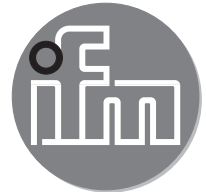


ifm electronic



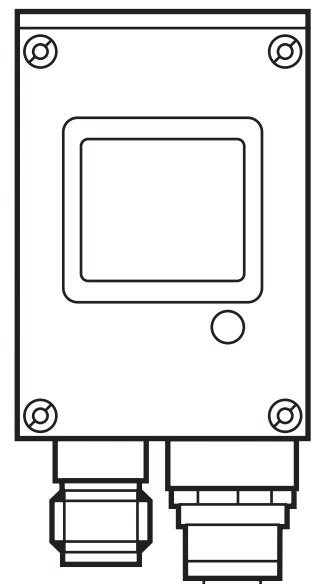
Device manual
Ethernet camera
for mobile applications

UK

efector 250[®]

O2M110

7390715/00 03/2012



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1 Safety instructions



These instructions are part of the device. They contain information and illustrations about the correct handling of the device and must be read before installation or use.

Adhere to the instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or handling can result in serious harm concerning the safety of persons and plant.

These instructions are intended for "authorised" persons according to the EMC and low-voltage directives. The device must only be installed, connected and put into operation by a qualified electrician.

Disconnect the device externally before handling it. If necessary, also disconnect any independently supplied output load circuits.

If the device is not supplied by the mobile on-board system (12/24 V battery operation), it must be ensured that the external voltage is generated and supplied according to the criteria for safety extra-low voltage (SELV) as this voltage is supplied without further measures to the connected controller, the sensors and the actuators.

The wiring of all signals in connection with the SELV circuit of the device must also comply with the SELV criteria (safety extra-low voltage, safe electrical separation from other electric circuits).

If the supplied SELV voltage has an external connection to ground (SELV becomes PELV), the responsibility lies with the user and the respective national regulations for installation must be complied with. All statements in this manual refer to the device the SELV voltage of which is not grounded.

The connection terminals may only be supplied with the signals indicated in the technical data and/or on the device label and only the approved accessories of ifm electronic gmbh may be connected.

In case of malfunctions or uncertainties please contact the manufacturer.

Tampering with the device can lead to serious risks for the safety of persons and plant. It is not permitted and leads to the exclusion of any liability and warranty claims.

2 Functions and features

The Ethernet camera serves for monitoring of areas outside of the field of view in mobile vehicles and utility vehicles. Connection, control and visualisation of the images is carried out via the process and dialogue module PDM360 with colour display.

The camera operates as a server and permanently transmits images to the connected dialogue module.

Applications are for example:

- Rear area or blind spot monitoring for municipal vehicles
- Machine monitoring in construction machinery
- Rear view camera on vehicles

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2.1 Features at a glance

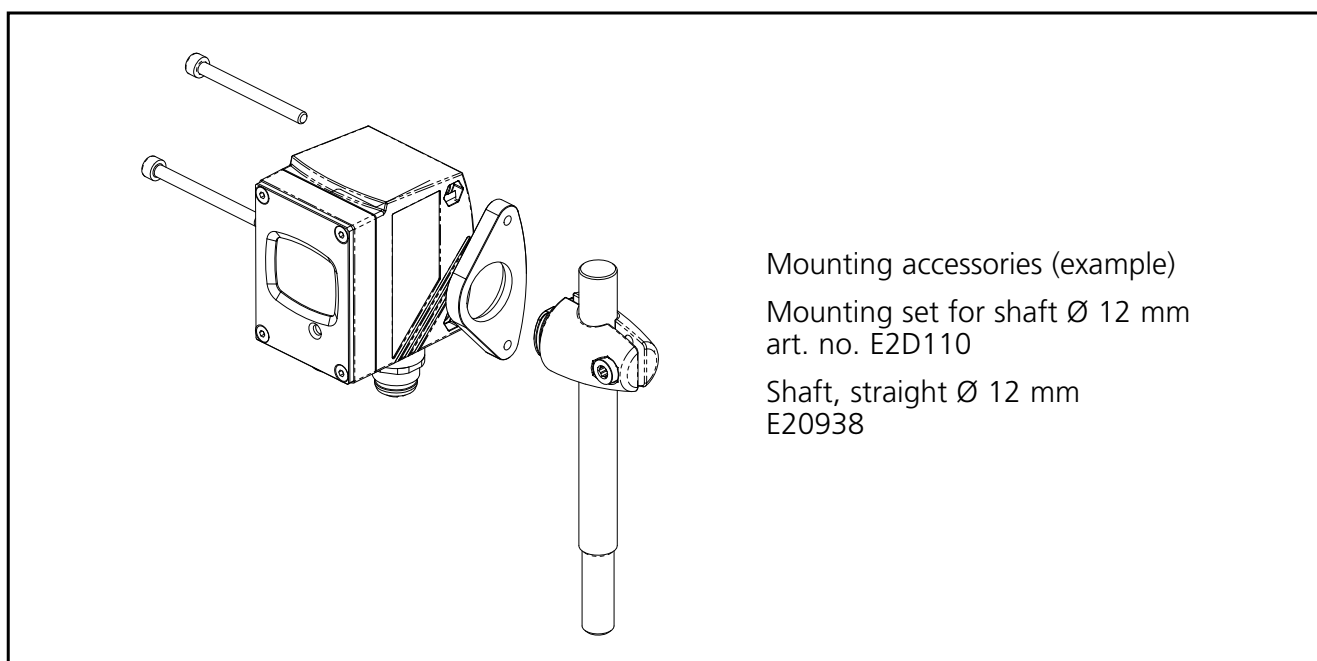
- Use and operation with process and dialogue module PDM360 (version with colour display, art. no. CR1051 from software version V4.3.2)
- Display of up to 4 camera images per PDM360
- 10 Mbits/s Ethernet interface (10Base-T/100Base-TX according to IEEE 802.3/802.3u)
- Sealed diecast zinc housing
- Protection rating IP 69 K
- Regulated lens heating (can be deactivated)
- CMOS image sensor, resolution ¼ VGA, 320 x 240 pixels
- Angle of aperture 75°
- Parameter setting and control functions via the CoDeSys application program, e.g.:
 - image mirror function (rear view mode)
 - rotating
 - parallel display of several camera images (split screen)
 - positioning of the images
 - activation/deactivation
 - debug mode (adjustable use of the band width of the network)
- Operation display via integrated LED
- Mixed display of camera image and PDM360 visualisation elements (text and/or graphics)

3 Mounting

3.1 Mounting accessories

The device is supplied without mounting accessories.
Depending on the intended location and type of mounting the following mounting accessories are available, for example:

Mounting accessories (examples):	Art. no.
Mounting set for shaft \varnothing 12 mm (clamp cylinder and fixing element for the types O2D, O2M)	E2D110
Shaft, straight \varnothing 12 mm, length 130 mm, M10	E20938
Shaft, angled \varnothing 12 mm, length 200 mm, M10	E20940
Mounting set for shaft \varnothing 14 mm (clamp cylinder and fixing element for the types O2D, O2M)	E2D112
Shaft, straight \varnothing 14 mm, length 130 mm, M12	E20939
Shaft, angled \varnothing 14 mm, length 200 mm, M12	E20941



Mounting example

You can find more information about the available accessories at:

www.ifm-electronic.com → Data sheet direct → e.g. O2M110 → Accessories

or directly

www.ifm-electronic.com → Data sheet direct → e.g. E2D110

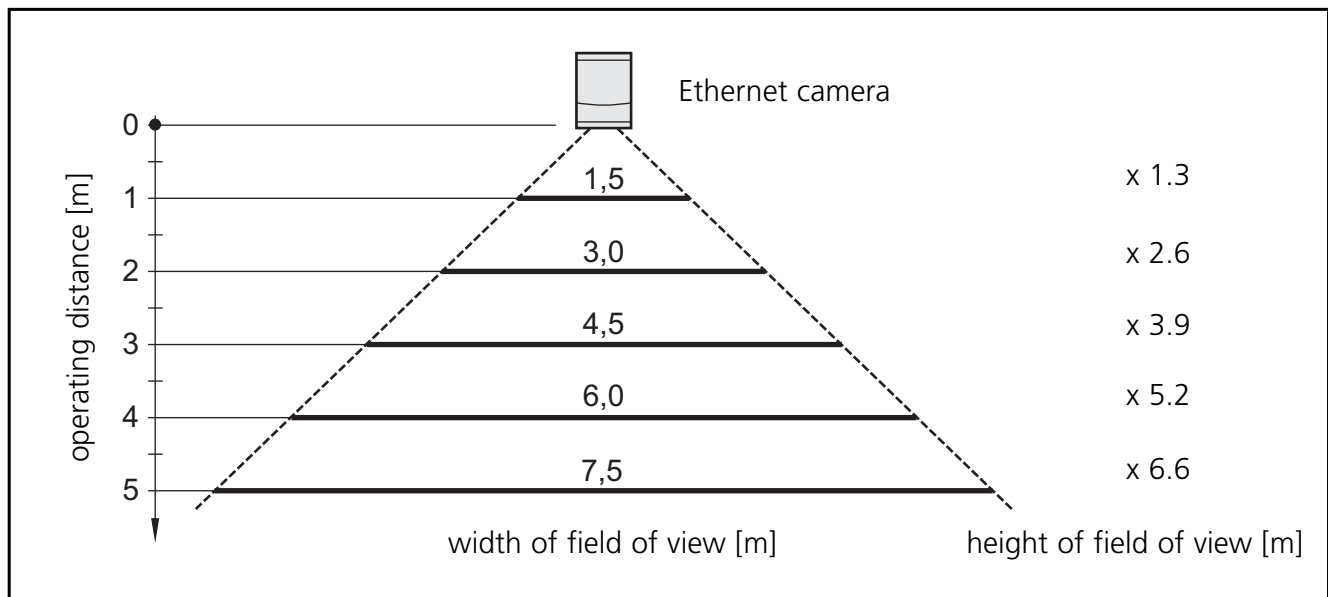
3.2 Mounting dimensions

Mounting is done using two M 4 x L screws.

Mounting dimensions of the camera → 7 Technical data (data sheets).

3.3 Mounting location

Mount the camera in front of or above the area to be monitored.
The size of the area to be monitored depends on the operating distance:



Operating distance and field of view size (example O2M110)

Device-specific data → 7 Technical data (data sheets).



Note in general

To avoid adverse effects on the image detection, avoid installation in heavily polluting areas of the machine (e.g. splashing water, tyre abrasion, etc.).

Avoid back light.

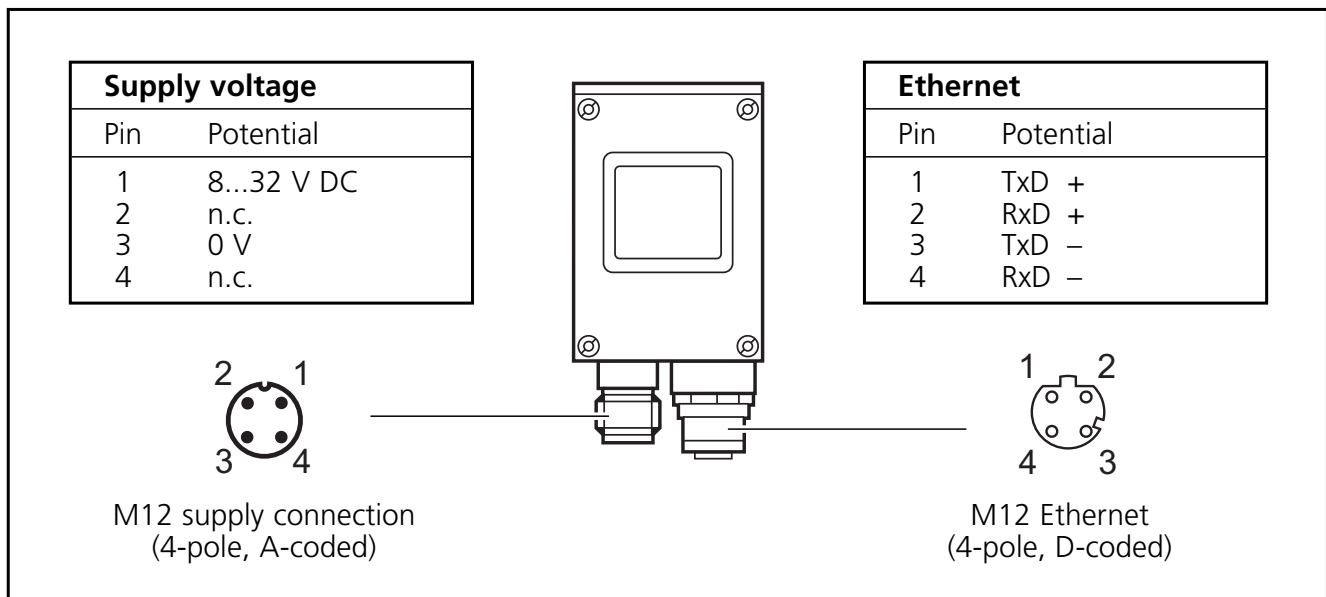
Do not position lighting elements directly facing the camera lens.

Mount the device in such a way that the cables/connectors are connected from below.

The connected cables must be provided with a strain relief.

4 Electrical connection

4.1 Ethernet camera



Wiring

For information about available connectors please go to:

www.ifm-electronic.com → Data sheet direct → e.g. O2M110 → Accessories

The supply voltage is electrically separated from the housing.

4.1.1 Ethernet connection

Use a shielded CAT5 cable.

(STP, Shielded Twisted Pair, according to EIA/TIA-568). Max. length 100 m

Use screened connector housings.

Connect the screen of the Ethernet cable to the connector housing.

Avoid transmission problems caused by induction.

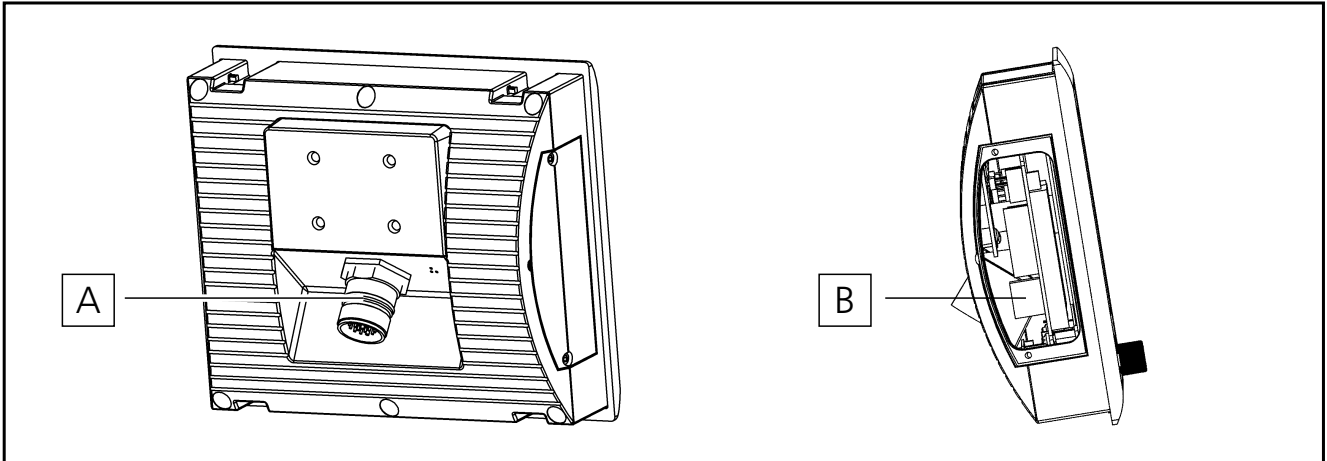
Do not lay the Ethernet connection cable in parallel to current-carrying cables.

Lay supply and signal cables away from the camera using the shortest possible route.

4.1.2 Interference due to external influences

Faulty or insufficient radio interference suppressors in electrical equipment, such as inverters or generators, as well as voltage fluctuations when switching on/off electric loads may lead to problems with the image transmission.

4.2 PDM360



PDM360 rear view and side view

A

Operating connection
M23 round connector
(19-pole central plug)

M23 round connector	
Pin	Potential
1	GND (Power)
2	GND (Power)
3	VBB + (Supply)
4	CAN 1 Low
5	CAN 1 High
6	n.c.
7	2nd RS 232, RxD
8	2nd RS 232, TxD
9	VBB + (supply switched)
10	GND (Power)
11	GND (Power)
12	n.c.
13	CAN 2 Low
14	CAN 2 High
15	Ethernet RxD -
16	Ethernet RxD +
17	Ethernet TxD -
18	Ethernet TxD +
19	Shield

PDM360 operating connection

B

Ethernet service interface
(8-pole RJ45 plug)

RJ45	
Pin	Potential
1	TxD + pair 1
2	TxD - "
3	RxD + pair 2
6	RxD - "

PDM360 service connection



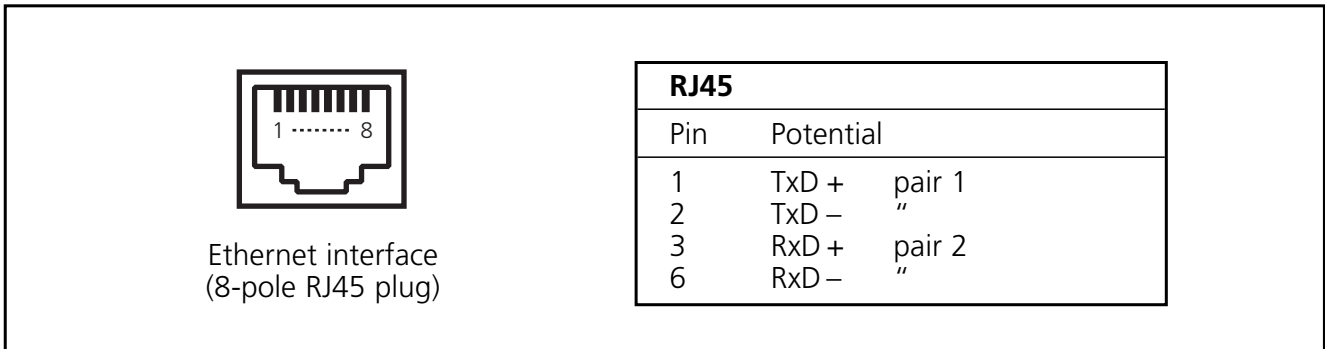
The Ethernet service interface behind the side cover is not intended for actual operation.

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4.3 PC/notebook

Connection to a PC or to a notebook may be necessary for service purposes (e.g. setting of the IP address).

The configuration of the PC Ethernet interface corresponds to that of the service interface (B) of the PDM360.



PC/notebook

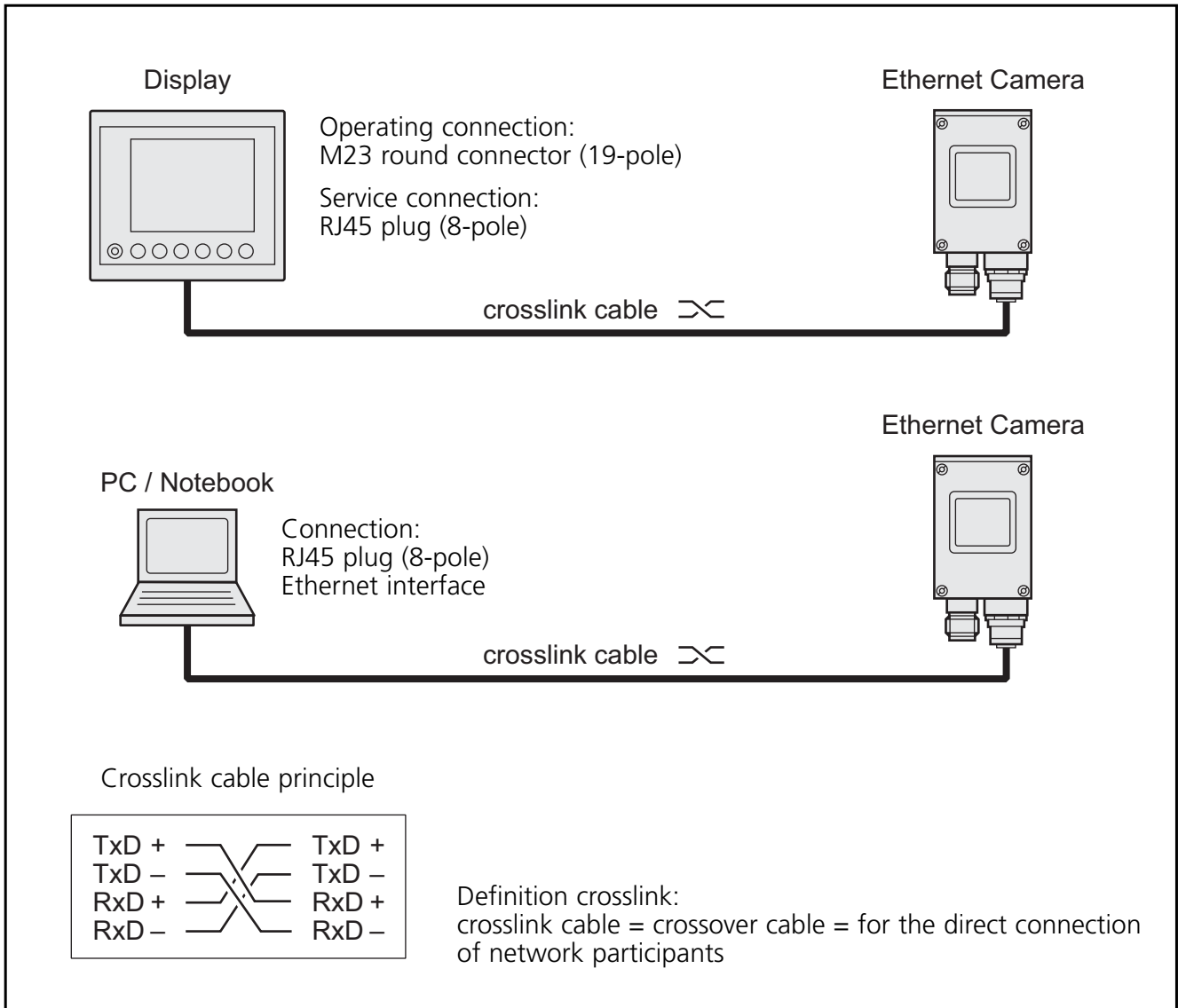
Note:

The IP address range (Net ID) of the PC must correspond to the IP address range of the camera. For the PC/notebook setting is carried out in the Control Panel → Network Connections → Properties

(also see → 6.1.2 IP address allocation Ethernet cameras).

4.4 Connection principle without hub/switch

- One camera at one PDM360
- One camera at one PC/notebook (e.g. service mode)



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Connection principle without hub/switch

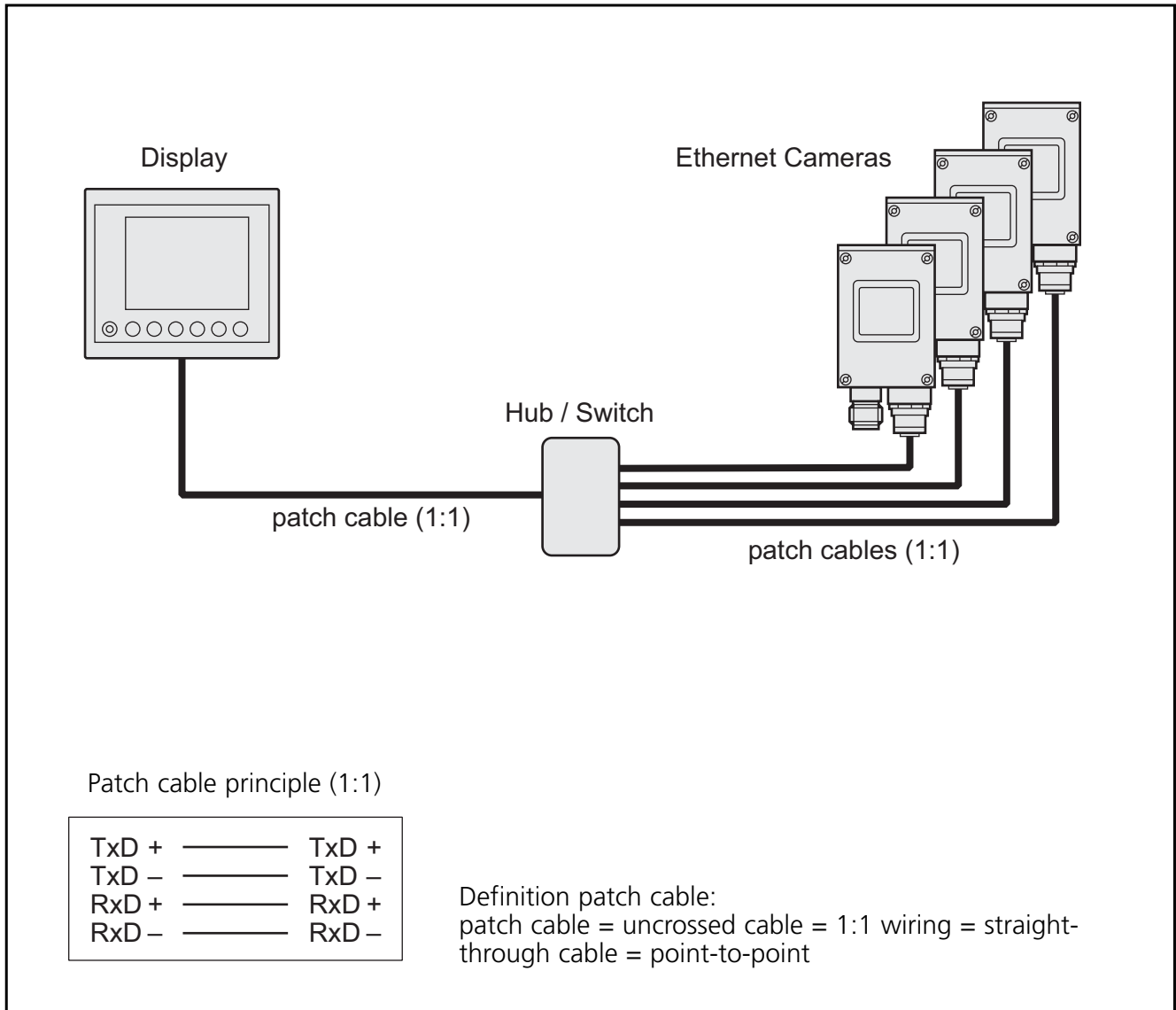
Crosslink cable (example):	art. no.
Ethernet connection cable, 2m M12 connector (4-pole, D-coded) – RJ45 (8-pole)	E11898

For further information about the connector go to:

www.ifm-electronic.com → Data sheet direct → E11898

4.5 Connection principle with hub/switch

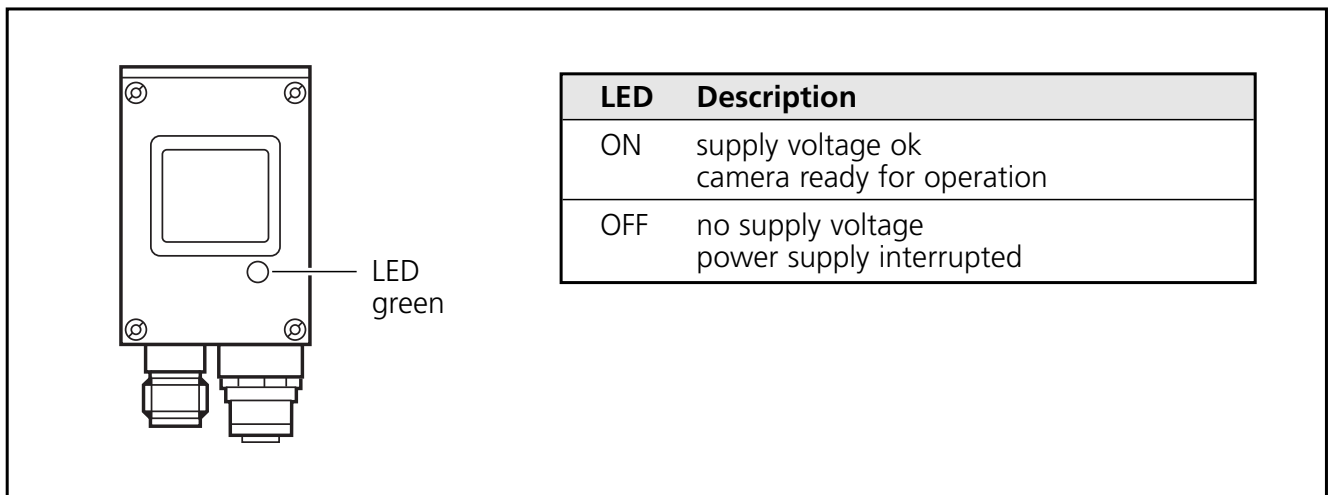
- Several cameras at one PDM360



Connection principle with hub/switch

i Adhere to the documentation of the switch manufacturer. Some switches have an “autocrossing” function. The transmit and receive wires are automatically recognised by these devices. In this case, 1:1 patch cables are not compulsory.

5 Operation display

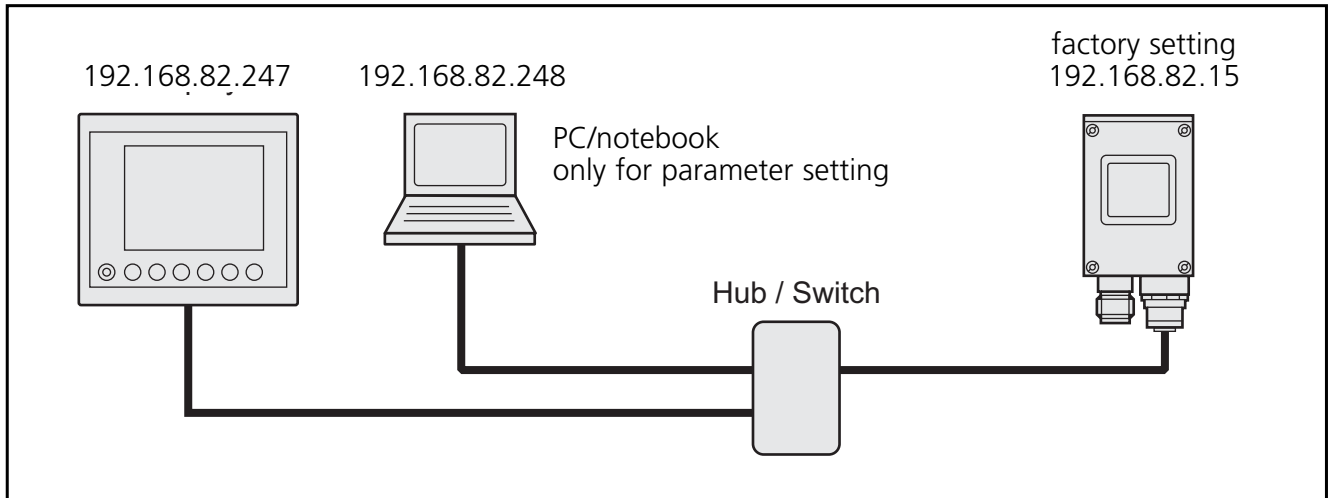


Operating indication O2M110/111

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6 Set-up

6.1 IP addresses



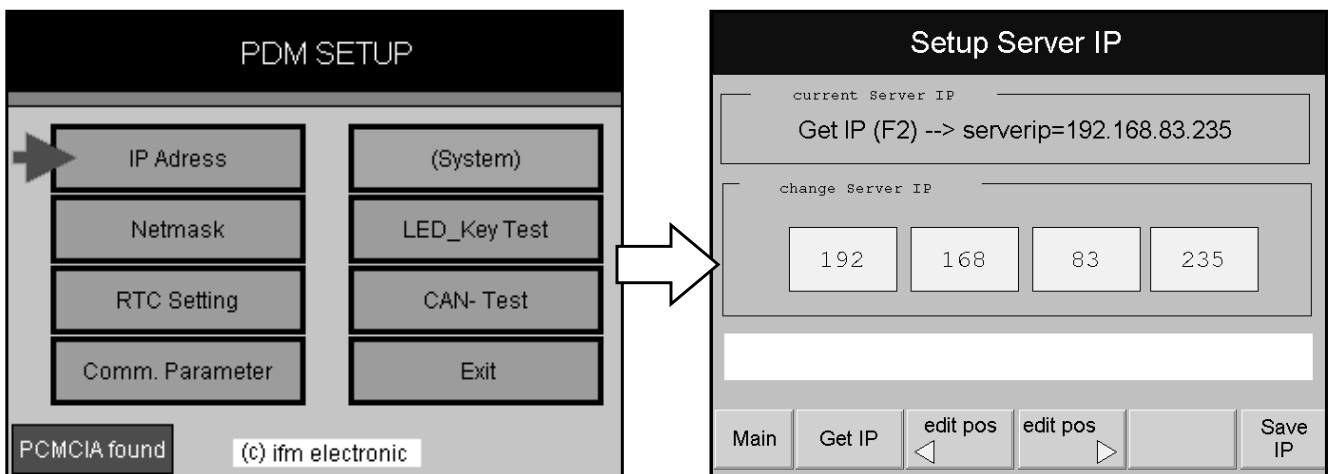
Example 1: IP address allocation

The address ranges of all network participants must be identical. This range of the IP address is also called Net ID.

Factory preset (subnet mask 255.255.255.0, class C):

Ethernet camera:	192.	168.	82.	15
general ...	↓ =	↓ =	↓ =	↓ ≠
PDM360:	192.	168.	82.	247
	\..... Net ID			Host ID

6.1.1 IP address allocation PDM360



For PDM360, the IP address is set via the PDM setup.

Open the PDM setup start menu:

Press **F1** and **F5** simultaneously and switch on the voltage supply.

Select "IP address" by turning and then pressing the rotary switch. Set the IP address range in the menu "Setup Server IP".

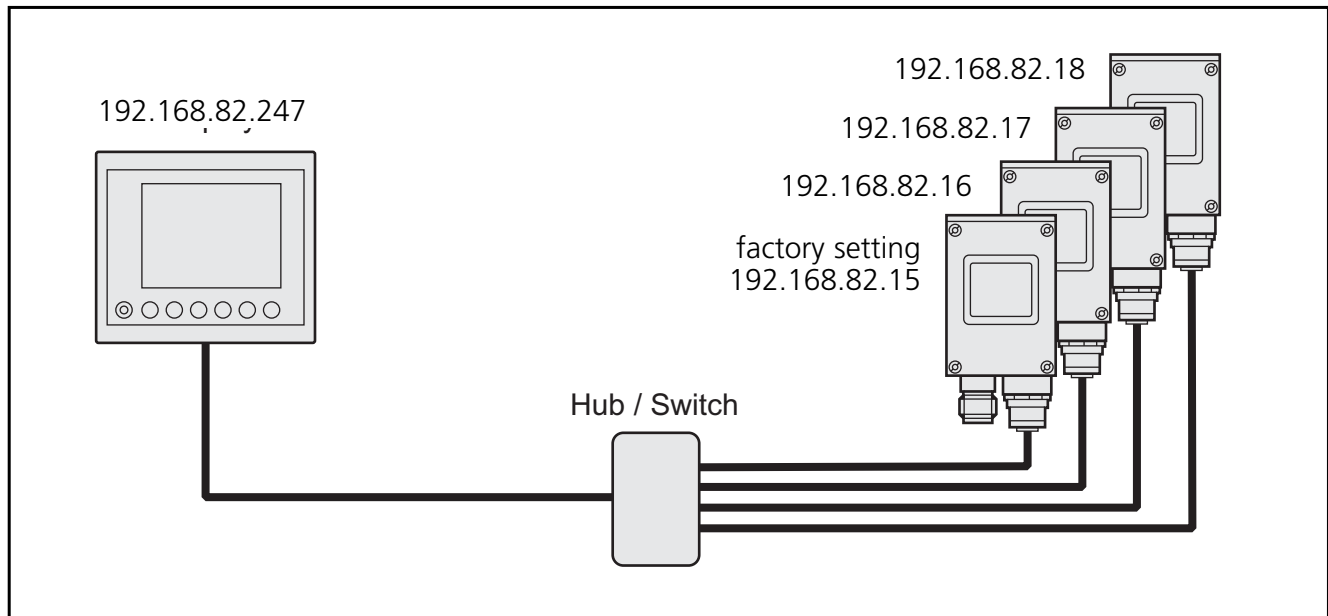
PDM360 online help:

The online description of the functions, operation and device-specific libraries of the PDM360 family is part of the CoDeSys online help.

It is also available for download on the internet.

www.ifm-electronic.com → Data sheet direct → e.g. O2M110 → Download/Software

6.1.2 IP address allocation cameras



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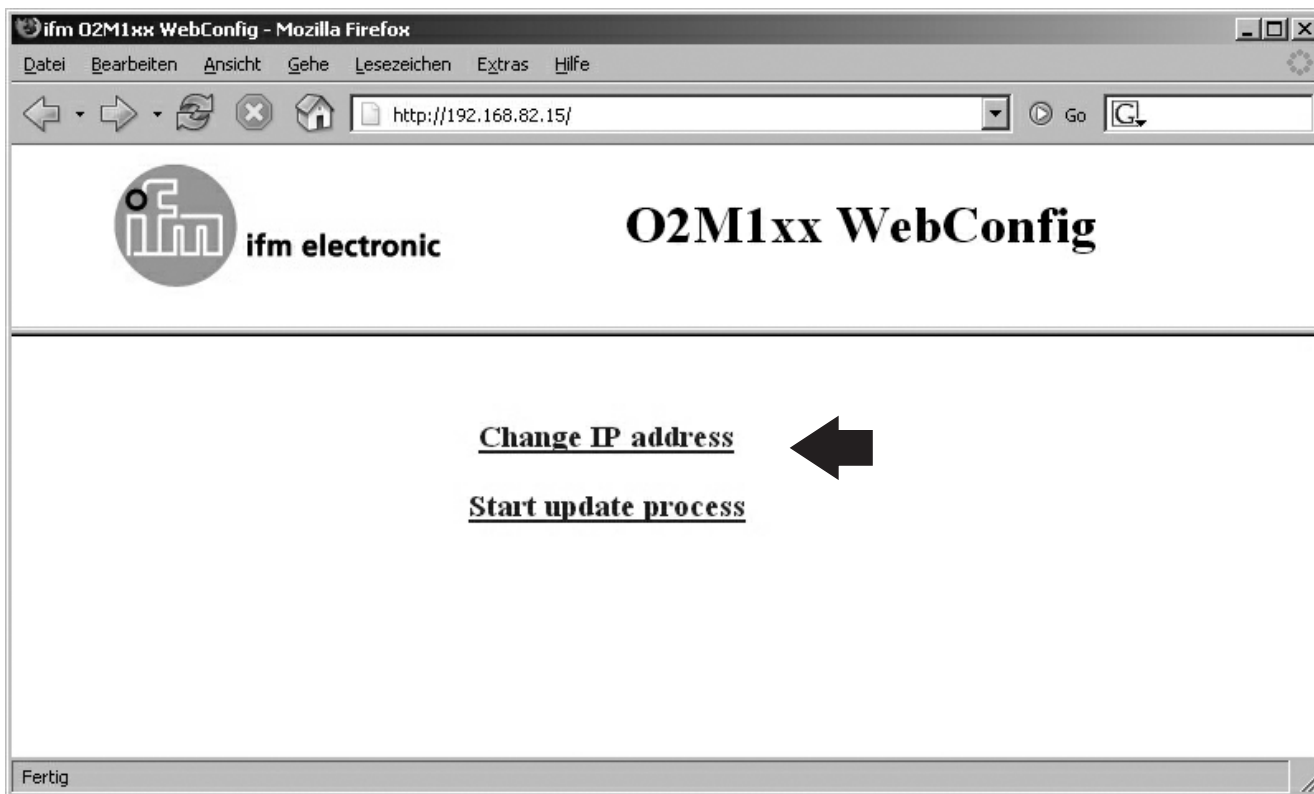
Example 2: IP address allocation when using 4 cameras

When using several cameras, set the IP addresses of the cameras via the "Hypertext Transfer Protocol" (HTTP). To do so, use standard programs such as Microsoft Internet Explorer, Mozilla Firefox or Opera.

Procedure:

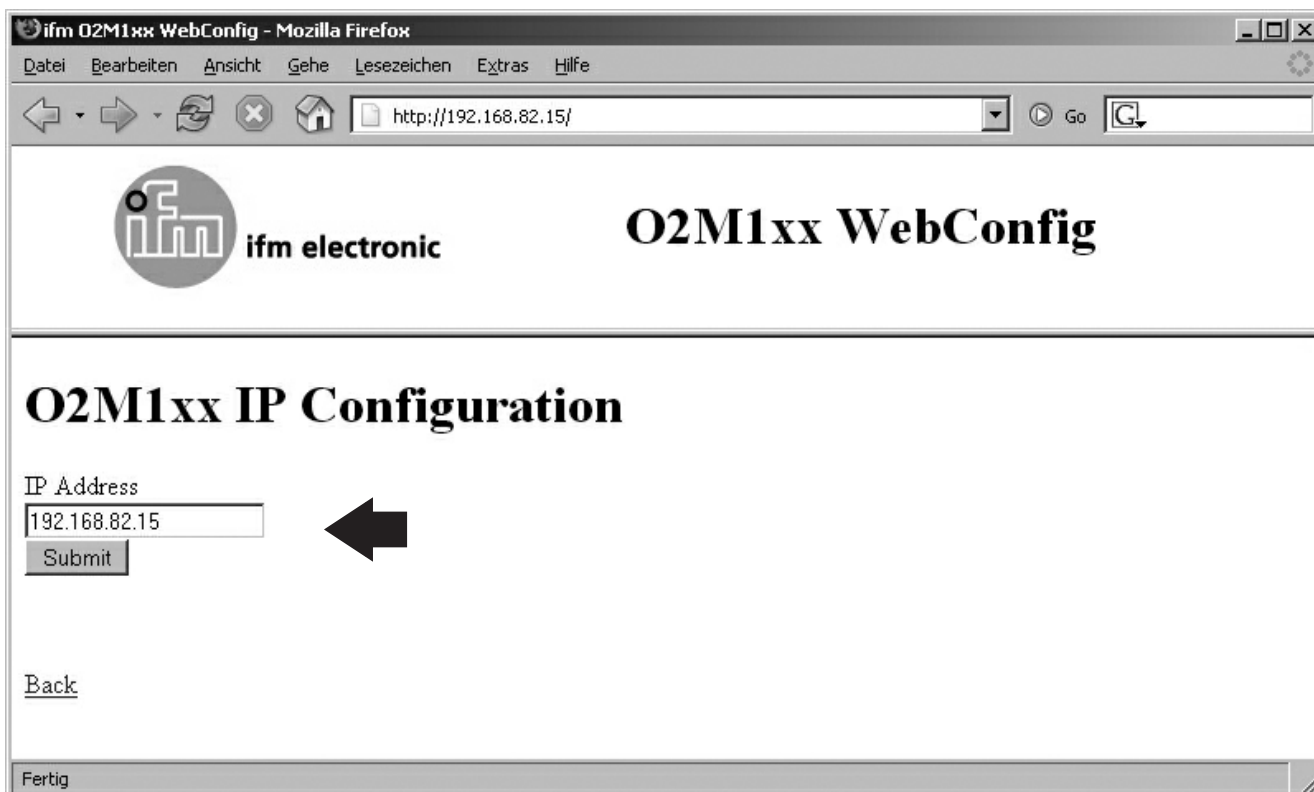
1. Check the IP settings of the PC/notebook and change them if necessary.
(Start → Control Panel → Network Connections → Local Area Connection)
Internet protocol: TCP/IP
IP address: 192.168.82.xx (except 15)
Subnet mask: 255.255.255.0
Connection: 10 MBits, half-duplex
Gateway IP address: 192.168.82.15
2. Establish an Ethernet connection between the camera and the PC/notebook.
3. Connect the camera to supply voltage.
Do not interrupt the supply voltage during IP address allocation!
Avoid voltage fluctuations during IP address allocation!
4. Open the internet browser.
5. Enter the preset IP address of the camera in the address line of the browser and confirm with "Enter" (http://192.168.82.15/).
The start window "O2M1xxx WebConfig" appears in the browser.

6. Click on "Change IP address".



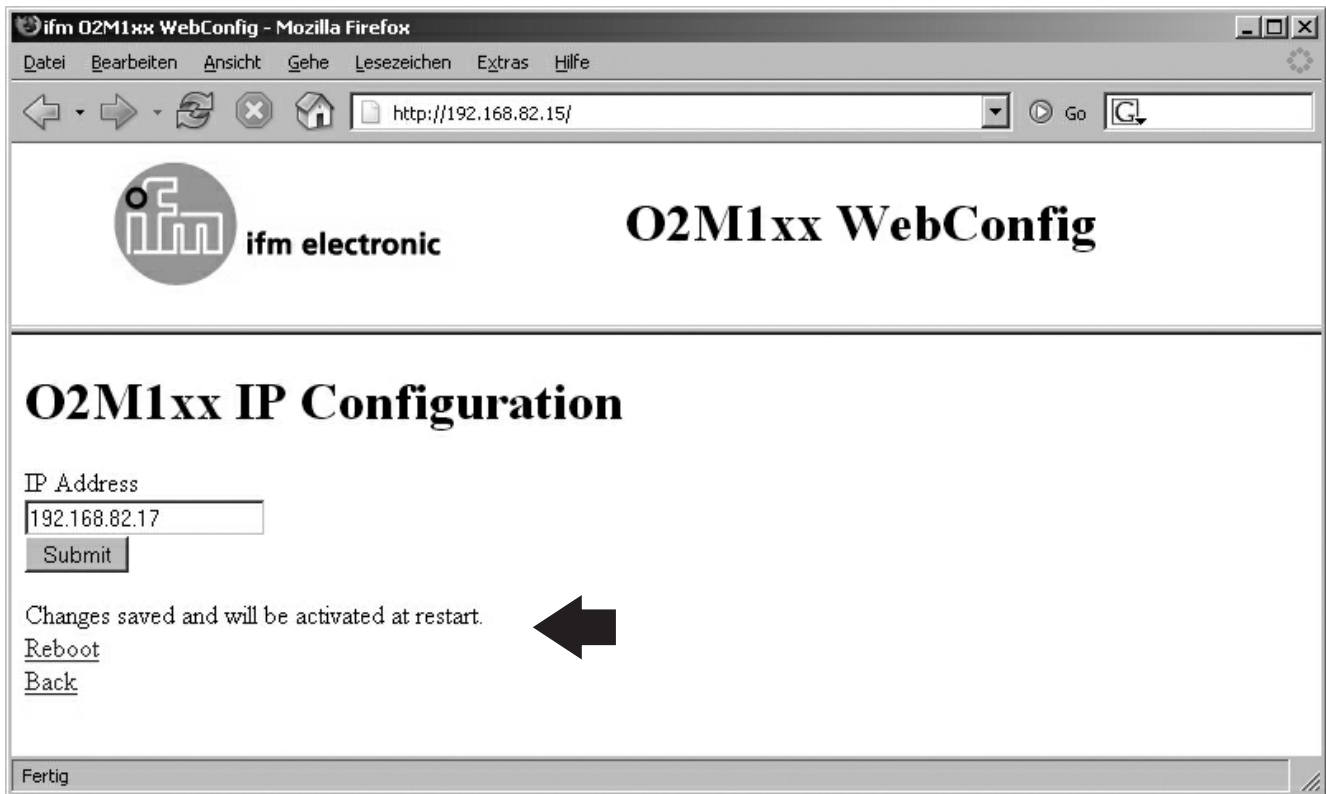
Start window "O2M1xx WebConfig"

7. Enter the new address in the field "IP address" and click on "Submit" to send it to the camera.



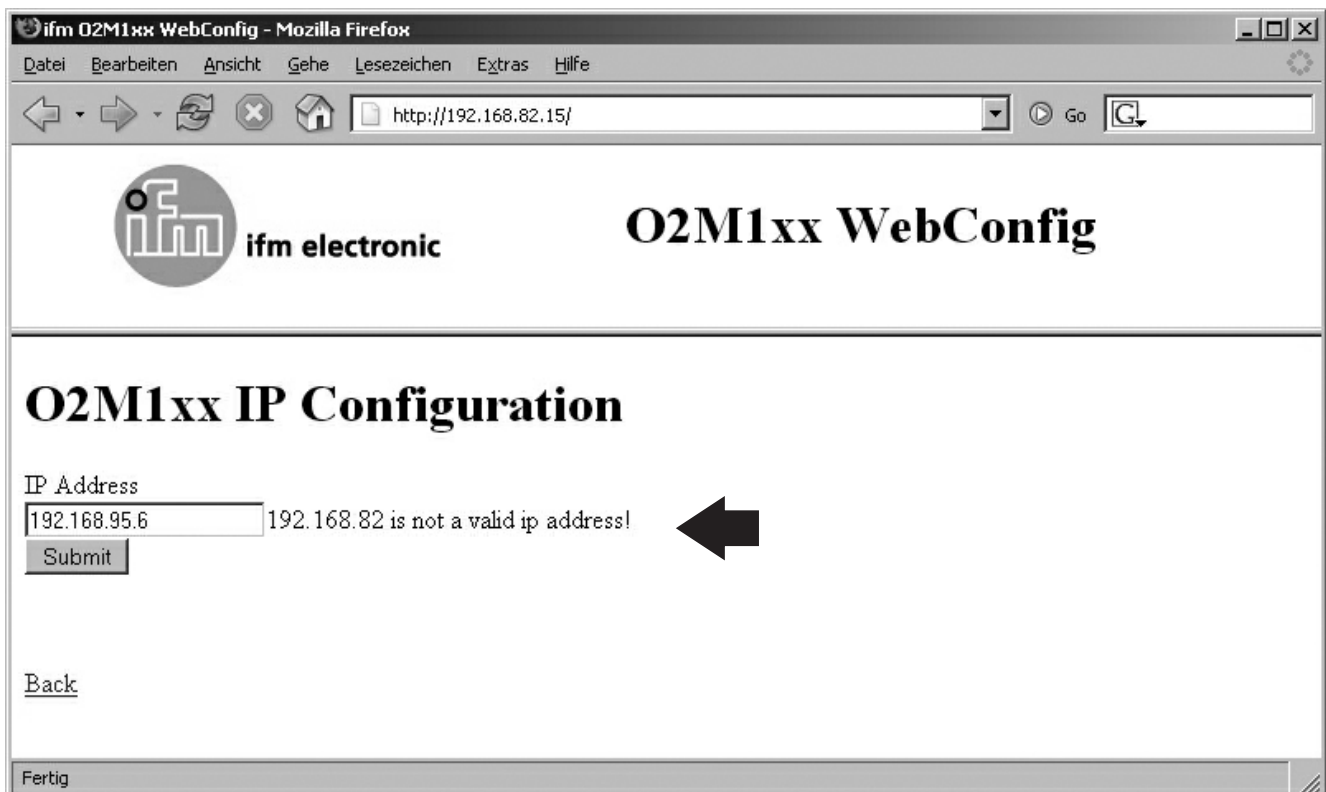
O2M1xx IP configuration

A confirmation appears if the address was successfully written to the flash memory of the camera.



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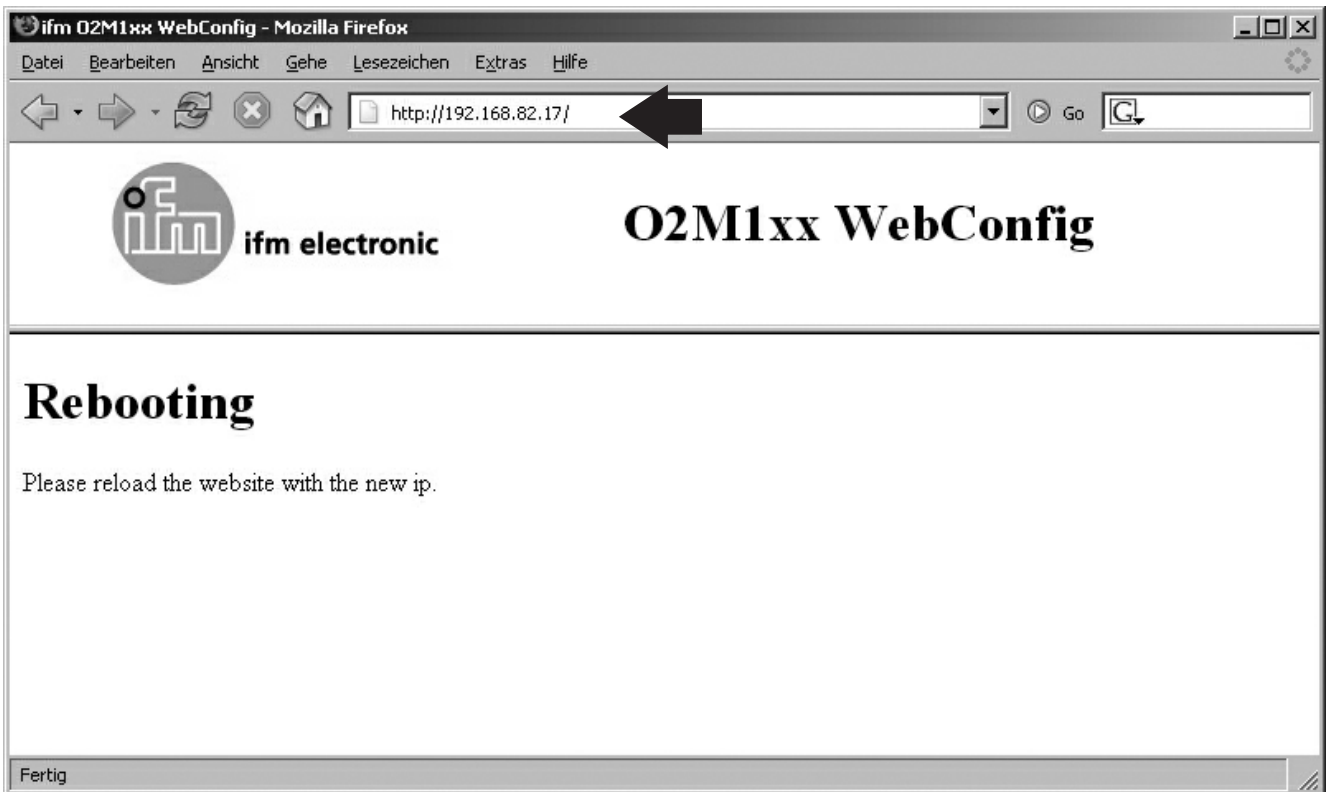
Confirmation of the address change



Error message in case of invalid IP address (e.g. wrong address range)

i An inadvertent, wrong address allocation makes subsequent communication with the camera impossible. For this reason, the following final test must be carried out.

8. Click on "Reboot".
9. Enter the new IP address of the camera in the address line of the browser and confirm with "Enter" (here e.g.: <http://192.168.82.17/>).
If the address corresponds to the previously allocated address, the start window "O2M1xxx WebConfig" appears again.



O2M1xx IP configuration, reboot request to check the allocated IP address

10. Repeat the steps 2 to 9 with further cameras.

The new camera IP address will become effective on reboot.
(camera supply voltage off/on).

6.2 Parameter setting PDM360

6.2.1 Library ifm_Camera_O2M_Vxxxxxx

The CoDeSys library "ifm_Camera_O2M_Vxxxxxx" is part of the CD-ROM "ecolog Software & Tools". It contains all parameters and functions for the control of the dialogue module PDM360 (art. no. CR1051) and the camera.

After installation of the CD, the library will be stored in the directory:

..\ifm electronic \ CoDeSys V2.3 \ Targets \ ifm \ Library \ ifm_CR1051

The library uses functions of the library "ifm_Camera_Vxxxxxx". It is loaded automatically. "ifm_Camera_Vxxxxxx" must not be inserted.

2 demo programs in the directory "... \ Projects \ DEMO_PDM" serve for introduction (CR1051Demo_O2M_1CAM.pro und CR1051Demo_O2M_2CAM.pro).

6.2.2 Function CAM_O2M

The function is part of the above-mentioned library. It serves for parameter setting / control of one camera and its image data.

One function block is required per camera.

```

FUNCTION_BLOCK CAM_O2M

(* Function block to control cameras.*)

(*You use an instance of the function block to show the
camera image.
Use an instance for every camera.*)

VAR_INPUT
    C_ENABLE: BOOL;          (* Enable the function block to work.*)
    C_ADDR: STRING(15);     (* Camera IP address as string e.g.192.168.082.016*)
    C_ROTATION: WORD;       (* Rotate the camera source image.*)
    C_MIRROR: BOOL;        (* Mirror the camera source image at the vertical axis. *)
    C_MODE: BYTE;          (* Source area of the camera image.
                            1: full screen
                            2: part screen, visu active -> set size via C_WINDOW_HEIGHT,
                            30: quad screen up left, no visu
                            31: quad screen up left, visu active)

    C_RESULT: BYTE;
    PDM_IP: STRING(15);
    C_WINDOW_HEIGHT: BYTE;
    C_DEBUG: BOOL;

```

Function block CAM_O2M (extract CoDeSys programming surface)

6.2.3 Parameter overview

Name	Data type	Description
Inputs		
C_ENABLE	BOOL	camera ON/OFF TRUE: initialisation of the function, transmission of image data Note: If TRUE, the PDM360 visualisation is not refreshed
C_ADDR	STRING (15)	IP address camera, factory setting: 192.168.82.15
C_ROTATION	WORD	rotate image clockwise (values: 90/180/270)
C_MIRROR	BOOL	image mirrored along the vertical axis TRUE: mirroring ON (rear view mode)
C_MODE	BYTE	image position on PDM360 display
		1: full screen (320 x 240 px)
		2: part screen (320 x "H" px) Define "H" with C_WINDOWS_HEIGHT
		30: ¼ screen, at the top left no PDM360 visualisation
		31: ¼ screen, at the top left PDM360 visualisation at the bottom (height 120 px)
		40: ¼ screen, at the top right no PDM360 visualisation
		41: ¼ screen, at the top right PDM360 visualisation at the bottom (height 120 px)
		50: ¼ screen, at the bottom left no PDM360 visualisation
		51: ¼ screen, at the bottom left PDM360 visualisation at the top (height 120 px)
		60: ¼ screen, at the bottom right no PDM360 visualisation
61: ¼ screen, at the bottom right PDM360 visualisation at the top (height 120 px)		
		(¼ screen scales the image to 160 x 120 px)
C_WINDOWS_HEIGHT	BYTE	visible height of the image data on the PDM360 display valid range: 120...240 px
C_DEBUG	BOOL	TRUE: greater bandwidth for CoDeSys programming or debugging (= lower transmission rate for image data) Factory setting: FALSE

Name	Data type	Description
Outputs		
C_RESULT	BYTE	0: function not initialised or not active 1: function successfully initialised parameters successfully written 2: function being processed 3: error; connection disturbed or interrupted parameter not written reinitialise function 97: check last byte of IP dress last byte of the IP adress between camera and PDM has to be different 98: PDM IP adress and camera IP adress are not in the same group 99: wrong IP adress check format of the input string
PDM_IP	STRING (15)	IP address of the connected PDM360

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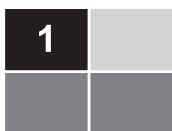
6.2.4 MODE combinations (1...4 cameras)



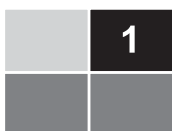
Full screen
 1 camera active, no visualisation
 C_MODE = 1
 C_WINDOW_HEIGHT = not defined



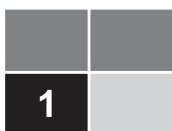
Part screen
 1 camera active, visualisation up to 120 px at the bottom
 C_MODE = 2
 C_WINDOW_HEIGHT = 120...240 px (height camera image)



1/4 screen at the top left
 1 camera active, visualisation 120 px at the bottom
 C_MODE = 31
 C_WINDOW_HEIGHT = not defined



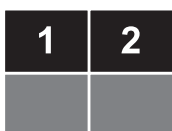
1/4 screen at the top right
 1 camera active, visualisation 120 px at the bottom
 C_MODE = 41
 C_WINDOW_HEIGHT = not defined



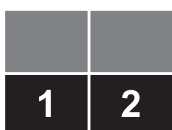
1/4 screen at the bottom left
 1 camera active, visualisation 120 px at the top
 C_MODE = 51
 C_WINDOW_HEIGHT = not defined















1/4 screen at the bottom right
 1 camera active, visualisation 120 px at the top
 C_MODE = 61
 C_WINDOW_HEIGHT = not defined



1/4 screen at the top left / top right
 2 cameras active,
 visualisation 120 px at the bottom, controlled by camera 1
 Camera 1: C_MODE = 31
 Camera 2: C_MODE = 40
 C_WINDOW_HEIGHT = not defined (both cameras)






1/4 screen at the bottom left / bottom right
 2 cameras active,
 visualisation 120 px at the top, controlled by camera 1
 Camera 1: C_MODE = 51, at the bottom left
 Camera 2: C_MODE = 60, at the bottom right
 C_WINDOW_HEIGHT = not defined (both cameras)

		<p>¼ screen at the top left / bottom left / bottom right 3 cameras active, no visualisation Camera 1: C_MODE = 30, at the top left Camera 2: C_MODE = 50, at the bottom left Camera 3: C_MODE = 60, at the bottom right C_WINDOW_HEIGHT = not defined (all cameras)</p>
		
		<p>¼ screen at the top right / bottom left / bottom right 3 cameras active, no visualisation Camera 1: C_MODE = 40, at the top right Camera 2: C_MODE = 50, at the bottom left Camera 3: C_MODE = 60, at the bottom right C_WINDOW_HEIGHT = not defined (all cameras)</p>
		
		<p>¼ screen at the top left / top right / bottom left / bottom right 4 cameras active, no visualisation Camera 1: C_MODE = 30, at the top left Camera 2: C_MODE = 40, at the top right Camera 3: C_MODE = 50, at the bottom left Camera 4: C_MODE = 60, at the bottom right C_WINDOW_HEIGHT = not defined (all cameras)</p>
		

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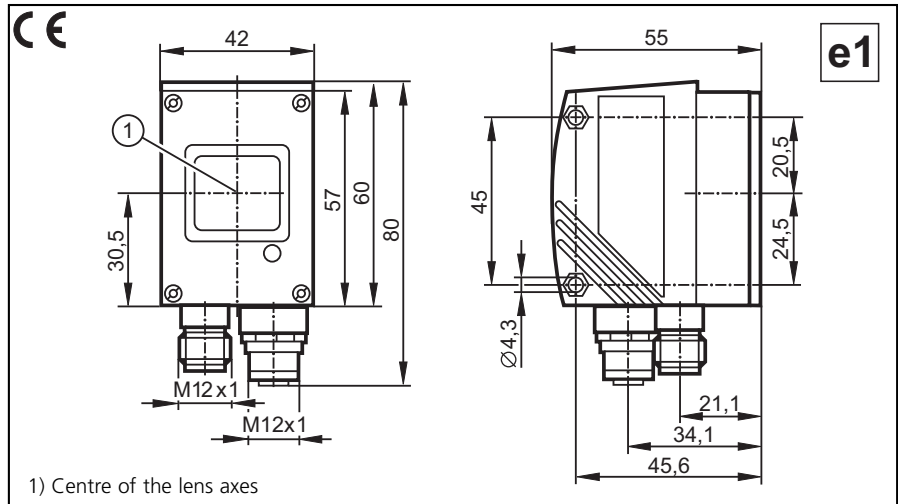
Legend:

	Camera image
	Active PDM360 visualisation area (text and/or graphics) Note: activate visualisation only for one camera!
	Static background image (visualisation before activating one or several cameras)

7 Technical data

7.1 O2M110/111

O2M110/111
Ethernet camera
Angle of aperture 75°
Lens heating



Electrical design

Operating distance	[m]
Field of view size	[m]
Operating voltage	[V]
Power consumption	[W]
Lens heating	[W]
Type of sensor	
Image repetition rate	[Hz]
Protocol	
Data format	
Readiness for operation	[LED]
Operating temperature	[°C]
Storage temperature	[°C]
Protection	
Standards, tests	
Materials	
Interface	
Transmission rate	
IP address (default)	
Wiring	

DC

-	1	2	5	-	-
-	1.5 x 1.1	3 x 2.2	7.5 x 5.5	-	-
8...32 DC					
typ. 4 (excl. lens heating)					
typ. 6					
CMOS image sensor colour, QVGA resolution 320 x 240					
min. 15					
image transmission via UDP/IP					
8-bit Windows® bitmap format / image format QVGA					
green					
-30...75					
-40...85					
IP 69K, III					
DIN EN 61326 / IEC 60255-5 / DIN EN 61373 cat. 1B / Automotive Directive 05/49/EC (e1)					
housing: diecast zinc / coating: cathodic dip painting (KTL) front lens: glass					
Ethernet 10Base-T / 100Base-TX					
10 Mbits/s (fixed)					
192.168.82.15					

**Power supply connection:
M12, 4-pole**



- 1: U+
- 2: not connected
- 3: 0 V
- 4: not connected

**Parameter setting connection:
M12, 4-pole, D-coded**



- 1: TD+
- 2: RD+
- 3: TD-
- 4: RD-

8 Maintenance, repair, disposal



Keep the lens window of the camera free from soiling. Soiling may considerably affect the image quality!

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 must be maintained by the user. The unit may only be repaired by the manufacturer.

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

UK

9 Approvals/standards

Test standards and provisions → 7 Technical data.

The CE Declaration of Conformity and the e1 approval are available at:

www.ifm-electronic.com → Data sheet direct → e.g. O2M110 → Approvals