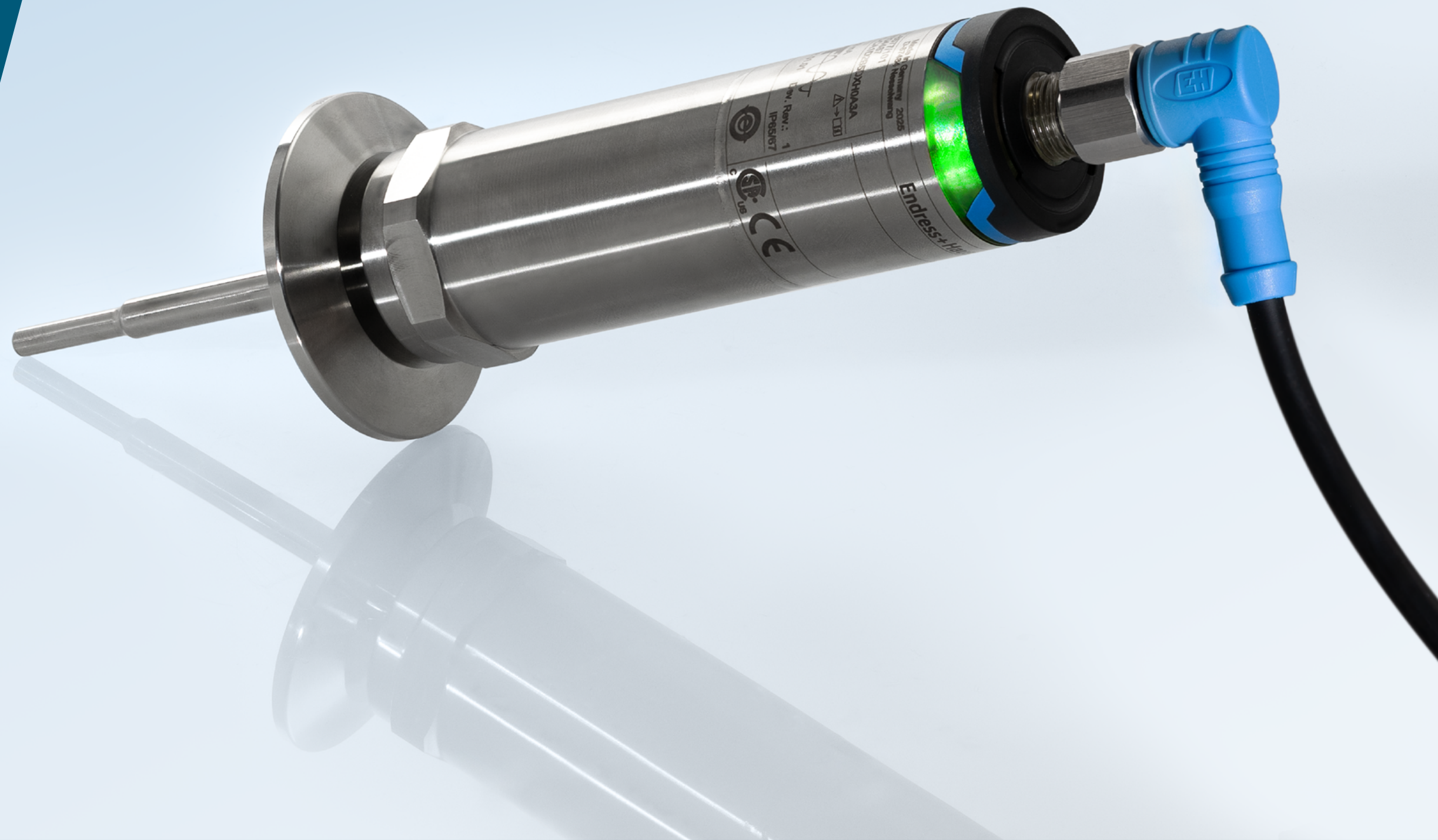


100% compliance.
0% risk.

iTHERM TrustSens: self-calibrating
thermometer for hygienic and aseptic
applications.



iTHERM TrustSens

RTD thermometer with self-calibration technology for hygienic and aseptic applications

iTHERM TrustSens is **the only self-calibrating RTD thermometer** for hygienic processes, delivering continuous accuracy and compliance without interrupting production.

Its fully automated in-situ self-calibration and Heartbeat Technology ensure reliable drift detection, audit-proof documentation, and maximum process efficiency.

iTHERM TrustSens TM371 (metric version):

iTHERM TrustSens TM372 (imperial version):



Benefits at a glance

The main advantage of iTHERM TrustSens is risk reduction, achieved through inline self-calibration and automatic, traceable documentation to ensure reliable process temperature values at all times.

This major advantage is complemented by additional benefits.



Highest measurement accuracy
thanks to individual sensor-transmitter matching performed at the factory.



Safe audits and minimized risk:
Automatically generated, traceable and audit-proof calibration certificates.



No plant downtime and reduced operational costs:
Fully automated in-situ self-calibration without interrupting the process for recalibration.



Improved product quality and process safety:
Continuous device monitoring and verification with Heartbeat Technology, including automated loop checks.



Easy handling: iTHERM TrustSens comes preconfigured for quick integration; simply connect and start measuring. Guided wizards support intuitive commissioning, if needed.



Digitally future-ready: 24/7 access to all calibration data, including cloud-based availability via Netilion.

Risk reduction

Traditional calibration

All temperature sensors, including Pt100, are subject to aging and drift. With traditional manual calibrations performed at long intervals, the risk of undetected drift increases continuously over time. If a deviation is finally discovered at the interval check, you face critical questions:

- When did the problem start?
- Which batches are affected?
- Do we now need investigation, rework, or even recall?

Manual calibration requires process interruption, device removal, and manual documentation, adding labor cost, downtime, and the risk of mechanical damage during handling. In short, conventional calibration exposes production to periods of elevated and unknown risk between checks.

iTHERM TrustSens self-calibration

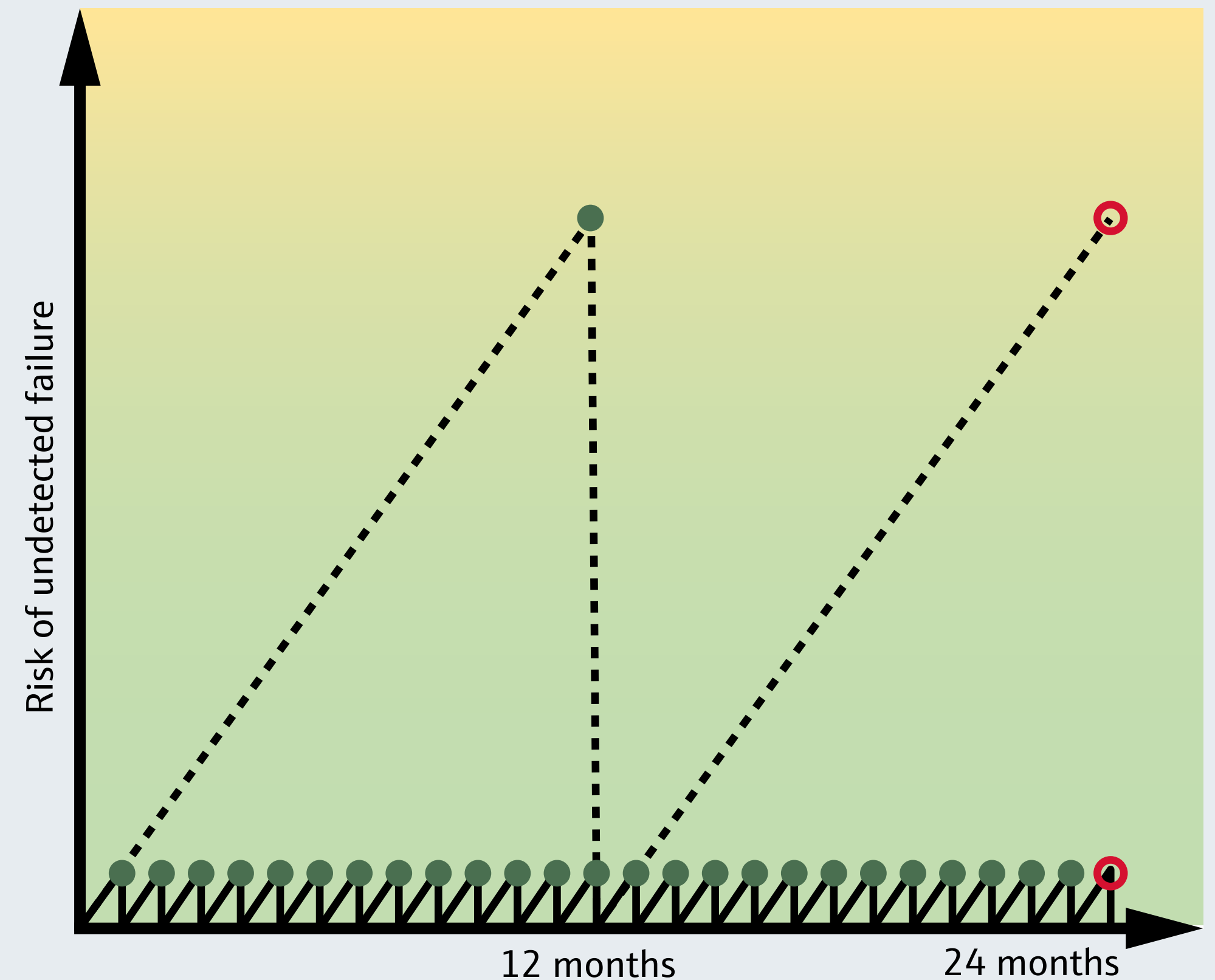
With iTHERM TrustSens, calibration happens automatically, inline, and without interrupting the process. Every time the process temperature passes the integrated Curie reference point, e.g. after every cleaning process, the device performs a fully traceable, certified self-calibration. Risk is reset batch-by-batch, eliminating the possibility of undetected failures and ensuring product quality.

.....
Traditional
calibration

—————
iTHERM
TrustSens
calibration

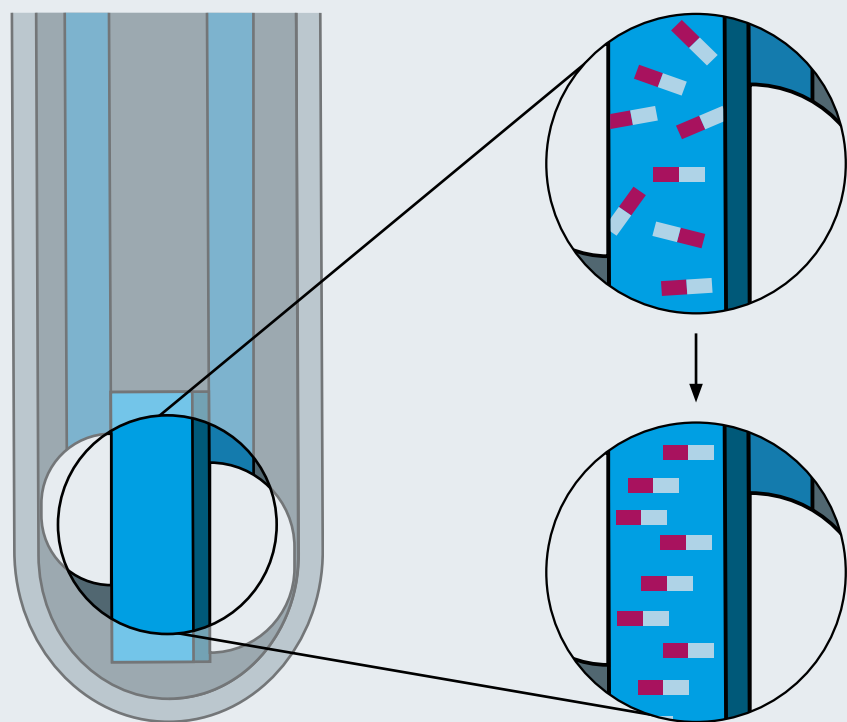
●
Successful
calibration

○
Deviation
detected



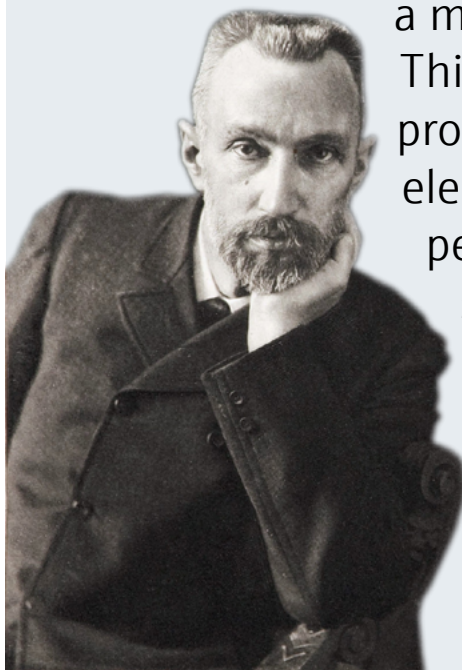
Self-calibration

iTHERM TrustSens uses the phenomenon of the Curie-temperaure as the basis for fully automated, traceable self-calibration.



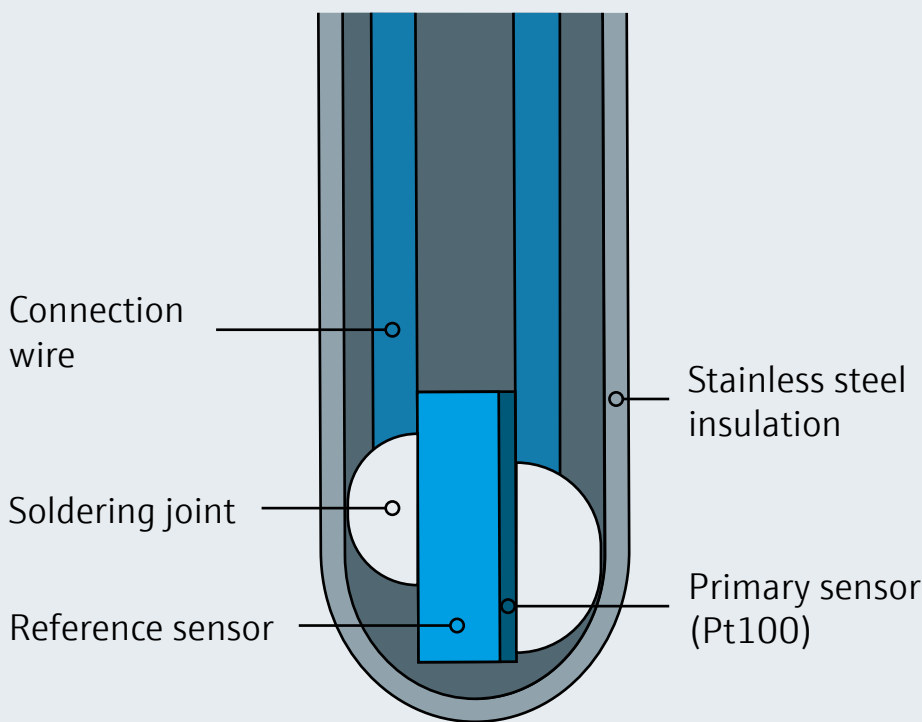
Curie temperature

The French physicist Pierre Curie discovered and gave his name to the Curie temperature, which is the physical fixed point at which the ferromagnetic properties of a material abruptly change.



Pierre Curie

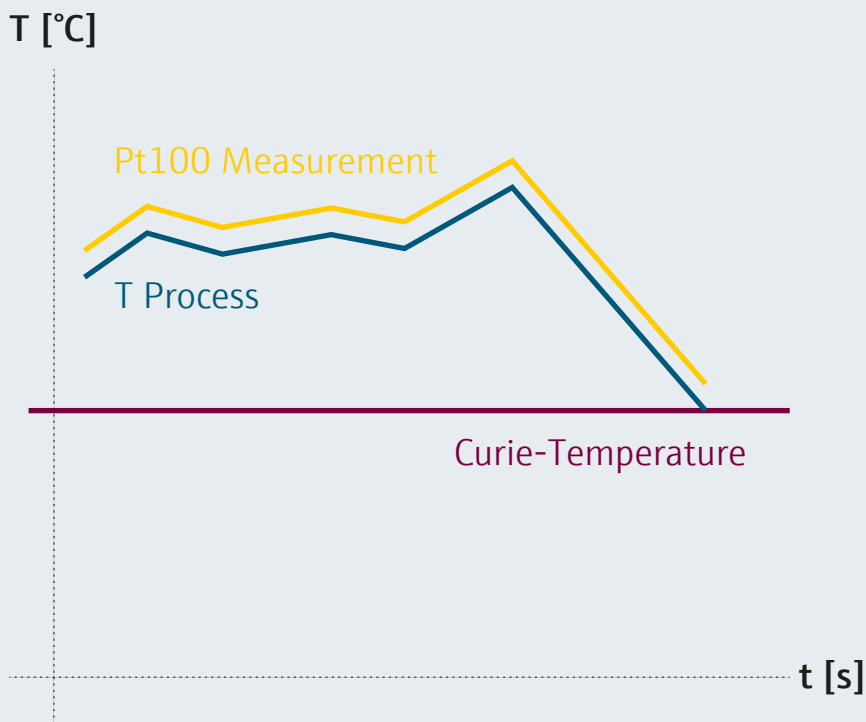
This instant change in properties can be detected electrically. This Curie temperature is a material specific constant that will not vary from its original determined temperature.



Sensor design

Our thermometer uses this phenomenon in the form of a calibrated reference (master) sensor placed directly next to the primary Pt100 . For every device, the exact Curie temperature of this reference element (118 or 39 °C / 244 or 102 °F) is determined, stored in the device during production and documented in an individual calibration certificate supplied with each instrument.

As a physically fixed reference point, it provides a stable calibration reference for the Pt100.



Self-calibration

Each time a cooling process is initiated starting at higher temperatures, the Pt100 sensor is calibrated automatically. Once the Curie temperature is reached, the reference sensor transmits an electrical signal.

At the same time a measurement is carried out in parallel via the primary sensor. Comparison between these two values is effectively a calibration.

Verification vs. Calibration

Calibration and verification are often used interchangeably but describe fundamentally different concepts in metrology.

iTHERM TrustSens is currently the only device on the market to perform a true calibration.

Other solutions on the market that are based on sensor redundancy, NTC sensors, drift monitoring, or plausibility checks perform a verification. The described principles do not meet the ISO/IEC requirements for calibration and constitute validation only. They are based on sensor-to-sensor comparison or temporal trend monitoring without a physical fixed point or metrological reference. Traceability, calibration certificates, and third-party certification are not provided.

Verification

Functional check of sensor integrity and limit compliance

Not traceable to standards

No defined measurement uncertainty

No calibration certificate

Not audit-ready



Calibration

Metrological comparison to a reference standard under defined conditions

Traceable to recognized standards

Quantified measurement uncertainty

Auditable calibration certificates

Audit-ready for regulated environments

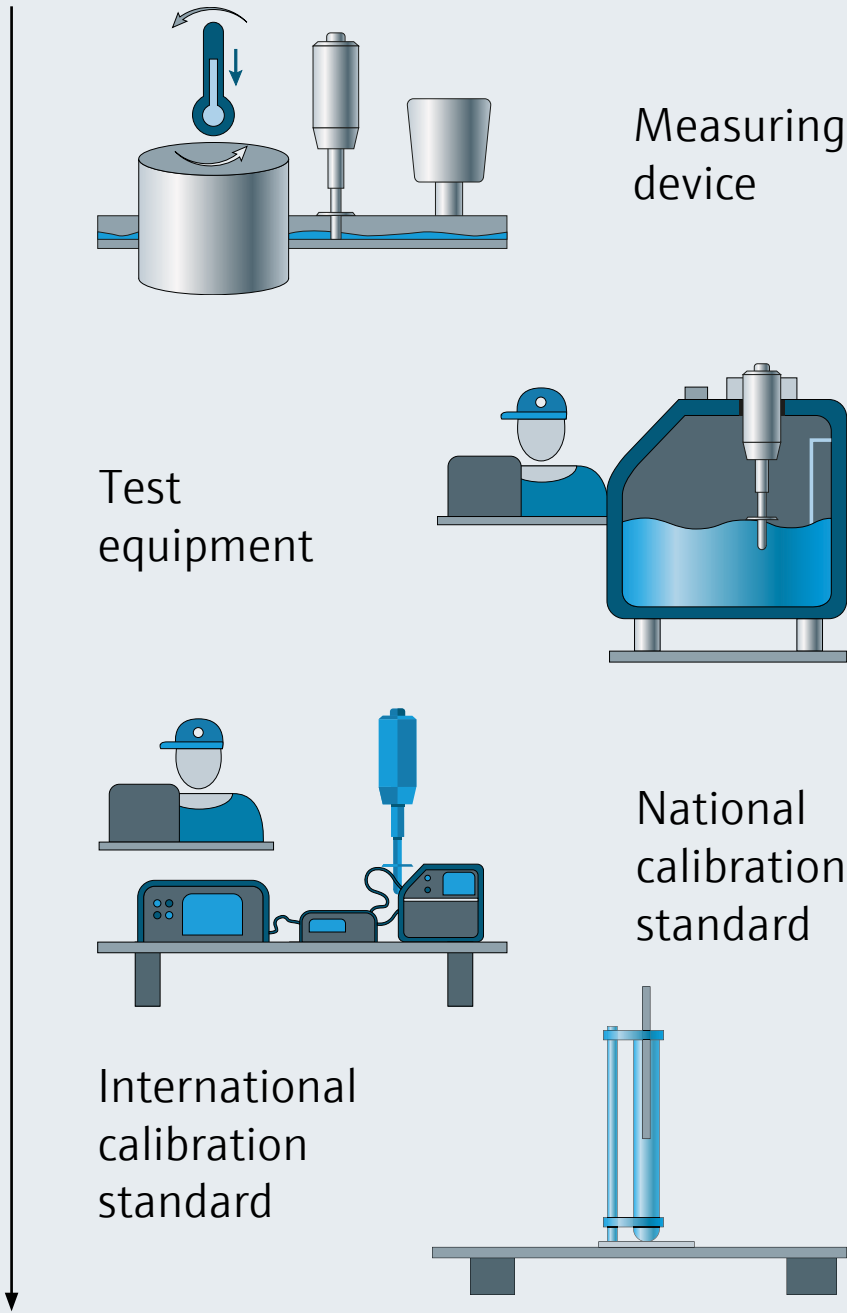




Proof of concept

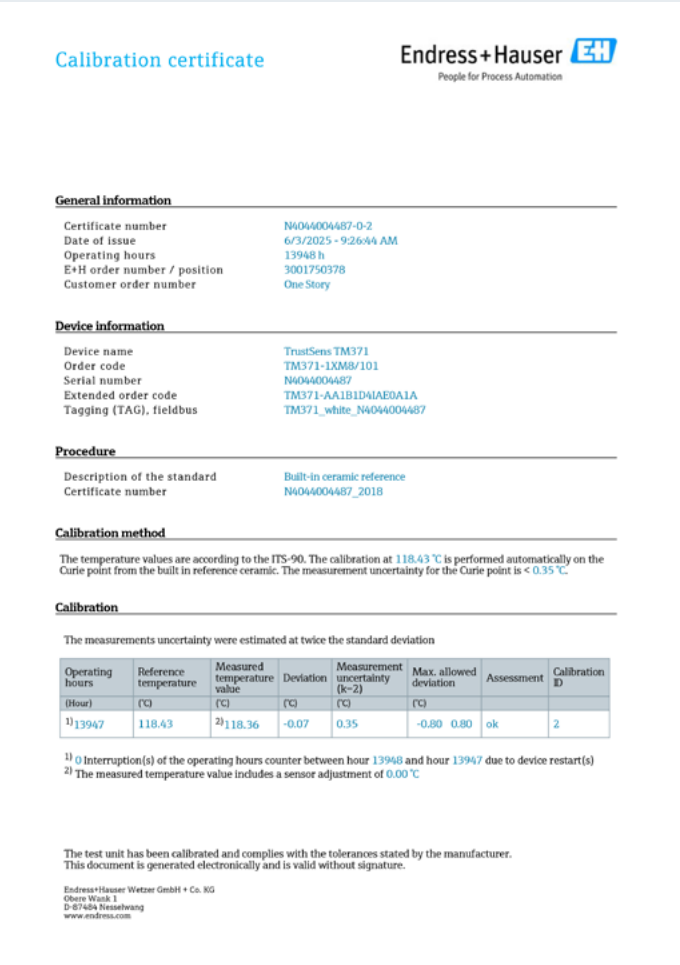
Traceable calibration – seamlessly integrated into your process.

Each iTHERM TrustSens is delivered with certified traceability to recognized standards, verified through independent testing procedures. Calibration data is stored, accessible, and ready whenever proof is required.



Traceable calibration

- Supplied ex works with a calibration certificate for the integrated fixed point reference
- Ensuring traceability to the ITS 90 temperature scale



Audit-ready

- Up to 350 calibrations are stored
- Valid calibration certificates can be generated with a few clicks
- Certificates can be exported and integrated into QA workflows



Independently verified

- Independently verified by TÜV (test report available)
- Performance confirmed by extensive load tests over many thousands of calibration cycles (lab + field)

Industry focus

iTHERM TrustSens was designed for critical hygienic / aseptic applications in life sciences and food & beverage.

The calibration point at 118 °C (244 °F) supports **steam-based applications like SIP cleaning or autoclaves in Life Sciences**, while in Food and Beverages a focus application is the UHT treatment of milk.

The calibration point of 39°C (102 °F) opens up a wider world. Focus applications are **CIP cycles in both industries but also, pasteurization** at lower temperatures, where steam isn't present but compliance still is.

The thermometer is available with a comprehensive set of hygienic, food-safety and instrumentation approvals, including EHEDG, ASME BPE, FDA, 3-A, and explosion-protection standards such as ATEX, IECEx, ensuring suitability for a wide range of applications.



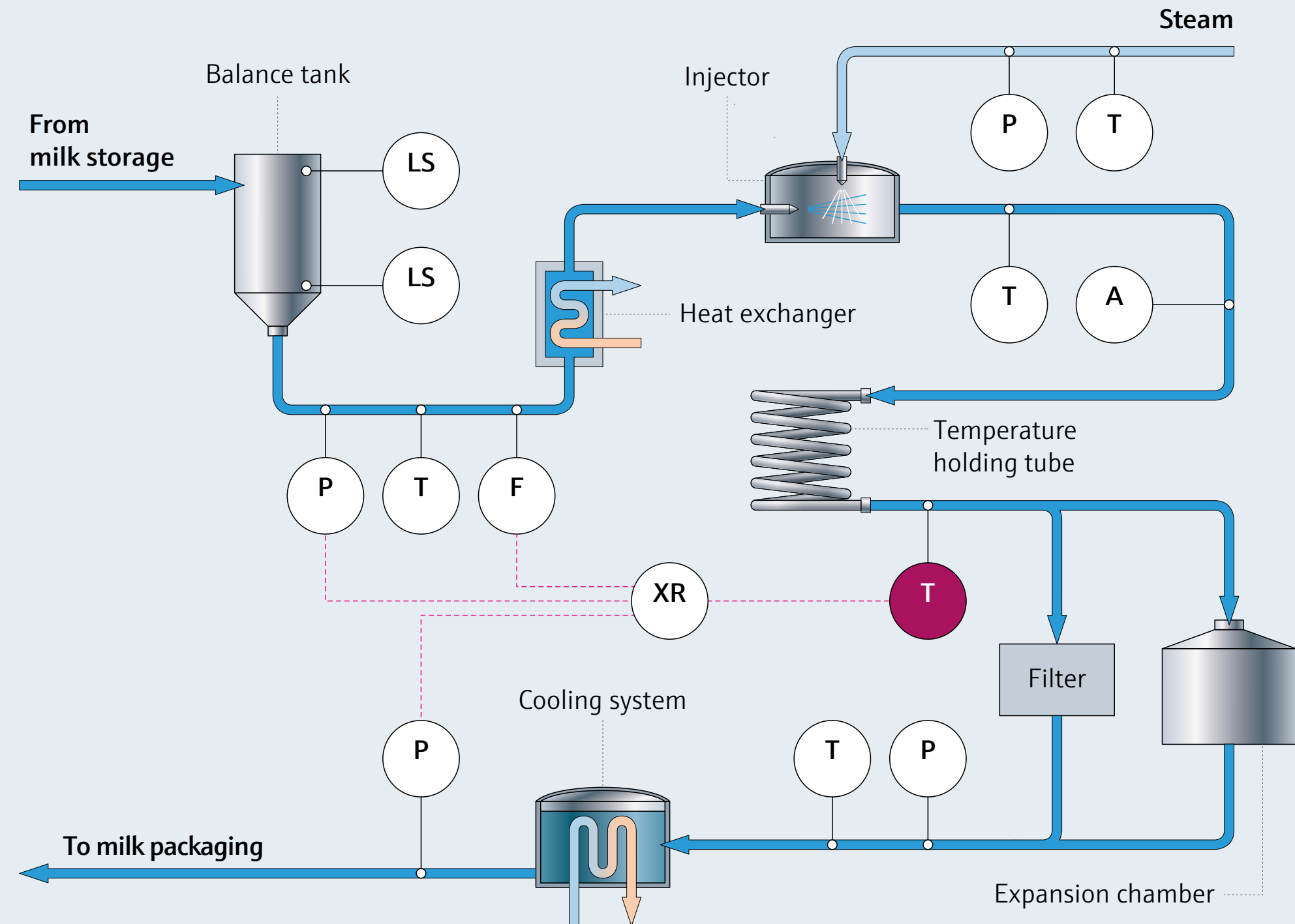
Increase process safety and product quality in thermal treatment (pasteurization)

Pasteurization is most commonly used for milk and other dairy products, but the process is also applied to beverages, egg products, canned food and ready meals. The objective is to destroy pathogenic microorganisms and ensure product safety.

The most critical process parameter is temperature, in combination with holding time. Pasteurization therefore requires precise and reliable temperature measurement to ensure product safety, maintain product quality, support regulatory compliance and enable efficient operation.

Typical pasteurization methods include:

- **HTST (High Temperature Short Time):**
72-75 °C (162-167 °F) for 15-30 seconds
- **LTLT (Low Temperature Long Time):**
63-65 °C (145-149 °F) for 30 minutes



Your challenge

- **Measuring task:** Accurate temperature monitoring during pasteurization
- **Measuring points:** Heating, holding (CCP) and cooling sections
- **Medium:** Dairy products, beverages, prepared foods
- **Process temperature:** 63-75 °C (145-167 °F)
- Ensuring product safety through reliable temperature control
- Preventing overheating and quality losses
- Meeting compliance and documentation requirements
- Reducing calibration effort and downtime

Our answer

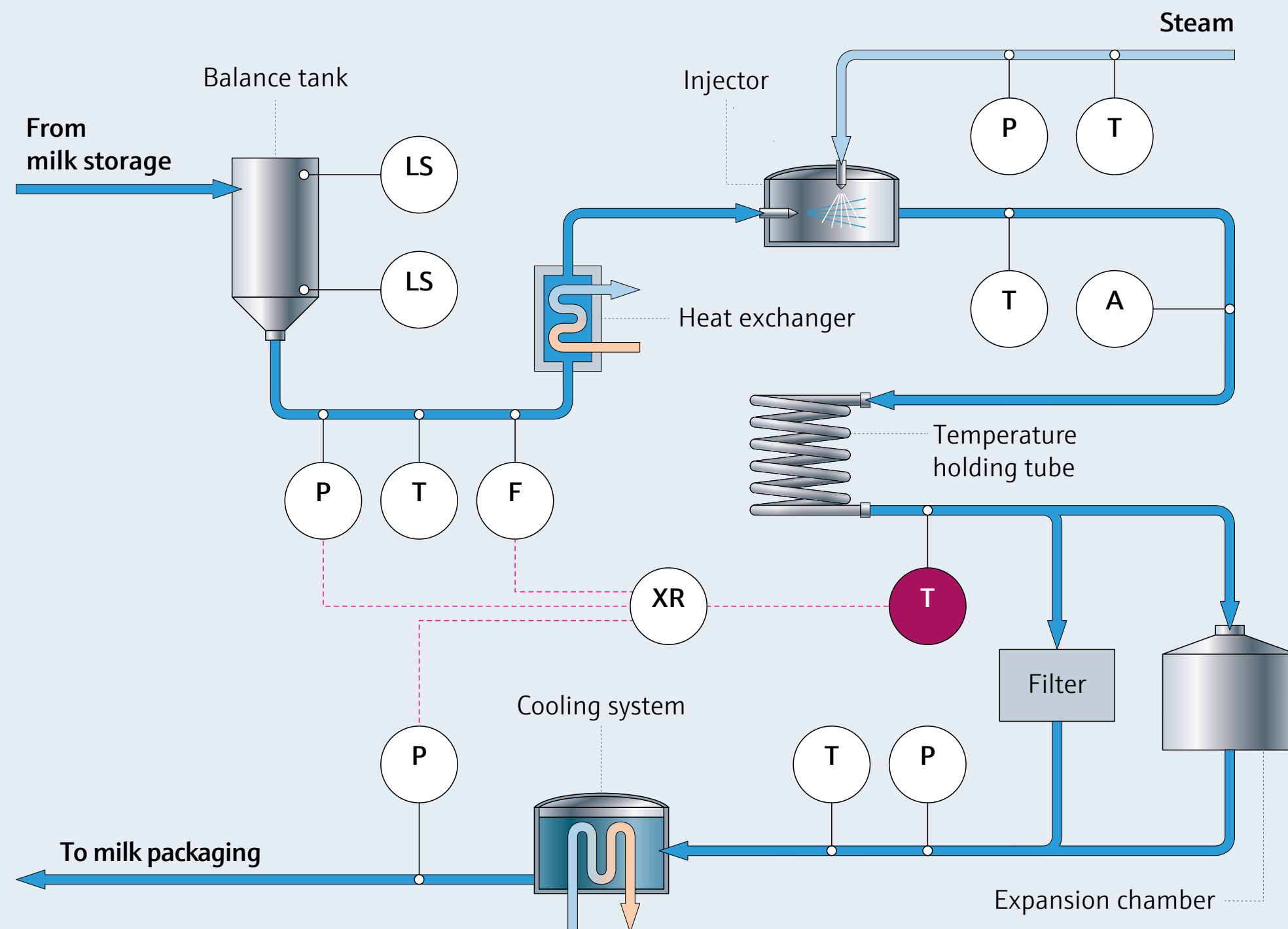
iTHERM TrustSens automatically performs a traceable self-calibration whenever the process passes the **39 °C (102 °F)** calibration point, for example during batch changes or cleaning cycles.

Maximize product safety, product quality and productivity in UHT processing

Ultra-high temperature (UHT) processing is a critical sterilization method used not only in dairy production but also in the manufacture of fruit juices, cream, soy milk, yogurt, wine, soups, honey, and ready-to-eat meals. Its objective is the destruction of all microorganisms and spores that could compromise product safety or shelf life.

As temperature and holding time directly determine the effectiveness of microbial inactivation, temperature represents the most important process variable.

For this reason, UHT applications demand highly accurate and reliable temperature measurement systems to ensure product safety, regulatory conformity, and consistent process performance.



Your challenge

- **Measuring task:** Accurate temperature monitoring throughout the UHT cycle
- **Measuring points:** Heating, holding (CCP) and cooling sections of UHT systems
- **Medium:** Dairy products, beverages, prepared foods
- **Process temperature:** 135-150 °C (275-302 °F)
- Hitting the exact holding temperature that guarantees microbial safety
- Avoiding overheating that degrades flavor, denatures proteins and destroys heat-sensitive vitamins
- Steam-hammer pressure surges when operating above the boiling point
- Sensor damage and measurement drift that erode reliability over time

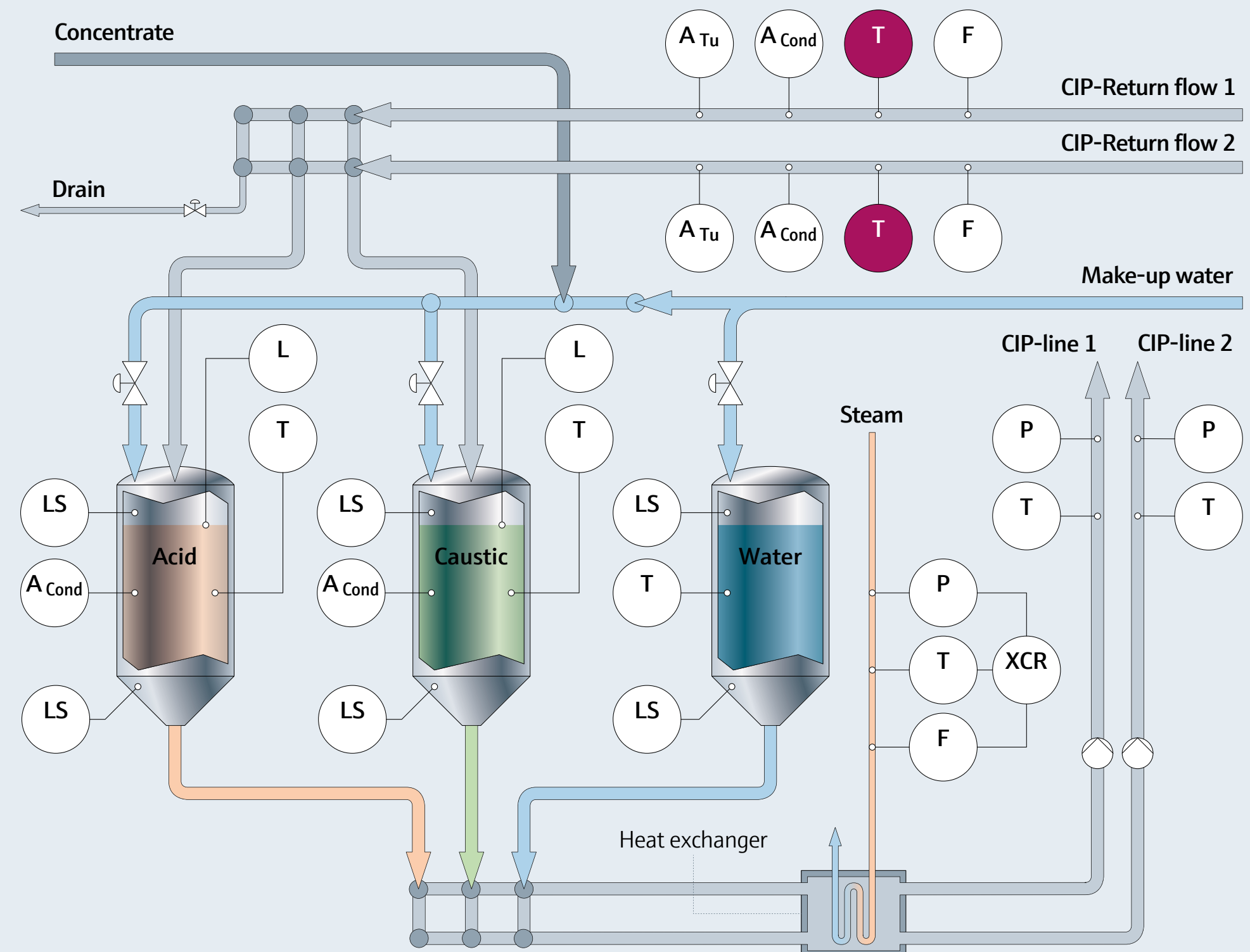
Our answer

iTHERM TrustSens self-calibrates automatically each time the UHT process is stopped before a CIP cleaning, when the sensor passes the calibration point at **118 °C (244 °F)**, typically with every batch.

Achieve consistent cleaning performance and reliable hygiene compliance in CIP processes

Cleaning-in-place (CIP) is a critical process in nearly every production step inside the food & beverage industry and the life sciences industry. Its objective is to remove product residues and deposits from all inner surfaces of the production plant. These cycles rely on precise and repeatable temperature control to ensure that cleaning agents perform as intended and hygiene standards are consistently met.

Because temperature at critical control points (CCP) directly impacts cleaning efficiency, even small measurement drifts can lead to non-compliant cleaning results, extended downtime, or repeated CIP cycles. Reliable, drift-free temperature measurement is essential to maintain product safety and process integrity.



Your challenge

- **Measuring task:** Temperature monitoring during CIP cleaning steps
- **Measuring points:** Return line, critical control points, tanks, vessels, valves, filters
- **Medium:** Caustic and acid cleaning solutions, water
- **Process temperature:** 20–85 °C (68–185 °F)
- Hitting the target temperature that makes cleaning agents fully effective
- High flow velocities during flush-out that physically stress the sensor
- Measurement drift building up over repeated cleaning cycles

Our answer

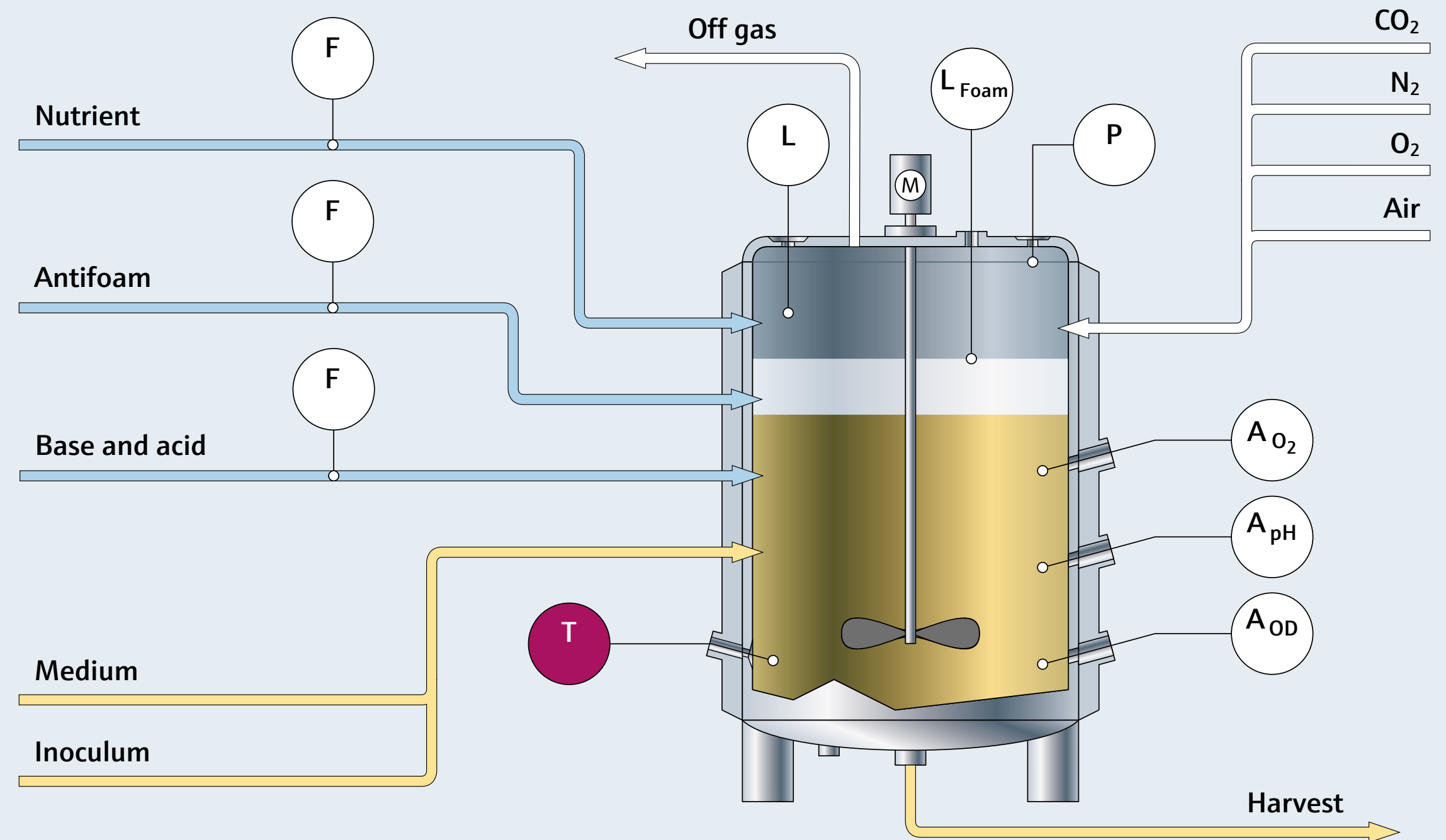
iTHERM TrustSens self-calibrates automatically whenever the cleaning agent is flushed out with fresh or recycled water and the process passes the calibration point at **39 °C (102 °F)**, typically several times a week.

Safe cell cultures and sterilization in bioreactors

The entire plant needs to be steam-sterilized before the starter culture (Inoculum) can be inserted. Sterilization-in-place (SIP) uses pressurized steam to destroy all microorganisms and spores that could compromise product safety. In this step, temperature and holding time directly determine the effectiveness of microbial inactivation. During the production phase the temperature has to be controlled exactly on the value which is optimal for the growth and well-being of the cultivated (living) cells.

For this reasons, cell culture applications demand highly accurate and reliable temperature measurement systems to ensure product safety, regulatory conformity, and consistent process performance.

To ensure that sterilization temperatures are maintained at all critical measurement points, additional sensors are required, which must be installed around the bioreactor (not shown in the diagram).



Your challenge

- **Measuring task:** Accurate temperature monitoring throughout the production and cleaning cycle
- **Measuring points:** Bioreactors, Fermenters, pipes, filters
- **Medium:** Cell culture liquid, sterilization steam
- **Production temperature:** 28-37 °C (82-98 °F)
- **Sterilization temperature:** 121-134 °C (249-273 °F)
- Reaching the holding temperature that guarantees sterilization
- Avoiding overheating that damages filters and seals
- Steam-hammer pressure surges when operating above the boiling point
- Sensor damage and measurement drift that threaten reliability

Our answer

iTHERM TrustSens self-calibrates automatically each time the SIP process is stopped, when the sensor passes the calibration point at **118 °C (244 °F)**, typically with every production batch.

Guarantee sterilization integrity and full traceability in medical autoclaves

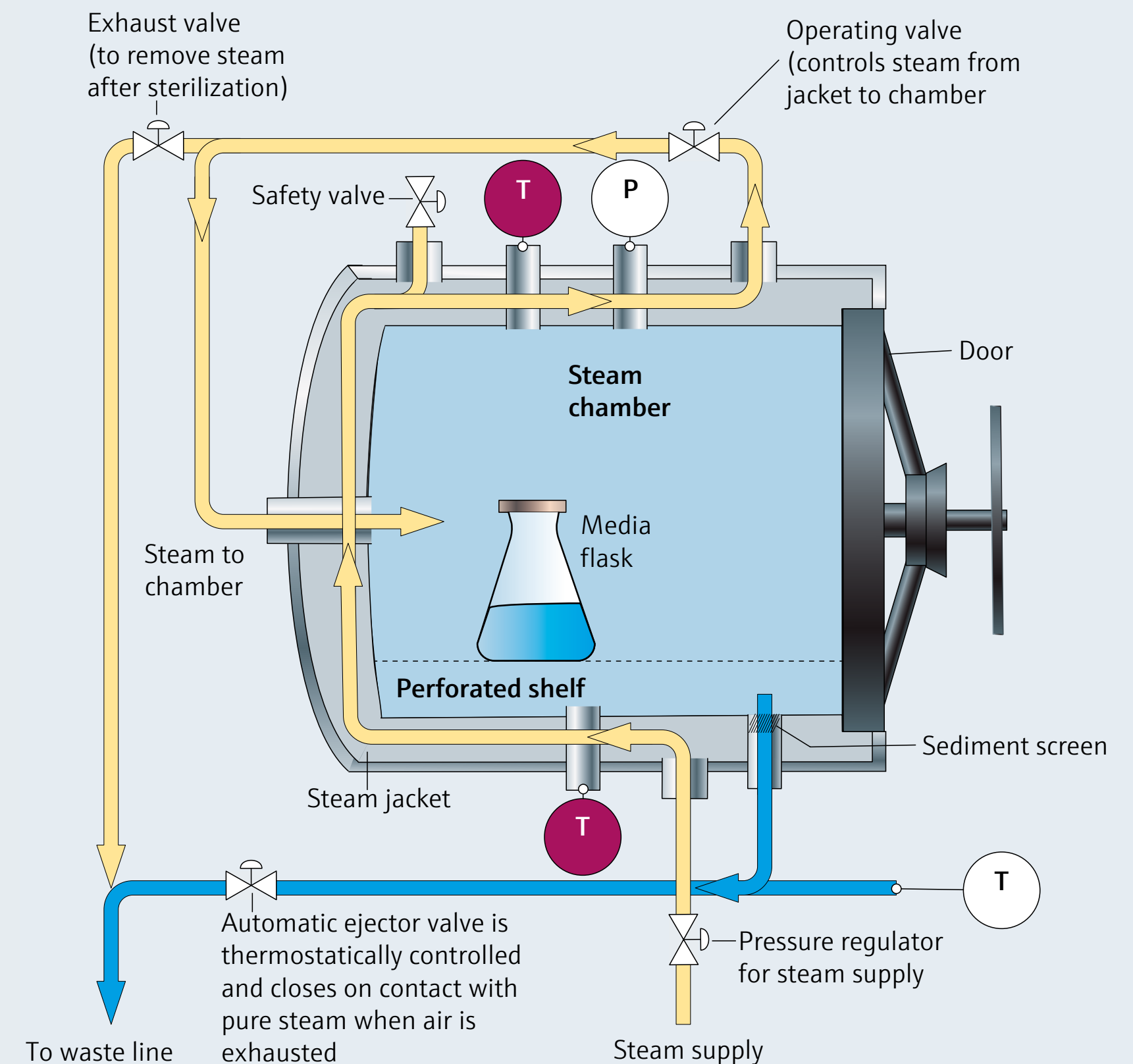
The objective of the autoclave process is the destruction of all microorganisms and spores that could compromise product safety. It is used for the final product but also to disinfect tools, clothing or parts of the production process, which can not be cleaned by a Sterilization-in-Places methods.

As temperature and holding time directly determine the effectiveness of microbial inactivation, temperature represents the most important process variable.

For this reason, autoclaves demand highly accurate and reliable temperature measurement systems to ensure product safety, regulatory conformity, and consistent process performance.

Your challenge

- **Measuring task:** Accurate temperature monitoring throughout the autoclave cycle
- **Measuring points:** Heating and holding zone; coldest zone (drain/bottom areas) of the steam chamber
- **Medium:** Pressurized steam
- **Process temperature:** 121-125 °C (249-257 °F)
- Reaching the hold-phase temperature that ensures sterilization
- Avoiding overheating that decomposes products and destroys heat-sensitive ingredients
- Mechanical damage to thermometers during manual loading and unloading
- Tip impacts that compromise measurement accuracy



Our answer

iTHERM TrustSens self-calibrates automatically each time the autoclave stops, when the inside temperature passes the calibration point at **118 °C (244 °F)** before the door can be opened. This happens once per cycle, so each calibration certificate maps to a specific batch.

Related offering

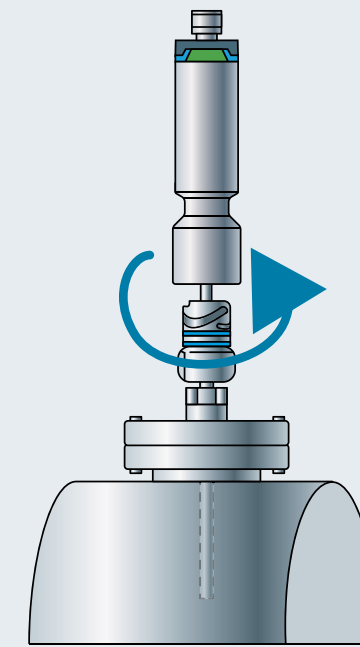
iTHERM TrustSens includes mechanical Endress+Hauser innovations that simplify handling, improve hygiene, and reduce operating effort.

Complementary components and software support operation, integration and monitoring of iTHERM TrustSens across different process environments:

iTHERM QuickNeck

Divisible extension neck with tool-free quick release

More than
50%
cost + time
savings



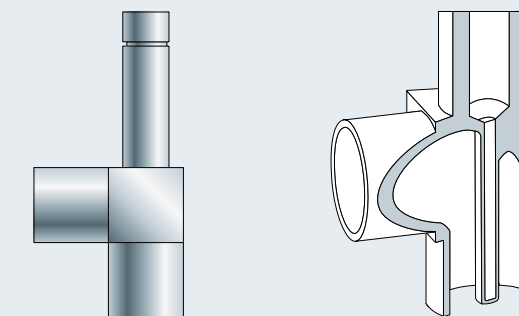
- Simple, tool-free and very fast removal and reinstallation of the insert: with just one twist.
- Minimized risk of errors or damage: no rewiring required, eliminating risks of water ingress, mechanical damage, loss of mounting parts or connection errors (IP69K).
- Increased plant availability and reduced downtime: faster maintenance and safe, hygienic operation ensure higher productivity and process reliability.

Tee and elbow thermowells

Hygienic, weld-free thermowells for hygienic and aseptic applications

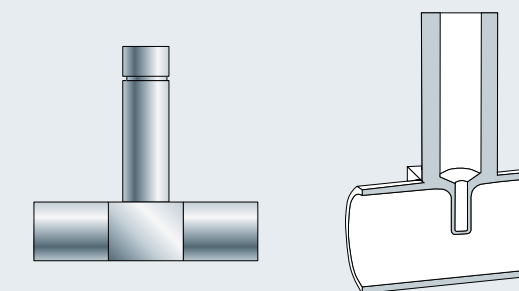
- Milled from a single-piece of stainless steel
- Easy to clean and fully drainable
- CIP/SIP-optimized design
- Reliable measurement even with very short immersion lengths

No dead legs,
no welds.



Elbow thermowell

Pipe elbow and thermowell, with the thermowell projecting straight into one side of the pipe bend.



Tee thermowell

Straight pipe segment joined to a thermowell, with the thermowell projecting into the pipe segment at a 90° angle.

Accessories

iTHERM TrustSens becomes even more powerful when paired with the right system components or software.

These complementary products help you automatically record and visualize calibration events, generate secure documentation, centralize data, and ensure reliable signal and power integrity.

Memograph M RSG45 data manager

- Automated recording of self-calibration events
- Tamper-proof certificate creation & storage
- Easy integration via PROFINET / Ethernet-IP / Modbus
- Supports up to 20 HART® devices for full calibration visibility



FDM Software MS20 Field Data Manager Software

- Centralized management of iTHERM TrustSens calibration data
- Automated batch and audit-ready reporting
- Secure, tamper-proof calibration history
- Live visualization of measurements and trends



RIA15 process indicator

- Direct display of HART values, including calibration counter and last measured deviation
- Immediate on-site status indication
- Simple, low-effort installation
- Ideal for basic local visualization



RN42 active barrier

- Intrinsically safe power supply for iTHERM TrustSens
- Clean, isolated transmission of diagnostics
- Slim, space-saving cabinet design
- Reliable operation in all environments
- Connection jacks for easy device access, e.g. for certificate generation





Heartbeat Technology

iTHERM TrustSens includes Heartbeat Technology by Endress+Hauser.

Heartbeat Technology provides you with in-depth device and process insights to increase your plant performance and reduce operating and maintenance costs. This technology is integrated into numerous Endress+Hauser measuring devices and consists of three functions.



Heartbeat Diagnostics – Permanent process and device diagnostics

- Increased measuring reliability and safety thanks to continuously best-in-class diagnostic coverage (up to 97%) and device development according to IEC 61508
- Immediate indication of device failures or processes being run out of device specifications
- Standardized diagnostic messages with clear text instructions regarding cause and remedy

Heartbeat Verification – Documented device functionality without process interruption

- Optimized calibration and proof test cycles due to traceable device verification at the push of a button
- Reduced documentation and auditing efforts thanks to comprehensive verification report
- Clear verification result and third-party attested verification concept (according to ISO 9001)

Heartbeat Monitoring – Information for process optimization and predictive maintenance

- Conversion of physical sensor responses into easily understandable process and device insights
- Monitoring of specific device parameters to optimize operations by identifying and, if necessary, correcting deviations in the process
- Maintenance planning and predictive measures for reliable and safe process operation



People for Process Automation



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