

Welcome to HBM webinar

“Smart signal condition or PLC-measurement - a comparison”

A graphic featuring the word "WEBINAR" in a blue, sans-serif font. The "WEB" part is enclosed within a dark blue circle, and the entire graphic is set against a light gray rounded rectangle with a subtle reflection below it.

WEBINAR

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- Product manager for industrial signal conditioners and software
- Graduate engineer
- 20 years of experience in factory automation
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Michael Guckes

Topics:

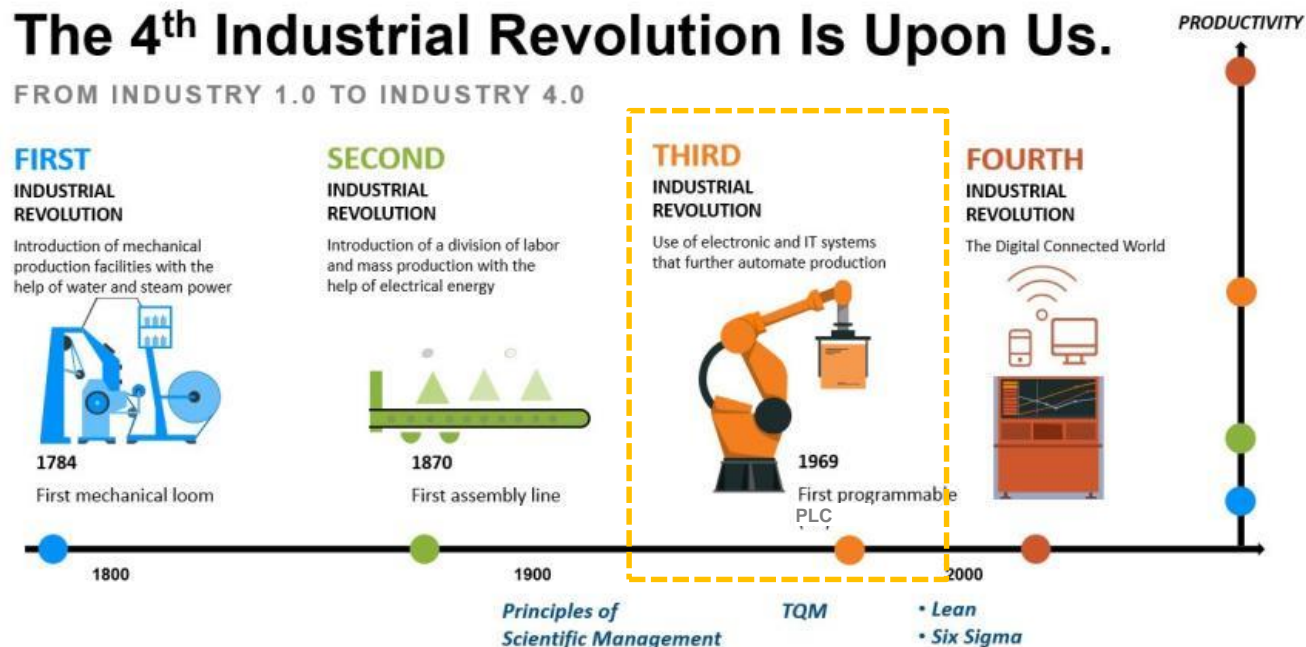
- Which automation concepts are needed
- Function, areas of application and limits of a PLC
- Measurement technology components become multifunctional
- Operation Technology (OT) and Information Technology (IT) are growing together
- With Edge Computing to Smart Factory
- The factory in the cloud - practical example
- Applications metrological automation components

- Decentralized real-time data processing and machine control
- Central storage of data for traceability
- Scalable computing power
- Big data
- Low cost
- Efficient
- Easy data storage and -analysis



PLC = **P**rogrammable **L**ogic **C**ontroller

- Device for controlling and regulating machines and plants
- Contains digital components and only its operation must be programmed by means of specific software
- Their dissemination took place during the 3rd industrial revolution



Components

- CPU = central processing unit with operating system and application program
- I / O modules = components for digital and analog input / output signals, sensors and actuators
- Fieldbus modules = component to connect further fieldbus modules

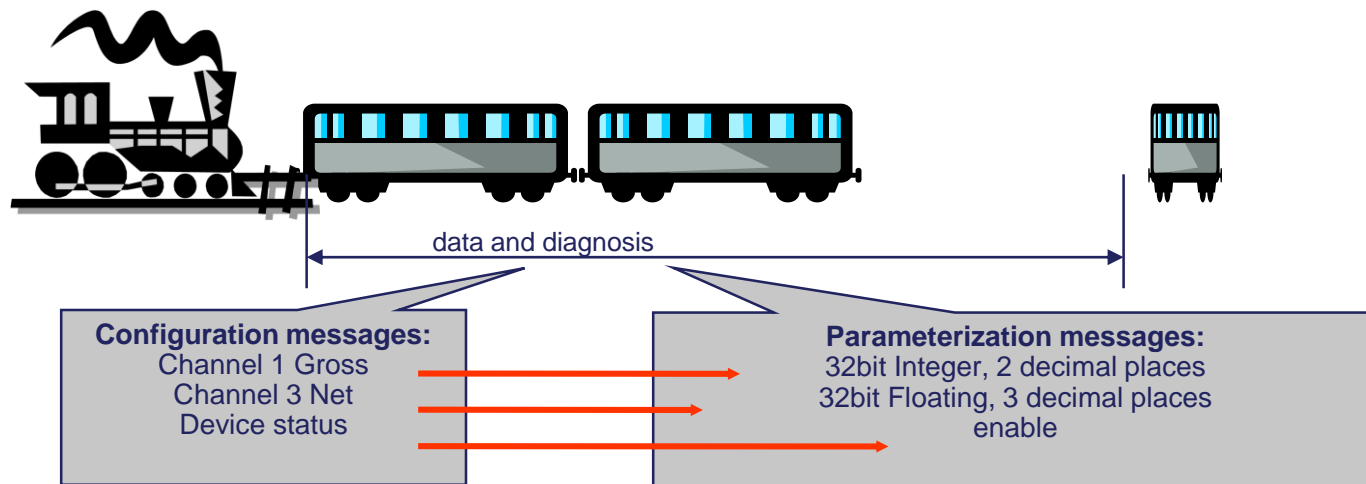


Fig. Small-/ Compact-PLC

Fig. Control cabinet with PLC consisting of CPU (head station) and peripheral I / O modules

Functionality

- Works after the master (CPU) / slave (modules) move
- Absolutely deterministic time behavior, specified by the CPU
- Clock-accurate processing of the application program
- Construction is referred to as fieldbus because all components and also the data transmission via a cable (fieldbus) are interconnected



Areas of application

- High number of signals
- Recurring work processes
- Work and isochronous
- Control of actuators
- Low measurement accuracy
- High degree of automation

Building



Manufacture



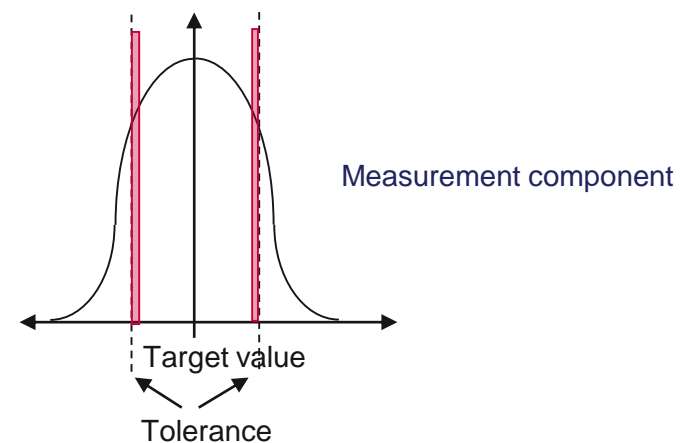
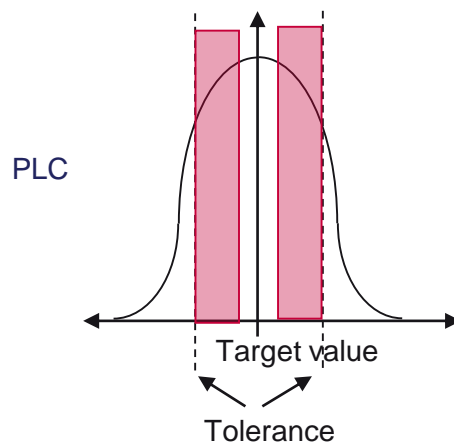
Process



PLC - Automation

Limits

- PLC programming requires special training
- Even small changes have to be made by the specialist
- The PLC program is not very flexible
- Only relatively little data can be transmitted via the fieldbus
- Diagnosis is usually only coded, i. Troubleshooting difficult
- The measuring accuracy of the I / O modules is very limited (high measurement uncertainty), thus lacks the basis of optimal control and Prozessausbeute



ClipX – 7 sensor technologies

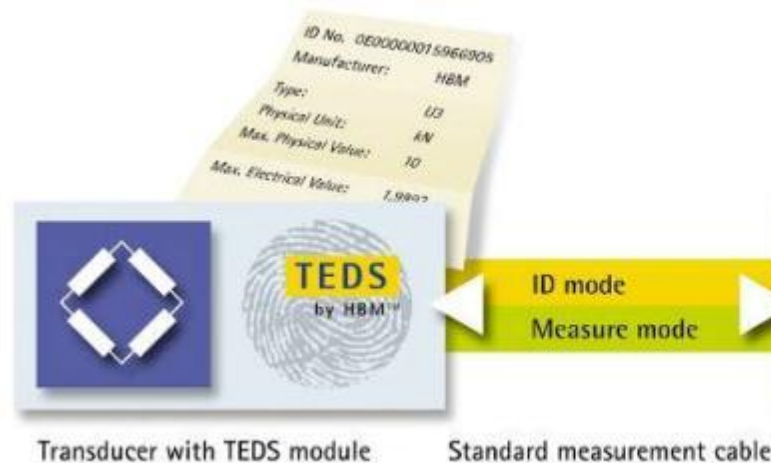
1 sensor input channel

- SG / Piezores.-full-bridge – up 4 sensors in parallel , impedance 80Ohm.. 5kOhm, 0.01% accuracy
- DC amplifier with 32 bit resolution and integrated sensor supply 5V
- Sample rate 19.2 kS/s & bandwidth up to 3.5 kHz



TEDS – Setup of measuring chain within seconds

Transducer Electronic Data Sheet



- Reads TEDS (0 and 1-wire) as per the IEEE1451.4 standard
- Easy setup of the measuring chain
- Scaling options: 2-point, table, polynom

1998



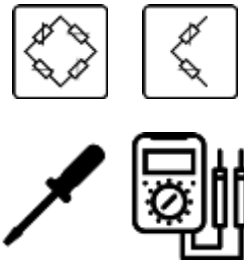
2018



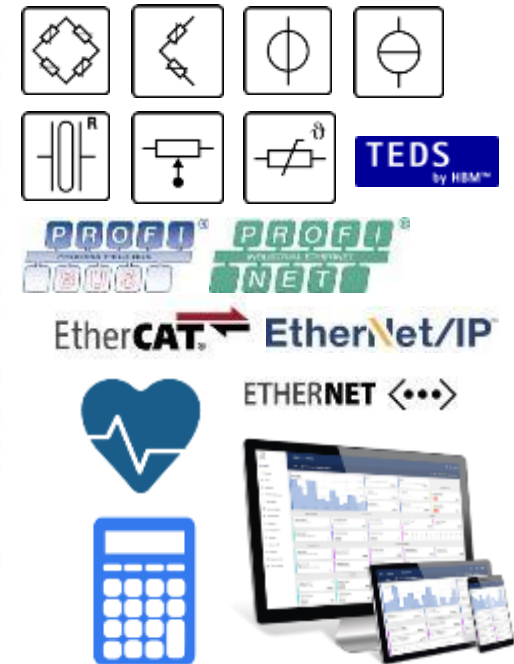
4G  **LTE**



1998



2018



Live-Demo available around the world (max. 2 connections)



ClipX live on the internet: <http://clipxdemo2.hbm.com>



ClipX provides Diagnostic for reliable operation and predicted maintenance:

Signals and visualization:

- (1) ClipX with 3 different operator levels, password protected
- (2) Level 2 freely configurable
- (3) Measuring-status, TEDS- and System-status
- (4) Test-signals free configurable
- (5) Indication and diagnostic for error and operations on the Web-GUI
- (6) Status-information (short) in the head-line



ClipX – WebServer:

ClipX > route_status

clipxdemo (1.1.3) Default name of parameter set (01)

33 % Status: EtherCAT: INIT

Status

- Device ready
- Sync master
- Sync slave
- Test signal active
- Changing parameter set
- Reading TEDS
- Fieldbus I/O
- Heartbeat

Invalid values

- Electrical Value (Field value)
- Gross (Gross)
- Net (Net)
- Minimum (Minimum)
- Peak to Peak (Peak-to-peak)
- Captured Value 1 (Captured Value 1)
- Captured Value 2 (Captured Value 2)
- ClipX Bus Value 1 (ClipX bus 1)
- ClipX Bus Value 2 (ClipX bus 2)

IT:

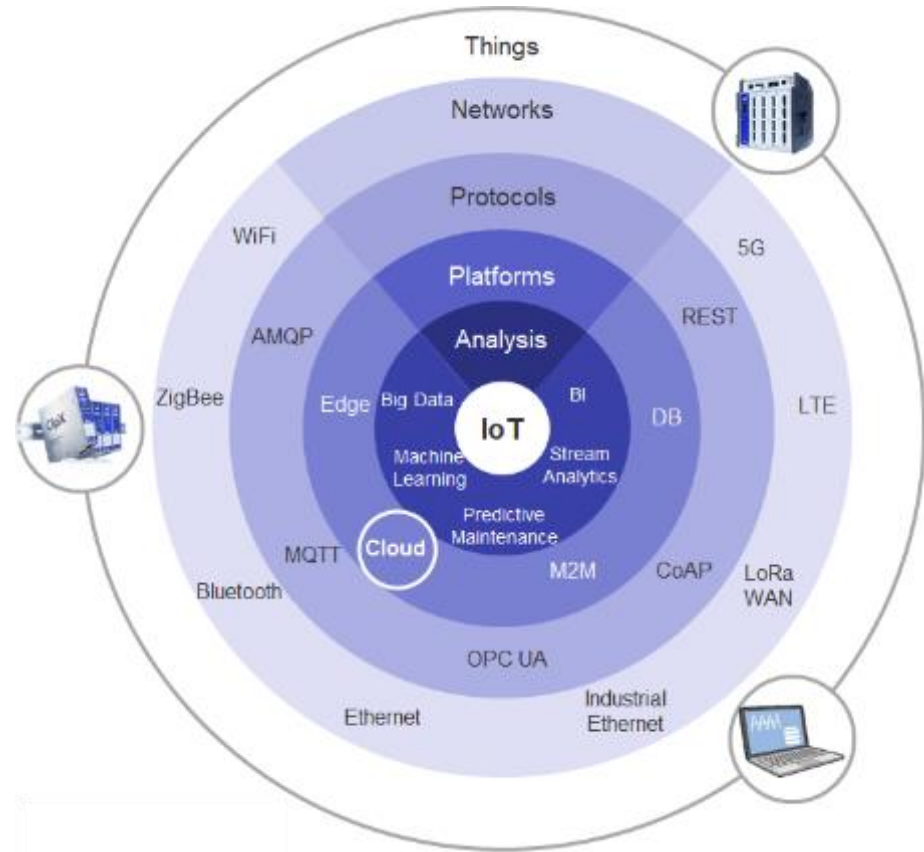
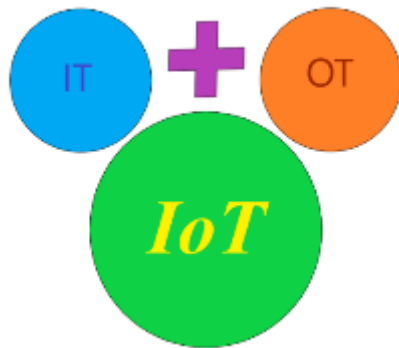
- Spectrum of technologies for data processing
- Does not include embedded technologie

OT:

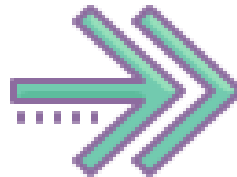
- Gartner: OT is hardware and software that detects or causes a change by directly monitoring and / or controlling physical devices, processes, and events in the enterprise.



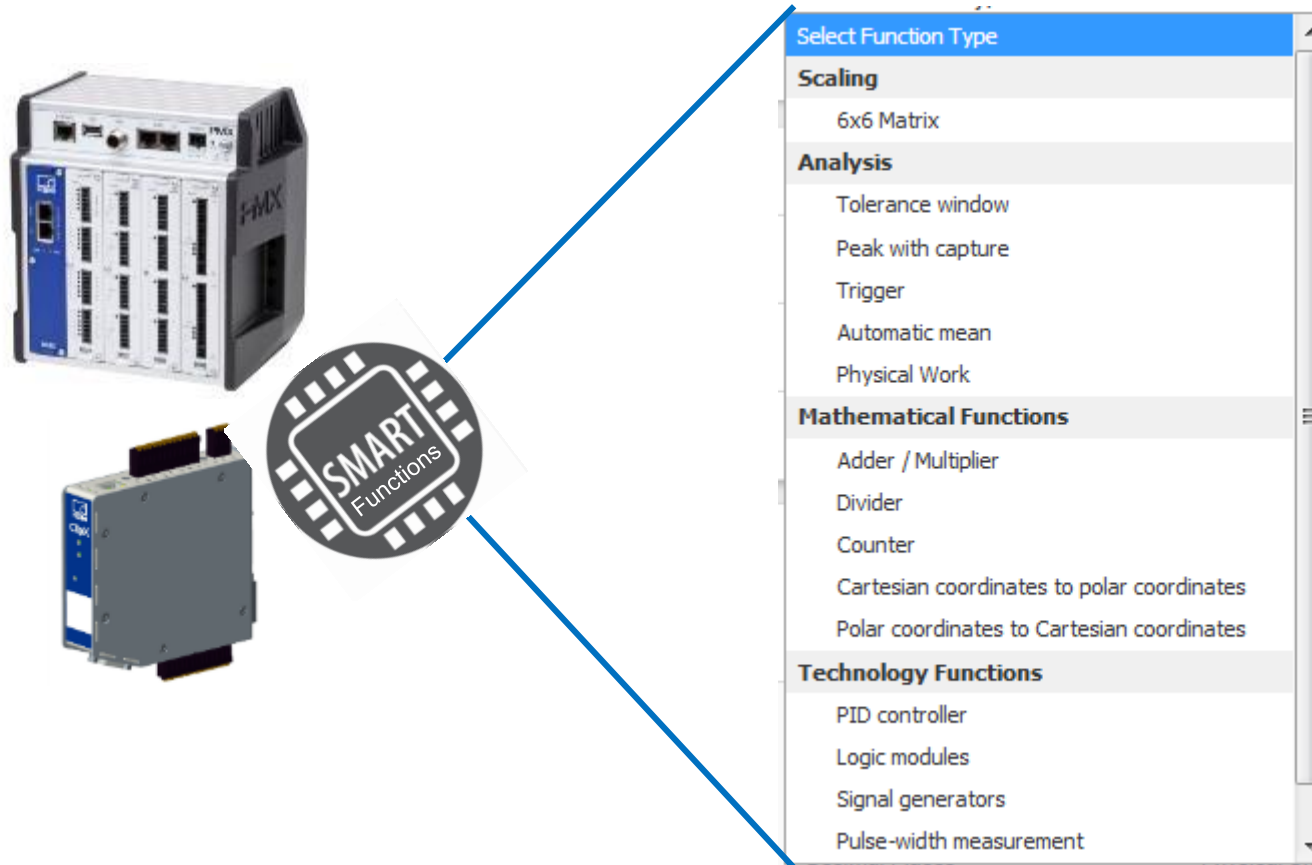
- Merging of IT and OT
- Integration of 'things' in the communication flow of the internet
- Industrial part: IIoT
(Industrial Internet of Things)



- Edge Computing = decentral processing of the data at the edge of the network
 - „Analytics on the Edge“
- Remarkably low latencies → Real-time processing
- Processing data from sources that can not be transferred to the cloud for cost or technology reasons
- Fast and easy algorithms

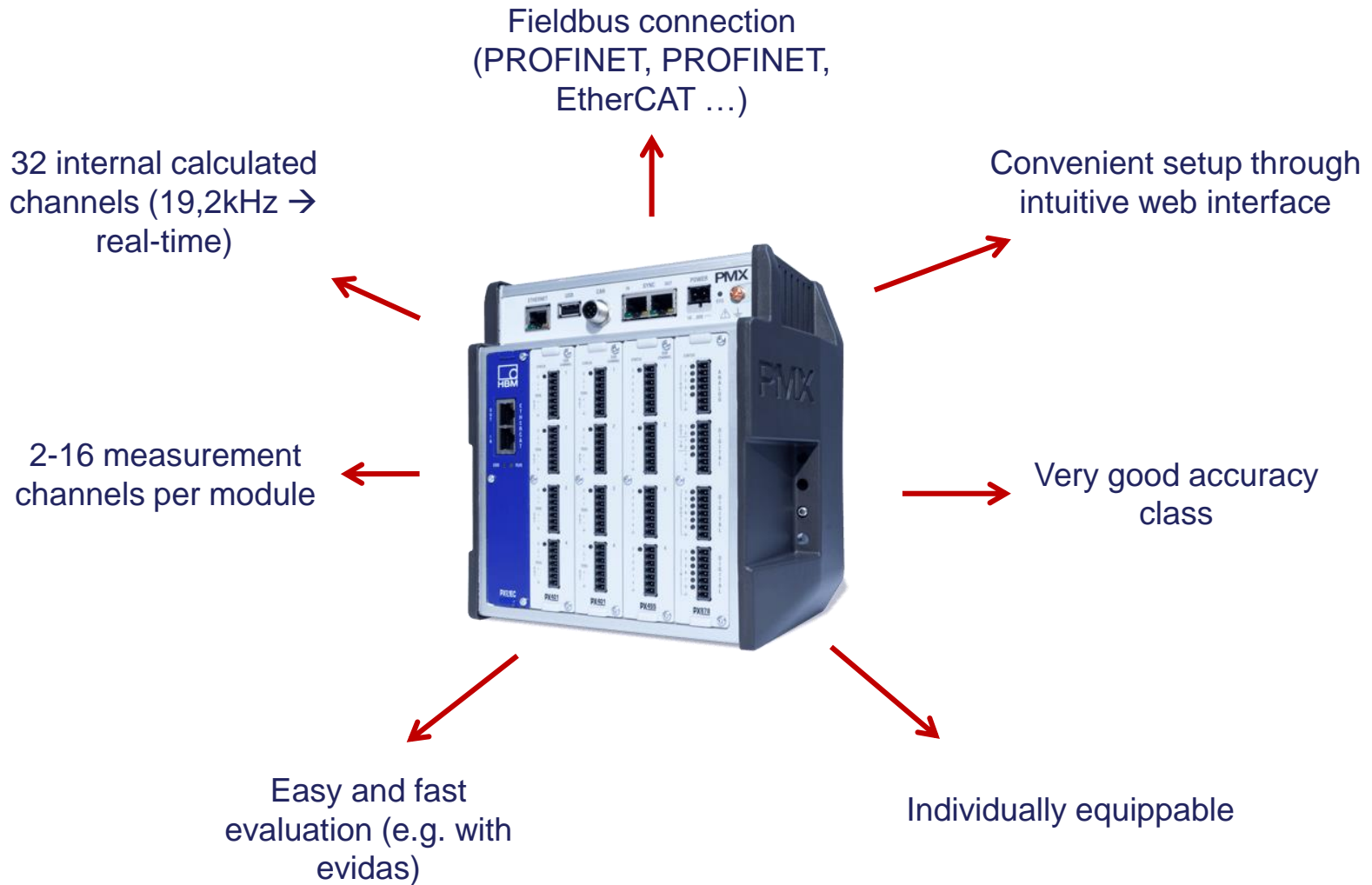


Automation with Calculated channels

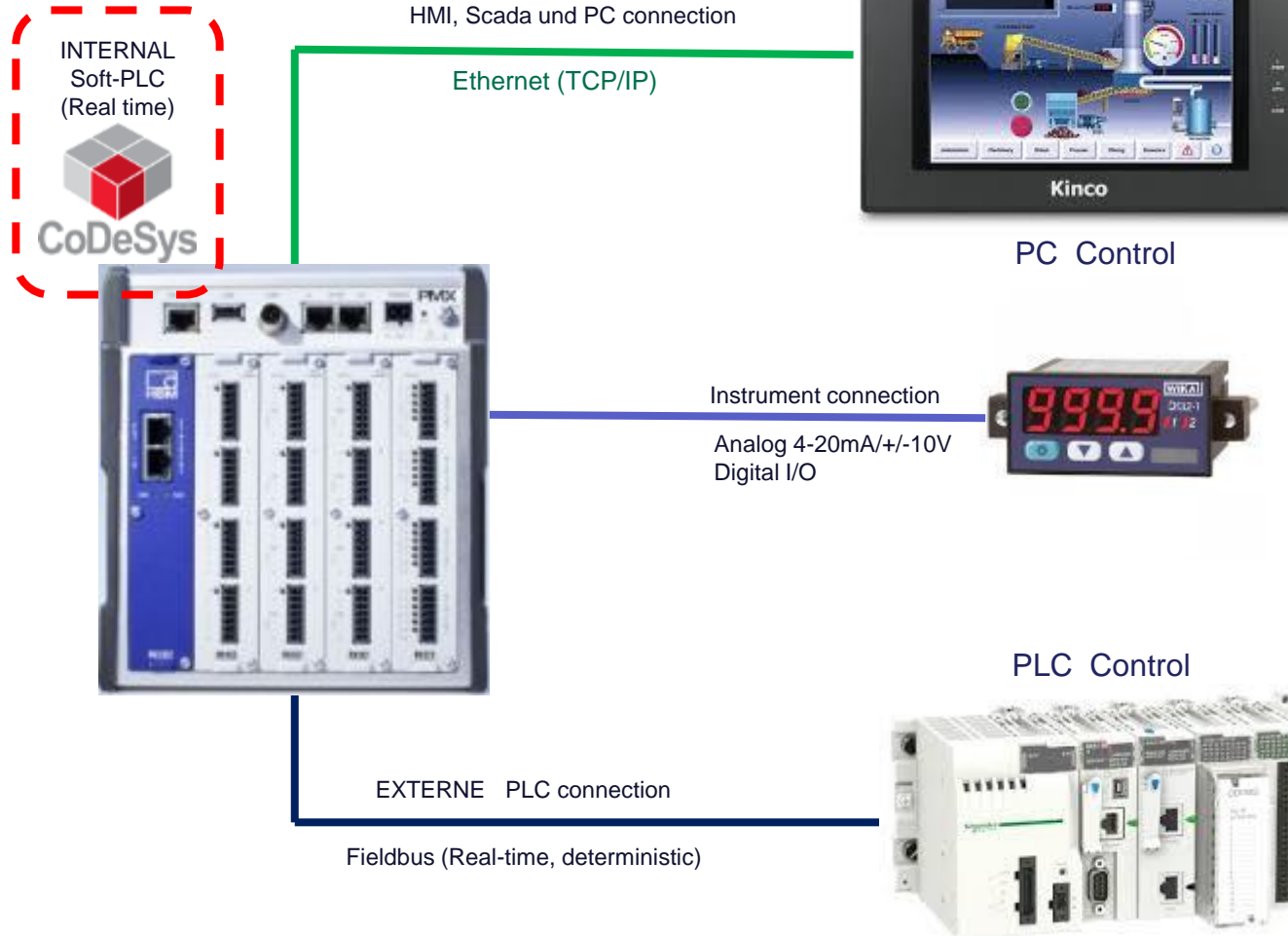


A lot of **applications** require **additional signals/ information and calculations** coming from the measuring signal .e.g.: Peak, Mean, math. logic functions, timer, counter, PID regulator,..

- Each **ClipX** provides 17 different functions, 6 can be used in parallel, combinations are possible, Calculation speed is **1ms** for each channel, easy setup via Web-GUI
- Each **PMX** provides 38 different functions, 32 can be used in parallel, combinations are possible, Calculation speed is **52 us** for each channel, easy setup via Web-GUI



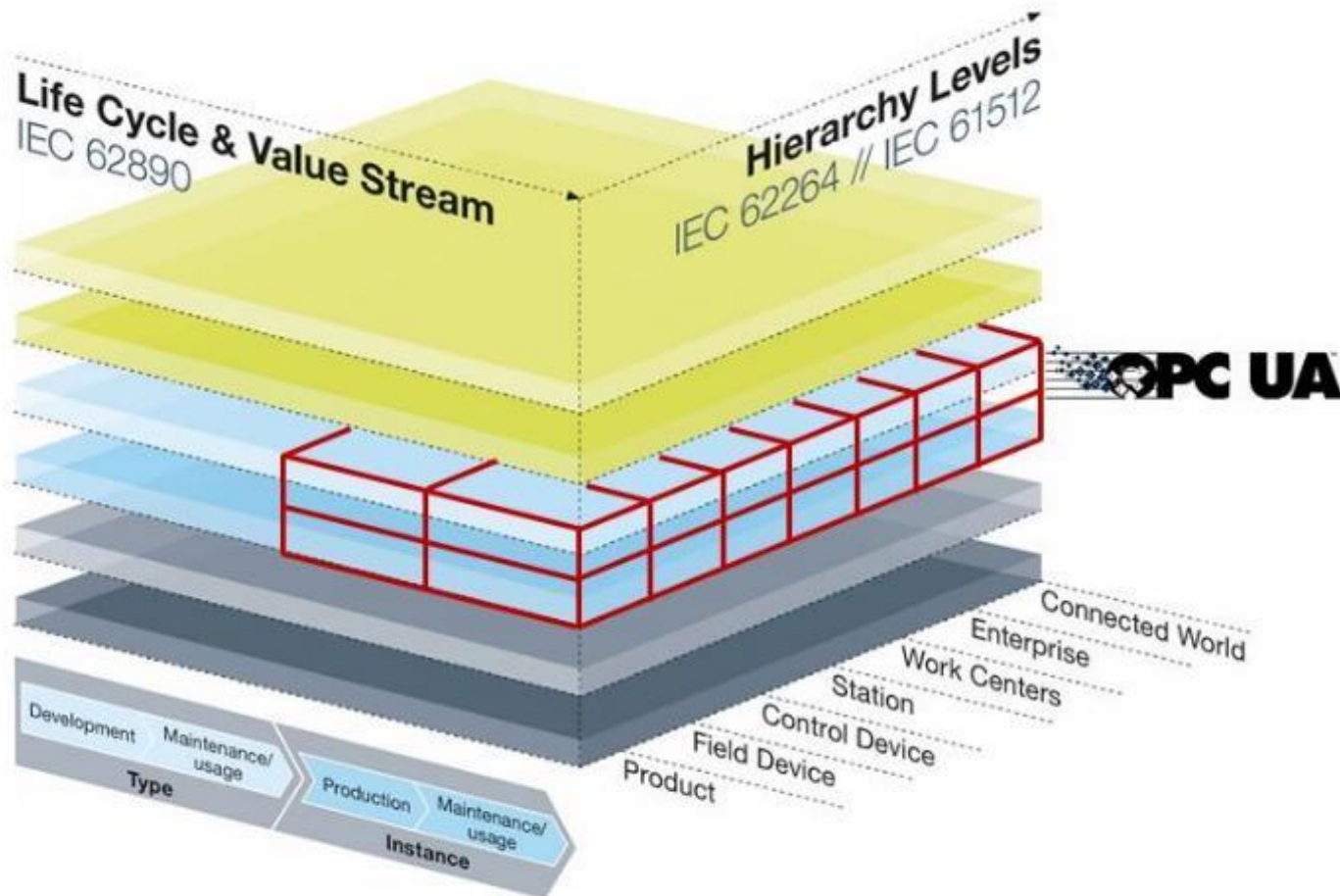
Simultaneous connection of PC and PLC



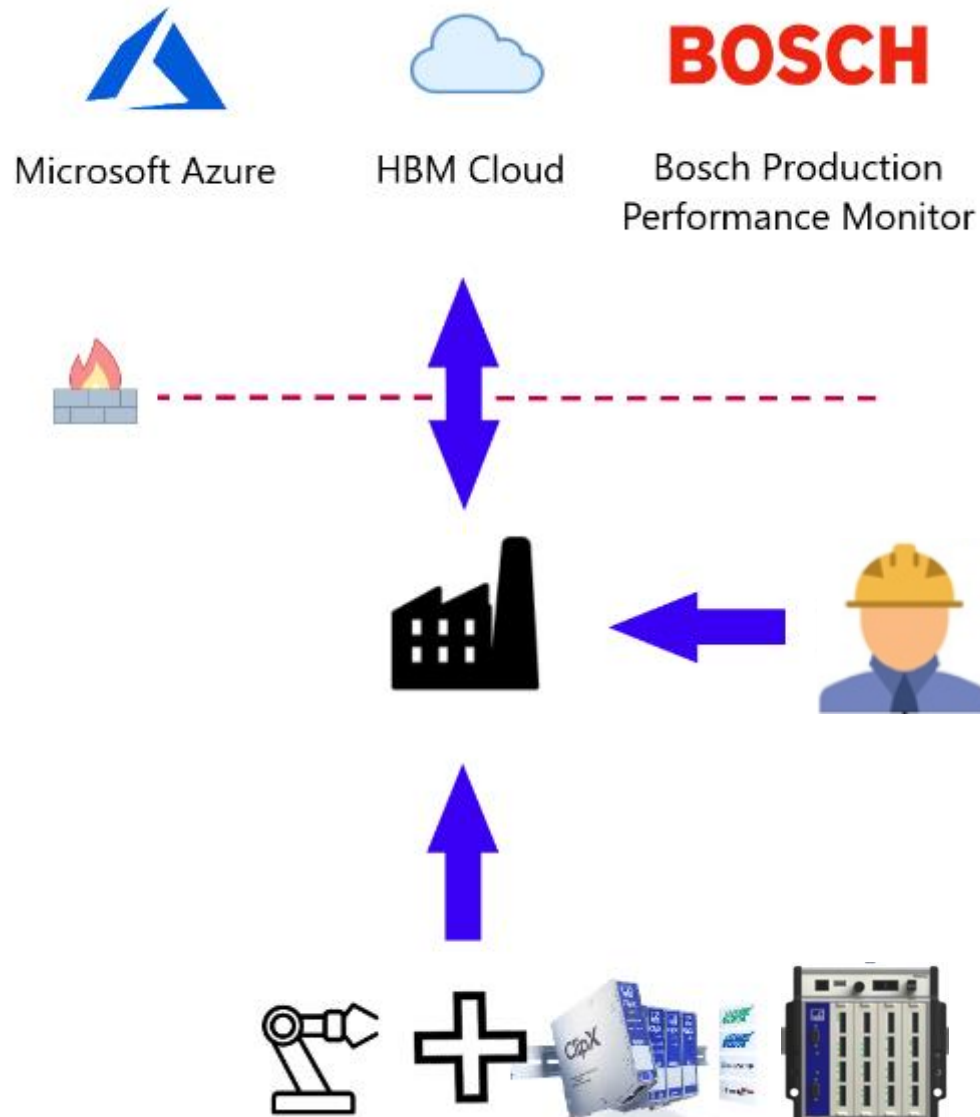
- OPC UA is a standardized, platform-independent software interface
- Minimal software development and maintenance effort
- Powerful, user-friendly and flexible
- Multiple access possible
- Safe → user rights
- Server ↔ Client principle



- OPC UA covers a large area of the Industry 4.0 Reference Architecture Model (RAMI 4.0)



Practical example: ClipX with OPC UA and REST



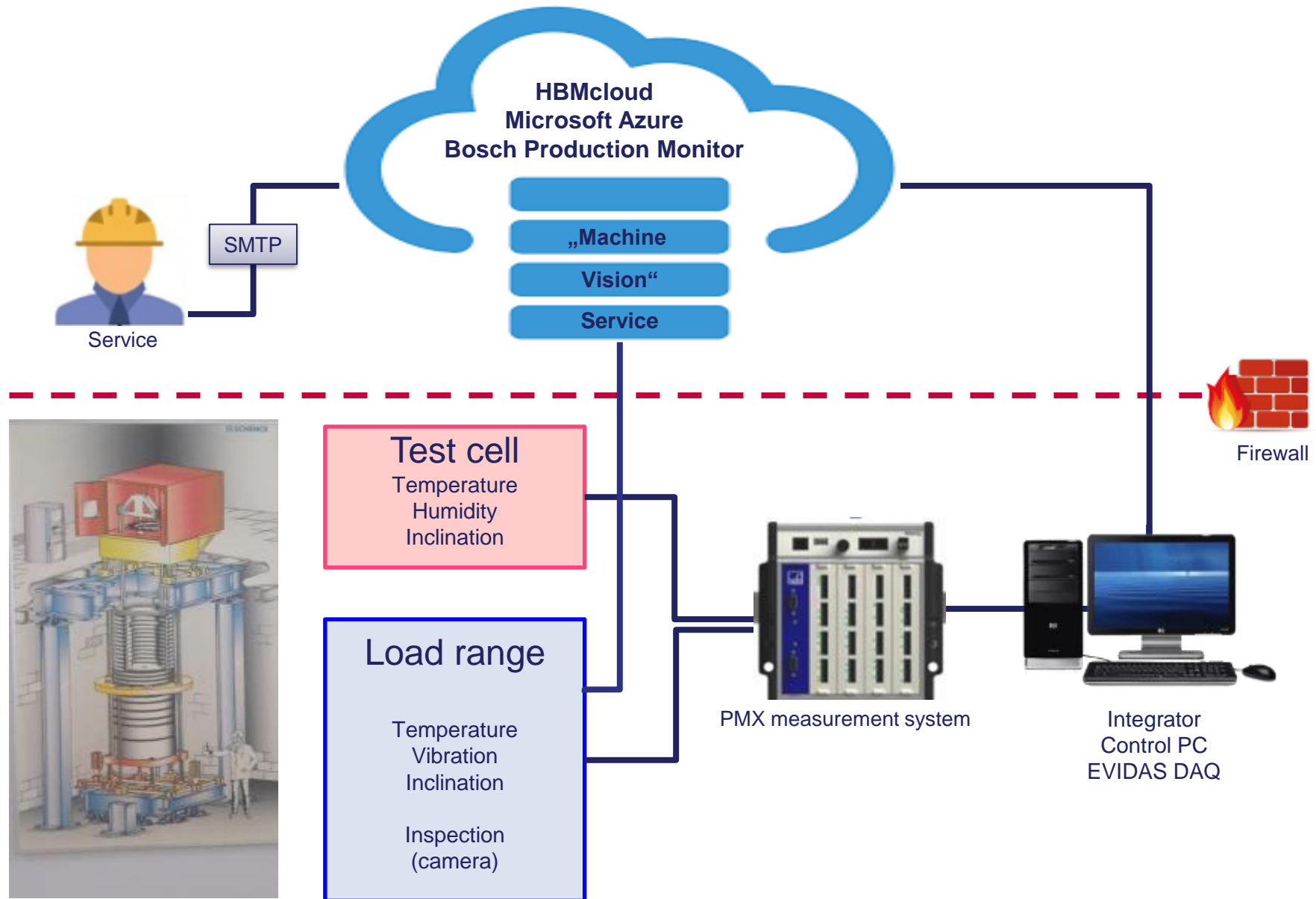
Sensor calibration

Calibration station with test chamber

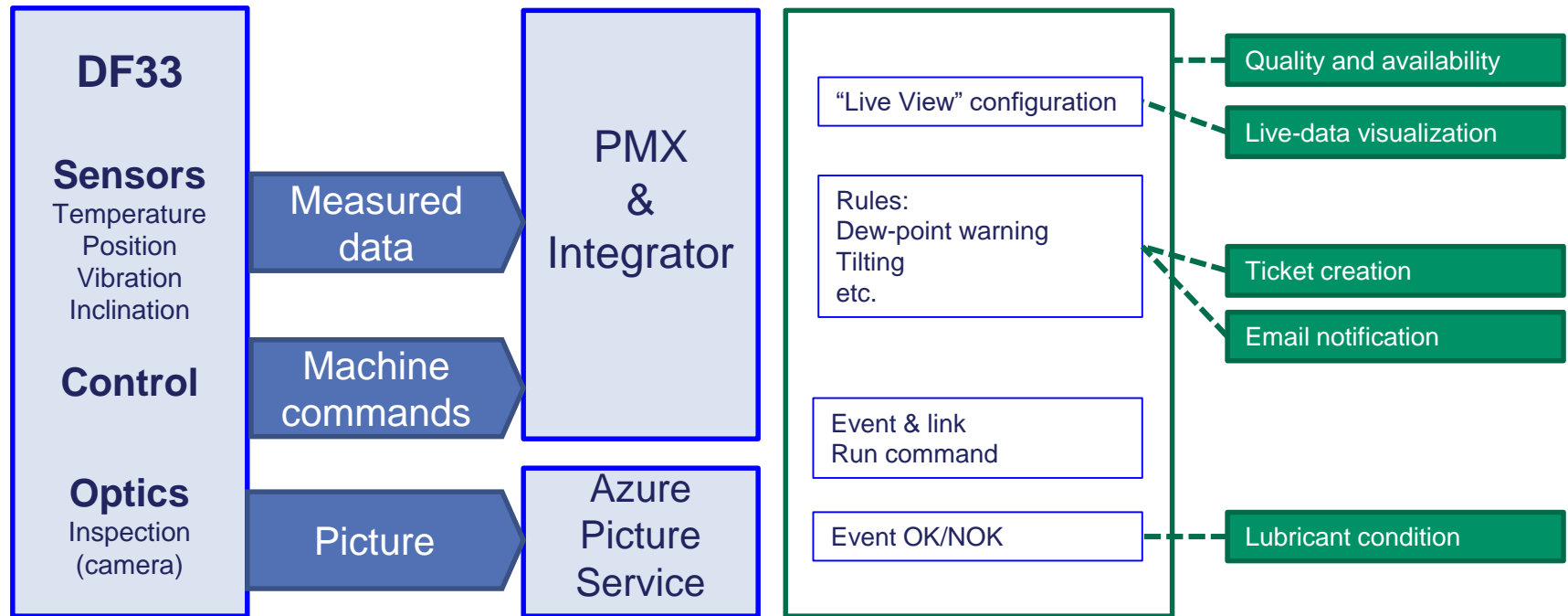


Load space with deadweight system





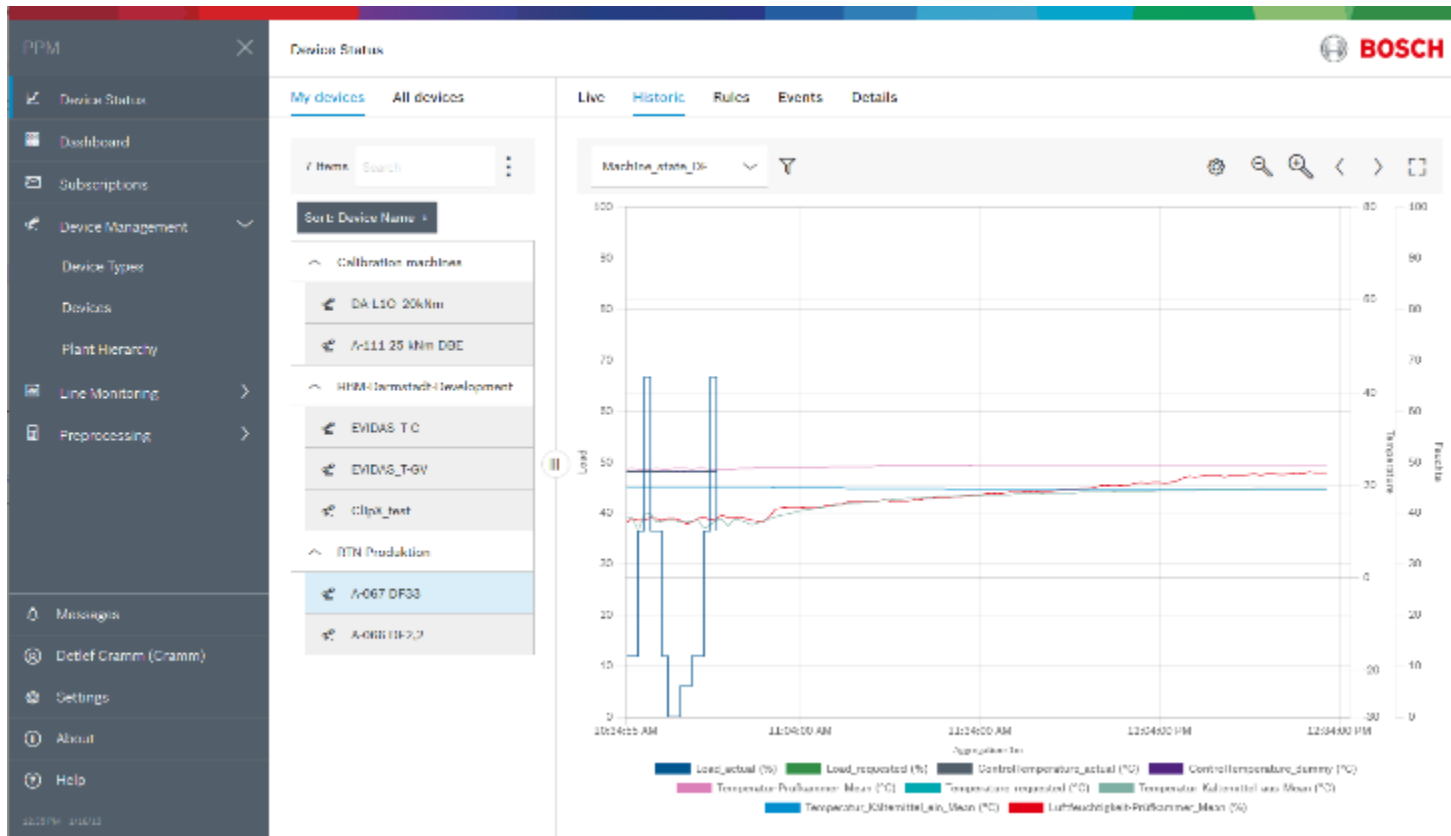
HBM test bench - signal and data flow diagram



Engine room

Bosch Production Monitor

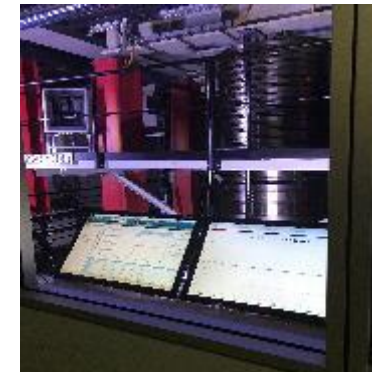
Innovation gain



Link

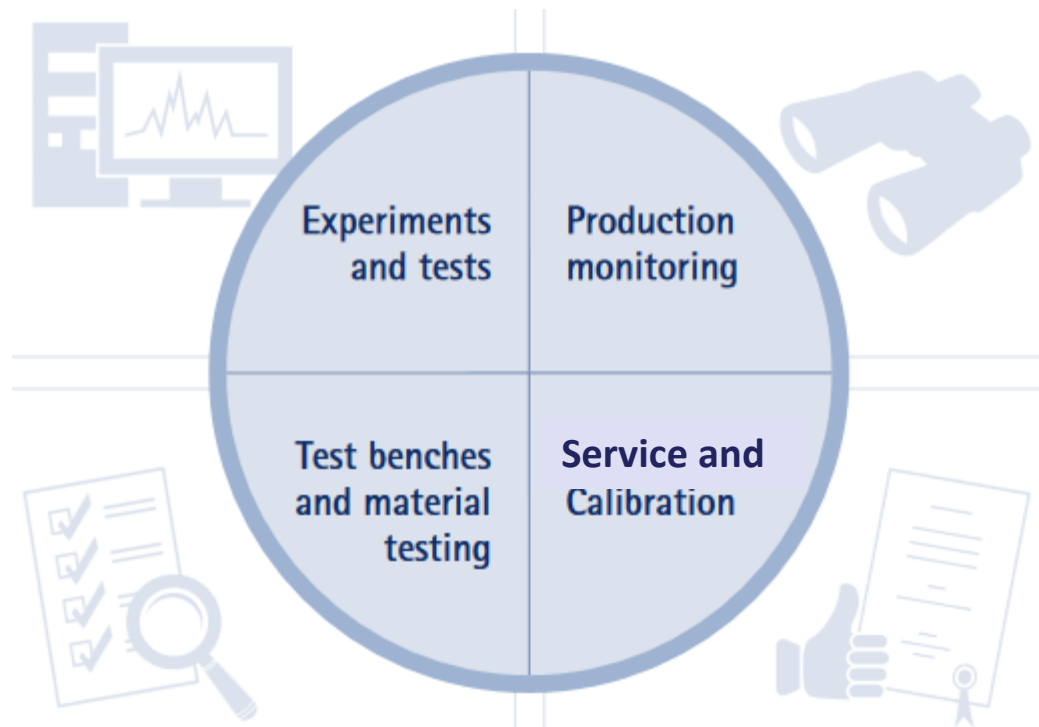
Integration of monitoring data into IOT-software like Bosch Production Performance Manager (PPM)
Based on standard Ethernet connections [BOSCH-Infolink](#) and [HBM-Infolink](#).

- PMX - via IOT-Hub like Evidas into the Cloud
- ClipX - direct into the Cloud via IOT-Protocol (REST, Bosch)



Reliable measurements in diverse industries including aerospace, automotive or **test stand constructions**

For **production monitoring**: ensures high quality, fast cycle times and reliable processes



International quality guidelines require that **material and product properties** are checked for safety

HBM measuring chains with industrial precision for **machine and factory calibration** in industrial process control

- Ideal for precise industrial measurements for a wide range of sensor technologies
- Edge technology through integrated SMART functions
- Fast commissioning and simple diagnostics
- Innovative integration via bus systems and DAQ in machine control systems
- Flexible for monitoring and automation tasks in various applications
- Optional CODESYS Soft-PLC



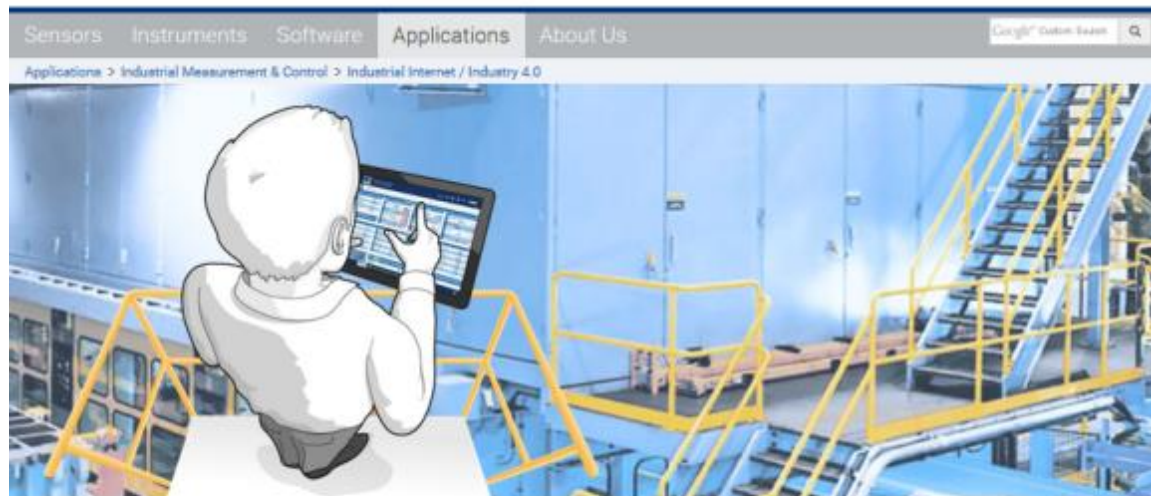
Limits

- Large controllers with many I / O nodes and deterministic time response
- Very fast motion control applications

Tips&tricks: <https://www.hbm.com/en/7407/ipc-fundamentals/>

More information on IOT can be found on our website:

- <https://www.hbm.com/en/4547/industrial-internet-industry-40/>



Test and measurement technology meets Industry 4.0

Enhanced flexibility, higher speed and increased efficiency in the production process are the objectives pursued by forward-thinking companies. The vision of networking man and machine with other objects is the central pillar in this context and is quickly becoming a reality. 'Industry 4.0' is the name the vision is known by.

Only through the use of cutting-edge "Test and measurement technology 4.0" can this vision of a networked production of the future become reality. Since the more complex and dynamic the processes in the manufacturing companies throughout the world, the more important becomes the availability of real-time data on critical parameters.

"Test and Measurement Technology 4.0": What Does That Actually Mean?

- **Sensors** that allow for easy and fast integration with complex production systems - for example through availability of "electronic data sheets"
- **Measuring amplifiers** that can communicate in real time with sensors and today's Industrial Internet systems
- **Test and measurement software** that bridges the gap between easiest possible handling and increasingly complex functionality

"We Learn About Industry 4.0 and What it Means for Test and Measurement Technology"



"HBM, as a test and measurement partner in the industry, is proud to be able to contribute to the success of Industry 4.0. In joint projects with universities we learn what Industry 4.0

means in practice for test and measurement technology. Our innovative products for use in manufacturing are proof that we have many ideas for making Industry 4.0 a reality."

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Any questions?

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