Your Global Automation Partner

TURCK

Complete Portfolio
Ultrasonic Sensors

Ultrasonic Sensors

The RU-U ultrasonic sensor series from Turck enables the user to cover large sensing ranges with fewer sensor variants. The Turck ultrasonic sensors in M08, M12, M18 and M30 and 40 x 40 housing styles thus effectively reduce the range of variants required for stock-keeping. This is made possible by the particularly short blind zones of the sensors, which offer large sensing ranges at the same time. In order to offer the right sensor for every application with only a few sensor variants, Turck has increased the versatility of the individual models: The simple compact version of the RU40 and RU100 modules thus enables the user to set diffuse mode and retro-reflective operation as well as NC and NO switching outputs with a teach adapter. The standard sensor variants offer several operating modes and enable the setting of switch windows or two separate switch points, either by a teach adapter or via a teach button directly on the sensor. The High-End versions can be operated as a switch and as an analog sensor. Different operating modes, temperature compensation or the output function can also be set via IO-Link. If several sensors are installed next to each other, the customer can set the sensor parameters in synchronization or multiplex mode, in order to prevent mutual interference of the sensors.

Operating principle

The operation of the sensors is based on the time of flight principle. With this a sonic pulse is emitted and the time required by the reflected signal to be received again by the same sonic transducer is measured. The distance to the object is calculated on the basis of the known speed of sound in air and output as the measured value or as a switch signal. As the speed of sound depends on the air temperature, the sensors use a separate temperature measurement to compensate the time of flight difference at different temperatures.

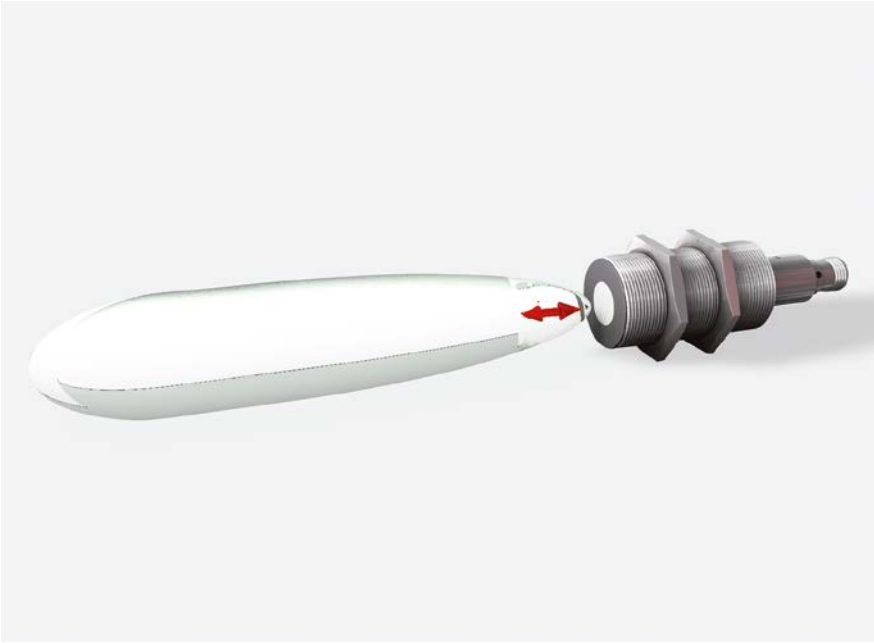
Ultrasonic sensor technology is generally an important link in the field of industrial sensors, which is positioned between inductive and photoelectric sensors on account of its possible object detection ranges. However, the measuring principle takes a special place as it is not based on an electromagnetic but a mechanical operating principle and therefore requires some additional knowledge for the application. Useful information on this is available at: www.turck.en/ru

Contents

Features

Large measuring range

The newly developed sonic transducers enable large measuring ranges for the entire sensor series of up to 130 cm in the M18 version and 600 cm in the M30 version. The 300 cm version in the M30 in particular operates without the need for an enlarged transducer head. This increases the options available in existing applications and enlarges the application range.



Short blind zone

The extremely short blind zone (e.g. only 2.5 cm in the M18 version with 40 cm range) ensures maximum downward compatibility. This enables the reliable detection of objects close to the sensor and optimum adaption of mounting depths – such as for level monitoring applications. As the blind zone has to be kept free to exclude signal errors, a short blind zone also improves the possibilities for mounting and effective object detection.

Robust mechanical design

The highly robust housing with a continuous threaded barrel completely made of metal is particularly short and stands out on account of the metal M12 connector, which is turned as one piece with the threaded sleeve. This eliminates any potential weak points that could cause damage in harsh environments and at low temperatures. The thread runs over the entire length of the sensor so that the mounting position can be varied as required within the mounting bracket.

Flush-front membrane

The smooth sonic transducer front of the M18 and M30 sensors reliably prevents contamination and the formation of particle deposits. The mechanical movement of the membrane even shakes off deposits and thus cleans itself. Particle deposits that can occur when the air humidity is high can likewise be simply wiped off completely, without any residue remaining in the transition area between the transducer layer and the transducer ring. Damage arising from sharp and pointed cleaning objects therefore becomes a thing of the past.

Features

Easy teach

In order for the user to set the sensors simply and intuitively without a PC, all M18 and M30 ultrasonic sensors are provided with a teach-in function which can be implemented via pin 5. The start of switch and measuring ranges can thus be set easily without the use of any external software.

The teach-in is carried out either via the teach adapter using the typical TURCK Easy Teach function or via sensor variants with integrated pushbuttons. The pushbuttons are fitted inside the metal housing and are thus protected from accidental actuation. The setting is carried out inside a fixed time window after a preceding voltage reset. The subsequent automatic lock reliably excludes the possibility of the sensor settings from being accidentally changed.

The devices of the M18 compact design also have a teach input on PIN 2, which makes this series 100% downward compatible with the previous series.

IO-Link interface

Besides setting via the teach-in function, the High-End variants with a switch and analog output can also be parameterized via the version 1.1 IO-Link interface. The devices can be configured in different operating modes such as in opposed mode with exclusive send and receive operation. Other features include settings for the time in which the teach button can be used after a voltage reset or also the temperature compensation setting via the internal or optional external temperature sensor.

This last feature enables a more precise measuring result by including the ambient temperature in the calculation.

The user has the choice between a rising or falling characteristic for the analog output signal, and the user can set the hysteresis for the switching output. If two independent switching outputs are required instead of the switching output and analog output, these can be set to PNP or NPN switching output types with an NC or NO function.

If several devices are installed in the same environment, any mutual interference must be prevented. The sensors can therefore be synchronized or set to multiplex mode, in which the individual devices operate sequentially. The 16-bit data width of the process value can be read at a transfer rate of 38,400 baud via the supported COM2 communication type.

Benefits for the User

The features of the new RU-U ultrasonic sensor series offer clear benefits for the user:

System availability

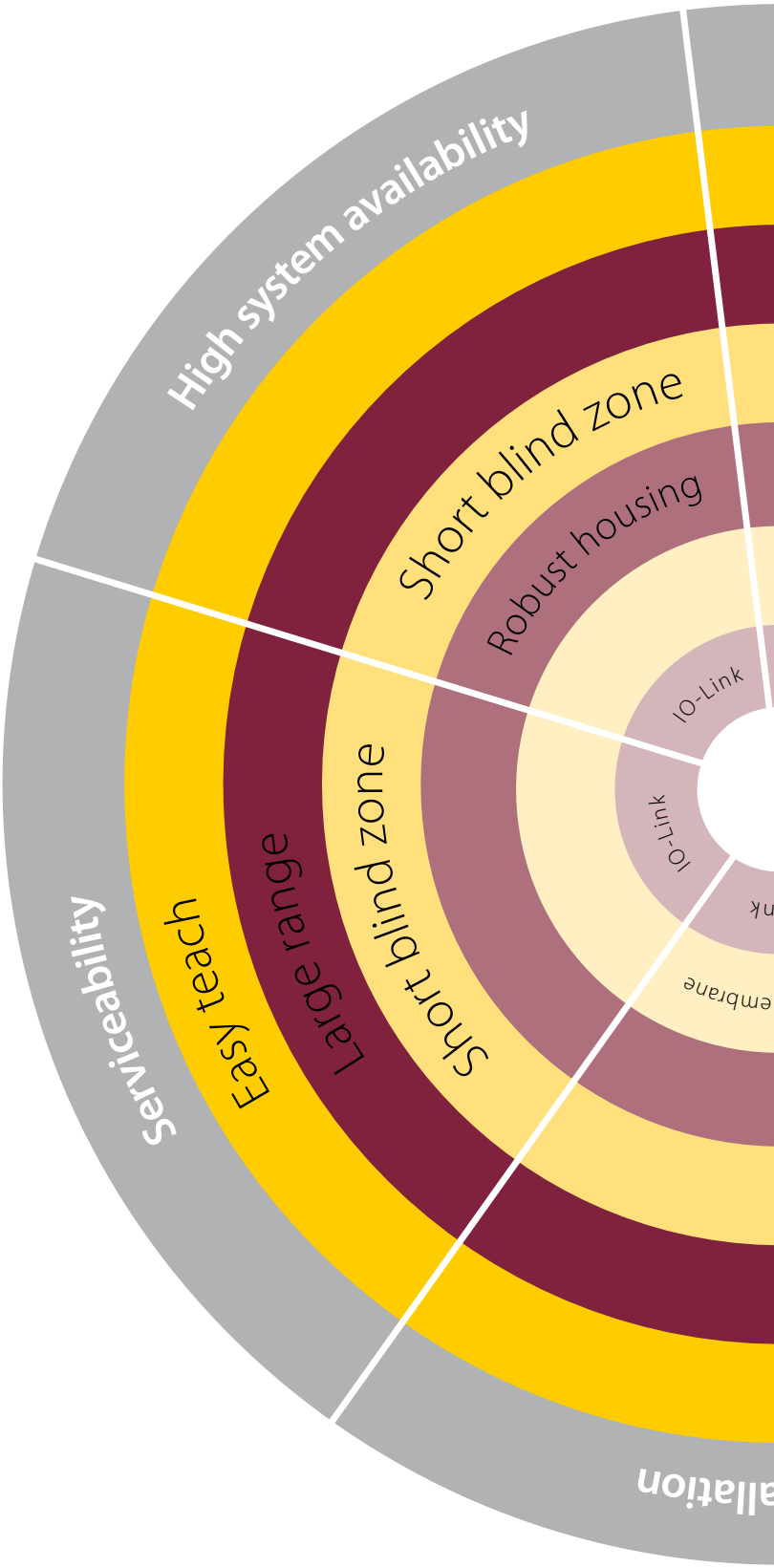
Maximum process safety is provided by the robust metal housing design in which the threaded sleeve and the connector thread are made from one piece, and also from the smooth front on which any dirt cannot accumulate. The high interference immunity also significantly contributes to the availability of this product line.

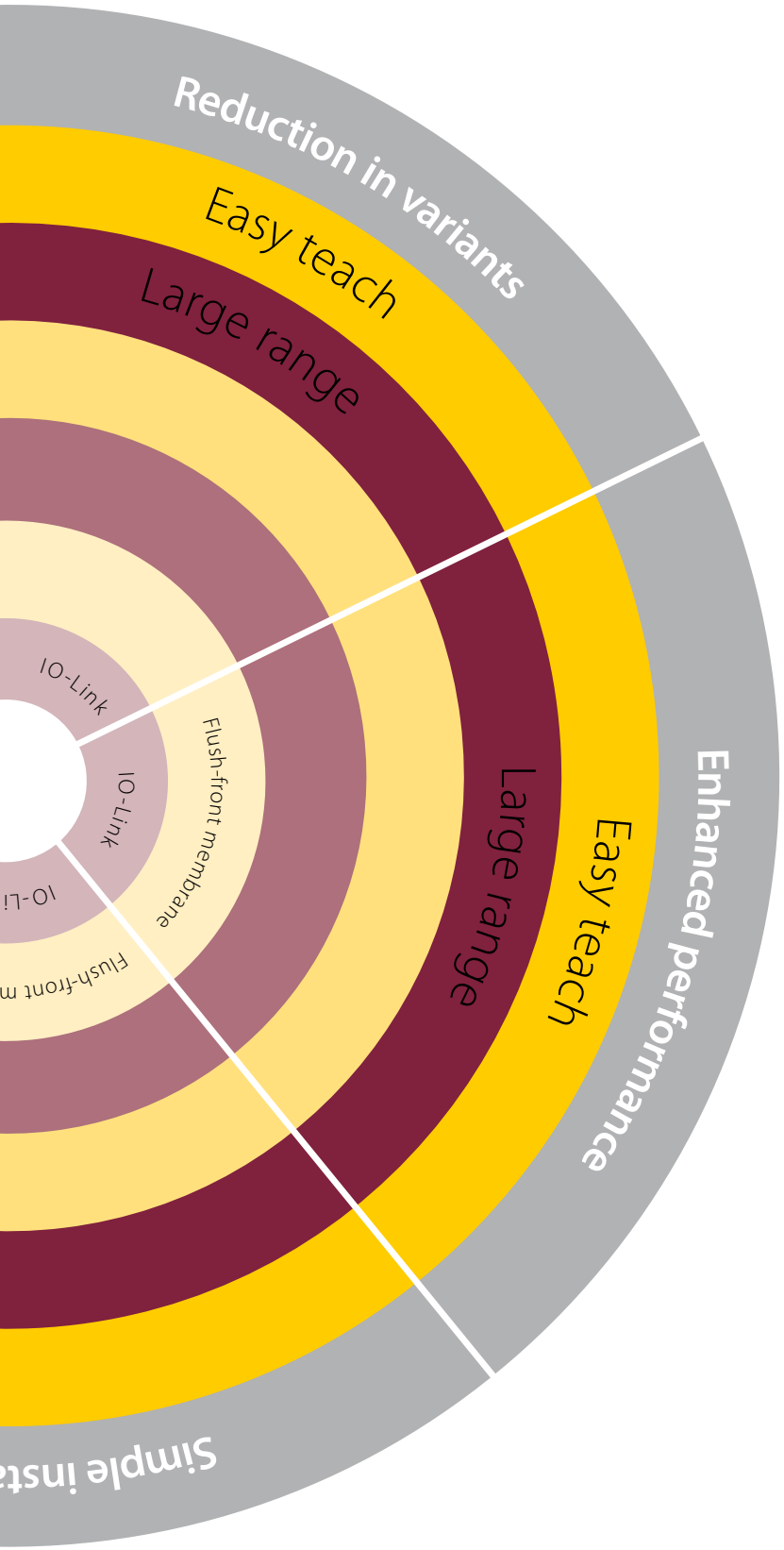
Serviceability

As an alternative to the flexibly configurable PNP or NPN switching outputs and the current or voltage analog outputs, IO-Link enables the sensor to be configured easily via software precisely to the requirements of the application. Besides the parameterization functions, IO-Link also enables the process value to be read out routinely at any time if the standard is used as a communication channel. This flexibility enormously increases serviceability and shortens the replacement lead time.

Installation

Turck Easy Teach simplifies the installation and commissioning of the new ultrasonic sensors. The concept enables the user, for example, to precisely define the switching or measuring range limits without the uncertainty arising from turning a potentiometer. It is also possible to set parameters via IO-Link using the PACTware™ software standard popular with many suppliers. No proprietary software modules complicate the entry of the different settings and the maintenance of updates is considerably easier.





Variant reduction

With their extremely short blind zones the sensors can also detect very close objects, thus providing greater flexibility for mounting. Together with the larger measuring ranges and the possibility to teach diffuse mode, retroreflective mode as well as NC and NO operation, the user can cover a wide range of applications with fewer models of TURCK's new ultrasonic sensor series.

Enhanced performance

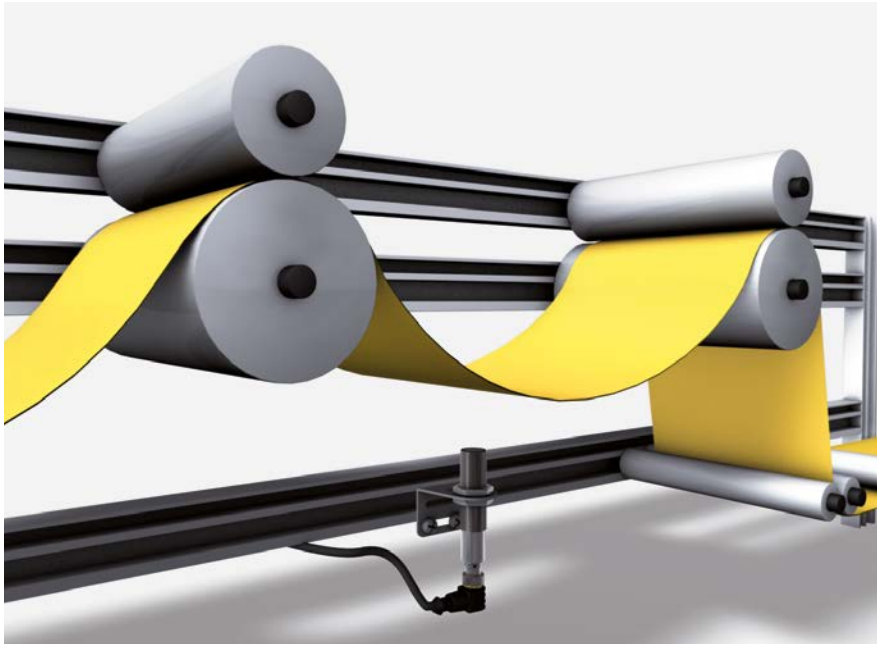
The newly developed sonic transducers enable larger measuring ranges up to 130 cm in the M18 design and 600 cm in the M30 version. Larger transducer heads for larger ranges are no longer required. Together with the short blind zones this increases the options available in existing applications and widens the application range.

- IO-Link
- Flush-front membrane
- Robust housing
- Short blind zone
- Large range
- Easy Teach

Application Examples

Conveyor belt

Ultrasonic sensors are ideal for measuring the profile of bulk material on a conveyor belt in harsh and dust-laden environments. The measuring is implemented above the conveyor belt. Several sensors are mounted here next to each other in order to detect the entire width of the belt. To prevent any mutual interaction the sensor combination uses multiplex operation in which each sensor has its own address. In this mode the sensors operate cyclically in sequence. It is also possible to selectively activate each individual sensor via the controller. If the sensors are arranged further apart, the combination can also be synchronized.



Sag control

Foils, paper and other winding materials are often checked for sag when wound or unwound. This task is mostly carried out by ultrasonic sensors as they are not affected by surface features such as the color of the material or by dust produced from wear. Depending on the size of the sag, detection ranges of up to several meters can be measured accurately to the nearest millimeter. As a limit switch the sensor is used for starting and stopping the drive. However, it can also be used to control speed via the analog output.

Glass pane detection

Clear objects which are difficult to detect using photoelectric sensors are not a problem for ultrasonic sensors. From the right angle, the sensor also detects a glass pane reliably from a great distance. This makes it suitable, for example, in final assembly applications for checking the presence of clear objects, but also other mounted components such as seats, valves, seals or general interiors – as it does not depend on surface colors. The ultrasonic sensor technology also simplifies the functional testing of moving parts, such as for the end position control of seats or the open position of electrically operated car roofs.

Level monitoring

Liquids are a very good reflector of ultrasonic waves if they do not form any foam. Ultrasonic sensors are therefore ideal for monitoring the level of liquid containers. Spray and droplets do not affect the sensor and it even cleans itself through the through the movement of the sonic transducer. The sensor enables several switch limit values, continuous level measuring or also the direct activation of a pump. Due to its short blind zone, the sensor can be mounted where space is limited, as a minimum clearance from the surface of the liquid is no longer required.

Variants

Miniature sensors

In confined spaces, only small designs can be used. The housings in the M8 and M12 standard designs are robustly designed with IP67 protection and, thanks to their fully encapsulated design, can also be used in pressure ranges from 0.5 to 5 bar in the case of filling level tasks. The front-flush transducer diaphragm is largely insensitive to contamination, as adhering particles are virtually removed by the user's own movement. Both series feature IO-Link communication, so that the switching variant can also be used directly as a measuring sensor via the process value output. The M12 version is also available as a pure analog version.

ECO series

The RU50 Eco sensors are available with switching and analog outputs. You can choose between a variant with M12 plug output and a variant with cable output. The translucent end cap also has the advantage that the switching status of the sensor can be clearly seen from almost any angle.

Compact series

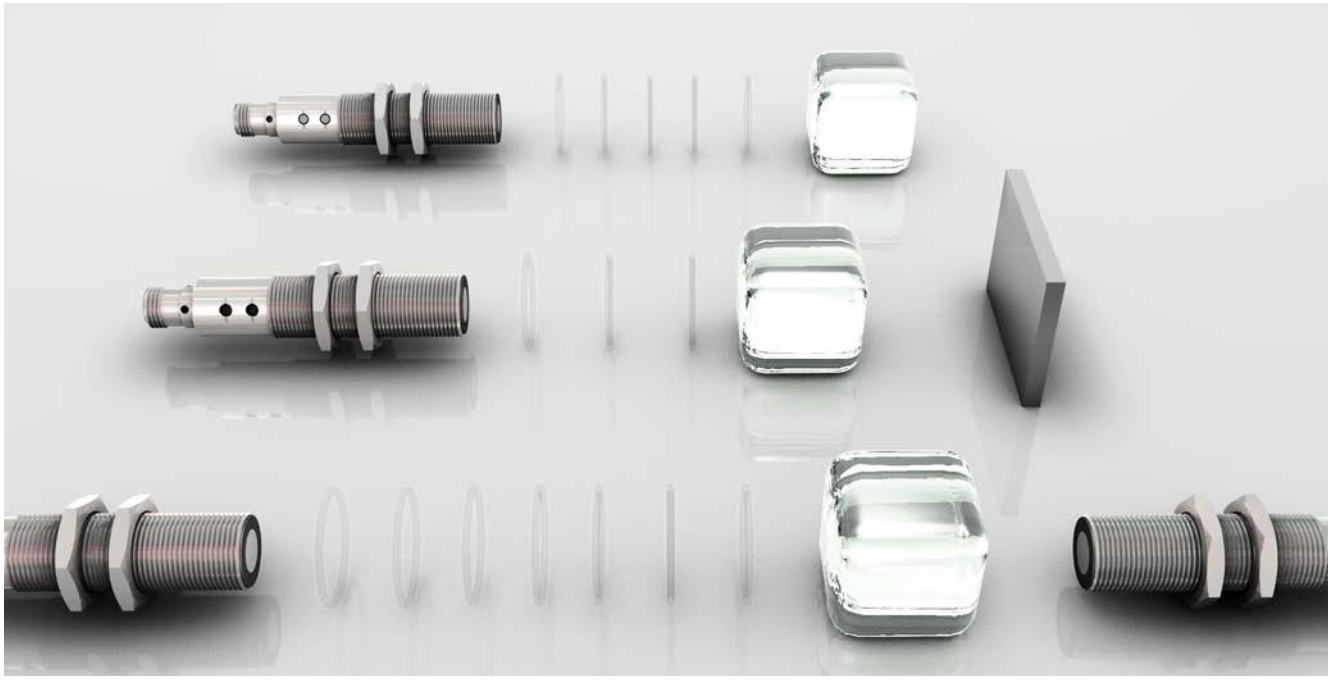
The compact version (RU40 and RU100) with ranges of up to 40 cm and 100 cm significantly reduces the variety of types, as the output function can now be switched directly via teach adapter or cable to pin 5. The compact series offers maximum ranges in the compact M18 design. The devices are available as diffuse or retroreflective mode versions.

Standard series

The standard variants can also be set via pin 5, depending on the model via teach adapter or teach buttons on the device. With their double switching output, they complete the program by allowing direct setting of the switching range limits and the output function. The sensors offer two independent switching outputs with adjustable switching points or also switching windows or analog output. It is also possible to teach in the sensor on a fixed surface in order to form a reflection barrier in which an object to be detected interrupts the signal reflection from the taught-in surface.

High-end series

The high-end series represents the switch/analog version which, in addition to programming with teach buttons, can always be parameterized to various settings via IO-Link and even functions as a double switch if required. The standard and high-end variants in the M30 design round off the Turck ultrasonic portfolio with a longer range.



The High-end series can be set to different operating modes such diffuse mode, retroreflective opposed mode for a fixed reflector or also to opposed mode with an emitter and receiver.

Ultrasonic sensors – Range overview

	M08	M12	S18	M18		M30		CK40
								
Compact/ Miniature 1 switching output	10 cm	20 cm 40 cm		40 cm 100 cm				
ECO switching or analog output			50 cm					
Standard 2 switching outputs					40 cm 130 cm	40 cm 130 cm 300 cm	600 cm	200 cm
Standard switching or analog output		20 cm 40 cm		40 cm 130 cm		130 cm 300 cm	600 cm	200 cm
High-End switching or analog output					40 cm 130 cm	130 cm 300 cm	600 cm	

Miniature Sensors – Cylindrical Design

The smallest ultrasonic sensors in the M8 threaded housing are available in four versions, as screens or barriers, each with PNP or NPN interfaces. The sensors have a range of 100 millimeters and a blind zone of only 20 millimeters.

The ultrasonic sensors in the M12 threaded housing are available in six variants, four types with anlog output and two variants with switching output. The ultrasonic sensors with switching output also have integrated IO-Link functionality. The sensors have a range of 200 or 400 millimeters, the blind zones are small in both cases and are just 20 or 40 millimeters.

Features

- Large measuring range
- Short blind zone
- Robust mechanics thanks to metal housing and metal plug
- Use in confined environments
- IO-Link
- Teach-Function via PIN 2 or PIN 4

Type Code

RU 10 U – M08 – U P 8 X – V1 1 4 1

RU 10 U Series – **M08** Design – **U P 8 X** Electrical version –

Series
- **U** universal
- **L** retroflective

Range
- **10** [cm]
- **20** [cm]

Functional principal
- **RU** ultrasonic sensor

Housing
- **M08** threaded barrel, metal, 8 Ø in [mm]
- **M12** threaded barrel, metal, 12 Ø in [mm]

Display
- **X** LED

Voltage range
- **6** 10…30 VDC
- **8** 15…30 VDC

Output type
- **N** NPN output
- **P** PNP-output

Output function
- **U** adjustable NO/NC
- **A** NO
- **LU** analog output voltage 0…10 V
- **LI** analog output current 4…20 mA

V1 1 4 1 Electrical connection: connector

Assignment
- **1** assignment acc. to norm

Number of pins
- **4** number of pins

Connector form
- **1** straight

Connector type
- **V1** connector M18 × 1
- **H1** connector M12 × 1

Miniature sensor M8 – Diffuse Mode/Mode – Switching

General data			
Operating voltage	18…30 VDC	**Transducer material**	Plastic, epoxy resin and PU-foam
DC rated operating current	≤ 150 mA	**Connection**	Connector M8 x 1
Ambient temperature	0…+50 °C	**Protection class**	IP67
Housing material	Metal, CuZn, nickel-plated	**Temperature drift**	± 1.5 % of full scale

Types and Data – Selsction table

Type	Ident. no.	Operating mode	Output function
RU10U-M08-UP8X-V1141	100003157	Diffuse	PNP, IO-Link
RU10U-M08-UN8X-V1141	100003158	Diffuse	NPN, IO-Link
RU10L-M08-UP8X-V1141	100003159	Retroreflective	PNP, IO-Link
RU10L-M08-UN8X-V1141	100003160	Retroreflective	NPN, IO-Link

Miniature sensor M12 –Diffuse Mode – Switching

General data			
Operating mode	Ultrasonic diffuse mode	**Transducer material**	Plastic, epoxy resin and PU-foam
Operating voltage	10…30 VDC (AP) 15…30 VDC (LI/LU)	**Connection**	Connector, M12 x 1
DC rated operating current	≤ 150 mA	**Protection class**	IP67
Ambient temperature	10…+60 °C	**Temperature drift**	± 1.5 % of full scale
Housing material	Metall, CuZn, nickel-plated		

Types and Data – Selsction table

Type	Ident. no.	Range [cm]	Output function
RU20U-M12-AP6X2-H1141	100000278	2…20	PNP, IO-Link
RU40U-M12-AP6X2-H1141	100000279	2.5…40	PNP, IO-Link
RU20U-M12-LI8X2-H1141	100000280	2…20	4…20 mA
RU40U-M12-LI8X2-H1141	100000281	2.5…40	4…20 mA
RU20U-M12-LU8X2-H1141	100000282	2…20	0…10 V
RU40U-M12-LU8X2-H1141	100000283	2.5…40	0…10 V

ECO Series – Cylindrical Design

Based on state-of-the-art transducer technology, a new ultrasonic sensor has been developed which, despite its economy orientation, does not compromise on quality.

The devices in the plastic threaded barrel are made of highly resistant liquid crystal polymer (LCP), the translucent end cap with M12 connector output is made of Ultem. The customer can choose between a variant with M12 connector output and a variant with cable output. The translucent end cap also has the advantage that the switching status of the sensor can be clearly seen from almost any angle.

Features

- Optimum price/performance ratio
- Simple to use
- Robust sensors in plastic housing with integrated LED display
- Analog or switching output
- Teach-Function via PIN 2 or PIN 4

Type code

RU 50 U – S18 – A P 8 X – H1 1 4 1

RU 50 U Series – **S18** Design – **A P 8 X** Electrical version –

Series
- **U** universal
- **L** retroreflective

Range
- **…** [cm]

Functional principal
- **RU** ultrasonic

Housing
- **S…** threaded barrel, plastic, Ø in [mm]

Display
- **X** LED

Voltage range
- **8** 15…30 VDC

Output type
- **N** NPN output
- **P** PNP output

Output function
- **A** NO
- **LU** analog output voltage 0…10 V
- **LI** analog output rurrent 4…20 mA

H1 1 4 1 Electrical connection: connector

Assignment
- **1** assignment acc. to norm

Number of pins
- **4** number of pins

Connector form
- **1** straight

Connector type
- **H1** connector M12 × 1

ECO Series – S18 – Diffuse Mode/Mode–Switching/Measuring

General data			
Operating voltage	15…30 VDC	**Transducer material**	Plastic, epoxy resin and PU-foam
DC rated operating current	≤ 150 mA	**Protection class**	IP67
Ambient temperature	-20…+50 °C	**Temperature drift**	± 1.5 % of full scale
Housing material	Plastic, LCP		

Types and Data – Selsction table

Type	Ident. no.	Output	Electrical connection	Operating mode
RU50U-S18-AP8X	100000394	Swiching output PNP	Cable 2 m	Diffuse
RU50U-S18-AN8X	100000984	Swiching output NPN	Cable 2 m	Diffuse
RU50U-S18-AP8X-H1141	100000746	Swiching output PNP	Connector M12 x 1	Diffuse
RU50U-S18-AN8X-H1141	100000983	Swiching output NPN	Connector M12 x 1	Diffuse
RU50L-S18-AP8X	100002165	Swiching output PNP	Cable 2 m	Retroflective
RU50L-S18-AN8X	100002166	Swiching output NPN	Cable 2 m	Retroflective
RU50L-S18-AP8X-H1141	100002167	Swiching output PNP	Connector M12 x 1	Retroflective
RU50L-S18-AN8X-H1141	100002168	Swiching output NPN	Connector M12 x 1	Retroflective
RU50U-S18-LI8X	100000747	4…20 mA	Cable 2 m	Diffuse
RU50U-S18-LU8X	100000749	0…10 V	Cable 2 m	Diffuse
RU50U-S18-LI8X-H1141	100000748	4…20 mA	Connector M12 x 1	Diffuse
RU50U-S18-LU8X-H1141	100000750	0…10 V	Connector M12 x 1	Diffuse

Compact Series – Cylindrical Design

The very robust compact variant offers ranges up to 100 cm and is available in straight and angled design. The compact devices are especially suited for use in applications with restricted installation conditions. Little installation effort and high availability make commissioning and maintenance easier for the user.

Features

- Large measuring range
- Short blind zone
- Robust mechanics thanks to metal housing and metal connector
- Front-flush diaphragm
- Easy teaching via pin 2 or pin 5
- Short design

Type code

RU 100 U – M18 MS – U P 8 X2 – H1 1 5 1

RU 100 U Series – **M18 MS** Design – **U P 8 X2** Electrical version –

Series
- **U** universal
- L retroreflective

Range
- **…** [cm]

Functional principle
- **RU** ultrasonic sonic

Housing length
- **M** medium-sized
- **S** sonic converter angled

Housing
- **M…** threaded barrel, metal, Ø in [mm]

Display
- **X2** 2 x LED/2-color LED

Voltage range
- **8** 15…30 VDC

Output type
- **N** NPN output
- **P** PNP output

Output function
- **U** adjustable: NO/NC
- **A** IO-Link

H1 1 5 1 Electrical connection: connector

Assignment
- **1** assignment acc. to norm

Number of pins
- **5** number of pins

Connector form
- **1** straight

Connector type
- **H1** connector M12 × 1

Compact Series – M18 – Diffuse Mode – Switching

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Protection class**	IP67
Configuration	via pin 2 or pin 5	**Ambient temperature**	-25 …+70 °C
Output 1	Switching output	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plated		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Output function	Radiation direction
RU40U-M18M-AP8X2-H1151	1610094	2.4 …40	PNP, IO-Link	straight
RU40U-M18MS-AP8X2-H1151	1610105	2.4 …40	PNP, IO-Link	side
RU40U-M18M-UP8X2-H1151	1610008	2.5…40	PNP	straight
RU40U-M18MS-UP8X2-H1151	1610009	2.5…40	PNP	side
RU40U-M18M-UN8X2-H1151	1610080	2.5…40	NPN	straight
RU40U-M18MS-UN8X2-H1151	1610082	2.5…40	NPN	side
RU100U-M18M-AP8X2-H1151	1610095	15…100	PNP, IO-Link	straight
RU100U-M18MS-AP8X2-H1151	1610106	15…100	PNP, IO-Link	side
RU100U-M18M-UP8X2-H1151	1610010	15…100	PNP	straight
RU100U-M18MS-UP8X2-H1151	1610011	15…100	PNP	side
RU100U-M18M-UN8X2-H1151	1610081	15…100	NPN	straight
RU100U-M18MS-UN8X2-H1151	1610083	15…100	NPN	side

Compact Series – M18 – Retroreflective – Switching

General data			
Operating mode	Retroreflective ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Protection class**	IP67
Configuration	via pin 2 or pin 5	**Ambient temperature**	-25 …+70 °C
Output 1	Switching output	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plated		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Output Function	Radiation direction
RU40L-M18M-UP8X2-H1151	1610076	2.5…40	PNP	straight
RU40L-M18MS-UP8X2-H1151	1610078	2.5…40	PNP	side
RU40L-M18M-UN8X2-H1151	1610084	2.5…40	NPN	straight
RU40L-M18MS-UN8X2-H1151	1610086	2.5…40	NPN	side
RU100L-M18M-UP8X2-H1151	1610077	15…100	PNP	straight
RU100L-M18MS-UP8X2-H1151	1610079	15…100	PNP	side
RU100L-M18M-UN8X2-H1151	1610085	15…100	NPN	straight

Type	Ident no.	Range [cm]	Output Function	Radiation direction
RU100L-M18MS-UN8X2-H1151	1610087	15…100	NPN	side

Compact Series – M18 – Diffuse Mode – Measuring

General data

Operating mode	Diffuse mode ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Protection class**	IP67
Configuration	via pin 2 or pin 5	**Ambient temperature**	-25 …+70 °C
Output Function	Frequency	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plated		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Radiation direction
RU40U-M18M-LFX-H1151	1610021	2.5…40	straight
RU40U-M18MS-LFX-H1151	1610019	2.5…40	side
RU100U-M18M-LFX-H1151	1610022	15…100	straight
RU100U-M18MS-LFX-H1151	1610020	15…100	side

Standard Series – Cylindrical Design with Analog Output

In addition to the analog output, this sensor offers a special switching output whose switching range always follows the set measuring range limits of the analog output. In the factory settings the sensor gives its output signal from 0...10 V or 4...20 mA over the entire measuring range. The measuring range can be set individually via a teach adapter or the controller. This also allows the switching point to be defined individually when used as a switch.

Features

- Variant reduction through additional functions
- Standardized measuring output signal 4...20 mA or 0...10 V
- Variety of available ranges
- High availability due to rugged design

Type code

RU 130 U – M18 E – LU 8 X2 – H1 1 5 1

RU 130 U Series

- **Series**
  - **U** universal
- **Range**
  - **…** [cm]
- **Functional principle**
  - **RU** ultrasonic sensor

–

M18 E Design

- **Housing length**
  - **E** long
  - **S** sonic converter angled
- **Housing**
  - **M…** threaded barrel, metal, Ø in [mm]

–

LU 8 X2 Electrical version

- **Display**
  - **X2** 2 x LED/2-color LED
- **Voltage range**
  - **8** 15…30 VDC
- **Output function**
  - **LU** analog output voltage 0…10 V
  - **LI** analog output current 4…20 mA

–

H1 1 5 1 Electrical connection: connector

- **Assignment**
  - **1** assignment acc. to norm
- **Number of contacts**
  - **5** number of contacts
- **Connector form**
  - **1** straight
- **Connector type**
  - **H1** connector M12 × 1

Standard Series –M18/M30 – Diffuse Mode – Measuring

General data			
Operating mode	Ultrasonic diffuse mode sensor	**Transducer material**	Plastic, epoxy resin and PU-foam
Operating voltage	15…30 VDC	**Electrical connection**	Connector, M12 x 1
DC rated operating current	≤ 150 mA	**Protection class**	IP67
Ambient temperature	-25…+70 °C	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plate		

Standard analog

Type	Ident no.	Range	Output/AUX	Radiation direction
RU40U-M18E-LI8X2-H1151	1610069	2,5…40 cm	4…20 mA/PNP	straight
RU130U-M18E-LI8X2-H1151	1610089	15…130 cm	4…20 mA/PNP	
RU300U-M30E-LI8X2-H1151	1610099	30…300 cm	4…20 mA/PNP	
RU600U-M30E-LI8X2-H1151	1610100	60…600 cm	4…20 mA/PNP	
RU40U-M18ES-LI8X2-H1151	1610097	2,5…40 cm	4…20 mA/PNP	side
RU130U-M18ES-LI8X2-H1151	1610098	15…130 cm	4…20 mA/PNP	
RU40U-M18E-LU8X2-H1151	1610109	2,5…40 cm	0…10 V/PNP	straight
RU130U-M18E-LU8X2-H1151	1610110	15…130 cm	0…10 V/PNP	
RU300U-M30E-LU8X2-H1151	1610113	30…30 cm	0…10 V/PNP	
RU600U-M30E-LU8X2-H1151	1610114	60…600 cm	0…10 V/PNP	
RU40U-M18ES-LU8X2-H1151	1610111	2,5…40 cm	0…10 V/PNP	side
RU130U-M18ES-LU8X2-H1151	1610112	15…130 cm	0…10 V/PNP	

RU40/130U
M18 gerade

RU40/130U
M18 gewinkelt

RU300U
M30

RU600
M30

Standard Series – Cylindrical Design

The standard variant is available as M18 and M30 versions and has two independently adjustable switching outputs. The switching outputs can either be parametrized via the external teaching adapter or directly on the sensor via the integrated button. Thanks to further setting options, the device can also be used as a retroreflective sensor or the hysteresis can be adapted to the application. The devices achieve ranges of up to 600 cm.

Features

- Large measuring range
- Short blind zone
- Robust mechanics thanks to metal housing and metal connector
- Front-flush diaphragm
- Easy teaching via pin 5 or button
- Short design

Type code

RU 130 U – M30 E – 2U P 8 X2 T – H1 1 5 1

RU 130 U Series

Series
U universal

Range
… [cm]

Functional principle
RU ultrasonic sensor

– **M30 E** Design

Housing length
E long
M medium-sized
S sonic converter angled

Housing
M… threaded barrel, metal, Ø in [mm]

– **2U P 8 X2 T** Electrical version –

T with teach button
blank without teach button

Indication
X2 2 x LED/2-color LED

Voltage range
8 15…30 VDC

Output mode
P PNP output

Output function
2 number outputs, if >1
U adjustable NO/NC

H1 1 5 1 Electrical connection: Connector

Assignment
1 standard assignment

… contacts
5 … contacts

Connector type
1 straight

Connector design
H1 flange connector M12 × 1

Standard Series – M18 – Universal – Switching

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Protection class**	IP67
Output 1	Switching output	**Ambient temperature**	-25 …+70 °C
Output 2	Switching output	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plated		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Configuration	Radiation direction
RU40U-M18E-2UP8X2-H1151	1610012	2.5…40	via pin 5	straight
RU40U-M18ES-2UP8X2-H1151	1610013	2.5…40	via pin 5	side
RU40U-M18E-2UP8X2T-H1151	1610016	2.5…40	via pin 5 or button	straight
RU130U-M18E-2UP8X2-H1151	1610014	15…130	via pin 5	straight
RU130U-M18ES-2UP8X2-H1151	1610015	15…130	via pin 5	side
RU130U-M18E-2UP8X2T-H1151	1610018	15…130	via pin 5 or button	straight

Switchable between diffuse mode and retroreflective mode

Standard Series – M30 – Universal – Switching

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Radiation direction**	straight
Output 1	Switching output	**Protection class**	IP67
Output 2	Switching output	**Temperature drift**	± 1.5 % of full scale
Housing material	Metal, CuZn, nickel-plated		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Configuration	Ambient temperature [°C]
RU40U-M30M-2UP8X2-H1151	1610032	2.5…40	via pin 5	-25 …+70
RU130U-M30M-2UP8X2-H1151	1610034	15…130	via pin 5	-25 …+70
RU130U-M30E-2UP8X2T-H1151	1610038	15…130	via pin 5 or button	-25 …+70
RU300U-M30M-2UP8X2-H1151	1610036	30…300	via pin 5	-25 …+70
RU300U-M30E-2UP8X2T-H1151	1610040	30…300	via pin 5 or button	-25 …+70
RU600U-M30M-2UP8X2-H1151	1610037	60…600	via pin 5	-25 …+50
RU600U-M30E-2UP8X2T-H1151	1610041	60…600	via pin 5 or button	-25 …+50

Switchable between diffuse mode and retroreflective mode

Standard Series – Rectangular Design

The rectangular CK40 with integrated connector or the CP40 variants with terminal chamber combine the advantages of a large detection range with a wide opening angle and a very small blind zone. These sensors are thus ideally suited for safe detection of objects that provide only a weak reflection signal due to their geometry or are moved in a large environment. Both the switching as well as the measuring devices can be customized easy to use via teach button.

Features

- Large measuring range
- Very short blind zone
- Easy teaching via pin 5 or button
- Very large opening angle

Type code

RU 200 – CK40 – LIU2 P 8 X2 T – H1 1 5 1

RU 200 Series

- **Range**
  - **…** [cm]
- **Functional principle**
  - **RU** ultrasonic sensor

–

CK40 Design

- **Housing**
  - **CK…** rectangular, plastic, flange connector, dimensions in mm
  - **CP…** rectangular, plastic terminal chamber, dimensions in mm

–

LIU2 P 8 X2 T Electrical version

- **T** with teach button
- **blank** without teach button
- **Indication**
  - **X2** number of LEDs
- **Voltage range**
  - **8** 15…30 VDC
- **Output mode**
  - **N** NPN output
  - **P** PNP output
- **Output function**
  - **2** number outputs, if > 1
  - **LIU** analog output and voltage

–

H1 1 5 1 Electrical Connection: Connector

- **Assignment**
  - **1** standard assignment
- **… contacts**
  - **5** … contacts
- **Connector type**
  - **1** straight
- **Connector design**
  - **H1** flange connector M12 × 1

Standard Series – 40 x 40 – Universal – Switching

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Output 2**	Switching output
Range	5…200 cm	**Housing material**	Plastic
Operating voltage	15… 30 VDC	**Radiation direction**	straight
DC rated operational current	≤ 150 mA	**Protection class**	IP40
Output 1	Switching output	**Ambient temperature**	0 …+70 °C

Types and Data – Selection table

Type	Ident no.	Configuration	Output Function	Connection
RU200-CK40-2UP8X2T-H1151	1610051	via pin 5 or button	PNP	connector, M12 x 1
RU200-CK40-2UN8X2T-H1151	1610057	via pin 5 or button	NPN	connector, M12 x 1
RU200-CP40-2UP8X2T	1610052	via button	PNP	terminal chamber, Terminal box with cable gland
RU200-CP40-2UN8X2T	1610055	via button	NPN	terminal chamber, Terminal box with cable gland

Variable orientation of active face in 5 directions, switchable between diffuse mode and retroreflective mode

Standard Series – 40 x 40 – Universal – Measuring

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Output 2**	Analog output
Range	5…200 cm	**Housing material**	Plastic
Operating voltage	15… 30 VDC	**Radiation direction**	straight
DC rated operational current	≤ 150 mA	**Protection class**	IP40
Output 1	Switching output	**Ambient temperature**	0 …+70 °C

Types and Data – Selection table

Type	Ident no.	Configuration	Output Function	Connection
RU200-CK40-LIU2P8X2T-H1151	1610053	via pin 5 or button	PNP	connector, M12 x 1
RU200-CK40-LIU2N8X2T-H1151	1610058	via pin 5 or button	NPN	connector, M12 x 1
RU200-CP40-LIU2P8X2T	1610054	via button	PNP	terminal chamber, Terminal box with cable gland
RU200-CP40-LIU2N8X2T	1610056	via button	NPN	terminal chamber, Terminal box with cable gland

Variable orientation of active face in 5 directions, switchable between diffuse mode and retroreflective mode

High-End Series – Cylindrical Design

The high-end variant offers universal possibilities for adjustment and adaptation also to the most difficult application conditions. Operation as a diffuse mode, retroreflective or opposed mode sensor is possible, as well as the synchronization of multiple sensors to protect against mutual interference. On demand, process values can be transferred directly or settings changed during operation via IO-Link. The presence of the objects is typically emitted via the switching output and the distance via the analog output. Highest accuracy can be achieved through the possibility to adjust the temperature compensation.

Features

- Large measuring range
- Short blind zone
- Robust mechanics thanks to metal housing and metal connector
- Front-flush diaphragm
- Easy teaching via pin 5 or button
- IO-Link
- Temperature compensation

Type code

RU	600	U	–	M30	E	–	LIU2	PN	8	X2	T	–	H1	1	5	1

RU	600	U	Series	–	M30	E	Design	–	LIU2	PN	8	X2	T	Electrical version	–

Series
- **U** universal
- L retroreflective sensor

Range
- **…** [cm]

Functional principle
- **RU** ultrasonic sensor

Housing length
- **E** long
- **S** sonic converter angled

Housing
- **M…** threaded barrel, metal, Ø in [mm]

T with teach button

blank without teach button

Indication
- **X2** 2 x LED/2-color LED

Voltage range
- **8** 15…30 VDC

Output mode
- **N** NPN output
- **P** PNP output

Output function
- **U** adjustable NO/NC

H1	1	5	1	Electrical Connection: Connector

Assignment
- **1** standard assignment

… contacts
- **5** … contacts

Connector type
- **1** straight

Connector design
- **H1** flange connector M12 × 1

High-End Series – M18 – Universal – Switching/Measuring

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Housing material**	Metal, CuZn, nickel-plated
Operating voltage	15… 30 VDC	**Transducer material**	Plastic, Epoxyd resin and PU foam
DC rated operational current	≤ 150 mA	**Connection**	connector, M12 x 1
Configuration	via pin 5, button or IO-Link	**Protection class**	IP67
Output 1	Switching output or IO-Link mode	**Ambient temperature**	-25 …+70 °C
Output 2	Analog output	**Temperature drift**	± 1.5 % of full scale
IO-Link Specification	V 1.1		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Radiation direction
RU40U-M18E-LIU2PN8X2T-H1151	1610024	2.5…40	straight
RU40U-M18ES-LIU2PN8X2T-H1151	1610025	2.5…40	side
RU130U-M18E-LIU2PN8X2T-H1151	1610026	15…130	straight
RU130U-M18ES-LIU2PN8X2T-H1151	1610027	15…130	side

Switchable between diffuse mode, retroreflective mode and PNP/NPN

High-End Series – M30 – Universal – Switching/Measuring

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Housing material**	Metal, CuZn, nickel-plated
Operating voltage	15… 30 VDC	**Transducer material**	Plastic, Epoxyd resin and PU foam
DC rated operational current	≤ 150 mA	**Connection**	connector, M12 x 1
Configuration	via pin 5, button or IO-Link	**Radiation direction**	straight
Output 1	Switching output or IO-Link mode	**Protection class**	IP67
Output 2	Analog output	**Temperature drift**	± 1.5 % of full scale
IO-Link Specification	V 1.1		

Types and Data – Selection table

Type	Ident no.	Range [cm]	Ambient temperature [°C]
RU130U-M30E-LIU2PN8X2T-H1151	1610046	15…130	-25 …+70
RU300U-M30E-LIU2PN8X2T-H1151	1610048	30…300	-25 …+70
RU600U-M30E-LIU2PN8X2T-H1151	1610049	60…600	-25 …+50

Switchable between diffuse mode, retroreflective mode and PNP/NPN

High-End Series – Cylindrical Design for Hazardous Areas

Also for use in hazardous areas, the high-end series provides a selection of cylindrical sensors with universal possibilities for adjustment and adaptation to various application conditions. Operation as a diffuse mode, retroreflective or opposed mode sensor is possible, as well as the synchronization of multiple sensors to protect against mutual interference. On demand, process values can be transferred directly or settings changed during operation via IO-Link. The presence of the objects is typically emitted via the switching output and the distance via the analog output. Highest accuracy can be achieved through the possibility to adjust the temperature compensation.

Features

- Large measuring range
- Short blind zone
- Robust mechanics thanks to stainless steel housing
- Front-flush diaphragm
- Easy teaching via pin 5 or button
- IO-Link
- Temperature compensation
- Suitable for the Ex zones 2 and 22

Type code

RU 300 U – EM30 E – LIU2 PN 8 X2 T – H1 1 5 1 / 3GD

RU 300 U Series – **EM30 E** Design – **LIU2 PN 8 X2 T** Electrical version –

Series
U universal

Range
… [cm]

Functional principle
RU ultrasonic sensor

Housing length
E long

Housing
EM… threaded barrel, stainless steel, Ø in [mm]

T with teach button

blank without teach button

Indication
X2 2 x LED/2-color LED

Voltage range
8 15…30 VDC

Output mode
PN bipolar

Output function
2 number outputs, if > 1
LIU analog output and voltage

H1 1 5 1 Electrical Connection: Connector / **3GD** Approval

Assignment
1 standard assignment

… contacts
5 … contacts

Connector type
1 straight

Connector design
H1 flange connector M12 × 1

Approval
3D ATEX II 3D approval
3G ATEX II 3G approval
3GD ATEX II 3G and II 3D approval

High-End Series – M18 – Universal – Switching/Measuring

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Transducer material**	Plastic, Epoxyd resin and PU foam
Operating voltage	15… 30 VDC	**Connection**	connector, M12 x 1
DC rated operational current	≤ 150 mA	**Radiation direction**	straight
Configuration	via pin 5, button or IO-Link	**Protection class**	IP67
Output 1	Switching output or IO-Link mode	**Ambient temperature**	-25 …+70 °C
Output 2	Analog output	**Temperature drift**	± 1.5 % of full scale
IO-Link Specification	V 1.1	**Device designation**	II 3 GD
Housing material	Stainless steel 1.4404 (AISI 316L)		

Types and Data – Selection table

Type	Ident no.	Range [cm]
RU40U-EM18E-LIU2PN8X2T-H1151/3GD	1610071	2.5…40
RU130U-EM18E-LIU2PN8X2T-H1151/3GD	1610072	15…130

Switchable between diffuse mode, retroreflective mode and PNP/NPN

High-End Series – M30 – Universal – Switching/Measuring

General data			
Operating mode	Diffuse mode ultrasonic sensor	**Housing material**	Stainless steel 1.4404 (AISI 316L)
Operating voltage	15… 30 VDC	**Transducer material**	Plastic, Epoxyd resin and PU foam
DC rated operational current	≤ 150 mA	**Connection**	connector, M12 x 1
Configuration	via pin 5, button or IO-Link	**Radiation direction**	straight
Output 1	Switching output or IO-Link mode	**Protection class**	IP67
Output 2	Analog output	**Temperature drift**	± 1.5 % of full scale
IO-Link Specification	V 1.1	**Device designation**	II 3 GD

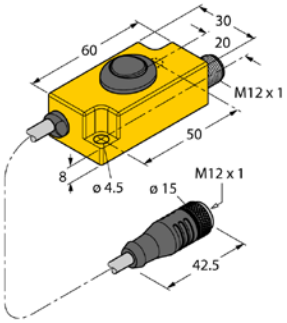
Types and Data – Selection table

Type	Ident no.	Range [cm]	Ambient temperature [°C]
RU130U-EM30E-LIU2PN8X2T-H1151/3GD	1610073	15…130	-25 …+70
RU300U-EM30E-LIU2PN8X2T-H1151/3GD	1610074	30…300	-25 …+70
RU600U-EM30E-LIU2PN8X2T-H1151/3GD	1610075	60…600	-25 …+50

Switchable between diffuse mode, retroreflective mode and PNP/NPN

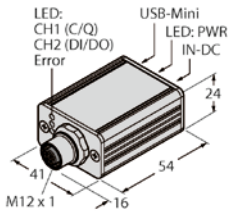
Accessories

TX1-Q20L60



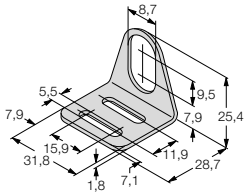
Teach adapter for inductive encoders, linear position, angle, ultrasonic and capacitive sensors

USB-2-IOL-0002



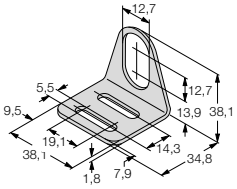
IO-Link Master with integrated USB port

MW-08



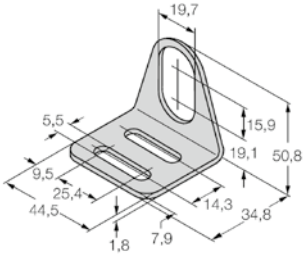
Mounting bracket for threaded barrel sensors, M8 x 1; material: Stainless steel A2 1.4301 (AISI 304)

MW-12



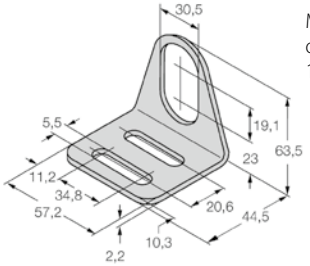
Mounting bracket for threaded barrel sensors, M12 x 1; material: Stainless steel A2 1.4301 (AISI 304)

MW-18



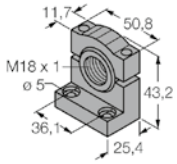
Mounting bracket for threaded barrel devices; material: Stainless steel A2 1.4301 (AISI 304)

MW-30



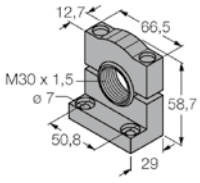
Mounting bracket for threaded barrel devices; material: Stainless steel A2 1.4301 (AISI 304)

SMB18SF



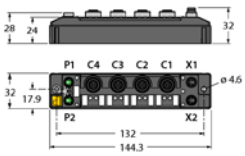
Mounting bracket, PBT black, for sensors with 18 mm thread, rotatable

SMB30SC



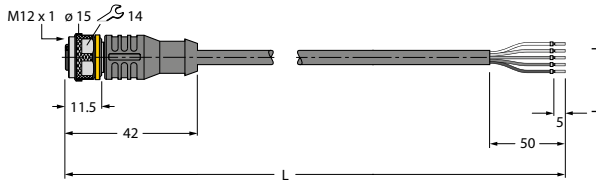
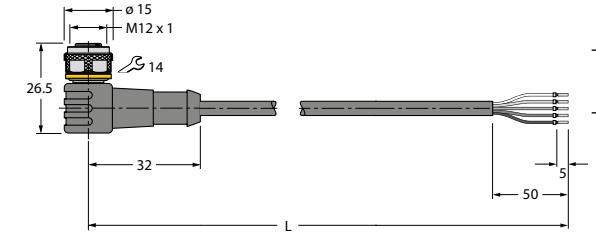
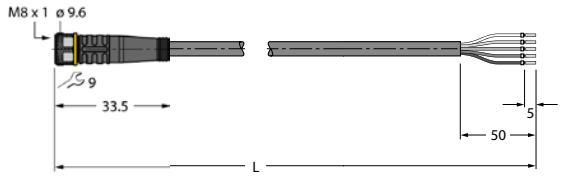
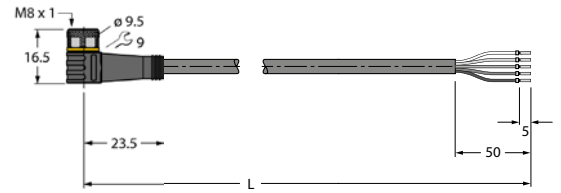
Mounting bracket, PBT black, for sensors with 30 mm thread, rotatable

TBEN-S2-4IOL



Compact multiprotocol I/O module, 4 IO-Link Master 1.1 Class A, 4 universal PNP digital channels 0.5 A

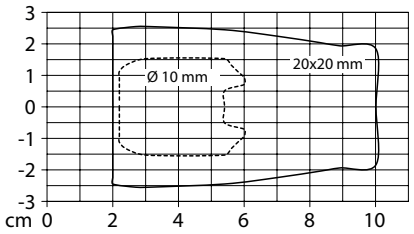
Connection Cable

Dimension drawing	Type code	Ident-No.	Description
	RKC4.5T-2/TEL	6625016	M12 female, straight, 5-pin, cable length: 2 m
	RKC4.5T-5/TEL	6625017	M12 female, straight, 5-pin, cable length: 5 m
	RKC4.5T-10/TEL	6625018	M12 female, straight, 5-pin, cable length: 10 m
	WKC4.5T-2/TEL	6625028	M12 female, angled, 5-pin, cable length: 2 m
	WKC4.5T-5/TEL	6625029	M12 female, angled, 5-pin, cable length: 5 m
	WKC4.5T-10/TEL	6625030	M12 female, angled, 5-pin, cable length: 10 m
	PKG4M-2/TEL	6625061	M8 female, straight, 4-pin, cable length: 2 m
	PKG4M-5/TEL	6625062	M8 female, straight, 4-pin, cable length: 5 m
	PKG4M-10/TEL	6625063	M8 female, straight, 4-pin, cable length: 10 m
	PKW4M-2/TEL	6625067	M8 female, angled, 4-pin, cable length: 2 m
	PKW4M-5/TEL	6625068	M8 female, angled, 4-pin, cable length: 5 m
	PKW4M-10/TEL	6625069	M8 female, angled, 4-pin, cable length 10 m

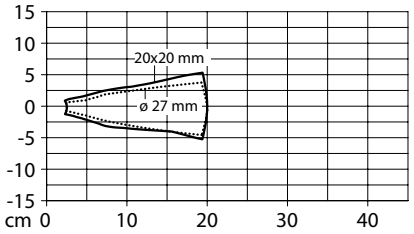
Performance Curves

The diagrams show the detection ranges of the individual ultrasonic sensors, covering reaches of 40 to 600 cm. There are different targets used in sizes 20 x 20 mm, 100 x 100 mm according to the EN standard 60947-5-2, as well as a round rod with a diameter of 27 mm in order to compare the detection ranges of different ultrasonic sensors. When using other targets than the aforementioned standard ones, the detection ranges may vary due to different reflection properties and geometries.

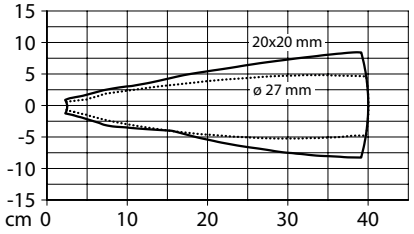
RU10 (M8)



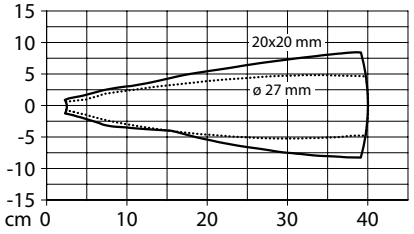
RU20 (M12)



RU40 (M12)



RU40 (M18)



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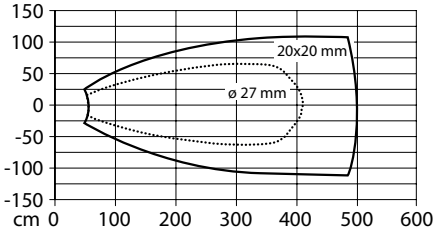

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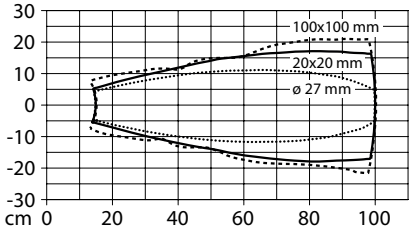

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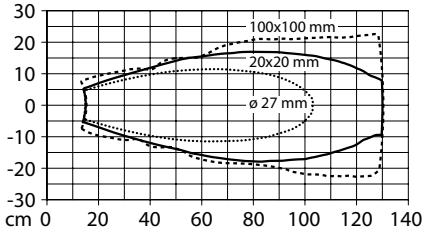

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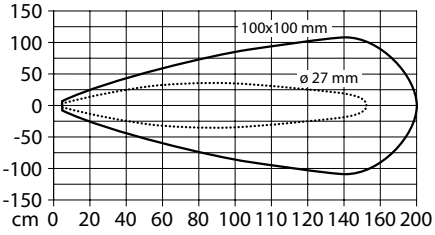

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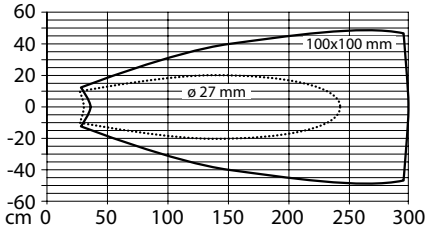

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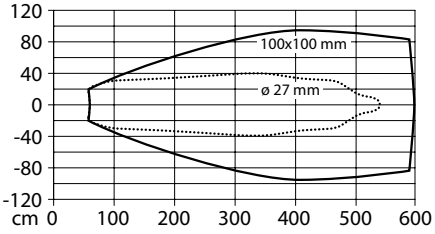

Glossar

What you always wanted to know – Basic information on ultrasonic sensors

Ultrasonic sensors are designed for the contactless and wear-free detection of a variety of targets by means of sound waves. A smooth and firm surface is required for the sound waves in order to ensure optimum reflectivity. Environmental conditions such as spray, dust or rain hardly affect the functioning of the sensors. Coarse material, furs or foam present a challenge since these mainly absorb the sound waves. Target surfaces with a surface variation of more than 0.15 mm have the advantage that the surface does not have to be aligned to the sensor so precisely. However, this does reduce the possible sensing range. The colour of the target has no influence on the switching distance, and transparent targets such as glass or plexiglass can also be detected reliably. However, the temperature of the target does influence the sensing range: Hot surfaces do not reflect sound waves as well as cold surfaces. Liquid surfaces reflect the sound waves in the same way as targets that are solid and smooth. However, the correct alignment should be ensured. Fabrics, foams, wool etc. absorb sound waves so this reduces the sensing range.

Sensing modes
Ultrasonic sensors are primarily used in diffuse mode. The distance to the target is calculated on the basis of the echo time and the known speed of sound in air. A target located in front of the sensor reflects part of the sound wave emitted and is thus detected in the same way on the surface of the sonic transducer. To do this, the sensor constantly alternates between emitter and receive mode. The settling time required by the surface of the sensor transducer to reach the basic state for reception determines the so-called blind zone. Within this zone, located directly in front of the sonic transducer surface, the echo time to the target cannot be measured (Fig. 1). This area must therefore be kept clear at all times. Opposed mode and reflective mode barriers can also be operated using ultrasonic waves. An opposed mode ultrasonic sensor consists of an emitter and a receiver that are constantly "listening" to each other. If there is a sufficiently large target between them, even within the blind zone, the sound is interrupted and the sensor generates a switching signal.

Sensing ranges and sonic angles
The range of ultrasonic sensors depends on the wave lengths and frequencies used. The signal range increases the longer the wave length and the smaller the frequency. For example, compact sensors are able to detect ranges from of 300-500 mm with wave lengths in the millimetre range. Longer wave lengths of 5 mm are suitable for detection ranges up to 8 m. Many sensors have a very narrow sonic angle of around 6 ° and are therefore particularly suitable for the precise detection of relatively small targets. Other sensors with sonic angles of 12-15 ° are also able to detect targets with large tilt angles. Some ultrasonic sensors are also available with an external sonic transducer. This is contained in a separate compact housing, whilst the electronics are located in the regular sensor housing. This separation is especially advantageous when mounting space is limited.

Adjustments
With almost all ultrasonic sensors it is possible to adjust the lower and the upper limit of the switching or measuring range with a potentiometer, by pressing a button or by means of a control line. Targets outside of the set range may be detected, but they don't initiate the output to change state. Several different parameters can often be adjusted, such as the sensor's response time, its response to a loss of echo, or if a pump is operated directly at the sensor. Programming devices can also be used with some ultrasonic sensors to adjust a host of other variables such as hysteresis or sensitivity, in addition to switching and measuring range limits. For example, by changing the averaging function

Synchronization
In most cases, sensor synchronisation will prevent mutual interference. Most sensors are capable of self-synchronisation by simply connecting the synchronisation line. Synchronised sensors emit sonic pulses simultaneously. When mounted correctly, they function like a single sensor with an extended detection angle. A well-known example of this are the ultrasonic parking sensors on modern automobiles.

Alternate sensor operation (multiplexing)
Alternately operating ultrasonic sensors function as fully independent units that are unable to influence each other. The more sensors are operated alternately, the lower the switching frequency. An enable input can also often be used for multiplexing. The sensor is enabled when the enable input is connected to +24 V and disabled when the input is connected to 0V. Multiplexing via this input has the advantage that for each enable-operation only the response time has to be considered and not also the time-delay before availability. Most sensors can be programmed with a programming device so that they can multiplex automatically by connecting the synchronisation lines.

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