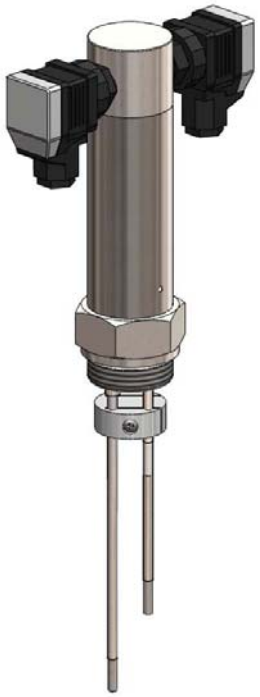
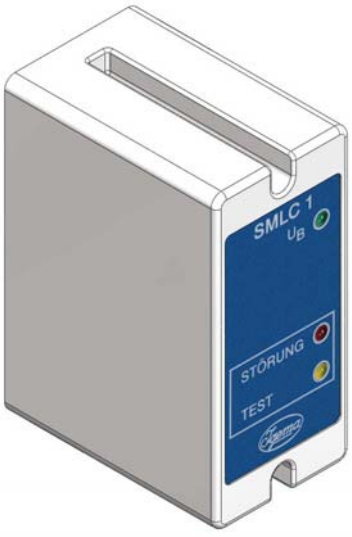
Stand 01/2009

Electronic Boiler Control





Level probe type EL030

Application and function

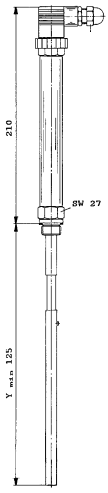
The level probe EL030 in connection with the controller SMLC2 is a LLW-limiter with safety function according to EC-Directive 2014/68/EC.

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

EG-component test	see controller		
	CE 0035		
Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C



Dimension Y [mm] min. 125		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

EC-Type-Examination
SIL 3
Production monitored

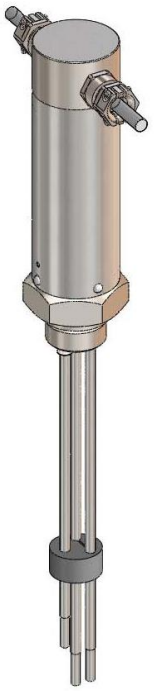
Multiple probe type MS015-A

(multirod probe) with limiting probe

Application and function

The multirod probe type MS 015-A is n connection with the controller SMLC2 a self-monitoring water level limiter with safety function as per 2014/68/EC. With an additional controller (e.g. DLR1/DHR1) a 2-point water-level-controll is possible.

Type	Function	EG-component test
SMLC2	Low level limiter, self checking, self-monitoring	see controller
DLR1/ DHR1	2-point water level controller	-----



EC-Type-Examination
SIL 3
Production monitored

Technical basic equipment

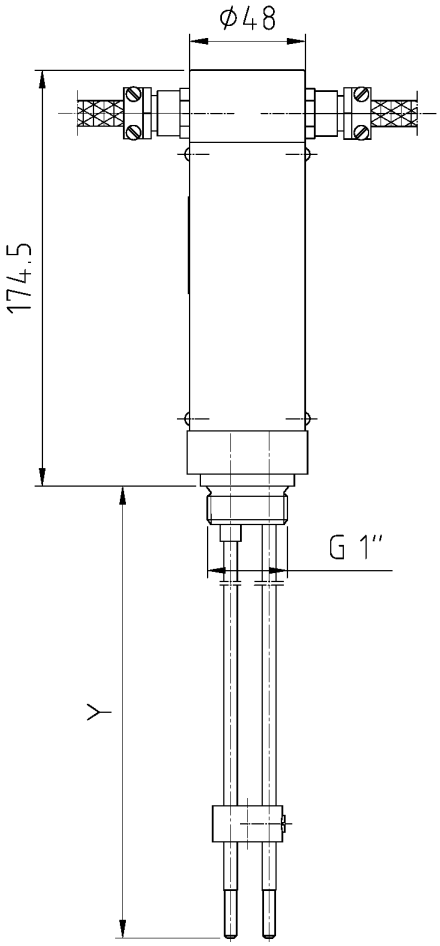
Mechanical connection	G 1 (SW50)	
Electrical connection	Pilot wire BiHFP-0; 4 x 0,75 mm², 3 m length, cable ends left unprepared • Braide made of Cu, galvanized • Insulation and mantle made of silicon • Reinforcement / net work made of galvanized steel wire to screen and protect	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Sealing ring	Soft iron
	Connection housing	stainless steel

Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Dimension Y [mm]			$60 \leq Y \leq 1500$
Installation position			vertical
Protection as per DIN VDE 0470			IP54
Allowable temperature on plug			100° C

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0



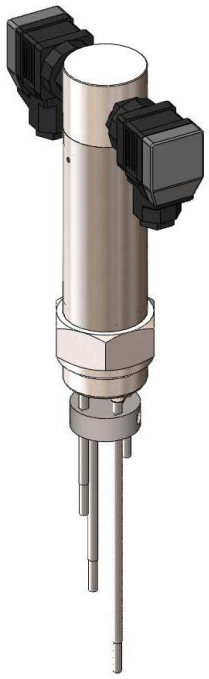
Multiple probe type MS015-B

(multirod probe) with limiting probe

Application and function

The multrod probe type MS015-B is in connection with the controller SMLC2 a self-monitoring water level limiter with safety function as per DGRL 2014/68/EC. With an additional controller (e.g. DLR1/DHR1) a 2-point water-level control and LWL or HWL signalisation is possible.

Type	Function	EG-component test
SMLC1	Low level limiter, self-checking, self monitoring	see controller
DLR1/ DHR1	2-point water level controller with LWL or HWL signaling	-----



EC-Type-Examination
SIL 3
Production monitored

Technical basic equipment

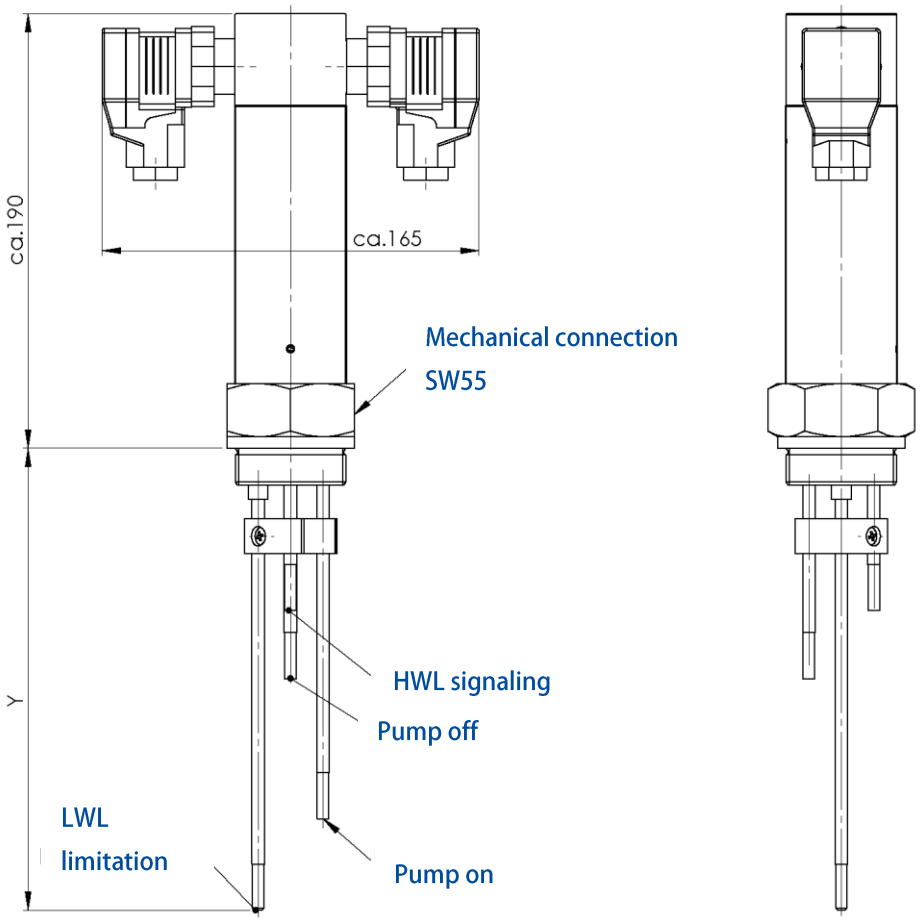
Mechanical connection	G 1 ½ (SW55)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Dimension Y [mm]			60 ≤ Y ≤ 1500
Installation position			vertical
Protection as per DIN VDE 0470			IP54
Allowable temperature on plug			100° C

Electrical connection controller and signaling marking „R“

Electrical connection limiter marking „B“



Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

Level probe type EL19-2

Application and function

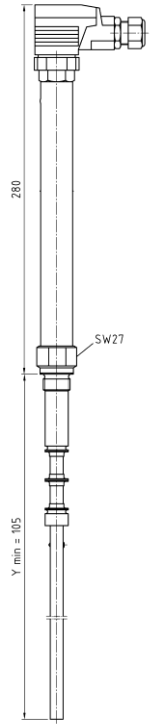
The level probe EL19-2 in connection with the controller SMLC2 is a limiter with safety function according to EC-Directive 2014/68/EC

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	Ceramic
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

EG-component test	see controller					
	CE 0035					
Allowable pressure	PS [bar]	50	80	100	160	200
Allowable temperature	TS [° C]	265	296	312	346	367
Cable gland	M16x1,5					
Protection as per DIN VDE 0470	IP65					
Allowable pressure on plug	100° C					



Dimension Y [mm] min. 150		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

EC-Type-Examination
SIL 3
Production monitored

Datasheet issue 08/2016

Self-monitoring low water level limiter SMLC2

Application and function

In conjunction with the appropriate IGEMA level probes the SMLC2 self-monitoring low water level limiter is a limiter with safety function in accordance with the Pressure Equipment Directive (PED) (special design according to Water Level 100).

The product meets EU Directive 2014/68/EU (PED). Conformity (CE marking) is certified in accordance with Annex III, Modules B+D (Category IV); notified body NB 0035.

Regulations applied: corresponding DIN EN standards.

Due to the permanent self-monitoring, the limiter ensures the safety function. Thus he can be implemented in systems with safety requirements up to SIL 3.

Function SMLC2

The SMLC2 low water level limiter works in conjunction with the IGEMA Level Probes on the basis of 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 µS/cm. For the secure functioning of this method of measurement a minimum conductivity of the substance to be measured is required.
The conductive method of measurement makes two statements: electrode submerged or electrode uncovered or switch point reached or not reached. Before installation the electrode must be adjusted to the length at which the switching procedure is to be executed, e.g. for switching off burner and interrupting the safety circuit.

LEDs in different colors show the state of the system. This assists the troubleshooting.

If all conditions for correct operation are met, the safety circuit for the steam generator is enabled (burner can switch on).

In the SMLC2 the current across the electrical contacts of the safety circuit is limited by a 4A fuse. Thus jamming of the contacts is avoided.

In the case of low water, the output (relays) of the safety circuit is deactivated after a total adjustable delay of 4s, 8s, 12s or 16s, thus the burner is cut-off. The preset delay time is 4s.

A latching is not implemented in to the SMLC2. It has to be installed by the operator.

The permanent self-monitoring ensures the functionality. Thus a test button is not necessary.

- EU Type Approval
- SIL 3
- Production monitored

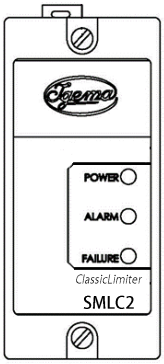
Probes

name	PS	TS	connection	electrode length
EL030	32 bar	239° C	G ½“	125mm – 1700mm
EL19-2	200 bar	367° C	G ½“	150mm – 1700mm
EL963	8 bar	175° C	Flange	130mm
MS 015A	32 bar	239° C	G 1“	60mm – 1500mm
MS 015B	32 bar	239° C	G 1½“	60mm – 1500mm

Technical basic equipment

- SMLC2 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

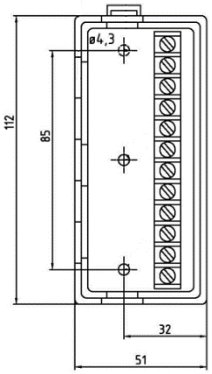
front view



Technical Data

EU – component test	CE 0035 DIN EN 12952-11 : 2007; DIN EN 12953-9 : 2007
Safety integrity level	SIL 3 EN 61508: 2010; EN 12952-11: 2007 5.5; EN 12953-9: 2007 5.5
Electromagnetic compatibility	EN 61326-1: 2006
Low voltage	EN 61010-1: 2010

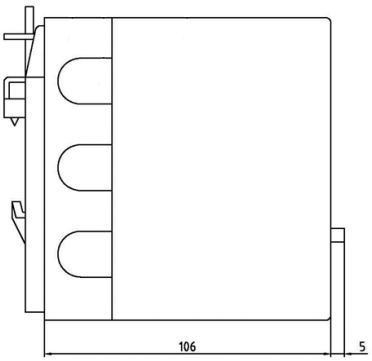
socket with terminals



Mains connection	230V (-15% + 10%) / 50/60Hz
Power consumption	3 VA
Hardware protection	short-circuit-proof transformer
Protection class (DIN EN 60529)	IP40 [1)]
Ambient temperature	0° C - 55° C
Self monitoring	every 2 s

[1)] according to DIN EN 12952-11, 4.3.4 a protection of IP54 has to be maintained in the boiler area (switching cabinet)

side view



Max. operating data of potential free contacts		
Burner cut-off	Voltage	max. 250 VAC*
	Current	max. 6 A* ohmsch
Auxiliary output (relay)	Voltage	max. 250 VAC*
	Current	max. 5 A* ohmsch
Electrical conductivity of the liquid	0,5 µS/cm ≤ æ ≤ 10.000 µS/cm (25° C)	
Lenght of connection line	max. 100m	

* observe load curve / use contactor
At the auxiliary output the terminals are not fused.
The burner-cut-off output has a 4A microfuse to avoid jamming of the contacts in the case of excess current.
The load has to be reduced regarding the nominal values of the relay.
Relay used: Schrack V23092-A1024-A301

Level probe type EL040

Application and function

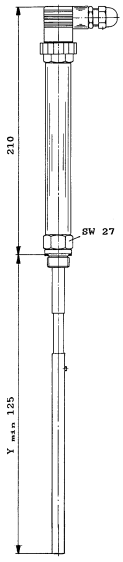
The level probe EL040 in connection with the controller SMHC2 is a HHW limiter with safety function according to EC-Directive 2014/68/EU.

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

EC-component test	see controller	
	CE 0035	
Allowable pressure	PS [bar]	32
Allowable temperature	TS [° C]	239
Cable gland		M16x1,5
Protection as per DIN VDE 0470		IP65
Allowable temperature on plug		100° C



Dimension Y [mm] min. 125		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

EC-Type-Examination
SIL 3
Production monitored

Level probe type EL21-2

Application and function

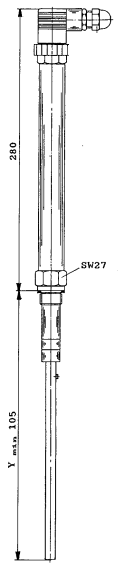
The level probe EL21-2 in connection with the controller SMHC2 is a HHW limiter with safety function according to EC-Directive 2014/68/EU.

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	Ceramic
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

Component mark	see controller					
	CE 0035					
Allowable pressure	PS [bar]	50	80	100	160	200
Allowable temperature	TS [° C]	265	296	312	346	367
Cable gland	M16x1,5					
Protection as per DIN VDE 0470	IP65					
Allowable temperature on plug	100° C					



Dimension Y [mm] min. 105		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

EC-Type-Examination
SIL 3
Production monitored

Datasheet issue 08/2016

Self-monitoring high water level limiter SMHC2

Application and function

In conjunction with the appropriate IGEMA level probes the SMHC2 self-monitoring high water level limiter is a limiter with safety function in accordance with the Pressure Equipment Directive (PED) (special design according to Water Level 100).

The product meets EU Directive 2014/68/EU (PED). Conformity (CE marking) is certified in accordance with Annex III, Modules B+D (Category IV); notified body NB 0035.

Regulations applied: corresponding DIN EN standards.

Due to the permanent self-monitoring, the limiter ensures the safety function. Thus he can be implemented in systems with safety requirements up to SIL 3.

- EC Type Approval
- SIL 3
- Production monitored

Function SMHC2

The SMHC2 high water level limiter works in conjunction with the IGEMA Level Probes on the basis of 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 µS/cm. For the secure functioning of this method of measurement a minimum conductivity of the substance to be measured is required.
The conductive method of measurement makes two statements: electrode submerged or electrode uncovered or switch point reached or not reached. Before installation the electrode must be adjusted to the length at which the switching procedure is to be executed, e.g. for switching off burner and interrupting the safety circuit.

LEDs in different colors show the state of the system. This assists the troubleshooting.

If all conditions for correct operation are met, the safety circuit for the steam generator is enabled (burner can switch on).

In the SMHC2 the current across the electrical contacts of the safety circuit is limited by a 4A fuse. Thus jamming of the contacts is avoided.

In the case of high water, the output (relays) of the safety circuit is deactivated after a total adjustable delay of 4s, 8s, 12s or 16s, thus the burner is cut-off. The preset delay time is 4s.

A latching is not implemented into the SMHC2. It has to be installed by the operator.

The permanent self-monitoring ensures the functionality. Thus a test button is not necessary.

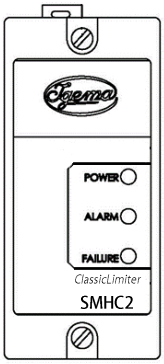
Probes

name	PS	TS	connection	electrode length
EL040	32 bar	239° C	G ½“	125mm – 1700mm
EL21-2	200 bar	367° C	G ½“	125mm – 1700mm

Technical basic equipment

- SMHC2 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

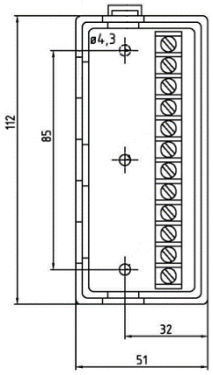
front view



Technical Data

EU – component test	CE 0035 DIN EN 12952-11 : 2007; DIN EN 12953-9 : 2007
Safety integrity level	SIL 3 EN 61508: 2010; EN 12952-11: 2007 5.5; EN 12953-9: 2007 5.5
Electromagnetic compatibility	EN 61326-1: 2006
Low voltage	EN 61010-1: 2010

socket with terminals

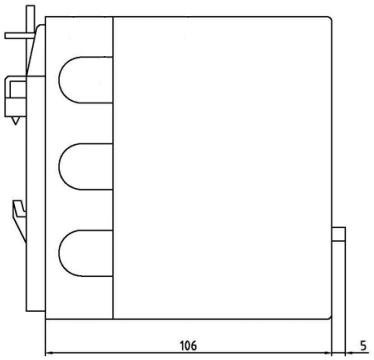


Mains connection	230V (-15% + 10%) / 50/60Hz
Power consumption	3 VA
Hardware protection	short-circuit-proof transformer
Protection class (DIN EN 60529)	IP40 [1)]
Ambient temperature	0° C - 55° C
Self monitoring	every 2 s

[1)] according to DIN EN 12952-11, 4.3.4 a protection of IP54 has to be maintained in the boiler area (switching cabinet)

Max. operating data of potential free contacts		
Burner cut-off	Voltage	max. 250 VAC*
	Current	max. 6 A* ohmic
Auxiliary output (relay)	Voltage	max. 250 VAC*
	Current	max. 5 A* ohmic
Electrical conductivity of the liquid	0,5 µS/cm ≤ æ ≤ 10.000 µS/cm (25° C)	
Lenght of connection line	max. 100m	

side view



* observe load curve / use contactor
At the auxiliary output the terminals are not fused.
The burner-cut-off output has a 4A microfuse to avoid jamming of the contacts in the case of excess current.
The load has to be reduced regarding the nominal values of the relay.
Relay used: Schrack V23092-A1024-A301

Level probe type EL041

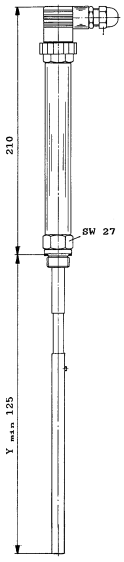
Application and function

The level probe type EL041 serves as primary element for the following controllers

LMC2	Low water level limiter
DHR1	2-point water level controller with HWL-alarm
DLR1	2-point water level controller with LWL-alarm
DS1	LWL and HWL signaling

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron



Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C

Dimension Y [mm] min. 125		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0

Level probe type EL4-1

Application and function

The level probe type EL4-1 serves as primary element for the following controllers:

LMC2	self-testing Low water level limiter (SIL 3)
DHR1	2-point water level controller with HWL-alarm
DLR1	2-point water level controller with LWL-alarm
DS1	LWL and HWL signaling

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Probe extension	stainless steel
	Insulator	Ceramic
	Socket	Polyamid
	Sealing ring	Soft iron

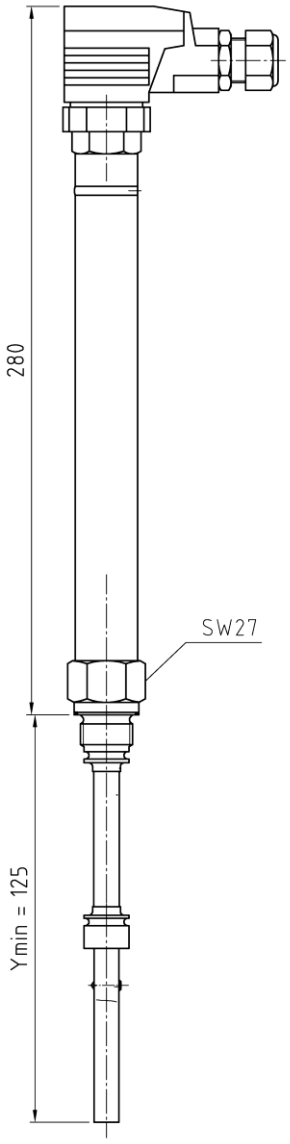
Technical data

Allowable pressure	PS	[bar]	50	80	100	160	200
Allowable temperature	TS	[° C]	265	296	312	346	367
Cable gland			M16x1,5				
Protection as per DIN VDE 0470			IP65				
Allowable temperature on plug			100° C				

Dimension Y [mm] min. 125		
1700	with protection tube > DN80	vertical installation position
800	with protection tube DN50	vertical installation position
800	with protection tube DN50/100	inclined installation up to 45°

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0



SIL 3 (LMC2)
Production monitored

Multiple level probe type EL912

Appliction and function

The level probe type EL912 serves as primary element for the following controllers

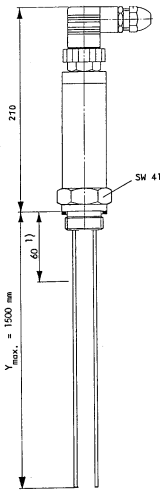
DHR1	2-point water level controller with HWL-alarm
DLR1	2-point water level controller with LWL-alarm
DS1	LWL and HWL signaling

Technical basic equipment

Two probe rods		
Mechanical connection	G 1 (SW41)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron

Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C



Dimension Y [mm]	60 ≤ Y ≤ 1500
Installation	vertical

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0
- For probe installation see data sheet D-08-D-16352-0

Multiple level probe type EL913

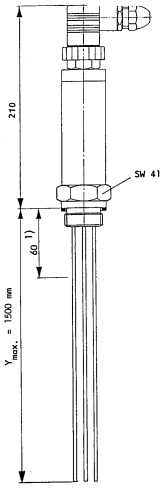
Appliction and function

The level probe type EL913 serves as primary element for the following controllers

LMC2	self-testing Low water level limiter (SIL 3)
DHR1	2-point water level controller with HWL-alarm
DLR1	2-point water level controller with LWL-alarm
DS1	LWL and HWL signaling

Technical basic equipment

Three probe rods		
Mechanical connection	G 1 (SW41)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron



SIL 3 (LMC2)
Production monitored

Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C

Dimension Y [mm]	60 ≤ Y ≤ 1500
Installation	vertical

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.

For electrode support flange see Data Sheet D-08-D-22510-0

Multiple level probe type EL914

Application and function

The level probe type EL914 serves as primary element for the following controllers

LMC2	self-testing Low water level limiter (SIL 3)
DHR1	2-point water level controller with HWL-alarm
DLR1	2-point water level controller with LWL-alarm
DS1	LWL and HWL signaling

Technical basic equipment

Four probe rods		
Mechanical connection	G 1 (SW41)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Zinc die casting
	Sealing ring	Soft iron

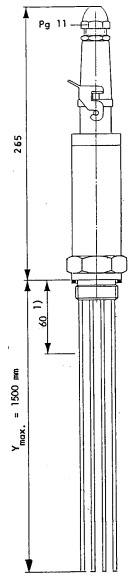
Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C

Dimension Y [mm]	60 ≤ Y ≤ 1500
Installation	vertical

Addition

- 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) has to be installed.
- A drain valve is to be mounted to the add-on-housing.
- Use in mounting supports if the boiler support corresponds to the representations according to Data Sheet D-08-D-16351-0.
  Protective tube K, flange, screws, nuts and seals can also be supplied.
- For electrode support flange see Data Sheet D-08-D-22510-0



SIL 3 (LMC2)
Production monitored

Datasheet issue 08/2016

Low water level limiter type LMC2

Application and function

In conjunction with the appropriate IGEMA level probes the LMC2 low water level limiter is a limiter in accordance with the Pressure Equipment Directive (PED).

The product meets EU Directive 2014/68/EU (PED).

Regulations applied: corresponding DIN EN standards.

Due to a self-test, the limiter ensures the safety function. Thus he can be implemented in systems with safety requirements up to SIL 3.

- SIL 3
- Production monitored

Function LMC2

The LMC2 low water level limiter works in conjunction with the IGEMA Level Probes on the basis of 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 µS/cm. For the secure functioning of this method of measurement a minimum conductivity of the substance to be measured is required.
The conductive method of measurement makes two statements: electrode submerged or electrode uncovered or switch point reached or not reached. Before installation the electrode must be adjusted to the length at which the switching procedure is to be executed, e.g. for switching off burner and interrupting the safety circuit.

LEDs in different colors show the state of the system. This assists the troubleshooting.

If all conditions for correct operation are met, the safety circuit for the steam generator is enabled (burner can switch on).

In the LMC2 the current across the electrical contacts of the safety circuit is limited by a 4A fuse. Thus jamming of the contacts is avoided.

In the case of low water, the output (relays) of the safety circuit is deactivated after a total adjustable delay of 4s, 8s, 12s or 16s, thus the burner is cut-off. The preset delay time is 4s.

A latching is not implemented in to the LMC2. It has to be installed by the operator.

The self-test ensures the functionality. Thus a test button is not necessary.

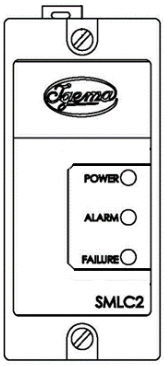
Probes

name	PS	TS	connection	electrode length
EL041	32 bar	239° C	G ½“	125mm – 1700mm
EL4-1	200 bar	367° C	G ½“	150mm – 1700mm
EL913	32 bar	239° C	G 1”	60mm – 1500mm
EL914	32 bar	239° C	G 1“	60mm – 1500mm

Technical basic equipment

- LMC2 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

front view



Technical Data

PED-Standard	DIN EN 12952-11 : 2007; DIN EN 12953-9 : 2007
Safety integrity level	SIL 3 EN 61508: 2010; EN 12952-11: 2007 5.5; EN 12953-9: 2007 5.5
Electromagnetic compatibility	EN 61326-1: 2006
Low voltage	EN 61010-1: 2010

Mains connection	230V (-15% + 10%) / 50/60Hz
Power consumption	3 VA
Hardware protection	short-circuit-proof transformer
Protection class (DIN EN 60529)	IP40 [1)]
Ambient temperature	0° C - 55° C
Self monitoring	every 2 s

1
)

according to DIN EN 12952-11, 4.3.4 a protection of IP54 has to be maintained in the boiler area (switching cabinet)

side view

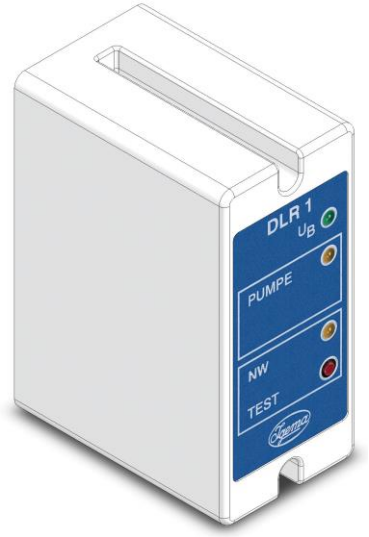
Max. operating data of potential free contacts		
Burner cut-off	Voltage	max. 250 VAC*
	Current	max. 6 A* ohmsch
Auxiliary output (relay)	Voltage	max. 250 VAC*
	Current	max. 5 A* ohmsch
Electrical conductivity of the liquid	0,5 µS/cm ≤ æ ≤ 10.000 µS/cm (25° C)	
Lenght of connection line	max. 100m	

* observe load curve / use contactor
At the auxiliary output the terminals are not fused.
The burner-cut-off output has a 4A microfuse to avoid jamming of the contacts in the case of excess current.
The load has to be reduced regarding the nominal values of the relay.
Relay used: Schrack V23092-A1024-A301

2-point water level controller DLR1/DHR1

with low alarm (DLR1) or
high alarm (DHR1)

Application and function

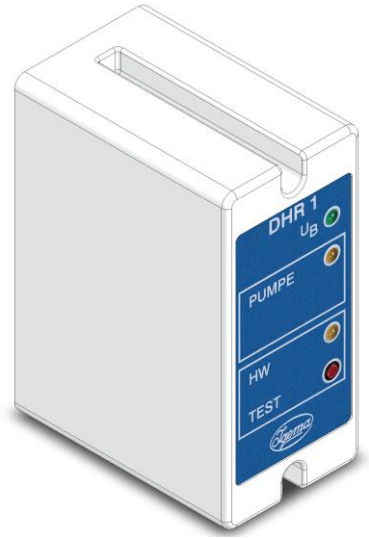


This is, together with IGEMA conductivity probes, a two-point water level controller plus low level alarm (DLR1) or high level alarm (DHR1), to be used in steam boilers or in tanks with conductive liquids.

The product meets EC Directive 2014/658/EU (PED).
Applied rules: corresponding DIN EN standards.

Function DLR1/DHR1

The indicator lamp **"U_B"** shows that the power supply is on.



- Two-point control (pump on-off) by two probes of different length "Pump on" if both probes are out of water, "pump off" if both probes are immersed.
- Feed control with one probe and one (external) time relay. Only one probe (rod) is needed for pump control. "Pump on" if the probe is out of water and at the same time start of an external time relay. After an adjusted time, the time relay switches "pump off".
- Outlet control: special version as DLR1-A/DHR1-A
  Outlet control (flow-off) by two probes of different length "Valve open" when both probes are immersed, "valve closed" when both probes are out of water.

Level alarms:
Low level alarm (DLR1)
When the probe is immersed, the relay is energised and the alarm contacts are closed. No alarm (LED **"NW"**) should be indicated. If the low level probe is out of water, the relay is de-energised and the low level alarm contact opens. The red indicator lamp **"NW"** lights.
High level alarm (DHR1)
When the probe is out of water, the relay is energised and the alarm contacts are closed. No alarm (LED **"HW"**) should be indicated. If the low level probe is immersed, the relay is de-energised and the low level alarm contact opens. The red indicator lamp **"HW"** lights.

Standard technical equipment

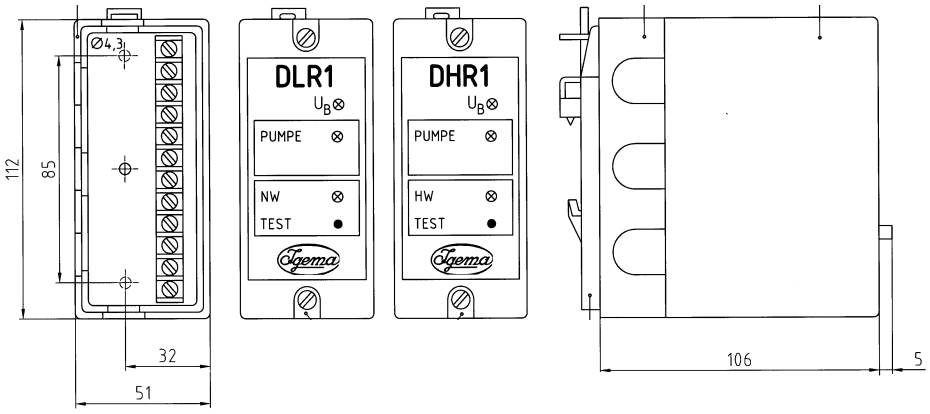
- DLR1/DHR1 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

Technical data

Power supply	230V ± 10% / 50-60 Hz
Input	ca. 4,5 VA
Fuse	80 mA/T
Protection as per DIN EN 60529	IP40 [1)]
Allowable ambient temperature	0 – 60° C

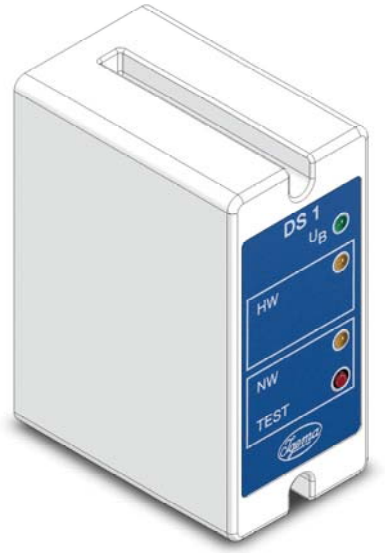
[1)] according to the German regulations VdTÜV-Wasserstand 100, 4.90
a protection of IP54 has to be maintained in the boiler area

Max. operating data of potential free contacts	
Voltage	max. 250 Vac
Current	max. 5 A ohmic
Electrical conductivity of the liquid	5 µs/cm ≤ æ ≤ 10.000 µS/cm
	0,5 µs/cm ≤ æ ≤ 2.000 µS/cm
Length of connection line	max. 100 m at 5 – 10.000 µS/cm
	max. 30 m at 0,5 – 2.000 µS/cm



Controller type DS1

for high and low alarm



Application and function

High and low alarm controller type DS1 in connection with the IGEMA level probes, e.g. for steam boilers or tanks with conductive liquids.
The product according to PED directive 97/23/EEC annex VII (Module B+D, category II) has the CE-mark no. 0035 of the notified body.
Applied rules as per TRD and AD2000.

Function DS1

The indicator lamp **„U_B“** that the power supply is on.

LWL alarm
If the long probe (low level) is out of water, the corresponding alarm relay is de-energised, the low alarm contact is open. The red indicator lamp **„NW“** lights.
If the long probe is immersed, the corresponding alarm relay is energised, the low alarm contact is closed. The red indicator lamp **„NW“** does not light.
A performance check can be done with the **„TEST“** button. With the water level normal, press and hold the **„TEST“** button to simulate a low level alarm condition.

HWL alarm
If the short probe (high level) is immersed, the corresponding alarm relay is de-energised, the high alarm contact is open. The red indicator lamp **„HW“** lights.
If the short probe is out of water, the corresponding alarm relay is energised, the high alarm contact is closed. The red indicator lamp **„HW“** does not light.
A performance check can be done with the **„TEST“** button. With the water level normal, press and hold the **„TEST“** button to simulate a high level alarm condition.

Technical basic equipment

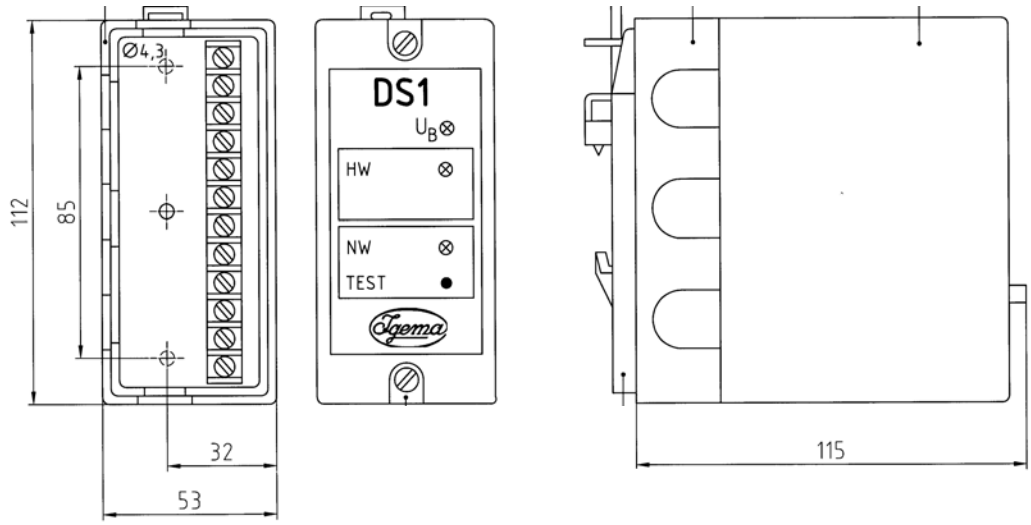
- DS1 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

Technical data

Inspection no.	01-06-0131
CE-mark	0035
Power supply	230V ± 15% / 50-60 Hz
Input	ca. 4,5 VA
Fuse	80 mA/T
Protection as per DIN EN 60529	IP40 [1)]
Allowable temperature	0 – 60° C

[1)] according to the German regulations VdTÜV-Wasserstand 100, 4.90
a protection of IP54 has to be maintained in the boiler area

Max. operating data of potential free contacts	
Voltage	max. 250 Vac
Current	max. 5 A ohmsch
Electrical conductivity of the liquid	5 µs/cm ≤ æ ≤ 10.000 µS/cm
	0,5 µs/cm ≤ æ ≤ 2.000 µS/cm
Length of connection line	max. 100 m at 5 – 10.000 µS/cm
	max. 30 m at 0,5 – 2.000 µS/cm



Probe (capacitive) type EC6

Application and function

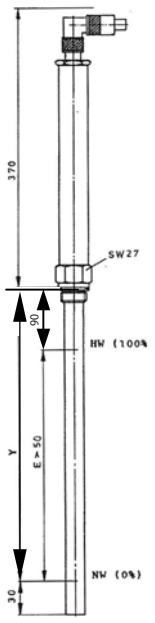
As primary element in connection with level transmitter type DLT1 for below listed equipment and function

	Function		Component mark
DLT1	Level transmitter	Continious regulation	TÜV WRS
KS90	Controller		
RV...	Motorized valve		
LB16	Indication		

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Coaxial through screw plug PL259/LF	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Brass, nickel-plated
	Sealing ring	Soft iron

Connection line to level transmitter DLT1 – **MIL-C-17F-RG-059BU** – max. 150 m
The plug-in connection must be protected on site against penetrating of humidity



Technical data

Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			Plug connector
Protection as per DIN VDE 0470			
Allowable temperature on plug			100° C
Dimension Y [mm]	Measuring range [mm]		
Maximal 1200	$E_{min.}$ = 50		Vertical installation
(Y > on request)	$E_{max.}$ = (Y – 100)		

Indicate measuring range E and dimension Y in case of order.
The probe must not be cut.

The component mark is only valid:

- For standpipes: if shutoff valves have been installed between connection flanges and boiler nozzles. A drain valve is also required
- For nozzels: if boiler nozzle corresponds to the construction according to data sheet D-08-D-16351-0.
- Protection tube K, flanges, screws, nuts and sealings can be delivered too.
- For probe installation see data sheet D-08-D-16352-0

Continuous Water Level Transmitter DLT2

Application and function

The DLT2 continuous fill level transmitter is intended for use in combination with the EC 8 level probe as a level transmitter for the output of an output current proportional to the fill level in the fluid tank (4 mA .. 20 mA).

It is intended for use in steam boilers or other fluid tanks.

The product meets EC Directive 2014/68/EU (PED).

Regulations applied: corresponding DIN EN standards.

Functioning of DLT2

The fill level transmitter DLT2 works in conjunction with the IGEMA EC 8 level probe on the basis of the capacitive fill level method of measurement whereby the electric conductivity of the medium is used. The conductivity of the medium is measured in µS/cm. For the secure functioning of this method a minimum conductivity of the substance to be measured is required.

Via the capacitive fill level method of measurement the continuous determination of the fill level is possible. The stored limits for low level (0%) and high level (100%) define the range for the determination of the current fill level. This value is converted into an output current at the 4mA .. 20mA power interface.

The transmitter supplies power to the level probe, which can be fitted into the tank, and evaluates its signal.

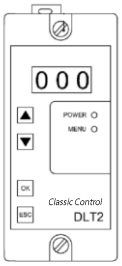
The 4mA .. 20mA output signal can be assessed at the terminals for further processing.

At an extra relay output the current output can be connected or a failure signaling can be attached.

Standard technical equipment

- DLT2 in a plastic plug-in housing for easy fitting into switch cabinets
- quick fitting with a spring catch for the DIN EN 50022 standard 35mm carrier rail or for screw fixing on a mounting plate

Front view

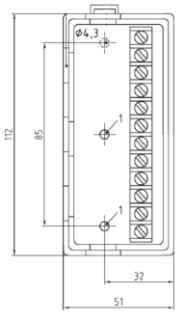


Technical data

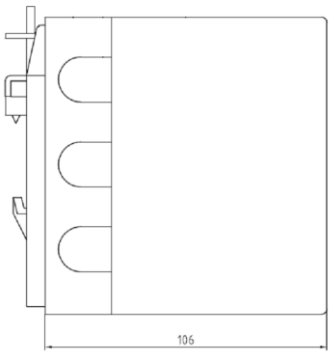
Supply voltage	230V - 15% + 15% / 50/60Hz	
Power consumption	3 VA	
Device fuse	63 mA/T	
Protection class according to DIN EN 60529	IP40 [1)]	
Allowable ambient temperature	0° C – 55° C	
power interface / output current	4-20 mA	
load	500 Ω	
Extra relay [2)]	Switching voltage	max. 250 VAC
	Switching current	max. 4 A resistive
		max. 0,75 A inductive cosφ 0,5

Electrical conductivity of the liquid	0,5 µS/cm ≤ æ ≤ 10.000 µS/cm
total length of lead	max. 250m

Base with connecting terminals



Side view



1) according to DIN EN 12952-11, 4.3.4 protection class IP54 is to be ensured in the boiler area (e.g. switch cabinet)

2) During switching operations the load profile of the relay is to be observed! For large loads use contactor! Relay used: Schrack V23092-A1024-A301

The DLT2 carries out periodic self-testing.

It is expected that because of the non-linear tank geometry the fill level (fluid quantity / volume) does not behave in a linear way to the fill depth / fill level!

Conductivity probe type EL18

Application and function

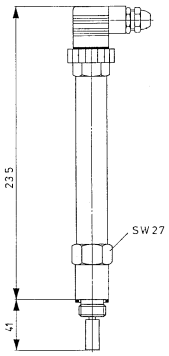
The level probe EL 18 (Fig.1), mounted in the measuring flange (Fig.2), in connection with the controller FAR1 and a desalting valve is a continuous desalting regulation.

Technical basic equipment

Mechanical connection	G ½ (SW27)	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron
	Measuring flange	1.0460

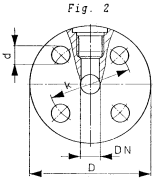
Technical data

Component mark	see controller		
Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C



PS [bar]	DN	DIN	ø D	ø k	ø d
32	15	2527 Form B	95	65	14
	20		105	75	
	35		115	85	
	40		150	110	18

Fig. 2



- Installation vertical and inclined up to 90°
- other dimensions and materials up on request
- screws, nuts and gaskets deliverable

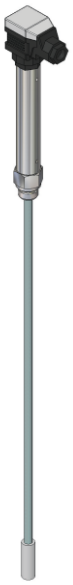
type examination
production monitored

Conductivity probe type EL22

Application and function

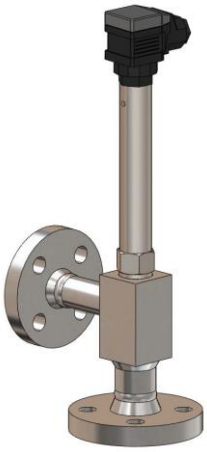
The level probe EL 22 in connection with the controller FAR1and a desalting valve is a continuous desalting regulation.

In connection with the controller FLB1 the probes serves as conductivity limitation



Technical basic equipment

Mechanical connection	G ½ (SW27)	
	with T-connection for mounting on boiler	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	PTFE
	Socket	Polyamid
	Sealing ring	Soft iron
	T-connection	1.0460



Technical data

Copmponent mark	see controller		
Allowable pressure	PS	[bar]	32
Allowable temperature	TS	[° C]	239
Cable gland			M16x1,5
Protection as per DIN VDE 0470			IP65
Allowable temperature on plug			100° C

- Installation vertical and inclined up to 90°
- other dimensions and materials up on request
- screws, nuts and gaskets deliverable

Caution! Never shorten or prolong the probe

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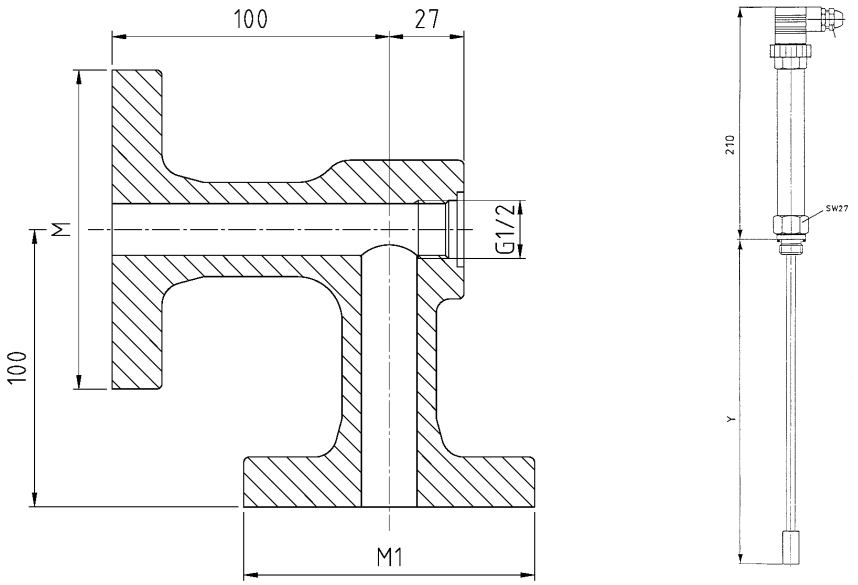
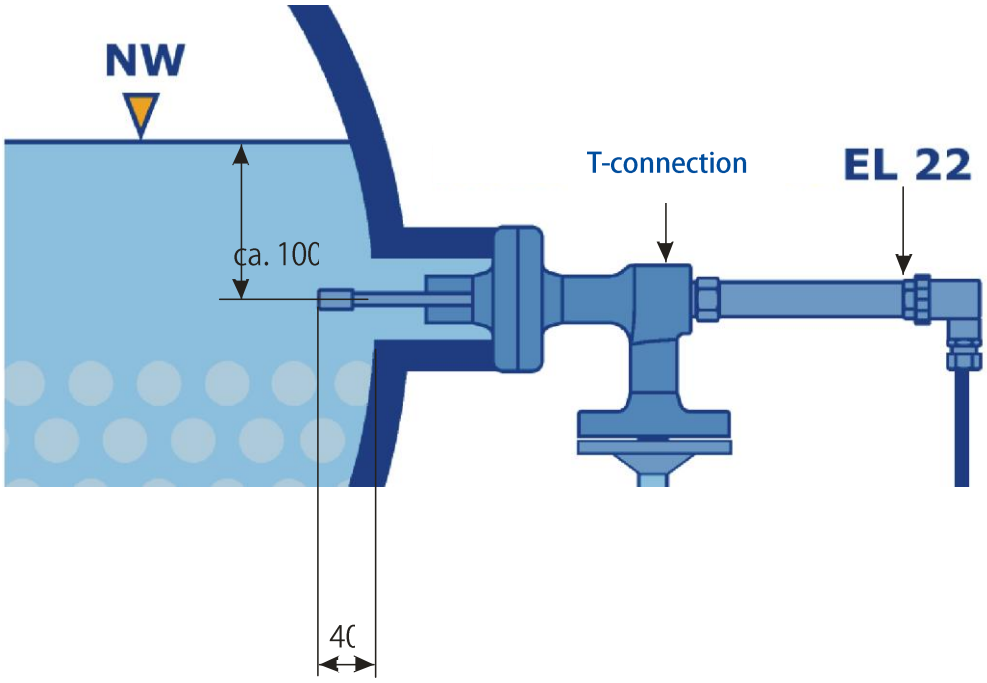
type examination
production monitored



PN	Process connection M		Connection desalting valve M1	
	DN	DIN 2535 Form B	DN	DIN 2535 Form B
40	20		15	
	25		20	



Conductivity probe type EL23

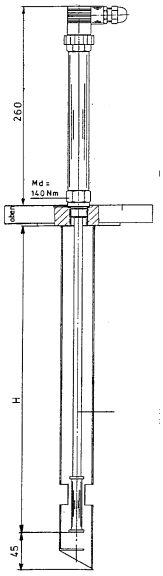
Application and function

The level probe EL 22 in connection with the controller FAR1and a desalting valve is a continuous desalting regulation.

In connection with the controller FLB1 the probes serves as conductivity limitation.

Technical basic equipment

Mechanical connection	G ½ (SW27)	
	with T-connection for mounting on boiler	
Electrical connection	Plug connection with screw terminals, traction relief	
Material	Probe housing	stainless steel
	Probe rod	stainless steel
	Insulator	Ceramic
	Socket	Polyamide
	Sealing ring	Soft iron
	Process flange	1.0460



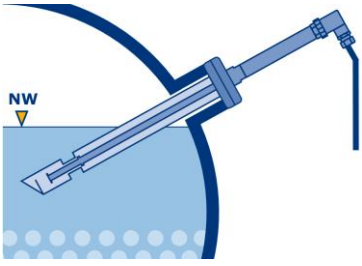
Technical data

Component mark	see controller			
Allowable pressure	PS	[bar]	50	80
Allowable temperature	TS	[° C]	265	296
Cable gland			M16x1,5	
Protection as per DIN VDE 0470			IP65	
Allowable temperature on plug			100° C	
Dimension H [mm]			max. 500	

Information:
The first delivery includes the process connection flange with integrated protection tube

- inclined installation, from 45° up to 15
- screws, nuts and gaskets deliverable

Caution! Never shorten or prolong the probe

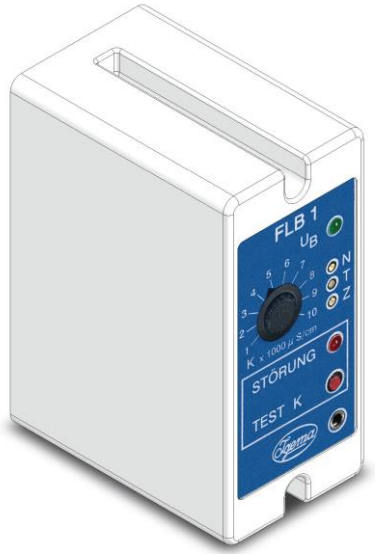


Installation example

type examination
production monitored

TDS limiter type FLB1

Application and function



The TDS limiter FLB1 is used for continuous control of the boiler water electrical conductivity.
The measurement of electrical conductivity is done by a measuring cell consisting of the TDS probe and the chamber wall of protection tube.

The product meets EC directive 2014/68/EC (PED) annex VII (Module B+D, category II) and has the CE-mark no. 0035 of the notified body.
Applied rules: corresponding DIN EN standards

Function FLB1

The controller continuously measures, at the electrode rod in the measuring cell, the electrical conductivity of the boiler water which is closely related to the level of TDS.
This measured value is compared with the set point of controller. If it is higher or equal than the set point, the controller relay is de-energised and will go to alarm to shut down the burner. The indicator lamp **"STÖRUNG"** (alarm) lights. If the measured value drops below 78 % of set point, the controller relay is energised. The indicator lamp **"STÖRUNG"** does not longer light.
A performance check can be done by pressing and holding of the button **"TEST K"** (limit value).
In case of failure of the system, e.g. break of mains supply or short circuit, the controller goes in position of higher or equal value than the set point.

The indicator lamp **"UB"** shows that the power supply is on.

- Baumuster geprüft
- Fertigung überwacht

Technical basic equipment

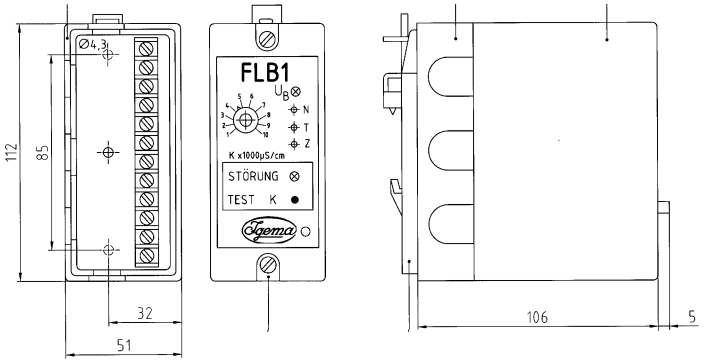
- FLB1 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

Technical data

Component mark	TÜV ID: 0000006175
CE-mark	0035
Power supply	230V ± 15% / 50-60 Hz
Input	ca. 4,5 VA
Fuse	80 mA/T
Protection as per DIN EN 60529	IP40 [1)]
Allowable temperature	0 – 60° C

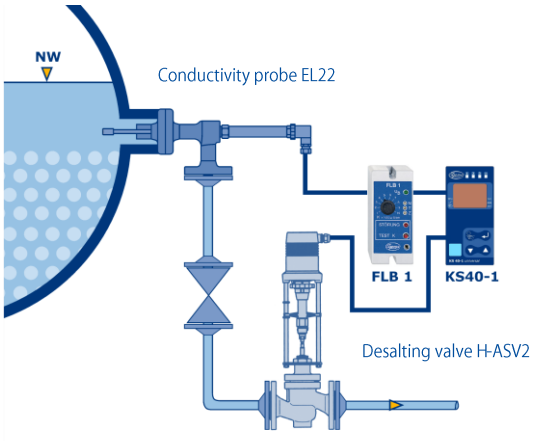
[1)] according to the German regulations VdTÜV-Wasserstand 100, 4.90
a protection of IP54 has to be maintained in the boiler area

Max. operating data of contacts		
Burner cut-off	Voltage	max. 250 Vac
	Current	max. 5 A ohmsch
Transmitter oputput	4-20mA	
Electrical conductivity of the liquid	0 µs/cm ≤ æ ≤ 10.000 µS/cm	
	0 µs/cm ≤ æ ≤ 1.000 µS/cm	
Adjustable limit value „K“ at 25° C	1.000 µs/cm ≤ æ ≤ 10.000 µS/cm	
	100 µs/cm ≤ æ ≤ 1.000 µS/cm	



Trimmer **N** for zero adjustment
Trimmer **T** for compensation of temperature
Trimmer **Z** for line constant
1 = conductivity range of liquid
2 = Jack ø 3,6 mm, for connection of measuring instrument for adjustment

Installation example

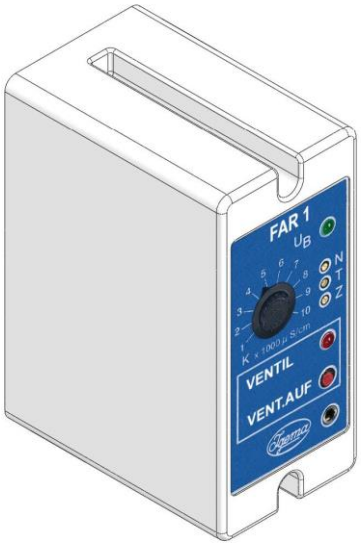


Desalting controller type FAR1

Application and function

The IGEMA liquid desalting controller type FAR1 is used for continuous desalting of liquids in connection with a valve.
A measuring cell that consists of a special conductivity probe and the cell wall (protection tube or block flange) detects the conductivity.

The product meets EC directive 2014/68/EU (PED).
Applied rules: corresponding DIN EN standards



Function FAR1

If there is a conducting liquid in the measuring cell, the supplying delta voltage drives a current through the liquid. The value of this current is proportional to the conductivity of the liquid in the measuring cell and is detected by the evaluating device where it is transformed into the interface 4 - 20 mA. At the same time, the current is transformed into a tension. This tension is amplified (depending on the position of the limit value regulator) or compared to a reference. If the result of this comparison ≥ to the reference, the relay becomes currentless and the contact "**VENTIL**" (valve) switches to the position "100%" (fully opened).
The LED "**VENTIL**" lights up. If the conductivity of the liquid falls beneath 78% of the adjusted limit value, the relay is activated again. The contact "**VENTIL**" takes the position "**BETRIEB**" (Operation) and the LED "**VENTIL**" goes out. This function can be checked by pressing and holding the key "**VENTIL AUF**" (valve open).
In case of a malfunction of the system, e.g. power failure or short circuit, the evaluating device reacts as if the conductivity would exceed the limit value.
The LED "U_B" shows that the operating voltage is on.

Technical basic equipment

- FAR1 is delivered in a plastic plug-in housing for installation in control panels
- Fixation on standard rail 35 mm according to DIN EN 50022 or directly screwed to chassis plate

www.tuv.com TÜV TÜV Rheinland Group ID:0000006175

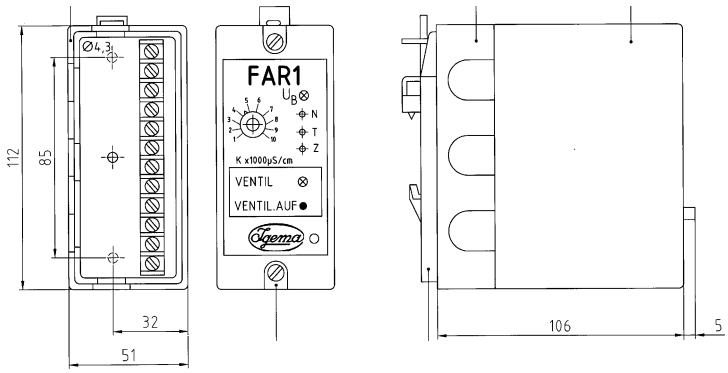
- **Baumuster geprüft**
- **Fertigung überwacht**

Technical data

Component mark	TÜV ID: 0000006175
Power supply	230V ± 15% / 50-60 Hz
Input	ca. 4,5 VA
Fuse	80 mA/T
Protection as per DIN EN 60529	IP40 [1)]
Allowable temperature	0 – 60° C

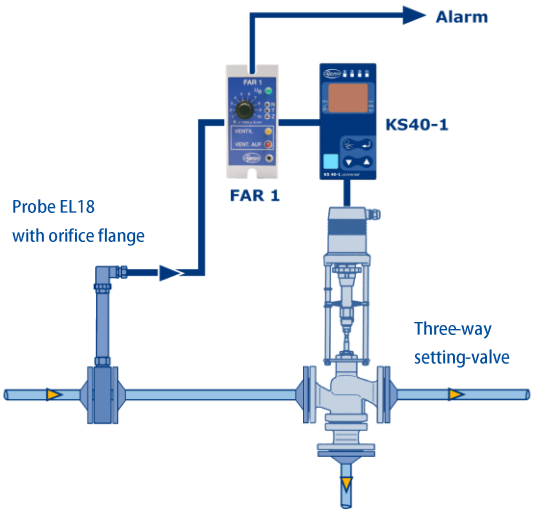
[1)] according to the German regulations VdTÜV-Wasserstand 100, 4.90
a protection of IP54 has to be maintained in the boiler area

Max. operating data of contacts	
Voltage	max. 250 Vac
Current	max. 5 A ohmsch
Transmitter oputput	4-20mA
Electrical conductivity of the liquid	0 µs/cm ≤ æ ≤ 10.000 µS/cm
	0 µs/cm ≤ æ ≤ 1.000 µS/cm
Adjustable limit value „K“ at 25° C	1.000 µs/cm ≤ æ ≤ 10.000 µS/cm
	100 µs/cm ≤ æ ≤ 1.000 µS/cm



Trimmer **N** for zero adjustment
Trimmer **T** for compensation of temperature
Trimmer **Z** for line constant
1 = conductivity range of liquid
2 = Jack ø 3,6 mm, for connection of measuring instrument for adjustment

Installation example



Universal controller type KS40-1

Application and function

The universal temperature controller KS40-1 are intended for universal, precise and cost-effectiv control tasks in all branches of industry. For this, the unit provides simple 2-point (on/off) control, continuous PID control, or 3-point stepping control. The process value signal is connected via a universal input. A supplementary analog input can be used for heating current measurement or as an external set-point input.
Every KS 40-1 has three process outputs that can be 3 relays or 2 relays plus a universal output. This universal output can be used for operating a solid-state relay, a continuous current/voltage output or to energize a two-wire transmitter.

Plug-in module
The KS 40-1 controller is built as plug-in module. This enables it to be replaced very quickly without tools, and without disturbing the wiring.

Self-tuning
During start-up, the self-tuning funktion determines the optimum settings for fast line-out without overshoot.
With three-point controller configuration, the “cooling” parameters are determined separately, thus ensuring an optimum match to the process.

Display and operation
Clear informations are given by ten indicator LED’s in the front panel that display operating mode, I/O states,
and errors. The auto/manual key switches the controller into the manual mode directly, without lengthy ope-
rating sequences. If required, the direct switch over can be disabled or the key can be configured e.g. to start
the internal timer. This results in a level of operational safety that is usually found only in controllers of a higher
price category.

Front interface and Engineering Tools
Control parameter adjustment in seconds has now also been implemented in the KS 40 class of instruments.
Via BlueControl software incl. its simulation functions, and especially the convenient BluePort front panel interface,
the required set-up for a specific control task can be determined without a detailed study of the operating instructions.
Off cause almost all adjustments can be done comfortably over the instrument front. (see page 3)

Password protection
If required, access to the various operating levels can be protected with a password. Similarly, access to a complete
level can be blocked.

Technical data

Inputs

Survey of the inputs

Input	Used for
INP1	X (process values)
INP2	Heating current, ext. set-point
di1	Operation disabled, switch-over to second set-point SP.2, external set-point SP.E fixed output signal Y2, manual operation, controller off, disabled auto/manual key, reset stored alarms, timer steárt (complete with Y2)
di2 (option)	
di3 (option	

Process value input INP1	
Resolution	>14 Bit
Decimal point	0 to 3 decimals
Digital input filter	adjustable 0,000···9999s
Scanning cycle	100 ms
Measured value correction	2-point or offset correction
Thermocuples (table 1)	
Eingangswiderstand	≥ 1MΩ
Effect of source resistance	1 µV/Ω
Cold junction compensation	
Max. additional error	± 0,5K
Sensor break monitoring	
Sensor current	≤ 1µA
Operating sense configurable	→ (Page 5)
Resistance thermometer	
Connection	3-wire
Lead resistance	max. 30Ω
Input circuit monitor	Break and short circuit
Resistance measuring range	
The blue control software can be used to match the input to the sensor KTY 11-6 (characteristic is stored in the controller)	
Physical measuring range	0 up to 4500 Ω
Linearization segments	16

Table 1

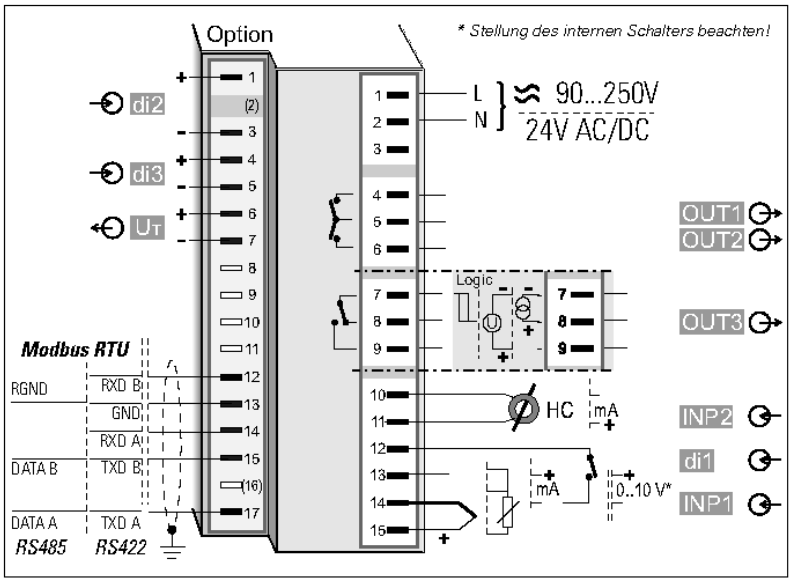
Thermocuple		Range		Accuracy	Resolution (ø)
L	Fe-CuNi (DIN)	-100 .. 900° C	-148..1652° F	≤ 2K	0,1 K
J	Fe-CuNi	-100 .. 1200° C	-148 .. 2192° F	≤ 2K	0,1 K
K	NiCr-Ni	-100 .. 1350° C	-148 .. 2462° F	≤ 2K	0,2 K
N	Nicrosil/Nisil	-100 .. 1300° C	-148 .. 2372° F	≤ 2K	0,2 K
S	PtRh-Pt 10%	0 .. 1760° C	32 .. 3200° F	≤ 2K	0,2 K
R	PtRh-Pt 13%	0 .. 1760° C	32 .. 3200° F	≤ 2K	0,2 K
	Special	-25 .. 75mV		≤ 0,1%	0,01%

Table 2 Resistance transducer

Type	Sensor current	Range		Accuracy	Resolution (ø)
Pt100	0,2mA	-200 .. 100 (150)° C	-328 .. 212 (302)° F	≤ 1K	0,1 K
Pt100		-200 .. 850° C	-328 .. 1562° F		
Pt1000		-200 .. 850° C	-328 .. 1562° F	≤ 2K	0,1 K
Resitance		4500 Ω		≤ 0,1%	0,01%

Table 3 Current and voltage

Range	Input resistance	Accuracy	Resolution (ø)
0 – 10V	~ 110kΩ	≤ 0,1%	0,6mV
0 – 20mA	49 Ω (voltage requirement ≤ 2,5V)	≤ 0,1%	1,5µA



Current and voltage signals

Span start, end of span	anywhere within the measuring range
Scaling	selectable –1999 .. 9999
Linearization	16 segments, adaptable with BlueControl
Decimal point	adjustable
Input circuit monitor	**12,5% below span start (2mA, 1V)**

Supplemetary INP2

Resolution	>14 Bit
Scanning cycle	100ms
Accuracy	better than 0,4%

Heating current measurement	
Measuring range	0 .. 50mA AC
Scaling	selectable1999 ..9999A

Current measuring range

Input resistance	approx. 120Ω
Scan:	configurable within 0 – 20mA
Scaling	selectable -1999 .. 9999
Input circuit monitor	12,5% below span start (4 .. 20mA → 2mA)

Control input DI1

Configurable as direct or invers switch or push-button Connection of a potential-free contact suitable for switching „dry“ circuits	
Switched voltage	2,5V
Switched current	50µA

Control inputs DI2, DI3 (Option)

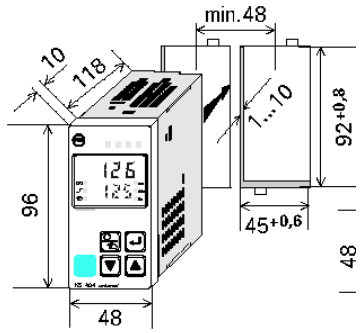
Configurable as switch or push-button! Octocoupler input for active triggering	
Nominal voltage	24Vdc external
Current sink (IEC 1131 Type 1)	
Logic „0“	-3 .. 5V
Logic „1“	15 .. 30V
Current requirement	approx. 5mA

Transmitter supply U_T (Option)

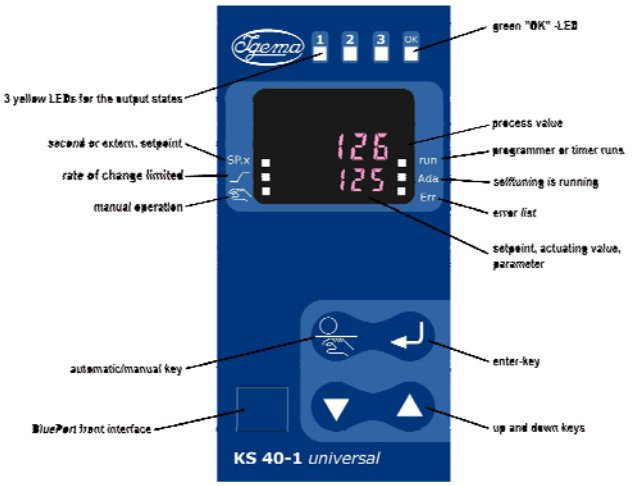
Output	22mA/~ 18V

If the universal output OUT3 is used there may be no external galvanic connection between measuring and output circuits

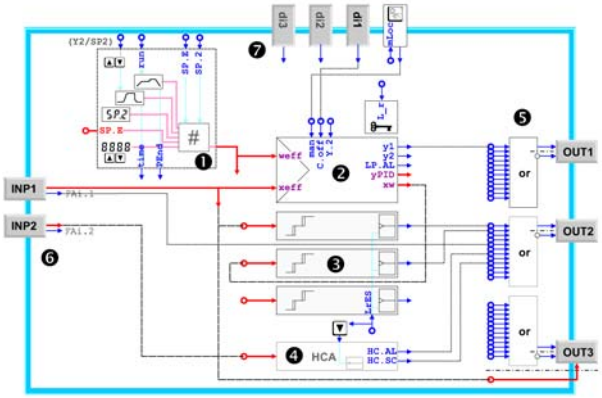
Dimensions



Display and operating



Example of the linkage of the internal functions



❶ setpoint processing with programmer and timer
❷ controller function with loop monitoring
❸ limit monitoring, configurable with latch and suppression
❹ heating current monitoring
❺ output processing with logic or-combination and inverting
❻ analog inputs with logical sensor fail signal
❼ digital inputs and -key with lock function

Outputs

Survey of the outputs

Output	Used for
OUT1 OUT2 (Relay)	Control output heating/cooling or Open/Close, limit contacts, alarms, timer or programmer End
OUT3 (Relay or logic)	as OUT1 and OUT2
OUT3 (continuous)	Control output, process value, set-point, control deviation, transmitter supply
* All logic signal can be OR-linked!	

Relay output OUT1, OUT2

Contacts	2 NO contacts with common connection
Max. contact rating	500VA, 250V, 2A bei 48 .. 62Hz resistive load
Min. contact rating	6V, 1mA DC
Duty cycle electric	for I = 1A/2A: ~ 800.00/500.00 (at ~ 250V resitive load)

OUT3 used as relay output

Contacts	Potential-free change over contact
Max. contact rating	500VA, 250V, 2A bei 48 .. 62Hz, resistive load
Min. contact rating	5V, 10mA AC/DC
Duty cycle electric	for I ≥ 1A/2A: ~ 1.000.000/600.000 (at 250V resistive load)

OUT3 as universal output

Galvanically isolated from the inputs	
Freely scalable	
Resolution	11 Bit
DA-converter limiting frequency T90	50ms
Limiting frequency of the complete continuous controller	> 2Hz

Current output

0/4 .. 20mA configurable	
Signal range	0 .. approx. 21,5 mA
Load	≤ 500 Ω
Load effect	0,02% / 100 Ω
Resolution	≤ 22 µA (01%)
Error	≤ 40 µA (0,2%)

Voltage output

0/2 .. 10V configurable	
Signal range	0 .. 11V
Load	≥ 2 kΩ
Load effect	kein Einfluss
Resolution	≤ 11mV (0,1%)
Error	≤ 20mV (0,2%)

OUT3 used as transmitter supply

Output	22mA / ≤ 13V

OUT3 used as logic output

Load <= 500Ω	0 / ≤ 20mA
Load > 500 Ω	0 / > 13V

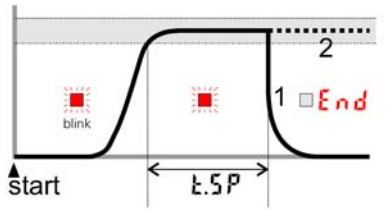
Note:
If the relays OUT1 ⋯ OUT3 operate external contactors, these must be fitted with RC snubber circuits to manufacturer specifications to prvent excessive switch-off voltage peaks

Galvanic isolations:

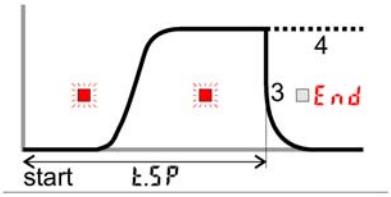
Safety isolation
Functional isolation

Mains supply	Process value input INP1 Supplementary input INP2 Digital input di1
Relay outputs OUT1,2	RS 422/485 interface
Relay output OUT3	Digital inputs di2, 3
	Universal output OUT3
	Transmitter supply UT

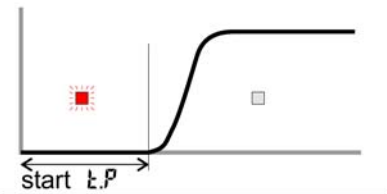
Timer modes 1 and 2



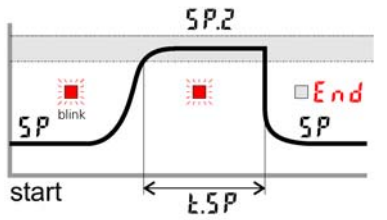
Timer modes 3 and 4



Timer mode 5



Timer mode 6



Control behavier

- Signaler with adjustable switching differential (ON/OFF-controller)
- PID-controller (2-point and continuous)
- Delta/Star/Off or 2-point controller with switch over from partial to full load
- 2xPID (heating/cooling, 3-point and continuous)
- 3-point stepping controller

Self tuning control parameters or adjustable manually via front keys or BlueControl software.

Set-point functions

- Adjustable set-point gradient 0,01 ... 9999° C/min
- Set-point control
- Set-point/cascade control
- Program controller with 4 segments (Set-point/section time)
- Timer

Timer

Time t.SP adjustable 0,1 .. 9999 min

Timer Start

- Mains on
- Control input
- □-key (complies with. Y.2 switch over)
- Direct adjustment of running time

Behavier with sensor break or short circuit

- Control outputs switched off
- Switch-over to a safe output value
- Switch-over to mean output value (PID-controller)

Limit signalling functions

MAX, MIN or MAX+MIN monitoring with adjustable hysteresis

Signals which can be monitored

- Process value
- Control deviation
- Control deviation with suppression during start-up or set-point changes
- Effective set-point
- Output signal Y

Functions

- Input signal monitoring
- Input signal monitoringn with latch (reset via front key or digital input)

Several limit signals or alarms can be OR-linked before being output.
Applications: Release of brake with motor actuators, general alarms, etc.

Alarms

Heating current alarm

- Overload and short circuit
- Open circuit and short circuit

Limit value adjustable 0 .. 9999A

Control loop alarm

Automatic detection if there is no response of the process to a change of output value.

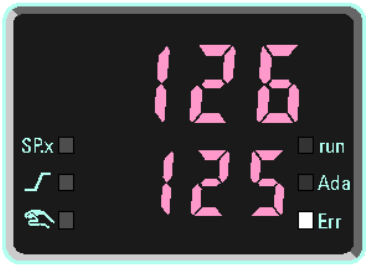
Sensor break or short circuit
Dependimng on selected input type, the input signal is monitored for break and short circuit.

Maintenance manager

Display of error signals, warnings,and latched limit messages in the error list. Signals are latched, and can be reset manually.

Possible signals in the error list

Sensor break,, short circuit, reversed polarity
Heating current alarm
Control loop alarm
Faul during self-tuning
Latched limit messages
e.g. re-calibration warning
(If the adjusted operating hours are exeeded a message is displayed)
e.g. maintenance interval of actuator
(If the adjusted switching cycles are exeeded a message is displayed)
Internal fault (RAM, EEPROM, ..)
Maintenance manager: Flashing error active alarm in the error list



Operating and display

	KS40-1
Process value	10,5 mm LED
Lower display	7,8 mm LED

Power supply
Depending on version
AC supply

Voltage	90 .. 260 VAC
Frequency	18 .. 62Hz
Power consump.	approx. 7VA(W)

Universal supply24 V UC

AC voltage	20,4 .. 16,4V AC
Frequency	48 .. 62Hz
DC voltage	18 .. 31V DC
Power consumpt.	approx. 7VA(W)

Behavier with power failure
Configuration, parameters and adjustable set-points control mode:
Non-volatile storage in EEPROM
BluePort ® front interface
Connection of PC via PC adapter (see accessories)
The BlueControl software is used to configure, set parameters and operate the KS40-1
Bus interface (option)

Galvanically isolated	
Physical	RS 422/485
Protocl	Modbus RTU
Transmission speed	2400, 4800, 9600 19.200 Bit/s
Address range	1 .. 247
Number of controller per bus	32
Repeaters must be used to connect more controller	

Enviromental conditions

Protection	
Front panel	IP65
Housing	IP20
Terminals	IP00

Aloowable temperatures	
For specified accur	0 .. 60° C
Warm-up time	< 15 minutes
Temperature effect	< 100 ppm/K
For operation	-20 .. +65° C
For storage	-40 .. +70° C

Humidity:
75% yearly average, no condensation

Shock and vibration

Vibration test Fc (DIN 68-2-6)	
Frequency	10 .. 150Hz
Unit in operation	1g resp.. 0,075 mm
Unit not in operat.	2g resp.0,15 mm

Shock test Ea 68-2-2-7)	
Shock	1 5g
Duration	11ms

Electromagnetic compatibility
Complies with EN 61326-1

- Complies with the immunity requirements for continuous, unattended operation
- Complies with the emmission requirements class B for rural areas
- Surge disturbances may increase the measurement error

General

Housing	
Material	Makrolon 9415 flame-retardent
Flammability class	ULK94 VO, self-extinguishing
Plug-in module	inserted from front

Safety test
Complies with EN 611010-1 (VDE 0411-1)
Over voltage category II
Contamination class 2
Working voltage range 300V AC
Protection class II

Certifications

Type test to DIN 3440
With the certified sensors it can be used in:

- Heat generating plants with outflow temperature up to 120° C to DIN 4751
- Hot-water plants with outflow temperatures above 110° C to DIN 4752
- Thermal transfer plants with organic transfer media to DIN 4754
- Oil-heated plants to DIN 4755

cUL-certification
(Type 4x, indoor use)
File: E 208286

Electrical connection
Depending on version

- Flat-pin connectors 1 x 6,3 mm or 2 x 2,8 mm to DIN 46244
- Screw terminals for conductor cross-section from 0,5 to 2,5 mm²

Mounting
Panel mounting with two fixing clamps at top/bottom or left/right
Close mounting possible

Mounting position: not critical
Weight : 0,27 kg

Accessories supplid with unit:
Operating instruction
2 fixing clamps

Accessorie equipment

Bluecontrol (Engineering Tool)
PC-based programfor configuring, setting parameters and operating (commissioning) the KS40-1 controller. Moreover, all settings are saved and can be printed on demand. Depending on version a powerful data acquisition module is available, complete with trend graphics.

Simulation

The built-in simulation serves to test the controller settings, but can also be used for general training and observing the interaction between controller and control loop.

Software requirements

Windows 95/98/NT/2000.

Configurations that can only be implemented via the BlueControl software (not via the front-panel keys):

- Customer-specific linearizations
- Enable „forcing" for inputs/outputs. Forcing allows to write the analog and digital inputs and outputs via Modbus interface.
- Adjustment of limits for operating hours and switching cycles
- Switch-over to 60 Hz mains frequency
- Disable operator actions and operating levels, plus password definition
- Prevent automatic optimization of cycle times T1, T2

Hardware requirements

A PC-adapter (→"Accessories") is required for connecting the controller.

LED-Indicating instrument type LB16

Application and function

Indication of continuous measurement (current signal 4-20mA) of a production process as

- filling height
- flow rate and filling quantity
- pH-values
- etc.

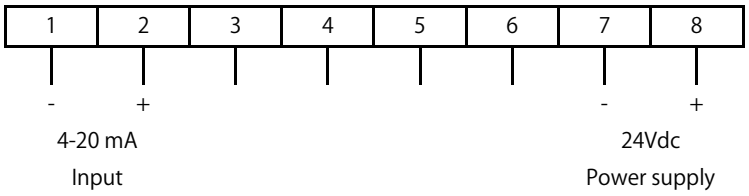
by vertically arrangend LED's.

It is used where a short overview about the relevant data of a production process is sufficient. The change from red to green allows a quick optical detection of the measured value and thus rapid possibility to react.

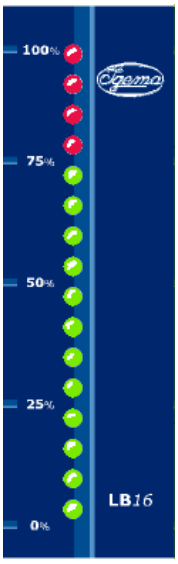
Technical data

Supply voltage		24Vdc
Power input		7,5 VA
Measurent input	Measuring range	4-20 mA
	Input resistance	~ 100 Ω
Housing	Design	Control panle case according to DIN 43700/IEC 61554
	Material	Glass fibre reinforced Noryl SE1 GFN2
	Dimensions (B x H x T)	48 x 144 x 116,5 mm
	Installation detail	45 x 138 mm
	Connection	Terminal connection: max. 2,5 mm^2 (on backside)
Protection	Front	IP40
	Backside	IP00
Weight		0,3 kg
Allowable ambient temperature		0 up to +55° C
Indication	Display red/green LED-indication (16 points)	

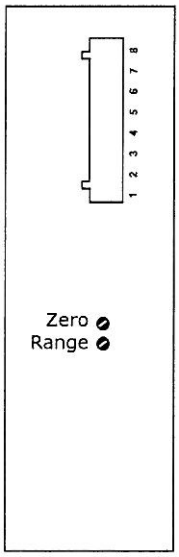
Wiring diagram



Settings



Front view LB16



Rear view LB16

1. Connect indicating instrument (LED) according to the wiring diagram and switch on supply voltage
2. Setting of indicating value: on the back side of the case there are 2 pontentiometers. By means of these potentiometers the zero point (potentiometer „Zero“) and the final value (potentiometer „Range“) can be set
3. Set requested input current on terminal 1 and 2 and adjust the neccessary indicating value with the setting potentiometers

Standpipe and nozzels type AG-08x

Application and function

The standpipe according to Fig. 1 and the nozzles acc. Fig. 2 to Fig. 4 are planned acc. to TRD/EN as well as Wasserstand 100. They belong to the water level controllers and limiters with component mark.

Shutoff and drain installations have to be provided in connection with the standpipes acc. to fig. 1 for a boiler operation acc. to TRD (see leaflets of group 9).

Technical basic equipment

- Process connection M1: flanges DN 100 as per DIN
- Process connection M2: flanges as per DIN
- Material according as per DIN:
- Flanges 1.0460, tubes 1.0305 or 1.5415 (depending on pressure stage)

Available (optional) version

- Material according to ASME
- Process connection: welding end, Socket Welding

Technical data

PS [bar]	DN / process connection		DIN	contact face DIN
	M1	M2		
32	50/100	20	2635	2526 Form C
50		25	2637	
80				
100			2638	2526 Form E
160			2628	
200			2629	

Dimensions

Fig. 1

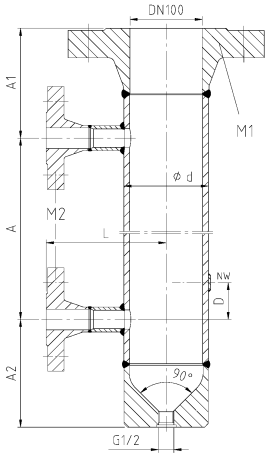


Fig. 2

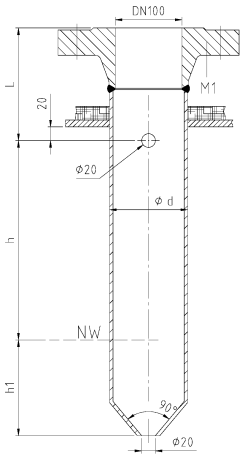


Fig. 3

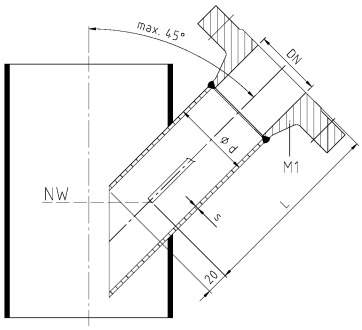


Fig. 4

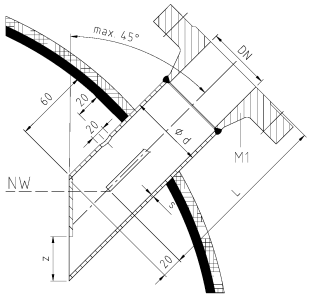


Fig.	PS [bar]	DN	ø d	L	D	A1	A2	h1 (Fig.2
1-4	13	50	60,3	115	15	85	100	80
	20							
	32							
	50			130		100		
	80					105		
	100					112		
	160			140		132		
	200			160		145		
	13	100	114,3	140	15	100	150	
	20					115		
	32							
	50			160		140		
	80					155		
	100					165		
	160		127			185		
	200		133	180		210		

Flanges and fixing elements

for probes

Application and function

The following flanges, gaskets, screws and nuts are planned according to the technical rules for steam boilers (TRD) and checked by the Association for Technical Inspection (TÜV).
They serves as fixation for probes on the boiler.

Technical data

PS [bar]	DN	DIN	Contact face	Form	Tapped hole acc. to fig.	Material	Sealing as per DIN	Material
32	50	2635	DIN 2526	B	1, 2 or 8	1.0460	EN 1514-1 IBC	Asbestos free
50		2636		E	1		2697	RSt 37-2/0,5 Graphit
80 / 100		2638						
200		2628						
32	100	2635		B	1 up to 7		EN 1514-1 IBC	Asbestos free
50		2636		E	1, 3 up to 5		2697	RSt 37-2/0,5 Graphit
80 / 100		2638						
160		2628						
200		2629						

PS [bar]	DN	Screw				Nut			
32	50	DIN	Qty	Dimension	Material	DIN	Qty	Dimension	Material
50		976	4	M16x75	1.7709	EN 24032	8	M16	1.7258
80 / 100				M20x100				M20	
160		2510	8	M24x110		2510	16	M24	
32	100	976	8	M20x90	1.7709	EN 24032	16	M20	1.7258
50				M24x110				M24	
80 / 100		2510		LM27x145		2510		NFM27	
160				LM30x190				NFM30	
200				LM33x220				NFM33	

Fig. 1

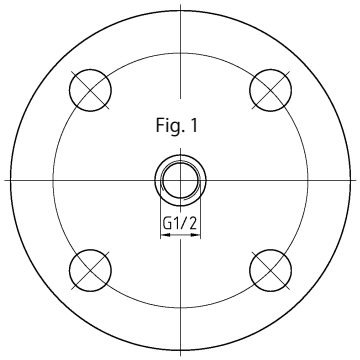


Fig. 2

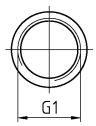


Fig. 3

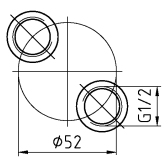


Fig. 4

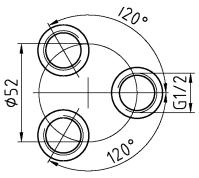


Fig. 5

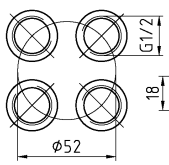


Fig. 6

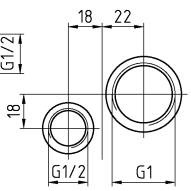


Fig. 7

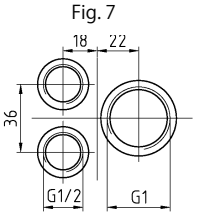


Fig. 8