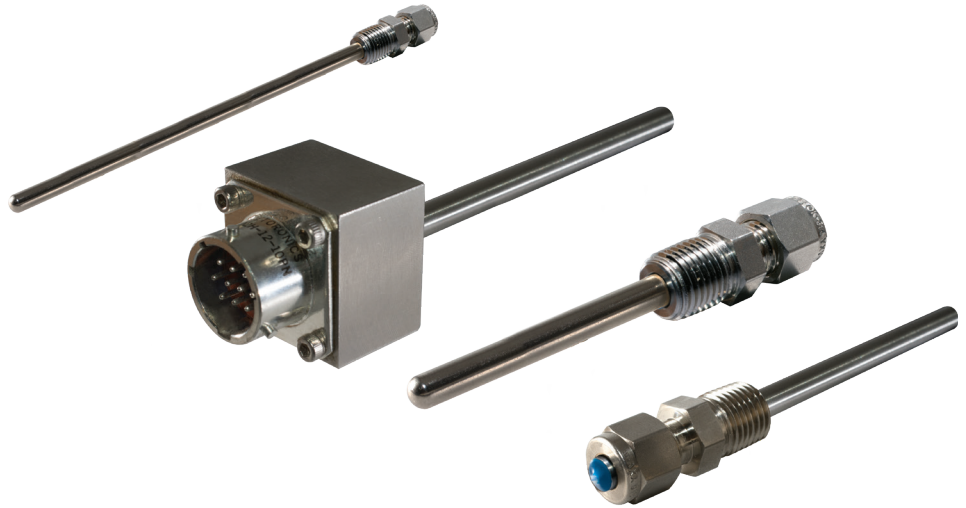




Temperature Probes

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*
1/8 in stem	0.010 in ± 0.001 in	20 in

²Not suitable for direct immersion in liquid oxygen or hydrogen environments.

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

Internal components

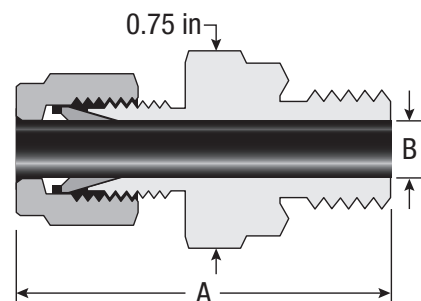
Internal atmosphere: Air

Internal atmosphere pressure: 98 kPa (14.2 psia)

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

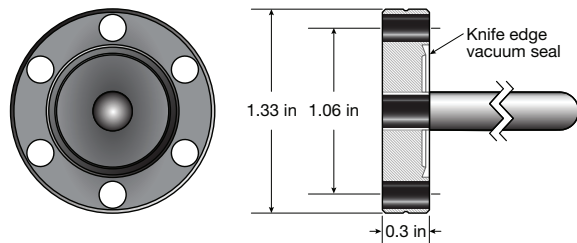
Probe mount

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: 1 1/3 in (DN16)

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

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

Connectors

BNC connector

Standard male BNC connector. When ordering with 4-lead wire, two separate BNC connectors will be provided to maintain the 4-lead measurement.

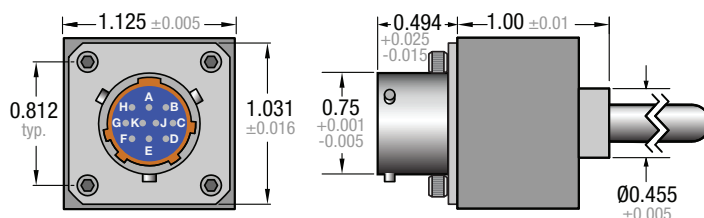
Configuration:

	BNC 1		BNC 2	
	Center pin	Shield	Center pin	Shield
2-lead cable	I/V+ (anode)	I/V- (cathode)	—	—
4-lead cable	I+	I-	V+	V-

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.

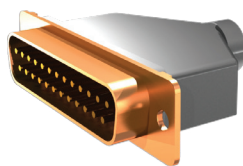
Materials

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

Supported discontinued instruments:

- Model 340
- Model 331/332
- Model 330 (diodes only)
- Model 321 (silicon diodes only)

Connector configurations

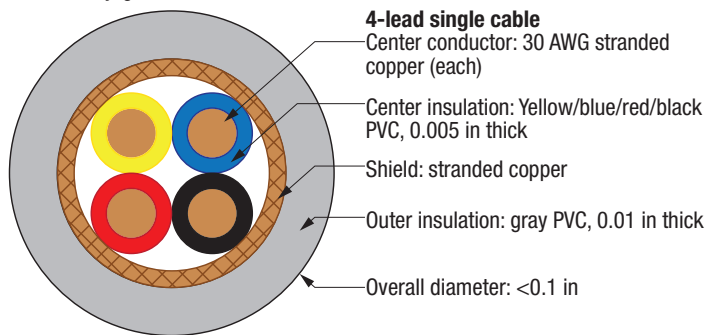
Connector type	I+	V+	I-	V-	Shield*
2-lead BNC (1 connector)	Center pin		Outer cup (shield)		Not connected
4-lead BNC (2 connectors)	Center pin of 'I' BNC	Center pin of 'V' BNC	Outer cup of 'I' BNC	Outer cup of 'V' BNC	Not connected
10-pin probe-mounted Detorionics connector®	Pin A	Pin C	Pin B	Pin D	NA
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

*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

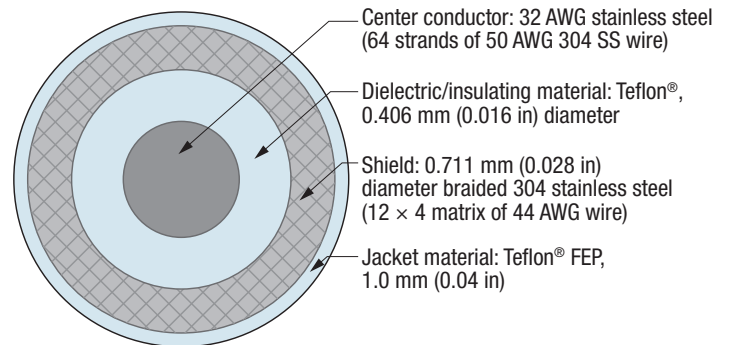
Phosphor-bronze wire combinations that limit heat transfer into the temperature probe and are themselves rated for use in cryogenic environments.

	Quad-Twist™ 36 AWG*	Quad-Twist™ 32 AWG	Quad-Lead™ 32 AWG	Duo-Twist™ 32 AWG
Configuration	4-lead			2-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	One twisted pair
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			Diodes only

*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.

SS (stainless steel) coaxial cable

2-lead cabling solution that is extremely robust and limits heat transfer into the probe. Due to the 2-lead configuration, this cable is only compatible with diode sensors and will cause a predictable (potentially insignificant) offset in any temperature readings.



Electrical properties

Resistance—center conductor at 295 K (22 °C): 23.62 Ω/m (7.2 Ω/ft)

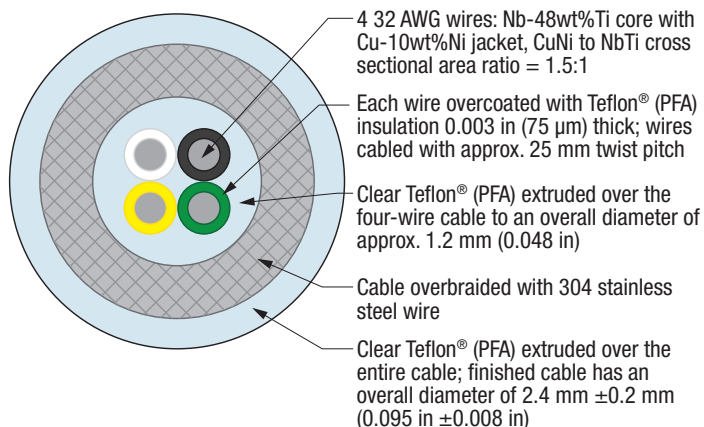
Resistance—shield at 295 K (22 °C): 3.61 Ω/m (1.1 Ω/ft)

Insulation temperature range: 10 mK to 473 K

Supported sensor types: Silicon diode, GaAlAs diode, platinum RTD

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 μ m) diameter superconductive wires consisting of a NbTi core (128 μ m 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*
Overbraid resistance (Ω /m)	0.90	0.64	0.62
Thermal conductivity—entire cable assembly (W/(m·K))	7.6	2.8	0.17

*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
Duo-Twist™ 32 AWG	Clear		Green		None
Stainless steel coaxial	Center conductor		Shield		None
Cryocable™	Black	Yellow	White	Green	Stainless steel braid

Instrument cable



Quad-Twist™ 36 AWG



Quad-Twist™ 32 AWG



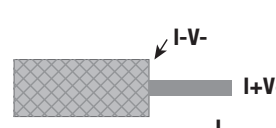
Quad-Lead™ 32 AWG



Duo-Twist™ 32 AWG



Stainless steel coaxial



Cryocable™



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.