Ultrasonic Sensors

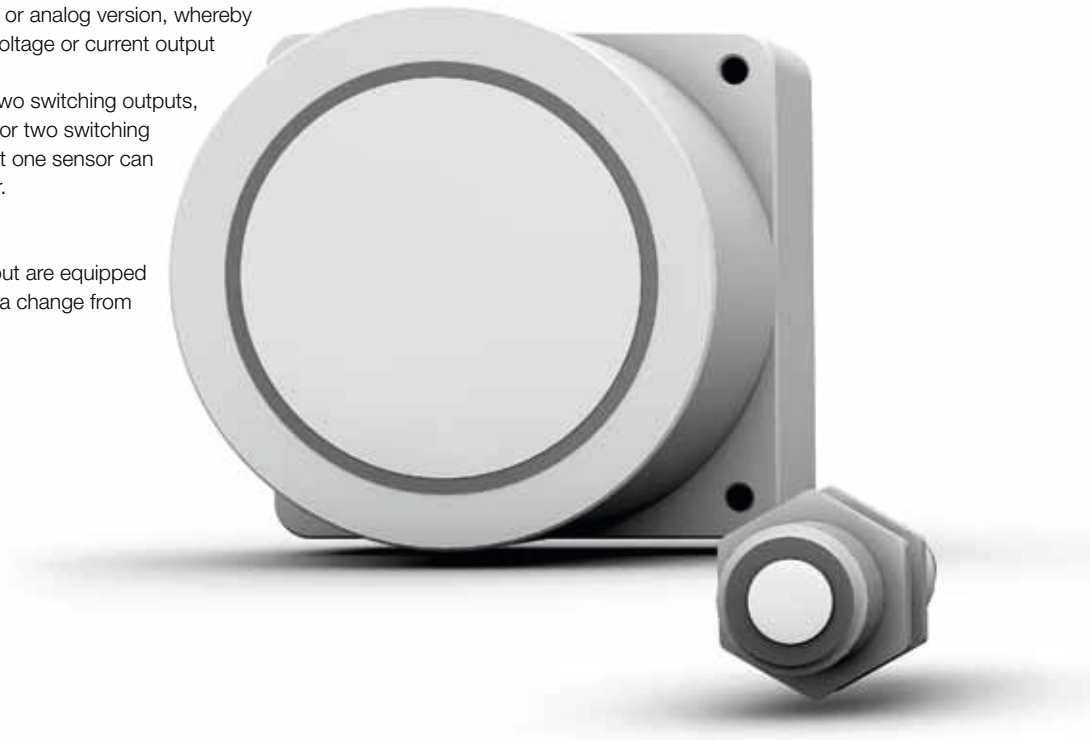
Ultrasonic sensors for object detection

Regardless of color and surface properties
BUS ultrasonic sensors can be used universally and are perfect for distance measurement or position detection of granular materials, liquids and powders. They measure fill levels, heights and sag without making contact as well as count and monitor the presence of objects.
They do this regardless of color and surface properties. Therefore transparent objects that generate strong reflections pose no problem for them.
As precision all-rounders, ultrasonic sensors are particularly suited for critical situations. Dust, dirt and steam do not impair them.

Broad detection range – high precision
Their detection range extends from 20 mm to 8 m, meaning that even longer object distances can be handled without problem. Their high resolution and small blind zones ensure extreme precision. Integrated synchronization means that the sensors do not interfere with one another.

Switching and analog variants
BUS ultrasonic sensors differ form one another in their output signal. Each series is available as a switching or analog version, whereby all analog versions are available with voltage or current output (0…10 V or 4…20 mA).
The BUS M30 includes variants with two switching outputs, one switching and one analog output or two switching outputs and one analog output so that one sensor can adopt the function of a second sensor.

IO-Link
BUS 18M sensors with push/pull output are equipped with an IO-Link interface that enables a change from SIO mode to IO-Link mode.



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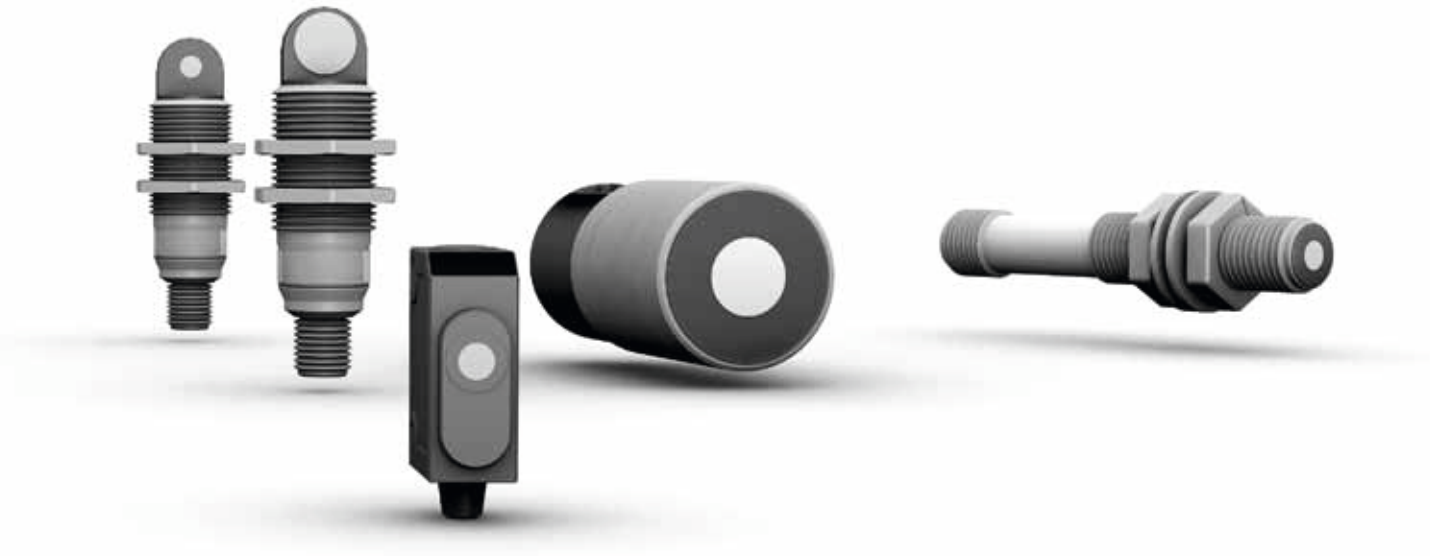


The all-rounders, even for difficult environments

Because the distance to the object is determined via a sound transit time, ultrasonic sensors have excellent background suppression. With their travel time measurement, ultrasonic sensors can record the measured value with resolution that is precise to the millimeter. Some sensors to even 0.025 mm. The sensors are able to measure in dusty air or through paint spray mist. They detect nearly all materials that reflect sound. Even thin films, transparent materials and different colors. Thin deposits on the sensor membrane do not affect sensor function.

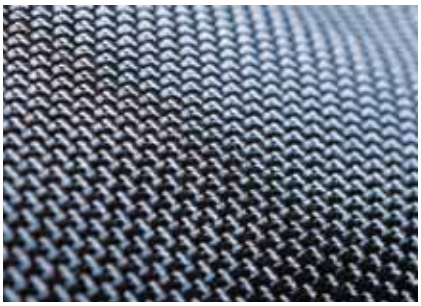
Colors
Red, green, yellow or blue—all make no difference to Balluff ultrasonic sensors: They reliably detect all colors.

Transparent layers
Glass plates, Plexiglas and razor thin foils — BUS ultrasonic sensors reliably detect transparent layers.

Surfaces of bulk materials
Fine sand, shavings or coarse-grained materials—in the areas of fill-level measurement, our ultrasonic sensors are ideal.

Contrasts
Black objects against a black background or white on white—even with weak contrasts, our BUS ultrasonic sensors measure achieve the best results.

Liquids
Clear water, cloudy liquids, oils or black coffee — ultrasonic sensors can be used with nearly any liquid. The liquid surface should have no foam.



Material surfaces
Whether velvet, wool or leather—nearly all clothing materials can be reliably detected with our BUS ultrasonic sensors.

BUS ultrasonic sensors are particularly well suited for the following industries

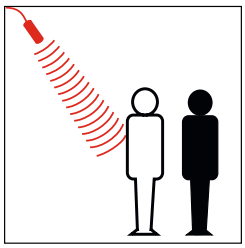
- Handling and automation
- Specialty machine construction
- Automotive industry
- Bottling and packaging
- Pharmaceutical industry
- Plastic and rubber industry
- Timber and furniture industry
- Paper and printing industry
- Conveyor technology
- Commercial vehicles
- Scales
- Agricultural machinery
- Food processing machinery
- Office and information technology
- Construction and building material machinery
- Textile machinery

Handling and automation

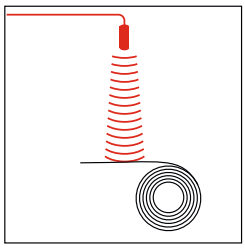
Bottling and packaging

Automotive industry

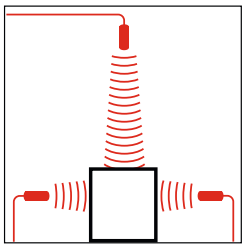
Ultrasonic sensors can be used in many application areas



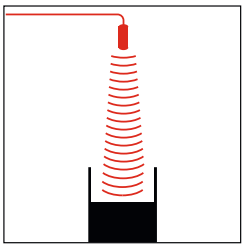
Detection of people
If people need to be detected, a sensor should be used that has an operating scanning range that is considerably greater than the required measurement distance. The greater the operating scanning range, the lower the ultrasonic frequency. And the better absorbent pieces of clothing, such as wool, can be detected.



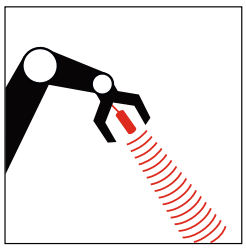
Foil tear monitoring
Ultrasonic sensors with switching output can be used for foil tear monitoring. If large waves are formed in the foil, the sensor should be operated as a diffuse reflective sensor. This operating mode functions reliably even if the sound is reflected by waves in the foil.



Height and width measurement
Through the use of multiple BUS M30 or BUS _18M ultrasonic sensors, three-dimensional measurements can be made for everything from small boxes to large cartons.



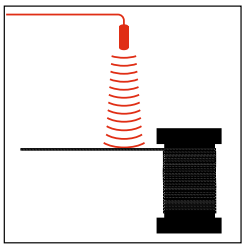
Presence verification
BUS detect filled or empty pallets and measure the content of transport containers. If a box or a container is to be inspected with multiple sensors, they can be synchronized with each other.



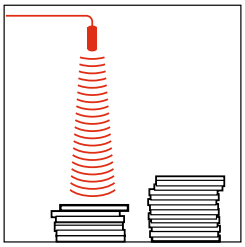
Robot positioning
Due to their small dimensions, BUS sensors are ideally suited for exactly positioning robot arms: BUS_18M ultrasonic sensors in a threaded sleeve and BUS R06K in a block-shaped housing.

Other applications on the next page

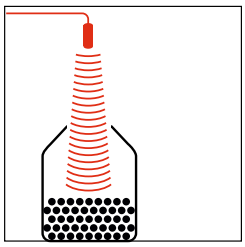
Positioning
When scanning glass plates or other smooth and flat surfaces, make certain that the ultrasound strikes the surface at a right angle.



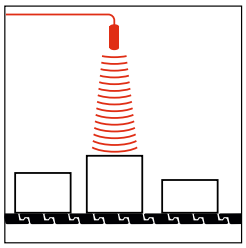
Wire-breakage monitoring
When winding and unwinding a wire rope, ultrasonic sensors with analog output detect its position on the layer.



Stack-height detection
Whether wooden boards, glass plates, paper or color plastic plates, BUS ultrasonic sensors measure stack heights with high precision.



Fill-level monitoring
In silos, bunkers, containers – for all bulk materials (e.g., sand, gravel, coal, grain), our ultrasonic sensors are ideal.



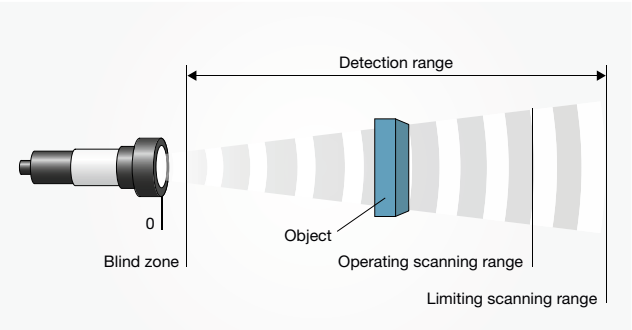
Object detection
BUS ultrasonic sensors sort containers and parts with different heights. BUS count objects. And with absolute reliability.

Sensor selection

Important selection criteria for an ultrasonic sensor are its sensing distance and the associated, three-dimensional detection range.

Definitions

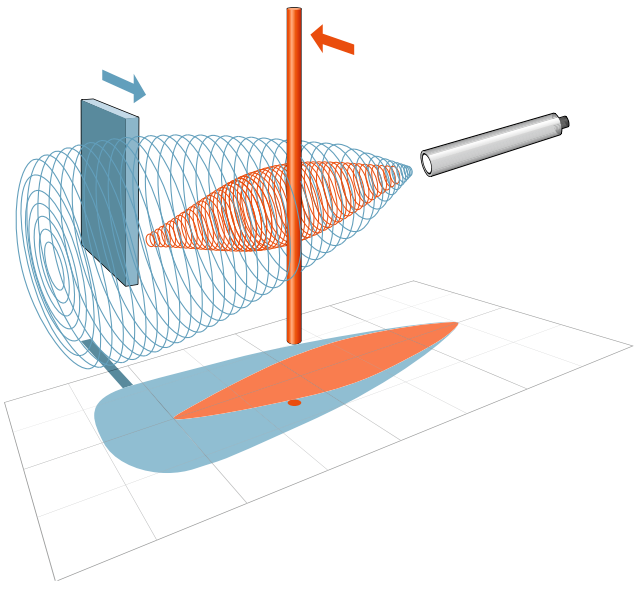
- **Blind zone**
  The blind zone defines the smallest reliable scanning range of the sensor. There must be no objects or interfering reflections within the blind zone, as measurement errors may otherwise occur.
- **Operating scanning range**
  The operating scanning range is the typical working range of a sensor.
- **Limiting scanning range**
  For objects with good reflective properties, the sensor can also be used up to its limiting scanning range.
- **Detection range**
  The detection range is measured using various standard reflectors.



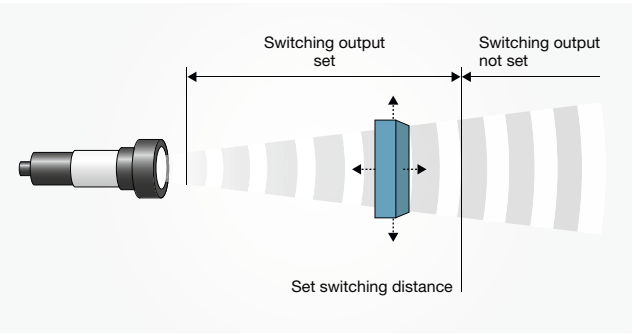
Detection ranges
The red areas are measured with a thin round rod (Ø 10 mm or 27 mm, depending on sensor type) and show the typical working range of a sensor.

To obtain the blue areas, a plate is moved into the sound fields from the side. In doing so, the optimum angle of the plate to the sensor is set. This is thus the maximum detection range of the sensor.

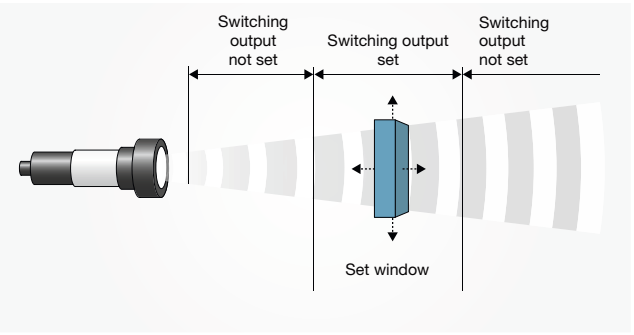
It is not possible to evaluate ultrasound reflections outside of the blue sound cones.



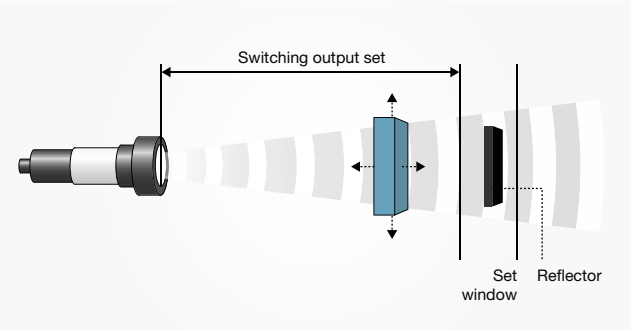
The classic operating mode of the **ultrasonic sensor is as a reflective light scanner**. Compared to other sensor principles, it has superior background suppression. During operation, the switching output is set as soon as the object is located within the set switching distance. The switching point has a hysteresis. The operating mode is suitable for, e.g., counting objects on a conveyor belt or for performing presence verification.



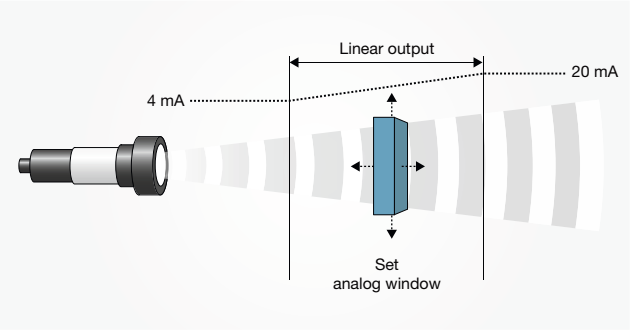
The **ultrasonic sensor in window mode** is an extended function of the ultrasonic reflective light scanner. In this case, the switching output can only be set if the object is located within a window that is defined by two window limits. This can be used to monitor, e.g., the correct bottle size in a bottle crate. Bottles that are too tall or too short are sorted out. Window mode and the diffuse reflection ultrasonic sensor can be set on all ultrasonic sensors that are equipped with teach-in.



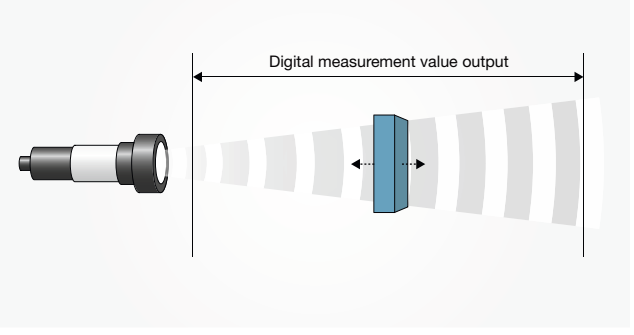
The function of the **diffuse reflection ultrasonic sensor** is similar to that of a photoelectric sensor. Any reflector, such as a metal sheet, is sufficient. In window mode, the ultrasonic sensor is set so that the permanently mounted reflector lies within the window. The ultrasonic sensor returns a signal as soon as an object fully covers the reflector. It plays no role here whether the object completely absorbs or reflects away the sound. This operating mode is therefore used for materials than can be only poorly reflected, such as foam, or for scanning objects with irregular surfaces.



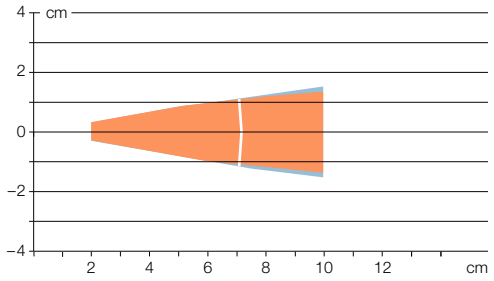
Ultrasonic sensors with analog output output the measured distance value as a voltage that is proportional to distance (0...10 V) or as current that is proportional distance (4...20 mA). For the ultrasonic sensors with analog output, the sensor-near and sensor-distant window limits of the analog characteristic as well as a rising or falling characteristic can be set. Depending on the sensor type and window width, the resolution is between 0.025 mm and 0.36 mm.



Ultrasonic sensors with IO-Link enable gapless communication through all levels of the system architecture: from the sensor to the top fieldbus level. Transmission of the measured distance value to the controller is bit serial.

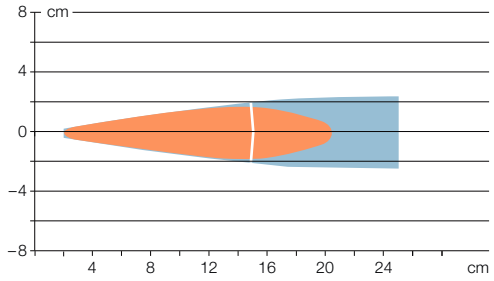


Sound cone No. 1, 0.07 m



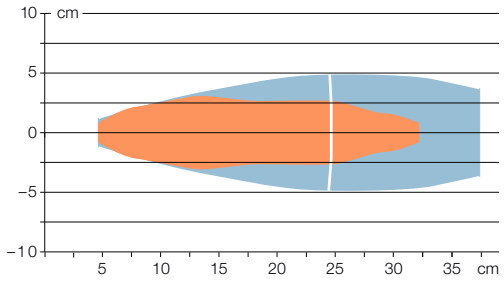
Blind zone	20 mm
Scanning range	70 mm
Limiting scanning range	100 mm
Ultrasonic frequency	380 kHz

Sound cone No. 2, 0.15 m



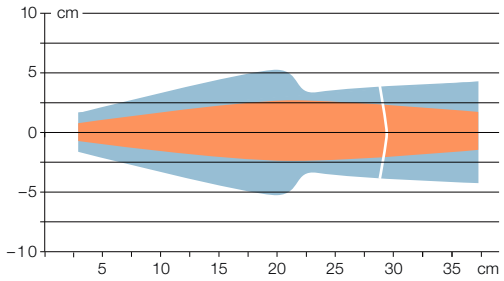
Blind zone	20 mm
Scanning range	150 mm
Limiting scanning range	250 mm
Ultrasonic frequency	380 kHz

Sound cone No. 3, 0.24 m



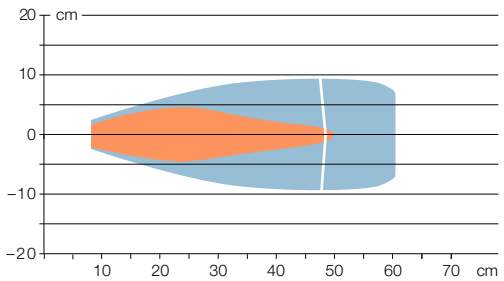
Blind zone	50 mm
Scanning range	240 mm
Limiting scanning range	350 mm
Ultrasonic frequency	500 kHz

Sound cone No. 4, 0.25 m



Blind zone	30 mm
Scanning range	250 mm
Limiting scanning range	350 mm
Ultrasonic frequency	320 kHz

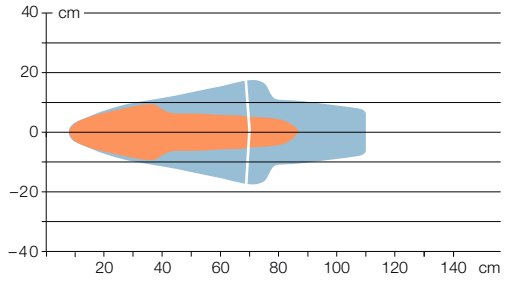
Sound cone No. 5. 0.35 m



Blind zone	65 mm
Scanning range	350 mm
Limiting scanning range	600 mm
Ultrasonic frequency	400 kHz

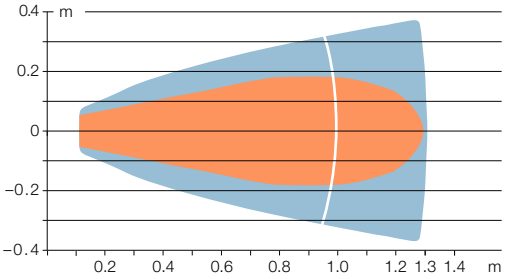
- Round rod 10 mm/27 mm
- Plate 500x500 mm
- Scanning range

Sound cone No. 6, 0.7 m



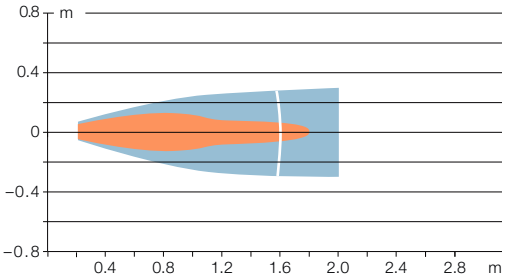
Blind zone	120 mm
Scanning range	0.7 m
Limiting scanning range	1.0 m
Ultrasonic frequency	300 kHz

Sound cone No. 7, 1.0 m



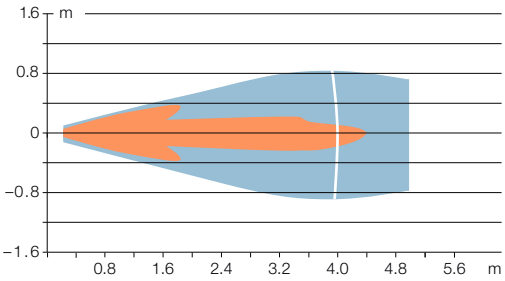
Blind zone	120 mm
Scanning range	1.0 m
Limiting scanning range	1.3 m
Ultrasonic frequency	200 kHz

Sound cone No. 8, 1.3 m



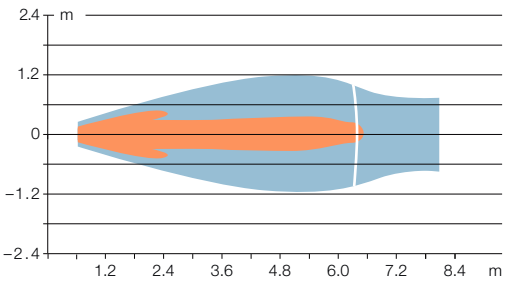
Blind zone	200 mm
Scanning range	1.3 m
Limiting scanning range	2.0 m
Ultrasonic frequency	200 kHz

Sound cone No. 9, 3.4 m



Blind zone	350 mm
Scanning range	3.4 m
Limiting scanning range	5.0 m
Ultrasonic frequency	120 kHz

Sound cone No. 10, 6.0 m



Blind zone	600 mm
Scanning range	6 m
Limiting scanning range	8 m
Ultrasonic frequency	80 kHz

- Round rod 10 mm/27 mm
- Plate 500x500 mm
- Scanning range

Ultrasonic Sensors
Cylinder design, BUS M30M switching output, with display

DEXYI®
M30

Thanks to their display, the ultrasonic sensors of the BUS M30M series with a metal housing are particularly easy to operate. A complete numeric presetting of the sensor is possible. You can choose to have all measured values displayed in mm/cm or % during operation.

The sensor family includes five versions and, with a measuring range from 30 cm to 8 m, covers a wide range of applications.
All versions are available with the option of one or two switching outputs, a current and voltage analog output, or as a combination with switching output and analog output, so that nearly every application can be solved.
The sensors can be used in multiplex operation as well as automatically synchronized to prevent them from interfering with one another.

Features
- **Display with direct, measured value output**
  for immediately visible results
- **Numeric setting of the sensor via the display**
  for completely presetting the sensor
- **Automatic synchronization and multiplex operation**
  for simultaneous operation of up to ten sensors
- **5 sensing distances with a measuring range from 30 mm to 8 m**
- **1 or 2 switching outputs in PNP or NPN design**
- **Analog output 4...20 mA and 0...10 V**
  Automatic changeover between current and voltage output
- **Analog output plus switching output**
  for measurement that is proportional to distance with an additional limit value
- **Teach-in via 2 buttons**
  for simple, menu-driven commissioning

Touch Control
All settings on the sensors are configured using Touch Control. The three-digit LED indicator continuously displays the current distance value and automatically switches between mm and cm display. Two buttons are used to call up the configuration and navigate through the self-explanatory menu structure.

Inspecting transport boxes for completeness
Performance shows up on conveyor belts. Multiple ultrasonic sensors simultaneously monitor transport containers for completeness. Reflective, transparent or different-colored surfaces are reliably detected. In multiplex operation, mutual interference of the sensors is prevented.

Type	Ordering code / Part number	Sensing distance	Housing material: Brass	Housing material: Stainless steel	Output: PNP, NO/NC contact	Output: NPN, NO/NC contact	Output: 2x PNP, NO/NC contact	Output: 2x NPN, NO/NC contact	Output: 0…10 V/4…20 mA	U_S: 9...30 V DC	Connection: M12 connector, 5-pin	Special features: Display	Page
BUS M30M Switching output													
BUS0022	BUS M30M1-PPX-03/025-S92K	30…250 mm	■		■					■	■	■	412
BUS002J	BUS M30M1-NPX-03/025-S92K	30…250 mm	■			■				■	■	■	412
BUS002R	BUS M30M1-PWX-03/025-S92K	30…250 mm	■				■			■	■	■	412
BUS002H	BUS M30M1-NWX-03/025-S92K	30…250 mm	■					■		■	■	■	412
BUS005F	BUS M30M1-PPX-07/035-S92K	65…350 mm	■		■					■	■	■	412
BUS005P	BUS M30M1-NPX-07/035-S92K	65…350 mm	■			■				■	■	■	412
BUS005H	BUS M30M1-PWX-07/035-S92K	65…350 mm	■				■			■	■	■	412
BUS005R	BUS M30M1-NWX-07/035-S92K	65…350 mm	■					■		■	■	■	412
BUS0039	BUS M30M1-PPX-20/130-S92K	200…1300 mm	■		■					■	■	■	413
BUS0036	BUS M30M1-NPX-20/130-S92K	200…1300 mm	■			■				■	■	■	413
BUS003C	BUS M30M1-PWX-20/130-S92K	200…1300 mm	■				■			■	■	■	413
BUS0035	BUS M30M1-NWX-20/130-S92K	200…1300 mm	■					■		■	■	■	413
BUS003P	BUS M30M1-PPX-35/340-S92K	350…3400 mm	■		■					■	■	■	413
BUS003J	BUS M30M1-NPX-35/340-S92K	350…3400 mm	■			■				■	■	■	413
BUS003W	BUS M30M1-PWX-35/340-S92K	350…3400 mm	■				■			■	■	■	413
BUS0046	BUS M30M1-NWX-35/340-S92K	350…3400 mm	■					■		■	■	■	413
BUS0045	BUS M30M1-PPX-60/600-S92K	600…6000 mm	■		■					■	■	■	413
BUS0054	BUS M30M1-NPX-60/600-S92K	600…6000 mm	■			■				■	■	■	413
BUS003Z	BUS M30M1-PWX-60/600-S92K	600…6000 mm	■				■			■	■	■	413
BUS0055	BUS M30M1-NWX-60/600-S92K	600…6000 mm	■					■		■	■	■	413
BUS M30M Analog output													
BUS002N	BUS M30M1-XC-03/025-S92K	30…250 mm	■						■	■	■	■	414
BUS005K	BUS M30M1-XC-07/035-S92K	65…350 mm	■						■	■	■	■	414
BUS003F	BUS M30M1-XC-20/130-S92K	200…1300 mm	■						■	■	■	■	415
BUS003T	BUS M30M1-XC-35/340-S92K	350…3400 mm	■						■	■	■	■	415
BUS0041	BUS M30M1-XC-60/600-S92K	600…6000 mm	■						■	■	■	■	415
BUS BUS M30M Switching and analog output													
BUS002L	BUS M30M1-PPC-03/025-S92K	30…250 mm	■		■				■	■	■	■	416
BUS005M	BUS M30M1-PPC-07/035-S92K	65…350 mm	■		■				■	■	■	■	416
BUS0038	BUS M30M1-PPC-20/130-S92K	200…1300 mm	■		■				■	■	■	■	417
BUS003N	BUS M30M1-PWC-20/130-S92K	200…1300 mm	■				■		■	■	■	■	417
BUS003L	BUS M30M1-PPC-35/340-S92K	350…3400 mm	■		■				■	■	■	■	417
BUS0044	BUS M30M1-PWC-35/340-S92K	350…3400 mm	■				■		■	■	■	■	417
BUS0043	BUS M30M1-PPC-60/600-S92K	600…6000 mm	■		■				■	■	■	■	417

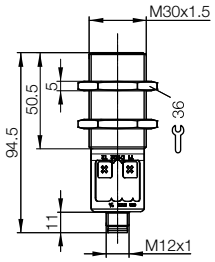
Ultrasonic Sensors
Media
Industries
Application Areas
Sensor Selection
Operating Modes
Sound Cones
Cylinder Designs
Block Designs

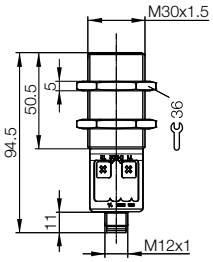
Accessories for Ultrasonic Sensors

DEXYÍ®
M30
Switching Output

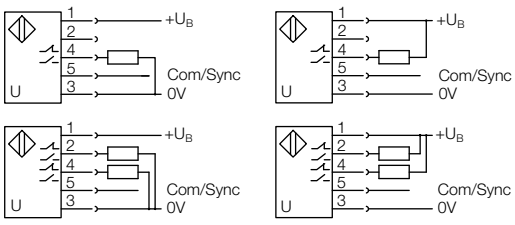
Size		**M30×1**	**M30×1**
Type		**Switching output**	**Switching output**
Operating scanning range		**30…250 mm**	**65…350 mm**
PNP,	**Ordering code**	**BUS0022**	**BUS005F**
NO/NC contact	Part number	BUS M30M1-PPX-03/025-S92K	BUS M30M1-PPX-07/035-S92K
NPN,	**Ordering code**	**BUS002J**	**BUS005P**
NO/NC contact	Part number	BUS M30M1-NPX-03/025-S92K	BUS M30M1-NPX-07/035-S92K
2x PNP,	**Ordering code**	**BUS002R**	**BUS005H**
NO/NC contact	Part number	BUS M30M1-PWX-03/025-S92K	BUS M30M1-PWX-07/035-S92K
2x NPN,	**Ordering code**	**BUS002H**	**BUS005R**
NO/NC contact	Part number	BUS M30M1-NWX-03/025-S92K	BUS M30M1-NWX-07/035-S92K
Blind zone		0...30 mm	0...65 mm
Limiting scanning range		350 mm	600 mm
Resolution		0.025 mm	0.025 mm
Sound cone		See page 408, No. 4	See page 408, No. 5
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Switching hysteresis		3 mm	5 mm
Supply voltage U_S		9...30 V DC	9...30 V DC
Output current		200 mA	200 mA
No-load supply current I_0 max.		≤ 80 mA	≤ 80 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in	Teach-in
Response delay		32 ms	64 ms
Switching frequency f		25 Hz	12 Hz
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated CuZn	Nickel-plated CuZn
	Plastic parts	PBT, TPU	PBT, TPU
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

Sensors are also available as stainless steel variants.



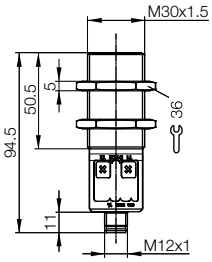


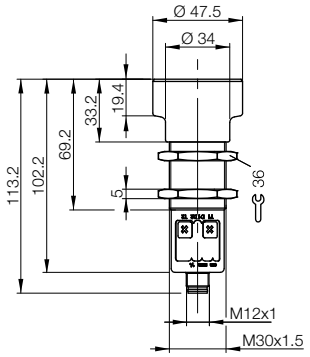
Wiring diagrams

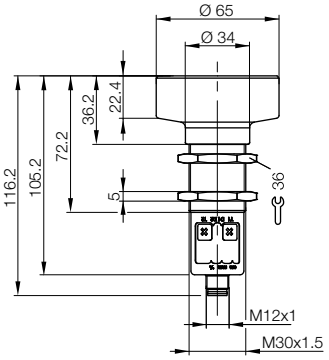




M30×1	**M30×1**	**M30×1**
Switching output	**Switching output**	**Switching output**
200…1300 mm	**350…3400 mm**	**600…6000 mm**
BUS0039	**BUS003P**	**BUS0045**
BUS M30M1-PPX-20/130-S92K	BUS M30M1-PPX-35/340-S92K	BUS M30M1-PPX-60/600-S92K
BUS0036	**BUS003J**	**BUS0054**
BUS M30M1-NPX-20/130-S92K	BUS M30M1-NPX-35/340-S92K	BUS M30M1-NPX-60/600-S92K
BUS003C	**BUS003W**	**BUS003Z**
BUS M30M1-PWX-20/130-S92K	BUS M30M1-PWX-35/340-S92K	BUS M30M1-PWX-60/600-S92K
BUS0035	**BUS0046**	**BUS0055**
BUS M30M1-NWX-20/130-S92K	BUS M30M1-NWX-35/340-S92K	BUS M30M1-NWX-60/600-S92K
0...200 mm	0...350 mm	0...600 mm
2000 mm	5000 mm	8000 mm
0.18 mm	0.18 mm	0.18 mm
See page 409, No. 8	See page 409, No. 9	See page 409, No. 10
± 0.15 %	± 0.15 %	± 0.15 %
± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
20 mm	50 mm	100 mm
9...30 V DC	9...30 V DC	9...30 V DC
200 mA	200 mA	200 mA
≤ 80 mA	≤ 80 mA	≤ 80 mA
Yes/Yes	Yes/Yes	Yes/Yes
Teach-in	Teach-in	Teach-in
92 ms	172 ms	240 ms
8 Hz	4 Hz	3 Hz
IP 67	IP 67	IP 67
–25...+70 °C	–25...+70 °C	–25...+70 °C
Nickel-plated CuZn	Nickel-plated CuZn	Nickel-plated CuZn
PBT, TPU	PBT, TPU	PBT, TPU
Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
M12 connector, 5-pin	M12 connector, 5-pin	M12 connector, 5-pin







Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00HN**
Mounting clamp	**BAM00TN**
Mounting bracket	**BAM00HH**
Sound deflection angle	**BAM01ER**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

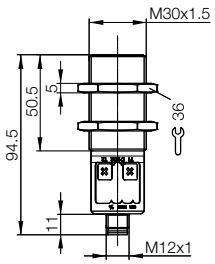
You can find additional mechanical accessories in our catalog **Accessories Line**.

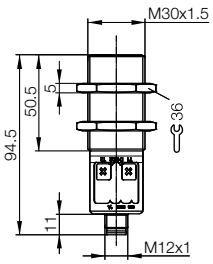
DEXYI®

M30
Analog Output

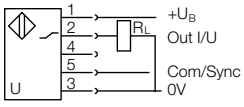
Size		**M30×1**	**M30×1**	
Type		**Analog output**	**Analog output**	
Operating scanning range		**30…250 mm**	**65…350 mm**	
0…10 V/4…20 mA	**Ordering code**	**BUS002N**	**BUS005K**	
	Part number	BUS M30M1-XC-03/025-S92K	BUS M30M1-XC-07/035-S92K	
Blind zone		0...30 mm	0...65 mm	
Limiting scanning range		350 mm	600 mm	
Resolution (depends on analog window used)		0.025...0.10 mm	0.025...0.17 mm	
Sound cone		See page 408, No. 4	See page 408, No. 5	
Repeat accuracy		± 0.15 %	± 0.15 %	
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	
Supply voltage U_S		9...30 V DC	9...30 V DC	
Output current		200 mA	200 mA	
No-load supply current I_0 max.		≤ 80 mA	≤ 80 mA	
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes	
Settings		Teach-in	Teach-in	
Response delay		32 ms	64 ms	
Degree of protection as per IEC 60529		IP 67	IP 67	
Operating temperature		–25...+70 °C	–25...+70 °C	
Material	Housing	Nickel-plated CuZn	Nickel-plated CuZn	
	Plastic parts	PBT, TPU	PBT, TPU	
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	
Connection		M12 connector, 5-pin	M12 connector, 5-pin	

Sensors are also available in stainless steel variants.

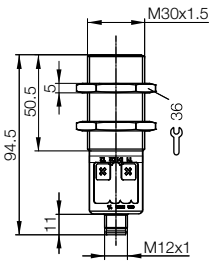


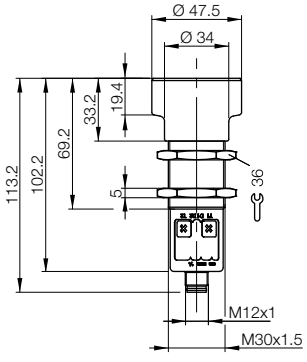


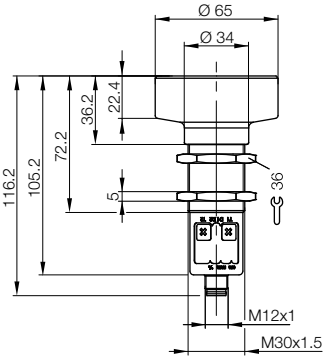
Wiring diagram



	M30×1	**M30×1**	**M30×1**
	Analog output	**Analog output**	**Analog output**
	200…1300 mm	**350…3400 mm**	**600…6000 mm**
	BUS003F	**BUS003T**	**BUS0041**
	BUS M30M1-XC-20/130-S92K	BUS M30M1-XC-35/340-S92K	BUS M30M1-XC-60/600-S92K
	0...200 mm	0...350 mm	0...600 mm
	2000 mm	5000 mm	8000 mm
	0.18...0.57 mm	0.18…1.5 mm	0.18…2.4 mm
	See page 409, No. 8	See page 409, No. 9	See page 409, No. 10
	± 0.15 %	± 0.15 %	± 0.15 %
	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
	9...30 V DC	9...30 V DC	9...30 V DC
	200 mA	200 mA	200 mA
	≤ 80 mA	≤ 80 mA	≤ 80 mA
	Yes/Yes	Yes/Yes	Yes/Yes
	Teach-in	Teach-in	Teach-in
	92 ms	172 ms	240 ms
	IP 67	IP 67	IP 67
	–25...+70 °C	–25...+70 °C	–25...+70 °C
	Nickel-plated CuZn	Nickel-plated CuZn	Nickel-plated CuZn
	PBT, TPU	PBT, TPU	PBT, TPU
	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
	M12 connector, 5-pin	M12 connector, 5-pin	M12 connector, 5-pin







Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00HN**
Mounting clamp	**BAM00TN**
Mounting bracket	**BAM00HH**
Sound deflection angle	**BAM01ER**

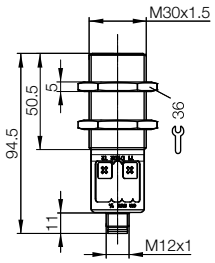
You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

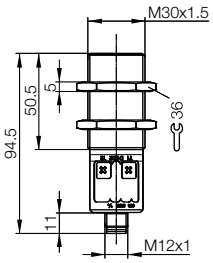
You can find additional mechanical accessories in our catalog **Accessories Line**.

M30
Switching and Analog Output

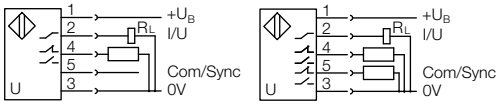
Size		**M30×1**	**M30×1**
Type		**Switching and analog output**	**Switching and analog output**
Operating scanning range		**30…250 mm**	**65…350 mm**
0…10 V/4…20 mA	**Ordering code**	**BUS002L**	**BUS005M**
PNP, NO/NC contact	Part number	BUS M30M1-PPC-03/025-S92K	BUS M30M1-PPC-07/035-S92K
0…10 V/4…20 mA	**Ordering code**		
2x PNP, NO/NC contact	Part number		
Blind zone		0...30 mm	0...65 mm
Limiting scanning range		350 mm	600 mm
Resolution (depends on analog window used)		0.025...0.10 mm	0.025...0.17 mm
Sound cone		See page 408, No. 4	See page 408, No. 5
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Switching hysteresis		3 mm	5 mm
Supply voltage U_S		9...30 V DC	9...30 V DC
Output current		200 mA	200 mA
No-load supply current I_0 max.		≤ 80 mA	≤ 80 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in	Teach-in
Response delay		32 ms	64 ms
Switching frequency f		25 Hz	12 Hz
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated CuZn	Nickel-plated CuZn
	Plastic parts	PBT, TPU	PBT, TPU
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

Sensors are also available in stainless steel variants.



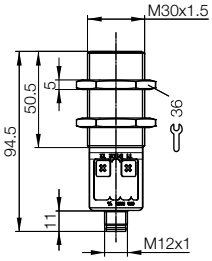


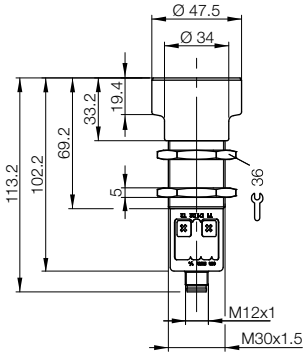
Wiring diagrams

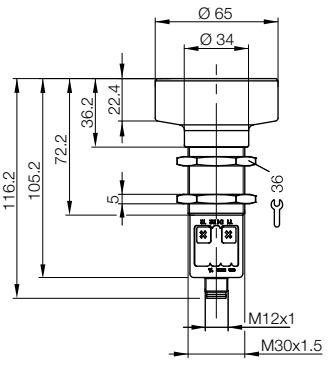


Ultrasonic Sensors
Cylinder design, BUS M30M with display

M30×1	**M30×1**	**M30×1**
Switching and analog output	**Switching and analog output**	**Switching and analog output**
200…1300 mm	**350…3400 mm**	**600…6000 mm**
BUS0038	**BUS003L**	**BUS0043**
BUS M30M1-PPC-20/130-S92K	BUS M30M1-PPC-35/340-S92K	BUS M30M1-PPC-60/600-S92K
BUS003N	**BUS0044**	
BUS M30M1-PWC-20/130-S92K	BUS M30M1-PWC-35/340-S92K	
0...200 mm	0...350 mm	0...600 mm
2000 mm	5000 mm	8000 mm
0.18...0.57 mm	0.18…1.5 mm	0.18…2.4 mm
See page 409, No. 8	See page 409, No. 9	See page 409, No. 10
± 0.15 %	± 0.15 %	± 0.15 %
± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
20 mm	50 mm	100 mm
9...30 V DC	9...30 V DC	9...30 V DC
200 mA	200 mA	200 mA
≤ 80 mA	≤ 80 mA	≤ 80 mA
Yes/Yes	Yes/Yes	Yes/Yes
Teach-in	Teach-in	Teach-in
92 ms	172 ms	240 ms
8 Hz	4 Hz	3 Hz
IP 67	IP 67	IP 67
–25...+70 °C	–25...+70 °C	–25...+70 °C
Nickel-plated CuZn	Nickel-plated CuZn	Nickel-plated CuZn
PBT, TPU	PBT, TPU	PBT, TPU
Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
M12 connector, 5-pin	M12 connector, 5-pin	M12 connector, 5-pin







Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00HN**
Mounting clamp	**BAM00TN**
Mounting bracket	**BAM00HH**
Sound deflection angle	**BAM01ER**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

You can find additional mechanical accessories in our catalog **Accessories Line**.

Ultrasonic Sensors
Cylinder design, BUS 18M

DEXYI® 18M

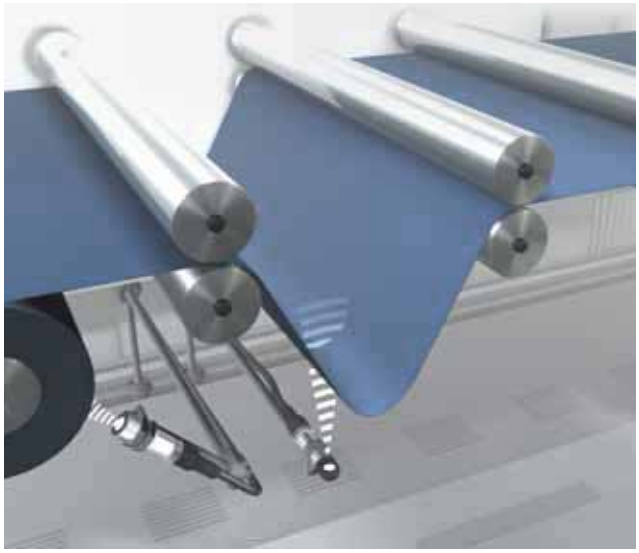
With a housing length of only 41 mm, the ultrasonic sensors BUS 18M are extremely compact. With their narrow sound cone and a blind zone of only 20 mm, they provide flexible application options. Two housing variants—straight and with a 90° angle head—are available, each with four sensing distances up to 1.3 m. The sensor family covers a broad range of applications through three different output stages: a push-pull switching output or an analog output, available with 4...20 mA or 0...10 V.
The highlight of the sensors is their complete support of the IO-Link interface. By means of the switching output, they can communicate with an IO-Link-capable controller or an IO-Link master.
The sensors can be synchronized with one another, so that they do not influence one another.

Features
- **Variant with 90° angle head**
  for individual installation situations
- **IO-Link interface**
  for supporting the new industrial standard
- **Automatic synchronization and multiplex operation**
  for simultaneous operation of up to ten sensors
- **4 sensing distances with a measuring range from 20 mm to 1.3 m**
- **1 push/pull switching output PNP or NPN switching**
- **Analog output 4...20 mA or 0...10 V**
  for analog distance measurements
- **Teach-in via control line (pin 5)**

IO-Link

IO-Link — the new standard
The IO-Link interface fulfills the prerequisites for gapless communication through all levels of the system architecture all the way to the sensor. Commissioning and maintenance of a machine are simplified and productivity increased.

Advantages of IO-Link
- In IO-Link mode, the measured distance values are transmitted to the master in cyclical form. This makes the IO-Link mode a cost-effective replacement for an analog output.
- After a sensor failure, the controller can automatically load all settings to the new sensor.



Control foil sag and monitor roll diameter
Using an ultrasonic sensor with analog output, the material on a roll or a coil is detected and the roll drive or a brake readjusted. Another sensor with analog output readjusts the material infeed at the dancer roller as a function of the cable loop.

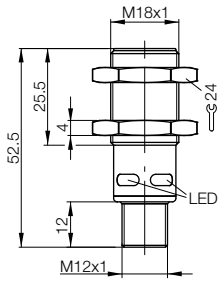
Type		Sensing distance/ Range	Design		Output				U_S	Connection		Special features		Page
			Straight	Angled	PNP, NO/NC contact	NPN, NO/NC contact	0…10 V	4…20 mA	10...30 V DC	M12 connector, 5-pin		IO-Link SIO mode	Focusing attachment possible	
Ordering code / Part number														
BUS M18M Switching output														
BUS0020	BUS M18M1-GPXI-02/015-S92G	20…150 mm	■		■	■			■	■		■	■	420
BUS0029	BUS M18M1-GPXI-03/025-S92G	30…250 mm	■		■	■			■	■		■	■	420
BUS004Z	BUS M18M1-GPXI-07/035-S92G	65…350 mm	■		■	■			■	■		■		421
BUS004P	BUS M18M1-GPXI-12/100-S92G	120…1000 mm	■		■	■			■	■		■		421
BUS0023	BUS W18M1-GPXI-02/015-S92G	20…150 mm		■	■	■			■	■		■		422
BUS002A	BUS W18M1-GPXI-03/025-S92G	30…250 mm		■	■	■			■	■		■		422
BUS004Y	BUS W18M1-GPXI-07/035-S92G	65…350 mm		■	■	■			■	■		■		423
BUS004N	BUS W18M1-GPXI-12/100-S92G	120…1000 mm		■	■	■			■	■		■		423
BUS M18M Analog output														
BUS0026	BUS M18M1-XA-02/015-S92G	20…150 mm	■				■		■	■			■	424
BUS0025	BUS M18M1-XB-02/015-S92G	20…150 mm	■					■	■	■			■	424
BUS0024	BUS M18M1-XA-03/025-S92G	30…250 mm	■				■		■	■			■	424
BUS002C	BUS M18M1-XB-03/025-S92G	30…250 mm	■					■	■	■			■	424
BUS004T	BUS M18M1-XA-07/035-S92G	65…350 mm	■				■		■	■				425
BUS004W	BUS M18M1-XB-07/035-S92G	65…350 mm	■					■	■	■				425
BUS0052	BUS M18M1-XA-12/100-S92G	120…1000 mm	■				■		■	■				425
BUS004M	BUS M18M1-XB-12/100-S92G	120…1000 mm	■					■	■	■				425
BUS0028	BUS W18M1-XA-02/015-S92G	20…150 mm		■			■		■	■				426
BUS0027	BUS W18M1-XB-02/015-S92G	20…150 mm		■				■	■	■				426
BUS0050	BUS W18M1-XA-03/025-S92G	30…250 mm		■			■		■	■				426
BUS002E	BUS W18M1-XB-03/025-S92G	30…250 mm		■				■	■	■				426
BUS004R	BUS W18M1-XA-07/035-S92G	65…350 mm		■			■		■	■				427
BUS004U	BUS W18M1-XB-07/035-S92G	65…350 mm		■				■	■	■				427
BUS0051	BUS W18M1-XA-12/100-S92G	120…1000 mm		■			■		■	■				427
BUS0053	BUS W18M1-XB-12/100-S92G	120…1000 mm		■				■	■	■				427

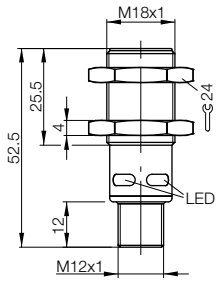
Ultrasonic Sensors
Media
Industries
Application Areas
Sensor Selection
Operating Modes
Sound Cones
Cylinder Designs
Block Designs

Accessories for Ultrasonic Sensors

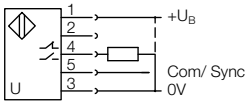
M18M
Switching Output
IO-Link

Size		**M18×1**	**M18×1**
Type		**Switching output, straight**	**Switching output, straight**
Operating scanning range		**20…150 mm**	**30…250 mm**
Push/Pull, IO-Link, NO/NC	**Ordering code**	**BUS0020**	**BUS0029**
	Part number	BUS M18M1-GPXI-02/015-S92G	BUS M18M1-GPXI-03/025-S92G
Blind zone		0...20 mm	0...30 mm
Limiting scanning range		250 mm	350 mm
Resolution		0.069 mm	0.069 mm
Sound cone		See page 408, No. 2	See page 408, No. 4
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Switching hysteresis		2 mm	3 mm
Supply voltage U_S		10...30 V DC	10...30 V DC
Output current		100 mA	100 mA
No-load supply current I_0 max.		≤ 40 mA	≤ 40 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in (via Pin 5)/IO-Link	Teach-in (via Pin 5)/IO-Link
Response delay		32 ms	32 ms
Switching frequency f		25 Hz	25 Hz
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts	PBT	PBT
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

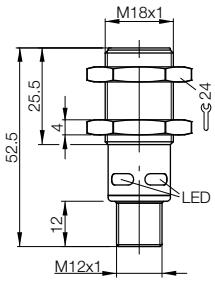


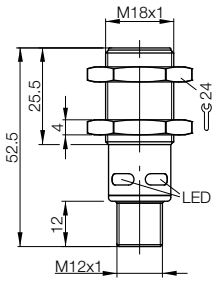


Wiring diagram



M18×1	**M18×1**	
Switching output, straight	**Switching output, straight**	
65…350 mm	**120…1000 mm**	
BUS004Z	**BUS004P**	
BUS M18M1-GPXI-07/035-S92G	BUS M18M1-GPXI-12/100-S92G	
0...65 mm	0...120 mm	
600 mm	1300 mm	
0.069 mm	0.069 mm	
See page 408, No. 5	See page 409, No. 7	
± 0.15 %	± 0.15 %	
± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	
5 mm	20 mm	
10...30 V DC	10...30 V DC	
100 mA	100 mA	
≤ 40 mA	≤ 40 mA	
Yes/Yes	Yes/Yes	
Teach-in (via Pin 5)/IO-Link	Teach-in (via Pin 5)/IO-Link	
64 ms	80 ms	
12 Hz	10 Hz	
IP 67	IP 67	
–25...+70 °C	–25...+70 °C	
Nickel-plated brass tube	Nickel-plated brass tube	
PBT	PBT	
Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	
M12 connector, 5-pin	M12 connector, 5-pin	





Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00F2**
Mounting clamp	**BAM00T3**
Mounting bracket	**BAM00EY**
Focusing attachment*	**BAM01HJ**
Weld protection	**BAM01LS**

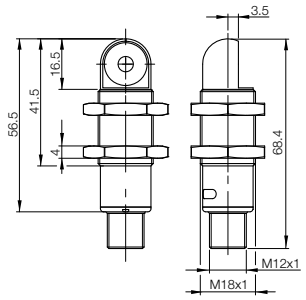
You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

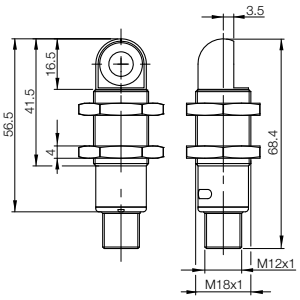
* Only for BUS0020 and BUS0029

You can find additional mechanical accessories in our catalog **Accessories Line**.

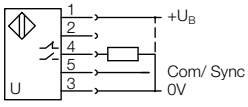
W18M Switching Output IO-Link

Size		**M18×1**	**M18×1**
Type		**Switching output, angled**	**Switching output, angled**
Operating scanning range		**20…150 mm**	**30…250 mm**
Push/Pull, IO-Link,	**Ordering code**	**BUS0023**	**BUS002A**
NO/NC	Part number	BUS W18M1-GPXI-02/015-S92G	BUS W18M1-GPXI-03/025-S92G
Blind zone		0...20 mm	0...30 mm
Limiting scanning range		250 mm	350 mm
Resolution		0.069 mm	0.069 mm
Sound cone		See page 408, No. 2	See page 408, No. 4
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Switching hysteresis		2 mm	3 mm
Supply voltage U_S		10...30 V DC	10...30 V DC
Output current		100 mA	100 mA
No-load supply current I_0 max.		≤ 40 mA	≤ 40 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in (via Pin 5)/IO-Link	Teach-in (via Pin 5)/IO-Link
Response delay		32 ms	32 ms
Switching frequency f		25 Hz	25 Hz
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts	PBT	PBT
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

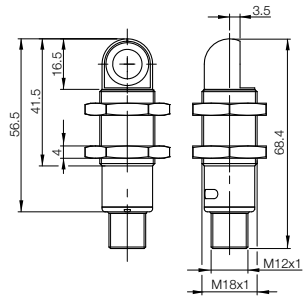


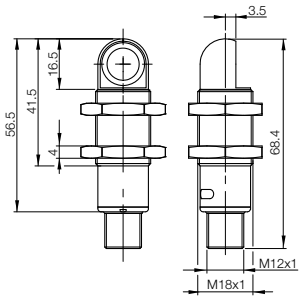


Wiring diagram



M18×1	**M18×1**	
Switching output, angled	**Switching output, angled**	
65…350 mm	**120…1000 mm**	
BUS004Y	**BUS004N**	
BUS W18M1-GPXI-07/035-S92G	BUS W18M1-GPXI-12/100-S92G	
0...65 mm	0...120 mm	
600 mm	1300 mm	
0.069 mm	0.069 mm	
See page 408, No. 5	See page 409, No. 7	
± 0.15 %	± 0.15 %	
± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	
5 mm	20 mm	
10...30 V DC	10...30 V DC	
100 mA	100 mA	
≤ 40 mA	≤ 40 mA	
Yes/Yes	Yes/Yes	
Teach-in (via Pin 5)/IO-Link	Teach-in (via Pin 5)/IO-Link	
64 ms	80 ms	
12 Hz	10 Hz	
IP 67	IP 67	
–25...+70 °C	–25...+70 °C	
Nickel-plated brass tube	Nickel-plated brass tube	
PBT	PBT	
Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	
M12 connector, 5-pin	M12 connector, 5-pin	





Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

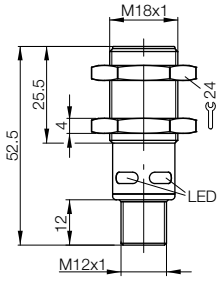
Description	Ordering code
Mounting cuff	**BAM00F2**
Mounting clamp	**BAM00T3**
Mounting bracket	**BAM00EY**

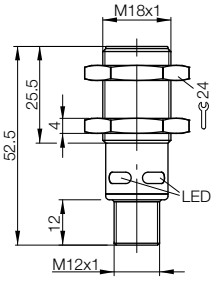
You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

You can find additional mechanical accessories in our catalog **Accessories Line**.

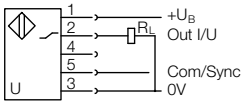
M18M
Analog Output

Size		**M18×1**	**M18×1**
Type		**Analog output, straight**	**Analog output, straight**
Operating scanning range		**20…150 mm**	**30…250 mm**
0…10 V	**Ordering code**	**BUS0026**	**BUS0024**
Rising/falling	Part number	BUS M18M1-XA-02/015-S92G	BUS M18M1-XA-03/025-S92G
4…20 mA	**Ordering code**	**BUS0025**	**BUS002C**
Rising/falling	Part number	BUS M18M1-XB-02/015-S92G	BUS M18M1-XB-03/025-S92G
Blind zone		0...20 mm	0...30 mm
Limiting scanning range		250 mm	350 mm
Resolution (depends on analog window used)		0.069 mm	0.069...0.10 mm
Sound cone		See page 408, No. 2	See page 408, No. 4
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Supply voltage U_S		10...30 V DC	10...30 V DC
Output current		100 mA	100 mA
No-load supply current I_0 max.		≤ 40 mA	≤ 40 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in (via pin 5)	Teach-in (via pin 5)
Response delay		32 ms	32 ms
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts	PBT	PBT
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

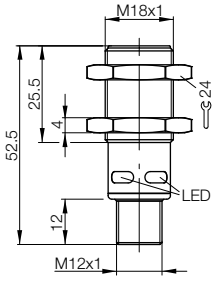


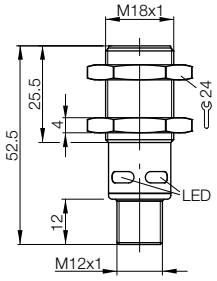


Wiring diagram



	M18×1	**M18×1**	
	Analog output, straight	**Analog output, straight**	
	65…350 mm	**120…1000 mm**	
	BUS004T	**BUS0052**	
	BUS M18M1-XA-07/035-S92G	BUS M18M1-XA-12/100-S92G	
	BUS004W	**BUS004M**	
	BUS M18M1-XB-07/035-S92G	BUS M18M1-XB-12/100-S92G	
	0...65 mm	0...120 mm	
	600 mm	1300 mm	
	0.069...0.17 mm	0.069...0.38 mm	
	See page 408, No. 5	See page 409, No. 7	
	± 0.15 %	± 0.15 %	
	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	
	10...30 V DC	10...30 V DC	
	100 mA	100 mA	
	≤ 40 mA	≤ 40 mA	
	Yes/Yes	Yes/Yes	
	Teach-in (via pin 5)	Teach-in (via pin 5)	
	64 ms	80 ms	
	IP 67	IP 67	
	–25...+70 °C	–25...+70 °C	
	Nickel-plated brass tube	Nickel-plated brass tube	
	PBT	PBT	
	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	
	M12 connector, 5-pin	M12 connector, 5-pin	





Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00F2**
Mounting clamp	**BAM00T3**
Mounting bracket	**BAM00EY**
Focusing attachment*	**BAM01HJ**
Weld protection	**BAM01LS**

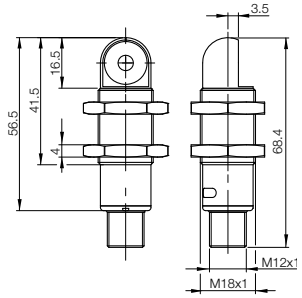
You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

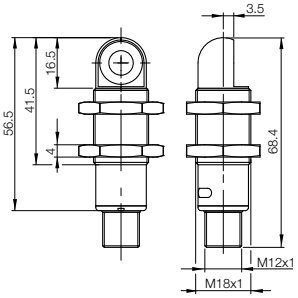
* Only for BUS0026, BUS0025, BUS0024 and BUS002C

You can find additional mechanical accessories in our catalog **Accessories Line**.

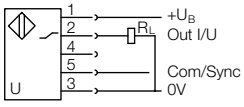
W18M
Analog Output

Size		**M18×1**	**M18×1**
Type		**Analog output, angled**	**Analog output, angled**
Operating scanning range		**20…150 mm**	**30…250 mm**
0…10 V	**Ordering code**	**BUS0028**	**BUS0050**
Rising/falling	Part number	BUS W18M1-XA-02/015-S92G	BUS W18M1-XA-03/025-S92G
4…20 mA	**Ordering code**	**BUS0027**	**BUS002E**
Rising/falling	Part number	BUS W18M1-XB-02/015-S92G	BUS W18M1-XB-03/025-S92G
Blind zone		0...20 mm	0...30 mm
Limiting scanning range		250 mm	350 mm
Resolution (depends on analog window used)		0.069 mm	0.069...0.10 mm
Sound cone		See page 408, No. 2	See page 408, No. 4
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)
Supply voltage U_S		10...30 V DC	10...30 V DC
Output current		100 mA	100 mA
No-load supply current I_0 max.		≤ 40 mA	≤ 40 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in (via pin 5)	Teach-in (via pin 5)
Response delay		32 ms	32 ms
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	Nickel-plated brass tube	Nickel-plated brass tube
	Plastic parts	PBT	PBT
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M12 connector, 5-pin	M12 connector, 5-pin

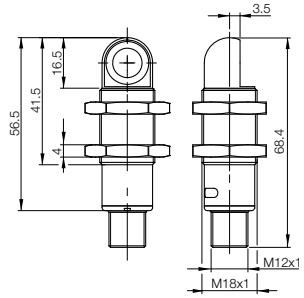


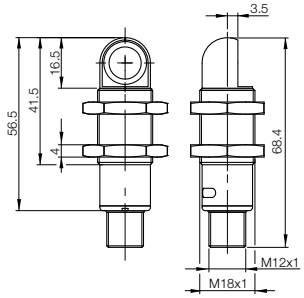


Wiring diagram



	M18×1	**M18×1**	
	Analog output, angled	**Analog output, angled**	
	65…350 mm	**120…1000 mm**	
	BUS004R	**BUS0051**	
	BUS W18M1-XA-07/035-S92G	BUS W18M1-XA-12/100-S92G	
	BUS004U	**BUS0053**	
	BUS W18M1-XB-07/035-S92G	BUS W18M1-XB-12/100-S92G	
	0...65 mm	0...120 mm	
	600 mm	1300 mm	
	0.069...0.17 mm	0.069...0.38 mm	
	See page 408, No. 5	See page 409, No. 7	
	± 0.15 %	± 0.15 %	
	± 1% (temperature drift internally compensated)	± 1% (temperature drift internally compensated)	
	10...30 V DC	10...30 V DC	
	100 mA	100 mA	
	≤ 40 mA	≤ 40 mA	
	Yes/Yes	Yes/Yes	
	Teach-in (via pin 5)	Teach-in (via pin 5)	
	64 ms	80 ms	
	IP 67	IP 67	
	–25...+70 °C	–25...+70 °C	
	Nickel-plated brass tube	Nickel-plated brass tube	
	PBT	PBT	
	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	
	M12 connector, 5-pin	M12 connector, 5-pin	





Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00F2**
Mounting clamp	**BAM00T3**
Mounting bracket	**BAM00EY**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

You can find additional mechanical accessories in our catalog **Accessories Line**.

Ultrasonic Sensors
Block design, BUS R06K

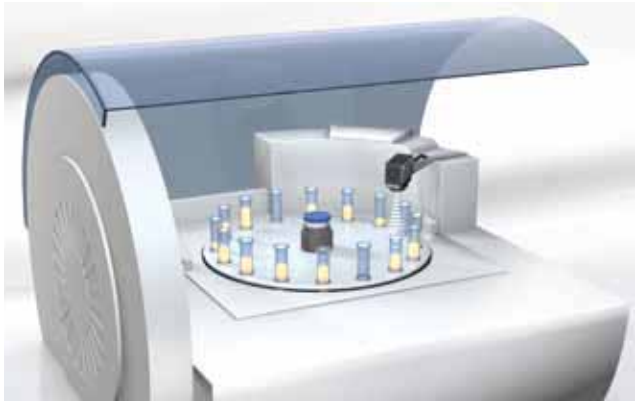
The small ultrasonic sensors in a block-shaped housing operate with high resolution, so that they provide a high degree of accuracy.

For tough measuring tasks, the BUS R06K1..02/007 and BUS R06K1..02/015 can be equipped with a sound transmission attachment. This makes it possible to carry out measurements in bore holes and openings with diameters > 5 mm.
Due to its short response delay and the high switching frequency of 250 Hz, the BUS R06K1..02/015 is particularly suitable for detecting fast processes.

For the simultaneous operation of up to ten sensors in a constricted space, the series is equipped with a synchronization input. The diversity of their versions with switching output or current or voltage analog output with five scanning ranges offer nearly endless fields of application.

Features
- **Small ultrasonic sensor in block-style housing**
  makes possible completely new solutions
- **Same construction as many optical sensors**
  a true alternative in critical applications
- **Option for focusing attachment**
  for challenging measurement tasks
- **5 sensing distances with a measuring range from 20 mm to 1 m**
- **1 switching output in PNP or NPN design**
- **Analog output 4...20 mA or 0...10 V**
- **Teach-in via button**

Focusing attachment
For fill-level measurement through tiny openings with diameters to 5 mm, the sensor with focusing attachment is positioned directly over the measurement location. The tightly bundled sound field is incident exactly on the location that is to be measured. The blind zone of the sensor lies within the focusing attachment, making measurement possible starting directly from the sound outlet.



Fill-level measurement in narrow containers
On a rotary indexing table, narrow containers are filled with liquid or solid media. The ultrasonic sensor then checks the exact filling level.

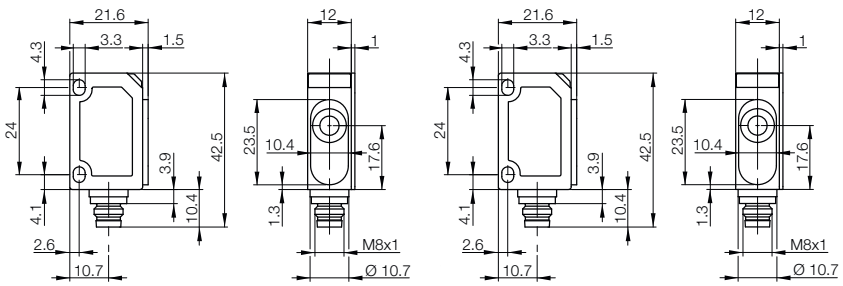
Type ■ **Ordering code** □ Part number		Sensing distance/ Range	Design		Output				U_S	Connec-tion		Special features			Page
			Front sound outlet	Side sound outlet	PNP, NO/NC contact	NPN, NO/NC contact	0…10 V	4…20 mA	20...30 V DC	M8 connector, 4-pin		Increased switching frequency	High switching frequency	Focusing attachment possible	
BUS R06K Switching output															
BUS0021	BUS R06K1-PPX-02/007-S75G	20…70 mm	■		■				■	■			■	■	430
BUS004E	BUS R06K1-NPX-02/007-S75G	20…70 mm				■							■	■	430
BUS004C	BUS R06K1-PPX-02/015-S75G	20…150 mm	■		■				■	■				■	430
BUS004A	BUS R06K1-NPX-02/015-S75G	20…150 mm				■								■	430
BUS0049	BUS R06K1-PPX-02/015-S75G-F01	20…150 mm	■		■				■	■		■		■	430
BUS004H	BUS R06K1-NPX-02/015-S75G-F01	20…150 mm				■						■		■	430
BUS004L	BUS R06K1-PPX-05/024-S75G	55…240 mm	■		■				■	■					431
BUS0048	BUS R06K1-NPX-05/024-S75G	55…240 mm				■									431
BUS0057	BUS R06K1-PPX-03/025-S75G	30…250 mm		■	■				■	■					431
BUS0058	BUS R06K1-NPX-03/025-S75G	30…250 mm				■									431
BUS0059	BUS R06K1-PPX-12/070-S75G	120…700 mm		■	■				■	■					431
BUS005A	BUS R06K1-NPX-12/070-S75G	120…700 mm				■									431
BUS R06K Analog output															
BUS004K	BUS R06K1-XA-02/015-S75G	20…150 mm	■				■		■	■				■	432
BUS004J	BUS R06K1-XB-02/015-S75G	20…150 mm	■					■	■	■				■	432
BUS0056	BUS R06K1-XA-05/024-S75G	55…240 mm	■				■		■	■					432
BUS004F	BUS R06K1-XB-05/024-S75G	55…240 mm	■					■	■	■					432
BUS005E	BUS R06K1-XA-12/070-S75G	120…700 mm		■			■		■	■					433
BUS005C	BUS R06K1-XB-12/070-S75G	120…700 mm		■				■	■	■					433

Ultrasonic Sensors
Media
Industries
Application Areas
Sensor Selection
Operating Modes
Sound Cones
Cylinder Designs
Block Designs

Accessories for Ultrasonic Sensors

R06K
Switching Output

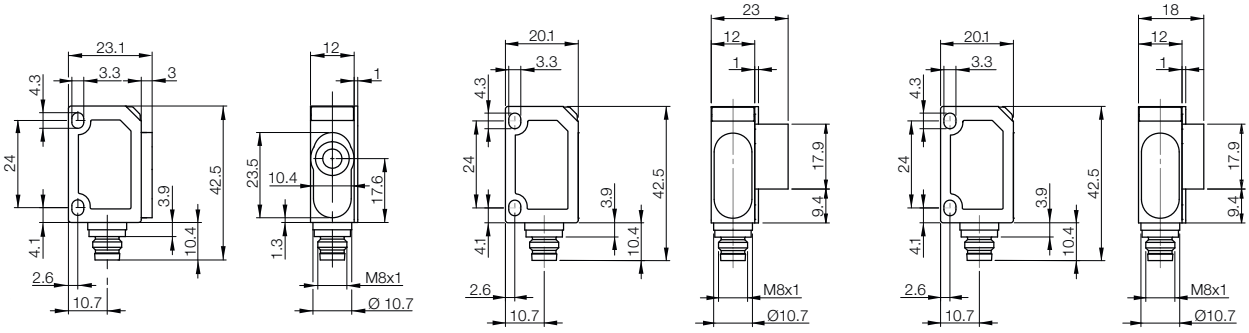
Size			**21.6×32×12 mm**	**21.6×32×12 mm**
Type			**Switching output**	**Switching output**
Operating scanning range			**20…70 mm**	**20…150 mm**
PNP	NO/NC	**Ordering code**		**BUS004C**
		Part number		BUS R06K1-PPX-02/015-S75G
NPN	NO/NC	**Ordering code**		**BUS004A**
		Part number		BUS R06K1-NPX-02/015-S75G
PNP	NO/NC	**Ordering code**		**BUS0049**
50 Hz		Part number		BUS R06K1-PPX-02/015-S75G-F01
NPN	NO/NC	**Ordering code**		**BUS004H**
50 Hz		Part number		BUS R06K1-NPX-02/015-S75G-F01
PNP	NO/NC	**Ordering code**	**BUS0021**	
250 Hz		Part number	BUS R06K1-PPX-02/007-S75G	
NPN	NO/NC	**Ordering code**	**BUS004E**	
250 Hz		Part number	BUS R06K1-NPX-02/007-S75G	
Blind zone			0...20 mm	0...20 mm
Limiting scanning range			100 mm	250 mm
Resolution			0.056 mm	0.056 mm
Sound cone			See page 408, No. 1	See page 408, No. 2
Repeat accuracy			± 0.15 %	± 0.15 %
Accuracy			Temperature drift 0.17 %/K	Temperature drift 0.17 %/K
Switching hysteresis			2 mm	2 mm
Supply voltage U_S			20...30 V DC	20...30 V DC
Output current			200 mA	200 mA
No-load supply current I_0 max.			≤ 30 mA	≤ 30 mA
Polarity reversal/short-circuit protected			Yes/Yes	Yes/Yes
Settings			Teach-in	Teach-in
Response time			≤ 3 ms	≤ 24 ms (≤ 7 ms)
Switching frequency f			250 Hz	25 Hz (50 Hz)
Degree of protection as per IEC 60529			IP 67	IP 67
Operating temperature			–25...+70 °C	–25...+70 °C
Material		Housing	ABS	ABS
		Plastic parts	PBT, TPU	PBT, TPU
		Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection			M8 connector, 4-pin	M8 connector, 4-pin



Wiring diagrams

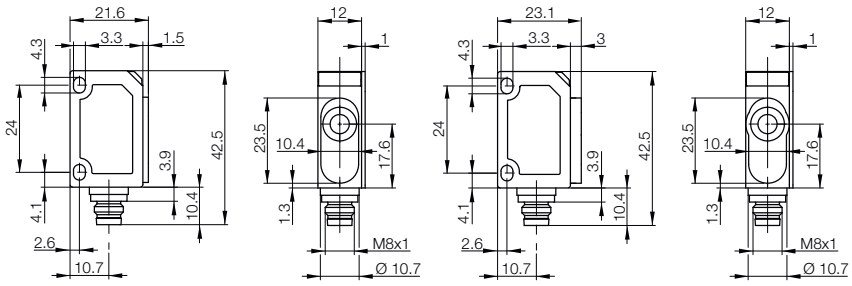


23×32×12 mm	**20×32×23 mm**	**20×32×18 mm**
Switching output	**Switching output**	**Switching output**
55…240 mm	**30…250 mm**	**120…700 mm**
BUS004L	**BUS0057**	**BUS0059**
BUS R06K1-PPX-05/024-S75G	BUS R06K1-PPX-03/025-S75G	BUS R06K1-PPX-12/070-S75G
BUS0048	**BUS0058**	**BUS005A**
BUS R06K1-NPX-05/024-S75G	BUS R06K1-NPX-03/025-S75G	BUS R06K1-NPX-12/070-S75G
0...55 mm	0...30 mm	0...120 mm
350 mm	350 mm	1000 mm
0.037 mm	0.069 mm	0.037 mm
See page 408, No. 3	See page 408, No. 4	See page 409, No. 6
± 0.15 %	± 0.15 %	± 0.15 %
Temperature drift 0.17 %/K	Temperature drift 0.17 %/K	Temperature drift 0.17 %/K
2 mm	2 mm	2 mm
20...30 V DC	20...30 V DC	20...30 V DC
200 mA	200 mA	200 mA
≤ 35 mA	≤ 35 mA	≤ 35 mA
Yes/Yes	Yes/Yes	Yes/Yes
Teach-in	Teach-in	Teach-in
24 ms	20 ms	36 ms
25 Hz	31 Hz	11 Hz
IP 67	IP 67	IP 67
–25...+70 °C	–25...+70 °C	–25...+70 °C
ABS	ABS	ABS
PBT, TPU	PBT, TPU	PBT, TPU
Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
M8 connector, 4-pin	M8 connector, 4-pin	M8 connector, 4-pin

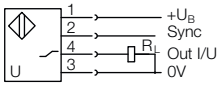


R06K
Analog Output

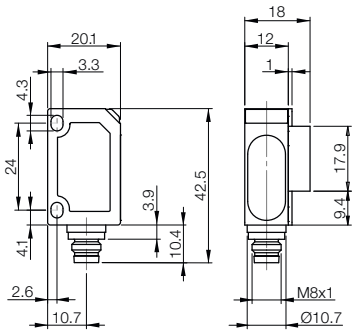
Size		**21.6×32×12 mm**	**23×32×12 mm**
Type		**Analog output**	**Analog output**
Operating scanning range		**20…150 mm**	**55…240 mm**
0…10 V	**Ordering code**	**BUS004K**	**BUS0056**
Rising/falling	Part number	BUS R06K1-XA-02/015-S75G	BUS R06K1-XA-05/024-S75G
4…20 mA	**Ordering code**	**BUS004J**	**BUS004F**
rising/falling	Part number	BUS R06K1-XB-02/015-S75G	BUS R06K1-XB-05/024-S75G
Blind zone		0...20 mm	0...55 mm
Limiting scanning range		250 mm	350 mm
Resolution (dependent on set window)		0.056 mm	0.037...0.072 mm
Sound cone		See page 408, No. 2	See page 408, No. 3
Repeat accuracy		± 0.15 %	± 0.15 %
Accuracy		Temperature drift 0.17 %/K	Temperature drift 0.17 %/K
Supply voltage U_S		20...30 V DC	20...30 V DC
Output current		200 mA	200 mA
No-load supply current I_0 max.		≤ 25 mA	≤ 25 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in	Teach-in
Response time		24 ms	24 ms
Degree of protection as per IEC 60529		IP 67	IP 67
Operating temperature		–25...+70 °C	–25...+70 °C
Material	Housing	ABS	ABS
	Plastic parts	PBT, TPU	PBT, TPU
	Sensing surface	Polyurethane foam, epoxy resin containing glass	Polyurethane foam, epoxy resin containing glass
Connection		M8 connector, 4-pin	M8 connector, 4-pin



Wiring diagram



20×32×18 mm			
Analog output			
120…700 mm			
BUS005E			
BUS R06K1-XA-12/070-S75G			
BUS005C			
BUS R06K1-XB-12/070-S75G			
0...120 mm			
1000 mm			
0.037...0.215 mm			
See page 409, No. 6			
± 0.15 %			
Temperature drift 0.17 %/K			
20...30 V DC			
200 mA			
≤ 25 mA			
Yes/Yes			
Teach-in			
36 ms			
IP 67			
–25...+70 °C			
ABS			
PBT, TPU			
Polyurethane foam, epoxy resin containing glass			
M8 connector, 4-pin			



Suitable connectors

Size/design	Length/cable material	Ordering code
M8, 4-pin/straight	2 m/PUR	**BCC02N2**
M8, 4-pin/straight	2 m/PVC	**BCC02PL**
M8, 4-pin/angled	2 m/PUR	**BCC02NC**
M8, 4-pin/angled	2 m/PVC	**BCC02PZ**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

Recommended accessories

Description		Ordering code
Mounting tab	**Included**	
Focusing attachment*		**BAM01YU***
Mounting bracket		**BAM00UH**

* Only for BUS0021, BUS004E, BUS004C, BUS004A, BUS0049, BUS004H, BUS004K and BUS004J

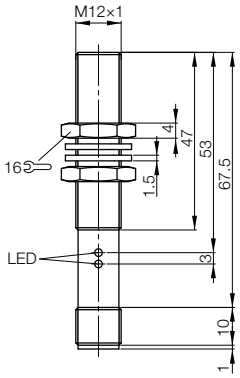
You can find additional mechanical accessories in our catalog **Accessories Line**.

M12 Stainless Steel Switching Output

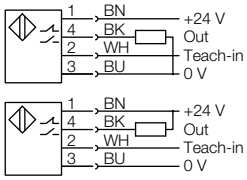
- **Stainless steel housing**
- **Measuring range from 25 mm to 200 mm**
- **1 switching output in PNP or NPN design**
- **Teach-in via line (PIN 2)**

Monitoring of packages
High hygienic requirements in the food industry place special demands on sensor technology. The ultrasonic sensor reliably monitors the proper sealing of packages and thereby ensures uniform quality.

Size		**M12×1**
Type		**Switching output**
Operating scanning range		**25...200 mm**
PNP	**Ordering code**	**BUS0005**
NO/NC	Part number	BUS M12E0-PPXCR-020-S04G
NPN	**Ordering code**	**BUS0006**
NO/NC	Part number	BUS M12E0-NPXCR-020-S04G
Blind zone		0...25 mm
Resolution		0.2 mm
Sound cone opening		approx. 8°
Repeat accuracy		≤ 0.3 mm
Switching hysteresis		1 %
Supply voltage U_S		18...30 V DC
Output current		100 mA
No-load supply current I_0 max.		≤ 35 mA
Polarity reversal/short-circuit protected		Yes/Yes
Settings		Teach-in (pin 2)
Switching frequency		30 Hz
Degree of protection as per IEC 60529		IP 65
Operating temperature		–20...+70 °C
Material	Housing	V2A
	Plastic parts	PA
	Sensing surface	Epoxy resin - hollow-glass sphere /PUR
Connection		M12 connector, 4-pin



Wiring diagrams



Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 4-pin/straight	2 m/PUR	**BCC032F**
M12, 4-pin/straight	5 m/PUR	**BCC032H**
M12, 4-pin/angled	2 m/PUR	**BCC032Y**
M12, 4-pin/angled	5 m/PUR	**BCC032Z**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

Recommended accessories

Description	Ordering code
Mounting cuff	**BAM00C4**
Mounting clamp	**BAM01KM**
Mounting bracket	**BAM00C0**
Focusing attachment	**BAM01ET**

You can find additional mechanical accessories in our catalog **Accessories Line**.

DEXYI®

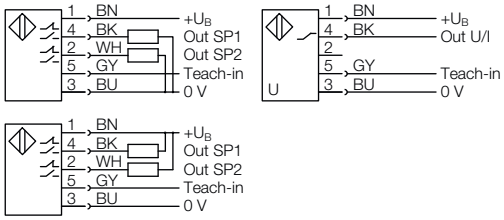
Q80
Switching Output
Analog Output

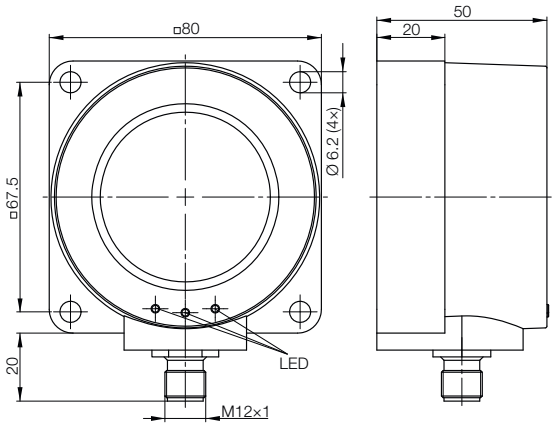
- **Measuring range from 600 mm to 6000 mm**
- **2 switching outputs in PNP or NPN design**
- **Analog output 4...20 mA or 0...10 V**
- **Teach-in via line (PIN 5)**

Fill-level monitoring in silos
The fill level of bulk materials in a container is detected by a continuous measurement with ultrasonic sensors. The fill level can optionally be output by an analog signal or with two switching signals – as min./max. value.

Size		**Q80**	**Q80**
Operating scanning range		**600…6000 mm**	**600…6000 mm**
Switching output			
2× PNP	**Ordering code**	**BUS000A**	
NO/NC	Part number	BUS Q80K0-PWXER-600-S92K	
2x NPN	**Ordering code**	**BUS000C**	
NO/NC	Part number	BUS Q80K0-NWXER-600-S92K	
Analog output			
0...10 V	**Ordering code**		**BUS000E**
Rising/falling	Part number		BUS Q80K0-XAER-600-S92K
4...20 mA	**Ordering code**		**BUS000F**
Rising/falling	Part number		BUS Q80K0-XBER-600-S92K
Blind zone		0...600 mm	0...600 mm
Resolution		1 mm	1 mm
Sound cone opening		approx. 8°	approx. 8°
Repeat accuracy			≤ 0.2%
Switching hysteresis		1 %	1 %
Supply voltage U_S		18...30 V DC	18...30 V DC
Output current		500 mA	
No-load supply current I_0 max.		≤ 60 mA	≤ 35 mA
Polarity reversal/short-circuit protected		Yes/Yes	Yes/Yes
Settings		Teach-in (pin 5)	Teach-in (pin 5)
Response time			≤ 700 ms
Switching frequency		0.5 Hz	
Degree of protection as per IEC 60529		IP 65	IP 65
Operating temperature		–15...+70 °C	–20...+70 °C
Material	Housing	PBT	PBT
	Sensing surface	Epoxy resin - hollow-glass sphere /PUR	Epoxy resin - hollow-glass sphere /PUR
Connection		M12 connector, 5-pin	M12 connector, 5-pin

Wiring diagrams





Suitable connectors

Size/design	Length/cable material	Ordering code
M12, 5-pin/straight	5 m/PUR	**BCC098C**
M12, 5-pin/angled	5 m/PUR	**BCC08FC**

You can find additional electrical accessories in our catalog **Industrial Networking and Connectivity**.

Ultrasonic Sensors

Accessories for ultrasonic sensors

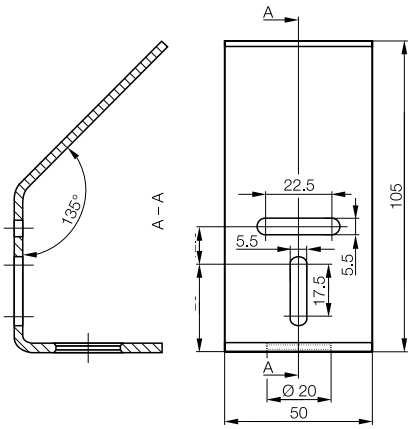
We offer special accessories for our ultrasonic sensors:
Adjustment aids for quick use or focusing attachments for narrow sound cones at close range.

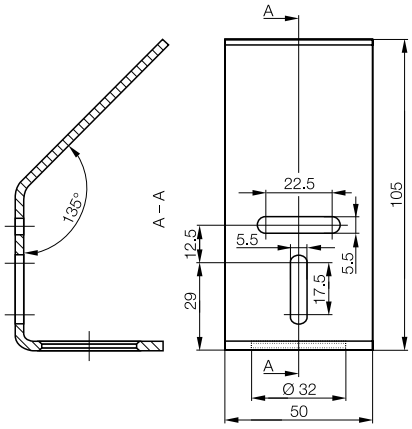
Contents

Basic information and definitions can be found on **page 952.**

Description	
Use	
Ordering code	
Part number	
Material	

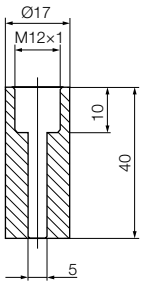
	Sound deflection angle	**Sound deflection angle**	
	For BUS M18	For BUS M30	
	BAM01EP	**BAM01ER**	
	BAM BD-US-001-D20-4	BAM BD-US-001-D32-4	
	Stainless steel	Stainless steel	

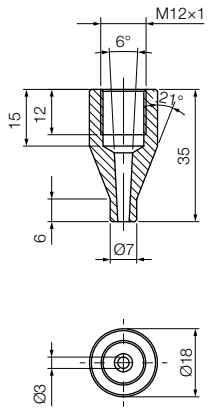


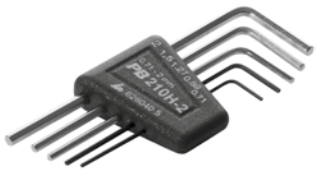


Other applications on the next page

Description	**Focusing attachments M12 → 5 mm**	**Focusing attachments M12 → 7 mm**
Ordering code	**BAM01ET**	**BAM01JR**
Part number	BAM AP-US-001-M12-O	BAM AP-US-003-M12-O
Material	POM	POM







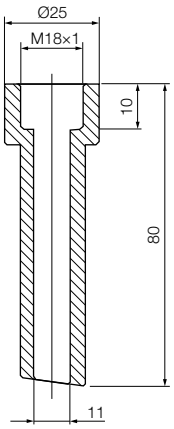
Description	**BMF hex key**	**Hex key set 0.7-2.0**
Type	Folding Allen key set, with additional blades, 8-piece	
Use	Tool set for all BMF sensors and BMF mounting brackets as well as for sensors having a potentiometer, e.g. BOS, BCS, BUS, etc.	Tool set for BMF sensors and BMF angle brackets
Material No.	**139868**	**123264**
Material	Blade: chrome vanadium steel, fully hardened, galvanically treated. Handle: ergonomic, fiberglass-reinforced housing, 55 mm long.	

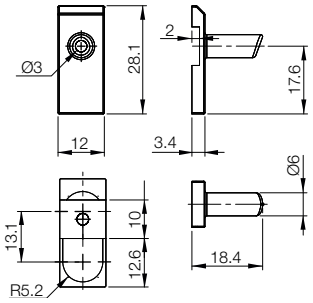
⬢	⊕	◐ mm
0.7		
0.9		
1.3		
1.5		
2.0		
2.5		
		3.0
	PH00	

Application
Practical folding holder for Allen keys to prevent them from getting lost.
Especially good for turning very small screws, for example, for tightening down or accurately adjusting sensors.
Sturdy housing with release button for easily selecting the right blade.
Eyelet with matching carabiner hook.
Self-service packaging for Euro hole display.

⬢
0.71
0.89
1.27
1.5
2.0

	Focusing attachments M18 → 11 mm	Focusing attachments for BUS R06K	
	BAM01HJ	**BAM01YU**	
	BAM AP-US-002-M18-O	BAM AP-US-004-R06-Y	
	POM	ABS	





Description	Teach adapter	Teach adapter
Use	For BUS M12E0-…-020-S04G	For BUS Q80K0-…-600-S92K
Ordering code	**BAE00E5**	**BAE00E6**
Part number	BAE PD-US-004-S04	BAE PD-US-004-S92
Teach-in	PIN2 to 0 V	PIN5 to 0 V