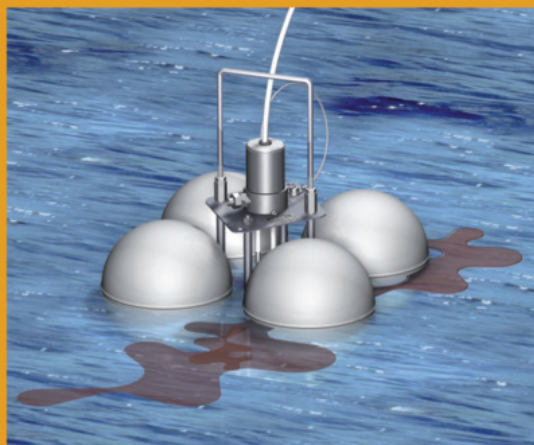




Ex floating electrodes

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

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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  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

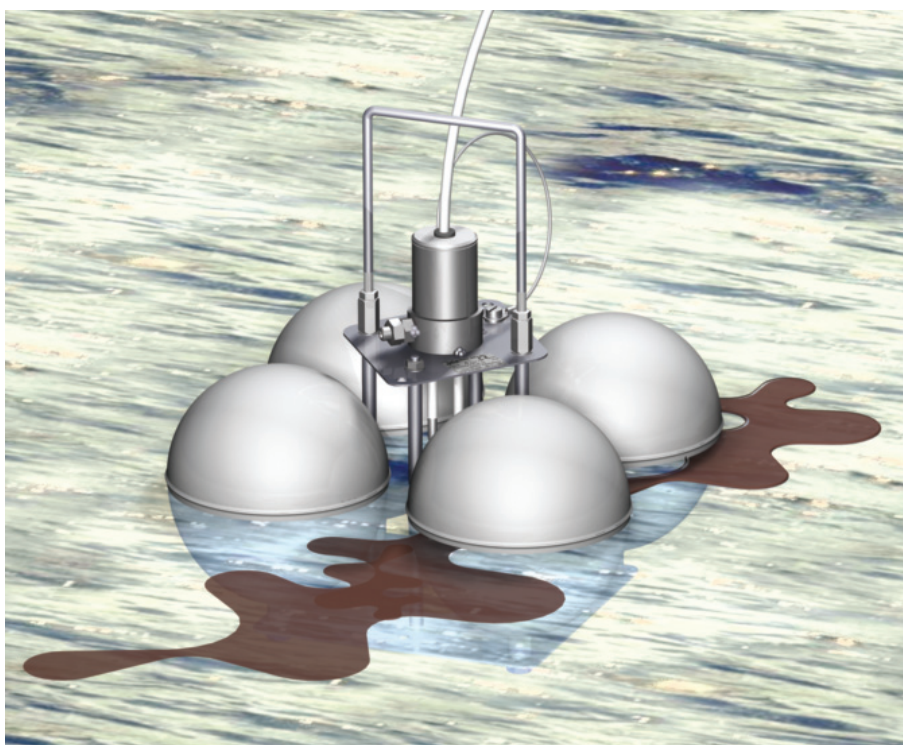
The Ex floating electrode normally floats on a conductive liquid, such as water. It is connected, via an obligatory Ex connection box, to an Ex electrode relay which supplies it with a low safety voltage. The height of the rod electrode is set in such a way that the two electrode rod tips are permanently 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.

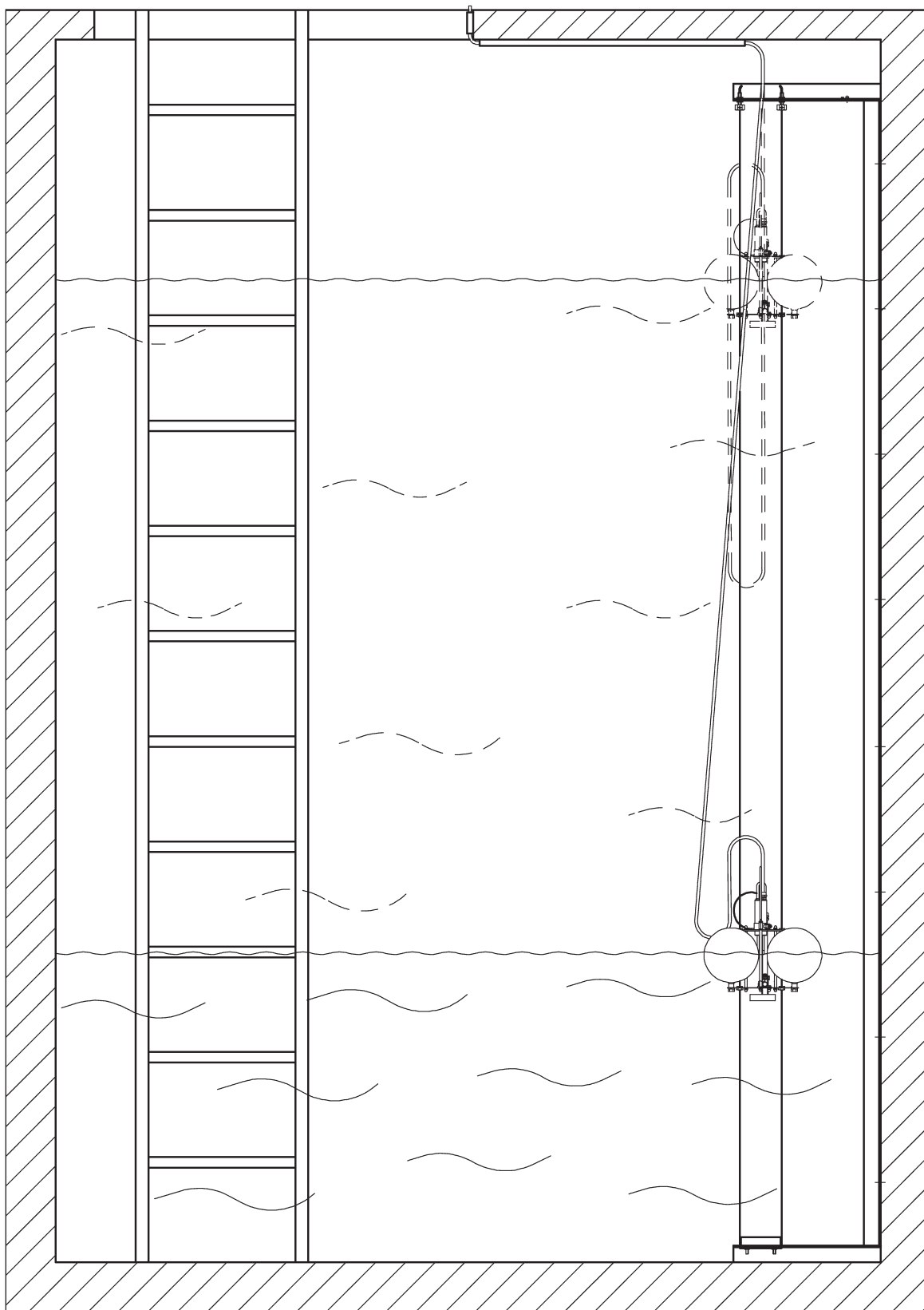
A SCHE 2/Ex ... floating electrode fitted with 2 electrode rods is designed for connection, via an obligatory OAK/SCHE/NR/2x1M Ω connection box, to an Ex electrode relay NR 5/Ex, Version A.

The NR 5/Ex, Version A electrode relay is fitted with a response sensitivity of approx. 30 k Ω (approx. 33 μ S). 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 k Ω (approx. 5 μ S).





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

Types	Main differentiation features	Ex zones	Connecting cable	Page
SCHE 2/Ex-0G Ⓔ II 1 G Ex ia IIB T6 Ga	2 electrode rods for 1 alarm (connected to 1 Ex electrode relay)	0, 1, 2	antistatic PURLF	39-2-7
SCHE 2/Ex-1G Ⓔ II 2 G Ex ia IIB T6 Gb		1, 2	PTFE	39-2-7
SCHE 2/Ex (Variante 3 tiges)-0G Ⓔ II 1 G Ex ia IIB T6 Ga	3 electrode rods for 2 alarms (connected to 2 Ex electrode relays)	0, 1, 2	antistatic PURLF	39-2-9
SCHE 2/Ex (Variante 3 tiges)-1G Ⓔ II 2 G Ex ia IIB T6 Gb		1, 2	PTFE	39-2-9
SCHE 2/Ex (Variante ILS)-0G Ⓔ II 1 G Ex ia IIB T6 Ga	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 functioning of the Ex floating electrode	0, 1, 2	antistatic PURLF	39-2-11
SCHE 2/Ex (Variante ILS)-1G Ⓔ II 2 G Ex ia IIB T6 Gb		1, 2	PTFE	39-2-11



Ex floating electrodes

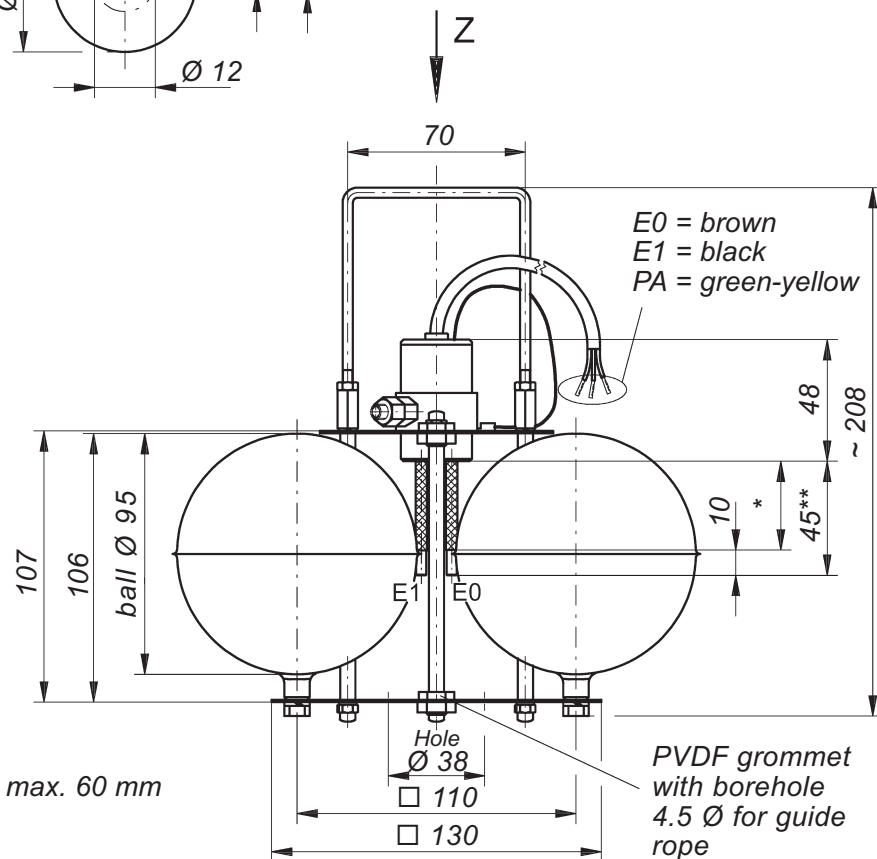
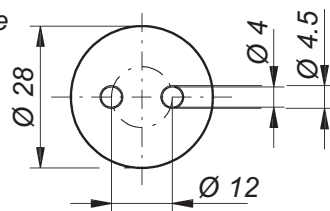
SCHE 2/Ex-0G II 1 G Ex ia IIB T6 Ga

and

SCHE 2/Ex-1G II 2 G Ex ia IIB T6 Gb

Technical data	SCHE 2/Ex-0G  II 1 G Ex ia IIB T6 Ga	SCHE 2/Ex-1G  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), potted in electrode head, other cable on request; length: 2 m, longer on request	PTFE cable,
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 $d = 1 \text{ g/cm}^3$)	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

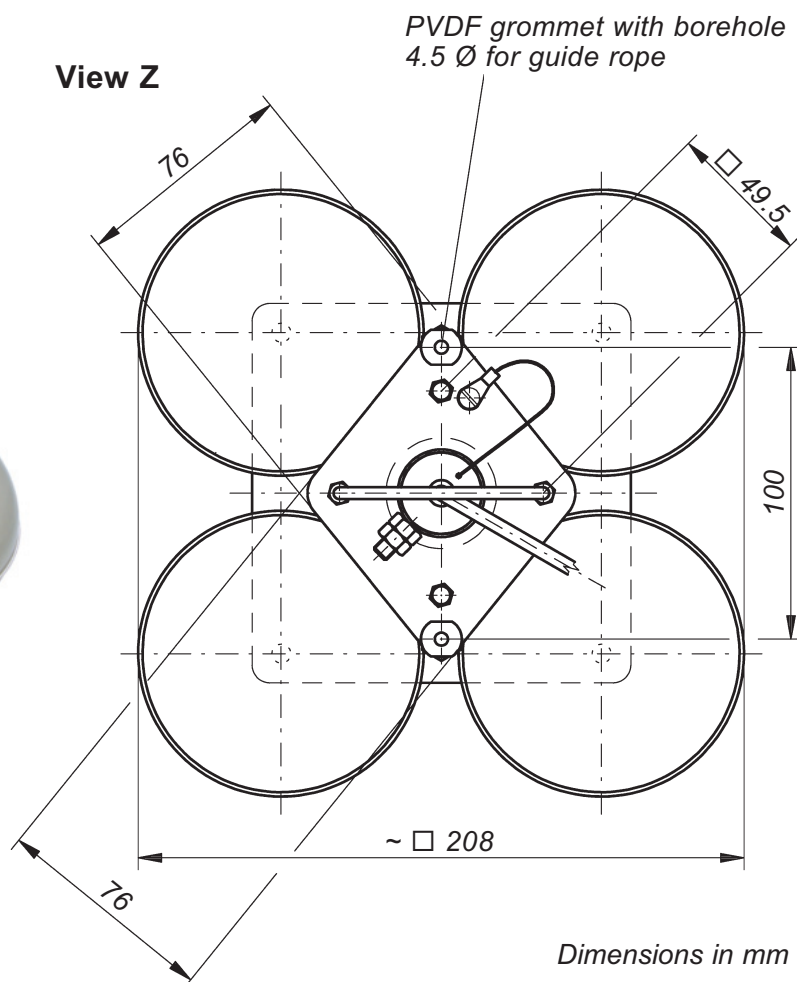


*) length of each shrinkdown tubing max. 60 mm

**) other lengths on request.



View Z



SCHE 2/Ex-1G II 2 G Ex ia IIB T6 Gb



Ex floating electrodes SCHE 2/Ex (Variante 3 tiges)-0G

⊕ II 1 G Ex ia IIB T6 Ga

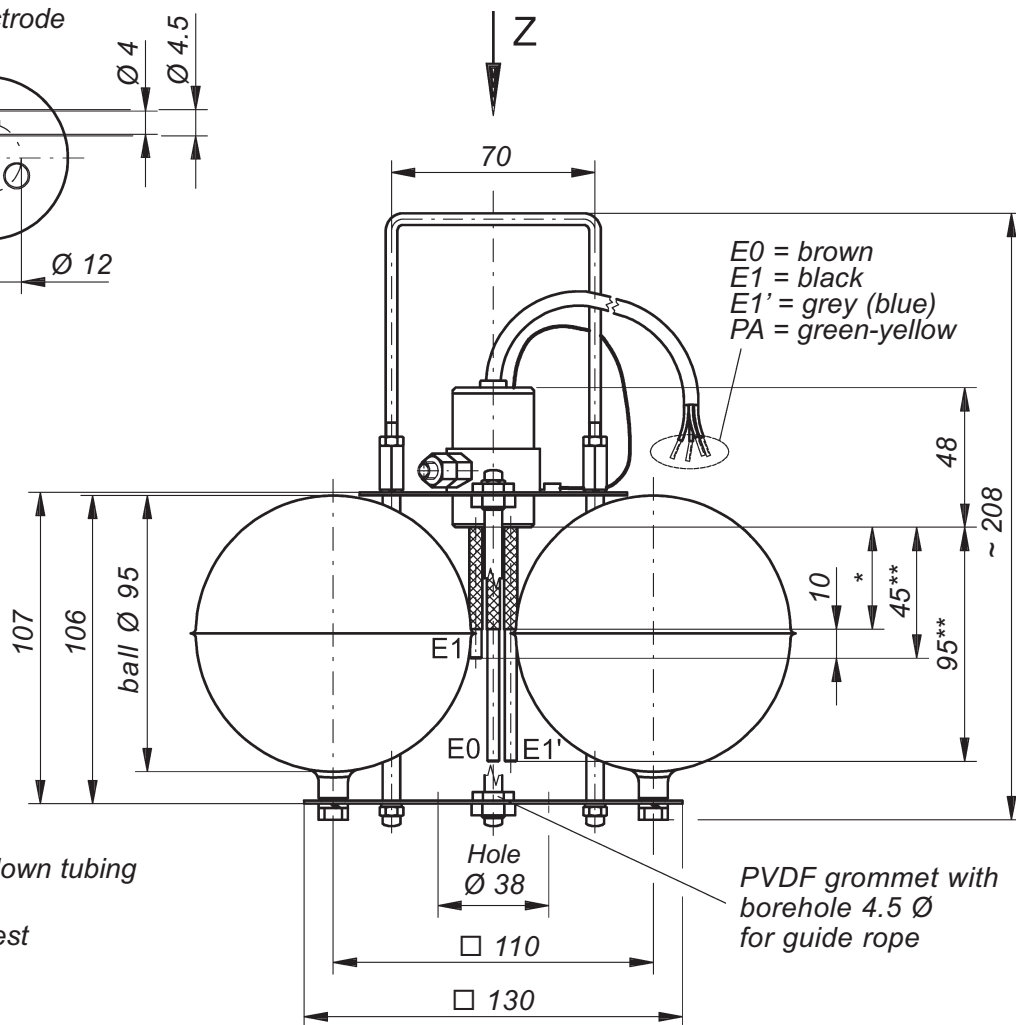
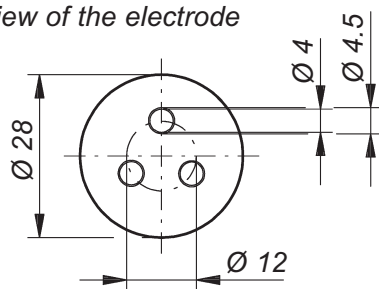
and

SCHE 2/Ex (Variante 3 tiges)-1G

⊕ II 2 G Ex ia IIB T6 Gb

Technical data	SCHE 2/Ex (Variante 3 tiges)-0G ⊕ II 1 G Ex ia IIB T6 Ga	SCHE 2/Ex (Variante 3 tiges)-1G ⊕ 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), potted in electrode head, other cable on request;	PTFE cable, 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 $d = 1 \text{ g/cm}^3$)	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)	

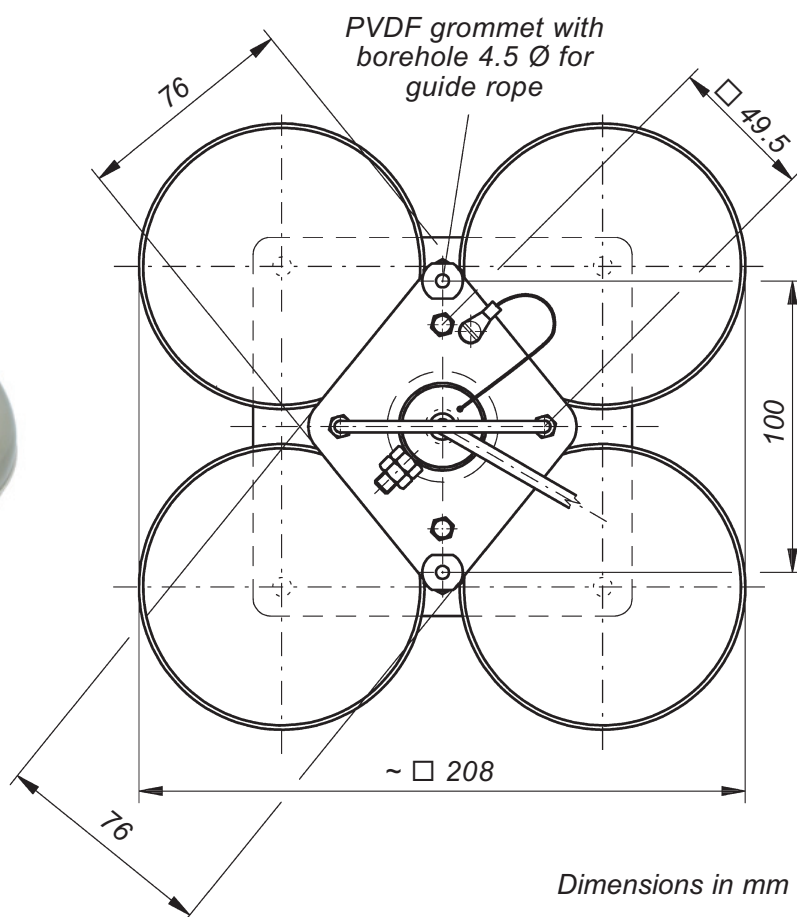
Bottom view of the electrode



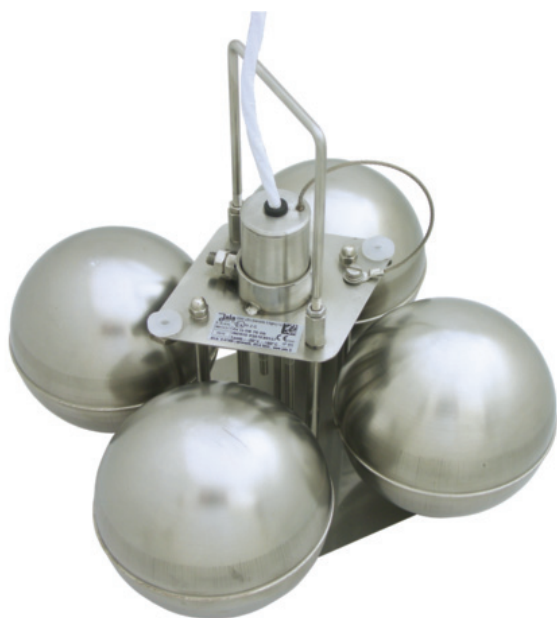
*) length of each shrinkdown tubing
max. 60 mm

**) other lengths on request

View Z



Dimensions in mm



SCHE 2/Ex (Variante 3 tiges)-1G  II 2 G Ex ia IIB T6 Gb



Ex floating electrodes SCHE 2/Ex (Variante ILS)-0G

⊕ II 1 G Ex ia IIB T6 Ga

and

SCHE 2/Ex (Variante ILS)-1G

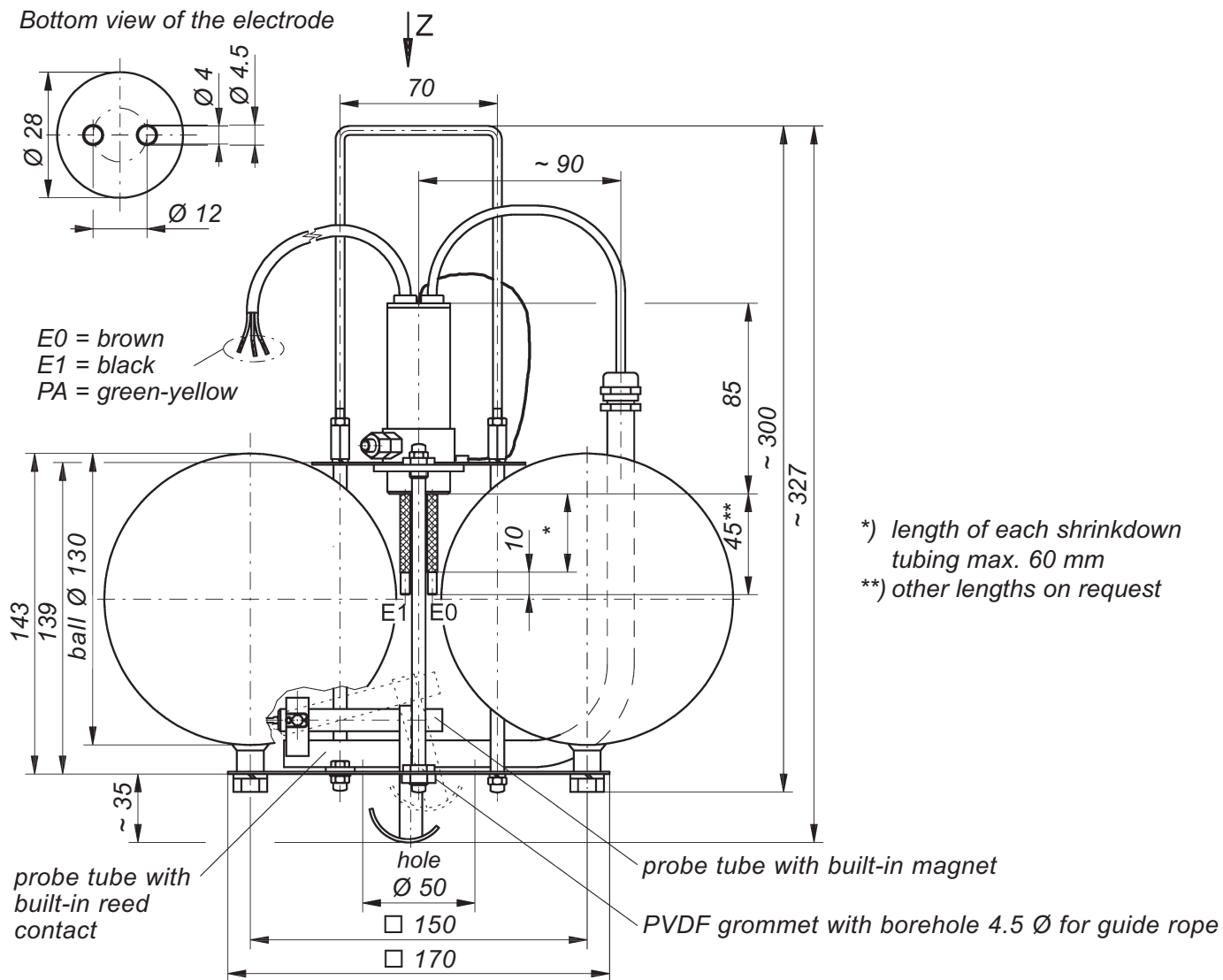
⊕ II 2 G Ex ia IIB T6 Gb

Technical data	SCHE 2/Ex (Variante ILS)-0G ⊕ II 1 G Ex ia IIB T6 Ga	SCHE 2/Ex (Variante ILS)-1G ⊕ 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), potted in electrode head, other cable on request; length: 2 m, longer on request	PTFE cable,
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 $d = 1 \text{ g/cm}^3$)	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)	



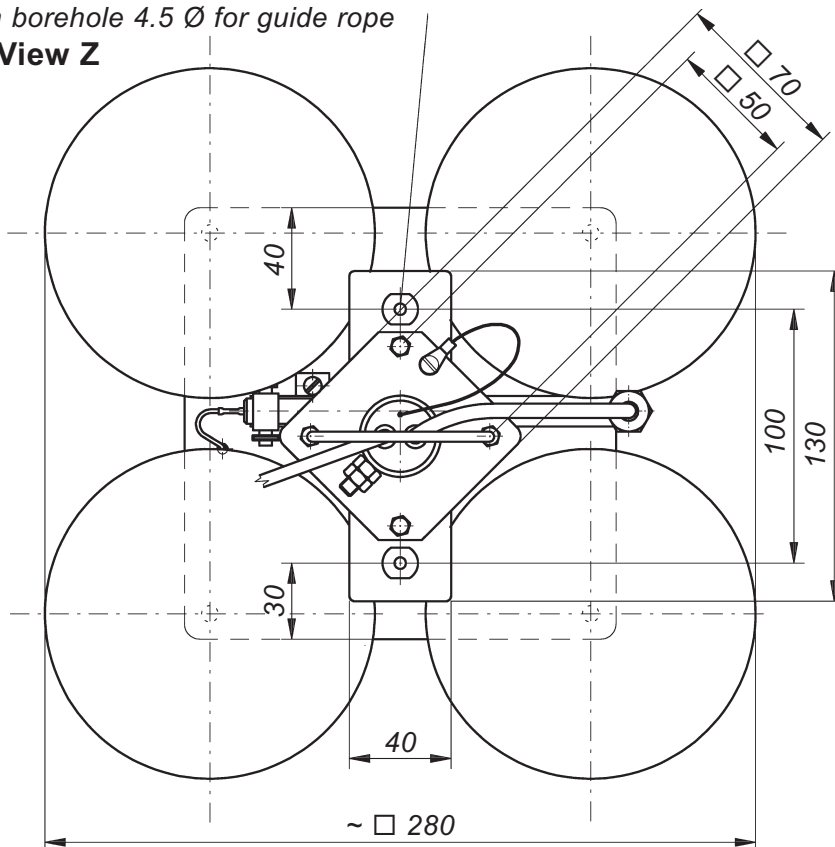
SCHE 2/Ex (Variante ILS)-1G  II 2 G Ex ia IIB T6 Gb

Bottom view of the electrode



PVDF grommet with borehole 4.5 $\varnothing$ for guide rope

View Z



Dimensions in mm

SCHE 2/Ex (Variante ILS)-1G Ex II 2 G Ex ia IIB T6 Gb



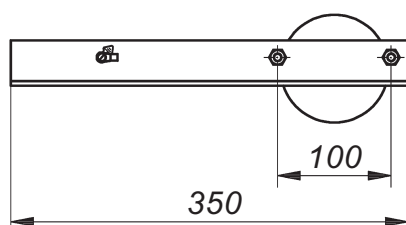
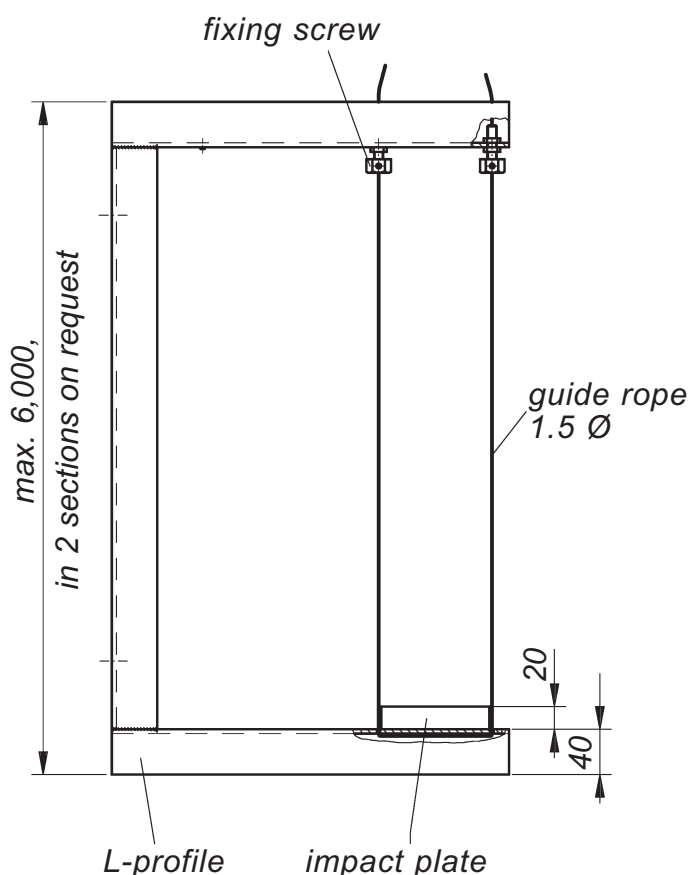
Mounting frame for Ex floating electrodes

It is always advisable to use a Jola mounting frame for Ex floating electrodes for the following reasons:

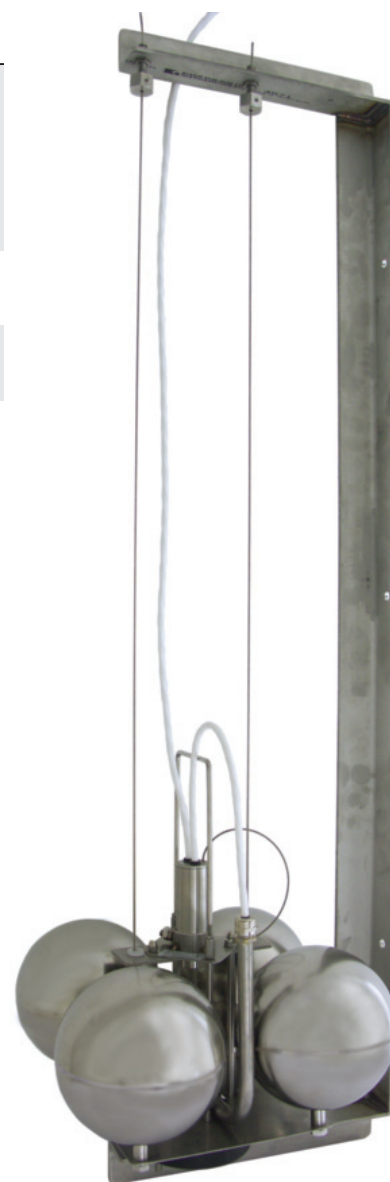
- In order to prevent spark formation when they rise and fall, the Ex floating electrodes must not be allowed to come into contact with any metal objects in the surrounding installation.
- The Ex floating electrodes must not float about in an uncontrolled fashion, as this could impair proper functioning.

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.

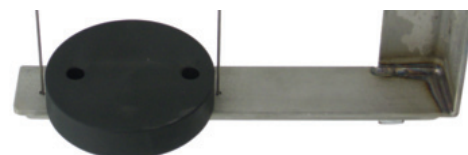
Technical data	Mounting frame
Frame	stainless steel 316 Ti
Fixing screws	stainless steel 316 Ti
Guide ropes	stainless steel 316
Impact plate	antistatic (conductive) PP
Height	to customer specifications, but max. 6 m
Option	mounting frame in 2 sections, max. admissible height: 6 m



Dimensions in mm



Mounting frame with SCHE 2/Ex (Variante ILS)-1G floating electrode



Impact plate to prevent spark formation

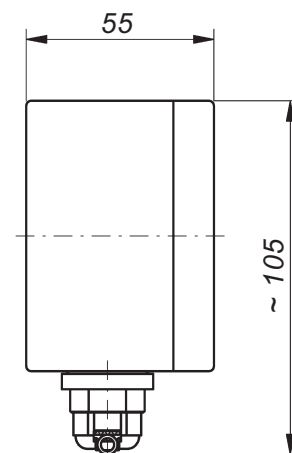
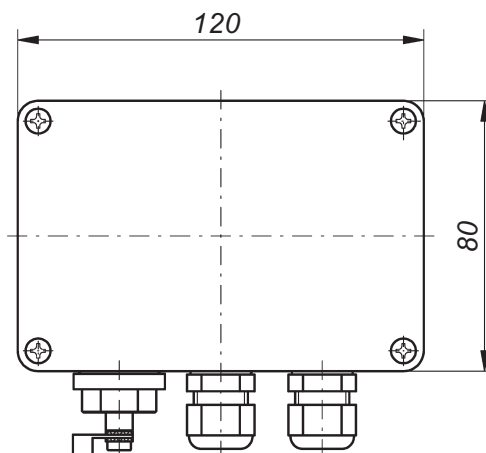
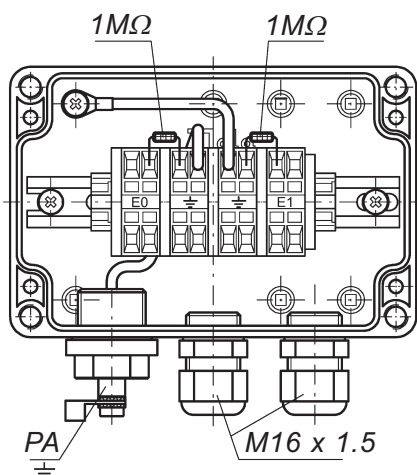


Obligatory Ex connection box OAK/SCHE/NR/2x1MΩ ⊕ II 2 G Ex ia IIC T6 Gb



Technical data	OAK/SCHE/NR/2x1MΩ ⊕ 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 mm ² and < 2.5 mm ² 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



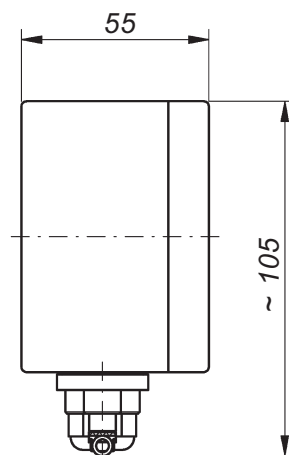
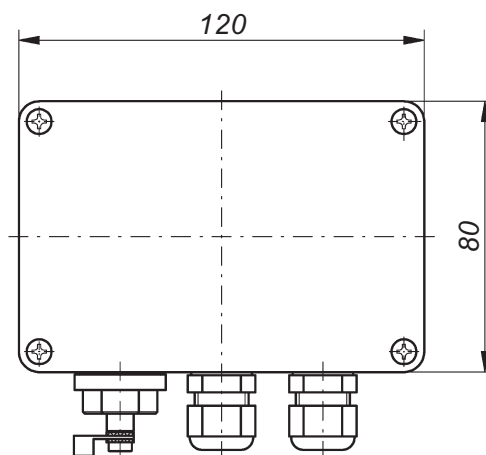
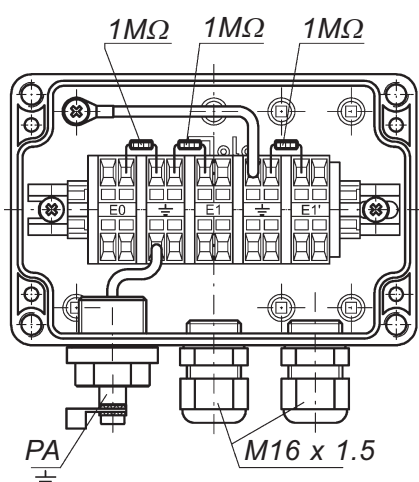
Obligatory Ex connection box OAK/SCHE/NR/3x1MΩ

Ex II 2 G Ex ia IIC T6 Gb



Technical data	OAK/SCHE/NR/3x1MΩ Ex 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 mm ² and < 2.5 mm ² 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 outside potentially explosive atmospheres and may therefore only be mounted / installed in these locations. It is suitable for use in clean environments only.

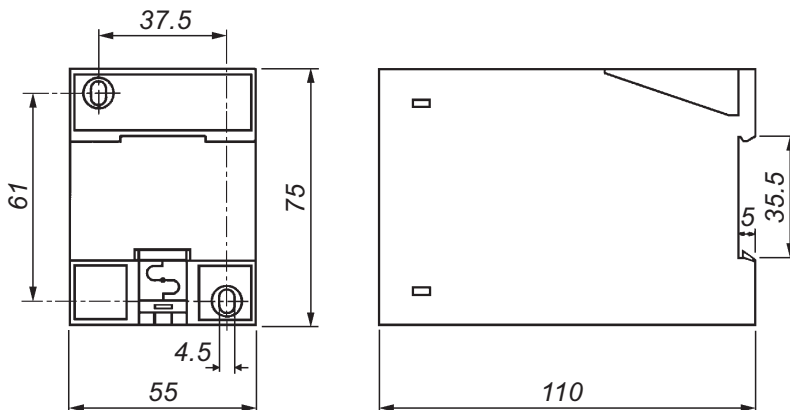
The NR 5/Ex Ex I (M1) / II (1) GD [Ex ia Ma] I / [Ex ia Ga] IIC / [Ex ia Da] IIIC, Version A electrode relay is designed to transmit control commands from an intrinsically safe control current circuit to a non-intrinsically safe active current circuit. **It must be installed outside potentially explosive 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.

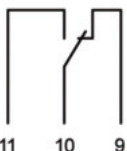


Dimensions in mm



Position of output contact of the NR 5/Ex, Version A electrode relay

Without supply voltage



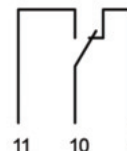
LEDs dark –
output relay not energised

Standby status



green LED lights –
output relay energised

Alarm status

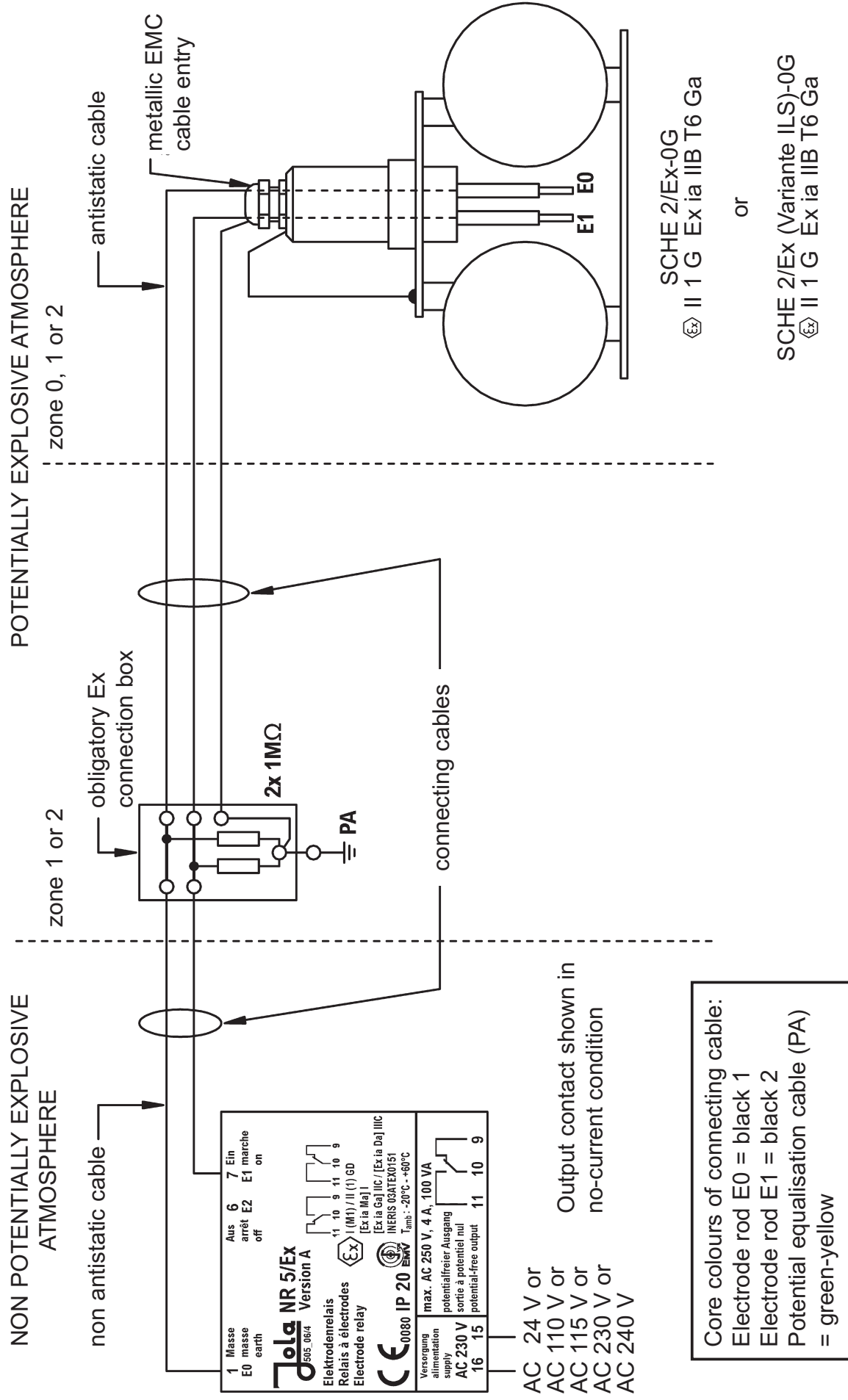


red LED lights –
output relay not energised

Technical data	NR 5/Ex  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  II 1 G Ex ia IIB T6 Ga or SCHE 2/Ex (Variante ILS)-0G  II 1 G Ex ia IIB T6 Ga



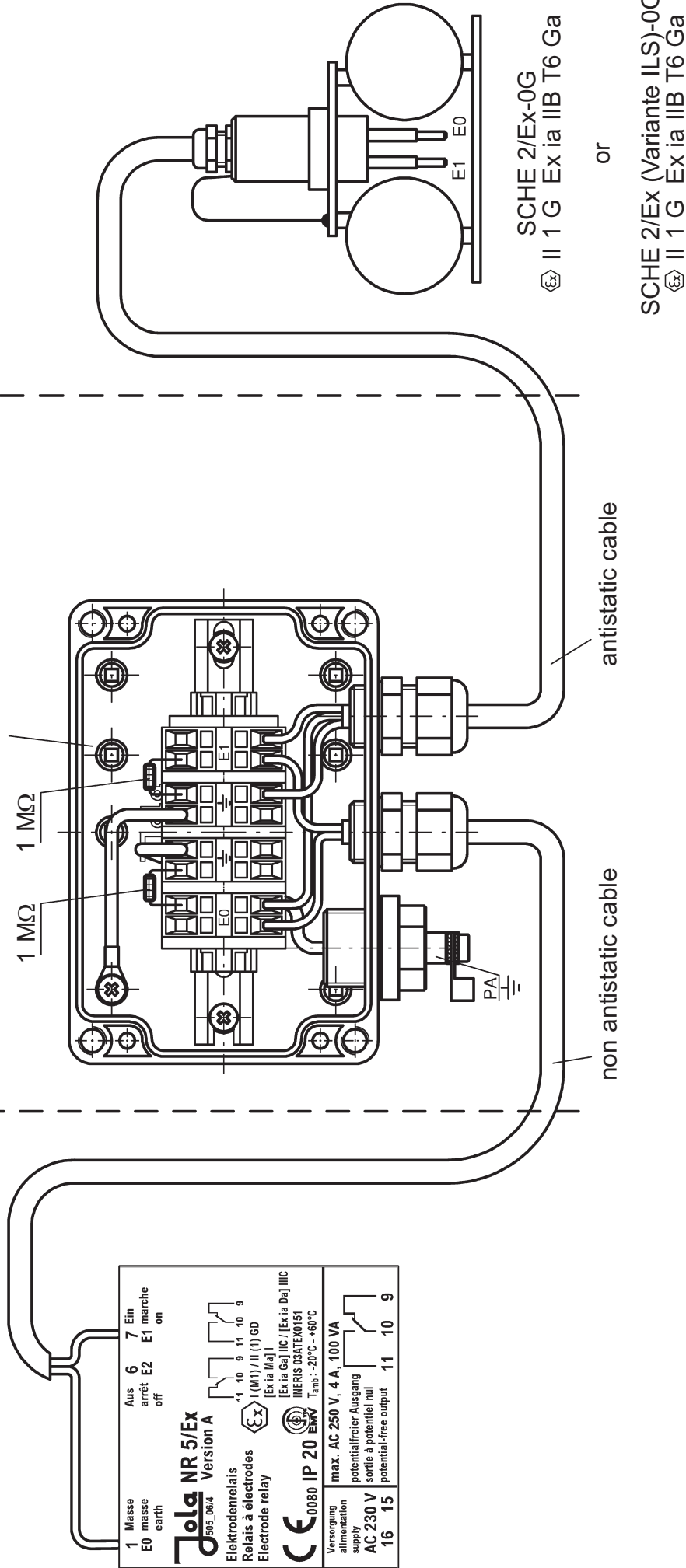
NON POTENTIALLY EXPLOSIVE
ATMOSPHERE

POTENTIALLY EXPLOSIVE ATMOSPHERE

zone 0, 1 or 2

obligatory Ex connection box

zone 1 or 2



POTENTIALLY EXPLOSIVE ATMOSPHERE

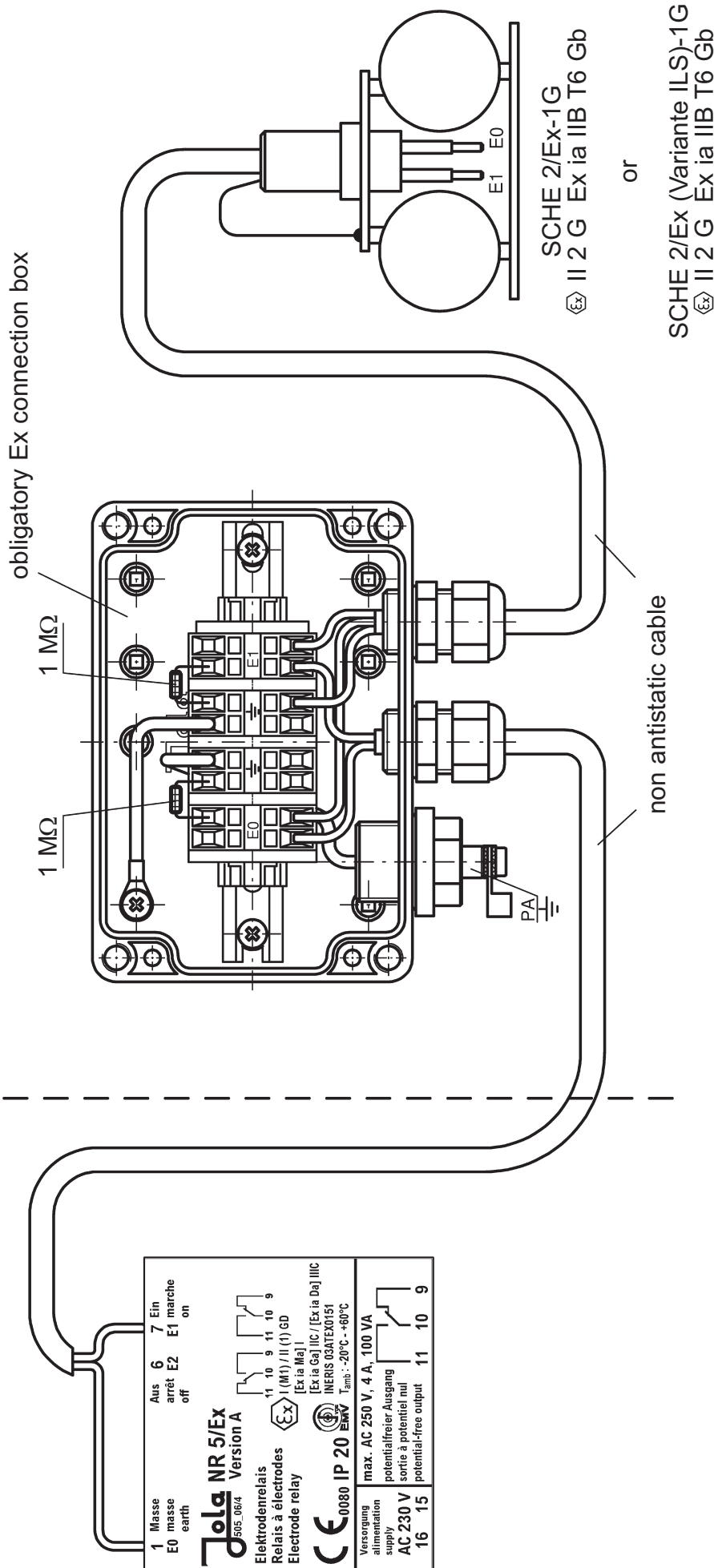


Core colours of connecting cable:
Electrode rod E0 = brown
Electrode rod E1 = black
Potential equalisation cable (PA)
= green-yellow

NON POTENTIALLY EXPLOSIVE
ATMOSPHERE

POTENTIALLY EXPLOSIVE ATMOSPHERE

zone 1 or 2



SCHE 2/Ex-1G

II 2 G Ex ia IIB T6 Gb

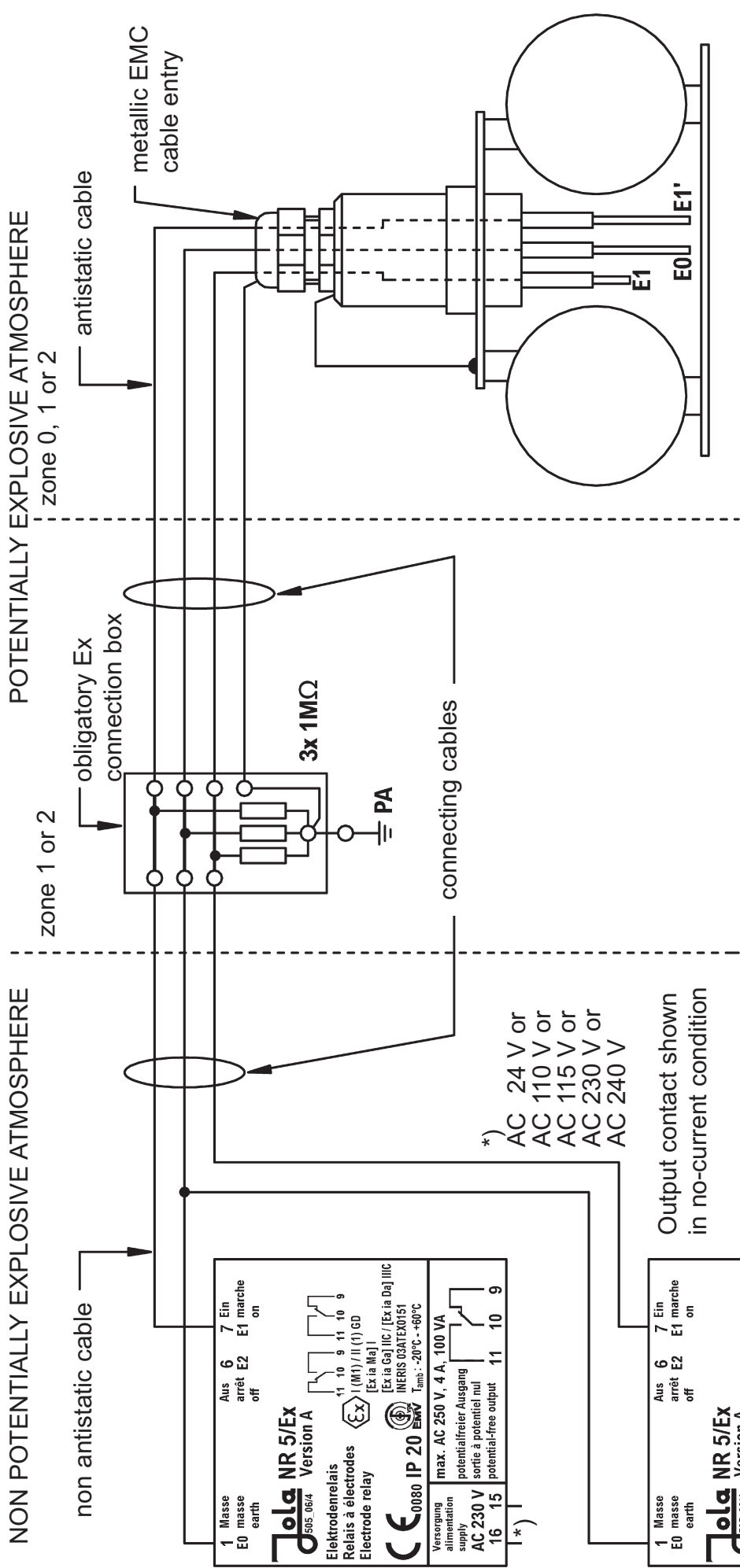
or

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 ia IIB T6 Ga



SCHE 2/Ex (Variante 3 tiges)-0G
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

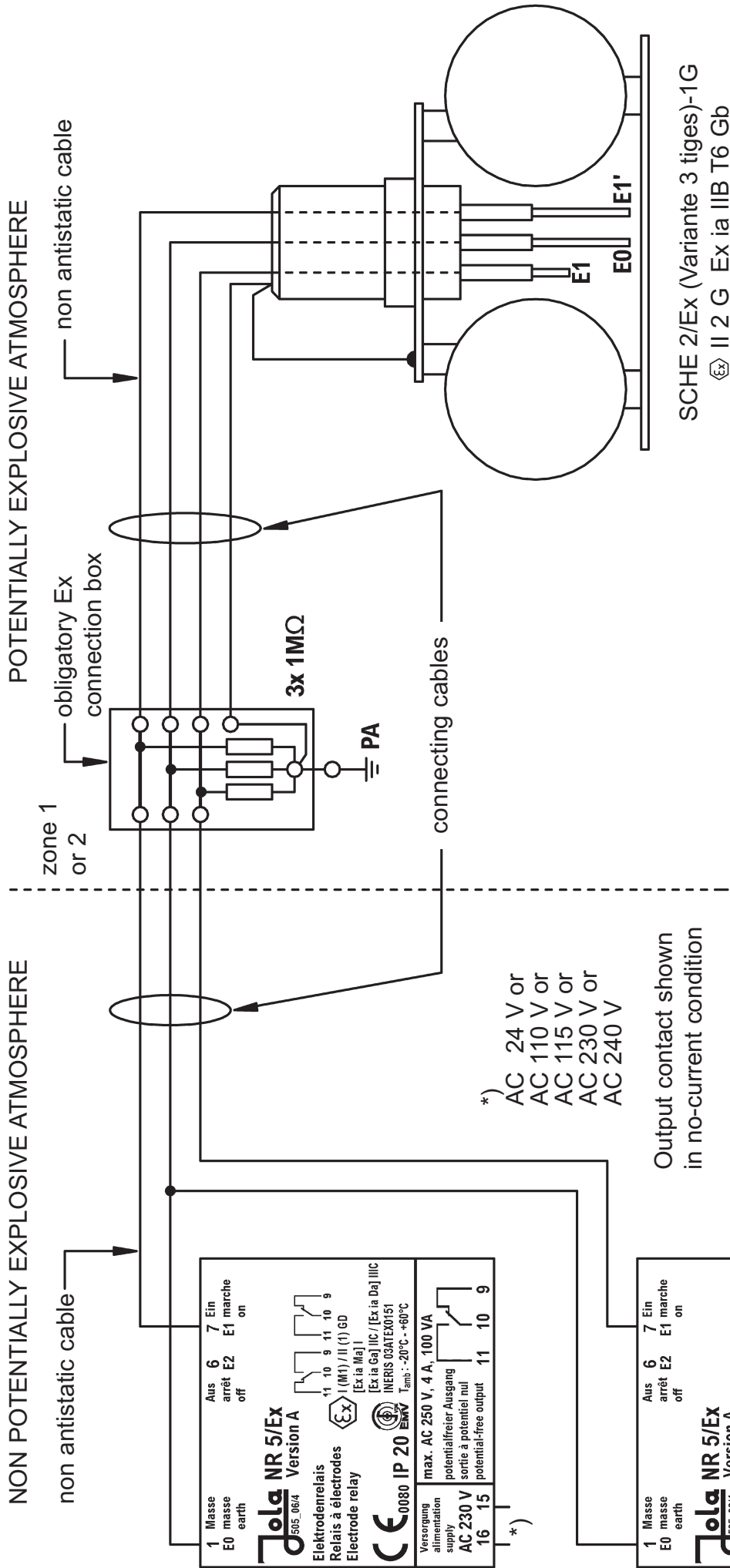
Output contact shown
in no-current condition

POTENTIALLY EXPLOSIVE ATMOSPHERE



Circuit diagrams for connection of floating electrode

SCHE 2/Ex (Variante 3 tiges)-1G Ex ia IIB T6 Gb



SCHE 2/Ex (Variante 3 tiges)-1G
Ex ia IIB T6 Gb

Core colours of connecting cable:
Electrode rod E0 = brown
Electrode rod E1 = black
Electrode rod E1' = grey (blue)
Potential equalisation cable (PA) = green-yellow

*)
AC 24 V or
AC 110 V or
AC 115 V or
AC 230 V or
AC 240 V

Jola NR 5/Ex
505_06/4 Version A
Elektrodenrelais
Relais à électrodes
Electrode relay

CE 0080 IP 20 **EMV**
[Ex ia Ga] IIC / [Ex ia Da] IIIC
INERIS 03ATEX0151
T_{amb} : -20°C - +60°C

Versorgung
alimentation
supply
AC 230 V
16 15
potential-free output 11 10 9

Aus 6 7 Ein
arrêt E2 E1 marche
off on

11 10 9 11 10 9
[Ex ia Ma] I
I (M1) / II (1) GD

Jola NR 5/Ex
505_06/4 Version A
Elektrodenrelais
Relais à électrodes
Electrode relay

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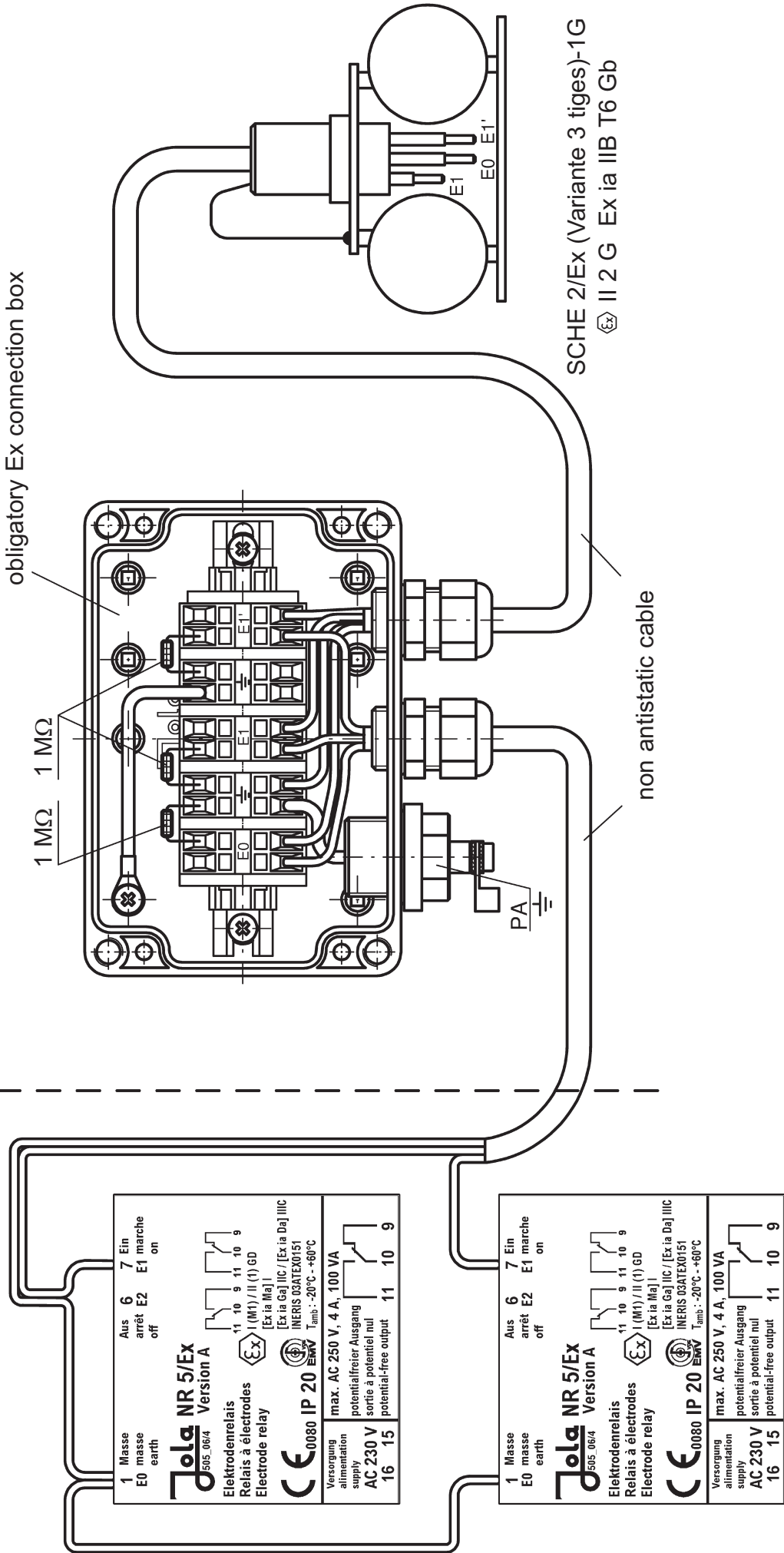
Aus 6 7 Ein
arrêt E2 E1 marche
off on

11 10 9 11 10 9
[Ex ia Ma] I
I (M1) / II (1) GD

NON POTENTIALLY EXPLOSIVE
ATMOSPHERE

POTENTIALLY EXPLOSIVE ATMOSPHERE

zone 1 or 2





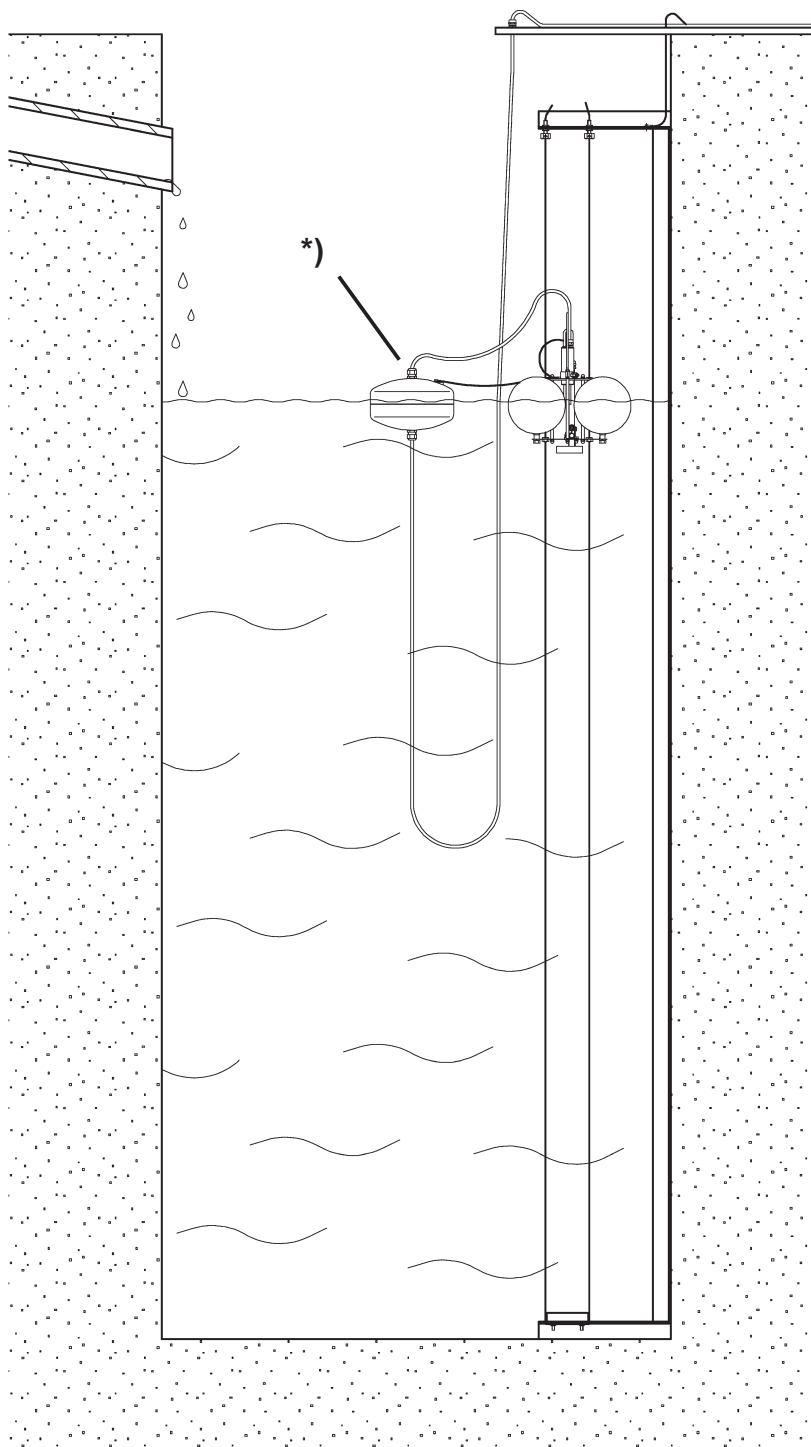
Optional supplementary float for Ex floating electrodes

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