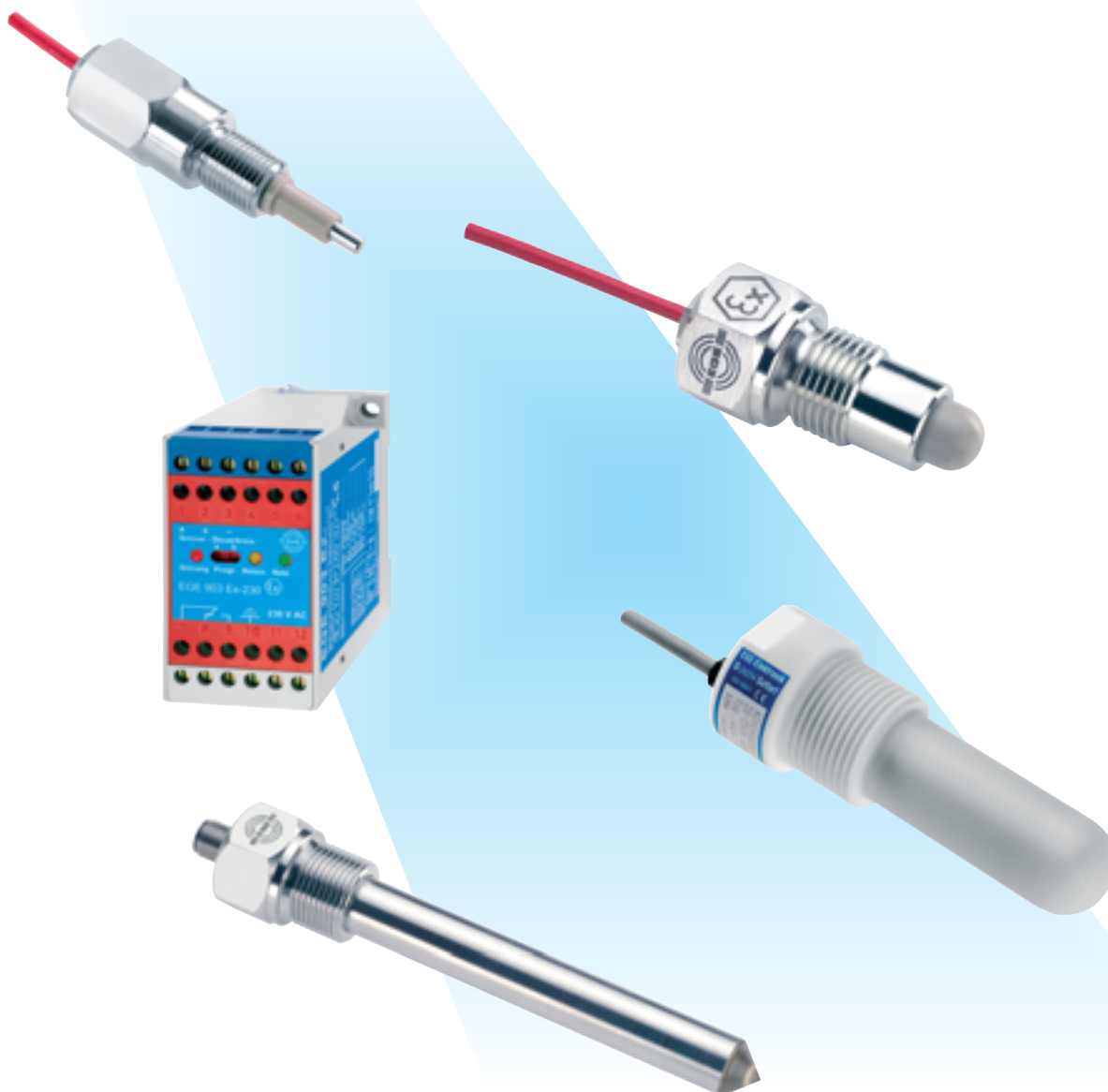


# Special-Sensors for Automation



## Level Control

2008/2009

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We reserve the right to make technical alterations without prior notice.

# LEVEL CONTROL

## Application notes



### Capacitive sensors

The operation of these level sensors is based on a dielectric measuring method. All media which are surround the sensors measuring electrode, built into the tip of the probe, change the state of dielectric balance between the measuring electrode and the surrounding space. This disturbance in the balance triggers a switching command inside the device. The balance can be adjusted with a built-in potentiometer so that materials with different bulk densities and correspondingly different dielectric constants can be measured optimally. Metallic or metal clad vessels should be earthed. In the case of plastic vessels filled with electrically conductive materials, the latter should be earthed. In the case of plastic vessels filled with non-conducting materials, an earthed metal band applied on the outside of the vessel may be used as a counter-electrode.

### Medium adjustment for capacitive sensors

Level sensors are set in such a way that they switch upon contact with a medium. The medium adjustment should, if possible, take place without removal under operating conditions. If the built-in part of the sensor can be completely submerged or covered during operation, the adjustment must also take place in this state. If only medium contact is possible, the adjustment takes place upon contact. The trimmer potentiometer is protected by a plastic bolt. This bolt must be removed before the desired sensitivity is set. Turning it clockwise increases the response sensitivity. The adjustment potentiometer is turned until the switch output switches through (normally-open contact). You achieve switching point safety by continuing to turn the potentiometer half a turn to one turn. Devices with a LED line are adjusted to two green LEDs. If the medium adjustment has taken place, the plastic bolt must be fixed again.

Electrically conductive media are difficult to monitor using capacitive level controllers. For this task, a microwave compact device (Series MFC, page 2.08) is considerably better suited.

### Laboratory adjustment

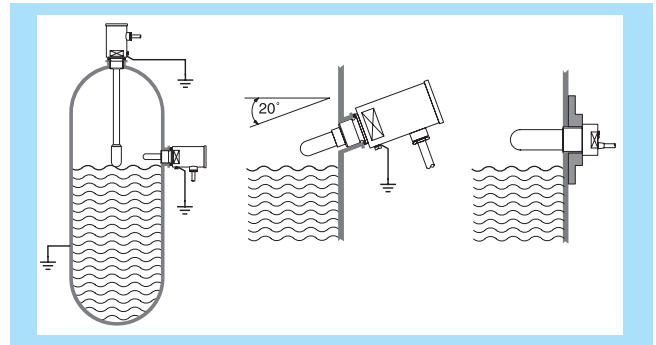
If adjustment cannot be carried out with the sensor mounted in operating position, it can be performed upon a similar vessel. It must, however, be made sure that this vessel is set upon an earthed metal plate, or that the liquid within the vessel is earthed by means of an introduced wire. The minimum height and minimum diameter of the experimental vessel should be about 10 cm.

If setting is correct, the filling level monitor reacts correctly if 50% of the electrode diameter is covered. When mounted vertically, sensors reacts upon contact with the medium. Reaction time lag is less than 0.25 sec.

### Installation

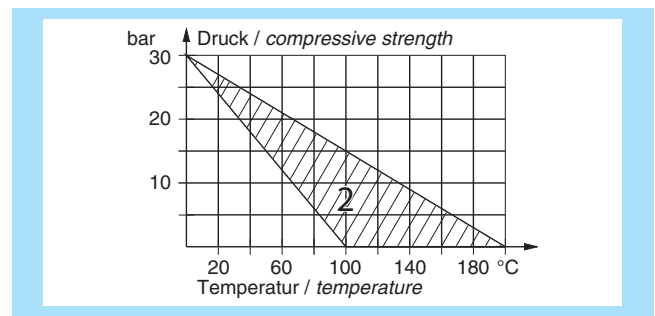
At the side installation of capacitive sensors we prefer to put the sensor tip on an angle of 20 degree to protect sedimentation.

The sensor should be protected against damages by side power effects for example by blungers.



### Sealings

The sealings used for our sensors are made of PTFE, NBR, FPM or AFM. For water applications with water temperatures up to 150 °C and with pressures less than 5 bar, EDPM O-rings must be used. If the temperatures exceed 100 °C or the pressures are higher special sealings are necessary (2). When ordering sensors for such applications, such special sealings must be ordered too.



### Threads

The threads of the sensors in this prospectus are manufactured to DIN ISO 228-1, tolerance class B. They are designated with (") or (G).

If it is necessary to combine different threads, e.g. the sensor-thread made to DIN ISO 228-1 and an inner thread made to DIN ISO 229, such inner thread must be widened by a thread drill.

### Sensors for explosion hazardous areas

Fill level monitors for use in zone 0 or zone 20 are operated with the associated amplifiers listed in the respective connection chart. The analysis devices are always operated outside of the Ex area. Sensors of the series KGFT...Ex are used in conjunction with an intermediate amplifier, which is approved for installation in zone 1. Optical Ex sensors URFG-Ex can also be driven with the amplifier SF3 for application in zone 1.

### Opto-sensors UF../UR..

Optical sensors react to a change of the refraction index within the proximity of the sensor tip when being immersed into fluid. The sensor does not have to be adjusted. In rare cases, the container wall or particles within the fluid may reflect the light emitted by the sensor and thus interfere with the fluid detection. A trial run is recommended in such instances. The sensors are designed to be used with the respectively listed fluids under normal conditions. The chemical compatibility and technical suitability of the sensor should be tested when used with unlisted fluids.

### Resistance UFGS..., UFGS...Ex, URFG...Ex

Water / water steam	Monoethylenglycole
Vegetable oil	Glyceric
Diluted acids	Acetone
Diluted bases	Fuels
Ethyl alcohol	Benzol
Methyl alcohol	Diesel
Isopropanol	Motor oil
Isohexan	Hydraulic oil
n-Heptan	Paraffin oil DAB

## Glossary

### Switching Point

Capacitative level sensors react to conductive materials and non-conductive materials with a dielectrical constant  $\epsilon > 1$ . The switching point depends on the material.

When the sensor-tip is immersed in a fluid, a switching command inside the device is triggered. This trigger is set between contact with the liquid and some mm more into the liquid. This distance between the tip of the sensor and the trigger is the nominal switching point. The immersion-distance has a negative sign, e. g. -8 mm.

The following table lists the approximate values for the material dependent reduction factors. In practical applications there could be variations, because of the mounting conditions, for example.

Material	$\epsilon$	Sensitivity in % (approx.)
Steel ST 37	Conductive	100
Saltwater	80	100
Marble	8	65
Porcelain	4-5	50
PE	2.3	10
Oil	2.2	10
Wood	2-7	10-60

The water content of an object or a liquid has a decisive influence on the switching point. A high humidity content increases the switching point considerably.

If the sensor is moistened with conductive materials, its function can be impaired when a conductive film builds up that electrically connects the sensor electrode with a metallic conducting side.

### Switching point $s_p$

The switching point or rated operating distance is a device parameter that does not take into account sample variances and external influences such as temperature and supply voltages. Optical sensors are switching by immersing the tip. When the sensor tip is immersed in a fluid, the switching point has a negative sign.

### Effective operating distance $s_r$

The effective operating distance is the operating switching point at nominal voltage and at nominal temperature of 23 °C. It is between 90% and 110% of the rated operating distance.

### Usable operating distance $s_u$

The usable operating point is in the entire allowable temperature and voltage range is between 80% and 120% of the effective operating distance.

### Assured operating distance $s_a$

The assured operating point takes into account all the external influences, sample and media variances and is in the range from 0% to 72% of the rated operating distance point. Within this range a guaranteed switching is ensured.

### Switching point drift

The operating distances are given for an ambient temperature of 23 °C. In the permissible temperature range the switching point varies by less than 15% from the value at 23 °C. The temperature of the measured object has no influence on the switch point.

### Hysteresis $H$

The switching hysteresis describes the distance between the turn on point while immersing in the liquid and the turn off point during the separation of it from the sensor. The hysteresis brings about a stable switching signal even when there are vibrations, temperature drift, or electrical failures. The hysteresis is defined according to EN60947-5-2 to be a maximum 20% from the real switching point, and carries a value of typically 10% from the real switching distance  $s_r$  for EGE sensors.

### Repeating accuracy $R$

The repeating accuracy describes the maintenance of the switching point after the repeated immersing in the liquid under specified circumstances. EGE sensors have typical tolerances of less than 3% of the effective operating point.

### Switching frequency

The maximum switching frequency of the sensor is determined at nominal switching point  $S_p$  when immersing in the water.

### Supply voltage

The operating voltage is the voltage range in which EGE sensors function safely. For a constant voltage supply it is important to make sure that the limits are still observed when the residual ripple is included.

### Switching current

This current gives the maximum long-term current for the switching output of the sensor at an ambient temperature of 25 °C and ohmic load. At an elevated ambient temperature, the current load capability decreases.

For analog outputs, the boundary values given in the appropriate technical data, and particularly the permissible values for resistance loads, must be observed.

### Short circuit protection

The short circuit proof ensures the sensor against destruction through a short circuit on the output. After removal of the fault, the output is reactivated. Where a maximum overload current is listed, this should not be exceeded.

### Overcurrent release

This value indicates the median value of current at which the short circuit protection responds with a tolerance of  $\pm 20\%$ .

### Reverse polarity protection

The reverse polarity protection prevents destruction of the sensor by a reversal of the polarity of the voltage supply.

### Voltage drop $U_d$

The voltage drop arises in the semiconductor elements of the sensor. It is measured on the active output.

### Residual current $I_r$

The residual current flows in the load current circuit when the output is blocked. The residual current must be considered when switching sensors in parallel.

### Minimum load current $I_m$

The minimum load current is necessary for flawless operation with two-wire devices.

### Current consumption

The current consumption is the maximum value of the no-load current  $I_0$  that the sensor can absorb without a load.

### Ambient temperature

The ambient temperature indicates the maximum allowable temperature range for the sensor.

### Electromagnetic compatibility EMC

The EMC class is a measure of the noise immunity of the sensor against external electrical and magnetic influences. The information is based on the standard EN 61000-6-2.

### Switch-on impulse suppression

EGE sensors have a switch-on impulse suppression that blocks the output during the switch-on phase, when the operational voltage is applied.

### Protection

The protective system indicates the protection of the sensors against penetration of foreign bodies and water according to EN 60529.

### LED-Display

EGE sensors with yellow light-emitting diodes indicate the switching status optically.

### Housing material

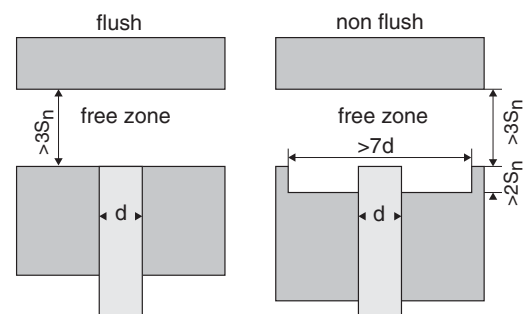
The housing material determines the chemical resistance of the sensor against external influences. For special applications, other housing materials are available.

### Connection

The connection of the sensors is accomplished through plug-in connections or cables. Different cable types and lengths are available upon request.

## Instructions for mounting

For flush mounting, the sensor can be built into influencing material up to its active surface without changing its characteristics. For non-flush mounting, a metal-free zone around the sensor must be allowed for. A free zone to the material opposite the sensor must be maintained for all sensors.



The indicated free zones are in accordance with the standard EN 60947-5-2.



### Collocation

When collocating the sensors, a minimum separation must be kept between the devices in order to avoid mutual influence. When in doubt, a test should be conducted under application conditions. For capacitive sensors, the lateral separation from one another must correspond to at least twice the diameter of the sensor. For separations greater than eight times the diameter no mutual influence is to be expected. For oppositely mounted sensors, a minimal separation of eight times the nominal switching separation should be allowed for.

### Torques

In order to prevent destruction of the threaded bushing during fitting, the following maximum torques must not be exceeded:

Design	Metal housing	Plastic housing
M12x1	10 Nm	1 Nm
M18x1	25 Nm	2 Nm
M30x1.5	40 Nm	5 Nm

PTFE sensors may only be tightened by hand.

## Instructions for operation

### Serial connection

For the serial connection of two wire or three wire sensors the individual voltage drops are added together. Therefore there is a lesser operational voltage at the disposal of the load. The addition of the switch-on delay times should be noted.

### Parallel connection

The parallel connection of two wire sensors can only be conditionally recommended since the residual currents are added together and flow through the load. For the parallel connection of three wire sensors, the current consumption of the individual devices is added together. Since this current does not flow through the load, the maximum number of parallel connectable three wire sensors depends only on the power supply.

## Approval for safety applications

Sensors for personal security must have a qualification approval according to EN 954-1 and must be labeled accordingly. Sensors that are not labeled must not be used for applications of this kind.

## Valid standards

- EN 60947-5-2  
Control units; low voltage control units, auxiliary switch, proximity switch
- EN 61000-6-4  
Electromagnetic compatibility (EMC)  
Interference emissions in the industrial area
- EN 61000-6-2  
Electromagnetic compatibility (EMC)  
Generic standards immunity for industrial environments
- EN 61000-4-2 (ESD)  
Electrostatic discharging immunity
- EN 61000-4-3 (HF radiated)  
Radiated radio-frequency electromagnetic field immunity test
- EN 61000-4-4 (Burst)  
Electrical fast transient/burst immunity test
- EN 61000-4-5 (Surge)  
Surge immunity test
- EN 60529  
Protective systems, IP-designation
- EN 60079-0  
Electrical apparatus for potentially explosive atmospheres  
– General requirements
- EN 60079-11  
Electrical apparatus for potentially explosive atmospheres  
– Intrinsic safety "i"
- EN 50281  
Electrical apparatus for use in the presence of combustible dust

## Authorisations

TÜV-cert Zertifizierungsstelle - Deutschland  
(technical monitoring certification agency - Germany)

## Certification

- TÜV-cert      ISO 9001
- TÜV-cert      Quality control production  
Attachment IV of the EC-Guidelines 94/9/EG
- TÜV Nord      Re-cancelling certificate according to EN 10204

Color code: BK = black    BN = brown    BU = blue    GN = green    YE = yellow    GY = grey    PK = pink    WH = white



***Compact sensors***  
***Special sensors***

# LEVEL CONTROLLER

## Microwave-Compact



Series MFC

G3/4 thread

DC 16...30 V

Sensor length up to 1000 mm



Design	DC PNP • G3/4	
Dimensions		
Switching point sp	[mm]	-6
Switching output		
ID-No.	P21188...	
Typ-sensor length L	MFC 075 GSP-Lxxx	
Supply voltage	[V]	16...30 DC
Switching current	[mA]	200
Short circuit proof	•	
Overcurrent release	[mA]	250
Reverse protection	•	
Voltage drop	[V]	2
Current consumption	[mA]	50
Switching frequency	[Hz]	approx. 5
Ambient temperature	[°C]	-20...+85
Sensitivity*	[ε <sub>r</sub> ]	pre-selectable
Protection	[EN 60529]	IP 67
LED display	•	
Housing material	AISI 316 Ti / PTFE	
Sealing material	NBR, different materials on request	
Compressive strength	[bar]	16
Connection	M12 connector	
Adjustment notice ε <sub>r</sub> :	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p><b>* Sensitivity</b></p> <p>○ green : ε<sub>r</sub> ≥ 60</p> <p>○○ green : ε<sub>r</sub> ≥ 25</p> <p>○○○ green : ε<sub>r</sub> ≥ 4</p> <p>○○○○ green : ε<sub>r</sub> ≥ 1.7</p> </div>	
Accessories	Connecting cable SLG 3... SLW 3..., see page 2.38	

### Sensor length

The total length L of the sensors is specified by appending „Lxxx“ to the type.

xxx: length in mm

Preferred excess lengths	ID-No.
120 mm: L120	P21188012
200 mm: L200	P21188020
400 mm: L400	P21188040



# LEVEL CONTROLLER

## Microwave-Compact



**Series MFK**  
**G3/4 thread**

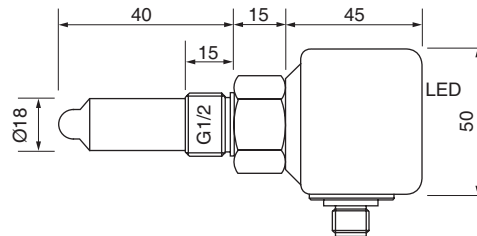
**DC 16...30 V**

**Sensor length up to 40 mm**

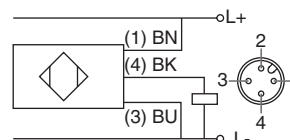


**Design** **DC PNP • G1/2**

**Dimensions**



Switching point sp [mm]	-6
Switching output	
ID-No.	<b>P21193</b>
Type	<b>MFK 50 GSP</b>
Supply voltage [V]	<b>16...30 DC</b>
Switching current [mA]	<b>200</b>
Short circuit proof	•
Overcurrent release [mA]	<b>250</b>
Reverse protection	•
Voltage drop [V]	<b>2</b>
Current consumption [mA]	<b>40</b>
Switching frequency [Hz]	<b>approx. 5</b>
Ambient temperature [°C]	<b>-20...+85</b>
Sensitivity [εr]	<b>&gt; 10</b>
Protection [EN 60529]	<b>IP 67</b>
LED display	•
Housing material	<b>PBT / AISI 316 Ti (A4) / PTFE</b>
Sealing material	<b>NBR, different materials on request</b>
Compressive strength [bar]	<b>16</b>
Connection	<b>M12 connector</b>



**Zubehör** **Connecting cable SLG 3... SLW 3..., see page 2.38**

# LEVEL CONTROLLER

## Integral switch



**Series KGF**  
**PTFE housing**  
**M14x1**  
**M30x1.5**

**AC 20...250 V**  
**DC 10...55 V**



Design	DC PNP • M14x1		DC PNP • M30x1.5		AC • M30x1.5	
Dimensions						
Switching point sp [mm]	-2	-2	-3	-3	-3	-3
Switching output						
Best.-Nr.	P20130	P21106	P20051	P20052	P20002	P20003
Type	KGf 014 GSP	KGf 014 GOP	KGf 030 GSP	KGf 030 GOP	KGf 030 WS	KGf 030 WO
Supply voltage [V]	10...33 DC		10...55 DC		20...250 AC	
Switching current [mA]	200		400		400	
Short circuit proof	•		•		-	
Overcurrent release [mA]	800		800		-	
Reverse protection	•		•		-	
Voltage drop [V]	1 DC		1 DC		8 AC	
Minimum load current [mA]	-		-		5	
Current consumption [mA]	4		4		2.5	
Switching frequency [Hz]	10		10		10	
Ambient temperature [°C]	-25...+75		-25...+75		-25...+75	
EMC-class	A		A		A	
Protection [EN 60529]	IP 67		IP 67		IP 67	
LED display	•		•		•	
Housing material	PTFE		PTFE		PTFE	
Connection	2m PVC-cable 3x0.34 mm <sup>2</sup>		2m PVC-cable 0.5 mm <sup>2</sup>		2m PVC-cable 0.5 mm <sup>2</sup>	
Switching current						
Accessories	Fixing nuts are part of delivery					

# LEVEL CONTROLLER

## Integral switch



Series **KGf/KGMR**

**G3/4 thread**

**AC 20...250 V**

**DC 10...55 V**



Design	AC • G3/4		DC PNP • G3/4		DC PNP • G3/4	
Dimensions						
Switching point sp	-2		-2		-3	
Switching output						
ID-No.	P20005		P20055		P21101	
Type	KGF 075 WS		KGF 075 GSP		KGMR 107 GSP	
Supply voltage [V]	20...250 AC		10...55 DC		10...55 DC	
Switching current [mA]	400		400		300	
Short circuit proof	-		•		•	
Overcurrent release [mA]	-		800		800	
Reverse protection	-		•		•	
Voltage drop [V]	8 AC		1 DC		1.5 DC	
Minimum load current [mA]	5		-		-	
Current consumption [mA]	2.5		4		4	
Switching frequency [Hz]	10		10		10	
Ambient temperature [°C]	-25...+75		-25...+75		-25...+75	
EMC-class	A		A		A	
Protection [EN 60529]	IP 67		IP 67		IP 67	
LED display	•		•		•	
Housing material	PTFE		PTFE		PTFE/AISI 316 Ti	
Sealing material	-		-		FPM	
Connection	2 m PVC-cable 0.5 mm <sup>2</sup>					
Switching current						

# LEVEL CONTROLLER

## Integral switch



**Series KGFR**  
**PTFE housing**  
**G1 thread**

**AC 20...250 V**  
**DC 10...55 V**



Design	AC • G1		DC PNP • G1	
Dimensions				
Switching point sp	-6		-6	
Switching output				
ID-No.	P20009	P20010	P20063	P20064
Type	KGFR 100 WS	KGFR 100 WO	KGFR 100 GSP	KGFR 100 GOP
Supply voltage [V]	20...250 AC		10...55 DC	
Switching current [mA]	400		400	
Short circuit proof	-		•	
Overcurrent release [mA]	-		800	
Reverse protection	-		•	
Voltage drop [V]	8 AC		1 DC	
Minimum load current [mA]	5		-	
Current consumption [mA]	2.5		4	
Switching frequency [Hz]	10		10	
Ambient temperature [°C]	-25...+75			
EMC-class	A			
Protection [EN 60529]	IP 67			
LED display	•			
Housing material	PTFE			
Connection	2 m PVC-cable 0.5 mm <sup>2</sup>			
Switching current				

# LEVEL CONTROLLER

## Integral switch



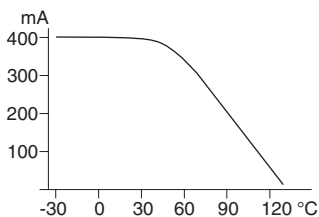
Series KA

G1 thread

DC 10...55 V



Design	DC PNP • G1 • L= 45 mm	DC PNP • G1 • L= 120 mm
Dimensions		
Switching point sp [mm]	-8	-8
Switching output		
ID-No.	P21010	P21011
Type-sensor length L	KA-L45-GPP	KA-L120-GPP
Supply voltage [V]	10...55 DC	
Switching current [mA]	400	
Short circuit proof	•	
Overcurrent release [mA]	800	
Reverse protection	•	
Voltage drop [V]	2	
Minimum load current [mA]	-	
Current consumption [mA]	4	
Switching frequency [Hz]	5	
Ambient temperature [°C]	housing: -25...+70 / sensor tip: -25...+120	
EMC-class	A	
Protection [EN 60529]	IP 67	
LED display	•	
Housing material	PTFE / AISI 316 Ti	
Sealing material	FPM	
Compressive strength [bar]	30 (25 °C)	
Connection	terminal screws	
Switching current		



# LEVEL CONTROLLER

## Integral switch



Series KB

G1 thread

DC 10...55 V



Design	DC PNP • G1			
Dimensions				
Switching point sp [mm]	-8	-8	-8	-8
Switching output				
ID-No.	P21012	P21013	P21014	P21015
Type-sensor length L	KB-L200-GPP	KB-L400-GPP	KB-L600-GPP	KB-L1000-GPP
Supply voltage [V]	10...55 DC			
Switching current [mA]	400			
Short circuit proof	•			
Overcurrent release [mA]	800			
Reverse protection	•			
Voltage drop [V]	2			
Minimum load current [mA]	-			
Current consumption [mA]	4			
Switching frequency [Hz]	5			
Ambient temperature [°C]	housing: -25...+70 / sensor tip: -25...+120			
EMC-class	A			
Protection [EN 60529]	IP 67			
LED display	•			
Housing material	PTFE / AISI 316 Ti			
Sealing material	FPM			
Compressive strength [bar]	16 (25 °C)			
Connection	terminal screws			
Switching current				

# LEVEL CONTROLLER

## Integral switch



**Series KFC**  
**G1/2 thread**

**DC 18...33 V**

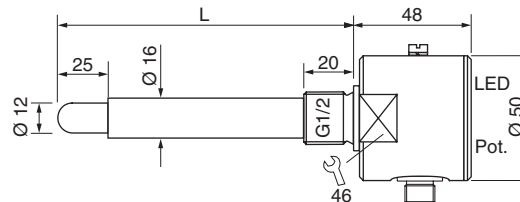
**Stainless steel housing**

**PTFE-sensor**

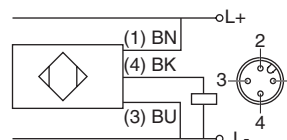
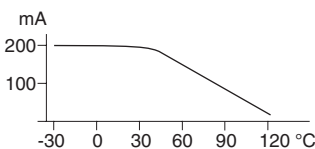


**Design** **DC PNP • G1/2**

**Dimensions**



Switching point sp [mm]	-6			
Switching output				
ID-No.	P21161	P21162	P21163	P21164
Type-sensor length L	KFC 050 GSP-L50	KFC 050 GSP-L100	KFC 050 GSP-L200	KFC 050 GSP-L400
Supply voltage [V]	18...33 DC			
Switching current [mA]	200			
Short circuit proof	•			
Overcurrent release [mA]	250			
Reverse protection	•			
Voltage drop [V]	2			
Minimum load current [mA]	-			
Current consumption [mA]	10			
Switching frequency [Hz]	5			
Ambient temperature [°C]	housing: -25...+75 / sensor tip: -25...+120			
EMC-class	A			
Protection [EN 60529]	IP 67			
LED display	•			
Housing material	AISI 316 Ti / PTFE			
Sealing material	FFKM (Kalrez)			
Compressive strength [bar]	16 (25 °C)			
Connection	M12 connector			



**Accessories** **Connecting cable type SLG 3... SLW 3..., see page 2.38**

# LEVEL CONTROLLER



## Opto-integral switch

Series UFGS

Opto glass-sensor

G3/4 thread

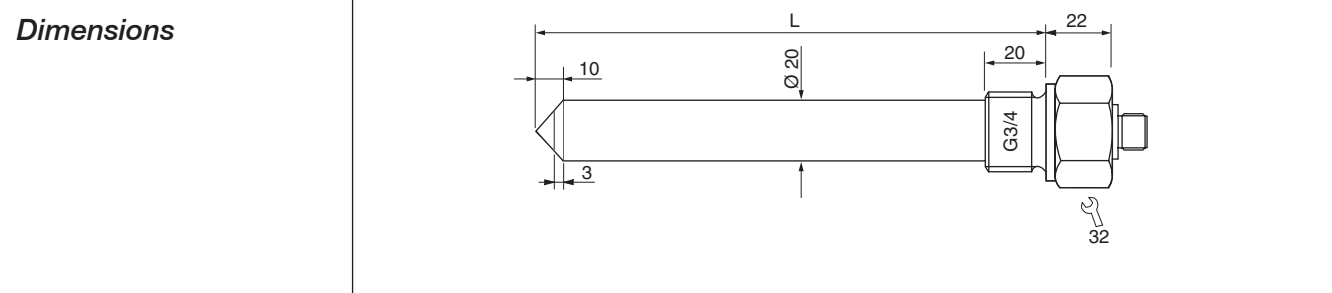
DC 10...33 V

Resistant to detergents

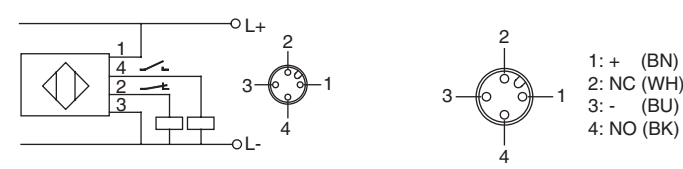
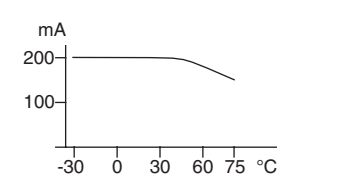
Resistant to hydraulic oil • motor oil



### Design DC PNP • G3/4



Switching point sp [mm]	-10	
Switching output		
<b>ID-No.</b>	<b>P21181...</b>	
Type-sensor length L [mm]	UFGS 075 GSOP-Lxxxx	<p><b>Sensor length</b></p> <p>The total length L of the sensors is specified by appending "Lxxxx" to the type.</p> <p>xxxx: length in mm</p> <p><b>Preferred excess lengths ID-No.</b></p> <p>120 mm: L120 P21181012</p> <p>200 mm: L200 P21181020</p> <p>400 mm: L400 P21181040</p> <p>1000 mm: L1000 P21181100</p>
Supply voltage [V]	10...33 DC	
Switching current [mA]	200	
Short circuit proof	•	
Overcurrent release [mA]	250	
Reverse protection	•	
Voltage drop [V]	2	
Minimum load current [mA]	-	
Current consumption [mA]	10	
Switching frequency [Hz]	5	
Ambient temperature [°C]	-25...+70	
EMC-class	A	
Protection [EN 60529]	IP 67	
LED display	plug with LED	
Housing material	AISI 316 Ti / glass	
Sealing material	FFKM (Kalrez)	
Compressive strength [bar]	16 (25 °C)	
Connection	M12 connector	



### Accessories Connecting cable type SLW 4-2 LED (Z01157), see page 2.38



# LEVEL CONTROLLER

## Opto-integral switch



Series UFS

G3/4 thread

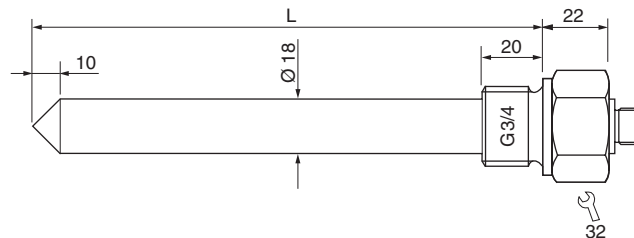
DC 10...33 V

Plug connection

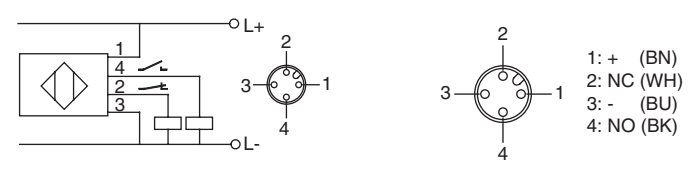
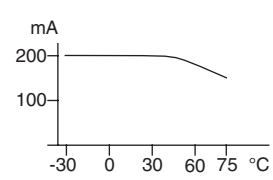


### Design DC PNP • G3/4

#### Dimensions



Switching point sp [mm]	-10	-10	-10	-10	-10
Switching output					
ID-No.	P21121	P21122	P21123	P21124	P21125
Type	UFS 075 GSOP-L100	UFS 075 GSOP-L200	UFS 075 GSOP-L400	UFS 075 GSOP-L600	UFS 075 GSOP-L1000
Supply voltage [V]	10...33 DC				
Switching current [mA]	200				
Short circuit proof	•				
Overcurrent release [mA]	250				
Reverse protection	•				
Voltage drop [V]	2				
Minimum load current [mA]	-				
Current consumption [mA]	10				
Switching frequency [Hz]	5				
Ambient temperature [°C]	-25...+70				
EMC-class	A				
Protection [EN 60529]	IP 67				
LED display	plug with LED				
Housing material	AISI 316 Ti / Polysulfon				
Sealing material	FPM				
Compressive strength [bar]	16 (25 °C)				
Connection	M12 connector				
Switching current					



### Accessories Connecting cable type SLW 4-2 LED (Z01157), see page 2.38

# LEVEL CONTROLLER

## Analog sensor



Series KFA  
up to 200 °C

4...20 mA output



Design	G1/2		KU 120 GI
Dimensions			
Sensing length M [mm]	100	200	
Output	-	-	
ID-No.	P21151	P21152	P21153
Type-sensor length L	KFA 150-L135	KFA 150-L235	KU 120GI
Supply voltage [V]	-	-	24 DC ±20%
Current output [mA]	-	-	4...20
Current consumption [mA]	-	-	50
Working resistance [Ω]	-	-	50...400
Reaction frequency [Hz]	-	-	5
Ambient temperature [°C]	-35...+200	-35...+200	-20...+60
EMC-class	A	A	A
Protection [EN 60529]	IP 68	IP 68	IP 65
LEM-connection	IP 54	IP 54	IP 54
LED display	-	-	•
Housing material	PEEK / AISI 316 Ti	PEEK / AISI 316 Ti	AL
Sealing material	PTFE	PTFE	-
Compressive strength [bar]	16	16	-
Connection	2 m PTFE-cable / LEM 01 plug system		M12 connector

Accessories

Connecting cable SLG 3-2, see page 2.38

# LEVEL CONTROLLER

## -230 °C-Low temperature



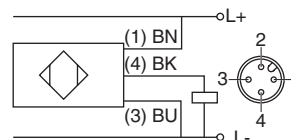
### Series KGFP

Detection of liquid gases  
Detection of cooled granulates

Sensor for connection to  
an external amplifier



Design	G1/2		KU 125...
Dimensions			
Switching point sp	adjustable	adjustable	adjustable
Switching output			
ID-No.	P21167	P21196	P21166
Type	KGFP 050	KGFP 051	KU 125 GPP
Application area	liquid gases	cooled granulates	
Medium temperature [°C]	-230...+80		-
Cable temperature [°C]	-80...+120		-
Supply voltage [V]	-		24 DC ±20%
Current consumption [mA]	-		50
Switching current [mA]	-		400
Hysteresis [%]	-		10 (adjustable)
Switching frequency [Hz]	-		10
Ambient temperature [°C]	-		-20...+60
EMC-class	-		A
Protection [EN 60529]			
housing	IP 68		IP 65
plug	IP 67		IP 67
LED display			•
Power on LED			•
Housing material	AISI 316 Ti / PTFE		AL
Connection	2 m PTFE-cable with LEM 02 plug system		M12 connector



Accessories Connecting cable type SLG 3... or SLW..., see page 2.38

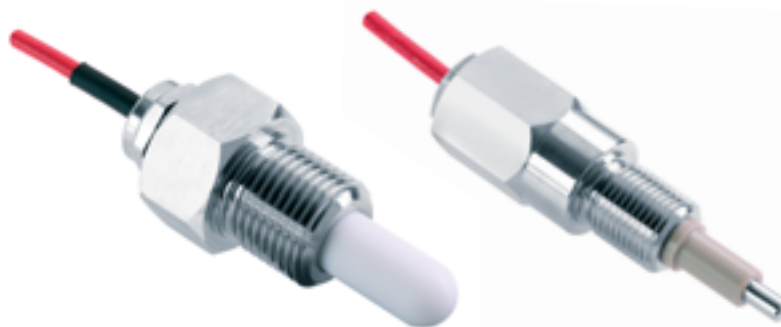
# LEVEL CONTROLLER

## 230 °C-High temperature

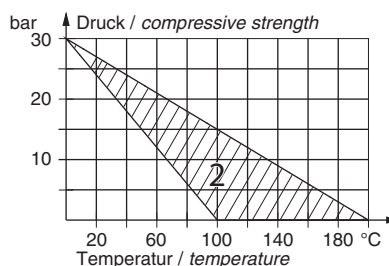


### Series KGFT

Sensor for connection  
to an external amplifier



Design	G1/4	G1/2	G1/4	G1/2	G1/4
Dimensions					
Switching point sp [mm]	-6	-6	-6	-6	-6
ID-No.	P21092	P21093	P21119	P21120	P21108
Type	KGFT 025	KGFT 050	KGFT 125	KGFT 150	KGFT 325
Temperature range [°C]	-35...+180	-35...+180	-35...+200	-35...+200	-35...+230
Protection [EN 60529]					
sensor	IP 68	IP 68	IP 68	IP 68	IP 68
plug LEM 01	IP 54	IP 54	IP 54	IP 54	IP 54
Compressive strength [bar]	10	10	30	30	0.5
Housing material	PTFE / 316 Ti	PTFE / 316 Ti	PEEK / 316 Ti	PEEK / 316 Ti	PEEK / 316 Ti
Sealing material	FPM	FPM	PTFE	PTFE	EP
Connection	2 m PTFE-cable with LEM 01 plug system				
	For special applications the seal must be separate determined. The combination of pressure and temperature is in that case of great importance (see diagram). Special EPDM seals will be used on customer request for water applications up to +150 °C and pressure up to 5 bar. For applications of media temperatures higher than +100 °C or the pressures are higher special seals are necessary (2).				



Required amplifiers: KK 030 GSP , KU 120..., KUA 120..., KK 030 S, KKM 125 GR, see page 2.21 - 2.23

# LEVEL CONTROLLER

## Amplifiers



### Series KK-KU

For sensors KGFT  
up to +230 °C

IP 67 Protection

LED display



Design	KK 030...	KU 120...		
Dimensions				
Switching point sp	adjustable		adjustable	
Switching output				
ID-No.	P21095	P21107	P21118	P21117
Type	KK 030 GSP	KU 120 GPP-24	KU 120 WP-230	KU 120 WP-115
Supply voltage [V]	16...55 DC	24 DC ±20%	230 AC ±10%	115 AC ±10%
Current consumption [mA]	15		50	
Switching current max. [mA]	200		400	
Hysteresis [%]	10		10 (adjustable)	
Switching frequency [Hz]	15		5	
Ambient temperature [°C]	-5...+60		-20...+60	
EMC-class	A		A	
Protection [EN 60529]	IP 67		IP 65	
LEM-Connection	IP 54		IP 54	
LED display	LED yellow		LED-array	
Power on LED	LED green		•	
Housing material	AISI 316 Ti		AL	
Sensor Connection	LEM 01 plug		LEM 01 plug	
Connection	M12 connector	M12 connector	2 m PVC-cable 4x0.75 mm <sup>2</sup>	

Accessories

Connecting cable type SLG 3... or SLW 3..., see page 2.38

# LEVEL CONTROLLER

## Amplifier



### Series KUA

Automatic adjustment on medium

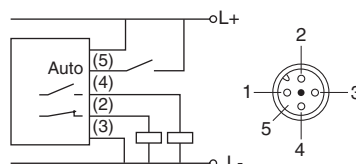
For sensors KGFT up to +230 °C

Cable break monitoring

LED display



<b>Design</b>	<b>KUA 120 GSOP</b>
<b>Dimensions</b>	
Switching point sp Switching output	automatic adjustment by push-button or control input 
<b>ID-No.</b>	<b>P21190</b>
Type	KUA 120 GSOP
Supply voltage [V]	18...30 DC
Current consumption [mA]	approx. 100
Switching current max. [mA]	100
Hysteresis [%]	10
Switching frequency [Hz]	10
Ambient temperature [°C]	0...+60
EMC-class	A
Protection [EN 60529]	IP 65
LEM-Connection	IP 54
LED display	LED-array
cable break monitoring	•
Housing material	AL
Sensor Connection	LEM 01 plug
Connection	M12 connector
	The capacitive amplifier is designed to be connected to the level controller of type KGFT... The adjustment depending on different media or installation situations is carried out by automatic adjustment.



	non activated	activated	cable break
LED-array			
Output NO			
Output NC			

**Accessories** Connecting cable type SLG 5... or SLW 5..., see page 2.38

# LEVEL CONTROLLER

## Amplifier with remote adjustment



### Series KKM

For remote adjustment of level sensors

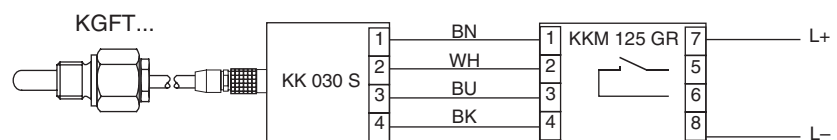
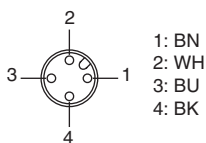
For connection cable up to 200 m length

For sensors series KGFT



Design	Preamplifier KK 030 S	Amplifier KKM 125
Dimensions		
Switching point sp	remote adjustable	
Switching output		
ID-No.	P21154	P21155
Type	KK 030 S	KKM 125 GR
Supply voltage [V]	-	24 DC $\pm 20\%$
Current consumption [mA]	30	70
Output	-	relay-NO
LED display	•	LED array
Switching voltage max. [V]	-	230 AC 250 DC
Switching current max. [A]	-	1 AC 1 DC
Switching power max.	-	125 VA 60 W
Ambient temperature [°C]	-25...+60	-20...+60
Protection [EN 60529]	IP 54	screws: IP 20 / housing: IP 40
Housing material	AISI 316 Ti	PC
Connection	M12 connector	terminal screws

#### M12 connector



#### Notice

The amplifier KK 030 S must be operated together with the amplifier KKM 125

# LEVEL CONTROLLER



**Ex** - Sensor Zone 20      **Intrinsically safe**

**Series KGEX**

**Category 1**  
**Dust Ex II 1D T95 °C**

**Proximity switches**  
**Level controller**



Design	M18x1	M30x1.5	G1	G3/4
<b>Dimensions</b>  Installation flush (f) non flush (nf)				
Operating distance sn [mm]	8 nf	10 nf	-10	-5
ID-No.	P21157	P21158	P21159	P21160
Type	KGEX 018	KGEX 030	KGEX 100	KGEX 107
Ambient temperature [°C]	-25...+75			
Ex marking	II 1D T95 °C			
Certificate No.	TÜV 03 ATEX 2046			
Maximum values	Ci = negligibly small Li = negligibly small Ii = 80 mA Ui = 12.6 V Pi = 252 mW			
Only for the connection to certified intrinsically safe circuits with the following maximum values:				
Housing material	PVDF	PTFE	PTFE	PTFE/AISI 316 Ti FPM
Protection [EN 60529]	IP 67			
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup>			
For the connection to amplifiers EGE 903 Ex...				
Notice	Fixing nuts are part of delivery			



# LEVEL CONTROLLER



- Sensor Zone 22

Compact model



Series **KGEX**

Category 3

Dust  $\text{Ex}$  II 3D T80°C

DC 24 V

PNP switching output



Design	M18x1	M30x1.5	DC PNP • G1	DC PNP • G3/4
Dimensions				
Installation flush (f) non flush (nf)				
Switching point sp (Adjustable)	5 f (1...7)	10 f (3...15)	-6	-3
Switching output				
ID-No.	P21170	P21171	P21172	P21173
Type	KGEX 018 GSP	KGEX 030 GSP	KGEX 100 GSP	KGEX 107 GSP
Ex-Marking	II 3D T80°C			
Supply voltage [V]	10...55 DC			
Switching current [mA]	300			
Short circuit proof	•			
Overcurrent release [mA]	800			
Reverse protection	•			
Voltage drop max. [V]	1.5			
Current consumption [mA]	4			
Switching frequency [Hz]	25	25	10	10
Ambient temperature [°C]	-25...+70			
EMC-class	A			
LED-Display	•			
Housing material	Brass-Ni / PPO	Brass-Ni / PPO	PTFE	PTFE/AISI 316 Ti FPM
Protection [EN 60529]	IP 67			
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup>			
Notice: Do not use in the presence of conductive dusts				

# LEVEL CONTROLLER



**Ex** - Sensor Zone 0

**Series UFGS..Ex**  
**Opto glass-sensor**

**Ex II 1G EEx ia IIC T6...T4**  
**Category 1**

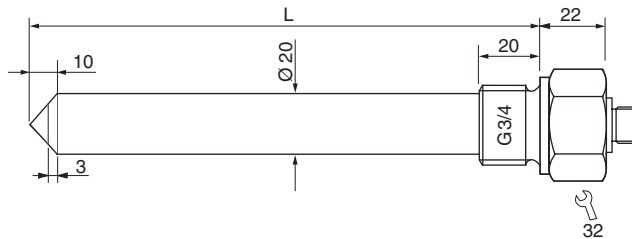
**Resistant in kerosine • motor fuels**

**3-wire sensor, intrinsically safe**



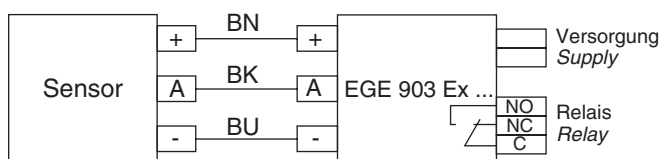
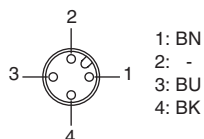
**Design** **G3/4**

**Dimensions**



Switching point sp [mm]	-10	
<b>ID-No.</b>	<b>P21183...</b>	
Type-sensor length L [mm]	UFGS 075 Ex-Lxxxx	<b>Sensor length</b>
Ex marking	II 1G EEx ia IIC T6...T4	The total length L of the sensors is specified by appending "Lxxxx" to the type.
Certificate no.	TÜV 01 ATEX 1662	xxxx: length in mm
Ambient temperature for temperature classes [°C]	T6: 75 T5: 90 T4: 100	<b>Preferred excess lengths</b>
Max. power Pi [mW]	252	<b>ID-No.</b>
Housing material	AISI 316 Ti / glass	120 mm: L120 P21183012
Sealing material	FFKM (Kalrez)	200 mm: L200 P21183020
Tightening torque [Nm]	100	400 mm: L400 P21183040
Ambient temperature [°C]	-25...+70	1000 mm: L1000 P21183100
Protection [EN 60529]	IP 67	
Compressive strength [bar]	16	
Connection	M12 connector	

For the connection to amplifiers EGE 903 Ex..., page 2.33



**Accessories** **plug M12, SBW-DC or SBG-DC**

# LEVEL CONTROLLER



**Ex** - Sensor Zone 0

**Series URFG..Ex**  
**Opto glass-sensor**

**Ex II 1G EEx ia IIC T6...T4**  
**Category 1**

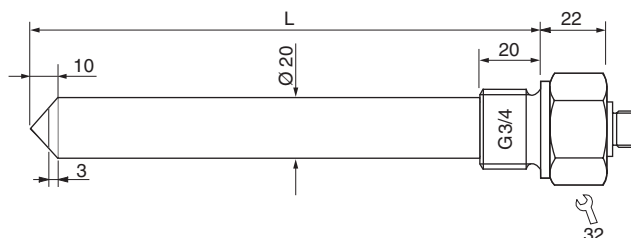
**Resistant in kerosine • motor fuels**

**2-wire sensor, intrinsically safe**



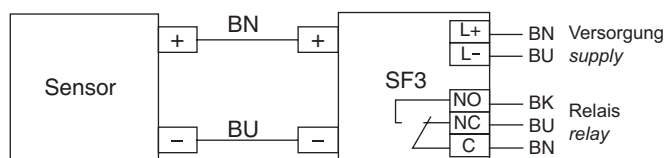
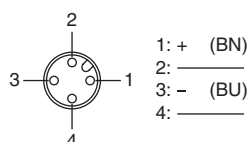
**Design** **G3/4**

**Dimensions**



Switching point sp [mm]	-10	<p><b>Sensor length</b></p> <p>The total length L of the sensors is specified by appending "Lxxxx" to the type.</p> <p>xxxx: length in mm</p> <p><b>Preferred excess lengths ID-No.</b></p> <p>120 mm: L120 P21185012</p> <p>200 mm: L200 P21185020</p> <p>400 mm: L400 P21185040</p> <p>1000 mm: L1000 P21185100</p>
ID-No.	P21185...	
Type-sensor length L [mm]	URFG 075 Ex-Lxxxx	
Ex marking	II 1G EEx ia IIC T6	
Certificate no.	TÜV 00 ATEX 1632	
Ambient temperatur for temperature classes [°C]	T6: 70 T5: 80 T4: 100	
Maximum values	li = 154 mA Ui = 23.1 V Pi = 890 mW	
Housing material	AISI 316 Ti / glass	
Sealing material	FFKM (Kalrez)	
Tightening torque [Nm]	100	
Ambient temperature [°C]	-25...+70	
Protection [EN 60529]	IP 67	
Compressive strength [bar]	16	
Connection	M12 connector	

For the connection to amplifiers SF3, page 2.34



**Accessories** **plug M12, SBW-DC or SBG-DC**

# LEVEL CONTROLLER



## Ex - Sensor Zone 0 - 1

Series TF...Ex

Thermal level sensor  
For fuel tanks and fuel trucks

Ex II 1G Ex ia IIC T4

Ex II 2G Ex ia IIC T4

Category 1, Category 2

2-wire sensor, intrinsically safe



Design	G3/4 fixed fitting length		G3/4 adjustable fitting length	
<b>Dimensions</b>				
Switching point sp [mm]	-10		-10	
Type	TFGS 026 Ex-L200	TFGS 126 Ex-L200	TFKS 026 Ex-L400	TFKS 126 Ex-L400
ID-No.	P21191	P21194	P21192	P21195
Fitting length L [mm]	200		400 (variable)	
Zone	0		1	
Ex marking	II 1G Ex ia IIC T4		II 2G Ex ia IIC T4	
Certificate No.	TÜV 07 ATEX 55375			
Maximum values	Ii = 154 mA Ui = 23.1 V Pi = 890 mW Ci ≤ 100 nF Li ≤ 0.8 µH			
Nominal resistance [Ω]	160			
Reaction time [s]	ca. 2			
Start-up time [s]	40			
Ambient temperature [°C]	-20...+80			
Function indicator	at the amplifier			
Housing material	AISI 316 Ti	AISI 316 Ti	AISI 316 Ti	AISI 316 Ti
Pipe material	AISI 316 Ti	Aluminium	AISI 316Ti	Aluminium
Sealing material	PVDF, FPM			
Protection [EN 60529]	IP 68			
Connection	M12 connector			
Sensors for the connection to amplifiers SF3, page 2.34				
Accessories	plug M12, SBW-DC or SBG-DC			

# LEVEL CONTROLLER

**Ex** - Sensor Zone 0



**Series KEAC**

**Ex** EEx ia IIC T6...T4

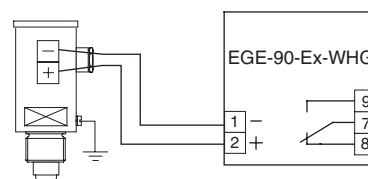
**Category 1**

**Medium up to 120 °C**

**Sensor length up to 1 m**



<b>Design</b>	<b>G1</b>				
<b>Dimensions</b>					
Sensitivity adjustable					
<b>Switching point sp</b> [mm]	-8	-8	-8	-8	-8
<b>ID-No.</b>	<b>P21086</b>	<b>P21087</b>	<b>P21088</b>	<b>P21089</b>	<b>P21090</b>
Type-sensor length L [mm]	KEAC-L80	KEAC-L200	KEAC-L400	KEAC-L600	KEAC-L1000
<b>Ex marking</b>	EEx ia IIC T6...T4				
<b>Certificate no.</b>	TÜV 96 ATEX 1095				
<b>Ambient temperature for temperature classes</b> [°C]	T6: 80 T5: 95 T4: 120				
<b>Max. power Pi</b> [mW]	50				
<b>Housing material</b>	AISI 316 Ti / PTFE				
<b>Sealing material</b>	FPM				
<b>Force thread</b> [Nm]	100				
<b>Sensitivity</b>	adjustable with pot				
<b>Ambient temperature</b> [°C]	housing: -25...+75 / sensor tip: -40...+120				
<b>Protection</b> [EN 60529]	IP 67				
<b>Compressive strength</b> [bar]	30				
<b>Connection</b>	terminal screws				



**Notice** different materials on request

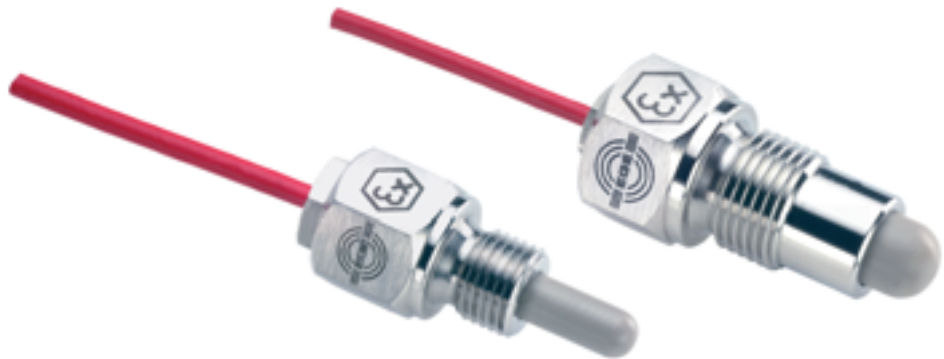
# LEVEL CONTROLLER



**Ex** - Sensor Zone 0

**Series KGFT**  
up to 200 °C

**Ex** EEx ia T6...T3  
Category 1



Design	G1/4	G1/2
Dimensions		
Switching point sp [mm]	-8	-8
ID-No.	P21149	P21150
Type	KGFT 125 Ex	KGFT 150 Ex
Ex marking	EEx ia IIC T6...T3	
Certificate No.	TÜV 01 ATEX 1670	
Ambient temperature for temperature classes [°C]	T6: 80 T5: 95 T4: 130 T3: 195	
Max. power Pi [mW]	110	
Housing material	AISI 316 Ti / PEEK	
Sealing material	PTFE	
Torque [Nm]	50	100
Ambient temperature [°C]	-35...+200	
Protection [EN 60529]	IP 68	
LEM-connection	IP 54	
Compressive strength [bar]	30	
Connection	2 m PTFE-cable plug system LEM 01	
Accessories		
	Required amplifiers KK 030-Ex and EGE 903...	

# LEVEL CONTROLLER



## Ex - Preamplifier Zone 1

Series KK 030 Ex

Ex II (1) 2G EEx ia IIC T6...T4

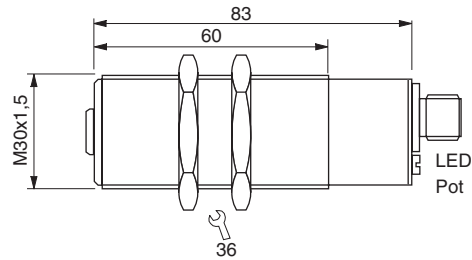
Installation in Zone 1  
Intrinsically safe

For connection of sensors  
series KGFT...Ex

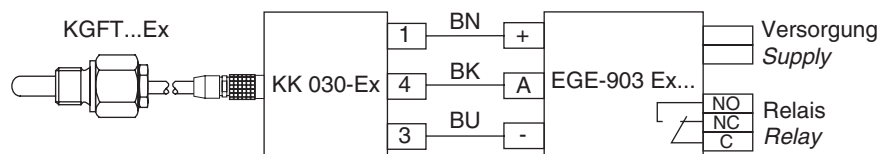
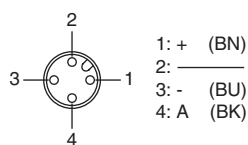


**Design** KK 030 Ex for the connection to amplifiers EGE 903 Ex...

### Dimensions



<b>ID-No.</b>	P21144
Type	KK 030 Ex
Ex marking	II (1) 2G EEx ia IIC T6...T4
Certificate no.	TÜV 01 ATEX 1671
Ambient temperature for temperature classes [°C]	T6: 75 T5: 90 T4: 120
Max. power PI [mW]	252
Housing material	AISI 316 Ti
Torque [Nm]	50
Sensitivity adjustable	•
Ambient temperature [°C]	-25...+60
Protection [EN 60529]	IP 54
LED display	•
Connection	plug system LEM 01 / M12 connector



**Accessories** Connecting cable type SLG 3..., SLW 3..., see page 2.38

# LEVEL CONTROLLER



## Ex - Amplifiers

Series EGE 90 Ex

Dust and gas

Cable break and short circuit monitoring

Connection of 2-lead sensors



Design	EGE 90 Ex...				
Dimensions					
ID-No.	P30340	P30341	P31035	P30342	P31036
Type	EGE 90 Ex1-230	EGE 90 Ex1-115	EGE 90 Ex1-24	EGE 90 Ex-WG 230	EGE 90 Ex-WG 24
Supply voltage [V]	230 AC +10/-15%	115 AC +10/-15%	24 DC ±15%	230 AC +10/-15%	24 DC ±15%
Certificate no.	TÜV 97 ATEX 1148				
Ex marking	II (1) GD [Ex ia] IIC				
Maximum values	U <sub>o</sub> = 12.6 V I <sub>o</sub> = 15.9 mA P <sub>o</sub> = 50 mW C <sub>o</sub> = 1.15 µF L <sub>o</sub> = 120 mH				
Output	relay / change over				
Switching voltage max. [V]	250 AC / 24 DC				
Switching current max. [A]	4 AC / 4 DC				
Switching power	cos φ > 0.7 / L/R < 200 ms				
Ambient temperature [°C]	-20...+60				
Protection [EN 60529]	IP 20				
Connection	terminal screws				
Notes:	The amplifier EGE 90 EX1 is suited for connection of NAMUR sensors.				



# LEVEL CONTROLLER

## Ex - Amplifiers



Series EGE 903 Ex

Dust and gas Ex

Cable break and short circuit monitoring

Connection of 3-lead sensors



Design	EGE 903 Ex...		
Dimensions			
ID-No.	P21141	P21142	P21143
Type	EGE 903 Ex-230	EGE 903 Ex-115	EGE 903 Ex-24
Supply voltage [V]	230 AC +10/-15%	115 AC +10/-15%	24 DC ±15%
Certificate no.		TÜV 01 ATEX 1663	
Ex marking		II (1) GD [Ex ia] IIC	
Maximum values		$U_o = 12.6 \text{ V}$ $I_o = 80 \text{ mA}$ $P_o = 252 \text{ mW}$ $C_o = 270 \text{ nF}$ $L_o = 5.4 \text{ mH}$	
Output		relay / change over	
Switching voltage max. [V]		250 AC / 24 DC	
Switching current max. [A]		4 AC / 4 DC	
Switching power		$\cos \varphi > 0.7 / L/R < 200 \text{ ms}$	
Ambient temperature [°C]		-20...+60	
Protection [EN 60529]		IP 20	
Connection		terminal screws	

# LEVEL CONTROLLER



## Ex - Amplifier Zone 1

### Series SF3

Gas Ex II (1) 2G EEx em [ia/ib] IIC T6

Installation in Zone 1

For the connection of 160 Ω Thermo-sensors

For the connection of Opto-level sensors



Design	SF3	
Dimensions		
ID-No.	P21174	
Type	SF3	
Supply voltage [V]	24 DC +15 / -10%	
Ex marking	II (1) 2G EEx em [ia/ib] IIC T6	
Certificate no.	TÜV 04 ATEX 2447	
Ambient temperature for temperature classes [°C]	T6 : 35 T5 : 50 T4 : 85	
Maximum values	U <sub>O</sub> = 23.1 V I <sub>O</sub> = 154 mA P <sub>O</sub> = 890 mW C <sub>O</sub> = 86 nF L <sub>O</sub> = 0.4 mH	
Connectable sensors	Opto-level sensors (URF...) / Level sensors (R <sub>i</sub> = 160 Ω)	
Output relay	increased safety   intrinsically safe	
Switching voltage [V]	250 AC    250 DC   60 DC   24 DC	EEx ib IIC 30 V
Switching current [A]	2 AC    0.3 DC   0.8 DC   2 DC	IIC: 0.1 DC IIB: 0.25 DC IIA: 0.34 DC
Switching power	cos φ ≥ 0.7 / L/R ≤ 200 ms	
Ambient temperature [°C]	-20...+60	
Protection [EN 60529]	IP 54	
Housing material	PA, Aluminium	
Connection	sensor: tabs size 6.3-0.8 (DIN 46244)	relay/supply: 2 m PVC-cable 0.5 mm <sup>2</sup>

# LEVEL CONTROLLER



## $\text{Ex}$ - housing for amplifier Zone 1/21

### System GAM

Dust  $\text{Ex}$  II 2D IP66 T65°C

Gas  $\text{Ex}$  II (1) 2G EEx em [ia/ib] II CT6

For installation of amplifiers  
within Zone 1/21



Design	GAM...																																														
Dimensions	<table border="1"> <thead> <tr> <th>Type</th> <th>ID-No.</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>Amount of SF3</th> </tr> </thead> <tbody> <tr> <td>GAM-SF1530</td> <td>P21175</td> <td>150</td> <td>300</td> <td>110</td> <td>320</td> <td>1</td> </tr> <tr> <td>GAM-SF2030</td> <td>P21176</td> <td>200</td> <td>300</td> <td>160</td> <td>320</td> <td>2</td> </tr> <tr> <td>GAM-SF3030</td> <td>P21177</td> <td>300</td> <td>300</td> <td>260</td> <td>320</td> <td>4</td> </tr> <tr> <td>GAM-SF3040-5</td> <td>P21178</td> <td>300</td> <td>400</td> <td>260</td> <td>420</td> <td>5</td> </tr> <tr> <td>GAM-SF3040</td> <td>P21179</td> <td>300</td> <td>400</td> <td>260</td> <td>420</td> <td>6</td> </tr> </tbody> </table>					Type	ID-No.	A	B	C	D	Amount of SF3	GAM-SF1530	P21175	150	300	110	320	1	GAM-SF2030	P21176	200	300	160	320	2	GAM-SF3030	P21177	300	300	260	320	4	GAM-SF3040-5	P21178	300	400	260	420	5	GAM-SF3040	P21179	300	400	260	420	6
Type	ID-No.	A	B	C	D	Amount of SF3																																									
GAM-SF1530	P21175	150	300	110	320	1																																									
GAM-SF2030	P21176	200	300	160	320	2																																									
GAM-SF3030	P21177	300	300	260	320	4																																									
GAM-SF3040-5	P21178	300	400	260	420	5																																									
GAM-SF3040	P21179	300	400	260	420	6																																									
ID-No.	P21175	P21176	P21177	P21178	P21179																																										
Type	GAM-SF1530	GAM-SF2030	GAM-SF3030	GAM-SF3040-5	GAM-SF3040																																										
Housing dimensions [mm]	150x300x120	200x300x120	300x300x120	300x400x120	300x400x120																																										
Number of amplifiers	1	2	4	5	6																																										
Ex marking	II (1) 2G EEx em [ia/ib] IIC T6 bzw. II 2D IP 66 T 65 °C																																														
Certificate no.	TÜV 04 ATEX 2555 X																																														
Ambient temperature [°C] for temperature classes	T6: 27 T5: 42 T4: 60																																														
Electrical connection	connection terminals 2.5 mm <sup>2</sup>																																														
Relay output	connection terminals 1.5 mm <sup>2</sup>																																														
Power supply	connection terminals 1.5 mm <sup>2</sup>																																														
Sensor connection	sensor: tabs nominal size 6.3 - 0.8 mm (DIN 46244)																																														
Cable diameter [mm]	4...8																																														
Ambient temperature [°C]	-20...+60																																														
Housing material	sheet steel case, lacquered																																														
Protection [EN 60529]	IP 66																																														
Example: Schematic for the installation of two amplifiers in a GAM-SF2030 housing.																																															

# FLOW CONTROLLER



## Ex - Housing for screw terminals

### Series GK...

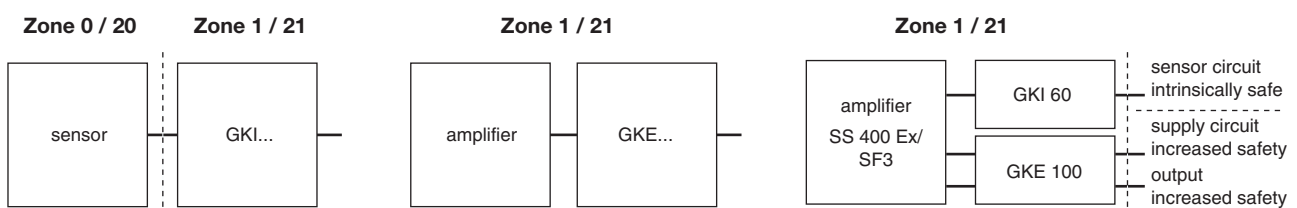
- Ex II 2G EEx e II T6
- Ex II 2G EEx ia IIC T6
- Ex II 2G EEx e [ia] IIC T6
- Ex II 2D IP 65 T75 °C

For the connection of supply- and signal lines in Zone 1 / 21



Design	GK...				
Dimensions					
ID-No.	Z01168	Z01169	Z01170	Z01171	Z01172
Type	GKE 60	GKE 100	GKI 60	GKI 100	GKEI 100
Amount of terminals	4	8	4	8	4 EEx e + 4 EEx ia
Dimensions [mm]	58x64	98x64	58x64	98x64	98x64
Electric circuit	increased safety		intrinsically safe		intrinsically safe + increased safety
Ex marking	II 2G EEx e II T6 II 2D IP 65 T75 °C		II 2G EEx ia IIC T6 II 2D IP 65 T75 °C		II 2G EEx e [ia] IIC T6 II 2D IP 65 T75 °C
Certificate No.	BVS 05 ATEX E022 X				
Ambient temperature [°C]	-20...+70				
for temperature classes [°C]	T4, T5, T6 : 70				
Rated voltage [V]	275				
Rated current [A]	2				
Cross section wires	single wire		0.5...2.5 mm <sup>2</sup>		
	multistrand		0.5...1.5 mm <sup>2</sup>		
Cable diameter [mm]	4...8				
Housing material	aluminium				
Protection [EN 60529]	IP 65				
Connection	terminal space				

The enclosure for screw terminals type GK... is designed for the connection of intrinsically safe and / or non-intrinsically safe circuits in explosion-hazardous areas of category 2 (zone 1 and 21).



# ACCESSORIES

## Mounting sleeves



**It is not necessary to empty the vessel for routine sensor inspection.**

**PTFE housing for high chemical resistance**

**O-ring moisture barrier**



Design	KNM-35	KNM-20	KPM-35
Dimensions			
ID.-No.	P40501	P40500	P40502
Type	KNM-35	KNM-20	KPM-35
Housing material	PTFE	PTFE	Crastin
Torque max. [Nm]	1	1	3
Compressive strength [bar]	3	3	6
Thread	G1 1/4	G3/4	G1 1/2
For sensor type	KNK-025...	KNK-015...	KNK-025...
Usefully sensors	see in our catalogue „Capacitive proximity switches“		

### Fitting in of sleeves and sensors

Mounting sleeves are used for lateral or vertical passage through the vessel side. In order to ensure full pressure resistance, the thread should be screwed into the vessel threaded bush over a length of approximately 20 mm. If this is not possible because the vessel side is too thin, a suitable bush must be installed. However, the threaded passage should not be longer than the thread on the mounting sleeve. The interior thread must comply with DIN ISO 228. Sealing of the thread is either carried out with hemp and a sealing paste according to DIN-DVGW, or with PTFE sealing tape if higher chemical resistance is required. In any case, chemical resistance of the seal must be checked for this application. When screwing in the sleeve, maximum admissible torque must not be exceeded.

Metallic or metal clad vessels should be earthed. In the case of plastic vessels filled with electrically conductive materials, the latter should be earthed. In the case of plastic vessels filled with non-conducting materials, an earthed metal band applied on the outside of the vessel may be used as a counter electrode. For fitting the sensor, the closing ring is unscrewed from the

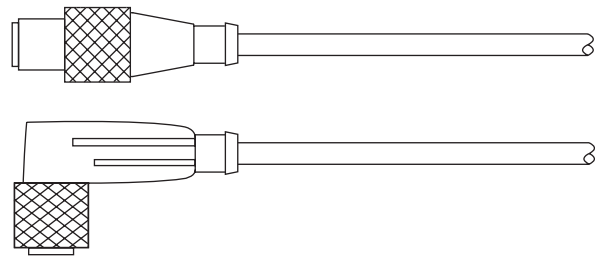
mounting sleeve. The sensor connecting cable must be fitted through the closing ring and the sensor fitted into the sleeve. After this, the closing ring is screwed back into the mounting sleeve, until the gasket is firmly pressed against the sensor housing. This ensures that no external humidity will penetrate into the mounting sleeve, as this might lead to sensor switching failures.

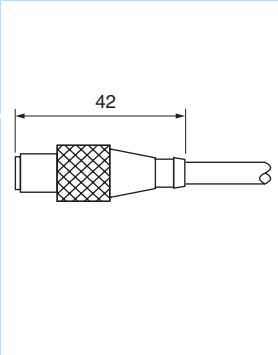
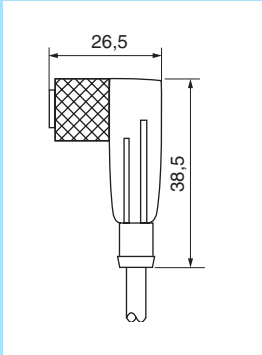
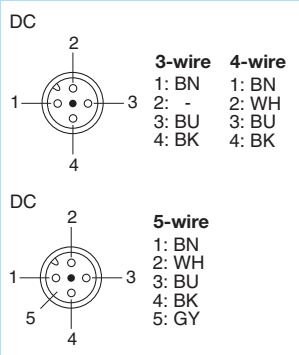
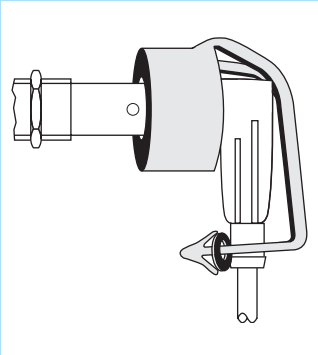
### Sensor compensation

To start with, the plastic screw which protects the compensating potentiometer against humidity must be removed. The screwdriver blade used for compensation should be narrower than 2.4 mm. The sensor is now fitted into the sleeve, and the vessel filled to a level allowing for complete immersion of the sleeve. Beginning at the left limit, turn the potentiometer clockwise until the switching output is operated (NO), after which the potentiometer is turned further clockwise about one revolution. The switching output of the sensor should now be closed. In case of very small bulk densities and corresponding small dielectric constant, it may be necessary to turn only half a revolution.

### System SL

**Finished cable plug casing**  
**Self locking screw plug**  
**Protection IP 67**



Cable plug housing straight	Cable plug housing angular	Pin-assignment	Plug-lock
		<p>DC</p>  <p>3-wire                      1: BN                      2: -                      3: BU                      4: BK</p> <p>4-wire                      1: BN                      2: WH                      3: BU                      4: BK</p> <p>5-wire                      1: BN                      2: WH                      3: BU                      4: BK                      5: GY</p>	
<b>SLG...</b>	<b>SLW...</b>	<b>DC</b>	<b>PL-M12</b>

TYPE	ID-NO.	DESIGN	
SLG 3-2	Z01076	Cable plug housing M12 DC, straight	2 m PVC-cable 3x0.34 mm <sup>2</sup>
SLG 3-5	Z01077	Cable plug housing M12 DC, straight	5 m PVC-cable 3x0.34 mm <sup>2</sup>
SLW 3-2	Z01078	Cable plug housing M12 DC, angular	2 m PVC-cable 3x0.34 mm <sup>2</sup>
SLW 3-5	Z01079	Cable plug housing M12 DC, angular	5 m PVC-cable 3x0.34 mm <sup>2</sup>
SLW 3-2-LED	Z00052	Cable plug housing M12 DC, angular	2 m PVC-cable 3x0.34 mm <sup>2</sup> PNP with LED
SLG 4-2	Z00445	Cable plug housing M12 DC, straight	2 m PVC-cable 4x0.25 mm <sup>2</sup>
SLG 4-5	Z00449	Cable plug housing M12 DC, straight	5 m PVC-cable 4x0.25 mm <sup>2</sup>
SLW 4-2	Z00446	Cable plug housing M12 DC, angular	2 m PVC-cable 4x0.25 mm <sup>2</sup>
SLW 4-5	Z00450	Cable plug housing M12 DC, angular	5 m PVC-cable 4x0.25 mm <sup>2</sup>
SLW 4-2-LED	Z01157	Cable plug housing M12 DC, angular	2 m PVC-cable 4x0.25 mm <sup>2</sup> PNP with LED
SLG 5-2	Z01150	Cable plug housing M12 DC, straight	2 m PVC-cable 5x0.34 mm <sup>2</sup>
SLW 5-2	Z01151	Cable plug housing M12 DC, angular	2 m PVC-cable 5x0.34 mm <sup>2</sup>
PL-M12	Z01182	Plug-lock for sensors in Ex areas	

### TECHNICAL DATA

Protection	IP 67	Rated voltage	250 VDC
Contact resistance	≤ 5 mΩ	Insulation resistance	> 10 <sup>9</sup> Ω
Switching resistance	4A (CSA=3A)	Testing voltage	2.0 KV eff.
Temperature range	-25...+80 °C		

### Note

Sensors with NC output are connected to 4 pole cable plug housings. In this case, the break output is connected to the white lead (connection 2).

# PROCESS SENSORS

## A selection



### Flow Controller

- Electronical monitoring of flow
- Lubrication
- Minimum dose 1 ml/min
- Up to 80 l/min
- Reaction time 0.5 s



### Level Controller

- For level monitoring -35...+200 °C
- For hot motor oil
- For liquid nitrogen
- For leakage detection
- For chemically aggressive media



### Ultrasonic

- Switching distance up to 5000 mm
- Level monitoring
- Watertight housing
- Teach-in functions



### Pressure Controller

- Compact model with digital display
- Monitoring in pipes and containers
- Pressure up to 16 bar
- Level up to 10 m ( $\pm 1$  cm)
- Programmable



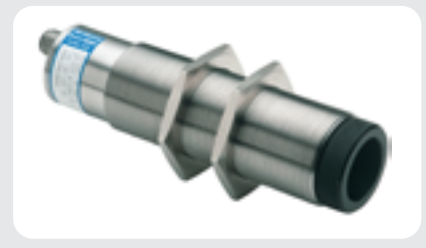
### Temperature Controller

- Compact model with digital display
- Monitoring in pipes and containers
- Temperature -40...+120 °C ( $\pm 0.3$  °C)
- Pressure up to 200 bar
- Multi use output NO/NC + analog



### Infrared Detectors

- Measurement of temperature
- Monitoring of hot media
- Position control





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