Specification Sheet
SS-CP-2285-US

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JOFRA™ ATC series

Advanced Temperature Calibrators

The JOFRA™ ATC series (Advanced Temperature Calibrators) combines the accuracy of laboratory temperature sources with the speed and portability of field dry block calibrators. The unique dual-zone design sets new standards for optimum temperature performance.

Wide temperature range

ATC-155 -24 to 155°C (-11 to 311°F)
ATC-156 -24 to 155°C (-11 to 311°F)
ATC-157 -45 to 155°C (-49 to 311°F)
ATC-320 33 to 320°C (91 to 608°F)
ATC-650 33 to 650°C (91 to 1202°F)

Improved temperature homogeneity

The unique dual-zone block ensures good temperature homogeneity in the critical calibration zone of the heating/ cooling block.

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. Autostepping, switch testing and many more features make the daily use smoth and fast.

Documentation made easy

RS-232 communication and calibration software AMECAL-TEMPERATURE are standard delivery.

PRODUCT DESCRIPTION

The ATC series calibrators are available in four different temperature ranges and each version in two models, A and B.

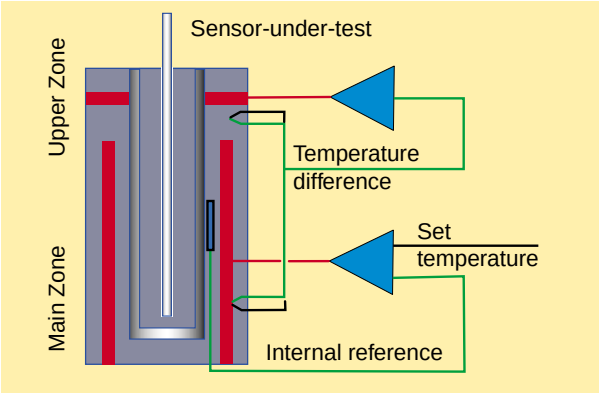
All JOFRA ATC series models (except the ATC-155) feature the unique dual-zone heating block - designed for optimum performance and superior temperature homogeneity throughout the block. This new design has a performance equivalent to a liquid temperature bath. The ATC-157 (super cooler) features the 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 RS-232 serial communication and standard delivery also includes the AMECAL-TEMPERATURE 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 block. All JOFRA ATC models (except the ATC-155) feature a dual-zone heating block. Each heating zone is independently controlled for precision temperature measurement. The homogeneity in the lower part of the block is close to that of a laboratory liquid bath. The lower zone ensures optimum heat dissipation throughout the entire block. The upper zone compensates for heat loss from the sensor-under-test and from the top of the block. 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.

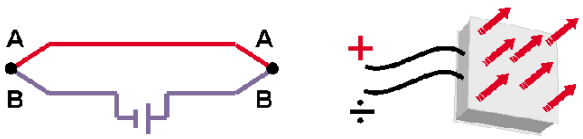


ATC heating and cooling models

The models with both heating and cooling capabilities (ATC-155, -156, -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 goes as deep as minus 71°C (128°F) below ambient temperature.

Peltier effect (ATC-155, -156, -157)

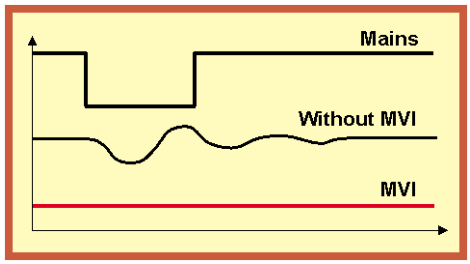
In 1834, Jean Peltier, a French physicist found that an ''opposite thermocouple effect'' could be observed when an electric current was connected to a thermocouple. Heat would be absorbed at one of the junctions and discharged at the



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 thermo-electric 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-320 and ATC-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 seperate specification sheet: SS-CP-2279)
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 block is matched to 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)

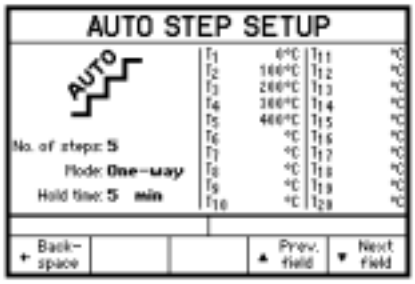
ATC series calibrators can be user-programmed for completely automated temperature calibrations. Once the unit is set up, the instrument operates itself by performing the configured calibration routine. All calibration data is stored and available for uploading and generating exact calibration certificates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



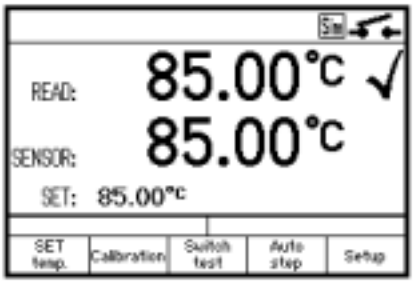
Easy-to-use, intuitive operation

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

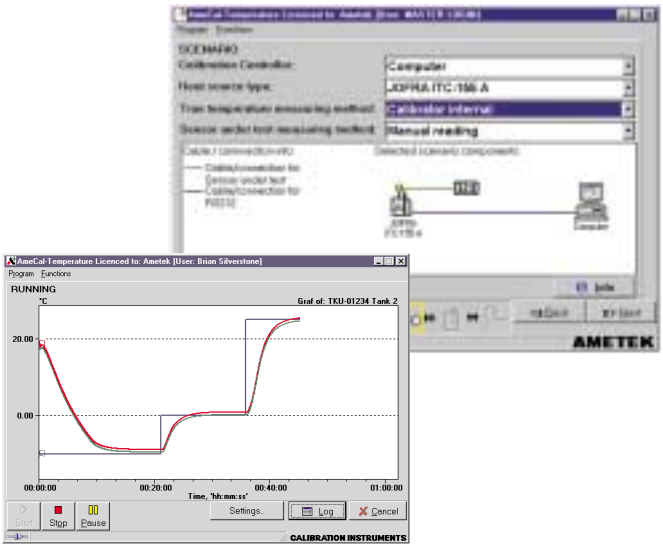
All ATC series calibrators are provided with the AMECAL-TEMPERATURE software. This WINDOWS®-based software allows the user to customize his or her calibration routines. The software is easy to use so you do not need to be a programmer to configure your own calibration procedures. The software features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

Calibrations are collected and stored as “Work orders” in a file and downloaded to the calibrator from a personal computer using a standard RS-232 interface cable. 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 AMECAL-TEMPERATURE software for post-processing and printing of certificates. The calibration data collected may be stored on the personal computer for later recall or analysis.

The AMECAL-TEMPERATURE software supports all JOFRA dry-block calibrators equipped with an RS-232 serial data interface, the JOFRA DTI-1000 reference thermometer and applications using liquid baths, ice point or other dry-block heat sources. Using the software’s “SCENARIO” function, instruments may be combined in virtually any configuration.



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	Model B
Dual-zone heating/cooling block (not ATC-155)	•	•
MVI - Mains Variance Immunity (or similar)	•	•
Stability indicator	•	•
Automatic step function	•	•
Calibration software included	•	•
SYNC output (for external recording device)	•	•
Display resolution 0.01°	•	•
Inserts storage compartment	•	•
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”		•

GUIDELINE EA-10/13

EA means European Accreditation. The purpose of this organization is to maintain and develop multilateral agreements within member and non-member accreditation bodies to achieve universal acceptance of accredited certificates and reports and interchange of technical knowledge among the countries.

EA has given birth to a new “Guideline on the Calibration of Temperature Block Calibrators”, including a complete uncertainty budget. Publication reference is EA-10/13.

Besides measuring absolute temperature by representative set points, the calibrator must also be investigated for the following: Axial temperature homogeneity, temperature difference between the borings, influence on the temperature in the measurement zone due to different loading, stability with time, and temperature deviation due to heat conduction.

AMETEK CALIBRATION INSTRUMENTS is convinced that this guideline will become the standard of how to specify/qualify a dry-block temperature calibrator in the future.

FUNCTIONAL SPECIFICATIONS

Mains specifications

ATC-155/156/157/320 ..... 115V(90-127) 230V(180-254)
ATC-650 ..... 115V(100-127) 230V(200-254)
Frequency ..... 45 - 65 Hz
Power consumption (max.) ATC-155 ..... 200 VA
Power consumption (max.) ATC-156/157 ..... 300 VA
Power consumption (max.) ATC-320/650 .....1150 VA

Temperature range

ATC-155/156 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-320 ..... 33 to 320°C (91 to 608°F)
ATC-650 .....33 to 650°C (91 to 1202°F)

Resolution (user-selectable)

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

Stability

ATC-155/156/157..... ±0.02°C (±0.04°F)
ATC-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. Measuring time is 30 minutes.

Time to stability (approximate)

All models ..... 10 minutes

Accuracy (model B)

ATC-155/156/157 B ..... ±0.04°C (±0.07°F)
ATC-320 B..... ±0.07°C (±0.13°F)
ATC-650 B..... ±0.11°C (±0.20°F)
12 month period. Relative to reference standard. Specification by use of the external reference.

Accuracy (model A+B)

ATC-155/156/157 A+B .....±0.19°C (±0.34°F)
ATC-320 A+B ..... ±0.26°C (±0.47°F)
ATC-650 A+B..... ±0.39°C (±0.70°F)
12 month period. Specification by use of the internal reference.

Radial homogeneity (difference between holes)

ATC-155/156/157.....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-155/156/157..... 160 mm (6.3 in.)
ATC-320/650.....150 mm (5.9 in.)

Heating time

ATC-155
-24 to 23°C (-11 to 73°F) ..... 4 minutes
23 to 100°C (73 to 212°F) ..... 10 minutes
100 to 155°C (212 to 311°F) ..... 13 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-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-155
155 to 100°C (311 to 212°F)..... 3 minutes
100 to 23°C (212 to 73°F) ..... 10 minutes
23 to 0°C (73 to 32°F) ..... 7 minutes
0 to -20°C (32 to -4°F)..... 15 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
-30 to -45°C (-22 to -45°F)..... 15 minutes

ATC-320
320 to 100°C (608 to 212°F) ..... 22 minutes
100 to 50°C (212 to 122°F) ..... 20 minutes

ATC-650
650 to 100°C (1202 to 212°F)..... 43 minutes
100 to 50°C (212 to 122°F) ..... 25 minutes

SYNC output (dry contact)

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

INPUT SPEC'S (B MODELS ONLY)

All input specifications apply with the calibrator's dry-block running at the respective temperature (stable plus an additional 20 minute 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 12VDC
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

RTD reference input (B models only)

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

RTD Type	Temperature °C	Temperature °F	12 Months °C	12 Months °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 measurement are an effective method to eliminate errors from induced thermoelectrical voltages

RTD input

Type of RTD ..... 2-, 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 °C	Temperature °F	12 Months °C	12 Months °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
	500	932	±0.130	±0.235
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
	700	1292	±0.112	±0.202
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
	700	1292	±0.169	±0.303
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
	700	1292	±0.620	±1.116
Cu100	-50	-58	±0.050	±0.090
	0	32	±0.052	±0.094
	150	302	±0.060	±0.108
Cu50	-50	-58	±0.090	±0.162
	0	32	±0.093	±0.167
	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 °C	Temperature °F	12 Months °C	12 Months °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	±0.19
	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
	1760	3200	±0.50	±0.90
S	-50	-58	±0.98	±1.77
	0	32	±0.78	±1.40
	155	311	±0.50	±0.90
	320	608	±0.46	±0.83
	650	1202	±0.45	±0.81
	1768	3214	±0.52	±0.94
B	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
	800	1472	±0.17	±0.31
XK	-50	-58	±0.07	±0.13
	0	32	±0.06	±0.11
	155	311	±0.06	±0.12
	320	608	±0.07	±0.13
	650	1202	±0.11	±0.19
	800	1472	±0.12	±0.22
U	-50	-58	±0.12	±0.21
	0	32	±0.10	±0.18
	155	311	±0.09	±0.17
	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).

PHYSICAL SPECIFICATIONS

Instrument dimensions (L x W x H)

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

Instrument weight

ATC-155 ..... 12.4 kg (27.3 lb)
ATC-156 ..... 12.2 kg (26.9 lb)
ATC-157 ..... 13.1 kg (28.9 lb)
ATC-320 ..... 10.2 kg (22.5 lb)
ATC-650 ..... 12.1 kg (26.7 lb)

Insert dimensions

ATC-155/156 ..... 30 x 150 mm (1.18 x 5.91 in.)
ATC-157 ..... 20 x 150 mm (0.79 x 5.91 in.)
ATC-320/650 ..... 30 x 160 mm (1.18 x 6.3 in.)

Weight of non-drilled insert (approximate)

ATC-155/156 ..... 290 g (9 oz)
ATC-157 ..... 130 g (4.6 oz)
ATC-320/650 ..... 940 g (33.2 oz)

Shipping (including optional carrying case)

ATC-155 ..... 22.4 kg (49.4 lb)
ATC-156 ..... 22.2 kg (48.9 lb)
ATC-157 ..... 23.1 kg (50.9 lb)
ATC-320 ..... 20.7 kg (45.6 lb)
ATC-650 ..... 22.6 kg (49.8 lb)

Size: L x W x H 659x309x514 mm (26x12.2x20.2 in.)

Shipping (without carrying case)

ATC-155 ..... 16.7 kg (36.8 lb)
ATC-156 ..... 16.5 kg (36.4 lb)
ATC-157 ..... 17.4 kg (38.4 lb)
ATC-320 ..... 15 kg (33.1 lb)
ATC-650 ..... 16.9 kg (37.2 lb)

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

Shipping (carrying case only)

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

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

Miscellaneous

Serial data interface ..... RS-232C (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 : 1993/A2:1995

STANDARD DELIVERY

Standard delivery ATC-155, -156, -157, -320 and -650

- 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-155/156 only)
- 3 pcs. insulation plugs for 5, 8, 11 mm sensors (ATC-157 only)
- Tool for insertion tubes
- RS-232 cable
- Software, AMECAL-TEMPERATURE
- Software, AMETRIM-ATC 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

AMECAL-TEMPERATURE software

Listed are the minimum hardware requirements needed for running the AMECAL-TEMPERATURE calibration software.

- 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 (640 x 480, 16 colors) compatible screen (800 x 600, 256 colors recommended)
- CD-ROM drive for installation of the program
- 1 or 2 free RS-232 serial ports, depending on configuration

ACCESSORIES

Part no.	Description
105446	ATC series, reference manual
105447	ATC series, user manual
105805	Carrying case
122832	Cleaning brush, 4 mm (3/pkg)
60F174	Cleaning brush, 6 mm (3/pkg)
122822	Cleaning brush, 8 mm (3/pkg)
60D711+712	Connector, Lemo (male) for reference input cable (4.3 to 5.1 mm diameter)
122771	Connector, Mini Jack, for “stable” relay output
60F135	Mains cable, 115V, USA, type B
60F139	Mains cable, 220V, Australia, type F
60F138	Mains cable, 220V, Italy, type E
60F137	Mains cable, 220V, South Africa, type D
60F141	Mains cable, 230V, Denmark, type G
60F140	Mains cable, 230V, Europe, type A
60F143	Mains cable, 230V, Israel, type I
60F142	Mains cable, 230V, Switzerland, type H
60F136	Mains cable, 240V, UK, type C
122823	Ref. input cable, Lemo to Banana
122801	Ref. probe cable, Lemo to Lemo (0.5 m)
STS-100A901AA	Ref probe, with accredited certificate
STS-100A901CA	Reference probe, no certificate
105366	RS-232 cable
104203	Test cable set (model B only)
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
60F170	Tool for insertion tube
105810	Insulation plug (ATC-155/156 series only) 3 pcs. for 6 mm (1/4 in.), 10 mm (3/8 in.), 16 mm (5/8 in.)
123374	Insulation plug (ATC-157 series only) 3 pcs. for 5 mm (0.2 in.), 8 mm (0.31 in.), 11 mm (0.43 in.)
122833	Basic calibration kit for ATC-155/-156
123685	Basic calibration kit for ATC-157
122834	Basic calibration kit for ATC-320/-650

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.

Basic calibration kit contains a heat protection shield, cleaning brushes (4 mm, 6 mm and 8 mm), undrilled inserts with 4 mm reference holes (3 pcs.) and a self-drilling guide for inserts.

INSERTS FOR ATC SERIES

General insert description

JOFRA dry-block insert compatability and materials:
ATC-320 = ATC-650 = ITC-320 = ITC-650 (brass)
ATC-155 = ATC-156 (aluminium)
ATC-157 = ITC-155 (aluminium)

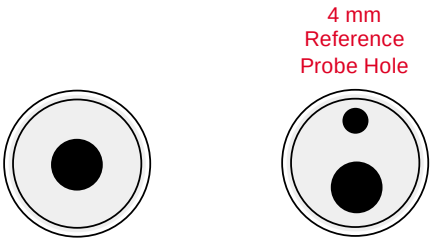
Custom-made special inserts on request (see order number below).

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

Inserts - predrilled - metric

Sensor diameter	ATC-155/156 part no.	ATC-157 part no.	ATC-320/650 part no.
3 mm	105623	123270	105622
4 mm	105625	123271	105624
5 mm	105627	123272	105626
6 mm	105629	123273	105628
7 mm	105631	123274	105630
8 mm	105633	123275	105632
9 mm	105635	123276	105634
10 mm	105637	123277	105636
11 mm	105639	123278	105638
12 mm	105641	123299**	105640
13 mm	105643	123300**	105642
14 mm	105645	-	105644
15 mm	105647	-	105646
16 mm	105649	-	105648
Other diminsions (please describe)	122885	123400	122886

Note: All inserts (metric and inches) are supplied with a hole for the 4 mm OD reference probe.
Note** ATC-157 only: 12 and 13 mm inserts are delivered without the 4 mm reference hole but supplied with a matching insulation plug.

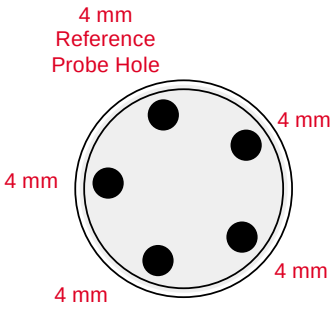


Single hole inserts

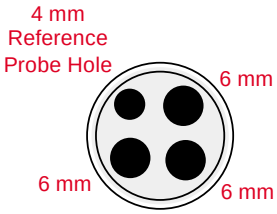
Inserts - multi-hole - metric

Description	ATC-155/156 part no.	ATC-157 part no.	ATC-320/650 part no.
Type 1	122751	123294	122750
Type 2	122753	123295	122752
Type 3	122755	123296	122754
Type 4	122757	-	122756
Custom-made max. 7 holes (please describe)	123398	123401	123399

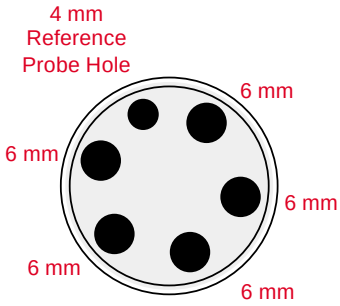
Note: All multi-hole inserts (metric and inches) for ATC-155/ -156/ -157 are supplied with a matching insulation plug.



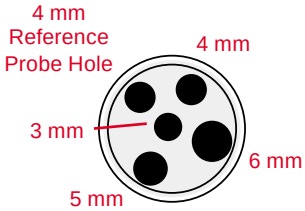
Multi-hole type 1 (ATC-155/156/320/650)



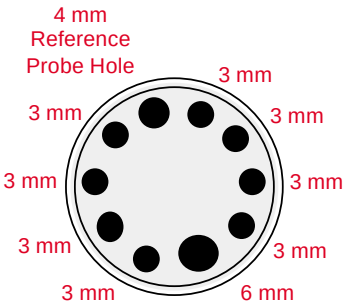
Multi-hole type 1 (ATC-157)



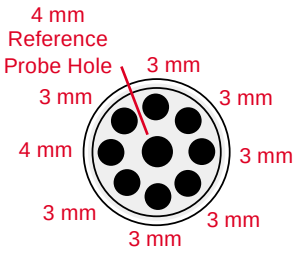
Multi-hole type 2 (ATC-155/156/320/650)



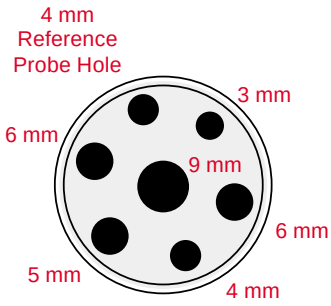
Multi-hole type 2 (ATC-157)



Multi-hole type 3 (ATC-155/156/320/650)



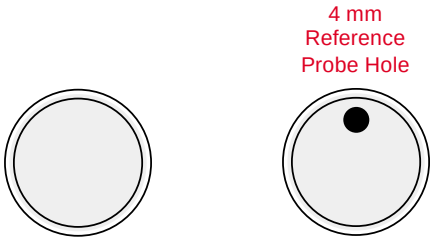
Multi-hole type 3 (ATC-157)



Multi-hole type 4 (ATC-155/156/320/650)

Inserts - undrilled

Inserts	ATC-155/156 part no.	ATC-157 part no.	ATC-320/650 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



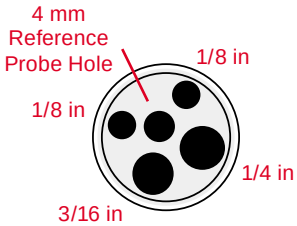
Undrilled inserts

Inserts - predrilled - imperial (inch)

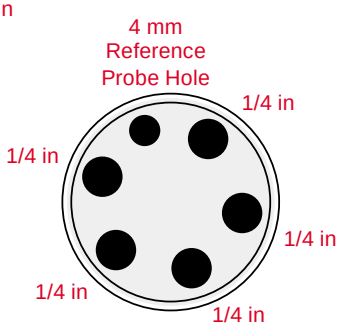
Sensor diameter	ATC-155/156 part no.	ATC-157 part no.	ATC-320/650 part no.
1/8 in.	105677	123279	105676
3/16 in.	105679	123280	105678
1/4 in.	105681	123281	105680
5/16 in.	105683	123282	105682
3/8 in.	105685	123283	105684
7/16 in.	105687	123301**	105686
1/2 in.	105689	123302**	105688
9/16 in.	105691	-	105690
5/8 in.	105693	-	105692
Other diminsions (please describe)	122885	123400	122886

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

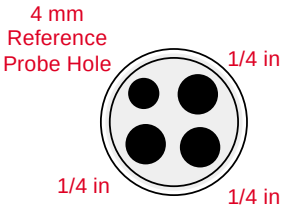
Note** ATC-157 only: 7/16 and 1/2 in inserts are delivered without the 4 mm reference hole but supplied with a matching insulation plug.



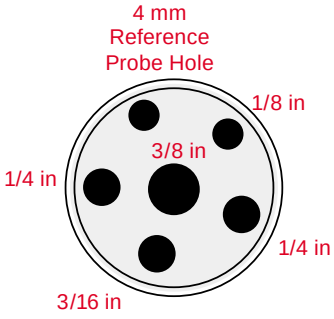
Multi-hole type 4 (ATC-157)



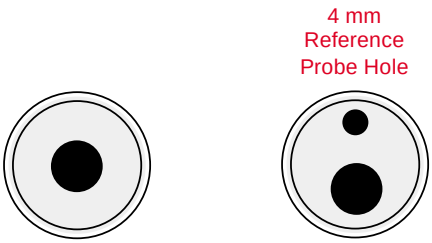
Multi-hole type 5 (ATC-155/156/320/650)



Multi-hole type 5 (ATC-157)



Multi-hole type 6 (ATC-155/156/320/650)



Single hole inserts

Inserts - multi-hole - imperial (inch)

Description	ATC-155/156 part no.	ATC-157 part no.	ATC-320/650 part no.
Type 4	-	123297	-
Type 5	122759	123298	122758
Type 6	122761	-	122760
Custom-made max. 7 holes (please describe)	123398	12401	123399

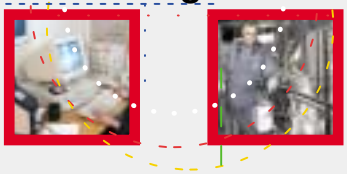
Note: All multi-hole inserts (metric and inches) for ATC-155/156/157 are supplied with a matching insulation plug.

ORDERING INFORMATION

Model ATC series dry-block temperature calibrators

Order number	Description
	Base model number - 1st thru 6th characters
ATC155	ATC-155 series, -23 to 155°C (-9 to 311°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)
ATC320	ATC-320 series, 50 to 320°C (122 to 608°F)
ATC650	ATC-650 series, 50 to 650°C (122 to 1202°F)
	Model version - 7th character
A	Basic model no sensor-under-test or reference probe input
B	Including sensor-under-test and reference probe input
	Power supply - 8th thru 10th characters
115	115VAC, 50/60Hz
230	230VAC, 50 Hz
	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
003	Metric, pre-drilled, 3 mm
004	Metric, pre-drilled, 4 mm
005	Metric, pre-drilled, 5 mm
006	Metric, pre-drilled, 6 mm
007	Metric, pre-drilled, 7 mm
008	Metric, pre-drilled, 8 mm
009	Metric, pre-drilled, 9 mm
010	Metric, pre-drilled, 10 mm
011	Metric, pre-drilled, 11 mm
012	Metric, pre-drilled, 12 mm
013	Metric, pre-drilled, 13 mm
014	Metric, pre-drilled, 14 mm (Not available for ATC-157)
015	Metric, pre-drilled, 15 mm (Not available for ATC-157)
016	Metric, pre-drilled, 16 mm (Not available for ATC-157)
125	Inch, pre-drilled, 1/8 in.
187	Inch, pre-drilled, 3/16 in.
250	Inch, pre-drilled, 1/4 in.
312	Inch, pre-drilled, 5/16 in.
375	Inch, pre-drilled, 3/8 in.
437	Inch, pre-drilled, 7/16 in.
500	Inch, pre-drilled, 1/2 in.
562	Inch, pre-drilled, 9/16 in. (Not available for ATC-157)
625	Inch, pre-drilled, 5/8 in. (Not available for ATC-157)
M01	Multi-hole insert type 1
M02	Multi-hole insert type 2
M03	Multi-hole insert type 3
M04	Multi-hole insert type 4
M05	Multi-hole insert type 5
M06	Multi-hole insert type 6 (Not availble for ATC-157)
	Options - 15th thru 18th characters
A	Basic calibration kit
C	Carrying case
F	Traceable certificate (standard for Europe, Asia, Australia and Africa)
G	NIST traceable certificate (standard for Western Hemisphere)
H	Accredited certificate
R	90° angled reference probe with accredited certificate
ATC320B 115 B M06 C	**Sample order number** JOFRA ATC-320 B series dry-block calibrator, 115VAC power with US power cord and insert: Pre-drilled multi-hole type 6 (4 mm ref. hole, 1x1/8 in., 2 x 1/4 in., 1 x 3/16 in., 1 x 3/8 in.) including carrying case.

temperature
software
pressure
signal



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

Temperature standards
Portable precision thermometer. Dry-block calibrators: 3 series, more than 13 models - featuring speed, portability, accuracy, and advanced documenting functions.

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

Electronic 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.

Signal calibration
Process signal measurement and simulation for easy control loop calibration and measurement tasks - from the small mA loop calibrator to the complete, software supported, modular-based ''calibration shop''.

...because calibration is a matter of confidence

AMETEK®
CALIBRATION INSTRUMENTS

ISO 9001 Manufacturer

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

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