temperature

JOFRA™ CTC series

Compact Temperature Calibrators

Fast, timesaving, and reliable true temperature calibrator

Temperature ranges

CTC-140 A	-17 to 140°C / -1 to 284°F
CTC-320 A	33 to 320°C / 91 to 608°F
CTC-320 B	33 to 320°C / 91 to 608°F
CTC-650 A	33 to 650°C / 91 to 1202°F
CTC-650 B	33 to 650°C / 91 to 1202°F
CTC-1200 A	300 to 1205°C / 572 to 2200°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
You are not limited by fixed holes. Inter-changeable insertion tubes are used to match the diameter of your sensor-under-test

Enhanced stability
MVI circuitry ensures stability despite mains supply variations in the process environment

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

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

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

A fast, timesaving, and reliable true temperature calibrator designed for on-site use. The CTC series is a fast dry-block that offers both interchangeable inserts, the MVI stability circuitry, and calibration software. Both speed and portability are superior to liquid baths. Dry-block calibrators do not require hazardous liquids and provide a wide temperature range. Calibrate your RTD's, thermocouples, thermoswitches, thermistors, and other common temperature sensing devices.

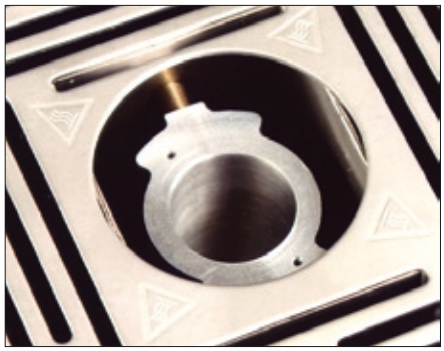
PRODUCT DESCRIPTION

The CTC 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 user interface is easy and intuitive. One-key-one-function gives you quick access to timesaving features such as the switch test or the auto-stepping function. All models feature a large, backlit LCD display panel, which is easy-to-read even in well-lit areas. Units feature an informative display that provides icons and information regarding the status of the CTC and the calibration in-progress. The JOFRA CTC series consists of six different models that differ in temperature ranges and immersion depths. All units offer similar features. A rugged, slim-line, aluminum outer casing with die-cast top and bottom protects the CTC series of dry-block calibrators. For easy documentation and automatic calibration, all units are delivered with RS232 serial communication and JOFRACAL calibration software.

AMETEK®
CALIBRATION INSTRUMENTS

Fast heating and cooling

The CTC-320 A and the CTC-650 A contain an innovative heating block profile. This design heats up the CTC-320 A to maximum temperature in just 4 minutes and the CTC-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 25 mm / 1 in. outer diameter. This design is a balanced compromise between temperature stability / homogeneity and rapid heating / cooling.



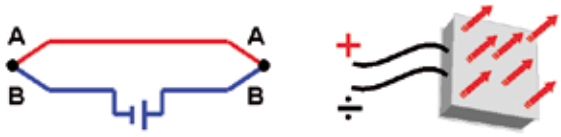
Deep immersion depth

The CTC-320 B and CTC-650 B models offer a deeper immersion depth of 200 mm / 7.9 in. If you have liquid-filled sensors or other sensors that require a deeper immersion depth, look for the B versions. While the units do not heat and cool as quickly as their shorter counterparts, they offer the capability to accommodate longer sensors.

Peltier effect (CTC-140 A)

The model CTC-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 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.

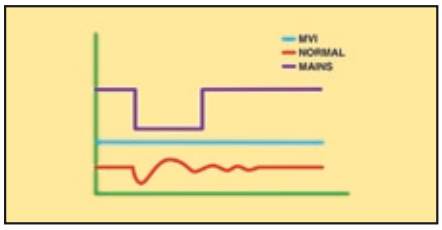
Maximum temperature

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 CTC 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 CTC 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

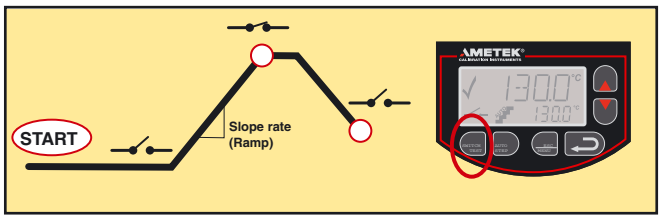
The CTC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto-step settings, and maximum temperature.

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.

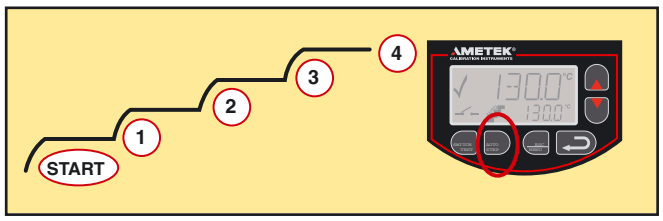
Automatic switch test

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 CTC 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 CTC 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.

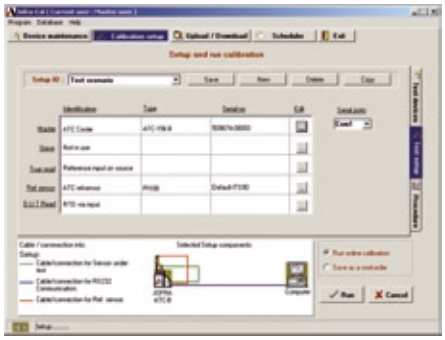
Place the probe in the calibrator and follow the instructions on the display. Third-party labs and calibration facilities will be able to perform this function if a certificate from an independent source is necessary. Of course, AMETEK can provide you with a traceable calibration certificate from our labs when you require a higher level of confidence.

Liquid filled sensors and switches

The tall B models with an immersion depth of 190 mm / 7.5 in are ideal for calibration of liquid filled sensors. The specially designed non-linear heating elements in the CTC-650 B and the increased block mass provide a very homogeneous temperature throughout the block. It is essential for the quality of the calibration/test that the full lenght of the sensing part of the sensor is exposed to the same temperature. Calibrate analog reading devices or switches with very high repeatability.

Simplified calibration documentation - JOFRACAL

All CTC 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.

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

Calibration of up to 24 sensors with JOFRA ASM

Using the JOFRA CTC 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

STANDARD DELIVERY

- CTC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- Tool for insertion tubes
- User manual
- Reference manual (English)
- Test cables (1 x red, 1 x black)
- RS232 cable (9-pin)
- JOFRACAL calibration software
- CTC-140A only: Matching insulation plug kit (3 pcs)
- CTC-1200 A only: Matching Insulation plug kit (3 pcs)

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)
123469	Insulation plug kit for CTC-140 A only (3 pcs.)
124528	Reference sensor Ø4,5 mm x 500 mm type N for CTC-1200 A
124414	Insulation plug kit for CTC-1200 A (3 pcs.): 12 mm - ½ in
124415	Insulation plug kit for CTC-1200 A(3 pcs.): 3 and 4 mm - 1/8 in
124416	Insulation plug kit for CTC-1200 A (3 pcs.): 5 and 6 mm - 1/4 and 3/16 in
124518	Insulation plug kit for CTC-1200 A (3 pcs.): 7, 8 and 9 mm - 5/16 in
124519	Insulation plug kit for CTC-1200 A (3 pcs.): 10 and 11 mm - 3/8 and 7/16 in
124520	Suspension holder for sensors for CTC-1200 A

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.

The heat shield protects the sensor/transmitter under test from the heated air.

Use the cleaning brushes to clean the borings in your inserts when necessary.

Carrying case - Option C

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

Insulation tube and plates - 65-F100 / 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. This insulation is important for all dry-block calibrators without the dual-zone heating block.

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 CTC-140/320/650/1200 115V(90-127) / 230V(180-254)
Voltage CTC-650 B ..... 115V(105-127) / 230V(210-254)
Frequency, non US deliveries ..... 50 Hz ±5, 60 Hz ±5
Frequency, US deliveries ..... 60 Hz ±5
Power consumption (max.) CTC-140 A..... 150 VA
Power consumption (max.) CTC-320 B ..... 600 VA
Power consumption (max.) CTC-1200 A ..... 650 VA
Power consumption (max.) CTC-320 A / 650 A/B.....1150 VA

Temperature range

CTC-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
CTC-320 A/B.....33 to 320°C / 91 to 608°F
CTC-650 A/B.....33 to 650°C / 91 to 1202°F
CTC-1200 A.....300 to 1205°C / 572 to 2200°F

Resolution (user-selectable)

Selectable ..... 1° or 0.1°C/°F

Stability

CTC-140 A.....±0.05°C / 0.09°F
CTC-320 A/B..... ±0.1°C / 0.18°F
CTC-650 A / 1200 A..... ±0.1°C / 0.18°F
CTC-650 B .....±0.05°C / 0.09°F

Measured after the stability indicator has been on for 10 minutes. Measuring time is 30 minutes.

Time to stability (approximate)

CTC-140 A .....5 minutes
CTC-320/650 A/B .....8 minutes
CTC-1200 A .....20 minutes

Accuracy

CTC-140 A.....±0.4°C / 0.7°F
CTC-320 A/B.....±0.5°C / 0.9°F
CTC-650 A .....±0.9°C / 1.62°F
CTC-650 B .....±0.6°C / 1.08°F
CTC-1200 A.....±2.0°C / 3.6°F

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

Immersion depth

CTC-140 A (insulation included) ..... . 115 mm / 4.5 in
CTC-320 A / CTC-650 A / CTC-1200 A ..... 110 mm / 4.3 in
CTC-320 B / CTC-650 B ..... 190 mm / 7.5 in

Well diameter

CTC-140 ..... . 19,2 mm / 0.76 in
CTC-320 / CTC-650.....26 mm / 1.0 in
CTC-1200 .....27 mm / 1.6 in

Heating time

CTC-140 A
-17 to 23°C / 1 to 73°F.....3 minutes
23 to 140°C / 73 to 284°F..... 15 minutes
CTC-320 A
23 to 320°C / 73 to 608°F.....4 minutes
CTC-650 A
23 to 650°C / 73 to 1202°F..... 10 minutes
CTC-320 B
23 to 320°C / 73 to 608°F.....20 minutes
CTC-650 B
23 to 650°C / 73 to 1202°F.....39 minutes
CTC-1200 A
23 to 1205°C / 73 to 2200°F.....45 minutes

Cooling time

CTC-140 A
100 to 0°C / 212 to 32°F..... 10 minutes
0 to -15°C / 32 to 5°F..... 16 minutes
140 to 100°C / 284 to 212°F .....2 minutes
CTC-320 A
320 to 100°C / 608 to 212°F..... 16 minutes
CTC-650 A
650 to 100°C / 1202 to 212°F .....28 minutes
CTC-320 B
320 to 100°C / 608 to 212°F.....22 minutes
CTC-650 B
650 to 100°C / 1202 to 212°F .....65 minutes
CTC-1200 A
1205 to 300°C / 2200 to 572°F ..... 120 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

KEY FEATURES

Automatic switch test

Finds switching temp. ..... Open, close, hysteresis
Slope rate, programmable ..... 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
Clear 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 explaining 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 or °F
Slope rate ..... 0.1 to 9.9°/minute
Maximum temperature ..... Any value within range

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
DNV Marine Approval, Certificate no..... A-9557

PHYSICAL SPECIFICATIONS

Instrument dimensions

CTC-140 A / CTC-320 A / CTC-650 A
L x W x H:..... 241 x 139 x 325 mm / 9.5 x 5.5 x 12.8 in
CTC-320 B / CTC-650 B / CTC-1200 A
L x W x H:..... 241 x 139 x 408 mm / 9.5 x 5.5 x 16.1 in

Instrument weight

CTC-140 A / CTC-320 B..... 7 kg / 15.5 lb
CTC-320 A ..... 5 kg / 11 lb
CTC-650 A ..... 6 kg / 13 lb
CTC-650 B ..... 10.5 kg / 23 lb
CTC-1200 A..... 12 kg / 26.5 lb

Insert dimensions

CTC-140 A outer diameter ..... 19,1 mm / 0.75 in
CTC-140 A inner diameter..... 15,0 mm / 0.59 in
CTC-140 A lenght..... 100 mm / 3.9 in

CTC-320 / CTC-650 A outer diameter ..... 25,7 mm / 1.01 in
CTC-320 / CTC-650 A inner diameter ..... 21,5 mm / 0.85 in
CTC-320 / CTC-650 A lenght ..... 120 mm / 4.7 in

CTC-320 / CTC-650 B outer diameter ..... 25,7 mm / 1.01 in
CTC-320 / CTC-650 B inner diameter ..... 21,5 mm / 0.85 in
CTC-320 / CTC-650 B lenght ..... 200 mm / 7.9 in

CTC-1200 A outer diameter ..... 25 mm / 0.98 in
CTC-1200 A inner diameter..... 22 mm / 1.6 in
CTC-1200 A lenght..... 155 mm / 6.1 in

Weight of non-drilled insert (approximate)

CTC-140 A..... 75 g / 2.6 oz
CTC-320 A ..... 170 g / 5.8 oz
CTC-650 A ..... 510 g / 17.8 oz
CTC-320 B ..... 280 g / 9.8 oz
CTC-650 B ..... 860 g / 30.3 oz
CTC-1200 A..... 460 g / 16.3 oz

Shipping (including optional carrying case)

CTC-140 A..... 12.5 kg / 27.6 lb
CTC-320 A ..... 11 kg / 24 lb
CTC-650 A ..... 12 kg / 27 lb
CTC-320 B ..... 13.5 kg / 21 lb
CTC-650 B ..... 17 kg / 37 lb
CTC-1200 A..... 18 kg / 39 lb

Size L x W x H:..... 507 x 232 x 415 mm / 19.9 x 9.1 x 16.3 in

Shipping (without carrying case)

CTC-140 A..... 10 kg / 22 lb
CTC-320 A ..... 8 kg / 17.5 lb
CTC-650 A ..... 9.5 kg /21 lb

A Size L x W x H: .. 465 x 255 x 470 mm / 18.3 x 10.0 x 18.5 in

CTC-320 B ..... 11 kg / 24 lb
CTC-650 B ..... 14 kg / 26 lb
CTC-1200 A..... 15 kg / 32 lb

B Size L x W x H: .. 465 x 255 x 470 mm / 18.3 x 10.0 x 18.5 in

Shipping (carrying case only)

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

INSERTS FOR CTC SERIES

Inserts for CTC-140 A and CTC-320 A/B are made of aluminum. Inserts for CTC-650 A/B are made of brass. Inserts for CTC-1200 A are made of high-temperature steel alloy.

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.

Inserts, undrilled

	Instruments					
Inserts	**CTC-140 A** [2]	**CTC-320 A**	**CTC-650 A**	**CTC-320 B**	**CTC-650 B**	**CTC-1200 A** [4]
5-pack, undrilled inserts	60F448	100175	100194	60F356	60F420	124403
Undrilled insulation plug	123937	N/A	N/A	N/A	N/A	see below [4]

Spare part no. for predrilled inserts - metric (mm)

		Instruments					
Probe diameter	**Insert code** [1]	**CTC-140 A** [2]	**CTC-320 A**	**CTC-650 A**	**CTC-320 B**	**CTC-650 B**	**CTC-1200 A** [4]
3 mm	**003**	123428	123436	123444	N/A	N/A	124503
4 mm	**004**	60F451	100177	100196	60F359	60F423	124406
5 mm	**005**	123429	123437	123445	123452	123460	124504
6 mm	**006**	60F453	100179	100198	60F361	60F425	124407
7 mm	**007**	123430	123438	122516	123453	123461	124505
8 mm	**008**	105185	100182	100201	105190	105195	124506
9 mm	**009**	105186	100183	100202	105191	105196	124507
10 mm	**010**	105187	100185	105188	105192	105197	124508
11 mm	**011**	123431	100188	100204	105193	105198	124509
12 mm	**012**	123432	100186	100206	105194	105199	124510
13 mm	**013**	123433	60F339	105189	123454	123462	N/A
14 mm	**014**	N/A	100190	100208	123455	123463	N/A
15 mm	**015**	N/A	100191	100209	123456	123464	N/A
16 mm	**016**	N/A	123439	123446	123457	123465	N/A
18 mm	**018**	N/A	123440	122517	123458	123466	N/A
20 mm	**020**	N/A	123441	122518	123459	123467	N/A
Package of the above inserts		124679	124681	124685	124683	124687	124689
Multi-hole type 1	**M01**	123479 [3]	123475	123476	N/A	N/A	N/A

Spare part no. for predrilled inserts - imperial (inch)

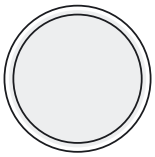
		Instruments					
Probe diameter	**Insert code** [1]	**CTC-140 A** [2]	**CTC-320 A**	**CTC-650 A**	**CTC-320 B**	**CTC-650 B**	**CTC-1200 A** [4]
1/8 in	**125**	60F450	100176	100195	60F358	60F422	124511
3/16 in	**187**	60F452	100178	100197	60F360	60F424	124512
1/4 in	**250**	60F454	100180	100199	60F362	60F426	124404
5/16 in	**312**	60F456	100181	100200	60F364	60F428	124513
3/8 in	**375**	60F458	100184	100203	60F366	60F430	124514
7/16 in	**437**	60F460	100187	100205	60F368	60F432	124515
1/2 in	**500**	60F462	100189	100207	60F370	60F434	124405
9/16 in	**562**	60F464	60F344	60F408	60F372	60F436	N/A
5/8 in	**625**	60F466	100192	100210	60F374	60F438	N/A
11/16 in	**688**	N/A	60F348	60F412	60F376	60F440	N/A
3/4 in	**750**	N/A	100193	100211	60F378	60F442	N/A
13/16 in	**813**	N/A	60F352	60F416	105184	60F444	N/A
7/8 in	**875**	N/A	60F354	60F418	60F377	60F446	N/A
Package of the above inserts		124680	124682	124686	124684	124688	124690
Multi-hole type 2	**M02**	123480 [3]	123477	123478	N/A	N/A	N/A

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

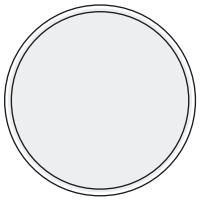
Note 2: CTC-140 A only: Remember to use matching insulation plugs (see accessories).

Note 3: CTC-140 A only: All multi-hole inserts are delivered with a matching insulation plug.

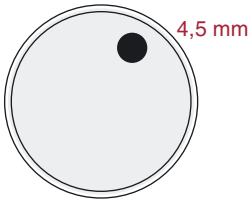
Note 4: CTC-1200 A only: Remember to order matching insulation plugs (see accessories).



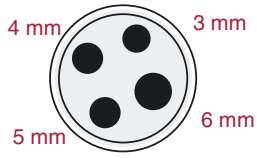
Undrilled inserts (CTC-140 A)



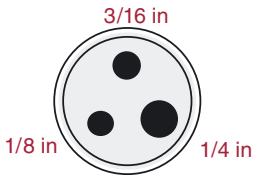
Undrilled inserts (CTC-320 / 650 A/B)



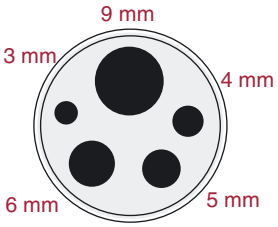
Undrilled inserts (CTC-1200 A)



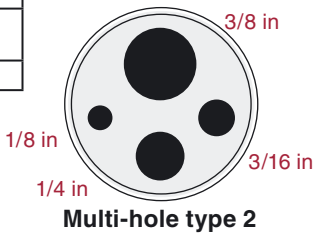
Multi-hole type 1 (CTC-140 A)



Multi-hole type 2 (CTC-140 A)



Multi-hole type 1 (CTC-320 A / 650 A)



Multi-hole type 2 (CTC-320 A / 650 A)

ORDERING INFORMATION

Order number	Description
	Base model number
CTC140A	CTC-140 A, -17 to 140°C / -1 to 284°F
CTC320A	CTC-320 A, 33 to 320°C / 91 to 608°F
CTC650A	CTC-650 A, 33 to 650°C / 91 to 1202°F
CTC320B	CTC-320 B, 33 to 320°C / 91 to 608°F
CTC650B	CTC-650 B, 33 to 650°C / 91 to 1202°F
CTC1200A	CTC-1200 A, 300 to 1205°C / 572 to 2200°F
	Power supply (US deliveries 60 Hz only)
115	115VAC
230	230VAC
	Mains power cable type
A	European, 230 V,
B	USA/CANADA, 115 V
C	UK, 240 V
D	South Africa, 220 V
E	Italy, 220 V
F	Australia, 240 V
G	Denmark, 230 V
H	Switzerland, 220 V
I	Israel, 230 V
	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	NLP Traceable temperature certificate (standard for Europe, Asia, Australia and Africa)
G	NIST traceable temperature certificate (standard for Western Hemisphere)
H	Accredited certificate with 5 std. points (except CTC-1200 A)
H	Accredited certificate with 4 std. points (for CTC-1200 A)
	Options
C	Carrying case
X	No option used

CTC650A230AM01FX **Sample order number**
JOFRA CTC-650 A dry-block, 230 VAC power with European power cord and insert: 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), and NLP traceable certificate.

AMETEK Calibration Instruments
is one of the world's leading manufacturers and developers of calibration instruments for temperature, pressure and process signals as well as for temperature sensors both from a commercial and a technological point of view.

JOFRA Temperature Instruments
Portable precision thermometers. Dry-block and liquid bath calibrators: 4 series, with more than 25 models and temperature ranges from -90° to 1205°C / -130° to 2200°F. All featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL calibration software.

JOFRA Pressure Instruments
Convenient electronic systems ranging from -1 to 1000 bar (25 inHg to 14,500 psi) - multiple choices of pressure ranges, pumps and accuracies, fully temperature-compensated for problem-free and accurate field use.

JOFRA Signal Instruments
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 Instruments
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.

M&G Pressure Testers
Pneumatic floating-ball or hydraulic piston deadweight testers - easy-to-use with accuracies to 0.015% of reading.

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