JOFRA calibration

RTC Series

Reference Temperature Calibrator

RTC-159 Ultra Cooler

AMETEK
SENSORS, TEST & CALIBRATION

Product Description

The JOFRA RTC-159 is the top model dry-block calibrator, and is unsurpassed in the market. It is the most versatile temperature calibrator available with a temperature range that makes it especially ideal for use in the healthcare, medical, pharmaceutical, biotechnology, and food industries.

The RTC-159 is just one member of the well-known JOFRA RTC family. The RTC family can meet any type of industrial temperature calibration need within the -100 to 700°C (-148 to 1292°F) temperature range.

Advantages & Models

The RTC-159 offers many advantages:

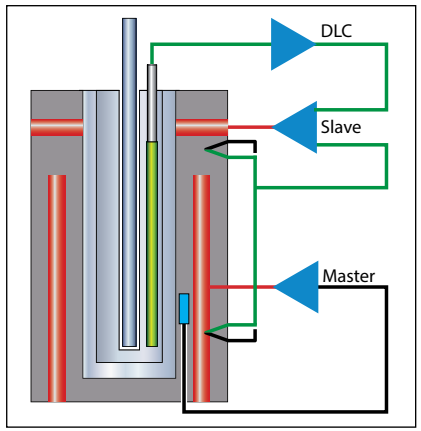
- **Relevant for Many Applications**
  With its extremely wide temperature range, the RTC-159 can be used in many applications where either high heat or extreme cooling is needed.
- **User Friendly**
  Intuitive to use and easy to run, the RTC-159 is equipped with a large informative, easy-to-read color display which makes reading error a thing of the past.
- **Ergomically Correct**
  Easy to carry, the RTC-159 is easy to move from job to job.
- **Mechanically Stable**
  With its high-tech design, the RTC-159 ensures durability and lasting quality.
- **The 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.




Key Features

- **High Accuracy**
  Down to ± 0.06°C (± 0.11°F) using the external reference sensor. 4-wire True-Ohm Measurement technology is used.
- **Excellent Stability: ± 0.03°C (± 0.05°F)**
- **Widest Temperature Range**
  From -100 to 155°C (-148 to 311°F).
- **DLC (Dynamic Load Compensation)**
  Perfect temperature uniformity in the insert, even when calibrating large sensors or many sensors at a time. The patented DLC system in combination with JOFRA's dual-zone technology ensures perfect temperature homogeneity. (B and C models only.)
- **Fastest Calibration Possible**
  The efficient, free piston stirling cooler (FPSC) technology is used to secure fast cooling and heating temperature changes.
- **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 and play calibration system.
- **Easy to Carry**
  Weighing only 15.2 kg (33.5 lb) the RTC-159 is by far the lightest and most portable ultra cooler on the market.
- **USB Communication**
  All RTC 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.

DLC—Dynamic Load Compensation



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

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

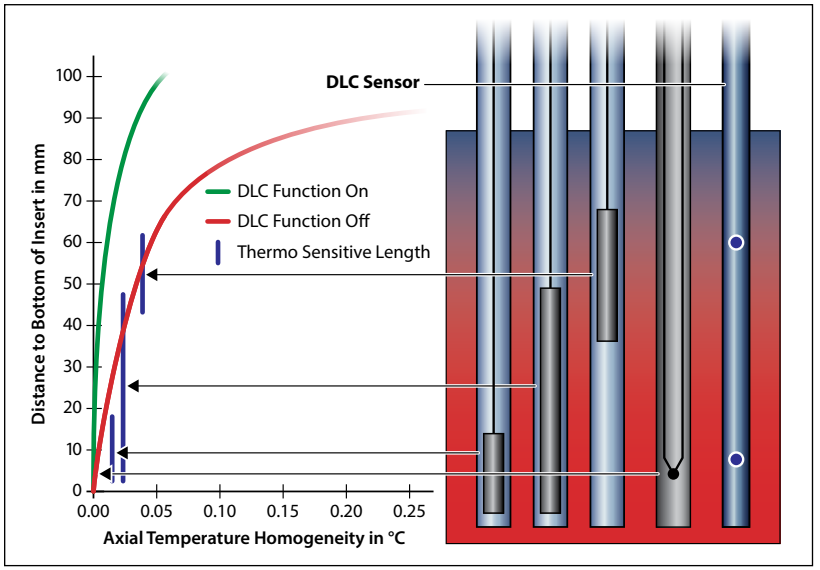
The DLC sensor improves on the RTC calibrator's already advanced dual-zone technology by controlling the homogeneity in not only the well, but inside the insert where the sensors-under-test are placed during calibration. The DLC sensor measures the temperature homogeneity in the insert and provides feedback to the active dual-zone system, which 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, making the RTC the best performing dry-block calibrator on the market when calibrated and tested according to the globally accepted EURAMET/cg-13v.01 guideline for calibration and testing of dryblocks.

The DLC system is comprised of 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, along with the normal temperature control and stabilization.

DLC—User Advantages

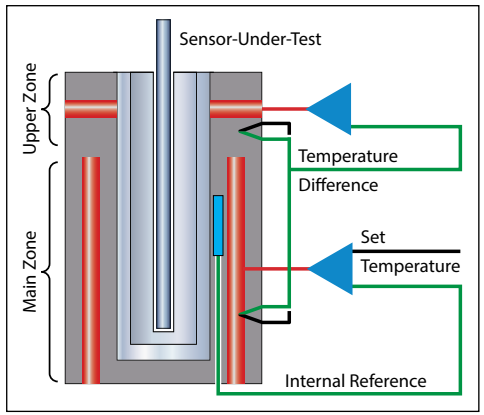
Calibrating with the DLC sensor offers the following advantages:

1. Calibration of several sensors simultaneously.
2. Calibration of thick sensors.
3. Gives TSL (Thermo Sensitive Length) independency. It is no longer necessary to know the TLS of the sensor.
4. Compensates 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 60 mm length.
6. The DLC indicator proves that the dual-zone is active and functioning well.
7. Proves that the calibrator is working perfectly. The DLC value should be very close to 0.00 when the calibrator is loaded with 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.

Unique Temperature Performance



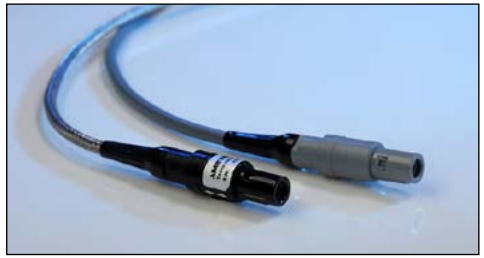
The RTC series of calibrators provide precision temperature calibration of sensors, whatever the type or format. This is accomplished through an innovative active dual-zone heating technology.

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.

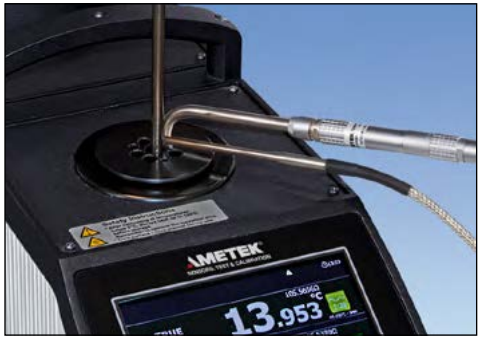


Intelligent Reference Sensors

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 RTC calibrator.

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

Easy to Carry Only 33.5 lbs/15.2 kg

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 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.

Efficient Cooling Technology

The RTC-159 features the FPSC (Free Piston Stirling Cooler) as the cooling source. It is much more efficient than thermo-electric (Peltier) coolers.

Fast Temperature Calibration

Time is money! This is why all the RTC 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 only four inserts covering all diameters from 3 to 13mm. The other is an imperial insert kit consisting of only three inserts covering six different sizes from ⅛" to ½".

All inserts have holes for both STS reference sensors and DLC 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 both the STS reference sensors and DLC sensors in the carrying case with optimum physical protection. There is room for inserts and insulation plugs to cover all dimensions and compartments for the integrated support rod set, wires, manuals, certificates, plugs, insert tools etc.

All compartments 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.

Wide Temperature Range 255°C

The RTC Series can perform calibration over a very wide temperature range starting from -100°C and up to 155°C (-148 to 311°F). This makes it possible to perform calibrations in applications from ultra-coolers to autoclaves over a range of 255° C (360° F) with only one calibrator.

Easy to Read Color Display and User-Friendly 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 RTC user interface is available in English, German, Chinese, and Japanese.

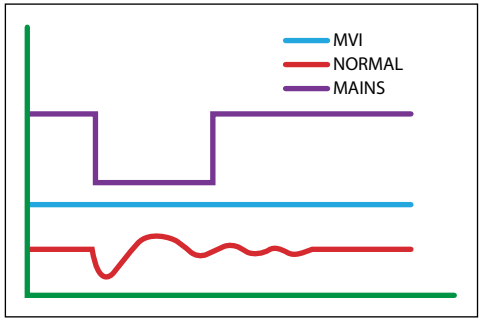
The large display contains more detailed information at a glance, such as:

- Stability status.
- Load compensation status.
- Real time clock.
- Serial number of reference sensor.
- Sensor-under-test status.

Integrated Support Rod

The 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.

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

Highest Accuracy (models 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 calibrations on-site, while maintaining high accuracy.

A special 90° angled external reference sensor has been designed to accommodate the calibration of sensors with a transmitter head, top connector, or similar arrangement. 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 (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 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 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 thermoswitch 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.

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 RTC 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.

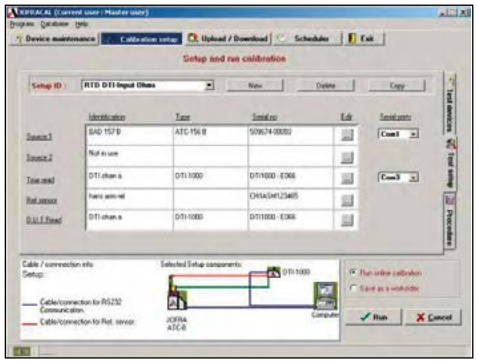
Calibration of Indication Devices

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 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.

JofraCal Calibration Software



JofraCal is a highly versatile calibration software that is supplied together with the RTC calibrators. The software ensures easy calibration of all kinds of temperature sensors, such as RTD´s, thermocouples, transmitters, and thermoswithes. 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 RTC calibrator stores the calibration procedure and may be taken out to the process site without bringing a personal computer.

This allows 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 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 RTC 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.

Once attached to any RTC (or PTC) 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

JOFRA calibration

Functional Specifications

Temperature Range

@ ambient temp. 0°C / 32°F ..... **-100 to 155°C/-148 to 311°F**

@ ambient temp. 23°C / 73°F ..... **-100 to 155°C/-148 to 311°F**

@ ambient temp. 40°C / 104°F ..... **-83 to 155°C/-117 to 311°F**

Patented heating technology: Patent No. EP2074374/US8342742

Accuracy with External STS Ref. Sensor (models B and C)

± 0.06°C / ± 0.11°F

12-month period. Relative to reference standard. Specifications by use of the external JOFRA STS-200 reference sensor

Accuracy with Internal Ref. Sensor

± 0.30°C / ± 0.54°F

Stability

± 0.03°C / ± 0.054°F

Measured after the stability indicator has been on for 15 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° or 0.001°**

Temperature Unit in Display

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

Heating Time

-100 to 23°C / -148 to 73°F ..... **12 minutes**

23 to 155°C / 73 to 311°F ..... **14 minutes**

Cooling Time

155 to 23°C / 311 to 73°F ..... **40 minutes**

23 to -80°C / 73 to -112°F ..... **65 minutes**

-80 to -90°C / -176 to -130°F ..... **20 minutes**

-90 to -100°C / -194 to -148°F ..... **50 minutes**

23 to -100°C / 73 to -148°F ..... **135 minutes**

155 to -100°C / 311 to -148°F ..... **175 minutes**

Time to Stability (approx.)

10 minutes

Immersion Depth

190mm / 6.3 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 the RTC-159.

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) ..... **±(0.0012% rdg. + 0.0005% F.S.)**

	Temperature		12 Months	
RTD Type	°C	°F	°C	°F
PT100 Reference	-100	-148	± 0.007	± 0.013
	0	32	± 0.008	± 0.015
	155	311	± 0.011	± 0.020

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

DLC Sensor Input (models B and C)

	Temperature		12 Months	
TC diff	°C	°F	°C	°F
DLC 159	-100	-148	± 0.014	± 0.025
	0	32	± 0.010	± 0.018
	155	311	± 0.010	± 0.018

RTD Sensor Under Test Input (model B)

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**

	Temperature		12 Months	
RTD Type	°C	°F	°C	°F
PT1000	-100	-148	± 0.057	± 0.103
	0	32	± 0.064	± 0.115
	155	311	± 0.075	± 0.136
PT500	-100	-148	± 0.107	± 0.193
	0	32	± 0.116	± 0.209
	155	311	± 0.129	± 0.232
PT100	-100	-148	± 0.023	± 0.042
	0	32	± 0.026	± 0.047
	155	311	± 0.030	± 0.054

AMETEK SENSORS, TEST & CALIBRATION

Specifications

JOFRA calibration

Thermocouple Input

Range ..... **± 78 mV**
F.S. (Full Scale) ..... **78 mV**
Accuracy (12 months) ..... **±(0.005% Rdg. + 0.005% F.S.)**

	Temperature		12 Months*	
TC Type	°C	°F	°C	°F
E	-100	-148	± 0.10	± 0.18
	0	32	± 0.06	± 0.11
	155	311	± 0.06	± 0.11
J	-100	-148	± 0.10	± 0.18
	0	32	± 0.08	± 0.14
	155	311	± 0.09	± 0.16
K	-100	-148	± 0.14	± 0.25
	0	32	± 0.10	± 0.18
	155	311	± 0.11	± 0.20
T	-100	-148	± 0.15	± 0.27
	0	32	± 0.10	± 0.18
	156	311	± 0.08	± 0.14
R	-50	-58	± 1.30	± 2.34
	0	32	± 0.78	± 1.40
	155	311	± 0.47	± 0.85
S	-50	-58	± 0.98	± 1.76
	0	32	± 0.78	± 1.40
	155	311	± 0.49	± 0.88
N	-100	-148	± 0.20	± 0.36
	0	32	± 0.15	± 0.27
	155	311	± 0.13	± 0.23
XK (only in Russian versions)	-100	-148	± 0.09	± 0.16
	0	32	± 0.06	± 0.11
	155	311	± 0.06	± 0.11
U	-100	-148	± 0.13	± 0.23
	0	32	± 0.10	± 0.18
	155	311	± 0.08	± 0.14

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

Transmitter Supply

Output Voltage ..... **24VDC ±10%**
Output Current ..... **Maximum 28 mA**

Transmitter Input mA (model B)

Range ..... **0 to 24 mA**
Accuracy (12 months) ..... **±(0.005% Rdg. +0.010% F.S.)**

Voltage Input VDC (model B)

Range ..... **0 to 12 VDC**
Accuracy (12 months) ..... **±(0.005% Rdg. +0.010% F.S.)**

Switch Input (model B)

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 ..... **50/60 Hz (47-63 Hz)**
Frequency, US Deliveries ..... **60 Hz (57-63 Hz)**
Power Consumption (max.) ..... **450 VA**

Communications 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 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

Weight ..... **15.2 kg / 33.5 lb**
(LxWxH) ..... **531 x 169 x 432 mm / 20.9 x 6.65 x 17.0 in**

Shipping (with carrying case)

Weight ..... **38.0 kg / 83.8 lb**
(LxWxH) ..... **800 x 500 x 800 mm / 31.5 x 19.7 x 31.5 in**
Shipped on half-pallet, bound.

Inserts

Insert Dimensions

Outer Diameter ..... **29.7 mm / 1.17 in**
Inner Diameter ..... **25.6 mm / 1.01 in**
Length ..... **150 mm / 5.91 in**

Weight of Non-Drilled Insert

290 g / 10.2 oz

Use of other inserts may reduce the 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.

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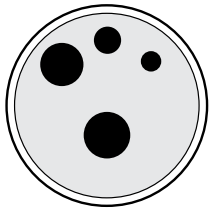
SENSORS, TEST & CALIBRATION

Specifications

Predrilled Inserts

All predrilled inserts have holes for: 4 mm reference sensor • ¼" reference sensor • 3 mm hole for DLC sensor. All inserts are supplied with an insulation plug drilled with the necessary holes.

Sensor Diameter	Instrument	
	Insert Code*	RTC-159 (A/B/C)
3 mm	003	128477
4 mm	004	128478
5 mm	005	128479
6 mm	006	128480
7 mm	007	128481
8 mm	008	128482
9 mm	009	128483
10 mm	010	128484
11 mm	011	128485
12 mm	012	128486
13 mm	013	128487
14 mm	014	128488
15 mm	015	128489
16 mm	016	128490
Package of Above Inserts	SMM	128492



Sensor Diameter	Instrument	
	Insert Code*	RTC-159 (A/B/C)
1/8 in	125	128468
3/16 in	187	128469
1/4 in	250	128470
5/16 in	312	128471
3/8 in	375	128472
7/16 in	437	128473
1/2 in	500	128474
9/16 in	562	128475
5/8 in	625	128476
Package of Above Inserts	SIM	128491

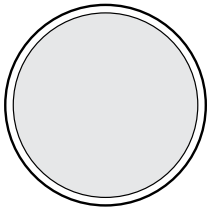
* Use the insert code, when ordering a JOFRA standard insert together with the RTC calibrator.

Undrilled Inserts

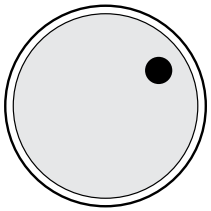
All undrilled inserts include insulation plugs.

Inserts	Instrument	
	Insert Code*	RTC-159 (A/B/C)
5-pack, undrilled inserts with no holes	UN1	128453
5-pack, undrilled inserts with hole for DLC sensor	UN2	128454
5-pack, undrilled inserts with 2 holes for STS reference sensors (4mm & ¼") and 1 hole for DLC sensor	UN3	128455
Undrilled insulation plug	—	126040

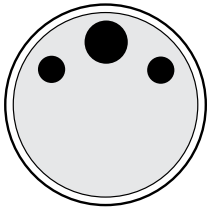
* Use the insert code, when ordering a JOFRA standard undrilled insert together with the RTC calibrator.



UN1



UN2



UN3

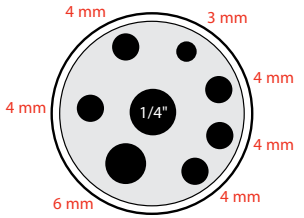
Specifications

Multi-Hole Inserts—Metric (mm)

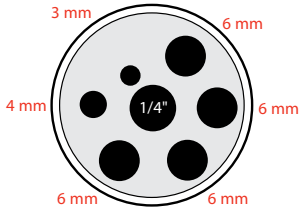
All inserts are supplied with an insulation plug drilled with the necessary holes.

Insert Type	Instrument	
	Insert Code*	RTC-159 (A/B/C)
Multi-hole Type 1	M01	128456
Multi-hole Type 2	M02	128457
Multi-hole Type 3	M03	128458
Multi-hole Type 4	M04	128459
Multi-hole Type 7	M07	128462
Multi-hole Type 8	M08	128463
Multi-hole Type 9	M09	128464
Set of 4 Metric Multi Inserts, 3 to 13 mm. *(Includes 128459, 128462, 128463, and 128464)*	SM	128466

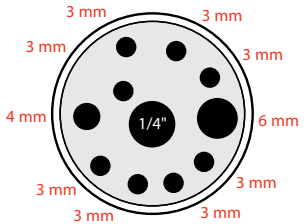
* Use the insert code, when ordering a JOFRA standard multi-hole insert together with the RTC calibrator.



Multi-hole M01

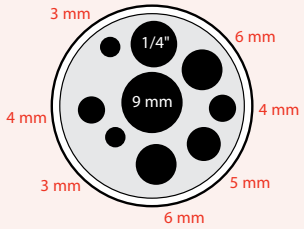


Multi-hole M02

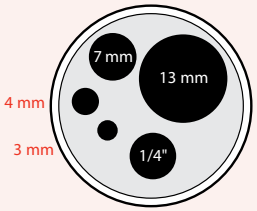


Multi-hole M03

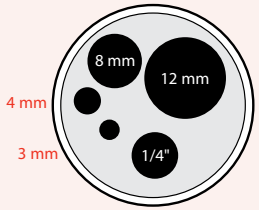
Insert Code SM



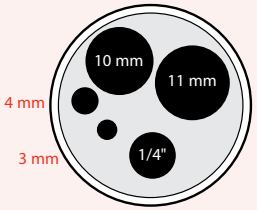
Multi-hole M04



Multi-hole M07



Multi-hole M08



Multi-hole M09

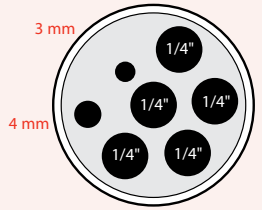
Multi-Hole Inserts—Imperial (in)

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

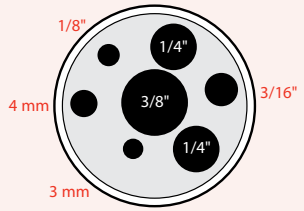
Insert Type	Instrument	
	Insert Code*	RTC-159 (A/B/C)
Multi-hole Type 5	M05	128460
Multi-hole Type 6	M06	128461
Multi-hole Type 10	M010	128465
Set of 3 Imperial Inserts, 1/8 to 1/2 in. *(Includes 128460, 128461, and 128465)*	SI	128467

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

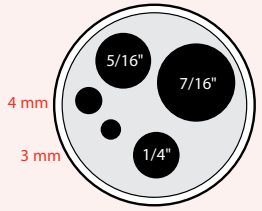
Insert Code SI



Multi-hole M05



Multi-hole M06



Multi-hole M10

Options & Accessories

Standard Delivery

Models A, B, and C Include:

- RTC 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 and DLC sensor.
- Traceable certificate - input performance for sensor-under-test inputs.

Model C Instruments Also Include:

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

Accessories

Extra fixture for sensor grip	**125066**
Extra sensor grip	**125067**
Mini-Jack connector for stable relay output	**122771**
Thermocouple Male Plug — Type J — Black	**120516**
Thermocouple Male Plug — Type K — Yellow	**120517**
Thermocouple Male Plug — Type N — Orange	**120514**
Thermocouple Male Plug — Type T — Blue	**120515**
Thermocouple Male Plug — Type R / S — Green	**120518**
Thermocouple Male Plug — Type Cu-Cu — White	**120519**

Optional DLC-159 Sensor

Temperature Range

-100 to 155°C/-148 to 311°F

Sensing Element

Differential TC

Dimensions

Diameter	**3 mm / 0.12 in**
Length	**196 mm / 7.72 in**
Max Height on Calibrator Top	**8 mm / 0.31 in**

Standard Delivery

DLC-159, Plastic Protection Case, Accredited Certificate, USB key with JofraCal and manual.

Optional STS-200 Sensor

Temperature Range

-100 to 155°C/-148 to 311°F

Sensing Element

PT100

Dimensions

Diameter	**4 mm / 0.16 in or 6.35 mm / 0.25 in**
Length	**192 mm / 7.56 in**
Max Height on Calibrator Top	**22 mm / 0.87 in**

Standard Delivery

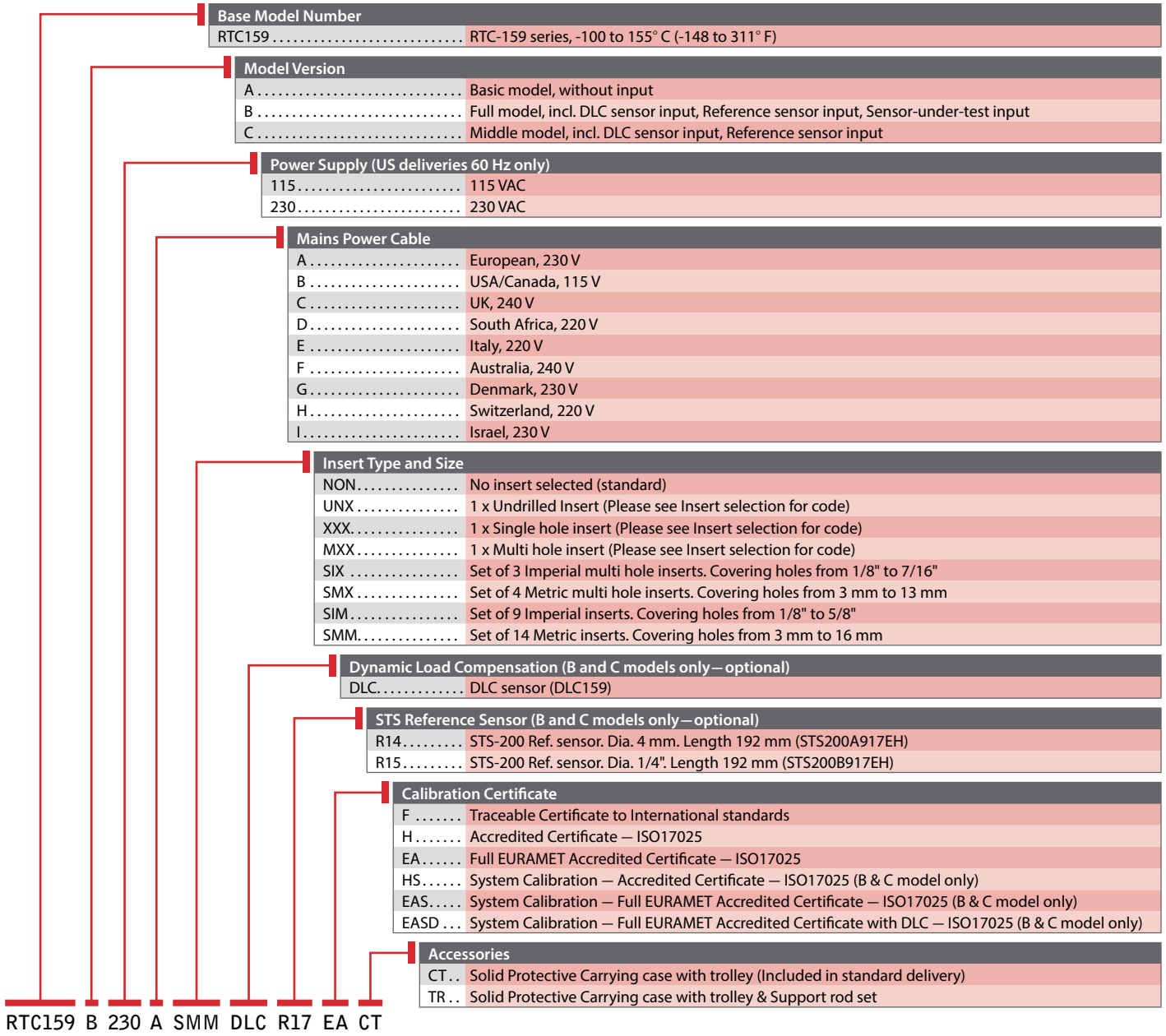
STS-200 A/B Sensor, Plastic Protection Case, Accredited Certificate, Cable, USB key with JofraCal and manual.

For more detailed specifications and description, refer to the STS Series Specification Sheet.

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)	■	■	■
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



Base Model Number

RTC159	RTC-159 series, -100 to 155° C (-148 to 311° F)

Model Version

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

Power Supply (US deliveries 60 Hz only)

115	115 VAC
230	230 VAC

Mains Power Cable

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

Insert Type and Size

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 7/16"
SMX	Set of 4 Metric multi hole inserts. Covering holes from 3 mm to 13 mm
SIM	Set of 9 Imperial inserts. Covering holes from 1/8" to 5/8"
SMM	Set of 14 Metric inserts. Covering holes from 3 mm to 16 mm

Dynamic Load Compensation (B and C models only—optional)

DLC	DLC sensor (DLC159)

STS Reference Sensor (B and C models only—optional)

R14	STS-200 Ref. sensor. Dia. 4 mm. Length 192 mm (STS200A917EH)
R15	STS-200 Ref. sensor. Dia. 1/4". Length 192 mm (STS200B917EH)

Calibration Certificate

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)
EASD	System Calibration — Full EURAMET Accredited Certificate with DLC — ISO17025 (B & C model only)

Accessories

CT	Solid Protective Carrying case with trolley (Included in standard delivery)
TR	Solid Protective Carrying case with trolley & Support rod set

Sample Order Number

`RTC159B230ASMMDLCR14EACT`

JOFRA RTC-159 B with 230VAC, EU power cord, set of metric inserts, DLC, 4 mm diameter STS-200 reference sensor, full EA temperature calibration certificate, and carrying case with trolley.

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SS-RTC-159 ISSUE 2007

*ISO 17025 accredited calibration lab.

JOFRA® calibration

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