

# PTC Series

## Professional Temperature Calibrator

PTC-155/350/425/660



# Product Description

The JOFRA PTC-155/350/425/660 professional dry-block temperature calibrators are versatile temperature calibrators available with a temperature range that makes them especially ideal for use in the healthcare, medical, pharmaceutical, biotechnology, and food industries.

With a temperature range of 33 to 425°C (91 to 797°F) the PTC-425 is ideal for sterilization tunnels or for process validation and monitoring solutions.

## Advantages & Models

The PTC-155/350/425/660 offer many advantages:

### ■ Relevant for Many Applications

With their wide temperature range, the PTC Series can be used in many applications where either high heat or low cooling is needed.

### ■ User Friendly

Intuitive to use and easy to run, the PTC Series are equipped with a large informative, easy-to-read color display which makes reading error a thing of the past.

### ■ Ergonomically Correct

Easy to carry, the PTC Series are easy to move from job to job.

### ■ Mechanically Stable

With its high-tech design, the PTC Series ensure durability and lasting quality.

### ■ The PTC Calibrators Come in Three Different Models—A, B, and C.

- PTC-A reference temperature calibrator.
- PTC-B reference temperature calibrator with input for reference sensor, and sensors-under-test.
- PTC-C reference temperature calibrator with input for reference sensor.

## Key Features

### ▶ High Accuracy

Down to  $\pm 0.06^{\circ}\text{C}$  ( $\pm 0.11^{\circ}\text{F}$ ) using the external reference sensor. 4-wire True-Ohm Measurement technology is used.

### ▶ Excellent Stability:

PTC-155:  $\pm 0.01^{\circ}\text{C}$  (0.018°F).

PTC-350:  $\pm 0.02^{\circ}\text{C}$  (0.036°F).

PTC-425:  $\pm 0.02^{\circ}\text{C}$  (0.036°F).

PTC-660:  $\pm 0.04^{\circ}\text{C}$  (0.072°F).

### ▶ Wide Temperature Range

PTC-155: From  $-25$  to  $155^{\circ}\text{C}$  ( $-13$  to  $311^{\circ}\text{F}$ ).

PTC-350: From  $33$  to  $350^{\circ}\text{C}$  ( $91$  to  $662^{\circ}\text{F}$ ).

PTC-425: From  $33$  to  $425^{\circ}\text{C}$  ( $91$  to  $797^{\circ}\text{F}$ ).

PTC-660: From  $33$  to  $660^{\circ}\text{C}$  ( $91$  to  $1220^{\circ}\text{F}$ ).

### ▶ Intelligent Reference Sensors

JOFRA reference sensors are supplied with intelligent plugs, holding the calibration data (coefficients) of the reference sensor. This is a true plug and play calibration system.

### ▶ Easy to Carry

Weighing from between only 8.2 kg (18.1 lb) to 10.3 kg (22.7 lb) the PTC Series are by some of the lightest and most portable calibrators on the market.

### ▶ USB Communication

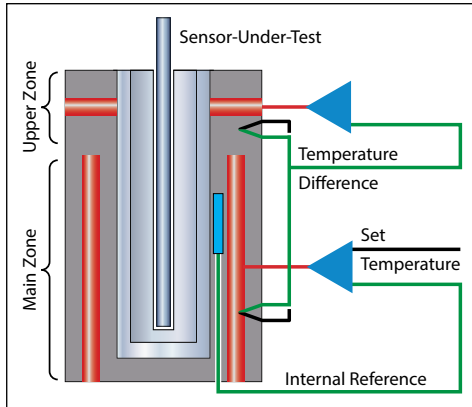
All PTC calibrators communicate via an easy-to-use USB port.

### ▶ EURAMET

Best performing dry-block with regard to the EURAMET/cg-13v.01 guideline for the testing of dry-blocks.



## Unique Temperature Performance



The PTC series of calibrators provide precision temperature calibration of sensors, whatever the type or format. This is accomplished through an innovative active dual-zone heating technology.

With JOFRA's active dual-zone heating technology, each heating zone is independently controlled for precision temperature calibration. The homogeneity in the lower part is close to that of a laboratory liquid bath. The lower zone ensures optimum heat dissipation throughout

the entire calibration zone. The upper zone compensates for heat loss from the sensor-under-test, and from the open top. This design also eliminates the need for extra insulation of sensors-under-test and makes it possible to calibrate liquid-filled and other mechanical sensors.

## USB and LAN/Ethernet Connection

A USB connection facilitates easy communication with JofraCal. The USB connection also supports easy download of future firmware upgrades. The USB connection provides fast and easy access to all laptops without the need of RS-232 to USB converters.

Future-proof through e.g. a flash capability for easy firmware upgrades as well as already integrated LAN communication, SD-card slot, and USB host connectors for future use.



## Intelligent Reference Sensors

The JOFRA STS-200 intelligent reference sensors and the DLC sensor contain individual calibration data regarding the sensor. Firstly, this means that the time-consuming coefficient

downloading sequence with risk of errors is no longer necessary. Secondly, the user can change the reference sensor and be up and running immediately.

With the intelligent sensors, AMETEK has eliminated a source of error, and the system is now giving a fail-safe plug'n'play calibration system.

## Unique Reference Sensors



The STS-200 reference sensors and the DLC sensors have been specially designed. They are both angled 90° and have been customized to fit the calibrator so that they are only slightly higher than the top of the PTC calibrator.

The unique design makes it possible to calibrate threaded sensors and sensors with connection heads without any problems.

## Easy to Carry

A calibrator is carried from one job to another. Therefore, it is essential that the weight of the calibrator is as low as possible.

We have thoroughly included the weight issue in our design and have developed design techniques that have made the PTC calibrators lightweight and easy to carry around without compromising its quality, durability, and functionality.

## Fast Temperature Calibration

Time is money! This is why all the PTC calibrators have an increased heating and cooling speed compared to all other calibrators. Heating and cooling speeds have been increased by up to 20%. The implication is savings in both production downtime and general calibration costs.

## Multi-Hole Insert Kits



Two special multi-hole insert kits have been developed to comply with the calibration of almost any sensor diameter without having to buy numerous inserts.

The first kit is a metric insert kit consisting of just four inserts covering all diameters from 3 to 12mm. The other is an imperial insert kit consisting of just three inserts covering six different sizes from 1/8" to 1/2".

All inserts have holes for both STS reference sensors. With this insert kit in the carrying case, the user is

now able to calibrate all commonly known sensor sizes. These insert kits are part of the JOFRA lightweight strategy.

## Special Designed Carrying Case



AMETEK has designed an all-in-one-handle carrying case that makes it possible to store the STS reference sensor in the carrying case with optimum physical protection. There is room for inserts and insulation plugs to cover all dimensions, and compartments for the wires, manuals, certificates, plugs, insert tools etc.

All compartments are specially designed to hold the above mentioned items. This makes it very easy to keep track of any accessories. For optimum protection of the calibrator and the accessories, the compartments are designed to hold the accessories fixed during transportation.

## IRI—Intelligent Recalibration Information

In order to comply with ISO, SOPs, and FDA, it is imperative that the calibration equipment never exceeds the expiry date of the calibration certificate. When switched on, the PTC calibrator constantly checks calibration dates on the calibrator, as well connected STS sensors. If the calibration period has expired, a warning will appear on the display. This feature prevents costly consequence evaluation.

## Bright Color Display and Intuitive Navigation



The 5.7" full color VGA display is very easy to read. The main temperatures, like SET, READ, TRUE and SUT (Sensor under test), are always displayed at all stages of the programming or calibration procedure.

The navigation is menu-driven and very logical to use, and the display shows any important information needed for the current function in use. The communication windows pop up and

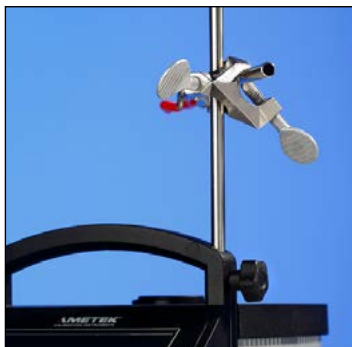
are followed by discrete sound messages. The display is very bright, and the main information can easily be read from a distance. The advanced simplicity PTC user interface is available in English, German, Chinese, and Japanese.

The large display contains more detailed information at a glance, such as:

- Stability status.
- Reference Temperature.
- Real time clock.
- Serial number of reference sensor.
- Sensor-under-test status.



## Integrated Support Rod

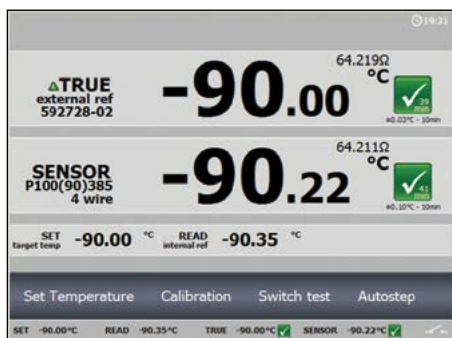


The integrated support rod is part of the reduced weight philosophy. It is lightweight and very easy to mount on the PTC. Two fixing holes are integrated in the calibrator where the support rods can be mounted.

## SET-Follows-TRUE (models B & C only)

Available on B and C models only, the "SET-Follows-TRUE" makes the instrument tune in until the temperature reading of the external reference "TRUE" meets the desired "SET" temperature. This feature is important when it is critical that the temperature of the calibration zone matches the desired temperature when measured with accurate external reference sensors.

## Reading of Sensor-Under-Test (model B only)



Model B of the PTC is equipped with a built-in accurate measuring circuit for sensor-under-test (input), which enables measurement of virtually any type of temperature sensors including: Resistance thermometers (RTD), thermocouples (TC), transmitters, milliamps (mA), and thermostats.

The PTC calibrators can be user-programmed from the keyboard for fully automatic sensor calibrations. Once the unit is programmed, the

instrument is self-operating and performs the configured calibration routine. All calibration data is stored and can be read on the display.

## Switch Test (model B only)

Users may perform a thermostatic test and find "Open", "Closed", and the hysteresis (deadband) automatically. The instrument retains the last twenty test results.

## Auto-Stepping

Up to 20 different temperature steps may be programmed including the hold time for each step. Upon completion of an auto-step routine, the user can easily read the results for the sensor-under-test on the PTC display. Results from twenty auto-step calibrations are stored.

The "Set temperature" feature allows the user to set the exact desired temperature with a resolution of 0.001°.

## Enhanced Stability

A stability indicator shows when the PTC calibrator has reached the desired temperature and is stable. The user may change the stability criteria for the external reference and the sensor-under-test quickly and simply. The stability criterion is the user's security of a correct calibration. A count-down timer is displayed next to the temperature read-out.

## Instrument Setups

The PTC series allows the user to store up to ten (10) complete instrument setups. You may store all sorts of information including temperature units, stability criteria, use of external reference sensors, resolutions, sensors-under-test (SUT), conversions to temperature, display contrasts, etc. The setup may be recalled at any time.

## Maximum and Minimum Temperature

From the setup menu, the user can select the maximum and minimum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by excessive temperatures, and it helps reducing sensor drift from exposures of too high temperatures. This feature can be locked with an access code.

## IRI—Intelligent Recalibration Information

In order to comply with ISO, SOPs, and FDA, it is imperative that the calibration equipment never exceeds the expiry date of the calibration certificate. When switched on, the PTC calibrator constantly checks calibration dates on the calibrator, as well connected STS sensors. If the calibration period has expired, a warning will appear on the display. This feature prevents costly consequence evaluation.

## As Found/As Left (model B only)

When running a calibration initiated from a work order, the user can select the calibration as an As Found or an As Left calibration.

## Calibration of Indication Devices (model B only)

When calibrating an indicating device in the work order mode, users may key in the results during or after the test. Using the "Calibration info" function, the user may view the complete calibration task, including the "Scenario" before the calibration takes place.

## Calibration of Up To 24 Sensors with the JOFRA ASM Scanner



Using the JOFRA PTC series together with the ASM, Advanced Signal Multi-scanner, offers a great time-saving automatic solution to calibrate multiple temperature sensors at the same time. The ASM series is an eight channel scanner controlled by the JofraCal software on a PC. Up to three ASM units can be stacked to calibrate up to 24 sensors at a time. It can handle signals from 2-, 3- and 4- wire RTD's, thermocouples, transmitters, temperature switches, and voltage.

## MVI—Secure Temperature Stability

MVI stands for "Mains power Variance Immunity". Unstable mains power is a major contributor to on-site calibration inaccuracies. Traditional temperature calibrators often become unstable in production environments where large electrical motors, heating elements, and other devices are periodically cycled on or off. The cycling of supply power can cause the temperature regulator to perform inconsistently, leading to both inaccurate readings and unstable temperatures.

The JOFRA PTC calibrators all employ the MVI functionality, thus avoiding such stability problems. The MVI functionality is obtained by running the calibrator on stabilized DC voltage.

## Optional PTC Firmware Package (model B only)

The PTC calibrator can be supplied with additional functionality. Upon buying the User Interface functionality (U1), the following capabilities are enabled:

- Engineering units in display.
- Work order functionality.
- Additional sensor-under-test input types: Pt10(90)385, Pt50(90)385, Pt200(90)385, Pt500(90)385, Pt50(90)391, M50(90)428, M100(90)428, Pt100 Mill, and YSI-400.

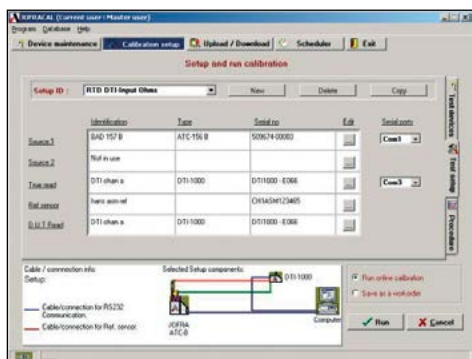
## Documenting Temperature Calibrator (model B only)

The PTC calibrator can store calibration procedures and may be taken out to the process site without having to bring a personal computer. This allows the PTC calibrator to:

- Operate as a stand-alone instrument, using advanced calibration routines without the assistance of a personal computer on site. This is the work order functionality.
- Prevent unauthorized changes to a calibration routine. Personnel who are not authorized to alter a calibration routine cannot do so.

Once all calibrations are completed, the data may be uploaded to JofraCal for printing of certificates. The data collected may be stored on the personal computer for later recall or analysis.

## JofraCal Calibration Software



JofraCal is a highly versatile calibration software that is supplied together with the PTC calibrators. The software ensures easy calibration of all kinds of temperature sensors, such as RTD's, thermocouples, transmitters, and thermoswitches. Furthermore, it can be used for pressure calibration i.e. pressure gauges and pressure switches. JofraCal integrates with Jofra calibration instruments. As for temperature calibrators, it is the whole range of temperature

calibrators. Regarding pressure calibrators, it integrates with the Crystal XP2i and nVision. JofraCal also has full integration with the series of signal calibrators.

JofraCal may also be used for manual calibrations, as it can be set up to accept manual entry of calibration data together with other liquid baths, ice points, or dry-block heat sources.

The calibration data collected can be stored on a PC for later recall or analysis. The PTC calibrator stores the calibration procedure and may be taken out to the process site without bringing a personal computer.

This allows the PTC calibrator to:

- Operate as a stand-alone instrument, using advanced calibration routines without the assistance of a personal computer on site. The work order functionality
- Prevent unauthorized changes to a calibration routine. Personnel who are not authorized to alter a calibration routine cannot do so

Once all calibrations are completed, the data may be uploaded to JOFRACAL for the printing of certificates. The data collected may be stored on the personal computer for later recall or analysis.

JOFRACAL offers extended output formats of the captured calibration data such as PDF file format and ASCII/ semicolon separated text format for further processing and calculation of data in spreadsheets and word processors.

## JofraCal Hardware Requirements

- INTEL™ 486 processor.
- (PENTIUM™ 800 MHz recommended).
- 32 MB RAM (64 MB recommended).
- 80 MB free disk space on hard disk prior to installation.
- Standard VGA (800 x 600, 16 colors) compatible screen.
- (1024 x 786, 256 colors recommended).

## JofraCloud Remote Calibrator Operation



JofraCloud is a way to perform remote reading and setting of PTC temperature calibrators over unlimited distances, with transmission coverage equal to that of a smartphone.

The data is presented as a copy of the calibrator's display, and can be viewed on a PC, laptop, tablet, or smartphone at [jofracloud.com](http://jofracloud.com).

Once attached to any PTC (or RTC) calibrator, the gateway reads data every 2 seconds, and allows you to print a timestamped pdf as documentation. JofraCloud features:

- **Remote Setpoints**—Select a new temperature setpoint on your calibrator using your device.
- **Documented Stability Reporting**—When the calibrator reaches the set temperature and gains stability, an emailed report will be sent to your controlling device.
- **On-demand Reporting**—Generate a timestamped emailed report at any time. You can get an audible notification when the calibrator reaches stability.
- **Multiple Calibrator Control**—Control and communicate with up to 5 calibrators simultaneously with a single Gateway.

# Specifications for PTC-155

## Functional Specifications

### Temperature Range

@ ambient temp. 23°C/73°F ..... **-250 to 155°C/-13 to 311°F**

Patented heating technology: Patent No. EP2074374/US8342742

### Accuracy with External STS Ref. Sensor

**± 0.06°C / ± 0.11°F**

12-month period. Relative to reference standard. Specifications by use of the external JOFRA STS-150 reference sensor.

### Accuracy with Internal Ref. Sensor

**± 0.18°C / ± 0.32°F**

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

### Stability

**± 0.013°C / ± 0.018°F**

Measured after the stability indicator has been on for 10 minutes.  
Measuring time is 30 minutes.

### Radial Homogeneity

**(difference between holes)**

**0.01°C / 0.02°F**

### Resolution (user selectable)

All Temperatures ..... **1° or 0.1° or 0.01°**

### Temperature Unit in Display

User Selectable ..... **°C, °F, or K**

### Heating Time

-25 to 23°C / -13 to 73°F ..... **4 minutes**

23 to 155°C / 73 to 311°F ..... **12 minutes**

### Cooling Time

155 to 23°C / 311 to 73°F ..... **10 minutes**

23 to -25°C / 73 to -13°F ..... **15 minutes**

### Time to Stability (approx.)

**10 minutes**

## Electrical

### Mains Specifications

Voltage ..... **115V (90-127) / 230V (180-254)**

Frequency, non US Deliveries ..... **50 Hz ±5, 60 Hz ±5**

Frequency, US Deliveries ..... **60 Hz ±5**

Power Consumption (max.) ..... **400 W**

### Switch Input (model B)

#### Switch Dry Contacts

Test Voltage ..... **Maximum 5 VDC**

Test Current ..... **Maximum 2.5 mA**

### Communications Interface

Serial Data Interface ..... **USB 2.0 Device Port**

## Physical Specifications

### Weight and Instrument Size

Weight ..... **10.3 kg / 22.7 lb**

(LxWxH) ..... **362 x 171 x 363 mm / 14.3 x 6.7 x 14.3 in**

### Well Diameter

**26 mm / 1.02 in**

### Immersion Depth

**160mm / 6.3 in**

### Insert Dimensions

Diameter ..... **25.8 mm / 1.02 in**

Length ..... **150 mm / 5.91 in**

### Miscellaneous

Operating Temperature ..... **0 to 40°C / 32 to 104°F**

Storage Temperature ..... **-20 to 50°C / -4 to 122°F**

Humidity ..... **0 to 90% RH**

Protection Class ..... **IP-10**

## External Reference Sensors

Unless noted, specifications apply to both STS-102-A and STS-150-A

### Temperature Range

**-45 to 155°C / -49 to 311°F**

### Accuracy

Hysteresis @ 0°C/32°F ..... **0.01°C / 0.02°F**

Long Term Stability @ 0°C/32°F ..... **typ. 0.014°C / 0.025°F**

Repeatability ..... **0.004°C / 0.007°F**

Stability when exposed to maximum temperature for 100 hours.

### Sensing Element

**Pt100**

### Response Time

#### STS-102-A

t<sub>05</sub> (50%) ..... **5 seconds**

t<sub>09</sub> (90%) ..... **16 seconds**

#### STS-150-A

t<sub>05</sub> (50%) ..... **7 seconds**

t<sub>09</sub> (90%) ..... **18 seconds**

Liquid in motion, 0.4 m/sec.

### Dimensions

#### STS-102-A

Diameter ..... **4 mm / 0.157 in**

Length ..... **30 mm / 1.18 in**

Max. Height Over Calibrator Top ..... **20 mm / 0.79 in**

#### STS-102-A

Diameter ..... **4 mm / 0.157 in**

Length ..... **180 mm / 7.08 in**

Cable Length ..... **1 m / 3.28 ft**



# Specifications for PTC-350

## Functional Specifications

### Temperature Range

@ ambient temp. 23°C / 73°F ..... **33 to 350°C / 91 to 662°F**

Patented heating technology: Patent No. EP2074374/US8342742

### Accuracy with External STS Ref. Sensor

**± 0.08°C / ± 0.15°F**

12-month period. Relative to reference standard. Specifications by use of the external JOFRA STS-150 reference sensor.

### Accuracy with Internal Ref. Sensor

**± 0.2°C / ± 0.36°F**

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

### Stability

**± 0.02°C / ± 0.036°F**

Measured after the stability indicator has been on for 10 minutes. Measuring time is 30 minutes.

### Radial Homogeneity

**(difference between holes)**

**0.02°C / 0.036°F**

### Resolution (user selectable)

All Temperatures ..... **1° or 0.1° or 0.01°**

### Temperature Unit in Display

User Selectable ..... **°C, °F, or K**

### Heating Time

33 to 350°C / 91 to 662°F ..... **7 minutes**

### Cooling Time

350 to 100°C / 662 to 212°F ..... **12 minutes**

100 to 50°C / 212 to 122°F ..... **12 minutes**

### Time to Stability (approx.)

**10 minutes**

## Electrical

### Mains Specifications

Voltage ..... **115V (90-127) / 230V (180-254)**

Frequency, non US Deliveries ..... **50 Hz ±3, 60 Hz ±3**

Frequency, US Deliveries ..... **60 Hz ±3**

Power Consumption (max.) ..... **1150 VA**

### Switch Input (model B)

#### Switch Dry Contacts

Test Voltage ..... **Maximum 5 VDC**

Test Current ..... **Maximum 2.5 mA**

### Communications Interface

Serial Data Interface ..... **USB 2.0 Device Port**

## Physical Specifications

### Weight and Instrument Size

Weight ..... **8.2 kg / 18.1 lb**

(LxWxH) ..... **362 x 171 x 363 mm / 14.3 x 6.7 x 14.3 in**

### Well Diameter

**26 mm / 1.02 in**

### Immersion Depth

**140 mm / 5.5 in**

### Insert Dimensions

Diameter ..... **25.8 mm / 1.02 in**

Length ..... **150 mm / 5.91 in**

### Miscellaneous

Operating Temperature ..... **0 to 40°C / 32 to 104°F**

Storage Temperature ..... **-20 to 50°C / -4 to 122°F**

Humidity ..... **0 to 90% RH**

Protection Class ..... **IP-10**

## STS-150-A

### External Reference Sensor

### Temperature Range

**0 to 350°C / 32 to 662°F**

### Accuracy

Hysteresis @ 0°C / 32°F ..... **0.01°C / 0.02°F**

Long Term Stability @ 0°C / 32°F ..... **typ. 0.014°C / 0.025°F**

Repeatability ..... **0.004°C / 0.007°F**

Stability when exposed to maximum temperature for 100 hours.

### Sensing Element

**Pt100**

### Response Time

$\tau_{05}$  (50%) ..... **7 seconds**

$\tau_{09}$  (90%) ..... **18 seconds**

Liquid in motion, 0.4 m/sec.

### Dimensions

Diameter ..... **4 mm / 0.157 in**

Length ..... **165 mm / 6.50 in**

Max. Height Over Calibrator Top ..... **20 mm / 0.79 in**

# Specifications for PTC-425

## Functional Specifications

### Temperature Range

@ ambient temp. 23°C / 73°F ..... **33 to 425°C / 91 to 797°F**

Patented heating technology: Patent No. EP2074374/US8342742

### Accuracy with External STS Ref. Sensor

**± 0.13°C / ± 0.23°F**

12-month period. Relative to reference standard. Specifications by use of the external JOFRA STS-150 reference sensor.

### Accuracy with Internal Ref. Sensor

@ 33 to 350°C ..... **± 0.20°C / ± 0.36°F**

@ 350 to 425°C ..... **± 0.25°C / ± 0.45°F**

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

### Stability

**± 0.02°C / ± 0.036°F**

Measured after the stability indicator has been on for 10 minutes.  
Measuring time is 30 minutes.

### Radial Homogeneity

(difference between holes)

**0.02°C / 0.036°F**

### Resolution (user selectable)

All Temperatures ..... **1° or 0.1° or 0.01°**

### Temperature Unit in Display

User Selectable ..... **°C, °F, or K**

### Heating Time

33 to 425°C / 91 to 797°F ..... **10 minutes**

### Cooling Time

425 to 100°C / 797 to 212°F ..... **25 minutes**

100 to 50°C / 212 to 122°F ..... **16 minutes**

### Time to Stability (approx.)

**10 minutes**

## Electrical

### Mains Specifications

Voltage ..... **115V (90-127) / 230V (180-254)**

Frequency, non US Deliveries ..... **50 Hz ±3, 60 Hz ±3**

Frequency, US Deliveries ..... **60 Hz ±3**

Power Consumption (max.) ..... **1150 VA**

### Switch Input (model B)

#### Switch Dry Contacts

Test Voltage ..... **Maximum 5 VDC**

Test Current ..... **Maximum 2.5 mA**

### Communications Interface

Serial Data Interface ..... **USB 2.0 Device Port**

## Physical Specifications

### Weight and Instrument Size

Weight ..... **9.2 kg / 20.3 lb**

(LxWxH) ..... **362 x 171 x 363 mm / 14.3 x 6.7 x 14.3 in**

### Well Diameter

**26 mm / 1.02 in**

### Immersion Depth

**150 mm / 5.91 in**

### Insert Dimensions

Diameter ..... **25.8 mm / 1.02 in**

Length ..... **155 mm / 6.1 in**

### Miscellaneous

Operating Temperature ..... **0 to 40°C / 32 to 104°F**

Storage Temperature ..... **-20 to 50°C / -4 to 122°F**

Humidity ..... **0 to 90% RH**

Protection Class ..... **IP-10**

## STS-150-A

### External Reference Sensor

#### Temperature Range

**0 to 660°C / 32 to 1220°F**

#### Accuracy

Hysteresis @ 0°C / 32°F ..... **0.01°C / 0.02°F**

Long Term Stability @ 0°C / 32°F ..... **typ. 0.014°C / 0.025°F**

Repeatability ..... **0.004°C / 0.007°F**

Stability when exposed to maximum temperature for 100 hours.

#### Sensing Element

**Pt100**

#### Response Time

$\tau_{05}$  (50%) ..... **7 seconds**

$\tau_{09}$  (90%) ..... **18 seconds**

Liquid in motion, 0.4 m/sec.

#### Dimensions

Diameter ..... **4 mm / 0.157 in**

Length ..... **203 mm / 7.99 in**

Max. Height Over Calibrator Top ..... **38 mm / 1.50 in**

# Specifications for PTC-660

## Functional Specifications

### Temperature Range

@ ambient temp. 23°C / 73°F ..... **33 to 660°C / 91 to 1220°F**

Patented heating technology: Patent No. EP2074374/US8342742

### Accuracy with External STS Ref. Sensor

**± 0.15°C / ± 0.27°F**

12-month period. Relative to reference standard. Specifications by use of the external JOFRA STS-150 reference sensor.

### Accuracy with Internal Ref. Sensor

@ 33 to 420°C ..... **± 0.30°C / ± 0.54°F**

@ 420 to 660°C ..... **± 0.50°C / ± 0.54°F**

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

### Stability

**± 0.04°C / ± 0.072°F**

Measured after the stability indicator has been on for 10 minutes.  
Measuring time is 30 minutes.

### Radial Homogeneity

(difference between holes)

**0.1°C / 0.18°F**

### Resolution (user selectable)

All Temperatures ..... **1° or 0.1° or 0.01°**

### Temperature Unit in Display

User Selectable ..... **°C, °F, or K**

### Heating Time

33 to 660°C / 91 to 1220°F ..... **20 minutes**

### Cooling Time

660 to 100°C / 1220 to 212°F ..... **36 minutes**

100 to 50°C / 212 to 122°F ..... **15 minutes**

### Time to Stability (approx.)

**10 minutes**

## Electrical

### Mains Specifications

Voltage ..... **115V (90-127) / 230V (180-254)**

Frequency, non US Deliveries ..... **50 Hz ±3, 60 Hz ±3**

Frequency, US Deliveries ..... **60 Hz ±3**

Power Consumption (max.) ..... **1150 VA**

### Switch Input (model B)

#### Switch Dry Contacts

Test Voltage ..... **Maximum 5 VDC**

Test Current ..... **Maximum 2.5 mA**

### Communications Interface

Serial Data Interface ..... **USB 2.0 Device Port**

## Physical Specifications

### Weight and Instrument Size

Weight ..... **8.9 kg / 19.6 lb**

(LxWxH) ..... **362 x 171 x 363 mm / 14.3 x 6.7 x 14.3 in**

### Well Diameter

**25 mm / 0.98 in**

### Immersion Depth

**150 mm / 5.91 in**

### Insert Dimensions

Diameter ..... **24.8 mm / 0.98 in**

Length ..... **160 mm / 6.3 in**

### Miscellaneous

Operating Temperature ..... **0 to 40°C / 32 to 104°F**

Storage Temperature ..... **-20 to 50°C / -4 to 122°F**

Humidity ..... **0 to 90% RH**

Protection Class ..... **IP-10**

## STS-150-A

### External Reference Sensor

#### Temperature Range

**0 to 660°C / 32 to 1220°F**

#### Accuracy

Hysteresis @ 0°C / 32°F ..... **0.01°C / 0.02°F**

Long Term Stability @ 0°C / 32°F ..... **typ. 0.014°C / 0.025°F**

Repeatability ..... **0.004°C / 0.007°F**

Stability when exposed to maximum temperature for 100 hours.

#### Sensing Element

**Pt100**

#### Response Time

$\tau_{05}$  (50%) ..... **8 seconds**

$\tau_{09}$  (90%) ..... **26 seconds**

Liquid in motion, 0.4 m/sec.

#### Dimensions

Diameter ..... **4 mm / 0.157 in**

Length ..... **203 mm / 7.99 in**

Max. Height Over Calibrator Top ..... **38 mm / 1.50 in**

# Specifications

## Input Specifications

All input specifications apply to the dry-block of the calibrator running at the respective temperature (stable plus an additional 20 minute period).  
Input specifications are *not* applicable to the A models.

### RTD Reference Input (models B and C)

Type ..... **4-wire RTD with true ohm measurements (1)**  
F.S. (Full Scale)..... **400 ohm**  
Accuracy (12 months)..... **±(0.003% rdg. + 0.0007% F.S.)**

RTD Type	Temperature		12 Months	
	°C	°F	°C	°F
Pt100 Reference	-25	-13	± 0.014	± 0.025
	0	32	± 0.015	± 0.027
	55	131	± 0.017	± 0.031
	100	212	± 0.018	± 0.032
	155	311	± 0.020	± 0.036
	350	662	± 0.028	± 0.051
	660	1220	± 0.041	± 0.074

(1) True ohm measurement is an effective method to eliminate errors from induced thermoelectrical voltage.

### RTD Sensor Under Test Input (model B)

F.S. (range) ..... **400 ohm**  
Accuracy (12 months)..... **±(0.006% Rdg.+0.002% F.S)**  
F.S. (range) ..... **4000 ohm**  
Accuracy (12 months)..... **±(0.006% Rdg. + 0.005% F.S.)**  
2-wire..... **add 50 mOhm**

RTD Type	Temperature		12 Months	
	°C	°F	°C	°F
Pt1000 (90) 385	-25	-13	± 0.07	± 0.12
	0	32	± 0.07	± 0.12
	155	311	± 0.08	± 0.15
	350	662	± 0.10	± 0.18
	660	1220	± 0.13	± 0.23
Pt500 (90) 385	-25	-13	± 0.12	± 0.22
	0	32	± 0.12	± 0.22
	155	311	± 0.14	± 0.24
Optional	350	662	± 0.16	± 0.28
	660	1220	± 0.20	± 0.35
Pt100 (90) 385	-25	-13	± 0.04	± 0.06
	0	32	± 0.04	± 0.06
	155	311	± 0.05	± 0.08
	350	662	± 0.06	± 0.11
	660	1220	± 0.08	± 0.15

The PTC calibrator has as standard input for resistance sensors and curves such as: Pt100(90)391, Pt100(90)392, H120(90)672.

The PTC can optionally be supplied with input for resistance sensors and curves such as: Pt10(90)385, Pt50(90)385, Pt200(90)385, Pt500(90)385, Pt50(90)391, M50(90)428, M100(90)428, Pt100 Mill and YSI-400.

### Thermocouple Input

Range ..... **± 78 mV**  
F.S. (Full Scale)..... **78 mV**  
Accuracy (12 months) ..... **±(0.02% Rdg. + 0.01% F.S.)**

Refer to the table in the next column.

TC Type	Temperature		12 Months*	
	°C	°F	°C	°F
E	0	32	± 0.14	± 0.25
	155	311	± 0.14	± 0.25
	350	662	± 0.17	± 0.31
	660	1220	± 0.22	± 0.40
J	0	32	± 0.17	± 0.31
	155	311	± 0.17	± 0.31
	350	662	± 0.23	± 0.41
	660	1220	± 0.25	± 0.45
K	0	32	± 0.22	± 0.40
	155	311	± 0.22	± 0.40
	350	662	± 0.26	± 0.48
	660	1220	± 0.32	± 0.57
T	0	32	± 0.20	± 0.36
	155	311	± 0.20	± 0.36
	350	662	± 0.19	± 0.35
R	400	752	± 0.19	± 0.35
	155	311	± 1.56	± 2.812
	350	662	± 0.83	± 1.50
S	660	1220	± 0.75	± 1.36
	155	311	± 1.56	± 2.81
	350	662	± 0.92	± 1.66
B	660	1220	± 0.85	± 1.53
	250	482	± 3.17	± 5.70
	350	662	± 2.42	± 4.35
N	660	1220	± 1.32	± 2.37
	0	32	± 0.30	± 0.54
	155	311	± 0.30	± 0.54
	350	662	± 0.29	± 0.52
U	660	1220	± 0.32	± 0.57
	0	32	± 0.20	± 0.36
	155	311	± 0.18	± 0.33
	350	662	± 0.19	± 0.35
	660	1220	± 0.21	± 0.37

\* Excludes CJC accuracy ± 0.3° C / ± 0.54° F



# Inserts

## Predrilled Inserts

Sensor Diameter	Instrument				
	Insert Code*	PTC-155	PTC-350	PTC-425	PTC-660
3 mm	003	127937	127990	129722	128031
4 mm	004	127938	127991	129723	128032
5 mm	005	127939	127992	129724	128033
6 mm	006	127940	127993	129725	128034
7 mm	007	127941	127994	129726	128035
8 mm	008	127942	127995	129727	128036
9 mm	009	127943	127996	129728	128037
10 mm	010	127944	127997	129729	128038
11 mm	011	127945	127998	129730	128039
12 mm	012	127946	127999	129731	128040
13 mm	013	127947	128000	129732	128041
14 mm	014	127948	128001	129733	128042
15 mm	015	127949	128002	129734	128043
Package of Above Inserts	SMM	127951	128004	129743	128045

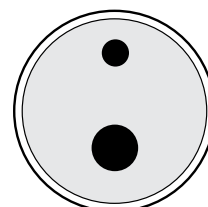
Sensor Diameter	Instrument				
	Insert Code*	PTC-155	PTC-350	PTC-425	PTC-660
1/8 in	125	127952	128005	129735	128046
3/16 in	187	127953	128006	129736	128047
1/4 in	250	127954	128007	129737	128048
5/16 in	312	127955	128008	129738	128049
3/8 in	375	127956	128009	129739	128050
7/16 in	437	127957	128010	129740	128051
1/2 in	500	127958	128011	129741	128052
9/16 in	562	127959	128012	129742	128053
5/8 in	625	127960	128013	n/a	n/a
Package of Above Inserts	SIM	127961	128014	129744	128055

\* Use the insert code, when ordering a JOFRA standard insert together with the PTC calibrator.

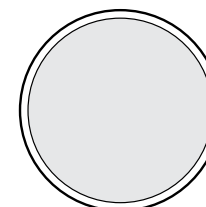
## Undrilled Inserts

Inserts	Instrument				
	Insert Code*	PTC-155	PTC-350	PTC-425	PTC-660
5-pack, undrilled inserts with no holes	UN1	127935	127988	129720	128029
5-pack, undrilled inserts with 2 holes for STS reference sensors (4mm & 1/4")	UN2	127936	127989	129721	128030
Undrilled insulation plug	—	127969	n/a	n/a	n/a

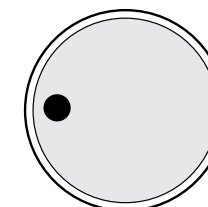
\* Use the insert code, when ordering a JOFRA standard undrilled insert together with the PTC calibrator.



Predrilled Insert



Undrilled Insert UN1



Undrilled Insert UN2

Inserts for PTC-155 and PTC-350 are made of aluminum. Inserts for PTC-425 and PTC-660 are made of brass. All specifications on hole sizes refer to the outer diameter of the sensor-under-test. The correct clearance size is applied in all predrilled inserts.

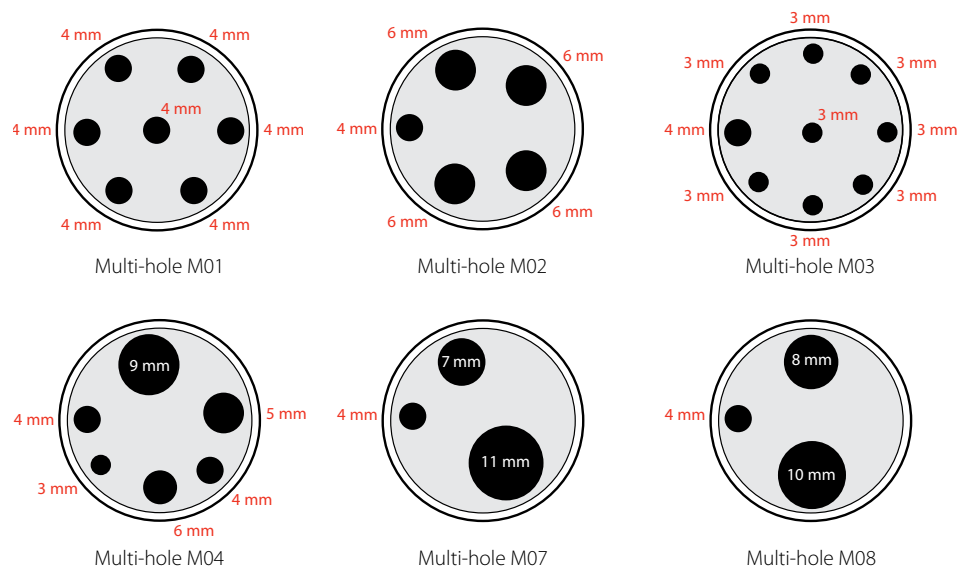
# Specifications

## Multi-Hole Inserts—Metric (mm)

All inserts are supplied with an insulation plug drilled with the necessary holes.

Insert Type	Instrument				
	Insert Code*	PTC-155	PTC-350	PTC-425	PTC-660
Multi-hole Type 1	M01	127962	128015	129697	128056
Multi-hole Type 2	M02	127963	128016	129698	128057
Multi-hole Type 3	M03	127964	128017	129699	128058
Multi-hole Type 4	M04	127965	128018	129700	128059
Multi-hole Type 7	M07	127966	128019	129701	128060
Multi-hole Type 8	M08	127967	128020	129702	128061
Set of 4 Inserts, 3 to 12 mm.	SMX	127976	128022	129748	128067

\* Use the insert code, when ordering a JOFRA standard multi-hole insert together with the PTC calibrator.

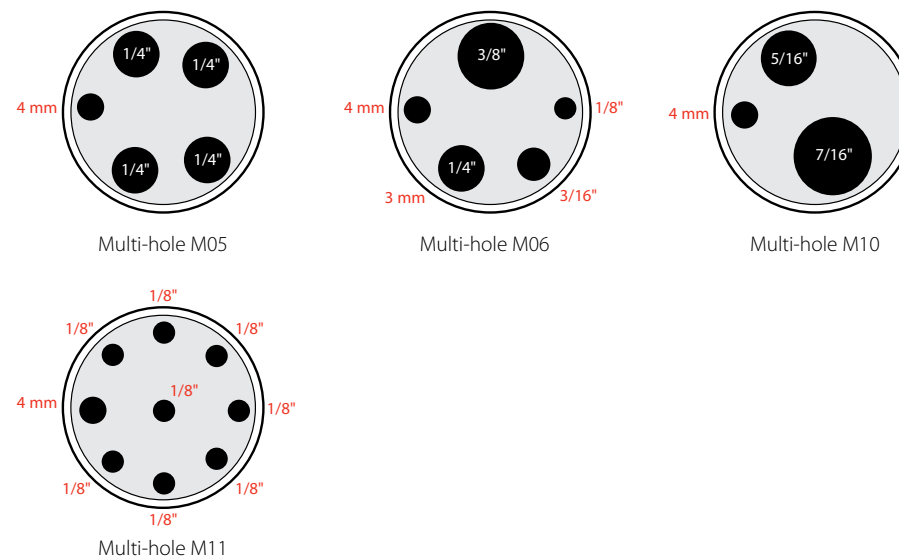


## Multi-Hole Inserts—Imperial (in)

All inserts are supplied with an insulation plug drilled with the necessary holes.

Insert Type	Instrument				
	Insert Code*	PTC-155	PTC-350	PTC-425	PTC-660
Multi-hole Type 5	M05	127970	128023	129703	128063
Multi-hole Type 6	M06	127972	128025	129704	128065
Multi-hole Type 10	M10	127973	128026	129705	128066
Multi-hole Type 11	M11	127971	128024	129706	128064
Set of 3 Inserts, 1/8 to 1/2 in.	SIX	127977	128027	129749	128068

\* Use the insert code, when ordering a JOFRA standard multi-hole insert together with the PTC calibrator.



# Options & Accessories

## Standard Delivery

### Models A, B, and C Include:

- PTC dry-block calibrator (user specified).
- Mains power cable (user specified).
- Traceable certificate - temperature performance.
- Tool for insertion tubes.
- USB cable.
- Set of rubber cones for insulation plugs.
- Carrying Case.
- USB key containing JofraCal software package and reference manual.

### Model B Instruments Also Include:

- Test cables (2 x red, 2 x black).
- Traceable certificate - input performance for reference sensor.
- Traceable certificate - input performance for sensor-under-test inputs.

### Model C Instruments Also Include:

- Traceable certificate - input performance for reference sensor.



## Accessories

Reference sensor for PTC-350 .....	<b>STS150A915EH</b>
Reference sensor for PTC-660 & PTC-425 .....	<b>STS150A915EH</b>
Reference sensor STS-102 .....	<b>STS150A915EH</b>
Extra fixture for sensor grip .....	<b>125066</b>
Extra sensor grip .....	<b>125067</b>
Thermocouple Male Plug – Type J – Black .....	<b>120516</b>
Thermocouple Male Plug – Type K – Yellow .....	<b>120517</b>
Thermocouple Male Plug – Type N – Orange .....	<b>120514</b>
Thermocouple Male Plug – Type T – Blue .....	<b>120515</b>
Thermocouple Male Plug – Type R / S – Green .....	<b>120518</b>
Thermocouple Male Plug – Type Cu-Cu – White .....	<b>120519</b>

# Ordering Information

<b>Base Model Number</b>	
PTC155 .....	PTC-155, -25 to 155° C (-13 to 311° F)
PTC350 .....	PTC-350, 33 to 350° C (91 to 662° F)
PTC425 .....	PTC-425, 33 to 425° C (91 to 797° F)
PTC660 .....	PTC-660, 33 to 660° C (91 to 1220° F)
<b>Model Version</b>	
A .....	Basic model, without input
B .....	Full model, incl. Reference sensor input, Sensor-under-test input
C .....	Middle model, incl. Reference sensor input
<b>Power Supply (US deliveries 60 Hz only)</b>	
115 .....	115 VAC
230 .....	230 VAC
<b>Mains Power Cable</b>	
A .....	European, 230 V
B .....	USA/Canada, 115 V
C .....	UK, 240 V
D .....	South Africa, 220 V
E .....	Italy, 220 V
F .....	Australia, 240 V
G .....	Denmark, 230 V
H .....	Switzerland, 220 V
I .....	Israel, 230 V
<b>Insert Type and Size</b>	
NON .....	No insert selected (standard)
UNX .....	1 x Undrilled Insert (Please see Insert selection for code)
XXX .....	1 x Single hole insert (Please see Insert selection for code)
MXX .....	1 x Multi hole insert (Please see Insert selection for code)
SIX .....	Set of 3 Imperial multi hole inserts. Covering holes from 1/8" to 1/2"
SMX .....	Set of 4 Metric multi hole inserts. Covering holes from 3 mm to 12 mm
SIM .....	Complete Set of Imperial inserts (inch)
SMM .....	Complete Set of Metric inserts (mm)
<b>User Interface Functionality (B model only – optional)</b>	
U1 .....	Complete functionality package: Workorders, Full Sensor-Under-Test types, and Engineering Units
<b>External Reference Sensor (B and C models only – optional)</b>	
R1 .....	STS-102 Ref. sensor. Temperature range up to 155° C/311° F
R11 .....	STS-150-A-915 Ref. sensor for PTC-155
R12 .....	STS-150-A-935 Ref. sensor for PTC-350
R13 .....	STS-150-A-935 Ref. sensor for PTC-425 and STS-150-A-966 Ref. sensor for PTC-660
<b>Calibration Certificate</b>	
F .....	Traceable Certificate to International standards
H .....	Accredited Certificate – ISO17025
EA .....	Full EURAMET Accredited Certificate – ISO17025
HS .....	System Calibration – Accredited Certificate – ISO17025 (B & C model only)
EAS .....	System Calibration – Full EURAMET Accredited Certificate – ISO17025 (B & C model only)
<b>Accessories</b>	
CX ..	Solid Protective Carrying Case
CR ..	Solid Protective Carrying Case with Support Rod Set
CT ..	Solid Protective Carrying Case with Trolley
SR ..	Support Rod Set
TR ..	Solid Protective Carrying Case with Trolley & Support Rod Set

PTC155 B 230 A SMX U1 R11 EA TR

## Sample Order Number

**PTC155B230ASMXXU1R11EAGTR**

JOFRA PTC-125 B with 230VAC, EU power cord, set of metric inserts, UI functionality package, 4 mm diameter STS-150 reference sensor, full EA temperature calibration certificate, and carrying case with trolley plus support rod set.



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