



Low water level probes

DP111 and DP121 with CAN-connection,
for use with the low water level limiter DLL



Edition 02/2021

D-08-B-51073-DE-00

INSTALLATION- AND OPERATION INSTRUCTION



Product philosophy

Thank you for placing your trust in IGEMA and deciding in favour of one of our high-quality products.

For more than 100 years, measuring and control systems have been developed, produced and sold worldwide under the IGEMA brand name.

“Steam is our passion” and we offer you the entire programme for the safe and economic operation of your plants, especially in the steam and condensate sector.

Please read the installation and operating instructions carefully to ensure a safe and reliable operation.

In addition to the information on installation and operation, you will also find important information on maintenance, care, safety and value retention of your measuring and control system.



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1. Important safety instructions

KEEP THESE INSTALLATION AND OPERATING INSTRUCTIONS IN A SAFE PLACE!

Commissioning as well as maintenance and repair work may only be carried out by qualified persons in compliance with the installation instructions given in this operating manual. The correct installation, commissioning, maintenance and operation of the device presupposes that the person in charge is familiar with measurement and control systems and complies with the general installation and safety instructions. In addition, the correct and intended use of tools and the handling of safety devices must be ensured. Unqualified persons must not be assigned the above tasks!

IGEMA GmbH accepts no liability for damage to property or personal injury caused by unqualified persons or by failure to observe these installation and operating instructions. If no sufficiently qualified person can be found, IGEMA GmbH can be commissioned with the installation/maintenance.

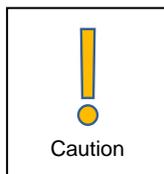
1.1 Symbols used in these instructions

In the following installation and operating instructions, safety instructions are marked with the following symbols:

 Danger	This symbol and signal word refer to a potentially hazardous situation which could result in death or injuries if ignored.
 Caution electrical voltage	This symbol and signal word indicate live parts with an immediate danger of death from electric shock.
 Caution hot	This symbol with a signal word indicates a potentially hazardous situation that can result in severe burns and scalds all over the body.

 <p>Caution</p>	<p>This symbol and signal word refer to a potentially hazardous situation which could result in personal injury, property and environmental damage if ignored.</p>
 <p>Caution</p>	<p>This symbol and signal word refer to a potentially hazardous situation which could result in damage to the equipment if ignored.</p>
 <p>Info</p>	<p>This symbol indicates useful information and recommendations as well as measures that will prolong the value of your measuring and control system.</p>

1.2 Intended use of the device



Use these installation and operating instructions, the identification on the rating plate (see 5.6) and the technical data sheet to check whether the device is suitable for the intended use/application. The device complies with the requirements of the European Pressure Equipment Directive 2014/68/EU.

The device may only be used to indicate fill levels on containers.

The maximum values of the pressure and temperature range of the device must be checked before installation. If the maximum allowable operating values of the device are lower than those of the system on which it is to be installed, protective instruments for the device, such as pressure reducers or similar, must be provided to avoid limit situations. The device may only be used in accordance with the information in these installation and operating instructions or for the parameters and applications agreed in the supply contract. (see rating plate, 5.6) The operator of the direct water level indicator is obliged to familiarise himself on the compatibility of the medium and the device. In case of doubt, contact the relevant installation manager or site manager.

The correct installation position, alignment and flow direction of the device must be observed! Before installing the IGEMA product on boilers or containers, it is essential to remove all protective covers and, if necessary, the protective film from rating plates and sight glasses.

1.3 Safety at work



Before installation or carrying out maintenance work on the device, safe access must be ensured and a secure working area with sufficient lighting must be defined and marked out. Always use lifting equipment for heavy loads!

Before starting any work, carefully check which liquids or gases are or have been in the pipeline. (flammable substances, irritating substances, substances hazardous to health) When opening or dismantling the device, residues of the medium can escape. Subsequent fumes are also possible in unpressurized and cold systems. Use designated PPE such as safety goggles and respiratory protection!

Special attention must be paid to the condition of the environment around the installation or maintenance site. Be aware of e.g.: potentially explosive atmospheres, lack of oxygen in tanks and pits, dangerous gases/liquids, extreme temperatures, hot surfaces, fire hazard (e.g. during welding) and moving machine and system components. Protect yourself from excessive noise by taking the required protective measures.

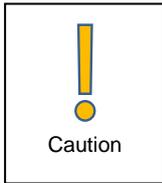
For all maintenance work or new installations, on new or existing boilers or vessels, it is imperative to check that the boiler or vessel has been depressurised and that the pressure has been safely reduced to atmospheric pressure. In principle, no system should be regarded as unpressurized even if indicated by pressure measuring devices such as pressure gauges or sensors. When releasing the pressure, make sure that no persons are in the release area. Carefully check whether you and/or other persons in the vicinity need PPE to protect yourself from external influences such as high and low temperatures, radiation, noise, danger to eyes, loose objects that can fall down or chemicals.

There is always a risk of injury when handling large and/or heavy equipment. Observe the load handling regulation as a minimum requirement for working with loads. Avoid handling the device with your own physical force, e.g. by lifting, pulling, carrying, pushing or supporting it, especially to prevent back injuries. Use lifting equipment to move heavy and bulky equipment in accordance with Article 1, Section 2 of the German Load Handling Regulation (LasthandhabV).



Under normal operating conditions the surface of the device can become very hot! Under the maximum operating conditions, the surface temperature can exceed 350°C. After shutting off or, if necessary, shutting down the boiler, wait until the temperature has normalized to room level. To avoid the risk of burns and scalds, always use PPE including safety goggles!

1.4 Safety instructions for this device



These installation and operating instructions are an integral part of the device and must be forwarded to the responsible departments "Goods inward, Transport, Installation, Commissioning and Maintenance". They must be kept in such a way that the technical staff have access to these documents at all times. If the device is passed on to a third party, these installation and operating instructions must also be included in the national language of the third party.

Avoid shocks and hard contact during transport, as this can lead to damage. During intermediate storage, the device must be kept dry and secured against damage.

When servicing the unit, check for damage. There is a risk of cutting hands and arms! Wear work gloves!

When returning goods to IGEMA GmbH, the applicable safety and environmental laws according to GGVSEB [German ordinance on the national and international carriage of dangerous goods by road, rail, and inland waterways] must always be observed. If there are any risks to health or the environment due to residues or the device has a mechanical defect this must be indicated when returning the device and the necessary precautionary measures must be taken. If the returned goods are devices that have come into contact with or contain hazardous substances, a safety data sheet must be enclosed, and the goods must be clearly marked. In addition, the hazardous substance must be reported to the logistics service provider.

1.5 Exclusion of liability

IGEMA GmbH Mess- und Regelsysteme will assume no liability if the above regulations, instructions and safety precautions are not observed and followed. If they are not expressly listed in the installation and operating instructions, changes to an IGEMA device are carried out at the risk of the user.

2. Contents of the packaging

1 Low water level probe (low pressure) DP111* or

1 Low water level probe (high pressure) DP121*

1 Installation and operating instruction

* depending on order

3. Use in compliance with regulations

The self-monitoring low-water level probes DP111 (low pressure) or DP121 (high pressure) in combination with the low-water level limiter DLL result in a piece of equipment with a safety function according to:

EU-Richtlinie 2014/68/EU

EN 12952-11

EN 12953- 9

EN 61508 -1/ -2/ -3

EN 61326-1/-3-2

EN 61010-1

They meet the requirements for intrinsic fault detection according to SIL3.

Type approval certificates:

Type aproval due to PED / Certificatenummer: 01 202 931-B-12-0012

Type aproval due to SIL / Registrationnummer: 44 799 13775203



For an explanation of the terms used in the probe setup see Chap. 5.1

The probe is used for identifying a water fill level below the minimum in steam boilers. For this the probe is fitted in the boiler or the add-on housing. The fitting position of the probe must be between 0° (vertical) and 45° to the surface of the water. To prevent incorrect measurement results (e.g. frothing on the surface of the water) the probe must be fitted in a protective tube when installed directly in the boiler.

The prescribed minimum water fill level in the boiler is dependent on the system and is given by the boiler manufacturer. The mechanical length (observe thermal elongation) of the electrode must correspond to the minimum water fill level of the steam boiler.

IGEMA probes are supplied in a minimum electrode length of $Y=125$ mm. By fitting an extension tube on the electrode tip electrodes with a max. length of 1700 mm can be achieved.

When operating a steam boiler system with limited supervision (24h), as well as when operating without constant supervision (72h), the required maintenance procedures must be carried out self-monitored via control devices on the limiter devices.

4. System description

4.1 Function

The DP111 and DP121 level probes work based on the conductive fill level method of measurement whereby the electric conductivity of the water medium is used. The conductivity of the medium is measured in $\mu\text{S}/\text{cm}$. For this method of measurement to function reliably a minimum conductivity of the substance to be measured is required.

The result of the conductive measurement supplies two statements: electrode submerged, or electrode emerged, or switch point reached or not reached. Before installation the length (observe thermal elongation) of the electrode must be adjusted to the desired switching points, e.g. for switching off burner and interrupting the safety circuit.

In addition, with these probes a second ring-shaped electrode is attached on the top end of the electrode shank. This electrode is for monitoring the insulation between the level electrode and the boiler earth connection. There is likewise electrical wire-break monitoring of this safety electrode. A fault in the insulation monitoring leads to a pre-alarm which is followed, after the pre-set delay time, by the interruption of the safety chain of the burner.

The probe electronics send their measuring data, which are based on the current water level (electrode submerged / electrode emerged), via the CAN bus to the evaluation device.



The serial number of the probe must be entered in the limiter via the configuration menu to achieve a clear allocation between limiter and probe.

4.2 Error messages

If the probe electronics report malfunctions, they will be displayed in the associated limiter. By using the “▲” key it can be checked which probe has caused the malfunction. The key has no function when only one probe is connected.

For analysis and error correction see Chap. 8.

5. Assembly and Installation



It is essential to remove the protective tube for transport before installation!

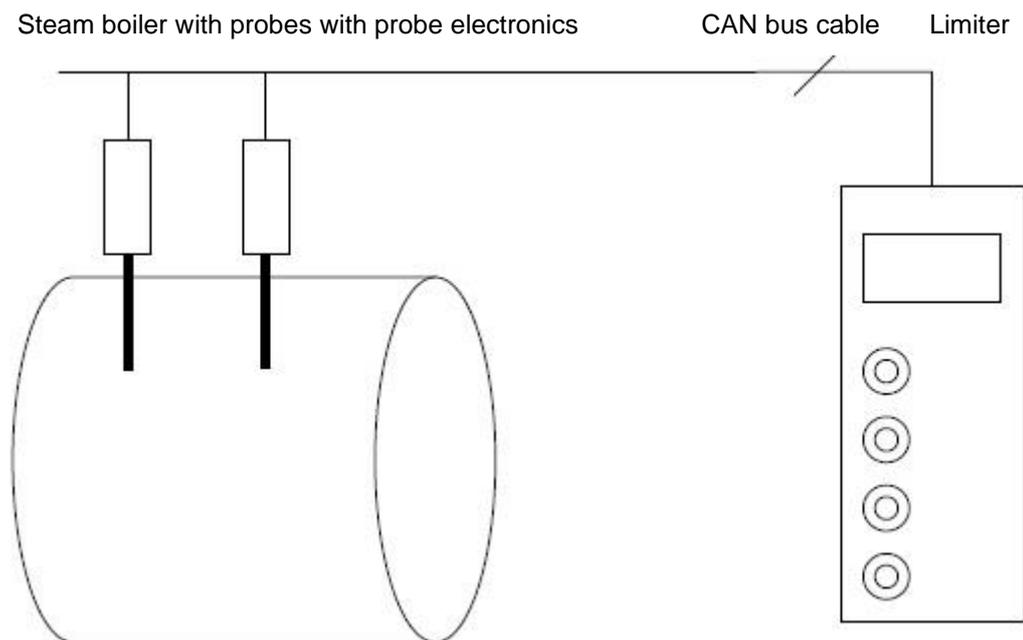


Do not heat insulate the electronics component!!

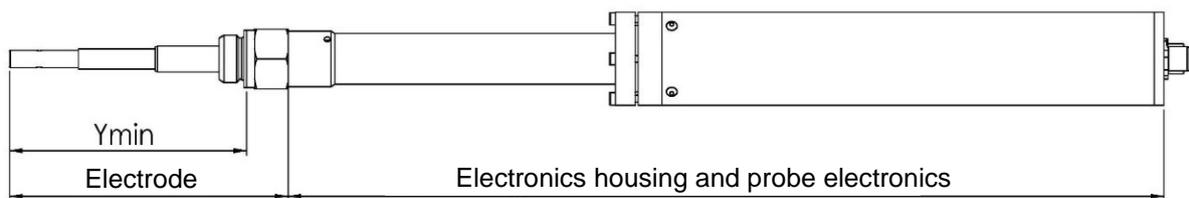


Ensure protection class in accordance with current regulations!

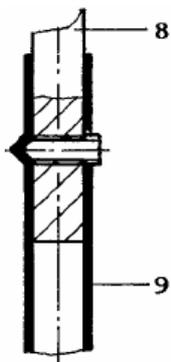
Schematic diagram:



5.1 Setup and descriptions of the individual probe parts



5.2 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 AF2 hexagon socket.

5.3 Screwing-in the probe in the boiler

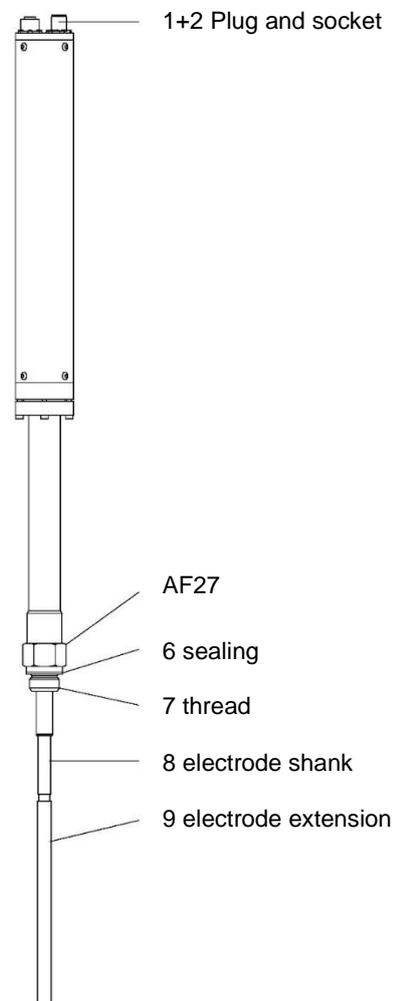
- Clean and check sealing surfaces
- Insert sealing ring (6)
- Lubricate thread (7) with heat-resistant solid lubricant (e.g. graphite).
- Screw-in probe and tighten, max.
- Fit into the boiler before connecting the power.



Do not seal the thread with PTFE tape or similar!



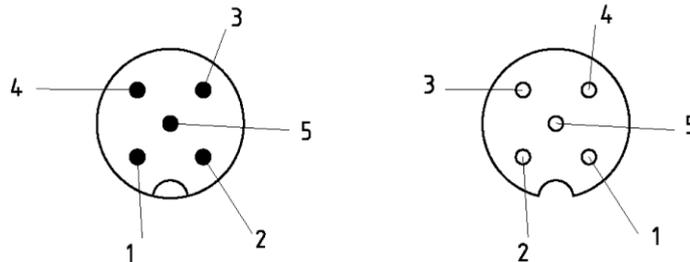
When commissioning the boiler, check the screw connection of the probe in the flange for tightness and retighten if necessary!



5.4 Electrical connection

The probes are fitted with plug connections (M12, 5-pole, A-coded).

Input (e.g. from the controller)	output (e.g. to further probes)
M12 plug; 5-pole; A-coded	M12 socket; 5-pole; A-coded



1 Shielding	2 +24V	3 GND
4 CANH	5 CANL	

The probe must be connected with the associated evaluation device according to the wiring plan via a multi-core, pairwise-twisted shielded control cable (e.g. UNITRONIC®BUS CAN 2x2x0.34mm²) (see also Installation and Operating Instructions DLL Chap. 6.3)

If several probes are connected to the CAN bus, serial connection is to be observed.

The last probe is given the terminator (terminator plug) 120Ω:



For connecting the bus devices pre-assembled control cables in various lengths are available as accessories. If pre-assembled control cables are not used, the connecting plugs must be wired according to the wiring plan.

The **total length** of the bus line must be a maximum of 250m.

The short-circuit-proof 24V voltage of the CAN bus is designed exclusively for the supply to the probes and must not be used for the external supply of further devices. Only CAN bus capable IGEMA controllers and probes may be operated on this CAN bus control cable.

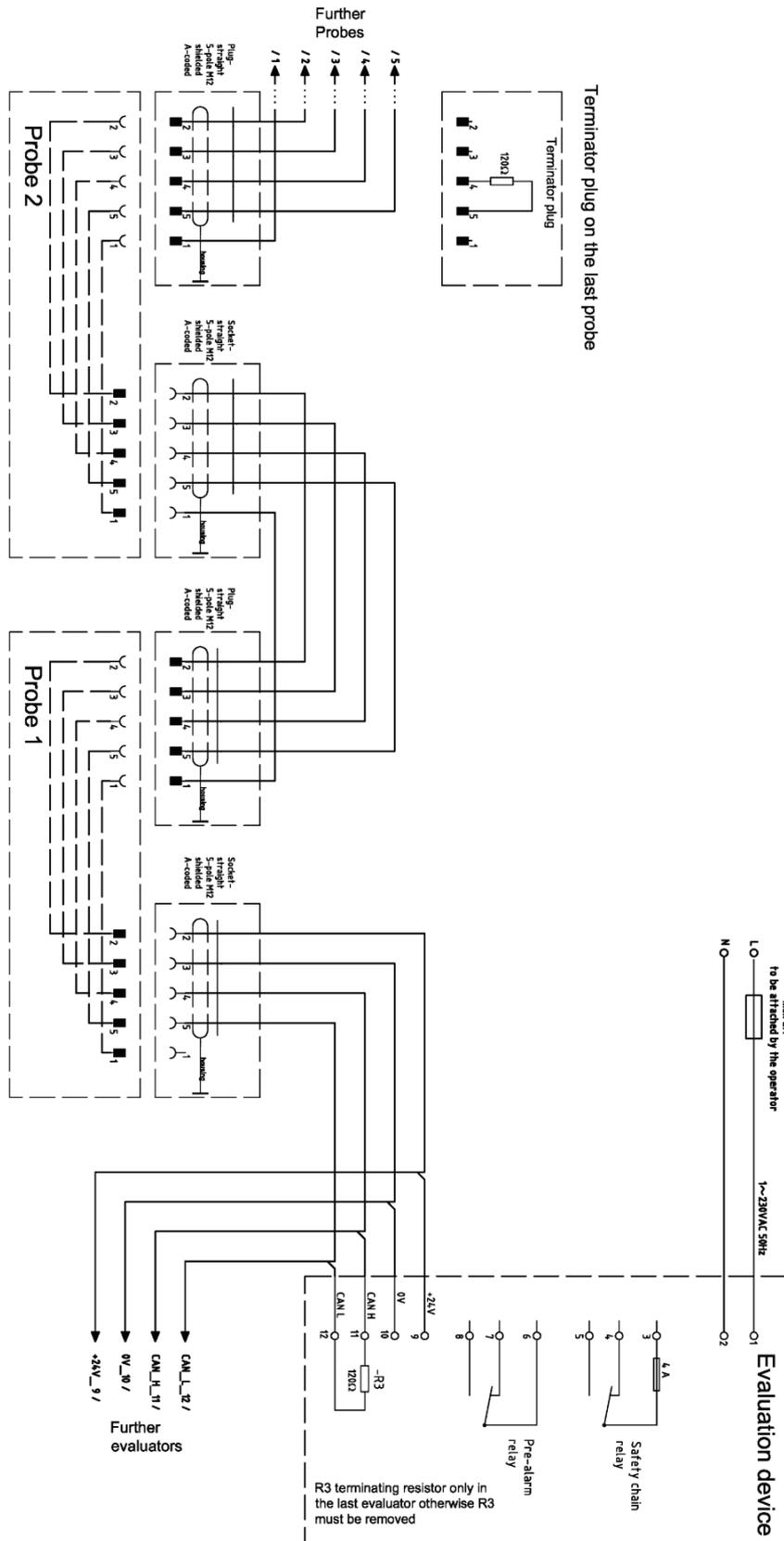


During installing it must be considered whether the CAN bus cable used is UV-resistant and that the UV protection is ensured on the installation side if necessary.

The cable must not come into contact with heat-conducting parts.

Overview wiring diagram

Further probes: e.g. controller probes



Further evaluators: e.g. level controller

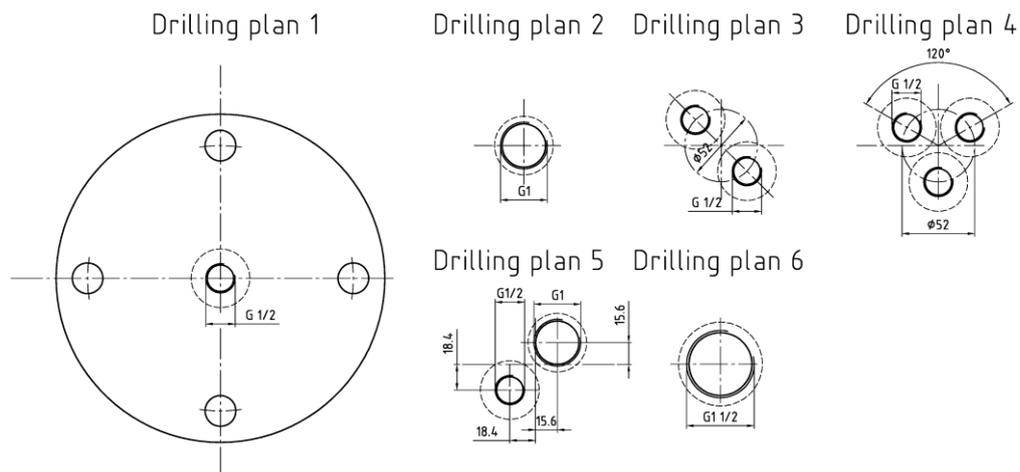
5.5 Fixing elements for receiving probes

The flanges, seals, screws and nuts listed in the table below are designed in accordance with DIN EN 12952 und 12953 and tested by the TÜV Technical Inspection Agency.

DIN flanges

PN	DN	DIN	Form	Threaded hole	Material
40	50	EN1092-1	A	According to drilling plan 1	1.0460
63		EN1092-1	B2		
100 / 160		EN1092-1			
40	100	EN1092-1	A	According to drilling plan 1,3,4,5	1.0460
63		EN1092-1	B2		
100 / 160		EN1092-1			

Drilling plans 1-6



DIN seals

PN	DN	DIN	Material
40	50	EN 1514-1 IBC	Graphite with plain metal insert
63		2697	S235JRG2/ 0.5 graphite
100 / 160			
40	100	EN 1514-1 IBC	Graphite with plain metal insert
63		2697	S235JRG2/ 0.5 graphite
100/160			

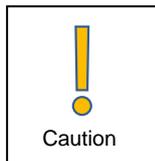
DIN screws

PN	DN	DIN	Quantity	Dimensions	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	C 35 E

DIN nuts

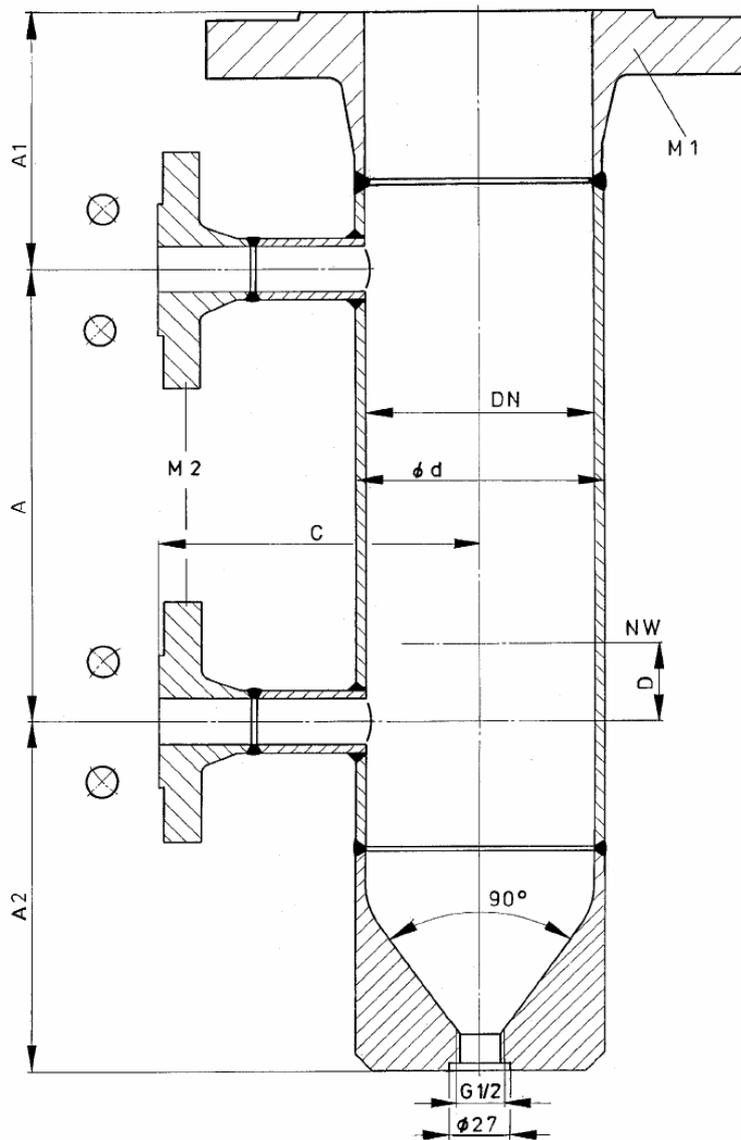
PN	DN	DIN	Quantity	Dimensions	Material
40	50	EN 24032	8	M16	1.7258
63				M20	
100/160				M24	
40	100	EN 24032	16	M20	1.7258
63				M24	
100/160		2510		NFM27	C 35

5.6 Mounting in the add-on housing



If shut-off valves are mounted between the process connections of the add-on-housing and the boiler supports, an electric locking system (end switch) must be installed. A drain valve should be mounted to the add-on-housing.

Illustration of add-on housing



Construction dimensions

PN	DN	Construction dimensions min. mm				
		ø d	C	D	A1	A2
16	50	60,3	115	15	85	100
25					100	
40					105	
63			135		115	
100					100	
160					150	
16	100	114,3	140	15	140	160
25					155	
40					165	
63			160		140	
100					155	
160					165	

Materials

Flanges	1.0460
Pipes	P235GH / 16Mo3 (according to pressure range)

Stainless steel and ASME-compliant materials upon request.

Process connection M1

PN	DN	DIN	DIN sealing form
16	50	DIN EN 1092-1 Type 11	Form B1
25			
40			
63	100		Form B2
100			
160			

Process connection M2

PN	DN	DIN	DIN sealing form
16	20	DIN EN 1092-1 Type 11	Form B1
25			
40			
63	25		Form B2
100			
160			

On request ASME-compliant flanges, weld-on ends or DIN or ASME-compliant socket welding on the process connection M2 are also an option.

5.7 Shortening the electrode extension



Always depressurise the boiler / add-on housing and allow it to cool down before dismantling the probe!

The Probe is hot during operation! Severe burns at hands or arms are possible. During dismantling of the probe steam or hot water may escape! Severe burns of the whole body are possible.

- Release socket (1) and plug (2).
- Screw out probe.
- Dismount electrode extension (9) by screwing out the set screw.
- Carefully clamp electrode extension (9) directly at the point to be shortened and shorten it carefully with a suitable tool. Do not distort the electrode extension! Deburr cut surface of the extension before assembly.
- Fitting see Chap. 5.3.



When starting up the boiler check the probe screw connection in the flange for tightness and retighten if necessary!



**Extending an electrode extension is not permitted!
Probe head - all parts above the thread (7) - do not heat insulate!!!**

5.8 Cleaning the electrodes



Always depressurise the boiler / add-on housing and allow it to cool down before dismantling the probe! (see 5.7)

- Release socket (1) and plug (2).
- Carefully screw out probe.
- Allow electrode to cool down completely and clean carefully when cold with a soft, clean cloth.



PTFE or ceramic insulation must not be damaged.

- Fitting see Chap. 5.3



When starting up the boiler check the probe screw connection in the flange for tightness and retighten if necessary!

6. Emergency Operation

In a low water limiter system with 2 level probes it is permissible to continue to operate the system provisionally in emergency operation under constant supervision with one probe

For this operation, the following actions are to be taken:

- Note the start of the emergency operation in the boiler log.
- In the configuration menu of the evaluation device reduce the number of probes to 1 and enter the serial number of the functioning level probe as the 1st serial number.
- The system must not be left unattended when working in emergency mode.
- Replace the faulty probe immediately.
- In the configuration menu of the evaluation device increase the number of probes back up to 2 and enter the serial number of the level probe replaced as the 2nd serial number.
- Note the end of the emergency operation in the boiler log.

7. Technical Data

7.1 Device data

Component identification mark: 01 202 931-B-12-0012

CE ID no.: 0035

Manufacture in accordance: EU-Directive 2014/68/EU, Annex III; Modules B+D (Category IV)

Applied standards: DIN EN 12952-11; DIN EN 12953- 9; DIN EN 61508-1/ -2/ -3
DIN EN 61326-1; DIN EN 61326-3-2; DIN EN 61010-1

Responsiveness: > 0,5µS/cm at 25°C

Power supply: 24V

Power consumption: 0,6W

Data exchange: CAN-Bus in accordance with DIN ISO 11898, CANopen-protocol

Electrical connection: CAN-Bus in accordance with DIN ISO 11898

Protection class: IP65 in accordance with DIN EN 60529

Allowable ambient temperature: 0°C bis 85°C

Self-test: alle 3sec

Service life probe: The service life of the probe depends on the operating conditions and state of the boiler water.

Total length of CAN bus: max. 250m

Electrical conductivity of the liquid: $0.5 \mu\text{S/cm} \leq \infty \leq 10,000 \mu\text{S/cm}$

Probe		DP111	DP121				
Nominal pressure	PN	40	63	100	160	250	320
Max. all. pressure	PS [bar]	32	50	80	100	160	200
Max. all. temperature	TS [°C]	239	265	296	312	346	367
Construction dimension Y [mm]		> 125	> 148				
Mechanical connection		Thread G ½"					
Power connection		Electrical connector with plug and socket					
Protection class in accordance with DIN VDE 0470		IP 65					
Max. allowable ambient temperature at the plug [°C]		85°C					

Construction dimension Y [mm]	DP111 / DP121	
1.700	with protective tube > DN 80,	vertical installation position
800	with protective tube DN 50,	vertical installation position
800	with protective tube DN 50 / 100,	installation position inclined up to 45°

Probe	DP111	DP121
Insulator	PTFE	Ceramic
Sealing ring	Soft iron	
Electronics housing	Stainless steel	
Electrode	Stainless steel	
Electrode extension	Stainless steel	

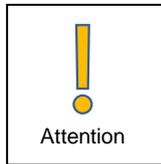
7.2 Data plate

		Type DP111		CE 0035	
Build 2016		Art. Nr. 15-10233			
PS 32 bar	TS 239°C	DN G1/2"	IP 65		
0°C < Tamb < 85°C		0,5 - 10.000 µS / cm			
S/N 12050009		CAN: 24V DC 0,6W			
* EU-Type-Examination * SIL 3 * Production monitored		Certificate Nr. 01 202 931-B-12-0012			
IGEMA GmbH Mess- und Regeltechnik D-48163 Münster Made in Germany		 See installation instructions!			

		Type DP121		CE 0035	
Build 2016		Art. Nr. 15-10234			
PS 200 bar	TS 367°C	DN G1/2"	IP 65		
0°C < Tamb < 85°C		0,5 - 10.000 µS / cm			
S/N 12080032		CAN: 24V DC 0,6W			
* EU-Type-Examination * SIL 3 * Production monitored		Certificate Nr. 01 202 931-B-12-0012			
IGEMA GmbH Mess- und Regeltechnik D-48163 Münster Made in Germany		 See installation instructions!			

8. Fault analysis and rectification

Error states in the probe electronics are displayed on the controller (see Installation and operating instructions DLL). These error codes can be assigned to possible causes of error with the following table.



Any error code (except "121"), will cause the safety chain to be switched off to the safe mode.

Error code	Description	Cause	Remedial Action
102	Fault in the probe hardware Insulation monitoring safety electrode	e.g. broken cable, hardware fault Electrode become overgrown	Replace probe Clean electrode, replace probe if necessary
104	Incorrect probe type recognised	e.g. DP211 probe (HW probe) on DLL (LW limiter)	allocate appropriate probe
105	Probe temperature too high, occurs with $T_{\text{probe}} \geq 105^{\circ}\text{C}$	Ambient temperature of probe probably too high	Carry out heat insulation measures at the flange not at the electronics part
106	CAN bus time-out Malfunction	e.g. broken cable, incorrect probe serial number bus leads CANL and CANH wrong way round, CAN bus configuration (terminators) incorrect, ...	Check wiring, Check probe serial number; check terminator configuration
107	Insulation monitoring safety electrode	Electrode become overgrown	Clean electrode, replace probe if necessary
108	SIL3 error	Hardware fault	Replace probe
120	Safety cut-out	Minimum level in the boiler below	Ensure supply of water
121	Pre-alarm for cut-out	Minimum level in the boiler below	Ensure supply of water



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

If the device supplied indicates transport damage or gives cause for complaint in spite of our final quality control, please contact our SERVICE department on telephone +49 2501 92424-0 by return.

9. Declaration of Conformity



Declaration of Conformity

Declaration of Conformity in accordance with the EU-Directives

2014/68/EU,

2014/35/EU,

2014/30/EU

The Company:

IGEMA GmbH

Antwerpener Str. 1

48163 Münster

Germany

declares as manufacturer, that the product:

„SmartLimiter // LW Water level limiter“

as limiter with safety function

Product type:

“DLL” with the probes

DP111, DP121, DP114

complies with the directives

and has been subjected to the following conformity assessment procedure:

Category IV, Modules B and D

Applicable standards:

EN 12952-11; EN 12953-9

EN 61508; EN 61326-1

EN 61010-1

Notified Body for the modules:

TÜV-Rheinland Industrieservice GmbH

Am Grauen Stein

51105 Köln

Deutschland

Identification no.: 0035

Münster, 05. 09. 2017

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