“Transmitter to Enterprise”
The Connected Enterprise at Work in Modern Process Industry

Innovation for information integrity for Process Industry

Strategic Alliance Partners
Endress+Hauser and Rockwell Automation
Complementary Products & Services

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Products:
- Process instruments
- Variable speed drives

Networks:
- Fieldbus
- System integration
- Device configuration

Packaged Solutions:
- Overspill Protection
- Inventory Management
- Asset management

System Platforms:
- PlantPAx System
- Device profiles
- MES/information
- Batch

Engineered Solutions:
- Complete process automation projects

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Global partnership draws from the core competencies of both companies to deliver scalable engineered solutions. $1+1>2$.

- Value added integration
  - Reduce risk, time, effort & cost
- Advanced diagnostics
  - Information from field to enterprise
  - Right information to the right person at right time
- Collaborative Life Cycle Management
- Open Networking Architecture
- Integration office tools
Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.

James Harrington
From smart products to the connected enterprise...

- Value provided by the Field Instruments over the last few Decades

<table>
<thead>
<tr>
<th>Time</th>
<th>Signal</th>
<th>Information</th>
<th>Information with data</th>
<th>Knowledge</th>
<th>Networked Knowledge</th>
</tr>
</thead>
</table>

- Transformation of the Automation Pyramid

- Process control becomes part of the IT world (Infrastructure, WEB, Security, Standards...)

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Major Dilemma today

1. How do I bring **Reliability** & reduce Risk in my plant (**Safety**)
2. What is the **integrity** of the measurement? (**Quality**).
3. Predictive Maintenance? (**Availability**)
Exploit the Reliability potential with Smart Sensors

90% of our field device portfolio is already digital!

Let’s unlock it!
Heartbeat Technology™
Heartbeat Technology™ from Endress+Hauser

The Pulse of the equipments!
Measurement Products digitized with Heartbeat Technology

**Flow**
- Micropilot FMR5x/6x
- Levelflex FMP5x
- Incl. new Proline
- B200 300/500

**Level**
- TrustSens TM371
- Self calibrating RTD Sensor

**Temperature**

**Analysis**
- Liquiline CM44x

... and more to come ...
Heartbeat Technology™ from Endress+Hauser

Advanced Diagnostics

- Reliable self-monitoring
- Risk Reduction

Documented Verification

- Compliant, traceable testing
- Measurement Integrity

Condition Monitoring

- Process consistency analysis
- Predictive Maintenance

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Example - Flow meter

- Continuous testing, during operation
- Quick, concise remedy in case of errors

Total Diagnostic Coverage 95+%
Heartbeat Diagnostics

Heartbeat diagnostics (Reliable self-monitoring)
• Continuous, built-in diagnostic functionality 24X7
• Broadest test coverage >95%
• Quick, concise guidance in case of errors (NE 107)

“NAMUR NE 107 Nomenclature”
- Failure
- System OK
- Out of Specification
- Maintenance Required
- Check

Diagram:
- Power supply
- Temperature sensors
- Excitation system
- Electro-dynamic pick-ups
- I/O Module
- CPU
- ISEM
Wide Diagnostic coverage.

“Low $\lambda_{du}$ Safer Devices”

- Low $\lambda_{DU}$
- Safe devices
- Extended proof test cycles

![Diagram showing PFD (probability of failure on demand) comparison between Device 1 and Device 2 with and without Heartbeat.]

* Device 1 with Heartbeat
Device 2 without Heartbeat
Traceable Verification

- Internal
- 1 to 10 minutes
- Press of a button
- Total Diagnostic Coverage 94 – 98%

Operational Reliability On Demand with Factory Traceable references

I/O module
- 4…20 mA output loop-back test

Sensor electronic module
- Zero-point tracking
- Reference clock

Sensor
- Inlet / Outlet pick-up coil
- Measuring tube / Carrier tube temperature
- Pick-up coil symmetry
- Frequency lateral / torsion mode

Sensor Integrity (HBSI)
- Electromechanical integrity of Promass
### Traceable Verification

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Passed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet pickup coil</td>
<td>Passed</td>
</tr>
<tr>
<td>Outlet pickup coil</td>
<td>Passed</td>
</tr>
<tr>
<td>Measuring tube temperature sensor</td>
<td>Passed</td>
</tr>
<tr>
<td>Carrier tube temperature sensor</td>
<td>Passed</td>
</tr>
<tr>
<td>Pickup coil symmetry</td>
<td>Passed</td>
</tr>
<tr>
<td>Frequency lateral mode</td>
<td>Passed</td>
</tr>
<tr>
<td>Frequency torsion mode</td>
<td>Passed</td>
</tr>
<tr>
<td>Sensor integrity</td>
<td>Passed</td>
</tr>
<tr>
<td>Sensor electronic module</td>
<td>Passed</td>
</tr>
<tr>
<td>Zero point tracking</td>
<td>Passed</td>
</tr>
<tr>
<td>Reference clock</td>
<td>Passed</td>
</tr>
<tr>
<td>Reference temperature</td>
<td>Passed</td>
</tr>
<tr>
<td>I/O module</td>
<td>Passed</td>
</tr>
</tbody>
</table>

- Completed within seconds, no process interruption
- Allows to identify where a problem occurs
• Fulfills the requirement of traceable verification.

Heartbeat Technology is a test method integrated in the measuring device for the diagnostics and verification of flowmeters when used in a particular application throughout the useful lifetime of the measuring device. Testing is based on internal factory-traceable references which are redundantly reproduced in the device.

Heartbeat Verification verifies the function on demand within the specified measuring tolerance ... with a total test coverage ... >95%.

Heartbeat Technology™ complies with the requirements for traceable verification according to DIN EN ISO 9001:2008 – Section 7.6 a) "Control of monitoring and measuring equipment".
# Heartbeat Condition Monitoring

<table>
<thead>
<tr>
<th>Types of process impact</th>
<th>Relevant parameters</th>
</tr>
</thead>
</table>
| Entrained gas, cavitation, as well as empty tube | - Tube damping  
- Damping fluctuation  
- Frequency fluctuation |
| Coating build-up, corrosion, erosion            | - Tube damping  
- Signal asymmetry  
- Resonance frequency |
Run from PlantPAx

- Access via all available interfaces

1. Display

- “No man in the field”
- No need to open the device

2. On-site
- Web server
- FieldCare®

3. Remote
- Control system
- Asset management e.g. FieldCare®

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People for Process Automation

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AssetCenter PlantPAx System
Visualization: Using AOIs & Faceplates Heartbeat Diagnostic

Bar Graph of Reading plus Alarm Info

Alarm Codes

Run Heartbeat Diagnostics with Results
Instruments on EtherNet/IP
Preferred Integration for Process Industries

ICS Industrial Control System

Engineering station

Operator Station

Plant Asset Management Station

Native 4-wire field devices
Preferred Integration for Process Industries
New Proline 300/500 with EtherNet/IP

• 2-Ethernet ports
• Line and Ring topologies support (DLR)
• Less cabling / no single point of failure
Preferred Integration
The Integration Office provides the tools & packages to assure seamless integration needed for our customers process control systems.
1.0 Customer Challenges

Faster Time to Market
- Increased Engineering Efficiencies
- Decreased risk

Connected Enterprise
- Seamless Integration
- “Internet of Things” Ready
- Enabling a digital enterprise

2.0 Key Deliverables

Installation & Configuration Guides
- Connect E+H instruments to RA PlantPAx
- Configure network interface
- Configure instrument

Visualization
- Faceplates for Smart Devices
Joint Value Proposition – Integration Office Tools

3.0 Proven Customer Value

Time Savings
- Faster Integration Time – Ongoing Savings of 34%

Cost Savings
- Reduces device integration costs by 68%, on average

Regulatory
- Optimized traceability to meet regulatory demands

Availability & Productivity
- Predictive maintenance of Intelligent devices
- Improved Productivity
Preferred Integration – Pre-engineered PlantPAx!

- Comprehensive and easy guidance to system design and setup
- Installation
  - Connect instrument to controls
- Configuration
  - Offline and online configuration
  - Configure network interface
  - Configure instrument
- Visualization
  - Pre-engineered and standardized faceplates

### Pre-engineered application code …

- Documents for setup and operation
- Instrument Interface Function Blocks
- Operator Workstation Faceplates
- Preventive Diagnostic

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**Integrated Device Package**

- **Electronic Data Sheets (EDS)**
  Can be downloaded automatically from device
  EDS files are used to identify and commission the device on a network.

- **Custom Add-On Profile (AOP)**
  Can be downloaded from Internet and is delivered with Studio 5000
  AOP standardizes module configuration, reduce programming and configuration errors and increase productivity.

- **System Integration Document**
  can be downloaded from Internet
  Provides a step-by-step approach for integrating a device

- **Add-On Instruction (AOI) and Faceplates**
  Available within the PlantPAx Library of Process Objects from Rockwell Automation

- **Reduces DCS programming time**
Preferred Integration – Add On Instruction (AOI) and Faceplates

A global object links the tag name to the faceplate

Real time display of all process variables

Alarms, Trends, Reset Totalizers

Available within “Library of Process Objects” of PlantPAx
Visualization - Using AOIs & Faceplates

Faceplates

- Real time display of all Totalizer plus reset to zero
- Real time display of all process variables
- Threshold for Alarm settings

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Asset Management

Standard Based Representation
**Indication of good or bad status**

- **Point-wise detailed diagnostics**
- **System-wide status of asset health**
- **Detailed device status and live interaction**

Source: Fieldbus.org

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All diagnostic information are unstructured and unfiltered

- The process operator has to understand all messages and abbreviations individually. A misinterpretation can happen easily.
- The safe plant operation depends on the device knowledge of the operator
All diagnostic information are unstructured and unfiltered

- The process operator has to understand all messages and abbreviations individually. A misinterpretation can happen easily.
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Example - Complexity in the Digital world

All of the Information

What you really need to know = Keep It Simple
Diagnostic with NAMUR NE 107

All diagnostic codes are classified according Namur NE107

- Safer plant operation with plain status signals for clear directives
- Cost savings by well defined procedures for operation and maintenance
Condition Based Maintenance Increases Operational Performance

Performing Unnecessary Maintenance

Unexpected Equipment Failures
Data Insights

Scalable Analytics

| ENTERPRISE |
| Which plant performed the best? |
| Why is Site A throughput below plan? |
| Will I meet plan today? Tomorrow? |
| How can I change operations to improve Safety? Profitability? Yield? Quality? |

| SYSTEM |
| Is the system running ok? |
| Why is Line 1 quality affected? |
| Will the process be stable? |
| How do I adjust to maintain/improve process stability? |

| DEVICE |
| Am I running ok? |
| What is happening? |
| What's the likely next device state? When will it occur? |
| What maintenance action is required? When? |

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REMOTE MONITORING & ANALYTICS

Get Connected
to assets and data to enable remote collaboration

Get Informed
of asset performance and alerts to enable real-time remote monitoring

Get Ahead
by analyzing data to enable optimization of operations and business transformation
Providing World Class Solutions

- Reduced integration costs throughout engineering, commissioning and start-up
- Optimized plant availability and output
- Reduced risk associated with intelligent device integration
- Ensured product quality and consistency
- Optimized traceability to meet regulatory demands
- Predictive maintenance through intelligent devices
Thank You!

Share your Feedback !!!

www.in.endress.com

www.rockwellautomation.com