temperature

JOFRA™ ITC series

Industrial

Temperature

Calibrators

Portable and easy-to-use temperature calibrator

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

ISO 9001 Manufacturer

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.

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.

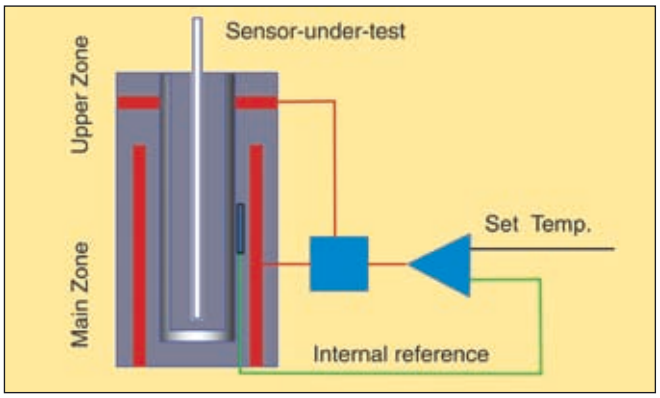
The ITC series dry-block calibrators are available in 3 different temperature ranges and all models are equipped with RS232 serial communication capabilities. The standard delivery also includes the JOFRACAL calibration PC software.

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.

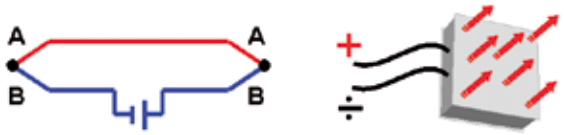


ITC-155 heating/cooling block

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

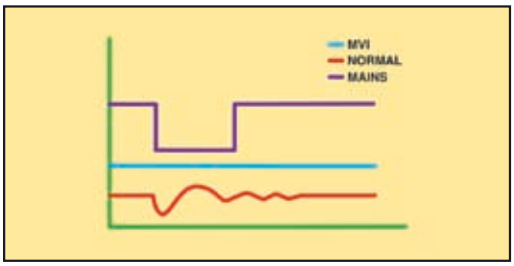
From the setup menu, the user can select the maximum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by the application of excessive temperatures. The feature also aids in reducing drift resulting from extended periods of exposures to high temperatures.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

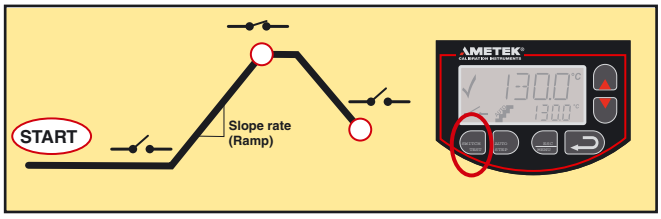
The ITC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto-step settings, and maximum temperature.

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.

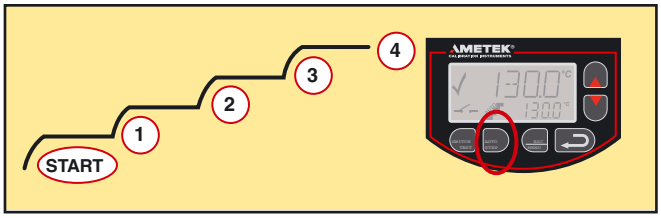
Automatic switch test

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

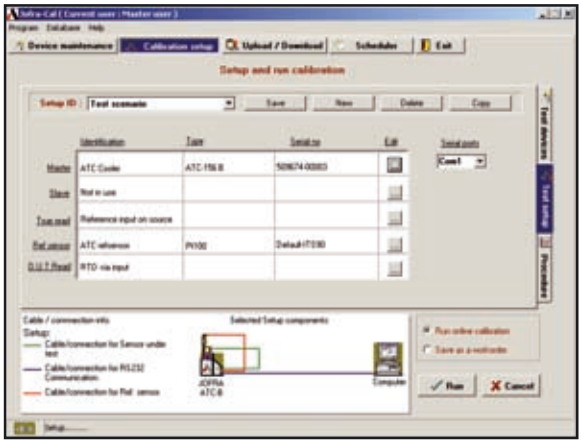
Using the JOFRA ITC series together with the ASM Advanced Signal Multi-scanner offers a great time-saving automatic solution to calibrate multiple temperature sensors at the same time.

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

Simplified calibration documentation - JOFRACAL

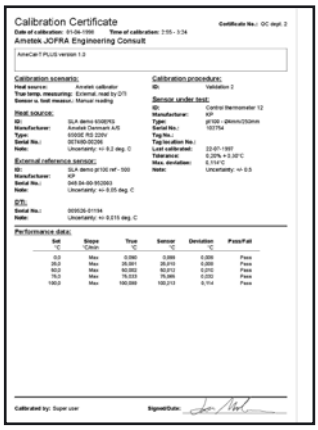
All ITC series calibrators are provided with the JOFRACAL calibration software. This software allows the user to customize his or her calibration routines. The software is easy-to-use so you do not have to be a programmer to configure your own calibration procedures. The software features prompts, menus, 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 DTI050 digital thermometer, the JOFRA DTI-1000 digital thermometer and the JOFRA ASM Multi-scanner.

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.

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.


Calibration Certificate

Ametek JOFRA Engineering Consult

The JOFRACAL temperature calibration software may be donwloaded from our web-page www.jofra.com.

Please also see more about JOFRACAL calibration software in specification sheet SS-CP-2510, which can be found at www.jofra.com

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

Part no.	Description
122832	Cleaning brush, 4 mm (3/Pkg)
60F174	Cleaning brush, 6 mm (3/Pkg)
122822	Cleaning brush, 8 mm (3/Pkg)
123304	Undrilled insulation plug (ITC-155 series only)

Carrying case - 123396

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

Heat shield - 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.

FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage ITC-155/320 ..... 115V(90-127) / 230V(180-254)
Voltage ITC-650 ..... 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..... 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 / 6.30 in
ITC-320 A / ITC-650 A ..... 150 mm / 5.91 in

Well diameter

ITC-155..... 20 mm / 0.79 in
ITC-320 / ITC-650 ..... 30 mm / 1.18 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 outer diameter .....19,9 mm / 0.78 in
ITC-155 inner diameter..... 16,9 mm / 0.67 in
ITC-155 length.....150 mm / 5.91 in

ITC-320/650 outer diameter.....29,7 mm / 1.17 in
ITC-320/650 inner diameter (multi hole)..... 25,9 mm / 1.02 in
ITC-320/650 inner diameter (single hole)..... 22,0 mm / 0.87 in
ITC-320/650 length..... 160 mm / 6.30 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 ..... 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.

Spare part no. for predrilled inserts with 4 mm reference hole			
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

Spare part no. for predrilled inserts with 4 mm reference hole			
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 REFERENCE HOLE

Spare part no. for predrilled inserts with 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 [1]	125279
13 mm	**813**	123300 [1]	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

Spare part no. for predrilled inserts with 1/4 in (6.35 mm) reference hole			
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 [1]	125307
1/2 in	907	123302 [1]	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, undrilled		
Inserts	**ITC-155 A**	**ITC-320/650 A/B**
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

4 mm Reference probe hole

1/4 in Reference probe hole

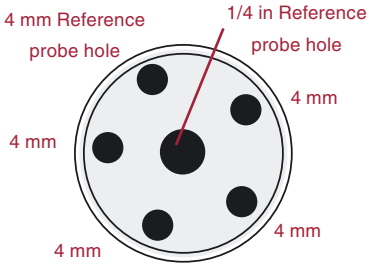
MULTI-HOLE INSERTS FOR ITC SERIES - METRIC (MM)

Spare part no. for multi-hole inserts - metric (mm)		
Insert code [1]	ITC-155 A	ITC-320/650 A/B
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

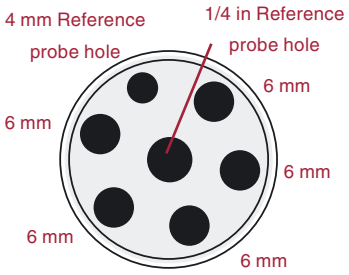
Note: All multi-hole inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.

Note: Remember to use matching insulation plugs.

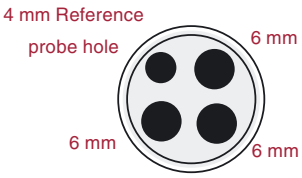
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.



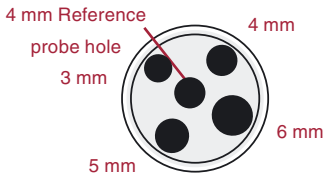
Multi-hole M01
(ITC-320/650 A/B)



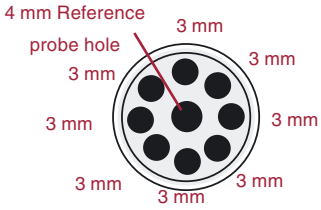
Multi-hole M02
(ITC-320/650 A/B)



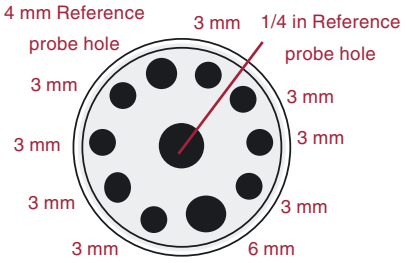
Multi-hole M01
(ITC-155 A)



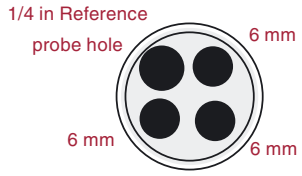
Multi-hole M02
(ITC-155 A)



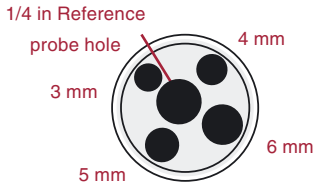
Multi-hole M03
(ITC-155 A)



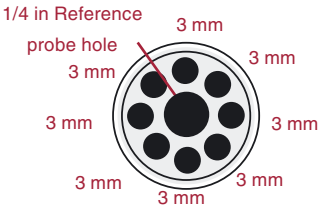
Multi-hole M03
(ITC-320/650 A/B)



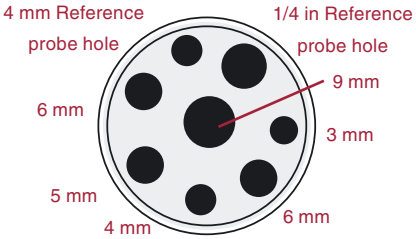
Multi-hole M06
(ITC-155 A)



Multi-hole M07
(ITC-155 A)



Multi-hole M08
(ITC-155 A)



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

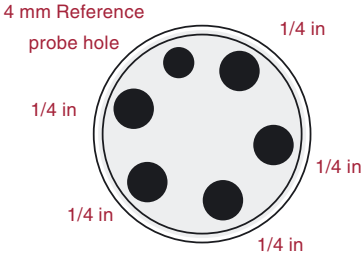
MULTI-HOLE INSERTS FOR ITC SERIES - IMPERIAL (INCH)

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

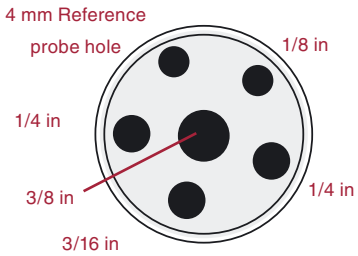
Note: All multi-hole inserts (metric and inches) for ITC-155 are supplied with a matching insulation plug.

Note: Remember to use matching insulation plugs.

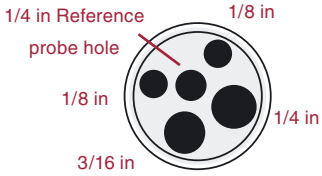
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.



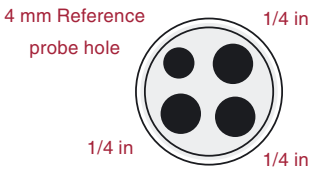
Multi-hole M05
(ITC-320/650 A/B)



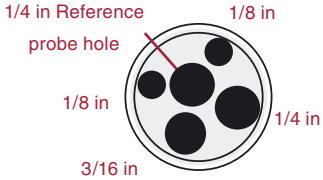
Multi-hole M06
(ITC-320/650 A/B)



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 pre-drilled multi-hole insert 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.

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

JOFRA Temperature Calibrators
Portable precision thermometer. Dry-block and liquid bath calibrators: 4 series, with more than 20 models - featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL temperature calibration software.

JOFRA Pressure Calibrators
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 Calibrators
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.

JOFRA / JF Marine Calibrators
A complete range of calibration equipment for temperature, pressure and signal, approved for marine use.

FP Temperature Sensors
A complete range of temperature sensors for industrial and marine use.

...because calibration is a matter of confidence

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