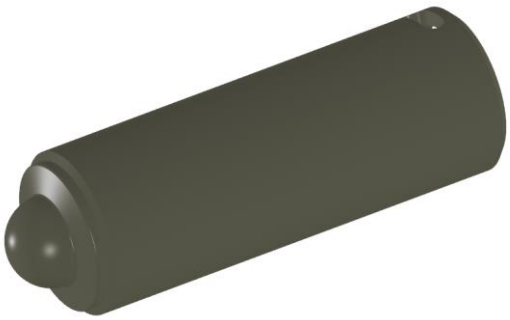
Universalsensor Datasheet



Housing type A

Housing type B

1 General Description

- Smart optoelectronic sensor for universal use
- Very low ambient-light susceptibility due to Lock-In algorithm
- Operation temperature range between -40°C .. +55°C
- 24VDC +30% / -50% input voltage range
- Reverse polarity and overvoltage protection
- Output configurable to high-side, low-side or push-pull
- Integrated LED indication (red / green)
- Integrated temperature sensor
- Sensor is equipped with M12-plug for easy integration into application
- Complies to EN 61326-1
- Complies to EN 50155
- Complies to EN 45545-2

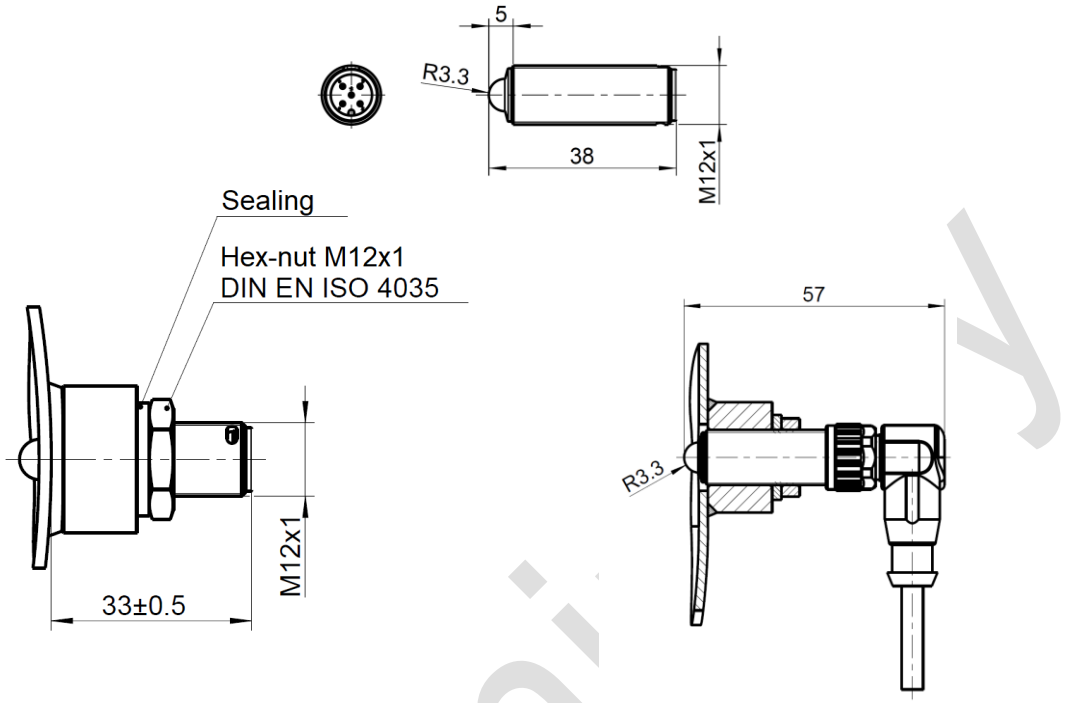
2 Applications, Intended Use

- The Universalsensor is intended for use in laboratory, industrial or rolling stock applications.
- The sensor may be used in applications as a refractive sensor for binary liquid mixtures (housing type A preferred), or as a liquid level sensor (housing type B preferred).

3 Mechanical characteristics

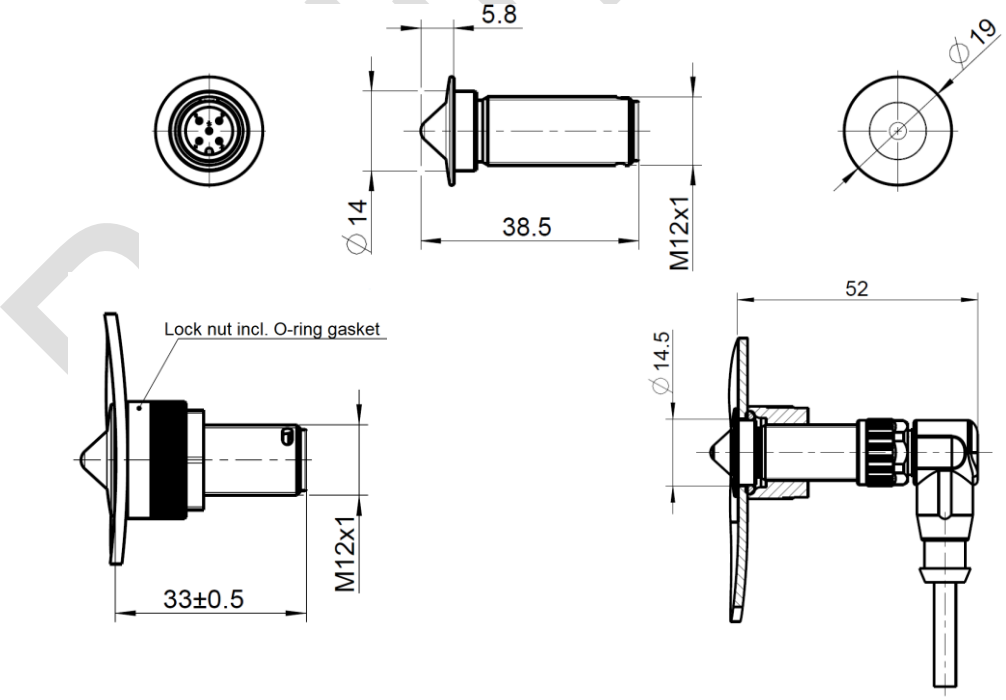
Housing type A back faced mounting

Product variant 30-109260:



Housing type B push-through installation

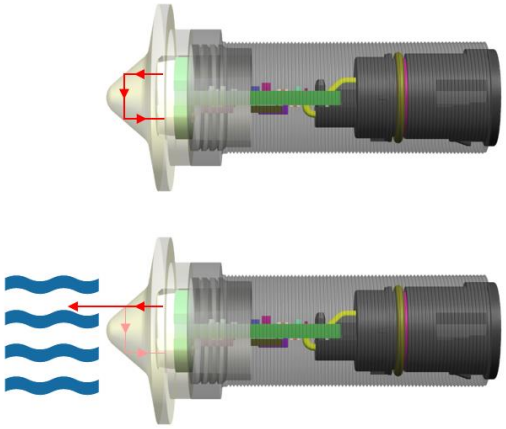
Product variant 30-109261:



Technical data	
Overall length (typical)	ca. 57mm (type A; incl. mating angled M12 connector)
	ca. 58mm (type B; excl. M12 angled mating connector)
Length of housing	38mm (type A) / 38.5mm (type B)
Diameter of housing dome	10.8mm (type A) / 19mm (type B)
Diameter of mounting hole	M12x1 (type A) / 14.5mm (type B)
Diameter of screw nut	20mm (type B)
Housing Material	PSU (polysulfone)
Colour of housing	transparent
Thread	M12 x 1
Weight	approx. 4g
IP class	IP67 (with appropriate external connector interface)

4 General Description

The mode of operation of the Universalsensor is derived from the principle of total internal reflection. An infrared LED is emitting light to the sensor's optical head. When the optical head is dry, the light will be internally reflected into the sensor's infrared detector. When the optical head is wetted, a part of the light is coupled out into the liquid and doesn't reach the detector. An integrated processing unit analyses the signal from the infrared detector and switches the sensor outputs depending on the signal level and the corresponding threshold parameter.



Available Sensor variants		
Part No.	**Part description**	**Remark**
30-109260	Universalsensor type A	Back faced mounting (housing type A); Refractive measurement application preferred
30-109261	Universalsensor type B	Push-trough installation (housing type B); Liquid level sensing application preferred

Standards	Description	Remarks
2014/30/EU	EU directive electromagnetic compatibility	
2011/65/EU	EU directive on restriction of the use of certain hazardous substances in electrical and electronic equipment	
EN 50155	Railway application - Electronic equipment used on rolling stock	
EN 50121-3-2	Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus	
EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements	
EN 50124-1	Railway applications - Insulation coordination – Part 1: Basic requirements - Clearance and creepage distances	
EN 50153	Railway applications - Rolling stock - Protective provisions relating to electrical hazards	
EN 45545-2	Fire protection on railway vehicles – Part 2: Requirements for fire behaviour of materials and components	HL1 – HL3
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests	See ch. 6
EN 60529	Degrees of protection provided by enclosures (IP Code)	See ch. 3

Functional Data	
Detection delay	<= 0,1sec
Detection accuracy	±2mm
Detecion hysteresis	<= 2mm
Power on delay	<= 2sec
Indicator LED	Color = green LED = on when liquid detected (optional factory preset) LED = on when no liquid detected (optional factory preset) LED = blinking self-test failed
Power on self-test	Code memory checksum = ok Data memory = ok Parameter data = ok Datalogger data = ok Optical sensor subsystem = ok

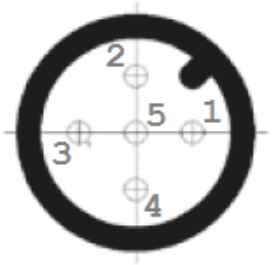
Factory Preset Parameters	
Power on delay	0 – 60,000msec (see note 2)
Liquid Level detection on-delay	0 – 60,000msec (see note 2)
Liquid Level detection off-delay	0 – 60,000msec (see note 2)
Note 2	Factory preset values, default = 0msec

Built-In Datalogger	
No. of power on cycles	max. 2,147,483,648
Elapsed time meter	15min resolution / max. 536,870,912 hours / abt. 61,000 years
No. of Liquid Level on transitions	max. 2,147,483,648

Life cycle data	
lifetime	approx. 10 years (class L2 acc. EN 50155)
warranty	1 year

5 Electrical characteristics

Feature	Description
Power supply	24VDC +30% / -50%
Supply voltage interruption	≤ 10ms (class S2 acc. EN 50155)
Supply change over	0,6 U_N <100ms (class C1 acc. EN 50155)
Current consumption	< 5mA (w/o output load)
Output (digital)	24 VDC based configurable high-side / low-side / push-pull output (< 10 Ω) configurable short circuit current ≥ 110mA
Communication interface	Raw sensor data via serial 1-wire-interface based on IEC 61131-9 (optional)

Plug position / conductor marking	Description
	M12 acc. IEC 61076-2-101 Male, A-coded 
1	+24V DC
2	Not connected
3	Ground (0V DC)
4	Output
5	Do not connect / not for customer use

6 Environment characteristic

Feature	Description
Operating temperature	-40°C .. +55°C (class OT2 acc. EN 50155)
Start-up extended temperature	+70°C (class ST1 acc. EN 50155)
Temperature variation	No requirements (class H1 acc. EN 50155)
Storage temperature	-40°C .. +70°C
Storage humidity	max. 95%, non-condensing
Working humidity	max. 95%, non-condensing
Working height	max. 1400m asl (class A1 acc. EN 50125-1)
Pollution degree	PD1
Shock / vibration	Cat. 1 class B (classification acc. EN 61373)
Protective coating class	Hermetically sealed (class PCX acc. EN 50155)
Resistance to chemicals	Liquid solutions of Citric acid:15 % Amidosulfon acid:15 % Phosphor acid: 5% Chlordioxid: 5% Hydrogene peroxide :5% Waste water / black water Human Urea

7 Installation

- The typical mounting orientation of the sensor is horizontal. A vertical mounting orientation is not recommended. It has to be ensured, that liquids do not adhere on the sensor housing.
- Assembling instruction are given within an instruction leaflet, which is scope of delivery.
- The bonding surface of sensor and position of installation must be clean and free from burrs.
- The connection cable of sensor should be supported mechanically.
- Assemble the sensor including the gasket with a torque of 100 Ncm.
- Housing type A variant:
  Thread sealant has to be considered. For details, please refer to the instruction leaflet.

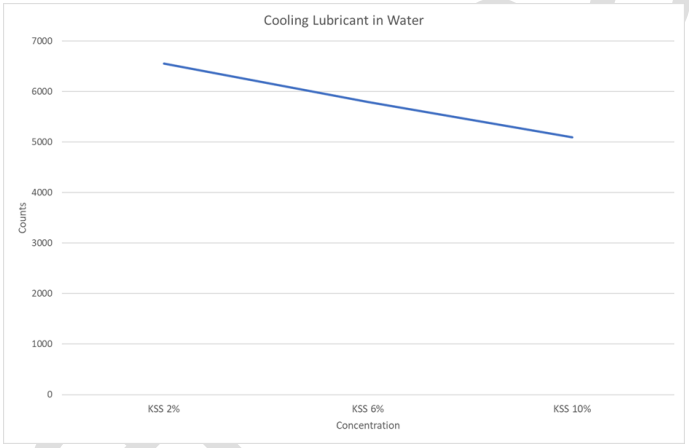
8 Application information

General information:

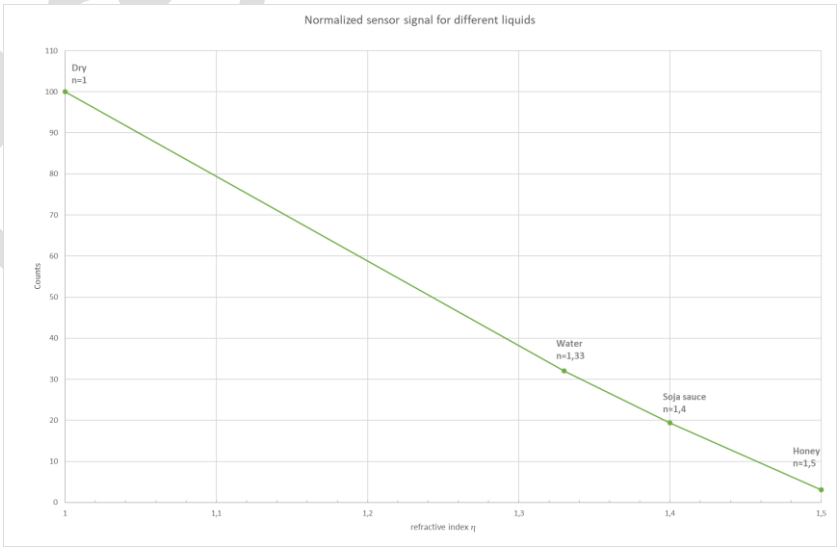
- The measurement is continuously internal triggered by software. The calculation of the sensor state against internal threshold level requires a time period of 1 second.
- If the dome of the sensor housing is dipped into liquids, the sensor signal will be activated with a delay of 1s. If the sensor front is removed from the liquid surface completely, the signal will be deactivated with a delay of at least 1s.
- It has to be considered, that liquids may adhere to the sensor housing during liquid level drops, depending on the viscosity of the media. Therefore, an additional delay within the external control application is recommended.

Application examples:

- Determination of cooling lubricant concentration in water:



- Sensor signal response regarding different refractive liquids:



9 Cleaning

- Neutral cleaning agent and warm water may be used for cleaning purpose
- The sensor is resistant to the following common ingredients of cleansing agents:
    - Citric acid:15 %
    - Amidosulfon acid:15 %
    - Phosphor acid: 5%
    - Chlordioxid: 5%
    - Hydrogene peroxide :5%
- Make sure that the cleaner does not react with the sensor housing materials
- Do not use abrasive cleaning options
- Remove cleaning material after use
- The sensor should be free of cleaning residues

10 Packaging Information

The Universalsensor is provided by m-u-t preassembled and tested with an additional instruction leaflet. The package includes the sensors, screw nuts and additional accessories like O-ring gasket (depending on product variant). An instruction leaflet regarding further necessary preparations is included in the package.

10.1 Labelling

The package of the Universalsensor is marked with a type label, including an individual serial number.

11 Contact

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Version History

Version	Date	Author	Comments
0.1	2022-10-28	T. Steinbeck	Preliminary issued for initial sample