

Sensors for Automation

Catalog Section Ultrasonic Sensors

ALSEN TK 8
Edition 4.11



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Ultrasonic Sensors

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V Agencies and distributors

You will find a further selection of sensors from our extensive product range in the following catalogs:

Catalog Section Inductive Proximity Switches and Accessories **TK 1 + 12.1**

Catalog Section Pulse Sensors and Accessories **TK 2 + 12.1**

Catalog Section Safety Elements and Accessories **TK 5 + 12.2**

Catalog Section Capacitive Sensors **TK 9**

Ref. no.	Type designation	Page	Type designation	Ref. no.	Page
13.25-10	AAD-12eg80b200-1o2Sd1B	8.1.1	AAD-12eg80b200-1o2Sd1B	13.25-10	8.1.1
13.25-11	AAD-18fg100b2000-11o22Se1C	8.1.3	AAD-12mg95b8-1Sc1A	13.25-13	8.1.7
13.25-12	AAD-30fg140b3500-11o22Se1C	8.1.5	AAD-18fg100b2000-11o22Se1C	13.25-11	8.1.3
13.25-13	AAD-12mg95b8-1Sc1A	8.1.7	AAD-30fg140b3500-11o22Se1C	13.25-12	8.1.5
13.25-14	AGA-18fg100b400-1Se1A	8.2.1	AAD-80x80fs50b6000-11o22Se1C	13.25-15	8.1.9
13.25-15	AAD-80x80fs50b6000-11o22Se1C	8.1.9	AGA-18fg100b400-1Se1A	13.25-14	8.2.1
13.25-16	AGH-18fg92b600-3ND1	8.2.3	AGH-18fg92b600-3ND1	13.25-16	8.2.3
13.25-17	AGH-18fg96b1600-3Se1C	8.2.5	AGH-18fg96b1600-3Se1C	13.25-17	8.2.5

Ultrasonic Sensors

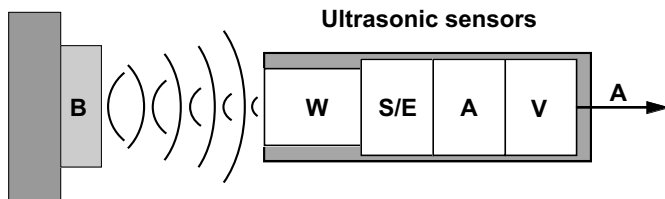
Task, mode of operation and application examples

Task

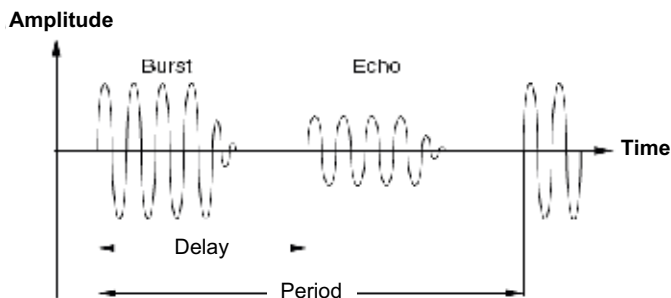
Ultrasonic sensors can detect targets of any material with any type of surface. Thus they are suitable for detecting solid, grain, powder, or liquid targets, even if these are transparent or coloured. However, they are not suitable for safety applications because of their physical properties.

Mode of operation

Ultrasonic sensors operate in the **ultrasonic** range. They consist of a switchable send and receive unit S/E, an evaluation unit A, and a succeeding amplifier stage V. The ultrasonic transducer W consists of a piezoceramic vibrator or an electrostatic transducer.



Transmit and receive modes alternate. While sending, sound waves are transmitted in short intervals (bursts). The transmission frequency lies in the range which is optimum for the physical properties of the transducer. If the sound waves impinge on a sound reflecting target, the waves are reflected as an echo back to the transducer. In the mean time, the S/E unit switches to receive mode. Thus, the evaluation unit determines the distance of a target on the basis of the transit-time of the detected echo. An internally adjustable threshold detector switches the output amplifier according to the required target distance. A built-in potentiometer is used to adjust the detection range.



Examples of applications

- Winding and unwinding monitors
- Sorting of targets on a conveyor belt
- Level monitoring of bulk goods and liquids
- Door monitoring
- Protection of vehicles against collision

Note

Air temperature

The sonic velocity varies with the air temperature by 0.17 % / K. If the ambient temperature changes from 20 °C to 40 °C the sonic velocity will increase by about 3.5 %. Thus, the operating distance increases by the same amount. All Klaschka ultrasonic versions are equipped with an internal temperature compensation to reduce the influence of temperature to a minimum.

Air humidity, rain

Ultrasonic sensors are largely unaffected by humidity. Compared to dry air, a relative humidity of 90 % reduces the operating distance by no more than 2 %. Water or dirt directly on the surface of the transducer may reduce the sensitivity, and thus have to be avoided.

Air currents and different temperatures

Strong air currents or atmospheric layers of different temperature may distort the narrow sound lobe. However, for flow velocities of up to 10 m/s, the effect on the functioning is negligible. Ultrasonic sensors, however, are not suitable for detecting glowing hot metal targets because the air turbulence smears the ultrasonic waves preventing an evaluation of the echo.

Targets, adjustment

Ultrasonic sensors can detect solid, liquid, grain, and powder materials. The targets can have any shape, but they have to remain above the minimum target size mentioned in the technical data. Ideally, the surface of the target should be flat and smooth. Any roughness should have a depth of less than 0.15 mm. The surface should be perpendicular to the beam axis of the ultrasonic waves. Greater depth of roughness scatters the ultrasonic waves, resulting in a decrease in available operating distance. Curved surfaces (e.g. cylindrical) can also be detected, but the available operating distance may be reduced.

Liquid surfaces

For ultrasonic waves, liquid surfaces exhibit the same reflection characteristics as solid targets with flat smooth surfaces. It should be noted, however, that a moving liquid will deflect the echos, resulting in unpredictable functioning of the sensor.

Sound absorbing targets

For materials such as foam, cotton, carpet, or similar materials, possessing sound absorbing characteristics, the operating distance is greatly reduced. The echos may be of such low intensity that the target cannot be detected.



Distance sensors with switching output

Type	Ref. no.	Mounting *)	Range (mm)	Operation mode	Outputs	Page
Design cylindrical M12 x L						
AAD-12eg80b200-1o2Sd1B	13.25-10	b	25 ... 200	Teach-In	2, Sp and/or Öp, switching	8.1.1
Design cylindrical M18 x L						
AAD-18fg100b2000-11o22Se1C	13.25-11	b	200 ... 2000	Teach-In	2, Sp and/or Öp, switching	8.1.3
Design cylindrical M30 x L						
AAD-30fg140b3500-11o22Se1C	13.25-12	b	300 ... 3500	Teach-In	2, Sp and/or Öp, switching	8.1.5
Design ashlar shaped 12 x 40						
AAD-12x40fs26b250-1o2Wd1B	13.25-13	b	25 ... 250	Teach-In	1, Sp or Öp, switching	8.1.7
Design ashlar shaped 80 x 80						
AAD-80x80fs50b6000-11o22Se1C	13.25-15	b	600 ... 6000	Teach-In	2, Sp and/or Öp, switching	8.1.9

*) b = flush mounting, n = non-flush mounting

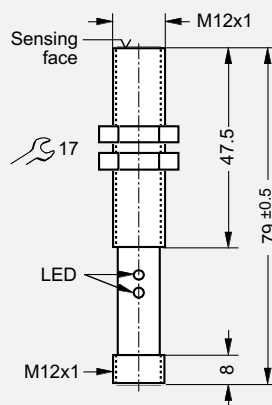
Distance sensors with analogue output signal

Type	Ref. no.	Mounting *)	Range (mm)	Operation mode	Outputs	Page
Design cylindrical M18 x L						
AGA-18fg100b400-1Se1A	13.25-14	b	30 ... 400	Teach-In	1 x analogue voltage output	8.2.1
AGH-18fg92b600-3ND1	13.25-16	b	100 ... 600	Teach-In	1 x analogue current output	8.2.3
AGH-18fg96b1600-3Se1C	13.25-17	b	80 ... 1600	Teach-In	1 x analogue current output	8.2.5

*) b = flush mounting, n = non-flush mounting

Ultrasonic Sensors

Series AAD-12eg

Design; length		O M12 x 1; 79 mm	
Material of the housing		stainless steel	
Setting of the switching points, mounting		Teach-In, flush	
Range assured operating distance for target sizes 100 x 100 mm^2		25 ... 200 mm	
Type designation, Ref. no. (Wiring)	1 output plus switching NO (Sp), NC (Öp), hysteresis and window function Optionally programmable	AAD-12eg80b200-1o2Sd1B	13.25-10 (1/1)
Maximum switching frequency		25 Hz	
Wiring (connector or lead); number of wires		Connector M12; 4-pole	
Common Technical Data			
Hysteresis of the switching point s	2 %		
Repetition accuracy of the switching point s	0.3 %		
Short-circuit-proof ?	yes		
Reverse polarity protection ?	yes		
Ambient temperature range	- 20 ... + 70 °C		
Specific Technical Data			
Permissible operating voltage range	10 ... 24 ... 30 V DC		
Current consumption without load	≤ 25 mA		
Load current	≤ 100 mA		
Resolution	0.25 mm		
Sound lobe	8 °		
Function indication ? / Echo LED ?	yes / yes		
Maximum lead length	150 m		
Lead type / standard lead length / number of wires x lead cross section			
Protection rating according to IEC 60529	IP 65		
Protection class			
Permissible torque without / with toothed disc	12 Nm / 45 Nm		
Weight	25 g		
Recommended accessories	chapter 12.1		

For proximity switches with connectors: Please find the required connector with outgoing lead in chapter 12 "Accessories". Order separately.

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..

Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

Proximity switches according to standard:
DIN EN 60 947-5-2 (VDE 0660 part 208).
We are certified according to DIN EN ISO 9001



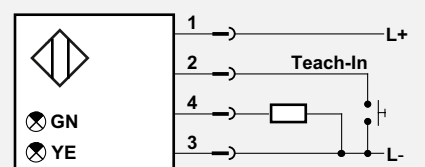
!!! WARNING !!! Personal injury

DO NOT USE these products as safety or EMERGENCY stop device, or in any other application where failure of the product may result in personal injury. Failure to comply with these instructions may lead to serious personal injuries or even to death.

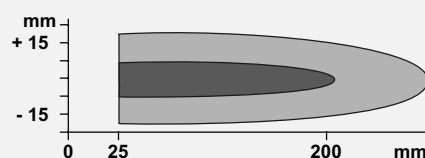
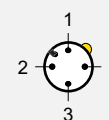
Subject to technical changes!

Wiring (1)

DC 4-pole, plug



Euro Plug M12 with LED YE



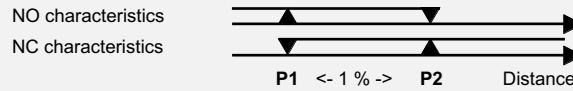
- Safe detection of a target 100 x 100 mm²
- Potential detection of a large target

Normal function: The **yellow LED** indicates the switching state of the output. The **green LED** indicates when receiving an echo (alignment assistance).

Teach-In procedure

A. Programming of the switching point

Switching function



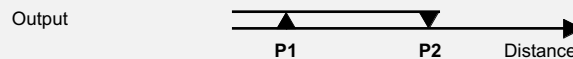
Connect the Teach-In input to GND (0 V) for approximately 8 s until the yellow LED P1 is blinking at ~2 Hz.

Disconnect: the sensor is now running in Teach-In mode: the yellow LED P1 is blinking at ~1/2 Hz. The programming of the switching point has to take place within 35 s! Place the target at the selected operating distance P1, connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The programming of the switching point is completed. P2 is at 1 % farther away from the sensor.

Switching characteristics NO/NC: If during the programming of the switching point LED P1 is on, the switching point will have NO characteristics. If it is off, it will have NC characteristics. The sensor is now operating normally with new value.

B. Switching point with programmed hysteresis with NO switching characteristics (Setting of P1 and P2)

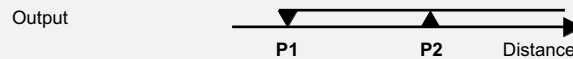
Hysteresis setting



1. **Programming of the switching point (switching function-NO) at distance P1, as described in section "A".**
2. **Programming of P2:** Connect the Teach-In input to GND (0 V) for approx. 16 s. After approx. 8 s the yellow LED is blinking at ~2 Hz, after another 8 s the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED is blinking at ~1/2 Hz. Place the target at the selected hysteresis operating distance P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

C. Switching point with programmed hysteresis with NC switching characteristics (Setting of P1 and P2)

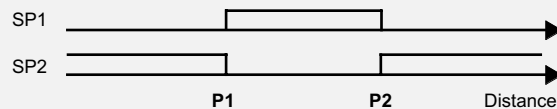
Hysteresis setting



1. **Programming of the switching point (switching function-NC) at distance P1, as described in section "A".**
2. **Programming of P2:** Connect the Teach-In input to GND (0 V) for approx. 16 s. After approx. 8 s the yellow LED is blinking at ~2 Hz, after another 8 s the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: yellow LED is blinking at ~1/2 Hz. Place the target at the selected hysteresis operating distance P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

D. Window function

Window function



1. **Programming of the switching point (switching function-NC) at distance P1, as described in section "A".**
2. **Programming of P2:** Connect the Teach-In input to GND (0 V) for approx. 16 s. After approximately 8 s the yellow LED starts blinking at ~2 Hz, after another 8 s, the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: yellow LED is blinking at ~1/2 Hz. Place the target at the window border P2. With the yellow LED on: Connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

Ultrasonic sensors

Series AAD-18fg

Design; length		O M18 x 1; 100 mm																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

Proximity switches according to standard:
DIN EN 60 947-5-2 (VDE 0660 part 208).
We are certified according to DIN EN ISO 9001



!!! WARNING !!! Personal injury

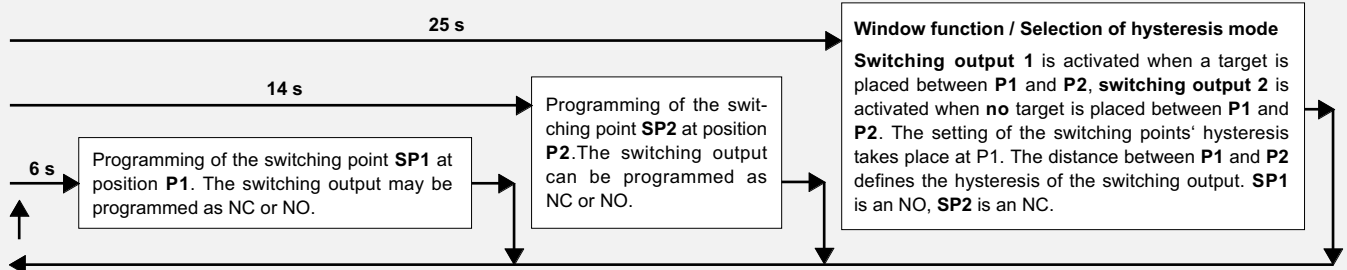
DO NOT USE these products as safety or EMERGENCY stop device, or in any other application where failure of the product may result in personal injury. Failure to comply with these instructions may lead to serious personal injuries or even to death.

Subject to technical changes!

Normal function: The **yellow LEDs P1 + P2** indicate the switching state of **SP1 + SP2**. The **green LED** indicates when receiving an echo (alignment assistance).

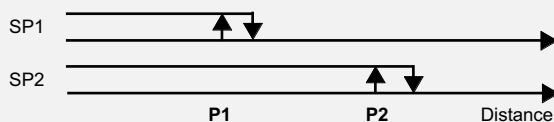
Teach-In procedure

The following **3 different modes** of the switching outputs can be programmed: **A.** normal switching function, **B.** window function, **C.** adjustable hysteresis. Use the LEDs **Echo**, **P1**, and **P2** to teach in all functions via the programming input (Pin 5). The time sequence is shown in the following diagram.

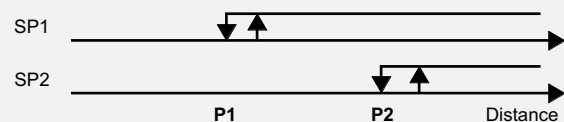


A. Normal switching function NO / NC

NO characteristics



NC characteristics



Teach-In mode P1 (Position SP1)

Connect the Teach-In input to GND until the LEDs **P1** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P1: the yellow LED P1 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P1 has to take place within 30 s! Place the target at the new position P1. Connect the Teach-In input to GND for a few seconds and disconnect: The programming of P1 is now completed.

Switching characteristics NO/NC: If during the programming of the switching point LED P1 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P1.

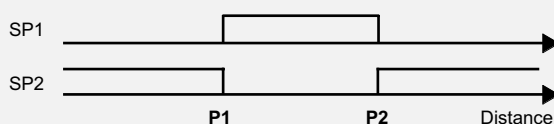
Teach-In mode P2 (Position SP2)

Connect the Teach-In input to GND until the LEDs **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED P2 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P2 has to take place within 30 s! Place the target at the new position P2. Connect the Teach-In input to GND for a few seconds and disconnect. The programming of P2 is now completed.

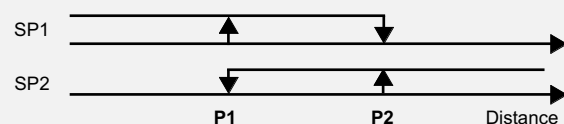
Switching characteristics NO/NC: If during the programming of the switching point LED P2 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P2.

B. Window function / C. Setting of hysteresis

Window function



Setting of Hysteresis



Connect the Teach-In input to GND for a few seconds until the LEDs **P1**, **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then LEDs **P2** and **Echo** start blinking at ~2 Hz and finally all LEDs are blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for window function / setting of hysteresis: the yellow LEDs P1 and P2 are blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of this function has to take place within 30 s! Connect the Teach-In input to GND for a few seconds and disconnect: (pay attention to LED P1 and P2!) If the LEDs P1 and P2 do not light up when connecting, the programming of the window function is completed.

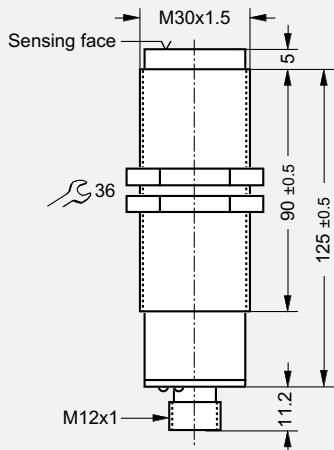
If the target is between P1 and P2, SP1 switches on and SP2 off. If there is no target between P1 and P2, SP1 switches off and SP2 on.

If the LEDs P1 and P2 are on when connecting, the programming of the hysteresis setting is completed.

The switching point of SP1 (NO) is at P1 with P1 - P2 hysteresis. The switching point SP2 (NC) is also at P1 with P1 - P2 hysteresis.

Ultrasonic sensors

Series AAD-30fg

Design; length		Ø M30 x 1,5; 140 mm	
Housing material		plastic	
Setting of the switching points, mounting		Teach-In, flush	
Range assured operating distance for targets 100 x 100 mm^2		300 ... 3500 mm	
Type designation, Ref. no. (Wiring)	2 outputs plus switching NO (Sp), NC (Öp), hysteresis and window function Optionally programmable	AAD-30fg140b3500-11o22Se1C	13.25-12 (1/1)
Maximum switching frequency		2,5 Hz	
Wiring (connector or lead); number of wires		Connector M12; 5-pole	
Common Technical Data			
Hysteresis of the switching point s	1 %		
Repetition accuracy of the switching point s	0.2 % 2 mm		
Short-circuit-proof ?	yes		
Reverse polarity protection ?	yes		
Ambient temperature range	- 20 ... + 70 °C		
Specific Technical Data			
Permissible operating voltage range	12 ... 24 ... 30 V DC		
Current consumption without load	≤ 60 mA		
Load current	≤ 500 mA		
Resolution	1 mm		
Sound lobe	8 °		
Function indication ? / Echo LED ?	yes / yes		
Maximum lead length	150 m		
Lead type / standard lead length / number of wires x lead cross section		IP 67	
Protection rating according to IEC 60529			
Protection class		8 Nm / 10 Nm	
Permissible torque without / with toothed disc			
Weight	150 g	chapter 12.1	
Recommended accessories			

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Certifications

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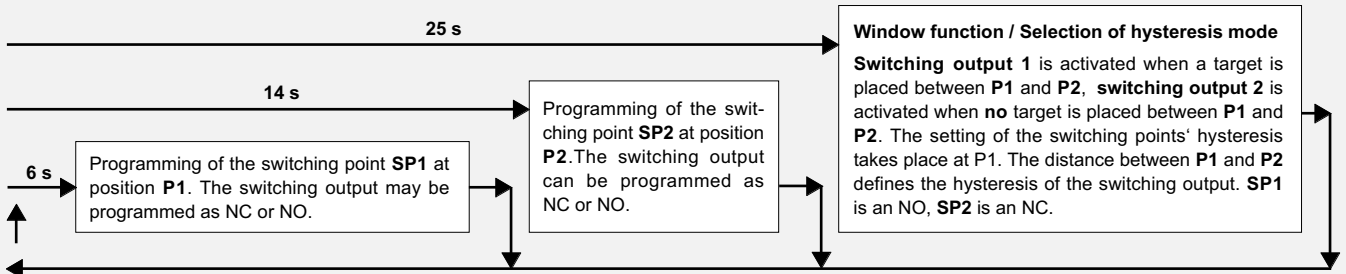
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Teach-in procedure

The following **3 different modes** of the switching outputs can be programmed: **A.** normal switching function, **B.** window function, **C.** adjustable hysteresis. Use the LEDs **Echo**, **P1** and **P2** to teach in all functions via the programming input (Pin 5). The time sequence is shown in the following diagram.

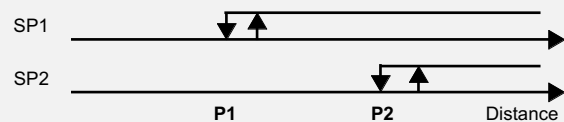


A. Normal switching function NO / NC

NO characteristics



NC characteristics



Teach-In mode P1 (Position SP1)

Connect the Teach-In input to GND until the LEDs **P1** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P1: the yellow LED P1 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P1 has to take place within 30 s! Place the target at the new position P1. Connect the Teach-In input to GND for a few seconds and disconnect: P1 is now programmed.

Switching characteristics NO/NC: If during the programming of the switching point LED P1 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P1.

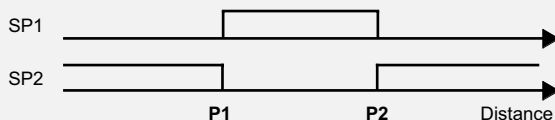
Teach-In mode P2 (Position SP2)

Connect the Teach-In input to GND until the LEDs **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** are blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED P2 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistant). The programming of P2 has to take place within 30 s! Place the target at the new position P2. Connect the Teach-In input to GND for a few seconds and disconnect. P2 is now programmed.

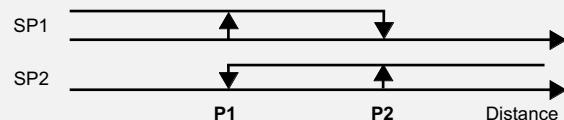
Switching characteristics NO/NC: If during the programming of the switching point LED P2 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P2.

B. Window function / C. Setting of hysteresis

Window function



Setting of hysteresis



Connect the Teach-In input to GND for a few seconds until the LEDs **P1**, **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** are blinking at ~2 Hz and finally all LEDs are blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for window function / setting of hysteresis: the yellow LEDs P1 and P2 are blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming has to take place within 30 s! Connect the Teach-In input to GND for a few seconds and disconnect: (pay attention to LED P1 and P2!) If the LEDs P1 and P2 do not light up when connecting, the programming of the window function is completed.

If the target is between P1 and P2, SP1 switches on and SP2 off. If there is no target between P1 and P2, SP1 switches off and SP2 on.

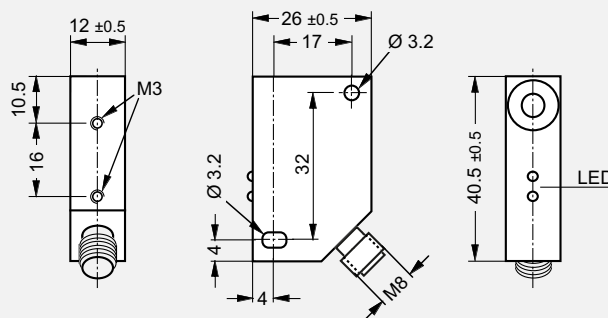
If the LEDs P1 and P2 are on when connecting, the programming of the hysteresis setting is completed.

The switching point of SP1 (NO) is at P1 with P1 - P2 hysteresis. The switching point SP2 (NC) is also at P1 with P1 - P2 hysteresis.

Ultrasonic Sensors

Series AAD-12x40fs

Design; length		□ 12 x 40; 26 mm		
Housing material		plastic		
Setting of the switching points, mounting		Teach-In, flush		
Range assured operating distance for target sizes 100 x 100 mm^2		25 ... 250 mm		
Type designation, Ref. no. (Wiring)	1 output plus switching NO (Sp), NC (Öp), hysteresis and window function Optionally programmable	AAD-12x40fs26b250-1o2Wd1B	13.25-13	(1/1)
Maximum switching frequency		25 Hz		
Wiring (connector or lead); number of wires		Connector M8; 4-pole		
Common Technical Data				
Hysteresis of the switching point s	2 %			
Repetition accuracy of the switching point s	0.3 %			
Short-circuit-proof ?	yes			
Reverse polarity protection ?	yes			
Ambient temperature range	- 20 ... + 70 °C			



For proximity switches with connectors: Please find the required connector with outgoing lead in chapter 12 "Accessories". Order separately.

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..

Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

Proximity switches according to standard:

DIN EN 60 947-5-2 (VDE 0660 part 208).

We are certified according to DIN EN ISO 9001



!!! WARNING !!! Personal injury

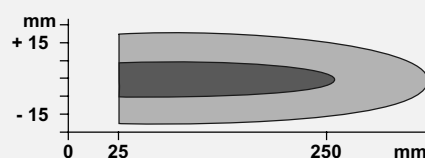
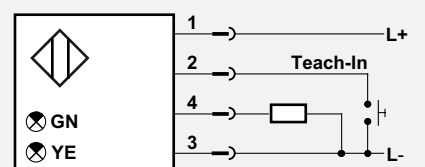
DO NOT USE these products as safety or EMERGENCY stop device, or in any other application where failure of the product may result in personal injury. Failure to comply with these instructions may lead to serious personal injuries or even to death.

Subject to technical changes!

Wiring (1)

DC 4-pole, plug

Euro Plug M8



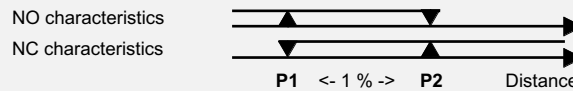
- Safe detection of a target 100 x 100 mm²
- Potential detection of a large target

Normal function: The **yellow LED** indicates the switching state of the output. The **green LED** indicates when receiving an echo (alignment assistance).

Teach-In procedure

A. Switching point with 1 % hysteresis

Switching function



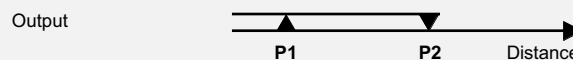
Connect the Teach-In input to GND (0 V) for approximately 8 s until the yellow LED P1 is blinking at ~2 Hz.

Disconnect: the sensor is now running in Teach-In mode: the yellow LED P1 is blinking at ~1/2 Hz. The programming of the switching point has to take place within 35 s! Place the target at operating distance P1, connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The programming of the switching point is completed. P2 is 1 % further away from the sensor.

Switching characteristics NO/NC: If during the programming of the switching point LED P1 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is now operating normally with new value.

B. Switching point with programmed hysteresis with NO switching characteristics (Setting of P2)

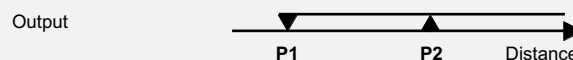
Hysteresis setting



1. Programming of the switching point (switching function-NO) at distance P1, as described in section "A".
2. Programming of P2: Connect the Teach-In input to GND (0 V) for approx. 16 s. After approximately 8 s the yellow LED starts blinking at ~2 Hz, after another 8 s the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED is blinking at ~1/2 Hz. Place the target at the selected hysteresis switching distance P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

C. Switching point with programmed hysteresis with NC switching characteristics (Setting of P2)

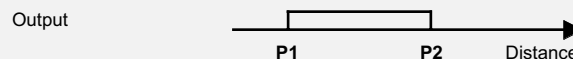
Hysteresis setting



1. Programming of the switching point (switching function-NC) at distance P1, as described in section "A".
2. Programming P2: Connect the Teach-In input to GND (0 V) for approx. 16 s. After approx. 8 s the yellow LED starts blinking at ~2 Hz, after another 8 s the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED is blinking at ~1/2 Hz. Place the target at the selected hysteresis switching distance P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

D. Window function NO switching characteristics

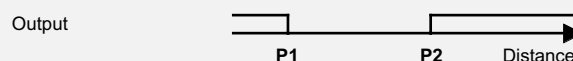
Window function



1. Programming of the switching point (switching function-NC) at distance P1, as described in section "A".
2. Programming P2: Connect the Teach-In input to GND (0 V) for approx. 16 s. After approximately 8 s the yellow LED starts blinking at ~2 Hz, after another 8 s, the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED is blinking at ~1/2 Hz. Place the target at the selected window border P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

E. Window function NC switching characteristics

Window function



1. Programming of the switching point (switching function-NO) at distance P1, as described in section "A".
2. Programming P2: Connect the Teach-In input to GND (0 V) for approx. 16 s. After approximately 8 s the yellow LED starts blinking at ~2 Hz, after another 8 s, the yellow LED is blinking at 1 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED is blinking at ~1/2 Hz. Place the target at the selected window border P2. With the yellow LED on: connect the Teach-In input to GND (0 V) for a few seconds and disconnect. The sensor is now programmed as required.

Ultrasonic sensors

Series AAD-80x80fs

Design; length		□ 80 mm; 80 mm; 50 mm		
Housing material		plastic		
Setting of the switching points, mounting		Teach-In, flush		
Range assured operating distance for targets 100 x 100 mm^2		600 ... 6000 mm		
Type designation, Ref. no. (Wiring)	2 outputs plus switching NO (Sp), NC (Öp), hysteresis and window function Optionally programmable	AAD-80x80fs50b6000-11o22Se1C	13.25-15	(1/1)
Maximum switching frequency		1 Hz		
Wiring (connector or lead); number of wires		Connector M12; 5-pole		
<div><div><div>Common Technical Data</div><div><div>Hysteresis of the switching point s</div><div>1 %</div></div><div><div>Repetition accuracy of the switching point s</div><div>0.2 % 2 mm</div></div><div><div>Short-circuit-proof ?</div><div>yes</div></div><div><div>Reverse polarity protection ?</div><div>yes</div></div><div><div>Ambient temperature range</div><div>- 15 ... + 70 °C</div></div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></d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For proximity switches with connectors: Please find the required connector with outgoing lead in chapter 12 "Accessories". Order separately.

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..

Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

Proximity switches according to standard:

DIN EN 60 947-5-2 (VDE 0660 part 208).

We are certified according to DIN EN ISO 9001



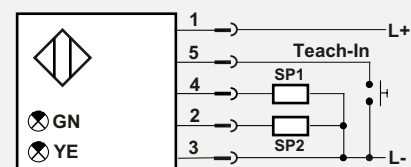
!!!! WARNING !!! Personal injury

DO NOT USE these products as safety or EMERGENCY stop device, or in any other application where failure of the product may result in personal injury. Failure to comply with these instructions may lead to serious personal injuries or even to death.

Subject to technical changes!

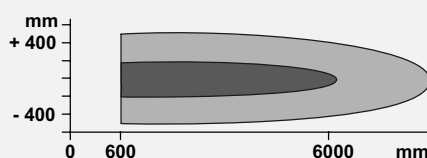
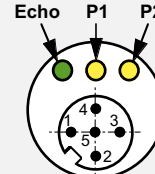
Wiring (1)

DC 5-pole, plug



Euro Plug M12

5-pole

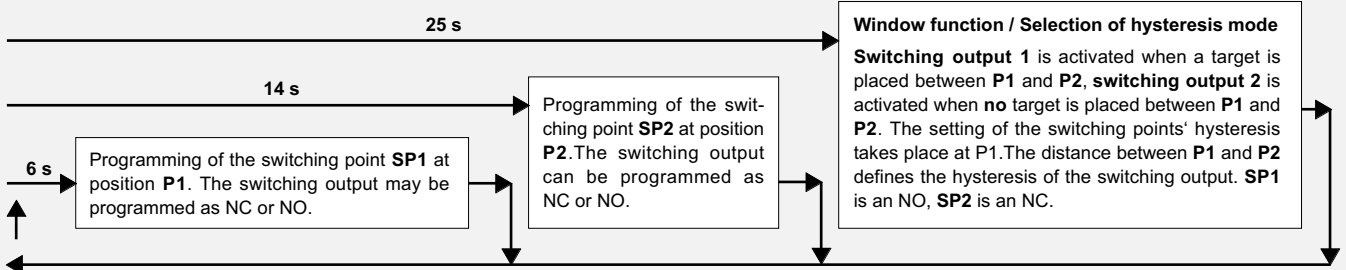


- Safe detection of a target 100 x 100 mm²
- Potential detection of a large target

Normal function: The **yellow LEDs P1 + P2** indicate the switching state of **SP1 + SP2**. The **green LED** indicates when receiving an echo (alignment assistance).

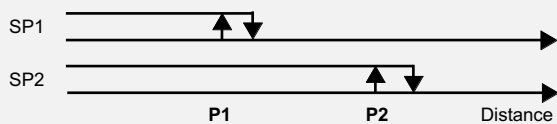
Teach-In procedure

The following **3 different modes** of the switching outputs can be programmed: **A.** normal switching function, **B.** window function, **C.** adjustable hysteresis. Use the LEDs **Echo**, **P1** and **P2** to teach in all functions via the programming input (Pin 5). The time sequence is shown in the following diagram.

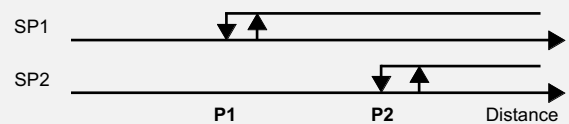


A. Normal switching function NO / NC

NO characteristics



NC characteristics



Teach-In mode P1 (Position SP1)

Connect the Teach-In input to GND until the LEDs **P1** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P1: the yellow LED P1 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P1 has to take place within 30 s! Place the target at the new position P1. Connect the Teach-In input to GND for a few seconds and disconnect: P1 is now programmed.

Switching characteristics NO/NC: If during the programming of the switching point LED P1 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P1.

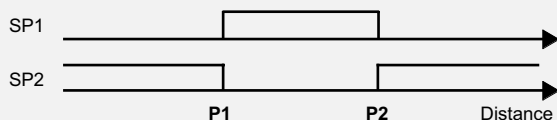
Teach-In mode P2 (Position SP2)

Connect the Teach-In input to GND until the LEDs **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** are blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED P2 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P2 has to take place within 30 s! Place the target at the new position P2. Connect the Teach-In input to GND for a few seconds and disconnect: P2 is now programmed.

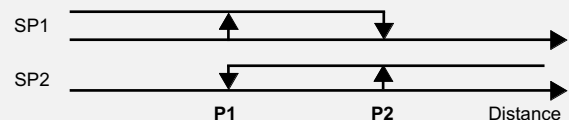
Switching characteristics NO/NC: If during the programming of the switching point LED P2 is on, the switching point will have NO characteristics, if it is off it will have NC characteristics. The sensor is operating now normally with new value for P2.

B. Window function / C. Setting of hysteresis

Window function



Setting of hysteresis



Connect the Teach-In input to GND until the LEDs **P1**, **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** are blinking at ~2 Hz and finally all LEDs are blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for window function / setting of hysteresis: the yellow LEDs P1 and P2 are blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of the function has to take place within 30 s! Connect the Teach-In input to GND for a few seconds and disconnect: (pay attention to LED P1 and P2!) If the LEDs P1 and P2 do not light up when connecting, the window function is programmed.

If the target is between P1 and P2, SP1 switches on and SP2 off. If there is no target between P1 and P2, SP1 switches off and SP2 on.

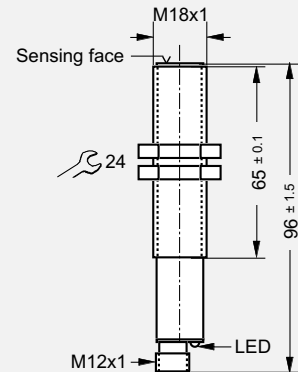
If the LEDs P1 and P2 are on when connecting, the programming of the hysteresis setting is completed.

The switching point of SP1 (NO) is at P1 with P1 - P2 hysteresis. The switching point SP2 (NC) is also at P1 with P1 - P2 hysteresis.

Analogue Ultrasonic Sensor

Series AGA-18fg

Design; length		Ø M18 x 1; 100 mm			
Material of the housing		plastic			
Setting of the switching points, mounting		Teach-In, flush			
Range assured operating distance for target sizes 100 x 100 mm^2		30 ... 400 mm			
Type designation, Ref. no. (Wiring)	Analogue output characteristics	0 ... 10 V	AGA-18fg100b400-1Se1A	13.25-14	(1/1)
	Parameter of the characteristics teachable				
	Analogue output characteristics	4 ... 20 mA			
	Parameter of the characteristics teachable				
Response time		60 ms			
Wiring (connector or lead); number of wires		Connector M12; 5-pole			
Common Technical Data					
Repetition accuracy of the switching point s		0.2 % 1 mm			
Short-circuit-proof ?		yes			
Reverse polarity protection ?		yes			
Ambient temperature		- 20 ... + 70 °C			
Specific Technical Data					
Permissible operating voltage range		15 ... 24 ... 30 V DC			
Current consumption without load		< 30 mA			
Resolution		0.125 mm			
Linearity error		< 0.5 %			
Sound lobe		8 °			
Alignment assistance ? / Echo LED ?		yes / yes			
Maximum length of the lead		150 m			
Lead type / standard lead length / number of wires x lead cross section					
Protection rating according to IEC 60529		IP 65			
Protection class					
Permissible torque without / with toothed disc		2.5 Nm / 3.5 Nm			
Weight		60 g			
Recommended accessories		chapter 12.1			



For proximity switches with connectors: Please find the required connector with outgoing lead in chapter 12 "Accessories". Order separately.

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..

Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

Proximity switches according to standard:

DIN EN 60 947-5-2 (VDE 0660 part 208).

We are certified according to DIN EN ISO 9001



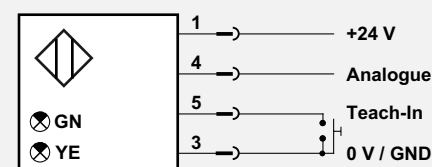
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Subject to technical changes!

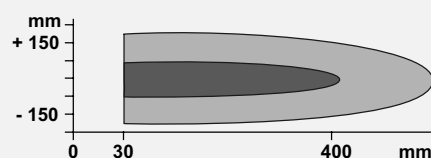
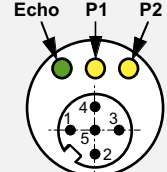
Wiring (1)

DC 4-pole, plug



Euro Plug M12

5-pole



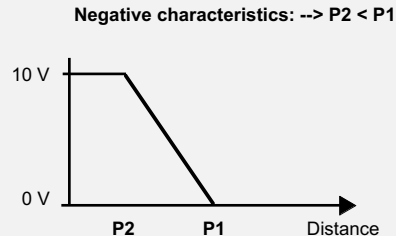
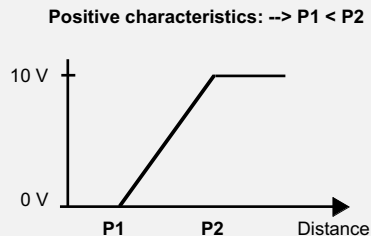
- Safe detection of a target 100 x 100 mm²
- Potential detection of a large target

Normal function: The **yellow LEDs P1 + P2** indicate the switching state of **SP1 + SP2**. The **green LED** indicates when receiving an echo (alignment assistance).

Teach-In procedure

A. Analogue characteristics

P1 and **P2** are used to determine the operating range of the analogue characteristics: **P1** determines the position where the characteristics value is 0 V, **P2** determines the position 10 V.



B. Programming of the characteristics

Teach-In mode P1 (Position SP1)

Connect the Teach-In input to GND until the LEDs **P1** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P1: the yellow LED P1 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P1 has to take place within 30 s! Place the target at the new position P1. Connect the Teach-In input to GND for a few seconds and disconnect: The programming of P1 is now completed.

Characteristics positive/negative: If P1 is closer to the sensor than P2, the sensor will operate with positive characteristics. If P2 is closer to the sensor than P1, the sensor will operate with negative characteristics.

Teach-In mode P2 (Position SP2)

Connect the Teach-In input to GND until the LEDs **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED P2 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P2 has to take place within 30 s! Place the target at the new position P2. Connect the Teach-In input to GND for a few seconds and disconnect. The programming of P2 is now completed.

Characteristics positive/negative: If P1 is closer to the sensor than P2, the sensor will operate with positive characteristics. If P2 is closer to the sensor than P1, the sensor will operate with negative characteristics.

Analogue Ultrasonic Sensor

Series AGH-18fg

Design; length		O M18 x 1; 92 mm		
Material of the housing		plastic		
Setting of the switching points, mounting		flush		
Range assured operating distance for target sizes 100 x 100 mm²		100 ... 600 mm		
Type designation, Ref. no. (Wiring)	Analogue output characteristics	0 ... 10 V		
	Parameter of the characteristics teachable			
	Analogue output characteristics	4 ... 20 mA		
Response time		< 60 ms		
Wiring (connector or lead); number of wires		lead; 4-pole		
Common Technical Data				
Repetition accuracy of the switching point s		0.2 % 1 mm		
Short-circuit-proof ?		yes		
Reverse polarity protection ?		yes		
Ambient temperature		- 15 ... + 70 °C		
Specific Technical Data				
Permissible operating voltage range		19 ... 24 ... 30 V DC		
Current consumption without load		≤ 35 mA		
Linearity error		< 0.3 %		
Sound lobe		8 °		
Alignment assistance ? / Echo LED ?		no / no		
Maximum length of the lead		150 m		
Lead type / standard lead length / number of wires x lead cross section				
Protection rating according to IEC 60529		IP 67		
Protection class				
Permissible torque without / with toothed disc		2.5 Nm / 3.5 Nm		
Weight		60 g + lead weight		
Recommended accessories		chapter 12.1		

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..


Certifications

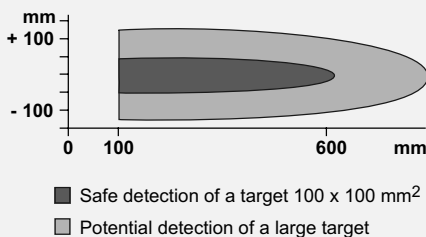
DIN EN 60 947-5-2 (VDE 0660 part 208).

CE

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Wiring (1)

	BN	+ 24 V
	BK	Analogue
	PK	Hold / Sync
	BU	0 V



Series AGH-18fg

Design; length		O M18 x 1; 96 mm	
Material of the housing		plastic	
Setting of the switching points, mounting		Teach-In, flush	
Range assured switching distance for target sizes 100 x 100 mm ²		80 ... 1600 mm	
Type designation, Ref. no. (Wiring)	Analogue output characteristics 0 ... 10 V Parameter of the characteristics teachable	AGH-18fg96b1600-3Se1C 13.25-17 (1/1)	
	Analogue output characteristics 4 ... 20 mA Parameter of the characteristics teachable		
Response time		140 ms	
Wiring (connector or lead); number of wires		Connector M12; 5-pole	
Common Technical Data			
Repetition accuracy of the switching point s	0.2 % 2 mm		
Short-circuit-proof ?	yes		
Reverse polarity protection?	yes		
Ambient temperature	- 20 ... + 70 °C		
Specific Technical Data			
Permissible operating voltage range	15 ... 24 ... 30 V DC		
Current consumption without load	< 30 mA		
Resolution	1 mm		
Linearity error	< 0.5 %		
Sound lobe	8 °		
Alignment assistance ? / Echo LED ?	yes / yes		
Maximum length of the lead	150 m		
Lead type / standard lead length / number of wires x lead cross section			
Protection rating according to IEC 60529	IP 65		
Protection class			
Permissible torque without / with toothed disc	2.5 Nm / 3.5 Nm		
Weight	60 g		
Recommended accessories	chapter 12.1		

For proximity switches with connectors: Please find the required connector with outgoing lead in chapter 12 "Accessories". Order separately.

For proximity switches with outgoing lead: The standard length is 2.0 m or 5.0 m. Lead lengths are marked at the end of the ref. no. by index -020 or -050. In case that deviating lengths are required, please indicate this in the ref. no..

Examples: Lead length 10.0 m: Index -100, lead length 0.5 m: Index -005.

Certifications

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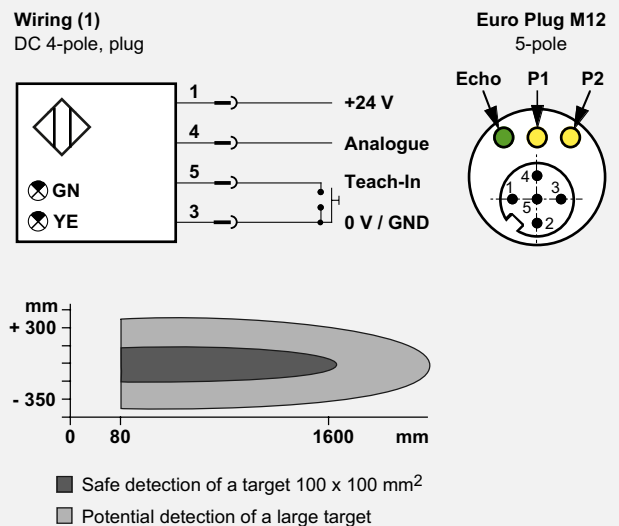


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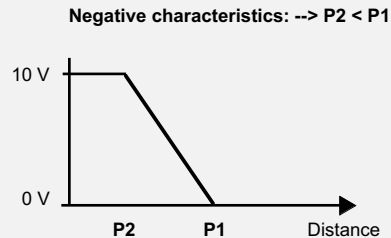
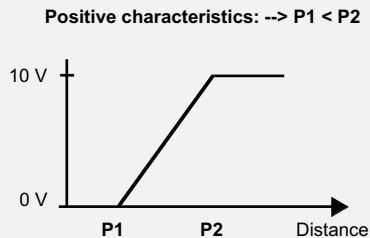


Normal function: The **yellow LEDs P1 + P2** indicate the switching state of **SP1 + SP2**. The **green LED** indicates when receiving an echo (alignment assistance).

Teach-In procedure

A. Analogue characteristics

P1 and **P2** are used to determine the operating range of the analogue characteristics: **P1** determines the position where the characteristics value is 0 V, **P2** determines the position 10 V.



B. Programming of the characteristics

Teach-In mode P1 (Position SP1)

Connect the Teach-In input to GND until the LEDs **P1** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P1: the yellow LED P1 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P1 has to take place within 30 s! Place the target at the new position P1. Connect the Teach-In input to GND for a few seconds and disconnect: The programming of P1 is now completed.

Characteristics positive/negative: If P1 is closer to the sensor than P2, the sensor will operate with positive characteristics. If P2 is closer to the sensor than P1, the sensor will operate with negative characteristics.

Teach-In mode P2 (Position SP2)

Connect the Teach-In input to GND until the LEDs **P2** and **Echo** start blinking at ~2 Hz. The LEDs **P1** and **Echo** are the first to blink, then the LEDs **P2** and **Echo** start blinking at ~2 Hz. **Disconnect:** now the sensor is in Teach-In mode for P2: the yellow LED P2 is blinking at ~1 Hz; the green Echo LED returns to its normal function (alignment assistance). The programming of P2 has to take place within 30 s! Place the target at the new position P2. Connect the Teach-In input to GND for a few seconds and disconnect. The programming of P2 is now completed.

Characteristics positive/negative: If P1 is closer to the sensor than P2, the sensor will operate with positive characteristics. If P2 is closer to the sensor than P1, the sensor will operate with negative characteristics.