Baumer
Passion for Sensors

Operating Manual

IDC

Multicode Reader for Code and Text

EN-US

V1.2.1 | 9/19/2024 | 11721150

Table of contents

1 About this document

1.1 Purpose

This operating manual (subsequently referred to as manual) allows the safe and efficient handling of the product .

The manual does not provide instructions on operating the machine in which the product is integrated. Information on this is found in the operating manual of the machine.

The manual is a constituent part of the product. It must be kept in the immediate vicinity of the product and must be accessible to personnel at all times.

Personnel must have carefully read and understood this manual before beginning any work. The basic prerequisite for safe working is compliance with all safety instructions and handling instructions given in this manual.

In addition, the local occupational health and safety regulations and general safety regulations apply.

The illustrations in this manual are examples only. Deviations are at the discretion of Baumer at all times.

1.2 Warnings in this manual

Warnings draw attention to potential personal injury or material damage. The warnings in this manual indicate different hazard levels:

Symbol	Warning term	Explanation
	**DANGER**	Indicates an imminent potential danger with high risk of death or serious personal injury if not being avoided.
	WARNING	Indicates potential danger with medium risk of death or (serious) personal injury if not being avoided.
	CAUTION	Indicates a danger with low risk, which could lead to light or medium injury if not avoided.
	NOTE	Indicates a warning of material damage.
	**INFO**	Indicates practical information and tips that enable optimal use of the devices.

1.3 Labels in this manual

Identifier	Usage	Example
Dialog element	Indicates dialog elements.	Click the ***OK*** button.
Unique name	Indicates the names of products, files, etc.	*Internet Explorer* is not supported in any version.
`Code`	Indicates entries.	Enter the following IP address: `192.168.0.250`

1.4 Liability limitation

All information and notes in this manual have been compiled in accordance with the applicable standards and regulations, the state of the art, and our many years of knowledge and experience.

The manufacturer accepts no liability for damage due to the following reasons:

- Non-observance of the manual
- Improper use
- Use of unqualified personnel
- Unauthorized conversions

The obligations agreed in the delivery contract, the general terms and conditions and the delivery conditions of the manufacturer and its suppliers, as well as the legal regulations valid at the time of conclusion of the contract apply.

1.5 Scope of delivery

The scope of delivery includes:

- 1 x Sensor
- 1 x Quickstart Guide
- 1 x General information leaflet

In addition, the following information is available in digital form at www.baumer.com:

- Operating manual
- Quickstart Guide
- Data sheet
- 3D CAD drawing
- Dimensional drawing
- Connection diagram & pin assignment
- GSD file (**G**eneral **S**tation **D**escription) for device integration into PLC configuration software
- Certificates (EU declaration of conformity, interface certificates, etc.)

2 Safety

2.1 Personnel requirements

Certain work with the product may only be carried out by specialized personnel.

Specialized personnel are staff members who can evaluate the tasks assigned to them and recognize potential danger, based on their training and work as well as a reliable understanding of technical safety issues.

Qualified personnel are divided into the following categories:

- **Instructed personnel:**
  A person who has been informed and, if required, trained, by a specialist about the assigned tasks and potential dangers of improper behavior.
- **Specialist:**
  A person who, based on his/her training, experience, and instruction, as well as his/her knowledge of applicable standards, rules, and accident prevention regulations, has been authorized to carry out the respectively required tasks, while recognizing and avoiding potential dangers.
- **Electrical specialist:**
  A person with the appropriate specialist training, knowledge, and experience allowing him/her to recognize and avoid dangers originating from electricity.

2.2 General information

Intended use

This product is a precision device and serves the detection of items, objects, or physical measurement variables and the preparation or provision of measured values as electric variables for the higher-level system.

Unless specifically labeled, this product may not be used in explosive environments.

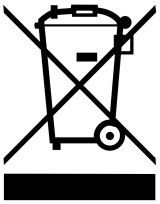
Commissioning

Assembly, installation, and calibration of this product may only be performed by a specialist.

Installation

Only use the fasteners and fastener accessories intended for this product for installation. Outputs not in use must not be wired. Unused wires of cable outputs must be insulated. Do not go below the permissible cable bending radii. Disconnect the system from power before the product is electrically connected. Use shielded cables to prevent electro-magnetic interference. If the customer assembles plug connections on shielded cables, then EMC-version plug connections should be used and the cable shield must be connected to the plug housing across a large surface area.

Disposal (environmental protection)

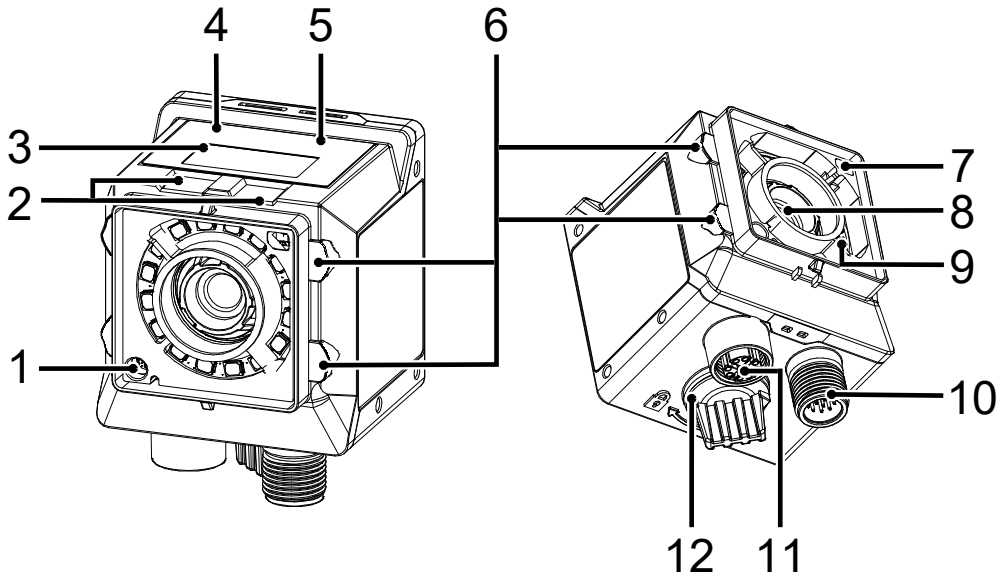


Used electrical and electronic devices may not be disposed of in household waste. The product contains valuable raw materials that can be recycled. Therefore dispose of this product at the appropriate collection point. For additional information visit www.baumer.com.

3 Description

3.1 Sensor

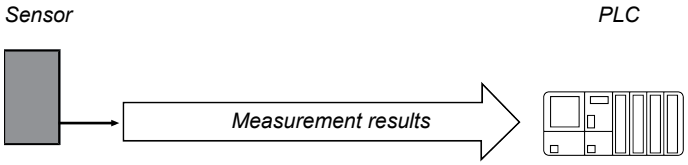
3.1.1 Structure



Ill. 1: Sensor design

1	Pointer (positioning aid)	2	qTeach Buttons
3	Display	4	LED Link
5	LED Power	6	Illuminated ring (4 x RGB LED indicators)
7	Sensor (filter recognition)	8	Camera (with electromechanical focus)
9	Internal illumination (each segment to be switched on individually)	10	Electrical connection; 12-pin M12, A-encoding
11	Ethernet connection (1 GigE); X-encoding	12	USB-C connection with blind plug

3.1.2 Functionality



Ill. 2: Functionality

- The sensor features integrated image processing and delivers concrete results (e.g. the code which was read).

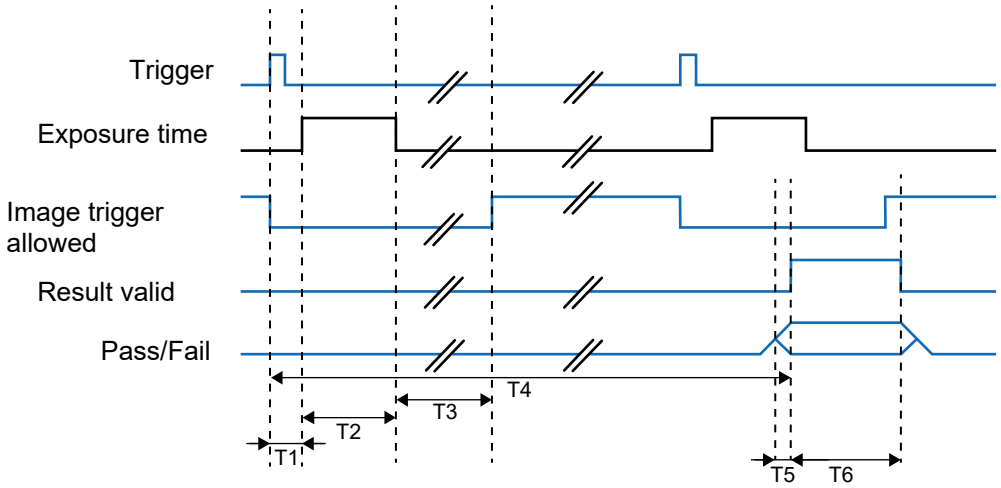
The full sensor measurement cycle comprises the following steps:

1. Exposure and read out
2. Calculation
3. Measured value output

INFO

Process steps are executed in parallel for increased measurement speed. The measurement rate is limited by the process which takes more time: exposure time or processing time.

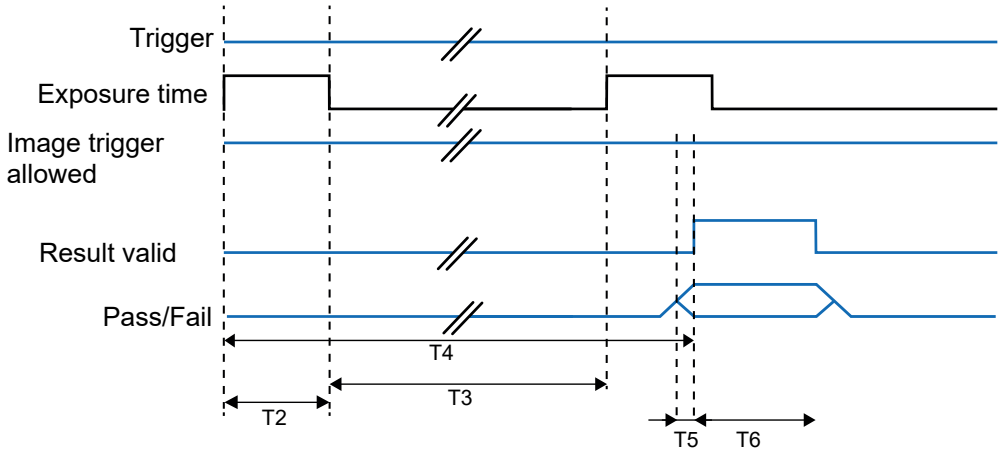
Timing for single measurement (using a trigger)



Signal	min.	max.
Delay trigger exposure time (T1)	2.2 ms	2.9 ms
	plus the set trigger delay	
Exposure time (T2)	11 µs	2 ms
Image acquisition (T3)	16 ms	18 ms
Output time; min / max (T4)	20 ms	
run-up result (T5)	10 µs	2 ms
Retention time result (T6)	1 ms	1 s or next result

After image acquisition, signal *Image trigger allowed* will be disabled. At the end of image acquisition, signal *image trigger allowed* is enabled again and another image can be immediately acquired. Signal *pass-fail* will switch at the set output time, even if further evaluations have already been done. Signal *Result valid* is active during this time.

Timing for continuous image acquisition



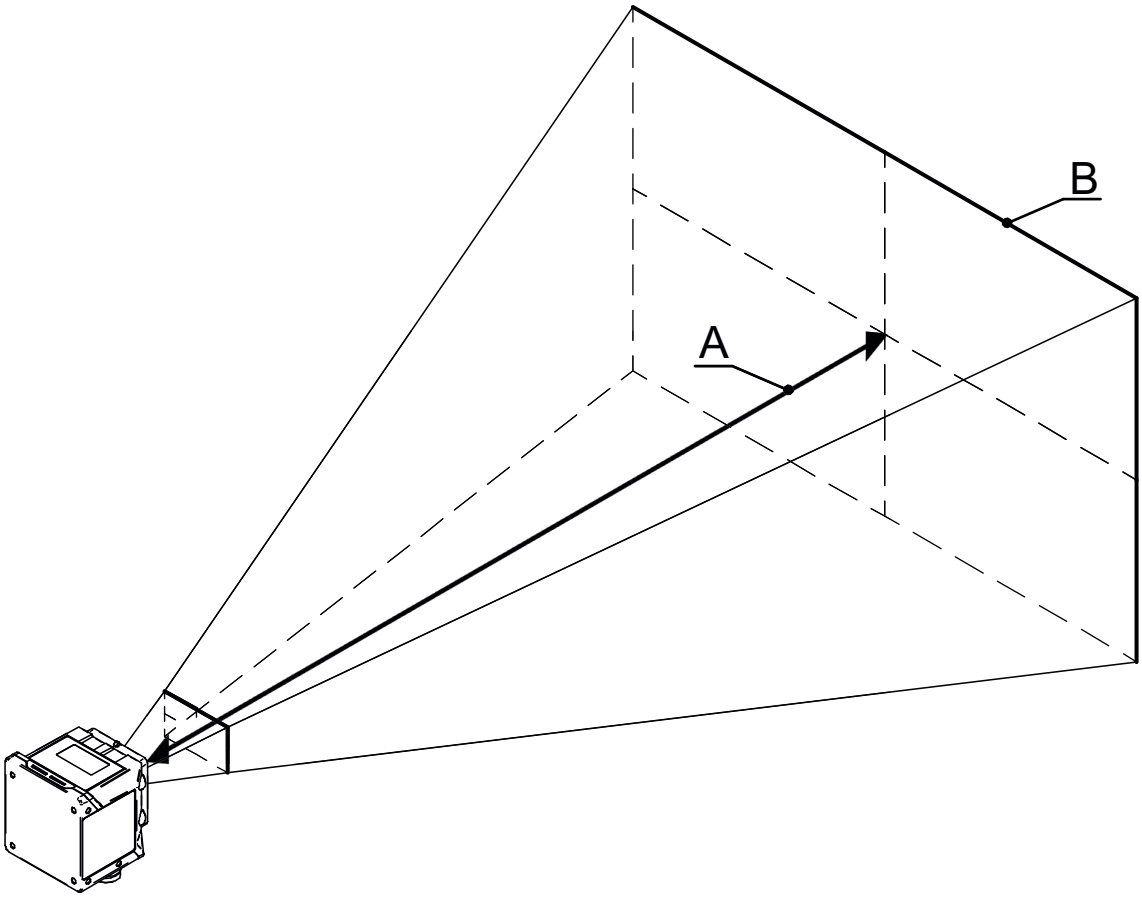
Signal	min.	max.
Exposure time (T2)	11 µs	2 ms
Image acquisition (T3)	18 ms	20 ms
Output time; min / max (T4)	20 ms	
run-up result (T5)	10 µs	2 ms
Retention time result (T6)	1 ms	1 s or next result

If *continuous image acquisition* is set in the job, the image will be captured as soon as the acquisition of the previous image has been completed. Signal *Image trigger allowed* is permanently enabled. Signal *pass-fail* will switch at the end of image evaluation, but earliest at the set output time. This point in time can be seen by the rising edge of signal *Result valid* .

3.1.3 Optical specification

3.1.3.1 Field of view

Below you see the minimum and maximum fields of view of the devices with different focal lengths.



Minimum

	IDC2xx-W06	IDC2xx-W08	IDC2xx-W16
A	50 mm	50 mm	100 mm
B	41 mm x 25 mm	29 mm x 18 mm	23 mm x 14 mm

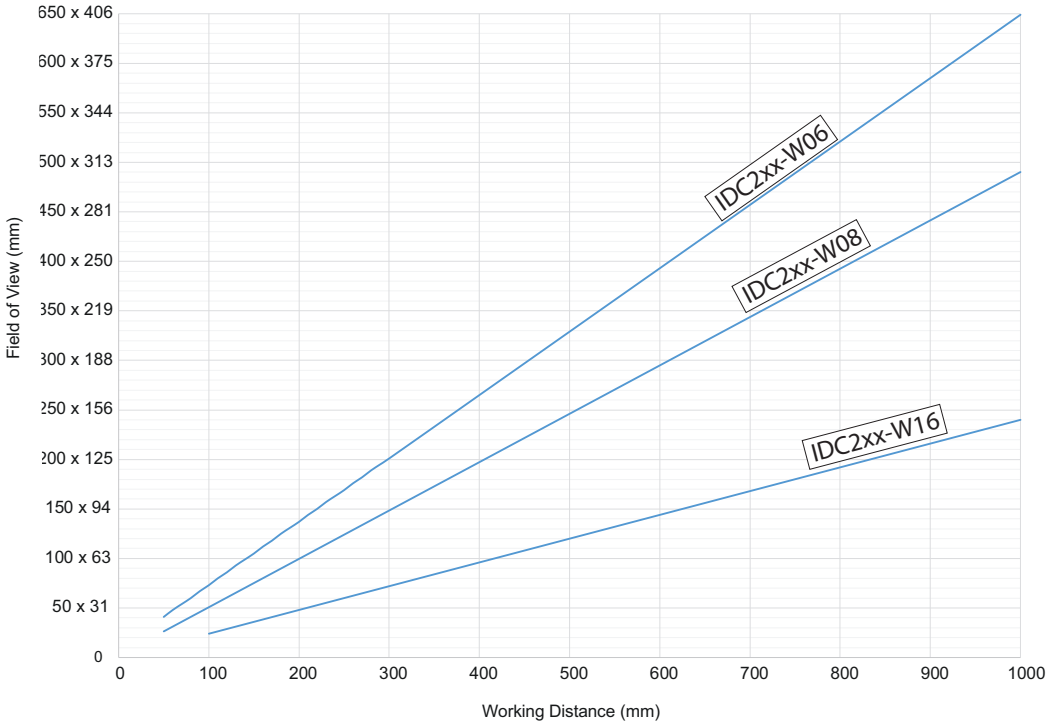
Maximum

	IDC2xx-W06	IDC2xx-W08	IDC2xx-W16
A	1000 mm	1000 mm	1000 mm
B	649 x 408 mm	485 mm x 303 mm	240 mm x 150 mm

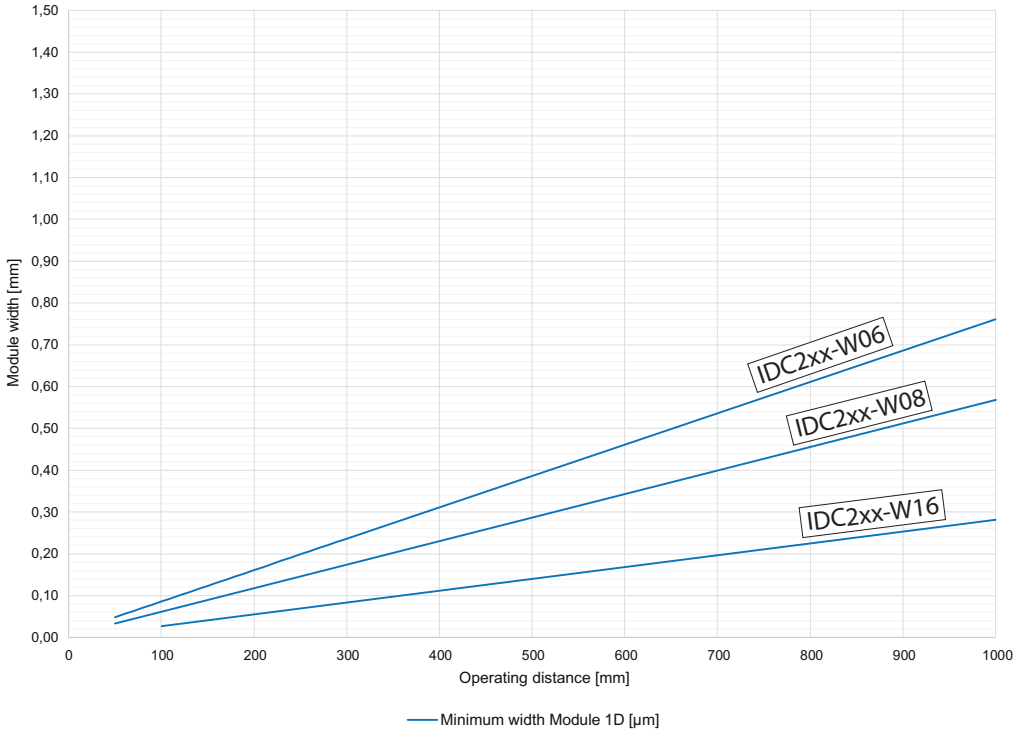
3.1.3.2 Field of view / module width - operating distance

For more information on the field of view or module width in relation to working distance see the following diagrams.

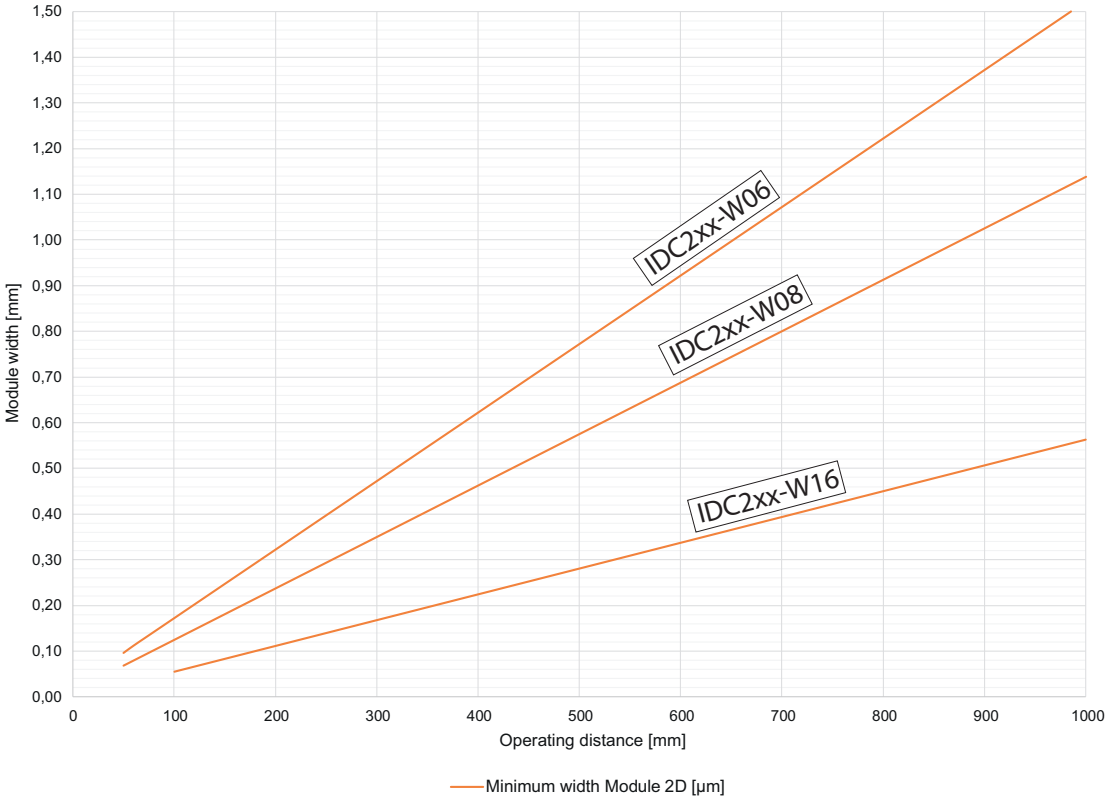
Field of view - operating distance



Module width-operating distance (1D code)



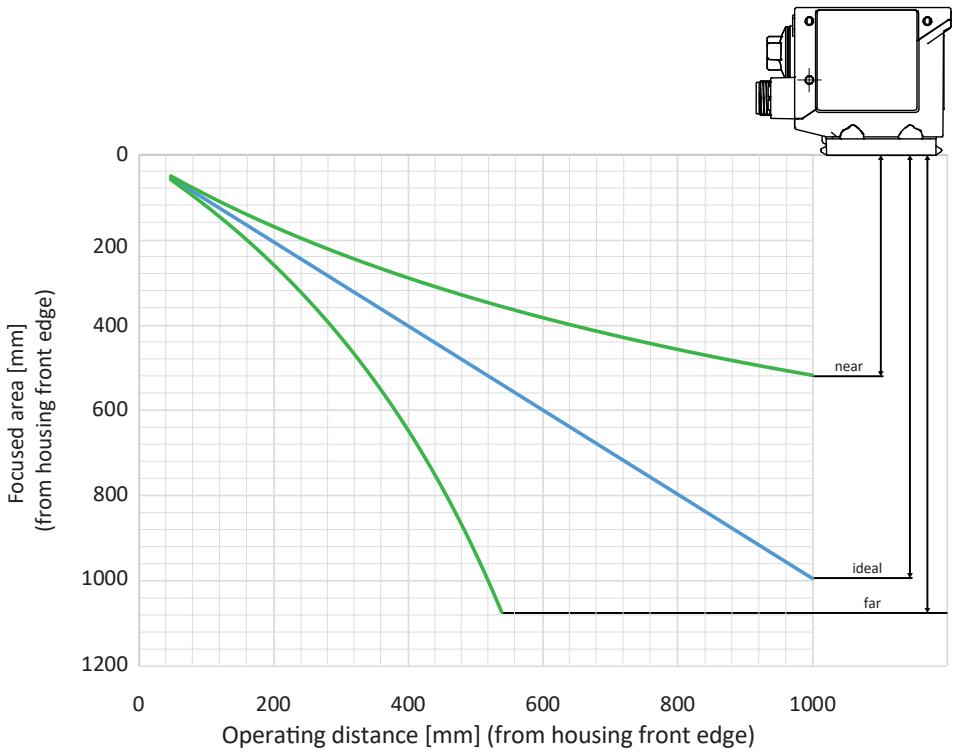
Module width-operating distance (2D code)



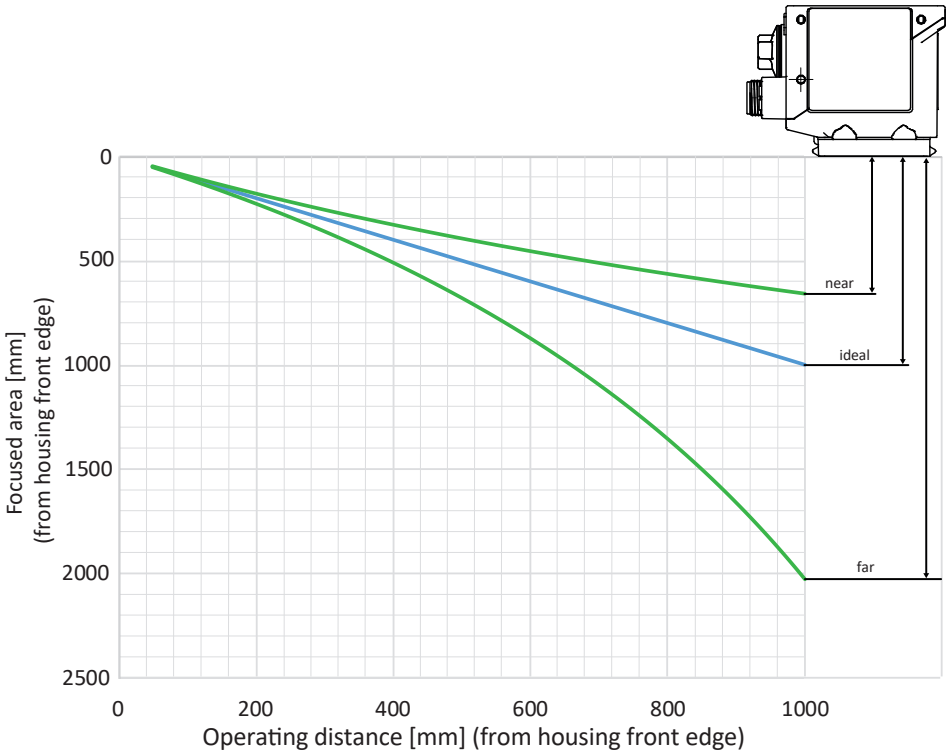
3.1.3.3 Depth of field

For depth of field (*near / ideal / far*) of every device please see the following diagrams.

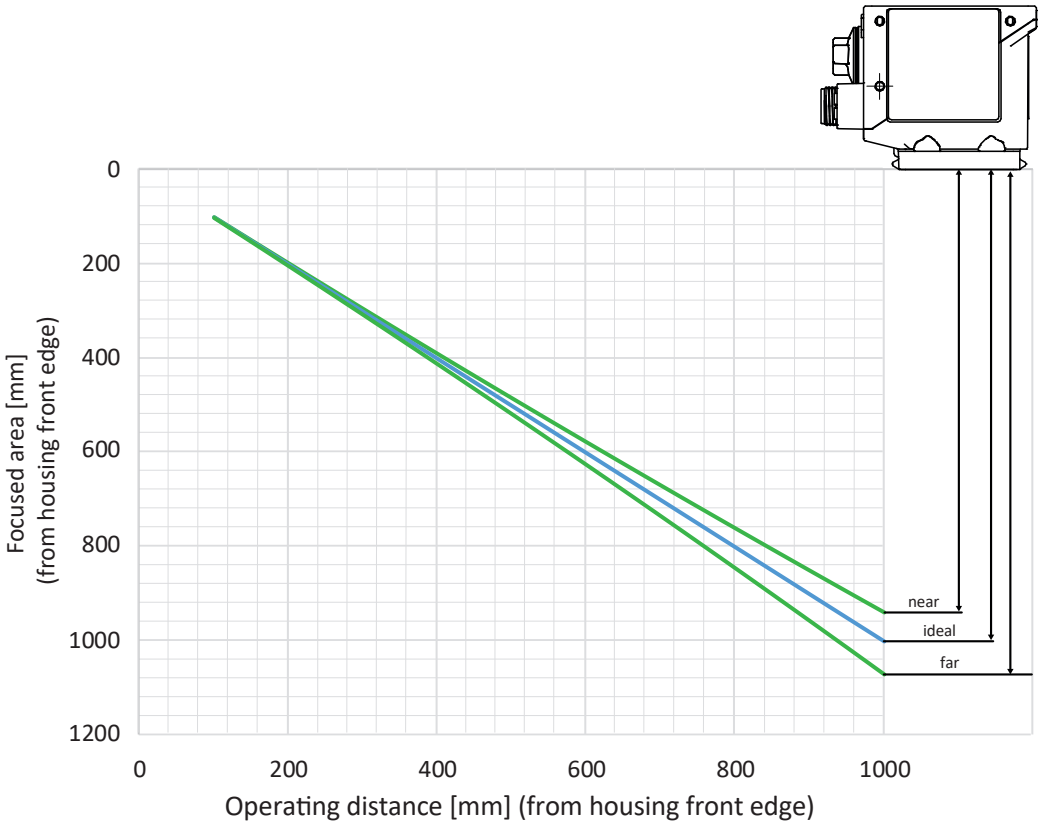
IDC2xx-W06 (focal length: 6 mm / aperture: 3.5)



IDC2xx-W08 (focal length: 8 mm / aperture: 3.5)



IDC2xx-W16 (focal length: 16 mm / aperture: 1.8)

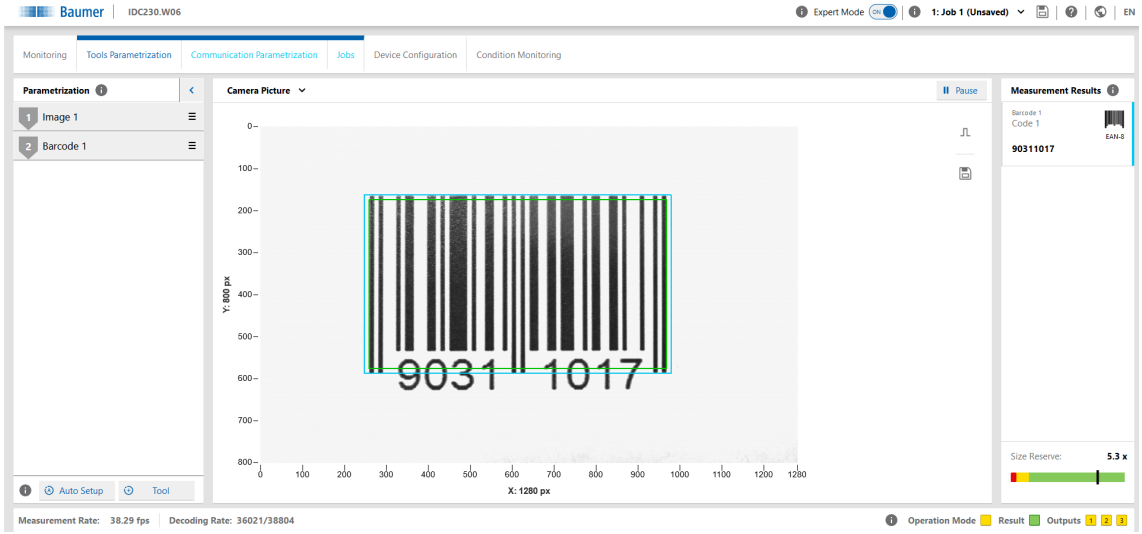


3.2 Operating and display elements

3.2.1 Web interface

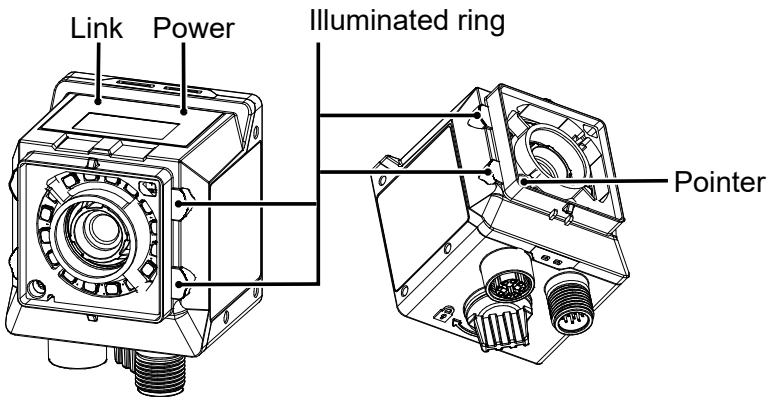
The supplied sensor features web interface for sensor parameterization and data visualization. To this end, the sensor integrates web server. The web interface can be accessed via web browser.

For a detailed description of the web interface, the individual elements of the user interface and all required operating processes, see *Web interface [▶ 31]*.



Ill. 3: Web interface – Overview

3.2.2 Sensor LEDs



Designation		Illuminated	Flashing
Link	green	▪ if Ethernet connection present	▪ Device identification
Power	green	▪ Voltage supply present	—
Illuminated ring (disable via web interface)	red	▪ Fail	—
	green	▪ Pass	—
	blue	▪ Ready for reading in monitoring mode	▪ Device identification
Pointer (disable via web interface)	green	▪ Device in monitoring mode (positioning aid)	▪ Device in parameterization mode (positioning aid)

3.2.3 Display

The sensor features a display showing the different sensor parameters.

The following functions are available:

- Indicating firmware version at sensor boot up
- Indicating the sensor's IP address (alternating in between USB and Ethernet address)
- Indicating progress bar at Auto Setup
- Indicating job number of the currently loaded job
- Indicating the first code being read in the current job
- Indicating type and nature of the first code being read
- Indicating the type of the first text being read

Display will deactivate after having remained unaltered for 60 minutes (e.g. job execution). Display reactivates using the qTeach buttons or when alternating (e.g. Auto Setup).

4 Transport and storage

4.1 Transport

NOTICE

Material damage due to improper transport.

a) Ensure maximum diligence when unloading the delivered packages as well as when transporting them inside the company.

b) Note the information and symbols on the packaging.

c) Only remove packaging immediately before mounting.

4.2 Delivery inspection

Upon receipt immediately inspect the delivery for completeness and transport damage.

Claim any defect as soon as it is detected. Damages can only be claimed within the applicable claims deadlines.

In case of externally visible transport damage, proceed as follows:

Instruction:

a) Do not accept the delivery or only with reservations.

b) Note the scope of the damage on the transport documents or the delivery slip of the carrier.

c) Initiate the claim.

4.3 Storage

Store the product at the following conditions:

- Only transport or store the device in its original packaging.
- Do not store outdoors.
- Store dry and free from dust.
- Do not expose to aggressive media.
- Keep away from the sun.
- Avoid mechanical agitation.
- Storage temperature: -10 (14)... +60 (140) °C (°F)
- Ambient humidity: 20 ... 85 %
- When storing for longer than 3 months, regularly check the general state of all parts and the packaging.

5 Installation

5.1 General safety instructions

- Assembly, mounting, and calibration of the sensor may only be performed by a specialist.
- Only use the appropriate fasteners and mounting accessories intended for installation.
- Do not use any unassigned output. Unused wires of cable outputs must be insulated.
- Do not go below the permissible cable bending radii.
- Prior to electrical connection of the product, the system must be down and not live.
- Use shielded cables as protection against electromagnetic interference.
- Cable dielectric strength must at least correspond to the operating voltage.
- The selected minimum cable cross-section must match the maximum current.
- The cable temperature resistance must be within the specified device temperature range.
- Where plug-in connections are added to shielded cables by the customer, these plug-in connections must be EMC compliant and the cable shield must be attached to the connector housing over a large surface area.

5.2 General information for mounting

- The device can be operated in any installation position.
- Mount the device using the provided M3 threads.
- Align the device in a way the image center is focused on the object under verification.
- Make sure when installed the device will be exposed to as few vibrations as possible during operation to prevent impaired image quality (blurred images).
- When installing the device, make sure there are no obstacles between sensor and object which may block sensing or create reflections.
- Make sure the installation location offers maximum protection against dust.
- Power supply is via the electrical connection (12-pin M12 connecter, A-encoding, male).
- The USB interface is intended for data transfer only, not for power supply. Power supply always via the 12-pin M12 connector.

INFO

Special fastening material for mounting available. It will allow sensor installation even at profiles and rods.

5.3 Notes on heat dissipation

⚠ CAUTION

Device may heat up during operation!

High temperatures may damage the device and when in contact with the skin for a longer time may cause irritations.

a) Make sure that heat dissipation is provided by appropriate installation. Best, heat dissipates via the rear.

b) Use at limit level requires mounting to a solid metal body (aluminum)!

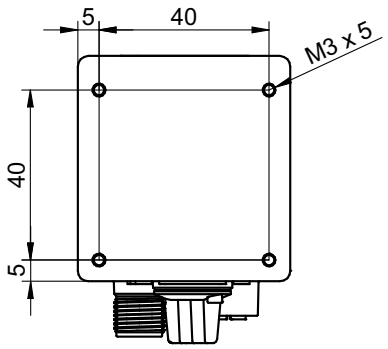
c) Temperature monitoring allows for temperature checks in installed condition. Implement safety measures at the warning threshold. If required, use the cooling element provided at the device and/or support.

Furthermore, we recommend the following for heat dissipation by device installation:

- Avoid installation onto stainless steel. Stainless steel has a roughly 10-fold lower thermal conductivity compared to aluminium.
- Do not install the device at the end of a profile; this will allow heat to dissipate on both sides (higher temperature drops over a larger area)!
- Matt painted surfaces (any color) and anodized surfaces provide better heat dissipation than bare metallic surfaces (radiation heat). Use painted or anodized profiles for device installation.
- Any form of convection around device and fittings helps lower the temperature. Avoid heat accumulation!
- Do not operate any other devices close to the sensor, since the sensor could heat up further by exhaust heat.
- Mount the sensor at rear optimal heat dissipation.

5.4 Mounting the sensor

Rear sensor mounting (preferred installation)



Ill. 4: Screwing points - rear mount

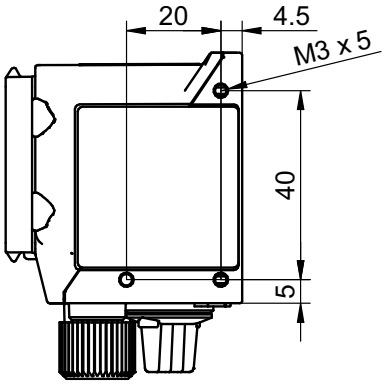
Condition:

⇨ M3 screws × (5 + x) (4 pieces) / x = sheet thickness of the screw-on angle

Instruction:

- Screw the sensor in place.Torque: max. 0.8 Nm.

Side mounting



Ill. 5: Screw-on points - side mounting

Condition:

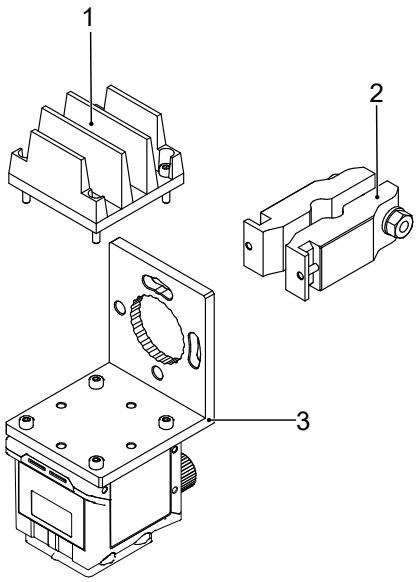
⇨ M3 screws × (5 + x) (3 pieces) / x = sheet thickness of the screw-on angle

- Screw the sensor in place.Torque: max. 0.8 Nm.

5.5 Accessories (not included)

Sensor attachment

For sensor attachment please use the modular *Smart Mounting Kit*. It will allow sensor installation even at profiles and rods.

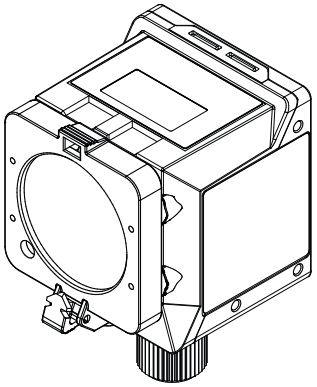


Ill. 6: Smart Mounting Kit A

Number	Denotation	Item number
1	Cooling element *Smart Mounting Kit A*	11720395
2	Attachment by bar *Smart Mounting Kit A*	11720396
3	Angle	11720397

Polarizing filter

Polarization filters may be used for better performance in measuring tasks on glossy surfaces.



Ill. 7: Polarizing filter snap-on 44 mm (item number: 11704588)

INFO

Using a filter will darken the image. Re-parameterization of image acquisition configuration may be required.

Additional accessories can be found on the website at:

https://www.baumer.com

6 Electrical installation

6.1 General instructions for electric installation

NOTICE

Device damage due to faulty power supply.

The device can be damaged due to faulty power supply.

a) Operate the device only with protected low voltage and safe electrical isolation of protection class III.

NOTICE

Device damage or unintended operation due to work on live parts.

Any wiring work on live parts may lead to unintentional operation.

a) Prior to performing any wiring work disconnect power supply.

b) Only connect or disconnect any terminals when not live.

NOTICE

IP50 protection will still be present even if the protective plug is removed.

Remove the protective plug for the shortest time possible and only in a clean ambiance (free from dust, liquids, etc.).

- The sensor's USB interface is for data transfer only, not for power supply. Power supply always via the 12-pin M12 connector.
- Prerequisites for IP rating:
  - Cable connection present at the process interface (12-pin M12 connector).
  - The USB interface must be closed during operation (protective plug) to achieve IP67. Utilizing the HID protocol with hence missing protective plug will achieve IP50 rating.

6.2 Connecting the sensor to the electrical system

NOTICE

Use a power unit for sensor supply. The USB interface is intended for data transfer only. Power supply is always via the 12-pin M12 connector.

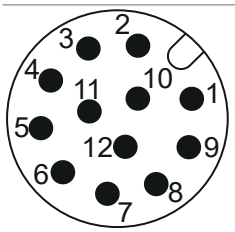
Instruction:

a) Ensure that the system is disconnected from power.

b) Connect the sensor according to the pin assignment.

6.3 Pin assignment

Power Supply / Digital-IO

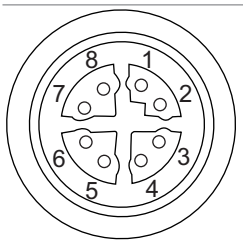


1	Power (19.2 … 28.8 VDC)	2	Ground
3	IN1 (Trigger)	4	IN2
5	IN3	6	OUT1
7	(not used)	8	OUT2
9	OUT3	10	(not used)
11	(not used)	12	(not used)

Wire colors according to DIN IEC 757

1	BN – Brown	2	BU – Blue
3	WH – White	4	GN – Green
5	PK – Pink	6	YE – Yellow
7	BK – Black	8	GY – Grey
9	RD – Red	10	VT – Violet
11	GY-PK – Grey Pink	12	RD-BU – Red Blue

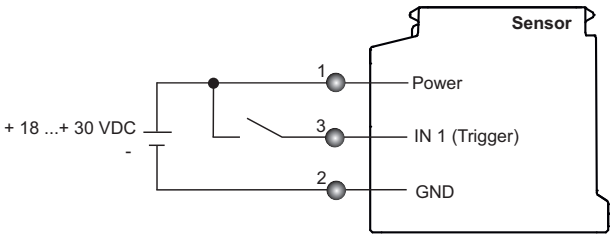
Industrial Ethernet



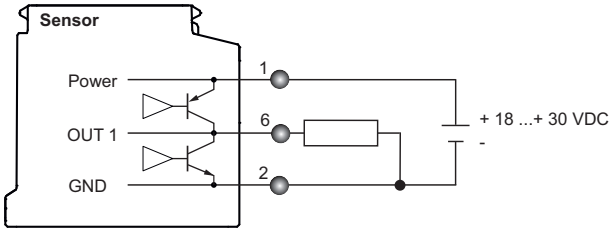
1	RX+	2	RX-
3	TX+	4	TX-
5	-VDC	6	-VDC
7	+VDC	8	+VDC

6.4 Wiring

Input



Output



7 Commissioning

7.1 Connecting the sensor to the PC

INFO

Internet Explorer is not supported in any version, there will be no sensor connection.
Microsoft Edge is not supported. However, most of the cases allow for use without restrictions.
The sensor does not support encrypted data transmission (`https://`). Use web protocol `http://`.

Condition:

⇨ PC with web browser *Mozilla Firefox* version 96 or higher or *Google Chrome* version 77 or higher.

Instruction:

a) Connect sensor to a PC via a USB C cable.

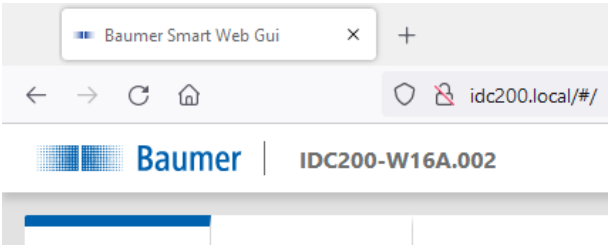
b) Establish power supply with 12-pin M12 connector.

c) Open the web browser on your PC.

d) Enter the following in the address bar of the web browser:
- local domain: `IDCxxx.local` (`xxx` = device model, e.g. `IDC200.local`)
or
- IP address of the sensor (USB: `169.254.2.1` fixed / Ethernet: `192.168.0.50` can be changed in the web interface), see display.

Result:

✓ The sensor is now connected to the PC.



INFO

If the preset port (80) has been changed in the device configuration, the changed port must be explicitly specified during the connection, e.g. `idc200.local:4711` or `169.254.2.1:4711` (connection via USB), otherwise no connection to the sensor is possible.

Establish a connection to a sensor via the Mac address or serial number

Condition:

⇨ PC with web browser *Mozilla Firefox* version 96 or higher or *Google Chrome* version 77 or higher.

Instruction:

a) Connect sensor to a PC via a USB C cable.

b) Establish power supply with 12-pin M12 connector.

c) Open a browser.

d) Enter the following command in the address bar of the browser:
`IDC200-[identifier].local`
Replace `[identifier]` with the serial number (S/N) or with the MAC address (MAC) specified on the sensor.
Both information can be seen on the sensor label. Contrary to the type plate, the `.` may only be used before `local`.
Example S/N: `IDC200-J381-10-X-0128-413.local`
Example MAC: `IDC200-11-22-33-44-55-66.local`

Result:

✓ The device opens the web interface.

Establishing multiple connections to one sensor (Multiple WIF)

Four parallel connections to one sensor are feasible *(Multiple-WIF)*. This works also from different PCs which are connected to the same network as the sensor. Each connection requires a separate window or a separate tab in the web browser.

The following connection options are available:

Enter in the address field of the browser	Description

`IDCxxx.local`
or
`[IP address]`
Examples
`http://IDC230.local`
or
`169.254.2.1`
	Standard sensor connection for basic parameterization.
	Note: Switching the sensor to mode *Parametrization* while a connection is established, this function will be blocked in other connections.

`IDCxxx.local/?monitoring`
or
`[IP address]/?monitoring`
Examples
`http://IDC230.local/?monitoring`
or
`169.254.2.1/?monitoring`
	Connection to the sensor in ***Monitoring*** mode. The functions ***Parametrization***, ***Device Configuration*** and ***Condition Monitoring*** are hidden here.

`IDCxxx.local/?liveImage`
or
`[IP address]/?liveImage`
Examples
`http://IDC230.local/?liveImage`
or
`169.254.2.1/?liveImage`
	Connection to the sensor and display of the camera image with search area.

(`xxx` = device model, e.g. `IDC230`)

7.1.1 Allocating an IP address to the PC

NOTICE

Network errors due to multiple allocations of IP addresses.

a) Make sure that each IP address within the network is unique and not already allocated.

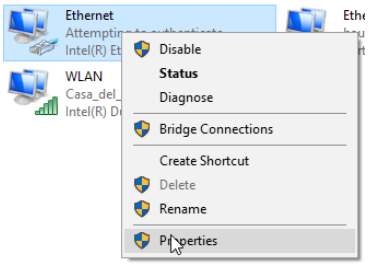
The following section describes how to allocate a unique IP address to the PC. Prerequisite here is that the IP address of the sensor was not The prerequisite for this is that the IP address of the sensor has not been changed.changed.

a) In Windows select ***Start*** | ***System control*** | ***Network and Internet*** | ***show network status and tasks*** | ***edit adapter settings***.

✓ Window ***Network Connections*** opens.

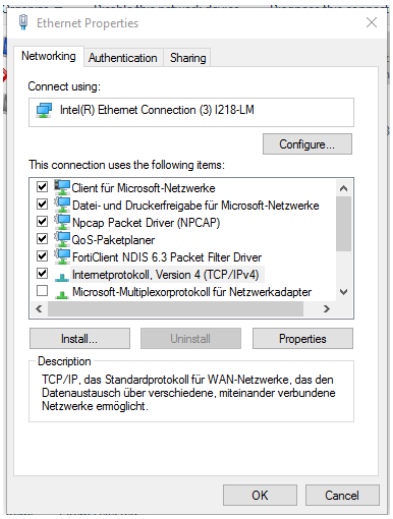
b) Click the symbol of the network adapter in use.
If you do not know the network adapter, remove the network cable of the sensor from the PC and observe which text changes in window ***Network Connections***.

c) In the context menu (right-click on icon) of the network adapter select ***Properties***.



✓ Window ***Properties of Ethernet*** opens.

d) Tick checkbox ***Internet Protocol Version 4 (TCP/IPv4)***.



e) Click ***Properties***.

✓ Window ***Properties of Internet Protocol Version 4 (TCP/IPv4)*** opens.

f) Under ***Use following-IP-Address*** enter the following parameters:
IP-Address: in the range from `192.168.0.1` to `192.168.0.254`. Select an IP address that is not yet allocated in your network.
Subnet mask: `255.255.255.0`.

g) Click ***OK***.

Result:

✓ The PC as been allocated an IP address.

7.1.2 Determining the sensor's IP address

Below is a description of how to determine the sensor's IP allocated in the Ethernet network. This is required if the IP address was assigned by DHCP, in the event the information on statically set IP address is no longer available or if the sensor display is out of sight. In general, there are 2 options for identifying the IP address.

INFO
IP address in USB connection is `169.254.2.1` and cannot be edited.

Option 1: IP address query via mDNS (using IDC200 as an example)

a) Open a browser.

b) Enter the following command in the address bar of the browser:
`IDC200-[identifier].local`
Replace `[identifier]` with the serial number (S/N) or with the MAC address (MAC) specified on the sensor.
Both information can be seen on the sensor label. Contrary to the type plate, the `.` may only be used before `local`.
Example S/N: `IDC200-J381-10-X-0128-413.local`
Example MAC: `IDC200-11-22-33-44-55-66.local`
INFO: If only one sensor of the family is connected to network or PC, this identifier can be omitted. In this case, the sensor is accessible at `IDC200.local`.

Result:

✓ The device opens the web interface and the IP address can be read out in the device configuration.

Option 2: IP address query via ping command (using IDC200 as an example)

a) In Windows, select ***Start*** | ***Search***.

b) In the search bar, enter the value `cmd`.

✓ The ***Prompt*** window opens.

c) Enter the following command: `ping IDC200-[identifier].local`
Replace `[identifier]` with the serial number (S/N) or with the MAC address (MAC) specified on the sensor.
Both specifications can be found on the sensor label. Contrary to the type plate, the `.` may only be used before `local`.
Example S/N: `ping IDC200-J381-10-X-0128-413.local`
Example MAC: `ping IDC200-11-22-33-44-55-66.local`

Result:

✓ You are provided with the sensor's IP address (in the example: `192.168.0.250`):
"Ping is being executed for IDC200- J381-10.X-0128-413.local [192.168.0.250] with 32 bytes of data"

The sensor might not be accessible by PC though having entered the sensor's IP address. In this case, allocate a new IP address to your PC (see *Allocating an IP address to the PC [▶ 29]*). Make sure to allocate your PC an IP address that is close to the sensor's IP address, e.g.:

- PC IP address: `192.168.0.251`
- Sensor IP address: `192.168.0.250`

8 Web interface

8.1 Functions and tasks

You as a user may benefit from the web interface by eased device parameterization. Further to parameterization of up to 32 jobs, there are configuration options for device settings, backup for device replacement for data generation and upload as well as diagnostic data for monitoring the device temperature. In monitoring mode, settings can be checked in operation.

NOTICE

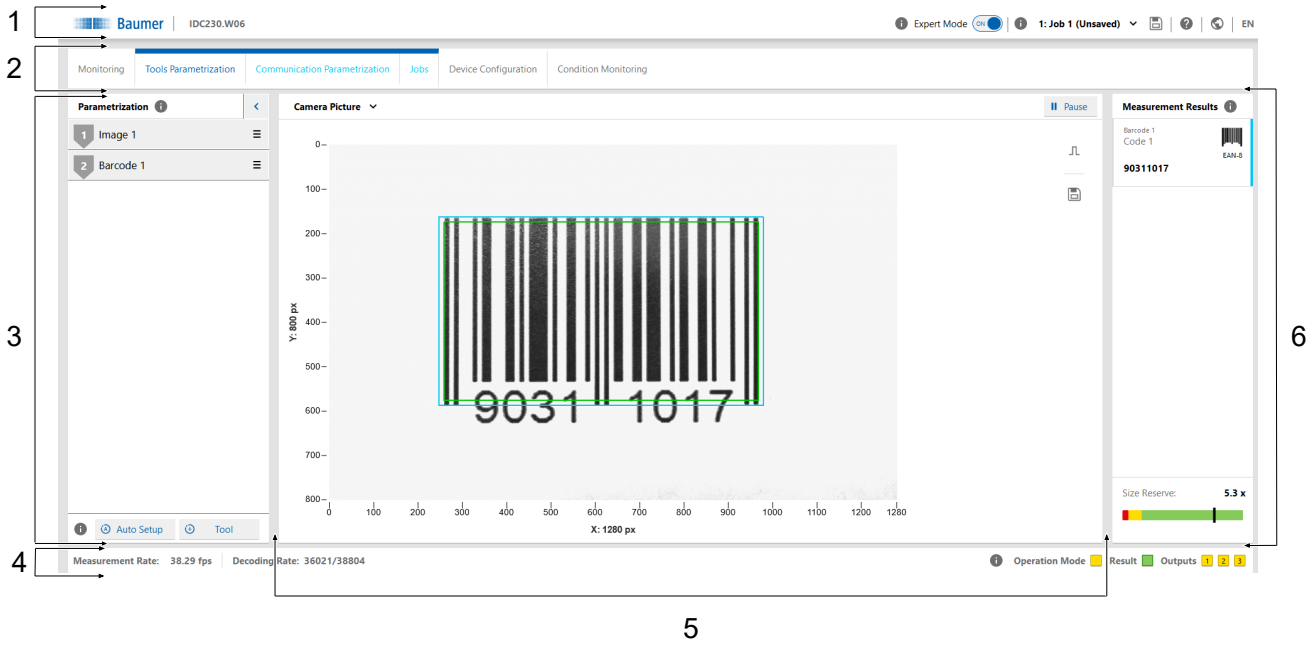
Damage caused by unauthorized access

When using the web interface, observe security aspects of web technology to prevent access by unauthorized persons.

a) Avoid any sensor access from outside the machine.

b) Do not use VPN sensor connection.

8.2 User interface description



III. 8: Web interface - user interface

1	Header	2	Menu bar
3	Parametrisation area	4	Footer
5	Visualisation area	6	Measured values

8.2.1 Header

The header is found in the top section of the user interface. The header is always visible, no matter which mode is currently applied.

Sensor name	▪ Sensor name
Expert Mode	▪ Enable / disable ***Expert Mode***. ▪ In expert mode, more complex functions and parameters become visible that require a deeper understanding of measurement physics and the applied algorithm. The expert mode can be activated and deactivated at any time.
	▪ Call up the context help.
Job (1 - 32)	▪ Select desired job (1 - 32) ▪ Selection is available if saved in a job, changes will be effective immediately. However, the changes must be saved in a job for being available after sensor restart.
Unsaved	▪ Message that a change has not been stored yet.
	▪ Quick saving of a changed job. This is automatically set as ***Start with Setup***.
	▪ Display sensor type ▪ Display serial number. ▪ Download diagnostic data from the device for submission to helpdesk for further analysis. ▪ Button for requesting support via e-mail.
	▪ Link to website.
EN	▪ Selection of the language of the user interface.

8.2.2 Menu bar

The menu bar allows the navigation among the modes of the web interface. The currently selected menu item is highlighted by a blue ribbon and blue text.

Monitoring	▪ Measured value display. ▪ No parameter change enabled.
Parametrization	▪ Sensor parameterization. ▪ Access to this mode can optionally be stored with a password at ***Device Configuration***.
− ***Tools Parametrization***	▪ **Image 1:** Manual setting of image and lighting parameters, such as trigger, exposure and focus. ▪ **Tools:** Manual interference on the code reading parameters as post-parameterization or after ***Auto Setup***. ▪ ***Auto Setup*****:** Automatic setting of image parameters, such as exposure time and focus (if selected). Codes within the sensor's field of view are automatically detected. ▪ ***Tool*****:** Add new measurement tasks and auxiliary measurement tasks. **INFO: Parameterization is limited to 8 tools max.**
− ***Communication Parametrization***	▪ Configuration of the data telegrams to the PLC. ▪ Sensor digital outputs settings.
− **Jobs**	▪ Save configured test tasks in a job. Specify which job is to be executed at sensor start. Import and export jobs.
Device Configuration	▪ Setting and retrieving of sensor-specific features and information, network settings, time synchronization, process interface settings, defining password, retrieving settings of web interface and firmware.
Condition Monitoring	▪ Display of diagnostic data, such as operating time, temperature and operating voltage.

8.2.3 Parametrisation area

The parameterization section allows for setting various parameters according to the selected menu item in ***Parametrization*** mode.

8.2.4 Footer

The *footer* is found at the bottom of the user interface. The *footer* is always visible, no matter of the currently applied *sensor mode*.

Measurement Rate	▪ Display of current measuring rate (in fps). In continuous image acquisition, the measurement rate is limited by the decoding time required per image.
Decoding Rate	▪ Display images with identified code / total images ▪ Respective display count up to 4.294.967.296 (2^{32}), and then resets to 0.
Alarm	▪ Display of an alarm message. Triggers may be: ▪ Excess temperature ▪ Communication error
Operating mode	▪ Display operating mode
	▪ Yellow: Sensor is in *parameterization* operating mode
	▪ Green: Sensor is in *Run* operating mode
Result	▪ Display of overall result
	▪ Red: Overall result is Fail
	▪ Green: Overall result is Pass
Outputs	▪ Digital output status. **NOTE: The symbol color does not change, regardless if the switching output is busy at that very moment.** *Communication: Digital output [▶ 64]*
1	▪ Yellow: digital output enabled
1	▪ Gray: digital output disabled

8.2.5 Visualisation area

The measured data is displayed in the visualisation area. The style and structure of the visualisation area depend on the currently active mode of the web interface.

The following functions are available when viewing the camera image:

II ***Pause***	▪ Visualization is being stopped.
	▪ Trigger will be released if operation is not in ***Trigger Mode Free running***.
	▪ Save the currently displayed image as a .bmp file.
	▪ Zoom into camera image by clicking the button and selecting the marked area in the camera image.
	▪ Reset the defined zoom.

8.2.6 Measured values

In window ***Measurement*** appear the parameterized tools (e.g. codes) together with the related measured values. The display layout depends on the configured sensor tasks.

In the web interface, the measured values come in the order they are transmitted by the process interface.

Size Reserve

The bottom section of the window provides the function ***Size Reserve***. This function would map how many times a code may be smaller but yet will remain readable, both as graphics and as a number. This allows for direct code evaluation under aspects of structural size and the influence of distance in relation to resolution and readability.

Matrix codes also consider the settings in ***Parameter Set***. Setting **Maximum** has a higher reserve capacity than **Standard**, since the algorithm can also handle lower resolutions. However, this entails increased processing time.

With several codes present in the image, the indication refers to the code which is in the lower level of readability. ***Size Reserve*** is displayed as a tool tip for the respective measuring tool. Clicking on ***Size Reserve*** will highlight the respective code in the image.

Readability criteria are as follows:

- Size
- Structure (print quality)
- Reading method

Examples

Display	Code	Description
		Current distance of the sensor to the code: 10 cm Increasing the distance is not possible.
		Current distance of the sensor to the code: 10 cm Maximum possible distance of the sensor so that the code can still be read: 17 cm

8.3 Monitoring mode

Mode ***Monitoring*** provides the current live image of the sensor in the visualization area. If measurement tasks have been parameterized, the found areas will be marked in the image. The results of these measurement tasks will appear in window ***Measurement***.

In ***Monitoring*** mode, no parameters can be changed.

Statistics functions (***History***, ***Speed***, ***Quality***, ***Failed images***) are accessible, see chapter *Statistical functions [▶ 71]*.

8.4 Parameterization mode

Mode ***Parametrization*** is for settings of measuring tools, communication and jobs.

Also see about this

Overview of measuring tools [▶ 101]

8.4.1 Mode Parameterization Tools

In ***Tools Parametrization*** mode you can allocate tools to the sensor and define properties of the individual measurement tools.

Tools are predefined sensor functions for reading measured values (e.g. codes) based on the acquired image.

An overview of which sensors have which measuring tools can be found under: *Overview of measuring tools [▶ 101]*

Furthermore, you can execute ***Auto Setup*** for automated image parameterization and for automated tracking of features in the image.

Tool vs. *Auxiliary tool*

Tools use the image as input. Auxiliary tools use the tool output as input. For an auxiliary tool, the input must be defined before a measured value can be displayed.For an auxiliary tool, the input must be defined before a measured value can be displayed. If the input has not been defined or in the event of invalid measured values applied at the input will provide NaN (Not a Number) .

Shape (evaluation range)

Shape resp. evaluation range is the section of the image considered for evaluation. You can select the shape in the related tool.

Auto Setup

INFO

Executing ***Auto Setup*** will delete all configured tools. If required, save a ***Job*** prior to execution.

Camera Picture	▪ ***Focus***: automatic focus settings ▪ ***Exposure***: automatic exposure settings ▪ **Max. Object speed**: Setting the objects' moving speed (e.g. on a conveyor belt). The system automatically ensures that ***Exposure Time*** is small enough to allow the speed. To this end, ***Gain*** may be increased to reduce ***Exposure Time***. Recommended to always specify a value for object speed. **NOTE: Brightness is reduced by a polarizing filter, in an analog way no polarizing filter will increase brightness. This will shorten exposure time and increase object speed.**
Code search	▪ ***1D Barcode*** ▪ ***2D Matrixcode*** ▪ ***Search 2D Codes with separate tools (faster)*** **NOTE: Defining an evaluation range may be useful if the image has more codes than must be read. This can be done by parameterization of the corresponding measuring tool.**

Tool add

+Tool	Add ***Object position*** / ***Tool*** / ***Auxiliary tool***

8.4.1.1 Object localization

8.4.1.1.1 Object localization: Contour search

This tool is for determining the object position by previously teach-in of the object contour.

Condition:

⇨ Tool *Contour search* from category *Object localization* has been added.

Instruction:

a) Select menu item *Show contour*.

b) Adjust *sensitivity* in a way allowing sufficient for contour elements in the selected image area (highlighted in yellow).

c) With a pinch, enlarge the search area enclosing the selected contour.

d) Define the search settings.

e) Select *Degree of compliance* to define the level of compliance at which the inspection is evaluated as a pass.

Result:

✓ You have parameterized the *contour search*.

INFO

A *contour search* tool can be added. Multiple contour searches are currently not supported.

Show contours (in the menu bar)	Activation of the display of all contour points found (yellow) in the image.
Contour	▪ ***Teach*:** Search for new contours in the previously selected area. ▪ ***Sensitivity*:** Setting the sensitivity of the contour detection. The higher the sensitivity, the more contour points are detected and used as a contour model. Adjust the setting so that the desired contour is clearly visible. **INFO: Make sure that the contours are maintained throughout and that there are not too many "pseudo-contours".** ▪ **Teach area:** Shape of the area from which the contours are taken. **INFO: It is necessary to mark a teach area in order to be able to make the following settings.**
Search settings	▪ **Limit search area:** Activation and manual adjustment if you do not want to search for contours in the entire image. ▪ **Parameter set:** Settings for refined contour filtering. ▪ ***Fast:*** Fastest possible detection of the taught-in contour, with minimum computing time**.** ▪ **Standard:** Normal detection of the taught-in contour, with average calculation time. ▪ ***Robust*:** slowest, but robust detection of the taught-in contour. A higher computing time is required. ▪ ***User defined*:** manual settings - **Contour shape:** Shape of the contour to be determined (curved / slightly curved / straight).

	- ***Algorithm:*** Search algorithm for determining the contour model . (Exact = high computing effort / Normal = medium computing effort / Fast = lowest computing effort). ▪ ***Maximum rotation*:** Definition of the maximum permissible ro-tation position of the contour to be searched for. Restricting the rotation shortens the calculation time.
Result	▪ **Degree of match:** Setting the threshold value from which a found contour is evaluated as a PASS result. The measure-ment results are output: PASS / FAIL, position of the object center in the image in pixels (x / y) and rotation in degrees.

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Algorithm	Text	Exact Normal Fast	-
Contour shape	Text	Curved Slightly curved Straight	-
maximum rotation [°]	Integer	0 - 180	°
Parameter Set	Text	Fast Standard Robust	-
Narrow down search area	Bool	0 = off 1 = on	-
Degree of compli-ance [%]	Integer	0 - 100	%

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Valid	Bool	— = cannot be evaluated 0 = invalid 1 = valid	-
Object rotation angle	Float-Point	- 180 - 180	Angle of the object (degrees)
Object center X-coor-dinate	Integer	0 - maximum sensor width	Center of the con-tour in X direction (pixels)
Object center -Y co-ordinate	Integer	0 - maximum sensor height	Center of the con-tour in Y-coordi-nate (pixels)

Data output	Data type	Measurement range	Description
Agreement [%]	Integer	0 - 100	Conformity with the tested object (%)
Parameter			
Algorithm	Text	Exact Normal Fast	-
Contour shape	Text	Curved Slightly curved Straight	-
maximum rotation [°]	Integer	0 - 180	°
Parameter Set	Text	Fast Standard Robust	-
Narrow down search area	Bool	0 = off 1 = on	-
Degree of compliance [%]	Integer	0 - 100	%

8.4.1.2 Tool

8.4.1.2.1 Tool: Image

Reliable measurements require the measuring features in the image being clearly readable to the sensor. For reliable results perform the required parameterization.

Exposure	▪ ***Exposure Time:*** Manual setting of exposure time in µs**.** ▪ ***Auto***: Automatic setting of exposure time.
Gain	▪ Enable / disable further image brightening by amplification. ▪ ***Expert Mode*** is for selecting the gain level (2 / 4 / 8).
Internal Illumination	▪ Enable / disable the internal sensor illumination. ▪ ***Expert Mode*** provides a selection of individual segments.
Focus	▪ Manual focus adjustment in mm (sensor distance towards the surface to be inspected). ▪ ***Auto*****:** Automatic focusing.
Trigger mode	▪ ***Free running*****:** Immediately at the end of an image evaluation the next image will be acquired. ▪ ***Interval*****:** Image acquisition is triggered at the set interval. ▪ ***Trigger*****:** Image acquisition is manually triggered, system awaiting an external event (***Digital Inputs***, button ***Trigger***) as image acquisition trigger. The previous measuring operation is always completed first, even if a event is present. ▪ ***Burst*****:** Start triggered by external event (***Digital Inputs***, button ***Trigger***). Image acquisition continues until the set value (***Timeout*** / ***Image count***) is reached or after a successful read result. ▪ ***Reading signal required*****:** Image acquisition only triggered if ***Digital Inputs*** enabled. Only available in modes ***Free running*** and ***Interval***. ▪ ***Trigger delay*****:** Setting a one-time power-on delay prior to image acquisition. Only available in trigger modes ***Trigger*** and ***Burst***. ▪ ***Stop after*****:** Stop image acquisition after a defined event. Only available at ***Burst*** .
Processing time	▪ ***Total job duration*****:** Limiting the job processing time.

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Input value	Data type	Measurement range	Unit
Exposure time	Integer	0 - 5000	µs
FocusDist [mm]	Integer	50 - 1000	mm
Segment (North)	Bool	0 = off 1 = on	-
Segment (East)	Bool	0 = off 1 = on	-
Segment (South)	Bool	0 = off 1 = on	-
Segment (West)	Bool	0 = off	-

Input value	Data type	Measurement range	Unit
		1 = on	
Trigger mode	Integer	Free Running Interval Manual Burst	-
Gain	Integer	2 / 4 / 8	-

The process interface is capable of reading the following values:

Output value	Data type	Measurement range	Unit
Parameter			
Exposure time	Integer	0 - 5000	µs
FocusDist [mm]	Integer	50 - 1000	mm
Segment (North)	Bool	0 = off 1 = on	-
Segment (East)	Bool	0 = off 1 = on	-
Segment (South)	Bool	0 = off 1 = on	-
Segment (West)	Bool	0 = off 1 = on	-
Trigger mode	Integer	Free Running Interval Manual Burst	-
Gain	Integer	2 / 4 / 8	-

8.4.1.2.2 Tool: Barcode

Barcodes can be read with this tool. Furthermore, the code reading quality can be specified compliant to ISO/IEC 15416.

Search area	Enable/disable search area (blue frame) in the image. ▪ ***Shape*:** Selecting the shape of the area the code appears in. ▪ **Object localization:** Select a previously configured object localization.
Code settings	▪ ***All*:** Image is searched for every for every readable barcode. ▪ ***List*:** Shows a barcode list for selection. ▪ ***EAN/UPC*:** Shows a list of EAN and UPC codes. ▪ ***GS1*:** Shows a list of GS1 codes. ▪ ***Misc*:** Shows the codes that are not GS1 or EAN/UPC codes. **NOTE: Defining specified types will reduce error identifiers and processing time.** ▪ **Maximum number of codes:** Defines the maximum number of codes to be read in an image. **NOTE: Setting more codes than available in the image will increase processing time! Therefore, defining a region for evaluation is recommended.**
Timeout	▪ Limitation of processing time for code identification in ms. **NOTE: Exceeding the defined calculation time will abort the reading operation. This may either implicate reading of fewer codes than present in the image or not executing any quality check.**
Quality	▪ Code quality checks enabled / disabled compliant to ISO/IEC 15416. **NOTE: Enabling this function will increase calculation time!** **NOTE: To make any settings on minimum quality level please use the tool Quality Check.**
Extended	▪ ***Parameter Set:*** Setting the degree of ruggedness in code detection**.** ▪ **Standard:** Standard code detection, average processing time. ▪ **Robust:** This mode enables detection of more contours, however at increased processing time. **NOTE: Enabling this function will increase calculation time!** ▪ **Reading direction:** Defines the reading direction on the image. This allows for sorted output if multiple codes are present on the image. ▪ **Auto:** Attempt of reading the code like a book (line by line from top to bottom or from left to right within a line). ▪ **Top > Bottom** ▪ **Bottom > Top** ▪ **Left > Right** ▪ **Right > Left**

	▪ **Polarity:** Indicates whether the code to be read is darker or lighter than the background. ▪ **All** ▪ **Dark on light** ▪ **Light on dark**

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Selected EAN/UPC types	Text	EAN-13 Add-On 5 EAN-13 Add-On 2 EAN-13 UPC-A Add-On 5 UPC-A Add-On 2 UPC-A EAN-8 Add-On 5 EAN-8 Add-On 2 EAN-8 UPC-E Add-On 5 UPC-E Add-On 2 UPC-E	-
SelectedGS1 types	Text	GS1 DataBar Omnidir GS1 DataBar Truncated GS1 DataBar Stacked GS1 DataBar Stacked Omnidir GS1 DataBar Limited GS1 DataBar Expanded GS1 DataBar Expanded Stacked GS-128	-
Selected other types	Text	2/5 Interleaved 2/5 Industrial Code 128 Code 93 Code 39 Code 39 Extended Codabar MSI Pharmacode	-
EnableTimeout	Bool	0 = off 1 = on	ms
Reading direction	Text	Disabled	-

Data input	Data type	Measurement range	Unit
		AutoLeftRightTopDown TopDown DownTop LeftRight RightLeft	
Maximum number of codes	Integer	1 - 10	-
Parameter Set	Text	Standard Robust	-
Polarity	Text	Any DarkOnBright BrightOnDark	-
Quality	Text	None ISO/IEC 15416	-
Narrow down search area	Bool	0 = off 1 = on	-
Timeout [ms]	Integer	1 - 2000	ms
Enable type selection	Bool	0 = off 1 = on	-

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Code	Text	-	Read code
Code type	Text	see above	Read code type
Quality	Text	-	-
Rotation	Float-Point	- 180 - 180	Angular range
Center X coordinate	Integer	-	Code center in X direction
Center Y coordinate	Integer	-	Code center in Y direction
Parameter			
Selected EAN/UPC types	Text	EAN-13 Add-On 5 EAN-13 Add-On 2 EAN-13 UPC-A Add-On 5 UPC-A Add-On 2 UPC-A EAN-8 Add-On 5 EAN-8 Add-On 2	-

Data output	Data type	Measurement range	Description
		EAN-8 UPC-E Add-On 5 UPC-E Add-On 2 UPC-E	
SelectedGS1 types	Text	GS1 DataBar Omnidir GS1 DataBar Truncated GS1 DataBar Stacked GS1 DataBar Stacked Omnidir GS1 DataBar Limited GS1 DataBar Expanded GS1 DataBar Expanded Stacked GS-128	-
Selected other types	Text	2/5 Interleaved 2/5 Industrial Code 128 Code 93 Code 39 Code 39 Extended Codabar MSI Pharmacode	-
EnableTimeout	Bool	0 = off 1 = on	ms
Reading direction	Text	Disabled AutoLeftRightTopDown TopDown DownTop LeftRight RightLeft	-
Maximum number of codes	Integer	1 - 10	-
Parameter Set	Text	Standard Robust	**-**
Polarity	Text	Any DarkOnBright BrightOnDark	-
Quality	Text	None ISO/IEC 15416	-

Data output	Data type	Measurement range	Description
Narrow down search area	Bool	0 = off 1 = on	-
Timeout [ms]	Integer	1 - 2000	ms
Enable type selection	Bool	0 = off 1 = on	-

8.4.1.2.3 Tool: Matrix code

This tool is for reading matrix codes. Furthermore, the code reading quality can be specified compliant to ISO/IEC 15415.

INFO

Where it comes to reading several matrix codes of different types, individually parameterized tools may speed up things.

Search area	Enable/disable search area (blue frame) in the image. ▪ ***Shape*:** Selecting the shape of the area the code appears in. ▪ **Object localization:** Select a previously configured object localization.
Code settings	▪ ***All*:** image is searched for all readable matrix codes. ▪ ***List*:** Shows a list of matrix codes for selection. ▪ ***GS1*:** Shows a list of GS1 codes. ▪ ***Misc*:** Shows the list of codes that are not GS1 codes. **NOTE: Defining specified types will reduce error identifiers and processing time.** ▪ **Maximum number of codes:** Defines the maximum number of codes to be read in an image. **NOTE: Setting more codes than available in the image will increase processing time! Therefore, defining a search area is recommended.**
Timeout	▪ Limits the calculation time for code identification in ms. **NOTE: Exceeding the defined calculation time will abort the reading operation. This may either implicate reading of fewer codes than present in the image or not executing any quality check.**
Quality	▪ Code quality checks enabled / disabled compliant to ISO/IEC 15415. **NOTE: Quality checks are only performed if the code with its light margin is completely visible in the image, otherwise F is output even if the code content is readable. Enabling this function will increase processing time!**
Extended	▪ ***Parameter Set:*** Setting the degree of ruggedness in code detection**.** ▪ **Fast:** Fast code detection. ▪ **Standard:** Standard code detection, average processing time. ▪ **Robust:** This mode enables detection of more contours, however at increased processing time. ▪ **Reading direction:** Defines the reading direction on the image. This allows for sorted output if multiple codes are present on the image. ▪ **Auto:** Attempt of reading the code like a book (line by line from top to bottom or from left to right within a line).

	▪ **Top > Bottom:** Considers the alignment of every code. Hence, any twist or slight offset in height will not effect the sorted output. ▪ **Bottom > Top:** Considers the alignment of every code. Hence, any twist or slight offset in height will not effect the sorted output. ■ **Verify white space:** Enable/disable verification of the white space of the matrix code. This function disabled means reading also adjacent matrix codes without space.

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Selected GS1 types	Text	GS1 DataMatrix GS1 QR Code GS1 Aztec Code GS1 DotCode	-
Selected other types	Text	Data Matrix ECC 200 QR Code Micro QR Code Aztec Code DotCode PDF417	-
Reading direction	Text	Disabled AutoLeftRightTopDown TopDown DownTop	-
Maximum number of codes	Integer	1 - 10	-
Parameter Set	Text	Fast Standard Robust	-
Verify code white space	Bool	0 = off 1 = on	-
Quality	Text	None ISO/IEC 15415	-
Narrow down search area	Bool	0 = off 1 = on	-
Timeout [ms]	Integer	1 - 2000	ms
Activate timeout	Bool	0 = off 1 = on	-
Enable type selection	Bool	0 = off	-

Data input	Data type	Measurement range	Unit
		1 = on	

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Code	Text	-	Read code
Code type	Text	-	Read code type
Quality	Text	-	-
Rotation	Float-Point	- 180 - 180	Angular range
Center X coordinate	Integer	-	Code center in X direction
Center Y coordinate	Integer	-	Code center in Y direction
Parameter			
Selected GS1 types	Text	GS1 DataMatrix GS1 QR Code GS1 Aztec Code GS1 DotCode	-
Selected other types	Text	Data Matrix ECC 200 QR Code Micro QR Code Aztec Code DotCode PDF417	-
Reading direction	Text	Disabled AutoLeftRightTopDown TopDown DownTop	-
Maximum number of codes	Integer	1 - 10	-
Parameter Set	Text	Fast Standard Robust	-
Verify code white space	Bool	0 = off 1 = on	-
Quality	Text	None ISO/IEC 15415	-
Narrow search range	Bool	0 = off 1 = on	-
Timeout [ms]	Integer	1 - 2000	ms

Data output	Data type	Measurement range	Description
Activate timeout	Bool	0 = off 1 = on	-
Enable type selection	Bool	0 = off 1 = on	-

8.4.1.2.4 Tool: Text (device-dependent)

This tool is for reading dates, numbers and words. Only reading one line per tool.

Condition:

⇨ You have added tool *Text* from category *Tools*.

Instruction:

a) Select *reading area* in the image where the elements to be read are located.

b) Optionally, you can select *object localization*.

c) Define appearance*(polarity, mirroring, font*).

✓ An automatic *teach* operation runs.

d) Optionally, you can customize the read result using *read setting* and *character segmentation*.

Result:

✓ Tool parameterization *Text* completed.

INFO

For optimum detection, the background should be as little structured as possible.

Reading area	▪ ***Shape*:** Select the area with text. ▪ **Object localization:** Select a previously configured object lo-calization.
Appearance	▪ **Polarity:** Indicates whether the code to be read is darker or lighter than the background. ▪ **Mirroring:** Specifies whether text is mirrored*(No, Horizontal, Vertical*). The reading direction (blue arrow) is adjusted accordingly. ▪ **Font:** Defines the font*(standard* / *dot print*). *Dot-Print* font cannot read lower case letters.
Read settings	▪ ***Teach*:** Search for readable characteristics in the previously selected area. ▪ ***Text type*:** Setting the type of text to be read. ▪ **Date:** Optional setting (masking) of the date format. - DD - Day (two digits) - DDD - Tag (three letters) - MM - Month (two digits) - MMM - Month (three letters) - YY - Year (two digits) - YYYY - Year (four digits)

	- allowed separators: - / , **INFO: No processing of spaces.** ▪ ***Numerals*:** Automatic or manual definition of the number of characters. ▪ ***Letters*:** definition whether small, large or mixed, automatic or manual definition of the number of characters. ▪ ***Mask*:** Optional masking of text to be read. - 1 - any digit - A - any capital letter - a - any lower case letter - ? - any capital letter or number - H - any hexadecimal character - $ - any additional character - x - Ignore character **INFO: No processing of spaces.** ▪ ***Time:*** Select time format. (HH:MM / HH:MM:SS) ▪ ***Hexadecimal characters*:** Automatic or manual definition of the number of characters.
Advanced	▪ ***Parameter Set*:** Setting the reading mode(*Fast* / *Standard*). The selected mode defines processing times. *Standard* mode consumes maximum processing time but ensures better reading stability with less-than-optimum print images. ▪ **Find print field:** Function to improve / stabilize the result if characters are very close to a print field edge (edge in the background with strong contrast) or to cut characters.
Character segmentation	▪ **Contrast threshold:** Setting the threshold for separation of background and character. ▪ ***Font weight*:** Setting the line width of the characters found. ▪ **Remove small characters:** Threshold defining the minimum character area. Set the slider to the level the required characters will be recognized and smaller characters will be filtered out. ▪ **None:** every contour element will be interpreted as potential sign (highly prone to errors) ▪ **Maximum:** all characters found will be ignored

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Letters	Text	Lower Upper Mixed	-
Find print field	Bool	0 = off	-

Data input	Data type	Measurement range	Unit
		1 = on	
Format (date)	Text	DD - Day (two digits) DDD - Tag (three letters) MM - Month (two digits) MMM - Month (three letters) YY - Year (two digits) YYYY - Year (four digits)	-
Format (time)	Text	HH:MM - Hour:minute HH:MM:SS - Hour:Minute:Second	-
Remove small characters	Integer	0 - 100	-
Contrast threshold	Integer	0 - 100	%
Mask	Text	1 - any digit A - any capital letter a - any lower case letter ? - any capital letter or number H - any hexadecimal character $ - any additional character x - Ignore character	-
Parameter set	Text	Standard Fast	-
Polarity	Text	DarkOnBright BrightOnDark	-
Font	Text	Default Dot-Print	-
Reflection	Text	None Horizontal Vertical	-
Text type	Text	Date Numerals Letters Mask Time Hexadecimal characters	-
Number of characters	Integer	1- 32	-
Number of characters (mode)	Text	Fixed Auto	-
Character width	Integer	-5 - 5 - (thin - thick)	-

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result Data			
Text	Text	-	read text
Parameter Data			
Letters	Text	Lower Upper Mixed	-
Find print field	Bool	0 = off 1 = on	-
Format (date)	Text	DD - Day (two digits) DDD - Tag (three letters) MM - Month (two digits) MMM - Month (three letters) YY - Year (two digits) YYYY - Year (four digits)	-
Format (time)	Text	HH:MM - Hour:minute HH:MM:SS - Hour:Minute:Second	-
Remove small characters	Integer	0 - 100	-
Contrast threshold	Integer	0 - 100	%
Mask	Text	1 - any digit A - any capital letter a - any lower case letter ? - any capital letter or number H - any hexadecimal character $ - any additional character x - Ignore character	-
Parameter set	Text	Standard Fast	-
Polarity	Text	DarkOnBright BrightOnDark	-
Font	Text	Default Dot-Print	-
Reflection	Text	None Horizontal Vertical	-
Text type	Text	Date Numerals Letters	-

Data output	Data type	Measurement range	Description
		Mask Time Hexadecimal characters	
Number of characters	Integer	1- 32	-
Number of characters (mode)	Text	Fixed Auto	-
Character width	Integer	-5 - 5 - (thin - thick)	-

8.4.1.2.5 Annex: Quality features for barcode and matrix code

Various code types provide numerous quality features described in more detail in the following.

Please note that these standards define lighting arrangement and image quality requirements, reason why the found values cannot directly be mapped to every installation situation.

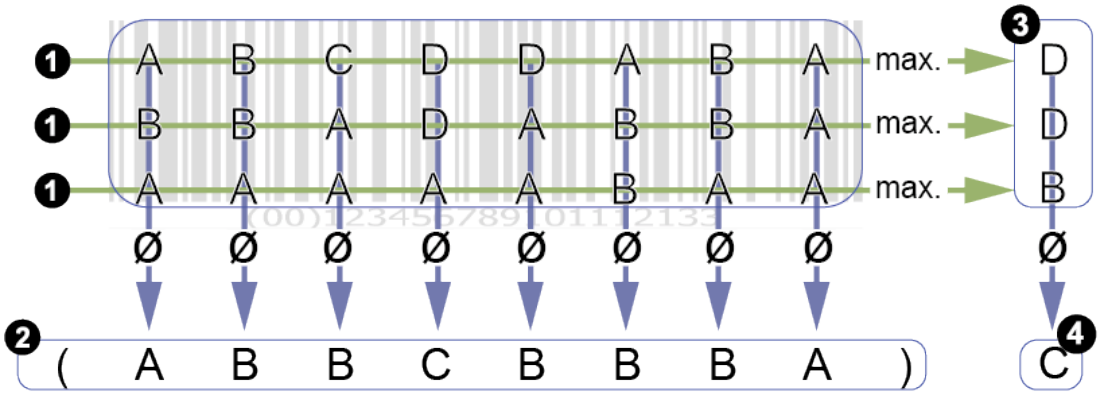
Barcode quality features (ISO/IEC 15416)

Designation	Description
Readability	A = Code readable / F = Code not read
Symbol contrast	Difference between maximum and minimum symbol gray values
Minimum reflection value	A = minimum gray value ≤ 0.5 * maximum gray value F = otherwise
Edge contrast	Minimum contrast between two symbol elements
Modulation	Amplitude between symbol elements
Defects	Irregularities in a symbol's gray value profile
Decoding capability	Deviation in width of symbol elements
Other code-specific parameters	Depending on the code type, e.g. evaluation of light margin width, symbol width ratio, etc.

Determining the barcode quality

Several search beams (1) scan the barcode for evaluation of the above defined quality features. The average quality of same characteristics of all search beams is determined and output (2).

Furthermore, the worst rated (3) quality feature for each search beam is identified, building the average for output as overall quality (4).



The overall quality of a barcode may be inferior to that of individual quality features. The reason for this is that the worst individual scores (3) are included in the overall rating in each case. Evaluation of quality features (2) does not map the overall quality.

Individual values of search beams rated very poor will entail poor overall quality, though individual quality features may not be rated worse.

Quality features DataMatrix (ECC200) and QR Code (ISO/IEC 15415 + AIM DPM-1-2006)

Designation	Example		Description
Contrast			Difference between the modules' maximum and minimum gray values.
Modulation			Amplitude between data code modules. (According to error correction!)
Damage to the pattern			Disturbances of the frame pattern (finder pattern).
Readability			A = Code readable F = Code was not read
Axial non-conformity			Evaluation of module width and height.
Grid non-consistency			Evaluation of the tilt angle (perspective distortion).
Unused error correction			Proportion of unused error redundancy.

Designation	Example		Description
Gray value of bright modules			Average gray value of all light modules of the DataMatrix or QR code. **Gray value / evaluation** 0.7 .. 0.86 / A 0.86 .. 1.0 / B 0.55 .. 0.7 / B 0.4 .. 0.55 / C 0.25 .. 0.4 / D 0 .. 0.25 / F

Quality features PDF 417 (ISO/IEC 15415)

Designation	Description
Reflective properties Start/stop pattern	Evaluation of reflection properties and line widths of start-stop pattern
Percentage of decoded code words	Relative proportion of decoded code words
Unused error correction	Proportion of unused error redundancy
Modulation	Amplitude between symbol modules
Decoding capability	Deviation in width of symbol elements
Defects	Scan profile irregularities within modules

8.4.1.3 Auxiliary tool

8.4.1.3.1 Auxiliary tool: Value Check

You can use the measurement tool to compare values from two input sources. Codes read by the sensor as well as an individually expected value can be selected as input sources.

Auxiliary Tool Comparison	**NOTE: Auxiliary tools can only use previously parameterized measuring tools as input source.** ■ ***Input source 1*:** Selection of first input source. Selection enabled if measuring tool has been parameterized. ■ ***Comparison type*:** definition of a criterion for the comparison of both input sources. ▪ ***is equal*** ▪ ***is not equal*** ▪ ***contains*** ▪ ***not contains*** ▪ ***begins with*** ▪ ***not begins with*** ▪ ***ends with*** ▪ ***not ends with*** ■ ***Input source 2*:** Selection of second input source. Selection enabled if measuring tool has been parameterized.
Compare value	■ Definition of the expected value. Default value entry may use the following formats: ▪ **ANSI** ▪ ***Raw data (Hex)*** ▪ **UTF8**

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Input source 1	Text	None Barcecode 1 – Code 1 Matrixcode 1 – Code 1 ExpectedCode	-
Input source 2	Text	None Barcecode 1 – Code 1 Matrixcode 1 – Code 1 ExpectedCode	-
expected value	Character		-
Type of comparison	Text	IsEqual IsNotEqual Contains NotContains BeginsWith NotBeginsWith EndsWith NotEndsWith	-

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Valid	Bool	— = cannot be evaluated 0 = invalid 1 = valid	-
Parameter			
Input source 1	see above	see above	see above
Input source 2			
expected value			
Type of comparison			

8.4.1.3.2 Auxiliary tool: Quality Check

Auxiliary tool can be used to determine the quality of one or more codes that have been read.

Auxiliary Tool Quality	**NOTE: Auxiliary tools can only use previously parameterized measuring tools as input source.** ▪ ***Input source:*** Selection of the code to be evaluated ▪ ***All 1D-Codes - Code Qualities*:** every 1D code (barcode) found is checked and the set ***Minimum quality*** is applied to the worst. ▪ ***All 2D-Codes - Code Qualities*:** Every 2D code (matrix code) is checked and the set ***Minimum quality*** is applied to the worst. ▪ Checks a specific parameterized measuring tool.
	▪ ***Minimum quality:*** selection of the quality level ▪ ***Quality level A - very good*** ▪ ***Quality level B - good*** ▪ ***Quality level C - satisfactory*** ▪ ***Quality level D - sufficient*** ▪ ***Quality level F - fail*** *Annex: Quality features for barcode and matrix code [▶ 55]*

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

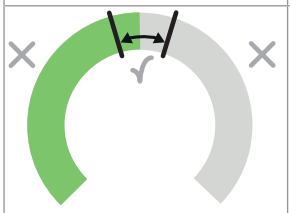
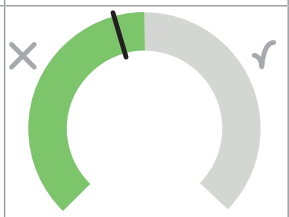
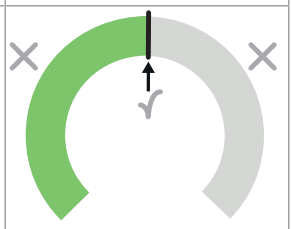
Data input	Data type	Measurement range	Unit
Selected code	Text	None All1DCodeQualities All2DCodeQualities parameterized tool	-
Minimum quality	Text	QualityLevelA QualityLevelB QualityLevelC QualityLevelD QualityLevelE QualityLevelF	-

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Valid	Bool	— = cannot be evaluated 0 = invalid 1 = valid	-
Parameter			
Selected code	see above	see above	see above
Minimum quality			

8.4.1.3.3 Auxiliary tool: Length check

Auxiliary tool is used to length (number of digits read, including spaces) of a read code in relation to a defined value range, threshold value or target value.

<table>
<tr><td rowspan="4">Auxiliary Tool Length Check</td><td colspan="3">NOTE: Auxiliary tools can only use previously parameterized measuring tools as input source.
▪ Input source: Selection of the code to be checked.
▪ Compare Type: Selection of the criterion to be evaluated.</td></tr>
<tr><td>Range: The length of the read code must be within the set minimum and maximum limits.</td><td>Threshold: The length of the read code must be greater than or equal to the set threshold.</td><td>Target value: The length of the code read must correspond to the set target.</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td colspan="3">▪ Compare Value: Setting the respective values.
▪ Invert: Invert settings.
▪ Teach: Automatic adjustment of the comparison values.</td></tr>
</table>

The following values can be set via the process interface (*Communication: Data telegram [▶ 61]*):

Data input	Data type	Measurement range	Unit
Reference value	Integer	0 - 8192, depending on source	-
Input source	Text	selected source	-
Invert	Integer	0 = off 1 = on	-
Maximum length	Integer	8192, depending on source	-
Minimum length	Integer	0	-
Type of comparison	Text	Range Threshold Setpoint	-

The process interface is capable of reading the following values:

Data output	Data type	Measurement range	Description
Result			
Valid	Bool	— = cannot be evaluated 0 = invalid 1 = valid	-
Length	Integer	depending on source	Number of digits in the code
Parameter			
Reference value	see above	see above	see above

Data output	Data type	Measurement range	Description
Input source			
Invert			
Maximum length			
Minimum length			
Type of comparison			

Also see about this

Annex: Quality features for barcode and matrix code [▶ 55]

8.4.2 Mode Parameterization Communication

8.4.2.1 Communication: Data telegram

In mode **communication** ***Data Telegram***, ***Data Input*** and ***Data Output*** are parameterized via the process interface, see *Interfaces and protocols [▶ 73]*.

The sensor can output data via the process interface (***Data Output***) or enables reparameterization during runtime (***Data Input***). For doing so, one ***Data Telegram*** can be configured to ***Data Input*** / ***Data Output***. Data telegrams are organized in data blocks and separated with ***Separator***. Depending on the selected process interface, a ***Data Telegram*** also has a defined start (header) and a defined footer (***Line ending***).

INFO

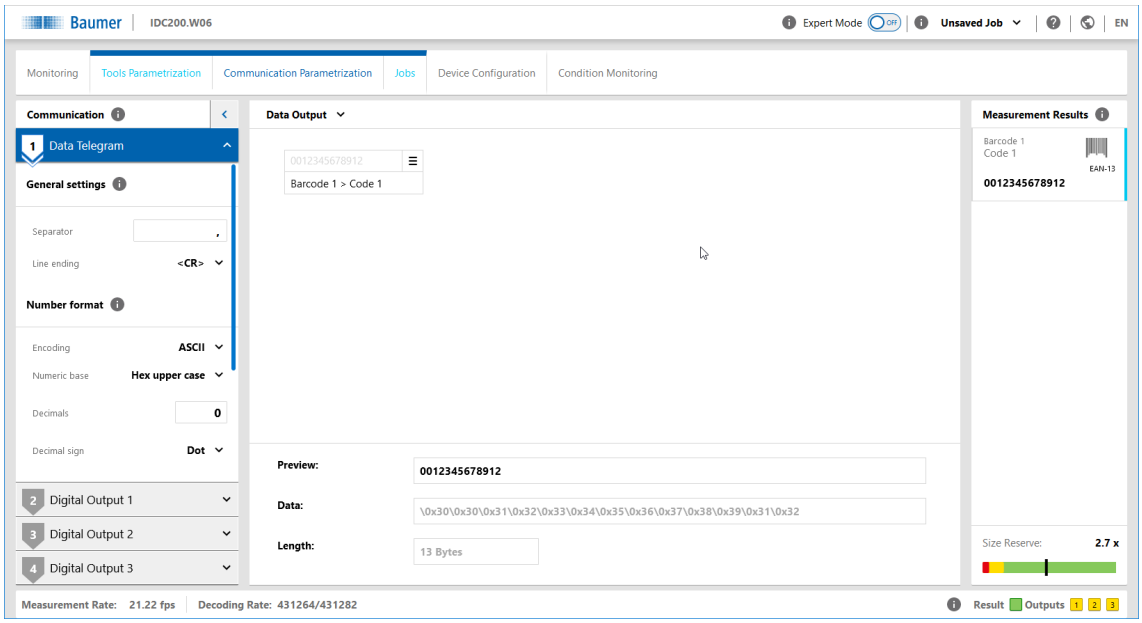
For data telegram configuration, first some of the features to be controlled/retrieved (e.g. expected code value or read code) must be created via the web interface. Image acquisition parameters (e.g. the exposure time) are immediately available for data telegram configuration.

Mode Parameterization Tools [▶ 37]

The desired function (***Data Input*** / ***Data Output***) is selected in the upper area. General settings for data telegram configurations are performed in the left area.

The center area defines data block contents.

The lower preview area shows how data telegrams are input or output via the process interface. The preview may differ according to the selected protocol.



Ill. 9: Data telegram communication

General settings	▪ ***Separator***: Character string that stands as a separator between each transmitted value (e.g. ,). ▪ ***Line ending***: footer or end identifier of the data stream ▪ ***<LF>*** ▪ ***<CR>*** ▪ ***<CR><LF>***
Number format	▪ ***Encoding***: encoding for the data to be transmitted (***ASCII*** /***Binary***). **INFO: The following setting options differ depending on the selected data encoding.** ***Encoding*: *ASCII*** ▪ ***Numeric base***: Number system for data transmission ▪ ***Hex lower case***: Hexadecimal with lowercase letters ▪ ***Hex upper case***: Hexadecimal capital letters ▪ ***Decimal***: Decimal numbers ▪ ***Decimals***: value is round to set decimal digit (0-4) ▪ ***Decimal sign***: Separates the digits before and after the decimal point (***Dot*** / ***Comma***) ***Encoding*: *Binary*** ▪ ***Global data type***: Defines the total of bytes per number ▪ ***Int32*** (4 bytes, signed) ▪ ***UInt32*** (4 bytes, non-signed) ▪ ***Int64*** (8 bytes, signed) ▪ ***UInt64*** (8 bytes, non-signed) ▪ ***Float*** (4 bytes, signed) ▪ ***Double*** (8 bytes, signed) ▪ ***Byte order***: Byte reading direction ▪ **little-endian** (reading from right to left) ▪ **big-endian** (reading from left to right)

Numeric width	**INFO: Function only available with data encoding *ASCII*.** Enable / disable fix number width. ■ ***Global width*:** Number selection (0-16). ■ ***Padding*:** If the value to be transmitted is inferior to the defined ***Global width*** the remaining space will be filled by the selected characters. ▪ ***Zero ("0")*** ▪ ***Empty space (" ")*** ■ ***Alignment*:** Position of the value to be transferred within the number. ▪ ***left aligned*** ▪ ***right aligned*** (only for selected ***Padding Empty space (" ")***
Text width	■ ***Padding*:** Specification of a fill character. ■ ***Alignment*:** Position of the value to be transmitted within the text. ▪ ***left aligned*** ▪ ***right aligned*** **INFO: Setting *Local width* is made in the data block of the data telegram!**

***Preview*:**	Preview ***Data Telegram*** as human readable text.
***Data*:**	Preview ***Data*** in hexadecimal.
***Length*:**	Length ***Data Telegram*** in bytes. **INFO: When using the TCP protocol, *Data Telegram* must not exceed 4096 bytes.** **Applied PROFINET protocol allows for a length of 8 - 240 bytes, according to PLC configuration.**

8.4.2.2 Communication: Digital Output

Mode ***Digital Output*** is for assigning the sensor outputs the related actions. In the left section, each output has its own panel.

INFO

Settings for ***Digital Inputs*** are performed in menu item ***Device Configuration***.

Switching output	■ Select output assignment. ▪ ***Disabled*** ▪ **Pass:** Output if all measurement results are pass. ▪ **Fail:** Output as soon as a measurement result is Fail. ▪ **Result Valid:** The digital output signal indicates a new result being available. It signals to the controller that the digital outputs (e.g. **Pass** / **Fail**) are ready for polling results. ***Duration*** time should be shorter than the other output times. ▪ ***Trigger Ready*****:** is output when the device is ready for another trigger. ▪ ***Alarm:*** Is output in the event of an alarm. ▪ **Device Ready:** is output when the device is operational after start-up. The output remains permanently active. ▪ **Flash Sync:** Output signal for external lighting control (only available with *digital output 3*). ▪ **Measuring tool: Pass** ▪ **Measuring tool: Fail**
Limit output duration	■ Activation/deactivation of limited output time. ▪ ***Duration***: Output time of the selected signal in ms.
Polarity	■ Select output polarity (output level). ▪ ***Active High*** ▪ ***Active Low***

8.4.3 Job mode

Job mode is for job management at the sensor. Up to 32 jobs can be stored on the sensor. Furthermore, the job to be executed at start up can be defined.

There is also the option to export and import all jobs in one file.

Import / Export	▪ ***Start with Setup***: Selects the job to be executed at startup. **NOTE: Sensor start up is with the job defined here. When working with a PLC, the PLC may envisage another job at startup. For this purpose, create a job including the image settings only (trigger mode: single measurement).** ▪ **Import** / **Export**: Import / export all jobs in one file. External saving is in a file including the packed and encoded jobs. This file can be imported if the sensors are identical.
Save as Job Setup	▪ ***Save*****:** Saves the current job to the next free memory loca-tion (1 - 32). In parallel, this job will be active at sensor startup. **NOTE: Saving to a specific memory location is via the menu of the desired memory location.** ▪ ***Delete all*****:** Delete all saved jobs. ▪ List of all saved jobs / memory locations with the following functions for each job via menu item: ▪ ***Save*** ▪ ***Rename*** ▪ ***Reset*** ▪ ***Delete*** ▪ ***Import*** ▪ ***Export***

8.5 Device configuration mode

Device-specific settings can be made in ***Device Configuration*** mode.

Sensor Info	Show the sensor characteristics. Please pass on this information in a service case. ▪ ***Sensor Type*:** Provides sensor type and order number. ▪ ***Serial Number*:** Provides the sensor serial number. ▪ ***Vendor Name*:** Provides the sensor manufacturer. **NOTE: MAC address and production date please are seen on the sensor label.**
Sensor	▪ ***Pointer*:** Enable / disable projection of optical test result (red/ green) on the control surface. Provides remarks for code positioning without camera image. ▪ ***Display*:** Enable/ disable display at sensor. ▪ **Luminous ring:** Enable / disable the luminous ring at the sensor.

Network	Settings for sensor Ethernet connection.
	▪ ***IP Address*:** Setting of IP address in the IPv4 address range.
	▪ **Current IP address:** Provides the current IP address (only in Ethernet connection).
	IPv4 address range
	`10.0.0.0 – 10.255.255.255`
	`172.16.0.0 – 172.31.255.255`
	`192.168.0.0 – 192.168.255.255`
	▪ ***Subnet Mask*:** input subnet mask
	▪ **Current subnet mask:** Provides the current subnet mask
	▪ ***Standard Gateway*:** input Standard Gateway
	▪ ***MAC Address*:** display of the MAC address of the sensor
	▪ ***DHCP*:** activate / deactivate DHCP
	INFO: The IP address for a connection via USB is `169.254.2.1` and cannot be edited. The values displayed here refer to a connection via Ethernet.

Web Interface	Configuration of the web interface. ▪ ***Port*:** Setting the port for connecting the web interface to the sensor. **INFO: Ports 21, 22, 443, 5353, 5942, 51972 are occupied by other processes and must therefore not be set.**
FTP	Using the FTP / SFTP function you can save selected images to the FTP server. **INFO: To this end, the device must have read, write and delete FTP server rights. Furthermore, device and FTP server must be in the same subnet. In order to use SFTP, the FTP server must support encryption.** ▪ ***Connection***

	▪ ***Protocol*:** FTP (unencrypted data transfer) / SFTP (encrypted data transfer) ▪ **Server:** IP address of the FTP server ▪ ***Port*:** FTP server port number ▪ ***User Name:*** user name for FTP access ▪ ***Password:*** password for FTP access ▪ ***Test connection:*** test the entered access data ■ ***Image Backup*** ▪ ***Type*:** pass only = images with overall result Pass / Fail only = images with overall result Fail / Pass and Fail = all im-ages ▪ ***Image format*:** select image file format (BMP / PNG) ▪ ***Image resolution*:** image resolution (full / reduced = 2x2 binning) ▪ ***Destination Path*:** image directory on FTP server ▪ ***Name of Image Series*:** Name of image series ▪ ***Number limitation*:** if enabled, once the defined numer of saved images has been reached, previous images will be overwritten ▪ ***Number*:** limit the total of saved images ▪ ***Image Name Entry*** Edit the image naming structure - ***Name of Image Series*:** defined name (limited image number) - ***Image Number*:** consecutively assigned image number (limited image number) - ***Result*:** evaluation result (optional if ring buffer is enabled) - ***Job Name*:** job name (if image number is not limited) - ***Job Number*:** job number (if image number is not limited) - **Trigger data:** secondary image data transferred using command *TD*(if image number is not limited) - **Time stamp (UTC)**: Time specification according to ISO 8601 `(year-month-day:hour:Minute:Second.MillisecondZ)` (Z=time zone UTC), with every Sensor restart or FTP activation, runs synchronous with FTP server ▪ ***Image Name Preview*:** preview of the configured file name
Time synchronization	With this function, the sensor synchronizes its internal clock with a defined network time server. The time stamps of the measurement results are set according to synchronization. ■ **FTP:** Time synchronization via FTP (automatically activated if the connection is configured) ■ **NTP:** after activating NTP (Network Time Protocol), the time is obtained from a time server in the network ▪ **Time server:** IP address or local domain of the time server (default port:123)

	▪ **Time offset:** Option for manually setting a time offset versus the server-delivered time (FTP or NTP). The sensor does not switch between summer and winter time. **Info: If both methods are activated, time synchronization via NTP is preferred.**
Process Interface	Enable/disable process interfaces. If disabled, the sensor will no longer respond to requests transmitted via this protocol. ▪ ***Protocol*:** ▪ **TCP:** enable / disable. Setting the communication parameters (***Port***, ***Receive Timeout***, ***Alive Timeout***, **Data telegram output**, **Continuous (default):** Data telegram transmission at every trigger and/or GD command. **After GD command:** The sensor will only transmit an RD telegram after a GD command. ▪ ***Profinet IO*:** Enable / disable sensor integration into PLC projects requires installing a product specific driver (GSD file). This file is available straight in the device. ▪ **USB-HID:** enable / disable. The device will act as keyboard. The configured ***Data Telegram*** is output via the USB interface and can be evaluated by a connected system like a keyboard entry. Setting of **keyboard layout** (German/English). Selecting the point in time for **data output**. After **result change** (changed or successfully read code) or **All** read codes. Furthermore, a **waiting time** in ms can be set which defines the waiting time prior to output of the next result. **NOTE: After the saving operation on the sensor, device connection via USB interface and web interface is no longer possible.** **NOTE: After sensor restart, it may take some time until the connected system (e.g. a PC) has fully set up the sensor HID keyboard. Therefore, the PC will not receive resp. ignore any data telegrams transmitted during this time.** ▪ **Ethernet/IP**: enable / disable. Sensor integration into a PLC project requires installing a product-specific driver (EDS file). This file is available straight in the device.
Digital Inputs	Sensor digital input settings. ▪ ***Input switch*:** setting the respective input function ▪ ***Disabled*** ▪ ***Trigger*** ▪ Job selection (switchover only in mode ***Monitoring***) ▪ ***Polarity*:** Polarity settings of the respective input.
System	▪ ***Security*** ▪ ***Password Protection*:** Enable / disable password protec-tion for mode ***Parametrization***.

	■ ***Backup & Restore*** ▪ ***Create device backup*****:** Save a complete sensor backup to PC. Jobs and the firmware are saved in a single file. ▪ ***Restore device*****:** Restore complete PC backup to sensor. ■ ***Firmware*** ▪ ***Firmware Version*****:** provides the current firmware version and licenses. ▪ ***Webinterface Version*****:** provides the current web interface version and licenses. ▪ **Update:** Firmware update to sensor. It is possible to install a more recent revision of the firmware on the sensor, as long as the compatibility of the firmware is not excluded by the release notes. *Downgrade* is also possible. However, only down to the firmware revision at the time of sensor delivery. ▪ **Factory settings:** Restore default, sensor reset to the factory settings. Any data which had not been saved will be lost! ▪ ***Reboot Sensor***

8.6 Diagnostic data mode

In this mode, diagnostic data such as ***Temperature***, ***Auto focus cycles*** and **operating time** are displayed. Display refresh is every 2 seconds. The values can be exported as a .csv file via the button.

General Overview

Device time	▪ Display of device time and time source for time (system = internal time from the sensor / NTP = time obtained from the NTP time server / FTP = time obtained from the FTP server).
Temperature	▪ Current sensor temperature.
Auto focus cycles	▪ Counts of performed ***Auto focus cycles***. **NOTE: Counting the focus cycles considers autofocus and manual focus.** **Autofocus: Every autofocus performed will increase the count by one.** **Manual focus: Every other manually performed focus operation will crease the count by one.**
Up time	▪ Provides of the operating time since power up.
Total up time	▪ Provides the total operating time.
Export diagnostic data	▪ Saving the current data records as a .csv file.

Temperature (since Power-On)

Display is as curve diagram together with the minimum and maximum values.

Maximum	▪ Maximum temperature ever since sensor power up.
Minimum	▪ Minimum sensor temperature since sensor power up.
Alarm limit	▪ Reaching this temperature will output an alarm. **NOTE: If the fixed alarm limit is exceeded, image recording is stopped and the device is switched to overtemperature mode. To end overtemperature mode, the power supply must be disconnected.**
Warning limit	▪ Reaching this temperature will output a warning.

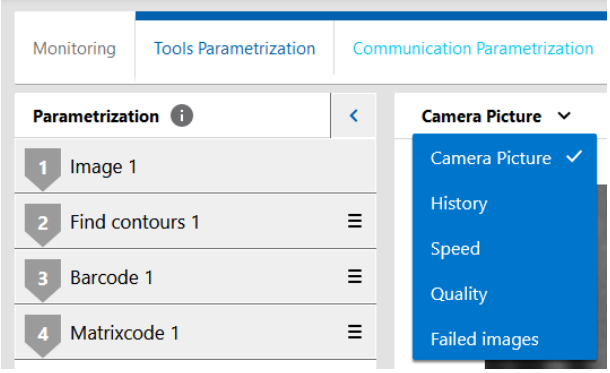
Temperature (Lifetime)

Display is by frequency distribution diagram together with the minimum and maximum values. The display is scalable.

Maximum	▪ Maximum sensor temperature ever.
Minimum	▪ Minimum sensor temperature ever.
Scale values	Display scaling in the diagram: ▪ ***absolute*** ▪ ***logarithmic*** ▪ ***normalized***

8.7 Statistical functions

For job analysis and evaluation, modes ***Monitoring***, ***Tools Parametrization***,***Communication Parametrization*** and **Jobs** provide several statistics functions.



INFO

In mode **Parameterization Communication | Data telegram** statistic functions are not available.

Camera Picture	Shows the sensor's live image.
History	▪ **Index:** Image number ▪ ***Tool*:** parameterized measuring tool ▪ **ID:** result number, if a single image provides multiple results. The order is determined by ***Sorting*** during parameterization. ▪ **Result:** test result ▪ ***Length*:** number of characters of the code content (including spaces) ▪ **Type:** Type of code ▪ ***Quality*:** Provides the code quality, if enabled in measuring tool ▪ ***Size Reserve*:** display, determined size reserve ▪ ***Position x*:** code center in X direction (pixel) ▪ ***Position y*:** code center in Y direction (pixel) ▪ ***Rotation*:** code shift towards X-axis
Speed	▪ ***Tool*:** shows the elements of an evaluation which take processing time ▪ **Image acquisition:** Time of image acquisition (e.g. image sensor readout) ▪ **Waiting time:** Waiting time due to sensor working at full processing capacity and being busy from previous processes ▪ **Job:** Total time for the parameterized job ▪ **Tools:** Total time for processing the individual measuring tools **INFO: Calculation times of individual measuring tools do not add up to the total time since evaluation is in parallel.**

	INFO: If a maximum job duration is defined in the Image tool or a timeout is defined for the measuring tools, you are provided with the time until evaluation aborted should the set time not be sufficient for completing the evaluation. ▪ **Other:** Internal system time for data transfer and provision of results ▪ ***Current*:** currently required processing time required for individual measuring tools respectively the entire job ▪ **Minimum:** minimum processing time required by measuring tool ▪ ***Average*:** average processing time required by measuring tool ▪ **Maximum:** maximum processing time required by tool
Quality	▪ **Job:** parameterized job with its individual measuring tools ▪ ***Read*:** successfully read jobs individual measuring tools ▪ ***Unread*:** jobs not read, individual measuring tools ▪ ***Read Rate*:** success rate in % for job, individual measuring tools
Failed images	▪ Show / save failed images (max.16)

The following functions are available.

	Display refresh **NOTE: Pausing is required for refresh.**
	Reset statistics (only for **reading history**, **reading speed** and **quality**)
	Select previous image (only **failed images**)
	Select next image (only **failed images**)
	Saves current data records as a .csv file or respectively marked failed images as a .bmp file. **NOTE: Pausing is required to enable saving of data records.**
	Zoom into camera image by clicking the button and selecting the marked area in the camera image.
	Reset the defined zoom.

9 Interfaces and protocols

NOTICE

Unprotected network environment

The sensor does not provide any IT security. Unauthorized persons might access the sensor.

a) Check the sensor access possibilities.

b) Restrict access rights.

The sensor provides several interface and protocol options (multi-protocol sensor). The available functions and measuring rates depend on the protocol used.

Available hardware interfaces are Ethernet, USB as well as digital I/O. Ethernet (`192.168.0.50`) and USB (`169.254.2.1`) are available as network adapters. Logical interfaces are service interface and process interface. The service interface is provided as a web interface.

An active process interface can be selected out of the following variants: PROFINET IO (via Ethernet), TCP (via Ethernet), Ethernet/IP™ (via Ethernet) and USB-HID (via USB). Web interface and process interfaces TCP and USB-HID utilize proprietary protocols.

The sensor supports one client connection per logical interface. At any time there is read access via the protocols. Changing the configuration is only feasible in parameterization mode. Switching to parameterization mode is via the web interface.

For the exact scope of interfaces and protocols please refer to the data sheet available for download at www.baumer.com.

Also see about this

Communication: Data telegram [▶ 61]

9.1 Abbreviations for Industrial Ethernet

Abbreviation / Term	Description
C	Controller (SPS)
D	Device (Vision Sensor)
HSS	Handshake simple
HSWA	Handshake with Acknowledge
HS	Handshake
ACT	Activation / Active
ACK	Acknowledge
pad	Padding
Img Proc	Image Processing
Res	Result
PIF	Process Interface
Buf OV	Buffer Overflow
Pipe OV	Pipeline Overflow
Inv	Invalid
TRG	Trigger
RDY	Ready
Res	Result
O	Originator
T	Target
SM	Switch Mode
SP	Set Parameter
SJ	Switch Job

9.2 PROFINET

PROFINET (Process Field Network) is an open Industrial Ethernet standard from PI (Profibus and Profinet International) based on existing IT standards (such as UDP).

PROFINET data organization is modular. Data is clustered in logical groups and mapped to the existing interfaces.

Different PROFINET modules are approved for specific PROFINETPLC slots. PROFINET modules comprise one to several submodules. Each of these modules is assigned exactly one submodule in subslot 1 of the sensor. The submodules are built from several data elements.

Data element update between sensor and controller (PLC) is periodically and module by module. The desired update time is defined by control (PLC) configuration. Supported are update times from 4 ms to 512 ms.

The following tables show the related data elements provided by the individual PROFINET sensor modules.

Data mapping and evaluation in the PLC requires configuration with the respective manufacturer-specific tool.

More information on data telegrams at *Communication: Data telegram [▶ 61]*.

Sensor functionalities mapping to PROFINET modules

The following tables provide an overview of how the sensor functionalities (data elements) are arranged in the individual PROFINET modules.

Module: Control and status

Sensor control and status information (selected by default).

- permitted in slot 1

Input data (device -→ PLC)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status-Word	pad (0)							
1		pad (0)				Setup	pad (0)	Busy	TrgRdy
2	ActiveJob	active job number							
3									
4	Temperature	Temperature info							
5									
6	Result	pad (0)							
7		pad (0)						Fail	Pass
8	Result-ID	Unambiguous "Result-ID" assigned to Result, will increase by 1 with every new result, handled at 0xFFFFFF							
9									
10	Alarm	PN HS Error	PN Buffer Overflow	PN Pipeline Overflow	pad (0)				

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
11		FTP Error	Temperature error	Temperature warning	Error focus module	Error Set-Param	Error job selection	Job Timeout	Invalid Trigger
12	Handshake for input data - ControlAck	Alarm HS error	Alarm Pipeline Overflow	pad (0)				HS Modus (0-Info, 1-ack.)	HS Active
13	Handshake for input data - HSCnt	HS Counter							
14	Handshake for output data - ControlAck	pad (0)						HS Modus (0-Info, 1-ack.)	HS Active
15	Handshake for output data - HSAck	Confirmation HS Counter							

Output data (PLC → device)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control-Word	pad (0)							
1		pad (0)							Trigger
2	SelectJob	Selection Active job number							
3									
4	Handshake for input data - Control	pad (0)						Selection HS Modus (0-Info, 1-ack.)	HS Activation
5	Handshake for input data - HSAck	Confirmation HS Counter							
6	Handshake for output data - Control	pad (0)						Selection HS Modus (0-Info, 1-ack.)	HS Activation

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
7	Handshake for output data - HSCnt	HS Counter							

Module: Control status and trigger data

Control of sensor and status information as well as secondary trigger data.

- permitted in slot 1

Input data (device -→ PLC)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status-Word	pad (0)							
1		pad (0)				Setup	pad (0)	Busy	TrgRdy
2	ActiveJob	active job number							
3									
4	Tempera-ture	Temperature info							
5									
6	Result	pad (0)							
7		**pad (0)**						Fail	Pass
8	Result-ID	Unambiguous "Result-ID" assigned to the result, will increase by 1 with every new result, handled at 0xFFFFFF							
9									
10	Alarm	PN HS Error	PN Buf-fer Over-flow	PN Pipeline Over-flow	pad (0)				
11		FTP Er-ror	Temper-ature er-ror	Temper-ature warning	Error fo-cus module	Error Set-Param	Error job selec-tion	Job Timeout	Invalid Trigger
12	Handshake for input data - Con-trolAck	HS error alarm	Alarm Pipeline Over-flow	pad (0)				HS Modus (0-info, 1 -con-firma-tion.)	HS Ac-tive
13	Handshake for input data - HSCnt	HS Counter							
14	Handshake for output data - Con-trolAck	pad (0)						HS Modus (0 info, 1 ack.)	HS Ac-tive

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
15	Handshake for output data - HSAck	Confirmation HS Counter							

Output data (PLC → device)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control-Word	pad (0)							
1		pad (0)							Trigger
2	SelectJob	Selection Active job number							
3									
4	Length	Actual length of the user data in TriggerData<X>							
5									
6 .. 6+X-1	Trigger-Data<X> (X = 8, 16, 32, 64, 128 or 240)	Trigger Data							
6+X	Handshake for input data - Control	pad (0)						Selection HS Modus (0-Info, 1-ack.)	HS Activation
7+X	Handshake for input data - HSAck	Confirmation HS Counter							
8+X	Handshake for output data - Control	pad (0)						HS mode selection (0-Info, 1-ack.)	HS Activation
9+X	Handshake for output data - HSCnt	HS Counter							

Module: Results

Result data - first code or data telegram being read according to user definition. Several modules possible (8, 16, 32, 64, 128, 240 bytes), X=16 selected by default.

- permitted in slot 2

Input data (device -→ PLC)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Result	pad (0)							
1		pad (0)						Fail	Pass
2	Result-ID	Unambiguous "Result-ID" assigned to the result, will increase by 1 with every new result, handled at 0xFFFFFF							
3									
4	Length	Actual length of the user data in Result<X>							
5									
6 .. 6+X-1	Result<X> (X = 8, 16, 32, 64, 128 or 240)	Result Data							
6+X	Handshake for input data - ControlAck	Handshake for input data - ControlAck	Alarm Pipeline Overflow	pad (0)				HS Mode (0-Info, 1-ack.)	HS Active
7+X	Handshake for input data - HSCnt	HS Counter							

Output data (PLC → device)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Handshake for input data - Control	pad (0)						HS mode selection (0-Info, 1-ack.)	HS Activation
1	Handshake for input data - HSAck	Confirmation HS Counter							

Module: Parameter

Parameter - default value for first code or parameter telegram being read according to user definition. Multiple modules permitted (8, 16, 32, 64, 128, 240 bytes).

- permitted in slot 3

Input data (device -→ PLC)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Handshake for output data - ControlAck	pad (0)						HS Mode (0-Info, 1-ack.)	HS Active
1	Handshake for output data - HSAck	Confirmation HS Counter							

Output data (PLC → device)

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Length	Actual length of the user data in Parameter<X>							
1									
2 .. 2+X-1	Parameter<X> (X = 8, 16, 32, 64, 128 or 240)	Parameter Data							
2+X	Handshake for output data - Control	pad (0)						HS mode selection (0-Info, 1-ack.)	HS Activation
3+X	Handshake for output data - HSCnt	HS Counter							

9.2.1 Handshake

To ensure data communication among networked devices with different processing speeds, the data flow among user devices requires synchronization at application level.

For doing so, there are two types of handshake: *simple handshake* and *handshake with confirmation*.

9.2.1.1 Simple handshake

The transmitter increases handshake count with every transmission of new data. This way the receiver recognizes new data being sent, even if data content remains the same.

Example: Every job evaluation produces the same result (e.g. identical code). Handshake count up shows a new image having been evaluated and the (unchanged) result having been transmitted.

General procedure simple handshake PLC input data (status, result data):

1. Simple handshake activated by PLC (outbound handshake input data in HS-I mode, bit 0 = 1, bit 1 = 0).
2. Sensor confirms handshake activation (inbound confirmation of activated handshake input data in HS-I mode, bit 0 = 1, bit 1 = 0).
3. Upon new data transmission, sensor counts up handshake of input data.
4. Count up of handshake input data will make PLC recognize arrival of new data for processing. PLC confirmation of data receipt is not required respectively will be ignored by the sensor.

General flow in single handshake of PLC output data (control, parameters, trigger data):

1. PLC activates the simple handshake (activation of outbound output data handshake in HS-I mode, bit 0 = 1, bit 1 = 0).
2. Sensor confirms the handshake activation (inbound confirmation of output data handshake activation in HS-I mode, bit 0 = 1, bit 1 = 0).
3. PLC increases the output data handshake count with every transmission of new data. Any further transmission of new data will immediately increase the output data handshake count.
4. By increased output data handshake count the PLC recognizes new data being received for processing. Sensor acknowledgement of data receipt is not required respectively will be ignored by the PLC.

Data sequence handshake for output data (PLC → device, e.g. TriggerData or parameters) - HS I (Info)

Step	Output data (PLC → device)			Input data (Device → PLC)		Explanation
	Data	HS Con-trol	HS Cnt	HS Con-trolAck	HS Ack	
	<>	0x00	0x00	0x00	0x00	Ausgangssituation
1	<>	**0x01**	0x00			PLC activating "HS I"
2				**0x01**	0x00	Device confirms activa-tion "HS I"
3	**<A>**	0x01	0x01			PLC transmits new data <A> and by changing HS cnt signalizes that the data is to be adopted.
				0x01	0x00	Device is process sing the new data <A>, but there is no direct change in the input data.
4	**<B>**	0x01	0x01			Optional: PLC transmits new data <B> HS Cnt not yet changed -> the data has not yet been adopted.
5	<B>	0x01	**0x02**			By changing HS Cnt, the PLC signalizes that the data are to be adopted.
				0x01	0x00	Device is processing the new data <B>, but there is no direct change in the input data.

Data sequence handshake for input data (device → PLC, Result) - HS I (Info)

Step	Output data (PLC → device)		Input data (Device → PLC)			Explanation
	HS Control	HS Ack	Data	HS ControlAck	HS Cnt	
	0x00	0x00	<>	0x00	0x00	Initial situation
1	**0x01**	0x00	<>			PLC activating "HS I"
2				**0x01**	0x00	Device confirms activation "HS I"
3			**<A>**	0x01	**0x01**	Device is transmitting new data <A> and byh the changed HS Cnt signalizes that the data are to be adopted
	0x01	0x00				PLC is processing the new data <A>, but there is no direct change in the input data.
4			**<B>**	0x01	0x01	Optional: Device is transmitting new data <B> HS Cnt not yet changed -> the data will not be adopted.
5			<B>	0x01	**0x02**	By changing HS Cnt the device signalizes that the data are to be adopted.
	0x01	0x00				PLC processes new data <B>, but there is no direct change in the input data.

9.2.1.2 Handshake with acknowledgement

The transmitter increases handshake count with every transmission of new data. Receiver returns the received handshake count to transmitter as HS-Ack. Transmitter will not transmit new data until having received the acknowledgement (with increased handshake count). This mode will reduce the amount of data transferred per time period.

General handshake routine with input data confirmation by PLC (status, result data):

1. PLC activates the handshake (outbound input data handshake activated in HS-I mode, bit 0 = 1, bit 1 = 1).
2. Sensor confirms handshake activation (inbound confirmation of activated handshake input data in HS-I mode, bit 0 = 1, bit 1 = 1).
3. Sensor will increase input data handshake count with every new data transmission and awaits acknowledgement of receipt (HS-Ack). Any further data for transmission will be held in pipeline.
4. Count up of handshake input data will make PLC recognize arrival of new data for processing. By doing so, sensor acknowledges data receipt by returning HS-Ack.
5. The acknowledged HS count (outbound HS Ack) informs the sensor that the transmitted data were received and the sensor will transmit another data.

General process flow of handshake with PLC output data acknowledgement (control, parameters, trigger data):

1. Handshake activated by PLC (outbound handshake of output data in HS-I mode, bit 0 = 1, bit 1 = 1).
2. Sensor acknowledges handshake activation (inbound handshake acknowledgement of activation for output data in HS-II mode, bit 0 = 1, bit 1 = 1).
3. With every new data transmission, the PLC increases the output data handshake count and awaits the acknowledgement of receipt(inbound HS-Ack). Any further data ready for transmission will be held in pipeline or can be deleted.
4. By the increased output data handshake count the PLC recognizes receipt of new data for processing. By doing so, the sensor acknowledges data receipt by returning the received handshake count (HS-Ack).
5. By the inbound acknowledgement (HS-Ack of output data), the PLC recognizes data receipt and would transmit another data package.

Data sequence handshake for output data (PLC → device, e.g. TriggerData or parameters) - HS II (with confirmation)

Step	Output data (PLC → device)			Input data (Device → PLC)		Explanation
	Data	HS Control	HS Cnt	HS ControlAck	HS Ack	
	<>	0x00	0x00	0x00	0x00	Initial situation
1	<>	**0x03**	0x00			SPS enables"HS II"
2				**0x03**	0x00	
3	**<A>**	0x03	**0x01**			PLC transmits new data <A> and by changing HS cnt signalizes that the data is to be adopted.
4				0x03	**0x01**	Device acknowledges receipt of the data <A> by returning the current HS Cnt (0x01) on HS Ack. Device is processing the data.
5	**<B>**	0x03	0x01			Optional: PLC transmits new data <B> HS Cnt not yet changed -> the data has not yet been adopted.
6	<B>	0x03	**0x02**			By changing HS Cnt, the PLC signalizes that the data are to be adopted.
7				0x03	**0x02**	Device acknowledges receipt of the data <A> by returning the current HS Cnt (0x02) on HS Ack. Device is processing the data.
Example HS error:						
8	**<C>**	0x03	**0x03**			PLC transmits new data <C> and by changing HS Cnt signalizes that the data are to be adopted.
				0x03	0x02	however, new data <C> is not yet confirmed by the device.
9	**<D>**	0x03	**0x04**			PLC transmits new data <D> and by changing HS Cnt signalizes that the data are to adopted without prior confirmation of the previous data <C>.

Step	Output data (PLC → device)			Input data (Device → PLC)		Explanation
10				**0x83**	0x02	Device reports Profinet handshake error.

Data sequence handshake for input data (device → PLC, result) - HS II (with confirmation)

Step	Output data (PLC → device)		Input data (Device → PLC)			Explanation
	HS Con-trol	HS Ack	Data	HS Con-trolAck	HS Cnt	
	0x00	0x00	<>	0x00	0x00	Initial situation
1	**0x03**	0x00	<>			SPS enables"HS II"
2				**0x03**	0x00	Device confirms "HS II" enabled
3			**<A>**	0x03	**0x01**	Device is transmitting new data <A> and by changing HS Cnt signalizes that the data are to be adopted.
4	0x03	**0x01**				PLC confirms receipt of the data <A> by returning the current HS Cnt value (0x01) on HS Ack. PLC is processing the data.
5			**<B>**	0x03	0x01	Optional: Device transmits new data <B> but HS Cnt not yet changed -> the data are not yet adopted.
6			<B>	0x03	**0x02**	By changing HS Cnt the device signalizes that the data are to be adopted.
7	0x03	**0x02**				PLC acknowledges receipt of the data <B> by returning the current value of HS Cnt (0x02) on HS Ack. PLC is processing the data.

9.3 EtherNet/IP™

EtherNet/IP™ is a TCP/IP- and UDP/IP-based network protocol that is widely used in automation technology. As with other protocols developed further by ODVA, it uses the Common Industrial Protocol (CIP) in the application layer.

9.3.1 EtherNet/IP™ Object classes and instances

According to the EtherNet/IP™ protocol, access to object classes and instances is supported by acyclic access (*Explicit Messaging*).

The sensor supports the following general objects:

Class	Number of instances
0x01: Identification object	1
0x02: Message router object	1
0x04: Assembly object	6
0x06: Connection manager object	1
0xF4: Port object	2
0xF5: TCP/IP interface object	1
0xF6 EtherNet link object	2

User data are assigned as follows:

Instance	Type	Contents	Size (byte)
100	Output (O -> T)	Data from PLC to sensor	396
101	Input (T -> O)	Data from sensor to PLC	274
102	Input (T -> O)	Data from sensor to PLC	270

O = Originator (PLC) / T = Target (device)

All these objects can be acyclically accessed. Generally, cyclical connections (*Explicit Messaging*) is recommended.

Connections

The sensor supports the following Ethernet/IP-Connections.

Number	Name	Type	Output (O → T)	Input (T → O)
1	Input only	Input only	-	Assembly 102 (270 Byte)
2	Input-Output	Exclusive Owner	Assembly 100 (396 Byte)	Assembly 101 (274 Byte)

9.3.2 Data element mapping to the assembly instances

The following tables describe data element mapping to assembly instances.

Output data (PLC -→ sensor) / originator (O) to target (T), assembly instance 100

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control-Word	pad (0)							Trigger
1		pad (0)							
2	SelectJob	Selection of active job number							
3									
4	Trigger-DataLength	Actual length of user data in TriggerData							
5									
6 ... 261	Trigger-Data	Trigger Data							
262	Parameter-Length	Actual length of user data in Parameter							
263									
264 ... 1287	Parameter	Parameter Data							
1288	Handshake for input data - Control	pad (0)						HS mode selection (0 - info, 1 - confirmation)	HS Activation
1289	Handshake for input data - HSAck	Confirmation HS Counter							
1290	Handshake for output data - Control	pad (0)						HS mode selection (0 - info, 1 - confirmation)	HS Activation
1291	Handshake for output data - HSCnt	HS Counter							

Input data (sensor -→ PLC) / target (T) to the originator (O), assembly instance 101

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status-Word	pad (0)				Setup	pad (0)	Busy	TrgRdy
1		pad (0)							
2	ActiveJob	active job number							
3									
4	Tempera-ture	Temperature info							
5									
6	Alarm	FTP er-ror	Temper-ature er-ror	Temper-ature warning	Error fo-cus module	Error Set-Param	Error job selec-tion	Job Timeout	Invalid trigger
7		PN HS Error	PN Pipeline Over-flow	PN Pipeline Over-flow	pad (0)				
8	Result	pad (0)						Fail	Pass
9		pad (0)							
10	Result-ID	Unambiguous "Result-ID" assigned to Result, will increase by 1 with every new result, handled at 0xFFFF							
11									
12	Re-sultLength	Actual length of user data in Result							
13									
14 ... 141	Result	Result Data							
142	Handshake for input data - Con-trolAck	HS error alarm	Alarm Pipeline Over-flow	pad (0)				HS mode (0 - info, 1 - confir-mation)	HS Ac-tive
143	Handshake for input data - HSCnt	HS Counter							
144	Handshake for output data - Con-trolAck	pad (0)						HS mode (0 - info, 1 - confir-mation)	HS Ac-tive
145	Handshake for output data - HSAck	Confirmation HS Counter							

Input data (sensor -→ PLC) / target (T) to the originator (O), assembly instance 102

Byte	Data element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Status-Word	pad (0)				Setup	pad (0)	Busy	TrgRdy
1		pad (0)							
2	ActiveJob	active job number							
3									
4	Tempera-ture	Temperature info							
5									
6	Alarm	FTP er-ror	Temper-ature er-ror	Temper-ature warning	Error fo-cus module	Error Set-Param	Error job selec-tion	Job Timeout	invalid trigger
7		PN HS Error	PN Pipeline Over-flow	PN Pipeline Over-flow	pad (0)				
8	Result	pad (0)						Fail	Pass
9		pad (0)							
10	Result-ID	Unambiguous "Result-ID" assigned to Result, will increase by 1 with every new result, handled at 0xFFFF							
11									
12	Re-sultLength	Actual length of user data in Result							
13									
14 ... 141	Result	Result Data							

9.4 TCP

Device integration here is via Ethernet connection and the preset *port 50000*. For doing so, connect the device to your system and complete parameterization, particularly configuration of the IP address.

See chapter: *Device configuration mode [▶ 66]*

Once device connection via the preset port has been established, data can be retrieved or commands can be transmitted. For doing so you may use ***Data Telegram***. They comprise a 2 byte command followed by the parameters.

INFO

For data telegram configuration, first some of the features to be controlled/retrieved (e.g. expected code value or read code) must be created via the web interface. Image acquisition parameters (e.g. the exposure time) are immediately available for data telegram configuration.

Communication: Data telegram [▶ 61]

Data telegrams must end with one of the following control characters:

- `<CR>` (Hex: `0D`, escape sequence: `\r`)
- `<LF>` (Hex: `0A`, escape sequence: `\n`)
- `<CR><LF>` (Hex: `0D 0A`, escape sequence: `\r\n`)

9.4.1 Command "CS - Clear Statistics"

Sensor statistics reset (result counter, history of reading cycles, reading speed, quality).

Example

PLC → Sensor (command)	
Command	**Parameter**
CS (**C**lear **S**tatistics)	None

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None

9.4.2 Command "GD - Get Data"

In established TCP communication, the sensor will transmit an RD telegram after every image acquired. Command *GD* is to retrieve RD telegrams independently of the image acquisition.

Device behavior at command *GD* can be set via ***Device Configuration*** - ***Process Interface*** - **Output data telegram**. (**Continuous (default):** A data telegram is sent with every trigger and/ or GD command. **After GD command:** The sensor will only send an RD telegram after a GD command)

INFO

The content of the response (RD) is defined at ***Communication Parametrization*** - (***Data Output***).

Example

PLC → Sensor (command)	
Command	**Parameter**
GD (**G**et **D**ata)	none

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
RD (**R**esponse **D**ata)	`RD5901234123457,4013743004201` <read code>,<expected code>

9.4.3 Command "GJ - Get Job"

Download configured job from the sensor.

Example

PLC → Sensor (command)	
Command	**Parameter**
GJ (**G**et **J**ob)	<JobID> Job selection with index (1-32) ASCII-Hex

Sensor → PLC (response)	
BD (**B**inary **D**ata)	<length>,<data of the job>
ERR (**ERR**or)	GetJob,Invalid job index or not allowed <ErrorCategory>, <ErrorDescription>

9.4.4 Command "GS - Get State"

Sensor returns status information.

Example

PLC → Sensor (command)	
Command	**Parameter**
GS (**G**et **S**tate)	none

Sensor → PLC (response)	
RS (**R**esponse **S**tate)	**Arrangement** <OperatingMode>,<CurrentJob>,<Power up Job>, <Trigger-Ready>,<Temperature>,<Alarm> **Explanation** <OperationMode>: RUN = Image processing / SETUP = Parameterization <CurrentJob>: 1- 32 (ASCII-Hex) <Power up Job>: 1- 32 (ASCII-Hex) <TriggerReady>: 0 = no / 1 = yes <Temperature>: current temperature (ASCII-Hex) <Alarm>: see table below **Example** `RSRUN,7,7,1,29,PifAlarm`

Alarms

Alarm	Description
TemperatureWarn	Device temperature warning threshold is reached.
TemperatureErr	Reading error device temperature.
InvalidTrigger	Invalid trigger identified.
JobTimeout	Maximum processing time for job is exceeded.
FokusErr	Focus error.
JobSelErr	Job selection error.
PifNoConn	Process interface error: No connection. A previously established process interface connection has been closed.
SetParamErr	Parameterization error. Parameterization error identified in the data received. Data interpretation according to the defined input data telegram not feasible. Parameter modification missing or incomplete.
PifProtErr	Process interface error: protocol error. Data received via process interface not compliant to protocol definition.
PifRecvTimeout	Process interface error: Receive timeout. When receiving related data via process interface, the set maximum pause time has been exceeded.
PifAliveTimeout	Process interface error: Monitoring timeout. When receiving independent data via process interface, the set maximum pause time has been exceeded.
PifPipeOV	Process interface error: Queue overflow. Queuing the data to be transmitted or received not possible since internal queue is full. This data has been lost. Typical root cause: data transmission secured by handshake, often means that the receiving control unit (PLC) does not transmit acknowledgements of receipt fast enough (or not at all) or the transmitting control unit (PLC) transmits data faster than it can be processed by the receiving device.
PifBufOV	Process interface error: Buffer overflow. Data to be transmitted cannot be fully written into the intended data area. Data has been shortened to the available size.
PifHSErr	Process interface error: Handshake error. Error in handshake operation. Typical root cause: Receiving unit has acknowledged receipt without prior request or the transmitting unit has transmitted new data though receipt of the previous data has not yet been acknowledged.
FtpConErr	FTP server connection error.
FtpLogErr	FTP server logon error (e.g. incorrect user data).
FtpWrErr	Writing error at FTP server.
FtpImgDrpTrf	Error in image saving to FTP server. Images to be saved are deleted. A possible cause may be trigger too fast or FTP server connection too slow.

9.4.5 Command "Help"

Sensor returns all available commands.

PLC → Sensor (command)	
HELP	

9.4.6 Command "RS - Reading Signal"

Enable/ disable read signal for image acquisition.

INFO

The RS command becomes effective in trigger modes ***Free running*** and ***Interval*** if ***Reading signal required*** enabled.

Example

PLC → Sensor (command)	
Command	**Parameter**
RS (**R**eading **S**ignal)	`0` = disable read signal `1` = enable read signal, image acquisition is only triggered if digital inputs are active.

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
ERR (**ERR**or)	ReadingTrigger,Reading signal enable failed ReadingTrigger,Reading signal disable failed <ErrorCategory>, <ErrorDescription>

9.4.7 Command "SJ - Switch Job"

Switch to a job previously created on the sensor.

INFO

To execute this command the sensor must be in *RUN* mode.

Example

PLC → Sensor (command)	
Command	**Parameter**
SJ (**S**witch **J**ob)	Job change with given index (1-32) ASCII-Hex

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
ERR (**ERR**or)	SwitchJob,Invalid job index or not allowed <ErrorCategory>, <ErrorDescription>

9.4.8 Command "SM - Switch Mode"

Switches the current sensor operating mode to another one.

Example

PLC → Sensor (command)	
Command	**Parameter**
SM (**S**witch **M**ode)	`RUN =` Monitoring mode `SETUP =` Parameterization mode

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
ERR (**ERR**or)	SwitchMode,Invalid mode = wrong mode selected SwitchMode,Not allowed for current user = Password protection enabled <ErrorCategory>, <ErrorDescription>

9.4.9 Command "SP - Set Parameters"

Setting the expected values for measurement tasks and image acquisition parameters on the sensor.

Mode Parameterization Tools [▶ 37]

INFO

To execute this command the sensor must be in *RUN* mode.

Example

PLC → Sensor (command)	
Command	**Parameter**
SP (**S**et **P**arameters)	`SP4444,Free Running` <exposure time>,<trigger mode>

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
ERR (**ERR**or)	SetParameter,Invalid data or not allowed = Data invalid <ErrorCategory>, <ErrorDescription>

9.4.10 Command "TR - Trigger"

Activation of software trigger with optional trigger data.

INFO

The content of the response (RD) is defined at ***Communication Parametrization*** - (***Data Output***).

Example

PLC → Sensor (command)	
Command	**Parameter**
TR (**TR**igger Image)	<additional data only if configured>

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
RD (**R**esponse **D**ata)	`RD5901234123457,4013743004201` <read code>,<expected code>

9.4.11 Command "UJ - Upload Job"

Transfer job to the sensor.

INFO

To execute this command the sensor must be in *RUN* mode.

Example

PLC → Sensor (command)	
Command	**Parameter**
UJ (**U**pload **J**ob)	<JobID> Job selection with index (1-32) ASCII-Hex <Size> Job size <Data> Job data

Sensor → PLC (response)	
ACK (**ACK**nowledge)	None
ERR (**ERR**or)	UploadJob,Invalid data = no valid job file UploadJob,Invalid mode = Sensor not in mode *RUN* UploadJob,Invalid job index or not allowed = invalid job index or device is currently busy <ErrorCategory>, <ErrorDescription>

9.5 USB-HID

The device will act as keyboard. The configured ***Data Telegram*** (without RD header) is output via the USB interface for evaluation by a connected system using its active software, similar to keyboard input.

Device configuration mode [▶ 66]

10 Maintenance

The sensor is maintenance-free. No special preventive maintenance is required. Regular cleaning and visual inspection of the plug connections are recommended.

10.1 Cleaning the sensor

External cleaning

When cleaning the exterior of the sensor, make sure to use cleaning agents that do not affect the housing surface and seals.

NOTICE

Material damage due to improper cleaning.

Unsuitable cleaning agents and methods can cause leaks and damage the sensor, the seals or the connections.

a) Always check the suitability of the cleaning agent for the surface to be cleaned.

b) Use alcohol-based cleaning agents but never any scouring agents, solvents or other aggressive cleaning agents.

c) Never use a high-pressure cleaner for cleaning.

d) Do not scrape off soiling with sharp-edged items.

e) Only use lens cleaning cloths for the front pane of the sensor.

Interior cleaning

No interior cleaning of the sensor is required.

11 Troubleshooting

11.1 Return and repair

In case of complaints, please contact the relevant sales company.

11.2 Support

In case of any questions please contact our Technical & Application Support Center.

Worldwide

Tel.: +49 (0)3528 4386 845

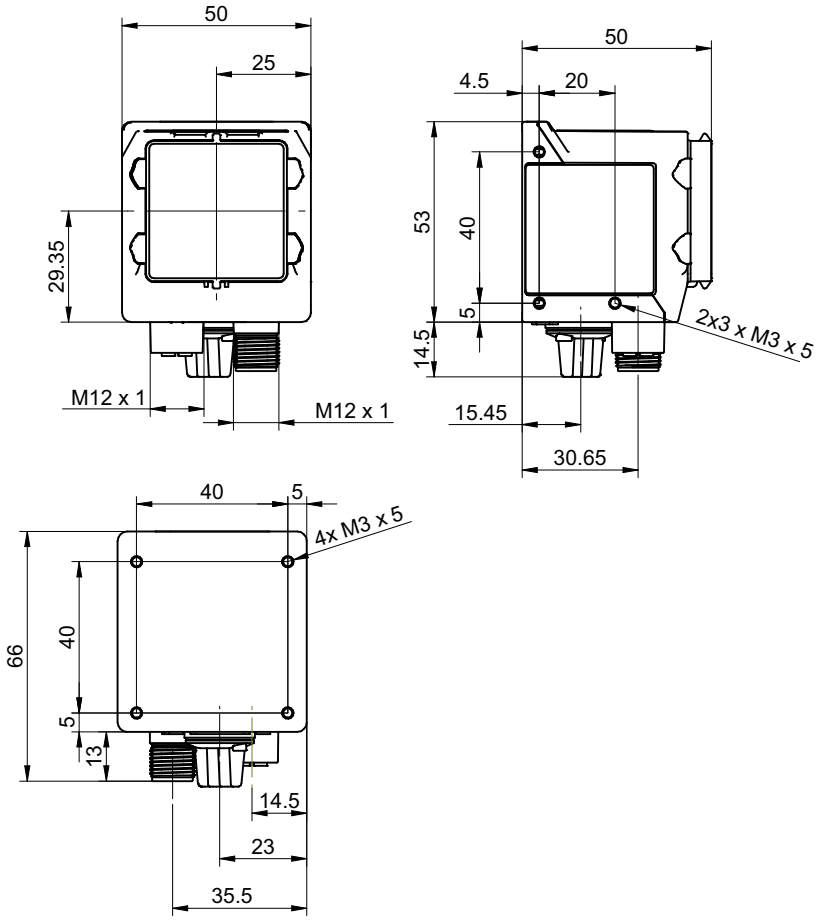
www.baumer.com

support.codereader@baumer.com

12 Technical data

The technical data for your sensor can be found in the data sheet available for download at www.baumer.com.

12.1 Dimensional drawing



Ill. 10: Dimensional drawing - IDC

12.2 Overview of measuring tools

Measuring tool	IDC200	IDC230
Object localization		
Contour search	●	●
Tool		
Bar code	●	●
Matrix code	●	●
Text	-	●
Auxiliary tool		
Value Check	●	●
Quality Check	●	●
Length check	●	●

List of illustrations

63050394985032715

Baumer
Passion for Sensors

Baumer Electric AG
Hummelstrasse 17
CH − 8501 Frauenfeld
www.baumer.com