temperature

JOFRA calibration

Industrial Temperature Calibrator
ITC-155/320/650

» 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

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

» Documentation made easy
RS232 communication and JOFRACAL calibration software are included in the standard delivery

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.

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 RS232 serial communication capabilities. The standard delivery also includes the JOFRACAL calibration PC software.

ISO 9001 Manufacturer

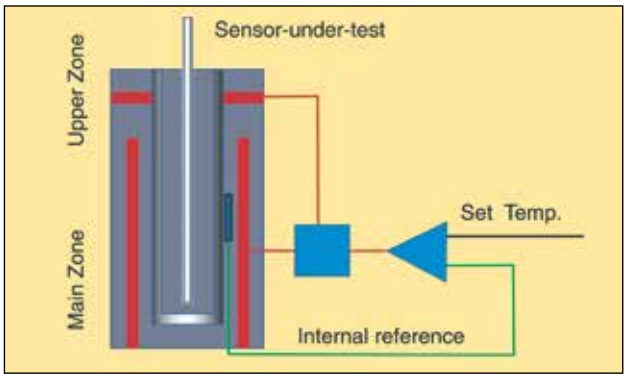
Specification Sheet
SS-ITC

AMETEK®
TEST & 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.

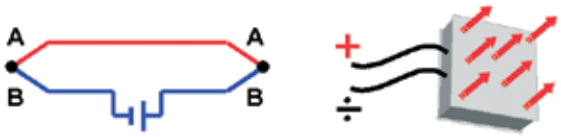


ITC-155 heating/cooling block

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

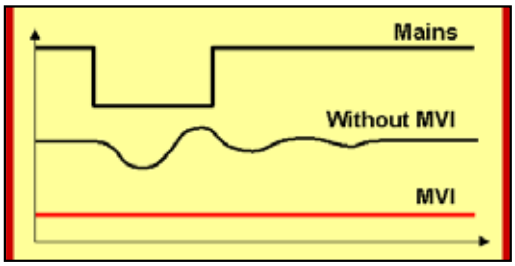
From the setup menu, the user can select the maximum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by the application of excessive temperatures. The feature also aids in reducing drift resulting from extended periods of exposures to high temperatures.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

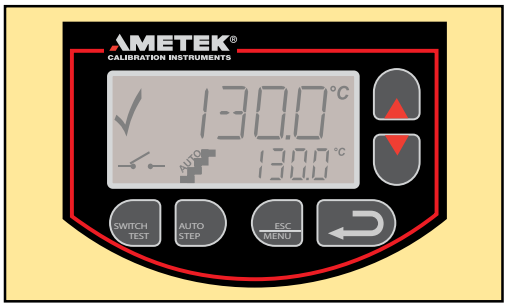


Easy-to-use, intuitive operation

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.

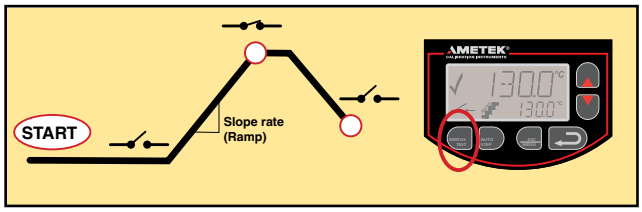


Set temperature
The ''Up'' and ''Down'' arrow keys allow the user to set the exact temperature desired with a resolution of 0.1°.

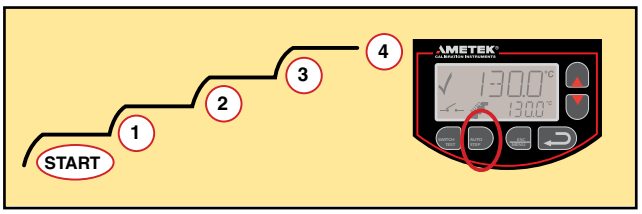
Instrument setups
The ITC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto-step settings, and maximum temperature.

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.

Calibration of up to 24 sensors with JOFRA ASM
Using the JOFRA ITC series together with the ASM Advanced Signal Multi-scanner offers a great time-saving automatic solution to calibrate multiple temperature sensors at the same time.

The ASM series is an eight channel scanner controlled by JOFRACAL software on a PC. Up to 3 ASM units can be stacked to calibrate up to 24 sensors at the same time. It can handle signals from 2-, 3- and 4 wire RTD's, TC's, transmitters, thermisters, temperature switches and voltage.

Please also see more in specification sheet SS-CP-2360, which can be found at www.jofra.com

JOFRACAL CALIBRATION SOFTWARE

JOFRACAL calibration software ensures easy calibration of RTD´s, thermocouples, transmitters, thermoswithes, pressure gauges and pressure switches. JOFRACAL can be used with all JOFRA calibration instruments. When used with ASM-800 signal multi scanner, JOFRACAL can perform a simultaneous semi automatic calibration on up to 24 pressure and/or temperature devices under test in any combination.

JOFRACAL software controls the complete calibration procedure, stores the results and provides a calibration audit trail through hard-copy certificates. All calibration data are stored for each sensor to monitor drift and optimise recalibration intervals. A scheduler feature allows planning of future calibrations.

JOFRACAL software

Minimum hardware requirements for JOFRACAL calibration software.

- INTEL™ 486 processor
- (PENTIUM™ 800 MHz recommended)
- 32 MB RAM (64 MB recommended)
- 80 MB free disk space on hard disk prior to installation
- Standard VGA (800 x 600, 16 colors) compatible screen
- (1024 x 786, 256 colors recommended)
- CD-ROM drive for installation of the program
- 1 free RS232 serial port

STANDARD DELIVERY

- 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
- RS232 cable
- JOFRACAL calibration software
- User manual
- Reference manual (English)
- Test cables (1 x red, 1 x black)

ACCESSORIES

122832	Cleaning Brushes - 4 mm - Package of 3 pcs
60F174	Cleaning Brushes - 6 mm - Package of 3 pcs
122822	Cleaning Brushes - 8 mm - Package of 3 pcs
123374	Set of 3 pcs of insulation plugs / 4 mm ref. hole * 5, 8 and 11 mm / 0.2, 0.31 and 0.43 in. (ITC-155 A only)
125510	Set of 3 pcs of insulation plugs / 1/4 in ref. hole * 5, 8 and 11 mm / 0.2, 0.31 and 0.43 in. (ITC-155 A only)
125068	Support rod set for sensors, 2 gribs, 2 fixtures * Support rod set can be mounted on all JOFRA dry-blocks
125066	Extra fixture for sensor grib
125067	Extra sensor grib
125002	Edge port Converter with 4 pcs of RS232 ports
123396	Carrying Case for ITC Series

Carrying case (Optional) - 123396

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

Heat shield (Optional) - 104216

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.

Support rod set (Optional) - 125068

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

FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage ITC-155/320 A.....115V(90-127) / 230V(180-254)
Voltage ITC-650 A.....115V(100-127) / 230V(200-254)
Frequency, non US deliveries .....50 Hz ±5, 60 Hz ±5
Frequency, US deliveries .....60 Hz ±5
Power consumption (max) ITC-155 A.....150 VA
Power consumption (max) ITC-320/650 A.....1150 VA

Temperature range

ITC-155 A
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 A .....33 to 320°C / 91 to 608°F
ITC-650 A .....33 to 650°C / 91 to 1202°F

Resolution (user-selectable)

All temperatures ..... 1° or 0.1°

Stability - NEW [1)]

ITC-155 A.....±0.01°C / ±0.02°F
ITC-320 A.....±0.02°C / ±0.04°F
ITC-650 A.....±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 - NEW [1)]

ITC-155 A.....±0.18°C / ±0.32°F
ITC-320 A.....±0.25°C / ±0.45°F
ITC-650 A.....±0.45°C / ±0.81°F
12 month period. Specification by use of the internal reference.

Radial homogeneity (difference between holes) - NEW [1)]

ITC-155 A..... 0.02°C / 0.04°F
ITC-320 A..... 0.04°C / 0.07°F
ITC-650 A..... 0.1°C / 0.18°F

Immersion depth

ITC-155 A .....160 mm / 6.30 in
ITC-320 A / ITC-650 A ..... 150 mm / 5.91 in

Well diameter

ITC-155 A ..... 20 mm / 0.79 in
ITC-320/ITC-650 A..... 30 mm / 1.18 in

Heating time

ITC-155 A	-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 A	50 to 320°C / 122 to 608°F	7 minutes
ITC-650 A	50 to 650°C / 122 to 1202°F	25 minutes

1) Improved specifications from January 1, 2008

Cooling time

ITC-155 A	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 A	320 to 100°C / 608 to 212°F	30 minutes
	320 to 50°C / 608 to 122°F	60 minutes
ITC-650 A	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 A .....7.6 kg / 16.8 lb
ITC-320 A .....6.5 kg / 14.3 lb
ITC-650 A ..... 8.5 kg / 18.7 lb

Insert dimensions

ITC-155 A	Outer diameter	19,9 mm / 0.78 in
	Inner diameter	16,9 mm / 0.67 in
	Length	150 mm / 5.91 in
ITC-320/650 A	Outer diameter	29,7 mm / 1.17 in
	Inner diameter (multi hole)	25,9 mm / 1.02 in
	Inner diameter (single hole)	22,0 mm / 0.87 in
	Length	160 mm / 6.30 in

Weight of non-drilled insert (approximate)

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

Shipping (including optional carrying case)

Weight: ITC-155 A..... 14.0 kg / 30.9 lb
Weight: ITC-320 A.....13.7 kg / 30.2 lb
Weight: ITC-650 A.....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 A.....11.0 kg / 24.3 lb
Weight: ITC-320 A .....10.7 kg / 23.6 lb
Weight: ITC-650 A.....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 ..... RS232 (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

PREDRILLED INSERTS FOR ITC SERIES - 4 MM REFERENCE HOLE

JOFRA dry-block insert compatibility and materials:
ATC-320 = ATC-650 = ITC-320 = ITC-650 (made of brass)
ATC-155 = ATC-156 (made of aluminum)
ATC-157 = ITC-155 (made of aluminum)
ATC-140 = ATC-250 (made of aluminum)

All specifications on hole sizes are referring to the outer diameter of the sensor-under-test.
The correct clearance size is applied in all predrilled inserts.

Probe diameter	Insert code [1]	ITC-155 A	ITC-320/650 A
3 mm	003	123270	105622
4 mm	004	123271	105624
5 mm	005	123272	105626
6 mm	006	123273	105628
7 mm	007	123274	105630
8 mm	008	123275	105632
9 mm	009	123276	105634
10 mm	010	123277	105636
11 mm	011	123278	105638
12 mm	012	123299 [2]	105640
13 mm	013	123300 [2]	105642
14 mm	014	N/A	105644
15 mm	015	N/A	105646
16 mm	016	N/A	105648
Package of the above inserts	-	124699	124701
Set of insulation plugs	-	123374	N/A

Probe diameter	Insert code [1]	ITC-155 A	ITC-320/650 A
1/8 in	125	123279	105676
3/16 in	187	123280	105678
1/4 in	250	123281	105680
5/16 in	312	123282	105682
3/8 in	375	123283	105684
7/16 in	437	123301 [2]	105686
1/2 in	500	123302 [2]	105688
9/16 in	562	N/A	105690
5/8 in	625	N/A	105692
Package of the above inserts	-	124700	124702
Set of insulation plugs	-	123374	N/A

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 ITC-155 are supplied with a matching insulation plug.
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.
Note 2: ITC-155 : 12 mm, 13 mm, 7/16 in and 1/2 in inserts are delivered without the 4 mm reference hole, but supplied with a matching insulation plug.

PREDRILLED INSERTS FOR ITC SERIES - 1/4 IN (6.35 mm) REFERENCE HOLE

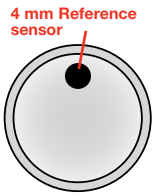
Probe diameter	Insert code [1]	ITC-155 A	ITC-320/650 A
3 mm	803	125290	125259
4 mm	804	125291	125261
5 mm	805	125292	125263
6 mm	806	125293	125265
7 mm	807	125294	125267
8 mm	808	125295	125269
9 mm	809	N/A	125271
10 mm	810	N/A	125273
11 mm	811	N/A	125277
12 mm	812	123299 [2]	125279
13 mm	813	123300 [2]	125281
14 mm	814	N/A	125283
15 mm	815	N/A	125285
Package of the above inserts	-	125387	125388
Set of insulation plugs	-	125510	N/A

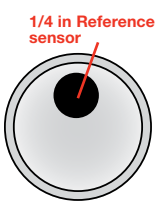
Probe diameter	Insert code [1]	ITC-155 A	ITC-320/650 A
1/8 in	901	125314	125296
3/16 in	902	125315	125298
1/4 in	903	125316	125300
5/16 in	904	125317	125303
3/8 in	905	N/A	125305
7/16 in	906	123301 [2]	125307
1/2 in	907	123302 [2]	125309
9/16 in	908	N/A	125311
Package of the above inserts	-	125390	125391
Set of insulation plugs	-	125510	N/A

Note: All inserts (metric and inches) are supplied with a hole for the 1/4 in OD reference probe.
Note: All inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.
Note 2: ITC-155: 12 mm, 13 mm, 7/16 in and 1/2 in inserts are delivered without the 1/4 in reference hole, but supplied with a matching insulation plug.

UNDRILLED INSERTS FOR ITC SERIES

Inserts	ITC-155 A	ITC-320/650 A
5-pack, undrilled inserts	123286	122719
5-pack, undrilled inserts with a 4 mm hole for the reference probe	123285	122721
5-pack, undrilled inserts with a 1/4 in hole for the reference probe	125313	125287
One undrilled insert	N/A	N/A
Undrilled insulation plug	123304	N/A

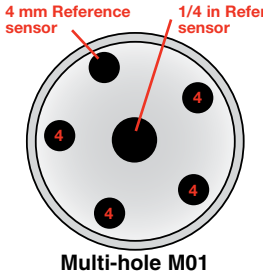




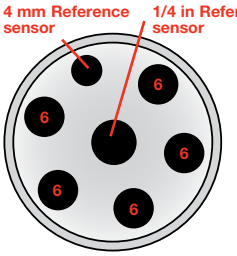
MULTI-HOLE INSERTS FOR ITC SERIES - METRIC (MM)

Spare part no. for multi-hole inserts - metric (mm)		
Insert code [1]	ITC-155 A	ITC-320/650 A
M01	123294	122750
M02	123295	122752
M03	123296	122754
M04	N/A	122756
M06	125377	N/A
M07	125378	N/A
M08	125379	N/A

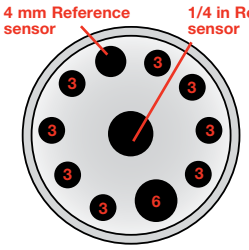
Note: All multi-hole inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.
Note: Remember to use matching insulation plugs.
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.



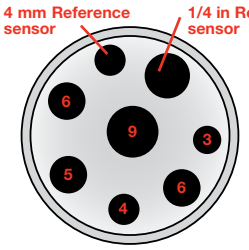
Multi-hole M01 (ITC-320/650 A)



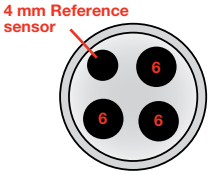
Multi-hole M02 (ITC-320/650 A)



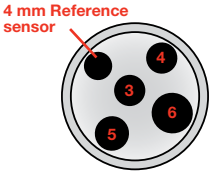
Multi-hole M03 (ITC-320/650 A)



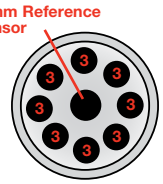
Multi-hole M04 (ITC-320/650 A)



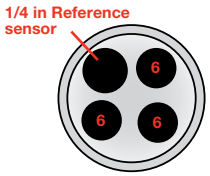
Multi-hole M01 (ITC-155 A)



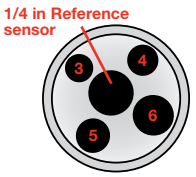
Multi-hole M02 (ITC-155 A)



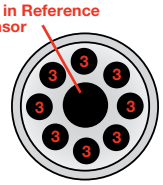
Multi-hole M03 (ITC-155 A)



Multi-hole M06 (ITC-155 A)



Multi-hole M07 (ITC-155 A)

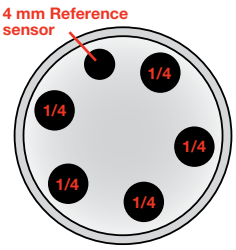


Multi-hole M08 (ITC-155 A)

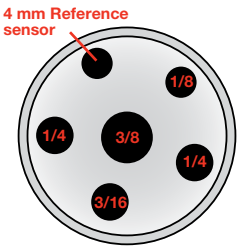
MULTI-HOLE INSERTS FOR ITC SERIES - IMPERIAL (INCH)

Spare part no. for multi-hole inserts - imperial (inch)		
Insert code [1]	ITC-155 A	ITC-320/650 A
M02	N/A	N/A
M04	123297	N/A
M05	123298	122758
M06	N/A	122760
M09	125380	N/A

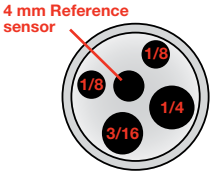
Note: All multi-hole inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.
Note: Remember to use matching insulation plugs.
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.



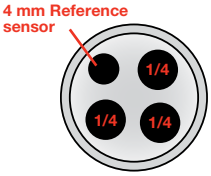
Multi-hole M05 (ITC-320/650 A)



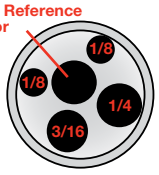
Multi-hole M06 (ITC-320/650 A)



Multi-hole M04 (ITC-155 A)



Multi-hole M05 (ITC-155 A)



Multi-hole M09 (ITC-155 A)

ORDERING INFORMATION

Order number	Description
	Base model number
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 (US deliveries 60 Hz only)
115	115VAC
230	230VAC
	Mains power cable type
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
XXX	1 x Insert for dry-block configuration (please see the previous insert pages for the right insert codes)
	Calibration certificate
F	Traceable calibration certificate (standard for Europe, Asia, Australia and Africa)
G	NIST traceable calibration certificate (standard for Western Hemisphere)
H	Accredited calibration certificate
	Options
C	Carrying case
X	No option used
ITC320A115BM06CGXX	**Sample order number** JOFRA ITC-320 A dry-block calibrator, 115VAC power with US power cord and predrilled multi-hole insert type 6 including carrying case and NIST traceable certificate.

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

JOFRA Calibration Instruments
Temperature Calibrators
Portable dry-block calibrators, precision thermometers and liquid baths. Temperature ranges from -90°C(-130°F) to 1205°C(2200°F). Temperature sensors for industrial and marine use.
Pressure Calibrators
Convenient electronic systems ranging from -25 mbar to 1000 bar - fully temperature-compensated for problem-free and accurate field use.
Signal Instruments
Process signal measurement and simulation for easy control loop calibration and measurement tasks.

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

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

Davenport Polymer Test Equipment
Allows measurement and characterization of moisture-sensitive PET polymers and polymer density.

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

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

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