

# JOFRA™ ATC series

## Advanced Temperature Calibrator

**NOTICE**  
New ATC models for both liquid  
and dry-block calibration



Your choice for optimum temperature calibration

### Wide temperature range

ATC-140	-20 to 140°C (-4 to 284°F)
ATC-156	-24 to 155°C (-11 to 311°F)
ATC-157	-45 to 155°C (-49 to 311°F)
ATC-250	28 to 250°C (82 to 482°F)
ATC-320	33 to 320°C (91 to 608°F)
ATC-650	33 to 650°C (91 to 1202°F)

### Liquid bath or dry-block

Use ATC-140 and ATC-250 as liquid bath or large diameter dry-block calibrator

### Improved temperature homogeneity

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

### High accuracy

Using the internal reference or the external reference probe. 4-wire True-Ohm-Measurement technology is used.

### Enhanced stability

MVI circuitry ensures temperature stability despite mains supply variations.

### Cost effective calibration system

Stand-alone operation eliminates the need for secondary equipment and PC. Universal inputs handle multiple type temperature sensors.

### Timesaving features

Up- and download complete calibration tasks. Auto-stepping, switch testing and many more features make the daily use smooth and fast.

### Documentation made easy

RS232 communication and JOFRACAL calibration software are included in the standard delivery.

ISO 9001 Manufacturer

The JOFRA ATC series (Advanced Temperature Calibrators) combines the accuracy of laboratory temperature sources with the speed and portability of field dry-block calibrators.

With the latest ATC models it is now possible to calibrate even more sensors at the same time and to calibrate large and odd size sensors in either a large diameter dry-block or in a liquid bath.



### PRODUCT DESCRIPTION

The ATC series calibrators are available in six different temperature ranges with two models offered in each range; A and B.

All JOFRA ATC series models feature the unique dual-zone heating block - designed for optimum performance and superior temperature homogeneity throughout the block. This new design has a performance equivalent to a liquid temperature bath. The ATC-157 features the widest temperature range for a cooling dry-block on the market today.

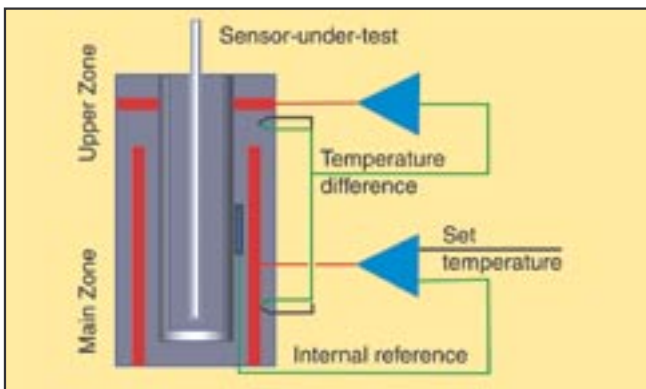
Each ATC dry-block calibrator may be used to perform fully automatic calibration routines without using an external computer. Use the computer for full upload and download capabilities. Units may also be supplied with inputs for external reference sensors and for sensors-under-test. All ATC calibrators feature RS232 serial communication and standard delivery also includes the JOFRACAL calibration PC software.

**AMETEK®**  
CALIBRATION INSTRUMENTS

**Unique temperature performance**

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

All JOFRA ATC models feature a dual-zone heating technology. Each heating zone is independently controlled for precision temperature measurement. 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 insulation of the sensors-under-test and makes it possible to calibrate liquid-filled and other mechanical sensors.

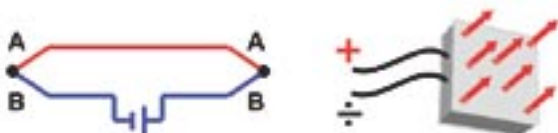


**ATC heating and cooling models**

The models with both heating and cooling capabilities (ATC-140, -156 and -157) feature the Peltier element multi-stage-technology. This both improves efficiency and extends the life of the »electronic heat pump«. The JOFRA ATC-157 offers a typical differential temperature of 68C (122 F) below the ambient temperature.

**Peltier effect (ATC-140, -156 and -157)**

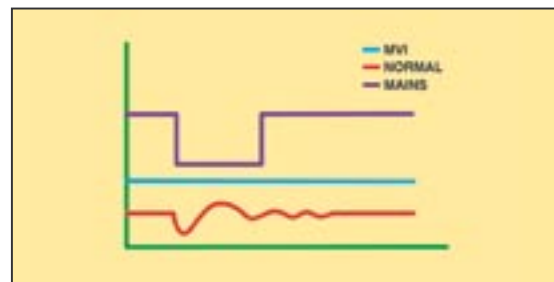
In 1834, Jean Peltier, a French physicist found that an »opposite thermocouple effect« could be observed when an electric current was connected to a thermocouple. Heat would be absorbed at one of the junctions and discharged at the other junction. This effect is called the »PELTIER EFFECT«.



The practical Peltier element (electronic heating pump) consists of many elements of semiconductor material connected electrically in series and thermally in parallel. These thermoelectric elements and their electrical interconnections are mounted between two ceramic plates. The plates serve to mechanically hold the overall structure together and to electrically insulate the individual elements from one another.

**MVI - Improved temperature stability**

MVI stands for »Mains power Variance Immunity«. Unstable mains power supplies are 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 ATC series calibrators ATC-250, -320 and -650 employ the MVI, thus avoiding such stability problems. The MVI circuitry continuously monitors the supply voltage and ensures a constant energy flow to the heating elements. All other ATC models run on stabilized DC voltage and thus do not need the MVI circuitry.

**Highest accuracy (model B only)**

ATC series calibrators may be supplied with a built-in reference thermometer for use with an external probe. This feature allows one instrument to provide the freedom and flexibility to perform calibrations at the process site while maintaining a high accuracy.

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

(More information about the JOFRA STS-100 reference sensors in the separate specification sheet: SS-CP-2290, which can be found at [www.jofra.com](http://www.jofra.com)).

The user can decide whether to read the built-in reference sensor or the more accurate angled reference sensor from the calibrator's large, easy-to-read LCD display. The external sensor and the internal sensor are independent of one another. Downloading of reference sensor linearization is done via a personal computer.



**SET-Follows-TRUE (model B only)**

Available on B models only, the “SET-Follows TRUE” causes the instrument to tune-in so that the temperature of the external reference “TRUE” is related to the desired “SET” temperature. This is used when it is critical that the temperature in the calibration zone matches the desired temperature as measured with an accurate external reference sensor.

This function is ideal for calibrating gas correctors or other custody transfer applications. It is extremely beneficial in the calculation process.

**Reading of sensor-under-test (model B only)**

The ATC series model B is equipped with built-in converters (inputs) that measure virtually any type of temperature sensor including:

- thermostats
- resistance thermometers
- thermocouples
- transmitters
- milliamps (mA)
- voltage (V)

ATC series calibrators can be user-programmed for completely automated temperature calibrations. Once the unit is set up, the instrument operates itself by performing the configured calibration routine. All calibration data is stored and available for uploading and generating exact calibration certificates or reports.

**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 five tests. This information cannot be uploaded to a personal computer.

**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. Up to five (5) auto step results are retained.

AUTO STEP SETUP				
	1	0°C	R11	Hold
	2	100°C	R12	Hold
	3	200°C	R13	Hold
	4	300°C	R14	Hold
	5	400°C	R15	Hold
	6	°C	R16	Hold
	7	°C	R17	Hold
	8	°C	R18	Hold
	9	°C	R19	Hold
	10	°C	R20	Hold
No. of steps: 5 Mode: One-way Hold time: 5 min				
Back=		Prev=	Next=	
+ space		▲ field	▼ field	

**Easy-to-use, intuitive operation**

All instrument controls may be performed from the front panel. The heat source is positioned away from the panel which helps protect the operator.

The ATC keyboard is equipped with five, positive feedback function keys. They correspond to the text in the display and change functionality based on instrument operations. There are also dedicated function keys with permanent functions.

The easy-to-read, backlit display is large with a high contrast that is readable even in high ambient light conditions. The display is easily read from all angles and from a distance without parallax problems. The display also features icons which help identifying instrument conditions and operational steps.

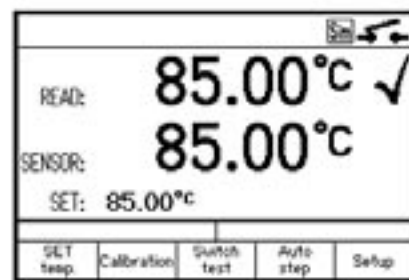


**Set temperature**

The “Set temperature” feature allows the user to set the exact desired temperature with a resolution of 0.01°.

**Enhanced stability**

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



**Instrument setups**

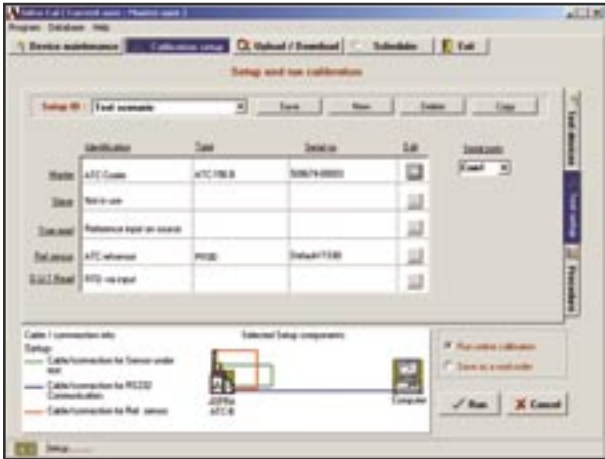
The ATC series allows the user to store up to nine (9) complete instrument setups. You may store all sorts of information including temperature units, stability criteria, use of external reference sensor, resolution, sensor-under-test (SUT), conversion to temperature, display contrast, etc. The setup may be recalled at any time.

**Maximum temperature**

From the setup menu, the user can select the maximum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by the application of excessive temperatures. The feature also aids in reducing drift resulting from extended periods of exposures to high temperatures. This feature can be locked with an access code.

**Simplified calibration documentation**

All ATC series calibrators are provided with the JOFRACAL calibration software. This software allows the user to customize his or her calibration routines. The software is easy-to-use so you do not have to be a programmer to configure your own calibration procedures. The software features prompts, menus, and help functions that guide you through the configuration process.



The JOFRACAL calibration software supports automatic calibration for all JOFRA dry-block calibrators equipped with an RS232 serial data interface including the JOFRA DTI-1000 digital thermometer. For semi-automatic calibrations, the software also supports liquid baths, ice points, or other dry-block heating and cooling sources. Using the software's "SCENARIO" function allows for combining instruments in virtually any configuration.

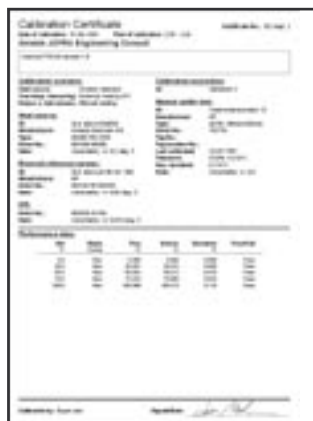
The calibration data collected may be stored on a PC for later recall or analysis.

The ATC calibrator stores the calibration procedure and may be taken out to the process site without using a personal computer. This allows your ATC calibrator to:

- Operate as a stand-alone instrument, using advanced calibration routines without the assistance of a personal computer on site;
- 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 calibration software for post-processing and printing of certificates. The calibration data collected may be stored on the personal computer for later recall or analysis.

Please see more about JOFRACAL calibration software in specification sheet SS-CP-2510, which can be found at [www.jofra.com](http://www.jofra.com)



**As found/as left (model B only)**

The JOFRA ATC series calibrator automatically handles "As Found/As Left" calibrations. The calibrator stores both results. The first performed calibration is "As found" and the last performed calibration is the "As left", regardless of the number of calibrations/adjustments that may have been made in between.

**SYNC output**

An output is located directly on the front of the ATC calibrator. This 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 your calibrations when calibrating external reading devices.

**Calibration (model B only)**

Users may perform or read the results of the calibration tasks directly on the instrument. When calibrating an indicating device, 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.

**FUNCTIONAL COMPARISON**

Feature	Model	
	A	B
Dual-zone heating/cooling block	•	•
MVI - Mains Variance Immunity (or similar)	•	•
Stability indicator	•	•
Automatic step function	•	•
Calibration software included	•	•
SYNC output (for external recording device)	•	•
Display resolution 0.01°	•	•
Graphical LCD display	•	•
Programmable max. temperature	•	•
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)		•
External precision reference probe input		•
Download of calibration work orders from PC		•
Upload of calibration results (as found & as left)		•
"SET" follows "TRUE"		•



## ATC-140 A/B and ATC-250 A/B

Two models of the ATC series (ATC-140 and ATC-250) fitted with a 160 mm (6.3 in) deep well with a diameter of 63.5 mm (2.5 in) can be used both as dry-block calibrators and as liquid calibration baths with a magnetic stirrer.

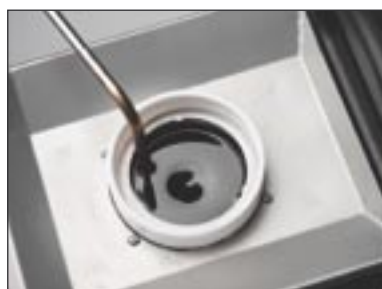
A liquid bath and a dry-block diameter of 63.5 mm (2.5 in), which is twice the size of any other JOFRA dry-block, are both new in the JOFRA product range. With these options it is now possible to calibrate even more temperature sensors at the same time and to calibrate large as well as odd sizes and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

ATC-140 & ATC-250 can be used without an external reference sensor, but if a STS-100 reference sensor is connected directly to a B version or the JOFRA reference thermometer DTI-1000, you obtain better accuracies and thereby use the full potential of the calibrators.

## Liquid bath kit for ATC-140 A/B and ATC-250 A/B

- 1 x Sensor basket
- 2 x Covering lids
- 1 x Magnet – for the magnetic stirrer
- 1 x Magnet remover
- 1 x Liquid drainage tube
- 1 x Silicone oil 0,75 l (25.4 oz)

It is also possible to order extra silicone oil and a support rod for sensors, which can be mounted on the side of all JOFRA dry-block calibrators and hold the sensors under test in the correct position during calibration.



The support rod is especially important, when you work with liquid baths and do not have the inserts to hold the sensors under test.



## 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

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

- 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

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

## Dry-block kit for the ATC-140 A/B and ATC-250 A/B

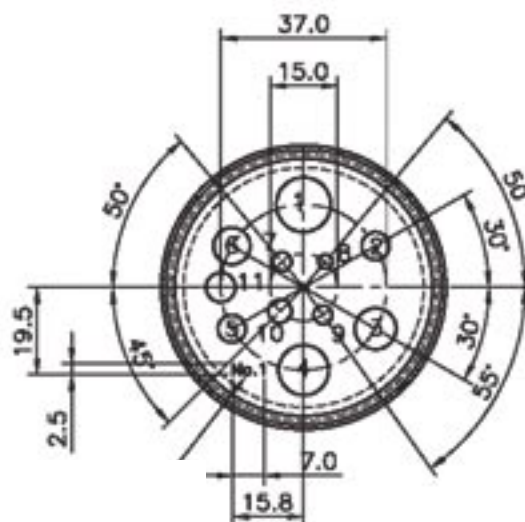
1 x Multi-hole insert - you may choose between a metric and an imperial version:

The metric version has holes for the following sizes of sensors: 1 x 12, 1 x 11, 1 x 9, 1 x 8, 2 x 6, 1 x 5, 2 x 4, 1 x 3 mm and 1 x 1/4 in.

The imperial version has holes for the following sizes of sensors: 1 x 1/8 in, 1 x 3/16 in, 1 x 1/4 in, 1 x 5/16 in, 1 x 3/8 in, 1 x 7/16 in, 1 x 1/2 in, 1 x 9/16 in, 1 x 5/8 in and 1 x 4 mm.

1 x Insulation plug for the ATC-140.

It is also possible to order undrilled and special drilled inserts.



**FUNCTIONAL SPECIFICATIONS**

**Mains specifications**

ATC-140/156/157/250/320	..... 115V(90-127) 230V(180-254)
ATC-650	..... 115V(100-127) 230V(200-254)
Frequency	..... 45 - 65 Hz
Power consumption (max.) ATC-140/156/157	..... 300 VA
Power consumption (max.) ATC-250/320/650	..... 1150 VA

**Temperature range**

ATC-140 Maximum (Dry block)	..... 140°C (284°F)
Minimum @ ambient temp.	0°C (32°F)..... -35°C (-31°F)
Minimum @ ambient temp.	23°C (73°F)..... -20°C (-4°F)
Minimum @ ambient temp.	40°C (104°F)..... -5°C (23°F)
ATC-140 Maximum (Liquid bath)	..... 140°C (284°F)
Minimum @ ambient temp.	0°C (32°F)..... -33°C (-27°F)
Minimum @ ambient temp.	23°C (73°F)..... -18°C (0°F)
Minimum @ ambient temp.	40°C (104°F)..... -3°C (27°F)
ATC-156 Maximum	..... 155°C (311°F)
Minimum @ ambient temp.	0°C (32°F)..... -40°C (-40°F)
Minimum @ ambient temp.	23°C (73°F)..... -24°C (-11°F)
Minimum @ ambient temp.	40°C (104°F)..... -12°C (10°F)
ATC-157 Maximum	..... 155°C (311°F)
Minimum @ ambient temp.	0°C (32°F)..... -57°C (-71°F)
Minimum @ ambient temp.	23°C (73°F)..... -45°C (-49°F)
Minimum @ ambient temp.	40°C (104°F)..... -31°C (-24°F)
ATC-250 (Dry block)	..... 28 to 250°C (82 to 482°F)
ATC-250 (Liquid bath)	..... 28 to 250°C (82 to 482°F)
ATC-320	..... 33 to 320°C (91 to 608°F)
ATC-650	..... 33 to 650°C (91 to 1202°F)

**Stability**

ATC-140/156/157/250/320	..... ±0.02°C (±0.04°F)
ATC-650	..... ±0.03°C (±0.06°F)

Measured after the stability indicator has been on for 10 minutes (ATC-156/157/320 and 650) or 15 minutes (ATC-140/250).

Measuring time is 30 minutes.

**Time to stability (approximate)**

ATC-156/157/320/650	..... 10 minutes
ATC-140/250	..... 15 minutes

**Accuracy (model B)**

ATC-140/156/157 B	..... ±0.04°C (±0.07°F)
ATC-250 B/320 B	..... ±0.07°C (±0.13°F)
ATC-650 B	..... ±0.11°C (±0.20°F)

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

**Accuracy (model A+B)**

ATC-140 A+B <sup>1)</sup>	..... ±0.20°C (±0.36°F)
ATC-156/157 A+B	..... ±0.19°C (±0.34°F)
ATC-250 A+B <sup>2)</sup>	..... ±0.30°C (±0.54°F)
ATC-320 A+B	..... ±0.26°C (±0.47°F)
ATC-650 A+B	..... ±0.39°C (±0.70°F)

12 month period. Specifications by use of the internal reference sensor.

1) When used with the dry-block kit. When used with the liquid bath kit the standard accuracy is ±0.30°C (0.54°F).

2) When used with the dry-block kit. When used with the liquid bath kit the standard accuracy is ±0.50°C (0.90°F).

Better accuracy with the liquid kits is obtainable, if a special calibration and adjustment are done with liquid.

**Resolution (user-selectable)**

All temperatures	..... 1° or 0.1° or 0.01°
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**Radial homogeneity (difference between holes)**

ATC-140/250 (dry-block)	..... 0.05°C (0.09°F)
ATC-140/250 (liquid bath)	..... 0.025°C (0.045°F)
ATC-156/157	..... 0.02°C (0.04°F)
ATC-320	..... 0.01°C (0.02°F)
ATC-650	..... 0.05°C (0.09°F)

**Immersion depth**

ATC-140 (dry-block)	..... 7.1 in (180 mm)
ATC-140/250 (liquid bath)	..... 5.9 in (150 mm)
ATC-156/157	..... 6.3 in (160 mm)
ATC-250 (dry-block)	..... 5.9 in (150 mm)
ATC-320/650	..... 5.9 in (150 mm)

**Heating time**

ATC-140:	-20 to 23°C (-4 to 73°F)	..... 10 minutes
	23 to 100°C (73 to 212°F)	..... 31 minutes
	100 to 140°C (212 to 284°F)	..... 23 minutes
ATC-156	-24 to 23°C (-11 to 73°F)	..... 4 minutes
	23 to 100°C (73 to 212°F)	..... 9 minutes
	100 to 155°C (212 to 311°F)	..... 10 minutes
ATC-157	-45 to 23°C (-49 to 73°F)	..... 6 minutes
	23 to 100°C (73 to 212°F)	..... 8 minutes
	100 to 155°C (212 to 311°F)	..... 9 minutes
ATC-250	50 to 250°C (122 to 482°F)	..... 11 minutes
ATC-320	50 to 320°C (122 to 608°F)	..... 7 minutes
ATC-650	50 to 320°C (122 to 608°F)	..... 10 minutes
	50 to 650°C (122 to 1202°F)	..... 27 minutes

**Cooling time**

ATC-140	140 to 100°C (284 to 212°F)	..... 7 minutes
	100 to 23°C (212 to 73°F)	..... 27 minutes
	23 to 0°C (73 to 32°F)	..... 17 minutes
	0 to -15°C (32 to 5°F)	..... 35 minutes
ATC-156	155 to 100°C (311 to 212°F)	..... 4 minutes
	100 to 23°C (212 to 73°F)	..... 9 minutes
	23 to 0°C (73 to 32°F)	..... 6 minutes
	0 to -20°C (32 to -4°F)	..... 13 minutes
ATC-157	155 to 100°C (311 to 212°F)	..... 3 minutes
	100 to 23°C (212 to 73°F)	..... 6 minutes
	23 to 0°C (73 to 32°F)	..... 3 minutes
	0 to -30°C (32 to -22°F)	..... 9 minutes
ATC-250	-30 to -45°C (-22 to -45°F)	..... 15 minutes
	250 to 100°C (482 to 212°F)	..... 27 minutes
ATC-320	100 to 50°C (212 to 122°F)	..... 27 minutes
	320 to 100°C (608 to 212°F)	..... 22 minutes
ATC-650	100 to 50°C (212 to 122°F)	..... 20 minutes
	650 to 100°C (1202 to 212°F)	..... 43 minutes
ATC-650	100 to 50°C (212 to 122°F)	..... 25 minutes

**SYNC output (dry contact)**

Switching voltage	..... Maximum 30 VDC
Switching current	..... Maximum 100 mA

**RTD reference input (B models only)**

Type..... 4-wire RTD with true ohm measurements<sup>1)</sup>  
 F.S. (Full Scale).....350 ohm  
 Accuracy (12 months) .....±0.003% rdg. + 0.002% F.S.

RTD Type	Temperature		12 months	
	°C	°F	°C	°F
Pt100 reference	-50	-58	±0.024	±0.042
	0	32	±0.026	±0.046
	155	311	±0.032	±0.057
	320	608	±0.038	±0.068
	650	1202	±0.047	±0.084
	700	1292	±0.056	±0.101

Note 1: True ohm measurements are an effective method to eliminate errors from induced thermoelectrical voltages

**RTD input**

Type of RTD ..... 2-wire  
 F.S. (range) ..... 350 ohm or 2900 ohm  
 Accuracy (12 months) ±0.005% rdg. + 0.005% F.S. + 50 mΩ  
 Type of RTD ..... 3- or 4-wire  
 F.S. (range) ..... 350 ohm or 2900 ohm  
 Accuracy (12 months) .....±0.005% rdg. + 0.005% F.S.

RTD Type	Temperature		12 months	
	°C	°F	°C	°F
Pt1000	-50	-58	±0.046	±0.083
	0	32	±0.050	±0.090
	155	311	±0.061	±0.110
	320	608	±0.071	±0.127
	500	932	±0.087	±0.156
Pt500	-50	-58	±0.083	±0.149
	0	32	±0.087	±0.157
	155	311	±0.100	±0.180
	320	608	±0.111	±0.200
Pt100	-50	-58	±0.054	±0.097
	0	32	±0.058	±0.104
	155	311	±0.069	±0.124
	320	608	±0.079	±0.142
	650	1202	±0.106	±0.191
Pt50	-50	-58	±0.098	±0.176
	0	32	±0.103	±0.185
	155	311	±0.116	±0.209
	320	608	±0.128	±0.230
	650	1202	±0.161	±0.290
Pt10	-50	-58	±0.453	±0.815
	0	32	±0.462	±0.831
	155	311	±0.495	±0.891
	320	608	±0.524	±0.943
	650	1202	±0.610	±1.098
Cu100	-50	-58	±0.050	±0.090
	0	32	±0.052	±0.094
	150	302	±0.060	±0.108
	-50	-58	±0.090	±0.162
	0	32	±0.093	±0.167
Cu50	150	302	±0.100	±0.180

**Thermocouple input**

Range ..... 78 mV  
 F.S. (Full Scale)..... 78 mV  
 Accuracy (12 months) ..... 0.01% rdg. + 0.005% F.S.

TC Type	Temperature		12 months	
	°C	°F	°C	°F
E	-50	-58	±0.08	±0.14
	0	32	±0.07	±0.12
	155	311	±0.07	±0.12
	320	608	±0.08	±0.14
	650	1202	±0.11	±0.20
	1000	1832	±0.15	±0.28
J	-50	-58	±0.10	±0.17
	0	32	±0.08	±0.14
	155	311	±0.08	±0.15
	320	608	±0.10	±0.18
	650	1202	±0.12	±0.22
	1200	2192	±0.19	±0.34
K	-50	-58	±0.11	±0.20
	0	32	±0.10	±0.18
	155	311	±0.11	±0.20
	320	608	±0.12	±0.22
	650	1202	±0.16	±0.28
	1372	2502	±0.28	±0.50
T	-50	-58	±0.12	±0.22
	0	32	±0.10	±0.18
	155	311	±0.09	±0.16
	320	608	±0.09	±0.17
	400	752	±0.10	±0.17
R	-50	-58	±1.31	±2.35
	0	32	±0.78	±1.40
	155	311	±0.50	±0.90
	320	608	±0.42	±0.75
	650	1202	±0.41	±0.74
S	-50	-58	±0.50	±0.90
	0	32	±0.78	±1.40
	155	311	±0.50	±0.90
	320	608	±0.46	±0.83
	650	1202	±0.45	±0.81
B	1768	3214	±0.52	±0.94
	250	482	±1.57	±2.83
	320	608	±0.99	±1.78
	650	1202	±0.69	±1.23
	1820	3308	±0.48	±0.86
N	-50	-58	±0.16	±0.29
	0	32	±0.15	±0.27
	155	311	±0.14	±0.24
	320	608	±0.14	±0.25
	650	1202	±0.16	±0.28
XK	800	1472	±0.17	±0.31
	-50	-58	±0.07	±0.13
	0	32	±0.06	±0.11
	155	311	±0.06	±0.12
	320	608	±0.07	±0.13
U	650	1202	±0.11	±0.19
	800	1472	±0.12	±0.22
	-50	-58	±0.12	±0.21
	0	32	±0.10	±0.18
	155	311	±0.09	±0.17
U	320	608	±0.09	±0.17
	600	1112	±0.10	±0.19

If automatic cold junction compensation is used, the specification for CJ is ±0.40°C (±0.72°F).

**INPUT SPEC'S (B MODELS ONLY)**

All input specifications apply to the calibrator's dry-block running at the respective temperature (stable plus an additional 20 minutes period). Where the input measuring range is out of the calibrator's range, the SET temperature is either MIN. or MAX.

**Transmitter supply**

Output voltage ..... 24VDC +10%  
 Output current ..... Maximum 25 mA

**Transmitter input mA**

Range ..... 0 to 24 mA  
 Accuracy (12 months) ..... +0.01% Rdg. +0.015% F.S.

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

Range: ..... 0 to 12 VDC  
 Accuracy (12 months) ..... +0.005% Rdg. +0.015% F.S.

**Switch input (B models only)**

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



**JOFRACAL software**

Minimum hardware requirements:

- INTEL™ 486 processor (PENTIUM™ 200 MHz recommended)
- 16 MB RAM (32 MB recommended)
- 40 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)
- CD-ROM drive for installation of the program
- 1 free RS232 serial port

**PHYSICAL SPECIFICATIONS**

**Instrument dimensions (L x W x H)**

All models ..... 13.9 x 6.1 x 14.2 in (352 x 156 x 360 mm)

**Instrument weight**

ATC-140 ..... 12.8 kg (28.2 lb)  
 ATC-156 ..... 12.2 kg (26.9 lb)  
 ATC-157 ..... 13.1 kg (28.9 lb)  
 ATC-250 ..... 10.8 kg (23.8 lb)  
 ATC-320 ..... 10.2 kg (22.5 lb)  
 ATC-650 ..... 12.1 kg (26.7 lb)

**Insert dimensions (D x L)**

ATC-140 ..... 2.5 x 6.3 in (63.5 x 160 mm)  
 ATC-156 ..... 1.18 x 5.91 in (30 x 150 mm)  
 ATC-157 ..... 0.79 x 5.91 in (20 x 150 mm)  
 ATC-250 ..... 2.5 x 6.3 in (63.5 x 160 mm)  
 ATC-320/650 ..... 1.18 x 6.3 in (30 x 160 mm)

**Weight of non-drilled insert (approximate)**

ATC-140 ..... 1200 g (42.3 oz)  
 ATC-156 ..... 290 g (10.2 oz)  
 ATC-157 ..... 130 g (4.6 oz)  
 ATC-250 ..... 1200 g (42.3 oz)  
 ATC-320/650 ..... 940 g (33.2 oz)

**Shipping (including optional carrying case)**

ATC-140 \* ..... 23.4 kg (51.6 lb)  
 ATC-156 ..... 22.2 kg (48.9 lb)  
 ATC-157 ..... 23.1 kg (50.9 lb)  
 ATC-250 \* ..... 21.3 kg (47.0 lb)  
 ATC-320 ..... 20.7 kg (45.6 lb)  
 ATC-650 ..... 22.6 kg (49.8 lb)

Size: L x W x H ..... 26 x 12.2 x 20.2 in ( 659 x 309 x 514 mm)

**Shipping (without carrying case)**

ATC-140 \* ..... 16.7 kg (36.8 lb)  
 ATC-156 ..... 16.5 kg (36.4 lb)  
 ATC-157 ..... 17.4 kg (38.4 lb)  
 ATC-250 \* ..... 14.6 kg (32.2 lb)  
 ATC-320 ..... 15.0 kg (33.1 lb)  
 ATC-650 ..... 16.9 kg (37.2 lb)

Size: L x W x H ..... 22.4 x 9.3 x 17.3 in (570 x 235 x 440 mm)

**Shipping (carrying case only)**

Weight: ..... 6.0 kg (13.2 lb)

Size: L x W x H ..... 26 x 12.2 x 20.2 in (659 x 309 x 514 mm)

**Miscellaneous**

Serial data interface ..... RS232C (9-pin male)  
 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  
 CE Conformity ..... EN61326 : 1997/A1:1998  
 ..... EN61010-1 : 2001

\*If a dry-block or liquid bath kit is ordered, there will be an extra collie of approximately 2 kg (4.4 lb).



**STANDARD DELIVERY**

**Standard delivery**

- ATC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- 3 pcs. insulation plugs for 6, 10, 16 mm sensors (ATC-156 only)
- 3 pcs. insulation plugs for 5, 8, 11 mm sensors (ATC-157 only)
- Tool for insertion tubes
- RS232 cable
- JOFRACAL software
- AMETRIM-ATC software to adjust the ATC series
- Users' manual (multi-language)
- Reference manual (English)

Model B instruments contain the following extra items:

- Test cables (2 x red, 2 x black)
- Traceable certificate - input performance

Model ATC-140/250 instruments contain either a kit for liquid bath use **OR** a kit for dry-block use

**ACCESSORIES**

Part no.	Description
105805	Carrying case
122832	Cleaning brush, 4 mm (3/pkg)
60F174	Cleaning brush, 6 mm (3/pkg)
122822	Cleaning brush, 8 mm (3/pkg)
125069	Cleaning oil for liquid bath
60D711+712	Connector, Lemo (male) for reference input cable (4.3 to 5.1 mm diameter)
122771	Connector, Mini Jack, for "stable" relay output
122823	Ref. input cable, Lemo to Banana
122801	Ref. probe cable, Lemo to Lemo (0.5 m)
105496	Heat shield
120519	Thermocouple, type Cu-Cu, male plug
120517	Thermocouple, type K, male plug
120514	Thermocouple, type N, male plug
120515	Thermocouple, type T, male plug
122833	Basic calibration kit for ATC-156
123685	Basic calibration kit for ATC-157
122834	Basic calibration kit for ATC-320/-650
125022	Kit - liquid bath - ATC-140 A/B
125035	Kit - liquid bath - ATC-250 A/B
125023	Kit - dry-block - ATC-140 A/B - metric
125024	Kit - dry-block - ATC-140 A/B - inch
125025	Kit - dry-block - ATC-250 A/B - metric
125026	Kit - dry-block - ATC-250 A/B - inch
125033	Silicone oil for ATC-140 (0.75 l)
124885	Silicone oil for ATC-250 (0.75 l)
125068	Support rod set for sensors
STS-100A901AA *	Reference probe, with accredited certificate
STS-100A901CA *	Reference probe, no certificate

\* More information about the JOFRA STS-100 reference sensors in the separate specification sheet: SS-CP-2290, which can be found at [www.jofra.com](http://www.jofra.com)

**Liquid bath kit**

The liquid bath kit for ATC-140 and ATC-250 contains a sensor basket, 2 covering lids, a magnet and a magnetic remover, a liquid drainage tube and 0.75 l silicone oil.



**Dry-block kit**

The dry-block kit for ATC-140 and ATC-250 contains a multihole insert.

The dry-block kit for the ATC-140 also contains a matching insulation plug.



**Carrying case (Optional)**

The optional protective carrying case ensures safe transportation and storage of the instrument and all associated equipment.



**Heat shield (Optional)**

An external heat shield is available and may be placed on top of the calibrator to reduce the hot air stream around the sensor-under-test. This is especially important for testing thermocouples having head-mounted transmitters with cold-junction compensation.



**Calibration kits (Optional)**

Calibration kits contain various supplies required for a complete calibration system. These kits may be ordered with the instrument as an option or they may be ordered separately.

The basic calibration kit for ATC-156/157/320 and 650 contains a heat protection shield, cleaning brushes (4, 6 and 8 mm), undrilled inserts with 4 mm reference holes (3 pcs.) and a self-drilling guide for inserts.



# Specification Sheet

SS-CP-2285-US

## INSERTS FOR ATC SERIES

### General insert description

JOFRA dry-block insert compatibility and materials:

ATC-320 = ATC-650 = ITC-320 = ITC-650 (brass)

ATC-155 = ATC-156 (aluminium)

ATC-157 = ITC-155 (aluminium)

ATC-140 = ATC-250 (aluminium)

Custom-made special inserts on request (see order number below).

All specifications about hole sizes are referring to the outer diameter of the sensor-under-test.

The correct clearance size is applied in all predrilled inserts.

### Inserts - predrilled - metric

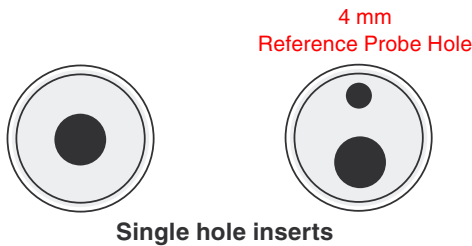
Insert Code <sup>1)</sup>	Sensor diameter	ATC-156 part no.	ATC-157 part no. <sup>2)</sup>	ATC-320/650 part no.
003	3 mm	105623	123270	105622
004	4 mm	105625	123271	105624
005	5 mm	105627	123272	105626
006	6 mm	105629	123273	105628
007	7 mm	105631	123274	105630
008	8 mm	105633	123275	105632
009	9 mm	105635	123276	105634
010	10 mm	105637	123277	105636
011	11 mm	105639	123278	105638
012	12 mm	105641	123299**	105640
013	13 mm	105643	123300**	105642
014	14 mm	105645	-	105644
015	15 mm	105647	-	105646
016	16 mm	105649	-	105648
Custom made		122885	123400	122886

Note: All inserts (metric and inches) are supplied with a hole for the 4 mm OD reference probe.

Note: All inserts (metric and inches) for ATC-140/156/157 are supplied with a matching insulation plug.

Note 1: Use this number, when ordered as the standard insert together with a new ATC calibrator.

Note 2: ATC-157 only: 12 and 13 mm inserts are delivered without the 4 mm reference hole, but supplied with a matching insulation plug.

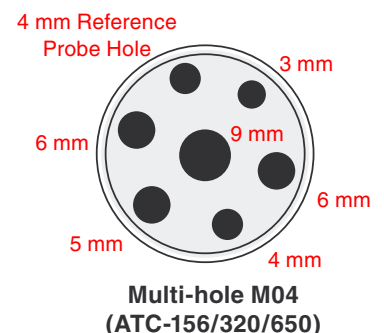
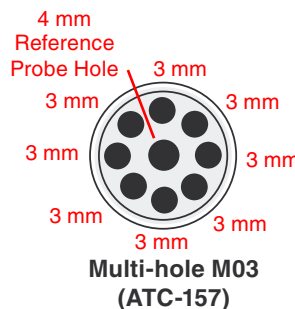
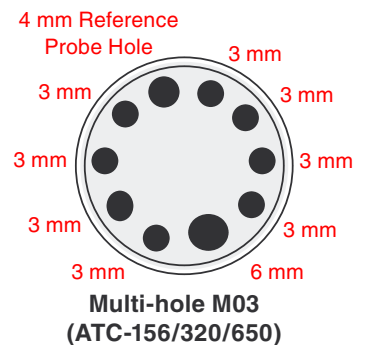
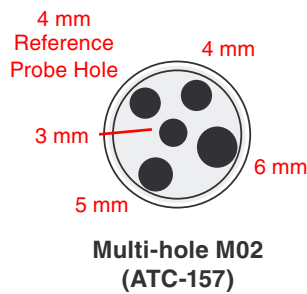
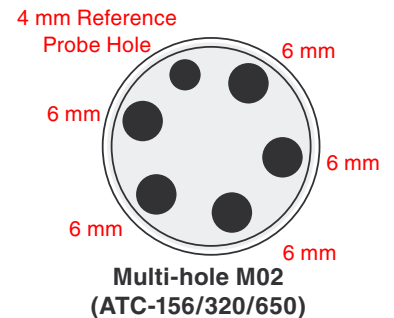
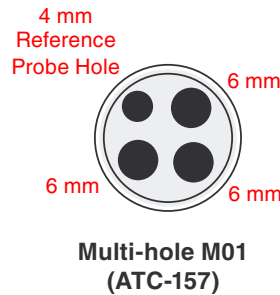
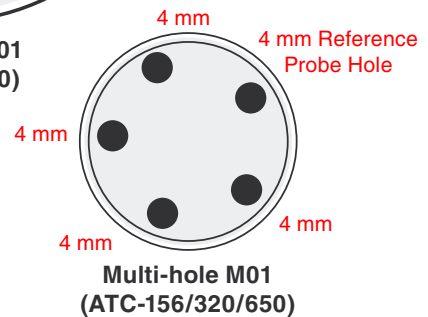
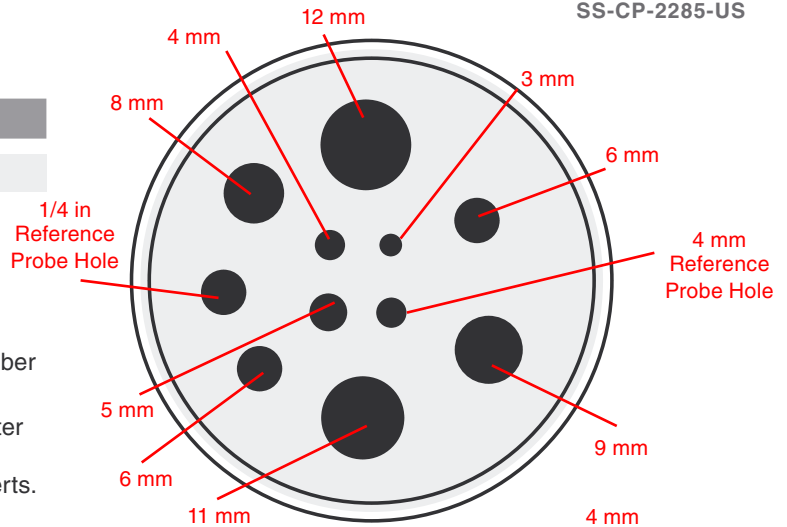


### Inserts - multi-hole - metric

Insert Code <sup>1)</sup>	ATC-156 part no.	ATC-157 part no.	ATC-320/650 part no.	ATC-140 part no.	ATC-250 part no.
M01	122751	123294	122750	124897	124889
M02	122753	123295	122752	-	-
M03	125755	123296	122754	-	-
M04	125757	-	122756	-	-
Custom made	123398	123401	123399	124900	124892

Note: All multi-hole inserts (metric and inches) for ATC-140/156/-157 are supplied with a matching insulation plug.

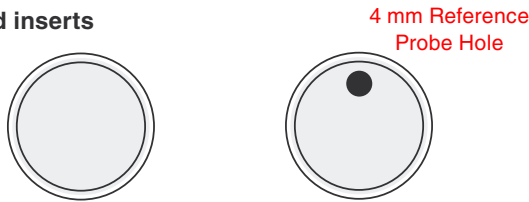
Note 1: Use this number, when ordered as the standard insert together with a new ATC calibrator.



Inserts - undrilled

Insert Code	ATC-156 part no.	ATC-157 part no.	ATC-320/650 part no.	ATC-140 part no.	ATC-250 part no.
5-pack, undrilled insertion tubes	122720	123286	122719	-	-
5-pack, undrilled insertion tubes with a 4 mm hole for the reference probe	122722	123285	122721	-	-
One undrilled insertion tube	-	-	-	124899	124891

Undrilled inserts



Inserts - predrilled - imperial (inch)

Insert Code <sup>1)</sup>	Sensor diameter	ATC-156 part no.	ATC-157 part no. <sup>2)</sup>	ATC-320/650 part no.
125	1/8 in	105677	123279	105676
187	3/16 in	105679	123280	105678
250	1/4 in	105681	123281	105680
312	5/16 in	105683	123282	105682
375	3/8 in	105685	123283	105684
437	7/16 in	105687	123301**	105686
500	1/2 in	105689	123302**	105688
562	9/16 in	105691	-	105690
625	5/8 in	105693	-	105692
Custom made		122885	123400	122886

Note: All inserts (metric and inches) are supplied with a hole for the 4 mm OD reference probe.

Note: All inserts (metric and inches) for ATC-140/156/157 are supplied with a matching insulation plug.

Note 1: Use this number, when ordered as the standard insert together with a new ATC calibrator.

Note 2: ATC-157 only: 12 and 13 mm inserts are delivered without the 4 mm reference hole, but supplied with a matching insulation plug.

Single hole inserts

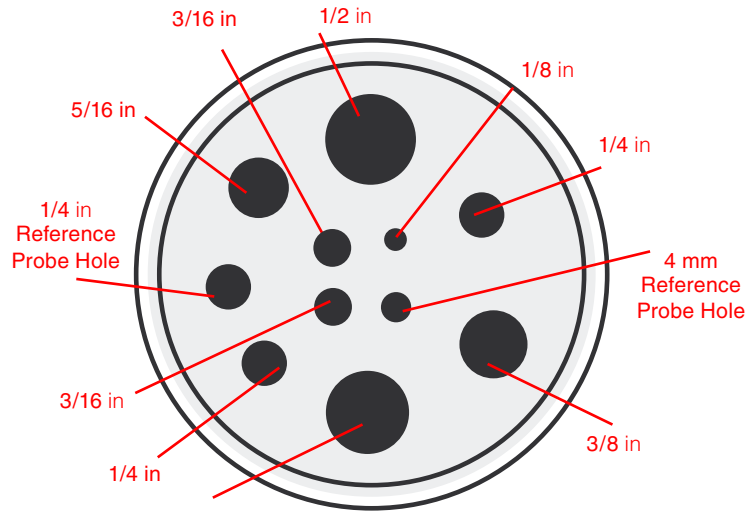


Inserts - multi-hole - imperial (inch)

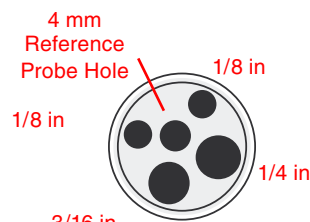
Insert Code <sup>1)</sup>	ATC-156 part no.	ATC-157 part no.	ATC-320/650 part no.	ATC-140 part no.	ATC-250 part no.
M02	-	-	-	124898	124890
M04	-	123297	-	-	-
M05	122759	123298	122758	-	-
M06	122761	-	122760	-	-
Custom made	123398	123401	123399	124900	124892

Note: All multi-hole inserts (metric and inches) for ATC-140/156/157 are supplied with a matching insulation plug.

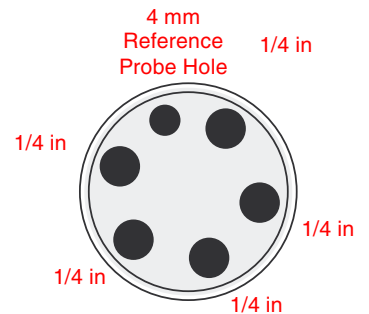
Note 1: Use this number, when ordered as the standard insert together with a new ATC calibrator.



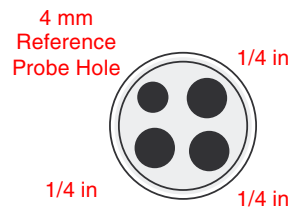
Multi-hole M02 (ATC-140/250)



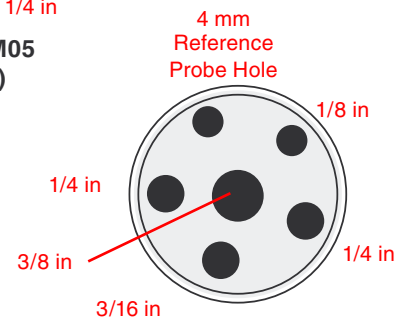
Multi-hole M04 (ATC-157)



Multi-hole M05 (ATC-156/320/650)



Multi-hole M05 (ATC-157)



Multi-hole M06 (ATC-156/320/650)

## ORDERING INFORMATION

### Model ATC series dry-block temperature calibrators

#### Order number Description

ATC140	<b>Base model number - 1st thru 6th characters</b> ATC-140 series, -20 to 140°C (-4 to 284°F)
ATC156	ATC-156 series, -23 to 155°C (-9 to 311°F)
ATC157	ATC-157 series, -45 to 155°C (-49 to 311°F)
ATC250	ATC-250 series, 28 to 250°C (82 to 482°F)
ATC320	ATC-320 series, 33 to 320°C (91 to 608°F)
ATC650	ATC-650 series, 33 to 650°C (91 to 1202°F)

#### Model version - 7th character

Basic model no sensor-under-test or reference probe input  
Including sensor-under-test and reference probe input

A  
B

<b>Power supply - 8th thru 10th characters</b>	115VAC, 50/60Hz
	230VAC, 50 Hz

115  
230

#### Mains power cable type - 11th character

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

#### Insert type and size - 12th thru 14th characters

XXX	1 x Insert for dry-block configuration (please see the previous insert pages for the right insert codes)
BAT	Liquid bath (liquid bath configuration for ATC140 or ATC 250 only)

#### Options - 15th thru 18th characters

A	Basic calibration kit for ATC-156, ATC-157, ATC-320 and ATC-650 only
C	Carrying case
F	Traceable certificate (standard for Europe, Asia, Australia and Africa)
G	NIST traceable certificate (standard for Western Hemisphere)
H	Accredited certificate
M	Additional liquid kit, if the dry-block configuration is ordered above (ATC-140 / ATC-250 only)
R	90° angled reference probe with accredited certificate
X	No option used

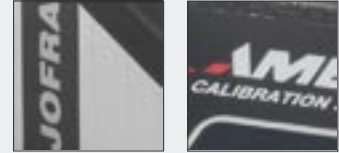
#### Sample order number

JOFRA ATC-140 B with standard accessories, 230VAC, European power cord, dry-block configuration with multihole insert type M01, carrying case, NPL traceable certification, additional liquid kit and 90° angled reference probe.

ATC140 B 230 A M01 CFMR



temperature  
software  
pressure  
signal



#### AMETEK

#### Calibration Instruments

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

#### JOFRA Temperature standards

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

#### M&G Primary pressure standards

Pneumatic floating-ball or hydraulic piston deadweight testers - easy-to-use with accuracies up to 0.015% of reading.

#### JOFRA Pressure standards

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

#### JOFRA Signal calibration

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

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

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**ISO 9001 Manufacturer**

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