

Technical Report

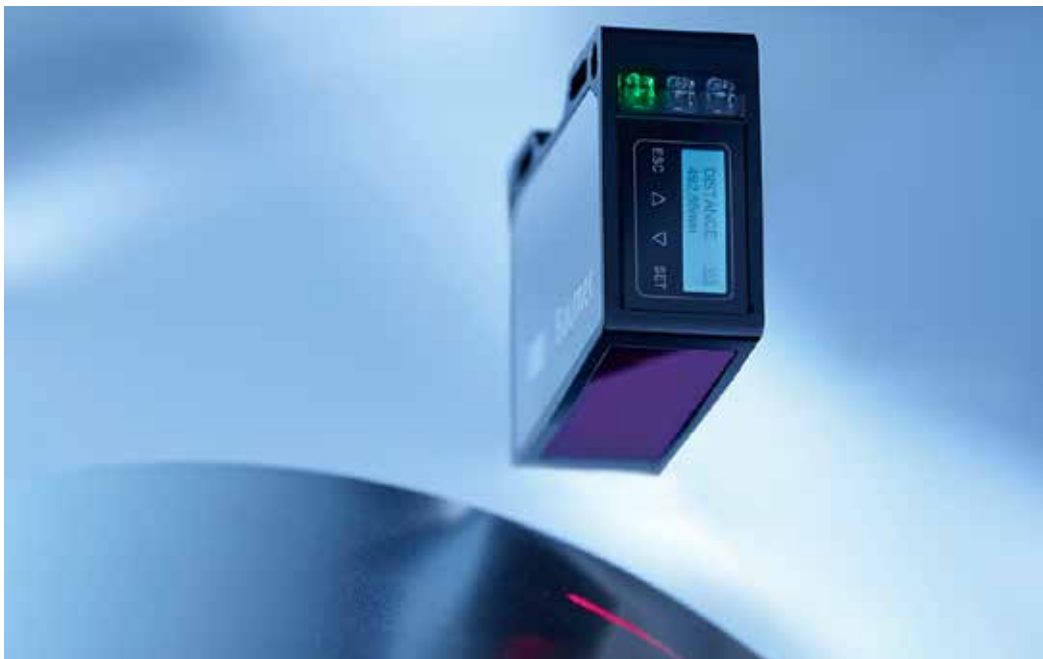
# Undeterred precision – How micrometer-accurate optical distance measurement becomes more reliable.

Laser distance sensors enable high-precision distance and position measurement with a resolution of less than one micrometer. In practice, however, there are interference effects that can reduce the repeatability of optical distance measurements. With the introduction of selectable focus ranges, Baumer OM70 laser distance sensors enable significantly better local repeatability and thus ensure more reliable measurement results and higher process reliability for automated measurement tasks.

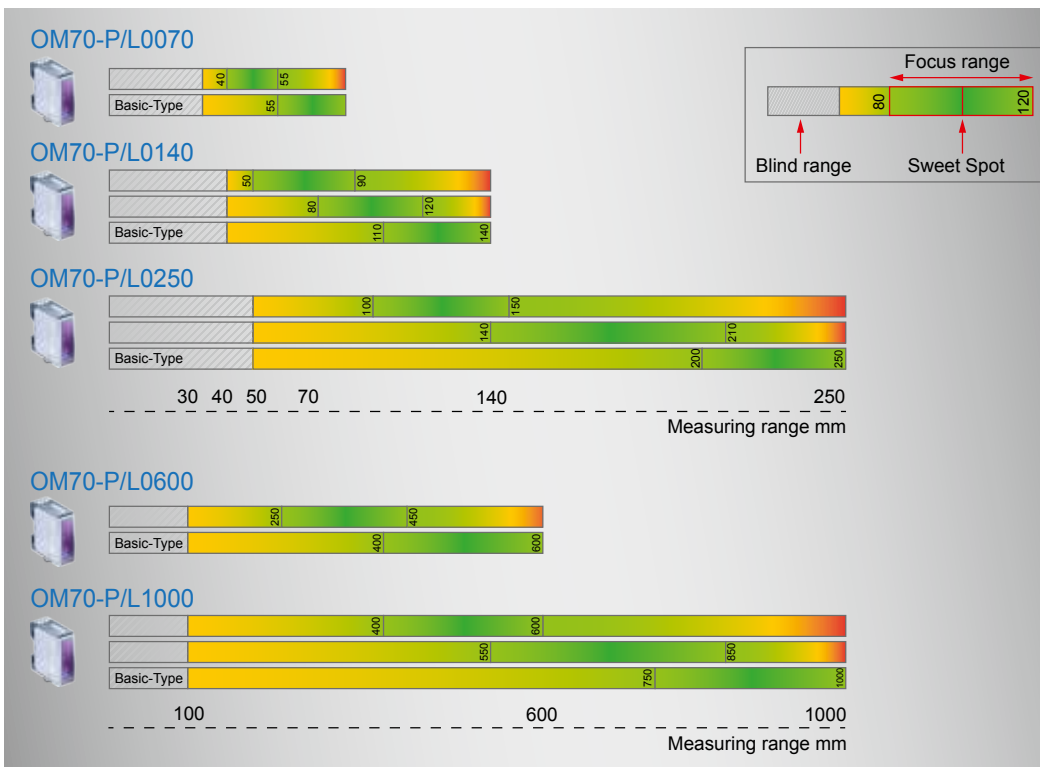
## Repeat accuracy for optically demanding surfaces

The resolution in the data sheet of a laser distance sensor, often used as an accuracy scale, is a value that can only be achieved if the position of the measuring point on the object does not change. However, as soon as the lateral position of the measuring point changes, the local repeatability is decisive for the accuracy of the measurement result. This repeatability is always worse than

the resolution. The local repeatability of an optical measuring system is strongly dependent on the homogeneity of the object surface to be measured. Because there are differently structured surfaces, this value is very difficult to determine in practice. Small changes in reflectivity color or surface structure can have a considerable effect on the measurement result. High-contrast coatings, brushed or galvanized metal surfaces, color-structured nat-



Baumer OM70 laser distance sensors with selectable focus ranges for enhanced reliability.



OM70 laser distance sensors offer several focus ranges. In this range the sensors measure even more reliably with demanding targets (e.g. strong color contrasts up to white-black changes, deep black and porous materials).

ural materials such as stone or wood, black and white color changes or etched printed circuit boards are examples of such optically demanding surfaces.

**Focus range increases reliability**

The extent to which the effect of inhomogeneous surfaces influences the measurement result depends on the size of the laser spot reflected from the object. The smaller the spot size is, the small-

er is the effect of inhomogeneous surfaces on the measurement results. Since the light of the laser diode in the sensor must be focused via a lens, the spot size changes over the measuring range. The smallest laser spot is achieved at the focus point of the optical system. Thus the most reliable measurement results are obtained when the object to be measured is measured in an area around the focus point of the sensor – the focus range.

Max. measuring distance	Beam type	Accuracy		
		Resolution	Repeat accuracy	Linearity error
<b>Very high measuring accuracy</b>				
70 mm	•	0.7 µm	0.1 µm	±0.06%
140 mm	•	1.2 µm	0.3 µm	±0.07%
250 mm	•	1.4 µm	0.3 µm	±0.09%
<b>Large measuring distances</b>				
600 mm	•	3 µm	1 µm	±0.12%
1000 mm	•	8 µm	2 µm	±0.19%
1500 mm	•	13 µm	3 µm	±0.32%

• point    — line

The right sensor for any application – focus ranges are available with resolutions starting from 0.7 µm with a repeat accuracy of 0.1 µm and a maximum measuring distance up to 70 mm. For distances up to 1000 mm, the resolution is 8 µm with a repeatability of 2 µm.

### Different applications – Different sensors

In order to cover different object sizes, varying object geometries and possible installation situations in industrial plants, it is essential to select the sensor which fits best to the required object distance and object size and which guarantees the required measuring accuracy. OM70 laser distance sensors from Baumer are available in 6 different measuring ranges between 70 and 1500 mm. Selectable focus ranges are available for the measuring ranges 70, 140, 250, 600 and 1000 mm. By selecting the sensor, which covers exactly the important distance in the application with the focus range, the reliability of the measurement result can be significantly improved even with optically very demanding surfaces. If measured values are evaluated in the calibration over the entire measuring range, the sensor variant with focus range at the end of the measuring range should be selected.

### OM70 – undeterred precision

OM70 high performance distance sensors from Baumer combine high-precision measurement technology and easy handling in the automation industry. Thanks to a resolution of up to 0.7 µm and linearity deviation of up to 0.06 %, the sensors enable reliable measurement of components as well as high-precision positioning of objects or grippers. The sensors guarantee extremely high process stability despite variations in temperature or varying ambient light conditions and allow measuring distances up to 1500 mm.

#### Further information:

[www.baumer.com/om70](http://www.baumer.com/om70)



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