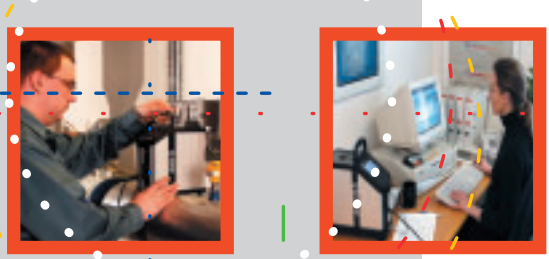
temperature



JOFRA™ CTC Series

Compact Temperature Calibrator

NOW
Improved specifications
RS232 interface
Calibration software

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.

Temperature ranges

CTC140A	-17 to 140°C / -1 to 284°F
CTC320A	33 to 320°C / 91 to 608°F
CTC320B	33 to 320°C / 91 to 608°F
CTC650A	33 to 650°C / 91 to 1202°F
CTC650B	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

You are not limited by fixed holes. Interchangeable 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 interface and AMECAL-LIGHT calibration software package are part of the standard delivery.

ISO 9001 Manufacturer

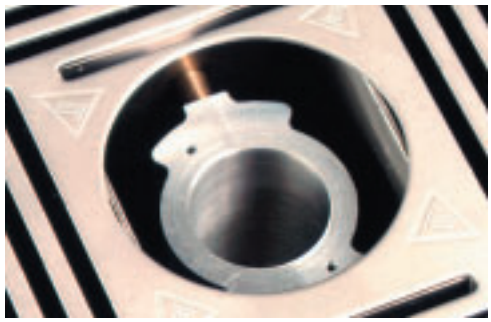
PRODUCT DESCRIPTION

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 five 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 AMECAL-LIGHT PC calibration software.

AMETEK®
CALIBRATION INSTRUMENTS

Fast heating and cooling

The CTC320A and the CTC650A contain an innovative heating block profile. This design heats up the CTC320A to maximum temperature in just 4 minutes and the CTC650A 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 model CTC320B and CTC650 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.

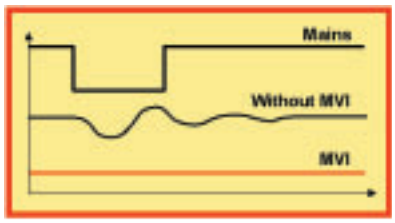
CTC140A heating/cooling block

The model CTC140A features Peltier elements. In 1834, Jean Peltier, a French physicist found that an ''opposite thermo-couple 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 is 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 production 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.

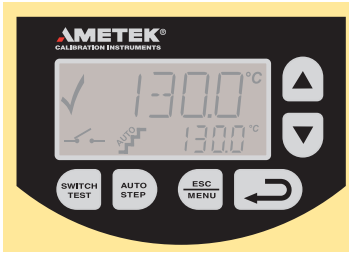
The CTC series calibrators CTC320A/B and CTC650A/B employ the MVI, thus avoiding such stability problems. The MVI circuitry continuously monitors the supply voltage and ensures a constant energy flow to the heating elements.



The CTC140A does not require the MVI circuitry because the Peltier elements are energized with a stabilized 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 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°C or °F.

Instrument setups

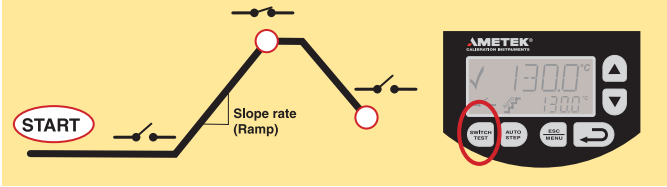
The CTC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto step settings, and maximum temperature.

Stability indicator

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.

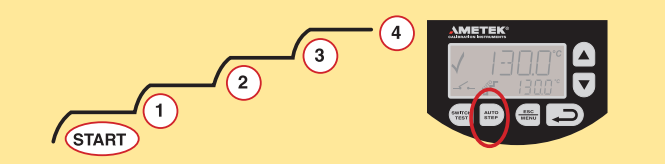
Automatic switch test

Operators can save a lot of time using the automatic thermo-switch 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 thermo-switches. 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.
This feature is also ideal for burning-in new sensors prior to installation: This minimizes initial drift and allows for initial testing. It is also useful for testing temperature data loggers.



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.

Re-calibration/adjustments

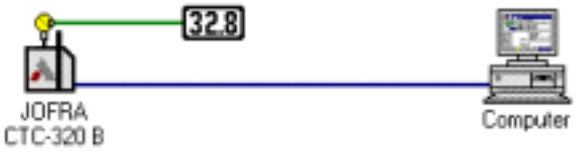
The CTC series has a very easy and straight forward procedure for re-calibration/adjustment. There is no need for a screwdriver or PC software. The only thing you need is a reliable reference thermometer. Place this reference probe in the calibrator and follow the instructions on the display.

Liquid filled sensors and switches

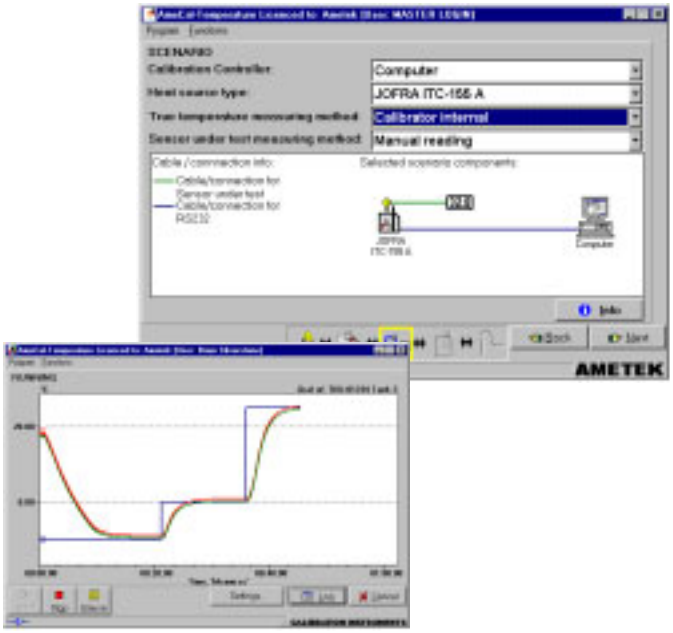
The tall B models with an immersion depth of 190 mm / 7.5 in. are ideal for calibration of liquid filled sensors. The specially designed non-linear heating elements in the CTC650B and the increased block mass provide a very homogeneous temperature throughout the block. It is essential for the quality 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 repeat-ability.

Simplified calibration documentation

All JOFRA CTC instruments are supplied with RS232 computer interface and the AMECAL-LIGHT Calibration software.
This WINDOWS®-based software allows the user to customize his or her calibration routines. The software is easy to use so you do not have to be a programmer to configure your own calibration procedures. After calibration you can print out certificates that contain all necessary information for your ISO-9000 or similar quality systems. The AMECAL-LIGHT software supports automatic calibration for all JOFRA dry-block calibrators equipped with an RS232 serial data interface including the JOFRA DTI-1000 digital thermometer. For semi-automatic calibrations, the software also supports liquid baths, ice points, or other dry-block heating and cooling sources. Using the software's "SCENARIO" function allows for combining instruments in virtually any configuration.



Upgrade to the AMECAL-TEMPERATURE software and be able to store all your results in a certificate database, sensor database and instrument database and use the database function history and search.



FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage CTC140/320/650 .....115V(90-127) 230V(180-254)
Voltage CTC650B .....115V(105-127) 230V(210-254)
Frequency ..... 45 - 65 Hz
Power consumption (max.) CTC140A.....150 VA
Power consumption (max.) CTC320B ..... 600 VA
Power consumption (max.) CTC320A / 650A/B ..... 1150 VA

Temperature range

CTC140A
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

CTC320A/B ..... 50 to 320°C / 122 to 608°F
CTC650A/B ..... 50 to 650°C / 122 to 1202°F

Resolution (user-selectable)

Selectable ..... 1° or 0.1°C/°F

Stability

CTC140A ..... ±0.05°C / 0.09°F
CTC320A/B ..... ±0.1°C / 0.18°F
CTC650A..... ±0.1°C/ 0.18°F
CTC650B..... ±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)

CTC140A ..... 5 minutes
CTC320/650 ..... 8 minutes

Accuracy

CTC140A ..... ±0.4°C / 0.7°F
CTC320A/B ..... ±0.5°C / 0.9°F
CTC650A..... ±0.9°C / 1.62°F
CTC650B..... ±0.6°C / 1.08°F
Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

Immersion depth

CTC140A (insulation included) ..... 115 mm / 4.5 in.
CTC320A/ CTC650A.....110 mm / 4.3 in.
CTC320B/ CTC650B .....190 mm / 7.5 in.

Heating time

CTC140A
-17 to 23°C / 1 to 73°F ..... 3 minutes
23 to 140°C / 73 to 284°F .....15 minutes
CTC320A
50 to 320°C / 122 to 608°F..... 4 minutes
CTC650A
50 to 650°C / 122 to 1202°F .....10 minutes
CTC320B
50 to 320°C / 122 to 608°F..... 20 minutes
CTC650B
50 to 650°C / 122 to 1202°F ..... 39 minutes

Cooling time

CTC140A
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
CTC320A
320 to 100°C / 608 to 212°F .....16 minutes
CTC650A
650 to 100°C / 1202 to 212°F ..... 28 minutes
CTC320B
320 to 100°C / 608 to 212°F ..... 22 minutes
CTC650B
650 to 100°C / 1202 to 212°F ..... 62 minutes

Switch input (dry contact)

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

AMECAL software

Minimum hardware requirements for AMECAL-LIGHT and AMECAL-TEMPERATURE calibration software.

- INTEL™ 486 processor (PENTIUM™ 200 MHz recommended)
- 16 MB RAM (32 MB recommended)
- 40 MB free disk space on hard disk prior to installation
- Standard VGA (640 x 480, 16 colors) compatible screen (800 x 600, 256 colors recommended)
- CD-ROM drive for installation of the program
- 1 free RS232 serial port

KEY FEATURE TABLE

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

PHYSICAL SPECIFICATIONS

Instrument dimensions

CTC140A, CTC320A, CTC650A
L x W x H: .....241 x 139 x 325 mm / 9.5 x 5.5 x 12.8 in.
CTC320B, CTC650B
L x W x H: .....241 x 139 x 408 mm / 9.5 x 5.5 x 16.1 in.

Instrument weight

CTC140A .....6.5 kg / 14 lb
CTC320A.....5 kg / 11 lb
CTC650A.....6.4 kg / 14 lb
CTC320B.....6.7 kg / 15 lb
CTC650B.....10.4 kg / 23 lb

Insert dimensions

CTC140A
Diameter x length ..... 19 mm x 100 mm / 0.75 x 3.9 in.
CTC320A, CTC650A
Diameter x length ..... 26 mm x 120 mm / 1.0 x 4.7 in.
CTC320B, CTC650B
Diameter x length ..... 26 mm x 200 mm / 1.0 x 7.9 in.

Weight of non-drilled insert (approximate)

CTC140A ..... 73 g / 2.6 oz
CTC320A..... 164 g / 5.8 oz
CTC650A.....506 g / 17.8 oz
CTC320B..... 277 g / 9.8 oz
CTC650B..... 858 g / 30.3 oz

Shipping (including optional carrying case)

Weight: CTC140A.....13 kg / 28 lb
Weight: CTC320A .....12 kg / 27 lb
Weight: CTC650A .....14 kg / 30 lb
Weight: CTC320B .....14 kg / 31 lb
Weight: CTC650B .....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)

Weight: CTC140A.....10 kg / 22 lb
Weight: CTC320A .....9 kg / 20 lb
Weight: CTC650A .....11 kg / 23 lb
A Size L x W x H: ....410 x 250 x 370 mm / 16.4 x 9.8 x 14.6 in.

Weight: CTC320B .....11 kg / 24 lb
Weight: CTC650B .....15 kg / 32 lb
B Size L x W x H: ... 480 x 235 x 440 mm / 18.9 x 9.3 x 17.3 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.

Miscellaneous

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

STANDARD DELIVERY

Standard delivery CTC140 /320 /650

- CTC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- Tool for insertion tubes
- User's manual (multi-language)
- Reference manual (English)
- Test cables (1 x red, 1 x black)
- RS232 cable (9-pin)
- Calibration software, AMECAL-LIGHT
- CTC140 only: 3 pcs. insulation plugs for: 6, 10, 13 mm (1/4, 3/8, 1/2 in.) sensors

ACCESSORIES

Part no.	Description
123198	CTC series, reference manual
123199	CTC series, user manual
123408	Carrying case for version A
123409	Carrying case for version B
122832	Cleaning brush, 4 mm (3/Pkg)
60F174	Cleaning brush, 6 mm (3/Pkg)
122822	Cleaning brush, 8 mm (3/Pkg)
60F135	Mains cable, 115V, USA, Type B
60F139	Mains cable, 220V, Australia, Type F
60F138	Mains cable, 220V, Italy, Type E
60F137	Mains cable, 220V, South Africa, Type D
60F141	Mains cable, 230V, Denmark, Type G
60F140	Mains cable, 230V, Europe, Type A
60F143	Mains cable, 230V, Israel, Type I
60F142	Mains cable, 230V, Switzerland, Type H
60F136	Mains cable, 240V, UK, Type C
105366	RS232 cable
104203	Test cable set
104216	Heat shield
60F170	Tool for insertion tube
123469	Insulation plug (CTC140A only) 3 pcs. for 6 mm / 1/4 in. 10 mm / 3/8 in. 13 mm / 1/2 in.
65-F100	Insulation tube 100 mm (4 in.)
105173	10 insulation plates
105813	Calibration software AMECAL-TEMPERATURE
124003	Calibration software AMECAL-LIGHT

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.

Insulation tube and plates

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.

Carrying case

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

Heat shield

An external heat shield is available and may be placed on top of the calibrator to reduce the hot air stream around the sensor-under-test. This is especially important for testing thermocouples having head-mounted transmitters with cold-junction compensation.

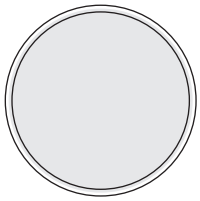
INSERTS FOR CTC SERIES

General inserts description

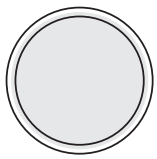
Inserts for CTC140A and CTC320A/B are made of aluminum.
Inserts for CTC650A/B are made of brass.

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

Special drilled inserts on request.



Undrilled inserts (CTC320 /650)



Undrilled inserts (CTC140A)

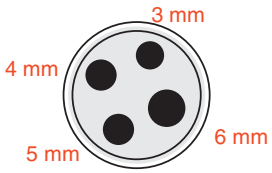
Inserts - undrilled

Inserts	140A part no.	320A part no.	650A part no.	320B part no.	650B part no.
5-pack, undrilled insertion tubes	60F448	100175	100194	60F356	60F420

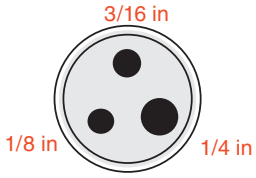
Inserts - predrilled - metric

Probe diameter	140A part no.	320A part no.	650A part no.	320B part no.	650B part no.
3 mm	123428	123436	123444	N/A	N/A
4 mm	60F451	100177	100196	60F359	60F423
5 mm	123429	123437	123445	123452	123460
6 mm	60F453	100179	100198	60F361	60F425
7 mm	123430	123438	122516	123453	123461
8 mm	105185	100182	100201	105190	105195
9 mm	105186	100183	100202	105191	105196
10 mm	105187	100185	105188	105192	105197
11 mm	123431	100188	100204	105193	105198
12 mm	123432	100186	100206	105194	105199
13 mm	123433	60F339	105189	123454	123462
14 mm	N/A	100190	100208	123455	123463
15 mm	N/A	100191	100209	123456	123464
16 mm	N/A	123439	123446	123457	123465
18 mm	N/A	123440	122517	123458	123466
20 mm	N/A	123441	122518	123459	123467
Multi-hole type 1	123479	123475	123476	N/A	N/A

*Note: CTC140A only: All multi-hole inserts are delivered with a matching insulation plug.



Multi-hole type 1 (CTC140A)

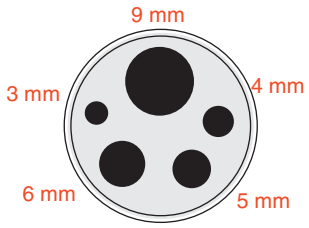


Multi-hole type 2 (CTC140A)

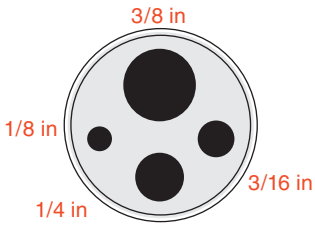
Inserts - predrilled - imperial (inch)

Probe diameter	140A part no.	320A part no.	650A part no.	320B part no.	650B part no.
1/8 in.	60F450	100176	100195	60F358	60F422
3/16 in.	60F452	100178	100197	60F360	60F424
1/4 in.	60F454	100180	100199	60F362	60F426
5/16 in.	60F456	100181	100200	60F364	60F428
3/8 in.	60F458	100184	100203	60F366	60F430
7/16 in.	60F460	100187	100205	60F368	60F432
1/2 in.	60F462	100189	100207	60F370	60F434
9/16 in.	60F464	60F344	60F408	60F372	60F436
5/8 in.	60F466	100192	100210	60F374	60F438
11/16 in.	N/A	60F348	60F412	60F376	60F440
3/4 in.	N/A	100193	100211	60F378	60F442
13/16 in.	N/A	60F352	60F416	105184	60F444
7/8 in.	N/A	60F354	60F418	60F377	60F446
Multi-hole type 2	123480	123477	123478	N/A	N/A

*Note: CTC140A only: All multi-hole inserts are delivered with a matching insulation plug.



Multi-hole type 1 (CTC320A /650A)



Multi-hole type 2 (CTC320A /650A)

JOFRA CTC ORDER INFORMATION

Order number				Description	
				Base model number - 1st thru 7th characters	
CTC140A				CTC140A, -17 to 140°C / -1 to 284°F	
CTC320A				CTC320A, 50 to 320°C / 122 to 608°F	
CTC650A				CTC650A, 50 to 650°C / 122 to 1202°F	
CTC320B				CTC320B, 50 to 320°C / 122 to 608°F - Deep immersion depth	
CTC650B				CTC650B, 50 to 650°C / 122 to 1202°F - Deep immersion depth	
				Power supply - 8th thru 10th characters	
	115			115 VAC, 50/60Hz	
	230			230 VAC, 50 Hz	
				Mains power cable type - 11th characters	
		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 - 12th thru 14th characters	
			003	Metric, pre-drilled, 3 mm	
			004	Metric, pre-drilled, 4 mm	
			005	Metric, pre-drilled, 5 mm	
			006	Metric, pre-drilled, 6 mm	
			007	Metric, pre-drilled, 7 mm	
			008	Metric, pre-drilled, 8 mm	
			009	Metric, pre-drilled, 9 mm	
			010	Metric, pre-drilled, 10 mm	
			011	Metric, pre-drilled, 11 mm	
			012	Metric, pre-drilled, 12 mm	
			013	Metric, pre-drilled, 13 mm	
			014	Metric, pre-drilled, 14 mm	(Not available for CTC140A)
			015	Metric, pre-drilled, 15 mm	(Not available for CTC140A)
			016	Metric, pre-drilled, 16 mm	(Not available for CTC140A)
			018	Metric, pre-drilled, 18 mm	(Not available for CTC140A)
			020	Metric, pre-drilled, 20 mm	(Not available for CTC140A)
			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 CTC140A)
			750	Inch, pre-drilled, 3/4 in.	(Not available for CTC140A)
			813	Inch, pre-drilled, 13/16 in.	(Not available for CTC140A)
			875	Inch, pre-drilled, 7/8 in.	(Not available for CTC140A)
			M01	Multi-hole insert type 1	(Not available for B models)
			M02	Multi-hole insert type 2	(Not available for B models)
				Options - 15th thru 18th characters	
				C Carrying case	
				F Traceable certificate (standard for Europe, Asia, Australia and Africa)	
				G NIST traceable certificate (standard for Western Hemisphere)	
				H Accredited certificate	
				X Placeholder character for unused option	

CTC650A 230 A M01 CFXX **Sample order number (all 18 characters)**

JOFRA CTC650A series dry-block, 230 VAC power with European power cord and insert: Pre-drilled multi-hole type 1 (1 x 3mm, 1 x 4mm., 1 x 5mm, 1 x 6mm, 1 x 9mm) including carrying case and traceable certificate.

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