Condition Monitoring

Keep your port moving with healthy port equipment

Acting rather than reacting: Avoiding high downtime costs through early damage detection

Port machine failures usually occur gradually. Different condition parameters can indicate deterioration.

Condition monitoring based on vibration provides an effective way to predict such changes. Increased vibration and friction occur long before the port machine fails. With active monitoring, potential damage can be detected weeks or even months in advance.

Digitalise maintenance with solutions from ifm!

The most efficient way to avoid unplanned downtime

With condition-based monitoring, imminent machine damage can be detected at an early stage. This enables predictive maintenance planning, which in turn ensures consistent product quality and efficient use of resources.

Vibration products from ifm reliably detect and evaluate the vibration data of port machines. This way, the current machine condition is transmitted to the controller or IT infrastructure as a condition value and, if necessary, a warning or alarm signal.

Counter functions also facilitate the calculation of component lifetimes affected by the frequency and intensity of impacts, temperature, or speed.

Condition

Months   Weeks   Days   Minutes

Prevention Time

1 Set-up
2 Vibration/ Friction
3 Noise
4 Heat
5 Smoke
6 Failure

Looseness

Unbalance

Misalignment

Friction

Rolling element bearing

Impact

Tooth faults

Contamination

Benefits of Condition Monitoring

Minimise downtime
Active monitoring enables early damage detection and helps prevent unexpected downtime.

Extend equipment's lifespan
Timely maintenance and repairs help prolong the lifespan of port equipment.

Increase safety
Identifying potential risks in port equipment strengthens safety for both port workers and machinery.

Cost savings
Perform maintenance work only when needed and avoid the costs of unexpected downtime.

Enhance efficiency
Data insights enable timely equipment maintenance, optimising port operations.

Real-time visibility
Real-time data provide valuable insights that support quick and accurate decisions, ensuring smooth operations, also remote.

5 YEARS Warranty on **ifm products**

From vibration monitoring to real-time maintenance
ifm.com/cnt/ vibration-monitoring

Vibration monitoring systems

Condition monitoring sensor with CANopen type VMB
Real-time condition monitoring with triaxial precision – seamlessly connected to your mobile control network via CANopen.

Find out more about VMB301
ifm.com/cnt/vmb3

Acceleration sensors type VSA, VSP & VSM
High-accuracy, real-time acceleration measurement – available in a wide variety of housing designs.

Diagnostic electronics and acceleration sensors
ifm.com/cnt/evaluation-unit-and-sensors

Diagnostic electronics type VSE
4-channel diagnostic system for evaluating dynamic signals, with additional analogue support variables such as speed and load.

Systems for vibration monitoring and diagnostics

Basic vibration sensor and transmitter types VT & VK
For permanent monitoring of the overall vibration condition of machines and equipment according to ISO 20816.

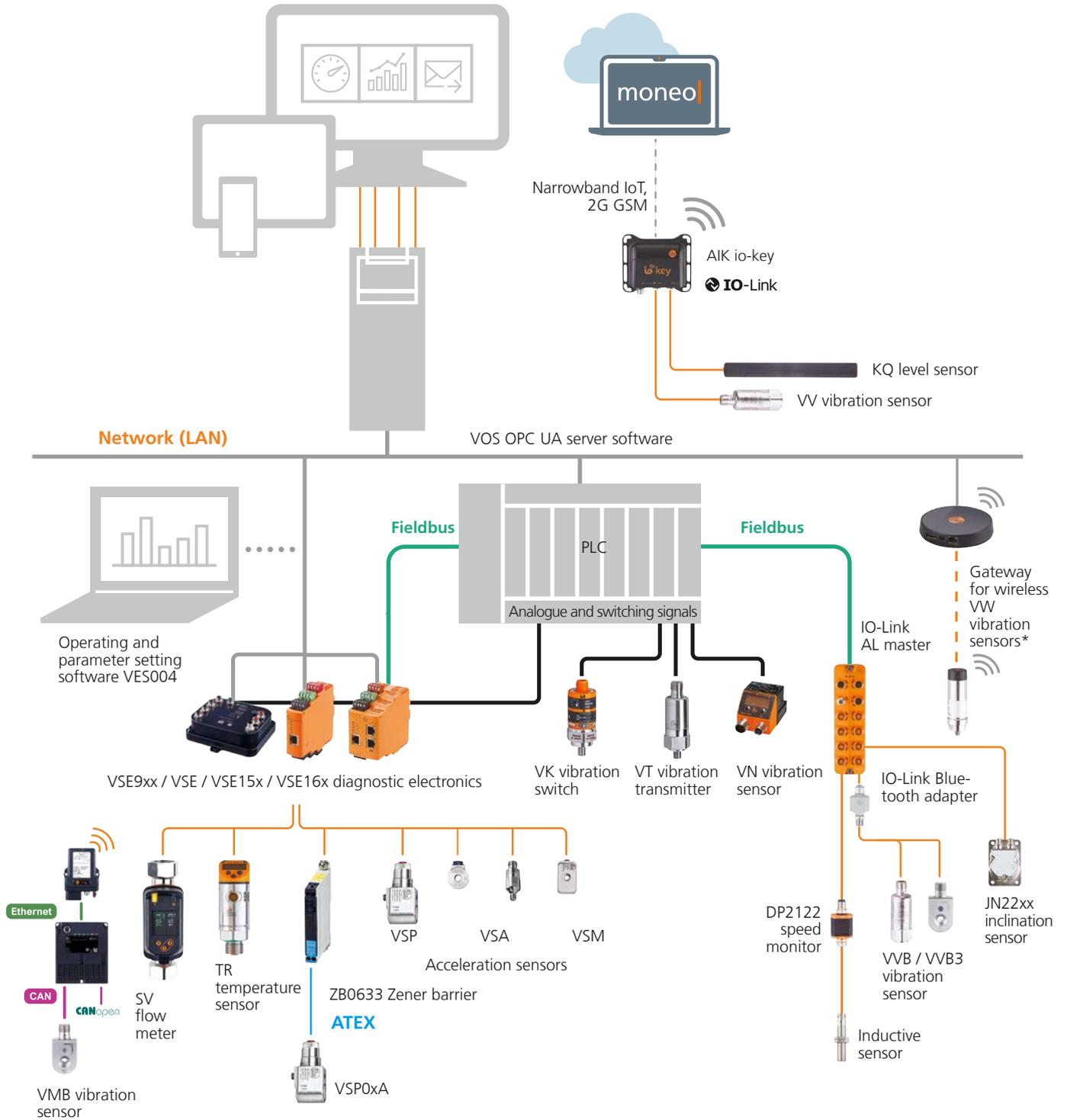**Condition monitoring sensor with IO-Link type VVB**
Enables real-time monitoring of reliable condition indicators: impact, fatigue, friction and temperature.

Intelligent vibration sensor type VN
Measurement of overall machine condition in accordance with ISO 20816 to prevent catastrophic failure.

Find out more about ifm vibration sensors and transmitters by types
ifm.com/cnt/switch-and-transmitter

Vibration monitoring system overview

moneo

Narrowband IoT,
2G GSM

AIK io-key

IO-Link

KQ level sensor

VV vibration sensor

Network (LAN)

VOS OPC UA server software

Fieldbus

PLC

Fieldbus

Analogue and switching signals

Operating and
parameter setting
software VES004

Gateway
for wireless
VW
vibration
sensors*

IO-Link
AL master

VSE9xx / VSE / VSE15x / VSE16x diagnostic electronics

VK vibration
switch

VT vibration
transmitter

VN vibration
sensor

IO-Link Blue-
tooth adapter

Ethernet

CAN

CANopen

SV
flow
meter

TR
temperature
sensor

ZB0633 Zener barrier

ATEX

VSP

VSA

VSM

Acceleration sensors

DP2122
speed
monitor

VVB / VVB3
vibration
sensor

JN22xx
inclination
sensor

VMB vibration
sensor

VSP0xA

Inductive
sensor

*The gateway for wireless vibration sensors and the wireless VW vibration sensor are excluded from the 5-year warranty.

Temperature monitoring systems

Temperature sensor for mobile use type TA

The hermetically sealed stainless steel housing withstands harsh environmental conditions such as high shock and vibration. It is suitable for multiple applications in tanks or pipes, especially in hydraulic or pneumatic systems. This robust and accurate sensor is ideal for long-lasting and reliable temperature measurement, helping to reduce downtime and save maintenance costs.

Compact temperature transmitters for mobile machines

Bolt-on and screw-in sensors type TS

The bolt-on and screw-in sensors are the perfect choice for measuring temperature focused on machine condition. The flexible, cable-based design can be mounted even in narrow spaces and reliably detect any signs of machine wear and tear. As with vibration behaviour, the housing temperature is indicative of the condition, quality and life expectancy of a bearing or motor. These passive sensing elements can be connected directly to a control unit or linked to an evaluation unit to provide a standardised analogue value.

Bolt-on and screw-in sensors

Oil quality monitoring systems

Optical oil particle monitor type LDP

Monitoring the level of contamination in hydraulic oils such as mineral, ester and biodegradable oils. The integrated data memory enables data recording over extended periods. The LCD display indicates cleanliness levels according to ISO 4406:99 or SAE AS4059E as range numbers. The device features a CANopen interface and a sequential analogue output.

Particle monitor for oil condition monitoring

Oil humidity sensor type LDH

Water is generally undesirable in hydraulic fluids and lubricants. High concentrations of water can seriously impair operation or even cause damage. The oil moisture sensor of the LDH series measures the relative moisture content in oil within a range of 0...100% using a capacitive measuring element. In addition to relative humidity, the sensor also outputs the medium temperature as an analogue signal.

Moisture measurement in oil

Condition monitoring applications in ports

Condition monitoring of ship-to shore crane's motors and gearboxes

Undetected machine faults in cranes can lead to considerable efficiency losses. Condition monitoring systems can anticipate such faults and help prevent such incidents. Typical examples of machine faults include bearing failure, unbalance, looseness or misalignment.

Monitoring spreader sheaves' lubrication and bearing condition

Continuous operation of the spreader can cause wear and tear on the sheaves. Monitoring the bearing and lubrication condition on the support bearings is essential, primarily to prevent failures in service and the potential secondary damage they can cause.

Shock detection of spreaders during operation

In the long run, hard landings or even collisions of spreaders, for example with containers, can lead to costly damage if left unaddressed. Sensors of types VMB or VSE+VSA detect such events and transmit them to the PLC. The PLC logs the information with a time stamp, allowing the results to be analysed via video recording so that maintenance requirements can be identified in good time.

Temperature monitoring of crane's gearbox

Temperature is the physical variable most frequently measured in system components used in port technology. The temperature or temperature difference measured at drives, gearboxes and motors plays an important role as an indicator of machine condition.
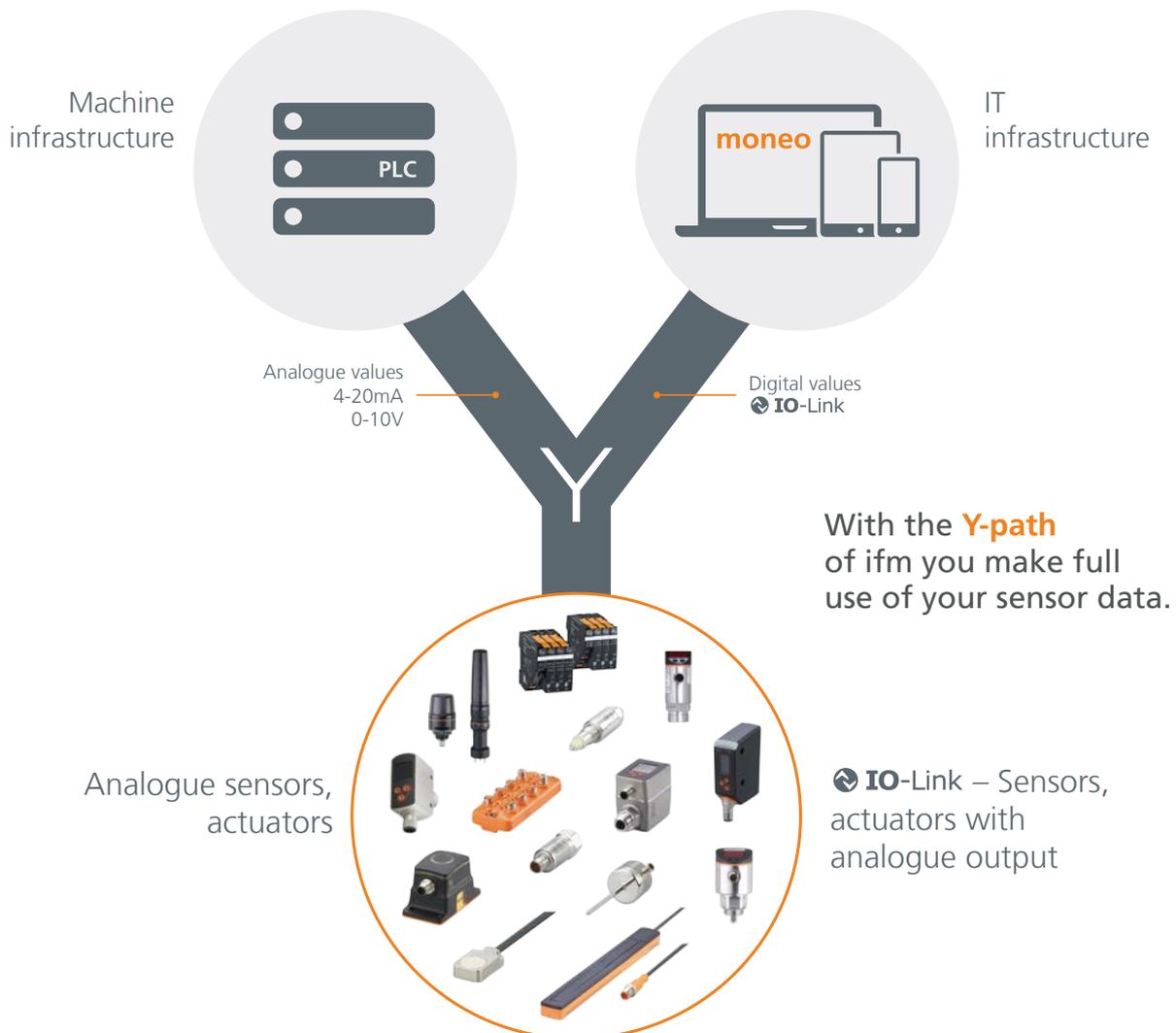
The sensors of the TS series are characterised by their compact design, wide temperature range and precise temperature measurement.

This makes them suitable, for example, for condition monitoring of gearboxes on RTGs, temperature monitoring of lubricating oil, or trolley applications.

Retrieving useful data from port equipment with IO-Link

IO-Link: What is it?

In the past, binary switches typically provided only simple switching signals or analogue values. Today, data from intelligent sensors forms the basis for the next industrial revolution. These sensors extract comprehensive information from port machinery and equipment using the key technology IO-Link.

IO-Link is a standardised, fieldbus-independent interface for automation, providing users with a point-to-point connection without complex addressing.

Talk to us to remain efficient and competitive for the port of tomorrow. IO-Link delivers convincing efficiency gains and cost savings – see for yourself!

Benefits of using IO-Link

- Easy setup and fast sensor replacement
- Error-proof transmission of precise measured values
- Controller- and fieldbus-independent
- Several measured values in a single unit
- Remote access to sensor parameters
- Condition monitoring and diagnostics

Discover the IO-Link advantage
ifm.com/cnt/io-link

Automation technology

Industrial Internet of Things

PLC

moneo configure

Y-path
separate networks

network 1 fieldbus

network 2 IoT

IIoT PLATFORM
PLUG & WORK

3RD PARTY
CUSTOMIZED

Switch

PROFINET
EtherNet/IP
EtherCAT
POWERLINK
Modbus

24V

IO-Link master AL13

IO-Link master AL15

API (REST)
{ j s o n }
OPC UA
MQTT

IIoT DEVICES

AI

DI

PWM

DO

Vibration sensors and transmitters

Process sensors

Position sensors

Identification systems

Accessories

IO-Link modules

Increase port efficiency and reduce downtime with IO-Link

To maintain smooth and efficient port operations, advanced technologies such as data analytics are required to improve processes, streamline workflows and simplify decision-making. Critical port assets must therefore be monitored effectively, and collected data analysed in real time. IO-Link offers exactly this advantage – enabling the easy retrieval and integration of data from a variety of field sources.

IO-Link is a standardised technology, but ifm's IO-Link solution provides something unique – the Y-path. This concept enables the collection of real-time operational data and allows health monitoring of your equipment without interrupting ongoing operations. This parallel access to data ensures hassle-free diagnostics and continuous monitoring, which is critical for maximising uptime and maintaining efficiency in port operations.

Machine infrastructure

PLC

moneo

IT infrastructure

Analogue values
4-20mA
0-10V

Digital values
◎ **IO**-Link

With the **Y-path** of ifm you make full use of your sensor data.

Analogue sensors, actuators

◎ **IO**-Link – Sensors, actuators with analogue output

moneo IIoT platform: Harness the full power of your data to become a smart port

Deep understanding of your port equipment

With ifm's moneo IIoT platform, sensor and production data can be visualised, analysed, and monitored at any time. This provides a clear overview of whether your port equipment is operating within the green zone or showing early signs of declining performance, increasing consumption, or the need for maintenance.

In addition, alerts can be configured individually: if predefined thresholds are exceeded, moneo automatically sends a notification, allowing responsible staff to react immediately and prevent downtime.

Reduce machine downtime with smart machine health monitoring
ifm.com/cnt/moneo

Turning data into knowledge:
Monitoring gearboxes and motors on STS cranes 24/7
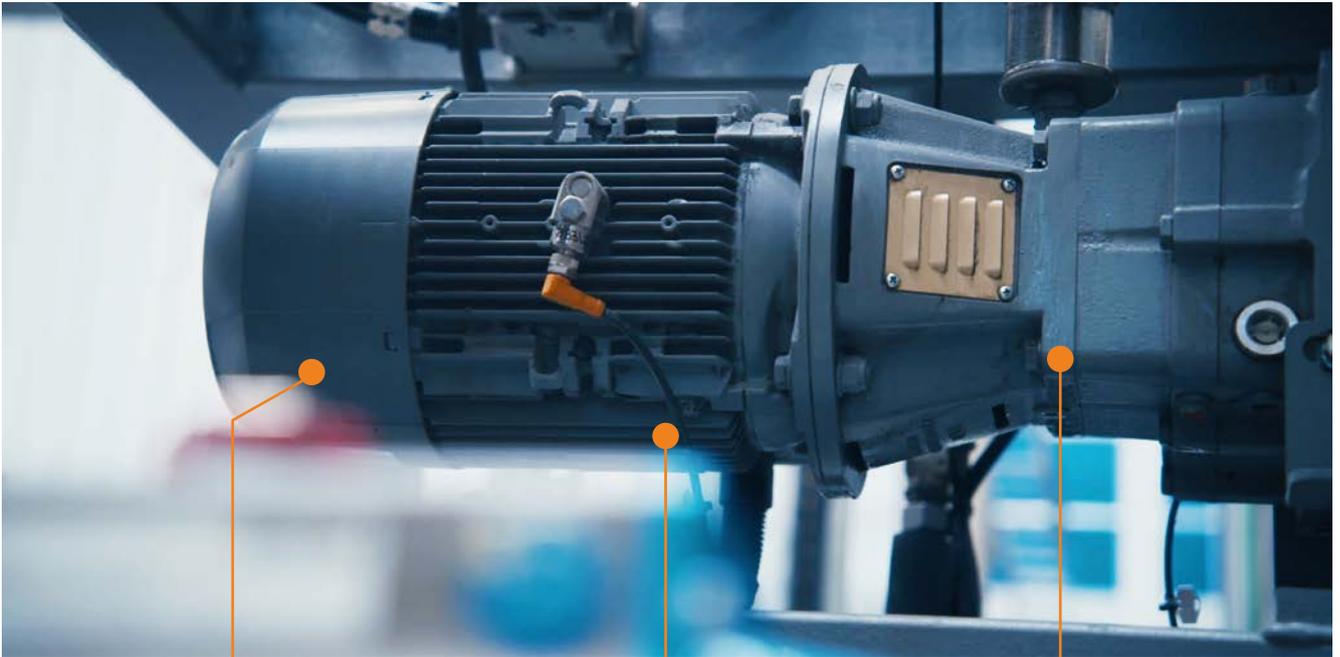
Loose footing   Friction (bearing)   Misaligned shafts

Protect your port equipment in three simple steps:

STEP 1

Connect your port terminal facilities with a moneo IIoT device

moneo IIoT devices – Record machine data

- Openness: fast integration into OT and IT systems

- Scalability: can be extended as required

- Cybersecurity: comprehensive protection of sensitive data

AIK050   AE2100

AE2400   QHA300

STEP 2

Transform asset data with moneo IIoT Core

moneo IIoT Core – Optimise workflows

- Parameter setting, data acquisition, visualisation and monitoring

- Plug-and-work insights into machine conditions and process parameters

moneo|IIoT Core Cloud

moneo| – no-code IIoT platform
Seamlessly collect, visualize and monitor sensor data to

Improve machine availability   Maintain process quality   Optimize energy consumption

Article no.: QCM001 QCM100, QCM110, QMI001

STEP 3

Predict and act with moneo IIoT Insights

moneo IIoT Insights – Predict and act

Industrial AI Assistant
- AI-powered machine health monitoring detects anomalies early and predicts remaining service life, reducing downtime and cost

moneo Track & Trace
- Track goods, identify objects, and ensure full production traceability

moneo|IIoT Insights Cloud

moneo| IIoT Insights

Industrial AI Assistant   Track & Trace

**Article no.:** QCM001, QCM500

Ready to become a smart port

moneo IIoT Core:
Transform data into information

moneo IIoT Core combines all essential functions of our IIoT platform: easily set sensor parameters, and collect, visualise, and monitor data. In this way, you can improve machine availability, maintain process quality, and optimise energy consumption.

Prevent unplanned downtime with predictive maintenance and condition-based monitoring – set up in just minutes.
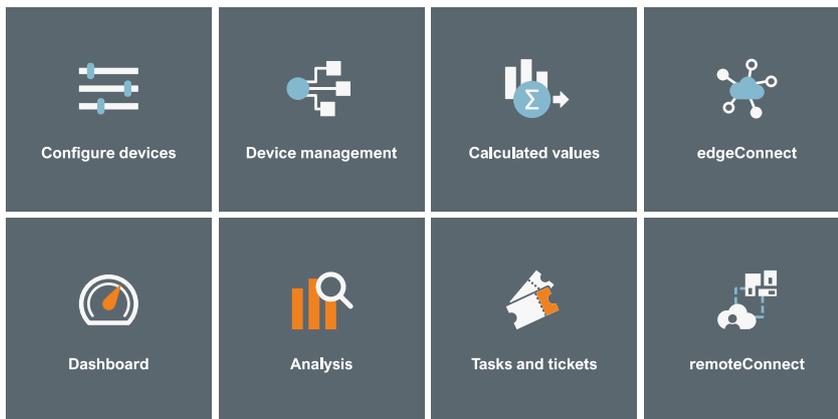
- Easy parameter setting of sensors
- Collect and visualise data on dashboards for comprehensive condition monitoring
- Individually configurable alarms for process deviations

Configure devices	Device management	Calculated values	edgeConnect
Dashboard	Analysis	Tasks and tickets	remoteConnect

* Free version of moneo configure:
Simple configuration of existing IO-Link devices in your port facilities. If additional functions are required, moneo IIoT Core is necessary.

Customised dashboards
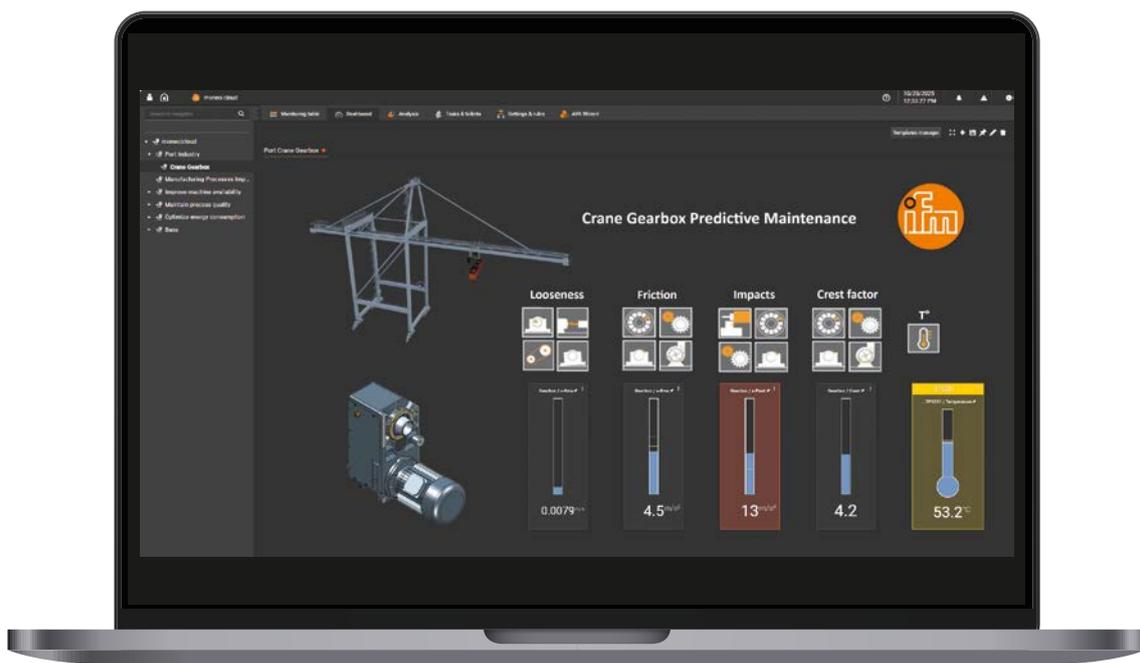
moneo IIoT Insights:
Software add-on for even more benefits

moneo IIoT Insights is a software add-on for the moneo IIoT platform and extends the functionality of moneo IIoT Core.

The add-on analyses production data in real time using artificial intelligence: the Industrial AI Assistant automatically detects anomalies and predicts the remaining lifetime of components. If deviations from the target state are identified, the user is notified immediately.

Unlock the full potential of your port equipment data and gain meaningful insights.

A brief impression: the tools of the Industrial AI Assistant
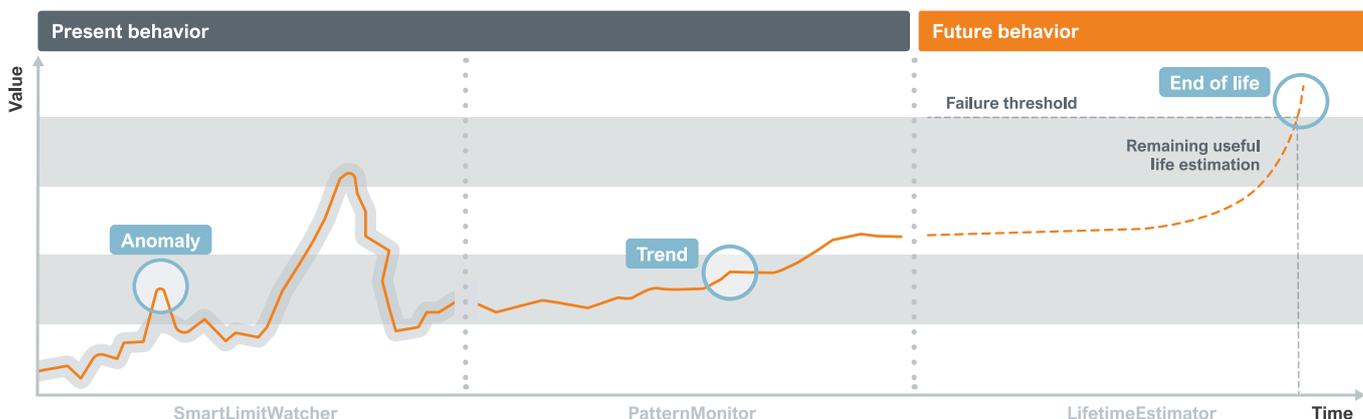

SmartLimitWatcher

Monitors complex, dynamic port processes, automatically detects anomalies based on sensor data such as temperature, flow and vibration and sends warnings based on dynamic thresholds.

PatternMonitor

Monitors individual critical process values, identifies structural changes and sends automatically generated alarms to initiate measures at an early stage.

LifetimeEstimator

Predicts the remaining service life of components subject to cyclical wear based on current usage behaviour as well as operating, sensor and maintenance data. By detecting patterns, it supports predictive maintenance, helping to reduce unplanned downtime and maximise the service life of machines.

Present behavior | Future behavior

Value

End of life

Failure threshold

Remaining useful life estimation

Anomaly

Trend

SmartLimitWatcher | PatternMonitor | LifetimeEstimator | Time

Example of use in ports:
Components such as hydraulic units, gearboxes and motors on cranes, spreaders, straddle carriers and AGVs.

moneo Industrial AI Assistant
ifm.com/cnt/
moneo-ai-assistant

Smart port cranes boost uptime

Vibration analysis secures operational reliability of remote-controlled gantry crane systems in modern megaports.

ifm.com/cnt/cs-port-cranes-boost-uptime

High availability in bulk material handling

Vibration monitoring on the bucket wheel drive.

ifm.com/cnt/cs-port-bulk-material-handling

Gantry cranes less susceptible to defects

Increased system availability with condition monitoring solutions by ifm.

ifm.com/cnt/cs-port-gantry-cranes

ifm.com