

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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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.

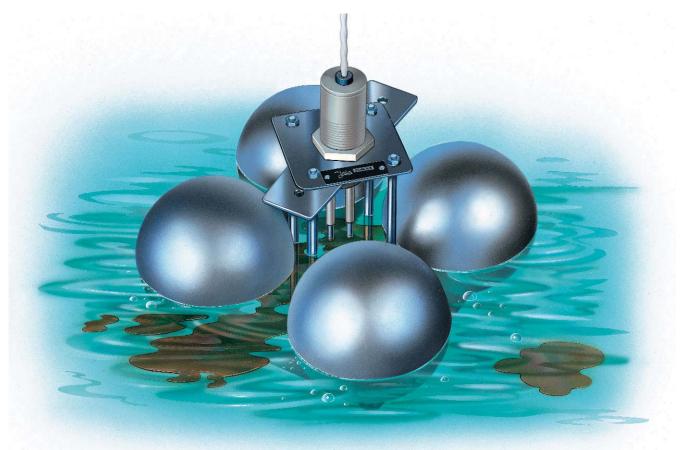
Mode of operation and adjustment

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 <u>only just</u> 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.



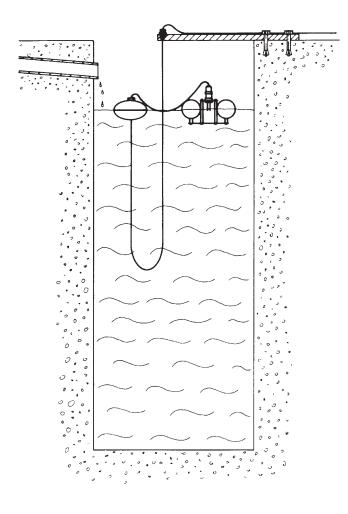


Floating electrode types and main differentiating features

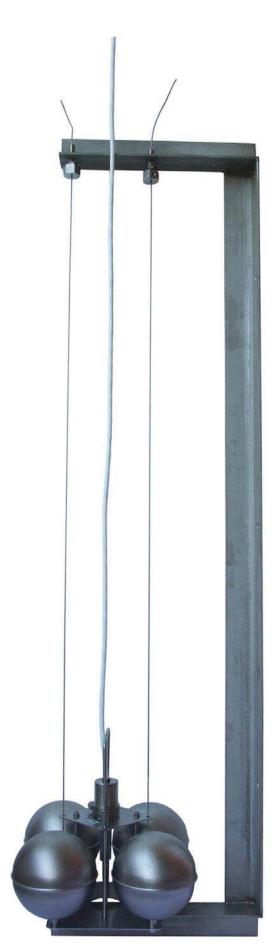
Types	Main differentiating features	Pages
– SCHE 2/T/GR	Floats made of PP , plates and brackets made of PVC , conductive electrode with 2 electrode rods , for signalling 1 alarm .	39-1-5 to 39-1-7
– SCHE 2/T/KL	Floats made of PP , plates and brackets made of PVC , conductive electrode with 2 electrode 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

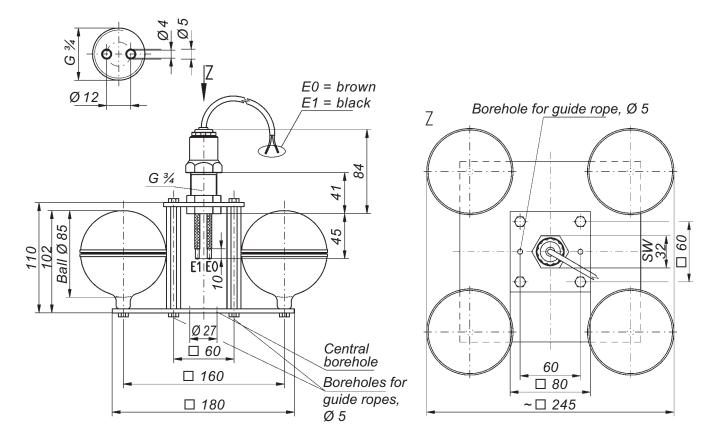
Technical data	SCHE 2/T/GR	SCHE 2/T/KL	SCHE 2/E
Design	1 control electrode and 1 earth electrode		
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of		
	polyo	lefine	PVDF or PTFE
Length of electrode rods	approx. 45 mm, other electrode rod lengths on request		
Material of electrode head	Ρ	Р	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	P۱	/C	stainless steel 316 Ti or other stainless steel
No. of floats, float material and float dimensions	4 units made of		
	PP, stainless steel		
	approx. 8	35 mm Ø	316 Ti, approx. 95 mm Ø
Minimum liquid level above the floor to ensure functioning of the floating			
electrode (with d = 1 g/cm ³)	80 mm	75 mm	85 mm
Temperature range	from + 8°C	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	



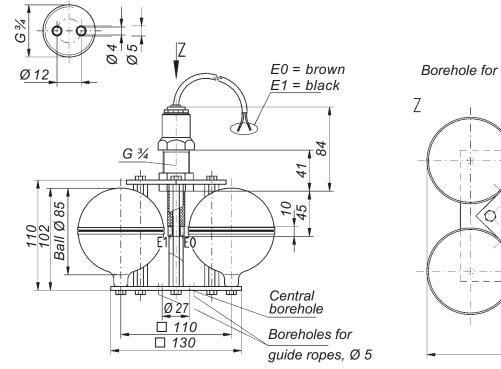


SCHE 2/E

<u>]ola</u> SCHE 2/T/.. floating electrodes



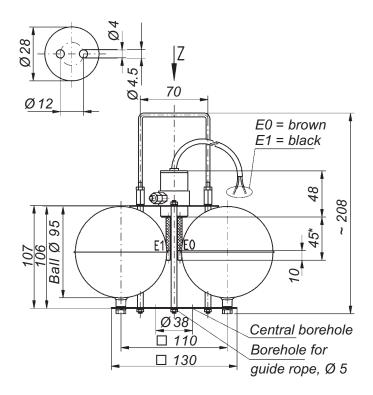
SCHE 2/T/GR



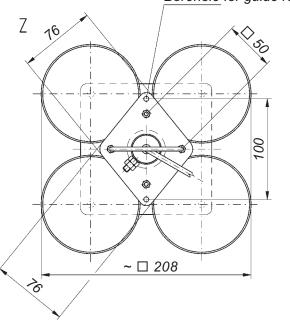
Borehole for guide rope, Ø 5

SCHE 2/T/KL





*) other lengths, between 45 mm and 500 mm, on request.



Borehole for guide rope, Ø 5

SCHE 2/E

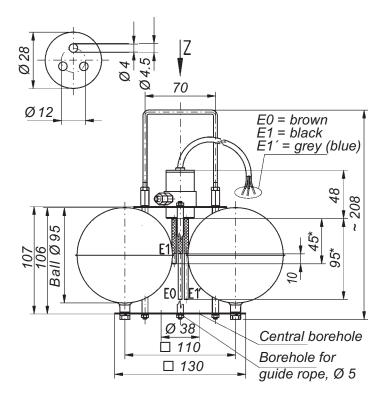


SCHE 3/E floating electrode with conductive electrode with 3 electrode rods for signalling 2 alarms (for connection to 2 electrode relays)

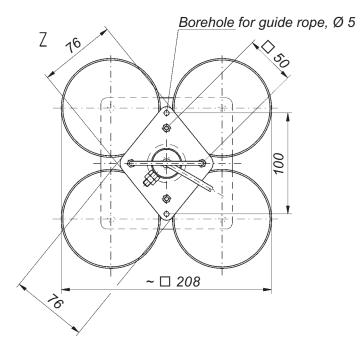
Technical data	SCHE 3/E
Design	2 control electrodes and 1 earth electrode
Electrode rods	stainless steel 316 Ti, 4 mm Ø, covered with shrinkdown tubing made of PVDF or PTFE
Length of electrode rods	approx. 45 mm – 95 mm – 95 mm, other electrode rod lengths on request
Material of electrode head	stainless 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
39-1-9	



<u>ા ઢા </u>SCHE 3/E floating electrode



*) other lengths, between 45 mm and 500 mm, on request.

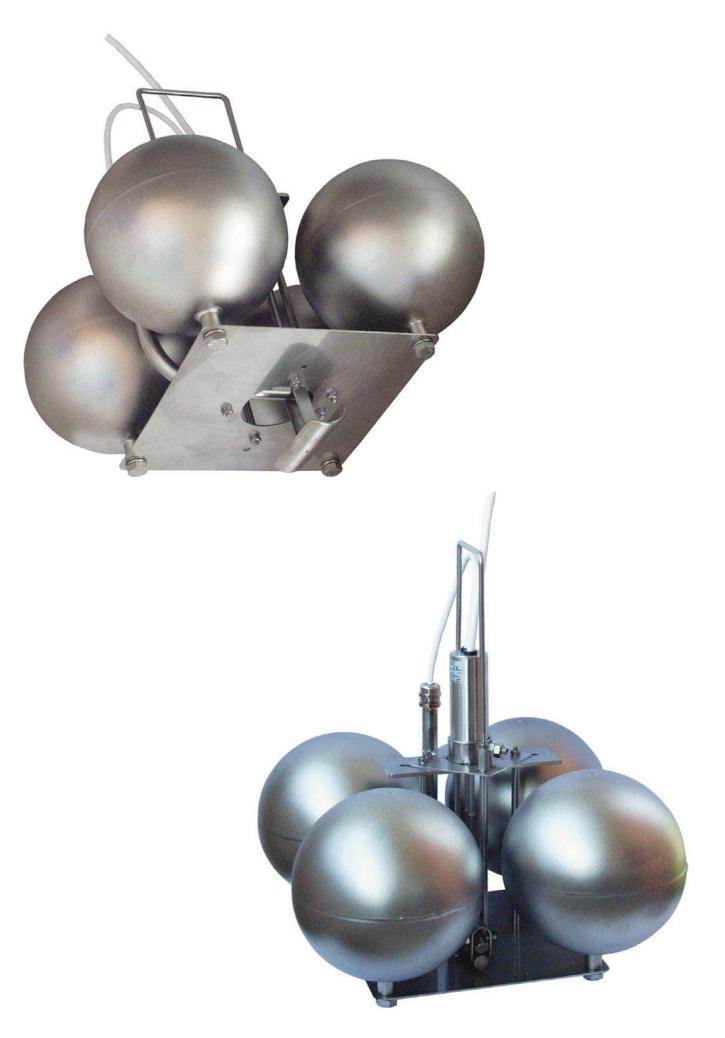


SCHE 3/E



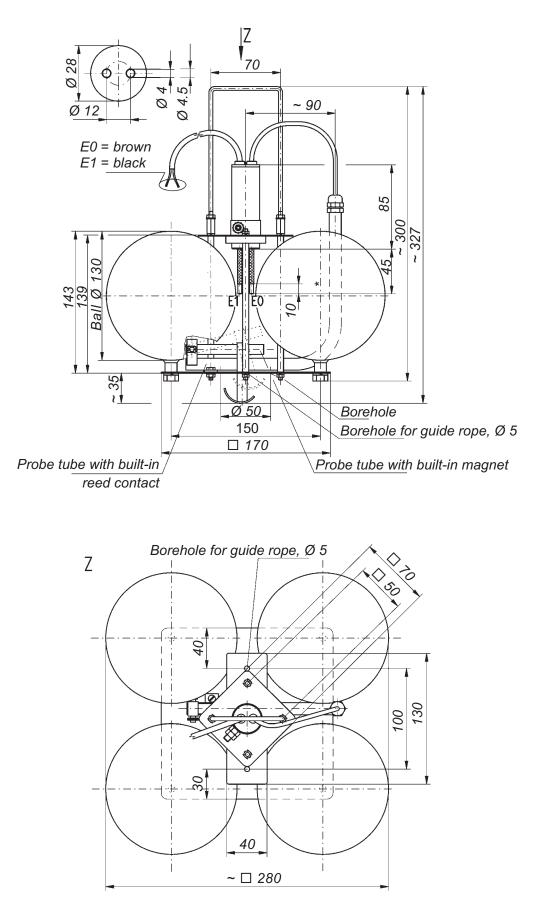
with conductive electrode with 2 electrode rods for signalling 1 alarm, special version with alarm bridging contact for the event that no or insufficient conductive liquid is present to ensure functioning of the floating electrode

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)

<u>lola</u> 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.

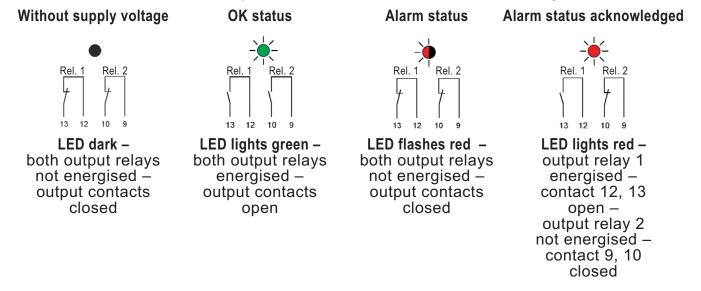
In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the two potential-free output contacts are in activated condition (= open) and the two-colour LED lights green.

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.



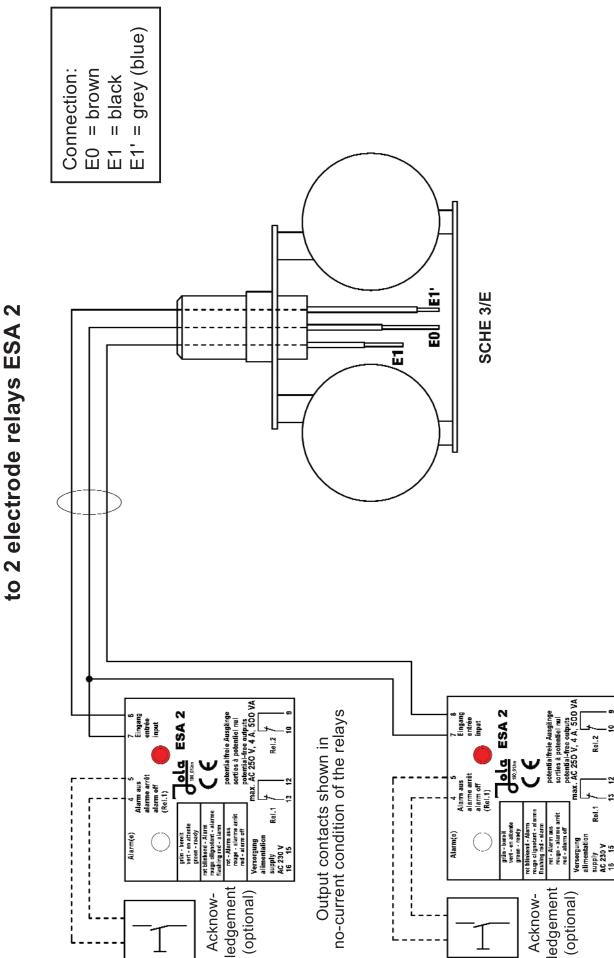
Position of output contacts of the ESA 2 electrode relay



Technical data	ESA 2
Alternative supply voltages (AC versions:	- AC 230 V (delivered if no other supply voltage is specified in the order) or
terminals 15 and 16;	- AC 240 V or
DC versions: - terminal 15: –	- AC 115 V or - AC 24 V or
- terminal 16: +)	 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 	9 V _{eff} 10 Hz (safety extra low voltage SELV)
 short-circuit current response sensitivity 	max. 0.5 mA $_{\rm eff}$ 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 46277 and EN 50022 or fastening via two boreholes
Mounting orientation	any
Temperature range	from -20° C to $+60^{\circ}$ 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 require- ments for industrial companies

ctrode (ILS variant)	Connection: E0 = brown E1 = black
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	Image: series of the series
	Acknow- ledgement (optional) no-curre

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 **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.

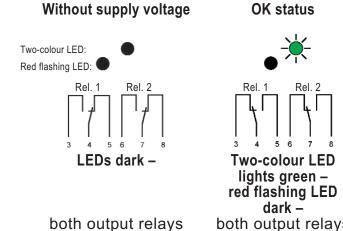
In standby status (unit is supplied with voltage and electrode rods are in a conductive liquid), the two potential-free changeover contacts in the output are in activated condition and the two-colour LED lights green.

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.

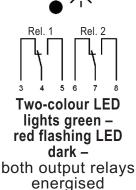
In order to cancel the alarm given via one of the two output relays, one of the two output relays can be reset using a connected external acknowledgement button. The red flashing LED then stops flashing and the two-colour LED reverts to permanent red.



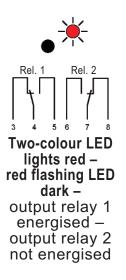
Position of output contacts of the ESA 2 electrode relay **OK** status Alarm status Alarm status acknowledged



not energised

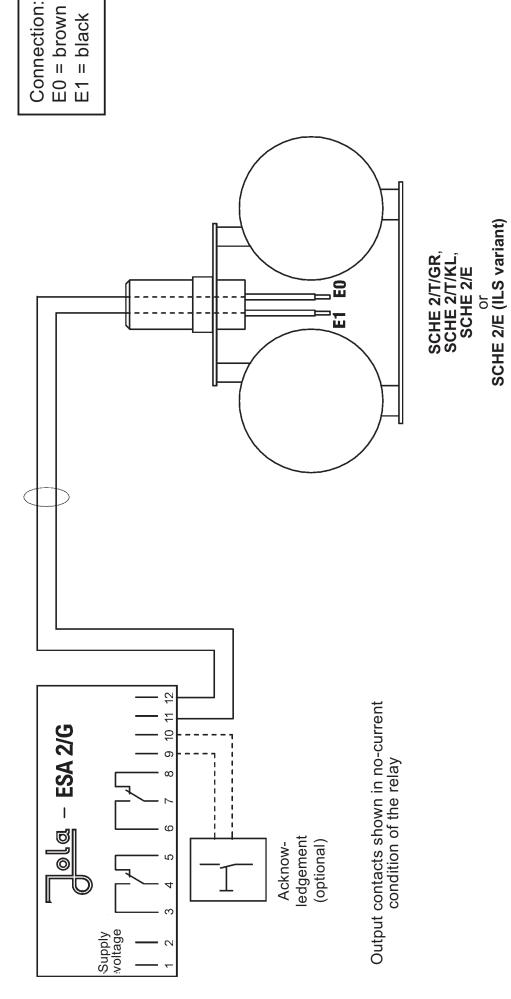


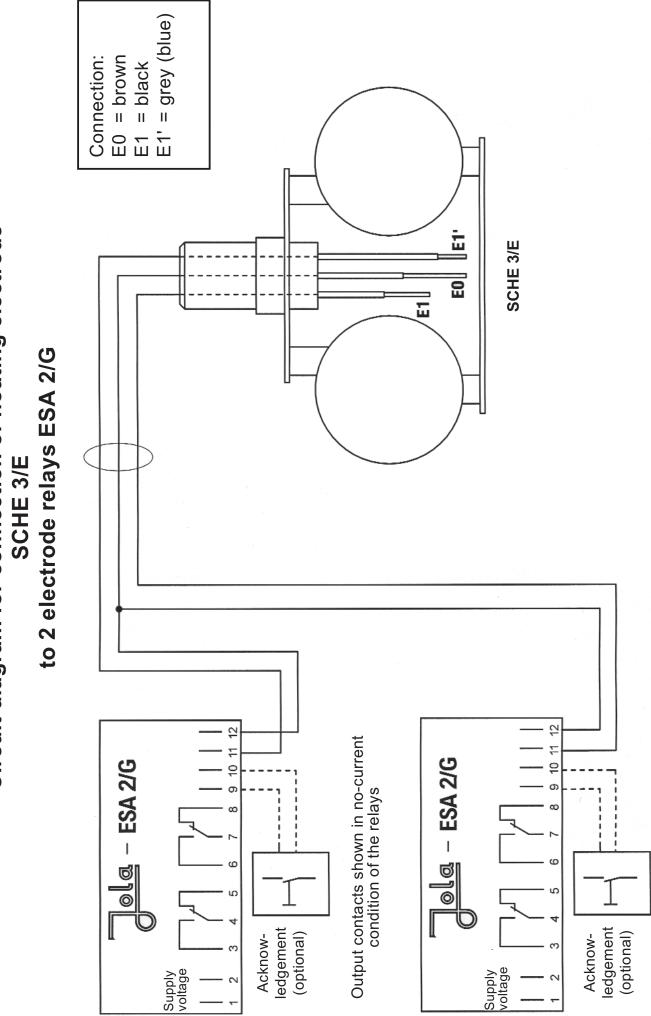
Rel. 1 Rel. 2 Two-colour LED flashes red – red flashing LED flashes – both output relays not energised



Technical data	ESA 2/G
Alternative supply voltages (AC versions: terminals 1 and 2;	 AC 230 V (delivered if no other supply voltage is specified in the order) or AC 240 V or
DC versions: - terminal 1: –	- AC 115 V or
- terminal 2: +)	 AC 24 V or DC 24 V or) in these two cases, the unit must only be con- DC 12 V or) nected 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 short-circuit current 	9 V _{eff} ⊣_ 10 Hz (safety extra low voltage SELV) max. 0.5 mA _{eff}
 response sensitivity 	approx. 30 kOhm or approx. 33 μ S (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 $+60^{\circ}$ 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 require- ments for industrial companies

SCHE 2/T/GR, SCHE 2/T/KL, SCHE 2/E or SCHE 2/E (ILS variant) Circuit diagram for connection of floating electrode to electrode relay ESA 2/G





Circuit diagram for connection of floating electrode





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

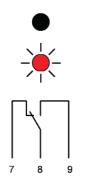
OK status



| | | 7 8 9 LEDs dark –

output relay not energised

green LED lights – output relay energised



Alarm status

red LED lights – output relay not energised

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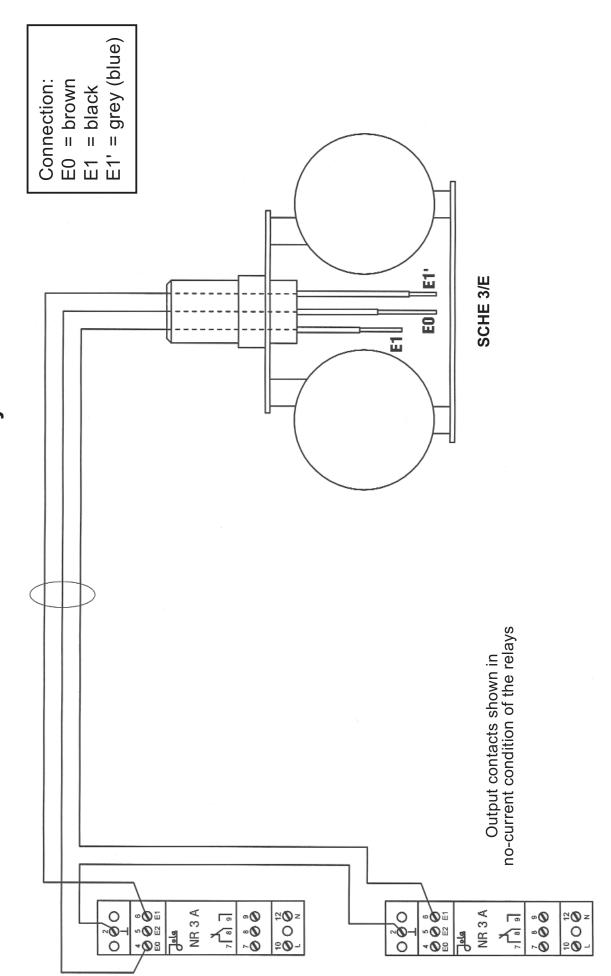
Technical data	NR 3 A
Alternative supply voltages (AC versions: terminals 10 and 12; DC versions: - terminal 10: – - terminal 12: +)	 AC 230 V (delivered if no other supply voltage is specified in the order) or AC 240 V or AC 115 V or AC 24 V or DC 24 V or in these two cases, the unit must only be DC 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 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 require- ments for industrial companies

	Connection: E0 = brown E1 = black
to electrode relay NR 3 A	SCHE 2/T (LS variant)
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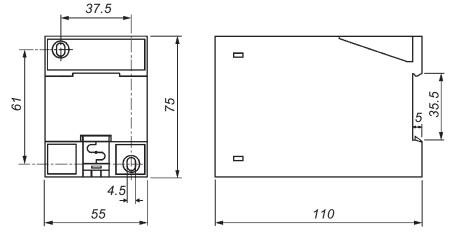
SCHE 2/T/GR, SCHE 2/T/KL, SCHE 2/E or SCHE 2/E (ILS variant)

Circuit diagram for connection of floating electrode

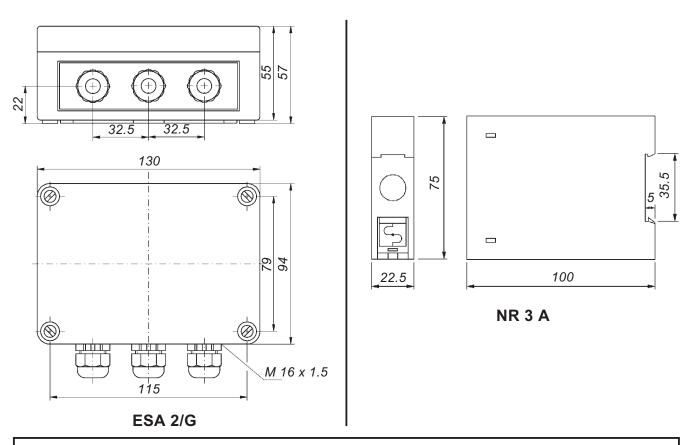
Circuit diagram for connection of floating electrode to 2 electrode relays NR 3 A SCHE 3/E



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.