Welcome to the “Benefits of the Modern-Day Measurement Chain” Webinar

The presentation will begin at 1pm Eastern time

All attendees microphones are muted for the entire webinar session. Be sure your speaker is active and join the audio conference.

If you have a question, please send it to the host using the “Q&A” function. Questions will be answered at the end of the presentation.

Host: Bernadette Humm
Presenter: Chris Novak

Organizational Information

- All participants' **microphones** are **muted** during the webinar.
- Please do not forget to **activate** your PC **speakers** to enable **audio** or connect **headphones** to your PC. You may have to take the step of joining the audio conference to hear sound.
- Please type any questions you have into the WebEx Q&A dialog
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- Today’s presentation will be E-mailed to all attendees. The webinar will also be posted on our website: http://www.hbm.com/en/3157/webinars/
- If you have additional technical questions, feel free to contact our technical support team at support@usa.hbm.com

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Chris Novak

- Bachelor’s degree in Electrical Engineering from Cleveland State University
- Field Sales Engineer and Business Development Manager with HBK
- Previously – Global Applications Engineer with Honeywell for Test & Measurement
- Has 25+ years of sensor experience

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Benefits of the Modern-Day Measurement Chain

AGENDA:

- Key Features and Parameters of the Modern-Day Measurement Chain
- Benefits / Advantages of Smart Signal Conditioning
- Benefits high-quality measurement technology brings to production
- Target Applications:
  - Press Fit Application Example
  - Torque Application Examples
- Q&A Session

Three key factors count in industry: quality, time and cost

- Manufacturing Monitoring, Test Rigs, Functional Test Stands, Condition Monitoring
- Absolute cost control through integrated systems and functionality driven by today's Industry 4.0

Assembly

Metal working

Machine control

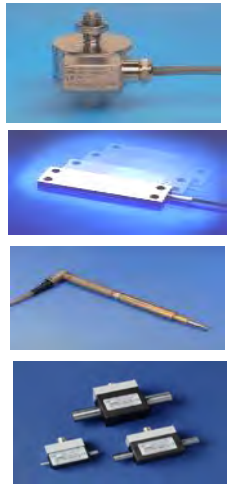
Functionality testing

Energy production

Medical production

Functional test stands

Tasks of Modern Control & the Measurement Chain



Today's Requirements and Preferences:

- Precise and electrical robust operation
- Simple integration into the system components
- Easy handling
- Comprehensive, preventive diagnostics, easy maintenance
- **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
- **Measurement & software** interfacing 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

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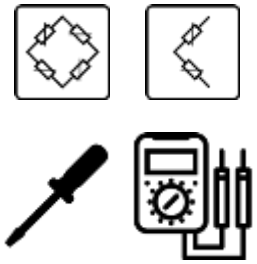
Digital revolution: Process Control Instrumentation

1998



Today's Smart Electronics

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Open Flexibility & Connectivity Of Today's Smart Electronics

Simultaneous PC and PLC connection

High Signal Sampling Rates

HMI, Scada and PC connection

Ethernet (TCP/IP)

PC Control

Instrument connection

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

PLC connection

Fieldbus (Real-time)

PLC Control

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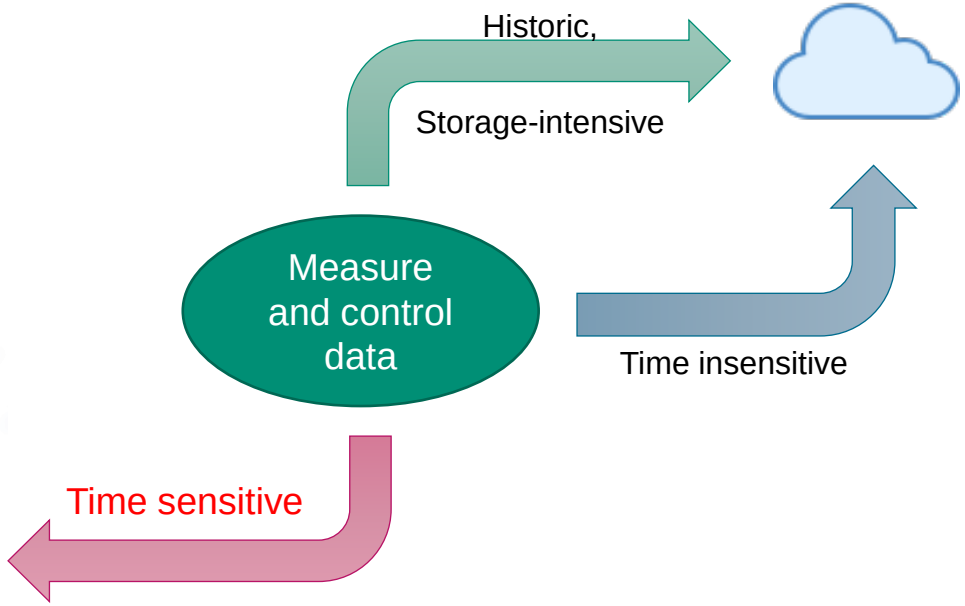
Why Do I Need a Smart Signal Conditioner?

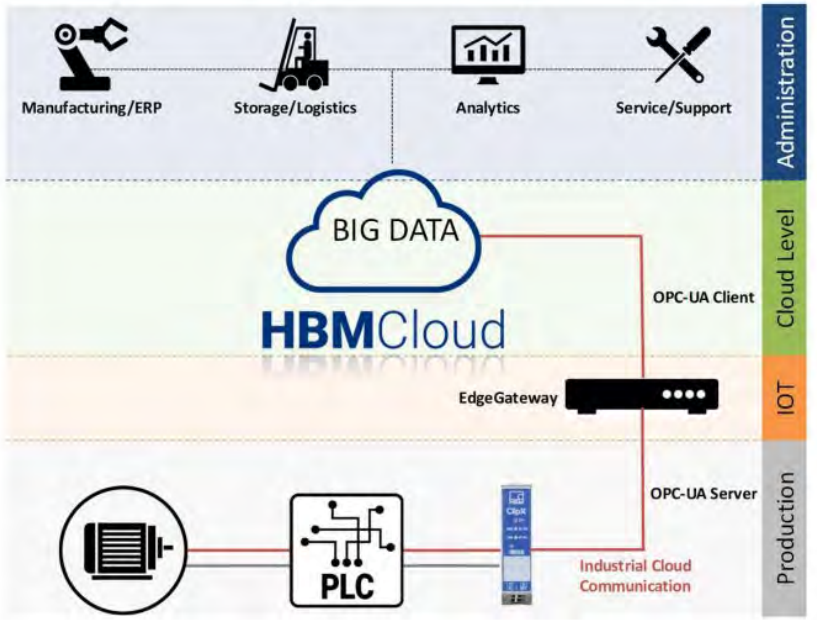
- Interconnected devices share information through multi-layered systems
- Access data anywhere from multiple locations
- Edge computing: Deliver *results*, not just *readings*
- ‘Process data where it is most useful’

PMX

ClipX

MP85A FastPress





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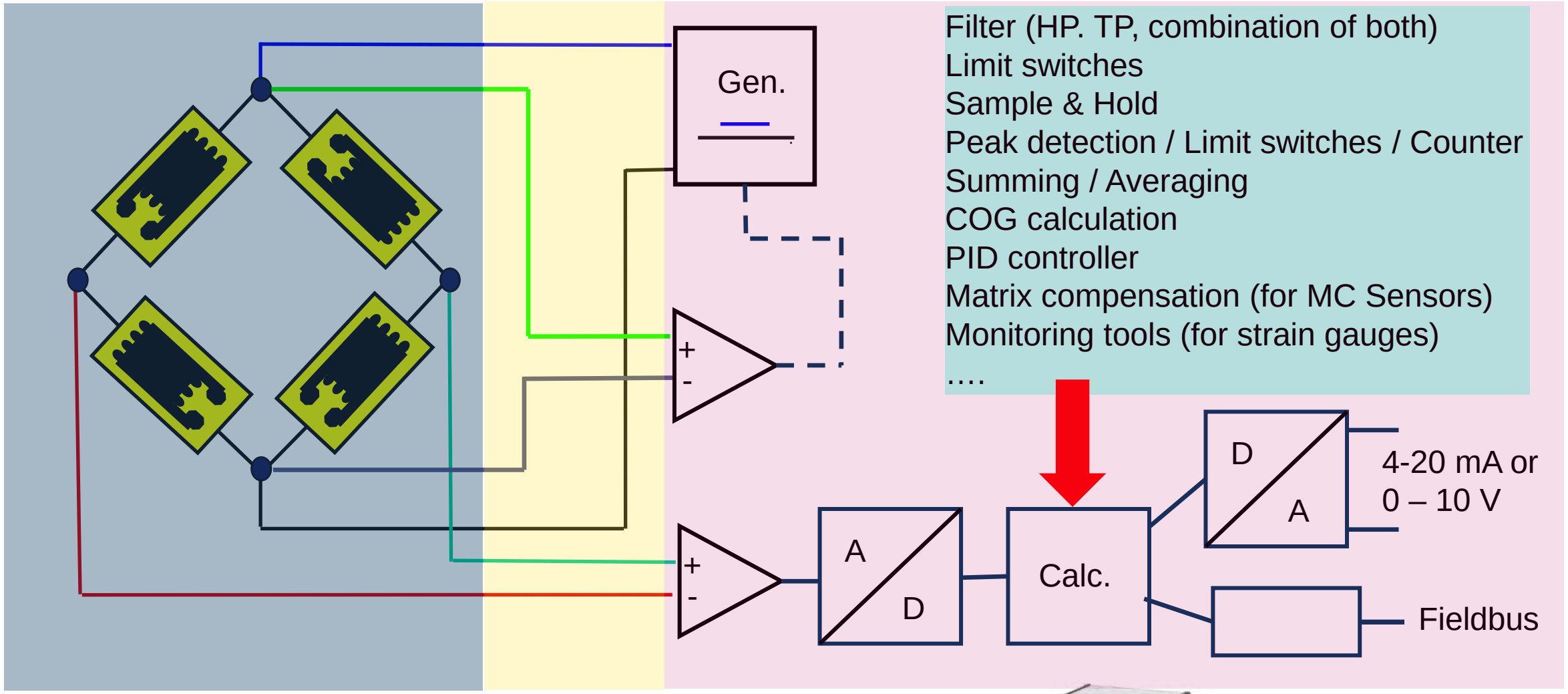
State of the art load cell / instrument combination



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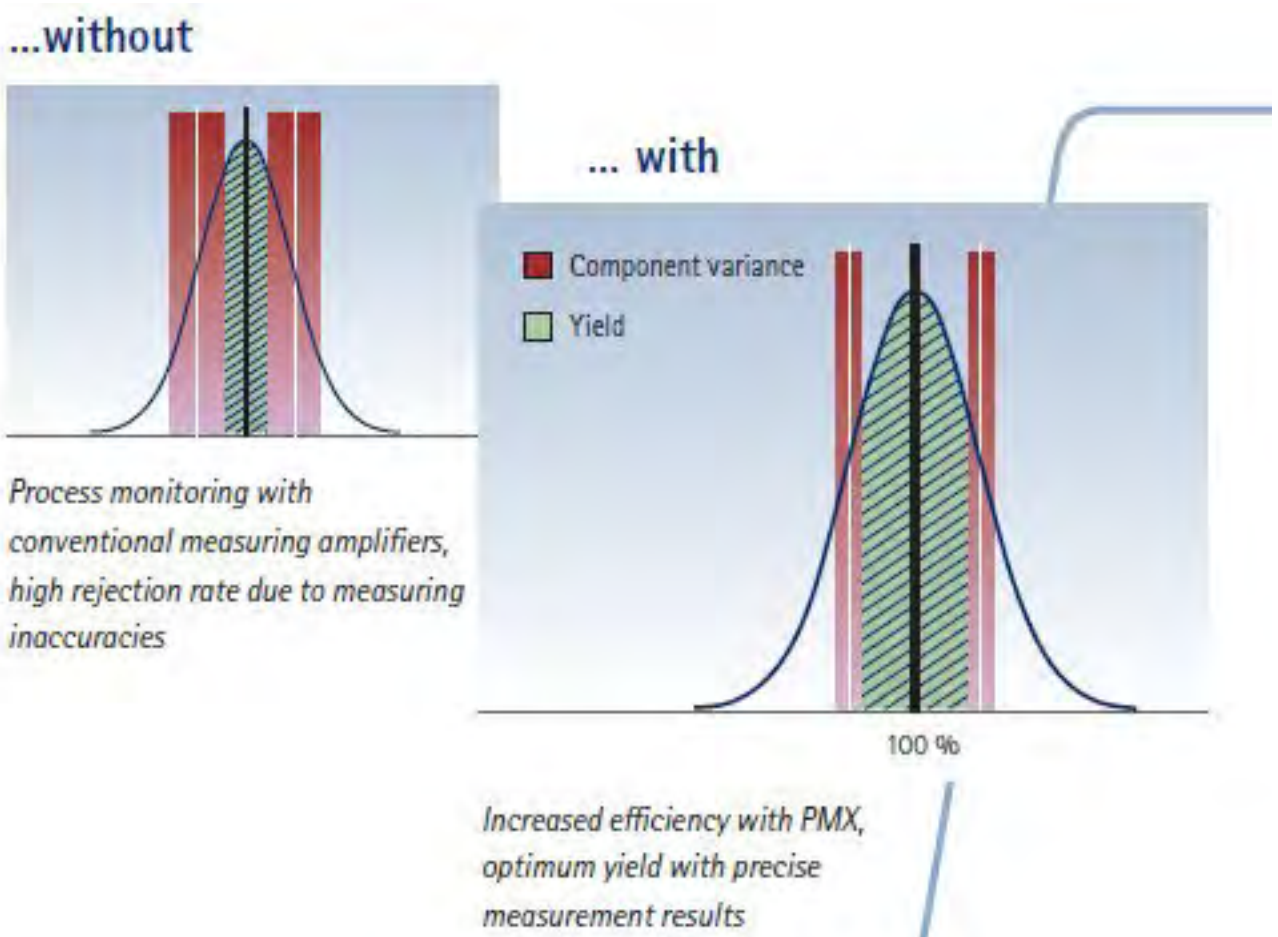
Benefit of Modern-Day Measurement Chain:

- Greater accuracy makes it possible to record manufacturing tolerances more precisely.
- Components are precisely tested and manufactured with the necessary tolerance.
- Reduces rejects and conserves resources while maximizing output.



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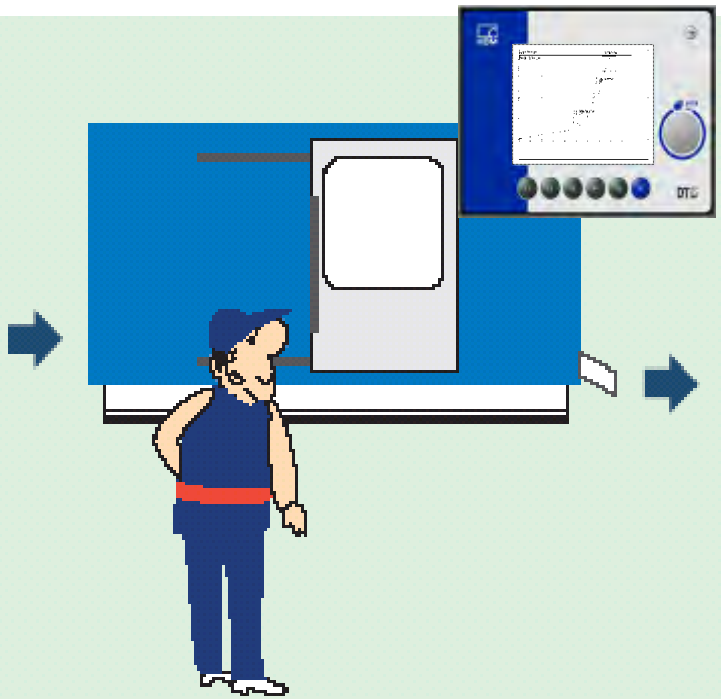
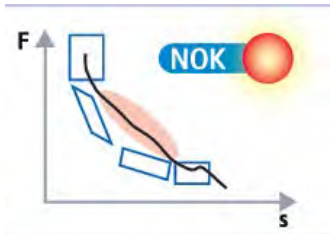
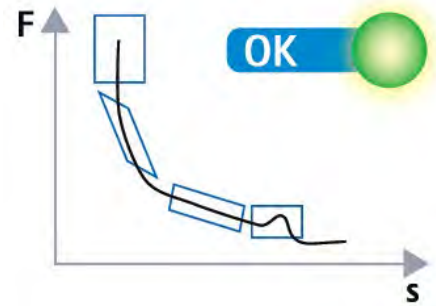
Benefits for Machine/Equipment Operators



- Adjustment help
- Scope into the process
- Immediate realization of disturbances
- Fast reactions in case of change
- Trend recognition
- Process optimizations



Reject: fit too tight



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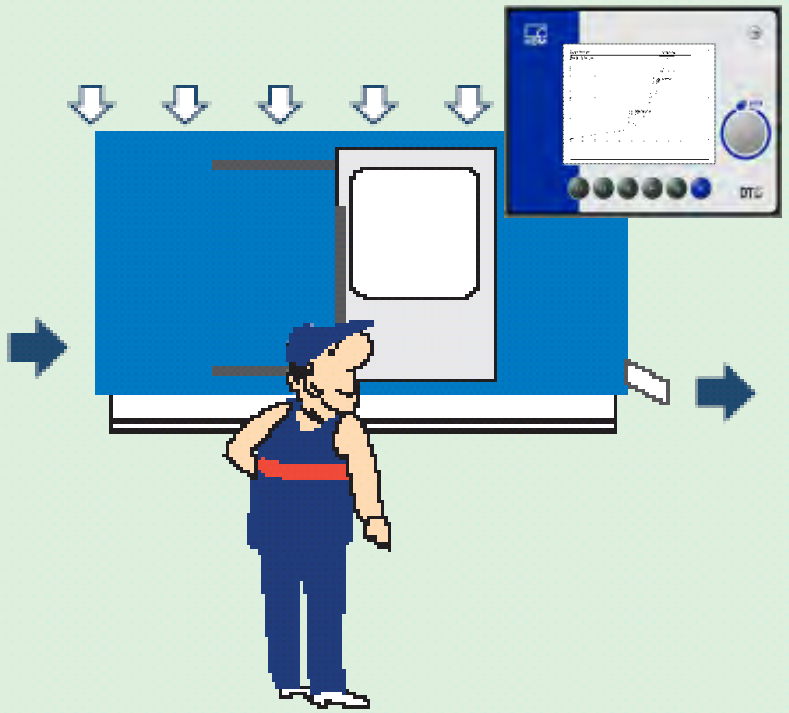
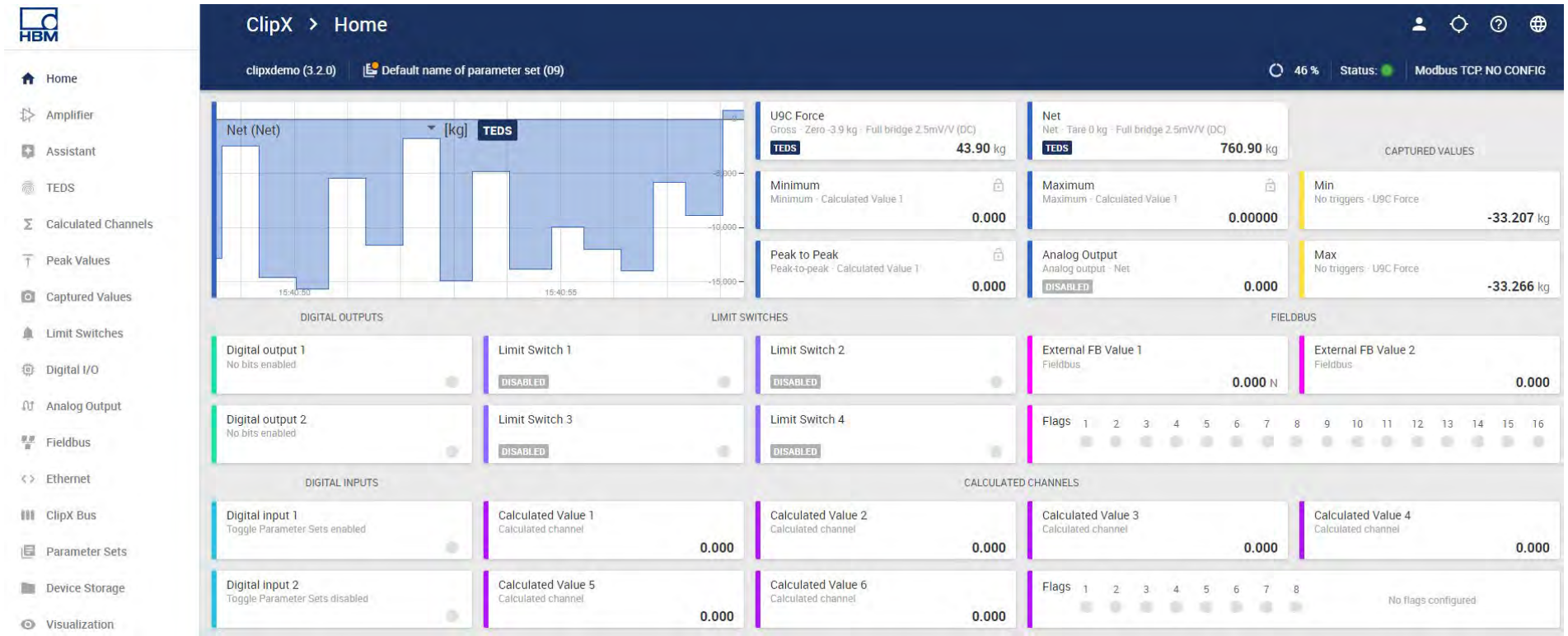
Benefits for the Plant



- Reduction of stand still, repair and set-up times; faster throughput or cycle time
- Reduction of repair and tooling costs
- Decreasing part costs
- Decreasing production disturbances
- Longer production times; less downtime
- Parallel machine operations

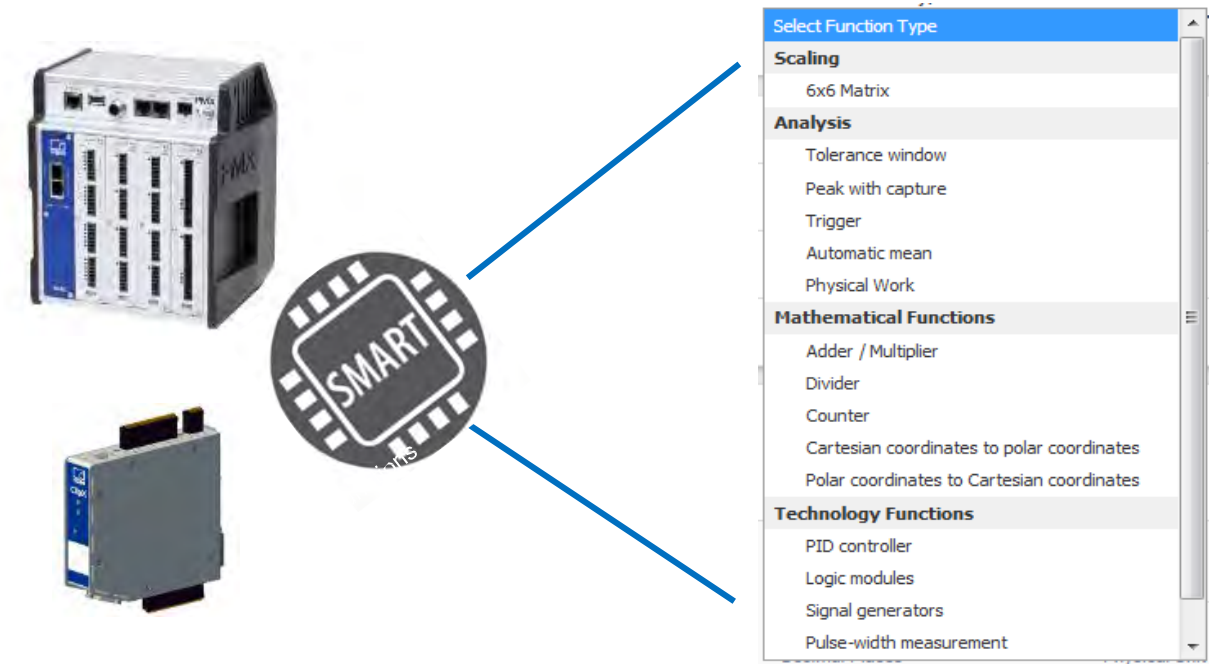
Smart Signal Conditioner Advantages

- Digital Configuration



Smart Signal Conditioner Advantages

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,..
- Combinations are possible, Calculation speed is **1ms** for each channel, easy setup via Web-GUI

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Smart Signal Conditioner Advantages

- Intelligence in the measurement components
- Change from programming to parameterization

Pre-implemented logic:

```
0001 IF switch = TRUE THEN
0002     devSpeed:=T#10ms;
0003 ELSE
0004     devSpeed:=T#25ms;
0005 END_IF
0006
0007 IF devTimer.Q THEN
0008     devTimer ( IN := FALSE, PT := devSpeed );
0009     engine := NOT engine;
0010     IF engine = FALSE THEN
0011         steps := steps + 1;
0012     END_IF
0013 ELSE
0014     devTimer ( IN := TRUE, PT := devSpeed );
0015 END_IF
```

Software program code

Pre-implemented calculated channel in the edge controller

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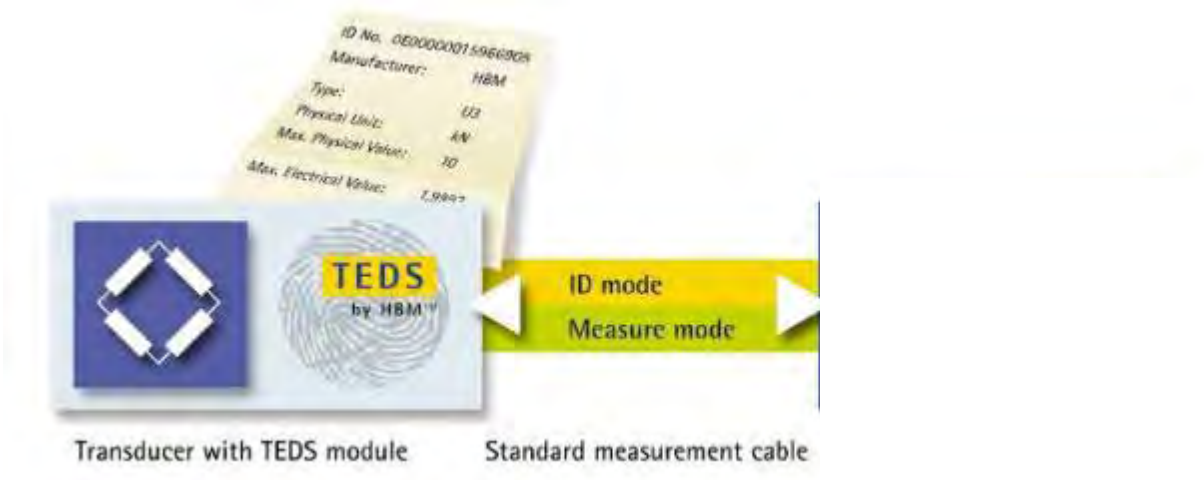
TEDS – Setup measuring chain in only seconds



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

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Calibration Accessibility

- The calibration data is stored as a calibration certificate in PDF format in the internal amplifier device memory.
- Users can download it at any time via www.hbm.com or via the browser of the amplifier
- Quality assurance in production and test benches

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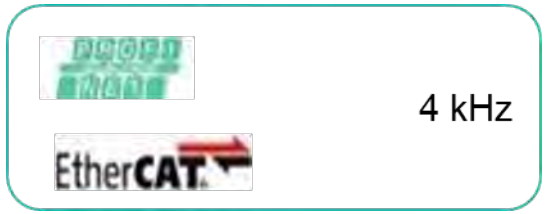
Smart Signal Conditioner Integration

- Real-Time Industrial Ethernet Outputs
  - Sending *results*, not *readings*



- Old-school Analog Outputs available too
  - ±10 V
  - ±20 mA
  - 3 kHz bandwidth

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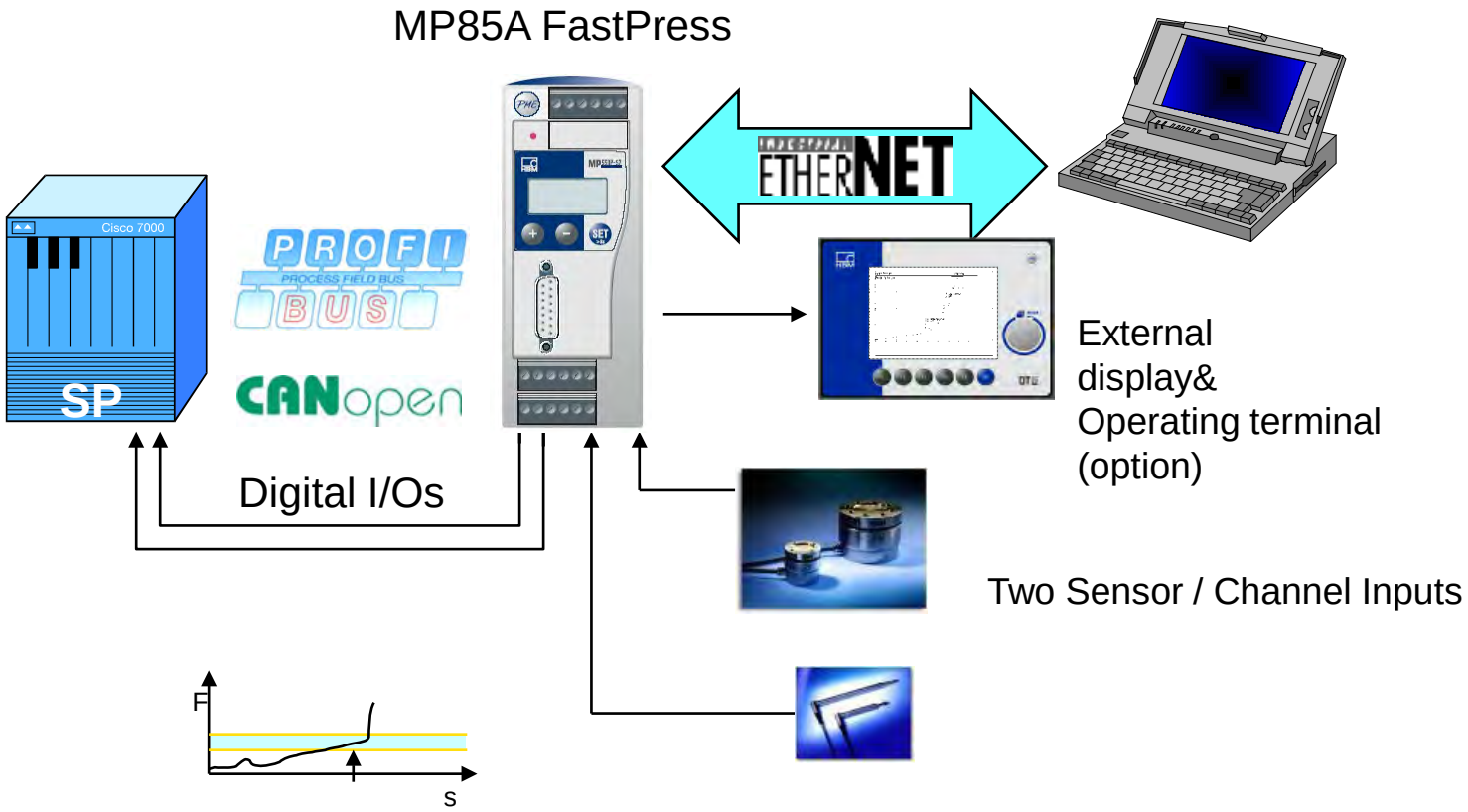
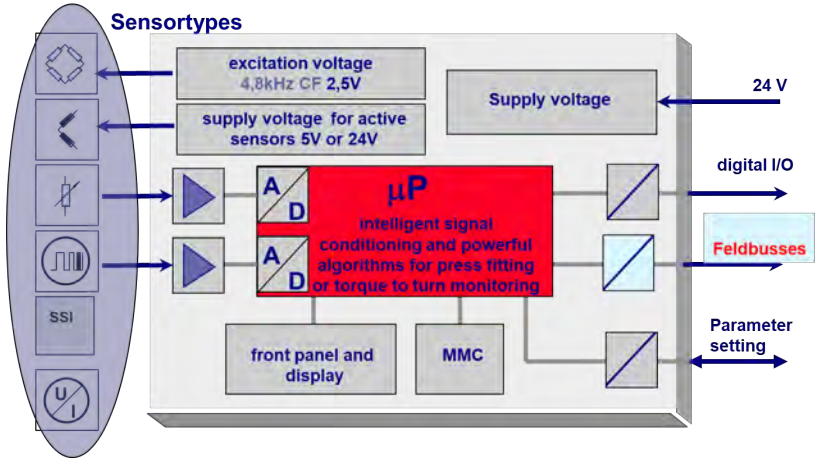
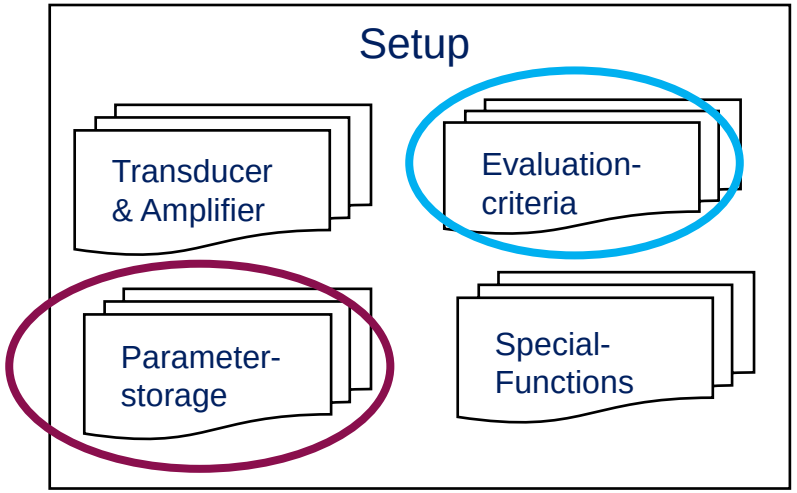
Process Control Evaluation: HBK - MP85A FastPress

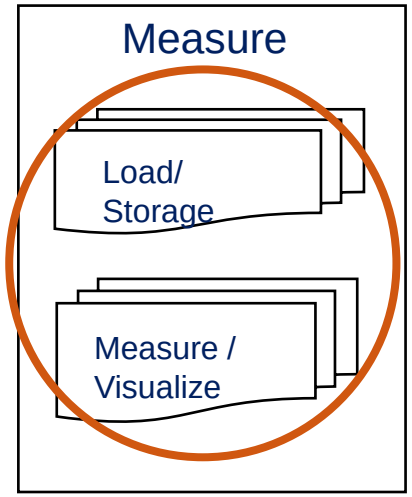


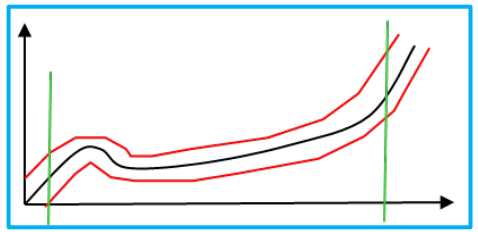


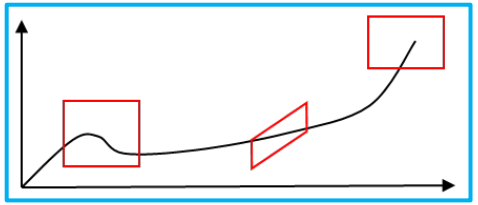
MP85A – 2 Channel Press-Fit & Torque to Turn Monitoring

MP85A FastPress

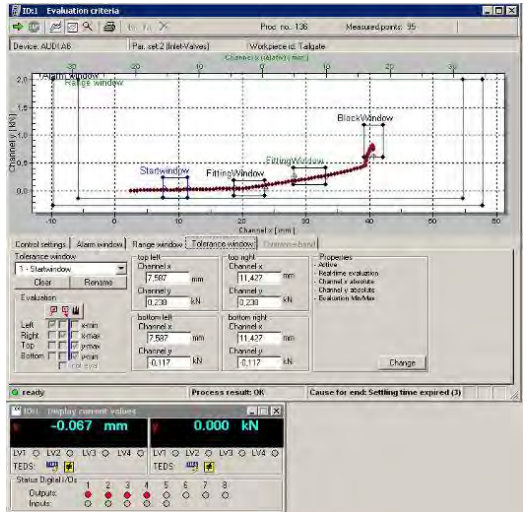








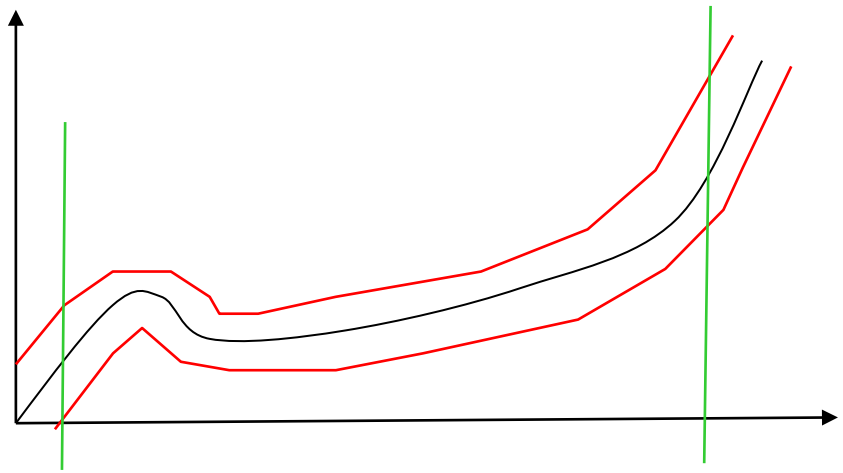
- Up to 31 parameter-sets can be stored
- Flexible Evaluation Criteria
  - With Tolerance Band, Envelope Curve
    - for evaluating a complete process
  - With tolerance windows (up to 9 per parameter set)
    - with relative or absolute reference
- Multiple ways of visualizations:
  - PC/IPC/Laptop with PME-Assistant
  - Decentral visualization with Panel-PC
  - Usage of an available HMI or IPC with configurable Visualization- and terminal software running Windows with FASTpress Software-Suite



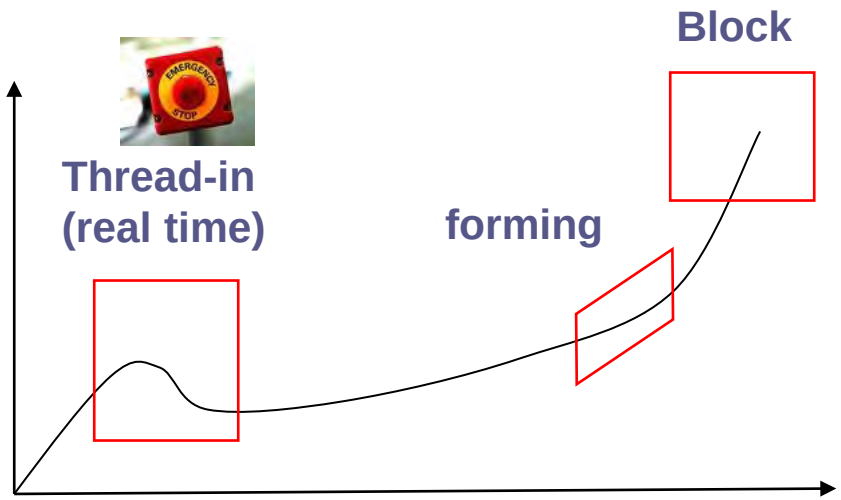
Press Fit Evaluation Criteria Examples

Monitoring the process / Setting Controls:

Option 1: With Tolerance Band, Envelope Curve
→ **evaluating the complete process**



Option 2: With Tolerance Windows
→ **check process relevant to situations**



Potential Application Areas

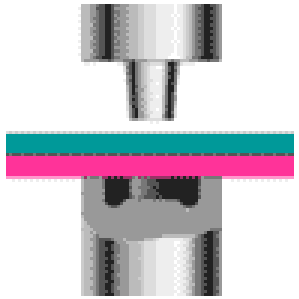
Metal Forming

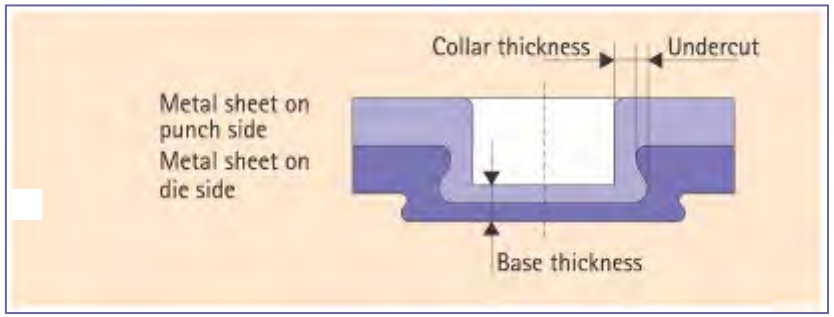
Press systems

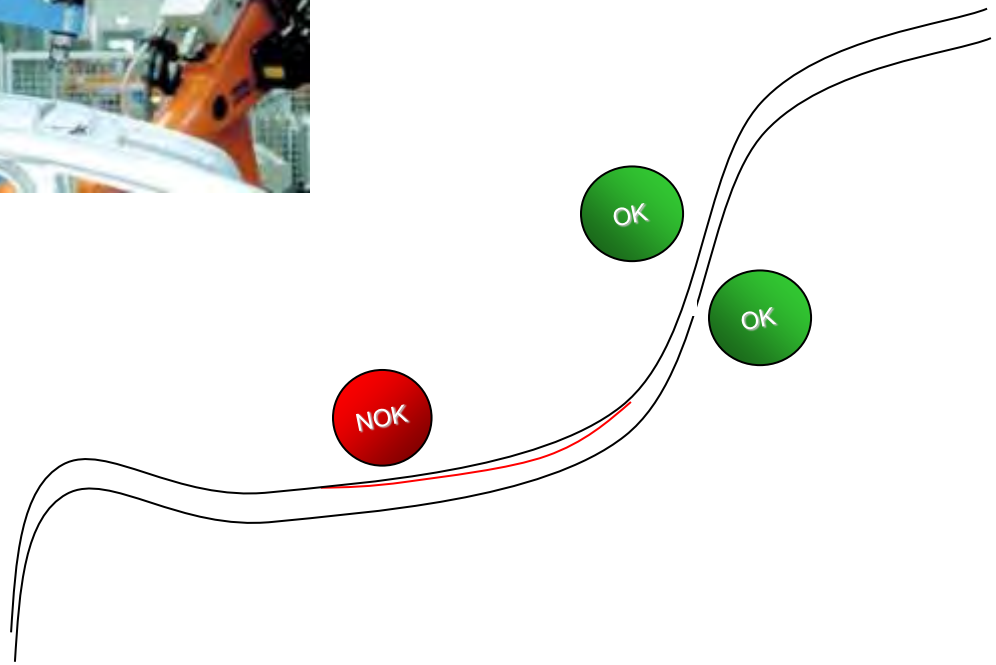
Assembly lines

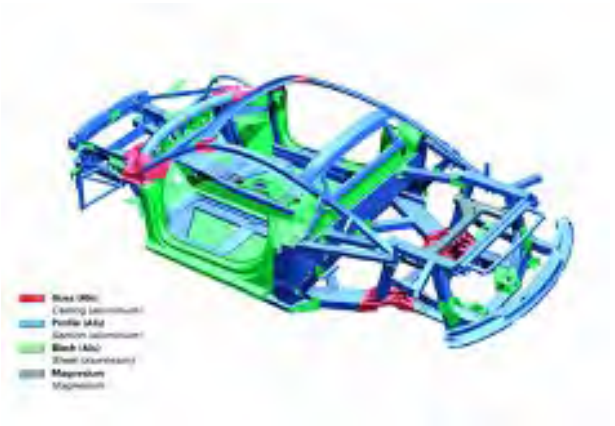
Press-Fit
Functional / Final Testing

Application Example - Car Body Joining



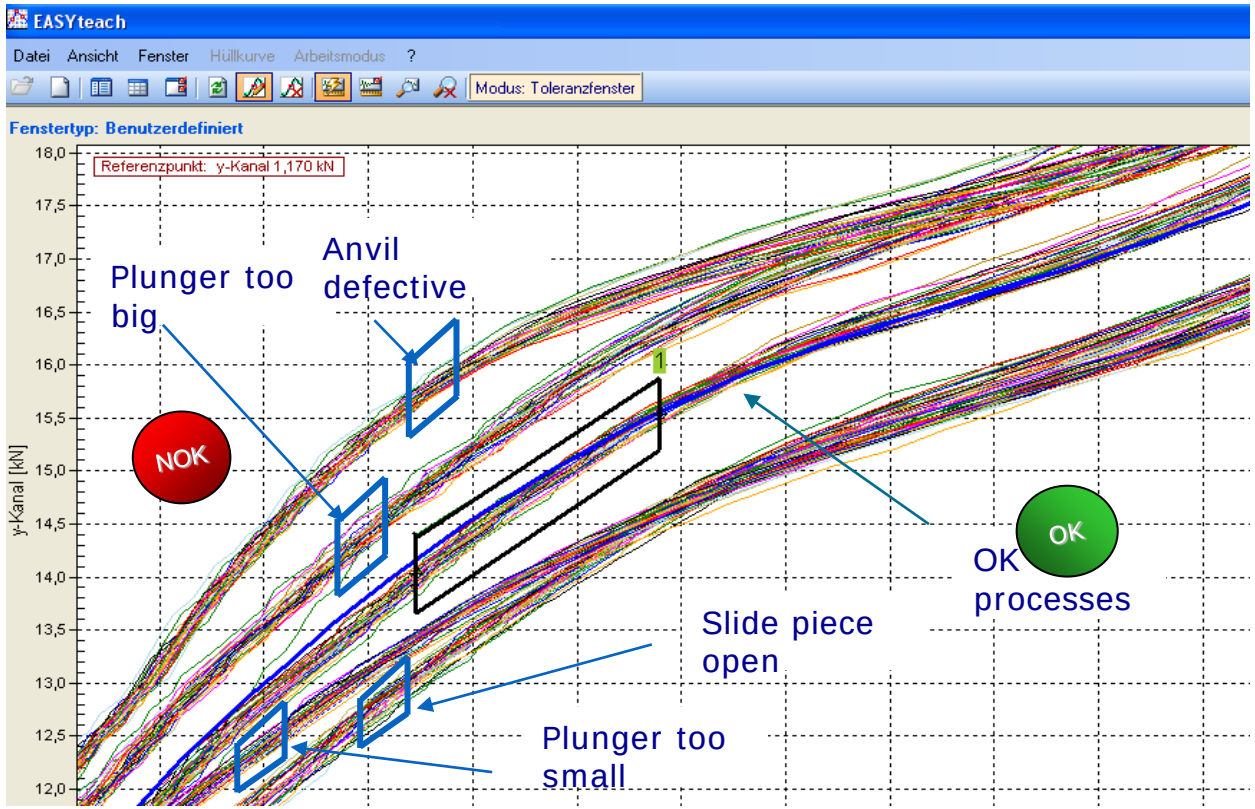






Force and Displacement Measurements

Application Example - Car Body Joining



Immediate identification of minimal errors :

Every tolerance window detects a process state or tool error

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Application Example – Press Fit on Bearings

Sensors:
- Force
- Displacement

Instrumentation:
- MP85 FastPress

Press Fit of Bearings - Possible Fault Detections

Example: Pressing a bearing into a hole

Hole too small	→	Force too big
Hole too big	→	Force too small
Wrong Position	→	Thread-in force too big
No Piece in position	→	No force

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Torque & Assembly

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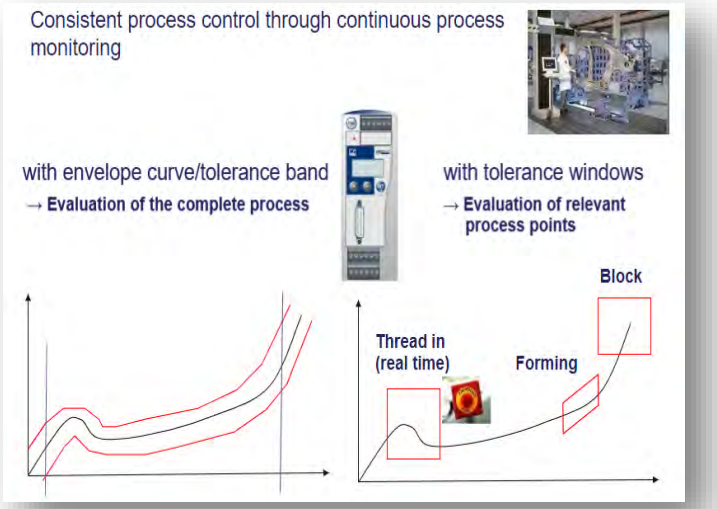
Torque to Turn Assembly

T210
Torque
Transducer
0.1Nm to 200Nm
360 Pulse Encoder
<0.05% fs Accuracy
Self Amplified

Pass – Fail Analysis



MP85
2 Channel
Process Controller

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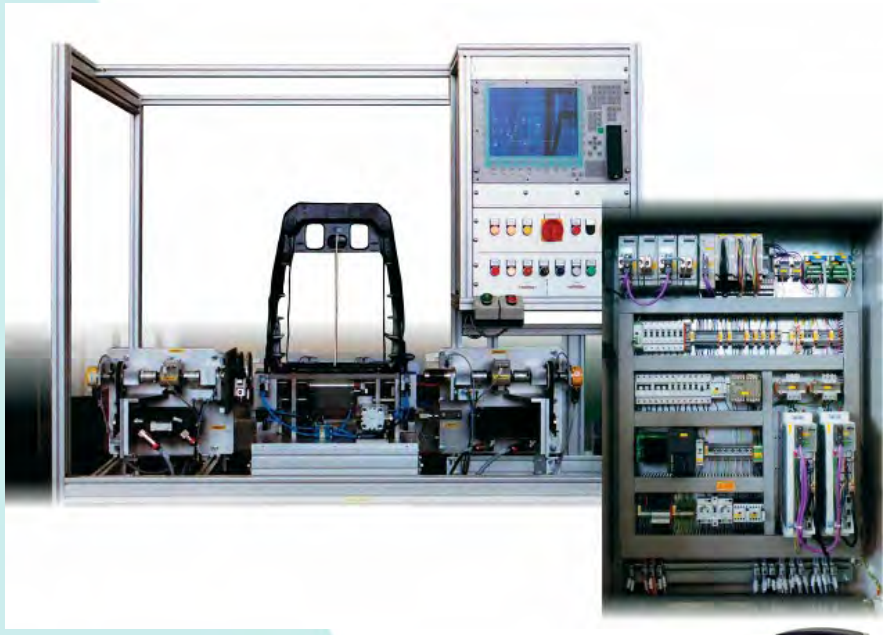
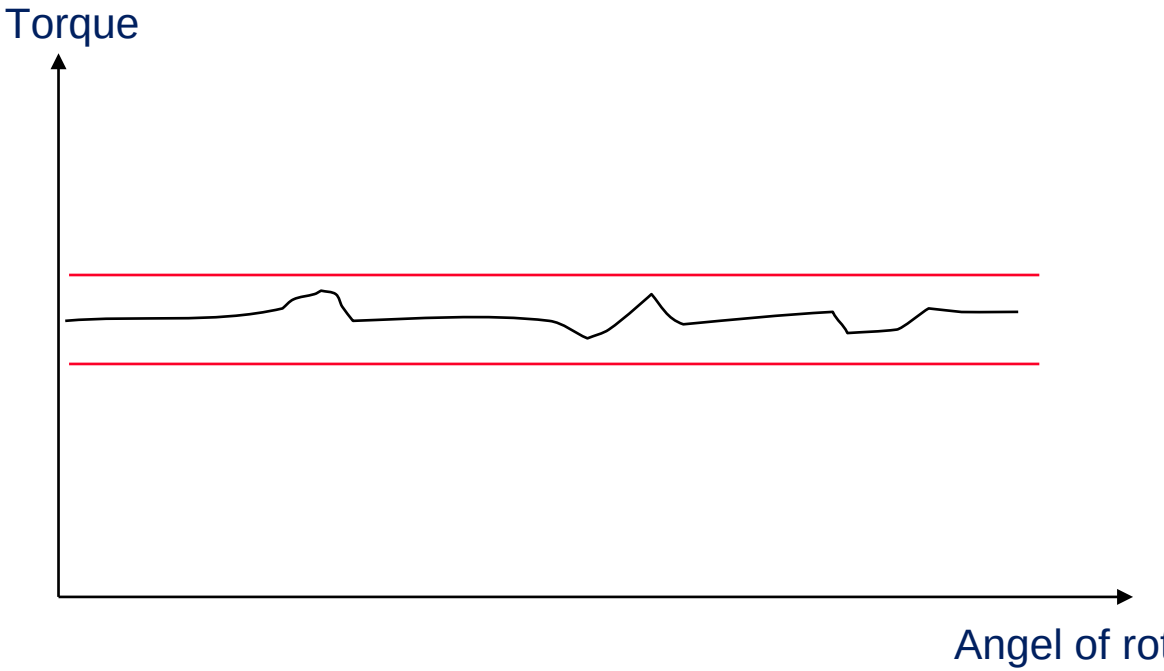
Torque to Turn - Testing of car seats





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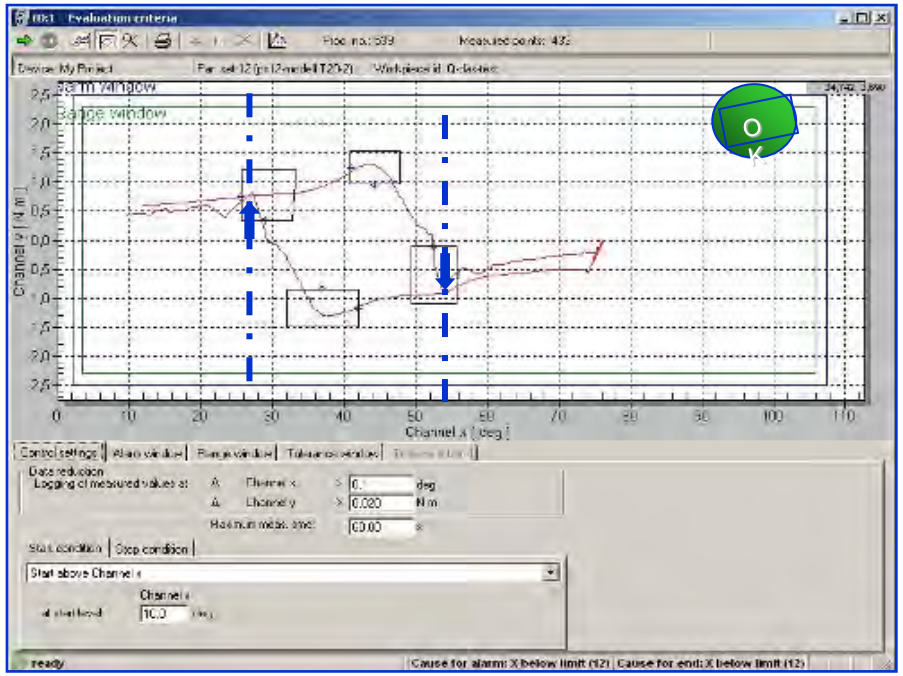
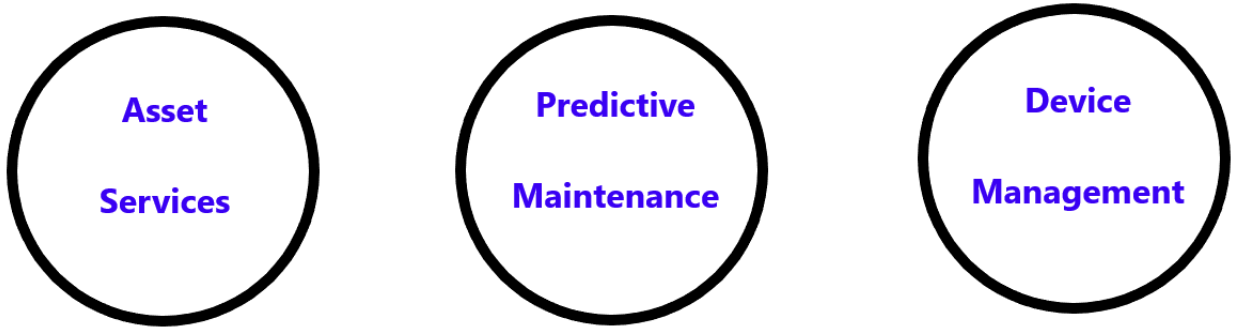
Torque to Turn Switch Control with T210

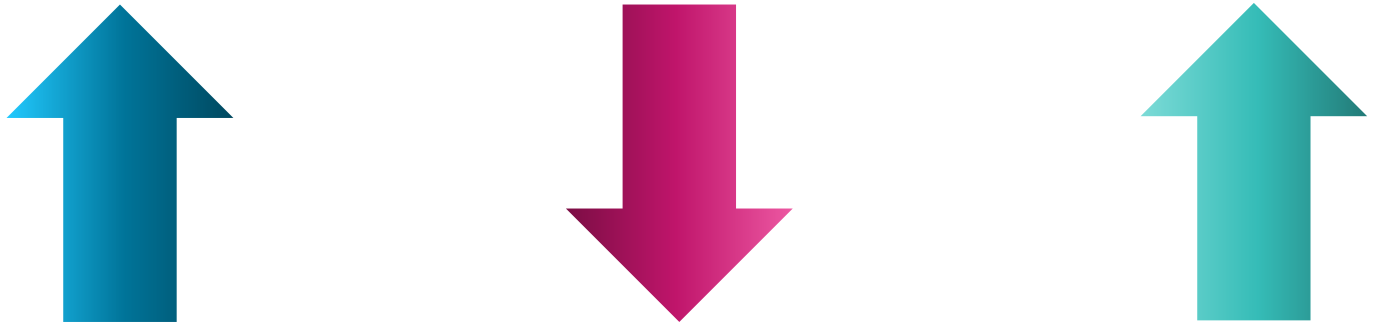


Evaluation with Tolerance windows

Summary: What do we win with using Modern Industrial Process Instrumentation

- Intelligent components
- Ensure quality
- Avoid rejects
- Avoid machine downtimes
- Increase transparency in the production





Optimize processes | Decrease costs | Increase turnover

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Questions?

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Thank You

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