ifm electronic

CE

Operating instructions
Multicode Reader

efector190®

O2I10x
O2I30x

Content

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1 Preliminary note

1.1 Symbols used

►   Instructions

>   Reaction, result

[…]   Designation of keys, buttons or indications

→   Cross-reference

> ⚠ Important note
> Non-compliance may result in malfunction or interference.

> ⓘ Information
> Supplementary note

1.2 Warning signs used

> **⚠ WARNING**
>
> Warning of serious personal injury.
> Death or serious irreversible injuries may result.

> **⚠ CAUTION**
>
> Warning of personal injury.
> Slight reversible injuries may result.

> **NOTE**
>
> Warning of damage to property.

2 Safety instructions

These instructions are part of the device. They contain texts and figures concerning the correct handling of the device and must be read before installation or use.

Observe the operating instructions.

Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can affect the safety of operators and machinery.

The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.

Only the signals indicated in the technical data or on the device label may be supplied to the connections or wires.

> **⚠ WARNING**
>
> Visible laser light; laser protection class 2.
>
> Use of controls or adjustments other than those specified herein may result in hazardous radiation exposure. Damage to the retina is possible.
>
> ► Do not stare into the laser beam!
> ► Apply the enclosed labels (laser warning) in the immediate vicinity of the unit.
> ► Adhere to the caution and warning notes on the product label.
> ► Use the enclosed label for the power supply cable.

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Label for power supply cable

ATTACH TO CABLE **WARNING:**
CLASS 2 LASER PRODUCT
DO NOT STARE INTO BEAM
– AVOID EXPOSURE
– UNPLUG CONNECTOR TO
EXTINGUISH LASER BEAM
ifm electronic gmbh   D-45128 ESSEN
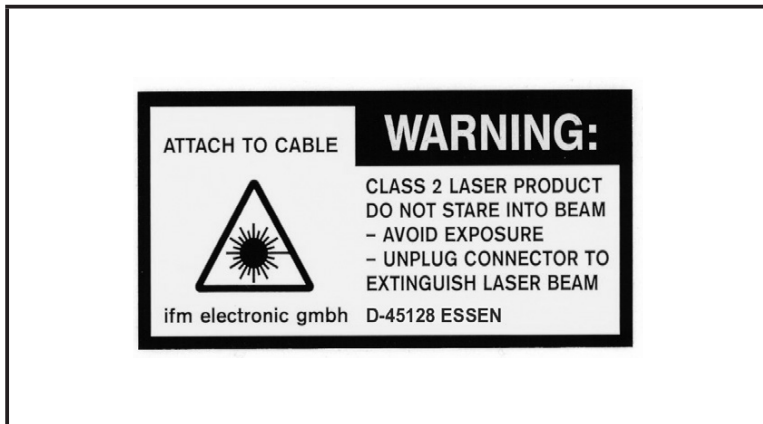
Laser warning

Product label

CAUTION
LASER LIGHT
DO NOT STARE INTO
BEAM
CLASS 2 LASER
PRODUCT
max POWER 4.1 mW
WAVELENGTH 650 nm
PULSE 1.3 ns
21 CFR PART 1040
EN60825-1:2003-10

AVOID EXPOSURE
LASER LIGHT EMITTED
FROM THIS APERTURE
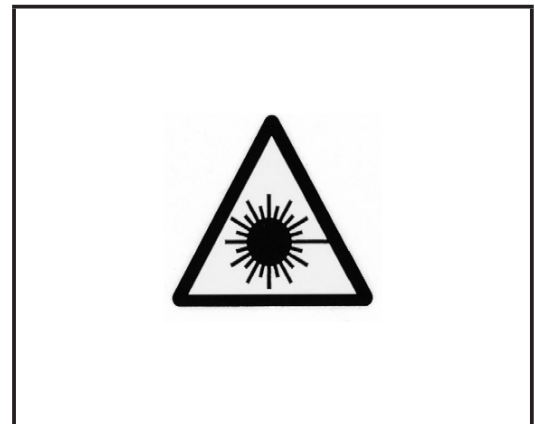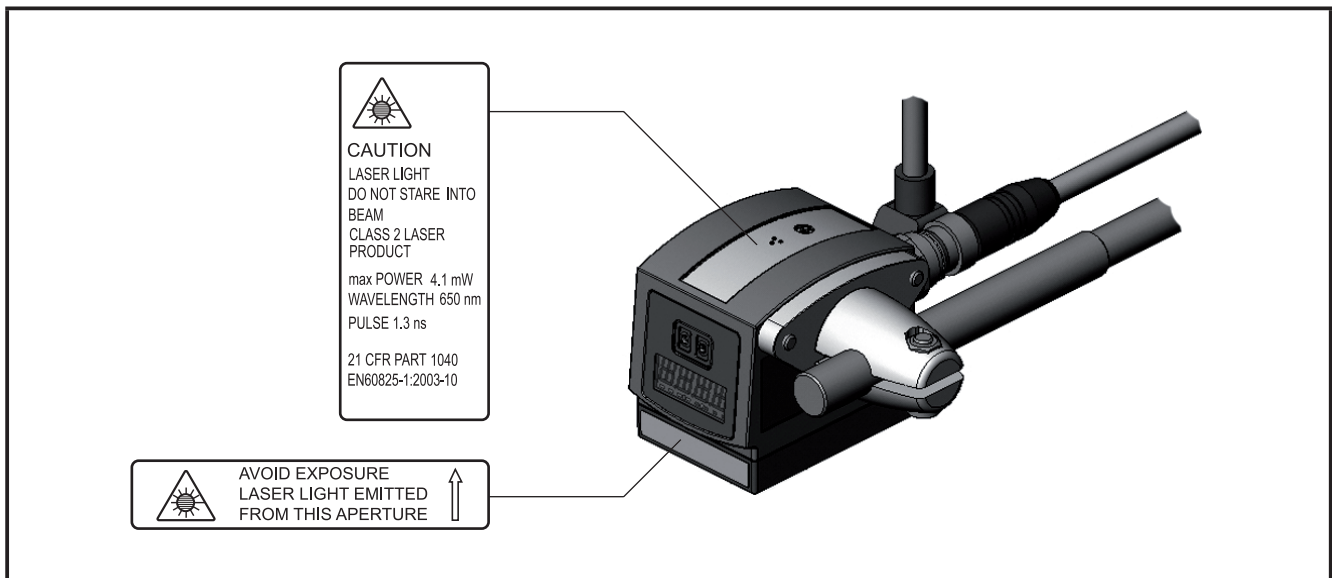
3 Items supplied

1 Multicode Reader O2I
The device is supplied without installation/connection accessories and software.

3.1 Accessories

www.ifm.com → Data sheet search → e.g. O2I102 → Accessories

3.2 Software

www.ifm.com → Service → Download → Identification systems

4 Functions and features

The device decodes labelled and directly marked 2D codes and 1D bar codes.

4.1 Features at a glance

- Integrated, configurable code evaluation
- Process interfaces RS-232, Ethernet TCP/IP and EtherNet/IP
- Parameter setting interface Ethernet TCP/IP and UDP/IP
- Internal illumination red light (625 nm) or infrared (850 nm)
- Internal or external triggering

The O2I3xx series devices also support the following functions:

- Reading of additional code types
- External selection of the switching outputs via the process initerface, adjustable via PC operating program

Detailed information → 11 Technical data

5 Installation

5.1 Mounting accessories

The device is compatible with the mounting accessories for the photoelectric sensors O2Dxxx (object recognition), O2Mxxx (EthernetCamera) etc. from ifm.

Example mounting with clamp and bracket:

Depending on the intended installation location and type of mounting the following mounting accessories are available:

Description	Art. no.
Mounting set for shaft Ø 12 mm (clamp and bracket for types O2Dxxx, O2Mxxx, O2Ixxx)	E2D110
Shaft, straight Ø 12 mm, length 130 mm, M10	E20938
Shaft, angled Ø 12 mm, length 200 mm, M10	E20940
Mounting set for shaft Ø 14 mm (clamp and bracket for types O2Dxxx, O2Mxxx, O2Ixxx)	E2D112
Shaft, straight Ø 14 mm, length 130 mm, M12	E20939
Shaft, angled Ø 14 mm, length 200 mm, M12	E20941

You can find more information about the available accessories at www.ifm.com

5.2 Mounting dimensions

The device is mounted using 2 M4 screws and nuts.
Hole dimensions → 10 Scale drawing.

5.3 Installation location

> **NOTE**
>
> High-energy lasers (class 3 and above) could destroy the image sensor if they impinge on the lens.
>
> ► Do not position the unit in the immediate vicinity of high-energy lasers (e.g. laser labelling systems)
>
> ► Use a laser screen or filter if the lens of the unit cannot be protected from high-energy lasers.
> You can find more information about the available accessories at www.ifm.com

► Mount the device in front of or above the area to be monitored.
The detectable field of view size depends on the operating distance → 11 Technical Data.

► Avoid back light or scattered light situations and continuously changing light conditions.

► Do not position illumination elements directly facing the device lens.

► To avoid adverse effects on the image capturing, avoid installation in heavily polluting areas of the machine.

► Provide the connected cables with a strain relief.

6 Electrical connection

> **NOTE**
>
> The unit must be connected by a qualified electrician.
>
> ► Disconnect power before connecting the unit.

> **NOTE**
>
> The voltage on pins 2, 4, 5, 6, 7 and 8 must not exceed the supply voltage on pin 1 (U+).
>
> ► Use the same power supply and protective equipment for
>
>   • the device (e.g. O2Dxxx),
>   • the signal generator at the inputs (e.g. trigger switch, plc),
>   • the signal pick-up at the outputs (e.g. plc).
>
> As an alternative, a diode at the switching outputs can prevent feedback (see fig. below).
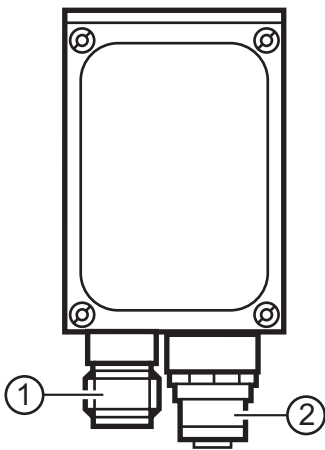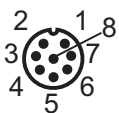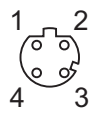
1	unit
2	switching output
3	diode
4	plc
5	common load

6.1 Wiring

Process interface (1)	
M12 connector, A-coded, 8 poles	
	1 U+ 2 Trigger input, positive switching 3 0 V 4 Trigger output/switching output 1, positive switching (code evaluation) 5 RxD RS-232 6 TxD RS-232 7 switching output 2 (ready), positive switching 8 GND RS-232 (electrically isolated up to 50 V)
Parameter setting/process interface (2)	
M12 socket, D-coded, 4 poles	
	1 Ethernet TxD + 2 Ethernet RxD + 3 Ethernet TxD - 4 Ethernet RxD -

You can find information about available sockets/connectors at:
www.ifm.com → Product line → Accessories

6.2 External illumination

► Connect an external illumination unit to the trigger output of the device.

Example	Art. no.
Illumination unit, transmitter red light 630 nm	O2D909

6.3 External trigger source

► Connect an external trigger source (e.g. a diffuse reflection sensor) to the trigger input of the device.

You can find information about available articles at:
www.ifm.com → Product line

6.3.1 Timing diagram
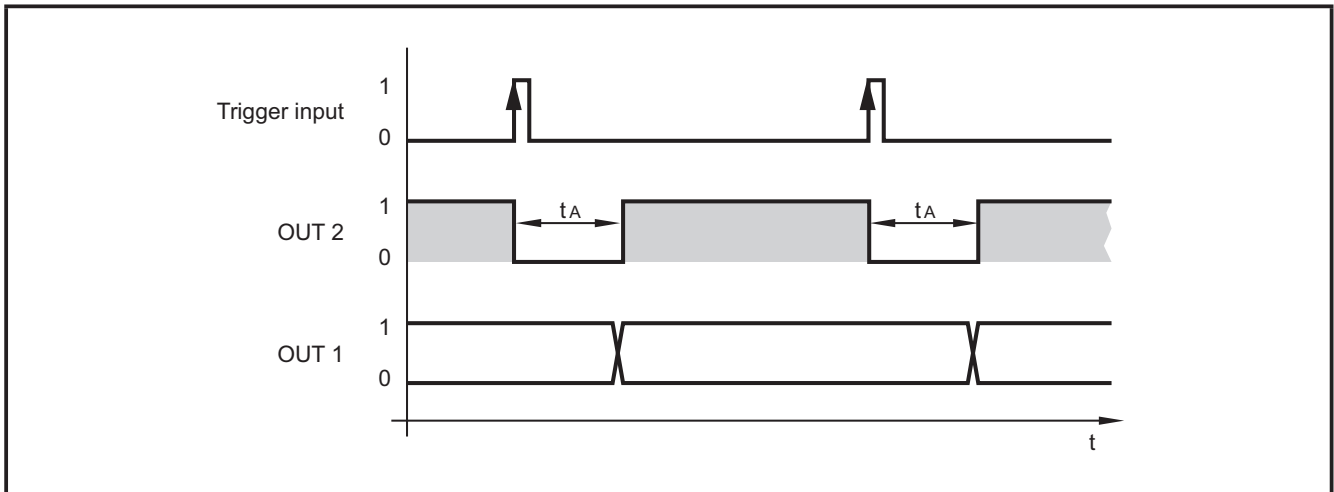
Example: triggering positive edge

		Default	External illumination	Via process interface
OUT2	Switching output 2	Ready signal 0: Device busy 1: Device ready for trigger signal	Ready signal 0: Device busy 1: Device ready for trigger signal	Selectable via command
OUT1	Switching output 1	Code evaluation 0: Code evaluation not successful 1: Code evaluation successful	Trigger output	

Evaluation times t_A: 50...200 ms
The times depend for example on the image preprocessing time.

6.4 Process interface RS-232 (factory setting)

Bits per second: 9,600 bit/s
Data bits: 8
Parity: none
Stop bits: 1
Flow control: none

6.5 Process interface TCP/IP, EtherNet/IP

RS-232, TCP/IP or EtherNet/IP can be selected in the PC operating program at "Global settings" → Programming manual E2I200.

Pushbutton-controlled selection is not possible.

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7 Operating and display elements

7.1 View of the unit
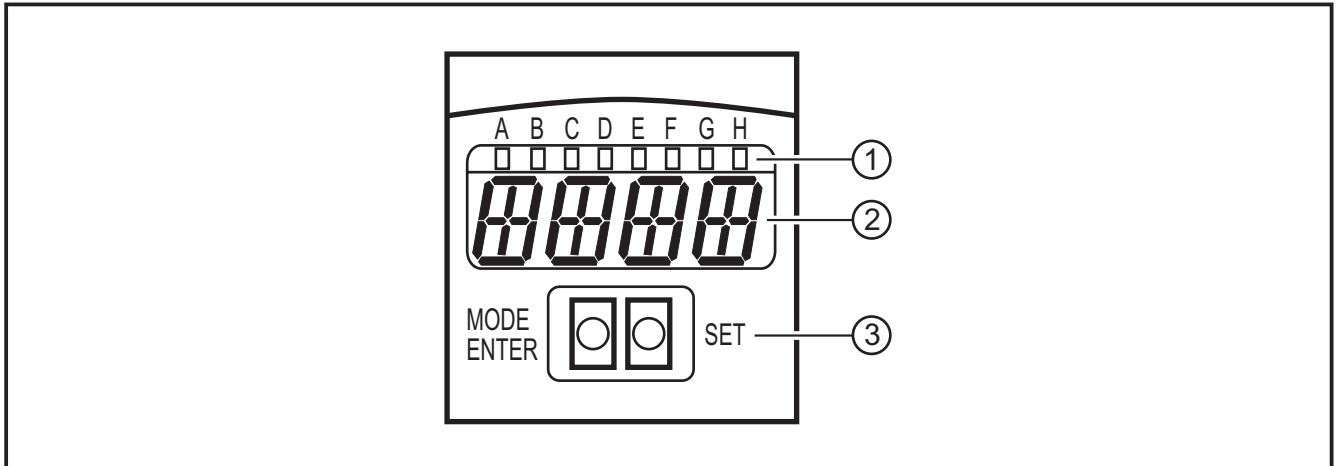
1. LEDs (function display)
2. Display (operation indication/dialogue/parameters)
3. Pushbuttons (parameter setting)

7.2 LEDs

LED	Name	Colour	Status	Description
A	power	green	on	supply voltage applied device ready for operation
			flashing (2 Hz)	no configuration saved in the device (factory setting)
			flashing (20 Hz)	device fault
B	Eth	green	on	Ethernet connection exists
			flashing	Ethernet signal
C	Con	green	on	connected with PC operating program
D	–	–	–	not used
R	TxD	yellow	off / flashing	RS-232 TxD status
F	RxD	yellow	off / flashing	RS-232 RxD status
G	1	yellow	on	switching output 1 switched code evaluation successful
			flashing (20 Hz)	short circuit switching output 1
H	2	yellow	on	switching output 2 switched (ready signal) device ready for next trigger signal
			flashing (20 Hz)	short circuit switching output 2

7.3 Display

7.3.1 Operation indication

Display	Description
ui05	Version number of the IO controller software (1st indication after power on)
Init	Device initialisation (2nd indication after power on)
nnnn	Firmware version (3rd indication after power on)
rEdY	Device ready for trigger (4th indication after power-on if one configuration is active with external triggering. Device waiting for triggering.)
WAIT	No active/valid configuration available Unit is busy (4th indication after power on if no configuration is active or valid = on delivery)
nr28	Configuration number after successful code evaluation
SCAn	Indication with internal triggering as long as no code has been found
run	Device is waiting for connection, no active configuration or group
LOAd	Loading a new configuration
donE	Loading a new configuration terminated (indication 1 s)
uLoc	Pushbuttons unlocked Parameter values can be displayed and changed
Lok1	Pushbuttons locked Parameter values cannot be displayed and changed
Lok2	Pushbuttons locked Parameter values can be displayed but not changed
FWUP	Firmware update running

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7.3.2 Connection via the operating program

Display	Description
OnLI	Configuration mode
Parm	Create or modify a configuration
Moni	Monitor mode
SerP	Service mode

7.3.3 Error messages

Display	Description
FAIL	Last code evaluation not successful

Display	Description
ErrT	Temperature of the device too high or too low
ErrD	Fatal device error
SC	Short circuit of a switching output
DHCP noIP	No DHCP server found. Both character strings are displayed alternately.

Parameter designations → 8.2.2 Parameter structure

7.4 Pushbuttons

Pushbutton	Function
MODE/ENTER	Change to the parameter setting mode Selection of the parameters Confirmation of the parameter values
SET	Selection of the subparameters Setting/change/selection of the parameter values - incremental by pressing briefly - scrolling by holding pressed

8 Set-up

Depending on the application and code quality, the device is set up via a pushbutton-controlled parameter setting or via a menu-guided PC operating program.

The device stores up to 32 configurations (= parameter sets).
A configuration consists, for example, of the type of image preprocessing, the exposure time or the format of the process data.

The settings of the process interface (baud rate, parity ...) cover all configurations.

8.1 Overview of the parameter setting options

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With pushbutton-controlled parameter setting the partly predefined default values are used (→ 8.2.3 Parameter description → tCod).

Parameter setting	Pushbutton-controlled without PC operating program	With PC operating program
Create configurations	●	●
Administer, name configurations	–	●
Group configurations	–	●
Switch laser marking on/off	●	●
Rotate/switch off display	●	–
Focussing	manual	manual
Image preprocessing	predefined	●
Code recognition	predefined	●
Process data	predefined	●
Trigger mode	predefined	●
Network settings	●	●
Select process interface RS-232, TCP/IP, EtherNet/IP	–	●
Querying firmware	●	●
Reset the device to factory setting	●	–

● = adjustable / – = not adjustable

8.2 Parameter setting without PC operating program

The device parameters are set using the 2 buttons [MODE/ENTER] and [SET].

Basic principle:
1. Activate a parameter with [MODE/ENTER].
2. Display/set/select the parameter value with [SET].
3. Confirm the value with [MODE/ENTER].

8.2.1 Parameter structure

START

[MODE/ENTER]

CON ── [SET] ──────────────────────→ select/activate configuration

[MODE/ENTER]

FOCU ── [SET] ──────────────────────→ adjust focus

[MODE/ENTER]

tCod ── [SET] ──────────────────────→ teach code try all possibilities

[MODE/ENTER]

EF ── [SET] ──→ **diS** ── [SET] ──────→ display mode

[MODE/ENTER]   [MODE/ENTER]

back to RUN MODE   **LAS** ── [SET] ──────→ laser mode off/on

                    [MODE/ENTER]

                    nET ── [SET] ──→ **dHCP** ── [SET] → DHCP off/on

                    [MODE/ENTER]   [MODE/ENTER]

                                        IP ── [SET] → IP address

                                        [MODE/ENTER]

                                        nETm ── [SET] → net mask

                                        [MODE/ENTER]

                                        GWIP ── [SET] → gateway address

                                        [MODE/ENTER]

                                        back to "nET"

MODE ENTER ● | ● SET

START

                    FW ── [SET] ──────→ firmware

                    [MODE/ENTER]

                    rES ── [SET] ──────→ reset

                    [MODE/ENTER]

                    back to "EF"

8.2.2 Parameter setting

1. Change to the parameter mode and activate parameters:

► Press [MODE/ENTER] 1 x.
> The first parameter (CON) is displayed.

► If necessary, press [MODE/ENTER] again until the requested parameter is displayed (CON, FOCU, tCod, EF).

► If necessary, activate subparameters with [SET] (e.g. EF → diS)

2. Display/set/select the parameter value

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► Press [SET].
> The current value or the current setting of the parameter is displayed.

► Press [SET] again and keep pressed.
> Display starts flashing (approx. 5 s).
> Display stops flashing.

► Release [SET].

► Set/select the value with [SET] by pressing the button once or continuously by keeping the button pressed.
Preset selection values are continuously passed through when the button is kept pressed (e.g.: off, on, off, on, etc.).

3. Confirm parameter value

► Confirm the displayed setting/selection with [MODE/ENTER].
> Display changes to the output parameter.

If no button is pressed for 15 s, the device returns automatically to the respective output parameter (e.g. IP → nET → EF → evaluation mode). Settings that were not confirmed with [MODE/ENTER] are rejected.

8.2.3 Parameter description

Parameter			Description	Adjustable values Factory setting (x)
CON			Configuration Creating/activating a configuration Numeric filing (0.01...0.32) n.nn group number (1...8) n.nn configuration number (1...32)	0.01F...0.32F

Parameter			Description	Adjustable values Factory setting (x)
			Abbreviations: F: memory location free I : memory location used by an inactive application A: memory location used by the active application e.g. 0.14A = configuration 14, not assigned to any group, active	
FOCU			Focussing	—
			Manual setting of the lens via focal setter on the back of the device. The optimum definition is obtained once the max. possible value is displayed. Note: The value displayed does not relate to the actual operating distance. It is merely an internal operand.	
tCod			Teach code	
	TEACH		Start the teach process	
			The configuration via teaching is made using predefined default values: ● Trigger mode: once, positive edge ● No image preprocessing with filters ● Code representation black on white, not mirrored ● Only one code is read in the image ● Internal illumination, all segments lit ● Sensor characteristics linear ● Exposure time is determined automatically ● Trigger output for illumination control ● Code search zone is full screen	
			Indications/response (approx. 1 s): 1 = teach process successful (automatic changeover to parameter EF) 0 = teach process not successful (automatic return to parameter tCod)	
EF			Extended functions	
	diS		Display mode Rotate display by 180° or switch off in evaluation mode.	norm, USd, off
	LAS		Laser marking (laser pointer) The laser marking serves as alignment aid and is parallel to the optical axis. It is located approx. 2 cm above the middle of the field of view.	off, on

Parameter			Description	Adjustable values Factory setting (x)
	nET		Network Parameters for network operation (DHCP, IP, nETm and GWIP). These parameters are intended for set-up using the PC operating program or for use in another network.	
		DHCP	Dynamic Host Configuration Protocol Ensures dynamic assignment of an IP address using a DHCP server. If set to "on" the device must be operated in a network with DHCP server. Otherwise it cannot be accessed via the PC operating program E2I200. If set to "off", the fixed network settings (→ IP, nETm, GWIP) are used.	<u>off</u>, on
		IP	IP address Is used when the device does not operate in the DHCP mode. The input is made in the "dotted decimal notation", e.g. 192.168.000.079. The respective group is visualised by a letter in the first position of the display (A, B, C, D). After parameter selection the 4 groups are automatically displayed consecutively or can be activated and set with [SET].	Annn. Bnnn. Cnnn. Dnnn <u>192.168.000.079</u>
		nETm	Subnet mask Is used when the device does not operate in the DHCP mode. The subnet mask must match the IP address. It is input in the same way as the IP address.	Annn. Bnnn. Cnnn. Dnnn <u>255.255.255.000</u>
		GWIP	Gateway address Is used when the device does not operate in the DHCP mode. It is input in the same way as the IP address.	Annn. Bnnn. Cnnn. Dnnn <u>192.168.000.201</u>
	FW		Firmware Query of the installed firmware version.	
	rES		Reset Reset the device to factory setting (display mode, laser marking etc.). Note: Stored configurations remain unchanged.	

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8.2.4 Lock/unlock pushbuttons

► Press [MODE/ENTER] and [SET] simultaneously > 10 s.

> The current setting is displayed (e.g. uLoc = pushbuttons unlocked).
(→ 7.3.1 Operation indication)

► Select the requested setting with [SET].

► Confirm setting with [MODE/ENTER].

> Setting is saved.

> Unit returns to the evaluation mode.

8.2.5 Reset device to factory settings

► Activate the parameter "rES".

► Press [SET] > 5 s.

8.3 Parameter setting via PC operating program

The PC operating program is described in a separate document
→ Programming manual E2I200.

The programming manual can be found at www.ifm.com

9 Operation

9.1 Code evaluation

After power on the unit is automatically in the evaluation mode. If an active configuration is stored on the device, it will perform the configured functions and create output signals according to the set parameters.

The display indicates the current evaluation result, the yellow LEDs signal the switching status of the outputs.
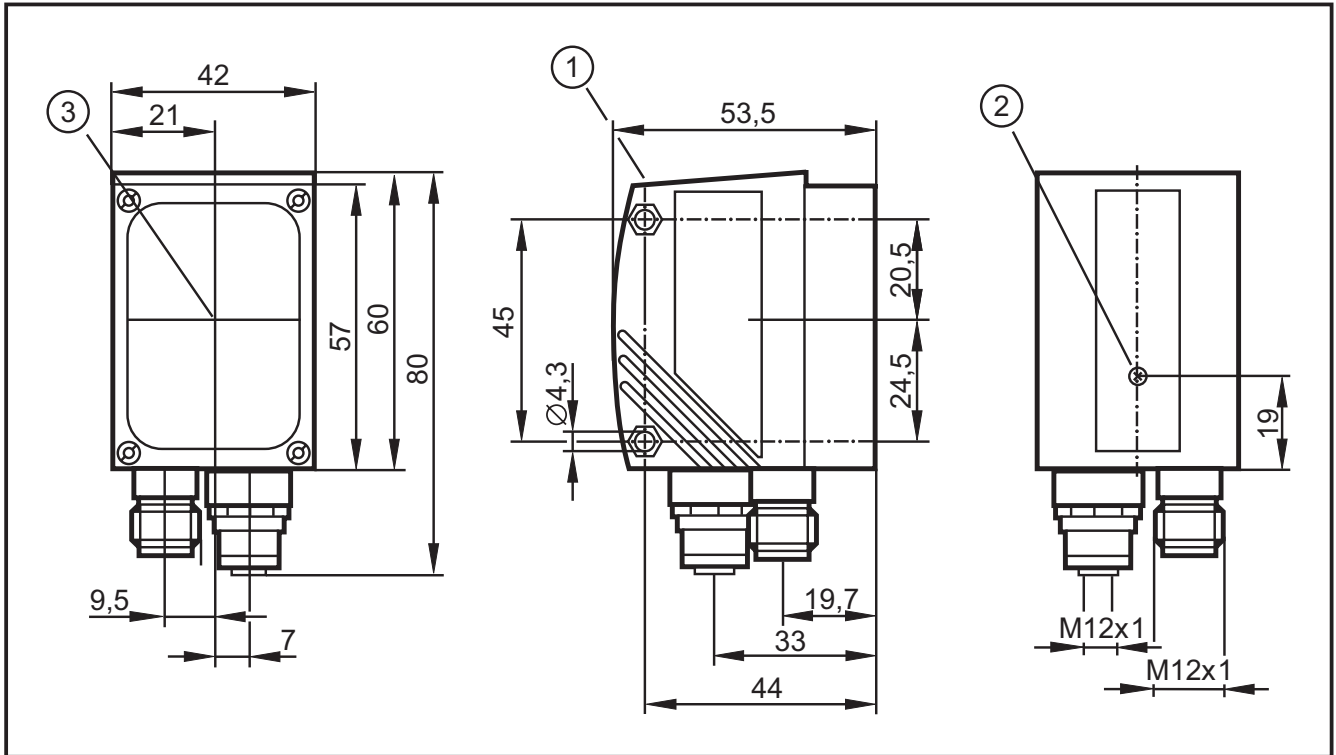
9.2 Process data protocol

The process data protocol is part of the programming manual E2I200.
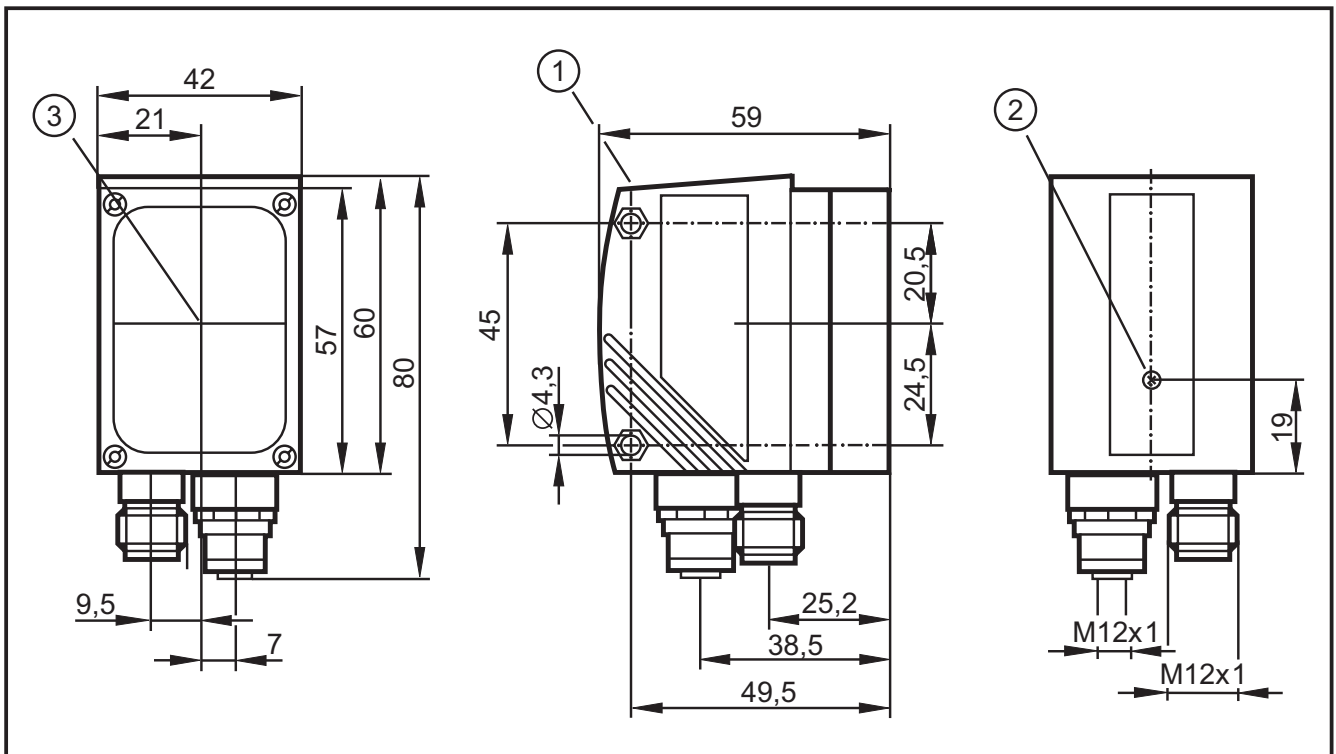
The programming manual can be found at www.ifm.com

10 Scale drawing

10.1 O2Ix00, O2Ix01, O2Ix02; O2Ix03

10.2 O2Ix04, O2Ix05

1. Operating and display elements
2. Focal setter
3. Middle of the optical axis

11 Technical data

Type of sensor		CMOS image sensor black/white VGA resolution 640 x 480
Readable codes		
O2I1xx and O2I3xx		2D: ECC200, PDF-417, QR 1D bar codes: Interleaved 2-of-5, Industrial 2-of-5, Code 39, Code 93, Code 128, Pharmacode, Codabar EAN8, EAN8-Add-On 2, EAN8-Add-On 5 EAN13, EAN13-Add-On 2, EAN13-Add-On 5 UPC-A, UPC-A Add-On 2, UPC-A Add-On 5 UPC-E, UPC-E Add-On 2, UPC-E Add-On 5 GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Stacked,GS1 DataBar Stacked Omnidirectional, GS1 DataBar Limited, GS1 DataBar Expanded, GS1 DataBar Expanded Stacked
In addition O2I3xx		2D: Micro-QR, Aztec Code, GS1 ECC200, GS1 QR Code, GS1 Aztec Code, 1D bar codes: GS1 - 128, MSI bar code

Operating distance		mm	**50**		**100**		**200**	
Field of view size	**O2Ix00** **O2Ix01**	mm	16 x 12		32 x 24		64 x 48	
	O2Ix02 **O2Ix03**	mm	33 x 24		66 x 47		132 x 94	

Operating distance		mm	**75**	**100**	**200**	**400**	**1000**	**2000**
Field of view size	**O2Ix04** **O2Ix05**	mm	15 x 11	20 x 15	40 x 30	80 x 60	200 x 150	400 x 300

Omnidirectional reading	Yes
Inclination to the image plane	≤ 45°
Readings	≤ 20/s
Motion speed	≤ 7 m/s
Function display	3 x LED green (Power, Ethernet, PC) 4 x LED yellow (RS-232, Out1/Trigger, Out2)
Operation indication / dialogue	4-digit 10-segment display
Possible parameter settings	via 2 pushbuttons and 10-segment display or via PC/notebook with E2I200 operating program
Laser marking	red, laser protection class 2 to DIN EN 60825-1

Operating voltage		24 V DC (± 10%)
Current consumption		< 300 mA
Current rating		100 mA (per switching output)
Voltage drop		< 2 V
Short-circuit protection, pulsed		yes
Overload protection		yes
Reverse polarity protection		yes
Material		housing: die-cast zinc, powder coating lens window: glass LED window: polycarbonate
Trigger (optional)		internal external (24 V PNP to IEC 61131-2, type 2) via RS-232, TCP/IP or EtherNet/IP
Number switching outputs		max. 2 (24 V PNP)
Internal illumination	**O2Ix00** **O2Ix02** **O2Ix04**	red light (625 nm) 4 lighting segments (individual control via PC operating program)
	O2Ix01 **O2Ix03** **O2Ix05**	infrared (850 nm) 4 lighting segments (individual control via PC operating program)
Connection external illumination		24 V DC PNP
Process interfaces		RS-232: 9600...115200 bits/s Ethernet TCP/IP, EtherNet/IP: 10Base-T/100Base-TX
Parameter setting interface		Ethernet TCP/IP, UDP/IP
IP address		192.168.0.79
Subnet mask		255.255.255.0 (class C)
Gateway IP address		192.168.0.201
MAC address		see type label
Ambient temperature		-10...50 °C
Storage temperature		-40...85 °C
Protection		IP 67, III
EMC		interference emission / immunity to DIN EN 61326
Mechanical tests		shocks to IEC 60068-2-27 vibration to IEC 60068-2-6

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11.1 Module size specifications (ECC200)

11.1.1 General specifications

Image size O2I	640 x 480 pixels
Code size in the image	max. ⅔ image size (≈ approx. 430 x 320 pixels)
Module size (standard recognition)	min. 6 pixels
Module size (extended recognition)	min. 2 pixels

11.1.2 Module size in dependence of the operating distance

Article no.	Operating distance	50	100	200
O2Ix00 O2Ix01	Field of view size	16 x 12	32 x 24	64 x 48
	Module size (min.) Standard recognition	0.28	0.51	0.96
	Module size (min.) Extended recognition	0.09	0.17	0.32
O2Ix02 O2Ix03	Field of view size	33 x 24	66 x 47	132 x 94
	Module size (min.) Standard recognition	0.65	1.08	1.97
	Module size (min.) Extended recognition	0.22	0.36	0.66

Values in mm

Article no.	Operating distance	75	100	200
O2Ix04 O2Ix05	Field of view size	15 x 11	20 x 15	40 x 30
	Module size (min.) Standard recognition	0.21	0.28	0.56
	Module size (min.) Extended recognition	0.07	0.09	0.19
	Operating distance	400	1000	2000
	Field of view size	80 x 60	200 x 150	400 x 300
	Module size (min.) Standard recognition	1.13	2.81	5.63
	Module size (min.) Extended recognition	0.38	0.94	1.88

Values in mm

12 Maintenance, repair and disposal

► Keep the lens window free from soiling.
Soiling may considerably affect the reading result!

► To clean the lens window, do not use any detergents or solvents which might damage the front glass.

► Do not open the housing as the device does not contain any components which can be maintained by the user. The device must only be repaired by the manufacturer.

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► Dispose of the device in accordance with the national environmental regulations.

13 Approvals/standards

Test standards and regulations → 11 Technical data.

The EC declaration of conformity is available at www.ifm.com