NEWS

from the world of temperatur probes

EMATEM

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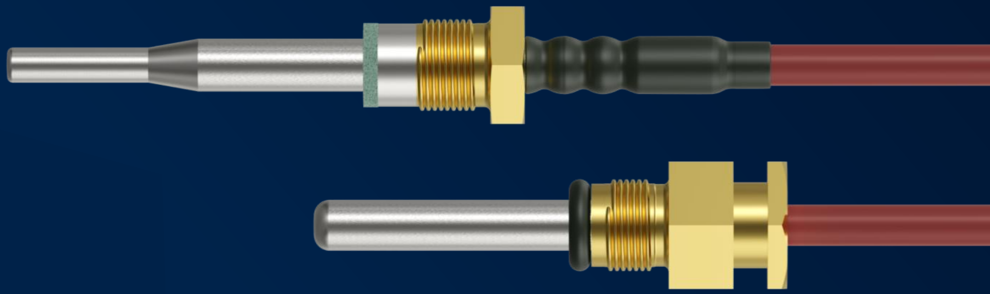
AGENDA

PART 1

New findings and results
from the working group on
pockets in relation to the expiry
of the tolerance regulation in Germany

PART 2

Selection of temperature probes
for use in additional meters
for energy accumulation



PART 1

New findings and results from the working group on pockets in relation to the expiry of the tolerance regulation in Germany

The toleration short pockets in Germany has a long history.

Even though it currently appears to be a purely German issue, the physics are the same everywhere.

For those who are not yet familiar with the topic, I will explain it again in a very brief summary.

THE SHORTEST SUMMARY

Starting Point

Investigations have shown that pockets with an installation length of ⩽ 60 mm have an impact on billing.

It was assumed that there were 2.5 million of these pockets in the field.

2009

Working groups decided to continue tolerating 56 different pockets in symmetrical installations until 2016.

New installations with these small pockets were no longer permitted.

2015

The installation of new heating systems or the modernization of existing ones should have minimized the number of old pockets by 30 October 2016.

However, this was not the case. There were still approximately 2 million pockets in use, most of which were installed asymmetrically.

2015

Following discussions about a further extension of the toleration, this was decided.

2023

There were still approximately 2 million pockets in asymmetrical use.

Therefore, discussions were held once again to determine whether the pockets could continue to be used and to find new regulations.

2024

Launch of the 'Pocket Working Group' moderated by the PTB in Berlin

< 2006 → Toleration period 1 (10 years) → 2016 → Toleration period 2 (again 10 years) → 2026

What does the working group do?

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Selection of a representative group of participants

The working group includes representatives from the PTB, FIGAWA, the German calibration authorities, as well as manufacturers of heat meters and their components.

Meetings will be held online approximately every three months.

Establishment of necessary definitions

Terms such as 'symmetry' and 'asymmetry' are used, but these are not defined (e.g. in EN1434).

Furthermore, this is not only relevant for existing immersion sleeves, but for all installation situations that differ between flow and return sensors.

The new definition was presented for the first time in my EMATEM lecture in 2024.

Determination of requirements for a metrological examination

What are the requirements for a test bench for the investigation?

What parameters and measurement range should be used to conduct an investigation?

Various measurement series and comparative measurements are carried out for this purpose.

However, current procedures remain valid.

Find a solution for the existing pockets

A solution is being wanted without having another 10-year toleration period.

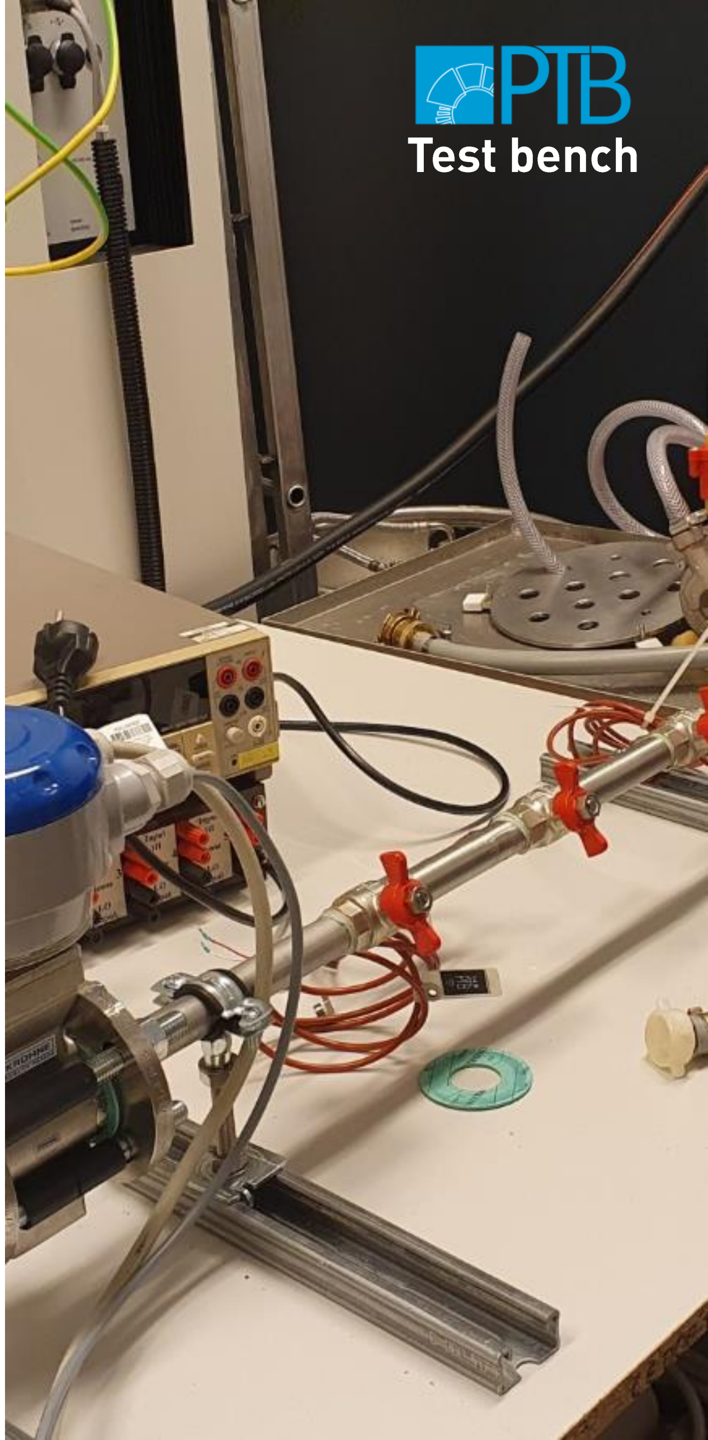
Since the existing short pockets are almost exclusively used asymmetrically, the old rule does not apply anyway.

So the new regulation for Germany should continue to protect consumers from incorrect billing.

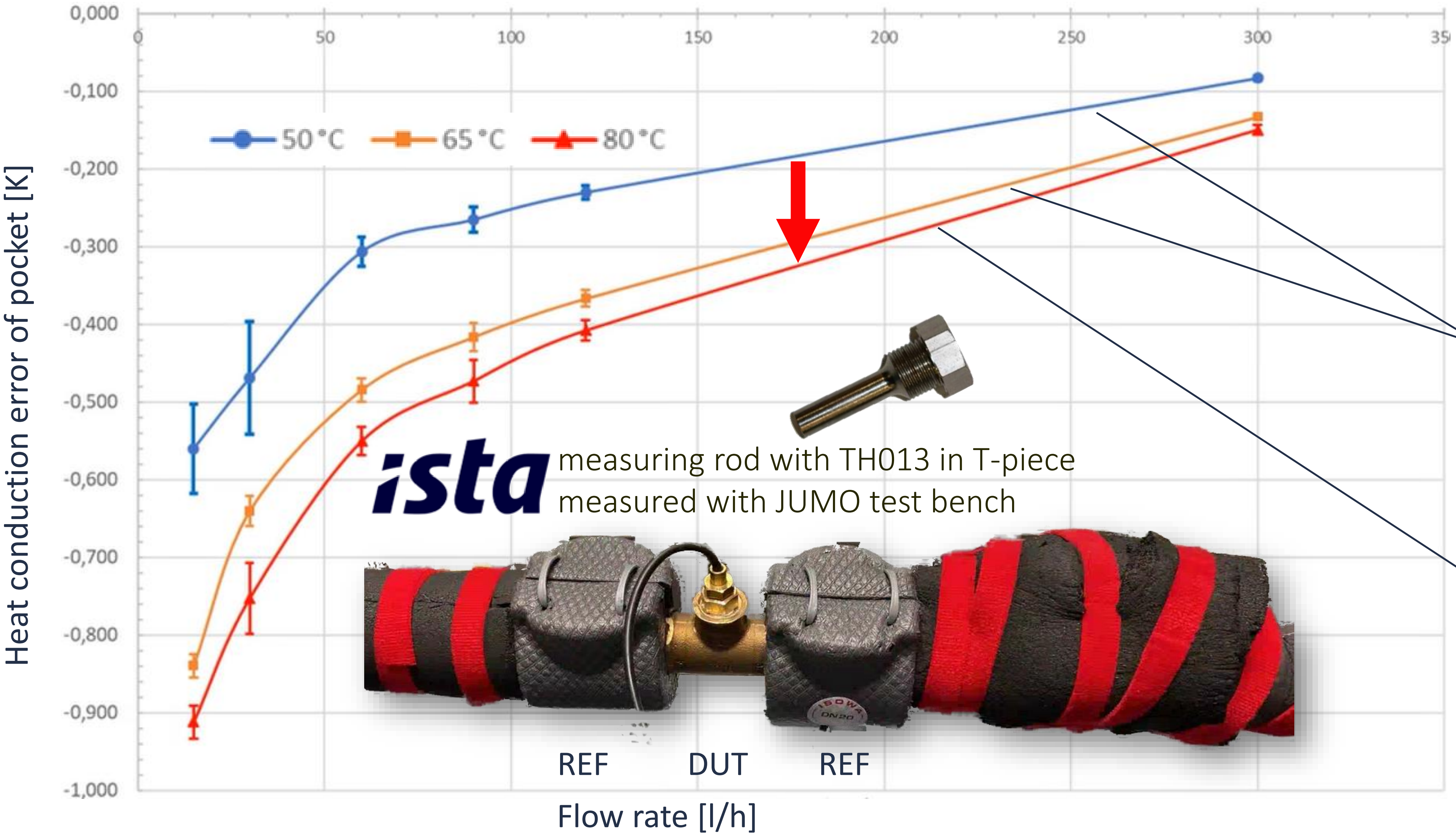
Revision of TRK 8 is in progress.

Ongoing comparative measurements

- Currently, we want to see how reproducible measurements are on different test benches.
- Various participants in the working group have announced their intention to take part in comparative measurements.
- This is not only done on existing test benches, but in some cases new ones are even being built for this purpose.



Latest results – Comparison JUMO and ista

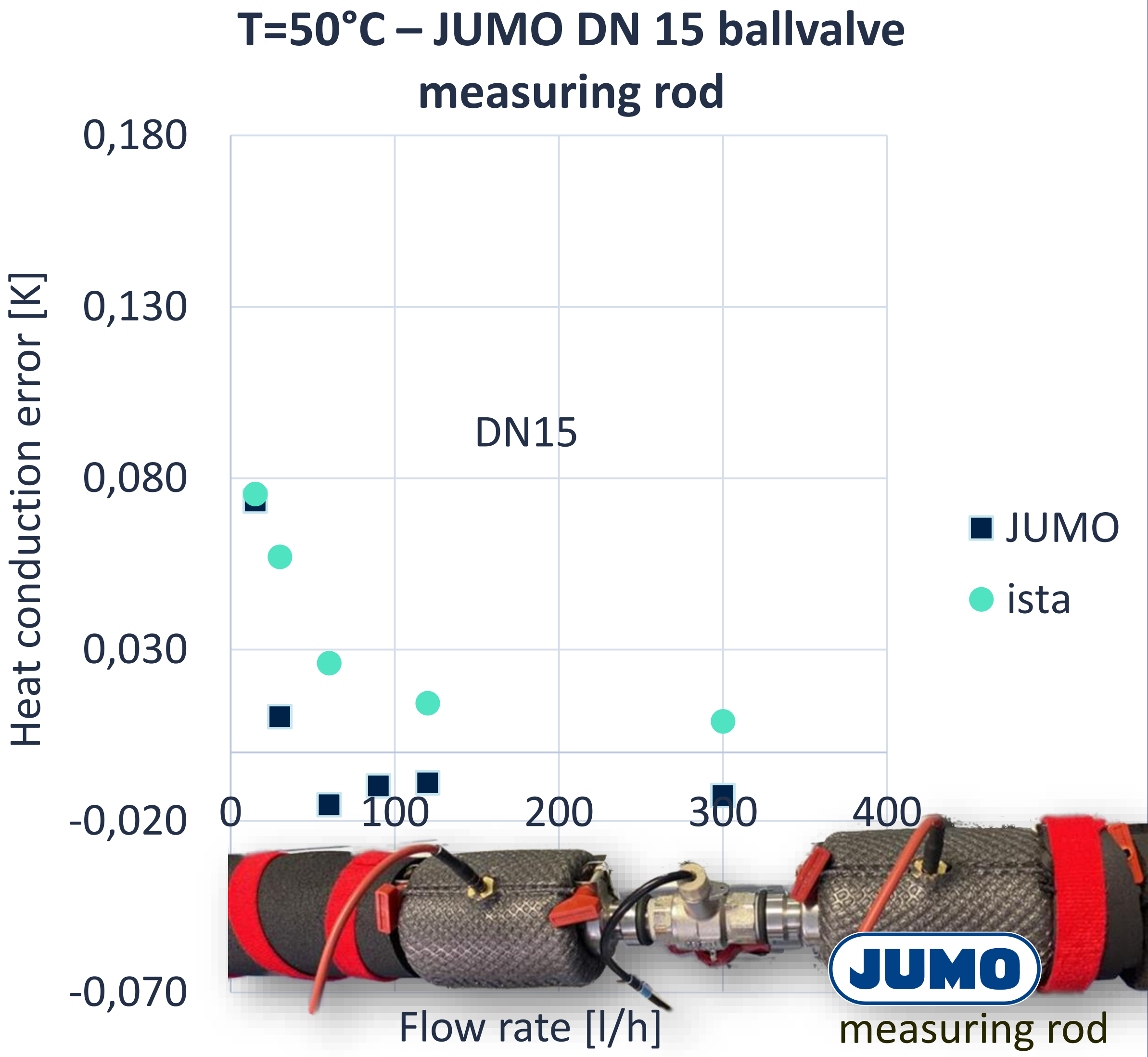


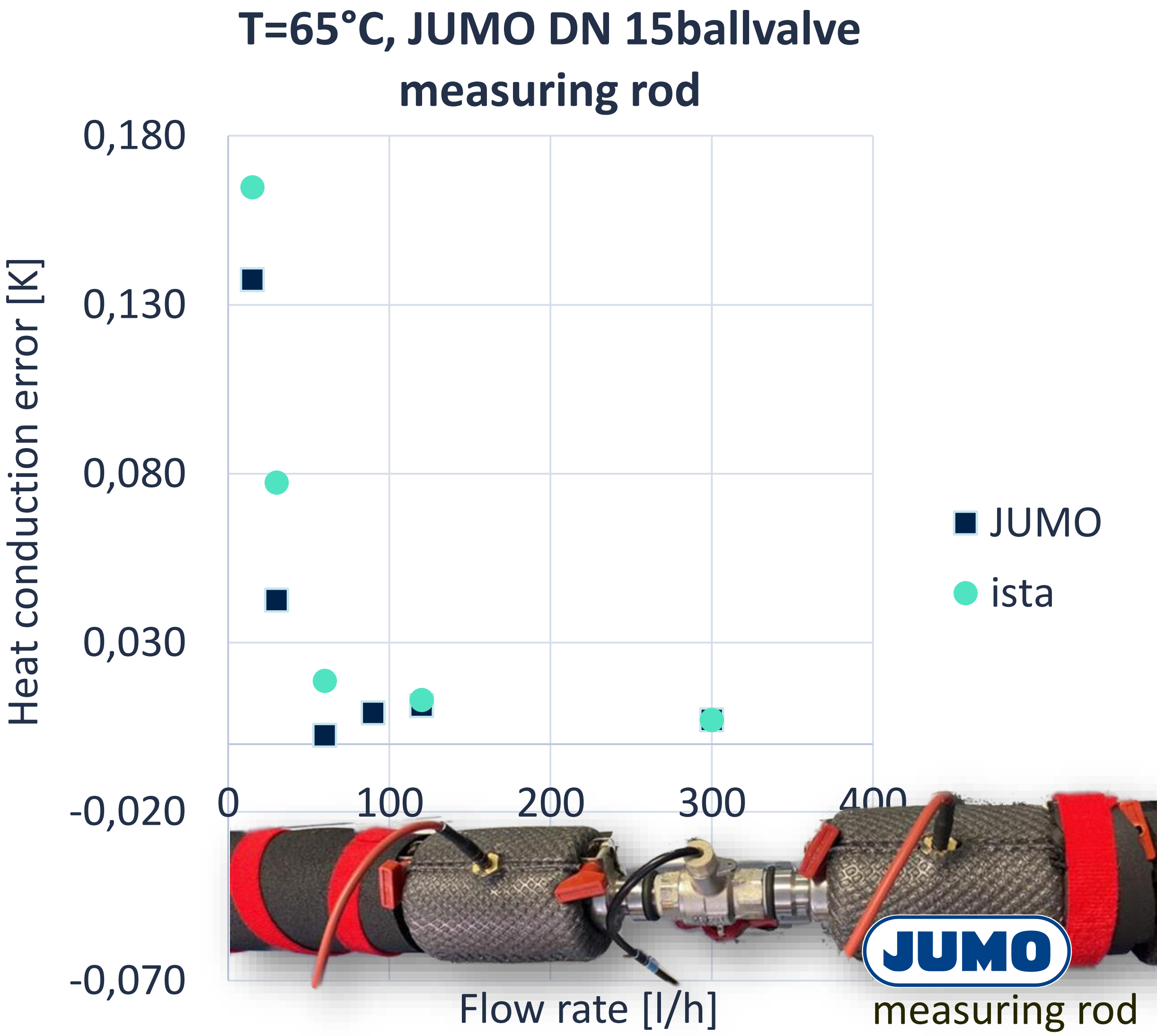
Expectation: as the temperature rises, the heat conduction error should increase linearly.

Measured with…

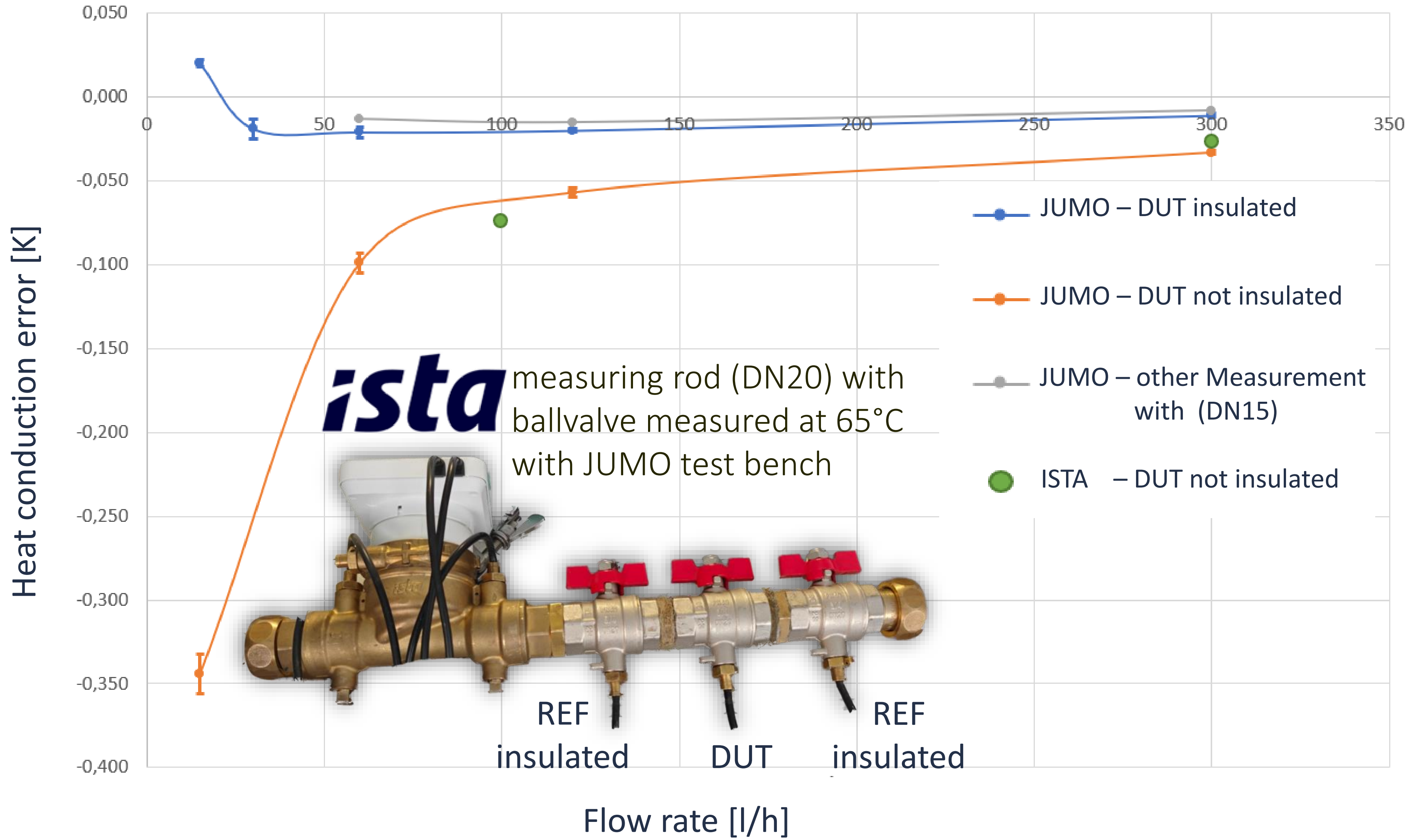
… both calibrated, but different uncertainties or settings (e.g. Offset-Compensation)?

Latest results – Comparison JUMO and ista





Latest results – Comparison JUMO and ista



ISTA (Mr. Brücher) visited JUMO in Fulda and we carried out together measurements with each measurement equipment

Both measured with…

Both use the same type of measuring device, but different devices.

Laboratory measurement vs Practical measurement

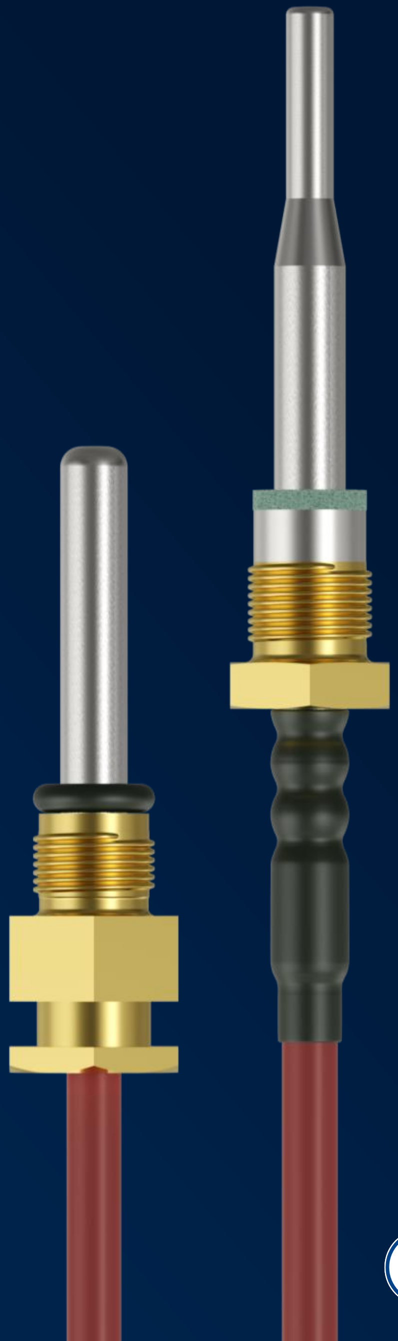
- Requirements for measurement technology and procedures usually significantly higher (e.g. 4-wire measurement for all probes)
- Often a worst-case scenario. Testing on borderline samples that do not exist in practice
- Comparability between different test benches significantly better

- Requirements for measurement technology and procedures are easy to implement (e.g. 2-wire measurement of the test object, as is also the case in practice)
- Testing on practical test specimens (e.g. real pockets from the field)
- When comparing different test benches, there are more influencing factors.

The working group must find a good balance here

PART 2

Selection of temperature probes for use in additional meters for energy accumulation



What does energy accumulation mean?

Customer pays only 0.14€/kWh, as the return temperature is < 50°C.

BONUS

MALUS

The customer must pay 0.18€/kWh because the return temperature is > 50°C.

It is used for threshold-controlled recording of thermal energy in separate meters, e.g. to promote energy-efficient system behaviour within the framework of bonus-malus regulations.

- Absolute flow temperature
- Absolute return temperature
- Temperature difference between flow and return (Δθ)
- ...

EN 1434-1:2022

Normative basis for this

5.10.5.2 Required accuracy when the measured temperature is used for additional energy accumulations

1,0 K	for temperature measurement in case of a complete meter (calculator with single temperature sensor); up to 100 °C
0,7 K	for temperature measurement in case of a combined meter (single temperature sensor); up to 100 °C

NOTE In applications of smart metering, one or both single sensors of the pair are used as additional single sensor. In case of Platinum (Pt) sensors, according to EN 60751:2008, at least class B with 4 wire connections is recommended.

9.2.2.2 Temperature sensor pair

$$E_t = \pm\left(0{,}5 + 3\frac{\Delta\Theta_{min}}{\Delta\Theta}\right) \qquad (4)$$

where

E_t is the error, which relates the indicated value to the conventional true value of the relationship between temperature sensor pair output and temperature difference.

The relationship between temperature and resistance of each single sensor of a pair shall not differ from the values of the equation given in EN 60751:2008 (using the standard values of the constants A, B and C) by more than an amount equivalent to 2 K.

For thermal energy meters and cooling meters with tariff depending on absolute temperature the tolerance of each single sensor should fulfil class B of EN 60751:2008.

JUMO

EN 1434-5:2022

For thermal engery meter with exchangeable probes

6.3.3 Single temperature sensor for smart metering applications

The compliance with the permissible error of the temperature sensor of ± 0,7 K compared to the performance curve according to EN 60751:2008, including the signal cables thereof, shall be tested for each temperature sensor at three typical temperature points for field applications (e.g. 10 °C; 30 °C; 50 °C).

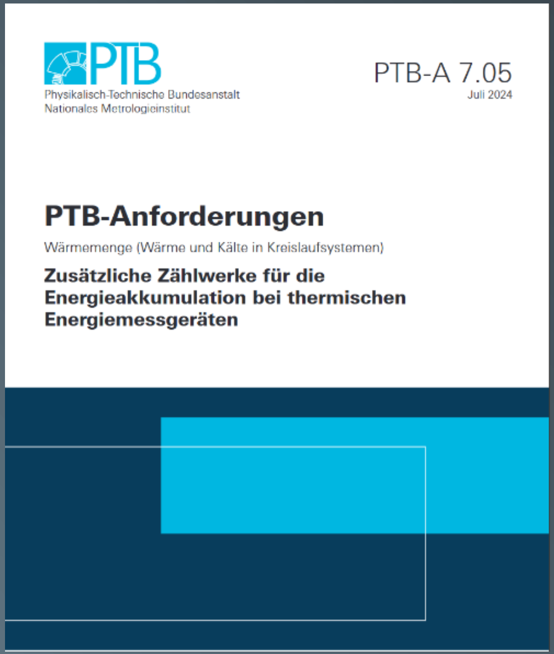
For combined thermal engery meter (compact meter)

6.5.2 Calculator with single temperature sensor for smart metering applications

The compliance with the permissible error on temperature indication of the inlet and outlet temperatures compared to the correct value of the measured temperature of ± 1,0 K shall be tested. The test shall be examined in accordance with 6.3.3 and 6.4.

Normative basis for this

In Germany, the PTB requirement 'PTB-A 7.05' has also been in force since July 2024.


PTB
Physikalisch-Technische Bundesanstalt
Nationales Metrologieinstitut

PTB-A 7.05
Juli 2024

PTB-Anforderungen

Wärmemenge (Wärme und Kälte in Kreislaufsystemen)

Zusätzliche Zählwerke für die Energieakkumulation bei thermischen Energiemessgeräten

Type examination of the meter
also out of the PTB-A 7.05

Checking that the respective counter is activated correctly depending on the signal

Compliance with the error limits for the absolute flow and return temperatures must therefore be checked by the meter manufacturer.

Temperature difference

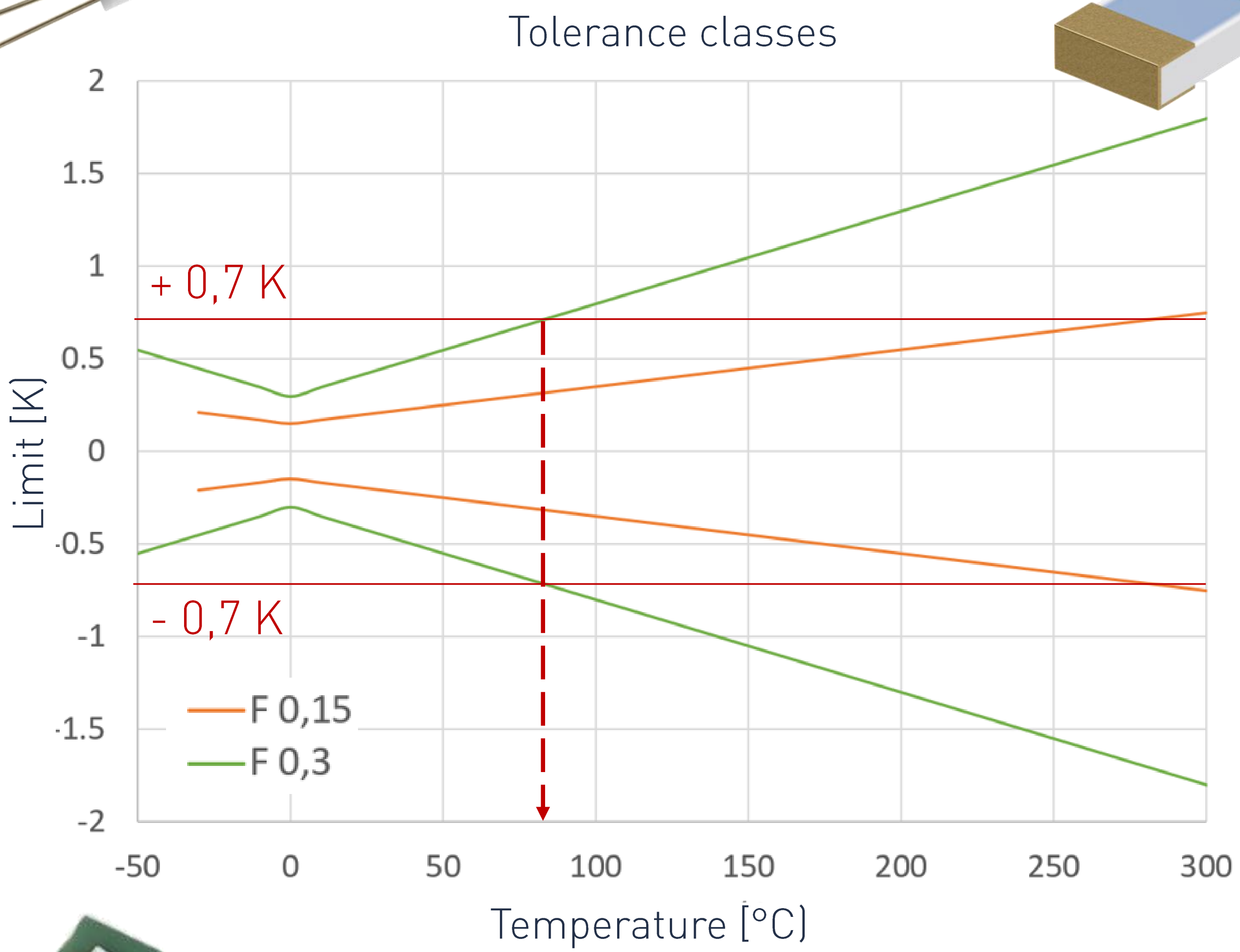
Test with two-sided approach in 0.25K increments at a minimum of Δθmin (+ 5K) and Δθmax (- 5K)

Absolute flow- or return temperature

Test with two-sided approach in 0.25K increments with at least 3 threshold values evenly distributed across the temperature range.

Requirements for the sensor tolerance class

- According to PTB-A 7.05 and EN1434, at least sensor class F0.3 (formerly known as class B) should be used
- A sensor (not probe) in tolerance class F0.3 with a four-wire connection **maintains the error limit** for the absolute flow and return temperature of 0.7 K **only up to 80 °C**.
- JUMO recommendation: Sensor class F0.15 (compliance with the error limit of 0.7 K to 270 °C)



Caution with 2-wire connection

Influence with PT100 Sensor	Influence with PT500 Sensor	Influence with PT1000 Sensor
+1,075K	+0,215K	+0,107K
Compliance with the error limit of 0.7 K not possible	Compliance with the error limit of 0.7 K using sensor class F0.3 only up to 37 °C	Compliance with the error limit of 0.7 K using sensor class F0.3 only up to 58 °C

According to PTB-A 7.05 and EN1434, at least sensor class F0.3 should be used

BUT: Increase in resistance with two-wire connection

Example here: 3 m cable with 0.25 mm2 cross-section → 420 mΩ

Caution with temperature probes with PCB Board

SURVEY: What do you think the loop resistance marked in red here is (in mΩ)?

All resistances along the measuring chain must be taken into account. This includes loop resistance of the conductor track on the circuit board.

To minimize heat conduction error, the conductor track is very thin.
This results in higher resistance.→ ~200 mΩ

Only when you know all the resistances of the measuring chain and the temperature operating range can you select the correct tolerance class for the sensor.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Einbau von Temperaturfühlern für Wärme- und Kältezähler in eine Normeinbaustelle
7:30
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JUMO
Hands-On Video
Ein Temperaturfühler für nahezu alle Einbaustellen für Wärme- und Kältezähler
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Market Segment Day
Neues aus der Wärme- und Kältezählerwelt – die Zukunft wird digital!
55:26
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Image Video
Temperature probes for thermal energy meters
2:43
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Symmetric vs. asymmetric installation

We look forward to your questions!

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