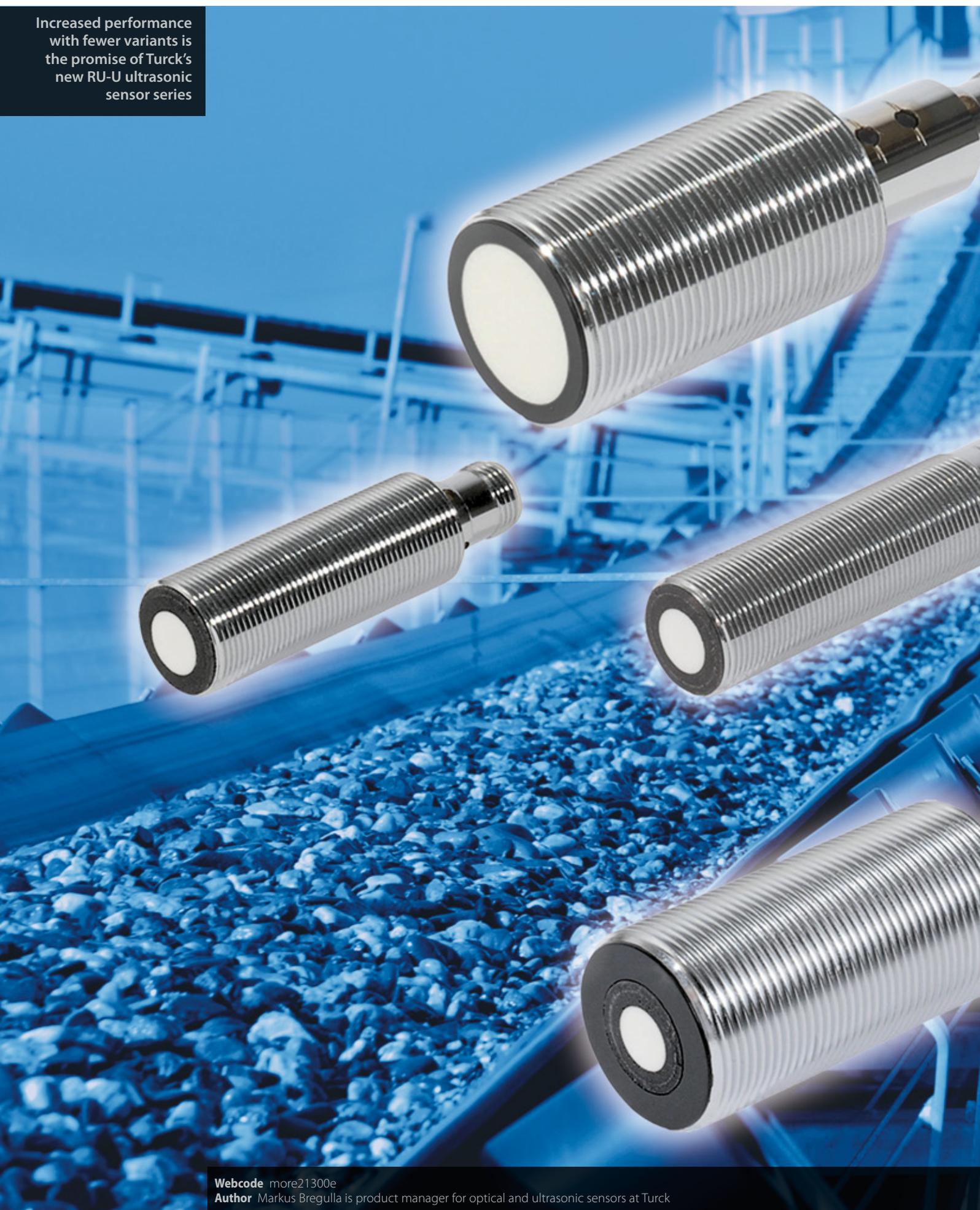


Increased performance with fewer variants is the promise of Turck's new RU-U ultrasonic sensor series



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Middle Distance Champion

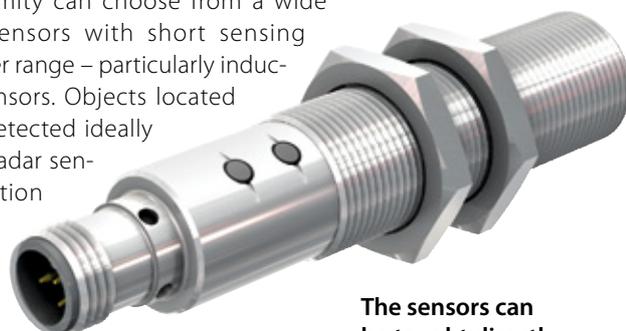
New ultrasonic sensor series with short blind zones and large measuring ranges reduces the number of variants required for sensing distances up to 300 centimeters

Whoever wants to sense objects located in close proximity can choose from a wide range of sensors with short sensing ranges in the centimeter range – particularly inductive and capacitive sensors. Objects located further away can be detected ideally with photoelectric or radar sensors. For object detection in the middle distance range up to 300 centimeters ultrasonic sensors are often the best choice. However, these have the drawback that they can often only serve a limited measuring range due to their large blind zones and limited distances – a clear disadvantage at least for those wishing to cover different sensing ranges in the middle distance zone. For these implementations, the user must have a number of different variants available.

Another ideal application field for ultrasonic sensors is in the detection of high gloss materials such as glass, liquids, or granulate. The use of ultrasonic sensors here is considerably more effective than photoelectric sensors, as they are insensitive to reflections.

Ultrasonic challenge

Sound is a mechanical wave that is propagated in solid material, gases or liquids. The speed of this propagation depends on the composition of the parameters for pressure, temperature and the ambient medium (air). As ultrasonic sensors measure the time of flight of their



The sensors can be taught directly on the sensor via pin 5 – via the teach cable, adapter or button, depending on the model

▶ Quick read

Anyone wishing to sense objects in the middle distance range up to 300 centimeters previously had to keep a large number of variants in stock, as each one could only cover a limited measuring range. Turck now has the solution with its new RU-U ultrasonic sensor series: Three sensor lines with short blind zones and a large measuring range that can be taught via pin 5 can cover all requirements, regardless of whether analog or switching outputs are needed. The high-end version also offers parameterization and communication via IO-Link.

signal, the accuracy of the result depends on the speed at which the sound is propagated. This means that factors that can be ignored with other technologies have an effect here. Air pressure and the composition of the ambient air in open space are normally sufficiently constant, whilst the temperature on the other hand may fluctuate. It is therefore necessary for ultrasonic sensors to compensate for the difference in time of flight at different temperatures by means of an integrated or external temperature measuring function.

Another special requirement is presented by the measuring principle: All ultrasonic sensors have a more or less large blind zone directly in front of the sonic transducer. The size of this depends on the frequency at which each sensor switches between emitter and receiver. If an object is too near to the sensor, it continues to transmit whilst the signal to be received is already being reflected by the object. The object is thus too near in order to detect it. It is the same with some conversation partners: If the answer comes too quickly, the sensor doesn't hear the reflected signal because it is still talking. Sensors with large sensing ranges work at low frequencies and have accordingly large blind zones. The aim of the manufacturer is to keep the blind zone as small as possible in order to cover a large operating range with one sensor.

Turck has made a major step towards this aim with its new RU-U ultrasonic sensor series. With the development of the new sensor technology, the Turck specialists made use of their many years of experience with ultrasonic sensors and placed particular importance on reducing the weaknesses present in previous models as much as possible. The sensors are therefore not only particularly robust but also operate with larger measuring ranges and shorter blind zones than the previous models. The new ultrasonic sensor series also offers devices that are highly flexible and easy to operate, with practical features such as the easy-teach function and the IO-Link.

With their short blind zones and large measuring ranges the sensors effectively reduce the number of variants required in stock

► Operating principle

Ultrasonic sensors primarily operate using the time of flight measuring principle. The sensor emits a sonic pulse and receives the sound reflected back by objects. The time of flight between the emitted pulse and the received pulse enables ultrasonic sensors to be used not only for the discrete detection of objects, but also for measuring distances and for the output of an analog signal if required.

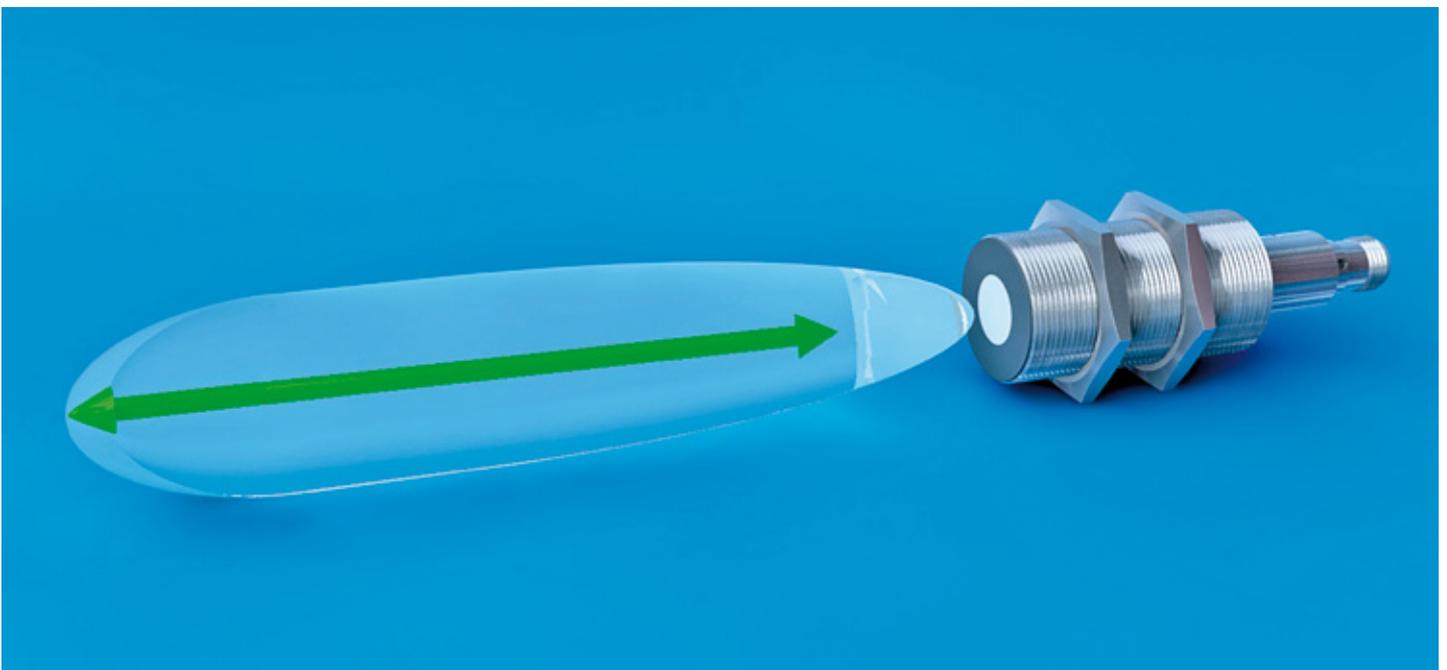
Short blind zone, large measuring ranges

The extremely short blind zones enable objects to be also detected that are close to the sensor. For example, the M18 version with a 40 centimeter range has a blind zone of only 2.5 centimeters. This increases flexibility in many mounting positions. The mounting depths – such as for level sensing applications – are less, as space does not have to be reserved for a large blind zone. Thanks to the shorter blind zones it was also possible for Turck to reduce the number of variants in the series. The newly developed sonic transducers offer particularly large measuring ranges over the entire sensor series: In the M18 model up to 130 centimeters, in the M30 version up to 300 centimeters.

The downward compatibility of the new ultrasonic sensors is their special feature: Every sensor of the series being phased out can be replaced directly with a model from the RU-U series. It is also possible to use the previous accessories.

Increased operating safety

Ultrasonic sensors are used in particularly harsh environments and therefore must be able to withstand



a wide range of different environmental conditions such as dust, water, temperature changes or vibration. The RU-U series meets all these requirements. Their improved process safety is firstly due to their robust metal housing design: threaded sleeve and plug thread are designed as one piece. This eliminates any potential weak points that could cause damage in harsh environments and at low temperatures. The male thread on all new models runs over the entire length of the sensor so that customers can flexibly adjust the mounting position within the mounting bracket.

The smooth front flush sonic transducer membrane also contributes to greater process safety as it cannot accumulate dirt that may cause incorrect signals. On the contrary: Ideally, the mechanical movement of the membrane even shakes off deposits and thus cleans itself. Particle deposits that can arise 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.

Easy-teach simplifies settings

The flexibility provided for mounting is also present in the operating concept since a teach-in setting is possible for all sensors via pin 5. Depending on the model, users can teach the sensors via pushbuttons directly on the sensor, with a teach adapter or via a teach cable. The teach function enables the setting of individual switching or measuring range limits. The buttons have a clear pressure point and are embedded in the sensor housing so that the user cannot actuate them unintentionally. Particularly with the M18 series, the start of switch and measuring ranges can now also be set without any additional software. Alternative concepts use potentiometers, but the turn setting of these devices is often unreliable and imprecise.

Full flexibility with high end version

The high-end versions of the new ultrasonic sensor series also feature an IO-Link interface so that they can offer enhanced parameter and communication options. The widely used and free Pactware parameter software enables some sensor parameters to be tuned precisely to the requirements of the particular application. For example, the ultrasonic sensors can be set as a pure emitter or receiver, so that two sensors can be installed to create an ultrasonic opposed mode sensor.

However, even more extensive setting options are provided, enabling for example the setting of a time lock, the temperature compensation of the internal or an external temperature sensor, the setting of the analog output signal as a rising or falling characteristic or even as an additional 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



The ultrasonic sensor offers robust and flexible mounting thanks to its throughout metal housing and integrated M12 connection

N/C or N/O function. If several devices are installed in the same environment, the user can synchronize the sensors in order to prevent any mutual interference. An alternative to this is multiplex operation in which the individual devices operate in sequence. Besides the parameter options provided, IO-Link provides an elegant communication route between sensor and master. It therefore also enables the latest process value to be read out directly at any time if a switching or analog signal are not required.

The flexibility offered by IO-Link has enabled Turck to improve the maintainability of its ultrasonic sensors in many applications with specific requirements. The largely compatible connectors and pin assignments simplify the change for customers wishing to switch to the new ultrasonic sensors from Turck.

Three equipment lines

Turck addresses the different requirements of its customers with three equipment lines: The compact series is aimed at the particularly large market of single ultrasonic sensors in the M18 housing style with one switching output. As the output characteristics – diffuse mode or opposed mode, both with an N/O as well as an N/C switching output – can now be adjusted, two versions are enough to replace the previous multitude of types: A version with a 40 centimeter range and one with a 100 centimeter range are now available. The setting is carried out via the teach cable or an adapter.

Turck's sensors with a double switching output are the standard variant. Switching points, switching range limits and output functions can either be set via the teach cable/adapter or via teach buttons on the device. The switch window can be set as required within the sensing range. For this only switching output 1 is set and switching output 2 is linked by default with switching output 1. This enables up to three ranges to be detected and evaluated at the same time. The standard variants are available as 40 and 130 centimeter sensors in the housing styles M18, and as 300 centimeter sensors in the M30 housing style.

For particularly demanding applications, Turck has included the high-end variants in the series. With the parameter options via IO-Link, these offer total flexibility. The high-end versions are available in the M18 housing style with a 40 and 130 sensing range, and as an M30 version with a range of 130 and 300 centimeters. ■