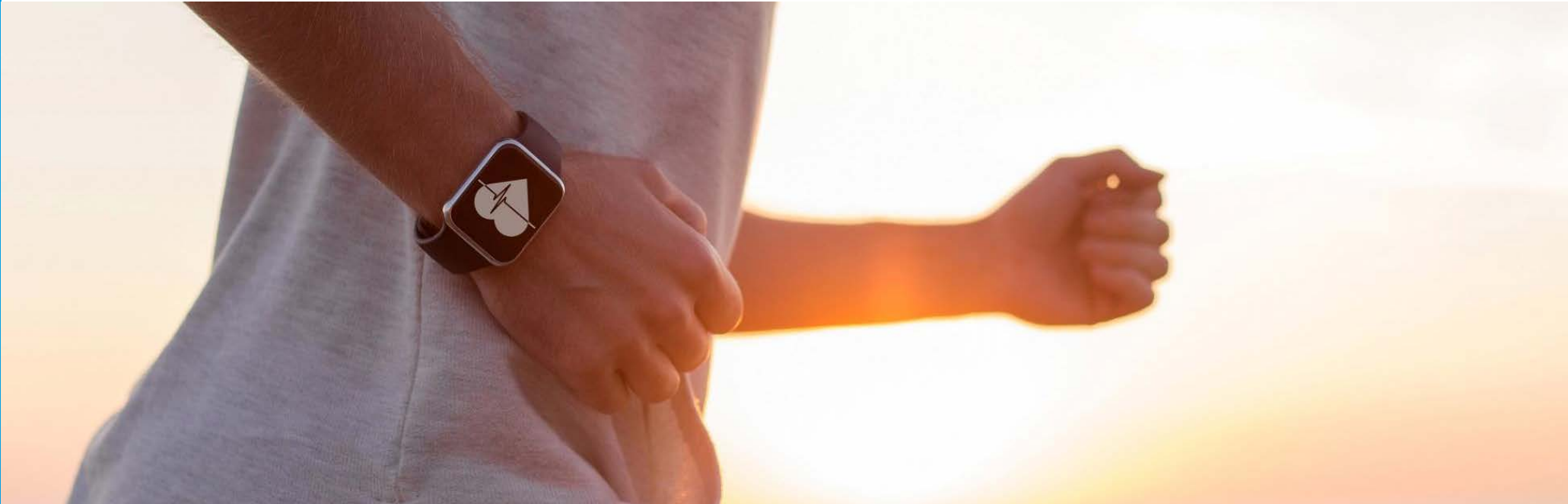


## Heartbeat Technology

Reduce maintenance efforts with smart device technologies



## What is Heartbeat Technology?

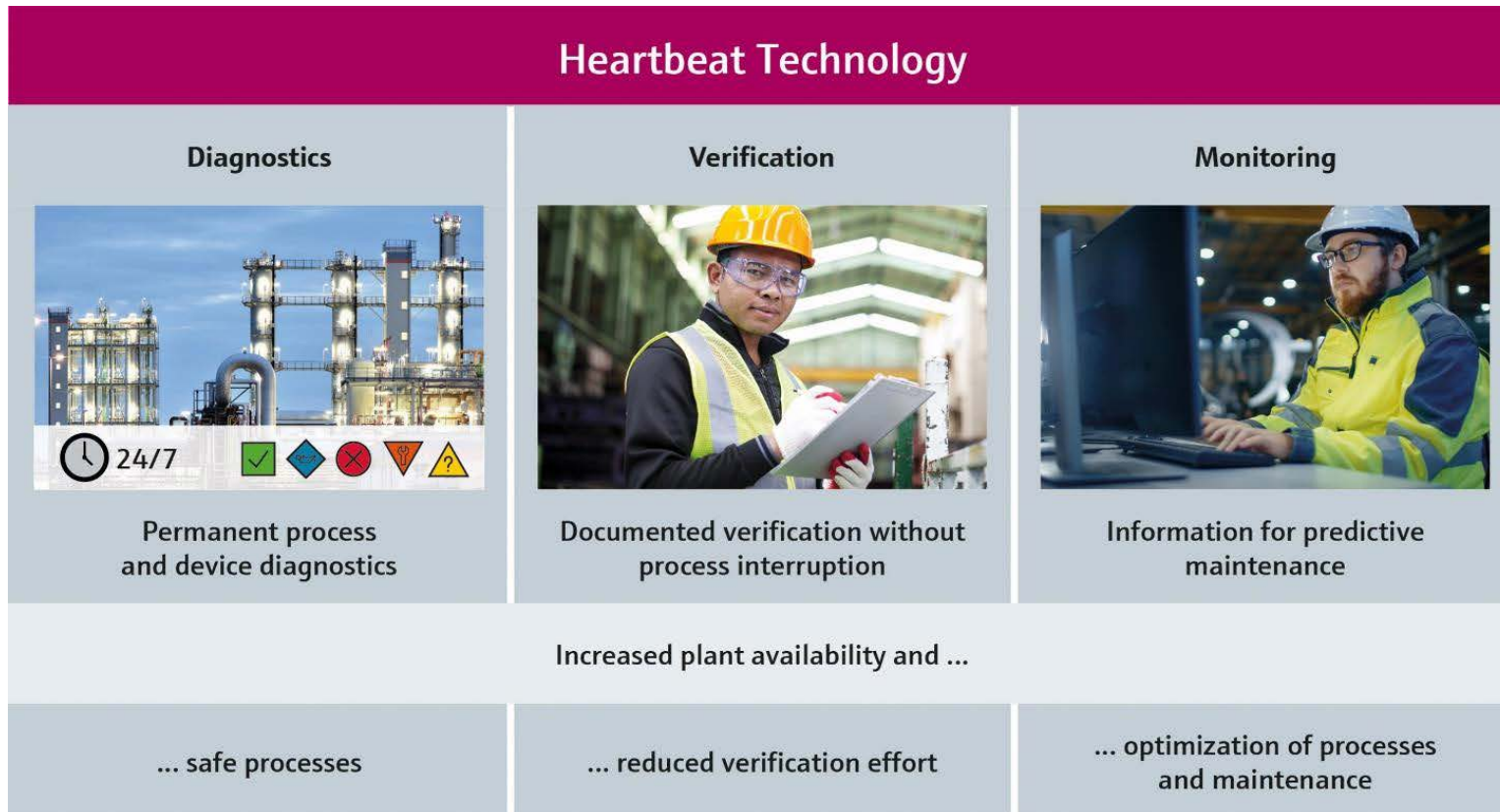
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**Heartbeat Technology** saves costs in processes of a plant and ensures the plant availability as well as a safe plant operation.

- Permanent **diagnostics** of processes and devices with standardized messages guarantee an **economical maintenance** and a **significant extension of test cycles**.
- Measuring devices are **verified** without process interruption. Customers' **documentation** requested by standards and regulations are organized by an automatic generated documentation.
- A good overview of all information for **monitoring** is available to derive **predictive maintenance** and **process optimization** strategies without requiring expert device knowledge.

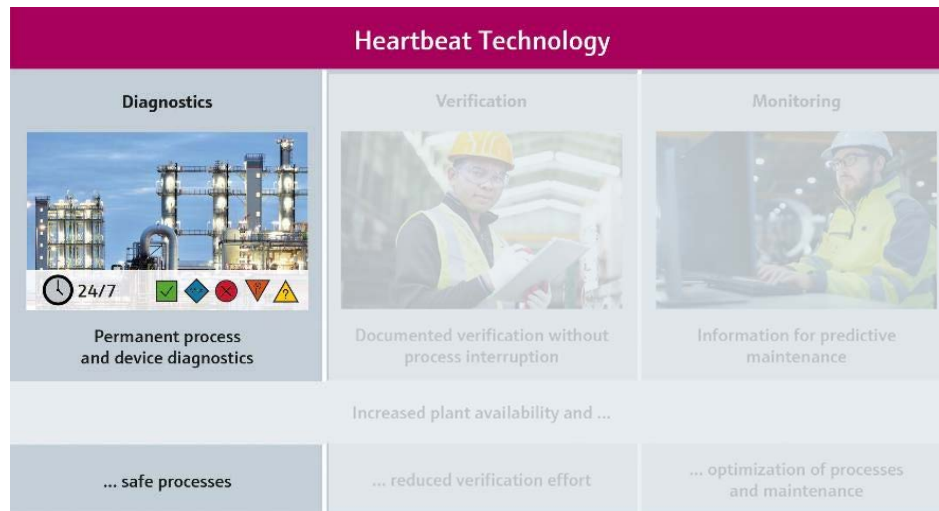
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## Heartbeat Technology at a glance



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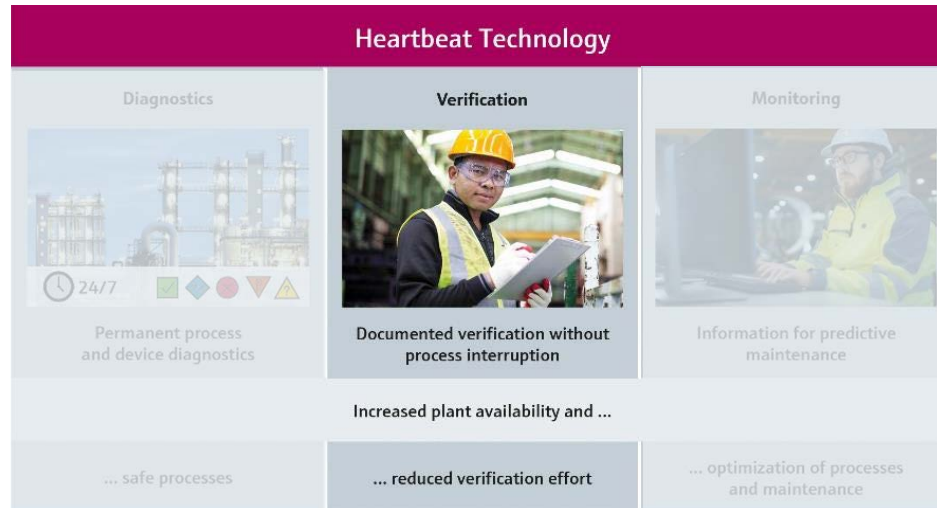
## What Diagnostics stands for



- Permanent process and **device diagnostics** with high internal diagnosis
- **Standardized diagnostic messages** with clear guidelines enable an economical maintenance
- Permanent device diagnostics guarantee a **safe plant operation** with **extended proof test cycles**

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## Explanation of Verification

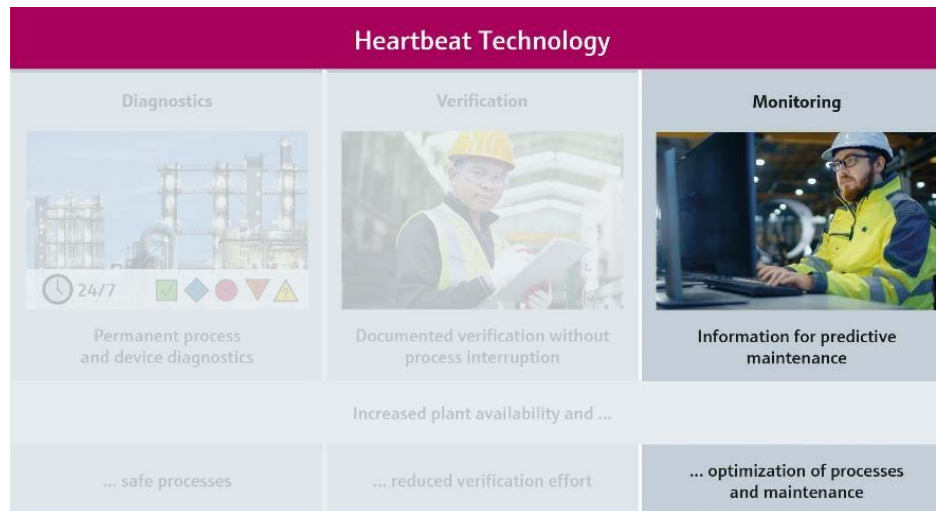


Verification ≠ Calibration  
Verification ≠ SIL

- Heartbeat Technology **verifies** the correct function of the measuring device according to the specifications and generates a **protocol without process interruption**
- The automatic generated protocol supports the documentation requested by internal and external **formalities, laws and standards**

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## Definition of Monitoring







Heartbeat Technology provides additional parameter for **predictive maintenance and/ or process optimization**

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## All products with Heartbeat Technology have to fulfill the requirements

- Exceptional **internal diagnostics**
- Verification **without process interruption** incl. protocol
- Monitoring functionalities **depending** on the respective **measurement principle**

Flow	Level	Temperature	Analysis
 <p>incl. New Proline</p> <p>B 200 <i>New</i> 300 / 500</p>	<p>Micropilot FMR5x/6x Levelflex FMP5x</p>  <p><i>New since Q1 2017</i></p>	 <p>TrustSens</p> <p><i>Available at ACHEMA 2018</i></p>	<p>Sampler</p>  <p><i>New 2017</i></p> <p>Liquiline CM44x</p>

And more to come...

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## Success so far

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**14.750** sold Heartbeat Technology options sold 2017 in **Flow**

Around **2.000** Heartbeat Technology options sold in **Level** in less than one year

**16%** of the new Proline

**20%** of Micropilot





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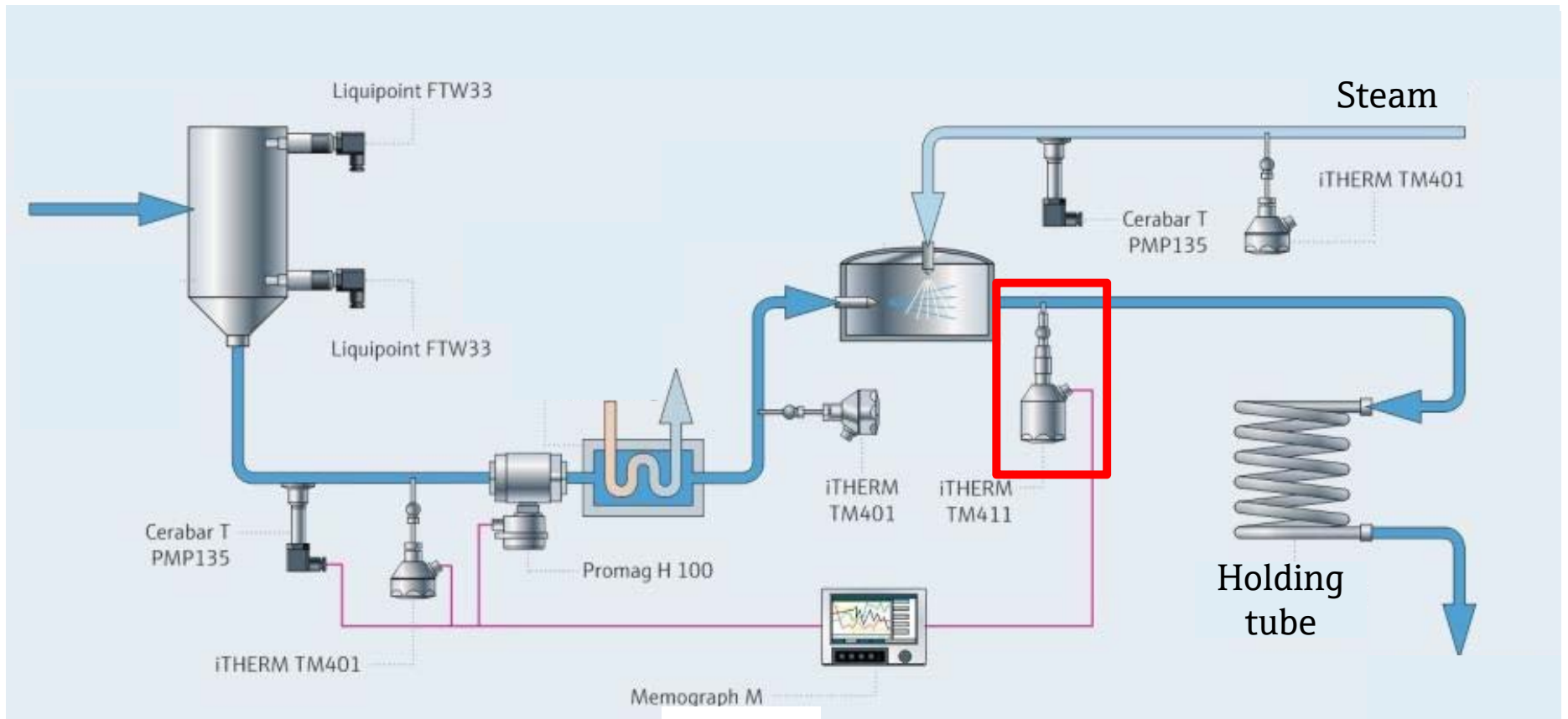
## Introducing



The world's first  
**self-calibrating**  
temperature sensor

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## Pasteurization process: Critical measurements must be calibrated!



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## Preconditions for a traceable - OFFLINE - Calibration

### Reference

Regularly calibrated by a third party.

Block- or oil-calibrator



accuracy  
homogeneity  
repeatability

Reference thermometer



accuracy

### Calibration

Regularly Re-Calibration  
by trained and skilled staff



remove

check



every  
12month

remounting

Manual  
validation

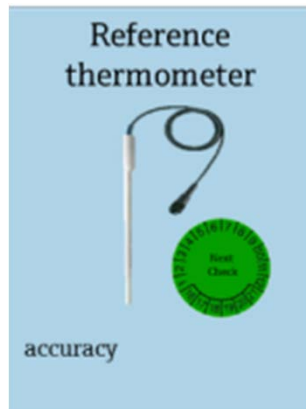
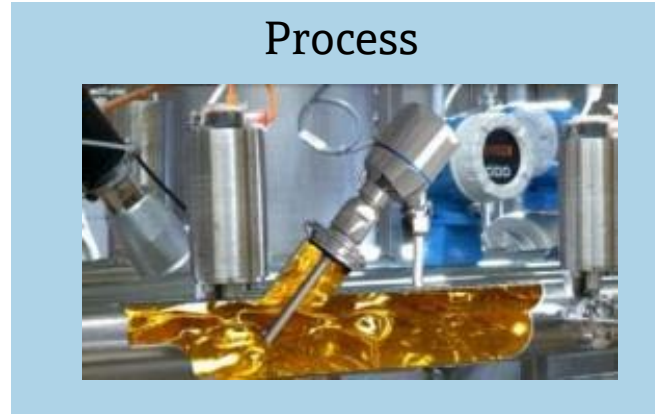
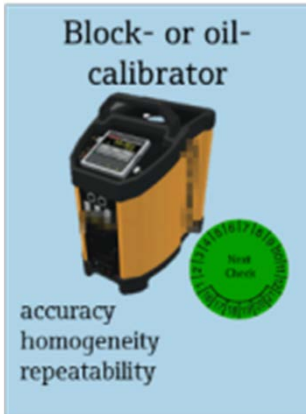


Certificate

Manual  
Docu

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## Traceable - INLINE- Calibration with Heartbeat technology



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## Why is it important to have a fixed point as a reference?

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A physical fixed point shows **no drift!**

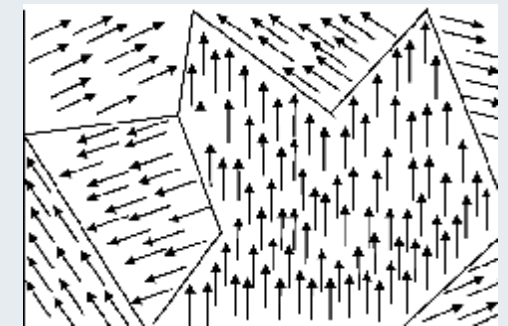
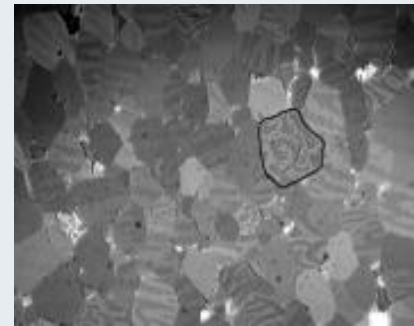
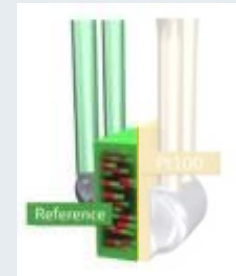
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## Offline fixed point vs. Inline fixed point

### Water triple point @0.01°C



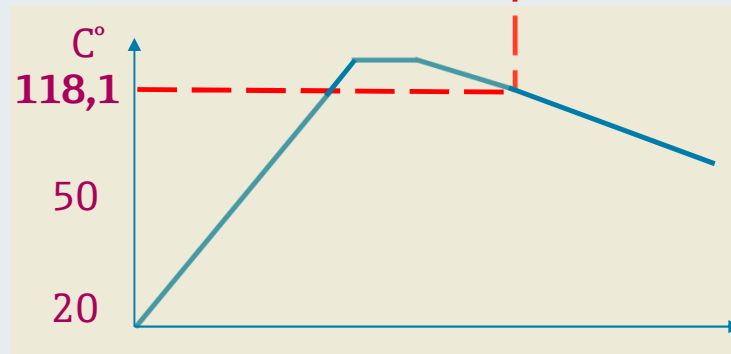
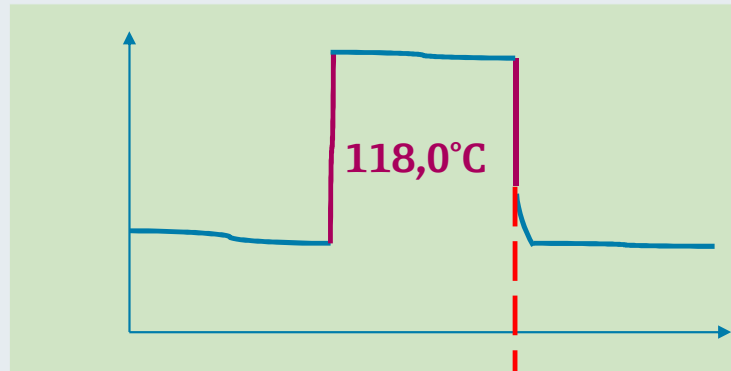
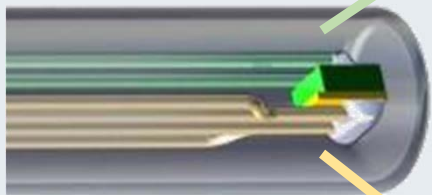
### TrustSens Ceramic Curie point @118°C



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## Traceable - INLINE- Calibration with Heartbeat technology

### Automated Inline Calibration



**Automated Calibration**

ceramic fix point

-

measured RTD value

=

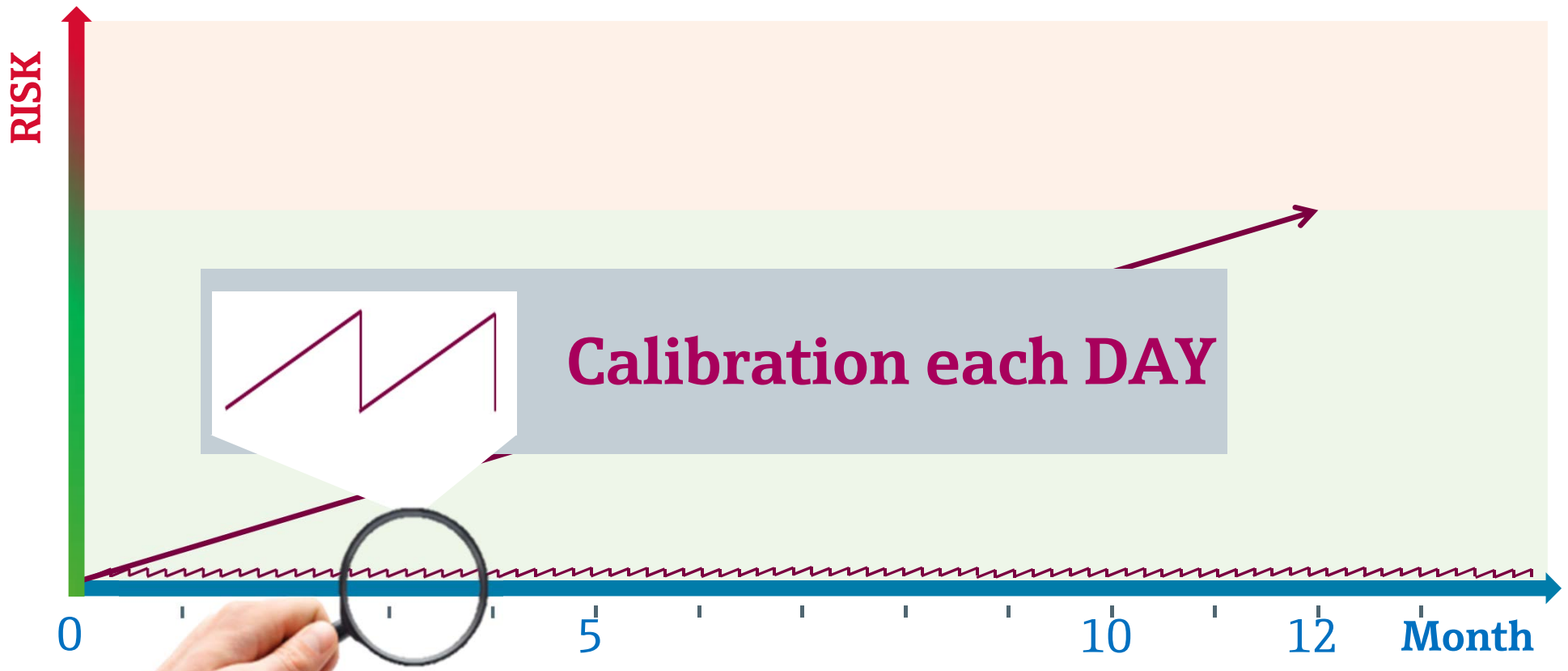
**Deviation**

$118,0^{\circ}\text{C} - 118,1^{\circ}\text{C} =$   
**-0,1°C**



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## 100% Risk reduction



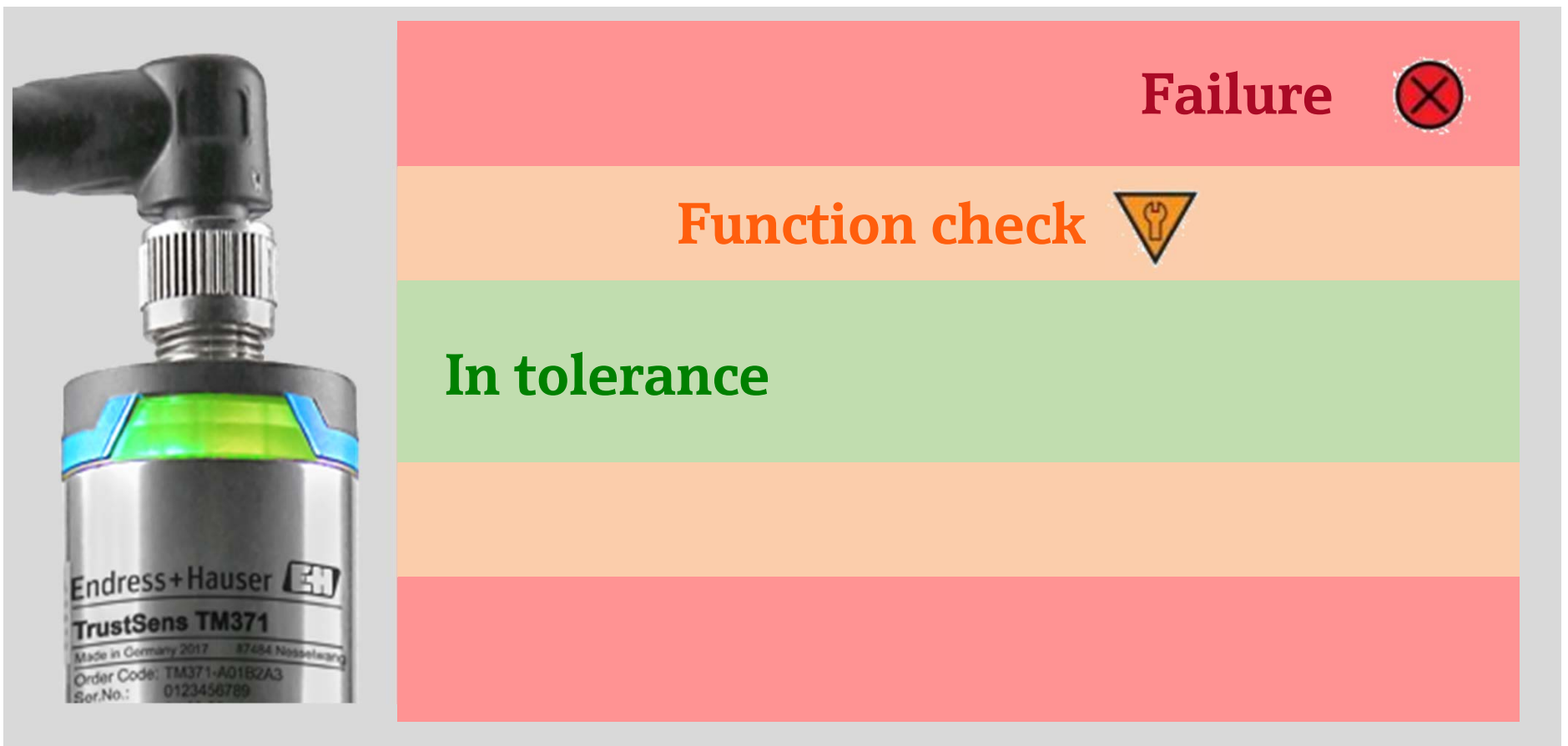
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## Real time health information with Heartbeat diagnosis



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## Free programmable ranges for real-time monitoring



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## How can the calibration be documented

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Memory of 350 calibration points inside the transmitter

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## Automated documentation process – fully audit proof

**Endress+Hauser**

People for Process Automation

every  
12 months

**HART**

**Calibration certificate**

Certificate-No. H100001143C2  
 Date of issue (DD.MM.YYYY) 20.02.2017  
 Operating hours counter 1000h  
 E+H order number / position 1234567890 / 0090  
 Customer order number / position 1234567890 / 0010

Device	Order code	Serial number	Est. order code
Thermometer	TM371-14L2/P	H1000141425	TM371-A1AAJAMAAT7

Tagging (TAG), on device TIR-0  
 Tagging (TAG), fieldbus TIR-0  
 Tagging (TAG), metal TIR-0  
 Tagging (TAG), RFID TIR-0  
 Tagging (TAG), Commissioning label TIR-0

**Standards used**

Description of the Standard	Certificate No
Built in Ceramic Reference	

**Description**  
 The temperature values are according to the ITS-90.  
 The calibration at 118,0°C is performed automatically on the Curie point from the built in reference ceramic.  
 The Measurement uncertainty for the curie point is <math>-0,3K</math>.

**Measurement results**

Operating hours Counter	Reference temperature $t_r$	Measured Temperature value (calculated acc. To IEC 60751)	Deviation	Measurement uncertainties $(k=2)$	Max. allowed deviation		Assessment	Calibration point ID
					- (°C)	+ (°C)		
950	118,0	118,30	0,30	0,30	-1,0	+1,0	ok	1445

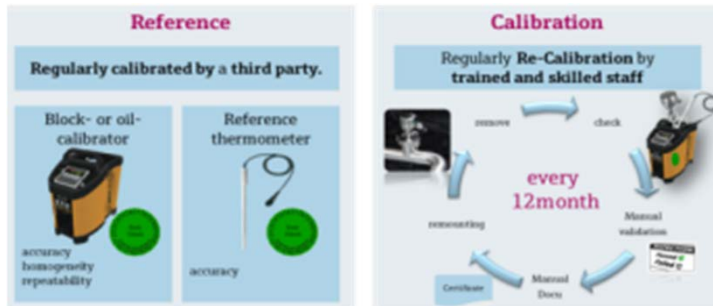
<sup>1)</sup> Interruption(s) of the operating hours counter between count 1000h and 950h due device restart(s)

**LoopCheck active**  
 The last signal pattern for LoopCheck was initiated at operating hours counter reading 905

The measurements uncertainty were estimated at twice the standard deviation.  
 The test unit has been calibrated and complies with the tolerances stated by the manufacturer.

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## Manual offline calibration vs. TrustSens inline calibration



Calibration every 12 months

Manual documentation

Shutdown needed

Drift is not detected

Calibration every 118°C/55°C

Completely automated

Inline during production

Permanent self monitoring



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**TrustSens is unique in the market**

