

ROSEMOUNT 162CE
LONG-STEM STANDARD
PLATINUM RESISTANCE THERMOMETER

- > Temperature Range -200°C to $+661^{\circ}\text{C}$
- > ITS-90 Interpolation Standard
- > Excellent Stability and Low Self-heating
- > Rugged, Shatter-proof Metal Sheath



DESCRIPTION

Model 162CE is a long-stem standard platinum resistance thermometer and satisfies all the requirements as a defining instrument on the International Temperature Scale of 1990 (ITS-90). The excellent stability, low self-heating error, and immersion characteristics of this thermometer meet or exceed the acceptance criteria required by the most demanding standards laboratories. The 162CE can be calibrated from the triple point of argon ($-189.3442^{\circ}\text{C}$) to the freezing point of aluminum (660.323°C) with expanded uncertainty ($k=2$) less than or equal to 0.001°C , as calibrated by the National Institute of Standards and Technology (NIST).

The 162CE offers versatility not found with more delicate glass sheath thermometers. For example; the metal sheath construction is compatible with all common calibration media including molten salts. The thermometer is insensitive to pressure up to 13.8 MPa (2000 psia). Without risk of breakage, the 162CE can be easily installed in a rigid calibration fixture having minimal clearance--ideal for dry-well calibrators. With over 35 years of field experience, the 162CE is built for lasting service.

CALIBRATION

Model 162CE is suited for calibration over all or part of the operating temperature range of -200°C to $+661^{\circ}\text{C}$. We offer several fixed-point and comparison calibration options traceable to the NIST. Alternatively, the thermometer may be submitted directly to the NIST or similar standards laboratory.

CONSTRUCTION

The nominal 25.5 ohm sensing element of the 162CE is made of annealed platinum wire with purity not less than 99.999%. The wire is formed into a single layer filament and is supported within a multi-bore ceramic tube and platinum case (see element illustration on page 2). This straight wire or "birdcage" configuration ensures strain-free operation, promotes low self-heating, minimizes inductance, and limits wire displacement caused by mechanical shock. High purity aluminum oxide is used for the support tube and insulators, which is not susceptible to devitrification or dehydration at high temperatures. The sensing element is hermetically sealed in a Inconel* X-750 sheath containing a dry mixture of helium and oxygen. The oxygen partial pressure is controlled to optimize performance over the entire operating range.

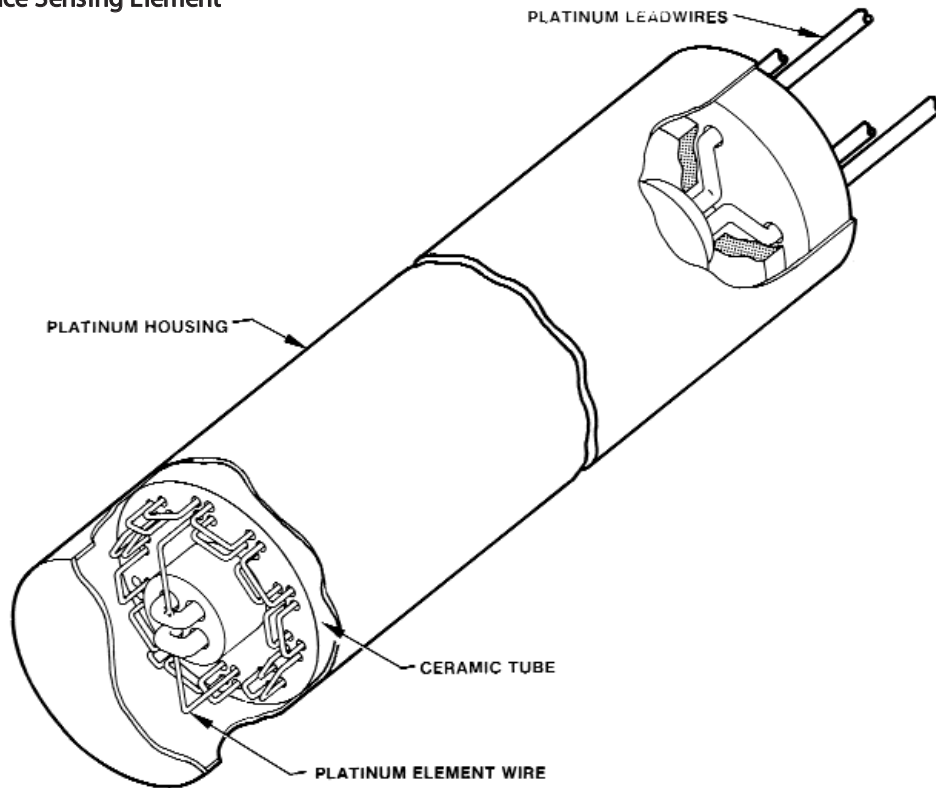
The flexible external cable consists of four 20 gage silver coated copper lead wires, Teflon** insulated, twisted, and covered with a braided shield and silicone rubber jacket. Each lead wire is terminated with a gold plated copper spade lug with a color-coded PVC molded strain relief. Other lead wire termination options are available to mate with specific measuring equipment.

STORAGE CASE

Model 162CE is supplied with an attractive storage case and reusable shipping crate, and should be retained for possible future transportation.



Platinum Resistance Sensing Element

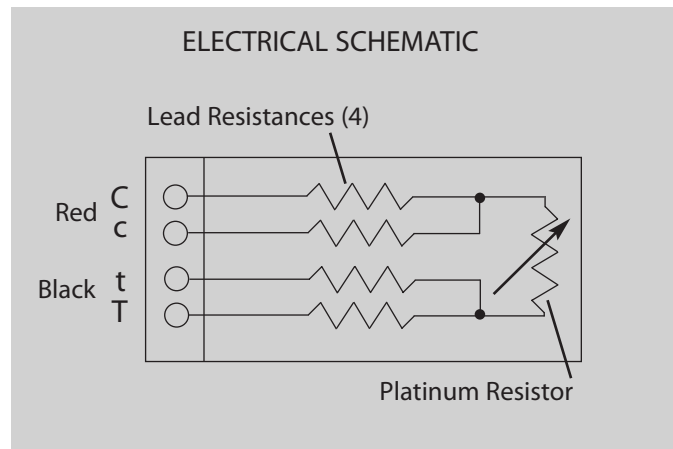


Electrical Circuit

The thermometer includes four leads so that lead resistance effectively cancels when used with a four terminal bridge or meter (see electrical schematic).

Sensitive Portion

The platinum resistor is located within the first 2 inches of the sheath tip. To minimize conduction error, the standard should be immersed to an adequate depth. In general, the depth is dependent upon the temperature and the medium being measured. Six inches is sufficient in a well-agitated oil or ice bath. The standard is long enough for accurate measurements in well-designed fixed point cells or furnaces.



SPECIFICATIONS

Temperature Range

-200°C to +661°C. Head and cable +200°C maximum.

Stability

When cycled over the specified temperature range, the $R(0.01^\circ\text{C})$ shall repeat to within the equivalent of 0.001°C . At maximum temperature, the $R(0.01^\circ\text{C})$ drift rate shall be less than 0.002°C per 100 hours. For routine laboratory service, the stability is typically better than 0.01°C per year.

Self-Heating

The temperature rise (self-heating) of the platinum resistor elements above the temperature of the case is less than $0.5\text{ m}^\circ\text{C}/\text{mA}^2$. The nominal value is 0.0003°C with a 1 mA current.

Insulation Resistance

The insulation resistance from the platinum resistor to the outside sheath is greater than 1000 megohms at 100 VDC and room temperature.

Pressure Range

When used in the temperature range, the thermometers will operate in a 0 to 2000 psia environment.

SPECIFICATIONS (continued)

Response

The response of the resistor is less than 3 seconds when immersed in 77°C water moving at 3 feet per second from 23°C ambient air. Response is defined as the time required for the resistor to reach 63.2 percent of a step change in temperature.

Resistance-Temperature Relationship

Model 162CE is suitable for interpolating temperatures on the International Temperature Scale of 1990. The nominal resistance at 0°C is 25.55 ohms and varies from 4.3 ohms at -200°C to 86.4 ohms at $+661^\circ\text{C}$. A slope of approximately $0.1\text{ ohms}/^\circ\text{C}$ allows for convenient interpolation.

Model 162CE resistance ratio, W , satisfies the requirements of ITS-90:

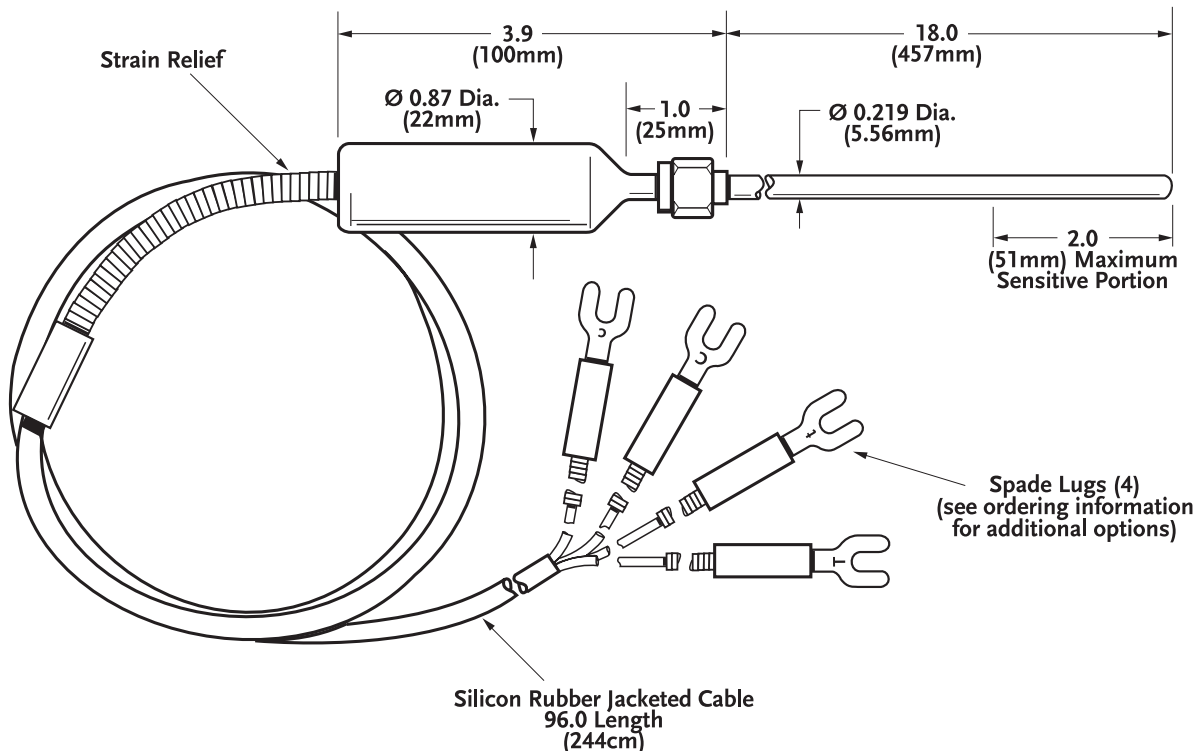
$$W(-38.8344^\circ\text{C}) \leq 0.844235$$

$$W(29.7646^\circ\text{C}) \geq 1.11807$$

Identification

The following information is labeled on the housing:
Rosemount Aerospace Inc.
Standard Platinum Resistance Thermometer
Model 162CE Serial Number _____

CONFIGURATION DRAWING



All dimensions in inches