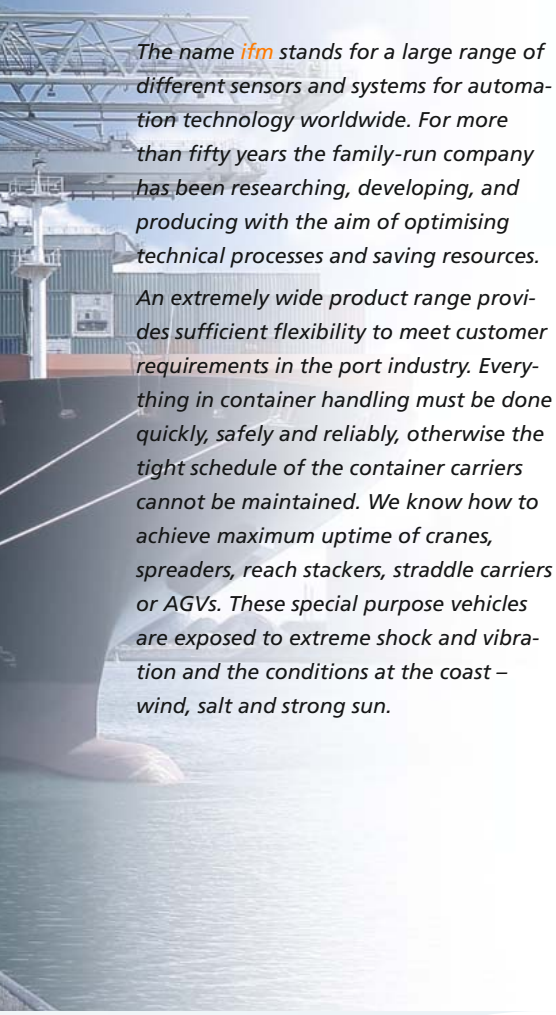
Sensors and systems for port automation

ifm.com

Sensors and systems for port automation.

Close to you!

We are close to our customers worldwide. With our many years of application experience, we support them with the implementation of even unusual or difficult application solutions.



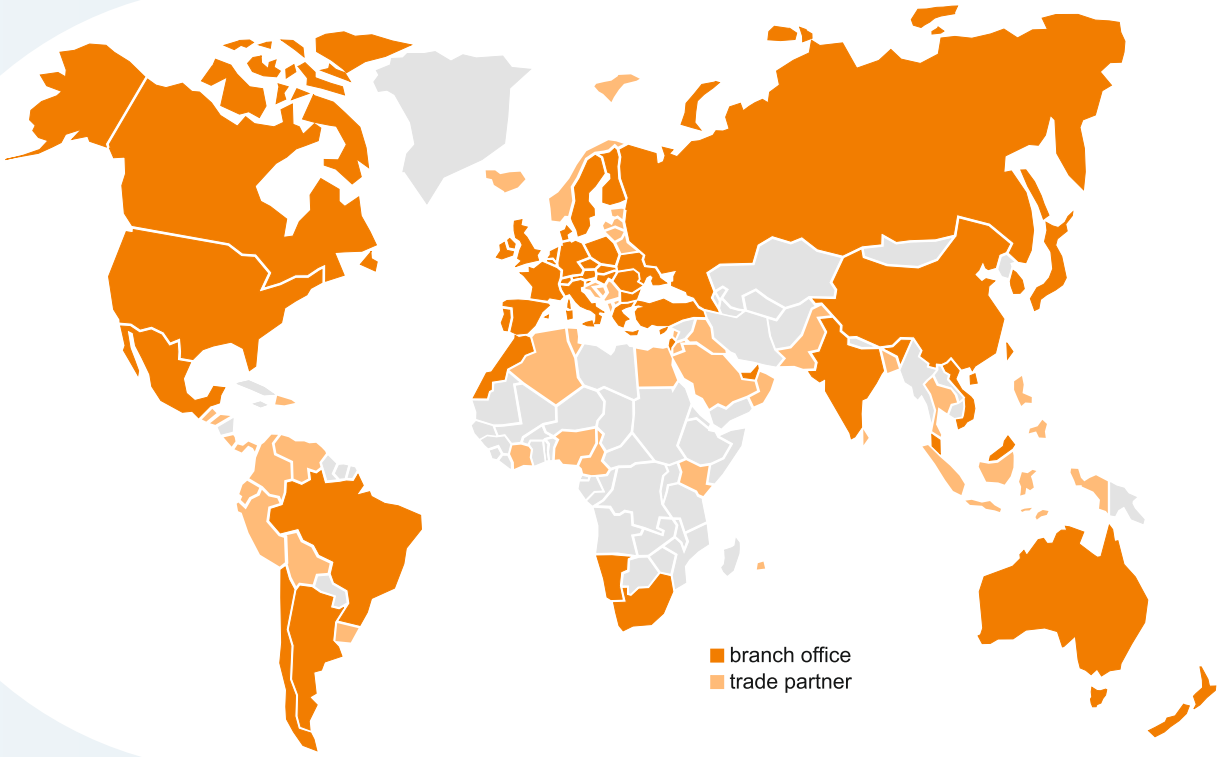
The name ifm stands for a large range of different sensors and systems for automation technology worldwide. For more than fifty years the family-run company has been researching, developing, and producing with the aim of optimising technical processes and saving resources.

An extremely wide product range provides sufficient flexibility to meet customer requirements in the port industry. Everything in container handling must be done quickly, safely and reliably, otherwise the tight schedule of the container carriers cannot be maintained. We know how to achieve maximum uptime of cranes, spreaders, reach stackers, straddle carriers or AGVs. These special purpose vehicles are exposed to extreme shock and vibration and the conditions at the coast – wind, salt and strong sun.

ifm has the solution: sensors and control systems with waterproof protection rating IP 68/69K, shock and vibration resistance up to 120 g and temperature ranges from -40 to 85 °C. In addition, they feature a robust metal housing with excellent EMC compatibility. Of course, all relevant approvals are available.

As one of the global players, ifm guarantees worldwide availability of its products. More than 70 branch offices worldwide ensure competent advice on-site.

ifm – close to you!



Always the first choice.
Robust, flexible, reliable.

Quay side

Container yard

Horizontal equipment

Intermodal area

Compact and flexible: ecomat*mobile* controllers.

Systems for mobile applications

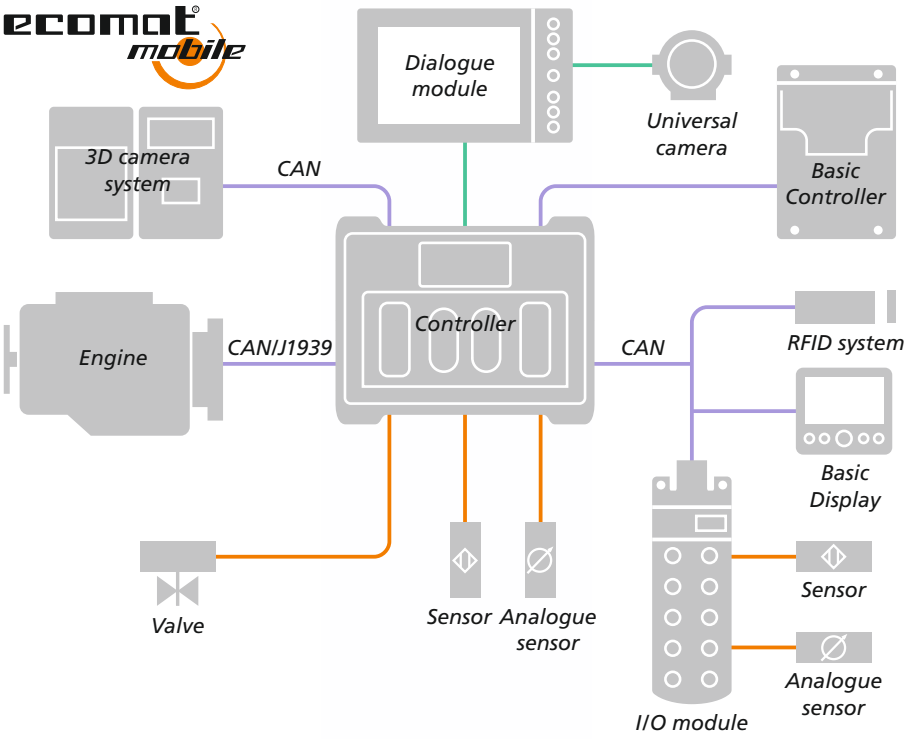
Powerful:
32-bit controller and CAN interface.

Robust:
Resistant to shock load, vibration, moisture, dirt and extreme ambient temperatures.

Reliable:
Versions for use in safety-related applications.

Simple:
Standardised programming to IEC-61131-3 with CODESYS.

Flexible:
Configurable I/O ports – digital, analogue, PWM.



Powerful mobile controllers for various tasks

Powerful 32-bit microcontrollers ensure very short cycle times.The large program memory enables the processing of complex application programs. A second integrated microcontroller monitors important system functions.

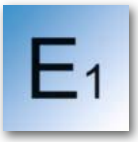
In addition to digital inputs and outputs the controller also has analogue ports. Inputs for fast signals up to 30 kHz can also be used.
All inputs and outputs are protected against interference and overload. Wide-range power supplies enable operation in 12 and 24 V on-board systems.

Gateway functions

Almost all controllers feature several CAN interfaces which are used to transmit data via the CANopen protocol, e.g. to the decentralised input / output modules or to a dialogue module. Controllers with more than one CAN interface can also be used as a gateway. This enables, for example, direct processing of control and diagnostic data of diesel engines with the SAE J1939 protocol.

Programmable to IEC 61131-3

With the programming via CODESYS to IEC 61131-3, programming is clear and simple for the user. Function libraries are available for special hardware functions (for example gateway SAE J1939 / CANopen).



ClassicController

The ClassicController is a proven process controller for a variety of mobile vehicles. It assumes complex working and controlling functions up to driving functions.

Devices for operation and monitoring tasks pages 14 - 17

Compact and flexible. ecomat*mobile* controllers.

The new ecomatmobile Basic starter set. Your introduction to mobile control technology.

Order no. EC0400

Systems for mobile applications

Mini controllers

BasicController

Modular and cost-effective mini controller.

Inputs / outputs in total	Inputs	Outputs	Order no.
20	12 x digital, 4 x analogue (U/I), 4 x frequency, 4 x resistance	8 x digital, 8 x PWM	**CR0401**
24	12 x digital, 4 x analogue (U/I), 4 x frequency, 4 x resistance	12 x digital, 2 x PWM-I, 10 x PWM	**CR0403**
16	8 x digital, 4 x analogue (U/I), 4 x frequency, 4 x resistance	8 x digital, 8 x PWM-I, 8 x PWM, 4 x H-bridge	**CR0411**
14	8 x digital, 4 x analogue (U/I), 4 x frequency, 4 x resistance	6 x relay	**CR0431**

SmartController

Cost-effective mini controller in robust metal housing with protection rating IP 67.

Inputs / outputs in total	Input / output functions		Order no.
32	16 x digital, 4 x analogue (U/I), 4 x frequency, 2 x resistance	16 x digital, 2 x PWM-I, 12 x PWM	**CR2530**
64	32 x digital, 8 x analogue (U/I), 8 x frequency, 4 x resistance	32 x digital, 4 x PWM-I, 24 x PWM	**CR2532**

Compact controllers

ClassicController

Powerful 32-bit mini controller in robust metal housing with protection rating IP 67.

SafetyController

Reliable, powerful 32-bit controller in robust metal housing with protection rating IP 67.

Inputs / outputs in total	Inputs	Outputs	Order no.
32	16 x digital, 16 x analogue (U/I), 16 x frequency	16 x digital, 16 x PWM-I, 16 x PWM, 2 x H-bridge	**CR0032**
32	32 x digital, 12 x analogue (U/I), 12 x frequency, 4 x resistance	16 x digital, 16 x PWM-I, 16 x PWM, 2 x H-bridge	**CR0033**
80	32 x digital, 32 x analogue (U/I), 32 x frequency	48 x digital, 32 x PWM-I, 32 x PWM, 4 x H-bridge	**CR0234**
80	40 x digital, 36 x analogue (U/I), 36 x frequency, 4 x resistance	40 x digital, 32 x PWM-I, 32 x PWM, 4 x H-bridge	**CR0235**
64	32 x digital, 16 x analogue (U/I), 16 x frequency, 6 x resistance	32 x digital, 18 x PWM-I, 28 x PWM, 2 x H-bridge	**CR0133**
	Safety		
32	16 x digital, 16 x analogue (U/I), 16 x frequency	16 x digital, 16 x PWM-I, 16 x PWM, 2 x H-bridge	**CR7032**
80	32 x digital, 32 x analogue (U/I), 32 x frequency	48 x digital, 32 x PWM-I, 32 x PWM, 4 x H-bridge	**CR7132**

ecomatController

1. *Application-specific-configurable user information (HMI).*
2. *Coded plug.*
3. *Ethernet interface with internal switch.*
4. *Robust aluminium housing with high protection rating IP 69K.*
5. *Plug and play CAN and RS232 interfaces.*

Compact controllers

ecomat controllers

Powerful 32-bit standard and safety PLC (SIL 2 / PL d) with large application memory.

Multifunctional inputs and outputs with diagnostic capabilities, two Ethernet and four CAN interfaces.

The CAN interfaces support all important bus protocols (CANopen, CANopen Safety and J1939).

Programming with CODESYS V3.5.

Inputs / outputs in total	Inputs	Outputs	Order no.
Safety			
37	8 x analogue (U/I) 8 x frequency, 4 x resistance	6 x digital, 1 x analogue 6 x PWM-I 2.5 A, 4 x H-bridge	**CR710S**[1)]
60	4 x digital, 16 x analogue (U/I) 8 x frequency, 4 x resistance	9 x digital, 1 x analogue, 3 x PWM-I 4.0 A, 9 x PWM-I 2.5 A, 6 x H-bridge	**CR711S**
98	16 x digital, 24 x analogue (U/I) 16 x frequency, 4 x resistance	12 x digital, 2 x analogue, 4 x PWM-I 4.0 A, 12 x PWM-I 2.5 A, 8 x H-bridge	**CR720S**
124	24 x digital, 24 x analogue (U/I) 16 x frequency, 4 x resistance	18 x digital, 1 x analogue, 6 x PWM-I 4.0 A, 18 x PWM-I 2.5 A, 12 x H-bridge	**CR721S**

[1)]device in preparation

Robust I/O modules for field applications and in the control cabinet.

Systems for mobile applications

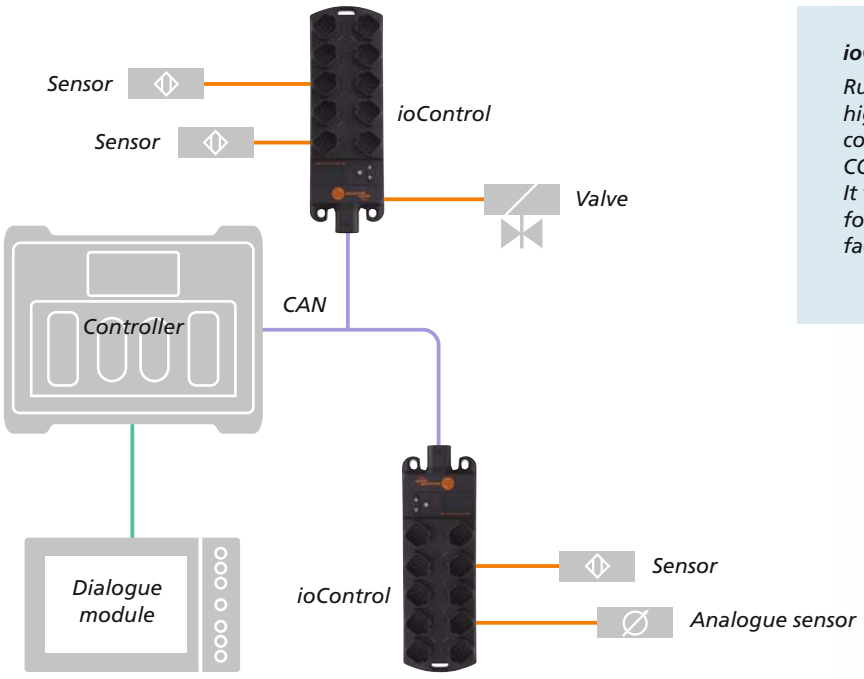
Adaptable:
Configurable input/output functions.

Convenient:
Direct connection of hydraulic valves or joysticks.

Options:
Modules with M12 connectors or central connectors.

Communicative:
CAN interface for various communication tasks.

Permitted:
E1 type approval by the Kraftfahrt-Bundesamt (German Federal Motor Transport Authority).



ioControl

Rugged module with integrated controller, high protection rating and DEUTSCH connectors. It can be used as independent, CODESYS-programmable mini controller. It features a display and keyboard interface for parameter setting and two CAN interfaces with CANopen and J1939 protocol.

Decentralised connection to the controller

Decentralised I/O modules connect binary and analogue sensors and actuators to the mobile controller.
They enable decentralised evaluation of sensor signals and control of actuators or proportional valves. Data output and parameter setting of the device functions is handled via a CAN interface.

The modules are particularly suited for mobile machinery such as construction equipment, agricultural machines or municipal vehicles.

The ifm product range includes models with digital, analogue and frequency inputs combined with digital or PWM outputs.

Modules for field use feature high protection ratings as well as shock and vibration resistance. The units offer increased EMC levels and hold an E1 type approval.

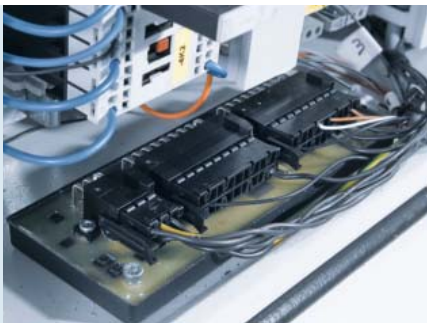
Modules to be installed in driver's cabs, control panels or control boxes serve to connect operating and display elements to the CAN bus.

Robust I/O modules for field applications and in the control cabinet.

Systems for mobile applications

CabinetModules

Among other things, the modules serve to connect operating and display elements to the CAN bus in mobile machines. They are designed for easy installation in driver's cabs, control panels or control boxes.



Modules for applications inside the control cabinet

CabinetController

Inputs and outputs for digital and analogue signals.

For use in cockpit or operating panels.

Inputs / outputs in total	Inputs	Outputs	Order no.
16	16 x digital, 4 x 0...10 V	4 x digital, 2 x PWM	**CR2012**
16	16 x digital, 4 x 0...5 V	4 x digital, 2 x PWM	**CR2014**
32	16 x digital, 4 x analogue, 4 x frequency	16 x digital, 4 x PWM	**CR2016**

Modules for field applications with central connector

I/O module

I/O module in robust metal housing with protection rating IP 67.

Inputs / outputs in total	Inputs	Outputs	Order no.
12	4 x digital	8 x digital	**CR2512**
30	15 x digital, 4 x analogue	15 x digital	**CR2520**

1. *DEUTSCH or M12 connector version with protection rating IP 67.*
2. *16 freely configurable inputs and outputs.*
3. *Pushbuttons for easy parameter setting.*
4. *Central connector for power outputs and CAN interface.*
5. *Display for parameter setting and for the indication of freely programmable application displays.*

Modules for field applications with M12 or DEUTSCH connector

ioControl

Can be used as independent, CODESYS-programmable mini controller.

Display and keyboard interface for parameter setting.

Configurable input / output function.

Two CAN interfaces with CANopen and J1939 protocol.

Inputs / outputs in total	Inputs	Outputs	Connection	Order no.
16	8 x analogue, 4 x frequency, 4 x resistance	–	M12	**CR2040**[1)]
16	–	8 x digital, 8 x PWM	M12	**CR2041**[1)]
16	4 x analogue, 4 x resistance	4 x digital, 4 x PWM	M12	**CR2042**[1)]
16	8 x analogue, 4 x frequency, 4 x resistance	–	DEUTSCH	**CR2050**
16	–	8 x digital, 8 x PWM	DEUTSCH	**CR2051**
16	4 x analogue, 4 x resistance	4 x digital, 4 x PWM	DEUTSCH	**CR2052**

[1)] device in preparation

M12 I/O module

I/O module in robust metal housing with protection rating IP 67.

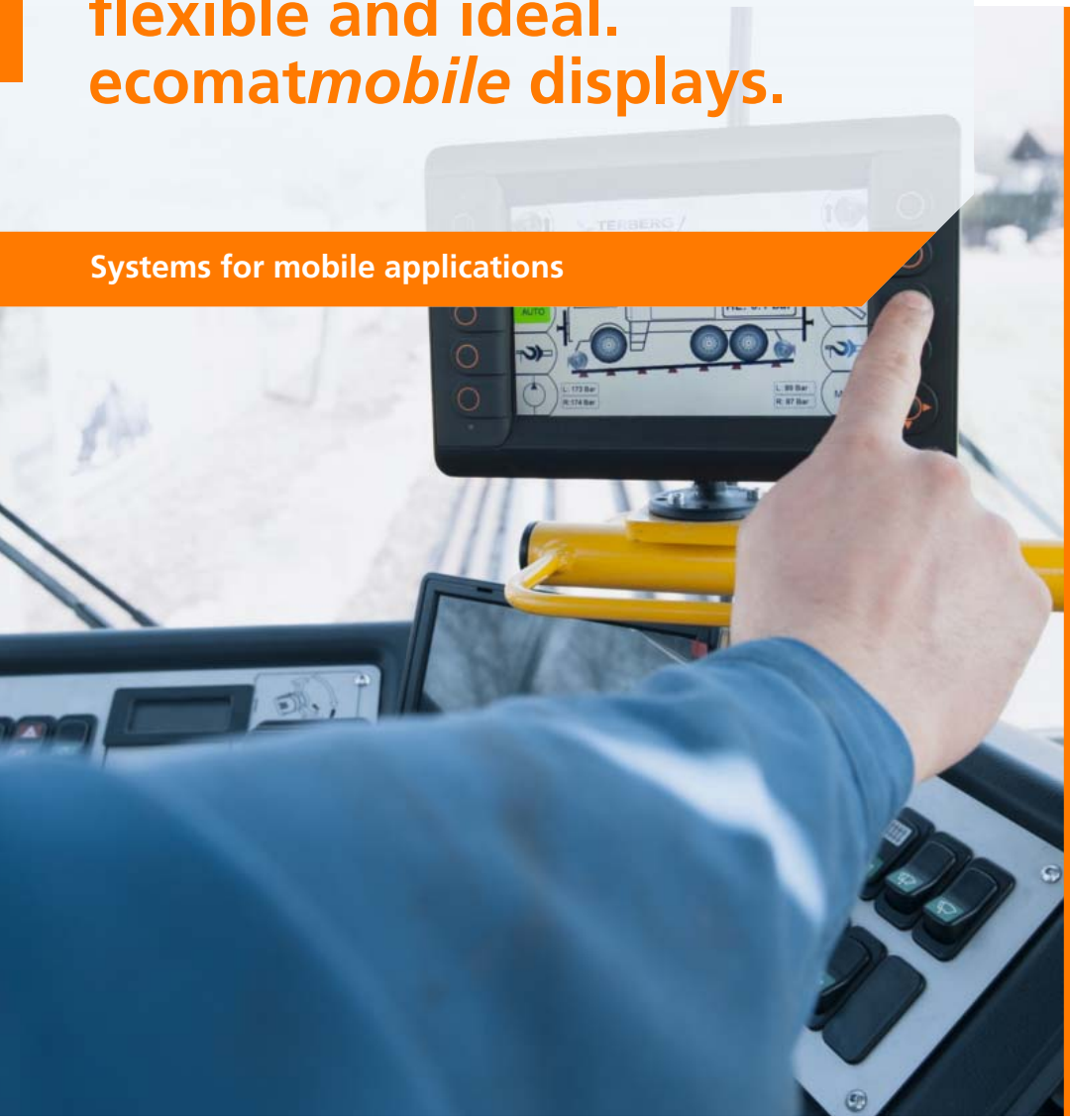
Configurable input / output function.

CAN interface.

Inputs / outputs in total	Inputs	Outputs	Connection	Order no.
8	–	8 x digital, 4 x PWM, 4 x PWM-I	M12	**CR2031**
16	8 x digital, 4 x analogue	8 x digital, 4 x PWM	M12	**CR2032**
12	8 x digital, 4 x analogue	4 x digital, 4 x PWM	M12	**CR2033**

Visualisation – flexible and ideal. ecomat*mobile* displays.

Systems for mobile applications



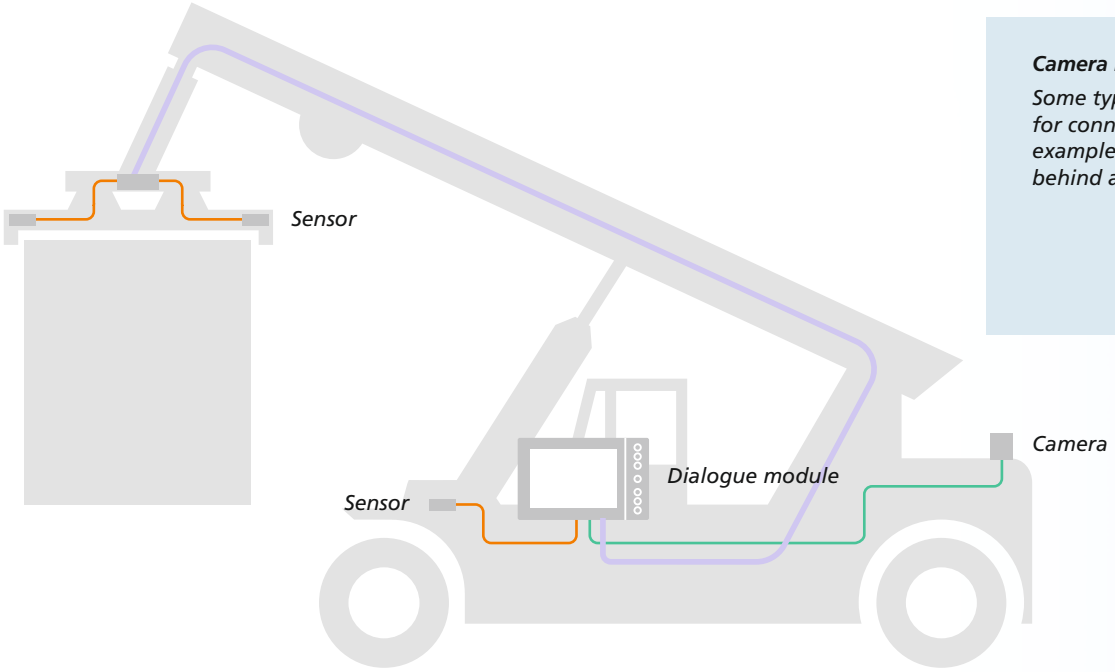
Informative:
Monochrome or colour displays with graphics capabilities and operating elements.

Adaptable:
Programmable to IEC 61131-3 with CODESYS.

Universal:
Robust housing for surface or panel mounting.

Suitable for use with camera:
Versions with interface for cameras for mobile use.

Communicative:
CAN interface for various communication tasks.



Camera image
Some types have an analogue video input for connection to a mobile camera, for example in order to monitor the area behind a reach stacker.

In dialogue with the mobile machine

Dialogue modules are programmable graphic displays for controlling, parameter setting and operation of mobile machines and installations. They can be used in conjunction with a mobile controller or as a stand-alone solution.

Data and device functions are safely transferred via CAN interfaces.

The displays feature many freely programmable backlit function keys. Some types are equipped with an additional navigation key, a potentiometer with pushbutton function or a touch screen.

The units offer increased EMC levels and hold an E1 type approval. Thanks to the high protection rating of the housing, the modules are suited for outside panel and surface mounting as well as for cabin installation in construction machines, agricultural machinery or municipal vehicles.

IP 67 Ethernet CAN open E1

O2M camera with analogue video output

Camera systems pages 18 - 21

Visualisation – flexible and ideal. ecomat*mobile* displays.

Systems for mobile applications

Human machine interface

Situation-dependent machine parameters are displayed. The user can change values or release machine functions by activating integrated function and navigation keys.

Dialogue modules with display sizes up to 4.3"

BasicDisplay

Colour display.

CAN interface.

Protection rating IP 65, IP 67.

Display Size / resolution	Operating elements	Order no.
2.8" / 320 x 240	5 freely programmable backlit function keys, navigation key for cursor function, matt film	**CR0451**
4.3" / 480 x 272	6 freely programmable backlit function keys, navigation key for cursor function, matt film	**CR0452**
2.8" / 320 x 240	5 freely programmable backlit function keys, navigation key for cursor function, clear film	**CR9221**
4.3" / 480 x 272	6 freely programmable backlit function keys, navigation key for cursor function, clear film	**CR9222**

Dialogue modules with display sizes up to 12"

PDM360 NG

Colour display.

Inputs / outputs: 1 x digital / analogue input, 1 x digital output.

Interfaces: 4 x CAN, 2 x USB, 1 x Ethernet, 2 x video.

Protection rating IP 65, IP 67.

Display Size / resolution	Operating elements	Order no.
7" / 800 x 480	8 freely programmable backlit function keys	**CR1083**
7" / 800 x 480	9 freely programmable backlit function keys, navigation key for cursor function, touch screen	**CR1082**
7" / 800 x 480	9 freely programmable backlit function keys, encoder with pushbutton	**CR1084**
7" / 800 x 480	9 freely programmable backlit function keys, navigation key with pushbutton	**CR1085**
12" / 1024 x 768	13 freely programmable backlit function keys, navigation key with pushbutton	**CR1200**
12" / 1024 x 768	13 freely programmable backlit function keys, navigation key with pushbutton, touch screen	**CR1201**

ecomatDisplay

Integrated interfaces for Ethernet, CAN, USB and analogue cameras.

Powerful processor with additional graphic processor.

1. *Display with "optical bonding" and a resolution of up to 1280 x 480 pixels.*
2. *Comprehensive software package for graphical design and programming.*
3. *Freely programmable keys with RGB background illumination.*
4. *Optional: capacitive touch screen.*

Dialogue modules with display sizes up to 12"

ecomatDisplay

Colour display.

Diecast aluminium housing.

Protection rating IP 65, IP 67.

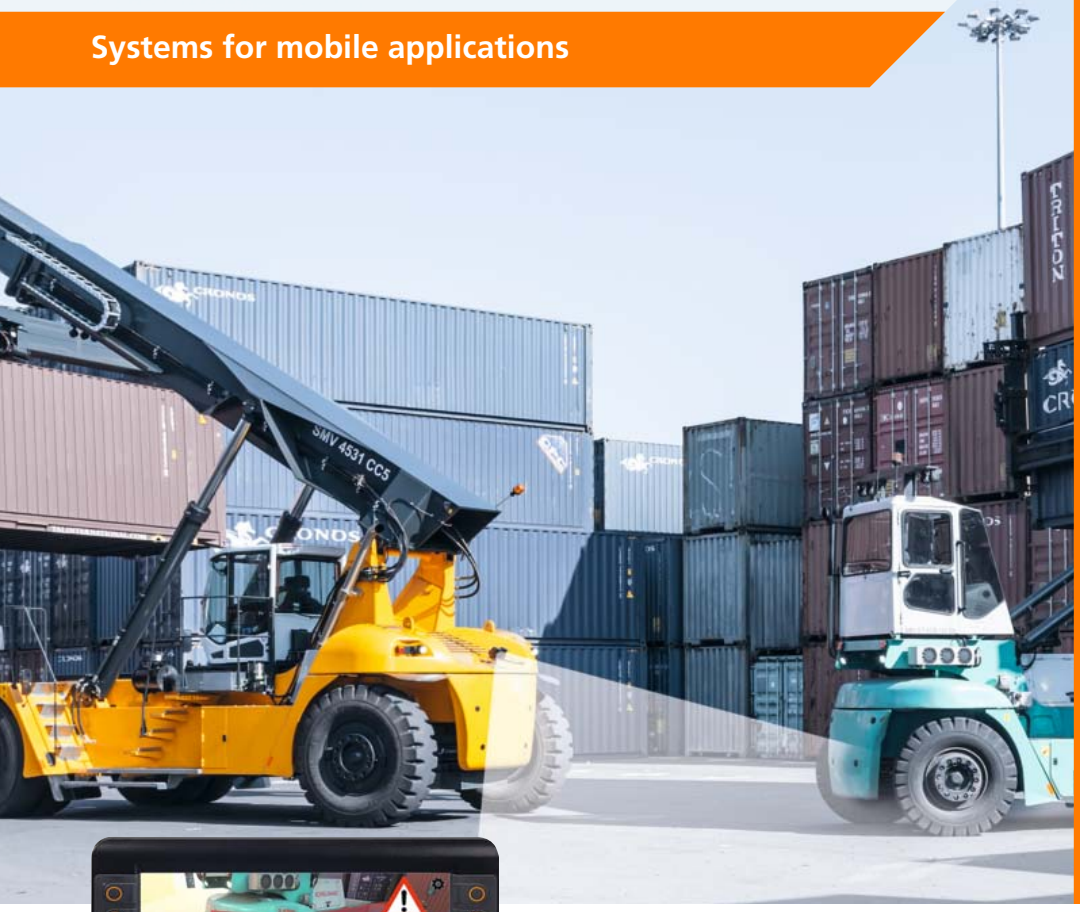
Programming to IEC 61131-3 with CODESYS V3.5.

Display Size / resolution	Operating elements	Order no.
5" / 16:10 / 800 x 480	4 function keys, navigation key with pushbutton, 1 x Ethernet, 2 x CAN, 1 x USB, touch screen	**CR1058**[1)]
5" / 16:10 / 800 x 480	4 function keys, navigation key with pushbutton, 1 x Ethernet, 4 x CAN, 1 x USB, 2 x video input	**CR1059**[1)]
7" / 16:10 / 800 x 480	6 function keys, navigation key with pushbutton, 1 x Ethernet, 2 x CAN, 1 x USB	**CR1074**[1)]
7" / 16:10 / 800 x 480	6 function keys, navigation key with pushbutton, 1 x Ethernet, 4 x CAN, 1 x USB, 2 x video input, digital I/O	**CR1075**[1)]
7" / 16:10 / 800 x 480	6 function keys, navigation key with pushbutton, 2 x Ethernet, 4 x CAN, 2 x USB, 4 x video input, digital I/O	**CR1076**[1)]
7" / 16:10 / 800 x 480	6 function keys, navigation key with pushbutton, 2 x Ethernet, 4 x CAN, 2 x USB, 4 x video input, digital I/O, touch screen	**CR1077**[1)]
12" / 8:3 / 1280 x 480	1 x Ethernet, 4 x CAN, 1 x USB, 2 x video input, digital I/O	**CR1202**[1)]
12" / 8:3 / 1280 x 480	2 x Ethernet, 4 x CAN, 2 x USB, 4 x video input, digital I/O, touch screen	**CR1203**[1)]

[1)] device in preparation

Three-dimensional detection of scenes. Automatic detection of objects.

Systems for mobile applications



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...85 °C is the basis for universal use.

Long range:

Range of up to 15 m in typical environments and up to 35 m on reflective objects.

Communicative:

Interfaces such as CAN with J1939 or CANopen and fast Ethernet are integrated as standard. Self-diagnostic functions inform about the system status at any time.

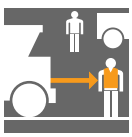
Reliable and fast:

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.

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.

Distance monitoring



Reflector tracking

Intelligent collision avoidance

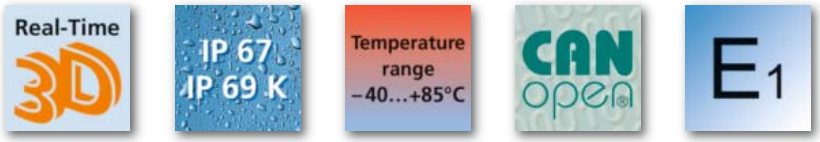
Automatic vehicle tracking with collision avoidance

The minimum and maximum distance to the vehicle ahead is set or recognition is limited to a certain arrangement of reflectors via various parameters. An additional collision warning ensures that obstacles are reliably detected and signalled to the machine control system in two stages.

Augmented reality – now in real 3D

The PMD 3D sensor from ifm detects scenes and objects three-dimensionally with only one image capture. This avoids the motion blur that can occur with line scanners. ifm's award-winning patented PMD technology forms the basis for a sensor system that can cope with the harsh operating conditions of mobile machines. Besides the robust and compact design the 3D sensor system is especially designed for outdoor applications with changing light conditions or bright sunlight. The ifm 3D sensor has no moving components in contrast to other sensors such as laser scanners.

Therefore it is particularly robust and not subject to wear.
The so far unique combination of PMD 3D sensor and 2D camera with integrated overlay function allows a completely new perception. Overlay of customer-specific symbols, warning messages, texts and even drawings of complex, geometric shapes is supported by the new 3D smart camera system. The request for overlay can either be event-controlled or directly triggered by the machine control system via CAN bus.



Intelligent collision avoidance

The integrated, automatic object recognition detects up to 20 stationary or moving objects. The collision probability is calculated by the 3D sensor, transferred to the machine control system and signalled to the driver. In a live image provided by the integrated camera the recognised obstacles are highlighted.

Three-dimensional detection of scenes. Automatic detection of objects.

Systems for mobile applications

3D sensors

O3M PMD 3D sensor

2D image with 3D distance information, available as pure camera or sensor with integrated evaluation.

Cameras

O2M camera with analogue video output

Aluminium housing, with lens heating.

Design	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**

E2M2xx monitor with analogue video input

Connection of up to four cameras with analogue video signal (with E2M235 video switch).

Design	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**

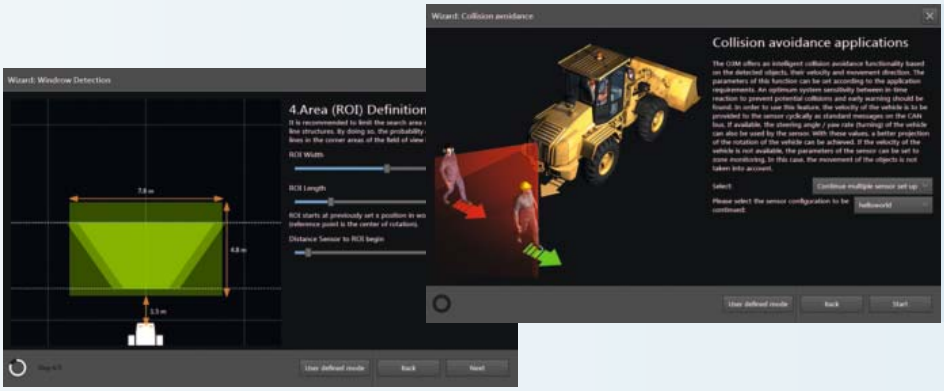
More information? Order your Camera systems for mobile machines brochure now! o3m.ifm

Design	Angle of aperture horizontal x vertical [°]	Sensor Order no.	Suitable illumination Order no.
Mobile 3D smart sensor[2)]	70 x 23	**O3M151**	**O3M950**
Mobile 3D smart sensor with integrated 2D/3D overlay	70 x 23 (3D) 90 (2D)	**O3M251**	**O3M950**
Mobile 3D smart sensor [2)]	95 x 32	**O3M161**	**O3M960**
Mobile 3D smart sensor with integrated 2D/3D overlay	95 x 32 (3D) 120 (2D)	**O3M261**	**O3M960**
Mobile 3D smart sensor with integrated 2D/3D overlay	97 x 44 (3D) 155 (2D)	**O3M271**	**O3M970**

[1)] Synchronous output of the 2D IR image and the 3D distance image as input information for customer-specific image processing
[2)] incl. application wizards

Application wizards for 3D sensors of types O3M151 / O3M161 / O3M251 / O3M261

Application wizards available in the ifm vision wizard	Application examples
Collision avoidance as driver assistance	Monitoring the area behind the construction vehicles and fork lifts, monitoring the blind spots, collision detection when moving forwards, collision detection on dockside cranes.
Area surveillance for mobile or stationary machinery	Area surveillance on drilling rigs, refuse trucks and cranes.
Automatic following for driverless transport vehicle	Automatic tracking of transport vehicles ahead and keeping safety distances.
Line guidance	Automatic windrow recognition and calculation of the volume flow, automatic steering of a grape harvester.



Set-up collision warning.

Easy set-up and handling

The 3D sensor system is set up and operated via ifm's user-friendly Vision Assistant. Its use ensures intuitive parameter setting of even complex configurations with several 3D sensor systems.

AS-Interface in particularly harsh environments.

AS-Interface systems

Standardised:
The actuator-sensor interface (AS-Interface) is a manufacturer-independent standard for connection of actuators and sensors of the first field level. ifm provides you with your complete AS-i system solution.

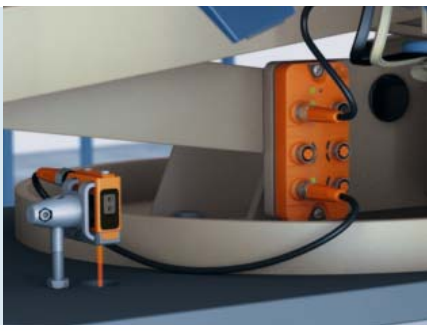
Reliable:
The sophisticated AS-i technology ensures high reliability and machine uptime.

Simple:
Modular structure and flexible connection technology ensure easy integration into the AS-Interface system.

Cost-optimised:
A two-wire flat cable transmits data and energy, eliminating complex parallel wiring.

IO-Link master meets wiring system

The decentralised IO-Link master modules serve as a gateway between intelligent IO-Link sensors and the AS-Interface field bus. With the 4-port IO-Link master you combine the advantages of the AS-i wiring system with the standardised IO-Link communication. IO-Link provides detailed sensor or actuator diagnostics and allows you to increase machine uptime.



CompactLine field modules with screw mounting technology

The decentralised AS-Interface I/O modules of the CompactLine series connect binary and analogue sensors and actuators to the gateway or PLC via AS-Interface. The upper and lower parts of the modules are mounted with screws. Connection of the two-wire flat cable by means of insulation displacement technology ensures reverse polarity protection. Sensors and actuators are connected via proven, robust connectors.

Thanks to their high luminosity, the LEDs for operation, function and fault indication are particularly easy to see.

The full potting and reliable screw connection provide shock and vibration resistance, making the modules ideally suited for field use in harsh industrial environments.

IO-Link masters with AS-i interface

The IO-Link master is a gateway for the connection of up to eight IO-Link devices including sensors, valves or binary input/output modules. The master transmits machine data, process parameters and diagnostic data to the controller.

Excellent electromagnetic stability, a wide temperature range, a high protection rating and a robust housing qualify the device for use in harsh industrial environments.

Cable extensions

AS-i repeaters are used to extend the cable length of an AS-i network by another 100 metres. The number of possible participants remains unchanged. Each repeater has an electrical separation which divides the network into two segments. Each segment has its own voltage supply.

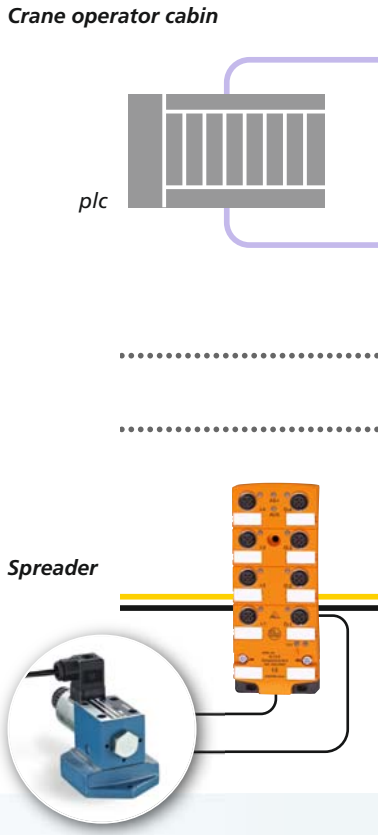
Lightning protection

The fibre optic repeater AC3227 with AS-i bus termination can be used to ensure a 100 % lighting protection and therefore to reduce the downtime.

CompactLine

Due to the compact design and a fully potted housing the field modules withstand even the most adverse environmental conditions. Hydraulic valves can also be switched via the 2 ampere output.

AS-Interface in particularly harsh environments.



AS-Interface systems

Even more choice? Further articles at ifm.com

AS-Interface SmartSPS DataLine

Number of AS-i masters	Interface	Connection	Order no.
1	PROFINET device interface	terminals 2.5 mm²	**AC1403**
2	PROFINET device interface	terminals 2.5 mm²	**AC1404**
1	ProfibusDP	terminals 2.5 mm²	**AC1411**
2	ProfibusDP	terminals 2.5 mm²	**AC1412**
1	Ethernet/IP device interface	terminals 2.5 mm²	**AC1423**
2	Ethernet/IP device interface	terminals 2.5 mm²	**AC1424**
1	EtherCAT slave interface	terminals 2.5 mm²	**AC1433**
2	EtherCAT slave interface	terminals 2.5 mm²	**AC1434**

AS-Interface I/O modules

CompactLine

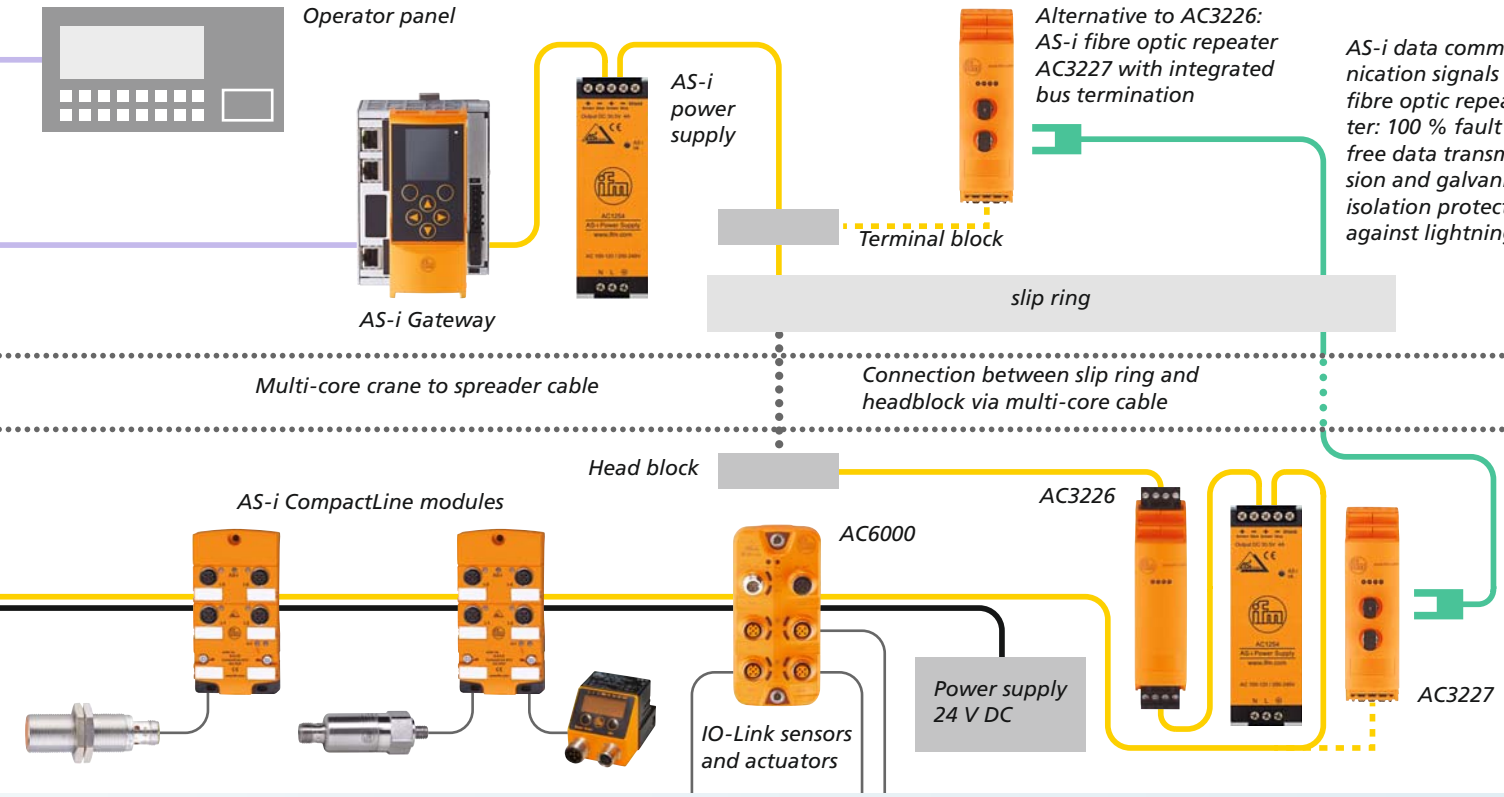
High vibration resistance due to full potting.

Sensor and actuator supply also possible with external voltage.

Reliable detection and display of peripheral and communication faults.

Addressing via infrared interface.

Inputs	Outputs	AS-i profile	Order no.
2 x analogue (4…20 mA); 2- and 3-wire	–	S-7.3.D	**AC2402**
2 x analogue (4…20 mA); 2- and 4-wire	–	S-7.3.D	**AC2403**
4 x digital	–	S-0.0.E	**AC2410**
4 x digital Y	–	S-0.A.E (A/B node)	**AC2457**
2 x digital	2 x digital	S-3.0.E	**AC2411**
–	4 x digital	S-8.0.F	**AC2417**
4 x digital Y	4 x digital	S-7.F.E	**AC2459**
4 x digital (AUX)	4 x digital	S-7.0.E	**AC2466**
4 x digital	4 x digital	S-7.0.E	**AC2412**
M12 module with increased EMC resistance			
4 x digital	–	S-0.0.E	**AC2434**
4 x digital	4 x digital	S-7.0.E	**AC2435**
4 x digital Y	–	S-0.A.E (A/B node)	**AC2477**
4 x digital Y	4 x digital	S-7.F.E	**AC2479**



IO-Link master

IO-Link master with AS-Interface

For connection of up to four IO-Link devices.

Reliable transmission of machine data, process parameters and diagnostic data to the controller.

Inputs / outputs in total	Inputs	Outputs	Connection	Order no.
8	8 x digital	4 x digital	M12	**AC6000**

AS-Interface cable extensions

AS-i fibre optic repeater

Reliable long term performance in tough conditions.

Fast data transfer for Safety at Work.

Design	Order no.
Extension of the AS-i network by another 100 m	**AC3226**
Extension of the AS-i network via fibre optics to max. 3,200 m	**AC3227**

Power supplies

AS-i power supply

Reliably power supply for modules, sensors and actuators.

No. of output circuits	Input voltage [V]	Output current AS-i [V]	Order no.
1	100...120 / 200...240 AC	8	**AC1258**
1	100...120 / 200...240 AC	4	**AC1254**
1	100...120 / 200...240 AC	2.8	**AC1256**
1	24 DC	4	**AC1257**

Vibration monitoring – detect damage at an early stage and avoid consequential costs.

Vibration monitoring systems

Simple:
Monitoring of the overall status of the machine.

Standardised:
Compliant to ISO 10816.

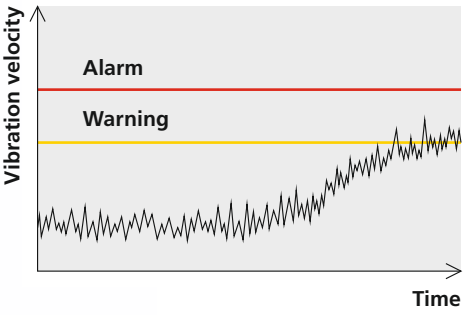
Reliable:
Protection against machine damage.

Flexible:
Easy integration in the application.

Reliable:
Increase of uptime.

Looseness, unbalance

Misalignment



Trending of the machine vibrations to ISO 10816

Why vibration monitoring?

Every machine generates vibrations during operation. These vibrations can quickly exceed a permissible level due to e.g. unbalance, misalignment or resonances. An increase in the oscillation amplitude has a negative effect on the machine condition. The result: unexpected failures and shorter lifetime.

Solution with efector octavis:

The overall vibration velocity is used in industry standards to evaluate the status of the complete machine. ISO 10816 categorises machines and recommends limit values for the strain caused by vibrations.

efector octavis monitors if the permissible degree of machine vibrations is exceeded. If damage is detected at an early stage, the affected components can be replaced and consequential damage can be avoded.

Reduce maintenance costs

In the long run, collisions of spreaders, e.g. with containers, can lead to expensive damage if ignored. Sensors of types VNB or VSA detect such events and signal them to the PLC via an AS-i module. The PLC stores the information with a time stamp, the result can be analysed via video recording and maintenance requirements can be detected in good time.

Condition monitoring of ship-to-shore cranes

Machine faults in cranes which remain undetected can result in considerable losses in terms of efficiency. The acceleration sensor type VSA and diagnostic type VSE can anticipate such faults and help to avoid such incidents. Examples of machine faults are bearing unbalance, looseness or overall condition.

Vibration monitoring – detect damage at an early stage and avoid consequential costs.

Vibration monitoring systems

Basic vibration sensor and transmitter

Description	Order no.
Vibration sensor to ISO 10816; RMS velocity 10…1000 Hz; analogue output 4…20 mA, switching output PNP, response delay and switch point adjustable via setting rings, measuring ranges 0…25 / 0…50 mm/s	**VKV021** **VKV022**
Vibration transmitter to ISO 10816, 10…1000 Hz RMS velocity, analogue output 4…20 mA, measuring ranges 0…50 / 0…25 / 0…25 mm/s, use in hazardous areas (type VTV12A)	**VTV121** **VTV122** **VTV12A**

Diagnostic electronics

Description	Order no.
Diagnostic electronics for evaluation of dynamic signals, e.g. of acceleration sensors type VSA / VSP; panel mounted; frequency-selective machine monitoring of up to 4 measuring points; TCP/IP Ethernet interface; integrated history memory with real-time clock; 2 digital outputs or 1 analogue and 1 digital output; counter function; further interfaces: - / 8 digital inputs/outputs / PROFINET/IO interface	**VSE002** **VSE100** **VSE150**

Accessories

Description	Order no.
Conical washer, 5 pcs., mounting accessories for acceleration sensors type VSA001, VSA101, VSA201, VNA001	**E30115**
PEEK adapter, mounting accessories for electrical insulation of the sensor, for acceleration sensors type VSA001, VSA101, VSA201, VNA001	**E30132**
Acceleration sensor for connection to vibration sensor type VN	**VNA001**
Y cable for vibration sensor type VN	**E12405**
USB cable for vibration sensor type VN	**E30136**
Protective cover for vibration sensor type VK	**E30094**
Cross-over patch cable for diagnostic electronics type VSE, 2 m / 5 m	**EC2080** **E30112**
Socket for acceleration sensors type VSA / VSP, M12, straight, PUR cable, shielded, 5 m / 30 m	**EVC527** **EVC561**
Socket for acceleration sensors type VSA / VSP, M12, angled, PUR cable, shielded, 20 m	**EVC597**

Intelligent vibration sensors

Description	Order no.
Vibration sensor to ISO 10816; 2 switching outputs or 1 switching output and 1 analogue output, history memory with real-time clock, 4-digit alphanumeric display, data interface USB; 2/10...1000 Hz RMS velocity; measuring range 0…25 mm/s; external input 4…20 mA / 4…20 mA or VNA001 acceleration sensor	**VNB001**
Vibration sensor to ISO 10816; 2 switching outputs or 1 switching output and 1 analogue output, history memory with real-time clock, 4-digit alphanumeric display, data interface USB; RMS acceleration / velocity and a-Peak 0…6000 Hz; measuring range +/- 25 g; external input 4…20 mA / 4…20 mA or VNA001 acceleration sensor	**VNB211**

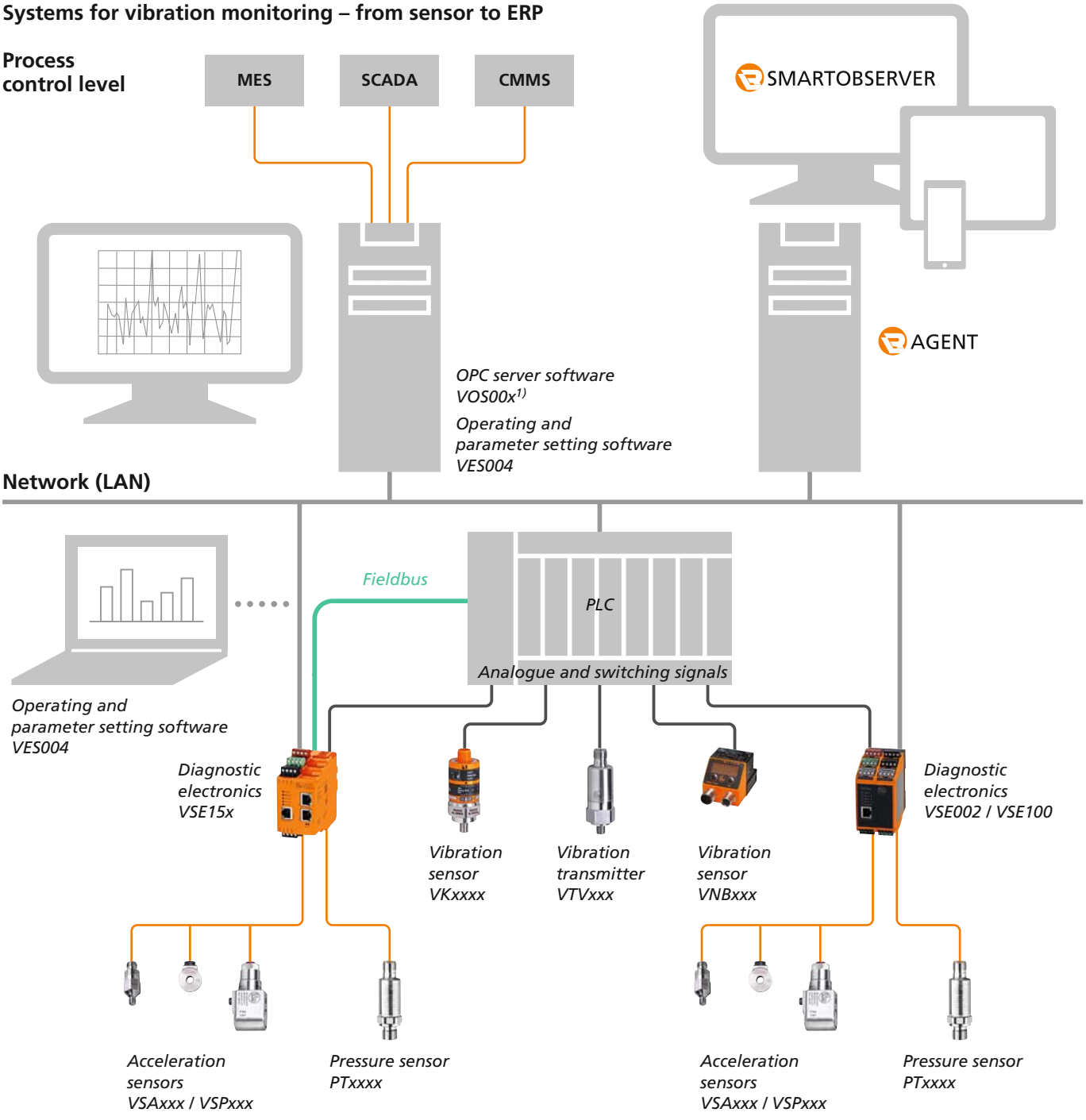
Acceleration sensors

Description	Order no.
Acceleration sensor for connection to diagnostic electronics type VSE, MEMS, frequency range 0...6000 Hz, measuring ranges ± 25 g / ± 250 g	**VSA001** **VSA201**
Acceleration sensor for connection to diagnostic electronics type VSE, MEMS, frequency range 0...1000 Hz, measuring range ± 3.3 g	**VSA101**
Acceleration sensor for connection to diagnostic electronics type VSE, MEMS; Frequency range 0…10,000 Hz, measuring range ± 25 g, 3 m cable / 10 m cable / 0.8 m cable and M12 connector / 6 m cable	**VSA004** **VSA005** **VSA002** **VSA006**
Acceleration sensor; piezo; 100 mV/g frequency range 0…10,000 Hz; measuring range ± 50 g	**VSP001**
Acceleration sensor for use in hazardous areas, group II category 1D/1G, connection via safety barrier, 100 mV/g; frequency range 2…10,000 Hz, measuring range ± 50 g	**VSP01A** **VSP02A**

Software

Description	Order no.
Parameter setting software for diagnostic electronics type VSE and vibration sensor type VNB	**VES004**
OPC server software (OPC DA) for diagnostic electronics type VSE002 and VSE100, licence depending on the number of connections 25 / 50 / 75 / 100 / 1000	**VOS001** **to** **VOS005**

Systems for vibration monitoring – from sensor to ERP



1) not compatible with VSE15x

Inductive sensors resist the worst environmental conditions.

Sensors for port applications

Universal:
Use in applications of -40...85 °C.

Reliable:
Protection rating IP 65 to IP 69K.

Variety:
Different housing lengths, NO or NC, connectors or cables.

Long service life:
Vibration and shock resistant.

Powerful:
Very good performance in industrial applications.

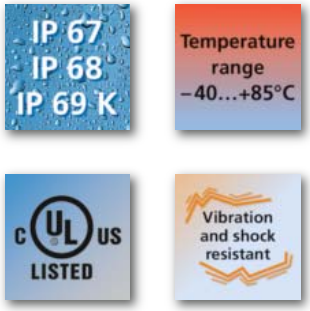
Inductive sensors for standard and coolant applications

Design / housing length [mm]	Sensing range [mm]	Order no.	Order no.	Order no.	Order no.
		DC PNP NO	DC NPN NO	DC PNP NC	DC NPN NC
M12 connector					
M18 / 60	8 f	IGS232	IGS234	IGS240	IGS241
M18 / 60	12 nf	IGS233	IGS235	IGS242	IGS243
M30 / 60	15 f	IIS226	IIS228	IIS234	IIS235
M30 / 60	22 nf	IIS227	IIS229	IIS236	IIS237
Cable PUR 2 m					
M18 / 60	8 f	IGS244	IGS246	IGS269	IGS271
M18 / 60	12 nf	IGS245	IGS247	IGS270	IGS272
M30 / 60	15 f	IIS261	IIS240	IIS264	IIS265
M30 / 60	22 f	IIS239	IIS241	IIS263	IIS266

f: flush installation nf: non-flush installation

Inductive sensors for universal use

The technical data of the inductive sensors for universal use cover many applications. The large temperature range and the high protection ratings allow use in industrial environments as well as in mobile machines. Increased sensing ranges provide sufficient excess gain. The targets are still reliably detected even if the mechanical tolerances increase in the course of time. Different housing lengths enable adjustment to the correct distance. The short housing lengths can even be fitted where space is at a premium.



Twist-lock control of spreaders

Whether in iciness, during thunderstorms or in continuous rainfall: The sensors for mobile applications resist the worst environmental conditions. Here at a spreader for twist-lock control in port logistics.

Inductive sensors for standard applications

Design / housing length [mm]	Sensing range [mm]	Order no.	Order no.	Order no.	Order no.
		DC PNP NO	DC PNP/NPN NO/NC selectable	DC PNP/NPN NO	Complementary
M12 connector					
Ø 34 / 95	20 nf		**IB5169**		
M30 / 60	18 qf	**II5978**			
M30 / 65	1.3...13		**II5973**[1)]		
M30 / 65	2.3...23		**II5974**[1)]		
M30 / 70	12 f			**II5920**	
M30 / 75	15 f	**IIS260**			
40 x 40 x 54	15 f			**IM5127**	
40 x 40 x 54	20 f	**IM5115**			
40 x 40 x 54	35 nf				**IM5134**
40 x 40 x 54	40 nf	**IM5117**			**IM5136**

f: flush installation nf: non-flush installation qf: quasi flush installation
[1)] with IO-Link

Inductive sensors resist the worst environmental conditions.

Sensors for port applications

More than 45 years of know-how integrated into one sensor

In 1969 ifm launched the first inductive sensor under the name "efector".

With a novel, patented coil structure and electronics optimised for noise immunity the new "Kplus" sensors today again set new standards for inductive sensors in factory automation and welding.

Long sensing range

Rectangular inductive sensors are especially suited for conveying applications thanks to their long sensing ranges. To meet the demands of harsh industrial environments, each model comes with a robust plastic housing with high protection rating. The sensing face of the IM type sensor (40 x 40 mm) can be rotated in five different positions for flexible mounting even under adverse installation conditions. The two corner LEDs are clearly visible in any mounted position.

Inductive Kplus sensors for coolant applications

Design / housing length [mm]	Sensing range [mm]	Order no.	Order no.
		DC PNP NO	complementary
M12 connector · Stainless steel housing			
M30 / 60	15 f	**IIS282**	
M30 / 60	22 nf	**IIS283**	
M30 / 60	30 f	**IIS284**	
M12 connector · Plated brass housing			
M30 / 60	15 f	**IIS267**	
M30 / 60	30 f	**IIS268**	

Inductive Kplus sensors

Design / housing length [mm]	Sensing range [mm]	Order no.	Order no.
		DC PNP NO	complementary
M12 connector			
40 x 40 x 54	20 f	**IM5128**	**IM5132**
40 x 40 x 54	35 nf	**IM5130**	**IM5134**
40 x 40 x 54	40 nf	**IM5131**	**IM5136**

f: flush installation nf: non-flush installation

Find the suitable accessories at ifm.com

AC and AC/DC sensors

AC or AC/DC sensors are suitable for use in alternating current networks. For units with combined output stage, the sensor decides which output (DC or AC) switches depending on the voltage applied.

Use in mobile machines

Sensors used in mobile machines are installed in exposed positions in order to meet special requirements. The devices are designed to ensure highest shock and vibration resistance. In combination with the connectors of the ecolink EVM series, the inductive sensors of the M series are ideally suited for mobile applications. The sensors have a temperature range of -40...85 °C so that they can operate reliably in extremely cold conditions and when installed next to hot engines. Moreover, the devices are insensitive to rapid temperature changes.

Inductive sensors with long range

Design / housing length [mm]	Sensing range [mm]	Order no.
		DC PNP NO
M12 connector		
40 x 40 x 54	20 f	**IM5115**
40 x 40 x 54	35 nf	**IM5116**
40 x 40 x 54	40 nf	**IM5117**

Inductive AC/DC sensors

Design / housing length [mm]	Sensing range [mm]	Order no.
		AC/DC NO
1/2" connector		
M30 / 72	15 nf	**II0340**
Cable PUR 2 m		
M18 / 80	5 f	**IG0011**
M18 / 82	5 f	**IG0400**
M30 / 81	15 nf	**II0012**

Inductive sensors for mobile applications

Design / housing length [mm]	Sensing range [mm]	Order no.	Order no.	Order no.	Order no.	Order no.
		DC PNP NO	DC PNP/NPN NO	DC PNP NC	DC PNP/NPN NC	DC NPN NO
M12 connector						
M18 / 70	8 f	**IGM204**	**IGM200**	**IGM209**		**IGM213**
M18 / 70	12 nf	**IGM205**	**IGM201**		**IGM208**	
M30 / 70	12 f	**IIM208**	**IIM200**			
M30 / 70	22 nf	**IIM209**	**IIM201**	**IIM215**		
Cable PUR 6 m						
M18 / 81	8 f	**IGM206**	**IGM202**			
M18 / 81	12 nf	**IGM207**	**IGM203**			
M30 / 81	12 f	**IIM210**	**IIM202**			
M30 / 81	22 nf	**IIM211**	**IIM203**			

f: flush installation nf: non-flush installation

Photoelectric sensors for harsh and wet areas – distance sensors with a high range.

Sensors for port applications

O5D series

Focussed:

Reliable background suppression and colour-independent detection.

Efficient:

Time-of-flight measurement in compact design.

Reliable:

Reliable detection of glossy surfaces.

OG WetLine series

Robust:

High protection rating for the requirements of harsh environments.

Protected:

Reliable sealing concept for wet areas.

Time-saving:

Ready for operation immediately thanks to fixed setting.

Container gap detection

When lifting two 20' containers under a spreader in the twin-twenty lifting function, there is a potential risk and danger that the lifting is not safe.
By using O5D photoelectric sensors with a measuring range of 2m, the gap between the two containers can be detected.

Container detection on trolley platform

While handling containers with trolley cranes at the quayside, it needs to be detected if containers are on the trolley platform or not. The photoelectric sensors such as the OG WetLine serie can be used in this application. They are optimized for harsh and wet areas with IP 69K.

Photoelectric sensors OG WetLine series

The robust stainless steel housing allows for the reliable detection of objects in port areas. A plastic lens is used to prevent glass splinters from getting into the process in case of damage to the sensor lens. The units of the OG WetLine series have fixed ranges for immediate set-up. A wide range of system components made from stainless steel ensures easy and safe integration into the application.

Distance sensors O5D series

The O5D is a distance sensor with time-of-flight measurement based on PMD technology (PMD = Photonic Mixer Device). It combines the advantages of long ranges, reliable background suppression, visible red light and high excess gain in one compact, rectangular standard housing. The switch point can be set to the nearest centimetre via „+/-" buttons and the display. Thanks to IO-Link, the switch point can also be set from a controller or PC. The current value can be viewed on the display at all times. The accurate background suppression ensures that even shiny, matt, dark or light objects are safety detected. The unit allows any angle of incidence and thus any mounting position, which facilitates installation and saves costs.

Photoelectric distance sensor with display type O5D

Background suppression.

Laser protection class 2.

Protection rating IP 65; IP 67.

Dimensions [mm]	Measuring range [m]	Laser protection class	Connection	Order no.
PNP · normally open / normally closed (complementary)				
56 x 18.2 x 46.8	0.03...2	2	M12 connector	**O5D100**
		1	M12 connector	**O5D150**
		2	M12 connector	**O5D101**[1)]
NPN · normally open / normally closed (complementary)				
56 x 18.2 x 46.8	0.03...2	2	M12 connector	**O5D102**

[1)] Display unit: inch

Diffuse reflection sensor type OG Wetline

High protection rating IP 65; IP 67; IP 68; IP 69K.

Dimensions [mm]	Range [mm]	Type of light	Connection	Order no.
PNP · light-on/dark-on mode (programmable)				
M18 x 1 / L: 72	2...800	red light	M12 connector	**OGT300**
M18 x 1 / L: 80.4	2...800	red light	Cable 6 m, PVC	**OGT301**
M18 x 1 / L: 72	2...600	infrared light	M12 connector	**OGT302**

Distance sensor with a very long range for positioning and speed control.

Sensors for port applications

Longest distance:
Photoelectric level detection of bulk materials and non-transparent liquids, for levels up to 9.8 m.

Convenient:
Scalable detection range with window function.

Reliable detection:
Can be used in applications needing background suppression.

Flexible mounting:
Extensive range of fixing components.

Deviation detection of containers

In order to avoid downtimes and accidents, the stacking process of containers leaves no room for deviations.
When the spreader stacks a container onto another one, the position is precisely measured by the O1D distance sensor via time-of-flight technology.

Distance sensors O1D series

The O1D is a distance sensor with time-of-flight measurement based on PMD technology (PMD = Photonic Mixer Device).

Measuring only 42 x 42 x 52 mm, the sensor offers a very long range, reliable background suppression, a visible red laser light spot and a high excess gain.

The sensor is resistant to extraneous light up to 100 klux. With the O1D distances can also be measured reliably when the light beam does not hit the object surface vertically. This allows flexible mounting, facilitates installation and saves costs.

The accurate background suppression ensures that even shiny, matt, dark or light objects are safely detected.

The O1D distance sensor is used for positioning and speed control in ports. It can, for example, provide positioning assistance in the stacking process of containers or protect vehicles and autonomous transport systems from collisions.

Photoelectric distance sensor with time-of-flight measurement type O1D

Measuring range [m]	Connection	Light spot diameter [mm]	Order no.
2 switching outputs or 1 switching output and 1 analogue output 4...20 mA / 0...10 V, scalable			
0.2...9.8	M12 connector	< 15 x 15	**O1D300**
0.2...10	M12 connector	< 15 x 15	**O1D105**
1...75	M12 connector	< 150 x 150	**O1D106**
1...100	M12 connector	< 200 x 200	**O1D209**

Spreader steering

The drivers of straddle carriers cannot accurately estimate the distance between spreader and container. This often leads to damage. The O1D laser sensor (damped mounting is required for shock protection) measures the distance between spreader and container. When the container is approached, this is signalled to the driver so that the speed can be adapted accordingly.

Encoders and inclination sensors – high measurement accuracy and precise detection.

Sensors for port applications

Reliable:
CAN interface via M12 connector.

Robust:
Vibration and shock resistant.

Permitted:
E1 type approval by the Kraftfahrt-Bundesamt (German Federal Motor Transport Authority).

Resistant:
Wide temperature range of -40...85 °C.

Ingress-resistant:
High ingress resistance (IP 67 / IP 69K) for the requirements in harsh environmental conditions.

Weight detection

When a reach stacker lifts up a container, the weight of the container is a crucial point that can make the vehicle unbalanced. The crane boom of the reach stacker has to be adjusted in this case to keep the balance between the load and the vehicle. The inclination sensor of the JN or JD series can be used in this case.

Static inclination sensors type JN.

Dynamic inclination sensors type JD.

For mobile applications.

Angular range [°]	Accuracy (static) [°]	Interfaces	Order no.
0...360 / ± 180	≤ ± 0.5	1 x CANopen	**JN2100**
0...360 / ± 180	≤ ± 0.5	1 x CAN / J1939	**JN2300**
± 180	≤ ± 0.5	1 x IO-Link (analogue/binary)	**JN2200**
± 45	≤ ± 0.01	1 x IO-Link (analogue/binary)	**JN2201**
± 45	≤ ± 0.01	1 x CANopen	**JN2101**
0...360	± 0.3	1 x CANopen	**JD1111**
0...360	± 0.3	1 x CANopen	**JD1121**
± 90	± 0.3	1 x CANopen	**JD2110**
± 90	± 0.3	1 x CANopen	**JD2120**

Inclination sensors JN series

Often the horizontal alignment of machines or machine parts is an important requirement for reliable operation. Inclination sensors are designed for angular position detection or levelling of mobile machines. Inclination sensors provide high measurement accuracy across the whole angular and temperature range with angles of inclination along the X and Y axes.

Dynamic inclination sensors JD series

In many applications, inclination sensors are subject to fast movements, abrupt impacts or vibration in three dimensions. Selecting a sensor suitable for such applications is extremely important. Where sensors based on the static measurement principle reach their limits, inclination sensors based on the dynamic measurement principle are used. Due to the combination of a 3D acceleration sensor and a 3D gyroscope (IMU), these acceleration-compensated inclination sensors have an extremely fast response time and provide a very stable angle value, even if subjected to the influences mentioned above.

Typical applications for inclination sensors based on the dynamic measurement principle include wheel loaders or AGVs.

Multiturn encoders RM series

The multiturn encoders are used for the detection of rotation or exact position detection for rotary movements. The gear-free system uses the Wiegand effect to keep the position values stored in case of a power failure without battery buffer. This means that the exact position can be transferred to the controller without any referencing.

Incremental encoders RA and RB series

Incremental encoders generate a precisely defined number of pulses per revolution. They are a measure of the angular or linear distance moved. The phase difference between the signals A and B, which are shifted by 90°, allows evaluation of the direction of rotation.

Absolute multiturn encoders type RM

For mobile applications.

M12 connectors, 5 poles.

Incremental encoders type RB and RA

For mobile applications.

M12 connectors, 5 poles.

Resolution	Interface	Materials		Shaft	Order no.
		flange	housing		
4096 steps; 4096 revolutions; 24 bit	1 x CANopen	aluminium	steel scratch-resistant cathodic dip coating	synchro flange 10 mm	**RM9000**
				synchro flange, flattened shaft 10 mm	**RM9001**
				synchro flange 10 mm	**RM9004**
	1 x CANopen	stainless steel		synchro flange 10 mm	**RM9010**
8192 steps; 13 bit	1 x SSI	aluminium		rectangular flange, solid shaft 10 mm	**RN6066**[1)]
	2 x SSI	aluminium		rectangular flange, solid shaft 10 mm	**RN6065**[1)]
1...10,000; (parameterisable; Factory setting: 1024) resolution	IO-Link	aluminium	stainless steel	solid shaft 6 mm	**RB3100**
				solid shaft 6 mm, centric ring	**RB3510**[2)]
				hollow shaft 6 mm	**RA3104**

[1)] with 0.15 m pigtail 8 poles
[2)] with 2 m PUR cable

Monitoring of rotation angles

The rotation angle and the speed of the AGV's steering need to be monitored. By mounting the CANopen or SSI multiturn encoder on each tyre of the AGV, the rotation angle can be determined, so that the AGV is moving in the right direction. The speed detection of each wheel is monitored by the incremental encoders.

For all pressure ranges: pressure sensors with user-friendly visualisation or as transmitters.

Sensors for port applications

Robust:
The ideal measuring cell for every pressure range.

Red – green ranges:
"Good ranges" or switching states can be identified quickly via the display colour.

Quick setting:
Easy to use via 3 pushbuttons.

Optimum orientation:
Process connection rotatable by approx. 345°.

Universal application areas:
High overload protection and protection rating IP 67 in pressure ranges of -1...600 bar.

Compact:
Pressure transmitters PT without display and with analogue output.

Pressure sensors type PN

Programmable 2-colour display, clearly visible switch-point LEDs.

Captive laser type label.

IO-Link.

Factory setting measuring range relative pressure [bar]	Process connection		Process connection		Process connection	
	G 1/4 female Order no.	G 1/4 male Order no.	G 1/4 female Order no.	G 1/4 male Order no.	G 1/4 female Order no.	G 1/4 male Order no.
	2 switching outputs		1 switching output and 1 analogue output 4...20 mA / 0...10 V		2 switching outputs or 1 switching output and 1 analogue output 4...20 mA / 0...10 V, scalable	
Measuring cell metal						
0...600	PN7160	PN7560	PN3160	PN3560	PN2160	PN2560
0...400	PN7070	PN7570	PN3070	PN3570	PN2070	PN2570
0...250	PN7071	PN7571	PN3071	PN3571	PN2071	PN2571
Ceramic-capacitive measuring cell						
0...100	PN7092	PN7592	PN3092	PN3592	PN2092	PN2592
0...25	PN7093	PN7593	PN3093	PN3593	PN2093	PN2593
0...10	PN7094	PN7594	PN3094	PN3594	PN2094	PN2594
0...2.5	PN7096	PN7596	PN3096	PN3596	PN2096	PN2596
0...1	PN7097	PN7597	PN3097	PN3597	PN2097	PN2597
0...0.25					PN2098	PN2598
-1...1	PN7099	PN7599			PN2099	PN2599
-1...0			PN3129	PN3529		
-0.5...0.5					PN2169	PN2569

Pressure sensors PN series

They are characterised by a modern and user-friendly design. The maximum robustness, high protection rating and captive laser labelling ensure reliable operation of the sensors even in in harsh industrial environments. The ceramic-capacitive measuring principle with a special support of the measuring diaphragm makes the sensors immune to overload operation and high pressure peaks, ensuring outstanding long-term stability.

Set-up, maintenance and operation are facilitated by a 4-digit LED display, which is visible from all sides even at great distances, and two switching status LEDs on the sensor head. The display can be switched from the indication of "red" to an alternating indication of "red – green". Like this, switching states can be highlighted or an independent colour window can be created.

The screwed-on sensor can be rotated in any direction. Mounting brackets, which can be obtained as an option, allow installation in any position.

Pressure transmitters PT series

They reliably detect the system pressure in machines and mobile applications. Designed without any seals, the transmitters can also be used in gaseous media.

The compact housing ensures flexible integration even where space is limited. The robust units offer high shock, vibration and pressure resistance and ensure wear-free operation over millions of pressure cycles. The PT sensors provide excellent measurement dynamics with a very short step response time for immediate reaction to fast pressure changes.

Pressure transmitters type PU / PT

For mobile applications.

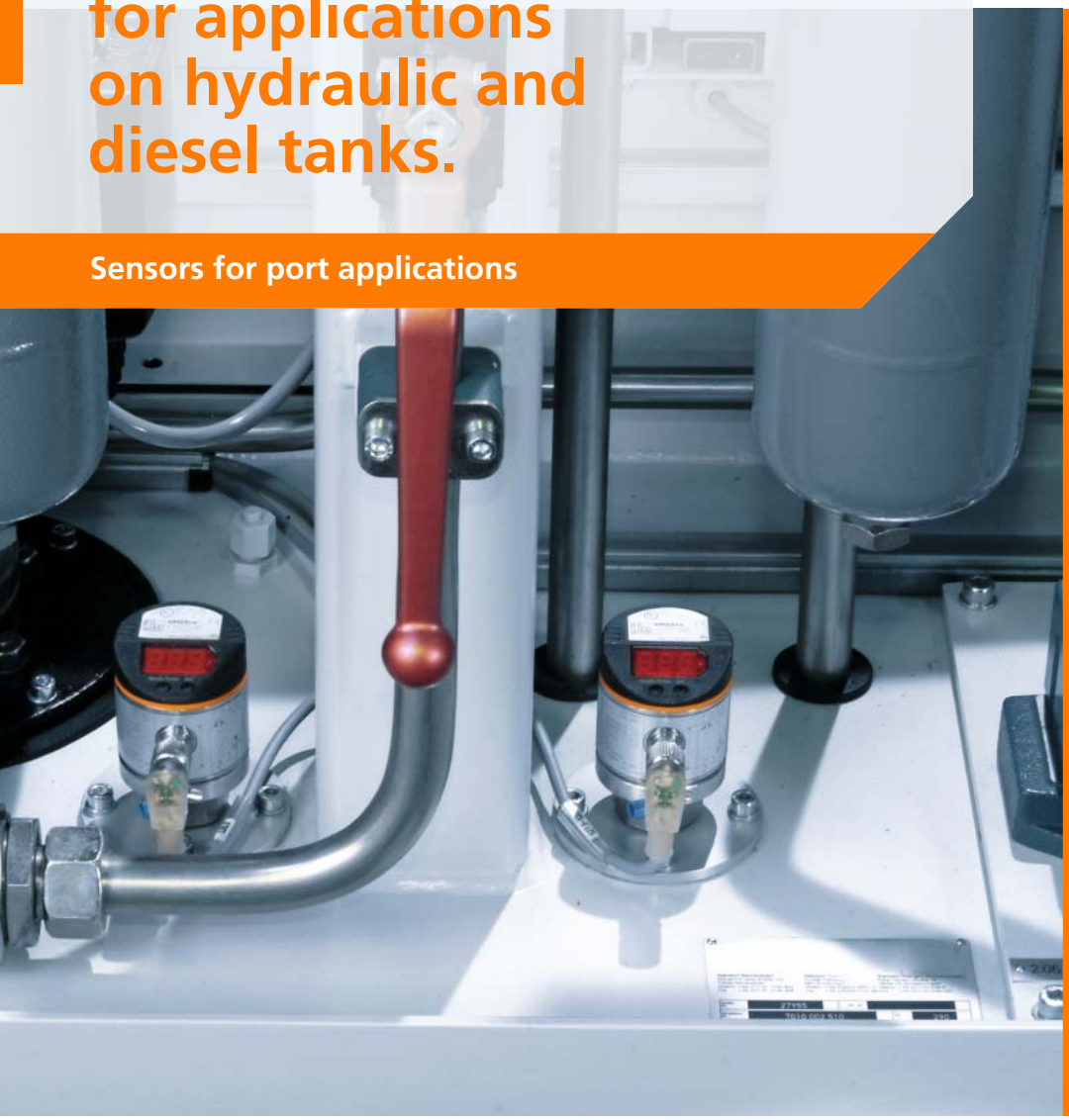
Process connection	Measuring range Relative pressure [bar]	Order no.	Order no.	Order no.
Plug-and-socket connection		M12	DEUTSCH	AMP
Analogue output 4...20 mA				
G 1/4 male	0...600	PT5560	PT5760	PT5660
	0...400	PT5500	PT5700	PT5600
	0...250	PT5501	PT5701	PT5601
	0...100	PT5502	PT5702	PT5602
	0...25	PT5503	PT5703	PT5603
	0...10	PT5504	PT5704	PT5604

Precise and reliable even under high pressure

Robust pressure sensors of the PN series with high shock and vibration resistance monitor the operating pressure in the hydraulic system of an automated guided vehicle.

Level sensors for applications on hydraulic and diesel tanks.

Sensors for port applications



Professional:
For industrial applications in water-based or oil-based media.

Versatile:
Versions with 2 or 4 switching outputs or analogue output 4...20 mA / 0...10 V.

Safe:
Type LK12 with approval as overflow prevention to WHG[1].

Combined:
Type LT for level and temperature monitoring.

Flexible:
Variable insertion depths thanks to clamp fitting.

Level sensors type LK / LT

Display and handling directly on the unit or via IO-Link.

Suitable for oil temperatures up to 70 °C.

Type LT: suitable for water-based and oil-based media.

For level and temperature.

Rod length [mm]	Type	Order no.
2 switching outputs		
264		**LK1022**
472		**LK1023**
728		**LK1024**
264	Automatic medium detection	**LK7022**
472		**LK7023**
728		**LK7024**
264	WHG[1]	**LK1222**
472		**LK1223**
728		**LK1224**
1 switching output and 1 analogue output 4...20 mA / 0...10 V		
264		**LK3122**
472		**LK3123**
728		**LK3124**
4 switching outputs		
264		**LK8122**
472		**LK8123**
728		**LK8124**

Rod length [mm]	Type	Order no.
4 switching outputs for level and temperature		
264	2 switching outputs level 2 switching outputs temperature[2]	**LT8022**
472		**LT8023**
728		**LT8024**
1 analogue output, 1 switching output		
264	1 analogue output level[2] 1 switching output temperature[2]	**LT3022**
472		**LT3023**
728		**LT3024**

[1] German Federal Water Act
[2] level / temperature selectable

Level sensors LK and LT series.

The level sensors of the LK / LT series provide reliable level detection in vessels and tanks. They are for example used to continuously measure the fill level of coolant containers or hydraulic reservoirs. The LT series can even monitor level and temperature in one unit. LT30XX type is suitable for hydraulic and diesel tanks.

The sensor displays the current level and signals via two switching outputs that the set limits have been reached or that the level is below the set limit. Setting to the medium to be measured and adjustment of the switch-on and switch-off points and switching functions of the outputs is simple thanks to the intuitive user menu.

The sensors are available with three different probe lengths. The immersion depth is easily adjusted using the optional screw-in or flange adapters.

The LK12 series is approved to the German Federal Water Act (WHG) section 19.

IO-Link IP 67 WHG

Diesel level detection

For monitoring the level of the fuel on RTGs the level sensor of the LK or LT series can help to transmit both analogue and binary signals to the PLC of the crane. The LK series has proven its worth for fuel monitoring, especially for diesel and LT series for hydraulic tanks. Thus the priority of refuelling can be determined without a physical check of the fuel level.

Find the suitable accessories at ifm.com

Systems for quality monitoring – an important part in predictive maintenance.

Sensors for port applications

Reliable:
Increase of uptime.

Good readability:
Indication of purity class on the LCD display.

Simple:
Intuitive, user-friendly handling.

Robust:
High protection rating and can be used in extremely harsh industrial environments.

ISO standards

ISO code number	Number of particles per ml	
	More than	Up to and including
22	20,000	40,000
21	10,000	20,000
20	5,000	10,000
19	2,500	5,000
18	1,300	2,500
17	640	1,300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
09	2.5	5
08	1.3	2.5
07	0.64	1.3

Particle monitoring of hydraulic oils

The LDP100 particle monitor monitors the cleanliness or contamination level of liquid media. The integrated data memory permits the analysis across a larger period of time. The LCD display indicates the purity class.

Systems for oil quality monitoring

Water or particles are generally not wanted in hydraulic liquids and lubricants. High concentrations of water or particles can seriously affect operation or even cause damage to crane gears.

The particle monitor of the LDP series monitors the degree of cleanliness – or the level of contamination – in oils and hydraulic oils.

This product will greatly facilitate condition-based maintenance actions and help avoid downtime.

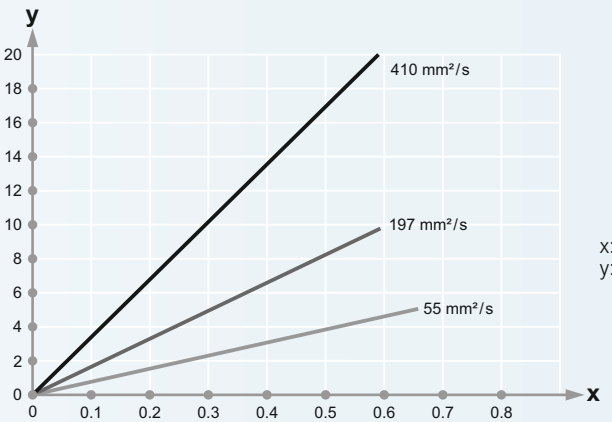
Benefits of LDP100

LDP monitors the degree of cleanliness – or the level of contamination – in oils and hydraulic oils. The integrated data memory allows data recording over a longer period. The LCD display indicates the cleanliness level to ISO 4406:99 or SAE AS4059E as a range number.
The device has a CANopen interface.
The measured value is also provided via an analogue output. In addition, a switching output is available which can be used as an alarm output.
The monitor is equipped with two Minimess connections to install it in the off-line circuit of the oil cycle. The electrical connection is conveniently established via an M12 connector. Thanks to its robust housing and high protection rating, the device can be used in extremely harsh industrial and mobile environments.

Particle monitor for oil condition monitoring type LDP

Medium temperature [°C]	Media	Connection	Order no.
1 digital output, 1 analogue output			
-10...80	mineral oils (e.g. HLP); ester oils (e.g. HEES); biodegradable oils (e.g. HETG)	M12 connector	**LDP100**

Δp-Q-characteristics for different viscosities



x: Volume flow in [l/min]
y: Δ p in [bar]

Temperature sensors – hydraulics and pneumatics under control.

Sensors for port applications

Matching:
Temperature transmitters with current or voltage output or PT1000.

Versatile:
Connector versions M12, DEUTSCH and AMP selectable.

Economical:
Operating voltage from 8 V with a fast reaction time (1 s / 3 s) and a high accuracy.

Robust:
Pressure resistance up to 400 bar.

Simple:
Plug and play via preset measuring ranges.

Flexible:
Different process connections, installation depth, adapters and thermowells available.

Temperature transmitter type TA / TU

Welded stainless steel housing.

Insertion depths of 25 to 200 mm.

T05 / T09: 1 / 3 s.

Accuracy [K]: ± 0.3 + (± 0.1 % Ms).

Measuring range [°C]	Process connection	Insertion depth [mm]	Plug-and-socket connection	Order no.	Order no.
Analogue output				4...20 mA	0.5...4.5 V
-50...150	G 1/4	25	M12	**TA3105**	**TU3105**
		50	M12	**TA3115**	
		200	M12	**TA3155**	
		25	DEUTSCH	**TA4105**	**TU4105**
		50	DEUTSCH	**TA4115**	
		25	AMP	**TA5105**	**TU5105**
		50	AMP	**TA5115**	
	M10 x 1	50	DEUTSCH	**TA4019**	

Temperature sensors TA/TU/TM series

The compact temperature transmitters of types TA/TU/TM are designed especially for use in mobile machines. The sensors feature high precision due to the factory-internal adjustment of the PT element and the electronics. The innovation, besides the wide measuring range, is the excellent response time. The high vibration and shock resistance enable use particularly in hydraulic and pneumatic applications with high operating pressure.

A voltage range of the temperature transmitters of 8 up to 32 V DC ensures that even high fluctuations of the on-board supply system do not affect the function. To comply with the ever increasing EMC requirements in mobile applications the devices feature increased EMC resistance.

The sensors are available with different probe lengths, process connections and measuring ranges.

PT1000 with process connection type TM

Insertion depths of 25 to 50 mm.

T05 / T09: 1 / 3 s.

Accuracy [K]: ± (0.15 + 0.002 x |t|).

Connection to evaluation unit.

Measuring range [°C]	Process connection	Insertion depth [mm]	Plug-and-socket connection	Order no.
PT1000				
-40...150	G 1/4	25	M12	**TM5105**
	G 1/2	50	M12	**TM5411**
	G 1/4	25	DEUTSCH	**TM6101**

Find the suitable accessories at ifm.com

Monitor the hydraulics

The sensors of type TA/TU/TM are suited for mobile applications and especially for hydraulic and pneumatic applications with high operating pressure. An example here is to monitor the hydraulics in the control cabinet of an Automated Guided Vehicle (AGV).

Long and low ranges for port logistics: UHF-RFID – systematic transparency.

Sensors for port applications

Flexible:
Ultra low, low, mid and wide range antennas for every application.

Simple:
UHF evaluation units with four external antenna terminals.

Integrated:
Ethernet TCP/IP and Ethernet IP interface for parameter setting and data transmission.

Robust:
The protection rating IP 65 / IP 67 meets all requirements for harsh industrial environments.

Handling of traffic management
Data collected by RFID systems is integrated in the IT platform that handles the traffic management in the terminals.

Up to 10 m: ANT860
Wide range antenna for truck detection at the gate in order to monitor the truck traffic in ports.

Up to 20 cm: ANT805 / ANT810
(Ultra) low range antenna for the selective detection of objects in the close range.

UHF evaluation units

As components of the UHF system platform, the UHF evaluation units DTE830 and DTE930 are compliant with the UHF bands in Europe and the USA respectively. The setting of corresponding country profiles enables use of the units in many other countries.

Ultra low and low range antennas

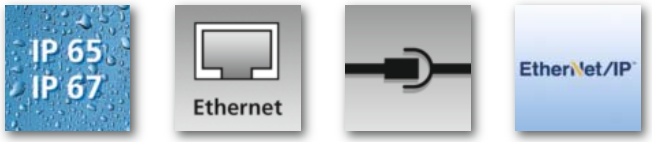
These antennas are distinguished by the near field. In order to achieve a high selectivity, the smallest possible designs are used as they manage short reading ranges.

Mid-range antennas

Due to its smaller dimensions the mid range antenna is chosen for applications in the near / far field with reading ranges of up to 2 m.

Wide range antennas

With an angle of aperture of 30° these antennas have been developed for applications in the far field where reading ranges of up to 10 m are required.



Still looking for more choice? You can find more tag versions at ifm.com

RFID UHF evaluation units	Order no.
300 x 300 x 71 mm, Ethernet/IP, TCP/IP, EU/ETSI	**DTE830**
300 x 300 x 71 mm, Ethernet/IP, TCP/IP, US/FCC	**DTE930**
138.1 x 63 x 156, TCP/IP, UHF RFID system with integrated antenna	**DTE804**

UHF RFID system DTE 865 to 928 MHz

Antennas	Order no.
RFID UHF ultra low range antenna, EU/ETSI/US/FCC	**ANT805**
RFID UHF low range antenna, EU/ETSI	**ANT810**
RFID UHF low range antenna, US/FCC	**ANT910**
RFID UHF mid range antenna, EU/ETSI/US/FCC	**ANT815**
RFID UHF mid range antenna, US/FCC	**ANT920**
RFID UHF mid range antenna, 100°/100° EU/ETSI	**ANT820**
RFID UHF wide range antenna, 70°/70° EU/ETSI	**ANT860**
RFID UHF wide range antenna, 70°/70° US/FCC	**ANT960**

Transponders	Order no.
ID tag; 860-930 MHz; 70 x 174 x 17.6 mm	**E80394**
ID tag / Ø 40 x 10 / 04	**E80354**

ecolink connection technology – reliable even in port applications.

Connection technology

Ingress-resistant:
The innovative sealing concept provides the high protection ratings IP 67 / IP 68 / IP 69K.

Held in place:
The saw-tooth type vibration protection ensures that the nut does not become loose unintentionally in case of shock and vibration.

By hand:
Easy to install and remove manually.

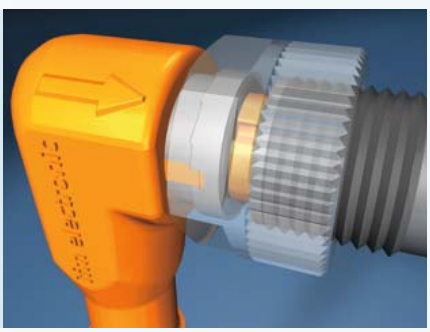
Visible:
Versions in a transparent black housing for an optimum visibility of the LED even in bright lighting conditions.

Standardised:
The connection technology meets the M12 standard EN 61076.

Tested to extremes
Again and again immersed in icy and boiling water: the connection remains ingress-resistant.

Easy mounting without using a tool.

Vibration protection with end stop
The saw-tooth type vibration protection ensures that the nut does not become loose unintentionally in case of shock and vibration.

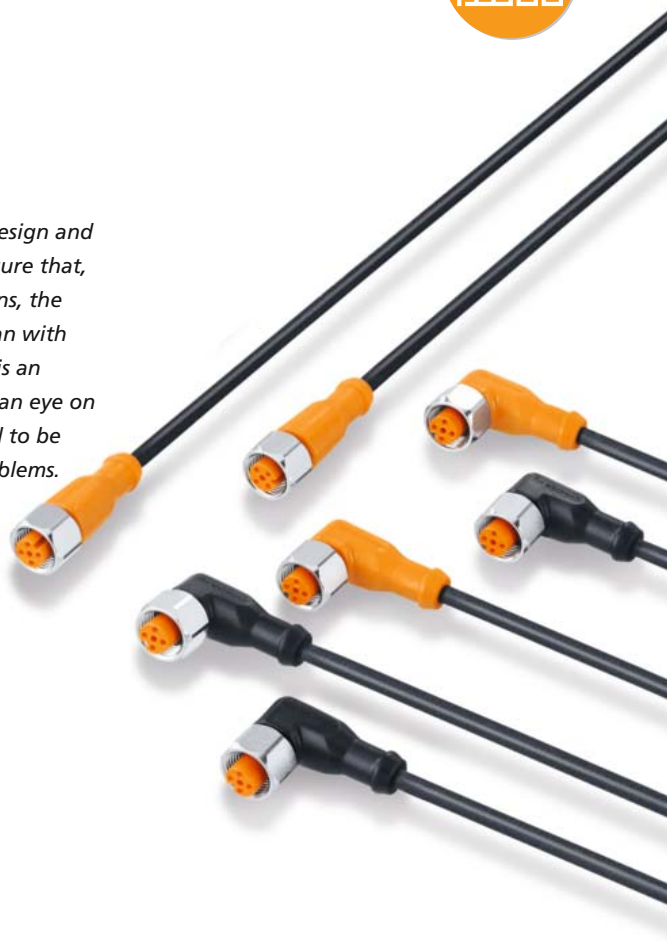


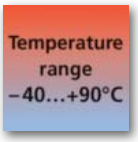
ecolink EVM series

Overpressure impossible: Due to the special installation of a mechanical end stop the O-ring is always correctly compressed and so permanently maintains its sealing function.

The saw tooth contoured vibration protection secures against strong shocks and vibrations. The high protection rating IP 67 / IP 68 / IP 69K, the wide temperature range of -40...90 °C as well as high-quality housing materials (high-grade stainless steel, TPU) ensure a permanently reliable connection in harsh environments such as salty moisture, oil and grease.

Clearly visible: The innovative design and a transparent black housing ensure that, even in bright lighting conditions, the LEDs are more clearly visible than with clear transparent versions. This is an important prerequisite to keep an eye on the plant status all the time and to be able to act quickly in case of problems.





Connection cables with M12 socket

Sensor connection technology for mobile applications.

Housing	Cable [m]	LEDs	Order no.
Straight, M12, 4 poles	2	–	**EVM001**
	5	–	**EVM002**
	10	–	**EVM003**
Straight, M12, 4 poles	2	•	**EVM068**
	5	•	**EVM069**
	10	•	**EVM070**
Angled, M12, 4 poles	2	–	**EVM004**
	5	–	**EVM005**
	10	–	**EVM006**
Angled, M12, 4 poles	2	•	**EVM007**
	5	•	**EVM008**
	10	•	**EVM009**

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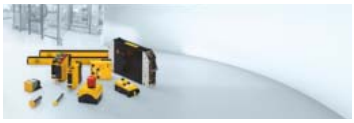

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