Leuze

Original operating instructions

CMS 708i

Contour measurement system

The Sensor People

We reserve the right to make technical changes
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1 About this document

These operating instructions contain information about the intended use of the CMS 700i contour measurement system. It is included in the delivery contents.

Used symbols and signal words

Tab. 1.1: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating possible property damage
NOTE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for serious injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.
DANGER	Signal word for life-threatening danger Indicates dangers with which serious or fatal injury is imminent if the measures for danger avoidance are not followed.

Tab. 1.2: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbol for action steps Text passages with this symbol instruct you to perform actions.
	Symbol for action results Text passages with this symbol describe the result of the preceding action.

2 Safety

The CMS 700i contour measurement system and its components were developed, manufactured and tested in accordance with the applicable safety standards. It corresponds to the state of the art.

2.1 Intended use

The contour measurement system is designed as a measuring and object-detecting, configurable, multi-sensor unit.

Areas of application

The contour measurement system is designed for the measurement and detection of objects for the following areas of application in handling and warehousing systems, the packaging industry or a comparable environment:

- Dimensional measurements such as length, width and height
- Orientation angle of measured material on a transport medium
- Contour measurement

CAUTION

Observe intended use!

The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not complying with its intended use.

- Only operate the device in accordance with its intended use.
- Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.
- Read these operating instructions before commissioning the device. Knowledge of the operating instructions is an element of proper use.

NOTICE

Comply with conditions and regulations!

- Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.

NOTICE

Provisions regarding the UL scope of application

When using the switch cabinet of the CMS 700i contour measurement system within the UL scope of application, only the labels on the inside that are marked with a corresponding UL symbol apply.

When using the switch cabinet of the CMS 700i contour measurement system outside of the UL scope of application, only the label on the outside applies.

The power supply cable installed standard is approved for use within the UL scope of application. If necessary, it can also be used outside of the UL scope of application.

Outside of the UL scope of application, the switch cabinet should be connected to the power supply according to the applicable local legal regulations and provisions. This may involve removing the power supply cable installed standard.

NOTICE

The evaluation unit of the contour measurement system may only be opened for the following purposes:

- for plugging in or unplugging the software dongle, see chapter 7.1 "Plugging in the software dongle".

- for viewing the inside label within the UL scope of application.

- for connecting to the power supply outside of the UL scope of application.

2.2 Foreseeable misuse

NOTICE
Do not modify or otherwise interfere with the device! ↳ Do not carry out modifications or otherwise interfere with the device. The device must not be tampered with and must not be changed in any way. ↳ There are no user-serviceable parts inside the device. ↳ Repairs must only be performed by Leuze electronic GmbH + Co. KG.

NOTICE
The evaluation unit of the contour measurement system may only be opened for the following purposes: - for plugging in or unplugging the software dongle, see chapter 7.1 "Plugging in the software dongle". - for viewing the inside label within the UL scope of application. - for connecting to the power supply outside of the UL scope of application.

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- in rooms with explosive atmospheres
- in circuits which are relevant to safety
- for medical purposes

2.3 Competent persons

Connecting, mounting, commissioning and adjustment of the contour measurement system must only be carried out by competent persons.

Requirements relating to competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the operating instructions of the contour measurement system and the components.
- They have been instructed by the responsible person on the mounting and operation of the contour measurement system and of the components.

WARNING
Electrical work! Electrical work must be carried out by a certified electrician.

Certified electricians

Electrical work must be carried out by a certified electrician.

Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations DGUV (German Social Accident Insurance) provision 3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- The device is not being used properly.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Changes (e.g., constructional) are made to the device.

3 Device description

3.1 Device overview

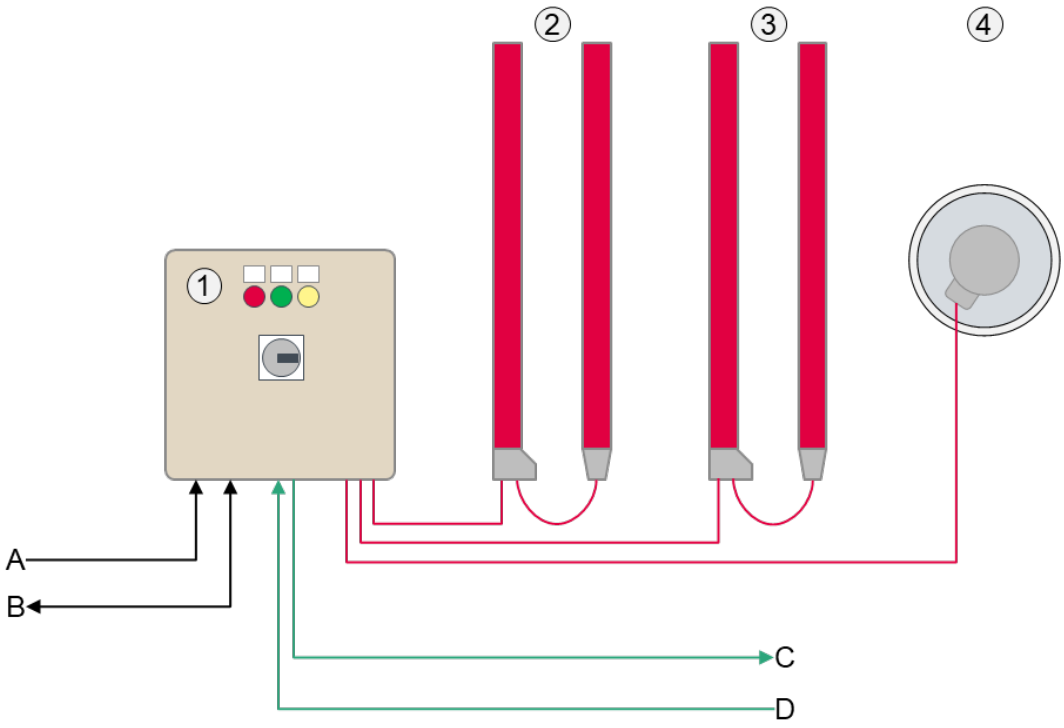
The CMS 708i contour measurement system is an overall system that consists of the following components:

- 2 CML 730 measuring light curtains (height and width measurement)
- 1 rotary encoder (length measurement)
- 1 evaluation unit (switch cabinet, LSC-Box)

The evaluation unit performs the capture, processing and preparation of the data.

The system makes the process data available via the Ethernet TCP/IP interface.

Peripheral devices such as scales, bar code readers and cameras can be integrated. The evaluation unit passes through the data of the peripheral devices unprocessed as part of its TCP/IP protocol.

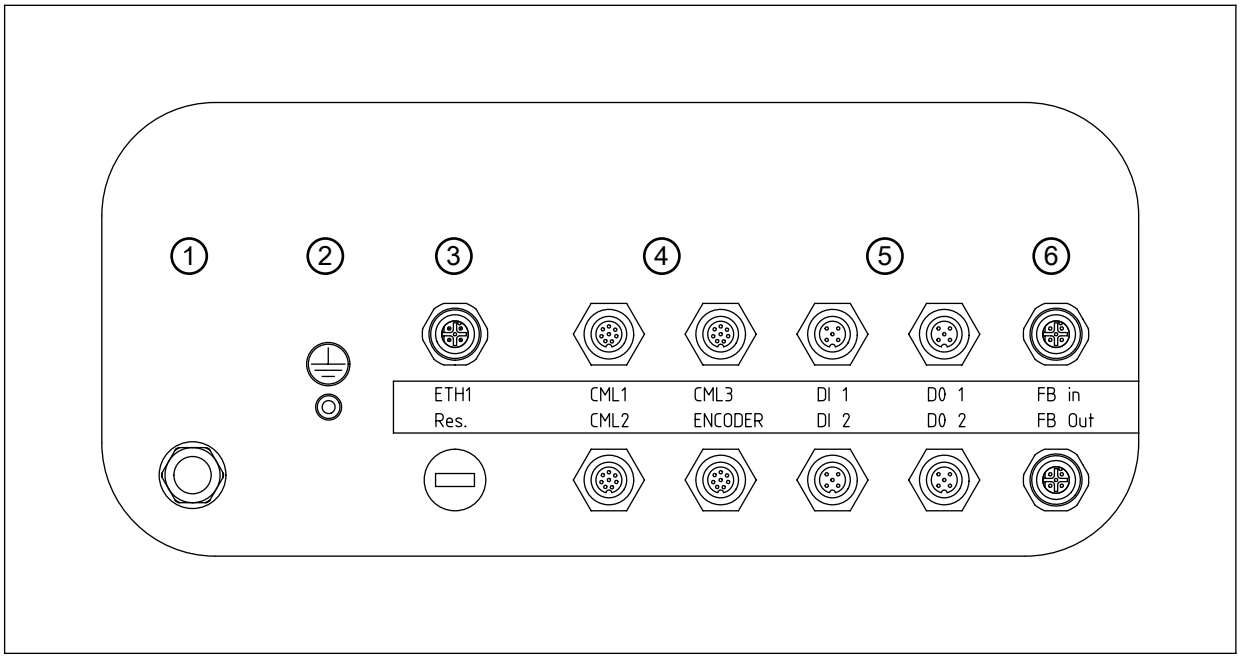


1 Evaluation unit (switch cabinet, LSC-Box)
2 Light curtain - Height measurement
3 Light curtain - Width measurement
4 Rotary encoder - Length measurement
A Voltage supply
B Ethernet TCP/IP (CMS 708i)
C Fieldbus OUT (CMS 748i, PROFINET)
D Fieldbus IN (CMS 748i, PROFINET)

Fig. 3.1: Device overview

3.2 Evaluation unit

3.2.1 Connections



1 Voltage supply
2 Grounding bolts
3 M12 Ethernet connection
4 3x interfaces for CML 730 light curtains (CML1 … CML3)
1x interface for rotary encoder (ENCODER)
5 2x M12 sockets, each with 2 switching inputs (DI 1, DI 2)
2x M12 sockets, each with 2 switching outputs (DO 1, DO 2)
6 PROFINET fieldbus interface (FB In, FB Out)

Fig. 3.2: Connections of the evaluation unit

3.2.2 Indicators and operational controls

1 LED 1 (white)
2 LED 2 (green)
3 LED 3 (yellow)
4 Door lock
5 Main switch

Fig. 3.3: Display and operating elements on the evaluation unit

Tab. 3.1: LED indicators

Display	Color	State	Description
LED 1	White	ON	Power supply
LED 2	Green	ON	System ready
LED 3	Yellow	ON	Fault at the peripheral elements (light curtains, rotary encoder)

4 Functions

4.1 Operating principle

The contour measurement system captures the following data of an arbitrarily shaped measurement object:

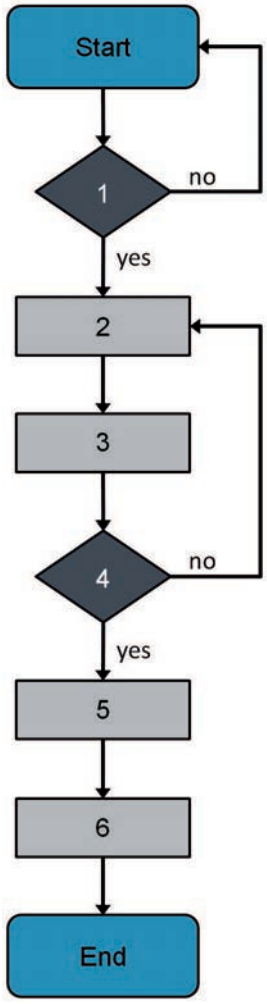
- Length, width, height of the smallest enclosing cuboid
- Orientation angle to the transport direction
- Smallest vertical distance between object and conveyor belt of the conveyor

Measurements

- All measurement objects are measured continuously.
- Start of measurement: Interruption of a beam of the width or height light curtain or triggering of an optional upstream trigger.
- End of measurement: All beams of the width and height light curtains are free again.
- After the measurement, the evaluation unit automatically forwards the calculated object data to a host via the communication interface.
  Data of other peripheral devices such as scales and bar code readers can also be transferred in the interface protocol.
  After the data have been output, the next object can be detected.

	NOTICE
	**Important for reliable measurements!** ↳ While the measurement is running, do not also interrupt the beams of the light curtains through manual interventions or other actions. This falsifies the measurement values. ↳ Observe the minimum object distance (see chapter 4.5 "Minimum distance between two measurement objects") and the maximum conveyor speed (see chapter 4.6 "Maximum conveyor speed").

Tab. 4.1: Example sequence of a measurement



1. Light curtain for width or height measurement: One beam interrupted
2. Measurement starts
3. Detection of height and width of the measurement object.
   Trigger: Light curtain for width or height measurement
4. Light curtains for width and height measurement: all beams free
5. Measurement ends
6. Output of the object dimensions, of the orientation angle and of the smallest object distance to the edge of the conveyor – acc. to the configuration

4.2 System resolution

The resolution is determined from the beam spacing of the measuring light curtains. The contour measurement system is delivered in two standard resolutions.

Tab. 4.2: Standard resolutions

System resolution/beam spacing	Measurement range for height, width, length
5 mm	≤ 1200 mm
10 mm	> 1200 mm

Once the contour measurement system contains at least one light curtain with a measurement field length > 1200 mm, the overall system is delivered with a system resolution of 10 mm.

NOTICE

Please note that the system resolution influences the following features:

- the minimum distance between two measurement objects (see chapter 4.5 "Minimum distance between two measurement objects")
- the maximum conveyor speed (see chapter 4.6 "Maximum conveyor speed")

4.3 Object angle of rotation, object length and object width

Object angle of rotation

The object angle of rotation determined by the contour measurement system is the angle between the lengthwise edge of the measurement object and the vector of the conveying direction.

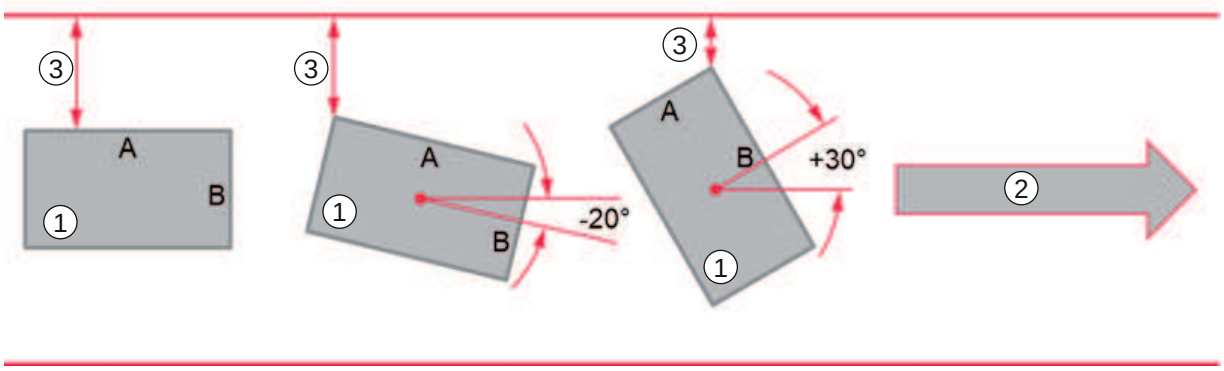
- The object angle of rotation can take values between -45° and +45°.
- If the magnitude of the object angle of rotation is > 45°, the length and width assignments are exchanged and the smaller angle is output with inverted sign.

Object length

The object length or length is – in the top view – defined as the side of the measurement object that has an angle with a magnitude of less than 45° to the conveying direction (= lengthwise direction).

Object width

The object width is – in the top view – defined as the side of the measurement object that is adjacent to the object length.



1 Measurement object
2 Conveying direction
3 Distance between measurement object and edge of conveyor

Fig. 4.1: Relationship between magnitude of the object angle of rotation and assignment of object length and object width

Tab. 4.3: Object angle of rotation and assignment of object length and object width

Output of object angle of rotation	-20°	+30° (instead of -60°)
Object length	A	B
Object width	B	A

4.4 Projections and deformations on the measurement object

This chapter describes the operating principle of the suppression of projections and the detection of deformations on the measurement object.

The settings for these functions are made in the webConfig tool (see chapter 8 "System configuration via webConfig tool").

4.4.1 Function

The evaluation of measurement objects for projections and deformations occurs in two steps.

Projection detection

In the first step, projections in length, width and height are determined from the raw data of the measurement object according a defined threshold value and then suppressed (see chapter 4.4.2 "Projection suppression"). Projections on the measurement object that do not impede the further handling can, thus, no longer influence the object measurement.

Deformation detection

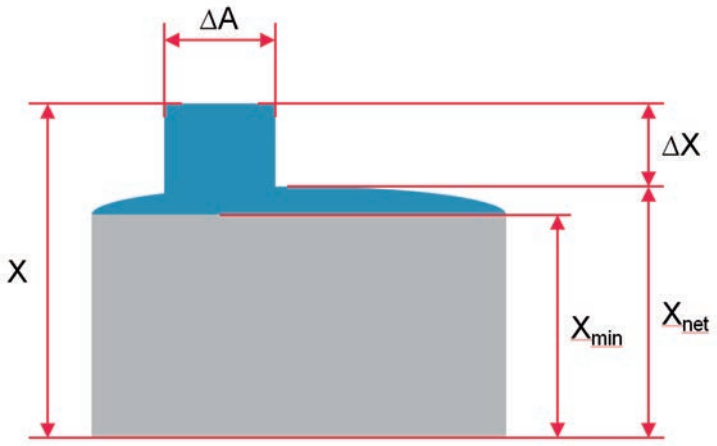
In the second step, the contour measurement system uses the raw data of the measurement object that has been reduced by the amount of the protrusions to determine the cuboid corners of the measurement object and then determine deformations between the cuboid corners. The determination of the deformations is referred to as deformation detection (see chapter 4.4.3 "Deformation detection").

Deformation detection can only be selected in combination with projection detection.

Example

A measurement object with projection and deformation is present.

- Projection ΔX has width ΔA.
- The deformation has a maximum value of X_{net} - X_{min}



ΔA	Width of the projection
X	Overall dimension of the measurement object
ΔX	Height of the projection
X_{min}	Dimension of the measurement object without projection and deformation
X_{net}	Dimension of the measurement object without projection

Fig. 4.2: Example object with projection and deformation

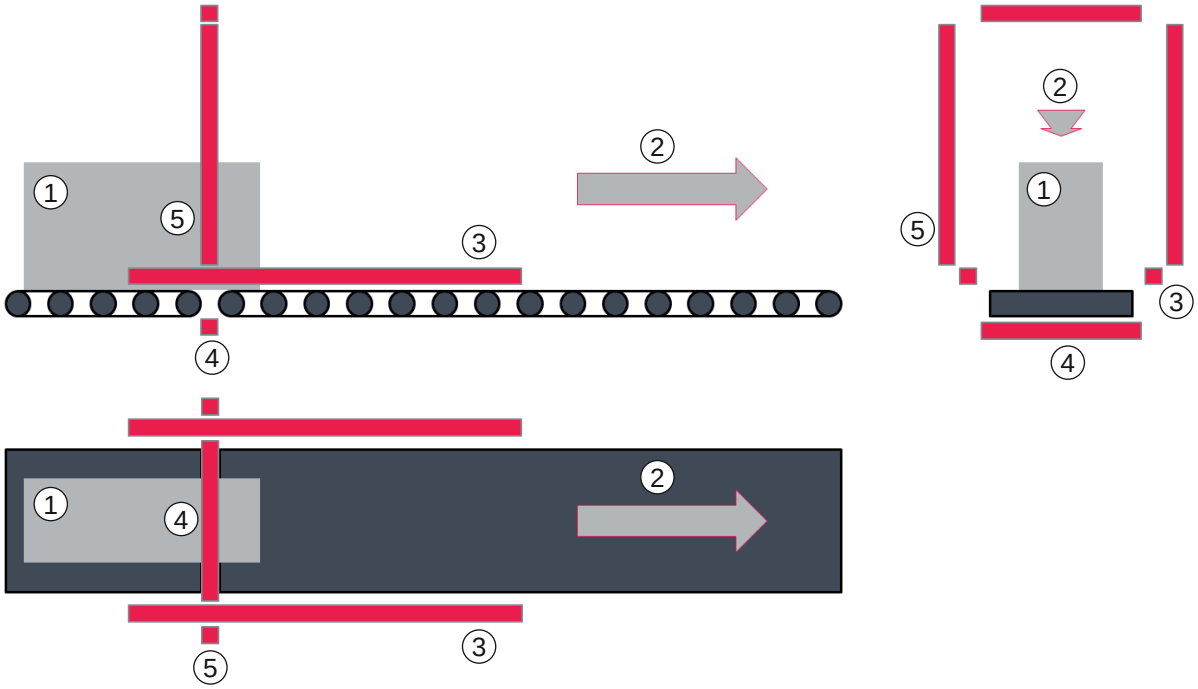
The following cases can occur

Deformation detection	Switched off		Switched on	
Projection threshold value	ΔA > threshold value	ΔA ≤ threshold value	ΔA > threshold value	ΔA ≤ threshold value
Evaluation of projection	ΔX counts towards the object	ΔX is projection and does not count towards the object	ΔX counts towards the object	ΔX is projection and does not count towards the object
Output of ACTUAL object dimension	X	X	X	X_{net}
Output of SPECIFIED object dimension	X	X_{net}	X	X_{min}
Deformation output (Deformations present)	None	None	None	Arrow indicating direction of deformation with output $X_{net} – X_{min}$ in mm
Error message	None	None	"Deformation detection not possible"	None
Status	OK	OK	NOK	OK

Projections and deformations on the measurement object can occur in the length, width and height directions.

The illustration of a measurement object on a conveyor shows the orientation of the directional information.

- The red bars represent the light curtains.
- The gray arrows indicate the conveying direction.



1 Measurement object
2 Conveying direction
3 Length
4 Width
5 Height

Fig. 4.3: Depiction of the directional information

	NOTICE
	The orientation of the directional information and the descriptions of projection suppression and deformation detection are each depicted using an example of a contour measurement system with three light curtains. Projection suppression and deformation detection occur in the same way for contour measurement systems with rotary encoder for the length measurement.

4.4.2 Projection suppression

Projections can occur in the length, width and height directions.

	NOTICE
	The descriptions of the projection suppression are depicted using the example of a contour measurement system with three light curtains. Projection suppression occurs in the same way for contour measurement systems with rotary encoder for the length measurement.

Projection suppression, length

If the width of the projection ΔA is less than the entered threshold value, the projection is suppressed and not taken into account in the length measurement.

1	Measurement object
2	Conveying direction
3	Projection
4	Length
ΔA	Width of the projection

Fig. 4.4: Object projection in length (schematic)

Projection suppression, width

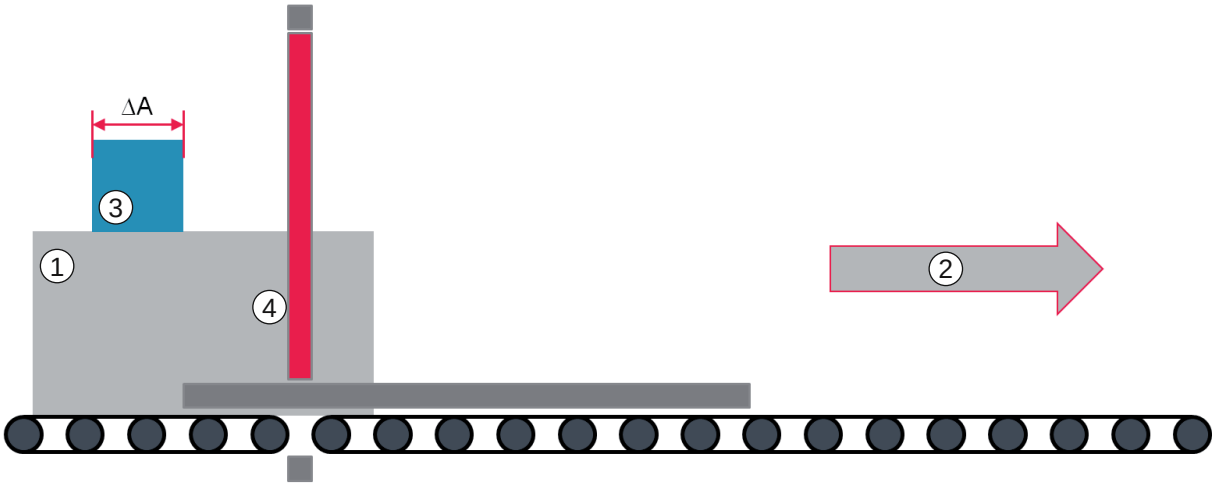
If the width of the projection ΔA is less than the entered threshold value, the projection is suppressed and not taken into account in the width measurement.

1	Measurement object
2	Conveying direction
3	Projection
4	Width
ΔA	Width of the projection

Fig. 4.5: Object projection in width (schematic)

Projection suppression, height

If the width of the projection ΔA is less than the entered threshold value, the projection is suppressed and not taken into account in the height measurement.



1	Measurement object
2	Conveying direction
3	Projection
4	Height
ΔA	Width of the projection

Fig. 4.6: Object projection in height (schematic)

4.4.3 Deformation detection

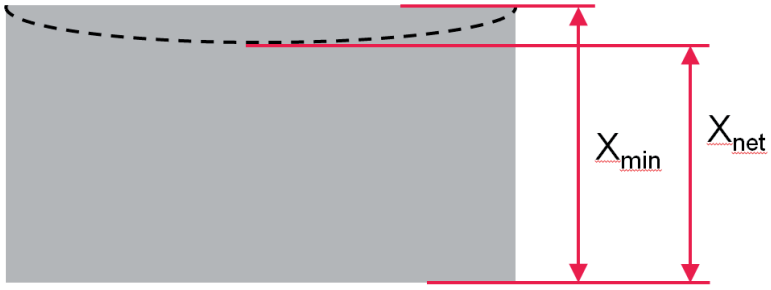
The contour measurement system sees bulges that protrude from the projected view of the measurement object as deformations.

X_{min}	Dimension of the measurement object without deformation
X_{net}	Dimension of the measurement object with deformation

Fig. 4.7: Top view of a measurement object with lateral deformation

Limits of deformation detection

Deformations that protrude into the measurement object and are shadowed by edges cannot be detected by the contour measurement system. In the case depicted here X_{net} would be < X_{min}.



X_{min} Dimension of the measurement object without deformation

X_{net} Dimension of the measurement object with inward protruding deformation

Fig. 4.8: Measurement object with inward protruding deformation

If the smallest enclosing perimeter of the measurement object (red) is much smaller than the object perimeter (blue), then a deformation cannot be distinguished from the remaining object structure.

In this case, the contour measurement system outputs the status *NOK* after the measurement as well as the length, width and height of the smallest enclosing cuboid – including all projections of the measurement object.

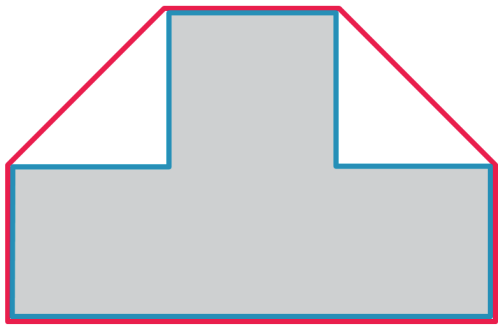


Fig. 4.9: Example object: The smallest enclosing perimeter (red) is less than the object perimeter (blue).

4.5 Minimum distance between two measurement objects

The minimum distance is dependent on the system resolution (= beam spacing of the light curtains).

Formula for calculating the minimum distance D_{min} between two measurement objects:

D_{min} = 12 x [system resolution: 5 mm or 10 mm] + [cycle time: 50 ms] x [conveyor speed v in m/s]

Calculation example with conveyor speed v = 0.8 m/s and system resolution 5 mm:

D_{min} = 12 x 5 mm + 50 ms x 0.8 m/s = 100 mm

4.6 Maximum conveyor speed

NOTICE

Observe the maximum conveyor speed!

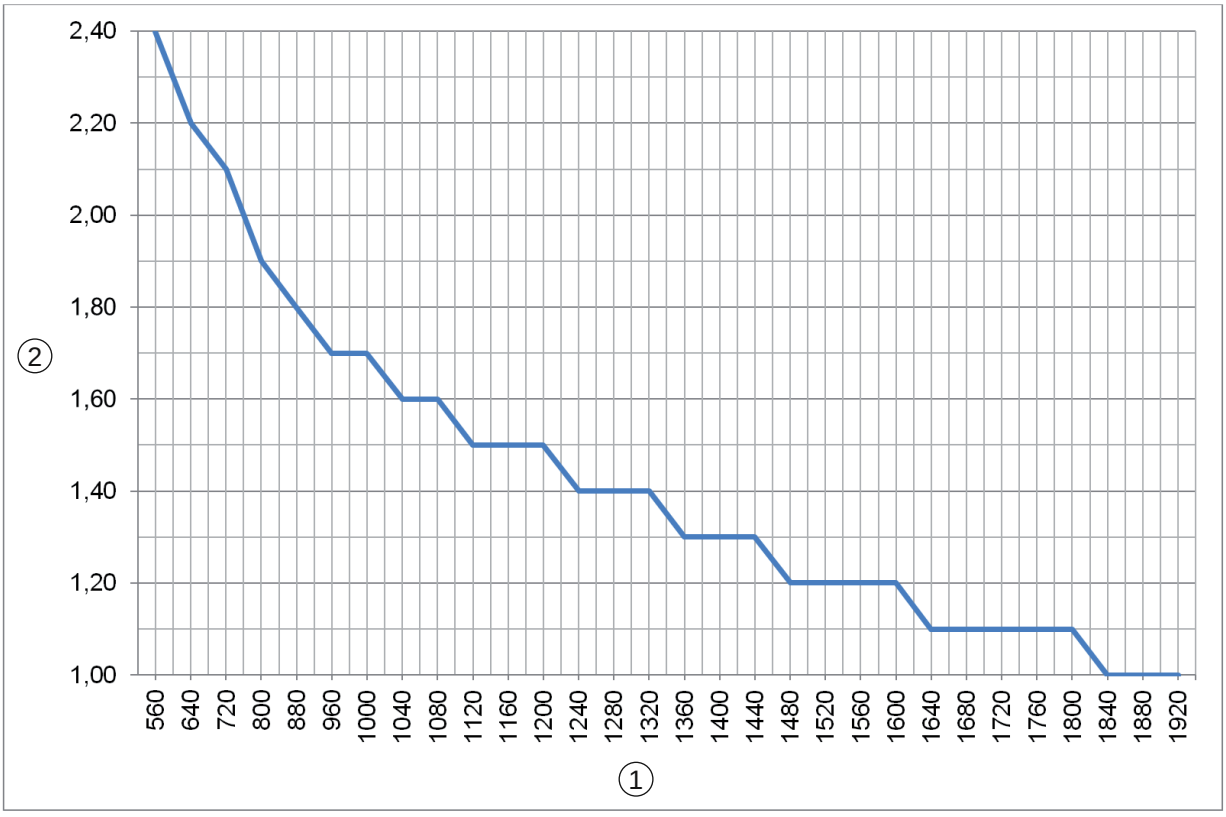
If the maximum conveyor speed is exceeded, the contour measurement system may not output reliable measurement results under certain circumstances.

The maximum conveyor speed is dependent on:

- the system resolution (5 mm or 10 mm) and
- the added measurement length of the width and height light curtains.

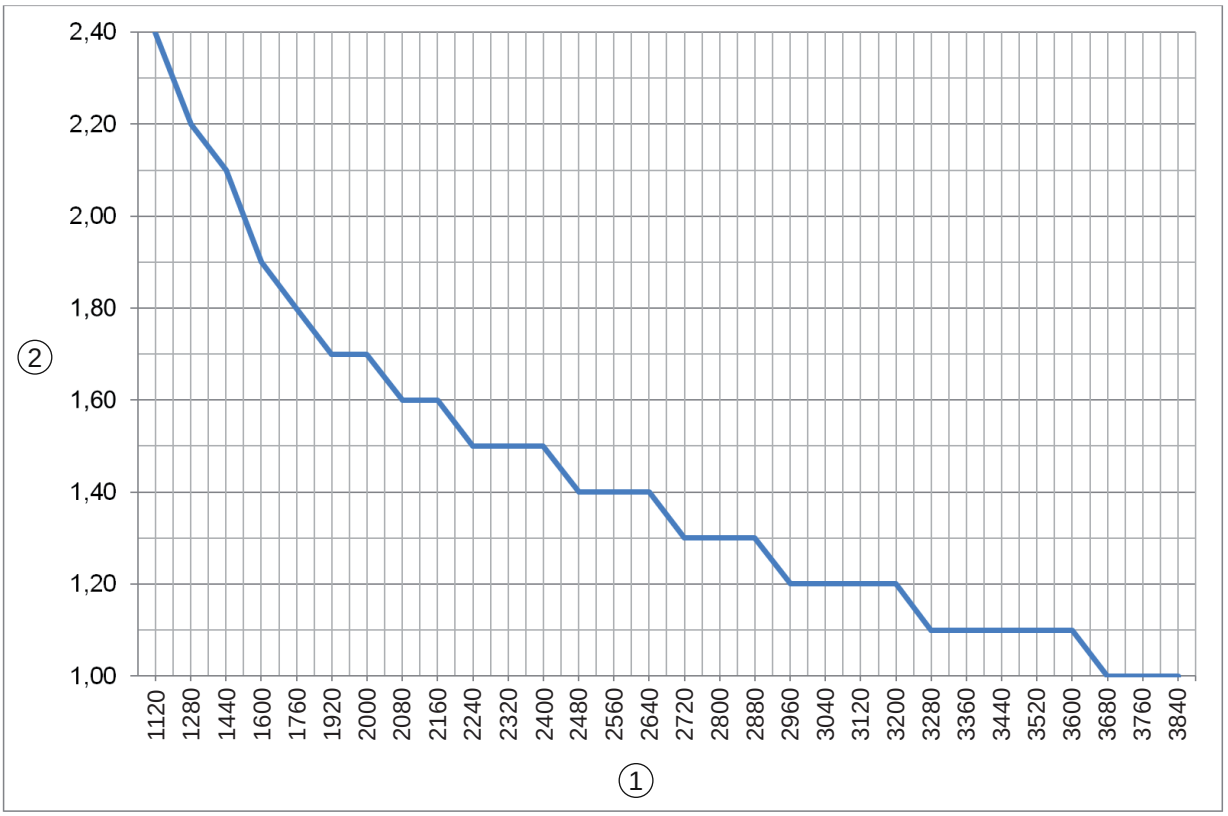
Determination of the maximum conveyor speed:

- Determine the system resolution. If all light curtains have a measurement field length ≤ 1200 mm, the system resolution is 5 mm.
  If at least one light curtain has a measurement field length > 1200 mm, the system resolution is 10 mm.
- Read the measurement field lengths on the name plates of the height and width light curtains.
- Add the two values together.
- Read the conveyor speed of the added values in the following diagrams.



1 Total measurement length of width and height light curtains [mm]
2 Maximum conveyor speed [m/s]

Fig. 4.10: Diagram of maximum conveyor speed for system resolution of 5 mm



1 Total measurement length of width and height light curtains [mm]
2 Maximum conveyor speed [m/s]

Fig. 4.11: Diagram of maximum conveyor speed for system resolution of 10 mm

5 Mounting

NOTICE
The figures apply across all interfaces for all connection types. You can find specific connection diagrams in the chapter on interfaces (see chapter 9 "TCP/IP interface description").

NOTICE
Alignment of the light curtains! The exact alignment of the light curtains for width and height measurement relative to one another directly affects the quality of the measurement results.

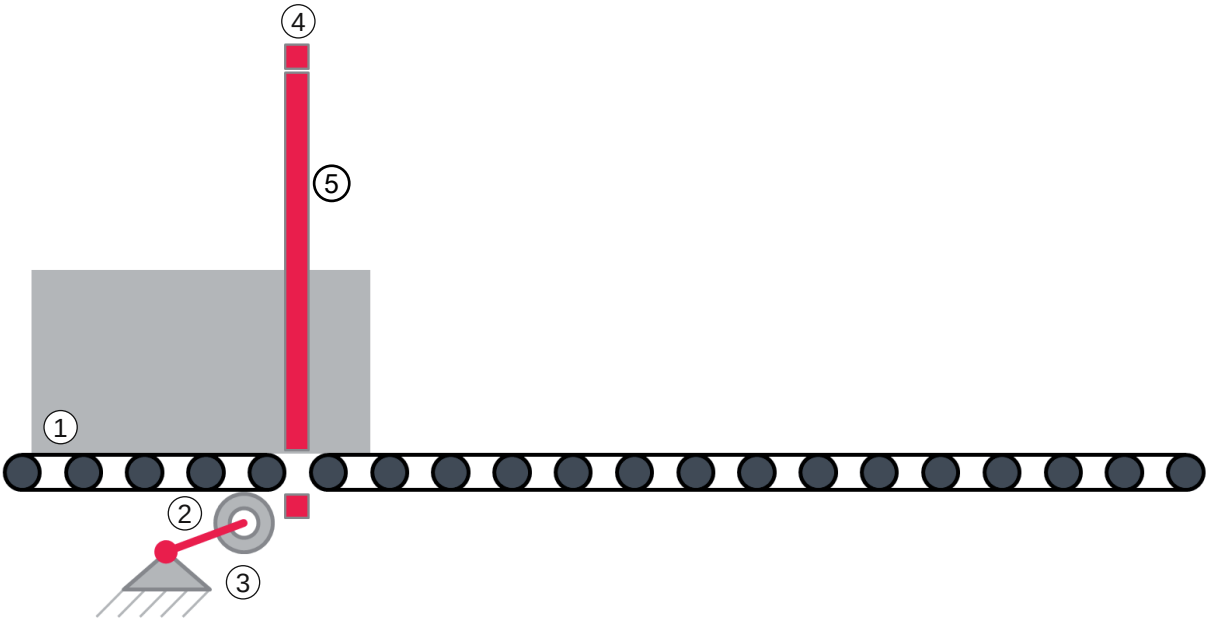
NOTICE
Falsified measurement results due to vibrations! Strong vibrations may falsify the measurement result. ↳ Mount the contour measurement system on a frame that is largely free of vibration.

5.1 Installation with two light curtains and rotary encoder

5.1.1 Mounting instructions

The following mounting regulations are to be observed:

- The light curtains for the height measurement and for the width measurement must be installed on the same plane.
- There must be no interfering contours present between transmitter and receiver of the light curtains – except in the edge areas.
- The rotary encoder must installed so that no slippage can occur between the conveyor belt and the measuring wheel of the rotary encoder.
- The clamping device on the measuring wheel of the rotary encoder must be set so that the measuring wheel can easily be moved with the conveyor belt.



1 Measurement object
2 Rotary encoder
3 Length measurement
4 Width measurement
5 Height measurement

Fig. 5.1: Schematic system design with two light curtains and rotary encoder

↳ Mount the transmitters and receivers of the light curtains for the height measurement and for the width measurement on the system (see chapter 5.2 "Mounting the light curtain").

↳ Mount the rotary encoder for the length measurement on the conveyor belt.

- Mount the measuring wheel of the rotary encoder from below and slip-free with respect to the conveyor belt.
- Mount the rotary encoder according to the enclosed mounting instructions for the rotary encoder (leaflet).

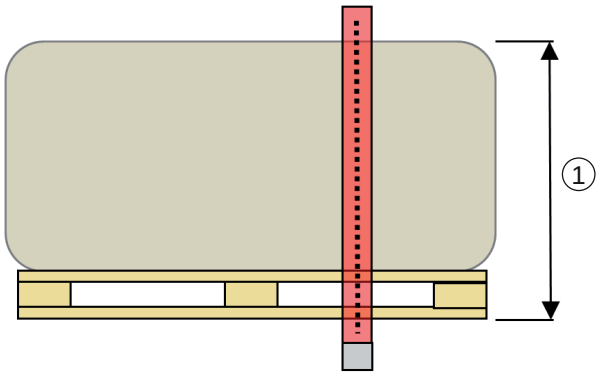
NOTICE	
	Exchanging the measurement wheel! ↳ When exchanging the measurement wheel, observe the mounting instructions of the rotary encoder.

5.1.2 Positioning for height measurement

- Align the transmitter and receiver of the height light curtain parallel to one another.
- Align the established plane of the height and width light curtains vertically relative to the transport direction of the measurement objects.
- ⇨ A deviating alignment significantly reduces the performance reserve of the contour measurement system.

NOTICE
Must be observed! ↳ The largest occurring object height must not protrude beyond the top beam of the **height** light curtain.

NOTICE
If the lowest beam of the height light curtain is above the lower edge of the measurement object, the correct offset of the height light curtain in the measuring scenario must be measured and entered in the webConfig tool (see chapter 8.3.2 "Setting the offset for height detection").



1 Object height

Fig. 5.2: Height measurement: Object height

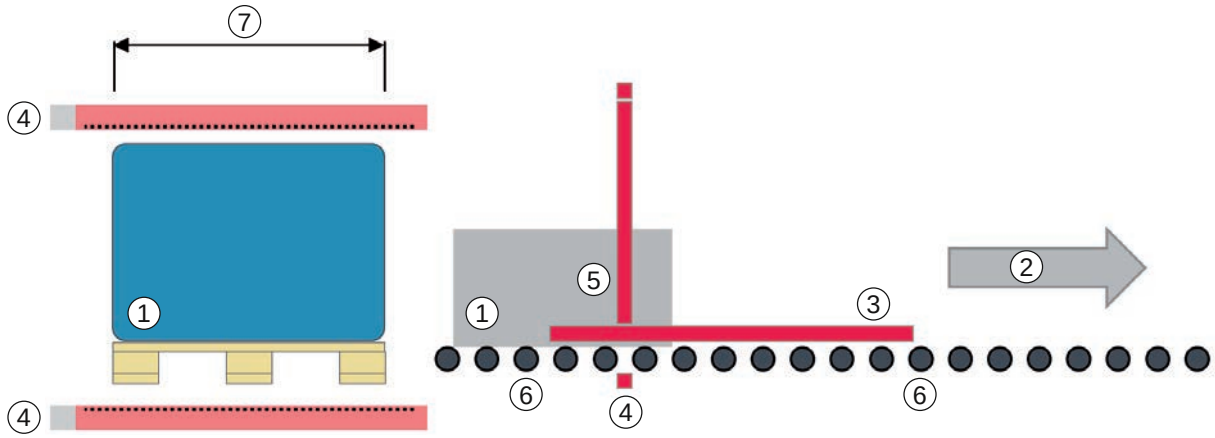
5.1.3 Positioning for width measurement

↳ Mount the light curtain for the width measurement exactly in the middle between two rollers of the conveyor as well as parallel to these rollers.

NOTICE
For the highest function reserve of the contour measurement system, even if there are very small gaps between the conveyor rollers, the transmitter must be mounted exactly in the middle between two rollers as well as parallel to these rollers!

↳ Set the smallest gap between the conveyor rollers to ≥10 mm so that the width light curtain can shine between them.

↳ Mount the width light curtain so that the entire width of the conveyor is detected by the light curtain.



1 Measurement object
2 Conveying direction
3 Length measurement
4 Width measurement
5 Height measurement
6 Conveyor rollers
7 Object width

Fig. 5.3: Width measurement: Object width

5.2 Mounting the light curtain

NOTICE
Avoid reflective surfaces, mutual interference, ambient light! ↳ Avoid reflective surfaces near the light curtains. Objects may otherwise not be precisely detected due to halation. ↳ Ensure sufficient distance, suitable positioning or partitioning. Optical sensors (e.g., light curtains, photoelectric sensors, etc.) must not interfere with one another. ↳ Avoid strong ambient light effect on the receiver, caused for example by flash lamps or direct sunlight.

	NOTICE
	Observe the mounting instructions! ↳ For horizontally mounted measuring light curtains with lengths > 2000 mm, use an additional mounting bracket in the middle of the light curtain. ↳ Have a suitable tool at hand and mount the light curtain in accordance with the notices regarding the mounting locations. ↳ Mount the transmitter and receiver at the same height or with the same housing reference edge, free of tension and with the base in full contact with the mounting surface. The optical surfaces of transmitter and receiver must be parallel to and opposite one another. The transmitter and receiver connections must point in the same direction. ↳ Secure transmitter and receiver against turning or sliding.

↳ Mount the transmitter and receiver of the light curtain using one of the following types of fastening:

- Fastening via sliding blocks on the standard profile (see chapter 5.2.2 "Fastening via sliding blocks")
- Fastening via mounting clamp (see chapter 5.2.3 "Fastening via BT-2P40 mounting clamp")

↳ Align the transmitter and receiver of the light curtain with one another.

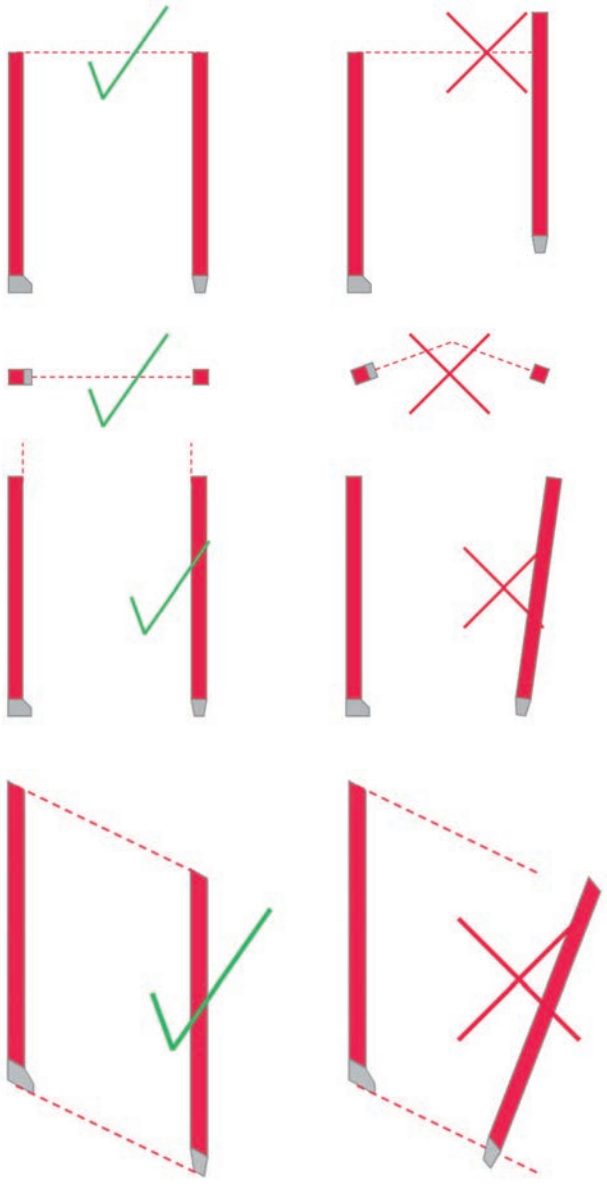
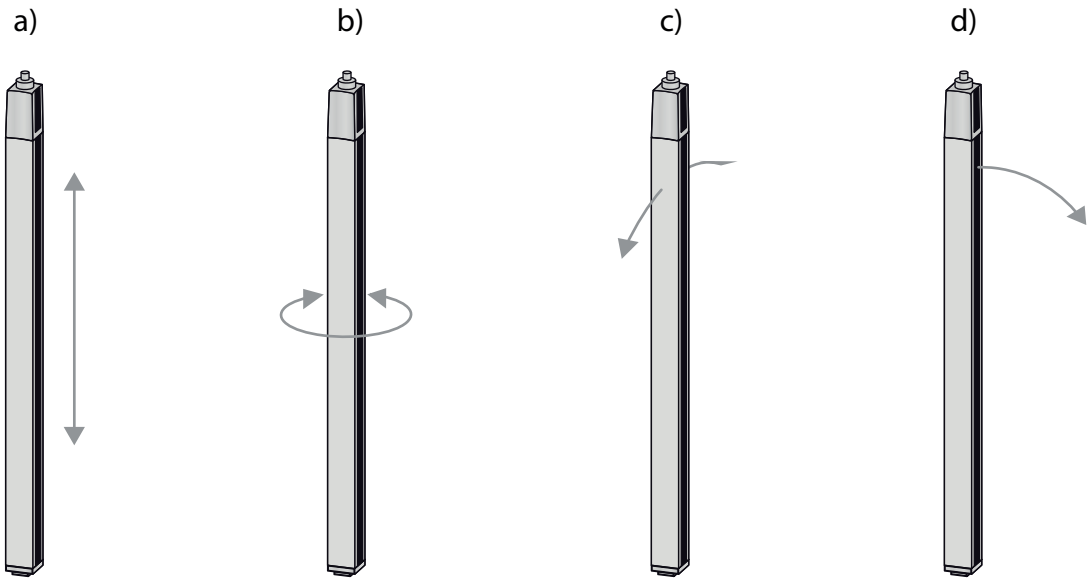


Fig. 5.4: Aligning transmitter and receiver

5.2.1 Definition of directions of movement

The following terms for alignment movements of a light curtain around one of its axes are used:



a	Sliding: movement along the longitudinal axis
b	Turning: movement around the longitudinal axis
c	Tilting: lateral turning movement diagonal to the front screen
d	Pitching: lateral turning movement in the direction of the front screen

Fig. 5.5: Directions of movement during alignment of the light curtain

5.2.2 Fastening via sliding blocks

By default, transmitter and receiver are delivered with two sliding blocks (three sliding blocks for measurement field lengths ≥ 2000 mm) each in the side groove.

↳ Fasten transmitter and receiver to the machine or system via the lateral T-groove with M6 screws.

⇨ Sliding in the direction of slot to set the height is possible, but turning, tilting and pitching is not.

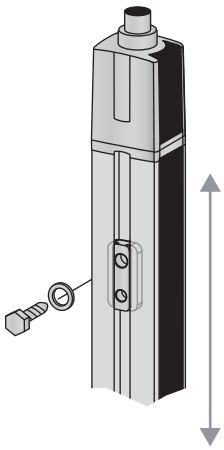


Fig. 5.6: Mounting via sliding blocks

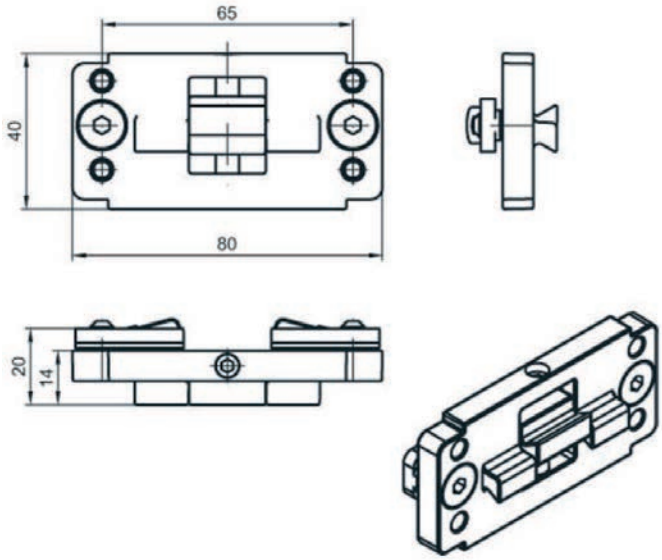
5.2.3 Fastening via BT-2P40 mounting clamp

Mounting with the BT-2P40 clamp bracket allows the device to be quickly exchanged. It is not necessary to re-align the light curtain after exchanging a device.

↳ Fasten transmitter and receiver via the lateral T-groove to the mounting clamp.

NOTICE
It is possible to slide the light curtain in the direction of the groove. It is not possible to turn, tilt and pitch the light curtain in the clamp bracket.

↳ Fasten the transmitter and receiver to the system with the clamp bracket.



All dimensions in mm

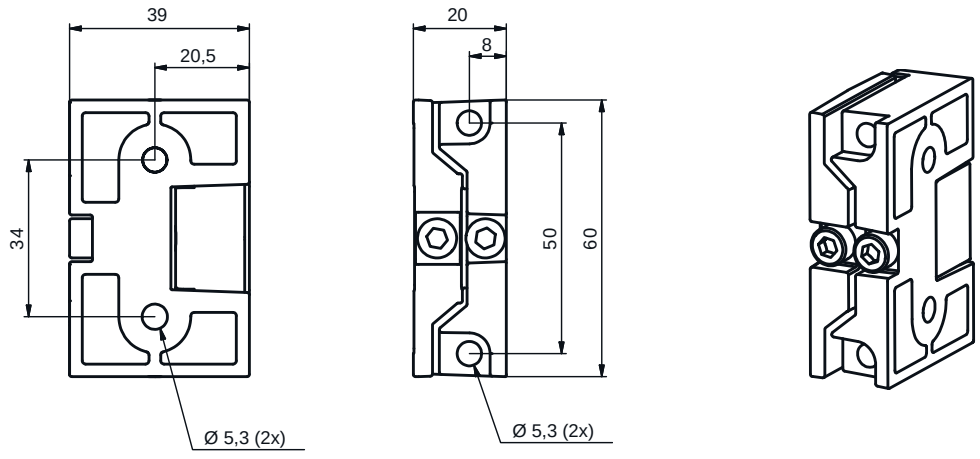
Fig. 5.7: BT-2P40 mounting clamp

5.2.4 Fastening of the length light curtain using BT-2SB10 mounting clamps

NOTICE
It is possible to slide the light curtain in the direction of the groove and tilt it around the longitudinal axis. It is not possible to turn and pitch the light curtain in this clamp bracket.

↳ Fasten the transmitter and receiver to the system with the clamp bracket.

↳ Ensure that the longitudinal axis of the light curtain and the plane of the conveyor are parallel to one another.



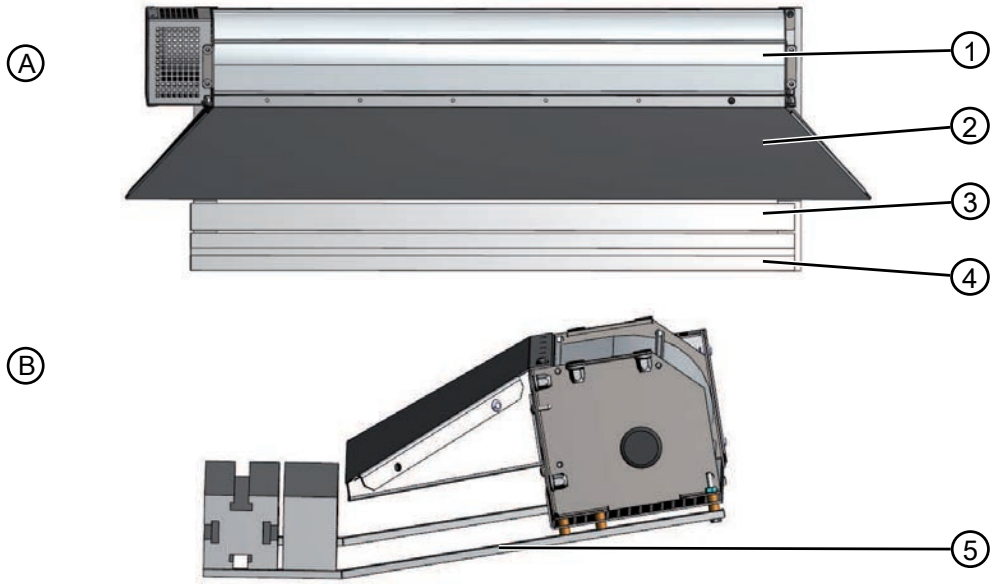
All dimensions in mm

Fig. 5.8: BT-2SB10 mounting clamp

5.3 Air wipe unit

The air wipe unit generates sealing air to protect the top side of the transmitter of the width light curtain against soiling from dry media.

The air wipe unit is available as an accessory in widths 600 mm, 800 mm, 1200 mm and 1600 mm.



A	Front view
B	Lateral view
1	Air wipe unit
2	Air outlet for air wipe unit
3	Top side of transmitter of width light curtain
4	Mounting profiles
5	Mounting arms

Fig. 5.9: Mounted air wipe unit

Mounting the air wipe unit

- Mount the air wipe unit on the bottom side of the mounting profile using the mounting arms.
- Mount the transmitter of the width light curtain on the mounting profile.
- Make sure that the transmitter of the width light curtain is mounted centered with respect to the air outlet.

6 Electrical connection

6.1 Connection overview

Connections on the bottom side of the evaluation unit (LSC box)

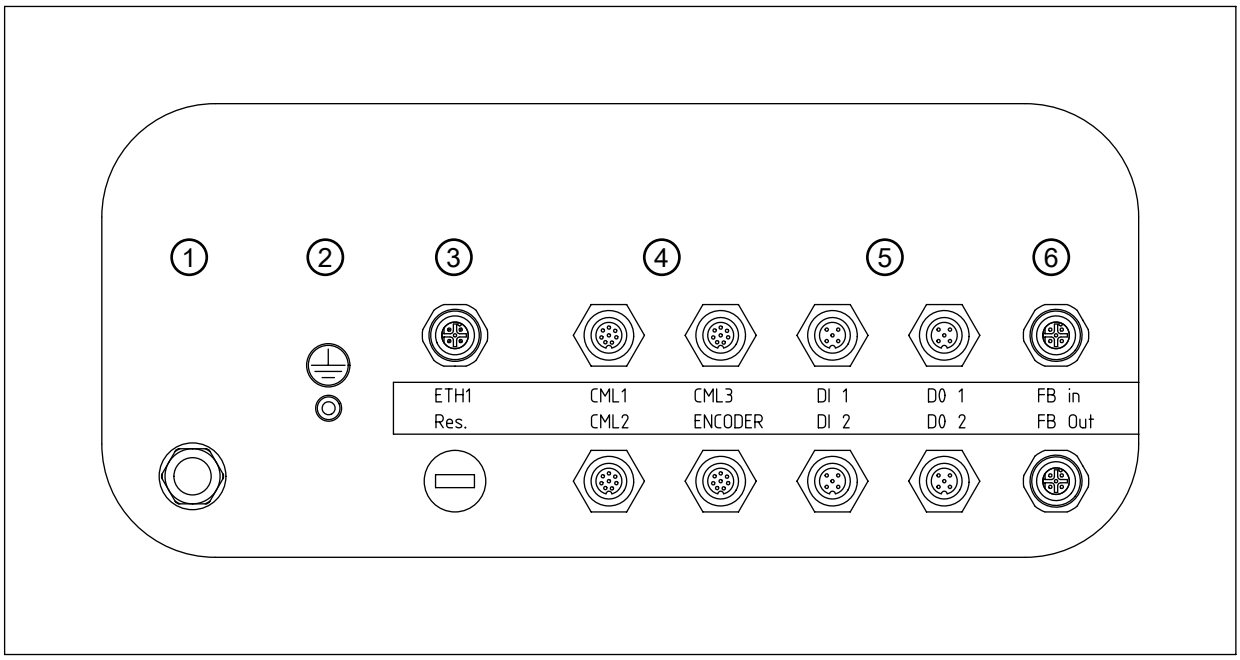


Fig. 6.1: Evaluation unit – connection overview

Power supply	
1	Cable outlet for power supply with mains plug, M20 cable bushing
2	Threaded bolt for grounding
Ethernet interface only for CMS 708i contour measurement systems	
3	ETH1 – External Ethernet TCP/IP connection
Connections for light curtains and rotary encoder	
4	CML1 – Light curtain connection for length measurement only for contour measurement systems with three light curtains CML2 – Light curtain connection for width measurement CML3 – Light curtain connection for height measurement ENCODER – Rotary encoder connection only for contour measurement systems with length measurement **Note**: For length measurement, only one device may be connected – either a light curtain (CML1) **or** a rotary encoder (ENCODER).
Switching inputs, switching outputs	
5	DI 1 – Switching input with two switching pins, 24 VDC, GND DI 2 – Switching input with two switching pins, 24 VDC, GND DO 1 – Switching output with two switching pins, 24 VDC, GND DO 2 – Switching output with two switching pins, 24 VDC, GND, connection for air wipe unit
PROFINET interface only for CMS 748i contour measurement systems	
6	FB In – Bus In PROFINET FB Out – Bus Out PROFINET

6.2 Connecting the power supply within the UL scope of application

DANGER

Risk of death by electric shock!

Dangerous currents could occur at the outputs depending on the external wiring!

- During all work, make certain that the power supply connection is disconnected and that it cannot be restored accidentally.
- Only have the electrical installation performed by specialists.
- Only the factory-installed power supply cable with mains plug may be used for power supply.
- Within the UL scope of application, only use in class 2 circuits acc. to NEC (National Electric Code) is permissible.

CAUTION

Connection data for UL applications on UL label

Within the UL scope of application, only the connection data on the UL label located inside of the evaluation unit is valid.

- Open the evaluation unit to view the label. When doing this, observe the danger notices in this chapter.

CAUTION

Make no changes to the switch cabinet components!

Leuze is responsible for the proper interaction of the modules.

- Make no changes to the components in the switch cabinet.
- In the event of malfunctions, contact the Leuze service center (see chapter 11 "Service and support").

NOTICE

- Observe the respective local safety and installation regulations.

Use the mains plug to connect the switch cabinet to a suitable power supply.

6.3 Connecting the power supply outside of the UL scope of application

DANGER

Risk of death by electric shock!

Dangerous currents could occur at the outputs depending on the external wiring!

- During all work, make certain that the power supply connection is disconnected and that it cannot be restored accidentally.
- Only have the electrical installation performed by specialists.

CAUTION

Observe the connection data located on the outside of the switch cabinet!

For applications outside of the UL scope of application, only the connection data printed on the label located on the outside of the switch cabinet is valid.

CAUTION

Make no changes to the switch cabinet components!

Leuze is responsible for the proper interaction of the modules.

- Make no changes to the components in the switch cabinet.
- In the event of malfunctions, contact the Leuze service center (see chapter 11 "Service and support").

NOTICE

- Observe the respective local safety and installation regulations.

- If the main cable that is installed standard is to be used, use the mains plug to connect the switch cabinet to a suitable power supply.

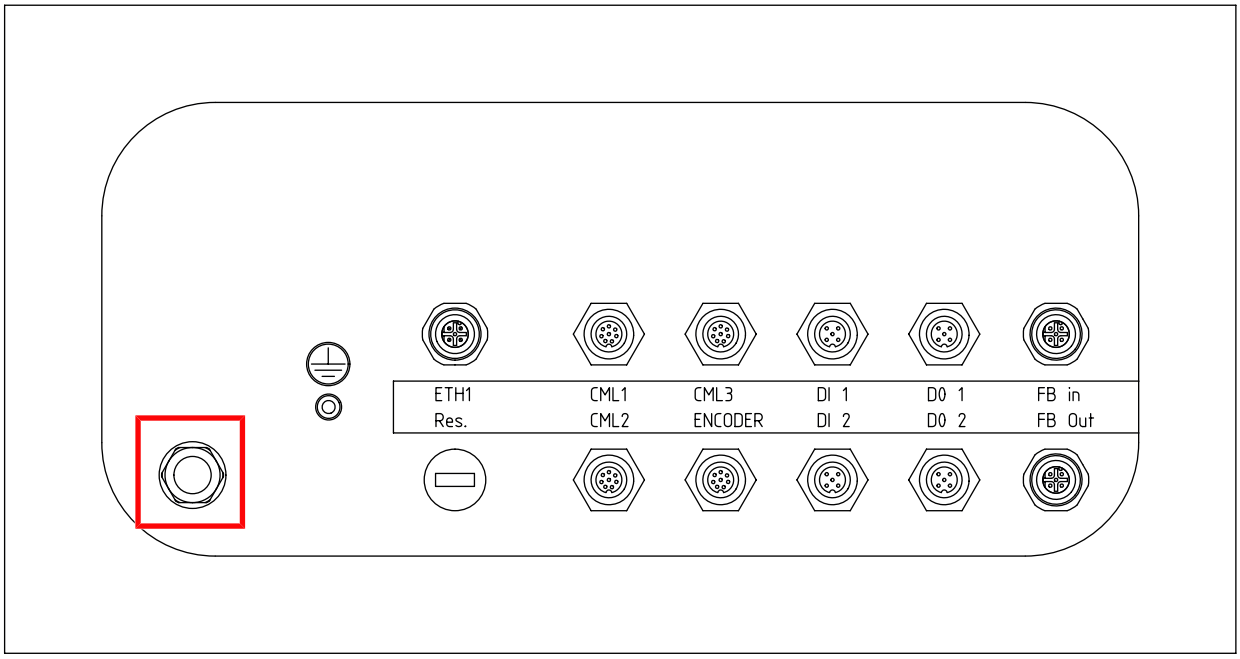


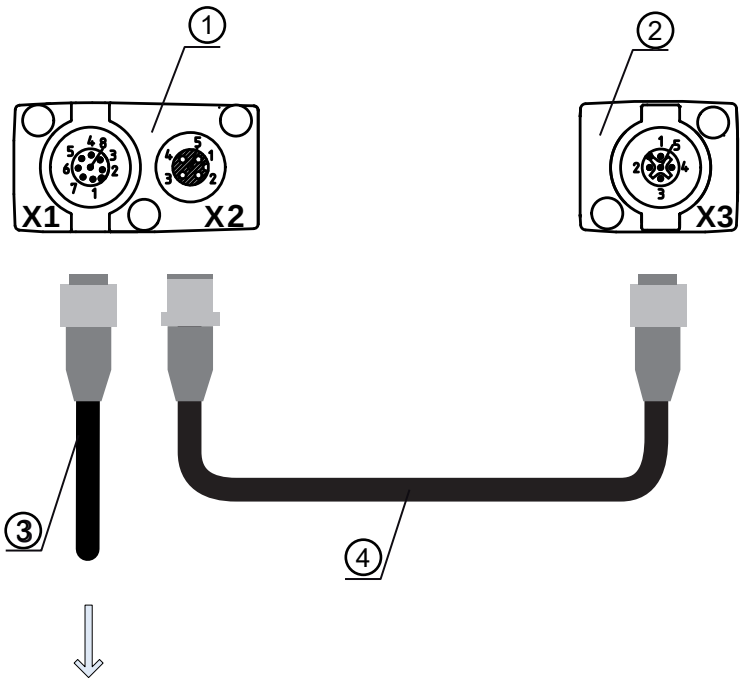
Fig. 6.2: Mains connection

If the mains cable that is installed standard is not to be used, another cable can be mounted.

Cable (number of wires x conductor cross section)	Minimum 3 x 1.5 mm^2
	Maximum 3 x 2.5 mm^2

6.4 Connecting light curtains

↳ For each light curtain, connect connection X3 on the transmitter to connection X2 on the receiver.



1 Receiver
2 Transmitter
3 Connection cable for evaluation unit
KDS S-M12-8A-M12-8A-P1-050
Part No. 50135146
4 Transmitter – receiver synchronization cable
KB DN/CAN-5000 SBA
Part No. 50114698

Fig. 6.3: Transmitter - receiver connection

- Connect connection X1 of the receiver to the bottom side of the evaluation unit according to the function of the light curtain:
  - Light curtain for width measurement: CML2
  - Light curtain for height measurement: CML3

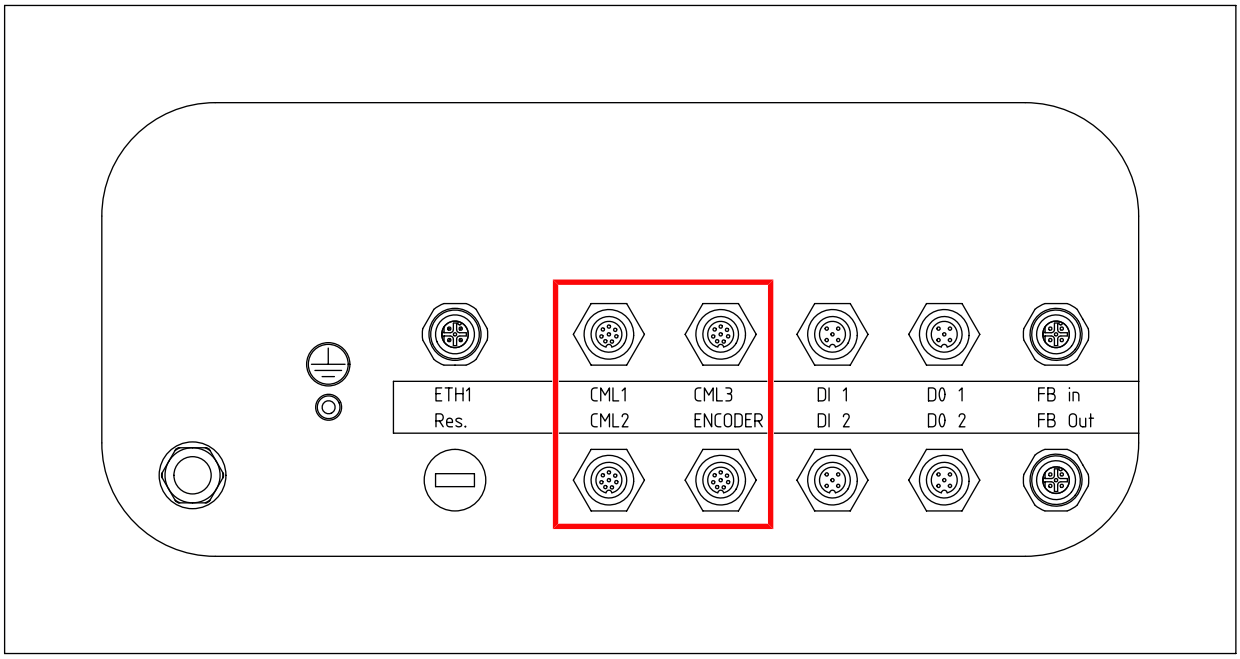


Fig. 6.4: Connections for light curtains

6.5 Connect rotary encoder

- Connect the socket of the rotary encoder connection cable (KDS S-M12-8A-M12-8A-P1-050; Part No. 50135146) to the rotary encoder.
- Connect the connector of the rotary encoder connection cable to the ENCODER connection on the bottom side of the evaluation unit.

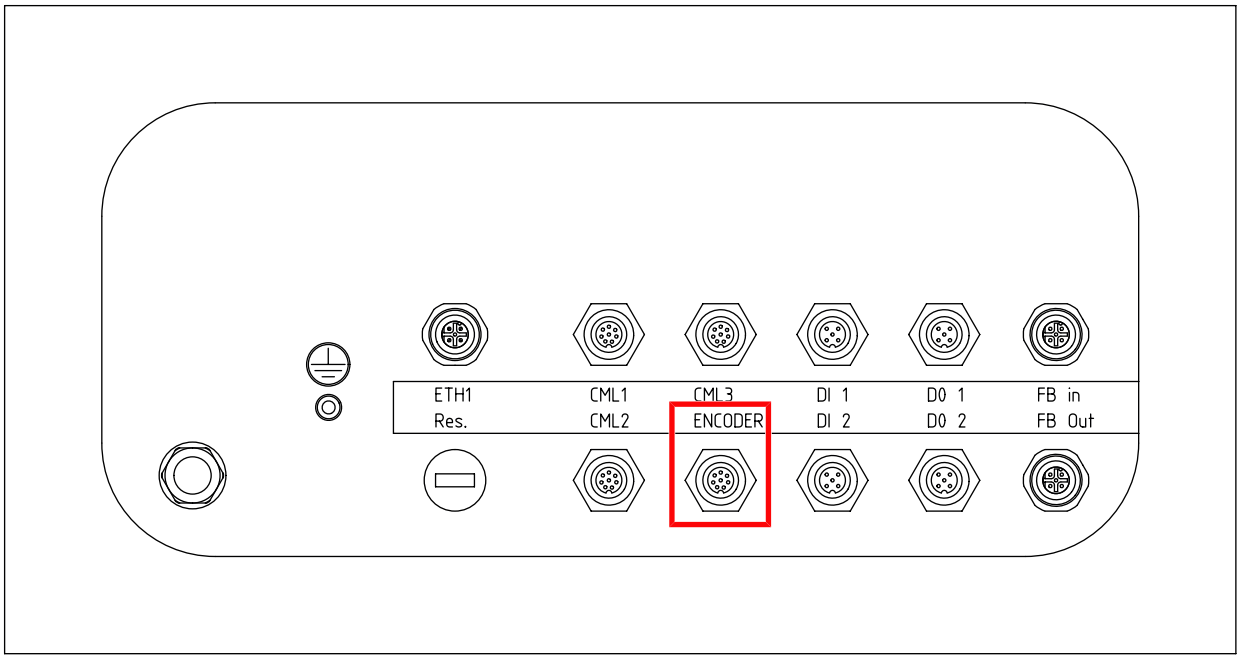
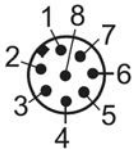


Fig. 6.5: Rotary encoder connection

Tab. 6.1: Pin assignment on the rotary encoder



Pin	Assignment	Core color of the cable
1	Minus U-	White/WH
2	Plus U+	Brown/BN
3	A	Green/GN
4	B	Yellow/YE
5	N	Gray/GY
6	A_{Inv}	Pink/PK
7	B_{Inv}	Blue/BU
8	N_{Inv}	Red/RD
Shield		Wire

6.6 Connecting the air wipe unit

Connect the optional air wipe unit to switching output DO 2 on the bottom side of the evaluation unit using the M12 connector.

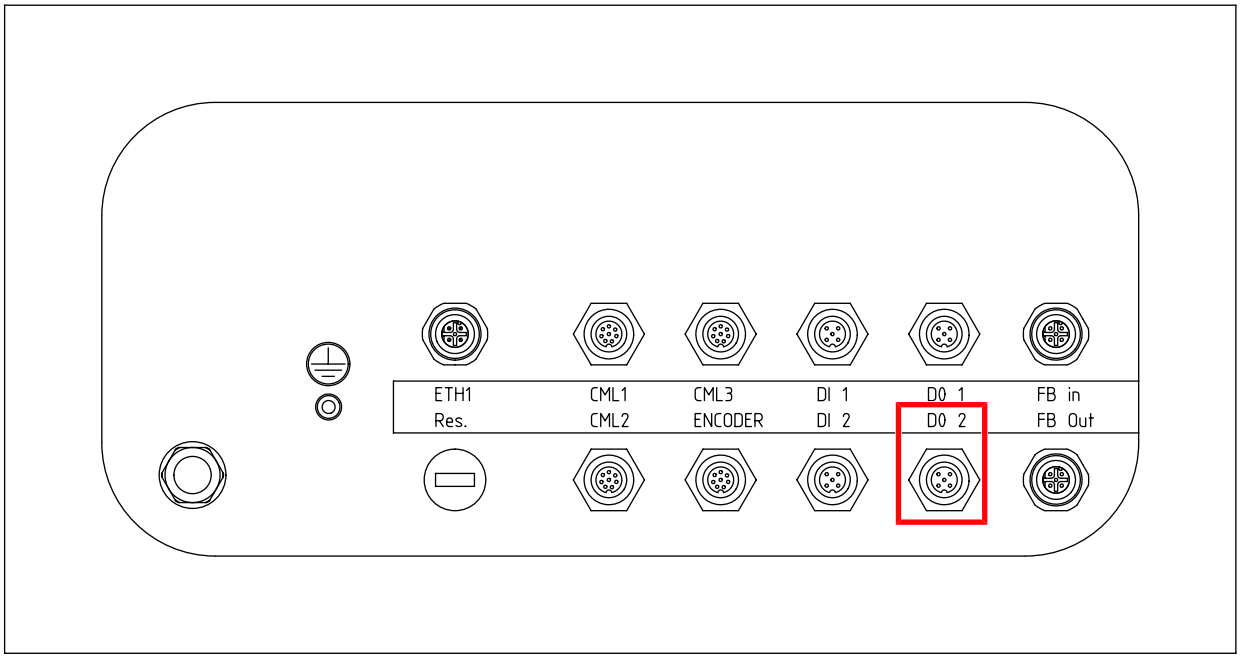


Fig. 6.6: Connection for air wipe unit

NOTICE	
	Operation may only occur on the switch cabinet with a powerful power supply unit. Ex works, the air wipe unit starts when the switch cabinet is switched on. Switching on and off is performed via the bus commands, see chapter 9 "TCP/IP interface description". The boot time is approx. 15 seconds.

NOTICE
Operation may only occur on the switch cabinet with a powerful power supply unit. Ex works, the air wipe unit starts when the switch cabinet is switched on. Switching on and off is performed via the bus commands, PROFINET interface description. The boot time is approx. 15 seconds.

6.7 Connecting Ethernet

Connect the Ethernet TCP/IP connection to the primary system at connection ETH1 on the bottom side of the evaluation unit.

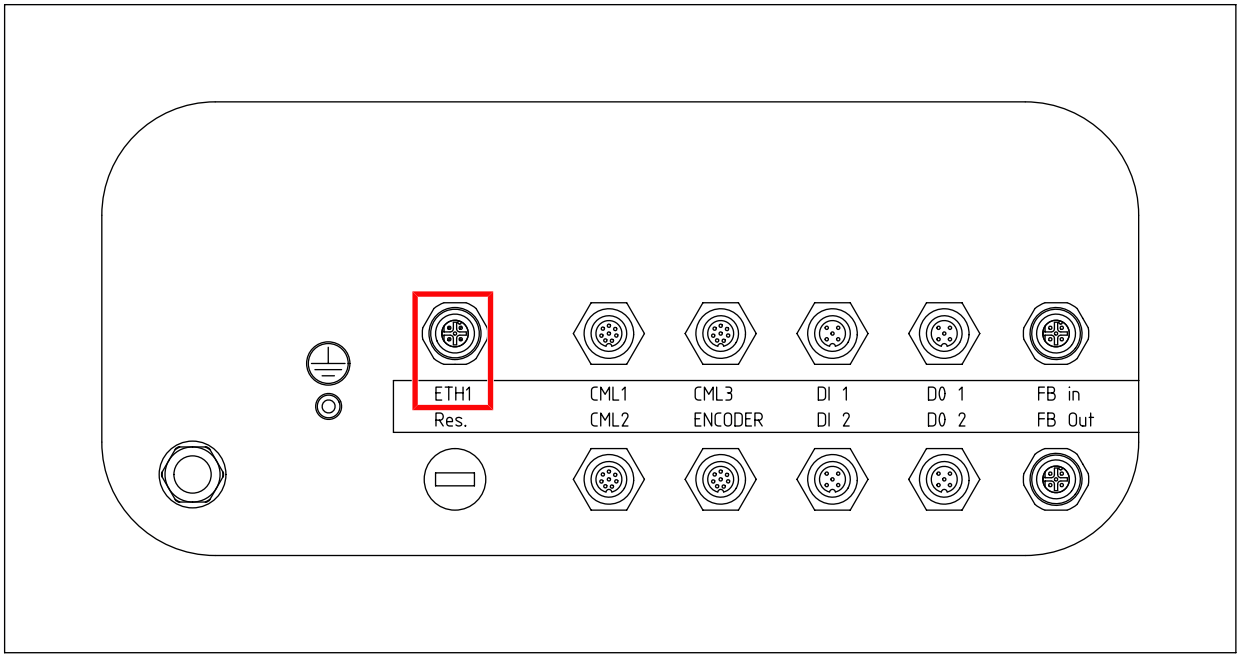


Fig. 6.7: Ethernet TCP/IP connection

6.8 EMC-compliant installation

NOTICE
Functional earth! The functional earth must be ensured at all components of the contour measurement system.

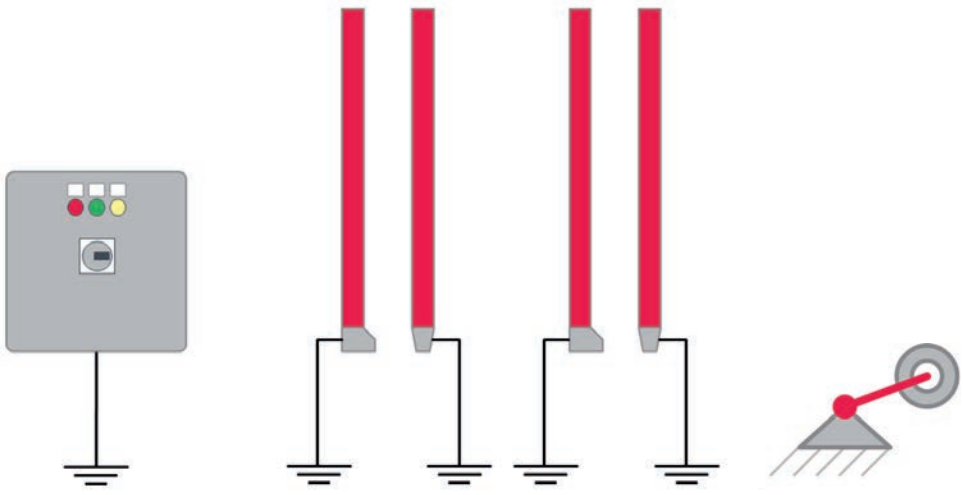


Fig. 6.8: Contour measurement system – grounding diagram

6.8.1 Grounding the evaluation unit

↳ Ground the evaluation unit with a grounding cable with conductor cross section > 6 mm².
A grounding bolt is installed on the bottom side of the evaluation unit.

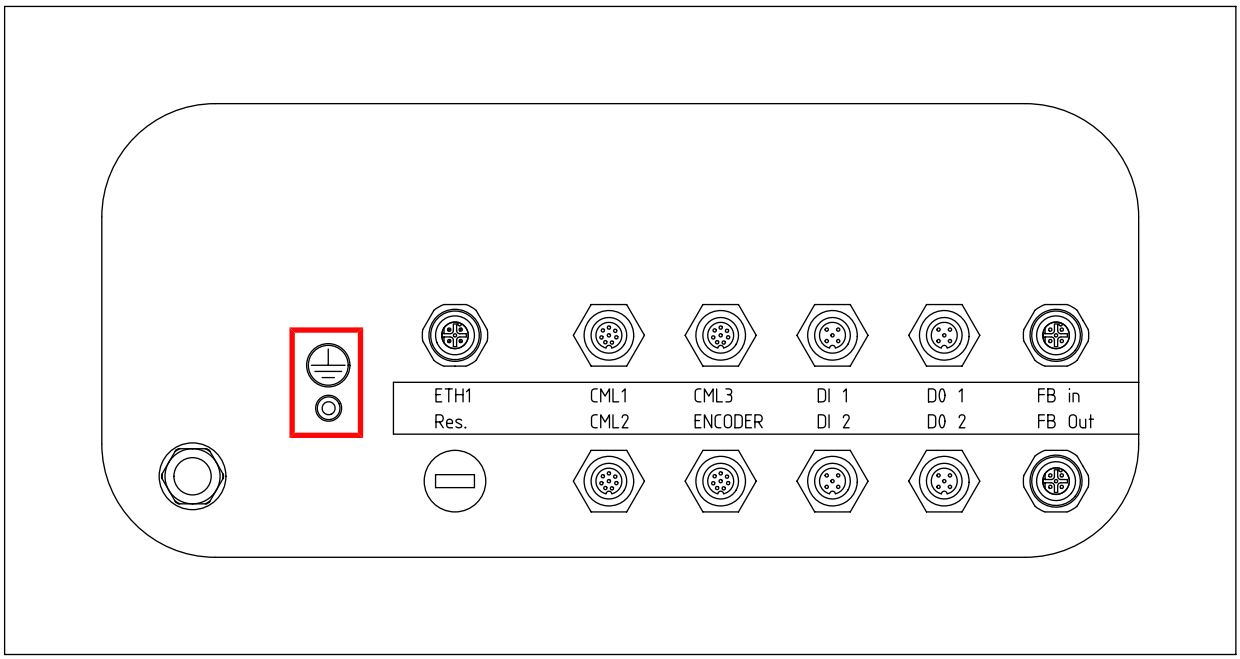


Fig. 6.9: Evaluation unit – grounding bolt

6.8.2 Grounding the light curtain housing

NOTICE
The transmitter housing and receiver housing of the light curtains must be connected to the protective conductor on the FE machine star point via the FE screw on the grounding slot nut. The grounding cable should be as short as possible and have a cross section ≥ 6 mm².

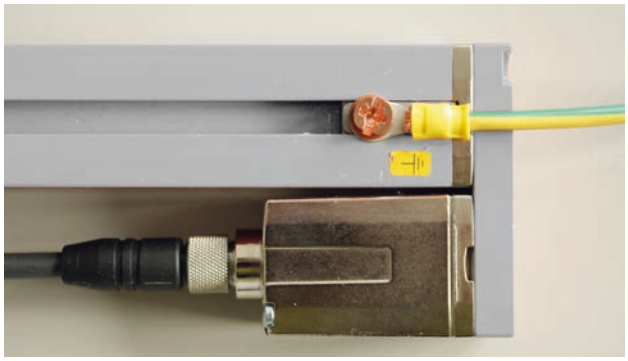


Fig. 6.10: Connecting the ground potential to the light curtain housing

↳ Check the set screw that secures the grounding slot nut on the device housing for secure seating. This set screw is correctly tightened upon delivery from the factory.

↳ Place a lock washer under the copper screw and check the penetration of the anodized layer on the device housing.

6.8.3 Shielding and line lengths

NOTICE

General information on the shield!

- Avoid interference emissions when using power components.
  The necessary specifications under which the power component satisfies its CE Declaration of Conformity can be found in the technical description of the power component.
  In practice, the following measures have proven effective:
  - ⇨ Properly ground the total system.
  - ⇨ Screw mains filter, frequency inverter, etc., flat to a galvanized mounting plate (thickness 3 mm) in the switch cabinet.
  - ⇨ Keep cable between mains filter and inverter as short as possible and twist cables.
  - ⇨ Shield both ends of the motor cable.
- Carefully ground all parts of the machine and of the switch cabinets using copper strips, ground rails or grounding cables with large cross section.
- Keep the length of the shieldless end of the cable as short as possible.
- Guide the shielding untwisted to a terminal (no "RF braid").

NOTICE

Disconnect power and control cables!

- Lay the cables of the power components as far as possible from the cables of the contour measurement system (distance > 30 cm).
- Avoid laying cables of the power components and cables of the contour measurement system parallel to one another.
- Cable crossings should be laid as perpendicular as possible.

NOTICE

Lay cables close to grounded metal surfaces!

- Lay the cables on grounded metal surfaces. This measure reduces interference coupling in the cable.

NOTICE

Avoid leakage currents in the cable shield!

- Carefully ground all parts of the machine.
  Leakage currents arise from incorrectly implemented equipotential bonding. You can measure leakage currents with a clip-on ammeter.

NOTICE

Use star-shaped cable connections!

- Ensure that the devices are connected in a star-shaped arrangement!
  You thereby avoid mutual influences from various loads.
  This prevents cable loops.

7 Starting up the device

7.1 Plugging in the software dongle

Prior to the initial commissioning, the software dongle must be plugged into the evaluation unit. The software dongle is supplied as a USB flash drive.

	NOTICE
	The contour measurement system does not function without the software dongle plugged in. If the evaluation unit is exchanged, the software dongle must be unplugged from the old evaluation unit and plugged into the new evaluation unit.

Fig. 7.1: Plugging in the software dongle

- Open the evaluation unit with the supplied key.
- Plug the software dongle into the USB connection in the evaluation unit.
- Close the evaluation unit.

7.2 Switching on and off

	NOTICE
	- Check the wiring before switching on for the first time. - Only switch the device on and off via the main switch, see chapter 3.2.2 "Indicators and operational controls". - Observe the wait time of 30 s after switching off before switching on again.

7.3 Setting up the system coordinate origin

For the contour measurement system to correctly output measurement values, projections and deformations, the coordinate origin of the contour measurement system must be set up once before starting the measurements.

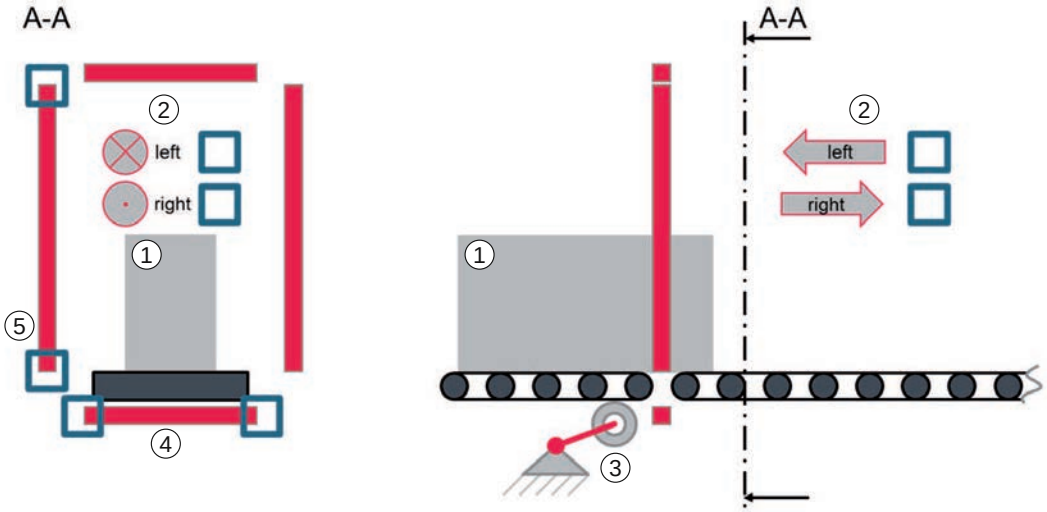
↳ Determine and note the installation scenario of your system using the figure:

- Conveying direction of the measurement objects (blue boxes, left or right).
- The respective positions of the connection units of the light curtains (blue boxes, right/left or top/bottom).

NOTICE

Note the conveying direction!

↳ First note down the conveying direction of the measurement objects (left or right).



1	Measurement object
2	Conveying direction
3	Rotary encoder for length measurement
4	Light curtain, width measurement (width CML)
5	Light curtain, height measurement (height CML)
A-A	View A-A

Fig. 7.2: Setting up the system coordinate origin

↳ Evaluate the determined installation scenario. Note the webConfig tool setting for your installation scenario.

- To set the coordinate origin in the webConfig tool, it may be necessary to invert the counting direction of the light beams for one or more light curtains depending on the installation scenario.

Installation scenario	Conveying direction	Width CML	Height CML	webConfig tool adjustment
1	Left	Left	Top	Reverse counting direction: Width CML Height CML
2	Left	Left	Down	Reverse counting direction: Width CML
3	Left	Right	Top	Reverse counting direction: Height CML
4	Left	Right	Down	---
5	Right	Left	Top	Reverse counting direction: Height CML
6	Right	Left	Down	---
7	Right	Right	Top	Reverse counting direction: Width CML Height CML
8	Right	Right	Down	Reverse counting direction: Width CML

↳ Enter the values for setting the coordinate origin of your system in the webConfig tool (see chapter 8.3.1 "Setting the system coordinate origin").

7.4 Setting up light curtains

NOTICE

Ensure the correct installation and alignment!

↳ Make sure that the light curtains are correctly installed and aligned (see chapter 5 "Mounting").

↳ Make sure that the light curtains are correctly connected to the evaluation unit (see chapter 6.4 "Connecting light curtains").

NOTICE

Important for transparent objects!

↳ When measuring transparent objects, such as beverage six packs, use the webConfig tool to adjust the *sensitivity* parameter (see chapter 8.3.5 "Adjust and teach in sensitivity").

NOTICE

The *sensitivity* parameter of the light curtain is the reciprocal of the *function reserve* parameter. You can find the technical explanation in the operating instructions of the light curtain in chapter *Setting the function reserve*.

↳ Switch on the evaluation unit to establish the voltage supply of the light curtains.

↳ Configure the light curtains via the corresponding receiver control panel. The settings that are made take effect without restarting.

7.4.1 Setting up the width and height light curtains

Settings for the light curtains for width and height measurement:

- Process data length (PD length): *32 bytes*
- Bit rate: *COM3: 230.4*
- Data storage: *Deactivated*

Level 0	Level 1	Level 2	Description		
Settings					
	Commands				
	Operation settings				
	IO-Link	Bit rate	**COM3: 230.4**	COM2: 38.4	
		PD Length	2 bytes	8 bytes	**32 bytes**
		Data memory	**Deactivated**	Activated	

7.5 Setting up the rotary encoder

No special settings are necessary for the rotary encoder.

Make sure that the rotary encoder is correctly installed and aligned (see chapter 5.1.1 "Mounting instructions").

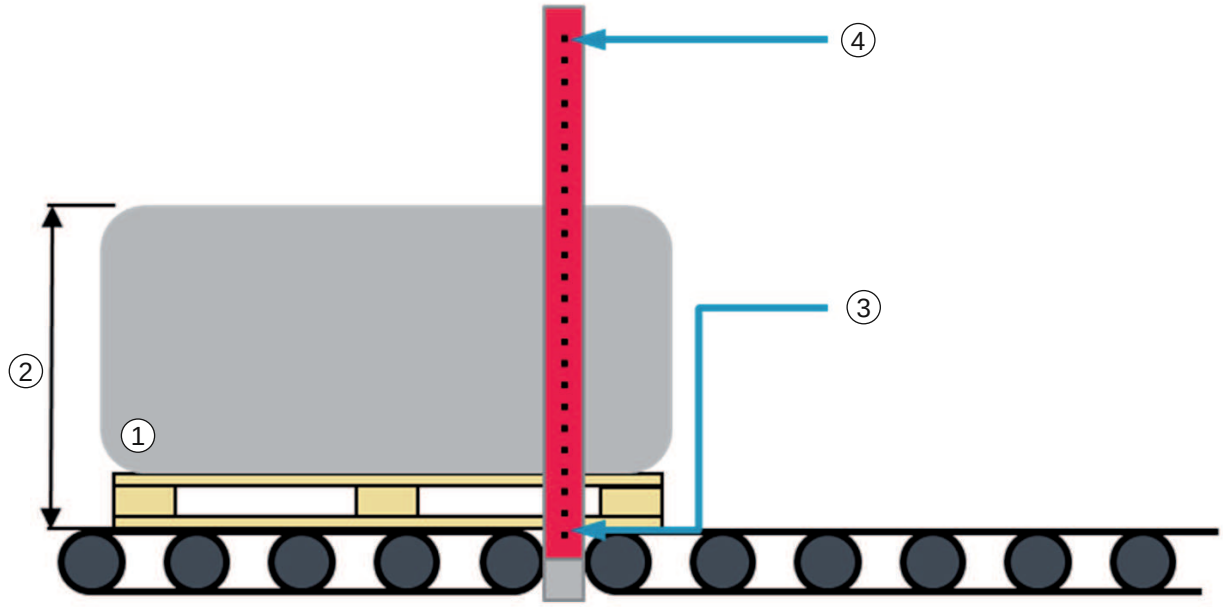
7.6 Determining the height offset

For the contour measurement system to output the correct height of a measurement object, the mechanical distance between the conveyor plane and the first beam of the light curtain for determining the height measurement must be entered via the webConfig tool.

NOTICE
The offset is relative to the mounting position of the light curtain. Depending on the distance to the conveyor, the offset may be different in every system.

NOTICE
The measurement resolution is determined by the light curtain and is 5 mm.

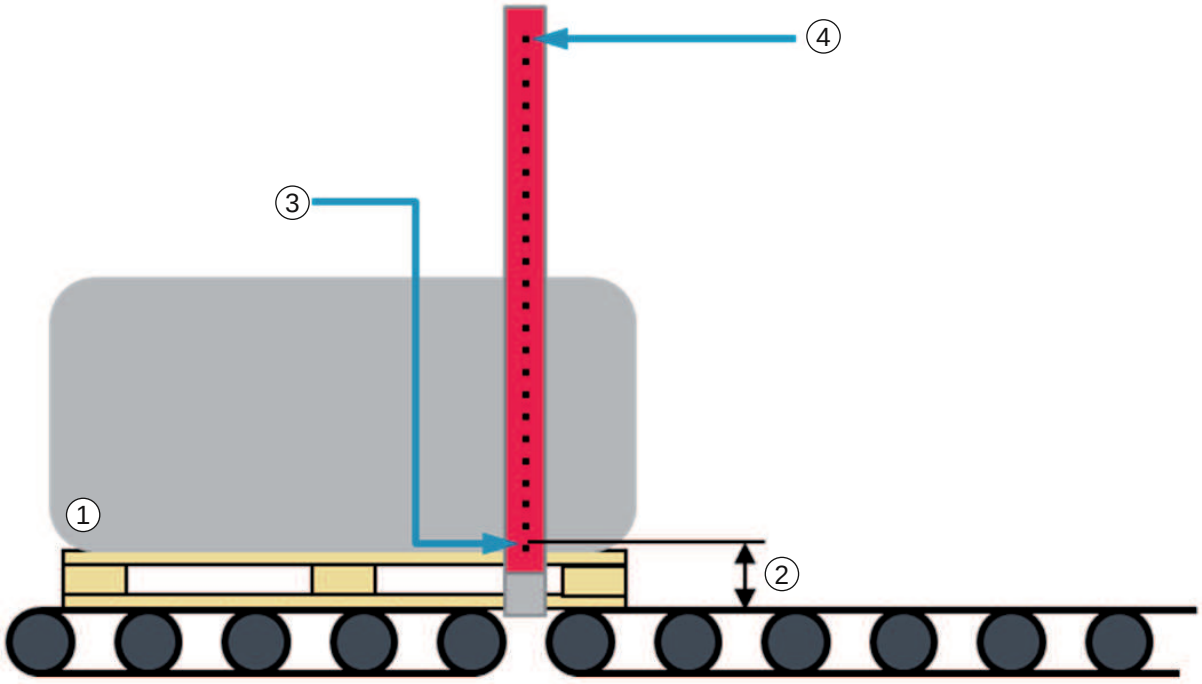
The first beam of the light curtain for height measurement should always be aligned with the conveyor.



1 Measurement object
2 Object height
3 First beam of the height light curtain
4 Last beam of the height light curtain

Fig. 7.3: Height offset = 0 mm

Offset when mounting the height light curtain above the conveyor



1 Measurement object
2 Height offset
3 First beam of the height light curtain
4 Last beam of the height light curtain

Fig. 7.4: Height offset

↳ Measure the mechanical distance between the conveyor plane and the first beam of the height light curtain in [mm].
Note the distance value.

↳ Enter the distance value in the webConfig tool (see chapter 8.3.2 "Setting the offset for height detection").

	NOTICE
	Alternative determination of the height offset Reference measurement on a measurement object with known height ↳ Move the measurement object through the contour measurement system. ↳ Determine the difference between the displayed object height and the known height of the measurement object. ↳ Enter the thereby determined height offset (numerical value in [mm]) in the webConfig tool (see chapter 8.3.2 "Setting the offset for height detection").

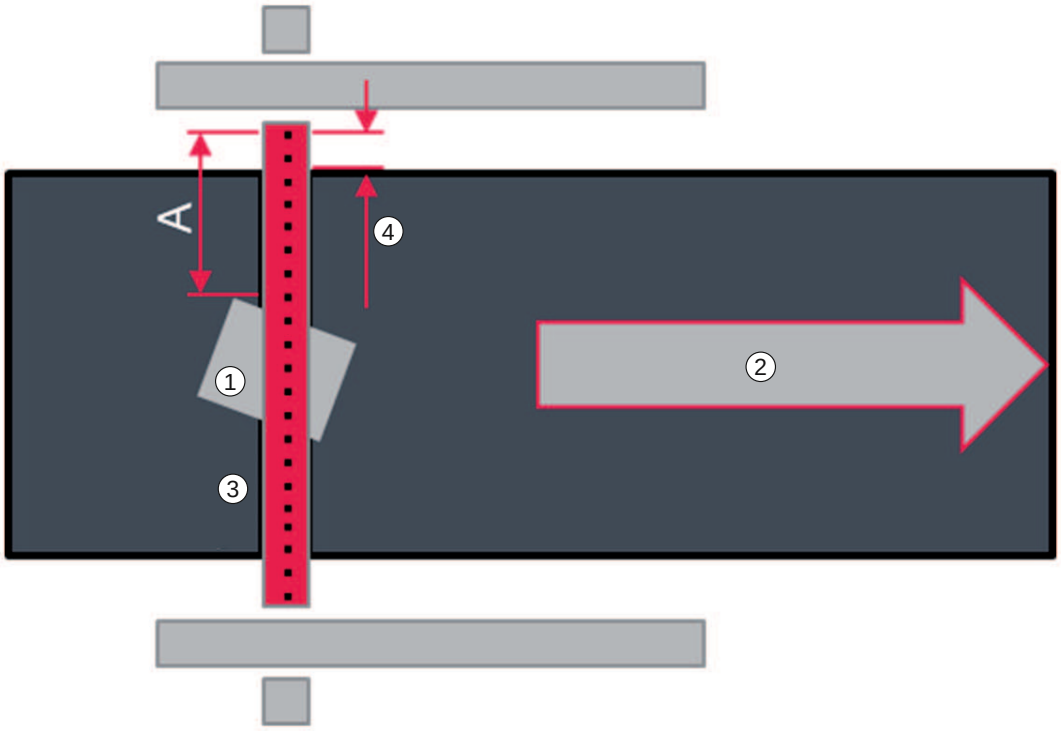
7.7 Determining the width offset

If the contour measurement system is to output the smallest distance between measurement object and the conveyor edge, the mechanical distance between the conveyor edge and the first beam of the light curtain for width measurement (width offset) must be entered via the webConfig tool.

NOTICE
The offset is relative to the mounting position of the light curtain. Depending on the distance to the conveyor, the offset may be different in every system.

NOTICE
The measurement resolution is determined by the light curtain and is 5 mm.

- Correctly align the transmitter and receiver of the light curtain for width measurement (see chapter 5.1.3 "Positioning for width measurement").
- Determine on which side of the width light curtain beam 1 is located.
- Measure the shortest distance between beam 1 and the edge of the conveyor in [mm]. Note the value.



1 Measurement object
2 Conveying direction
3 Light curtain width measurement
4 Width offset
A Distance between beam 1 and measurement object

Fig. 7.5: Width offset

- Enter the value determined for the width offset with negative sign in the webConfig tool (see chapter 8.3.3 "Setting the offset for distance measurement").

8 System configuration via webConfig tool

With the webConfig tool, an operating-system independent, web-technology based, graphical user interface is available for configuring the contour measurement system.

- The webConfig tool can be run on any Internet-ready PC.
- The webConfig tool uses HTTP as communication protocol and the client-side restriction to standard technologies (HTML, JavaScript and AJAX) that are supported by modern browsers.
- The user interface of the webConfig tool is largely self-explanatory through the displayed help texts.

NOTICE

The webConfig tool is offered in the following languages:

German, English, French, Italian, Spanish

NOTICE

The figures in this chapter show configuration examples and do not necessary correspond to the interface profile and the light curtain configuration of your contour measurement system.

8.1 Start webConfig tool

↳ Connect the PC and evaluation unit via the ETH1 connection using a suitable accessory cable (see chapter 13 "Order guide and accessories").

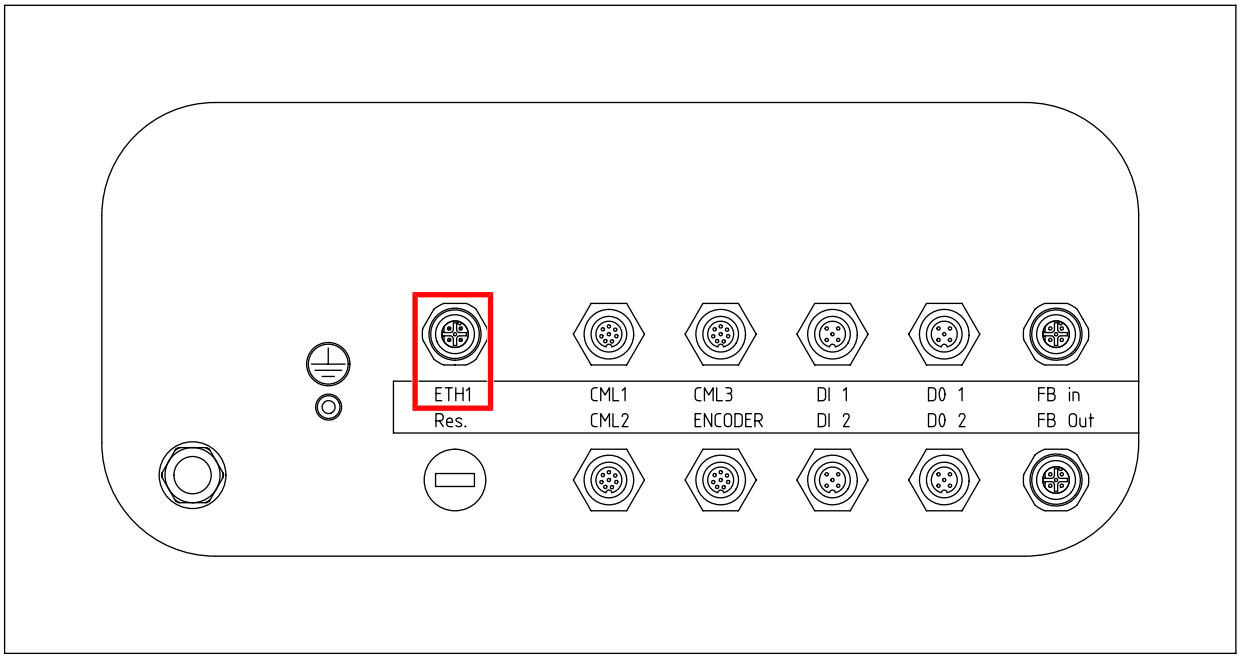


Fig. 8.1: ETH1 connection

↳ Set the network adapter of the PC to an IP address in the range **192.168.60.XXX**, e.g., **192.168.60.100**.

NOTICE

IP address of the evaluation unit

The preset IP address of the evaluation unit is **192.168.60.101.**

↳ Start the Internet browser on your PC and enter the IP address of the evaluation unit: **192.168.60.101.**

⇨ The start page of the webConfig tool is displayed on the PC.

8.2 Display of the process data

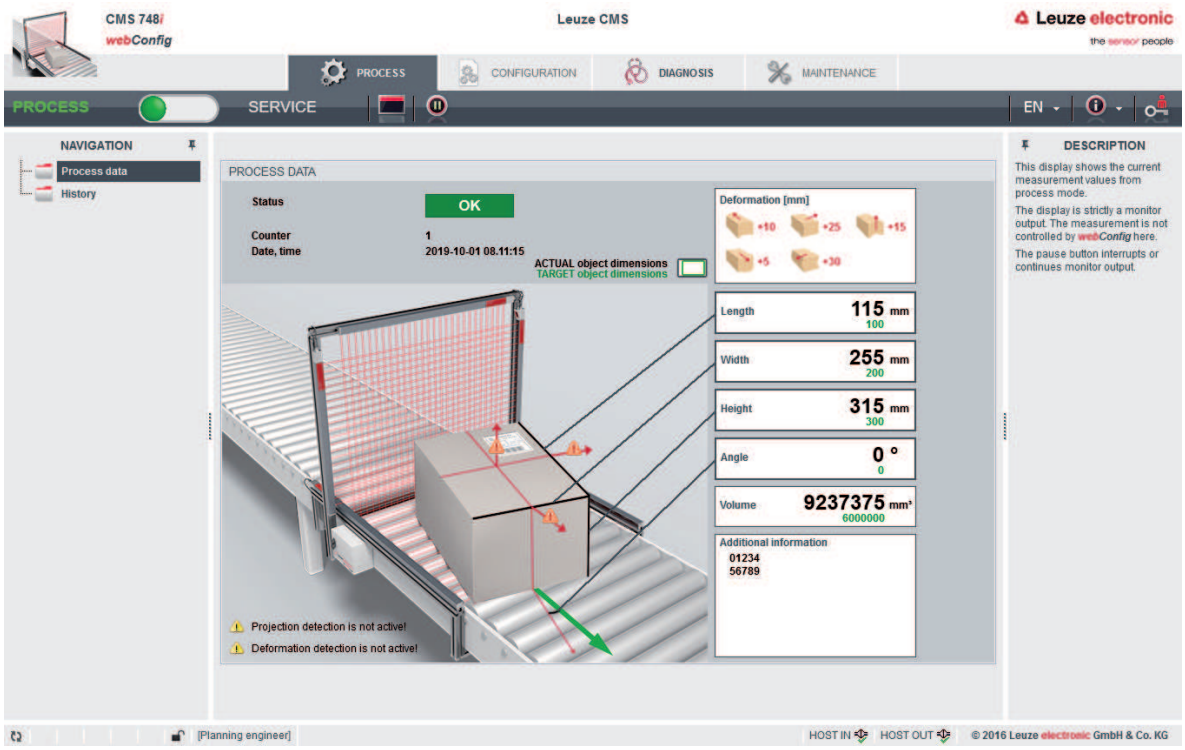


Fig. 8.2: Process data

8.3 Configuration of the light curtains

NOTICE

↳ Perform the configuration for all light curtains of the contour measurement system.

8.3.1 Setting the system coordinate origin

NOTICE

Note the installation scenario!

To set the coordinate origin in the webConfig tool, it may be necessary to invert the counting direction of the light beams for one or more light curtains depending on the installation scenario.

↳ Determine your installation scenario and the required webConfig settings (see chapter 7.3 "Setting up the system coordinate origin").

↳ Activate the respective light curtain or light curtains; activate the *Reverse counting direction* checkbox if necessary.

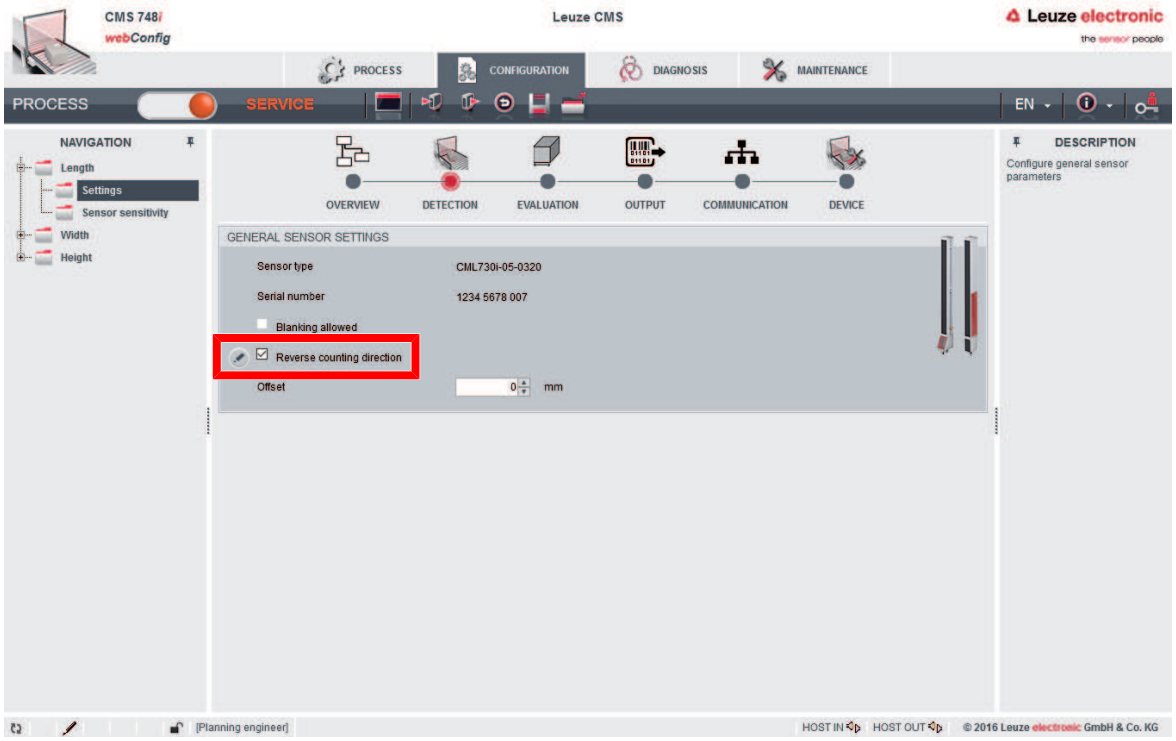


Fig. 8.3: Light curtain: Reverse counting direction of the light beams

8.3.2 Setting the offset for height detection

For the contour measurement system to output the correct height of a measurement object, the mechanical distance between the conveyor plane and the first beam of the light curtain for determining the height measurement must be entered via the webConfig tool.

NOTICE

This setting only affects the configuration of the light curtain for the height measurement.

↳ Determine the height offset for your system (see chapter 7.6 "Determining the height offset").

↳ Enter the determined height offset value in [mm] in the *Offset* input field.

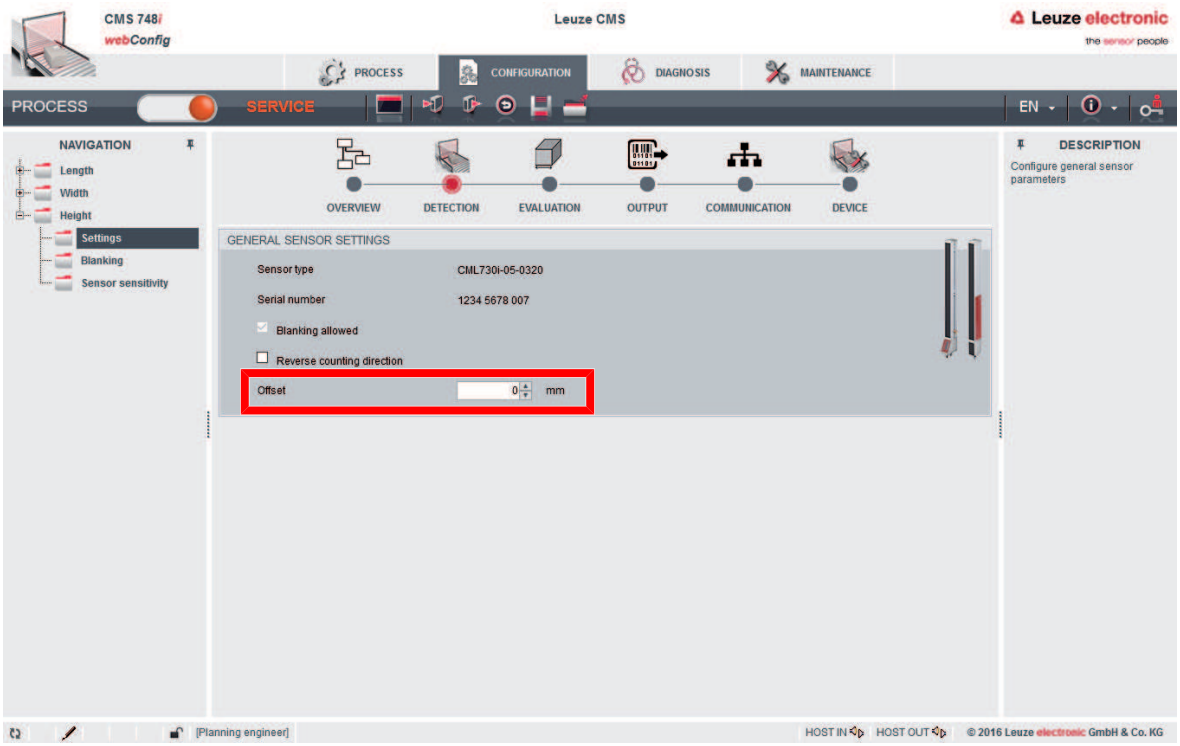


Fig. 8.4: Configuring the height light curtain – height offset

NOTICE

Measurement object height less than the minimum height!

Measurement value output if the height of the measurement object is less than the minimum height that can be detected by the light curtain:

↳ The contour measurement system does not output a reliable height measurement value.

8.3.3 Setting the offset for distance measurement

If the contour measurement system is to output the smallest distance between measurement object and the conveyor edge, the mechanical distance between the conveyor edge and the first beam of the light curtain for width measurement (width offset) must be entered via the webConfig tool.

NOTICE

This setting only affects the configuration of the light curtain for the width measurement.

Determine the width offset for your system (see chapter 7.7 "Determining the width offset").

Enter the determined width offset value in [mm] **with negative sign** in the *Offset* input field.

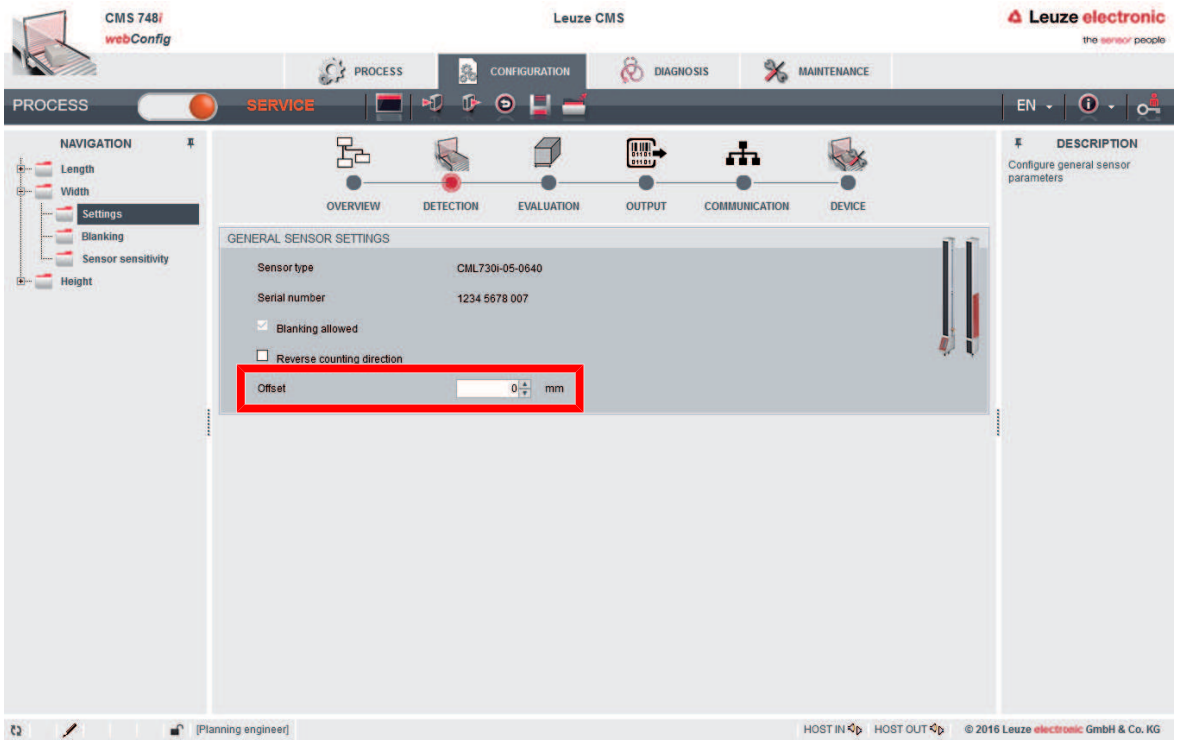


Fig. 8.5: Configuring the width light curtain – width offset

NOTICE

For the contour measurement system to output the detected distance, the *Distance (outer)* parameter must be dragged to the output protocol (see chapter 8.5 "Configuration of the output log").

8.3.4 Blanking areas

If obstacles constantly interrupt the edge beams of the width or height light curtain, you can blank the corresponding areas.

NOTICE

Incorrect measurements caused by blanked areas located in the middle of the measurement range of the light curtain!

A blanked area located in the middle of the measurement range of the light curtain is not permissible.

↳ Blanked areas must always contain the first or last beam of the light curtain.

Fig. 8.6: Blanking areas

8.3.5 Adjust and teach in sensitivity

NOTICE

Measure transparent objects!

When measuring transparent objects, e.g., beverage six packs, adjust the *Sensitivity* setting.

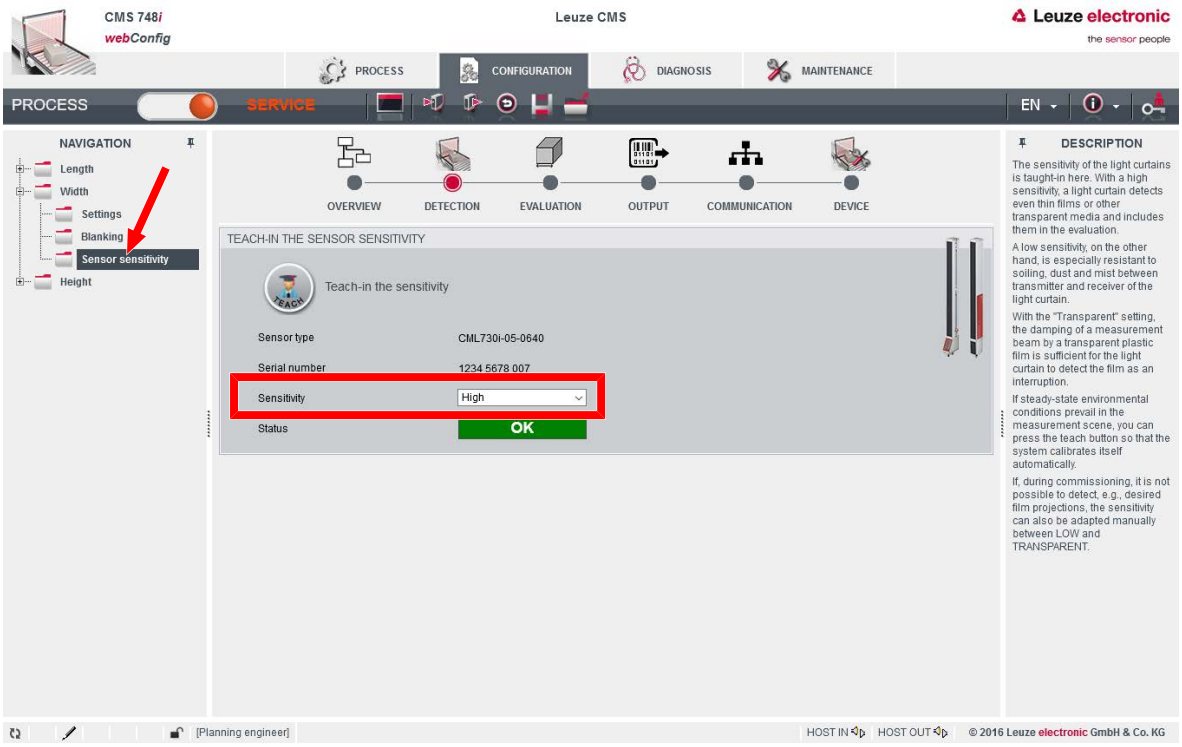


Fig. 8.7: Adjust sensitivity

8.4 Configuration of the evaluation

Functional principle of the evaluation: see chapter 4.1 "Operating principle"

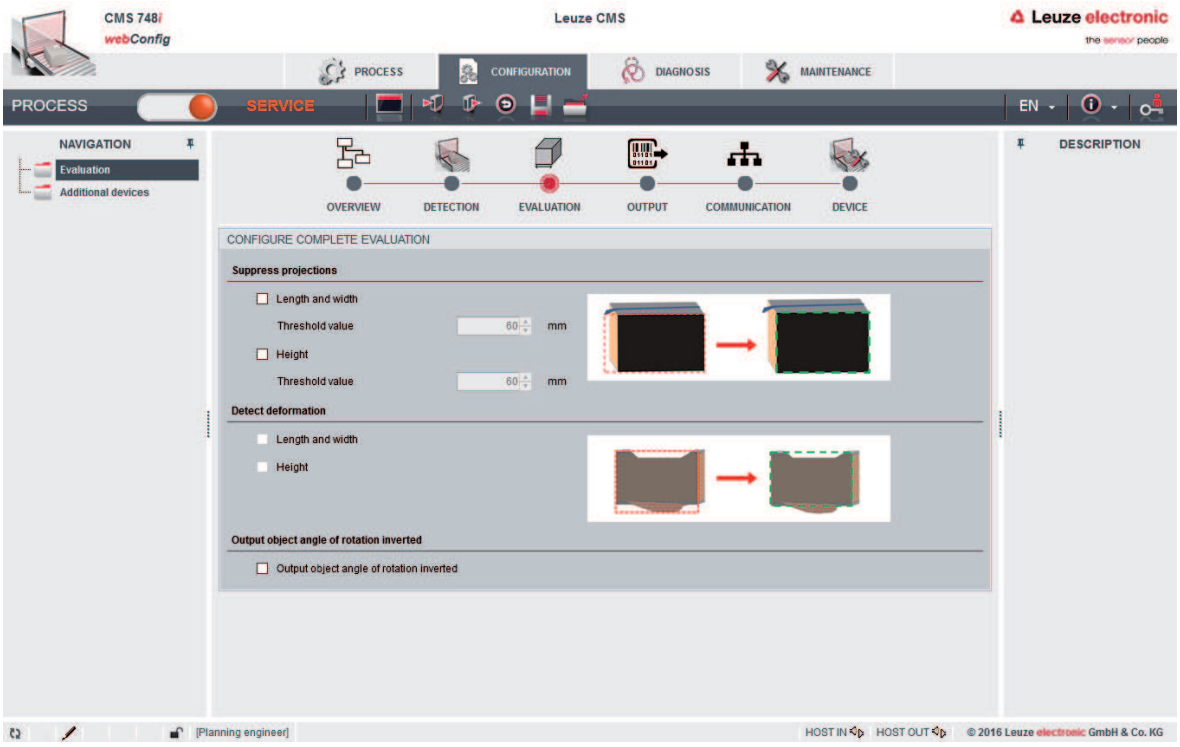


Fig. 8.8: Configuration of the evaluation

8.5 Configuration of the output log

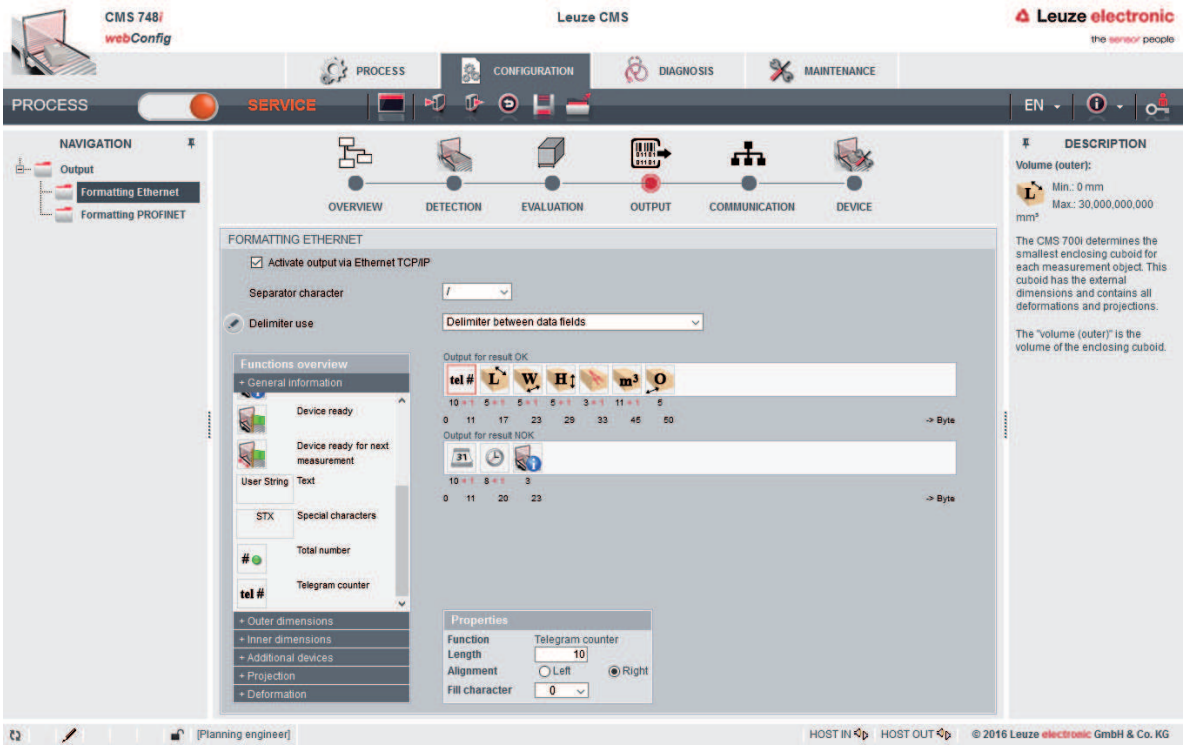


Fig. 8.9: Configuration of the output log

8.6 Configuration of the Ethernet interface

Fig. 8.10: Configuration of the Ethernet interface

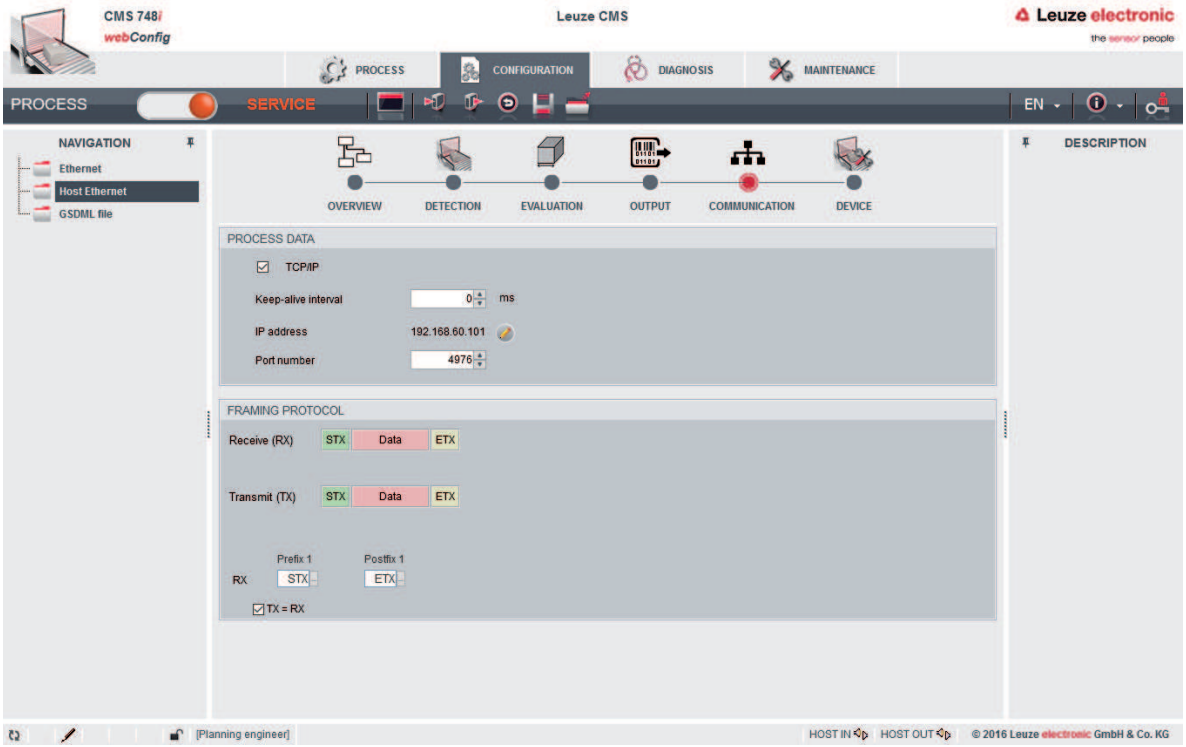


Fig. 8.11: Configuration of the Ethernet host

8.7 Designation of the contour measurement system in the network

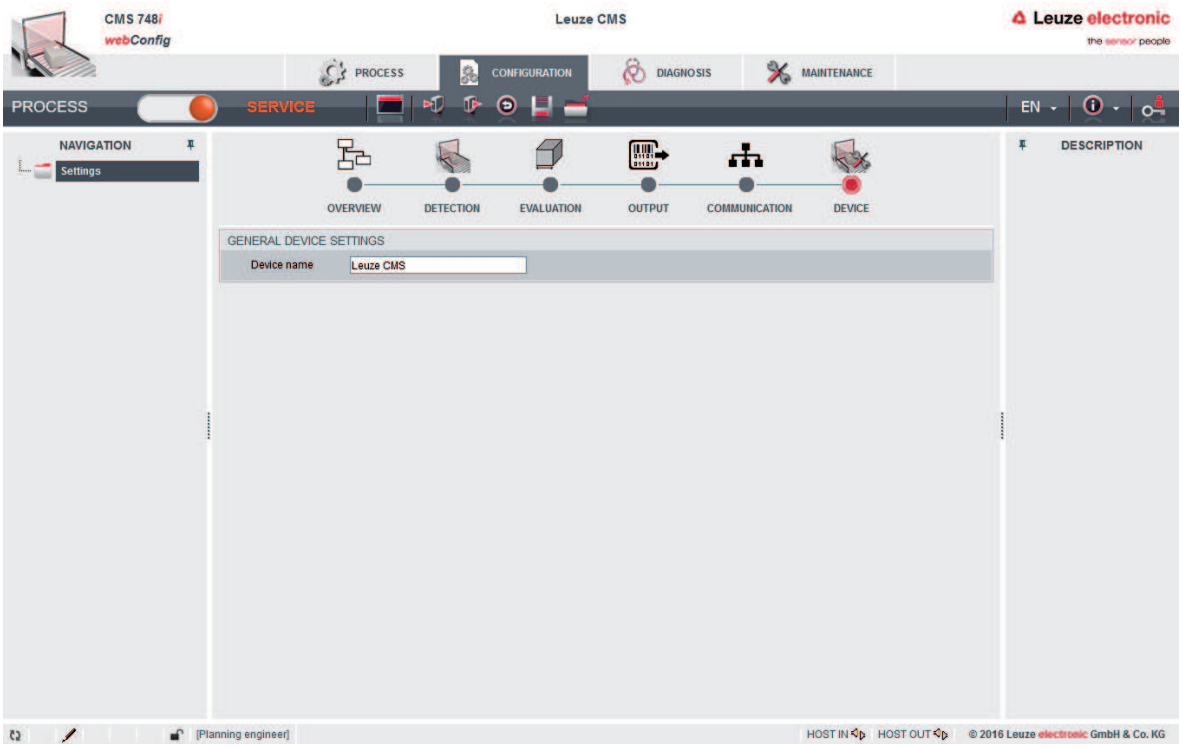


Fig. 8.12: Designation of the contour measurement system

9 TCP/IP interface description

- TCP server
- Port (factory settings): 4967

9.1 Device status

The *Device status* function is available in the configuration of the output formatting. The device status is output as a binary-encoded status byte.

Tab. 9.1: Status byte

Bit	Designation	Type	Remark
0	System status OK	BOOL	TRUE = System OK
1	Sensors status OK	BOOL	TRUE = Sensors OK
2	Length sensor NOK	BOOL	TRUE = Sensor error: Length measurement
3	CML width NOK	BOOL	TRUE = Light curtain error: Width measurement
4	CML height NOK	BOOL	TRUE = Light curtain error: Height measurement
5	SystemReady-ForNextMeas	BOOL	TRUE = System ready for next measurement
6		BOOL	Reserved
7	Toggle bit	BOOL	Changeover after every sent message

9.2 Last error code

Information indicating whether an error has occurred in the system. Displays the last error that occurred (see chapter 9.4 "Error codes").

9.3 Online commands

Online commands are commands that can be sent to the system directly via the interface. The commands are evaluated and executed by the system provided a valid command is present.

Framing

The TCP input data is subject to the same framing that was also configured for the output data.

Standard framing: *<STX>DATEN<ETX>*

Unless specified separately, all commands respond with *Command=OK* as soon as the internal command processing is completed. This answer is also subject to the standard framing.

System activation

Command	+
Command (including standard framing)	<STX>+<ETX>
Answer (including standard framing)	<STX>+=OK<ETX>
Description	

System deactivation

Command	-
Command (including standard framing)	<STX>-<ETX>
Answer (including standard framing)	<STX>-=OK<ETX>
Description	

Data Reset

Command	DR
Command (including standard framing)	<STX>DR<ETX>
Answer (including standard framing)	<STX>DR=OK<ETX>
Description	Resets the output data of the host interface. • Only affects data fields. • Status and error codes are not reset. • The internal object counter of the system is not affected; it continues with the next measurement as before.

Example:

Output before DR command:
<STX>00004,00300,00400,00050,+02,035,000<ETX>

Cyclic output following DR command:
<STX>00000,00000,00000,00000,000,035,000<ETX>

Output after the next measurement:
<STX>00005,00300,00395,00050,000,035,000<ETX>

Delete error

Command	EC
Command (including standard framing)	<STX>EC<ETX>
Answer (including standard framing)	<STX>EC=OK<ETX>
Description	Confirms and deletes error messages or warnings that may be present in the system.

System software restart

Command	SRS
Command (including standard framing)	<STX>SRS<ETX>
Answer (including standard framing)	<STX>SRS=OK<ETX>
Description	Performs an internal reset of the system modules. The process lasts just a few seconds. • During the reset, no objects may be located in the measuring frame. • The process also resets the system's internal object counter. Following the reset, the object counter resumes with zero.

System hard restart

Command	SRH
Command (including standard framing)	<STX>SRH<ETX>
Answer (including standard framing)	No answer Immediate system reset
Description	Performs a complete restart of the measurement system. This process lasts approximately 90 seconds. • During this time, the system performs no measurements and cannot be reached via either the host or the service interface. • During the reset, no objects may be located in the measuring frame.

Switching on the air wipe unit

Command	AP1
Command (including standard framing)	<STX>AP1<ETX>
Answer (including standard framing)	<STX>AP1=OK<ETX>
Description	Switches on the air wipe unit.

Switching off the air wipe unit

Command	AP0
Command (including standard framing)	<STX>AP0>ETX>
Answer (including standard framing)	<STX>AP0=OK<ETX>
Description	Switches off the air wipe unit.

9.4 Error codes

Value	Designation	Remark
000	Without error	System OK
001	General system error	General system error
002	General system error	Sensor error in the system
003	General communication error	Communication is faulty
004	General measurement error	Last measurement is invalid
005 … 019		Reserved
020	Length sensor error	General sensor error: length measurement
021	Communication error of the length sensor	Communication error of the sensor: Length measurement
022	Length sensor cleaning	Soiling on sensor: length measurement
023 … 029		Reserved
030	Width sensor error	General sensor error: width measurement
031	Communication error of the width sensor	Communication error of the sensor: Width measurement
032	Width sensor cleaning	Soiling on sensor: width measurement
033 … 039		Reserved
040	Height sensor error	General sensor error: height measurement
041	Communication error of the height sensor	Communication error of the sensor: height measurement
042	Height sensor cleaning	Soiling on sensor: height measurement
043 … 099		Reserved
100	Measurement dimension	Last measurement object was too small in at least one dimension
101	Measurement plausibility	Raw data could not be correctly or fully evaluated
102 … 255		Reserved

10 Care, maintenance and disposal

Cleaning

↳ If a sensor is dusty, clean the sensor with a soft, lint-free cloth; use a commercially available glass cleaner if necessary.

	NOTICE
	**Do not use aggressive cleaning agents!** ↳ Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device. ⇨ Use of improper cleaning agents can damage the lens cover.

Firmware update

In general, the firmware can only be updated by Leuze customer service on-site, at the headquarters or via a remote maintenance connection.

↳ With regard to firmware updates, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 11 "Service and support").

Maintenance

The components of the contour measurement system do not normally require any maintenance by the operating company.

Repairs to the devices may only be performed by the manufacturer.

↳ For repairs, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 11 "Service and support").

Disposing

↳ For disposal observe the applicable national regulations regarding electronic components.

11 Service and support

Service hotline

You can find the contact information for the hotline in your country on our website **www.leuze.com** under **Contact & Support**.

Repair service and returns

Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number and batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website **www.leuze.com** under **Contact & Support > Repair Service & Returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.

Part no.	Article	Description
S991030	CS-KRS/AS	Product training – daily package Including travel and accommodation in Germany
S991017	CS-SSF/FR	Commissioning support – daily package Including travel and accommodation in Germany
S991037	CS-SST/HR	Remote maintenance/support via the technical hotline

12 Technical data

12.1 General specifications

Optical data

Operating range Guaranteed operating range	0.1 m … 4.5 m
Operating range, transparent media Guaranteed operating range	0.1 m … 1.75 m
Operating range limit Typical values	0.1 m … 6 m
Beam spacing of the light curtains	5 mm (all measurement lengths ≤ 1200 mm) 10 mm (at least one measurement length > 1200 mm)

Measurement data

Minimum object height Rotary encoder for length measurement	5 mm

Time behavior

Readiness delay	60 s
Response time per beam	10 µs

Process interface

Ethernet TCP/IP: Configuration of the contour measurement system

Controls and indicators

Tab. 12.1: Evaluation unit

Display	3 LEDs
Configuration	webConfig tool via integrated web server Teach-in of the light curtains
Operational controls	On/off switch

Tab. 12.2: Light curtain

Display	2 LEDs OLED display
Configuration	Via the evaluation unit
Operational controls	Membrane keyboard

Electrical data

Protective circuit	Polarity reversal protection Short circuit protection Transient protection
Supply voltage	Within UL validity: see UL label in the device switch cabinet Outside of UL validity: 100 … 263 V AC
Open-circuit current	250 mA
Inputs/outputs selectable	No
Number of switching inputs	4
Input current	3 mA per switching input
Switching voltage, inputs	-3 V … 5 V DC (LOW) 11 V … 30 V DC (HIGH)
Number of switching outputs	4
Output current, maximum	100 mA per switching output channel
Switching voltage, outputs	24 V DC

Mechanical data

Tab. 12.3: Evaluation unit

Design	Cubic
Dimension (W x L x H) [mm]	380 x 380 x 210
Housing color/material	Metal/light gray
Net weight	12 kg
Fastening	4x bore holes Ø 12 mm on the rear side of the housing

Tab. 12.4: Rotary encoder - Length measurement

Resolution	100 pulses/revolution
Spatial resolution	5 mm/pulse
Size	58 mm
Measuring wheel	Circumference 500 mm Coating Plastic, smooth

Tab. 12.5: Light curtain - Width measurement

Design	Cubic
Dimension (W x H x L)	Measurement length 480 mm 29 mm x 35.4 mm x 555 mm Measurement length 560 mm 29 mm x 35.4 mm x 635 mm Measurement length 640 mm 29 mm x 35.4 mm x 715 mm
Housing color/material	Metal (aluminum)/gray
Lens cover material	Plastic
Net weight	Measurement length 480 mm 700 g Measurement length 560 mm 800 g Measurement length 640 mm 850 g
Fastening	Housing nut Mounting device BT-2P40

Tab. 12.6: Light curtain - Height measurement

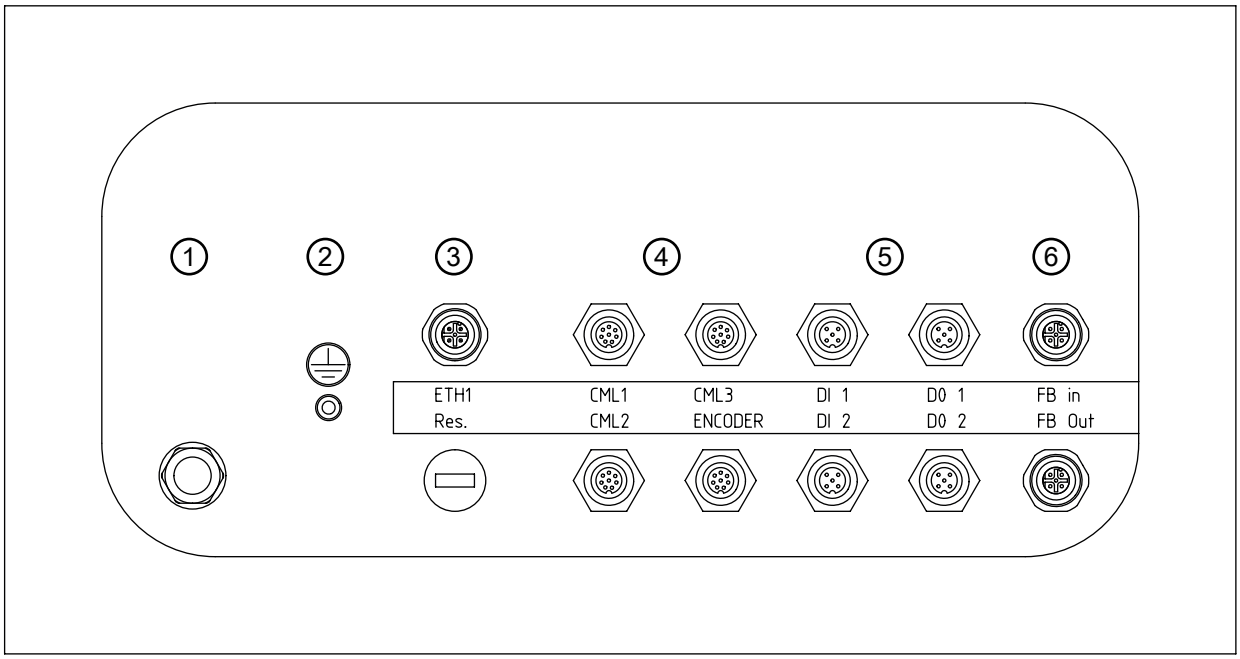
Design	Cubic
Dimension (W x H x L)	Measurement length 560 mm 29 mm x 35.4 mm x 635 mm Measurement length 640 mm 29 mm x 35.4 mm x 715 mm Measurement length 720 mm 29 mm x 35.4 mm x 795 mm
Housing color/material	Metal (aluminum)/gray
Lens cover material	Plastic
Net weight	Measurement length 560 mm 800 g Measurement length 640 mm 850 g Measurement length 720 mm 950 g
Fastening	Housing nut Mounting device BT-2P40

Environmental conditions

Operating temperature	0 °C … +45 °C
Storage temperature	-20 °C … +70 °C

12.2 Connections of the evaluation unit

Plug outlet: axial



1 Voltage supply
2 Grounding bolts
3 M12 Ethernet connection
4 3x interfaces for CML 730 light curtains (CML1 … CML3)
1x interface for rotary encoder (ENCODER)
5 2x M12 sockets, each with 2 switching inputs (DI 1, DI 2)
2x M12 sockets, each with 2 switching outputs (DO 1, DO 2)
6 PROFINET fieldbus interface (FB In, FB Out)

Fig. 12.1: Connections of the evaluation unit

Tab. 12.7: Grounding bolts

Function	Ground connection
Material	Metal

Tab. 12.8: Voltage supply

Type of connection	Harting connector, 4-pin Material: metal
Function	Voltage supply

Tab. 12.9: ETH1

Type of connection	M12 connector, 4-pin Material: metal
Function	External Ethernet TCP/IP connection
Pin assignment	Pin 1: TD+ Pin 2: RD+ Pin 3: TD- Pin 4: RD-

Tab. 12.10: CML1

Type of connection	M12 connector, 8-pin, A-coded Material: metal
Function	Light curtain connection for length measurement Not in combination with rotary encoder
Pin assignment	Pin 1: V+ Pin 2: IO1 Pin 3: GND Pin 4: IO-Link Pin 5: IO2 Pin 6: IO3 Pin 7: IO4 Pin 8: GND

Tab. 12.11: CML2

Type of connection	M12 connector, 8-pin Material: metal
Function	Light curtain connection for width measurement
Pin assignment	Pin 1: V+ Pin 2: IO1 Pin 3: GND Pin 4: IO-Link Pin 5: IO2 Pin 6: IO3 Pin 7: IO4 Pin 8: GND

Tab. 12.12: CML3

Type of connection	M12 connector, 8-pin Material: metal
Function	Light curtain connection for height measurement
Pin assignment	Pin 1: V+ Pin 2: IO1 Pin 3: GND Pin 4: IO-Link Pin 5: IO2 Pin 6: IO3 Pin 7: IO4 Pin 8: GND

Tab. 12.13: ENCODER

Type of connection	M12 connector, 8-pin Material: metal
Function	Rotary encoder connection Not in combination with length measuring light curtain
Pin assignment	Pin 1: GND Pin 2: +U Pin 3: A Pin 4: B Pin 5: N Pin 6: A inv. Pin 7: B inv. Pin 8: N inv.

Tab. 12.14: FB In

Type of connection	M12 connector, 4-pin Material: metal
Function	PROFINET IN connection (optional)
Pin assignment	Pin 1: TD+ Pin 2: RD+ Pin 3: TD- Pin 4: RD-

Tab. 12.15: FB Out

Type of connection	M12 connector, 4-pin Material: metal
Function	PROFINET OUT connection (optional)
Pin assignment	Pin 1: TD+ Pin 2: RD+ Pin 3: TD- Pin 4: RD-

Tab. 12.16: DI 1/DI 2

Type of connection	M12 connector, 5-pin Material: metal
Function	Switching input connection
DI 1 pin assignment	Pin 1: 24 V Pin 2: DI (DataBypass Start) Pin 3: 0 V Pin 4: NC Pin 5: NC
DI 2 pin assignment	Pin 1: 24 V Pin 2: DI (DataBypass Stopp) Pin 3: 0 V Pin 4: NC Pin 5: NC

Tab. 12.17: DO 1/DO 2

Type of connection	M12 connector, 5-pin Material: metal
Function	Switching output connection
Pin assignment	Pin 1: 24 V Pin 2: DO Pin 3: 0 V Pin 4: DO Pin 5: NC

13 Order guide and accessories

13.1 Part number code

CMS 7bbi-xxxx-yyyy-zzzz

CMS	Contour measurement system
7	Series: CMS 700
bb	Interface: 08: Ethernet 48: PROFINET
i	Integrated interface
xxxx	Measurement field length 1 in [mm]: 0160 … 2880 ENC1: Rotary encoder version
yyyy	Measurement field length 2 in [mm]: 0160 … 1200 (with 5 mm beam spacing) 0160 … 2400 (with 10 mm beam spacing)
zzzz	Measurement field length 3 in [mm]: 0160 … 1200 (with 5 mm beam spacing) 0160 … 2400 (with 10 mm beam spacing)

13.2 Scope of delivery

Position	Component	Quantity
1	Evaluation unit	1
2	Rotary encoder with measuring wheel and mounting kit	1
3	CML 730 light curtain for width measurement Transmitter and receiver	1
4	CML 730 light curtain for height measurement Transmitter and receiver	1
5	Mounting set for light curtain	4
6	Light curtain connection cable	2
7	Light curtain synchronization cable	2

13.3 System components

Component	Part no.
Evaluation unit (LSC-Box) PROFINET interface (CMS 748i)	50122123
Evaluation unit (LSC-Box) Ethernet interface (CMS 708i)	50134665
CML 730 light curtain for height measurement Measurement length 720 mm, beam spacing/resolution 5 mm	Transmitter: 50118920 Receiver: 50119138
CML 730 light curtain for width measurement Measurement length 640 mm, beam spacing/resolution 5 mm	Transmitter: 50118919 Receiver: 50119137
CML 730 light curtain for width measurement Measurement length 560 mm, beam spacing/resolution 5 mm	Transmitter: 50118918 Receiver: 50119135

Component	Part no.
CML 730 light curtain for width measurement Measurement length 480 mm, beam spacing/resolution 5 mm	Transmitter: 50118917 Receiver: 50119135
Mounting set for light curtain BT-2P40	424417
Light curtain connection cable 5 m	50135146
Light curtain synchronization cable	50114698
Rotary encoder with measuring wheel and mounting kit	50142538

13.4 Accessories

Mounting frame

Part no.	Article	Description
50142039	BT 712M-MRSET	Frame height: 2000 mm Inner width of frame: 1200 mm
50143669	BT 710M-MRSET	Frame height: 2000 mm Inner width of frame: 1000 mm
50143670	BT 708M-MRSET	Frame height: 2000 mm Inner width of frame: 800 mm
50143671	BT 70EM-MRSET	Rotary encoder kit for mounting frame

Bus connection cable (Ethernet or PROFINET)

Part no.	Article	Description
M12 connector for BUS, axial cable outlet, open cable end		
50135073	KS ET-M12-4A-P7-020	Connection cable, length 2 m
50135074	KS ET-M12-4A-P7-050	Connection cable, length 5 m
50135075	KS ET-M12-4A-P7-100	Connection cable, length 10 m
50135076	KS ET-M12-4A-P7-150	Connection cable, length 15 m
50135077	KS ET-M12-4A-P7-300	Connection cable, length 2 m
M12 connector for BUS, to RJ-45 connector		
50135080	KSS ET-M12-4A-RJ45-A-P7-020	Interconnection cable RJ45, 2 m
50135081	KSS ET-M12-4A-RJ45-A-P7-050	Interconnection cable RJ45, 5 m
50135082	KSS ET-M12-4A-RJ45-A-P7-100	Interconnection cable RJ45, 10 m
50135083	KSS ET-M12-4A-RJ45-A-P7-150	Interconnection cable RJ45, 15 m
50135084	KSS ET-M12-4A-RJ45-A-P7-300	Interconnection cable RJ45, 30 m

14 EC Declaration of Conformity

The contour measurement systems of the CMS 700 series have been developed and manufactured in accordance with the applicable European standards and directives.

The manufacturer of the product, **Leuze electronic GmbH + Co. KG** in D-73277 Owen, possesses a certified quality assurance system in accordance with ISO 9001.