STANDARD TEMPERATURE SENSORS

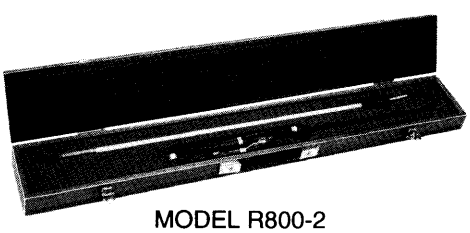
PERFORMANCE SPECIFICATION
CHINO

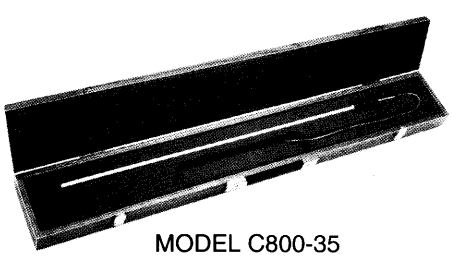
■STANDARD PLATINUM RESISTANCE THERMOMETERS
■STANDARD THERMOCOUPLES
■STANDARD PLATINUM-COBALT RESISTANCE THERMOMETER FOR CRYOGENIC TEMPERATURE

These are standard temperature sensors conforming to the International Temperature Scale, 1990.(*)
The temperature range from 4K to 1500°C is measured by these sensors which are classified into a standard platinum-cobalt resistance thermometer for cryogenic temperature, standard platinum resistance themometers for low temperature, medium temperature and high temperature, and standard thermocouples.
The R800 series standard platinum resistance thermometers, which have been commercialized under the guidance of the National Research Laboratory of Metrology, have been adopted by national standard bureau in overseas countries with reputation on their performance and reliability.

- These sensors are manufactured with selected quality materials by highly skilled manufacturing techniques under the guidance of the National Research Laboratory of Metrology.
- The standard platinum resistance thermometer for low temperature is the first international product in Japan as the standard thermometer applicable to 13K.
- The standard platinum resistance thermometers for medium temperature and for high temperature have been delivered to national standard bureau in overseas countries in large quantities. Its performance has been highly reputed in Comité Consultatif de Thermométrie (CCT).
- The standard platinum-cobalt resistance thermometer for cryogenic temperature features excellent reproducibility and stability in a cryogenic temperature range below to 4K.

MODEL R800-0


MODEL R800-2


MODEL C800-35

■ LIST OF STANDARD TEMPERATURE SENSORS

STANDARD TEMPERATURE SENSORS	STANDARD PLATINUM RESISTANCE THERMOMETERS R800 series	STANDARD PLATINUM-COBALT RESISTANCE THERMOMETER FOR CRYOGENIC TEMPERATURE	MODEL R800-4
		STANDARDPLATINUM RESISTANCE THERMOMETER FOR LOW TEMPERATURE	MODEL R800-0
		STANDARDPLATINUM RESISTANCE THERMOMETERS FOR MEDIUM TEMPERATURE	MODEL R800-2
		STANDARD PLATINUM RESISTANCE THERMOMETER FOR HIGH TEMPERATURE	MODEL R800-3
		LOW RESISTANCE TYPE STANDARD PLATINUM RESISTANCE THERMOMETER FOR HIGH TEMPERATURE	MODEL R800-3L
	STANDARD THERMOCOUPLES C800 series	S TYPE THERMOCOUPLE	MODEL C800-15
		R TYPE THERMOCOUPLE	MODEL C800-35
		B TYPE THERMOCOUPLE	MODEL C800-65

(*) The standard thermocouples are excluded from ITS-90 as reference.

STANDARD PLATINUM RESISTANCE THERMOMETER FOR LOW TEMPERATURE (CAPSULE TYPE)

MODEL R800-0

MODEL R800-0

This thermometer is designed as a capsule type standard temperature sensor covering the temperature range from 13.8033K (-259.3467°C triple point of equilibrium hydrogen) to 273.16K (0.01°C triple point of water).

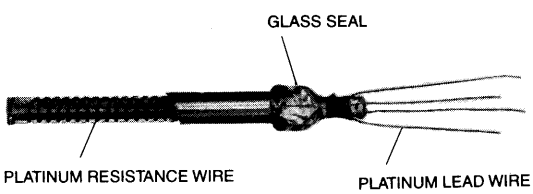
- Conforms to the specifications of ITS-90 (International Temperature Scale, 1990)
- The adoption of the strain-free double coil system structure in a sensing part and CHINO's unique manufacturing techniques have realized excellent reproducibility and stability of the thermometer for a long time.

■ GENERAL SPECIFICATIONS

MEASURING TEMPERATURE RANGE
: 13K to 30℃
RESISTANCE VALUE : 25.5Ω ± 1Ω (at 0°C)
SPECIFIED CURRENT : 1mA
TEMPERATURE CHARACTERISTIC
: R(-38.8344°C)/R(0.01°C) ≧ 0.844235
SENSITIVITY : 0.1Ω /K
SELF-HEATING : Approx. 1mK/1mA
SEALED GAS : Helium gas
CONNECTING LEAD WIRE
: 4-conductor type platinum wire ϕ0.3mm × 40mm
FRAME : Cross quartz
PROTECTING TUBE
: Capsule type platinum sheath ϕ 5mm × 43mm

■ CONSTRUCTION

An element made by winding a platinum resistance wire onto a cross quartz frame by the double coil system is accommodated a platinum-sheathed capsule, and connecting lead wires are led through the metal glass sealing.



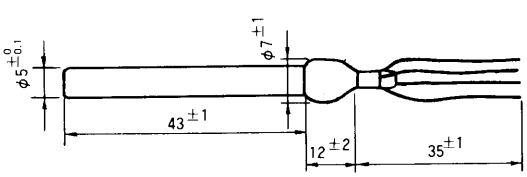
■ CALIBRATION

For applying this thermometer as a standard temperature sensor, the temperature-resistance value table must be prepared by calibrating it. CHINO will prepare a temperature-resistance value table at CHINO's standard laboratory if requested. (Calibration charge is separately asked.)

- **CALIBRATION TEST (CRYOGENIC CALIBRATION TEST L-5)**
  CALIBRATION POINT
  : Triple point of water (273.16K)
  ※ Equivalent to triple point of mercury (234.3156K)
  ※ Equivalent to triple point of argon (83.8058K)
  ※ Equivalent to triple point of oxygen (54.3584K)
  ※ Equivalent to triple point of neon (24.5561K)
  ※ Equivalent to boiling point of equilibrium hydrogen (20.2711K)
  ※ Equivalent to 17.035K point of equilibrium hydrogen (17.035K)
  ※ Equivalent to triple point of equilibrium hydrogen (13.8033K)
  CALIBRATION UNCERTAINTY : ±0.1K
  ※ By comparison calibration

- **TEMPERATURE-RESISTANCE VALUE TABLE**
  The temperature-resistance value table will be prepared by interpolating scales at intervals of 1K between 13K and 0°C according to the calibrated values in the calibration test.

■ EXTERNAL DIMENSIONS

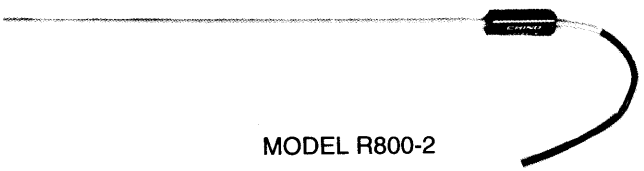


Unit : mm

* The lead wire section size may change more or less.

STANDARD PLATINUM RESISTANCE THERMOMETER FOR MEDIUM TEMPERATURE (STEM TYPE)

MODEL R800-2



MODEL R800-2

This thermometer is designed as a stem type standard temperature sensor with a quartz protecting tube covering the temperature range from 273.15K (0°C) to 933.473K (660.323°C, freezing point of aluminum).

■ FEATURES

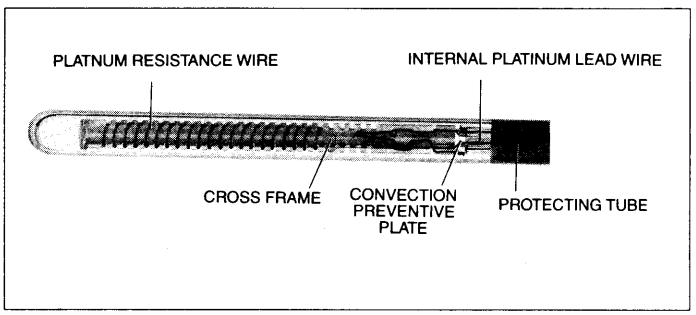
- Conforms to the specifications of ITS-90 (International Temperature Scale, 1990).
- The adoption of the strain-free double coil system structure in a sensing part and CHINO's unique manufacturing techniques have realized excellent reproducibility and stability of the thermometer for a long time.
- The unique structure including a convection preventive plate and a delustered surface finish protecting tube have reduced an error caused by thermal radiation, thermal conduction, and others.

■ GENERAL SPECIFICATIONS

MEASURING TEMPERATURE RANGE : 90K to 661°C
RESISTANCE VALUE : 25.5Ω ± 1Ω (at 0°C)
SPECIFIED CURRENT : 1mA
TEMPERATURE CHARACTERISTIC
: R (29.7646°C)/R (0.01°C) ≧ 1.11807
SENSITIVITY : 0.1Ω/K
SELF-HEATING : Approx. 2mK/1mA
SEALED GAS : Mixture gas (argon and oxygen)
CONNECTING INTERNAL LEAD WIRE : Platinum wire
CONNECTING EXTERNAL LEAD WIRE
: 4-conductor cabtyre cord 2m with gold-plated terminals
FRAME : Cross quartz
PROTECTING TUBE
: Delustered quartz tube (ϕ7.0 ± 0.5)mm × 600mm

■ CONSTRUCTION

An element made by winding a platinum resistance strand onto a cross quartz frame by the double coil system is accommodated into a quartz tube. The interior of the protecting tube is composed of the element, convection preventive plate, spacer, internal lead wire, etc., and 4-conductor external leads have gold-plated terminals.



■ CALIBRATION

For applying this thermometer as a standard temperature sensor, the temperature-resistance value table must be prepared by calibrating it. CHINO will prepare the temperature-resistance value table at CHINO's standard laboratory if requested. (Calibration charge is separately asked.)

- **CALIBRATION: TEST (FIXED POINT CALIBRATION TEST F-1)**

CALIBRATION POINT

: Freezing point of aluminum	(660.323°C)
Freezing point of zinc	(419.527°C)
Freezing point of tin	(231.928°C)
Triple point of water	(0.01°C)

CALIBRATION UNCERTAINTY : ±0.01K

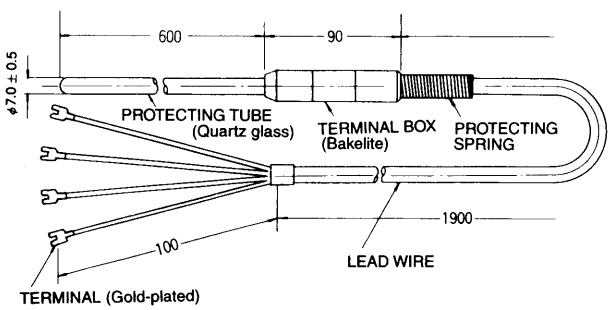
- **TEMPERATURE-RESISTANCE VALUE TABLE**

The temperature-resistance value table will be prepared by interpolating the R(t) values between 0°C and 661°C at intervals of 1K according to the calibrated values in the calibration test.

- **COMPARATIVE TEST DATA ISSUED BY JAPAN ELECTRIC METERS INSPECTION CORPORATION (JEMIC)**

JEMIC issues an authorized inspection report obtained by a comparison test at desired optional temperature between (-)50 and 600°C with charge. CHINO is ready to obtain this inspection report if requested.
UNCERTAINTY : ±0.03K at (-)50 to 600°C

■ EXTERNAL DIMENSIONS



Unit : mm

STANDARD PLATINUM RESISTANCE THERMOMETER FOR HIGH TEMPERATURE (STEM TYPE)

MODEL R800-3

MODEL R800-3

This thermometer using a high purity platinum wire with a large diameter as a temperature sensing wire is designed as a stem type standard temperature sensor covering the temperature from 933.473K (660.323℃, freezing point of aluminum) to 1234.93K (961.78℃, freezing point of silver).

- Conforms to the specifications of ITS-90 (International Temperature Scale, 1990).
- The adoption of the strain-free double coil system structure in a sensing part and CHINO's unique manufacturing processing techniques have realized excellent reproducibility and stability of the thermometer for a long time.
- A long quartz protecting tube is suitable for high-temperature measurement.

■ GENERAL SPECIFICATIONS

MEASURING TEMPERATURE RANGE : 0°C to 962°C
RESISTANCE VALUE : 2.55Ω ± 0.1Ω (at 0°C)
SPECIFIED CURRENT : 1mA
TEMPERATURE CHARACTERISTIC
: R(29.7646°C)/R(0.01°C) ≧ 1.11807 and
R(961.78°C)/ R(0.01°C) ≧ 4.2844
SENSITIVITY : 0.01Ω/K
SELF-HEATING : Approx. 1mK/1mA
SEALED GAS : Mixture gas (argon and oxygen)
CONNECTING INTERNAL LEAD WIRE
: Platinum lead wire
CONNECTING EXTERNAL LEAD WIRE
: 4-conductor cabtyre cord 2m with gold-plated
FRAME : Cross quartz
PROTECTING TUBE : Delustered quartz tube
(ϕ7.0 ± 0.5)mm × 700mm

■ CONSTRUCTION

An element made by winding a platinum resistance strand onto a cross quartz frame by the double coil system is accommodated into a quartz tube.
The interior of the protecting tube is composed of the element, convection protective plate, spacer, internal lead wire, etc. and 4-conductor external leads have gold-plated terminals.

■ CALIBRATION

For applying this sensor as a standard thermometer, the temperature-resistance value table must be prepared by calibrating it. CHINO will prepare the temperature-resistance value table at CHINO's standard laboratory if requested. (Calibration charge is separately asked.)

- **CALIBRATION TEST (FIXED POINT CALIBRATION TEST F-0)**

CALIBRATION POINT

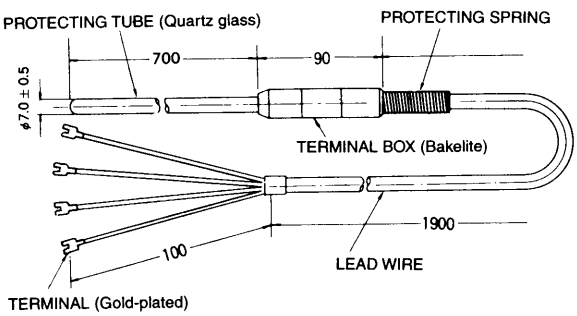
: Freezing point of silver	(961.78°C)
Freezing point of aluminum	(660.323°C)
Freezing point of zinc	(419.527°C)
Freezing point of tin	(231.928°C)
Triple point of water	(0.01°C)

CALIBRATION UNCERTAINTY : ±0.06℃

- **TEMPERATURE-RESISTANCE VALUE TABLE**

The temperature-resistance value table will be prepared by interpolating the R(t) values between 660°C and 962°C at intervals of 1K according to the calibrated values in the calibration test.

■ EXTERNAL DIMENSIONS



Unit : mm

STANDARD PLATINUM RESISTANCE THERMOMETER FOR HIGH TEMPERATURE (STEM TYPE)

MODEL R800-3L

MODEL R800-3L

This thermometer using a high purity platinum wire with a large diameter as a temperature sensing wire is designed as a stem type standard temperature sensor covering the temperature range from 273.15K (0°C) to 1234.93K (961.78°C, freezing point of silver).

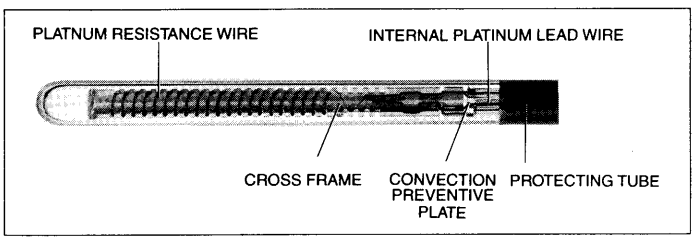
- Conforms to the specifications of ITS-90 (International Temperature Scale, 1990).
- The adoption of the strain-free single coil system structure in a sensing part and CHINO's unique manufacturing processing techniques have realized excellent reproducibility and stability of the thermometer for a long time.
- As a low resistance type platinum wire being suitable for high temperature measurement is used, the influence of insulation resistance is very low.

■ GENERAL SPECIFICATIONS

MEASURING TEMPERATURE RANGE : 0°C to 962°C
RESISTANCE VALUE : 0.25Ω ± 0.01Ω (at 0°C)
SPECIFIED CURRENT : 1 to 10mADC
TEMPERATURE CHARACTERISTIC
: R(29.7646°C)/R(0.01°C) ≧ 1.11807 and
R(961.78°C)/ R(0.01°C) ≧ 4.2844
SENSITIVITY : 1mΩ/K
SELF-HEATING : Approx. 1mK/1mA
SEALED GAS : Mixture gas (argon and oxygen)
CONNECTING INTERNAL LEAD WIRE
: Platinum lead wire
CONNECTING EXTERNAL LEAD WIRE
: 4-conductor cabtyre cord 2m with gold-plated
FRAME : Cross quartz
PROTECTING TUBE : Delustered quartz tube
(ϕ 7.0 ± 0.5)mm × 700mm

■ CONSTRUCTION

An element made by winding a platinum resistance strand onto a cross quartz frame by the single coil system is accommodated into a quartz tube. The interior of the protecting tube is composed of the element, convection preventive plate, spacer, internal lead wire, etc., and 4-conductor external leads have gold-plated terminals.



■ CALIBRATION

For applying this thermometer as a standard temperature sensor, the temperature-resistance value table must be prepared by calibrating it. CHINO will prepare the temperature-resistance value table at CHINO's standard laboratory if requested. (Calibration charge is separately asked.)

- **CALIBRATION: TEST (FIXED POINT CALIBRATION TEST F-0)**

CALIBRATION POINT

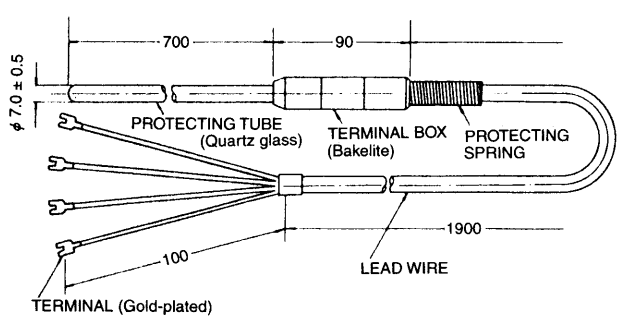
: Freezing point of silver	(961.78°C)
Freezing point of aluminium	(660.323°C)
Freezing point of zinc	(419.527°C)
Freezing point of tin	(231.928°C)
Triple point of water	(0.01°C)

CALIBRATION UNCERTAINTY : ±0.06℃

- **TEMPERATURE-RESISTANCE VALUE TABLE**

The temperature-resistance value table will be prepared by interpolating the R(t) values between 0°C and 962°C at intervals of IK according to the calibrated values in the calibration test.

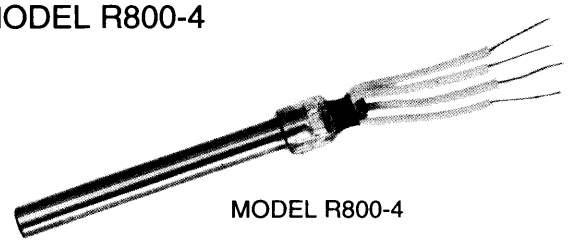
■ EXTERNAL DIMENSIONS



Unit : mm

STANDARD PLATINUM-COBALT RESISTANCE THERMOMETER FOR CRYOGENIC TEMPERATURE (CAPSULE TYPE)

MODEL R800-4



MODEL R800-4

This thermometer is designed as a standard temperature sensor covering from 4K to 13K. It adopts platinum-cobalt rarefied alloy as a temperature sensing wire.
The platinum-cobalt rarefied alloy is made by alloying precious metal platinum with infinitesimal magnetic element cobalt, and it features a considerably high resistance and sensitivity in a cryogenic temperature range, as compared with pure metals. A platinum-cobalt resistance thermometer (Model R800-6) for industrial use is prepared, too.

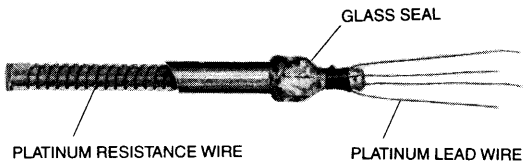
- A single sensor covers temperature range from 4K to 0℃
- Stable sensitivity (resistance change ratio).
- Double coil type temperature sensing structure features very excellent reproducibility of the thermometer.
- Excellent responsibility owing to sealed helium gas.

■ GENERAL SPECIFICATIONS

MEASURING TEMPERATURE RANGE : 4K to 0℃
TEMPERATURE SENSING ELEMENT
: Platinum-cobalt rarefied alloy (Pt-0.5At%Co)
RESISTANCE VALUE : 100Ω ± 4Ω (at 0℃)
MEASURING CURRENT : 1mA
SENSITIVITY : Min. 0.09Ω/K (at 12K)
Max. 0.4Ω/K
SELF-HEATING : Approx. 2mK/1mA in LN_2
SEALED GAS : Helium gas
LEAD WIRE : 4-conductor platinum wire ϕ0.3mm × 40mm
FRAME : Cross quartz
PROTECTING TUBE
: Capsule type platinum sheath ϕ 5mm × 43mm

■ CONSTRUCTION

An element made by winding a platinum resistance wire onto a cross quartz frame by the double coil system is accommodated into a platinum-sheathed capsule, and connecting lead wires are led through the metalglass sealing.

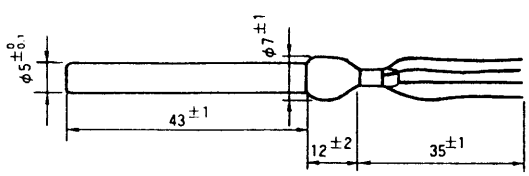


■ CALIBRATION

For applying this sensor as a standard thermometer, the temperature-resistance value table must be prepared by calibrating it. CHINO will prepare the temperature-resistance value table at CHINO's standard laboratory it requested. (Calibration charge is separately asked.)

CALIBRATION TEMPERATURE : 4K to 0℃ or 14K to 0℃
(CRYOGENIC CALIBRATION TEST L-3, 4)

■ EXTERNAL DIMENSIONS

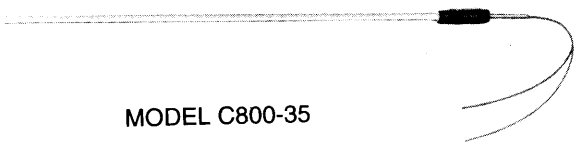


Unit : mm

* The lead wire section size may change more or less.

STANDARD THERMOCOUPLES

MODELS C800-15 (S TYPE)
C800-35 (R TYPE)
C800-65 (B TYPE)



MODEL C800-35

These sensors are designed as a standard thermometer covering from 200°C to 1554°C, and constructed with a stem structure of a high purity alumina ceramic protecting tube recrystallized.

- Strictly selected bare thermocouple and unique cleaning and heat treatment techniques have realized very stable and highly accurate sensor.
- The protecting tube and insulation tube are made of high purity recrystallized alumina. The thermocouples feature high heat conductivity and excellent stability under an oxidation-reduction atmosphere.
- Standard thermocouples are excluded from ITS-90 as reference but employed as industrial standards.

■ GENERAL SPECIFICATIONS

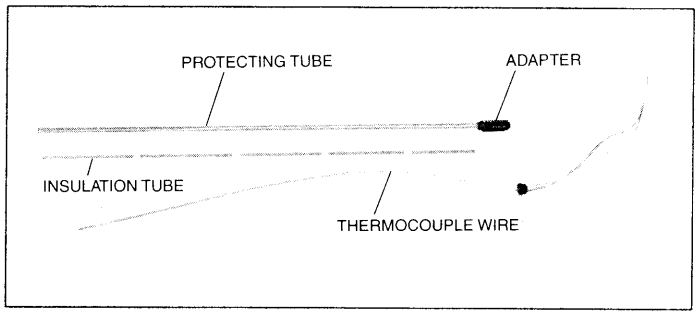
- C800-15
  WIRE : S type
  WIRE DIAMETER : ϕ0.5mm
  WIRE LENGTH : 1500mm
  MEASURING TEMPERATURE RANGE : Max. 1400℃
  PROTECTING TUBE
  : Corundum recrystallized alumina ϕ6mm × 600mm

- C800-35
  WIRE : R type
  WIRE DIAMETER : ϕ0.5mm
  WIRE LENGTH : 1500mm
  MEASURING TEMPERATURE RANGE : Max. 1400℃
  PROTECTING TUBE
  : Corundum recrystallized alumina ϕ6mm × 600mm

- C800-65
  WIRE : B type
  WIRE DIAMETER : ϕ0.5mm
  WIRE LENGTH : 1500mm
  MEASURING TEMPERATURE RANGE : Max. 1554°C
  PROTECTING TUBE
  : Corundum recrystallized alumina ϕ6mm × 600mm

■ CONSTRUCTION

These sensors are composed of the thermocouple wire, recrystallized alumina protecting tube, insulation tube, and adapter.



■ CALIBRATION

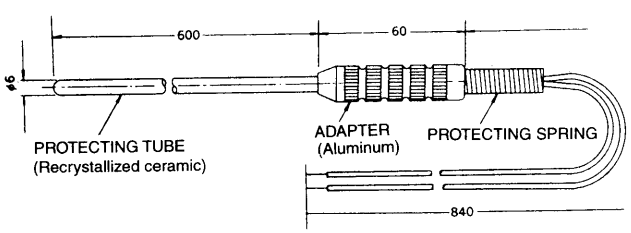
For applying these sensors as a standard thermometer, the temperature-thermoelectromotive force table must be prepared by calibrating them. CHINO will prepare the temperature-thermoelectromotive force table at CHINO's standard laboratory if requested. (Calibration charge is separately asked.)

CALIBRATION TEMPERATURE
: 0~1554℃ (C800-15, 35, 65)

- **COMPARATIVE TEST DATA ISSUED BY JAPAN ELECTRIC METERS INSPECTION COOPERATION (JEMIC)**
  JEMIC issues an authorized inspection report obtained by a comparison test at desired optional temperature between 0°C and 1100°C. CHINO is ready to obtain this inspection report if requested.

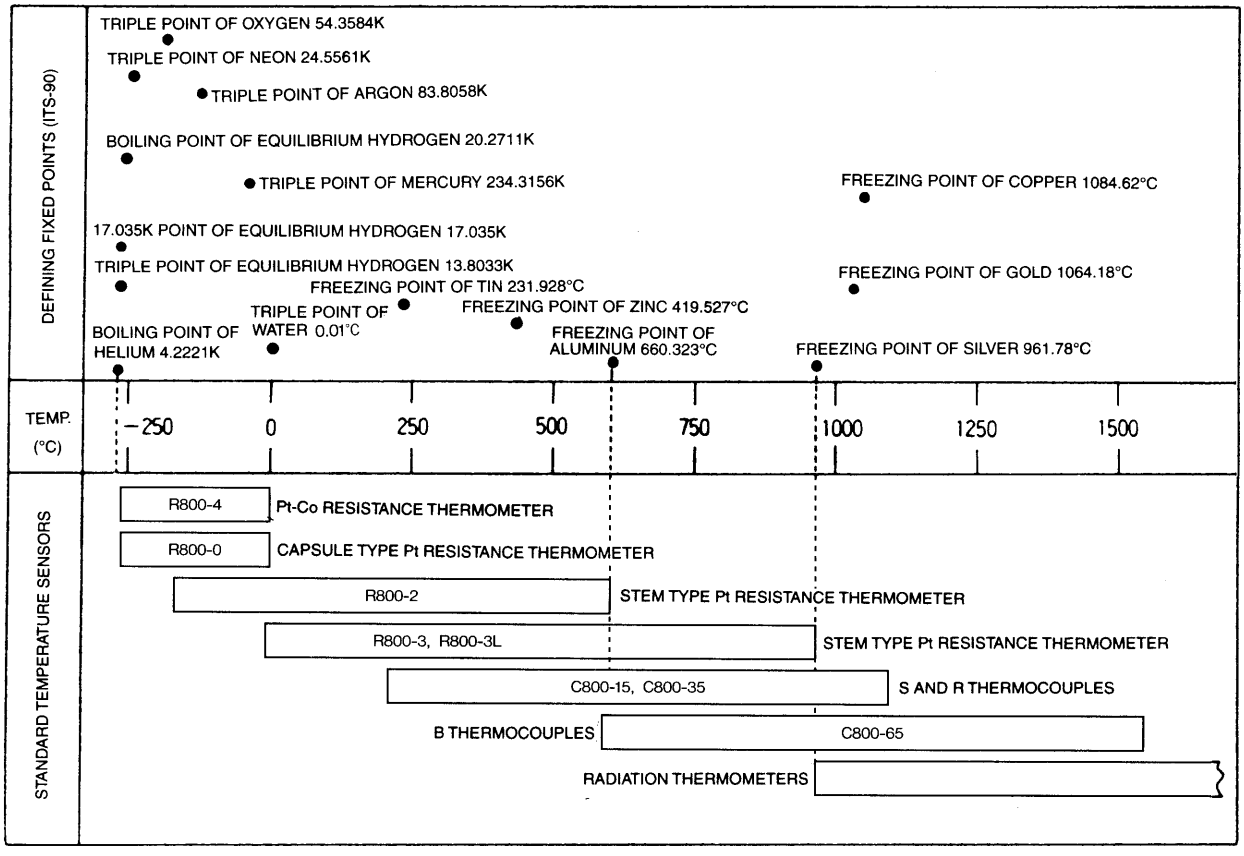
CALIBRATION ACCURACY : on Uncertainty

■ EXTERNAL DIMENSIONS



REFERENCES

■ STANDARD TEMPERATURE SENSORS



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