

# **CAPACITIVE SENSORS**

Capacitive sensors detect the presence of any object into the sensing area. They have a higher sensitivity when detecting metal objects or materials with a high content of water or which have a high dielectric constant.

#### WORKING PRINCIPLE

An electrostatic field is generated in the sensing area. When an object enters in the sensing area a change in the capacitive value takes place, the oscillator stage starts oscillating, creating commutation of the output stage. It's possible to adjust the sensing distance of capacitive sensors varing the potentiometer on the rear plastic cap or from the side in the connector versions. The factory setting is the maximum value of the range declared in the catalogue.

# **CAPACITIVE SENSORS**

amplified a.c.amplified d.c.NOT amplified d.c. NAMUR series AKS BKS NKS Diameter of cylindrical sensor. For other types, change the number with the following: = rectangular aluminium housing  $75 \times 30 \times 20$ P = plastic housing 45 = flush mounting = non flush mounting

BKS 18 P/ 4	6 0	9	KS	-5	PUR
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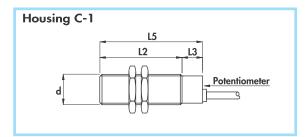
- 3 = with connector M12 x 1
- = standard type cable output = male connector cabled on sensor (see pag. H-1)
- NO (normally open output)
  NC (normally closed output)
  NO + NC (complementary outputs)
  NC (normally closed output on pin 2 of connector) 0 1 2 C
- 082919

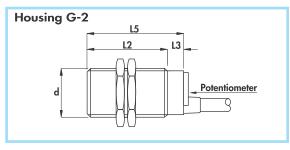
- = NAMUR series 2-wire = NPN with pull-up resistor = NPN open collector = PNP with pull-down resistor = PNP open collector = 20 ÷ 240 V. for a.c. sensors
- = protection against short circuit and overload = LED output status

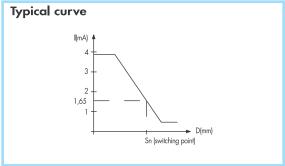
Cable length (if required different than standard 2m)

For Polyurethane cable add PUR

- NAMUR SERIES •
- Non-amplified in d.c. 2-wire
  - Cable output •







Diamete	er	M18 x 1	M30 x 1,5			
Nut	Size	SW24	SW36			
INUI	Thickness mm	4	5			
Max tig	htening Vm	35	80			

# Materials:

2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R. nickel plated brass Cable:

Housing:

plastic Sensing face:

#### **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear

Safety parameters:
• Working voltage: 7 ÷ 30 Vdc 7,7 ÷ 9 Vdc Supply voltage according to NAMUR: Max ripple:

with metal:  $\geq$  2,2 mA without metal: ≤ 1 mA - 25°÷ + 70°C Temperature range: ± 20%

Max thermal drift of sensing distance S<sub>r</sub>:

Repeat accuracy (R):

Consumption at 8,2 V with  $Rx = 1000 \Omega$ 

Degree of protection:

Cable conductor cross section: According to EN60947-5-6

Electromagnetic compatibility (EMC) according to EN60947-5-2

Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

For certified ATEX version see ATEX Catalogue

sing	ounting mounting	LI	L2	L3	L4	L5	Cable diameter	Body ameter (d)	switching quency (f)	inal sensing ance (Sn) ±10%	ORDERING REFERENCES	
Housing	Flush mounting Non flush mounting	mm	mm	mm	mm	mm	mm	mm	ô.≝ W Hz	ĝ. <u>∓</u> ₩ Hz	Nominal distance	blue +
C-1	•	-	50	10	-	60	5	M18 x 1	100	2 ÷ 5	NKS18/4600	
G-2	•	-	50	10	-	60	5	M30 x 1,5	100	4 ÷ 10	NKS30/4600	

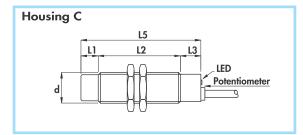
10%

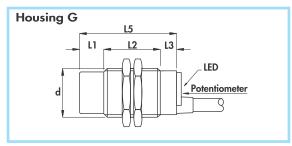
4%

IP65  $0,75 \text{ mm}^2$ 

# CYLINDRICAL CAPACITIVE SENSORS IN METAL HOUSING

- Diameters 18 30 mm
- Amplified in d.c. 4-wire
- Cable output





Diamet	er	M18 x 1	M30 x 1,5		
Nut	Size	SW24	SW36		
INUI	Thickness mm	4	5		
Max tig	htening Nm	35	80		

#### **Materials:**

2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R. Cable: Housing: nickel plated brass

plastic Sensing face:



#### **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear cap close to the LED.

# Technical data:

Supply voltage  $(U_B)$ : Max ripple: 10 ÷ 60 Vdc 10% No-load supply current (I<sub>o</sub>): Voltage drop (U<sub>d</sub>): ≤ 10 mA  $\leq 2.2 \text{ V}$ Temperature range:
Max thermal drift of sensing distance S<sub>r</sub>: 25°÷ + 70°C ± 20% Repeat accuracy (R): 4% Switching hysteresis max (H): Degree of protection: 15% IP65 yellow LED 0,35 mm<sup>2</sup> on 18 mm Switch status indicator: Cable conductor cross section:  $0,50 \text{ mm}^2 \text{ on } 30 \text{ mm}$ 

Protected against short-circuit and overload

Protected against any wrong connection
Suppression of initial false impulse
Electromagnetic compatibility (EMC) according to EN60947-5-2 Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

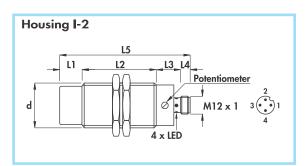
	mounting ush mounting	1.3	10	10	1.4	1.5	ole eter	بلا eter )	itching cy (f)	erational It (I <sub>e</sub> ) sensing e (S <sub>n</sub> )	ORDERING REFERENCES		
Housing	noun n mo	L1	L2	L3	L4	L5	Cable diameter	Body diameter (d)	Max switching frequency (f)	x sw duen	Max switching frequency (f) Rated operational current (l <sub>e</sub> )	l operation	PNP (positive switching)
운	Flush r Von flus						J	ŭ				Nominal ser distance ( ±10%	NO + NC  C
	Ž	mm	mm	mm	mm	mm	mm	mm	Hz	mA	mm	while blue	
C	•	<u>-</u> 10	50 40	10 10	- -	60 60	5 5	M18 x1 M18 x1	100 100	400 400	2 ÷ 5 3 ÷10	BKS18/4629KS BKS18/5629KS	
G G	•	- 15	50 35	10 10	- -	60 60	6 6	M30 x1,5 M30 x1,5	100 100	400 400	3 ÷10 5 ÷ 20	BKS30/4629KS BKS30/5629KS	

NPN (negative switching) with 8 (ie. BKS18/4628KS) Use the above mentioned part number changing the last number 9



# CYLINDRICAL CAPACITIVE SENSORS IN METAL HOUSING

- Diameter 30 mm
  - Amplified in d.c. •
- Connector output M12 x 1 •



Diamet	er	M30 x 1,5			
Nut	Size	SW36			
INUI	Thickness mm	5			
Max tig torque	htening Nm	80			

# **Materials:**

Housing: Sensing face: nickel plated brass plastic



#### General Features:

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the smooth part of the housing.

# Technical data:

- Supply voltage (U<sub>B</sub>): 10 ÷ 60 Vdc Max ripple:
  Noload supply current (I<sub>o</sub>):
  Voltage drop (U<sub>d</sub>): Temperature range: Max thermal drift of sensing distance S<sub>r</sub>: - 25°÷ + 70°C
- Repeat accuracy (R): Switching hysteresis max (H): Degree of protection: Switch status indicator:
- Protected against short-circuit and overload Protected against any wrong connection Suppression of initial false impulse

Electromagnetic compatibility (EMC) according to EN60947-5-2 Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

	ounting		10	10	1.4	1.5	ale sctor	الأراد - -	eter ) itching cy (f)		sensing (S <sub>n</sub> )	ORDERING REFERENCES
Housing	moun sh mo	L1	L2	L3	L4	L5	Female	Body diameter ( d )	x swi	Max switching frequency (f) Rated operational current (l <sub>e</sub> )	Rated operational current (1°)  Nominal sensing distance (5°,1)	PNP (positive switching)
운	- <del>S</del> -₽						0	Ü	Fred .			NO + NC   1     1
	문장	mm	mm	mm	mm	mm	n°	mm	mm Hz		mm	2 white 3 blue
I-2	•	-	50	18	8	<i>7</i> 6	6-8B-10	M30 x1,5	100	400	3 ÷ 10	BKS30S/4329KS
I-2	•	15	35	18	8	<i>7</i> 6	6-8B-10	M30 x1,5	100	400	5 ÷ 20	BKS30S/5329KS

NPN (negative switching)
Use the above mentioned part number changing the last number 9 with 8 (ie. BKS30S/4328KS)



10% ≤ 10 mA ≤ 2,2 V

± 20%

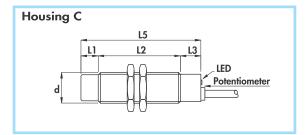
4% 15%

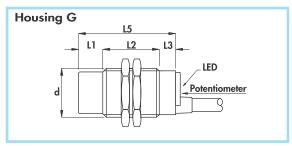
**IP65** 

yellow LED

# CYLINDRICAL CAPACITIVE SENSORS IN METAL HOUSING

- Diameters 18 30 mm
- Amplified in a.c. 2-wire + earth
- Cable output





Dia	meter	M18 x 1	M30 x 1,5		
Nut	Size	SW24	SW36		
INUI	Thickness mm	4	5		
Max	x tightening ue Nm	35	80		



2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R. Cable: Housing; nickel plated brass plastic Sensing face:



# **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear cap close to the LED.

20 ÷ 240 Vac

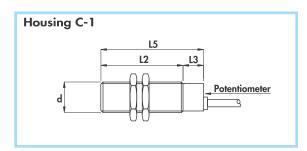
# Technical data:

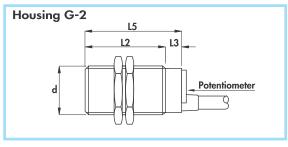
Supply voltage (U<sub>B</sub>): Frequenza di rete: 40 ÷ 60 Hz Off-state current (I,): ≤1,5 mA at 110 Vac Minimum operational current (I<sub>m</sub>): 5 mA Voltage drop (U<sub>d</sub>): ≤7 V Temperature range: Max thermal drift of sensing distance S<sub>r</sub>: - 25° ÷ + 70°C ± 20% Repeat accuracy (R): 4% Switching hysteresis max (H): Degree of protection: 15% IP65 yellow LED 0,35 mm<sup>2</sup> on 18 mm 0,75 mm<sup>2</sup> on 30 mm Switch status indicator: Cable conductor cross section:

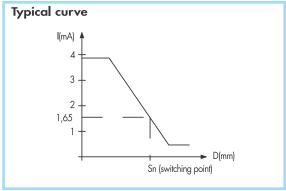
Suppression of initial false impulse Electromagnetic compatibility (EMC) according to EN60947-5-2 Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

Housing	ounting mounting	L1	L2	L3	L4	L5	Cable diameter	Body diameter ( d )	Max switching frequency (f)	Rated operational current (I <sub>e</sub> )	inal sensing ance (Sn) ±10%		ERING ENCES
훈	Flush m Von flush							O			Nominc distan	NO black	NC black ~
		mm	mm	mm	mm	mm	mm	mm	Hz	mA	mm	<u>yelkw-green</u>	yellow-green
C	•	<u>-</u> 10	50 40	10 10	-	60 60	5 5	M18 x1 M18 x1	10 10	250 250	2 ÷ 5 3 ÷10	AKS18/4609S AKS18/5609S	AKS18/4619S AKS18/5619S
G G	•	- 15	50 35	10 10	- -	60 60	6 6	M30 x1,5 M30 x1,5	10 10	250 250	3 ÷10 5 ÷ 20	AKS30/4609S AKS30/5609S	AKS30/4619S AKS30/5619S

- NAMUR SERIES diameters 18 30 mm
  - Non-amplified in d.c. 2-wire
    - Cable output •



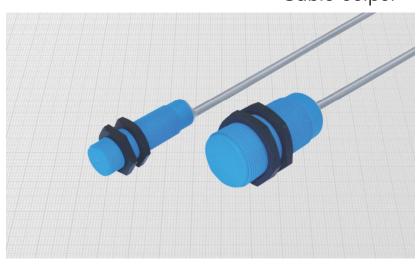




Diamet	er	M18 x 1	M30 x 1,5
Nut	Size	SW24	SW36
11401	Thickness mm	4	5
Max tig	ghtening Nm	5	20

#### Materials:

- Cable: 2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R.
- plastic Housing:
- Sensing face: plastic



#### **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear

- Safety parameters:
  Working voltage: Supply voltage according to NAMUR:
- Max ripple: Consumption at 8,2 V with Rx =  $1000 \Omega$

with metal: without metal:

- Temperature range: Max thermal drift of sensing distance  $S_r$ : Repeat accuracy (R):
- Degree of protection: Cable conductor cross section:
  - According to EN60947-5-6 Electromagnetic compatibility (EMC) according to EN60947-5-2 Shock and vibration resistance according to EN60068-2-27 EN60068-2-6
- For certified ATEX version see ATEX Catalogue

B	ounting nounting	L1	L2	L3	L4	L5	Cable diameter	sody xmeter ( d )	switching quency (f)	ial sensing nce (S <sub>n</sub> )	ORDERING REFERENCES
Housing	Flush mounting Non flush mounting							diai (	Max	Nominal distance ±10	NO
	_	mm	mm	mm	mm	mm	mm	mm	Hz	mm	
C-1	•	-	50	10	-	60	5	M18 x 1	100	2 ÷ 5	NKS18P/4600
G-2	•	-	50	10	-	60	5	M30 x 1,5	100	4 ÷ 10	NKS30P/4600

 $7 \div 30 \, \text{Vdc}$ 

7,7 ÷ 9 Vdc

 $\geq$  2,2 mA

- 25°÷ + 70°C ± 20%

≤ 1 mA

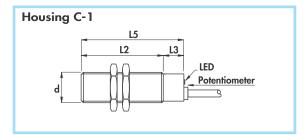
10%

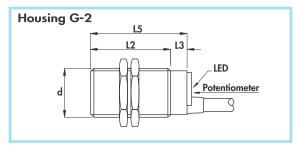
4%

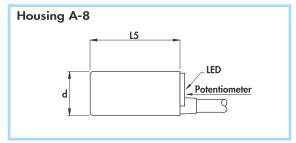
IP65  $0.75 \text{ mm}^2$ 

# CYLINDRICAL CAPACITIVE SENSORS IN PLASTIC HOUSING

- Amplified in d.c. 4-wire
- Diameters 18 30 34 mm
- Cable output



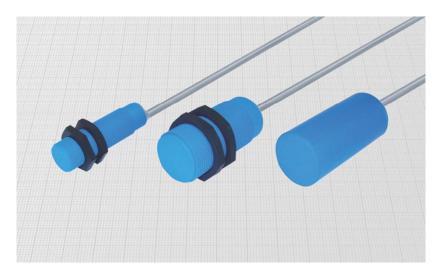




Diamet	er	M18 x 1	M30 x 1,5
Nut	Size	SW24	SW36
1401	Thickness mm	4	5
Max tig	htening Vm	5	20

# **Materials:**

- 2 m PVC CEI 20 22 II; 90°C; 300 V; O.R. Cable:
- Housing: Sensing face: plastic



#### **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear cap close to the LED.

# Technical data:

- Supply voltage (U<sub>B</sub>):
- Max ripple:
  No-load supply current (I<sub>o</sub>):
- Voltage drop  $(\dot{U}_d)$ :
- Temperature range: Max thermal drift of sensing distance S<sub>r</sub>:
- Repeat accuracy (R):
- Switching hysteresis max (H): Degree of protection:
- Switch status indicator:
- Cable conductor cross section:
- Protected against short-circuit and overload
- Protected against any wrong connection
- Suppression of initial false impulse

Electromagnetic compatibility (EMC) according to EN60947-5-2 Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

	ing	Cable diameter (d)  Max switching frequency (f)  Rated operational current (le)  Nominal sensing		ensing S, Sn)	ORDERING REFERENCES							
Housing	Flush mounting Non flush mounting	L1	L2	L3	L4	L5	Cable diameter	Body diameter ( d )	ax swii	d oper	Nominal sensing distance (S <sub>n</sub> ) ±10%	PNP (positive switching)
Ĭ	Flush Ion flus								₹±	Rate		NO + NC  C
	Z	mm	mm	mm	mm	mm	mm	mm	Hz	mA	mm	white blue
C - 1 C - 1	•	- -	50 40	10 10	- -	60 60	5 5	M18 x1 M18 x1	100 100	400 400	2 ÷ 5 3 ÷10	BKS18P/4629KS BKS18P/5629KS
G-2 G-2	•	- -	50 35	10 10	- -	60 60	6 6	M30 x1,5 M30 x1,5	100 100	400 400	3 ÷10 5 ÷ 20	BKS30P/4629KS BKS30P/5629KS
A - 8	•	-	-	-	-	<i>7</i> 0	6	34	100	400	3 ÷ 20	BKS34P/5629KS

NPN (negative switching) Use the above mentioned part number changing the last number 9 with 8 (ie. BKS18P/4628KS)



10 ÷ 60 Vdc

- 25° ÷ + 70°C ± 20%

10% ≤ 10 mA

4%

15%

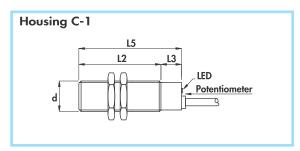
**IP65** 

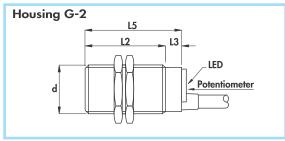
yellow LED

0,50 mm<sup>2</sup>

 $\leq 2.2 \text{ V}$ 

- Amplified in a.c. 2-wire
  - Diameters 18 30 mm
    - Cable output •





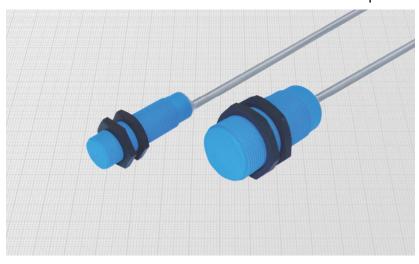
Diamet	er	M18 x 1	M30 x 1,5		
Nut	Size	SW24	SW36		
INUT	Thickness mm	4	5		
Max tig torque l	htening Vm	5	20		

#### **Materials:**

• Cable: 2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R.

• Housing: plastic

• Sensing face: plastic



#### **General Features:**

Capacitive sensors are suitable for any material detection. Some materials, mostly if liquids, can be detected also through plastic or glass walls. They can be used for many different applications: level controls on storage bin or tanks; detection of presence or filling of bottles; rain sensor; anti-vandal key; etc.

The adjustment of the sensing distance is possible via the potentiometer on the rear cap close to the LED.

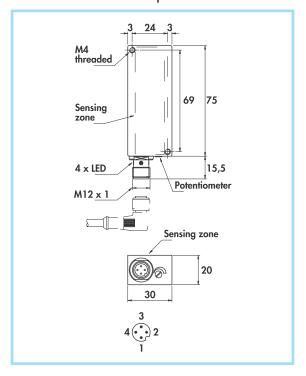
# Technical data:

- $20 \div 240 \, \text{Vac}$ Supply voltage (U<sub>B</sub>): Electrical system frequency: 40 ÷ 60 Hz  $\leq$  1,5 mA at 110 Vac Off-state current ( $I_r$ ): Minimum operational current (I<sub>m</sub>): 5 mA Voltage drop (U<sub>d</sub>): ≤7V - 25°÷ + 70°C Temperature range: Max thermal drift of sensing distance S<sub>r</sub>: ± 20% Repeat accuracy (R): 4% 15% Switching hysteresis max (H): Degree of protection: **IP65** Switch status indicator: yellow LED 0,50 mm<sup>2</sup> on 18 mm 0,75 mm<sup>2</sup> on 30 mm Cable conductor cross section:
- Suppression of initial false impulse
- Class 2 equipment according to EN61140 
   Shock and vibration according to EN60068.2.27 EN60068.2.
- Shock and vibration according to EN60068-2-27 EN60068-2-6
  Electromagnetic compatibility (EMC) according to EN60947-5-2

	ing	ounting mounting	LI	L2	L3	L4	L5	Cable diameter	Body diameter ( d )	Max switching frequency (f) Rated operational current (l <sub>e</sub> )		Nominal sensing distance (S <sub>n</sub> )		ERING ENCES
	Housing	Flush mo Non flush						<u> </u>	<u></u>	Max frequ	Rated curr	Nomir dista	NO C black	NC C black
			mm	mm	mm	mm	mm	mm	mm	Hz	mA	mm	black	DIGCK
	: - 1 : - 1	•	- -	50 50	10 10	-	60 60	5 5	M18 x1 M18 x1	10 10	250 250	2 ÷ 5 3 ÷10	AKS18P/4609S AKS18P/5609S	AKS18P/4619S AKS18P/5619S
9	6-2 6-2	•	- -	50 50	10 10	- -	60 60	6 6	M30 x1,5 M30 x1,5	10 10	250 250	3 ÷10 5 ÷ 20	AKS30P/4609S AKS30P/5609S	AKS30P/4619S AKS30P/5619S

# **RECTANGULAR CAPACITIVE SENSORS IN METAL HOUSING**

- Amplified in d.c.Wide sensing surface
- Connector output





# **General Features:**

This capacitive sensor allows the detection of parts made in every shape and material within an extended sensing area. It can be used whereas the object to be detected can be wherever in the sensing area. It's possible to put side by side more sensing area. sors in order to increase the sensing area. It is also possible to adjust the switching point turning the sensitivity potentiometer.

# Possible applications:

- Detection of presence of parts inside locking devices, clamps
- Level detection on tanks or bins
- Detection of passing parts

# Technical data: Supply voltage (U<sub>B</sub>):

Max ripple:	10%
<ul> <li>No-load supply current (I<sub>o</sub>):</li> </ul>	≤ 10 mA
<ul> <li>Voltage drop (Ú<sub>d</sub>):</li> </ul>	≤ 2,2 V
Temperature range:	- 25°÷ + 70°C
<ul> <li>Max thermal drift of sensing distance S<sub>r</sub>:</li> </ul>	± 20%
Repeat accuracy (R):	4%
<ul> <li>Switching hysteresis max (H):</li> </ul>	15%
Degree of protection:	IP65
Switch status indicator:	yellow LED
Drotostod gradinat about circuit and avarland	,

- Protected against short-circuit and overload Protected against any wrong connection
- Suppression of initial false impulse

•	Electromagnetic compatibility (EMC) according to EN6094/-5-2
•	Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

mounting 1sh mounting	Sensing	Max switching	Rated operational	Nominal sensing	Female	ORDERING REFERENCES	
nount Iom r	zone area	trequency (f)	current (I <sub>e</sub> )	distance	connector	PNP (positive switching)	
Flush ma Jon Flush		( - 7	\ 'e /	$(S_n) \pm 10\%$		NO + NC	
_ 3	mm	KHz	mA	mm	n°	<u>↑ 2                                   </u>	
•	70 x 17	0,1	400	5 - 10	15 - 16	BKS7530/4329KS	

NPN (negative switching) Use the above mentioned part number changing the last number 9 with 8 (ie. BKS7530/4328KS)



10 ÷ 60 Vdc