Accessory Sheet
AS-CP-2201-US

# Trouble-free calibration of sanitary- and short temperature sensors


**Save time**
Fast temperature calibration using a dry-block calibrator.

**High accuracy**
Special reference sensor minimizes the measuring uncertainty

**Improved repeatability**
Specially designed inserts ensure optimal heat-transfer around the sensor-under-test.

**Be prepared**
Tailor-made solution for sanitary and short sensors.

**Reduce setup errors**
Built-in measurement input for sensor-under-test and the reference sensor.

**Avoid defective cables**
Sensors are supplied with short, PVC protected cables to prevent damage during calibration.

**Documentation made easy**
RS232 communication and JOFRACAL calibration software are included in the standard delivery.

**ISO 9001 Manufacturer**

**AMETEK offers a complete, highly accurate, and portable calibration-solution. The kit is designed around an ATC series dry-block calibrator which features the dual-zone technology.**
**Customized inserts and a reference sensor have been developed specifically for this application.**
**Avoid cumbersome and lengthy liquid bath calibrations and the performance issues associated with older dry-block calibrators.**

## PRODUCT DESCRIPTION

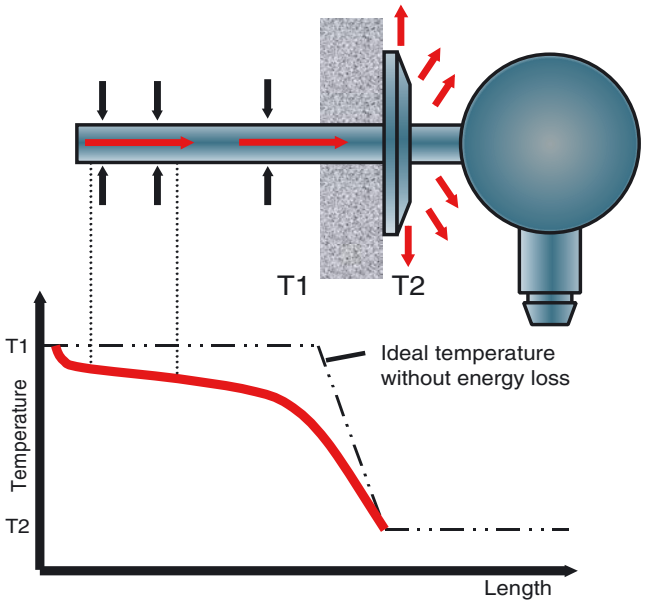
The JOFRA ATC-156 employs dual-zone technology to maintain full control of the temperature in the lower part as well as in the upper part of the heating block. This enables the ATC-156 to compensate for the extreme heat dissipation through the flange of the sanitary sensor. A special insert with a large mechanical contact face at the top ensures optimal contact with the sanitary sensor.
A small custom reference sensor is positioned in parallel with the sanitary sensor. The reference sensor accurately measures the ambient temperature adjacent to itself and the sanitary sensor. The result is an accurate, fast, and easy calibration of sanitary temperature sensors.

AMETEK®
CALIBRATION INSTRUMENTS

# SANITARY CLAMP SENSORS

## Sanitary clamp sensors

Most of the temperature sensors used for measurement within the food industry have to be approved for sanitary applications. Therefore, the temperature sensors have been designed in such a way that only a minimal number of germs or contaminants can conceal themselves on the sensors. Unfortunately, a side effect of these designs is a reduced ability for accurate measurement. Often, the sensors are not very long and the process connection consists of a large metal flange. This allows for considerable heat dissipation through the sensor and process connection. As a result, the sensing element at the end of the sensor will rarely reach the same temperature as the process and will consequently provide an incorrect indication.

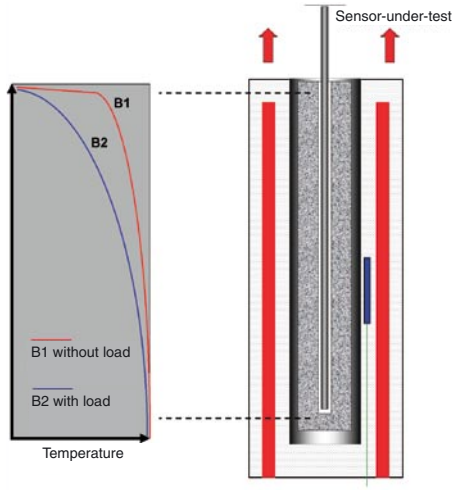



The figure above graphically illustrates a temperature measurement through an isolating wall. The sensor is a Pt100 element with a specific extension meaning that the sensor will measure an average of its own temperature and the process temperature. It is obvious that there is a temperature gradient along the entire length of the sensor; this is indicative of the energy loss to ambient conditions. Due to the design compromises necessary for sanitary sensors, the apparent error due to this energy loss should be taken very seriously. Within the process there is typically a constant flow of liquid surrounding the sensor, this equalizes the temperature around the sensor and the temperature dissipation will be minimal. However; when connected for calibrations or other static applications, for example tank measurements, the effects of temperature dissipation may be quite significant.

## Incorrect temperature calibration

The previous section clearly explains that most sanitary sensors are a compromise between correct temperature measurement and hygienic considerations: an energy loss error is the price for the compromise. Temperature dissipation is also a consideration during calibration. This energy loss and the associated measurement error is so considerable that a dry-block calibrator designed with older technology cannot be used.

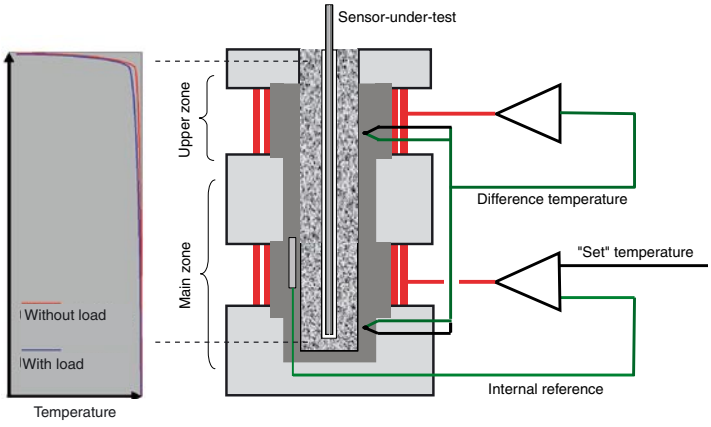
The following illustration shows the fundamental construction of a dry-block calibrator, including: the metal block, insert fitted to the sensor-under-test, heating element and an internal reference sensor. To the left of the illustration, a graph shows the temperature through the block (axial gradient) at minimal load B1 and at a random load B2. It is obvious from these curves that a large thermal load like a sanitary clamp sensor cannot be calibrated using an ordinary dry-block calibrator.




The temperature gradient, and consequently the uncertainty in the calibration process becomes unmanageable. A similar gradient also applies to other short sensors that do not reach the bottom of the calibration block.

## New technology compensates ..

The JOFRA ATC series of dry-block calibrators have a unique dual-zone heat control system. The design incorporates independent energy sources at the top and bottom of the block. The energy sources are controlled in such a way that temperature is kept uniform throughout the block despite thermal load. The upper zone is therefore able to compensate for the heat dissipation error.




The illustration above shows the dual-zone design. The graph indicates how the temperature is kept uniform despite the load.

# JOFRA ATC-156 & SANITARY KIT

## JOFRA ATC dual-zone heat source

The JOFRA ATC-156 is a cooling calibrator covering the temperature range from -26 to + 155°C (-14.8 to 311°F). The heating/cooling block employs the JOFRA dual-zone design. This means that the unit compensates for the thermal gradient that arises as a function of the thermal load of the block during calibration. In other words, the calibrator senses and controls for heat dissipation. The JOFRA ATC series contains a number of other functions that make the calibration tasks easier, faster and more accurate.

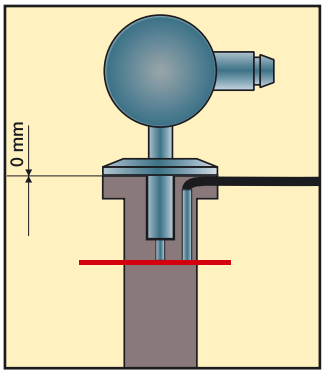

To learn more about JOFRA ATC calibrators, please see specification sheet SS-CP-2285-US available at www.jofra.com or from your local distributor.

## Custom insert

To make sure that the sanitary sensor receives the necessary energy, we have developed a custom insert. The insert has a large flange corresponding to the flange of the sanitary sensors. When the two surfaces are in physical contact with each other, the error due to heat dissipation is minimized. Additionally, the setup is very similar to the process conditions in which the sensor is normally working. The sensor on the right is complete while the sensor on the left does not yet have the hole for the sanitary sensor.

## External reference sensor - calibration accuracy

Optimal accuracy is achieved through the use of an external reference sensor during calibration. The reference sensor measures the temperature in the block. The reference sensor must be placed at the same level and in parallel with the sensor that is to be tested as indicated in the illustration to the right. The illustration also very clearly shows that the flange of the sanitary sensor is in contact with the insert. We have also designed a special cable type reference sensor. Due to the small size and flexible connection, the design allows for positioning of the sensor under a sanitary flange.




Below you see the custom insert and STS-102 A reference sensor placed in a JOFRA ATC-156 B dry-block calibrator. On the right, the sanitary sensor has been fitted into the insert and is ready for calibration. Note that the design makes room for the reference sensor cable.

To learn more about the possibilities with the JOFRA STS-100 reference sensors, see specification sheet SS-CP-2290-US available at www.jofra.com or from your local distributor.

## SET Follows TRUE

All JOFRA ATC B models feature the unique SET-follows-TRUE function. The calibrators employ this function to adjust the temperature automatically, based on the correlation between the reference sensor and the desired calibration set-point. The end result is that any axial variations in temperature are recognized by the reference probe and the temperature is adjusted accordingly without the need for operator action. In this way, the risk of error is minimized, and no compensating calculations are necessary. Additionally, the operator is assured that calibrations always take place at fixed temperatures.

## Save time

Beyond the portability advantage, a dry-block calibrator also has the added benefit of being able to perform a calibration much faster than a liquid bath. It takes less time to heat up or cool down the block versus oil or powder.
The JOFRA ATC series is also delivered with JOFRACAL calibration software for PC, offering further timesaving benefits. Create and perform all calibrations using this software and generate all of the necessary documentation for your calibrations. You may store calibration routines and calibration results in the calibrator itself, so it is not necessary to bring a PC into the process environment.

To learn more about the possibilities with JOFRACAL, see specification sheet SS-CP-2510-US available at www.jofra.com or from your local distributor.

## Accuracy

The JOFRA ATC system has been thoroughly tested in the AMETEK Denmark A/S calibration laboratory with numerous sanitary and short temperature sensors. These sensors represent a large portion of the sensors that are used within the industry today.
Results show that with the proper insert and correct system application, you may achieve overall measuring uncertainties of 0.1 to 0.3°C including the reference sensor.
Unfortunately, we have found that a few sensors, due to their construction, cause so big a heat loss that not even a JOFRA ATC-156 dual-zone calibrator is able to compensate for this. These sensors can only be calibrated with a considerably higher measuring uncertainty.

## ORDERING INFORMATION

### Sanitary and short temperature sensor calibration kit

| Part No. | Description |
|---|---|
| 123859 | Complete application kit for JOFRA ATC-156 B<br>- STS102A030SH (with accredited certificate)<br>- Recalibration tube (for recalibration of the ref. sensor in liquid bath)<br>- Manual<br>- Undrilled insertion tube with »cable groove« (5-pack)<br>- Carrying case with foam insert |
| STS102A030SH | Reference sensor, length 30 mm w. 1 m integrated cable and LEMO plug<br>- Manual<br>- Recalibration tube (for recalibration of the ref. sensor in liquid bath)<br>- Transportation and storage case in plast<br>- Accredited certificate: -45, 0, 50, 100, 155°C |
| STS102A030SG | Like the above but with traceable certificate to NIST |
| STS102A030SF | Like the above but with traceable certificate to NPL |
| STS102A030SI | Like the above but without traceable certificate |
| 123824 | Undrilled insertion tubes with “cable groove” (ATC-156) (5-pack) |
| 123868 | Insert with special drill according to customer drawing (ATC-156) |

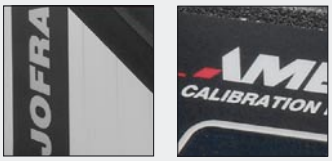
For further information, see the following specification sheets:

JOFRA ATC series (dry-block calibrators)..... SS-CP-2285-US
JOFRA DTI-1000 Reference Thermometer and
JOFRA STS Temperature Probes ..... SS-CP-2290-US
JOFRACAL calibration software .....SS-CP-2510-US

A complete application kit for calibration of sanitary temperature sensors with »clamp«.

An STS 102A030 reference sensor in the small transportation and storage case.

**temperature**
**software**
**pressure**
**signal**




**AMETEK**
**Calibration Instruments**
offers a complete range of calibration equipment for pressure, temperature, and signal - including software.

**JOFRA Temperature standards**
Portable precision thermometer. Dry-block calibrators: 4 series, more than 20 models - featuring speed, portability, accuracy, and advanced documenting functions.

**M&G Primary pressure standards**
Pneumatic floating-ball or hydraulic piston deadweight testers - easy-to-use with accuracies up to 0.015% of reading.

**JOFRA Pressure standards**
Convenient electronic systems ranging from -1 to 700 bar (25 inHg to 10,000 psi) - multiple choices of pressure ranges, pumps, and accuracies, fully temperature-compensated for problem-free and accurate field use.

**JOFRA Signal calibration**
Process signal measurement and simulation for easy control loop calibration and measurement tasks - from handheld field instruments for multi or single signals to laboratory reference level bench top instruments.

***...because calibration is a matter of confidence***

AMETEK is a leading global manufacturer of electrical and electromechanical products for niche markets. Listed on the New York Stock Exchange (AME) since 1930. AMETEK's annual sales exceed $1 billion. Operations are in North America, Europe, and Asia, with about one third of sales to markets outside the United States.

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CALIBRATION INSTRUMENTS

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