JMS Southeast, Inc.
Temperature Measurement

Specialty Sensors

SPECIALTY SENSORS

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JMS Southeast endeavors to manufacture very unique sensors to satisfy our customers' application needs. If you don't find the sensor you desire, please contact JMS for assistance.

CUSTOM DESIGN OFF THE SHELF TIME!

For other types of sensors/transducers (infrared, mercury and glass, bimetals, etc.) not manufactured by but available through JMS, See Section 10.

LABORATORY THERMOMETERS

JMS offers 7 different reference probes for laboratory use...

STANDARD PLATINUM RESISTANCE THERMOMETERS

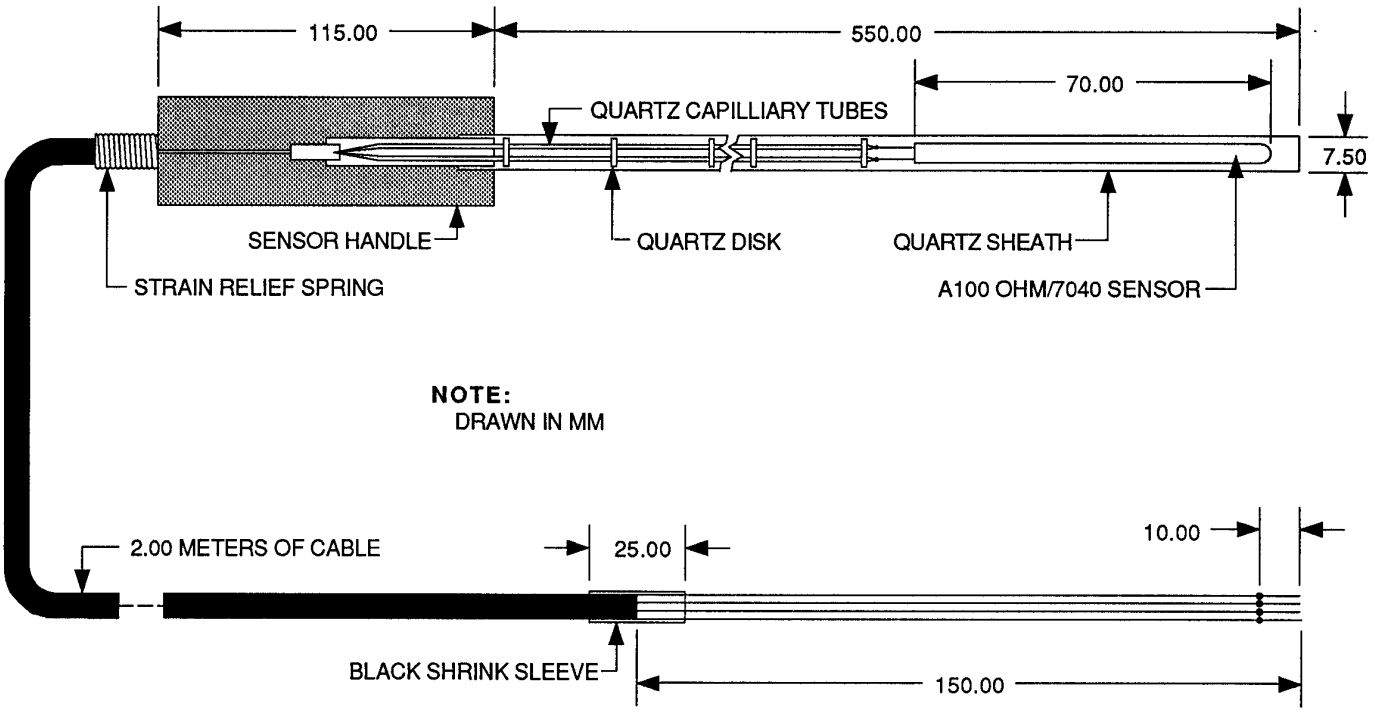
The first and most accurate of the laboratory probes is the SPRT. It has the tightest specifications and is also the most fragile and expensive. Typical drift rates are about 0.001°K annually or about 0.002°C after 100 hours at 660°C.

The SPRT allows the user to realize ITS 90. Our most common unit is the 4ZP model which allows the realization from the boiling point of nitrogen (-195.798°C) to the zinc freezing point (419.527°C). The JMS 4AP unit allows the user to realize ITS 90 from 0°C to the freezing point of aluminum (660.323°C).

Model # [3-21]	R@0°C*	Alpha Coefficient*
4ZP25.5C**	25.5Ω	.003925
4ZP100C**	100Ω	.003925
4AP25.5**	25.5Ω	.003925

* Calibration report will document the exact numbers along with the TPW/MPG ratios.

** The “C” in the part number indicates we will provide calibration. If you intend to send the probe to NIST or some other lab for calibration / certificate, omit the “C”



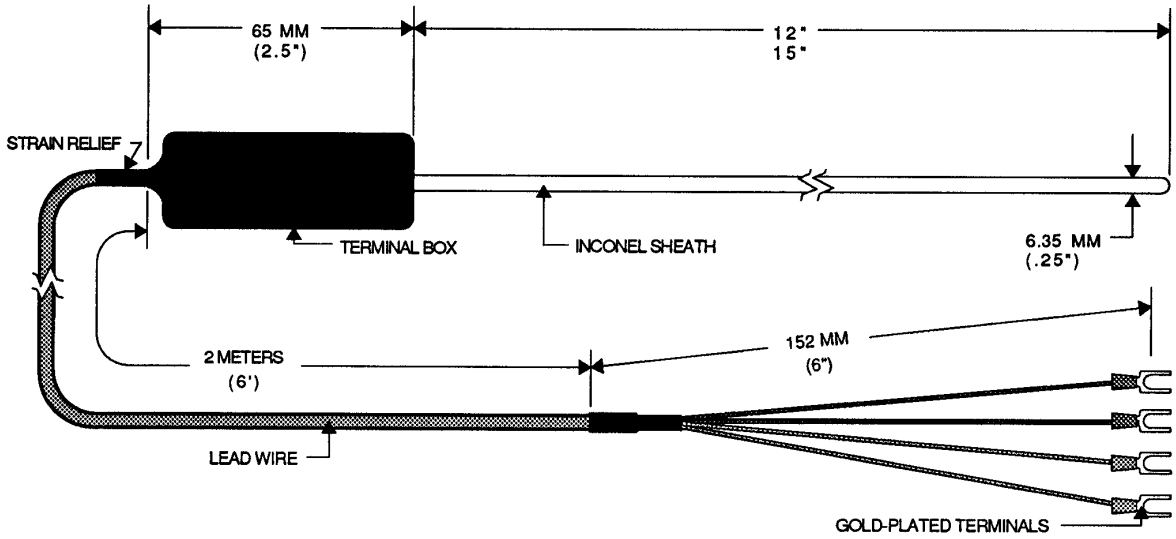
Note: ITS 90 says that an SPRT should have a resistance at melting point of gallium greater than 1.11807 times it’s water triple point resistance. That means that you should not use an RTD with a 0.00385 alpha coefficient as an SPRT. However the experience of JMS Southeast indicates that they are great as secondary standards and are described on the following pages.

LABORATORY THERMOMETERS

SECONDARY STANDARD RTD'S

These sensors are intended to be used as the standard for a working laboratory. For instance, JMS uses these types of probes as the reference for our day to day comparison calibrations done on the sensors you use in your processes. We use the SPRT mentioned on the previous page to calibrate and validate this secondary standard.

The secondary standard covers the full range from -200°C to 660°C. It is only slightly more drift prone than the SPRT. (<0.003°C per year or <0.005°C after 500 hours @ 600°C (estimated)) It is much more rugged than the SPRT it has an Inconel 600 sheath, which might not break if dropped on a laboratory floor.



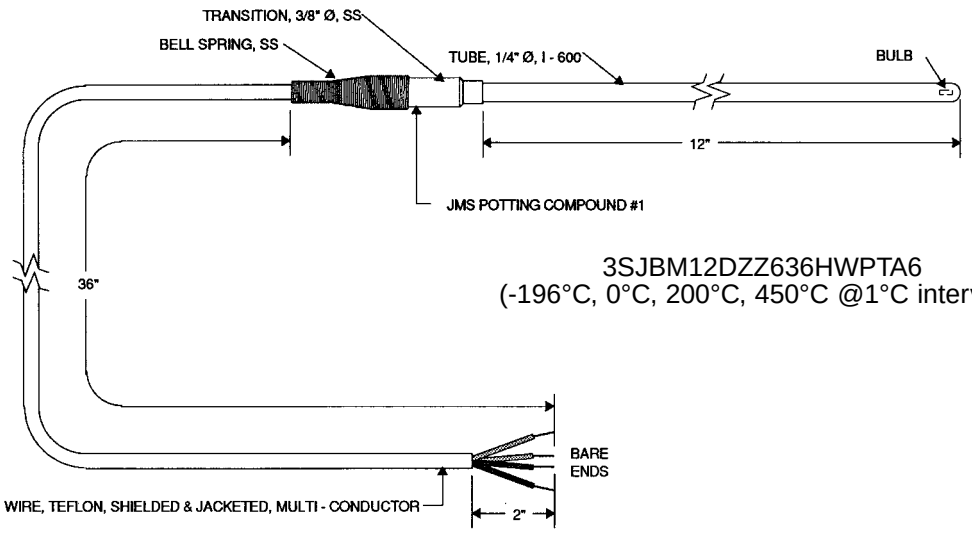
It can be manufactured to any length using the following part numbers:

4SS (length in inches) 25.5 C* (25.5Ω@0°C)
4SS (length in inches) 100 C* (100Ω@0°C)

*indicates a standard calibration will be done using 5 points between -200°C and 600°C. If you intend to send to another lab for calibration, omit the "C".

PRECISION INDUSTRIAL RTD

Our Precision Industrial RTD can be specified by using the pages from the regular RTD section. They can be made in almost any size or shape.



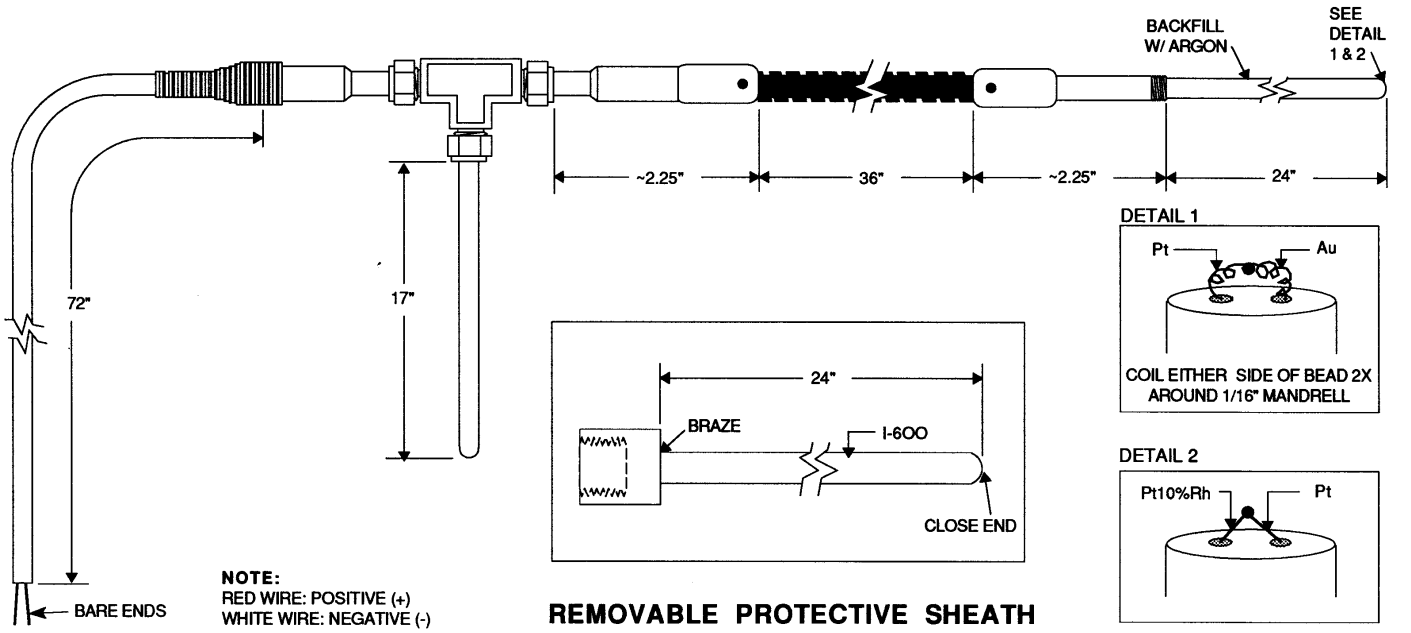
3SJBM12DZZ636HWPTA6
(-196°C, 0°C, 200°C, 450°C @1°C intervals)

GOLD-PLATINUM-RHODIUM LABORATORY THERMOMETERS

JMS STANDARDS THERMOCOUPLE

IPTS 68 allowed the use of type S thermocouples as a method to realize the temperatures above the range of an RTD. ITS 90 does not speak to the use of thermocouples, but they are recognized by many labs as a secondary standard and are great for comparison calibrations. ASTM and NIST still and will continue to recognize the use of Pt/Au and Pt/PtRh in laboratories, and NIST has defined the millivolt tables (Seebeck Coefficients) which are included in section 1 of this catalog. These tables are taken from ASTM E-1751 and ASTM E-230.

Use the appropriate drawing number to order.



These two referenced sensors are an excellent choice for comparing calibration equations in an industrial facility. An accurate and traceable millivolt meter plus one of these probes is all you need to do a totally accurate and effective standards traceable calibration.

Comparison of compositions of probes

JMS Part #4PTAUC*	JMS Part #4PTRHC*
Pt/Au	Pt/PtRh
0 - 1000°C	0 - 1450°C
Non alloyed metals	Higher range
Calibration extremely close to standard	
±0.2°C or better	±1.0°C or better

*A calibration is supplied with any probe and for no calibration, omit the C in the part #.

See Section 1 for temperature / EMF Tables.

SINTERING, FURNACE & GLASS THERMOCOUPLES

#1	SERIES
4G	Sintering, furnace & glass thermocouple (Purged and packed with high temperature inert gas.)

#2	TYPE
S	Platinum/Platinum 10% Rhodium
R	Platinum/Platinum 13% Rhodium
B	Platinum 6% Rhodium/Platinum 30% Rhodium
C	Tungsten 5% Rhenium/Tungsten 26% Rhenium
X	Other, specify

#3	OUTSIDE DIAMETER
B	1/4" (Standard)
C	3/16"
D	1/8"
E	1/16"
F	1/25"
X	Other, specify
Z	N/A

#4	SHEATH MATERIAL
A	Platinum - 10% Rhodium
B	Platinum - 20% Rhodium
R	Molybdenum (purged)
S	Tantalum
T	Titanium
M	Inconel 600
X	Other, specify

#5	THERMOCOUPLE JUNCTION
G	Grounded
U	Ungrounded (Standard)

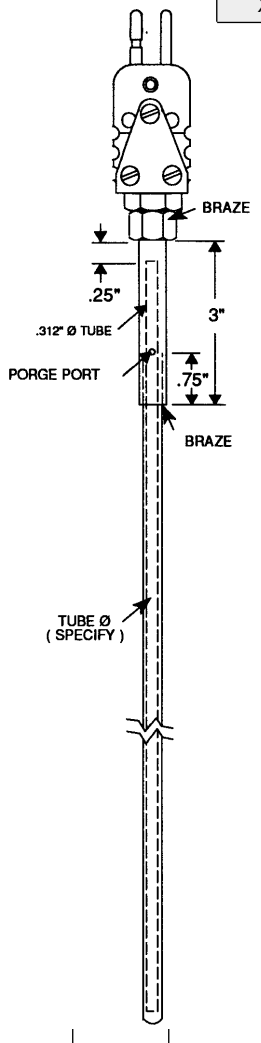
#6	IMMERSION LENGTH
__"	Length in inches

#7	INSULATION
M	MgO
A	Al2O3 (Standard)
B	BeO
H	HfO2
X	Other, specify

#8	FITTINGS
Z	No Fitting (Standard)
F	Reverse mounted steel plug fixed for attaching head
G	Fixed stainless steel to sheath
H	Compression fitting ss w/ ss ferrule } Fit on .312 diameter section of drawing.
X	Other, specify

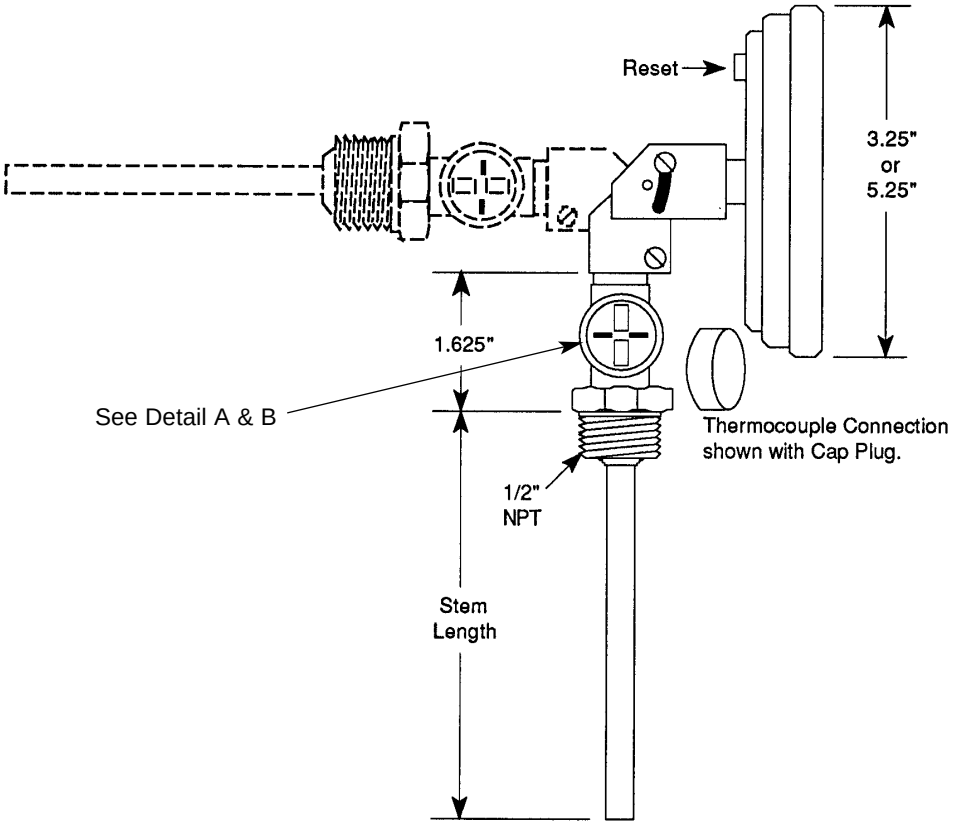
#9	PROCESS NPT
A	1/2
B	1/4
C	1/8
X	Other, specify
Z	N/A (Standard)

#10	COLD END TERMINATION
C	Standard plug
F	Hi temp std plug (Standard)
I	Explosion proof Nema 7 head
L	Aluminum head w/ hinged cover
M	Aluminum head w/ screw cover & chain
N	Cast iron head w/ screw cover
X	Other, specify



4G	S	B	R	U	14"	A	Z	A	F	

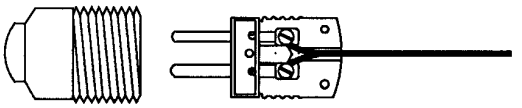
ANALOG BEMOMETER



Unites Bimetal with Either Thermocouple or RTD Technology!

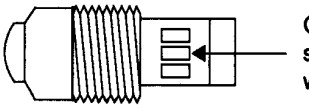
- **Bimetal Dependability**
- **Thermocouple / RTD Accuracy**
- **Direct AND Electronic Reading**
- **Easy To Use**
- **Easy To Calibrate**
- **Two Sensors in One Instrument**

Thermocouple Connection



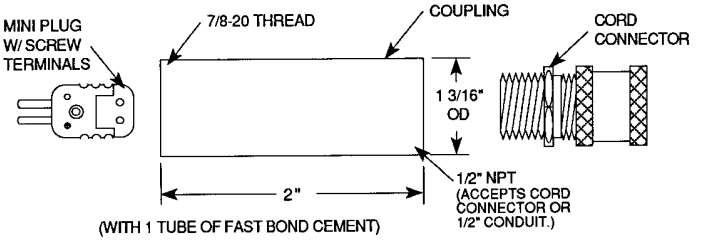
Subminiature T/C Plug
(Shown with cover off)

RTD Terminal Block Connection (3 pos.)



Permanent Wiring Kit

Detail A



Detail B

This thermometer combines the convenience, simplicity, and self-powered actuation of a bimetal thermometer with the digital accuracy and data acquisition capabilities of a thermocouple or RTD. With standards traceable to the NIST, this new instrument offers simplified calibration for ISO 9000 compliance and other statistical process control requirements. It is also ideal in applications requiring easy and quick readability while still affording a means of electronic data acquisition. There is no need to add access points or thermowells to your existing process in order to gain different types or readings. Plus two temperature sensors to work at each location.

This is available with a 3” or 5” dial, in a Back Connected or Adjustable angle case, 1/4” stem diameter in lengths to 12”, 1/2” NPT connection, in ranges from -100°F (-70°C) to 500°F (260°C), with Fahrenheit, Celsius and Dual Scale Dials available. Thermocouple output may be accessed via a plug-in connector; RTD output is accessed by a terminal block. Both have 1/2” conduit threaded mounting and a plastic cap standard. Optional weatherproof housing is available. Construction is of type 304 series stainless steel with a glass crystal. It is hermetically sealed per ASME B40.3 standard. It also comes with a one-year warranty.

ANALOG BEMOMETER

How To Order Your Adjustable Angle Bemometer:

KEY MODEL NUMBER: ***30 060 0 01 K - PWK*** *(Optional)* Permanent Wiring Kit

Table 1: Basic Model
Table 2: Stem Length
Table 3: Scale Type (F, C or F&C)
Table 4: Range
Table 5: Sensor Type

Table 1 - Model

KEY	DESCRIPTION
30	3” Back connection (with reset)
32	3” Adjustable angle (with reset)
50	5” Back connection (with reset)
52	5” Adjustable angle (with reset)

Table 2 - Stem Length

KEY	DESCRIPTION - Max. 12”
4	
6	
9	Length in inches
12	
X	Other, specify

Table 3 - Scale Type

KEY	DESCRIPTION
0	Dual scale Fahrenheit and Celsius
1	Single scale Celsius only
2	Single scale Fahrenheit only

Table 4 - Standard Ranges

KEY	DESCRIPTION		
	Dual scale F/C	Celsius only	Fahrenheit only
01	-100/150F & -70/70c	-70/70c	-100/150
02	-40/120F & -40/50C	-50/50C	-40/120F
03	25/125F & -5/50C	0/50C	25/125F
04	0/140F & -20/60C		0/140F
05	0/200F & -15/90C	0/100C	0/200F
06	0/250F & -20/120C	-20/120C	0/250F
07	20/240F & -5/115C		20/240F
08	50/300F & 10/150C	0/150C	50/300F
09	50/400F & 10/200C	0/200C	50/400F
10	50/500F & 10/260C	0/250C	50/500F

Table 5 - Sensor Type

KEY	DESCRIPTION
J	Thermocouple output, Type J
K	Thermocouple output, Type K
E	Thermocouple output, Type E
T	Thermocouple output, Type T
3	100Ω RTD output, 3 wire

COMBINATION THERMOCOUPLES AND RTD'S

JMS Southeast, Inc., manufactures a sensor that contains both a thermocouple and an RTD. The standard design allows the user to check and validate readings with one sensor while using another type for control or monitoring. Although two thermocouples can be used simultaneously, it is not advisable to use the thermocouple and RTD at the same time.

This type of sensor can be used in applications that require two different inputs. One advantage of this system is that the conditions which adversely affect a thermocouple may not affect the RTD and vice versa. Therefore, combination sensors provide a back-up sensor in the same probe. In extremely high temperature applications, this procedure is not recommended. JMS Southeast can also manufacture triple elements of just about any combination. Contact JMS for details.

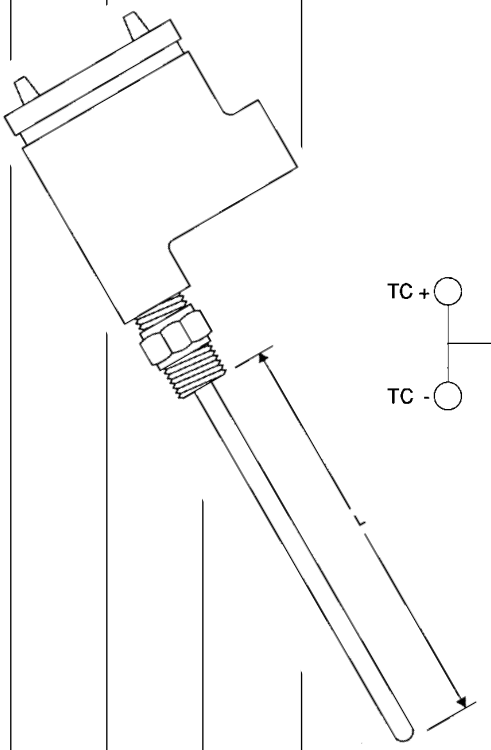
There are three types of popular transmitters which accept this sensor directly. We recommend our 8B (AI-2000) and the 8A (AI-1000).

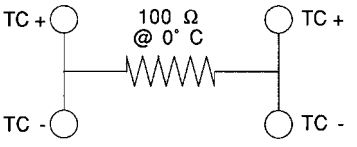
#1	SERIES
4C	Combination, 4 wire, dual element, 1/4" diameter, ungrounded/ non isolated thermocouple and RTD

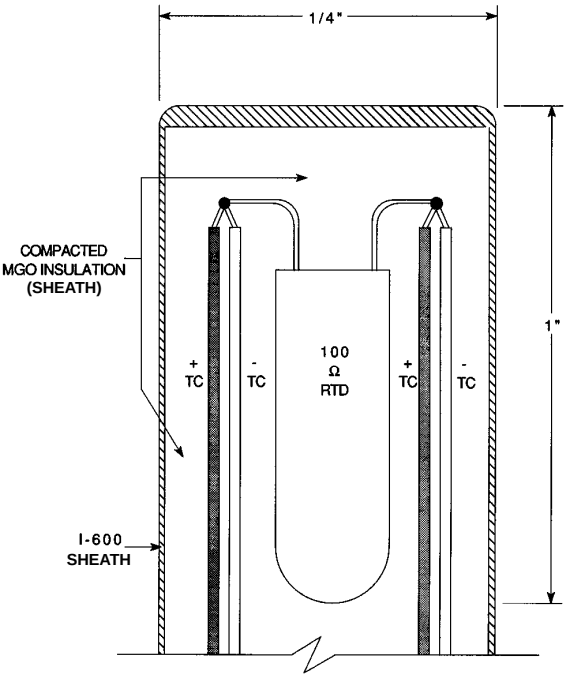
#2	THERMOCOUPLE TYPE
J	Dual element J thermocouple
K	Dual element K thermocouple
T	Dual element T thermocouple
N	Dual element N thermocouple
X	Other, specify

#3	RTD TYPE
3	Single element 100Ω Platinum RTD (.00385)
X	Other, specify

#4	TEMPERATURE LIMITS
1	Hollow tube < 550° F (T/C's and RTD's are not electrically connected)
2	Sheath <1200°F (Type K & N thermocouples only)







4C	J	3	1	

COMBINATION THERMOCOUPLES AND RTD'S

#5	IMMERSION LENGTH (L)
--"	Immersion in inches

#6	STANDARD INDUSTRIAL FITTING
S	Spring loaded 1/2"x x1/2" NPT SS fitting
W	Welded 1/2" x 1/2" NPT SS fitting
B	Bayonet style (standard) 1/2" process connection
	COMPRESSION FITTINGS
H	Stainless steel with SS ferrule - 1/8" NPT
M	Stainless steel with SS ferrule - 1/4" NPT
P	Stainless steel with SS ferrule - 1/2" NPT
X	Other, specify

#7	LEAD WIRE INSULATION AND LENGTH IN INCHES [3-2]
Z	No lead wire
1__"	Kapton - Standard for hollow tube
3__"	Teflon
6__"	Kapton/flex armor overall
X	Other, specify

#8	TYPE OF TRANSITION [1-16, 3-14]	
T	3/8" OD	**Note:** For extra high humidity / moisture environments, put a "2" after your selection. [See page 3-14]
X	Other,specify	For high temperature at the transition area use X + type of transition and maximum temperature.
Z	No transition	

#9	COLD END TERMINATION [SEE SECTION 6] Pick as many as applicable
A	Bare ends
I	Explosion proof Nema 7 head (6I / 6B2)
K	Spade lugs (6SL)
L	Aluminum head w/ hinged cover (6LW / 6NTB)
M	Aluminum head w/ screw cover & chain (6M / 6G)
N	Cast iron head w/ screw cover (6N / 6G)
O	Open ceramic terminal block (6N)
Q	Black nylon Nema 4 head (6Q / 6C)
R	High dome head (6R)
V	Hermetic connector (6DC) - Male*
W	Microphone style connector (6DA) - Male*
X	Other, specify

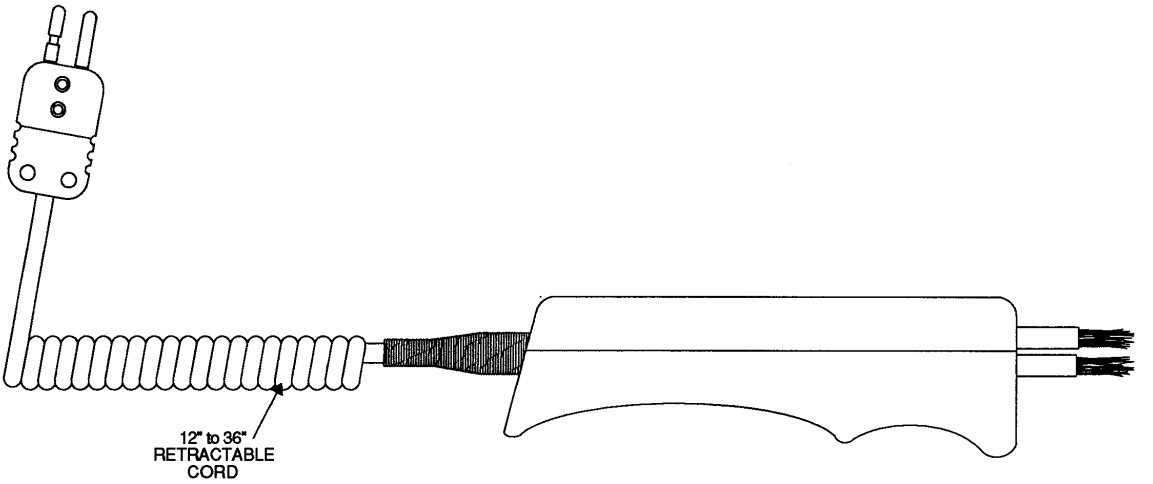
* Use double symbol here for matching female connector. i.e. W/WW (male with matching female).

Note: For any other cold end termination, use appropriate part numbers from section 6 in place of symbol #9.

#10	TAGGING AND CALIBRATION OPTIONS (USE ONLY IF APPLICABLE)
___	See page 1-2 #14 for ordering selections.

12"	W	Z	Z	N		

BRUSH THERMOCOUPLES



The JMS Brush Thermocouple can be used in applications in which a surface temperature of a stationary or moving electrically conducting surface is needed.

True temperature measurement of a surface is very hard to obtain. Previous designs called for the probe to fully contact with as small a junction as possible, spring load with as even pressure as possible, insulate around the surface to be measured, or combinations of all these methods.

All of the above methods have proven to have their own particular faults. When compared to an infrared sensor, which does accurately measure surface temperature (unit must have correct emissivity adjustment), most of these above mentioned sensors either read much hotter or colder than the infrared. However, even the infrared style exhibits problems when emissivity levels fall beneath .4 or less (most metallic surfaces).

JMS has applied for a patent on this brush sensor because of its unique design and widespread application, i.e., molds, rolls, bearings, nozzles, plates, pipes, engines, etc., it is usually preferred in a hand held design, but can be adapted for permanent mounting.

Standard calibration for this sensor is usually K because of its resistance to corrosion and stiffness. But any type thermocouple may utilize this design. Call or write for further information.

#1	SERIES
4B	Specialty brush sensor

#2	TYPE
J	Iron/Constantan
K	Chromel/Alumel (Standard)
X	Other, specify

#3	DESIGN
S	Standard handle / 12” polyvinyl coil cord. Length will stretch from 12” to 36”
X	Other, specify

#4	COLD END TERMINATION
A	Bare ends
B	Miniature plug (Standard)
C	Standard plug

#5	REPLACEMENT BRUSHES
0	None
1 +	Number of sets of replacement brushes

For replacement brushes only, use part #4B___ZZ.

4B	K	S	B	2	

PAD RTD'S

The JMS pad RTD is a speciality sensor which provides a fast response surface measurement. It is a 100 ohm platinum RTD with an alpha of .00385 Ω/Ω/°C. Pad material is fiberglass coated with a silicon rubber.

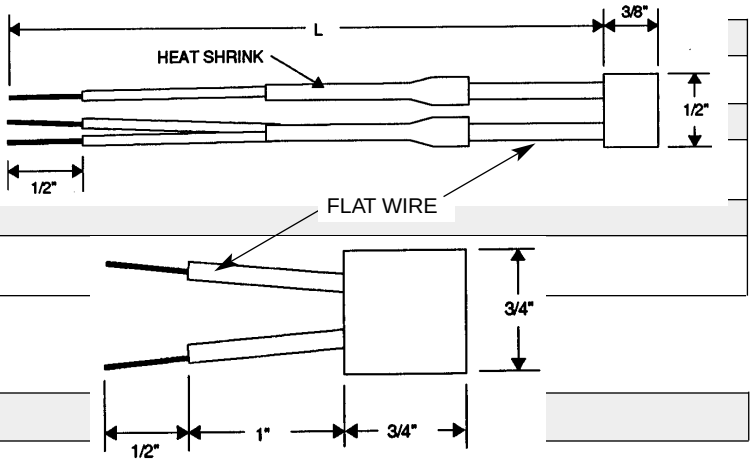
The pad RTD has an effective operating range from -200°C to 250°C and its tolerance is .1%. Additional teflon leadwire is configured as a 3 wire RTD.

#1	SERIES
4PAD	JMS pad RTD

#2	PAD DIMENSIONS
T	3/4" x 3/4", .05" Thick
L	1/2" W x 3/8" L, .05" Thick

#3	LENGTH OF LEADWIRE
Z	Standard 1"
X	Other, specify length in inches

4PAD	T	Z



MULTIPOINT SENSOR ASSEMBLIES

A multipoint sensor allows the measurement of a temperature profile across a large area. Thermocouples or RTD's are arranged with measuring junctions at various points along a pipe, allowing the measurement of various points from a complete assembly.

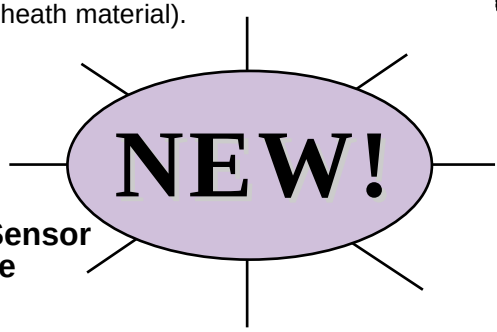
Many elements can be spaced along a probe. This opens up possibilities for improved profiling in catalytic reactors, for example, where flow interference prevents inserting large numbers of individual probes.

Multipoint probes can also be used to give a temperature profile where stratification of a tanks contents may be of concern.

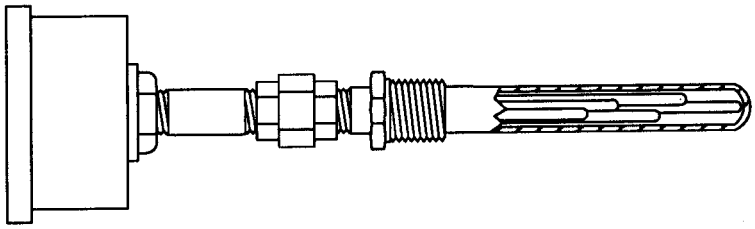
JMS will custom design your assembly to give you the most accurate temperature measurement for your process.

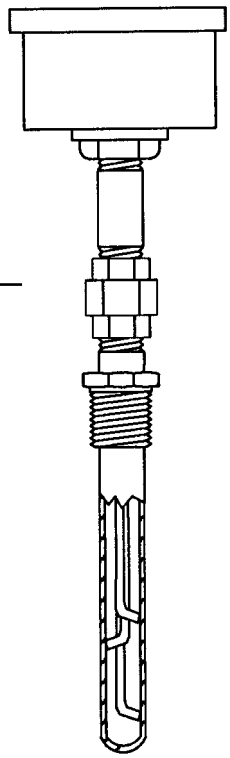
The following information and/or drawing is needed to properly design your assembly.

—Thermocouple calibration or RTD element type
—Outside diameter of pipe and pipe material.
—Number of elements required and lengths.
—Junction style of thermocouple.
—Sensor material (bare wire, 316 SS tubing, or sheath material).
—Overall length of the entire assembly.
—Process connection.
—Accuracy required.
—Cold-end termination.
—Maximum operating temperature.



Removable / Replaceable Sensor Design - Now Available





Note: JMS has a proprietary design which assures consistent response time for each probe, plus removability for recalibration. Call and ask about it!

HAND HELD SENSORS

DESCRIPTION

The standard JMS hand held sensor is 316 stainless steel.

#1	SERIES
4H	Hand held sensor

#2	TYPE
J	Iron/Constantan, standard limits of error
K	Chromel/Alumel, standard limits of error
T	Copper/Constantan, standard limits of error
E	Chromel/Constantan, standard limits of error
3	RTD 100Ω Platinum .00385 alpha, 3 wire, .12% accuracy
X	Other, specify

#3	OUTSIDE DIAMETER
A	3/8" (.375")
B	1/4" (.250")
C	3/16" (.188")
D	1/8" (.125")
E	1/16" (.063")
X	Other, specify

#4	LENGTH OF SHEATH [L]
--"	Length in inches

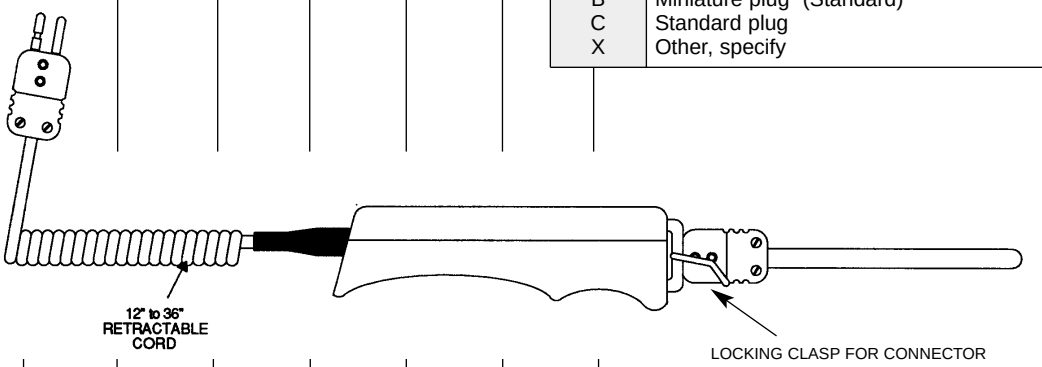
#5	MEASURING JUNCTION
G	Grounded
U	Ungrounded (RTD's are always ungrounded)
E	Exposed
X	See order symbols on Page 1-13 for special junctions such as pointed tip and gas/air.

#6	PRESENCE OF HANDLE
H	Handle
X	Other, specify
Z	N/A

#7	LEAD WIRE INSULATION AND LENGTH IN INCHES
S	Coil-cord. Length will stretch from 12" to 36" (Standard)
2__"	20 awg PVC
3__"	20 awg Teflon
5__"	20 awg Kapton
6__"	20 awg Glass braid/Flexible armor overall
7__"	20 awg Teflon/Flexible armor overall
8__"	20 awg Glass braid/Stainless steel overbraid
9__"	3 conductor Teflon with overall jacket of Teflon (RTD only)
10__"	3 conductor Teflon/Stainless steel overbraid with overall jacket of Teflon. (RTD only)
X	Other, specify

#8	COLD END TERMINATION
A	Bare ends
B	Miniature plug (Standard)
C	Standard plug
X	Other, specify

Other styles of hand-held sensors are available. Contact JMS Southeast, Inc. for your custom design.



4H	J	B	6"	G	H	9-36"	B	

SURFACE PROBES

JMS offers this standard surface probe as an option to the brush sensor (also included in this section) for surface temperature measurements.

Most all of these types of probes have a common weakness. Since the tips must remain in contact with the surface being measured, the tips are prone to damage and failure. Unlike our competitors, our design allows you to easily replace the tip and get back to business.

#1	SERIES
4	Surface Measurement Thermocouple

#2	STYLE
A	Hand Held
B	Permanent Mount

#3	TYPE
J	Iron/Constantan, standard limits of error
K	Chromel/Alumel, standard limits of error
X	Other, specify

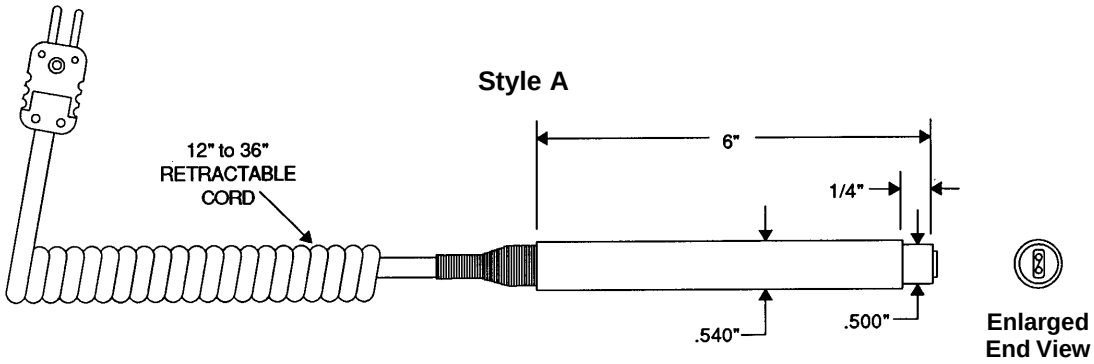
#4	LENGTH
2	Standard
X	Other, specify

#5	LEAD WIRE INSULATION AND LENGTH IN INCHES
S	Standard retractable cord. 12" - 36" long. (PVC)
X	Other, specify
Z	N/A (For Style B)

#6	COLD END TERMINATION
B	Miniature plug (Standard for Style A)
X	Other, specify
Z	N/A (For Style B)

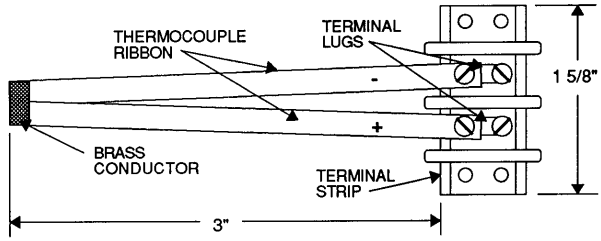
#7	# OF REPLACEMENT TIPS
0	None
1 +	Number of tips

Style A



Enlarged End View

Style B

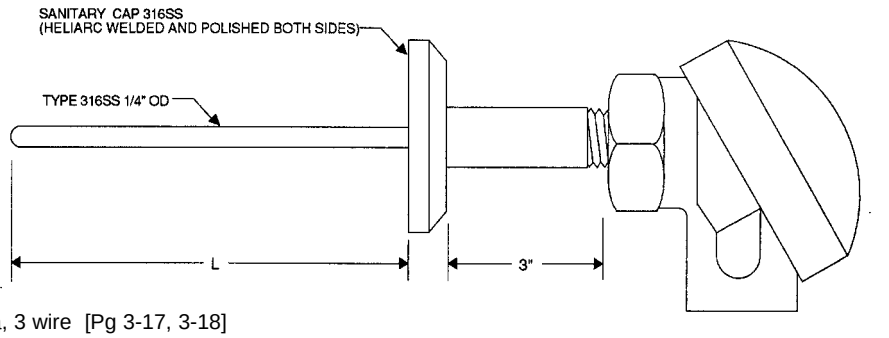


4	A	J	2	S	B	1	

3A APPROVED SANITARY SENSORS

CIP (clean-in-place) line of 3-A certified sanitary thermocouples and RTD's from JMS are specially designed to meet the needs of the food, dairy, beverage, pharmaceutical, chemical and cosmetic industries. They are ideally suited for a number of applications where corrosion and contamination are factors. They are fabricated from stainless steel using a method assuring imperfection-free surfaces.

Units may be supplied utilizing sanitary caps from Alloy Products, Cherry-Burrell or Lapish Tri-Clover, or spring loaded fittings in sanitary thermowells. Each design is polished to a No. 4 finish to assure that there are no pits, folds or crevices. The exterior nipple, also stainless steel, can be joined to a coated or plastic connection head, designed to withstand caustic washdown. A typical RTD or Thermocouple may be used with a sanitary thermowell, see pages 1-1 and 3-1.



#1	SERIES
4A	Sanitary Sensors

#2	TYPE
J	Iron/Constantan
K	Chromel/Alumel
T	Copper/Constantan
E	Chromel/Constantan
3	RTD 100Ω Platinum .00385 alpha, 3 wire [Pg 3-17, 3-18]
X	Other, specify

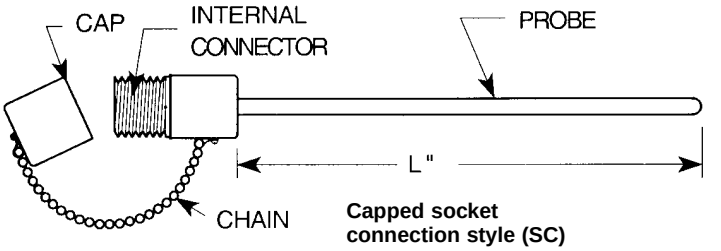
#3	LIMITS OF ERROR	ELEMENT CONSTRUCTION
1	Standard	Single
2	Standard	Dual
3	Special	Single
4	Special	Dual
X	Other, specify	

#4	MEASURING JUNCTION
G	Grounded
U	Ungrounded
I	Isolated
	Note: RTD is always ungrounded from tubing.

#5	IMMERSION LENGTH (L)
--"	Length in inches

#6	SANITARY CAP OPTIONS - CLAMP FITTINGS
A	Alloy Products (K16A)
B	Cherry-Burrell (16AI-14I) (Must specify standard or screwed)
T	Tri-Clover (16 AMP)
	SANITARY CAP OPTIONS - BEVEL SEAT FITTINGS
U	Alloy Products (16APV with No. 13H Nut) } SEE NOTE 1
V	Cherry-Burrell (16A-14 with No. 13H Nut) } SEE NOTE 1
Y	Tri-Clover (16A with No. 13H Nut) } SEE NOTE 1
	STANDARD INDUSTRIAL FITTINGS
R	Spring loaded with 1/2" x 1/2" NPT 4" nipple (To be used with a sanitary thermowell. See page 5-5.)
X	Other, specify
Z	N/A

Note 1: All caps are mounted facing the hot end - unless specified here.
ie. Use X + brand of cap + reverse mount

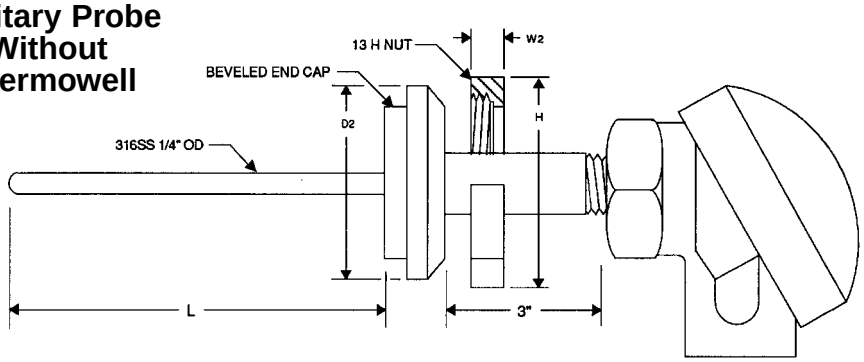


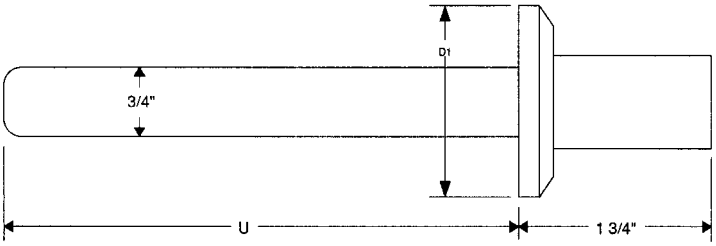
Capped socket connection style (SC)

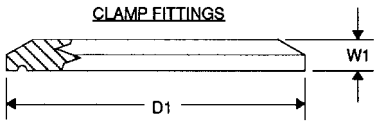
4A	J	1	G	12"	A	

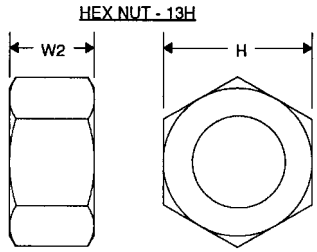
3A APPROVED SANITARY SENSORS

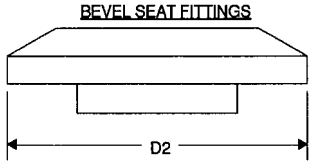
Sanitary Probe Without Thermowell











Standard Industrial Sanitary Thermowells

[See 5-5 and 5-6 for ordering info on TWells]

#7	CAP TUBE SIZE	CLAMP FITTING A (inches)	B	BEVEL SEAT FITTING A (inches)	B	HEX NUT - 13H A (inches)	B
15	1 1/2”	.250	1.984	1.844	N/A	31/32	2.4062
20	2”	.250	2.516	2.375	N/A	.250	3
25	2 1/2”	.250	3.047	2.906	N/A	.250	3.5938
30	3”	.250	3.579	3.438	N/A	.250	4.1875
40	4”	.312	4.682	4.500	N/A	.312	5.4375
Z	Not Applicable						
X	Other, specify						

#8	FINISH
H	#4 Finish (Standard)
E	Electropolish
P	Passivate (Includes #4 Finish)

#9	LEAD WIRE TYPE AND LENGTH IN INCHES	MAX. TEMP. °F
Z	No lead wire	
1__”	Glass braid	900°F
3__”	Teflon	400°F
X	Other, specify	

#10	COLD END TERMINATION
A	Bare ends
6P	Epoxy coated cast head with gasket
WP	White plastic head (3A Standard)
SC	Capped socket connection (with mating connection) - See Pg. 4-13
X	Other, specify*

***When specifying another style connection head or no head, be sure to observe requirements and restrictions as imposed by the 3-A Standard #09-09.**

15	H	3-36”	A	

CONTINUOUS THERMOCOUPLE TRANSDUCER CABLE

FTLD® - The Heat-Seeking Thermocouple

Introduction

The FLTD Continuous Thermocouple® is a temperature measuring sensor, which takes the form of a thin flexible cable. Like its predecessor CT²C®, it is a heat-seeking thermocouple, using similar thermo-electric techniques, but designed especially to reveal changes in the narrow band of temperatures only a few degrees above normal ambient.

FTLD is able to measure the maximum temperature detected between its two ends, then track any increase, even if the position of the "hot-spot" changes. Such ability offers an immense opportunity to prevent loss due to overheat, in commercial as well as industrial applications.

This advanced form of dector permits the design of overheat warning systems, which are highly sensitive to early departures from normal, yet exhibit an extraordinary freedom from false alarms.

Operating Principle

A Circuit formed from two dissimilar wires joined at both ends, develops an emf (voltage) proportional to the difference in the two junction temperatures. This is the long established Thermo-electric effect, and today the junctions are known as the "Measuring Junction". See diagrams below.

Although an FTLD sensor performs like a normal thermocouple, the measuring junction is not formed by directly joining the two wires. More remarkably, the Measuring Junction is not fixed, but becomes concentrated at the hottest point within the insulation resistance when subjected to an increase in temperature.

The nature of the insulation causing this phenomenon is such that the voltage developed between the two wires always relates to the highest temperature along the cable sheath.

Features

Stable

Moisture resistant

Sensor needs no power

Virtually free from false alarms

Ambient temperature compensation

Early warning of abnormal temperature

Alarm point unaffected by cold weather

Simple apparatus (Hazardous Area)

User adjustable alarm settings

No site calibration

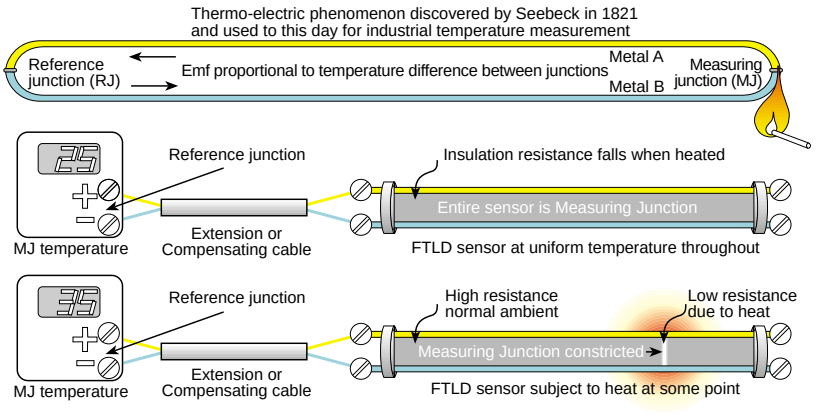
Advantages

Self-generating temperature sensor
Measures maximum temperature
Initial site temperature check not needed
Visible operating status
Optional rate of change alarm (same unit)
Alarm settings directly in degrees
Alarms can be set before installation
Interchangeable sensors
Sensor not microphonic
System check facility in sub zero band
Alarm units for mains power or low voltage
Sensor need not be near alarm unit

Specification

Protective sheath -	Dual layer PTFE
Measuring element -	Type "K" thermocouple - insulated
Sensor output -	Millivolts DC related to maximum cable temperature
Normal operating range -	-29 to 80°C (-20 to 176°F)
Survival range -	-40 to 200°C (-40 to 392°F)
EMI protection -	Twisted cores & metallised tape tube
Insulation -	Glass fibre impregnated with special insulating material
Minimum bend radius -	40 mm
Construction -	Twisted pair, NTC insulation, EMI screen, outer sheath
Sizes -	3.5mm OD approx. Cut to length as required
Minimum length -	15 meters
Hazardous area use -	Measuring element is "Simple Apparatus"

FTLD® - System Operating Principle



By measuring both the sensor output and the temperature at its own terminals the instrument is able to compute the hot spot temperature and make automatic compensation for ambient temperature changes

CONTINUOUS THERMOCOUPLE TRANSDUCER CABLE

FTLD® - Prevention of Loss due to Overheat

Think of your sphere of work, look around you - is there more you can do?

The Application

Temperature rise due to unrestrained release of physical or chemical energy, is a regular cause of serious loss in industry, commerce and everyday life. It is responsible for countless incidents, the financial consequences of which range from minor to catastrophic.

One common example of temperature rise ending in loss, is combustion. Some others are wear, distortion, fracture, melting, drying, and seizure.

Breakdown at temperatures well below the boiling point of water, is an area of particular concern - one where losses from shutdown can be enormous. For example, temperatures at which ordinary heat detectors remain dormant, can destroy the electronics crucial to computers, communications and data handling equipment.

For many years point type temperature detectors of various types, including conventional thermocouples, have been used to monitor processes and plant risk from heat induced damage. In almost every case the inevitable compromise between numbers (cost), and detector coverage (efficiency), has defeated the exercise.

FTLD offers a very powerful and cost effective alternative to any currently available system, by eliminating the question of where to place the sensor; by constantly monitoring maximum temperature in the area covered; and by possessing such stability, that false alarms are virtually non-existent.

Very often, a loss-inducing condition begins with temperature rising very slowly above normal for the installation at risk. This is the time when corrective action has the greatest chance of success. An FTLD system capitalizes on this opportunity by alerting operating personnel to the onset of a dangerous condition, some time before the main danger temperature alarm is initiated.

Areas of Risk

Storage & Maintenance

Foodstuffs, Beverages & Medicines
Wines & Spirits
Coal, Gas & Oil
Fabric, Timber & Building Materials
Clothing
Paper & Board
Aircraft, Ship & Vehicle Maintenance

Communications

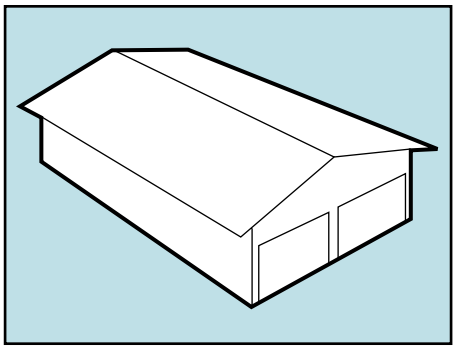
Telephone Exchanges
Computer Installations
Radio, Radar & Television Stations
Television& Film Studios
Data & Signal Cable Ducts
Instrumentation & Control Rooms
Civil & Defense Facilities

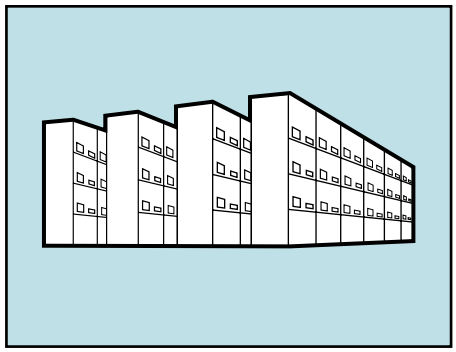
Services

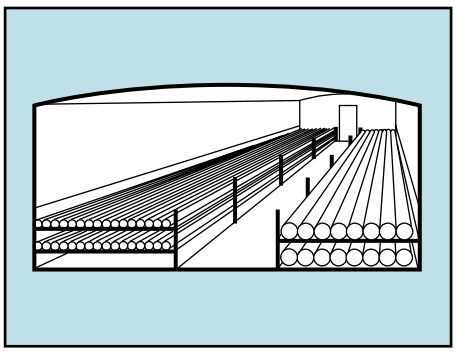
Food Production & Supply
Manufacturing Facilities
Rail, Road & Cable Tunnels
Fuel, Water & Sewage Treatment
Airports, Seaports, Rail & Bus Stations
Hospitals, Schools & Universities
Shopping, Sports & Leisure Centers

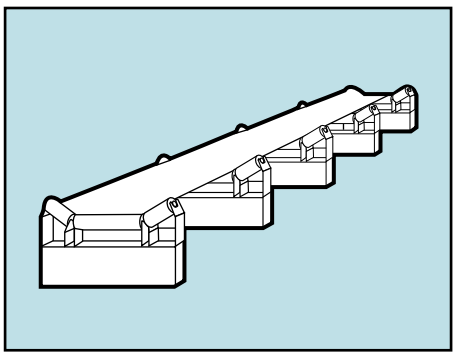
Materials Handling

Oil & Gas Pumps & Valves
Coal Conveyors & Silos
Electricity Sub-stations
Air, Sea & Land Vehicles
Agriculture
Ship, Aircraft & vehicle Loading
Goods & Mail Distribution









ASK ABOUT OUR HIGH TEMPERATURE VERSION < 1800°F.

EXOTIC THERMOCOUPLE SELECTIONS

JMS Southeast can provide a variety of exotic thermocouple designs and materials. The following information explains some of our capabilities. Please contact JMS Southeast for ordering information on these assemblies.

SENSOR TYPES

TYPE	THERMOELEMENTS	MAX. TEMP.°C
S	Platinum/Platinum 10% Rhodium	1600
B	Platinum 6% Rhodium/Platinum 30% Rhodium	1600
R	Platinum/Platinum 13% Rhodium	1600
W5 (C) ┐ Not	Tungsten 5% Rhenium/Tungsten 26% Rhenium	2200
W3 (D) ┘ ANSI	Tungsten 3% Rhenium/Tungsten 26% Rhenium	2200
W (G)	Tungsten/Tungsten 26% Rhenium	2200

(See Pg. 1-1 for standard materials.)

SHEATH MATERIAL

SHEATH MATERIALS	RECOMMENDED* TEMPERATURE °C	°F	MELTING** POINT °C	°F	WORKING ENVIRONMENT
Aluminum	427	800	660	1220	I
Boron Nitride	2000	3632	3000	5432	I, V, O***
Brass	371	700	1000	1832	I, V
Columbium (Niobium)	1981	3600	2468	4474	V
Copper	316	600	1083	1981	I, V
Graphite	3000	5425	3652	6606	I, V
Hastelloy X	1204	2200	1260-1354	2300-2470	O, I, V
Hastelloy C	1093	2000	1149	2100	O, R, I, V
Inconel 702	1204	2200			O, I
Molybdenum	2204	4000	2610	4730	I, V, R
Platinum	1677	3050	1760	3200	O, I, V
Silicon Nitride	1750	3182	1900	3452	I, V
Silicon Carbide	2200	3992	2700	4892	I, V
S/S 310	1149	2100	1399	2550	O, I, V
Tantalum	2483	4500	3000	5425	I, V
Titanium	850	1562	1675	3047	I, V
Tungsten	3000	5425	3315+	6000+	I, V, R

V=Vacuum I=Inert O=Oxidizing R=Reducing-Hydrogen

*Recommended temperatures indicated are for supported vertical installations and may be reduced if used in an unsupported horizontal direction.

**The melting points listed may not be always considered accurate as some materials sublime before melting.

**Boron Nitride may be used to 850°C in an oxidizing environment.

INSULATION MATERIAL

INSULATION MATERIALS		RECOMMENDED* TEMPERATURE °C	°F	MELTING** POINT °C	°F	WORKING ENVIRONMENT
Magnesium Oxide	MgO	2300	4172	2800	5072	I, O
Alumina Oxide	Al_2O_2	1900	3452	2050	3722	V, I, O
Hafnia Oxide	HfO_2	2400	4352	2812	5094	O, V, I
Boron Nitride	Bn	2000	3632	3000	5432	V, I, O