

KTML

Contrast sensors

SICK
Sensor Intelligence.



Described product

KTML

Manufacturer

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Original document

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Contents

1	About this document.....	5
1.1	Information on the operating instructions.....	5
1.2	Further information.....	5
1.3	Symbols and document conventions.....	5
2	Safety information.....	7
2.1	Basic safety notes.....	7
2.2	Qualification of personnel.....	7
2.3	Intended use.....	8
2.4	Improper use.....	8
3	Product description.....	9
3.1	Product identification via the SICK product ID.....	9
3.2	Operating and status indicators.....	9
4	Mounting.....	10
4.1	Scope of delivery.....	10
4.2	Mounting requirements.....	10
4.3	Mounting the device.....	10
5	Electrical installation.....	12
5.1	Notes on the electrical installation.....	12
5.2	Pin assignment of the connections.....	13
5.3	Connecting the supply voltage.....	13
5.4	Notes on UL approval.....	13
6	Commissioning.....	14
6.1	Sensitivity.....	14
6.2	2-point-teach-in (static) via teach-in button.....	15
6.3	Dynamic teach-in.....	16
7	Troubleshooting.....	18
7.1	Possible errors.....	18
8	Maintenance.....	19
8.1	Maintenance.....	19
8.2	Cleaning the device.....	19
9	Disposal.....	21
10	Technical data.....	22
10.1	General data.....	22
10.2	Dimensional drawing.....	23
11	Recommended accessories.....	24

12	Annex.....	25
12.1	Conformities and certificates.....	25
12.2	Licenses.....	25

1 About this document

1.1 Information on the operating instructions

Read these operating instructions carefully before starting any work in order to familiarize yourself with the product and its functions.

The operating instructions are an integral part of the product and should remain accessible to the personnel at all times. When handing this product over to a third party, include these operating instructions.

These operating instructions do not provide information on the handling and safe operation of the machine or system in which the product is integrated. Information on this can be found in the operating instructions for the machine or system.

1.2 Further information

You can find the product page with further information via the SICK Product ID: pid.sick.com/{P/N}/{S/N} (see "Product identification via the SICK product ID", page 9).

The following information is available depending on the product:

- This document in all available language versions
- Data sheets
- Other publications
- CAD files and dimensional drawings
- Certificates (e.g., declaration of conformity)
- Software
- Accessories

1.3 Symbols and document conventions

Warnings and other notes



DANGER

Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.



WARNING

Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.



CAUTION

Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.



NOTICE

Indicates a situation presenting possible danger, which may lead to property damage if not prevented.



NOTE

Highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

Instructions to action

- ▶ The arrow denotes instructions to action.
- 1. The sequence of instructions is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The tick denotes the results of an action.

2 Safety information

2.1 Basic safety notes

Please observe the safety notes and the warnings listed here and in other sections of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.



CAUTION

Failure to observe the relevant work safety regulations may lead to physical injury or cause damage to the system.

Laser notes



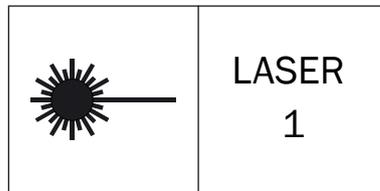
CAUTION

Optical radiation: Laser class 1

The accessible radiation does not pose a danger to the eyes or skin when viewed directly for up to 100 seconds.

Caution - if any operating or calibrating equipment other than those specified here are used or other methods are employed, this can lead to dangerous exposure to radiation.

- ▶ Use only the tools and auxiliary equipment specified in this documentation.
- ▶ Only carry out the procedures specified in this documentation.
- ▶ Do not open the housing unless carrying out the mounting and maintenance operations provided in this documentation. Opening the housing will not switch off the laser. Opening the housing may increase the level of risk.



EN 60825-1:2014+A11:2021

IEC 60825-1:2014

Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1:2007 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

Further laser protection regulations that need to be observed may apply (e.g. national laws).

Repairs and modifications



DANGER

Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ▶ Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.

2.2 Qualification of personnel

Any work on the product may only be carried out by personnel qualified and authorized to do so.

Qualified personnel are able to perform tasks assigned to them and can independently recognize and avoid any potential hazards. This requires, for example:

- technical training
- experience
- knowledge of the applicable regulations and standards

2.3 Intended use

The KTML contrast sensor is an opto-electronic sensor for the optical, non-contact detection of contrasts.

A contrast sensor is designed for mounting and may only be operated according to its intended function. For this reason, it is not equipped with direct safety devices.

The system designer must provide measures to ensure the safety of persons and systems in accordance with the legal guidelines.

SICK AG assumes no liability for losses or damage arising from the use of the product, either directly or indirectly. This applies in particular to use of the product that does not conform to its intended purpose and is not described in this documentation.

UL: Only for use in application in accordance with NFPA79.

2.4 Improper use

- The device does not constitute a safety-relevant device according to the EC Machinery Directive (2006/42/EC).
- The device must not be used in explosion-hazardous areas.
- Any other use that is not described as intended use is prohibited.
- Any use of accessories not specifically approved by SICK AG is at your own risk.

The device is not suitable for the following applications (this list is not exhaustive):

- As a safety device to protect persons, their hands, or other body parts
- Underwater
- In explosion-hazardous areas
- Outdoors, without additional protection



NOTICE

Danger due to improper use!

Any improper use can result in dangerous situations.

Therefore, observe the following information:

- ▶ The device should be used only in line with intended use specifications.
 - ▶ All information in these operating instructions must be strictly complied with.
-

3 Product description

3.1 Product identification via the SICK product ID

SICK product ID

The SICK product ID uniquely identifies the product. It also serves as the address of the web page with information on the product.

The SICK product ID comprises the host name pid.sick.com, the part number (P/N), and the serial number (S/N), each separated by a forward slash.

For many products, the SICK product ID is displayed as text and QR code on the type label and/or on the packaging.



Figure 1: SICK product ID

3.2 Operating and status indicators

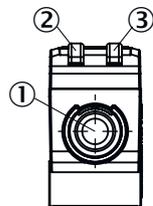


Figure 2: Operating elements

- ① Yellow LED: digital output
- ② Green LED: Supply voltage active
- ③ Teach-in button



NOTE



Activation and deactivation: hold down teach-in button > 30 s.

Yellow LED will blink continuously when holding down teach-in button during the 30 seconds and off when lock is activated. When locked, the yellow indicator will not lit even when teach-in button is pressed. To unlock, press teach in button for 30 seconds.

4 Mounting

4.1 Scope of delivery

- Contrast sensor in the version ordered
- Quickstart
- Safety notes

4.2 Mounting requirements

- Typical space requirement for the device, see type-specific dimensional drawing, see ["Technical data", page 22](#).
- Comply with technical data, such as the permitted ambient conditions for operation of the device (e.g., temperature range, EMC interference emissions, ground potential).
- To prevent condensation, avoid exposing the device to rapid changes in temperature.
- Protect the device from direct sunlight.
- The device must only be mounted using the pairs of mounting threads/fixing holes provided for this purpose.
- Shock and vibration-free mounting.

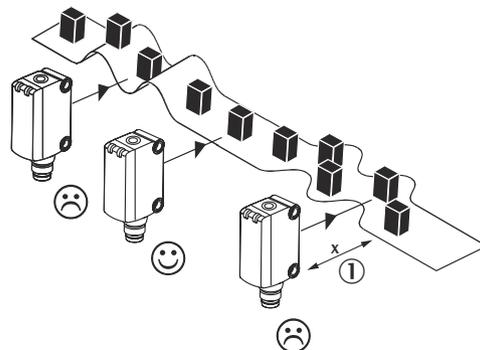
4.3 Mounting the device



Figure 3: KTML

1. Install the sensor via the fixing hole so that the light spot enters the mark longitudinally and the test object has the least possible vertical and horizontal movement. Note the sensing distance while doing so.
2. Compensate for the vertical and horizontal movement of the test object by marks of suitable lengths.
3. Ensure that any sensor movement does not affect the sensing distance.

To secure a stable detection when having high gloss material a tilt angle of 10°-15° might be necessary.



- ① Distance x:
KTM-Lx22xxxx = 50 mm
KTM-Lx55xxxx = 250 mm

5 Electrical installation

5.1 Notes on the electrical installation

**NOTICE****Device damage due to incorrect supply voltage!**

An incorrect supply voltage may result in damage to the device.

- Only operate the device with safety/protective extra-low voltage (SELV/PELV).

-



The sensor is a device of protection class III.

**NOTICE****Device damage due to incorrect supply voltage!**

An incorrect supply voltage may result in damage to the device.

- Only operate the device with an LPS (limited power source) in accordance with IEC 62368-1 or an NEC Class 2 power supply unit.

**NOTICE****Device damage or unpredictable operation due to working with live parts!**

Working with live parts may result in unpredictable operation.

- Only carry out wiring work when the power is off.
- Only connect and disconnect electrical connections when the power is off.

- **The electrical installation must only be performed by electrically qualified personnel.**
- **Standard safety requirements must be met when working on electrical systems!**
- Only switch on the supply voltage for the device when the connection tasks have been completed and the wiring has been thoroughly checked.
- When using extension cables with open ends, ensure that bare wire ends do not come into contact with each other (risk of short-circuit when supply voltage is switched on!). Wires must be appropriately insulated from each other.
- Wire cross-sections in the supply cable from the user's power system must be selected in accordance with the applicable standards.
- Only operate the device with an LPS (limited power source) in accordance with IEC 62368-1 or an NEC Class 2 power supply unit.
- All circuits connected to the device must be designed as SELV/PELV circuits.

The IP enclosure rating for the device is only achieved under the following conditions:

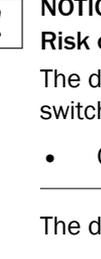
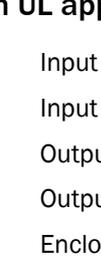
- The cables plugged into the connections are screwed tight with the correct tightening torque.

If these instructions are not complied with, the IP enclosure rating for the device is not guaranteed!

5.2 Pin assignment of the connections

Overview of pin assignment

Table 1: DC

KTM-	Lxxx181P Lxxx182P	Lxxx7A1P Lxxx742P
1 = BN	+ (L+)	+ (L+)
2 = WH	ET	Q
3 = BU	- (M)	- (M)
4 = BK	Q	C/Q
		

Legend

L+ = supply voltage

ET = external teach-in

M = ground

Q = switching output

C = Communication

5.3 Connecting the supply voltage



NOTICE

Risk of damage to the device!

The device can become damaged if it is connected to a voltage supply that is already switched on.

- Only connect the device when the supply cable is de-energized.

The device must be connected to a power supply unit with the following properties:

- Supply voltage DC 10,8 V – 28,8 V (SELV/PELV as per currently valid standards)
- Electricity source with at least 4 W power

To ensure protection against short-circuits/overload in the customer's supply cables, the wire cross-sections used must be appropriately selected and protected.

5.4 Notes on UL approval

Input voltage: 10...30 V DC (Class 2)

Input current: max. 100 mA

Output voltage: max. 30 V DC (Class 2)

Output current: max. 100 mA

Enclosure Type 1

6 Commissioning

6.1 Sensitivity

Light spot dimensions

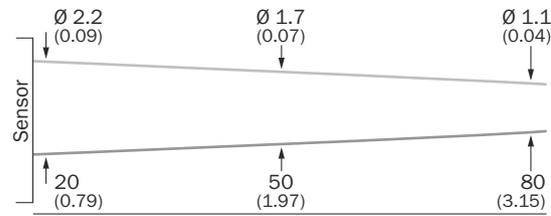


Figure 4: Line spot dimensions in mm (inch), 50 mm version

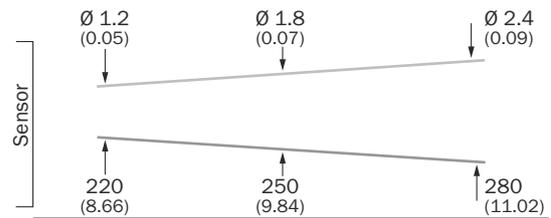


Figure 5: Line spot dimensions in mm (inch), 250 mm version

Please note the differences in the sensitivity at different sensing ranges.

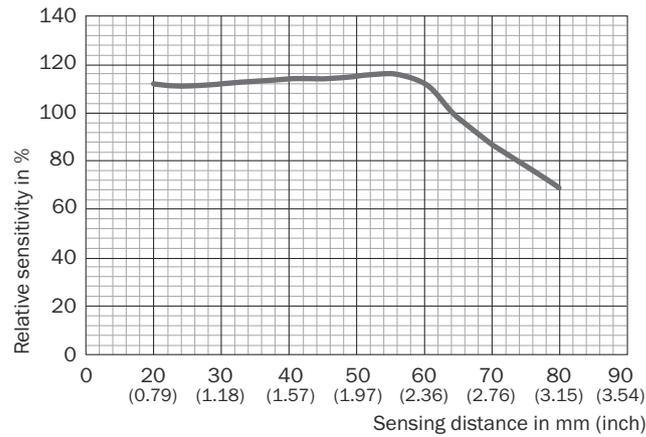


Figure 6: KTML 50 mm version

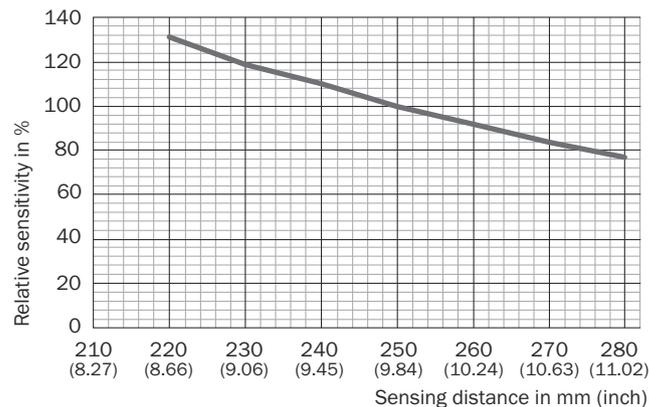
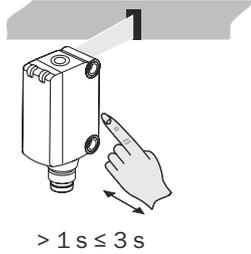


Figure 7: KTML 250 mm version

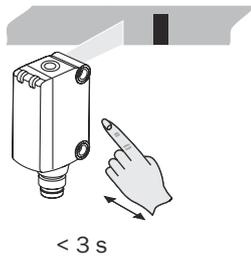
6.2 2-point-teach-in (static) via teach-in button

1. Bring the mark into the light spot and start teach-in with teach-in pushbutton ($> 1 \text{ s} \leq 3 \text{ s}$).

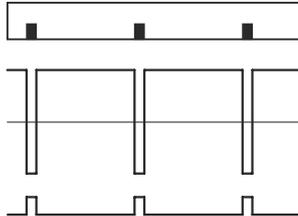


The emitted light and the yellow LED flash slowly: i. e. second teach-in process must be triggered.

2. Bring background into the light spot and start teach-in with teach-in button ($> 20 \text{ ms} < 3 \text{ s}$).



- ✓ The optimum emitted light is automatically selected. The switching threshold is set in the center between the mark's receive signal and background and is stored in a nonvolatile memory. Output active by mark (first teach-in). This example is showing dark switching (switch on the mark):



NOTE

Light / dark switch:

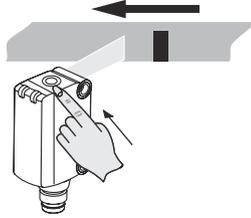
The light/dark setting is defined using teach-in sequence.

Light switch can be achieved by teaching the background first and then the mark.

6.3 Dynamic teach-in

Dynamic teach-in via teach-in button

1. Bring the mark or background into the light spot. Hold down teach-in button > 3 s < 30 s.

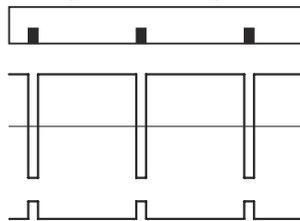


> 3 s ≤ 30 s

The emitted light and the yellow LED flash slowly. Move material through light spot (min. one repeat length).

- ✓ Quit the teach-in procedure by releasing the teach-in-button. The optimum emitted light is automatically selected.

The switching threshold is set in the center between the mark's receive signal and background and is stored in a nonvolatile memory. Output will be activated by mark (first teach-in).



Dynamic teach-in via ET

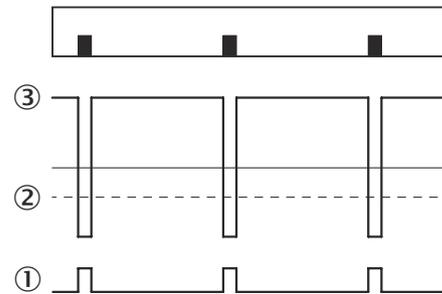
Dynamic teach-in can also be done via the control cable. Control cable High > 30 ms. Connecting pin 2 (ET) to pin 1 +(L+).

Switching threshold "close to mark" via teach-in-button



NOTE

By default, the switching threshold is set in the center between the background and the mark. In the event of intermittent error switching on the background, it may be helpful to place the threshold close to the mark to increase stability (dotted line instead of solid line in the figure below).



- ① Switching output Q
- ② Switching threshold
- ③ Internal signal received

This can be done by pressing teach-in button again > 20 ms and < 10 s after static or dynamic teach-in. Emitted light and function LED flash 2 x. If the switching threshold is to be reset to the center, new teach-in is required.



NOTE

Light / dark switch:

Switching output active on mark, if background is longer in the field of view during the teach-in or vice versa.

This can be reversed if mark is longer in the field of view during the teach in process.

7 Troubleshooting

7.1 Possible errors

Table 2: Troubleshooting

Display, error situation	Cause	Measure
<ul style="list-style-type: none">• Function LEDs blinking• Q Emitted light blinking• 5 Hz pulse via switching output Q	<ul style="list-style-type: none">• Insufficient contrast• Sensing distance exceeded	<ul style="list-style-type: none">• Readjust sensor• Clean the sensor lens• Try tilting the sensor

8 Maintenance

8.1 Maintenance

During operation, the device works maintenance-free.

Depending on the assignment location, the following preventive maintenance tasks may be required for the device at regular intervals:

Table 3: Maintenance schedule

Maintenance work	Interval	Implementation
Clean housing and front screen	Cleaning interval depends on ambient conditions and climate	Specialist
Check screw connections and plug connectors	Every 6 months	Specialist

8.2 Cleaning the device

At regular intervals (e.g., weekly), check the light emission window and the housing of the device for dirt. This is especially relevant in harsh operating environments (dust, abrasion, damp, fingerprints, etc.). The lens of the light emission window must be kept clean and dry during operation.



NOTICE

Device damage due to improper cleaning!

Improper cleaning may result in device damage.

- Only use suitable cleaning agents.
- Never use sharp objects for cleaning.

Cleaning the light emission window



NOTICE

Damage to the light emission window!

Reduced reading performance due to scratches or streaks on the light emission window!

- ▶ Clean the light emission window only when wet.
- ▶ Use a mild cleaning agent that does not contain powder additives. Do not use aggressive cleaning agents, such as acetone, etc.
- ▶ Avoid any movements that could cause scratches or abrasions on the light emission window.
- ▶ Only use cleaning agents suitable for the lens material.



NOTE

Static charge may cause dust particles to stick to the light emission window. This effect can be avoided by using an anti-static glass cleaner in combination with the SICK lens cloth (can be obtained from www.sick.com).



NOTE

If the light emission window is scratched or damaged (cracked or broken), the device must be replaced. Contact SICK Service to arrange this.

Cleaning the housing

In order to ensure that the heat produced by the internal power loss is adequately dissipated, the housing surface must be kept clean.

9 Disposal

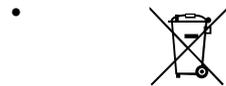
The product must be disposed of in line with applicable country-specific regulations. When disposing of them, you should try to recycle them (especially the precious metals).



NOTE

Disposal of batteries, electric and electronic devices

- According to international directives, batteries, accumulators and electrical or electronic devices must not be disposed of in general waste.
- The owner is obliged by law to return this devices at the end of their life to the respective public collection points.



WEEE:  This symbol on the product, its packaging or in the document indicates that a product is subject to the specified regulations.

10 Technical data

10.1 General data

Table 4: Technical data

Attribute	KTM-LP2218xP KTM-LP5518xP	KTM-LN2218xP KTM-LN5518xP	KTM-LP227AxP KTM-LP557AxP	KTM-LN227AxP KTM-LN557AxP
Sensing range	KTM-Lx22xxxx: 50 mm KTM-Lx55xxxx: 250 mm			
Light spot size	KTM-Lx22xxxx @ 50 mm: Ø1.7 mm ¹⁾ KTM-Lx55xxxx @250 mm: Ø1.8 mm ¹⁾			
Supply voltage U _B	DC 10 ... 30 V ²⁾			
Maximum pulse power	KTM-Lx22xxxx: ≤ 9.76 mW KTM-Lx55xxxx: ≤ 11.82 mW			
Pulse duration	2 µs			
Wavelength	670 ... 690 nm			
Switching type	PNP	NPN	PNP / IO-Link	NPN / IO-Link
Output function	PNP	NPN	PNP	NPN
Output current I _{max.}	100 mA ³⁾			
External teach	Teach: U = 10.8 V ... < V _S Run: U < 2 V or open	Teach: U < 2 V _S Run: U > V _S - 2 V or open	N. A.	N. A.
IO-Link	No	No	✓	✓
Switching frequency	KTM-Lx22xxxx: 4 kHz ⁴⁾ KTM-Lx55xxxx: 1.5 kHz ⁴⁾			
Max. web speed	10 m/s ⁵⁾			
Jitter	KTM-Lx22xxxx: 57 µs KTM-Lx55xxxx: 122 µs			
Response time	KTM-Lx22xxxx: 125 µs ⁶⁾ KTM-Lx55xxxx: 333 µs ⁶⁾			
Enclosure rating	IP 67			
Protection class				
Ambient temperature, operation	KTM-Lx22xxxx: -20 °C ... +45 °C KTM-Lx55xxxx: -20 °C ... +50 °C			

1) See diagrams in [page 14](#)

2) Limit value:

12 V (-10 %) ... 24 V (+20 %). Power consumption without load < 50 mA. Limit values
Reverse polarity protected U_B connections
Residual ripple max. 5 V_{SS}

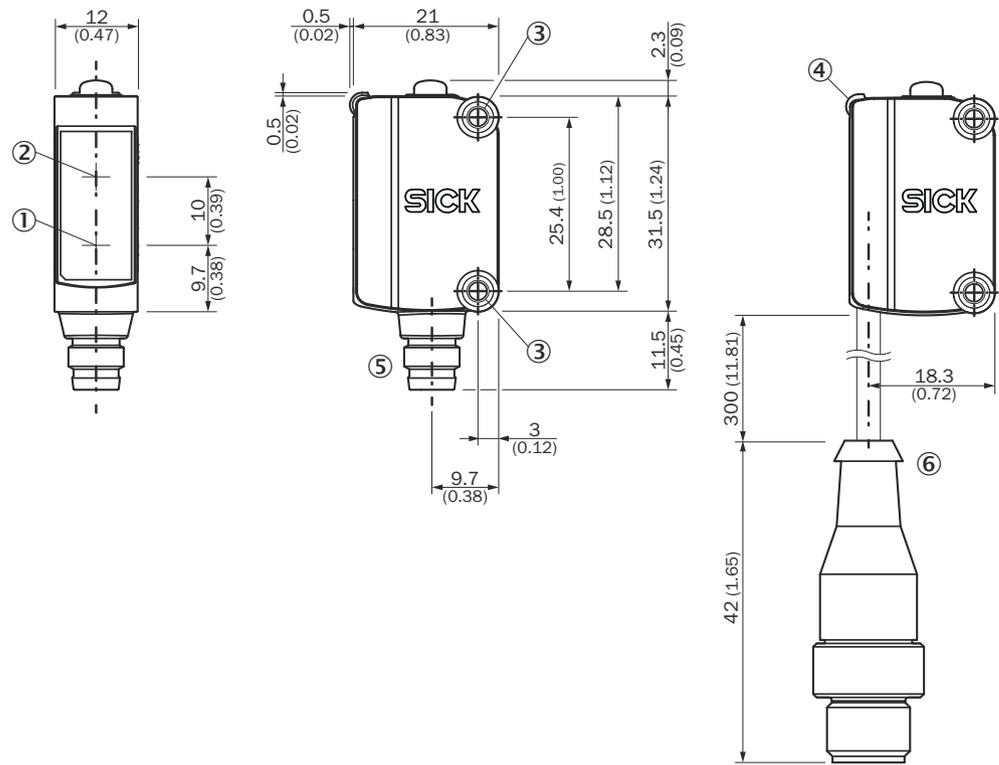
3) At supply voltage > 24 V, I_{max} = 50 mA. I_{max} is consumption count of all Qn.

4) With a light/dark ratio of 1:1.

5) At mark size = 1.5 mm

6) Signal transit time with resistive load

10.2 Dimensional drawing



- ① Center of optical axis, sender
- ② Center of optical axis, receiver
- ③ M3 threaded mounting hole
- ④ Operating and status indicators

11 Recommended accessories

Suitable connector to be used together with the KTML (connector variants) is connector cable with M8 connector, female, 4-pin.

Example of recommended connector cable is:

Table 5: Cable with M8 connector, female, 4-pin

Male connectors and cables			
	Head A: female connector, M8, 4-pin, straight, A-coded Head B: Flying leads Cable: Sensor/actuator cable, PVC, unshielded, 5 m	YF8U14-0 50VA3XLE AX	2095889

Suitable connector to be used together with the KTML (pigtail M12 connector variants) is connector cable with M12 connector, female, 4-pin.

Example of recommended connector cable is:

Table 6: Cable with M8 connector, female, 4-pin

Male connectors and cables			
	Head A: female connector, M12, 4-pin, straight, A-coded Head B: Flying leads Cable: Sensor/actuator cable, PVC, unshielded, 5 m	YF2A14-0 50VB3XLE AX	2096235

These are only examples and recommendations. Please refer to the SICK website for more connector cable options.

12 Annex

12.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

12.2 Licenses

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