Welcome to the webinar
"Automation made easy - limits were yesterday"

Michael Guckes

- **Product Manager Industrial Measurement Solutions**

- Product manager for industrial amplifiers and software

- Graduate engineer

- 20 years of experience in factory automation

- **E-Mail:** michael.guckes@hbm.com

Michael Guckes

Topics:

- Tasks of modern control technology
- How do Smart Functions help in testing and production technology?

- Modern automation concepts, efficient diagnosis & application examples

- Future development – "Smart factory"

The 4ᵗʰ Industrial Revolution Is Upon Us.

PRODUCTIVITY

FROM INDUSTRY 1.0 TO INDUSTRY 4.0

FIRST
INDUSTRIAL REVOLUTION

Introduction of mechanical production facilities with the help of water and steam power

1784

First mechanical loom

SECOND
INDUSTRIAL REVOLUTION

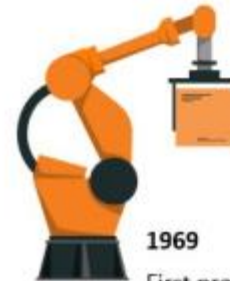Introduction of a division of labor and mass production with the help of electrical energy

1870

First assembly line

THIRD
INDUSTRIAL REVOLUTION

Use of electronic and IT systems that further automate production
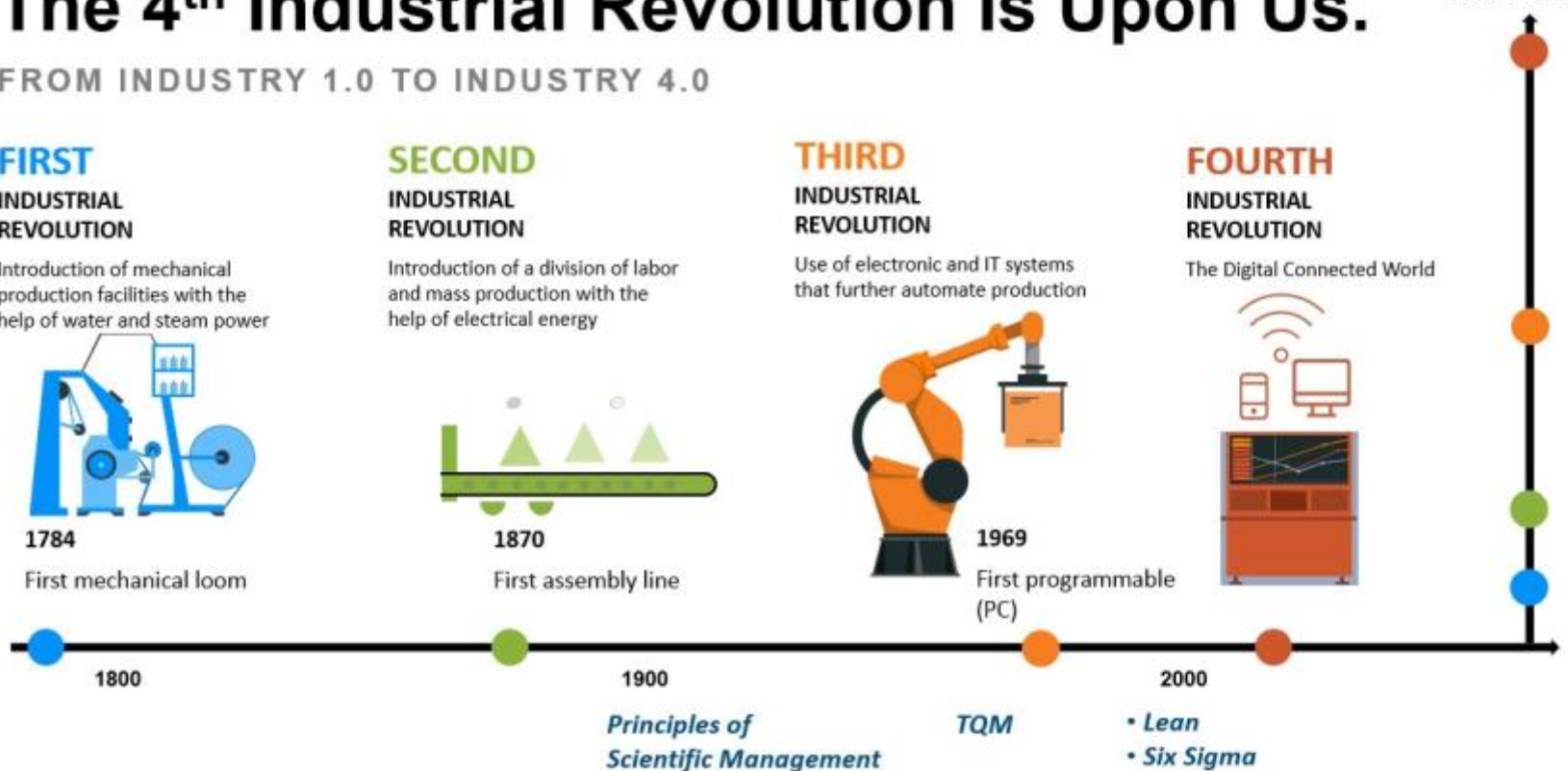
1969

First programmable (PC)

FOURTH
INDUSTRIAL REVOLUTION

The Digital Connected World

1800

1900

2000

Principles of Scientific Management

TQM

• Lean
• Six Sigma

Industrial environments include three factors:
**quality, time and cost**

What users need:

- Simple integration into the system components

- Precise and electrical robust operation

- Easy handling

- Comprehensive, preventive diagnostics, easy maintenance

- High system availability

Megatrends:

- Shorter and shorter product life cycles

- Increasing IT networking

- Demographic change

"Internet Of Things": What does that 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

- **Individual information** stored directly in the object

- **Network** of Internet-connected **objects**

- **Individual** decision making based on information evaluated locally Individual on-demand **services** for event-driven, real-time process control

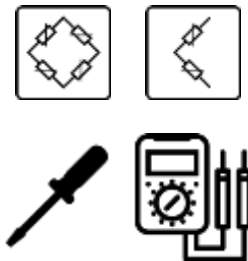HBM: public
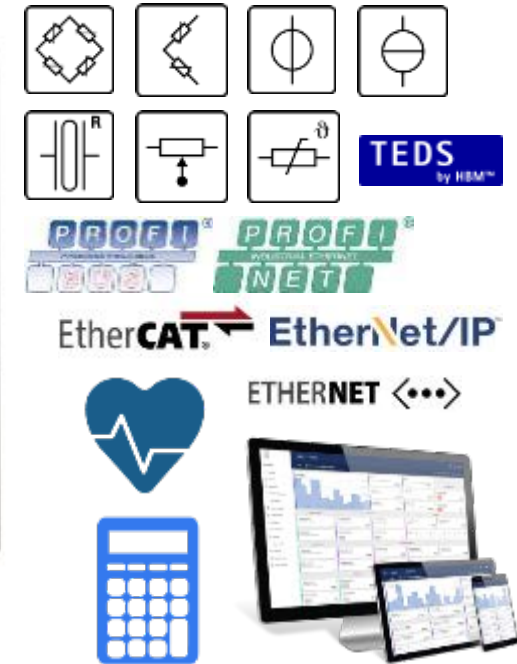
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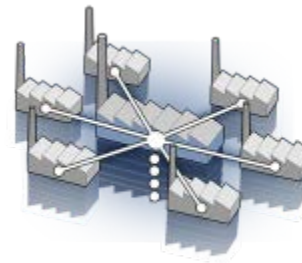
1998

2018

1998

2018

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

Sensor connection

- The calibration data is stored as a calibration certificate in PDF format in the internal ClipX device memory.

- Users can download it at any time via hbm.com or via the ClipX browser

- Quality assurance in production and test benches

Transducer with TEDS module Standard measurement cable
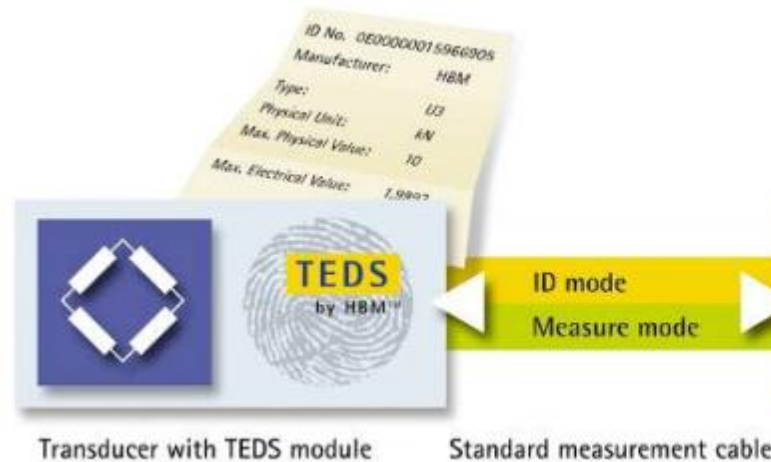
- Reads TEDS (0 <u>and</u> 1-wire) as per the IEEE1451.4 standard
- Easy setup of the measuring chain
- Scaling options: 2-point, table, polynom

Digital measurement chains

As…

- Solution provider for precise industrial measurements
- Innovative integration via bus-systems into machine contol systems
- Flexible for monitoring and automations tasks in various applications

User…

- Save time and money
- Use modern and future-proof technologies
- Get a „full service" with HBM
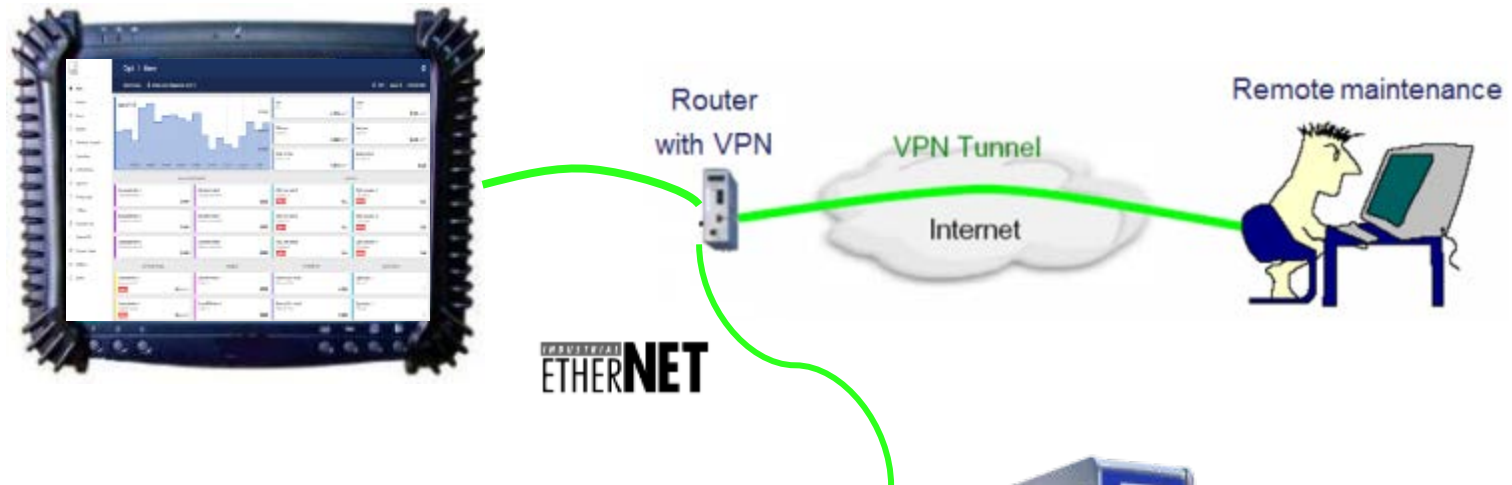
Connection for remote maintenance via Internet

Every ClipX has its own web interface with responsive design:

© HBM

Customer visualization

Simply parameterize instead of program

Max. 18 signals can be
Arranged freely
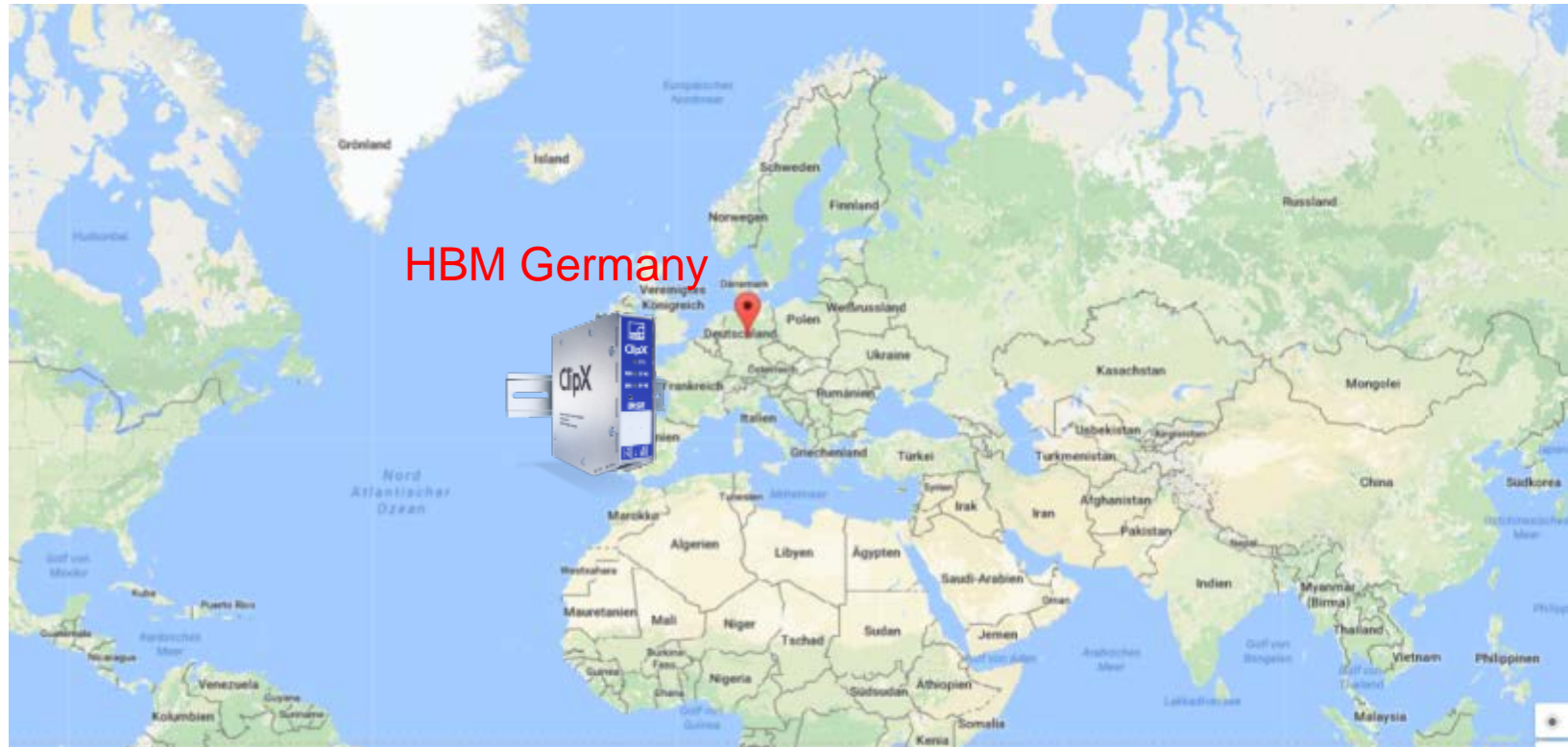with a few clicks:

Signals:
- Digital value
- Bar graph
- Line writer (y/t)

Digital values:
- limits
- digital I/O's
- flags

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

HBM Germany

ClipX live on the internet: http://clipxdemo.hbm.com

ClipX provides diagnostics for reliable operation and predicted maintenance:

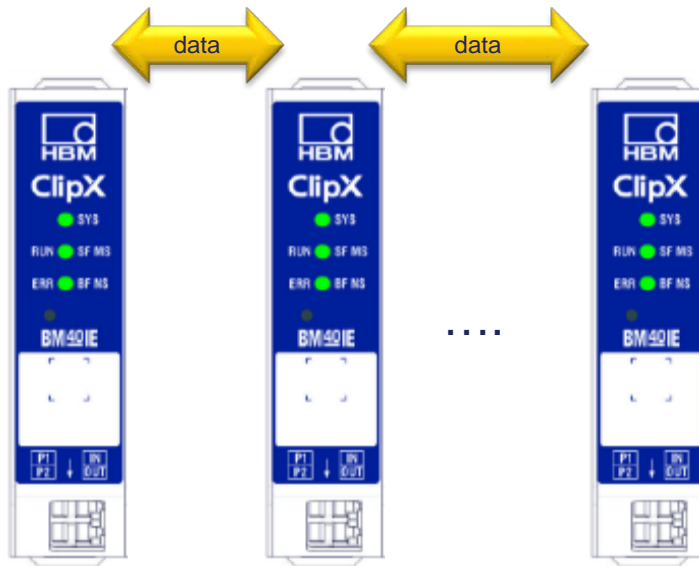

Signals and visualization:

- ClipX with 3 different operator levels; password protected

- Level 2 freely configurable

- Measuring-, TEDS- and System-status

- Test-signals freely configurable

- Log file for error and operator loggings, stored within ClipX

- Status information (short) in the head-line

ClipX web interface:



© HBM
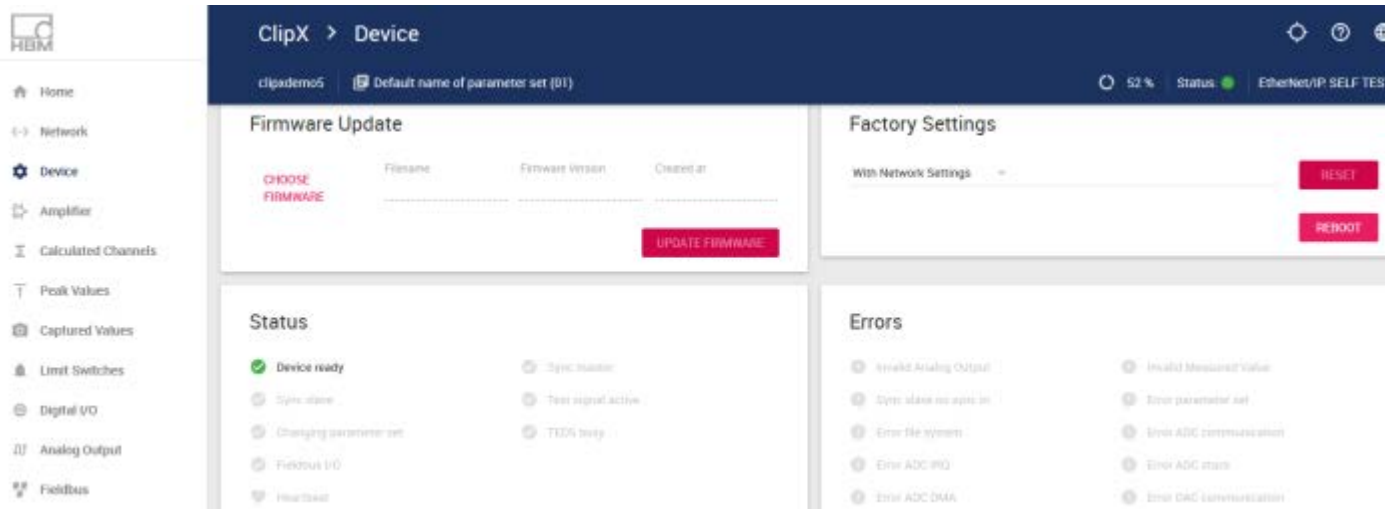
Intermodule communication - the ClipX-bus

max. 6 ClipX modules

- Every ClipX module can send and receive Data via the ClipX-bus

- Measuring values or calc. channel values with status

- Send: 1 signal, reveive max. 5 signals

- Every module has 6 internal calculated channels (SMART functions) and calculates with its own and/or meas. channels from neighbour modules

System variants

- The ClipX amplifier system adapts to your application and just grows with your needs while being easy to configure
- The measurements are synchronized via the internal ClipX bus and transmit measured values between the modules

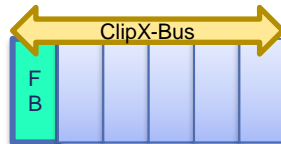ClipX single module, with and without fieldbus
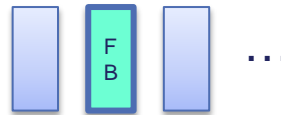
To each ClipX a sensor can be connected, with or without fieldbus
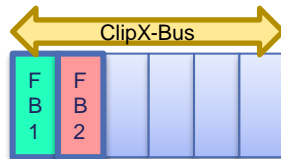
ClipX system without fieldbus
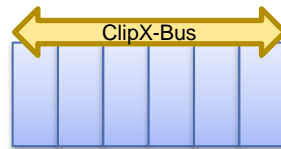
ClipX system with 2 to 6 modules internally synchronized without field bus module

ClipX system with one fieldbus

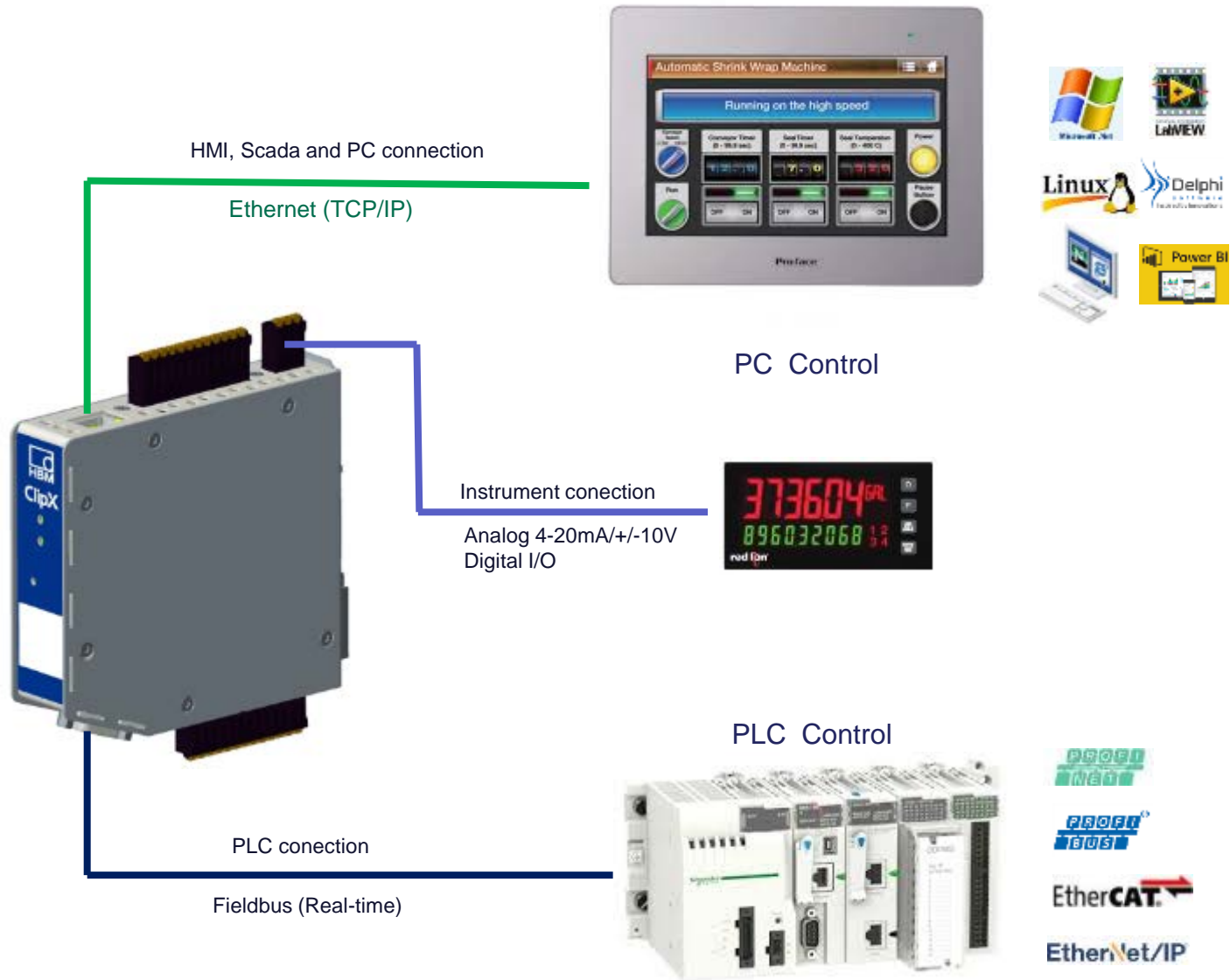ClipX system with 2 to 6 modules internally synchronized with a fieldbus module

ClipX system with several fieldbuses

ClipX system with 2 to 6 modules internally synchronized with 2 different fieldbus modules

Simultaneous PC and PLC conection

HMI, Scada and PC connection

Ethernet (TCP/IP)

PC Control

Instrument conection

Analog 4-20mA/+/-10V
Digital I/O

PLC Control

PLC conection

Fieldbus (Real-time)

Typical ClipX Ethernet application

Performance:
1 channel per ClipX, max 6 ClipX via the ClipX-bus
Up to several hundred ClipX
Up to 1000 Hz data-transmission
Sync to other modules, NTP

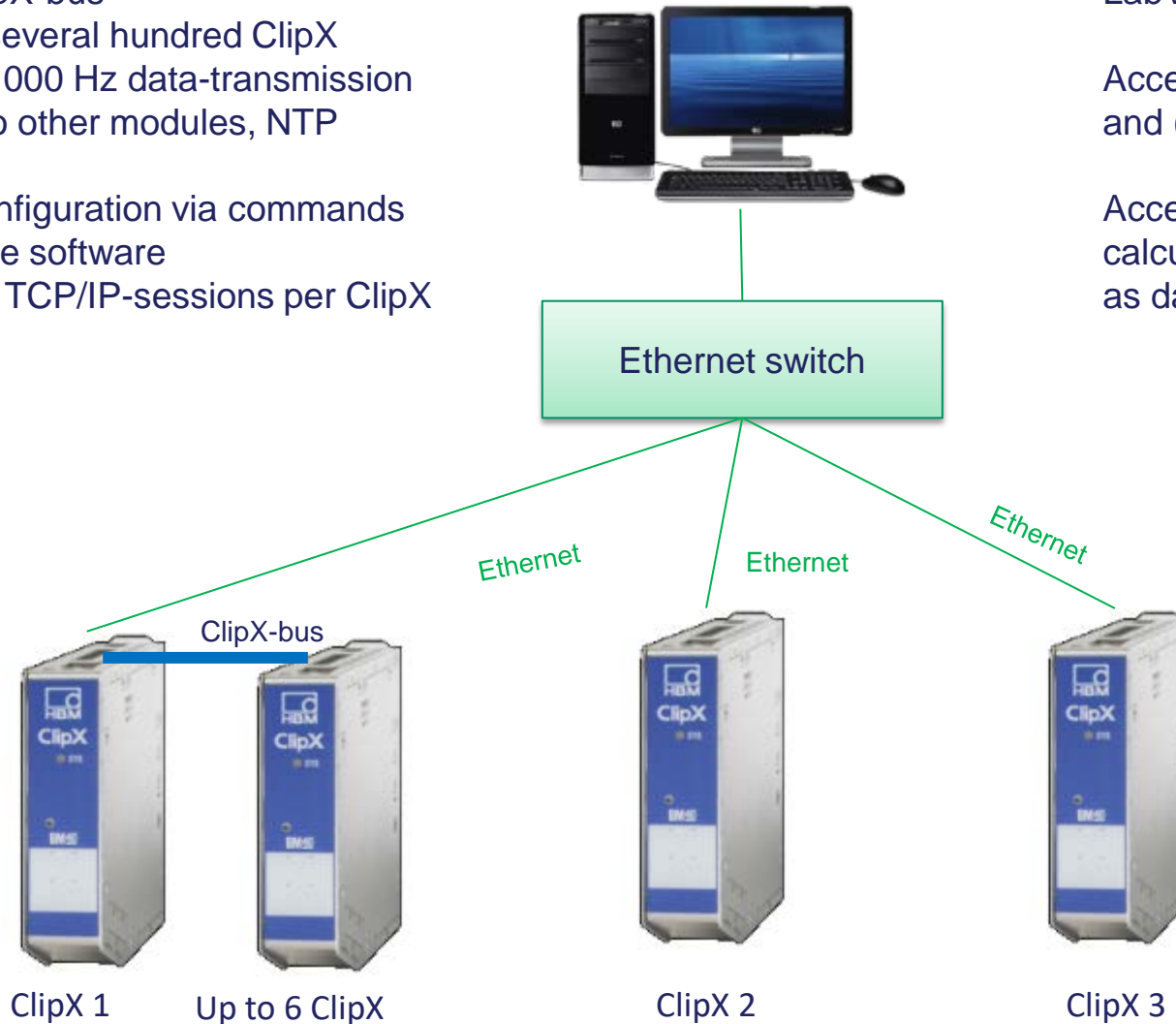Full configuration via commands from the software
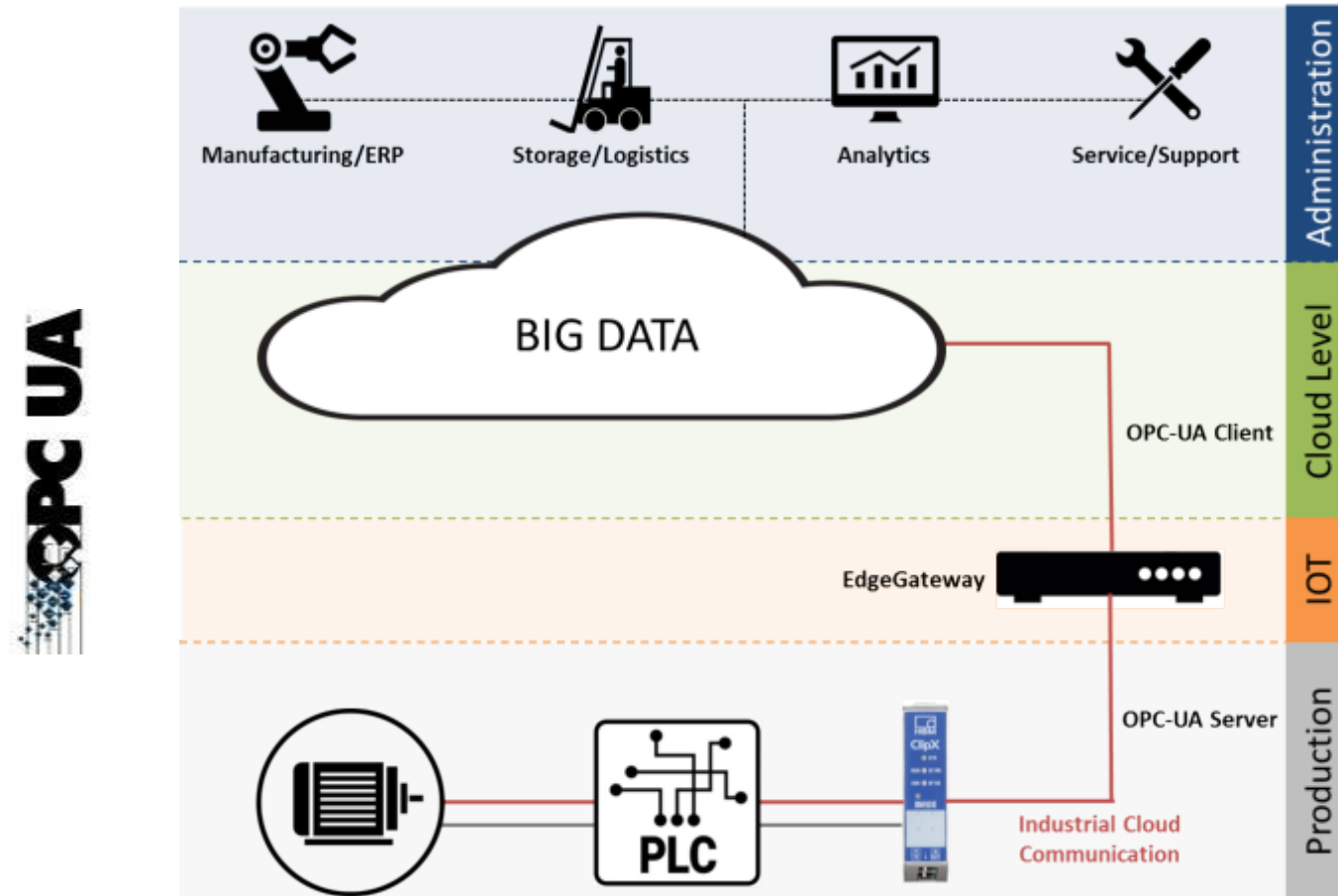Max. 1 TCP/IP-sessions per ClipX

Software:
For Windows, iOS, Linux, LabView, Delphi application

Access via Ethernet(TCP/IP) and (OPC-UA in preparation)

Access to all values and calculated channels as well as data from the fieldbus

Ethernet switch

Ethernet

Ethernet

Ethernet

ClipX-bus

ClipX 1

Up to 6 ClipX

ClipX 2

ClipX 3

The new OPC Unified Architecture unifies all previous OPC specifications by the OPC Foundation and extends them. In particular, machine data (**process values, measured data, parameters etc.)** now cannot only be transmitted but also semantically described in a machine readable way.

Application fields

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

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

Experiments and tests

Production monitoring

Test benches and material testing

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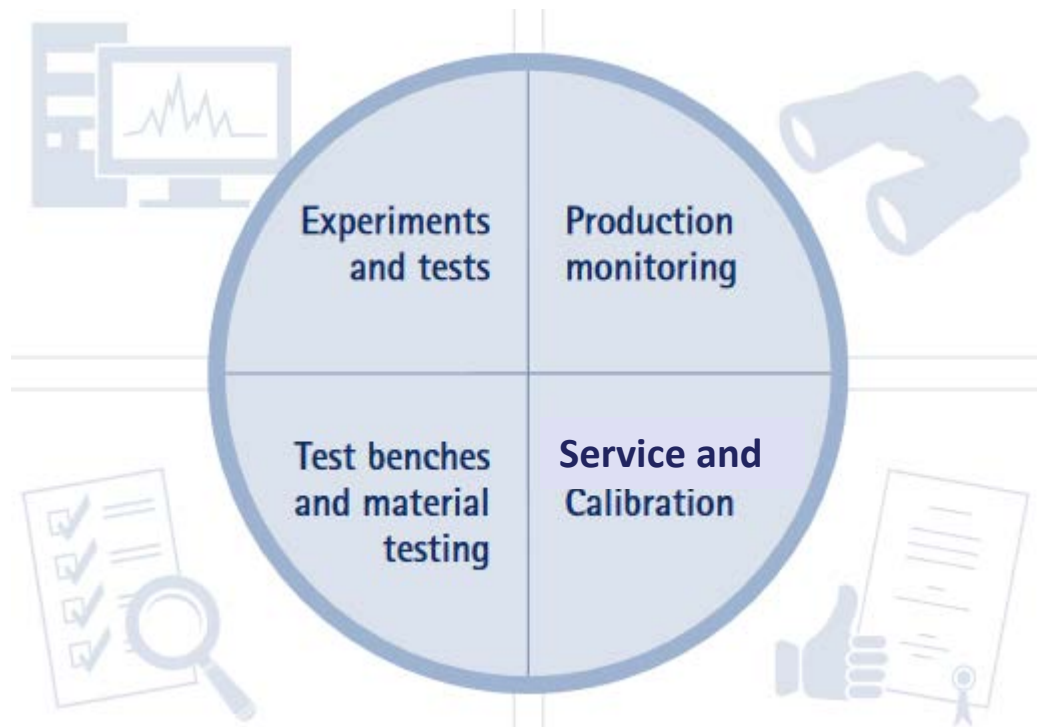
International quality guidelines require that **material and product properties** are checked for safety

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

Example: Measuring and controlling Press Capacity

$$x = \frac{F1 * x1 + F2 * x2 + F3 * x3}{F}$$
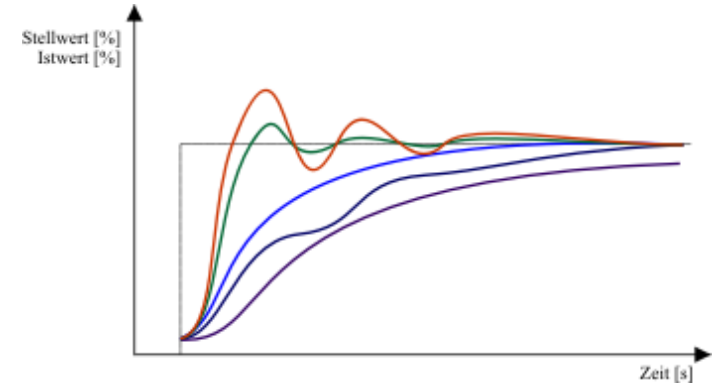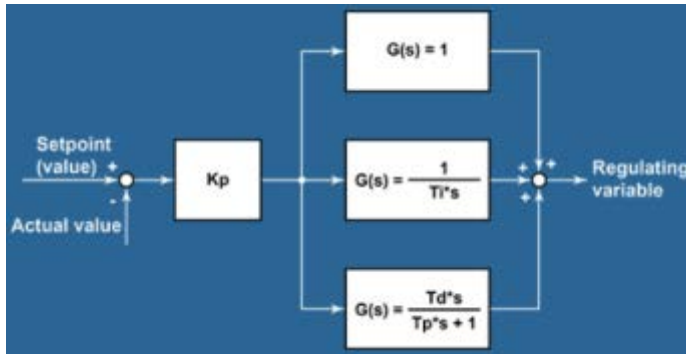
$$y = \frac{F1 * y1 + F2 * y2 + F3 * y3}{F}$$
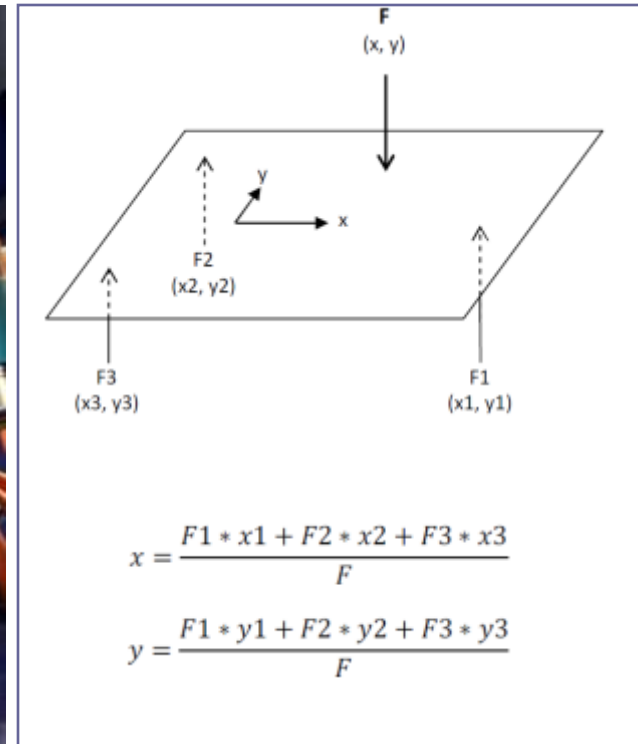
Calc. channel: mathematical functions

Industry compliant measurement technology:

- SLB700 strain sensors measuring forces on each column
- 2 sensors per column:
  - mounted in opposite positions, allow bending compensation of column
  - force measurement on 2 or 4 columns allow calculation of load-distribution

Calc. channel: OID - regulator

Manual
Fieldbus
Ethernet
Other ClipX

Set point

PID

Process value

Act. value

Sensor input
Fieldbus
Ethernet
Other ClipX

Analog output
Fieldbus
Ethernet
Other ClipX

HBMcloud
Microsoft Azure
Bosch Production Monitor

"Machine vision" Service

SMTP

Service

Firewall

Test cell
Temperature
Humidity
Inclination

Load range

Temperature
Vibration
Inclination

Inspection
(camera)

PMX measurement system

Integrator
Control PC
EVIDAS DAQ

© HBM
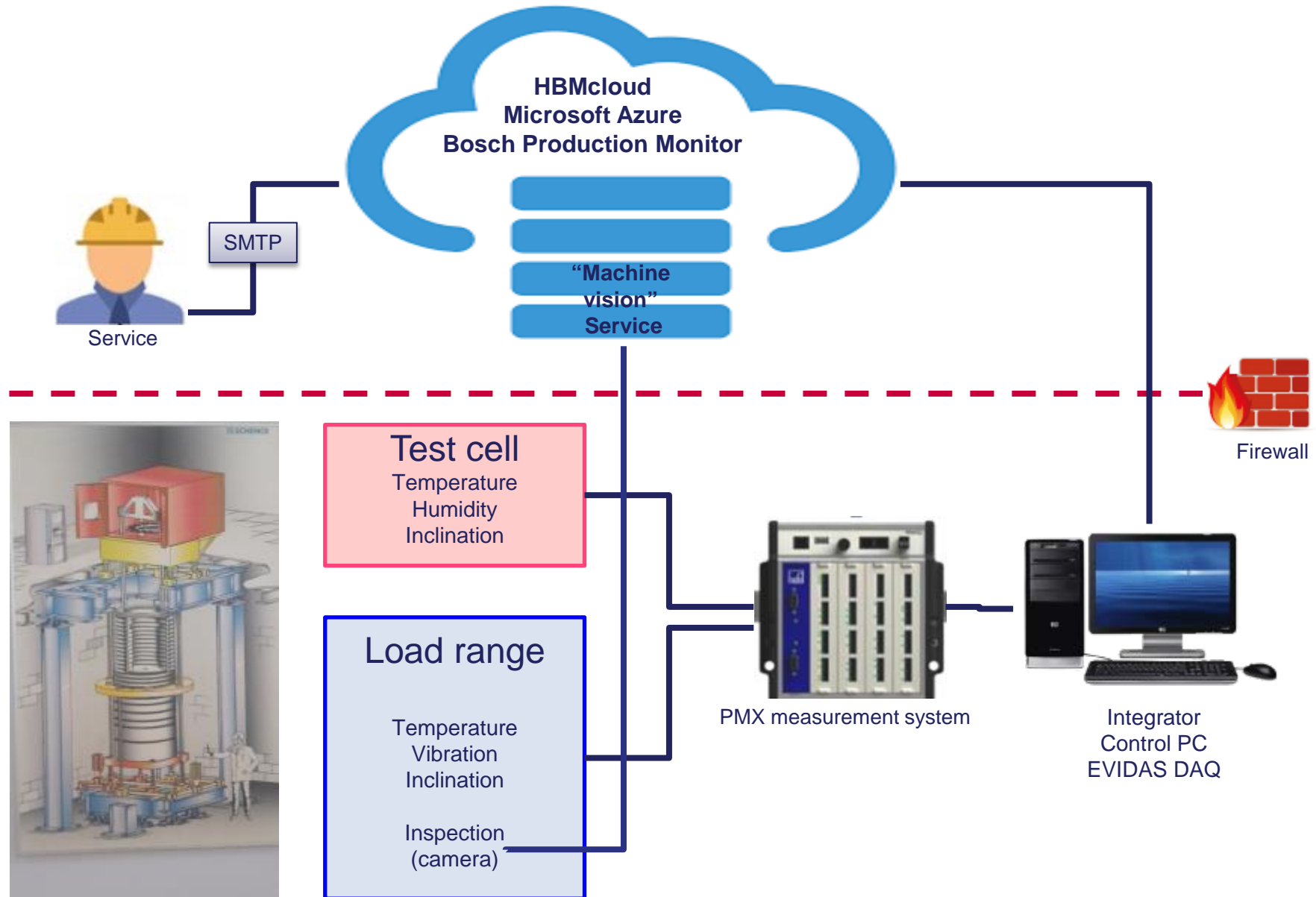
HBM test bench - signal and data flow diagram

DF33

Sensors
Temperature
Position
Vibration
Inclination

Control

Optics
Inspection
(camera)

Measured data

Machine commands

Picture

PMX & Integrator

Azure Picture Service

"Live View" configuration

Rules:
Dew-point warning
Tilting
etc.

Event & link
Run command

Event OK/NOK

Quality and availability

Live-data visualization

Ticket creation

Email notification

Lubricant condition

| Engine room | Bosch Production Monitor | Innovation gain |

www.hbm.com

Michael Guckes
International Product Marketing IMS
Tel. +49 6151 / 803 - 409
michael.guckes@hbm.com