



Instructions for set-up
ZZ1103

GB

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1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at documentation.ifm.com.

1.1 Symbols used

- ✓ Requirement
- 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 Warnings

Warnings indicate the possibility of personal injury and damage to property. This enables safe product handling. Warnings are graded as follows:



WARNING

Warning of serious personal injury

- ▷ If the warning is not observed, fatal and serious injuries are possible.



CAUTION

Warning of minor to moderate personal injury

- ▷ If the warning is not observed, minor to moderate injuries are possible.

ATTENTION

Warning of damage to property

- ▷ If the warning is not observed, damage to property is possible.

1.3 Legal and copyright information

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2 Safety instructions

The devices described are subcomponents for integration into a system.

- The operator is responsible for the safety of the system.
- The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- The system manufacturer is responsible for the functioning of the application programs.

Read this document before setting up the devices and keep it during the entire service life.

The devices must be suitable for the corresponding applications and environmental conditions without any restrictions.

Use the devices for their intended purpose. (→ Intended use □ 5)

If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.

The manufacturer assumes no liability or warranty for any consequences caused by tampering with the devices or incorrect use by the operator.

Installation, electrical connection, set-up, programming, configuration, operation and maintenance of the devices must only be carried out by qualified and authorised personnel for the respective activity.

Protect devices and cables against damage.

Because of the requirements for electromagnetic interference emissions, the devices are intended for use in industrial environments. The devices are not suitable for use in domestic areas.



WARNING

If the set is used for operator protection, death or serious injuries are possible.

- ▷ The set is an assistance system and only supports the detection of objects. The operator of the system bears full responsibility for persons within the monitored area.
- ▶ Only use the set as an assistance system and not for operator protection.

Safety note illumination unit



CAUTION

Non-visible infrared light

- ▷ The illumination unit emits infrared light of risk group 1 (IEC 62471:2006) invisible to the human eye.
- ▷ The infrared light can damage the retina of the eye when staring at it for a very long time.
- ▶ Use the illumination unit with the described devices and settings.
- ▶ Avoid staring into the infrared beam.

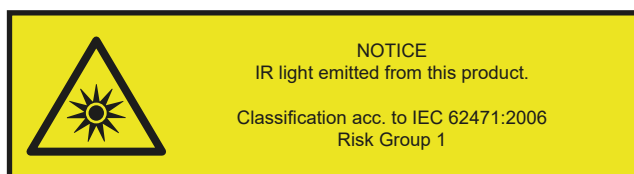


Fig. 1: Safety note regarding the illumination unit

Safety note E2M monitor**ATTENTION**

Permanent pixel errors

- ▷ Touching the display may result in permanent pixel errors.
- ▶ Do not touch the screen.

3 Intended use

The ZZ1103 O3M area surveillance set is an assistance system for area surveillance and collision warning. The set includes all devices and cables necessary for operation. The devices are pre-programmed and can be put into operation directly after installation and electrical connection to 12 V or 24 V on-board systems.

The ZZ1103 set can be used outdoors and indoors. The main application is active or static area surveillance of large vehicles and mobile machines. Objects detected in the hazardous area are signalled to the driver visually and acoustically. The following areas of a vehicle can be monitored:

- Front
- Rear
- Sides



The ZZ1103 O3M area surveillance set does not relieve the driver of his responsibility to operate the vehicle safely.



▷ **More information:** www.ifm.com and mobilevision@ifm.com

4 Items supplied

Number	Article number	Description	Photo
1	O3M271	Mobile 3D sensor with integrated 2D/3D overlay (pre-programmed). Angle of aperture 3D: 97°x44°.	
1	O3M970	IR illumination unit for O3M271.	
2	E3M102	Mounting bracket for 3D sensor and illumination unit, stainless steel, black.	
1	E3M120	MCI connection cable for 3D sensor and illumination unit.	

Number	Article number	Description	Photo
1	E3M133	Connection cable for illumination unit, length 10 m.	
1	E3M171	CAN adapter cable with integrated CAN terminating resistor (120 ohm), length 10 m. Connection and power supply of 3D sensor, CR0403 and CR0451.	
1	E3M172	Adapter cable for the connection of the buzzer and use of the output channels. The package contains additional connection cables for further output channels.	
1	80281057	Buzzer for 24 V for connection to CR0403. ► Use the buzzer 80281057 only with an operating voltage of 24 V.	
1	80303178	Buzzer for 12 V for connection to CR0403. ► Use the buzzer 80303178 only with an operating voltage of 12 V.	

Number	Article number	Description	Photo
1	CR0403	BasicController, programmable controller with multi-functional input and output channels (pre-programmed).	 A black rectangular electronic control unit with a terminal block at the top and a label with technical specifications and a CE mark.
1	EC0402	Cover for BasicController as protection against moisture and dust (IP54).	 A black plastic protective cover with a circular cutout in the center and a small orange label at the top.
1	CR0451	BasicDisplay, programmable graphic display with CAN connection (pre-programmed).	 A black square display unit with a monochrome screen and a control panel with four orange buttons and a central directional pad.
1	E2M231	7" TFT LCD monitor 12..32 V DC with LED back-light, 1 video input for display of the camera image.	 A black rectangular TFT LCD monitor with a cable connector on the side.
1	E2M239	Bracket for monitor E2M231.	 A black plastic mounting bracket with several screws and washers included for installation.

Number	Article number	Description	Photo
1	E2M203	Connection cable for analogue video signal, M16 connector to M16 socket, 5 m, black, PVC.	
1	E3M161	Analogue video adapter cable, M12 connector to M16 connector, for the connection of O3M271 to E2M203, 1 m, black.	

Tab. 1: Items supplied

5 Getting started

The chapter "Getting started" provides a brief description of the installation, the electrical connection and the set-up.



Fig. 2: The fully wired ZZ1103 set

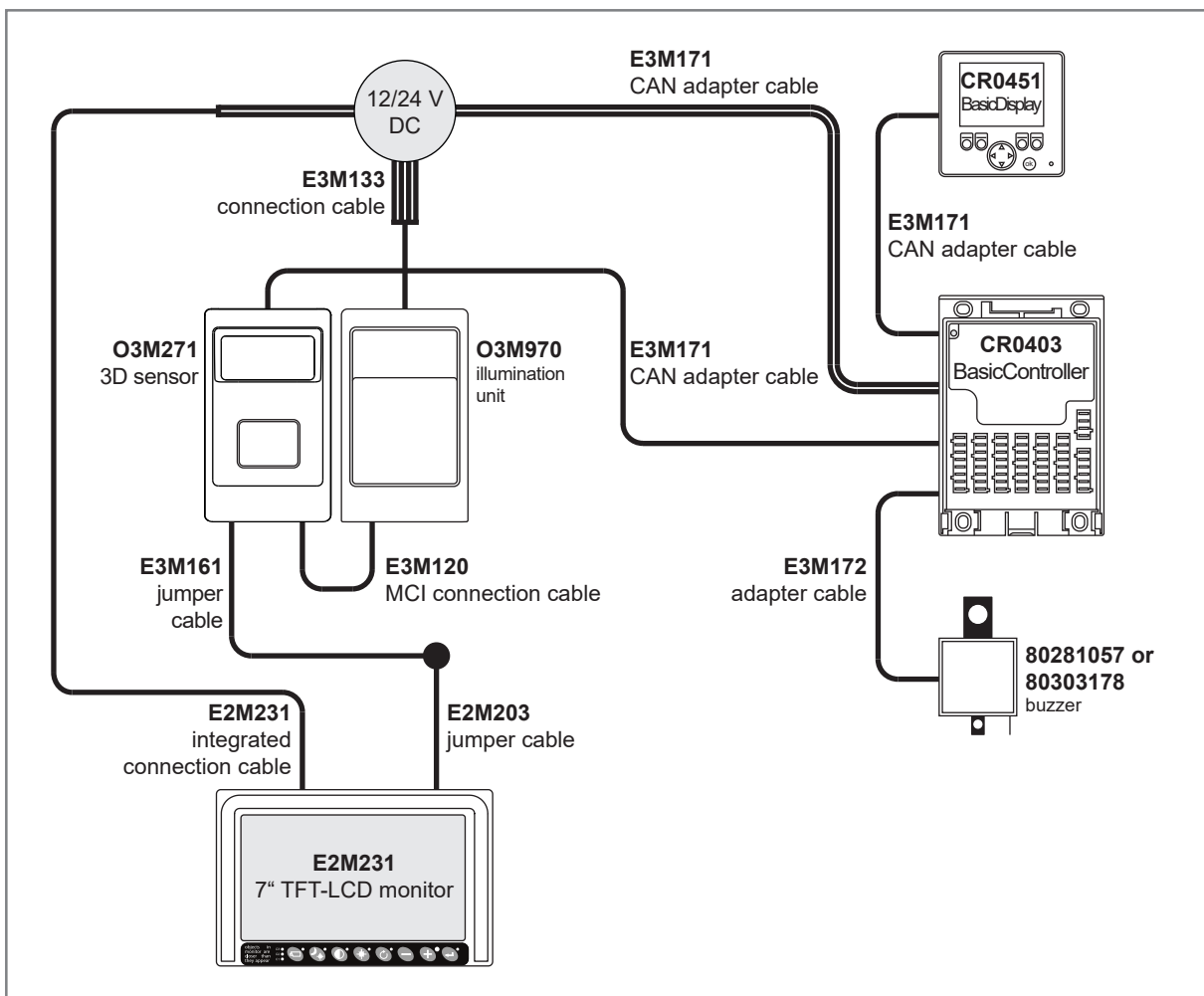


Fig. 3: Overview of the connected devices



► Depending on the operating voltage, use the buzzer for 12 V (80303178) or 24 V (80281057).

5.1 Mounting the 3D sensor and illumination unit

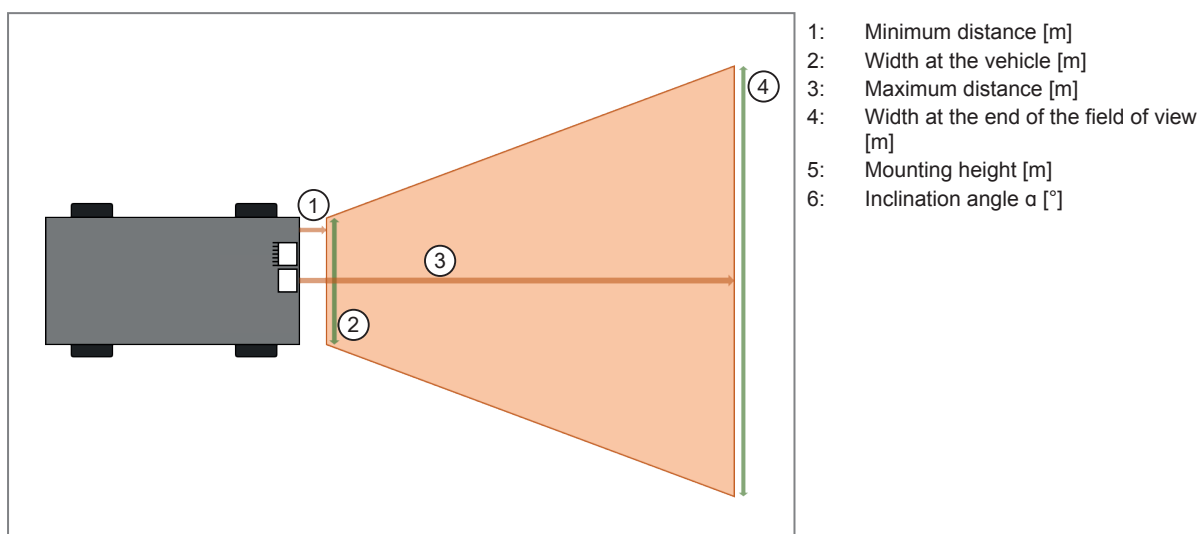


Fig. 4: Centrally mounted 3D sensor with representation of the 3D field of view

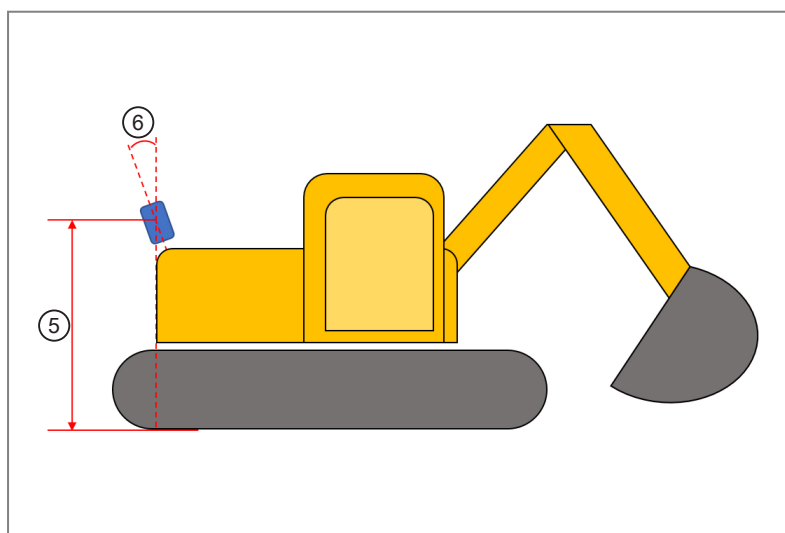


Fig. 5: 3D sensor with illumination unit mounted centrally on the rear of an excavator

Exemplary values

The table contains exemplary values for various mounting positions depending on the mounting location, taking into account a minimum distance A in front of the 3D sensor.

Mounting height [m]	Recommended inclination angle α [°]	Minimum distance [m]	Maximum distance [m]	Width at the vehicle 2D [m]	Width at the vehicle 3D [m]	Width at the end of the field of view 2D [m]	Width at the end of the field of view 3D [m]
1.6	19	0.5	7.0	8	2	63	16
2.0	33	0.5	6.5	11	3	59	15
2.2	38	0.5	5.1	13	3	47	12
2.4	41	0.5	4.6	14	4	44	11
2.6	44	0.5	4.4	16	4	42	11
2.8	47	0.5	4.4	17	4	43	11
3.0	49	0.5	4.4	19	5	43	11
4.0	55	0.5	4.9	28	7	52	13

Tab. 2: Exemplary values of different mounting positions



In the table, the width of the field of view at the vehicle is specified at a height of 1 m (minimum object height). At maximum distance, an object height of 0.7 m is assumed for the width of the field of view.

Central mounting

- Mount the 3D sensor as centrally as possible on a vehicle.

If central mounting of the 3D sensor is not possible:

- Use the zone definition to compensate for the deviation. (→ Zone definitions - expert settings □ 55)

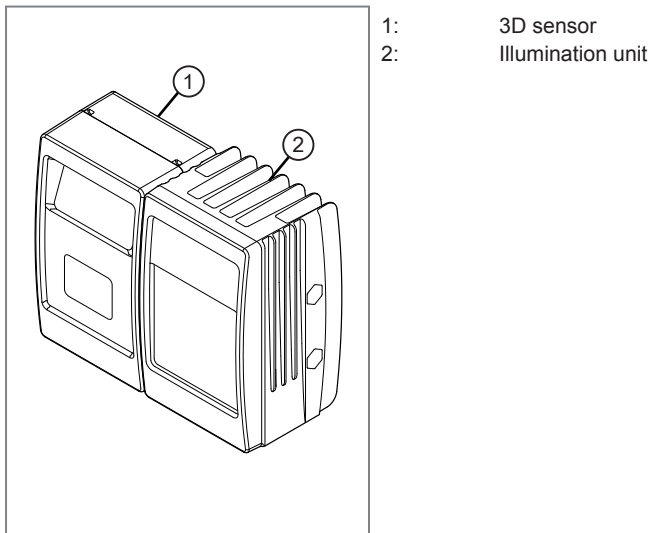


Fig. 6: 3D sensor and illumination unit mounted side by side

- Viewed from the front, mount the illumination unit (2) directly to the right of the 3D sensor (1).
 - ▷ If the illumination unit is mounted further away from the 3D sensor, the recognition rate of reflector objects will be reduced.
 - ▷ The mounting position of the 3D sensor and the illumination unit is selected so that the field of view and the measuring range of the 3D sensor cover the area to be monitored.

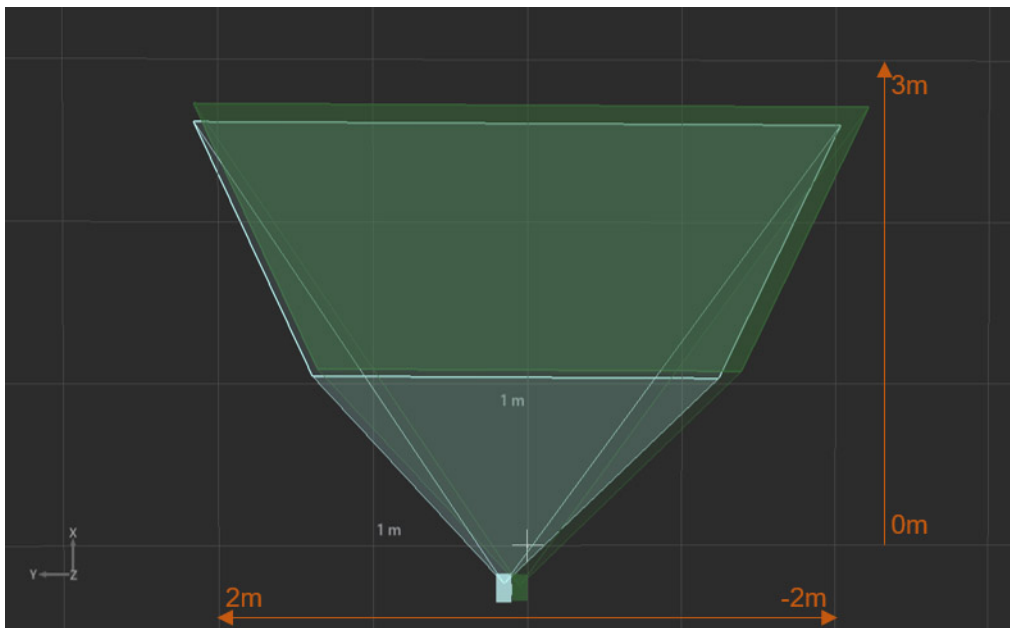


Fig. 7: 3D field of view of the 3D sensor at a height of 1.7 m and with an inclination angle of 45° .

Field of view and measuring range

Field of view and measuring range of the 3D sensor and illumination unit:

	3D image	2D image
Field of view	97° x 44°	155° x 122°
Measuring range	approx. 7 m	> 7 m

Tab. 3: Field of view and measuring range



The 2D image covers a larger measuring range than the 3D image.

5.2 Connection overview

The tables contain the electrical connections of the devices. The column "Connection" contains the connections of the devices. The column "Connection target" contains the target of the respective connection.



The devices are compatible with a 12 V and 24 V on-board system.

E3M171

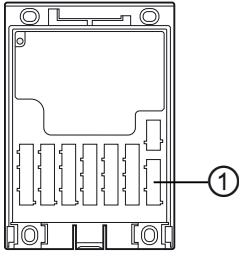
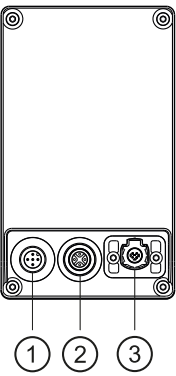
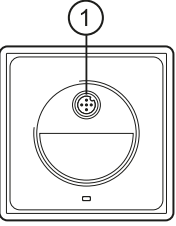
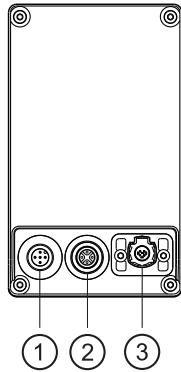
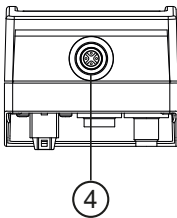
Photo	Connection	Connection target
	Terminal block	 Connect with CR0403 (1).
	M12 socket, long cable	 Connect with O3M271, M12 connector (1).
	M12 socket, short cable	 Connect with CR0451 (1).
	Wire, brown	Connect with U+ (8..32 V DC).

Photo	Connection	Connection target
	Wire, blue	Connect with GND.

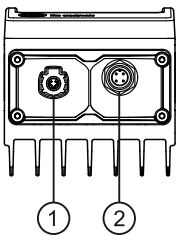
Tab. 4: E3M171 connections

O3M271

Photo	Rear	Bottom	Connection	Connection target
			(1) CAN bus / voltage supply	Connect with E3M171, long cable, M12.
			(2) Ethernet	Not used.
			(3) MCI	Connect with E3M120, angled.
			(4) Video output	Connect with E3M161.

Tab. 5: O3M271 connections

O3M970

Photo	Rear	Bottom	Connection	Connection target
			(1) MCI	Connect with E3M120, not angled.
			(2) Voltage supply	Connect with E3M133.

Tab. 6: O3M970 connections

E3M120

Photo	Connection	Connection target
	Angled	Connect with O3M271.
	Not angled	Connect with O3M970.

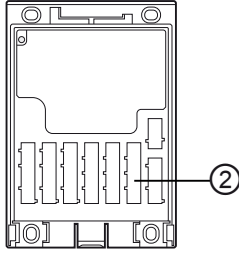
Tab. 7: E3M120 connections

E3M133

Photo	Connection	Connection target
	M12 socket	Connect with O3M970.
	Wires, brown	Connect with U+ (9..32 V DC).
	Wires, blue	Connect with GND.

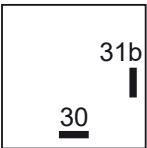
Tab. 8: E3M133 connections

E3M172

Photo	Connection	Connection target
	Terminal block	 Connect with CR0403 (2)
	Wire, white	Connect with 80281057, terminal 30.
	Wire, black	Connect with 80281057, terminal 31b.

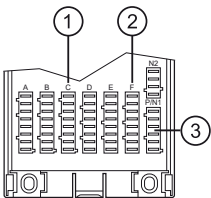
Tab. 9: E3M172 connections

80281057 and 80303178

Photo	Connection side	Connection	Connection target
		Terminal 30	Connect with E3M172, white.
		Terminal 31b	Connect with E3M172, black.

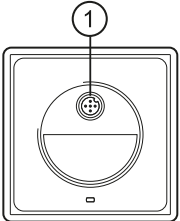
Tab. 10: 80281057 and 80303178 connections

CR0403

Photo	Connection side	Connection	Connection target
		(1) Inputs	<u>Optional connection.</u> Connect with IN011 (stand-by).
		(2) Outputs	Connect with E3M172.
		(3) Voltage supply / CAN	Connect with E3M171.

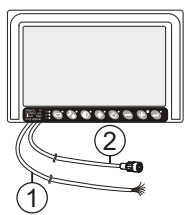
Tab. 11: CR0403 connections

CR0451

Photo	Connection side	Connection	Connection target
		(1) CAN	Connect with E3M171, short, M12.

Tab. 12: CR0451 connections

E3M231

Photo	Connection side	Connection	Connection target
		(1) Voltage supply, red	Connect with U+ (12...32 V DC).
		(1) Voltage supply, white	Connect with GND.
		(2) Video output	Connect with E2M203.

Tab. 13: E2M231 connections



Older versions of the device have a voltage range of 18...30 V DC (revision no. AA).

Current devices have a voltage range of 12...32 V DC (revision no. AB).

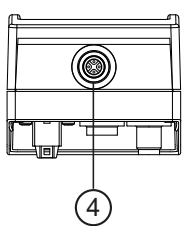
- Observe the voltage range on the type label.
- ▷ The type label indicates the voltage range of the device.

E2M203

Photo	Connection	Connection target
	M16 connector	Connect with E2M231, video input.
	M16 socket	Connect with E3M161, M16 connector.

Tab. 14: E2M203 connections

E3M161

Photo	Connection	Connection target
	M16 connector	Connect with E2M203, M16 socket.
	M12 connector	 Connect with O3M271, M12 socket (4).

Tab. 15: E3M161 connections

5.3 Area surveillance

The area surveillance is divided into 3 zones. The zones represent risk levels, with the [yellow zone] representing the lowest risk level and the [red zone] representing the highest risk level. The size of the zones can be adjusted for different vehicles and scenarios. The distance to the detected object determines the active zone:

- [Yellow zone]: risk level 1
- [Orange zone]: risk level 2
- [Red zone]: risk level 3

If an object is detected in a zone, this causes a change to:

- the output of the BasicController,
- the background and text colour of the BasicDisplay,
- the acoustic signal emitted (if a buzzer is connected).

Show settings wizard

Use the following key combination to return to the settings wizard from any menu:

- Press the 4 function keys simultaneously.

5.3.1 Start screen and operating status

Assignment of the function keys			
[Flag]	Select language	[Info]	Display device information
[Monitor]	Start monitoring mode	[Assist]	Start configuration wizard
[Back]	Show previous screen	[Expert]	Start expert settings

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

Start screen



The [start screen] is displayed when the system is started.

Fig. 8: [Start screen]

Operating status

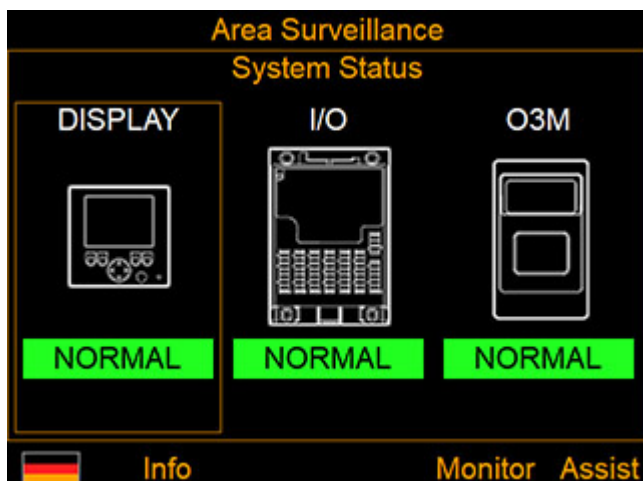


Fig. 9: [Operating status]

The [operating status] of the devices is displayed. Operating states (→ 61)



After power-on, it takes up to 30 s until all devices are ready for operation.

Device information

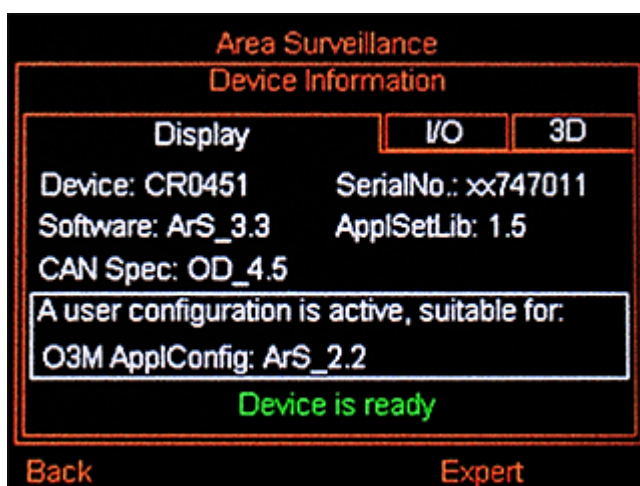


Fig. 10: [Device information]

[Device information] shows information about the individual devices of the set:

- Serial number
- Firmware and library versions
- [Operating status]

5.3.2 Calibration

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Save input and display next screen
[OK]	Start automatic calibration		
Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

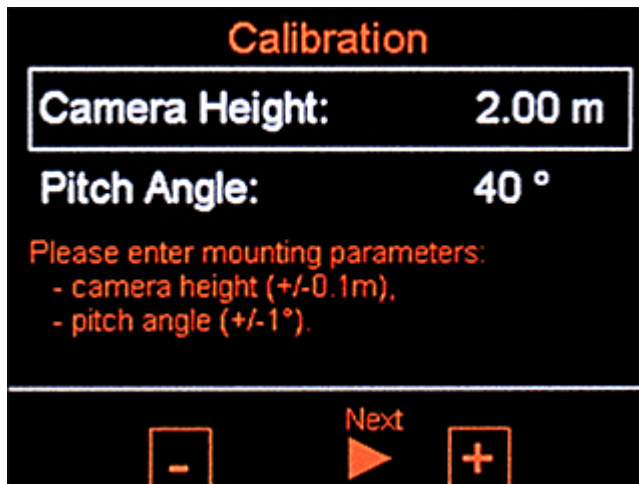


Fig. 11: Calibration

The 3D sensor must be calibrated before it can be used. The inclination angle and the height of the 3D sensor are required for [calibration]. Measuring the inclination angle and height of the 3D sensor (→ □ 28)

The [calibration] consists of 2 steps:

1. manual entry of the measured inclination angle and height of the 3D sensor,
2. [automatic calibration] (optional).

Automatic calibration

The [automatic calibration] is optional and optimises the manually entered values. The ground in the field of view is detected to determine the angle of inclination and the height.



For [automatic calibration], the 3D sensor must have a clear view of the ground (approx. 3 m wide and 3 m long).

[Automatic calibration] may take up to 80 s.



If the exact inclination angle and height of the 3D sensor are known, the [automatic calibration] can be skipped.

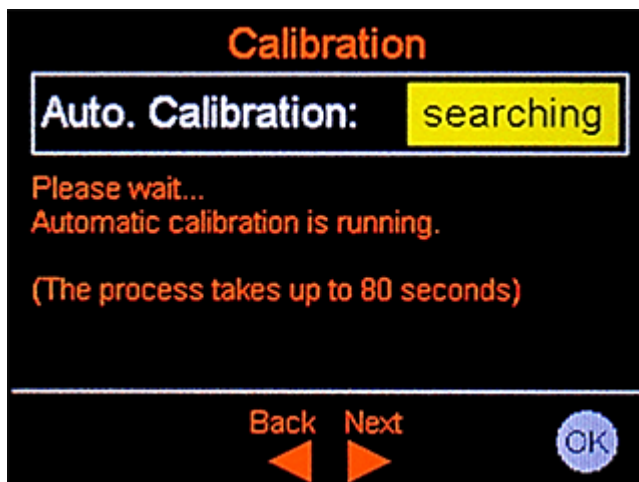


Fig. 12: Automatic calibration

[Auto. Calibration] displays the following information:

[searching]: The 3D sensor is calibrated.

[successful]: The 3D sensor has been calibrated successfully.

[not successful]: The 3D sensor has not been calibrated. [Automatic calibration] is not mandatory. The manually entered values can be used.

At the end of the [automatic calibration], the detected values are displayed for checking.

5.3.3 Zone definitions

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Save input and display next screen
Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

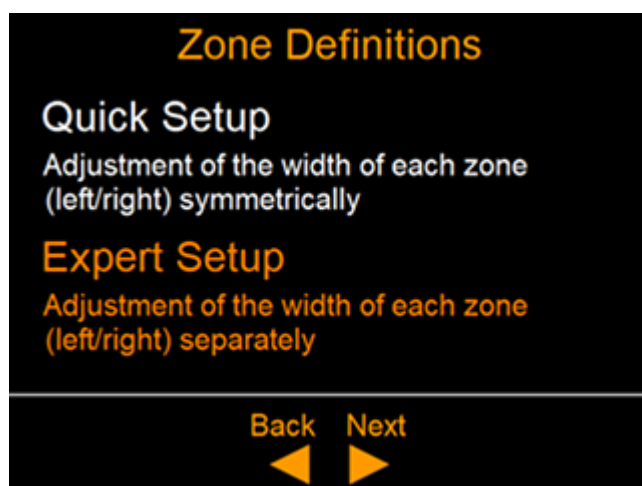


Fig. 13: [Zone definitions]

[Zone definitions] defines how the zone widths are set. Possible settings:

[Quick setup]: Adjusts the left and right areas of the zones symmetrically. (→ Zone definitions - default settings □ 21)



- Use the [Quick setup] if the 3D sensor is mounted centrally on the vehicle.

[Expert setup]: Adjusts the left and right areas of the zones separately. (→ Zone definitions - expert settings □ 55)



- Use the [Expert setup]

- if the 3D sensor is not mounted centrally on the vehicle,
- in case of an asymmetrical vehicle geometry.

5.3.4 Zone definitions - default settings

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Yellow zone]	Set the length and width of the [yellow zone].	[Orange zone]	Set the length and width of the [orange zone].
[Red zone]	Set the length and width of the [red zone].	[Blue zone]	Set the length and width of the [blue zone].
[-]	Decrease value	[+]	Increase value
[OK]	Confirm input	[Yes]	Save input
[No]	Don't save input		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

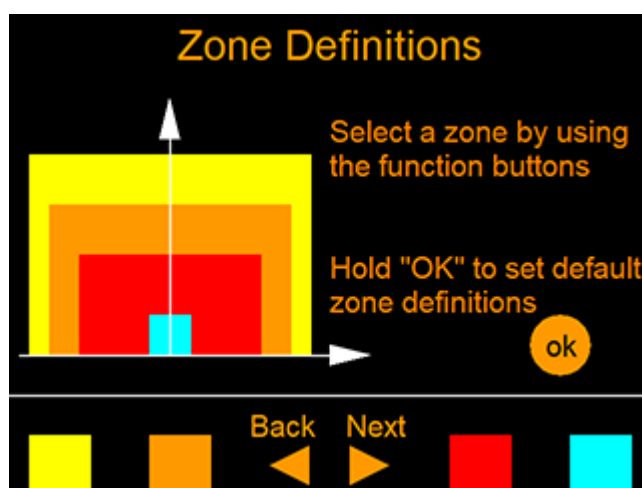


Fig. 14: [Zone definitions]

[Zone definitions] sets the width and length of the zones. The zones represent risk levels, with the [yellow zone] representing the lowest risk level and the [red zone] representing the highest risk level. With the default settings, the same value is set for the left and right areas of the zone.

In addition, choose what is to be recognised in the zones:

- reflectors only or
- reflectors and objects.

Within the [blue zone], objects and reflectors are ignored. This is particularly suitable for obstructions in the detection range of the 3D sensor.

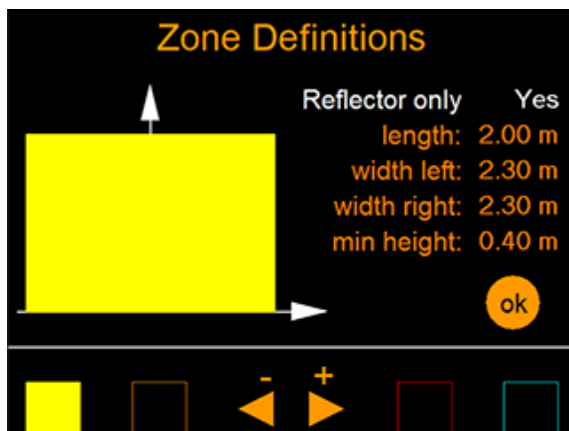


Fig. 15: [Yellow zone]

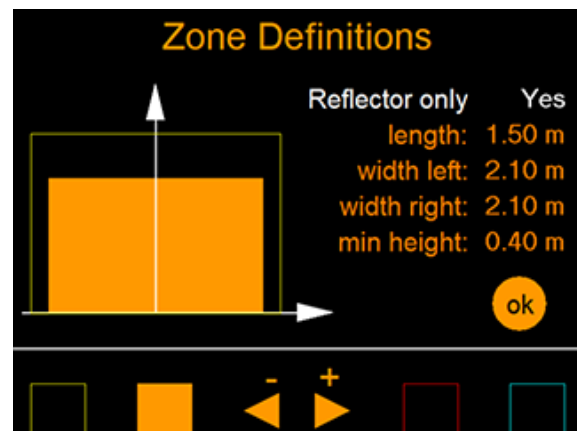


Fig. 16: [Orange zone]

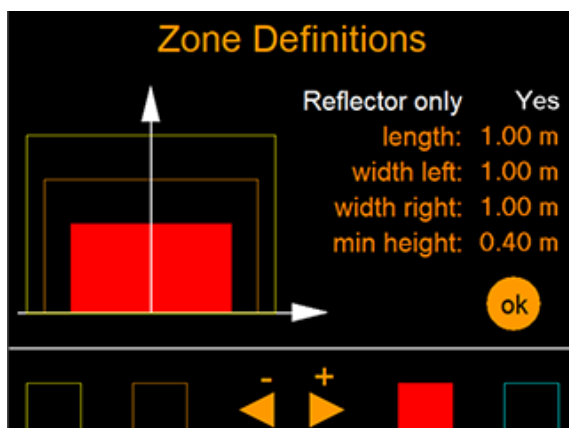


Fig. 17: [Red zone]

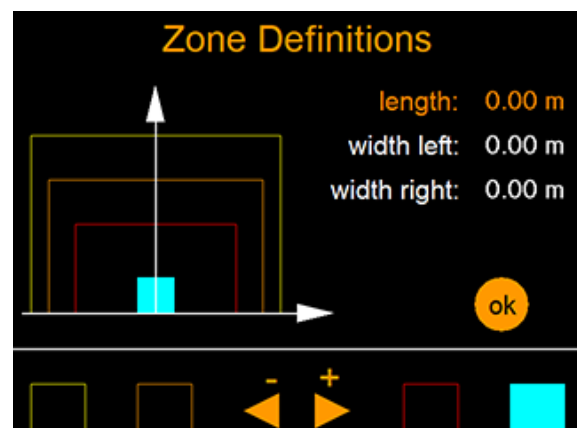


Fig. 18: [Blue zone]

Settings

[Reflectors only]:

- [Yes]: Only reflectors are detected.
For example, this setting is useful where persons with reflective vests must be detected. Normal objects are not recognised. This prevents false triggering, for example due to dust.
- [No]: Reflectors and normal objects are detected.



WARNING

Serious injury possible

If [Reflectors only] is activated:

- ▷ Persons and objects without reflectors are not recognised. No warning is displayed in the corresponding zone.
- ▷ Persons with reflectors (e.g. reflective vest) are not detected if only body parts without reflectors are visible to the 3D sensor.
- ▶ Only use the set as an assistance system and not for operator protection.



If [Reflectors only] is activated:

- ▶ Mount the 3D sensor and the illumination unit directly next to each other.
- ▷ The best way to mount the units side by side is with a threaded rod and u-shaped brackets. Suitable brackets are available as accessories: www.ifm.com

[Length]: Sets the length of the zone.

[Width left / right]: Adjusts the left and right width of the zone symmetrically. Adding the left and right areas gives the total width.

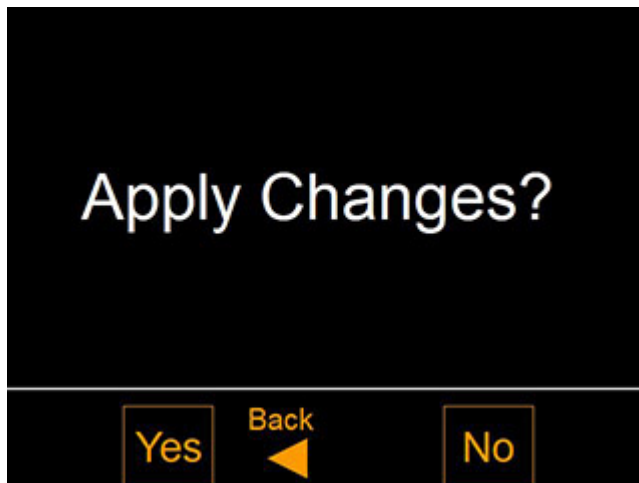
[Min. height]: Sets the minimum detection height of the zone. Objects below the minimum detection height are ignored. This reduces false triggering due to

- ramps,
- uneven ground,
- objects close to the ground.



For steep ramps, activate the setting [Reflectors only].

Saving and transferring the settings



The set values of the zones are saved and transferred to the 3D sensor.

Fig. 19: [Save changes]



Fig. 20: Set O3M parameters

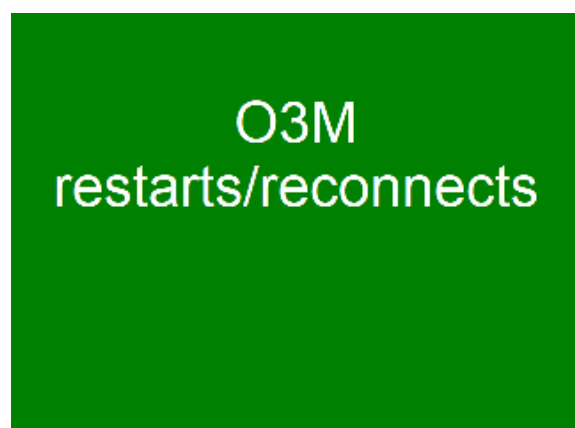


Fig. 21: Start and connect O3M



Fig. 22: O3M ready for operation



► During transmission, the 3D sensor is not available.

After the transmission, the system is restarted and the monitoring mode is displayed. (→ Monitoring mode □ 58)



If the buzzer beeps after restarting the 3D sensor:

- Press the 4 function keys simultaneously. (→ Operating and display elements □ 43)
- In the expert settings of the I/O module, set the volume of the acoustic warning signal to [Off]. Expert settings (→ □ 46)

6 Function

The devices included in the ZZ1103 set make up an assistance system that supports the surveillance of hazardous areas. A hazardous area can be, for example, the blind spot of mobile machines.

Mobile 3D smart sensor

The mobile 3D smart sensor is approved for operation on mobile machines. The mobile 3D smart sensor consists of an active 3D sensor with 1024 pixels, which provides 1024 distance values simultaneously. For this, the "time-of-flight" measurement principle is used.

CAN bus

All necessary signals are available via the CAN bus. The O3M271 3D sensor sends data via the CAN bus to the CR0403 BasicController and the CR0451 BasicDisplay.

Application package

The area surveillance application package included in the ZZ1103 set allows easy use of the above-mentioned technologies on mobile machines. No programming is required. The application package is configured via the setting help on the BasicDisplay. 3 warning zones are configured. Each warning zone can react independently to different objects and signals. If something is detected in a warning zone, the system provides warnings:

- acoustic signal via the buzzer,
- visual signal via the BasicDisplay,
- graphical representation in the live image of the E2M monitor.



Detailed information on the operating principle can be found in the operating instructions of the devices.

7 Installation

7.1 Mounting the BasicController

ATTENTION

Damaged BasicController and BasicDisplay

- ✓ The BasicController and the BasicDisplay can be damaged when installed in engines.
- Install the BasicController and the BasicDisplay in vehicle bodies.

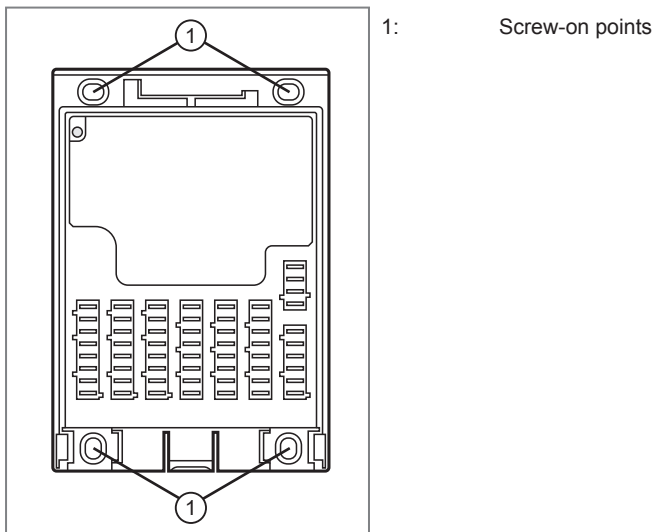


Fig. 23: Mounting the BasicController

- Mount the BasicController to a suitable surface using the screw-on points (1).

7.2 Mounting the 3D sensor and illumination unit

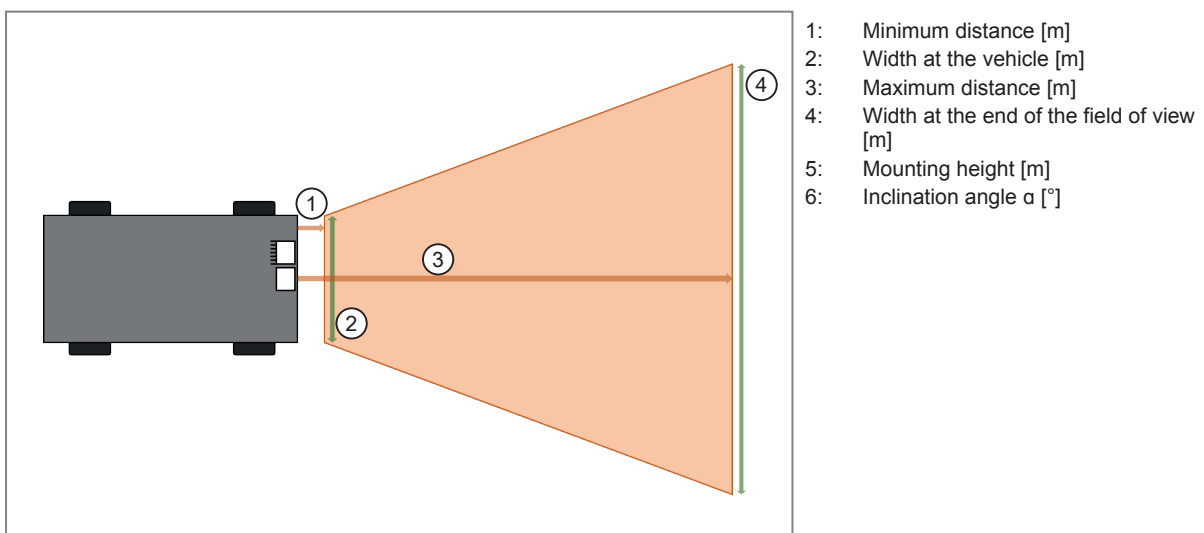


Fig. 24: Centrally mounted 3D sensor with representation of the 3D field of view

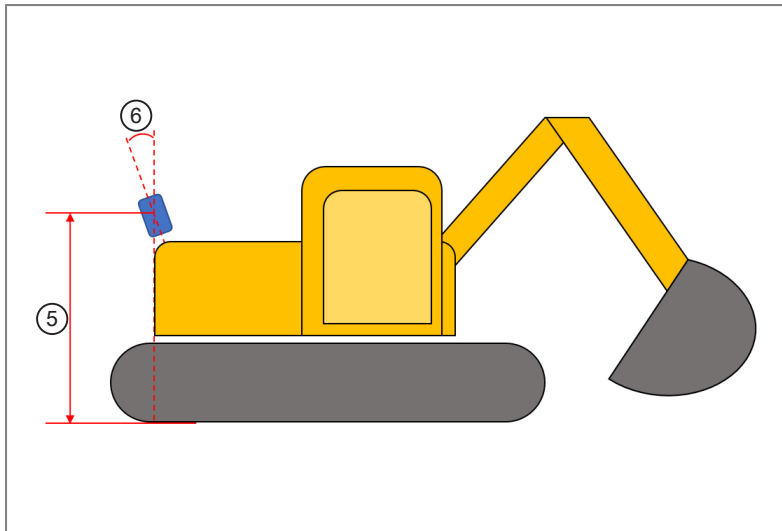


Fig. 25: 3D sensor with illumination unit mounted centrally on the rear of an excavator

Exemplary values

The table contains exemplary values for various mounting positions depending on the mounting location, taking into account a minimum distance A in front of the 3D sensor.

Mounting height [m]	Recommended inclination angle α [°]	Minimum distance [m]	Maximum distance [m]	Width at the vehicle 2D [m]	Width at the vehicle 3D [m]	Width at the end of the field of view 2D [m]	Width at the end of the field of view 3D [m]
1.6	19	0.5	7.0	8	2	63	16
2.0	33	0.5	6.5	11	3	59	15
2.2	38	0.5	5.1	13	3	47	12
2.4	41	0.5	4.6	14	4	44	11
2.6	44	0.5	4.4	16	4	42	11
2.8	47	0.5	4.4	17	4	43	11
3.0	49	0.5	4.4	19	5	43	11
4.0	55	0.5	4.9	28	7	52	13

Tab. 16: Exemplary values of different mounting positions



In the table, the width of the field of view at the vehicle is specified at a height of 1 m (minimum object height). At maximum distance, an object height of 0.7 m is assumed for the width of the field of view.

Central mounting

- Mount the 3D sensor as centrally as possible on a vehicle.

If central mounting of the 3D sensor is not possible:

- Use the zone definition to compensate for the deviation. (→ Zone definitions - expert settings □ 55)

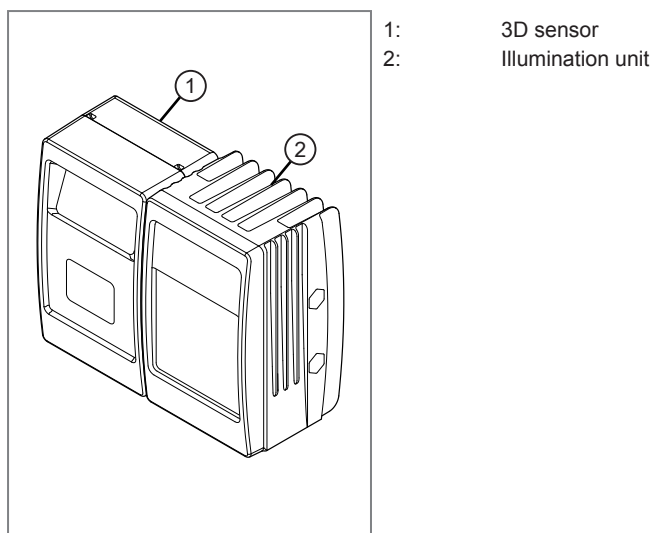


Fig. 26: 3D sensor and illumination unit mounted side by side

- Viewed from the front, mount the illumination unit (2) directly to the right of the 3D sensor (1).
 - ▷ If the illumination unit is mounted further away from the 3D sensor, the recognition rate of reflector objects will be reduced.
 - ▷ The mounting position of the 3D sensor and the illumination unit is selected so that the field of view and the measuring range of the 3D sensor cover the area to be monitored.

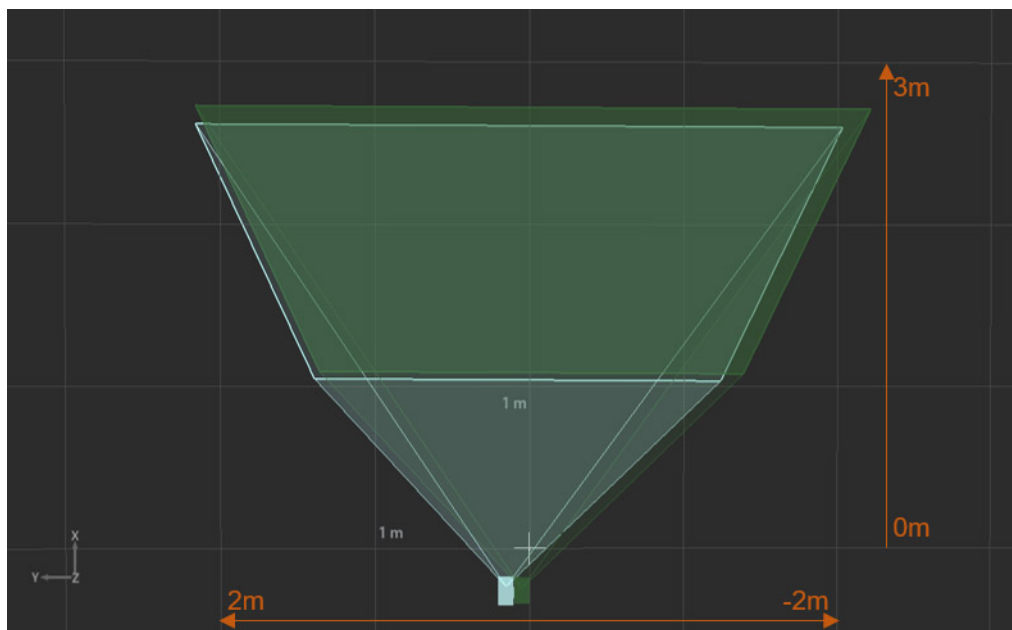


Fig. 27: 3D field of view of the 3D sensor at a height of 1.7 m and with an inclination angle of 45°.

Field of view and measuring range

Field of view and measuring range of the 3D sensor and illumination unit:

	3D image	2D image
Field of view	97° x 44°	155° x 122°
Measuring range	approx. 7 m	> 7 m

Tab. 17: Field of view and measuring range



The 2D image covers a larger measuring range than the 3D image.

7.3 Measuring the inclination angle and height of the 3D sensor

The 3D sensor must be calibrated before it can be used. The inclination angle and the height of the 3D sensor are required for calibration.

The inclination angle and the height refer to the world coordinate system. Both values are required for set-up. (→ Set-up □ 43)

Measuring the inclination angle with a smartphone



1: Joint of the housing parts of the 3D sensor

Fig. 28: Measuring the inclination angle with a smartphone

To measure the inclination angle “ α ” with a smartphone:

- Start an angle measurement app on the smartphone.
- Align the smartphone parallel to the joint of the housing parts (1).

Measuring the height via the reference socket



1: Reference socket in the housing of the 3D sensor

Fig. 29: Measuring the inclination angle via the reference socket

There is a reference socket (1) on the side of the 3D sensor. The height of the 3D sensor is measured via this reference socket.

- Measure the distance from the ground to the reference socket of the 3D sensor marked in red.

7.4 Example

The figure shows the 3D sensor mounted centrally on a vehicle with the illumination unit mounted directly next to it.

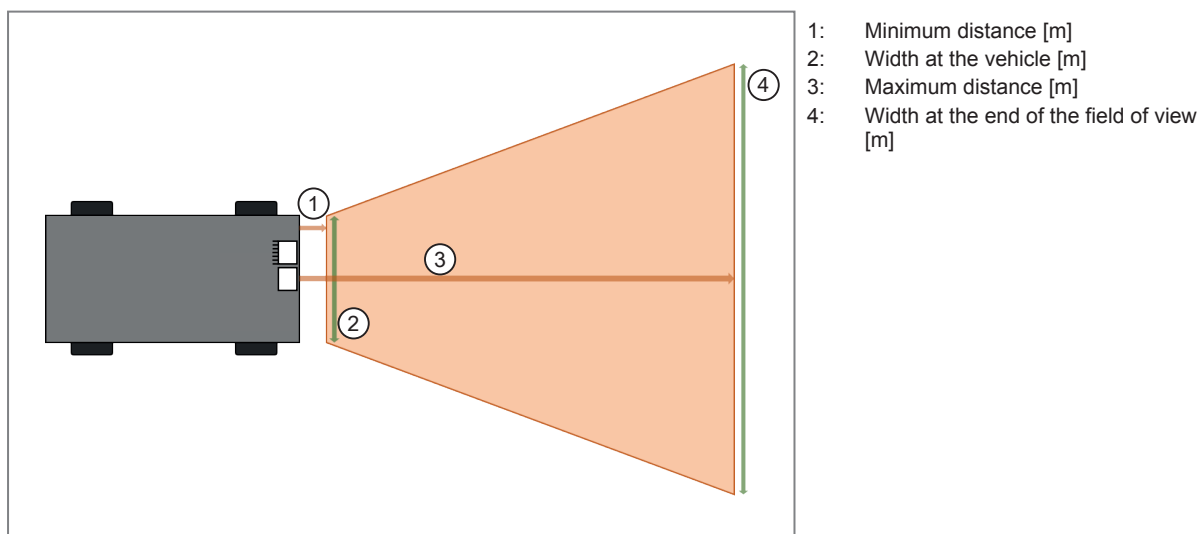


Fig. 30: 3D sensor mounted centrally on a vehicle with representation of the 3D field of view

The field of view points trapezoidally to the ground, with the following values:

- width of 3 m at the vehicle with a minimum distance of 0.5 m and
- width of 11 m at the end of the field of view at a maximum distance of 6.48 m.



The remaining blind zone behind the vehicle must be as small as possible.



The position of the ground to the coordinate system of the 3D sensor can be calibrated. This enables more accurate distance measurement, regardless of the mounting height and angle of inclination. (→ Configuration wizard 49)

8 Electrical connection

The unit must be connected by a qualified electrician.

► Disconnect power before connecting the unit.



Protection class III (PC III) unit (IEC 61010-2-201 chap. 6.5.2.101.4).

The electrical supply must

- be provided only by PELV circuits (IEC 61010-2-201 chap. 3.111),
- not exceed 35 V DC during operation,
- not exceed 60 V DC in the event of a single fault and
- not exceed the permitted operating voltage of the device (see data sheet).

The separation of external circuits must comply with IEC 61010-2-201, Figure 102.

ATTENTION

No suitable energy limitation of the circuit

▷ Fire hazard in case of a malfunction.

► Use energy-limited circuit according to IEC 61010-1 chap. 9.4.

Die Energie des Stromkreises kann durch eine Überstromschutzeinrichtung begrenzt werden:

Designation	Voltage	Nominal value fuse	Tripping characteristics
VBB	9....16 V DC	5 A	$T_{\text{fuse}} \leq 120 \text{ s}$ at max. 10 A
VBB	16....32 V DC	3 A	$T_{\text{fuse}} \leq 120 \text{ s}$ at max. 6.25 A

Observe the specific tripping characteristic. Possible overcurrent protection devices:

- fuse or
- - non-adjustable and non-self-reclosing electromechanical device.

For the correct rating of the overcurrent protection device take the technical data of the device and wiring into account. Separate the circuit from other, non-energy-limited circuits by at least basic insulation.

ATTENTION

- ▶ For cable lengths > 30 m use an additional protection against surge voltages to IEC 61000-4-5.

ATTENTION

Beschädigtes Gerät durch Potentialunterschied

- ▷ Wenn die Geräte unterschiedliche Massepotentiale verwenden, kann ein Ausgleichsstrom über den analogen Videoausgang fließen (Video-GND). Die Geräte können beschädigt werden. Die Videoqualität kann sich verschlechtern.
- ▶ Für den 3D-Sensor und die Anzeigeeinheit dieselbe Stromversorgung verwenden.
- ▶ Für die Geräte ausreichend dimensionierte Kabel verwenden.

ATTENTION

The unit can be damaged by insufficiently tightened M12 connectors.

- ▷ The IP rating indicated in the data sheet is only guaranteed if the M12 connectors are firmly screwed.
- ▶ Firmly screw the M12 connectors to the unit.
- ▶ Cover the unused sockets with the pre-mounted protective caps. Tightening torque: 0.6...0.8Nm.
 - ▷ Die Verschlusskappe für die Ethernet-Buchse des Sensors kann nachbestellt werden: article number ZJF051.
- ▶ Use strain reliefs for cables connected to the unit.



The devices can be connected to 12 V or 24 V on-board systems.



Information about available accessories at www.ifm.com



Fig. 31: The fully wired ZZ1103 set

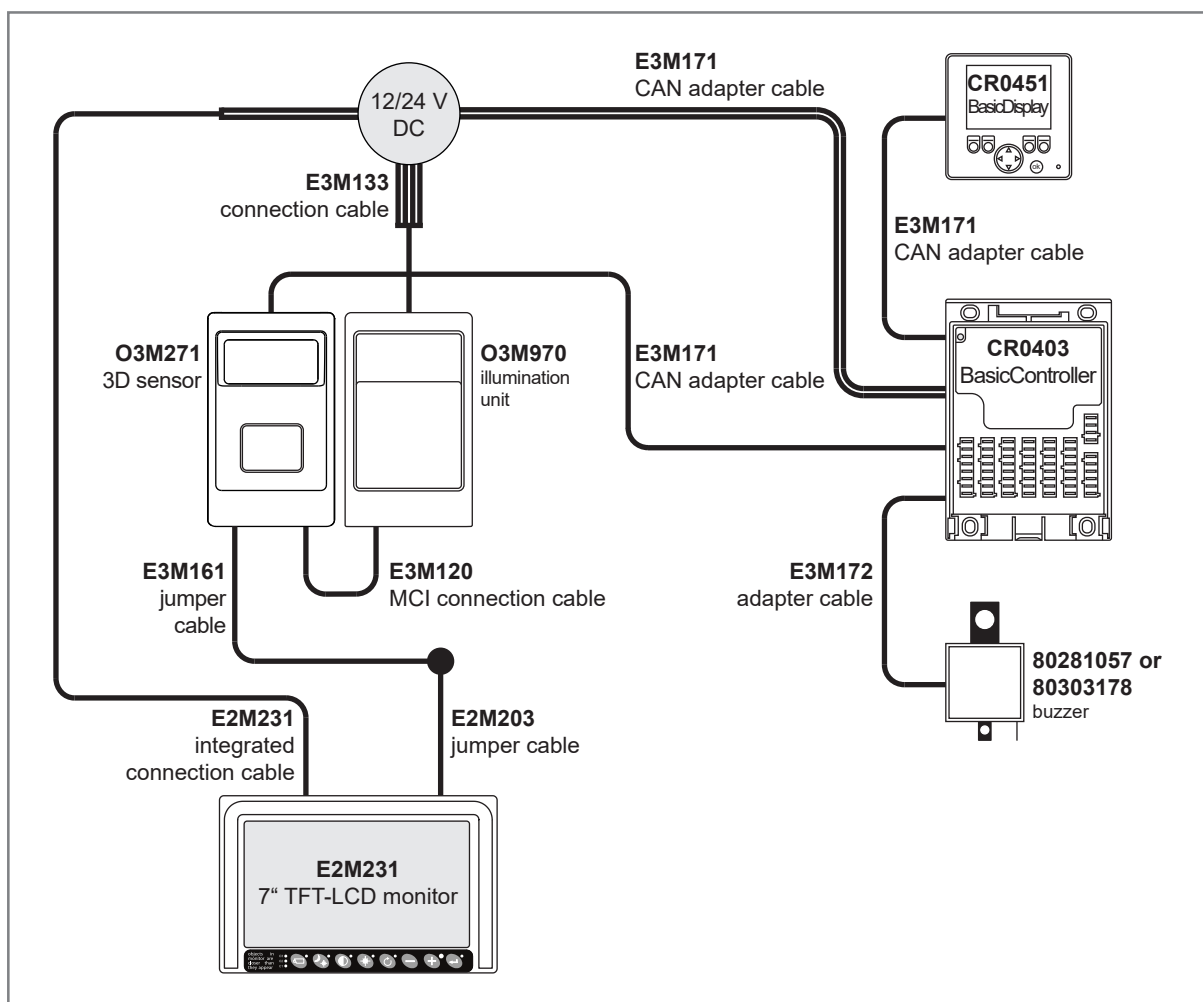


Fig. 32: Overview of the connected devices



▷ Depending on the operating voltage, use the buzzer for 12 V (80303178) or 24 V (80281057).

8.1 Wiring 3D sensor

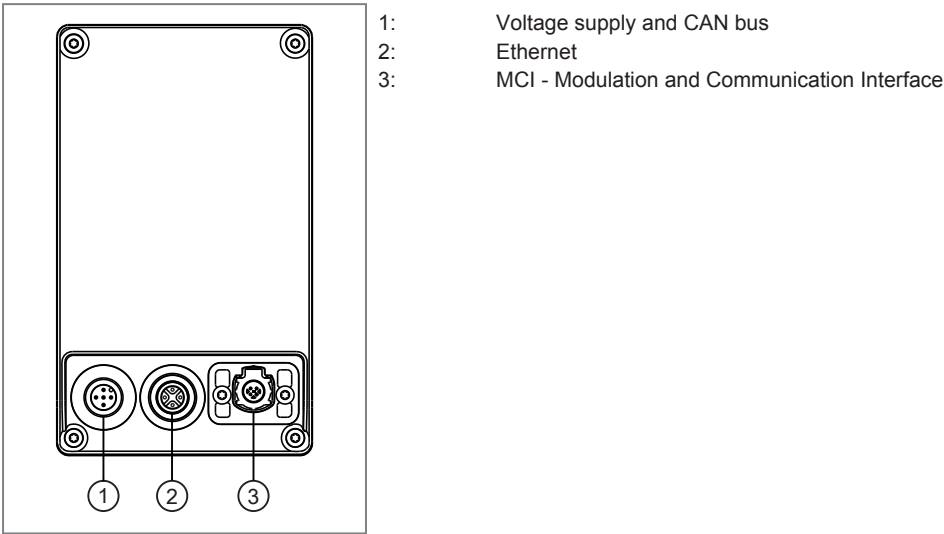


Fig. 33: Wiring 3D sensor, back

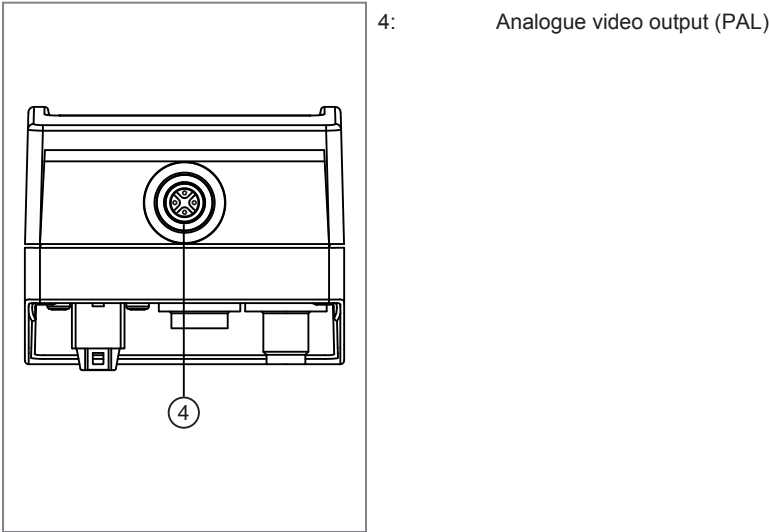


Fig. 34: Wiring 3D sensor, bottom

Voltage supply and CAN bus
M12 connector, A-coded, 5 poles

	Pin	Wiring
	1	Shield
	2	9..32 V DC
	3	GND
	4	CAN High
	5	CAN Low

Ethernet

M12 socket, D-coded, 4 poles

	Pin	Wiring
	1	TD+
	2	RD+
	3	TD-
	4	RD-
	5	Not used

MCI - Modulation and Communication Interface

Connection sensor – illumination unit

Analogue video output (PAL)

M12 socket, A-coded, 5 poles

	Pin	Wiring
	1	Shield
	2	Not used
	3	GND
	4	FBAS (video)
	5	Not used

8.2 Wiring illumination unit

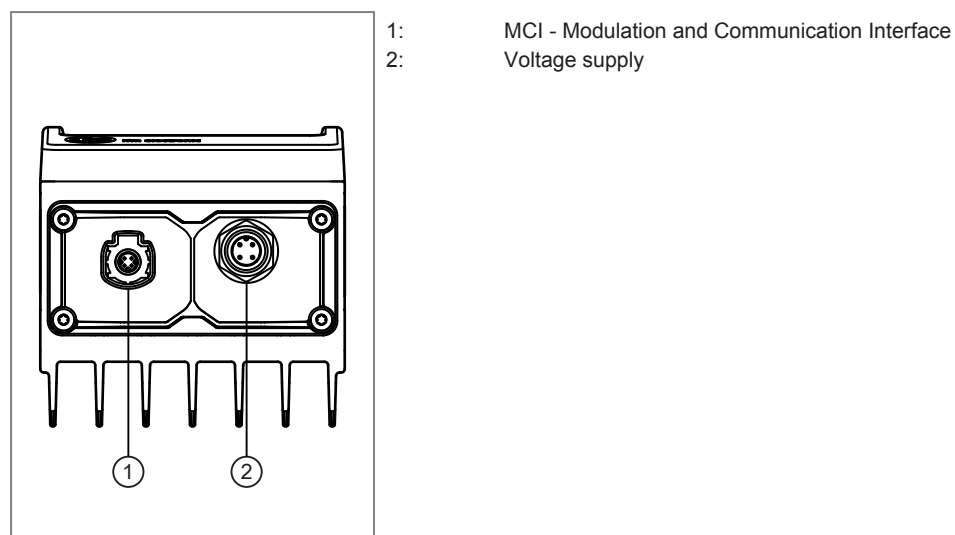


Fig. 35: Wiring illumination unit, bottom

MCI - Modulation and Communication Interface

Connection sensor – illumination unit



Only use original ifm cables:

▷ E3M120, E3M121, E3M122, E3M123, E3M124

Voltage supply

M12 connector, A-coded, 4 poles

	Pin	Wiring
	1	GND
	2	9..32 V DC
	3	9..32 V DC
	4	GND

8.3 Wiring BasicController

The supply cables, CAN interfaces, input and outputs are connected via 6.3 x 0.8 mm blade male terminals on the front of the BasicController.



The BasicController contains the application-specific area surveillance configuration. Depending on the configuration, only certain inputs are available.



The outputs of the BasicController (blocks D, E and F) can be used as input signals for engine controllers or similar. Block F is reserved.

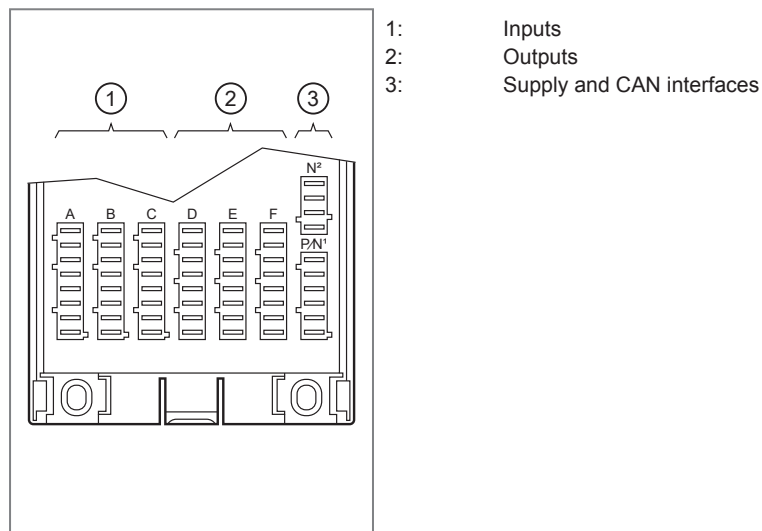


Fig. 36: Wiring BasicController

Block	Type	Name	Description	Number of poles
A	Input	IN0...3	Reserved. Do not use.	8
B		IN4...7	Reserved. Do not use.	
C		IN8...10	Reserved. Do not use.	
		IN11	High: system in standby. Low: system active. The behaviour of the input is adjustable. (→ Expert settings ▢ 46)	
D	Output	OUT0 binary	High: system available, low: system not available	
		OUT1 binary	High: object in red zone	
		OUT2 binary	High: object in orange zone	
		OUT3 binary	High: object in yellow zone	
E		OUT4 binary	High: object in red, orange or yellow zone	
		OUT5 binary	-	
		OUT6 binary		

Block	Type	Name	Description	Number of poles
E	Output	OUT7 binary	Connection for optical signal transmitter: • permanently on: red zone • flashing frequency high: orange zone • flashing frequency low: yellow zone	8
F		OUT8, analogue	0-100: The distance to the next object is indicated in %. 100% corresponds to 10 m.	
		OUT9, binary	Buzzer: • continuous tone: red zone • tone frequency high: orange zone • tone frequency low: yellow zone The volume can be adjusted. (→ Expert settings 46)	
		OUT10, binary	High: sensor pane dirty. Low: sensor pane clean.	
		OUT11, binary	High: normal operating mode. Low: error state.	
P/N1	CAN interface 1 and supply			6
N2	CAN interface 2			4

Tab. 18: Wiring BasicController

8.4 E2M monitor wiring

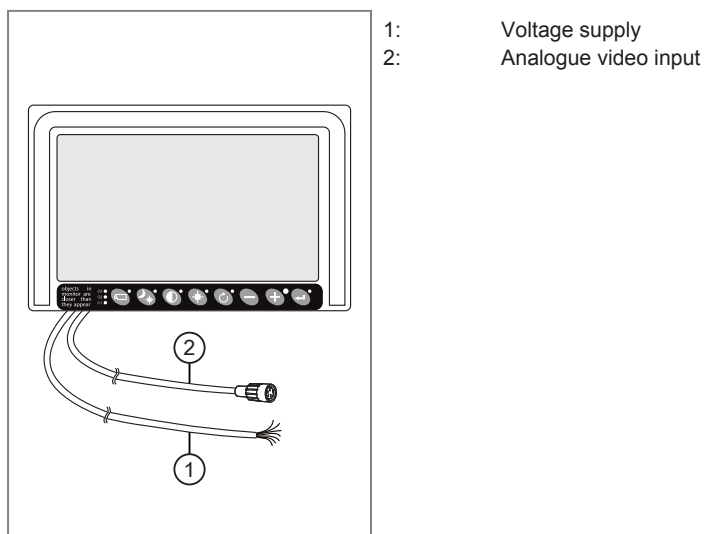


Fig. 37: E2M monitor wiring

Voltage supply

7 wires, open ends

Wire	Wiring
Red	9..32 V DC
White	GND

ATTENTION**Malfunction**

The wires that are not needed may cause the E2M monitor to malfunction.

Only the red (U+) and white (GND) wires are required.

- Insulate the blue, brown, white/yellow, grey and yellow wires.

ATTENTION

The E2M monitor and the 3D sensor could be damaged if separate grounds are used.

- Connect the grounds (GND) of the E2M monitor and the 3D sensor.



Older versions of the device have a voltage range of 18...30 V DC (revision no. AA).

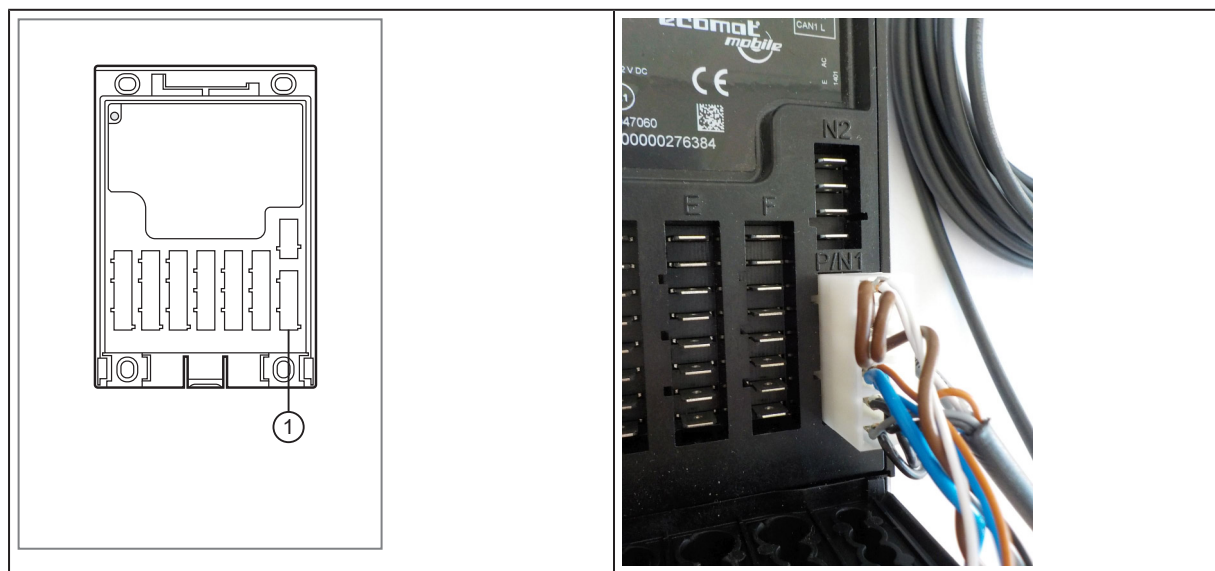
Current devices have a voltage range of 12...32 V DC (revision no. AB).

- Observe the voltage range on the type label of the device.

Analogue video input

M16 socket, 4 poles

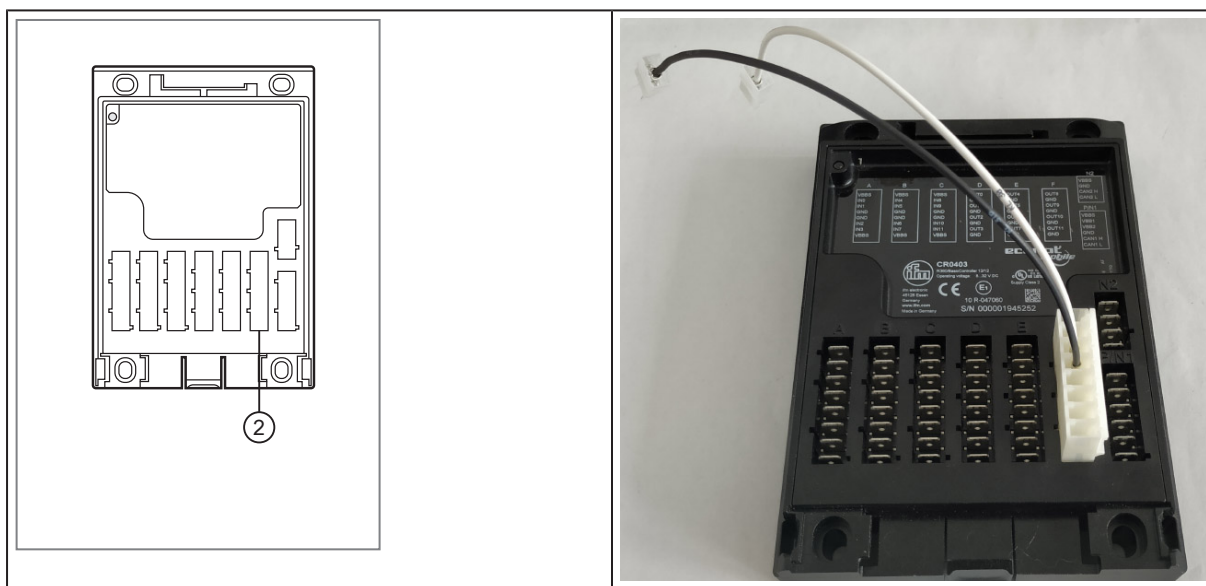
	Pin	Wiring
	1	Coax cable core (video signal)
	2	Coax screen (video GND)
	3	12 V DC
	4	GND

8.5 Connecting the BasicController to the BasicDisplay**CAN adapter cable**

1: P/N1

- Connect the E3M171 CAN adapter cable to "P/N1".

Cable for the buzzer



2: Block F

► Connect the cable for the buzzer (E3M172) to “Block F”.

▷ The cable for the buzzer (E3M172) is only required if the buzzer is used.

Buzzer



30: Terminal for white cable of E3M172.

31b: Terminal for black cable of E3M172.

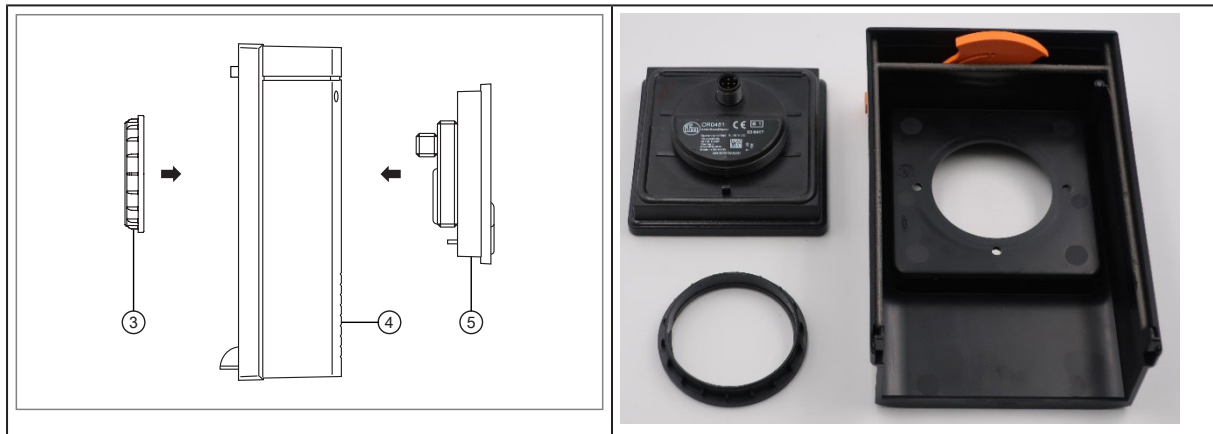
► Connect the white wire of E3M172 to terminal 30 of the buzzer.

► Connect the black wire of E3M172 to terminal 31b of the buzzer.



Depending on the operating voltage, use the buzzer for 12 V or 24 V.

Mounting the BasicDisplay

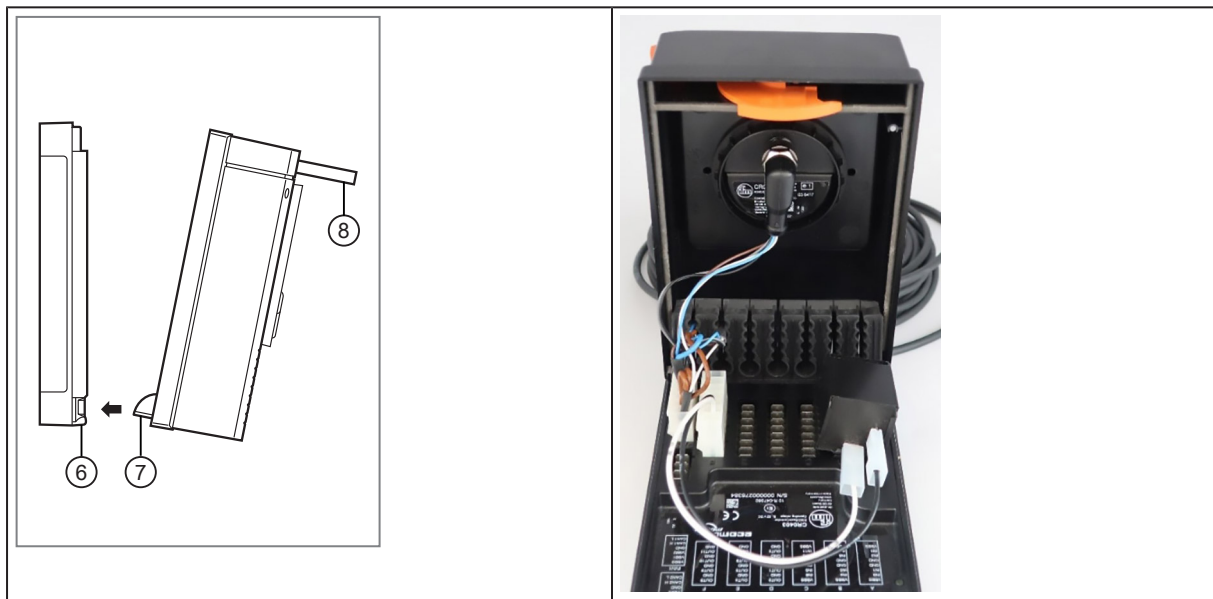


3: M52 nut
5: BasicDisplay

4: Display recess

- ▶ Remove the M52 nut from the BasicDisplay.
- ▶ Place the BasicDisplay into the cover with built-in display recess.
 - ▷ The BasicDisplay is not flush with the cover.
- ▶ Screw the M52 nut onto the BasicDisplay until it is hand-tight.
- ▶ Connect the M12 socket of the short side of the E3M171 CAN adapter cable to the M12 connector of the BasicDisplay.

Mounting the cover



6: Insertion slots
8: Locking lever

7: Cover guides

- ▶ Pull out the locking lever of the cover and rotate it towards you.
- ▶ Feed the remaining lines of the E3M171 CAN adapter cable through the rubber lip of the cover to the outside.
- ▶ Insert the cover guides into the insertion slots of the BasicController.
- ▶ Place the buzzer inside the cover or outside the cover using extension leads.



When placing the buzzer inside the cover:

- ▶ Place the buzzer so that the contacts of the BasicController are not short-circuited.

- ▶ Lay all supply and signal cables separately.
- ▶ Lay supply and signal cables away from the device using the shortest possible route.
- ▶ The cables must be provided with a strain relief at least 10 cm behind the cable entry.



9: Cover guides

- ▶ Tilt the cover onto the BasicController.
- ▷ The cover guides and slots serve as a pivot point.



10: Locking lever

- ▶ Move the locking lever back into its initial position.
- ▷ The cover is locked.

8.6 Connecting the 3D sensor to the illumination unit

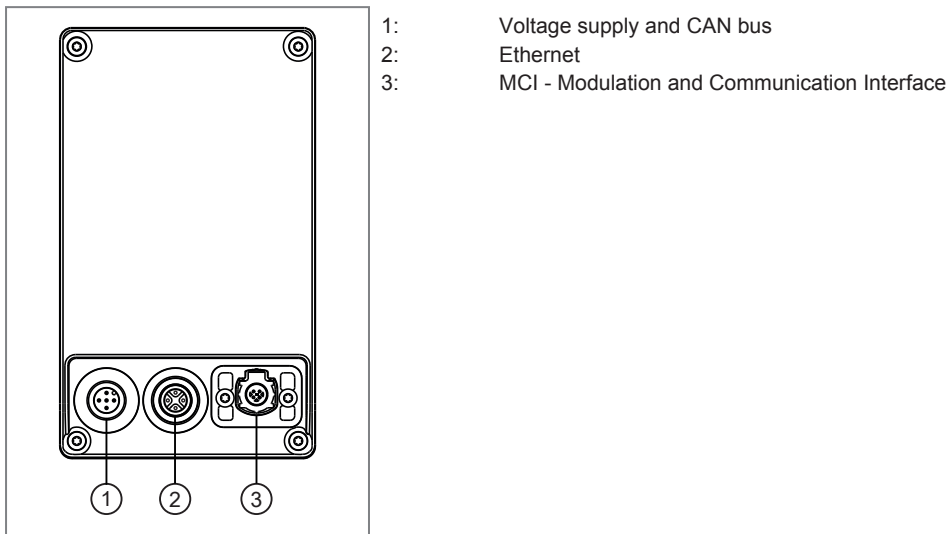


Fig. 38: Wiring 3D sensor, back

- ▶ Connect the M12 socket of the long side of the E3M171 CAN adapter cable to the M12 connector of the 3D sensor (1).
- ▶ Connect the blue and brown wires of the E3M171 CAN adapter cable to a power supply: blue: GND, brown: L+ (9..32 V DC).
 - ▷ The BasicDisplay, the BasicController and the 3D sensor are supplied with voltage via the E3M171 CAN adapter cable.
- ▶ Cover the Ethernet socket (2) with the pre-mounted protective cap if it is not needed in order to maintain the IP protection rating.
 - ▷ Tightening torque of the protective cap: 0.8 Nm.
- ▶ Connect the E3M120 MCI connection cable to the MCI connector (3) of the 3D sensor.

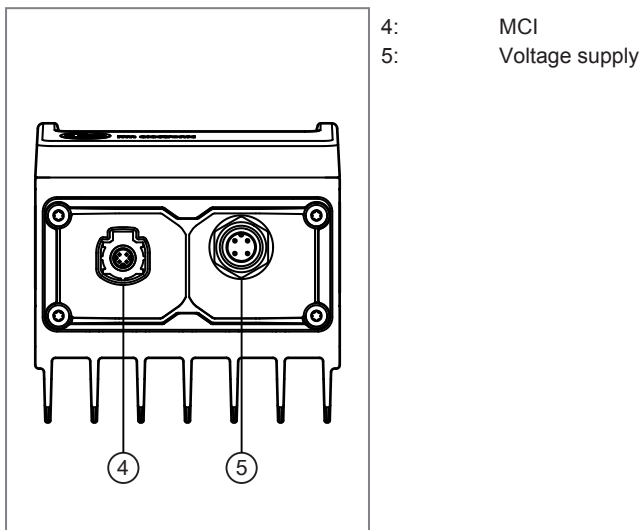


Fig. 39: Connections of the illumination unit

- ▶ Connect the E3M120 MCI connection cable to the MCI connector (4) of the illumination unit.
- ▶ Connect the M12 socket of the E3M133 connection cable to the M12 connector of the illumination unit (5).
- ▶ Connect the 4 wires of the E3M133 connection cable to a voltage supply: blue: GND, brown: L+ (9..32 V DC).

8.7 Connecting the E2M monitor

ATTENTION

The E2M monitor and the 3D sensor could be damaged if separate grounds are used.

▷ Connect the grounds (GND) of the E2M monitor and the 3D sensor.

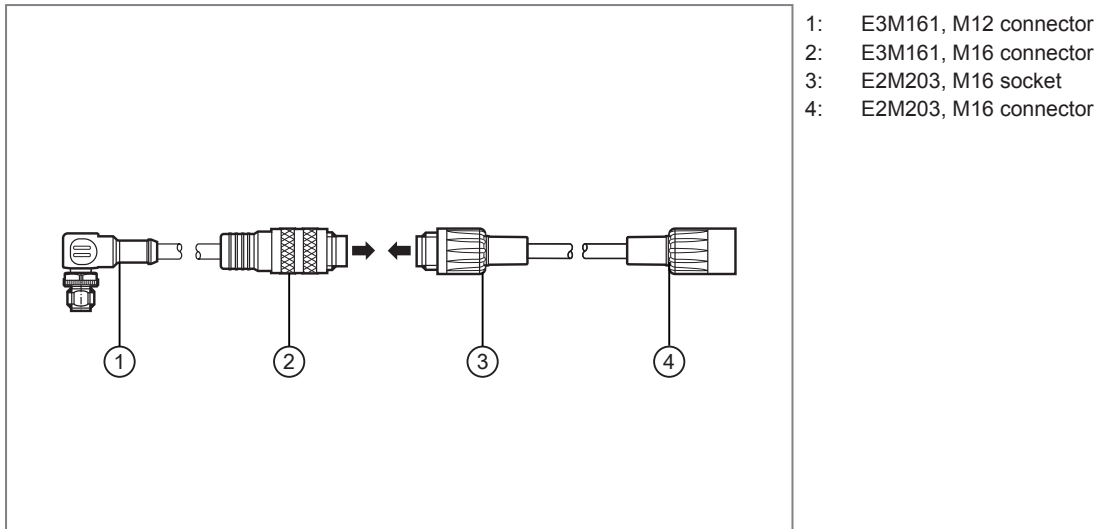


Fig. 40: E3M161 video adapter cable and E2M203 connection cable

► Connect the M16 connector (2) of the E3M161 video adapter cable to the M16 socket (3) of the E2M203 connection cable.

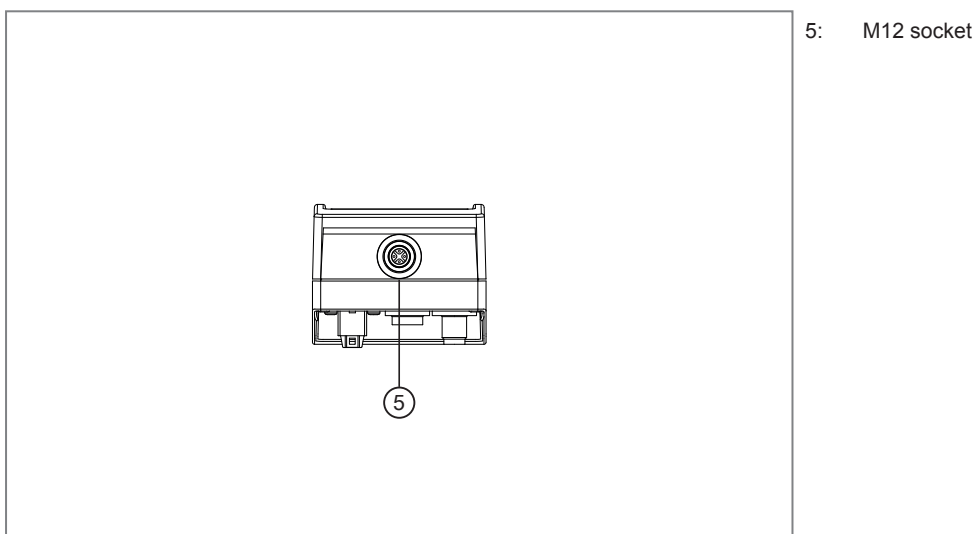


Fig. 41: Bottom of the 3D sensor

► Connect the M12 connector (1) of the E3M161 video adapter cable to the M12 socket (5) on the bottom of the 3D sensor.

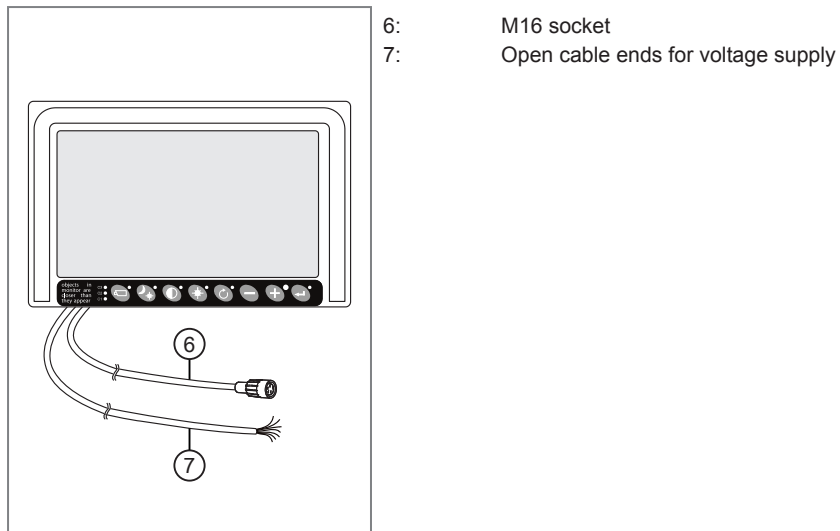


Fig. 42: Connections of the E2M monitor

- ▶ Connect the M16 connector (4) of the E3M203 connection cable to the M16 socket (6) of the E2M monitor.
- ▶ Connect the red and white wires (7) of the E2M monitor to a voltage supply: white: GND, red: U+ (12...32 V DC).
- ▶ Connect the grounds (GND) of the 3D sensor and the E2M monitor.

9 Operating and display elements

If an object is detected within the monitored area:

- The output of the BasicController changes depending on the distance to the detected object.
- The background and text colours of the BasicDisplay change.
- An acoustic signal is emitted if the buzzer is connected.

BasicDisplay

The area surveillance settings are made via the keypad of the BasicDisplay.

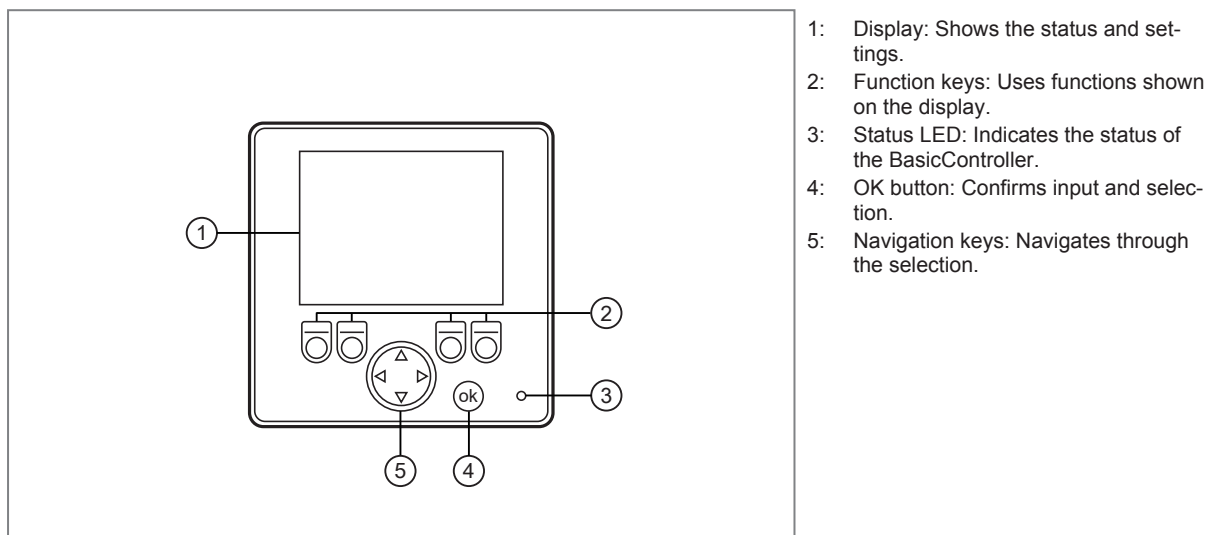


Fig. 43: Display and operating elements of the BasicDisplay

Buzzer

Depending on the zone in which an object was detected, an acoustic signal is emitted.



If the buzzer beeps after restarting the 3D sensor:

- Press the 4 function keys simultaneously. (→ Operating and display elements □ 43)
- In the expert settings of the I/O module, set the volume of the acoustic warning signal to [Off]. (→ Expert settings □ 46)



The buzzer is optional. (→ Connecting the BasicController to the BasicDisplay □ 36)

10 Set-up

Prior to set-up, the area surveillance is set via the BasicDisplay. (→ Configuration wizard □ 49)

The following parameters are required for set-up:

- inclination angle of the 3D sensor
- height of the 3D sensor (→ Measuring the inclination angle and height of the 3D sensor □ 28)
- width of the vehicle incl. tolerance

When the set-up has been completed, the monitoring mode is activated and the system is ready for operation. (→ Monitoring mode □ 58)



Fehlermeldungen beim Parametrieren des 3D-Sensors

- ▶ Der 3D-Sensor O3M1xx/2xx muss für die Parametrierung mit der Beleuchtungseinheit O3M9xx verbunden sein. Ist der 3D-Sensor nicht mit der Beleuchtungseinheit verbunden, wird die Parametrierung mit Fehlermeldungen abgebrochen.
- ▶ Den 3D-Sensor nur zusammen mit der Beleuchtungseinheit verwenden.



After set-up, carry out a function test:

- ▶ Drive towards an object at typical speed and check the reaction of the system.

10.1 Area surveillance

The area surveillance is divided into 3 zones. The zones represent risk levels, with the [yellow zone] representing the lowest risk level and the [red zone] representing the highest risk level. The size of the zones can be adjusted for different vehicles and scenarios. The distance to the detected object determines the active zone:

- [Yellow zone]: risk level 1
- [Orange zone]: risk level 2
- [Red zone]: risk level 3

If an object is detected in a zone, this causes a change to:

- the output of the BasicController,
- the background and text colour of the BasicDisplay,
- the acoustic signal emitted (if a buzzer is connected).



If an object is in more than 1 zone, the closest risk level is displayed.

Readjusting the zones

To readjust the 3 zones:

- ▶ Press the 4 function keys simultaneously. (→ Operating and display elements □ 43)

Show settings wizard

Use the following key combination to return to the settings wizard from any menu:

- ▶ Press the 4 function keys simultaneously.

10.1.1 Start screen and operating status

Assignment of the function keys			
[Flag]	Select language	[Info]	Display device information
[Monitor]	Start monitoring mode	[Assist]	Start configuration wizard
[Back]	Show previous screen	[Expert]	Start expert settings

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

Start screen



Fig. 44: [Start screen]

The [start screen] is displayed when the system is started.

Operating status

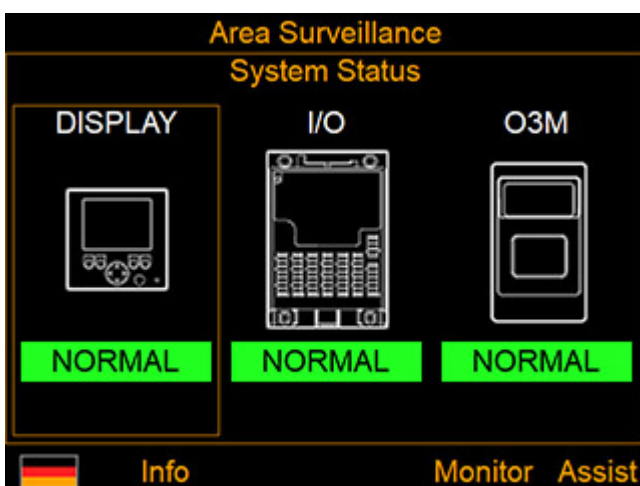


Fig. 45: [Operating status]

The [operating status] of the devices is displayed. Operating states (→ 61)



After power-on, it takes up to 30 s until all devices are ready for operation.

Device information

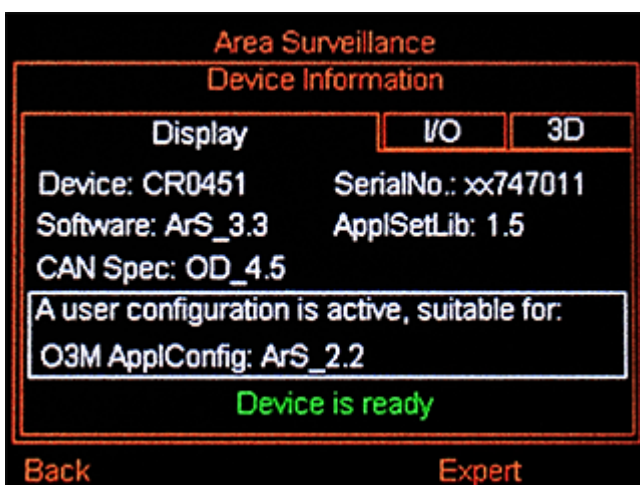


Fig. 46: [Device information]

[Device information] shows information about the individual devices of the set:

- Serial number
- Firmware and library versions
- [Operating status]

10.1.2 Expert settings

10.1.2.1 BasicDisplay

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Save input and display next screen
[Clear]	Reset selected digit to "0"	[Change]	Change selected entry
[Save]	Save settings		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

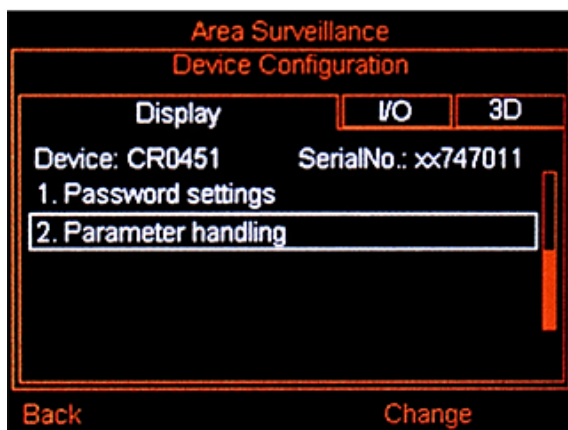


Fig. 47: Device configuration of the BasicDisplay

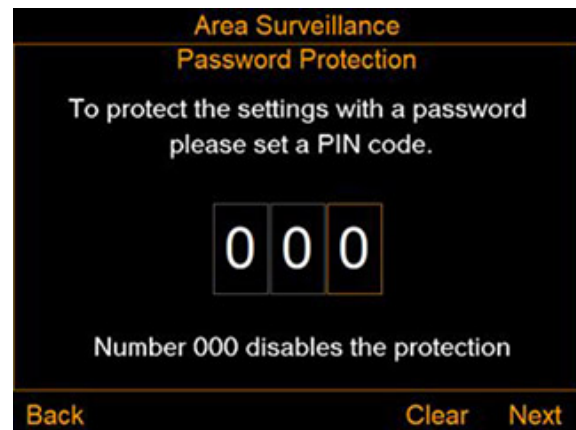


Fig. 48: Password protection of the BasicDisplay

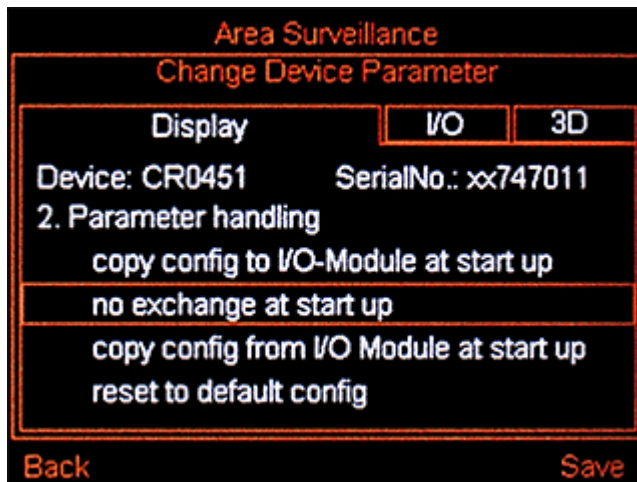


Fig. 49: Device parameters of the BasicDisplay

The [Display] tab contains the following settings:

[Password settings]: Activate password protection for the area surveillance settings. The password is requested once per operating cycle (time between switching on and off). The password "000" deactivates the password protection.



The master password is [241].

[Parameter handling]: Manage the user settings of the BasicDisplay.

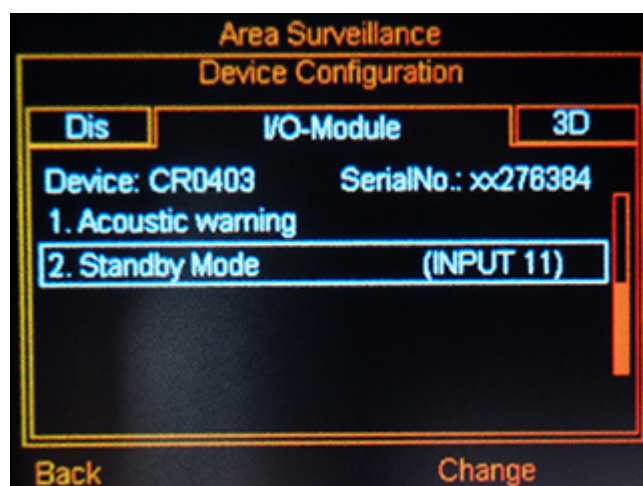
- [Copy config to I/O module at start-up]: Cops the user settings of the BasicDisplay to the BasicController at start-up. This is helpful if
 - several BasicControllers are set up with one BasicDisplay,
 - the ZZ1103 set will be operated without the BasicDisplay in the future or
 - the BasicDisplay is replaced.

- [No exchange at start-up]: Does not copy user settings between BasicDisplay and BasicController at start-up.
- [Copy config from I/O module at start-up]: Reads the user settings from the BasicController at start-up and writes them to the BasicDisplay. This is helpful if the user settings are to be written to a new BasicDisplay.
- [Reset to default config]: Resets all user settings to default values.

10.1.2.2 I/O modules

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Change]	Change selected entry	[Save]	Save settings

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value



The [I/O-Module] tab contains the following settings:

[Acoustic warning]: Adjust the volume of the buzzer. Possible settings:

- [Off]
- [100% volume]
- [75% volume]
- [50% volume]

Fig. 50: Device configuration of the IO module

[Standby mode]: The standby mode for the system is activated via input IN11 by applying a **High** signal (default setting) or **Low** signal. Possible settings:

- [0 = camera active; 1 = standby]
- [0 = standby; 1 = camera active]

10.1.2.3 3D sensor

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Change]	Change selected entry	[Save]	Save settings
[Reset]	Reset selected entry		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

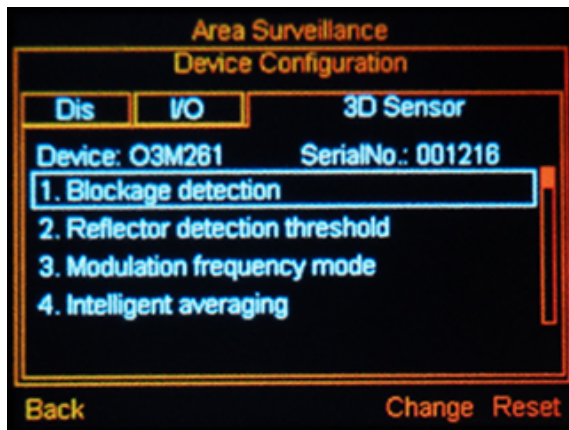


Fig. 51: Device configuration of the 3D sensor



Fig. 52: Device configuration of the 3D sensor



In standby mode

- ▶ the configuration wizard is not available,
- ▶ the settings of the 3D sensor cannot be changed.

The [3D Sensor] tab contains the following settings:

[Blockage detection]: Sets the sensitivity of the active blockage detection of the 3D sensor's front pane. Possible settings:

- [Off]
- [Low sensitivity]
- [Medium sensitivity]
- [High sensitivity]

[Reflector detection threshold]: Sets the detection of reflectors. Reflectors are detected more reliably at low levels.



The setting affects the detection of objects at close range and in wet conditions.

[Modulation frequency mode]: Prevents interference when the measuring ranges of several 3D sensors overlap. If there are several 3D sensors on a vehicle, each 3D sensor is assigned its own group. Possible settings:

- [Group 1]
- [Group 2]
- [Group 3]

[Intelligent averaging]: Calculates an average of the measured data. The number of distance measurements over which data averaging is calculated is set. A high setting reduces the signal noise and increases the accuracy of the 3D sensor. However, a high setting also increases the latency. Possible settings:

- [Off]
- [2 frames]
- [3 frames]

[Low-quality pixel filter]: Filters the objects by quality. With a high setting, the signal quality must be higher to be included in the evaluation. A high setting reduces sensitivity, which leads to the suppression of false triggers. However, detection of dark and small objects is more difficult. Possible settings:

- [Off]
- [Weak]
- [Medium]

- [Strong]

[Ethernet output configuration]: Switches the output of the Ethernet signal on or off. Possible settings:

- [Off]
- [On]

[Output 2D]: Switches the output of the 2D image on or off. The 2D image is an analogue PAL video signal. In addition, the mirroring of the 2D image can be switched on or off. Possible settings:

- [Output 2D video off]
- [Output 2D video on]
- [Mirror video off]
- [Mirror video on (rear view)]

[Visualisation configuration]: Switches the display of the ifm logo in the 2D image on or off. Possible settings:

- [ifm logo not visible]
- [ifm logo visible]

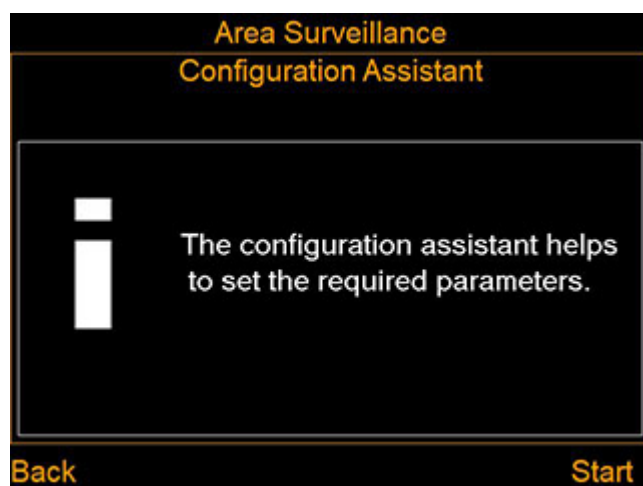


Recommended settings for different vehicle types: (→ Frequently asked questions 65)

10.1.3 Configuration wizard

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Clear]	Reset selected digit to "0"	[Start]	Start configuration wizard

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value



The configuration wizard guides you step by step through the configuration of the area surveillance.



In standby mode

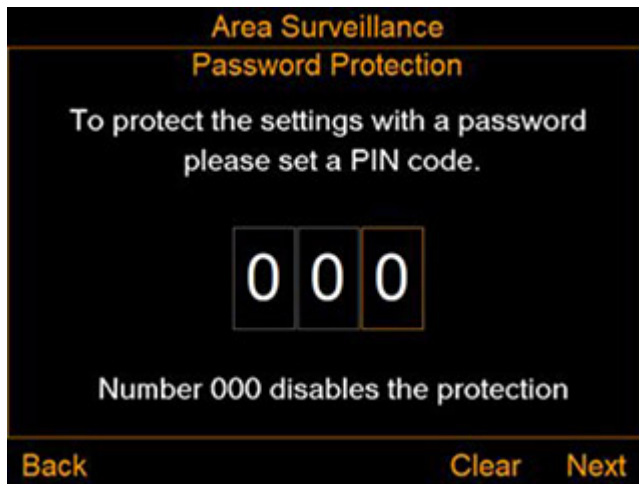
- ▶ the configuration wizard is not available,
- ▶ the settings of the 3D sensor cannot be changed.

Fig. 53: Configuration wizard

10.1.3.1 Password protection

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Clear]	Reset selected digit to [0]	[Start]	Start configuration wizard

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value



Password protection is activated for the area surveillance settings. The password is requested once per operating cycle (time between switching on and off). The password [000] deactivates the password protection.



The master password is [241].

Fig. 54: Password protection

10.1.3.2 Calibration

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Save input and display next screen
[OK]	Start automatic calibration		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value



The 3D sensor must be calibrated before it can be used. The inclination angle and the height of the 3D sensor are required for [calibration]. Measuring the inclination angle and height of the 3D sensor (→ □ 28)

The [calibration] consists of 2 steps:

1. manual entry of the measured inclination angle and height of the 3D sensor,
2. [automatic calibration] (optional).

Fig. 55: Calibration

Automatic calibration

The [automatic calibration] is optional and optimises the manually entered values. The ground in the field of view is detected to determine the angle of inclination and the height.

 For [automatic calibration], the 3D sensor must have a clear view of the ground (approx. 3 m wide and 3 m long).

[Automatic calibration] may take up to 80 s.

 If the exact inclination angle and height of the 3D sensor are known, the [automatic calibration] can be skipped.

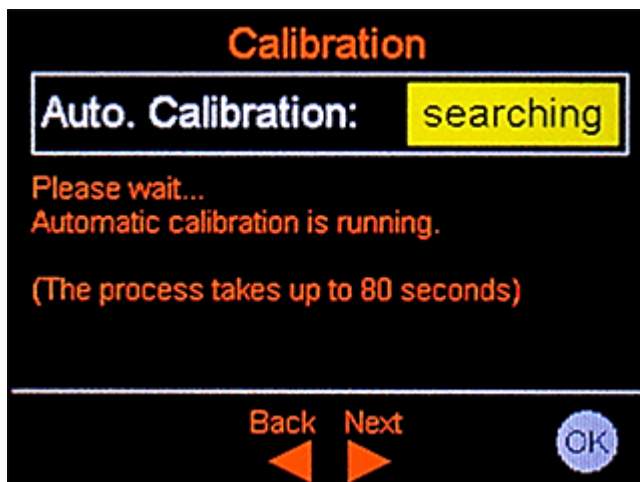


Fig. 56: Automatic calibration

[Auto. Calibration] displays the following information:

[searching]: The 3D sensor is calibrated.

[successful]: The 3D sensor has been calibrated successfully.

[not successful]: The 3D sensor has not been calibrated. [Automatic calibration] is not mandatory. The manually entered values can be used.

At the end of the [automatic calibration], the detected values are displayed for checking.

10.1.3.3 Zone definitions

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Save input and display next screen

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

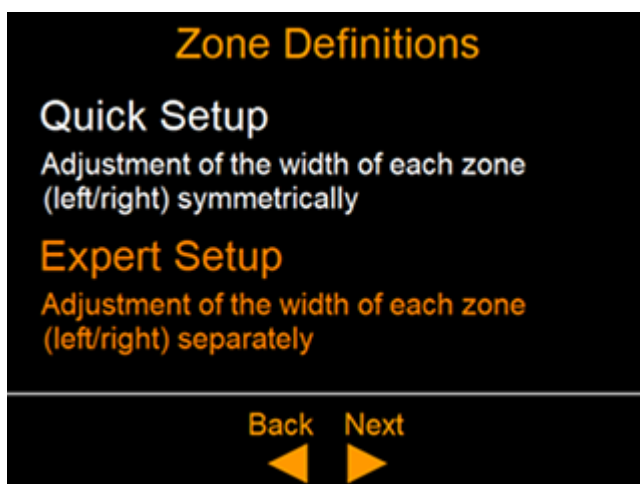


Fig. 57: [Zone definitions]

[Zone definitions] defines how the zone widths are set. Possible settings:

[Quick setup]: Adjusts the left and right areas of the zones symmetrically. (→ Zone definitions - default settings □ 52)



► Use the [Quick setup] if the 3D sensor is mounted centrally on the vehicle.

[Expert setup]: Adjusts the left and right areas of the zones separately. (→ Zone definitions - expert settings □ 55)

-  ► Use the [Expert setup]
- if the 3D sensor is not mounted centrally on the vehicle,
 - in case of an asymmetrical vehicle geometry.

10.1.4 Zone definitions - default settings

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Yellow zone]	Set the length and width of the [yellow zone].	[Orange zone]	Set the length and width of the [orange zone].
[Red zone]	Set the length and width of the [red zone].	[Blue zone]	Set the length and width of the [blue zone].
[-]	Decrease value	[+]	Increase value
[OK]	Confirm input	[Yes]	Save input
[No]	Don't save input		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

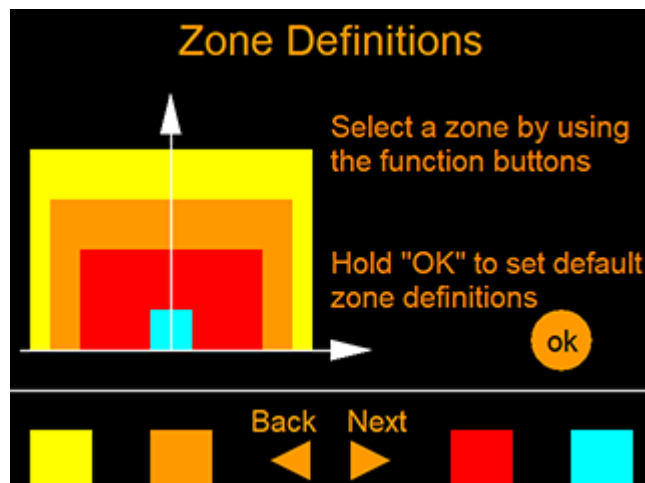


Fig. 58: [Zone definitions]

[Zone definitions] sets the width and length of the zones. The zones represent risk levels, with the [yellow zone] representing the lowest risk level and the [red zone] representing the highest risk level. With the default settings, the same value is set for the left and right areas of the zone.

In addition, choose what is to be recognised in the zones:

- reflectors only or
- reflectors and objects.

Within the [blue zone], objects and reflectors are ignored. This is particularly suitable for obstructions in the detection range of the 3D sensor.

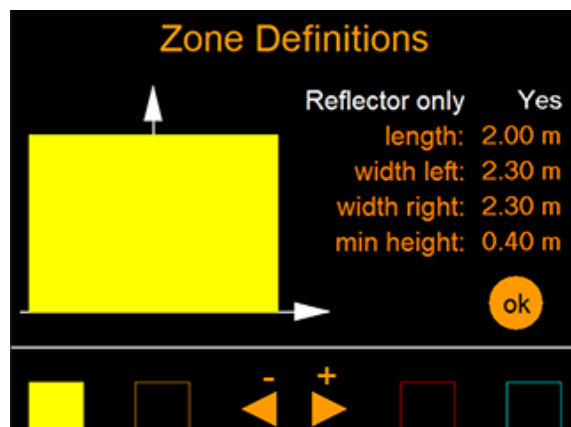


Fig. 59: [Yellow zone]

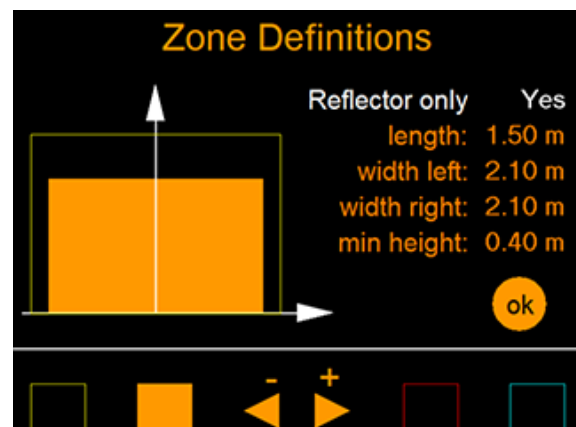


Fig. 60: [Orange zone]

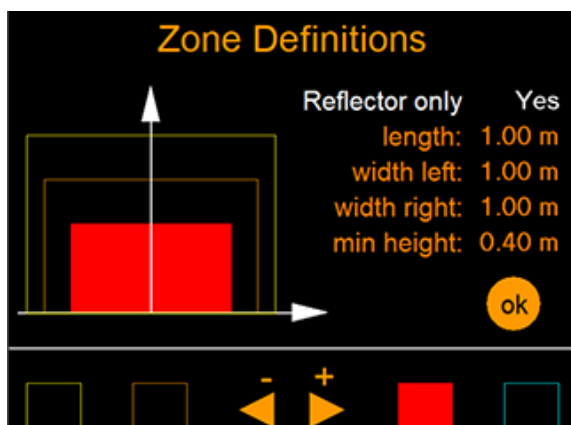


Fig. 61: [Red zone]

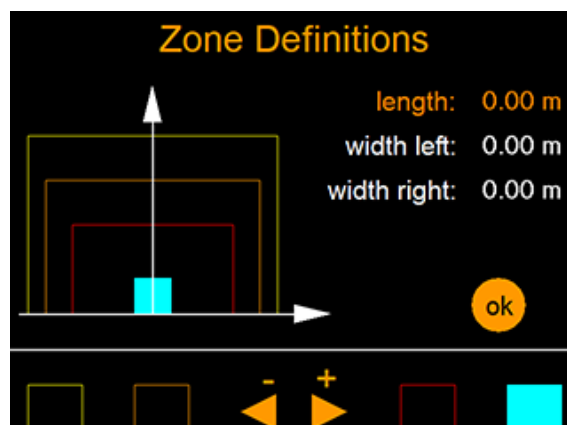


Fig. 62: [Blue zone]

Settings

[Reflectors only]:

- [Yes]: Only reflectors are detected.
For example, this setting is useful where persons with reflective vests must be detected. Normal objects are not recognised. This prevents false triggering, for example due to dust.
- [No]: Reflectors and normal objects are detected.



WARNING

Serious injury possible

If [Reflectors only] is activated:

- ▷ Persons and objects without reflectors are not recognised. No warning is displayed in the corresponding zone.
- ▷ Persons with reflectors (e.g. reflective vest) are not detected if only body parts without reflectors are visible to the 3D sensor.
- ▶ Only use the set as an assistance system and not for operator protection.



If [Reflectors only] is activated:

- ▶ Mount the 3D sensor and the illumination unit directly next to each other.
- ▷ The best way to mount the units side by side is with a threaded rod and u-shaped brackets. Suitable brackets are available as accessories: www.ifm.com

[Length]: Sets the length of the zone.

[Width left / right]: Adjusts the left and right width of the zone symmetrically. Adding the left and right areas gives the total width.

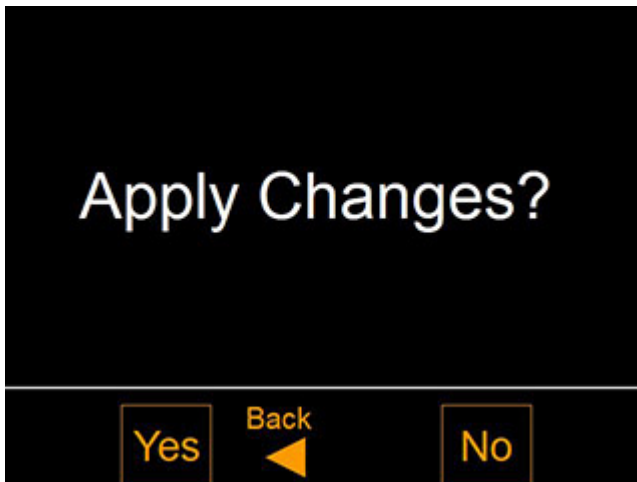
[Min. height]: Sets the minimum detection height of the zone. Objects below the minimum detection height are ignored. This reduces false triggering due to

- ramps,
- uneven ground,
- objects close to the ground.



For steep ramps, activate the setting [Reflectors only].

Saving and transferring the settings



The set values of the zones are saved and transferred to the 3D sensor.

Fig. 63: [Save changes]

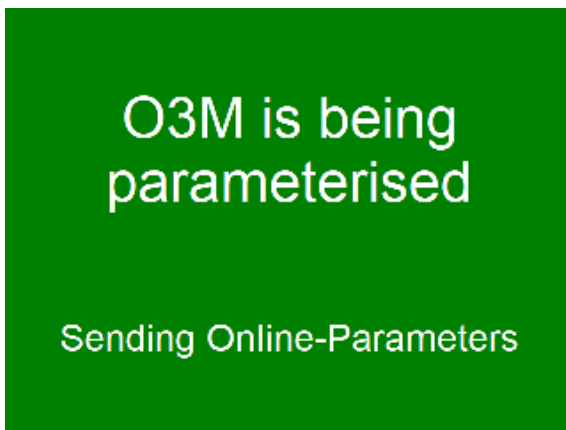


Fig. 64: Set O3M parameters

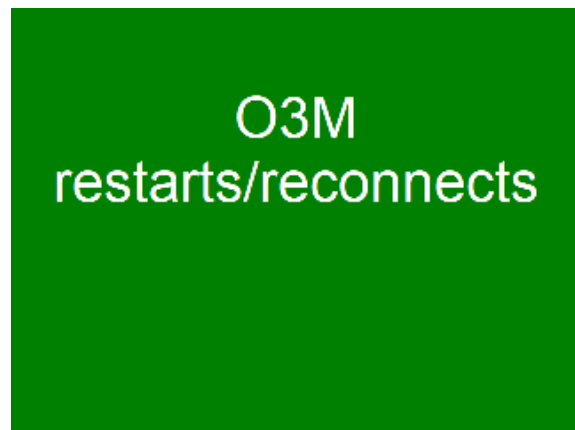


Fig. 65: Start and connect O3M



Fig. 66: O3M ready for operation



► During transmission, the 3D sensor is not available.

After the transmission, the system is restarted and the monitoring mode is displayed. (→ Monitoring mode [48](#))



If the buzzer beeps after restarting the 3D sensor:

- Press the 4 function keys simultaneously. (→ Operating and display elements [43](#))
- In the expert settings of the I/O module, set the volume of the acoustic warning signal to [Off]. Expert settings (→ [46](#))

10.1.5 Zone definitions - expert settings

Assignment of the function keys			
[Back]	Show previous screen	[Next]	Show next screen
[Yellow zone]	Set the length and width of the [yellow zone].	[Orange zone]	Set the length and width of the [orange zone].
[Red zone]	Set the length and width of the [red zone].	[Blue zone]	Set the length and width of the [blue zone].
[-]	Decrease value	[+]	Increase value
[OK]	Confirm input	[Yes]	Save input
[No]	Don't save input		

Assignment of the navigation keys			
[◀]	Show previous screen	[▶]	Show next screen
[▲]	Select the previous menu item	[▼]	Select next menu item
	Increase value		Decrease value

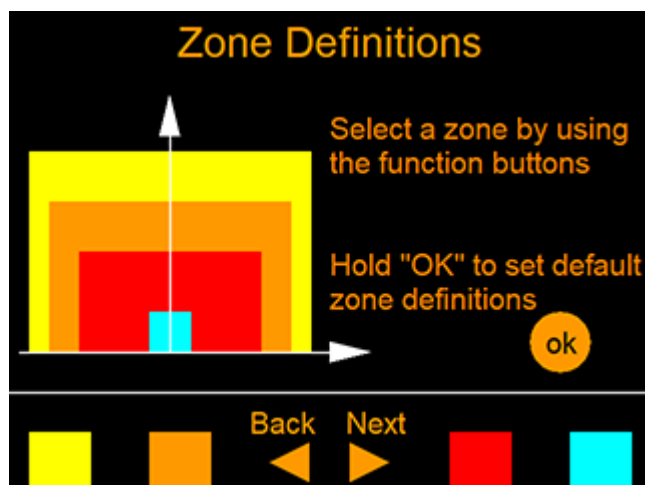


Fig. 67: Zone definitions

Zone definitions sets the width and length of the zones. The zones represent risk levels, with the [yellow zone] representing the lowest risk level and the [red zone] representing the highest risk level.

In the expert settings, the left and right areas of the zone are set separately. This makes asymmetrical zones possible if the 3D sensor is not mounted centrally.

In addition, choose what is to be recognised in the zones:

- reflectors only or
- reflectors and objects.

Within the [blue zone], objects and reflectors are ignored. This is particularly suitable for obstructions in the detection range of the 3D sensor.

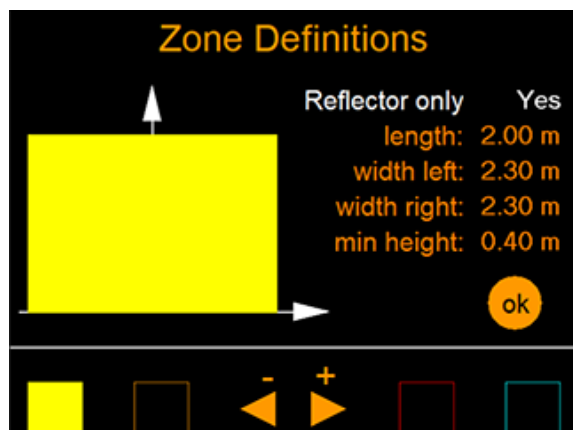


Fig. 68: [Yellow zone]

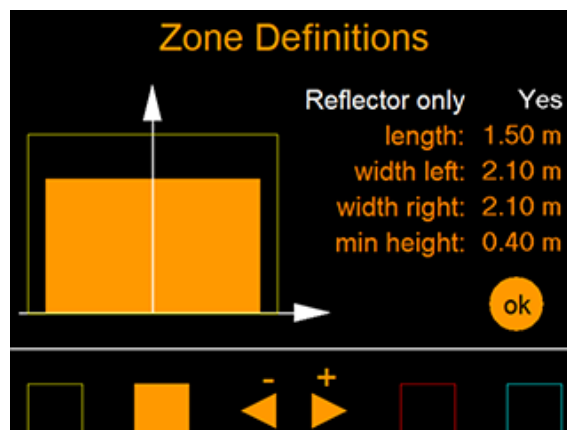


Fig. 69: [Orange zone]

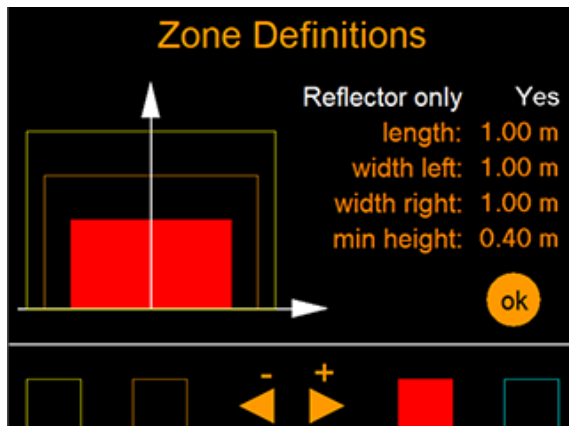


Fig. 70: [Red zone]

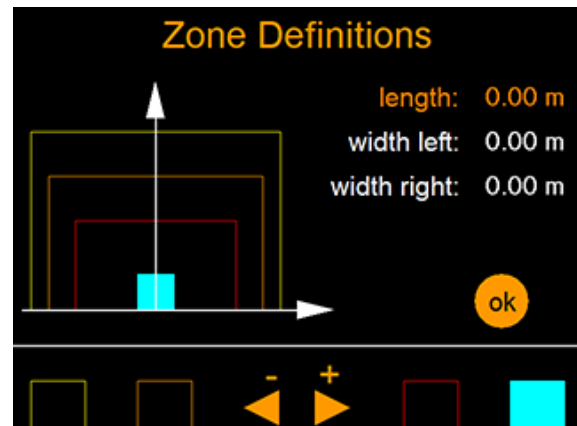


Fig. 71: [Blue zone]

Settings

[Reflectors only]:

- [Yes]: Only reflectors are detected.
For example, this setting is useful where persons with reflective vests must be detected. Normal objects are not recognised. This prevents false triggering, for example due to dust.
- [No]: Reflectors and normal objects are detected.



WARNING

Serious injury possible

If [Reflectors only] is activated:

- ▷ Persons and objects without reflectors are not recognised. No warning is displayed in the corresponding zone.
- ▷ Persons with reflectors (e.g. reflective vest) are not detected if only body parts without reflectors are visible to the 3D sensor.
- ▶ Only use the set as an assistance system and not for operator protection.



If [Reflectors only] is activated:

- ▶ Mount the 3D sensor and the illumination unit directly next to each other.
- ▷ The best way to mount the units side by side is with a threaded rod and u-shaped brackets. Suitable brackets are available as accessories: www.ifm.com

[Length]: Sets the length of the zone.

[Width left:]: Sets the left width of the zone. Adding the left and right areas gives the total width.

[Width right:]: Sets the right width of the zone. Adding the left and right areas gives the total width.

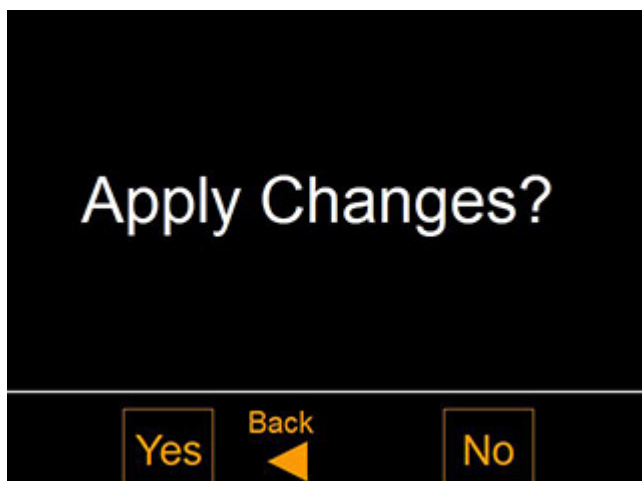
[Min. height]: Sets the minimum detection height of the zone. Objects below the minimum detection height are ignored. This reduces false triggering due to

- ramps,
- uneven ground,
- objects close to the ground.



For steep ramps, activate the setting [Reflectors only].

Saving and transferring the settings



The set values of the zones are saved and transferred to the 3D sensor.

Fig. 72: [Save changes]



Fig. 73: Set O3M parameters

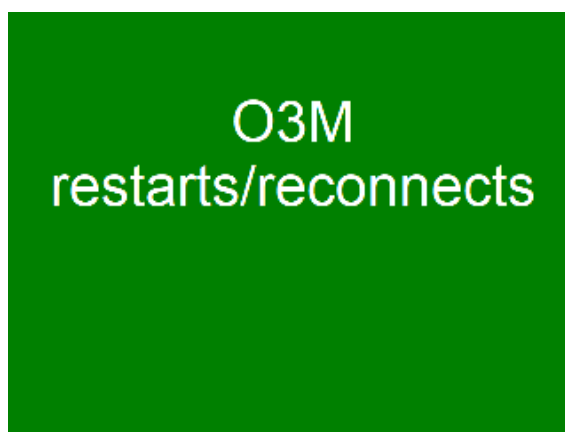


Fig. 74: Start and connect O3M



Fig. 75: O3M ready for operation



► During transmission, the 3D sensor is not available.

After the transmission, the system is restarted and the monitoring mode is displayed. (→ Monitoring mode  58)

10.2 Monitoring mode

Once the area surveillance has been set, the system is ready for operation and runs in monitoring mode.



After set-up, carry out a function test:

- Drive towards an object at typical speed and check the reaction of the system.

BasicDisplay

The BasicDisplay shows the risk level of the detected object.

Risk level 1	Risk level 2	Risk level 3

Tab. 19: Risk levels shown on the BasicDisplay

E2M monitor

If the E2M monitor is connected, the risk level and the distance to the detected object are displayed there.

Risk level 1	Risk level 2	Risk level 3
The buzzer emits a low-frequency warning tone.	The buzzer emits a high-frequency warning tone.	The buzzer emits a continuous tone.

Tab. 20: Risk levels displayed by the E2M monitor

The E2M monitor displays the following information:

- The detected object is highlighted in the colour of the risk level.
- The distance to the object is indicated at the top.
- The colour of the risk level is displayed as a frame around the live image.
- The readiness for operation of the system is displayed by the live ticker. The live ticker is the rotating circle at the top right.

10.2.1 Status indications in monitoring mode

In monitoring mode, the BasicDisplay shows status indications. The following status indications are possible:

Status display	Description
O3M is being parameterised Sending Online-Parameters	The set values are transferred to the 3D sensor. The 3D sensor is not available as long as the status display is active.
O3M restarts/reconnects	The sensor is restarted. The 3D sensor is not available as long as the status display is active.
IO Device is connected Initializing device	The BasicController is connected and is being initialised. The 3D sensor is not available as long as the status display is active.
O3M Standby Energy saving mode	The illumination unit is switched off. ► Switch on the illumination unit. The 3D sensor is not available as long as the status display is active.
O3M not connected Timeout	The 3D sensor is not connected to the BasicController. ► Connect the 3D sensor to the BasicController.
Sensor Error Try system restart	The 3D sensor signals an error and must be restarted. ► Restart the 3D sensor.

Status display	Description
Sensor Error Check error memory	The 3D sensor signals an error. The error can be read. ► Download the software ifm Vision Assistant, which can be found in the download area of the device: documentation.ifm.com ► Read the error via the ifm Vision Assistant.
Limited function blockage detected	The pane in front of the lens of the 3D sensor is dirty. ► Clean the pane.
Limited function errorcode: 97	The 3D sensor is available to a limited extent due to an error. (→ Error codes 3D sensor □ 63) Common reason: illumination unit not connected. ► Connect the illumination unit.
UI device critical error errorcode: 248 Please restart the system	The BasicController signals a critical error. (→ Error codes 3D sensor □ 63) ► Disconnect and reconnect the BasicController's connections to the devices. ► Restart the BasicController and the devices.

Tab. 21: Status indications in monitoring mode

10.3 Operating states

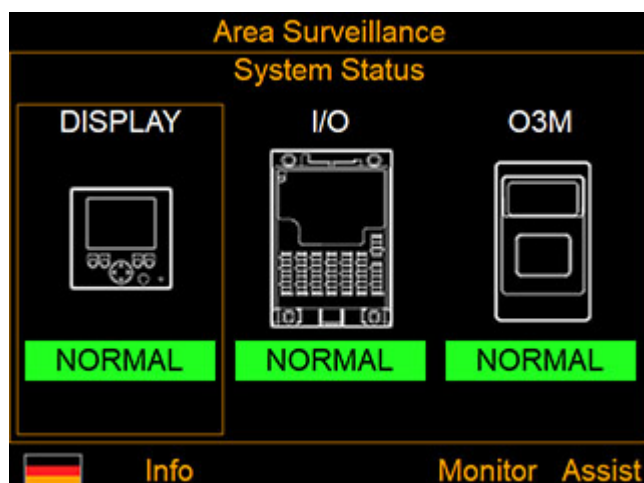


Fig. 76: Indication of the operating states

[System status] shows the operating states of the

- BasicDisplay
- BasicController
- 3D sensor

The operating states are displayed in the expert settings. (→ Expert settings [46](#)) The following operating states are possible:

Operating status	Description
[NORMAL]	The device is connected and compatible.
[STARTUP]	The device starts.
[STANDBY]	The device is in standby.
[PAIRING]	The 3D sensor is synchronised with an illumination unit.
[CALIB]	The 3D sensor is automatically calibrated.
[N/A]	The device is not connected.
[LIMITED] [Code 97]	The device has limited functionality.
[INCOMPAT] [Code 114]	The device has an incompatible configuration and must be reflashed. (→ Error codes 3D sensor 63)
[INCOMPAT] [Code 127]	The device is incompatible and must be reflashed. (→ Error codes 3D sensor 63)
[TIMEOUT] [Code 254]	The device is disconnected due to a timeout.
[ERROR] [Code 240]	The device is in error mode due to an unknown error.

Tab. 22: Operating states

10.4 Status LED

The status LED of the BasicDisplay indicates the operating states of the system.



The status LED of the BasicDisplay is synchronised with the status LED of the BasicController. Both show the same states.

Initialisation of BasicController and 3D sensor							
							
250 ms	250 ms	250 ms	250 ms	250 ms	250 ms	250 ms	250 ms

Device error (e.g. CAN bus not connected)							
							
250 ms	250 ms	250 ms	250 ms	250 ms	250 ms	250 ms	250 ms

System runs normally (standard IO module)	
	
1500 ms	500 ms

System runs normally (configured IO module)		
		
1500 ms	50 ms	450 ms

Device incompatible and deactivated	
	
1500 ms	500 ms

Connection establishment (3D sensor not accessible)								
								
150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	1100 ms

Calibration active (3D sensor not accessible)								
								
150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	1100 ms

Standby (3D sensor not accessible)	
	
150 ms	1850 ms

3D sensor not accessible (N/A, error or timeout)								
								
150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	1100 ms

3D sensor available to a limited extent								
								
150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	150 ms	100 ms	1100 ms

11 Troubleshooting

11.1 Error codes 3D sensor

The 3D sensor uses the following error codes:

Error code	Error name	Description
80	O3M function limited (unavailable)	Interference detected.
81	O3M function limited (unavailable)	Spray detected.
82	O3M function limited (unavailable)	Missing movement data from the vehicle.
83	O3M function limited (unavailable)	Invalid alignment of the 3D sensor.
84	O3M function limited (unavailable)	No error-free signal transmission between sensor and illumination unit.
85	O3M function limited (unavailable)	Internal fault.
86	O3M function limited (unavailable)	Blockage detected.
94	O3M function limited (unavailable)	Availability != 0 ► Contact ifm support.
95	O3M function limited (unavailable)	The O3M is not available, availability = 255 ► Contact ifm support.
96	O3M function limited (unavailable)	Returning to standard Run mode from limited Run mode.
97..110	O3M function limited (unavailable)	Limited Run mode due to active DTC. DTC will be indicated. Error code range reserved.
111	O3M function limited (unavailable)	Limited Run mode due to active DTC. DTC not classified. ► Contact ifm support
113	O3M incompatible	The CAN interface specification is inconsistent. The O3M has an incorrect firmware version.

Error code	Error name	Description
114	O3M incompatible	The O3M application configuration is not compatible. ► Flash a compatible O3M application configuration.
115	O3M incompatible	The user configuration requires a specific O3M interface specification which does not correspond to the one of the current O3M. ► Flash an O3M firmware with compatible CAN interface specification or ► discard the current user configuration.
116	O3M incompatible	The user configuration requires a specific O3M application configuration which does not correspond to the one of the current O3M. ► Flash an O3M firmware with compatible CAN application configuration or ► discard the current user configuration.
127	O3M incompatible	The O3M device information cannot be read or transmitted.
224..239	O3M ERROR	Emergency mode with known error cause. DTC will be indicated. Error code range reserved.
240	O3M ERROR	Emergency mode with unknown error cause.
241	O3M ERROR	O3M in <code>op_fault_super_state</code> mode
242	O3M ERROR	O3M in <code>op_safe_lock</code> mode
251	O3M ERROR	The O3M device information cannot be read. The diagnostic protocol UDS is blocked by another CAN member (e.g. by ifm Vision Assistant).
253	O3M ERROR	Parameter setting after setting OnP takes too long ($T \geq 500\text{ms}$).
254	O3M ERROR	Timeout: The connection to the O3M was lost.

Tab. 23: Error codes 3D sensor

11.2 Error codes BasicController

The BasicController uses the following error codes:

Error code	Error name	Description
126	Device is incompatible	The device is disabled due to incompatible O3M Rcv lib.
127	Device is incompatible	The device is disabled due to incompatible ApplSetCom lib.
241	Device error	Violation of the device library. An unknown O3M version was used when initialising the stock FRAM. ► Contact ifm support.
242	Device error	Violation of the device library. No default FRAM content has been defined. ► Contact ifm support.
248	Device error	The O3M device information cannot be read. The UDS is blocked by another member (e.g. ifm Vision Assistant).
249	Device error	No address can be assigned to the device. No device info available. ► Contact ifm support.
250	Device error	No address can be assigned to the device. Unknown device type. The device name cannot be set. ► Contact ifm support.
251	Device error	No address can be assigned to the device. The address assignment cannot access CAN_TX. ► Contact ifm support.
252	Device error	The address assignment has failed. The preferred source address is occupied. ► Check the bus member for address conflict.

Error code	Error name	Description
253	Device error	The address assignment has failed. An identical device name was transmitted. ► Contact ifm support.
254	Device error	Timeout, connection to device lost.
255	Device error	CAN BUSOFF or CAN initialisation failed. ► Check CAN wiring and CAN baud rate.

Tab. 24: Error codes BasicController

11.3 Frequently asked questions

Analogue video signal has poor quality

If the 3D sensor and the display unit (for example E2M231) use different ground potentials, a compensation current can flow via the analogue video output (video GND). The units can be damaged. The video quality may deteriorate.

- Increase the operating voltage from 12 V to 24 V.
 - ▷ The increased voltage reduces the current consumption and the voltage drop on the supply lines.



- ▷ **Depending on the operating voltage, use the buzzer for 12 V (80303178) or 24 V (80281057).**

- Separate the voltage supply of the 3D sensor and the illumination unit from each other.
- If a common ground of 3D sensor and display unit is not possible: Do not connect any other devices to the power supplies of the 3D sensor and the display unit.
- Use a larger cross-section for the voltage supply lines of the 3D sensor and the display unit.

False triggering during operation when there is a lot of dust

If there are lots of dust particles in the air, they may be misinterpreted as objects.

- In the expert settings, set the [Low-quality pixel filter] to a higher level.

False triggering when driving on a ramp

Driving on a ramp can result in different angles between the vehicle and the ground. As a result, the 3D sensor measures the ground higher than it actually is. In extreme cases, the measurement is higher than the set minimum detection height. (→ Zone definitions - default settings □ 52)

- Change the object detection type to [Reflector]. Configuration wizard (→ □ 49)
 - ▷ Afterwards, the [yellow zone] is only triggered by objects with reflectors (e.g. reflective vests).
- Set the minimum detection height in steps. (→ Zone definitions - default settings □ 52)
 - ▷ For example, set the [red zone] to the lowest detection height, the [orange zone] to the medium detection height and the [yellow zone] to the highest detection height.

Automatic calibration is not successful

During [automatic calibration], the 3D sensor measures the ground in the field of view. For calibration, the ground must be level and free of obstacles.

- Clear the 3 m wide and 3 m long field of view in front of the 3D sensor.
- Avoid reflective grounds (e.g. industrial floor or wet floor).
- Adjust the manually set parameters for calibration. (→ Configuration wizard □ 49)
 - ▷ The manually set parameters are used as start values for the [automatic calibration]. [Automatic calibration] will not be successful if the manually set parameters deviate too much from the automatically determined ones.

The [automatic calibration] determines height values that are too high

If there are walls near the field of view, the [automatic calibration] determines height values that are approx. 10-20 cm too high.

- ▶ Ensure that there are no walls near the field of view during [automatic calibration].

Reflector objects are not detected and normal objects are detected as reflector objects

A reflector object is classified via a threshold value. If the threshold value is too high, reflector objects are not detected. If the threshold value is too low, normal objects are detected as reflector objects:

- ▶ Adjust the [reflector detection] threshold.

Only activate the ZZ1103 set when reverse gear is engaged

The ZZ1103 set is used as a reversing assistance system and should only be active when reverse gear is engaged.

- ▶ Set the ZZ1103 set to standby mode via the digital input IN11 of the BasicController. (→ Wiring BasicController □ 34)
 - ▷ The corresponding logic can be set in the expert settings under [I/O-Module] -> [Standby mode]. Depending on the setting, the logic reacts to Low or High.



Switching in and out of standby mode is very fast (< 400 ms).



In standby mode

- ▶ the configuration wizard is not available,
- ▶ the settings of the 3D sensor cannot be changed.

Settings for special vehicles

The following settings are recommended for specific vehicle types:

Forklift truck or similar (little soiling and little exposure to weather conditions):

- [Blockage detection]: [high sensitivity]
- [Intelligent averaging]: [off]
- [Low-quality pixel filter]: [weak]

Municipal vehicles, airport apron vehicles or similar (little soiling and heavy exposure to weather conditions):

- [Blockage detection]: [medium sensitivity]
- [Intelligent averaging]: [2 frames]
- [Low-quality pixel filter]: [medium]

Construction site vehicles, agricultural machines or similar (heavy soiling and heavy exposure to weather conditions):

- [Blockage detection]: [low sensitivity]
- [Intelligent averaging]: [3 frames]
- [Low-quality pixel filter]: [strong]



The settings are made in the expert setup.

The acoustic and visual warning reacts with a delay

The acoustic and optical warning reacts with a delay if the response time of the ZZ1103 set is too long. The following settings reduce the response time:

- ▶ [Intelligent averaging]: [off]
- ▶ Increase the size of the zone in the x direction.

- ▷ If increasing the zone size does not reduce the response time, the foresight of the 3D sensor is probably too low. Reduce the inclination angle of the 3D sensor.

Setting up and operating several vehicles and ZZ1103 sets with one BasicDisplay

After successful set-up, a ZZ1103 set can be operated without BasicDisplay. The configuration is saved on the BasicDisplay and can be transferred to other sets.

- ▶ Complete the set-up. (→ Set-up [43](#))
- ▶ In the BasicDisplay expert settings, set the [Parameter handling] to [Copy config to I/O module at start-up] Expert settings (→ [46](#)).
 - ▷ The user settings of the BasicDisplay are copied to the BasicController at start-up.
- ▶ Restart the ZZ1103 set.
- ▶ Disconnect the BasicDisplay from the ZZ1103 set.

ATTENTION

Damaged ZZ1103 set

- ✓ The BasicDisplay may only be disconnected from the ZZ1103 set when disconnected from power.
 - ▶ Disconnect the devices of the ZZ1103 set from the power supply.
 - ▶ Disconnect the electrical connections of the BasicDisplay.

- ▶ With the configured BasicDisplay, transfer the configuration to other sets at start-up.

12 Accessories

The following articles are available in addition or as alternatives to the ZZ103 set:

Article	Description
O3M151	Mobile 3D sensor without integrated 2D sensor. For use without 2D monitor. Angle of aperture 3D: 70°x23°.
O3M161	Mobile 3D sensor without integrated 2D sensor. For use without 2D monitor. Angle of aperture 3D: 95°x32°.
O3M171	Mobile 3D sensor without integrated 2D sensor. For use without 2D monitor. Angle of aperture 3D: 97°x44°.
O3M251	Mobile 3D sensor with integrated 2D/3D overlay (pre-programmed). Angle of aperture 3D: 70°x23°.
O3M261	Mobile 3D sensor with integrated 2D/3D overlay (pre-programmed). Angle of aperture 3D: 95°x32°.
O3M950	IR illumination unit for O3M151 and O3M251.
O3M960	IR illumination unit for O3M161 and O3M261.
O3M970	IR illumination unit for O3M171 and O3M271.
E3M101	Protective cover for the 3D sensor. Reliable device protection in harsh industrial environments.
E3M103	Mounting set for clamp mounting. For mounting on a rod. Compatible with 3D sensor and illumination unit.
E3M131	Connection cable for illumination unit, length 2 m.
E3M132	Connection cable for illumination unit, length 5 m.

Article	Description
EC0401	Cover for BasicController if the BasicDisplay is not used.
E2M202	Connection cable, M16 connector to M16 socket, 3 m.
E2M204	Connection cable, M16 connector to M16 socket, 11 m.
E2M205	Connection cable, M16 connector to M16 socket, 16 m.
E2M206	Connection cable, M16 connector to M16 socket, 21 m.

Tab. 25: Accessories

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