

temperature

# JOFRA<sup>®</sup> calibration

## » High accuracy

Down to  $\pm 0.04^{\circ}\text{C}$  using the external reference sensor. 4-wire True-Ohm-Measurement technology is used

## » Excellent stability $0.01^{\circ}\text{C}$

## » Wide temperature range

RTC-158 from  $-22$  to  $155^{\circ}\text{C}$  ( $-8$  to  $311^{\circ}\text{F}$ )  
RTC-250 from  $28$  to  $250^{\circ}\text{C}$  ( $82$  to  $482^{\circ}\text{F}$ )

## » Excellent temperature homogeneity

Unique active dual-zone block ensures good temperature homogeneity in the calibration zone

Both for liquid bath  
and dry-block use

Patent  
pending!

## » DLC

### Dynamic Load Compensation

Perfect temperature uniformity in the insert, even when calibrating large sensors or many sensors at a time.  
B and C models only

## » Temperature uniformity indicator

Shows the degree of temperature uniformity in the insert when using the new DLC technology.  
B and C models only

## » New sensor basket

In combination with the stirrer the newly developed sensor basket ensures virtually zero axial and radial gradients in the calibration zone

NEW!

## » Intelligent reference sensors

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

## » USB communication

All RTC calibrators communicate via an easy-to-use USB port

## » EURAMET

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

ISO 9001 Manufacturer

Specification Sheet, SS-RTC-158/250

## Reference Temperature Calibrator RTC-158 & RTC-250



Liquid Bath



Dry-Block



AMETEK continues to develop new techniques to improve performance, accuracy, convenience and functionality of the well-known JOFRA calibration products. By doing so, we maintain our position as the leading worldwide manufacturer of temperature dry-block calibrators.

### Advantages of the combined liquid bath/dry-block calibrator

Calibration of many sensors at a time due to more space for example in connection with validation of many thermocouples, which saves time

- Automatic calibration of as many as 24 sensors at a time
- For customers, who only want to use liquid baths
- For calibration of odd sizes and shapes of sensors including sanitary sensors  
WET = no need for inserts, that fit the sensors  
DRY = more space for calibration of special sensors
- Industries who need to calibrate many sensors at a time or short sensors can benefit from the big well
- JOFRACAL software and RTC B-models can handle on-line calibration and documentation of multiple sensors calibrated simultaneously

### The RTC-158 and RTC-250

We are proud to introduce our new top model RTC (Reference Temperature Calibrator) series, which is even more sophisticated than any existing calibrators.

The RTC offers many new fantastic features, such as:

- Patent pending DLC, Dynamic Load Compensation system, for perfect temperature uniformity in the insert
- Unique intelligent sensors for plug'n'play connection
- USB connector for communication
- Easy-to-read color VGA display with perfect overview of the actual status
- Intuitive, fast and user-friendly navigation
- Lightweight and easy to carry around
- New functional carrying case design
- Multi-hole inserts covering all the most used sensor sizes
- High profile design and the well-known long lasting JOFRA quality

The new RTC calibrator comes in three different models – A, B, and C.

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



### Liquid bath / large diameter insert

The RTC-158/250 are fitted with a 160 mm (6.3 in) deep well with a diameter of 63.5 mm (2.5 in) and can be used both as dry-block calibrators and as liquid calibration baths with a magnetic stirrer.

A liquid bath and a dry-block diameter of 63.5 mm (2.5 in), which is twice the size of any other dry-block, are both new features. With these options, it is now possible to calibrate even more temperature sensors simultaneously and to calibrate large as well as odd sizes and shapes of sensors, which is not possible with the remaining product range.

RTC-158/250 can be used without an external reference sensor, but if an STS-200 reference sensor is connected directly to a B or C version or the reference thermometer DTI-1000, you will obtain better accuracies and thereby use the full potential of the calibrators.

### Liquid bath versus dry-block kit

The basic advantages of the liquid bath configuration versus the dry-block configuration are as follows:

- You do not need insertion tubes for all your different types of sensors
- You can calibrate sensors, which do not fit into insertion tubes
- You can calibrate glass thermometers and gas or liquid filled sensors
- You are ready to calibrate right away no matter what sensor you may have



The basic advantages of the dry-block configuration versus the liquid bath configuration are as follows:

- No hazardous hot liquids
- Easier to handle insertion tubes than liquids
- More convenient to carry than when filled with liquid
- No need for external exhaustion
- 100% repeatability in the sensor position in the block

All specifications given in the liquid bath configuration are based on the silicone oil supplied and recommended by JOFRA.



**NEW!**  
plug'n'play



### Intelligent reference sensors

The JOFRA STS-200 intelligent reference sensor as well as the new DLC sensor are both containing all 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 new STS-200 reference sensor and the DLC sensor have both been specially designed. They are both angled 90° and customized to fit the calibrator so they are only slightly higher than the top of the RTC calibrator.

The unique design allows calibration of 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 new design techniques that have made the RTC calibrator lightweight and easy to carry around without compromising its quality, durability and functionality.

The purpose of minimizing the weight of the RTC calibrator is to protect especially frequent users from overload.

### Improved temperature calibration

Time is money! This is why all new RTC calibrators have an increased heating and cooling speed. Heating and cooling speed has been increased by up to 25%. The implication is savings in both production downtime and general calibration costs.

### Multi-hole inserts

With the purpose of covering all sensor sizes, special multi-hole inserts have been developed.

Multi-hole inserts come in metric and imperial sizes. Metric covers all standard sizes from 3 to 12 mm. Imperial covers all standard sizes from 1/8 to 1/2 in.



These inserts have holes for both the DLC and two reference sensors (4 mm and 1/4"). These holes are marked for correct use.

With this multi-hole insert in the carrying case the user is able to calibrate all the most commonly known sensor sizes.

### New designed basket

The sensor basket is designed to prevent sensors from interfering with the stirrer. Numerous tests have been carried out to find the optimum design of the sensor basket in regard to create the largest possible temperature homogeneous zone. This work has resulted in a new sensor basket performing virtually zero axial and radial gradients in the calibration zone.



### Intelligent recalibration information

In order to comply with ISO, SOP's and FDA it is imperative that the calibration equipment never exceeds the expiry of the calibration certificate. RTC calibrators are constantly checking calibration dates on the calibrator as well as for the connected STS and DLC sensors. If the calibration period has expired, a warning will appear in the display. This feature prevents costly consequence evaluation.

### Easy-to-read color display and user-friendly navigation

The new 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. 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 large display contains more detailed information at a glance, such as: Stability status • Load compensation status • Real time clock • Serial number of reference sensor • Sensor-under-test status

**Integrated support rod**

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

**Special designed carrying case**

AMETEK has designed an all-in-one carrying case.

We have now made it possible to store both the STS reference sensors and the DLC sensor in the carrying case with an optimum physical protection. There is room for inserts, insulation plugs and calibration oil as well as compartments for the new integrated support rod set, wires, manuals, certificates, plugs, insert tools, etc.



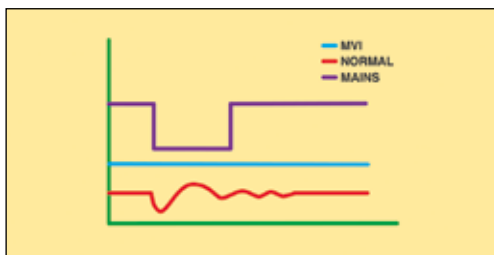
All rooms are specially designed to hold one of the above mentioned items. This makes it very easy to keep track of any accessories.

For optimum protection of the calibrator and the accessories, the compartments are designed to hold the accessories fixed during transportation.

The carrying case comes with integrated wheels for easy transportation.

**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.



**Highest accuracy (model B & C only)**

The RTC series calibrators may be supplied with a built-in reference thermometer to be used with an external reference sensor. This feature allows the instrument to perform calibration on-site, while maintaining a high accuracy.

The user can decide whether to read the built-in reference sensor or the more accurate angled reference sensor from the large, easy-to-read LCD display of the calibrator. The external sensor and the internal sensor readings are independent of one another.

**SET-Follows-TRUE (model 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 RTC 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), voltage (V) and thermostats.

The RTC-B calibrators can be programmed from the keyboard for fully automatic sensor calibration. Once the unit is programmed, the instrument is self-operating and performs the configured calibration routine. All calibration data are stored and can be read in the display.



**Switch test (model B only)**

Users may perform a thermostwitch 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 RTC 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 RTC 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 RTC 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.

### Silent operation

The RTC calibrator can be programmed to run in silent operation. This function is an advantage if calibrating in a laboratory or in an office. During silent operation, the calibrator is not using its full speed potential.

### SYNC output

A synchronization output signals when the instrument is stable and may be used with ancillary devices such as video recorders, digital cameras or as an input to a data logging device. The SYNC output may be useful for automating and documenting calibration when calibrating external reading devices.

### JOFRACAL calibration software

JOFRACAL is a highly versatile calibration software supplied with the RTC calibrators. The software ensures easy calibration of all kind 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.

Free download  
www.jofra.com



JOFRACAL integrates with JOFRA calibration instruments. As for temperature calibrators, it is the whole range of temperature calibrators. Regarding pressure calibrators, it integrates with DPC-500, HPC and IPI pressure calibrators. JOFRACAL also has full integration with the series of signal calibrators.

JOFRACAL can 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 collected calibration data can be stored on a PC for later recall or analysis. The RTC calibrator can be programmed to store the calibration procedures and may be taken out to the process site without bringing a personal computer. This feature is named Work Orders.

Work Orders allow the RTC 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 the JOFRACAL for printing of certificates. The data collected can of course 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.

### 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

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 JOFRA ASM

Using the RTC 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 3 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.



### Hardware requirements

1.1.1 PCs, minimum hardware requirements:

- Intel® Pentium® II 1.4 GHz processor
- 128MB RAM (256MB recommended)
- 512MB free disk space on hard disk (1GB recommended) prior to installation
- Standard VGA (800x600, 256 colors). 1024x768 recommended
- USB port
- One or more free RS-232 serial and USB ports, if using devices requiring RS-232 communication

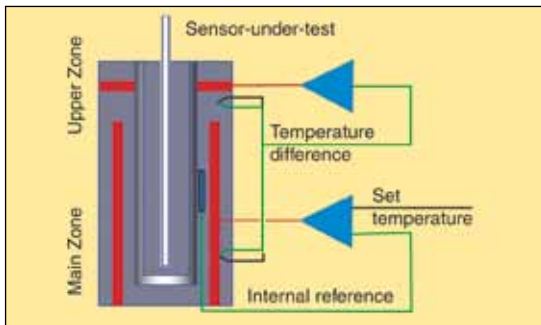
1.1.2 PCs, minimum software requirements:

- Microsoft Windows® ME, Microsoft Windows® XP, Window 7
- System fonts: MS Sans Serif and Arial

## Unique temperature performance

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

The RTC-series features our well-known 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.



## DLC - Dynamic Load Compensation

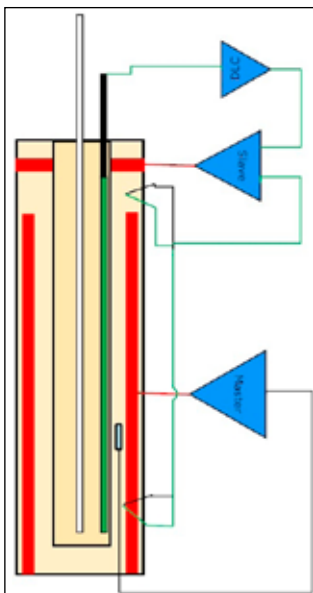
**Patent pending!**

To bring our well documented active dual-zone technology to an even higher level, we have developed the patent pending new DLC system.

This newly developed unique feature makes it possible to perform top calibration specifications without being affected by the actual load e.g. many sensors or very big sensors.

A new DLC sensor, Dynamic Load Compensation sensor, has been specially developed for this purpose.

The RTC calibrator features the active dual zone temperature control which improves the homogeneity in the well by adjusting the temperature in the top of the well to the same temperature as in the bottom. The dual zone keeps this difference at a minimum.



The new DLC sensor improves the homogeneity even more by controlling the homogeneity not only in the well, but also inside the insert, where the sensors-under-test are placed during calibration. The DLC sensor measures the temperature homogeneity in the insert and provides feedback to the active dual-zone system, which now compensates the temperature difference to a minimum inside the insert. In this way, the DLC function makes the homogeneity independent of the different loads of the insert.

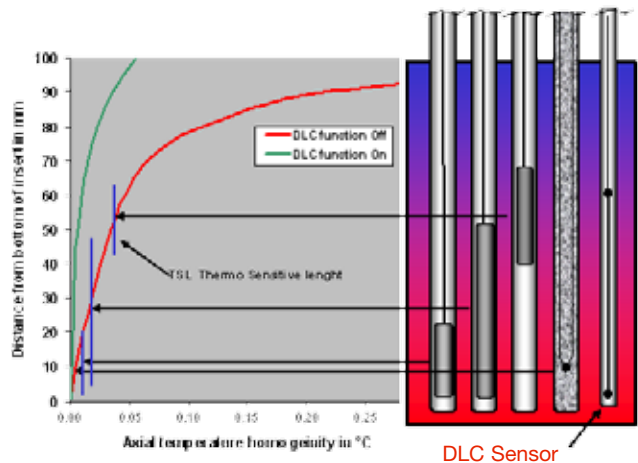
Based on the new DLC functionality, the RTC is the best performing dry-block calibrator on the market, when being calibrated and tested according to the globally accepted EURAMET/cg-13/v.01 guideline for calibration and testing of dry-blocks.

The DLC system comprises a special differential temperature sensor designed especially for the RTC. The sensor is placed in the insert and connected to the calibrator. When the DLC function is enabled, the calibrator will automatically equalize the temperature homogeneity inside the insert on top of the normal temperature control and stabilization.

## DLC - User advantages

Calibrating with DLC sensor has the following advantages:

1. Calibration of several sensors simultaneously
2. Calibration of thick sensors
3. TSL (Thermo Sensitive Length) independency. It is no longer necessary to know the TSL of the sensor
4. Compensation for sensor production tolerances like the PT100 element being mounted in various positions in the sensor
5. Trouble-free calibration of sensors with PT100 elements up to a 60 mm length
6. Verification that the dual-zone is active and well-functioning
7. A perfectly working calibrator. The DLC value should be very close to 0.00 when the calibrator is loaded with a DLC sensor and an external reference sensor
8. Together with the stability indication, the DLC indicates when the calibration values can be read



Axial temperature curves for an RTC calibrator with and without the DLC functionality activated. DLC controlling is automatically disabled when the stirrer is started.

## USB connector for communication

**NEW!**

Another new RTC feature is the USB connection. It 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.

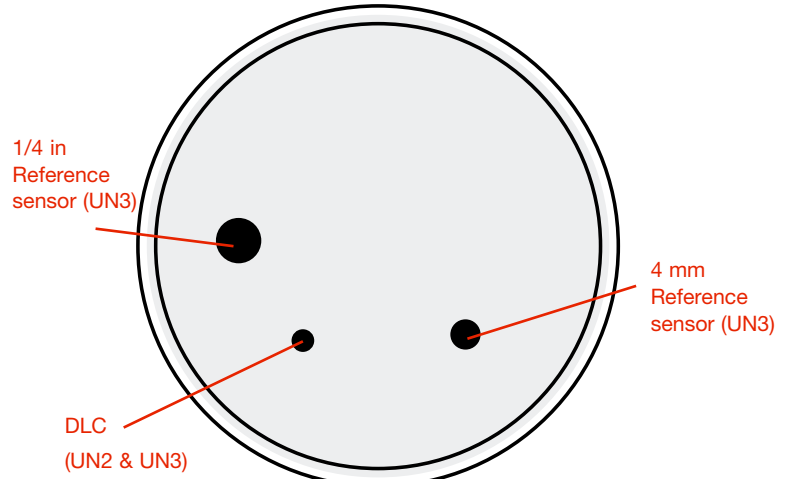
Future-proof through e.g. a flash capability for easy firmware upgrades as well as already integrated LAN communication, SD-card slot and USB host connectors for future use.

## INSERTS AND LIQUID BATH KIT

### Undrilled inserts for RTC-158/250

| Inserts, undrilled       |  |               |               |
|--------------------------|--|---------------|---------------|
| Insert Code <sup>1</sup> | Insert   | RTC-158 A/B/C | RTC-250 A/B/C |
| UN1                      | Undrilled insert   | 124899        | 127758        |
| UN2                      | Undrilled insert with DLC                                      | 127829        | 127834        |
| UN3                      | Undrilled insert with DLC and reference sensor 4 mm and 1/4 in | 127831        | 127835        |

Note 1: Use the insert code when ordered as the standard insert together with a new calibrator.

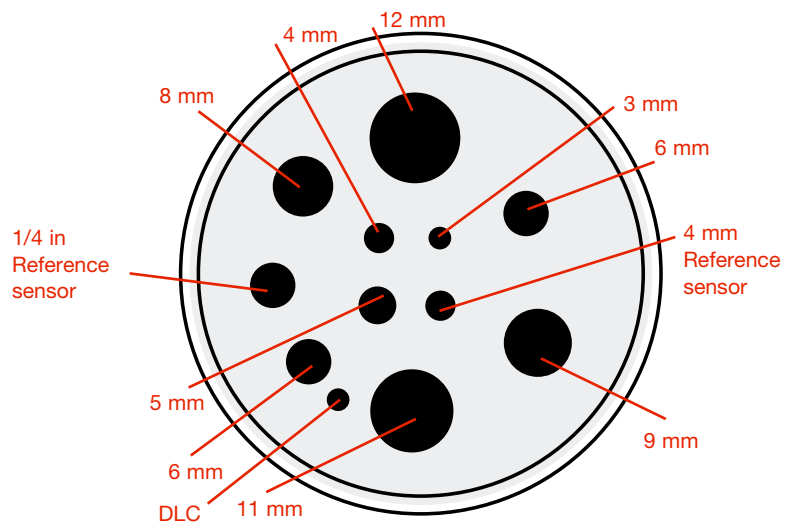


### Metric (mm)

#### Multi-hole inserts for RTC-158/250

| Spare part no. for multi-hole inserts - metric (mm) |               |               |
|---|---------------|---------------|
| Instruments   |               |               |
| Insert code <sup>1</sup>                            | RTC-158 A/B/C | RTC-250 A/B/C |
| M01   | 124897        | 127759        |

Note 1: Use the insert code when ordered as the standard insert together with a new calibrator.

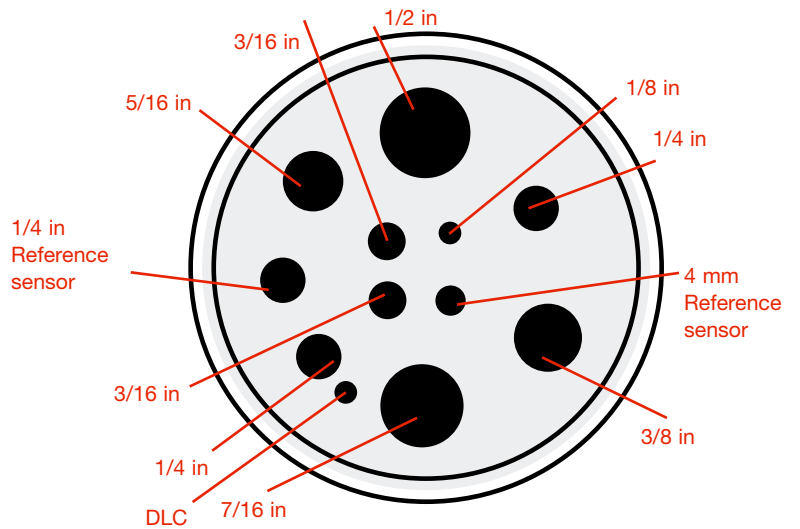


### Imperial (Inch)

#### Multi-hole inserts for RTC-158/250

| Spare part no. for multi-hole inserts - imperial (inch) |               |               |
|---|---------------|---------------|
| Instruments   |               |               |
| Insert code <sup>1</sup>                                | RTC-158 A/B/C | RTC-250 A/B/C |
| M02   | 124898        | 127760        |

Note 1: Use the insert code when ordered as the standard insert together with a new calibrator.



All inserts are supplied with a matching insulation plug.

### Liquid Bath Kit - Option BAT

The liquid bath kit for RTC-158/250 contains a sensor basket, 2 covering lids, a magnet, a magnetic remover, a liquid drainage tube and 0.75 l silicone oil.



## FUNCTIONAL SPECIFICATIONS

### Temperature range

RTC-158  
 @ ambient temp. 0°C/32°F ..... -37 to 155°C/-35 to 311°F  
 @ ambient temp. 23°C/73°F ..... -22 to 155°C/-8 to 311°F  
 @ ambient temp. 40°C/104°F ..... -9 to 155°C/16 to 311°F  
 RTC-250  
 @ ambient temp. 0°C/32°F ..... 5 to 250°C/41 to 482°F  
 @ ambient temp. 23°C/73°F ..... 28 to 250°C/82 to 482°F  
 @ ambient temp. 40°C/104°F ..... 45 to 250°C/113 to 482°F

### Accuracy (model B & C) with external STS ref. sensor

RTC-158 B & C ..... ±0.04°C/±0.07°F  
 RTC-250 B & C ..... ±0.07°C/±0.13°F  
 12-month period. Relative to reference standard. Specs by use of the external STS-200 reference sensor. Excl. sensor drift.

### Accuracy with internal reference sensor

RTC-158 A, B & C ..... ±0.18°C/±0.32°F  
 RTC-250 A, B & C ..... ±0.28°C/±0.50°F

### Stability

RTC-158 ..... ±0.01°C/±0.018°F  
 RTC-250 ..... ±0.02°C/±0.036°F  
 Measured after the stability indicator has been on for 15 minutes. Measuring time is 30 minutes.

### Radial homogeneity (difference between holes)

RTC-158 @ -22°C/-8°F, Block ..... 0.03°C/0.05°F  
 RTC-158 @ 155°C/311°F, Block ..... 0.05°C/0.09°F  
 RTC-158 @ range, Bath ..... 0.015°C/0.03°F  
 RTC-250 @ range, Block ..... 0.05°C/0.09°F  
 RTC-250 @ range, Bath ..... 0.015°C/0.03°F

### Resolution (user-selectable)

All temperatures ..... 1° or 0.1° or 0.01° or 0.001°

### Heating time

RTC-158 -22 to 23°C/-8 to 73°F ..... 9 minutes  
 23 to 100°C/73 to 212°F ..... 23 minutes  
 100 to 155°C/212 to 311°F ..... 28 minutes  
 RTC-250 28 to 100°C/82 to 212°F ..... 3 minutes  
 50 to 100°C/122 to 212°F ..... 2 minutes  
 100 to 250°C/212 to 482°F ..... 9 minutes

### Cooling time

RTC-158 155 to 100°C/311 to 212°F ..... 9 minutes  
 100 to 23°C/212 to 73°F ..... 24 minutes  
 23 to 0°C/73 to 32°F ..... 15 minutes  
 0 to -15°C/32 to 5°F ..... 21 minutes  
 RTC-250 250 to 100°C/482 to 212°F ..... 27 minutes  
 100 to 50°C/212 to 122°F ..... 27 minutes  
 50 to 28°C/122 to 82°F ..... 28 minutes

### Time to stability (approx.)

RTC-158 ..... 15 minutes  
 RTC-250 ..... 15 minutes

### Immersion depth

RTC-158/250 incl. insulation plug ..... 180 mm/7.1 in  
 RTC-158/250 bath version ..... 150 mm/5.9 in

## 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).

All input specifications are valid for RTC-158 and RTC-250.

### RTD reference input (B & C models only)

Type ..... 4-wire RTD with true ohm measurements<sup>1)</sup>  
 F.S. (Full Scale) ..... 400 ohm  
 Accuracy (12 months) ..... ±(0.0012% rdg. + 0.0005% F.S.)

| RTD Type        | Temperature |     | 12 months |        |
|-----------------|-------------|-----|-----------|--------|
|                 | °C          | °F  | °C        | °F     |
| Pt100 reference | -22         | -8  | ±0.008    | ±0.015 |
|                 | 0           | 32  | ±0.008    | ±0.015 |
|                 | 28          | 82  | ±0.009    | ±0.016 |
|                 | 155         | 311 | ±0.011    | ±0.020 |
|                 | 250         | 482 | ±0.012    | ±0.022 |

Note 1: True ohm measurement is an effective method to eliminate errors from induced thermoelectrical voltage

### DLC sensor input (B & C models only)

| Type    | Temperature |     | 12 months |        |
|---------|-------------|-----|-----------|--------|
|         | °C          | °F  | °C        | °F     |
| DLC 155 | -22         | -58 | ±0.014    | ±0.025 |
|         | 0           | 32  | ±0.010    | ±0.018 |
|         | 28          | 82  | ±0.010    | ±0.018 |
|         | 155         | 311 | ±0.008    | ±0.015 |
|         | 250         | 482 | ±0.008    | ±0.015 |

\* at 0.00°C / 0.00°F DLC reading

### RTD sensor under test input (B model only)

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

| RTD Type           | Temperature |     | 12 months |        |
|--------------------|-------------|-----|-----------|--------|
|                    | °C          | °F  | °C        | °F     |
| Pt100 90(385) IEC  | -22         | -8  | ±0.025    | ±0.045 |
|                    | 0           | 32  | ±0.026    | ±0.047 |
|                    | 28          | 82  | ±0.026    | ±0.047 |
|                    | 155         | 311 | ±0.030    | ±0.054 |
|                    | 250         | 482 | ±0.033    | ±0.060 |
| Pt500 90(385) IEC  | -22         | -8  | ±0.113    | ±0.203 |
|                    | 0           | 32  | ±0.116    | ±0.209 |
|                    | 28          | 82  | ±0.118    | ±0.212 |
|                    | 155         | 311 | ±0.129    | ±0.232 |
|                    | 250         | 482 | ±0.131    | ±0.236 |
| Pt1000 90(385) IEC | -22         | -8  | ±0.063    | ±0.114 |
|                    | 0           | 32  | ±0.064    | ±0.115 |
|                    | 28          | 82  | ±0.066    | ±0.119 |
|                    | 155         | 311 | ±0.075    | ±0.135 |
|                    | 250         | 482 | ±0.082    | ±0.148 |

Input and curves for many different resistance sensors such as:

0-400Ω

(P10(90)386/P50(90)385/P100(90)385/P50(90)391/  
 P100(90)391/P100(90)392/M50(90)428/M100(90)428/  
 H120(90)672/Pt-100 MILL)

0-4000Ω

(P200(90)385/P500(90)385/P1000(90)385/YSI-400)



**Thermocouple input**

Range .....  $\pm 78$  mV  
 F.S. (Full Scale) ..... 78 mV  
 Accuracy (12 months) .....  $\pm(0.005\% \text{ Rdg.} + 0.005\% \text{ F.S.})$

| TC Type | Temperature |     | 12 months* |            |
|---------|-------------|-----|------------|------------|
|         | °C          | °F  | °C         | °F         |
| E       | -50         | -58 | $\pm 0.09$ | $\pm 0.17$ |
|         | 0           | 32  | $\pm 0.06$ | $\pm 0.11$ |
|         | 155         | 311 | $\pm 0.06$ | $\pm 0.11$ |
|         | 320         | 608 | $\pm 0.07$ | $\pm 0.13$ |
| J       | -50         | -58 | $\pm 0.10$ | $\pm 0.18$ |
|         | 0           | 32  | $\pm 0.08$ | $\pm 0.14$ |
|         | 155         | 311 | $\pm 0.09$ | $\pm 0.16$ |
|         | 320         | 608 | $\pm 0.09$ | $\pm 0.16$ |
| K       | -50         | -58 | $\pm 0.14$ | $\pm 0.24$ |
|         | 0           | 32  | $\pm 0.10$ | $\pm 0.19$ |
|         | 155         | 311 | $\pm 0.11$ | $\pm 0.20$ |
|         | 320         | 608 | $\pm 0.11$ | $\pm 0.20$ |
| T       | -50         | -58 | $\pm 0.15$ | $\pm 0.26$ |
|         | 0           | 32  | $\pm 0.10$ | $\pm 0.18$ |
|         | 155         | 311 | $\pm 0.08$ | $\pm 0.15$ |
|         | 320         | 608 | $\pm 0.08$ | $\pm 0.15$ |
| R       | -50         | -58 | $\pm 1.30$ | $\pm 2.35$ |
|         | 0           | 32  | $\pm 0.78$ | $\pm 1.40$ |
|         | 155         | 311 | $\pm 0.47$ | $\pm 0.84$ |
|         | 320         | 608 | $\pm 0.40$ | $\pm 0.72$ |
| S       | -50         | -58 | $\pm 0.98$ | $\pm 1.76$ |
|         | 0           | 32  | $\pm 0.78$ | $\pm 1.40$ |
|         | 155         | 311 | $\pm 0.49$ | $\pm 0.89$ |
|         | 320         | 608 | $\pm 0.45$ | $\pm 0.81$ |
| N       | -50         | -58 | $\pm 0.20$ | $\pm 0.35$ |
|         | 0           | 32  | $\pm 0.15$ | $\pm 0.27$ |
|         | 155         | 311 | $\pm 0.13$ | $\pm 0.23$ |
|         | 320         | 608 | $\pm 0.13$ | $\pm 0.24$ |
| U       | -50         | -58 | $\pm 0.13$ | $\pm 0.24$ |
|         | 0           | 32  | $\pm 0.10$ | $\pm 0.18$ |
|         | 155         | 311 | $\pm 0.08$ | $\pm 0.14$ |
|         | 320         | 608 | $\pm 0.08$ | $\pm 0.15$ |

\* Excl. CJC accuracy  $\pm 0.3^\circ\text{C} / \pm 0.54^\circ\text{F}$

**Transmitter supply**

Output voltage..... 24VDC  $\pm 10\%$   
 Output current..... Maximum 28 mA

**Transmitter input mA (B model only)**

Range ..... 0 to 24 mA  
 Accuracy (12 months) .....  $\pm(0.005\% \text{ Rdg.} + 0.010\% \text{ F.S.})$

**Voltage input VDC (B model only)**

Range: ..... 0 to 12 VDC  
 Accuracy (12 months) .....  $\pm(0.005\% \text{ Rdg.} + 0.010\% \text{ F.S.})$

**Switch input (B model only)**

Switch dry contacts  
 Test voltage..... Maximum 5 VDC  
 Test current ..... Maximum 2.5 mA

**Mains specifications**

Voltage ..... 115V (90-127) / 230V (180-254)  
 Frequency, non US deliveries ..... 50 Hz  $\pm 5$ , 60 Hz  $\pm 5$   
 Frequency, US deliveries ..... 60 Hz  $\pm 5$   
 Power consumption (max.), RTC-158..... 400 W  
 Power consumption (max.), RTC-250..... 1150 W

**Communication interface**

Serial data interface ..... USB 2.0 device port  
 Serial data interface ..... USB 2.0 host double port\*  
 LAN..... Ethernet MAC 10/100 Base-T\*  
 SD..... SD slot\*  
 \* for future expansion

**Miscellaneous**

Operating ambient 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

**PHYSICAL SPECIFICATIONS**

**Weight and instrument size (L x W x H)**

RTC-158 ..... 11 kg/24.3 lb  
 RTC-250 ..... 9.9 kg/ 21.8 lb  
 RTC-158/250.... 366 x 171 x 363 mm / 14.4 x 6.7 x 14.3 in

**Shipping (without carrying case)**

RTC-158 ..... 17 kg/37.5 lb  
 RTC-250 ..... 16 kg/35.3 lb  
 Size..... 580 x 250 x 500 mm/22.8 x 9.8 x 19.7 in

**Shipping (including optional carrying case)**

RTC-158 ..... 28 kg/61.7 lb  
 RTC-250 ..... 27 kg/59.6 lb  
 Size..... 550 x 430 x 660 mm/21.7 x 16.9 x 26.0 in

**INSERTS**

**Insert dimensions**

RTC-158/250 outer diameter ..... 63.5 mm/2.5 in  
 RTC-158/250 length..... 160 mm/6.3 in

**Weight of non-drilled insert (approx.)**

RTC-158/250..... 1200 g/42.3 oz

**Alloy**

RTC-158/250..... Special aluminium alloy

*Use of other inserts may reduce performance of the calibrator. To get the best results out of the calibrator, the insert dimensions, tolerance and material is critical. We highly advise using JOFRA inserts, as they guarantee trouble free operation.*

## STANDARD DELIVERY

Model A, B and C:

- RTC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Tool for insertion tubes
- JOFRACAL
- AMETRIM
- USB cable
- Set of rubber cones for insulation plugs
- Manuals

Model B contains the following extra items:

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

Model C contains the following extra items:

- Traceable certificate - input performance for reference sensor and DLC sensor

## EXTRA PARTS

- 127277 Support rod set for sensors, 2 grips, 2 fixtures
- 125066 Extra fixture for sensor grib
- 125067 Extra sensor grib
- 122771 Mini-Jack connector for stable relay output
- 120516 Thermocouple Male Plug - Type J - Black
- 120517 Thermocouple Male Plug - Type K - Yellow
- 120514 Thermocouple Male Plug - Type N - Orange
- 120515 Thermocouple Male Plug - Type T - Blue
- 120518 Thermocouple Male Plug - Type R / S - Green
- 120519 Thermocouple Male Plug - Type Cu-Cu - White
- 125033 Silicone oil, Type 200/10cSt, 0.75 L, RTC-158
- 124885 Silicone oil, Type 200/50cSt, 0.75 L, RTC-250
- 125022 Liquid Bath Kit, RTC-158
- 125035 Liquid Bath Kit, RTC-250
- 127782 Carrying case with Trolley

## ACCESSORIES

### Carrying Case - Option CT

With our new special designed carrying case it is now possible to store all your sensors in the case with an optimum physical protection. An improved integrated trolley system for easy and safe transportation.



### Support rod set - Option SR

Support rod for sensors to be mounted on all JOFRA RTC dry-block calibrators. Holds the sensor under test in the right position, while calibrating. Includes 2 sensor grips and 2 fixtures for sensor grips.



## FUNCTIONAL COMPARISON



|  | Model A | Model B | Model C |
|--|---------|---------|---------|
| Dual-zone heating/cooling block                    | •       | •       | •       |
| MVI - Mains Variance Immunity (or similar)         | •       | •       | •       |
| Stability indicator                                | •       | •       | •       |
| Automatic step function                            | •       | •       | •       |
| USB communication                                  | •       | •       | •       |
| Display resolution 0.001°                          | •       | •       | •       |
| Programmable max. temperature                      | •       | •       | •       |
| SYNC output (for external recording device)        | •       | •       | •       |
| Calibration of short sensors in special insert     |         | •       | •       |
| External precision reference sensor input          |         | •       | •       |
| External precision DLC reference sensor input      |         | •       | •       |
| "SET" follows "TRUE"                               |         | •       | •       |
| Load compensation functionality                    |         | •       | •       |
| Input for RTD, TC, V, mA                           |         | •       |         |
| 4-20 mA transmitter input incl. 24 VDC supply      |         | •       |         |
| All inputs scalable to temperature                 |         | •       |         |
| Automatic switch test (open, close and hysteresis) |         | •       |         |
| Download of calibration work orders from PC        |         | •       |         |
| Upload of calibration results (as found & as left) |         | •       |         |

## ORDERING INFORMATION

| Order number |   |     |   |     |     |      |    |    |  | Description  |   |
|--------------|---|-----|---|-----|-----|------|----|----|--|--|---|
| RTC158       |   |     |   |     |     |      |    |    |  | <b>Base model number</b>   |   |
| RTC250       |   |     |   |     |     |      |    |    |  | RTC-158 Series, -22 to 155°C (-8 to 311°F)                         |   |
|              |   |     |   |     |     |      |    |    |  | RTC-250 Series, 28 to 250°C (82 to 482°F)                          |   |
|              |   |     |   |     |     |      |    |    |  | <b>Model version</b>   |   |
|              | A |     |   |     |     |      |    |    |  |  | Basic model, without input  |
|              | B |     |   |     |     |      |    |    |  |  | Full model, incl. DLC sensor input, Reference sensor input, Sensor-under-test input |
|              | C |     |   |     |     |      |    |    |  |  | Middle model, incl. DLC sensor input, Reference sensor input                        |
|              |   |     |   |     |     |      |    |    |  | <b>Power supply (US deliveries 60 Hz only)</b>                     |   |
|              |   | 115 |   |     |     |      |    |    |  |  | 115VAC  |
|              |   | 230 |   |     |     |      |    |    |  |  | 230VAC  |
|              |   |     |   |     |     |      |    |    |  | <b>Mains power cable</b>   |   |
|              |   |     | A |     |     |      |    |    |  |  | European, 230V  |
|              |   |     | B |     |     |      |    |    |  |  | USA/Canada, 115V  |
|              |   |     | C |     |     |      |    |    |  |  | UK, 240V  |
|              |   |     | D |     |     |      |    |    |  |  | South Africa, 220V  |
|              |   |     | E |     |     |      |    |    |  |  | Italy, 220V   |
|              |   |     | F |     |     |      |    |    |  |  | Australia, 240V   |
|              |   |     | G |     |     |      |    |    |  |  | Denmark, 230V   |
|              |   |     | H |     |     |      |    |    |  |  | Switzerland, 220V   |
|              |   |     | I |     |     |      |    |    |  |  | Israel, 230V  |
|              |   |     |   |     |     |      |    |    |  | <b>Insert type and size</b>  |   |
|              |   |     |   | NON |     |      |    |    |  | No insert selected (standard)                                      |   |
|              |   |     |   | UNX |     |      |    |    |  | 1 x Undrilled Insert (Please see Insert selection for code)        |   |
|              |   |     |   | MXX |     |      |    |    |  | 1 x Multi hole insert (Please see Insert selection for code)       |   |
|              |   |     |   | BAT |     |      |    |    |  | Liquid bath kit  |   |
|              |   |     |   |     |     |      |    |    |  | <b>Dynamic Load Compensation (B &amp; C models only, optional)</b> |   |
|              |   |     |   |     | DLC |      |    |    |  | DLC sensor   |   |
|              |   |     |   |     |     |      |    |    |  | <b>STS Reference sensor (B &amp; C models only, optional)</b>      |   |
|              |   |     |   |     |     | R1   |    |    |  |  | STS-102 Ref. sensor. Dia. 4mm. Length 30mm (STS102A030EH) For RTC-158               |
|              |   |     |   |     |     | R6   |    |    |  |  | STS-200 Ref. sensor. Dia. 4mm. Length 183mm (STS200A916) For RTC-158                |
|              |   |     |   |     |     | R7   |    |    |  |  | STS-200 Ref. sensor. Dia. 1/4". Length 183mm (STS200B916) For RTC-158               |
|              |   |     |   |     |     | R8   |    |    |  |  | STS-200 Ref. sensor. Dia. 4mm. Length 183mm (STS200A925) For RTC-250                |
|              |   |     |   |     |     | R9   |    |    |  |  | STS-200 Ref. sensor. Dia. 1/4". Length 183mm (STS200B925) For RTC-250               |
|              |   |     |   |     |     |      |    |    |  | <b>Calibration Certificate</b>                                     |   |
|              |   |     |   |     |     | F    |    |    |  |  | Traceable Calibration Certificate (standard)  |
|              |   |     |   |     |     | H    |    |    |  |  | Accredited Calibration Certificate  |
|              |   |     |   |     |     | EA   |    |    |  |  | Full EURAMET Calibration Certificate  |
|              |   |     |   |     |     | FS   |    |    |  |  | Traceable System Calibration Certificate (B & C models only)                        |
|              |   |     |   |     |     | HS   |    |    |  |  | Accredited System Calibration Certificate (B & C models only)                       |
|              |   |     |   |     |     | EAS  |    |    |  |  | Full EURAMET System Calibration Certificate (B & C models only)                     |
|              |   |     |   |     |     | EASD |    |    |  |  | Full EURAMET System Calibration Certificate with DLC (B & C models only)            |
|              |   |     |   |     |     |      |    |    |  | <b>Accessories</b>   |   |
|              |   |     |   |     |     |      | CT |    |  |  | Solid Protective Carrying case with integrated trolley                              |
|              |   |     |   |     |     |      | SR |    |  |  | Support rod set   |
|              |   |     |   |     |     |      | TR |    |  |  | Solid Protective Carrying case with integrated trolley & Support rod set            |
|              |   |     |   |     |     |      |    |    |  | <b>Sample order number</b>   |   |
| RTC158       | B | 230 | A | SM  | DLC | R2   | EA | CT | JOFRA RTC-158 B with 230VAC, EU power cord, set of metric inserts, DLC, STS-200 ref. sensor, full EA temp. calibration certificate, and carrying case with integrated trolley. |  |   |



#### **AMETEK Test & Calibration Instruments**

A business unit of AMETEK Measurement & Calibration Technologies Division offering the following industry leading brands for test and calibration instrumentation.

#### **JOFRA Calibration Instruments**

##### *Temperature Calibrators*

Portable dry-block calibrators, precision thermometers and liquid baths. Temperature ranges from -90°C(-130°F) to 1205°C(2200°F). Temperature sensors for industrial and marine use.

##### *Pressure Calibrators*

Convenient electronic systems ranging from -25 mbar to 1000 bar - fully temperature-compensated for problem-free and accurate field use.

##### *Signal Instruments*

Process signal measurement and simulation for easy control loop calibration and measurement tasks.

#### **M&G Pressure Testers & Pumps**

Pneumatic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading. Pressure generators delivering up to 1,000 bar.

#### **Lloyd Instruments**

Materials testing machines and software from Lloyd Instruments guarantees expert materials testing solutions. The comprehensive program also covers Texture Analysers to perform rapid, general food testing and detailed texture analysis on a diverse range of foods and cosmetics.

#### **Davenport Polymer Test Equipment**

Allows measurement and characterization of moisture-sensitive PET polymers and polymer density.

#### **Chatillon Force Measurement**

The hand held force gauges and motorized testers have earned their reputation for quality, reliability and accuracy and they represent the de facto standard for force measurement.

#### **Newage Testing Instruments**

Hardness testers, durometers, optical systems and software for data acquisition and analysis.

## **AMETEK®**

TEST & CALIBRATION INSTRUMENTS

**UK**  
Lloyd Instruments Ltd  
Tel +44 (0)1243 833 370  
uk-far.general@ametek.co.uk

**France**  
AMETEK S.A.S.  
Tel +33 (0)1 30 68 89 40  
general.lloyd-instruments@ametek.fr

**Germany**  
AMETEK GmbH  
Tel +49 (0)2159 9136 510  
info.mct-de@ametek.de

**Denmark**  
AMETEK Denmark  
Tel +45 4816 8000  
ametek@ametek.dk

**USA**  
AMETEK Measurement & Calibration Technologies  
Tel +1 (727) 536 7831  
chatillon.fl-lar@ametek.com

**India**  
AMETEK Instruments India Pvt Ltd.  
Tel +91 22 2836 4750  
ametek@ametek.dk

**Singapore**  
AMETEK Singapore Pte Ltd  
Tel +65 6484 2388  
aspl@ametek.com.sg

**China**  
AMETEK Inc. - Shanghai  
Tel +86 21 5868 5111  
AMETEK Inc. - Beijing  
Tel +86 10 8526 2111  
AMETEK Inc. - Guangzhou  
Tel +86 20 8363 4768  
lloyd@ametek.com.cn

[www.jofra.com](http://www.jofra.com)