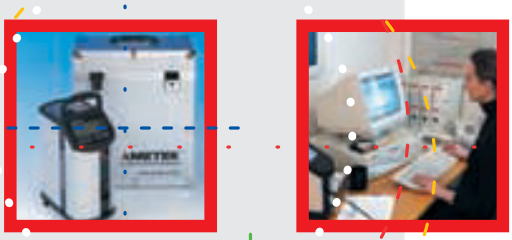
temperature



JOFRA™ ITC series

Industrial

Temperature

Calibrators

The JOFRA ITC series is the mid-range dry-block calibrator model offered by AMETEK. The design basis for the ITC series is portability and ease of use supplied at a reasonable cost without sacrificing accuracy, performance, and features.
The ITC series incorporates the features of the high-end ATC series with the functionality of the standard CTC series dry-block calibrators.

Wide temperature range
ITC-155 -23 to 155°C (-9 to 311°F)
ITC-320 33 to 320°C (91 to 608°F)
ITC-650 33 to 650°C (91 to 1202°F)

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

Enhanced accuracy and stability
MVI circuitry ensures temperature stability despite mains supply variations.

Timesaving features
Fast one-key-one-function access to the automatic switch test and the step function.

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

High accuracy and long-term stability
Specified drift over a one year period of time. Improves the reliability of the JOFRA ITC series.

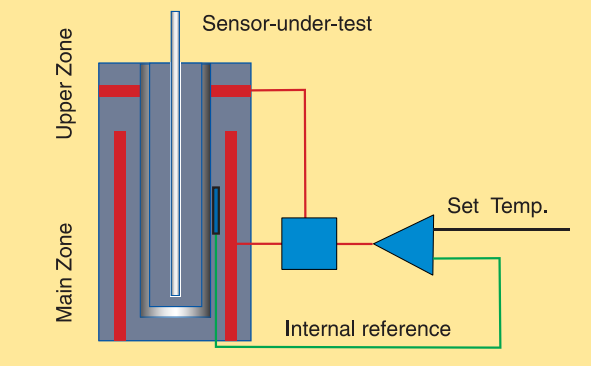
PRODUCT DESCRIPTION

The ITC series employs the slim and rugged design of the CTC series. This series also features the intuitive user interface, the clear LCD display, and the functionality that is used in the successful CTC series. However, the ITC is designed with the state-of-the-art dual-zone heating block and MVI circuitry that has been adopted from the ATC series. The MVI circuitry ensures stable temperatures even when the mains supply is unstable.
The ITC series is designed for both on-site and maintenance shop use. The applications are generally critical process control but can vary based on calibration and testing requirements.
The ITC series dry-block calibrators are available in 3 different temperature ranges and all models are equipped with RS-232 serial communication capabilities. The units are supplied with the AMECAL-TEMPERATURE software package.

AMETEK®
CALIBRATION INSTRUMENTS

ITC-320 & ITC-650 dual-zone heating block

The specialized block design increases the temperature homogeneity in the critical calibration zone. It also minimizes the need to insulate the sensors-under-test and makes it possible to calibrate liquid-filled and other mechanical sensors. The main, or lower, zone ensures optimum heat dissipation



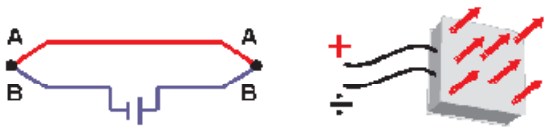
throughout the entire block. The secondary, or upper, zone compensates for the heat loss from the top of the block and from the sensor-under-test.

ITC-155 heating/cooling block

The model ITC-155 features improved Peltier elements that employ a ''Multi-Stage Technology''. This both improves efficiency and extends the useful life of the heating/cooling block.

Peltier effect (ITC-155)

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''.



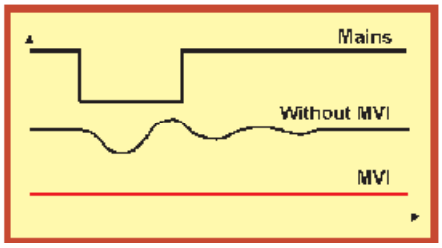
The practical Peltier element (electronic heating pump) consists of many elements of semiconductor material connected electrically in series and thermally in parallel. These thermoelectric elements and their electrical interconnections are mounted between two ceramic plates. The plates serve to mechanically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

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.

MVI - Improved temperature stability

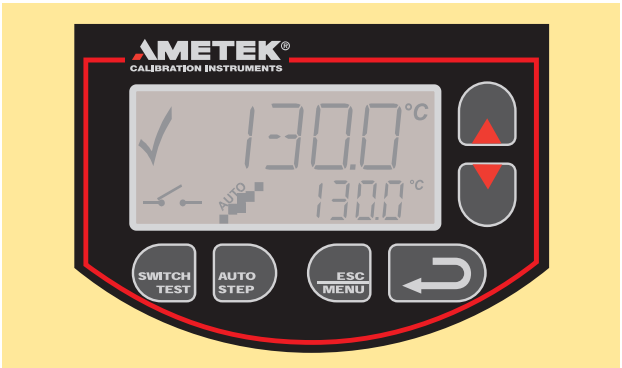
MVI stands for ''Mains power Variance Immunity''. Unstable mains power supplies are a major contributor to on-site calibration inaccuracies. Traditional temperature calibrators often become unstable in production environments where large electrical motors, heating elements, and other devices are periodically 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 ITC series calibrators ITC-320 and ITC-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.

Easy-to-use, intuitive operation

All instrument controls may be performed from the front panel. The heat source is positioned away from the panel. This design helps to protect the operator.
The main functions on the ITC series are designed with one-key-one-function logic. This means that there are no sub-menus or difficult to remember multiple keystrokes necessary to access primary functions.
The easy-to-read, backlit display features dedicated icons, which help in identifying instrument conditions and operational steps.



Set temperature

The ''Up'' and ''Down'' arrow keys allow the user to set the exact temperature desired with a resolution of 0.1°.

Instrument setups

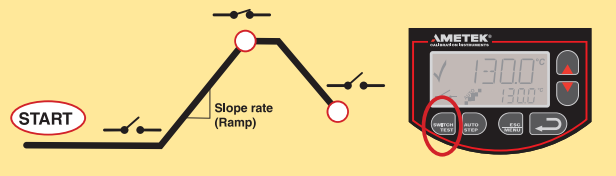
The ITC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto-step settings, and maximum temperature.

Stability indicator

A bold checkmark on the display indicates that the calibrator has reached the desired set temperature and is stable. The operator may change the stability criteria and establish a greater sense of security in the calibration results. A convenient countdown timer is activated five minutes before the unit reaches stability.

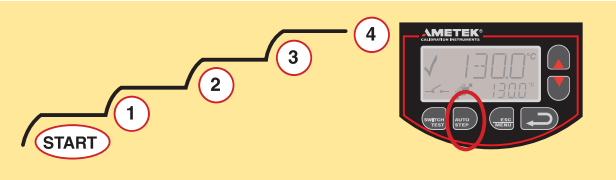
Automatic switch test

Operators can save a lot of time using the automatic thermoswitch test function to find values for the ''Open'' and ''Close'' temperatures. Additionally, this feature displays the hysteresis (deadband) between the two points. The feature ensures a very high repeatability when testing thermoswitches. Simply press the ''SWITCH TEST'' key to activate the function.



Auto stepping

This feature saves manpower. The operator may stay in the control room, or another remote location, monitoring the output from the sensor-under-test while the ITC series calibrator is placed in the process and automatically changes the temperature using a programmed step value and rate. Up to 9 different temperature steps may be programmed, including the hold time for each step.

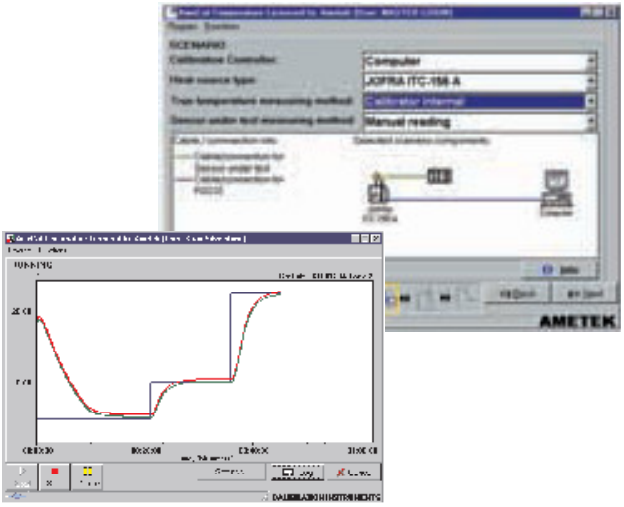


Re-calibration/adjustments

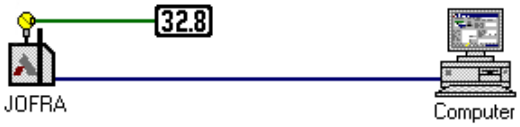
The ITC series has a very easy and straightforward procedure for re-calibration/adjustment. There is no need for a screwdriver or PC software. The only thing you need is a reliable reference thermometer.
Place the probe in the calibrator and follow the instructions on the display. Third-party labs and calibration facilities will be able to perform this function if a certificate from an independent source is necessary. Of course, AMETEK can provide you with a traceable calibration certificate from our labs when you require a higher level of confidence.

Simplified calibration documentation

All ITC 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 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 AMECAL-TEMPERATURE software supports automatic calibration for all JOFRA dry-block calibrators equipped with an RS-232 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.



FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage ITC-155/320 ..... 115V(90-127) 230V(180-254)
Voltage ITC-650 ..... 115V(100-127) 230V(200-254)
Frequency ..... 45 - 65 Hz
Power consumption (max.) ITC-155 ..... 150 VA
Power consumption (max.) ITC-320/650 ..... 1150 VA

Temperature range

ITC-155
Maximum ..... 155°C (311°F)
Minimum @ ambient temp. 0°C (32°F) ..... -39°C (-38°F)
Minimum @ ambient temp. 23°C (73°F) ..... -23°C (-9°F)
Minimum @ ambient temp. 40°C (104°F) ..... -10°C (14°F)

ITC-320 ..... 33 to 320°C (91 to 608°F)
ITC-650 ..... 33 to 650°C (91 to 1202°F)

Resolution (user-selectable)

All temperatures ..... 1° or 0.1°

Stability

ITC-155 ..... ±0.03°C (±0.05°F)
ITC-320 ..... ±0.03°C (±0.05°F)
ITC-650 ..... ±0.04°C (±0.07°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

ITC-155 A ..... ±0.25°C (±0.45°F)
ITC-320 A ..... ±0.3°C (±0.54°F)
ITC-650 A ..... ±0.5°C (±0.9°F)
12 month period. Specification by use of the internal reference.

Radial homogeneity (difference between holes)

ITC-155 A ..... 0.03°C (0.05°F)
ITC-320 A ..... 0.07°C (0.13°F)
ITC-650 A ..... 0.1°C (0.18°F)

Immersion depth

ITC-155 A ..... 160 mm (6.3 in.)
ITC-320 A/ ITC-650 A ..... 150 mm (5.9 in.)

Heating time

ITC-155
-20 to 23°C (-4 to 73°F) ..... 4 minutes
23 to 155°C (73 to 311°F) ..... 14 minutes
-20 to 155°C (-4 to 311°F) ..... 18 minutes

ITC-320
50 to 320°C (122 to 608°F) ..... 7 minutes

ITC-650
50 to 650°C (122 to 1202°F) ..... 25 minutes

Cooling time

ITC-155
155 to 100°C (311 to 212°F) ..... 4 minutes
155 to 23°C (311 to 73°F) ..... 14 minutes
23 to -20°C (73 to -4°F) ..... 23 minutes
155 to -20°C (311 to -4°F) ..... 37 minutes

ITC-320
320 to 100°C (608 to 212°F) ..... 30 minutes
320 to 50°C (608 to 122°F) ..... 60 minutes

ITC-650
650 to 100°C (1202 to 212°F) ..... 56 minutes
650 to 50°C (1202 to 122°F) ..... 95 minutes

Switch input (dry contact)

Test voltage ..... Maximum 5 VDC
Test current ..... Maximum 2.5 mA

PHYSICAL SPECIFICATIONS

Instrument dimensions (L x W x H)

241 x 139 x 375 mm (9.5 x 5.5 x 14.8 in.)

Instrument weight

ITC-155 ..... 7.6 kg (16.8 lb)
ITC-320 ..... 6.5 kg (14.3 lb)
ITC-650 ..... 8.5 kg (18.7 lb)

Insert dimensions

ITC-155 diameter ..... 20 mm (0.79 in.)
ITC-155 length ..... 150 mm (5.91 in.)
ITC-320/650 diameter ..... 30 mm (1.18 in.)
ITC-320/650 length ..... 160 mm (6.3 in.)

Weight of non-drilled insert (approximate)

ITC-155 ..... 130 g (4.6 oz)
ITC-320/650 ..... 940 g (33.2 oz)

Shipping (including optional carrying case)

Weight: ITC-155 ..... 14.0 kg (30.9 lb)
Weight: ITC-320 ..... 13.7 kg (30.2 lb)
Weight: ITC-650 ..... 15.7 kg (34.6 lb)

Size: L x W x H 490 x 220 x 405 mm (19.3 x 8.7 x 15.9 in.)

Shipping (without carrying case)

Weight: ITC-155 ..... 11.0 kg (24.3 lb)
Weight: ITC-320 ..... 10.7 kg (23.6 lb)
Weight: ITC-650 ..... 12.7 kg (28.0 lb)

Size: L x W x H 460 x 216 x 405 mm (18.1 x 8.5 x 15.9 in.)

Shipping (carrying case only)

Weight: ..... 5.0 kg (11 lb)

Size: L x W x H 490 x 220 x 405 mm (19.3 x 8.7 x 15.9 in.)

Miscellaneous

Serial data interface ..... RS-232C (9-pin Male)

Operating temperature.....0 to 40°C (32 to 104°F)

Storage temperature .....-20 to 60°C (-4 to 140°F)

Humidity ..... 0 to 90% RH

Protection class IP-10

CE Conformity..... EN61326-1 : 1997/A1:1998
.....EN61010-1 : 1993/A2:1995

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

STANDARD DELIVERY

Standard delivery ITC-155/320/650

- ITC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- 3 pcs. insulation plugs for 5, 8, 11 mm sensors (ITC-155 only)
- Tool for insertion tubes
- RS-232 cable
- Calibration software, AMECAL-TEMPERATURE
- User's manual (multi-language)
- Reference manual (English)
- Test cables (1 x red, 1 x black)

ACCESSORIES

Part no.	Description
123312	ITC series, reference manual
123311	ITC series, user manual
123396	Carrying case
122832	Cleaning brush, 4 mm (3/Pkg)
60F174	Cleaning brush, 6 mm (3/Pkg)
122822	Cleaning brush, 8 mm (3/Pkg)
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
105366	RS232 cable
104203	Test cable set
104216	Heat shield
60F170	Tool for insertion tube
123374	Insulation plug (ITC-155 series only) 3 pcs. for 5 mm (0.2 in.), 8 mm (0.31 in.), 11 mm (0.43 in.)
105813	AMECAL-TEMPERATURE software

Carrying case

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

Heat shield

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.

INSERTS FOR ITC SERIES

General insert description

All inserts for ITC-155 are made of aluminum.
All inserts for ITC-320 and ITC-650 are made of brass.
ITC-320 and ITC-650 inserts are identical to the inserts used by ATC-320 and ATC-650 from the JOFRA ATC series dry-block calibrators.

Custom-made special inserts on request.

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

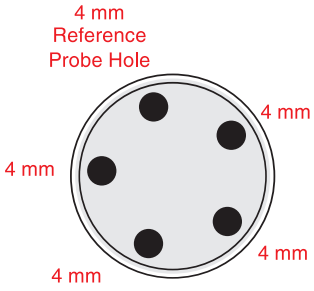
Sensor diameter	ITC-155 Part no.	ITC-320/650 Part no.
3 mm	123270	105622
4 mm	123271	105624
5 mm	123272	105626
6 mm	123273	105628
7 mm	123274	105630
8 mm	123275	105632
9 mm	123276	105634
10 mm	123277	105636
11 mm	123278	105638
12 mm	123299**	105640
13 mm	123300**	105642
14 mm	-	105644
15 mm	-	105646

Note: All inserts (metric and inches) are supplied with a hole for the 4 mm OD reference probe.
Note** ITC-155 only: 12 and 13 mm inserts are delivered without the 4 mm reference hole but supplied with a matching insulation plug.

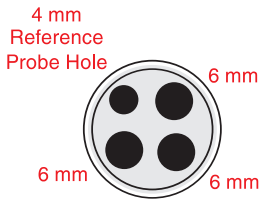
Inserts - multihole - metric

Description	ITC-155 Part no.	ITC-320/650 Part no.
Type 1	123294	122750
Type 2	123295	122752
Type 3	123296	122754
Type 4	-	122756

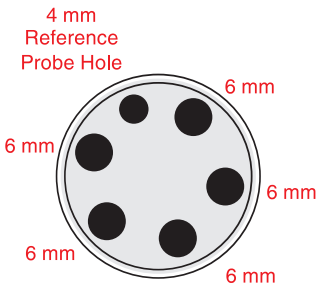
Note: All multi-hole inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.



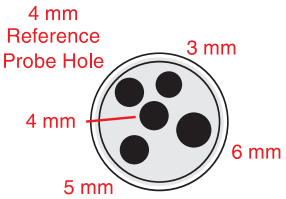
Multi-hole type 1 (ITC-320/650)



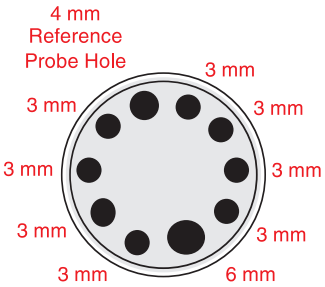
Multi-hole type 1 (ITC-155)



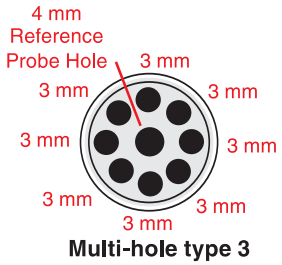
Multi-hole type 2 (ITC-320/650)



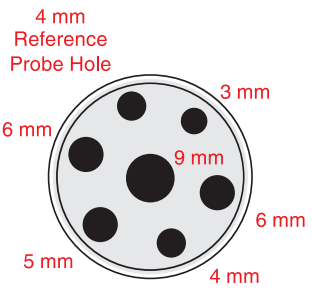
Multi-hole type 2 (ITC-155)



Multi-hole type 3 (ITC-320/650)



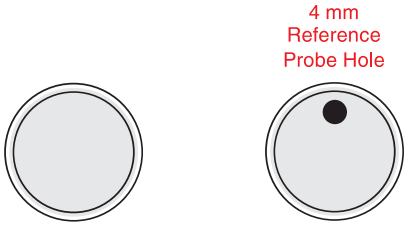
Multi-hole type 3 (ITC-155)



Multi-hole type 4 (ITC-320/650)

Inserts - undrilled

Inserts	ITC-155 Part no.	ITC-320/650 Part no.
5-pack, undrilled insertion tubes	123286	122719
5-pack, undrilled insertion tubes with a 4 mm hole for the reference probe	123285	122721



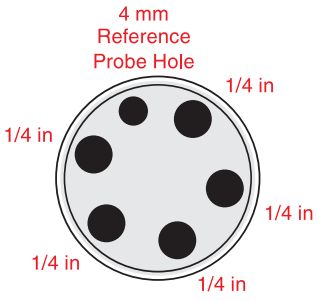
Undrilled inserts (ITC-155/320/650)

Inserts - predrilled - imperial (inch)

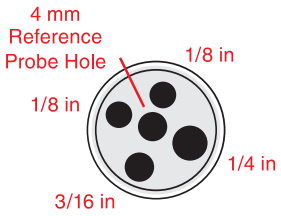
Sensor diameter	ITC-155 Part no.	ITC-320/650 Part no.
1/8 in.	123279	105676
3/16 in.	123280	105678
1/4 in.	123281	105680
5/16 in.	123282	105682
3/8 in.	123283	105684
7/16 in.	123301**	105686
1/2 in.	123302**	105688
9/16 in.	-	105690
5/8 in.	-	105692

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

Note** ITC-155 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 5 (ITC-320/650)

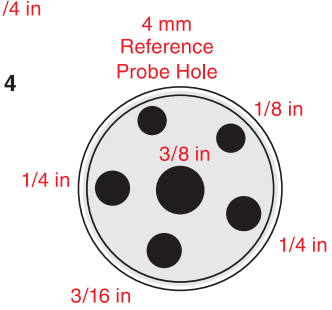


Multi-hole type 4 (ITC-155)

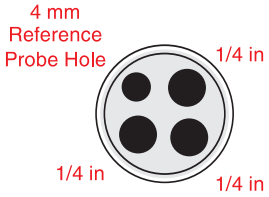
Inserts - multi-hole - imperial (inch)

Description	ITC-155 Part no.	ITC-320/650 Part no.
Type 4	123297	-
Type 5	123298	122758
Type 6	-	122760

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



Multi-hole type 6 (ITC-320/650)



Multi-hole type 5 (ITC-155)

ORDERING INFORMATION

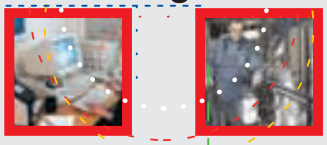
Model ITC series dry-block temperature calibrators

Order number	Description
	Base model number - 1st thru 7th characters
ITC155A	ITC-155 series, -23 to 155°C (-9 to 311°F)
ITC320A	ITC-320 series, 50 to 320°C (122 to 608°F)
ITC650A	ITC-650 series, 50 to 650°C (122 to 1202°F)
	Power supply - 8th thru 10th characters
115	115VAC, 50/60Hz
230	230VAC, 50 Hz
	Mains power cable type - 11th characters
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 ITC-155)
015	Metric, pre-drilled, 15 mm (Not available for ITC-155)
016	Metric, pre-drilled, 16 mm (Not available for ITC-155)
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 ITC-155)
625	Inch, pre-drilled, 5/8 in. (Not available for ITC-155)
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 ITC-155)
	Options - 15th thru 18th characters
C	Carrying case
F	Traceable certificate (standard for Europe, Asia, Australia and Africa)
G	NIST traceable certificate (standard for Western Hemisphere)
H	Accredited certificate
X	Placeholder character for unused option

ITC320A 115 B M06 CGXX **Sample order number (all 18 characters)**

JOFRA ITC-320 A series dry-block calibrator, 115VAC power with US power cord and insert: Pre-drilled multi-hole type 6 (4 mm ref. hole, 1 x 1/8 in., 2 x 1/4 in., 1 x 3/16 in., 1 x 3/8 in.) including carrying case and NIST traceable certificate.

temperature
software
pressure
signal



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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''.

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