Perception solutions for mobile machines

Camera systems with AI and radar fusion



www.o3m.ifm

Future-oriented technology meets user-friendly handling.

3D sensor system O3M



Augmented reality with AI-supported person detection – high precision thanks to the new 2D/3D smart camera system.

The function principle of ifm's PMD technology is based on time-of-flight (ToF). The scene is illuminated by modulated invisible infrared light and the reflected light hits the PMD sensor. This sensor is also connected to the source of modulation. Each pixel on the PMD chip determines the distances to the scene from the phase shift between the transmitted and the received signal.

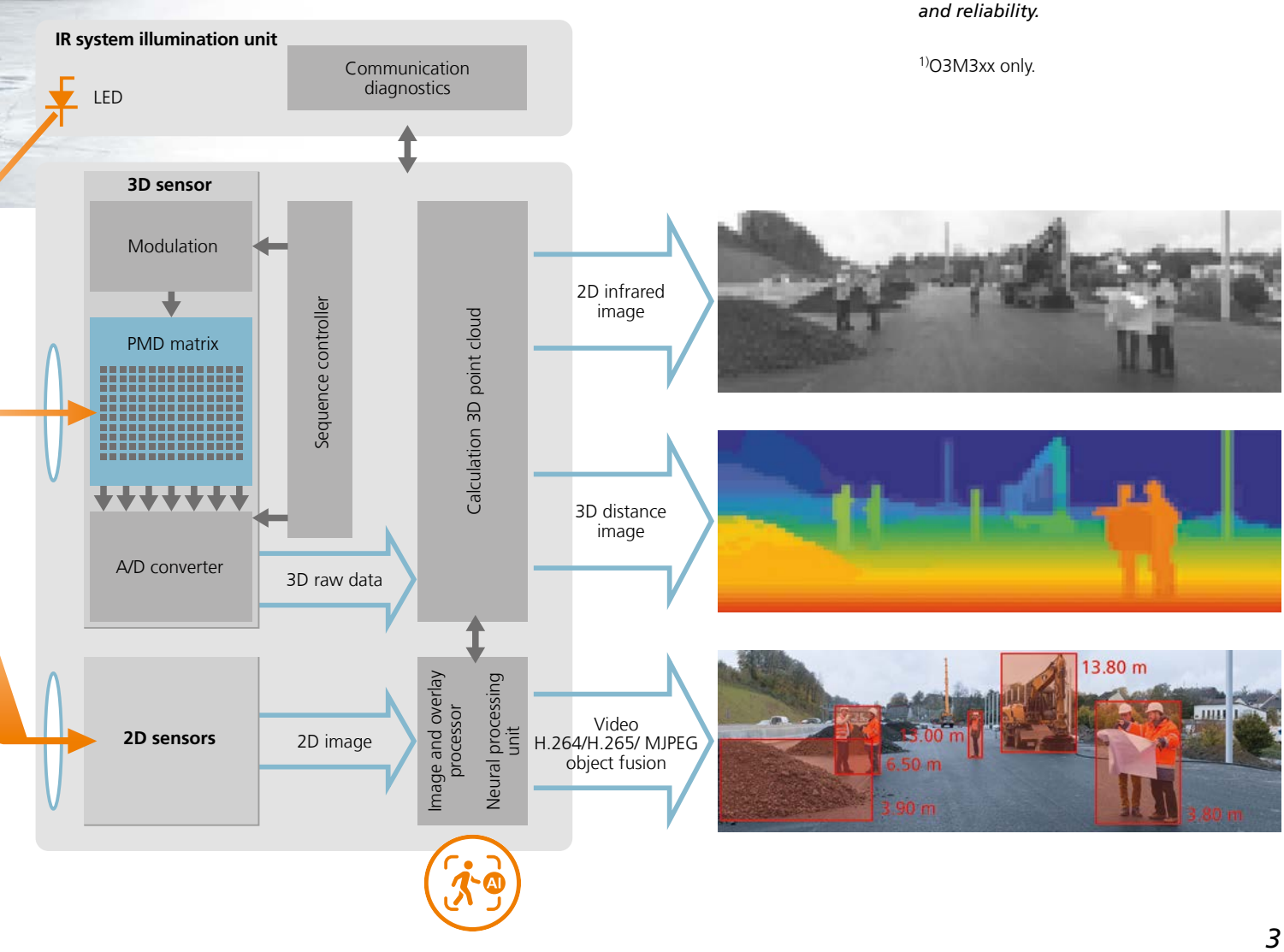
The integrated active suppression of background illumination almost completely prevents saturation of the image sensor by extraneous light. That means that ifm's PMD 3D sensor can be operated in bright sunlight up to 120 klx. Simultaneously the optionally integrated AI camera provides a live image with superimposed real-time warning messages such as in dangerous situations or with imminent collisions. The sensor system places warning symbols, icons, line objects or text into the image and combines them with the video signal. The command to display these objects can also be triggered directly by the machine controller via CAN bus and Ethernet. The digital video output supports the most common codecs, including H.264, H.265 and MJPEG via Fast Ethernet[1)].

Robust and reliable AI person detection.

The intelligent 2D/3D camera system accurately distinguishes between persons (O3M3 only) and other objects in real time. In the event of imminent danger, it sends graduated warnings to the machine operator. This means that the system is capable of warning the driver at an early stage during normal operation of persons or obstacles that would otherwise lead to an accident. This sophisticated warning concept reduces driver distraction and increases attentiveness in potentially hazardous situations.

The AI-supported person detection function and the PMD 3D camera work seamlessly in one device without the need for any additional hardware or ECU. By fusing both sensor technologies with a powerful AI processor, the system achieves an exceptionally high level of availability and reliability.

[1)]O3M3xx only.



Person detection and radar fusion

Radar fusion made simple

The fusion of AI-powered cameras and radar sensors provides an additional level of protection for people and objects in the vehicle's surroundings. While the cameras detect people, the radar sensor provides distance information. This information is displayed on the screen while simultaneously being transmitted to the machine controller. The fused data enables the controller to respond appropriately. In addition, the R2D201 detects more distant objects such as vehicles and approaching pedestrians.

Combined with the O3M372, it creates a diversified redundant object detection system. Person detection is performed independently while distance measurement can utilise information from the camera's time-of-flight measurement and/or radar measurement.



AI-generated image for illustrative purposes.

PERSON DETECTION

TECHNOLOGY

Deep learning at its finest – made in Germany, made by ifm.

Offering the world's first AI-supported 2D/3D PMD camera with person detection, ifm sets new standards in the domain of AI for image processing. Combining the tried-and-tested PMD technology with a powerful AI processor and a high-resolution 2D camera, this embedded solution delivers unrivalled detection performance.

Person detection using the 2D camera classifies the objects detected by the O3M3xx, ensuring high system availability while minimising false triggering.

In addition to the established sensor functions, the logic editor of ifm Vision Assistant offers flexible options for customer-specific data pre-processing. For example, video stream overlays or virtual inputs and outputs can be defined.

With the O2M5xx 2D camera, ifm also offers a dedicated 2D solution with AI-powered person detection.

The O3M camera seamlessly integrates with common machine controllers via CAN and/or Fast Ethernet. The video stream can be displayed with any device that supports H.264, H.265 or MJPEG.

For accurate spatial localisation of an object, both AI-powered cameras can also be combined with data from the R2D radar sensor (see page 4).



Infrared system illumination unit
O3M970



AI-powered 2D/3D camera
O3M372



R2D radar sensor for area monitoring



AI-powered 2D camera
O2M500

Camera systems for mobile machines. The optimum solution for every requirement.







Area surveillance with person detection

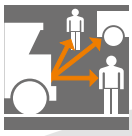


Line guidance



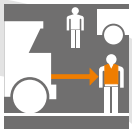
Distance monitoring





Object and person detection





Reflector tracking



Positioning help





Intelligent collision avoidance















Construction machines	**Area surveillance in harsh environments**	*8 - 9*
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Application packages Overview of articles	**3D sensor system O3M Heavy-duty universal camera O2M TFT LCD monitor "Ready-to-start"application package I/O module for 3D camera system O3M Operating distance / field of view sizes**	*24 - 39*

All-round monitoring in harsh environments

Construction machines

Intelligent collision avoidance

The integrated, automatic object recognition detects up to 20 stationary or moving objects in the path of a construction vehicle. By comparing the current speed, the motion vector and fixed parameters such as the braking distance, the collision probability is calculated by the 3D sensor and transferred to the machine control system via CAN bus or Ethernet and then signalled to the driver.



AI person detection:

O3M3xx 2D/3D camera for the real-time detection of people and obstacles, or O2M5xx 2D camera for the detection of people and additional object classes*.

Enormous far sightedness:

Optimised for long ranges, the 2D/3D sensors can detect moving reflective objects up to 35 metres and persons up to 25 metres away.

Integrated evaluation:

All calculations for 2D, 3D and surround view applications are performed within the powerful sensor system. The results are output via the CAN bus or Fast Ethernet interface.

Simply convenient:

The parameters of the system are set via the easy-to-handle "ifm Vision Assistant" for Windows. Ready-to-use function blocks are available for the CODESYS software for machine integration.

*Available as a feature upgrade.



AI-generated image for illustrative purposes.

360° surround view: best possible all-round visibility

Keep the entire surroundings in view at all times. What is already appreciated in modern passenger vehicles is now also possible for mobile machines. To achieve this, the installed cameras transmit their image data to a master camera.

The master camera generates the 360-degree view and sends it to the ecomatDisplay. Since the individual camera images are also available, a combined view consisting of the surround view and a selected detailed view can also be displayed. Any device supporting H.264, H.265 or MJPEG formats is suitable for displaying the video stream.



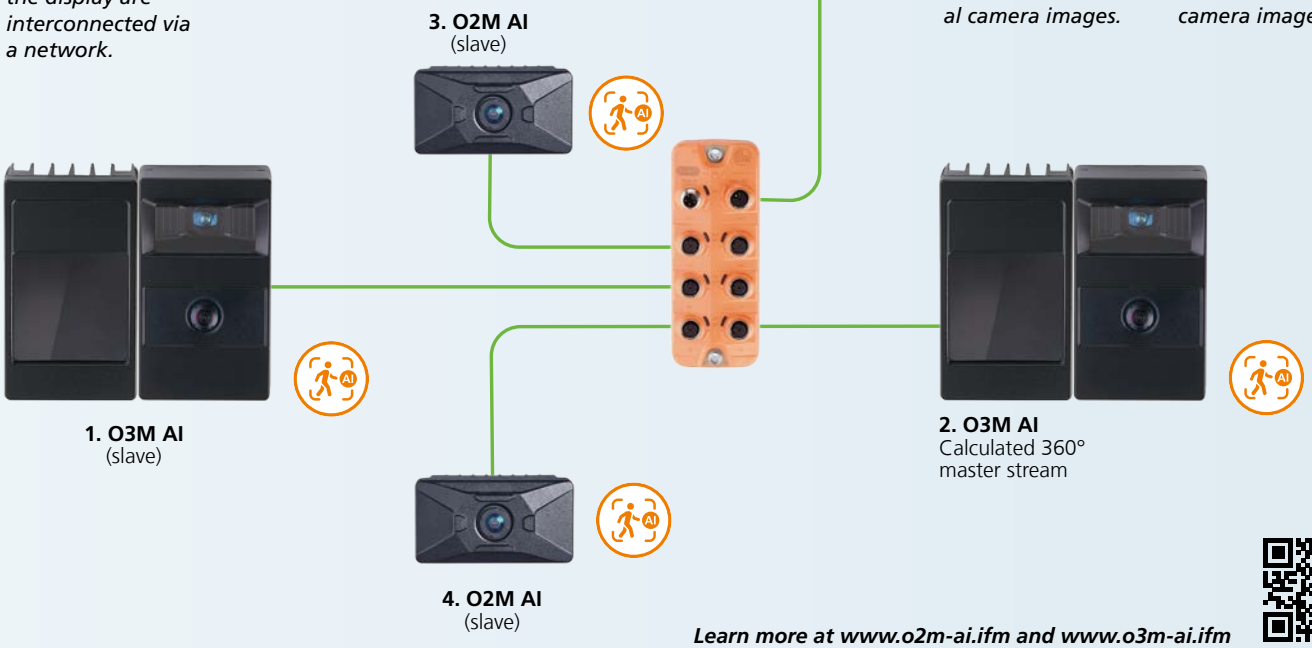
AI-generated image for illustrative purposes.

360° view made easy

The cameras and the display are interconnected via a network.

The master camera (2) generates the surround view from the individual camera images.

This view can be displayed on the screen alongside the individual camera images.



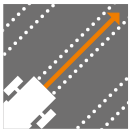
Learn more at www.o2m-ai.ifm and www.o3m-ai.ifm

Automation solutions for agricultural machinery

Agriculture and forestry

Line guidance for grape harvesting

A highly developed algorithm with generic recognition of linear contours provides the machine driver with a selection of recognised lines and their guidance. With interrupted contours the data is interpolated. This ensures that guidance does not stop in case of smaller interruptions. An offset function ensures fine adjustment between vehicle and the line to be followed.



For the harshest environments:

Since the sensor does not have any moving components, it is virtually free of wear. Its high ambient temperature range of -40 to 85°C is the basis for universal use.

Resistant to extraneous light:

The PMD technology ensures high repeatability of the measured data even in difficult ambient light conditions or with direct sunlight.

Communicative:

Interfaces such as CAN with J1939 or CANopen and Fast Ethernet are integrated as standard. Self-diagnostic functions from the sensor to the IR system illumination unit continually monitor the system status.

Reliable and fast:

With a highly developed algorithm from the automotive sector and a frame rate of up to 50 frames / second the sensor allows fast and reliable calculation of the 3D information.





Windrow recognition

The mobile 3D sensor recognises windrows and provides the information for automatic steering to the machine control system.

At the same time the quantity of material [m³/s] is determined to avoid overloading or underloading of the baler.





Learn more at ifm.com/gb/o3m-lg

Collision avoidance and area surveillance

Transport and logistics



Integrated camera:
Integrated in the 3D sensor system, the 2D camera not only provides the machine operator with a user-friendly overview, but also detects persons in real time to issue timely warnings in the event of potentially dangerous situations.

Continuously reliable:
Thanks to the specially modulated infrared light, a continuously high recognition rate can be achieved even with reflective material of different intensity. And this with a minimal response time of less than 50 ms.

High coverage:
The system has a person detection range of up to 25 m, and a 3D range of up to 15 m in typical environments and of up to 35 m on reflective objects.

Goal-oriented:
Object distances and dimensions are automatically provided in a clear grid using the selectable world coordinate system.
The ground recognition integrated in the algorithm ensures high unambiguity of object recognition.





Area monitoring with reliable person detection.

The 3D sensor generates over 1,000 individual distance values to precisely detect objects in the monitored area. Depending on their distance from the machine, a message is sent to the machine controller. Thanks to the integrated AI camera, the system can also reliably distinguish between persons and other objects.



Vertical drill

Automatic detection of persons and objects in the danger zone. The system is automatically stopped if something enters the monitored area.

As the machine parameters are pre-selected, the 2D/3D system is harder to bypass than conventional systems.



Learn more at ifm.com/gb/o3m-as

Collision avoidance and area surveillance

Transport and logistics



Intelligent collision avoidance

The integrated, automatic object recognition detects up to 20 stationary or moving objects in the path of a refuse truck. By comparing the current speed, the motion vector and fixed parameters such as the braking distance, the collision probability is calculated by the 3D sensor and transferred to the machine control system via CAN bus or Ethernet and then signalled to the driver.

The additional person detection, by means of an integrated AI camera, ensures a high level of safety for pedestrians in the vehicle's danger zone.



Integrated AI camera:

An additional 2D camera in the 3D sensor system not only provides the machine operator with a clear overview, but can also detect persons in real time to provide timely warnings of potentially dangerous situations.

Continuously reliable:

Thanks to the specially modulated infrared light a continuously high recognition rate can be achieved even with reflective material of different intensity.
All that with a minimum response time of less than 50 ms.

No interference:

Automatic suppression of background illumination ensures reliable recognition even with full solar radiation of 120 klx.

Reliable parallel operation:

The reliable operation of several 3D sensor systems in the same area is guaranteed by an adjustable frequency change method. This may be random or preset.







Side loader

The 3D system for the side loader automatically detects objects such as pedestrians or cyclists in the danger zone. Lowering is immediately stopped.

Refuse trucks can enter tight spaces even without a banksman utilising the 180° field of view of the system monitoring the area behind the vehicle. The 3D system detects objects and pedestrians in its path and automatically brakes and stops the vehicle.

Learn more at ifm.com/de/o3m-ca

Collision avoidance and area surveillance on rail vehicles

Transport and logistics



Continuously reliable:

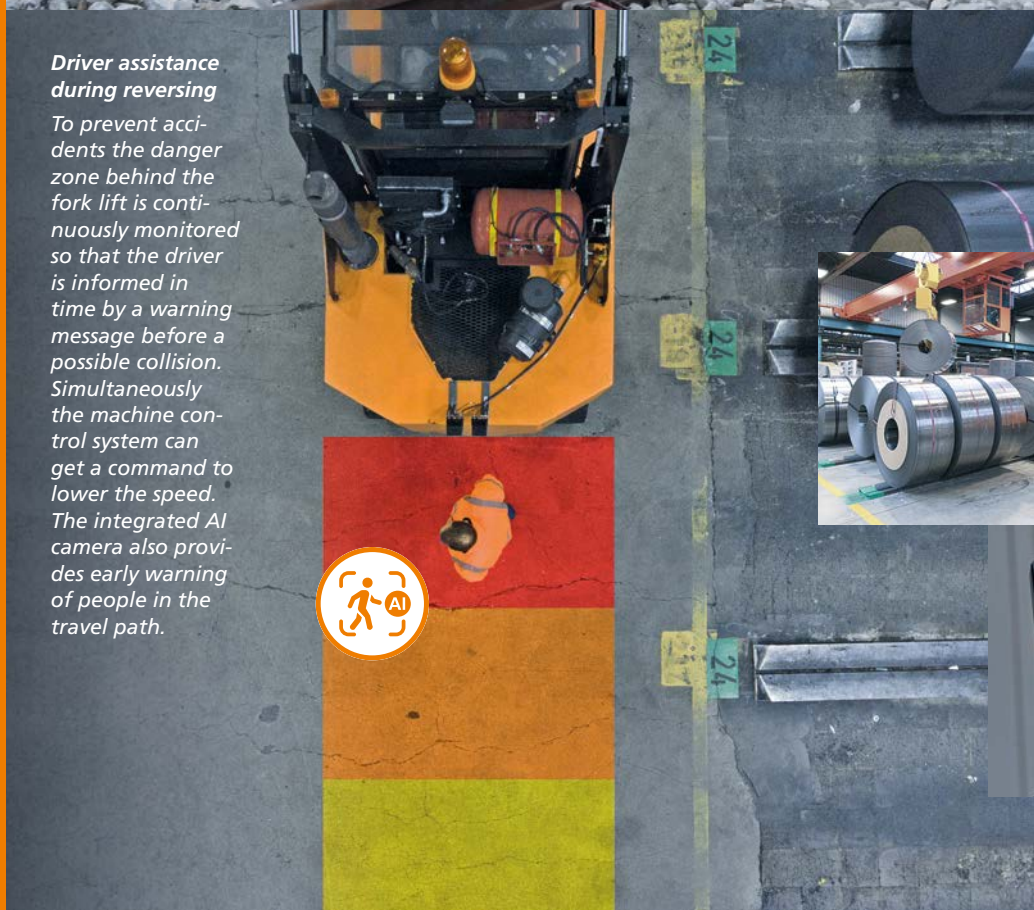
Thanks to the use of a high-performance AI processor, people and obstacles are detected reliably with a response time of just 60 ms. The camera's self-diagnostic functions provide continuous information about the system status.

High coverage:

The O3M3xx reliably detects people up to 25 m away and other obstacles at distances of up to 15 m. All detected objects are fused internally and transmitted directly to the machine control system via CAN and/or Ethernet.

Goal-oriented:

Object distances and dimensions are automatically provided in a clear grid using the selectable world coordinate system. The ground recognition integrated in the algorithm ensures high unambiguity of object recognition.



Driver assistance during reversing

To prevent accidents the danger zone behind the fork lift is continuously monitored so that the driver is informed in time by a warning message before a possible collision. Simultaneously the machine control system can get a command to lower the speed. The integrated AI camera also provides early warning of people in the travel path.

Track maintenance work

To provide the best possible protection for track workers, cameras mounted on the maintenance train continuously monitor the immediate surroundings.





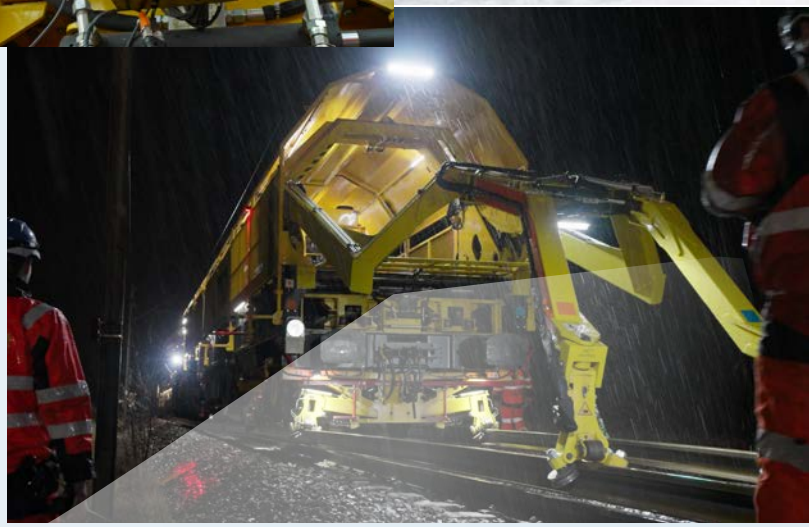


Watch TSO application video. ifm.com/cnt/tso



Position determination of transport vehicles

For simple position determination the integrated distance monitoring provides up to 64 adjustable regions of interest (ROIs), i.e. individual regions whose distances are to be monitored. This ensures, for example, position determination of a transport vehicle underneath a loading point.







Learn more at ifm.com/gb/o3m-dm

Collision avoidance and area surveillance in ports

Transport and logistics



Fast reaction:
The 2D/3D PMD camera with people detection uses its high-performance AI processor to deliver fast and reliable processing directly within the sensor system.

No interference:
Automatic suppression of background illumination ensures reliable recognition even with full solar radiation of 120 klx.

Reliable parallel operation:
The reliable operation of several 3D sensor systems in the same area is guaranteed by an adjustable frequency change method This may be random or preset.

Excluding objects outside the vehicle path
Using information from rotary encoders, the vehicle's predicted path can be determined. The camera then suppresses nearby objects located outside the route from the collision warning.





Collision avoidance and area monitoring for freely moving vehicles

Vehicles such as AGVs or straddle carriers move freely within the port environment. To prevent collisions with other vehicles, containers or people, O3M cameras continuously monitor the surroundings and detect objects within them. To ensure that collision warnings are issued to the operator only when there is an actual risk of collision, information from wheel-mounted rotary encoders can be used to predict the vehicle's path. Nearby objects that are not located within the vehicle path are then excluded from the warning.

Easy area surveillance in ports

The integrated functions in the 3D sensor are especially suited for monitoring the rails of a gantry crane. The sensor detects an obstacle on the rails or extending into the path and signals this to the crane driver in time. The crane is stopped automatically in critical situations.



3D area monitoring for AGVs

Unlike laser scanner-based area monitoring, which is restricted to a horizontal plane, 3D technology provides full spatial awareness of obstacles. As a result, suspended objects such as spreaders or crane hooks can also be detected, helping to prevent collisions.



Learn more at ifm.com/gb/o3m-dm

Collision avoidance and area surveillance in ports

Transport and logistics



Person detection with artificial intelligence:

Integrated in the 3D sensor system, an AI camera provides mobile machine operators with a clear overview. People and obstacles are detected in real time and highlighted directly in the camera image.

Customer-specific warning messages:

The overlay function of the 3D smart camera also allows overlay of graphics or text by the machine control system via CAN bus or Fast Ethernet.

No interference:

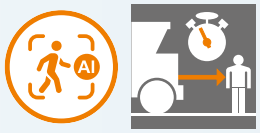
Automatic suppression of background illumination ensures reliable recognition even with full solar radiation of 120 klx.

Reliable parallel operation:

The reliable operation of several 3D sensor systems in the same area is guaranteed by an adjustable frequency change method. This may be random or preset.







Intelligent collision avoidance

The integrated, automatic object recognition detects up to 20 stationary or moving objects in the path of a reach stacker. On the basis of the current speed, the motion vector and fixed parameters, for example for the braking distance, the collision probability is calculated by the 3D sensor. It is transferred to the machine control system via CAN bus or Ethernet and signalled to the driver. In a live image provided by the integrated AI camera the recognised obstacles and persons are highlighted.





Learn more at ifm.com/gb/o3m-ca

Height and distance monitoring in airports

Transport and logistics



High-performance measuring system:

**Thanks to the patented PMD technology it is possible to have a high repeatability of the measured data even on materials of different reflectivity.
The multi-phase measuring system even detects interference caused by dust or water mist formation.**

Robust sensors:

The protection rating IP6K7 and IP6K9K and a wide temperature range of -40 to 85 °C ensure universal use in different applications.

High reliability:

**Integrated self-diagnostic functions from the sensor to the IR system illumination unit always ensure comprehensive information of the machine control system about the current function status of the 3D sensor.
In case of damage, interference or heavy soiling the sensor system can give corresponding signals in time.**

Height monitoring for tankers

The integrated distance function 'minimum distance' can monitor up to 64 selectable points above the tanker simultaneously.

The driver can, for example, be supported when he positions the tanker underneath the aeroplane wing or is informed if the wing is lowered.



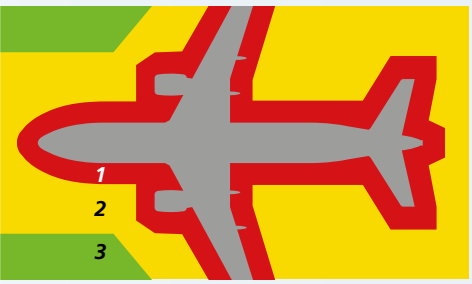




Positioning and docking help for airport ground equipment

More than 1,000 individual measurements precisely detect the environment of the vehicle. When approaching an aircraft the speed is automatically reduced depending on the distance until the vehicle comes to a complete stop.





Safety zones.

1 Docking area
2 Equipment restrain area
3 Ramp area



Learn more at ifm.com/gb/o3m-sd

AI-powered 2D/3D camera for person detection and collision avoidance

Overview of articles / Technical data

O3M AI-powered 2D/3D camera

Description	Horizontal x vertical opening angle [°]	Order no.	Suitable illumination	Order no.
Mobile 2D/3D smart sensor with integrated AI camera and people detection	97 x 44 (3D) 143 x 112 (2D)	**O3M372**	IR system illumination unit	**O3M970**

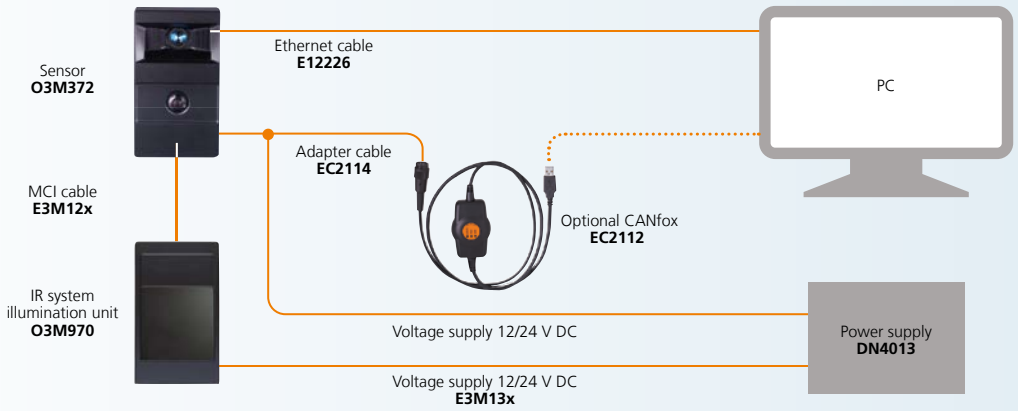


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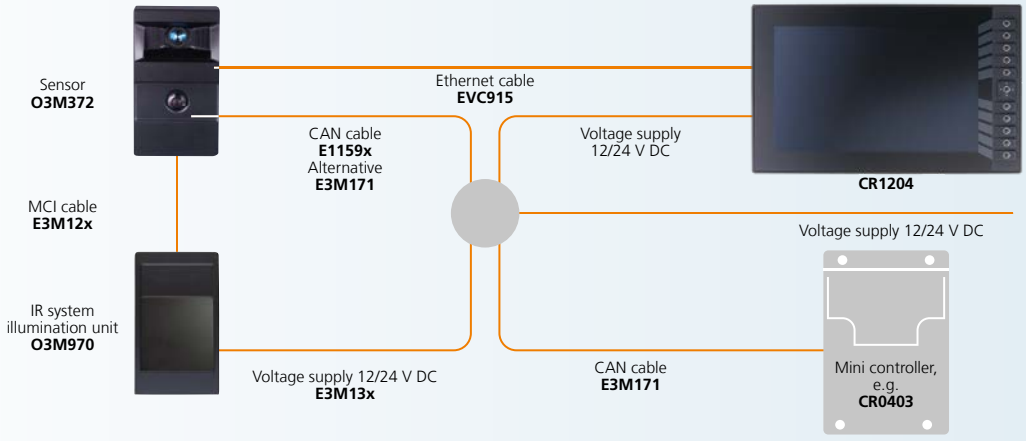
Note:
The O3M and O2M5 camera series can be used, among other applications, as operator assistance systems for collision warning and area monitoring. They are photoelectric systems whose function may be impaired by heavy soiling, for example. This system does not meet the requirements of IEC 61496 for electro-sensitive protective equipment and must not be used for implementing a safety function for operator protection. The cameras mentioned can be used to assist the machine operator. The machine operator is, however, always fully responsible.

Technical data		
Type of sensor		PMD 3D chip
Pixel resolution	[Pixel]	64 x 16
Illumination		IR system illumination unit 850 nm (wave length)
Max. frame rate	[Hz]	30
Connection		M12 connector
Protection rating / protection class		IP6K7 / IP6K9K, III
Operating voltage	[V DC]	9...32
Ambient temperature	[°C]	-40...75
Person detection		up to 25 m, ifm deep learning integrated, can be updated
KI processor		High-performance processor with NPU
Interface		1x CAN (CANopen, SAE J1939) 1x Fast Ethernet (UDP, RTP, RTSP, H.264, H.265, MJPEG)
Analogue and digital inputs/outputs		optional IO module ZZ1102
Maximum latency	[ms]	60
Approval		E1 type approval in accordance with UN ECE R10 regulation
2D camera		
Resolution	[Pixel]	1280 x 960 (1.3 MP)
FOV horizontal x vertical	[°]	143 x 112
Sensor type		1/4" 1.3 MP CMOS digital image sensor, HDR + LFM
3D camera		
FOV horizontal x vertical	[°]	97 x 44
Sensor type		PMD time-of-flight

Wiring for parameter setting



Wiring for installation



Learn more at www.o3m-ai.ifm

3D sensor system

Overview of articles / Technical data

O3M PMD 3D sensor

Description	Horizontal x vertical angle of aperture [°]	Order no.	Suitable illumination	Order no.
Mobile 3D smart sensor	70 x 23	**O3M151**	IR system illumination unit	**O3M950**
Mobile 3D smart sensor with integrated 2D/3D overlay	70 x 23 (3D), 90 (2D)	**O3M251**	IR system illumination unit	**O3M950**
Mobile 3D smart sensor	95 x 32	**O3M161**	IR system illumination unit	**O3M960**
Mobile 3D smart sensor with integrated 2D/3D overlay	95 x 32 (3D), 120 (2D)	**O3M261**	IR system illumination unit	**O3M960**
Mobile 3D smart sensor	97 x 44	**O3M171**	IR system illumination unit	**O3M970**
Mobile 3D smart sensor with integrated 2D/3D overlay	97 x 44 (3D), 155 (2D)	**O3M271**	IR system illumination unit	**O3M970**



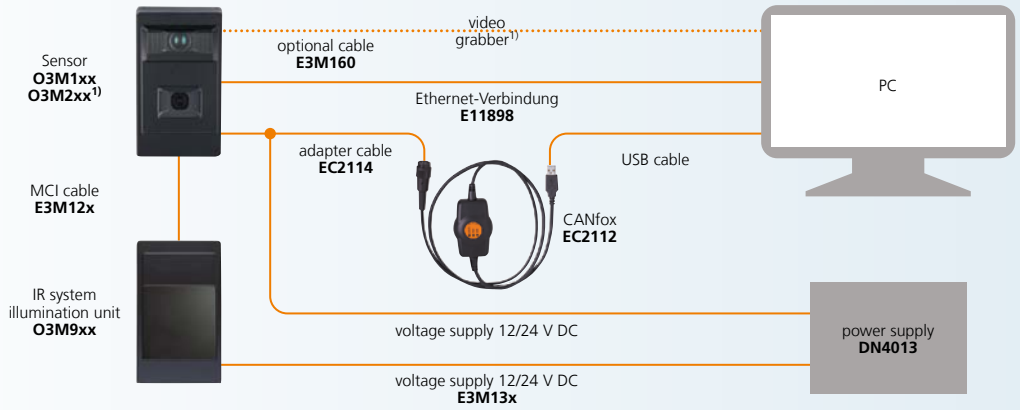
E1

Technical data		
Type of sensor		PMD 3D chip
Pixel resolution	[Pixel]	64 x 16
Illumination		IR system illumination unit 850 nm (wave length)
Max. frame rate	[Hz]	25 / 33 / 50
Wiring		M12 connector
Protection rating / protection class		IP6K7 / IP6K9K, III
Operating voltage	[V DC]	9...32
Ambient temperature	[°C]	-40...85

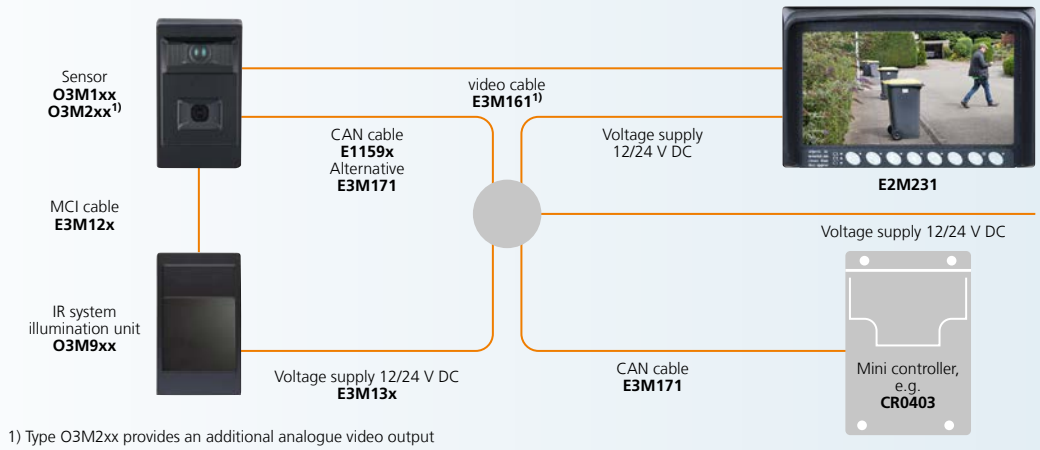
Further technical data		
Devices with 2D camera (PAL), without person detection		
Type of sensor		1/4" 4:3 VGA CMOS image sensor colour
PAL resolution	[Pixel]	640 x 480

Note:
The O3M and O2M5 camera series can be used, among other applications, as operator assistance systems for collision warning and area monitoring. They are photoelectric systems whose function may be impaired by heavy soiling, for example. This system does not meet the requirements of IEC 61496 for electro-sensitive protective equipment and must not be used for implementing a safety function for operator protection. The cameras mentioned can be used to assist the machine operator. The machine operator is, however, always fully responsible.

Wiring for parameter setting



Wiring for installation



1) Type O3M2xx provides an additional analogue video output

Learn more at www.o3m-ai.ifm

3D sensor system

Overview of articles / Technical data

Accessories

Design	Description	Order no.
	CAN/RS232 USB interface CANfox	**EC2112**
	Adapter cable set for CANfox	**EC2114**
	Weather protective cover, stainless steel black	**E3M101**
	U-shaped bracket, suitable for sensor or illumination unit, stainless steel black	**E3M102**

Design	Description	Order no.
	U-shaped bracket, suitable for sensor or illumination unit, stainless steel	**E3M100**
	Mounting set for clamp mounting, Ø 14 mm, stainless steel / high-grade stainless steel	**E3M103**
	Reflector, triangular, 200 mm	**E3M140**
	Reflective tape, triangular, self-adhesive, 200 mm	**E3M141**
	Reflective tape 210 x 297 mm, self-adhesive	**E3M142**

Software and firmware at ww.o3m.ifm

Connection technology

Design	Description	Order no.
	TPU cable, connection sensor / system illumination unit, 0.25 m	E3M120
	TPU cable, connection sensor / system illumination unit, 2 m	E3M124
	MCI cable, connection sensor / system illumination unit, 1 m	E3M121
	MCI cable, connection sensor / system illumination unit, 2 m	E3M122
	MCI cable, connection sensor / system illumination unit, 3 m	E3M123
	Socket, M12, voltage supply system illumination unit, 2 m, PUR cable, 4 poles	E3M131
	Socket, M12, voltage supply system illumination unit, 5 m, PUR cable, 4 poles	E3M132
	Socket, M12, voltage supply system illumination unit, 10 m, PUR cable, 4 poles	E3M133
	M12 video cable, Sensor-to-ecomatDisplay connection for Surround View applications, 2.5 m	E3M178

Design	Description	Order no.
	Video interconnection cable, M12, for connecting the camera to the display via E3M178, 5 m	E3M151
	M12 video connection cable for connecting the camera to the display via E3M178, 5 m, 11 m	E3M152
	M12 video extension cable, for extending E3M151 or E3M152, 5 m	E3M159
	M12 video adapter cable / Cinch plug, for connection of a video grabber, 1 m	E3M160
	Video adapter cable M12 connector to M16 connector for connection to the multi-view box E2M250 or monitor E2M231, 1 m	E3M161
	Socket, M12, CAN bus, 2 m, PUR cable, 5 poles	E11596
	Socket, M12, CAN bus, 5 m, PUR cable, 5 poles	E11597
	Ethernet, cross-over patch cable, 2 m, PVC cable, M12 / RJ45	E11898
	Ethernet, cross-over patch cable, 10 m, PVC cable, M12 / RJ45	E12204
	Ethernet, cross-over patch cable, 20 m, PVC cable, M12 / RJ45	E12205
	Ethernet, cross-over patch cable, 2 m, PVC cable, M12 / RJ45, angled / straight	E12226
	Ethernet, D-coded, M12, 5 m, PROFINET Type C, PUR cable	EVC907
	Ethernet, D-coded, M12, 20 m, PROFINET Type C, PUR cable	EVC909



Avoid accidents with AI-powered person detection

Overview of articles / Technical data





2D camera for mobile machines

- Reliable person detection at a range of up to 30 metres
- Robust functionality even in bright sunlight or twilight
- Built-in dashcam function with 5 GB of recording storage
- Customisable program logic
- OEM-specific programming and AI models can be implemented

IP6K9K

AI TECHNOLOGY

PERSON DETECTION

Description	Order no.
Digital Ethernet camera with AI person detection	**O2M500**

Enhanced safety with AI-powered person detection

With mobile machines that are difficult to manoeuvre, reliable person detection is essential to preventing accidents involving people. The AI-based 2D camera enables effective area and rear-area monitoring and alerts drivers at an early stage as soon as a person enters the working or danger zone. It is specifically designed to prioritise the detection of persons.

The robust die-cast aluminium housing and outstanding resistance to vibration and shock ensure that the camera operates reliably even under extreme conditions. It is suitable for use on machinery such as forklift trucks, excavators, wheel loaders, road rollers and refuse collection vehicles and has a detection range of up to 30 metres.

Powerful AI processing right inside the camera

All signal and image processing takes place directly inside the camera so no external processing unit is required. For processing of the AI-based algorithms, it features a powerful processor with an integrated neural processing unit. This ensures that people can be detected even in challenging situations, such as when they are lying on the ground, wearing dark clothing, or in difficult lighting conditions. If the front lens is dirty to the extent that safety is compromised, this is also detected and reported.

Parameter setting, updates and future AI enhancements can be carried out easily via the ifm Vision Assistant or the integrated web server. A customer-specific programming is also possible. In addition, relevant events can be recorded and saved using the dashcam function.

Technical data		
Resolution	[Pixel]	1920 x 1440 (3 MP)
FOV horizontal x vertical	[°]	148 x 118
Sensor type		CMOS (HDR)
Image repetition frequency	[Hz]	30
Simultaneous video streams		2
Maximum latency	[ms]	60
Operating voltage	[V DC]	12/24
Power consumption	[W]	< 6
Ambient temperature	[°C]	-40...85
Interface		1x CAN (CANopen, SAE J1939) 1x Fast Ethernet (TCP, UDP, RTP, RTSP, H.264, H.265, MJPEG)
Connection		Jumper cable 0.6 m with M12 connection for Ethernet (D-coded), M12 connection for CAN and power supply
Approval		E1, type approval according to the UN ECE R10 regulation is being sought
Protection rating		IP6K7, IP6K9K

Accessories

Design	Description	Order no.
	Mounting bracket for O2M500	**E2M100**

Learn more at www.o2m-ai.ifm

Heavy-duty universal camera

Overview of articles / Technical data



O2M2xx camera with analogue video output

Description	Angle of aperture [°]	Mirror function	Order no.
CMOS camera	80	–	**O2M200**
CMOS camera	80	integrated	**O2M201**
CMOS camera	118	–	**O2M202**
CMOS camera	118	integrated	**O2M203**
CMOS camera	170	–	**O2M210**
CMOS camera	170	integrated	**O2M211**

Technical data		
Type of sensor		1/4" 4:3 VGA CMOS image sensor colour
PAL resolution	[Pixel]	640 x 480
Image repetition rate	[fps]	25
Wiring		cable 0.5 m with M16 connector
Protection rating / protection class		IP 67 / IP 69K
Operating voltage	[V DC]	12...32
Ambient temperature	[°C]	-40...85
Lens heating		automatic

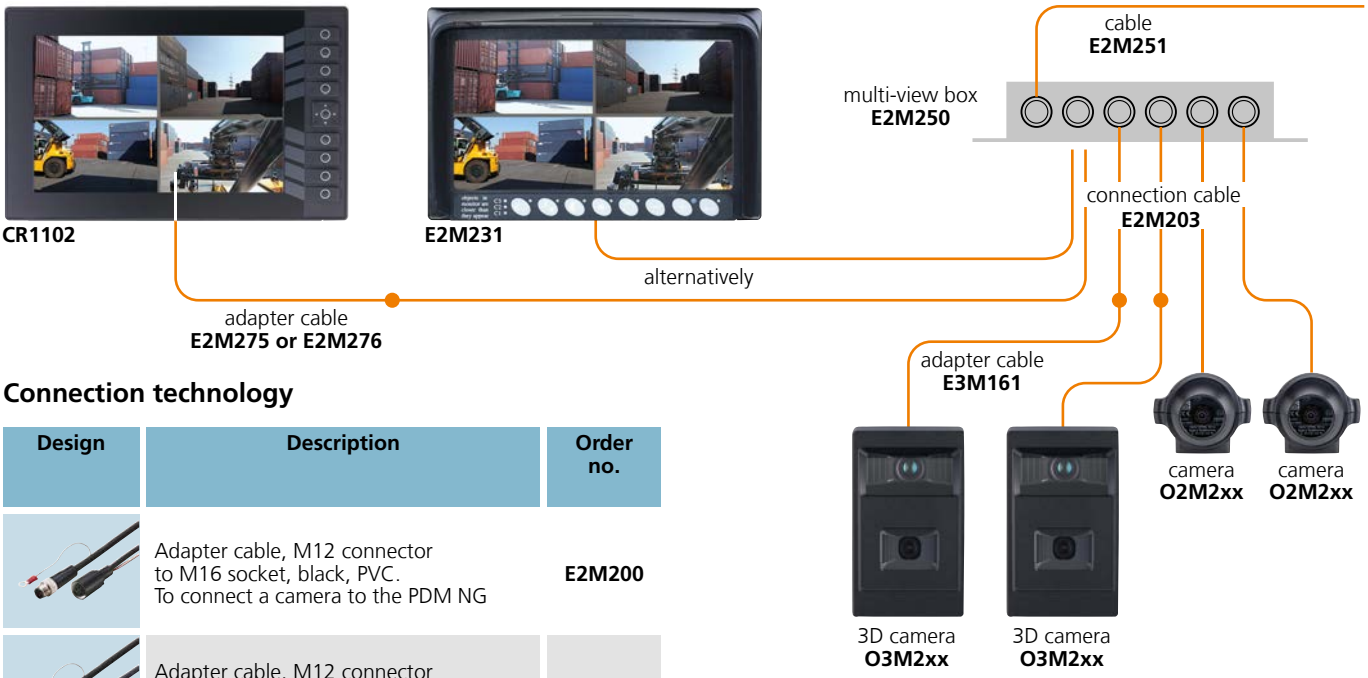
E4

Multi-view box

Design	Description	Order no.
	Video splitter with 4 inputs. Displays up to four camera images (PAL, 720H × 576) on a standard monitor. Connection: M16 connector	**E2M250**
	M16 cable, 3.85 m, 8 poles, for the voltage supply of the E2M250 multi-view box, open cable end	**E2M251**
	Socket, M16, wirable, 8 poles, for the voltage supply of the E2M250 multi-view box	**E2M252**

Accessories

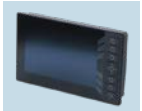
Design	Description	Order no.
	Metal protective cover, stainless steel	**E2M212**
	Dome fixture	**E2M211**
	Vibration damper set	**E2M213**
	Replacement fixture	**E2M210**



Connection technology

Design	Description	Order no.
	Adapter cable, M12 connector to M16 socket, black, PVC. To connect a camera to the PDM NG	**E2M200**
	Adapter cable, M12 connector to M16 socket, black, PVC. To connect two cameras to the PDM NG	**E2M201**
	Connection cable with AMP connector and 2 x M16 sockets for connecting 2 analogue cameras to the ecomatDisplay	**E2M275**
	Connection cable with AMP connector and 4 x M16 sockets for connecting 4 analogue cameras to the ecomatDisplay	**E2M276**
	Cable, M16 connector to M16 socket, 2 m, black, PVC	**E2M207**
	Cable, M16 connector to M16 socket, 3 m, black, PVC	**E2M202**
	Cable, M16 connector to M16 socket, 5 m, black, PVC	**E2M203**
	Cable, M16 connector to M16 socket, 11 m, black, PVC	**E2M204**
	Cable, M16 connector to M16 socket, 16 m, black, PVC	**E2M205**
	Cable, M16 connector to M16 socket, 21 m, black, PVC	**E2M206**
	Adapter cable, BNC connector to M16 socket, for connection to monitors with BNC socket	**E2M260**
	M16 socket, wirable, 4 poles, for connecting O2M2 cameras	**E2M261**

Monitors and graphic displays

Design	Description	Order no.
	7" TFT LCD monitor with LED backlight, 1 video input	**E2M231**
	7" TFT LCD monitor with LED backlight, 2 video inputs	**E2M232**
	Programmable 7" graphic display with LED backlight, touch function, 6 function keys, navigation key, 4 video inputs	**CR1077**
	Programmable 10" graphic display with LED backlight, touch function, 8 function keys, navigation key, 4 video inputs	**CR1102**
	Programmable 12" graphic display with LED backlight, touch function, 10 function keys, navigation key, 4 video inputs	**CR1204**

Learn more at www.o2m.ifm

Robust 7“ TFT LCD monitor

Overview of articles / Technical data



Monitor with analogue video input E2M2xx

Description	Order no.
7" TFT LCD monitor with LED backlight for direct connection of an O2M2 camera or O3M2 smart camera. With video input. Resolution WVGA 800 x RGB x 480.	**E2M231**
7" TFT LCD monitor with LED backlight for direct connection of O2M2 cameras and / or O3M2 smart cameras. With two video inputs. Resolution WVGA 800 x RGB x 480.	**E2M232**

E4

Accessories

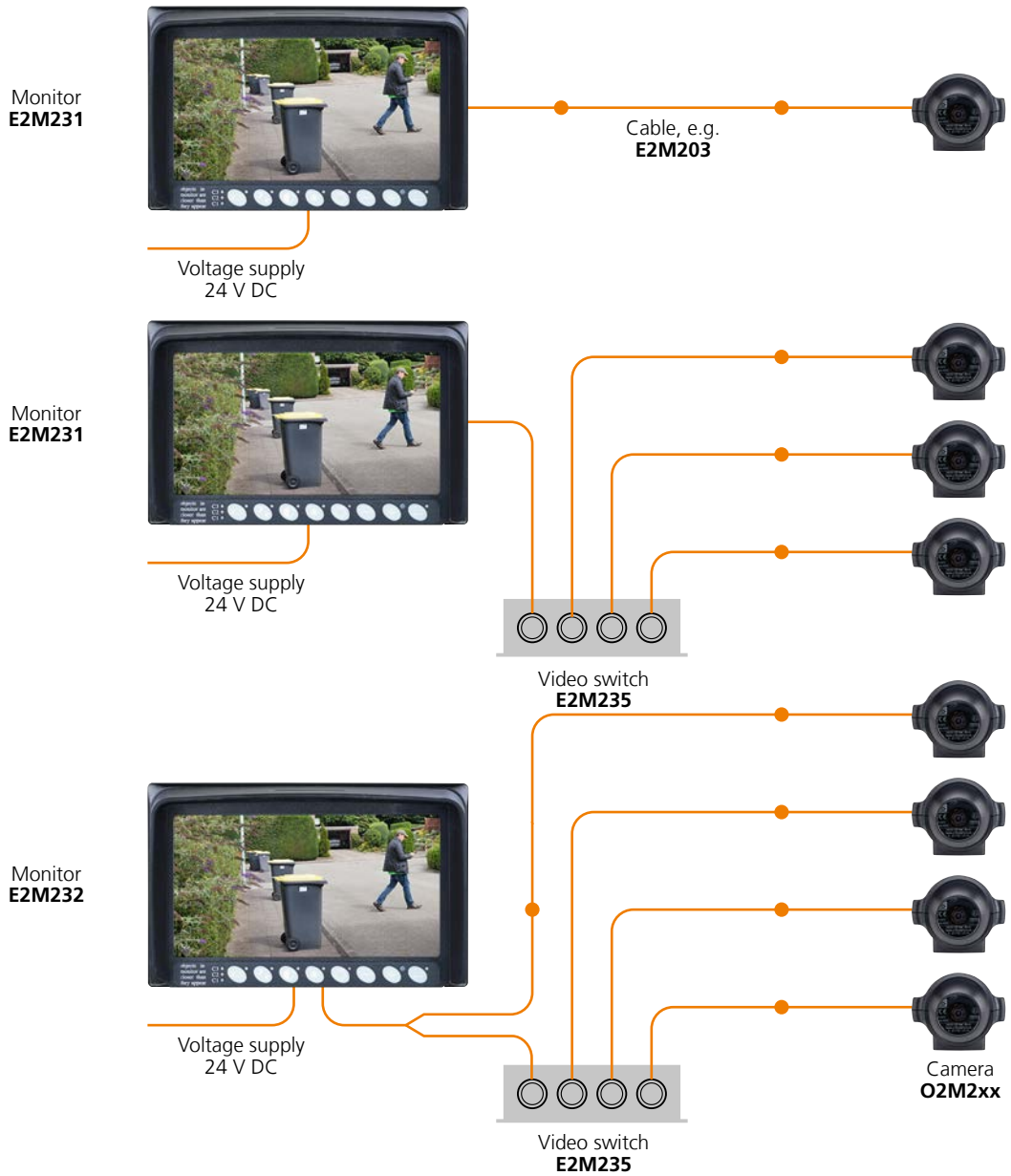
Design	Description	Order no.
	Anti-glare frame large, elastic	**E2M233**
	Anti-glare frame small (supplied with each monitor)	**E2M234**
	Video switch for connection of 3 further cameras	**E2M235**
	RAM mount bracket 90 mm	**E2M236**
	RAM mount bracket 144 mm	**E2M237**
	RAM mount mounting plate	**E2M238**

Design	Description	Order no.
	Monitor bracket - complete set	**E2M239**
	Video adapter cable M12 connector to M16 connector for connection to O3M2 3D cameras	**E3M161**

Cameras

Description	Angle of aperture [°]	Order no.
3D smart camera with PAL video output	70 x 23 (3D), 90 (2D)	**O3M251**[2)]
	95 x 32 (3D), 120 (2D)	**O3M261**[2)]
	97 x 44 (3D), 155 (2D)	**O3M271**[2)]
Analogue camera with PAL video output	80	**O2M200**
	118	**O2M202**
	170	**O2M210**
Analogue camera with PAL video output, integrated mirror function	80	**O2M201**
	118	**O2M203**
	170	**O2M211**
Video splitter, visualises up to 4 camera images (PAL)	–	**E2M250**

[2)] More accessories needed, see from page 25



Learn more at www.o2m.ifm

I/O module for 3D camera system O3M and O2M

Overview of articles / Technical data

Articles	Order no.
I/O module for a complete camera system set	**ZZ1102**

Content complete set

Quantity	Articles	Order no.
1	BasicController, programmable controller with multifunctional input and output channels (article is preprogrammed especially for the application package. In case of individual purchase, there is no pre-programming.)	**CR0403**
1	Module cover IP 54 without display recess, with cable seal	**EC0401**
1	CAN adapter cable for the connection and voltage supply of O3M or O2M500 and CR0403, 10 m	**E3M171**
1	Connection cable for BasicController CR04xx, inputs A/B/C, 1.5 m	**EC9206**
2	Connection cables for BasicController CR04xx, outputs D/E/F, 1.5 m	**EC9207**

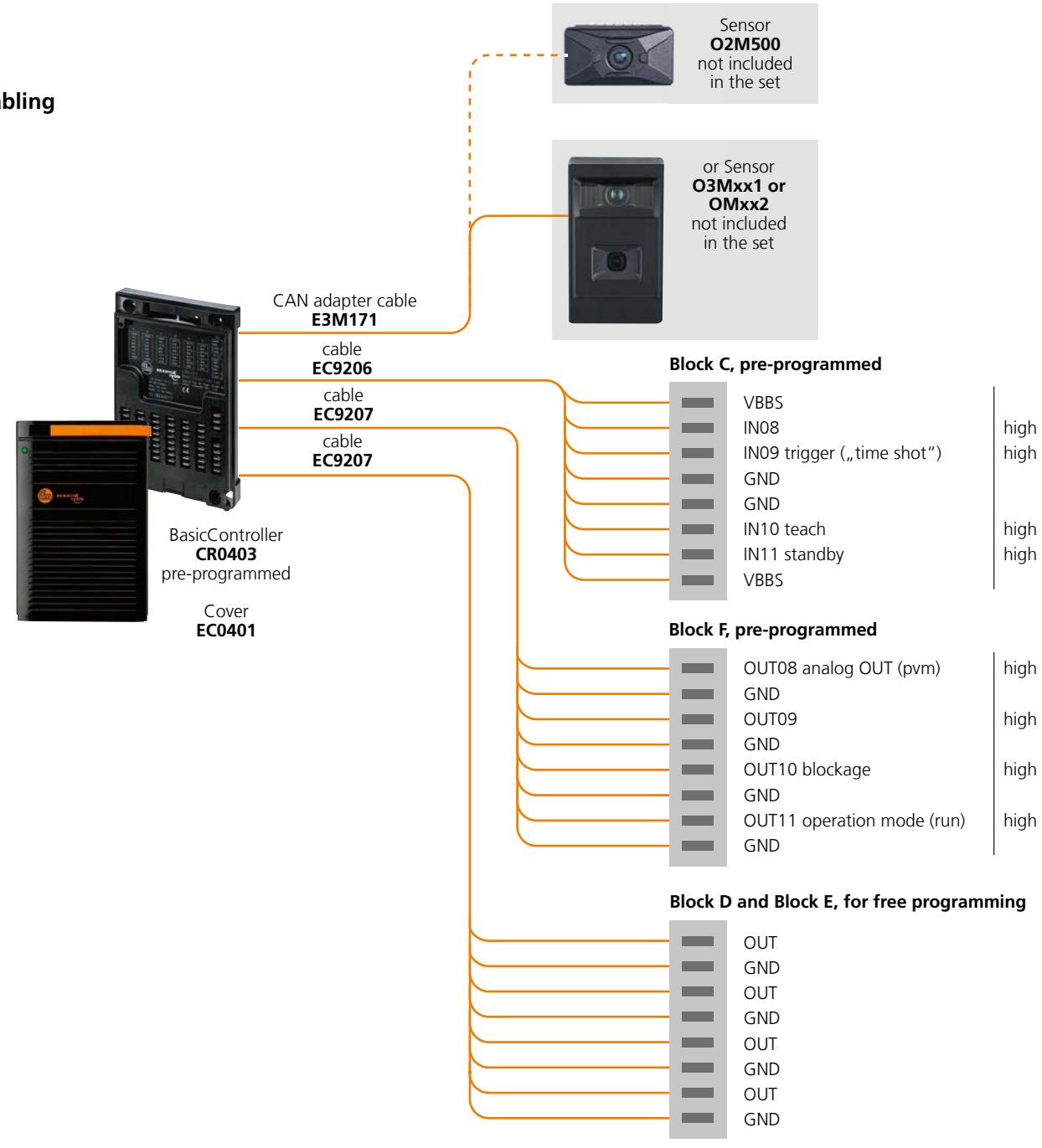
In addition:
Additional digital and analogue inputs and outputs for O3M and O2M500 camera systems.

Simple:
Easy retrofitting on mobile machines without a bus system.

User-friendly parameter setting:
The parameter setting and the creation of the logic in the device are carried out via the ifm Vision Assistant.

Complete:
Includes a CAN connection cable for connecting the O3M and O2M500 camera systems as well as all necessary adapter cables for the inputs and outputs.

Cabling



Watch unboxing and programming videos at
ifm.com/gb/o3m-howto

Ready-to-start application package 3D collision warning system for mobile machines

Overview of articles / Technical data

Articles	Order no.
Ready-to-start application package (complete set) 3D collision warning system for mobile machines	**ZZ1103**

Contents application package

Quantity	Articles	Order no.
1	Mobile 3D smart camera with integrated 2D/3D overlay (article is specifically pre-programmed for the application package. In case of individual purchase, there is no pre-programming.)	**O3M271**
1	IR system illumination unit	**O3M970**
2	U-shaped bracket, suitable for 3D camera or illumination unit, stainless steel black	**E3M102**
1	MCI cable, connection sensor / system illumination unit, 0.25 m	**E3M120**
1	Connection cable with M12 socket, voltage supply system, illumination unit, 10 m, PUR, 4 poles	**E3M133**
1	BasicController, programmable controller with multifunctional input and output channels (article is preprogrammed especially for the application package. In case of individual purchase, there is no pre-programming.)	**CR0403**
1	CAN adapter cable 10 m for the connection and voltage supply of O3M, CR0403 and CR0451	**E3M171**
1	Upper part of the housing for CR0403, suitable for installation of the CR0451 display	**EC0402**
1	Adapter cable for the connection of the buzzer to CR0403 and use of the output channels	**E3M172**
1	BasicDisplay, programmable graphic display with CAN connection (article is pre-programmed specifically for the application package. In case of individual purchase, there is no pre-programming.)	**CR0451**
1	7" TFT LCD monitor with LED backlight, 1 video input. Displays the camera image.	**E2M231**
1	Bracket for monitor E2M231	**E2M239**
1	Video extension cable, M16 connector / M16 socket, 5 m, black, PCV	**E2M203**
1	Video adapter cable M12 connector / M16 connector for the connection of O3M271 to E2M231	**E3M161**
1	Buzzer for connection to CR0403[3)]	

[3)] Article is part of the application package and cannot be ordered separately

Watch the unboxing and application package installation videos at ifm.com/gb/o3m-howto

Active obstacle detection:

The system monitors up to six danger zones around the vehicle and warns the driver of imminent collisions in good time. Warnings are provided visually, acoustically and in the form of icons via the supplied 7" monitor. The highly-developed 3D time-of-flight system reduces false alarms to a minimum.

Easy retrofitting:

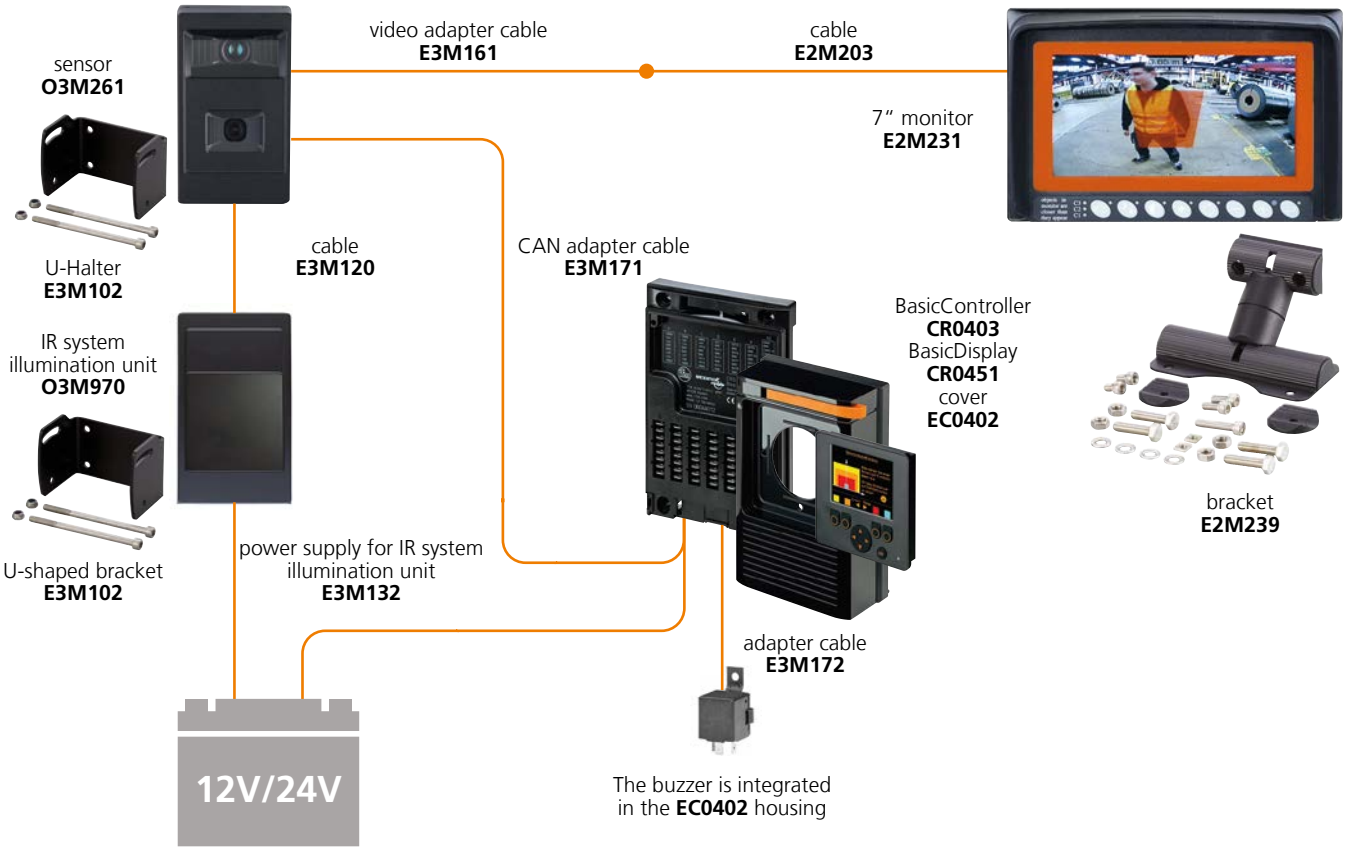
The application package contains all necessary components including any cables and mounting accessories. This means it can be easily retrofitted on all mobile machines with 24 V on-board system voltage.

Quick to set up:

After installation of the components and plug & play wiring, the system can be set up in just a few minutes thanks to its intuitive handling using the colour display supplied.



Application package cabling





Detection of reflective clothing.

Thanks to a special classification of reflective materials, e.g. reflective vests or clothing, the collision warning for persons can be given priority over other objects. This increases the safety of persons.

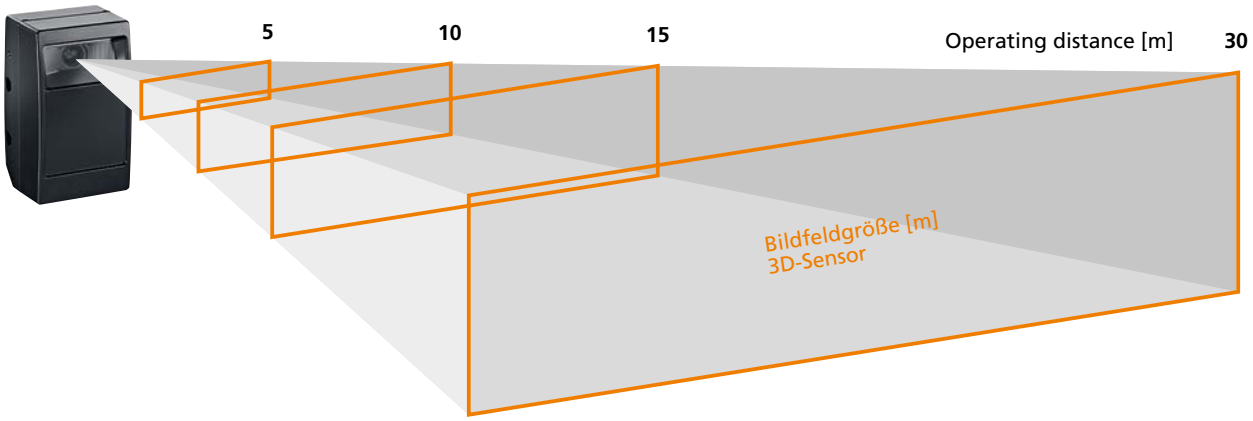
Watch the heavy-duty forklift application video at ifm.com/gb/o3m-hd

Watch the system parameter setting video at ifm.com/gb/o3m-howto

3D sensor system
Operating distance / field of view sizes

Overview of articles / Technical data

Type O3M angle of aperture 70° x 23° / 95° x 32° / 97° x 44



Type O3M151 / O3M251 / O3M161 / O3M261 / O3M171 / O3M372 Measuring accuracy

Software version	Object type size	Operating conditions	Measuring range for object recognition [m]		
			O3M151 O3M251	O3M161 O3M261	O3M171 O3M271 O3M372
OD object recognition	vehicle	sunny (~120 kLux)	0.25...30	0.25...21	0.25...17
		cloudy (~20 kLux)	0.25...40	0.25...30	0.25...25
		darkness	0.25...50	0.25...35	0.25...29
OD object recognition	person[5)]	sunny (~120 kLux)	0.25...12	0.25...9	0.25...7
		cloudy (~20 kLux)	0.25...16	0.25...12	0.25...10
		darkness	0.25...20	0.25...15	0.25...12
OD object recognition	retroreflector (e.g. reflective vest)	sunny (~120 kLux)	1...40	1...29	1...24
		cloudy (~20 kLux)	1...60	1...42	1...35
		darkness	1...80	1...55	1...46
DI / BF distance image basic functions		sunny (~120 kLux)	–	–	–
		cloudy (~20 kLux)	–	–	–
		darkness	–	–	–

[5)] The term person is only to be understood as a reference for size.

Note:
The O3M and O2M5 camera series can be used for a wide range of applications, including driver assistance systems for collision warning and area monitoring. They are photoelectric systems whose function may be impaired by heavy soiling, for example. This system does not meet the requirements of IEC 61496 for electro-sensitive protective equipment and must not be used for implementing a safety function for operator protection. The cameras mentioned can be used to assist the machine operator. The machine operator is, however, always fully responsible.

Operating distance / field of view sizes

Type	Angle of aperture [°]	Operating distance [m]	Field of view size [m]
O3M151 O3M251	70 x 23	5	7 x 2
		10	14 x 4.1
		15	21 x 6.5
		30	42 x 12.2
O3M161 O3M261	95 x 32	5	11 x 2.9
		10	21.8 x 5.7
		15	32.7 x 8.6
		30	65 x 17
O3M171 O3M271 O3M372	97 x 44	5	11.3 x 4
		10	22.6 x 8.1
		15	33.9 x 12.1
		30	67.8 x 24.2

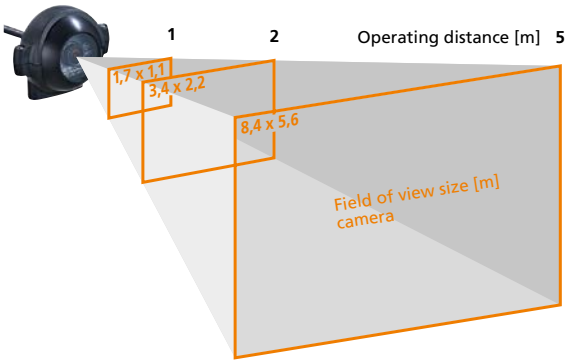
Typ. measuring range for ROI [m]			Typ. measurement accuracy [cm]		
O3M151 O3M251	O3M161 O3M261	O3M171 O3M271 O3M372	O3M151 O3M251	O3M161 O3M261	O3M171 O3M271 O3M372
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
–	–	–	–		
0.25...12	0.25...8	0.25...7	± 15		
0.25...15	0.25...11	0.25...9	± 10		
0.25...30	0.25...21	0.25...17	± 5		



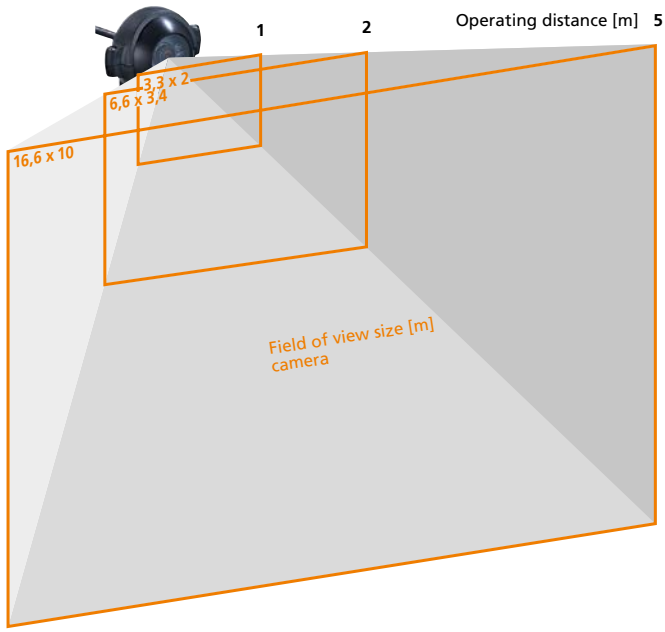
Heavy-duty universal camera Operating distance / field of view size

Overview of articles / Technical data

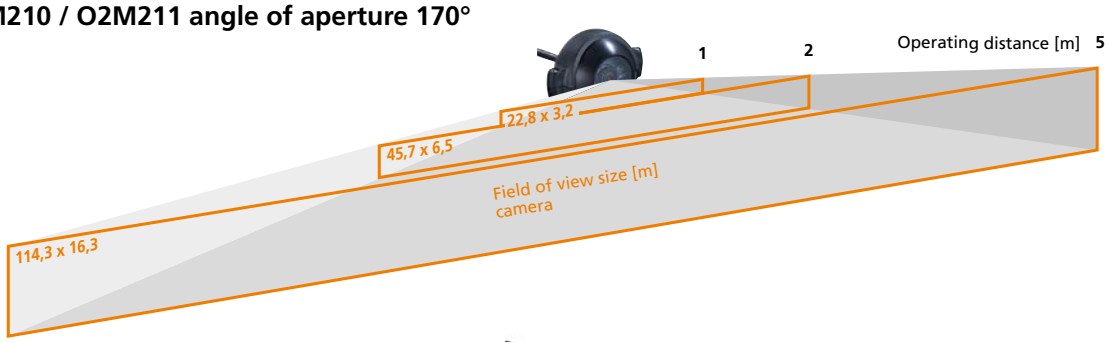
Type O2M200 / O2M201 angle of aperture 80°



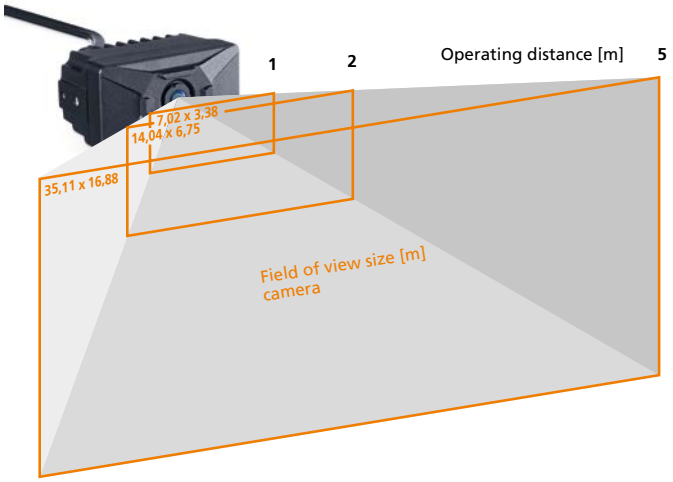
Type O2M202 / O2M203 angle of aperture 118°



Type O2M210 / O2M211 angle of aperture 170°



Type O2M500 angle of aperture 148°

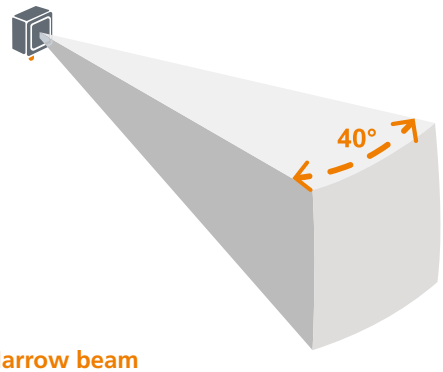


R2D radar sensor

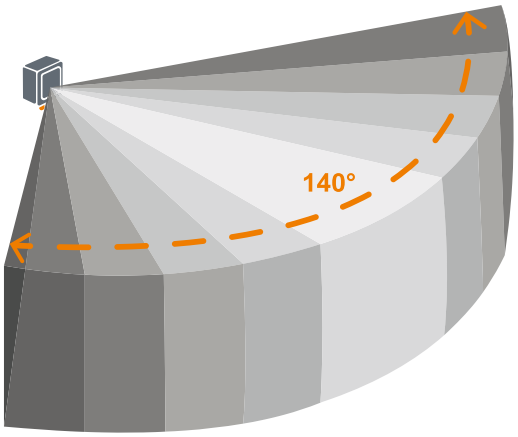
Overview of articles / Technical data



Radar distance sensors with CAN interface	Radar area sensors with CAN interface
Features • Long ranges and a wide temperature range from -40°C to 85°C • Reliable measurements even in precipitation, fog, dust and dirt • High protection rating IP67/IP69K • Simultaneous detection of distance and speed • Operating modes can be set in accordance with the specific application • Intuitive set-up and visualisation of the measured data using the ifm Vision Assistant software	**Features** • Large angle of aperture enables area monitoring • Long ranges and a wide temperature range from -40°C to 85° C • Freely adjustable 3D detection field (horizontal and vertical) • Angular resolution for precise output of position coordinates • Reliable measurements even in precipitation, fog, dust and dirt • High protection rating IP67/IP69K • Various operating modes allow long ranges or precise resolution in the millimetre range • Simultaneous detection of distance and speed • Intuitive set-up and visualisation of the measured data using the ifm Vision Assistant software
Applications Conveyor belt monitoring at bulk terminals, barrier automation at port terminals	**Applications** Ship-to-shore cranes, yard cranes, horizontal transport equipment
Selected radar sensor types R1D; please observe the relevant national radio approvals when selecting a product.	**Selected radar sensor types** R2D; please observe the relevant national radio approvals when selecting a product.



Narrow beam
Small opening angle



Wide beam
Large opening angle

www.radar.ifm

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