

3-A APPROVED SANITARY SENSORS

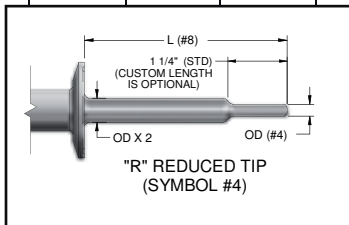
CIP (clean-in-place) line of 3-A certified sanitary thermocouples and RTD's from JMS are specially designed to meet the needs of the food, dairy, beverage, pharmaceutical, chemical and cosmetic industries. They are ideally suited for a number of applications where corrosion and contamination are factors. They are fabricated from stainless steel or other 3-A approved material using a method assuring imperfection-free surfaces. All sanitary grade thermocouples are provided to special limits of error. All sanitary RTDs are provided in 4 wire construction.

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 connection head, designed to withstand caustic washdown. A typical RTD or Thermocouple (see pages 1-1 and 3-1) may be used with a sanitary thermowell (see page 5-4).



www.3-A.org

#1	DESCRIPTION	
4S	Sanitary Sensors	
#2	RTD/THERMOCOUPLE TYPE (RTD-Platinum 0.00385 alpha (Ω/Ω/°C). Resistor accuracies at 0°C below & [3-1,17,18])	
B E P S X	RTD Options 4 wire ± 0.3°C 4 wire ± 0.15°C 4 wire ± 0.06°C 4 wire ± 0.03°C (JMS Standard) Other, specify	Thermocouple Options Copper/Constantan Chromel/Alumel Iron/Constantan Chromel/Constantan Other, specify
	Resistor accuracies at 0°C. Add 3 before selection for 3 wire RTD	T K J E X
#3	ELEMENT CONSTRUCTION	
1 2 X	1 Single 2 Dual X Other, specify	
#4	OUTSIDE DIAMETER	
A B C D	3/8" 1/4" 3/16" 1/8"	E 1/16" X Other, specify Z NA
	Note: For a reduced tip add R to tip O.D. selection. The shank will equal twice the tip O.D. See dwg. this page. (ex: RB steps down from 1/2" to 1/4" at the tip)	
#5	TUBING OR SHEATH	
K L H I X	K 316 Stainless Steel L 316 Low Carbon Stainless Steel (Standard) H 304 Stainless Steel I 304 Low Carbon Stainless Steel X Other, specify*	
#6	MEASURING JUNCTION	
G U	G Grounded U Ungrounded (Standard)	
	Note: RTD is always ungrounded from tubing.	
#7	IMERSION LENGTH (L)	
--"	Length in inches	



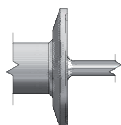
[] BRACKETS INDICATE PAGE NUMBERS WHERE ADDITIONAL HELPFUL INFORMATION CAN BE FOUND IN TECHNICAL CATALOG. NOW AVAILABLE ONLINE AT WWW.JMS-SE.COM/PDF/JMS_TECHNICAL_CATALOG.PDF

4S S 1 B K U 12"

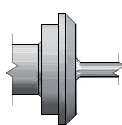
3-A APPROVED SANITARY SENSORS

#8	SANITARY CAP OPTIONS [SEE BELOW] Note: Standard Sanitary Thermowells (can be found on page 4-4 and 4-5).		
T B*** BH*** I** S**	Tri-Clover (16 AMP) Bevel Seat (16 A) without 13-H Nut Bevel Seat with 13-H Nut I Clamp (16AI-14I) 1/2" x 1/2" Spring Loaded fitting for assembly with Sanitary Thermowell.	P PH A*** X*	PV Gasket (16APV) without 13-H Nut PV Gasket with 13-H Nut 3A4 Adapter Other, specify

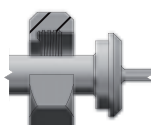
* When specifying X ensure that it meets 3-A standard.
 ** Not 3-A authorized.
 *** Must be cleaned manually.



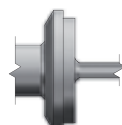
T Tri-Clover (16 AMP)



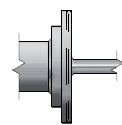
B Bevel Seat (16A) without 13-H Nut



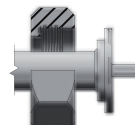
BH Bevel Seat (16A) with 13-H Nut



I Clamp (16I-14I)



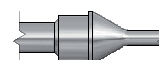
P PV Gasket (16APV) without 13-H Nut



PH PV Gasket (16APV) with 13-H Nut

#9	CAP SIZE		
05	1/2" x 3/4"	60	6"
15	1" x 1 1/2"	80	8"
20	2"	100	10"
25	2 1/2"	120	12"
30	3"	Z*	Not Applicable
40	4"	X*	Other, specify

Note: 05 Cap sizes (1/2" x 3/4") will use 1/4" NPT Nipple



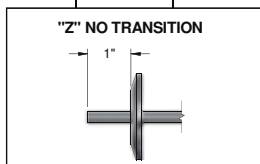
A 3A4 Adapter

#10	FINISH		
H	High polish (#4 Finish) (Standard)	X*	Other, specify
E	Electropolish (8G finish)		
P	Passivate (after #4 Finish)		

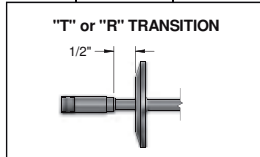
#11	LEAD WIRE TYPE AND LENGTH IN INCHES	MAX. TEMP. °F
Z	No lead wire (teflon will insulate the wires in the head.)	
1_	Glass braid	662°F
3_	Teflon 392°F	
X*	Other, specify	

#12	TRANSITION TYPE [1-16]		
H	Heat shrink	X*	Other, specify
S	Size on size	Z	No transition
T	3/8" OD (Standard)		
R	1/4" OD		
N	Nipple		
M	M12 Fixed Mount Transition		

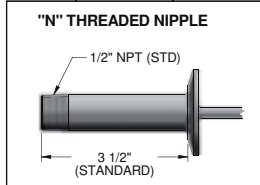
Note: For extra high humidity / moisture environments ≤ 500°F put a "2" after your selection. For high temperatures at the transition area use an X + type of transition and maximum temperature > 500°F.



"Z" NO TRANSITION



"T" or "R" TRANSITION



"N" THREADED NIPPLE

#13	COLD END TERMINATION [SEE SECTION 6] PICK AS MANY AS APPLICABLE		
WP	White plastic head (3-A Standard)	AW	Bare ends, teflon with nipple
A	Bare ends	SC	Capped socket connection [4-3]
P	Epoxy coated explosion proof rated cast iron head w/ gasket	8H	Isolated Transmitter
IA	Epoxy coated explosion proof rated aluminum head w/ chain	8M	Integral Transmitter (see page 4-3 for details)
ISS	Explosion proof stainless steel head	8N	Non Isolated Transmitter
SS	General purpose stainless steel head w/ screw cover	HD	Indicating Transmitter Housing
		Y	M12 Watertight Male Connector
		X*	Other, specify

#14	OPTIONS—USE ONLY IF APPLICABLE [INTRODUCTION]X*		
1	Stainless steel tag	6**	Premium calibration report
2	Plastic tag		Corrections data will be provided for all temperatures within the range.
3	Paper tag		
4	Laser etch on probe		
	Must specify information required on tag / laser etch	7	CE Marking [Page XV]
5	Calibrate at specified point(s). Corrections data will be provided for each point.	8	Guide 17025 calibration
		9	BAR CODE
		Z	N/A

T 15 H 3-36" T WP

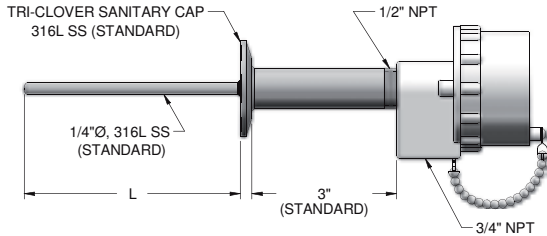
* When specifying X be sure to observe requirements and restrictions as imposed by the 3-A Sanitary Standards for Sensors and Sensor Fittings and Connections, Number 74-03.

**Must specify increments & range. (Ex. 0 to 300°F, 10° increments)

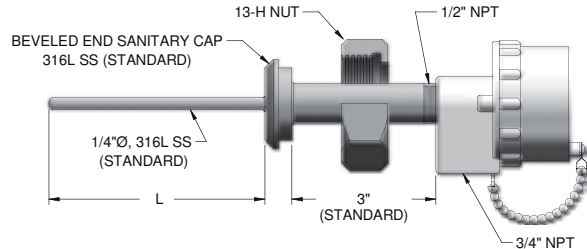
3-A APPROVED COMPLETE SENSORS

SANITARY CAP TYPICAL DESIGNS

TRI-CLOVER (16 AMP) (CAP OPTION "T")

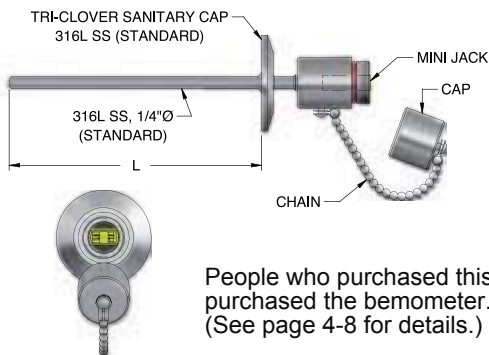


BEVEL SEAT WITH 13-H NUT (16 AMP) (CAP OPTION BH")



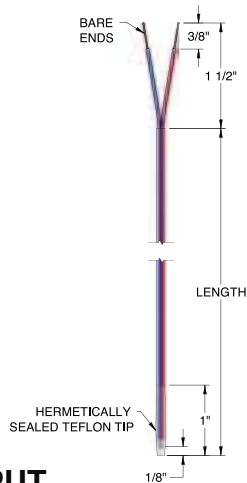
SPECIAL DESIGNS

SOCKET CAP COLD END TERMINATION (SC)



People who purchased this also purchased the bemometer. (See page 4-8 for details.)

ULTRA HIGH ACCURACY TYPE T WIRE THERMOCOUPLE



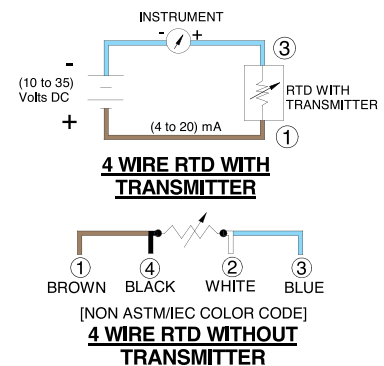
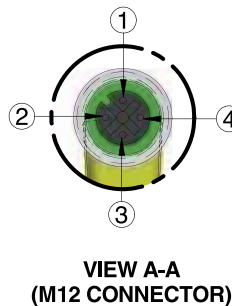
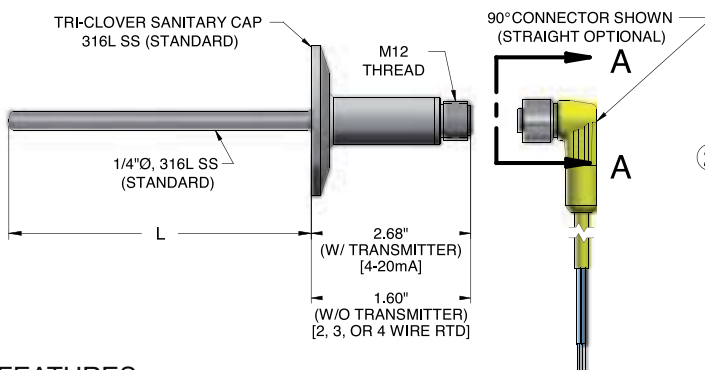
Moisture, rough handling and severe conditions all pose grave threats to the functionality of Type T thermocouple measurements - measurements which are a critical component of many high accuracy laboratory and pharmaceutical applications.

JMS presents its rugged, fast response, multi-strand Type T sensor. Manufactured from premium Type T thermocouple wires accurate to $\pm 0.22^\circ\text{C}$ at 121°C with hermetically sealed tips perfect for environments with high humidity, these sensors represent the cutting edge in thermocouple technology.

To order, simply specify JMS part #: DWG16238 followed by the length in parentheses (ex: DWG16238(120")) for an Ultra High Accuracy Type T sensor ten feet in length.

3-A RTD WITH 4-20 mA INTEGRAL OUTPUT

TOOL FREE RTD TEMPERATURE MEASUREMENT



FEATURES:


- PC Programmable,
- NEMA 6P (IP68) rated with M12 connector.
- Ideal for most applications from -60 to 320 F.
- Ambient Temperature limits -40 to 185 F.
- Quick-n-Clean M12 connection for easy replacement.
- Available in 3-A Certified and Standard Industrial Designs (see page 3-5)

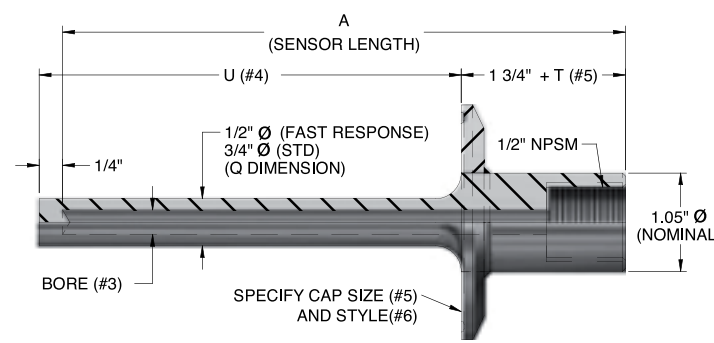


3-A CERTIFIED SANITARY THERMOWELLS

#1	DESCRIPTION									
5F	Sanitary Thermowells - Add "W" here for a plug with a chain attached to well. (i.e. 5FW)									
#2	STYLE [25-27]									
A	Step shank	F	Fast response straight shank (1/2" Q)			S	Straight shank (3/4" Q)		T	Tapered shank
#3	BORE SIZE									
2	.260" ID			3	.385" ID			X	Other, specify	
#4	U (INSERTION) DEPTH [15]				"U" DIMENSION		SENSOR LENGTH (NO LAG)			
B	2 1/2"				2 1/2"		4"			
C	4 1/2"				4 1/2"		6"			
D	6"				6"		7 1/2"			
E	7 1/2"				7 1/2"		9"			
X	Other, specify									
#5	LAG (T) LENGTH IN INCHES									
"	Lag length in inches									
#6	CAP SIZE [SECTION 4]									
05	1/2" x 3/4"		25	2 1/2"		60	6"		120	12"
15	1" x 1 1/2"		30	3"		80	8"		X*	Other, specify
20	2"		40	4"		100	10"		Z	N/A
#7	CAP STYLE [see 4-9, Row 9 for illustrations]									
T	Tri-Clover (16 AMP)			P	PV Gasket (16APV)			A***	3A4 Adapter	
B***	Bevel Seat w/o 13H Nut			PH	w/o 13-H Nut			X*	Other, specify	
BH***	Bevel Seat w/ 13H Nut									
I**	I Clamp (16Al-14l)									
#8	MATERIAL									
H	304 SS							L	316L SS	
I	304L SS							X*	Other, specify	
K	316 SS									
#9	POLISH									
H	High polish (#4 Finish \leq 32 Microinches) Standard									
E	Electropolish or (8G Finish \leq 8 Microinches)									
P	Passivate (After #4 Finish)									
#10	TAGGING OPTIONS									
1	Laser etched or stamped on well (Standard)									
X	Other Note: You must always specify information required on tag / laser etch.									
Z	N/A									
#11	DOCUMENTATION / CERTIFICATION --Use all that apply (I.E. "DU" requests Dye Penetrant Test and X-Ray Examination)									
M	Material Test Reports (MTR)									
D	Dye Penetrant Testing									
P	Internal Hydrostatic Pressure Test									
U	X-Ray Examination									
W	ASME PTC 19.3 Calculation (Murdock Calculation)									
S	Surface Finish Certificate									
E	Certificate of Electropolish									
A	Certificate of No Animal Derived Material (ADM)									
N	Certificate of No Polishing Compounds									
O	Certificate of Cleaned for Oxygen Service									

Note: Ingold socket and threaded fittings are readily available. Because of the diversity of sizes, materials and other options, please consult JMS directly.





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5F	A	2	D	20	T	K	H	1	M
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* When specifying "X" ensure that it meets 3A standard.
 ** Not 3A authorized.
 *** Must be cleaned manually.

3-A CERTIFIED SANITARY WELD-IN THERMOWELLS



JMS Southeast, Inc. is proud to be a US manufacturer of a full line of sanitary R TDs, thermocouples and thermowells (3-A Authorization No. 1482).

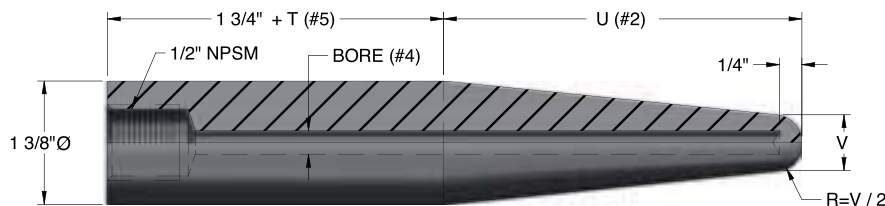
JMS Southeast's 3-A certified weld-in thermowells are designed to be used with either sanitary 3-A certified probes* or non-certified probes.** Sanitary thermowells should be welded to a tank or a vat with a full crevice-free fillet weld to avoid cracks and crevices. Standard sanitary weld-in wells are fabricated from stainless steel and then polished to a No. 4 finish.***

In addition to weld-in thermowells, JMS also offers a full line of 3-A certified sanitary cap thermowells. Illustrations of the most commonly selected cap styles can be found on page 4-2, Row 9 of this catalog.

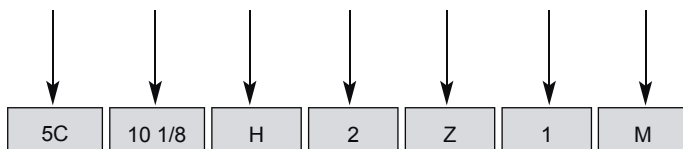
- * For ordering and additional information see pages 4-1 through 4-3 of this catalog.
- ** For thermocouples, please refer to section 1 of this catalog. For R TDs, please refer to section 3.
- *** Other finishes available upon request to meet customer requirements.

#1	DESCRIPTION				
5C	3-A Certified Sanitary Thermowells - Add "W" here for a plug with a chain attached to well. (i.e. 5CW)				
#2	Immersion Length (U)				
__"	Specify length in inches.		Note: When specifying spring loaded replacement sensor, customer should specify immersion length 1/4" shorter than the overall weld-in thermowell length		
#3	MATERIAL				
H I	304 SS 304L SS	K L	316 SS 316L SS	X*	Other, specify
#4	BORE SIZE				
2	.260" ID	3	.385" ID	X	Other, specify
#5	T (LAG) EXTENSION [5-15]				
Z	N/A (No Lag)		__"	Specify length in inches	
#6	TAGGING OPTIONS				
1 X* Z	Stamped on well (Standard) Other N/A *When specifying an "X", material selected must comply with 3-A standard, 74-03				
#7	DOCUMENTATION & CERTIFICATIONS -- use all that apply (i.e. "DU" requests Dye Penetrant Test & X-Ray Examination)				
M D P U W	Material Test Reports (MTRs) Dye Penetrant Testing Internal Hydrostatic Pressure Test X-Ray Examination ASME PTC 19.3 Calculation (Murdock Calculation)		S E A N O	Surface Finish Certificate Certificate of Electropolish Certificate of No Animal Derived Material (ADM) Certificate of No Polishing Compounds Certificate of Cleaned for Oxygen Service	

Note: Does not include head and nipple. These parts may be ordered separately.

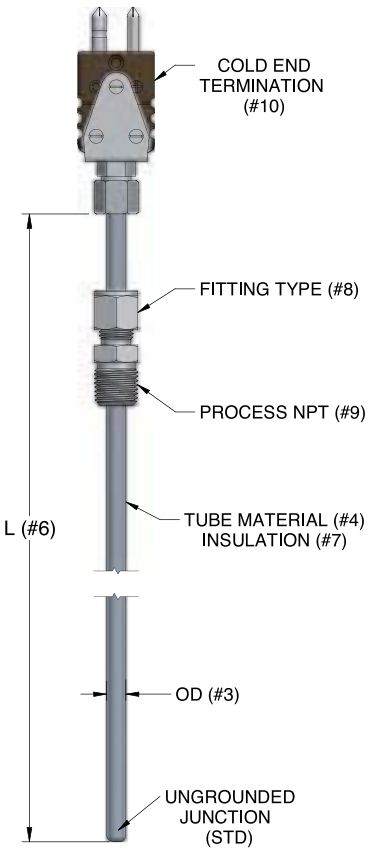


THERMOWELL DIMENSIONS	
BORE SIZE (#4)	"V" DIMENSION
.260" Ø	5/8"
.385" Ø	49/64"



SINTERING, FURNACE & GLASS THERMOCOUPLES

#1	DESCRIPTION											
4G	Sintering, furnace & glass thermocouple											
	#2	TYPE [Add a "2" before the letter to indicate dual element construction (ex: Dual type S would be coded "2S")]										
	S R	Platinum/Platinum 10% Rhodium Platinum/Platinum 13% Rhodium	B C X	Platinum 6% Rhodium/Platinum 30% Rhodium Tungsten 5% Rhenium/Tungsten 26% Rhenium Other, specify								
	#3	OUTSIDE DIAMETER										
	B C D E	1/4" (Standard) 3/16" 1/8" 1/16"	F X Z	1/25" Other, specify N/A								
	#4	TUBE MATERIAL										
	A B R S T M X	Platinum - 10% Rhodium Platinum - 20% Rhodium Molybdenum (purged) Tantalum Titanium Inconel 600 Other, specify									}	(Purged and filled with high temperature inert gas.)
	#5	THERMOCOUPLE JUNCTION										
	G U	Grounded Ungrounded (Standard)										
	#6	IMMERSION LENGTH										
	—	Length in inches										
	#7	INSULATION										
	M A H X	MgO (Magnesium Oxide) Al2O3 (Standard - Alumina Oxide) HfO2 (Hafnia) Other, specify										
	#8	FITTINGS										
	Z F G H X	No Fitting (Standard) Reverse mounted steel plug fixed for attaching head Fixed stainless steel to sheath Compression fitting ss w/ ss ferrule Other, specify										
	#9	PROCESS NPT										
	A B C X Z	1/2" 1/4" 1/8" Other, specify N/A (Standard)										
	#10	COLD END TERMINATION										
	C F I L M N X	Standard plug Hi temp std plug (Standard) Explosion proof Nema 7 head Aluminum head w/ hinged cover Aluminum head w/ screw cover & chain Cast iron head w/ screw cover Other, specify										
	#11	TAGGING AND CALIBRATION ONLY IF APPLICABLE										
	—	See page 1-2 #14 for ordering selections.										



Labels in diagram: COLD END TERMINATION (#10), FITTING TYPE (#8), PROCESS NPT (#9), TUBE MATERIAL (#4) INSULATION (#7), OD (#3), UNGROUNDED JUNCTION (STD), L (#6).

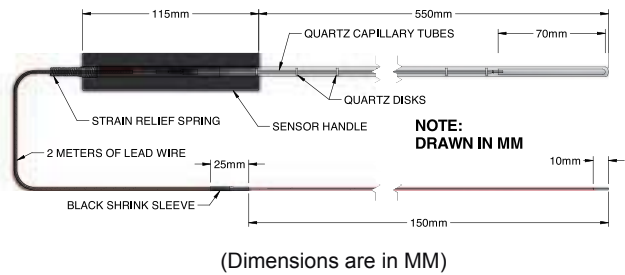
4G	S	B	R	U	14"	A	Z	A	F	
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LABORATORY THERMOMETERS

STANDARD PLATINUM RESISTANCE THERMOMETERS

The first and most accurate of the laboratory probes is the SPR T. 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).



(Dimensions are in MM)

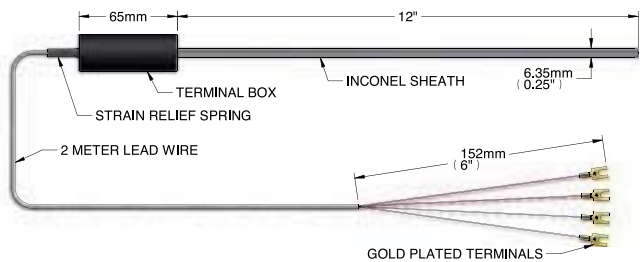
* Calibration report will document the exact numbers along with the TPW/MPG ratios. ** The "C" in the part number indicates we will provide calibration. If you intend to send the probe to NIST or some other lab for calibration certificate, omit the "C"

Note: ITS 90 says that an SPRT should have a resistance at melting point of gallium greater than 1.1 1807 times its 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.

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.



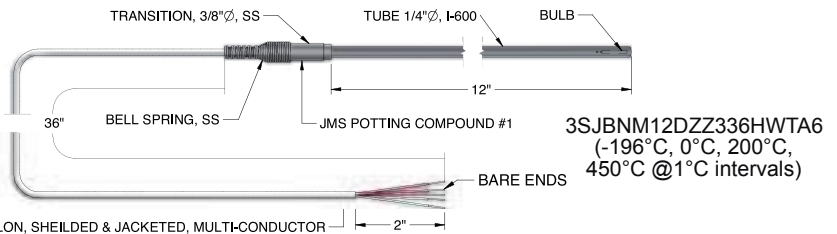
It can be manufactured to any length using the following part numbers:

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. Omit "C" if sent to another lab for calibration

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.



JMS STANDARDS THERMOCOUPLE

ITS 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.

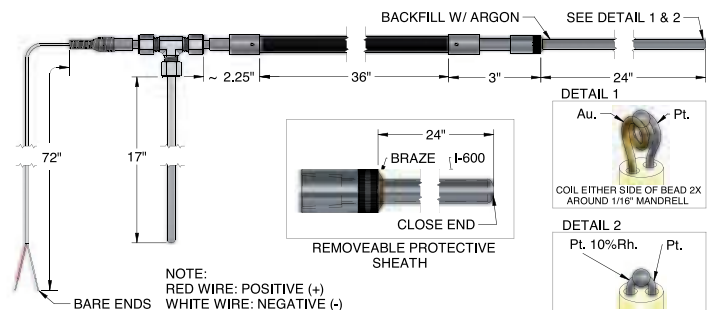
JMS Part #4PTAUC*

JMS Part #4PTRHC*

Pt/Au
0 - 1000°C
Non alloyed metals
Calibration close to standard
±0.2°C or better

Pt/PtRh
0 - 1450°C
Higher range

±1.0°C or better



REMOVABLE INCONEL 600 PROTECTIVE SHEATH

*A calibration is supplied with any probe. For no calibration, omit the C in the part #. See [1-22] through [1-53] for temperature / EMF Tables.

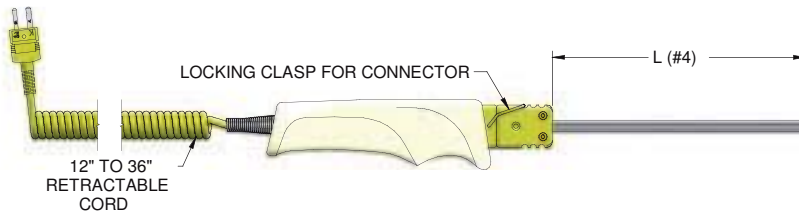
HAND HELD SENSORS

DESCRIPTION

The standard JMS hand held sensor is 316 stainless steel.

#1	DESCRIPTION	
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, Class B
	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 1-1, Row 6 for special junctions such as pointed tip and gas/air.
	#6	PRESENCE OF HANDLE
	H	Handle for replaceable probe (See dwg)
	R	Rugged handle for non replaceable probe
	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 w/ overall jacket of Teflon. (RTD only)
	Z	N/A
	X	Other, specify
	#8	COLD END TERMINATION
	A	Bare ends
	B	Miniature plug (Standard)
	C	Standard plug
	D	Replacement sensor
	X	Other, specify

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



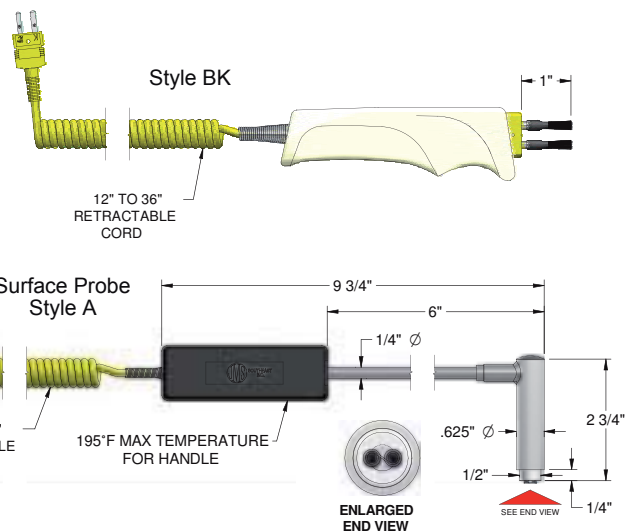
4H	K	B	6"	G	H	S	B
----	---	---	----	---	---	---	---

SURFACE SENSORS

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.

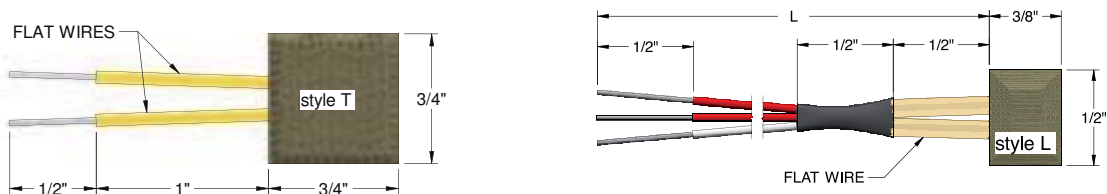
All of the above methods have proven to have their own particular faults. When compared to an infrared sensor, which does accurately measure surface temperature (unit must have correct emissivity adjustment), most of the above mentioned sensors either read much hotter or colder than the infrared. However, 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. The JMS brush probe eliminates emissivity, surface contact and heat wicking considerations



TEMPERATURE RATING IS BASED ON T/C TYPE FOR MOMENTARY MEASUREMENTS.

#1	DESCRIPTION		
4A	Hand held (use 4AS for straight design)		
4B	Permanent mount		
4BK	Specialty brush sensor		
4PADL	Small pad surface		
4PADT	Large pad surface		
#2	COLD END TERMINATION		
A	Bare ends		
B	Miniature plug		
C	Standard plug		
X	Other, specify		
Z	N/A		
#3	SURFACE SENSOR		
J	J thermocouple (not available for brush)		
K	K thermocouple		
2	2 wire RTD		
3	3 wire RTD		
X	Other, specify		
#4	LEADWIRE LENGTH		
S	Standard coil cord		
X	Other, specify		
Z	N/A		
#5	# OF REPLACEMENT TIPS		
0	No sets		
1 +	Number of sets		

The JMS pad RTD is a specialty sensor which provides a fast response surface measurement. It is a 100 Ω 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 -80°C to 200°C and its tolerance is 0.1 Ω (± 0.26 °C at 0 °C). Additional teflon leadwire is configured as a 3 wire RTD. High Temperature configuration can be designed.



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	DESCRIPTION		
4C	Combination, 4 wire, dual element, 1/4" diameter, ungrounded/ non isolated thermocouple and RTD		
#2	THERMOCOUPLE TYPE		
J	Dual element J thermocouple	N	Dual element N thermocouple
K	Dual element K thermocouple	X	Other, specify
T	Dual element T thermocouple		
#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)		
3	Hollow tube (T/C's and RTD's are electrically connected)		
#5	IMMERSION LENGTH (L)		
--"	Immersion in inches		
#6	STAND. INDUSTRIAL FITTING [6-13]	COMPRESSION FITTINGS	
S	Spring loaded 1/2"x x1/2" NPT SS fitting	H	Stainless steel w/ SS ferrule
W	Welded 1/2" x 1/2" NPT SS fitting	M	1/8" NPT
B	Bayonet style 1/2" process connection	P	1/4" NPT
X	Other, specify	X	Other, specify
#7	LEAD WIRE INSULATION AND LENGTH IN INCHES [3-2]		
Z	No lead wire	3"	Teflon
1"	Fiberglass	5"	Kapton (Standard)
		X	Other, specify
#8	TYPE OF TRANSITION [1-16, 3-14]		
T	3/8" OD		
X	Other,specify		
Z	No transition		
#9	COLD END TERMINATION [SEE SECTION 6]		
A	Bare ends		
I	Explosion proof Nema 7 head (6I / 6PT)		
K	Spade lugs (6SL)		
L	Aluminum head w/ hinged cover (6L / 6B4)		
M	Aluminum head w/ screw cover & chain (6M / 6B4)		
N	Cast iron head w/ screw cover (6N / 6B4)		
O	Open ceramic terminal block (6O)		
Q	Black nylon Nema 4 head (6Q / 6B4)		
R	High dome head (6R)		
V*	Hermetic connector (6DC) - Male		
W*	Microphone style connector (6DA) - Male		
X	Other, use appropriate part numbers from sect.#6		
#10	TAGGING AND CALIBRATION OPT		
---	Use only if applicable. See page 1-2 #14 for ordering selections.		

WIRING DIAGRAMS

SYMBOL #4=1	SYMBOL #4=2 or 3

TIP DETAIL (TYPE K TC SHOWN)

4C	K	3	1	12"	W	Z	Z	N
----	---	---	---	-----	---	---	---	---

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

MULTIPOINT

**3X
NEW!**

Removable /
Replaceable Sensor
Design - Now Available

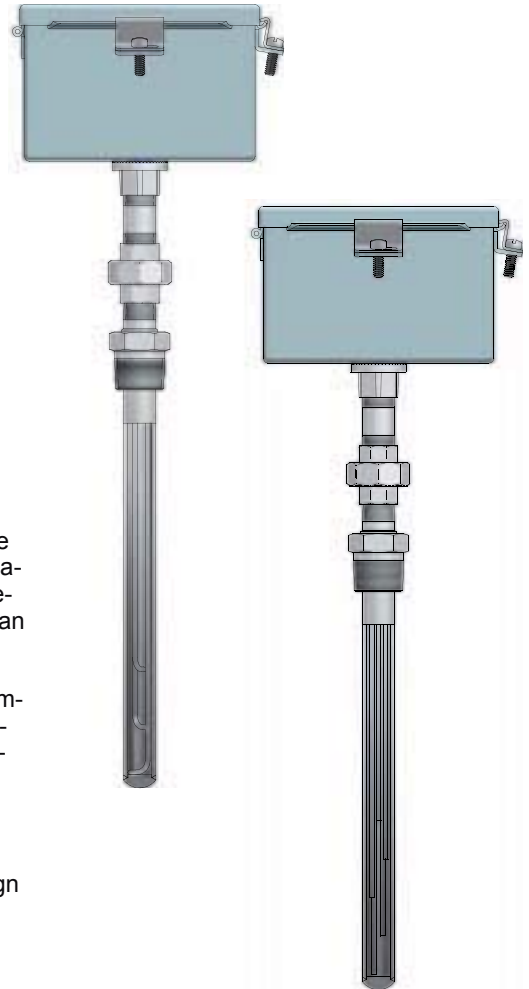
A multipoint sensor allows the measurement of a temperature profile across a large area. Thermocouples or RTD's are arranged with measuring junctions at various points along a pipe, allowing the measurement of various points from a complete assembly. Many elements can be spaced along a probe.

This opens up possibilities for improved profiling in 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.

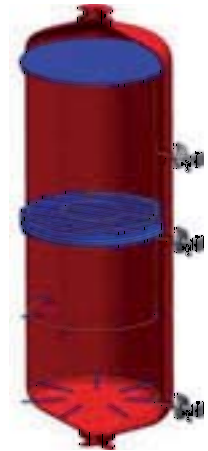
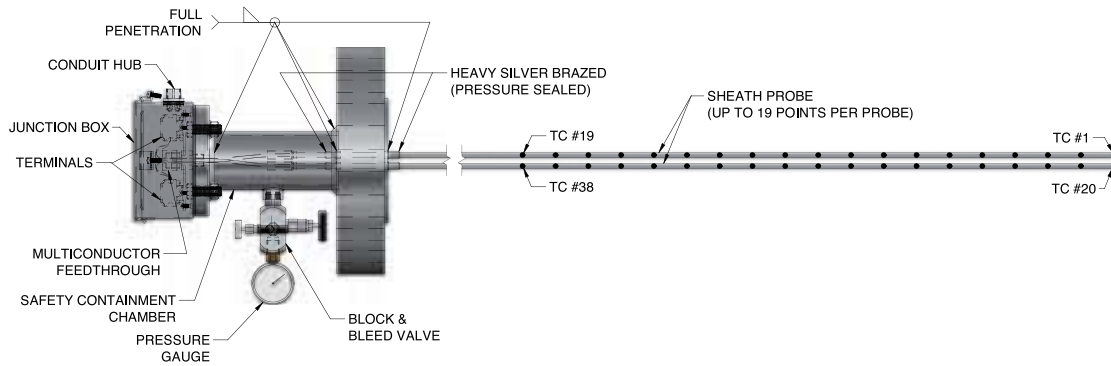
- Thermocouple calibration or RTD element type,
- Outside diameter of pipe and pipe material,
- Junction style of thermocouple,
- Sensor material (bare wire, 316 SS tubing, or sheath material),
- Overall length of the entire assembly,
- Process connection,
- Accuracy required,
- Cold-end termination,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

Note: For flexible high temperature reactor design see next two pages.



JMS will generate a free
drawing for your assembly.

CENTERPOINT



MI Cable Design and Construction

DESIGN

- CenterPoint MI cables are 0.070" thick, double-wall design with a 5/16" sheath O.D.
- First wall is 0.035" overlapping second wall of 0.035"
- Second wall acts as a flexible protective Thermowell wrapped around a flexible heavy walled thermocouple
- Single CenterPoint MI cable can house 19 points of temperature indication, greatest in the industry
- CenterPoint sheath materials are available in any metallurgy
- Thermocouples are available in any calibration
- A single CenterPoint assembly can be designed for complete coverage of a single catalyst bed

Each CenterPoint assembly is custom designed to meet the specification of the Process Licensor, Engineering Company and End User

CONSTRUCTION

- Double wall construction allows the MI cable to be welded to the flange face without damage to the cable caused by localized heat buildup during the welding procedure
- Drawing and Annealing sheath material provides a flexible housing for the thermocouples
- Restricting process flow (should the sheath integrity become breached) is tightly packed Magnesium Oxide insulation
- No special tools necessary for making long bends
- Tubing benders required for tight radius bends

COLD END DESIGN

- Pressure gauge directly tied to flange penetration creating secondary safety system
- Eliminates the need for additional welded or flanged safety chamber
- Reduced flange face penetrations maintains flange integrity
- Double block and bleed valve designed to bleed off trapped hydrogen or process fluids
- Each junction is equipped with a 10,000 psi pressure fitting,
- All welds are full penetration welds

CenterPoint provides optional secondary containment chambers available to meet the design needs and specifications of the customer

DIAGNOSTIC SYSTEMS

- Is process flow distribution a problem?
- Are quench zones working properly?
- Are new distribution trays necessary?
- Is process channeling occurring?
- Does the reactor exhibit areas of localized catalyst coking?
- Are heat related problems causing out-of-specification products?

SAFETY BENEFITS

- *Rapid Speed of Response time: Real time temperature measurements*
- *96% of a 100 degree step change in 3 to 8 seconds*
- *Eliminate temperature excursions on high temperature, high pressure*
- *Radial spread determines "hotspot" locations near reactor walls*
- *Reduce/ replace many reactor skin thermocouples*
- *Can be tied into the EMS system*
- *Redundancy – A duplicate sheath can be installed alongside the original at time of installation*

Can put as many temperature sensors into the reactor bed at any discreet point location in the catalyst bed where you want "real-time" temperature indication.

PROCESS BENEFITS

- *Greater process control*
- *Increased productivity on conversion reactors*
- *Flow distribution monitoring*
- *Creating a complete horizontal and vertical temperature profile*
- *Determining any process channeling*
- *Eliminating "blind spots"*
- *Eliminates low pressure areas around pipewells*
- *"Mirror image" thermocouple pattern creates a complete horizontal and vertical temperature profile*
- *Help determine the necessity of new reactor internals (i.e. distribution trays, quench zones)*
- *Monitoring optimum regeneration on naphtha reforming catalyst*
- *Finding localized "hotspots" in the catalyst bed*
- *Monitoring catalyst temperature during critical Startup Procedures*

Greater temperature control means increased production on conversion units such as Hydrocrackers, Naphtha Reformers, Dewaxing Units and Styrene Monomer Units

PROCESS LICENSORS

- Reduced number of nozzles and size
 - Reduces cost of manufacturing
 - Reduced number of penetrations
 - Less Exposure risks
 - Increased structural integrity of reactor
- 1" nozzle: 48 temperature indication points
- Enhanced operational information and process control of unit
- Eliminates large bundles of Thermo-couple cables and pathways for process flow that they can create

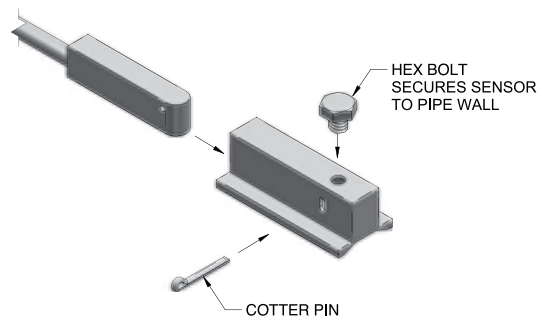
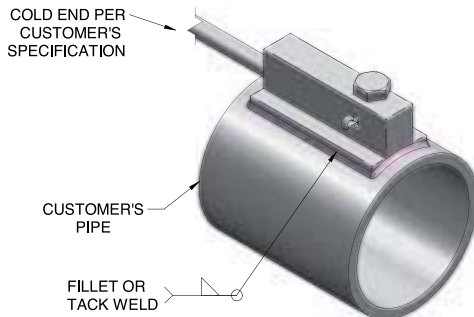
ENGINEERING COMPANIES

- Reduced number of nozzles
- Reduces cost of thermometry and maintenance platforms
 - Locate nozzles on one side of reactor for ease of design and maintenance
- Reduced cost compared to flexible thermocouple technology
 - Increased number of temperature points
 - Reduced installation cost
 - Eliminates expensive cranes used to install pipewells
 - Reduced number of MI cable reduces assembly cost

END USERS

- Reduces the overall cost of building
- Often times can install 3 times as many TI points for the same cost as using traditional thermometry
- Ease of catalyst loading and unloading, system stays in place and will not interfere with dense loader
 - No removal / replacement of horizontal pipewells when loading catalyst
 - Will not create a "shadow" side on back of pipewell when loading catalyst

FASTTRAX



APPLICATIONS

- Single or dual fired furnace tubes
- Top, side, or bottom fired furnace tubes
- Boiler tubes in power plants
- Catalyst Tubes/Tube Sheath Reactors (i.e. Steam Methane Reformers, Polygas Units, Acrylic Acid Units)
- Steam Tracing Lines
- Coker Units
- External Skin Temperature for Hydroprocessing units (i.e. Hydrocracking, Hydrotreating Reactor)

INSTALLATION

- Installation or supervision available
- Supervision recommended
- E&I Tech can replace Fasttrax probe using only a ladder and a pair of pliers

LOW-COST REPLACEMENT

- Install Hardware **ONE TIME**
- No need to scaffold furnace
- No grinding off existing TSTC
- No grinding down to base metal for welding (causes additional tube thinning)
- No welders necessary
- No moving Tubeskin TC out of the initial zone you want to measure because you cannot weld near last Tubeskin TC
- Re-order **ONLY** the replaceable probe

DESIGN

- Anti-slip cotter pin design
- Low profile heat shield
- Heavy-walled sheath
- Available in wrap-around design & parallel designs
- Available with S-Loops or expansion coils

HIGH RELIABILITY

- Fully protected probe
- S-Loops keep thermocouple sheath hidden and out of flame
- Clips placed on tube help hold thermocouple in place while process acts as a heat sink
- Wire contact **WON'T** slip from contact point due to JMS cotter pin design
- Safety
- Measure tube temperature, not process temperature
- Recognize tube wear and tube thinning
- Error set to high side of tube temperature-added safety
- Small offset allows you to push process furnace without sacrificing safety
- Highly accurate for safety
- Ceramic-filled heat shields may lead to low tube skin reading and compromise safety
- Large metal heat shields can absorb large amounts of radiant heat

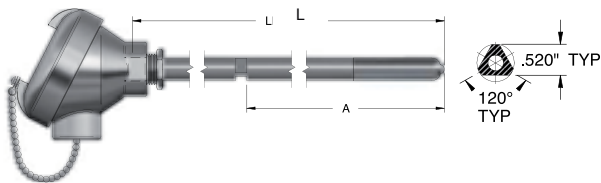
HIGH ACCURACY

- High accuracy bare wire contact with tube surface
- Bare wire is the standard by which all tube skin thermocouples are tested for accuracy
- Low heat transfer from heat shield/lowest profile heat shield in the industry
- Reduces effects of radiant heat on thermocouple

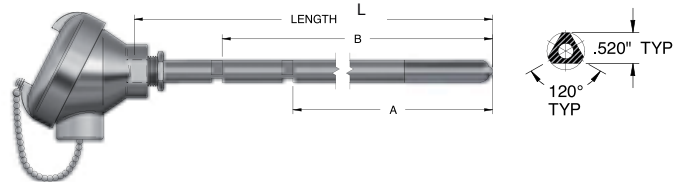
RUBBER COMPOUND MIXING SENSORS

TYPICAL DESIGNS

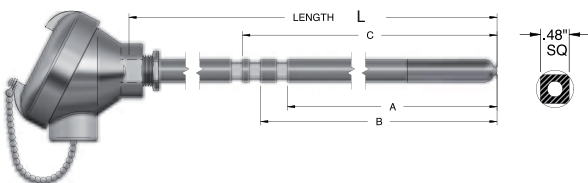
OPTION A — F270 MIXER TYPICAL



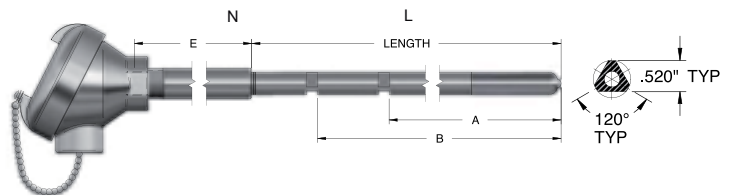
OPTION B & C — F270, F620 TYPICAL FOR OPTION B



OPTION D — 3 NOTCH SQUARE CUT



OPTION N — F370, F620 TYPICAL



#1	DESCRIPTION	
4R	Temperature sensors for compound mixing applications	
#2	SENSOR EXTERNAL CONFIGURATION (see above drawings)	
	Description	Mixer Models*
A	1 notch (triangular)	F270
N	2 notch (triangular)	F370, F620
B	2 notch (triangular)	F270, F620
C	2 notch (triangular)	
D	3 notch (square)	11D, F80, 9D, 3D
X	Other, specify	
	L	A
	12"	10 7/32"
	17 5/8"	13 31/32"
	18"	13 31/32"
	18"	15 31/32"
	13"	9 1/16"
	B	C
	—	—
	15 31/32"	—
	15 31/32"	—
	15 15/32"	10 5/16"
	9 13/16"	—
	*Note: Usage typical. Applications may vary by machine.	
#3	TIP TYPE	
1	Heavy Duty 316 SS	
2	Chrome Plating over Heavy Duty 316 SS	
3	JMS Tough Tip	
X	Other, specify.	
#4	SENSOR TYPE — ADD "2" FOR DUAL ELEMENT, "3" FOR TRIPLE (ex: J2 = dual element type J)	
J	Type J Thermocouple	
R	RTD — 100 ohm platinum	
X	Other, specify	
#5	COLD END TERMINATION (options from p.1-2 Row 13 may also be used)	
M	Aluminum screw top head with chain	
A6	Bare ends — 6" leads	
A36	Bare ends — 36" leads	
X	Other, specify.	

4S	E	3	3	M
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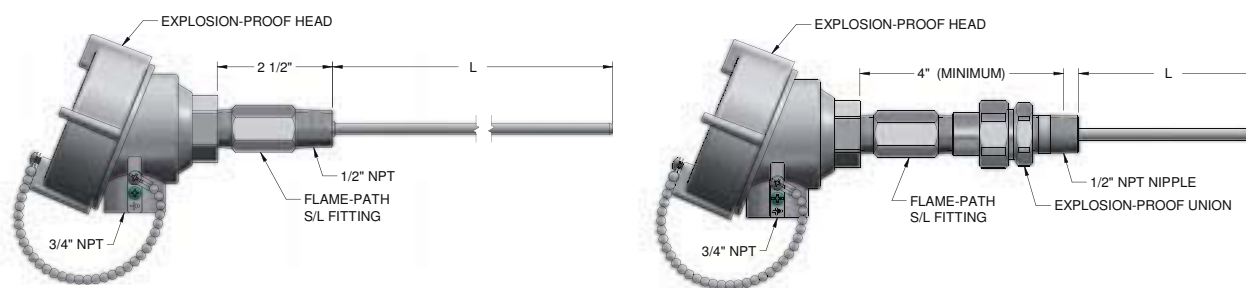
HEAVY DUTY ASPHALT AND AGGREGATE SENSOR



#1	DESCRIPTION
4F	Temperature sensors for asphalt drying — mixing applications
	#2 SENSOR EXTERNAL CONFIGURATION ("L" LENGTH)
	—" Immersion Length
	#3 SENSOR TYPE — ADD "U" for UNGROUNDED "2" FOR DUAL ELEMENT, "3" FOR TRIPLE
	J Type J Thermocouple. If other type use appropriate letter designation.
	3 RTD — 100 Ohm Platinum
	X Other, specify

4F	18	J
----	----	---

CSA CERTIFIED FLAME PATH SPRING LOADED T/Cs & RTDs



- Spring loaded flame path sensors with CSA certified fittings now available from JMS!
- Order by JMS part number (see pages 1-1 and 3-1, selection 8) or call 1-800-873-1835 for special and custom designs.
- Diametric clearance, finish and internal and external threading meet the special requirements demanded by CSA and the Standards Council of Canada.
- All conduit heads meet CSA Class I, Division 1, Groups B, C, D; Class II & III, Division 2, Groups E, F, G requirements and are labeled and certified accordingly.
- Maximum allowable temperature @ conduit head is 120°C (T4A temp rating).
- Flame-path fitting components are mechanically retained to prevent accidental or inadvertent removal.
- Thermowells (See Section 5) are required for final assembly of sensor into process with spring loaded fitting. For installation in Canada a valid Canadian Registration Number (CRN) is also required for the wells.
- Need a well with a CRN Number? JMS provides thermowells bearing CRN numbers valid in every province in Canada.
- Available with CSA certified transmitter. Call JMS at 1-800-873-1835 for details.