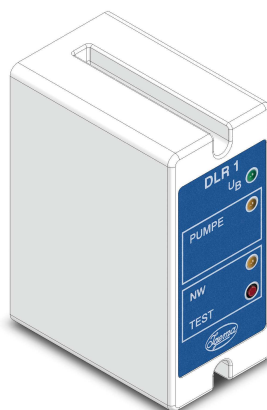




Mounting and Operating instructions



2-point water level controllers DLR1/DHR1

with LW alarm (DLR1)

with HW alarm (DHR1)

Low water level limiter LMC1

In combination with level control electrodes

EL041, EL4-1, EL912, EL913, EL914

D-08-B-18997-0.doc

Issue date 02/11

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Sicherheitshinweise



1 Risks and Safety precautions rgwsdfg

1.1 General safety instructions

1. Avoidance of risks to persons and property

- Only use the device supplied in accordance with the intended planning.
- Extensions and modifications to the device must only be carried out with our approval.
- Observe accident prevention regulations and system-specific safety instructions.
- Read and observe assembly and operating instructions.

2. Limitations of use

The device must only be used in accordance with the details in these operating instructions or for the parameters agreed in the supply contract (see name plate) and the application.

3. Avoidance of risks and damage

- Disseminate the assembly and operating instructions to the departments responsible for "goods in, transport, assembly, commissioning and maintenance".
- If this device is passed on to third parties these assembly and operating instructions in the relevant language of the country must accompany it.
- Work on the device should only be carried out by trained staff specially commissioned and exclusively with the current disconnected.
- Read and observe the assembly and operating instructions carefully and keep them in a safe place.
- **Take note of and follow the safety instructions printed in bold and highlighted in the individual sections!**
- When transporting, avoid e.g. knocks and putting down heavily, this can lead to damage.
- For intermediate storage ensure that the storage location is suitable for the device.
The storage location must be dry and the device secured against damage.

4. Symbols

In these assembly and operating instructions safety instructions are specially marked with the following symbols:



Danger

means that if they are not observed there is risk to life and / or significant damage to property may occur.



Take note

means that attention is particularly drawn to technical requirements.

1.2 Exclusion of liability

IGEMA GmbH Mess- und Regelsysteme will assume no liability if the above-mentioned regulations, instructions and safety precautions are not noted and followed.

2 Use in compliance with regulations

2.1 Controllers DHR1/DLR1

The DHR1 and DLR1-type control devices can be used in combination with the Igema level control electrodes EL041, EL4-1, EL912, EL913 and EL914 as 2-point water level controllers. In addition LW alarm (DLR1) and HW alarm (DHR1) are possible. Areas of application are TRD steam boilers or in other electrically conductive fluids.

Component identification mark: TÜV WR 01-383

The product complies with the EU Directive 97/23/EC Annex VII (Module D1, Category II) and bears the CE marking with CE identification number 0035 of the notified body. Regulations applied in accordance with TRD and AD2000.

2.2 Limiter LMC1

The self-monitoring LMC1-type control device can be used in combination with the Igema level control electrodes EL041, EL4-1, EL912, EL913 and EL914 as a low water level limiter.

Areas of application are TRD steam boilers or in other electrically conductive fluids.

Component identification mark: TÜV WB 06-385

The product complies with the EU Directive 97/23/EC Annex VII (Module D1, Category II) and bears the CE marking with CE identification number 0035 of the notified body. Regulations applied in accordance with TRD and AD2000.

3 DHR1/DLR1

The two-point water level controllers DHR1 and DLR1 measure the fill level of the boiler by means of two electrode rods and switch the supply pump on or off depending on lower or upper deviation. With a third electrode rod an additional alarm function can be carried out.

3.1 Function

The general function of the controller DLR1/DHR1 is displayed by lighting of the green LED "**U_B**". The feeder pump is switched on when both electrode rods are uncovered, the LED "**PUMP**" glows yellow. As soon as both electrode rods are submerged the feeder pump is switched off and the LED "**PUMP**" goes out.

3.1.1 Control function

Intake control:

- Via 2 electrode rods of different lengths. The feeder pump is switched on when both electrode rods are uncovered. As soon as both electrode rods are submerged the feeder pump is switched off.
- Via an electrode rod and a connected time-delay relay. The feeder pump is switched on for the duration of the time preset on the time-delay relay on the removal of the electrode rod.

Discharge control:

- Via electrode rods of different lengths. The discharge valve is opened when both electrode rods are submerged. If both electrode rods are uncovered the valve is closed.

3.1.2 Alarm function

LW alarm DLR1

- When the electrode rod is submerged the respective relay is charged, the "Alarm" contacts are closed and the "LW" LED is extinguished. If the electrode rod is uncovered the respective relay becomes de-energised, the "Alarm" contacts are opened (closed circuit principle) and the LED "LW" lights up.

HW alarm DHR1

- When the electrode rod is submerged the respective relay is charged, the "Alarm" contacts are closed and the "HW" LED is extinguished. If the electrode rod is submerged the respective relay becomes de-energised, the "Alarm" contacts are opened (closed circuit principle) and the LED "HW" lights up.

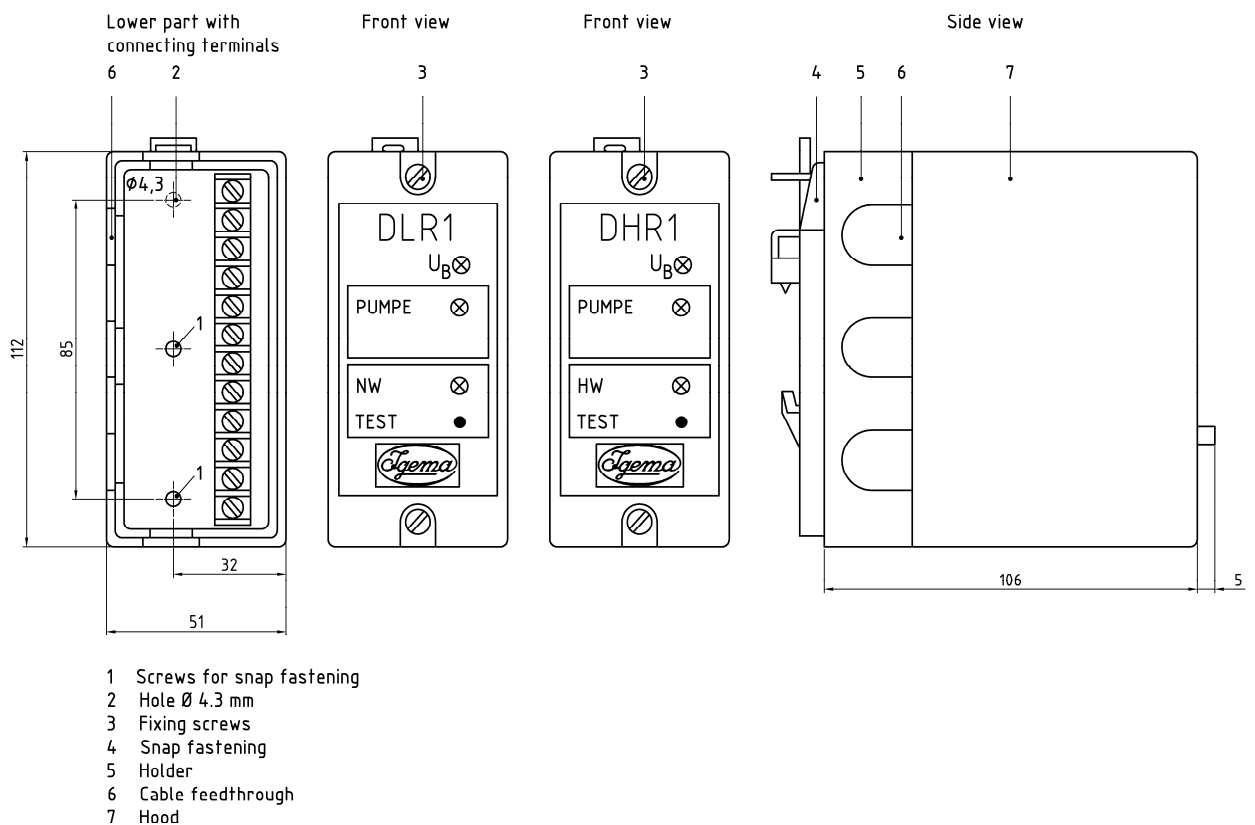
3.2 Operating principle

An AC voltage source feeds the electrode supply lines with approx. 3V AC. If an electrode rod is plunged into an electrically conductive fluid, electricity flows through it. This electricity is monitored and evaluated by a μ controller. Depending on the states on the electrode rods the μ controller carries out the predefined functions.

3.3 Design

The DHR1 and the DLR1 are supplied in a plastic plug-in housing for fitting into switch cabinets. The housing is designed for quick fitting with a spring catch for the DIN EN 50022 standard 35 mm carrier rail and for screw fixing on a mounting plate.

3.4 Installation dimensions and descriptions



3.5 Installation



Secure with protection class in accordance with current regulations!

With snap fastening for standard DIN EN 50022 35 mm carrier rail

- Fix device on standard carrier rail by means of the snap fastening (4).
- Release fixing screws (3) and pull hood (7) from holder (5).

Without snap fastening

- Release fixing screws (3) and pull hood (7) from holder (5).
- Release screws (1) and remove snap fastening (4). Drill through the marked point (2) in the holder (5) with \varnothing 4.3 mm drill.
- Fit holder (5) on base plate with two M4 screws.

4 LMC1

In combination with the level control electrodes EL041, EL4-1, EL912, EL913 and EL914 the self-monitoring low water level limiter LMC1 is a fill level limiter for electrical fluids.

4.1 Function LMC1

The general function of the limiter LMC1 is displayed by lighting of the green LED "UB".

The electrical conductivity of the water allows a current flow with the limiter electrode submerged. If current flows through the limiter electrode the "safety chain" contact is closed. If the limiter electrode comes out of the water the "safety chain" contact opens. The red signal lamp "Fault" lights up and the "Alarm" contact closes.

Locking must be carried out on site.

The "safety chain" contact also opens for:

- Failure of the supply voltage
- Broken cable
- End of cable

Via the "Alarm" contact an additional alarm e.g. a horn can be connected. Function monitoring is carried out automatically every two minutes. During the function monitoring the yellow "Test" LED is lit. The end of the function testing is displayed by the red signal lamp "Fault" lighting up briefly.

Meaning of the LEDs

- "UB" lights up green: operating voltage available
- "FAULT" lights up (red): lack of water, broken cable end of cable
- "TEST" lights up yellow: automatic self-test

4.2 Operating principle

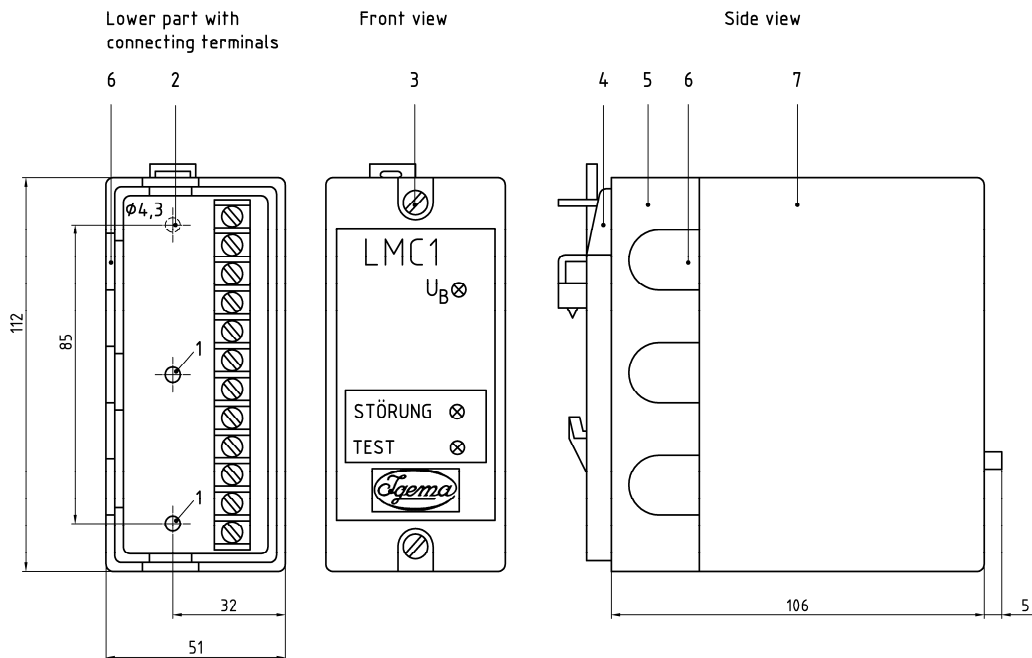
When the limiter electrode is submerged an alternating current flows through the electrode and generates a voltage on a measuring resistor. If this voltage reaches a threshold level the relays are charged and the "safety chain" contact is closed. When the electrode is uncovered the circuit is interrupted and the relays of the evaluation section, working on the closed circuit principle, become de-energised. The "safety chain" contact opens. The red signal lamp "FAULT" signals the de-energised state of the relays. The alarm contact relay working on the open circuit principle is charged and closes.

4.3 Design

The LMC1 is supplied in plastic plug-in housing for fitting into switch cabinets. The housing is designed for quick fitting with a spring catch for

the DIN EN 50022 standard 35 mm carrier rail and for screw fixing on a mounting plate.

4.4 Installation dimensions and descriptions



- 1 Screws for snap fastening
- 2 Hole, $\phi 4,3$ mm
- 3 Fixing screws
- 4 Snap fastening
- 5 Holder
- 6 Cable feedthrough
- 7 Hood

4.5 Installation



Secure with protection class in accordance with current regulations!

With snap fastening for DIN EN 50022 standard 35 mm carrier rail

- Fix device on standard carrier rail by means of the snap fastening (4).
- Release fixing screws (3) and pull hood (7) from holder (5).

Without snap fastening

- Release fixing screws (3) and pull hood (7) from holder (5).
- Release screws (1) and remove snap fastening (4). Drill through the marked point (2) in the holder (5) with \varnothing 4.3 mm drill.
- Fit holder (5) on base plate with two M4 screws.

4.6 Power connection

Pierce or pull out cable feedthrough (6) and feed connection cable through. Check supply voltage. See name plate for allowable voltage. After electrical connection - with device de-energised - put hood (7) on holder (5) and tighten fastening screws (3).

4.7 Configuration

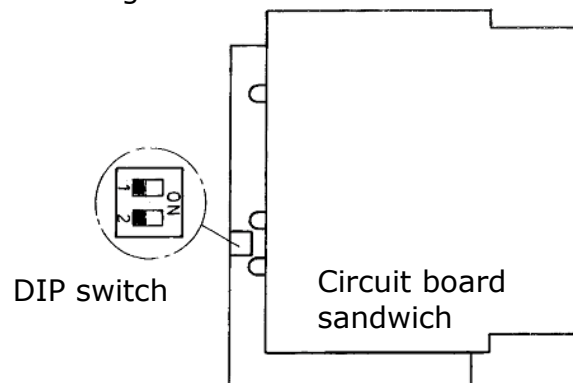


The preset switch-off time of 4 seconds can be changed. It is to be agreed with the local expert.

Setting the switch-off time:

Open LMC1. To do this release fixing screws (3) and - with device de-energised - pull hood (7) from holder (5). Pull the circuit board sandwich after unlatching the back plate out of the hood (7). On the smaller circuit board at the front edge there is a two-pole DIP switch (see diagram) via which the switch-off time can now be changed as follows:

DIP switch		Switch-off time
1	2	
off	off	4 s
on	off	8 s
off	on	12 s
on	on	16 s



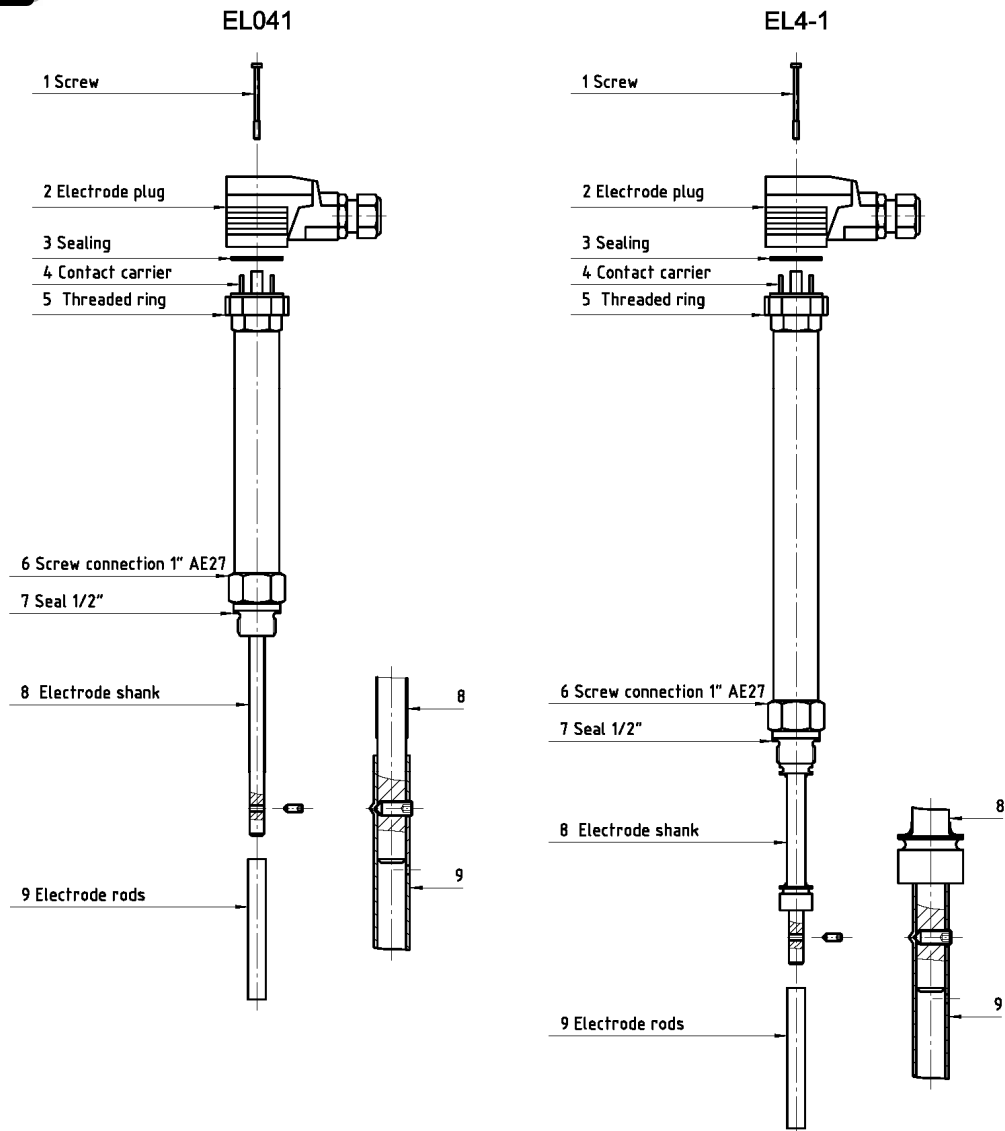
5 Level control electrodes EL041 and EL4-1



It is essential to remove the protective tube for transport before installation! Unscrew the protective tube by turning from the connection thread of the electrode. Do not pull or break off the protective tube.



If several electrodes are screwed into a flange the electrode plugs and the associated electrodes should be labelled to prevent confusion!



5.1 Fixing the electrode extension

Push the electrode extension (9) approx. 30 mm over the electrode shank (8) until the \varnothing 4.3 mm hole matches the threaded hole in the electrode shank. Screw up both parts by means of the enclosed M4 set screw with SW2 hexagon socket key wrench.

5.2 Screwing in the electrodes

Screwing in the electrode

- If required release screw (1) and pull off electrode plug (2)
- Clean sealing surfaces and check for damage
- Insert sealing ring (7)
- Lubricate thread (6) with heat-resistant solid lubricant (e.g. graphite).
- Screw in electrode and tighten, max. tightening torque $M_d=140$ Nm.



On commissioning the boiler check the electrode screw connection in the flange for tightness and if necessary retighten!

5.3 Adjusting the electrode plugs

If insertion of the electrode plugs (2) is not possible because of the position of the contact carrier (4) take the following steps:

- Keep releasing the threaded ring (5) until the contact carrier (4) can be lifted.
- Turn the contact carrier (4) into the required position and snap in; retighten the threaded ring (5).

5.4 Shortening the electrode extension



Never dismantle the electrode when the boiler / mounting housing is pressurised!

- Release screw (1) and pull off electrode plug (2).
- Screw out electrode.
- Dismount electrode extension (9) by screwing off the set screw.
- Clamp electrode extension (9) directly at the point to be shortened and shorten. Do not distort the electrode extension!



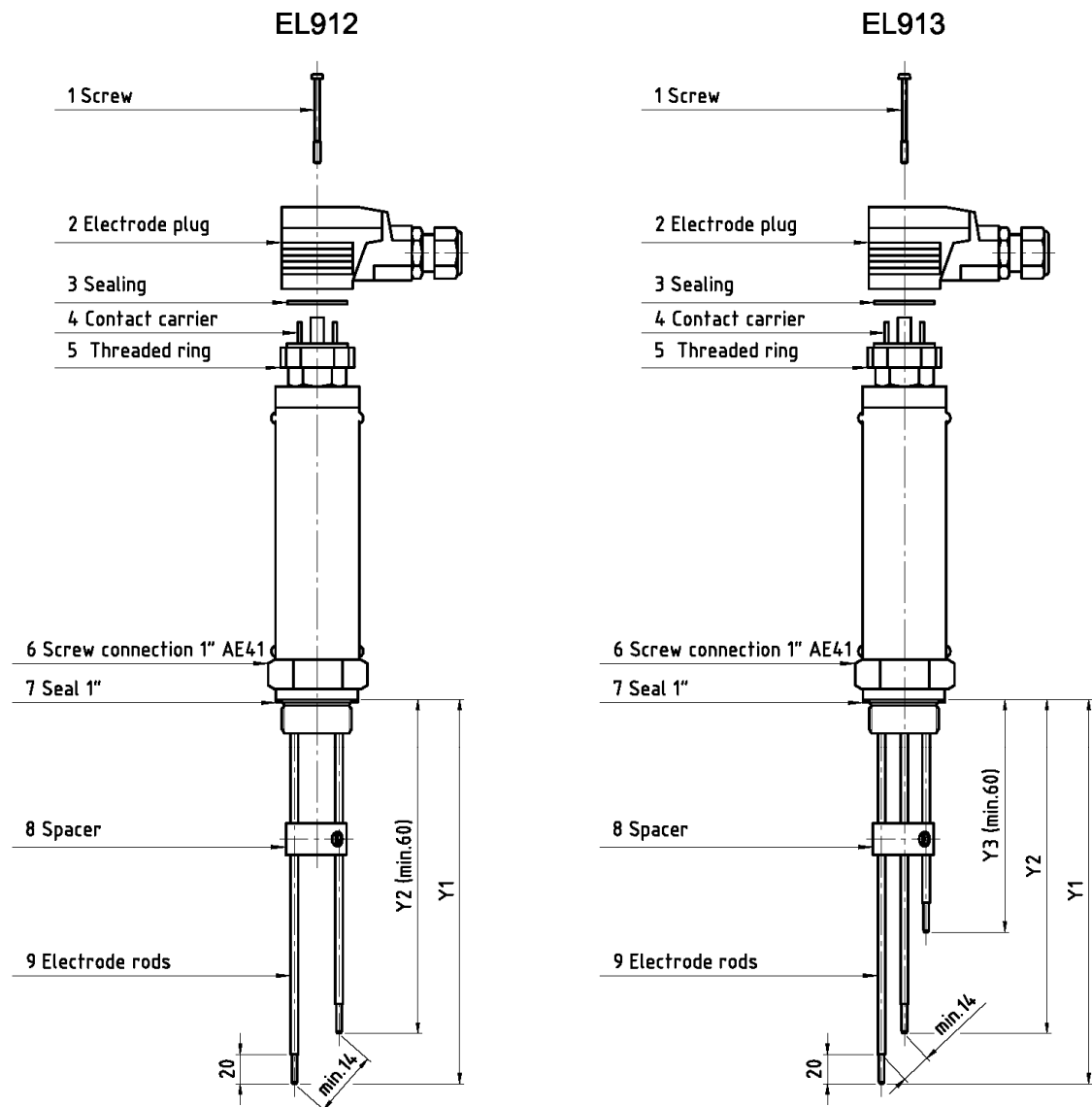
Lengthening is not permissible!



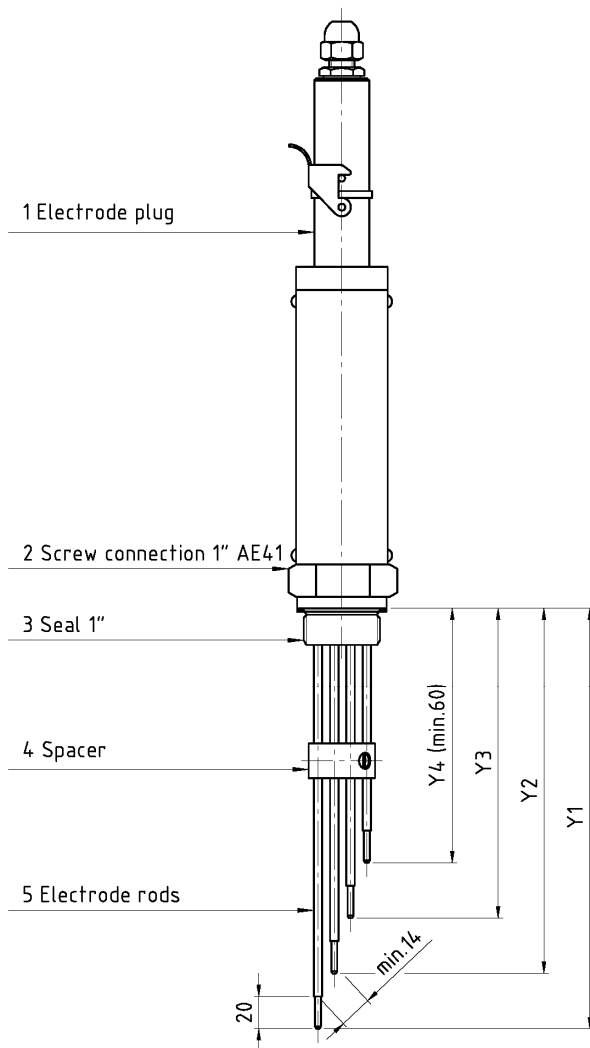
Do not heat insulate electrode head - all parts above the screw connection (6)!!

6 Multiple level control electrodes EL912, EL913

The electrodes EL912, EL913 and EL914 are multiple level electrodes with two electrode rods in the case of the EL912 or three electrode rods in the case of the EL913 and 4 electrode rods in the case of the EL914. The electrode rods are labelled with the numbers 1 to 2 (EL912), 1 to 3 (EL913) and 1 to 4 (EL914) on the end face of the screw connection. To shorten or remove insulation the following sketches are to be observed without fail.



EL914



6.1 Shortening the electrode rods



Important!

- The length of the electrode rod must never be less than 60 mm.
- Between the conductive surfaces of the electrode rods there must be a clearance of at least 14 mm.
- The electrode rods must be stripped of insulation for 20 mm at the lower end.
- The electrode rods must not be distorted!
- The spacer must be arranged in such a way that the even distances between the electrode rods are ensured.
- The spacer must only be fastened on the insulated part of the electrode rods.

6.2 Screwing in the electrode



On commissioning the boiler check the electrode screw connection in the flange for tightness and if necessary retighten!



When the electrodes are released steam or hot water can escape! Severe scalds may be sustained over the whole body!

Never dismantle the electrode when the boiler is pressurised! The electrode is hot during operation! Severe burns may be sustained on hands and arms.

Only carry out installation, dismantling or maintenance work in cold state!

6.2.1 Screwing in EL912 and EL91318

- If required release screw (1) and pull off electrode plug (2)
- Clean sealing surfaces and check for damage
- Insert sealing ring (7)
- Lubricate thread (6) with heat-resistant solid lubricant (e.g. graphite).
- Screw in electrode and tighten, max. tightening torque $M_d=140$ Nm.

6.2.2 Screwing in EL914

- If required pull off electrode plug (1) by opening the lever mechanism.
- Clean sealing surfaces and check for damage
- Insert sealing ring (3)
- Lubricate thread (2) with heat-resistant solid lubricant (e.g. graphite).
- Screw in electrode and tighten, max. tightening torque $M_d=140$ Nm.

6.3 Adjusting the electrode plugs for EL913 and EL914

If insertion of the electrode plugs (2) is not possible because of the position of the contact carrier (4) take the following steps:

- Keep releasing the threaded ring (5) until the contact carrier (4) can be lifted.
- Turn the contact carrier (4) into the required position and snap in; retighten the threaded ring (5).

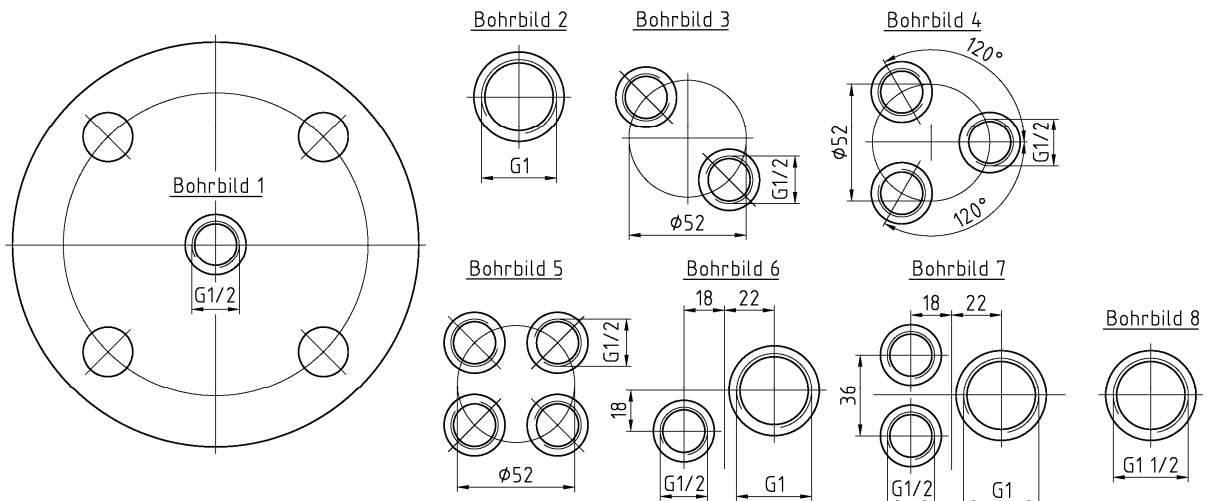
7 Fixing elements for receiving electrodes

The flanges, seals, screws and nuts listed in the table below are laid out in accordance with the Technical Rules for Steam Boilers (TRD) and tested by the Technischen Überwachungsverein (TÜV) [Technical Inspection Agency].

7.1 Flange according to DIN

PN	DN	DIN	Sealing surface	Form	Threaded hole	Material
40	50	2635	DIN 2526	B	according to drilling plan 1,2	C22.8
63		2636		E		
100 / 160		2638				
40	100	2635	DIN 2526	B	according to drilling plan 1,2,3,4,5,6,7,8	C22.8
63		2636		E		
100 / 160		2638				

7.2 Drilling plans 1-8



7.3 Seals according to DIN

PN	DN	DIN	Material
40	50	EN 1514-1 IBC	asbestos-free
63		2697	RSt 37-2/ 0.5
100 / 160			Graphite
40	100	EN 1514-1 IBC	asbestos-free
63		2697	RSt 37-2/ 0.5
100/160			Graphite

7.4 Screws according to DIN

PN	DN	DIN	Number	Dimension	Material
40	50	976	4	M16 x 75	1.7709
63				M20 x 100	
100/160				M24 x 110	
40	100	976	8	M20 x 90	1.7709
63				M24 x 110	
100/160		2510			LM27 x 145

7.5 Nuts according to DIN

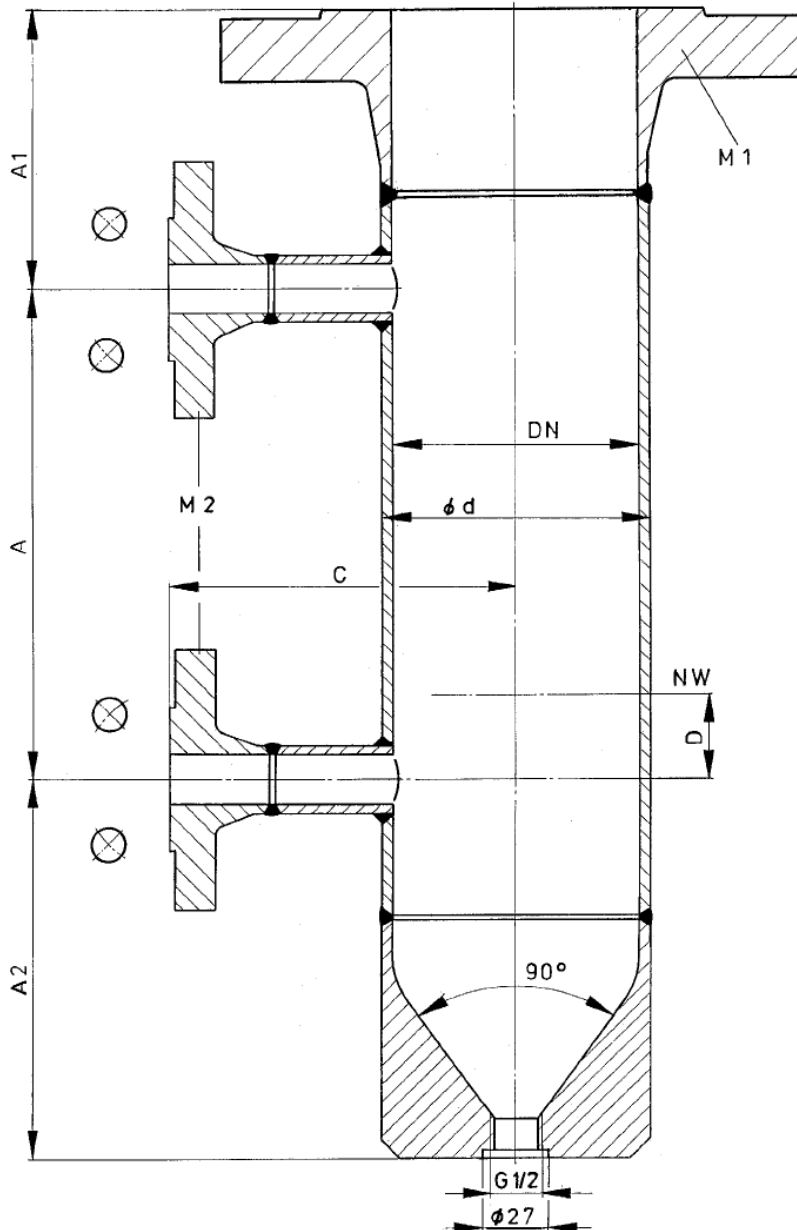
PN	DN	DIN	Number	Dimension	Material
40	50	EN 24032	8	M16	1.7258
63				M20	
100/160				M24	
40	100	EN 24032	16	M20	1.7258
63				M24	
100/160				2510	NFM27

8 Mounting in mounting housing



The approval is only valid if shut off valves are mounted between the process connections of the mounting housing and the boiler supports and a relief valve is fitted on the mounting housing!

Illustration Mounting Housing



8.1 Construction dimensions

PN	DN	Construction dimensions min. [mm]				
		Ød	C	D	A1	A2
16	50	60.3	115	15	85	100
25					100	
40					105	
63			135		115	
100					100	
160					115	
16	100	114.3	140	15	100	150
25					140	
40					140	
63			160		140	160
100					155	
160					165	

8.2 Materials

Flanges	1.0460
Pipes	St35.8 / 16 Mo 3 (according to pressure range)

8.3 Process connection M1

PN	DN	DIN	Sealing form DIN
16	50	2635	2526 Form C
25			
40			
63	100	2637	2526 Form E
100			
160			

8.4 Process connection M2

PN	DN	DIN	Sealing form DIN
16	20	2635	2526 Form C
25			
40			
63	25	2637	2526 Form E
100			
160			

On request ASME-compliant flanges, weld-on ends or DIN or ASME-compliant socket welding on the process connection are also an option.

9 Power connection



Carry out connection according to wiring diagram displayed!

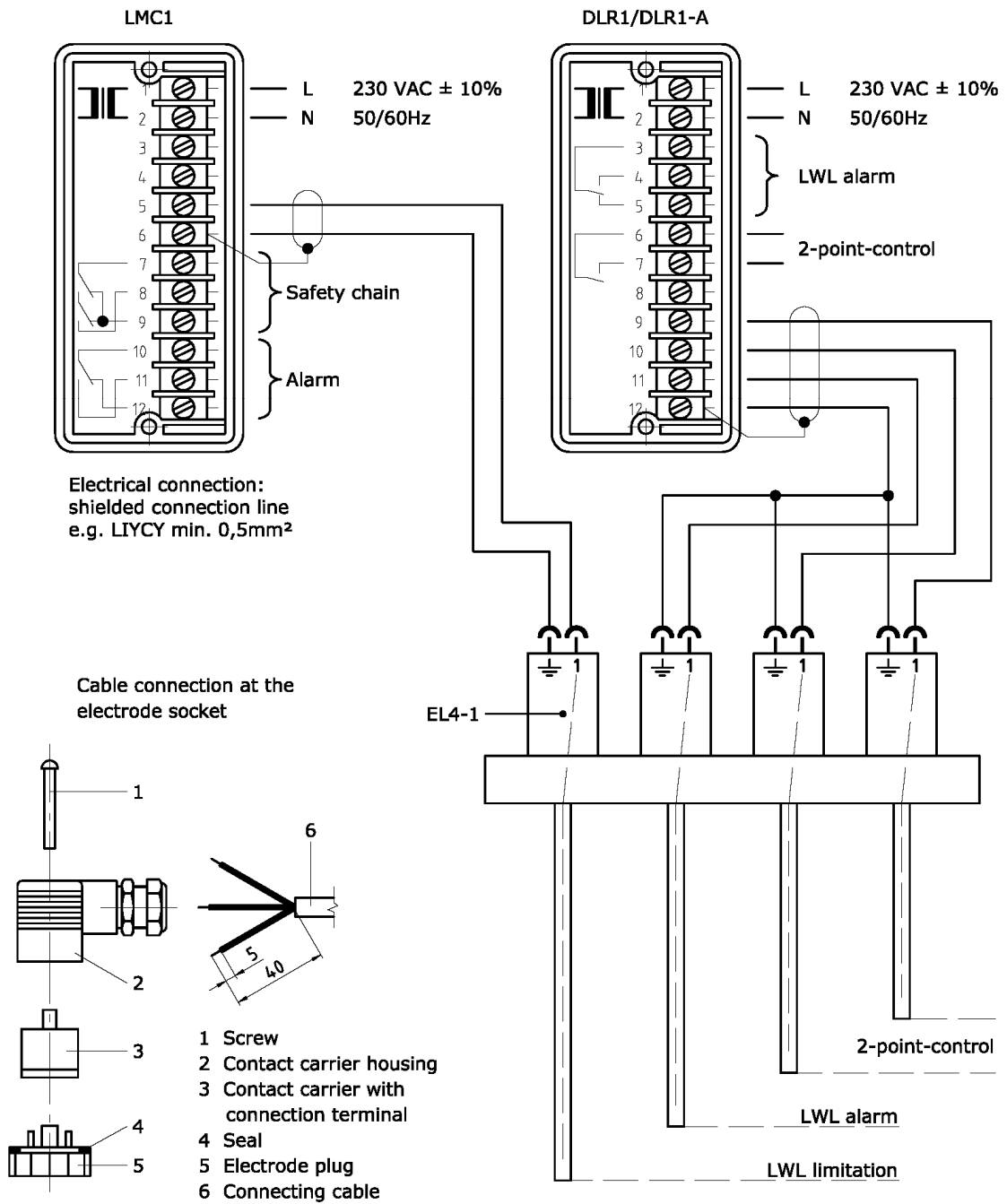


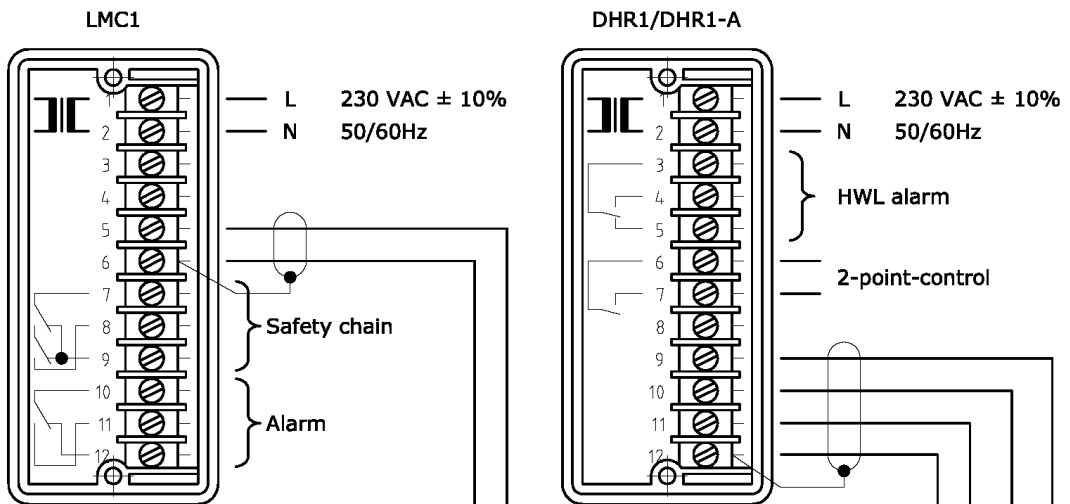
The device carries out a safety function and must only be fitted, electrically connected and put into operation by appropriate trained persons.

Maintenance and conversion work must only be carried out by authorised employees who have received special training.

- Pierce or pull out cable feedthrough on the control unit (6) and feed connection cable through. Check supply voltage. See name plate for allowable voltage.
- Use shielded connection cable to the electrode e.g. of type LIYCY, min. 0.5 mm².
- Length of connecting line max. 100 m at 5 – 10,000 µS/cm or max. 30 m at 0.5 – 2,000 µS/cm.
- Only connect shielding on the control unit according to the following wiring diagrams. After electrical connection - with device de-energised - put hood (7) on holder (5) and tighten fastening screws (3).

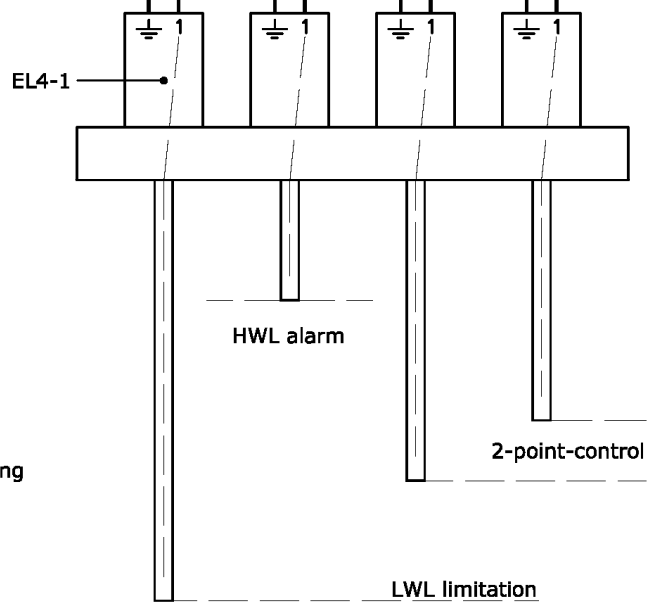
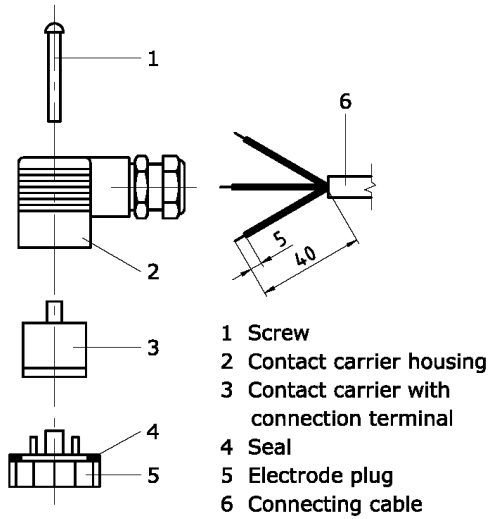
9.1 Wiring diagrams with EL4-1



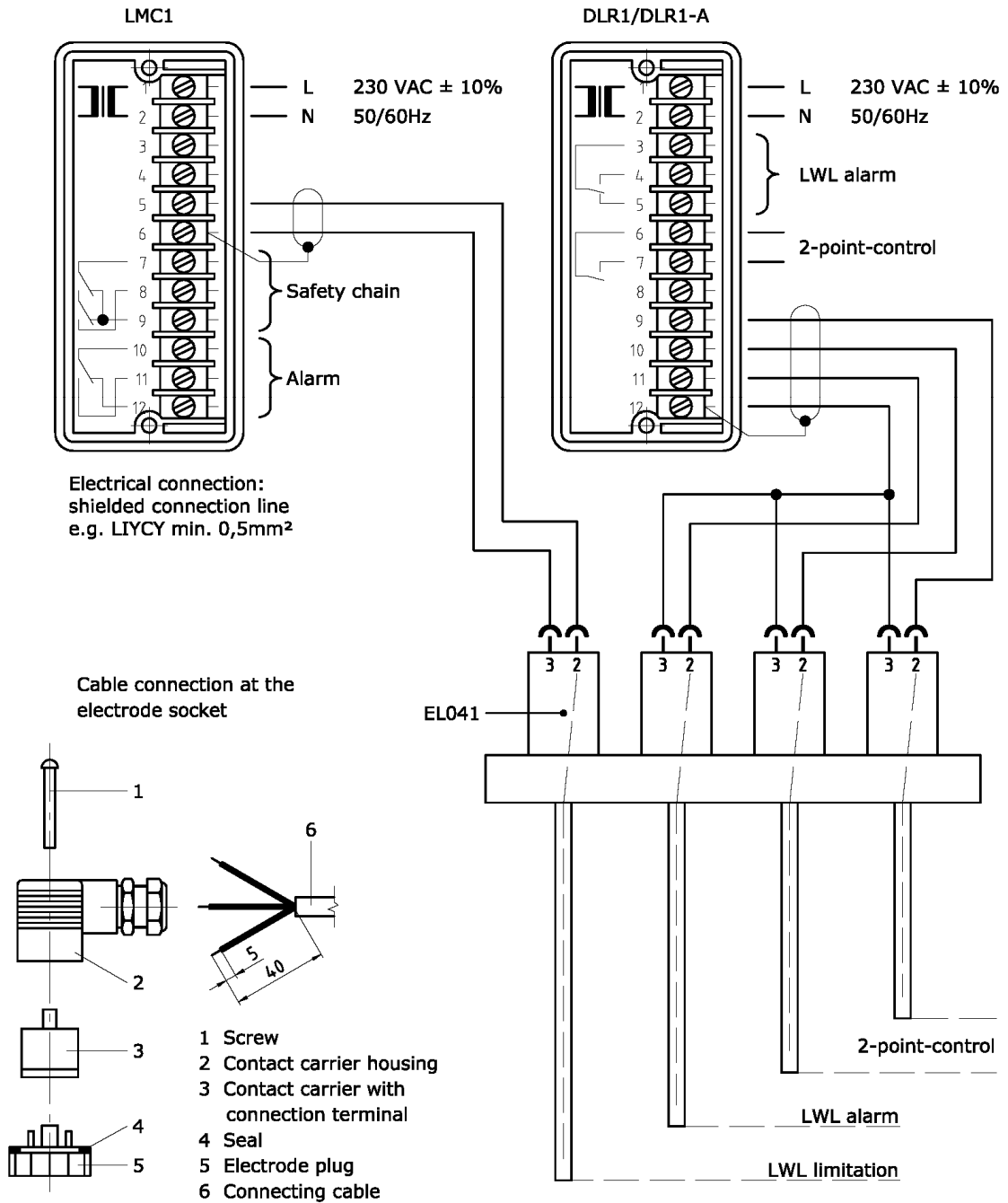


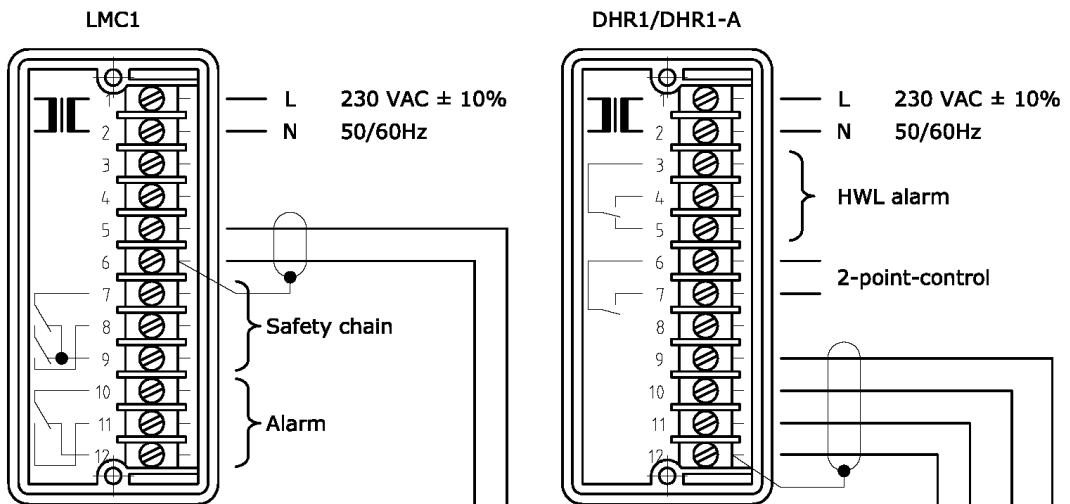
Electrical connection:
shielded connection line
e.g. LIYCY min. 0,5mm²

Cable connection at the
electrode socket



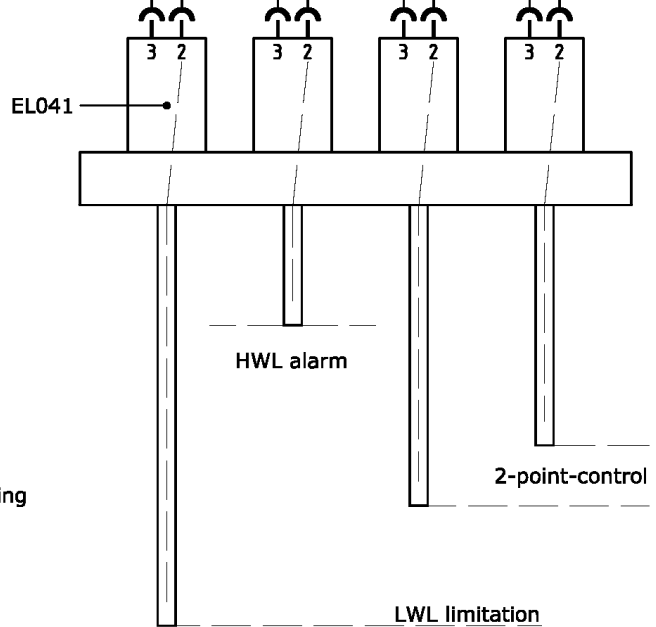
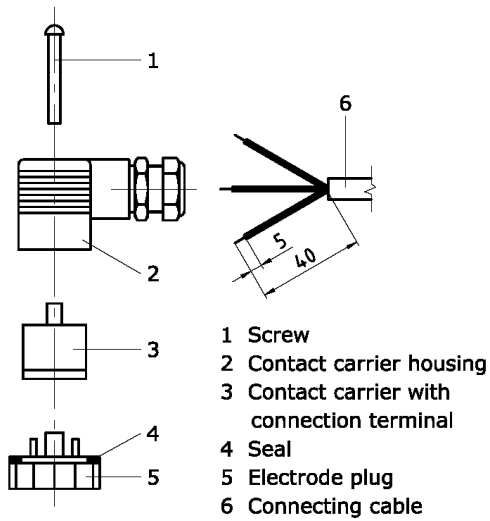
9.2 Wiring diagrams with EL041



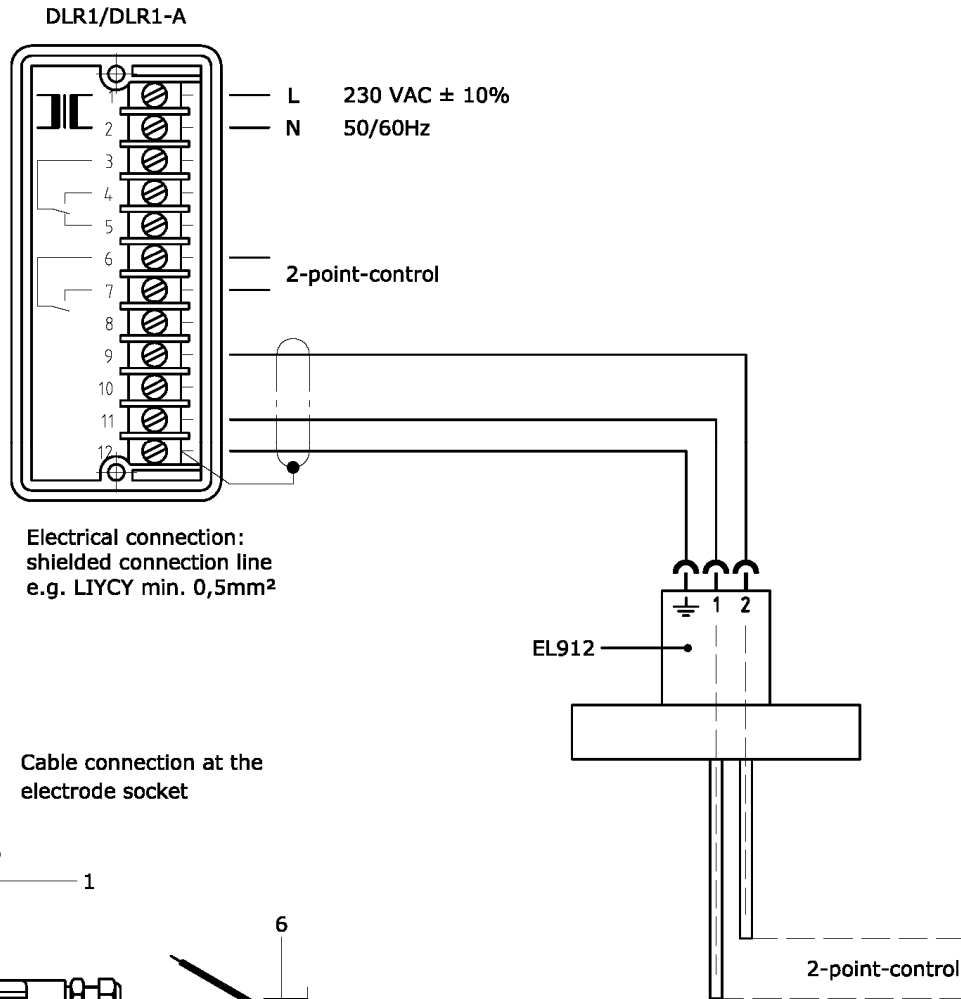


Electrical connection:
shielded connection line
e.g. LIYCY min. 0,5mm²

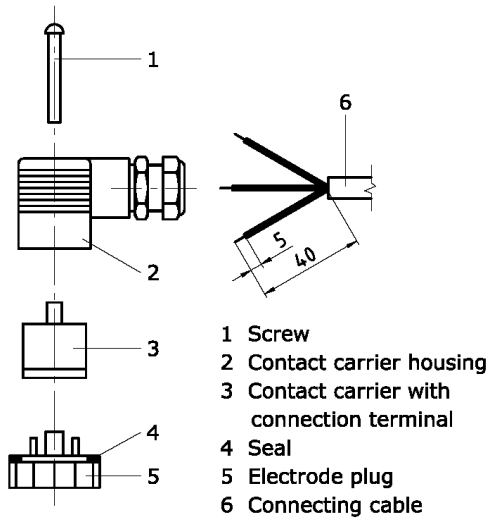
Cable connection at the
electrode socket



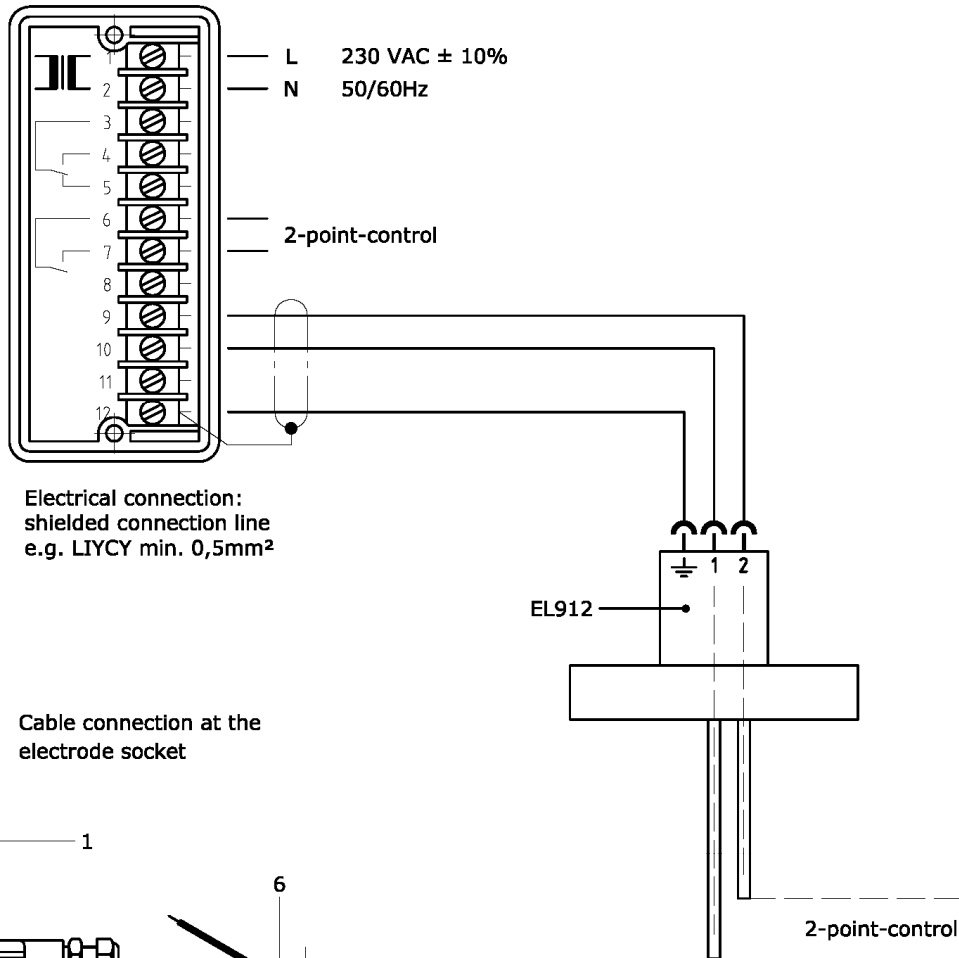
9.3 Wiring diagrams with EL912



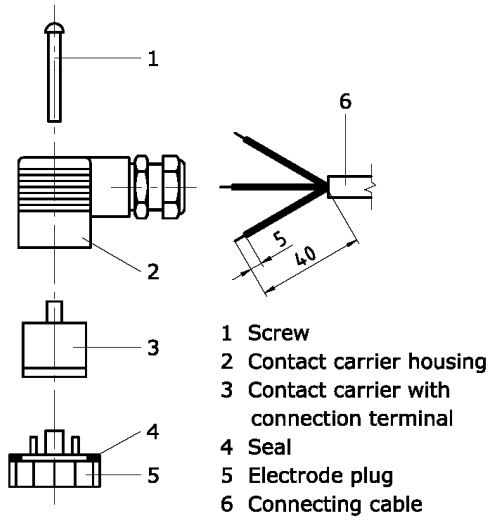
Cable connection at the electrode socket



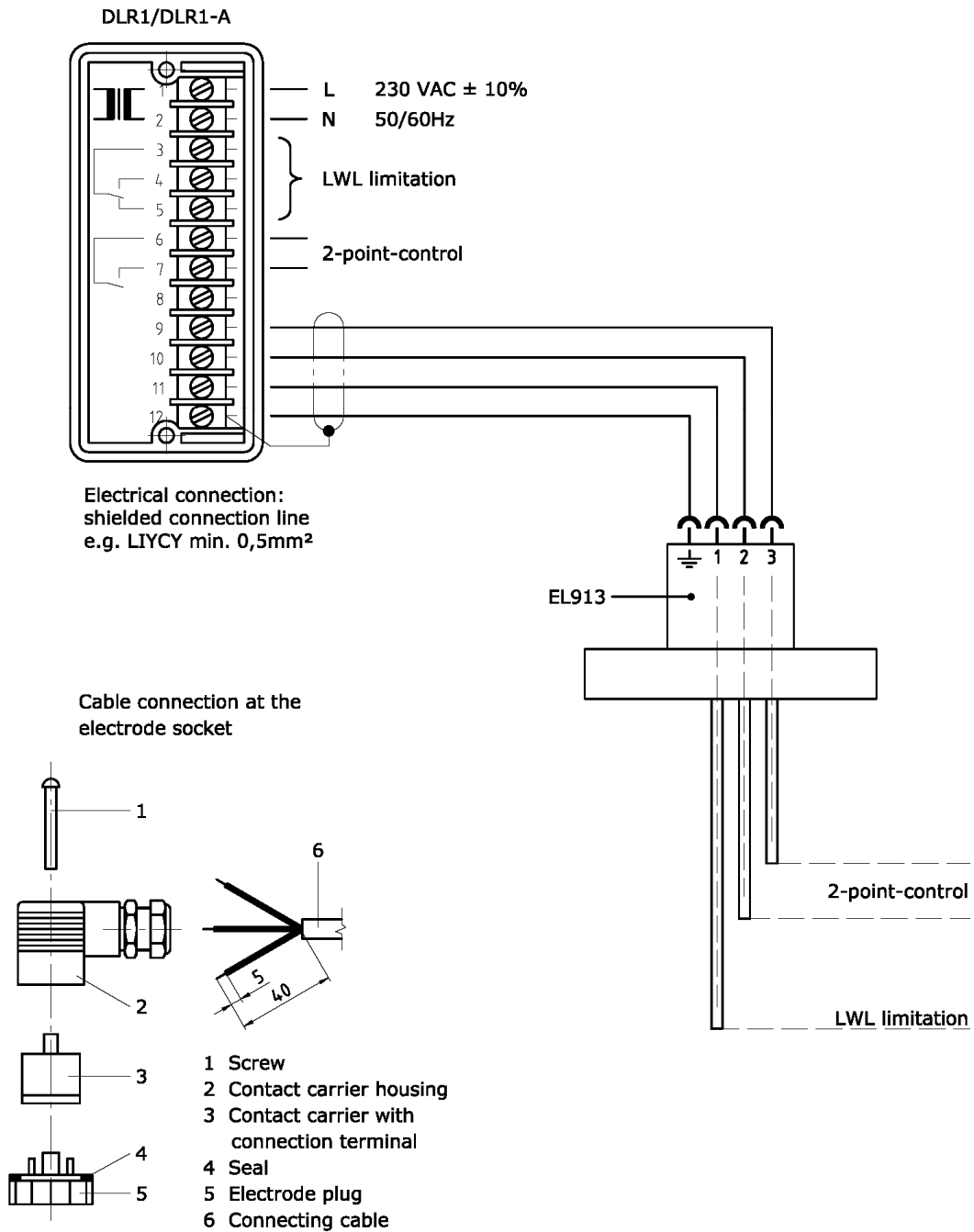
DHR1/DHR1-A



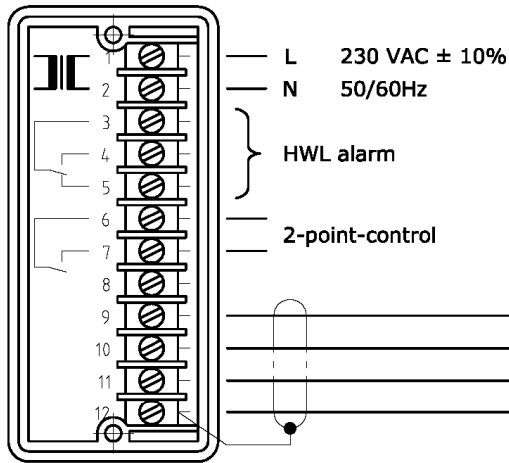
Cable connection at the electrode socket



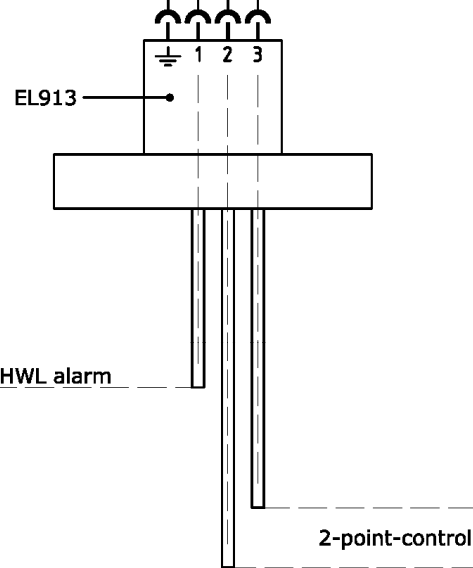
9.4 Wiring diagrams with EL913



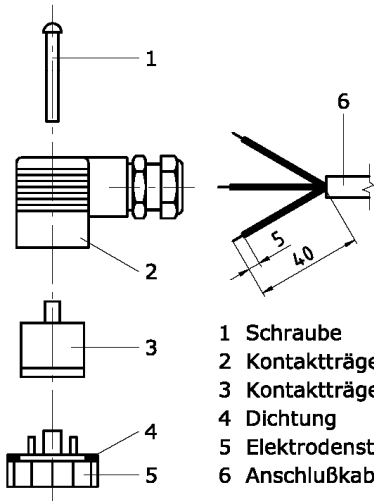
DHR1/DHR1-A



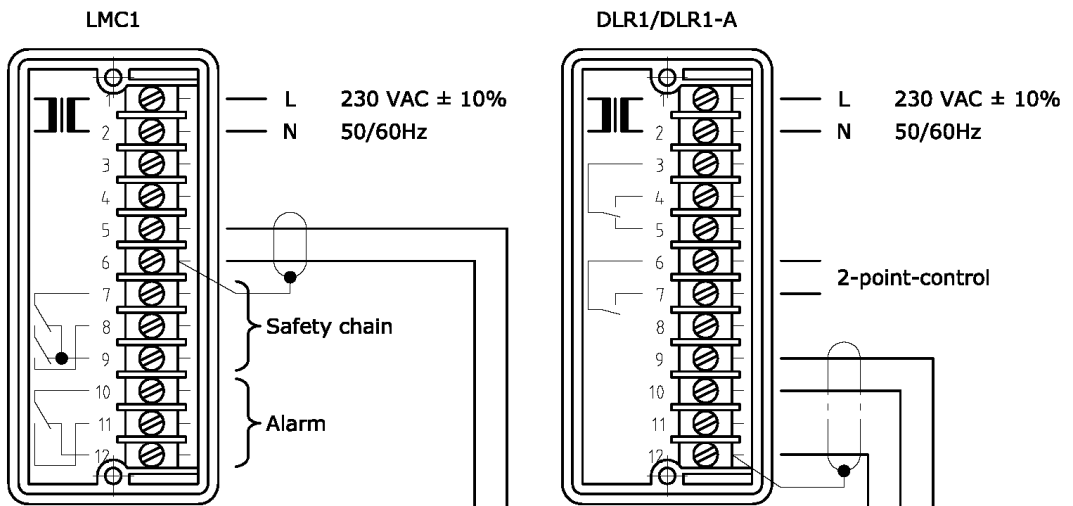
Electrical connection:
shielded connection line
e.g. LIYCY min. 0,5mm²



Kabelanschluß an der
Elektroden-Steckdose

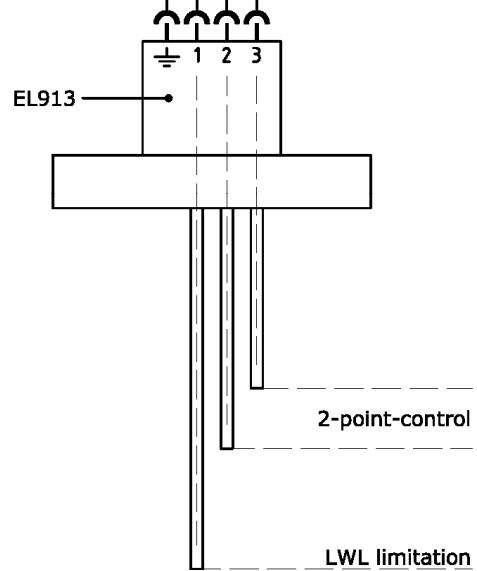
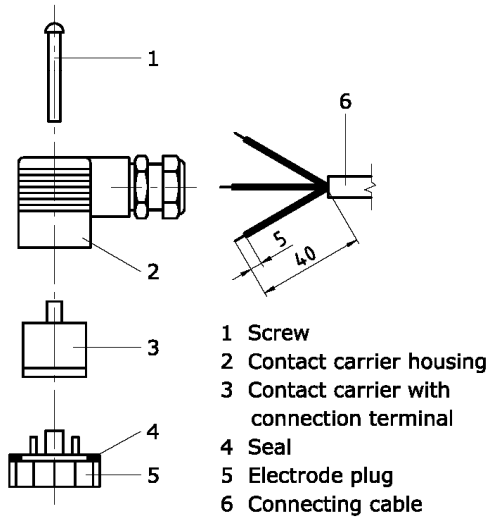


- 1 Schraube
- 2 Kontaktträgergehäuse
- 3 Kontaktträger mit Anschlußklemme
- 4 Dichtung
- 5 Elektrodenstecker
- 6 Anschlußkabel

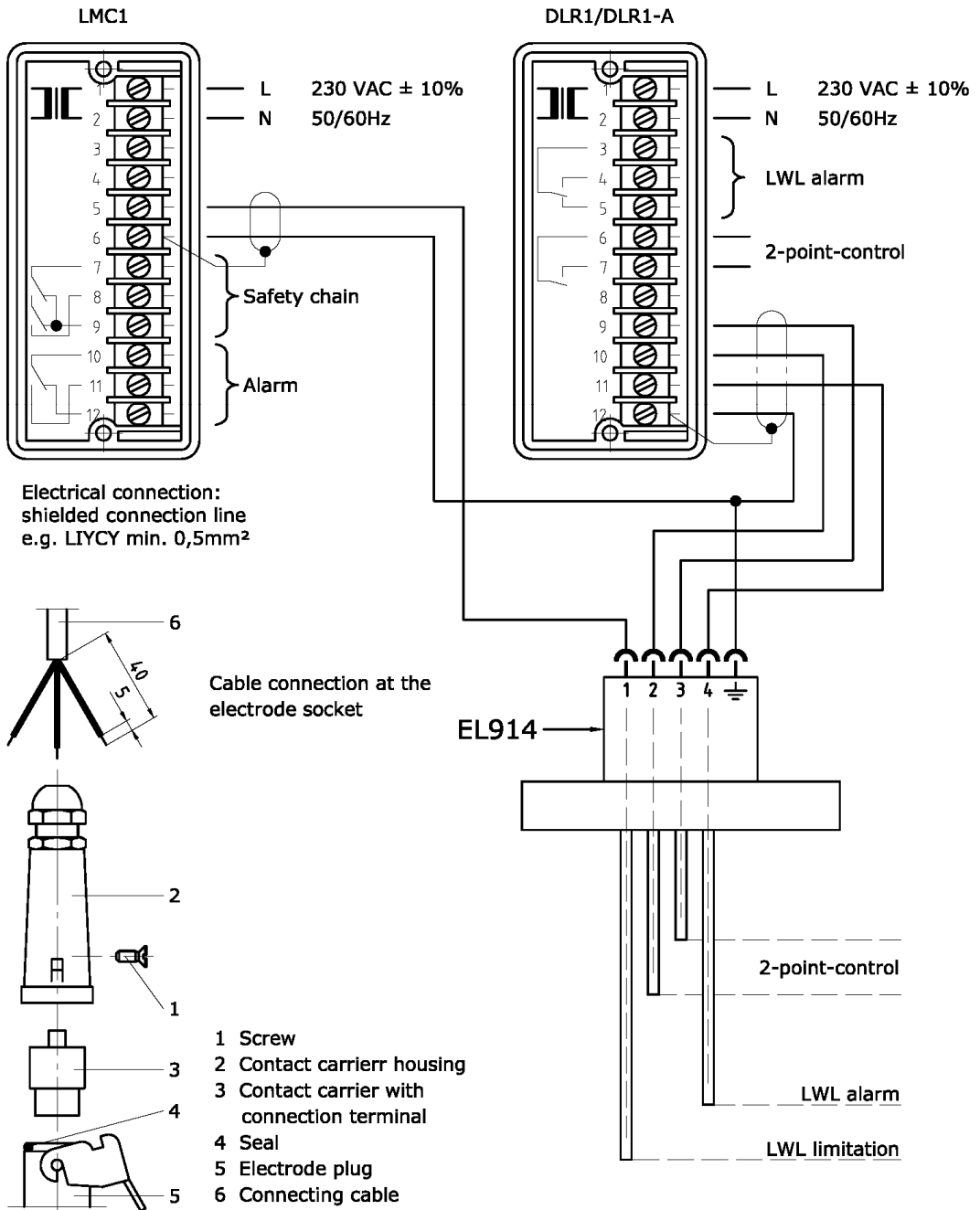


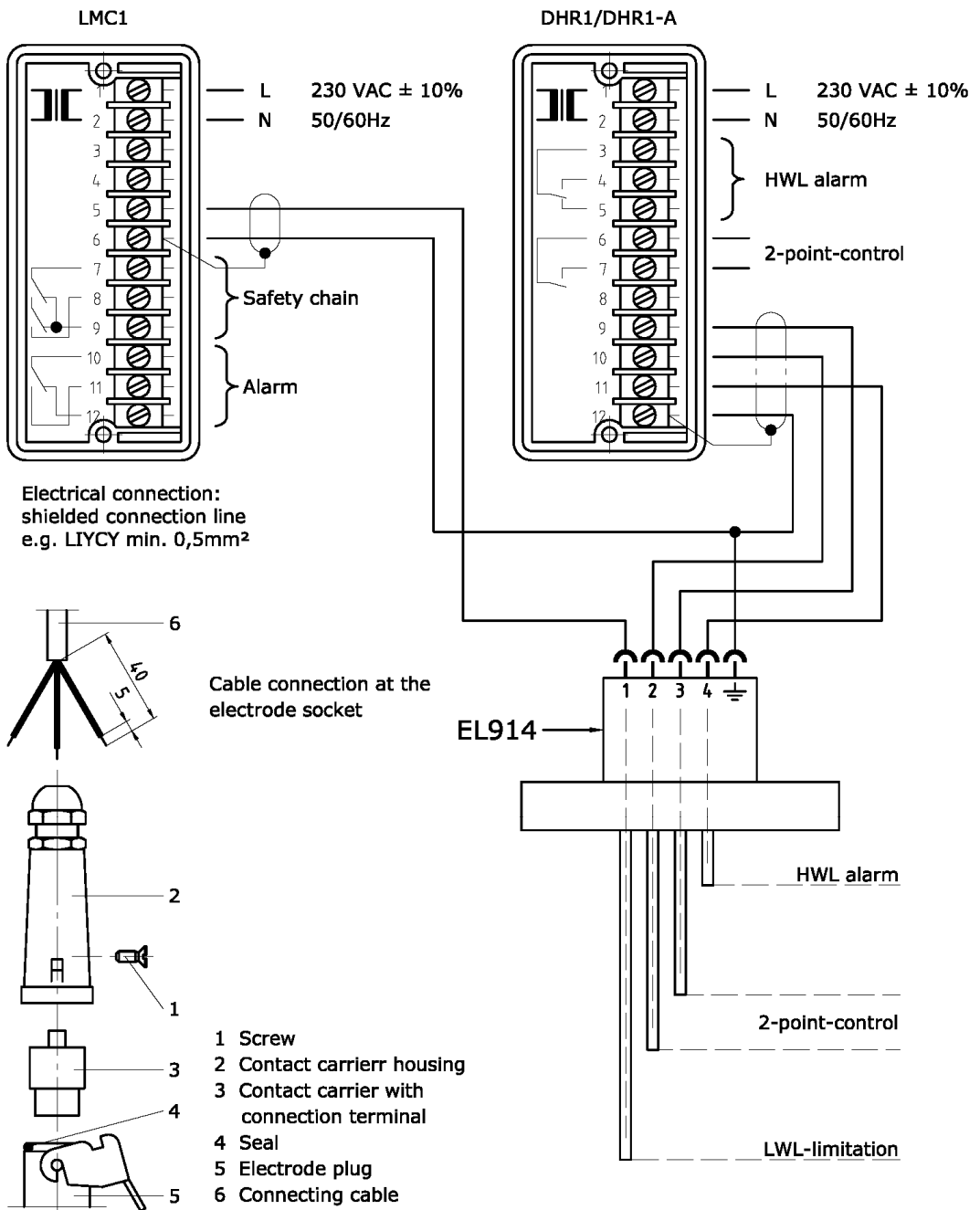
Electrical connection:
shielded connection line
e.g. LIYCY min. 0,5mm²

Cable connection at the
electrode socket



9.5 Wiring diagrams with EL914





9.6 Testing LMC1

Switch on supply voltage, the green LED "**U_B**" lights up.

- When the electrode is uncovered the red LED lights up "**FAULT**".
- When the electrode is submerged the LED "**FAULT**" must not light up.
- The LED "**TEST**" must light up for one second every two minutes.

A successful test is confirmed by the red LED flashing briefly.

9.7 Testing DLR1 / DHR1

Switch on supply voltage, the green LED "**U_B**" lights up.

- If the electrodes connected to terminals 9 and 10 are submerged the LED "**Pump**" must not light up.
- If the electrodes connected to terminals 9 and 10 are not submerged the LED "**Pump**" lights up and water is fed in.



To leave the test routine the "**Test**" button must be depressed.

10 Technical data

10.1 Device data DHR1 /DLR1

Component identification mark	TÜV WR 06-383
CE identification number	0035
Mains connection	230 VAC ± 10% 50/60Hz
Power consumption	approx. 4.5 VA
Device fuse	80 mA/T
Protection in accordance with DIN VDE 0470	IP 40*
Allowable ambient temperature	0 - 60°C
Electrical conductivity of the fluid	$5 \mu\text{S/cm} \leq \text{æ} \leq 10,000 \mu\text{S/cm}$
	$0.5 \mu\text{S/cm} \leq \text{æ} \leq 2,000 \mu\text{S/cm}$

* IP 54 protection class is to be ensured in the boiler area to comply with the German regulation VdTÜV-Wasserstand 100, 4.90.

10.2 Device data LMC1

Component identification mark	TÜV•WB•06-385
CE identification number	0035
Mains connection	230 VAC ± 10% 50/60Hz
Power consumption	approx. 4.5 VA
Device fuse	80 mA/T
Protection in accordance with DIN VDE 0470	IP 40*
Allowable ambient temperature	0 - 60°C
Electrical conductivity of the fluid	$5 \mu\text{S/cm} \leq \text{æ} \leq 10,000 \mu\text{S/cm}$
	$0.5 \mu\text{S/cm} \leq \text{æ} \leq 2,000 \mu\text{S/cm}$

* IP 54 protection class is to be ensured in the boiler area to comply with the German regulation VdTÜV-Wasserstand 100, 4.90.

10.3 Maximum ratings of potential free contacts

Switching voltage	max. 250 V AC
Switching current	max. 4 A resistive
	Max. 0.75A inductive ϕ 0.5

* IP 54 protection class is to be ensured in the boiler area to comply with the German regulation VdTÜV-Wasserstand 100, 4.90.

10.4 Device data EL912 / EL913 / EL914, EL041, EL4-1

Electrode	EL912 / EL913 EL914	EL 041	EL4-1
Max. allowable pressure PS [bar]	32	32	210
Max. allowable temperature TS [°C]	239	239	367
Mechanical connection	G 1	G 1/2	G 1/2
Power connection	Plug connection with screw terminals	Plug connection with screw terminals	Plug connection with screw terminals
Screw cable connection	M16x1.5	M16x1.5	M16x1.5
Protection in accordance with DIN VDE 0470	IP 65	IP 65	IP 65
Allowable ambient temperature at the plug	100°C	100°C	100°C
Insulator	PTFE	PTFE	Ceramic
Sealing ring	Soft iron	Soft iron	Soft iron
Electrode housing	Niro	Niro	Niro
Electrode rod	Niro	Niro	Niro

EC conformity declaration in accordance with
EC Directive 97/23/EC, Annex VII,
EC Directive EMC 89/336/EEC and Low Voltage Directive 73/23/EEC

We:

IGEMA GmbH
LECOS GmbH
J.G. Merckens Mess- and
Regelsysteme GmbH & Co. KG
Zieglerstraße 10-16
D-52078 Aachen

declare as the IGEMA Group that the products "controllers/alarms" as pressure accessories

Product types:

Control device DLR1; DHR1, DS1 with electrode EL041 or EL4-1 or
EL711/712/713/ 912/913/914/923/943-.../963-...,MS 015-...

comply with the directives
and have been subjected to the following conformity-assessment procedure:

Category II, Module D1

Applied standards:

Control device: DIN EN 50081-1, DIN EN 50082-1
Electrode TRD, AD2000

Specifications in accordance with prEN 12953-9, VdTÜV-Merkblatt Wasserstand 100

Notified body for the module:


TÜV Rheinland Industrieservice GmbH
Am Grauen Stein
D-51105 Köln (Cologne)

Identification no. 0035

Aachen, 09.11.2006



E.H. Kilchert
(Managing Director)



A. Scholl
(QM Manager)



P. Barth
(Development)

11 Appendix

Warranty

We give a guarantee period on our product of 24 months. The condition for this is proper handling in accordance with the assembly and operating instructions. For worn and replacement parts the warranty is limited to defects of material and manufacture.



This high-quality IGEMA product was designed, manufactured and checked with the application of the QM System guidelines in accordance with DIN EN ISO 9001:2000.

If the device supplied shows transport damage or gives reason for complaint in spite of our final quality control please contact our SERVICE department by return.
Telephone *0241- 5687-0*.

Prepared by: S.Bergs

Approved:

Date: 20.04.2011
