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ALTEK

MULTIPLE THERMOCOUPLE CALIBRATOR MODEL 322

DATA SHEET 322 Additional Thermocouple Calibrators: See Data Sheets 22, 222A & 422

- **STANDARD MODELS**
  Types J, T, E, K and MV
  Types B, R, S, K and MV
- **CUSTOM MODELS**
  Select desired combination from 14 T/C Types
- **TEMPERATURE INPUT & OUTPUT**
  Reads directly in degrees
- **"QUIK-CHEK®" SWITCH**
  Three points, HI, LO & SET
- **15 OUTPUT MEMORIES**
  Three for each T/C type & MV
- **0.007% ACCURACY, 1° or 0.1°RESOLUTION**

Conforms to ITS-90 Temperature Scale using the latest Thermocouple Tables published by NIST in Monograph 175. This affects Types J, T, E, K, R, S, B&N.



CE

GENERAL DESCRIPTION

THERMOCOUPLE CALIBRATOR

SOURCE and READ T/C's over the entire industrial temperature range with ALTEK's Model 322 Thermocouple Calibrator. Use with transmitters, recorders, controllers, alarms, indicators, data acquisition and computer systems. Switch between four T/C types or millivolts.

High accuracy and stability is achieved through Altek's exclusive isothermal block. Make your connections directly with thermocouple wire or with miniature thermocouple connectors.

Field customize the Model 322 to lock-in 1° resolution, fixed °F or °C or front panel selectable °F/°C operation. A shrouded miniature thermocouple connector receptacle plus terminal screws allow for easy hookups. Built in protection guards the Model 322 against mis-connection to 120 Volts AC or DC, in any mode.

The Model 322 turns on to the T/C type last used. Other T/C types may be selected each time the unit is turned on. If you always use one T/C type, lock in the selected T/C type (ex. type J) with the internal DIP switch to prevent accidental change to an unwanted type.

"SOURCE" MODE SIMULATES A T/C SENSOR

Resolution is 0.1° or 1° over the full listed range of all thermocouple types. Millivolts provides 1 microvolt resolution from -99.999 to 99.999mV. The ALTEK model 322 simulates key temperatures for repetitive calibrations. "QUIK-CHEK" function stores THREE output temperatures for each T/C type for real convenience.

Three output values are remembered for each T/C type & MV for a total of 15. Turn the knob to check trip points, controller action or hysteresis. The fast response 322 sets quickly without overshoot but allows slow changes at your own rate. Memory is retained for each thermocouple type even when power is off.

"READ" MODE MEASURES T/C'S DIRECTLY

The Model 322 display gives you fast, accurate temperature measurement with 0.1 and 1 degree or with 0.001 millivolt resolution. High resistance or open T/Cs and leads are detected and indicated on the LCD display. Two readings per second track fast moving temperatures.

"MAX" and "MIN" memories are continuously updated from turn-on or whenever the "RESET" pushbutton is pressed. The Model 322 gives you a handy tool to monitor temperatures for drift or control deviation. Just flip the "QUIK-CHEK" switch to display the MINimum and MAXimum temperature since reset.

TURN ON SEQUENCE

Each time the Model 322 is turned on, the LCD will display all segments for 3 seconds. It then displays the currently selected thermocouple type or mV for approximately 3 seconds. If °C/°F operation has been selected the currently selected temperature scale of °C or °F will display.

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OPERATING INSTRUCTIONS

GENERAL

INITIAL SETUP

The Model 322 is internally configurable for ease of use. Simply remove the four corner screws, flip a few DIP switches and follow the simple instructions given below (a condensed guide is found within the calibrator housing). The choices are based on the type of instruments in your shop or plant. For instance if your plant has only type E and your instruments display to 1°C, set up the Model 322 to lock out T/C type selection, choose full time °C and display with 1° resolution.

CONFIGURING TEMPERATURE SCALES

°F
°C

The Model 322 may be internally set-up for full time use of °C, full time use of °F or selectable °C/°F operation. The selectable mode lets you choose °C or °F each time the unit is turned on. If your facility is completely in °F or °C, set the internal DIP switches of the 322 to operate as a dedicated °F or °C instrument (see Configuring Operating Modes below).

LOCKING IN 1° RESOLUTION

250.0
250

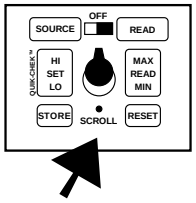
The Model 322 may be internally configured for 0.1° or 1° resolution. Select 1° resolution for less critical applications or 0.1° for increased resolution when necessary.

CHANGING T/C TYPES

J T E K
R S B L
N mV

Four T/C types or millivolts may be selected each time the Model 322 is turned on.

To change T/C types:



1) Repeatedly press or press and hold the SCROLL pushbutton when switching the unit on or while a T/C type is displayed during the first three seconds after the unit is turned on.
2) Continue to hold the SCROLL pushbutton. The LCD will scroll through the 4 T/C types and mV.
3) Release the SCROLL pushbutton when the desired T/C type is displayed.

To lock in a single T/C type:

An internal DIP switch may be used to disable the front panel selection to permanantly lock in a single T/C type.
1) Change to the desired T/C type (as above)
2) Set DIP Switch 2 up (see Configuring Operating Modes below)

OVER RANGE/UNDER RANGE

OVER
UNDER

Out-of-range temperatures are indicated by OVER and UNDER on the display. If out-of-range is displayed during READ mode check for proper connections and T/C type.

TURN-ON



Each time the Model 322 is turned on the LCD will display all segments for about 3 seconds. It then displays the currently selected thermocouple type for approximately 3 seconds. The currently selected temperature scale of °C or °F will then display for about 3 seconds. Depending on the configuration from 1 to 4 T/C types, millivolts or °C or °F may be selected during the thermocouple turn-on mode.
1) Move the power switch to SOURCE or READ
2) All segments on the LCD are turned on during self test
3) The display will indicate the currently selected T/C type for 3 seconds. Repeatedly press or press and hold the SCROLL pushbutton to change to the desired T/C type (based on configuration).

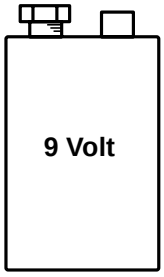
K

°F

4) The display will indicate the currently selected temperature scale for 3 seconds. Press the SCROLL pushbutton to switch between °C & °F (based on configuration). If a single T/C type, fixed °C or fixed °F have been selected, the user prompts for these selections will be skipped during turn-on. The three "QUIK-CHEK" temperature values will be the same as previously stored. Each time a different T/C type is selected, the three "QUIK-CHEK" values for that type will be recalled.

Hint: The Model 322 will automatically convert the temperatures in memory between °F and °C. For example, if 212°F is stored in HI and the Model 322 is switched to °C, 100°C will be displayed.

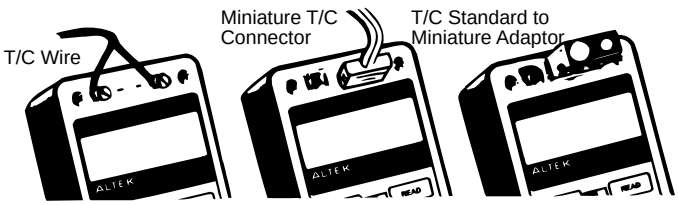
CHANGING BATTERY



Low battery is indicated by BAT on the LCD Display. Approximately 10 Hours of operation remain before the LCD goes blank and the Model 322 shuts itself down. Turn the 322 off, remove the four corner screws and lift the unit out of the case. The battery is fastened to the bottom printed circuit board and is easily removed.

CONNECTIONS

The Model 322 has connections for both miniature thermocouple connectors and for direct thermocouple wires. It is essential for accurate calibration that thermocouple wire is used to connect the Model 322 to the device being calibrated. Miniature or subminiature thermocouple connectors with thermocouple wire allow for the easiest connection. Different size thermocouple connectors may be used with an adaptor of the same thermocouple type. Copper wires, Copper connectors or Copper adaptors are not recommended as they will cause errors in cold junction compensation. Copper is used only for millivolt applications.

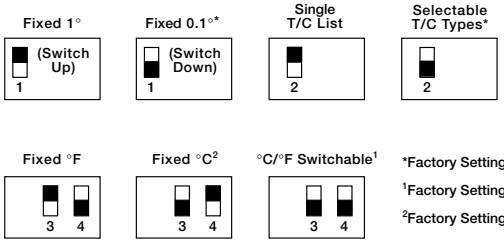


CONFIGURING OPERATING MODES

(DIP SWITCHES)

1) Turn the Model 322 OFF
2) Remove the 4 corner screws and lift faceplate assembly out of the case
3) Set the DIP switches for your options as diagrammed below

Note: °C/°F selection is the default for shipments in the U.S.A. °C for all other countries.

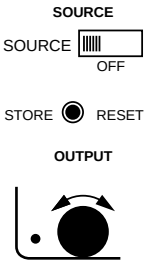


*Factory Setting (Switch 1 & 2 Down)
¹Factory Setting–USA
²Factory Setting–All other countries

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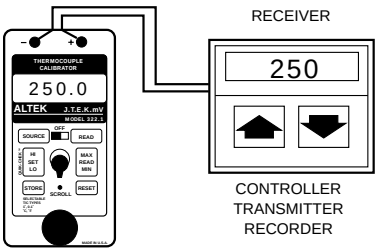
OPERATING INSTRUCTIONS

SOURCE MODE (Millivolt output or Simulate T/C temperatures)

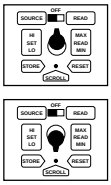


1) Set up the Model 322 for the correct T/C type and temperature scale (°C or °F)
2) Disconnect the input wires from the device to be calibrated or checked
3) Connect the Model 322 to the device to be calibrated, being careful to observe proper polarity & T/C type
4) Adjust the digital pot to the desired output value

Whenever SOURCE mode is selected the word SOURCE will appear on the LCD display. To change the output value, turn the speed sensitive digital pot. Turning the pot slowly will cause a gradual change in the output. A faster change will occur when the pot is turned faster. This function operates in all three output positions (HI, SET & LO).



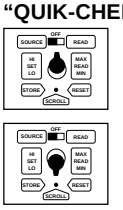
STORE



1) Switch to HI or LO
2) Turn the digital pot to desired value
3) Press the STORE/SCROLL pushbutton. The LCD will flash once to show that the value was saved.

If a value is in the SET position and you want that value stored in HI or LO, press and hold the STORE/SCROLL pushbutton while moving the switch to HI or LO. Then release the STORE button.

"QUIK-CHEK"

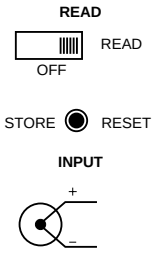


Any time you need a stored value just throw the "QUIK-CHEK" switch. Any value in the T/C range may be stored in HI & LO. The Model 322 remembers the HI, LO and SET values for all T/C types (15 memories) and millivolts for you with the power on or off. Each time a different T/C type is selected, the latest three "QUIK-CHEK" values for that type will be recalled.

OVERLOAD

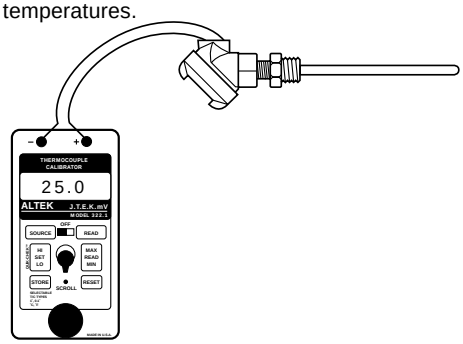
The Model 322 will indicate OVER and blank the digits on the display when the output leads have been shorted or when the device being calibrated requires more than 10mA.

READ MODE (MEASURE THERMOCOUPLES)

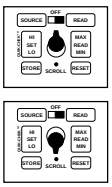


1) Set up the Model 322 for the correct T/C type and temperature scale (°C or °F)
2) Disconnect the wires from the thermocouple to be read or checked.
3) Connect the Model 322 to the sensor, being careful to observe proper polarity & T/C type
4) Display present reading, Maximum or Minimum temperatures

Whenever READ mode is selected the word READ will appear on the LCD. The Model 322 can measure temperatures for all T/C types with resolutions of 0.1° and 1°. The display is updated twice per second to continuously track fast moving temperatures.

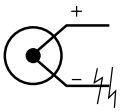


MIN/MAX



To read the Maximum or Minimum temperature since INPUT mode was entered, simply switch to MAX or MIN. The value will appear on the LCD along with the word MAX or MIN. The MAX/MIN values are automatically updated and may be viewed at any time without disturbing the other values. Pressing the RESET/SCROLL pushbutton will transfer the present temperature into both MAX and MIN and will update them as the measured temperature changes.

OPEN THERMOCOUPLES



The Model 322 checks for open or high resistance thermocouples. Open or burned out T/CS are indicated by "— — — — " on the display. Temperatures out of range for the T/C TYPE selected will be indicated by OVER and UNDER on the display.

PYROMETER CALIBRATION

Some thermocouple input pyrometers and controllers operate on the D'Arsonval meter movement principle. Millivolts from the thermocouple input drive a low resistance coil directly. For example, a coil may have a typical resistance of 60 ohms. Since the pyrometer resistance is so low, resistance of the input thermocouple leads must be taken into account. Pyrometers of this type have fixed or adjustable series resistance which corrects for lead length resistance.

To use the Model 322 to drive low resistance loads:

1) Disconnect the sensing thermocouple leads at the thermocouple head.

2) Connect leads from the Model 322 to the extension wires going to the pyrometer, using the screw connectors in the head. (If the sensing thermocouple sheath is within 1/4 to 2 times the length of the Model 322 lead length, the error due to resistance will be negligible.

3) Set the temperatures to be used for calibration per the recommendation of the pyrometer manufacturer.

If the thermocouple head cannot be accessed:

1) Determine the installed length of extension wire between the head and the pyrometer.
2) Select thermocouple extension wire of the same type, wire size and length as the installed wire between the head and the pyrometer to make up a calibrating wire.
3) Replace the active thermocouple extension wire with the calibrating wire at the pyrometer terminals.
4) Connect the other ends of the calibrating wire to the Model 322 and calibrate the pyrometer.

Note: A resistor of the same ohm value as the wire between the head and the pyrometer may be used in series with one lead instead of a length of calibrating wire. Make certain that both input and output leads to the resistor are the same temperature.

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SPECIFICATIONS

(Unless otherwise indicated, specifications are in ±% of span @ 23°C)

GENERAL

GENERAL ACCURACY: ±0.007% of 200 millivolt Span @ 23°C
COLD JUNCTION COMPENSATION: Built-in for specified thermocouple type, characterized to T/C curve
COLD JUNCTION TEMPERATURE EFFECT: Within 0.05° per °C change in ambient temperature over operating range
OPERATING TEMPERATURE RANGE: -5 to +140°F (-20 to +60°C)
STORAGE TEMPERATURE RANGE: -22 to + 175°F (-30 to +80°C)
RELATIVE HUMIDITY: 10 to 90%, non-condensing
ZERO STABILITY: Included in Cold junction effect
WARM UP TIME: 1 Minute to rated accuracy
OVERLOAD PROTECTION: 120 volts AC/DC for 30 seconds on connecting leads, in any mode
BATTERY LIFE: 9 Volt Alkaline: Nominal40 hours
LOW BATTERY: "BAT" indication on LCD at 7 Volts nominal, approximately 10 hours left. Batteries should be removed when storing the unit >3 months.
REFERENCE DRIFT: <10 PPM/°C
OVERALL SIZE: 2 1/2 x 2 5/8 x 5 1/8 inches (63.5 x 66.7 x 130 mm)
WEIGHT: 10.9 oz. (0.31kg)
CARRYING CASE: Included, zippered with belt loop and shoulder strap

SOURCE MODE

OUTPUT IMPEDANCE: <0.1 ohms
SOURCE CURRENT: up to 8 mA (drives 80mV into 10 Ohms)
OUTPUT NOISE: <4 microvolts p-p for frequencies of 10 Hz or below
OVERLOAD: Indicates OVER and blanks digits on the display

READ MODE

INPUT IMPEDANCE: >10 Megohms
OPEN THERMOCOUPLE DETECTION: 450 millisecond check pulse. Nominal threshold, 10 K Ohms. Displays " — — — —" for open circuit
NORMAL MODE REJECTION: 50/60 Hz, 50 dB
COMMON MODE REJECTION: 50/60 Hz, 120 dB

Specifications subject to change without notice

RANGES & ACCURACIES

Based on ±(0.008% of Reading + 0.006 Millivolts)

T/C TYPE	°C RANGE	ACCURACY	°F RANGE	ACCURACY	T/C MATERIAL	ISA/ANSI COLOR
J	-210.0 TO -180.0	±0.3°	-346.0 TO -292.0	±0.5°	+IRON	WHITE
	-180.0 TO -50.0	±0.2	-292.0 TO -58.0	±0.4	-CONSTANTAN	RED
	50.0 TO 500.0	±0.1	-58.0 TO 932.0	±0.2	JACKET	BLACK
	500.0 TO 1200.0	±0.2	932.0 TO 2192.0	±0.4		
K	-230.0 TO -100.0	±0.6°	-382.0 TO -148.0	±1.1°	+CHROMEL®	YELLOW
	-100.0 TO 1050.0	±0.2	-148.0 TO 1922.0	±0.4	-ALUMEL®	RED
	1050.0 TO 1371.1	±0.3	1922.0 TO 2500.0	±0.5	JACKET	YELLOW
T	-260.0 TO -200.0	±1.0°	-436.0 TO -328.0	±1.8°	+COPPER	BLUE
	-200.0 TO -50.0	±0.5	-328.0 TO -58.0	±0.9	-CONSTANTAN	RED
	-50.0 TO 0.0	±0.2	-58.0 TO 32.0	±0.4	JACKET	BLUE
	0.0 TO 400.0	±0.1	32.0 TO 752.0	±0.2		
E	-240.0 TO -200.0	±0.4°	-400.0 TO -328.0	±0.7°	+CHROMEL®	PURPLE
	-200.0 TO -100.0	±0.2	-328.0 TO -148.0	±0.4	-CONSTANTAN	RED
	-100.0 TO 850.0	±0.1	-148.0 TO 1562.0	±0.2	JACKET	PURPLE
	850.0 TO 1000.0	±0.2	1562.0 TO 1832.0	±0.4		
R	-18.3 TO 250.0	±1.2°	-1.0 TO 482.0	±2.2°	+Pt/13Rh	BLACK
	250.0 TO 750.0	±0.6	482.0 TO 1382.0	±1.1	-PLATINUM	RED
	750.0 TO 1600.0	±0.5	1382.0 TO 2912.0	±0.9	JACKET	GREEN
	1600.0 TO 1767.8	±0.6	2912.0 TO 3214.0	±1.1		
S	-18.3 TO 100.0	±1.2°	-1.0 TO 212.0	±2.1°	+Pt/10Rh	BLACK
	100.0 TO 400.0	±0.8	212.0 TO 752.0	±1.4	-PLATINUM	RED
	400.0 TO 1700.0	±0.6	752.0 TO 3092.0	±1.1	JACKET	GREEN
	1700.0 TO 1767.8	±0.7	3092.0 TO 3214.0	±1.3		
B	315.6 TO 900.0	±1.1°	600.0 TO 1652.0	±2.0°	+Pt/30Rh	GREY
	900.0 TO 1150.0	±0.7	1652.0 TO 2102.0	±1.3	-Pt/6Rh	RED
	1150.0 TO 1820.0	±0.6	2102.0 TO 3308.0	±1.1	JACKET	GREY

T/C TYPE	°C RANGE	ACCURACY	°F RANGE	ACCURACY	T/C MATERIAL	ISA/ANSI COLOR
N	-230.0 TO -180.0	±1.0°	-382.0 TO -292.0	±1.8°	+NICROSIL	ORANGE
	-180.0 TO -50.0	±0.5	-292.0 TO -58.0	±0.9	-NISIL	RED
	-50.0 TO 1100.0	±0.2	-58.0 TO 2012.0	±0.4	JACKET	ORANGE
	1100.0 TO 1300.0	±0.3	2012.0 TO 2372.0	±0.5		
G (W)	100.0 TO 150.0	±1.2°	212.0 TO 302.0	±2.2°	+Tungsten	WHITE
	150.0 TO 400.0	±0.8	302.0 TO 752.0	±1.4	-W26/Re	RED
	400.0 TO 1700.0	±0.4	752.0 TO 3092.0	±0.7	JACKET	WHITE/BLUE
	1700.0 TO 2320.0	±0.7	3092.0 TO 4208.0	±1.3		
C (W5)	-1.1 TO 1500.0	±0.5°	30.0 TO 2372.0	±0.9°	+W5/Re	WHITE
	1500.0 TO 1900.0	±0.6	2372.0 TO 3452.0	±1.1	-W26/Re	RED
	1900.0 TO 2100.0	±0.7	3452.0 TO 3812.0	±1.3	JACKET	WHITE/RED
	2100.0 TO 2320.0	±0.9	3812.0 TO 4208.0	±1.6		
D	-1.1 TO 50.0	±0.6°	30.0 TO 122.0	±1.1°	+W3/Re	WHITE
	50.0 TO 1400.0	±0.4	122.0 TO 2552.0	±0.7	-W25/Re	RED
	1400.0 TO 1800.0	±0.5	2552.0 TO 3272.0	±0.9	JACKET	WHT/YEL
	1800.0 TO 2320.0	±0.9	3272.0 TO 4208.0	±1.6		
P Platinel®	-217.7 TO -150.0	±1.2°	-360.0 TO -238.0	±2.2°	+Pd55/Pt31/Au14	YEL
	-150.0 TO -50.0	±0.4	-238.0 TO -58.0	±0.7	-Au65/Pd35	RED
	-50.0 TO 1000.0	±0.2	-58.0 TO 1832.0	±0.4	JACKET	BLACK
	1000.0 TO 1395.0	±0.3	1832.0 TO 2543.0	±0.5		
						DIN COLORS
L J DIN	-200.0 TO -50.0	±0.2°	-328.0 TO -58.0	±0.4°	+IRON	RED
	-50.0 TO 500.0	±0.1	-58.0 TO 932.0	±0.2	-CONSTANTAN	BLUE
	500.0 TO 750.0	±0.2	932.0 TO 1382.0	±0.4	JACKET	BLUE
U T DIN	-200.0 TO -75.0	±0.3°	-328.0 TO -103.0	±0.5°	+COPPER	RED
	-75.0 TO 100.0	±0.2	-103.0 TO 212.0	±0.4	-CONSTANTAN	BROWN
	100.0 TO 600.0	±0.1	212.0 TO 1112.0	±0.2	JACKET	BROWN

mV -99.999TO99.999 mV ±(0.008% of Reading +0.006 millivolts)

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PLATINEL® is a registered trademark of Engelhard Corporation.

WARRANTY

Our equipment is guaranteed against defective material and workmanship (excluding batteries) for a period of three years from date of shipment. Claims under guarantee can be made by returning the equipment prepaid to our factory. The equipment will be replaced, repaired or adjusted at our option. The liability of Altek is restricted to that given under our guarantee. No responsibility is accepted for damage, loss or other expense incurred through sale or use of our equipment. Under no condition shall Altek be liable for any special, incidental or consequential damage.

OTHER PRODUCTS

Altek designs and manufactures fast, accurate instruments for measurement, generation and simulation of virtually every process control signal. Consult our factory directly or your local supplier to order precise, low cost Milliamp, RTD, Thermocouple, Voltage and Frequency Calibrators. Additional models and ranges are frequently added to the Altek instrument family to meet all of your critical calibration requirements.

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STANDARD MODELS

MODEL 322–1 (Types J,T,E,K & mV)
MODEL 322–2 (Types B,R,S,K & mV)

CUSTOM MODELS

MODEL 322 – Custom Types __ __ __ __ & mV
Example: 322-Custom J, K, R, N ,mV
(Choose any four T/C types from the following list)
J, K, T, E, R, S, B, N, G, C, D, P (Platinel), L (J DIN), U (T DIN)

Included with each Model 322 are:
Carrying Case (Part No. 09-3782)
NIST Traceable Certificate and 3 Year Warranty

Also Available: Model 422 Includes all14 Thermocouple Types

OPTIONAL ACCESSORIES

PLUG IN WIRE KITS
Contains T/C Wires, 1 Meter long, terminated at one end with a miniature T/C connector.

MODEL KIT-1 (Types J, T, E, K)
MODEL KIT-2 (Types B, R/S, K)

Contact factory for additional T/C Types

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