

Sensor integration

As a core element of the concept phase in
system development

Olaf Ambros, Head of Engineering and Development

Introduction to baier & michels

- Company Locations
- Strategic Transformation
- Milestones

b&m-ECCO TEC®

- What is b&m-ECCO TEC®?
- FW800 Development Process

Sensor integration as a core element of the concept phase in system development

- Current state of the art
- FW800 sensor package

Baier&michels



7 Locations



Development
of new
Manufacturing
Technologies



500 Employees



180 Million
Euros in revenue



b&m from distributor to manufacturer

#b&m
goesgreen



1940

First screw
production starts



1932

Founded in
Frankfurt am Main

1973

Member of the
Würth Group

2003

Relocation
to O-R



2022

b&m goes
green



2025

New production
facility
b&m-ECCO TEC®



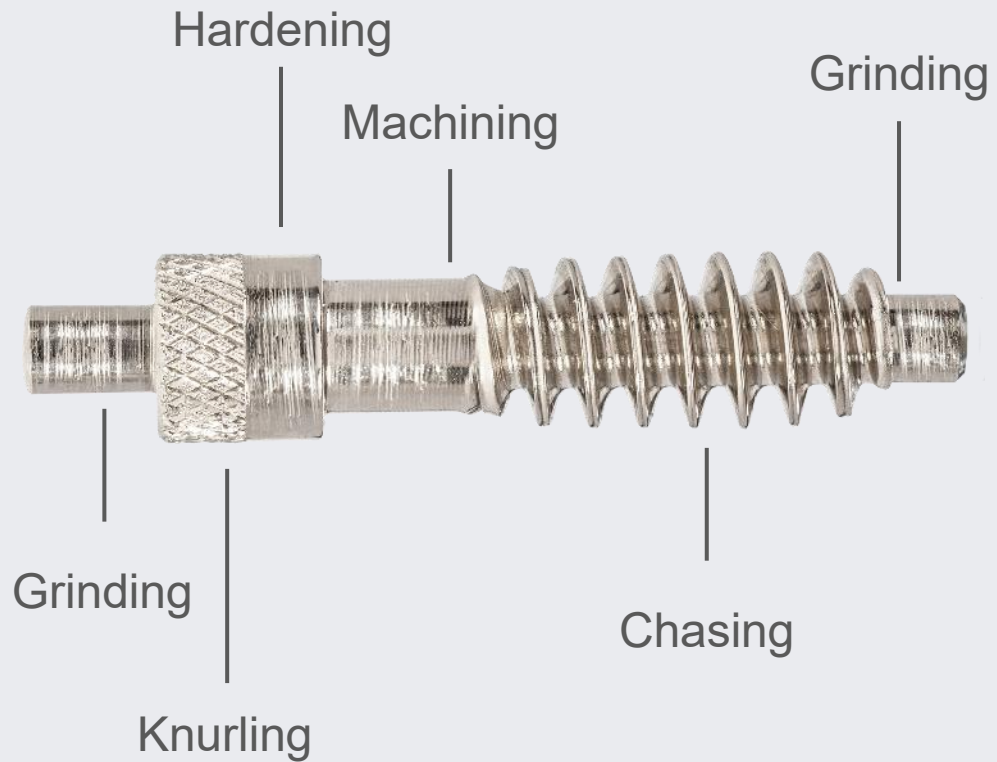
Motivation for the investment in German production



Secure jobs in Germany through intelligent machine technology and digitalization with innovative products.



Process comparison



Conventional Manufacturing



b&m-ECCO TEC®

Design Options



Up to
67 %

material and CO₂ savings
compared to
turned part manufacturing

(assumed CO₂ emission:
2.9 tons CO₂ per ton of steel)

Forming

Raw material: 10.5 g
Chip weight: 0.0 g
Finished part: 10.5 g

CO₂ emissions: approx. 30.45 g



= 40 parts

Machining

Raw material: 31.9 g
Chip weight: 21.4 g
Finished part: 10.5 g

CO₂ emissions: approx. 92.51 g



= 4 – 6 parts

b&m-ECCO TEC® Machine

How can cold-formed parts be manufactured with high precision?





b&m-ECCO TEC[®] Machine

- 125 t machine weight
- 60 m² footprint inside cabin
- 400 kW peak drive power
- Part length of up to 250 mm and up to 60 parts per minute
- High-precision servomotor-driven machine adjustment
- 3.5 t of moving mass

Process monitoring of flat die thread rolling by retrofitting force sensors

1. Working principle
2. Current state of the art in sensors and their integration in flat die thread rolling machines

Indirect force measurement enables reliable process monitoring during pressing and rolling in practice

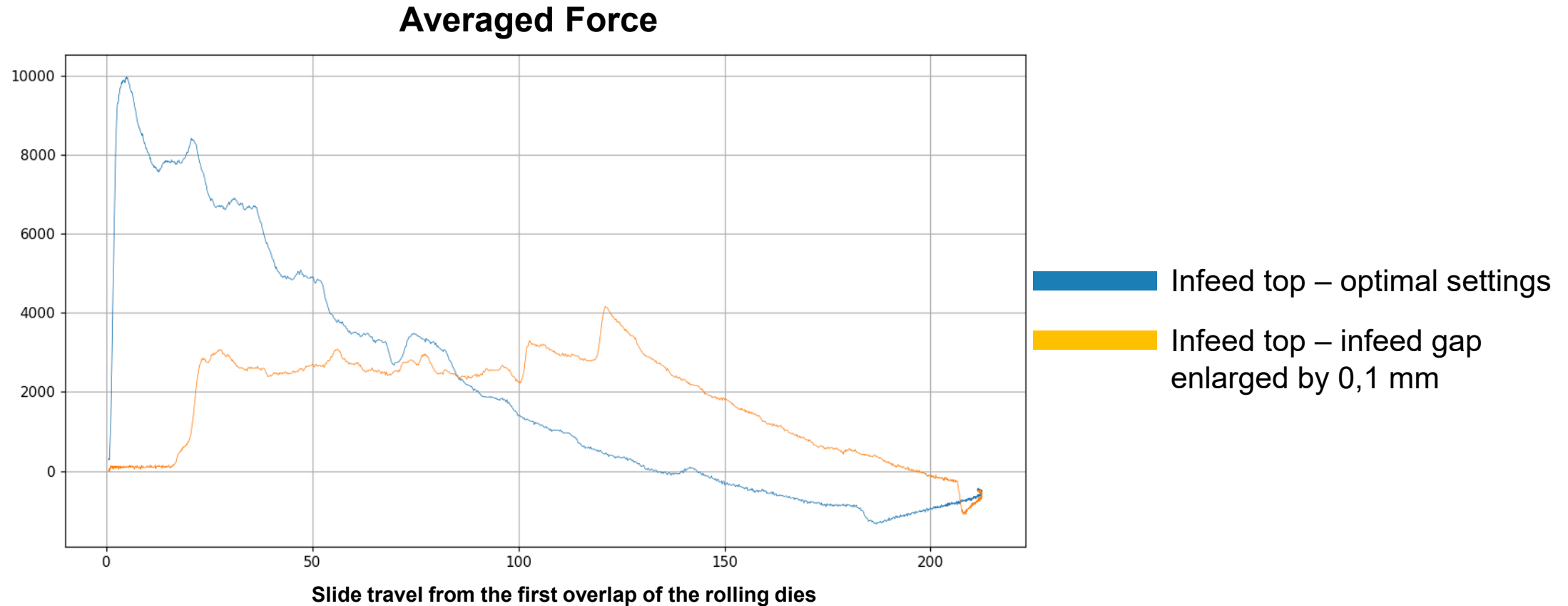
- Automatic machine stop in the event of a crash/tool failure
- Monitoring of forming forces with automatic sorting out in the event of anomalies
- Setting/monitoring the match point during rolling
- Setup assistance (e.g. periodic slippage while rolling)

Process monitoring by using envelope curves:

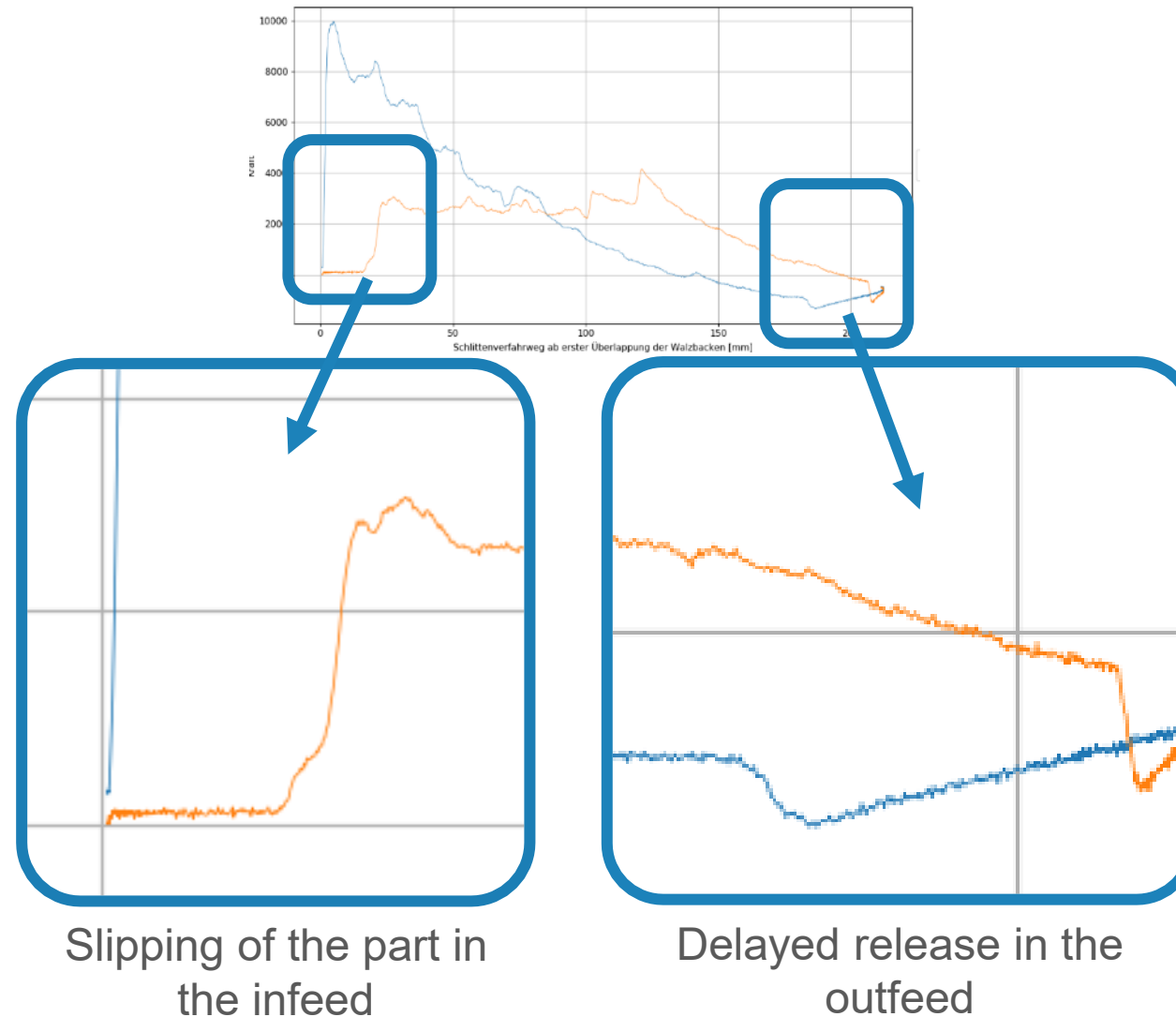
1. Recording of the forming forces of 20 good parts
2. Evaluation of the expected value and variance of each data point of the force curves
→ This results in the yellow envelope curve as the tolerance range
3. If the envelope curve is violated :
→ Automatic sorting out of faulty parts



Example: Machine setup detecting a slipping part



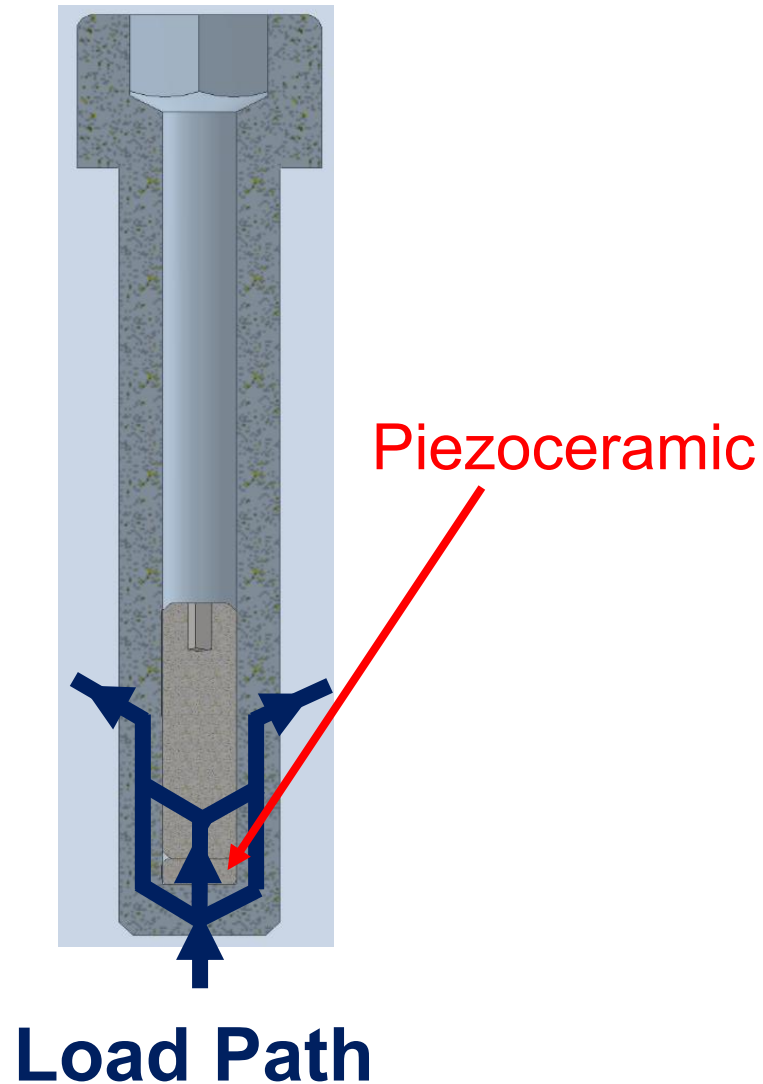
Example: Machine setup detecting a slipping part



Current state of the art in sensors and their integration in flat die thread rolling machines

1. Spindle with long axial bore and piezoelectric sensor
2. Piezoceramic load button

Spindle with long axial bore and piezoelectric sensor



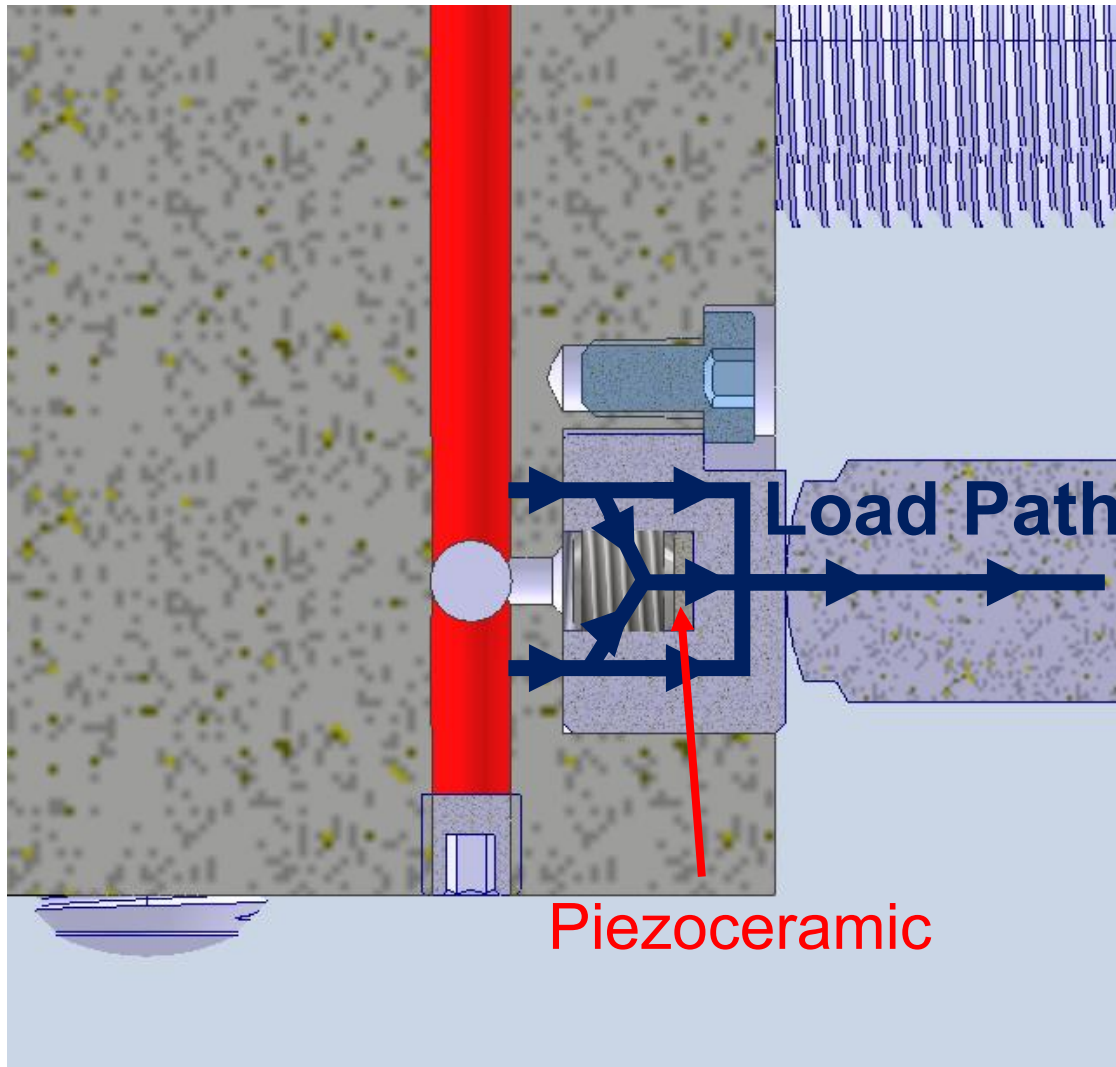
Advantages

1. **Near-Process:** Placed directly behind the rolling die block.
2. **Fast Response:** Instantly catches rapid force spikes.

Disadvantages

1. **Severe Force Shunting:** majority of load bypasses the piezoceramic
=> **Weak Signal:** Measuring a tiny load fraction reduces accuracy.
2. **Weak Spindles:** deep-bored adjusting screws.
3. **Removal of sensor wire required with every adjustment of spindle**

Sensor assembly



Advantages

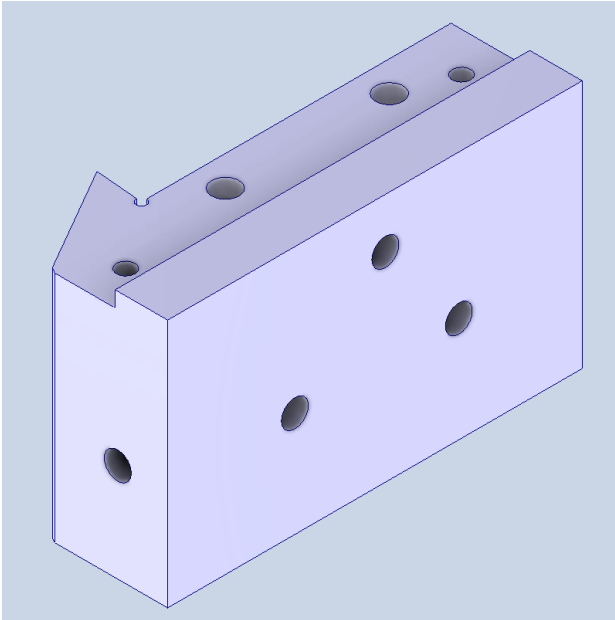
1. **Near-Process:** Placed directly behind the rolling die block.
2. **Strong Spindles:** Eliminates weak, deep-bored adjusting screws.
3. **Fast Response:** Instantly catches rapid force spikes.

Disadvantages

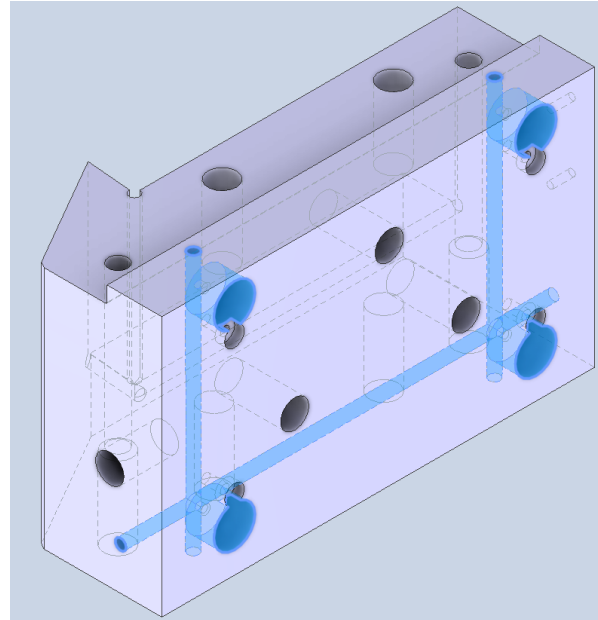
1. **Severe Force Shunting:** majority of load bypasses the piezoceramic
=> **Weak Signal:** Measuring a tiny load fraction reduces accuracy.

Sensor integration

Die Block design
without force sensor
integration:



Required Design
modifications:



✗ Sensor Integration requires Major Die Block Redesign:

⚙ Mechanical

- Major redesign required
- Reduced structural stiffness

📦 Packaging

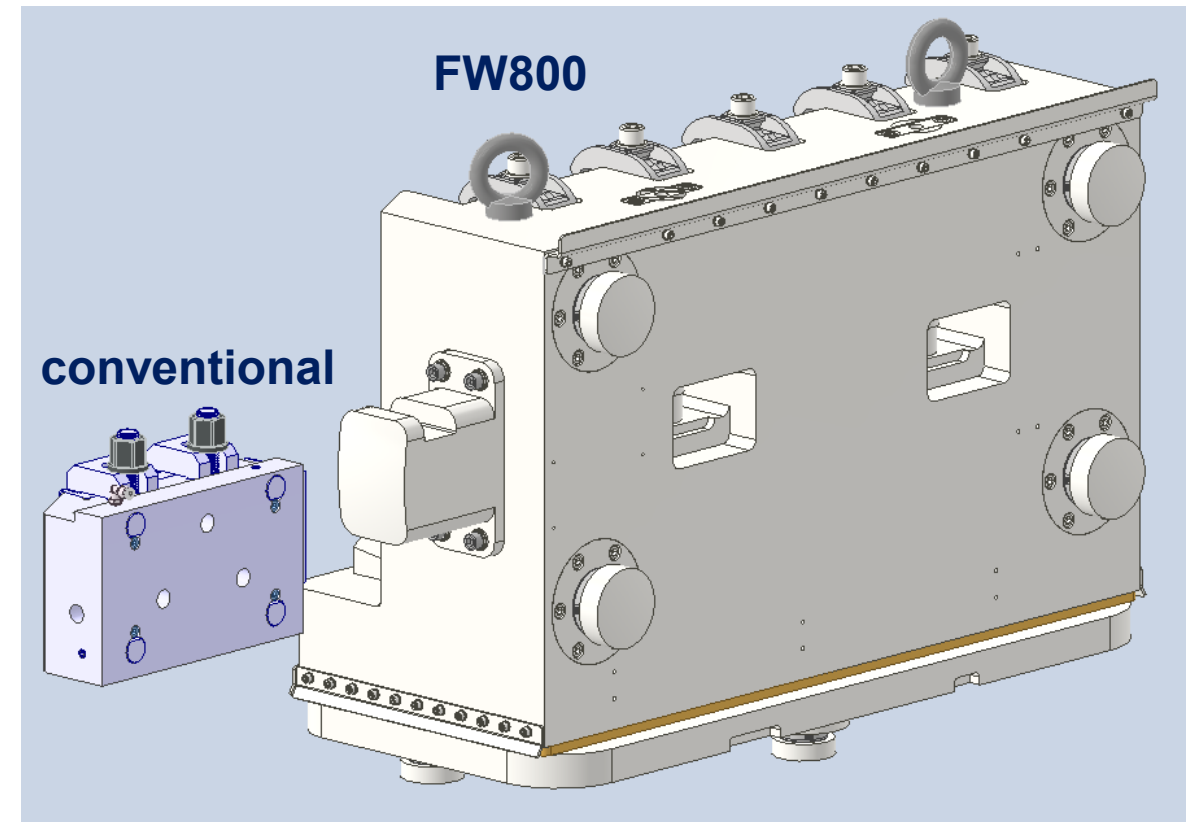
- Limited installation space
- Additional drilling and cable routing required

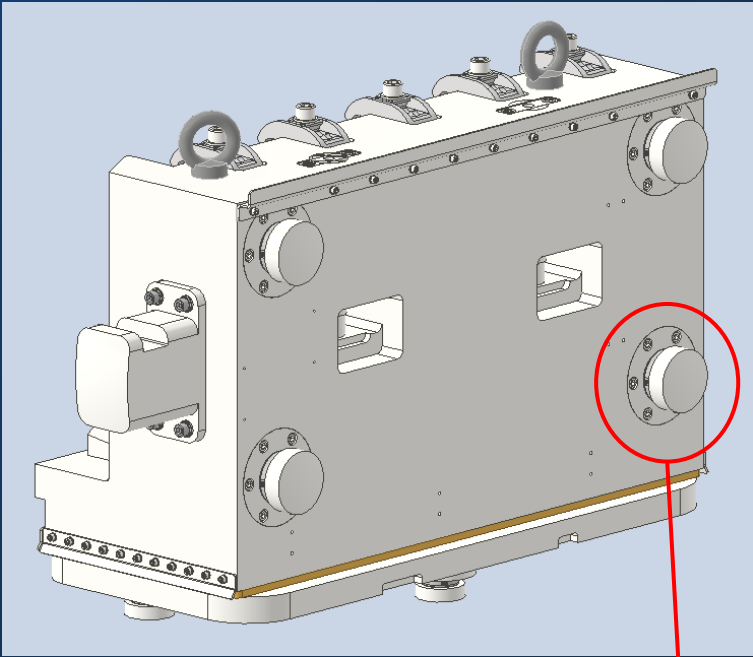
💰 Cost

- Specialized sensor hardware
- Increased Integration and maintenance effort

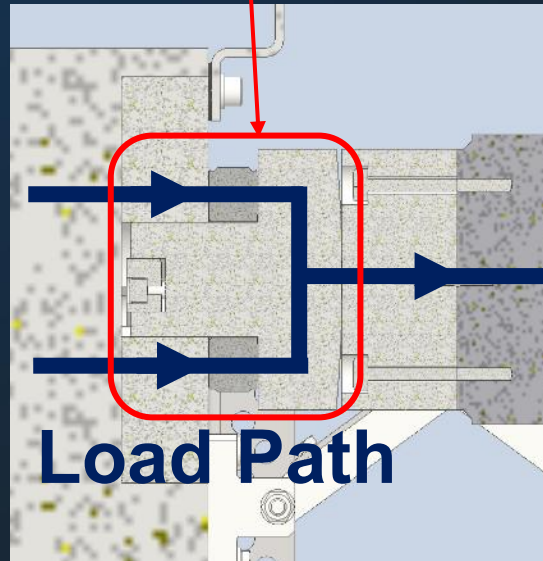
Comparison:

1. Die Block of a conventional thread rolling machine
2. FW800





Force Measuring
Ring Cross
Section:



✓ Force Measuring Ring Integrated into Force Flow:

⚙ Mechanical

- Optimal positioning within the force flow
- No structural compromises

🔍 Sensor Technology

- Standard force measuring rings available
- Calibrated measurements systems available
- Multiple qualified suppliers

💰 Cost & Maintenance

- Easy Sensor replacement
- Low integration effort

Key Benefit: The measurement system becomes an integral part of the machine architecture rather than a retrofit add-on.

Retrofit vs. Concept-Integrated Sensor Solution



Criterion	Retrofitted Integration	Integrated from Concept Phase
Available Installation Space	Poor	Good
Structural Integrity	Poor	Good
Sensor Availability	Poor	Good
Calibration Capability	Poor	Good
Replaceability	Poor	Good
Measurement Quality	Moderate	Good
Future Readiness	Poor	Good
Lifecycle Cost	Moderate	Good

Good

Moderate

Poor

Key Takeaway:

- ✓ Better measurement quality
- ✓ Higher maintainability
- ✓ Lower lifecycle cost
- ✓ Greater future flexibility

Recommendation:

Consider sensor integration during the concept phase rather than as a retrofit solution.





**baier & michels
GmbH & Co. KG**

Carl-Schneider-Str. 1
64372 Ober-Ramstadt

T +49 (0) 61 54 / 69 60 – 0

contact@baier-michels.com
www.baier-michels.com

© baier & michels 01.12.2025 | All rights reserved | All contents are subject to change

**Let's get
connected!**

Contact us

