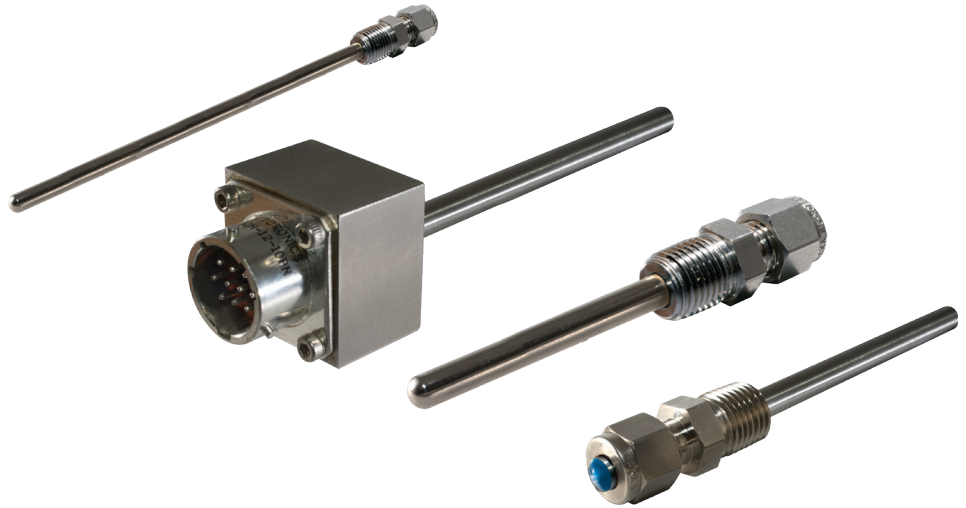




Temperature Probes

Temperature probe features

- Stainless steel-encased probes that provide highly reliable sensor performance in a thermowell or direct cryogen contact
- Highly customizable to suit your particular application
- May be configured with many sensor types, including Cernox® for superior temperature performance from room temperature down to 4 K (-269.15 °C) and below
- Thin-walled probe tubing reduces thermal lag and heat leak from outside the measurement space
- Ideal for temperature measurements in fluid containers and tanks
- Full 3-year standard warranty



Lake Shore offers a variety of temperature sensors in packages that enable mounting in very tight areas. But for some applications (especially if the sensors have to be immersed in liquid) you need to do more to protect the sensor circuitry. For these applications, a cryogenic temperature probe is the optimum choice. Encased in one of these stainless steel thermowell fixtures, the sensor can perform as designed, unaffected by high pressure and sealed to keep electrical components and wiring protected from fluids and other elements.

Typical applications

Lake Shore temperature probes are ideal for thermometry applications where you need to measure inside:

- fluid containers, tanks, and pipes
- cryostats and cryogenic liquid flow meters
- other liquid storage systems.

Highly customizable

Lake Shore temperature probes are made-to-order with a wide range of configuration options available. These include:

- Multiple sensor types including our extremely popular Cernox® RTDs and DT-670 diodes
- Either 1/8 in or 1/4 in stem diameter in lengths up to 0.71 m (28 in) are standard
- Various mounting adapters suited for either positive or negative pressures, if required
- Numerous connectivity options including wire types and lengths as well as various terminating connectors for direct connection to Lake Shore temperature instruments or third-party equipment

If you do not see an option available as part of our standard offerings, please contact Lake Shore to discuss further customization options.

Specifications

Note: These probes are not designed to be intrinsically safe. It is the responsibility of the user to operate these probes safely in explosive environments.

Probe construction

Stem

Material: 316 stainless steel (non-magnetic)¹

	Wall thickness	Maximum length
1/4 in stem	0.028 in ± 0.003 in	28 in ²
1/8 in stem	0.010 in ± 0.001 in	20 in

¹ Not suitable for direct immersion in liquid oxygen or hydrogen environments.

² Longer lengths may be possible depending on the overall configuration. Please contact Lake Shore to discuss.

Internal components

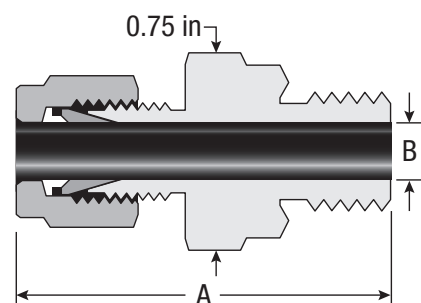
Internal atmosphere: Air

Internal atmosphere pressure: 98 kPa (14.2 psia)

Internal sensor wire: Quad-Twist™ 4-lead 36 AWG phosphor bronze wire with polyimide insulation

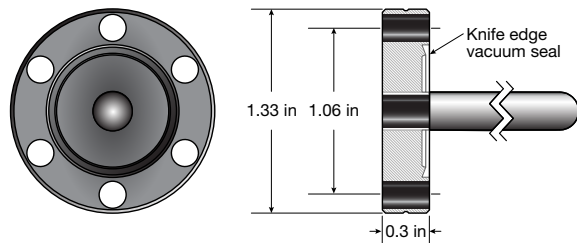
Probe mount

Swagelok® fittings



	1/4 in probe	1/8 in probe
Swagelok® part number	SS-400-1-4BT	SS-200-1-2BT
Material	316 stainless steel	
Thread	0.25 in NPT male	0.125 in NPT male
A	1.59 in	1.5 in
B	0.25 in	0.125 in

CF flange



Material: 304L stainless steel

Flange size: 11/3 in (DN16)

Vacuum rating: 1×10^{-13} torr ($< 1.3 \times 10^{-13}$ mbar)³

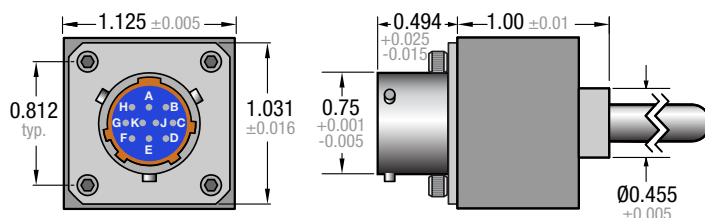
³ Requires the use of appropriate bolts, gasket and mating surface.

Connectors

10-pin Detorionics® connector

The Detorionics connector is o-ring sealed to the temperature probe.

Note: This connector is mounted directly to the probe, meaning that no external cable can be selected with this option. It also eliminates the CF flange probe mount option.



General specifications

Air leakage: 1×10^{-6} cm³/s at 15 psi

Insulation resistance: 5,000 MΩ at 500 VDC

Operating temperature: -55 °C to +125 °C (-67 °F to +257 °F)

Finish is tin-plated shell and pins.

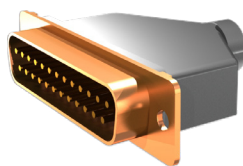
Materials

Shell, bayonet and flange: Carbon steel

Pins: 52 nickel alloy

Insulator: Glass

25-pin D-sub connector



The 25-pin D-sub is required to connect directly to particular Lake Shore temperature monitors.

Supported instruments:

- Model 211
- Model 218

6-pin DIN connector



The 6-pin DIN is required to connect directly to particular Lake Shore temperature controllers and monitors.

Supported current instruments:

- Model 350
- Model 336

- Model 335
- Model 224

Connector configurations

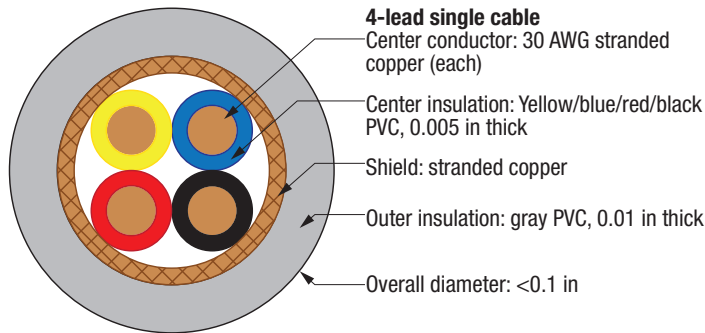
Connector type	I+	V+	I-	V-	Shield ⁴
10-pin probe-mounted Detorionics connector®	Pin A	Pin C	Pin B	Pin D	NA
6-pin DIN	Pin 5	Pin 4	Pin 1	Pin 2	Pin 6
25-pin D-sub	Pin 3	Pin 4	Pin 15	Pin 16	Pin 2

⁴ Shield connection is only used in conjunction with external cable choices that include a braided shield (Cryocable™ and instrument cable)

Wire

Instrument cable

Robust 4-lead cable best for wiring to instrument where both the wire and instrument are at room temperature. The 30 AWG signal wires make these wires easier to work with than traditional cryogenic wire.



Rated temperature: -20 °C to 80 °C

Thermal conductivity (300 K): 400 W/(m·K)

Resistance (300 K): 0.32 Ω/m

Supported sensor types: Cernox® RTD, silicon diode, GaAlAs diode, platinum RTD

Maximum rated temperature: 378 K

Cryogenic wire

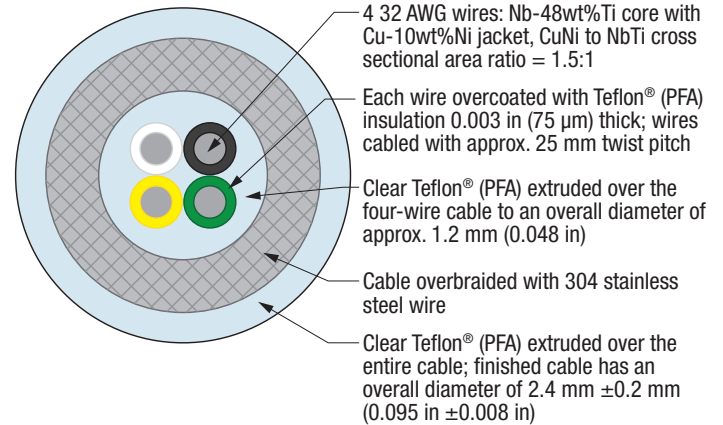
Phosphor-bronze wire combinations that limit heat transfer into the temperature probe and are themselves rated for use in cryogenic environments.

	Quad-Twist™ 36 AWG ⁵	Quad-Twist™ 32 AWG	Quad-Lead™ 32 AWG
Configuration	4-lead		
Wire	Phosphor bronze		
Gauge	36 AWG	32 AWG	
Insulation	Formvar	Polyimide	
Structure	Two twisted pairs		Four wires formed into a ribbon using Bond Coat 999 bonding film
Thermal conductivity (300 K)	48 W/(m·K)		
Resistance (300 K)	10.3 Ω/m	4.02 Ω/m	
Supported sensors	Cernox® RTD, silicon diode, GaAlAs diode, platinum RTD		

⁵ Also used for internal probe wiring. Ordering this cable will result in a continuous length of wire from the sensor through to the outside environment.

Cryocable™

A robust, 4-wire cable for use in cryogenic environments to room temperature for the ultimate in thermal isolation from external heat sources. This cable is designed around 32 AWG (203 μm) diameter superconductive wires consisting of a NbTi core (128 μm diameter) and a Cu-10% Ni jacket. The wire is LTS, requiring very low temperatures for it to become superconducting.



Minimum bend radius: 15 mm (0.6 in)

Superconducting critical temperature: 9.8 K

Superconducting critical magnetic field: 10 T

Supported sensor types: Cernox® RTD, silicon diode, GaAlAs diode, platinum RTD

Magnetic field	Critical current (per wire)
3 T	35 A
5 T	25 A
7 T	15 A
9 T	6 A

	Temperature (K)		
	295	77	4.2
Wire resistance (Ω/m)	9.2	8.4	0 ⁶
Overbraid resistance (Ω/m)	0.90	0.64	0.62
Thermal conductivity—entire cable assembly (W/(m·K))	7.6	2.8	0.17

⁶ Superconducting

Wire configurations

Wire type	I+	V+	I-	V-	Shield
Instrument cable	Black	Yellow	Red	Blue	Copper braid
Quad-Twist™ 36 AWG	Green (from red/green pair)	Green (from clear/green pair)	Red	Clear	None
Quad-Twist™ 32 AWG	Red	Black	Green	Clear	None
Quad-Lead™ 32 AWG	Clear	Black	Red	Green	None
Cryocable™	Black	Yellow	White	Green	Stainless steel braid

Temperature sensors

See the individual Cernox, DT-670, and platinum sensor pages for specifications:

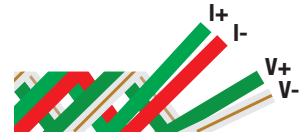
Sensor type	Installed sensor package
Cernox®	SD
DT-670	SD
Platinum	Standard PT-100 Series packages

All temperature sensor calibrations are performed before the device is installed into the probe. At this time, Lake Shore does not perform recalibrations on finished probes.

Instrument cable



Quad-Twist™ 36 AWG



Quad-Twist™ 32 AWG



Quad-Lead™ 32 AWG



Cryocable™





Temperature probe ordering information

US customers can use the online configurator at shop.lakeshore.com. Otherwise contact our Sales department at sales@lakeshore.com and we can assist you.

Specify TP-a-bcd-e-f-g, where:

a = probe length in inches—offered in whole inch increments from 1 to 28 inches

b = tube diameter¹

2	1/8 in
4	1/4 in

¹ Probes over 20 inches long are only available in 1/4-inch diameter

c = probe mount

N	no probe mount adapter
S	Swagelok® fitting ²
F	CF™ flange mount ³

² For 1/8 in diameter probe, Swagelok® fitting uses a 1/8 in NPT male thread; for 1/4 in diameter probe, Swagelok® fitting uses a 1/4 in NPT male thread

³ The CF™ flange is welded to the probe

d = external cable/wire type⁴

N	no external cable (usually used with Detronics connector)
I	30 AWG instrument cable (4-lead)
F	QT-32 (two twisted pairs of 32 AWG phosphor bronze wire)
Q	QT-36 (two twisted pairs of 36 AWG phosphor bronze wire)
L	QL-32 (four 32 AWG wires in a ribbon configuration)
C	CryoCable™ (4-lead cryogenic coaxial cable)

⁴ Lake Shore strongly recommends that all RTD temperature sensors use a 4-lead cable/wire type

e = terminator

N	no connector (leads stripped and tinned)
D	10-pin Detronics connector ⁵
Y	25-pin D-shell connector for temperature monitors
R	connector wired for temperature instruments (6-pin round)

⁵ Selecting a Detronics connector limits the following selections: **d** = N and **f** = 0; the Detronics connector is o-ring sealed to the probe

f = external cable length—offered in whole meter increments from 1 to 10 m (enter '0' for no external cable)

g = temperature sensor type⁶—specify sensor model number with calibration range, if applicable

⁶ Due to indium solder use, all SD sensors have an upper temperature usage limit of 400 K

Ordering example

TP- 06 - 2FC - D - 03 - S27

(6 in probe, 1/8 in diameter, flange, CryoCable, 10-pin Detronics connector, 3 m cable length, DT-670-SD calibrated 1.4 K to 325 K)

Calibration range suffix codes

Numeric figure is the low end of the calibration Letters represent the high end: B = 40 K, D = 100 K, L = 325 K, H = 500 K

Cernox® RTDs

Uncalibrated	C01	CX-1010-SD
	C02	CX-1030-SD
	C03	CX-1050-SD
	C04	CX-1070-SD
	C05	CX-1080-SD
Calibrated	C07	CX-1010-SD-0.1L
	C16	CX-1030-SD-0.3L
	C25	CX-1050-SD-1.4L
	C31	CX-1070-SD-4L
	C32	CX-1080-SD-20L
	C13	CX-1010-SD-1.4L

Platinum RTDs

Uncalibrated	P01	PT-102
	P02	PT-103
	P03	PT-111
Calibrated	P04	PT-102-2S
	P05	PT-102-3S
	P07	PT-102-14L
	P08	PT-102-14H
	P11	PT-103-2S
	P12	PT-103-3S
	P14	PT-103-14L
	P15	PT-103-14H
	P18	PT-111-2S
	P19	PT-111-3S
	P21	PT-111-14L
	P22	PT-111-14H

Silicon diodes

Uncalibrated	S07	DT-670A-SD
	S08	DT-670B-SD
	S09	DT-670C-SD
	S10	DT-670D-SD
	S0A	DT-670A1-SD
	S0B	DT-670B1-SD
Calibrated	S27	DT-670-SD-1.4L
	S28	DT-670-SD-1.4H
	S32	DT-670-SD-70L
	S33	DT-670-SD-70H