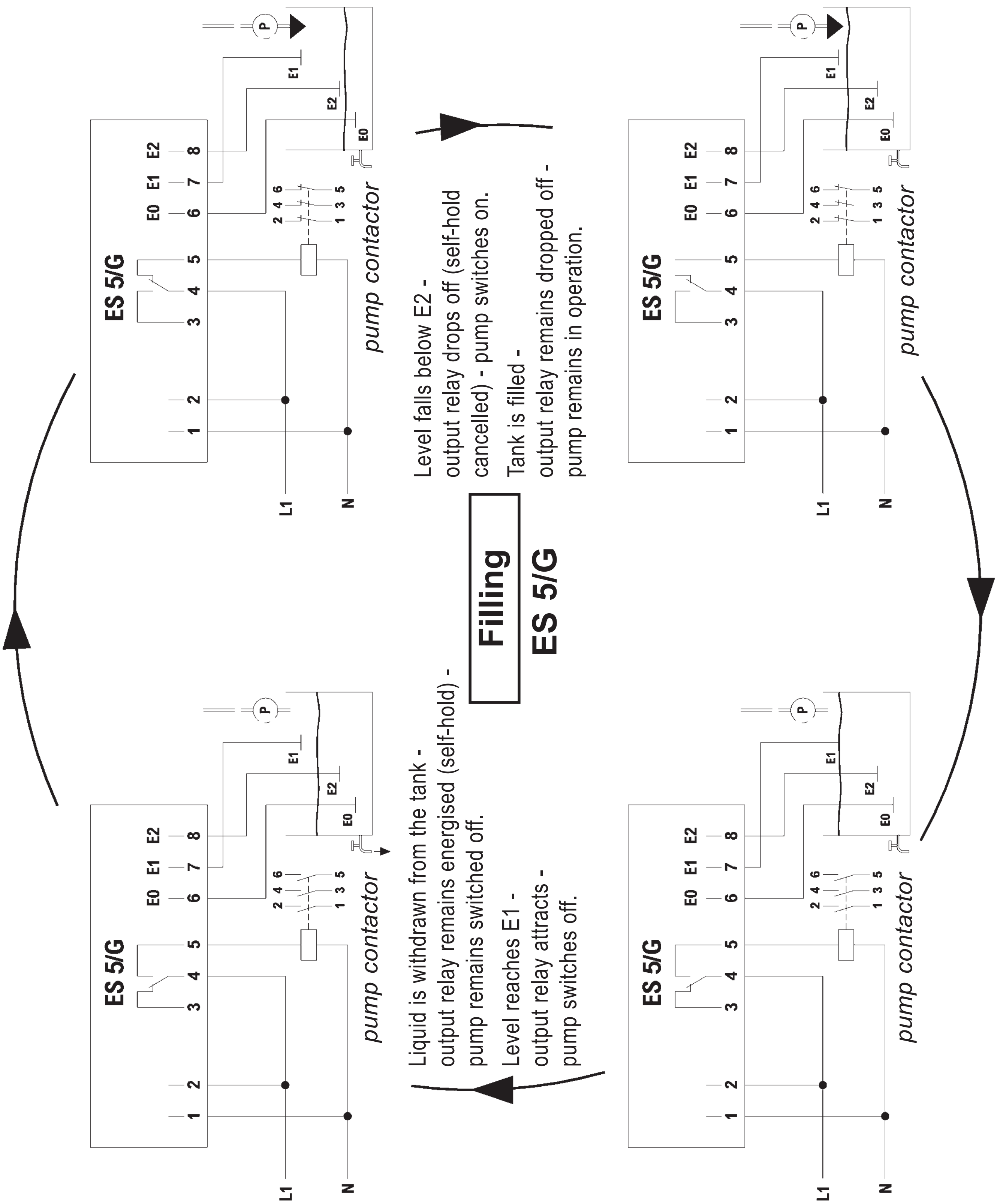


Output contact shown in no-current condition of the relay



N.B.

The connection of electrodes E0, E1 and E2 to the ES 5/G electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.



N.B.

The connection of electrodes E0, E1 and E2 to the ES 5/G electrode relay is always the same. The function selection “Emptying” or “Filling” is made on the basis of the terminal assignment chosen at the relay output.

ER 53 electrode relay

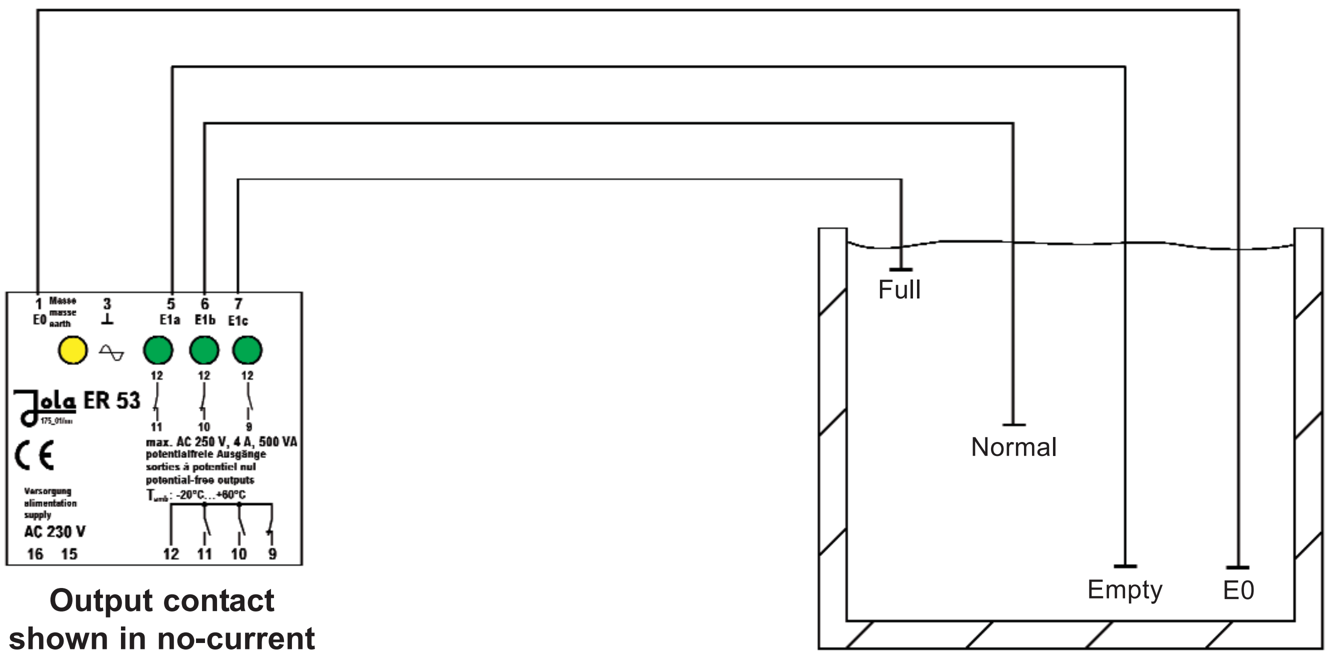
for signalling 3 limit levels

Electrode relay for U-bar mounting or surface mounting, with connection terminals on top of housing, with mains monitoring indicator and with 3 built-in LEDs for signalling the activation of the 3 inputs.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. It is suitable for use in clean environments only.

Technical data	**ER 53**
Alternative supply voltages: (AC versions: terminals 15 and 16; DC versions: - terminal 15: –, - terminal 16: +)	– AC 230 V (supplied if no other supply voltage is specified in the order) or – AC 240 V or – AC 115 V or – AC 24 V or – DC 24 V or – DC 12 V or (DC 24 V and DC 12 V: in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application) – further supply voltages on request
Mains monitoring indicator	1 yellow LED
Power input	approx. 3 VA
Electrode circuit (terminals 1, 5, 6, 7)	4 terminals (with safety extra low voltage SELV), acting on 3 output relays without self-hold
– no-load voltage	9 V_{eff} 10 Hz (safety extra low voltage SELV)
– short-circuit current	max. 0.5 mA_{eff}
– response sensitivity	approx. 30 kOhm or approx. 33 µS (electric conductance)
Controlled circuit (terminals 9, 10, 11, 12)	**2 make (NO) contacts (terminals 10 and 11) and 1 break (NC) contact (terminal 9) with common root contact (terminal 12)**
Functioning	**based on the working current principle**
Switching status indicators	3 green LEDs light correspondingly to the activation of the electrode inputs E1, E2 and E3 (each time when a conductive path is created between the rod of the earth electrode E0 and the non-insulated electrode rod sensor surface of a control electrode)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022 or fastening via 2 boreholes
Mounting orientation	any
Temperature application range	from – 20°C to + 60°C
Max. cable length between electrode relay and electrode(s)	**1,000 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.

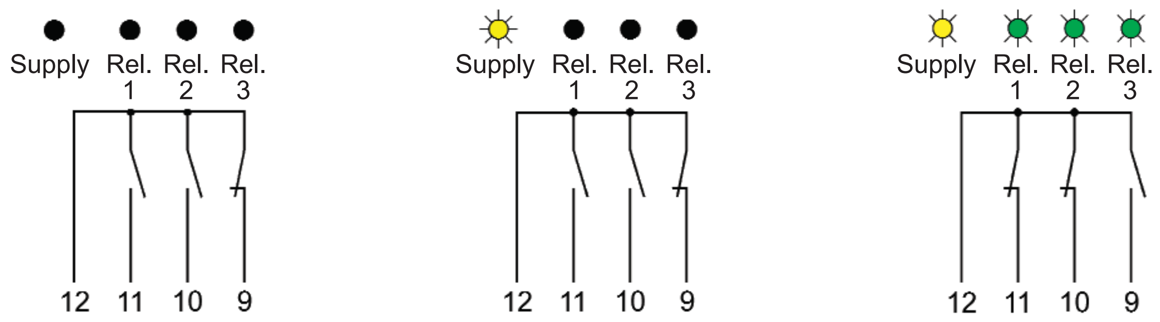
Application example: ER 53 with a 4-rod electrode for signalling 3 limit levels



Output contact shown in no-current condition of the relay

<u>Relevant information:</u>
When several electrode relays are used for automatic level control or signalling in the same tank, the earth electrode E0 may only be connected to <u>one</u> electrode relay. The other electrode relays are to be connected to each other via their earth terminal (terminal 3 for NR 5 and ER 53 or terminal 2 for NR 3) as shown on pages 7-1-19/20 and 7-1-25/26. It is important to note that only a maximum of 8 inputs can be used.
<u>The protective ground must never be connected to terminal 2 or 3!</u>

Position of output contacts of the ER 53 electrode relay



LEDs dark:

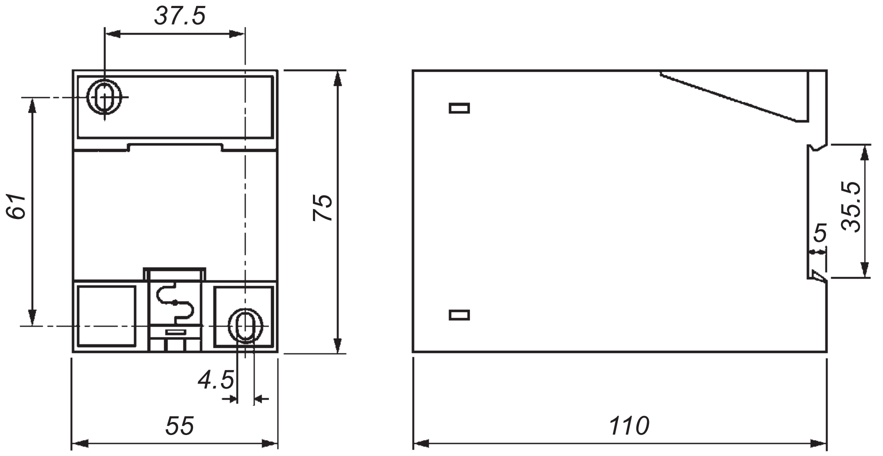
electrode relay without voltage

yellow LED lights, green LEDs dark:
electrode relay under voltage, electrodes dry (tank empty)

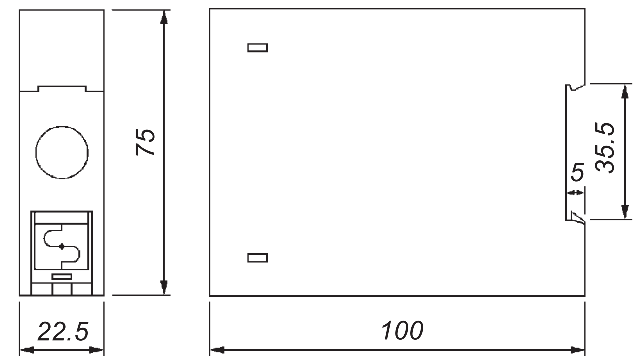
yellow LED lights, green LEDs light:
electrode relay under voltage, electrodes wet (tank full)

Dimensional drawings

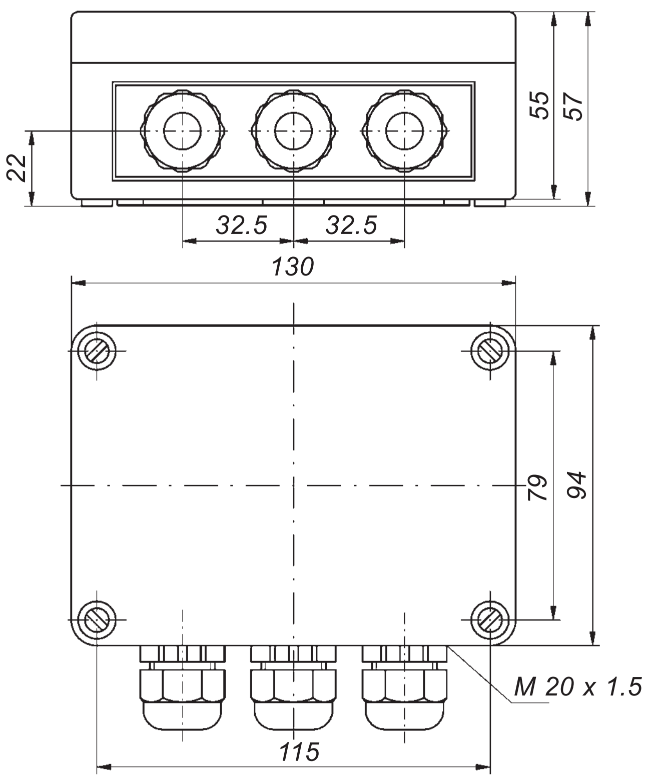
NR 5, NR 5 A, ER 53



NR 3, NR 3 A



NR 5/G, ES 5/G



“Pumpswitch” floor electrode

with integrated evaluation electronics and relay output

The Jola “Pumpswitch” device is a conductive floor electrode with integrated evaluation electronics and a delayed switch-off power relay for the direct switching of a flat suction pump.

- Pump switches on from a water level of 3 mm
- If the water level falls below 3 mm, the pump switches off again after a preset shutoff delay
- Connection via three-wire cable:
  - brown: power supply L1
  - black: switching wire for the pump
  - blue: joint reference conductor N
- Reliable galvanic separation of the contactable electrodes:
  - due to creepage and air distances ≥ 8 mm
  - due to safety transformer and safety relay with a voltage resistance ≥ 4 kV

“Pumpswitch” floor electrode with integrated evaluation electronics and relay output

"Pumpswitch" with mounting stand

View from below (looking at the electrode plates)

Mode of operation

The "Pumpswitch" floor electrode is equipped with two integral single electrodes in the form of two electrode plates: 1 control electrode and 1 earth electrode.

In the electrode housing, there is an evaluation electronics device with output relay with a switching contact which is looped into the pump circuit. As soon as an electrically conductive liquid creates a conductive connection between the two electrode plates, the built-in output relay in the electrode housing is switched on. The output relay operates on the working current principle: in other words, the relay is energised when the electrodes are wet. Once the electrodes are free again after the liquid has been pumped off, the output relay switches off again after a preset time delay.

The electrode circuit is reliably galvanically separated from the supply voltage and the pump circuit.

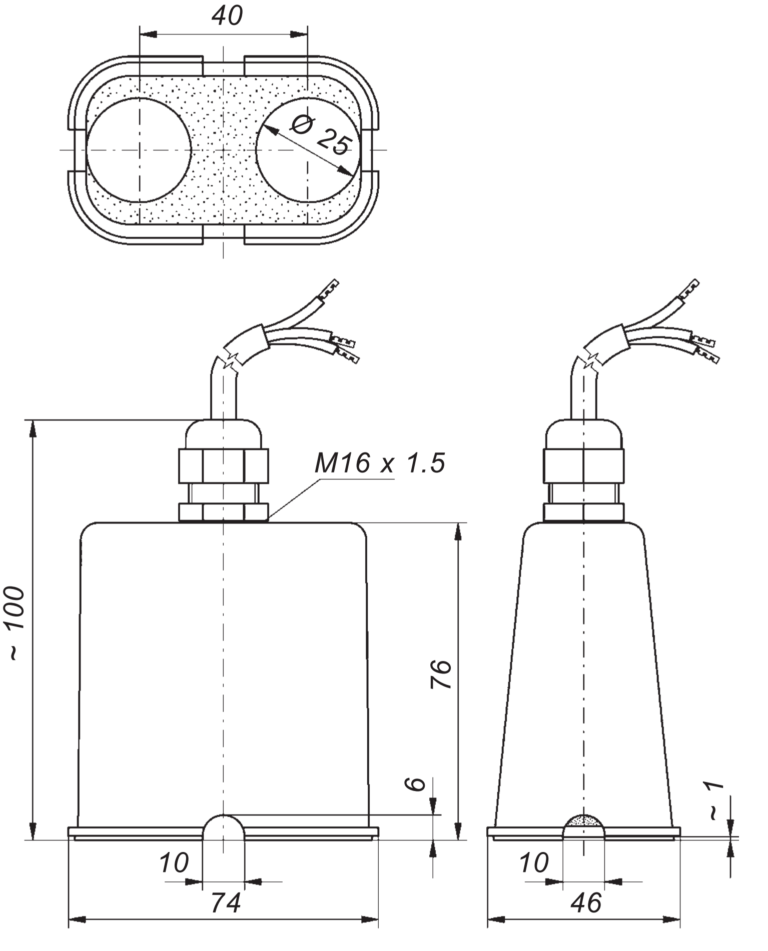
Important notes to ensure safe use

You have to ensure that the rated output of the pump to be switched does not exceed the switching capacity of the integrated output relay.

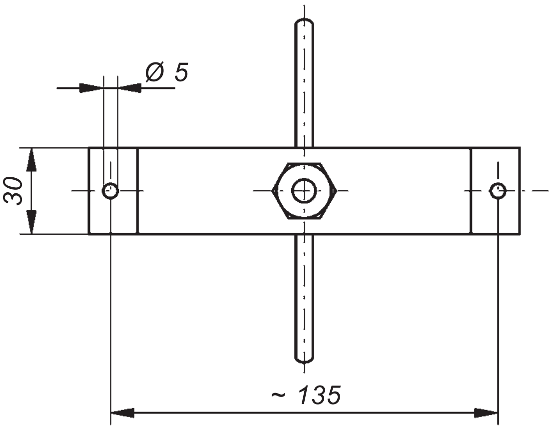
In order to ensure that the unit works as desired, the floor electrode may only be used in cases in which the electrode plates are free again once the liquid has been pumped off. Electrically conductive residues caused by such things as sludge can result in permanent activation of the floor electrode.

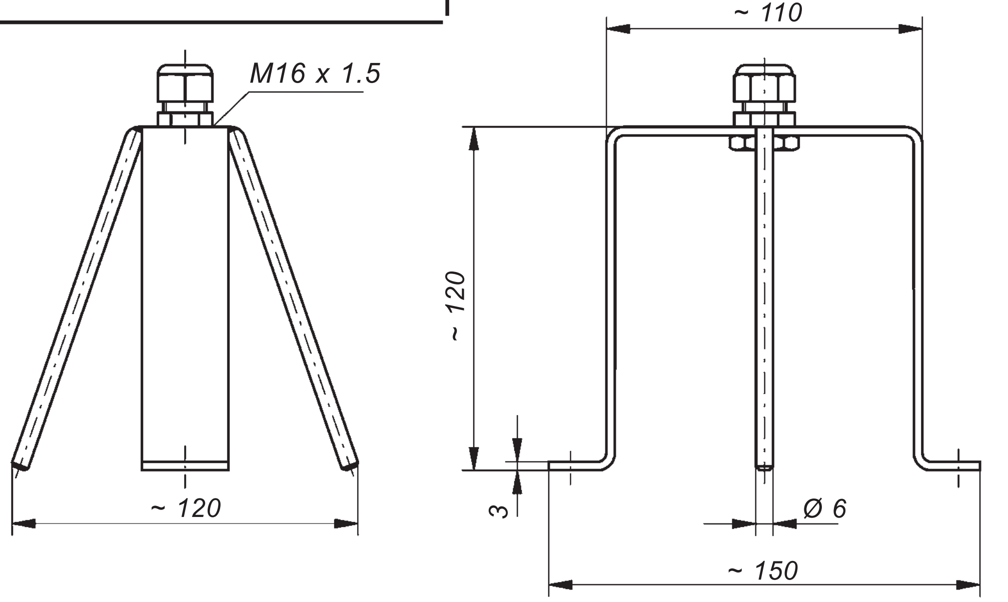
The floor electrode may not be used in aggressive liquids that attack the electrode plates, the electrode housing or the connecting cable.

Technical data	**“Pumpswitch”**
Area of application	for the direct switching of a flat suction pump if a water level rises above a preset low level
Electrode plates	2 electrode plates made of stainless steel 316 Ti
Response height	3 mm
Housing	PP and cast resin
Weight of electrode	approx. 300 g
Electrical connection	H05RN-F cable, 3 x 0.75; length 2 m, other length on request
Supply voltage (to brown and blue)	AC 230 V; other supply voltage on request
Power requirements of integrated electronics	approx. 3 VA
Electrode circuit:	
Electrode voltage	approx. 10 V_{eff} 50 Hz
Electrode current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)
Galvanic separation	air and creepage distances ≥ 8 mm; voltage resistance ≥ 4 kV
Pump circuit (to black and blue):	
Performance data of the looped relay contact	max. 4 (2) A, max. 500 VA; other values on request
Shutoff delay	to be defined when ordering: between 5 seconds and 90 seconds
Temperature application range	from - 20°C to + 60°C, higher temperature on request
Mounting accessory	mounting stand made of stainless steel 316 Ti (optional)
Protection class	IP 68
Operating position	upright on the floor or suspended in a mounting stand
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.



Option:
mounting stand made of
stainless steel 316 Ti
(diagrams with smaller
scale compared to
adjacent drawings)





The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Ex electrode controls

Conductive controlling devices for level signalling or regulation of electrically conductive liquids

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The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Ex electrode controls

Table of contents

General information on electrode controls

for level signalling or regulation of electrically conductive liquids

1. Operating principle

Electrode controls are used for the automatic control of pumps or electromagnetic valves as well as overflow or run-dry protection in wells or tanks with electrically conductive liquids.

The liquid levels are monitored by electrodes which give switching commands to the electronic relay if they come into contact with the liquid.

For a two-point control system, you require two control electrodes and one ground electrode.

If you only wish to signal a liquid level, the control electrode E1 and the ground electrode will suffice.

You can also use a metallic, conductive tank wall as a ground connection in place of the ground electrode.

However, we recommend the use of a separate ground electrode in all cases.

2. Recommendations for the use of control electrodes

The conductive liquid to be controlled should have a specific conductivity of min. 50 µS/cm. The specific conductivity of tap water is usually set in a range from 100 µS/cm to 1,000 µS/cm.

3. Recommendations for the design of the electrodes

- **Highly conductive liquids:** if there is sufficient space, we advise you to use **several single electrodes** at a spacing of approx. 100 mm instead of a multiple electrode.
- **Poorly conductive liquids:** if electrodes are used in poorly conductive liquids, the electrode rods should be mounted as close as possible to one another. For these applications, we recommend the use of a **multiple electrode** in place of several single electrodes.

4. Electrode controls can or should not be used:

- in electrically non-conductive liquids (e.g. in mineral oils)
- in mushy or viscous liquids
- in liquids with a tendency to foam (e.g. possibly washing sodas etc.)
- in liquids with a high level of steam generation and condensate (e.g. at higher temperatures)
- in liquids with a tendency to form deposits (e.g. in limestone milk, oily waste water etc.)
- in liquids with solid particles (e.g. pieces of wood, remnant etc.)

The conductive measuring principle

The conductive measuring principle is used for the detection of **electrically conductive liquids**.

It is not suitable for the detection of electrically non-conductive liquids (e.g. oils, diesel, fuel oil, demineralised water ...).

Electrically conductive liquids are generally aqueous solutions of salts, acids or alkalis. The molecules of these substances dissociate in water into positive and negative ions which give the aqueous solution its electrical conductivity. The Ex electrode controls consist of the combination of a conductive Ex electrode, an obligatory Ex connection box and a conductive Ex electrode relay. This combination detects the presence of an electrically conductive liquid at the Ex electrodes, and an alarm signal is then emitted.

The measurement process uses alternating current to ensure exact response sensitivity and to prevent galvanic processes at the electrodes.

Examples of electrically conductive liquids

Accumulator acid, 32 %
Acetic acid, 70 %
Acrylic acid, 70 %
Adipic acid *
Aluminium chloride *
Aluminium potassium sulphate: see alums
Aluminium salts from mineral acids: see alums
Aluminium sulphate *
Alums (Me(I)-Me(III) sulphates) *
Ammonia water (ammonia solution), 25 %
Ammonium acetate *
Ammonium bromide *
Ammonium carbonate *
Ammonium chloride *
Ammonium fluoride *
Ammonium nitrate *
Ammonium phosphate *
Ammonium sulphate *
Ammonium sulphide, 40 %
Ammonium thiosulphate *
Anodic oxidation bath (HNO_3-30 %, H_2SO_4-10 %)
Anticalcium: see antiliming agent (sulfamic acid)
Antiliming agent (sulfamic acid), 50 g/l of H_20
Aqua regia, nitrohydrochloric acid, 1 : 1

Barium carbonate *
Barium chloride *
Barium hydroxide *
Barium nitrate *
Bicarbonate of ammonia *
Borax (sodium tetraborate) *
Borofluoric acid (tetra boro fluoric acid), 35 %
Bromine water *

Cadmium chloride *
Cadmium sulphate *
Calcium acetate *
Calcium bromide *
Calcium chloride *
Calcium fluoride *
Calcium hydroxide *
Calcium hypochlorite *
Calcium sulphate
Caustic potash solution (potassium hydroxide) *
Caustic soda, 32 %
Chlorine water *
Chloroacetic acid, saturated
Chlorsulfon acid, > 97 %
Chromic acid, 5 %
Chromic sulfuric / acid mixture
Citric acid *
Cupric chloride *
Cupric cyanide *
Cupric nitrate *
Cupric sulphate *

Electroplating bath, $AgNO_3$/KCN
Ethylen diamine tetra acetic acid (trilon B)

Ferric (III) chloride *
Ferrous (II) sulfate
Formaldehyde, 40 %
Formic acid, 80 %

Glycol acid, 50 %

Hydrazine hydrate, 80 %
Hydrobromic acid, aqueous solution *
Hydrochloric acid, 37 %
Hydrofluoric acid (fluohydric acid), 40 %
Hydrogen peroxide, 30 %

Javel water / bleaching lye: see sodium hypochloride

Liquid fertilizer application: see manuring salts

Magnesium chloride *
Magnesium hydroxide carbonate (magnesium carbonate) *
Magnesium sulphate *
Manuring salts / saline manure
Mercury nitrate *
Mercury sulphate *

Naphtalene sulphonic acid *
N-butyric acid, 70 %
Nickel chloride *
Nickel nitrate *
Nitrating acid mixture: see aqua regia, nitrohydrochloric acid
Nitric acid (fuming)
Nitric acid (not fuming), approx. 65 %
Nitrolotriacetic acid (Trilon A) *
Nitrosylsulphuric acid, 30 %

Oleum: see sulfuric acid, fuming

Phenidone (1-Phenyl-3-Pyra-zolidinone)
Phosporic acid, concentrated
Photographic developer, pure
Picric acid *
Potassium bicarbonate *
Potassium borate *
Potassium bromade
Potassium bromide *
Potassium carbonate (potash) *
Potassium chlorate *
Potassium chloride *
Potassium cyanide *
Potassium ferrocyanide and potassium ferricyanide *
Potassium iodide *
Potassium nitrate *
Potassium sulphate *
Propionic acid, 80 %

Salicylic acid *
Silver nitrate, 2 % solution
Sodium acetate *
Sodium aluminium sulphate: see alums
Sodium bisulphite *
Sodium bromide *
Sodium carbonate *
Sodium chlorate *
Sodium chloride *
Sodium cyanide *
Sodium dichromate *
Sodium dithionite *
Sodium hydrogen carbonate *
Sodium hydrogen sulphate *
Sodium hypochlorite (up to 30°C; 150 g/l of active chlor)
Sodium nitrate *
Sodium nitrite *
Sodium peroxide *
Sodium phosphate *
Sodium silicate *
Sodium sulfide *
Sodium sulphate *
Sodium sulphite *
Sodium tetraborate: see Borax
Sodium thiosulphate *
Sulfuric acid, 20 %
Sulfuric acid, 96 - 98 %
Sulfuric acid, fuming (oleum), 65 % SO_3
Sulfurous acid, 5 - 6 % SO_2

Tartaric acid *
Tin(II) chloride *
Trichloracetic acid

Water (tap water)

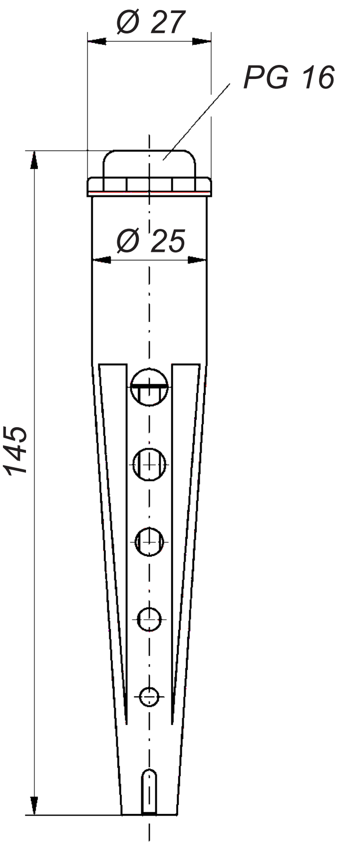
Zinc chloride *
Zinc nitrate *
Zinc sulphate *

* Saturated solution

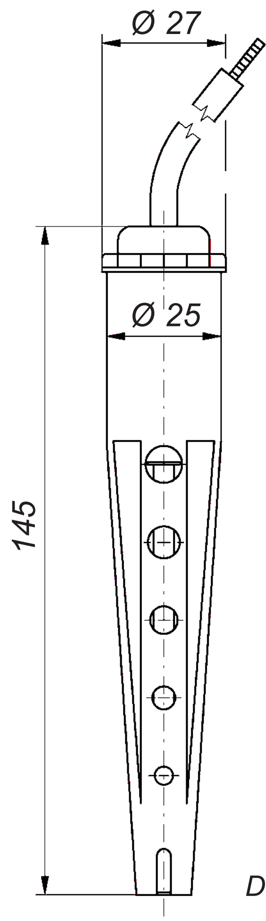
A reliable detection of electrically poor conductive liquids (compared to the above-mentioned liquids) can be achieved by adaption of the sensitivity of the conductive Ex electrode relay in our works (on request).

EL/0/EH./27/1/PP/ED/./Ex-1G
Ⓔx II 2 G Ex ia IIB T6 Gb
conductive Ex suspension electrodes

Technical data	**EL/0/EH/ 27/1/PP/ED/0/Ex-1G**	**EL/0/EHK/NL/ 27/1/PP/ED/1/Ex-1G**
	Ⓔx II 2 G Ex ia IIB T6 Gb	
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2** **EC type examination certificate INERIS 03ATEX0152**	
Design	1 control electrode or 1 ground electrode	
Sensitive element	1 electrode rod made of stainless steel 316 Ti, with 4 mm dia.	
Housing	PP, 27 mm Ø x approx. 145 mm	PP, 27 mm Ø x approx. 145 mm
Electrical connection	connection terminal	cable 1 x 1.5, length 1 m, longer on request
Mounting orientation	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)	



EL/0/EH/27/1/PP/ED/0/Ex-1G II 2 G Ex ia IIB T6 Gb



Dimensions in mm

EL/0/EHK/NL/27/1/PP/ED/1/Ex-1G II 2 G Ex ia IIB T6 Gb

EL/0/SB-1/G1/./ED/ED/0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
conductive Ex rod electrodes

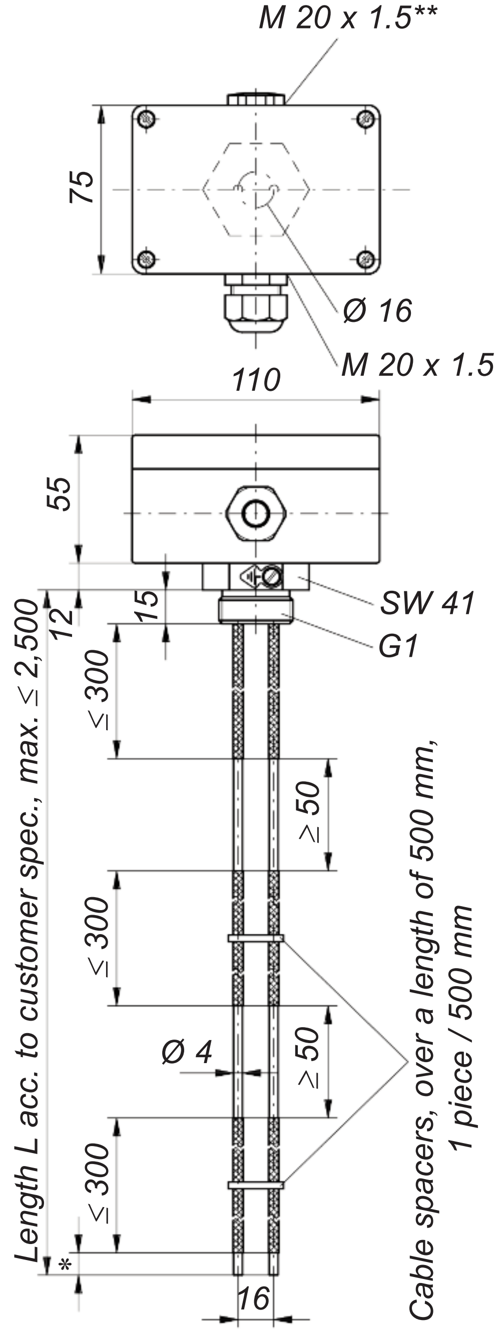
Technical data	**EL/0/SB-1/G1/1/**	**EL/0/SB-1/G1/2/**	**EL/0/SB-1/G1/3/**
	ED/ED/0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb		
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2** **EC type examination certificate INERIS 03ATEX0152**		
Design	1 control electrode or 1 ground electrode	1 control electrode and 1 ground electrode	2 control electrodes and 1 ground electrode
Sensitive element(s)	1 electrode rod	2 electrode rods	3 electrode rods
	made of stainless steel 316 Ti, each with 4 mm dia., covered with PVDF shrinkdown tubing of **max. 300 mm** in length, standard length of each rod: 300 mm, on request: • other materials (e.g. hastelloy) • other lengths		
Max. rod length(s)	2,500 mm		
Screw-in nipple	stainless steel 316 Ti, G1		
Electrical connection	connection box made of glass fibre reinforced antistatic polyester, A 301, 110 x 75 x 55 mm, protection class IP65		
Mounting orientation	vertical		
Temperature range	– 20°C to + 60°C		
Pressure resistance	for pressureless applications only, use only under atmospheric conditions		
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)		

EL/0/SB-1/G1/1/...
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/0/SB-1/G1/2/...
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/0/SB-1/G1/3/...
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/0/SB-1/G1/2/ED/ED/0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb



Dimensions in mm

** 8 % of the electrode rod length, however min. 10 mm*

***** only for***
EL/0/SB-1/G1/2/...
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/0/SZ-1/G1/./ED/ED/1/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
conductive Ex rod electrodes

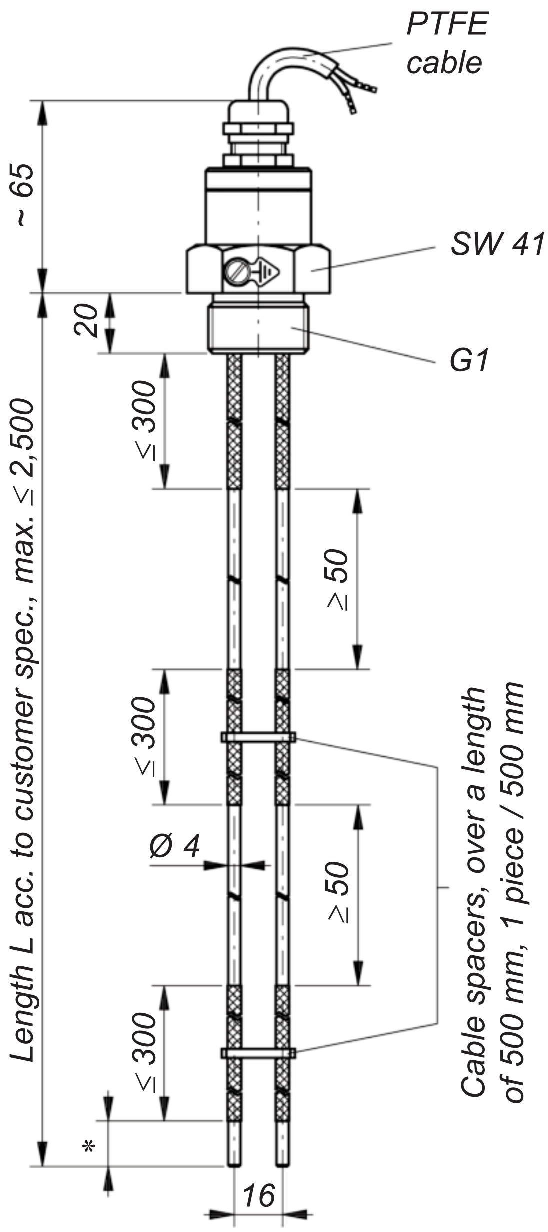
Technical data	EL/0/SZ-1/G1/1/	EL/0/SZ-1/G1/2/	EL/0/SZ-1/G1/3/
	ED/ED/1/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb		
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2** **EC type examination certificate INERIS 03ATEX0152**		
Design	1 control electrode or 1 ground electrode	1 control electrode and 1 ground electrode	2 control electrodes and 1 ground electrode
Sensitive element(s)	1 electrode rod	2 electrode rods	3 electrode rods
	made of stainless steel 316 Ti, each with 4 mm dia., covered with PVDF shrinkdown tubing of **max. 300 mm** in length, standard length of each rod: 300 mm, on request: • other materials (e.g. hastelloy) • other lengths		
Max. rod length(s)	2,500 mm		
Screw-in nipple	stainless steel 316 Ti, G1		
Electrical connection	connection head made of stainless steel 316 Ti with cable entry made of brass, protection class IP68, with free connecting cable made of PTFE, length 2 m, longer on request		
Mounting orientation	vertical		
Temperature range	– 20°C to + 60°C		
Pressure resistance	for pressureless applications only, use only under atmospheric conditions		
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)		

EL/0/SZ-1/G1/1/...
⟨Ex⟩ II 2 G
Ex ia IIC T6 Gb

EL/0/SZ-1/G1/2/...
⟨Ex⟩ II 2 G
Ex ia IIC T6 Gb

EL/0/SZ-1/G1/3/...
⟨Ex⟩ II 2 G
Ex ia IIC T6 Gb

EL/0/SZ-1/G1/2/ED/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIC T6 Gb



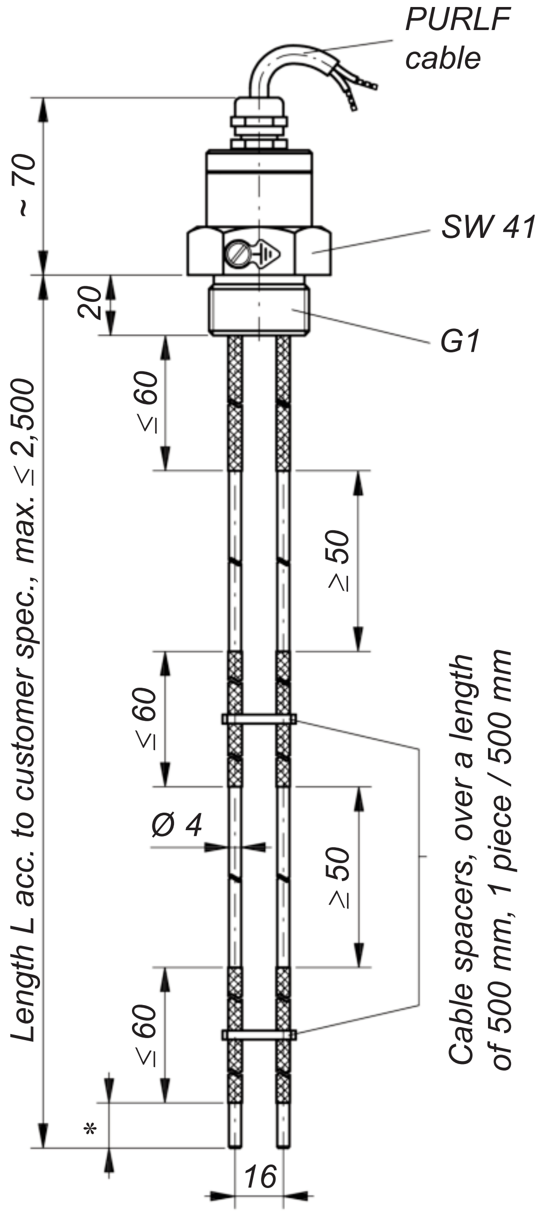
Dimensions in mm

** 8 % of the electrode rod length, however min. 10 mm*

EL/0/SZ-0/G1/./ED/ED/1/Ex-0G
⟨Ex⟩ II 1 G Ex ia IIC T6 Ga
conductive Ex rod electrodes

Technical data	EL/0/SZ-0/G1/1/	EL/0/SZ-0/G1/2/	EL/0/SZ-0/G1/3/
	ED/ED/1/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIC T6 Ga		
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 0, 1 or 2** **EC type examination certificate INERIS 03ATEX0152**		
Design	1 control electrode or 1 ground electrode	1 control electrode and 1 ground electrode	2 control electrodes and 1 ground electrode
Sensitive element(s)	1 electrode rod	2 electrode rods	3 electrode rods
	made of stainless steel 316 Ti, each with 4 mm dia., covered with PVDF shrinkdown tubing of **max. 60 mm** in length, standard length of each rod: 300 mm, on request: • other materials (e.g. hastelloy) • other lengths		
Max. rod length(s)	2,500 mm		
Screw-in nipple	stainless steel 316 Ti, G1		
Electrical connection	connection head made of stainless steel 316 Ti with cable entry made of brass, protection class IP68, with free connecting cable made of antistatic PURLF (with external conductive PUR sheath), length 2 m, longer on request		
Mounting orientation	vertical		
Temperature range	– 20°C to + 60°C		
Pressure resistance	for pressureless applications only, use only under atmospheric conditions		
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)		

EL/0/SZ-0/G1/2/ED/ED/1/Ex-0G
Ⓔx II 1 G Ex ia IIC T6 Ga



Dimensions in mm

** 8 % of the electrode rod length, however min. 10 mm*

EL/0/SZ-0/G1/1/...
Ⓔx II 1 G
Ex ia IIC T6 Ga

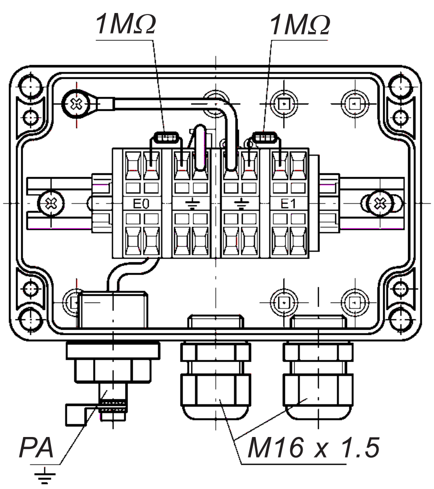
EL/0/SZ-0/G1/2/...
Ⓔx II 1 G
Ex ia IIC T6 Ga

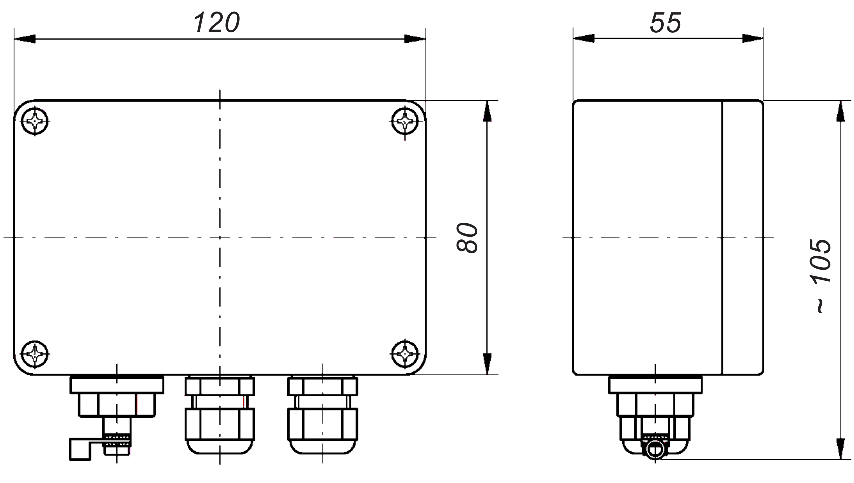
EL/0/SZ-0/G1/3/...
Ⓔx II 1 G
Ex ia IIC T6 Ga

OAK/EL/NR/2x1MΩ
Ex II 2 G Ex ia IIC T6 Gb
obligatory Ex connection box

Technical data	OAK/EL/NR/2x1MΩ Ex II 2 G Ex ia IIC T6 Gb
Application	• for integration of max. 2 electrode rods in the potential equalisation system of the installation • for connection of the intrinsically safe control circuit of the conductive Ex electrode relay to the conductive Ex electrode(s) • for installation in potentially explosive atmospheres in zone 1 or 2 EC type examination certificate INERIS 03ATEX0152
Material	antistatic (conductive) PP
Dimensions	120 x 80 x 55 mm
Cable entries	2 pieces made of plastic
Terminals	4 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes Ø 4 mm
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover



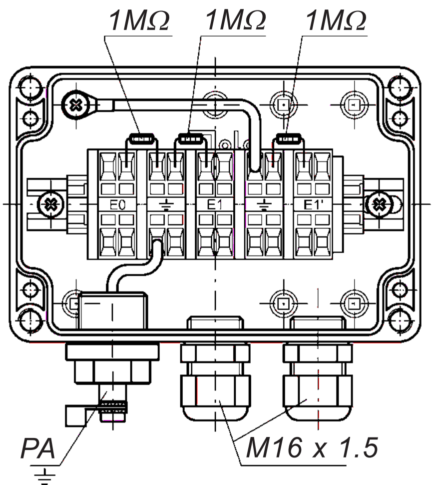


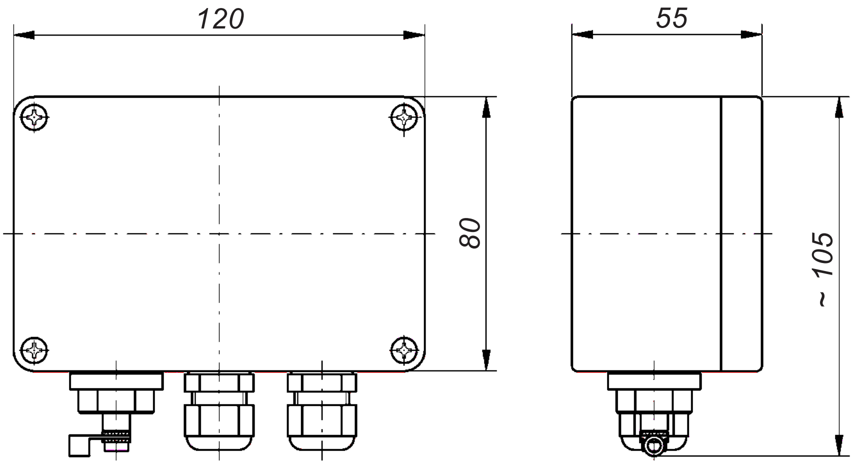
Dimensions in mm

OAK/EL/NR/3x1MΩ
⟨Ex⟩ II 2 G Ex ia IIC T6 Gb
obligatory Ex connection box

Technical data	OAK/EL/NR/3x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb
Application	• for integration of max. 3 electrode rods in the potential equalisation system of the installation • for connection of the intrinsically safe control circuit of the conductive Ex electrode relay to the conductive Ex electrode(s) • for installation in potentially explosive atmospheres in zone 1 or 2 EC type examination certificate INERIS 03ATEX0152
Material	antistatic (conductive) PP
Dimensions	120 x 80 x 55 mm
Cable entries	2 pieces made of plastic
Terminals	5 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes Ø 4 mm
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover





Dimensions in mm

NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC electrode relay

for signalling a limit level or for level controlling

Ex electrode relay for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top of the housing and with 2 built-in LEDs for signalling the respective alarm status.

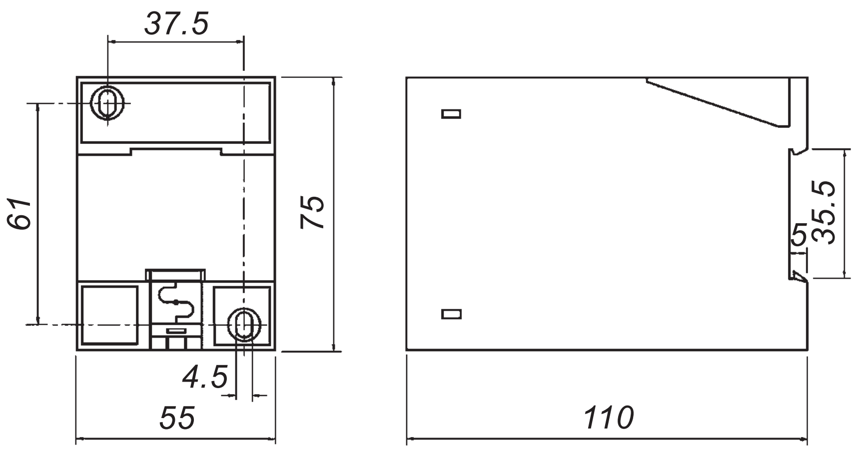
The unit is designed for switch cabinet mounting or installation in a suitable protective housing <u>outside potentially explosive atmospheres</u> and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

The **NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC** electrode relay is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

Ex ia II. T6 G. approved conductive electrodes, such as our types EL/./.../../../../../Ex ⓔx II 2 G or II 1 G Ex ia II. T6 G., may be used in the intrinsically safe control current circuit. **The different application possibilities and the special conditions for safe use are described in the corresponding Installation, Operating and Maintenance Instructions (sent on request).**

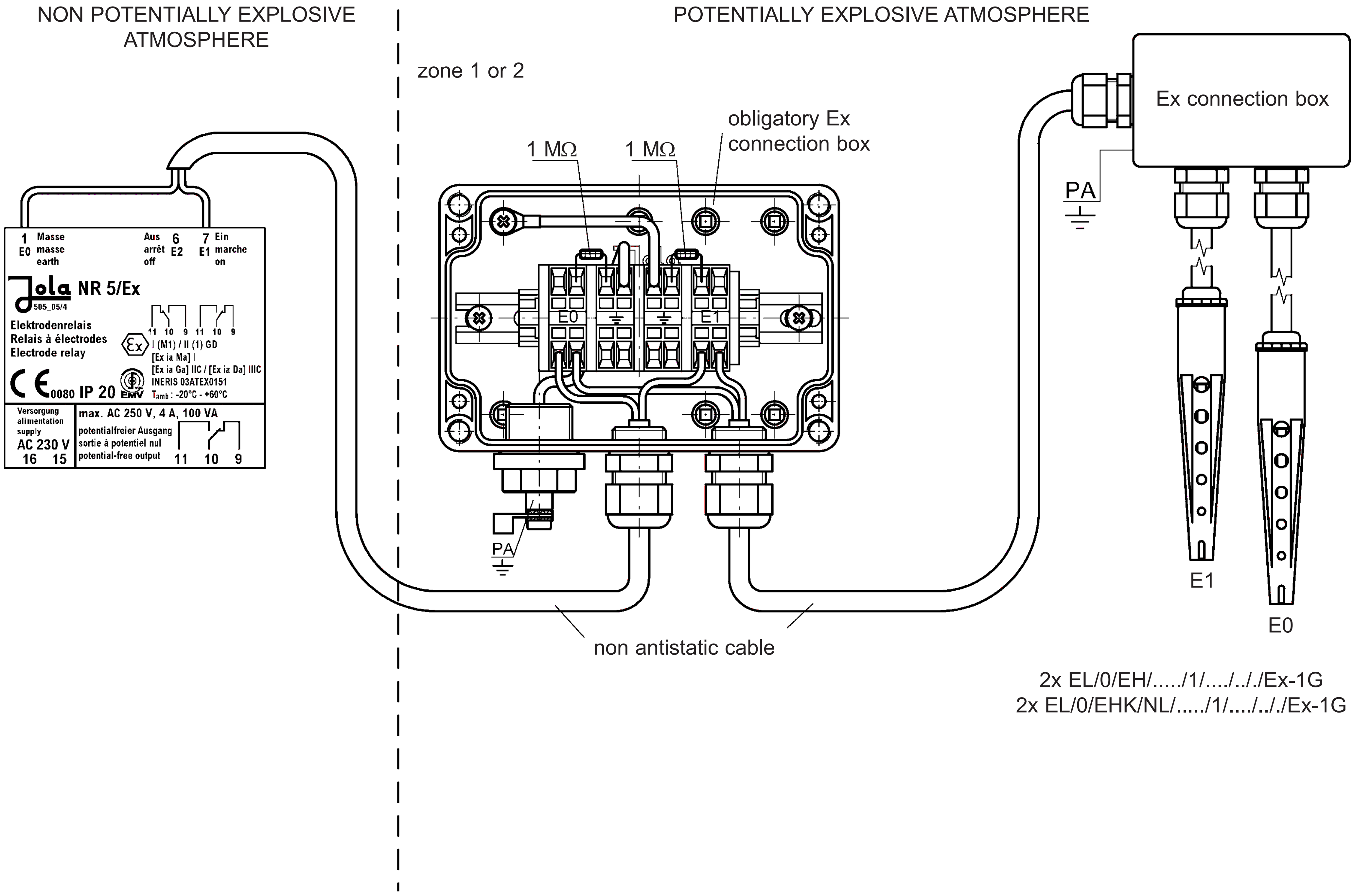
The Ex electrode relay
NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC is based on the **quiescent current principle**: in OK status, the output relay is energised.

The Ex electrode relay
NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC,
Version A is based on the **working current principle:** in OK status, the output relay is not energised.

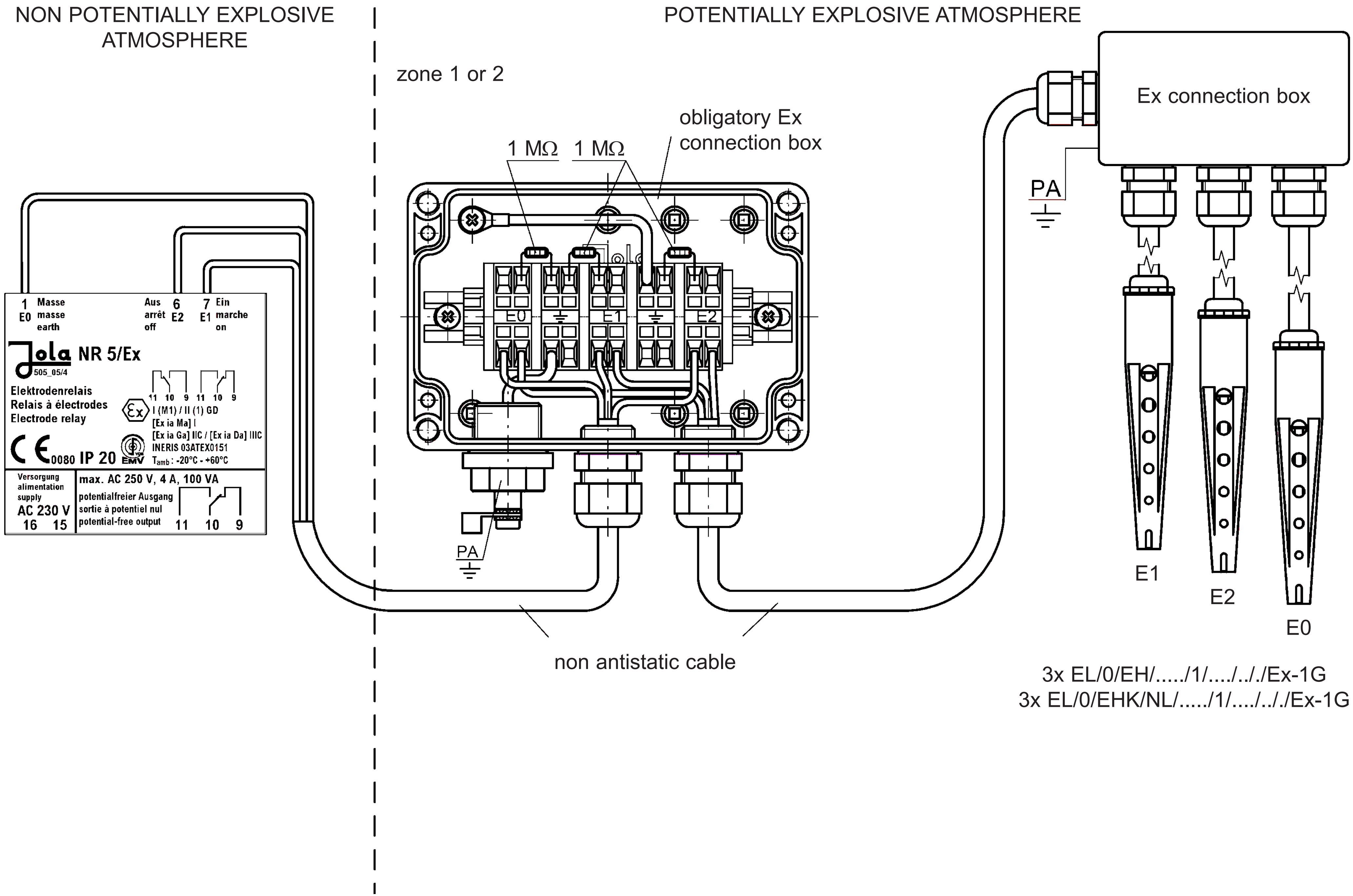


Dimensions in mm

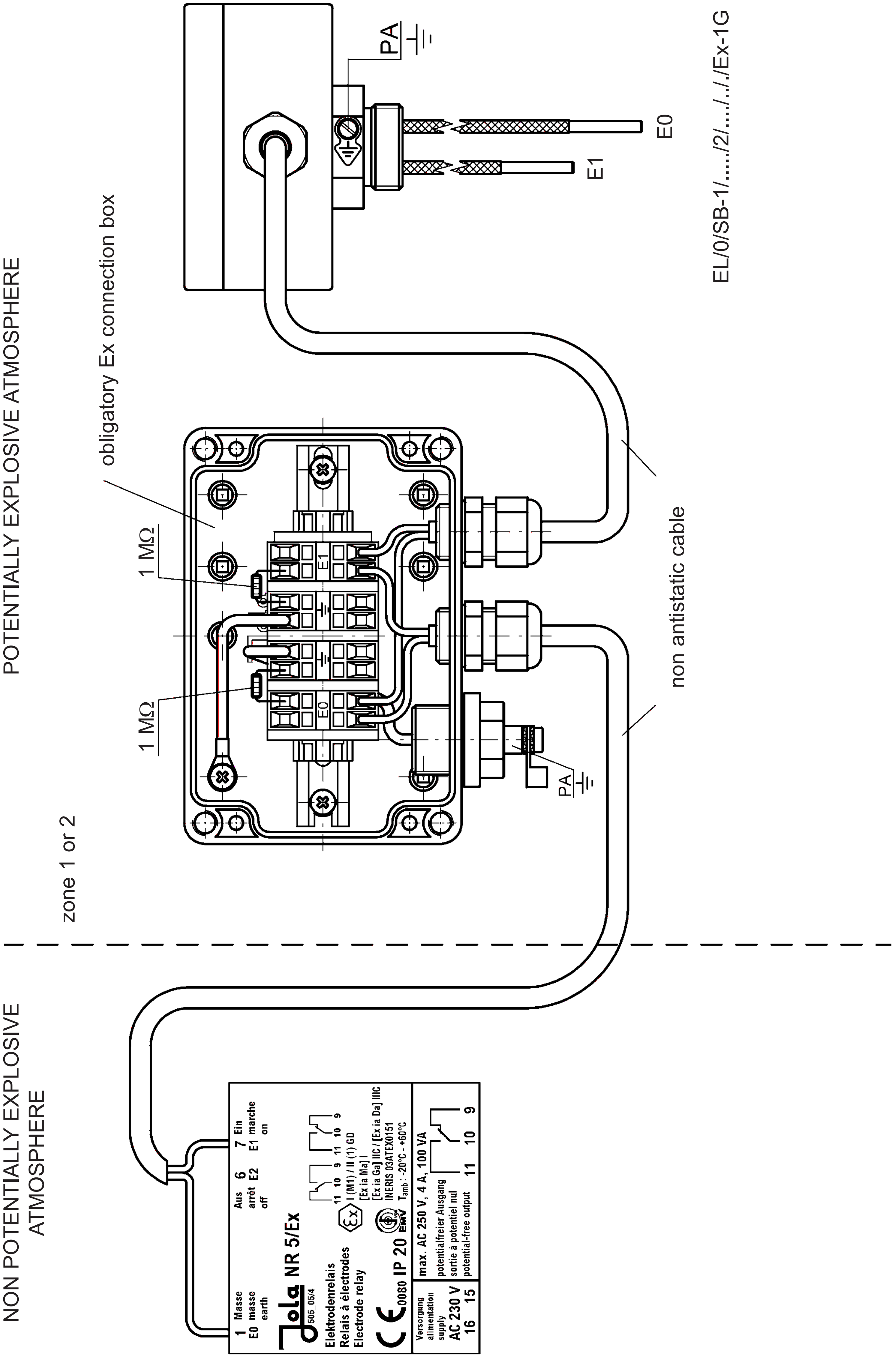
Technical data	**NR 5/Ex ⓔx I (M1) / II (1) GD** | **NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC Version A**
Supply voltage (terminals 15 and 16)	AC 230 V, on request: AC 240 V, AC 115 V, AC 110 V or AC 24 V
Power input	approx. 3 VA
Electrode circuit (terminals 1, 6, 7)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay
No-load voltage	3 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact with self-hold
Functioning	**quiescent current principle** | **working current principle**
Switching status indicators	1 green LED lights when output relay is energised 1 red LED lights when output relay is not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 100 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 7-2-17)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. cable length between Ex electrode relay and Ex electrode	see Installation, Operating and Maintenance Instructions (sent on request)
EC type examination certificate	INERIS 03ATEX0151
CEM	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

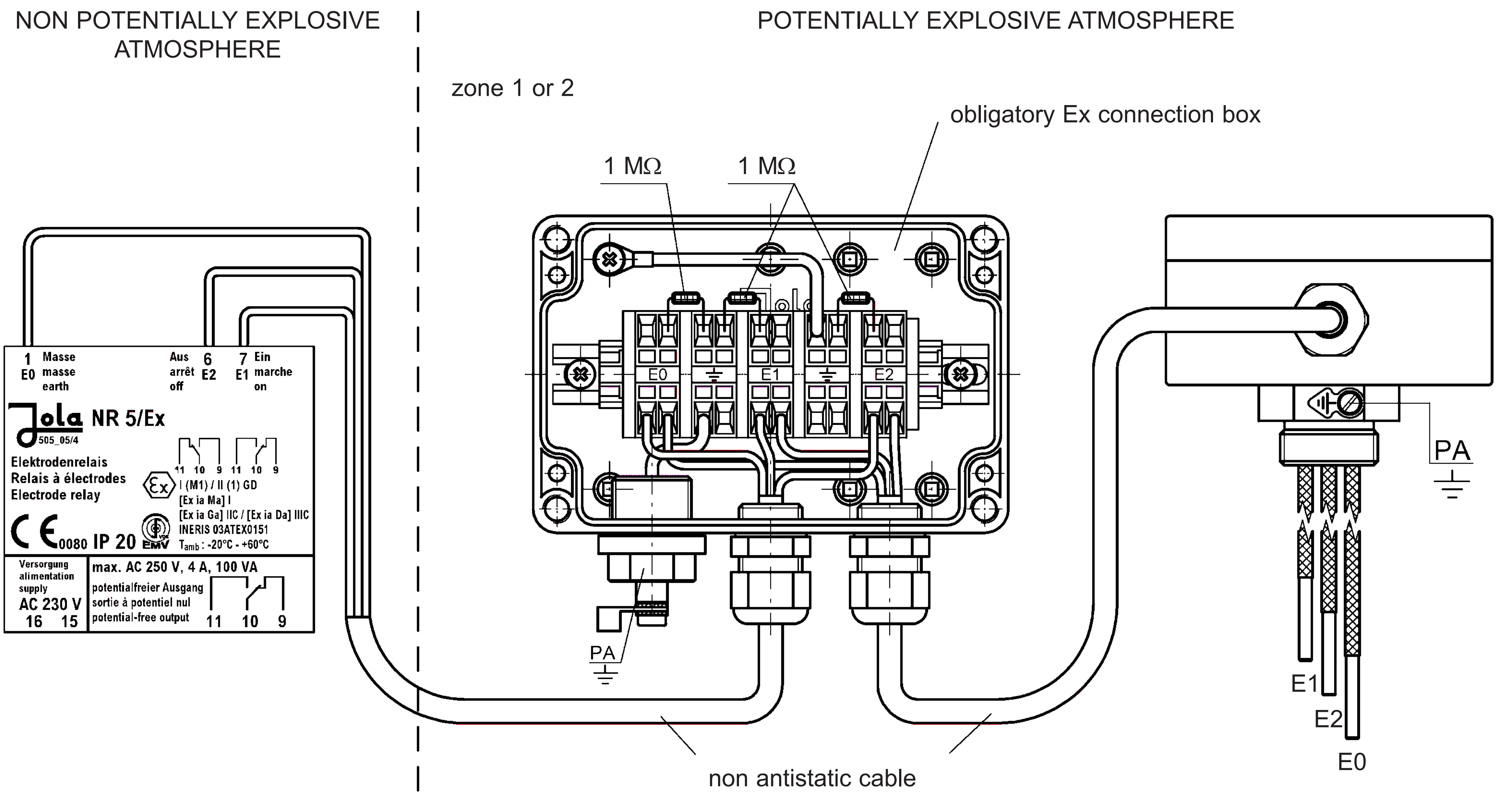


NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
Ex connection box
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
PA
PA
non antistatic cable
E1
E0
2x EL/0/EH/...../1/..../../Ex-1G
2x EL/0/EHK/NL/...../1/..../../Ex-1G
1 Masse
E0 masse
earth
Aus 6
arrêt E2
off
7 Ein
E1 marche
on
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080
IP 20
EMV
Versorgung
alimentation
supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

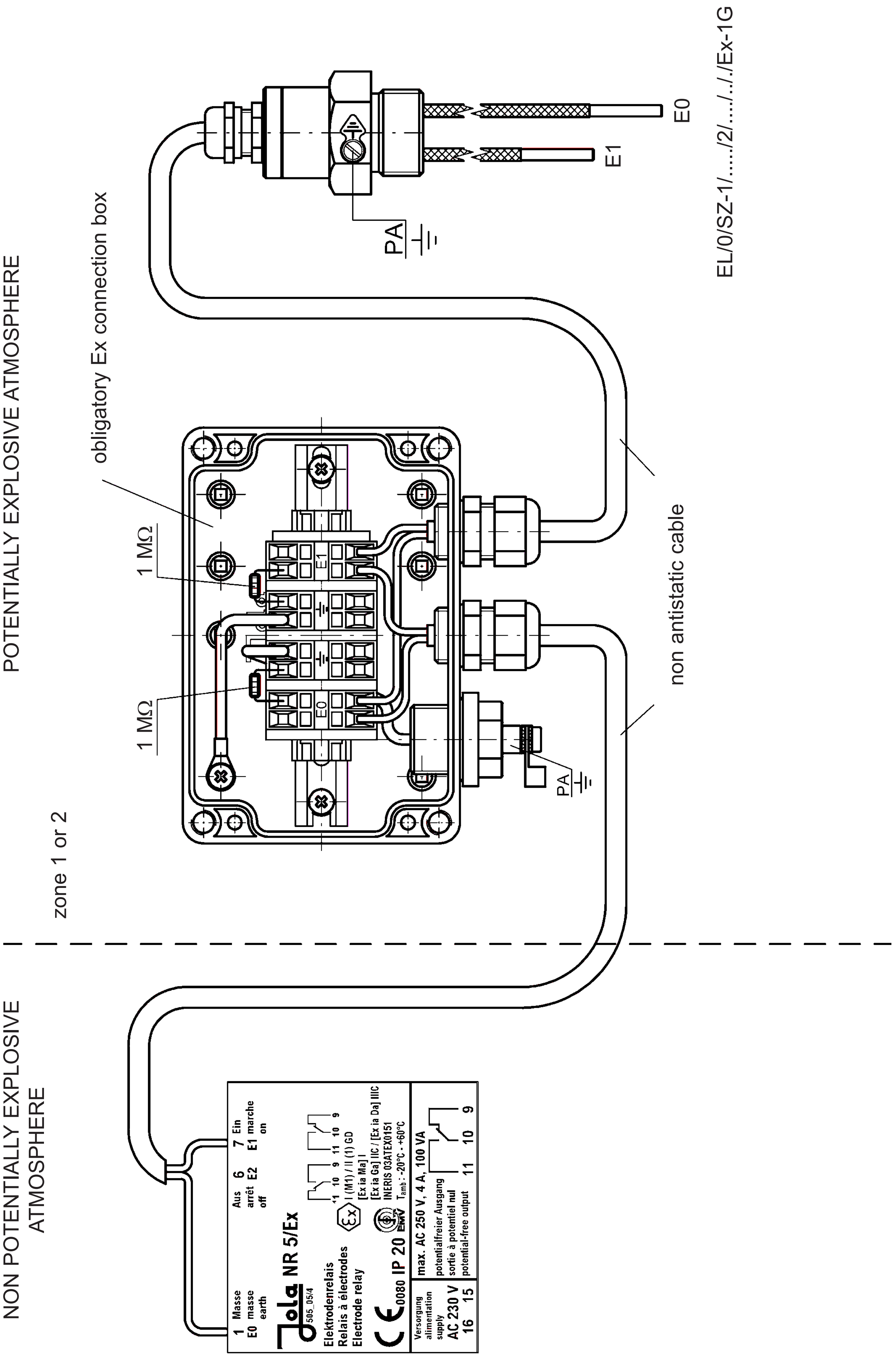


NON POTENTIALLY EXPLOSIVE
ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
obligatory Ex
connection box
1 MΩ
1 MΩ
Ex connection box
PA
PA
E0
E1
E2
E1
E2
E0
non antistatic cable
3x EL/0/EH/...../1/..../../../Ex-1G
3x EL/0/EHK/NL/...../1/..../../../Ex-1G
1 E0 Masse masse earth
Aus arrêt off 6 E2
7 E1 Ein marche on
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20 EMV
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

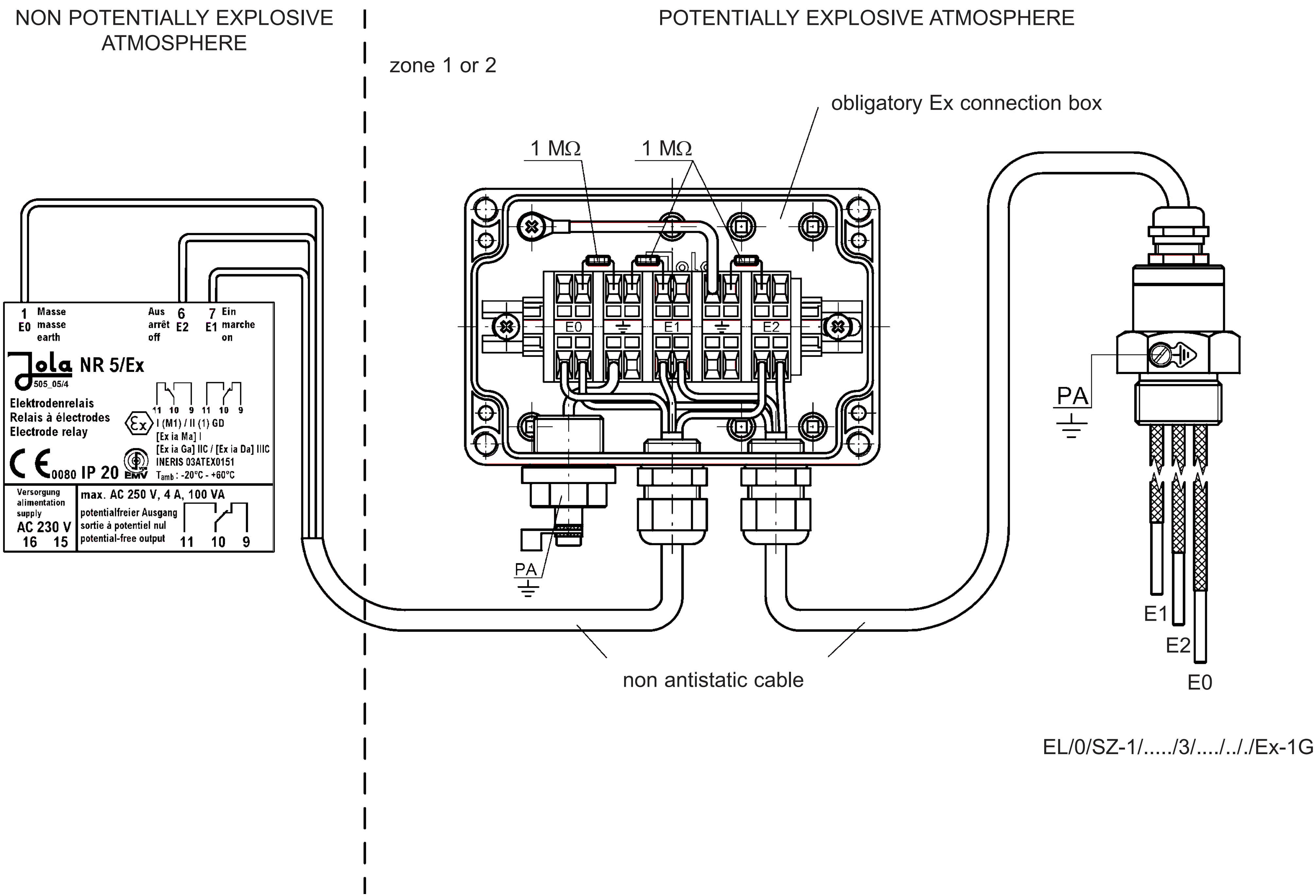

POTENTIALLY EXPLOSIVE ATMOSPHERE
obligatory Ex connection box
zone 1 or 2
NON POTENTIALLY EXPLOSIVE ATMOSPHERE
PA
E0
E1
EL/0/SB-1/...../2/..../../../Ex-1G
1 MΩ
1 MΩ
E1
E0
PA
non antistatic cable
1 Masse
E0 masse
earth
Aus 6
arrêt E2
off
7 Ein
E1 marche
on
Jola 505_05/4
NR 5/Ex
Elektrodenrelais
Relais à électrodes
Electrode relay
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
0080 IP 20 EMV
11 10 9 11 10 9
Versorgung
alimentation
supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

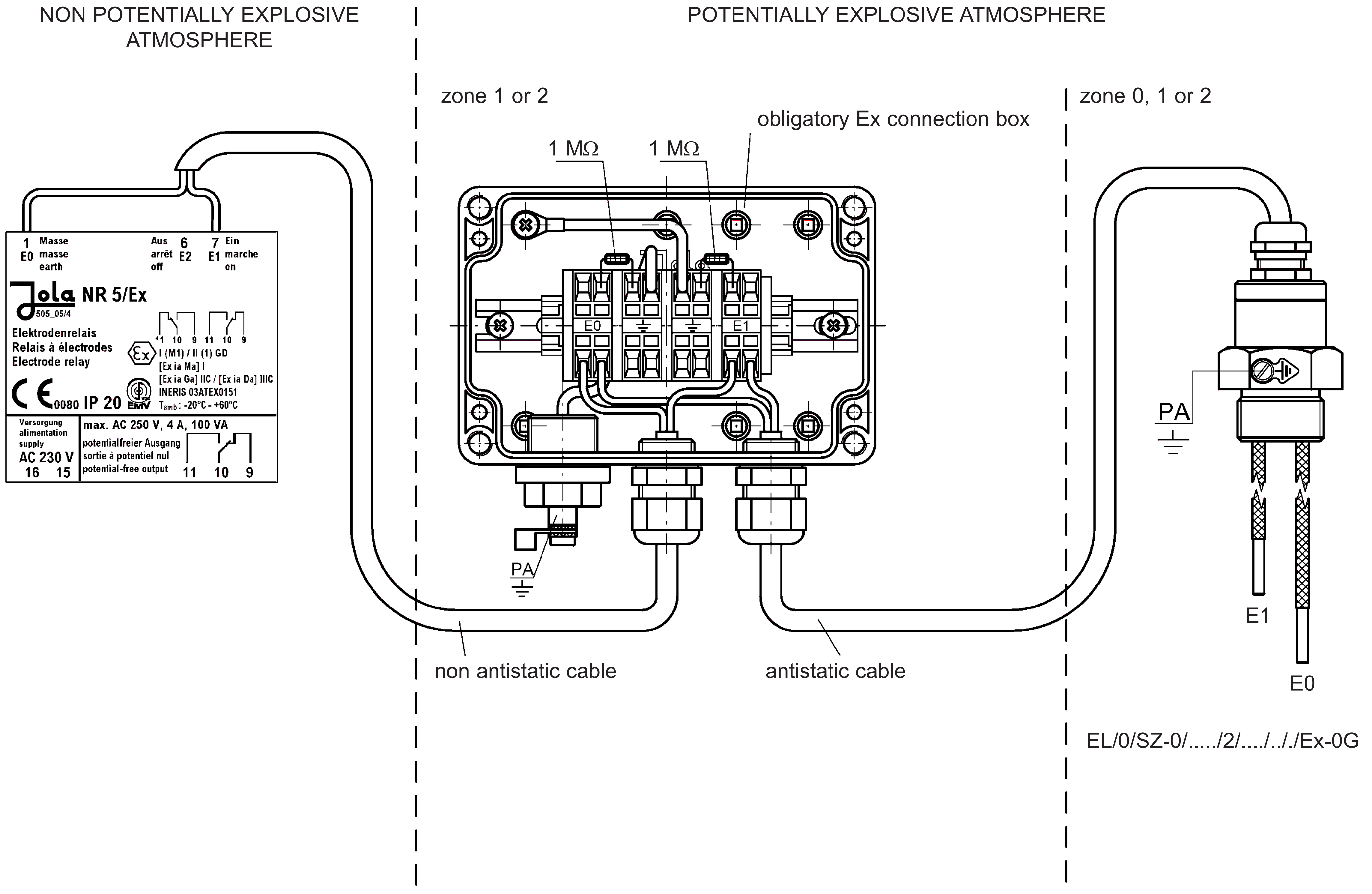


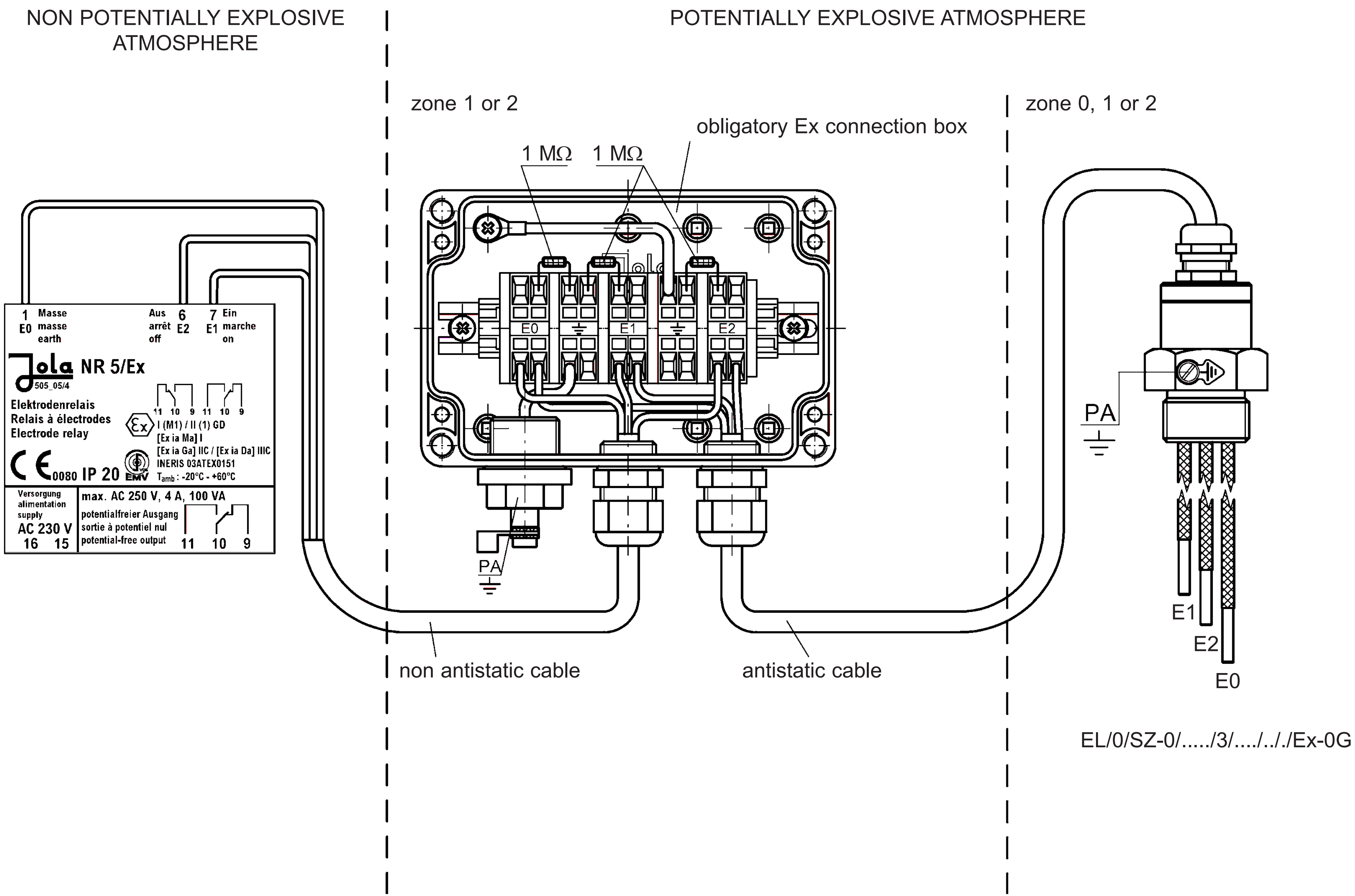
EL/0/SB-1/...../3/..../../../Ex-1G



POTENTIALLY EXPLOSIVE ATMOSPHERE
obligatory Ex connection box
zone 1 or 2
NON POTENTIALLY EXPLOSIVE ATMOSPHERE
non antistatic cable
1 MΩ
1 MΩ
E1
E0
PA
PA
E0
E1
EL/0/SZ-1/...../2/..../../../Ex-1G
1 Masse E0 masse earth
Aus 6 arrêt E2 off
7 Ein E1 marche on
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb: -20°C - +60°C
IP 20
0080
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
Versorgung
alimentation
supply
AC 230 V
16 15
11 10 9


NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
E2
PA
PA
non antistatic cable
E1
E2
E0
1 E0 Masse masse earth
Aus arrêt off 6 E2
7 E1 Ein marche on
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20
EMV
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9
EL/0/SZ-1/...../3/..../../../Ex-1G

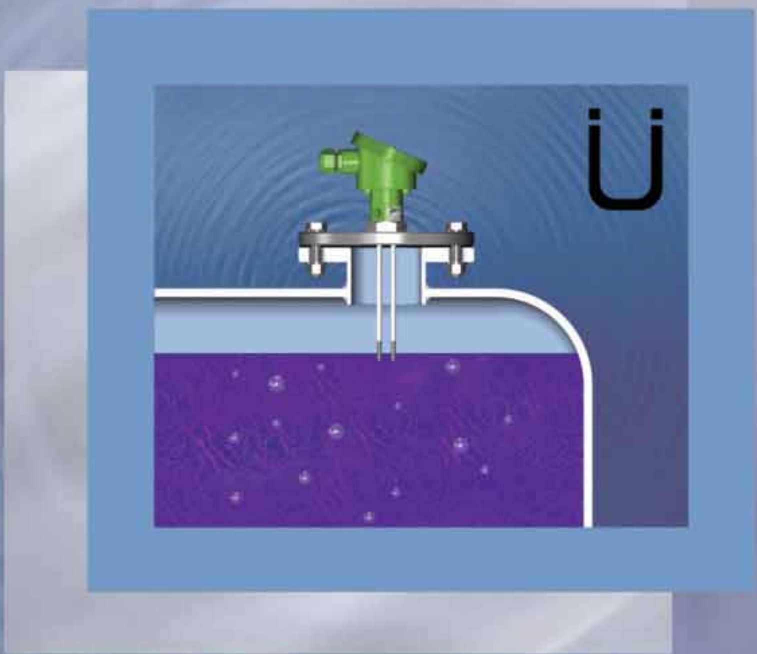

NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
zone 0, 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
PA
non antistatic cable
antistatic cable
E1
E0
EL/0/SZ-0/...../2/..../../../Ex-0G
1 E0 Masse masse earth
Aus arrêt off 6 E2
7 E1 Ein marche on
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20 EMV
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9


NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
zone 0, 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
E2
PA
1 Masse masse earth E0
Aus arrêt off 6 E2
7 Ein marche on E1
Jola NR 5/Ex
505_05/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20
EMV
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9
non antistatic cable
antistatic cable
E1
E2
E0
EL/0/SZ-0/...../3/..../../Ex-0G

Overfill protectors based on the conductive principle

for containers used to store liquids that are hazardous to water

with german general building inspectorate approval granted by DIBt (Deutsches Institut für Bautechnik)



Jola Spezialschalter GmbH & Co. KG
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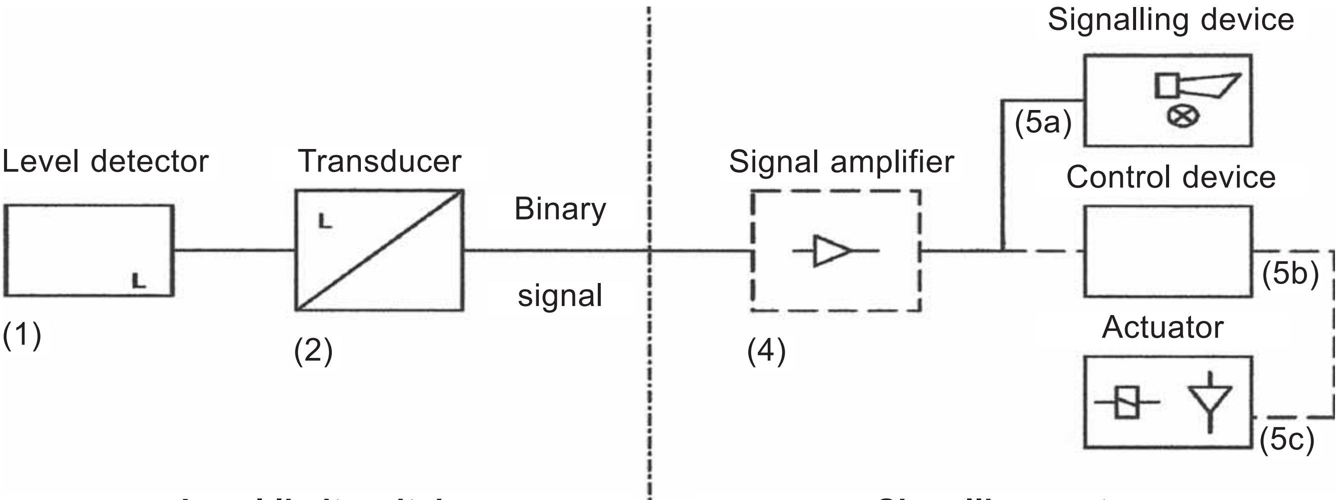
Tel. +49 6325 188-01 • Fax +49 6325 6396
contact@jola-info.de • www.jola-info.de

Design of the overfill protector

The level limit switch consists of the level detector (conductive rod electrode) and a transducer (electrode relay) with binary signal output. This signal can be routed directly or via a signal amplifier to the signalling device or the control device with an actuator.



Level limit switch	**Signalling system**
(1) Level detector Rod electrode, type LSE … (2) Transducer: Electrode relay Limitstar 101 or Limitstar 101/S	(4) Signal amplifier (5a) Signalling device with lamp and horn (5b) Control device (5c) Actuator

Description of function

The level detector in the form of a conductive electrode pair and the transducer in the form of an electrode relay interact to perform the described function. If the stored conductive liquid reaches the tips of the electrode rods of the level detector, this creates a conductive connection via which a control current flows – and this results in activation of a potential free changeover contact or a potential-free NC contact (binary signals) in the transducer depending on the design of the latter.

To ensure reliable signalling even in the event of failure of the auxiliary energy, the transducer is designed in line with the quiescent current principle; in other words, the contact status at the changeover contact or at the corresponding NC contact is the same in the case of an alarm as in the event of failure of the auxiliary energy.

In the event of a line break, the electronic line monitoring device additionally installed in the transducer is activated with the help of a Zener diode circuit in the head section of the level detector. This ensures that breaks in the connection lines between transducer and level detector are identified and the potential-free output contact switched over as in the event of failure of the auxiliary energy. Integrated LEDs indicate the switching and alarm status to allow visual checking of the operating status.

In standard operating mode, the transducer only signals an alarm if the reason for the alarm – e.g. electrode rods in contact with the conductive liquid or line break – is still present. The transducer no longer signals an alarm if the electrode rods are dry once again or if the line once again has contact.

The transducer can be switched to the "self-hold" operating mode so that an alarm that has been emitted can be stored – for subsequent confirmation by operating personnel (acknowledgement), for example. The transducer is switched to this mode by locking in place the switch on the front panel.

If the self-hold feature is activated in this way, the transducer signals the alarm even if the reason for the alarm is no longer present. If the switch for self-hold is subsequently switched off, the alarm is confirmed manually, and the transducer then only indicates "good" status if the reason for the alarm is no longer present.

There is no operating mode in which it is possible to suppress an alarm signal if a reason for an alarm is present.

Area of application

The level detectors may only be used for electrically conductive liquids with a specific electrical conductivity of at least 50 µS/cm (measurement based on DIN IEC 60093 and DIN IEC 60167) so that the response value of 30 kohms is reliably reached. The level detectors should not be used:

- in electrically non-conductive liquids,
- in liquids with a tendency to foam,
- in liquids with strong vapour formation and condensation,
- in liquids that destroy the electrode rods and/or the shrinkdown tubing,
- in liquids with a tendency to form deposits, particularly non-conductive deposits.

The level detector types without adapter are suitable for use in containers that are operated under atmospheric conditions. The types with adapter (LSE.....D) can also be used with a hydraulic pressure of max. 15 bar. The devices are not suitable for pressure in line with the Pressure Equipment Directive (2014/68/EU).

If there is a risk that insulating liquid residues can form on the electrodes, the electrode rod tips must be cleaned on a regular basis.

The transducers may be operated in a temperature range from – 20°C to + 60°C. They are only designed for installation in a switch cabinet or in a suitable protective housing and may therefore only be installed in same. They are only suitable for use in clean environments. If they are operated in switchboxes or switch cabinets in rooms that are not dry, the switchboxes or switch cabinets must be at least of protection class IP54.

Installation of the level detectors

The level detectors are designed for vertical installation from above but can also be mounted at inclines of up to 45 degrees. Installation is via the screw-in nipple of the level detector in question. A lateral counter-bearing made of non-conductive material is to be provided for the electrode rods:

- In the case of inclined installation from an electrode rod length of 1.5 m.

Spacers are provided for lengths above 500 mm.

Electrical connection

The electrical connection between the level detector and the transducer is to be made as shown on pages 7-3-12 and 7-3-14.
The level detector is connected via terminals in the connection head to terminals 7 and 8 of the transducer in question.
In the Limitstar 101, the signalling device is connected to terminals 9, 10 and 11, in the Limitstar 101/S to terminals 9 and 10.

Type key

Level detector
LSE . . . . . .

Electrode rods type
D = with adapter (only suitable for screw-in nipple materials 1 to 6) made of PVDF or PEEK, pressure-resistant version
without indication = direct to the connection head

Electrode rods diameter
4 = 4 mm Ø (only in combination with G1 and G¾ screw-in nipples, up to 700 mm rod length)
6 = 6 mm Ø (only in combination with G2 screw-in nipple, up to 3,000 mm rod length)

Electrode rods material
1 = austenitic CrNi or CrNiMo steel acc. to DIN 17440
2 = titanium
3 = hastelloy C
4 = hastelloy B
5 = monel
6 = tantalum

Connection head
AA = made of cast aluminium, big
AB = made of cast aluminium, small
P = made of polypropylen
R = round (same material as for the screw-in nipple) (not in pressure-resistant version D)

Screw-in nipple dimension
1 = G1
2 = G2 (only suitable for connection head R)
3 = G¾

Screw-in nipple material
1 = austenitic CrNi or CrNiMo steel acc. to DIN 17440
2 = titanium
3 = hastelloy C
4 = hastelloy B
5 = monel
6 = tantalum
7 = PP
8 = PVC
9 = PVDF
10 = PTFE
11 = PE

Basic type designation

Transducer
Limitstar .

Type of binary outputs
101 = one output (changeover contact) for alarm (cable break including)
101/S = two outputs (break contacts), one for alarm (cable break including), the other one for cable break

Basic type designation

LSE 11..14. level detectors

with G1 screw-in nipple made of stainless steel 316 Ti

LSE 11P14

LSE 11P14D

LSE 11AA14D

Technical data	LSE 11P14	LSE 11AA14	LSE 11P14D	LSE 11AA14D
Design	1 control electrode and 1 earth electrode			
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with PVDF shrinkdown tubing			
Lengths	as desired (measured from nipple sealing surface)			
Max. lengths	700 mm (over 500 mm in length: with spacers between the rods)			
Insulators	PVDF shrinkdown tubing and cast resin		PEEK or PVDF, PVDF shrinkdown tubing and cast resin	
Screw-in nipple	stainless steel 316 Ti, G1			
Electrical connection	PP	cast aluminium	PP	cast aluminium
	connection head, protection class IP54			
Mounting orientation	vertical			
Temperature range	– 20°C to + 60°C			
Pressure resistance	for pressureless applications		up to max. 15 bar (1.5 MPa) hydraulic pressure (not suitable for pressure in line with the Pressure Equipment Directive 2014/68/EU)	
Cable break monitoring	with Z10 cable break monitoring unit			
Max. length of connecting cable between level detector and transducer	1,000 m			

LSE 71P.4 level detectors

with G1 screw-in nipple made of PP

LSE 71P.4

Technical data	LSE 71P14	LSE 71P24	LSE 71P34	LSE 71P44	LSE 71P54
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	4 mm Ø, covered with PVDF shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	700 mm (over 500 mm in length: with spacers between the rods)				
Insulators	PP, PVDF shrinkdown tubing and cast resin				
Screw-in nipple	PP, G1				
Electrical connection	PP connection head with M20 x 1.5 cable entry, protection class IP54				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

LSE 91P.4 level detectors

with G1 screw-in nipple made of PVDF

LSE 91P.4

Technical data	LSE 91P14	LSE 91P24	LSE 91P34	LSE 91P44	LSE 91P54
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	4 mm Ø, covered with PVDF shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	700 mm (over 500 mm in length: with spacers between the rods)				
Insulators	PVDF, PVDF shrinkdown tubing and cast resin				
Screw-in nipple	PVDF, G1				
Electrical connection	PP connection head with M20 x 1.5 cable entry, protection class IP54				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

LSE 71R.4 level detectors

with G1 screw-in nipple made of PP

LSE 71R.4

Technical data	LSE 71R14	LSE 71R24	LSE 71R34	LSE 71R44	LSE 71R54
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	4 mm Ø, covered with PVDF shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	700 mm (over 500 mm in length: with spacers between the rods)				
Insulators	PP, PVDF shrinkdown tubing and cast resin				
Screw-in nipple	PP, G1; on request: G¾				
Electrical connection	round PP connection head with M16 x 1.5 cable entry, protection class IP55				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

LSE 101R.4 level detectors

with G1 screw-in nipple made of PTFE

LSE 101R.4

Technical data	LSE 101R14	LSE 101R24	LSE 101R34	LSE 101R44	LSE 101R54
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	4 mm Ø, covered with PTFE shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	700 mm (over 500 mm in length: with spacers between the rods)				
Insulators	PTFE, PTFE shrinkdown tubing and cast resin				
Screw-in nipple	PTFE, G1				
Electrical connection	round PTFE connection head with M16 x 1.5 cable entry, protection class IP55				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

LSE 72R.6 level detectors

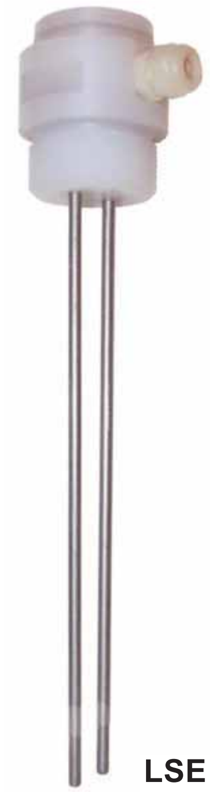
with G2 screw-in nipple made of PP

LSE 72R.6

Technical data	LSE 72R16	LSE 72R26	LSE 72R36	LSE 72R46	LSE 72R56
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	6 mm Ø, covered with PVDF shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	3,000 mm (over 500 mm in length: with spacers between the rods placed every 500 mm)				
Insulators	PP, PVDF shrinkdown tubing and cast resin				
Screw-in nipple	PP, G2				
Electrical connection	round PP connection head with M20 x 1.5 cable entry, protection class IP55				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

LSE 92R.6 level detectors

with G2 screw-in nipple made of PVDF



LSE 92R.6

Technical data	LSE 92R16	LSE 92R26	LSE 92R36	LSE 92R46	LSE 92R56
Design	1 control electrode and 1 earth electrode				
Electrode rods	stainless steel 316 Ti,	titanium,	hastelloy C,	hastelloy B,	monel,
	6 mm Ø, covered with PVDF shrinkdown tubing				
Lengths	as desired (measured from nipple sealing surface)				
Max. lengths	3,000 mm (over 500 mm in length: with spacers between the rods placed every 500 mm)				
Insulators	PVDF, PVDF shrinkdown tubing and cast resin				
Screw-in nipple	PVDF, G2				
Electrical connection	round PVDF connection head with M20 x 1.5 cable entry, protection class IP55				
Mounting orientation	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only				
Cable break monitoring	with Z10 cable break monitoring unit				
Max. length of connecting cable between level detector and transducer	1,000 m				

Limitstar 101 transducer

• with cable break monitoring feature and switchable self-hold
• for connection of 1 conductive electrode of the type LSE ...

Electrode relay for DIN rail mounting or surface mounting, with connection terminals on top of housing and 3 built-in LEDs for signalling the respective switching status.

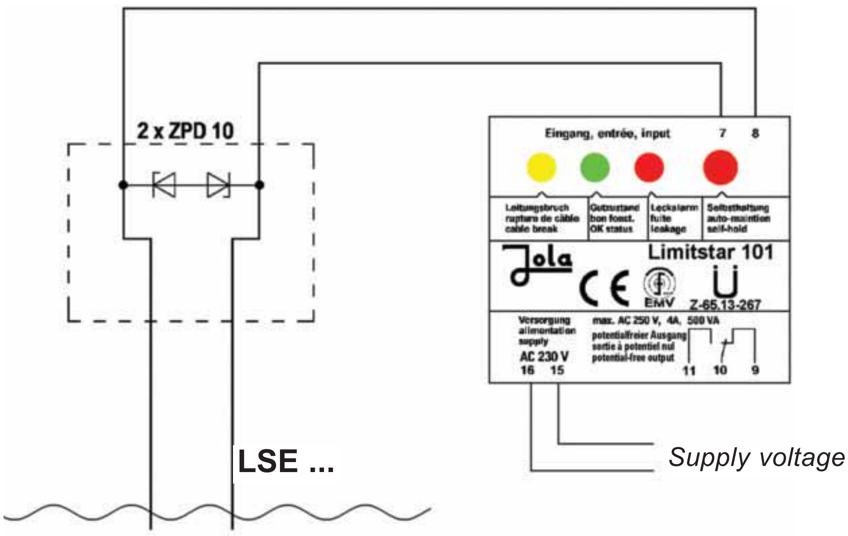
The appliance is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of conductive liquid or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is reset.

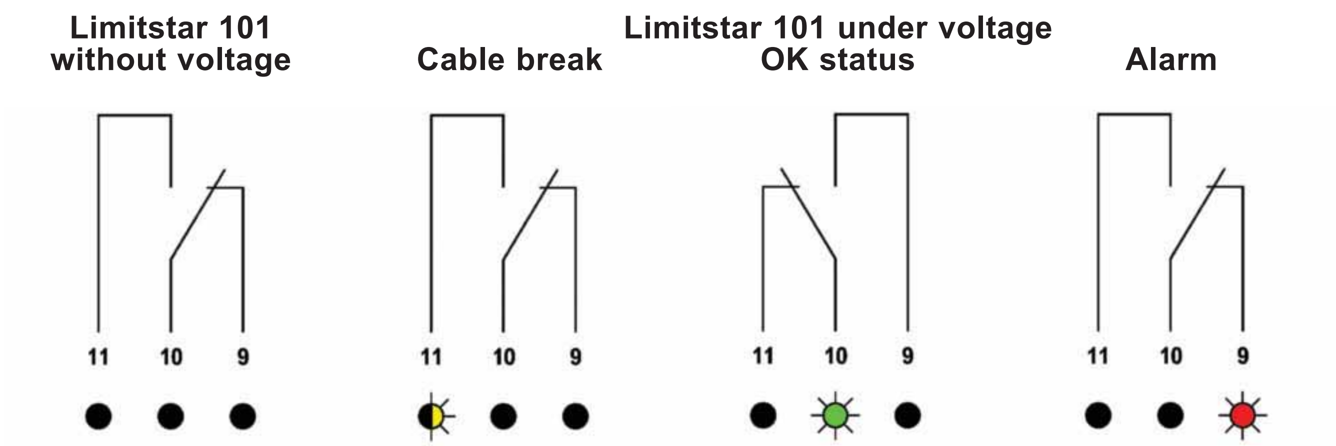
Technical data	**Limitstar 101**
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V, } for connection to a low safety voltage according DC 12 V } to the safety regulations relating to the application
Monitoring of the supply voltage	in case of voltage failure, the changeover contact in the control circuit is not energized
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay with switchable self-hold
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short-circuit current	0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (electric conductance)
Cable break monitoring	via Zener diode circuit (Z10) in the level detector head
Power circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle with switchable self-hold
Switching status indicators	3 LED (see page 7-3-12)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	macrolon, 75 x 55 x 110 mm (dimensions see page 7-3-12)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between transducer and level detector
CEM	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

Connection diagram



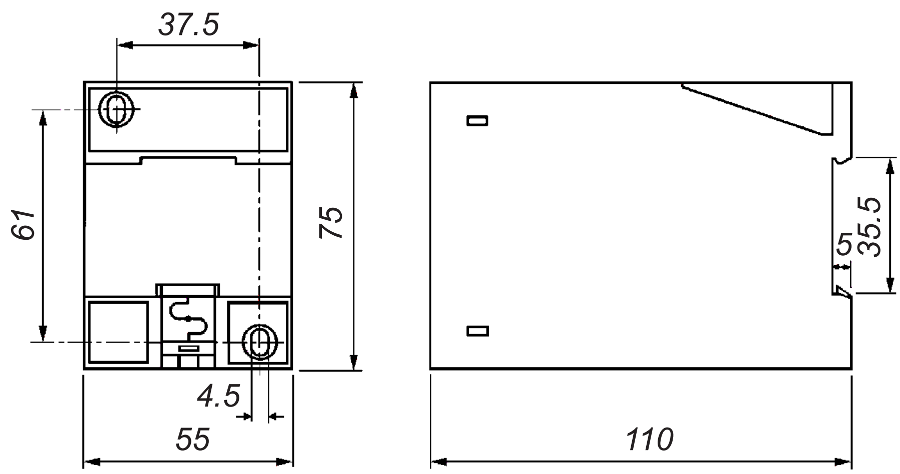
Position of contact when relay without voltage

Position of output contact of the Limitstar 101



LEDs dark:	**yellow LED flashes:**	**green LED lights:**	**red LED lights:**
output relay not energized	electrode cable break, output relay not energized	electrode rods dry, output relay energized	electrode rods wet, output relay not energized

Dimensions



Dimensions in mm

Limitstar 101/S transducer

• with cable break monitoring feature and switchable self-hold
• with separately routed cable break monitoring output
• for connection <u>of 1</u> conductive electrode of the type LSE ...

Electrode relay for DIN rail mounting or surface mounting, with connection terminals on top of housing and 3 built-in LEDs for signalling the respective switching status.

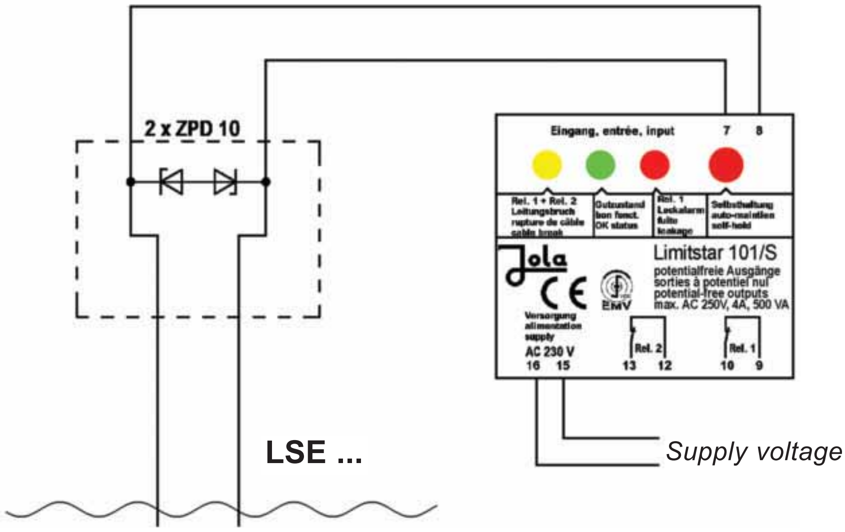
The appliance is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of conductive liquid or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is reset.

Technical data	**Limitstar 101/S**
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V, } for connection to a low safety voltage according DC 12 V } to the safety regulations relating to the application
Monitoring of the supply voltage	in case of voltage failure, the 2 break (NC) contacts in the power circuits are not energized
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays with switchable self-hold
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short-circuit current	0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (electric conductance)
Cable break monitoring	via Zener diode circuit (Z10) in the level detector head
1st power circuit (terminals 9, 10)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for signalling an alarm
2nd power circuit (terminals 12, 13)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for signalling a cable break
Switching status indicators	3 LED (see page 7-3-14)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	macrolon, 75 x 55 x 110 mm (dimensions see page 7-3-14)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between transducer and level detector
CEM	see page 7-3-11

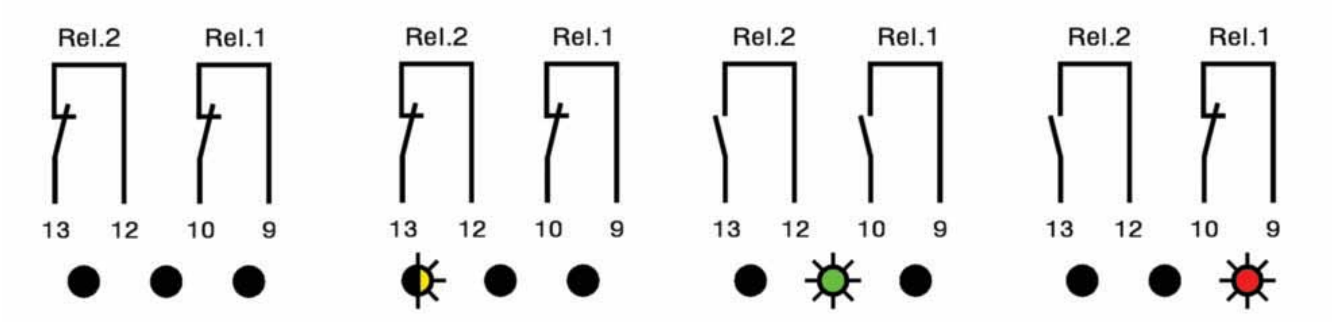
Connection diagram



Position of contact when relay without voltage

Position of output contacts of the Limitstar 101/S

Limitstar 101/S without voltage | **Limitstar 101/S under voltage**: **Cable break** | **OK status** | **Alarm**



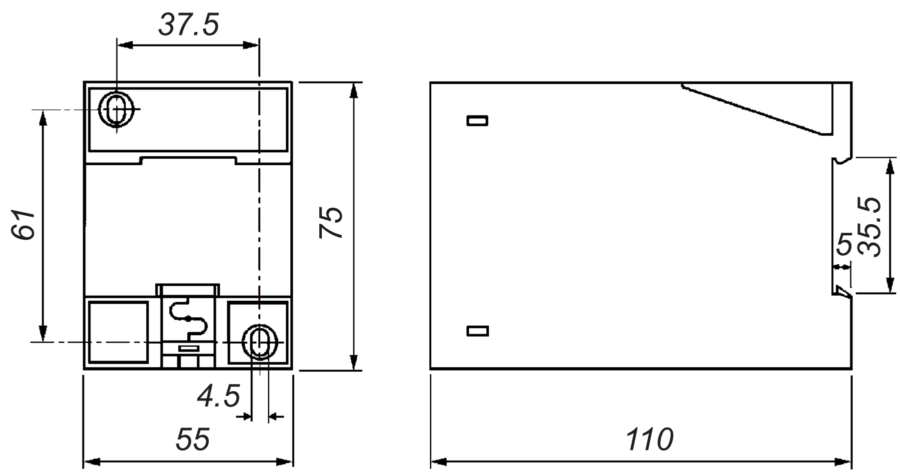
LEDs dark:
both output relays
not energized,
both output contacts
closed

yellow LED flashes:
electrode cable break,
both output relays
not energized,
both output contacts
closed

green LED lights:
electrode rods dry,
both output relays
energized,
both output contacts
open

red LED lights:
electrode rods wet,
output relay 1
not energized,
output contact 1 closed,
output relay 2
energized,
output contact 2 open

Dimensions



Dimensions in mm

The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Level controllers for rainwater utilisation systems

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Level controllers for rainwater utilisation systems, FNR range

Operating principle

The components of the FNR range are an **FNR fresh water refill controller** and one or more **suspension electrodes**.

The FNR 5 and FNR 7 fresh water refill controllers operate according to the conductive measuring principle.

In combination with an **LWZ suspension electrode**, the **FNR 5** is used for purposes such as the controlled refilling of fresh water into a rainwater tank.

If the level in the rainwater tank falls below the minimum fill level, a relay output activates refilling of fresh water (e.g. via a solenoid valve). Once the minimum fill level has been reached again, the switching status of the relay output is maintained for the duration of the delay time of approx. 10 seconds (standard) and the refill function is then switched off again. This time delay serves to suppress multiple switching actions in the event of wave motion and results in a level hysteresis whose magnitude depends on the tank dimensions and the strength of liquid inflow.

If, during the refilling cycle, the minimum fill level is not reached again within the monitoring time of approx. 30 seconds (standard), the relay output for refilling is switched off, and a second relay output is activated to issue an alarm due to timeout. This feature is designed to prevent uncontrolled refilling in the event of tank rupture or inflow defects, as well as in the case of electrode cable break, if there is ice on the electrode or if the electrode has been removed. The various switching statuses are indicated by LEDs.

In addition to the features described above, the version **FNR 7** is also equipped with 4 LEDs to indicate the tank fill level, and these LEDs are individually controlled **via 4 EH or EHK suspension electrodes**.

Functions \ Types	**FNR range**	
	FNR 5	**FNR 7**
Regulation of refill valve, time-controlled and time-monitored	●	●
Level indicator, 4-stage	—	●

Suspension electrodes

Use of suspension electrodes with a FNR 5 or FNR 7 fresh water refill controller

Electrode / Controller	**FNR 5**	**FNR 7**
LWZ	1 piece	1 piece
EH or EHK	—	up to max. 4 pieces

If the FNR 7 fresh water refill controller is only to be used as a liquid level indicator, an LWZ suspension electrode still has to be used for ground reference purposes; alternatively, a further EH or EHK suspension electrode can be connected to terminal 1 (E0).

Technical data	**LWZ**	**EH**	**EHK**
Design	1 control electrode and 1 ground electr.	1 control electrode or 1 ground electrode	
Sensitive element(s)	2 electrode rods, made of stainless steel 316 Ti, each with 5 mm Ø	1 electrode rod,	1 electrode rod,
Housing	PP and Duroplast 2 x 27 mm Ø x approx. 210 mm	PP 27 mm Ø x approx. 145 mm	PP 27 mm Ø x approx. 145 mm
Electrical connection	cable 2X0.75, length: 2 m, longer on request	connection terminal	cable 1X1.5, length: 1 m, longer on request
Mounting orientation	vertical		
Temperature range	max. + 60°C		
Pressure resistance	for pressureless applications only, use only under atmospheric conditions		

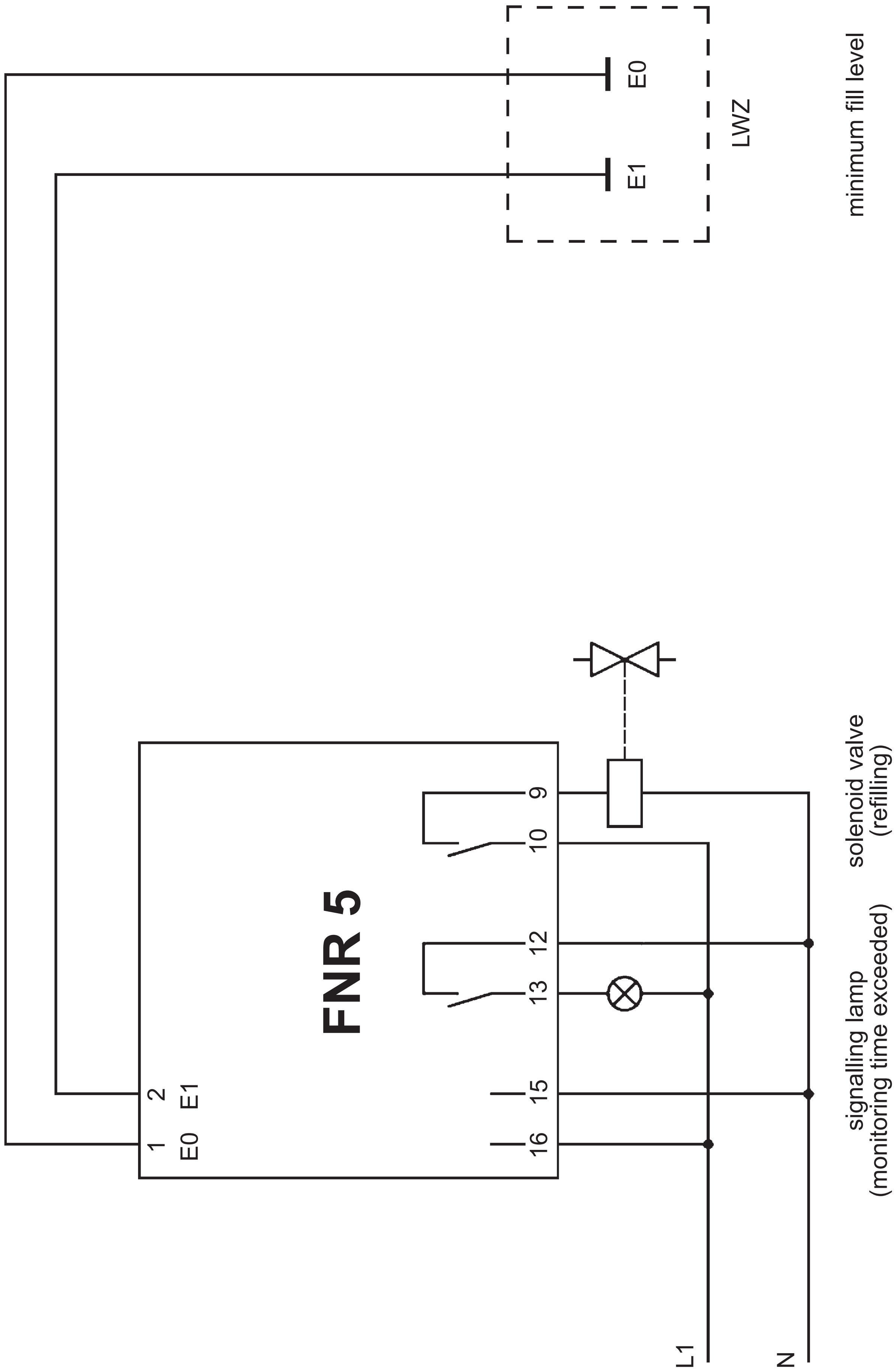
FNR 5 and FNR 7 fresh water refill controllers

Electronical water level controllers based on the conductive measuring principle, for DIN rail mounting, with connection terminals on top of the housing for cable cross-sections of max. 4 mm² and with built-in LEDs for signalling the operating statuses.

These units are designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. They are suitable for use in clean environnements only.

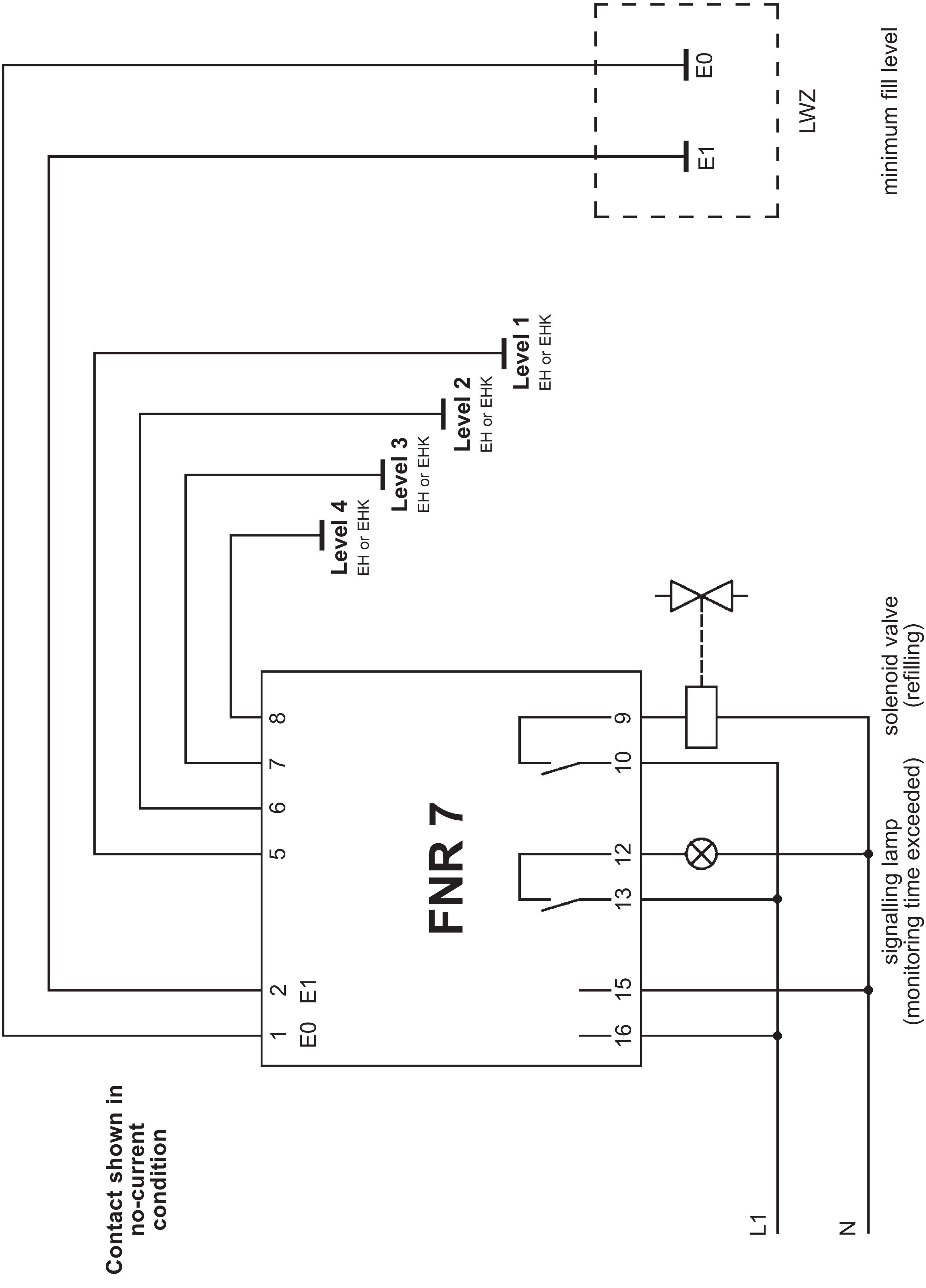
Technical data	FNR 5	FNR 7
Supply voltage (AC-versions: terminals 15 and 16; DC-versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V, } for connection to a low safety voltage DC 12 V } according to the safety regulations relating to the application or further supply voltages	
Power input	approx. 3 VA	
Electrode circuit(s) (terminals 1 and 2)	2 terminals (under safety extra low voltage SELV) acting on 2 output relays in a time-controlled manner	
(terminal 1 with terminals 5, 6, 7, 8)	——	5 terminals (under safety extra low voltage SELV) for electrodes for tank fill indication
No-load voltage	9 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)	
Short-circuit current	max. 0.5 mA_{eff}	
Response sensitivity for • fresh water refilling • level indication	 100 kΩ or 10 µS (conductance) 500 kΩ or 2 µS (conductance)	
Controlled circuits	2 potential-free normally open contacts based on the working current principle, both non-activated in standby status	
Terminals 9,10 - relay 1	• output relay 1 (for refilling): switches on when the level falls below the minimum fill level. It either switches off after the minimum fill level has been reached again with a switch-off delay of approx. 10 s (standard) or it switches off when the monitoring time of approx. 30 s (standard) is exceeded due to the fact that the minimum fill level has not been reached	
Terminals 12,13 - relay 2	• output relay 2 (for fault signalling): switches on when the monitoring time of approx. 30 s (standard) is exceeded due to the fact that the minimum fill level has not been reached	
Switch-off delay - relay 1	approx. 10 s (tolerance +/– 20 %), other delay time on request	
Monitoring time - relay 2	approx. 30 s (tolerance +/– 20 %), other monitoring time on request	
Switching status indication	via a bicolour LED: green = standby flashing red = monitoring time exceeded via a red LED: permanently lit = refill	
Tank fill indication		via 4 red LEDs for the limit levels at the electrodes of the terminals 5, 6, 7 and 8
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 55 x 110 mm	
Connection	terminals on top of housing for cable cross-sections of max. 4 mm²	
Protection class	IP20	
Mounting	on DIN rail or via two boreholes	
Mounting orientation	any	
Temperature range	– 20°C to + 60°C	
Length of the connection cable of the electrode	max. 300 m	max. 100 m
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies	

Connection diagram FNR 5



Contact shown in no-current condition

Connection diagram FNR 7



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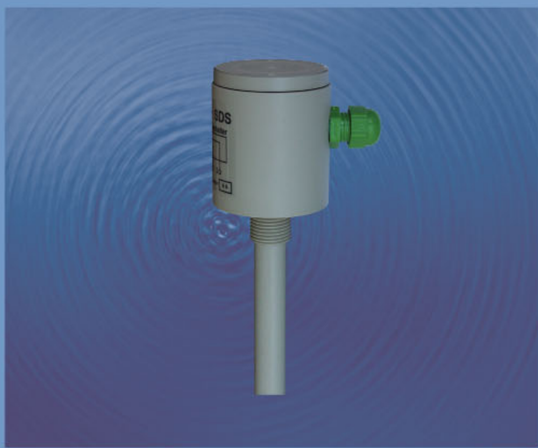
Dynamic pressure switches

Controlling devices with pressure operated diaphragm pressure switch, for signalling or regulation of liquid levels



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SDS/PP and SDS/PVDF/S dynamic pressure switches

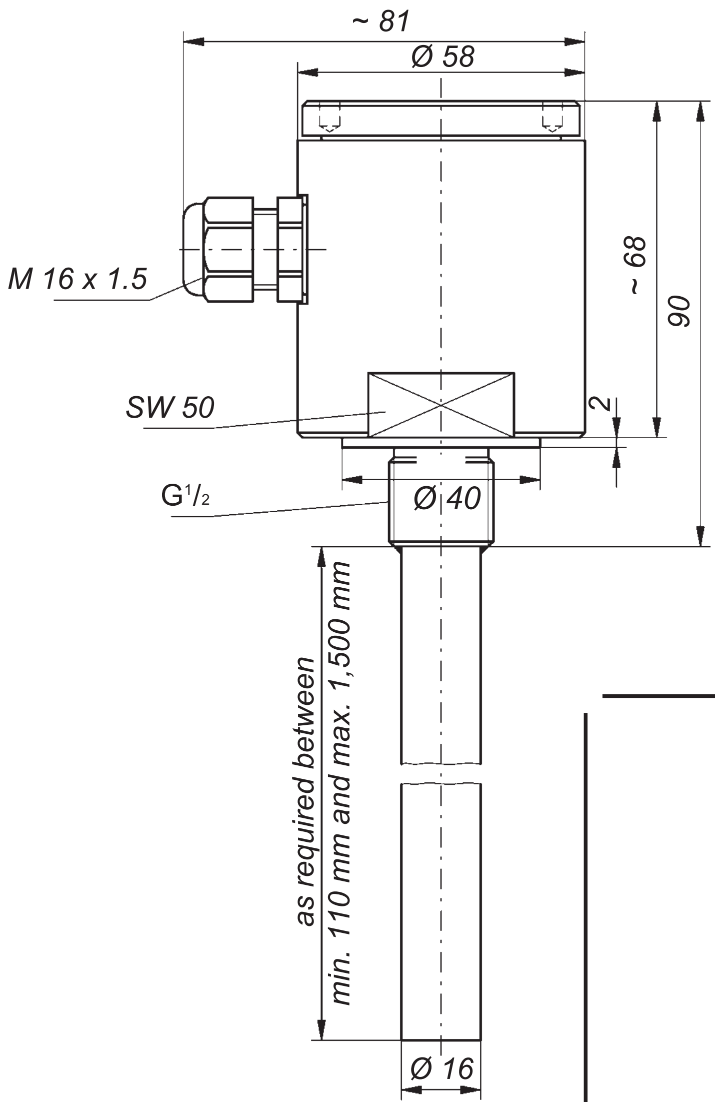
for signalling or regulation of levels of non aggressive liquids in open or pressure-free tanks

These dynamic pressure switches are suitable for the indication of the maximum level or the switching of pumps or solenoid valves.

The connection head contains a diaphragm pressure switch with changeover contact. Switching is effected by the air pressure rising in the air tube as the liquid level rises. After a fall in pressure of approx. 45 mm water column with the type SDS/PP or approx. 50 mm water column with the type SDS/PVDF/S the contact is broken again. Higher level differences can be controlled by using several SDS.

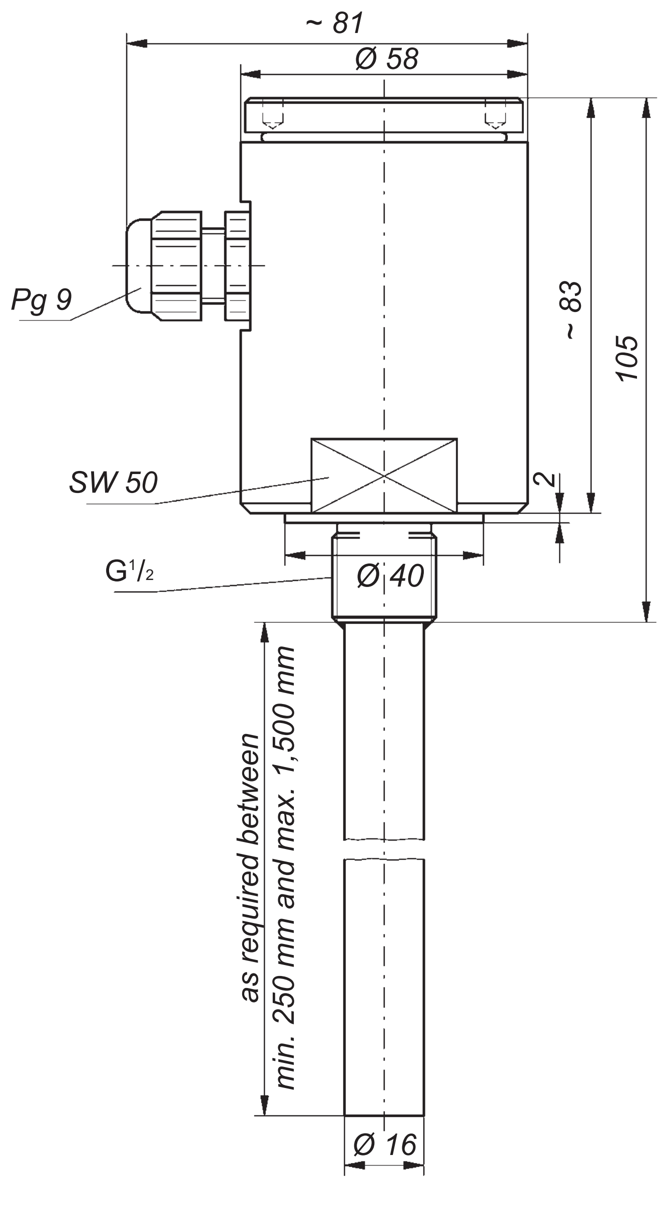
In the course of time, air escapes through the diaphragm. For this reason the tube should be ventilated every 6 - 8 weeks in order to prevent malfunctions.

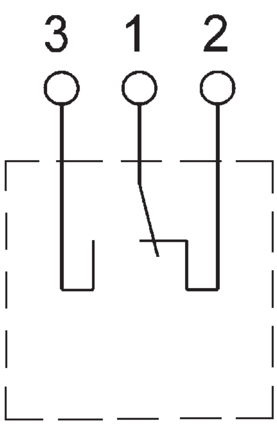
Technical data	SDS/PP	SDS/PVDF/S
Pressure tube	PP, 16 mm Ø	PVDF, 16 mm Ø
Pressure tube length	110 to 1,500 mm, as requested	250 to 1,500 mm, as requested
Diaphragm material	Perbunan	EPDM
Pressure resistance of the diaphragm	max. 0.5 bar (5 m water column)	max. 0.5 bar (5 m water column)
Screw-in nipple	PP, G1/2	PVDF, G1/2
Connection head	PP, 62 mm Ø x 70 mm, protection class IP42	PVDF, 62 mm Ø x 85 mm, protection class IP42
Cable entry	M 16 x 1.5	Pg 9
Mounting orientation	vertical	
Temperature range	+ 1°C to + 70°C	+ 1°C to + 85°C
Pressure resistance	for use in open or pressure-free tanks only, use only under atmospheric conditions	
Contact	diaphragm pressure switch, changeover contact	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Cut-in switching point	approx. 85 mm	adjustable between 50 and 200 mm
	(measured from lower end of pressure tube)	
Cut-out switching point	approx. 40 mm	hysteresis approx. 50 mm between cut-in and cut-out switching point
	(measured from lower end of pressure tube)	



SDS/PP

SDS/PVDF/S





Contact position with empty tank

SDS/PP

SDS/PVDF/S

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Subject to deviations from the diagrams and technical data.

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Jola-Protection relays

for connection of binary sensors
(e.g. Jola floating switches or Jola immersion probes) or
for connection of Namur-sensors
(e.g. inductive or capacitive proximity sensors)
and

Jola-Alarm relays

for connection of several relays to one alarm relay or
for connection of binary sensors
(e.g. Jola floating switches or Jola immersion probes)

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KR 3 and KR 3 A protection relays

for signalling a limit level (1 sensor) or for two-point control (2 sensors)

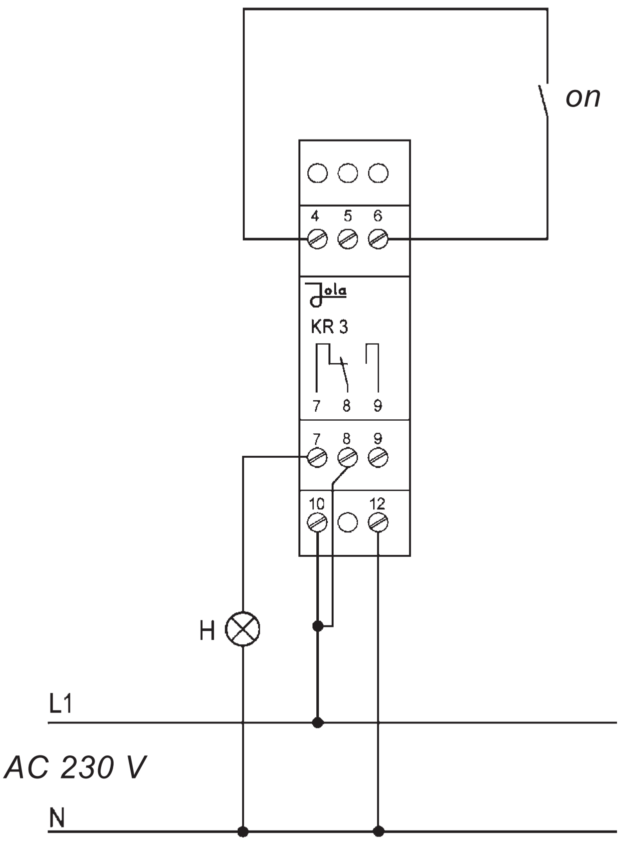
Protection relay for U-bar mounting, with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

These appliances are designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. They are only suitable for use in clean environments.

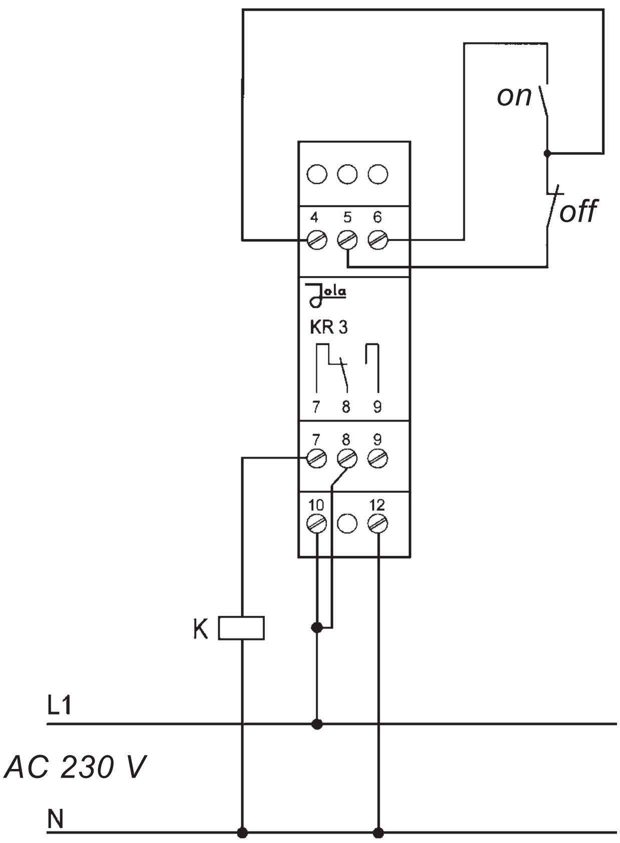
Technical data	**KR 3**	**KR 3 A**
Alternative supply voltages (AC versions: terminals 10 and 12; DC versions: - terminal 10: – - terminal 12: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } in these two cases, the unit must only be connected - DC 12 V or } to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request	
Power input	approx. 3 VA	
Control circuit (terminals 4, 5, 6)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold	
Sensor connection	according to DIN EN 50 227	
– no-load voltage	DC 8.4 V (safety extra low voltage SELV)	
– short-circuit current	< 10 mA	
– response hysteresis	1.5 mA 1.8 mA	
Controlled circuit (terminals 7, 8, 9)	**1 single-pole potential-free changeover contact with self-hold**	
Principle	**quiescent current principle**	**working current principle**
Switching status indicators	1 green LED lights when the output relay is energised 1 red LED lights when the output relay is not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 22.5 x 100 mm (dimensions see p. 12-1-13)	
Connection	terminals on top of housing	
Protection class	IP 20	
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022	
Mounting orientation	any	
Temperature appl. range	from – 15°C to + 60°C	
Max. cable length between relay and sensor(s)	**1,000 m**	
VDE marks licence in accordance with - the EMC guideline	for interferences emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	
VDE marks licence certific.	114502	
- in accordance with the low-voltage guideline	in accordance with EN 60 730	
VDE marks licence certific.	97540	

Connection diagrams

KR 3

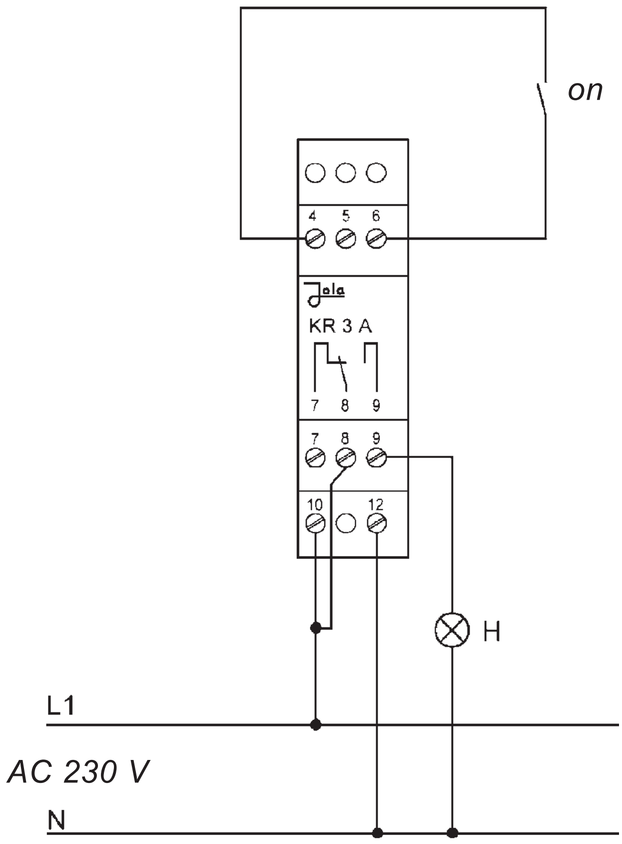


alarm

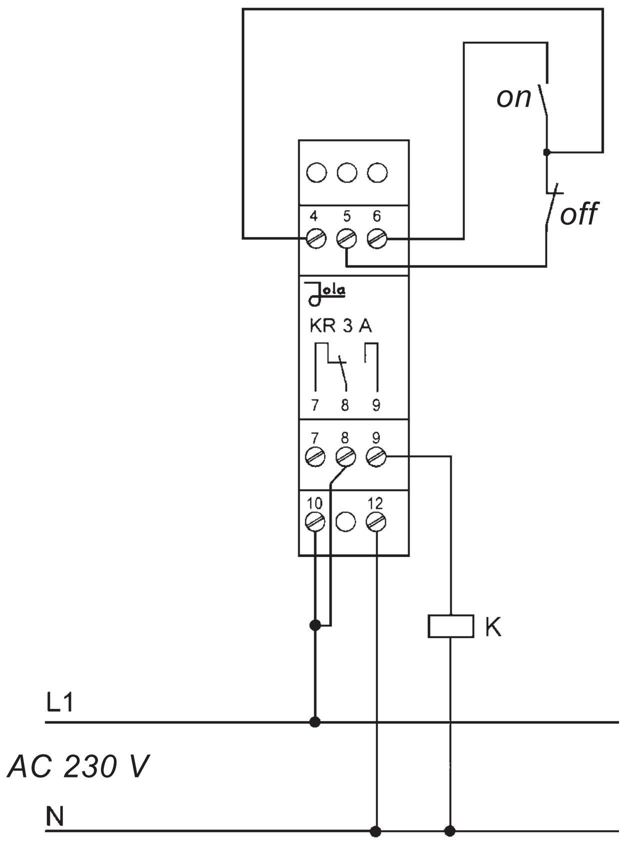


pump contactor

KR 3 A



alarm



pump contactor

Output contact shown in no-current condition

KR 5 and KR 5 A protection relays

for signalling a limit level (1 sensor) or for two-point control (2 sensors)

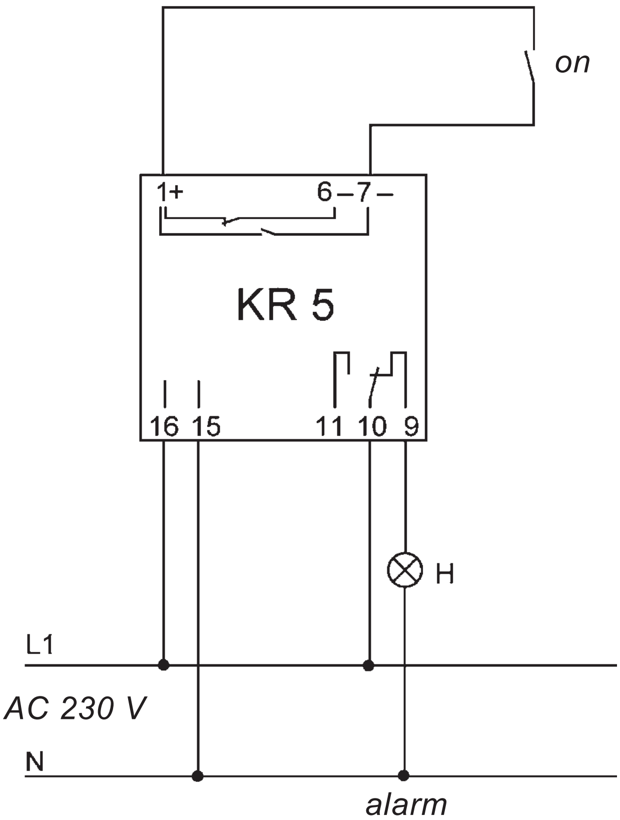
Protection relay for U-bar mounting or surface mounting, with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

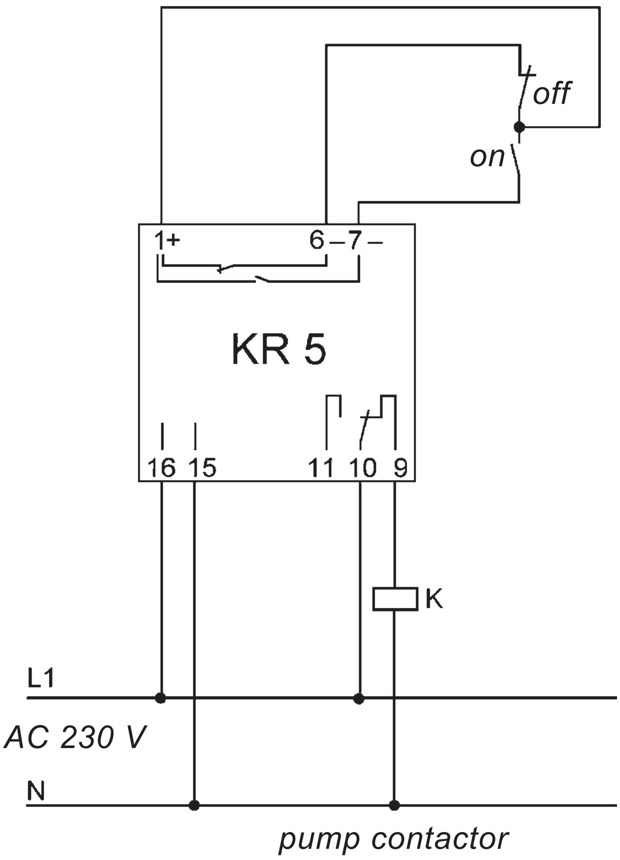
These appliances are designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. They are only suitable for use in clean environments.

Technical data	KR 5	KR 5 A
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: – - terminal 16: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request	
Power input	approx. 3 VA	
Control circuit (terminals 1, 6, 7)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold	
Sensor connection	according to DIN EN 50 227	
– no-load voltage	DC 8.4 V (safety extra low voltage SELV)	
– short-circuit current	< 10 mA	
– response hysteresis	1.5 mA ⎍ 1.8 mA	
Controlled circuit (terminals 9, 10, 11)	**1 single-pole potential-free changeover contact with self-hold**	
Principle	**quiescent current principle**	**working current principle**
Switching status indicators	1 green LED lights when the output relay is energised 1 red LED lights when the output relay is not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 12-1-13)	
Connection	terminals on top of housing	
Protection class	IP 20	
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes	
Mounting orientation	any	
Temperature appl. range	from – 15°C to + 60°C	
Max. cable length between relay and sensor(s)	**1,000 m**	
VDE marks licence in accordance with the EMC guideline	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	
VDE marks licence cert.	114502	

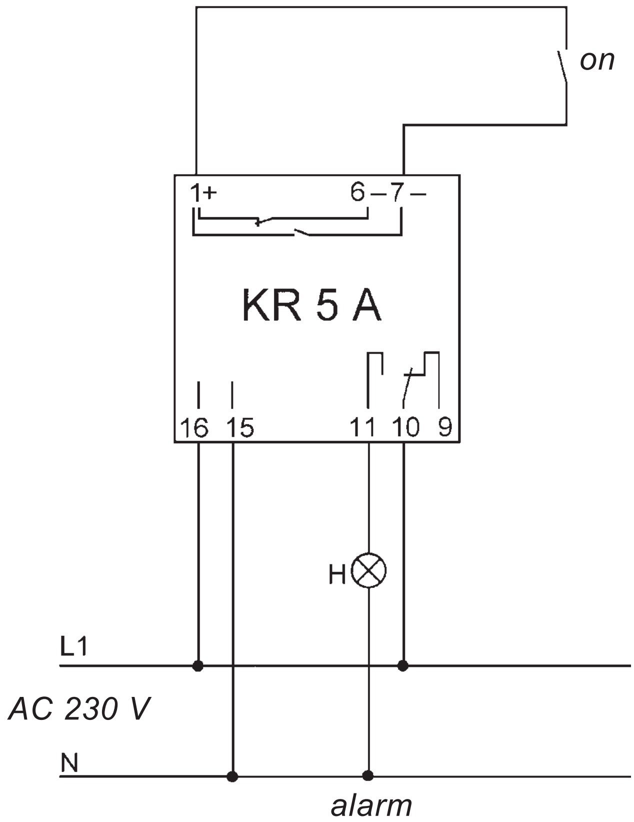
Connection diagrams

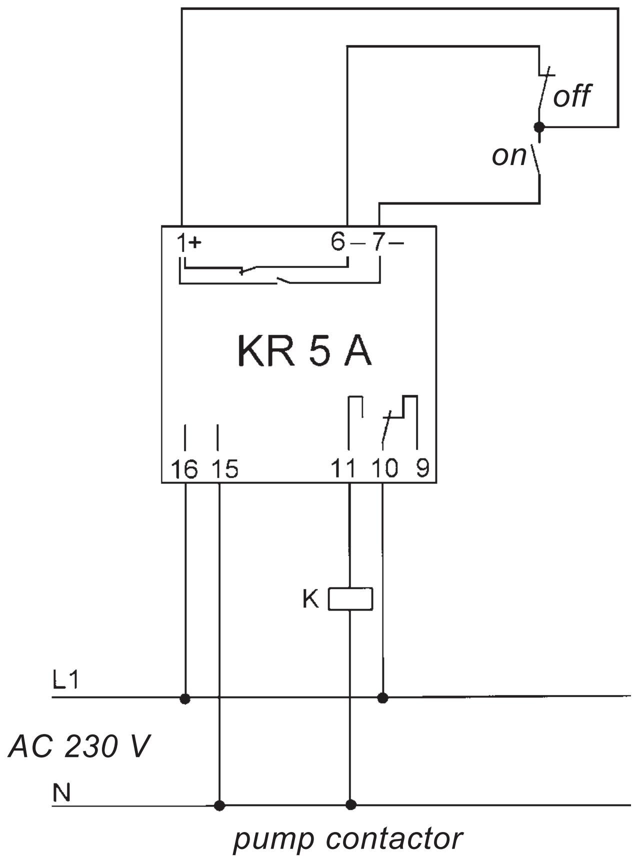
KR 5





KR 5 A





Output contact shown in no-current condition

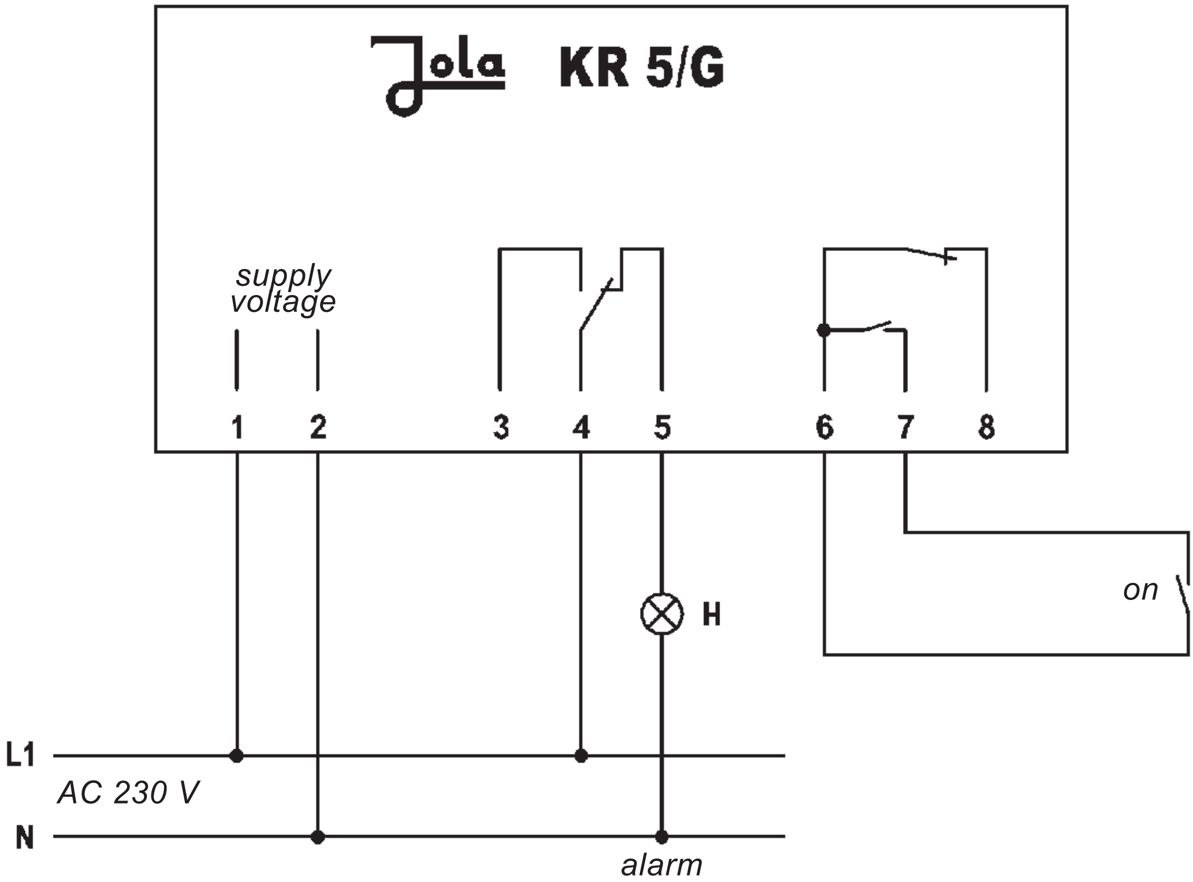
KR 5/G protection relay

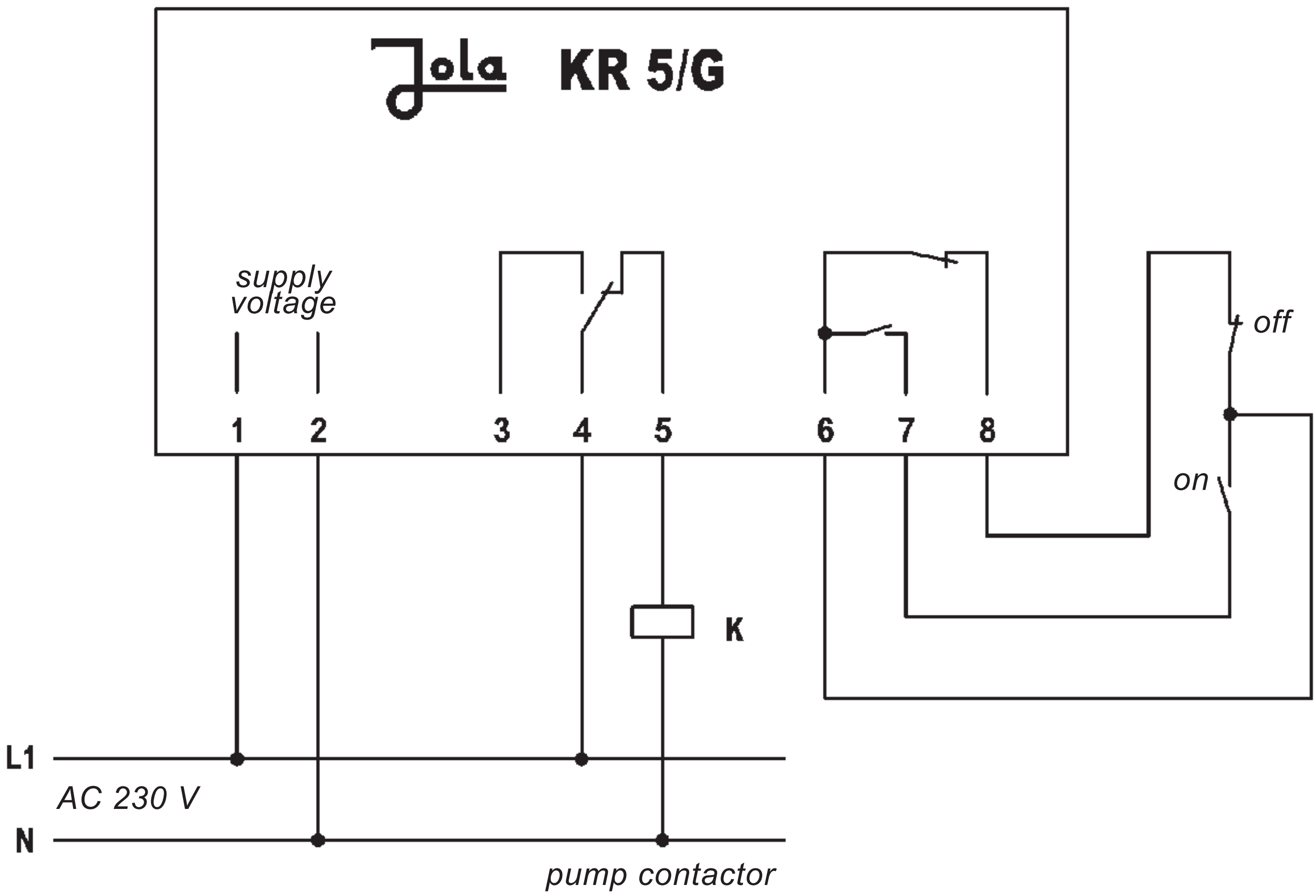
for signalling a limit level (1 sensor) or for two-point control (2 sensors)

Protection relay in surface-mount housing, with transparent cover and switching status indicators inside the housing

Technical data	KR 5/G
Alternative supply voltages AC versions: terminals 1 and 2; DC versions: - terminal 1: – - terminal 2: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Control circuit (terminals 6, 7, 8)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold
Sensor connection	according to DIN EN 50 227
– no-load voltage	DC 8.4 V (safety extra low voltage SELV)
– short-circuit current	< 10 mA
– response hysteresis	1.5 mA 1.8 mA
Controlled circuit (terminals 3, 4, 5)	**1 single-pole potential-free changeover contact with self-hold**
Principle	**quiescent current principle**
Switching status indicators	1 green LED lights when the output relay is energised 1 red LED lights when the output relay is not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 screw connections (dimensions see page 12-1-14)
Connection	internal terminals
Protection class	IP 54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature appl. range	from – 15°C to + 60°C
Max. cable length between relay and sensor(s)	**1,000 m**
VDE marks licence in accordance with the EMC guideline	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies
VDE marks licence cert.	114502

Connection diagrams





Output contact shown in no-current condition

ESA 2 alarm relay

Alarm relay for U-bar mounting or surface mounting, with connection terminals on top of housing and built-in two-colour LED for signalling the respective switching status.

This appliance is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

The design of the alarm relay is based on the **quiescent current principle**, in other words, an alarm signal is given if there is no connection between terminals 7 and 8; the output contacts of the unit also revert to alarm status if there is a supply voltage failure.

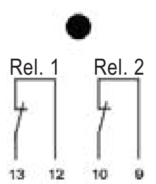
In standby status (unit is supplied with voltage and connection between terminals 7 and 8), the two potential-free outputs are in activated condition = open and the LED lights green.

In the event of an alarm (unit supplied with voltage and no connection between terminals 7 and 8), the two potentiel-free outputs are in non activated condition (contacts in quiescent state = closed) and the LED flashes red.

In order to cancel the alarm given via the output, one of the two relays in the output can be reset using the built-in acknowledgement button or a connected external acknowledgement button. The LED then stops flashing and reverts to permanent red.

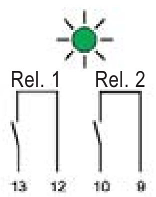
Position of output contacts in the ESA 2 alarm relay

without supply voltage



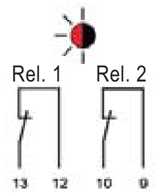
LED dark –
both output relays not energised –
output contacts closed

OK status



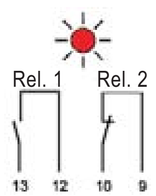
LED lights green –
both output relays energised –
output contacts open

alarm status



LED flashes red –
both output relays not energised –
output contacts closed

alarm status acknowledgement



LED lights red –
output relay 1 energised –
contact 12, 13 open –
output relay 2 not energised –
contact 9, 10 closed

Technical data	**ESA 2**
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: – - terminal 16: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the applications - further supply voltages on request
Power input	approx. 3 VA
Control circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays without self-hold, where one can be reset if an alarm is activated
– no-load voltage – short-circuit current – response sensitivity	$9\ V_{eff}$ ⎍ 10 Hz (safety extra low voltage SELV) max. $0.5\ mA_{eff}$ approx. 30 kOhm
Controlled circuits (terminals 12, 13 – rel. 1, terminals 9, 10 – rel. 2)	**2 potential-free normally closed contacts based on the quiescent current principle, both activated in standby status.** **One of the two normally closed contacts (terminals 12, 13 – rel. 1) can be reset in the event of alarm.** **The other normally closed contact (terminals 9, 10 – rel. 2) retains its switching status as long as the alarm is given.**
Acknowledgement	output relay 1 (terminals 12, 13) can be reset via a built-in button or external acknowledgement button (connection option at terminals 4 and 5)
Switching status indicator	via two-colour LED: green = standby, both output relays energised flashing red = alarm, both output relays not energised lights red = alarm acknowledged, output relay 1 reset
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 12-1-13)
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment to U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature application range	from – 15°C to + 60°C
Max. cable length between relay and contact(s) / sensor(s)	**1,000 m**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

ESA 2/G alarm relay

Alarm relay in surface-mount housing with transparent cover and switching status indicators inside the housing.

The design of the relay is based on the **quiescent current principle**, in other words, an alarm signal is given if there is no connection between terminals 11 and 12; the output contacts of the unit also revert to alarm status if there is a supply voltage failure.

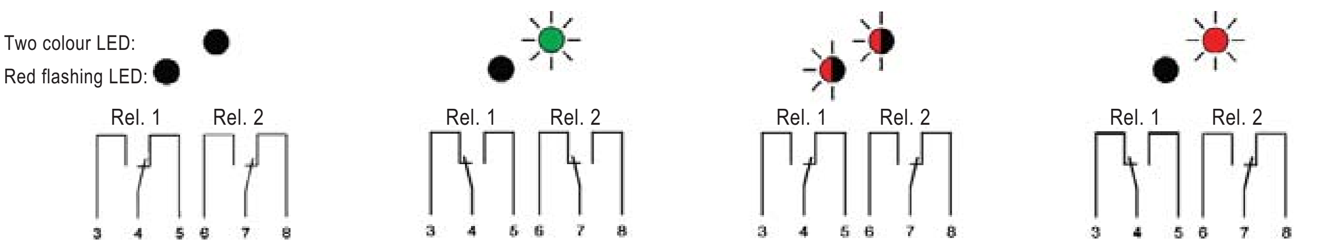
In standby status (unit supplied with voltage and connection between terminals 11 and 12), the two potential-free outputs are in activated condition and the two-colour LED lights green.

In the event of an alarm (unit supplied with voltage and no connection between terminals 11 and 12), the two potential-free outputs are in non activated condition (contacts in quiescent state), and the two-colour LED flashes red; an additionnal red flashing LED also flashes as a switching status indicator for the relay which can be acknoledged.

In order to cancel the alarm given via the output, one of the two relays in the output (terminals 3, 4, 5) can be reset using a connected external acknowledgement button (connection option at terminals 9 and 10). The red flashing LED then stops flashing and the two-colour LED reverts to permanent red.

Position of output contacts in the ESA 2/G alarm relay

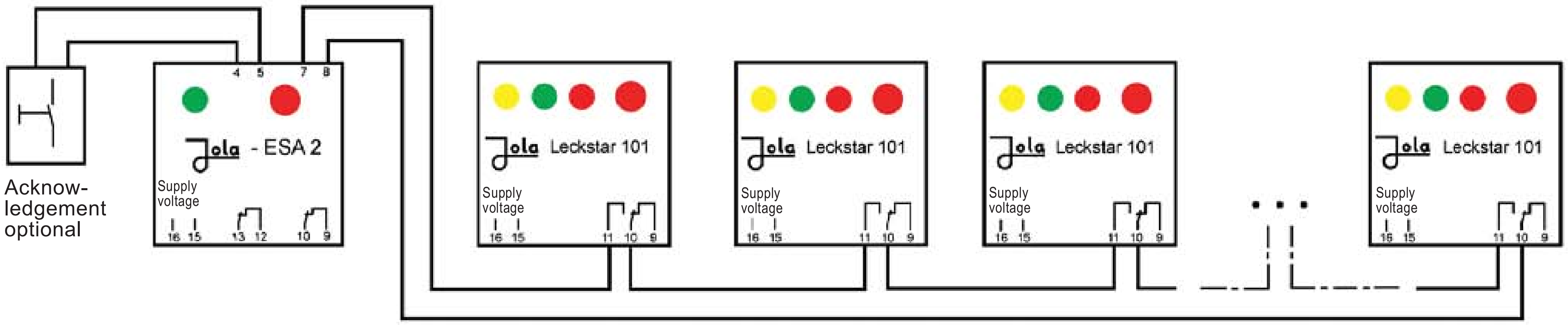
without supply voltage	OK status	alarm status	alarm status acknowledgement



LEDs dark – both output relays not energised	Two-colour LED lights green – red flashing LED dark – both output relays energised	Two-colour LED flashes red – red flashing LED flashes – both output relays not energised	Two-colour LED lights red – red flashing LED dark – output 1 energised – output 2 not energised

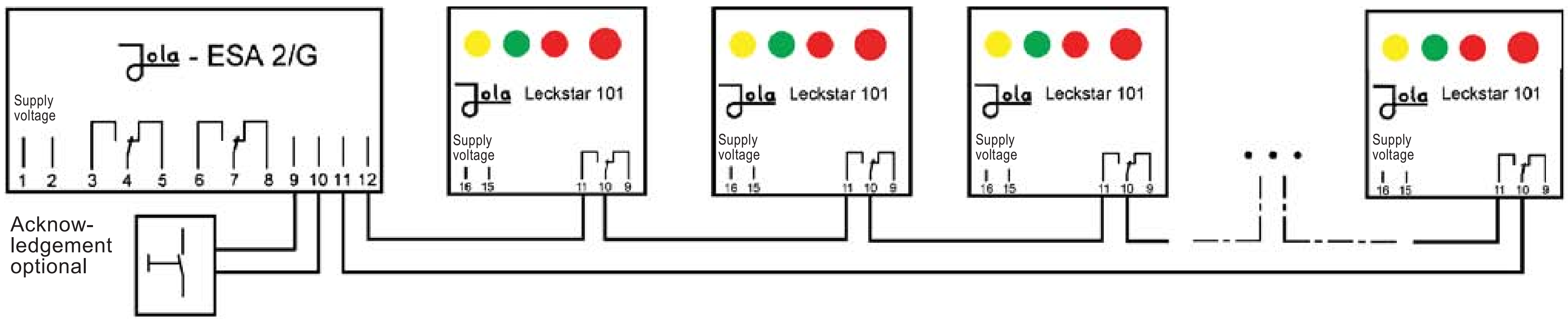
Technical data	ESA 2/G
Alternative supply voltages (AC versions: terminals 1 and 2; DC versions: - terminal 1: – - terminal 2: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Control circuit (terminals 11 and 12)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays without self-hold, where one can be reset if an alarm is activated
– no-load voltage – short-circuit current – response sensitivity	$9\ V_{eff}$ ⎍ 10 Hz (safety extra low voltage SELV) max. $0.5\ mA_{eff}$ approx. 30 kOhm
Controlled circuit (terminals 3 to 8)	**2 potential-free changeover contacts based on the quiescent current principle, both activated in standby status. One of the two changeover contacts (terminals 3, 4, 5 – rel. 1) can be reset in the event of alarm. The other changeover contact (terminals 6, 7, 8 – rel. 2) retains its switching status as long as the alarm is given.**
Acknowledgement	output relay 1 (terminals 3, 4, 5) can be reset via a connected external acknowledgement button (connection option at terminals 9 and 10)
Switching status indicators	– via two-colour LED: green = standby, both output relays energised flashing red = alarm, both output relays not energised lights red = alarm acknowledged, output relay 1 reset – and one red flashing LED: flashes red = output relay 1 in alarm status
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 screw connections (dimensions see page 12-1-14)
Connection	internal terminals
Protection class	IP 54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature application range	from – 15°C to + 60°C
Max. cable length between relay and contact(s) / sensor(s)	**1,000 m**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Circuit diagram for connection of several Leckstar 101 relays connected to each other to an alarm relay ESA 2 (example)



Output contacts shown in no-current condition

Circuit diagram for connection of several Leckstar 101 relays connected to each other to an alarm relay ESA 2/G (example)



Output contacts shown in no-current condition

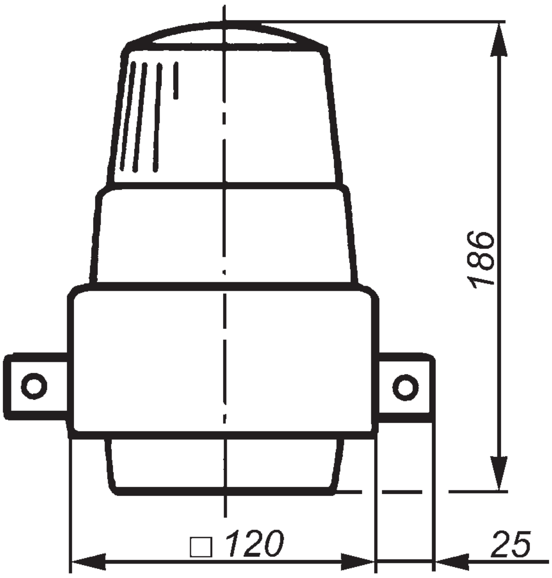
Hooter

for connection to an alarm relay ESA 2 or ESA 2/G

Technical data	HU 2	HU 4	HU 12, with incorporated flashlight
Application	dry rooms	damped rooms or outer mounting	dry rooms
Control voltage		**AC 230 V**	
Current consumption	AC 0.01 A	AC 0.1 A	AC 0.08 A
Power consumption	approx. 2.2 VA	approx. 22 VA	approx. 17.6 VA
Sound level at a distance of 1 m	approx. 93 dB	approx. 110 dB	approx. 100 dB
Dimensions	approx. 70 x 170 mm	approx. 140 x 162 mm	approx. 170 x 186 mm
Protection class	IP 33	IP 55	IP 43

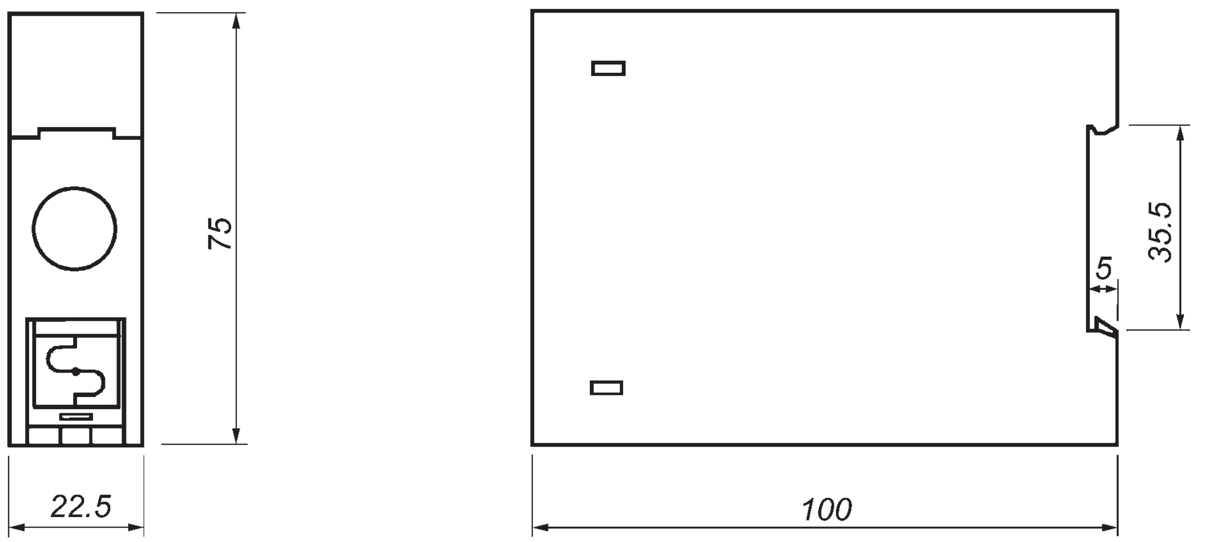
HU 2

HU 4

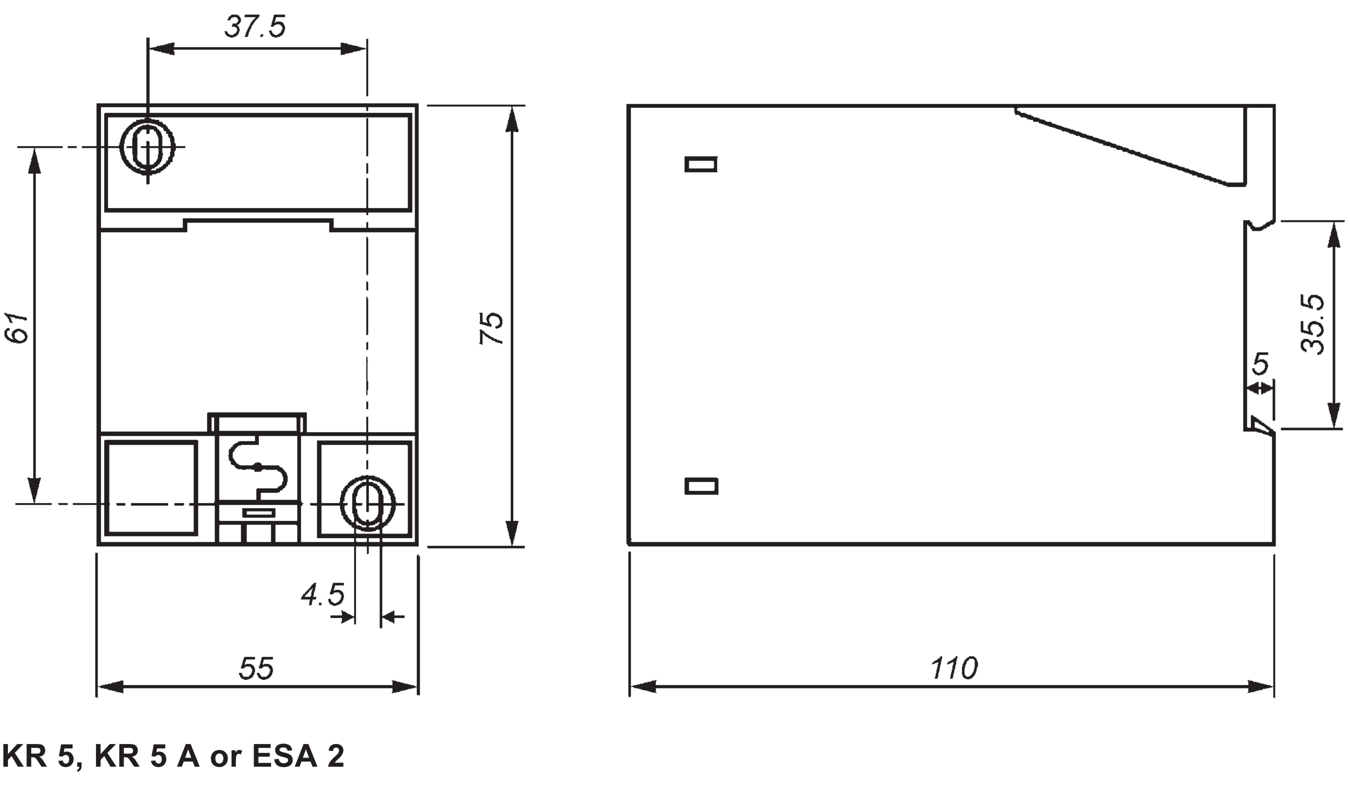


HU 12

Dimensional drawings

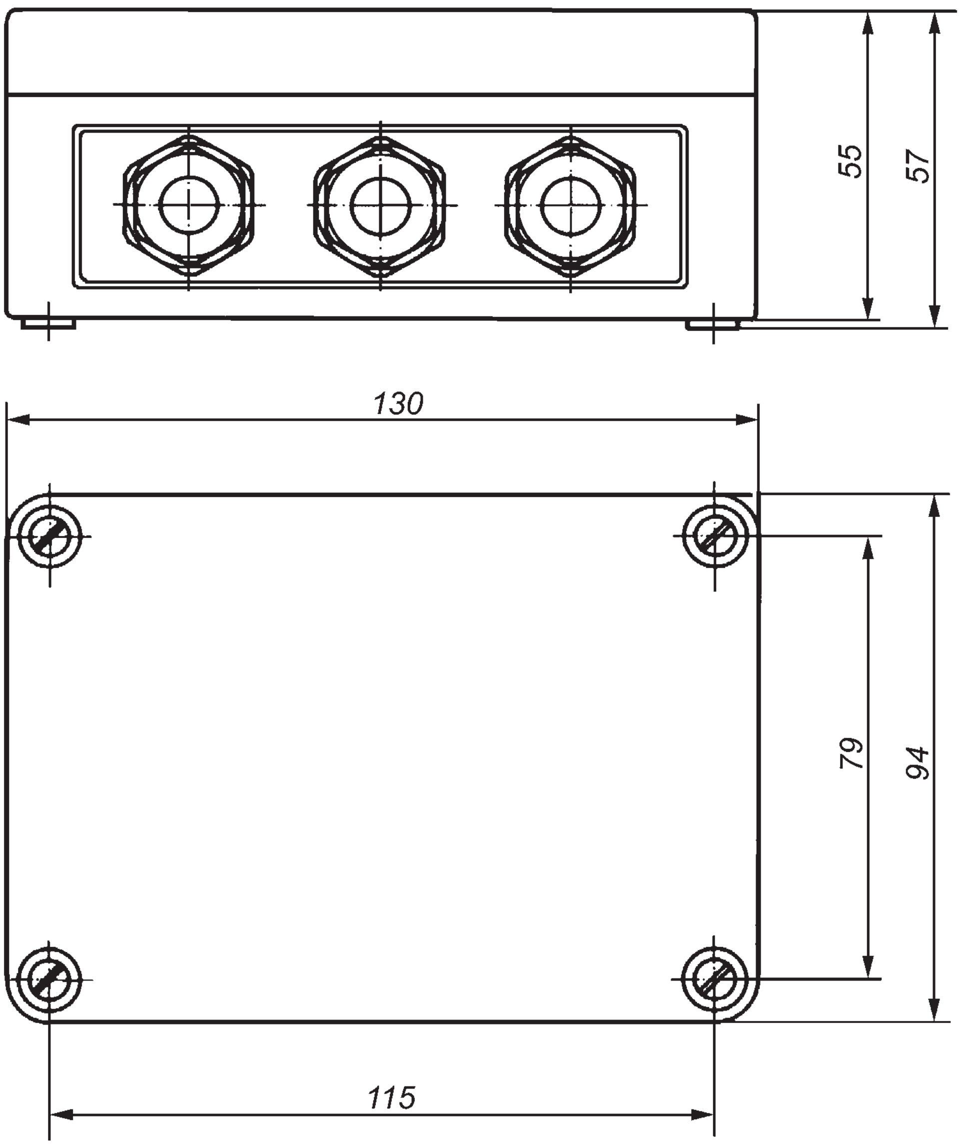


KR 3 or KR 3 A



KR 5, KR 5 A or ESA 2

Dimensional drawings



KR 5/G or ESA 2/G

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

KR
Ex protection relays

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KR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC protection relay

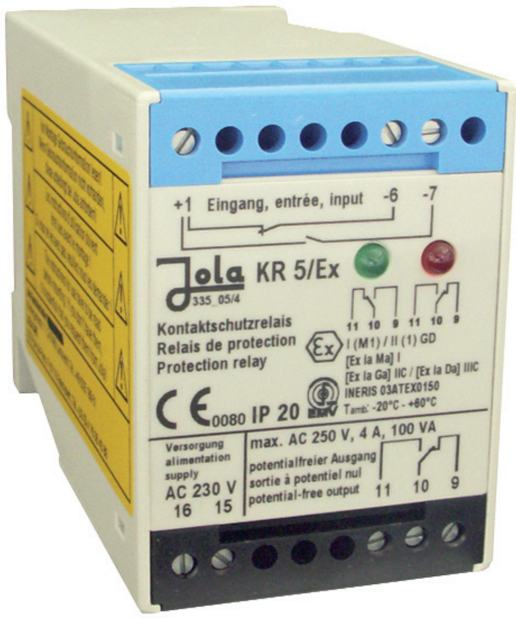
for signalling a limit level (1 sensor)
or
for two-point control (2 sensors)

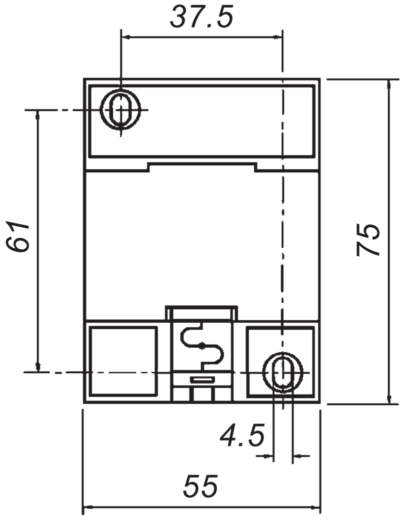
The **KR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC** protection relay is designed to transmit control commands from an intrinsically safe control circuit to a non-intrinsically safe active current circuit (controlled circuit). **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

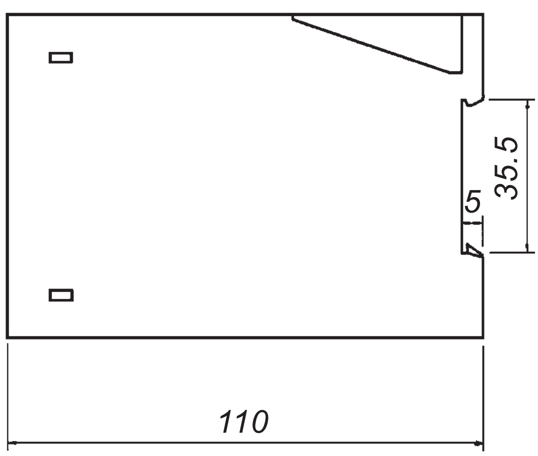
Ex ia approved sensors, such as floating switches or immersion probes (e.g. our types SI/SSP/NL/1/K/PVC Variante 0 ⟨Ex⟩ I M2 / II 2 G Ex ia I Mb / Ex ia IIB T6 Gb or TSR/ED/E8/Variante 0/Ex-0G ⟨Ex⟩ II 2/1 G Ex ia IIC T6 Ga/Gb) or a NAMUR sensor (e.g. inductive or capacitive Ex ia sensor) may be used in the intrinsically safe control circuit acc. to the relevant standards and instructions.

Protection relay for U-bar mounting or surface mounting,
with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

These units are designed for switch cabinet mounting or installation in a suitable protective housing outside potentially explosive atmospheres and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.



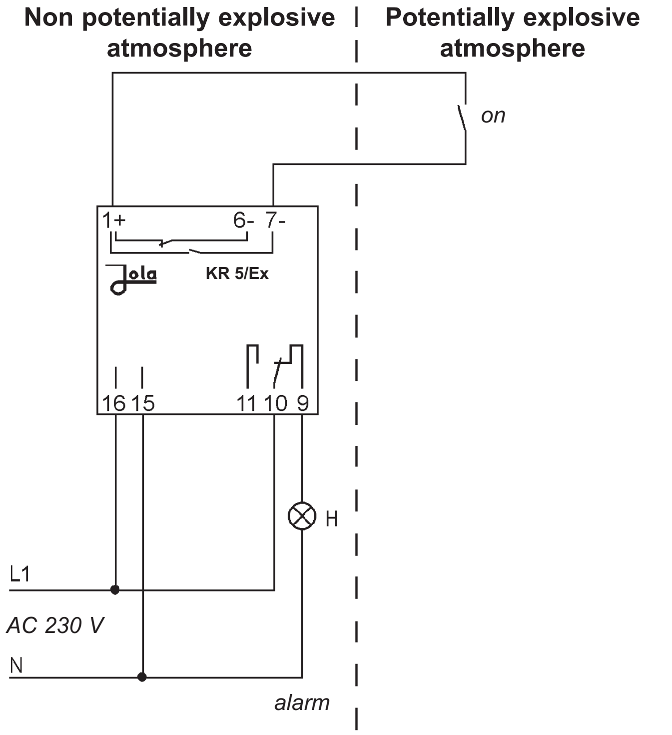


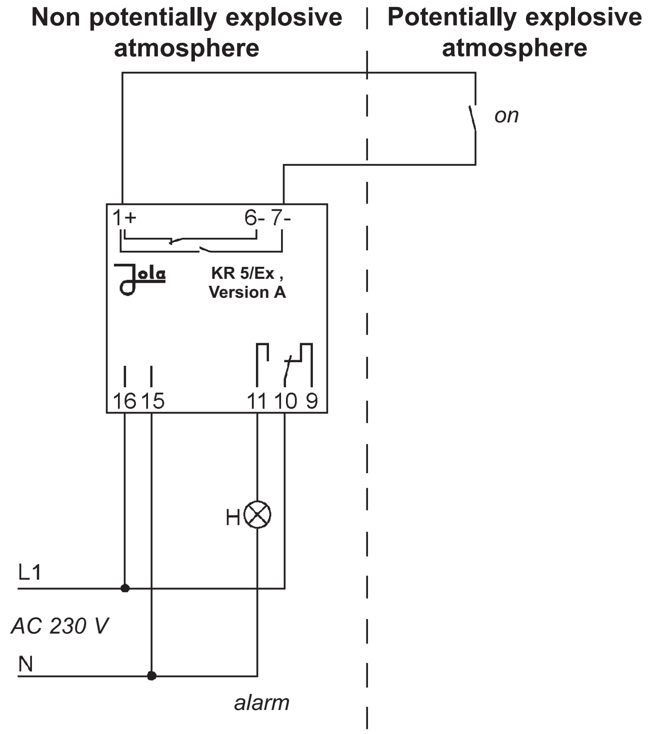


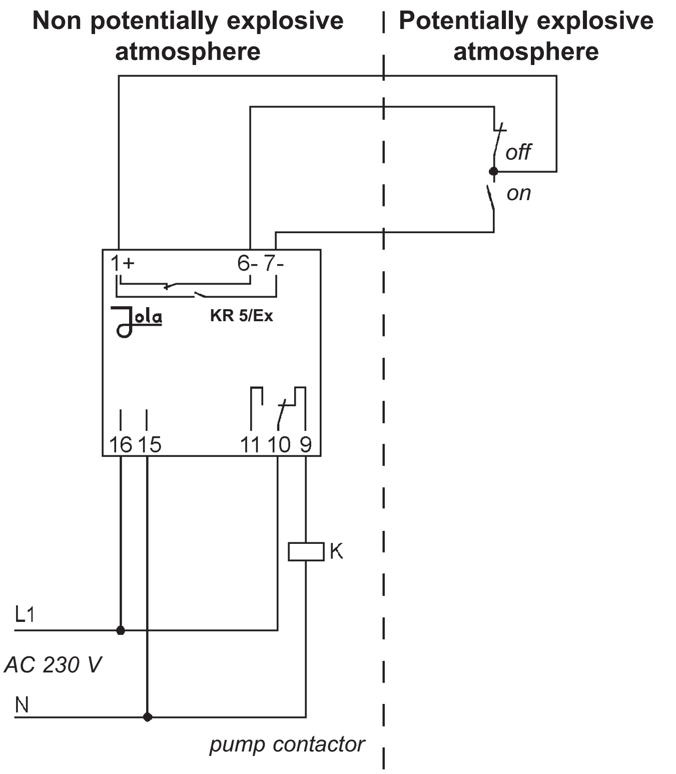
Technical data	KR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC	KR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A
Alternative supply voltages (terminals 15 and 16)	AC 230 V (delivered if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 110 V or AC 24 V	
Power input	approx. 3 VA	
Control circuit (terminals 1, 6, 7)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with self-hold	
Sensor connection	according to EN 50 227, NAMUR	
No-load voltage	DC 8.4 V (safety extra low voltage SELV)	
Short-circuit current	< 10 mA	
Response sensitivity	1.5 mA ⎍ 1.8 mA	
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact with self-hold	
Principle	quiescent current principle	working current principle
Switching status indicators	1 green LED lights when the output relay is energised 1 red LED lights when the output relay is not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 100 VA	
Housing	insulating material, 75 x 55 x 110 mm	
Connection	terminals on top of housing	
Protection class	IP20	
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes	
Mounting orientation	any	
Temperature range	– 20°C to + 60°C	
Max. cable length between protection relay and sensor	to be clarified by the customer in consultation with the competent technical monitoring organisation for the application in question	
EG type examination certificate	INERIS 03ATEX0150	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	

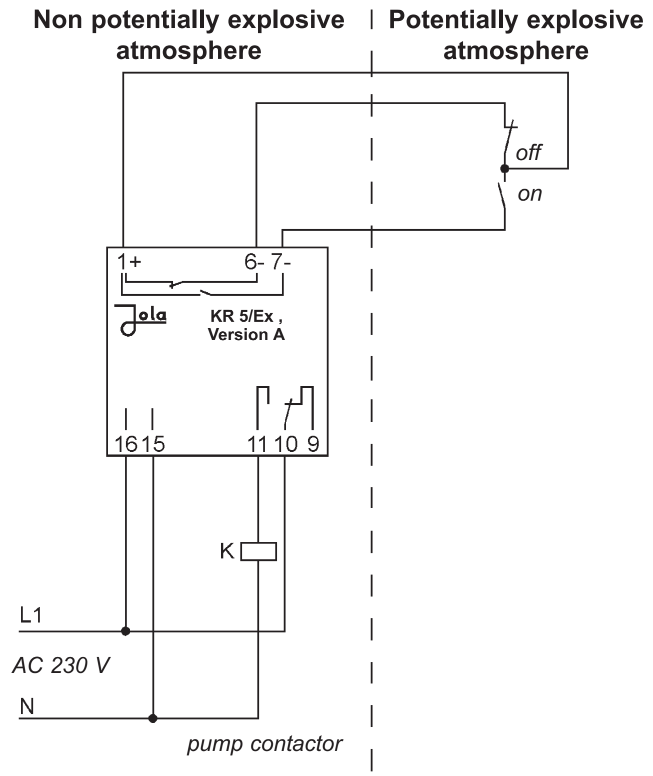
Connection diagrams

KR 5/Ex ⓔx | KR 5/Ex ⓔx, Version A









Output contact shown in no-current condition

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

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Mounting brackets

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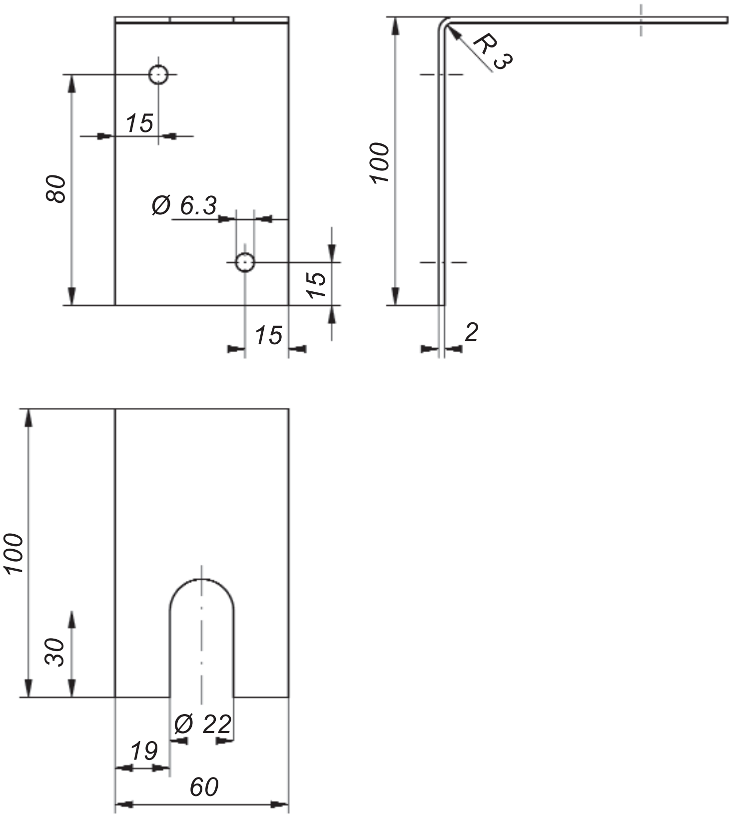
contact@jola-info.de • www.jola-info.de

Mounting bracket

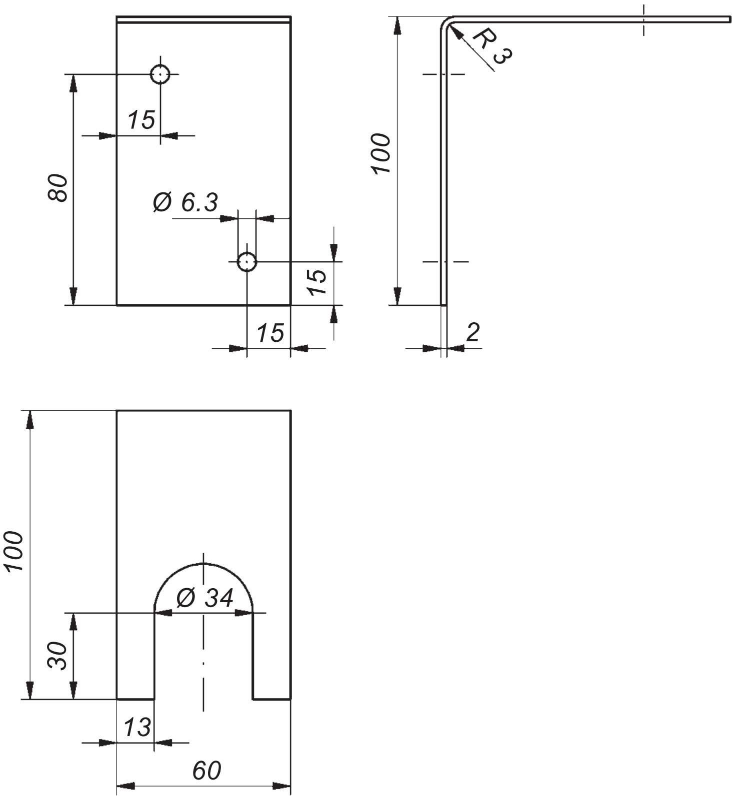
made of stainless steel 316 Ti

with lateral oblong hole

- **MW 100x100x60/G½/L**
  for G½ stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G½ counternut)



- **MW 100x100x60/G1/L**
  for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)

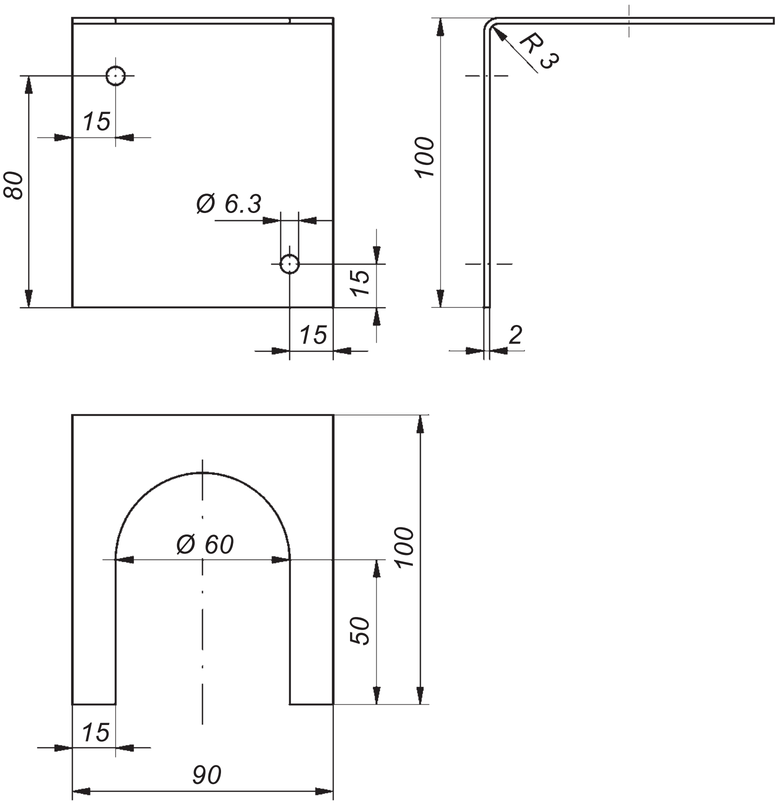


Mounting bracket

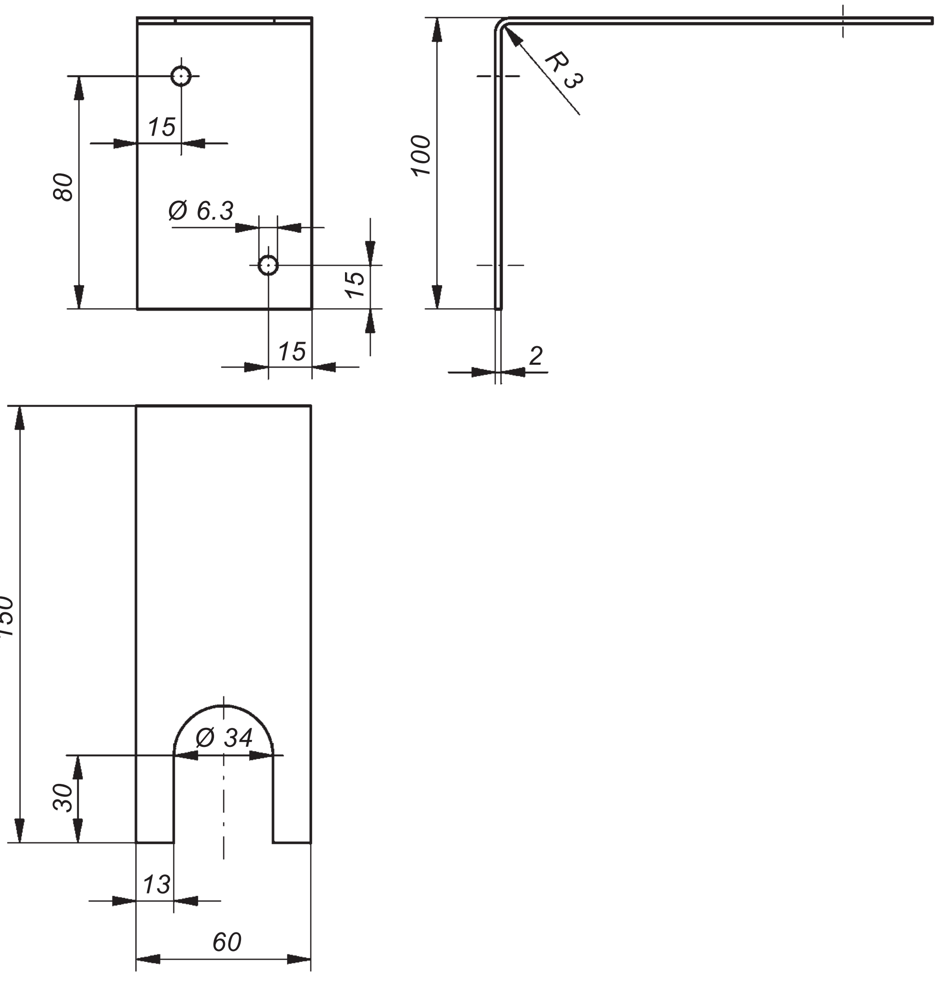
made of stainless steel 316 Ti

with lateral oblong hole

- **MW 100x100x90/G2/L**
  for G2 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G2 counternut)



- **MW 100x150x60/G1/L**
  for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)

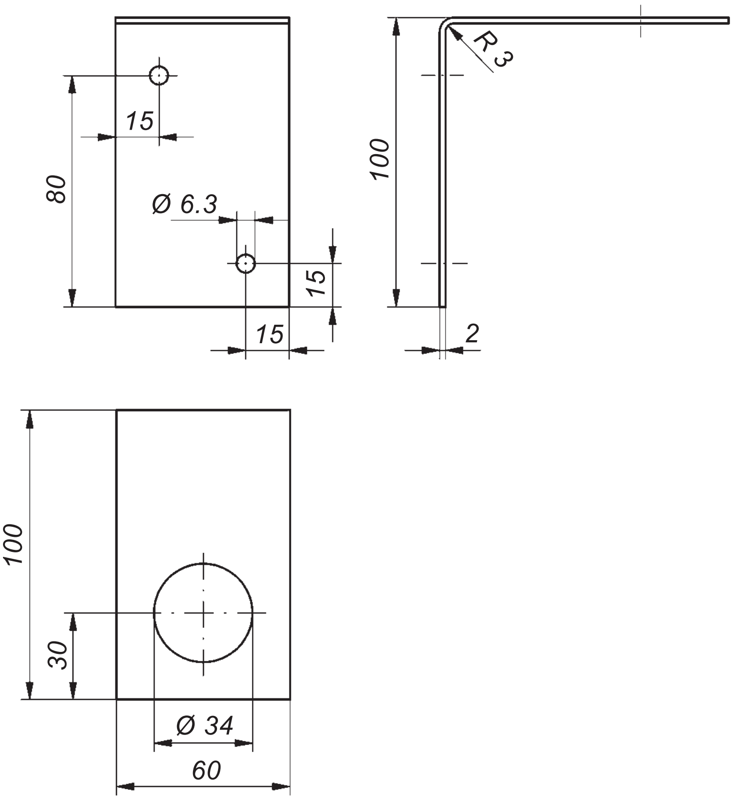


Mounting bracket

made of stainless steel 316 Ti

with lateral hole

- **MW 100x100x60/G1/B**
  for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)

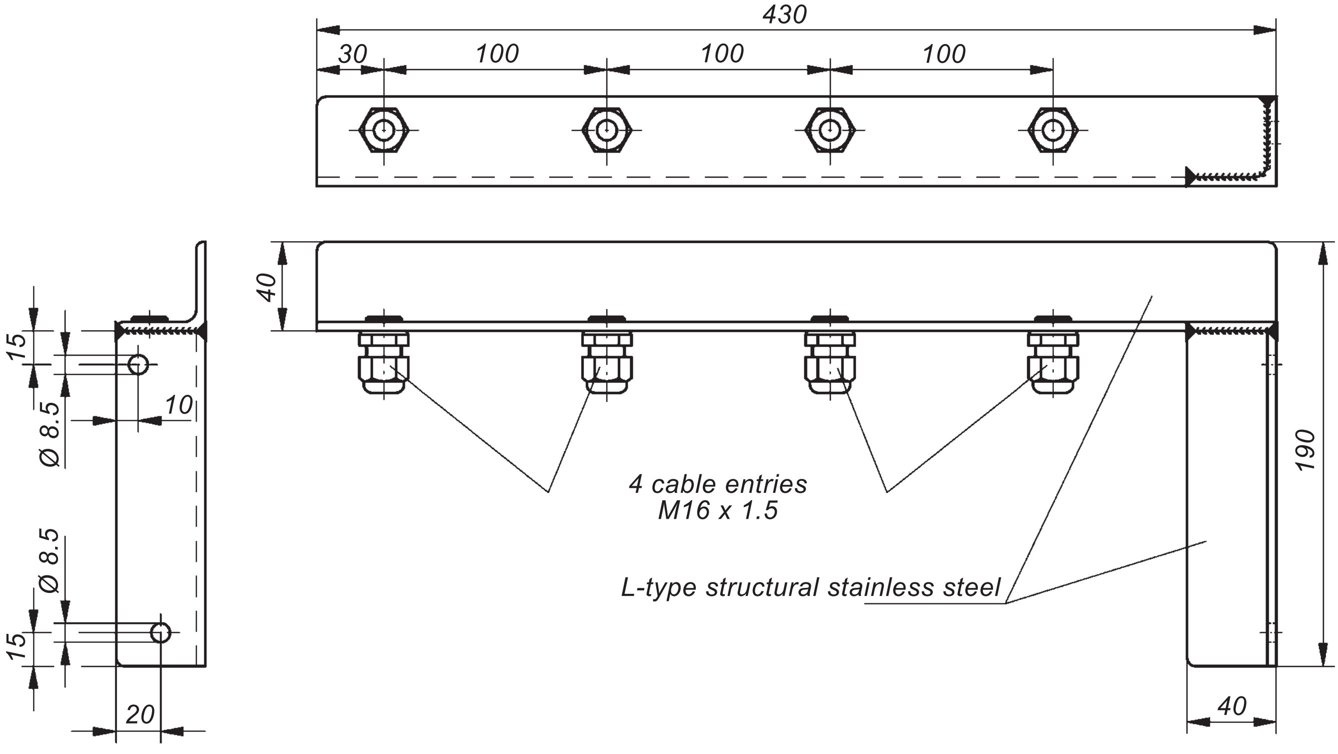


Mounting bracket

made of stainless steel 316 Ti

with 4 cable entries made of nickel-plated brass (on request made of PP or stainless steel) suitable for 4 floating switches

- **MW 190x430x40/4xM16-Ms**



Mounting brackets for Ex apparatus

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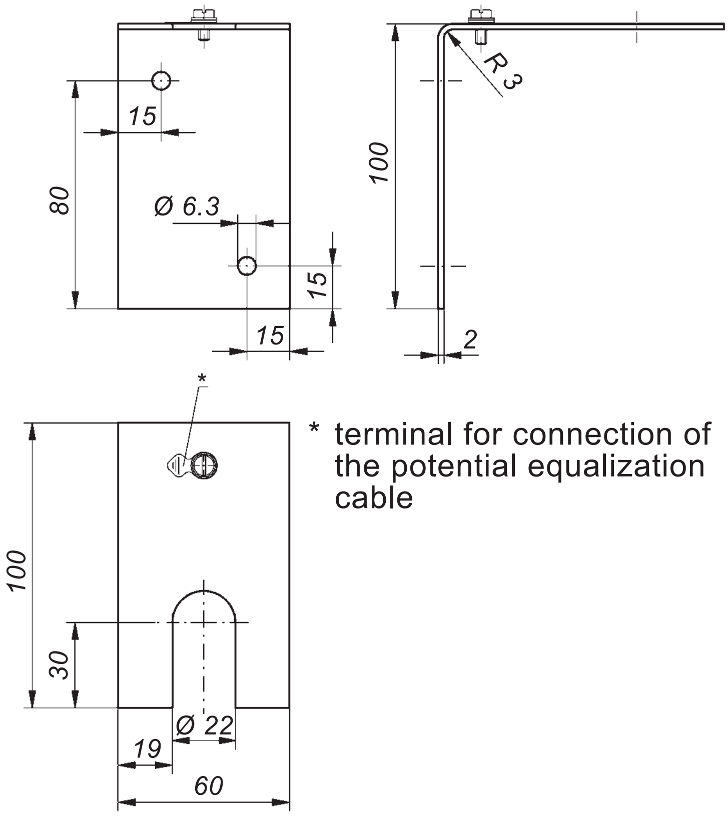
Mounting bracket

made of stainless steel 316 Ti

with lateral oblong hole

• MW 100x100x60/G½/L/Ex

for G½ stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G½ counternut)

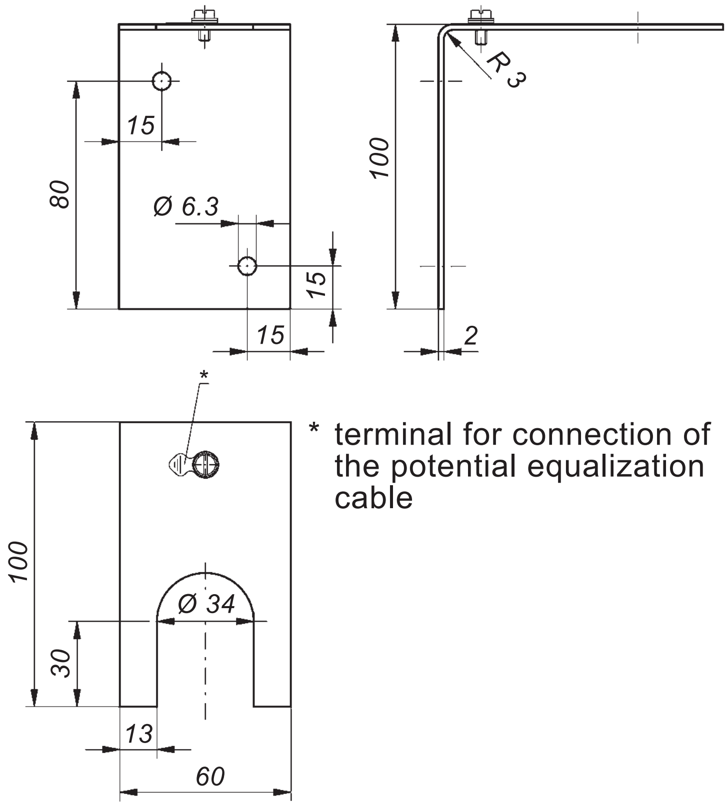


* terminal for connection of the potential equalization cable

---

• MW 100x100x60/G1/L/Ex

for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)



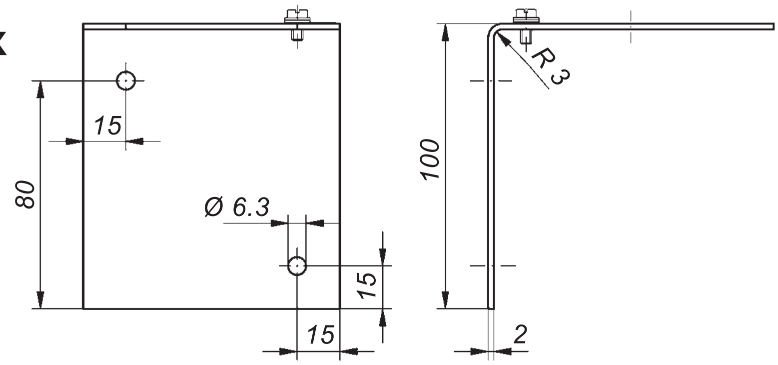
* terminal for connection of the potential equalization cable

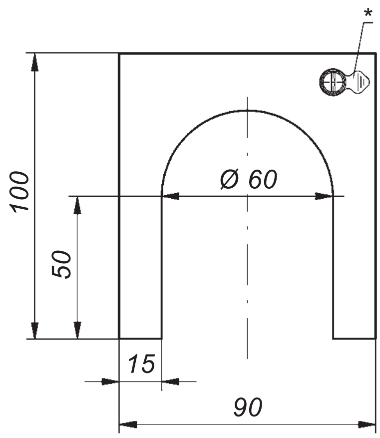
Mounting bracket

made of stainless steel 316 Ti

with lateral oblong hole

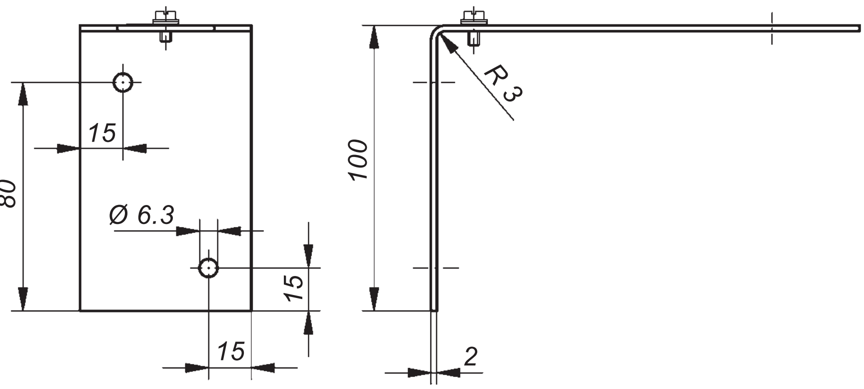
- **MW 100x100x90/G2/L/Ex**
  for G2 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G2 counternut)

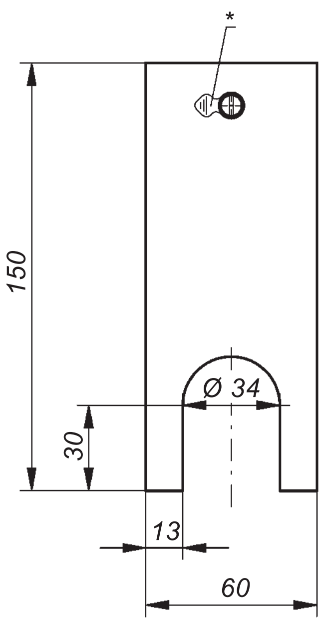




* terminal for connection of the potential equalization cable

- **MW 100x150x60/G1/L/Ex**
  for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)





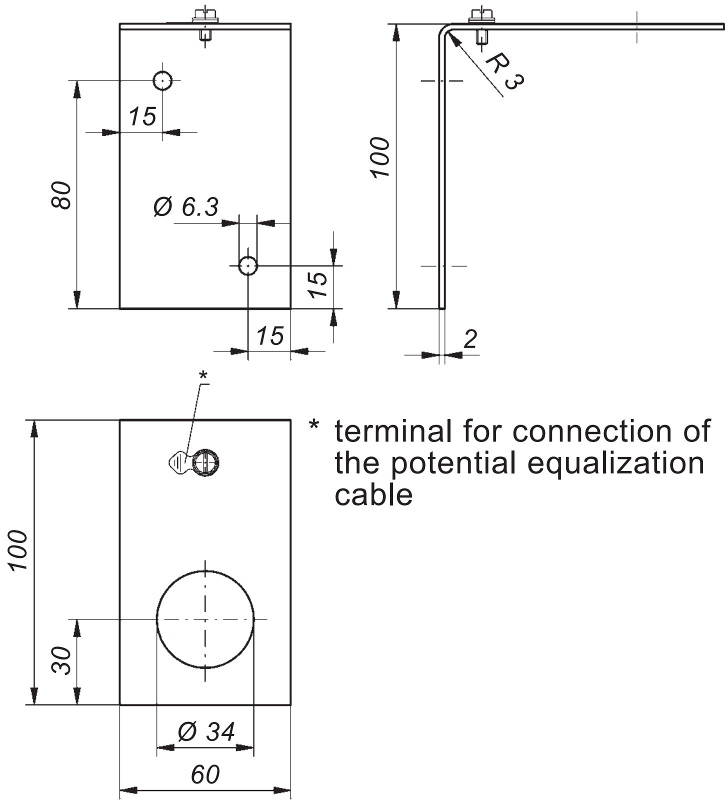
* terminal for connection of the potential equalization cable

Mounting bracket

made of stainless steel 316 Ti

with lateral hole

- **MW 100x100x60/G1/B/Ex**
  for G1 stuffing gland or screw-in nipple (fixing of the stuffing gland or screw-in nipple via G1 counternut)



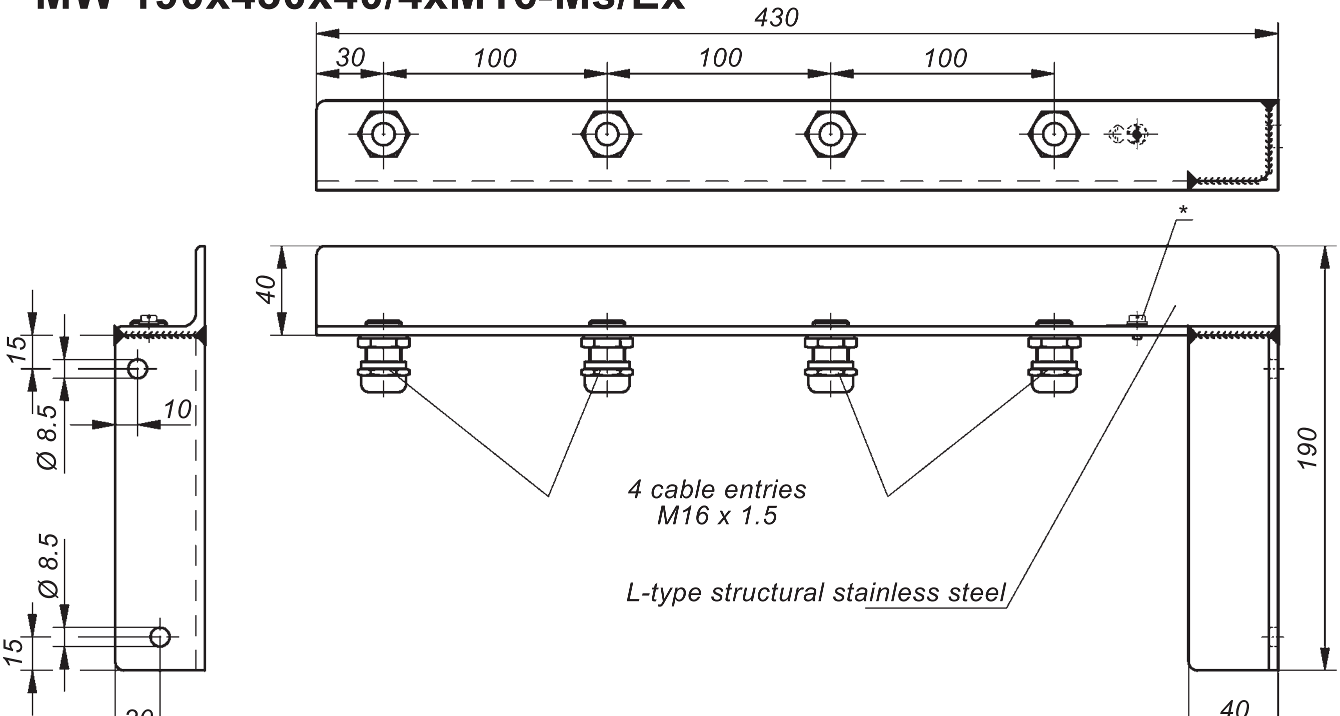
* terminal for connection of the potential equalization cable

Mounting bracket

made of stainless steel 316 Ti

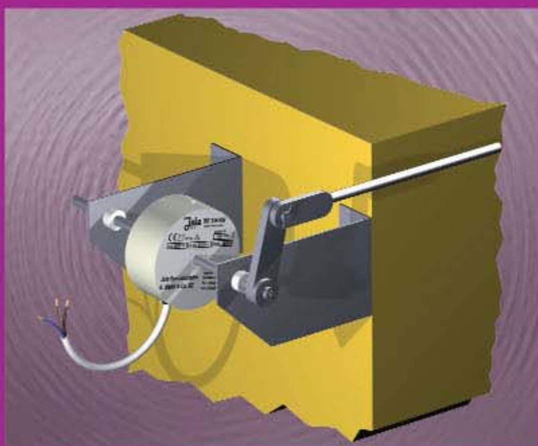
with 4 cable entries made of nickel-plated brass (on request made of stainless steel) suitable for 4 floating switches

- **MW 190x430x40/4xM16-Ms/Ex**



* terminal for connection of the potential equalization cable

RK
external-mounting limit switches
with ball-operated microswitch



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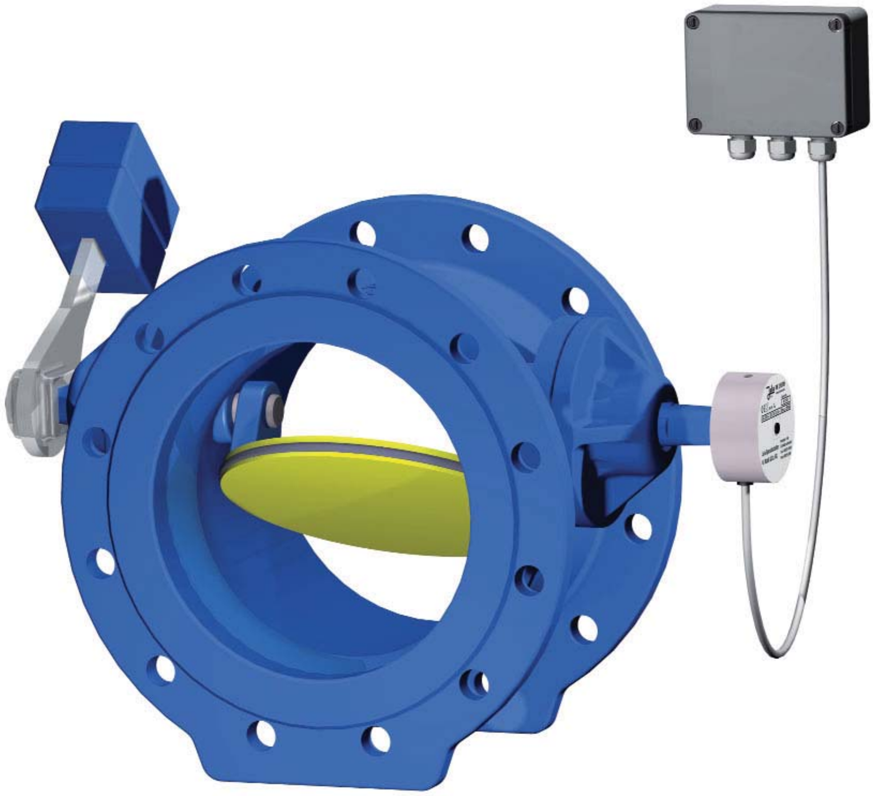
RK 3/K/...
external-mounting limit switches

Example of application



Application range, mounting and mode of operation of the RK 3/K/... limit switches

The RK 3/K/... limit switches are particularly suitable where the use of conventional limit switches is questionable because of severe working conditions, e.g. in damp or dirty environment.

The mounting of the RK 3/K/... limit switches has to be effected via a through hole situated in the middle of the body of the switch.

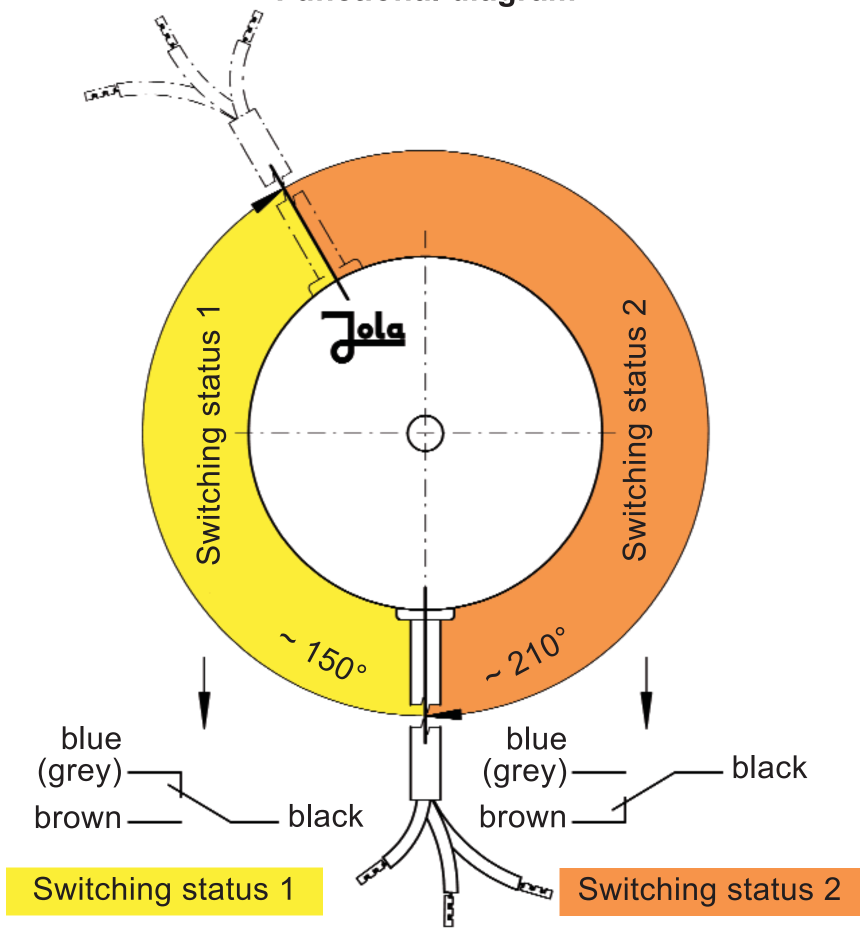
Through this hole, the limit switch has to be mounted on a horizontal shaft of the customer´s device which permits a rotation of max. +/- 180°. The rotation of the shaft causes the switching. In order to prevent an incorrect functioning of the limit switch and a cable break, a sufficient cable length must be left. After the limit switch has been set on the shaft, it has to be fixed by the screw placed inside the body of the switch.

The RK 3/K/... limit switches have as switching element a ball-operated microswitch (changeover contact) . Representation of the switching: see page 21-1-3.

Not for rotating shafts.

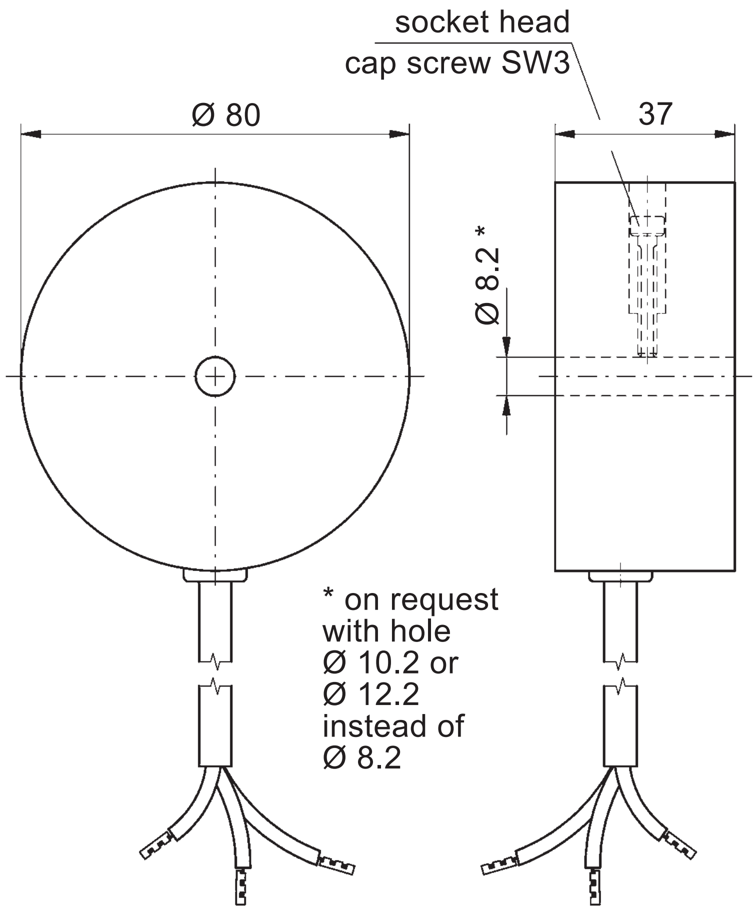
Technical data	RK 3/K/RN	RK 3/K/SIL
Application	**standard application**	
Switching voltage	between AC/DC 24 V and AC/DC 250 V	
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	
Switching capacity	max. 350 VA	
Operating principle	ball-operated microswitch, potential-free changeover contact	
Housing material	PP and cast resin	
Housing protection class	IP 65	
Connecting cable	A05RN-F 3 x 0.75	silicone 3 x 0.75
	other connecting cable on request	
Connecting cable length	2 metres, other cable length on request	
Temperature application range	from - 20°C to + 60°C	from - 20°C to + 85°C
Pressure resistance	for pressureless application only	
Mounting instructions	mounting only on a horizontal shaft, which allows a rotation of max. +/- 180°	

Functional diagram



The switching occurs by rotation to the right, clockwise, when looking at the front-side (rating plate side)

Dimensional drawing



The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

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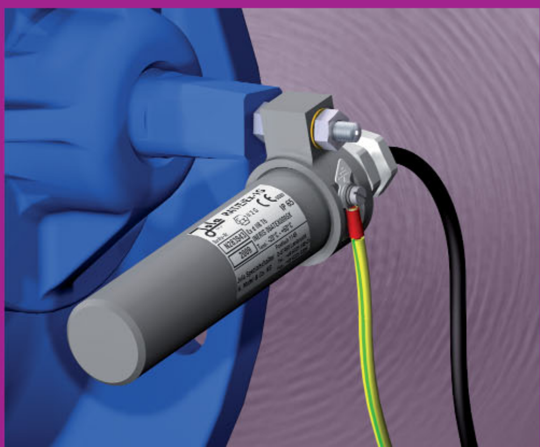
RAT Ex limit switches

with ball-operated microswitch



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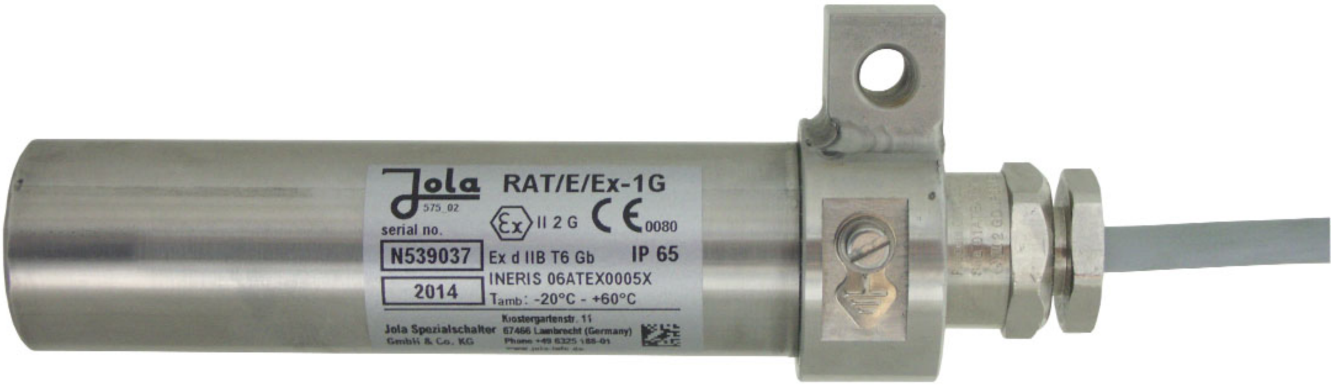
RAT/E/Ex-1G II 2 G Ex d IIB T6 Gb and RAT/H/E/Ex-1G II 2 G Ex d IIB T4 Gb limit switches



Areas of application, mounting and mode of operation of the RAT Ex limit switches

The RAT Ex limit switches are recommended for use wherever the use of conventional flameproof encapsulated limit switches is difficult due to demanding ambient conditions. Such conditions include, for example, wet or soiled environments.

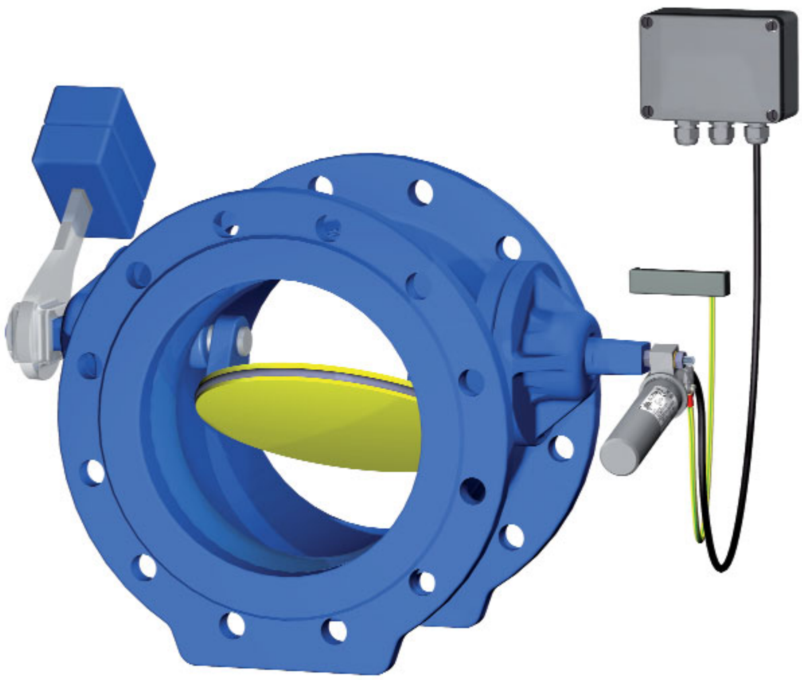
The RAT Ex limit switch is mounted via a borehole in the head section of the unit.

This borehole is used to secure a customer-supplied metallic horizontal shaft, but this shaft should not rotate away from the horizontal plane by more than +/– 90°. It is the rotational motion of this shaft that activates the switching process. In order to prevent an incorrect functioning of the limit switch and a cable break, a sufficient cable length must be left.

The RAT Ex limit switches are fitted with a microswitch (changeover contact) as electrical switching element, and this element is activated by an internal metal ball. Switch-over takes place when the limit switch is positioned approx. 17° +/– 8° above or approx. 3° +/– 3° below the horizontal plane.

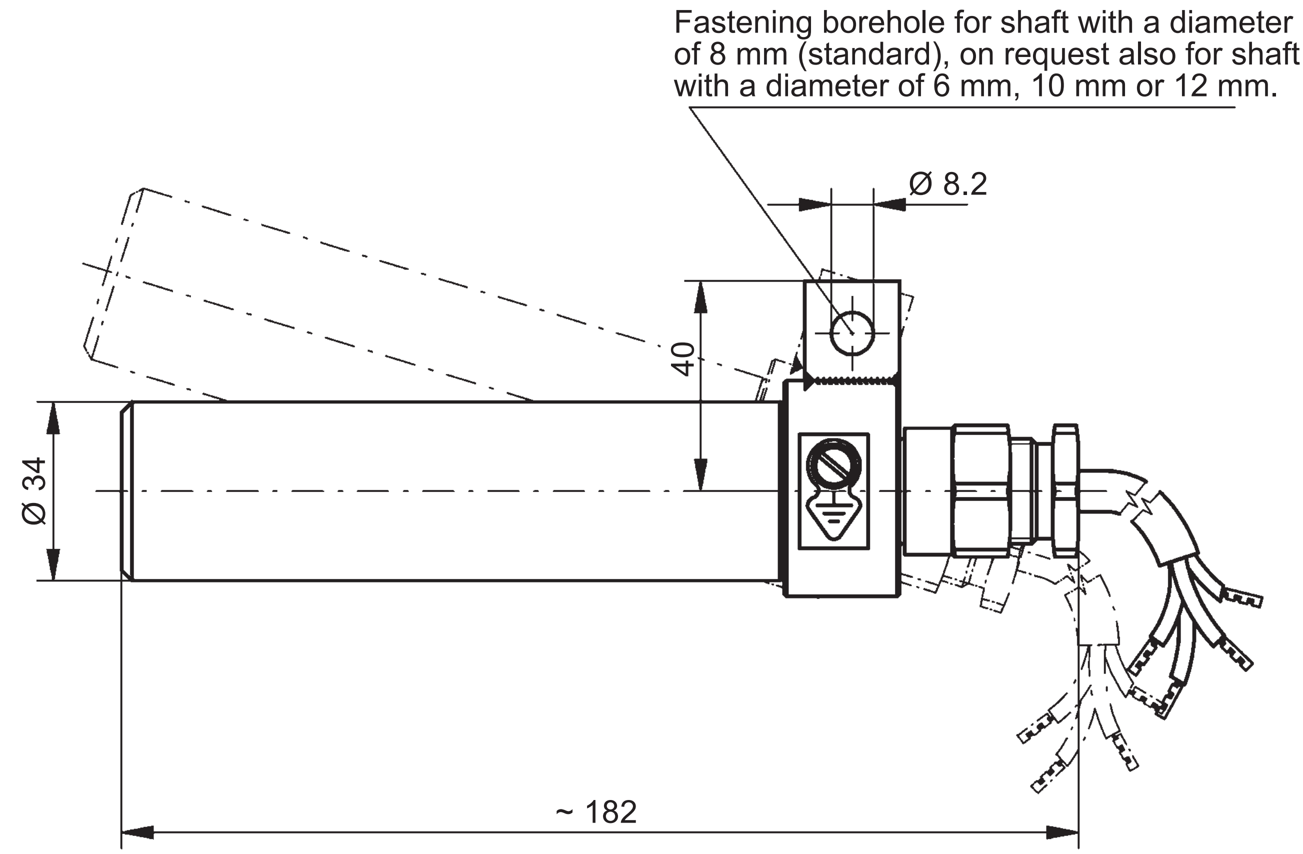
The limit switches are not suitable for use on rotating shafts.

Application example: indication of a predetermined position of a butterfly valve

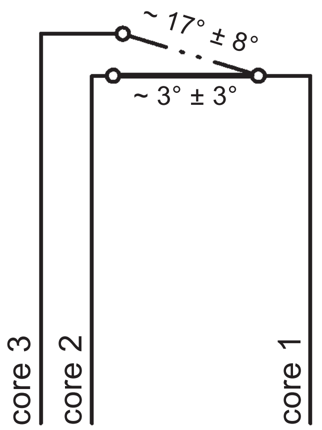


Technical data	RAT/E/Ex-1G Ⓔx II 2 G Ex d IIB T6 Gb	RAT/H/E/Ex-1G Ⓔx II 2 G Ex d IIB T4 Gb
Application	for use in potentially explosive atmospheres zone 1 or 2; EG type examination certificate INERIS 06ATEX0005X	
Switching voltage	between AC/DC 24 V and AC/DC 250 V	
Switching current	between AC 20 mA and AC 3 (1) A or between DC 20 mA and DC 100 mA	
Switching capacity	max. 350 VA	
Operating principle	ball-operated microswitch, potential-free changeover contact	
Housing material	stainless steel 316 Ti	
Cable entry	nickel-plated brass, protection class IP65	
Connecting cable	PUR 4 G 0.75	
Connecting cable length	2 m, other cable length on request	
Temperature range	– 20°C to + 60°C	– 20°C to + 85°C
Pressure resistance	for pressureless application only, for use under atmospheric conditions only	
Mounting instructions	to be mounted only on a metallic horizontal shaft which may only traverse an angle of max. +/– 90° from the horizontal position; the cable must point to the right from the point of view of the observer, the ground terminal must point towards the observer and the fastening block must point upwards.	

Dimensional diagram and swiching action representation



Contact switches over at



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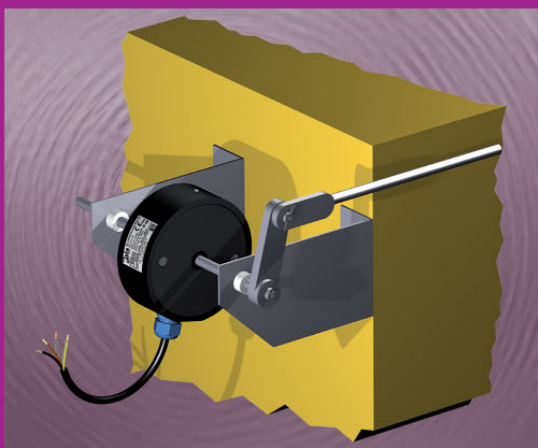
RK Ex limit switches

with ball-operated microswitch



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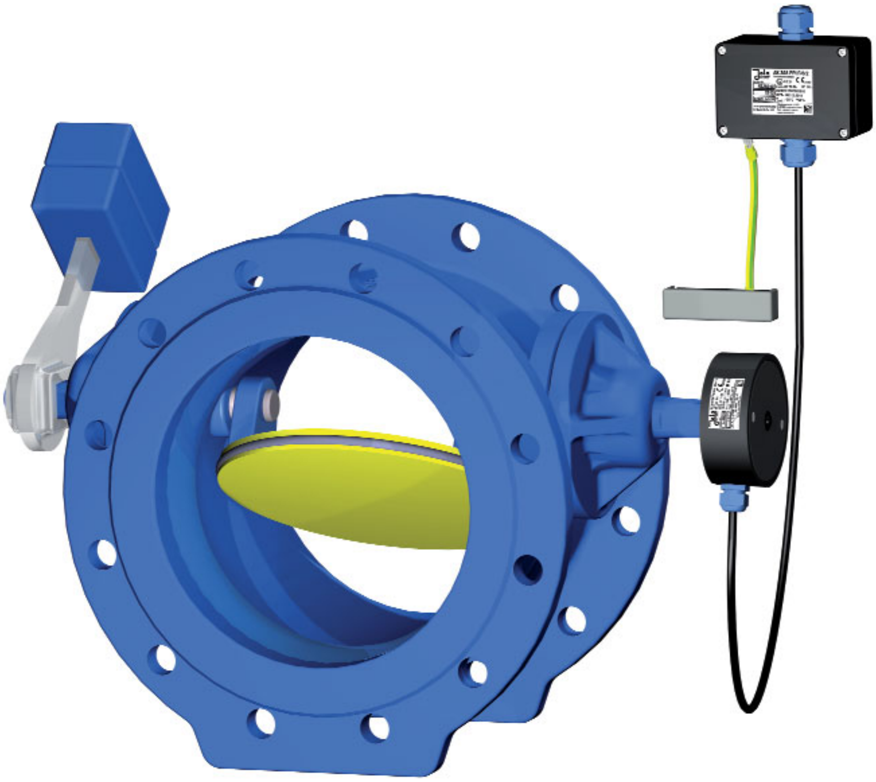
RK 1/K/.../Variante 0/Ex-...
limit switches

Application example:
indication of a predetermined position of a butterfly valve



Areas of application, mounting and mode of operation of the RK Ex limit switches

The RK Ex limit switches are particularly suitable where the use of conventional limit switches is questionable because of severe working conditions, e.g. in damp or dirty environment.

The mounting of the RK Ex limit switches has to be effected via a through hole situated in the middle of the body of the switch.

Through this hole, the limit switch has to be mounted on a horizontal metallic shaft of the customer's device which permits a rotation of max. +/– 180°. <u>It is the rotational motion of this shaft that activates the switching process.</u>

In order to prevent an incorrect functioning of the limit switch and a cable break, a sufficient cable length must be left. After the limit switch has been set on the shaft, it has to be fixed by the screw placed inside the body of the switch.

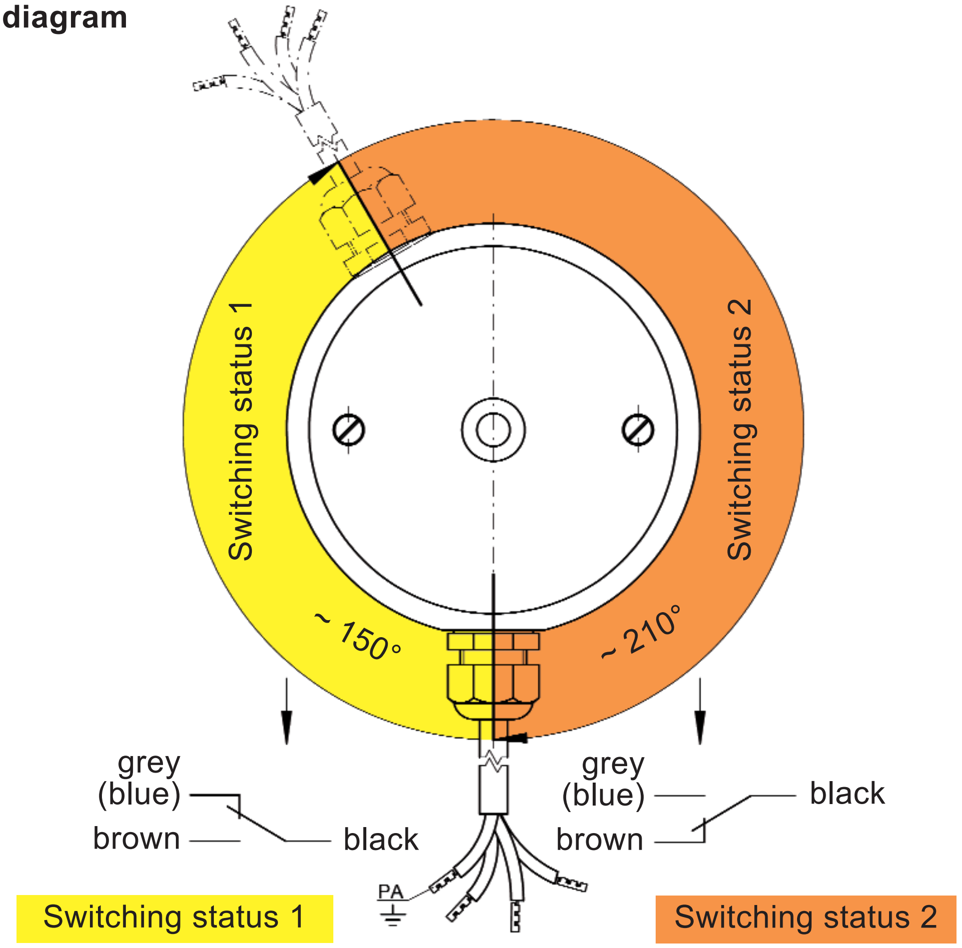
The RK Ex limit switches are fitted with a microswitch (changeover contact) as electrical switching element, and this element is activated by an internal metal ball. Switch-over takes place as shown on functional diagram on page 21-2-3.

The limit switches are not suitable for use on rotating shafts.

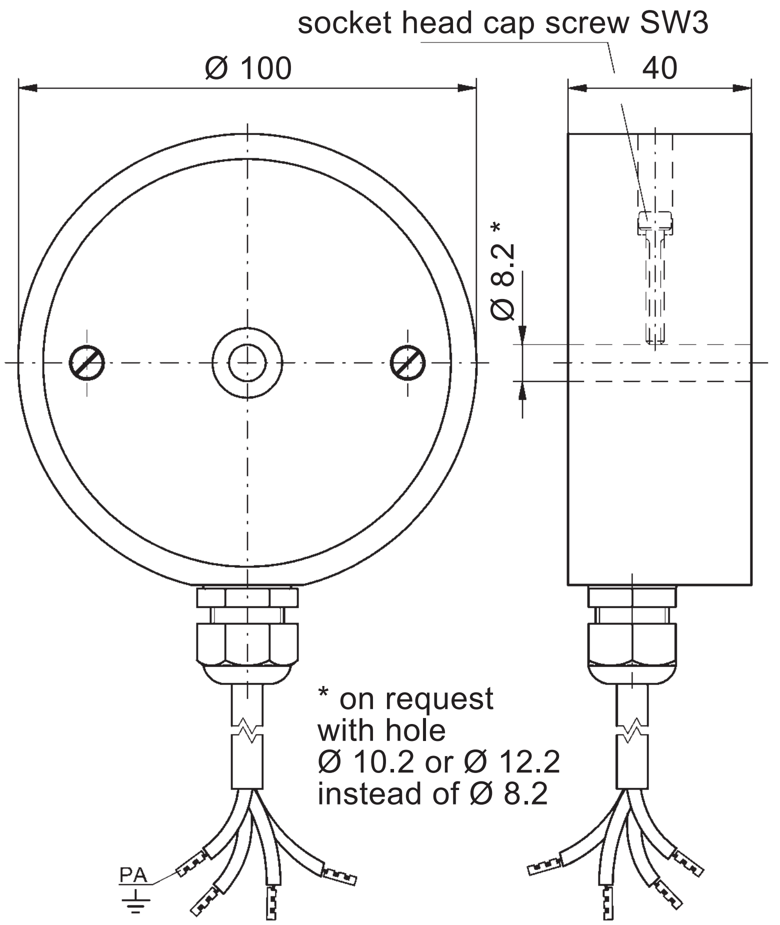
<table>
<tr><th>Technical data</th><th>RK 1/K/RN/Variante 0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb</th><th>RK 1/K/PURLF/Variante 0/Ex-0G
Ⓔx II 1 G Ex ia IIC T6 Ga</th></tr>
<tr><td>Application</td><td colspan="2">for use in intrinsically safe circuits
in potentially explosive atmospheres</td></tr>
<tr><td></td><td>zone 1 and 2;</td><td>zone 0, 1 and 2;</td></tr>
<tr><td></td><td colspan="2">version for use in mines susceptible to firedamp on request
EC type examination certificate INERIS 12ATEX0059
Certificate of conformity IECEx INE 12.0036</td></tr>
<tr><td>Operating principle</td><td colspan="2">ball-operated microswitch,
potential-free changeover contact</td></tr>
<tr><td>Option</td><td colspan="2">diodes (= variant 1) or resistors (= variant 2)
(variant 0 = without neither diodes, nor resistors)</td></tr>
<tr><td>Recommanded applicat.</td><td colspan="2">via Jola Ex protection relais</td></tr>
<tr><td>Housing</td><td colspan="2">antistatic (conductive) PP,
approx. 100 mm Ø x 37 mm</td></tr>
<tr><td>Protection class</td><td colspan="2">IP65</td></tr>
<tr><td>Connecting cable</td><td>A05RN-F cable, black,
4 G 0.75</td><td>antistatic PURLF cable
(with external conductive
PUR sheath), black, 4 G 0.75</td></tr>
<tr><td></td><td colspan="2">sealed in the housing,
other connecting cable on request</td></tr>
<tr><td>Connecting cable length</td><td colspan="2">2 m; other cable length on request</td></tr>
<tr><td>Mounting orientation</td><td colspan="2">vertical</td></tr>
<tr><td>Temperature range</td><td colspan="2">– 20°C to + 60°C</td></tr>
<tr><td>Pressure resistance</td><td colspan="2">for pressureless applications only,
use only under atmospheric conditions</td></tr>
<tr><td>Mounting</td><td colspan="2">mounting only on a horizontal metallic shaft,
which allows a rotation of max. +/– 180°</td></tr>
</table>

Functional diagram



Switching occurs by rotation to the right, clockwisely, when looking at the front-side (cover with screws).

Dimensional drawing



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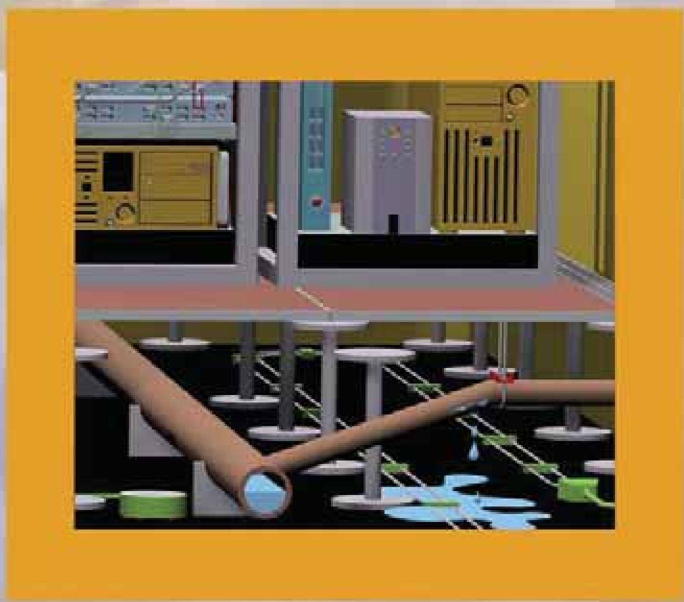
Conductive Leakage detectors of the Leckstar range

with electrode and relay



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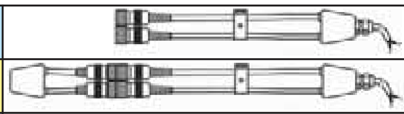
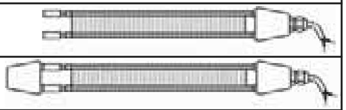
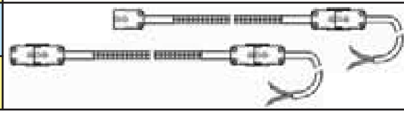
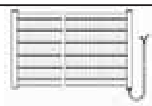
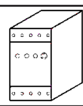
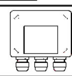
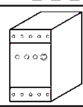
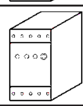
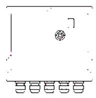
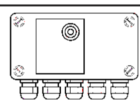
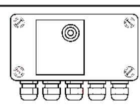
Model overview			Page
Leakage detection with conductive “Leckstar” line sensors			
Application examples with conductive cable electrodes			**31-1-21**
Application examples with conductive twin electrodes			**31-1-22**
Conductive cable electrodes	KE		**31-1-23**
	KE-Z10		
Conductive tape electrodes	BAE		
	BAE-Z10		
Conductive twin electrodes	ZE		
	ZE-Z10		
Leakage detection with conductive “Leckstar” surface sensors			
Application example with a conductive mat electrode			**31-1-31**
Conductive mat electrodes	MEL 6		**31-1-32**
	MEL 6-Z10		
Conductive electrode relays			
Without DIBt certificate, without cable break monitoring	Leckstar 5		**31-1-35**
	Leckstar 5/G		**31-1-36**
With DIBt certificate, with cable break monitoring	Leckstar 101		**31-1-39**
	Leckstar 101/S		**31-1-41**
Without DIBt certificate, with cable break monitoring	Leckstar 171/1 Leckstar 171/2		**31-1-43**
	Leckstar 155		**31-1-51**
	Leckstar 255		**31-1-57**

Explanation of the colours used:

= **without** cable break monitoring

= **with** cable break monitoring

= with relay: **without** cable break monitoring or

= with electrode + relay: **with** cable break monitoring

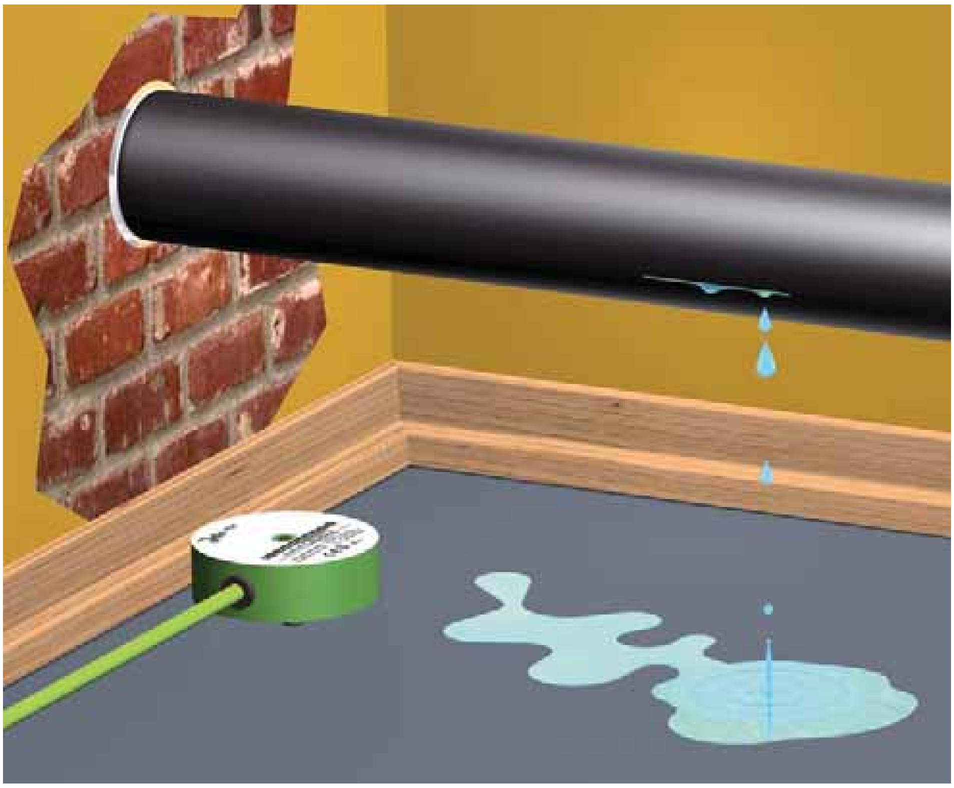
The conductive measuring principle

The conductive measuring principle is used for the detection of **electrically conductive liquids**.

It is not suitable for the detection of electrically non-conductive liquids (e.g. oils, diesel, fuel oil, demineralised water ...).

Electrically conductive liquids are generally aqueous solutions of salts, acids or alkalis. The molecules of these substances dissociate in water into positive and negative ions which give the aqueous solution its electrical conductivity. The conductive leakage detector of the Leckstar range consists of the combination of a conductive electrode and a conductive electrode relay. This combination detects the presence of an electrically conductive liquid at the electrodes, and an alarm signal is then emitted.

The measurement process uses alternating current to ensure exact response sensitivity and to prevent galvanic processes at the electrodes.



Use of a plate electrode for leakage detection of an electrically conductive liquid under a pipe

Examples of electrically conductive liquids

Accumulator acid, 32 %
Acetic acid, 70 %
Acrylic acid, 70 %
Adipic acid *
Aluminium chloride *
Aluminium potassium sulphate: see alums
Aluminium salts from mineral acids: see alums
Aluminium sulphate *
Alums (Me(I)-Me(III) sulphates) *
Ammonia water (ammonia solution), 25 %
Ammonium acetate *
Ammonium bromide *
Ammonium carbonate *
Ammonium chloride *
Ammonium fluoride *
Ammonium nitrate *
Ammonium phosphate *
Ammonium sulphate *
Ammonium sulphide, 40 %
Ammonium thiosulphate *
Anodic oxidation bath (HNO_3-30 %, H_2SO_4-10 %)
Anticalcium: see antiliming agent (sulfamic acid)
Antiliming agent (sulfamic acid), 50 g/l of H_20
Aqua regia, nitrohydrochloric acid, 1 : 1

Barium carbonate *
Barium chloride *
Barium hydroxide *
Barium nitrate *
Bicarbonate of ammonia *
Borax (sodium tetraborate) *
Borofluoric acid (tetra boro fluoric acid), 35 %
Bromine water *

Cadmium chloride *
Cadmium sulphate *
Calcium acetate *
Calcium bromide *
Calcium chloride *
Calcium fluoride *
Calcium hydroxide *
Calcium hypochlorite *
Calcium sulphate
Caustic potash solution (potassium hydroxide) *
Caustic soda, 32 %
Chlorine water *
Chloroacetic acid, saturated
Chlorsulfon acid, > 97 %
Chromic acid, 5 %
Chromic sulfuric / acid mixture
Citric acid *
Cupric chloride *
Cupric cyanide *
Cupric nitrate *
Cupric sulphate *

Electroplating bath, $AgNO_3$/KCN
Ethylen diamine tetra acetic acid (trilon B)

Ferric (III) chloride *
Ferrous (II) sulfate
Formaldehyde, 40 %
Formic acid, 80 %

Glycol acid, 50 %

Hydrazine hydrate, 80 %
Hydrobromic acid, aqueous solution *
Hydrochloric acid, 37 %
Hydrofluoric acid (fluohydric acid), 40 %
Hydrogen peroxide, 30 %

Javel water / bleaching lye: see sodium hypochloride

Liquid fertilizer application: see manuring salts

Magnesium chloride *
Magnesium hydroxide carbonate (magnesium carbonate) *
Magnesium sulphate *
Manuring salts / saline manure
Mercury nitrate *
Mercury sulphate *

Naphtalene sulphonic acid *
N-butyric acid, 70 %
Nickel chloride *
Nickel nitrate *
Nitrating acid mixture: see aqua regia, nitrohydrochloric acid
Nitric acid (fuming)
Nitric acid (not fuming), approx. 65 %
Nitrolotriacetic acid (Trilon A) *
Nitrosylsulphuric acid, 30 %

Oleum: see sulfuric acid, fuming

Phenidone (1-Phenyl-3-Pyra-zolidinone)
Phosporic acid, concentrated
Photographic developer, pure
Picric acid *
Potassium bicarbonate *
Potassium borate *
Potassium bromade
Potassium bromide *
Potassium carbonate (potash) *
Potassium chlorate *
Potassium chloride *
Potassium cyanide *
Potassium ferrocyanide and potassium ferricyanide *
Potassium iodide *
Potassium nitrate *
Potassium sulphate *
Propionic acid, 80 %

Salicylic acid *
Silver nitrate, 2 % solution
Sodium acetate *
Sodium aluminium sulphate: see alums
Sodium bisulphite *
Sodium bromide *
Sodium carbonate *
Sodium chlorate *
Sodium chloride *
Sodium cyanide *
Sodium dichromate *
Sodium dithionite *
Sodium hydrogen carbonate *
Sodium hydrogen sulphate *
Sodium hypochlorite (up to 30°C; 150 g/l of active chlor)
Sodium nitrate *
Sodium nitrite *
Sodium peroxide *
Sodium phosphate *
Sodium silicate *
Sodium sulfide *
Sodium sulphate *
Sodium sulphite *
Sodium tetraborate: see Borax
Sodium thiosulphate *
Sulfuric acid, 20 %
Sulfuric acid, 96 - 98 % **
Sulfuric acid, fuming (oleum), 65 % SO_3 **
Sulfurous acid, 5 - 6 % SO_2

Tartaric acid *
Tin(II) chloride *
Trichloracetic acid

Water (tap water)

Zinc chloride *
Zinc nitrate *
Zinc sulphate *

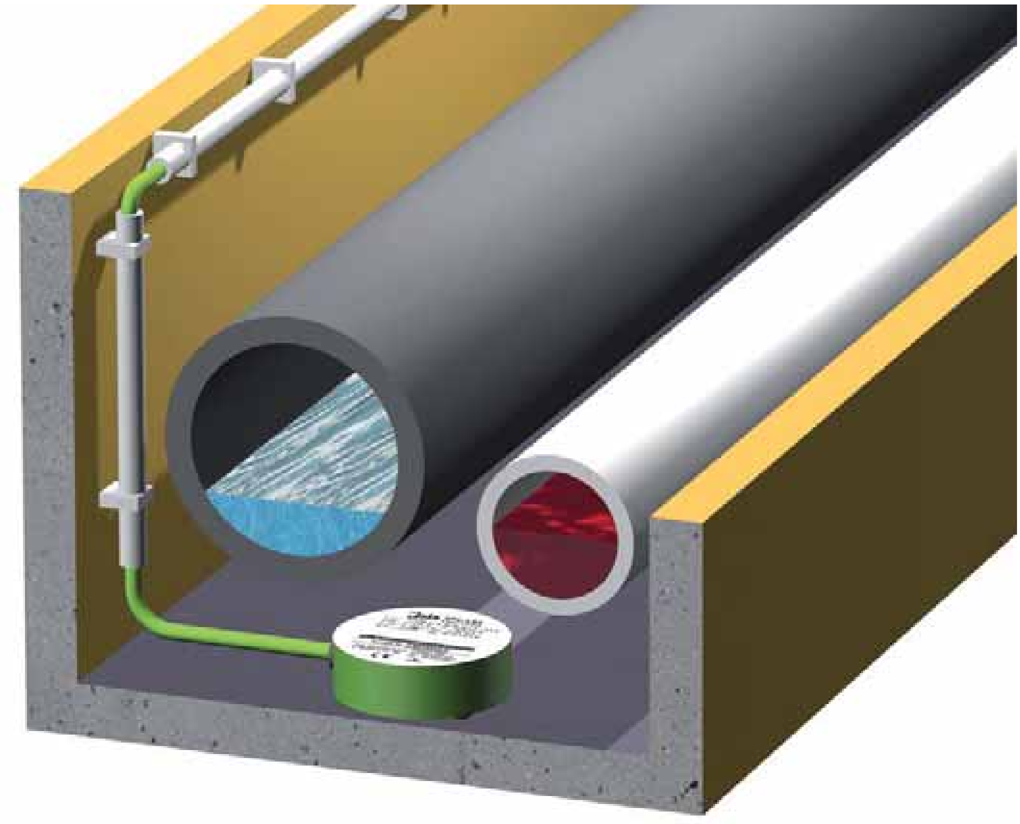
* Saturated solution

** Only suitable for point sensors, because the line and surface sensors have a too long reaction period

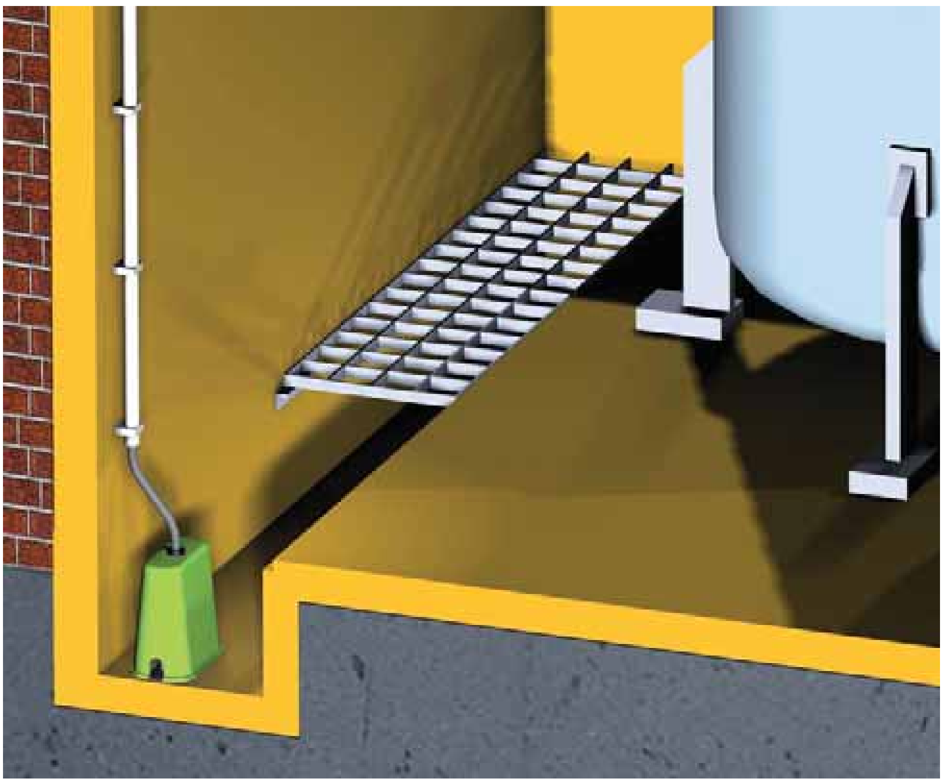
A reliable detection of electrically poor conductive liquids (compared to the above-mentioned liquids) can be achieved by adaption of the sensitivity of the conductive electrode relay in our works (on request).

Leakage detection with conductive "Leckstar" point sensors

Application examples with conductive plate electrodes



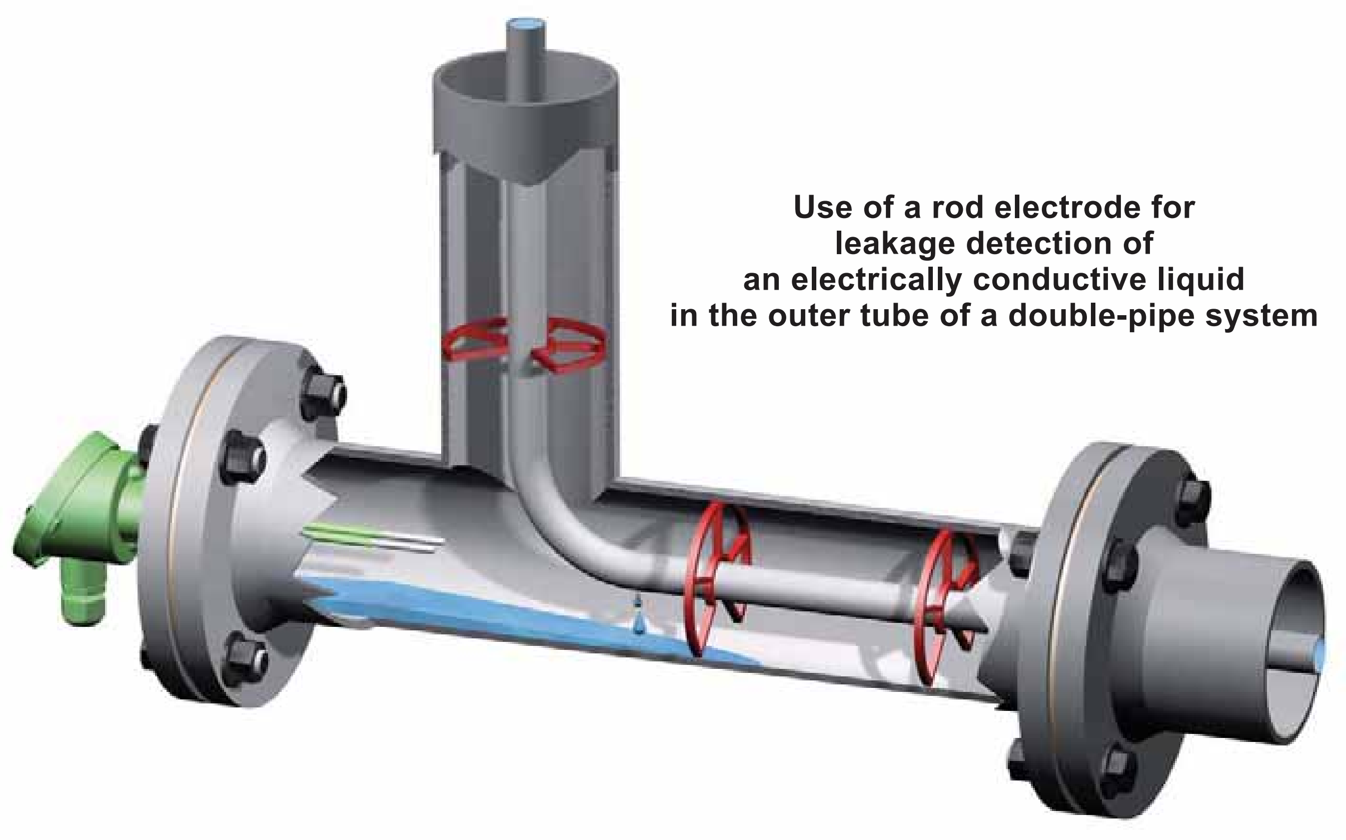
Use of a
plate electrode for
leakage detection
of an electrically
conductive liquid
in a pipe duct



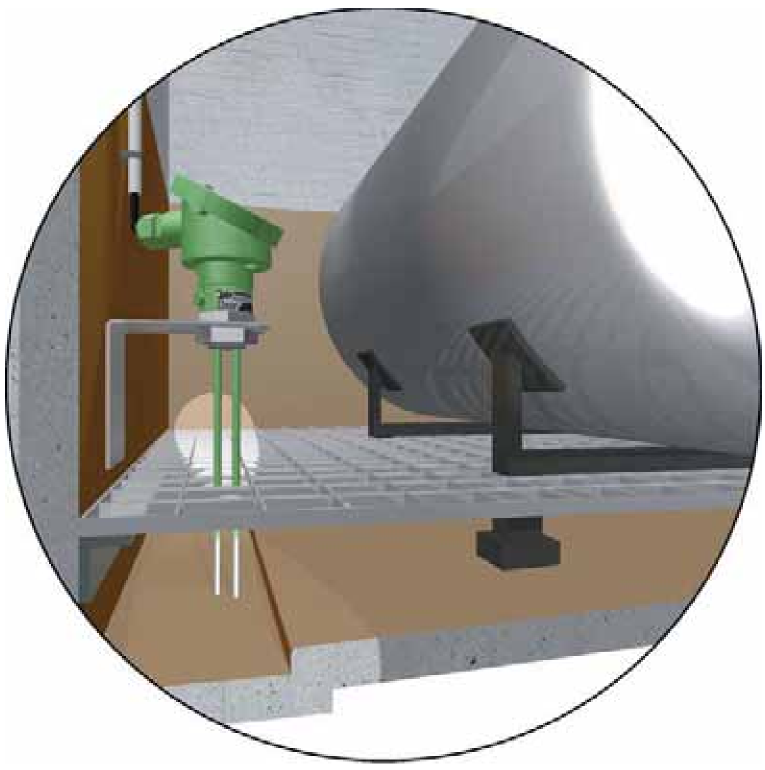
Use of a
plate electrode
for leakage detection
of an electrically
conductive liquid
at the lowest point
(groove in the picture)
of a collection room

Leakage detection with conductive "Leckstar" point sensors

Application examples with conductive rod electrodes



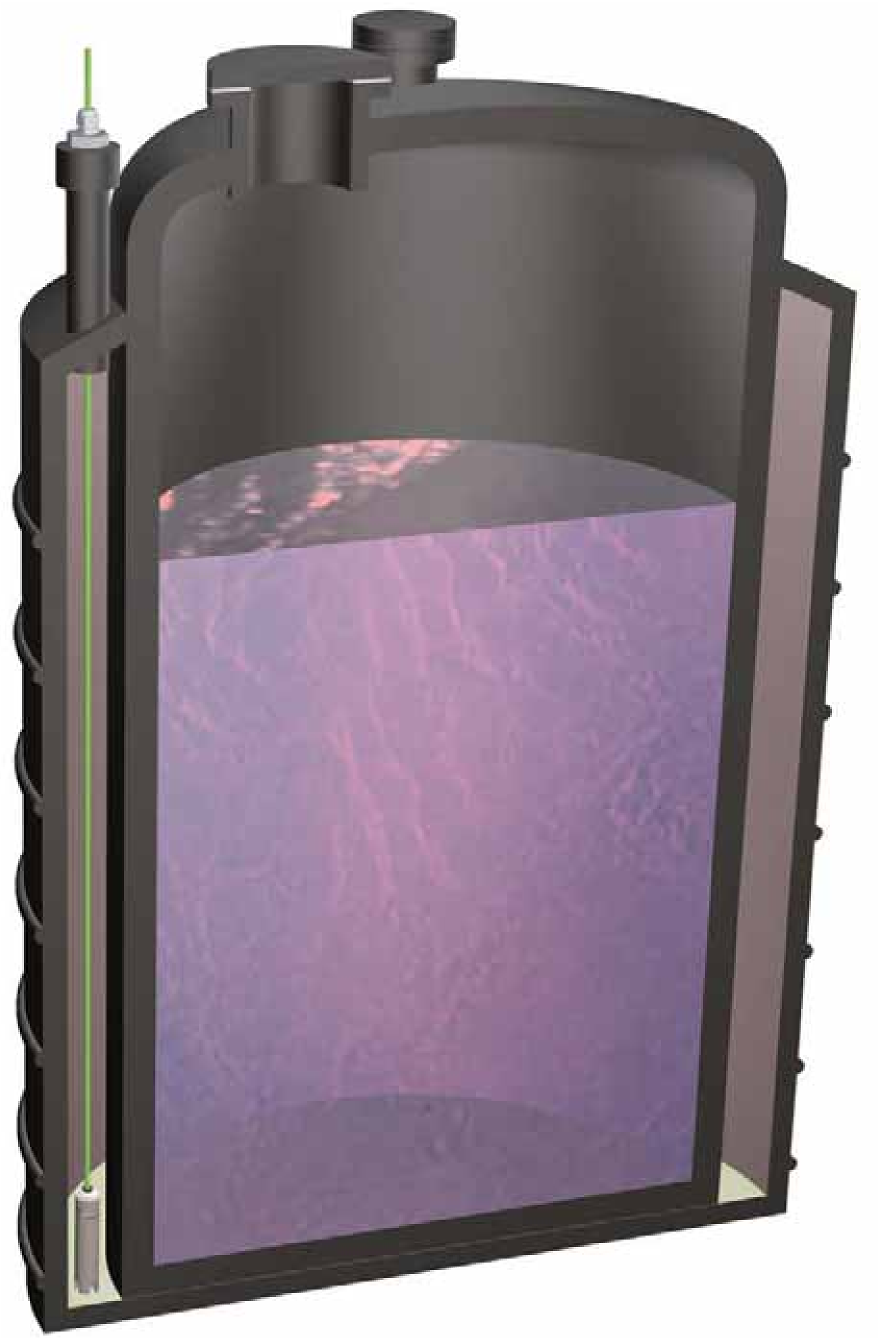
Use of a rod electrode for
leakage detection of
an electrically conductive liquid
in the outer tube of a double-pipe system

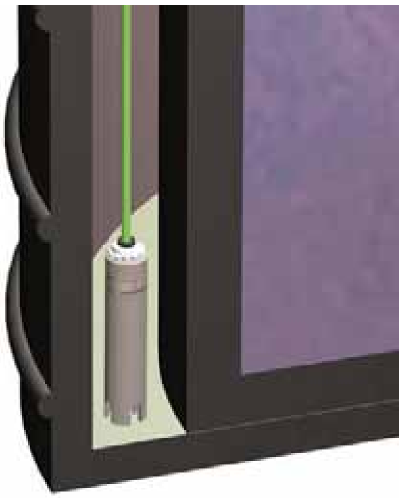


Use of a rod electrode for
leakage detection of
an electrically conductive liquid
at the lowest point
(groove in the picture)
of a collection room

Leakage detection with conductive “Leckstar” point sensors

Application example with a conductive suspension electrode





Use of a suspension electrode for leakage detection of an electrically conductive liquid in the collection tub of a storage tank for water-polluting liquids

PE... and WDX... conductive plate electrodes

Conductive plate electrodes are designed to signal via a connected conductive electrode relay the presence of an electrically conductive liquid caused, for example, by burst pipes.

Conductive plate electrodes should only be used in normally dry environments. They must be installed on the floor in such a way that the sensor side faces downwards.

The conductive plate electrodes are fitted with two sensitive elements in the form of two electrode plates: 1 control electrode and 1 ground electrode. If the two electrode plates come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given.

PE-Z10

PE

WDX-4

PEK-4

PEK-2/2

WDX... sensor side

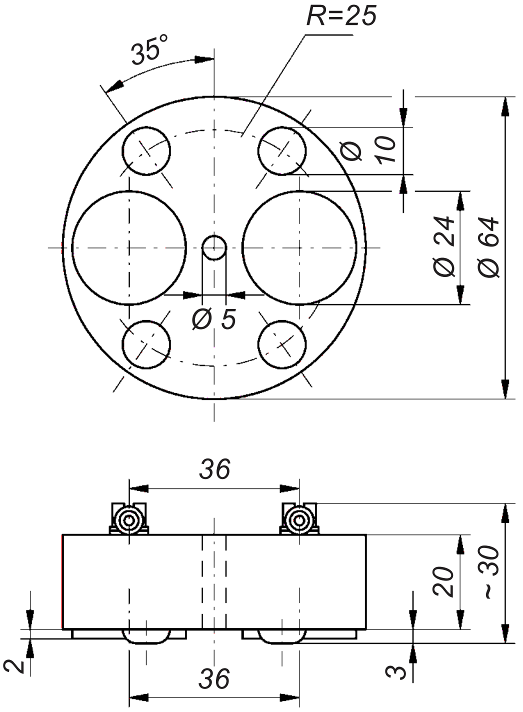
PE...
sensor side

PEK-Z10

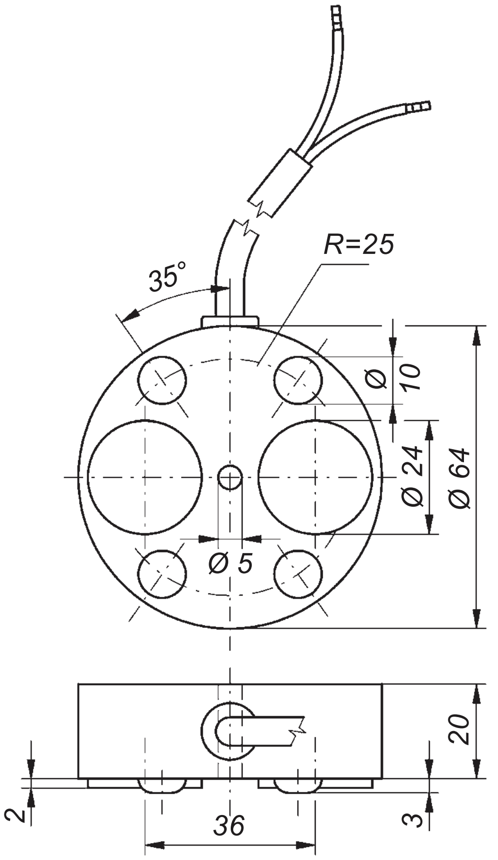
WDX-Z10

PE... conductive plate electrodes

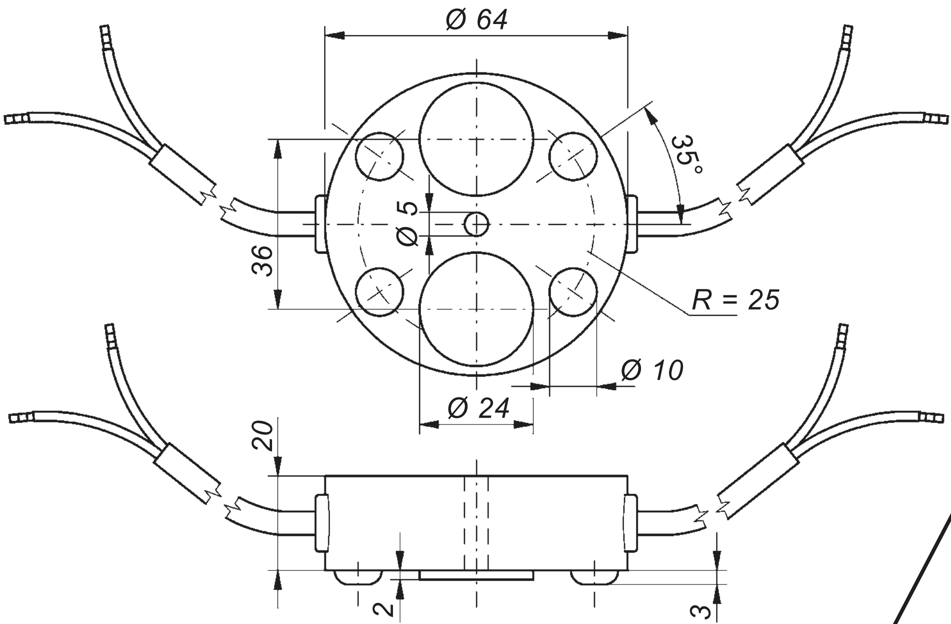
Technical data	PEK	PE	PEK-2/2	PEK-4	PE-Z10	PEK-Z10
Design	1 control electrode and 1 ground electrode					
Sensitive elements	2 electrode plates made of stainless steel 316 Ti, each 24 mm in dia.					
Housing	PP and cast resin					
Electrical connection	connecting cable* 2X0.75	screw-type / crimp connection	connecting cable* 2 x 2X0.75	connecting cable* 4X0.75	screw-type / crimp connection	connecting cable* 2X0.75
	* length 2 m, on request: • longer • halogen-free					
Temperature range	– 20°C to + 60°C, higher temperatures on request					
Cable break monitoring	**without**	**without**	**without**	**without**	**with**	**with**
	integrated Z10 cable break monitoring unit					
Classification	connection to one of the following conductive electrode relays					
• **with** cable break monitoring unit, **with** DIBt certificate No. Z-65.40-203					**Leckstar 101** or **Leckstar 101/S:** one PE-Z10 or one PEK-Z10	
		One or several PE, PEK-2/2 and/or PEK-4 may be connected in parallel between a PE-Z10 or PEK-Z10 and one of these relays.				
• **with** cable break monitoring unit, **without** DIBt certificate					**Leckstar 171/1** or **Leckstar 171/2:** one PE-Z10 or one PEK-Z10 **Leckstar 155:** max. five PE-Z10 or PEK-Z10	
		One or several PE, PEK-2/2 and/or PEK-4 may be connected in parallel between a PE-Z10 or PEK-Z10 and one of these relays.				
• **without** cable break monitoring unit, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of PEK, PE, PEK-2/2 and/or PEK-4 may be connected in parallel to either one of these relays.					
Max. length of connecting cable	1,000 m between electrode relay and last electrode					



PE(-Z10)

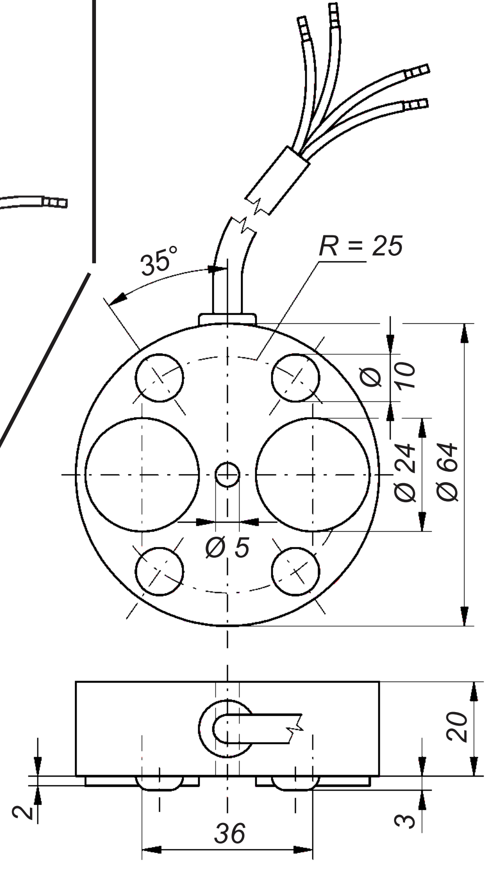


PEK(-Z10)



PEK-2/2

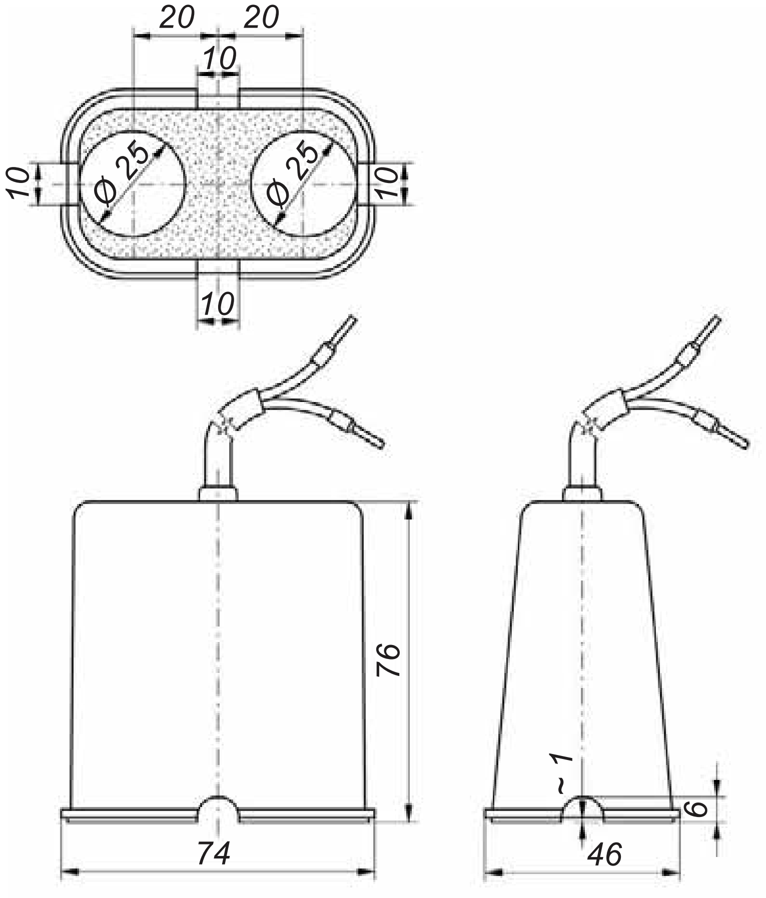
PEK-4



Dimensions in mm

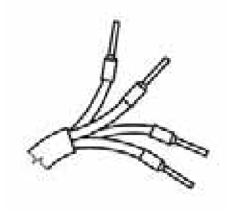
WDX... conductive plate electrodes

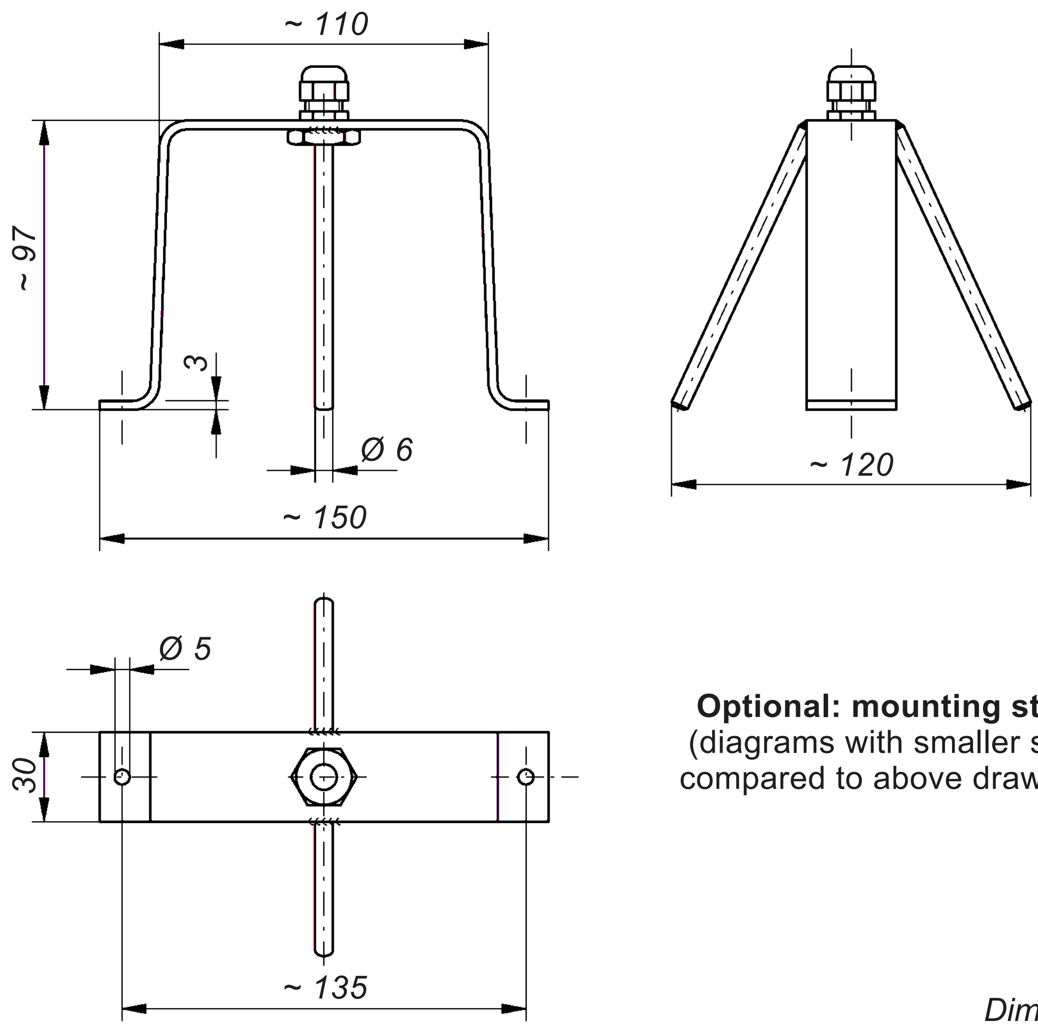
Technical data	**WDX**	**WDX-4**	**WDX-Z10**
Design	1 control electrode and 1 ground electrode		
Sensitive elements	2 electrode plates made of stainless st. 316 Ti, each 25 mm in dia.		
Housing	PP and cast resin		
Electrical connection	connecting cable 2X0.75	4X0.75 length 2 m, on request: • longer • halogen-free	2X0.75
Temperature range	– 20°C to + 60°C, higher temperatures on request		
Cable break monitoring	**without**	**without**	**with**
	integrated Z10 cable break monitoring unit		
Classification	connection to one of the following conductive electrode relays		
• **with** cable break monitoring unit, **with** DIBt certificate No. Z-65.40-203		One or several WDX-4 may be connected in parallel between a WDX-Z10 and one of these relays.	**Leckstar 101** or **Leckstar 101/S:** one WDX-Z10
• **with** cable break monitoring unit, **without** DIBt certificate		One or several WDX-4 may be connected in parallel between a WDX-Z10 and one of these relays.	**Leckstar 171/1** or **Leckstar 171/2:** one WDX-Z10 **Leckstar 155:** max. five WDX-Z10
• **without** cable break monitoring unit, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of WDX and/or WDX-4 may be connected in parallel to either one of these relays.		
Max. length of connecting cable	1,000 m between electrode relay and last electrode		
Mounting accessory	stand (option)		



WDX(-Z10)

WDX-4 version





Optional: mounting stand
(diagrams with smaller scale
compared to above drawings)

Dimensions in mm

SE ... and S 2 ... conductive rod electrodes

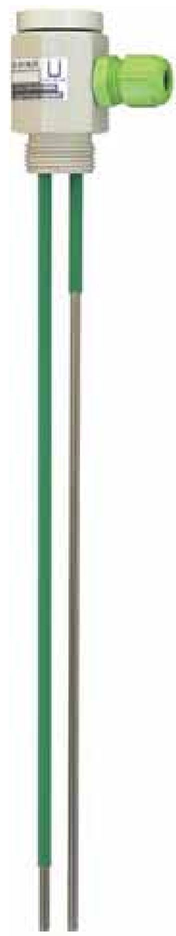
Conductive rod electrodes are designed to signal via a connected conductive electrode relay the presence of an electrically conductive liquid caused, for example, by burst pipes.

Conductive rod electrodes should only be used in normally dry environments. They can be installed from the top or from the side. In both cases, it must be ensured that the rod tips are just slightly above the floor to be monitored.

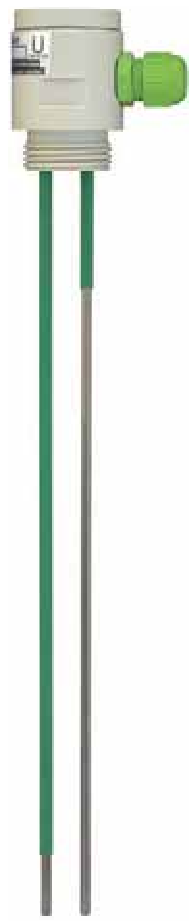
The conductive rod electrodes are fitted with two sensitive elements in the form of two electrode rods: 1 control electrode and 1 ground electrode. If the two non-insulated electrode rod sensor surfaces come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given.

Rod electrodes fitted or not with a Z10 cable break monitoring unit have the same appearance.

SE 2/¾"/M-Z10



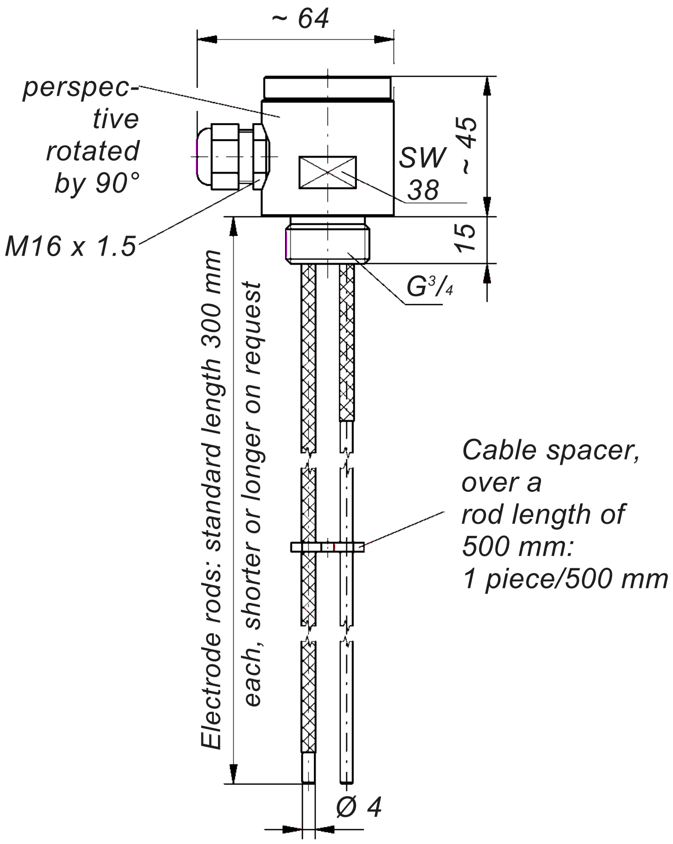
SE 2 M-Z10



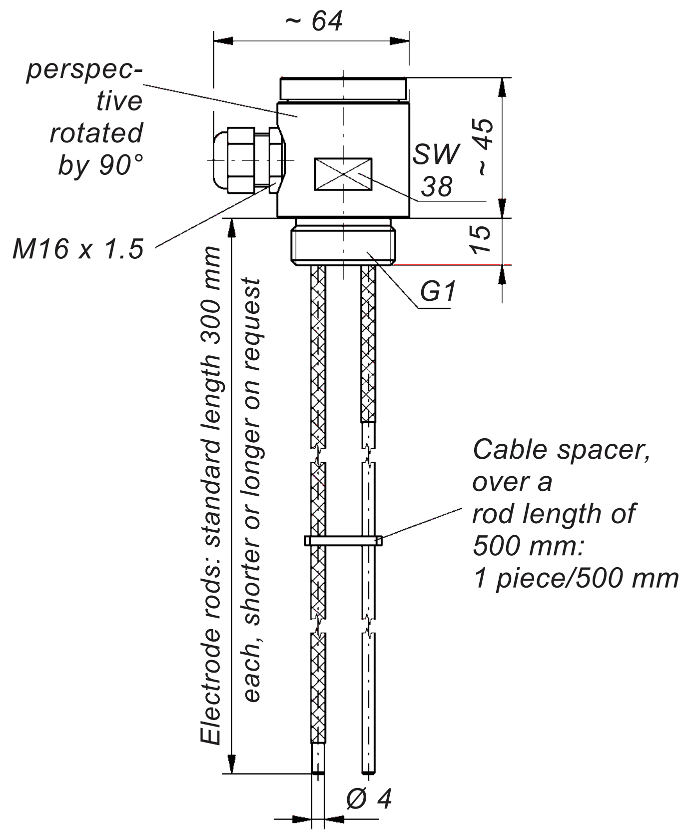
S 2 M/PP-Z10

S 2 M/PVDF-Z10

S 2 AM-Z10

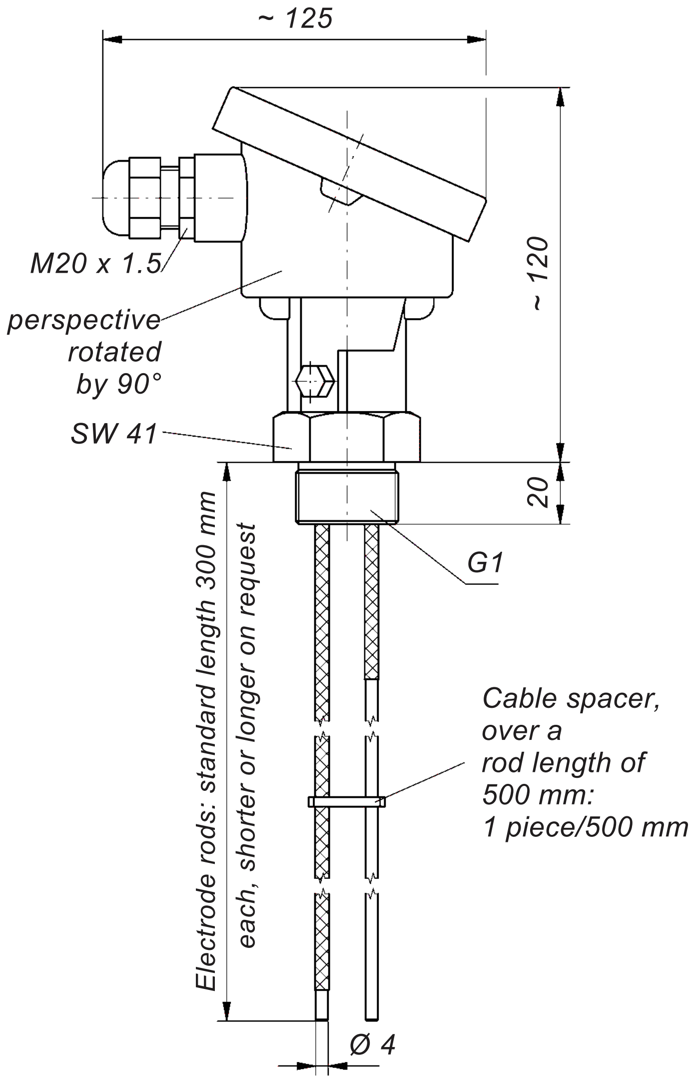


SE 2/3/4"/M(-Z10)

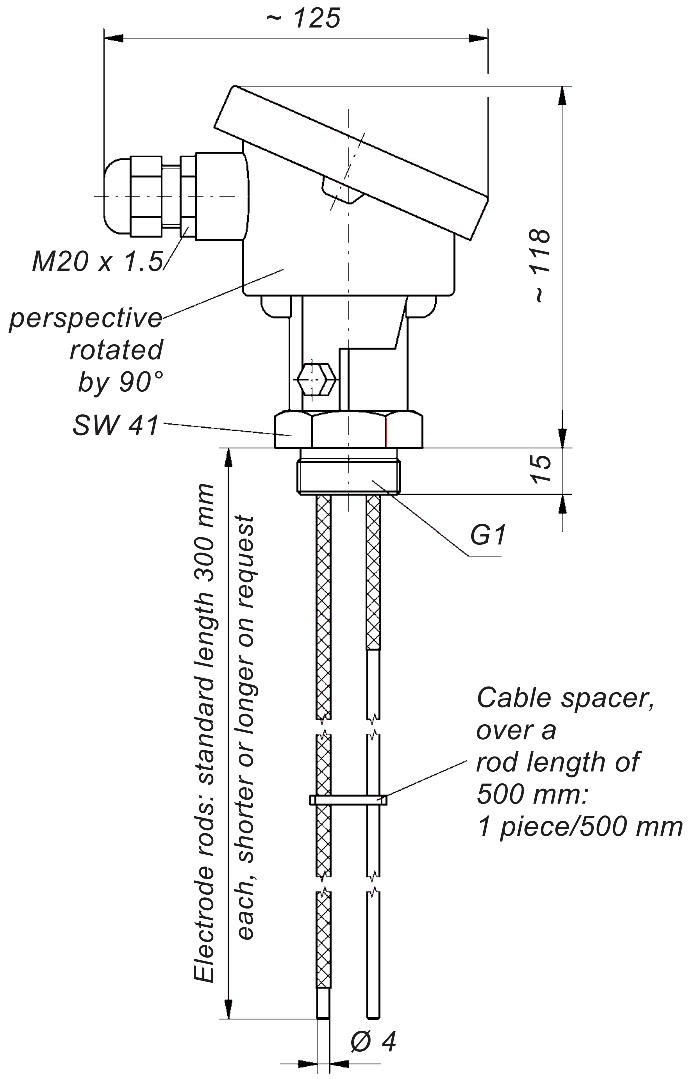


SE 2 M(-Z10)

Dimensions in mm



S 2 M/PP(-Z10) or S 2 M/PVDF(-Z10)



S 2 AM(-Z10)

SE … and S 2 … conductive rod electrodes

Technical data	SE 2/¾"/M	SE 2 M	S 2 M/PP	S 2 M/PVDF	S 2 AM
Design	1 control electrode and 1 ground electrode				
Sensitive elements	2 electrode rods made of stainless steel 316 Ti, each 4 mm in dia., covered with polyolefin shrinkdown tubing, standard length: 300 mm each, on request: • other materials: e. g. titanium, Hastelloy, Monel or tantalum • other shrinkdown tubing: e. g. PVDF or PTFE • shorter or longer rods				
Max. rod lengths	approx. 1,000 mm	approx. 2,500 mm			
Screw-in nipple	PP, on request: PVDF or PTFE		PP	PVDF	stainless steel 316 Ti
	G¾	G1, on request: G1¼, G1½ or G2	G1	G1	G1, on request: G1¼, G1½ or G2
Electrical connection	connection head made of the material of the screw-in nipple, protection class IP55		connection head made of PP, protection class IP54; on request: connection head made of cast aluminium, protection class IP54		
Temperature range	– 20°C to + 60°C, higher temperatures on request				
Cable break monitoring	**without**				
Classification • **without** cable break monitoring, **without** DIBt certificate	connection to one of the following conductive electrode relays **Leckstar 5** or **Leckstar 5/G:** any number of the above mentionned electrodes may be connected in parallel to either one of these relays.				
Max. length of connecting cable	1,000 m between electrode relay and last electrode				

SE ...-Z10 and S 2 ...-Z10 conductive rod electrodes

Technical data	SE 2/¾"/M -Z10	SE 2 M -Z10	S 2 M/PP -Z10	S 2 M/PVDF -Z10	S 2 AM -Z10
Design	1 control electrode and 1 ground electrode				
Sensitive elements	2 electrode rods made of stainless steel 316 Ti, each 4 mm in dia., covered with polyolefin shrinkdown tubing, standard length: 300 mm each, on request: • other materials: e. g. titanium, Hastelloy, Monel or tantalum • other shrinkdown tubing: e. g. PVDF or PTFE • shorter or longer rods				
Max. rod lengths	approx. 1,000 mm	approx. 2,500 mm			
Screw-in nipple	PP, on request: PVDF or PTFE G¾	G1, on request: G1¼, G1½ or G2	PP G1	PVDF G1	stainless steel 316 Ti G1, on request: G1¼, G1½ or G2
Electrical connection	connection head made of the material of the screw-in nipple, protection class IP55		connection head made of PP, protection class IP54; on request: connection head made of cast aluminium, protection class IP54		
Temperature range	– 20°C to + 60°C, higher temperatures on request				
Cable break monitoring	**with** integrated Z10 cable break monitoring unit				
Classification	connection to one of the following conductive electrode relays				
• **with** cable break monitoring unit, **with** DIBt certificate No. Z-65.40-203	**Leckstar 101** or **Leckstar 101/S:** one SE 2/¾"/M-Z10, SE 2 M-Z10, S 2 M/PP-Z10, S 2 M/PVDF-Z10 or S 2 AM-Z10				
• **with** cable break monitoring unit, **without** DIBt certificate	**Leckstar 171/1** or **Leckstar 171/2:** one SE 2/¾"/M-Z10, SE 2 M-Z10, S 2 M/PP-Z10, S 2 M/PVDF-Z10 or S 2 AM-Z10 **Leckstar 155:** max. five SE 2/¾"/M-Z10, SE 2 M-Z10, S 2 M/PP-Z10, S 2 M/PVDF-Z10 or S 2 AM-Z10				
Max. length of connecting cable	1,000 m between electrode relay and last electrode				

LWZ and EHW ...
conductive suspension electrodes

Conductive suspension electrodes are designed to signal via a connected conductive electrode relay the presence of an electrically conductive liquid caused, for example, by burst pipes.

Conductive suspension electrodes should only be used in normally dry environments. They must be mounted in suspended mode from above in such a way that the electrode rods are just slightly above the floor to be monitored.

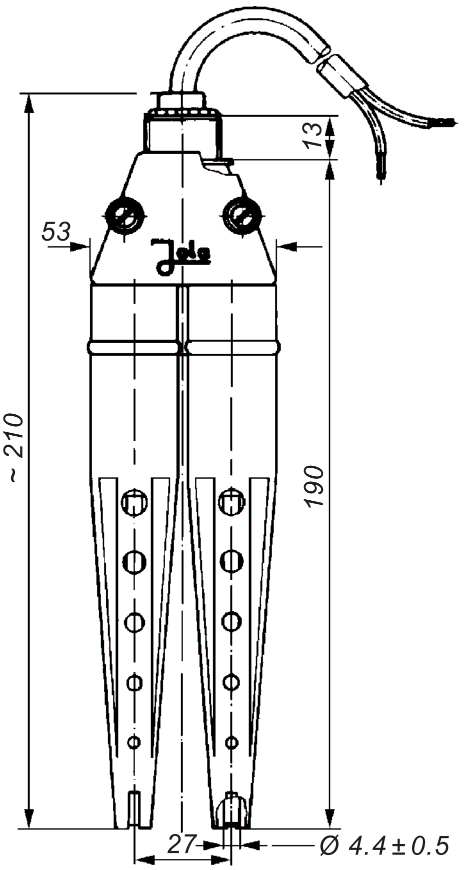
The conductive suspension electrodes are fitted with two sensitive elements in the form of two electrode rods: 1 control electrode and 1 ground electrode. If the two electrode rods come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given.

Suspension electrodes fitted or not with a Z10 cable break monitoring unit have the same appearance.

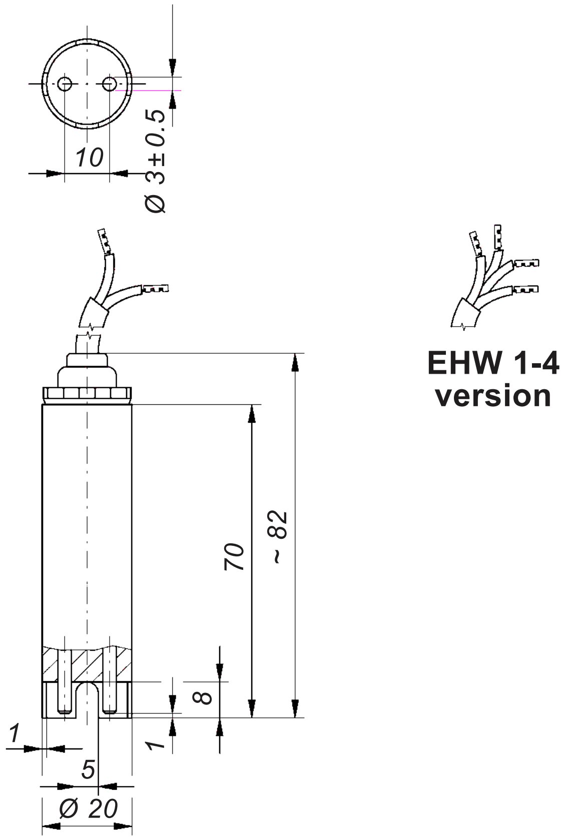
EHW 1-Z10

EHW 2-Z10

EHW 3-Z10

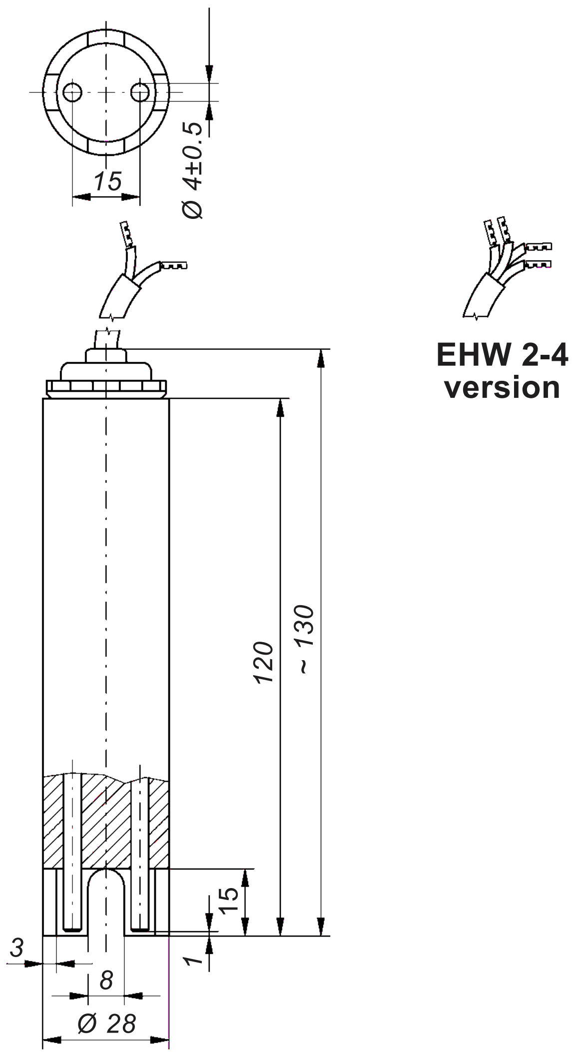


LWZ

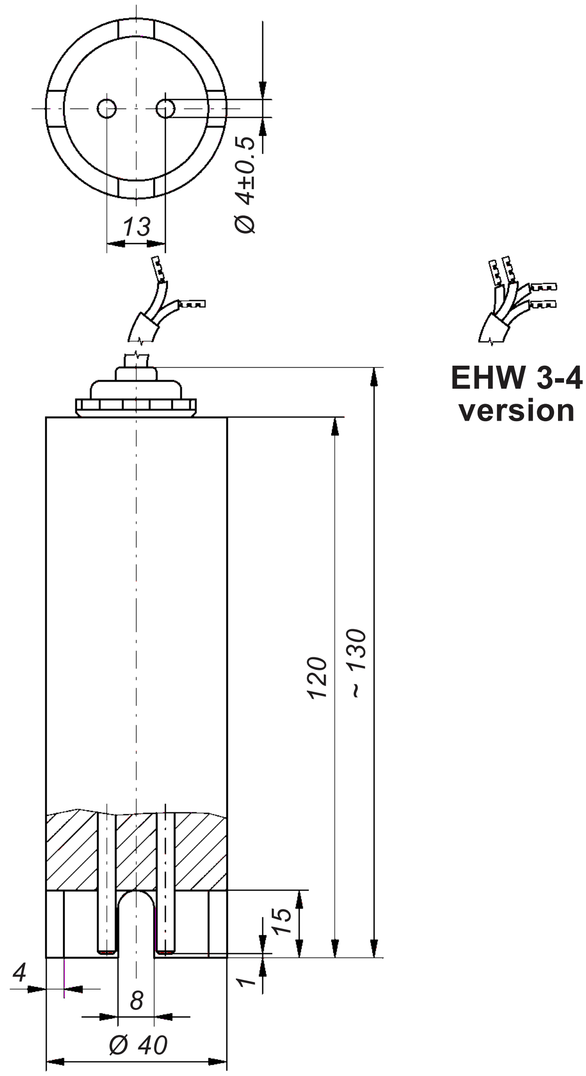


EHW 1(-Z10)

Dimensions in mm



EHW 2(-Z10)



EHW 3(-Z10)

LWZ and EHW .
conductive suspension electrodes

Technical data	LWZ	EHW 1	EHW 2	EHW 3
Design	1 control electrode and 1 ground electrode			
Sensitive elements	2 electrode rods made of stainless steel 316 Ti on request: other materials (e.g. titanium, Hastelloy, Monel or tantalum)			
Housing	PP on request: other materials (e.g. PVDF or PTFE)			
	2 x 27 mm Ø x approx. 210 mm	20 mm Ø x approx. 82 mm	28 mm Ø x approx. 130 mm	40 mm Ø x approx. 130 mm
Electrical connection	connecting cable 2X0.75 length 2 m, on request: • longer • made of CM or PTFE			
Temperature range	– 20°C to + 60°C, higher temperatures on request			
Cable break monitoring	**without**			
Classification	connection to one of the following conductive electrode relays			
• **without** cable break monitoring, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of LWZ and/or EHW **.** may be connected in parallel to either one of these relays.			
Max. length of connecting cable	1,000 m between electrode relay and last electrode			
Mounting accessories	stuffing glands, housings with integrated stuffing gland and flanges with stuffing gland on request			

EHW .-4 and EHW .-Z10 conductive suspension electrodes

Technical data	EHW 1-4	EHW 2-4	EHW 3-4	EHW 1 -Z10	EHW 2 -Z10	EHW 3 -Z10
Design	1 control electrode and 1 ground electrode					
Sensitive elements	2 electrode rods made of stainless steel 316 Ti; on request: other materials (e.g. titanium, Hastelloy, Monel or tantalum)					
Housing	PP on request: other materials (e.g. PVDF or PTFE)					
	20 mm Ø x approx. 82 mm	28 mm Ø x approx. 130 mm	40 mm Ø x approx. 130 mm	20 mm Ø x approx. 82 mm	28 mm Ø x approx. 130 mm	40 mm Ø x approx. 130 mm
Electrical connection	connecting cable					
	4X0.75			2X0.75		
	length 2 m, on request: • longer					
	• made of PTFE			• made of CM or PTFE		
Temperature range	– 20°C to + 60°C, higher temperatures on request					
Cable break monitoring	**without**	**without**	**without**	**with**	**with**	**with**
	integrated Z10 cable break monitoring unit					
Classification	connection to one of the following conductive electrode relays					
• **with** cable break monitoring, **with** DIBt certificate No. Z-65.40-203				**Leckstar 101** or **Leckstar 101/S:** one EHW .-Z10		
	One or several EHW .-4 may be connected in parallel between a EHW .-Z10 and one of these relays.					
• **with** cable break monitoring, **without** DIBt certificate				**Leckstar 171/1** or **Leckstar 171/2:** one EHW .-Z10 **Leckstar 155:** max. five EHW .-Z10		
	One or several EHW .-4 may be connected in parallel between a EHW .-Z10 and one of these relays.					
• **without** cable break monitoring, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of EHW .-4 may be connected in parallel to either one of these relays.					
Max. length of connecting cable	1,000 m between electrode relay and last electrode					
Mounting accessories	stuffing glands, housings with integrated stuffing gland and flanges with stuffing gland on request					

Leakage detection with conductive "Leckstar" line sensors

Application examples with conductive cable electrodes

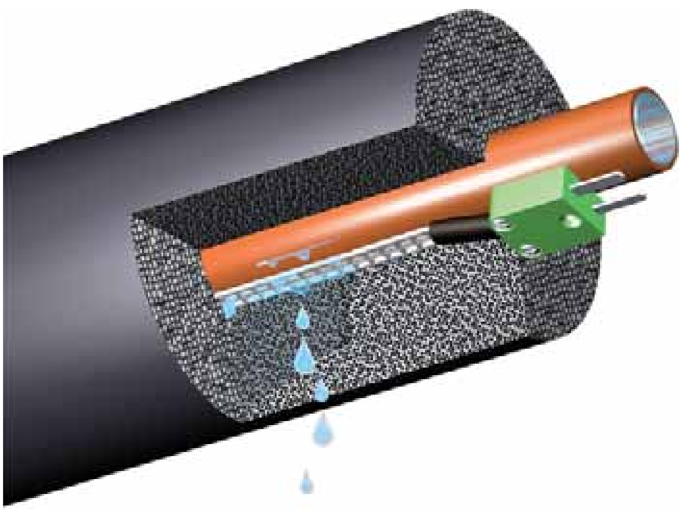
Monitoring of a false floor in a server room for the presence of an electrically conductive liquid using a cable electrode as well as a plate electrode in the adjacent room

Use of a cable electrode for leakage detection of an electrically conductive liquid in a storeroom

Leakage detection with conductive “Leckstar” line sensors

Application examples with conductive twin electrodes

Use of a twin electrode for leakage detection of electrically conductive heating water under a skirting board behind which pipes are routed



Use of a twin electrode for leakage detection of electrically conductive water inside the insulation of a heating or cooling pipe (use preferably with Leckstar 255 relay)

KE..., BAE..., ZE... conductive cable, tape and twin electrodes

Conductive cable, tape and twin electrodes are designed to signal via a connected conductive electrode relay the presence of an electrically conductive liquid caused, for example, by burst pipes.

Conductive cable, tape and twin electrodes should only be used in normally dry environments. They can be used on floors, false ceilings, alongside pipes or in double-pipe systems. They should be installed in any case in the way that leakage-liquid could reach the two sensor cables of the cable, tape or twin electrode immediately after a leakage.

The preferred application of twin electrodes is inside the insulation of heating and cooling pipes in server rooms or other sensitive areas.

Thanks to their compact design, the twin electrodes can also be used under skirting boards behind which pipes are routed or in joints in the floor.

Conductive cable, tape and twin electrodes are fitted with two sensitive elements in form of two sensor cables: 1 control electrode and 1 ground electrode. As soon as an electrically conductive liquid (e.g. water, acid etc.) creates a conductive path between the two sensor cables, a control current flows from the corresponding conductive electrode relay. The latter is then energized and a contact made.

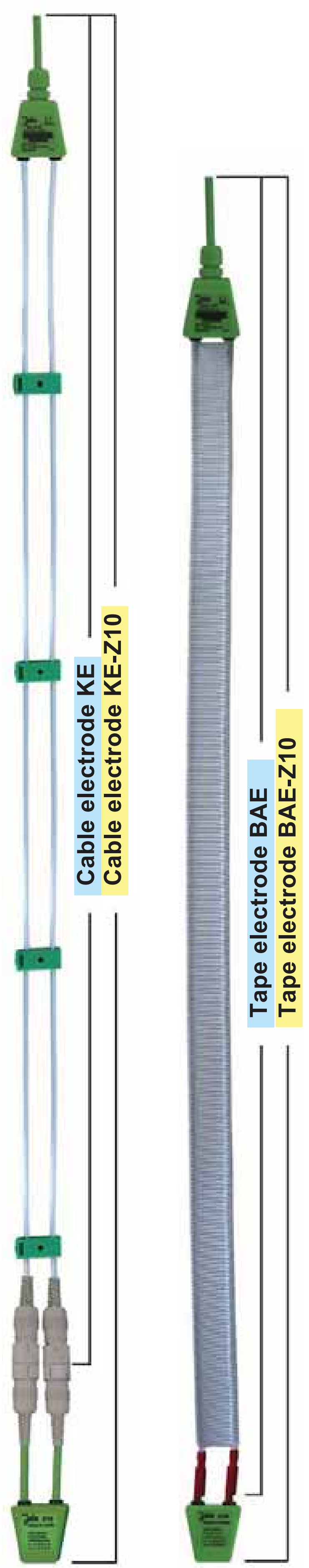
KE... conductive cable electrode

Each of the two sensor cables consists of a stainless steel rope core and a protective braiding made of polyester. This protective braiding is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid as far as possible false alarms, whilst allowing leakage liquid to penetrate throught to the stainless steel ropes.

BAE... conductive tape electrode

In contrast to the above mentionned cable electrode, the tape electrode is not fitted with two separate sensor cables. The two stainless steel ropes are integrated in a halogen-free polyester fabric tape which ensures that the spacing between them remains constant. This fabric tape is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid as far as possible false alarms, whilst allowing leakage liquid to penetrate through to the stainless steel ropes.

To avoid false alarms, it is essential that the surroundings of the tape electrodes are <u>absolutely dry</u> under normal circumstances, as the tape electrodes have the ability to bind moisture (including high levels of air humidity) causing false alarms particularly with long tape electrodes.



ZE... conductive twin electrode

Each of the two sensor cables consists of a stainless steel rope core and a protective breading made of polyester. There is a wire with plastic insulation between the two ropes serving as a spacer. These three adjacent "ropes" are held together by a polyester braiding to form a flat tape structure.

The protective polyester braiding is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid as far as possible false alarms, whilst allowing leakage liquid to penetrate through to the stainless steel ropes. There are holes in the outer braiding. This ensures that the braiding performs its holding function, but only a small amount of absorbent material is woven between the stainless steel ropes to ensure that the electrode dries quickly following a leakage incident.

<table>
<tr><th colspan="3"></th><th>Components</th><th>No.</th><th>Technical data</th></tr>
<tr><td rowspan="3">Basic versions of</td><td rowspan="3">ZE-Z10 twin electrode</td><td rowspan="2">ZE twin electrode</td><td>Connecting cable with bushing and fixing clip</td><td>1</td><td>Connecting cable 2X0.75, length 2 m,
on request: longer and/or halogen-free
Temperature range: – 20°C to + 60°C,
higher temperature resistance on request</td></tr>
<tr><td>Basic twin electrode with plug connector, bushing and fixing clip</td><td>2</td><td>2 ropes made of stainless steel 316,
each 0.8 mm in dia.,
each with polyester protective braiding, and
1 insulating spacer in between in the form of
a flat cable with polyester braiding
Length 2 m, longer on request (to max. 100 m)</td></tr>
<tr><td></td><td>Plug connector with Z10 end unit</td><td>3</td><td>Cable break monitoring unit to monitor the entire signalling line</td></tr>
<tr><td colspan="3" rowspan="2">Extension options</td><td>Connecting cable with plug connector, bushing and fixing clip</td><td>4</td><td>Technical data as under No. 1</td></tr>
<tr><td>Extension twin electrode with plug connector, bushing and fixing clip</td><td>5</td><td>Technical data as under No. 2</td></tr>
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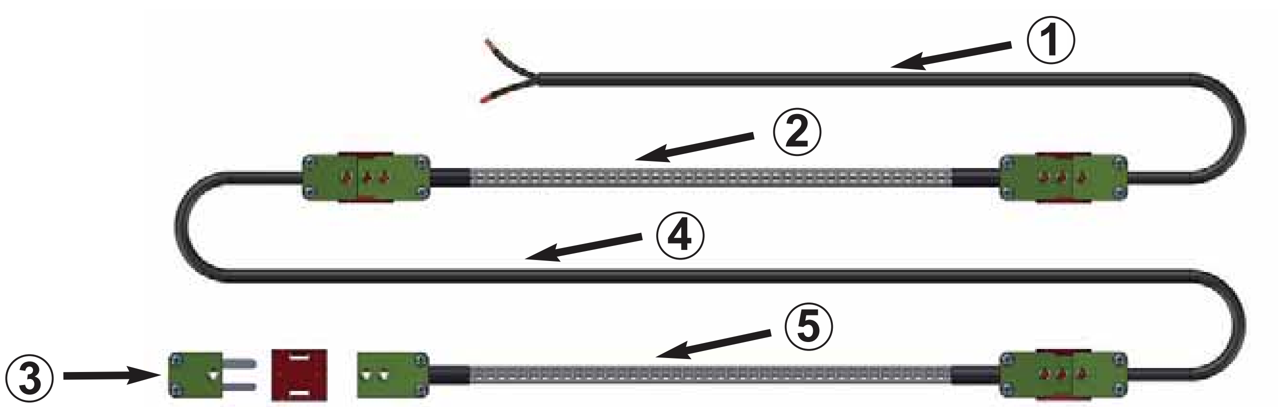


KE and KE-Z10 conductive cable electrodes

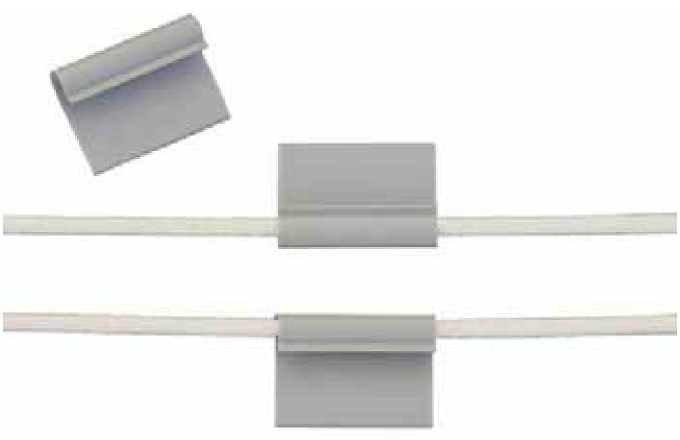
Technical data	KE	KE-Z10
Design	1 control electrode and 1 ground electrode	
Sensitive elements	2 sensor cables in form of 2 ropes made of stainless steel 316, each 3 mm in dia., each covered by a halogen-free protective polyester braiding, length 2 m each, shorter or longer on request	
Max. length of the sensor cables	100 m, if the sensor cables are wound around a pipe or tank, the possible length may be condiderably shorter depending on the type and method of laying.	
Supplied mounting accessories	4 sensor cable spacers made of PP per metre of sensor cable	
Electrical connection	connecting cable 2X0.75 length 2 m, on request: • longer • halogen-free	
Temperature range	– 20°C to + 60°C, higher temperatures on request	
Cable break monitoring to monitor the connecting cable and the sensor cables	**without**	**with** integrated Z10 cable break monitoring unit (removable for test purpose)
Classification	connection to one of the following conductive electrode relays	
• **with** cable break monitoring unit, **with** DIBt certificate No. Z-65.40-203		**Leckstar 101** or **Leckstar 101/S:** one KE-Z10
• **with** cable break monitoring unit, **without** DIBt certificate		**Leckstar 171/1** or **Leckstar 171/2:** one KE-Z10 **Leckstar 155** or **Leckstar 255:** max. five KE-Z10
• **without** cable break monitoring unit, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of KE may be connected in parallel to either one of these relays.	
Max. length of connecting cable	1,000 m including the length of the sensor cable pair, between electrode relay and electrode end	

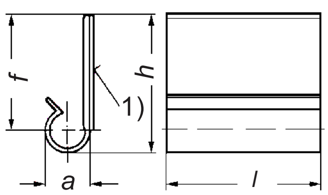
Supplied mounting accessories

Sensor cable spacers

Optional mounting accessories

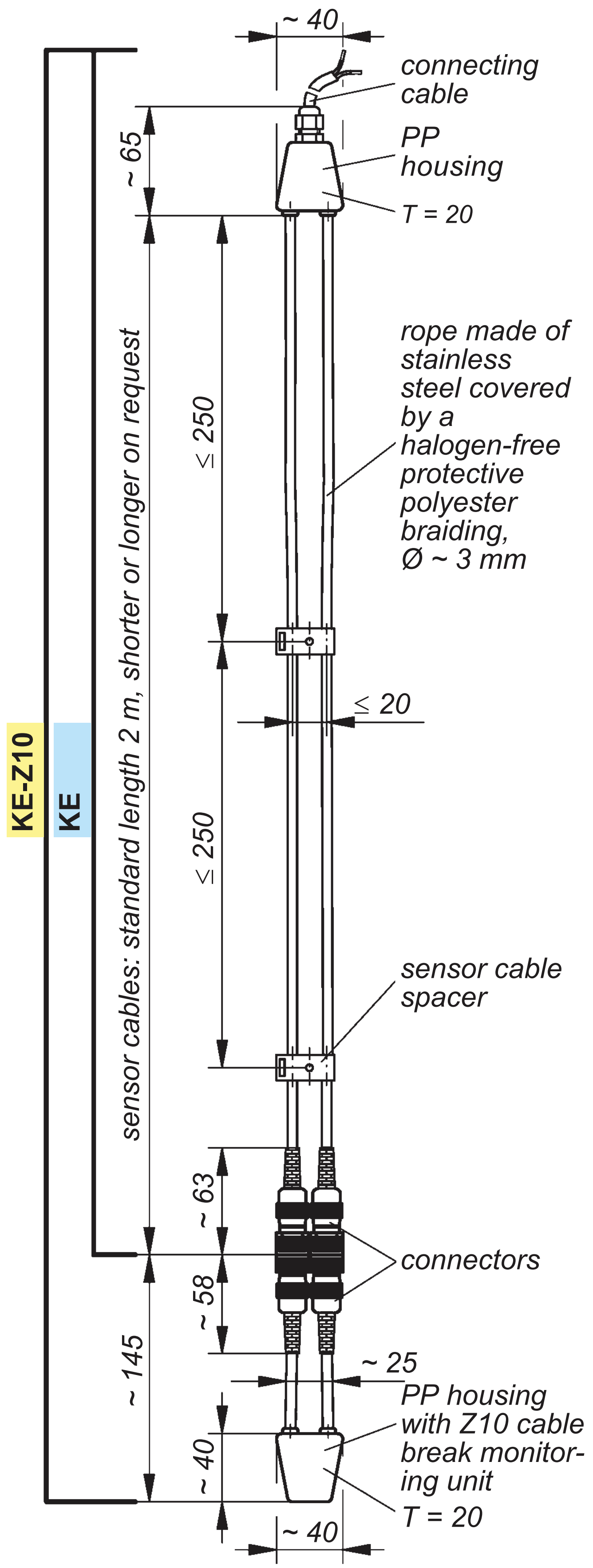
Self-adhesive sensor cable fastening clips





a = 7.6 mm
f = 19.6 mm
h = 22.6 mm
l = 31.8 mm

1) Self-adhesive foil



Dimensions in mm

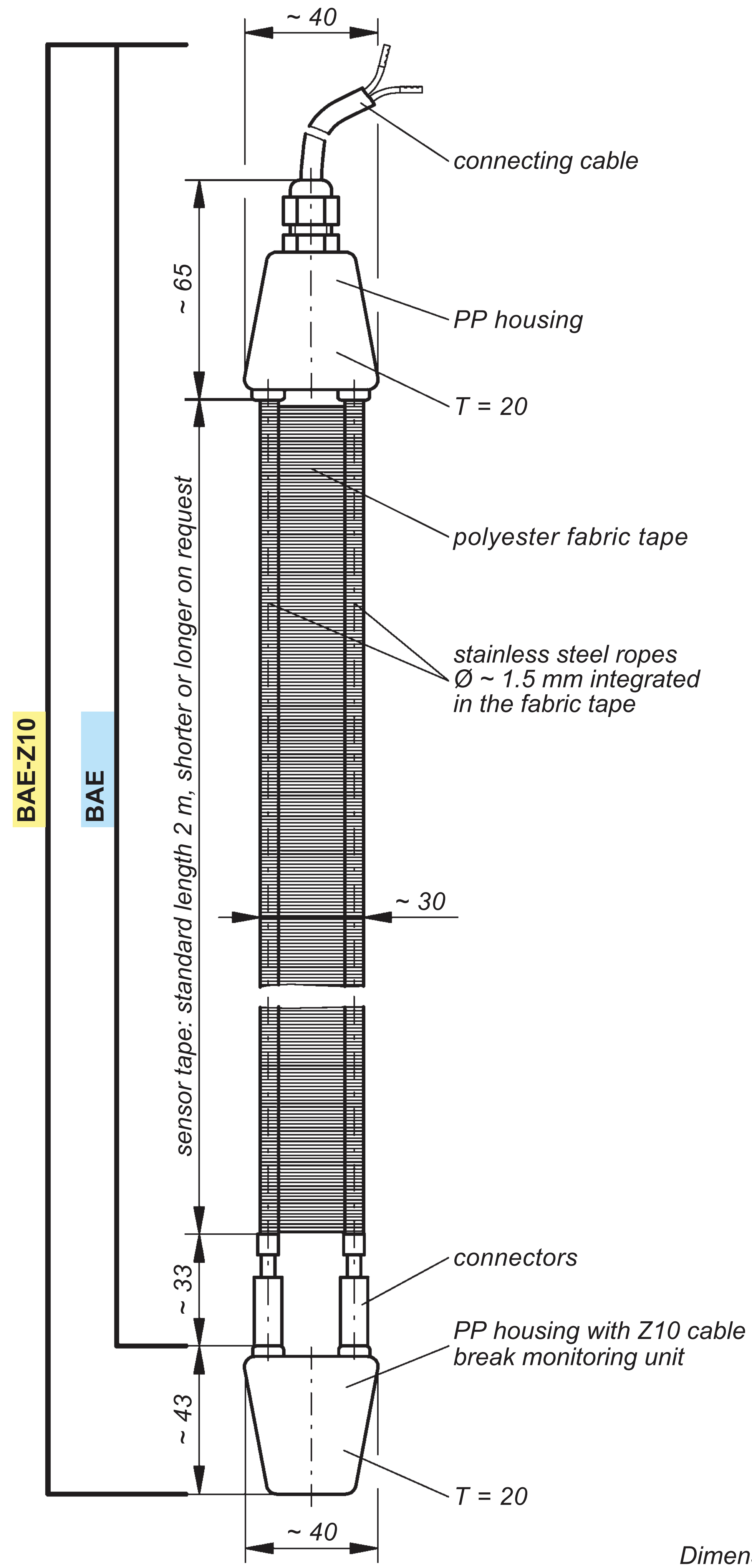
Mode of installation of the KE... cable electrode

The two sensor cables of the cable electrode must be mounted parallel to one another at a distance of approx. 2 cm using the sensor cable spacers, as a greater or lesser spacing affects the response level of the system in the event of leakage.

Only electrically non-conductive materials (e.g. cable ties, insulated cable clips etc.) must be used for installation of the sensor cables.

BAE and BAE-Z10 conductive tape electrodes

Technical data	BAE	BAE-Z10
Design	1 control electrode and 1 ground electrode	
Sensitive elements	2 sensor cables in form of 2 ropes made of stainless steel 316, each 1.5 mm in dia., woven into a halogen-free approx. 30 mm wide polyester fabric sensor tape at a spacing of approx. 24-25 mm, length: 2 m, shorter or longer on request	
Max. length of the sensor tape	30 m, if the sensor tape is wound around a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying.	
Electrical connection	connecting cable 2X0.75 length 2 m, on request: • longer • halogen-free	
Temperature range	– 20°C to + 60°C, higher temperatures on request	
Cable break monitoring to monitor the connecting cable and the sensor cables	**without**	**with** integrated Z10 cable break monitoring unit (removable for test purpose)
Classification	connection to one of the following conductive electrode relays	
• **with** cable break monitoring unit, **with** DIBt certificate No. Z-65.40-203		**Leckstar 101** or **Leckstar 101/S:** one BAE-Z10
• **with** cable break monitoring unit, **without** DIBt certificate		**Leckstar 171/1** or **Leckstar 171/2:** one BAE-Z10 **Leckstar 155** or **Leckstar 255:** max. five BAE-Z10
• **without** cable break monitoring unit, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of BAE may be connected in parallel to either one of these relays.	
Max. length of connecting cable	1,000 m including the length of the sensor tape, between electrode relay and electrode end	



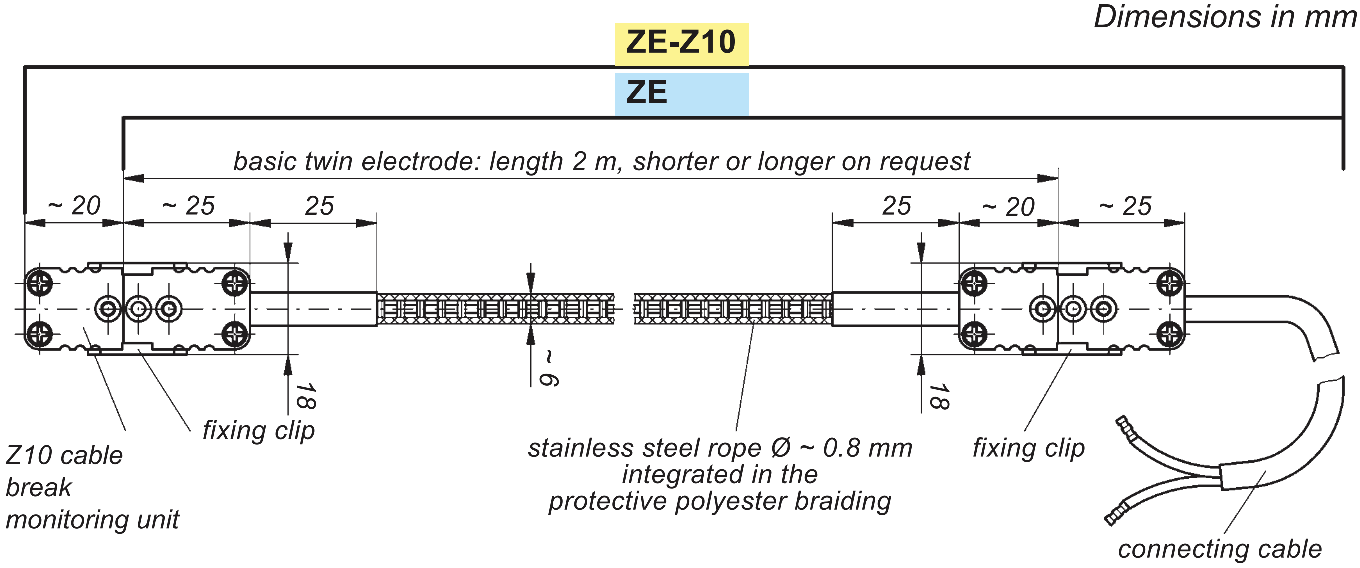
Dimensions in mm

ZE and ZE-Z10 conductive twin electrodes

<table>
<tr><th>Technical data</th><th>ZE</th><th>ZE-Z10</th></tr>
<tr><td>Design</td><td colspan="2">1 control electrode and 1 ground electrode</td></tr>
<tr><td>Sensitive elements</td><td colspan="2">2 sensor cables in form of 2 ropes made of stainless steel 316, each 0.8 mm in dia., each with polyester protective braiding and 1 insulating spacer in between in the form of a flat tape structure with polyester braiding, with plug connector, bushing and fixing clip length 2 m, shorter or longer on request</td></tr>
<tr><td>Max. length of the sensor tape</td><td colspan="2">100 m,
if the sensor tape is wound around a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying.</td></tr>
<tr><td>Electrical connection</td><td colspan="2">connecting cable
2X0.75
with bushing and fixing clip,
length 2 m, on request:
• longer
• halogen-free</td></tr>
<tr><td>Temperature range</td><td colspan="2">– 20°C to + 60°C,
higher temperatures on request</td></tr>
<tr><td>Cable break monitoring to monitor the connecting cable and the sensor cables</td><td>without</td><td>with integrated Z10 cable break monitoring unit
(removable for test purpose)</td></tr>
<tr><td>Classification</td><td colspan="2">connection to one of the following conductive electrode relays</td></tr>
<tr><td>• with cable break monitoring unit, <u>without</u> DIBt certificate</td><td></td><td>Leckstar 101 or Leckstar 101/S:
one ZE-Z10</td></tr>
<tr><td>• with cable break monitoring unit, without DIBt certificate</td><td></td><td>Leckstar 171/1 or Leckstar 171/2:
one ZE-Z10
Leckstar 155 or Leckstar 255:
max. five ZE-Z10</td></tr>
<tr><td>• without cable break monitoring unit, without DIBt certificate</td><td>Leckstar 5 or Leckstar 5/G:
any number of ZE may be connected in parallel to either one of these relays.</td><td></td></tr>
<tr><td>Max. length of connecting cable</td><td colspan="2">1,000 m including the length of the basic twin electrode and the extension options, between electrode relay and electrode end</td></tr>
</table>

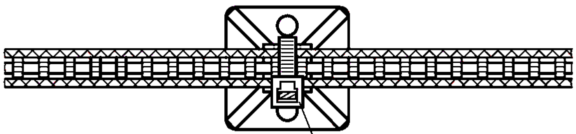
Dimensional drawing of the ZE or ZE-Z10 basic twin electrode

Dimensions in mm

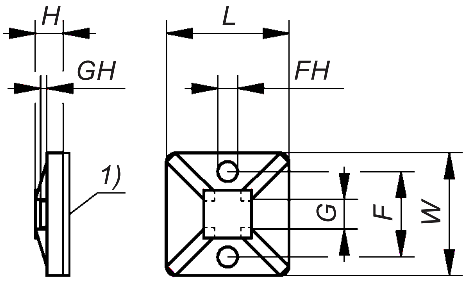


Optional mounting accessories: self-adhesive fixing holders

Type EB/84a

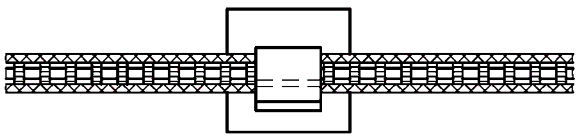


This fixing holder is especially practical if the twin electrode shall be permanently fixed.

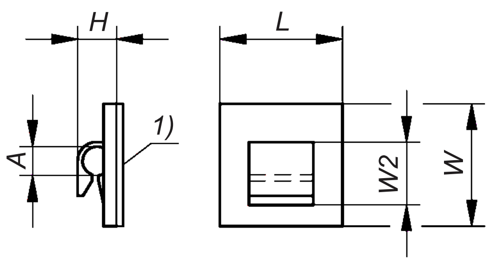


F = 13.2 mm
FH = Ø 3.1 mm
G = cable binder width max. 4.1 mm
GH = cable binder width max. 1 mm
H = 4.3 mm
L = 19 mm
W = 19 mm
1) = self-adhesive foil t = 1 mm

Type EZ/61a

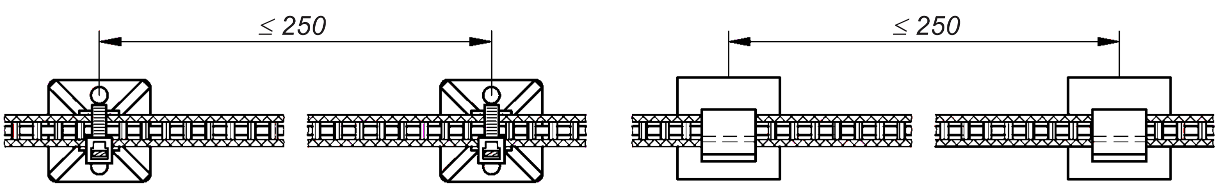


This fixing holder is especially practical if the twin electrode needs to be removed, e.g. for cleaning purpose.



A = max. Ø 5 mm
H = 6 mm
L = 19 mm
W = 19 mm
W2 = 9.7 mm
1) = self-adhesive foil t = 1 mm

The fixing holders must be fixed at a distance of approx. 250 mm



Leakage detection with conductive "Leckstar" surface sensors

Application example with a conductive mat electrode

Use of a mat electrode for leakage detection of an electrically conductive liquid in a collection tub

MEL 6 and MEL 6-Z10 conductive mat electrodes

Conductive mat electrodes are designed to signal via a connected conductive electrode relay the presence of an electrically conductive liquid caused, for example, by burst pipes.

Conductive mat electrodes should only be used in normally dry environments. They can be installed on the floor or in a collection tub below pipelines or small tanks.

MEL 6(-Z10)

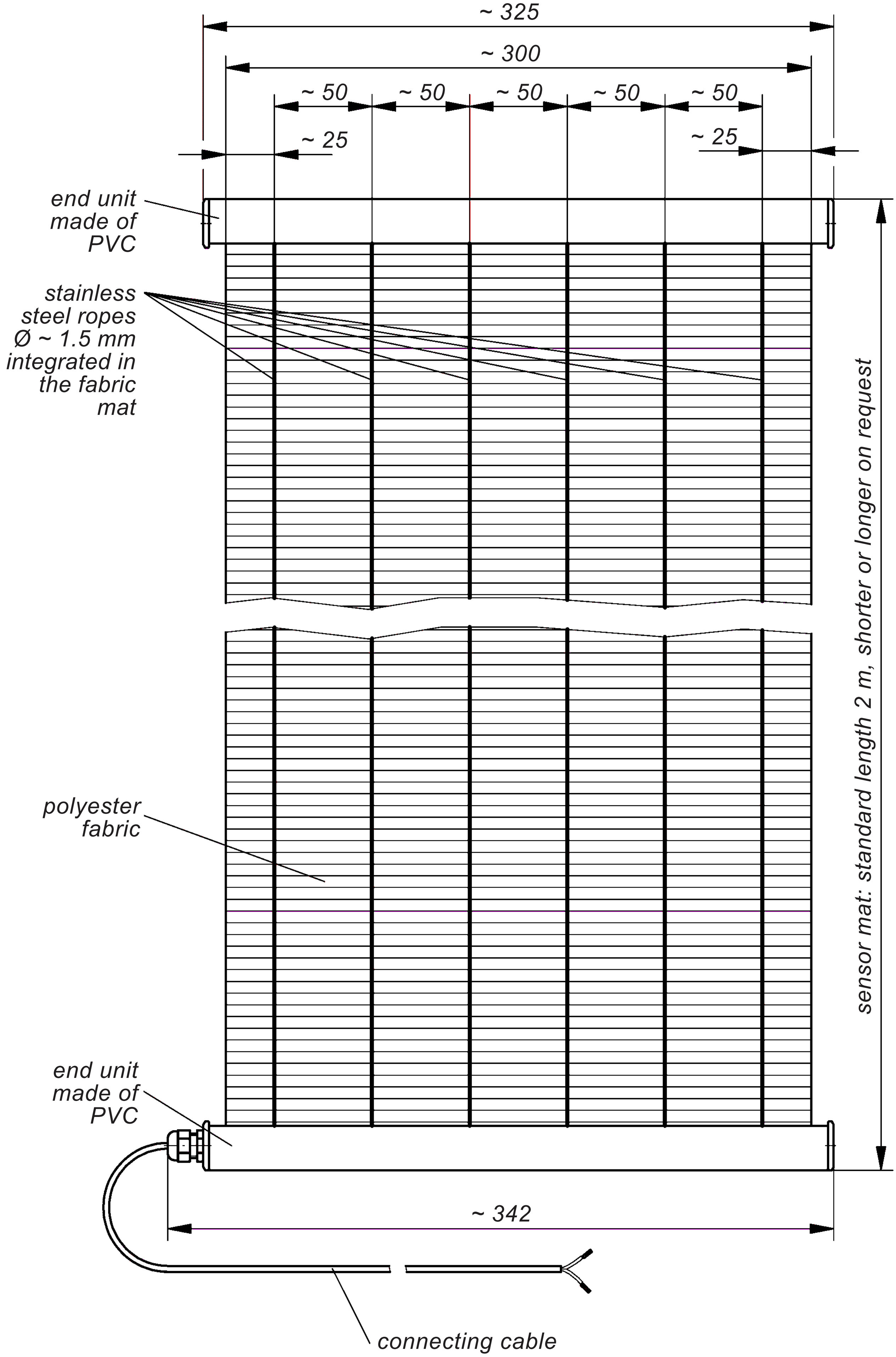
The conductive MEL 6... mat electrode is fitted with 6 sensitive elements in form of 6 sensor cables: 3 control electrodes and 3 ground electrodes. A ground electrode is always positioned next to a control electrode, a control electrode next to a ground electrode and so on. As soon as an electrically conductive liquid (e.g. water, acid etc.) creates a conductive path between a control electrode and a ground electrode, a control current flows from the corresponding conductive electrode relay. The latter is then energised and a contact made.

The 6 sensor cables of a MEL 6... mat electrode in form of 6 stainless steel ropes are woven into an approx. 30 cm wide polyester fabric as part of the warp, and the polyester fabric keeps them permanently equidistant from one another. This polyester fabric is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid as far as possible false alarms, whilst allowing leakage liquid to penetrate through to the stainless steel ropes.

To avoid false alarms, it is essential that the surroundings of the mat electrodes are absolutely dry under normal circumstances, as the mat electrodes have the ability to bind moisture (including high levels of air humidity) causing false alarms particularly with long mat electrodes.

MEL 6 and MEL 6-Z10 conductive mat electrode

Technical data	MEL 6	MEL 6-Z10
Design	3 control electrodes and 3 ground electrodes	
Sensitive elements	6 sensor cables in form of 6 ropes made of stainless steel 316, each 1.5 mm in dia., woven into an approx. 300 mm wide polyester fabric sensor mat at a spacing of approx. 50 mm, end units of the sensor mat made of PVC length 2 m, shorter or longer on request	
Max. length of the sensor mat	10 m, if the sensor mat is wound around a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying.	
Electrical connection	connecting cable 2X0.75 length 2 m, on request: • longer • halogen-free	
Temperature range	– 20°C to + 60°C	
Cable break monitoring to monitor the connecting cable and the sensor cables	**without**	**with** integrated Z10 cable break monitoring unit
Classification	connection to one of the following conductive electrode relays	
• **with** cable break monitoring unit, **without** DIBt certificate		**Leckstar 101** or **Leckstar 101/S:** one MEL 6-Z10 **Leckstar 171/1** or **Leckstar 171/2:** one MEL 6-Z10 **Leckstar 155** or **Leckstar 255:** max. five MEL 6-Z10
• **without** cable break monitoring unit, **without** DIBt certificate	**Leckstar 5** or **Leckstar 5/G:** any number of MEL 6 may be connected in parallel to either one of these relays.	
Max. length of connecting cable	1,000 m between electrode relay and mat electrode minus 3 x the length of the mat electrode	



Dimensions in mm

31-1-34

Leckstar 5 conductive electrode relay

without DIBt certificate

- **without cable break monitoring feature and with switchable self-hold**
- **for the connection of all conductive electrodes without cable break monitoring unit**
- **with 1 potential-free changeover contact at the output**

Electrode relay for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top and with 1 LED for signalling the alarm status

The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of water or a cable break) is no longer present – in other words, if the sensor is dry again. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Technical data	Leckstar 5
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V, DC 12 V } only for connection to a safety low voltage according to the safety regulations relating to the application or further supply voltages
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay with switchable self-hold
No-load voltage	18 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (electric conductance)
Power circuit (term. 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indication	1 red LED lights when electrode is wet / output relay is not energized
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 31-1-38)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and electrode(s)
CEM	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

Leckstar 5/G conductive electrode relay

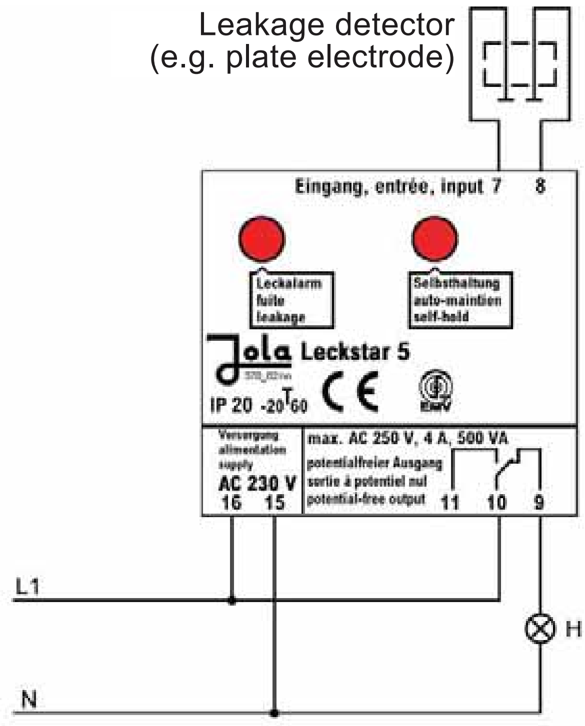
without DIBt certificate

- **without cable break monitoring feature**
- **for the connection of all conductive electrodes without cable break monitoring unit**
- **with 1 potential-free changeover contact at the output**

Electrode relay in surface-mount housing
with transparent cover,
with 1 LED for mains monitoring indication and
1 LED for signalling the alarm status, inside the housing

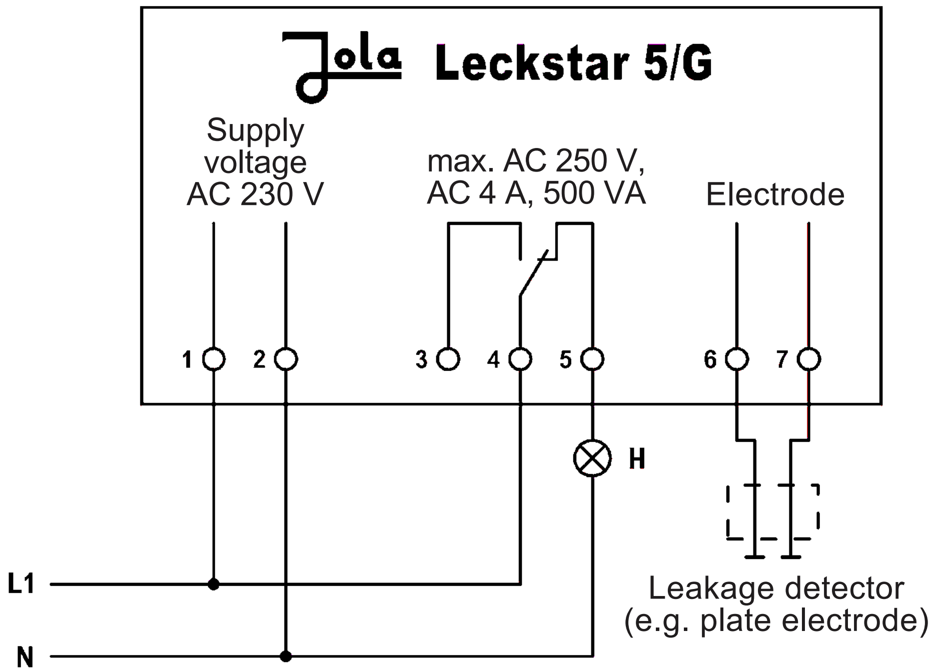
Technical data	Leckstar 5/G
Supply voltage (AC versions: terminals 1 and 2; DC versions: • terminal 1: – • terminal 2: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V } only for connection to a safety low voltage DC 12 V } according to the safety regulations relating to the application or further supply voltages
Mains monitoring indication	via 1 green LED
Power consumption	approx. 3 VA
Electrode circuit (terminals 6 and 7)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay without self-hold
No-load voltage	18 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (electric conductance)
Power circuit (terminals 3, 4, 5)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indication	1 red LED lights when electrode is wet / output relay is not energized
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 cable entries (dimensions see page 31-1-38)
Connection	internal terminals
Protection class	IP54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and electrode(s)
CEM	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

Connection diagram of Leckstar 5 electrode relay



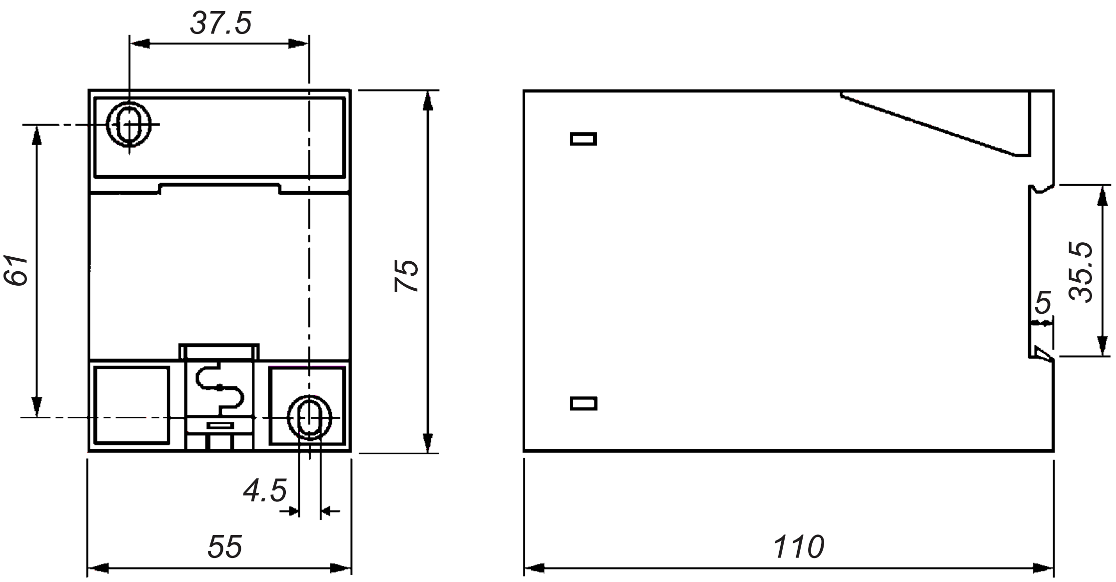
Position of contact when Leckstar 5 is
• without voltage supply
or
• with normal mains operation and with activated electrode (alarm)

Connection diagram of Leckstar 5/G electrode relay

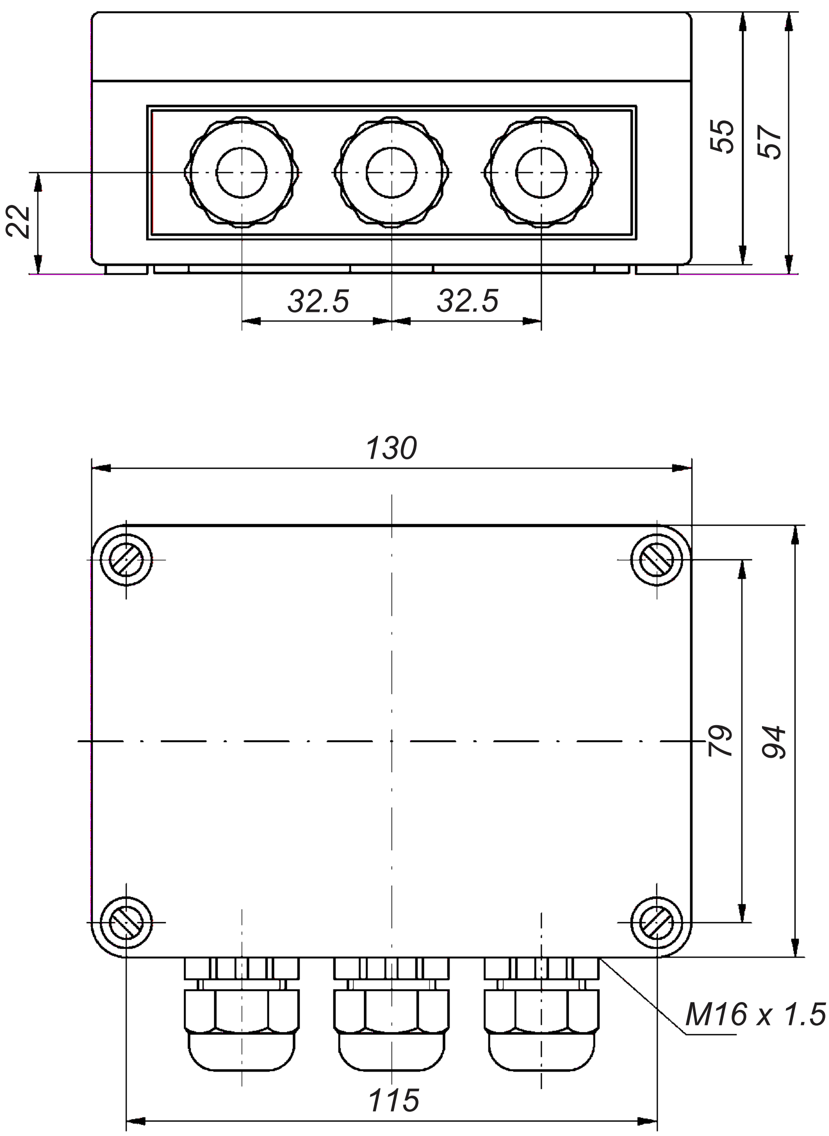


Position of contact when Leckstar 5/G is
• without voltage supply
or
• with normal mains operation and with activated electrode (alarm)

Dimensional drawings



Leckstar 5, Leckstar 101 and Leckstar 101/S



Leckstar 5/G

Dimensions in mm

Leckstar 101 conductive electrode relay with DIBt certificate no. Z-65.40-203

- **with cable break monitoring feature and switchable self-hold**
- **for connection of 1 conductive electrode with Z10 cable break monitoring unit**
- **with 1 potential-free changeover contact at the output**

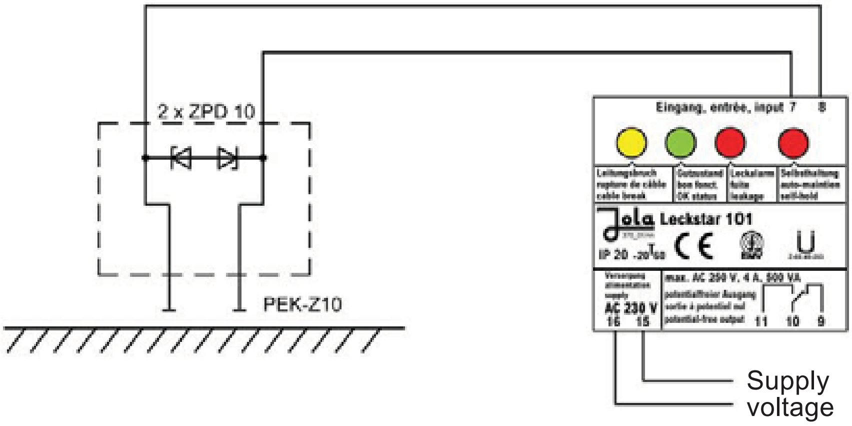
Electrode relay for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top and with 3 LEDs for signalling the operating statuses

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Technical data	Leckstar 101
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V } only for connection to a safety low voltage DC 12 V } according to the safety regulations relating to the application or further supply voltages
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV) acting on 1 output relay with switchable self-hold
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 μS (electric conductance)
Power circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indication	via 3 LEDs (see page 31-1-40)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 31-1-38)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and Z10 cable break monitoring unit
CEM	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

Connection diagram of Leckstar 101 electrode relay



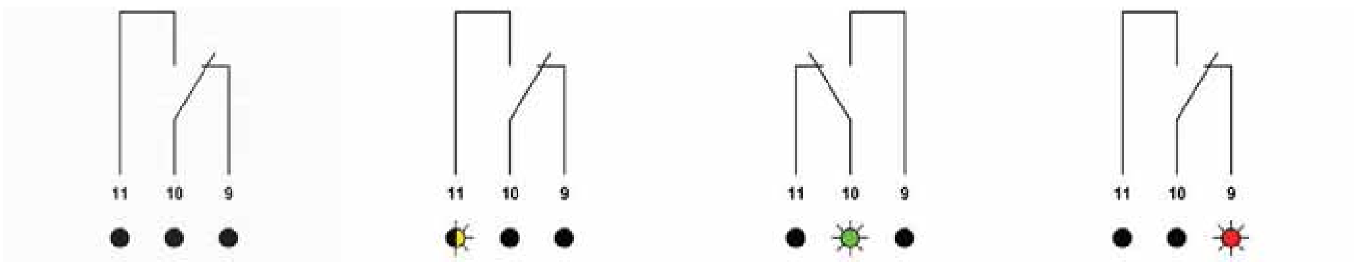
Position of contact when Leckstar 101 without voltage

Due to the design of the unit, only one electrode cable can be monitored for cable break.

If several electrodes are to be connected to a common Leckstar 101 electrode relay, only one electrode (the last one) may be fitted with the Z10 cable break monitoring unit. All other electrodes are to be used without integrated Z10 cable break monitoring unit (see right-hand circuit diagram below).

Position of output contact of the Leckstar 101 electrode relay

relay Leckstar 101 without voltage	cable break	Leckstar 101 under voltage standby	leakage



LEDs dark: output relay not energized	**yellow LED flashes:** electrode cable break, output relay not energized	**green LED lights:** electrode dry, output relay energized	**red LED lights:** electrode wet, output relay not energized

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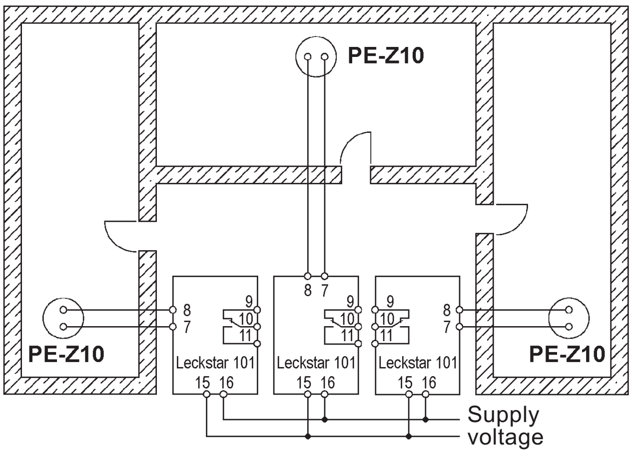
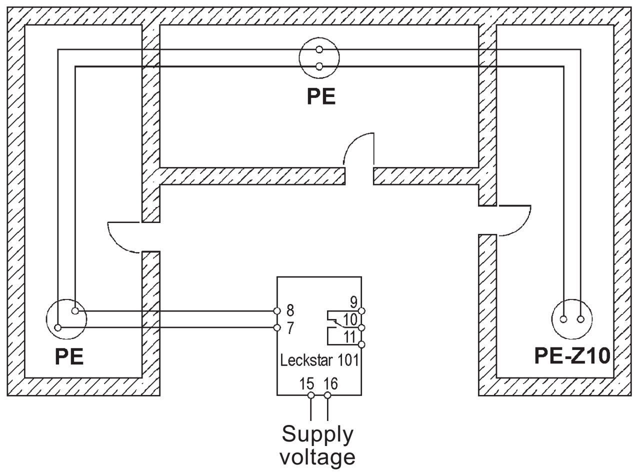
Circuit diagrams (position of contacts when Leckstar 101 without voltage)



Connection of several plate electrodes to several Leckstar 101 electrode relays – separate alarms



Connection of several plate electrodes to one Leckstar 101 electrode relay – group alarm

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The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Leckstar 101/S conductive electrode relay <u>with</u> DIBt certificate no. Z-65.40-203

- **with cable break monitoring feature and switchable self-hold**
- **with separately routed cable break monitoring output**
- **for connection of 1 conductive electrode <u>with</u> Z10 cable break monitoring unit**
- **with 2 potential-free break (NC) contacts at the output**

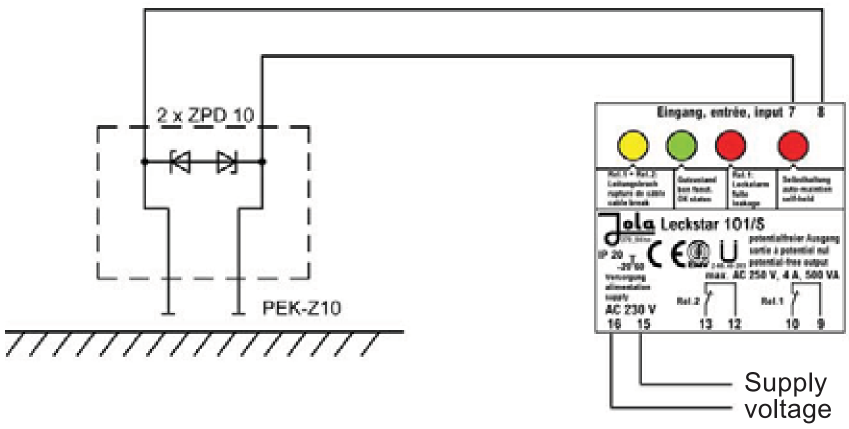
Electrode relay for DIN rail mounting or surface mounting, with connection terminals on top and with 3 built-in LEDs for signalling the operating statuses

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Technical data	Leckstar 101/S
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V } only for connection to a safety low voltage DC 12 V } according to the safety regulations relating to the application or further supply voltages
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays with switchable self-hold
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 μS (electric conductance)
1st power circuit (terminals 9, 10)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for signalling leakage or cable break
2nd power circuit (terminals 12, 13)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for additional signalling in the event of a cable break
Switching status indication	via 3 LEDs (see page 31-1-42)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 31-1-38)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Further technical data	see Leckstar 101, page 31-1-39

Connection diagram of Leckstar 101/S electrode relay

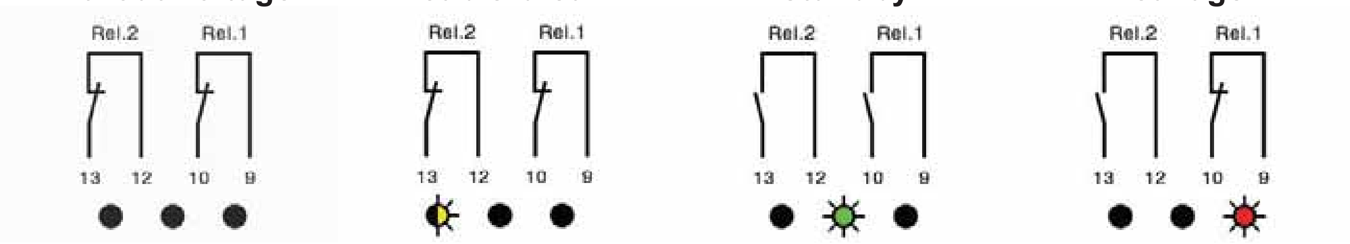


Position of contact when Leckstar 101/S without voltage

Due to the design of the unit, only one electrode cable can be monitored for cable break. If several electrodes are to be connected to a common Leckstar 101/S electrode relay, only one electrode (the last one) may be fitted with the Z10 cable break monitoring unit. All other electrodes are to be used without integrated Z10 cable break monitoring unit (see right-hand circuit diagram below).

Position of output contact of the Leckstar 101/S electrode relay

relay Leckstar 101/S without voltage | **Leckstar 101/S under voltage**: **cable break** | **standby** | **leakage**



LEDs dark:
both output relays not energized, output contacts closed

yellow LED flashes:
electrode cable break, both output relays not energized, output contacts closed

green LED lights:
electrode dry, both output relays energized, output contacts open

red LED lights:
electrode wet, output relay 1 not energized, output contact 1 closed, output relay 2 energized, output contact 2 open

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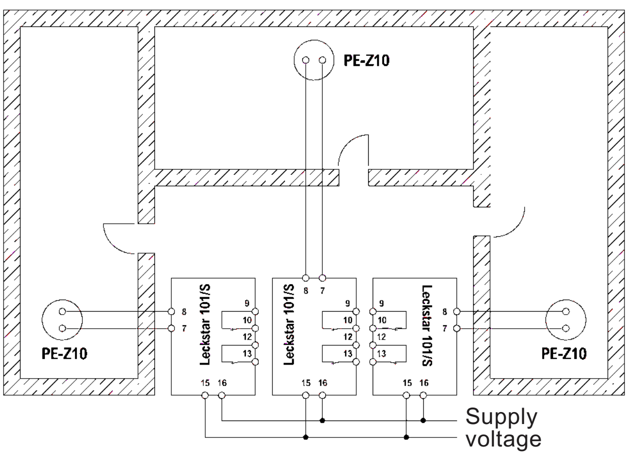
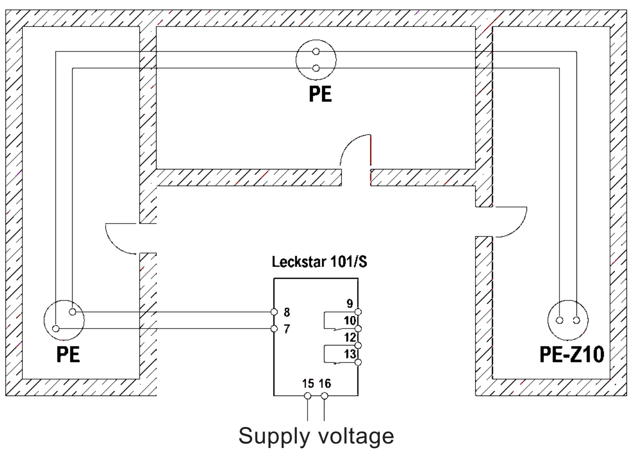
Circuit diagrams (position of contacts when Leckstar 101/S without voltage)



Connection of several plate electrodes to several Leckstar 101/S electrode relays – separate alarms



Connection of several plate electrodes to one Leckstar 101/S electrode relay – group alarm

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The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Leckstar 171/1 and Leckstar 171/2 conductive electrode relays

without DIBt certificate

- **with cable break monitoring feature**
- **for connection of 1 conductive electrode with Z10 cable break monitoring unit**
- **with built-in accumulator for emergency power supply in the event of a mains failure**
- **with 2 potential-free changeover contacts at the output**
- **with integrated buzzer**
- **with 1 horn power circuit**

Electrode relay in surface-mount housing, with 3 built-in LEDs for signalling the operating statuses

- **Optical indication**

The operating status (mains operation, accumulator operation, fuse defective) is indicated by a bi-colour LED.
2 LEDs are built into the electrode relay for signalling leakage or cable break.

Operating status	Type of optical indication
Supply voltage	Optical indication **without** effect on the active power circuits: Bi-colour LED lights green: mains operation, accumulator fuse OK flashes green: mains failure and accumulator operation lights red: mains operation and defective or absent accumulator fuse
Cable break	Optical indication **with** effect on the power circuits: yellow LED flashes: current cable break alarm yellow LED lights: cable break alarm acknowledged, alarm reason still present or alarm reason no longer present and acknowledged alarm in self-hold
Leakage	Optical indication **with** effect on the power circuits: rote LED flashes: current leakage alarm rote LED lights: leakage alarm acknowledged, alarm reason still present or alarm reason no longer present and acknowledged alarm in self-hold

• Power circuits

A buzzer is integrated in the electrode relay for the purpose of acoustic signalling at predetermined intervals in the event of an alarm. An optional external horn (DC 12 V, max. 1 A) may be installed additionally. It is fed in the event of an alarm via an internal relay contact with the supply voltage of DC 12 V generated in the electrode relay as a permanent signal.

Two potential-free changeover contacts are available at the output for the connection of additional signalling devices. The switching function of these contacts is different in the two unit versions.

Power circuits	**Leckstar 171/1**	**Leckstar 171/2**
Output relay 1 based on the quiescent current principle	for cable break alarm, with self-hold, can be acknowledged when the reason for the alarm is no longer present	for group alarm, with self-hold, can be acknowledged when the reason for the alarm is no longer present
Output relay 2 based on the quiescent current principle	for leakage alarm, with self-hold, can be acknowledged when the reason for the alarm is no longer present	for group alarm, with self-hold, can always be acknowledged
Optional external Horn based on the working current principle	for group alarm, with self-hold, can always be acknowledged	

• Alarm acknowledgement

A built-in acknowledgement button is fitted for the acknowledgement of the cable break alarm or the leakage alarm.

If a repeat alarm is emitted, all power circuits are once again set to alarm status with additional optical signal, regardless of whether an alarm has already been acknowledged.

If acknowledgement has also to be possible via an external acknowledgement button, an external acknowledgement button must be connected in parallel to the built-in acknowledgement button to terminals 11 and 12.

N.B.

The fuse next to the connecting terminals serves to protect the accumulator circuit.

If this fuse is defective or missing, the accumulator is not charged during mains operation and is not available as an emergency power supply in the event of a mains failure. Moreover, problems may occur with the operation of horns with higher loudness levels. You should therefore always ensure that a functioning fuse (1 A fast) is inserted.

In the event of mains failure, the built-in accumulator permits operation of the electrode relay for approx. 24 hours in standby status. Operating times when the alarm is sounding depend on the power consumption of the connected external horn. The accumulator capacity is 1.8 Ah. The life of the accumulator is approx. 4 to 5 years.

In non-connected status (unit not connected to the mains supply), the fuse located next to the connecting terminals is to be removed, as the accumulator will otherwise discharge via the electrode relay, thereby reducing its service life.

N.B.!
Fully disconnect the unit from the mains voltage before inserting or replacing the fuse!
When the fuse is inserted, the unit is operated off the accumulator:
a false alarm may be activated, and buzzer and optional external horn may sound!
Increased risk of accident "due to fright"!

<table>
<tr><th>Technical data</th><th>Leckstar 171/1</th><th>Leckstar 171/2</th></tr>
<tr><td>Supply voltage
(terminals 1 and 2)</td><td colspan="2">AC 230 V,
other supply voltage, e.g. DC 24 V, on request</td></tr>
<tr><td>Optical indication showing the type of power supply</td><td colspan="2">via a bi-colour LED
without effect on the power circuits:
• lights green =
mains operation, accumulator fuse OK
• flashes green =
mains failure and accumulator operation
• lights red =
mains operation and defective or absent accumulator fuse</td></tr>
<tr><td>Power consumption</td><td colspan="2">approx. 3 VA</td></tr>
<tr><td>Electrode circuit
(terminals 13 and 14)</td><td colspan="2">2 terminals (under safety extra low voltage SELV),
acting on
the 2 potential-free changeover contacts, the buzzer circuit and the circuit of the optional external horn</td></tr>
<tr><td>No-load voltage</td><td colspan="2">14 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)</td></tr>
<tr><td>Short circuit current</td><td colspan="2">max. 0.5 mA_{eff}</td></tr>
<tr><td>Response sensitivity</td><td colspan="2">approx. 30 kΩ or approx. 33 µS (electric conductance)</td></tr>
<tr><td rowspan="3">1st power circuit
(output relay 1 –
terminals 3, 4, 5)</td><td colspan="2">1 single-pole potential-free changeover contact based on the quiescent current principle</td></tr>
<tr><td>for cable break alarm,</td><td>for group alarm,</td></tr>
<tr><td colspan="2">with self-hold,
can be acknowledged when the reason for the alarm is no longer present</td></tr>
<tr><td rowspan="4">2nd power circuit
(output relay 2 –
terminals 6, 7, 8)</td><td colspan="2">1 single-pole potential-free changeover contact based on the quiescent current principle</td></tr>
<tr><td>for leakage alarm,</td><td>for group alarm,</td></tr>
<tr><td colspan="2">with self-hold,</td></tr>
<tr><td>can be acknowledged when the reason for the alarm is no longer present</td><td>can always be acknowledged</td></tr>
<tr><td>Electrical values of the potential-free changeover contacts:
• switching voltage
• switching current
• switching capacity</td><td colspan="2">
max. AC 250 V
max. AC 4 A
max. 500 VA</td></tr>
<tr><td>3rd power circuit
(internal buzzer and optional external horn –
terminals 9, 10)</td><td colspan="2">• internal buzzer in interval mode
• optional external horn without interval mode
for group alarm, with self-hold, can always be acknowledged</td></tr>
<tr><td>Electrical values for the optional external horn:
• supply voltage
• current consumption</td><td colspan="2">
DC 12 V
max. 1 A</td></tr>
<tr><td>Accumulator:
• capacity
• service life</td><td colspan="2">1.8 Ah

approx. 4 - 5 years</td></tr>
</table>

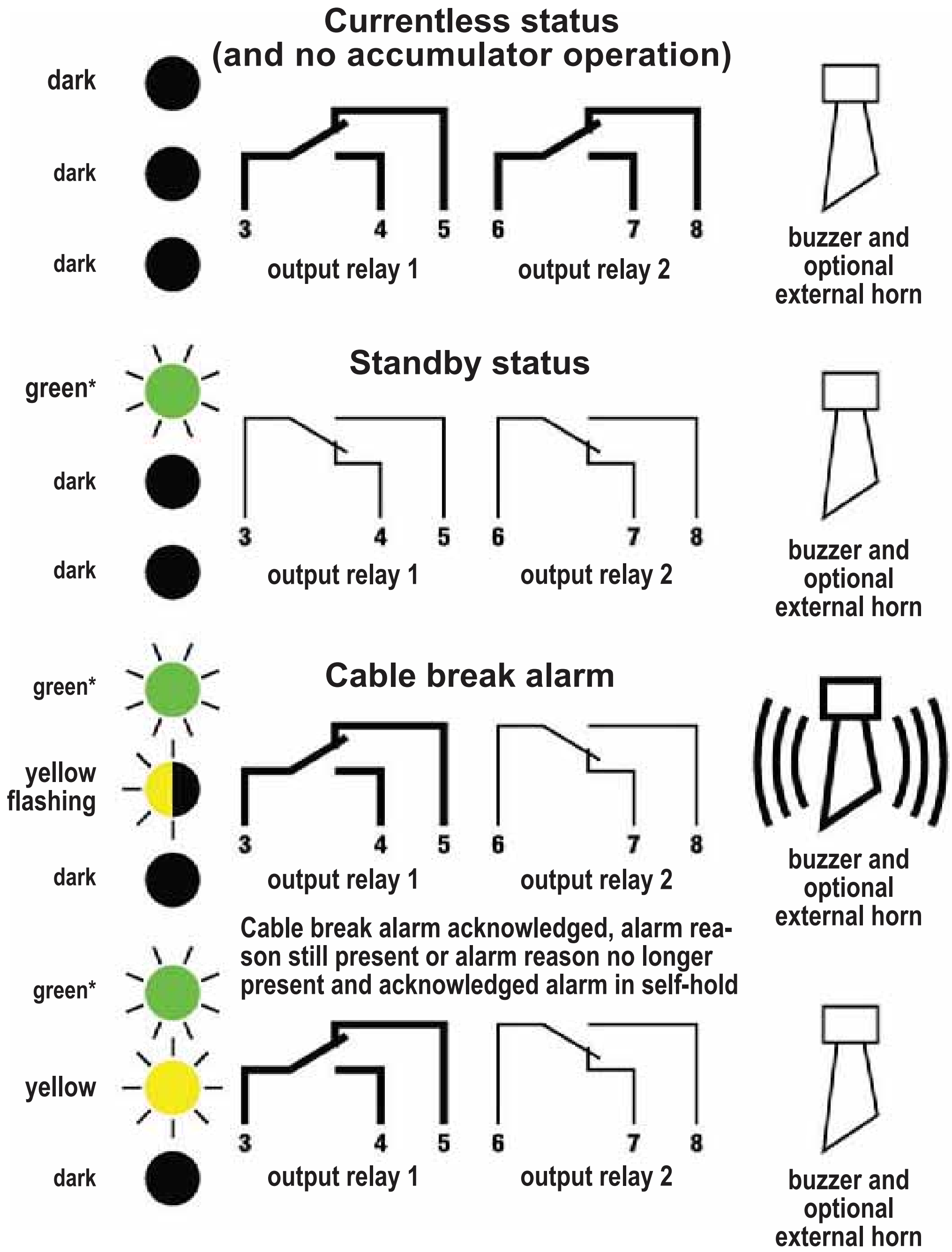
Technical data	Leckstar 171/1	Leckstar 171/2
Switching status indication	via 2 LEDs	
• yellow and red LED dark	functioning voltage supply output relay 1 and 2 energized	
• yellow LED flashes	cable break alarm	
output relay 1	not energised	not energised
output relay 2	energised	not energised
	internal buzzer and optional external horn active	
• yellow LED lights	cable break alarm acknowledged, alarm reason still present or alarm reason no longer present and acknowledged alarm in self-hold	
output relay 1	not energised	not energised
output relay 2	energised	energised
	internal buzzer and optional external horn inactive	
• red LED flashes	leakage alarm	
output relay 1	energised	not energised
output relay 2	not energised	not energised
	internal buzzer and optional external horn active	
• red LED lights	leakage alarm acknowledged, alarm reason still present or alarm reason no longer present and acknowledged alarm in self-hold	
output relay 1	energised	not energised
output relay 2	not energised	energised
	internal buzzer and optional external horn inactive	
Housing	insulating material, approx. 190 x 167 x 72 mm	
Connecting terminals	screw terminals: supply voltage and power circuits for max. 4 mm² solid or max. 2.5 mm² flexible cable; electrode circuit for max. 2.5 mm² solid or max. 1.5 mm² flexible cable	
Mounting orientation / Protection class	any position: IP40, vertical: IP41; to maintain the protection class, optional cable entries that are not used are to be sealed using the supplied sealing plugs, and the optionally double-used cable entry has to be fitted with the supplied double sealing insert	
Temperature range	0°C to + 50°C	
Max. length of connecting cable	1,000 m between electrode relay and Z10 cable break monitoring unit	
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies	

External opt. horn for connection to Leckstar 171/1 or Leckstar 171/2 electrode relay

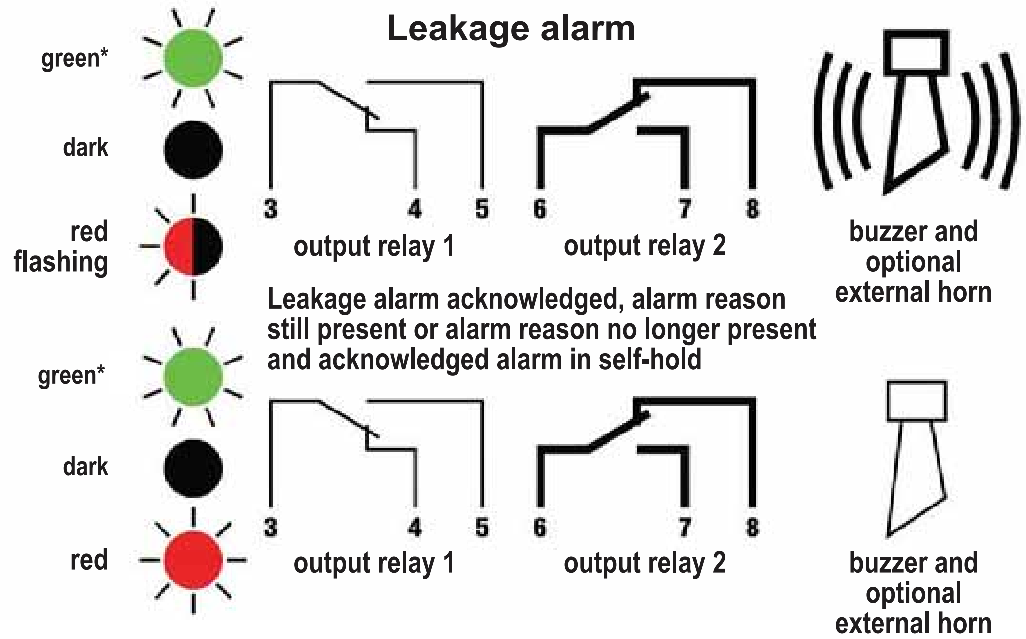
Technical data	HU 1
Application	dry rooms
Supply voltage	DC 12 V
Current consumption	DC 120 mA
Power consumption	1.44 W
Noise level at a distance of 1 m	approx. 92 dB
Dimensions	Ø approx. 70 x 170 mm
Protection class	IP43

Depiction of switching statuses of the **Leckstar 171/1**

symbols in bold indicate alarm status



*** lights green with mains operation and accumulator fuse OK, but:**
flashes green in the event of mains failure and accumulator operation or
lights red in the event of mains operation and defective or absent accumulator fuse



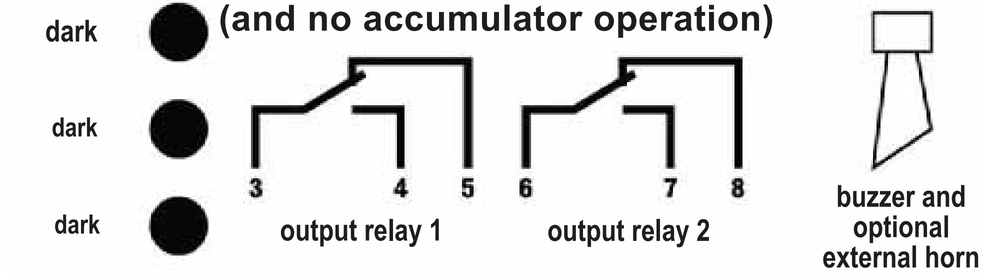
Depiction of switching statuses of the

Leckstar 171/2

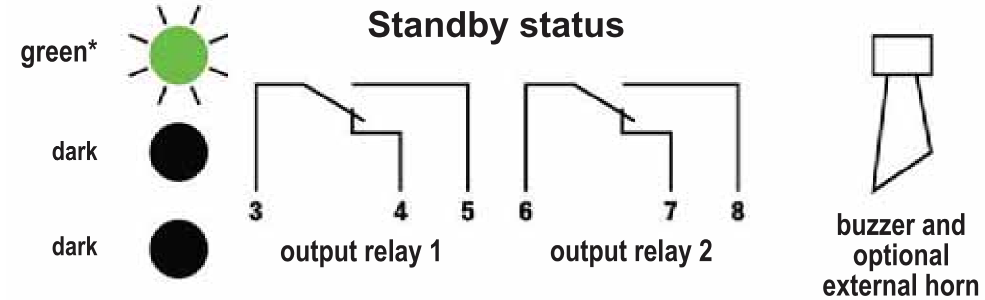
symbols in bold indicate alarm status

* lights green with mains operation and accumulator fuse OK,
but:
flashes green in the event of mains failure and accumulator operation or
lights red in the event of mains operation and defective or absent accumulator fuse

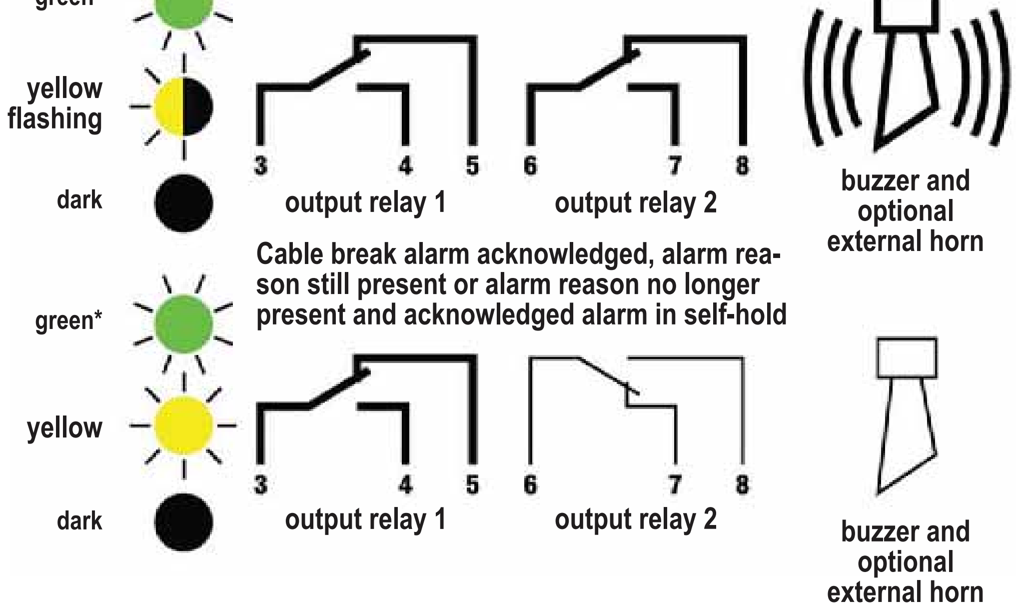
Currentless status (and no accumulator operation)



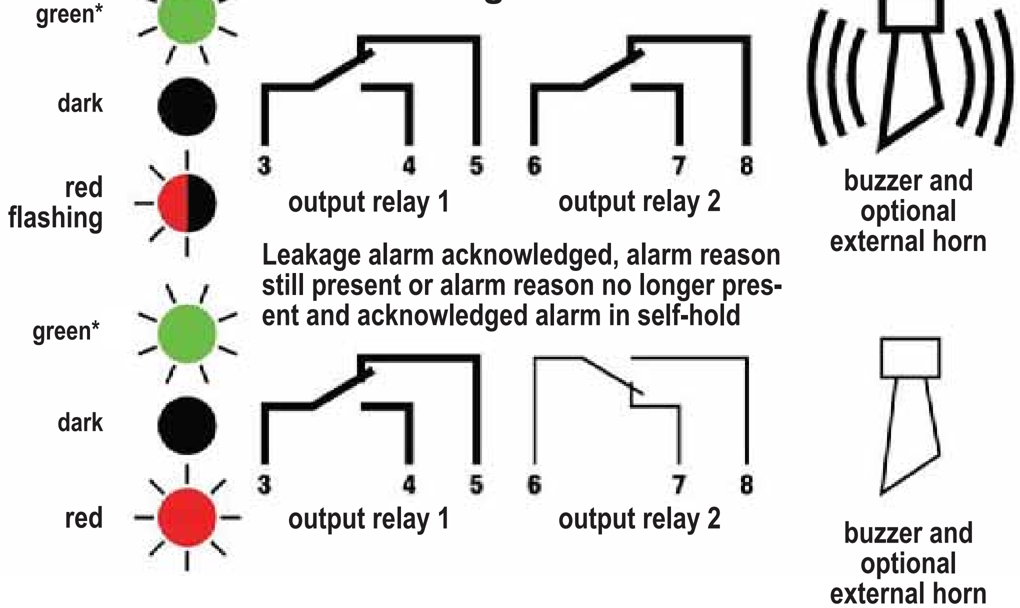
Standby status



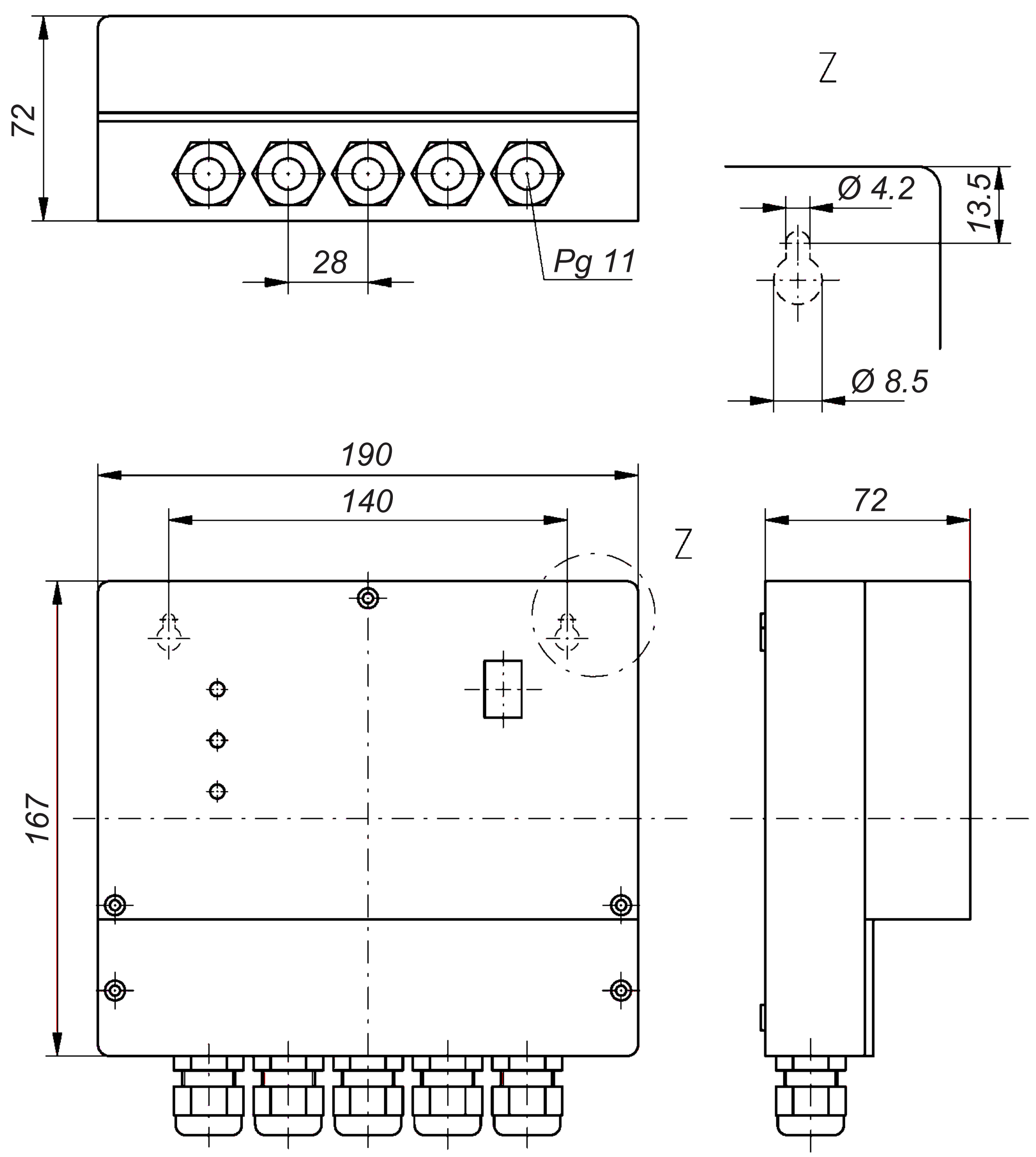
Cable break alarm



Leakage alarm

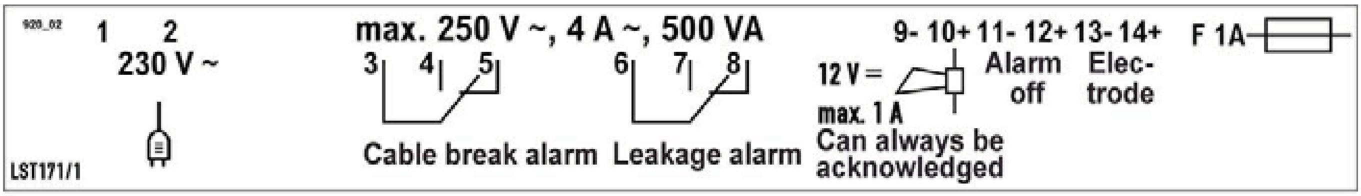


Dimensional drawing of Leckstar 171/1 / Leckstar 172/2

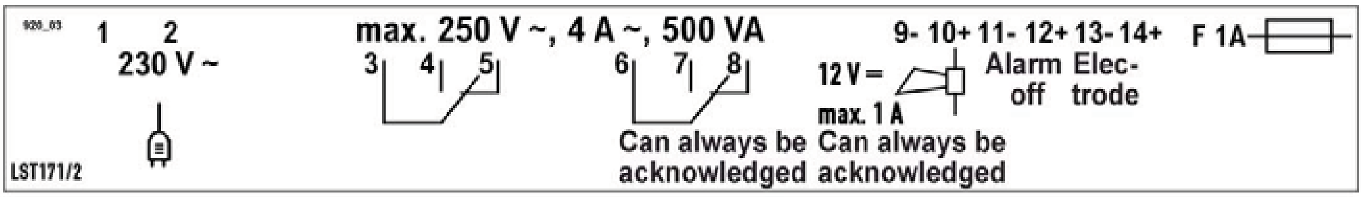


Dimensions in mm

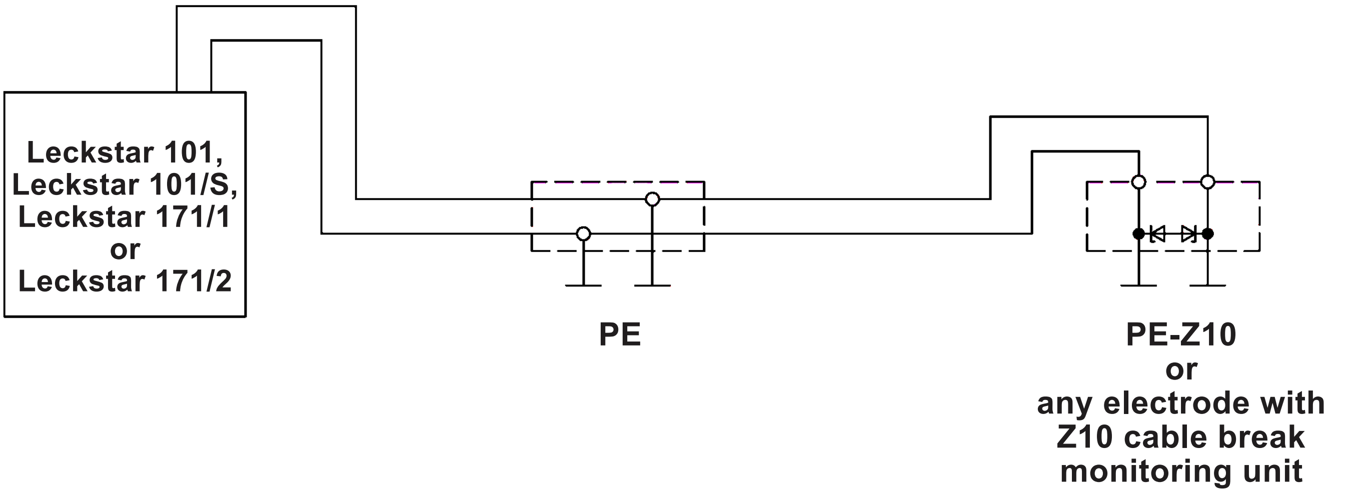
Connection diagram of Leckstar 171/1

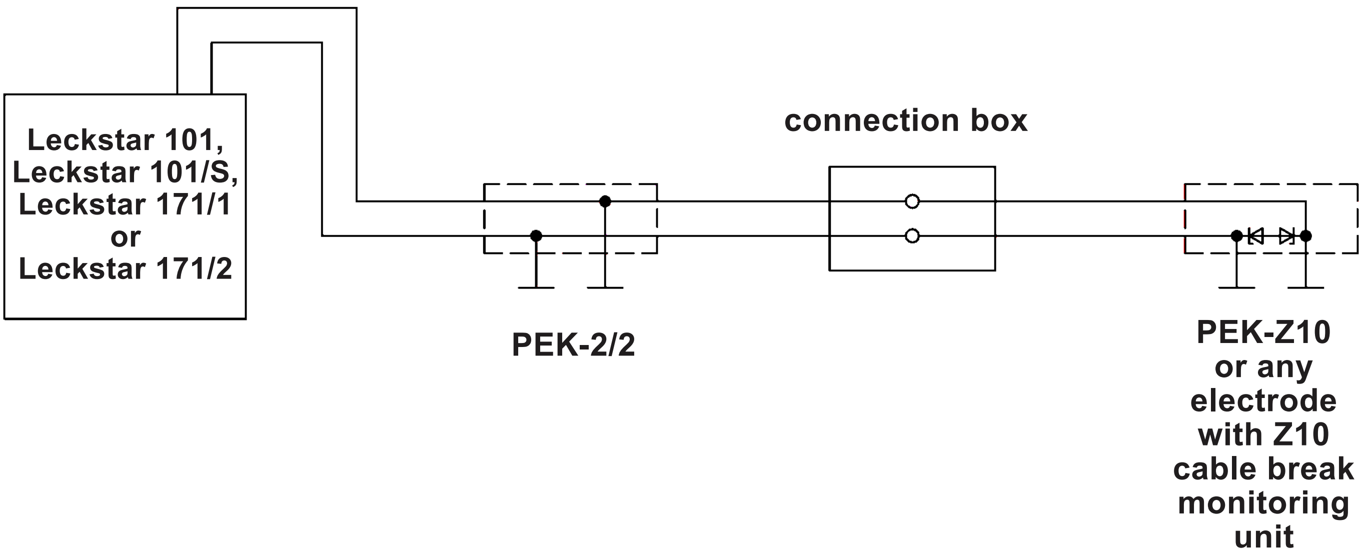


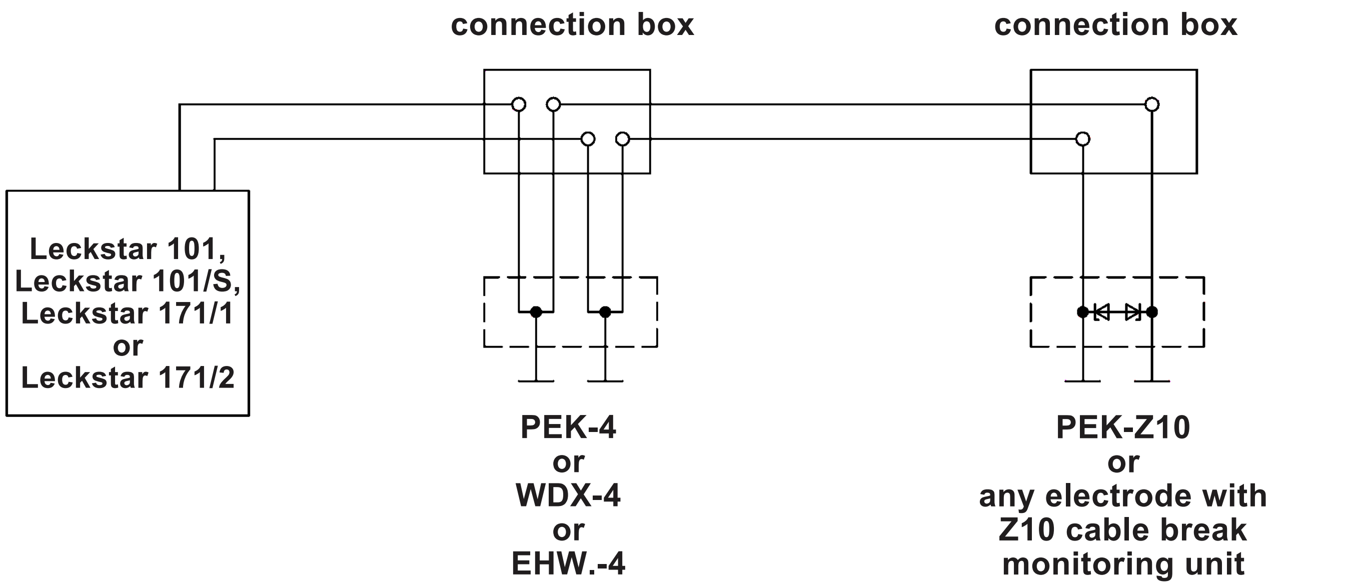
Connection diagram of Leckstar 171/2



Connection diagrams:
Connection of several electrodes to one
Leckstar 101, Leckstar 101/S, Leckstar 171/1 or Leckstar 171/2 electrode relay







Leckstar 155 conductive electrode relay without DIBt certificate

- **with cable break monitoring feature**
- **for the connection of 5 conductive electrodes with Z10 cable break monitoring unit**
- **with touch sensor button for alarm acknowledgement**
- **with 2 potential-free changeover contacts at the output and**
- **with 5 status signal outputs DC 20 V for the building control system**

Electrode relay in surface-mount housing, with transparent cover, with 5 x 3 LEDs for operating status indication and with 1 LED for acknowledgement status indication, inside the housing

• 5 signalling lines with common system ground

The Leckstar 155 electrode relay possesses inputs for the connection of 5 signalling lines.

A signalling line consists of one or more conductive electrodes. If electrodes designed for this purpose are used, it is possible to connect several electrodes one after the other to permit cable break monitoring at any point along the line route. At the end of each signalling line there is an electrode with integrated Z10 cable break monitoring unit. None of the other electrodes in the signalling line may be equipped with an integrated cable break monitoring unit.

In principle, the conductive electrodes consist of a pair of sensitive elements in the form of electrode plates, electrode rods or electrode ropes. One electrode is the control electrode and the other the ground electrode.

The electrode circuits are supplied with a safety extra low voltage generated in the Leckstar 155 which is reliably galvanically separated from the mains circuit and the potential-free changeover contacts of the two output relays.

All 5 signalling lines have a common system ground, which means there is no galvanic separation of the signalling lines. This factor must always be taken into account in the case of long signalling lines extending into different parts of the building and in particular with the use of cable, tape, twin or mat electrodes. There is a risk of formation of ground loops if the electrodes are mounted in such a way that an electrode can take on ground potential. It may be necessary to perform local potential equalisation in order to avoid potential equalisation currents via the signalling lines.

• Activation of the individual signalling lines

If not all 5 signalling lines are to be used, the signalling lines 2 to 5 can be activated (dip switch in active position) or deactivated (dip switch in inactive position) individually via 4 dip switches. Channel 1 is always activated. **Activation / Deactivation may only be performed in currentless status.**

• Type of indication

A group of 3 LEDs of different colours is assigned to each signalling line.

Operating status	Type of indication of each signalling line
Power supply	When the supply voltage is switched on, one of the three LEDs on each activated signalling line lights up to indicate the operating status of the activated signalling line in question
Leakage	Red LED lights, if the corresponding activated signalling line reports leakage • with effect on the two power circuits • with effect on the corresponding DC 20 V status signal output for the building control system
Standby	Green LED lights, if the corresponding activated signalling line reports standby • with effect on the corresponding DC 20 V status signal output for the building control system Only if **all** activated signalling lines indicate standby • with effect on the two power circuits
Cable break	Yellow LED flashes, if the corresponding activated signalling line reports cable break • with effect on the two power circuits • with effect on the corresponding DC 20 V status signal output for the building control system
Signalling line switched to inactive	None of the 3 LEDs in the deactivated signalling line (signalling line 2 to 5) lights up.

• Power circuits

Two potential-free changeover contacts are available at the output, one of which reacts based on the working current principle and the other on the quiescent current principle. In addition, there is a DC 20 V binary status output signal based on the quiescent current principle for each signalling line for the building control system. The potential-free changeover contact based on the working current principle can be acknowledged via a touch sensor button acting through the housing cover of the unit.

Power circuits	Switching statuses
Output relay 1 in working current principle	Output relay 1 is not energised in currentless status of the Leckstar 155 and in the standby status of all activated signalling lines. In the event of leakage or cable break in one or more activated signalling lines, output relay 1 is energised if the alarm has not been acknowledged. Output relay 1 can be acknowledged / reset using the touch sensor button.
Output relay 2 in quiescent current principle	Output relay 2 is energised in standby status of all activated signalling lines. Output relay 2 is not energised in currentless status of the Leckstar 155 and in the case of leakage or cable break in one or more activated signalling lines.
5 status signal outputs (DC 20 V) for the building control system	A DC 20 V binary switching status output signal in quiescent current principle is available for each of the 5 signalling lines: High signal, DC 20 V = standby status of the activ. signalling line Low signal, DC 0 V = • currentless status of the Leckstar 155 or • leakage or cable break in the activated signalling line or • signalling line that is switched inactive The 5 outputs are short circuit-protected and have a common reference ground.

Technical data	Leckstar 155
Supply voltage (terminals 1 and 2)	AC 230 V, other supply voltage, e.g. DC 24 V, on request
Power consumption	approx. 3 VA
Electrode circuit (one of the two ground terminals = ground and E1 to E5 = control inputs)	5 terminals under safety extra low voltage, for 5 signalling lines without mutual galvanic separation, with a common ground connection Connection of the signalling lines is to be made via a 6-core cable and an additional VK 1/5 connection box (see page 31-1-64). Local potential equalisation is to be performed to avoid ground loops in critical installations (see page 31-1-51).
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance), other response sensitivities for special applications on request
1st power circuit (output relay 1 - terminals 3, 4, 5)	1 single-pole potential-free changeover contact based on the working current principle, for group alarm in the event of leakage or cable break, can be acknowledged via the touch sensor button
2nd power circuit (output relay 2 - terminals 6, 7, 8)	1 single-pole potential-free changeover contact based on the quiescent current principle, for group alarm in the event of leakage or cable break
Electrical values of the potential-free changeover contacts:	
• switching voltage	max. AC 250 V
• switching current	max. AC 4 A
• switching capacity	max. 500 VA
Status signal outputs for the building control system (one of the two ground terminals = ground and A1 to A5 = control outputs)	5 terminals under safety extra low voltage for DC 20 V binary switching status output signal of each of the 5 signalling lines, without mutual galvanic separation, with a joint ground connection. **For connection to the building control system (e.g. PLC) opto-couplers should be fitted for the purpose of galvanic separation.** Standby of the signalling line: High signal (DC 20 V) Leakage/cable break/deactivated line: Low signal (DC 0 V)
No-load voltage	DC 20 V (sufficient for 24 V inputs, as at least 15 V are normally required for High signal)
Short circuit protection	short circuit current limitation with ≤ 30 mA

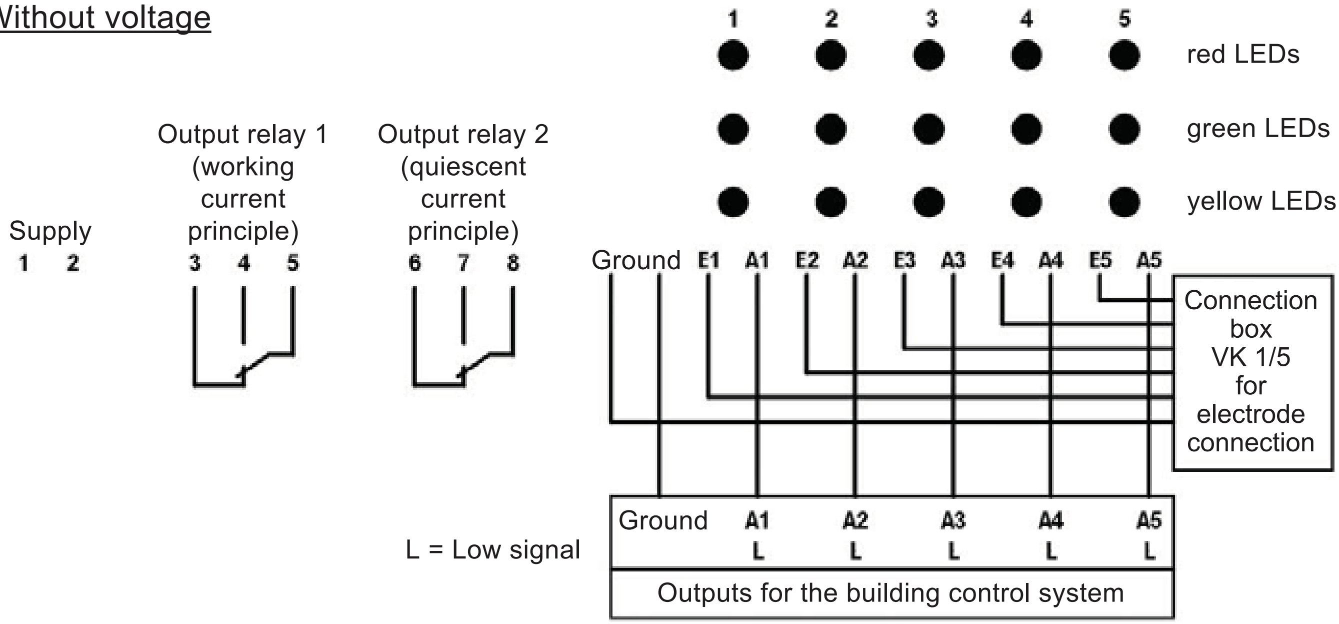
Technical data	Leckstar 155
Switching status indication for the activated signalling lines	optical indication for each of the 5 activated signalling lines by 3 differently coloured LEDs in each case
• the red LED of one or more signalling lines lights up	**Leakage** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding signalling line(s) for the building control system is at Low signal (quiescent current principle)
• the green LED of each signalling line lights up	**Standby** output relay 1 is not energised (working current principle) output relay 2 is energised (quiescent current principle) output signals of all signalling lines for the building control system are at High signal (quiescent current principle)
• the yellow LED of one or more signalling lines flashes	**Cable break** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding signalling line(s) for the building control system is at Low signal (quiescent current principle)
Housing	insulating material, approx. 180 x 94 x 57 mm, with 5 cable entries
Connection	inside terminals
Protection class	IP54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of signalling lines	each 1,000 m between electrode relay and Z10 cable break monitoring unit
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

• Acknowledgement via touch sensor button

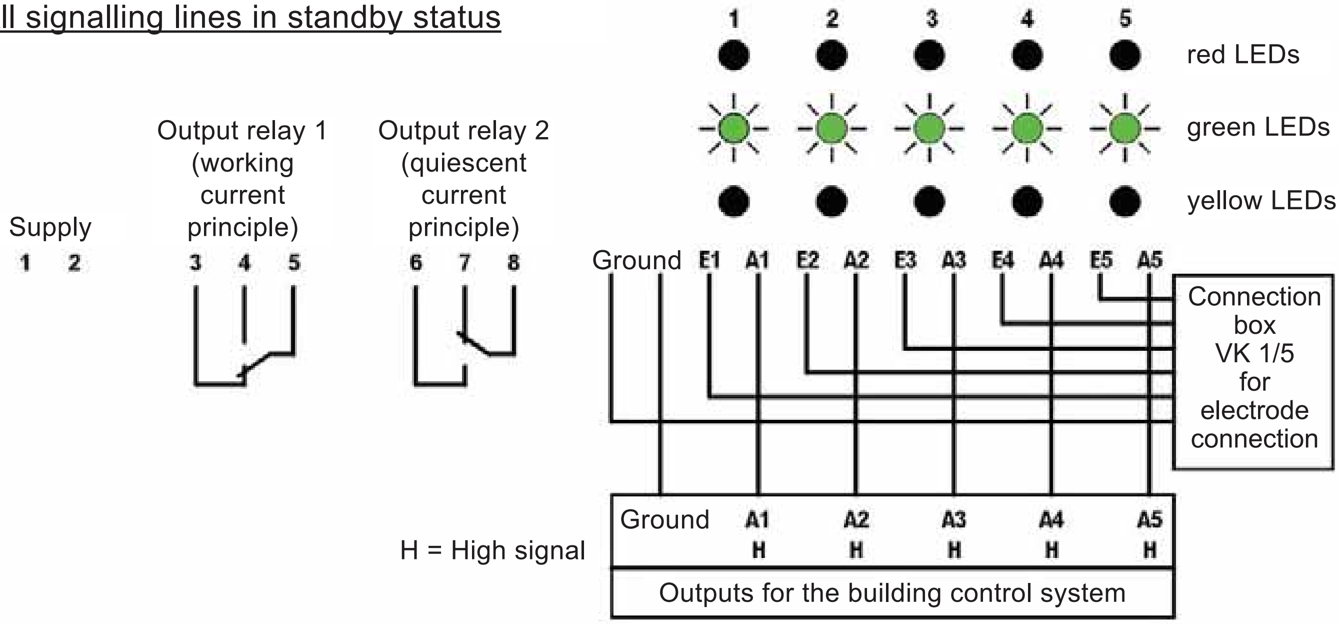
In the event of leakage or cable break in one of more activated signalling lines, output relay 1 is energised and the red LED on the touch sensor button flashes. The operator has to touch the sensor button panel if he wants to acknowledge the signal. Output relay 1 is then de-energised and the red LED reverts to steady.
In this status, <u>new alarms</u> from other signalling lines are signalled <u>only via the optical indicators and the status signal outputs for the building control system</u> of the affected signalling lines. In these cases, however, output relay 1 is not re-activated.
Acknowledgement has no effect whatsoever on output relay 2.

Position of the output contacts of the Leckstar 155 electrode relay

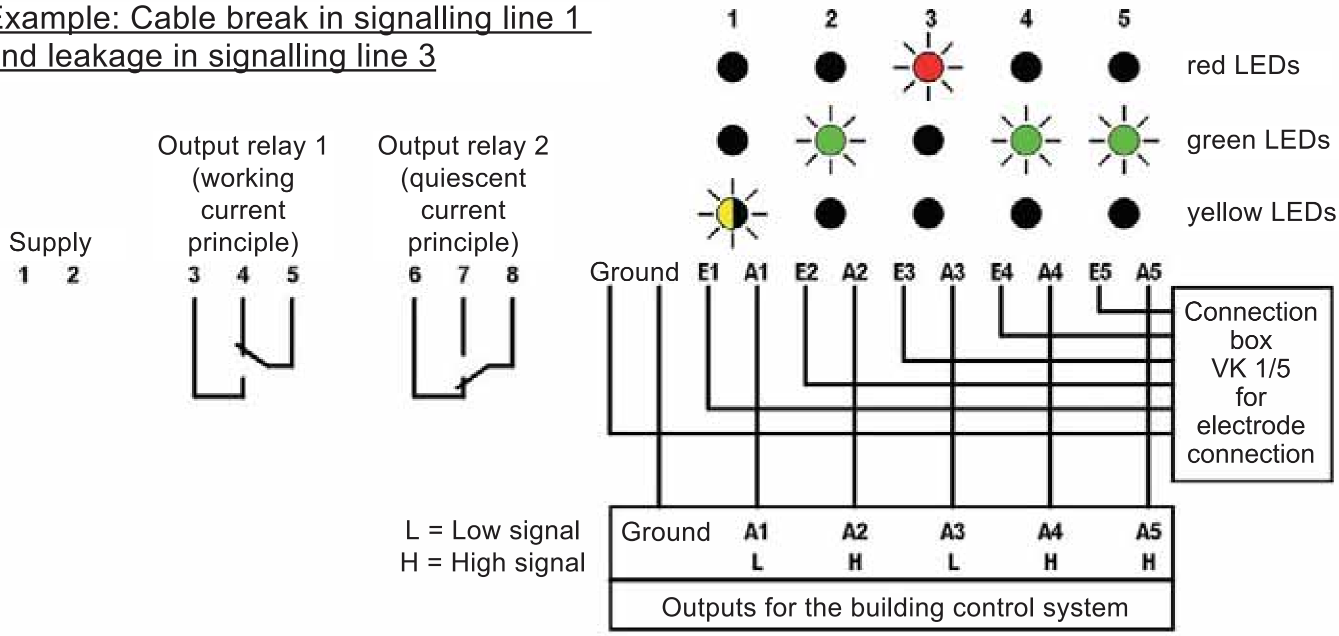
Without voltage



All signalling lines in standby status



Example: Cable break in signalling line 1 and leakage in signalling line 3



Leckstar 255 conductive electrode relay <u>without</u> DIBt certificate

with optical insulation fault / moisture status indicators

- **with cable break monitoring feature**
- **for the connection <u>of 5</u> conductive electrodes <u>with</u> Z10 cable break monitoring unit**
- **with touch sensor button for alarm acknowledgement**
- **with 2 potential-free changeover contacts at the output and**
- **with 5 status signal outputs, DC 20 V, for the building control system**

Electrode relay in surface-mount housing, with transparent cover, with 5 x 4 LEDs for operating status indication and with 1 LED for acknowledgement status indication, inside the housing

> Due to its response sensitivity of 3 kΩ (333 µS), the Leckstar 255 electrode relay may only be connected to conductive line or surface sensors (types KE-Z10, BAE-Z10, ZE-Z10 and MEL 6-Z10).
>
> **Attention:**
>
> If conductive point sensors are to be installed in a signalling line (types PE..., WDX..., SE...-Z10, S...-Z10 or EHW...), the electrode relay must be provided with a response sensitivity of 30 kΩ (33 µS).
>
> This must be specified in the order or the relay has to be sent back to Jola for modification.

• 5 signalling lines with common system ground

The Leckstar 255 electrode relay possesses inputs for the connection of 5 signalling lines.

A signalling line consists of one or more conductive electrodes. If electrodes designed for this purpose are used, it is possible to connect several electrodes one after the other to permit cable break monitoring at any point along the line route. At the end of each signalling line there is an electrode with integrated Z10 cable break monitoring unit. None of the other electrodes in the signalling line may be equipped with an integrated cable break monitoring unit.

In principle, the conductive electrodes to be normally used consist of at least 1 pair of electrode ropes (at least 1 control electrode and 1 ground electrode).

The electrode circuits are supplied with a safety extra low voltage generated in the Leckstar 255 which is reliably galvanically separated from the mains circuit and the potential-free changeover contacts of the two output relays.

All 5 signalling lines have a common system ground, which means there is no galvanic separation of the signalling lines. This factor must always be taken into account in the case of long signalling lines of cable, tape, twin or mat electrodes extending into different parts of the building. There is a risk of formation of ground loops if the electrodes are mounted in such a way that an electrode can take on ground potential. It may be necessary to perform local potential equalisation in order to avoid potential equalisation currents via the signalling lines.

• Activation of the individual signalling lines

If not all 5 signalling lines are to be used, the signalling lines 2 to 5 can be activated (dip switch in active position) or deactivated (dip switch in inactive position) individually via 4 dip switches. Channel 1 is always activated. **Activation / Deactivation may only be performed in currentless status.**

• Type of indication

A group of 4 LEDs of different colours is assigned to each signalling line.

Operating status	Type of indication of each signalling line
Power supply	When the supply voltage is switched on, one or two of the four LEDs on each activated signalling line light up to indicate the operating status of the activated signalling line in question
Leakage	Red LED lights, if the corresponding activated signalling line reports leakage • with effect on the two power circuits • with effect on the corresponding DC 20 V status signal output for the building control system
Insulation fault/ Moisture	Bi-colour LED (in addition to the green LED) dark: OK status flashes / lights green: transition phase / uncritical status flashes green + red: transition phase lights red: critical status • without effect on the two power circuits • without effect on the corresponding DC 20 V status signal output
Standby	Green LED lights, if the corresponding activated signalling line reports standby • with effect on the corresponding DC 20 V status signal output for the building control system Only if **all** activated signalling lines indicate standby • with effect on the two power circuits
Cable break	Yellow LED flashes, if the corresponding activated signalling line reports cable break • with effect on the two power circuits • with effect on the corresponding DC 20 V status signal output for the building control system
Signalling line switched to inact.	None of the 4 LEDs in the deactivated signalling line (signalling line 2 to 5) lights up.

• Power circuits

Two potential-free changeover contacts are available at the output, one of which reacts based on the working current principle and the other on the quiescent current principle. In addition, there is a DC 20 V binary status output signal based on the quiescent current principle for each signalling line for the building control system. The potential-free changeover contact based on the working current principle can be acknowledged via a touch sensor button acting through the housing cover of the unit.

Power circuits	Switching statuses
Output relay 1 in working current principle	Output relay 1 is not energised in currentless status of the Leckstar 255 and in the standby status of all activated signalling lines. In the event of leakage or cable break in one or more activated signalling lines, output relay 1 is energised if the alarm has not been acknowledged. Output relay 1 can be acknowledged / reset using the touch sensor button.
Output relay 2 in quiescent current principle	Output relay 2 is energised in standby status of all activated signalling lines. Output relay 2 is not energised in currentless status of the Leckstar 255 and in the case of leakage or cable break in one or more activated signalling lines.
5 status signal outputs (DC 20 V) for the building control system	A DC 20 V binary switching status output signal in quiescent current principle is available for each of the 5 signalling lines: High signal, DC 20 V = standby status of the activ. signalling line Low signal, DC 0 V = • currentless status of the Leckstar 255 or • leakage or cable break in the activated signalling line or • signalling line that is switched inactive The 5 outputs are short circuit-protected and have a common reference ground.

Technical data	Leckstar 255
Supply voltage (terminals 1 and 2)	AC 230 V, other supply voltage, e.g. DC 24 V, on request
Power consumption	approx. 3 VA
Electrode circuit (one of the two ground terminals = ground and E1 to E5 = control inputs)	5 terminals under safety extra low voltage, for 5 signalling lines without mutual galvanic separation, with a common ground connection Connection of the signalling lines is to be made via a 6-core cable and an additional VK 1/5 connection box (see page 31-1-64). Local potential equalisation is to be performed to avoid ground loops in critical installations (see page 31-1-57).
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
Short circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 3 kΩ or approx. 333 μS (conductance), other response sensitivities for special applications on request
1st power circuit (output relay 1 - terminals 3, 4, 5)	1 single-pole potential-free changeover contact based on the working current principle, for group alarm in the event of leakage or cable break, can be acknowledged via the touch sensor button
2nd power circuit (output relay 2 - terminals 6, 7, 8)	1 single-pole potential-free changeover contact based on the quiescent current principle, for group alarm in the event of leakage or cable break
Electrical values of the potential-free changeover contacts:	
• switching voltage	max. AC 250 V
• switching current	max. AC 4 A
• switching capacity	max. 500 VA
Status signal outputs for the building control system (one of the two ground terminals = ground and A1 to A5 = control outputs)	5 terminals under safety extra low voltage for DC 20 V binary switching status output signal of each of the 5 signalling lines, without mutual galvanic separation, with a joint ground connection. **For connection to the building control system (e.g. PLC) opto-couplers should be fitted for the purpose of galvanic separation.** Standby of the signalling line: High signal (DC 20 V) Leakage/cable break/deactivated line: Low signal (DC 0 V)
No-load voltage	DC 20 V (sufficient for 24 V inputs, as at least 15 V are normally required for High signal)
Short circuit protection	short circuit current limitation with ≤ 30 mA

Technical data	Leckstar 255
Switching status indication for the activated signalling lines	optical indication for each of the 5 activated signalling lines by 4 differently coloured LEDs in each case
• the red LED of one or more signalling lines lights up	**Leakage** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding signalling line(s) for the building control system is at Low signal (quiescent current principle)
• the bi-colour LED of of one or more signalling lines flashes/lights up (in addition to the green LED of the signalling line in question)	**Insulation fault/Moisture** without effect on the two power circuits and the status signal outputs for the building control system dark: OK status flashes green: transition phase lights green: uncritical status flashes green + red: transition phase lights red: critical status
• the green LED of each signalling line lights up	**Standby** output relay 1 is not energised (working current principle) output relay 2 is energised (quiescent current principle) output signals of all signalling lines for the building control system are at High signal (quiescent current principle)
• the yellow LED of one or more signalling lines flashes	**Cable break** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding signalling line(s) for the building control system is at Low signal (quiescent current principle)
Housing	insulating material, approx. 180 x 94 x 57 mm, with 5 cable entries
Connection	inside terminals
Protection class	IP54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of signalling lines	each 1,000 m between electrode relay and Z10 cable break monitoring unit
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

• Acknowledgement via touch sensor button

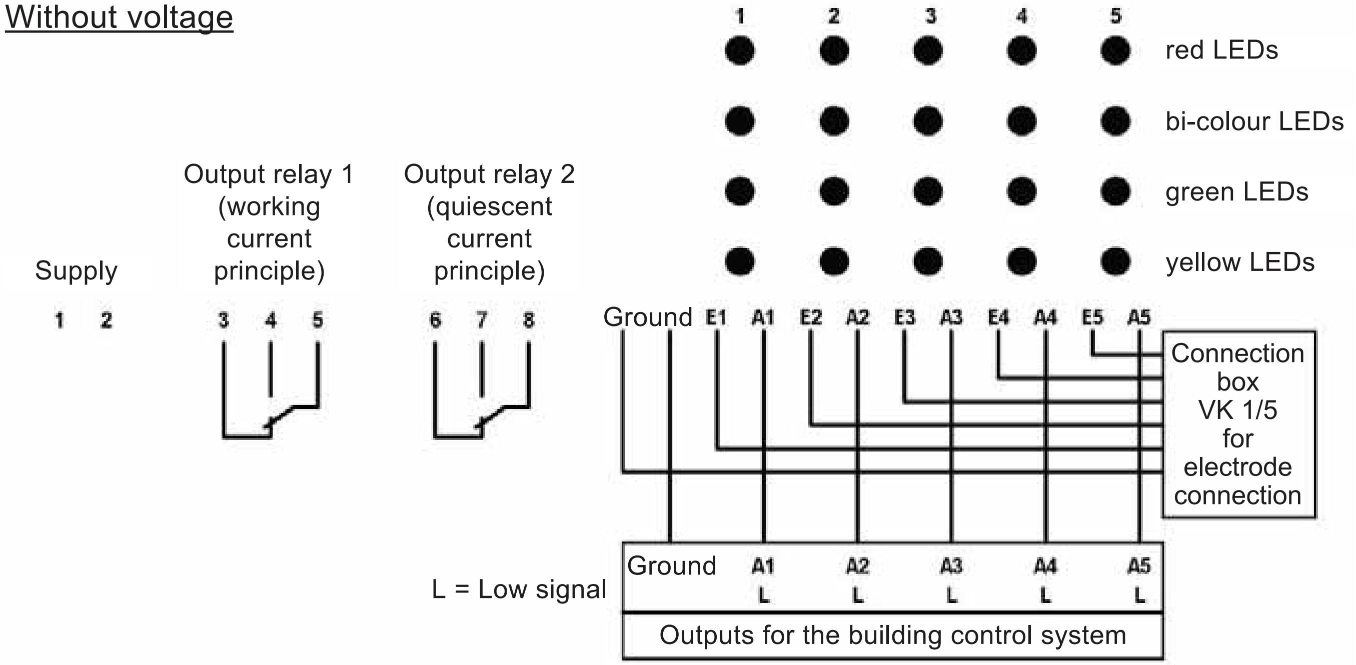
In the event of leakage or cable break in one or more activated signalling lines, output relay 1 is energised and the red LED on the touch sensor button flashes. The operator has to touch the sensor button panel if he wants to acknowledge the signal. Output relay 1 is then de-energised and the red LED reverts to steady.

In this status, new alarms from other signalling lines are signalled only via the optical indicators and the status signal outputs for the building control system of the affected signalling lines. In these cases, however, output relay 1 is not re-activated.

Acknowledgement has no effect whatsoever on output relay 2.

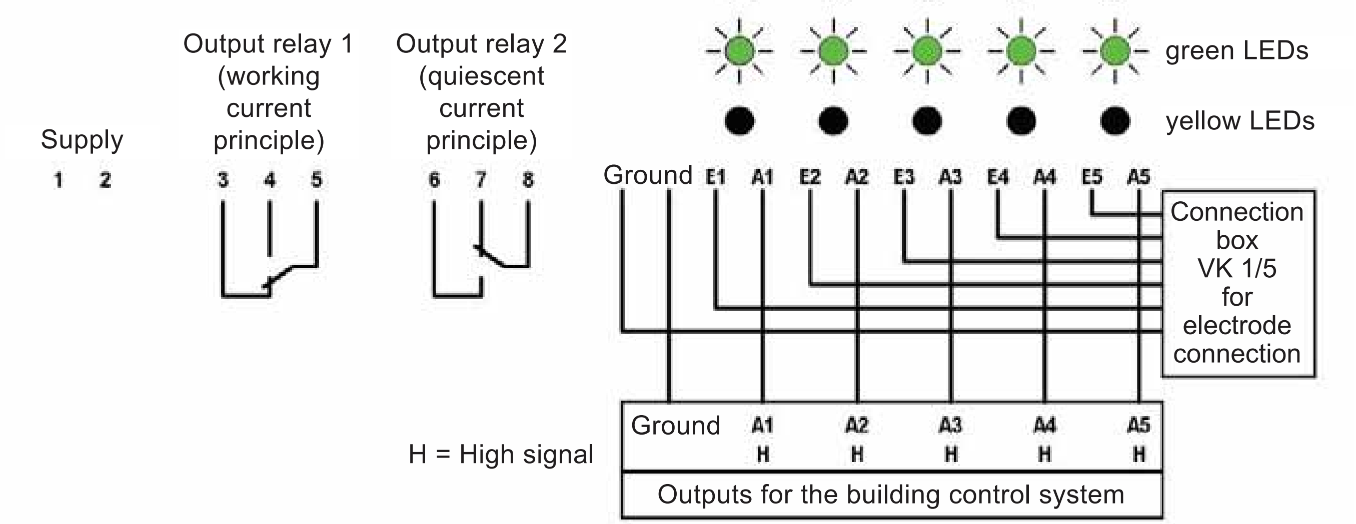
Position of output contacts of the Leckstar 255 electrode relay

Without voltage



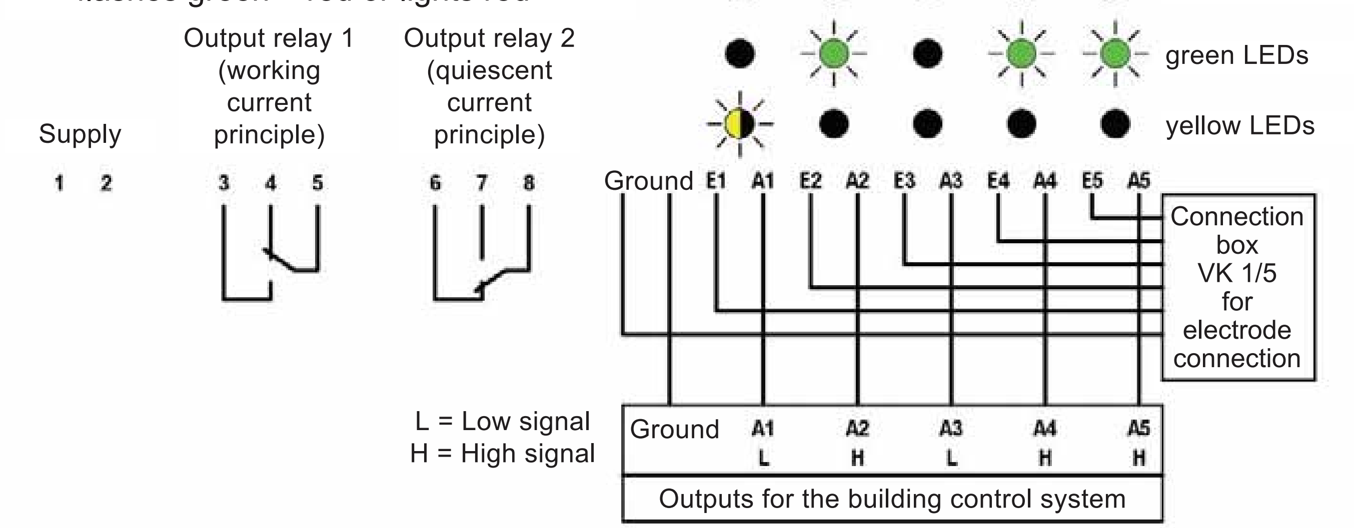
All signalling lines in standby status

? = dark, flashes/lights green, flashes green + red or lights red

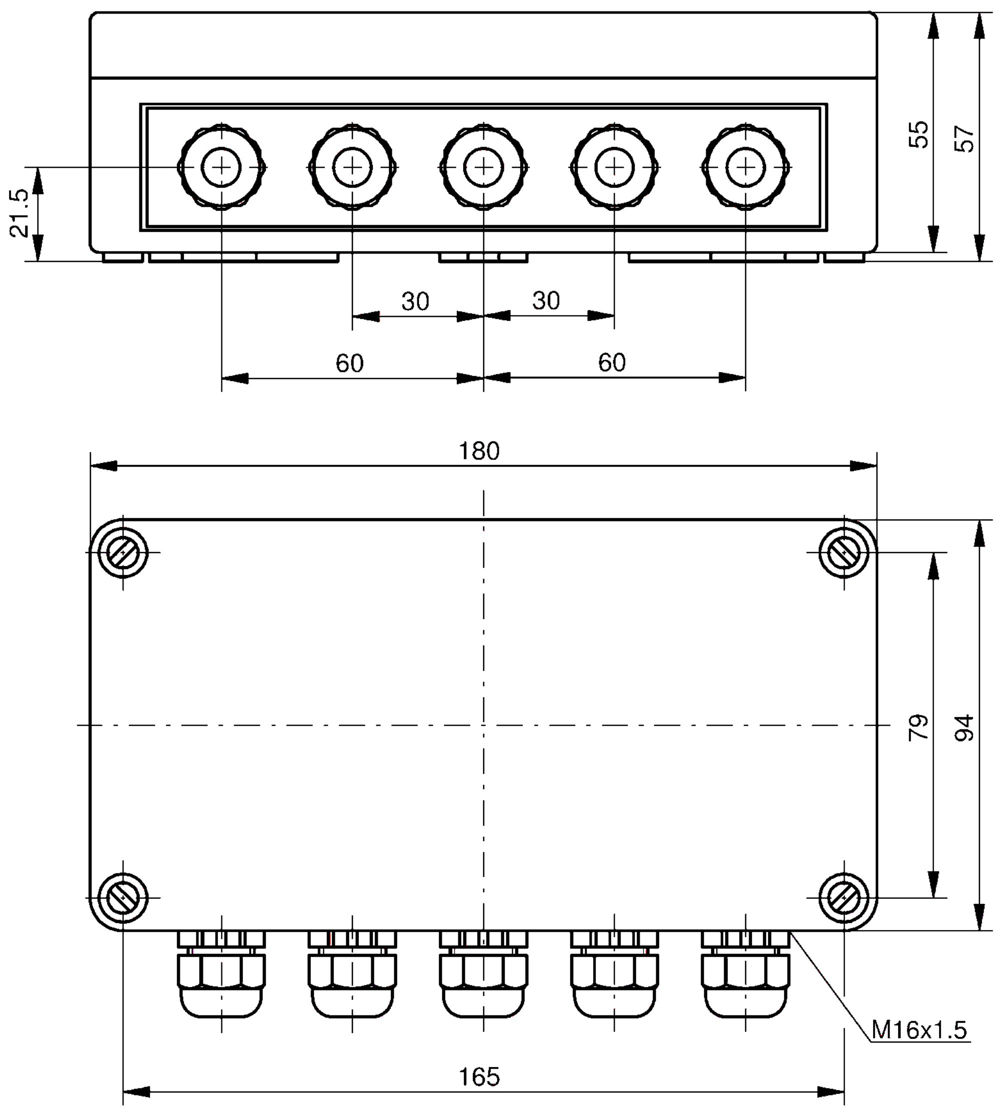


Example: Cable break in signalling line 1 and leakage in signalling line 3

? = dark, flashes/lights green, flashes green + red or lights red



Dimensions Leckstar 155 or Leckstar 255

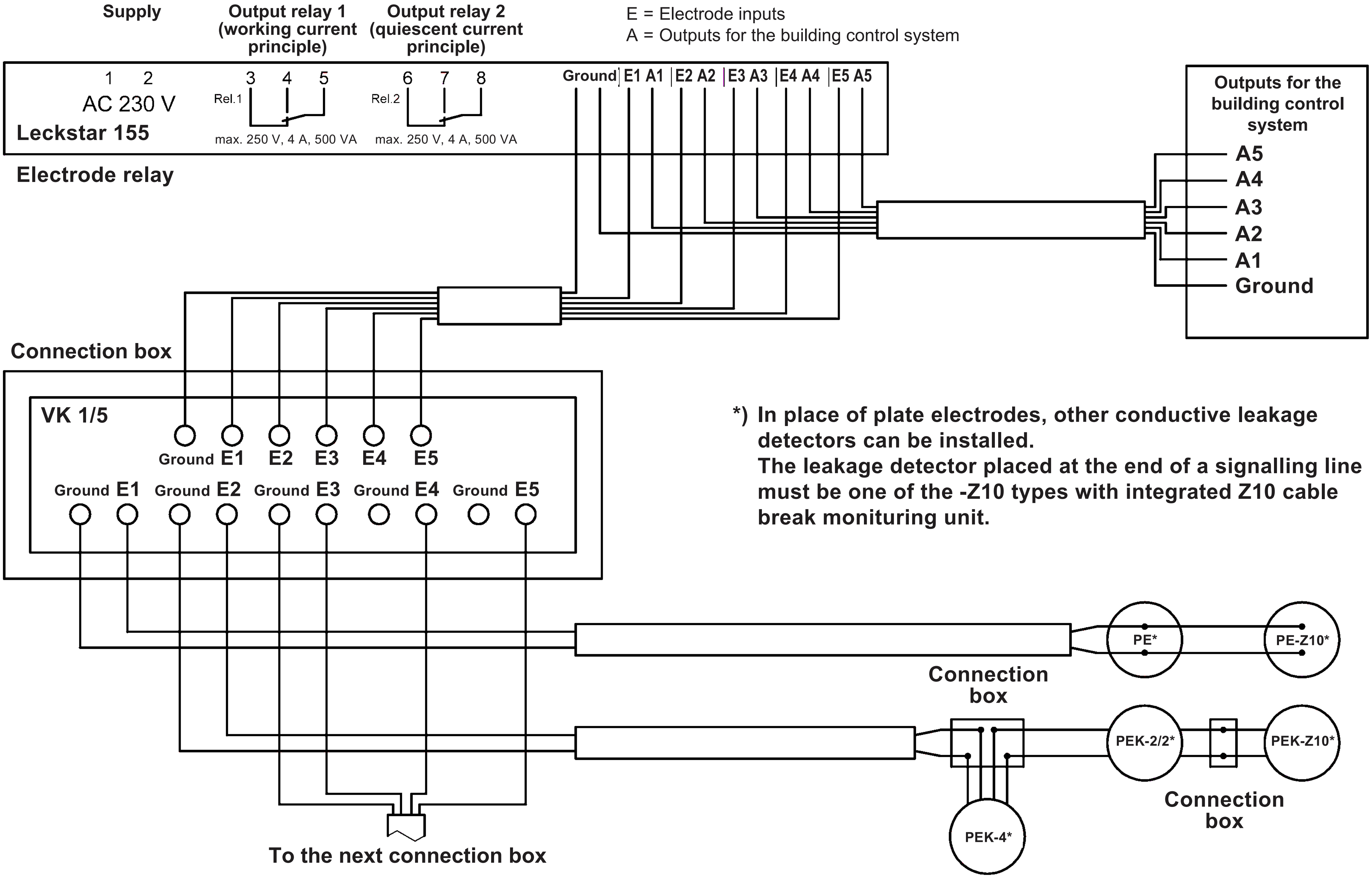


Dimensions in mm

VK 1/5 connection box

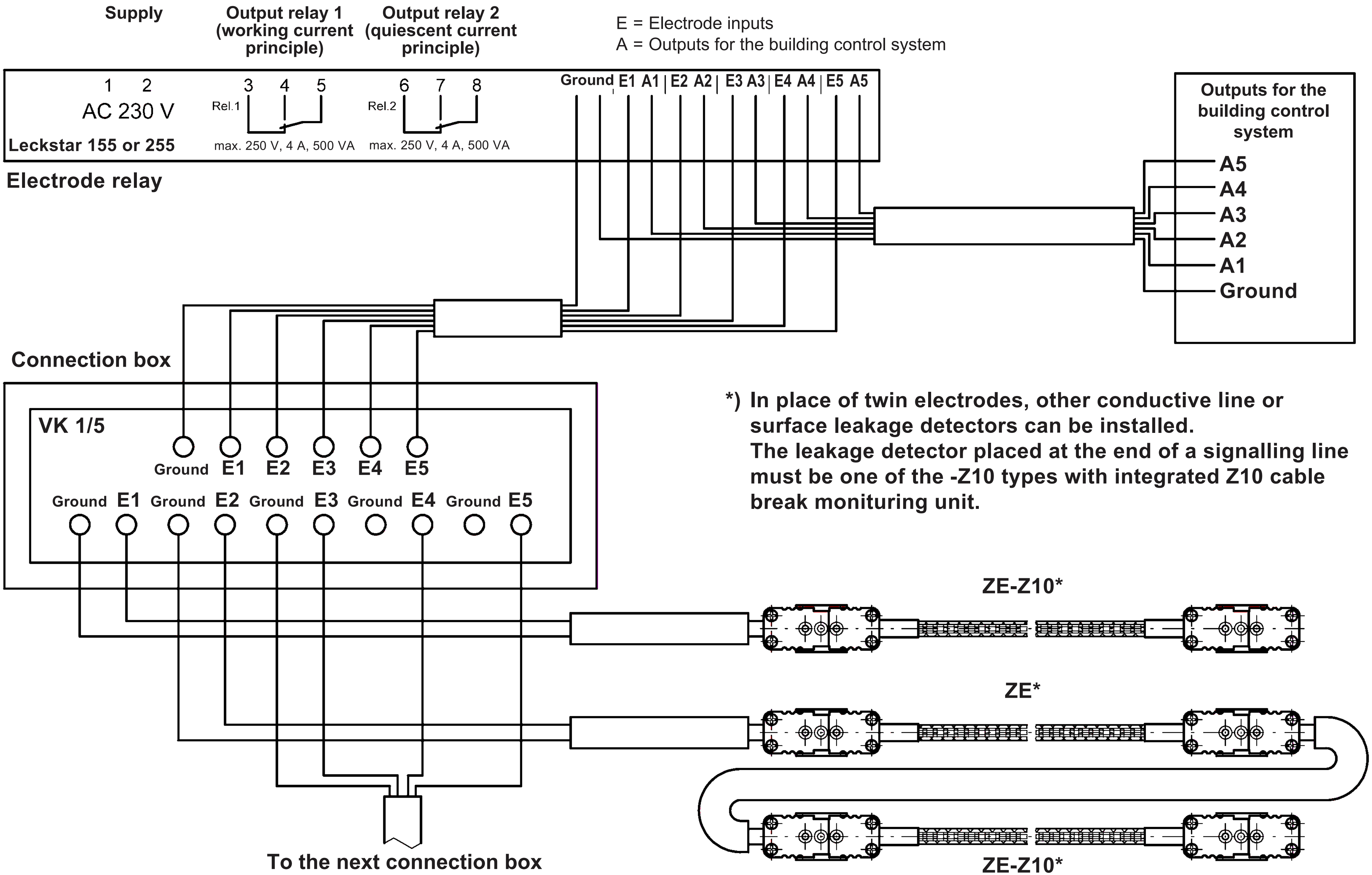
Technical data	**VK 1/5**
Application	for fast and easy connection of up to 5 electrodes to a Leckstar 155 or Leckstar 255 electrode relay
Supply voltage	only for safety extra low voltage SELV or PELV
Housing	insulating material, approx. 180 x 94 x 57 mm, with 6 cable entries
Connection	to the screw terminals on the board
Protection class	IP54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Example for the connection of electrodes in connection boxes VK 1/5



*) In place of plate electrodes, other conductive leakage detectors can be installed.
The leakage detector placed at the end of a signalling line must be one of the -Z10 types with integrated Z10 cable break monituring unit.

Example for the connection of electrodes in connection boxes VK 1/5



*) In place of twin electrodes, other conductive line or surface leakage detectors can be installed.
The leakage detector placed at the end of a signalling line must be one of the -Z10 types with integrated Z10 cable break monituring unit.

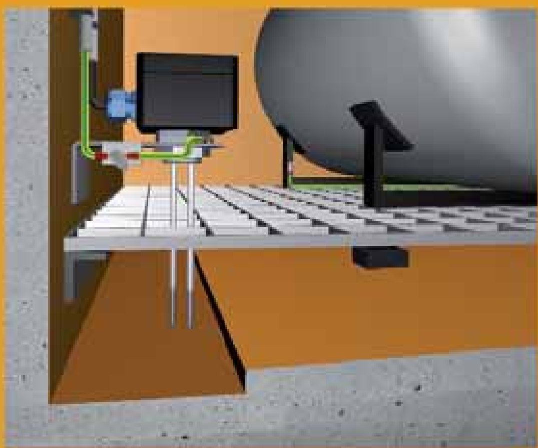
The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Conductive Ex leakage detectors of the Leckstar range

with electrode and relay



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The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Conductive Ex leakage detectors

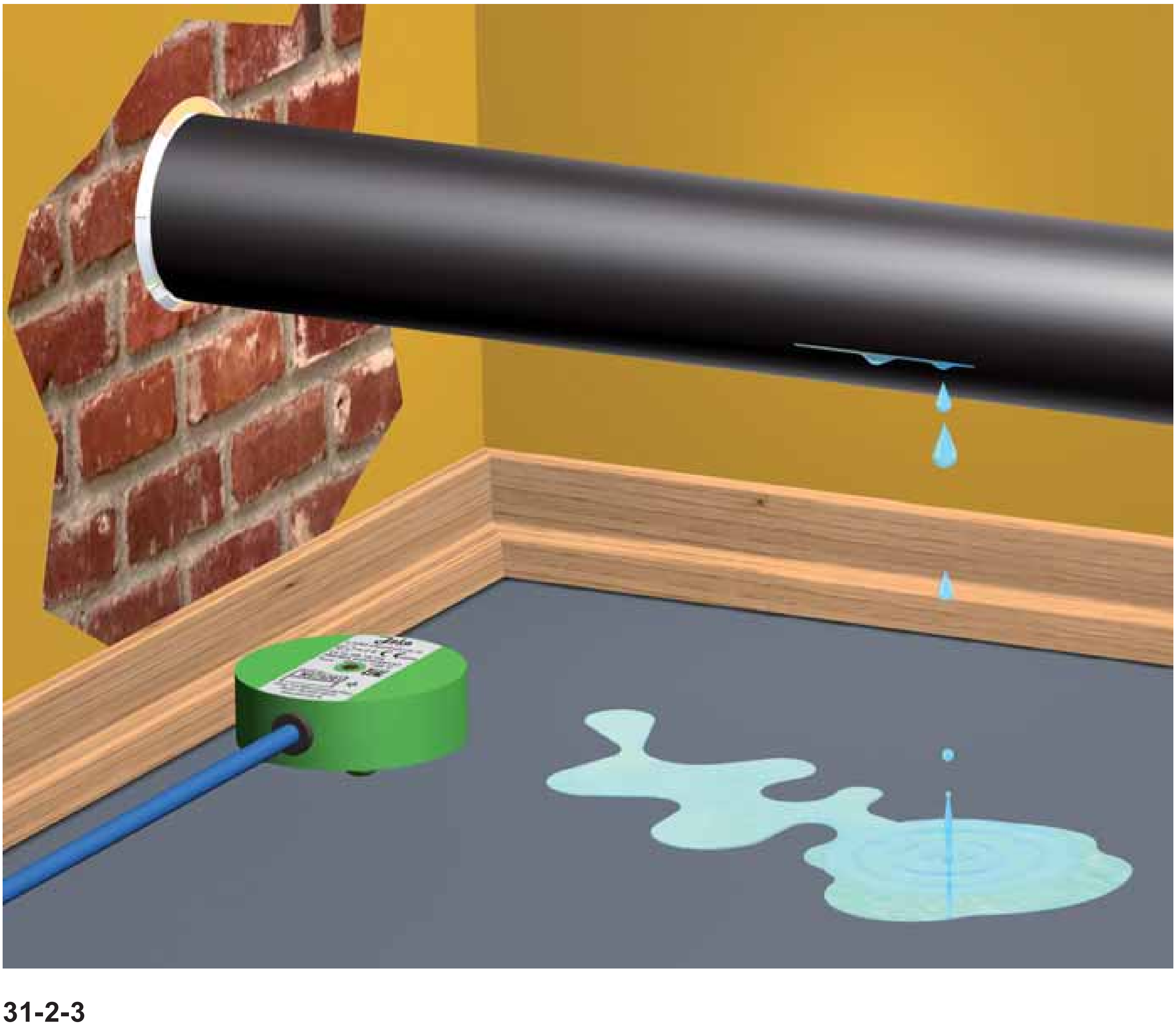
Contents **Pages**

The conductive measuring principle

The conductive measuring principle is used for the detection of **electrically conductive liquids**. It is not suitable for the detection of electrically non-conductive liquids.

Electrically conductive liquids are generally aqueous solutions of salts, acids or alkalis. The molecules of these substances dissociate in water into positive and negative ions which give the aqueous solution its electrical conductivity. The conductive Ex leakage detector of the Leckstar range consists of the combination of a conductive Ex electrode, an obligatory Ex connection box and a conductive Ex electrode relay. This combination detects the presence of an electrically conductive liquid at the electrodes, and an alarm signal is then emitted.

The measurement process uses alternating current to ensure exact response sensitivity and to prevent galvanic processes at the electrode.



Examples of conductive liquids

Accumulator acid, 32 %
Acetic acid, 70 %
Acrylic acid, 70 %
Adipic acid *
Aluminium chloride *
Aluminium potassium sulphate: see alums
Aluminium salts from mineral acids: see alums
Aluminium sulphate *
Alums (Me(I)-Me(III) sulphates) *
Ammonia water (ammonia solution), 25 %
Ammonium acetate *
Ammonium bromide *
Ammonium carbonate *
Ammonium chloride *
Ammonium fluoride *
Ammonium nitrate *
Ammonium phosphate *
Ammonium sulphate *
Ammonium sulphide, 40 %
Ammonium thiosulphate *
Anodic oxidation bath (HNO_3-30 %, H_2SO_4-10 %)
Anticalcium: see antiliming agent (sulfamic acid)
Antiliming agent (sulfamic acid), 50 g/l of H_20
Aqua regia, nitrohydrochloric acid, 1 : 1

Barium carbonate *
Barium chloride *
Barium hydroxide *
Barium nitrate *
Bicarbonate of ammonia *
Borax (sodium tetraborate) *
Borofluoric acid (tetra boro fluoric acid), 35 %
Bromine water *

Cadmium chloride *
Cadmium sulphate *
Calcium acetate *
Calcium bromide *
Calcium chloride *
Calcium fluoride *
Calcium hydroxide *
Calcium hypochlorite *
Calcium sulphate
Caustic potash solution (potassium hydroxide) *
Caustic soda, 32 %
Chlorine water *
Chloroacetic acid, saturated
Chlorsulfon acid, > 97 %
Chromic acid, 5 %
Chromic sulfuric / acid mixture
Citric acid *
Cupric chloride *
Cupric cyanide *
Cupric nitrate *
Cupric sulphate *

Electroplating bath, $AgNO_3$/KCN
Ethylen diamine tetra acetic acid (trilon B)

Ferric (III) chloride *
Ferrous (II) sulfate
Formaldehyde, 40 %
Formic acid, 80 %

Glycol acid, 50 %

Hydrazine hydrate, 80 %
Hydrobromic acid, aqueous solution *
Hydrochloric acid, 37 %
Hydrofluoric acid (fluohydric acid), 40 %
Hydrogen peroxide, 30 %

Javel water / bleaching lye: see sodium hypochloride

Liquid fertilizer application: see manuring salts

Magnesium chloride *
Magnesium hydroxide carbonate (magnesium carbonate) *
Magnesium sulphate *
Manuring salts / saline manure
Mercury nitrate *
Mercury sulphate *

Naphtalene sulphonic acid *
N-butyric acid, 70 %
Nickel chloride *
Nickel nitrate *
Nitrating acid mixture: see aqua regia, nitrohydrochloric acid
Nitric acid (fuming)
Nitric acid (not fuming), approx. 65 %
Nitrolotriacetic acid (Trilon A) *
Nitrosylsulphuric acid, 30 %

Oleum: see sulfuric acid, fuming

Phenidone (1-Phenyl-3-Pyra-zolidinone)
Phosporic acid, concentrated
Photographic developer, pure
Picric acid *
Potassium bicarbonate *
Potassium borate *
Potassium bromade
Potassium bromide *
Potassium carbonate (potash) *
Potassium chlorate *
Potassium chloride *
Potassium cyanide *
Potassium ferrocyanide and potassium ferricyanide *
Potassium iodide *
Potassium nitrate *
Potassium sulphate *
Propionic acid, 80 %

Salicylic acid *
Silver nitrate, 2 % solution
Sodium acetate *
Sodium aluminium sulphate: see alums
Sodium bisulphite *
Sodium bromide *
Sodium carbonate *
Sodium chlorate *
Sodium chloride *
Sodium cyanide *
Sodium dichromate *
Sodium dithionite *
Sodium hydrogen carbonate *
Sodium hydrogen sulphate *
Sodium hypochlorite (up to 30°C; 150 g/l of active chlor)
Sodium nitrate *
Sodium nitrite *
Sodium peroxide *
Sodium phosphate *
Sodium silicate *
Sodium sulfide *
Sodium sulphate *
Sodium sulphite *
Sodium tetraborate: see Borax
Sodium thiosulphate *
Sulfuric acid, 20 %
Sulfuric acid, 96 - 98 % **
Sulfuric acid, fuming (oleum), 65 % SO_3 **
Sulfurous acid, 5 - 6 % SO_2

Tartaric acid *
Tin(II) chloride *
Trichloracetic acid

Water (tap water)

Zinc chloride *
Zinc nitrate *
Zinc sulphate *

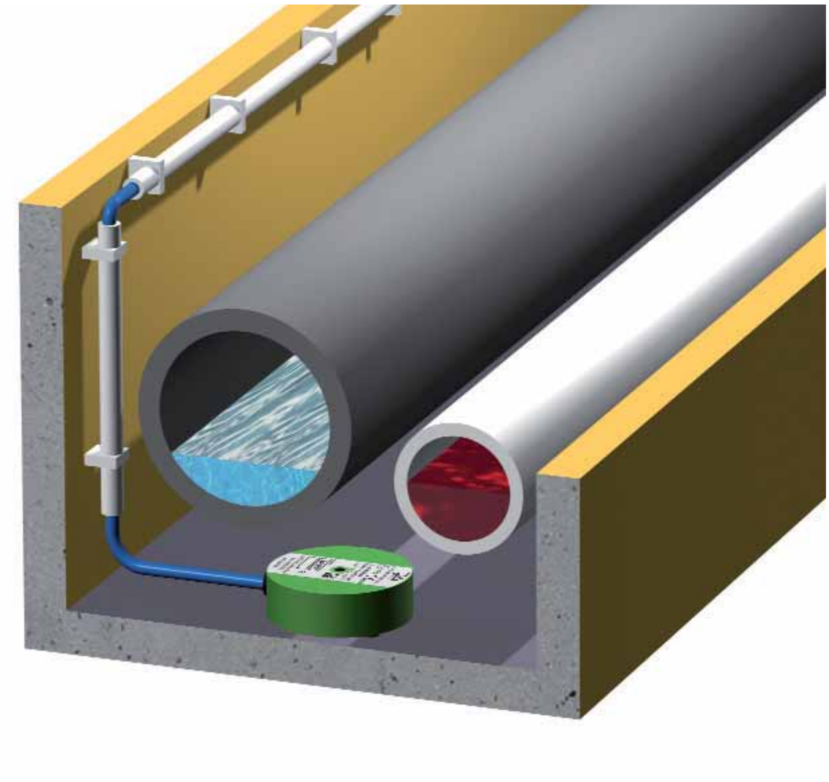
* Saturated solution

** Only suitable for point sensors, because the line sensor has a too long reaction period

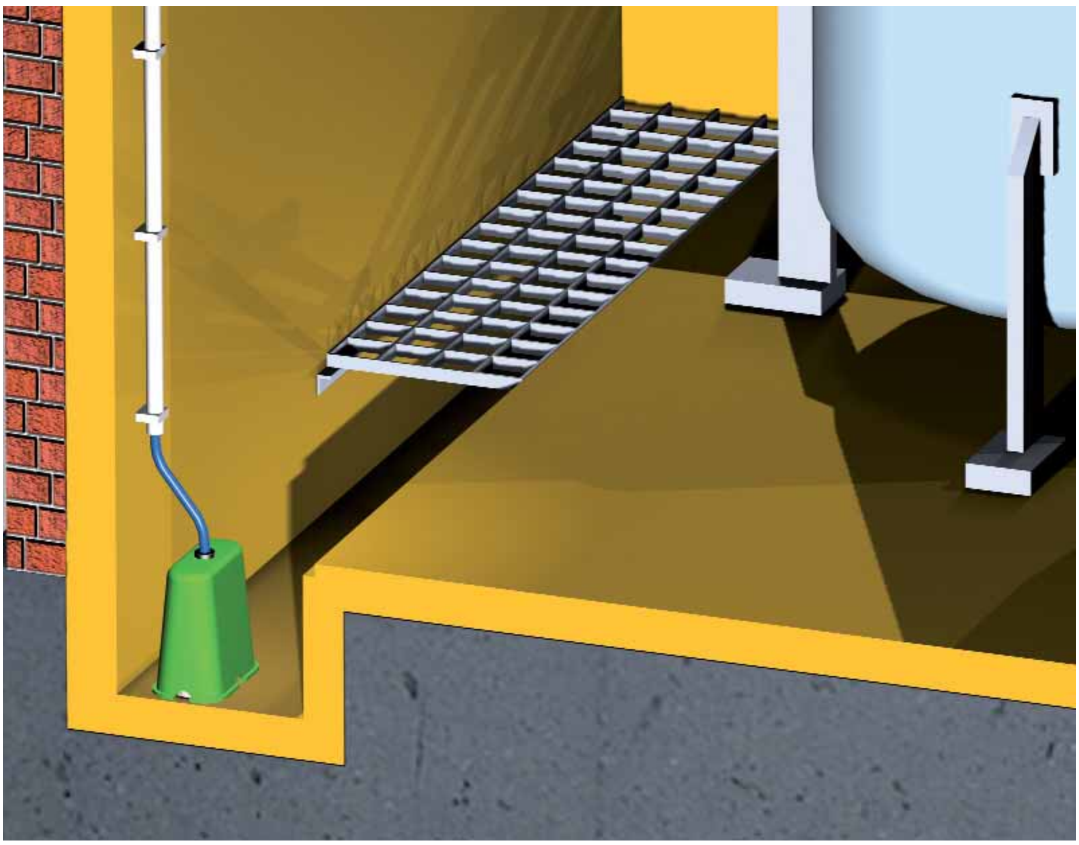
A reliable detection of electrically poor conductive liquids (compared to the above-mentioned liquids) can be achieved by adaption of the sensitivity of the Ex electrode relay in our works (on request).

Leakage detection with conductive “Leckstar” Ex point sensors

Application examples with conductive Ex plate electrodes



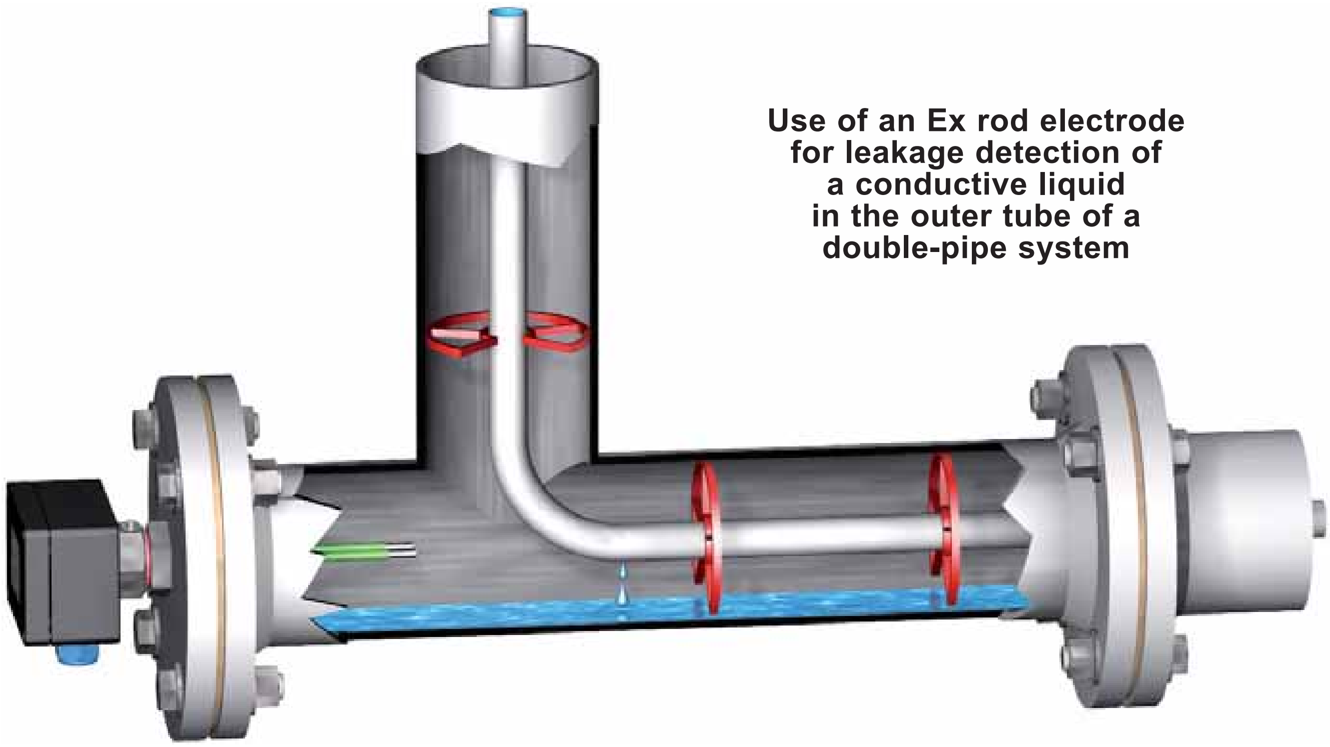
Use of an
Ex plate electrode
for leakage detection
of a conductive liquid
in a pipe duct



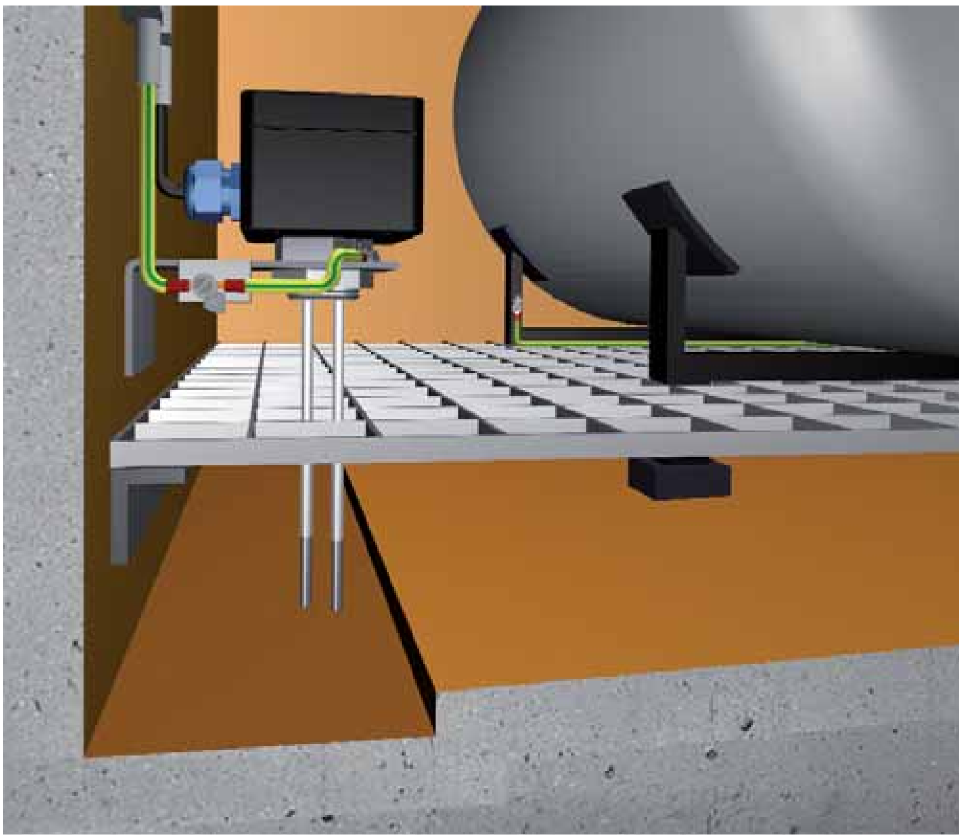
Use of an
Ex plate
electrode
for leakage
detection
of a conductive
liquid
at the lowest
point
(groove in the
picture) of a
collection room

Leakage detection with conductive "Leckstar" Ex point sensors

Application examples with conductive Ex rod electrodes



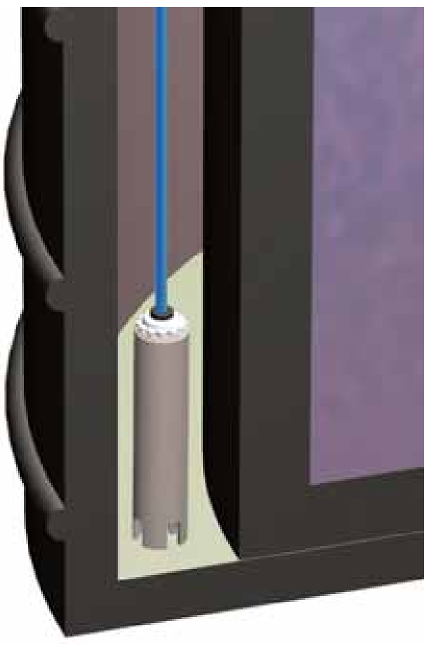
Use of an Ex rod electrode
for leakage detection of
a conductive liquid
in the outer tube of a
double-pipe system



Use of an Ex rod
electrode
for leakage detection
of a conductive liquid
at the lowest point
(groove in the picture)
of a collection room

Leakage detection with conductive "Leckstar" Ex point sensors

Application example with a conductive Ex suspension electrode



**Use of an Ex suspension electrode
for leakage detection of
a conductive liquid in the collection tub
of a storage tank
for conductive water-polluting liquids**

Conductive Ex plate electrodes

Conductive Ex plate electrodes are designed to signal via a connected conductive Ex electrode relay the presence of a conductive liquid caused, for example, by burst pipes.

Conductive Ex plate electrodes should only be used in normally dry environments. They must be installed on the floor in such a way that the sensor side faces downwards.

If the two electrode plates of a conductive Ex plate electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

EL/0/PE/64/2/PP/ED/0/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

EL/./PE/64/2/PP/ED/0/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb
sensor side

EL/0/PEK-2/2/64/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

EL/0/PEK-4/64/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

EL/Z6V2/WDX/74/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

EL/Z6V2/PEK/64/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

EL/./PE.../64/2/PP/ED/./Ex-1G
(Ex) II 2 G Ex ia IIB T6 Gb
conductive Ex plate electrodes

The conductive Ex plate electrodes are fitted with two electrode plates as sensitive elements: 1 control electrode and 1 earth electrode.

If the two electrode plates of a conductive Ex plate electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

Each conductive Ex plate electrode EL/Z6V2/PE/... or EL/Z6V2/PEK/... or an Ex plate electrode combination EL/0/PE/... or EL/0/PEK-2/2/... or EL/0/PEK-4/... + EL/Z6V2/PE/... or EL/Z6V2/PEK/... has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ (Ex) II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex (Ex) I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.

The connection must be made as shown in the circuit diagrams on pages 31-2-26 to 31-2-28.

Technical data	**EL/0/PE/ 64/2/PP/ED/0/**	**EL/Z6V2/PE/ 64/2/PP/ED/0/**	**EL/Z6V2/PEK/ 64/2/PP/ED/1/**	**EL/0/PEK-2/2/ 64/2/PP/ED/1/**	**EL/0/PEK-4/ 64/2/PP/ED/1/**
	Ex-1G (Ex) II 2 G Ex ia IIB T6 Gb				
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0152**				
Design	1 control electrode and 1 earth electrode				
Cable break monitoring	**without**	**with**	**with**	**without**	**without**
	integrated Z6V2 cable break monitoring unit				
Sensitive elements	2 electrode plates made of stainless st. 316 Ti, each with 24 mm dia.				
Housing	PP and cast resin				
Electrical connection	screw-type/ crimp connection		connecting cable 2 x 0.75,	connecting cable 2 x 2 x 0.75,	connecting cable 4 x 0.75,
			length 2 m, longer cable on request; halogen-free connecting cable on request		
Mounting	vertical				
Temperature range	– 20°C to + 60°C				
Pressure resistance	for pressureless applications only, use only under atmospheric conditions				
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)				

EL/Z6V2/WDX/74/2/PP/ED/1/Ex-1G
Ⓔx II 2 G Ex ia IIB T6 Gb
conductive Ex plate electrode

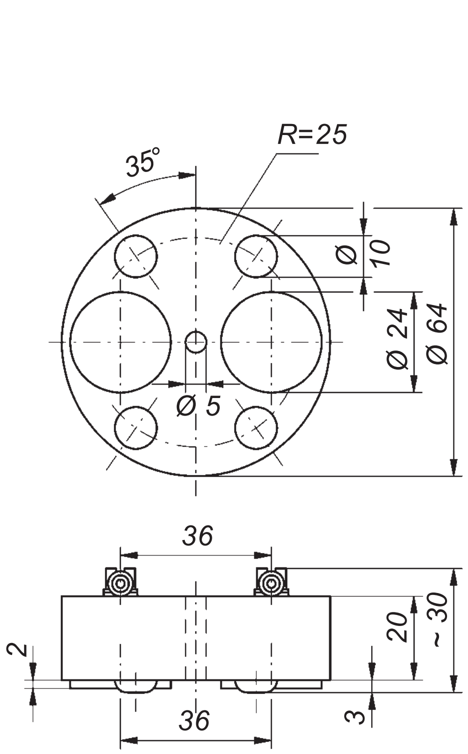
The conductive Ex plate electrode is fitted with two electrode plates as sensitive elements: 1 control electrode and 1 earth electrode.

If the two electrode plates of a conductive Ex plate electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

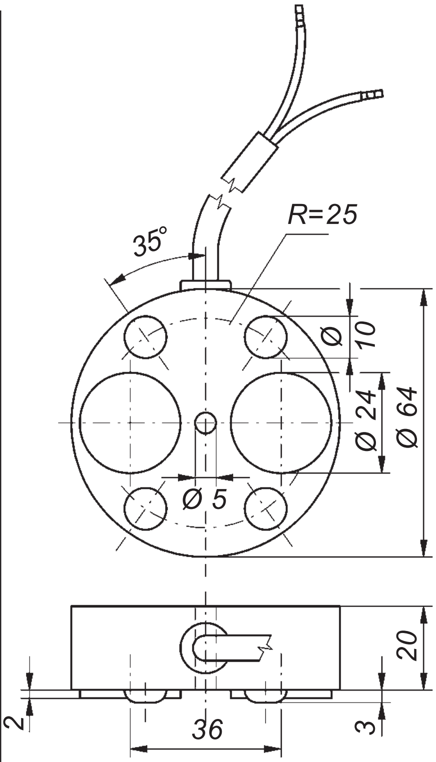
Each conductive Ex plate electrode EL/Z6V2/WDX/... has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.

The connection must be made as shown in the circuit diagrams on pages 31-2-26 to 31-2-28.

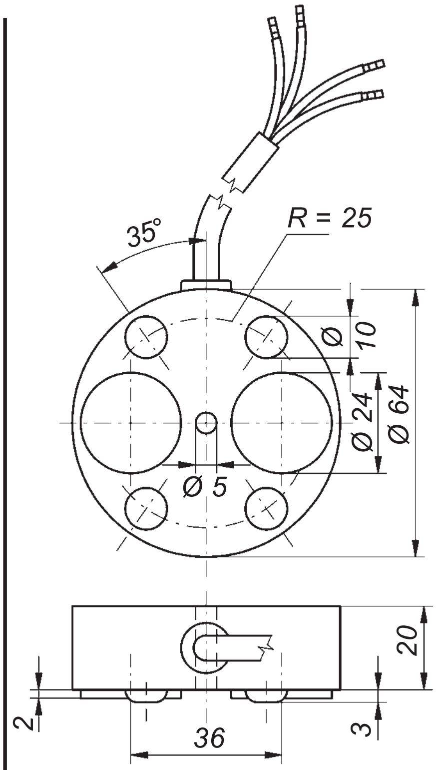
Technical data	**EL/Z6V2/WDX/74/2/PP/ED/1/Ex-1G Ⓔx II 2 G Ex ia IIB T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0152**
Design	1 control electrode and 1 earth electrode
Cable break monitoring	**with integrated Z6V2 cable break monitoring unit**
Sensitive elements	2 electrode plates made of stainless steel 316 Ti, each with 25 mm dia.
Housing	PP and cast resin
Weight of the electrode	approx. 630 g
Electrical connection	connecting cable 2 x 0.75, length 2 m, longer cable on request; halogen-free connecting cable on request
Mounting	vertical
Temperature range	– 20°C to + 60°C
Pressure resistance	for pressureless applications only, use only under atmospheric conditions
Max. cable length between electrode relay and electrode	see Installation, Operating and Maintenance Instructions (sent on request)
Mounting accessory	stand made of stainless steel 316 Ti (option)



EL/./PE/... ⟨Ex⟩ II 2 G
Ex ia IIB T6 Gb

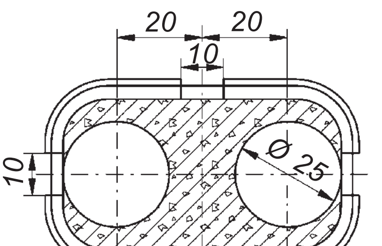


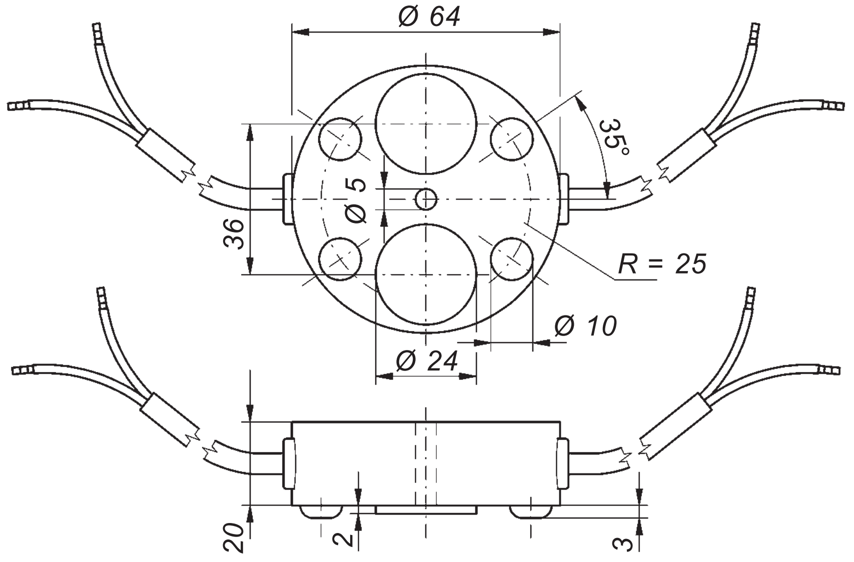
EL/Z6V2/PEK/... ⟨Ex⟩ II 2 G
Ex ia IIB T6 Gb



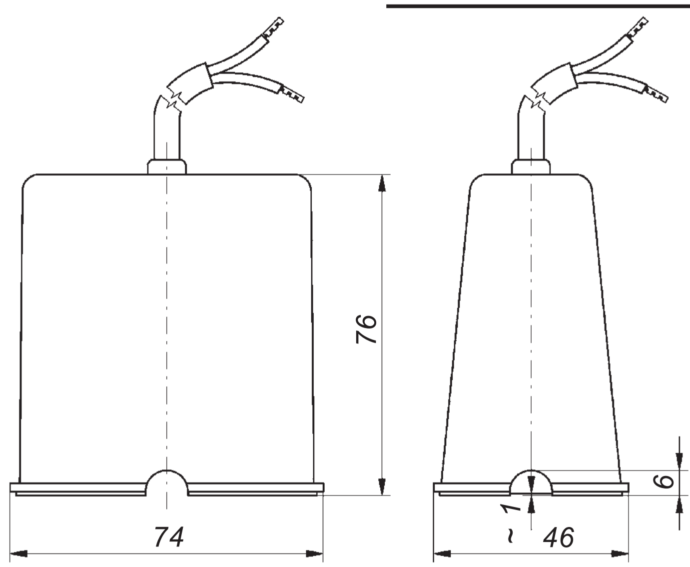
EL/0/PEK-4/... ⟨Ex⟩ II 2 G
Ex ia IIB T6 Gb

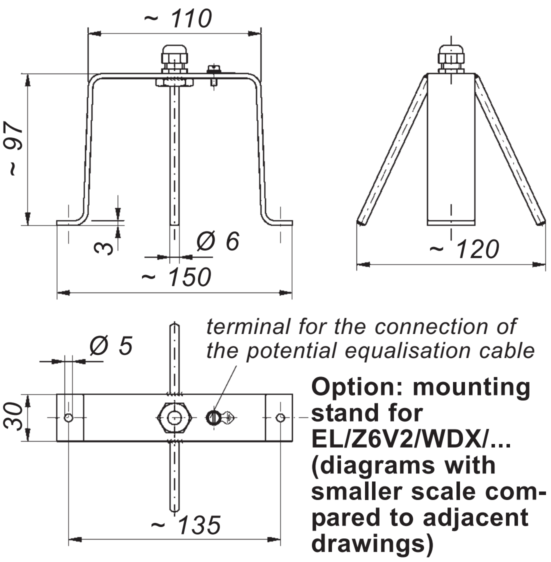
EL/Z6V2/WDX/... ⟨Ex⟩ II 2 G
Ex ia IIB T6 Gb





EL/0/PEK-2/2/... ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb





Option: mounting stand for EL/Z6V2/WDX/... (diagrams with smaller scale compared to adjacent drawings)

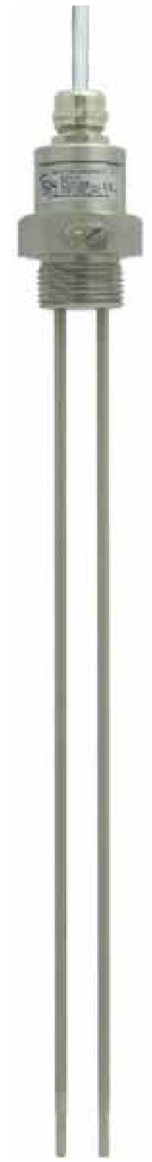
Conductive Ex rod electrode

Conductive Ex rod electrodes are designed to signal via a connected conductive Ex electrode relay the presence of a conductive liquid caused, for example, by burst pipes.

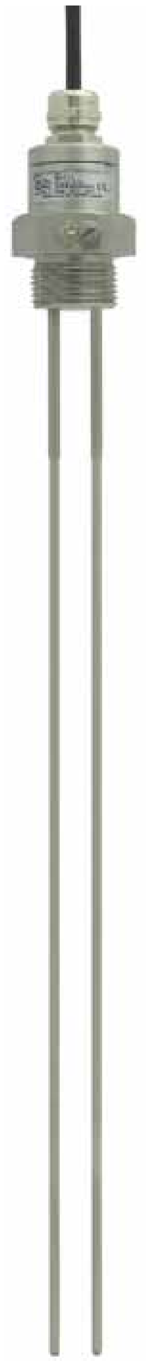
Conductive Ex rod electrodes should only be used in normally dry environments. They can be installed from the top or from the side. In both cases, it must be ensured that the rod tips are just above the floor to be monitored.

If the two non-insulated electrode rod sensor surfaces of a conductive Ex rod electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

EL/./SB-1/G1/2/ED/ED/0/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIC T6 Gb



EL/Z6V2/SZ-1/G1/2/ED/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIC T6 Gb



EL/Z6V2/SZ-0/G1/2/ED/ED/1/Ex-0G
⟨Ex⟩ II 1 G Ex ia IIC T6 Ga

EL/./SB-1/G1/2/ED/ED/0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb
conductive Ex rod electrodes

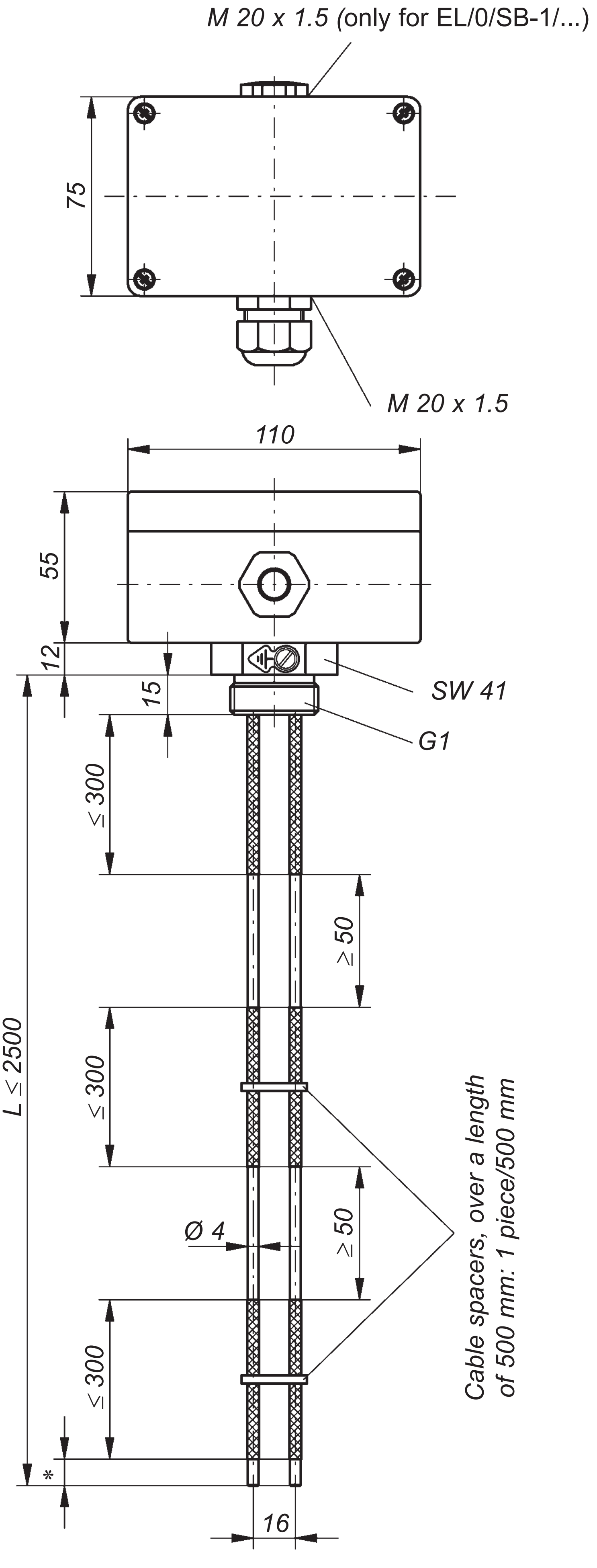
The conductive Ex rod electrodes are fitted with two electrode rods as sensitive elements: 1 control electrode and 1 earth electrode.

If the two electrode rods of a conductive Ex rod electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

Each conductive Ex rod electrode EL/Z6V2/SB-1/... or the Ex rod electrode combination EL/0/SB-1/... + EL/Z6V2/SB-1/... has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.

The connection must be made as shown in the circuit diagrams on pages 31-2-26, 31-2-27 and 31-2-29.

Technical data	**EL/0/SB-1/ G1/2/ED/ED/0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb**	**EL/Z6V2/SB-1/ G1/2/ED/ED/0/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0152**	
Design	1 control electrode and 1 earth electrode	
Cable break monitoring	**without**	**with**
	integrated Z6V2 cable break monitoring unit	
Sensitive elements	2 electrode rods made of stainless steel 316 Ti, each with 4 mm dia., covered with polyolefin shrinkdown tubing of **max. 300 mm** in length	
Lengths	as required (measured from the nipple sealing surface)	
Max. lengths	2,500 mm	
Screw-in nipple	stainless steel 316 Ti, G1	
Electrical connection	connection box made of glass fibre reinforced antistatic polyester, A 301, 110 x 75 x 55 mm, protection class IP65	
Mounting	vertical or horizontal	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Max. cable length between electrode relay and electrode(s)	see Installation, Operating and Maintenance Instructions (sent on request)	



* 8 % of the electrode rod length, however min. 10 mm

EL/./SB-1/G1/2/ED/ED/0/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/Z6V2/SZ-1/G1/2/ED/ED/1/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb and EL/Z6V2/SZ-0/G1/2/ED/ED/1/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga conductive Ex rod electrodes

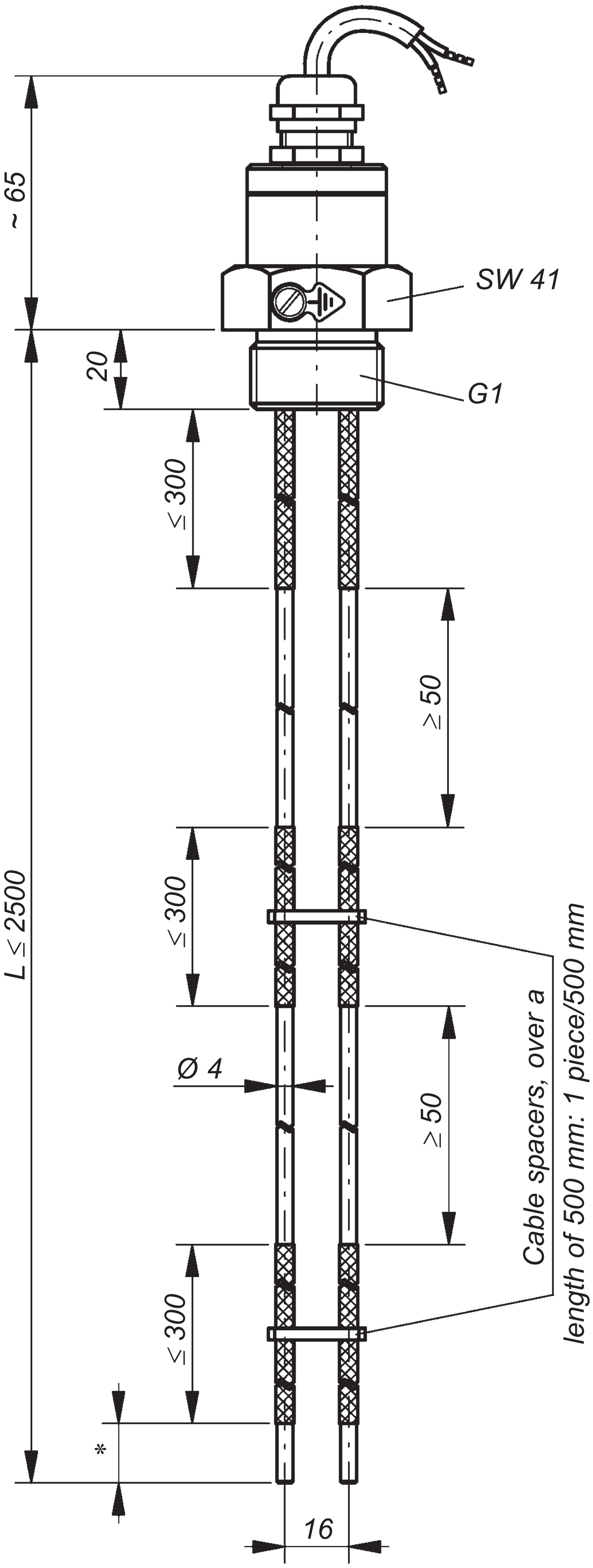
The conductive Ex rod electrodes are fitted with two electrode rods as sensitive elements: 1 control electrode and 1 earth electrode.

If the two electrode rods of a conductive Ex rod electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

Each of the above mentioned conductive Ex rod electrodes has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.

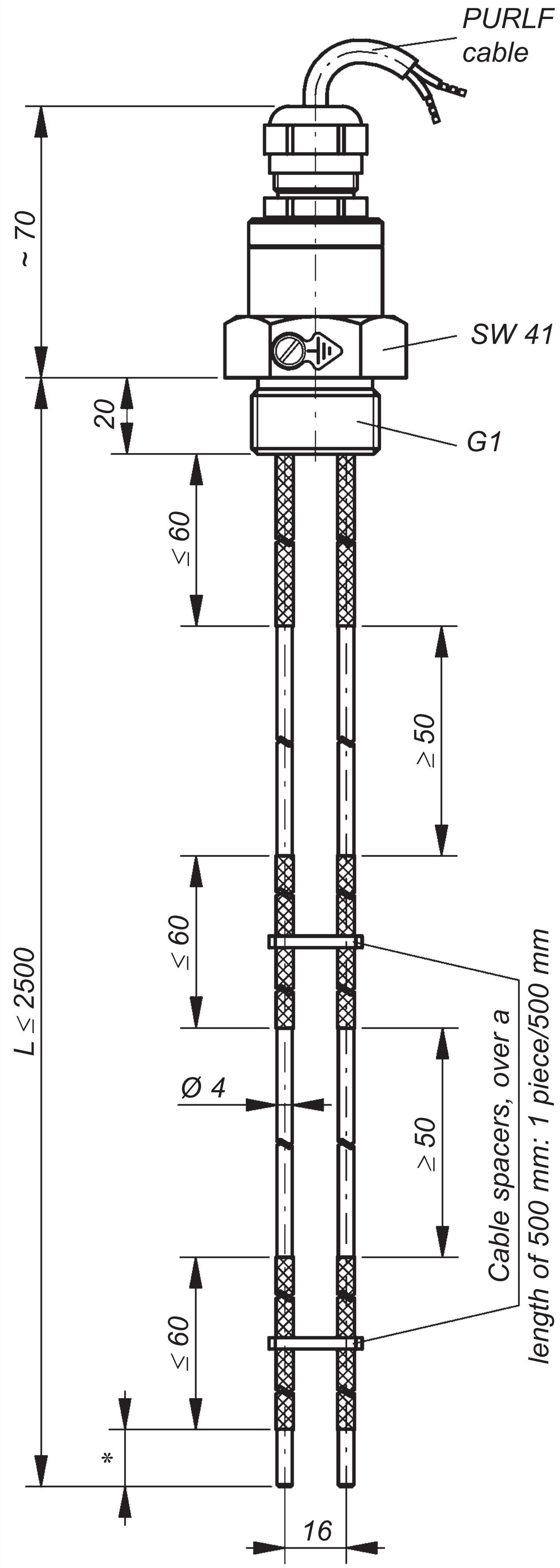
The connection must be made as shown in the circuit diagrams on pages 31-2-26, 31-2-27, 31-2-29 or 31-2-30.

Technical data	**EL/Z6V2/SZ-1/ G1/2/ED/ED/1/Ex-1G Ⓔx II 2 G Ex ia IIC T6 Gb**	**EL/Z6V2/SZ-0/ G1/2/ED/ED/1/Ex-0G Ⓔx II 1 G Ex ia IIC T6 Ga**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 1 or 2;	**zone 0, 1 or 2;**
	EC type examination certificate INERIS 03ATEX0152	
Design	1 control electrode and 1 earth electrode	
Cable break monitoring	**with integrated Z6V2 cable break monitoring unit**	
Sensitive elements	2 electrode rods made of stainless steel 316 Ti, each with 4 mm dia., covered with PVDF shrinkdown tubing of	
	max. 300 mm in length	**max. 60 mm** in length
Length	as required (measured from the nipple sealing surface)	
Max. lengths	2,500 mm	
Screw-in nipple	stainless steel 316 Ti, G1	
Electrical connection	connection head made of stainless steel 316 Ti with cable entry made of brass, protection class IP68, with free connecting cable 2 x 0.75 made of	
	PTFE,	antistatic PURLF (with external conductive PUR sheath),
	length 2 m, longer cable on request	
Mounting	vertical or horizontal	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Max. cable length between electrode relay and electrode	see Installation, Operating and Maintenance Instructions (sent on request)	



* 8 % of the electrode rod length, however min. 10 mm

EL/Z6V2/SZ-1/G1/2/ED/ED/1/Ex-1G
Ex II 2 G Ex ia IIC T6 Gb



* 8 % of the electrode rod length, however min. 10 mm

EL/Z6V2/SZ-0/G1/2/ED/ED/1/Ex-0G
Ex II 1 G Ex ia IIC T6 Ga

Conductive Ex suspension electrodes

Conductive Ex suspension electrodes are designed to signal via a connected conductive Ex electrode relay the presence of a conductive liquid caused, for example, by burst pipes.

Conductive Ex suspension electrodes should only be used in normally dry environments. They must be mounted in suspended mode from above in such a way that the electrode rods are just slightly above the floor to be monitored.

If the two electrode rods of a conductive Ex suspension electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

EL/Z6V2/EHW/NL1/20/2/PP/ED/1/Ex-1G
Ⓔx II 2 G Ex ia IIC T6 Gb

EL/Z6V2/EHW/NL2/28/2/PP/ED/1/Ex-1G
II 2 G Ex ia IIB T6 Gb

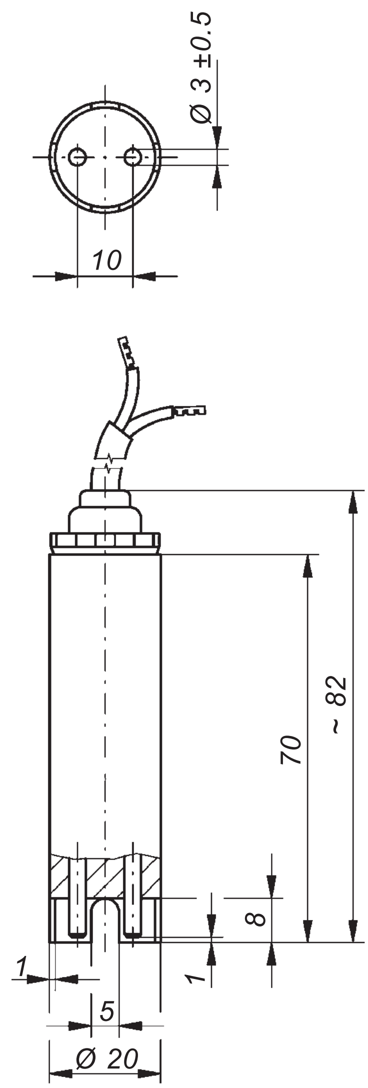
EL/Z6V2/EHW/NL1/20/2/PP/ED/1/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb and EL/Z6V2/EHW/NL2/28/2/PP/ED/1/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb conductive Ex suspension electrodes

The conductive Ex suspension electrodes are fitted with two electrode rods as sensitive elements: 1 control electrode and 1 earth electrode.

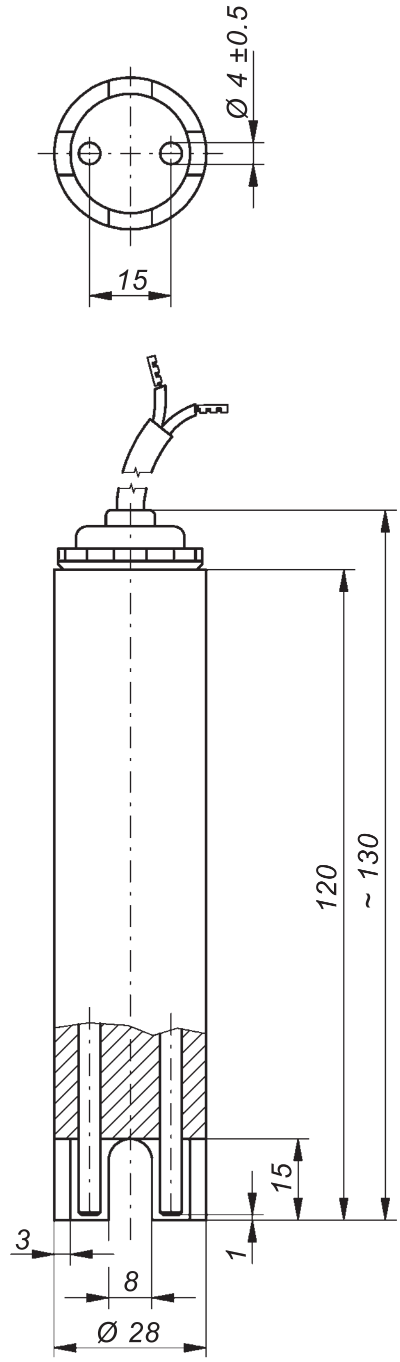
If the two electrode rods of an Ex suspension electrode come into contact with an electrically conductive liquid (e.g. water, acid etc.), an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

Each of the above mentioned conductive Ex suspension electrodes has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.
The connection must be made as shown in the circuit diagrams on pages 31-2-26 to 31-2-28.

Technical data	**EL/Z6V2/EHW/NL1/ 20/2/PP/ED/1/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**	**EL/Z6V2/EHW/NL2/ 28/2/PP/ED/1/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0152**	
Design	1 control electrode and 1 earth electrode	
Cable break monitoring	**with integrated Z6V2 cable break monitoring unit**	
Sensitive elements	2 electrode rods made of stainless steel 316 Ti, each with 3 mm dia.; other materials (e. g. Hastelloy) on request	2 electrode rods made of stainless steel 316 Ti, each with 4 mm dia.; other materials (e. g. Hastelloy) on request
Housing	PP; other materials (e. g. PVDF or PTFE) on request, 20 mm Ø x approx. 82 mm	PP; other materials (e. g. PVDF or PTFE) on request, 28 mm Ø x approx. 130 mm
Electrical connection	connecting cable made of TPK 2 x 0.75, length 2 m, longer cable on request; connecting cable made of CM or PTFE on request	
Mounting	vertical	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only, use only under atmospheric conditions	
Max. cable length between electrode relay and electrode	see Installation, Operating and Maintenance Instructions (sent on request)	
Mounting accessories	**stuffing glands and flanges with stuffing glands on request**	



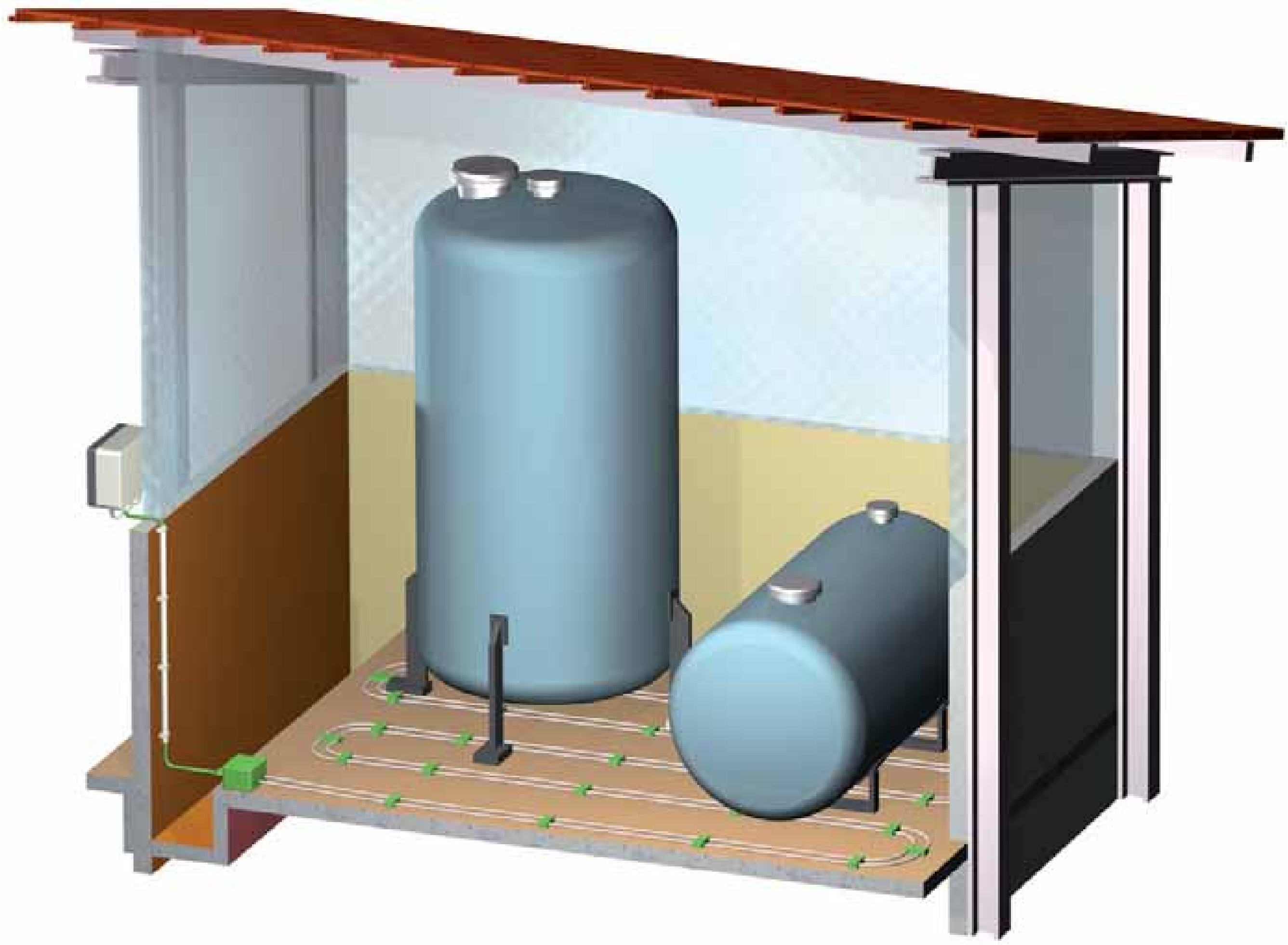
EL/Z6V2/EHW/NL1/20/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIC T6 Gb



EL/Z6V2/EHW/NL2/28/2/PP/ED/1/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

Leakage detection with conductive "Leckstar" Ex line sensor

Application example with a conductive Ex cable electrode



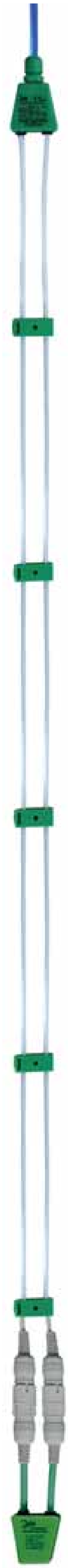
Use of an Ex cable electrode for leakage detection of a conductive liquid in a storeroom

Conductive Ex cable electrode

Conductive Ex cable electrodes are designed to signal via a connected conductive Ex electrode relay the presence of a conductive liquid caused, for example, by burst pipes.

Conductive Ex cable electrodes should only be used in normally dry environments. They can be used on floors, false ceilings, alongside pipes or in double-pipe systems. They should be installed at the lowest point of the potential hazard area which they are intended to monitor.

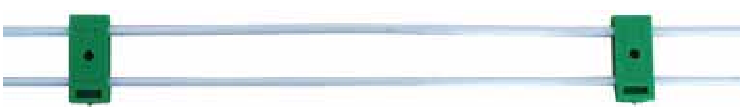
As soon as an electrically conductive liquid (e.g. water, acid etc.) creates a conductive path between the two sensor cables, an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.



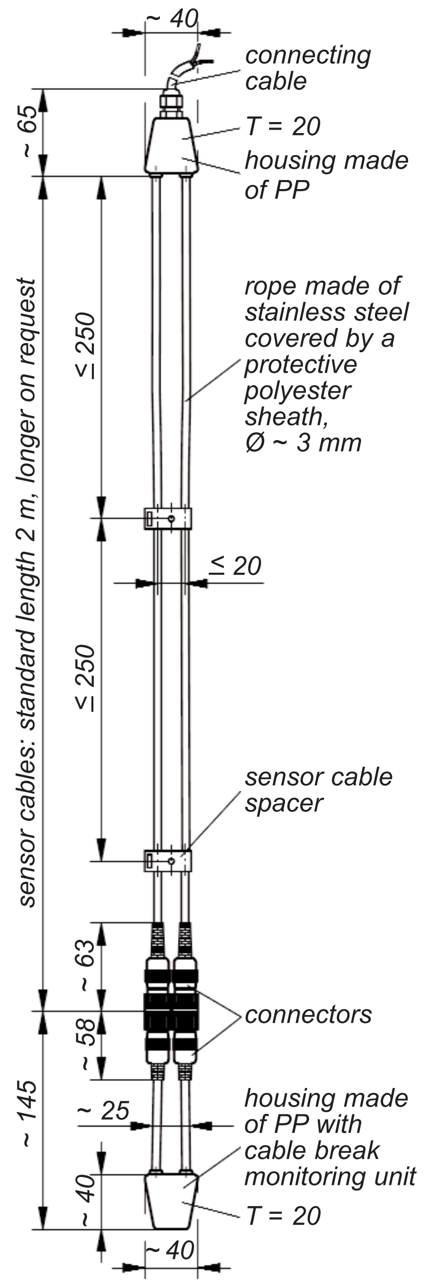
Supplied mounting accessories

Sensor cable spacers

Sensor cables with sensor cable spacers



Dimensions



EL/Z6V2/KE/40/2/PP/ED/1/Ex-1G
Ⓔx II 2 G Ex ia IIB T6 Gb

Mode of installation of the conductive Ex cable electrode

The two sensor cables of the conductive Ex cable electrode must be mounted parallel to one another at a distance of approx. 2 cm using the sensor cable spacers, as a greater or lesser spacing affects the response level of the system in the event of leakage.

Only non-conductive materials (e.g. cable ties, insulated cable clips etc.) must be used for installation of the sensor cables.

EL/Z6V2/KE/40/2/PP/ED/1/Ex-1G
Ⓔx II 2 G Ex ia IIB T6 Gb
conductive Ex cable electrode

The conductive Ex cable electrode is fitted with two sensor cables as sensitive elements: 1 control electrode and 1 earth electrode.

As soon as an electrically conductive liquid (e.g. water, acid etc.) creates a conductive path between the two sensor cables, an electrical contact is made and an alarm signal given via the connected conductive Ex electrode relay.

Each of the two sensor cables consists of a stainless steel rope core and a protective sheath made of polyester. This protective sheath is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid as far as possible false alarms, whilst allowing leakage liquid to penetrate throught to the stainless steel ropes.

Each conductive Ex cable electrode has to be connected via an obligatory Ex connection box OAK/LST/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb to a conductive Ex electrode relay Leckstar 101/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC.

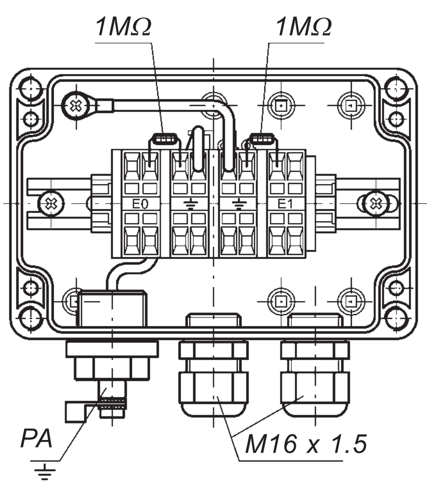
The connection must be made as shown in the circuit diagrams on pages 31-2-26 to 31-2-28.

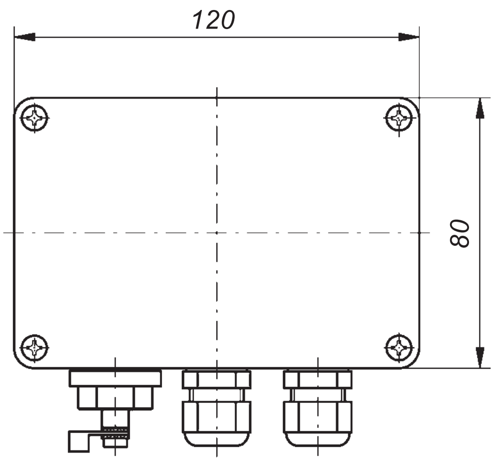
Technical data	**EL/Z6V2/KE/40/2/PP/ED/1/Ex-1G Ⓔx II 2 G Ex ia IIB T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2; EC type examination certificate INERIS 03ATEX0152**
Design	1 control electrode and 1 earth electrode
Cable break monitoring	**with integrated Z6V2 cable break monitoring unit**
Sensitive elements	2 sensor cables in form of 2 ropes made of stainless steel 316, each with 3 mm dia., each covered by a halogen-free protective polyester sheath; length 2 m each, shorter or longer on request
Max. length of sensor cables	**100 m; if the sensor cables are wound round a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying.**
Supplied mounting accessories	4 sensor cable spacers made of PP per metre of sensor cables
Electrical connection	connecting cable 2 x 0.75, length 2 m, longer cable on request; halogen-free connecting cable on request
Mounting	horizontal
Temperature range	– 20°C to + 60°C
Pressure resistance	for pressureless applications only, use only under atmospheric conditions
Max. cable length between electrode relay and electrode	see Installation, Operating and Maintenance Instructions (sent on request)

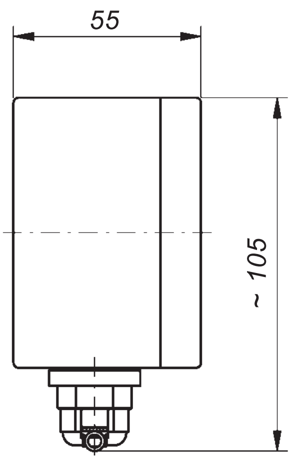
OAK/LST/2x1MΩ
Ⓔx II 2 G Ex ia IIC T6 Gb
obligatory Ex connection box

Technical data	OAK/LST/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb
Application	• for integration of the plates or rods or sensor cables of the conductive Ex electrode(s) in question in the potential equalisation system of the installation, • for connection of the intrinsically safe control circuit of the conductive Ex electrode relay to the conductive Ex electrode(s) • for installation in potentially explosive atmospheres in zone 1 or 2. EC type examination certificate INERIS 03ATEX0152
Material	PPLF (condutive polypropylene)
Dimensions	120 x 80 x 55 mm
Cable entries	2 cable entries made of PA
Terminals	4 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes Ø 4 mm
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover







Dimensions in mm

Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC conductive Ex electrode relay

- **with cable break monitoring feature and switchable self-hold**
- **for connection <u>of 1</u> conductive Ex electrode <u>with</u> Z6V2 cable break monitoring unit**
- **with 1 potential-free changeover contact at the output**

Conductive Ex electrode relay for U-bar mounting or surface mounting, with connection terminals on top and with 3 built-in LEDs for signalling the operating statuses.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing <u>outside potentially explosive atmospheres</u> and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

The Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC conductive electrode relay is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

Ex approved conductive electrodes, such as our conductive Ex plate, rod, suspension or cable electrodes, may be used, via an obligatory Ex connection box OAK/LST/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb, in the intrinsically safe control current circuit. **The different application possibilities and the special conditions for safe use are described in the corresponding Installation, Operating and Maintenance Instructions (sent on request).**

Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

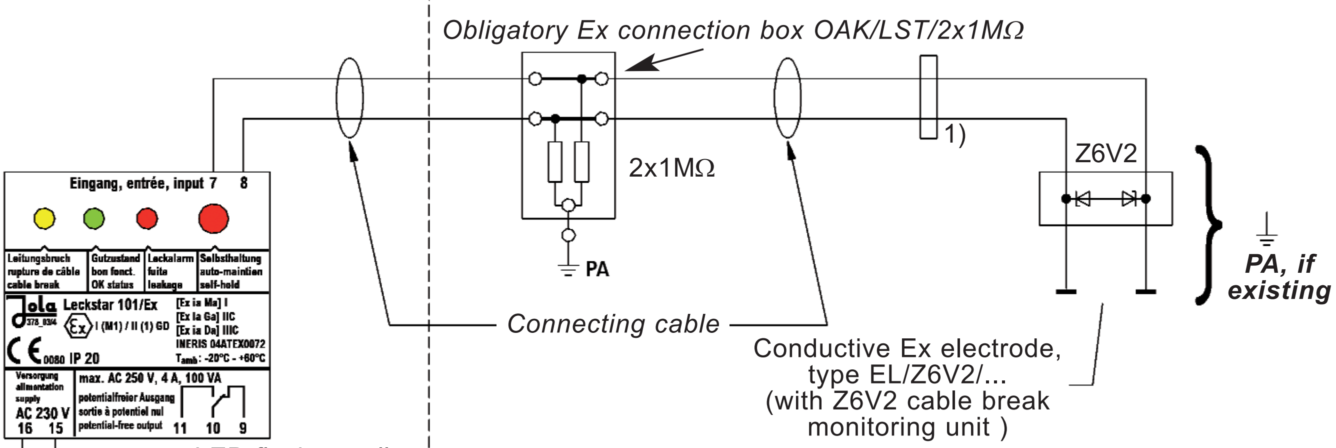
Connection diagrams
EL/./.../../../../../Ex-.. ⟨Ex⟩ II 2 G or II 1 G Ex ia II. T6 G. conductive Ex electrodes to Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC conductive Ex electrode relay:
see pages 31-2-26 to 31-2-30 and Installation, Operating and Maintenance Instructions (sent on request).

Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC conductive Ex electrode relay

Technical data	**Leckstar 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC**
Alternative supply voltages (terminals 15 and 16)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 110 V or AC 24 V
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay with switchable self-hold
No-load voltage	8 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (electric conductance)
Cable break monitoring	via Zener diode circuit (Z6V2) at the end of the electrode line
Power circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indication	3 LEDs (see page 31-2-26)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable between Ex electrode relay and Z6V2 cable break monitoring unit	Installation, Operating and Maintenance Instructions (sent on request).
EC type examination certificate	INERIS 04ATEX0072
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Connection diagram

Non explosive atmosphere | **Explosive atmosphere**



AC 230 V or	LED flashes yellow
AC 240 V or	= cable break
AC 115 V or	LED lights green
AC 110 V or	= OK status
AC 24 V	LED lights red = alarm

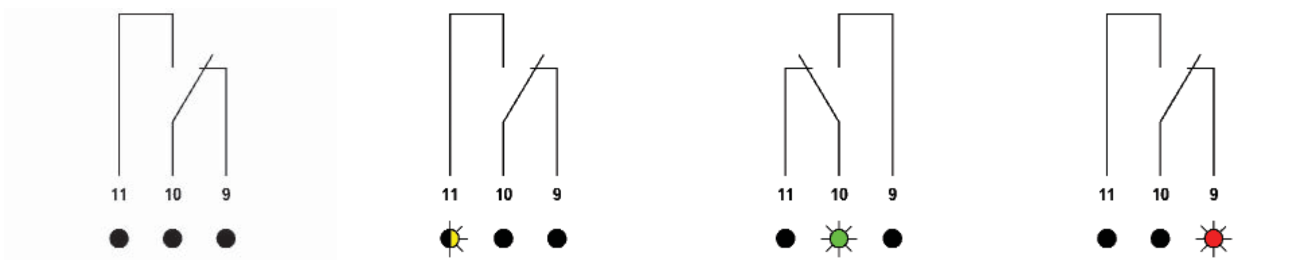
1) Further conductive Ex electrodes of the type EL/0/PE/... or EL/0/SB-1/... (without cable break monitoring unit Z6V2) may be connected in parallel

Position of contact when Leckstar 101/Ex without voltage

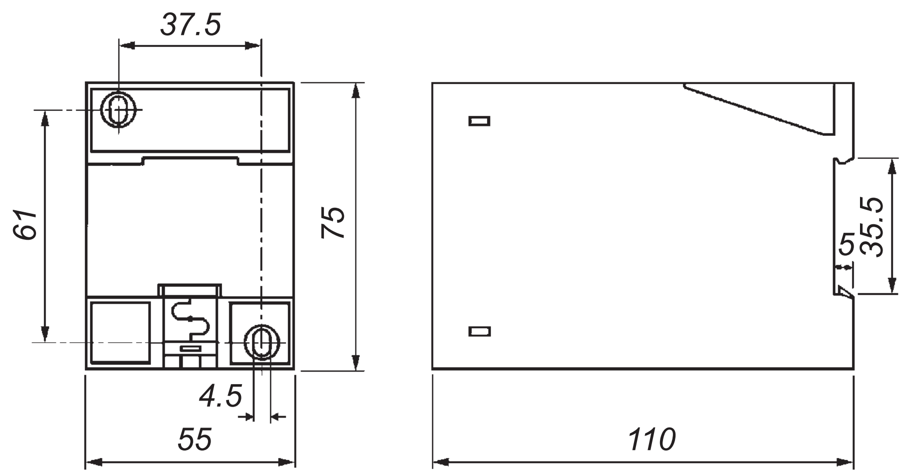
Due to the design of the unit, only one electrode cable can be monitored for cable break. If several Ex electrodes of the type EL/..../PE/... or EL/.../SB-1/... are to be connected to a common Leckstar 101/Ex electrode relay, only one electrode (the last one) may be fitted with the Z6V2 cable break monitoring unit. All other Ex electrodes are to be used without integrated Z6V2 cable break monitoring unit (see circuit diagrams on following pages).

Position of output contact of the Leckstar 101/Ex electrode relay

Leckstar 101/Ex without voltage	Cable break	OK status	leakage



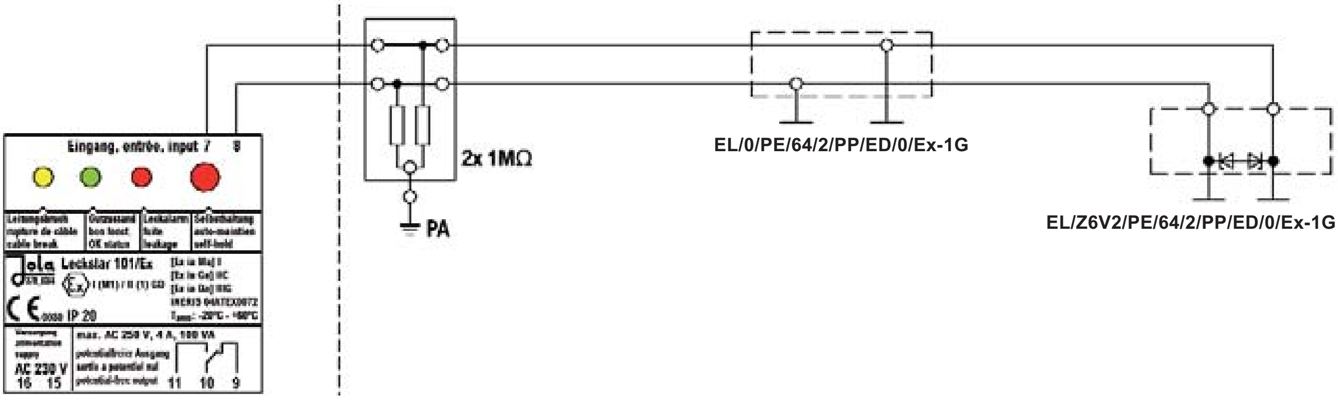
LEDs dark: Ex electrode relay without voltage, output relay not energized	**yellow LED flashes:** Ex electrode relay with voltage, electrode cable break, output relay not energized	**green LED lights:** Ex electrode relay with voltage, Ex electrode dry, output relay energized	**red LED lights:** Ex electrode relay with voltage, Ex electrode wet, output relay not energized



Connection diargrams:
Preservation of the cable break monitoring when connecting several electrodes, represented here with Ex electrode types EL/./PE... as an example

Non potentially explosive atmosphere | **Potentially explosive atmosphere**

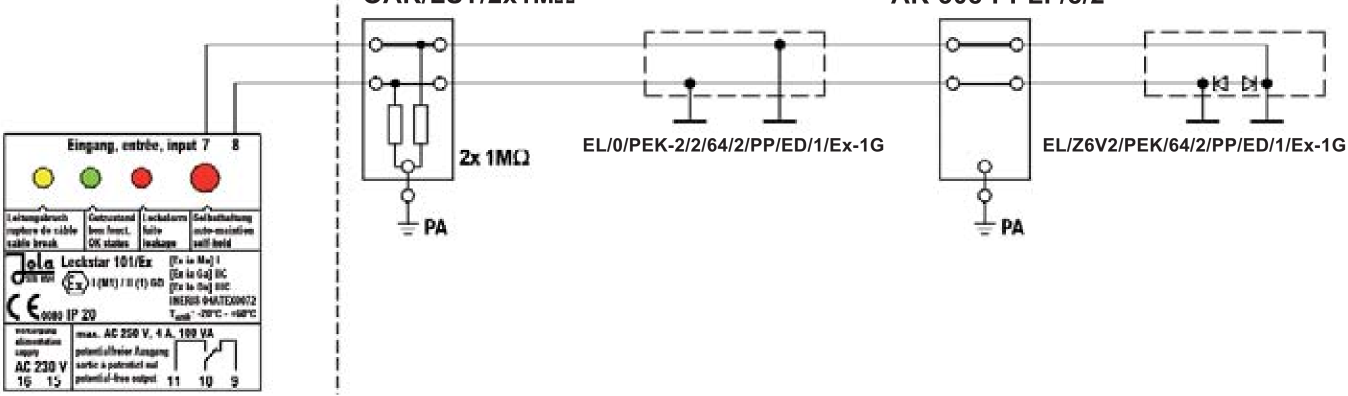
Obligatory
Ex connection box
OAK/LST/2x1MΩ



Non potentially explosive atmosphere | **Potentially explosive atmosphere**

Obligatory
Ex connection box
OAK/LST/2x1MΩ

Ex junction box
AK 308 PPLF/8/2

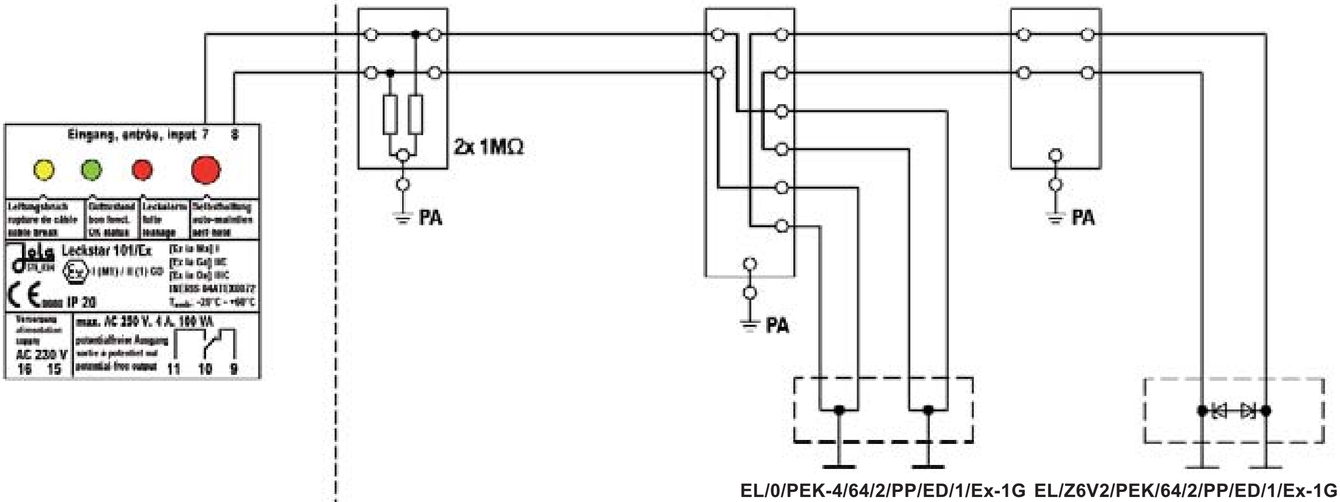


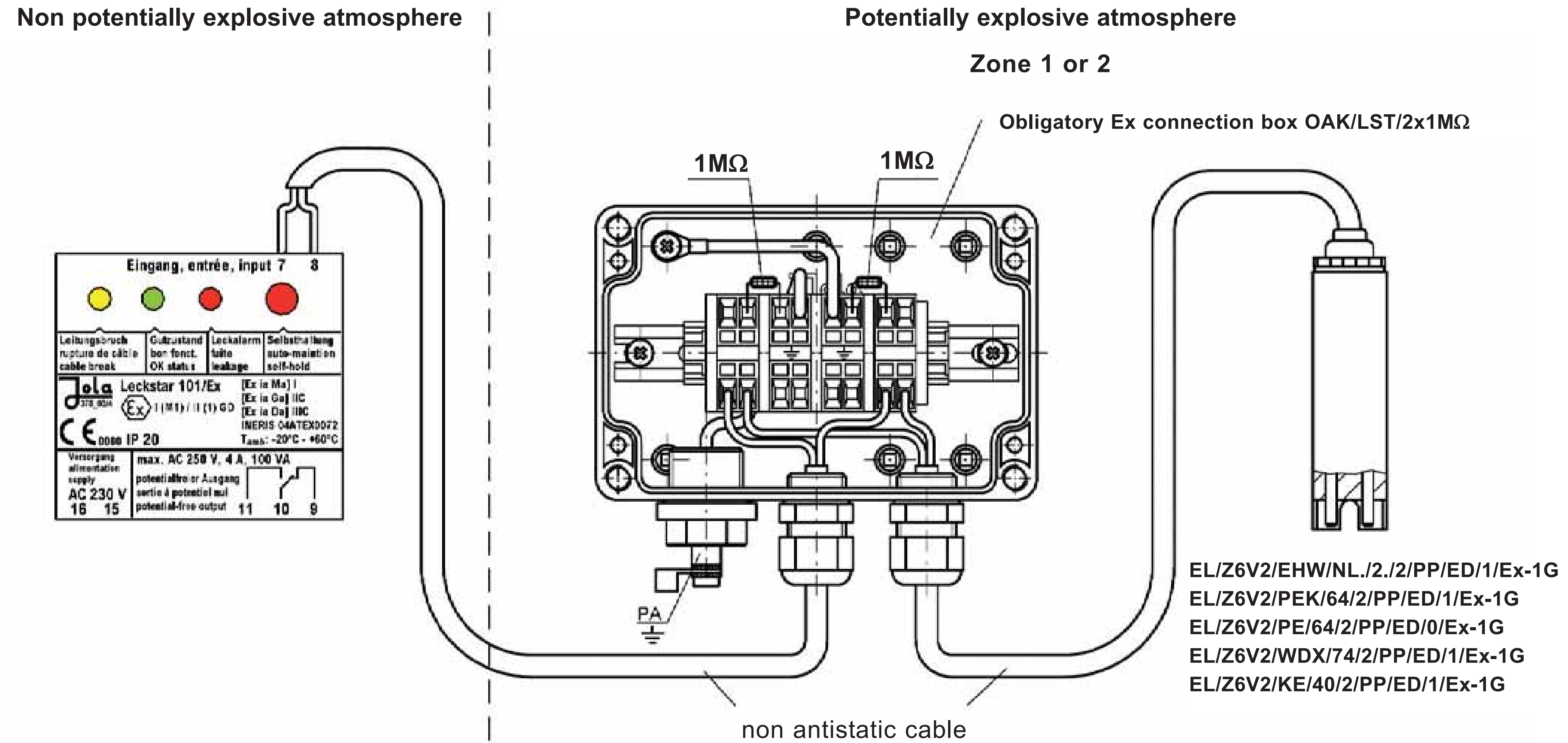
Non potentially explosive atmosphere | **Potentially explosive atmosphere**

Obligatory
Ex connection box
OAK/LST/2x1MΩ

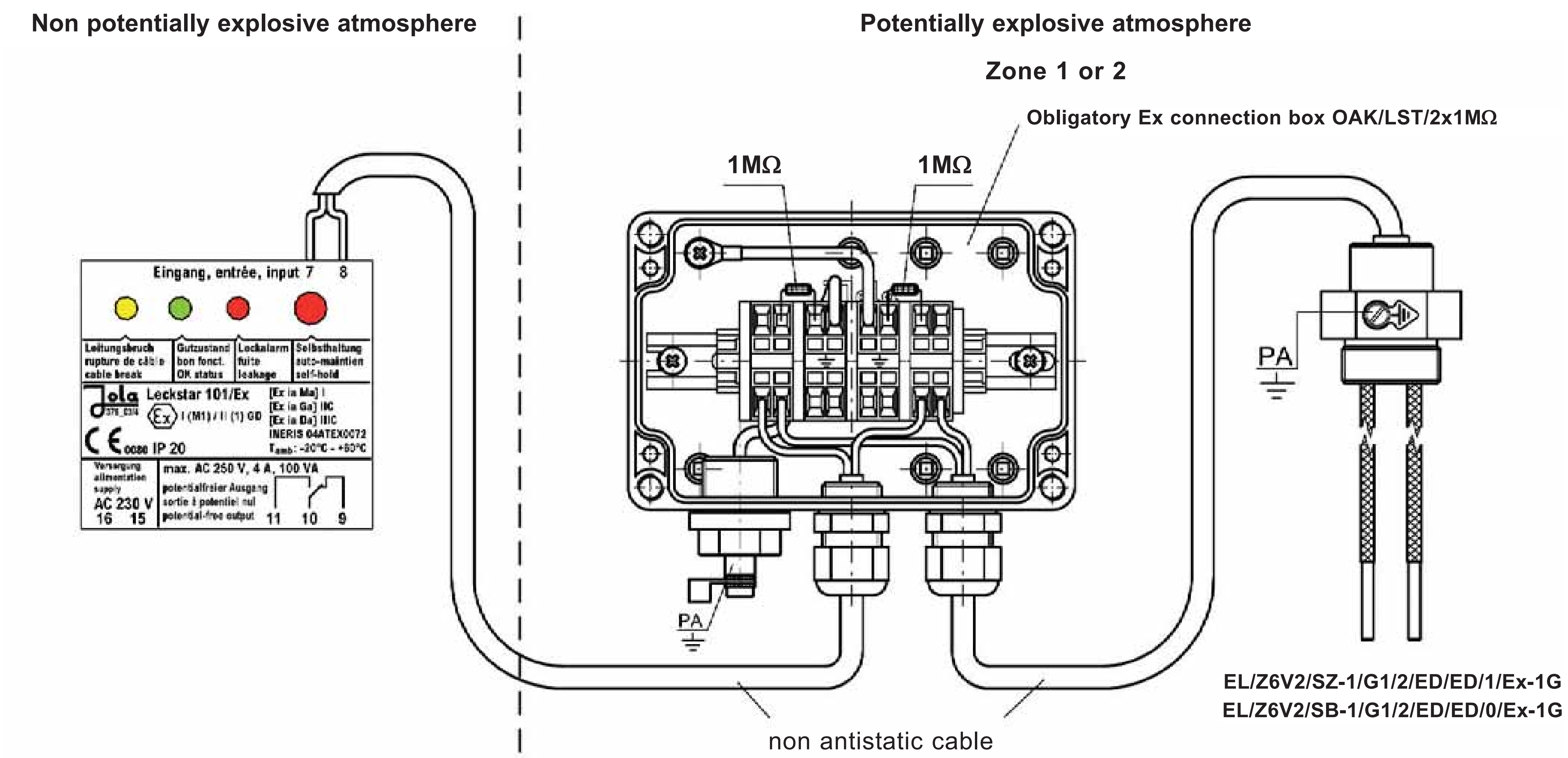
Ex junction box
AK 308 PPLF/8/4

Ex junction box
AK 308 PPLF/8/2

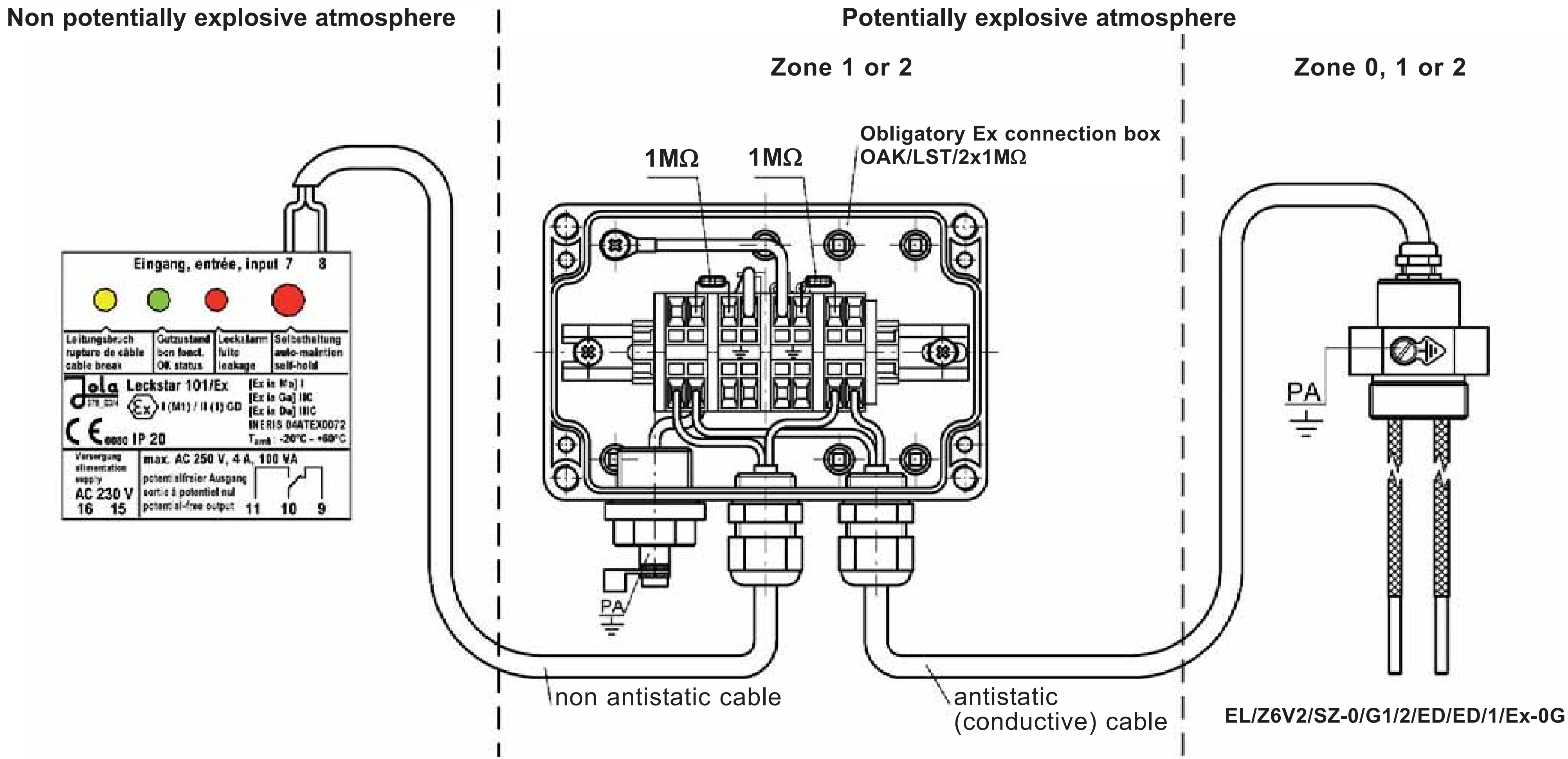




Non potentially explosive atmosphere
Potentially explosive atmosphere
Zone 1 or 2
Obligatory Ex connection box OAK/LST/2x1MΩ
1MΩ
1MΩ
Eingang, entrée, input 7 8
Leitungsbruch rupture de câble cable break
Gutzustand bon fonct. OK status
Leckalarm fuite leakage
Selbsthaltung auto-maintien self-hold
Leckstar 101/Ex
[Ex ia Ma] I
[Ex ia Ga] IIC
[Ex ia Da] IIIC
INERIS 04ATEX0072
IP 20
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang sortie à potentiel nul potential-free output
11 10 9
PA
non antistatic cable
EL/Z6V2/EHW/NL./2./2/PP/ED/1/Ex-1G
EL/Z6V2/PEK/64/2/PP/ED/1/Ex-1G
EL/Z6V2/PE/64/2/PP/ED/0/Ex-1G
EL/Z6V2/WDX/74/2/PP/ED/1/Ex-1G
EL/Z6V2/KE/40/2/PP/ED/1/Ex-1G

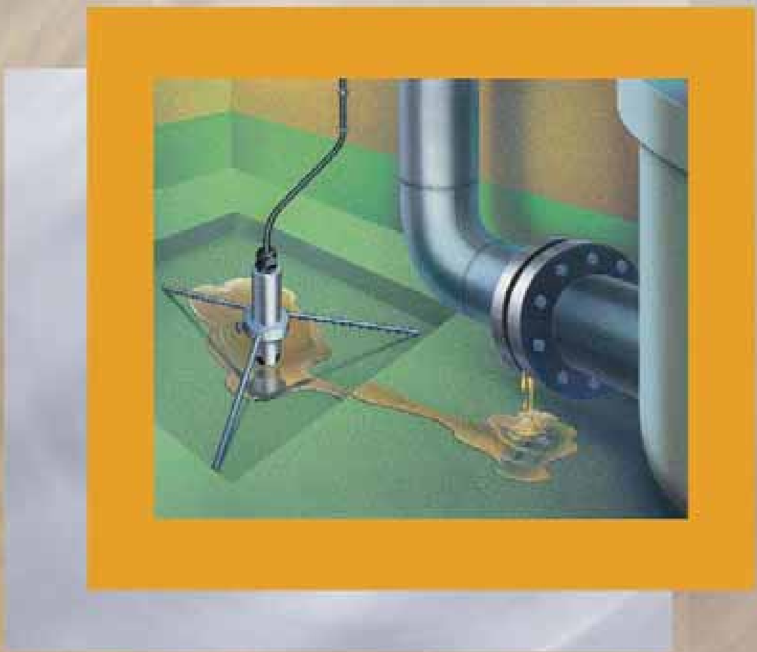


Non potentially explosive atmosphere
Potentially explosive atmosphere
Zone 1 or 2
Obligatory Ex connection box OAK/LST/2x1MΩ
1MΩ
1MΩ
Eingang, entrée, input 7 8
Leitungsbruch rupture de câble cable break
Gutzustand bon fonct. OK status
Leckalarm fuite leakage
Selbsthaltung auto-maintien self-hold
Leckstar 101/Ex
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC
[Ex ia Da] IIIC
INERIS 04ATEX0072
0086 IP 20
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang sortie à potentiel nul potential-free output
11 10 9
PA
PA
non antistatic cable
EL/Z6V2/SZ-1/G1/2/ED/ED/1/Ex-1G
EL/Z6V2/SB-1/G1/2/ED/ED/0/Ex-1G


Non potentially explosive atmosphere
Potentially explosive atmosphere
Zone 1 or 2
Zone 0, 1 or 2
Obligatory Ex connection box
OAK/LST/2x1MΩ
1MΩ
1MΩ
PA
PA
non antistatic cable
antistatic
(conductive) cable
EL/Z6V2/SZ-0/G1/2/ED/ED/1/Ex-0G
Eingang, entrée, input 7 8
Leitungsbruch rupture de câble cable break
Gutzustand bon fonct. OK status
Leckalarm fuite leakage
Selbsthaltung auto-maintien self-hold
Leckstar 101/Ex
IP 20
max. AC 250 V, 4 A, 100 VA
AC 230 V
16 15
11 10 9

Capacitive leakage detectors of the Leckmaster range

for installation in normally dry rooms



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Contents

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Leakage detectors of the Leckmaster range - general information

with integrated cable break monitoring

for conductive and non-conductive liquids; can basically be used for the detection of all low-viscosity liquids for such tasks as signalling the presence of fuel oil on the floor of a tank room or in a collection tub located underneath a fuel oil burner.

The Leckmaster leakage detectors consist of 2 components:

– a **COW/L** or **OWE 2/C** sensor

and

– a **Leckmaster 101** relay.

The **COW/L** and **OWE 2/C** sensors are designed for connection to the **Leckmaster 101** relay. They work on a capacitive basis. **If several sensors are used, a separate Leckmaster 101 relay is required for each sensor.**

The **COW/L** and **OWE 2/C** sensors can be mounted either

– upright on the floor (using the stand offered by Jola as an option)

or

– freely suspended by their cable above the floor.

Please follow the installation, operating and maintenance instructions (see page 31-6-11).

The COW/L and OWE 2/C sensors should only be used in normally dry surroundings – e.g. in collection rooms or collection tubs.

The **Leckmaster 101** relay is designed for U-bar mounting or surface mounting. The various operating statuses are shown by coloured LEDs.

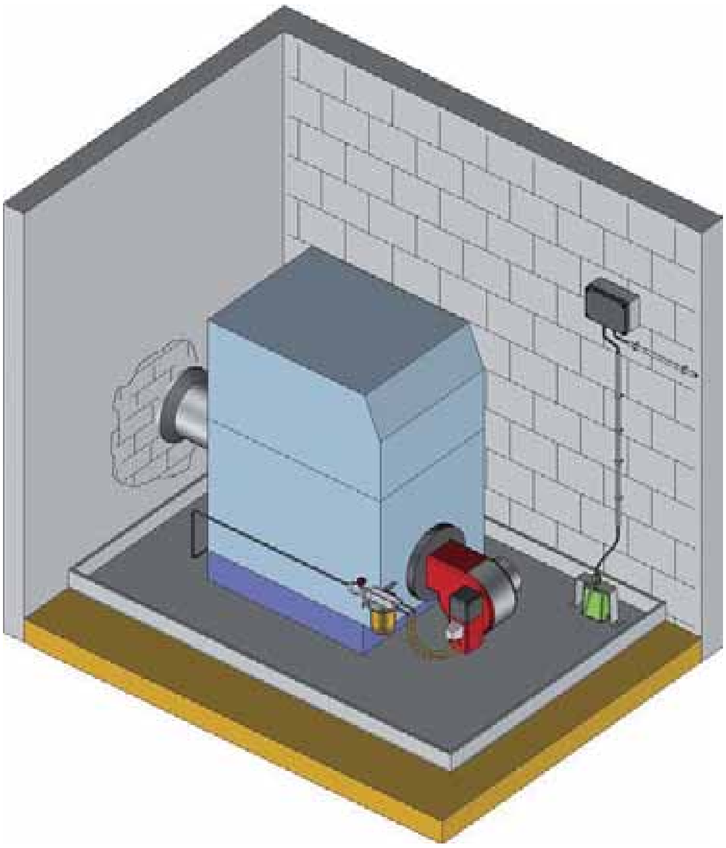
Areas of application:

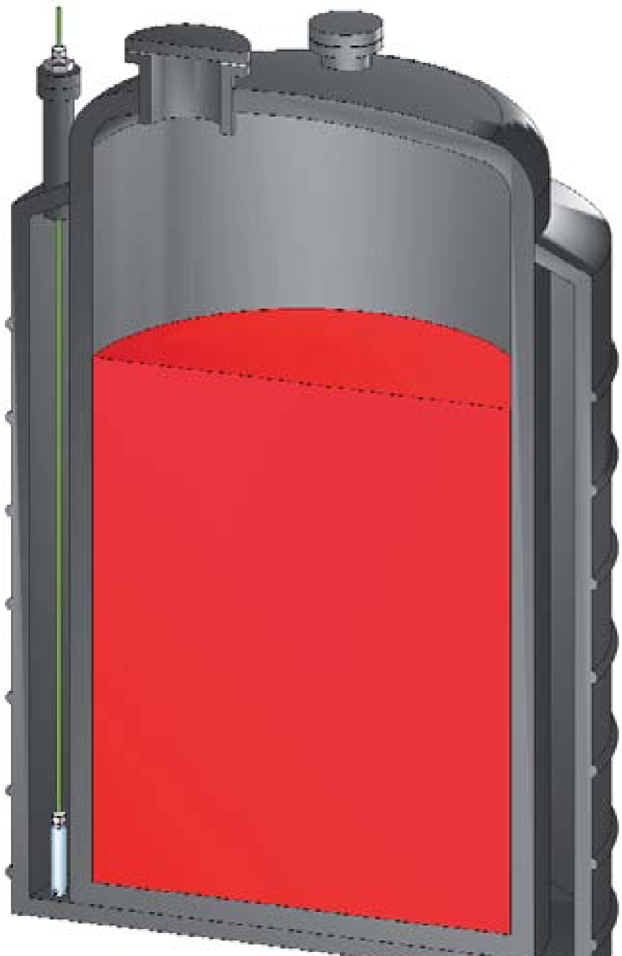
All organic and inorganic liquids with specific dielectric constants between 1.8 and 109.

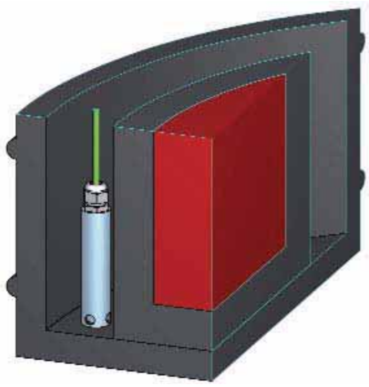
Prerequisite is that these liquids, dependent on the ambient temperature, are present in fluid form, and that the sensors to be used will be sufficiently wetted. Response height is approx. 12 mm.

Leakage detection with “Leckmaster” capacitive sensors

Application examples

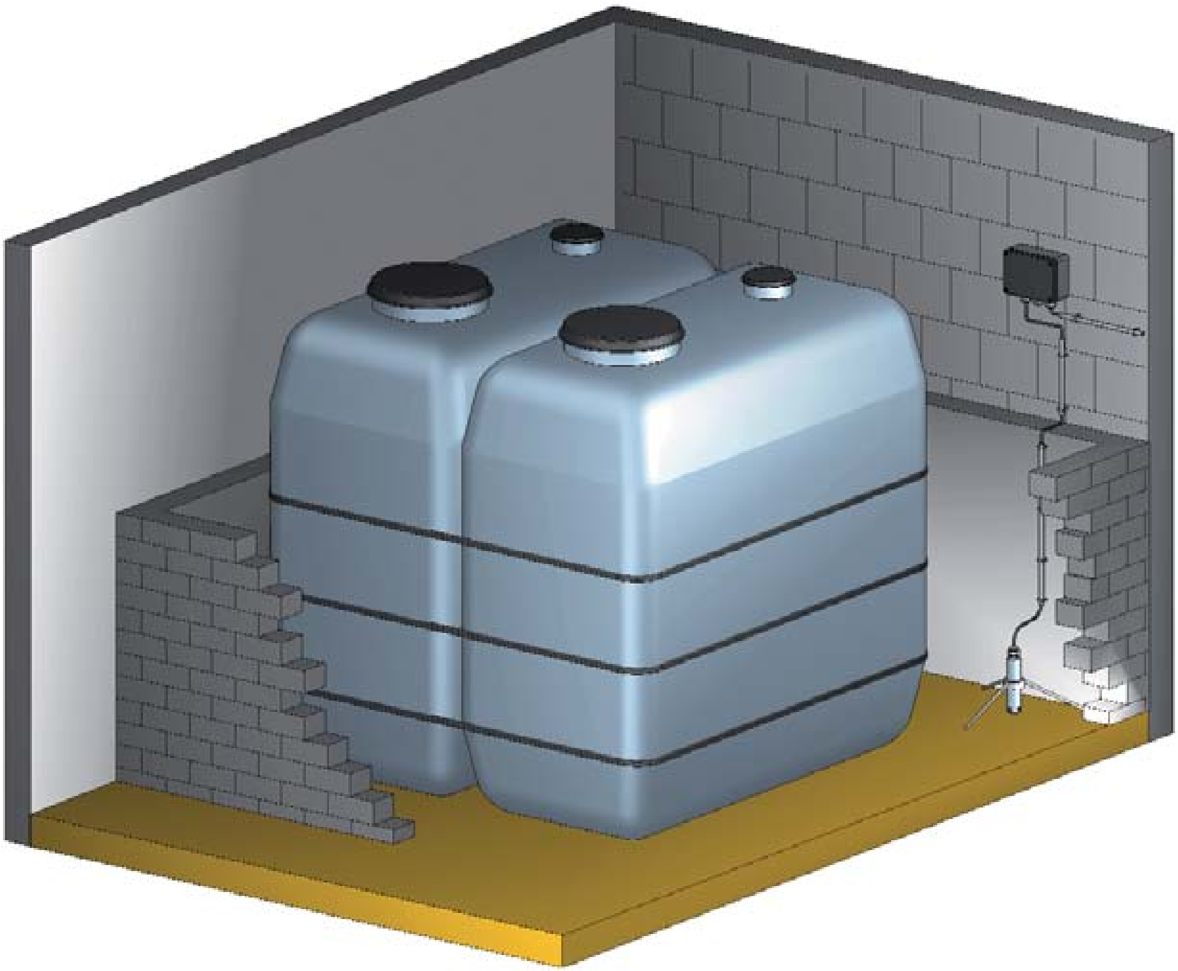


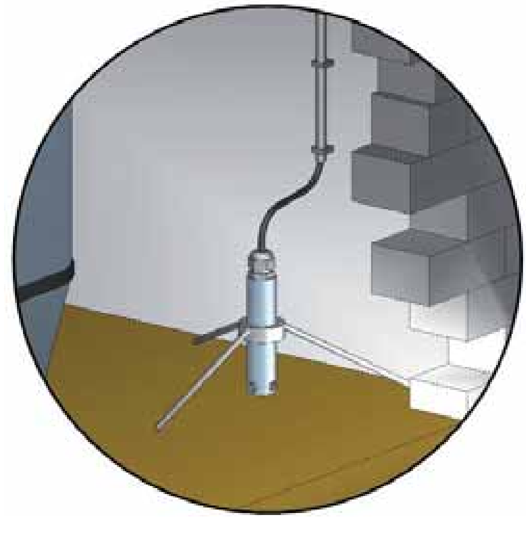




Leakage detection with "Leckmaster" capacitive sensors

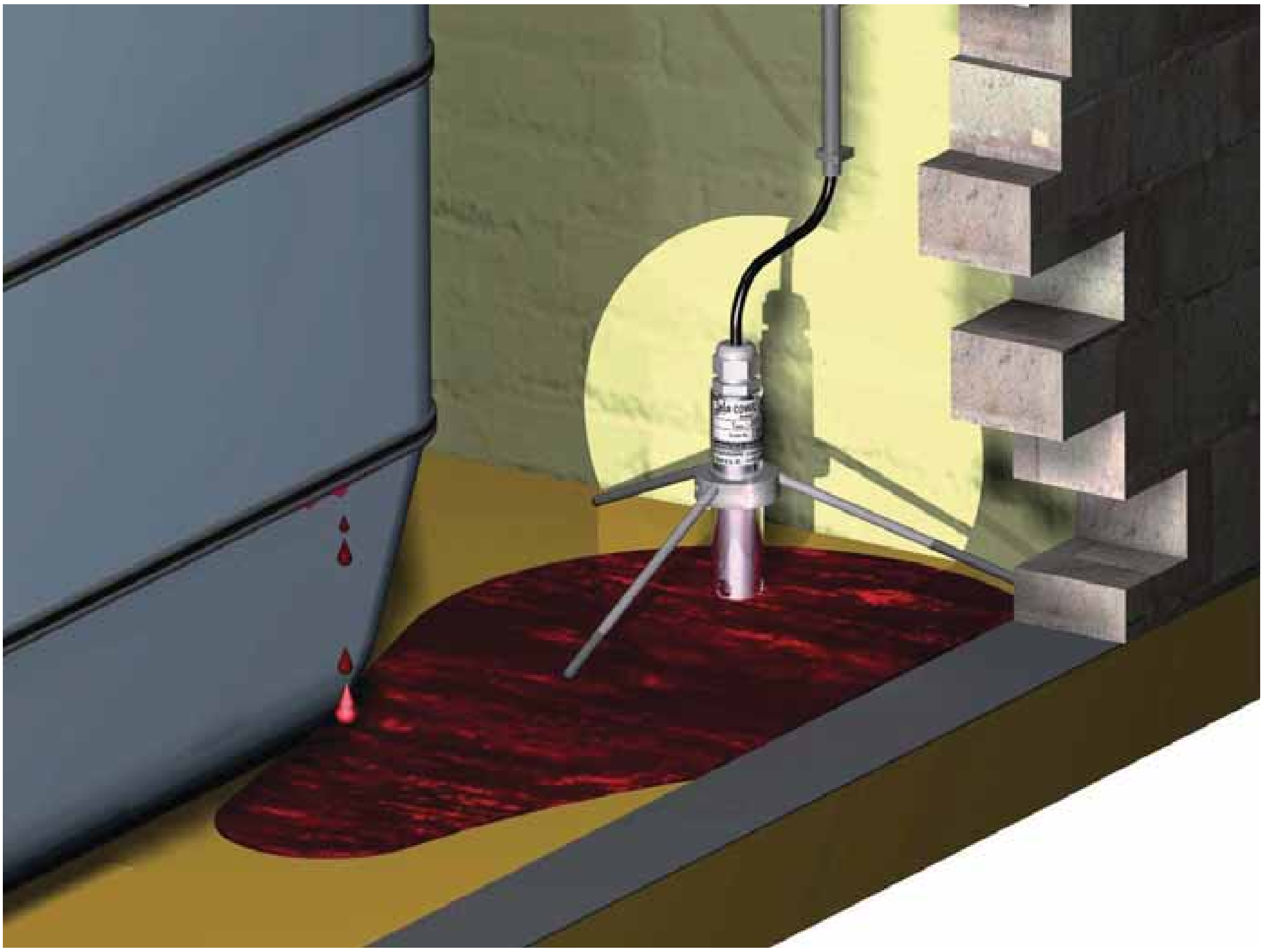
Application example





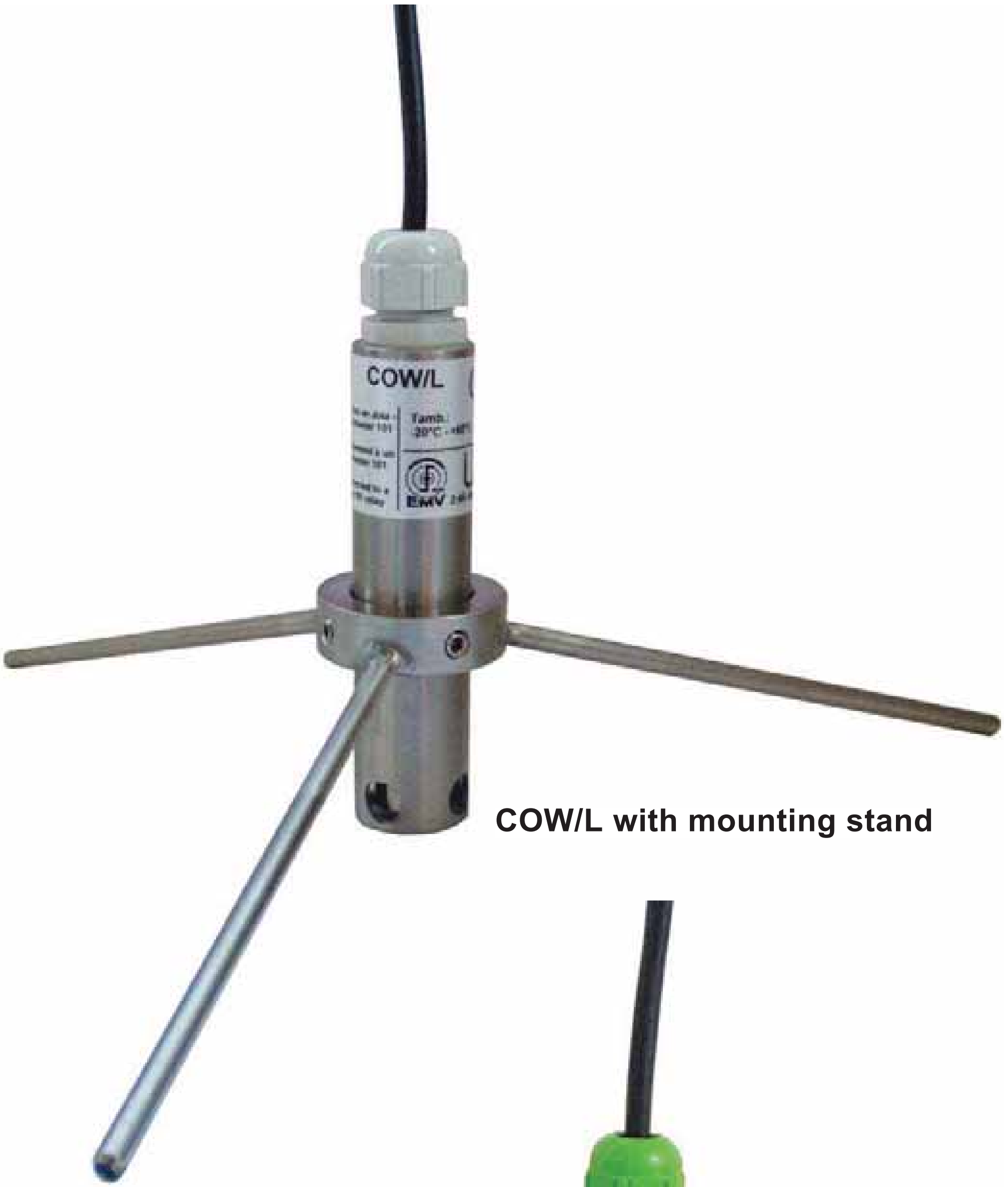
Leakage detection with “Leckmaster” capacitive sensors

Application example



COW/L and OWE 2/C sensors

COW/L

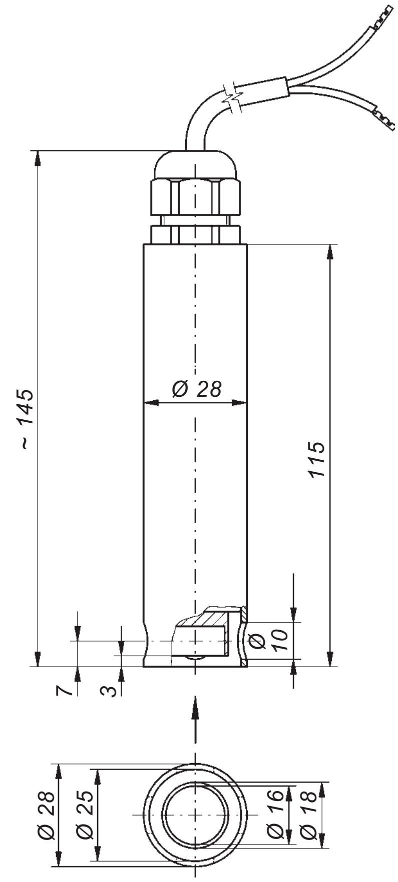


COW/L with mounting stand

OWE 2/C

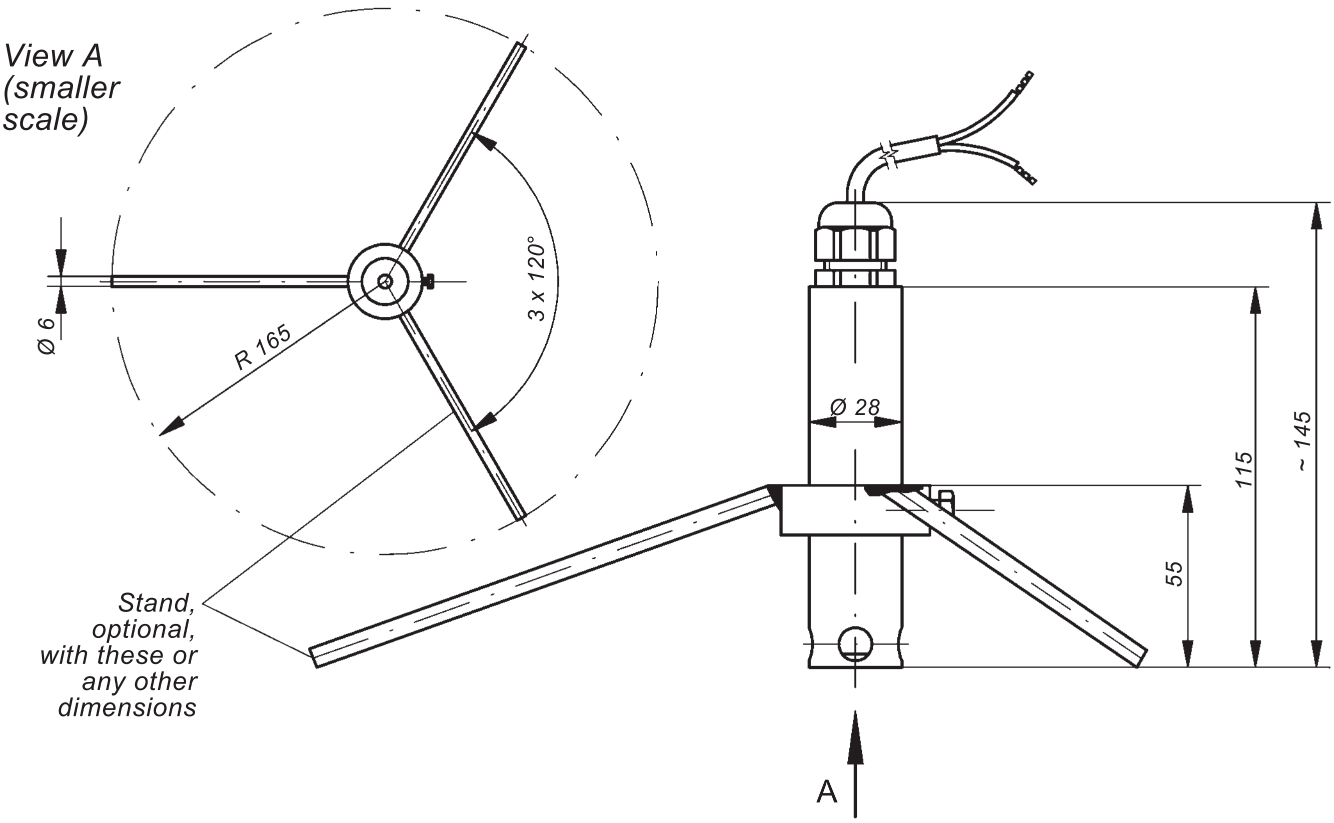
OWE 2/C with mounting stand

COW/L sensor



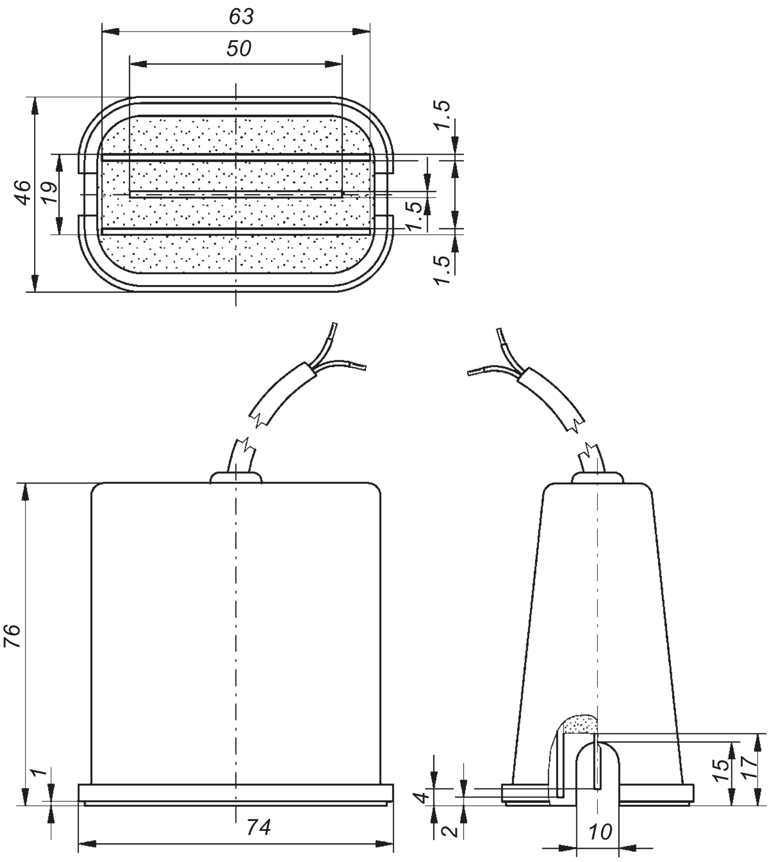
Technical data	COW/L
Housing	stainless steel 316 Ti and PTFE
Connecting cable	oil-resistant PVC cable 2 x 0.75 mm², cable length 5 metres, longer cable on request, other types of cable on request
Functional principle	capacitive sensor with stainless steel cylindrical capacitor
Self-capacitance	Ceq = 80 nF + 0.2 nF per metre of connecting cable
Self-inductance	Leq = 0 + 1 µH per metre of connecting cable
Protection class for the electronics sealed in the housing	IP 65
Temperature range	– 20°C to + 60°C
Response height from bottom edge of housing	≥ 12 mm (depending on the dielectric constant of the liquid)
Mounting accessory	stand made of stainless steel 316 Ti (optional)
Max. length of connecting cable between relay and sensor	1,000 metres, longer on request
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.

Optional: mounting stand made of stainless steel 316 Ti for COW/L

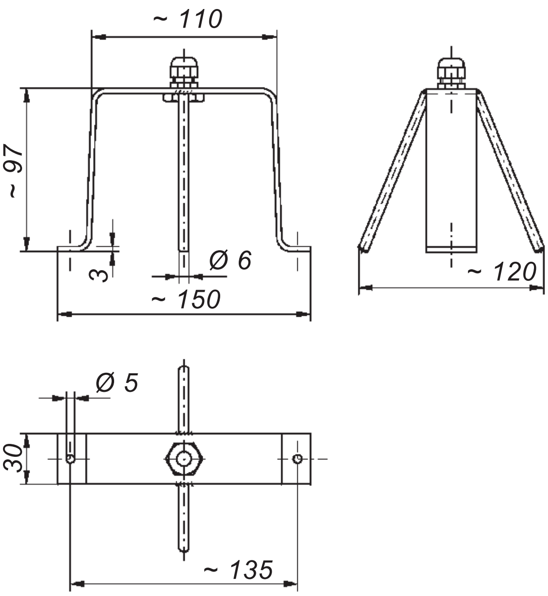


OWE 2/C sensor

Technical data	OWE 2/C
Housing	PP and cast resin
Connecting cable	oil-resistant PVC cable 2 x 0.75 mm², cable length 5 metres, longer cable on request, other types of cable on request
Functional principle	capacitive sensor with gold-plated capacitor plates on epoxy resin backing material
Self-capacitance	Ceq = 80 nF + 0.2 nF per metre of connecting cable
Self-inductance	Leq = 0 + 1 µH per metre of connecting cable
Protection class for the electronics sealed in the housing	IP 65
Temperature range	– 20°C to + 60°C
Response height from bottom edge of housing	≥ 12 mm (depending on the dielectric constant of the liquid)
Mounting accessory	stand made of stainless steel 316 Ti (optional)
Max. length of connecting cable between relay and sensor	1,000 metres, longer on request
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.



Optional:
mounting stand made of stainless steel 316 Ti for OWE 2/C (diagrams with smaller scale compared to adjacent drawings)



Leckmaster 101 relay

with cable break monitoring and switchable self-hold, for connection of a COW/L or OWE 2/C sensor

Switching unit for U-bar mounting or surface mounting, with connection terminals on top, with switchable self-hold function, and with built-in LEDs for signalling the operating status.

The appliance is designed for switch cabinet installation or mounting in an appropriate protective housing and may therefore not be installed in other locations. It is only suitable for use in clean environments.

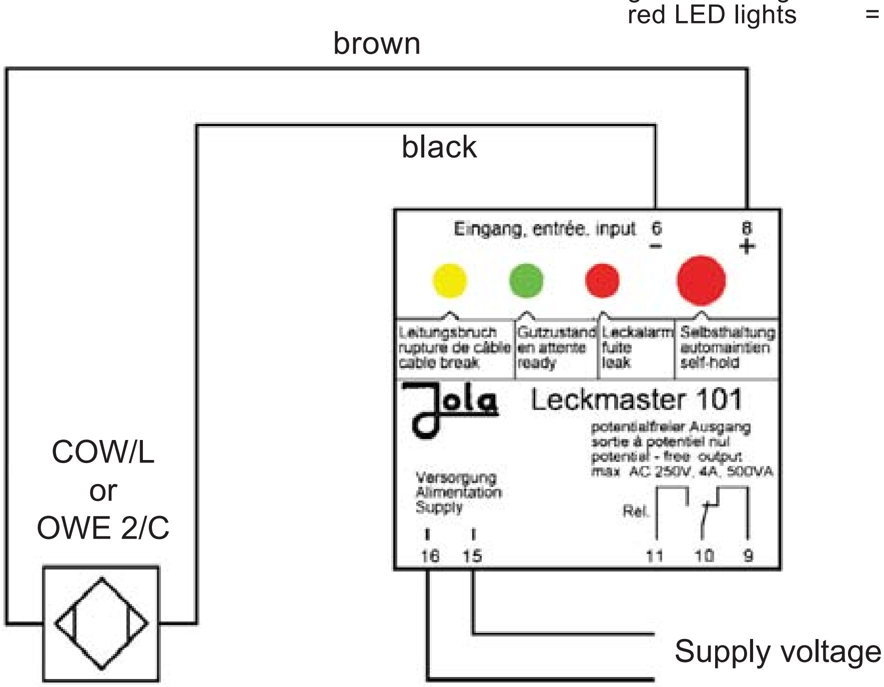
Self-hold:

– If the switch **for self-hold is switched on, an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of oil) is no longer present – in other words, if the sensor is dry again. The alarm is reset by switching off the switch for self-hold.
– If the switch **for self-hold is not switched on, the alarm is not maintained** when the cause of the alarm has been remedied but is reset.

Technical data	**Leckmaster 101**
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: –, - terminal 16: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } in these two cases, the unit must only be - DC 12 V or } connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Control circuit (terminals 6 and 8)	2 terminals (under safety extra low voltage SELV) acting on 1 output relay with switchable self-hold
Sensor connection (in line with EN 50 227):	
– no-load voltage	DC 8.4 V (safety extra low voltage SELV)
– short-circuit current	< 10 mA
– response hysteresis	1.5 mA ⎍ 1.8 mA
Cable break monitoring	I < 0.15 mA
Controlled circuit (terminals 9, 10, 11)	**1 single-pole potential-free changeover contact based on the quiescent current principle**
Switching status indicators	3 LEDs (see next page)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable between relay and sensor	1,000 metres, longer on request
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.

Connection diagram - Leckmaster 101 relay

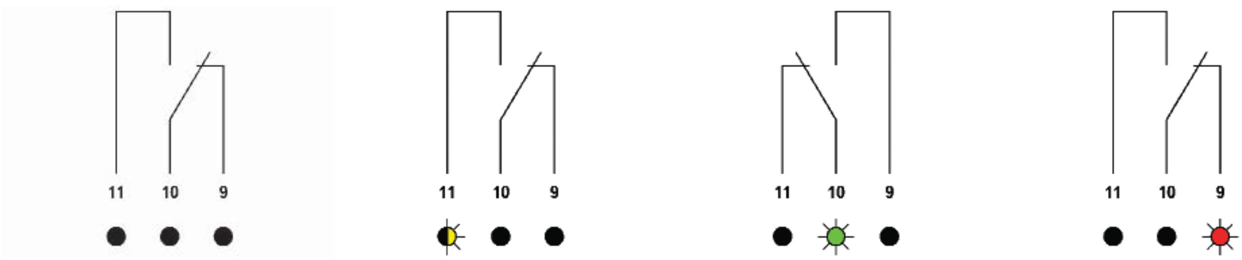
yellow LED flashes = cable break
green LED lights = OK status
red LED lights = leakage alarm



Position of contact when Leckmaster 101 without voltage

Position of the output contact of the Leckmaster 101 relay

Relay Leckmaster 101 without voltage	Cable break	OK status	Alarm status



LEDs dark: Leckmaster 101 without voltage, output relay not energised	**yellow LED flashes:** Leckmaster 101 under voltage, cable break in sensor or its connecting cable, output relay not energised	**green LED lights:** Leckmaster 101 under voltage, sensor not activated, output relay energised	**red LED lights:** Leckmaster 101 under voltage, sensor activated, output relay not energised

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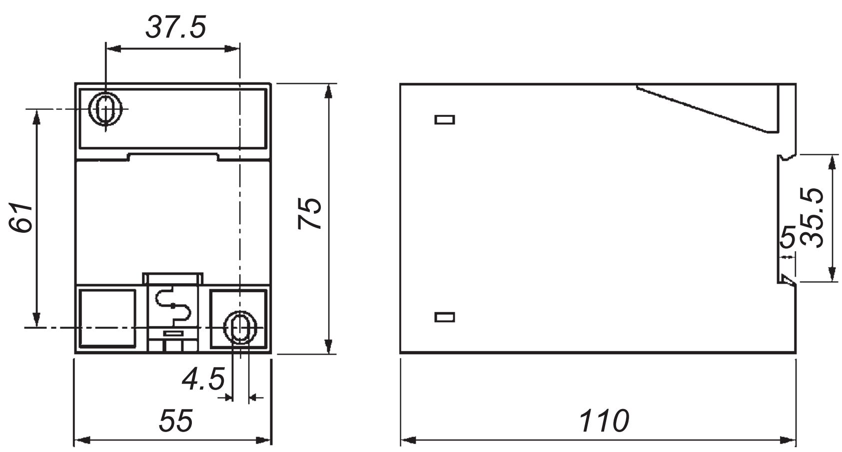

Installation, operating and maintenance instructions for the capacitive leakage detectors in the Leckmaster range

1. Areas of application:

All organic and inorganic liquids with specific dielectric constants between 1.8 and 109.

Prerequisite is that these liquids, dependent on the ambient temperature, are present in fluid form, and that the sensors to be used will be sufficiently wetted. Response height is approx. 12 mm.

The sensors may only be used in a temperature range between – 20°C and + 60°C. The admissible temperature range for use of the Leckmaster 101 relay is from – 20°C to + 60°C.

It is, however, advisable to use the unit in frost-free rooms or in heated protective boxes.

2. Installation site:

The COW/L and OWE 2/C sensors should only be used in normally dry surroundings – e.g. in collection rooms or collection tubs.

The COW/L and OWE 2/C sensors should be installed at the lowest point to ensure rapid leakage alarm.

3. Installation (see also the sample applications on pages 31-6-3 to 31-6-5):

The COW/L and OWE 2/C sensors can be installed using the standard mounting stands offered by JOLA. Where this is not feasible, the sensor should be suspended from above in a position just above the floor. In both cases, the cable of the sensor in question should be routed in an installation tube in such a way that it cannot be moved. In other words, the fastening should always ensure that the sensor cannot be tilted by external influences and the fastening mode should not be able to influence the sensitivity of the sensor.

If the COW/L or OWE 2/C sensor is used in extremely confined spaces, where none of the above installation modes is feasible, it can be suspended by its connecting cable. When it is at the lowest point, the connecting cable should be secured using suitable fasteners at the point of suspension. Stuffing glands, connection boxes with integrated stuffing gland or cable fastening clips can be used as fasteners. Wherever possible, installation tubes should be used, and they should be routed toward the sensor as far as possible in order to prevent tilting of the sensor. It should always be ensured that the sensor is at the lowest point, that its cable points vertically upwards, and that its position cannot be influenced by external factors.

4. Procedure following an alarm:

After every alarm, the sensor in question should be cleaned thoroughly and dried. The cable and floor surface should also be cleaned and dried. If there are traces of mechanical or chemical aggression on the sensor, a new sensor should be fitted.

5. Ongoing maintenance:

The COW/L and OWE 2/C sensors should be serviced at regular intervals, the intervals depending on the potential for soiling of the sensors and their environment. However, maintenance should be performed prior to startup and then at least at the intervals defined in the water regulations. Maintenance should always comprise the following tasks:

– cleaning and drying of the sensor and its environment,

– sight check of the sensor,

– functional test of the sensor using the liquid to be monitored (where this is not possible, using a liquid which is comparable to the liquid to be monitored with regard to the dielectric constant),

– disconnection of a sensor connecting cable wire in the junction box closest to the sensor or – if the sensor cable has been laid without junction box – from the relay to check the cable break monitoring function. Proper functioning of the cable break monitoring feature is indicated by yellow flashing of the LED on the Leckmaster 101 relay.

Capacitive
Ex leakage detectors
of the Leckmaster range

with sensor and relay

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Capacitive Ex leakage detectors

Contents **Pages**

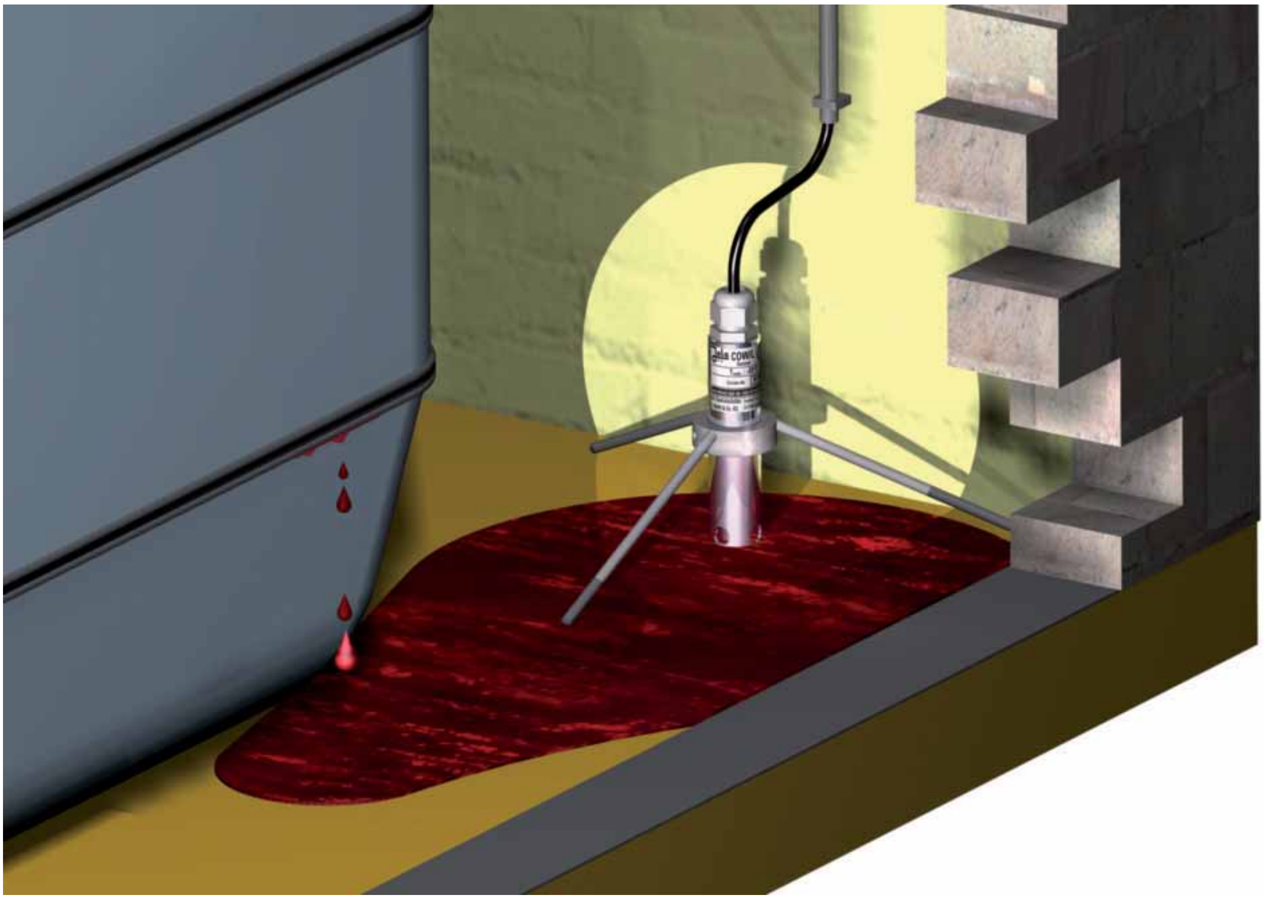
The capacitive measuring principle

The capacitive measuring principle is mainly used for the detection of **electrically non-conductive (insulating) liquids**, but it can also be used to detect electrically conductive liquids.

Electrically non-conductive liquids are generally organic liquids like oils and solvents. An electrode assembly forms a measuring capacitor, and the dielectric is either air or liquid. The dielectric constant of air is 1. The dielectric constant of the liquid to be detected is higher. For our capacitive sensors, the dielectric constant has to be higher than 1.8.

The capacitive leakage detector recognises a change in the dielectric constant at the measuring capacitor and an alarm signal is emitted. The design of the measuring capacitor allows direct mounting on the floor and generally rules out the possibility of interference effects due to different subsurfaces.

Application example:
detection of a heating oil leakage



Capacitive Ex leakage detectors of the Leckmaster range

with integrated cable break monitoring

for signalling the presence of electrically non-conductive and electrically conductive low-viscosity liquids on the floor of a normally dry tank room or in a normally dry collection tub

A capacitive **COW/Ex-1G, COW/Ex-0G, OWE/Ex-1G, OWE/Ex-0G** or **OWE 2/C/NL/Ex-1G** sensor installed in a potentially explosive atmosphere, transmits via an obligatory Ex connection box **OAK/LMT/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb** also installed in a potentially explosive atmosphere, electrical signals to a capacitive Ex relay **Leckmaster 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC**, wich is placed outside potentially explosive atmospheres**.**

Each capacitive **COW/Ex-1G, COW/Ex-0G, OWE/Ex-1G, OWE/Ex-0G** or **OWE 2/C/NL/Ex-1G** sensor must be connected, via an obligatory Ex connection box **OAK/LMT/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**, to a separate capacitive Ex relay **Leckmaster 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC**.

For more information relative to the use of a capacitive **COW/Ex-1G, COW/Ex-0G, OWE/Ex-1G, OWE/Ex-0G** or **OWE 2/C/NL/Ex-1G** sensor, an obligatory Ex connection box **OAK/LMT/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb** and a capacitive Ex relay **Leckmaster 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC**, please consult the Installation, Operating and Maintenance Instructions **(sent on request)**.

The capacitive **COW/Ex-1G, COW/Ex-0G, OWE/Ex-1G, OWE/Ex-0G** and **OWE 2/C/NL/Ex-1G** sensors can be mounted either
• upright on the floor (using the stand offered by Jola as an option)
or
• freely suspended by their cable above the floor.

They must be used in normally dry surroundings, e.g. in normally dry collection rooms or collection tubs. The obligatory Ex connection box **OAK/LMT/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb** has a protection class of IP65 and is designed for surface mounting.

The capacitive Ex relay
Leckmaster 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC is designed for U-bar mounting or surface mounting (in a switch cabinet or in a protective housing) **outside potentially explosive atmospheres**.The various operating statuses are shown by coloured LEDs.

Areas of application:

All organic and inorganic liquids with a specific dielectric constant of 1.8.

Prerequisite is that these liquids, dependent on the ambient temperature, are present in fluid form, and that the sensors to be used will be sufficiently wetted. Response height is approx. 12 mm.

Capacitive Ex sensors and obligatory Ex connection box

COW/Ex-1G ⟨Ex⟩ II 2 G
Ex ia IIC T5 Gb

COW/Ex-0G ⟨Ex⟩ II 1 G
Ex ia IIC T5 Ga

COW/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T5 Gb
with mounting stand

Capacitive Ex sensors and obligatory Ex connection box

OWE/Ex-1G ⓔx II 2 G
Ex ia IIC T5 Gb

OWE/Ex-0G ⓔx II 1 G
Ex ia IIC T5 Ga

OWE 2/C/NL/Ex-1G ⓔx II 2 G
Ex ia IIB T4 Gb

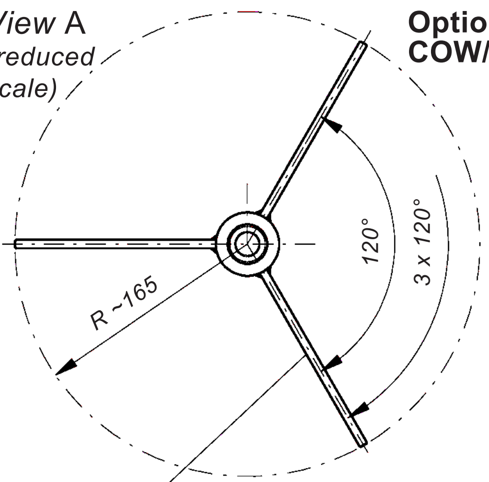
OWE/Ex-1G ⓔx II 2 G
Ex ia IIC T5 Gb
with mounting stand

Obligatory Ex connection box
OAK/LMT/2x1MΩ
ⓔx II 2 G Ex ia IIC T6 Gb

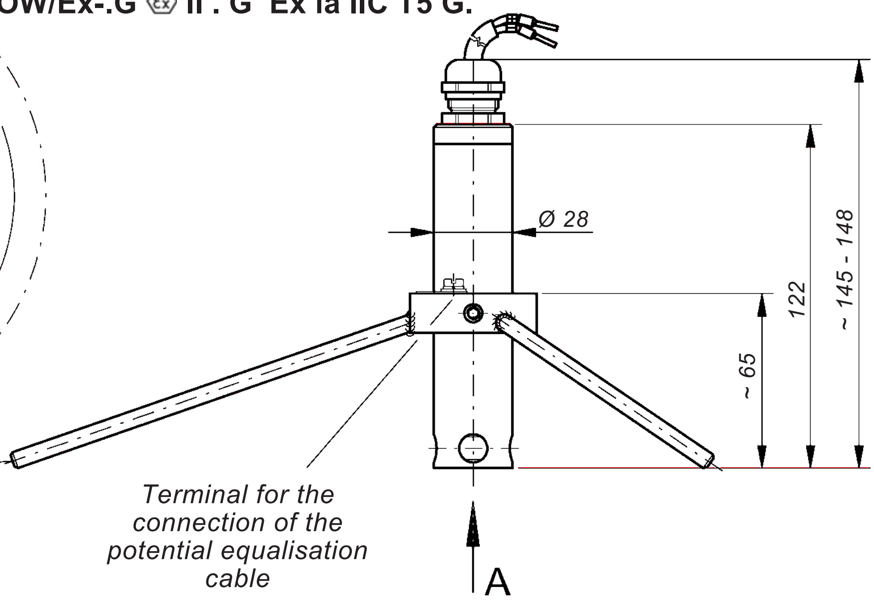
Capacitive Ex sensors COW/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T5 Gb and COW/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIC T5 Ga

Technical data	COW/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T5 Gb	COW/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIC T5 Ga
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 1 or 2	**zone 0, 1 or 2**
	EC type examination certificate INERIS 03ATEX0160	
Housing	stainless steel 316 Ti and PTFE	
Connecting cable	PVC cable, 2X0.75 mm², length 5 m, longer cable on request, PTFE cable on request	antistatic PURLF cable (with external conductive PUR sheath), 2X0.75 mm², length 5 m, longer cable up to max. 20 m on request
Functional principle	capacitive sensor with stainless steel cylindrical capacitor	
Self-capacitance	Ci = 220 nF + 200 pF per metre of connecting cable	
Self-inductance	Li = 1.1 mH + 1 µH per metre of connecting cable	
Protection class of the electronics sealed in the housing	IP65	
Response height from bottom edge of housing	≥ 12 mm (depending on the dielectric constant of the liquid)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between sensor and relay	approx. 1,000 m, see Installation, Operating and Maintenance Instructions (sent on request)	
CEM	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies	

View A (*reduced scale*)



Optional: mounting stand made of stainless steel 316 Ti for COW/Ex-.G ⟨Ex⟩ II . G Ex ia IIC T5 G.

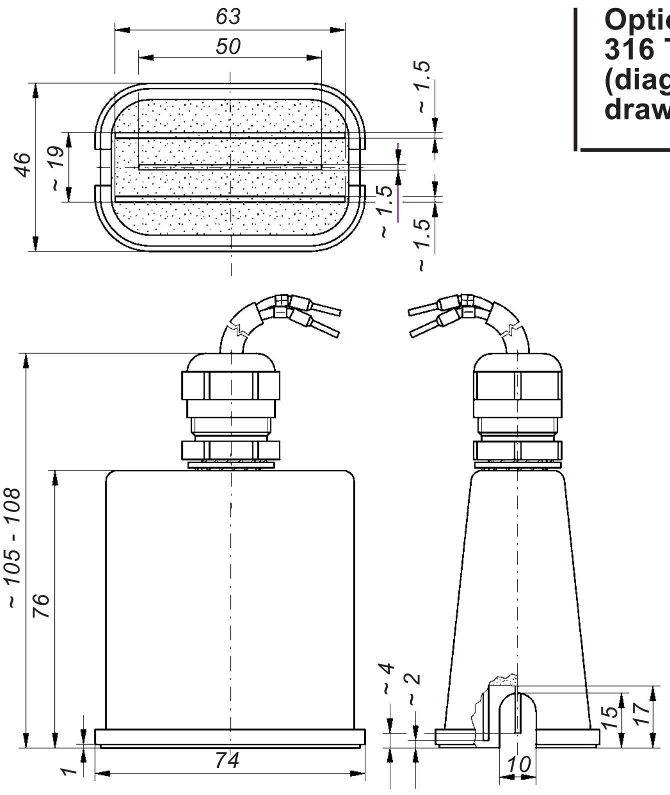


Stand (optional) with these or any other dimensions

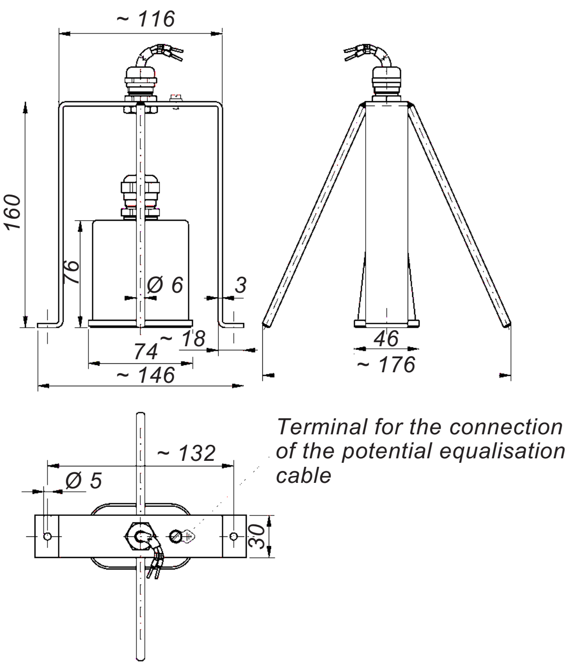
Terminal for the connection of the potential equalisation cable

Capacitive Ex sensors
OWE/Ex-1G (Ex) II 2 G Ex ia IIC T5 Gb
and
OWE/Ex-0G (Ex) II 1 G Ex ia IIC T5 Ga

Technical data	**OWE/Ex-1G (Ex) II 2 G Ex ia IIC T5 Gb**	**OWE/Ex-0G (Ex) II 1 G Ex ia IIC T5 Ga**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 1 or 2	**zone 0, 1 or 2**
	EC type examination certificate INERIS 03ATEX0160	
Housing	antistatic (conductive) PP and cast resin	
Connecting cable	PVC cable, 2X0.75 mm^2, length 5 m, longer cable on request, PTFE cable on request	antistatic PURLF cable (with external conductive PUR sheath), 2X0.75 mm^2, length 5 m, longer cable up to max. 20 m on request
Functional principle	capacitive sensor with gold-plated capacitor plates on epoxy resin backing material	
Self-capacitance	Ci = 220 nF + 200 pF per metre of connecting cable	
Self-inductance	Li = 1.1 mH + 1 µH per metre of connecting cable	
Protection class of the electronics sealed in the housing	IP65	
Response height from bottom edge of housing	≥ 12 mm (depending on the dielectric constant of the liquid)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between sensor and relay	approx. 1,000 m, see Installation, Operating and Maintenance Instructions (sent on request)	
CEM	see page 31-8-7	

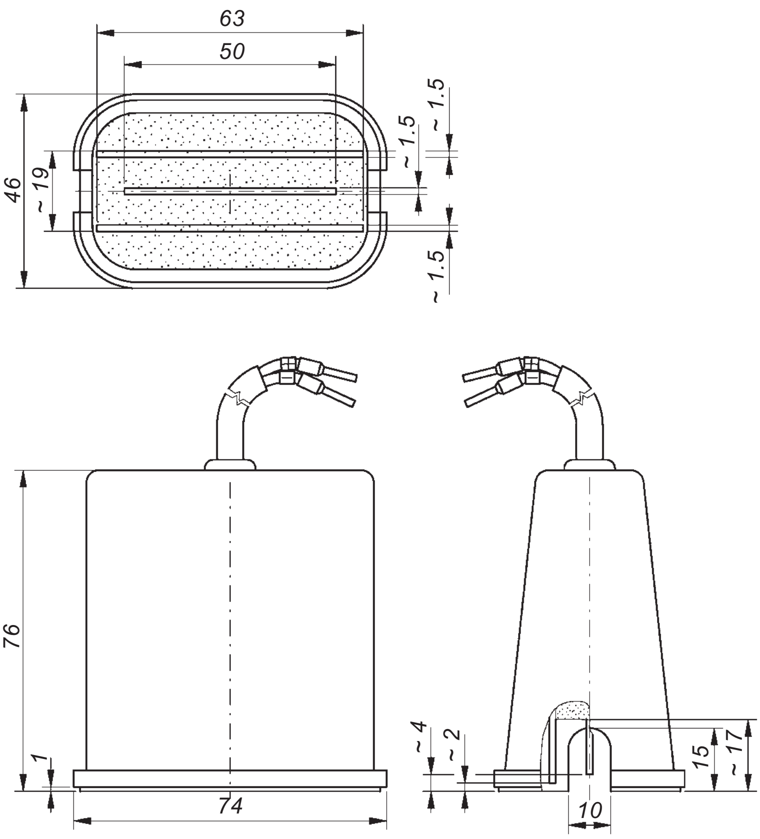


Optional: mounting stand made of stainless steel 316 Ti for OWE/Ex-0G (Ex) or COW/Ex-0G (Ex) (diagrams with smaller scale compared to adjacent drawings)



Capacitive Ex sensor OWE 2/C/NL/Ex-1G II 2 G Ex ia IIB T4 Gb

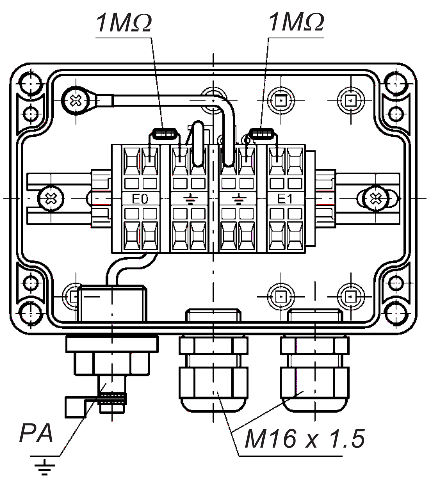
Technical data	OWE 2/C/NL/Ex-1G II 2 G Ex ia IIB T4 Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 or 2 EC type examination certificate INERIS 03ATEX0160**
Housing	PP and cast resin
Connecting cable	PVC cable, 2X0.75 mm², length 5 m, longer cable on request, PTFE cable on request
Functional principle	capacitive sensor with gold-plated capacitor plates on epoxy resin backing material
Self-capacitance	Ci = 80 nF + 200 pF per meter of connecting cable
Self-inductance	Li = 0 + 1 µH per meter of connecting cable
Protection class of the electronics sealed in the housing	IP65
Response height from bottom edge of housing	≥ 12 mm (depending on the dielectric constant of the liquid)
Temperature range	− 20°C to + 60°C
Max. length of connecting cable between sensor and relay	approx. 1,000 m, see Installation, Operating and Maintenance Instructions (sent on request)
CEM	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies
Mounting accessories (option)	mounting stand made of stainless steel 316 Ti (see page 31-8-8)

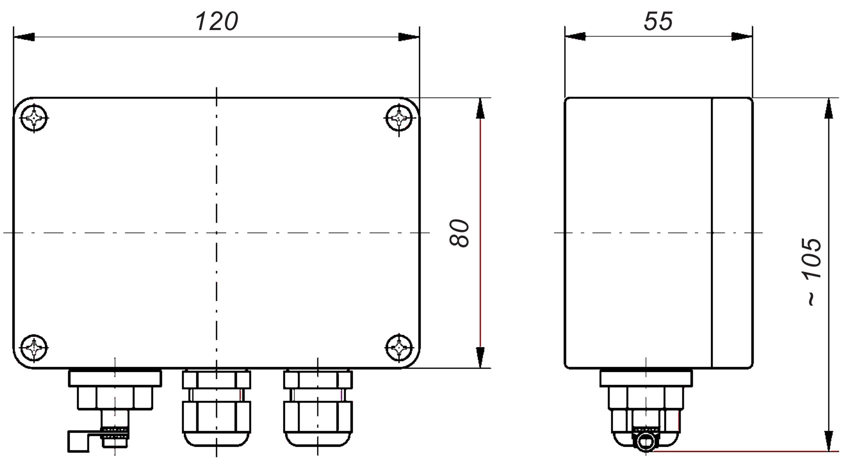


OAK/LMT/2x1MΩ
Ⓔx II 2 G Ex ia IIC T6 Gb
obligatory Ex connection box

Technical data	OAK/LMT/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb
Application	• for integration of a capacitive Ex sensor in the potential equalisation system of the installation • for the connection of the intrinsically safe control circuit of the capacitive Ex relay to the capacitive Ex sensor • for installation in potentially explosive atmospheres in zone 1 or 2 EC type examination certificate INERIS 03ATEX0160
Material	antistatic (conductive) PP
Dimensions	120 x 80 x 55 mm
Cable entries	2 cable entries made of PA
Terminals	4 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes Ø 4 mm
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover





Dimensions in mm

Leckmaster 101/Ex
Ex I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC capacitive Ex relay

• with cable break monitoring feature and switchable self-hold
• for connection <u>of 1</u> capacitive Ex sensor
• with 1 potential-free changeover contact at the output

Capacitive Ex relay for U-bar mounting or surface mounting, with connection terminals on top and with 3 built-in LEDs for signalling the operating statuses.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing <u>outside potentially explosive atmospheres</u> and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

The capacitive Ex relay **Leckmaster 101/Ex**
Ex **I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC** is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

An Ex approved capacitive sensor, such as our capacitive COW/Ex-1G, COW/Ex-0G, OWE/Ex-1G, OWE/Ex-0G or OWE 2/C/NL/Ex-1G sensor, may be used, via an obligatory Ex connection box OAK/LMT/2x1MΩ Ex II 2 G Ex ia IIC T6 Gb, in the intrinsically safe control current circuit.

The different application possibilities and the special conditions for safe use are described in the corresponding Installation, Operating and Maintenance Instructions (sent on request).

Self-hold:

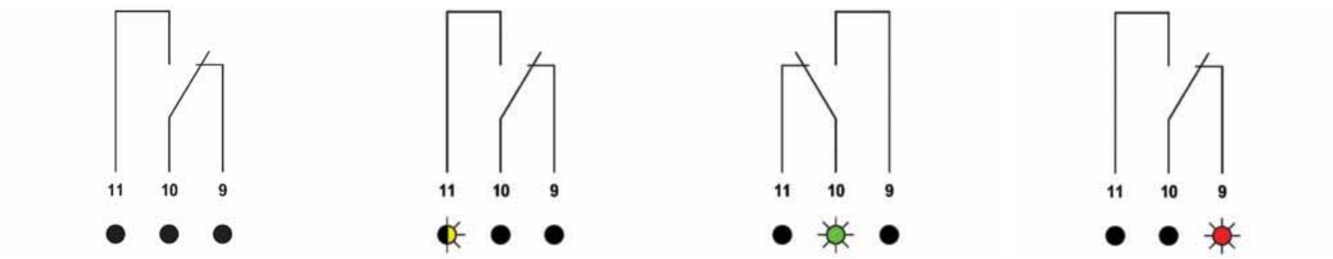
- If the switch **for self-hold is switched on, an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact.The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on, the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Connection diagrams
COW/Ex-.G or OWE/Ex-.G or OWE 2/C/NL/Ex-1G capacitive Ex sensors to a Leckmaster 101/Ex Ex I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC capacitive Ex relay:
see pages 31-8-14 to 31-8-22 and Installation, Operating and Maintenance Instructions (sent on request).

Technical data	Leckmaster 101/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC
Alternative supply voltages (terminals 15 and 16)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 110 V or AC 24 V
Power consumption	approx. 3 VA
Control circuit (terminals 6 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay with switchable self-hold
Sensor connection (in line with EN 50 227):	
No-load voltage	DC 8.4 V (under safety extra low voltage SELV)
Short-circuit current	< 10 mA
Response hysteresis	1.5 mA ⎍ 1.8 mA
Cable break monitoring	I < 0.15 mA
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indicators	3 LEDs (see page 31-8-13)
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46 277 and DIN EN 50 022 or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable between Ex relay and Ex sensor	see Installation, Operating and Maintenance Instructions (sent on request)
EC type examination certificate	INERIS 03ATEX0159
CEM	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Position of the output contact in the Leckmaster 101/Ex relay

Leckmaster 101/Ex without voltage	Cable break	OK status	Leakage



LEDs dark:	**yellow LED flashes:**	**green LED lights:**	**red LED lights:**
Ex relay without voltage,	Ex relay with voltage, cable break in sensor or its connecting cable,	Ex relay with voltage, sensor not energized,	Ex relay with voltage, sensor energized,
output relay not energized	output relay not energized	output relay energized	output relay not energized

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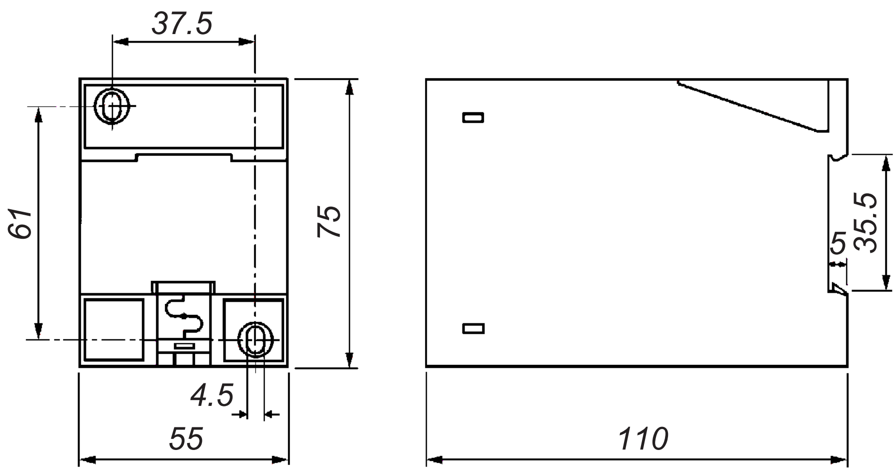
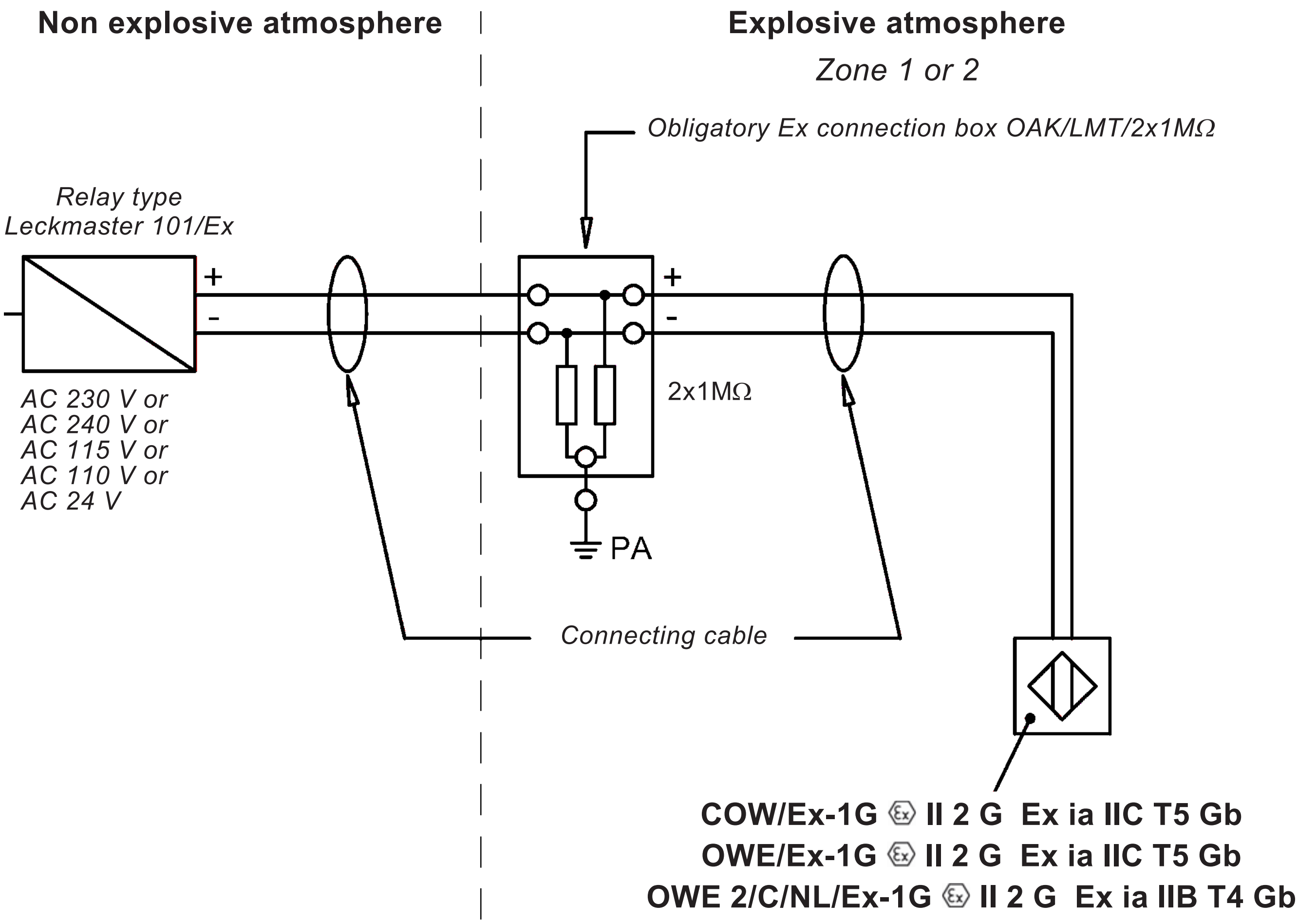
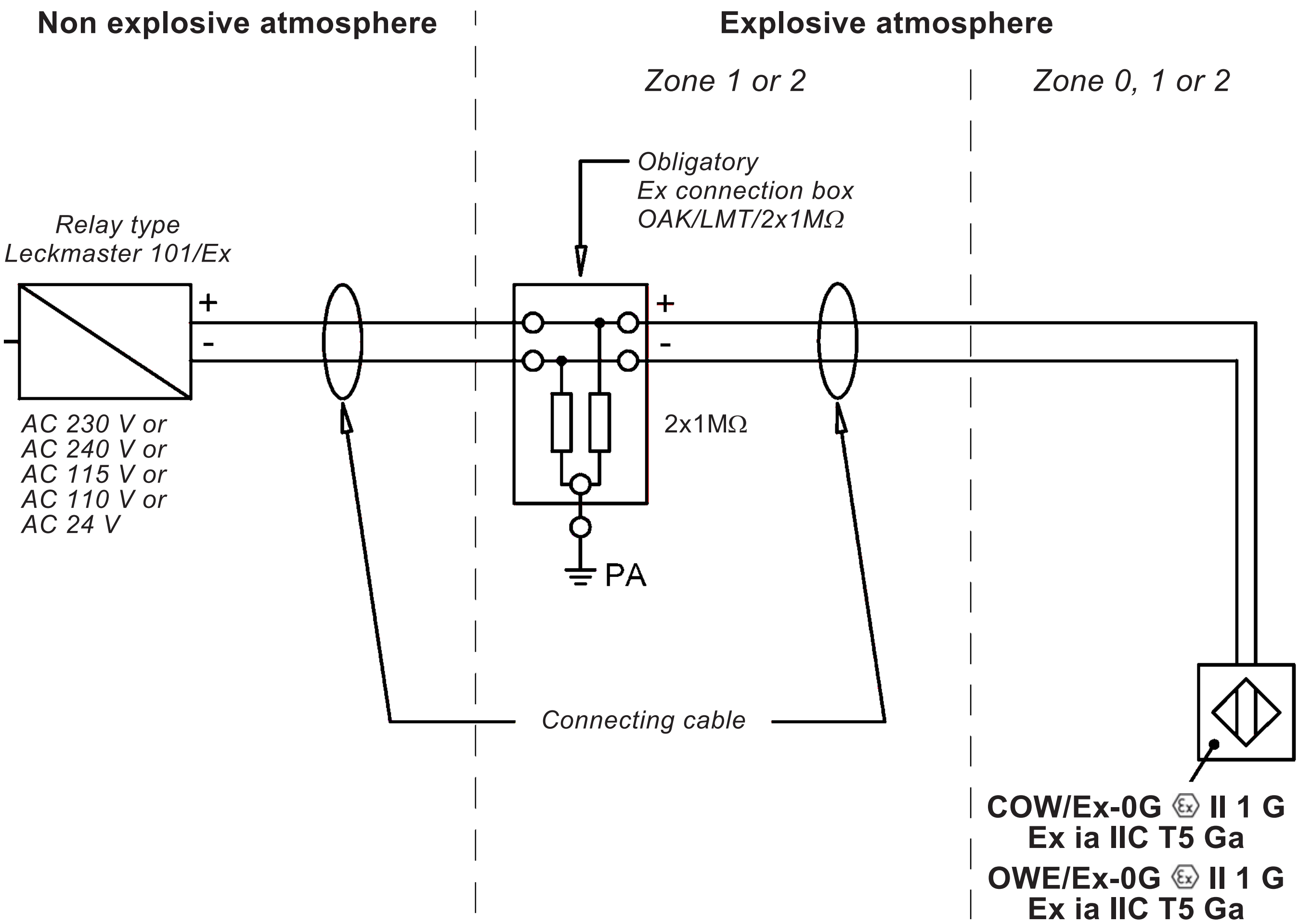
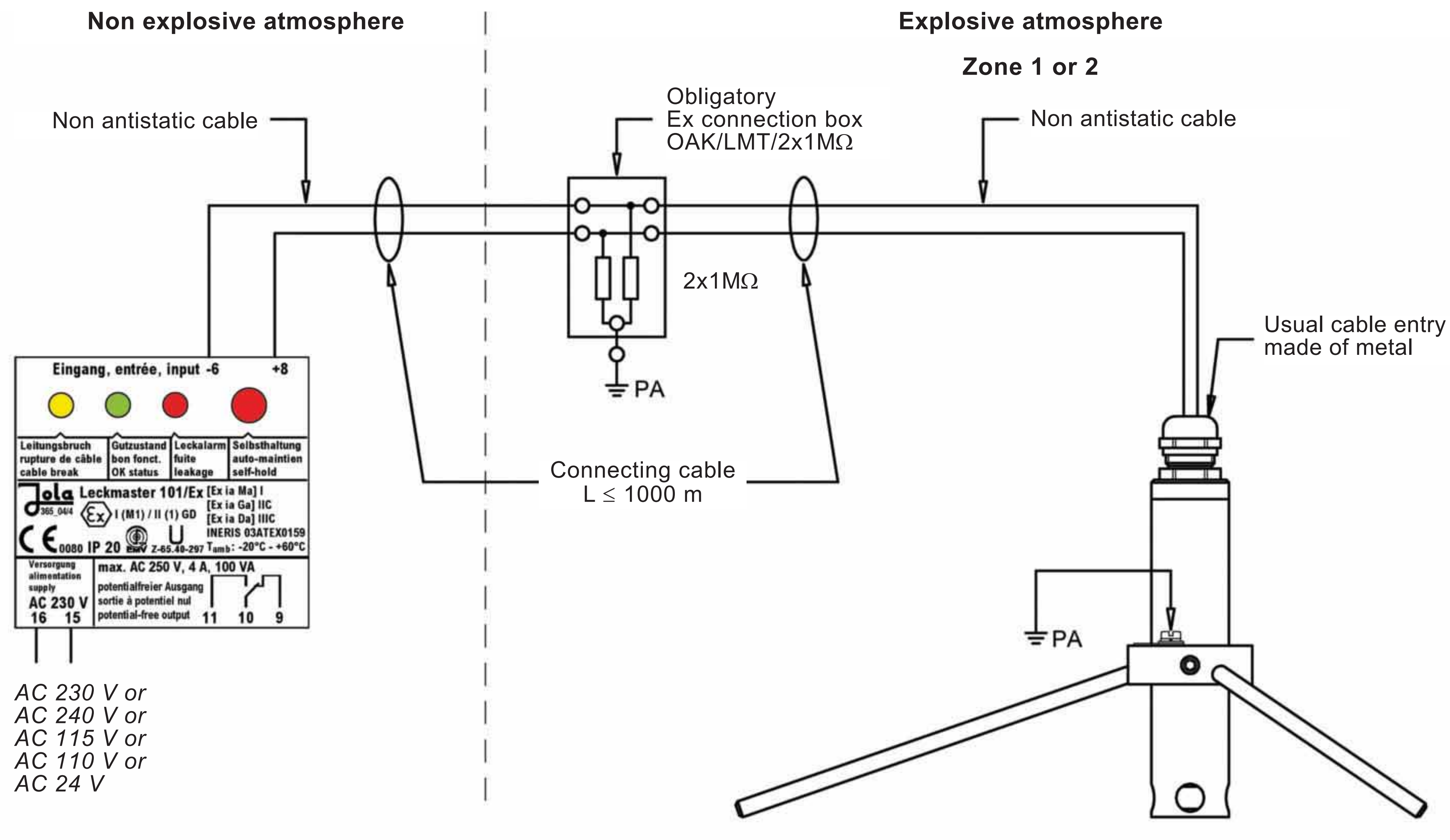
Dimensions Leckmaster 101/Ex



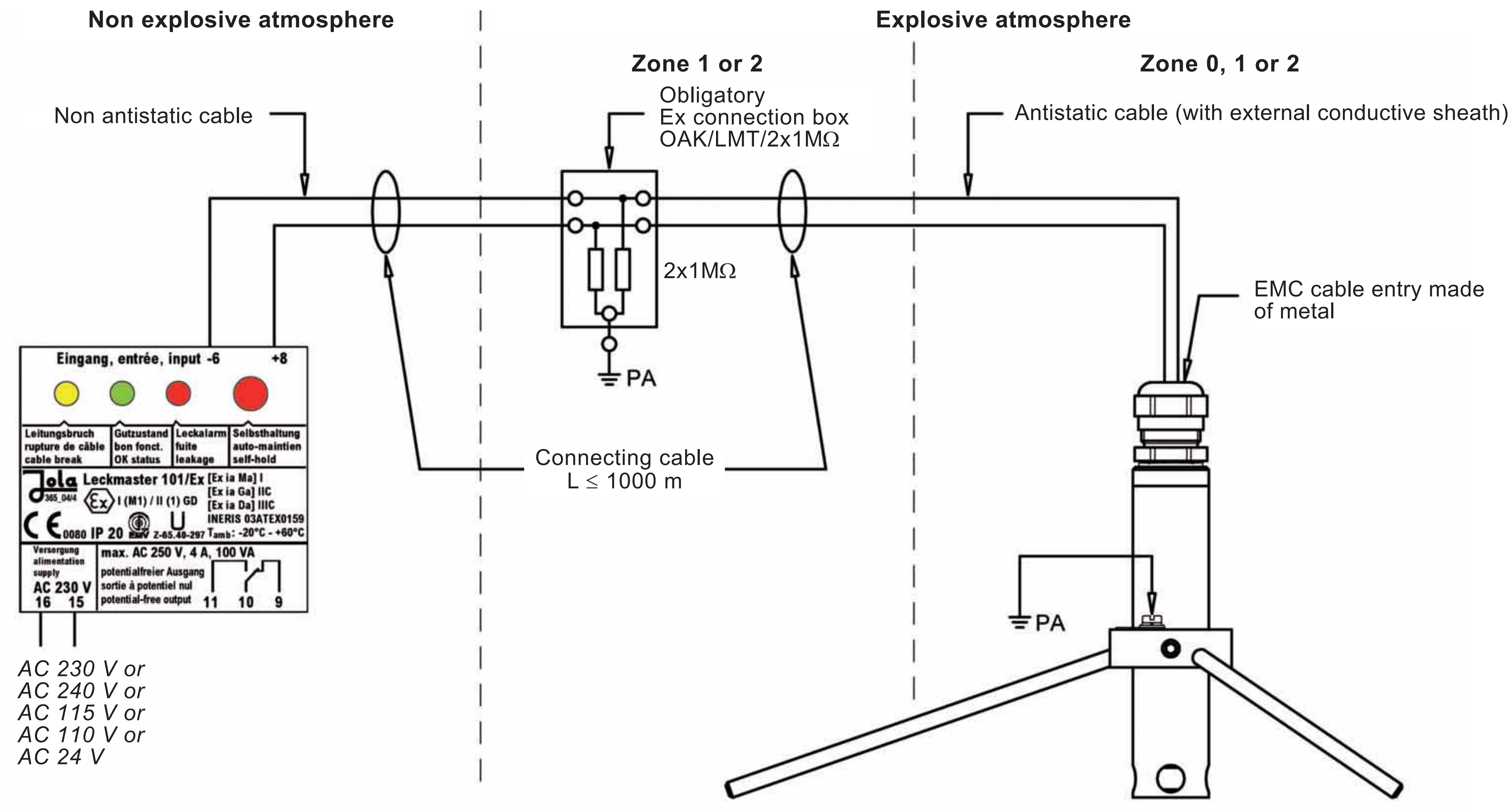
Connection diagrams



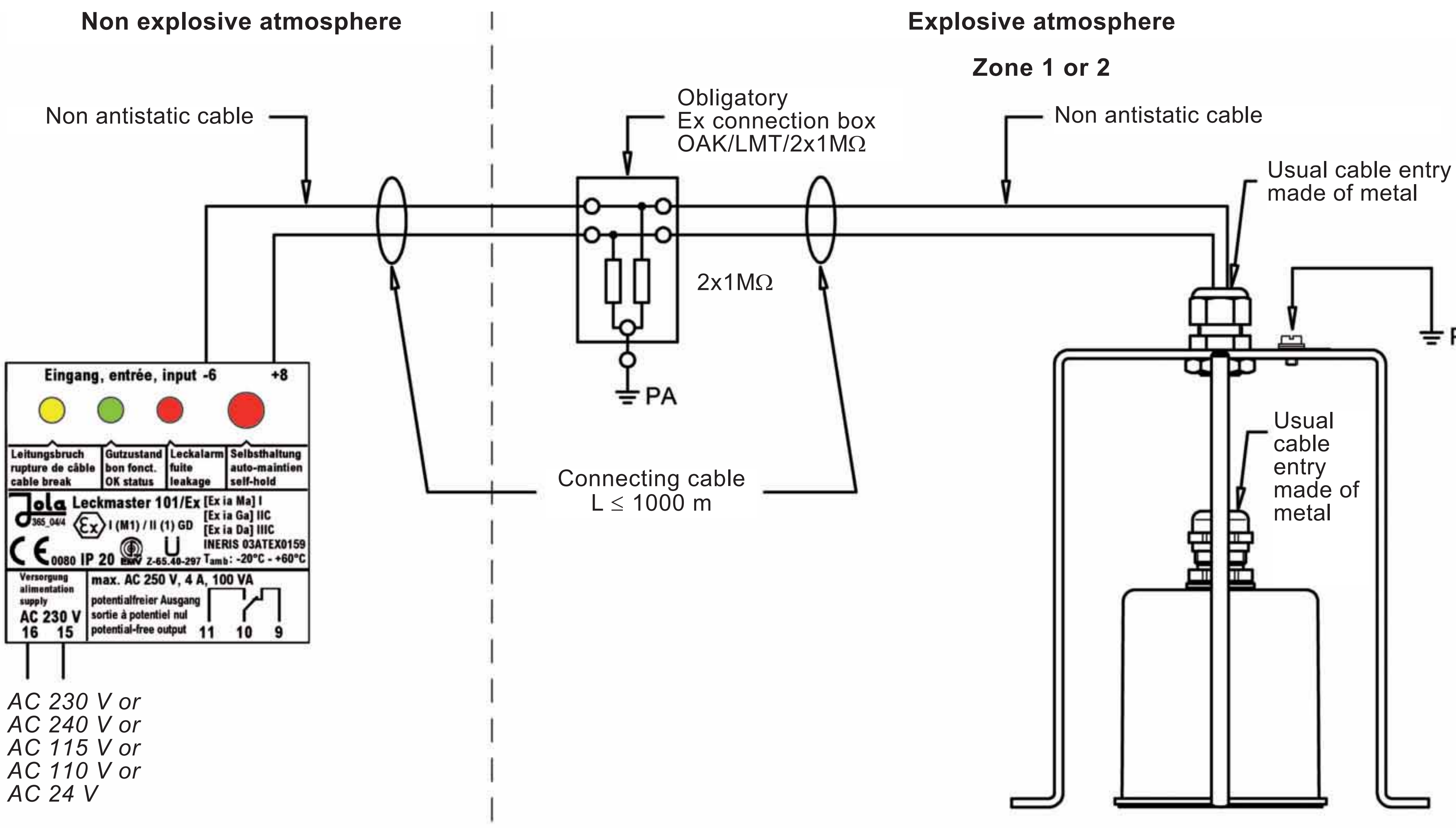




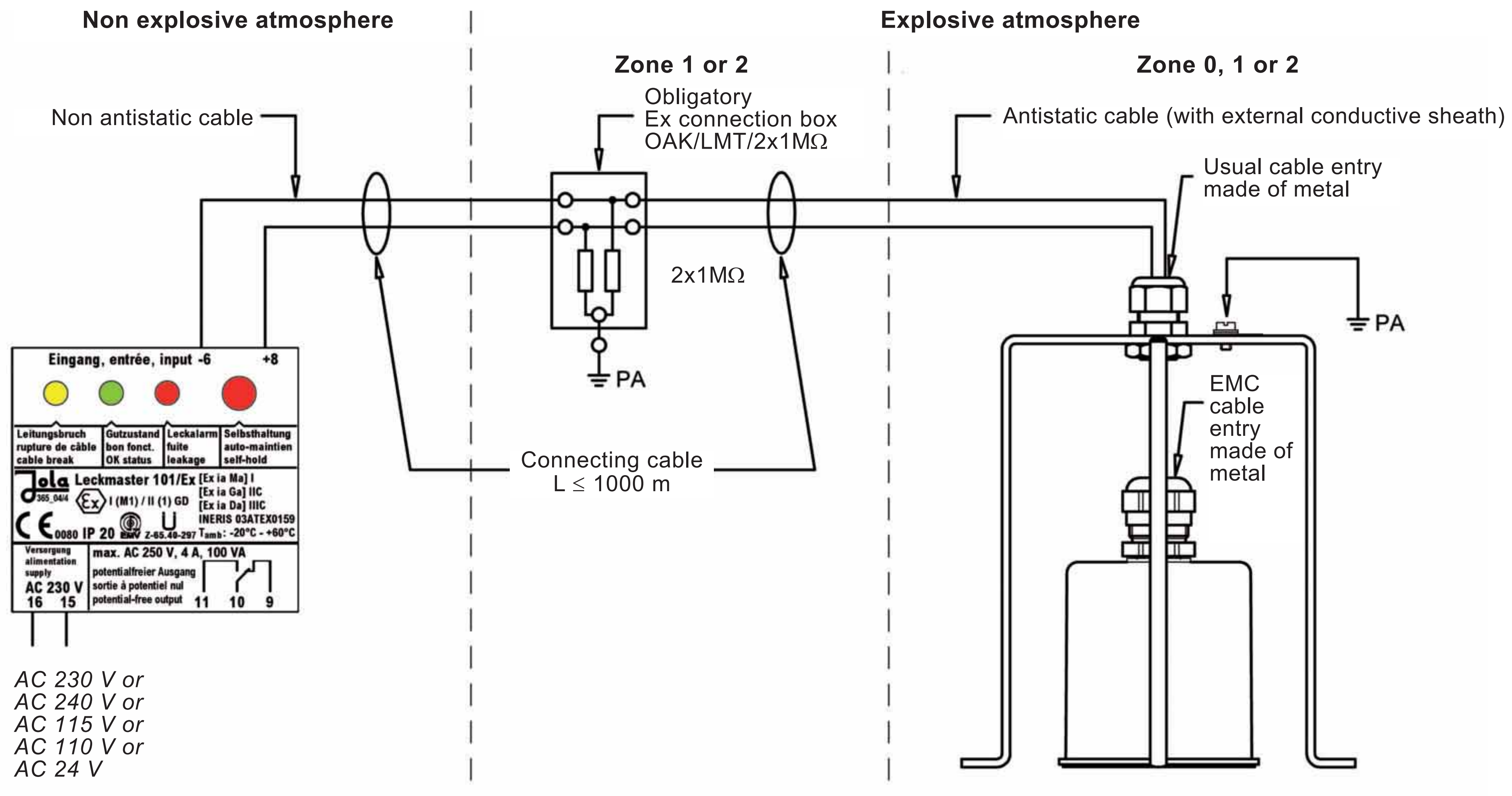
COW/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T5 Gb



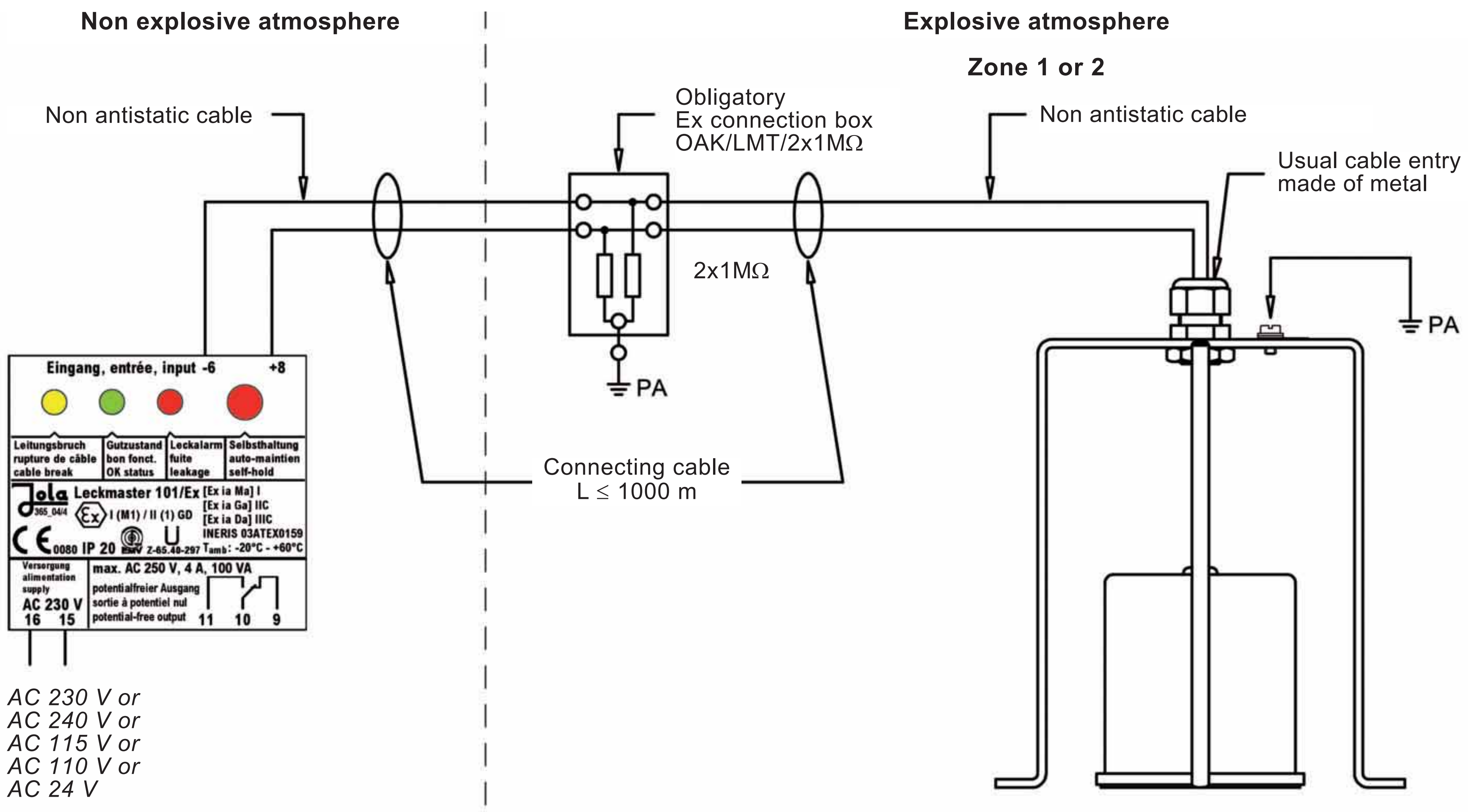
COW/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIC T5 Ga



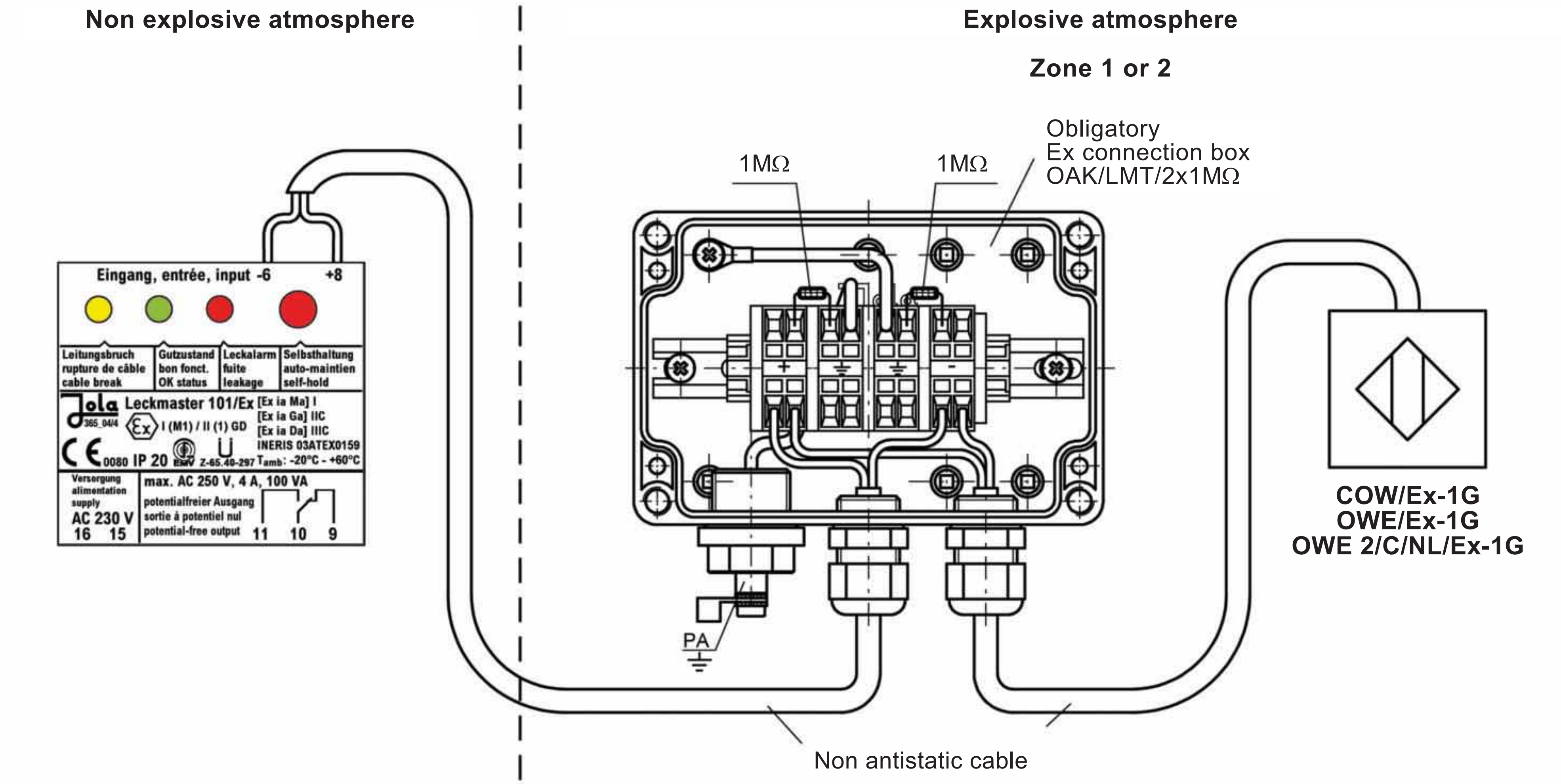
OWE/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T5 Gb

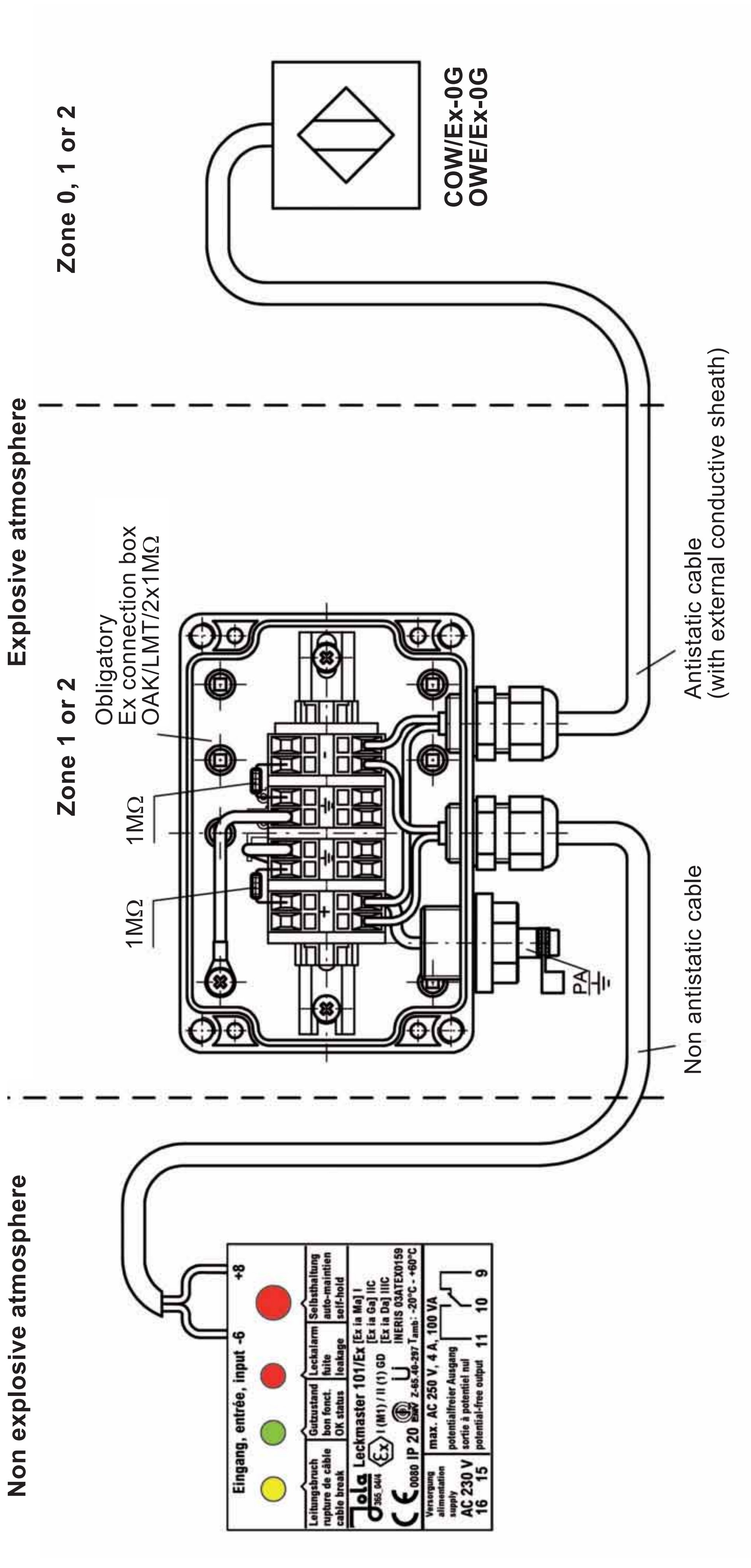


OWE/Ex-0G Ⓔx II 1 G Ex ia IIC T5 Ga



OWE 2/C/NL/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T4 Gb


Non explosive atmosphere
Explosive atmosphere
Zone 1 or 2
Obligatory
Ex connection box
OAK/LMT/2x1MΩ
1MΩ
1MΩ
Eingang, entrée, input -6
+8
Leitungsbruch
rupture de câble
cable break
Gutzustand
bon fonct.
OK status
Leckalarm
fuite
leakage
Selbsthaltung
auto-maintien
self-hold
Leckmaster 101/Ex
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC
[Ex ia Da] IIIC
INERIS 03ATEX0159
0080 IP 20
Z-65.40-297
Tamb: -20°C - +60°C
Versorgung
alimentation
supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9
PA
COW/Ex-1G
OWE/Ex-1G
OWE 2/C/NL/Ex-1G
Non antistatic cable

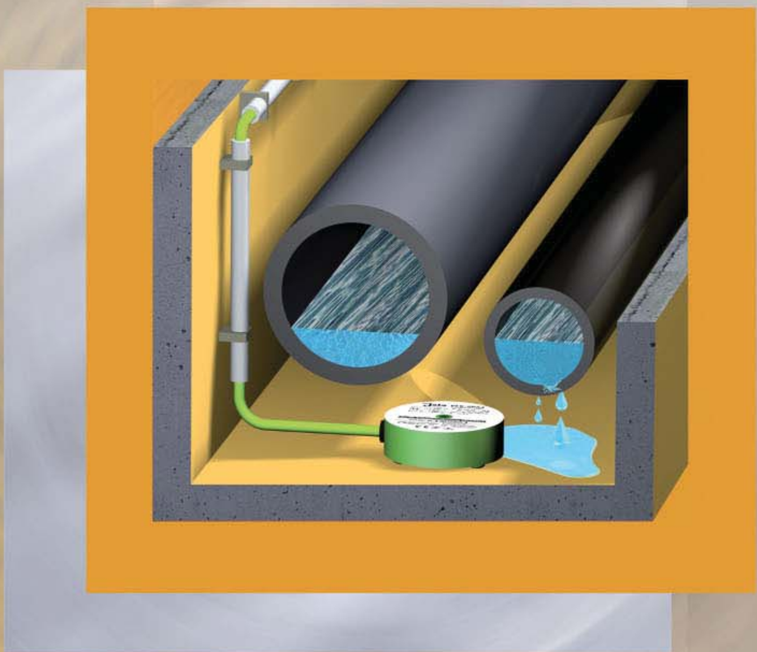


Non explosive atmosphere
Explosive atmosphere
Zone 1 or 2
Zone 0, 1 or 2
COW/Ex-0G
OWE/Ex-0G
Obligatory
Ex connection box
OAK/LMT/2x1MΩ
1MΩ
1MΩ
PA
Antistatic cable
(with external conductive sheath)
Non antistatic cable
Eingang, entrée, input -6
+8
Leitungsbruch
rupture de câble
cable break
Gutzustand
bon fonct.
OK status
Leckalarm
fuite
leakage
Selbsthaltung
auto-maintien
self-hold
Leckmaster 101/Ex
IP 20
INERIS 03ATEX0159
Versorgung
alimentation
supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

Conductive leakage detectors

Leckwatcher range
Liqui-Switch range
L-Pointer range

for connection to a PLC or DDC unit or a NAMUR circuit



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Contents

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Conductive leakage detectors for extra low voltage SELV or PELV

With integrated galvanic separation:

- **avoids interconnection of the electrode circuits**
- **avoids the formation of ground loops if more than one detector is connected to a common supply current circuit.**

Leckwatcher

- **Leakage detectors for connection to:**
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or a network connector
- **with integrated galvanic separation of the sensor electronics**

The detectors are designed in line with the peripheral interface standard for electronic controllers (power supply and binary interfaces).

The compatibility of the detector on the one hand and the PLC, DDC unit, small controller, fieldbus connector or network connector on the other must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

Liqui-Switch

- **Leakage detectors for connection to:**
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or a network connector
- **with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)**
- **with integrated galvanic separation of the sensor electronics**

The compatibility of the detector on the one hand and the actuator, PLC, DDC unit, small controller, fieldbus connector or network connector on the other must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

L-Pointer

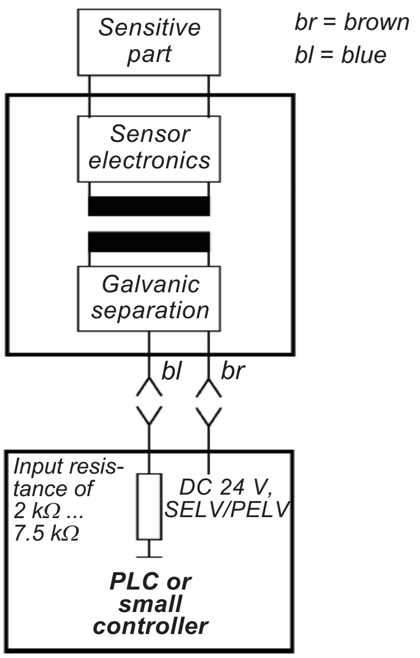
- **Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19 234) with the option of detecting cable break, standby status, alarm status and short-circuit**
- **for connection to:**
  NAMUR isolation amplifier or
  NAMUR fieldbus terminal
- **with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current**

The compatibility of the detector and the peripheral equipment must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

Leckwatcher

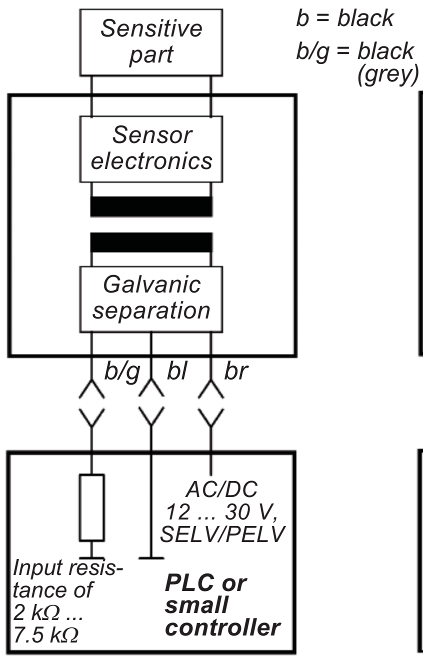
2-wire version: -SPS2	3-wire version: -SPS3 (with PNP transistor output)	4-wire version: -SPS4 (with potential-free reed contact output)
Connection: Only for connection to extra low voltage SELV or PELV!		
2 wires for the supply of direct voltage, fully functional with any polarity and short-circuit proof.	2 wires for the supply of direct or alternating voltage; fully functional with any polarity; 1 wire for the PNP transistor output, reverse polarity protected and short-circuit proof.	2 wires for the supply of direct or alternating voltage; fully functional with any polarity; 2 wires for the potential-free reed contact output.
Power consumption differs depending on whether the detector is in activated or non-activated status.	The PNP transistor output is in a different switching status depending on whether the detector is in activated or non-activated status.	The reed contact is open or closed depending on whether the detector is in activated or non-activated status.
This differential is used to generate the corresponding binary switching signal at the input resistance of the follow-up circuit.	With a Low signal, there is no voltage at the PNP transistor output; with a High signal, the rectified supply voltage is present at the output. This binary switching signal is implemented accordingly at the input resistance of the follow-up circuit.	The reed contact is an NO (make) contact, and its switching status is implemented in the follow-up circuit.
The input resistance must be in the range from 2 kΩ to 7.5 kΩ.	The input resistance must be in the range from 2 kΩ to 7.5 kΩ.	
Series or parallel connection of detectors of this type is not permitted.	Series or parallel connection of detectors of this type is not permitted.	Series or parallel connection of these detectors is possible, also in combination with other potential-free contacts.

Application example



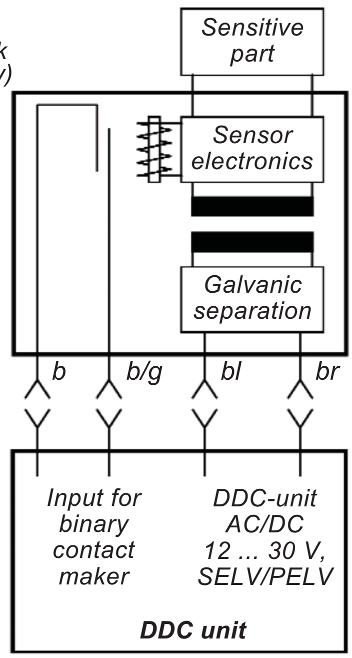
Follow-up circuit

Application example



Follow-up circuit

Application example



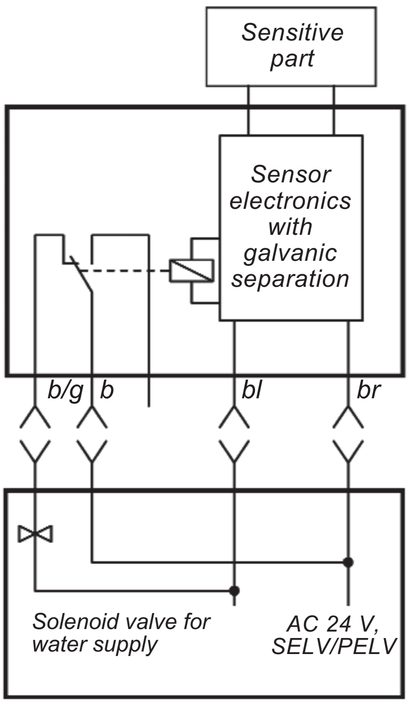
Follow-up circuit

Liqui-Switch

4-wire version with quiescent current contact: -LS4 (standard version)	4-wire version with working current contact: -LS4/A	5-wire version with changeover contact: -LS5
Connection: Only for connection to extra low voltage SELV or PELV!		
2 wires for the supply of direct or alternating voltage, fully functional with any polarity;		
2 wires for the potential-free quiescent current contact which is closed in standby status and open in the event of an alarm (leakage alarm, cable break in the voltage-supply line, failure of the supply voltage).	2 wires for the potential-free working current contact which is open in standby status and closed in the event of an alarm (leakage alarm, cable break in the voltage-supply line, failure of the supply voltage).	3 wires for the potential-free changeover contact. The output relay with the changeover contact is energised in standby status and de-energised in the event of an alarm.
A cable break in the contact loop (quiescent current loop) also activates an alarm.	A cable break in the contact line does not activate an alarm.	

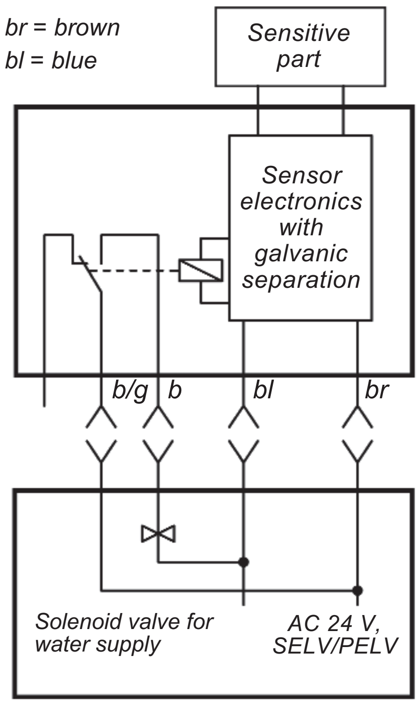
Series or parallel connection of these detectors is possible, also in combination with other potential-free contacts. In such cases, you must observe the relevant technical data and safety regulations.

Application example



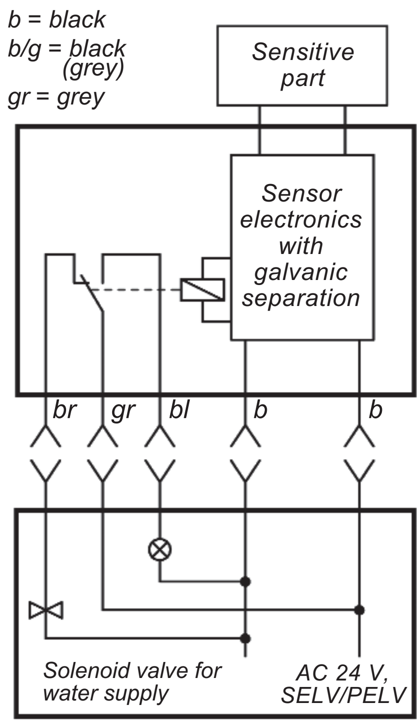
Follow-up circuit

Application example



Follow-up circuit

Application example



Follow-up circuit

Contact shown in standby status.

L-Pointer

2-wire quiescent current version: -KNI (standard version)	2-wire working current version: -KNI/A

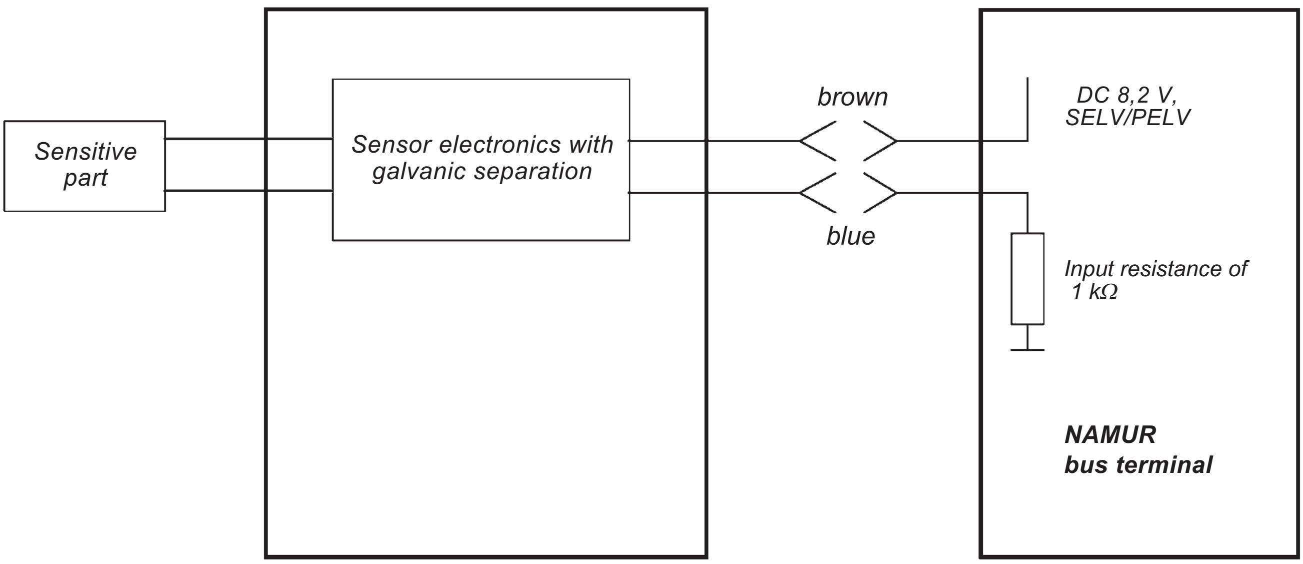
Connection: Only for connection to extra low voltage SELV or PELV!

2 wires for the supply of direct voltage;
functional with correct polarity; short circuit with false polarity

For NAMUR circuit with inverted signal evaluation.	For NAMUR circuit with non-inverted signal evaluation.
The power consumption of the detector serves as a switching signal for the following switching statuses: • No power consumption = cable break • Low power consumption = alarm status (leakage) • High power consumption = standby status • Maximum power consumption = short circuit or false polarity	The power consumption of the detector serves as a switching signal for the following switching statuses: • No power consumption = cable break • Low power consumption = standby status • High power consumption = alarm status (leakage) • Maximum power consumption = short circuit or false polarity
If the signal current is only to be evaluated between two switching statuses, low power consumption means alarm status and high power consumption means standby status.	If the signal current is only to be evaluated between two switching statuses, low power consumption means standby status and high power consumption means alarm status.

Series or parallel connection of detectors of this type is not permitted.

Application example



Follow-up circuit

The conductive measuring principle

The conductive measuring principle is used for the detection of **electrically conductive liquids**. It is not suitable for the detection of electrically non-conductive liquids.

Electrically conductive liquids are generally aqueous solutions of salts, acids or alkalis. The molecules of these substances dissociate in water into positive and negative ions which give the aqueous solution its electrical conductivity. The conductive leakage detector detects the presence of an electrically conductive liquid and an alarm signal is then emitted.

The measurement process uses alternating current to ensure exact response sensitivity and to prevent galvanic processes at the electrodes. The conductive leakage detector has an integrated electronic evaluation unit with galvanically separated circuits. This prevents interconnection of the electrode circuits and the formation of ground loops if more than one of these leakage detectors is connected.

Reliable detection of liquids with poor electrical conductivity such as condensate or demineralised water is ensured by the ex-factory setting for the response sensitivity of the conductive leakage detector.

Application example:
monitoring of a false floor in a server room using a cable electrode as well as a plate electrode in the adjacent room.

Conductive plate electrodes PEK-...

Leckwatcher

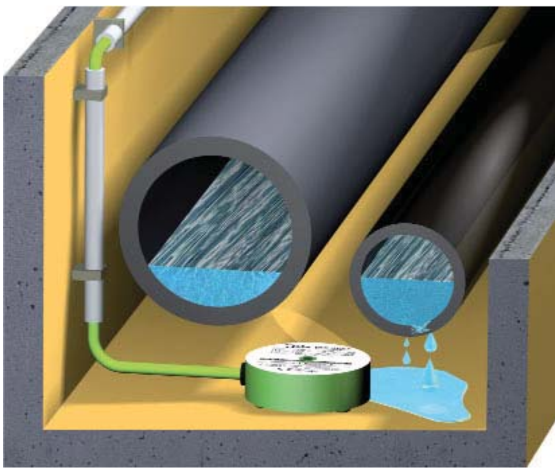
- Leakage detectors for connection to:
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or
  a network connector
- with integrated galvanic separation of the sensor electronics

Liqui-Switch

- Leakage detectors for connection to:
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or
  a network connector
- with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)
- with integrated galvanic separation of the sensor electronics

L-Pointer

- Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit
- for connection to:
  NAMUR isolation amplifier
  or
  NAMUR fieldbus terminal
- with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current



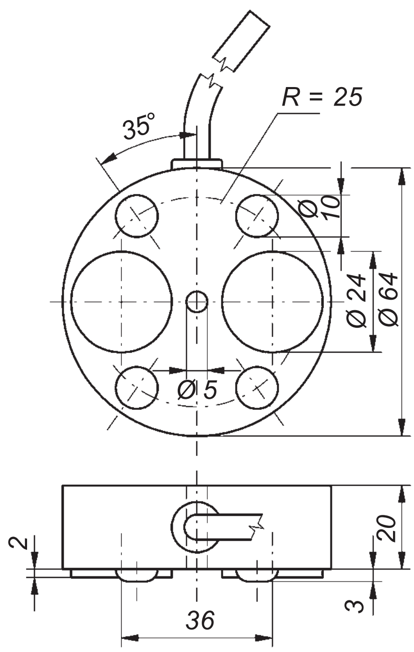
Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive plate electrodes PEK-... should only be used in normally dry environments. They must be installed on the floor in such a way that the sensor side faces downwards and the label side upwards.

The conductive plate electrode PEK-... is fitted with two separate electrodes in the form of two electrode plates: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the two electrode plates, the switching status of the leakage detector changes.

Plate electrode PEK-..., sensor side

Plate electrode PEK-KNI, label side



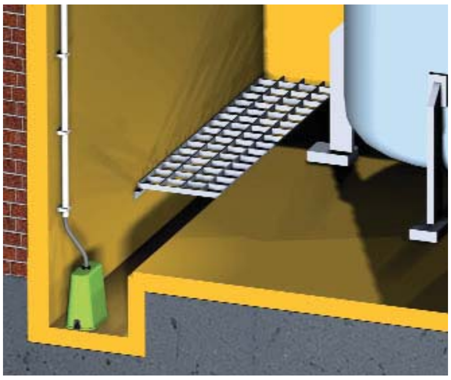
Technical data	PEK-SPS2	PEK-SPS3	PEK-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.		
Housing	PP and cast resin		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode plates	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode plates	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the electrode plates	5 V_{eff} 600 Hz		
Max. short circuit current at the electrode plates	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	PEK-LS4	PEK-LS4/A	PEK-LS5
Design	leakage detector with relay output		
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.		
Housing	PP and cast resin		
Electrical connection	**four-wire connection**	**four-wire connection**	**five-wire connection**
	via connecting cable		
	4 x 0.5	4 x 0.5	5 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
	wire colours: brown and blue	wire colours: brown and blue	wire colours: black and black
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V (extra low voltage SELV or PELV only); AC/DC 1 mA ... 3 (1) A		
	wire colours: black and black (grey)		wire colours: brown, grey a. blue
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Switching status with dry electrode plates	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in pos. 2 (grey and brown)
Switching status with wet electrode plates	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit, supply circuit and output circuit		
Max. no-load voltage at the electrode plates	5 V_{eff} ⎍ 15 kHz (safety extra low voltage SELV)		
Max. short circuit current at the electrode plates	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	PEK-KNI	PEK-KNI/A
Design	leakage detector with evalutation electronics as an initiator for a NAMUR circuit	
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.	
Housing	PP and cast resin	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75; length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	$I < 0.2$ mA	$I < 0.2$ mA
Switching status with wet electrode plates	$I \leq 1$ mA	$I \geq 3$ mA
Switching status with dry electrode plates	$I \geq 3$ mA	$I \leq 1$ mA
Switching status in case of short circuit or false polarity	$I > 6$ mA	$I > 6$ mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit and supply circuit with impressed signal current	
Max. no-load voltage at the electrode plates	5 V_{eff} 15 kHz (safety extra low voltage SELV)	
Max. short circuit current at the electrode plates	0.2 mA	
Response sensitivity	approx. 30 kΩ or approx. 33 μS (conductance)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Conductive plate electrodes WDX-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit
	• with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current



Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive plate electrodes WDX-... should only be used in normally dry environments. They must be installed on the floor in such a way that the sensor side faces downwards and the cable upwards.

The conductive plate electrode WDX-... is fitted with two separate electrodes in the form of two electrode plates: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the two electrode plates, the switching status of the leakage detector changes.

Optional: mounting stand
(diagrams with smaller scale compared to below drawings)

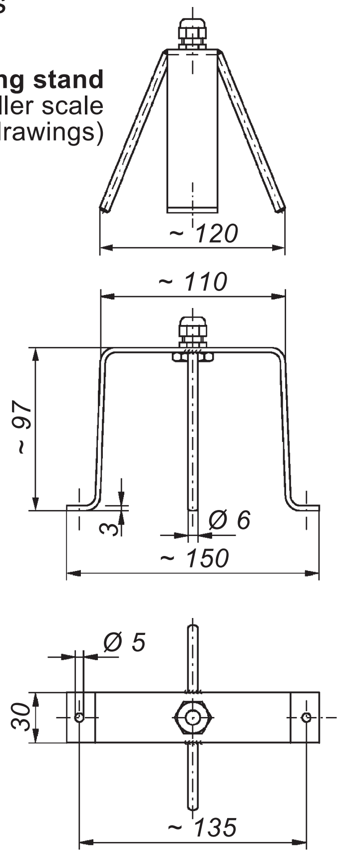
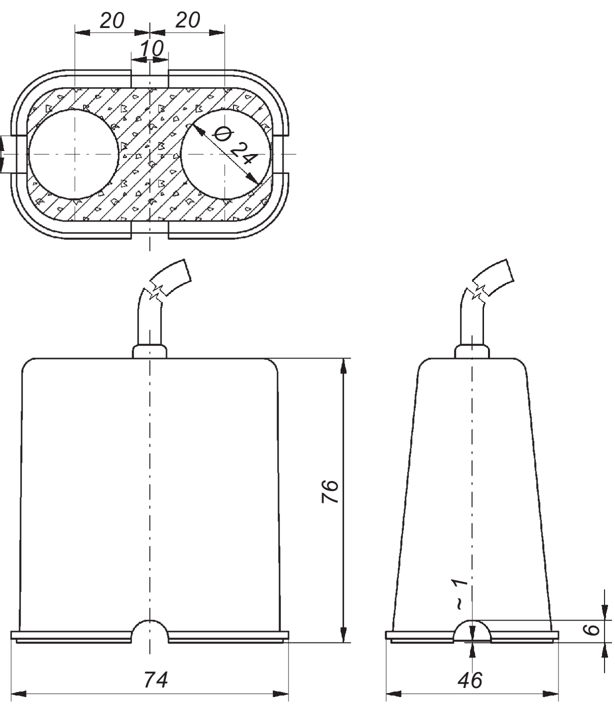


Plate electrode WDX-KNI



Technical data	WDX-SPS2	WDX-SPS3	WDX-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.		
Housing	PP and cast resin		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, $I_k < 30$ mA	at transistor output, $I_k < 30$ mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode plates	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode plates	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the electrode plates	5 V_{eff} 600 Hz		
Max. short circuit current at the electrode plates	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	WDX-LS4	WDX-LS4/A	WDX-LS5
Design	leakage detector with relay output		
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.		
Housing	PP and cast resin		
Electrical connection	**four-wire connection**	**four-wire connection**	**five-wire connection**
	via connecting cable		
	4 x 0.5	4 x 0.5	5 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
	wire colours: brown and blue	wire colours: brown and blue	wire colours: black and black
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V (extra low voltage SELV or PELV only); AC/DC 1 mA ... 3 (1) A		
	wire colours: black and black (grey)		wire colours: brown, grey a. blue
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Switching status with dry electrode plates	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in pos. 2 (grey and brown)
Switching status with wet electrode plates	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit, supply circuit and output circuit		
Max. no-load voltage at the electrode plates	5 V_{eff} 15 kHz (safety extra low voltage SELV)		
Max. short circuit current at the electrode plates	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	WDX-KNI	WDX-KNI/A
Design	leakage detector with evalutation electronics as an initiator for a NAMUR circuit	
Electrode plates	2 plates made of stainless steel 316 Ti, each with 24 mm dia.	
Housing	PP and cast resin	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75; length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	I < 0.2 mA	I < 0.2 mA
Switching status with wet electrode plates	I ≤ 1 mA	I ≥ 3 mA
Switching status with dry electrode plates	I ≥ 3 mA	I ≤ 1 mA
Switching status in case of short circuit or false polarity	I > 6 mA	I > 6 mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode plate circuit and supply circuit with impressed signal current	
Max. no-load voltage at the electrode plates	5 V_{eff} ⊓⊔ 15 kHz (safety extra low voltage SELV)	
Max. short circuit current at the electrode plates	0.2 mA	
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

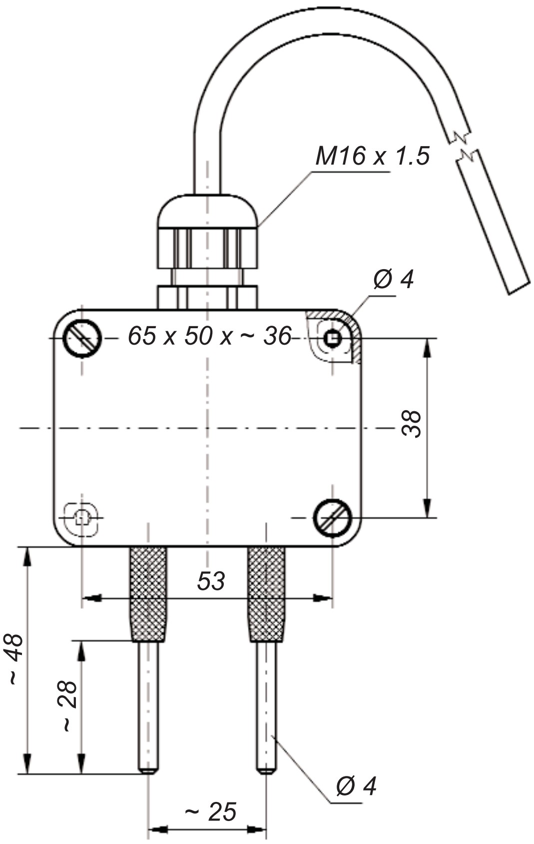
Conductive wall-mounted electrodes WAE1-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current

Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive wall-mounted electrodes WAE1-... should only be used in normally dry environments. They must be mounted on the wall in such a way that the electrode rod tips are just slightly above the floor to be monitored.

The conductive wall-mounted electrode WAE1-... is fitted with two separate electrodes in the form of two electrode rods: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the two electrode rods, the switching status of the leakage detector changes.



Technical data	WAE1-SPS2	WAE1-SPS3	WAE1-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Electrode rods	2 rods made of stainless steel 316 Ti, each with 4 mm dia.		
Housing	PC or PP		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode rods	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode rods	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the electrode rods	5 V_{eff} ⎍ 600 Hz		
Max. short circuit current at the electrode rods	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	WAE1-LS4	WAE1-LS4/A	WAE1-LS5
Design	leakage detector with relay output		
Electrode rods	2 rods made of stainless steel 316 Ti, each with 4 mm dia.		
Housing	PC or PP		
Electrical connection	**four-wire connection**	**four-wire connection**	**five-wire connection**
	via connecting cable		
	4 x 0.5	4 x 0.5	5 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
	wire colours: brown and blue	wire colours: brown and blue	wire colours: black and black
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V (extra low voltage SELV or PELV only); AC/DC 1 mA ... 3 (1) A		
	wire colours: black and black (grey)		wire colours: brown, grey a. blue
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Switching status with dry electrode rods	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in pos. 2 (grey and brown)
Switching status with wet electrode rods	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit, supply circuit and output circuit		
Max. no-load voltage at the electrode rods	5 V_{eff} 15 kHz (safety extra low voltage SELV)		
Max. short circuit current at the electrode rods	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	WAE1-KNI	WAE1-KNI/A
Design	leakage detector with evalutation electronics as an initiator for a NAMUR circuit	
Electrode rods	2 rods made of stainless steel 316 Ti, each with 4 mm dia.	
Housing	PC or PP	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75; length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	$I < 0.2$ mA	$I < 0.2$ mA
Switching status with wet electrode rods	$I \leq 1$ mA	$I \geq 3$ mA
Switching status with dry electrode rods	$I \geq 3$ mA	$I \leq 1$ mA
Switching status in case of short circuit or false polarity	$I > 6$ mA	$I > 6$ mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit and supply circuit with impressed signal current	
Max. no-load voltage at the electrode rods	5 V_{eff} 15 kHz (safety extra low voltage SELV)	
Max. short circuit current at the electrode rods	0.2 mA	
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

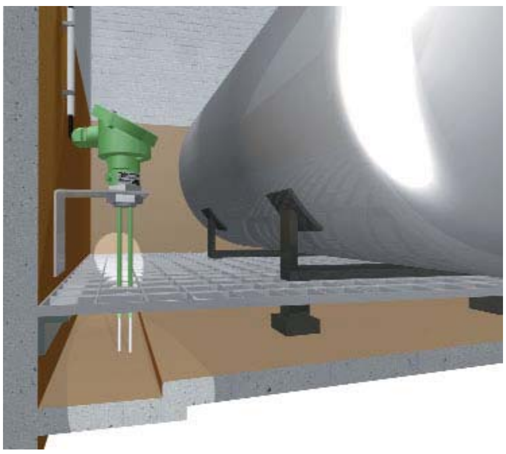
Conductive rod electrodes S 2 M/PP..., S 2 M/PVDF-... and S 2 AM-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current

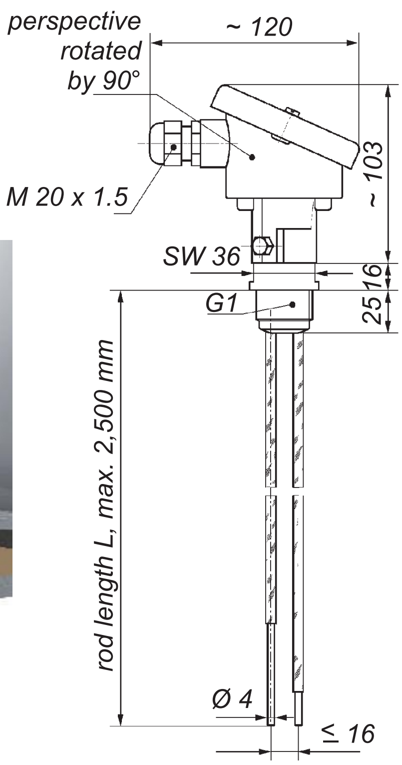
Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive rod electrodes should only be used in normally dry environments. They can be installed from the top or from the side. In both cases, it must be ensured that the electrode rod tips are just slightly above the floor to be monitored.

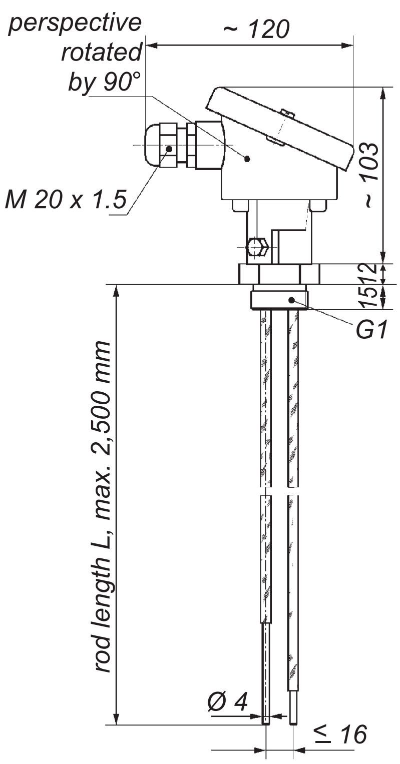
The conductive rod electrodes S 2 M/PP-..., S 2 M/PVDF-... and S 2 AM-... are fitted with two separate electrodes in the form of two electrode rods: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the two electrode rods, the switching status of the leakage detector changes.



S 2 M/PP-...
or **S 2 M/PVDF-...**



S 2 AM-...



Technical data	**S 2 M/PP-SPS2 S 2 M/PVDF-SPS2 S 2 AM-SPS2**	**S 2 M/PP-SPS3 S 2 M/PVDF-SPS3 S 2 AM-SPS3**	**S 2 M/PP-SPS4 S 2 M/PVDF-SPS4 S 2 AM-SPS4**
Design	leakage detector with quiescent current / NC (break) contact		
Electrode rods	2 rods made of stainless steel 316 Ti; other materials (e. g. titanium, Hastelloy, Monel or tantalum) on request; each with 4 mm dia., covered with shrinkdown tubing made of polyolefin (S 2 M/PP-SPS. and S 2 AM-SPS.) or PVDF (S 2 M/PVDF-SPS.)		
Length	on request (measured from nipple sealing surface)		
Max. lengths	2,500 mm		
Screw-in nipple	G1; S 2 M/PP-SPS.: PP; S 2 M/PVDF-SPS.: PVDF; S 2 AM-SPS.: stainless steel 316 Ti, other materials on request		
Electrical connection	**two-wire connection** via 2-pole terminal block for max. 2.5 mm²	**three-wire connection** via 3-pole terminal block for max. 2.5 mm²	**four-wire connection** via 4-pole terminal block for max. 2.5 mm²
	in the PP connection head with cable entry M 20 x 1.5, protection class IP 54		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V	AC/DC 12 ... 30 V
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W;
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode rods	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode rods	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the electrode rods	5 V_{eff} 600 Hz		
Max. short circuit current at the electrode rods	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	S 2 M/PP-LS4 S 2 M/PVDF-LS4 S 2 AM-LS4	S 2 M/PP-LS4/A S 2 M/PVDF-LS4/A S 2 AM-LS4/A	S 2 M/PP-LS5 S 2 M/PVDF-LS5 S 2 AM-LS5
Design	leakage detector with relay output		
Electrode rods	2 rods made of stainless steel 316 Ti; other materials (e. g. titanium, Hastelloy, Monel or tantalum) on request; each with 4 mm dia., covered with shrinkdown tubing made of polyolefin (S 2 M/PP-LS... and S 2 AM-LS...) or PVDF (S 2 M/PVDF-LS...)		
Length	on request (measured from nipple sealing surface)		
Max. lengths	2,500 mm		
Screw-in nipple	G1; S 2 M/PP-LS...: PP; S 2 M/PVDF-LS...: PVDF; S 2 AM-LS...: stainless steel 316 Ti, other materials on request		
Electrical connection	**four-wire connection** via 4-pole terminal block		**five-wire connection** via 5-pole terminal block
	for max. 2.5 mm² in the PP connection head with cable entry M 20 x 1.5, protection class IP 54		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V (extra low voltage SELV or PELV only); AC/DC 1 mA ... 3 (1) A		
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in position 1
Switching status with dry electrode rods	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in position 2
Switching status with wet electrode rods	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in position 1
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit, supply circuit and output circuit		
Max. no-load voltage at the electrode rods	$5\ V_{eff}$ 15 kHz (safety extra low voltage SELV)		
Max. short circuit current at the electrode rods	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	S 2 M/PP-KNI S 2 M/PVDF-KNI S 2 AM-KNI	S 2 M/PP-KNI/A S 2 M/PVDF-KNI/A S 2 AM-KNI/A
Design	leakage detector with evaluation electronics as an initiator for a NAMUR circuit	
Electrode rods	2 rods made of stainless steel 316 Ti; other materials (e.g. titanium, Hastelloy, Monel or tantalum) on request; each with 4 mm dia., covered with shrinkdown tubing made of polyolefin (S 2 M/PP-KNI... and S 2 AM-KNI...) or PVDF S 2 M/PVDF-KNI...)	
Length	on request (measured from nipple sealing surface)	
Max. length	2,500 mm	
Screw-in nipple	G1; S 2 M/PP-KNI...: PP; S 2 M/PVDF-KNI...: PVDF; S 2 AM-KNI...: stainless steel 316 Ti, other materials on request	
Electrical connection	**two-wire connection** via 2-pole terminal block for max. 2,5 mm² in the PP connection head with cable entry M 20 x 1.5, protection class IP 54	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	I < 0.2 mA	I < 0.2 mA
Switching status with wet electrode rods	I ≤ 1 mA	I ≥ 3 mA
Switching status dry electrode rods	I ≥ 3 mA	I ≤ 1 mA
Switching status in case of short circuit or false polarity	I > 6 mA	I > 6 mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit and supply circuit with impressed signal current	
Max. no-load voltage at the electrode rods	5 V_{eff} 15 kHz (safety extra low voltage SELV)	
Max. short circuit current at the electrode rods	0.2 mA	
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Conductive suspension electrodes EHE-... and EHW3-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current

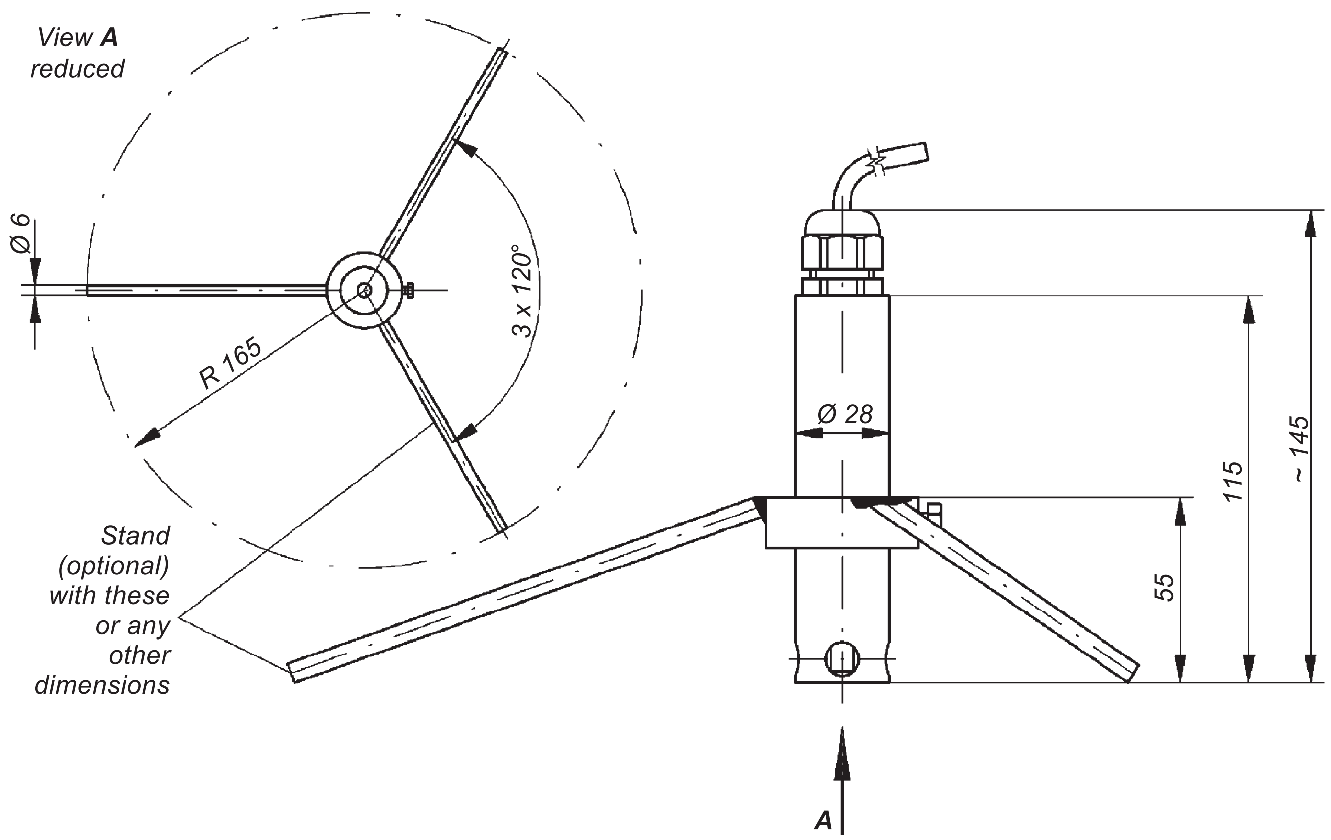
Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive suspension electrodes EHE-... and EHW-... should only be used in normally dry environments. They must be mounted in suspended mode from above (or in the case of the type EHE-... in an upright position using a mounting stand) in such a way that the sensor electrodes are just slightly above the floor to be monitored.

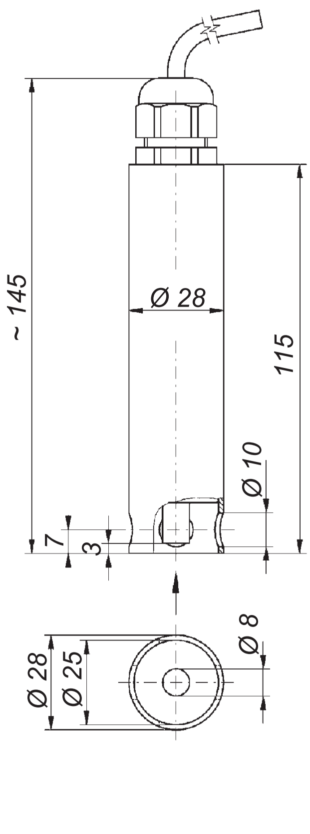
In the conductive suspension electrode EHE-..., the metal housing and a concentrically positioned electrode rod in the housing form an electrode pair; the conductive suspension electrode EHW3-... is fitted with two separate electrodes in the form of two electrode rods: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the control electrode and the earth electrode, the switching status of the leakage detector changes.

EHE-SPS. with mounting stand

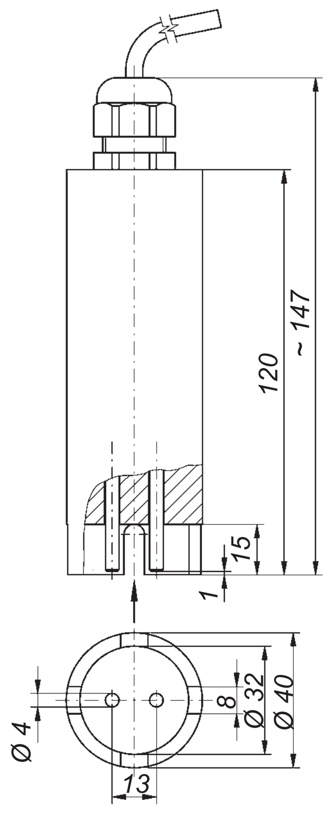
EHW3-SPS.



EHE-... with mounting stand



EHE-...



EHW3-...

Technical data	EHE-SPS2	EHE-SPS3	EHE-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Electrode rod	stainless steel 316 Ti, with 8 mm dia.		
Housing	stainless steel 316 Ti and PTFE		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode rod + housing	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode rod + housing	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod + housing circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at electrode rod + housing	5 V_{eff} 600 Hz		
Max. short circuit current at electrode rod + housing	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	EHW3-SPS2	EHW3-SPS3	EHW3-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Electrode rods	2 rods made of stainless steel 316 Ti, each with 4 mm dia., other materials (e. g. titanium, Hastelloy, Monel or tantalum) on request		
Housing	PP; other materials (e. g. PVC, PVDF or PTFE) on request		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; connecting cable made of CM or PTFE on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry electrode rods	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet electrode rods	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode rod circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the electrode rods	5 V_{eff} 600 Hz		
Max. short circuit current at the electrodes rods	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	EHE-LS4 EHW3-LS4	EHE-LS4/A EHW3-LS4/A	EHE-LS5 EHW3-LS5
Design	leakage detector with relay output		
Electrode pair	**EHE-...:** 1 rod made of stainless steel 316 Ti, with 8 mm dia., and a housing made of stainless steel 316 Ti **EHW3-...:** 2 rods made of stainless steel 316 Ti, other materials (e. g. titanium, Hastelloy, Monel or tantalum) on request		
Housing	**EHE-...:** stainless steel 316 Ti and PTFE **EHW3-...:** PP, other materials (e. g. PVDF or PTFE) on request		
Electrical connection	**four-wire connection**	**four-wire connection**	**five-wire connection**
	via connecting cable		
	4 x 0.5	4 x 0.5	5 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
	wire colours: brown and blue	wire colours: brown and blue	wire colours: black and black
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V (extra low voltage SELV or PELV only); AC/DC 1 mA ... 3 (1) A		
	wire colours: black and black (grey)		wire colours: brown, grey a. blue
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Switching status with dry electrode pair	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in pos. 2 (grey and brown)
Switching status with wet electrode pair	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode pair circuit, supply circuit and output circuit		
Max. no-load voltage at the electrode pair	5 V_{eff} 15 kHz (safety extra low voltage SELV)		
Max. short circuit current at the electrode pair	0.2 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	EHE-KNI EHW3-KNI	EHE-KNI/A EHW3-KNI/A
Design	leakage detector with evalutation electronics as an initiator for a NAMUR circuit	
Electrode pair	**EHE-...:** 1 rod made of stainless steel 316 Ti, with 8 mm dia., and a housing made of stainless steel 316 Ti **EHW3-...:** 2 rods made of stainless steel 316 Ti, other materials (e. g. titanium, Hastelloy, Monel or tantalum) on request	
Housing	**EHE-...:** stainless steel 316 Ti and PTFE **EHW3-...:** PP, other materials (e. g. PVDF or PTFE) on request	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75; length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	I < 0.2 mA	I < 0.2 mA
Switching status with wet electrode pair	I ≤ 1 mA	I ≥ 3 mA
Switching status with dry electrode pair	I ≥ 3 mA	I ≤ 1 mA
Switching status in case of short circuit or false polarity	I > 6 mA	I > 6 mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between electrode pair circuit and supply circuit with impressed signal current	
Max. no-load voltage at the electrode pair	5 V_{eff} 15 kHz (safety extra low voltage SELV)	
Max. short circuit current at the electrode pair	0.2 mA	
Response sensitivity	approx. 30 kΩ or approx. 33 μS (conductance)	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Conductive cable electrodes KE-SPS.

Leckwatcher
- Leakage detectors for connection to:
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or
  a network connector
- with integrated galvanic separation of the sensor electronics

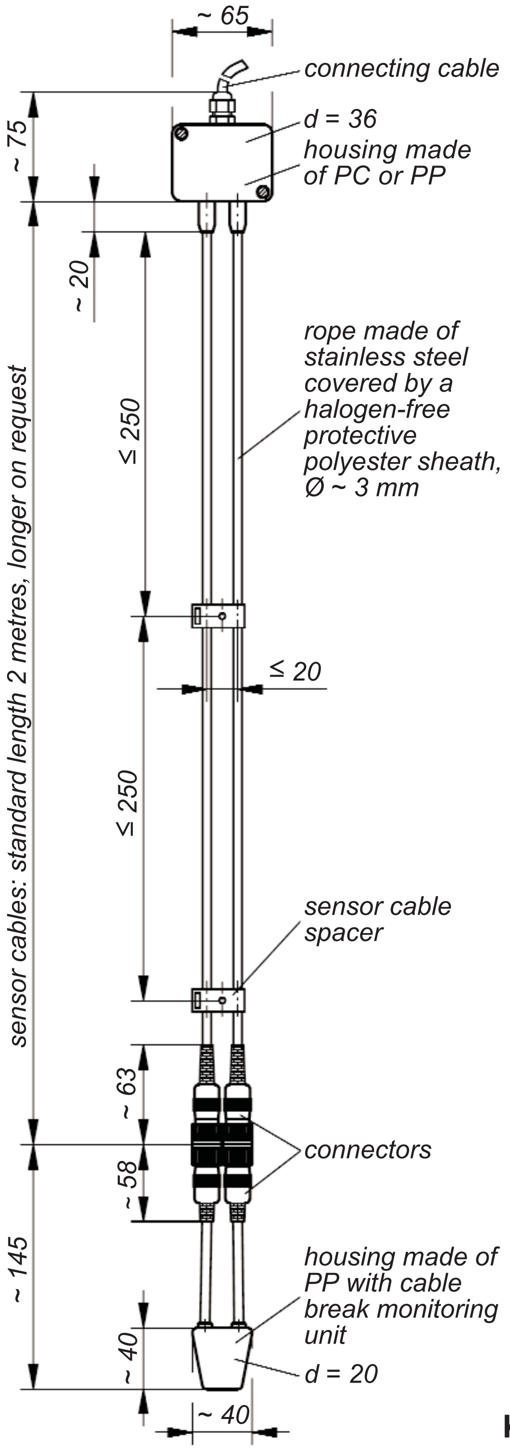
Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive cable electrodes KE-SPS. should only be used in normally dry environments. They can be used on floors, false ceilings, alongside pipes or in double-pipe systems. They should be installed at the lowest point of the potential hazard area which they are intended to monitor.

The conductive cable electrodes KE-SPS. are fitted with two separate electrodes in the form of two sensor cables: 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the two sensor cables, the switching status of the leakage detector changes.

Each of the two sensor cables consists of a stainless steel rope core and a protective sheath made of polyester. This protective sheath is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid false alarms, whilst allowing leakage liquid to penetrate throught to the stainless steel ropes.

The two sensor cables of the cable electrode must be mounted parallel to one another at a distance ≤ 2 cm using the sensor cable spacers, as a greater or lesser spacing affects the response level of the system in the event of leakage.



KE-SPS.

Technical data	KE-SPS2	KE-SPS3	KE-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Sensor cables	2 ropes made of stainless steel 316 Ti, each with 3 mm dia., each covered by a halogen-free protective polyester sheath; length: 2 m each, longer on request		
Max. length of sensor cables when laid in a relatively straight line	**100 metres; if the sensor cables are wound around a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying**		
Electrode head	PC or PP		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry sensor cables	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet sensor cables	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of sensor cables	via cable break monitoring unit Z-4V7 at the end of the sensor cables		
Switching status with break in sensor cables line	power consumption < 0,7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between sensor cable circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the sensor cables	10 V_{eff} 60 Hz		
Max. short circuit current at the sensor cables	0.1 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	see page 32-1-26		

Conductive tape electrodes BAE-SPS.

Leckwatcher

- Leakage detectors for connection to:
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or
  a network connector
- with integrated galvanic separation of the sensor electronics

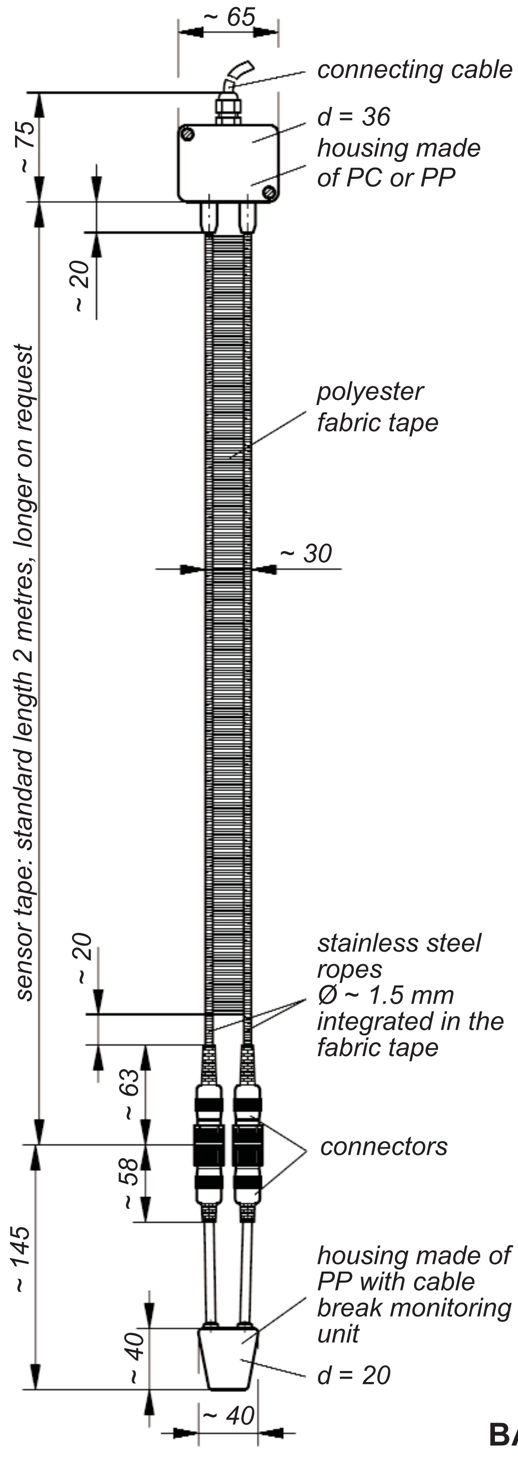
Designed to signal the presence of a **conductive liquid** caused, for example by burst pipes.

Conductive tape electrodes BAE-SPS. should only be used in normally dry environments. They can be used on floors, false ceilings, alongside pipes or in double-pipe systems. They should be installed at the lowest point of the potential hazard area which they are intended to monitor.

The conductive BAE-SPS. tape electrodes are fitted with two separate electrodes in the form of two stainless steel ropes: 1 control electrode and 1 earth electrode. As soon as a trace of a conductive liquid creates a conductive path between the two stainless steel ropes, the switching status of the leakage detector changes.

In contrast to the cable electrodes on the previous pages, the tape electrodes are **not fitted with** two **separate** sensor cables. The two stainless steel ropes are integrated in a halogen-free polyester fabric tape which ensures that the spacing between them remains constant. This polyester fabric tape is designed to prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel tub, steel pipe etc.) and thus to avoid false alarms, whilst allowing leakage liquid to penetrate through to the stainless steel ropes.

To avoid false alarms, it is essential that the surroundings of the tape electrodes are absolutely dry under normal circumstances, as the tape electrodes have the ability to bind moisture (including high levels of air humidity), and this can lead to false alarms in environments that are not absolutely dry, particularly with long tape electrodes.



BAE-SPS.

Technical data	BAE-SPS2	BAE-SPS3	BAE-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Sensor tape	2 ropes made of stainless steel 316 Ti or 316, each with 1.5 mm dia., woven into a halogen-free approx. 30 mm-wide polyester fabric tape at a spacing of approx. 24-25 mm; length: 2 m, longer on request		
Max. length of sensor tape when laid in a relatively straight line	**30 metres; if the sensor tape is wound around a pipe or tank, the possible length may be considerably shorter depending on the type and method of laying**		
Electrode head	PC or PP		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 2 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, Ik < 30 mA	at transistor output, Ik < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status with dry sensor tape ropes	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status with wet sensor tape ropes	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of sensor tape ropes	via cable break monitoring unit Z-4V7 at the end of the sensor tape ropes		
Switching status with break in sensor tape ropes line	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between sensor tape rope circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the sensor tape ropes	10 V_{eff} 60 Hz		
Max. short circuit current at the sensor tape ropes	0.1 mA		
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance)		
Temperature range	− 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	see page 32-1-26		

Conductive carpet electrodes TE-SPS.
Conductive sleeve electrodes MAE 6-SPS.

Leckwatcher
- Leakage detectors for connection to:
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or
  a network connector
- with integrated galvanic separation of the sensor electronics

Designed to signal the presence of a **conductive liquid** caused, for example, by burst pipes.

Conductive carpet electrodes are designed for use in normally dry rooms. They can be installed on floors or in collection tanks.

Each TE-SPS. carpet electrode is made up of 88 individual electrodes - 44 of which are connected as control electrodes and the other 44 as earth electrodes. An earth electrode is positioned next to a control electrode, which is in turn next to an earth electrode and so on. The spacing between two stainless steel ropes is approx. 10 mm. The carpet electrode is of fabric design to ensure a gap between the stainless steel ropes and therefore to prevent contact between a control and an earth electrode activating an alarm without any leakage being present. The aforementioned stainless steel ropes from the warp, while the weft consists of insulating plastic threads that are also woven in a matrix of approx. 10 mm.

As soon as an electrically conductive liquid creates a connection between two adjacent stainless steel ropes of the carpet electrode, the switching status of the leakage detector changes.

Technical data:
see BAE-SPS.

Conductive sleeve electrodes should only be used in normally dry environments. They can be wrapped fully around pipes or small tanks.

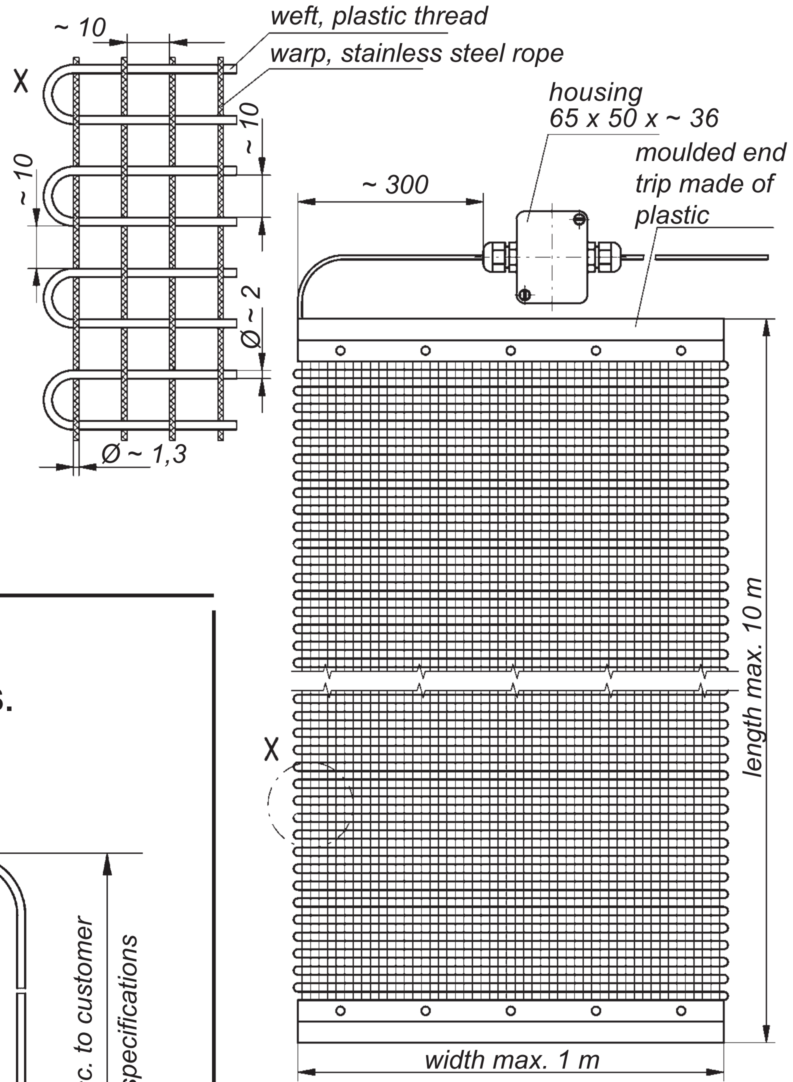
Sleeve electrodes allow full-surface pipe monitoring not only underneath the pipes in question (e.g. in collection tubs) but also **directly on the pipe in question**. Sleeve electrodes have a halogen-free polyester fabric structure with good capillary effect. Sensor cables are fitted in this polyester fabric as part of the warp; half of them are connected as control electrodes, the other half as earth electrodes.

The conductive sleeve electrodes MAE 6-SPS. are each fitted with 6 separate electrodes in the form of 6 stainless steel ropes: 3 control electrodes and 3 earth electrodes. An earth electrode is always positioned next to a control electrode, a control electrode next to an earth electrode and so on. As soon as a trace of a conductive liquid creates a conductive path between a control electrode and an earth electrode, the switching status of the leakage detector changes.

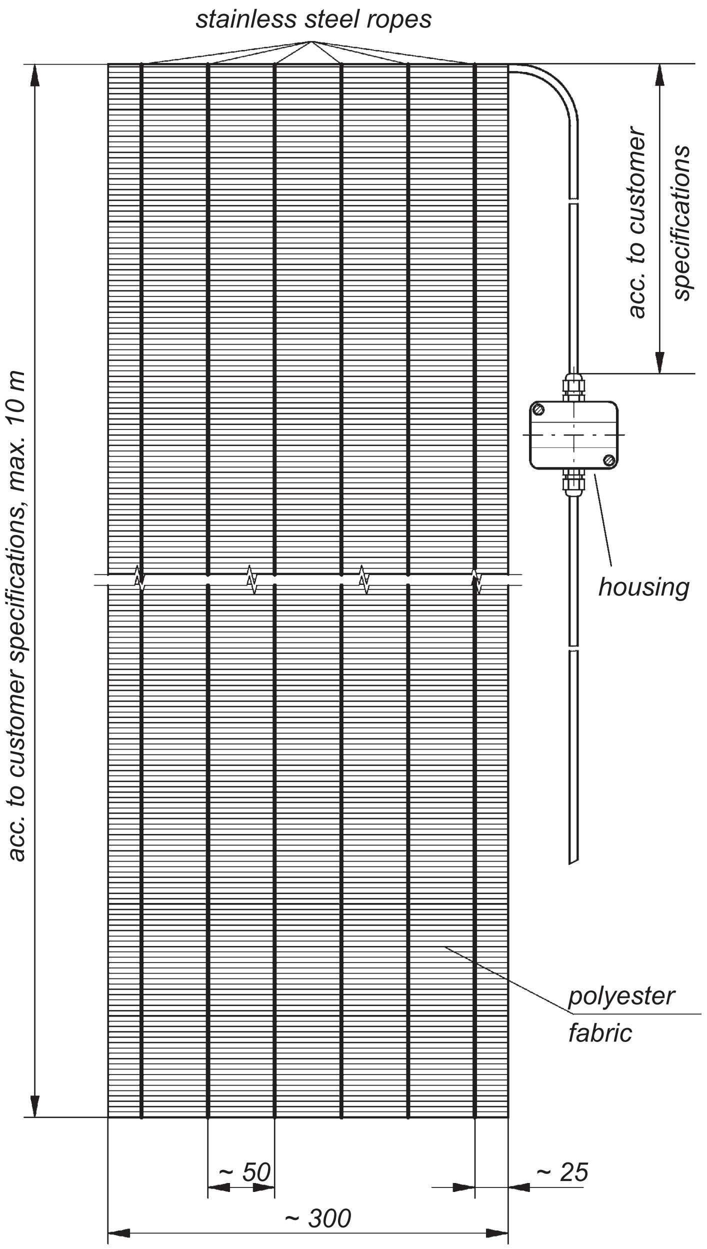
The 6 stainless steel ropes of the sleeve electrode are woven into a halogen-free, approx. 30 cm wide polyester fabric as part of the warp, and the polyester fabric keeps them permanently equidistant from one another. This polyester fabric is designed to almost totally prevent contact of the stainless steel ropes with one another or with an electrically conductive surface (e.g. steel pipe etc.) and thus to avoid false alarms, whilst allowing leakage liquid to penetrate through to the stainless steel ropes.

To avoid false alarms, it is essential that the surroundings of the sleeve electrodes are absolutely dry under normal circumstances, as the sleeve electrodes have the ability to bind moisture (including high levels of air humidity), and this can lead to false alarms in environments that are not absolutely dry, particularly with long sleeve electrodes.

Dimensions TE-SPS.



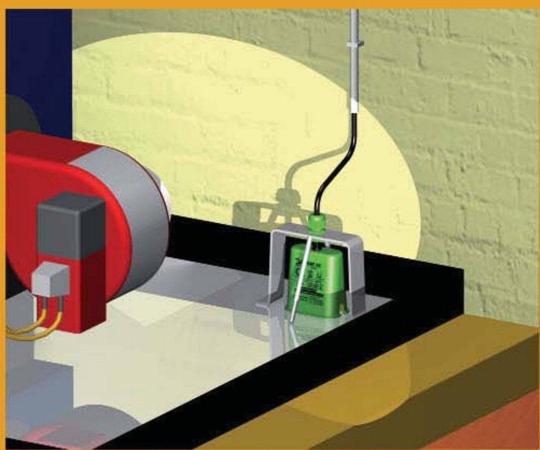
Dimensions MAE 6-SPS.



Capacitive leakage detectors

Leckwatcher range
Liqui-Switch range
L-Pointer range

for connection to a PLC or DDC unit or a NAMUR circuit



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Contents

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Capacitive leakage detectors for extra low voltage SELV or PELV

With integrated galvanic separation:
- **avoids interconnection of the electrode circuits**
- **avoids the formation of ground loops if more than one detector is connected to a common supply current circuit.**

Leckwatcher

- **Leakage detectors for connection to:**
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or a network connector
- **with integrated galvanic separation of the sensor electronics**

The detectors are designed in line with the peripheral interface standard for electronic controllers (power supply and binary interfaces).

The compatibility of the detector on the one hand and the PLC, DDC unit, small controller, fieldbus connector or network connector on the other must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

Liqui-Switch

- **Leakage detectors for connection to:**
  a PLC or DDC unit,
  a small controller,
  a fieldbus connector or a network connector
- **with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)**
- **with integrated galvanic separation of the sensor electronics**

The compatibility of the detector on the one hand and the actuator, PLC, DDC unit, small controller, fieldbus connector or network connector on the other must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

L-Pointer

- **Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19 234) with the option of detecting cable break, standby status, alarm status and short-circuit**
- **for connection to:**
  NAMUR isolation amplifier or
  NAMUR fieldbus terminal
- **with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current**

The compatibility of the detector and the peripheral equipment must be reviewed on a case-to-case basis with regard to the extra low voltage SELV or PELV and the conformity of their signal parameters.

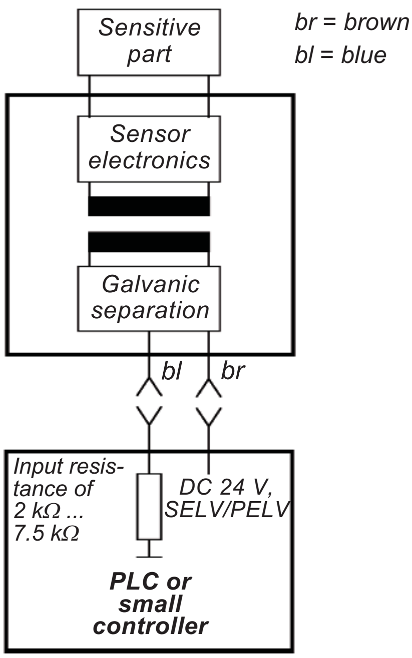
Leckwatcher

2-wire version: -SPS2	3-wire version: -SPS3 (with PNP transistor output)	4-wire version: -SPS4 (with potential-free reed contact output)

Connection: Only for connection to extra low voltage SELV or PELV!

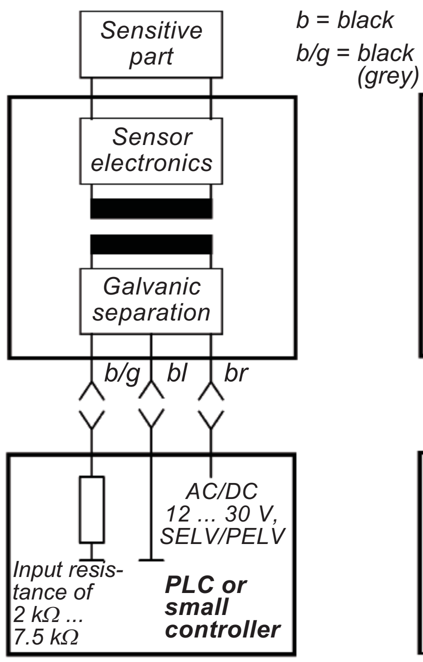
2 wires for the supply of direct voltage, fully functional with any polarity and short-circuit proof.	2 wires for the supply of direct or alternating voltage; fully functional with any polarity; 1 wire for the PNP transistor output, reverse polarity protected and short-circuit proof.	2 wires for the supply of direct or alternating voltage; fully functional with any polarity; 2 wires for the potential-free reed contact output.
Power consumption differs depending on whether the detector is in activated or non-activated status.	The PNP transistor output is in a different switching status depending on whether the detector is in activated or non-activated status.	The reed contact is open or closed depending on whether the detector is in activated or non-activated status.
This differential is used to generate the corresponding binary switching signal at the input resistance of the follow-up circuit.	With a Low signal, there is no voltage at the PNP transistor output; with a High signal, the rectified supply voltage is present at the output. This binary switching signal is implemented accordingly at the input resistance of the follow-up circuit.	The reed contact is an NO (make) contact, and its switching status is implemented in the follow-up circuit.
The input resistance must be in the range from 2 kΩ to 7.5 kΩ.	The input resistance must be in the range from 2 kΩ to 7.5 kΩ.	
Series or parallel connection of detectors of this type is not permitted.	Series or parallel connection of detectors of this type is not permitted.	Series or parallel connection of these detectors is possible, also in combination with other potential-free contacts.

Application example



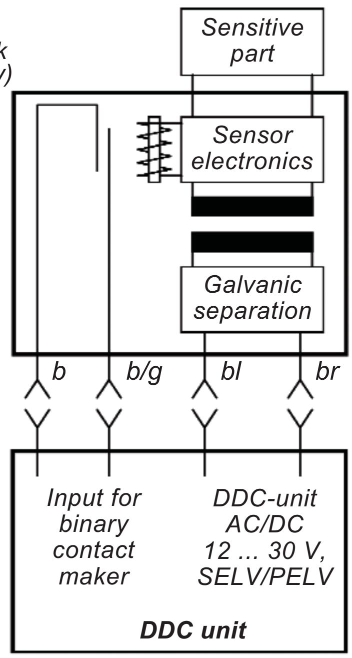
Follow-up circuit

Application example



Follow-up circuit

Application example



Follow-up circuit

Liqui-Switch

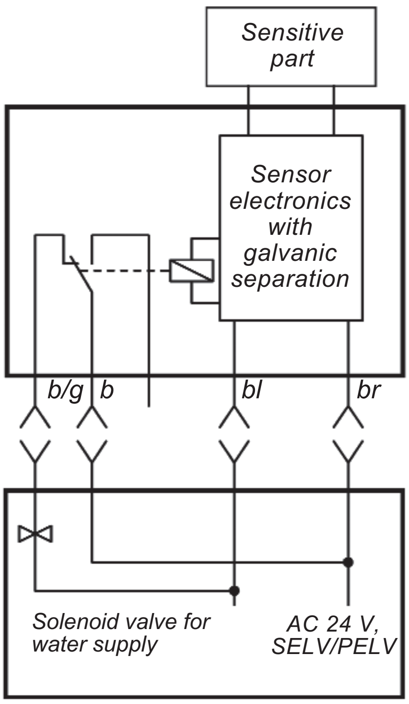
Connection: Only for connection to extra low voltage SELV or PELV!

2 wires for the supply of direct or alternating voltage,
fully functional with any polarity;

4-wire version with quiescent current contact: -LS4 (standard version)	4-wire version with working current contact: -LS4/A	5-wire version with changeover contact: -LS5
2 wires for the potential-free quiescent current contact which is closed in standby status and open in the event of an alarm (leakage alarm, cable break in the voltage-supply line, failure of the supply voltage).	2 wires for the potential-free working current contact which is open in standby status and closed in the event of an alarm (leakage alarm, cable break in the voltage-supply line, failure of the supply voltage).	3 wires for the potential-free changeover contact. The output relay with the changeover contact is energised in standby status and de-energised in the event of an alarm.
A cable break in the contact loop (quiescent current loop) also activates an alarm.	A cable break in the contact line does not activate an alarm.	

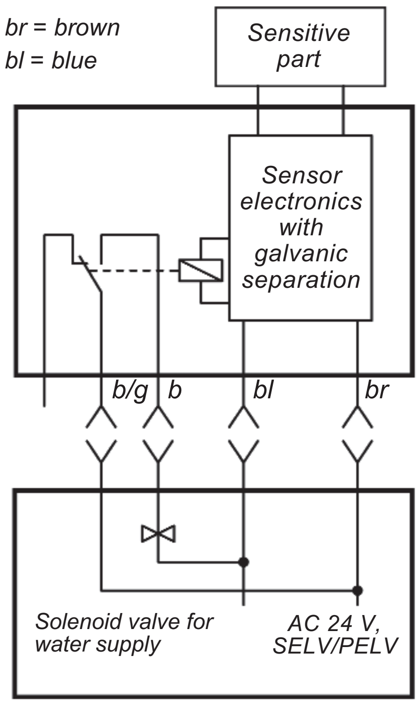
Series or parallel connection of these detectors is possible, also in combination with other potential-free contacts. In such cases, you must observe the relevant technical data and safety regulations.

Application example



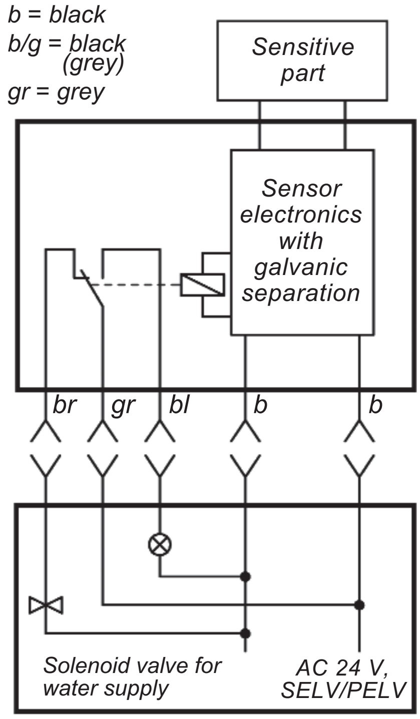
Follow-up circuit

Application example



Follow-up circuit

Application example



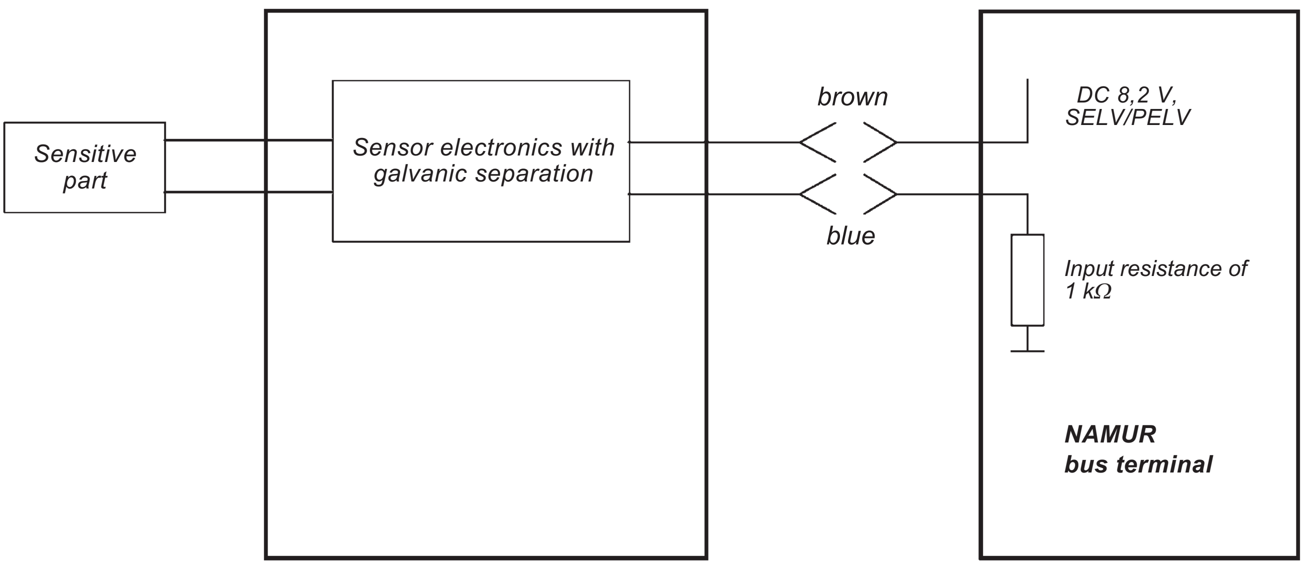
Follow-up circuit

Contact shown in standby status

L-Pointer

2-wire quiescent current version: -KNI (standard version)	**2-wire working current version: -KNI/A**
Connection: Only for connection to extra low voltage SELV or PELV!	
2 wires for the supply of direct voltage; functional with correct polarity; short circuit with false polarity	
For NAMUR circuit with inverted signal evaluation.	For NAMUR circuit with non-inverted signal evaluation.
The power consumption of the detector serves as a switching signal for the following switching statuses: • No power consumption = cable break • Low power consumption = alarm status (leakage) • High power consumption = standby status • Maximum power consumption = short circuit or false polarity	The power consumption of the detector serves as a switching signal for the following switching statuses: • No power consumption = cable break • Low power consumption = standby status • High power consumption = alarm status (leakage) • Maximum power consumption = short circuit or false polarity
If the signal current is only to be evaluated between two switching statuses, low power consumption means alarm status and high power consumption means standby status.	If the signal current is only to be evaluated between two switching statuses, low power consumption means standby status and high power consumption means alarm status.
Series or parallel connection of detectors of this type is not permitted.	

Application example



Follow-up circuit

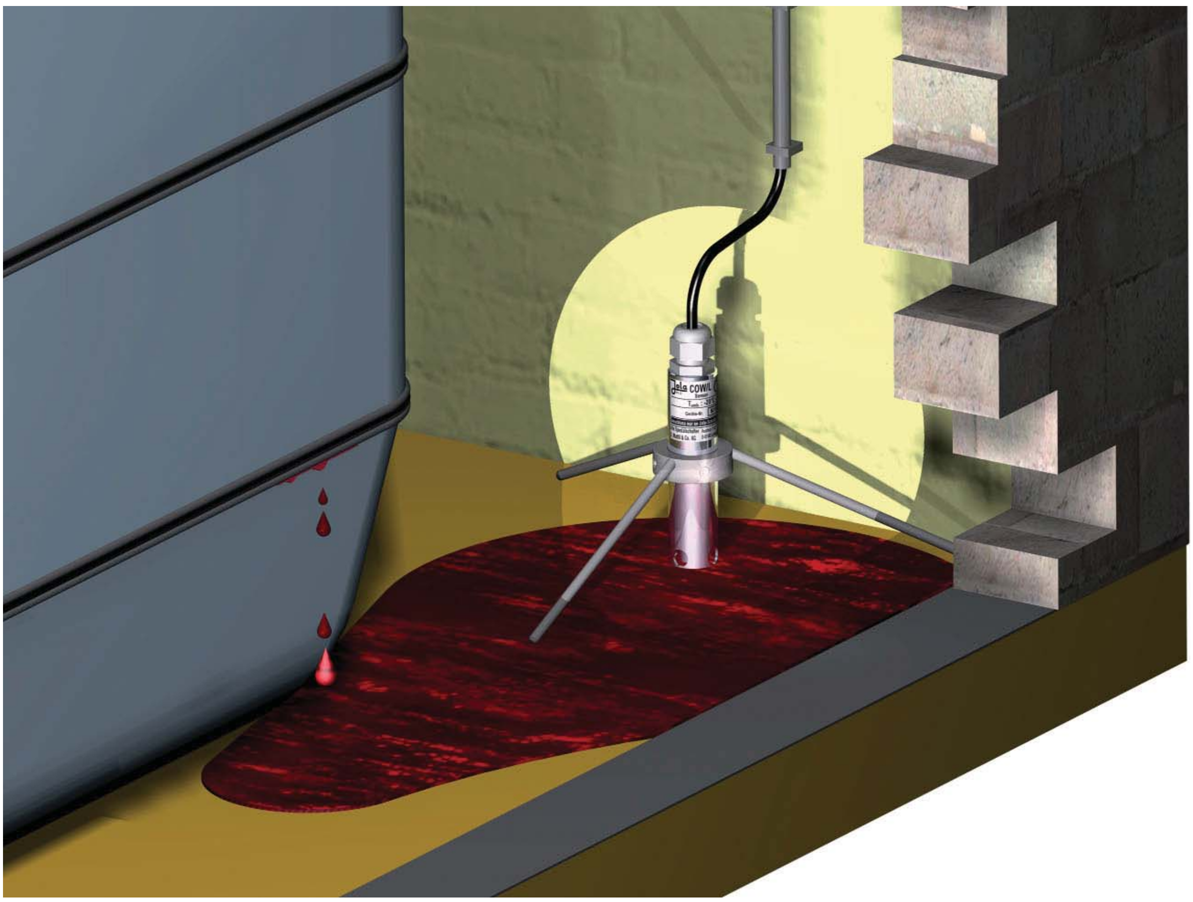
The capacitive measuring principle

The capacitive measuring principle is mainly used for the detection of **electrically non-conductive (insulating) liquids**, but it can also be used to detect electrically conductive liquids.

Electrically non-conductive liquids are generally organic liquids like oils and solvents. An electrode assembly forms a measuring capacitor, and the dielectric is either air or liquid. The dielectric constant of air is 1. The dielectric constant of the liquid to be detected is higher. For our capacitive sensors, the dielectric constant has to be higher than 2 (types CPE) or 1.8 (types OWE and COW).

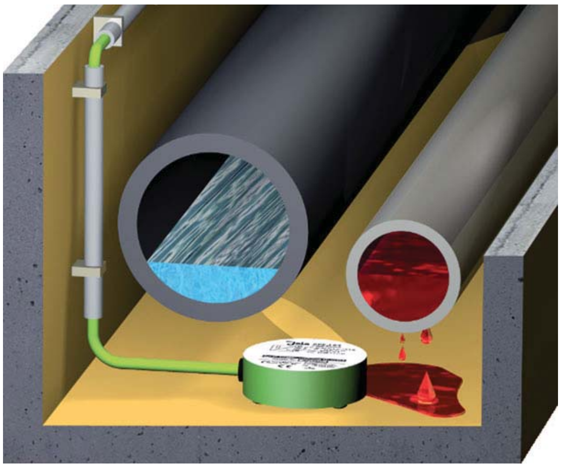
The capacitive leakage detector recognises a change in the dielectric constant at the measuring capacitor and an alarm signal is emitted. The design of the measuring capacitor allows direct mounting on the floor and generally rules out the possibility of interference effects due to different subsurfaces. The capacitive leakage detector has an integrated electronic evaluation unit with galvanically separated circuits. This prevents interconnection of the sensor circuits and the formation of ground loops if more than one of these leakage detectors is connected and where the detected liquid is conductive.

Application example: detection of a heating oil leakage



Capacitive plate sensors CPE-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current



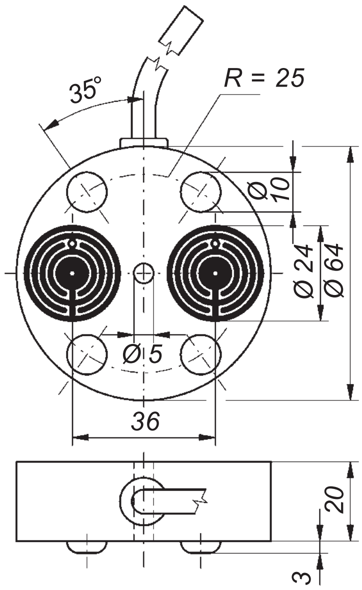
Designed to signal the presence of a **non-conductive or conductive liquid** caused, for example, by burst pipes.

Capacitive plate sensors CPE-... should only be used in normally dry environments. They must be installed on the floor in such a way that the sensor side faces downwards and the label side upwards.

Each capacitive plate sensor of the type CPE-... is equipped with two round PCBs with gold-plated concentric strip conductor rings. Rings as screening electrodes and rings as measuring electrodes form 1 detection capacitor per PCB. For reasons of symmetry, there are two such capacitive sensor elements. As soon as a non-conductive liquid comes into contact with the rings and the spaces of one or both capacitive sensor elements, the capacitance between the electrodes changes and so does the switching status of the leakage detector. If a conductive liquid is present, the rings of the capacitive sensor element are conductively bridged, and this also results in a change in the switching status of the leakage detector.

Plate sensor CPE-..., sensor side

Plate sensor CPE-SPS4, label side



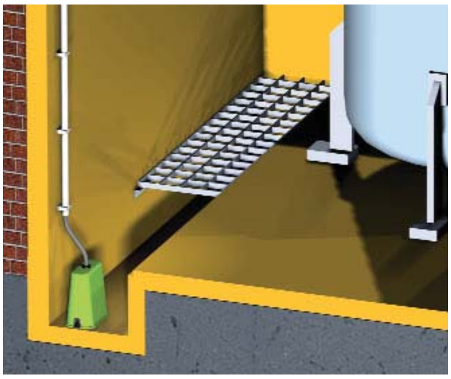
Technical data	CPE-SPS2	CPE-SPS3	CPE-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Detection capacitors	2 round PCBs with gold-plated concentric strip conductor rings form 2 detection capacitors		
Housing	PP and cast resin		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status both detection capacitors not activated	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status one or two detection capacitor(s) activated	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the detection capacitors	5 V_{eff} 40 kHz (safety extra low voltage SELV)		
Max. short circuit current at the detection capacitors	0.2 mA		
Min. dielectricity constant of the liquid to be detected	**2.0**		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

<table>
<tr><th>Technical data</th><th>CPE-LS4</th><th>CPE-LS4/A</th><th>CPE-LS5</th></tr>
<tr><td>Design</td><td colspan="3">leakage detector with relay output</td></tr>
<tr><td>Detection capacitors</td><td colspan="3">2 round PCBs with gold-plated concentric strip conductor rings form 2 detection capacitors</td></tr>
<tr><td>Housing</td><td colspan="3">PP and cast resin</td></tr>
<tr><td rowspan="4">Electrical connection</td><td>four-wire connection</td><td>four-wire connection</td><td>five-wire connection</td></tr>
<tr><td colspan="3">via connecting cable</td></tr>
<tr><td>4 x 0.5</td><td>4 x 0.5</td><td>5 x 0.5</td></tr>
<tr><td colspan="3">length 5 m, longer connecting cable on request;
fitted with halogen-free connecting cable on request</td></tr>
<tr><td rowspan="2">Supply voltage</td><td colspan="3">only for connection to extra low voltage SELV or PELV!
AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %</td></tr>
<tr><td>wire colours:
brown and blue</td><td>wire colours:
brown and blue</td><td>wire colours:
black and black</td></tr>
<tr><td>Power consumption</td><td colspan="3">approx. 0.5 VA</td></tr>
<tr><td rowspan="3">Output</td><td>potential-free quiescent current (NC) contact</td><td>potential-free working current (NO) contact</td><td>potential-free changeover (CO) contact</td></tr>
<tr><td colspan="3">max. load AC/DC 5 ... 24 V
(extra low voltage SELV or PELV only);
AC/DC 1 mA ... 3 (1) A</td></tr>
<tr><td colspan="2">wire colours:
black and black (grey)</td><td>wire colours:
brown, grey a. blue</td></tr>
<tr><td>Switching status without supply voltage</td><td>output relay de-energised, output contact open</td><td>output relay de-energised, output contact closed</td><td>output relay de-energised, changeover in pos. 1 (grey and blue)</td></tr>
<tr><td>Switching status both detection capacitors not activated</td><td>output relay energised, output contact closed</td><td>output relay energised, output contact open</td><td>output relay energised, changeover in pos. 2 (grey and brown)</td></tr>
<tr><td>Switching status one or two detection capacitor(s) activated</td><td>output relay de-energised, output contact open</td><td>output relay de-energised, output contact closed</td><td>output relay de-energised, changeover in pos. 1 (grey and blue)</td></tr>
<tr><td>Cable break monitoring of connecting cable</td><td>cable break monitoring due to the quiescent current</td><td>—</td><td>—</td></tr>
<tr><td>Galvanic separation</td><td colspan="3">only for connection to extra low voltage SELV or PELV!
voltage resistance > 500 V between capacitor circuit, supply circuit and output circuit</td></tr>
<tr><td>Max. no-load voltage at the detection capacitors</td><td colspan="3">5 V_{eff} 40 kHz (safety extra low voltage SELV)</td></tr>
<tr><td>Max. short circuit current at the detection capacitors</td><td colspan="3">0.2 mA</td></tr>
<tr><td>Min. dielectricity constant of the liquid to be detected</td><td colspan="3">2.0</td></tr>
<tr><td>Temperature range</td><td colspan="3">– 20°C to + 60°C</td></tr>
<tr><td>Max. length of connecting cable between leakage detector and follow-up circuit</td><td colspan="3">depends on the technical data of the follow-up circuit</td></tr>
<tr><td>EMC</td><td colspan="3">for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific</td></tr>
</table>

Technical data	CPE-KNI	CPE-KNI/A
Design	leakage detector with evaluation electronics as an initiator for a NAMUR circuit	
Detection capacitors	2 round PCBs with gold-plated concentric strip conductor rings form 2 detection capacitors	
Housing	PP and cast resin	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75, length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	$I < 0.2$ mA	$I < 0.2$ mA
Switching status one or two detection capacitor(s) activated	$I \leq 1$ mA	$I \geq 3$ mA
Switching status both detection capacitors not activated	$I \geq 3$ mA	$I \leq 1$ mA
Switching status in case of short circuit or false polarity	$I > 6$ mA	$I > 6$ mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit and supply circuit with impressed signal current	
Max. no-load voltage at the detection capacitors	5 V_{eff} ⎍ 200 kHz (safety extra low voltage SELV)	
Max. short circuit current at the detection capacitors	0.2 mA	
Min. dielectricity constant of the liquid to be detected	**2.0**	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	generally not critical but the line resistance should not exceed 100 Ω	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Capacitive suspension sensors OWE-...

Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current

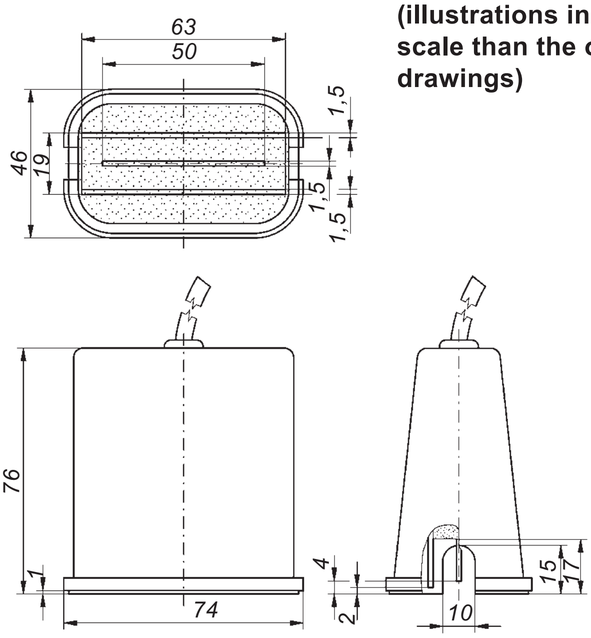


Designed to signal the presence of a **non-conductive or conductive liquid** caused, for example, by burst pipes.

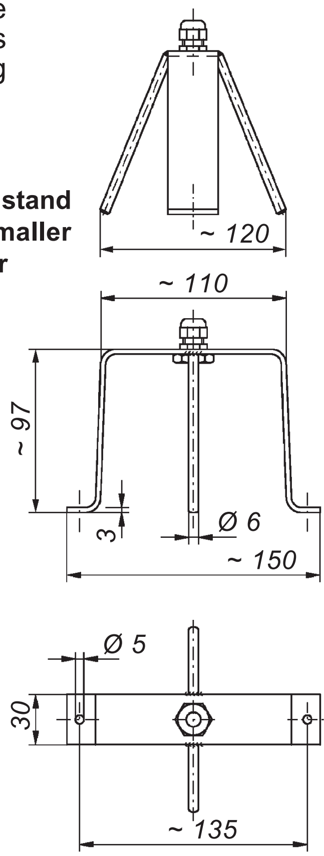
Capacitive suspension sensors OWE-... should only be used in normally dry environments. They must be installed in such a way that the sensor side points downwards.

Three gold-plated PCBs are integrated in the capacitive suspension sensor of the type OWE-.... The two outer one-side-gold-plated PCBs as screening electrodes and the two-side-gold-plated inner PCB as measuring electrode form a double plate capacitor. As soon as a non-conductive liquid flows into the space between the PCBs, the capacitance between the plates changes and so does the switching status of the leakage detector. If a conductive liquid is present, the plates are conductively bridged, and this also results in a change in the switching status of the leakage detector.

Suspension sensor OWE-LS4



Optional: mounting stand (illustrations in a smaller scale than the other drawings)



Technical data	OWE-SPS2	OWE-SPS3	OWE-SPS4
Design	leakage detector with quiescent current / NC (break) contact		
Detection capacitor	2 outer one-side-gold-plated PCBs and 1 inner two-side-gold-plated PCB form a double plate capacitor		
Housing	PP and cast resin		
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75	**three-wire connection** via connecting cable 3 x 0.75	**four-wire connection** via connecting cable 4 x 0.5
	length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!**		
	DC 24 V ± 20 % via input resistance 2 kΩ ... 7.5 kΩ	AC/DC 12 ... 30 V; wire colours: brown and blue	AC/DC 12 ... 30 V; wire colours: brown and blue
Power consumption	max. 0.5 W	max. 0.5 VA	max. 0.5 VA
Output	evaluation based on the magnitude of power consumption	PNP transistor output; to be wired via the input resistance of the follow-up circuit of 2 kΩ ... 7.5 kΩ; wire colour: black	potential-free reed contact with protective resistance 62 Ω, max. load AC/DC 30 V, 100 mA, 3 W; wire colours: black and black
Short circuit protection	present, I_k < 30 mA	at transistor output, I_k < 30 mA	reed contact at output short circuit proof for short periods via integrated protective resistance of 62 Ω; however, the reed contact is open if the supply voltage of the sensor is incorrectly connected
Switching status without supply voltage	Low signal	Low signal	reed contact open
Switching status detection capacitor not activated	power consumption > 2 mA, generates High signal at input resistance of follow-up circuit	PNP transistor output carries rectified supply voltage = High signal	reed contact closed
Switching status detection capacitor activated	power consumption < 0.7 mA, generates Low signal at input resistance of follow-up circuit	PNP transistor output carries no voltage = Low signal	reed contact open
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current		
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit and		
	supply circuit	supply circuit and transistor output	supply circuit and output circuit
Max. no-load voltage at the detection capacitor	5 V_{eff} 40 kHz (safety extra low voltage SELV)		
Max. short circuit current at the detection capacitor	0.2 mA		
Min. dielectricity constant of the liquid to be detected	**1.8**		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	OWE-LS4	OWE-LS4/A	OWE-LS5
Design	leakage detector with relay output		
Detection capacitor	2 outer one-side-gold-plated PCBs and 1 inner two-side-gold-plated PCB form a double plate capacitor		
Housing	PP and cast resin		
Electrical connection	**four-wire connection**	**four-wire connection**	**five-wire connection**
	via connecting cable		
	4 x 0.5	4 x 0.5	5 x 0.5
	length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request		
Supply voltage	**only for connection to extra low voltage SELV or PELV!** AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %		
	wire colours: brown and blue	wire colours: brown and blue	wire colours: black and black
Power consumption	approx. 0.5 VA		
Output	potential-free quiescent current (NC) contact	potential-free working current (NO) contact	potential-free changeover (CO) contact
	max. load AC/DC 5 ... 24 V **(extra low voltage SELV or PELV only);** **AC/DC 1 mA ... 3 (1) A**		
	wire colours: black and black (grey)		wire colours: brown, grey a. blue
Switching status without supply voltage	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Switching status detection capacitor not activated	output relay energised, output contact closed	output relay energised, output contact open	output relay energised, changeover in pos. 2 (grey and brown)
Switching status detection capacitor activated	output relay de-energised, output contact open	output relay de-energised, output contact closed	output relay de-energised, changeover in pos. 1 (grey and blue)
Cable break monitoring of connecting cable	cable break monitoring due to the quiescent current	—	—
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit, supply circuit and output circuit		
Max. no-load voltage at the detection capacitor	5 V_{eff} 40 kHz (safety extra low voltage SELV)		
Max. short circuit current at the detection capacitor	0.2 mA		
Min. dielectricity constant of the liquid to be detected	**1.8**		
Temperature range	– 20°C to + 60°C		
Max. length of connecting cable between leakage detector and follow-up circuit	depends on the technical data of the follow-up circuit		
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.		

Technical data	OWE-KNI	OWE-KNI/A
Design	leakage detector with evaluation electronics as an initiator for a NAMUR circuit	
Detection capacitor	2 outer one-side-gold-plated PCBs and 1 inner two-side-gold-plated PCB form a double plate capacitor	
Housing	PP and cast resin	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75, length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	$I < 0.2$ mA	$I < 0.2$ mA
Switching status detection capacitor activated	$I \leq 1$ mA	$I \geq 3$ mA
Switching status detection capacitor not activated	$I \geq 3$ mA	$I \leq 1$ mA
Switching status in case of short circuit or false polarity	$I > 6$ mA	$I > 6$ mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit and supply circuit with impressed signal current	
Max. no-load voltage at the detection capacitor	5 V_{eff} 200 kHz (safety extra low voltage SELV)	
Max. short circuit current at the detection capacitor	0.2 mA	
Min. dielectricity constant of the liquid to be detected	**1.8**	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	generally not critical but the line resistance should not exceed 100 Ω	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Capacitive suspension sensors COW-...

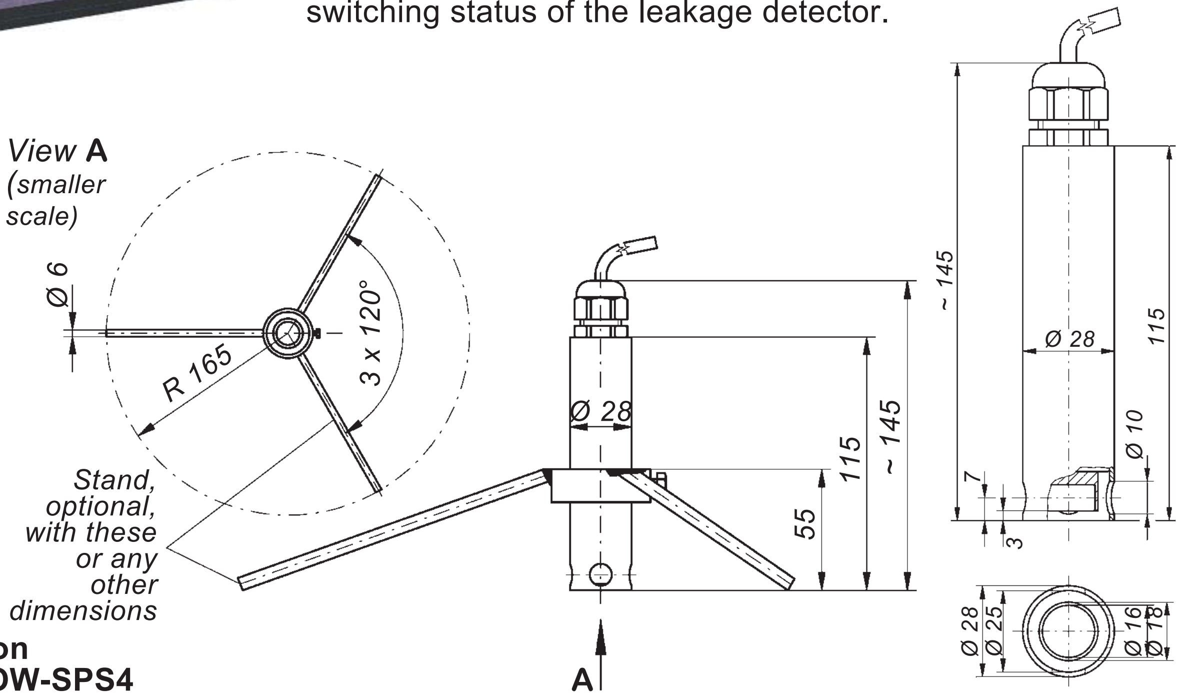
Leckwatcher	Liqui-Switch	L-Pointer
• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector	• Leakage detectors for connection to: a PLC or DDC unit, a small controller, a fieldbus connector or a network connector • with potential-free relay contact (for switching e.g. a solenoid valve with extra low voltage SELV or PELV)	• Leakage detectors for NAMUR circuits in line with EN 50 227 (formerly known as DIN 19234) with the option of detecting cable break, standby status, alarm status and short circuit • for connection to: NAMUR isolation amplifier or NAMUR fieldbus terminal
• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation of the sensor electronics	• with integrated galvanic separation between sensor circuit and supply current circuit with impressed signal current

Designed to signal the presence of a **non-conductive or conductive liquid** caused, for example, by burst pipes.

Capacitive suspension sensors COW-... should only be used in normally dry environments. They must be installed in such a way that the sensor side points downwards.

A hollow stainless steel cylinder is integrated in the capacitive suspension sensor of the type COW-.... The stainless steel housing as screening electrode and the hollow inner cylinder as measuring electrode form 1 detection capacitor. As soon as a non-conductive liquid flows into the space between housing and inner cylinder, the capacitance between housing and inner cylinder changes and so does the switching status of the leakage detector. If a conductive liquid is present, the housing and the inner cylinder are conductively bridged, and this also results in a change in the switching status of the leakage detector.

Suspension sensor COW-SPS4



<table>
<tr><th>Technical data</th><th>COW-SPS2</th><th>COW-SPS3</th><th>COW-SPS4</th></tr>
<tr><td>Design</td><td colspan="3">leakage detector with quiescent current / NC (break) contact</td></tr>
<tr><td>Detection capacitor</td><td colspan="3">stainless steel housing as screening electrode and
inner cylinder as measuring electrode form 1 detection capacitor</td></tr>
<tr><td>Housing</td><td colspan="3">stainless steel 316 Ti with PTFE insulator</td></tr>
<tr><td rowspan="2">Electrical connection</td><td>two-wire connection
via connecting cable
2 x 0.75</td><td>three-wire connection
via connecting cable
3 x 0.75</td><td>four-wire connection
via connecting cable
4 x 0.5</td></tr>
<tr><td colspan="3">length 5 m, longer connecting cable on request;
fitted with halogen-free connecting cable on request</td></tr>
<tr><td rowspan="2">Supply voltage</td><td colspan="3">only for connection to extra low voltage SELV or PELV!</td></tr>
<tr><td>DC 24 V ± 20 %
via input resistance
2 kΩ ... 7.5 kΩ</td><td>AC/DC 12 ... 30 V;
wire colours:
brown and blue</td><td>AC/DC 12 ... 30 V;
wire colours:
brown and blue</td></tr>
<tr><td>Power consumption</td><td>max. 0.5 W</td><td>max. 0.5 VA</td><td>max. 0.5 VA</td></tr>
<tr><td>Output</td><td>evaluation based on
the magnitude of
power consumption</td><td>PNP transistor output;
to be wired via
the input resistance of
the follow-up circuit of
2 kΩ ... 7.5 kΩ;
wire colour: black</td><td>potential-free reed
contact with protective
resistance 62 Ω,
max. load
AC/DC 30 V, 100 mA,
3 W; wire colours:
black and black</td></tr>
<tr><td>Short circuit protection</td><td>present,
I_k < 30 mA</td><td>at transistor output,
I_k < 30 mA</td><td>reed contact at
output short circuit
proof for short periods
via integrated protective
resistance of 62 Ω;
however,
the reed contact
is open if the supply
voltage of the sensor is
incorrectly connected</td></tr>
<tr><td>Switching status without
supply voltage</td><td>Low signal</td><td>Low signal</td><td>reed contact open</td></tr>
<tr><td>Switching status detection
capacitor not activated</td><td>power consumption
> 2 mA,
generates High signal
at input resistance of
follow-up circuit</td><td>PNP transistor output
carries rectified
supply voltage
= High signal</td><td>reed contact closed</td></tr>
<tr><td>Switching status detection
capacitor activated</td><td>power consumption
< 0.7 mA,
generates Low signal
at input resistance of
follow-up circuit</td><td>PNP transistor output
carries no voltage
= Low signal</td><td>reed contact open</td></tr>
<tr><td>Cable break monitoring
of connecting cable</td><td colspan="3">cable break monitoring due to the quiescent current</td></tr>
<tr><td rowspan="2">Galvanic separation</td><td colspan="3">only for connection to extra low voltage SELV or PELV!
voltage resistance > 500 V between capacitor circuit and</td></tr>
<tr><td>supply circuit</td><td>supply circuit
and transistor output</td><td>supply circuit
and output circuit</td></tr>
<tr><td>Max. no-load voltage
at the detection capacitor</td><td colspan="3">5 V_{eff} 40 kHz (safety extra low voltage SELV)</td></tr>
<tr><td>Max. short circuit current
at the detection capacitor</td><td colspan="3">0.2 mA</td></tr>
<tr><td>Min. dielectricity constant
of the liquid to be detected</td><td colspan="3">1.8</td></tr>
<tr><td>Temperature range</td><td colspan="3">– 20°C to + 60°C</td></tr>
<tr><td>Max. length of connecting
cable between leakage
detector and follow-up circuit</td><td colspan="3">depends on the technical data of the follow-up circuit</td></tr>
<tr><td>EMC</td><td colspan="3">for interference emission in accordance with the appliance-specific
requirements for households, business and commerce as well as
small companies, and for interference immunity in accordance with
the appliance-specific requirements for industrial companies.</td></tr>
</table>

<table>
<tr><th>Technical data</th><th>COW-LS4</th><th>COW-LS4/A</th><th>COW-LS5</th></tr>
<tr><td>Design</td><td colspan="3">leakage detector with relay output</td></tr>
<tr><td>Detection capacitor</td><td colspan="3">stainless steel housing as screening electrode and inner cylinder as measuring electrode
form 1 detection capacitor</td></tr>
<tr><td>Housing</td><td colspan="3">stainless steel 316 Ti with PTFE insulator</td></tr>
<tr><td>Electrical connection</td><td>four-wire connection</td><td>four-wire connection</td><td>five-wire connection</td></tr>
<tr><td></td><td colspan="3">via connecting cable</td></tr>
<tr><td></td><td>4 x 0.5</td><td>4 x 0.5</td><td>5 x 0.5</td></tr>
<tr><td></td><td colspan="3">length 5 m, longer connecting cable on request;
fitted with halogen-free connecting cable on request</td></tr>
<tr><td>Supply voltage</td><td colspan="3">only for connection to extra low voltage SELV or PELV!
AC/DC 24 V ± 20 %, on request AC/DC 12 V ± 20 %</td></tr>
<tr><td></td><td>wire colours:
brown and blue</td><td>wire colours:
brown and blue</td><td>wire colours:
black and black</td></tr>
<tr><td>Power consumption</td><td colspan="3">approx. 0.5 VA</td></tr>
<tr><td>Output</td><td>potential-free quiescent current (NC) contact</td><td>potential-free working current (NO) contact</td><td>potential-free changeover (CO) contact</td></tr>
<tr><td></td><td colspan="3">max. load AC/DC 5 ... 24 V
(extra low voltage SELV or PELV only);
AC/DC 1 mA ... 3 (1) A</td></tr>
<tr><td></td><td colspan="2">wire colours:
black and black (grey)</td><td>wire colours:
brown, grey a. blue</td></tr>
<tr><td>Switching status without supply voltage</td><td>output relay de-energised, output contact open</td><td>output relay de-energised, output contact closed</td><td>output relay de-energised, changeover in pos. 1 (grey and blue)</td></tr>
<tr><td>Switching status detection capacitor not activated</td><td>output relay energised, output contact closed</td><td>output relay energised, output contact open</td><td>output relay energised, changeover in pos. 2 (grey and brown)</td></tr>
<tr><td>Switching status detection capacitor activated</td><td>output relay de-energised, output contact open</td><td>output relay de-energised, output contact closed</td><td>output relay de-energised, changeover in pos. 1 (grey and blue)</td></tr>
<tr><td>Cable break monitoring of connecting cable</td><td>cable break monitoring due to the quiescent current</td><td>—</td><td>—</td></tr>
<tr><td>Galvanic separation</td><td colspan="3">only for connection to extra low voltage SELV or PELV!
voltage resistance > 500 V between capacitor circuit, supply circuit and output circuit</td></tr>
<tr><td>Max. no-load voltage at the detection capacitor</td><td colspan="3">5 V_{eff} ⎍ 40 kHz (safety extra low voltage SELV)</td></tr>
<tr><td>Max. short circuit current at the detection capacitor</td><td colspan="3">0.2 mA</td></tr>
<tr><td>Min. dielectricity constant of the liquid to be detected</td><td colspan="3">1.8</td></tr>
<tr><td>Temperature range</td><td colspan="3">– 20°C to + 60°C</td></tr>
<tr><td>Max. length of connecting cable between leakage detector and follow-up circuit</td><td colspan="3">depends on the technical data of the follow-up circuit</td></tr>
<tr><td>EMC</td><td colspan="3">for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.</td></tr>
</table>

Technical data	COW-KNI	COW-KNI/A
Design	leakage detector with evaluation electronics as an initiator for a NAMUR circuit	
Detection capacitor	stainless steel housing as screening electrode and inner cylinder as measuring electrode form 1 detection capacitor	
Housing	stainless steel 316 Ti with PTFE insulator	
Electrical connection	**two-wire connection** via connecting cable 2 x 0.75, length 5 m, longer connecting cable on request; fitted with halogen-free connecting cable on request	
Supply voltage	**only for connection to extra low voltage SELV or PELV!** DC 7 V ... 12 V with internal resistance of 500 Ω to 1,200 Ω, preferably in line with NAMUR DC 8.2 V with internal resistance of 1 kΩ	
Output signal	impressed current signal in the supply circuit	
Mode of operation	quiescent current principle	working current principle
Switching status in case of cable break	I < 0.2 mA	I < 0.2 mA
Switching status detection capacitor activated	I ≤ 1 mA	I ≥ 3 mA
Switching status detection capacitor not activated	I ≥ 3 mA	I ≤ 1 mA
Switching status in case of short circuit or false polarity	I > 6 mA	I > 6 mA
Galvanic separation	**only for connection to extra low voltage SELV or PELV!** voltage resistance > 500 V between capacitor circuit and supply circuit with impressed signal current	
Max. no-load voltage at the detection capacitor	5 V_{eff} ⎍ 200 kHz (safety extra low voltage SELV)	
Max. short circuit current at the detection capacitor	0.2 mA	
Min. dielectricity constant of the liquid to be detected	**1.8**	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between leakage detector and follow-up circuit	generally not critical but the line resistance should not exceed of 100 Ω	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

Leckmaster 155
relay
for leakage detection

for the connection of
5 capacitive sensors

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Leckmaster 155 relay

Relay in surface-mounted housing, with transparent cover and operating status indicators inside the housing,
- **for the connection of 5 capacitive sensors,**
- **with cable break monitoring on each line,**
- **with touch sensor button for alarm acknowledgement,**
- **with 2 potential-free changeover contacts at the output**
- **with 5 status signal outputs DC 24 V for the building control system**

The Leckmaster 155 relay in association with capacitive sensors, for instance CPE capacitive plate sensors, OWE capacitive suspension sensors or COW capacitive suspension sensors, is used for the detection of electrically non conductive liquids or electrically conductive liquids. This apparatus combination can be used for the detection of all low-viscosity liquids for such tasks as signalling the presence of fuel oil on the floor of a tank room or in a collection tub located underneath a fuel oil burner.

• Signalling lines

The capacitive sensors in question are described in our brochure “Capacitive leakage detectors of the Leckmaster range”.

The capacitive leakage detector recognises a change in the dielectric constant at the measuring capacitor of the capacitive sensor and an alarm signal is emitted. The design of the measuring capacitor allows direct mounting on the floor and generally rules out the possibility of interference effects due to different subsurfaces.

Only one capacitive sensor must be connected in a signalling line because each capacitive sensor needs a quiescent current to enable the cable break control.

The electrode circuits are supplied with a safety extra-low voltage generated in the Leckmaster 155 which is reliably galvanically separated from the mains circuit and the potential-free changeover contacts of the two output relays.

All 5 signalling lines have a common system ground, which means there is no galvanic separation of the signalling lines. This factor must always be taken into account in the case of long signalling lines extending into different parts of the building and in particular with the use of COW capacitive suspension sensors and for the detection of electrically conductive liquids.

There is a risk of formation of earth loops if the sensors are mounted in such a way that a sensor can take on earth potential. It may be necessary to perform local potential equalisation in order to avoid potential equalisation currents via the signalling lines.

• Activation of the individual signalling lines

If not all 5 signalling lines are to be used, the signalling lines 2 to 5 can be activated (dip switch in active position) or deactivated (dip switch in inactive position) individually via 4 dip switches. Channel 1 is always activated. **Activation / Deactivation may only be performed in currentless status.**

• Optical indication

A group of 3 LEDs of different colours is assigned to each signalling line.

Optical indication	Type of signal
Power supply	When the supply voltage is switched on, one of the three LEDs on each activated signalling line lights up to indicate the operating status of the activated signalling line in question
Leakage (red LED at the top)	Optical indication signalling leakage in the activated signalling line in question • with effect on the corresponding DC 24 V status signal output for the building control system • with effect on the two power circuits if **one or more** activated signalling lines report leakage
Standby (green LED in the middle)	Optical indication signalling standby status of the activated signalling line in question • with effect on the corresponding DC 24 V status signal output for the building control system • with effect on the two power circuits if **all** activated signalling lines indicate standby status
Cable break (yellow flashing LED at the bottom)	Optical indication signalling cable break of the activated signalling line in question • with effect on the corresponding DC 24 V status signal output for the building control system • with effect on the two power circuits if **one or more** activated signalling lines report cable break
Signalling line switched to inactive	None of the 3 LEDs in the deactivated signalling line (signalling lines 2 to 5) lights up

• Power circuits

Two potential-free changeover contacts are available at the output, one of which reacts based on the working current principle and the other on the quiescent current principle. In addition, there is a DC 24 V binary status output signal based on the quiescent current principle for each signalling line for the building control system. The potential-free changeover contact based on the working current principle can be acknowledged via a touch sensor button acting through the housing cover of the unit.

Power circuits	Switching statuses
Output relay 1 in working current principle	Output relay 1 is not energised in currentless status of the Leckmaster 155 and in the standby status of all activated signalling lines. In the event of leakage or cable break in one or more activated signalling lines, output relay 1 is energised if the alarm has not been acknowledged. Output relay 1 can be acknowledged or reset using the touch sensor button.
Output relay 2 in quiescent current principle	Output relay 2 is energised in standby status of all activated signalling lines. Output relay 2 is not energised in currentless status of the Leckmaster 155 and in the case of leakage or cable break in one or more activated signalling lines.
5 status signal outputs (DC 20 V) for the building control system	A DC 24 V binary switching status output signal in quiescent current principle is available for each of the 5 signalling lines: High signal, DC 24 V = standby status of the activated signalling line Low signal, DC 0 V = currentless status of the Leckmaster 155 or leakage or cable break in the activated signalling line or signalling line that is switched inactive The 5 outputs are short circuit-protected and have a common reference ground.

Technical data	**Leckmaster 155**
Supply voltage (terminals 1 and 2)	AC 230 V, other supply voltage, e.g. DC 24 V, on request
Power consumption	approx. 3 VA
Sensor circuits (one of the two ground terminals = ground and E1 to E5 = control inputs)	5 terminals under safety extra low voltage, for 5 signalling lines without mutual galvanic separation, with a common ground connection. Connection of the signalling lines is to be made via a 6-core cable and an additional connection box. Local potential equalisation is to be performed to avoid earth loops in critical installations.
No-load voltage	DC 8.4 V (safety extra low voltage SELV)
Short circuit current	< 10 mA
Response sensitivity	1.5 mA 1.8 mA
Cable break monitoring	I < 0.15 mA
1st power circuit (output relay 1 - terminals 3, 4, 5)	potential-free changeover contact based on the working current principle, for group alarm in the event of leakage or cable break, can be acknowledged via the touch sensor button
2nd power circuit (output relay 2 - terminals 6, 7, 8)	potential-free changeover contact based on the quiescent current principle, for group alarm in the event of leakage or cable break
Electrical values of the potential-free changeover contacts:	
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Status signal outputs for the building control system (one of the two ground terminals = ground and A1 to A5 = control outputs)	5 terminals under safety extra low voltage for DC 24 V binary switching status output signal of the 5 signalling lines, without mutual galvanic separation, with a joint ground connection. **For connection to the building control system (e.g. PLC) opto-couplers should be fitted for the purpose of galvanic separation.** Standby of the signalling line: High signal (DC 20 V) Leakage/cable break/deactivated line: Low signal (DC 0 V)
No-load voltage	DC 20 V (sufficient for 24 V inputs, as at least 15 V are normally required for High signal)
Short circuit protection	short circuit current limitation with $\leq$ 30 mA

Technical data	Leckmaster 155
Switching status indication for the activated signalling lines	optical indication for each of the activated signalling lines by 3 differently coloured LEDs in each case
• the red LED of one or more signalling lines lights up	**Leakage** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding activated signalling line(s) for the building control system is at Low signal (quiescent current principle)
• the green LED of each signalling line lights up	**Standby** output relay 1 is not energised (working current principle) output relay 2 is energised (quiescent current principle) output signals of all activated signalling lines for the building control system are at High signal (quiescent current principle)
• the yellow LED of one or more signalling lines flashes	**Cable break** output relay 1 is energised (working current principle) output relay 2 is not energised (quiescent current principle) output signal of the corresponding activated signalling line(s) for the building control system is at Low signal (quiescent current principle)
Housing	insulating material, approx. 180 x 94 x 57 mm, with 5 cable entries
Connection	inside terminals
Protection class	IP54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of signalling lines	each 1,000 m
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

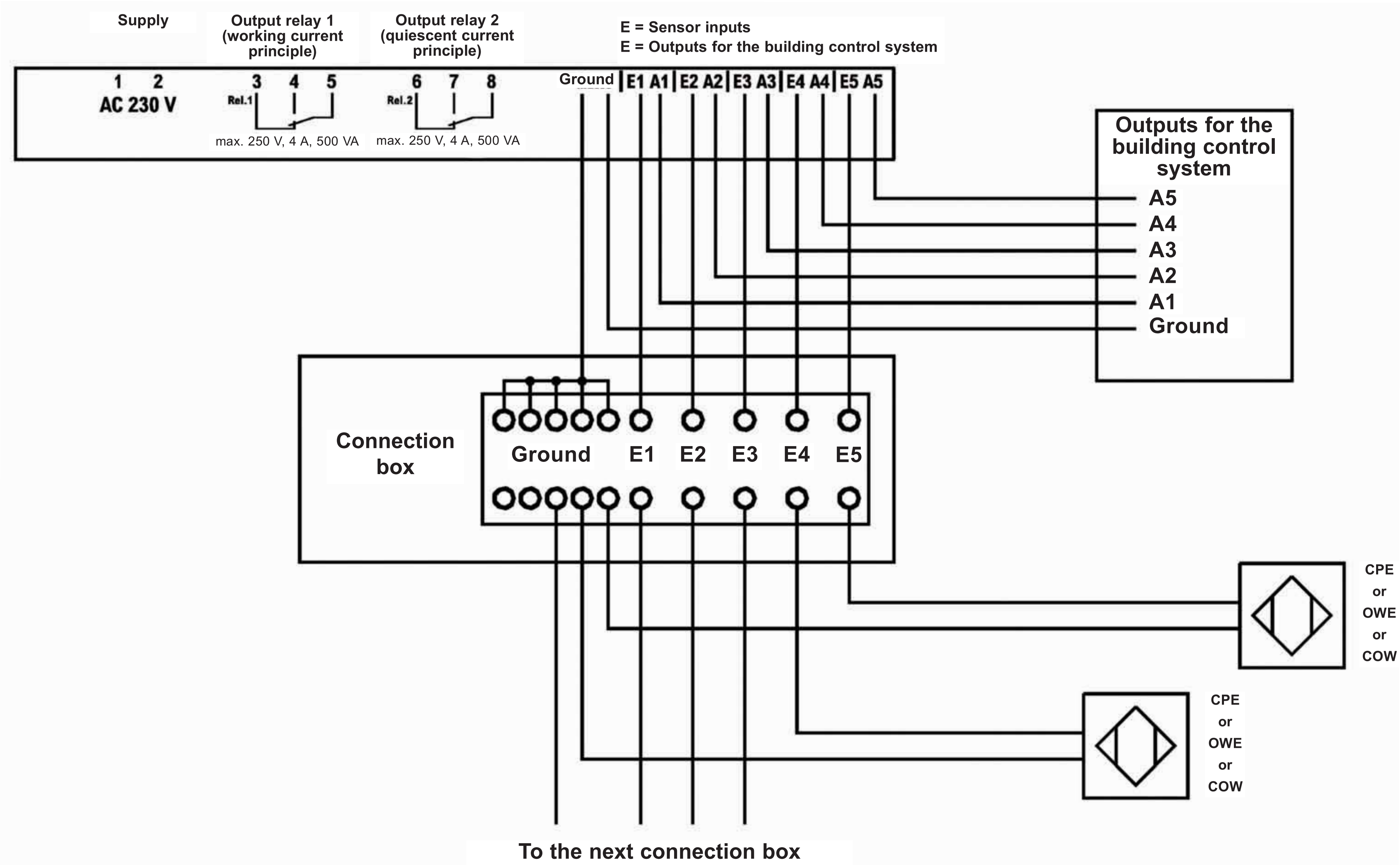
• Acknowledgement via touch sensor button

In the event of leakage or cable break in one or more activated signalling lines, output relay 1 is energised and the red LED on the touch sensor button flashes. The operator has to touch the sensor button panel if he wants to acknowledge the signal. Output relay 1 is then de-energised and the red LED reverts to steady.

In this status, new alarms from other signalling lines are signalled only via the optical indicators and the status signal outputs for the building control system of the affected signalling lines. In these cases, however, output relay 1 is not re-activated.

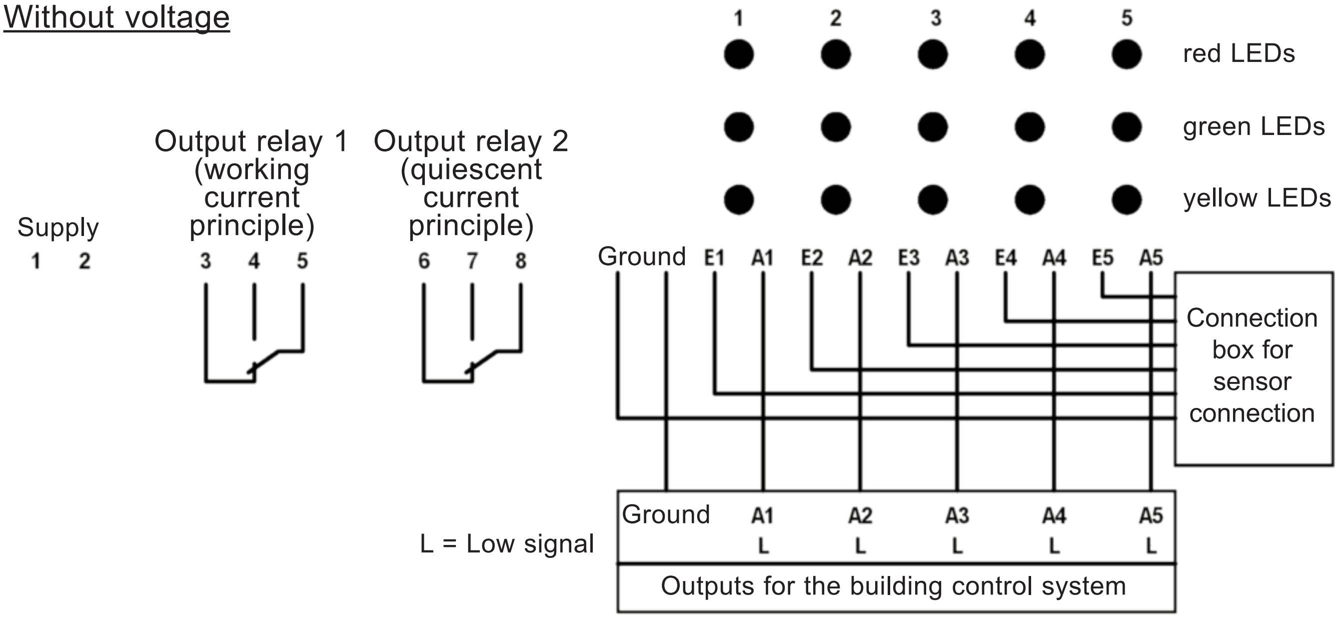
Acknowledgement has no effect whatsoever on output relay 2.

Example for the connection of sensors in connection boxes

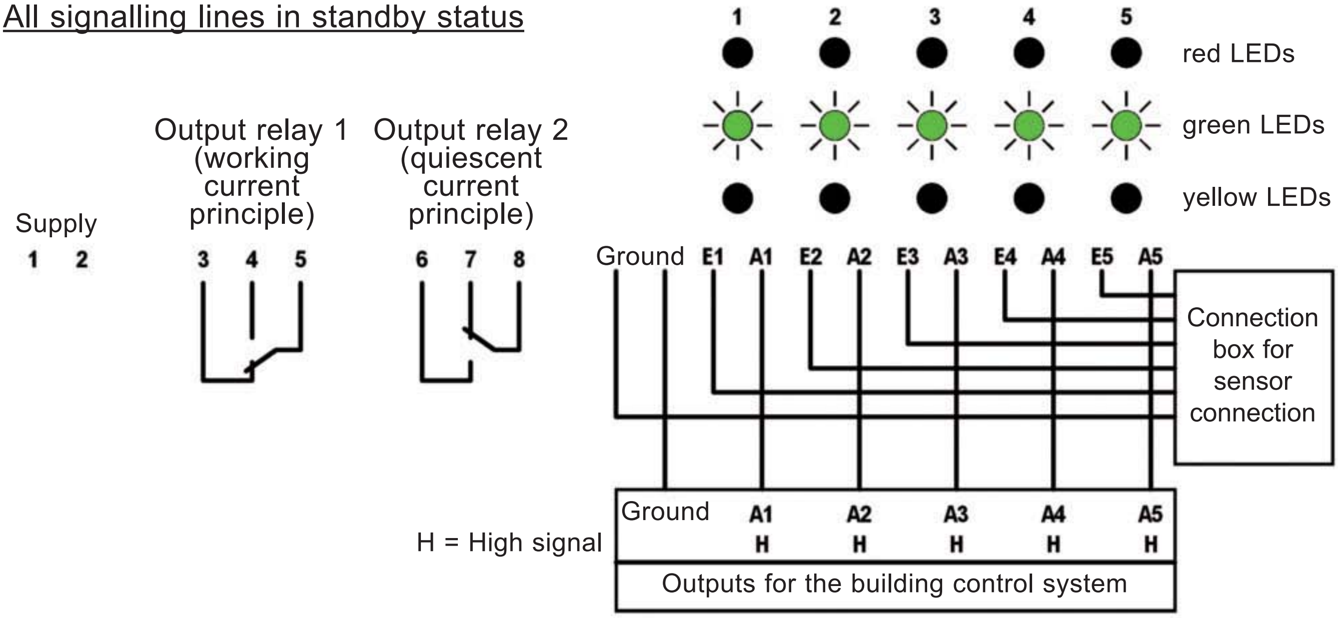


Position of the output contacts of the Leckmaster 155 relay

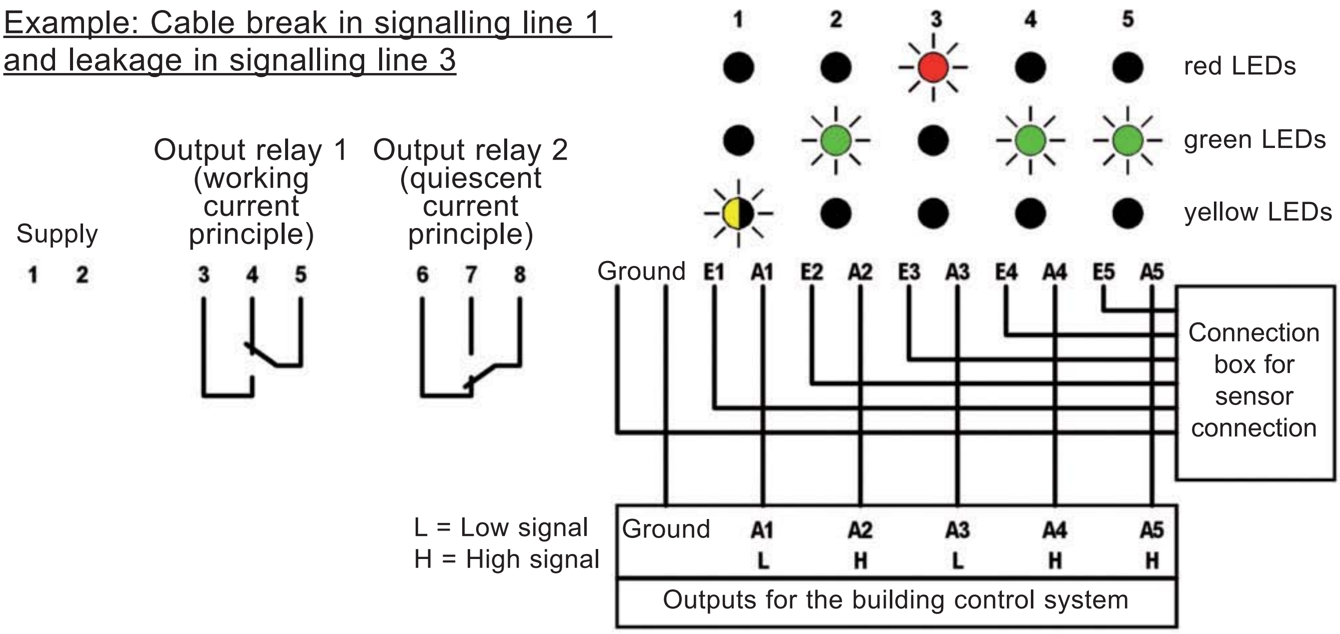
Without voltage



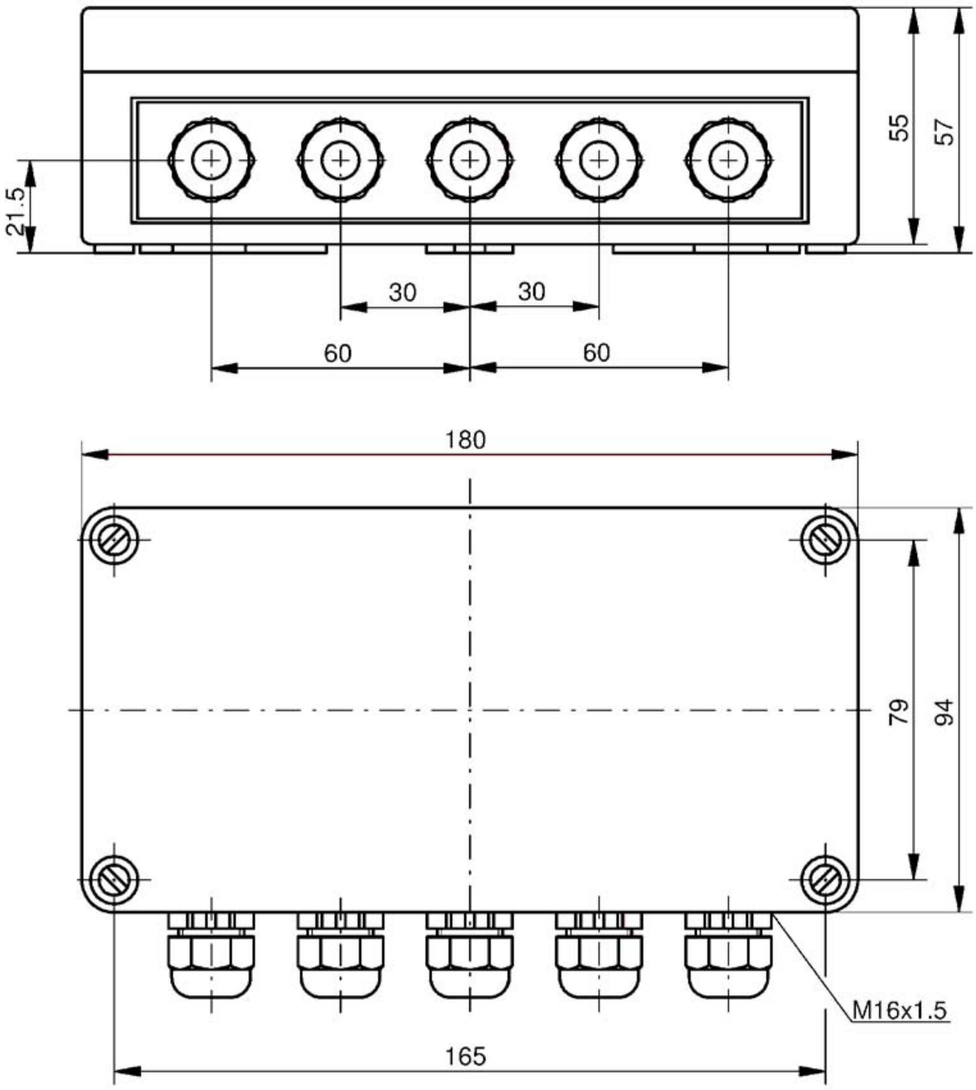
All signalling lines in standby status



Example: Cable break in signalling line 1 and leakage in signalling line 3



Dimensions



The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

LWR
conductance relays

**for signalling a change
of the conductance of a liquid**

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The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

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LWR conductance relays

Contents | Page

General information

The **Jola LWR … conductance relays** are used for the differentiation of liquids with different conductance values (e.g. acid, lye or saline solution on the one hand and rainwater or condensate on the other).

If liquids that have different conductance values are to be separated, the conductance relay can be used as a layer-separation relay.

The parameter measured is the resistance between the two electrode plates of a plate electrode or the two electrode rods of a suspension electrode or rod electrode (for a technical description of these electrodes, see the brochure "Conductive leakage detectors of the Leckstar range").

The response value of the **LWR 101/10** or **LWR 5/10** conductance relay can be set at any level **between > 0 and 10 kOhms**. Switchover is with a hysteresis of 20%.

The response value of the **LWR 101/100** or **LWR 5/100** conductance relay can be set at any level **between > 0 and 100 kOhms**. Switchover is with a hysteresis of 20%.

The conductance relay must be adjusted to the conductance of the more conductive liquid (e.g. acid or lye). It should be adjusted on site, gradually approaching the switching point by adjusting the potentiometer. In the case of a plate electrode, the more conductive liquid must fully cover both electrode plates, while in the case of a suspension electrode the more conductive liquid must cover both electrode rods. In the case of a rod electrode, the electrode rods must be immersed up to the bottom end of the shrinkdown tubing. **The conductance relay must be induced to switch**.

When the two electrodes of the plate electrode or the two electrode rods of the suspension electrode or rod electrode are in contact with the less conductive liquid (e.g. rainwater or condensate), the conductance relay must not switch, however.

If a different combination of liquids is to be monitored or if a different electrode is connected, the switching point must be re-adjusted.

LWR 101/... conductance relays

- **<u>with cable break monitoring feature</u>**
- **with switchable self-hold**
- **for connection of a plate electrode, a suspension elect-rode or a rod electrode <u>with Z10 cable break monitoring unit</u> (see brochure “Conductive leakage detectors of the Leckstar range”)**

Conductance relays for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top and with 3 built-in LEDs for signalling the operating statuses.

These units are designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Switchable self-hold function:

- If the switch for self-hold **is switched on**, an alarm **is stored**. The relay continues to signal the alarm even if the cause of the alarm (e. g. the presence of acid instead of water) is no longer present, in other words, if the sensor is no longer in contact with acid. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch for self-hold **is not switched on**, the alarm **is not maintained** when the cause of the alarm has been remedied but is terminated.

LWR 101/100

LWR 101/10

<table>
<tr><th>Technical data</th><th>LWR 101/10</th><th>LWR 101/100</th></tr>
<tr><td>Supply voltage
(AC versions:
terminals 15 and 16;
DC versions:
• terminal 15: –
• terminal 16: +)</td><td colspan="2">AC 230 V, on request:
AC 240 V,
AC 115 V,
AC 24 V,
DC 24 V, } for connection to to a low safety voltage
DC 12 V } according to the safety regulations relating to the application
or further supply voltages</td></tr>
<tr><td>Power consumption</td><td colspan="2">approx. 3 VA</td></tr>
<tr><td>Electrode circuit
(terminals 7 and 8)</td><td colspan="2">2 terminals (under safety extra low voltage SELV),
acting on 1 output relay with switchable self-hold</td></tr>
<tr><td>No-load voltage</td><td colspan="2">18 V_{eff} 10 Hz (safety extra low voltage SELV)</td></tr>
<tr><td>Short-circuit current</td><td colspan="2">0.5 mA_{eff}</td></tr>
<tr><td>Response sensitivity</td><td colspan="2">adjustable between</td></tr>
<tr><td></td><td>> 0 and 10 kOhm
(∞ and 0.1 mS)</td><td>> 0 and 100 kOhm
(∞ and 0.01 mS)</td></tr>
<tr><td>Switching hysteresis</td><td colspan="2">20 %</td></tr>
<tr><td>Cable break monitoring</td><td colspan="2">via Zener diode circuit (Z10) at the end of the electrode line</td></tr>
<tr><td>Power circuit
(terminals 9, 10, 11)</td><td colspan="2">1 single-pole potential-free changeover contact based on
the quiescent current principle with switchable self-hold</td></tr>
<tr><td>Switching status
indicators</td><td colspan="2">• yellow LED flashes:
cable break, output relay not energised
• green LED lights:
electrode in liquid with conductivity < to the setted value,
output relay energised
• red LED lights:
short circuit or electrode in liquid
with conductivity > to the setted value,
output relay not energised</td></tr>
<tr><td>Switching voltage</td><td colspan="2">max. AC 250 V</td></tr>
<tr><td>Switching current</td><td colspan="2">max. AC 4 A</td></tr>
<tr><td>Switching capacity</td><td colspan="2">max. 500 VA</td></tr>
<tr><td>Housing</td><td colspan="2">insulating material, 75 x 55 x 110 mm</td></tr>
<tr><td>Connection</td><td colspan="2">terminals on top of housing</td></tr>
<tr><td>Protection class</td><td colspan="2">IP20</td></tr>
<tr><td>Mounting</td><td colspan="2">on 35 mm DIN rail or fastening via 2 boreholes</td></tr>
<tr><td>Mounting orientation</td><td colspan="2">any</td></tr>
<tr><td>Temperature range</td><td colspan="2">– 20°C to + 60°C</td></tr>
<tr><td>Max. length of connecting
cable between electrode
relay and electrode</td><td>1,000 m</td><td>300 m</td></tr>
<tr><td>EMC</td><td colspan="2">• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies
• for interference immunity in accordance with the appliance-specific requirements for industrial companies</td></tr>
</table>

LWR 5/... conductance relays

- **<u>without cable break monitoring feature</u>**
- **with switchable self-hold**
- **for connection of a plate electrode, a suspension electrode or a rod electrode <u>without Z10 cable break monitoring unit</u> (see brochure “Conductive leakage detectors of the Leckstar range”)**

Conductance relays for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top and with a built-in LED for signalling the alarm status.

These units are designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Switchable self-hold function:

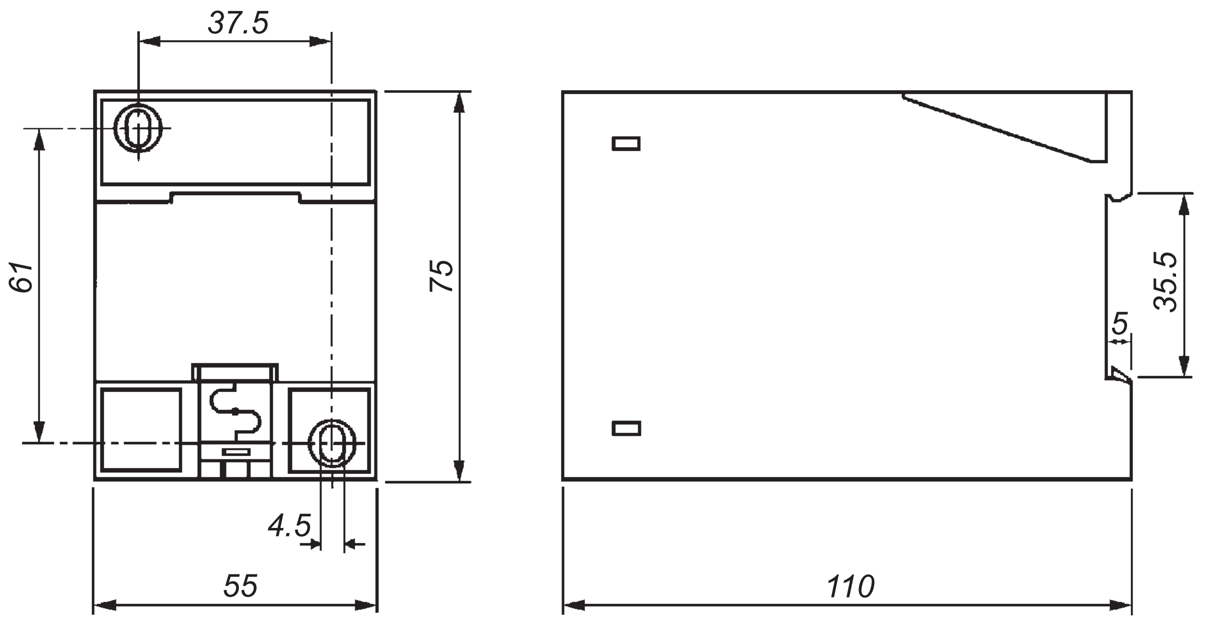
- If the switch for self-hold **is switched on**, an alarm **is stored**. The relay continues to signal the alarm even if the cause of the alarm (e. g. the presence of acid instead of water) is no longer present, in other words, if the sensor in no longer in contact with acid. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch for self-hold **is not switched on**, the alarm **is not maintained** when the cause of the alarm has been remedied but is terminated.

LWR 5/100

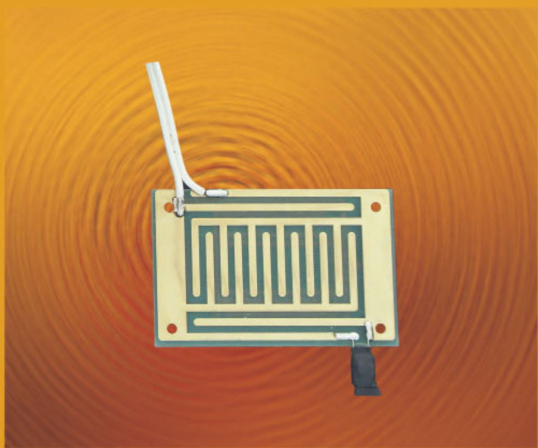
LWR 5/10

Technical data	LWR 5/10	LWR 5/100
Supply voltage (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V, on request: AC 240 V, AC 115 V, AC 24 V, DC 24 V, } for connection to to a low safety voltage DC 12 V } according to the safety regulations relating to the application or further supply voltages	
Power consumption	approx. 3 VA	
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay with switchable self-hold	
No-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)	
Short-circuit current	0.5 mA_{eff}	
Response sensitivity	adjustable between > 0 and 10 kOhm (∞ and 0.1 mS)	adjustable between > 0 and 100 kOhm (∞ and 0.01 mS)
Switching hysteresis	20 %	
Power circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle with switchable self-hold	
Switching status indicator	• red LED dark: electrode in liquid with conductivity < to the setted value, output relay energised • red LED lights: short circuit or electrode in liquid with conductivity > to the setted value, output relay not energised	
Switching voltage	max. AC 250 V	
Switching current	max. AC 4 A	
Switching capacity	max. 500 VA	
Housing	insulating material, 75 x 55 x 110 mm	
Connection	terminals on top of housing	
Protection class	IP20	
Mounting	on 35 mm DIN rail or fastening via 2 boreholes	
Mounting orientation	any	
Temperature range	– 20°C to + 60°C	
Max. length of connecting cable between electrode relay and electrode	1,000 m	300 m
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies	

Dimensional drawing LWR



Condensate water detectors



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KWS .-Z10
condensate water detectors

KWS .-Z10 condensate water detectors can be used for the detection of condensate water, e. g. in a collection tray under an air conditioning unit.

The detectors are printed circuit boards, which can be disposed or glued at a straight even surface.

Each printed circuit board is fitted with two separate electrodes as sensitive elements : 1 control electrode and 1 earth electrode. As soon as a conductive liquid creates a conductive path between the control electrode and the earth electrode, an electrical contact is made and an alarm signal given.

Each KWS .-Z10 condensate water detector is to be connected to 1 Leckstar 101 or Leckstar 101/S electrode relay.

Due to the comb-shaped structure of the conductors of each printed circuit board the condensate water detectors have a high sensitivity for the detection of electrically low conductive liquids (e.g. condensate). For a better surface protection, the conductors of each printed circuit board are gilded.

The detectors are fitted with a 3 m long, thin, white cable. Other cable lengths are available on request.

To avoid that the functional efficiency of the condensate water detectors could strongly be reduced or complete invalidated, it is absolutely necessary, that the sensitive surface of the printed circuit board is kept free of grease and that it does not come into contact with chemical agents.

The condensate water detectors have to be installed where condensation water is most probably expected to occur.

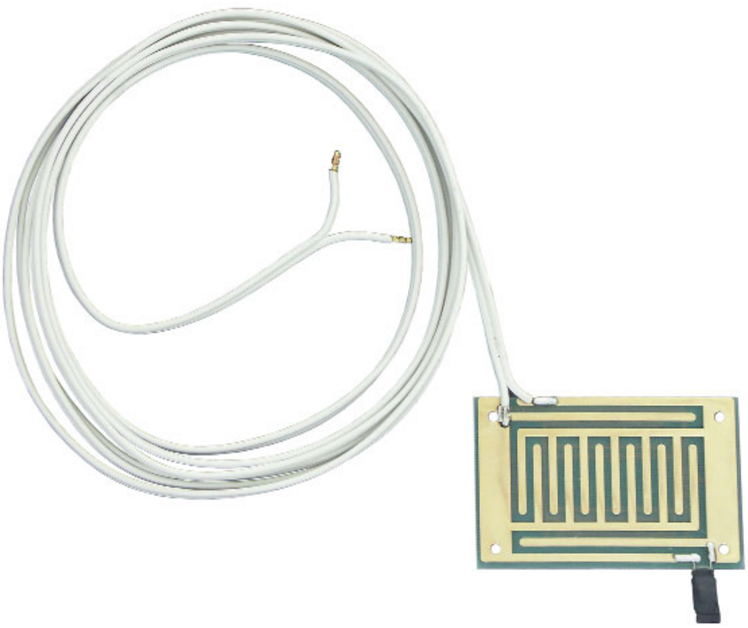
KWS .-Z10
condensate water detectors

Technical data	KWS 0-Z10	KWS 1-Z10	KWS 2-Z10	KWS 3-Z10	KWS 3-Z10/S	KWS 4-Z10
Design	1 control electrode and 1 earth electrode					
Sensitive elements	2 comb-shaped conductors made of gilded copper					
Printed circuit board	film with adhesive agent	rigid sensor without adhesive agent				
Printed circuit board dimensions	65 mm x 20 mm	50 mm x 15 mm	86 mm x 56 mm	500 mm x 30 mm	120 mm x 30 mm	220 mm x 100 mm
Electrical connection	white PVC cable; length 3 m, longer cable on request; halogen-free connecting cable on request					
Temperature range	– 20°C to + 60°C					
Cable break monitoring	with integrated Z10 cable break monitoring unit					
Max. length of connecting cable	1,000 m between KWS .-Z10 and electrode relay					

KWS .-Z10
condensate water detectors

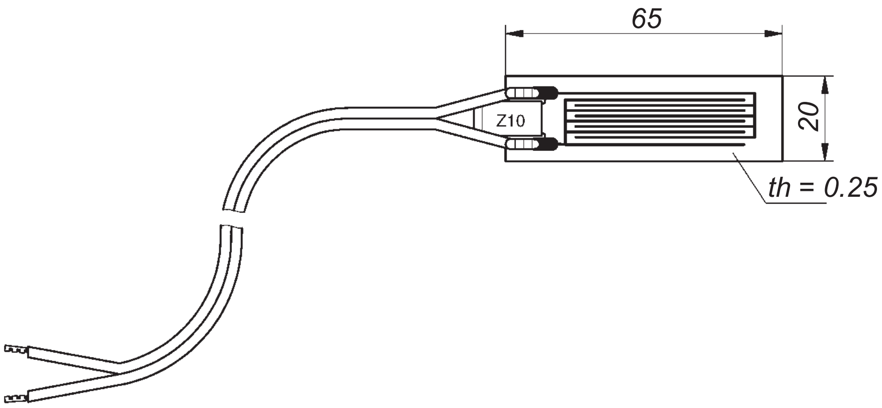
KWS 0-Z10

KWS 1-Z10

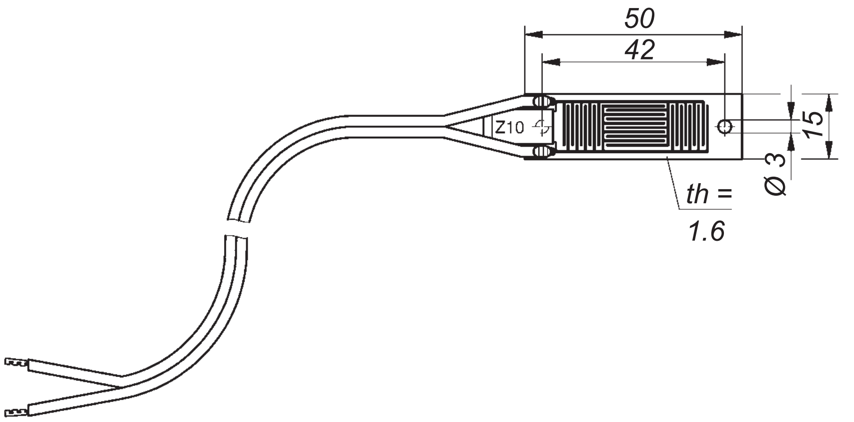


KWS 2-Z10

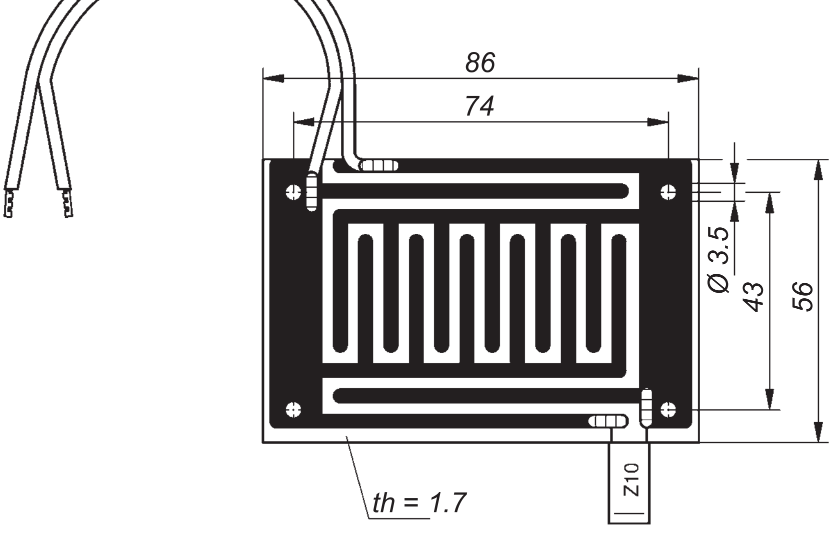
KWS .-Z10
condensate water detectors



KWS 0-Z10



KWS 1-Z10

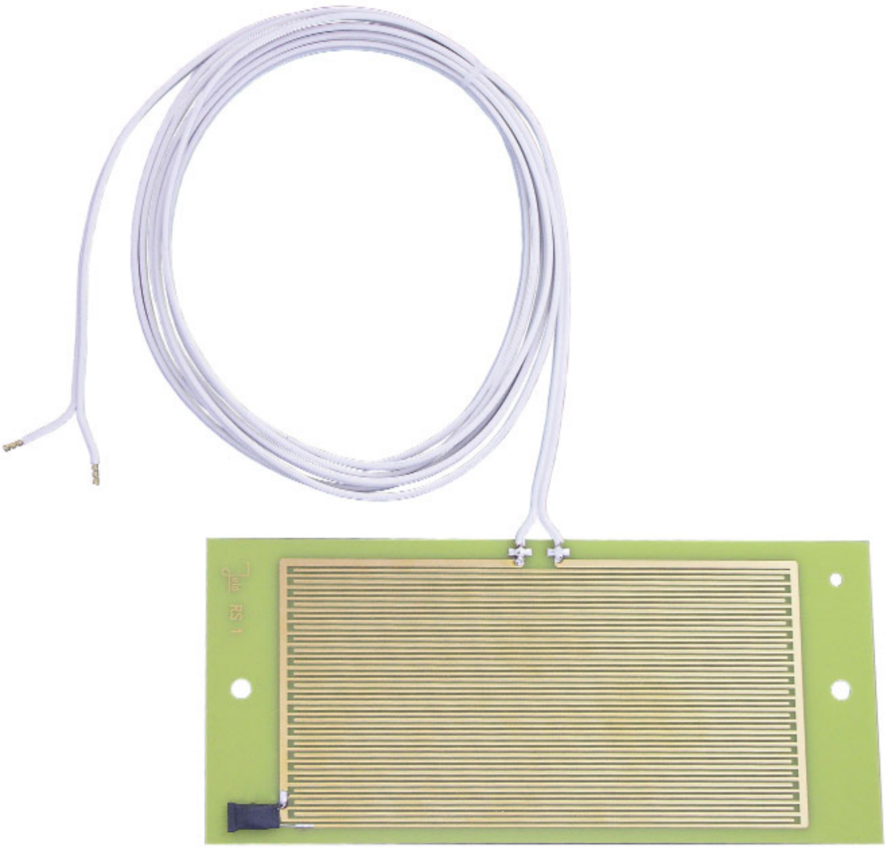


KWS 2-Z10

KWS .-Z10
condensate water detectors

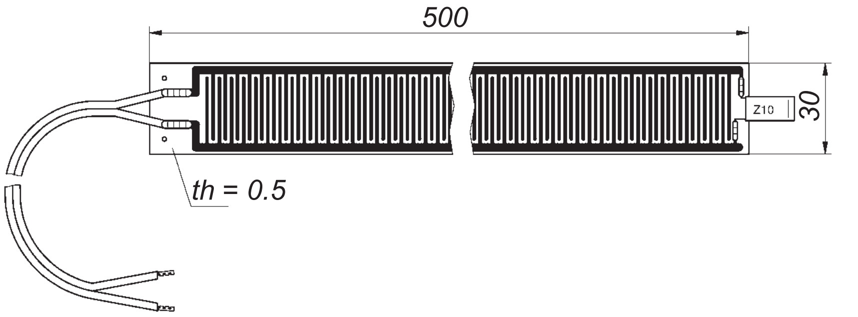
KWS 3-Z10/S

KWS 3-Z10

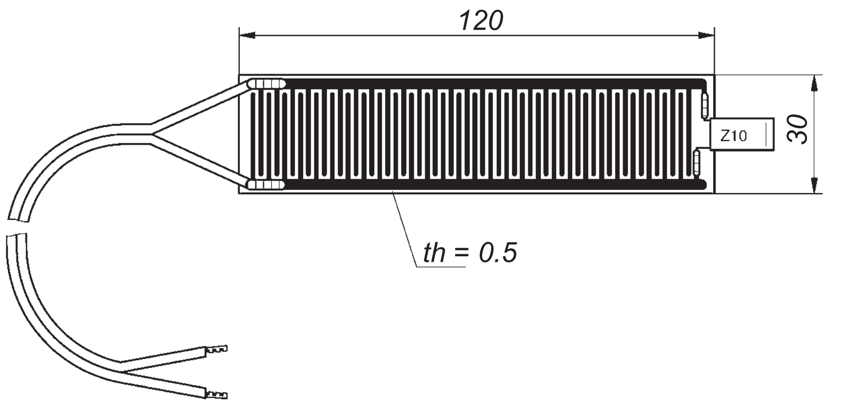


KWS 4-Z10

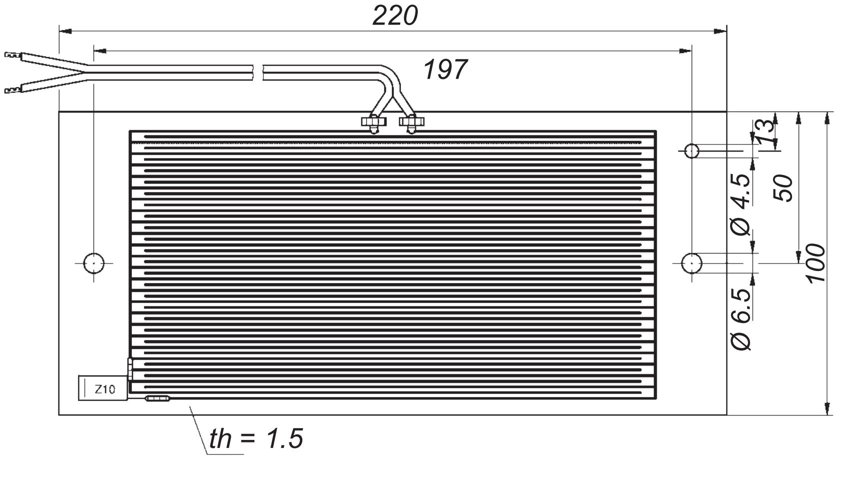
KWS .-Z10 condensate water detectors



KWS 3-Z10



KWS 3-Z10/S



KWS 4-Z10

Leckstar 101 electrode relay

- **with cable break monitoring feature and switchable self-hold**
- **for connection of 1 condensate water detector with Z10 cable break monitoring unit**
- **with 1 potential-free changeover contact at the output**

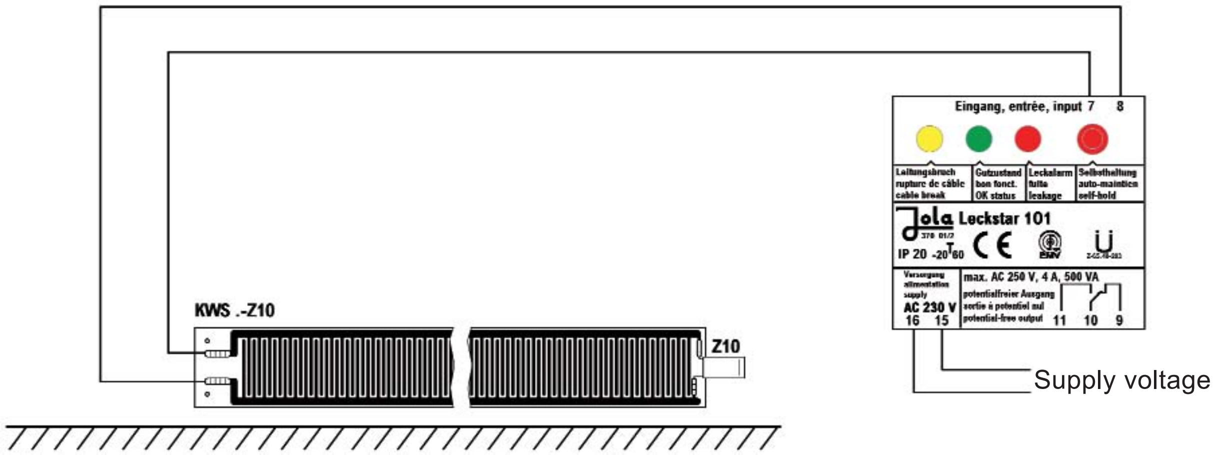
Electrode relay for U-bar mounting or surface mounting, with connection terminals on top and with 3 built-in LEDs for signalling the operating statuses.

Self-hold:

- If the switch **for self-hold is switched on, an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of condensate water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Technical data	**Leckstar 101**
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or } in these two cases, the unit must only be DC 12 V or } connected to a low safety voltage which corresponds to the safety regulations relating to the application further supply voltages on request
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV) acting on 1 output relay with switchable self-hold
No-load voltage	18 V_{eff} ⊓⊔ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 μS (electric conductance)
Cable break monitoring	via Zener diode circuit (Z10) at the end of the electrode line
Power circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact based on the quiescent current principle
Switching status indication	3 LEDs
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and Z10 cable break monitoring unit
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Connection diagram of Leckstar 101 electrode relay

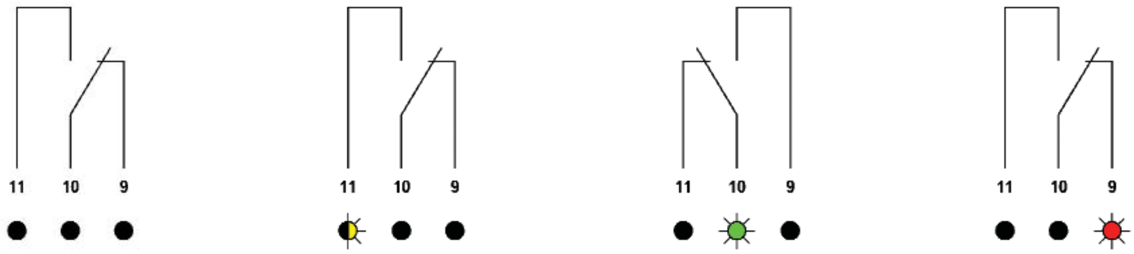


Position of contact when Leckstar 101 without voltage

Each KWS .-Z10 condensate water detector is to be connected to 1 Leckstar 101 or Leckstar 101/S electrode relay.

Position of output contact of the Leckstar 101 electrode relay

relay Leckstar 101 without voltage	cable break	OK status	condensate water present



LEDs dark: Leckstar 101 without voltage, output relay not energized	**yellow LED flashes:** Leckstar 101 under voltage, detector cable break, output relay not energized	**green LED lights:** Leckstar 101 under voltage, conductors dry, output relay energized	**red LED lights:** Leckstar 101 under voltage, conductors wet, output relay not energized

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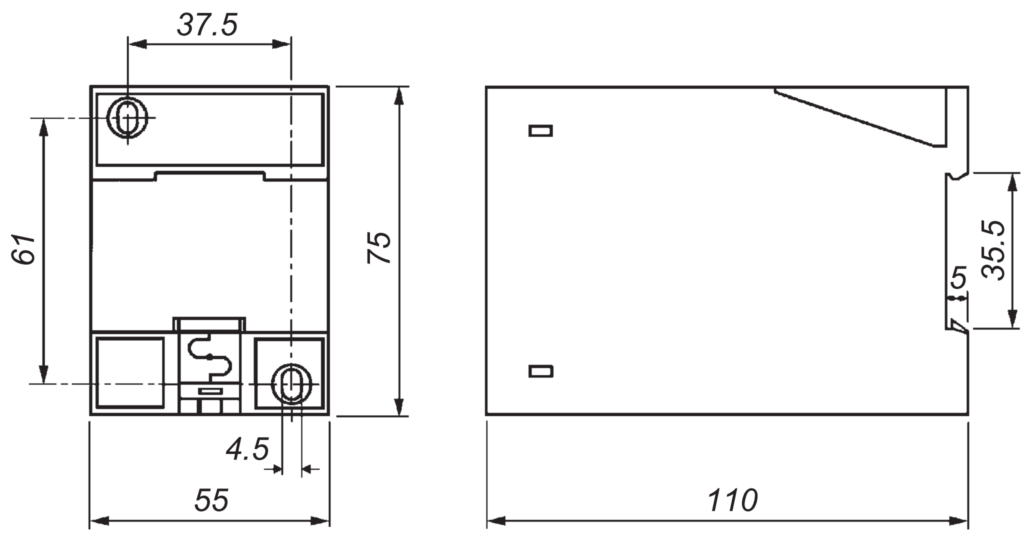
Dimensions Leckstar 101

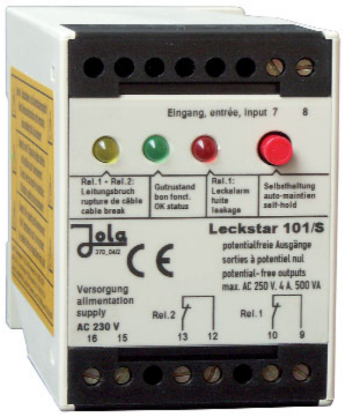


The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

Leckstar 101/S electrode relay

- **with cable break monitoring feature and switchable self-hold**
- **with separately routed cable break monitoring output**
- **for connection of 1 condensate water detector with Z10 cable break monitoring unit**
- **with 2 potential-free break (NC) contacts at the output**

Electrode relay for U-bar mounting or surface mounting, with connection terminals on top, and with 3 built-in LEDs for signalling the operating statuses.

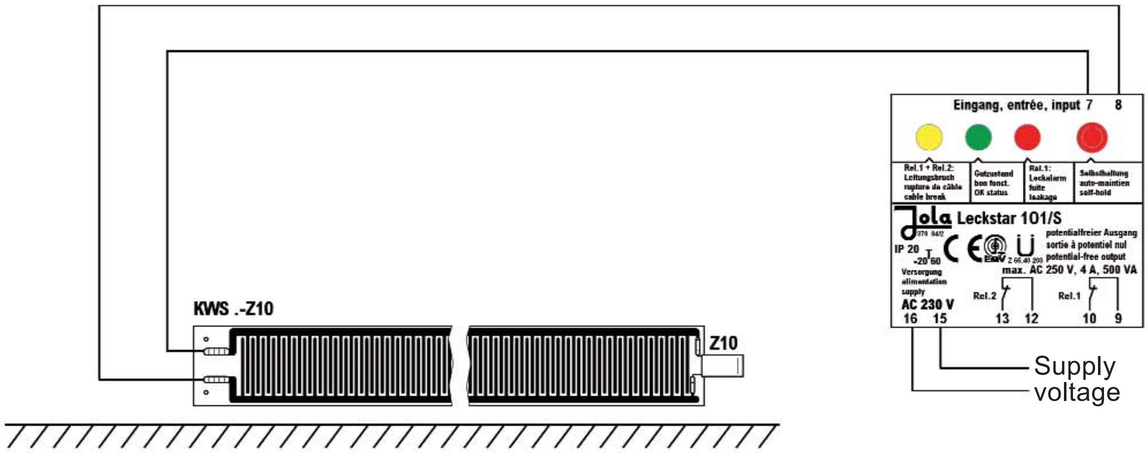


Self-hold:

- If the switch **for self-hold is switched on**, **an alarm is stored**. The relay continues to signal the alarm even if the cause of the alarm (e.g. the presence of condensate water or a cable break) is no longer present – in other words, if the sensor is dry again or if the line has contact. The alarm is acknowledged by switching off the switch for self-hold.
- If the switch **for self-hold is not switched on**, **the alarm is not maintained** when the cause of the alarm has been remedied but is terminated.

Technical data	Leckstar 101/S
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application further supply voltages on request
Power consumption	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV) acting on 2 output relays with switchable self-hold
No-load voltage	18 V_{eff} ⊓⊔ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 μS (electric conductance)
Cable break monitoring	via Zener diode circuit (Z10) at the end of the electrode line
1st power circuit (terminals 9, 10)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for signalling the presence of condensate water or cable break
2nd power circuit (terminals 12, 13)	1 single-pole potential-free break (NC) contact based on the quiescent current principle for additional signalling in the event of a cable break
Switching status indication	3 LEDs
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and DIN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Further technical data	see Leckstar 101, page 37-2-7

Connection diagram of Leckstar 101/S electrode relay

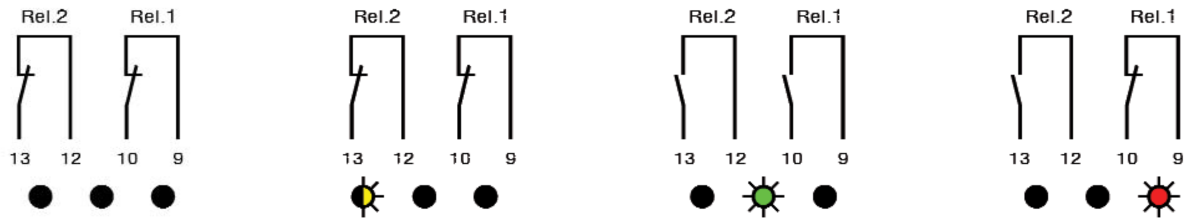


Position of contact when Leckstar 101/S without voltage

Each KWS .-Z10 condensate water detector is to be connected to 1 Leckstar 101 or Leckstar 101/S electrode relay.

Position of output contact of the Leckstar 101/S electrode relay

relay Leckstar 101 without voltage — cable break — OK status — condensate water present



LEDs dark:
Leckstar 101/S without voltage, both output relays not energized, output contacts closed

yellow LED flashes:
Leckstar 101/S under voltage, detector cable break, both output relays not energized, output contacts closed

green LED lights:
Leckstar 101/S under voltage, conductors dry, both output relays energized, output contacts open

red LED lights:
Leckstar 101/S under voltage, conductors wet, output relay 1 not energized, output contact closed, output relay 2 energized, output contact open

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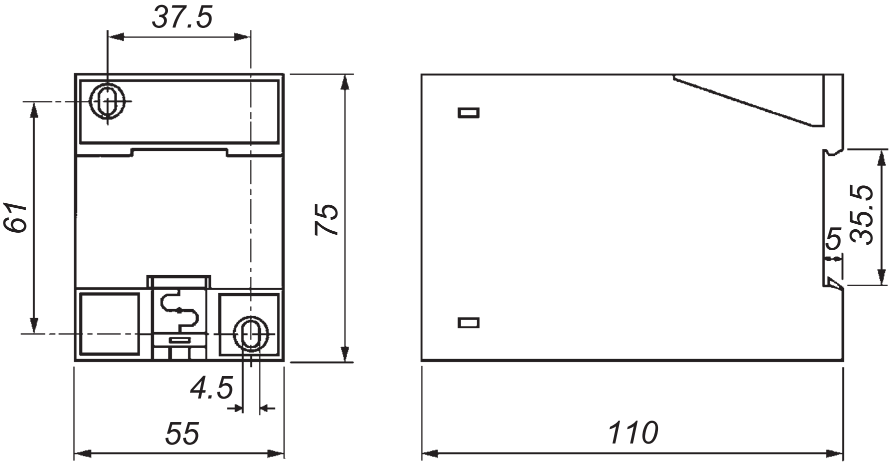
Dimensions Leckstar 101/S



The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Conductive leakage detectors

for the detection of substances like
- Glycol in water
- Acid or lye in water
- Liquid manure in water
- Silage in water

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Contents	Pages

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The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

General information on conductive leakage detectors for the detection of substances like

• Glycol in water
• Acid or lye in water
• Liquid manure in water
• Silage in water

1. Principle

Conductive leakage detectors are generally used to detect and signal the presence of electrically conductive liquids.

A measuring current flows via the electrically conductive liquid between the two electrode rods of a rod electrode and activates a switching command in the corresponding electrode relay.

The size of the measuring current depends on the specific conductivity and the temperature of the liquid, the applied measuring voltage and the geometry of the electrode rods.

One criterion for the differentiation of liquids is the differing specific conductivity.

<u>The job of the leakage detectors described here is to detect and signal the presence of a generally water-polluting liquid with a far higher specific conductivity than water with a lower specific conductivity (e.g. condensation, process water, rainwater).</u>

The electrical conductivity of aqueous liquids is highly dependent on their temperature, and an electronic circuit for temperature compensation is therefore integrated in the rod electrode.

2. Recommendation for use

The electrically conductive liquid **not to be recorded** should have a <u>maximum</u> specific conductivity of <u>250 µS/cm</u> (by way of comparison, rainwater: approx. 10 … 100 µS/cm).

The electrically conductive leakage liquid **to be recorded** must have a specific conductivity of <u>at least 1,000 µS/cm</u>. This minimum conductance must be reached in cases where the leakage liquid becomes mixed with low-conductivity water. It is particularly important to take this into consideration with liquids whose conductivity is **not** many times 1,000 µS/cm.

In the case of highly conductive liquids (> 3,000 µS/cm) detection may still be possible with a dilution of 1:10 or even 1:100.

The change in conductivity is not linearly dependent on the degree of dilution but mainly depends on the type of liquid.

<u>Signs that proper functioning is no longer assured, leading to potential false alarms:</u>

- If it is possible that fats and oils are present, the electrode rods may become partially or completely, temporarily or permanently insulated. This means that correct functioning is no longer assured.
- If surface water is present rather than rainwater (the specific conductivity of surface water can reach or even exceed 1,000 µS/cm), it is possible that the resulting higher conductivity may trigger a false alarm.

3. Conductive leakage detectors can or should generally not be used:

a) With electrically non-conductive liquids (e.g. in mineral oils),

b) With pulpy or viscous liquids,

c) With liquids that form foam,

d) With liquids with a tendency to form deposits (e.g. waste water containing fats),

e) With liquids with high dirt content, which can clog the electrode rods (e.g. rainwater with leaves, twigs, refuse and sweepings).

4. Electrode relays

A GR 3 or GR 5 electrode relay is to be used with the STK-¾” rod electrode. Both electrode relays operate on the quiescent current principle (refers to the relay output).

Before connecting the electrode relay, it is important to check that the mains voltage to be connected to the mains terminals is the same as that stated on the rating label. The built-in transformer steps the mains voltage down to a safe low voltage and transports the voltage via the connected electrode to the relay electronics.

To ensure correct functioning, the three connection wires of the electrode must be connected to terminals E0, E1 and ⊥ of the electrode relay in the right order.

5. Electrical connection

For the connection between electrode and electrode relay, we recommend the use of standard control cables that meet the electrical, chemical and mechanical requirements.

6. Triggering of the alarm signal

The output relay is energised when the supply voltage is present and the electrode rods are dry or if rainwater is in contact with the electrode rods. This switching status is the "OK" status. The green LED is lit.

The activated NO contact of the output relay can be used as a quiescent contact in a quiescent current loop.

If the electrode rods come into contact with a leakage liquid that has a far higher electrical conductivity, the output relay is de-energised. This switching status is the "Alarm" status. The red LED lights up.

This switching status corresponds to the switching status in the event of a power failure.

7. Self-hold function

In some cases, it is a good idea to keep an alarm event stored even after the cause of the alarm is no longer present.

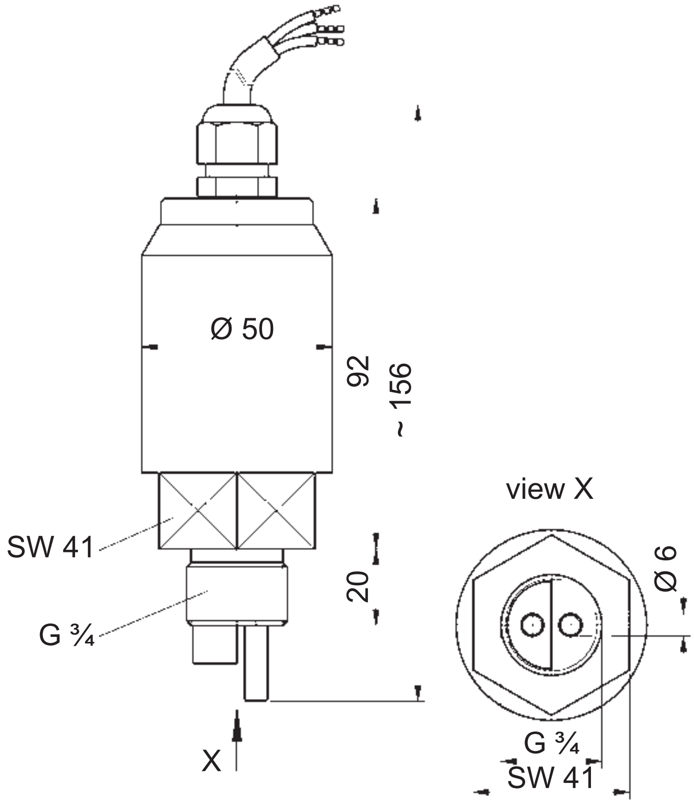
To do this, make a connection between E0 and E2 at the electrode relay via an NC contact. A switching status caused by a leakage alarm is then retained and can be cancelled once again by opening the NC contact (cancellation of self-hold function, no acknowledgement function).

8. Warning

If the self-hold function described under 7. is used, an alarm status caused by failure of the supply voltage may lead to undefined memory behaviour.

STK-¾” conductive rod electrode

for connection to a conductive electrode relay GR 3 or GR 5



STK-¾” with optional floor stand

The Jola STK-¾” rod electrode is a conductive rod electrode with 2 sensor elements for conductivity measurement in the form of 1 electrode rod made of solid material (for conductivity measurement) and 1 electrode sleeve with integrated temperature sensor (for conductivity measurement and temperature compensation). It serves to generate an alarm signal in the presence of an electrically highly conductive and generally water-polluting leakage liquid.

An integrated resistor circuit suppresses the alarm signal if the detected liquid is only low-conductivity water (e.g. condensation or rainwater).

As the electrical conductivity of liquids is highly dependent on their temperature, the electrode is fitted with a temperature compensation device.

A suitable Jola electrode relay must be used to ensure safe operation and avoid electric shocks.

Each STK-¾” rod electrode must therefore be connected to a GR 3 or GR 5 electrode relay. You may not connect multiple rod electrodes of the type STK-¾” to one electrode relay.

The connection must be in line with the schematic diagrams on pages 37-3-7 or 37-3-9.

Important notes for safe use

In order to ensure the desired mode of operation, the rod electrode may only be used in cases in which the electrode rods can be reliably covered by the highly electrically conductive liquid to be detected.

Highly electrically conductive residues such as sludge or incrustation can result in permanent activation of the rod electrode.

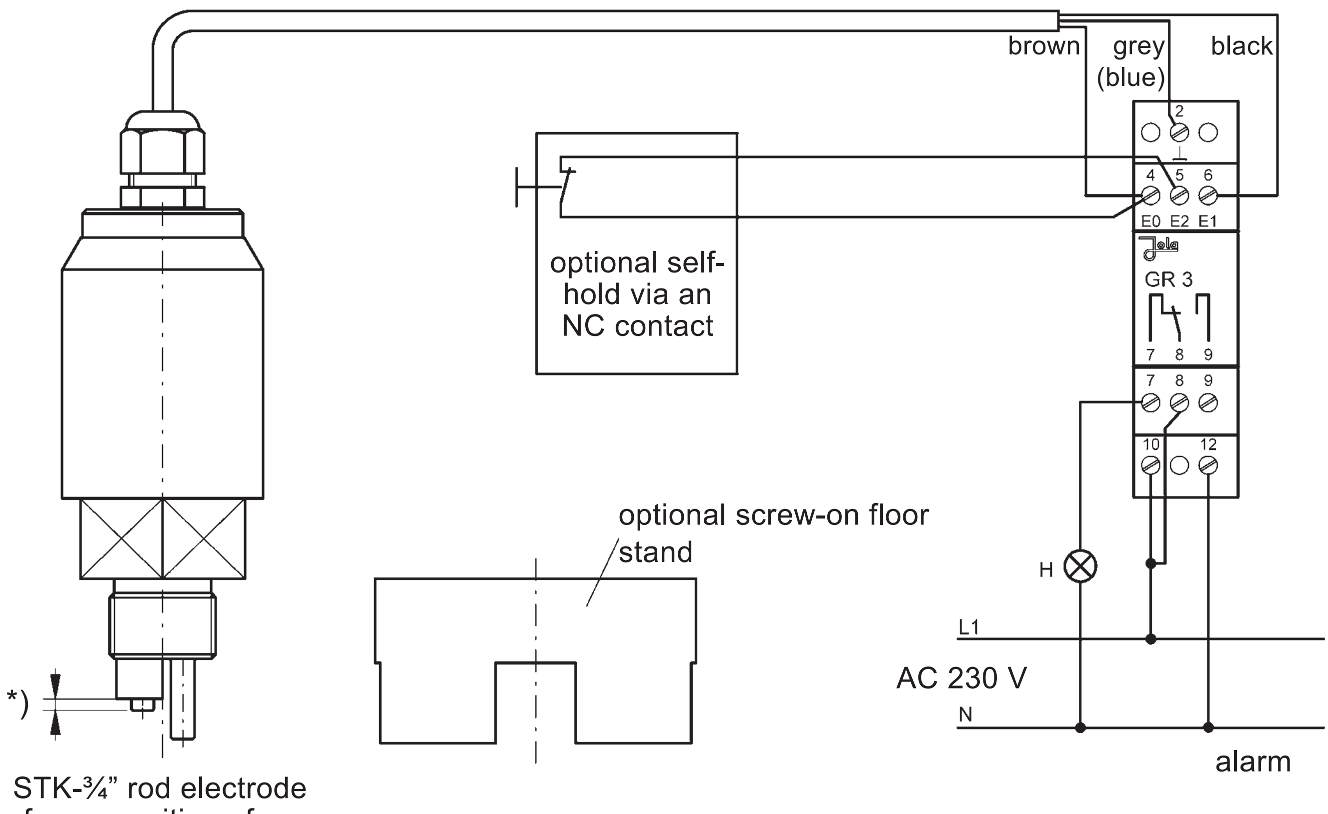
Technical data	STK-¾”
Application	signalling of an alarm in the presence of an electrically highly conductive (generally water-polluting) leakage liquid. The presence of a liquid with low electrical conductivity (e.g. condensation or rainwater) does not trigger an alarm.
Functional principle	measurement of conductivity with integrated automatic temperature compensation
Sensor elements	1 electrode rod made of solid material (for conductivity measurement) and 1 electrode sleeve with integrated temperature sensor (for conductivity measurement and temperature compensation) made of stainless steel 1.4571, each with 6 mm Ø
Housing	PP, approx. 156 mm (overall length) x 50 mm Ø, potted with polyurethane resin
Screw-in nipple	G¾
Electrical connection	3-wire connection, only suitable for connection to GR 3 or GR 5 electrode relay, with moulded cable, 3 x 0.75 mm², length 2 m, longer connecting cable on request wire colours: brown: electrode alternating voltage supply (E0) black: switching signal (E1) grey: common earth (⊥)
Mounting orientation	vertical or horizontal
Temperature range	– 20°C to + 60°C, up to + 90°C with reduced temperature compensation
Temperature compensation	compensation by approx. 2.1 %/K accross the full temperature application range from – 20°C to + 60°C; compensation falls to approx. 1.5 %/K in the range from + 60°C to + 90°C.
Response sensitivity	response of corresponding GR 3 or GR 5 electrode relay at a value of approx. 1,000 µS/cm of the electrically highly conductive (generally water-polluting) leakage liquid at the STK-¾” rod electrode; other response sensitivity on request
Switching delay	in line with the specifications of the corresponding Jola GR 3 or GR 5 electrode relay
Switching status indicator	in line with the specifications of the corresponding Jola GR 3 or GR 5 electrode relay
Optional mounting accessories	screw-on floor stand made of PP, approx. 80 mm Ø x 41 mm, also available with other dimensions between 50 and 150 mm Ø on request

The STK-¾” rod electrode can be screwed into a G¾ thread, attached to an optional floor stand, or suspended from above.

GR 3 conductive electrode relay

for the recognition of a contamination from an electrically highly conductive (generally water-polluting) leakage liquid

Electrode relay for U-bar mounting, with connection terminals on top and with 2 built-in LEDs for signalling the operating status.
This unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.



STK-¾" rod electrode for recognition of an electrically highly conductive liquid

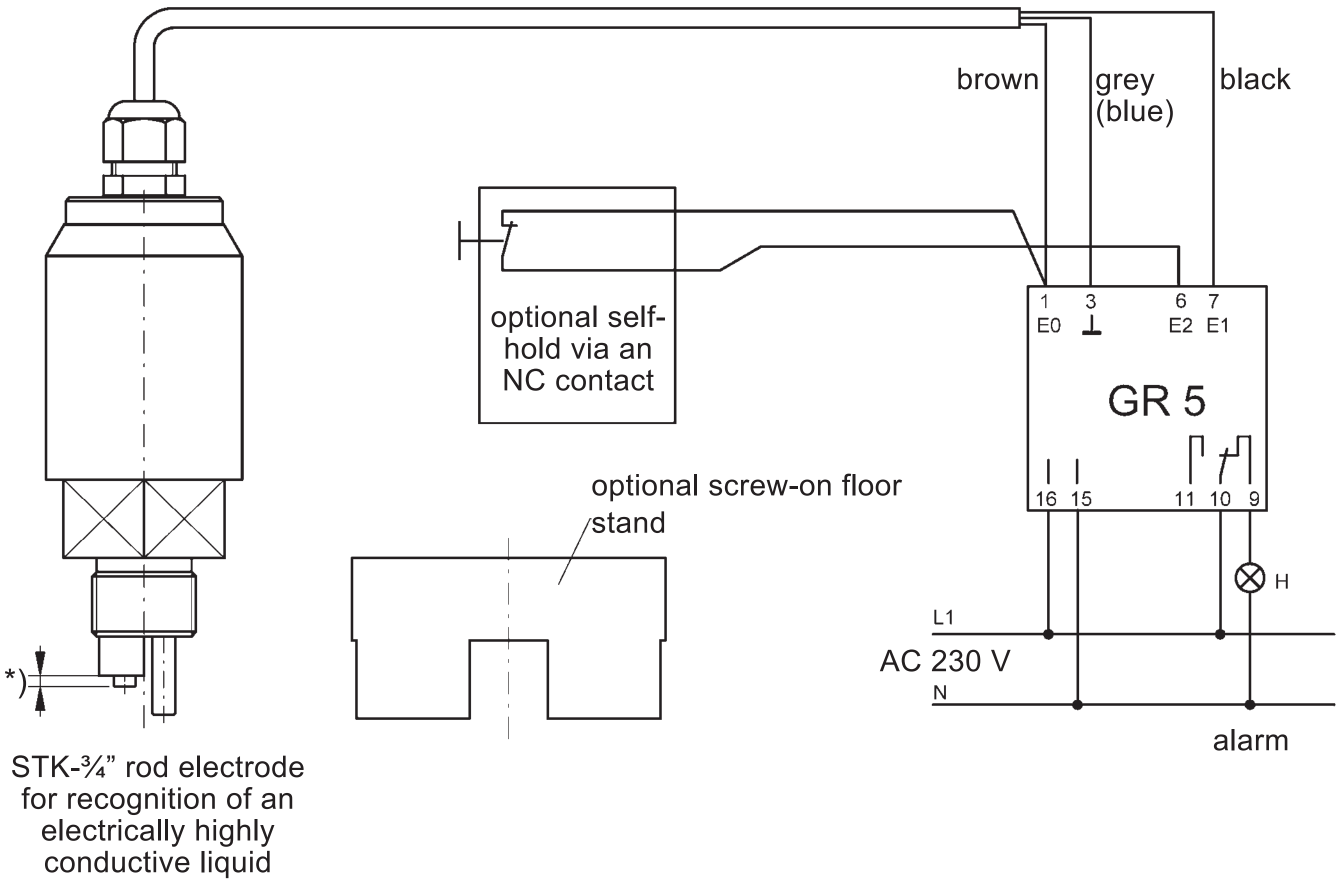
*) 1...10 mm for adapted response sensitivity

Technical data	GR 3
Alternative supply voltages (AC versions: terminals 10 and 12; DC versions: • terminal 10: – • terminal 12: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or } in these two cases, the unit must only be DC 12 V or } connected to a low safety votage which corresponds to the safety regulations relating to the application further supply voltages on request
Power consumption	approx. 3 VA
Electrode circuit (terminals 2, 4 and 6)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with optional self-hold
No-load voltage	9 V_{eff} ⊓⊔ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. approx. 20 mA_{eff} between E0 and ⊥
Response sensitivity	response of the GR 3 electrode relay at a value of approx. 1,000 µS/cm of the electrically highly conductive (generally water-polluting) leakage liquid at the STK-¾” rod electrode; other response sensitivity on request
Optional self-hold circuit (terminals 4 and 5)	A self-hold of an alarm can be realised via a quiescent current loop (pushbutton with NC contact) between E0 and E2. The self-hold can be cancelled by opening the quiescent current loop (by pressing the pushbutton) if the the cause of the alarm is no longer present (cancellation of self-hold function, no acknowledgement function).
Power circuit (terminals 7, 8 and 9)	1 single-pole potential-free changeover contact with self-hold
Functioning principle	quiescent current principle
Switching status indication	1 green LED lights when output relay is energised 1 red LED lights when output relay is not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 22.5 x 100 mm, see page 37-3-11
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and electrode
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

GR 5 conductive electrode relay

for the recognition of a contamination from an electrically highly conductive (generally water-polluting) leakage liquid

Electrode relay for U-bar mounting or surface mounting, with connection terminals on top and with 2 built-in LEDs for signalling the operating status.
This unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

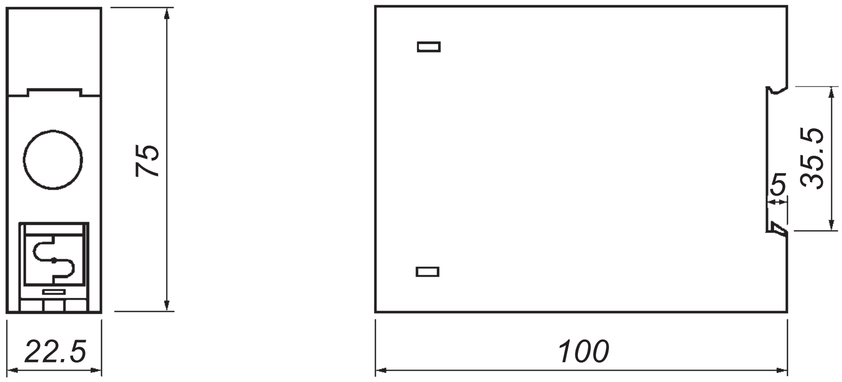


*) 1...10 mm for adapted response sensitivity

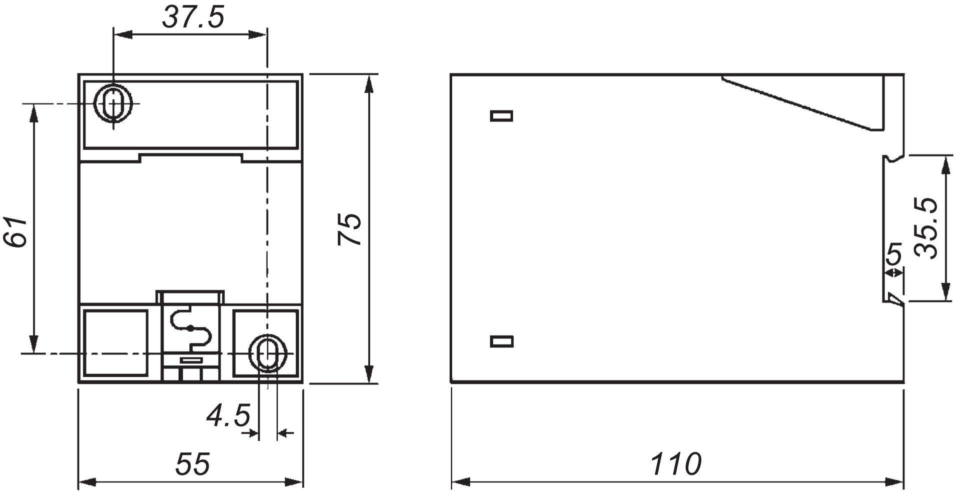
Technical data	GR 5
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: • terminal 15: – • terminal 16: +)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or DC 12 V or in these two cases (DC 24 V, DC 12 V), the unit must only be connected to a low safety votage which corresponds to the safety regulations relating to the application further supply voltages on request
Power consumption	approx. 3 VA
Electrode circuit (terminals 1, 3 and 7)	3 terminals (under safety extra low voltage SELV), acting on 1 output relay with optional self-hold
No-load voltage	9 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. approx. 20 mA_{eff} between E0 and ⊥
Response sensitivity	response of the GR 5 electrode relay at a value of approx. 1,000 µS/cm of the electrically highly conductive (generally water-polluting) leakage liquid at the STK-¾” rod electrode; other response sensitivity on request
Optional self-hold circuit (terminals 4 and 5)	A self-hold of an alarm can be realised via a quiescent current loop (pushbutton with NC contact) between E0 and E2. The self-hold can be cancelled by opening the quiescent current loop (by pressing the pushbutton) if the the cause of the alarm is no longer present (cancellation of self-hold function, no acknowledgement function).
Power circuit (terminals 7, 8 and 9)	1 single-pole potential-free changeover contact with self-hold
Functioning principle	quiescent current principle
Switching status indication	1 green LED lights when output relay is energised 1 red LED lights when output relay is not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm, see page 37-3-11
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46277 and EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. length of connecting cable	1,000 m between electrode relay and electrode
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Dimensions

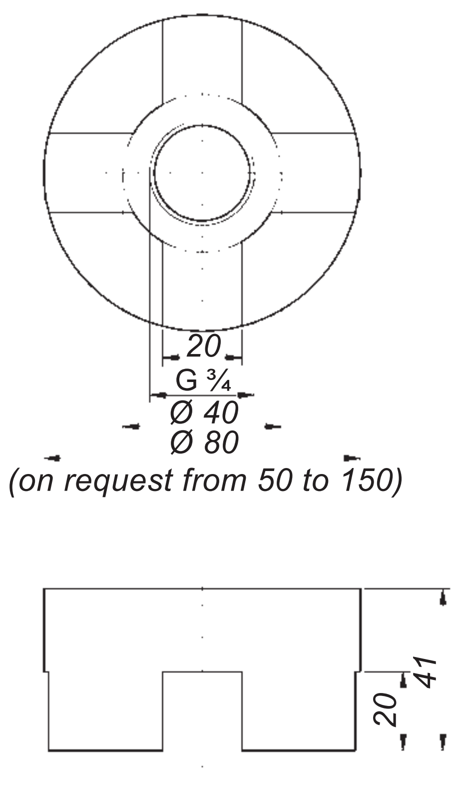
GR 3



GR 5

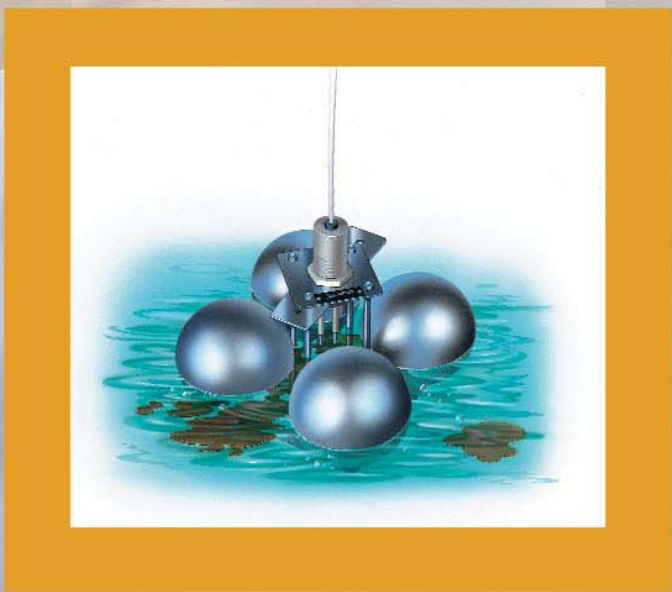


Optional screw-on foot stand for STK-¾”



Floating electrodes

for detection of a thin layer of non-conductive liquids with a lower specific gravity on top of conductive liquids with a higher specific gravity



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SCHE … floating electrodes

Areas of application

Floating electrodes are designed for use only **in pits, reservoirs, pump shafts, separator plants for light liquids or similar areas**.

It should be noted that floating electrodes can only be used **to detect the presence of a layer of a light liquid which is not soluble in water and which is not conductive on a surface of water (or another conductive liquid which has a higher specific density than the respective light liquid) which is sufficiently calm to allow phase formation.**

The precondition for proper functioning of the floating electrodes is, namely, **that clear separation between the heavy conductive liquid and the lighter non-conductive liquid to be detected** is possible in the various locations, such as pits, reservoirs, pump shafts, separator plants or similar.

In analogy to DIN 1999-100, DIN EN 858-1 and DIN EN 858-2 (separators for light liquids), the separation of light liquids which are insoluble in water and which are non-saponifiable, such as benzines, diesel and fuel oils as well as other oils of mineral origin with densities up to max. 0.95 g/cm³, is proven. Functioning of the floating electrodes is therefore ensured **when used in closed surveillance areas without discharges (pits, reservoirs, pump shafts) and in separator plants in compliance with DIN 1999-100, DIN EN 858-1 and DIN EN 858-2** for the listed media. Application tests have shown that an alarm is activated if non-conductive liquids have formed layers between approx. 3 mm and 10 mm on the heavy liquid (e.g. water) to be monitored.

For all other application areas, a test must be performed prior to the desired use to ascertain whether the phase formation and minimum layer thickness of the non-conductive liquid required for exact functioning can be achieved in the operating conditions in question (such as flow parameters, possible dwell times of the light liquid to be detected in the application site etc.).

In case of doubt, the installation conditions should be assessed by an expert from JOLA or from a supervisory organisation to determine whether the use of the floating electrodes is feasible.

It should also be noted that, although the floating electrodes can generally be used in the respective temperature ranges specified in the brochure, **it is absolutely essential that both media are present in light liquid form** to ensure proper functioning (which, for example, is only assured with water with a temperature above 0° C).

Design

The SCHE … floating electrodes are made up of an upper section and a lower section. The upper section consists of an electrode holder and a rod electrode (whose position can be adjusted in the electrode holder) with one control electrode and one earth electrode for alarm signalling. Alternatively, the rod electrode is also available with two control electrodes and one earth electrode for pre-alarm and main alarm. The lower section of the floating electrode is made up of four floats and a stabilising plate.

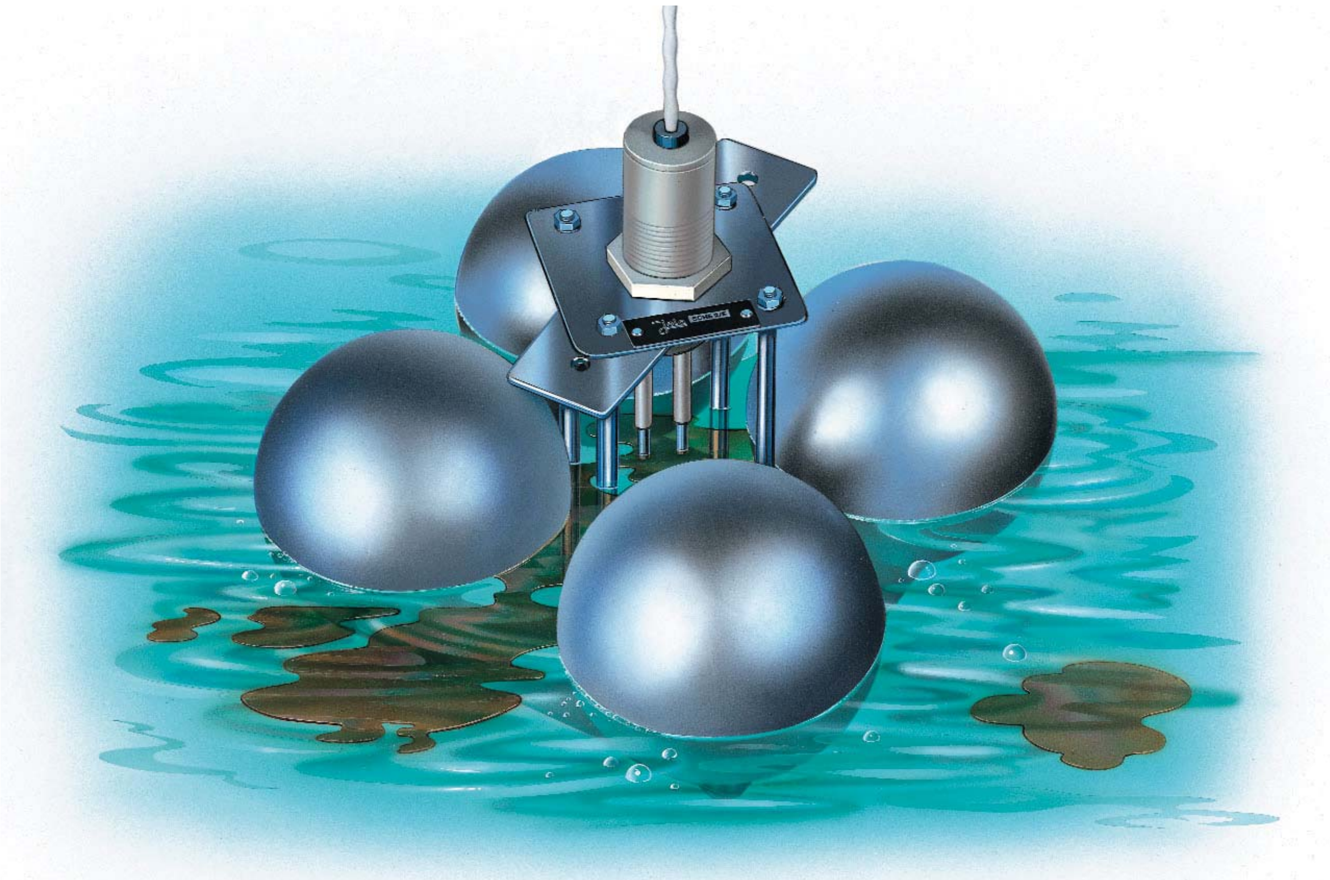
Mode of operation and adjustment

The SCHE … floating electrode normally floats on a conductive liquid, such as water. It is connected to an electrode relay which supplies it with a low safety voltage. The height of the rod electrode is set in such a way that the two electrode rod tips are permanently underwater. Depending on the movement of the surface of the liquid, the rod electrode should be set further up or down. Although the two electrode rod tips should be permanently underwater, they should only just be underwater, so that when a conductive liquid (water in our example) is overlaid by a non-conductive liquid (such as oil), a thin layer of the non-conductive liquid (oil) is sufficient to lift the electrode rod tips of the rod electrode from the conductive water layer into the non-conductive oil layer, to thus interrupt the current flowing from the electrode relay via the rod electrode, and therefore to activate an alarm.

If, for example, oil flows onto a still water surface following a leak, exact setting of the rod electrode will ensure that an oil layer of only approx. 3 to 10 mm thickness is sufficient to interrupt the control current flowing via the rod electrode and activate an alarm.

To ensure functionning of the SCHE … floating electrode, there must be a minimum liquid level above the floor (see technical data of the individual floating electrodes). If this condition is not fulfilled, the two electrode rod tips will no longer be underwater – in other words, they will not be electrically bridged by a conductive liquid. This will lead to normally undesired alarm activation via the connected electrode relay. The only model with an alarm bridging contact for this eventuality is the SCHE 2/E (ILS variant).

A SCHE … floating electrode is designed for connection to an **electrode relay ESA 2, ESA 2/G** or **NR 3 A.**

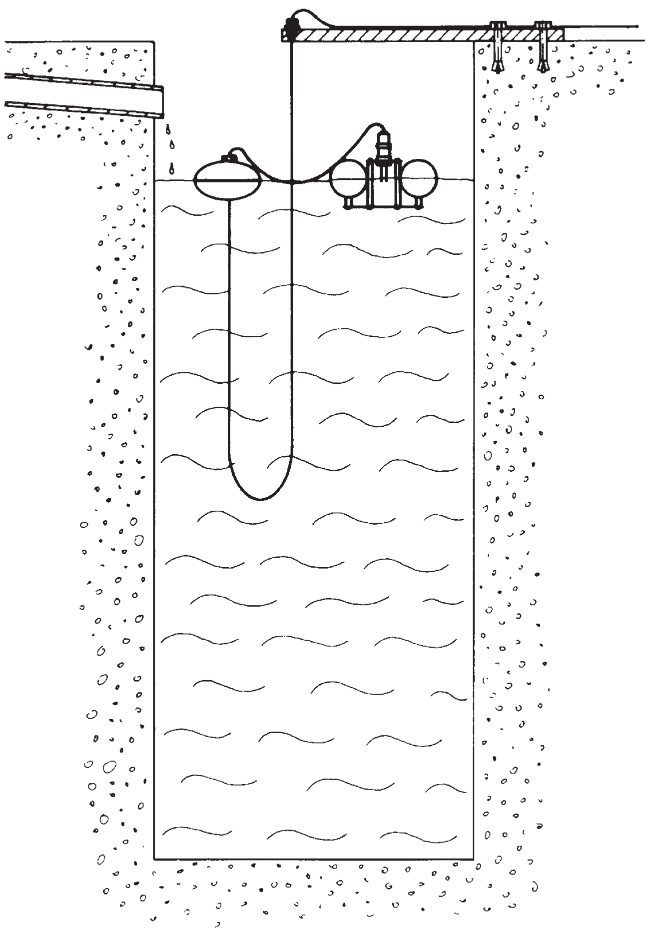


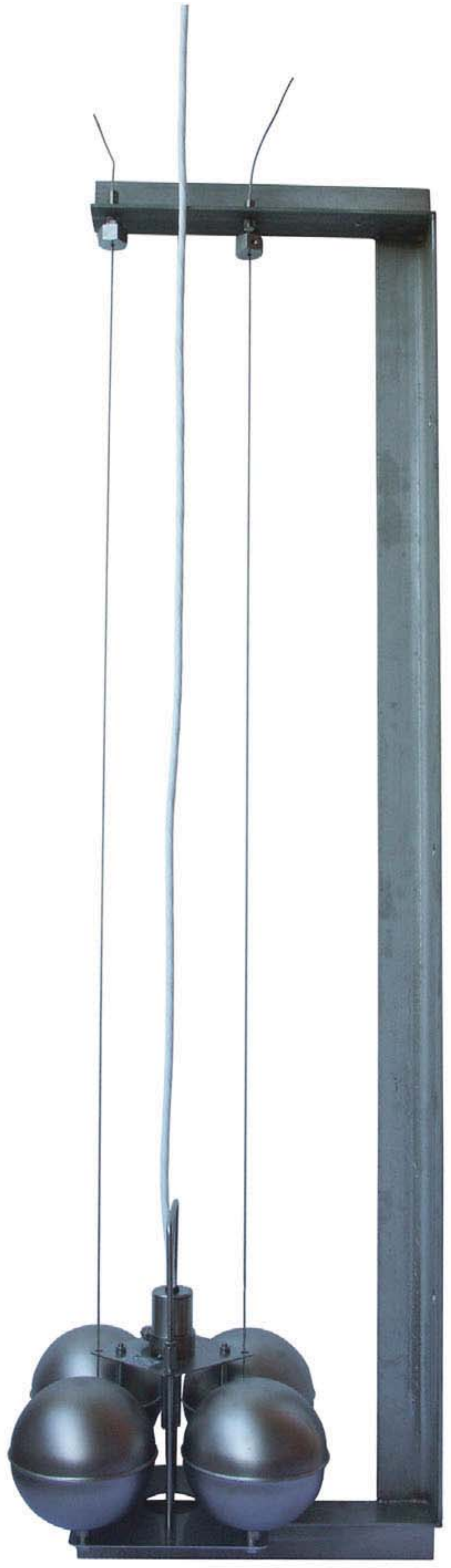
Floating electrode types and main differentiating features

Types	Main differentiating features	Pages
– **SCHE 2/T/GR**	Floats made of **PP**, plates and brackets made of **PVC**, conductive electrode with **2 electrode rods**, **for signalling 1 alarm**.	39-1-5 to 39-1-7
– **SCHE 2/T/KL**	Floats made of **PP**, plates and brackets made of **PVC**, conductive electrode with **2 electrode rods**, **for signalling 1 alarm**.	39-1-5 to 39-1-7
– **SCHE 2/E**	Floats, plates and brackets made of **stainless steel**, conductive electrode with **2 electrode rods**, **for signalling 1 alarm**.	39-1-5 to 39-1-8
– **SCHE 3/E**	Floats, plates and brackets made of **stainless steel**, conductive electrode with **3 electrode rods**, **for signalling 2 alarms**.	39-1-9 to 39-1-11
– **SCHE 2/E (ILS variant)**	Floats, plates and brackets made of **stainless steel**, conductive electrode with **2 electrode rods**, **for signalling 1 alarm,** **special version with alarm bridging contact for the event that no or insufficient conductive liquid is present to ensure functioning of the floating electrode.**	39-1-12 to 39-1-14

Option for all floating electrodes

To assure the proper functioning of the floating electrodes, when they are used in deep pits with an significant differential between the highest and the lowest liquid level, we recommend the use of one or several supplementary float(s) which has/have to be fixed to the connecting cable of each electrode. The float(s) will then carry the weight of the electrode connecting cable and this will prevent the electrode from leaning sideways or turning over.





Mounting frame made of stainless steel,
with guide ropes made of stainless steel
for the floating electrode, shown here using the
SCHE 2/E as an example

SCHE 2/.. floating electrodes

with conductive electrode with 2 electrode rods for signalling 1 alarm

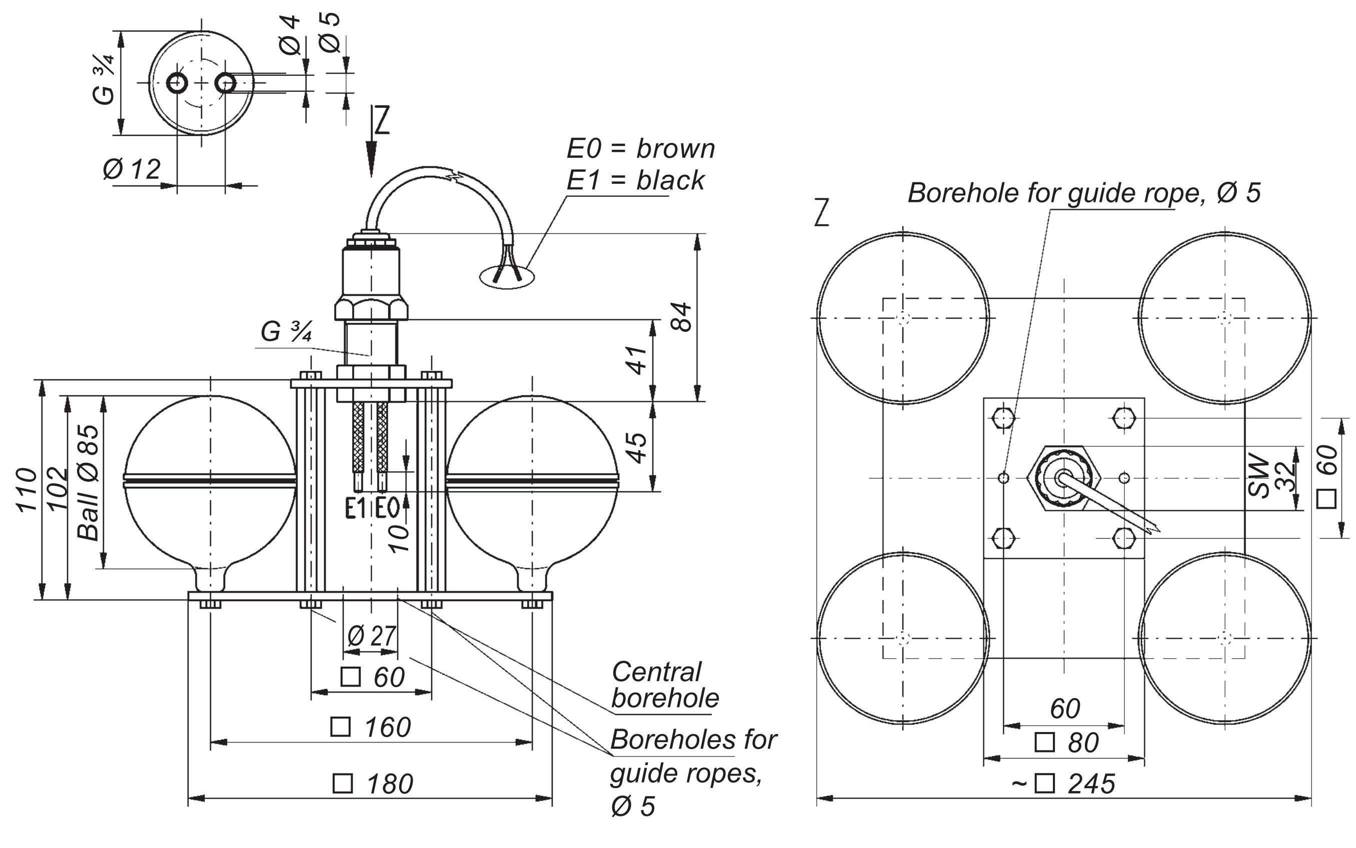
Technical data	SCHE 2/T/GR	SCHE 2/T/KL	SCHE 2/E
Design	1 control electrode and 1 earth electrode		
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of		
	polyolefine		PVDF or PTFE
Length of electrode rods	approx. 45 mm, other electrode rod lengths on request		
Material of electrode head	PP		stainless steel 316 Ti
Electrical connection	PVC cable,		PTFE cable,
	potted in electrode head, other cable on request		
Length of connecting cable	2 metres; longer connecting cable on request		
Protection class of the electrode head	IP 67		
Material of electrode holder, stabiliser plate and brackets	PVC		stainless steel 316 Ti or other stainless steel
No. of floats, float material and float dimensions	4 units made of		
	PP, approx. 85 mm Ø		stainless steel 316 Ti, approx. 95 mm Ø
Minimum liquid level above the floor to ensure functioning of the floating electrode (with d = 1 g/cm³)	**80 mm**	**75 mm**	**85 mm**
Temperature range	from + 8°C to + 60°C		from – 20°C to + 90°C
Pressure resistance	for pressureless applications only		
Max. length of connecting cable between floating electrode and electrode relay	**1,000 metres**		

SCHE 2/T/GR

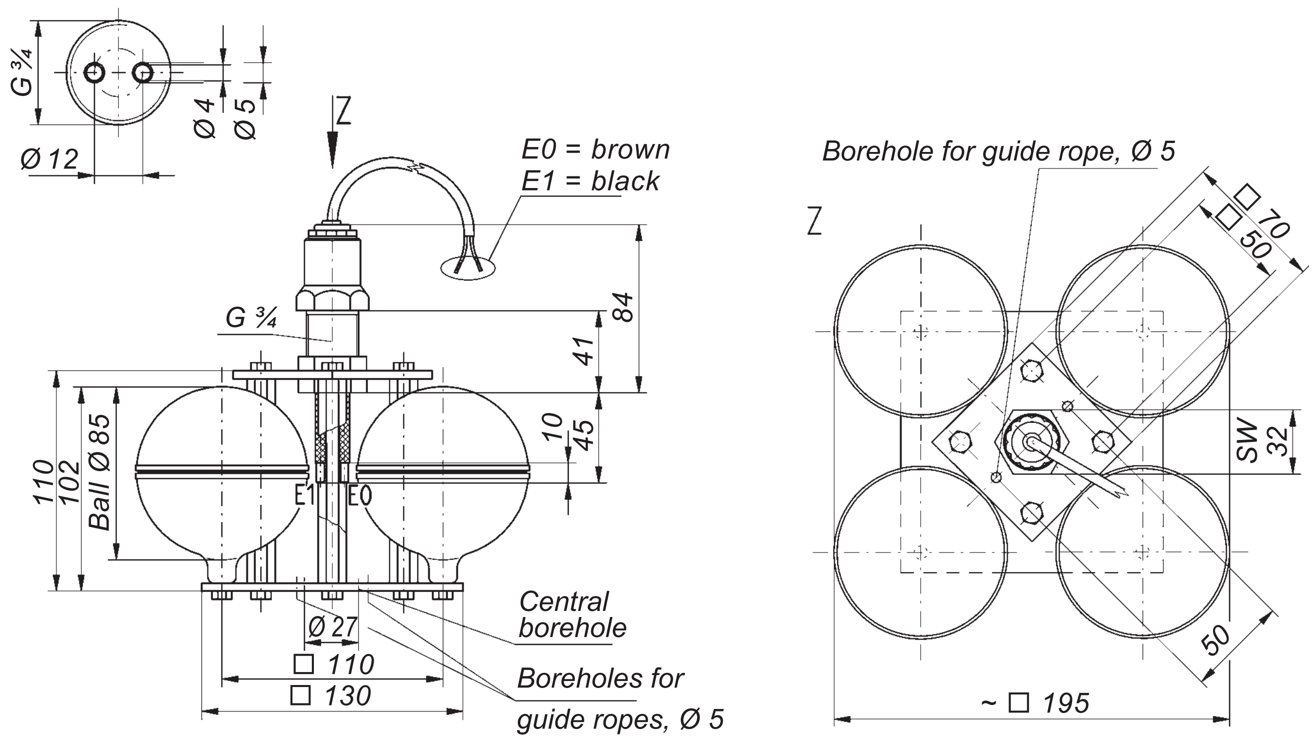
SCHE 2/T/KL

SCHE 2/E

SCHE 2/T/.. floating electrodes

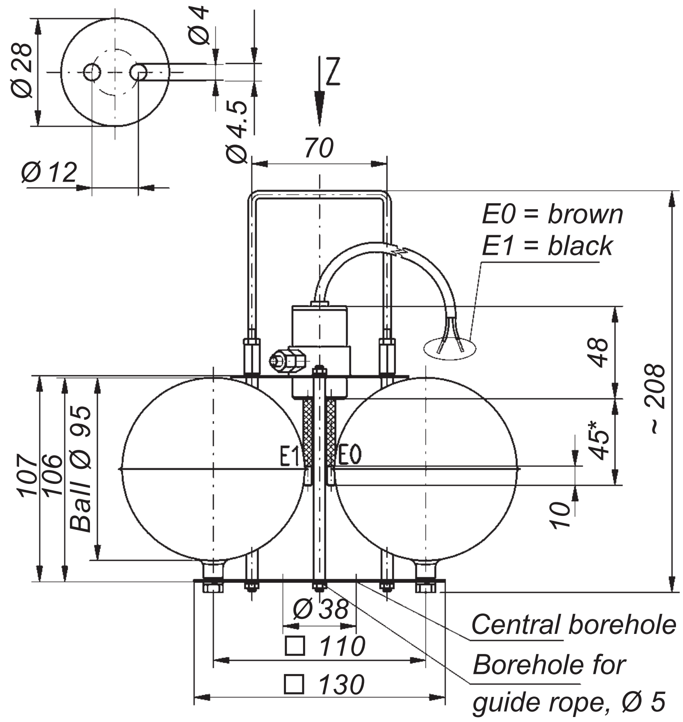


SCHE 2/T/GR

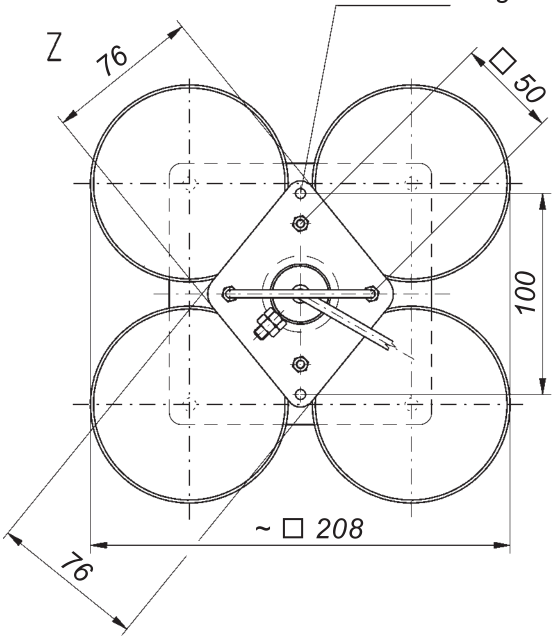


SCHE 2/T/KL

SCHE 2/E floating electrode



*) other lengths, between 45 mm and 500 mm, on request.



SCHE 2/E

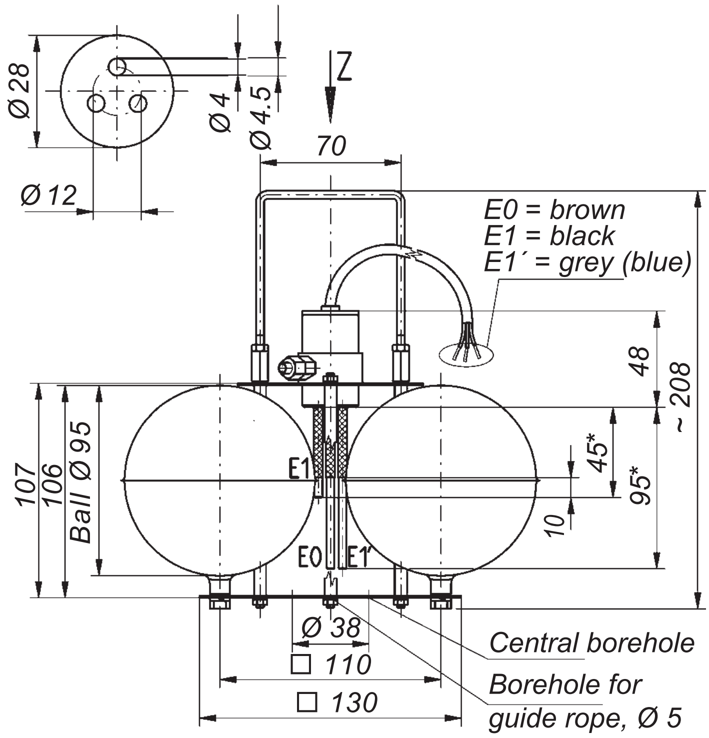
SCHE 3/E floating electrode

with conductive electrode with 3 electrode rods for signalling 2 alarms (for connection to 2 electrode relays)

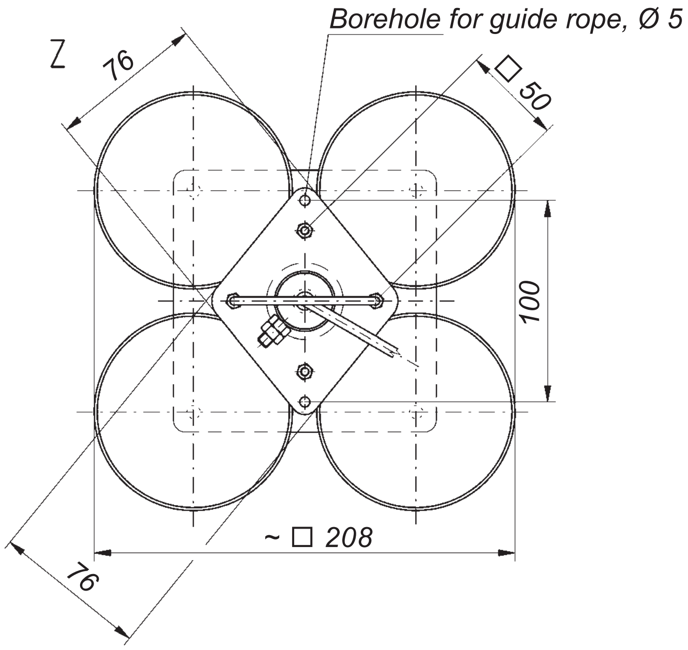
Technical data	SCHE 3/E
Design	2 control electrodes and 1 earth electrode
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of PVDF or PTFE
Length of electrode rods	approx. 45 mm – 95 mm – 95 mm, other electrode rod lengths on request
Material of electrode head	stainless steel 316 Ti
Electrical connection	PTFE cable, potted in electrode head; other cable on request
Length of connecting cable	2 metres; longer connecting cable on request
Protection class of the electrode head	IP 67
Material of electrode holder, stabiliser plate, brackets and floats	stainless steel 316 Ti or other stainless steel
No. of floats and float dimensions	4 units, approx. 95 mm Ø
Minimum liquid level above the floor to ensure functioning of the floating electrode (with d = 1 g/cm³)	**90 mm**
Temperature range	from – 20°C to + 90°C
Pressure resistance	for pressureless applications only
Max. length of connecting cable between floating electrode and electrode relay	**1,000 metres**

SCHE 3/E

SCHE 3/E floating electrode



*) other lengths, between 45 mm and 500 mm, on request.



SCHE 3/E

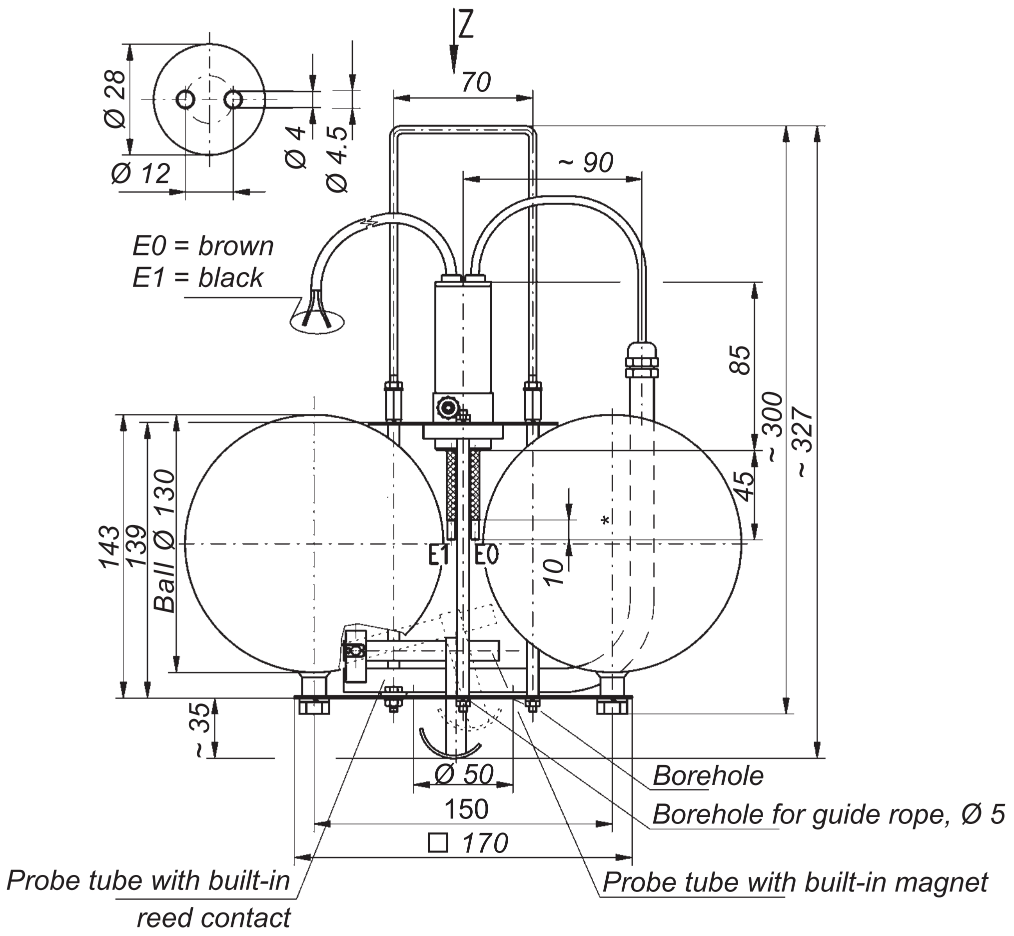
SCHE 2/E (ILS variant) floating electrode

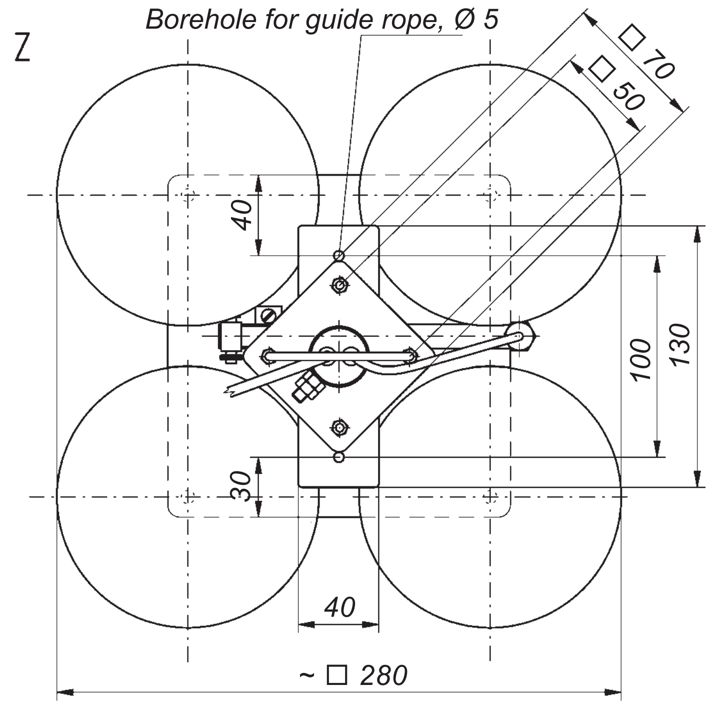
with conductive electrode with 2 electrode rods for signalling 1 alarm, special version with alarm bridging contact for the event that no or insufficient conductive liquid is present to ensure functioning of the floating electrode

Technical data	**SCHE 2/E (ILS variant)**
Design	1 control electrode and 1 earth electrode
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of PVDF or PTFE
Length of electrode rods	approx. 45 mm, other electrode rod lengths on request
Material of electrode head	stainless steel 316 Ti
Electrical connection	PTFE cable, potted in electrode head; other cable on request
Length of connecting cable	2 metres; longer connecting cable on request
Protection class of the electrode head	IP 67
Material of electrode holder, stabiliser plate and brackets	stainless steel 316 Ti or other stainless steel
No. of floats and float dimensions	4 units, approx. 130 mm Ø
Minimum liquid level above the floor to ensure functioning of the floating electrode (with d = 1 g/cm³)	**130 mm**
Alarm bridging contact	reed contact activated via a magnet located in the moving part of the mechanism in the event that no or insufficient conductive liquid is present to ensure functioning of the floating electrode
Temperature range	from – 20°C to + 90°C
Pressure resistance	for pressureless applications only
Max. length of connecting cable between floating electrode and electrode relay	**1,000 metres**

SCHE 2/E (ILS variant)

SCHE 2/E (ILS variant) floating electrode





SCHE 2/E (ILS variant)

ESA 2 electrode relay

Electrode relay for U-bar mounting or surface mounting, with connection terminals on top of housing and built-in two-colour LED for signalling the respective switching status.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. It is suitable for use in clean environments only.

The design of the electrode relay is based on the **quiescent current principle**; in other words, an alarm signal is given if there is no conductive connection between the two connected electrode rods of the JOLA SCHE ... floating electrode; the output contacts of the unit also revert to alarm status if there is a supply voltage failure.

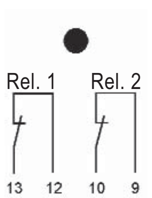
In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the two potential-free output contacts are in activated condition (= open) and the two-colour LED lights green.

In the event of an alarm, the two potential-free output contacts are in non activated condition (= closed) and the two-colour LED flashes red.

In order to cancel the alarm given via one of the two output relays, one of the two output relays can be reset using the built-in acknowledgement button or a connected external acknowledgement button. The LED then stops flashing and reverts to permanent red.

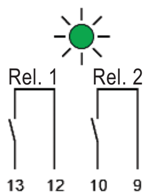
Position of output contacts of the ESA 2 electrode relay

Without supply voltage



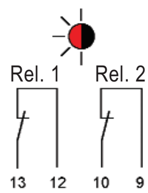
LED dark –
both output relays not energised – output contacts closed

OK status



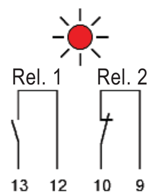
LED lights green –
both output relays energised – output contacts open

Alarm status



LED flashes red –
both output relays not energised – output contacts closed

Alarm status acknowledged

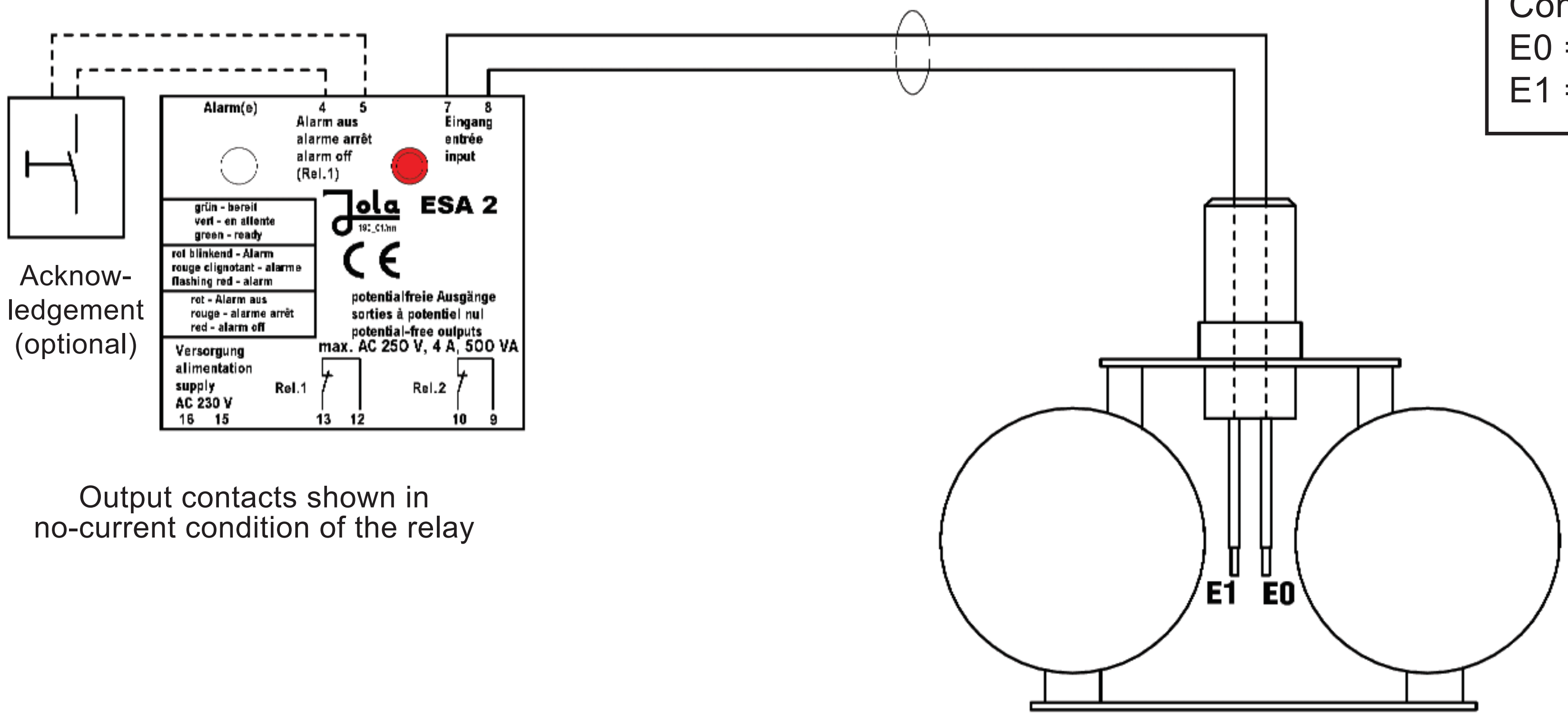


LED lights red –
output relay 1 energised – contact 12, 13 open – output relay 2 not energised – contact 9, 10 closed

Technical data	ESA 2
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: – - terminal 16: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } in these two cases, the unit must only be - DC 12 V or } connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Electrode circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays without self-hold, where one can be reset if an alarm is activated
– no-load voltage – short-circuit current – response sensitivity	$9\ V_{eff}$ ⎍ 10 Hz (safety extra low voltage SELV) max. $0.5\ mA_{eff}$ approx. 30 kOhm or approx. 33 µS (electric conductance)
Controlled circuits (terminals 12, 13 – rel. 1, terminals 9, 10 – rel. 2)	**2 potential-free normally closed contacts based on the quiescent current principle, both activated in standby status. One of the two normally closed contacts (terminals 12, 13 – rel. 1) can be reset in the event of alarm. The other normally closed contact (terminals 9, 10 – rel. 2) retains its switching status as long as the alarm is given.**
Acknowledgement	output relay 1 (terminals 12, 13) can be reset via a built-in button or external acknowledgement button (connection option at terminals 4 and 5)
Switching status indicator	via two-colour LED: green = standby, both output relays energised flashing red = alarm, both output relays not energised lights red = alarm acknowledged, output relay 1 reset
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 39-1-27)
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment to U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature range	from – 20°C to + 60°C
Max. cable length between ESA and floating electrode	**1,000 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Circuit diagram for connection of floating electrode SCHE 2/T/GR, SCHE 2/T/KL, SCHE 2/E or SCHE 2/E (ILS variant) to electrode relay ESA 2

Connection:
E0 = brown
E1 = black

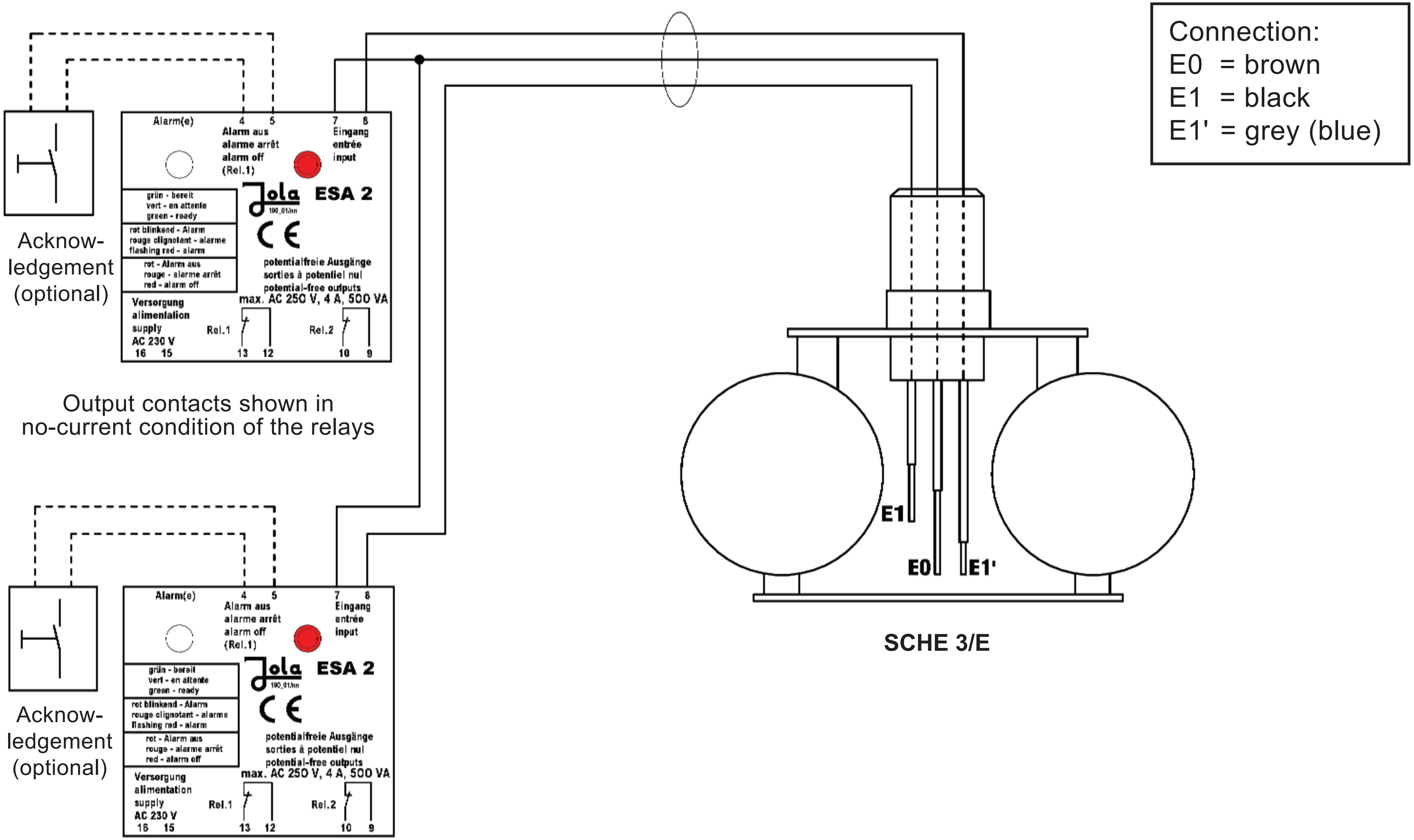


Acknow-
ledgement
(optional)

Output contacts shown in
no-current condition of the relay

SCHE 2/T/GR,
SCHE 2/T/KL,
SCHE 2/E
or
SCHE 2/E (ILS variant)

Circuit diagram for connection of floating electrode SCHE 3/E to 2 electrode relays ESA 2



ESA 2/G electrode relay

Electrode relay in surface-mount housing, with transparent cover and with 2 built-in LEDs (inside the housing) for signalling the respective switching status.

The design of the electrode relay is based **on the quiescent current principle**; in other words, an alarm signal is given if there is no conductive connection between the two connected electrode rods of the Jola SCHE … floating electrode; the output contacts of the unit also revert to alarm status if there is a supply voltage failure.

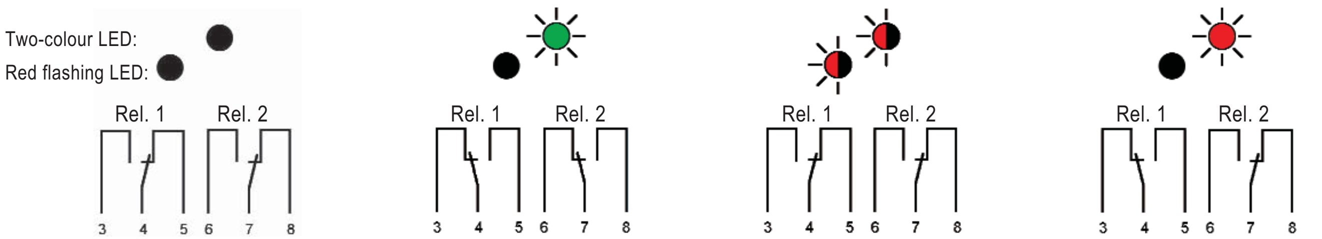
In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the two potential-free changeover contacts in the output are in activated condition and the two-colour LED lights green.

In the event of an alarm, the two potential-free changeover contacts in the output are in non activated condition (quiescent state), and the two-colour LED flashes red; an additional red flashing LED also flashes as a switching status indicator for the output relay which can be acknowledged.

In order to cancel the alarm given via one of the two output relays, one of the two output relays can be reset using a connected external acknowledgement button. The red flashing LED then stops flashing and the two-colour LED reverts to permanent red.

Position of output contacts of the ESA 2 electrode relay

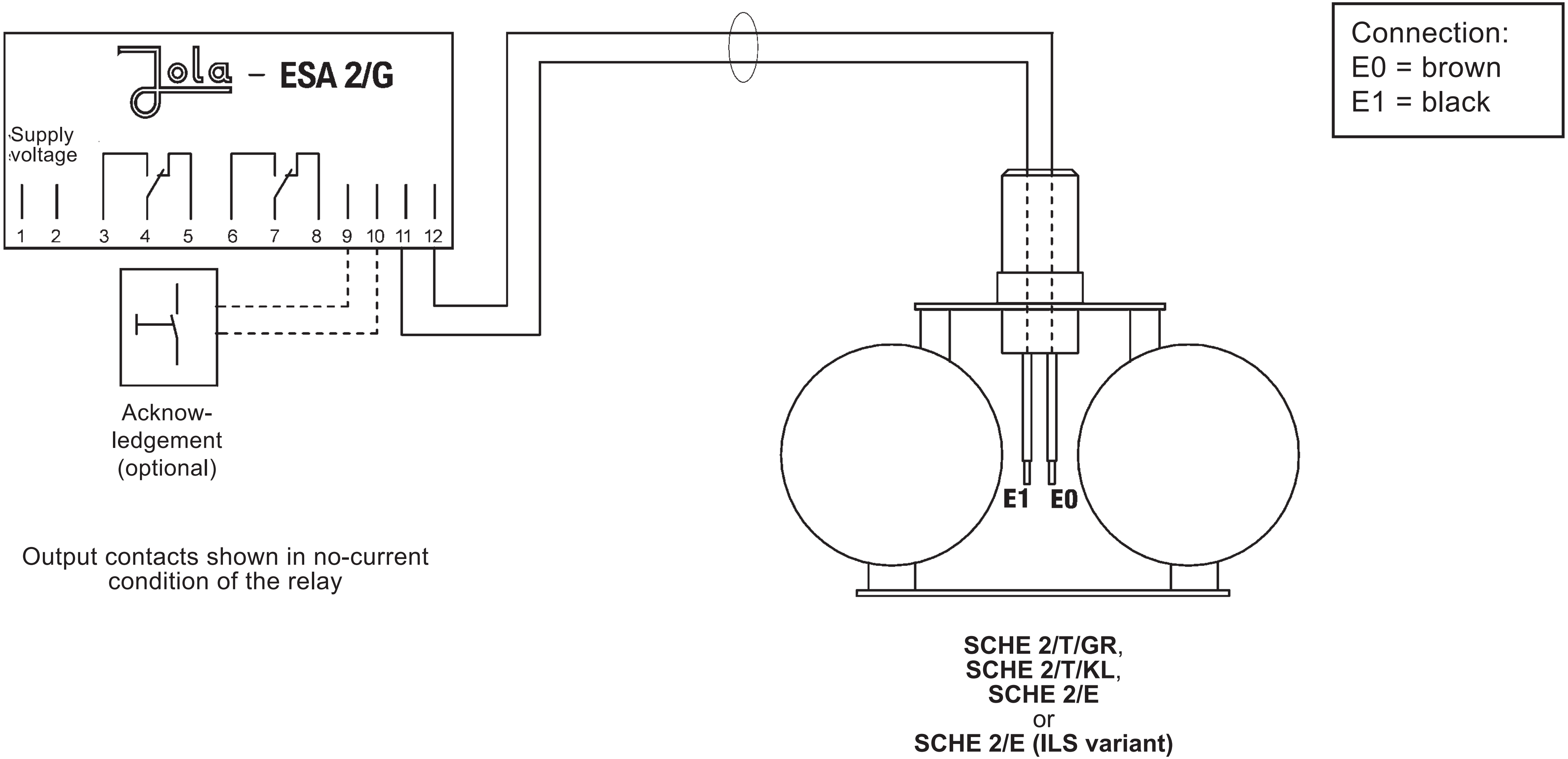
Without supply voltage	OK status	Alarm status	Alarm status acknowledged



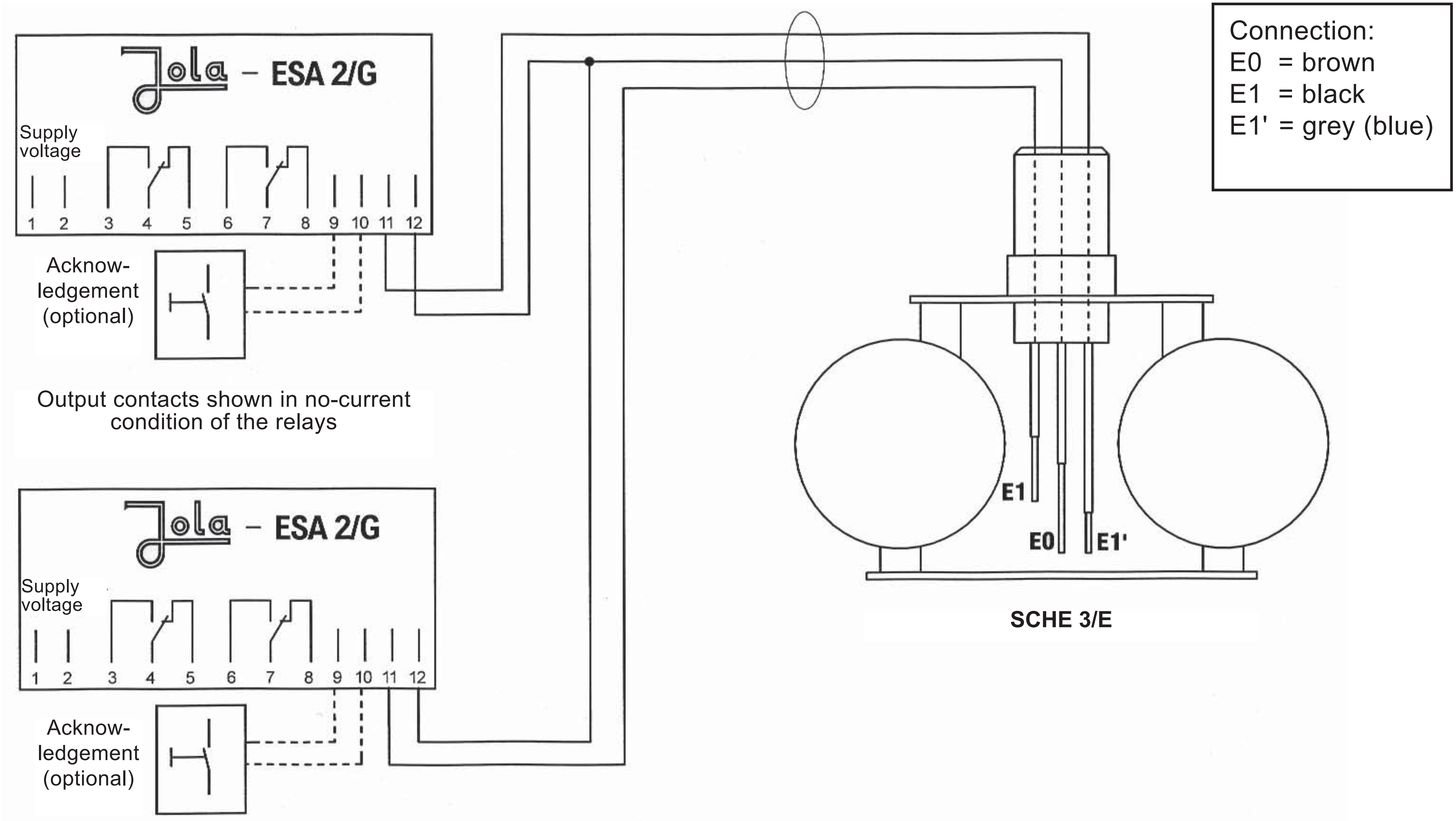
LEDs dark –	**Two-colour LED lights green – red flashing LED dark –**	**Two-colour LED flashes red – red flashing LED flashes –**	**Two-colour LED lights red – red flashing LED dark –**
both output relays not energised	both output relays energised	both output relays not energised	output relay 1 energised – output relay 2 not energised

Technical data	ESA 2/G
Alternative supply voltages (AC versions: terminals 1 and 2; DC versions: - terminal 1: – - terminal 2: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or (DC 24 V and DC 12 V:) in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Electrode circuit (terminals 11 and 12)	2 terminals (under safety extra low voltage SELV), acting on 2 output relays without self-hold, where one can be reset if an alarm is activated
– no-load voltage	9 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
– short-circuit current	max. 0.5 mA_{eff}
– response sensitivity	approx. 30 kOhm or approx. 33 μS (electric conductance)
Controlled circuit (terminals 3 to 8)	**2 potential-free changeover contacts based on the quiescent current principle, both activated in standby status.** **One of the two changeover contacts (terminals 3, 4, 5 – rel. 1) can be reset in the event of alarm.** **The other changeover contact (terminals 6, 7, 8 – rel. 2) retains its switching status as long as the alarm is given.**
Acknowledgement	output relay 1 (terminals 3, 4, 5) can be reset via a connected external acknowledgement button (connection option at terminals 9 and 10)
Switching status indicators	– via two-colour LED: green = standby, both output relays energised flashing red = alarm, both output relays not energised lights red = alarm acknowledged, output relay 1 reset – and one red flashing LED: flashes red = output relay 1 in alarm status
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 screw connections (dimensions see page 39-1-27)
Connection	internal terminals
Protection class	IP 54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	from – 20°C to + 60°C
Max. cable length between ESA 2/G and floating electrode	**1,000 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Circuit diagram for connection of floating electrode SCHE 2/T/GR, SCHE 2/T/KL, SCHE 2/E or SCHE 2/E (ILS variant) to electrode relay ESA 2/G



Circuit diagram for connection of floating electrode SCHE 3/E to 2 electrode relays ESA 2/G



NR 3 A electrode relay

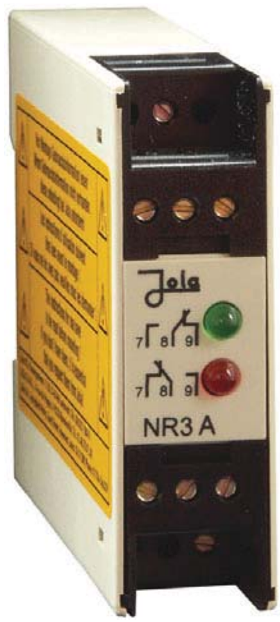
Electrode relay for U-bar mounting, with connection terminals on top of housing and with 2 built-in LEDs for signalling the respective switching status.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. It is suitable for use in clean environments only.

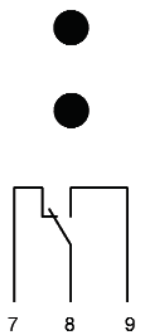
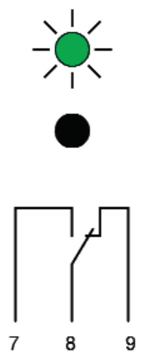
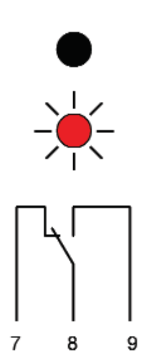
The design of the electrode relay is based **on the quiescent current principle**; in other words, an alarm signal is given if there is no conductive connection between the two connected electrode rods of the JOLA SCHE ... floating electrode; the output contact of the unit also reverts to alarm status if there is a supply voltage failure.

In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the potential-free changeover contact in the output is in activated condition and the green LED lights.

In the event of an alarm, the potential-free changeover contact in the output is in non activated condition (quiescent state) and the red LED lights.



Position of output contact of the NR 3 A electrode relay

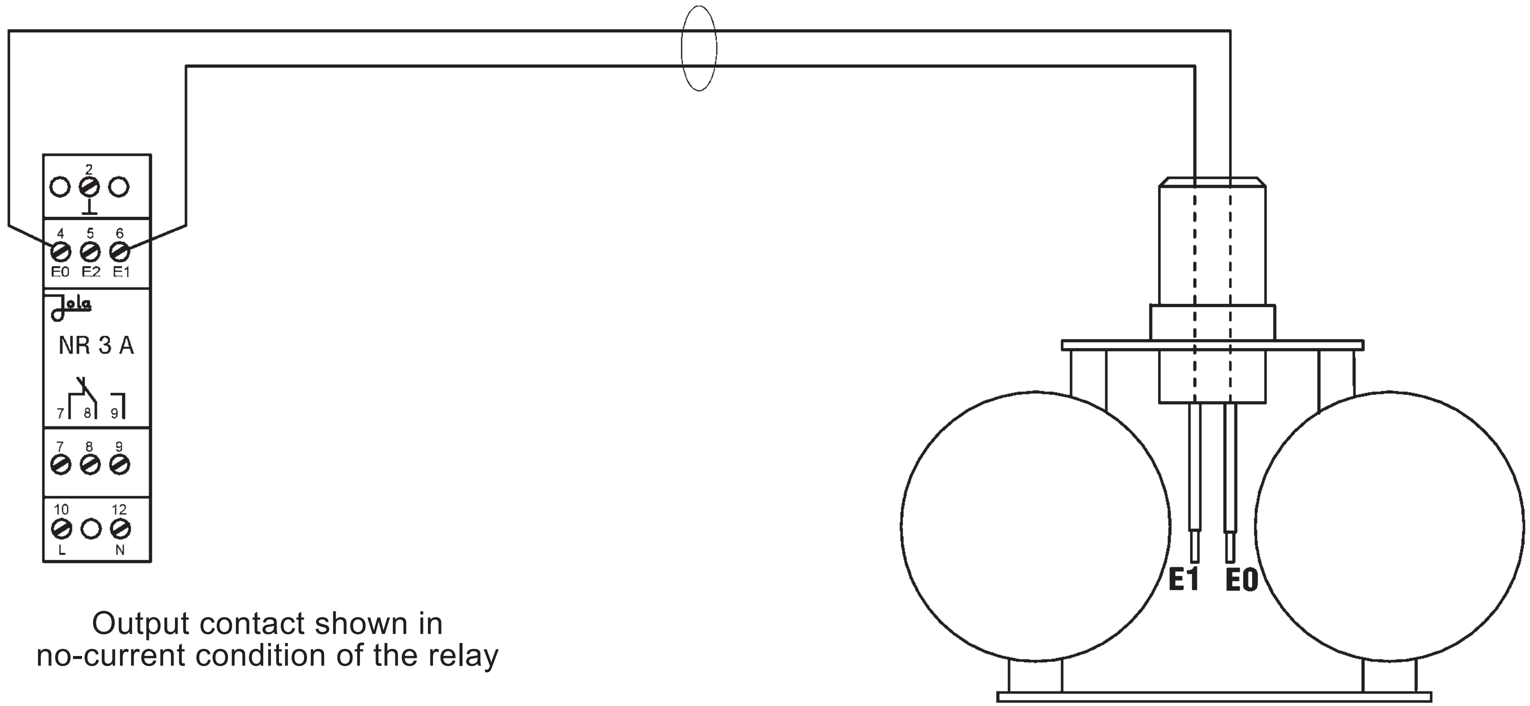
Without supply voltage	**OK status**	**Alarm status**
		
LEDs dark – output relay not energised	**green LED lights –** output relay energised	**red LED lights –** output relay not energised

Technical data	NR 3 A
Alternative supply voltages (AC versions: terminals 10 and 12; DC versions: - terminal 10: – - terminal 12: +)	- AC 230 V (delivered if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or - DC 12 V or } in these two cases, the unit must only be connected to a low safety voltage which corresponds to the safety regulations relating to the application - further supply voltages on request
Power input	approx. 3 VA
Electrode circuit (terminals 4 and 6)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay
- no-load voltage - short-circuit current - response sensitivity	$9\ V_{eff}$ 10 Hz (safety extra low voltage SELV) max. $0.5\ mA_{eff}$ approx. 30 kOhm or approx. 33 μS (conductance)
Controlled circuits (terminals 7, 8, 9)	**1 single-pole potential-free changeover contact based on the quiescent current principle, activated in standby status**
Switching status indicators	- via a green LED: lights = OK status, output relay energised - via a red LED: lights = alarm status, output relay not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 22.5 x 100 mm (dimensions see page 39-1-27)
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment to U-bar to DIN 46277 and EN 50022
Mounting orientation	any
Temperature range	from - 20°C to + 60°C
Max. cable length between NR 3 A and floating electrode	**1,000 metres**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

39-1-25

Circuit diagram for connection of floating electrode SCHE 2/T/GR, SCHE 2/T/KL, SCHE 2/E or SCHE 2/E (ILS variant) to electrode relay NR 3 A

Connection:
E0 = brown
E1 = black

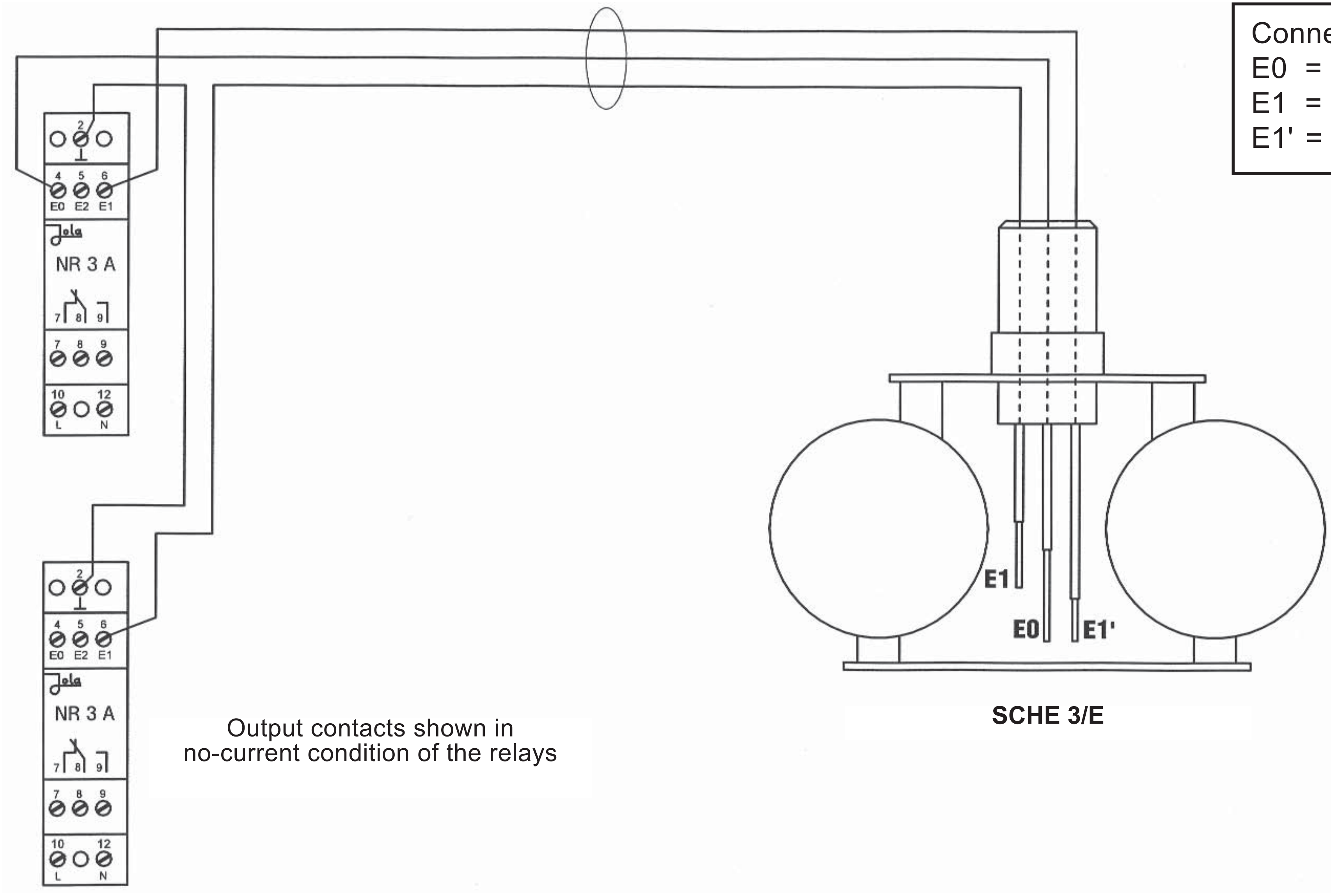


Output contact shown in
no-current condition of the relay

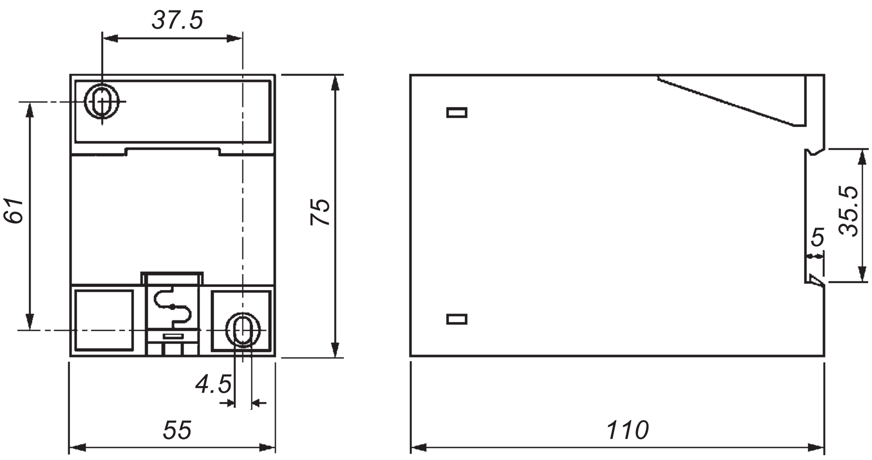
SCHE 2/T/GR,
SCHE 2/T/KL,
SCHE 2/E
or
SCHE 2/E (ILS variant)

Circuit diagram for connection of floating electrode
SCHE 3/E
to 2 electrode relays NR 3 A

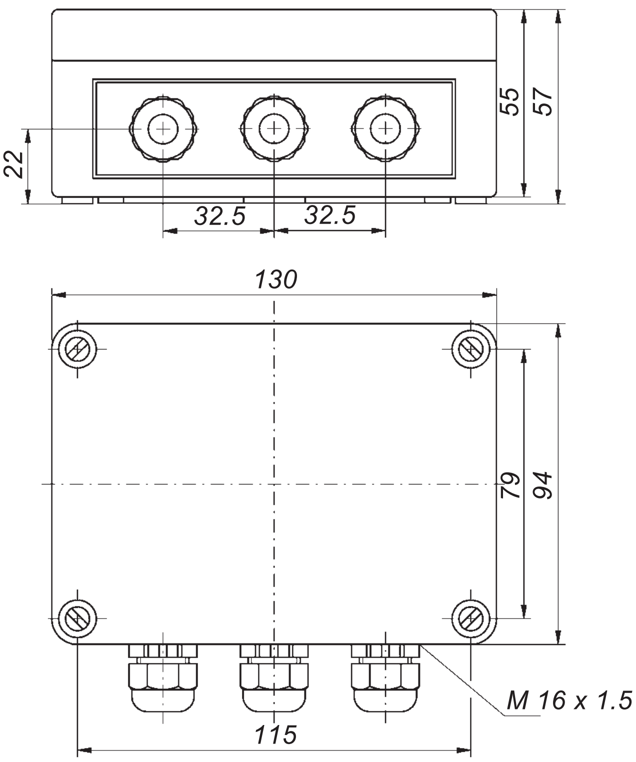
Connection:
E0 = brown
E1 = black
E1' = grey (blue)



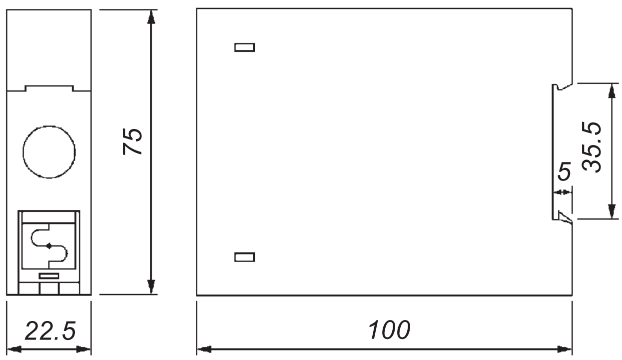
Dimensions



ESA 2



ESA 2/G



NR 3 A

The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Ex floating electrodes

for detection of liquid hydrocarbons on water surfaces

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The units described in this documentation may only be installed, connected, started up, serviced and replaced by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Ex floating electrodes

Contents | Page

Ex floating electrodes

Areas of application

Ex floating electrodes are designed for use only **in pits, reservoirs, pump shafts, separator plants for light liquids or similar areas**.

It should be noted that Ex floating electrodes can only be used **to detect the presence of a layer of a light liquid which is not soluble in water and which is not conductive on a surface of water (or another conductive liquid which has a higher specific density than the respective light liquid) which is sufficiently calm to allow phase formation.**

The precondition for proper functioning of the Ex floating electrodes is, namely, **that clear separation between the heavy conductive liquid and the lighter non-conductive liquid to be detected** is possible in the various locations, such as pits, reservoirs, pump shafts, separator plants or similar.

In analogy to DIN 1999-100, DIN EN 858-1 and DIN EN 858-2 (separators for light liquids), the separation of light liquids which are insoluble in water and which are non-saponifiable, such as benzines, diesel and fuel oils as well as other oils of mineral origin with densities up to max. 0.95 g/cm³, is proven. Functioning of the Ex floating electrodes is therefore ensured **when used in closed surveillance areas without discharges (pits, reservoirs, pump shafts) and in separator plants in compliance with DIN 1999-100, DIN EN 858-1 and DIN EN 858-2** for the listed media. Application tests have shown that an alarm is activated if non-conductive liquids have formed layers between approx. 3 mm and 10 mm on the heavy liquid (e.g. water) to be monitored.

For all other application areas, a test must be performed prior to the desired use to ascertain whether the phase formation and minimum layer thickness of the non-conductive liquid required for exact functioning can be achieved in the operating conditions in question (such as flow parameters, possible dwell times of the light liquid to be detected in the application site etc.).

In case of doubt, the installation conditions should be assessed by an expert from Jola or from a supervisory organisation to determine whether the use of the Ex floating electrodes is feasible.

It should also be noted that, although the Ex floating electrodes can generally be used in the respective temperature ranges specified in the brochure, **it is absolutely essential that both media are present in light liquid form** to ensure proper functioning (which, for example, is only assured with water with a temperature above 0°C).

If temperatures below 0°C are expected, we recommend the installation of an Ex floating electrode with trace heating of the type HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4.

Design

The Ex floating electrodes are made up of an upper section and a lower section. The upper section consists of an electrode holder and a rod electrode (whose position can be adjusted in the electrode holder) with one control electrode and one earth electrode for alarm signalling. Alternatively, the rod electrode is also available with two control electrodes and one earth electrode for pre-alarm and main alarm. The lower section of the floating electrode is made up of four floats and a stabilizer plate.

Mode of operation and adjustment

Description based on Ex floating electrodes with 2 electrode rods

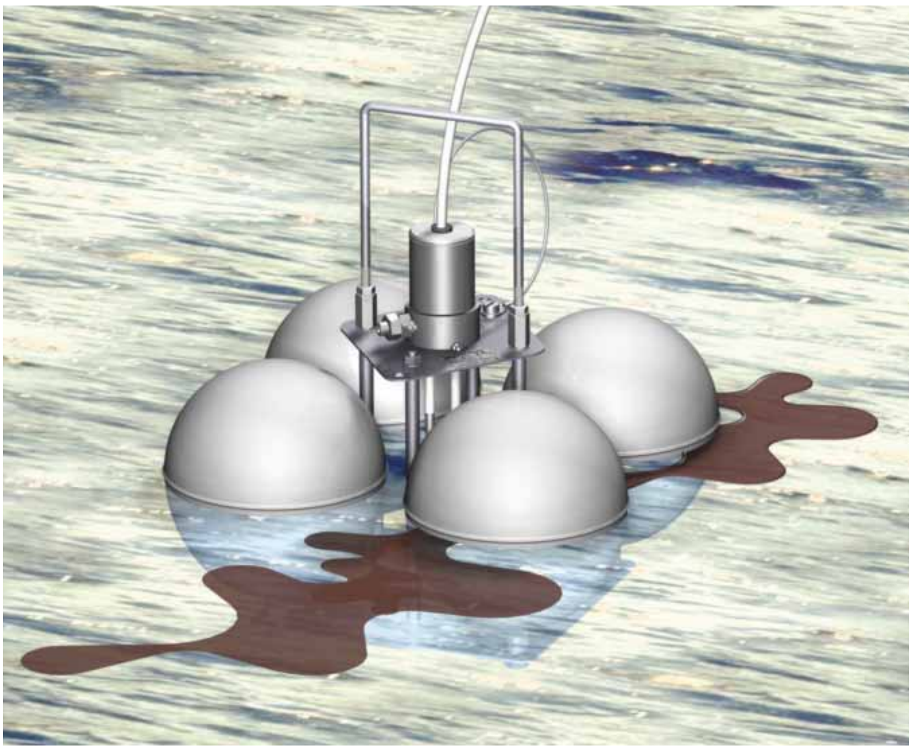
The Ex floating electrode normally floats on a conductive liquid, such as water. It is connected, via an obligatory Ex connection box, to an Ex electrode relay which supplies it with a low safety voltage. The height of the rod electrode is set in such a way that the two electrode rod tips are permanently underwater. Depending on the movement of the surface of the liquid, the rod electrode should be set further up or down. Although the two electrode rod tips should be permanently underwater, they should only just be underwater, so that when a conductive liquid (water in our example) is overlaid by a non-conductive liquid (such as oil), a thin layer of the non-conductive liquid (oil) is sufficient to lift the electrode rod tips of the rod electrode from the conductive water layer into the non-conductive oil layer, to thus interrupt the current flowing from the Ex electrode relay via the rod electrode, and therefore to activate an alarm.

If, for example, oil flows onto a still water surface following a leak, exact setting of the rod electrode will ensure that an oil layer of only approx. 3 to 10 mm thickness is sufficient to interrupt the control current flowing via the rod electrode and activate an alarm.

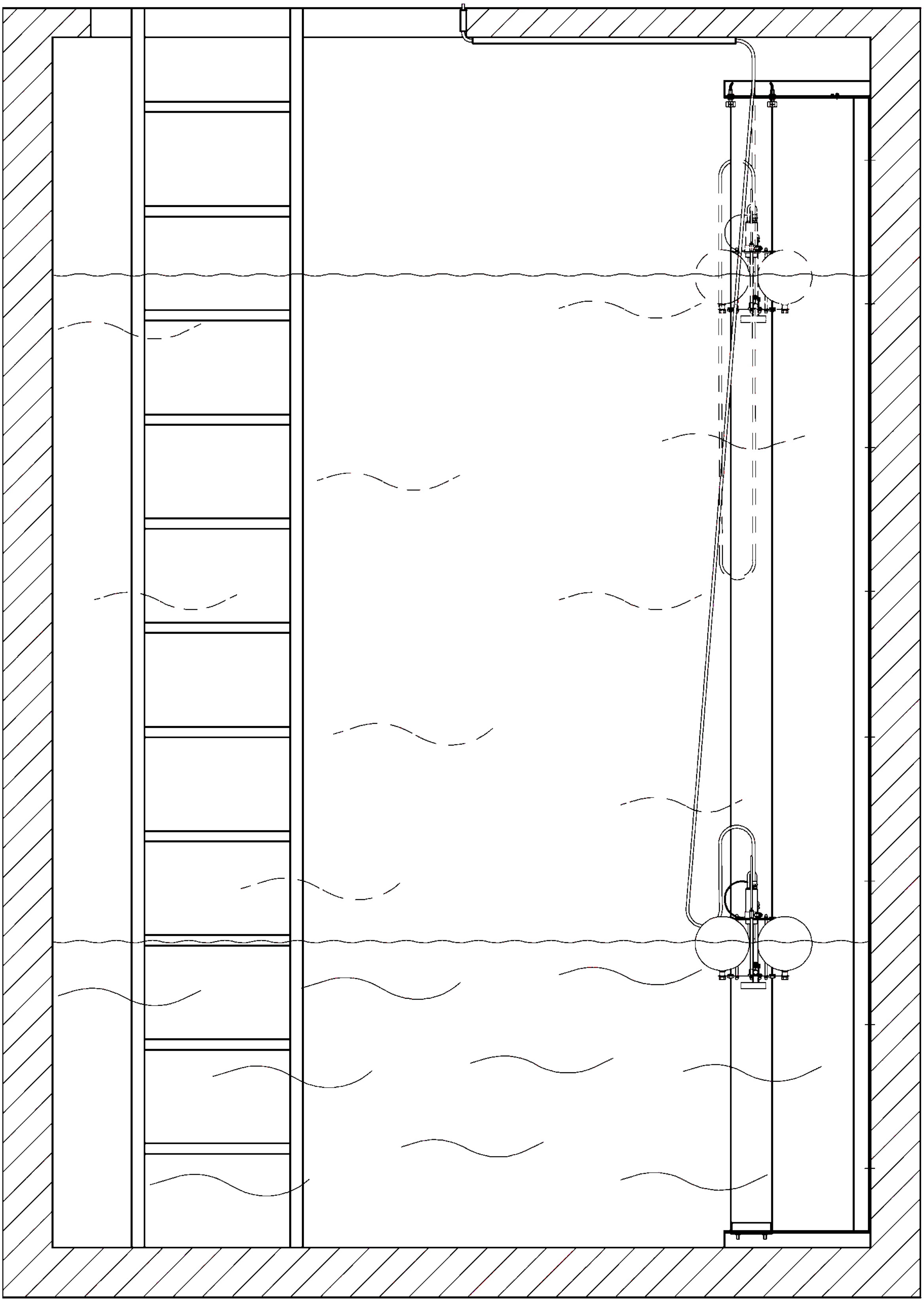
To ensure functioning of the Ex floating electrode, there must be a minimum liquid level above the floor (see technical data of the individual Ex floating electrodes). If this condition is not fulfilled, the two electrode rod tips will no longer be underwater – in other words, they will not be electrically bridged by a conductive liquid. This will lead to normally undesired alarm activation via the connected Ex electrode relay. The only models with an alarm bridging contact for this eventuality are the SCHE 2/Ex (Variante ILS)-.G.

A SCHE 2/Ex ... floating electrode fitted with 2 electrode rods is designed for connection, via an obligatory **OAK/SCHE/NR/2x1MΩ** connection box, to an **Ex electrode relay NR 5/Ex, Version A.**

The NR 5/Ex, Version A electrode relay is fitted with a response sensitivity of approx. 30 kΩ (approx. 33 µS). For applications during long lasting rainfalls which cause a decrease of conductivity, the response sensitivity might not be sufficient. In this case, the NR 5/Ex, Version A electrode relay can be fitted with a higher response sensitivity of approx. 200 kΩ (approx. 5 µS).



Ex floating electrodes



Application example:

Use of an Ex floating electrode in an underground rainwater retention basin of a tunnel

Ex floating electrodes

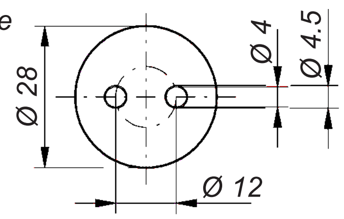
Type overview

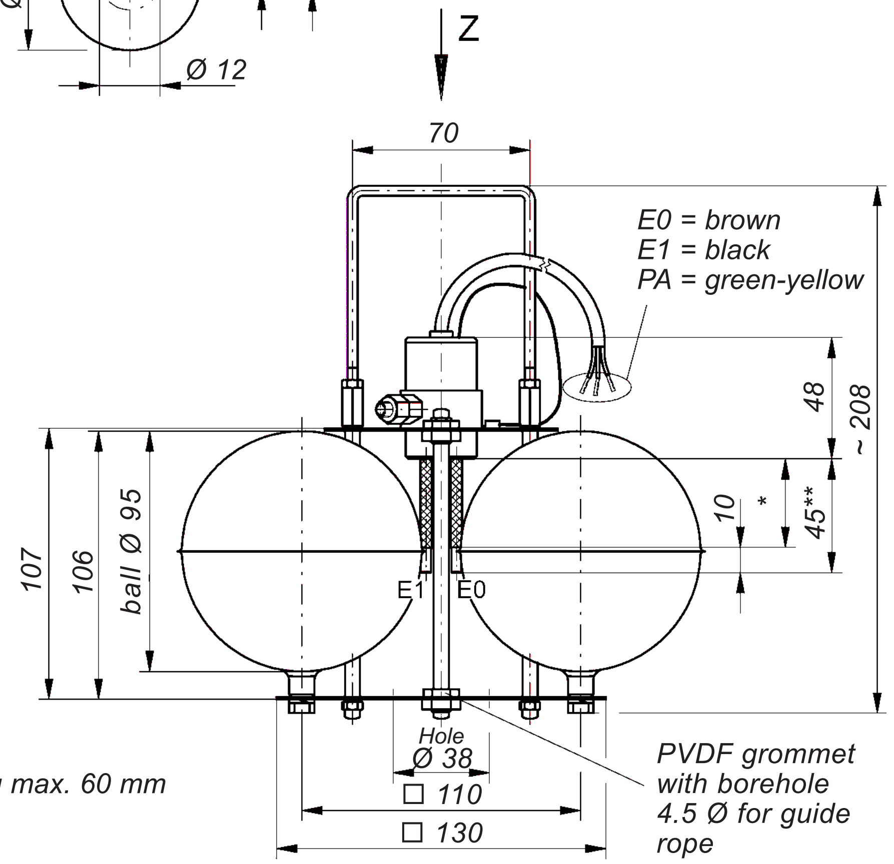
<table>
<tr><th>Types</th><th>Main differentiation features</th><th>Ex zones</th><th>Connecting cable</th><th>Page</th></tr>
<tr><td>SCHE 2/Ex-0G
Ex II 1 G
Ex ia IIB T6 Ga</td><td rowspan="2">2 electrode rods
for
1 alarm
(connected to
1 Ex electrode relay)</td><td>0, 1, 2</td><td>antistatic
PURLF</td><td>39-2-7</td></tr>
<tr><td>SCHE 2/Ex-1G
Ex II 2 G
Ex ia IIB T6 Gb</td><td>1, 2</td><td>PTFE</td><td>39-2-7</td></tr>
<tr><td>SCHE 2/Ex
(Variante 3 tiges)-0G
Ex II 1 G
Ex ia IIB T6 Ga</td><td rowspan="2">3 electrode rods
for
2 alarms
(connected to
2 Ex electrode relays)</td><td>0, 1, 2</td><td>antistatic
PURLF</td><td>39-2-9</td></tr>
<tr><td>SCHE 2/Ex
(Variante 3 tiges)-1G
Ex II 2 G
Ex ia IIB T6 Gb</td><td>1, 2</td><td>PTFE</td><td>39-2-9</td></tr>
<tr><td>SCHE 2/Ex
(Variante ILS)-0G
Ex II 1 G
Ex ia IIB T6 Ga</td><td rowspan="2">2 electrode rods
for
1 alarm
(connected to
1 Ex electrode relay)
with
alarm bridging contact
for the event that no or
insufficient liquid is present
to ensure functionning of
the Ex floating electrode</td><td>0, 1, 2</td><td>antistatic
PURLF</td><td>39-2-11</td></tr>
<tr><td>SCHE 2/Ex
(Variante ILS)-1G
Ex II 2 G
Ex ia IIB T6 Gb</td><td>1, 2</td><td>PTFE</td><td>39-2-11</td></tr>
</table>

Ex floating electrodes SCHE 2/Ex-0G ⟨Ex⟩ II 1 G Ex ia IIB T6 Ga and SCHE 2/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

Technical data	**SCHE 2/Ex-0G** **⟨Ex⟩ II 1 G Ex ia IIB T6 Ga**	**SCHE 2/Ex-1G** **⟨Ex⟩ II 2 G Ex ia IIB T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 0, 1 or 2	**zone 1 or 2**
	EC type examination certificate INERIS 03ATEX0157X	
Design	1 control electrode and 1 earth electrode	
Electrode rods	stainless steel 316 Ti; 4 mm Ø, covered with shrinkdown tubing made of PVDF; length: approx. 45 mm, other lengths on request	
Electrode head	stainless steel 316 Ti, protection class IP65	
Connecting cable	antistatic PURLF cable (with external conductive PUR sheath),	PTFE cable,
	potted in electrode head, other cable on request; length: 2 m, longer on request	
Electrode holder, stabilizer plate and brackets	stainless steel 316 Ti or other stainless steel	
Floats	4 units made of stainless steel 316 Ti, approx. 95 mm Ø	
Min. level of conductive liquid above the floor to ensure functioning of the Ex floating electrode (with d = 1 g/cm³)	85 mm, it is therefore recommended to install the Ex floating electrode in a liquid collection shaft which should be as small as possible	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only	
Max. length of connecting cable between Ex floating electrode and Ex electrode relay	see Installation, Operating and Maintenance Instructions (sent on request)	

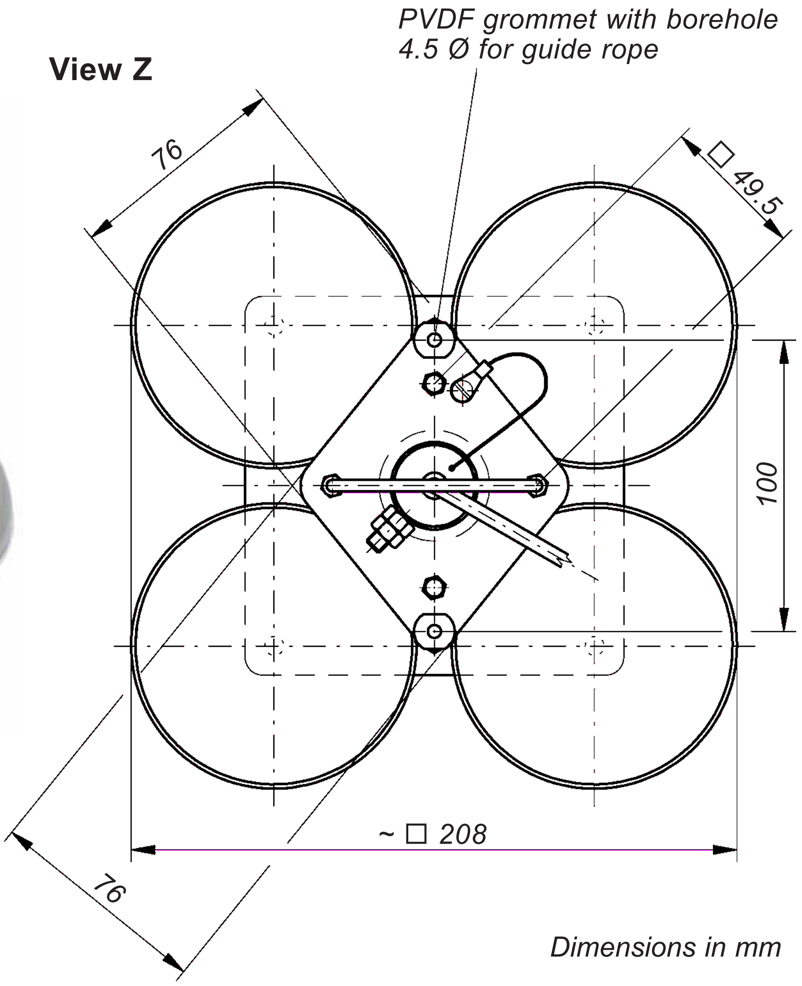
Bottom view of the electrode





*) length of each shrinkdown tubing max. 60 mm
**) other lengths on request.

View Z



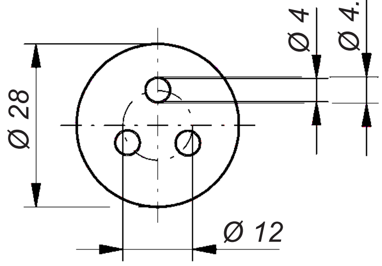
Dimensions in mm

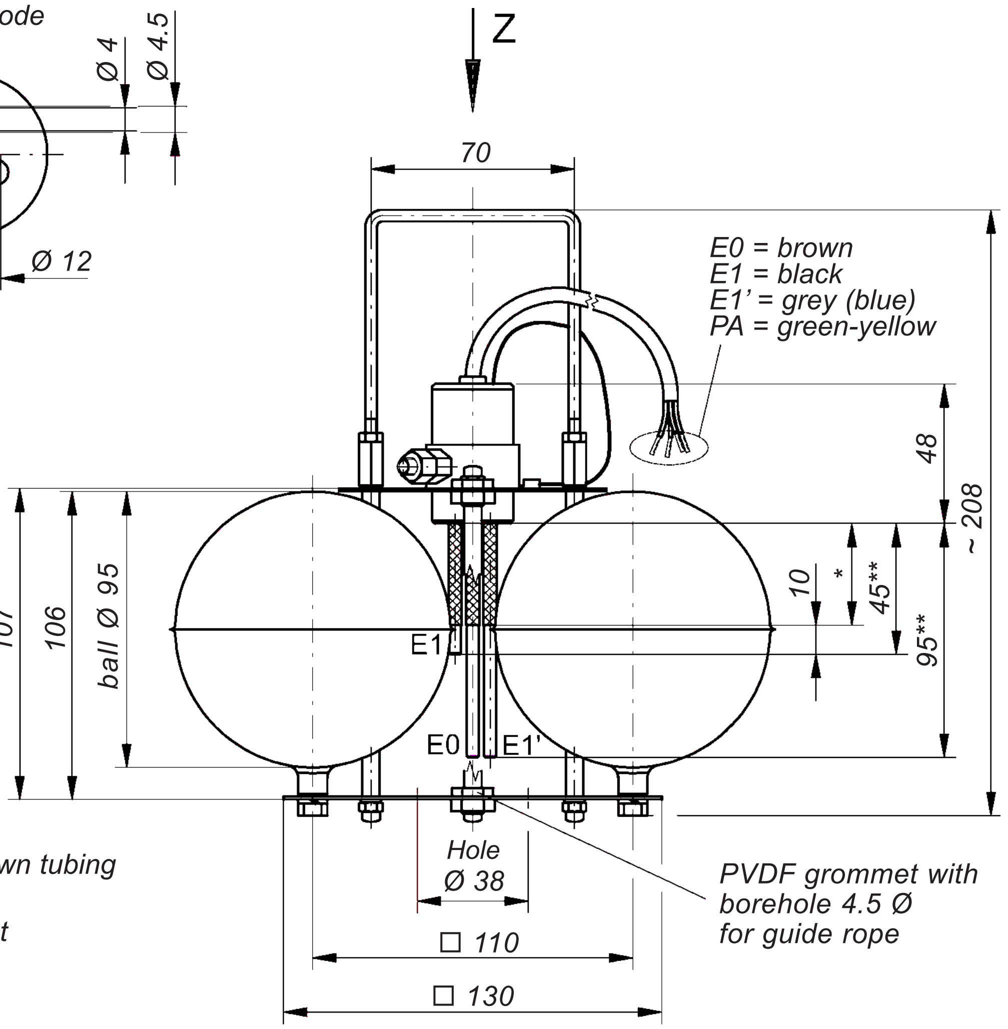
SCHE 2/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

Ex floating electrodes SCHE 2/Ex (Variante 3 tiges)-0G
Ⓔx II 1 G Ex ia IIB T6 Ga
and
SCHE 2/Ex (Variante 3 tiges)-1G
Ⓔx II 2 G Ex ia IIB T6 Gb

Technical data	SCHE 2/Ex (Variante 3 tiges)-0G Ⓔx II 1 G Ex ia IIB T6 Ga	SCHE 2/Ex (Variante 3 tiges)-1G Ⓔx II 2 G Ex ia IIB T6 Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 0, 1 or 2	**zone 1 or 2**
	EC type examination certificate INERIS 03ATEX0157X	
Design	2 control electrodes and 1 earth electrode	
Electrode rods	stainless steel 316 Ti; 4 mm Ø, covered with shrinkdown tubing made of PVDF; length: approx. 45 mm – 95 mm – 95 mm, other lengths on request	
Electrode head	stainless steel 316 Ti, protection class IP65	
Connecting cable	antistatic PURLF cable (with external conductive PUR sheath),	PTFE cable,
	potted in electrode head, other cable on request; length: 2 m, longer on request	
Electrode holder, stabilizer plate and brackets	stainless steel 316 Ti or other stainless steel	
Floats	4 units made of stainless steel 316 Ti, approx. 95 mm Ø	
Min. level of conductive liquid above the floor to ensure functioning of the Ex floating electrode (with d = 1 g/cm³)	90 mm, it is therefore recommended to install the Ex floating electrode in a liquid collection shaft which should be as small as possible	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only	
Max. length of connecting cable between Ex floating electrode and Ex electrode relay	see Installation, Operating and Maintenance Instructions (sent on request)	

Bottom view of the electrode

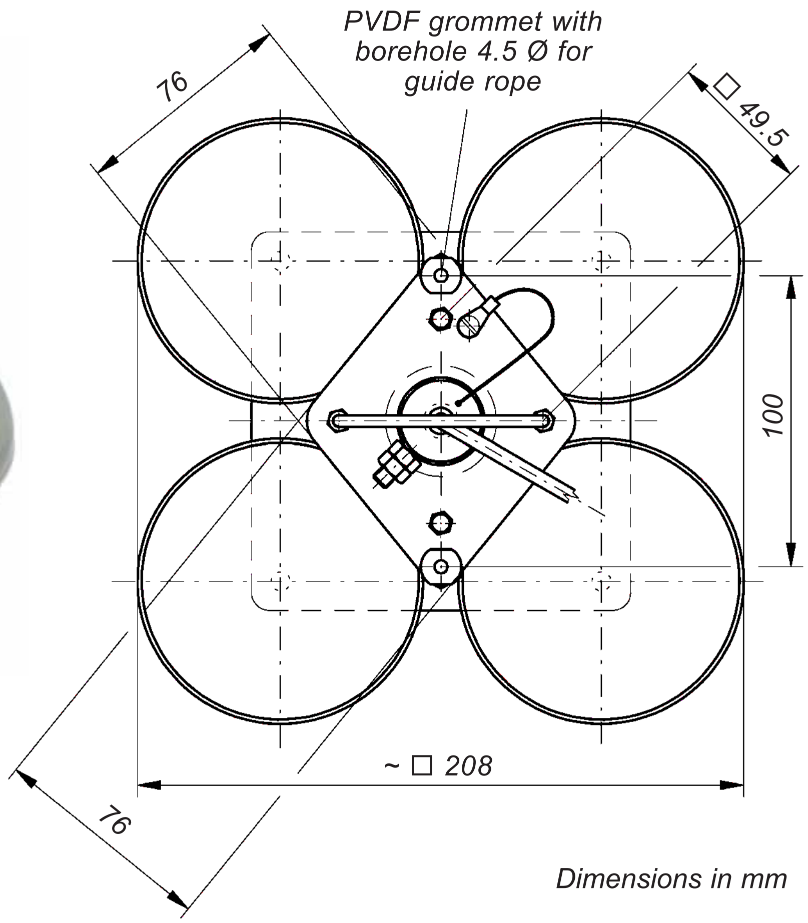




*) length of each shrinkdown tubing max. 60 mm

**) other lengths on request

View Z



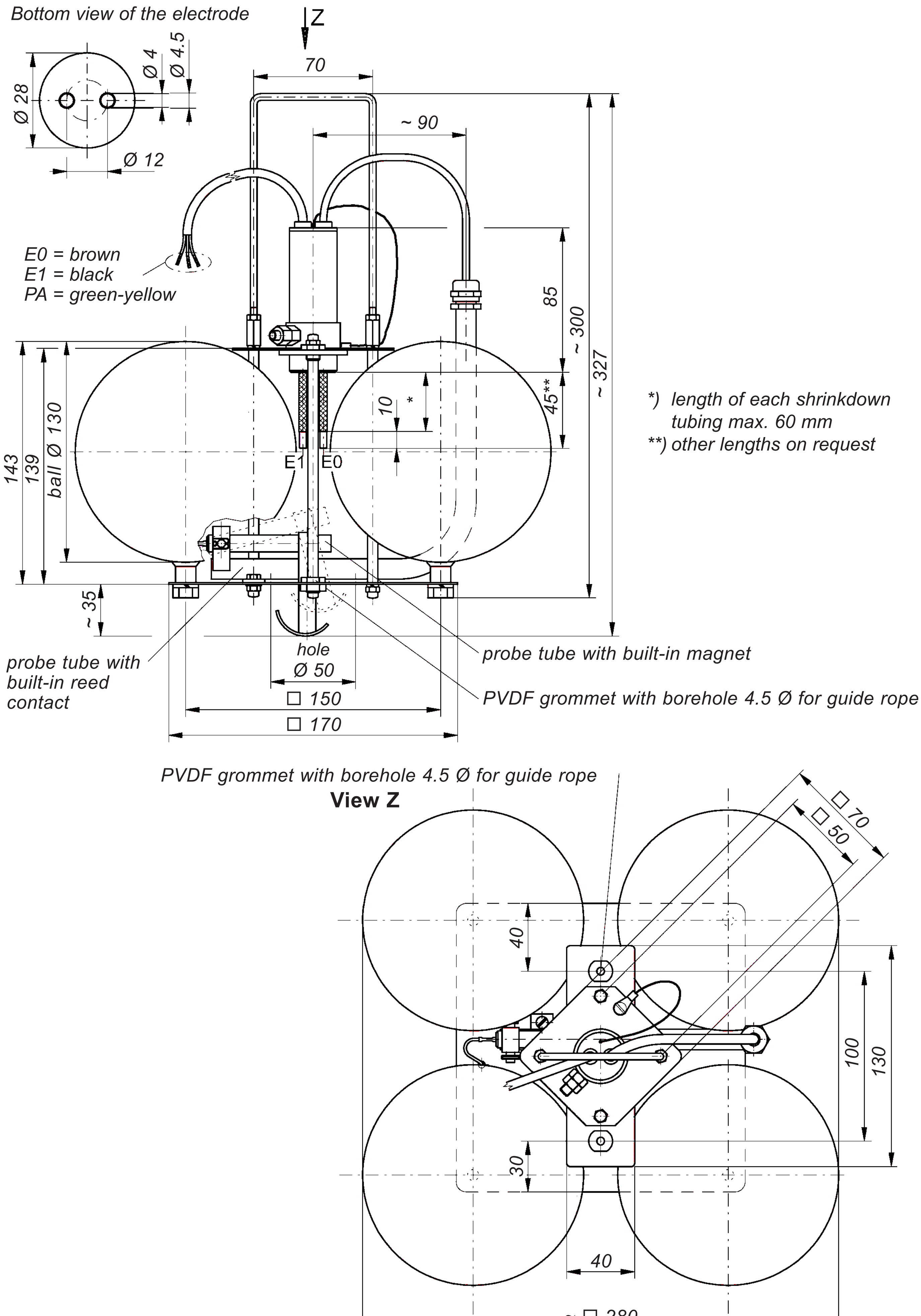
Dimensions in mm

SCHE 2/Ex (Variante 3 tiges)-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

Ex floating electrodes SCHE 2/Ex (Variante ILS)-0G ⟨Ex⟩ II 1 G Ex ia IIB T6 Ga and SCHE 2/Ex (Variante ILS)-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

Technical data	SCHE 2/Ex (Variante ILS)-0G ⟨Ex⟩ II 1 G Ex ia IIB T6 Ga	SCHE 2/Ex (Variante ILS)-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres**	
	zone 0, 1 or 2	**zone 1 or 2**
	EC type examination certificate INERIS 03ATEX0157X	
Design	1 control electrode and 1 earth electrode	
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of PVDF; length: approx. 45 mm, other lengths on request	
Electrode head	stainless steel 316 Ti, protection class IP65	
Connecting cable	antistatic PURLF cable (with external conductive PUR sheath),	PTFE cable,
	potted in electrode head, other cable on request; length: 2 m, longer on request	
Electrode holder, stabilizer plate and brackets	stainless steel 316 Ti or other stainless steel	
Floats	4 units made of stainless steel 316 Ti, approx. 130 mm Ø	
Min. level of liquid above the floor to ensure functioning of the Ex floating electrode (with d = 1 g/cm³)	130 mm, it is therefore recommended to install the Ex floating electrode in a liquid collection shaft which should be as small as possible	
Alarm bridging contact to prevent a false alarm in the event of drying out of the liquid collection shaft	reed contact activated via a magnet located in the moving part of the mechanism for the event that no or insufficient liquid is present to ensure floating of the Ex floating electrode and detecting water or liquid hydrocarbons	
Temperature range	– 20°C to + 60°C	
Pressure resistance	for pressureless applications only	
Max. length of connecting cable between Ex floating electrode and Ex electrode relay	see Installation, Operating and Maintenance Instructions (sent on request)	

SCHE 2/Ex (Variante ILS)-1G Ex II 2 G Ex ia IIB T6 Gb



Dimensions in mm

SCHE 2/Ex (Variante ILS)-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

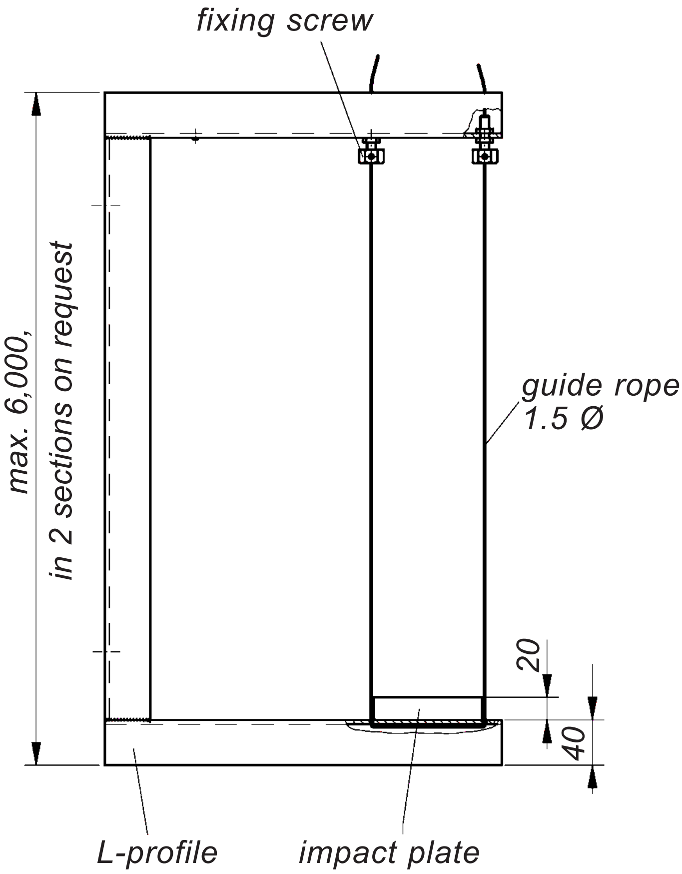
Mounting frame for Ex floating electrodes

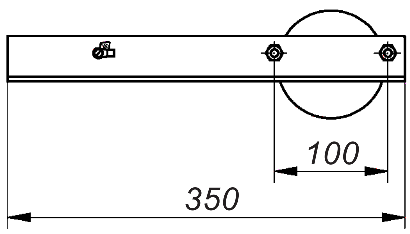
It is always advisable to use a Jola mounting frame for Ex floating electrodes for the following reasons:

- In order to prevent spark formation when they rise and fall, the Ex floating electrodes must not be allowed to come into contact with any metal objects in the surrounding installation.
- The Ex floating electrodes must not float about in an uncontrolled fashion, as this could impair proper functioning.

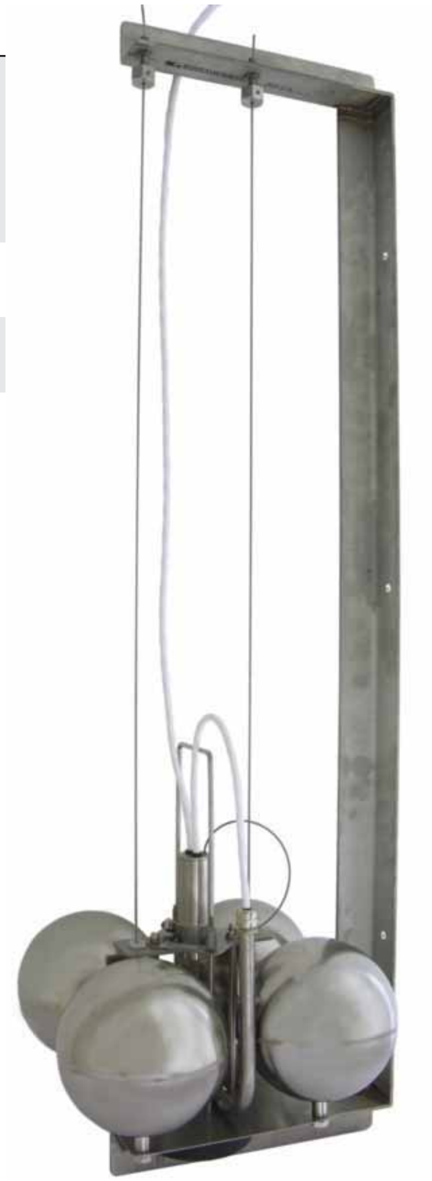
The Jola mounting frame for Ex floating electrodes is fitted with 2 guide ropes and an impact plate to prevent spark formation upon contact with the falling Ex floating electrode.

Technical data	Mounting frame
Frame	stainless steel 316 Ti
Fixing screws	stainless steel 316 Ti
Guide ropes	stainless steel 316
Impact plate	antistatic (conductive) PP
Height	to customer specifications, but max. 6 m
Option	mounting frame in 2 sections, max. admissible height: 6 m





Dimensions in mm



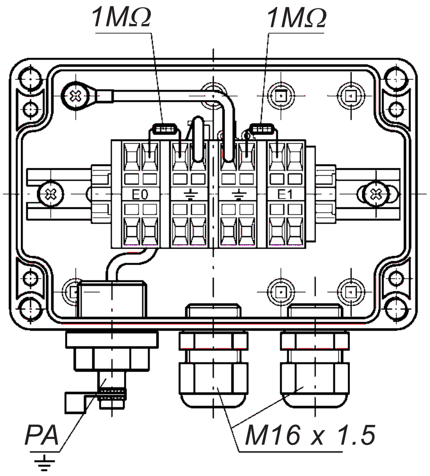
Mounting frame with
SCHE 2/Ex (Variante ILS)-1G
floating electrode

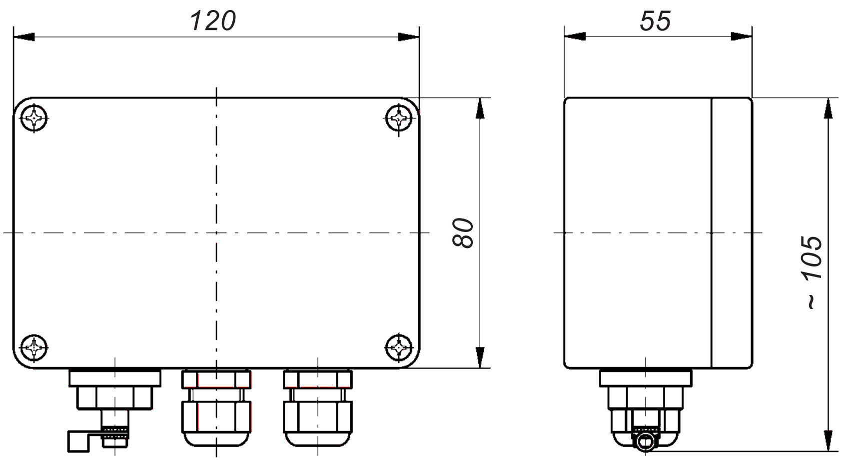
Impact plate to prevent
spark formation

Obligatory Ex connection box OAK/SCHE/NR/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb

Technical data	**OAK/SCHE/NR/2x1MΩ ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**
Application	• for integration of the electrode rods of the Ex floating electrode SCHE 2/Ex-.G or SCHE 2/Ex (Variante ILS)-.G in the potential equalisation system of the installation • for connection of the intrinsically safe control circuit of the Ex electrode relay to the Ex floating electrode in question • for installation in potentially explosive atmospheres in zone 1 or 2 EC type examination certificate INERIS 03ATEX0157X
Material	antistatic (conductive) PP
Dimensions	120 x 80 x 55 mm
Cable entries	2 pieces made of plastic
Terminals	4 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes 4 mm Ø
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover



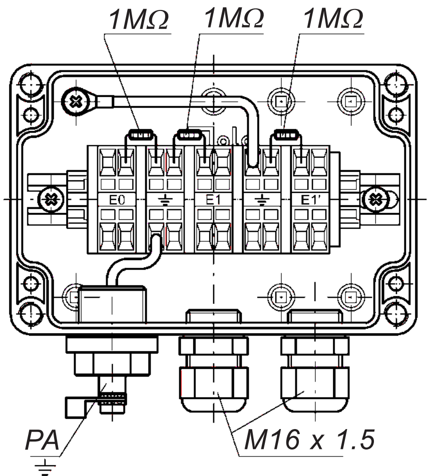


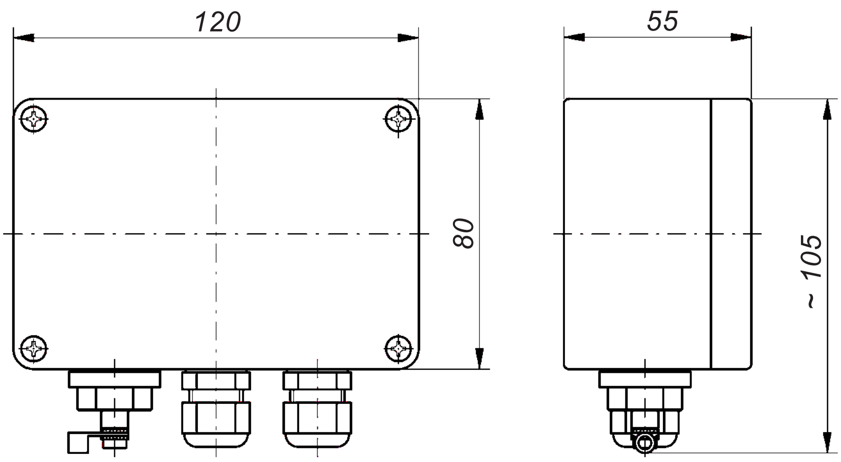
Dimensions in mm

Obligatory Ex connection box OAK/SCHE/NR/3x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb

Technical data	OAK/SCHE/NR/3x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb
Application	• for integration of the electrode rods of the Ex floating electrode SCHE 2/Ex (Variante 3 tiges)-.G in the potential equalisation system of the installation • for connection of the intrinsically safe control circuits of the 2 Ex electrode relays to the Ex floating electrode mentioned above • for installation in potentially explosive atmospheres in zone 1 or 2 EC type examination certificate INERIS 03ATEX0157X
Material	antistatic (conductive) PP
Dimensions	120 x 80 x 55 mm
Cable entries	2 pieces made of plastic
Terminals	5 terminals for cable with a cross-section > 0.196 mm² and < 2.5 mm² and with a minimum diameter of 0.5 mm in case of multi-core conductors
Connection to the potential equalisation system	to outer potential equalisation terminal
Protection class	IP65
Mounting	via 4 boreholes 4 mm Ø
Mounting orientation	any
Temperature range	– 20°C to + 60°C

Representation without cover





Dimensions in mm

NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A electrode relay

Ex electrode relay for DIN rail mounting or fastening via 2 boreholes, with connection terminals on top of the housing and with 2 built-in LEDs for signalling the respective switching status.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing <u>outside potentially explosive atmospheres</u> and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

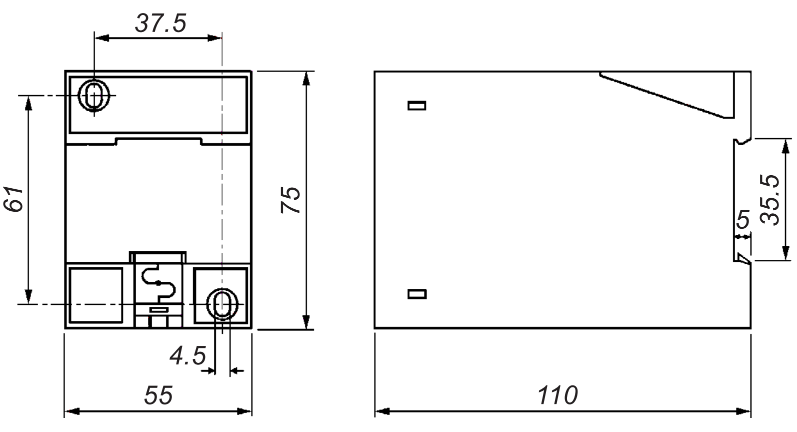
The **NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A** electrode relay is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

Ex approved conductive electrodes, such as the Ex floating electrodes, may be used in the intrinsically safe control current circuit. **The different application possibilities and the special conditions for safe use are described in the corresponding Installation, Operating and Maintenance Instructions (sent on request).**

The design of the Ex electrode relay is based **on the quiescent current principle**; in other words, an alarm signal is given if there is no conductive connection between the two connected electrode rods of the Ex floating electrode; the output contact of the NR 5/Ex, Version A electrode relay also reverts to alarm status if there is a supply voltage failure.

In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the potential-free changeover contact in the output is in activated condition and the green LED lights.

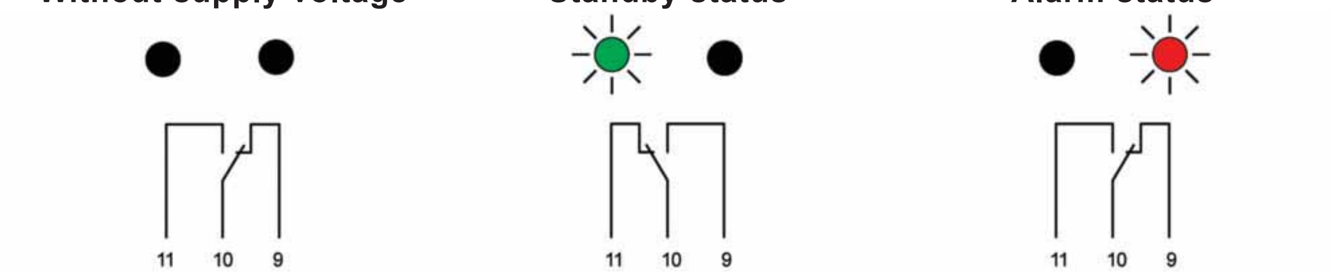
In the event of an alarm, the potential-free changeover contact in the output is in non activated condition (quiescent state) and the red LED lights.



Dimensions in mm

Position of output contact of the NR 5/Ex, Version A electrode relay

Without supply voltage **Standby status** **Alarm status**



LEDs dark – output relay not energised

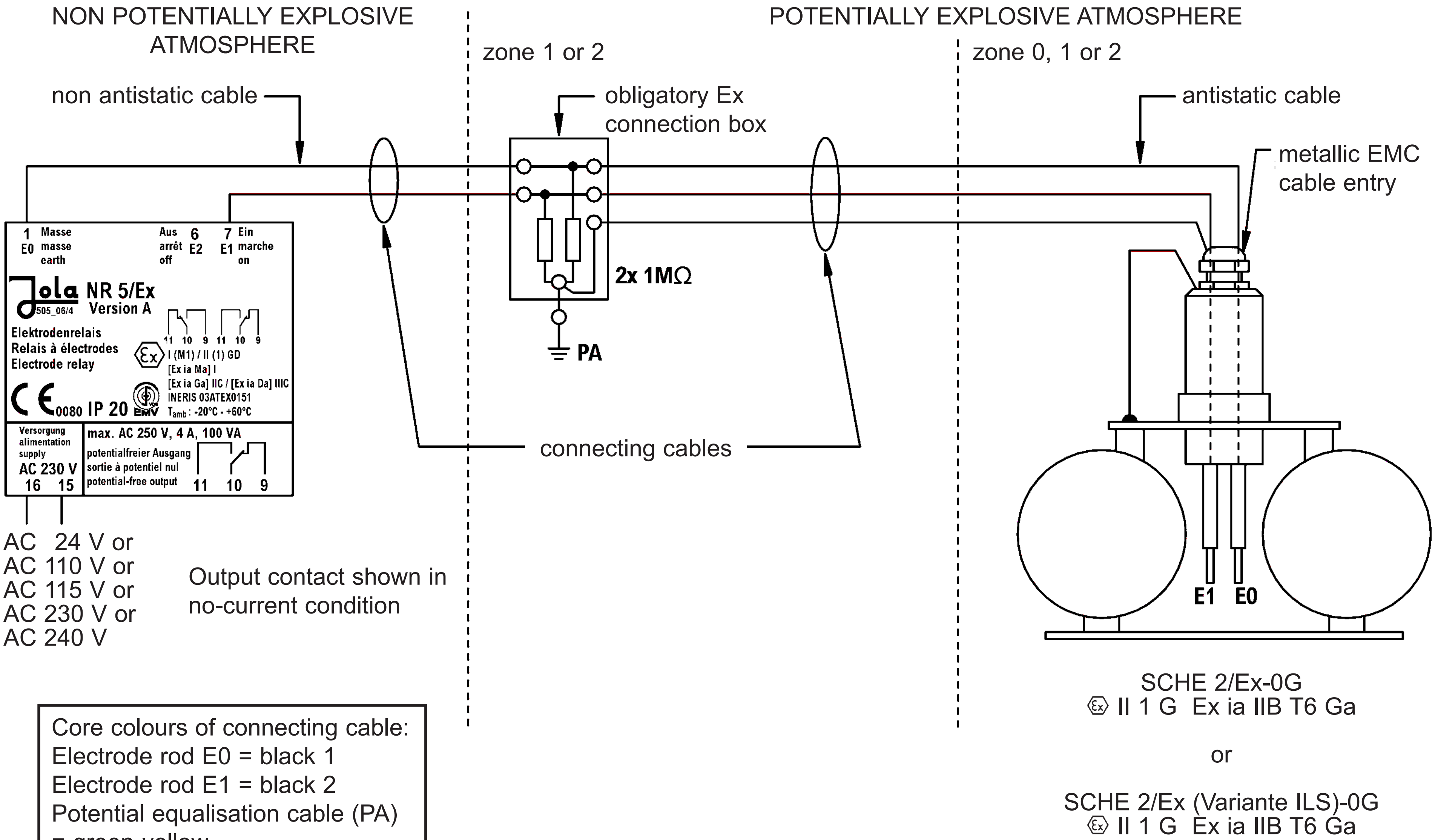
green LED lights – output relay energised

red LED lights – output relay not energised

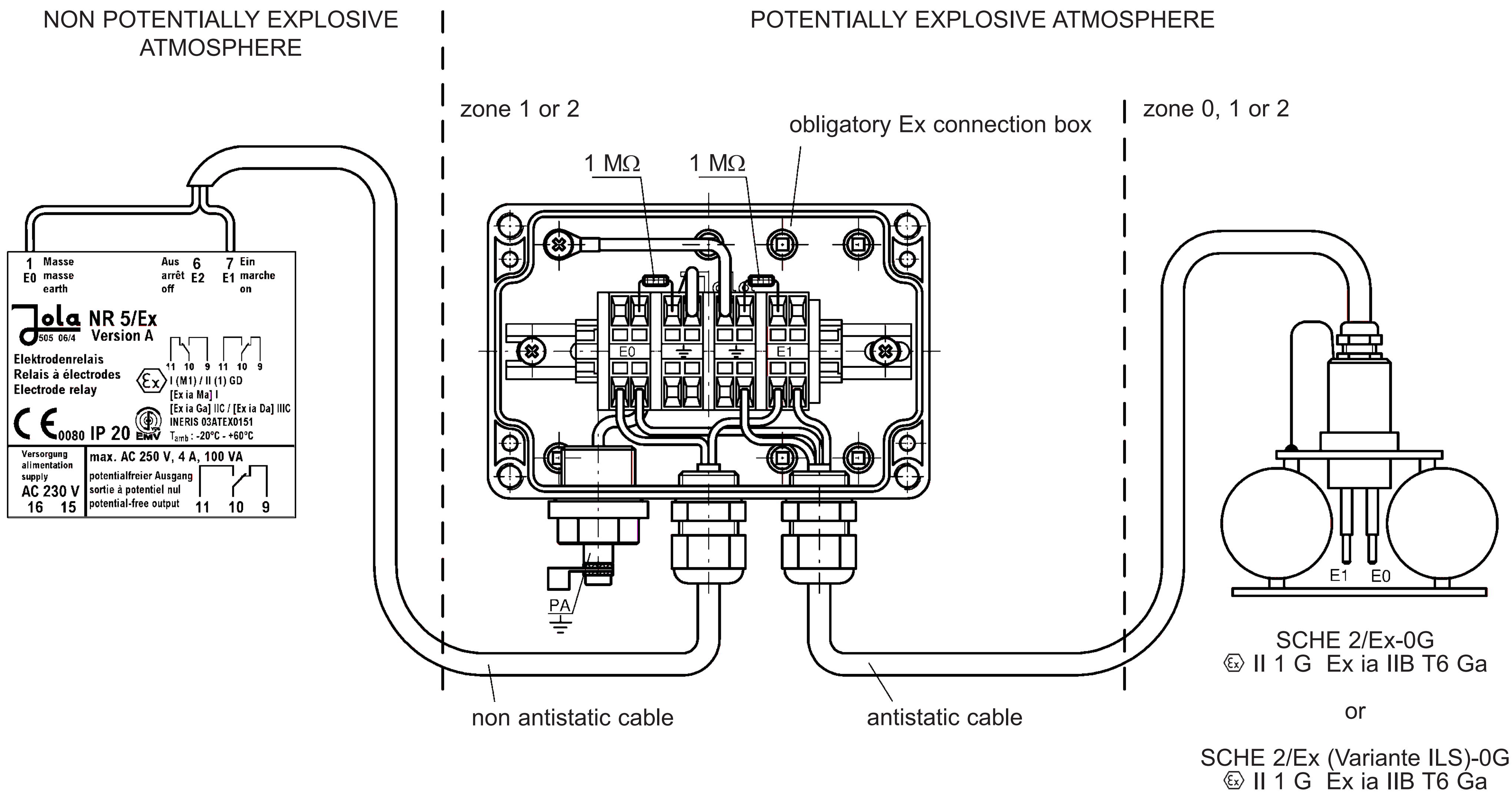
Technical data	NR 5/Ex ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A
Supply voltage (terminals 15 and 16)	AC 230 V, on request: AC 240 V, AC 115 V, AC 110 V or AC 24 V
Power input	approx. 3 VA
Electrode circuit (terminals 1 and 7)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay
No-load voltage	3 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance); on request with higher response sensitivity for less conductive rain water, e.g. during long lasting rainfalls: approx. 200 kΩ or approx. 5 µS (conductance)
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact, based on the quiescent current principle
Switching status indicators	• via a green LED: lights = standby status, output relay energised • via a red LED: lights = alarm status, output relay not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 100 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 39-2-17)
Connection	terminals on top of housing
Protection class	IP20
Mounting	on 35 mm DIN rail or fastening via 2 boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. cable length between NR 5/Ex, Version A and Ex floating electrode	see Installation, Operating and Maintenance Instructions (sent on request)
EC type examination certificate	INERIS 03ATEX0151
EMC	• for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies • for interference immunity in accordance with the appliance-specific requirements for industrial companies

Circuit diagrams for connection of floating electrode

SCHE 2/Ex-0G Ⓔx II 1 G Ex ia IIB T6 Ga or SCHE 2/Ex (Variante ILS)-0G Ⓔx II 1 G Ex ia IIB T6 Ga

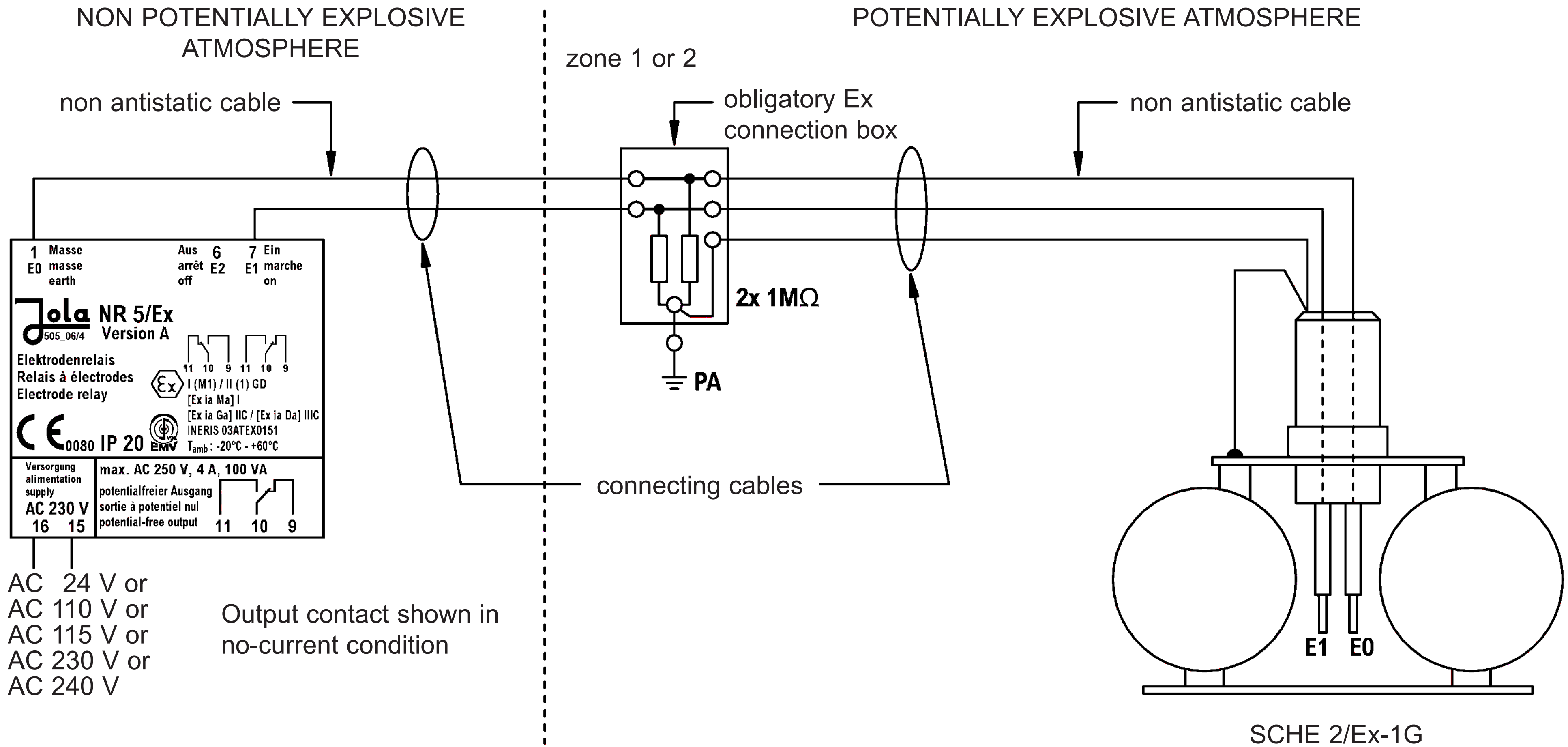


Core colours of connecting cable:
Electrode rod E0 = black 1
Electrode rod E1 = black 2
Potential equalisation cable (PA)
= green-yellow


NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
zone 0, 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
PA
non antistatic cable
antistatic cable
E1
E0
SCHE 2/Ex-0G
II 1 G Ex ia IIB T6 Ga
or
SCHE 2/Ex (Variante ILS)-0G
II 1 G Ex ia IIB T6 Ga
1 Masse
E0 masse
earth
Aus 6
arrêt E2
off
7 Ein
E1 marche
on
Jola
505 06/4
NR 5/Ex
Version A
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20 EMV
Versorgung
alimentation
supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

Circuit diagrams for connection of floating electrode

SCHE 2/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb or SCHE 2/Ex (Variante ILS)-1G ⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

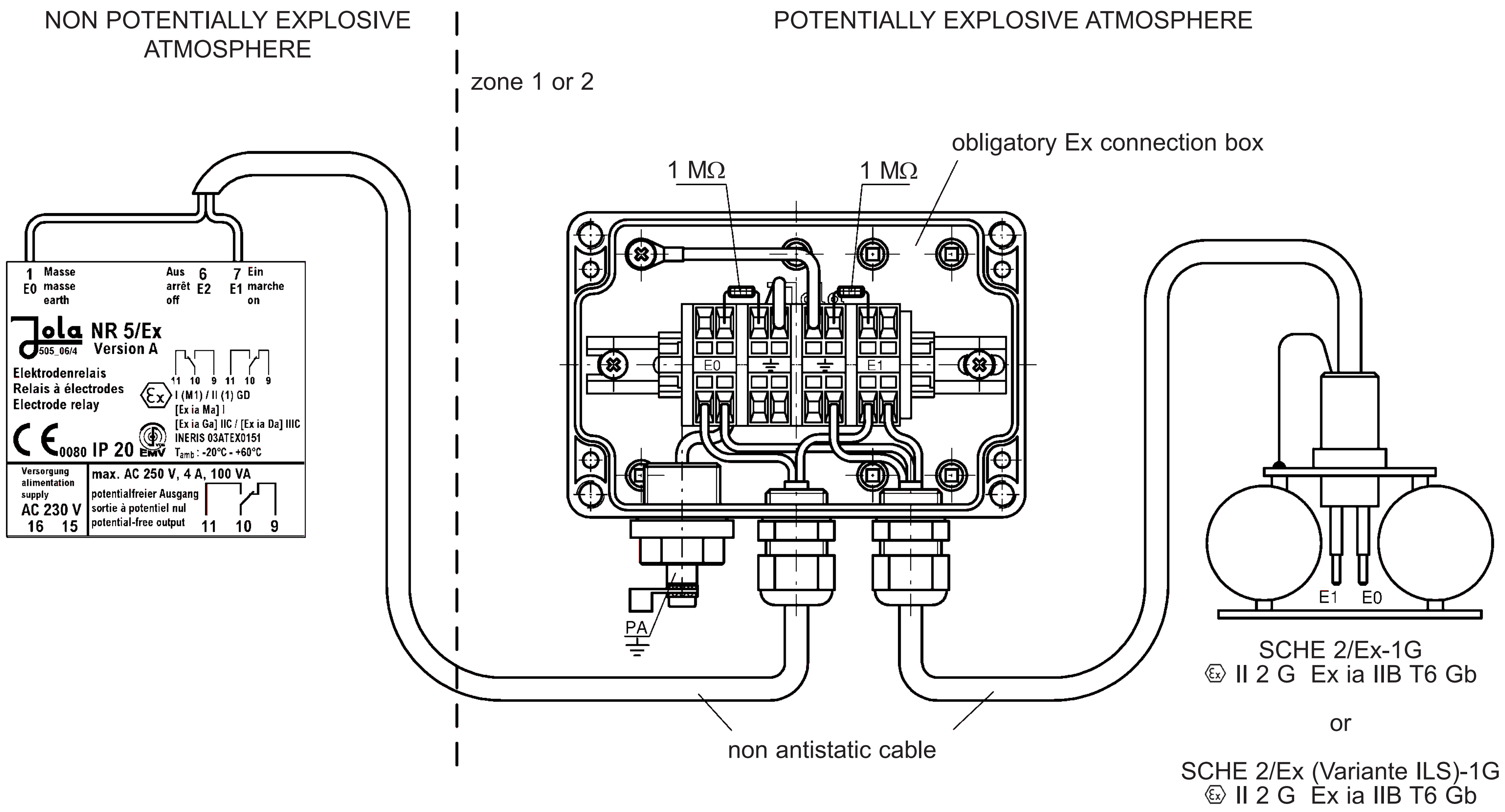


Core colours of connecting cable:
Electrode rod E0 = brown
Electrode rod E1 = black
Potential equalisation cable (PA)
= green-yellow

SCHE 2/Ex-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

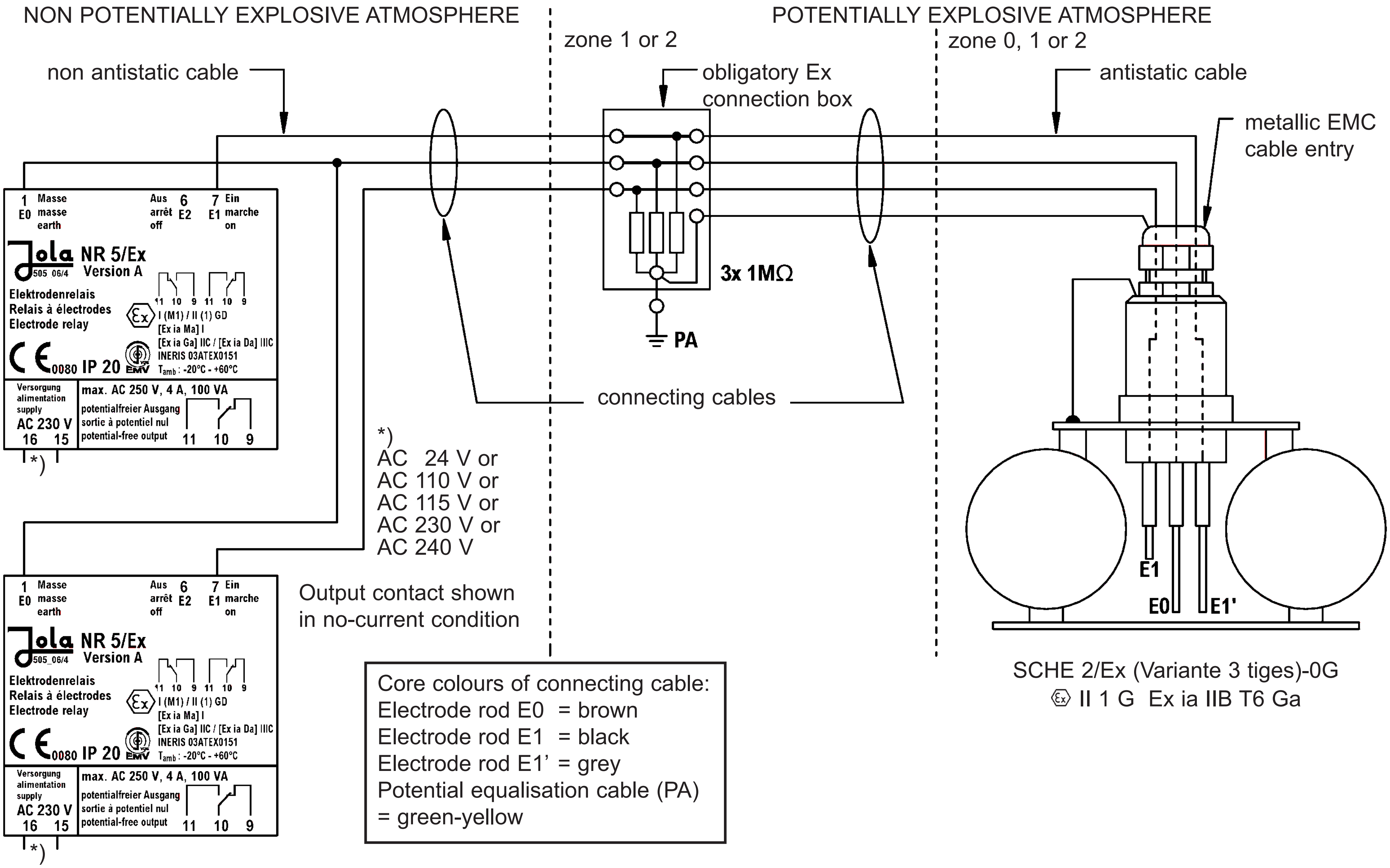
or

SCHE 2/Ex (Variante ILS)-1G
⟨Ex⟩ II 2 G Ex ia IIB T6 Gb

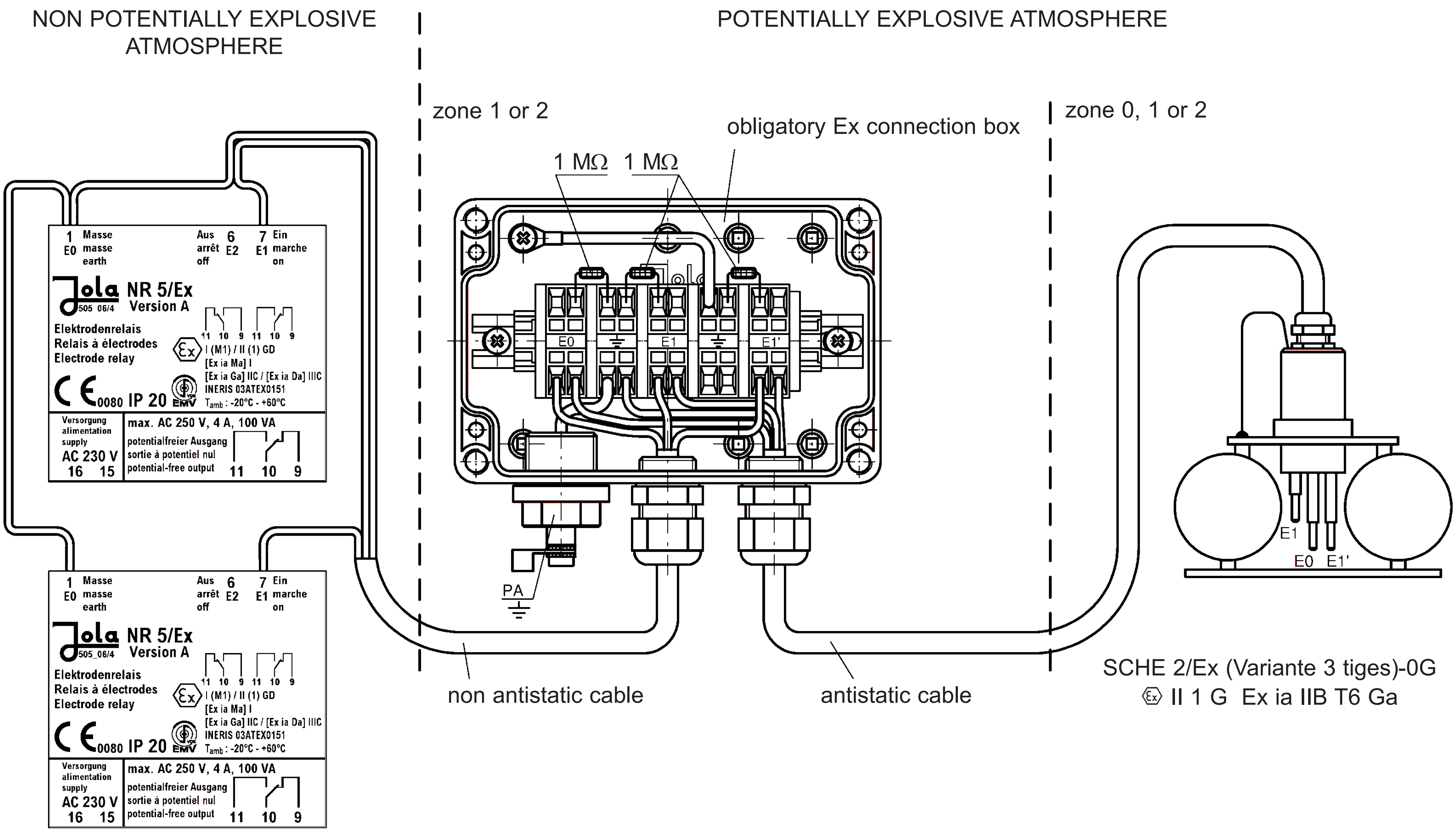

NON POTENTIALLY EXPLOSIVE
ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
1 E0 Masse masse earth
Aus arrêt off 6 E2
7 E1 Ein marche on
Jola NR 5/Ex Version A
505_06/4
Elektrodenrelais
Relais à électrodes
Electrode relay
11 10 9 11 10 9
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20 EMV
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9
E0
E1
PA
E1 E0
non antistatic cable
SCHE 2/Ex-1G
II 2 G Ex ia IIB T6 Gb
or
SCHE 2/Ex (Variante ILS)-1G
II 2 G Ex ia IIB T6 Gb

Circuit diagrams for connection of floating electrode

SCHE 2/Ex (Variante 3 tiges)-0G ⟨Ex⟩ II 1 G Ex ia IIB T6 Ga

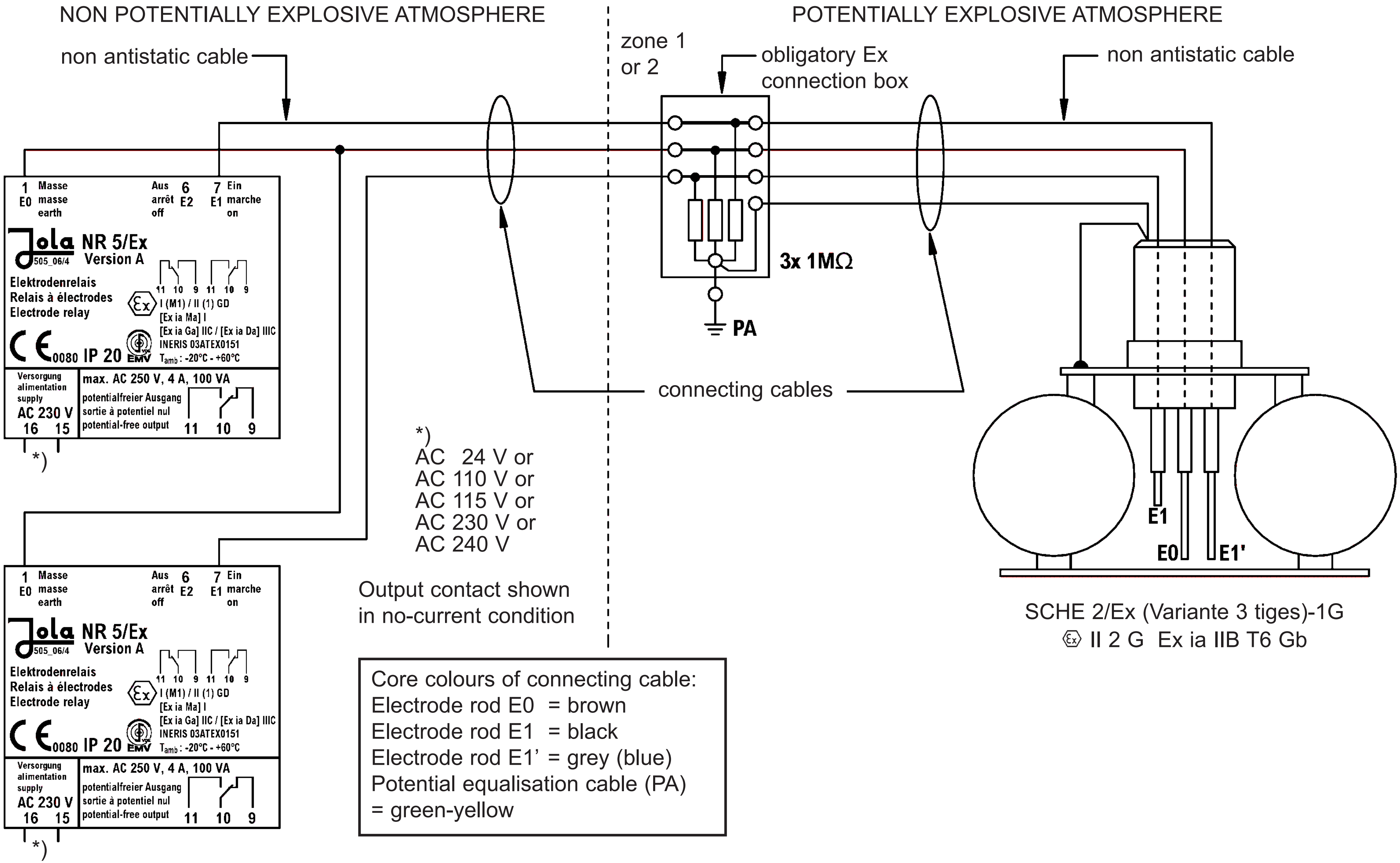


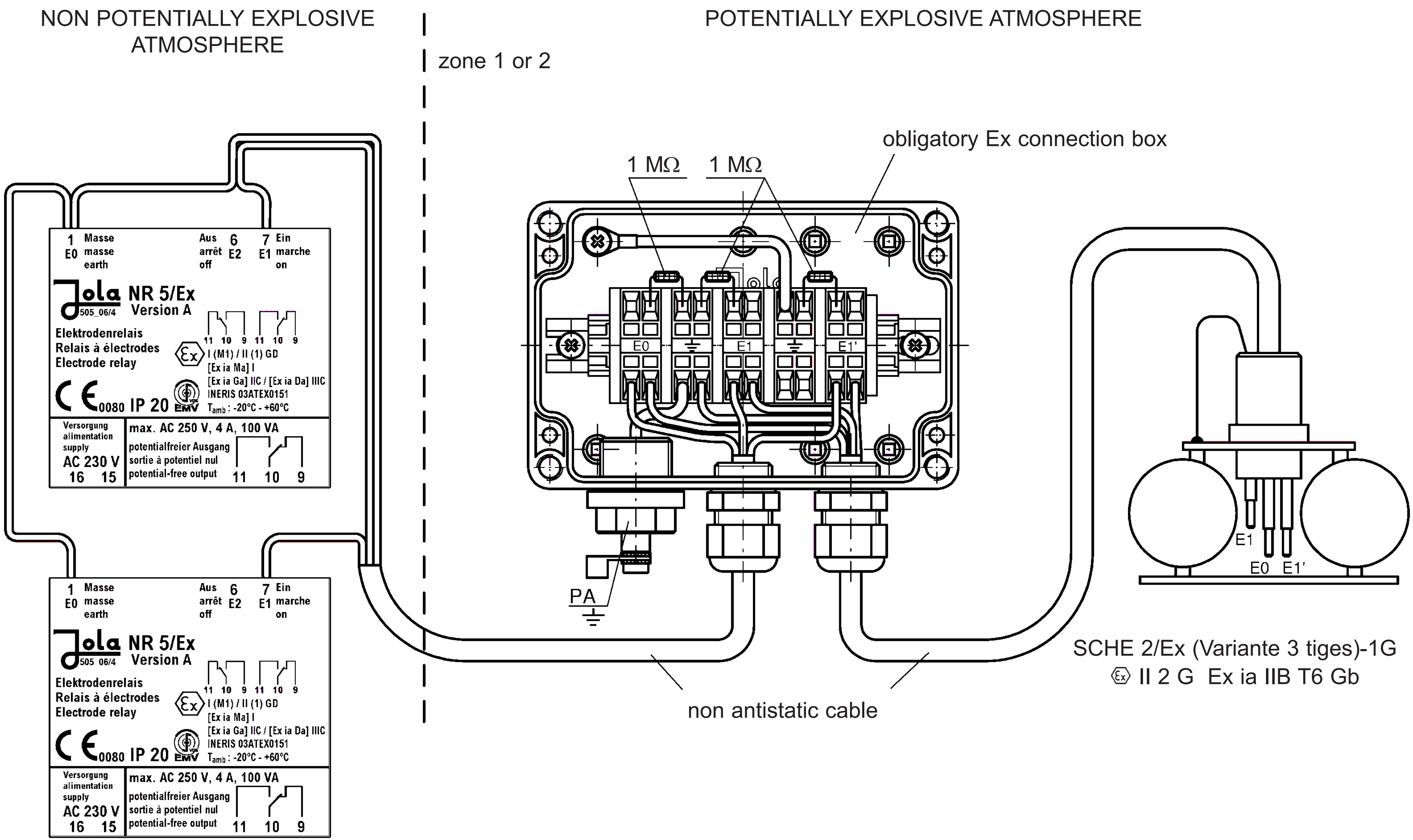
Core colours of connecting cable:
Electrode rod E0 = brown
Electrode rod E1 = black
Electrode rod E1' = grey
Potential equalisation cable (PA)
= green-yellow


NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
zone 0, 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
E1'
PA
non antistatic cable
antistatic cable
SCHE 2/Ex (Variante 3 tiges)-0G
II 1 G Ex ia IIB T6 Ga
1 E0 Masse masse earth
Aus arrêt off 6 E2
7 E1 Ein marche on
Jola NR 5/Ex Version A
Elektrodenrelais
Relais à électrodes
Electrode relay
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
CE 0080 IP 20
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

Circuit diagrams for connection of floating electrode

SCHE 2/Ex (Variante 3 tiges)-1G Ⓔx II 2 G Ex ia IIB T6 Gb





NON POTENTIALLY EXPLOSIVE ATMOSPHERE
POTENTIALLY EXPLOSIVE ATMOSPHERE
zone 1 or 2
obligatory Ex connection box
1 MΩ
1 MΩ
E0
E1
E1'
PA
non antistatic cable
SCHE 2/Ex (Variante 3 tiges)-1G
II 2 G Ex ia IIB T6 Gb
1 Masse masse earth E0
Aus arrêt off 6 E2
7 Ein marche on E1
Jola NR 5/Ex Version A
505_06/4
Elektrodenrelais
Relais à électrodes
Electrode relay
I (M1) / II (1) GD
[Ex ia Ma] I
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
Tamb : -20°C - +60°C
0080 IP 20
Versorgung alimentation supply
AC 230 V
16 15
max. AC 250 V, 4 A, 100 VA
potentialfreier Ausgang
sortie à potentiel nul
potential-free output
11 10 9

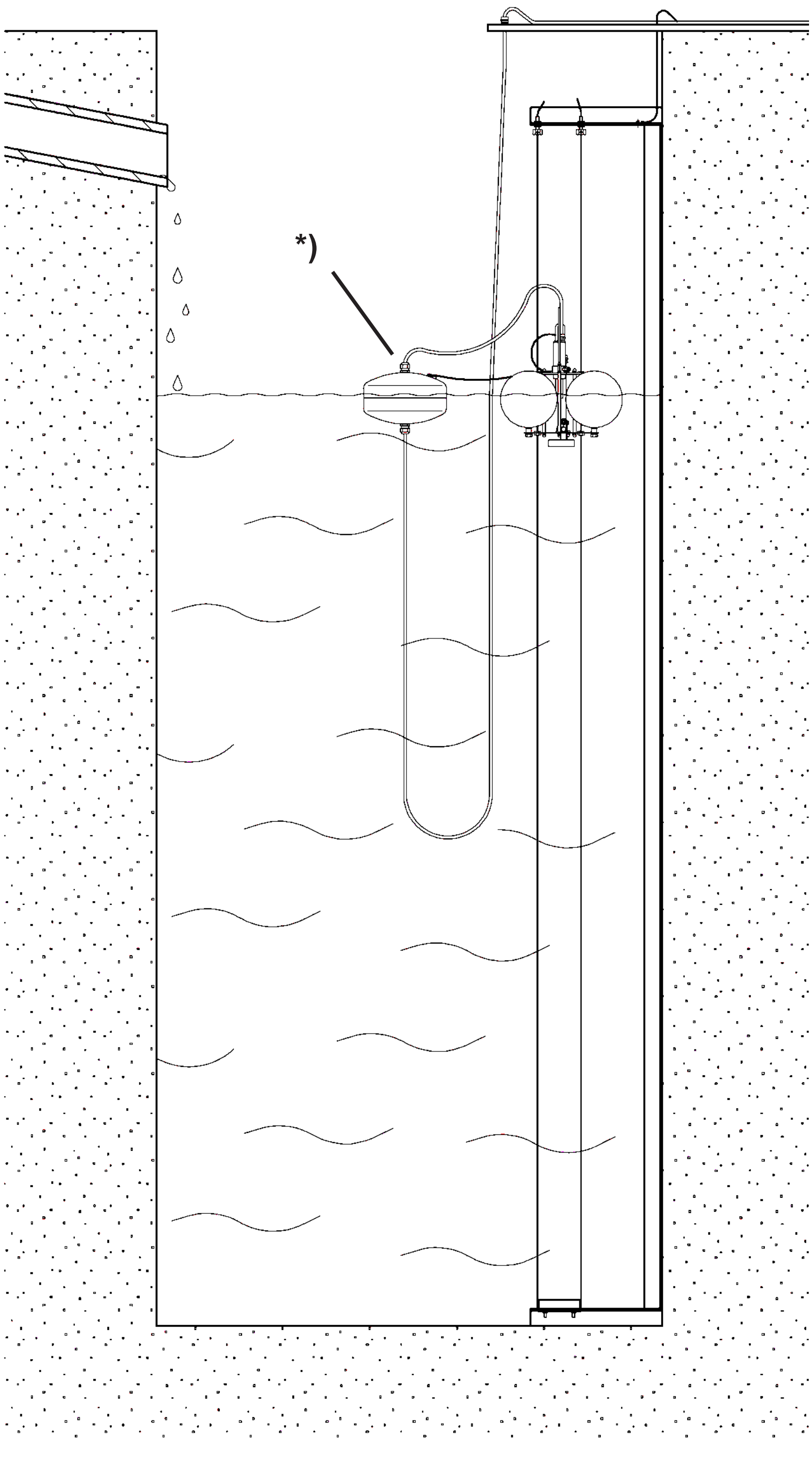
Optional supplementary float for Ex floating electrodes

To assure the proper functioning of the Ex floating electrodes, **when they are used in deep pits with a significant differential between the highest and the lowest liquid level**, we recommend the use of a supplementary float which has to be fixed to the connecting cable of each electrode.

The float will then carry the weight of the electrode connecting cable and this will prevent the electrode from leaning sideways or turning over when the liquid level is high.

Application example:

Ex floating electrode installed in a mounting frame and equipped with a supplementary float



***) supplementary float,
190 mm Ø x approx. 120 mm,
made of antistatic (conductive) PP**

Ex floating electrode

**with trace heating
to prevent ice formation
at temperatures below 0°C**

**for detection of
liquid hydrocarbons on water surfaces**

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contact@jola-info.de • www.jola-info.de

Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4

Function and area of application:

The Ex floating electrode with trace heating to prevent the formation of ice at temperatures below 0°C, in the following called "Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4", can be used to detect a layer of light liquid, such as diesel oil or gasoline (non-conductive liquids) on water (conductive liquid). This Ex leakage detector is particularly suitable for use in liquid collection sumps in catch basins of large containers in tank depots for flammable liquids.

The Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G is the combination of an Ex floating electrode SCHE 2/Ex (Variante ILS)-1G and a heating unit.

Floating electrodes monitor a calm water surface for leaked diesel oil, gasoline or some other light layer-forming liquid that is not soluble in water. For this purpose, two electrode rods are permanently in contact with the water just below the water surface. An alternating current generated in the Ex electrode relay flows via the electrode rods and the conductive water. Following a gasoline spill, for example, the insulating gasoline layer that has formed on the water surface interrupts the flow of the current, and this triggers an alarm.

During the cold season, there is a risk that the water might freeze, which means the electrode rods are then "in ice". Ice is an insulator and interrupts the current flowing via the electrode rods and the water. This would trigger a false alarm.

In order to prevent this, the Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G is equipped with a heating unit that automatically switches on at an outside temperature of approx. + 4°C and switches off again at a temperature of approx. + 11°C.

The floating electrode is fitted with an alarm-bridging contact for the eventuality that there is no water bed in hot summers, for example. This bridging contact remains active until the electrode rods have contact with water once again or the leakage liquid – diesel oil or gasoline, for example – has lifted the floating electrode out of the area in which the alarm-bridging contact is active.

The Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4 consists of the following components:

- an Ex floating electrode SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G Ex ia IIB T6 Gb, version PURLF with anti-static PURLF cable (with conductive PUR sheath) and with an alarm-bridging contact for situations in which there is no water bed
- a mounting frame made of stainless steel and with an overall height of approx. 1,290 mm, and a protective cage made of perforated sheet stainless steel with a height of approx. 1,000 mm, a diameter of approx. 430 mm, an impact plate made of anti-static (conductive) polypropylene and guide ropes made of stainless steel to guide the aforementioned Ex floating electrode
- a cable-routing unit with 3 fixed rollers and a cable-straightening counter-weight which is encased in a stainless steel tube, coated with antistatic (conductive) polypropylene, and located outside the protective cage
- a self-limiting heating cable routed in a corrugated stainless steel tube in the protective cage with a heating power of 31 W/m at + 5°C
- an obligatory Ex terminal box OAK/SCHE/NR/2x1MΩ Ⓔx II 2 G Ex ia IIC T6 Gb, protected at the rear and bottom by stainless steel sheet, to integrate the floating electrode rods in the potential equalisation system of the unit and for connection of an Ex electrode relay NR 5/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A, installed outside the potentially explosive zone
- an Ex terminal box, protected at the rear and bottom by stainless steel sheet, for connection of the heating cable; the Ex terminal box is fitted with an Ex minithermostat with the characteristic ON at + 4°C and OFF at + 11°C
- a hook made of stainless steel to lift the floating electrode for servicing purposes

The Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G must be connected to an Ex electrode relay NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A installed outside the potentially explosive zone.

Option for level control or for triggering of an alarm when a specific liquid level is reached:

On request, the outside of the Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G can be additionally fitted with magnetically controlled Ex immersion probes for level control or for triggering of an alarm.

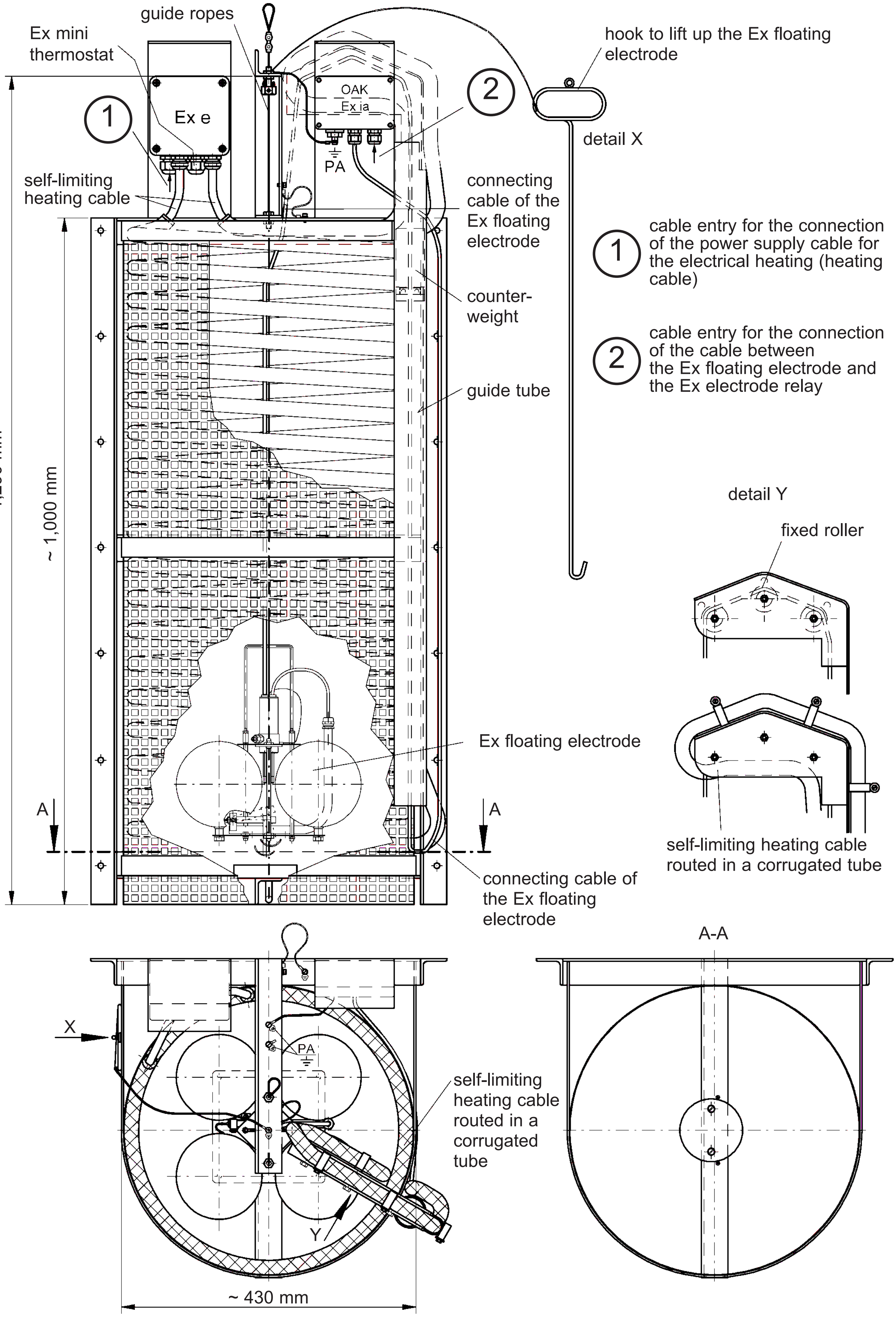
view from above of
the self-limiting heating cable
routed in a corrugated stainless steel tube
and the Ex floating electrode

HE/SCHE 2/Ex (Variante ILS)-1G

Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4

Technical data	HE/SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G c IIB T4
Areas of application	**zone 1 and 2 with gases in groups IIA and IIB**
Type examination certificate	**INERIS 16ATEX3001X**
Integrated Ex floating electrode	SCHE 2/Ex (Variante ILS)-1G Ⓔx II 2 G Ex ia IIB T6 Gb, version PURLF with antistatic PURLF cable (with conductive PUR sheath) and with alarm-bridging contact for the eventuality that there is no water bed
Minimum required liquid level above the floor (in the case of water with a density of 1g/cm³)	130 mm
Connection of the Ex floating electrode	to an Ex electrode relay NR 5/Ex Ⓔx I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A installed outside the potentially explosive zone
Supply voltage for the self-limiting heating cable	AC 230 V
Customer-side fusing	the self-limiting heating cable is to be connected to a customer-side AC 10 A fusing with type characteristic C by a qualified electrician of the operator outside the potentially explosive atmosphere
Self-limiting heating cable:	
• length	approx. 27 m
• heating power	31 W/m at + 5°C
• working range, limiting by Ex mini thermostat	ON at + 4°C, OFF at + 11°C
Temperature range	– 20°C to + 60°C **Down to which minus temperatures the prevention of ice formation can be guaranted depends on the volume and the level of water in the collection sump of the catch basin and the wind force.**
Pressure resistance	for pressureless applications only, to be used only under atmospheric conditions
Max. length of connecting cable between Ex leakage detector HE/SCHE and Ex electrode relay NR 5/Ex, Version A	see Installation, Operating and Maintenance Instructions (available on request)

Zone 1 or 2


guide ropes
Ex mini thermostat
Ex e
1
self-limiting heating cable
OAK
Ex ia
PA
2
hook to lift up the Ex floating electrode
detail X
connecting cable of the Ex floating electrode
cable entry for the connection of the power supply cable for the electrical heating (heating cable)
counter-weight
cable entry for the connection of the cable between the Ex floating electrode and the Ex electrode relay
guide tube
~ 1,290 mm
~ 1,000 mm
detail Y
fixed roller
Ex floating electrode
A
A
self-limiting heating cable routed in a corrugated tube
connecting cable of the Ex floating electrode
A-A
X
PA
self-limiting heating cable routed in a corrugated tube
Y
~ 430 mm

Magnetically operated Ex immersion probes can optionally be added to the Ex leakage detector HE/SCHE 2/Ex (Variante ILS)-1G for level control or alarm signalling

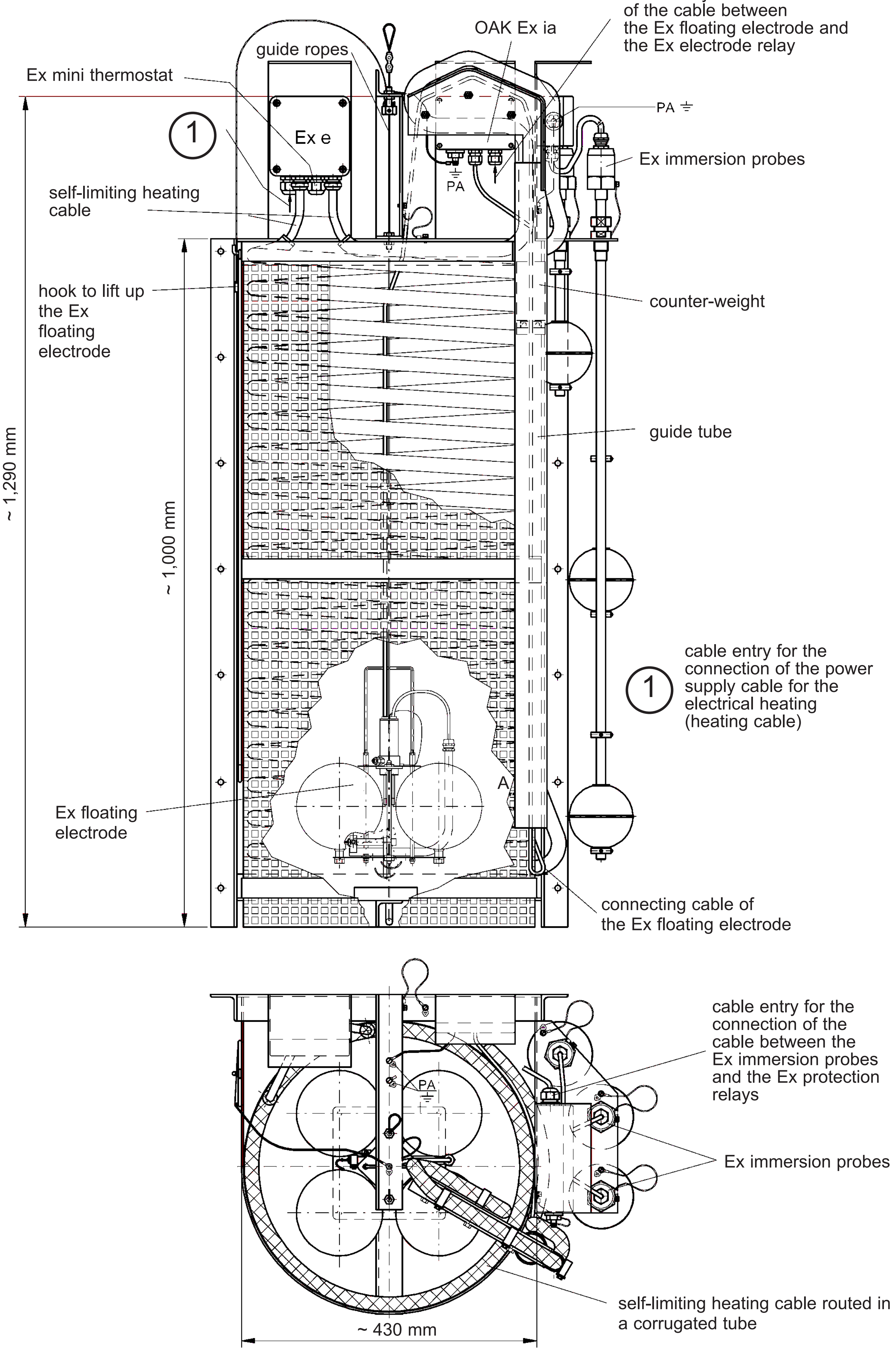
TSR/FED/E8/Variante 0/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb immersion probe

Technical data	**TSR/FED/E8/Variante 0/Ex-1G ⟨Ex⟩ II 2 G Ex ia IIC T6 Gb**
Application	**for use in intrinsically safe circuits in potentially explosive atmospheres zone 1 and 2** **EC type examination certificate INERIS 03ATEX0163X**
Probe tube:	
• material	stainless steel 316 Ti
• diameter	14 mm
• length	according to customer’s specifications, however max. 1,000 mm, measured from nipple sealing surface
Screw-in nipple	G½, on request: special screw-in nipple to make the Ex immersion probe height-adjustable
Float	stainless steel 316 Ti, 72 mm Ø, for use in media with a specific gravity ≥ 0.70 g/cm³
Cable entry	nickel-plated brass, on request stainless steel, protection class IP65
Connecting cable	PVC, other connecting cable on request
Ex connection box mounted on the Ex leakage detector, for the connection of the Ex immersion probe	A 308, 120 x 80 x 55 mm, made of antistatic (conductive) PP, protection class IP65; Ex connection box for use with several Ex immersion probes on request
Mounting orientation	vertical
Temperature range	– 20°C to + 60°C
Pressure resistance	for pressureless applications only, use only under atmospheric conditions
Contacts	reed contacts: make (NO), break (NC) or changeover (OC) contacts
Max. number of contacts:	
• OC	3
• NO or NC	3

Min. distances to be observed for the contacts (based on liquids with a specific gravity of 1 g/cm³):			
from the nipple sealing surface to the upper contact	between contacts when using		from the lower contact to the end of the probe tube (when float is falling)
	1 float	2 floats	
80 mm	80 mm	100 mm	60 mm

The above equipment will be manufactured in accordance with your specifications.

Zone 1 or 2



guide ropes
OAK Ex ia
cable entry for the connection of the cable between the Ex floating electrode and the Ex electrode relay
Ex mini thermostat
PA
Ex e
1
Ex immersion probes
self-limiting heating cable
PA
hook to lift up the Ex floating electrode
counter-weight
guide tube
~ 1,290 mm
~ 1,000 mm
cable entry for the connection of the power supply cable for the electrical heating (heating cable)
1
A
Ex floating electrode
connecting cable of the Ex floating electrode
PA
cable entry for the connection of the cable between the Ex immersion probes and the Ex protection relays
Ex immersion probes
self-limiting heating cable routed in a corrugated tube
~ 430 mm

NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A electrode relay

Ex electrode relay for U-bar mounting or surface mounting, with connection terminals on top of the housing and with 2 built-in LEDs for signalling the respective switching status.

The unit is designed for switch cabinet mounting or installation in a suitable protective housing outside potentially explosive atmospheres and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

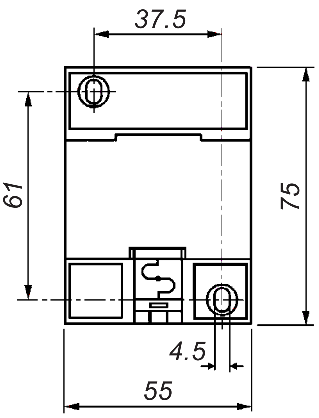
The **NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A** electrode relay is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive areas in compliance with the relevant standards and regulations.**

Ex approved conductive electrodes, such as the Ex floating electrodes, may be used in the intrinsically safe control current circuit. **The different application possibilities and the special conditions for safe use are described in the corresponding Installation, Operating and Maintenance Instructions (sent on request).**

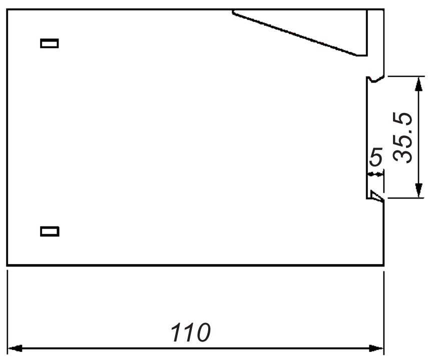
The design of the Ex electrode relay is based **on the quiescent current principle**; in other words, an alarm signal is given if there is no conductive connection between the two connected electrode rods of the Ex floating electrode; the output contact of the NR 5/Ex, Version A electrode relay also reverts to alarm status if there is a supply voltage failure.

In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the potential-free changeover contact in the output is in activated condition and the green LED lights.

In the event of an alarm, the potential-free changeover contact in the output is in non activated condition (quiescent state) and the red LED lights.

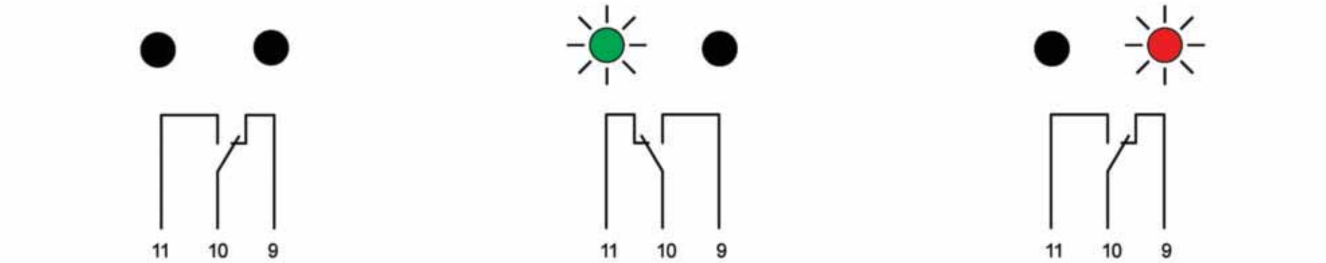


Dimensions (*in mm*)



Position of output contact of the NR 5/Ex, Version A electrode relay

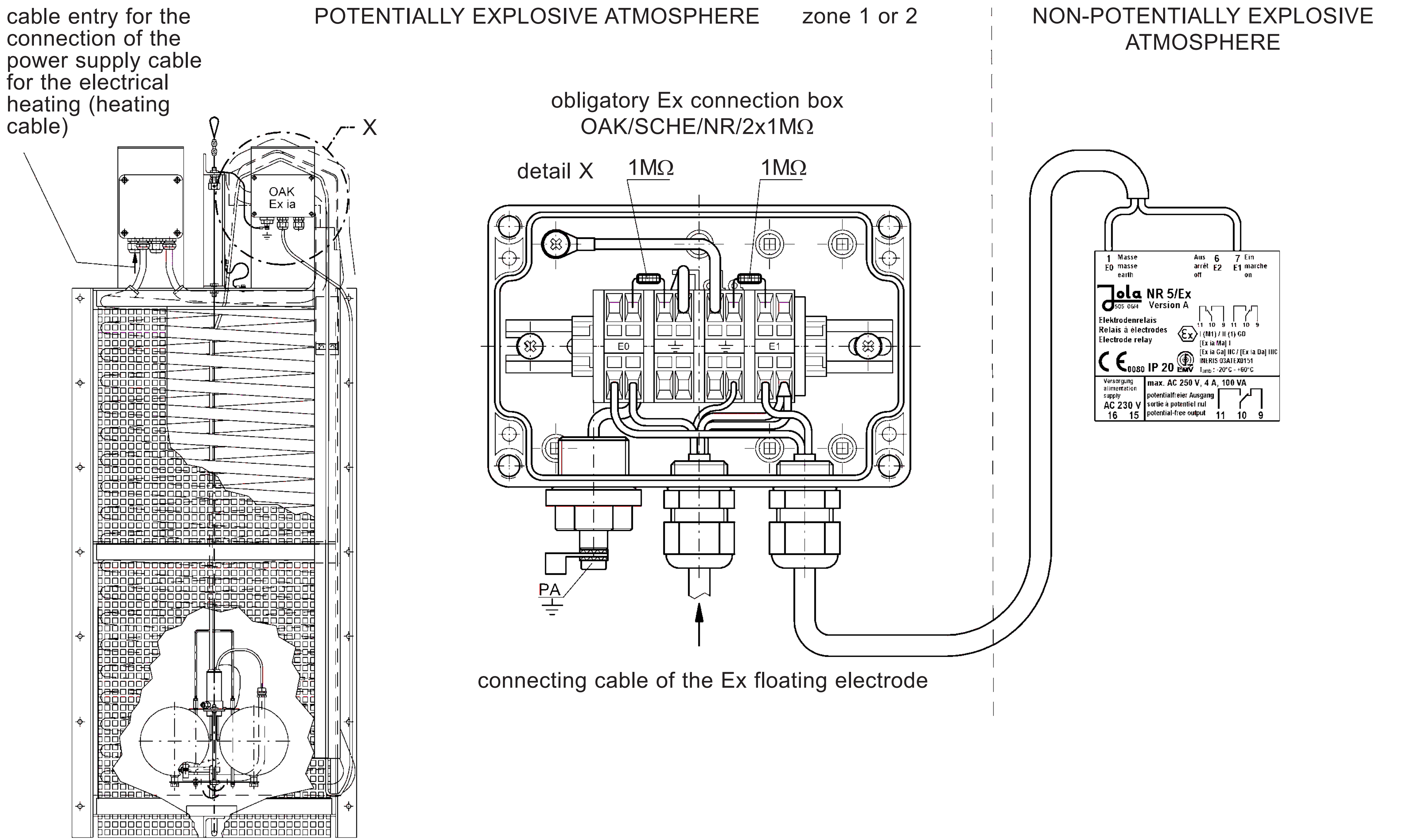
Without supply voltage | **OK status** | **Alarm status**



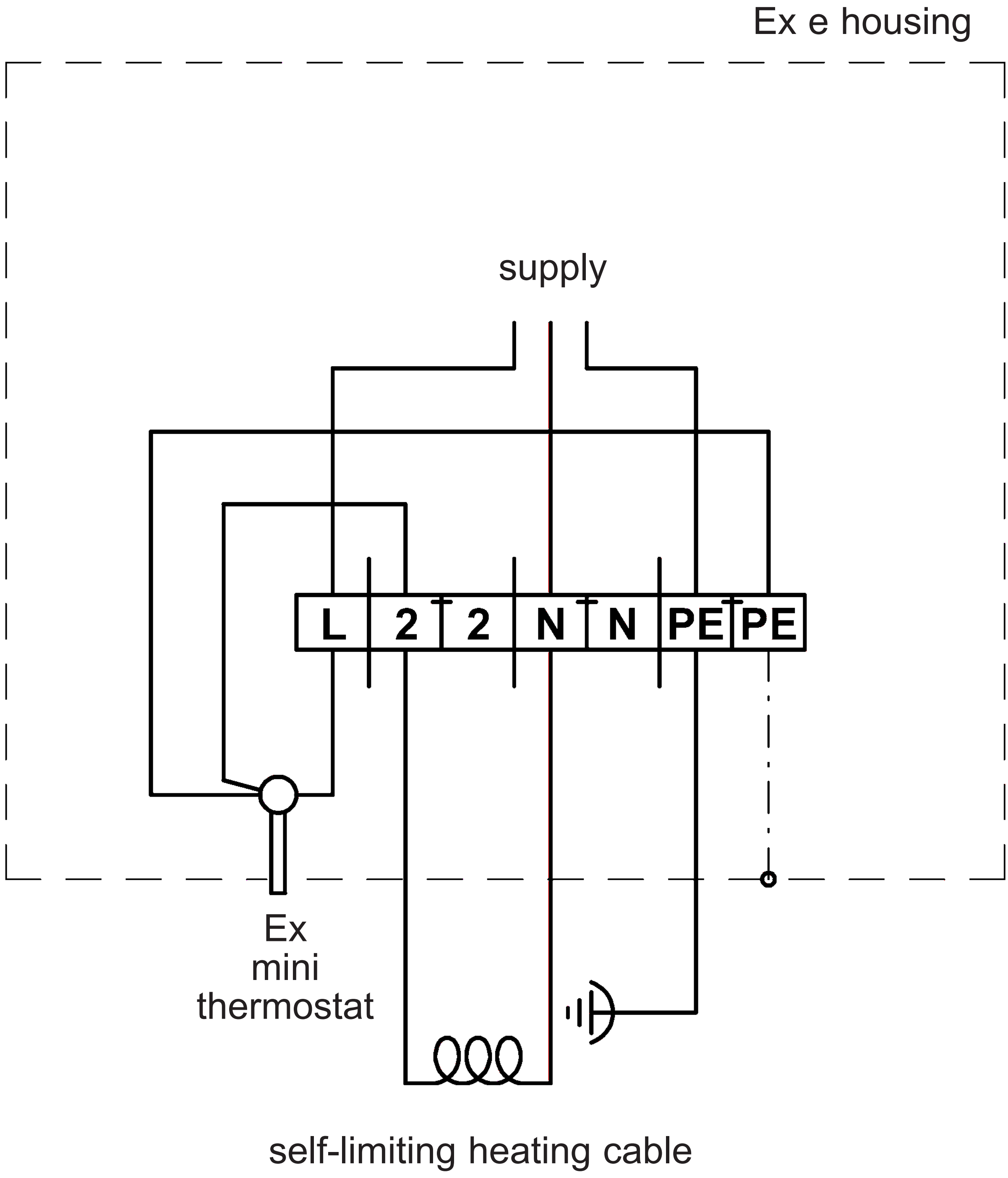
LEDs dark – output relay not energised | green LED lights – output relay energised | red LED lights – output relay not energised

Technical data	NR 5/Ex ⟨Ex⟩ I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A
Alternative supply voltages (terminals 15 and 16)	AC 230 V (supplied if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 110 V or AC 24 V
Power input	approx. 3 VA
Electrode circuit (terminals 1 and 7)	2 terminals (under safety extra low voltage SELV), acting on one output relay
No-load voltage	3 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)
Short-circuit current	max. 0.5 mA_{eff}
Response sensitivity	approx. 30 kΩ or approx. 33 µS (conductance); on request with higher response sensitivity for less conductive rain water, e.g. during long lasting rainfalls: approx. 200 kΩ or approx. 5 µS (conductance)
Controlled circuit (terminals 9, 10, 11)	1 single-pole potential-free changeover contact, based on the quiescent current principle
Switching status indicators	• via a green LED: lигths = OK status, output relay energised • via a red LED: lights = alarm status, output relay not energised
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 100 VA
Housing	insulating material, 75 x 55 x 110 mm (dimensions see page 39-3-7)
Connection	terminals on top of housing
Protection class	IP20
Mounting	clip attachment for U-bar to DIN 46 277 and EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature range	– 20°C to + 60°C
Max. cable length between electrode relay NR 5/Ex, Version A and Ex floating electrode	see Installation, Operating and Maintenance Instructions (sent on request)
EC type examination certificate	INERIS 03ATEX0151
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

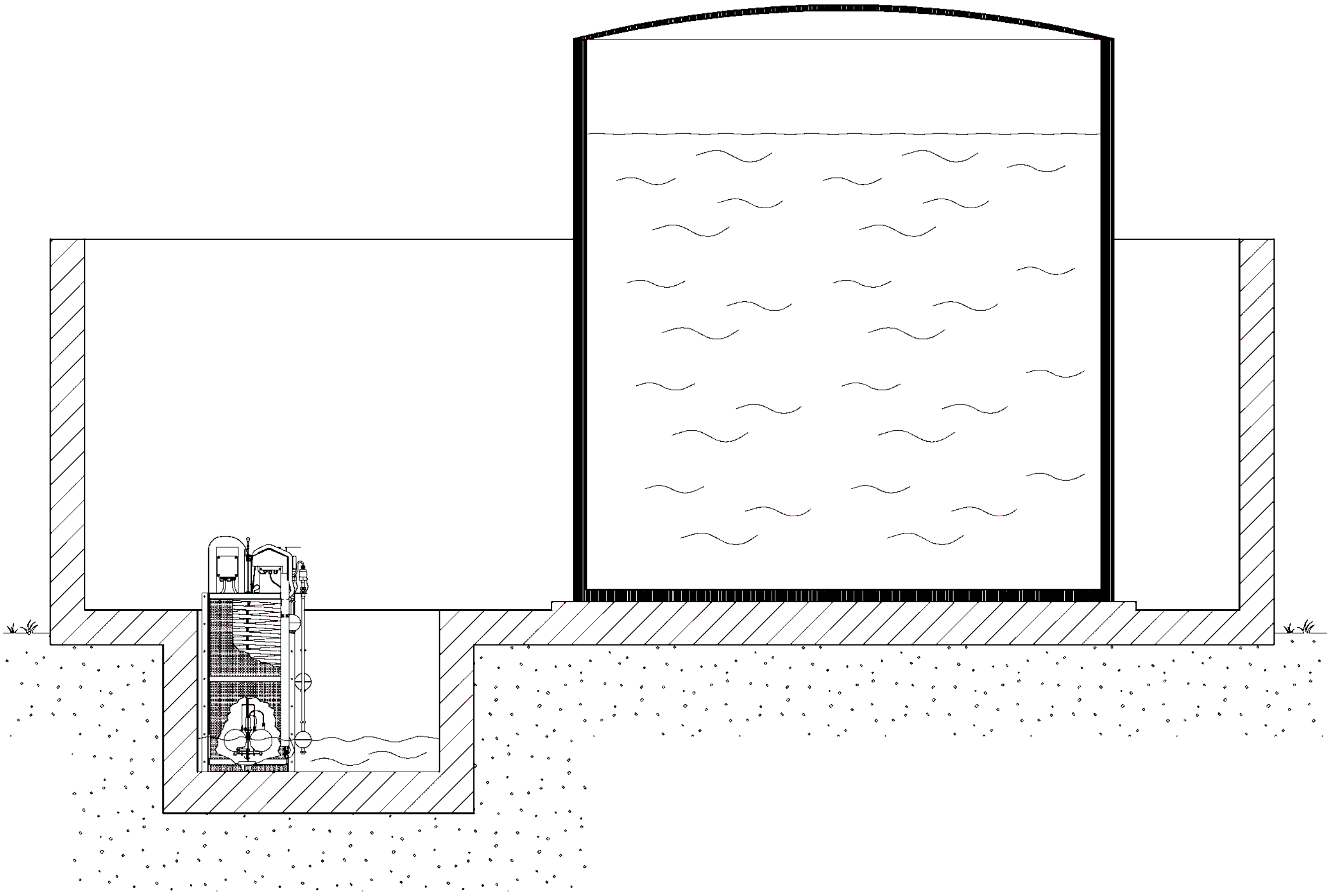
Connection diagram for the Ex floating electrode



Connection diagram for the self-limiting heating cable



**Application example:
Installation of the Ex leakage detector
HE/SCHE 2/Ex (Variante ILS)-1G
in the liquid collection sump in a catch basin**



The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

Detection of moisture

for cooling ceiling control

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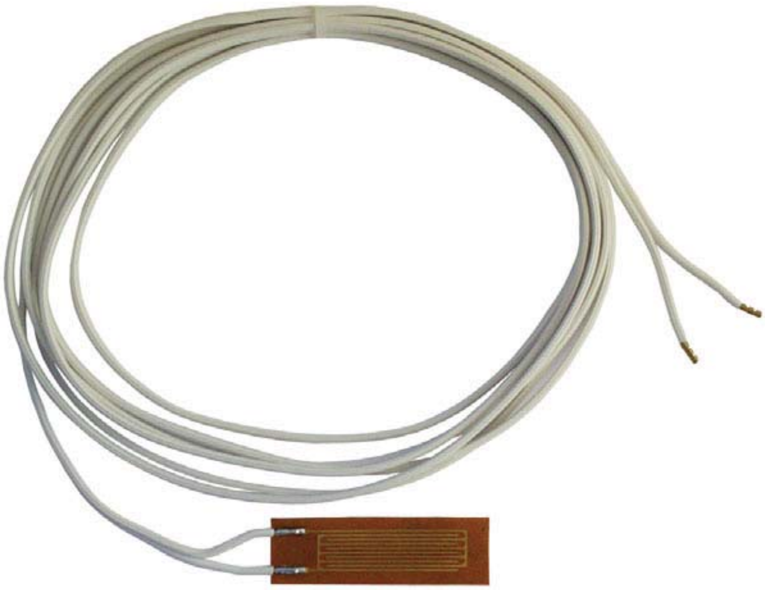
The units described in this documentation may only be installed, connected and started up by suitably qualified personnel!

Subject to deviations from the diagrams and technical data.

The details in this brochure are product specification descriptions and do not constitute assured properties in the legal sense.

FTS/KO-1 film sensor for cooling ceiling controller



The FTS/KO-1 film sensor is a PCB film which can be stuck to a copper pipe or an even metal surface. The back of the film sensor is coated with an adhesive agent and a protective film.

The film sensor is equipped with parallel-routed printed conductors (sensitive surface) which are gold-plated for improved surface protection.

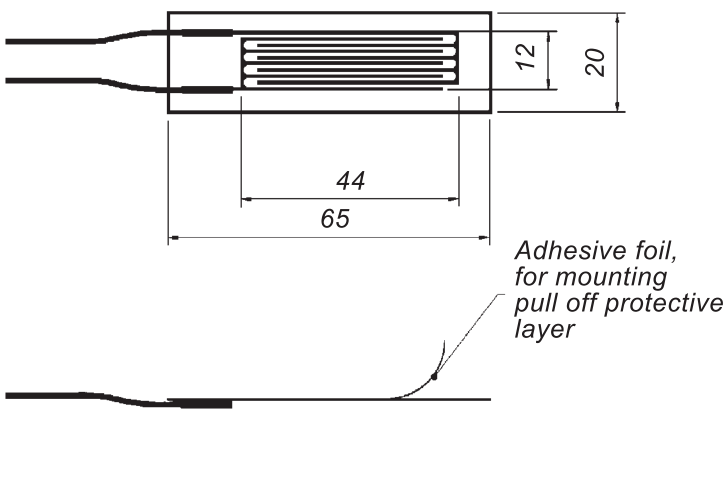
The sensor acts as a conductivity measuring cell. The conductivity is measured using alternating current in order to prevent corrosion and polarisation effects.

The sensor is available with connected 3-metre long thin white wire. Other connecting line lengths are available on request.

Care should always be taken to ensure that the sensitive surface of the sensor remains grease-free and is not treated with chemical substances, as these can severely impair or even completely destroy the functionality of the sensor.

The film sensor should be installed at the point in the cooling ceiling system where moisture is most probably expected to occur.

One FTS/KO-1 film sensor can be connected to one KUR 5, KUR 5/G or KUR-L4 cooling ceiling controller.



KUR 5 cooling ceiling controller

for connection of a FTS/KO-1 film sensor

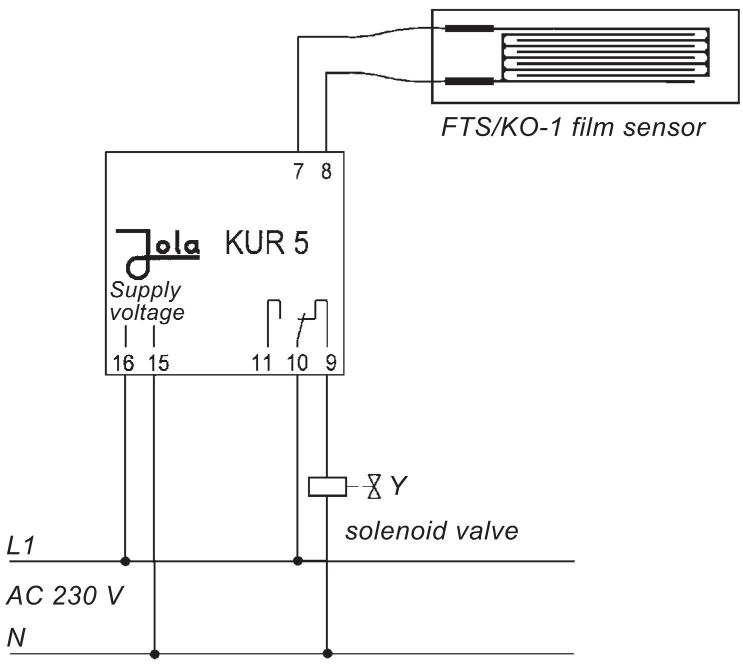
for detection of moisture on a cooling ceiling and for cooling ceiling control

Conductive relay for U-bar or surface mounting, with connection terminals on top of housing and red LED for moisture signalling.

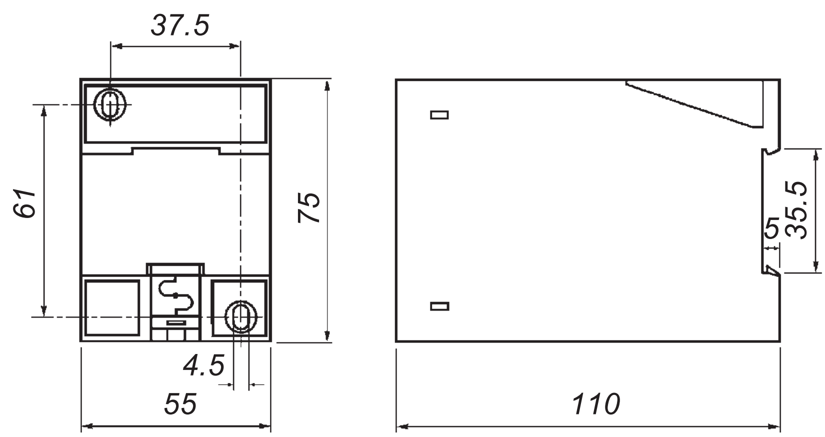
The unit is designed for switch cabinet mounting or installation in a suitable protective housing and may therefore only be mounted/installed in these locations. It is suitable for use in clean environments only.

The KUR 5 cooling ceiling controller is designed to measure the moisture between the printed conductors of a FTS/KO-1 film sensor and to switch the built-in output relay when a set sensitivity level is reached, thus permitting activation of an external solenoid valve.

The cooling ceiling controller is in protective circuit design: the potential-free changeover contact is in quiescent current design - in other words, the relay is energized when the sensor is dry.

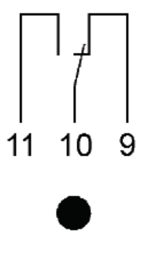


Position of contact in no-current status of the KUR 5

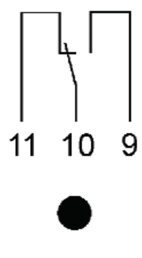


Technical data	**KUR 5**
Alternative supply voltages (AC versions: terminals 15 and 16; DC versions: - terminal 15: – - terminal 16: +)	- AC 230 V (supplied if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } only for connection to a safety low voltage - DC 12 V or } which corresponds to the safety regulations relating to the application - further supply voltages on request
Power consumption	approx. 3 VA
Control circuit (terminals 7 and 8)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay without self-hold
- no-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
- short-circuit current	0.3 mA
- response sensitivity	approx. 50 kΩ or approx. 20 µS (electric conductance)
Controlled circuit (terminals 9, 10, 11)	**1 single-pole potential-free changeover contact without self-hold**
Operating principle	quiescent current
Switching status indicator	1 red LED lights when the sensor is wet / output relay is not energized
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, 75 x 55 x 110 mm
Connection	terminals on top of housing
Protection class	IP 20
Mounting	clip attachment for U-bar to DIN 46 277 and DIN EN 50 022 or fastening via two boreholes
Mounting orientation	any
Temperature range	- 20°C to + 60°C
Max. length of connecting cable between cooling ceiling controller and sensor	**500 m**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

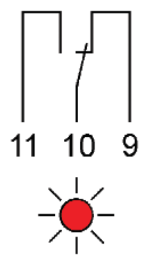
Position of output contact in the KUR 5 cooling ceiling controller



red LED dark:
KUR 5 without voltage ***–***
sensor dry or moistened –
output relay not energised



red LED dark:
KUR 5 under voltage ***–***
sensor dry –
output relay energised



red LED lit:
KUR 5 under voltage ***–***
sensor moistened –
output relay not energised

KUR 5/G cooling ceiling controller

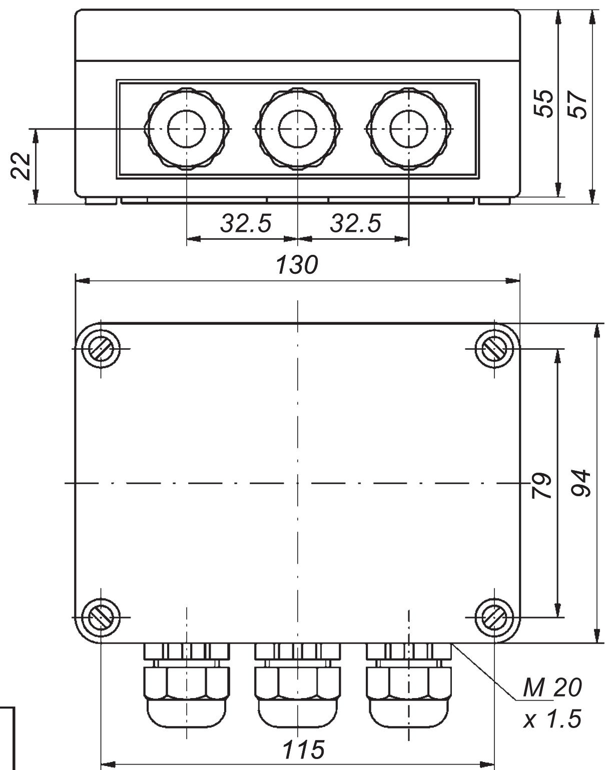
for connection of a FTS/KO-1 film sensor

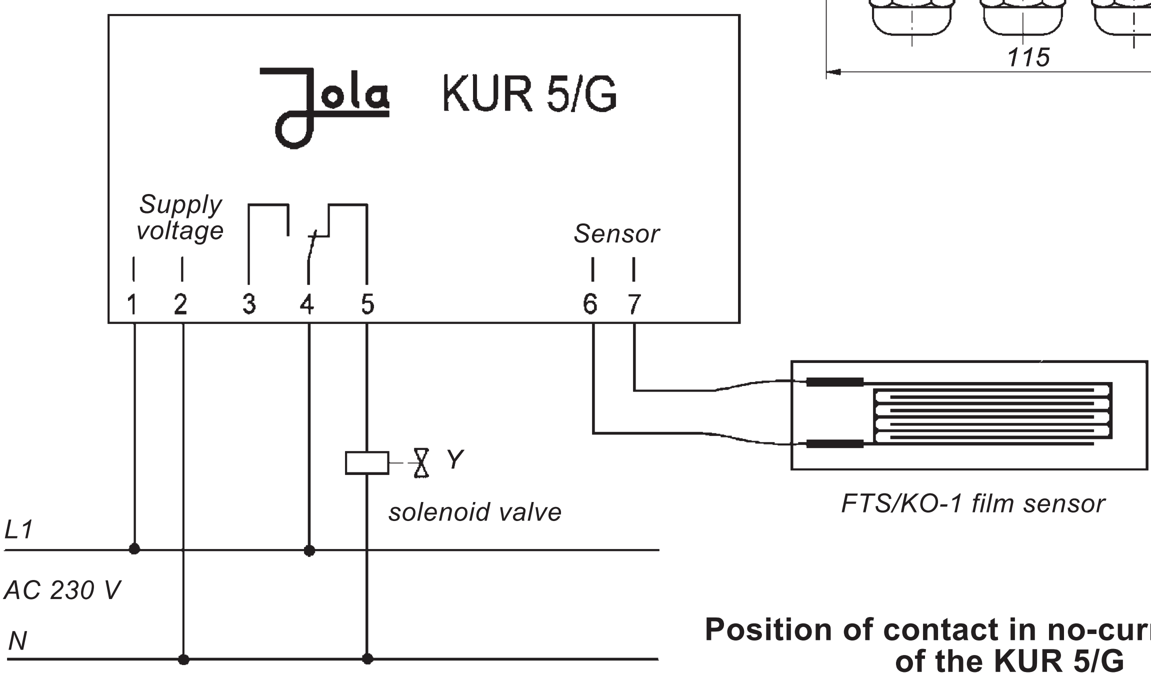
for detection of moisture on a cooling ceiling and for cooling ceiling control

Conductive relay in surface-mount housing with transparent cover, green mains monitoring indicator LED and red LED for moisture signalling inside the housing.

The KUR 5/G cooling ceiling controller is designed to measure the moisture between the printed conductors of a FTS/KO-1 film sensor and to switch the built-in output relay when a set sensitivity level is reached, thus permitting activation of an external solenoid valve.

The cooling ceiling controller is in protective circuit design: the potential-free changeover contact is in quiescent current design - in other words, the relay is energized when the sensor is dry.

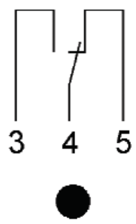




Position of contact in no-current status of the KUR 5/G

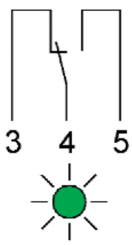
Technical data	KUR 5/G
Alternative supply voltages (AC versions: terminals 1 and 2; DC versions: - terminal 1: – - terminal 2: +)	- AC 230 V (supplied if no other supply voltage is specified in the order) or - AC 240 V or - AC 115 V or - AC 24 V or - DC 24 V or } only for connection to a safety low voltage - DC 12 V or } which corresponds to the safety regulations relating to the application - further supply voltages on request
Mains monitoring indicator	1 green LED
Power consumption	approx. 3 VA
Control circuit (terminals 6 and 7)	2 terminals (under safety extra low voltage SELV), acting on 1 output relay without self-hold
- no-load voltage	18 V_{eff} 10 Hz (safety extra low voltage SELV)
- short-circuit current	0.3 mA
- response sensitivity	approx. 50 kΩ or approx. 20 μS (electric conductance)
Controlled circuit (terminals 3, 4, 5)	**1 single-pole potential-free changeover contact without self-hold**
Operating principle	quiescent current
Switching status indicator	1 red LED lights when the sensor is wet / output relay is not energized
Switching voltage	max. AC 250 V
Switching current	max. AC 4 A
Switching capacity	max. 500 VA
Housing	insulating material, with 3 cable entries
Connection	internal terminals
Protection class	IP 54
Mounting	surface mounting using 4 screws
Mounting orientation	any
Temperature range	- 20°C to + 60°C
Max. length of connecting cable between cooling ceiling controller and sensor	**500 m**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

Position of the output contact in the KUR 5/G cooling ceiling controller



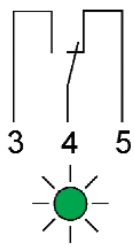
green LED dark –
KUR 5/G without voltage

red LED dark –
sensor dry or moistened –
output relay not energised



green LED lit –
KUR 5/G under voltage

red LED dark –
sensor dry –
output relay energised



green LED lit –
KUR 5/G under voltage

red LED lit –
sensor moistened –
output relay not energised

KUR-L4

compact cooling ceiling controller for safety extra low voltage SELV with integrated connecting cable

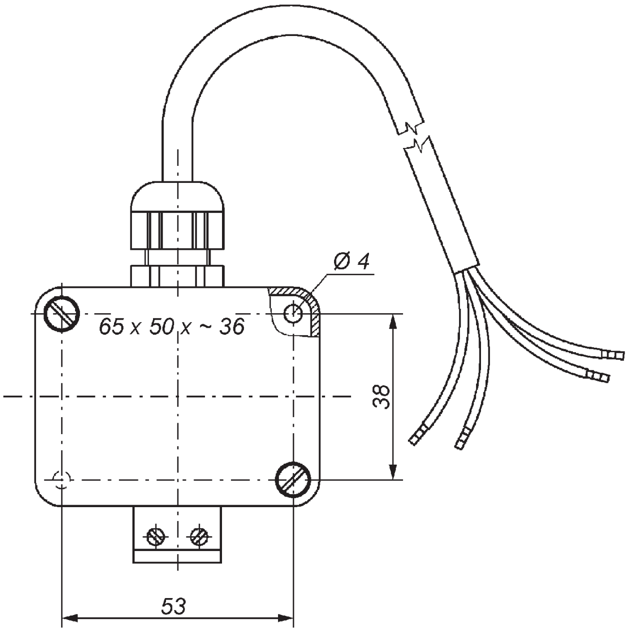
for connection of a FTS/KO-1 film sensor

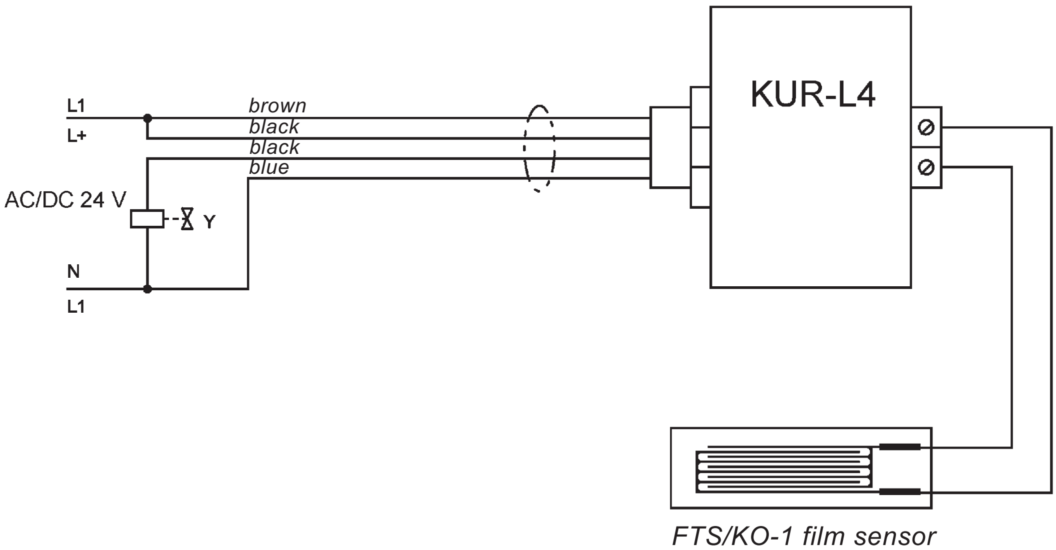
for detection of moisture on a cooling ceiling and for cooling ceiling control

Conductive relay in surface-mount housing, with potential-free make contact based on the quiescent current principle, with integrated connecting cable for supply voltage and controlled circuit.

The KUR-L4 compact cooling ceiling controller is designed to measure the moisture between the printed conductors of a FTS/KO-1 film sensor and to switch the built-in output relay when a set sensitivity level is reached, thus permitting activation of an external solenoid valve.

The cooling ceiling controller is in protective circuit design: the potential-free make contact is in quiescent current design - in other words, the relay is energized when the sensor is dry.

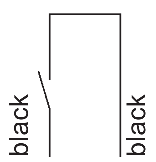




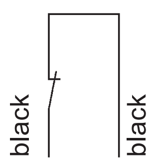
FTS/KO-1 film sensor

Technical data	KUR-L4
Supply voltage	AC/DC 24 V (safety extra low voltage SELV), colour of ropes: brown and blue
Power consumption	approx. 0.5 W
Control circuit	2 terminals (under safety extra low voltage SELV), acting on 1 output relay without self-hold
– no-load voltage	18 V_{eff} 60 Hz (safety extra low voltage SELV)
– short-circuit current	0.1 mA
– response sensivity	approx. 50 kΩ or approx. 20 µS (electric conductance)
Controlled circuit	**1 single-pole potential-free make contact without self-hold, colour of ropes: black and black**
Operating principle	quiescent current
Switching voltage	max. AC/DC 24 V (safety extra low voltage SELV)
Switching current	max. AC/DC 3 A (1 A)
Housing	PC or PP, 65 x 50 x approx. 36 mm
Connection	by means of an integrated connecting cable 4 x 0.5 mm²; 2 leads (brown and blue) for the supply voltage (DC or AC voltage), appliance operative by any polarity; 2 leads (black and black) for the potential-free make contact based on the quiescent current; length of the integrated connecting cable: 2 metres, longer on request
Protection class	IP 20
Mounting	surface mounting using 2 screws
Mounting orientation	any
Temperature range	- 20°C to + 60°C
Max. length of the connecting cable between sensor and KUR-L4	**100 m**
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies

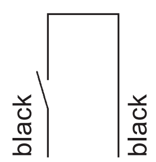
Position of the output contact in the KUR-L4 compact cooling ceiling controller



KUR-L4 without voltage - sensor dry or moistened - output relay not energized



KUR-L4 under voltage - sensor dry - output relay energized



KUR-L4 under voltage - sensor moistened - output relay not energized

KUR 5/K/..
compact cooling ceiling controller for safety extra low voltage SELV

for direct mounting on a copper pipe, with integrated FTS/KO-1 film sensor

for detection of moisture on a copper pipe of a cooling ceiling and for cooling ceiling control

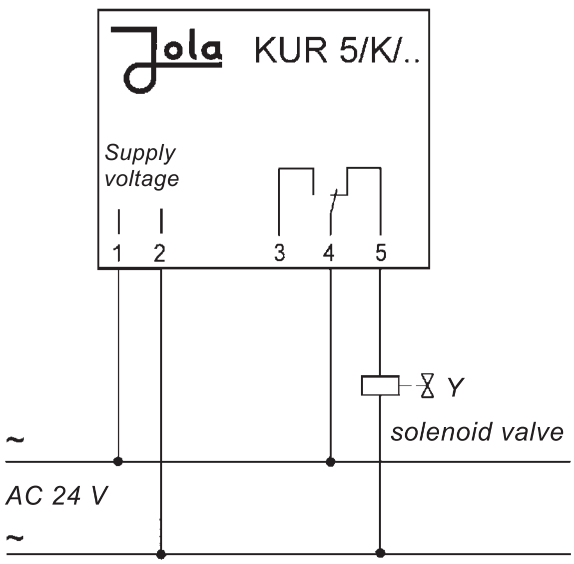
Conductive relay for mounting on a copper pipe.

The KUR 5/K/.. compact cooling ceiling controllers are designed to measure the moisture between the printed conductors of the FTS/KO-1 film sensor located on a plate on the bottom of the housing and and to switch the built-in output relay when a set sensitivity level is reached, thus permitting activation of an external solenoid valve.

The compact cooling ceiling controllers are in protective circuit design: the potential-free changeover contact is in quiescent current design - in other words, the relay is energised when the sensor is dry.

KUR 5/K/WI

KUR 5/K/BA



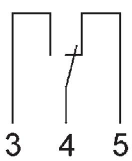
Position of contact in no-current status

Technical data	KUR 5/K/WI	KUR 5/K/BA
Application range	for mounting on a copper pipe with an external diameter between	
	10 mm and 25 mm	25 mm and 32 mm
	(for inquiries or orders please always state the outer diameter! special executions on request)	
Supply voltage (terminals 1 and 2)	AC 24 V (safety extra low voltage SELV), further supply voltage on request	
Power consumption	approx. 3 VA	
Control circuit	2 terminals (under safety extra low voltage SELV), acting on 1 output relay without self-hold	
– no-load voltage	9 V_{eff} ⎍ 10 Hz (safety extra low voltage SELV)	
– short-circuit voltage	0.3 mA	
– response sensivity	approx. 50 kΩ or approx. 20 µS (electric conductance)	
Controlled circuit (terminals 3, 4, 5)	**1 single-pole potential-free changeover contact without self-hold**	
Operating principle	quiescent current	
Switching voltage	max. AC 24 V (safety extra low voltage SELV)	
Switching current	max. AC 4 A	
Housing	insulating material, with 2 M 20 x 1.5 cable entries	
Connection	internal terminals	
Protection class	IP 54	
Mounting	on a copper pipe using a copper angle and 2 cable binders	on a copper pipe using a tape clip
Mounting orientation	any	
Temperature range	> 0°C to + 60°C	
EMC	for interference emission in accordance with the appliance-specific requirements for households, business and commerce as well as small companies, and for interference immunity in accordance with the appliance-specific requirements for industrial companies.	

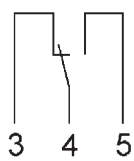
Mounting instructions:

The KUR 5/K/.. compact cooling ceiling controllers should be installed at the point on the copper pipe where moisture is most probably expected to occur. After fastening the cooling ceiling controller to the pipe, do not push the cable binder ends or the protruding end of the tape clip between the foil sensor and the housing as this could damage the film sensor.

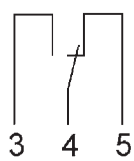
Position of the output contact in the KUR 5/K/.. compact cooling ceiling controller



KUR 5/K/.. without voltage - sensor dry or moistened - output relay not energized

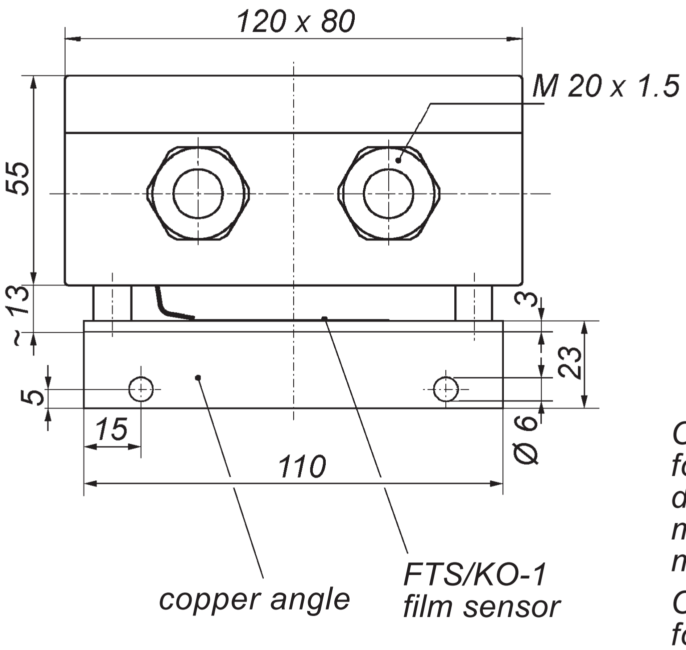


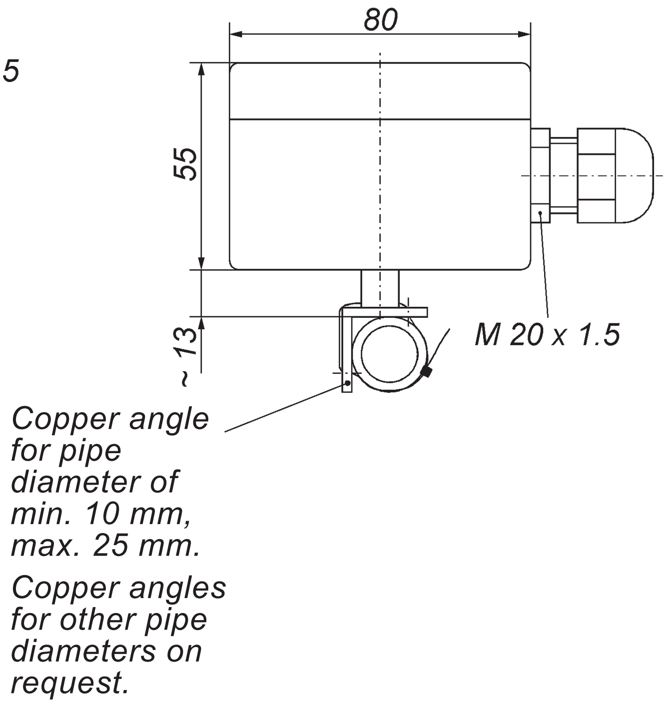
KUR 5/K/.. under voltage - sensor dry - output relay energized



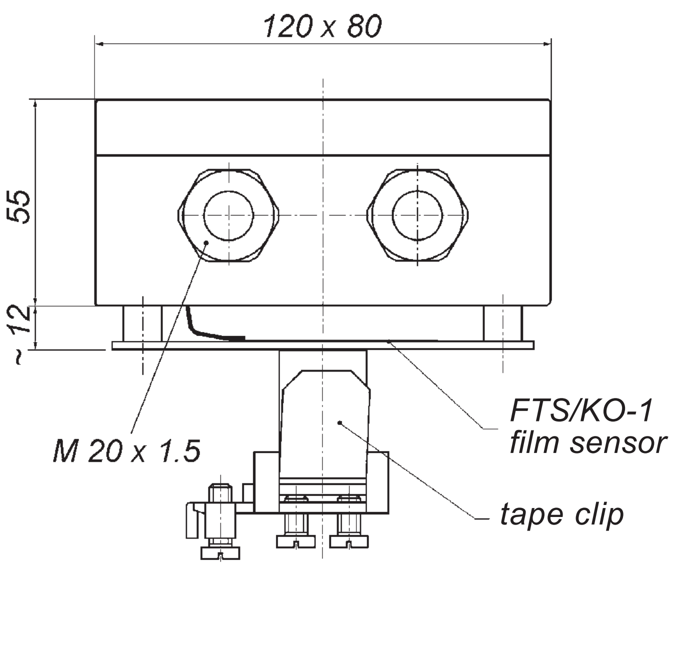
KUR 5/K/.. under voltage - sensor moistened - output relay not energized

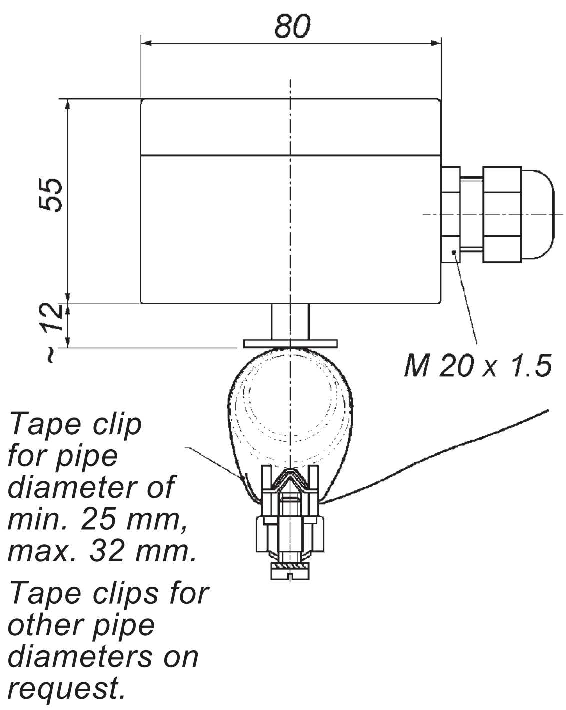
Dimensional drawing KUR 5/K/WI





Dimensional drawing KUR 5/K/BA





Jola