

Special-Sensors for Automation



Ultrasonic Sensors

- Level control
- Distance measurement
- Monitoring of all materials
- Waterproof
- Teach-in function



**ISO 9001
certified**

Application notes

Basics

Ultrasonic sensors are transmitting and receiving ultrasonic signals. These signals have a frequency range from 65 kHz up to 300 kHz. Ultrasonic sensors can be used for several different applications, for example:

- diameter detection
- looptension
- height detection
- level measuring
- counting

Application notes

Non-contact detection of:

- distances
- presence
- level
- diameter
- position

Independent of:

- material
- colour
- light
- smoke
- dust

Cycle period

A short ultrasonic pulse is transmitted at the time 0, reflected by an object. The sensor receives this signal and converts it to an electric signal. The next pulse can be transmitted when the echo is faded away. This time period is called cycle period. (Fig. 1)

Sensors with

- long sensing ranges have long cycle periods and slow reaction time
- short sensing ranges have short cycle periods and fast reaction times

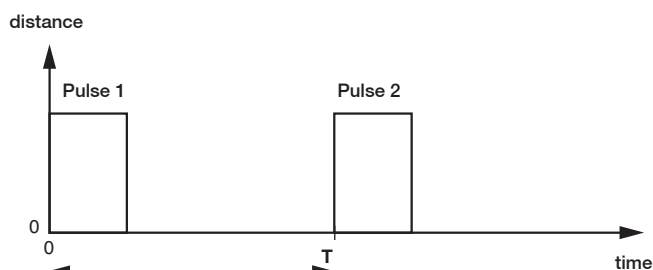


Fig. 1: cycle period T

Angle of beam

The energy of the ultrasonic pulse is transmitted in form of a cone along the transducer axis. The highest intensity is on the axis and decreases with rising angles. The angle of beam is defined by the angle through which the energy of the ultrasonic pulse is reduced of 33% of its maximum value.

The best detection is given by an object that stands vertical to the transducer axis. To give a save detection, the object should not have an greater angle than half of the angle of beam ($\alpha/2$). (Fig. 2) If the object is canted at a greater angle, there is no reflection of the ultrasonic pulses. An object with a flat surface and canted at an angle of 45° to the transducer axis refracts the ultrasonic pulse in an angle of 90° . An ultrasonic pulse can be compared to a light beam.

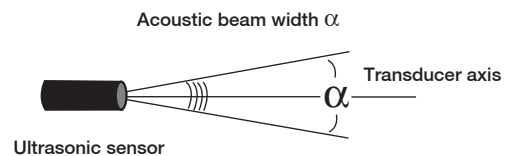


Fig. 2: angle of beam

Voltage amplitude

During the transmission the voltage amplitude of the ultrasonic pulse is approximate 80 V PP. The pulse period of the ultrasonic pulse depends on the duration of the transmission pulse and on the ringing time of the transducer.

The voltage amplitude of the received echo is in the range of μV . (Fig. 3)

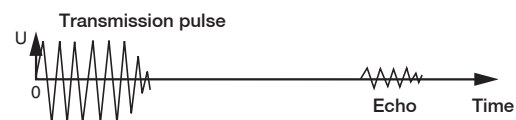


Fig. 3: voltage amplitude

Blind zone

It is not possible to receive an echo during the transmission of the ultrasonic pulse. This time period defines the range of the blind zone. In this blind zone it is not possible to measure a distance. (Fig. 4)

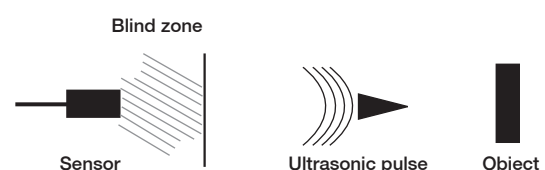


Fig. 4: blindzone

With switching point

Series ARK

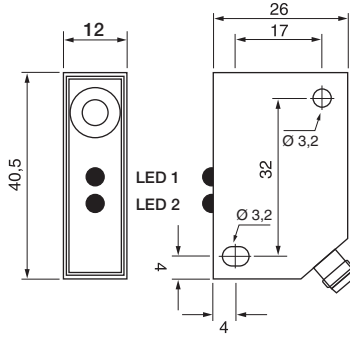
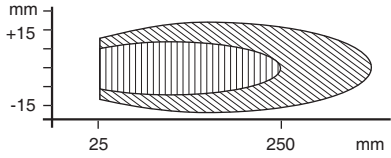
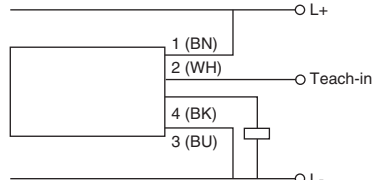
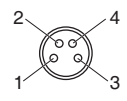
Plastic miniature housing

DC 18...30 V

PNP output

Teach-in programming



Design	DC PNP • rectangular housing 26x40x12	
Dimensions		
Sensing range	[mm]	25...250
Output		
ID-No.		P72026
Type		ARKS 250 GPP
Supply voltage	[V]	18...30 DC
Current consumption	[mA]	35
Switching current	[mA]	100
Switching frequency	[Hz]	50
Ambient temperature	[°C]	-20...+70
Protection	[EN 60529]	IP 67
Housing material		PBTP
Connection		M8 connector
	  	
Accessories	M8 plug type connection, 2 m PVC-cable is part of delivery	

With switching point

Series AGK

Metal / plastic thread

M12x1

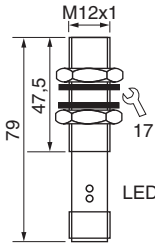
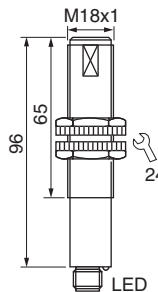
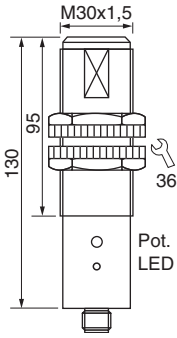
M18x1

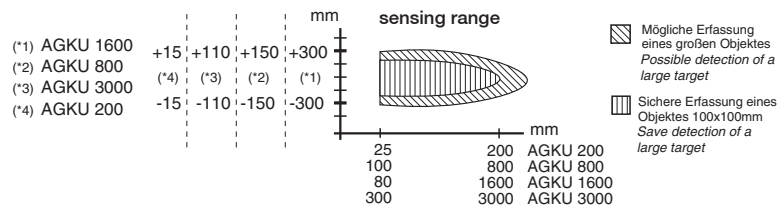
M30x1.5

DC 18...30 V

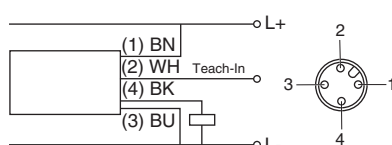
Sensing range adjustable



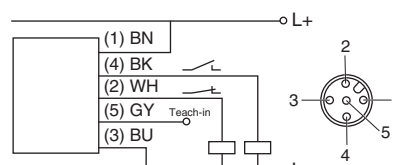
Design	DC PNP • M12x1	DC PNP • M18x1		DC PNP • M30x1.5
Dimensions				
Sensing range [mm]	25...200	100...800	80...1600	300...3000
Output				
ID-No.	P72018	P72030	P72031	P72003
Type	AGKU 200 GPP	AGKU 800 GSOP	AGKU 1600 GSOP	AGKU 3000 GSP
Supply voltage [V]	10...30 DC	12...30 DC	12...30 DC	18...30 DC
Switching current [mA]	100	500	500	400
Short circuit proof	•	•	•	•
Reverse protection	•	•	•	•
Switching frequency [Hz]	50	10	6	1
Ambient temperature [°C]	-15...+70	-20...+70		-15...+70
Protection [EN 60529]	IP 67	IP 67		IP 67
LED display	•	•		•
Housing material	AISI 316 Ti	PBTP		PBTP
Connection	M12 connector			



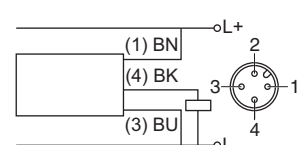
AGKU 200 GPP



AGKU 800 GSOP / AGKU 1600 GSOP



AGKU 3000 GSP



Accessories

Connecting type SLG 4-2 (Z00445), SLG 3-2 (Z01076), SLG 5-2 (Z01150)

Switching points and analog output

Series AGK

Plastic thread

M18x1

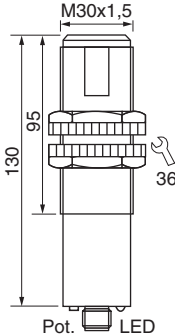
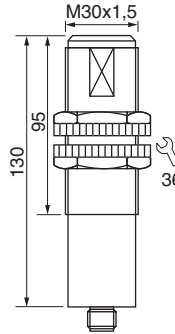
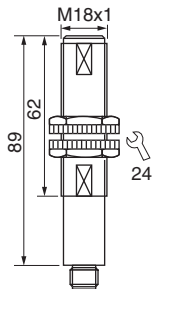
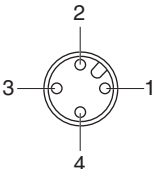
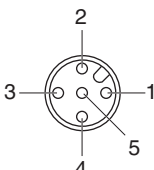
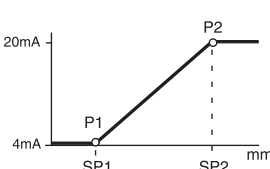
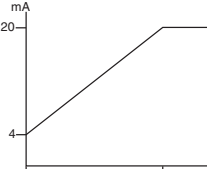
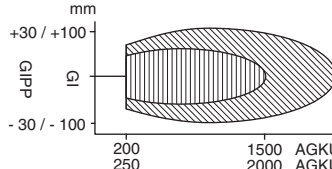
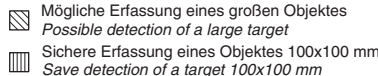
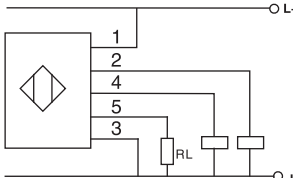
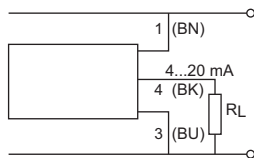
M30x1.5

DC 18...30 V

Two switching points PNP

Sensing range adjustable



Design	Teach-in • M30x1.5	4...20 mA • M30x1.5	4...20 mA • M18x1
Dimensions			
Sensing range [mm]	250...2000	300...2500	200...1500
Output	2x  / 		
ID-No.	P72005	P72011	P72010
Type	AGKU 2000 GIPP	AGKU 2500 GI	AGKU 1500 GI
Supply voltage [V]	19...30 DC	18...30 DC	18...30 DC
Current consumption [mA]	25	35	35
Load current [mA]	100	—	—
Current output [mA]	—	4...20	—
Load resistance R _L [Ω]	—	0...500	—
Linear deviation [%]	—	0.5	—
Ambient temperature [°C]	—	−15...+70	—
Temperature drift [%]	—	0.5	—
Protection [EN 60529]	—	IP 67	—
Housing material	—	PBTP	—
Connection	M12 connector		
 1: + (BN) 2: — (BU) 3: - (BK) 4: A (BK)  1 + (BN) 2 SP2 (WH) 3 - (BU) 4 SP1 (BK) 5 Analog (GY)	 20mA 4mA P1 P2 SP1 SP2 mm  mA 20 4 200 300 1500 2500  mm +30 / +100 -30 / -100 200 250 300 1500 2000 2500 AGKU 1500 GI AGKU 2000 GIPP AGKU 2500 GI  Mögliche Erfassung eines großen Objektes Possible detection of a large target Sichere Erfassung eines Objektes 100x100 mm Save detection of a target 100x100 mm  AGKU 2000 GIPP  AGKU 1500 GI		
Accessories	Connecting type SLG 5-2 (Z01150), SLG 3-2 (Z01076)		

Two switching points

Series ARK

Rectangular housing 100x36 mm

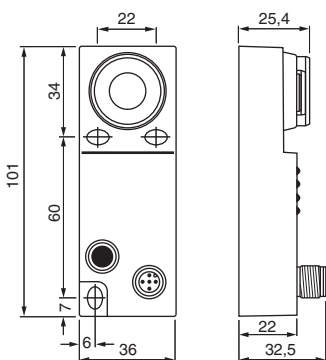
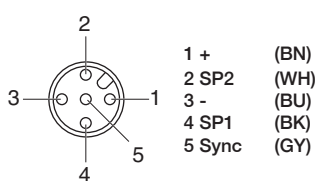
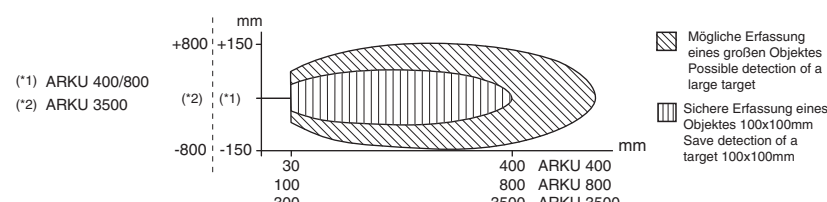
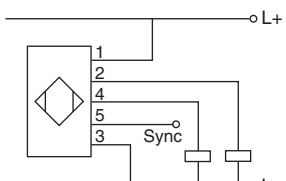
DC 12...30 V

Two independent switching points

Teach-in programming

Sync input



Design	DC PNP • rectangular housing 100x36		
Dimensions			
Sensing range [mm]	30...400	100...800	300...3500
Output	2x 	2x 	2x 
ID-No.	P72020	P72021	P72022
Type	ARKU 400 GPP	ARKU 800 GPP	ARKU 3500 GPP
Supply voltage [V]	12...30 DC		
Current consumption [mA]	35		
Switching current [mA]	400		
Repeatability [%]	0.2	0.1	0.2
Ambient temperature [°C]	-15...+70		
Protection [EN 60529]	IP 67		
Housing material	PBTP		
Connection	M12 connector		
	 		

Accessories

Connecting cable type SLG 5-2 (Z01150), SLW 5-2 (Z01151)

Analog output

Series ARK

Rectangular housing 100x36 mm

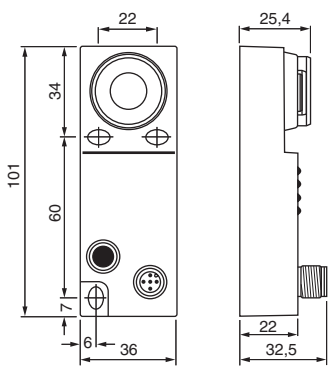
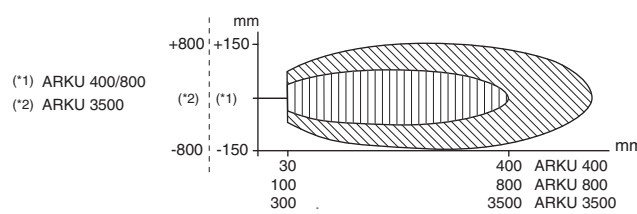
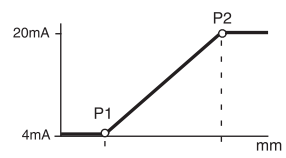
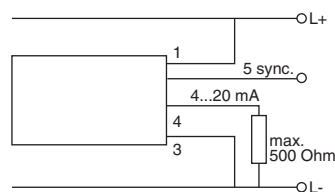
DC 15...30 V

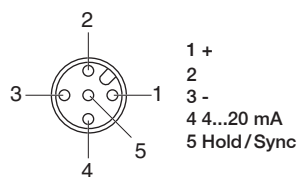
4...20 mA

Teach-in programming

Sync input



Design	4...20 mA • rectangular housing 100x36		
Dimensions			
Sensing range [mm]	30...400	100...800	300...3500
Output			
ID-No.	P72023	P72024	P72025
Type	ARKU 400 GI	ARKU 800 GI	ARKU 3500 GI
Supply voltage [V]	15...30 DC		
Current consumption [mA]	40		
Current output [mA]	4...20		
Repeatability [%]	±0.2		
Ambient temperature [°C]	-15...+70		
Protection [EN 60529]	IP 67		
Housing material	PBTP		
Connection	M12 connector		
	 (*) ARKU 400/800 (*) ARKU 3500   Mögliche Erfassung eines großen Objektes Possible detection of a large target Sichere Erfassung eines Objektes 100x100mm Safe detection of a target 100x100mm		
Accessories	Connecting cable type SLG 5-2 (Z01150), SLW 5-2 (Z01151)		



Ultrasonic thru scan

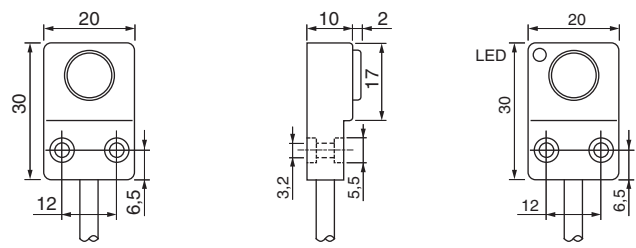
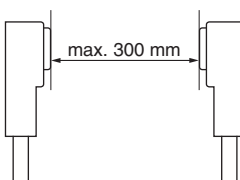
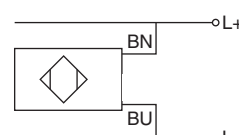
Series ARK

Rectangular housing
30x20x12 mm

DC 18...30 V

High switching frequency



Design	DC PNP • rectangular housing 30x20x12	
Dimensions		
Sensing distance max. [mm]	0...300	
Function	Transmitter	Receiver
Output		
ID-No.	P72029	
Type	ARK 300 GSP	
Supply voltage [V]	18...30 DC	
Current consumption [mA]	< 40	
Switching current [mA]	500	
Switching frequency [Hz]	150	
Ambient temperature [°C]	-15...+60	
Protection [EN 60529]	IP 67	
Housing material	PBTP	
Connection	2 m cable	
		Transmitter  Receiver 