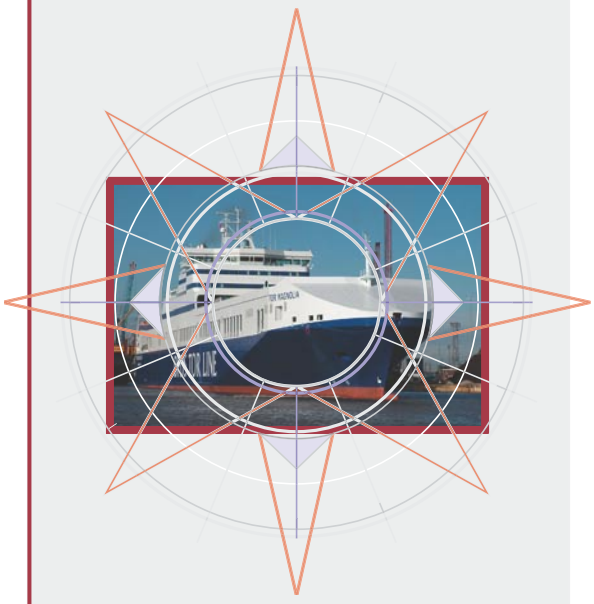
temperature



JF INSTRUMENTS™ MTC Series

Marine Temperature Calibrator

NOTICE
Now with RS232 and JOFRACAL calibration software

Type approved temperature calibrators to optimize the performance of your vessel

The MTC series of portable temperature calibrators from JF Instruments facilitates correct readings on all of your temperature monitoring devices. The MTC dry-block design does not use any hazardous hot liquid and heats up and cools down much faster than traditional ways of calibrating temperature sensors on a vessel. You can reach 320°C (608°F) in just 4 minutes and do it safely.

Maintain and calibrate monitoring devices for:

• Turbo-charger lubrication • Lubricating oil systems • Cylinder / piston / fuel valve cooling media • Fuel oil inlet • Scavenge air • Exhaust gas • Sea water cooling • Thrust / shaft plane / stern tube bearings • Crankcase protection • Charge air • Turbine and gear bearings • Uptake gas • Steam • Feed water • Servo oil propeller pitch • Cooling water outlet • Purifiers • Refrigeration systems • Starting air • Gland steam • Hydraulic systems • Condensing system • Oil burner • Main steam • Generators • Condensers • Safety valves

Wide temperature range

MTC-140 A -17 to 140°C (-1 to 284°F)
MTC-320 A 33 to 320°C (91 to 608°F)
MTC-650 A 33 to 650°C (91 to 1202°F)

Fast calibration is timesaving

The specially designed heating block profile heats up to 320°C (608°F) in just 4 minutes and to 650°C (1202°F) in only 10 minutes

High flexibility

Not limitations by fixed holes. Interchangeable insertion tubes are used to match the diameter of the sensor-under-test

Enhanced stability

MVI circuitry ensures stability despite mains supply variations in the engine room environment

Timesaving features

Fast one-key-one-function access to the automatic switch test and auto-stepping

Documentation made easy

RS232 communication interface and JOFRACAL calibration software package are part of the standard delivery

DNV approval

All JF Instruments calibrators are marine type approved by Det Norske Veritas

Complete marine program

Part of a complete program of marine approved temperature, pressure and signal calibrators; including temperature sensors

See more at www.jofra.com

ISO 9001 Manufacturer

AMETEK®
CALIBRATION INSTRUMENTS

JF INSTRUMENTS™

Marine Temperature Calibrator

The MTC series features a large backlit display that is easy to read even in well-lit areas. Units feature an informative display that provides icons and information regarding the status of the MTC and the calibration in-progress.

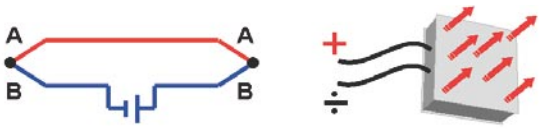
The MTC series also features an auto-step function. Using this function you may stay in the control room or on the bridge and monitor the temperature reading while the calibrator, located in the engine room by the sensor, automatically steps through a number of pre-programmed temperatures.

Fast heating and cooling

The MTC-320 A and the MTC-650 A contain an innovative heating block profile. This design heats up the MTC-320 A to maximum temperature in just 4 minutes and the MTC-650 A in only 10 minutes. The fast performance of the heating block is due to the special profile that minimizes mass and yet, still accepts an insertion tube with a 1 in (26 mm) outer diameter. This design is a balanced compromise between temperature stability, homogeneity, and rapid heating and cooling.

MTC-140 A heating/cooling block

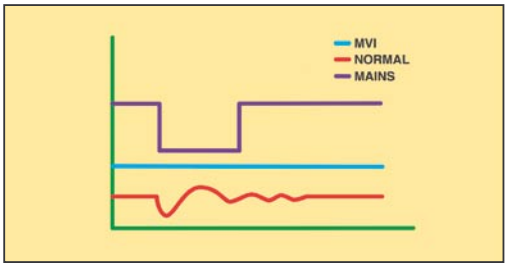
The model MTC-140 A features Peltier elements. In 1834, Jean Peltier, a French physicist found that an ''opposite thermocouple effect'' could be observed when an electric current was connected to a thermocouple. Heat would be absorbed at one of the junctions and discharged at the other junction. This effect is called the ''PELTIER EFFECT''.



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

MVI - Improved temperature stability

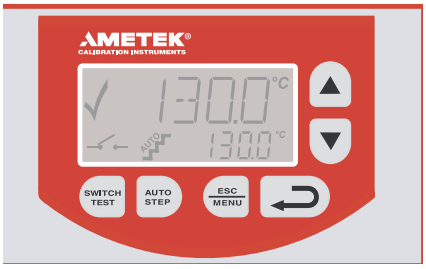
MVI stands for ''Mains power Variance Immunity''.
Unstable mains power supplies are a major contributor to on-site calibration inaccuracies. Traditional temperature calibrators often become unstable in shipboard environments where large electrical motors, heating elements, and other devices are periodically cycled on and off. The cycling of supply power can cause the temperature regulator to perform inconsistently leading to both inaccurate readings and unstable temperatures.



The MTC series calibrators MTC-320 A and MTC-650 A 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.
The MTC-140 A does not require the MVI circuitry because the Peltier elements are energized with a stabilised DC voltage.

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 MTC 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

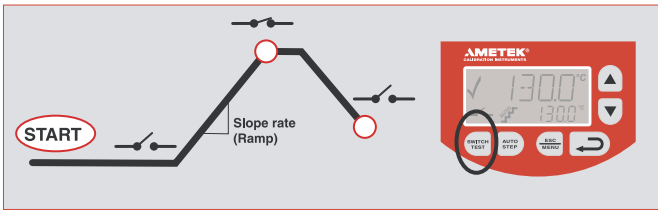
The ''Up'' and ''Down'' arrow keys allow the user to set the exact temperature desired with a resolution of 0.1°C or °F.

Instrument setups

The MTC 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

The 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.

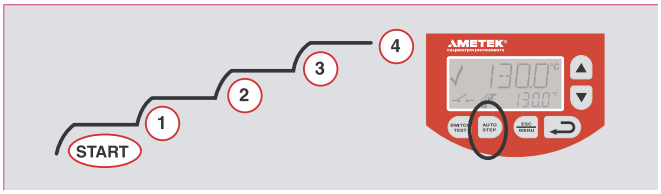


Automatic switch test

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 on the bridge, monitoring the output from the sensor-under-test while the MTC series calibrator is placed in the engine room 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.
This feature is also ideal for burning-in new sensors prior to installation; this minimizes initial drift and allows for initial testing.



Maximum temperature

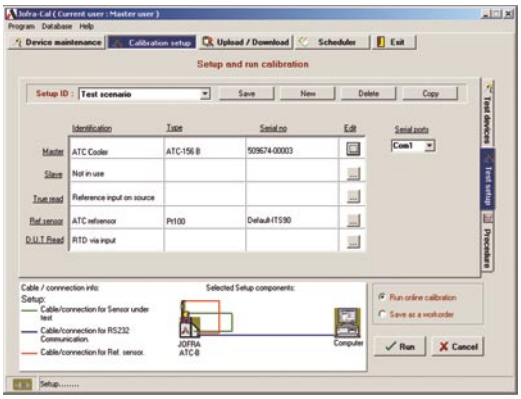
From the setup menu, the user can select the maximum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by the application of excessive temperatures. The feature also aids in reducing drift resulting from extended periods of exposures to high temperatures.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

Re-calibration/adjustments

The MTC 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 MTC instruments are supplied with RS232 computer interface and 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.
After calibration you can print out certificates that contain all necessary information for your ISM or similar quality systems.



The JOFRACAL software supports automatic calibration for all JF-Instruments dry-block calibrators equipped with a RS232 serial data interface. 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 JOFRACAL software is able to store all your results in a certificate database, a sensor database and an instrument database, and use a database function history and search.

Please find more information about JOFRACAL calibration software in specification sheet SS-CP-2510, which can be found at www.jofra.com. Here it is also possible to downlaod JOFRACAL calibration software.

FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage MTC-140/320/650 A .... 115V(90-127) 230V(180-254)
Frequency ..... 45 - 65 Hz
Power consumption (max.) MTC-140 A ..... 150 VA
Power consumption (max.) MTC-320 A / 650 A ..... 1150 VA

Temperature range

MTC-140 A
Maximum..... 140°C (284°F)
Minimum @ ambient temp. 0°C (32°F).....-30°C (-22°F)
Minimum @ ambient temp. 23°C (73°F).....-17°C (1°F)
Minimum @ ambient temp. 40°C (104°F) ..... -2°C (28°F)

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

Resolution (user-selectable)

Selectable ..... 1° or 0.1°C/°F

Stability

MTC-140 A .....±0.05°C (±0.09°F)
MTC-320 A / 650 A .....±0.1°C (±0.18°F)
Measured after the stability indicator has been on for 10 minutes. Measuring time is 30 minutes.

Time to stability (approximate)

MTC-140 A .....5 min.
MTC-320 A / 650 A .....8 min.

Accuracy

MTC-140 A .....±0.4°C (±0.7°F)
MTC-320 A.....±0.5°C (±0.9°F)
MTC-650 A..... ±0.9°C (±1.6°F)
Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

Immersion depth

MTC-140 A (insulation included)..... 4.5 in (115 mm)
MTC-320 A / 650A ..... 4.3 in (110 mm)

Heating time

MTC-140 A	-17 to 23°C (1 to 73°F)	3 minutes
MTC-140 A	23 to 140°C (73 to 284°F)	15 minutes
MTC-320 A	33 to 320°C (91 to 608°F)	4 minutes
MTC-650 A	33 to 650°C (91 to 1202°F)	10 minutes

Cooling time

MTC-140 A	100 to 0°C (212 to 32°F)	10 minutes
MTC-140 A	0 to -15°C (32 to 5°F)	13 minutes
MTC-140 A	140 to 100°C (284 to 212°F)	2 minutes
MTC-320 A	320 to 100°C (608 to 212°F)	16 minutes
MTC-650 A	650 to 100°C (1202 to 212°F)	28 minutes

Switch input (dry contact)

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

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

Engine rooms - testing the temperature in exhaust gas

Savings

The exhaust gas temperature is a very important factor. If the temperature is too low, too little fuel is let into the cylinder, and if the temperature is too high, too much fuel is let into the cylinder.
Often a range of ±10°C (50°F) is allowed, before an alarm is activated. However, if calibration is performed more often, this range could be reduced and a more economical combustion could be achieved.

Engine rooms - testing the temperature in exhaust gas

Application

On each cylinder, a thermometer has been placed close to the exhaust gas outlet to measure the temperature of the exhaust gas. This thermometer breaks very often due to the impact from the exhaust gas. As a consequence the temperature indication is often inaccurate. The thermometers most frequently have a scale from 350 to 450°C (662 to 842°F).

KEY FEATURES

Automatic switch test

Finds switching temp. ..... Open, close, hysteresis
Slope rate, programable ..... 0.1 to 9.9 °C/°F

Auto stepping

Programmable..... Up to 9 steps
Dwell time on each step..... Programmable

Enhanced stability

Unstable mains protection ..... MVI Circuitry
Stability indication ..... Yes, in display

Multi-information display

Stability indicator..... Bold checkmark
Countdown timer before stable ..... 4 minutes
Temperature .....SET and READ simultaneously
Alphanumeric messages..... Yes
Calibration status icons..... Yes

Training mode (heating/cooling block disabled)

Simulation of all functions ..... Yes
Simulating heating and cooling..... Approx. 100° per minute

Service facilities

Adjustment of the unit from the keypad ..... Yes
Self explanatory guide in display ..... Yes

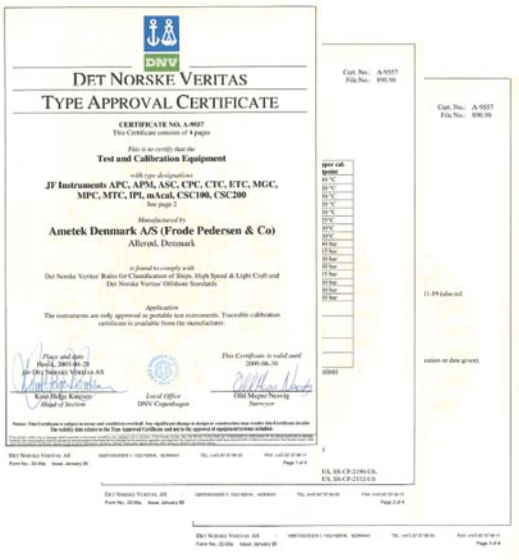
Other information: Displays serial number, software revision level, and last calibration date

Setup facilities

Stability criteria..... Extra time before ”stable indication” is shown
Display resolution..... 0.1° or 1°C/°F
Temperature units ..... °C and °F
Slope rate..... 0.1 to 9.9°/minute
Maximum temperature .....Any value within range

Type approval certifcate

All JF Instruments calibrators are type approved by DET NORSKE VERITAS.
DNV Marine Approval, Certificate no.:..... A-9557


DNV
DET NORSKE VERITAS
TYPE APPROVAL CERTIFICATE
CERTIFICATE NO. A-9557
Test and Calibration Equipment
JF Instruments APC, APM, ASC, CPC, CTC, ETC, MGC, MPC, MTC, IPI, mAcal, CSC100, CSC200
Ametek Denmark A/S (Frode Pedersen & Co)
Allerød, Denmark

PHYSICAL SPECIFICATIONS

Instrument dimensions

MTC-140 A, MTC-320 A, MTC-650 A
L x W x H:.....9.5 x 5.5 x 12.8 in (241 x 139 x 325 mm)

Instrument weight

MTC-140 A ..... 14.3 lb (6.5 kg)
MTC-320 A..... 11 lb (5 kg)
MTC-650 A..... 14.1 lb (6.4 kg)

Insert dimensions

MTC-140 A
Diameter x length..... 0.75 x 3.9 in (19 mm x 100 mm)
MTC-320 A, MTC-650 A
Diameter x length..... 1 x 4.7 in (26 mm x 120 mm)

Weight of non-drilled insert (approximate)

MTC-140 A .....2.6 oz (75 g)
MTC-320 A..... 5.8 oz (170 g)
MTC-650 A.....17.8 oz (510 g)

Shipping (with std. accessories + carrying case)

Weight: MTC-140 A .....27.6 lb (12.5 kg)
Weight: MTC-320 A..... 24 lb (11 kg)
Weight: MTC-650 A ..... 27 lb (12 kg)
Size: L x W x H..... 19.9 x 9.1 x 16.3 in (507 x 232 x 415 mm)

Shipping (with std. accessories but no carrying case)

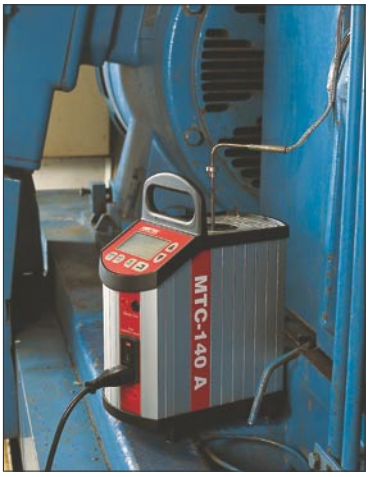
Weight: MTC-140 A ..... 22 lb (10 kg)
Weight: MTC-320 A..... 17.5 lb (8 kg)
Weight: MTC-650 A .....21 lb (9.5 kg)
Size: L x W x H.....16.4 x 9.8 x 14.6 in (465 x 255 x 470 mm)

Shipping (carrying case only)

Weight: ..... 11 lb (5.0 kg)
Size: L x W x H..... 19.9 x 9.1 x 16.3 in (507 x 232 x 415 mm)

Miscellaneous

Serial data interface ..... RS232 (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 / corr. (2000)
.....EN61010-1 : 1993/A2:1995



STANDARD DELIVERY

Standard delivery MTC-140/320/650 A

- MTC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- Tool for insertion tubes
- User manual
- Test cables (1 x red, 1 x black)
- 3 pcs. insulation plugs for:
  1/4, 3/8, 1/2 in (6, 10, 13 mm) sensors (MTC-140 A only)
- Aluminium carrying case
- RS232 cable
- JOFRACAL calibration software

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)
104216	Heat shield
65-F100	Insulation tube 4 in (100 mm)
105173	10 insulation plates

Inserts, heat shield, and cleaning brushes

Always use the original inserts where material and physical dimensions have been optimized. A drilling guide is included if you buy undrilled inserts.
Use the cleaning brushes to clean the bores in your inserts when necessary.

Carrying case - standard

The protective carrying case ensures safe transportation and storage of the instrument and all associated equipment. The carrying case is included in the standard delivery.

Marine approved temperature sensors

JF instruments also has a series of temperature sensors which are type approved by classification societies for marine applications such as measuring exhaust gases, cooling water for diesel engines, and product or room temperatures in refrigeration stores. These sensors are specially designed with high enduance for vibration according to IEC 68-2-6.

Approvals from Lloyds Register of Shipping and Det Norske Veritas.

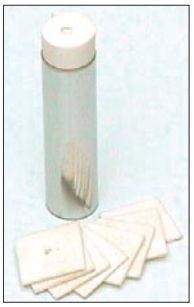
For further information please visit our web-page at www.jofra.com

Thermal Protection Shield - part no. 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.

Insulation tube and plates - part no. 65F100 and 105173

Improve your calibration uncertainty by insulating the sensor-under-test.
Minimize the heat dissipation from the top of the block and through the sensor-under-test.



INSERTS FOR MTC SERIES

General inserts description

Inserts for MTC-140 A and MTC-320 A are made of aluminium. Inserts for MTC-650 A are made of brass.

All specifications on hole sizes refer to the outer diameter of the sensor-under-test.

The correct clearance size is applied in all predrilled inserts.

Specially drilled inserts are available on request.

Spare part no. for predrilled inserts - metric (mm)			
	Instruments		
Probe diameter	MTC-140 A [1]	MTC-320 A	MTC-650 A
3 mm	123428	123436	123444
4 mm	60F451	100177	100196
5 mm	123429	123437	123445
6 mm	60F453	100179	100198
7 mm	123430	123438	122516
8 mm	105185	100182	100201
9 mm	105186	100183	100202
10 mm	105187	100185	105188
11 mm	123431	100188	100204
12 mm	123432	100186	100206
13 mm	123433	60F339	105189
14 mm	N/A	100190	100208
15 mm	N/A	100191	100209
16 mm	N/A	123439	123446
18 mm	N/A	123440	122517
20 mm	N/A	123441	122518
Package of the above inserts	124679	124681	124685
Multi-hole type 1	123479 [2]	123475	123476

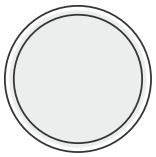
Spare part no. for predrilled inserts - imperial (inch)			
	Instruments		
Probe diameter	MTC-140 A [1]	MTC-320 A	MTC-650 A
1/8 in	60F450	100176	100195
3/16 in	60F452	100178	100197
1/4 in	60F454	100180	100199
5/16 i	60F456	100181	100200
3/8 in	60F458	100184	100203
7/16 in	60F460	100187	100205
1/2 in	60F462	100189	100207
9/16 in	60F464	60F344	60F408
5/8 in	60F466	100192	100210
11/16 in	N/A	60F348	60F412
3/4 in	N/A	100193	100211
3/16 in	N/A	60F352	60F416
7/8 in	N/A	60F354	60F418
Package of the above inserts	124680	124682	124686
Multi-hole type 2	123480 [2]	123477	123478

Note 1: MTC-140 A only: Remember to use matching nsulation plugs.

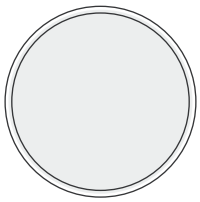
Note 2: MTC-140 A only: All multi-hole inserts are delivered with a matching insulation plug.

Inserts - undrilled

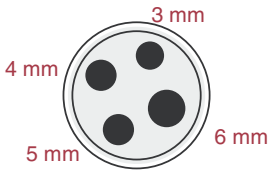
Inserts, undrilled			
	Instruments		
Inserts	MTC-140 A [1]	MTC-320 A	MTC-650 A
5-pack, undrilled inserts	60F448	100175	100194
Undrilled insulation plug	123937	N/A	N/A



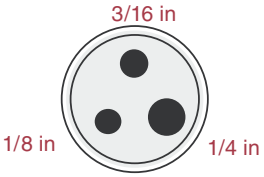
Undrilled inserts (MTC-140 A)



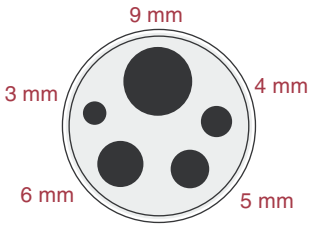
Undrilled inserts (MTC-320 A) (MTC-650 A)



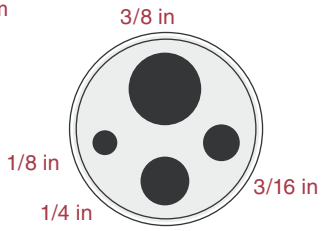
Multi-hole M01 (MTC-140 A)



Multi-hole M02 (MTC-140 A)



Multi-hole M01 (MTC-320 A) (MTC-650 A)



Multi-hole M02 (MTC-320 A) (MTC-650 A)

ORDERING INFORMATION

Order number	Description	
	Base model number	
MTC140A	MTC-140 A, -17 to 140°C (-1 to 284°F)	
MTC320A	MTC-320 A, 50 to 320°C (122 to 608°F)	
MTC650A	MTC-650 A, 50 to 650°C (122 to 1202°F)	
	Power supply	
115	115VAC, 50/60Hz	
230	230VAC, 50 Hz	
	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	
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 MTC-140)
015	Metric, pre-drilled, 15 mm	(Not available for MTC-140)
016	Metric, pre-drilled, 16 mm	(Not available for MTC-140)
018	Metric, pre-drilled, 18 mm	(Not available for MTC-140)
020	Metric, pre-drilled, 20 mm	(Not available for MTC-140)
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	
625	Inch, pre-drilled, 5/8 in	
688	Inch, pre-drilled, 11/16 in	(Not available for MTC-140)
750	Inch, pre-drilled, 3/4 in	(Not available for MTC-140)
813	Inch, pre-drilled, 13/16 in	(Not available for MTC-140)
875	Inch, pre-drilled, 7/8 in	(Not available for MTC-140)
M01	Multi-hole insert type 1	
M02	Multi-hole insert type 2	
	Options	
C	Carrying case (standard)	
F	Traceable certificate (standard for Europe, Asia, Australia and Africa)	
G	NIST traceable certificate (standard for Western Hemisphere)	
H	DANAK accredited certificate	
X	Placeholder character for unused option	

MTC650A230AM01CFXX **Sample order number**
JOFRA MTC-650 A series dry-block, 230VAC power with European power cord, pre-drilled multi-hole type 1 (1 x 3 mm, 1 x 4 mm., 1 x 5 mm, 1 x 6 mm, 1 x 9 mm) including carrying case and traceable certificate.

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

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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.

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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.

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Pub code SS-CP-2400-US Issue 0602