



**JMS Southeast, Inc.**  
**Temperature Measurement**

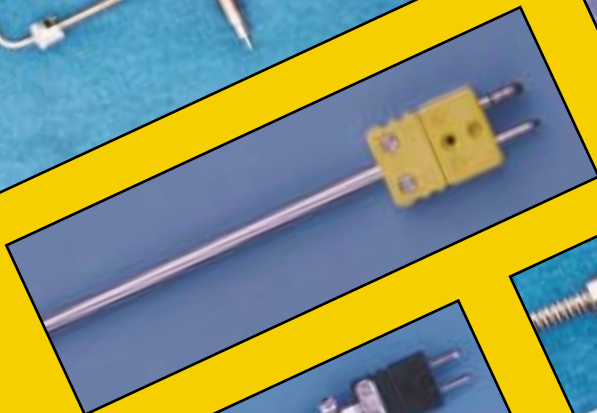
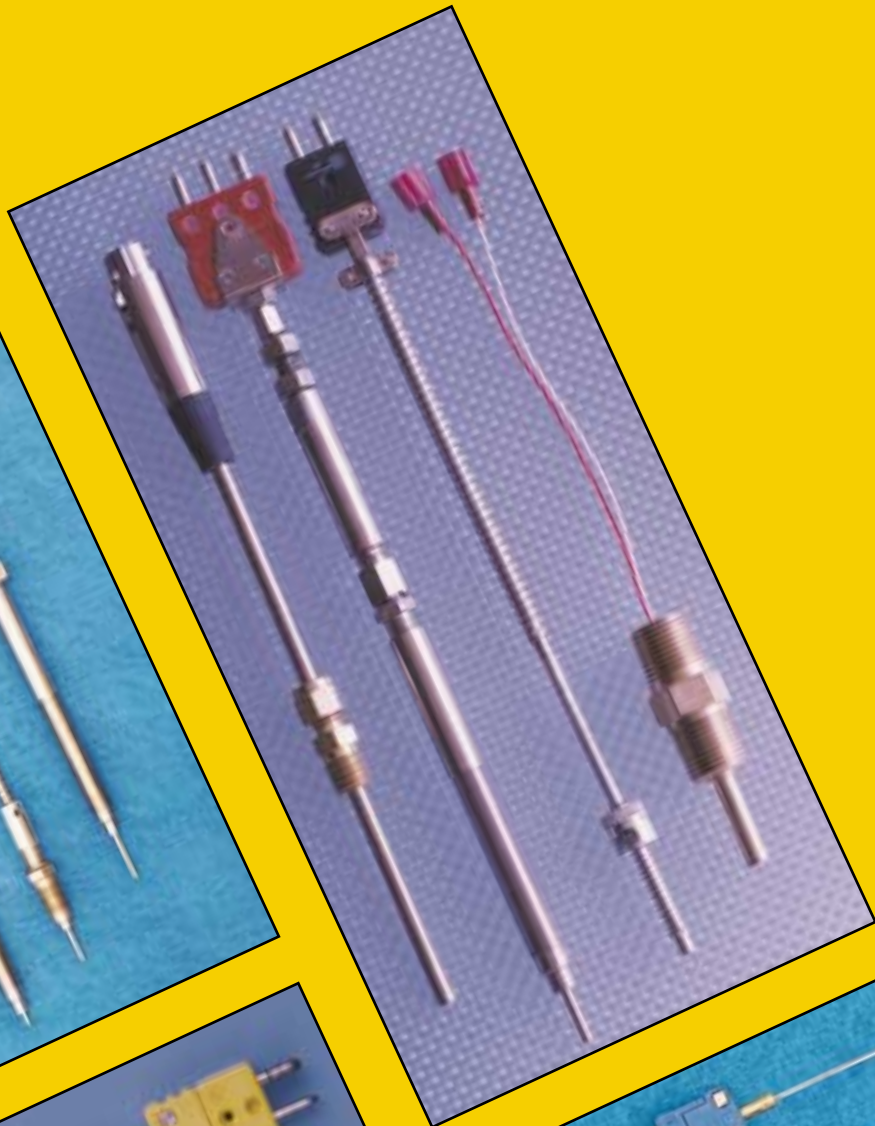


SECTION 2



# Plastics Sensors





# PLASTICS SENSORS

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**NOTE:** JMS Southeast, Inc. is a stocking distributor for electric heaters and controllers. Please call for any requirements.

# PLASTICS SENSORS

SECTION 2

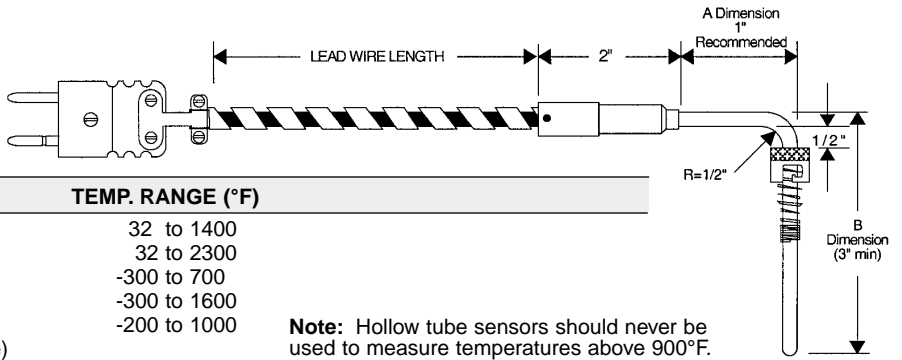
## BAYONET TEMPERATURE SENSORS

Bayonet style attachments are the most common in Plastics Processing. JMS has adapted this useful and safe design to other industrial sensors to utilize the best features of both.

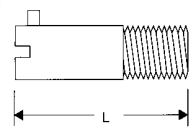
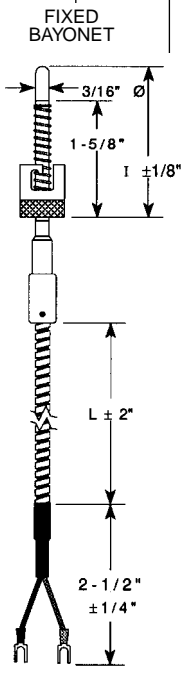
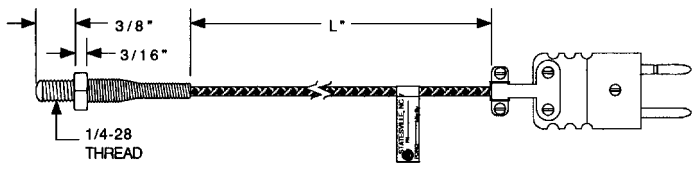
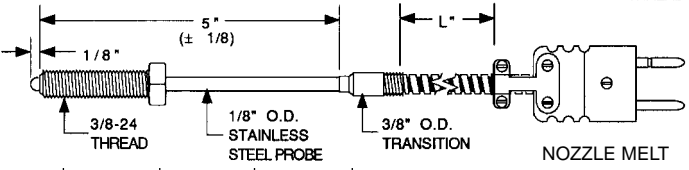
Our standard design and most commonly used is the Adjustable Bayonet attachment device which incorporates a chrome plated brass cap with a 303 stainless steel spring. The spring fits like chinese handcuffs around the appropriately sized sensor and remains in position until such a time as the user adjusts it. This enables the same sensor to be used for many different applications in the same facility. It also makes for lower inventory levels which your accountant will love.

The other attachment devices we make for your sensors are standard in the industry. For those "Old Dogs" who refuse to try something innovative we still offer the fixed bayonet design. The length of this sensor cannot be changed and will only go in the hole it was specifically built to fit.

#1	SERIES									
2	Plastics Sensors									
#2	DESIGN [8]									
M	MgO insulated									
H	Hollow tube									
#3	TYPE									
J	Iron/Constantan	TEMP. RANGE (°F)							32 to 1400	
K	Chromel/Alumel								32 to 2300	
T	Copper/Constantan								-300 to 700	
E	Chromel/Constantan								-300 to 1600	
3	100Ω Platinum RTD (.00385 alpha, 3 wire)								-200 to 1000	
X	Other, specify									
#4	OUTSIDE DIAMETER									
C	3/16" (.188")									
D	1/8" (.125")									
B	1/4" (.250")									
X	Other, specify									
#5	LIMITS OF ERROR	ELEMENT CONSTRUCTION	RTD	T/C						
1	Standard	Single	(.1% @ 0°C)	See page 1-9						
2	Standard	Dual	(.1% @ 0°C)							
3	Special	Single	(.01% @ 0°C)							
4	Special	Dual	(.01% @ 0°C)							
X	Other, specify									
#6	CONSTRUCTION									
S	Straight									
4	45° bend									
9	90° bend									
X	Specify bend									
You must specify dimension A and B in symbol #9.										
#7	MAXIMUM TEMPERATURE AT WHICH TIP WILL BE EXPOSED									
A	<100°C (212°F)	=2 PVC*	*If no transition (Z) is in symbol 13, we recommend these corresponding selections for primary wire insulation on hollow tube sensors.							
B	<200°C (392°F)	=3 Teflon*								
C	<285°C (550°F)	=5 Kapton*								
D	<482°C (900°F)	=1 Fiberglass*								
E	<705°C (1300°F)	=4 HT Fiberglass*								
F	>705°C (1300°F)	=7 Bare ends (heat shrink)*								
#8	MEASURING JUNCTION [9]									
G	Grounded									
U	Ungrounded (RTD's are always ungrounded)									
I	Isolated									
E	Exposed									
X	Other, specify									
#9	IMMERSION LENGTH (L)									
.."	Length in inches									
<p><b>Note:</b> If any attaching device is used with a bent sensor, you must specify here if it is to be installed on "A" dimension or "B" dimension. "B" dimension is standard.</p> <p><b>Note:</b> 1/2" radius bends are standard. Other radius may be specified but they may deform diameter of tube at bend.</p> <p><b>Note:</b> See appropriate drawing on page 2-1 &amp; 2-2 before you specify the immersion length.</p> <p>[ ] BRACKETS INDICATE PAGE NUMBERS TO REFER TO FOR ADDITIONAL TECHNICAL INFORMATION</p>										
2	M	J	D	1	S	B	G	3"		



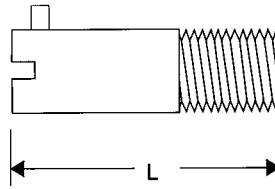
# PLASTICS SENSORS

#10	ATTACHING DEVICES		
J	Adjustable bayonet (standard)	X Other, specify	
F	Fixed bayonet		
P	Brass compression fitting 1/8" NPT		
N	Non-Immersion nozzle	Use "0" in symbol #9 for standard length. (See drawings on this page.) <b>Note:</b> Non-fixed fittings does not affect the immersion length.	
M	Nozzle melt		
Z	N/A		
#11	ADAPTER TYPE		
1/8" NPT	3/8" x 24	<b>NICKEL PLATED STEEL SLOT HEAD MOUNTING ADAPTER (FOR BAYONET ONLY)</b>	
Z	Z	No adapter required	
A	E	7/8" overall length	
B	F	1 1/2" overall length	
C	G	2 1/2" overall length	
D	J	3 1/2" overall length	
X	X	Other, specify	
			
#12	LEAD WIRE TYPE & LENGTH IN INCHES	T/C	RTD
Z	No lead wires	20 awg	24 awg
1"	Glass braid	20 awg	24 awg
3"	FEP teflon	20 awg	24 awg
6"	Glass braid / flex armor overall	20 awg	24 awg
7"	Teflon / flex armor overall	20 awg	24 awg
8"	Glass braid / stainless steel overbraid	20 awg	24 awg
X"	Other, specify		
Note: 24 awg wire or smaller may be used if necessary.			
#13	TYPE OF TRANSITION		
H	Heat shrink	<b>Note:</b> For high humidity / moisture environments, put a "2" after your selection. (See page 1-16)	
S	Size on size	For high temperature at the transition area use an X + type of transition and maximum temperature.	
T	3/8" OD (std)		
R	1/4" OD		
X	Other,specify	<b>Note:</b> When "Z" no transition is specified for a hollow tube sensor, the extension lead is crimped to the tube.	
Z	No transition		
C	Cutttable design (No crimp at end of tube / nylon insert)		
#14	COLD END TERMINATION [SECT 6] CHOOSE AS MANY AS APPLICABLE		
A	Bare ends	* Use a double symbol here for matching female connector. i.e. B/BB (male with matching female).	
B	Miniature plug (6A1B2)*		
C	Standard plug (6A1C2)*		
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 (6N / 6G)		
N	Cast iron head w/ screw cover & chain (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		
#15	TAGGING AND CALIBRATION OPTIONS (USE ONLY IF APPLICABLE)		
----	See page 1-2 #14 for ordering selections.		
			
			
			
J	A	636"	T C

# BAYONET ACCESSORIES

## NICKEL PLATED STEEL SLOT HEAD ADAPTERS

SYMBOL			LENGTH
1/8" NPT	3/8"-24	1/4" NPT	
2A	2E	6BA	7/8" overall length
2A1	----		1 1/4" overall length
2B	2F		1 1/2" overall length
2C	2G		2 1/2" overall length
2D	2J		3 1/2" overall length

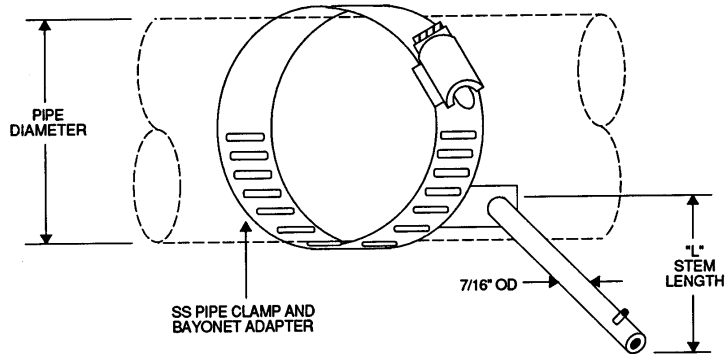


**NOTE:** To order adapters of different lengths, use 2A + X for 1/8" NPT and 2E + X for 3/8"-24 threads. You must specify length.

## STAINLESS STEEL PIPE CLAMP ADAPTERS

#1	SERIES		
2C	Pipe clamp bayonet adapter		
#2	"L" LENGTH OF STEM IN INCHES		
R	1 3/4"		
S	3 3/4"		
T	8 3/4"		
X	Other, specify		
#3	BAND CLAMP DIAMETER (INCHES)	STANDARD PIPE SIZE (INCHES)	
	MIN.	MAX.	
1	7/16	25/32	1/4 to 3/8
2	1 1/16	1 1/4	1/2 to 3/4
3	1 1/6	2	1 to 1 1/2
4	2 1/16	3	2 to 2 1/2
5	3 15/16	4 1/4	3 to 3 1/2
6	3 9/16	4 1/2	4
7	5 1/8	6	5
8	6 1/8	7	6

**Note:** "L" = Length of stem. Should be equal to the maximum insulation thickness + 3/4".  
The bayonet sensor length should be "L" + 3/4".



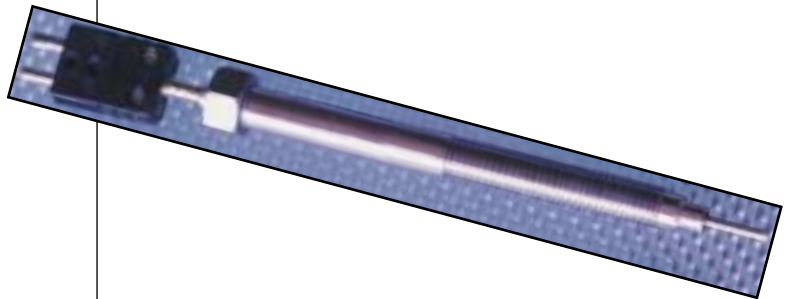
2C	S	3
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# PLASTIC MELT SENSORS

Plastic melt thermocouples and RTD's can fit directly into the melt stream of extruder heads. They can be used to control melt temperature gradients within the melt stream, or to monitor incoming melt temperatures, or to achieve control of nozzle and nozzle manifold temperatures. All plastic melt bolts are Stainless Steel. The bolt tips are back filled with a ceramic insulator. The probe is .125" O.D.

#1	<b>SERIES</b>	
2P	Plastic Melt Sensor	
#2	<b>STYLE [2-6]</b>	
4	*Bolt with 1 1/2" bendable metal extension and plug	
5	Bolt with direct mount plug	
6	**Bolt with 24" of fiberglass wire with flexible armor and plug	
X	Other, specify	
*Tubular extension between bolt and plug can be formed by hand at application site to any desired angle. If a longer metal extension from hex to plug connection is required, use X and specify length desired. Example: 2PXJ13BGP X=4-6" long		
**If a length other than 24" of flex armor is required, use X and specify length desired. Example: 2PXJ13BCP X=6-36" long		
#3	<b>SENSOR TYPE [1-1, 3-3]</b>	
J	Iron/Constantan, standard limits of error	
A	100Ω Platinum RTD .00385 alpha (3 wire) ±.12 % accuracy - Thin film is standard.	
X	Other, specify	
#4	<b>LIMITS OF ERROR</b>	<b>ELEMENT CONSTRUCTION</b>
1	Standard	Single
2	Standard	Dual
3	Special	Single
4	Special	Dual
X	Other, specify	
#5	<b>BOLT LENGTH (B) [6]</b>	
3	3"	
6	6"	
X	Other, specify	
#6	<b>IMMERSION (I) [6]</b>	
A	Flush	
B	1/2" Immersion	
C	1" Immersion	
X	Other, specify	
#7	<b>MEASURING JUNCTION [9]</b>	
G	Grounded	
U	Ungrounded (RTD's are always ungrounded)	
E	Exposed	
I	Isolated	
X	Other, specify	
For special wetted parts facing, use X + description. i.e. X=Grounded + Hastalloy facing		
#8	<b>MAXIMUM SERVICE TEMPERATURE</b>	
P	Below 500°F	
Q	500°F - 900°F	

[ ] BRACKETS INDICATE PAGE NUMBERS TO REFER TO FOR ADDITIONAL TECHNICAL INFORMATION



2P	5	J	1	6	B	G	P
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# ADJUSTABLE PLASTIC MELT SENSORS

Adjustable plastic melt sensors can be used to measure temperature gradients in melt streams. This design gives you the ability to have an adjustable immersion depth during full operation at maximum flow rates and pressure.

The length of the measuring junction is controlled by adjusting the setting of the knurled adjusting screw.

The probe should be adjusted to flush prior to melt cool down to eliminate probe breakage on start up.

This design also eliminates melt stream barriers and turbulence that could affect product quality.

It is used to profile dimensional stream temperature variations.

**SPECIFICATIONS:**

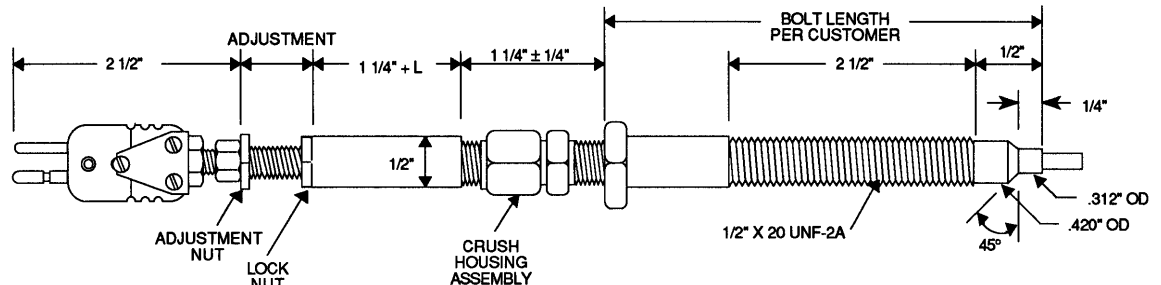
304 SS sheath, .125" O.D. Maximum temperature rating is 900°F. Pressure rating is 15,000 PSI.

**TO INSTALL PROBE:**

- 1) Use wrench only on hex closest to hot end.
- 2) Use fingers to adjust depth and lock nut.
- 3) **Do not use wrench on any part of assembly when machine is hot or under pressure.**

#1	SERIES
27	Adjustable plastic melt sensor
#2	SENSOR TYPE [3-3]
J	Iron/Constantan
3	100Ω Platinum, .00385 alpha, RTD (3 wire)
X	Other, specify
#3	BOLT LENGTH
3	3" Bolt
5	5" Bolt
7	7" Bolt
X	Other, specify
#4	IMMERSION JUNCTION [9]
A	1/8" - 1"
B	1/8" - 2 1/2"
X	Other, specify
#5	MEASURING JUNCTION
G	Grounded (Standard)
U	Ungrounded
E	Exposed (Recommended for profiling)
I	Isolated
X	Other, specify
#6	MAXIMUM SERVICE TEMPERATURE
P	Below 500°F
Q	500°F - 900°F
#7	TAGGING AND CALIBRATION OPTIONS (USE ONLY IF APPLICABLE)
—	See page 1-2 #14 for ordering selections.

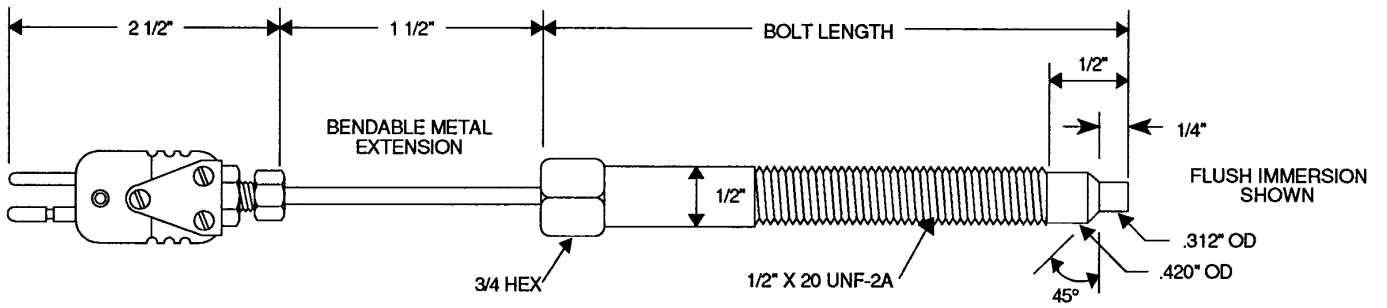
[ ] BRACKETS INDICATE PAGE NUMBERS TO REFER TO FOR ADDITIONAL TECHNICAL INFORMATION



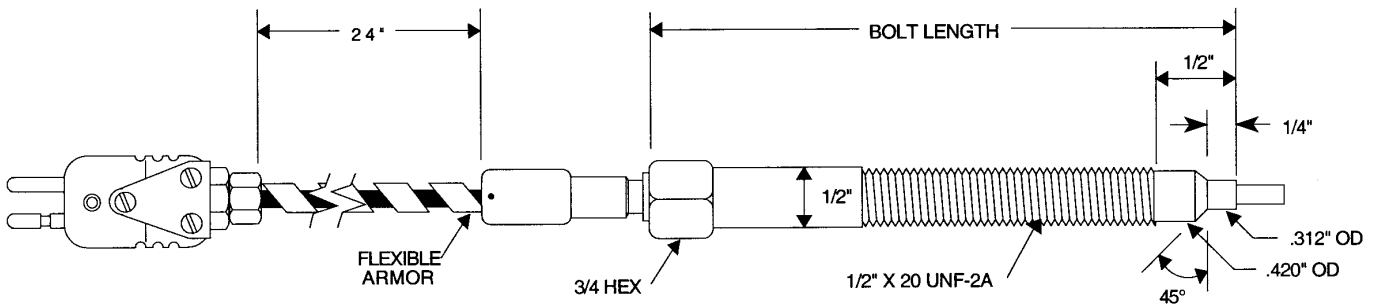
27	J	5	B	G	P	
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# PLASTIC MELT SENSORS



**BOLT WITH 1 1/2" BENDABLE METAL EXTENSION AND FLUSH IMMERSION**



**BOLT WITH 24" FLEXIBLE ARMOR AND 1/2" IMMERSION**



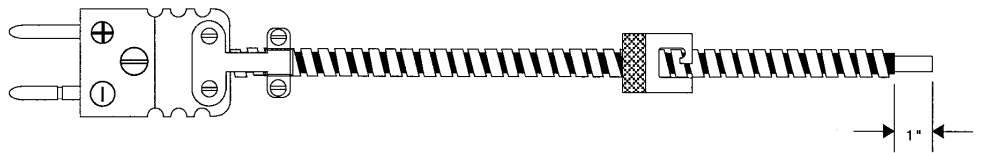
**ADJUSTABLE PLASTIC MELT SENSOR**

# FLEX-ARMOR ADJUSTABLE DEPTH SENSOR

The flexible armor adjustable depth sensor allows adjustable immersion and spring loading in the field by simply moving the bayonet cap up and down the flexible armor. The construction is a hollow-tube design using 20 gauge or smaller fiberglass insulated wire inserted into the 1/8" or 3/16" tubing or flex armor. The flex armor is also rigid for the first 1 1/8" past the tip or hot end. Grounded thermocouples have a flush immersion. Ungrounded thermocouples and RTDs have a 1" immersion. The picture below shows a variation of this thermocouple. Good for temperatures up to 900°F.

SECTION 2

#1	SERIES
2K	Flexible armor adjustable depth sensor
#2	SENSOR TYPE
J	Iron/Constantan (Standard)
K	Chromel/Alumel
T	Copper/Constantan
E	Chromel/Constantan
3	100Ω Platinum RTD (.00385 alpha, ±.12 %Ω @ 0°C, 3 wire)
X	Other, specify
#3	DIAMETER OF FLEX
1	.125 ID
2	.188 ID (Standard)
#4	TUBE LENGTH
—"	Length in inches
Z	Flush - no tube (Standard)
#5	JUNCTION
G	Grounded (Standard)
U	Ungrounded - (RTDs are always ungrounded)
#6	LEAD WIRE LENGTH
48"	Length in inches
60"	(Stainless Steel armor)
X	Other, specify
#7	COLD END TERMINATION
A	Bare ends ( Standard)
C	Standard plug
E	Standard jack
K	Spade lugs (compensated)
T	Junction box connector
X	Other, specify
<b>Note:</b> If slot head adapter is needed for mounting, see pg. 2-3.	

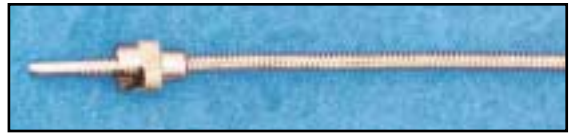


2K	J	2	Z	G	60"	T
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# SPRING ADJUSTABLE DEPTH SENSOR

The JMS Southeast spring adjustable sensor allows adjustable immersion in the field by moving the bayonet cap up and down the 12" spring. The construction is a hollow-tube design. Single element wire is 20 awg solid and dual element may be smaller to accommodate the tubing diameter. The wires are fiberglass insulated with stainless steel over-braid inserted into a .188" Ø tubing. (Available in .188" Ø only) The tube length immersion is 1/2". This design is good for temperatures up to 900°F.

#1	<b>SERIES</b>				
2Q	Spring adjustable depth bayonet sensor				
	#2	<b>SENSOR TYPE</b>			
	J	Iron/Constantan (Standard)			
	K	Chromel/Alumel			
	T	Copper/Constantan			
	E	Chromel/Constantan			
	3	100Ω Platinum RTD (.00385 alpha, ±.12 %Ω @ 0°C, 3 wire)			
	X	Other, specify			
		#3	<b>LEAD WIRE LENGTH</b>		
		48"	Length in inches		
		60"	(Measured from front of spring to back of cable clamp.)		
		X	Other, specify		
			#4	<b>JUNCTION</b>	
			G	Grounded (Standard)	
			U	Ungrounded - (RTDs are always ungrounded)	
				#5	<b>COLD END TERMINATION [6-7]</b>
				A	Bare ends (Standard)
				C	Standard plug
				E	Standard jack
				K	Spade lugs (compensated)
				T	Junction box connector
				X	Other, specify
					<b>Note:</b> If bayonet adapter is required, see pg. 2-3.
2Q	J	60"	G	C	



## MgO VS HOLLOW TUBE

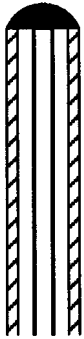
Bayonet thermocouples can be constructed with magnesium oxide sheath material of .125" or .188" O.D. Hollow tube units are made with lead wires inserted in tubing of .125" or .188" outer diameter. The magnesium oxide insulation is a dry, uncontaminated compacted ceramic powder. The MgO gives the thermocouple high insulation resistance and dielectric strength. Also, it allows excellent insulation of the positive and negative wire conductors in relation to each other and to the outer sheath. Among the outstanding features of sheath material are: (A) flexibility to bend or form to twice the radius of the sheath diameter, (B) its rigidity to maintain size and shape after bending or straightening, (C) vibration or shock has no effect on the material, (D) sheath material withstands pressures upward to 50,000 psi, and (E) sheath material may be used in applications where temperatures may range from -400° to 3000°F depending on requirements and selection of materials.

INSULATOR	PURITY %	MELTING POINT		USABLE TEMP.	
		°C	°F	°C	°F
MAGNESIA (MGO)	96.4% (std)	2790	5050	1650	3000
	99.4% (must specify)				
	99.8% (must specify)				

New insulation materials are being developed. Use an X and describe to specify.

The hollow-tube design is used for disposable thermocouples that can be replaced easily. Their life is about half of that of a magnesium oxide insulated thermocouple. The advantage of a hollow-tube design is the cost. It is the least expensive design, for the short run.

# MEASURING JUNCTION



**GROUNDING JUNCTION**

The **grounded** thermocouple junction is an integral part of the thermocouple sheath tip.

**Advantages:**

- fast response time in relation to ungrounded and isolated junctions.
- protects the wires from environmental chemicals and corrosives.
- prolongs the operational life of the thermocouple. Longer lifespan than the exposed junction thermocouple.
- it is recommended for high pressure applications.
- it is the least expensive construction.

**Disadvantages:**

- thermal expansion of sheath material may differ from element to cause mechanical stress and work hardening of metals.
- ground loops may cause interference with instruments.
- faults in insulation are more difficult to detect.



**UNGROUNDING JUNCTION**

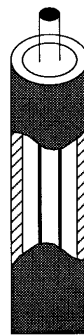
The **ungrounded** thermocouple junction is electrically insulated and electrically isolated from the outer sheath material. In a dual ungrounded thermocouple, one common junction is electrically insulated from the outside sheath.

**Advantages:**

- the thermocouple junction is isolated from the ground.
- defects in the MgO insulation can be detected by measuring resistance from loop to sheath.
- long term drift under cycling conditions is minimized.

**Disadvantages:**

- response time is usually slower than grounded thermocouples.
- more expensive than grounded thermocouples.



**EXPOSED JUNCTION**

The **exposed** thermocouple junction extends beyond the protective metallic sheath.

**Advantages:**

- recommended for measurement of noncorrosive static gas, or air.
- very fast response time, faster than grounded junction.

**Disadvantages:**

- cannot be used in an environment with a high percentage of solids, high pressure, or flowing material since the junction is exposed to this environment.

**Isolated** thermocouple junctions are used in a dual or triple thermocouple when the junctions are isolated from the outer sheath material as well as from each other.

**Advantages:**

- the two elements are insulated from ground.
- performs better than ungrounded or grounded junctions in a thermal cycling environment.

**Disadvantages:**

- slower response time than a grounded dual thermocouple.



**ISOLATED JUNCTION**

\* For tip sensitivity information, see pg. 3-8.

# Please Note:

JMS Southeast has helped develop several new & innovative designs for measuring temperature in numerous sorts of plastic melt situations, from automatic profiling of nozzle melts to surface temperatures. Ask us & we'll refer you to the real experts in plastics extrusion & molding!