

# Capacitive Sensors



Special-Sensors for Automation

# Capacitive Sensors

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

# Capacitive Sensors

## Technique & Application

### Terminology

#### Operating principal

A capacitive proximity switch works with a high frequency oscillating circuit that creates an electromagnetic field on the active sensor surface by means of a capacitor. When a substantial or fluid substance nears this field a capacitance unbalance occurs and leads to a variation of the amplification in the oscillating circuit. If this amplification exceeds a threshold value, a switching signal is generated.

#### Operating distance

The operating distance is the separation of an object from the active sensor surface at which a switching signal is produced. The operating distance depends on the diameter of the sensor surface. Therefore larger sensors are required for longer operating distances. Many EGE sensors have an adjustable operating distance.

Capacitive proximity switches react to conductive materials and non-conductive materials with a dielectrical constant  $\epsilon > 1.8$ . The operating distance depends on the material. Constant measurement of different materials against earthed steel ST 37 yields a changed operating distance.

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	$\epsilon$	Operating distance 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 operating distance. A high humidity content increases the operating distance considerably.

If the proximity switch 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. Capacitive proximity switches can detect filling products right through non-electrically conducting container sides. The filler will certainly be detected if its dielectric constant is at least as large as that of the container sides.

#### Rated operating distance $s_n$

The rated operating distance is a device parameter that does not take into account sample variances and external influences such as temperature and supply voltages.

#### Effective operating distance $s_f$

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

#### Usable operating distance $s_u$

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

#### Assured operating distance $s_a$

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

#### Switch point drift

The operating distances are given for an ambient temperature of 23 °C. In the permissible temperature range the operating distance 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 approaching an object 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 EN 60947-5-2 to be a maximum 20% from the real operating distance, and carries a value of typically 10% from the real operating distance  $s_r$  for EGE sensors.

#### Repeating accuracy R

The repeating accuracy describes the maintenance of the switching point after the repeated approach of an object under specified circumstances. EGE sensors have typical tolerances of less than 3% of the real operating distance.

#### Switching frequency

The maximum switching frequency of the sensor is determined at half nominal operating distance  $s_n$  with standard measurement plates ST 37 according to EN 60947-5-2.

# Capacitive Sensors

## Technique & Application

### Terminology/Installation and operation

#### 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 at the internal resistance of semiconductor elements, which are in the current-path of the output. It is dependent of the load-current and is declared according to EN 60947-5-2 for a mean current of 50 mA.

#### 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.

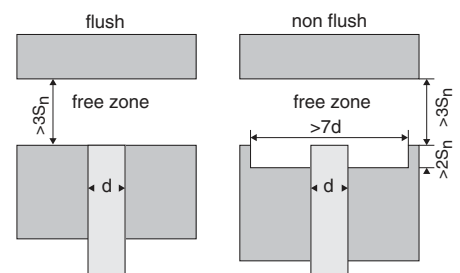
#### Connection

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

##### Mounting

For flush mounting the sensor can be built into metal 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.

For mounting clamps see page 4.14.

# Capacitive Sensors

## Technique & Application

### Installation and operation

#### 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 flush mounting the lateral separation between two sensors must correspond to at least the diameter of the sensor. For non flush mounting, the lateral separation from each other 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 distance should be allowed.

#### 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 61508 and must be labeled accordingly. Sensors that are not labeled must not be used for applications of this kind.



## Standard switches

Smooth-body switches  
Ø 20 mm

DC 10...55 V



Design	DC PNP • Ø 20 mm		DC PNP • Ø 20 mm	
Dimensions				
Installation flush (f) non flush (nf)				
Operating distance sn [mm] (Adjustable range)	10 nf (1...15)	10 nf (1...15)	10 nf (1...15)	10 nf (1...15)
Switching output				
ID-No.	P40092	P40093	P41208	P41209
Type	KNK 015 GSP	KNK 015 GOP	KNKU 015 GSP	KNKU 015 GOP
Supply voltage [V]	10...55 DC	10...55 DC	10...55 DC	10...55 DC
Switching current [mA]	400	400	400	400
Short circuit proof	•	•	•	•
Reverse protection	•	•	•	•
Voltage drop max. [V]	1.5	1.5	1.5	1.5
Residual current [mA]	0.2	0.2	0.2	0.2
Current consumption (not actuated) [mA]	4	12	4	12
Switching frequency [Hz]	25	25	25	25
Ambient temperature [°C]	-25...+70	-25...+70	-25...+70	-25...+70
EMC-class	A	A	A	A
Protection [EN 60529]	IP 67	IP 67	IP 67	IP 67
LED display	•	•	•	•
Housing material	PBT	PBT	PBT	PBT
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup>	2 m PVC-cable 3x0.5 mm <sup>2</sup>	M12 connector	M12 connector
Connection diagram				
Accessories (see page 4.13)	Mounting clamps Ø 20 mm (Z00100) are part of delivery			



## Standard switches

Smooth-body switches  
Ø 34 mm

DC 10...55 V



Design	DC PNP • Ø 34 mm		DC PNP • Ø 34 mm	
<b>Dimensions</b>				
Installation flush (f) non flush (nf)				
Operating distance sn [mm] (Adjustable range)	20 nf (1...30)	20 nf (1...30)	20 nf (1...30)	20 nf (1...30)
Switching output				
ID-No.	P40096	P40097	P41220	P41221
Type	KNK 025 GSP	KNK 025 GOP	KNKU 025 GSP	KNKU 025 GOP
Supply voltage [V]	10...55 DC	10...55 DC	10...55 DC	10...55 DC
Switching current [mA]	400	400	400	400
Short circuit proof	•	•	•	•
Reverse protection	•	•	•	•
Voltage drop max. [V]	1.5	1.5	1.5	1.5
Residual current [mA]	0.2	0.2	0.2	0.2
Current consumption (not actuated) [mA]	4	12	4	12
Switching frequency [Hz]	25	25	25	25
Ambient temperature [°C]	-25...+70	-25...+70	-25...+70	-25...+70
EMC-class	A	A	A	A
Protection [EN 60529]	IP 67	IP 67	IP 67	IP 67
LED display	•	•	•	•
Housing material	PBT	PBT	PBT	PBT
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup>	2 m PVC-cable 3x0.5 mm <sup>2</sup>	M12 connector	M12 connector
Connection diagram				
Accessories (see page 4.13)	Mounting clamps Ø 34 mm (Z00102) are part of delivery			



## Long sensing range

Plastic-housing  
Ø 80 mm

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



Design	DC PNP • Ø 80 mm	AC • Ø 80 mm
Dimensions		
Installation flush (f) non flush (nf)		
Operating distance sn [mm] (Adjustable range)	55 nf (1...70)	55 nf (1...70)
Switching output		
ID-No.	P40100	P40021
Type	KD 080 GSP	KD 080 WS
Supply voltage [V]	10...55 DC	20...250 AC
Switching current [mA]	400	400
Short circuit proof	•	3000 mA/10 ms
Reverse protection	•	-
Voltage drop [V]	1.5	10
Residual current [mA]	0.2	-
Minimum load current [mA]	-	5
Current consumption [mA]	4 (unbetätigt)	2.5
Switching frequency [Hz]	10	10
Ambient temperature [°C]	-25...+70	-25...+70
EMC-class	A	A
Protection [EN 60529]	IP 67	IP 67
LED display	•	•
Housing material	PBT	PBT
Connection	2 m PVC-cable 3x0,5 mm <sup>2</sup> (PG plug connection)	2 m PVC-cable 2x0,5 mm <sup>2</sup> PG plug connection)
Connection diagram		
Accessories	see Seite 4.15	



## Long sensing range

Plastic-housing  
Ø 100 mm

DC 10...55 V



Design	DC PNP • Ø 100 mm
<b>Dimensions</b>	
Installation flush (f) non flush (nf)	
Operating distance sn [mm] (Adjustable range)	70 nf (1...120)
Switching output	
ID-No.	P40105
Type	KNK 090 GSP
Supply voltage [V]	10...55 DC
Switching current [mA]	400
Short circuit proof	•
Reverse protection	•
Voltage drop [V]	1.5
Residual current [mA]	0.2
Minimum load current [mA]	-
Current consumption [mA]	4 (not actuated)
Switching frequency [Hz]	10
Ambient temperature [°C]	-25...+70
EMC-class	A
Protection [EN 60529]	IP 67
LED display	•
Housing material	PBT
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup> (PG plug connection)
Connection diagram	
Accessories	see Seite 4.14



## 200 °C-High temperature

Proximity switch for high temperature

Sensors for connection to an external amplifier

Temperature range  $-40...+200\text{ °C}$

Level detection

Dry run protection

PTFE sensortip, stainless steel housing



Design	M18x1	M30x1.5
Dimensions		
Installation flush (f) non flush (nf)		
Operating distance sn [mm]	5 nf	10 nf
Amplifier	KK 030... KU 120...	KK 030... KU 120...
ID-No.	P41301	P41302
Type	KGMT 05 S-200	KGMT 10 S-200
Hysteresis [%]	approx. 10	approx. 10
Temperature range Sensor [°C]	$-40...+200$	$-40...+200$
Temperature range cable [°C]	$-40...+200$	$-40...+200$
Compressive strength [bar]	2	2
Protection [EN 60529] Sensor	IP 67	IP 67
Protection [EN 60529] Stecker	IP 54	IP 54
Housing material	AISI 316 Ti / PTFE	AISI 316 Ti / PTFE
Connection	2 m PTFE-cable LEM 01 plug system	2 m PTFE-cable LEM 01 plug system
LEM plug system		
Cable plug housing LEM 01		
Accessories	Amplifiers see page 4.12	



## Analog sensors

### Metal thread

M30x1.5  
Ø 80 mm

4...20 mA



Design	M30x1.5	Ø 80 mm
<b>Dimensions</b>		
Installation flush (f) non flush (nf)		
Analog range [mm]	0...15 nf	0...80 nf
ID-No.	P41309	P41310
Type	KGA 015 GI	KDA 080 GI
Supply voltage [V]	18...27 DC	18...27 DC
Current consumption max. [mA]	40	40
Output current max. [mA]	23	23
Linearity deviation [% of scale]	±10	±10
Load resistance $R_L$ [kΩ]	< 0.4	< 0.4
Ambient temperature [°C]	-25...+70	-25...+70
Temperature deviation max. [% of scale]	10	10
Protection [EN 60529]	IP 67	IP 67
Housing material	Br-Ni / PPO	PBT
Connection	2 m PVC-cable 3x0.5 mm <sup>2</sup>	2 m PVC-cable 3x0.5 mm <sup>2</sup>
Output signal		
<b>Connection diagramm</b>		
<b>Accessories</b>	fixing nuts are part of delivery	



## Capacitive amplifiers

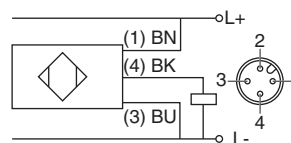
For sensors  
KGFT up to +230 °C  
KGMT up to +200 °C

IP 67 Protection

LED display



Design	KK 030...	KU 120...
Dimensions		
Switching point sp	adjustable	adjustable
Switching output		
ID-No.	P21095	P21107
Type	KK 030 GSP	KU 120 GPP-24
Supply voltage [V]	16...55 DC	24 DC ±20%
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	Aluminium
Sensor connection	LEM 01 plug	LEM 01 plug
Connection	M12 connector	M12 connector



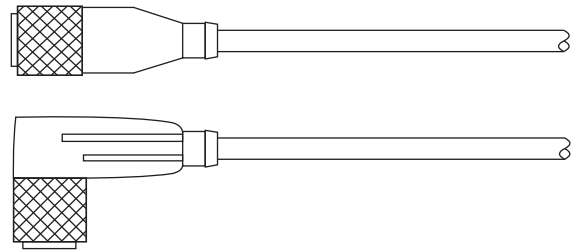
Accessories

connecting cable SLG 3..., SLW 3..., see page 4.13



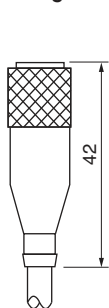
## Accessories | M12 connector

Finished cable plug housing  
Self locking screw plug  
Protection IP 67

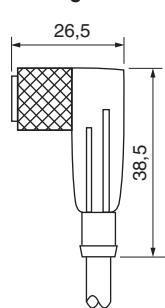


### Cable plug housing

straight



angular

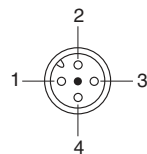


SLG...

SLW...

### Pin-assignment

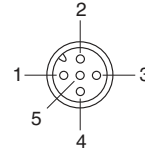
DC



**3-wire**  
1: BN  
2: -  
3: BU  
4: BK

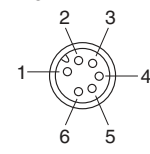
**4-wire**  
1: BN  
2: WH  
3: BU  
4: BK

DC



**5-wire**  
1: BN  
2: WH  
3: BU  
4: BK  
5: GY

DC



**6-wire**  
1: BN  
2: WH  
3: BU  
4: BK  
5: GY  
6: PK

DC

TYPE	ID-NO.	DESIGN
SLG 3-2	Z01076	Cable plug housing straight, 2 m cable 3x0.34 mm <sup>2</sup> max. 250 V / 4 A
SLG 3-5	Z01077	Cable plug housing straight, 5 m cable 3x0.34 mm <sup>2</sup> max. 250 V / 4 A
SLW 3-2	Z01078	Cable plug housing angular, 2 m cable 3x0.34 mm <sup>2</sup> max. 250 V / 4 A
SLW 3-5	Z01079	Cable plug housing angular, 5 m cable 3x0.34 mm <sup>2</sup> max. 250 V / 4 A
SLW 3-2-LED	Z00052	Cable plug housing angular, 2 m cable 3x0.34 mm <sup>2</sup> max. 250 V / 4 A PNP with LED
SLG 4-2	Z00445	Cable plug housing straight, 2 m cable 4x0.25 mm <sup>2</sup> max. 250 V / 4 A
SLG 4-5	Z00449	Cable plug housing straight, 5 m cable 4x0.25 mm <sup>2</sup> max. 250 V / 4 A
SLW 4-2	Z00446	Cable plug housing angular, 2 m cable 4x0.25 mm <sup>2</sup> max. 250 V / 4 A
SLW 4-5	Z00450	Cable plug housing angular, 5 m cable 4x0.25 mm <sup>2</sup> max. 250 V / 4 A
SLW 4-2-LED	Z01157	Cable plug housing angular, 2 m cable 4x0.25 mm <sup>2</sup> max. 250 V / 4 A PNP with LED
SLG 5-2	Z01150	Cable plug housing straight, 2 m cable 5x0.34 mm <sup>2</sup> max. 60 V / 2 A
SLW 5-2	Z01151	Cable plug housing angular, 2 m cable 5x0.34 mm <sup>2</sup> max. 60 V / 2 A
SLG 6-2	Z01197	Cable plug housing straight, 2 m cable 6x0.25 mm <sup>2</sup> max. 36 V / 2 A
SLW 6-2	Z01198	Cable plug housing angular, 2 m cable 6x0.25 mm <sup>2</sup> max. 36 V / 2 A

### DATA

Thread	M12x1	Contact resistance	≤ 5 mΩ
Material	PVC	Insulation resistance	>10 <sup>9</sup>
Protection	IP 67	Testing voltage	2.0 KV eff. / 5 and 6 pol. 1.5 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).



## Accessories | Assembly parts

### Lock nuts, brass-nickel - plated

ID-NO.	Z00106	Z00107	Z00114	Z00109	Z00110
Nut thickness [mm]	4	4	4	5	5
Thread	M12x1	M18x1	M22x1	M30x1.5	M38x1.5
Spanner size	17	24	27	36	50

### Lock nuts, stainless steel

ID-NO.	Z01098	Z00112	Z00113	Z00115
Nut thickness [mm]	4	4	4	5
Thread	M8x1	M12x1	M18x1	M30x1.5
Spanner size	13	17	24	36

### Lock nuts, plastics

ID-NO.	Z00180	Z00120	Z00117	Z00118	Z00119	Z01092	Z01052
Nut thickness [mm]	6	8	4	5	5,5	8	8
Thread	M14x1	M30x1.5	M12x1	M18x1	M30x1.5	G 3/4	G 1
Spanner size	22	41	17	24	36	41	50
Material	PTFE	PTFE	PPE	PPE	PPE	PTFE	PTFE

### Central screw, polyamide

Z00104	M12, length 70 mm, hexagon socket 10 mm, material PA
Z00105	M16, length 90 mm, hexagon socket 14 mm, material PA

### MOUNTING CLAMPS

TYPE	ID-NO.	DIMENSIONS	DESIGN																			
KLS 20 KLS 34	Ø 20 Ø 34	Z00100 Z00102	<p>E: hexagon socket screw 1.4305</p>	Clamps of PA, for smooth-bodied switches <table border="1"> <thead> <tr> <th>F</th> <th>Ø 20</th> <th>Ø 34</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>47</td> <td>61</td> </tr> <tr> <td>B</td> <td>30</td> <td>47</td> </tr> <tr> <td>C</td> <td>17</td> <td>15</td> </tr> <tr> <td>D</td> <td>32</td> <td>45</td> </tr> <tr> <td>E</td> <td>M5x30</td> <td>M5x50</td> </tr> </tbody> </table>	F	Ø 20	Ø 34	A	47	61	B	30	47	C	17	15	D	32	45	E	M5x30	M5x50
F	Ø 20	Ø 34																				
A	47	61																				
B	30	47																				
C	17	15																				
D	32	45																				
E	M5x30	M5x50																				
KLB 35	Ø 35	Z00125	<p>hexagon socket screw 1.4571</p>	Clamp of PTFE (Teflon), for smooth-bodied switches hexagon socket screw M5x40																		
KBM 025 KBM 030 KBM 035	Ø 25 Ø 30 Ø 35	Z01189 Z01188 Z01187		Mounting clamp of aluminium <table border="1"> <thead> <tr> <th>Typ</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>KBM 025</td> <td>Ø 25</td> </tr> <tr> <td>KBM 030</td> <td>Ø 30</td> </tr> <tr> <td>KBM 035</td> <td>Ø 35</td> </tr> </tbody> </table>	Typ	D	KBM 025	Ø 25	KBM 030	Ø 30	KBM 035	Ø 35										
Typ	D																					
KBM 025	Ø 25																					
KBM 030	Ø 30																					
KBM 035	Ø 35																					



## Accessories | Cable

TYPE	ID-NO.	MATERIAL/SHEAT	$\varnothing_A$ [mm]*	WIRE SPECIFICATION	COLOUR
PVC205	Z01061	PVC, grey	5.2	2x0.5 mm <sup>2</sup>	BU, BN
PVC205B	Z01062	PVC, blue	5.1	2x0.5 mm <sup>2</sup>	BU, BN
PVC275	Z01086	PVC, grey	6.0	2x0.75 mm <sup>2</sup>	BU, BN
PVC275BS	Z01108	PVC, blue	6.3	2x0.75 mm <sup>2</sup> shielded	numbered cable
PVC334	Z01109	PVC, grey	4.5	3x0.34 mm <sup>2</sup>	BU, BN, BK
PVC305E	Z01064	PVC, grey	5.2	3x0.5 mm <sup>2</sup>	BU, BN, GN/YE
PVC305	Z01063	PVC, grey	5.2	3x0.5 mm <sup>2</sup>	BU, BN, BK
PVC305B	Z01167	PVC, blue	5.2	3x0.5 mm <sup>2</sup>	BU, BN, BK
PVC375	Z01065	PVC, grey	6.0	3x0.75 mm <sup>2</sup>	numbered cable
PVC375E	Z01111	PVC, grey	6.0	3x0.75 mm <sup>2</sup>	BU, BN,GN/YE
PVC425	Z01110	PVC, grey	4.3	4x0.25 mm <sup>2</sup>	BU, BN, BK, WH
PVC434	Z01066	PVC, grey	4.5	4x0.34 mm <sup>2</sup>	BU, BN, BK, WH
PVC405	Z01067	PVC, grey	5.5	4x0.5 mm <sup>2</sup>	BU, BN, BK, WH
PVC475E	Z01113	PVC, grey	6.5	4x0.75 mm <sup>2</sup>	BU, BN, BK, GN/YE
PVC475BS	Z01114	PVC, blue	7.3	4x0.75 mm <sup>2</sup> shielded	numbered cable
PVC505	Z01116	PVC, grey	5.8	5x0.5 mm <sup>2</sup>	BU, BN, WH, BK, GY
PVC705	Z01117	PVC, grey	6.6	7x0.5 mm <sup>2</sup>	BU, BN, WH, GN/YE, GY, PK
PUR334	Z01156	PUR, grey	5.0	3x0.34 mm <sup>2</sup>	BU, BN, BK
PUR375	Z01068	PUR, black	6.0	3x0.75 mm <sup>2</sup> -40°C	BU, BN, BK
PUR425S	Z01069	PUR, grey	5.0	4x0.25 mm <sup>2</sup> shielded	BU, BN, WH, BK
PUR425BS	Z01070	PUR, blue	5.0	4x0.25 mm <sup>2</sup> shielded	BU, BN, WH, BK
PUR405	Z01112	PUR, black	5.0	4x0.5 mm <sup>2</sup>	BU, BN, WH, BK
PUR405BS	Z01173	PUR, blue	6.2	4x0.5 mm <sup>2</sup> shielded	BU, BN, WH, BK
PUR475SE	Z01118	PUR, grey	9.0	4x0.75 mm <sup>2</sup> shielded	numbered cable
PUR410E	Z01119	PUR, orange	8.0	4x1.0 mm <sup>2</sup>	BU, BN, BK, GN/YE
FEP375S	Z01126	FEP, red	5.0	3x0.75 mm <sup>2</sup> shielded	BU, BN, BK
FEP334	Z01071	FEP, red	3.8	3x0.34 mm <sup>2</sup>	BU, BN, BK
FEP425S	Z01073	FEP, red	4.1	4x0.25 mm <sup>2</sup> shielded	BU, BN, BK, WH
FEP425	Z01072	FEP, red	3.7	4x0.25 mm <sup>2</sup>	BU, BN, BK, WH
FEP425BS	Z01125	FEP, blue	4.1	4x0.25 mm <sup>2</sup> shielded	BU, BN, BK, WH
FEP375	Z01165	FEP, red	4.2	3x0.75 mm <sup>2</sup>	BU, BN, GN/YE
Silikon375E	Z01121	Silicone, red	6.0	3x0.75 mm <sup>2</sup>	BU, BN, GN/YE
Silikon475E	Z01122	Silicone, red	6.3	4x0.75 mm <sup>2</sup>	BU, BN, BK, GN/YE
Silikon475SE	Z01115	Silicone, red	8.8	4x0.75 mm <sup>2</sup> shielded	BU, BN, BK, GN/YE
Silikon305	Z01143	Silicone, red	5.5	3x0.5 mm <sup>2</sup>	BU, BN, BK
PVC705SE	Z01123	PVC-transparent	9.2	7x0.5 mm <sup>2</sup> shielded	numbered cable, GN/YE

\*Tolerance of diameter  $\pm 0,4$  mm

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

# Sales partners, wholesalers and representatives



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We look forward to your enquiry.  
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