

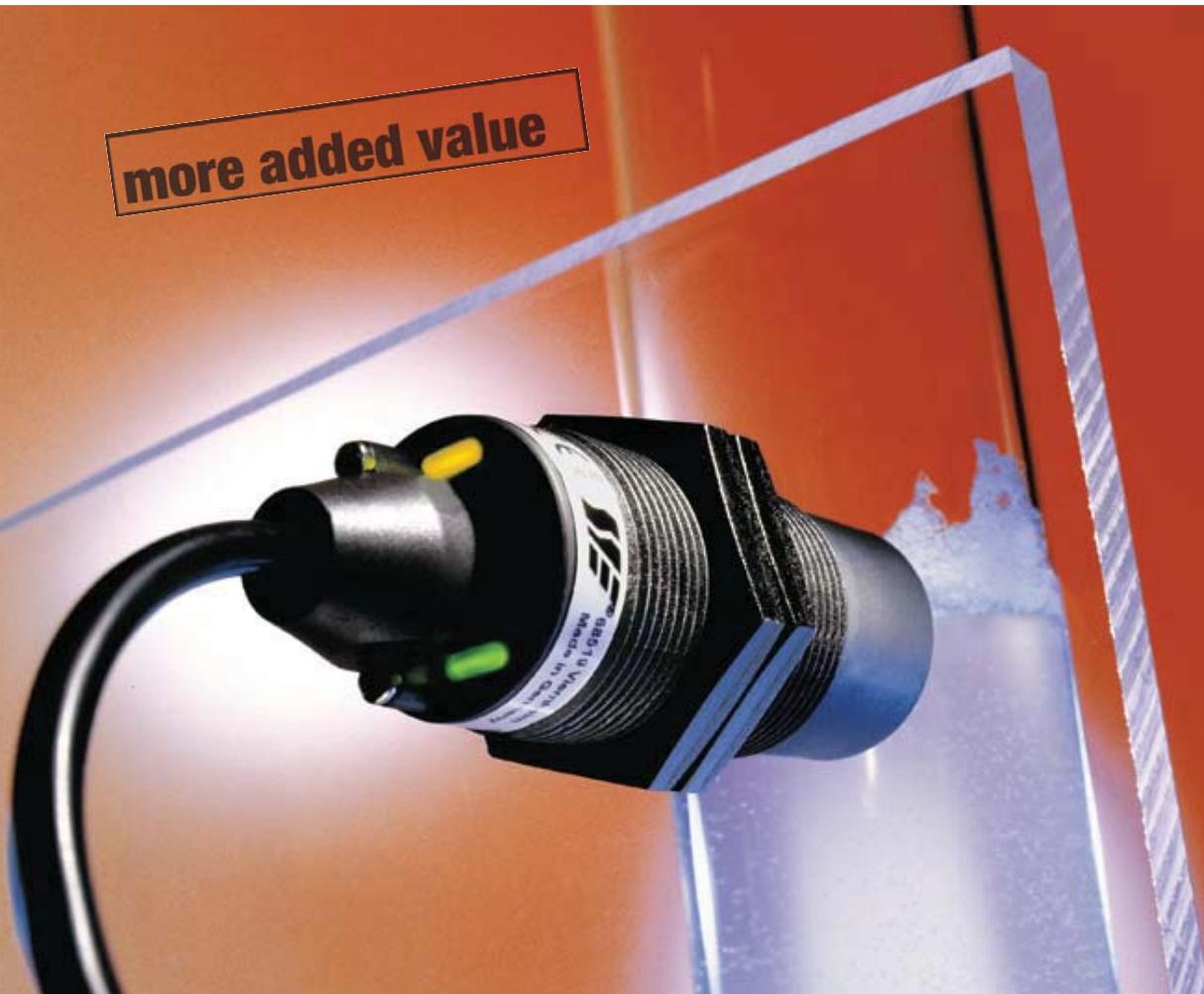
BALLUFF

SIESENSORIK

Capacitive Sensors

... new possibilities in object detection and level sensing

more added value



Overview

**Capacitive Mini-sensors, SK**

- Housings in V2A/PTFE from Ø 4 mm
- Flat disk form from Ø 18 mm by only 2.5 mm high
- Sensing distance adjustable on the amplifier
- Variety of processing electronics available

**Capacitive sensors for object detection, SK1-B**

- Housings made of metal or plastic
- Compact sizes with potentiometer starting at Ø 6.5 mm
- Disc sizes up to Ø 50 mm
- Sensing distance up to 25 mm
- Flush mounting
- Connecting lead or plug connector

**Capacitive sensors for level sensing, SK1-NB**

- Housings M12 and larger in metal, plastic and PTFE
- Cable, connector and terminal versions available
- Operating temperature up to 125 °C at 10 bar pressure rating
- Dependable switching for granules, powders and liquids

**Sensors for level sensing****Capacitive smartLEVEL sensors, FSA**

- For aqueous media
- No adjustment in standard application
- Self-compensating
- Through glass or plastic
- Flush and non-flush versions

**Sensors for level sensing****Capacitive microBOX sensors**

- As sensors for object detection of in smartLEVEL technology
- Compact housing design
- Variety of mounting options
- Mounting bracket included
- Polypropylene housing
- 3-D cable exit

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Analog sensor

Series SK1-A 0800

- Measuring range 0...8 mm adjustable
- Flush mounting
- Output signal current 4...20 mA
- Housing M18

8.01 –
8.04



DIN EN ISO 9001:2000
QA 05 100 1050



0.8



M18

application notes

Type code (abstract)

SK sensor capacitive, w/o amplifier
 SKF sensor cap., w/o amplifier, flexible
 SK1 sensor capacitive, self-contained
 SV(D) sensor amplifier (dynamic)
 SNG sensor power pack

HT### high temperature use
 TM pulse modulation technique (High noise immune)

/ FS(A) max sensing distance / Fill-level switch (adaptive)

M30 model and/or dimension

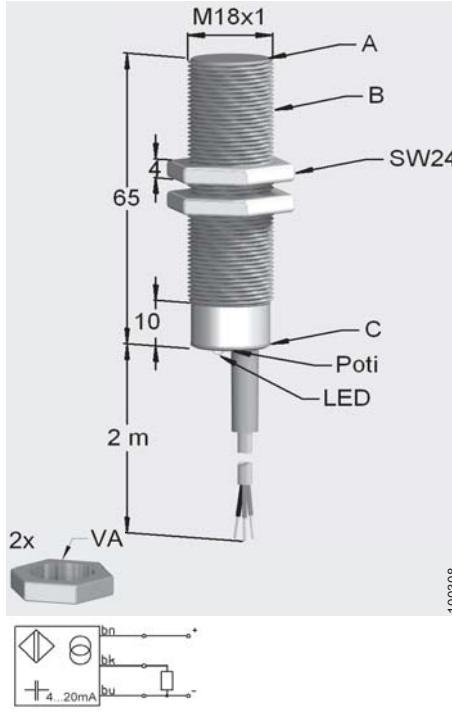
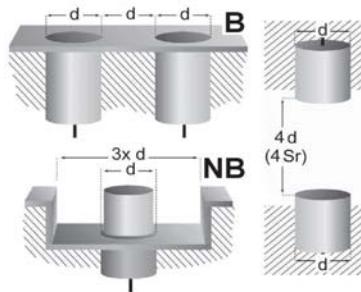
P output stage PNP, NPN, X (switchable)

B mounting B=flush
 NB=non-flush

S S=N.O. Ö=N.C.
 X=function switchable

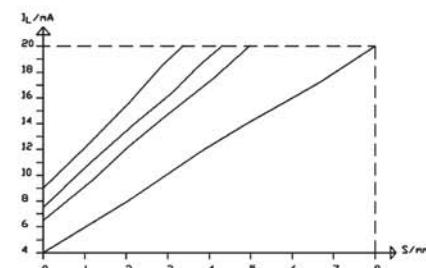
(C)PTFE Housing material, e.g. **PTFE**
 CPTFE=complete PTFE

1M2-Y2 cable & connector:
 Y# = connector
 1M2 = 1.2m cable length



Calibration

When performing measurements on objects with a low relative dielectric coefficient ($\epsilon_r \leq 10$), it is possible to calibrate the sensor to match the specific material properties involved (Fig. 8.02) or the size of the object in order to maintain the full output signal range (4...20 mA).



For this purpose, the object in question is held against the sensor (distance $S = 0$ mm) and the trimming potentiometer (which can be operated from the rear of the sensor) adjusted until the signal LED lights up green. While performing the calibration procedure, make sure that the object is lying flush against the sensor surface and that there is no other object (which might disturb the procedure) located directly behind the object in the direct extension of the active sensor surface. If the signal LED lights up red, turn the trimming potentiometer to the right (clockwise); when this LED lights up orange, turn it to the left. The sensor has now been calibrated to match the properties of the new object.

This calibration procedure ensures that the sensor will always supply the full output signal range as long as the size of the object is sufficient and the object possesses a relative dielectric coefficient still allowing evaluation. In the case of objects with insufficient dielectric coefficient or insufficient size, the signal range is restricted. Objects with a relative dielectric coefficient ϵ_r of about 1 or objects which are too small will not cause the output signal to alter.

For appropriate reduction factors in dependence on the object properties involved, please consult the table.

Typ / Type

SK1-A-8-M18-4I20-B-VA/PBT

Mounting [flush / nonflush]	[B / NB]	B
Operating distance	Sn [mm]	0... 8
Hysteresis	H [%SR]	
Frequency of operating cycles	f [Hz]	100
Repeat accuracy	R [%SR]	0,05mm
Operating temperature range	Ta [°C]	10... 55
Temperature drift [range]	[%SR]	10[10... 55]
Protection class		IP 67
Rated insulation voltage	Ui [V]	75 d.c.
Material of housing		A: PBT; B: VA; C: PVC
Utilisation category		
Connection		2m / 3x 0,25mm ² PVC
Supply voltage range UB	Ub [V]	12... 35
No-load supply current	Iomax. [mA]	17
Minimum operational current	Im [mA]	
Operational current	Ie [mA]	4... 20
Off-state current	Ir [mA]	
Voltage drop	Ud @ Ie [V]	
Time delay before availability	tv [ms]	
Indicator [UB / Output]		• / •
Short circuit- overload-protection		• / •
Reverse polarity protection		•
Conformity	EMC EEC-direct.	IEC 60947-5-2 : 2004



IEC 61000-4-6 (Testlevel 3V) Functional errors may occur in partition of working frequency 1.2 Mhz.

Material	Thickness d / mm	Measuring range S / mm	I _L /mA	Reduction-factor
Steel ST-37	1,5	0...8	4...20	/
Brass Ms	1,5	0...8	4...20	/
Water				/
Polyvinylchloride (PVC)	4,0	0...2,8	4...20	0,35
	6,0	0...3,25		0,41
Acryl glass (PMMA)	8,0	0...3,45		0,47
	12,0	0...3,75		0,47
Hard paper	6,5	0...5,5	4...20	0,69
Foamed PVC	3	0...1,75	6,5...20	0,22
	6	0...2	5,7...20	0,25

If the sensor has to be used for material selection in a particular application, the calibration can be dispensed with if the trimming potentiometer has not been adjust after delivery.

The as-delivered condition is calibration on a metal target.

Application

Functional principle

Function principle

The functional principle behind the capacitive analog position pickup is similar to that of a capacitive proximity switch. It detects objects which are within its response range without touching them. The function is based on the effect on the electric field in the vicinity of its "active sensor surface". The basic structure of the sensor consists of an oscillator, a demodulator, the linearization network and the controlled current source.



Fig. 8.01

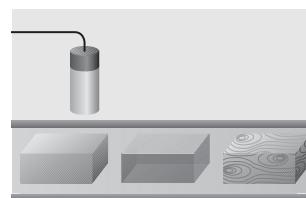
The criteria for an analog evaluation are the material properties, the size of the object involved, and its distance from the "active sensor surface". For objects deviating from the standard target, the maximum working distance is reduced (see Fig. 8.06 on page 8.04). In actual operation, the optimum calibration to be performed from the rear of the housing over a trimming potentiometer is signaled to the user by the adjacent LED. As a further special feature, this LED also signals if the load impedance at the output is too high or non-existent.

Advantages of the capacitive analog pickup

The capacitive analog sensor scans objects without contact. This means that the object scanned is not subjected to any mechanical wear and tear. Nor do colors and surface roughnesses have any negative effect on the measured result. In the case of differing object materials, the output signal deviates from the standard output signal of 4...20 mA, and can be returned by a simple-to-perform user calibration procedure to the standard output signal.

Applications

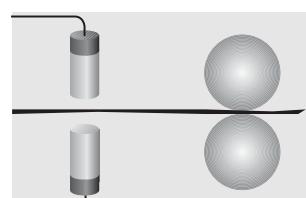
The capacitive analog sensor makes linear evaluation of a position for the first time; as soon as an object is located within the sensor's measuring range, a precise output current is produced. The uses shown represent only a fraction of the multifaceted application options provided by the capacitive analog sensor.



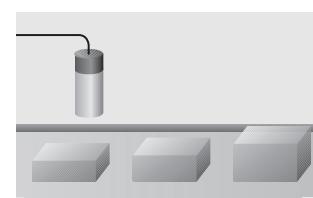
Material selection



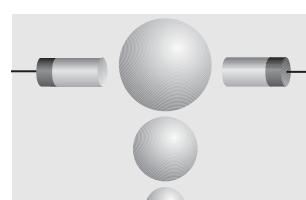
Measuring nonmetallic coating thicknesses



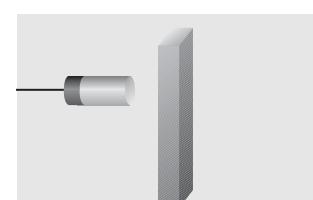
Product thickness monitoring



Height measurement



Determining diameters



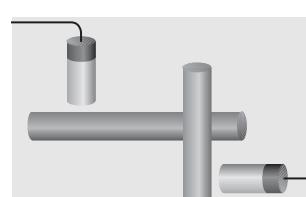
Static/dynamic movement



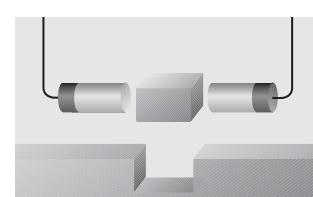
Registering radial runout



Concentricity and eccentricity



Axial and radial runout deviation



Monitoring fit

Functional principle

Calibration

When performing measurements on objects with a low relative dielectric coefficient ($\epsilon_r < 10$), it is possible to calibrate the sensor to match the specific material properties involved (Fig. 8.02) or the size of the object in order to maintain the full output signal range (4...20 mA).

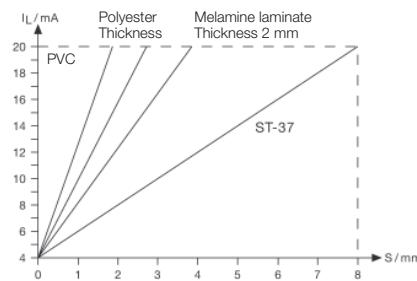


Fig. 8.02

For this purpose, the object in question is held against the sensor (distance $S = 0$ mm) and the trimming potentiometer (which can be operated from the rear of the sensor) adjusted until the signal LED lights up green. While performing the calibration procedure, make sure that the object is lying flush against the sensor surface and that there is no other object (which might disturb the procedure) located directly behind the object in the direct extension of the active sensor surface. If the signal LED lights up red, turn the trimming potentiometer to the right (clockwise); when this LED lights up orange, turn it to the left. The sensor has now been calibrated to match the properties of the new object.

This calibration procedure ensures that the sensor will always supply the full output signal range as long as the size of the object is sufficient and the object possesses a relative dielectric coefficient still allowing evaluation. In the case of objects with insufficient dielectric coefficient or insufficient size, the signal range is restricted. Objects with a relative dielectric coefficient ϵ_r of about 1 or objects which are too small will not cause the output signal to alter.

For appropriate reduction factors in dependence on the object properties involved, please consult the table of Fig. 8.06.

If the sensor has to be used for material selection in a particular application, the calibration can be dispensed with if the trimming potentiometer has not been adjusted after delivery. The as-delivered condition is calibration on ST-37 target.

Determining the load impedance

Mathematical determination of the max. permissible value for load impedance R_L

$$R_L = [(40 \times U_B/V) - 200] \Omega$$

with $U_B/V = 12\ldots35$ VDC

Please note:

Care must be taken to ensure that the load impedance is made up of the line impedance R_{ZL} and the actual load impedance R_L . The sum of these two impedance values must be within the impedance range mentioned above.

Graphical determination of the maximum permissible load impedance

Fig. 8.03 shows the diagram used for determining permissible load impedance values R_L in dependence on the sensor supply voltage U_B .

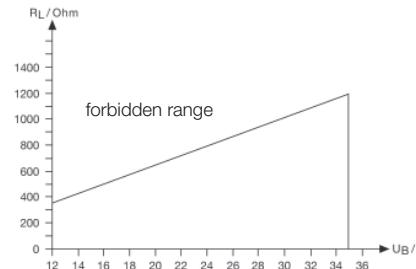


Fig. 8.03

Dimensioning example

(Fig. 8.04)

Application data: $U_B = 24$ V

To find: possible impedance range for load impedance.

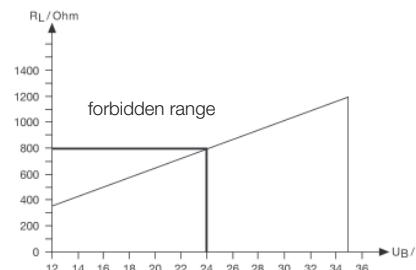


Fig. 8.04

How to proceed:

Move vertically upwards from the defined supply voltage value U_B to obtain an intersection point with the load impedance limit curve. The maximum permissible value for load impedance R_L can now be read off on the Y-axis at the height of this intersection point. The minimal value for load impedance R_L is always 0 Ω . You will thus obtain a permissible load impedance range of 0...760 Ω for the supply voltage value mentioned above.

Error messages

The analog sensor automatically detects whether the load impedance connected has been too generously dimensioned.

In this case, proper function of the sensor is no longer guaranteed, since the behavior of the output signal is no longer proportional to the distance from the object. An operating error of this type is indicated by the flashing calibration display.

To check the sensor for proper function, the following two tests should be performed:

- Object located as close as 0 mm to the object: signal LED permanently lit up green.
- Object outside the response range of the sensor: signal LED permanently lit up orange.

If these two tests have given the above results, the load impedance selected is okay.

If these two tests produce different LED displays, this indicates impermissible operating conditions. An error analysis can be performed using the table below (Fig. 8.05).

Distance Sensor-Object	Display	Meaning of Display
0 mm	red flashing	calibration too low/ R_L too high
0 mm	green flashing	calibration okay/ R_L too high
0 mm	orange flashing	calibration too high/ R_L too high
0 mm	red steady	calibration too low/ R_L ?
0 mm	green steady	calibration okay/ R_L ?
0 mm	orange steady	calibration too high/ R_L ?
>11 mm	orange flashing	calibration? $/R_L$ too high
<11 mm	orange steady	calibration? $/R_L$ okay

Fig. 8.05

If the signal LED is permanently flashing (even if the output has been short-circuited to ground), this means that there is a cable break. In this case, check the cable between sensor and evaluation device, and replace it if necessary.

Material correction table

The measuring ranges reduced due to different material properties can be taken from the following table (Fig. 8.06)

Material	Thickness d / mm	Measuring range S / mm	I_L / mA	Reduction-factor
Steel ST-37	1.5	0...8	4...20	/
Brass Ms	1.5	0...8	4...20	/
Water				/
Polyvinyl chloride (PVC)	4.0	0...2.8	4...20	0.35
	6.0	0...3.25		0.41
Acrylic (PMMA)	8.0	0...3.45		0.47
	12.0	0...3.75		0.47
Hard paper	6.5	0...5.5	4...20	0.69
Foamed PVC	3	0...1.75	6.5...20	0.22
	6	0...2	5.7...20	0.25

Fig. 8.06

Sensors for the high temperature range

Series SK-HT 0900

- Ambient temperature up to 180 °C and up to 250 °C
- Housing M18, M30 and 3/8" in V2A/PTFE
- Connection sensor lead with plug connector
- Non-flush mountable
- Adjustment using sensor amplifiers 0400



9.01 -
9.03



DIN EN ISO 9001:2000
QA 05 100 1050

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Type code (abstract)

SK sensor capacitive, w/o amplifier
SKF sensor cap., w/o amplifier, flexible
SK1 sensor capacitive, self-contained
SV(D) sensor amplifier (dynamic)
SNG sensor power pack

HT### high temperature use
TM pulse modulation technique (High noise immune)

/ FS(A) max sensing distance /
Fill-level switch (adaptive)

M30 model and/or dimension

P output stage PNP, NPN,
X (switchable)

B mounting B=flush
NB=non-flush

S S=N.O. Ö=N.C.
X=function switchable

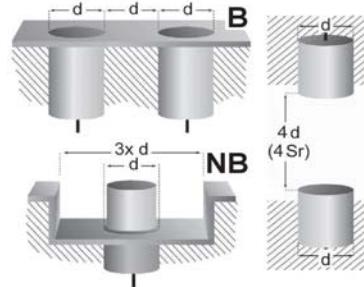
(C)PTFE Housing material, e.g. PTFE

CPTFE=complete PTFE

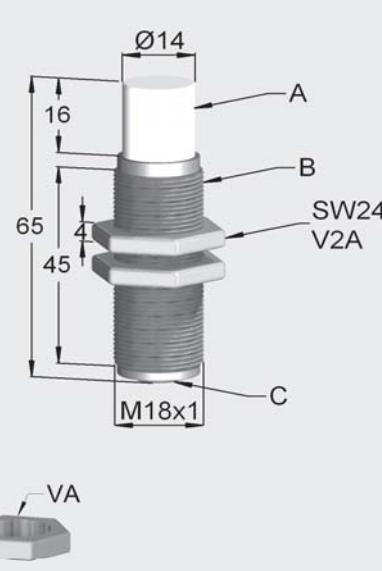
1M2-Y2 cable & connector:

Y# = connector

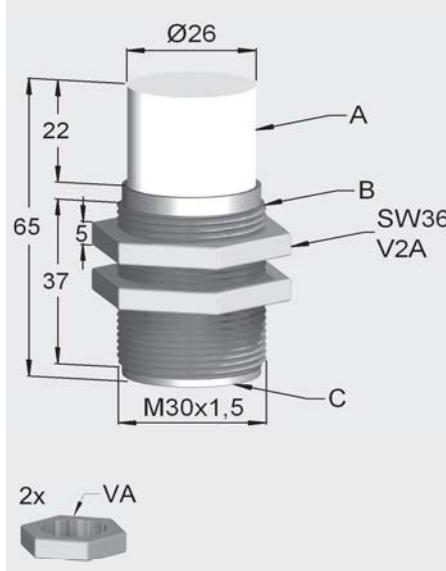
1M2 = 1.2m cable length



1..10 M18



1..20 M30



190308

190308

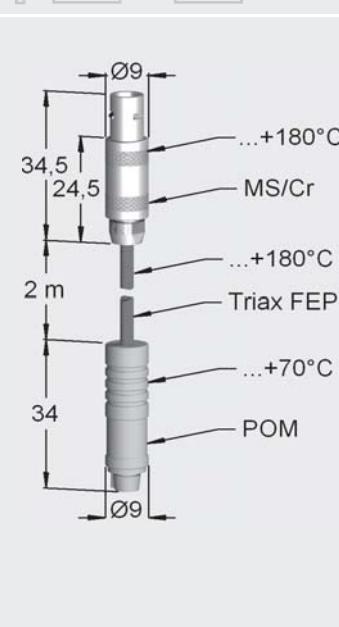
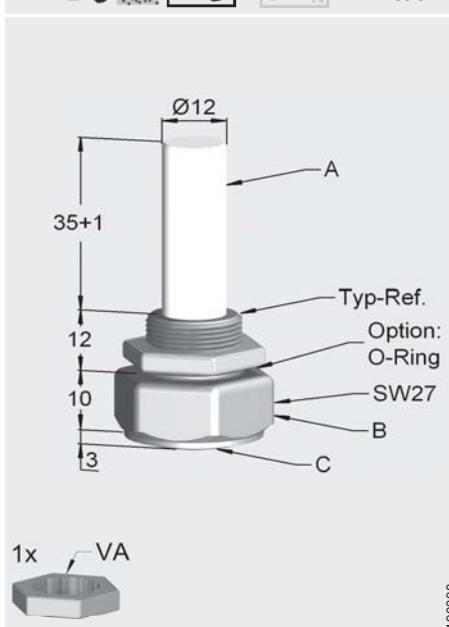
Typ / Type
SK-HT250-10-M18-NB-VA/PTFE

Typ / Type
SK-HT250-20-M30-NB-VA/PTFE

Mounting [flush / nonflush]	[B / NB]	NB	NB
Operating distance	Sn [mm]	1... 10	1... 20
Hysteresis	H [%SR]	15	15
Frequency of operating cycles	f [Hz]		
Repeat accuracy	R [%SR]	2	2
Operating temperature range	Ta [C°]	-180... 250	-180...250
Temperature drift [range]	[%SR]		
Protection class		IP 66 / IP 54	IP 66 / IP 54
Rated insulation voltage	Ui [V]		
Material of housing		A: PTFE; B: V2A; C: PTFE/MS/Cr	A: PTFE; B: V2A; C: PTFE/MS/Cr
Utilisation category			
Connection		SLK-HT	SLK-HT
Supply voltage range UB	Ub [V]		
No-load supply current	Iomax. [mA]		
Minimum operational current	Im [mA]		
Operational current	Ie [mA]		
Off-state current	Ir [mA]		
Voltage drop	Ud @ Ie [V]		
Time delay before availability	tv [ms]		
Indicator [UB / Output]			
Short circuit- overload-protection			
Reverse polarity protection			
Conformity	EMC EEC-direct.	IEC 60947-5-2 : 2004	CE IEC 60947-5-2 : 2004
Associated equipment	EMC	IEC 61000-4-6 (3V) Functional errors may occur in frequency range 0.25-0.6 Mhz (sensor grounded) SLK-HT	IEC 61000-4-6 (3V) Functional errors may occur in frequency range 0.25-0.6 Mhz (sensor grounded) SLK-HT
Additional functionality			

Application



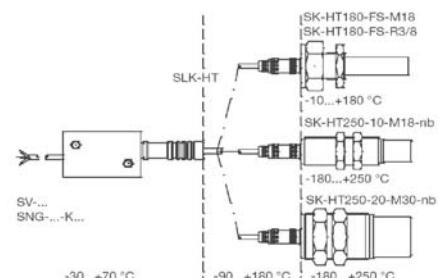
M18
R3/8

application notes

The capacitive high temperature sensors are especially suitable for applications where the sensor head is exposed to a high ambient temperature, or comes directly into contact with hot materials.

The units are used as fill level detectors in liquids and bulk goods, or as distance sensors for detecting block materials in hot surroundings.

Application



Sensors of the SK-HT series connected only via additional lead / triax FEP 2 m fix with integrated oscillator, Type **SLK-HT**, Art. No. 09007

Typ / Type
SK-HT180-FS-M18-VA/PTFE
SK-HT180-FS-R3/8-VA/PTFE
SK-HT180-FS-J3/8/NPTF-VA/PTFE

Typ / Type
SLK-HT

NB

-10... 180

-10...70

IP 68 (6 bar max) / IP 54

IP 54

A: PTFE; B: V2A; C: PTFE/MS/Cr

SLK-HT



2m Triax FEP

IEC 60947-5-2 : 2004



IEC 60947-5-2 : 2004



IEC 61000-4-6 (3V) Functional errors may occur in frequency range 0.25-0.6 MHz (sensor grounded)
SLK-HT

see SK-HT### sensors

SV-; SNG-...-K & SL-YA-m20; SL-YAZA-3m



Sensor power packs

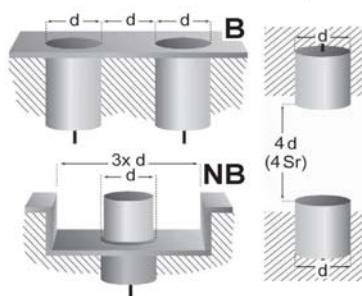
Series SNG 1200

- Clamps housing width 22.5 mm
- Quick-mount
- Relay output
- Supply voltage 230 VAC or 115 VAC
- Sensor input PNP and NPN
- Min-Max control



Type code (abstract)

SK	sensor capacitive, w/o amplifier
SKF	sensor cap., w/o amplifier, flexible
SK1	sensor capacitive, self-contained
SVD(D)	sensor amplifier (dynamic)
SNG	sensor power pack
HT###	high temperature use
TM	pulse modulation technique (High noise immune)
## / FS(A)	max sensing distance / Fill-level switch (adaptive)
M30	model and/or dimension
P	output stage PNP, NPN, X (switchable)
B	mounting B=flush NB=non-flush
S	S=N.O. Ö=N.C. X=function switchable
(C)PTFE	Housing material, e.g. PTFE CPTFE =complete PTFE
1M2-Y2	cable & connector: Y# = connector 1M2 = 1.2m cable length

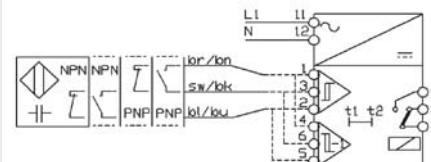


DC

application notes

Not for use with XDC-output
stage
(e.g. microLEVEL)

Wiring diagramm



Typ / Type
SNG-230AC/24DC-T
SNG-115AC/24DC-T

10308

Mounting [flush / nonflush] [B / NB]

Operating distance Sn [mm]

Hysteresis H [%SR]

Frequency of operating cycles f [Hz]

10

Repeat accuracy R [%SR]

Operating temperature range Ta [C°]

-30... 70

Temperature drift [range] [%SR]

Protection class

IP 40 / 20



IP 20

Rated insulation voltage Ui [V]

Material of housing

Makrolon 8020, 2800

Utilisation category

Connection

Klemmen



Supply voltage range UB [V]

230 (115) V 40... 60 Hz

No-load supply current Iomax. [mA]

20 / 40

Minimum operational current Im [mA]

Operational current Ie [mA]

380VAC / 250VDC / 8A



Off-state current Ir [mA]

Voltage drop Ud @ Ie [V]

Time delay before availability tv [ms]

- / •

Indicator [UB / Output]

Short circuit- overload-protection

Reverse polarity protection

Conformity

IEC 60947-5-2 : 2004



EMC EEC-direct.

73/23

EMC

Associated equipment

Additional functionality

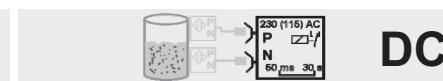
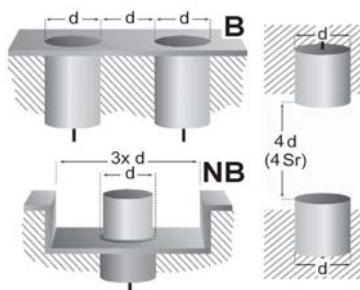
50ms...30s
50ms...30s

Application



Type code (abstract)

SK	sensor capacitive, w/o amplifier
SKF	sensor cap., w/o amplifier, flexible
SK1	sensor capacitive, self-contained
SV(D)	sensor amplifier (dynamic)
SNG	sensor power pack
HT##	high temperature use
TM	pulse modulation technique (High noise immune)
## / FS(A)	max sensing distance / Fill-level switch (adaptive)
M30	model and/or dimension
P	output stage PNP, NPN, X (switchable)
B	mounting B=flush NB =non-flush
S	S=N.O. Ö=N.C. X=function switchable
(C)PTFE	Housing material, e.g. PTFE CPTFE=complete PTFE
1M2-Y2	cable & connector: Y# = connector 1M2 = 1.2m cable length

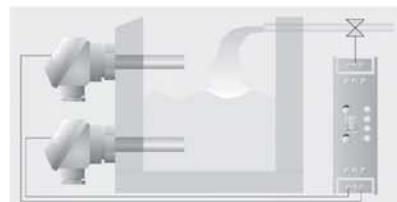


DC

application notes

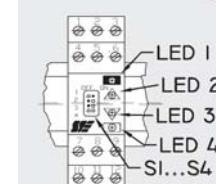
Not for use with XDC-output stage
(e.g. microLEVEL)

Function

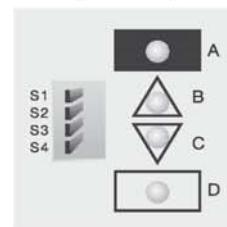


When both sensors are de-activated, the relay switches on "LED-empty" lights up (contact 7/9 locked out). When the minimum sensor gives a closed signal, the "LED-filling" illuminates. As soon as both sensors are activated, the relay switches off "LED-full" lights up (contact 7/9 open). When the maximum sensor signals open, the "LED indicating empty" will light up. The relay will not switch on again until both sensors are de-activated. Further functions are possible with the Mini-Dip-Switch (see below).

100308



Typ / Type
SNG-230AC-MINMAX
SNG-115AC-MINMAX



Dip-Switch Function

Sensing setting (sketch) = as-delivered condition

S1 Time-delay Max sensor (off: approx. 0.2 sec.; on: approx. 5 sec.)

S2 Time-delay Min sensor (off: approx. 0.2 sec.; on: approx. 5 sec.)

S3 Power-on set-up (off: filling; on: emptying)

S4 Output (Relay invers)

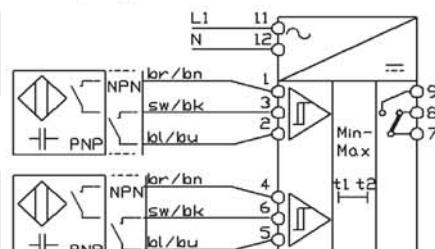
Display

A fill - B filling - C emptying - D empty

Features

- Min/Max level sensor controls
- automatical adapting PNP and NPN Connection points for two sensors SK-1 series (N.O.)
- Short circuit proof on the DC side
- Separate switchable delays for either Min – Max sensor from approx. 0,2 sec / 5sec

Wiring diagram



Mounting [flush / nonflush]

[B / NB]

Operating distance	Sn	[mm]	
Hysteresis	H	[%SR]	
Frequency of operating cycles	f	[Hz]	5
Repeat accuracy	R	[%SR]	
Operating temperature range	Ta	[°C]	-30... 70
Temperature drift [range]		[%SR]	
Protection class			IP 40 / 20
Rated insulation voltage	Ui	[V]	
Material of housing			Makrolon 8020, 2800
Utilisation category			
Connection			Klemmen
Supply voltage range UB	Ub	[V]	230 (115) V 40... 60 Hz
No-load supply current	Iomax.	[mA]	20 / 40
Minimum operational current	Im	[mA]	
Operational current	Ie	[mA]	380VAC / 250VDC / 8A
Off-state current	Ir	[mA]	
Voltage drop	Ud @ Ie	[V]	
Time delay before availability	tv	[ms]	
Indicator [UB / Output]			- / •
Short circuit- over-load-protection			
Reverse polarity protection			
Conformity	EMC	IEC 60947-5-2 : 2004	
	EEC-direct.	73/23	

CE

EMC

Associated equipment
Additional functionality

Min Sensor: 0,2 s / 5s
Max-Sensor: 0,2s / 5s
INIT-set-up



Application

13.01 –
13.05

Accessories

Series 1300

- Mounting blocks
- Plugs
- Connection leads
- Threaded adapters



DIN EN ISO 9001:2000
QA 05 100 1050

BALLUFF

SIESENSORIK

Type code (abstract)

SK sensor capacitive, w/o amplifier
 SKF sensor cap., w/o amplifier, flexible
 SK1 sensor capacitive, self-contained
 SV(D) sensor amplifier (dynamic)
 SNG sensor power pack

HT### high temperature use
 TM pulse modulation technique (High noise immune)

/ FS(A) max sensing distance / Fill-level switch (adaptive)

M30 model and/or dimension

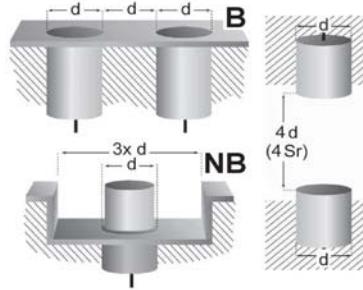
P output stage PNP, NPN, X (switchable)

B mounting B=flush
 NB=non-flush

S S=N.O. Ö=N.C.
 X=function switchable

(C)PTFE Housing material, e.g. **PTFE**
 CPTFE=complete PTFE

1M2-Y2 cable & connector:
 Y# = connector
 1M2 = 1.2m cable length



Mounting [flush / nonflush] [B / NB]

Operating distance Sn [mm]

Hysteresis H [%SR]

Frequency of operating cycles f [Hz]

Repeat accuracy R [%SR]

Operating temperature range Ta [C°]

-30... 60

-30... 70

Temperature drift [range] [%SR]

Protection class

Rated insulation voltage Ui [V]

Material of housing PVC

PUR

Utilisation category

Connection

2m / 3x 0,14mm² PUR

Supply voltage range UB [V]

No-load supply current I_{0max.} [mA]Minimum operational current I_m [mA]Operational current I_e [mA]Off-state current I_r [mA]Voltage drop U_d @ I_e [V]Time delay before availability t_v [ms]

Indicator [UB / Output]

Short circuit- overload-protection

Reverse polarity protection

Conformity EMC

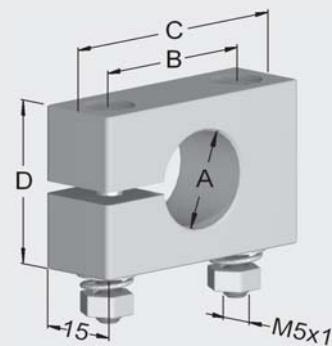
EEC-direct.

EMC

Associated equipment

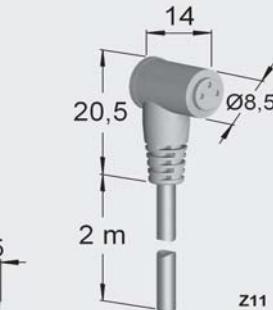
Additional functionality

Application



	13001	13002	13003	13004
A	ø18	ø22	ø30	ø34
B	18	22	30	34
C	30	30	45	45
D	45	45	60	60
	30	30	45	45

100308



Z11



Z10

Typ / Type

MB-18

Typ / Type

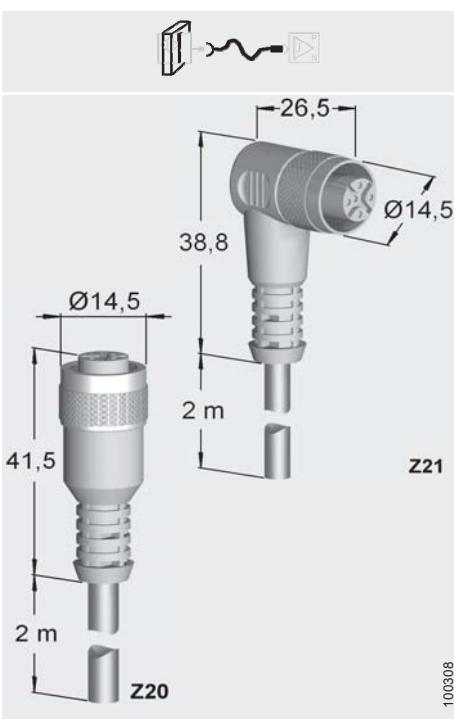
Z10

MB-22

Z11

MB-30

MB-34



Typ / Type
Z20

Z21

-30 70

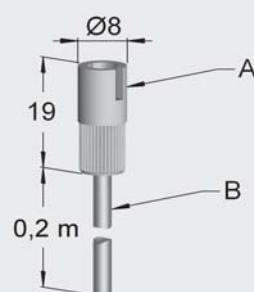
-30- 70

PUR

A: PA; B: PUR

2m / 3x 0,34mm² PUR

0,2m / 3x 0,14mm² PUR



General note:

General note:
Application notes not available. Please follow the general requirements given in the product catalog.

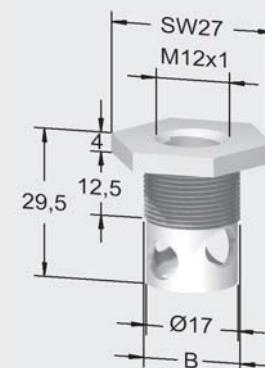
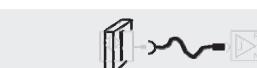
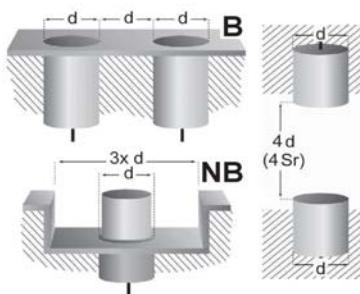
Notes:

BALLUFF

SIESENSORIK

Type code (abstract)

SK	sensor capacitive, w/o amplifier
SKF	sensor cap., w/o amplifier, flexible
SK1	sensor capacitive, self-contained
SV(D)	sensor amplifier (dynamic)
SNG	sensor power pack
HT###	high temperature use
TM	pulse modulation technique (High noise immune)
## / FS(A)	max sensing distance / Fill-level switch (adaptive)
M30	model and/or dimension
P	output stage PNP, NPN, X (switchable)
B	mounting B=flush NB =non-flush
S	S=N.O. Ö=N.C. X=function switchable
(C)PTFE	Housing material, e.g. PTFE CPTFE =complete PTFE
1M2-Y2	cable & connector: Y# = connector 1M2 = 1.2m cable length



	90092	90093	90109
B	M30+1,5	M32x1,5	R1"

	13014	13016
B	M18x1	G1/2"

Typ / Type
MA-M18/M30/10-VA
MA-M18/M32/10-VA
MA-M18/R1/10-VA

Typ / Type
MSA-MLM12/M18x1-VA
MSA-MLM12/G1/2-VA

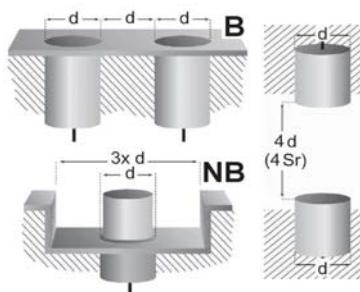
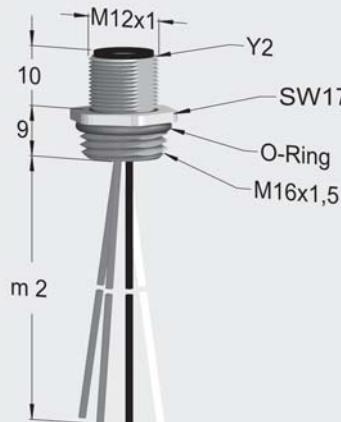
Mounting [flush / nonflush]	[B / NB]
Operating distance	Sn [mm]
Hysteresis	H [%SR]
Frequency of operating cycles	f [Hz]
Repeat accuracy	R [%SR]
Operating temperature range	Ta [C°]
Temperature drift [range]	[%SR]
Protection class	
Rated insulation voltage	Ui [V]
Material of housing	A: V2A; C: O-Ring
Utilisation category	V2A
Connection	
Supply voltage range UB	Ub [V]
No-load supply current	Iomax. [mA]
Minimum operational current	Im [mA]
Operational current	Ie [mA]
Off-state current	Ir [mA]
Voltage drop	Ud @ Ie [V]
Time delay before availability	tv [ms]
Indicator [UB / Output]	
Short circuit- overload-protection	
Reverse polarity protection	
Conformity	EMC
	EEC-direct.
Associated equipment	
Additional functionality	

EMC

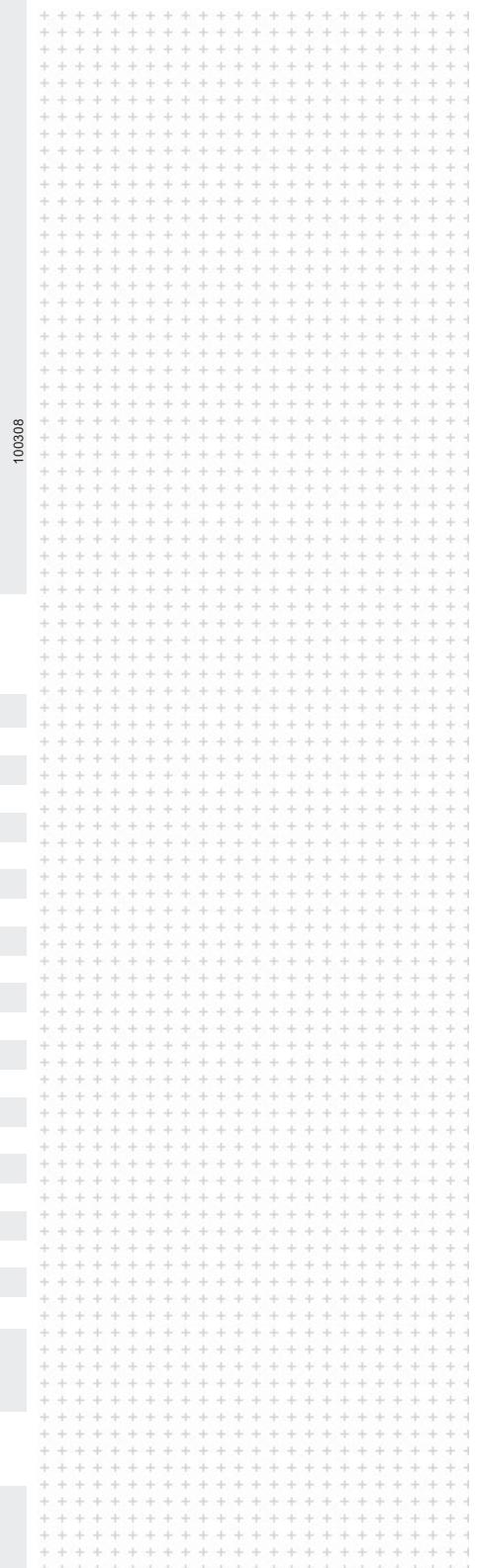
Application

Type code (abstract)

SK	sensor capacitive, w/o amplifier
SKF	sensor cap., w/o amplifier, flexible
SK1	sensor capacitive, self-contained
SV(D)	sensor amplifier (dynamic)
SNG	sensor power pack
HT##	high temperature use
TM	pulse modulation technique (High noise immune)
## / FS(A)	max sensing distance / Fill-level switch (adaptive)
M30	model and/or dimension
P	output stage PNP, NPN, X (switchable)
B	mounting B=flush NB =non-flush
S	S=N.O. Ö=N.C. X=function switchable
(C)PTFE	Housing material, e.g. PTFE CPTFE =complete PTFE
1M2-Y2	cable & connector: Y# = connector 1M2 = 1.2m cable length

**Typ / Type**
Y2-M16**General note:**

Application notes not available. Please follow the general requirements given in the product catalog.

Notes:**Mounting [flush / nonflush] [B / NB]**

Operating distance Sn [mm]

Hysteresis H [%SR]

Frequency of operating cycles f [Hz]

Repeat accuracy R [%SR]

Operating temperature range Ta [°C] -30... 70

Temperature drift [range] [%SR]

Protection class

Rated insulation voltage Ui [V]

Material of housing PA / MS/Ni

Utilisation category

Connection 0,2m / 3x 0,25mm² PVC

Supply voltage range UB [V]

No-load supply current Iomax. [mA]

Minimum operational current Im [mA]

Operational current Ie [mA]

Off-state current Ir [mA]

Voltage drop Ud @ Ie [V]

Time delay before availability tv [ms]

Indicator [UB / Output]

Short circuit- overload-protection

Reverse polarity protection

Conformity EMC

EEC-direct.

EMC

Associated equipment

Additional functionality

Application

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2838940
balluff@nsys.by

Accessories – optimized for every automation task



Industrial Networking and Connectivity

■ Connectors

■ Splitter Boxes

■ Active Splitter Boxes

■ IO-Link

■ Inductive Transmission Systems Remote

■ BUS Systems

■ Wireless

■ Electrical Devices



Mechanical Accessories

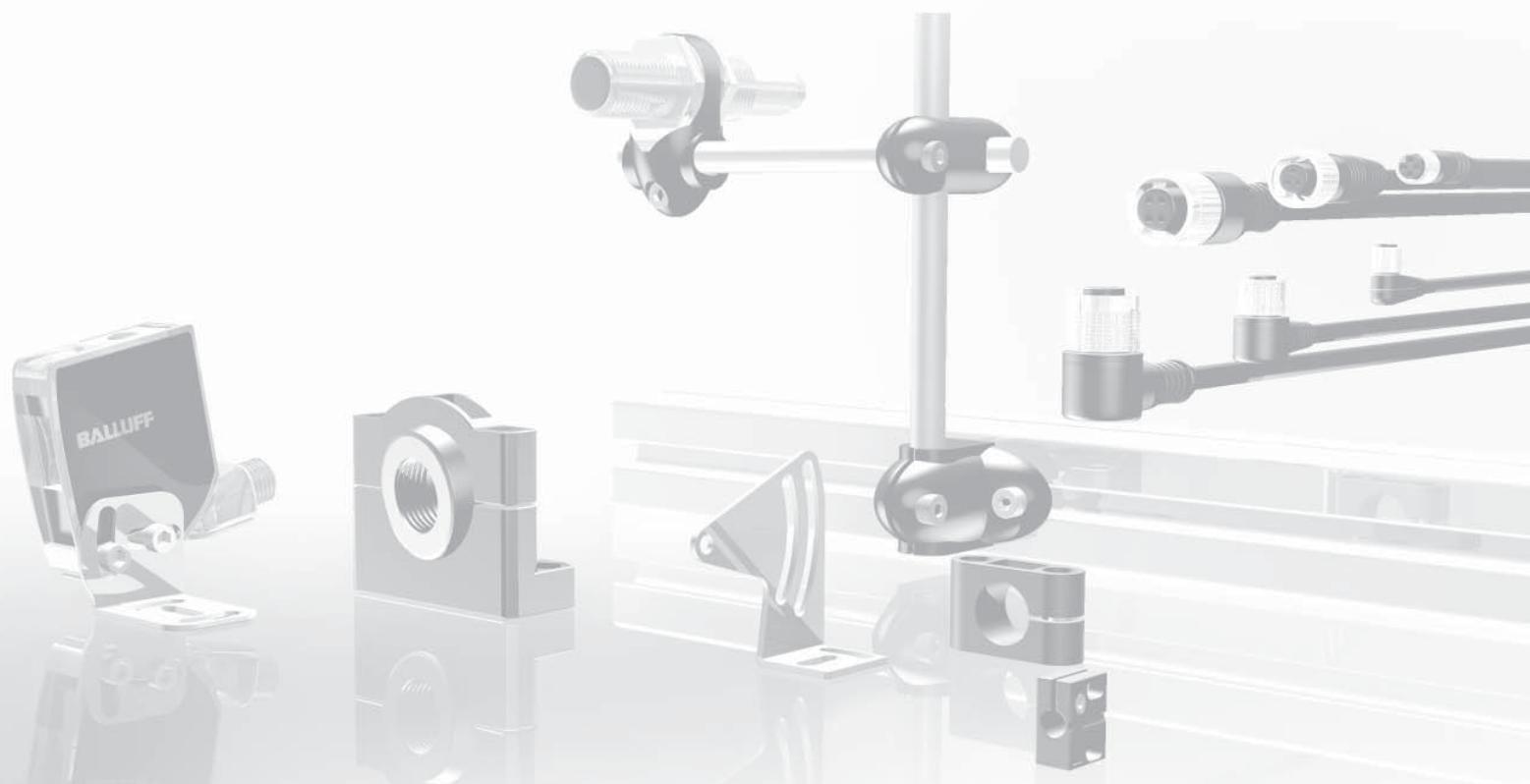
■ Fasteners

■ Mounting System



■ www.sie-sensorik.de
■ www.balluff.com

Additional accessories can be found in the Internet, our "Accessories" catalog or the "Object Detection" catalog".



Object Detection



Sensor Line

Inductive Sensors DC 3-/4-wire
Inductive Sensors DC 2-wire
Inductive Sensors AC/DC
Inductive Sensors with special properties
Sensors for Pneumatic Cylinders
Magnetic Field Sensors
Capacitive Sensors



Photoelectric Line

Diffuse energetic with front- and background suppression
Retro-reflective sensors
Through-beam sensors (emitter/receiver)
Fiber optic systems
Slot sensors
Optical Window Sensors
Light Grids
Contrast Sensors
Luminescence Sensors
Color Sensors
Photoelectric Distance Sensors



Mechanical Line

Mechanical Multiple and Single Position Switches
Mechanical Multiple and Single Position Switches to DIN EN 60204-1/VDE 0113
Mechanical Multiple and Single Position Switches with positive opening
Mechanical Multiple Position Switches with quick-change plunger unit
Inductive single and multiple position switches
Inductive single and multiple position switches with extended switching distance
Mechanical wireless position switches
Mixed Assembly Multiple Position Switches

Linear Position Sensing



Linear Position Sensing

Micropulse® Transducer BTL Profile Series
Micropulse® Transducer BTL AT Series
Micropulse® Transducer BTL Rod-Style Series
Micropulse® Transducer BTL Compact Rod Series
Micropulse® processors, BUS interfaces
Magnetic Linear Encoder System BML
Incremental and Absolute Encoders BDG/BRG
Inductive Linear Displacement system BIW
Inductive Distance Sensors BAW
Magnetoinductive Linear Position Sensors BIL
Photoelectric Distance Sensors BOD

Industrial Identification



Industrial Identification

Industrial RFID Systems BIS C
Industrial RFID Systems BIS L
Industrial RFID Systems BIS M
Industrial RFID Systems BIS S
Vision Sensor BVS

Industrial Networking and Connectivity



Industrial Networking and Connectivity

Connectors BKS
Splitter Boxes BSB
Valve Connectors BNI
IO-Link
Remote Inductive Transmission Systems
BUS Systems
Wireless
Electrical Devices

Mechanical Accessories



Mechanical Accessories

Attachments
Mounting System BMS

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CD-ROM Full Line

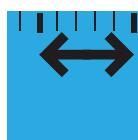
DVD-ROM Full Line with 3D data



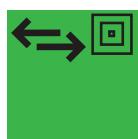
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Object Detection



Linear Position Sensing



Industrial Identification



Industrial Networking and Connectivity



Mechanical Accessories



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