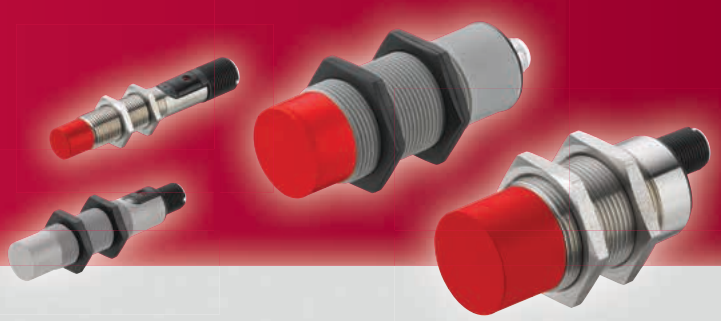
Leuze electronic

the sensor people

SMART
SENSOR
BUSINESS

CAPACITIVE SENSORS

Reliable detection of objects and fill levels



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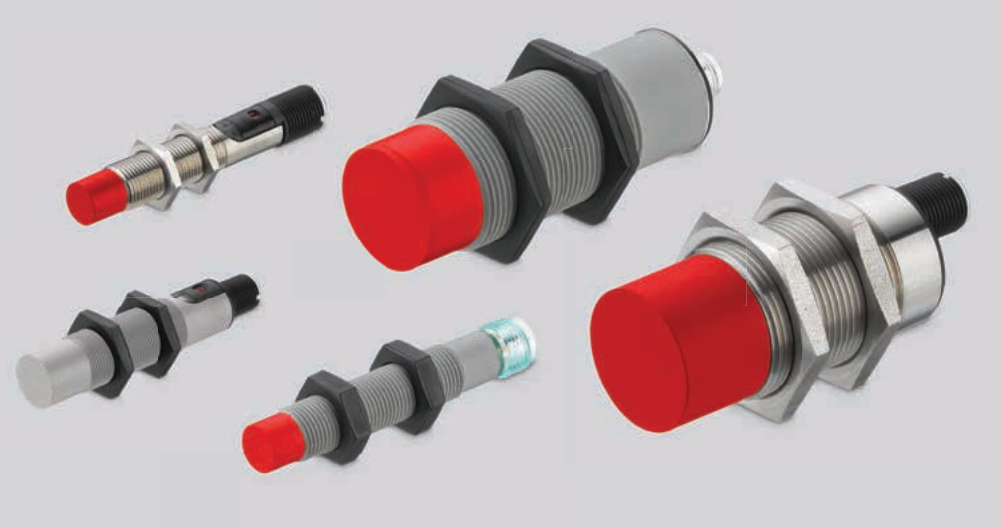
ПРОМЭЛЕКТРОНИКА / sales@prom-elec.com

CONTACT-FREE AND REACTIONLESS

Capacitive sensors make reliable detection of almost all materials in automation possible.



SOLID, LIQUID OR GRANULAR

Capacitive sensors are able to detect different objects and media without contact and regardless of shape. With these sensors, the fill levels of liquids or bulk materials can also be detected in direct contact with the medium or through a non-metallic container wall. In addition to object positioning, material flow monitoring, overflow protection and leak detection are therefore also important areas of application.

Due to their high sensitivity and capability of detecting both electrically conductive and non-conductive objects, capacitive sensors are used anywhere where other measurement principles no longer work.

Together with our overall portfolio of optoelectronic and inductive sensors, you can therefore find solutions for all detection requirements from a single source.

THE OPERATING PRINCIPLE MAKES THE DIFFERENCE

The function of a capacitive sensor is based on changes to the electrical field in the surroundings of its active zone. If the capacitor plate which is arranged behind the active zone is supplied with current, an electrostatic field is generated. This reacts to capacitance changes which are caused by an introduced object. Measurement variables which are interesting from a production-related point of view such as distances or fill levels can be transmitted to the control.

- Contactless and wear-free operation
- Detection has no influence on the product
- Resistant to interferences and contamination e.g. dust in the air
- Resistant to electromagnetic influences
- No moving parts, so the life expectancy is independent of the switching frequency
- Sensors suitable for different installation situations

*easy*handling.

- The large operating range makes presence detection possible in packaging or containers
- Particularly suitable for applications in contaminated and dusty environments
- Simple product selection via design and operating range in the product selector on our website
- Standardized connection technology, M12 and M8 connectors or cables for quick and error-free initial setup
- Adjustable switching distances for functional reliability and flexibility during use
- Broad range of connecting and attachment accessories

*think*modular.

- Selectable output types PNP/NPN with NC/NO switching function
- Variants for embedded and non-embedded mounting
- Cylindrical designs M12 to M30 in plastic, Teflon (PTFE) and metal housing with adjustable switching distance
- Cubic designs in plastic with adjustable switching distance, e.g. for attachment at pipelines
- IO-Link types with teach button for setting of switching distance and for permanent process optimization
- Versions for use in pharmaceutical or food processes in Teflon (PTFE) housing available
- Products with optimal function range for typical applications and for more complex application cases

WHAT YOU NEED TO KNOW ABOUT CAPACITIVE SENSORS

Basic technical know-how for successful use of capacitive sensors.

TWO DESIGNS ARE AVAILABLE FOR YOUR APPLICATION

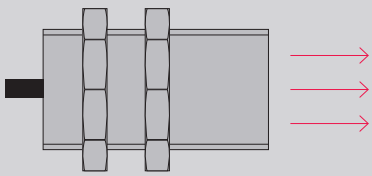
Capacitive sensors are available with embedded and non-embedded design.

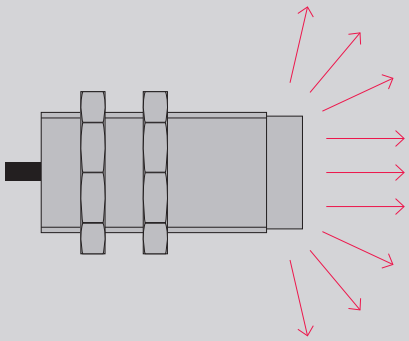
Embedded-mounted sensors
These sensors, which have a linear electrical field, scan solid objects (e.g. wafers, components, circuit boards, hybrids, cardboard boxes, stacks of paper, bottles, plastic blocks and panels) or media through a non-metallic dividing wall at a distance.

- Also suitable for solid objects with a low dielectric constant
- Object detection through non-metallic container wall (max. 4 mm thick)
- Detection of liquids and granulates is possible

Non-embedded-mounted sensors
These designs with a spherical-shaped electrical field should touch the product to be detected, i.e. bulk material or liquids (e.g. granulates, sugar, flour, grain, sand, oil and water), with their active surface in order to detect them reliably. Material stuck to the active surface does not impair sensor performance.

- Also suitable for bulk materials or liquids
- Sensor must touch the material to be detected
- Suppression of adhesions stuck to the active surface thanks to the spherical-shaped electrical field





THE MOST IMPORTANT INFLUENTIAL FACTORS

The capability of the sensor to detect an object is essentially determined by the size of the object, the dielectric constant (ε) and the distance from the sensor. Attention must also be paid to temperature-related influences and the speed of the measurement object.

YOUR DECISION-MAKING BASIS

Capacitive sensors have a unique technical characteristic, which determines their area of use and makes selection easier.

Advantages

1. Detection of metallic and non-metallic objects, liquids and solid objects
2. Sensors can "see through" certain materials (products in packaging and container walls)
3. Long life expectancy due to semiconductor technology
4. Diverse mounting options
5. Detection with or without contact possible

Note

1. The switching distance fluctuates considerably depending on the material to be detected
2. The detection of objects with low correction factor may be affected by environmental influences

Typical applications

- Level monitoring of bulk materials and granulates in silos and other containers
- Fill level monitoring of liquids
- Control switches for stack height control
- Breakage control of drive and conveying belts
- Material flow monitoring in mixing systems
- Edge monitoring of plastic sheeting
- Signal transmitter for counting tasks in the packaging and food industry and in the wood and plastic processing industry

THE ROLE OF THE DIELECTRIC CONSTANTS ε

The dielectric constant is a specific material property. This means that materials with large dielectric constants are easier to detect than ones with low values because the capacitive coupling between object and sensor depends on the size and the dielectric constants.

The theoretical correction factor relative to the switching distance is dependent upon the used material. The correction factor acts as a multiplier with the standard switching distance in order to take the material-related influence into account.

Object material	Correction factor
Alcohol	0.85
Epoxy resin	0.15 … 0.35
Grain	0.15 … 0.30
Glass	0.20 … 0.55
Rubber	0.15 … 0.90
Wood, wet	0.60 … 0.85
Wood, dry	0.10 … 0.40
Flour	0.05
Nylon	0.20 … 0.30
Polyamide	0.30
Salt	0.35
Sand	0.15 … 0.30
Water	1.00
Sugar	0.15

CYLINDRICAL AND CUBIC DESIGNS

Cylindrical sensors
LCS 1 / LCS 2

	LCS 1	LCS 2
	Extended Series	Advanced Series
Operating range	1 – 30 mm	
Switching frequency	Up to 100 Hz	
Types of installation	Embedded / non-embedded	
Certifications	UL / CE	CE
Housing material	Plastic / stainless steel	Plastic / brass, nickel-plated

- Reliable detection in demanding environments
- Large adjustment range of the operating range via potentiometer at all models
- NPN or PNP sensor output with NC or NO switching function
- M12 connection or cable, cable material PVC or PUR

Cylindrical sensors with PTFE - Special applications
LCS 1

	LCS 1
	Extended Series
Operating range	1 – 30 mm
Switching frequency	Up to 100 Hz
Types of installation	Non-embedded
Certifications	UL / CE
Housing material	Teflon (PTFE)

- Cylindrical sensors in Teflon (PTFE) are available for use in pharmaceutical packaging systems or food processes
- Only available with extruded cable for hygiene reasons
- Particularly suitable for semiconductor production
- NPN or PNP sensor output with NC or NO switching function
- Connecting cable in Teflon
- Detection in aggressive and polluted environments

Detection in rough and soiled environments

Completeness monitoring in the packaging industry

Cubic sensors
LCS 1

	LCS 1
	Extended Series
Operating range	1 – 20 mm
Switching frequency	Up to 100 Hz
Types of installation	Embedded
Certifications	UL / CE
Housing material	Plastic

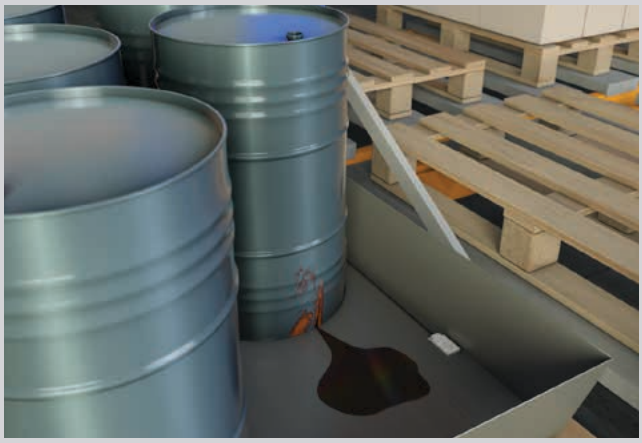
- Reliable detection of granules or liquids
- Flat design for fitting to exterior of containers e.g. for fill levels
- Different variants available: 40 x 40 x 10 mm and 54 x 20 x 5 mm

IO-Link
LCS 1

	LCS 1
	Extended Series
Operating range	1 – 10 mm
Switching frequency	Up to 10 Hz
Types of installation	Embedded
Certifications	UL / CE
Housing material	Plastic

- Process data via IO-Link
- Teach button
- With IO-Link interface for direct parameterization via the control
- Configurable switching behavior of the output

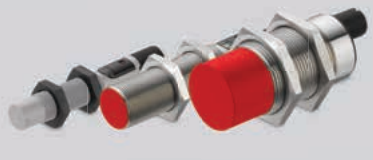
Leak monitoring of liquid containers



OUR PRODUCT RANGE OF CAPACITIVE SENSORS

Our wide range of variants provide an optimal solution for any application.

IO-Link



	Cylindrical sensors Extended series	Cylindrical sensors, Extended series with IO-Link	Cylindrical sensors, Extended series with PFTE housing
	M12 / M18 / M30	M18 / M30	M12 / M18 / M30
Dimensions	M12: Length 61 – 75 mm* M18: Length 75.5 – 88.5 mm* M30: Length 66.5 – 79 mm*	M18: Length 87.3 mm M30: Length 87.3 mm	M12: Length 53 mm M18: Length 73 mm M30: Length 72 mm
Operating range	1 – 25 mm	1 – 10 mm	1 – 30 mm
Switching frequency	100 Hz	10 Hz	100 Hz
Switching function	PNP / NPN NO / NC	PNP / NPN NO / NC (adjustable)	PNP / NPN NO / NC
Types of installation	Embedded / non-embedded	Embedded / non-embedded	Non-embedded
Housing	Stainless steel / plastic	Plastic	Teflon (PTFE)
Connection	M12 connector / PUR cable 2 m	M12 plug	PFTE cable 2 m
Certifications	UL / CE	UL / CE	UL / CE
Degree of protection	IP 67	IP 67	IP 67 (M12: IP65)
IO-Link*	–	Specified in accordance with version 1.1	–

*Type-dependent

	Cubic sensors Extended series	Cylindrical sensors Advanced series
		M12 / M18 / M30
Dimensions	54 × 20.3 × 5.5 mm 40 × 40 × 10 mm	M12: Length 55 – 68 mm* M18: Length 70 – 85 mm* M30: Length 85 – 98 mm*
Operating range	1 – 20 mm	1 – 30 mm
Switching frequency	100 Hz	100 Hz
Switching function	PNP / NPN NO / NC	PNP / NPN NO / NC
Types of installation	Embedded	Embedded / non-embedded
Housing	Plastic	Brass, plated / plastic
Connection	PUR cable 2 m / 0.3 m with M8 connector	M12 connector / PVC cable 2 m
Certifications	UL / CE	CE
Degree of protection	IP 67	IP 67

*Type-dependent

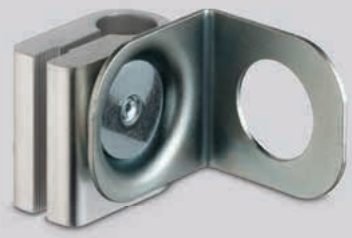
THE RIGHT ACCESSO-RIES COMPLETE THE PRODUCT RANGE

The best sensor is always only as good as the right accessories.

EVERYTHING PERFECTLY COORDINATED

AC D18M CS:
Quick change adapter

BTU D18M-Dxx:
Sensor attachment for rod mounting



BT DxxM:
Sensor mounting bracket

MC0xxK:
Mounting clamp

Sensor distribution box with M8 or M12 ports:
Sensor distribution boxes with 4/6/8/10 ports provide greater transparency in installation

Connection and interconnection cables with M8, M12 and M23 connectors, straight or angled, optionally with LED

OUR PROMISE TO YOU

SMARTER **PRODUCT USABILITY**

With regard to our product developments, we systematically place emphasis on the especially good usability of all devices. To this end, simple mounting and alignment are taken into account – just as the uncomplicated integrability of the sensors in existing field bus systems and easy configuration, e.g. via a web browser, are.

SMARTER **APPLICATION KNOW-HOW**

Whoever can do it all, can do nothing right. Which is why we concentrate on selected target sectors and applications. There, we are specialists and know all aspects inside out. For this purpose, we optimize our solutions and offer a comprehensive product range that makes it possible for our customers to obtain the absolute best solutions from a single source.

SMARTER **CUSTOMER SERVICE**

The technical and personal proximity to our customers, and a skilled, straightforward handling of queries and problems, are among our strengths – and will remain so. Consequently, we will continue to expand our service offerings and, indeed, also forge ahead in new directions to persistently redefine the utmost in customer service. Whether on the phone, on the Internet or on-site with our customers – regardless of when and where the expertise of the sensor people is needed at any time.

Info at: **www.leuze.com**

Martina Weil,
Employee in the
Customer Care Center

Switching Sensors
Optical Sensors
Ultrasonic Sensors
Fiber Optic Sensors
Inductive Switches
Forked Sensors
Light Curtains
Special Sensors

Measuring Sensors
Distance Sensors
Sensors for Positioning
3D Sensors
Light Curtains
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Safe Control Components
Machine Safety Services

Identification
Bar Code Identification
2D-Code Identification
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Data Transmission / Control Components
MA Modular Connection Units
Data Transmission
Safe Control Components
Signaling Devices
Connection Technology and Passive Distribution Boxes

Industrial Image Processing
Light Section Sensors
Smart Camera

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