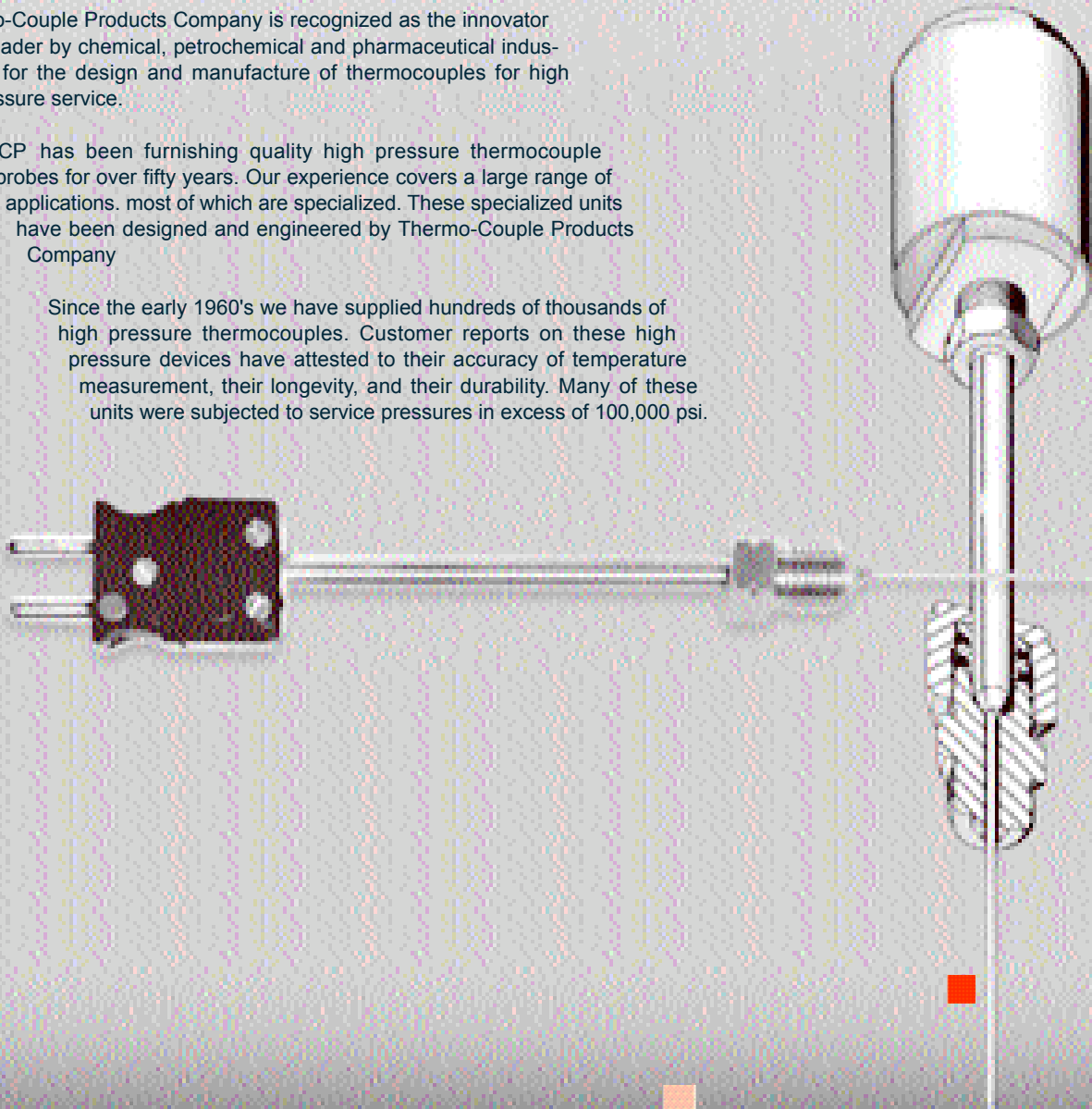


High Pressure Thermocouples

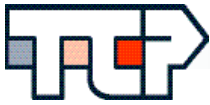
Thermo-Couple Products Company is recognized as the innovator and leader by chemical, petrochemical and pharmaceutical industries for the design and manufacture of thermocouples for high pressure service.

TCP has been furnishing quality high pressure thermocouple probes for over fifty years. Our experience covers a large range of applications, most of which are specialized. These specialized units have been designed and engineered by Thermo-Couple Products Company

Since the early 1960's we have supplied hundreds of thousands of high pressure thermocouples. Customer reports on these high pressure devices have attested to their accuracy of temperature measurement, their longevity, and their durability. Many of these units were subjected to service pressures in excess of 100,000 psi.



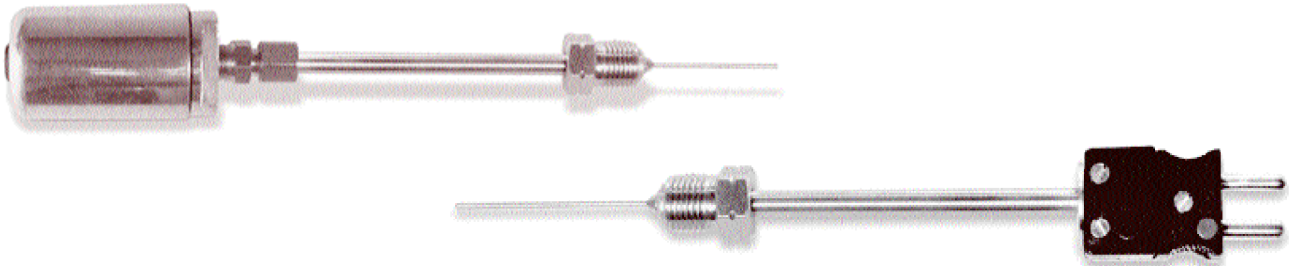
High Pressure



Thermo-Couple Products Co.

INTRO TO HIGH PRESSURE THERMOCOUPLES

High Pressure



There are many considerations which must be taken into account, when designing thermocouples for high pressure service. The designer must be familiar with the effects of corrosion, environment, creep, fatigue, and thermal and mechanical stress.

Corrosion:

The designer must be aware of the possibility of corrosive conditions to make intelligent material choices. Material choices must be compatible with the process media over the entire operating temperature range of the device. This consideration is important to prevent production losses due to a premature failure of the high pressure devices.

Embrittlement:

Embrittlement occurs when metals exceed rated temperature or combine chemically with certain gases or other compounds. TCP engineers, in cooperation with the customer, carefully select the proper alloys to minimize or eliminate this problem.

Creep:

This condition is caused by high pressure and temperature. Careful attention is given to the possibility of metal deformation to hold it within prescribed limits. The design limits are particularly important when designing the sealing areas in high pressure service. Poor seals result in leaks with their associated safety record of their high pressure devices and thermocouple probes.

Fatigue:

Vibration, flexing, twisting etc. all are causes of fatigue failure. Fatigue failure is another problem our designers minimize by carefully questioning the customer and becoming familiar with the application. In this area, overdesign can be as harmful as underdesign in obtaining useful service life with maximum safety. Our design engineers have many years of successful experience in this important area.

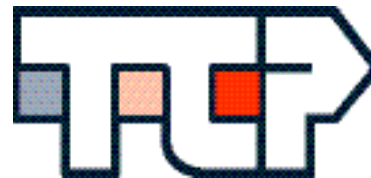
Thermal Stress:

A critical area requiring a high degree of proficiency in the metallurgical sciences. Conditions caused by different coefficients of expansion in materials can cause problems at operating temperatures. These problems can become aggravated when subjected to overheating. Once again, these problems are handled routinely by TCP assuring you of a safe and accurate long lasting device.

Mechanical Stress:

Similar to thermal stress except mechanical stress failure is due to high pressures. Symptoms include bulges and ruptures. Successful design of devices to handle mechanical stress in addition to all the other conditions listed above is what sets TCP apart from the usual thermocouple supplier.

Manufacturing facilities at TCP include a machine shop, atmosphere brazing, controlled atmosphere heat treating facilities, heliarc and plasma arc welding, hydrostatic pressure testing, radiographic equipment rated at 200 KV, metallurgical examination, and a complete testing and inspection program in accordance with ISO 9001:2000.

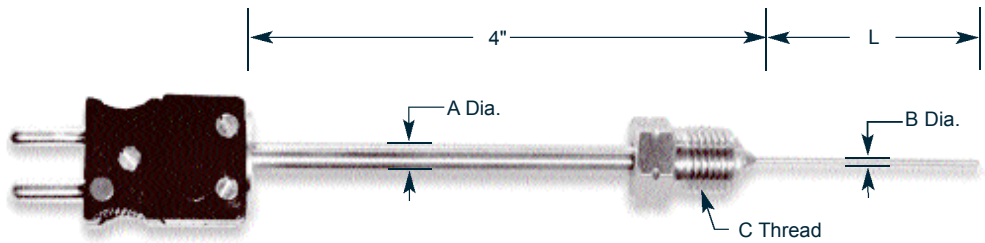


Thermo-Couple Products Co.

HIGH PRESSURE THERMOCOUPLE

Series 1500

- Temperature Sensing at Pressures Up to 60,000 PSI (PSI Rating Limited Only By High Pressure Fitting)
- 316 Stainless Steel Sheath Material and Support Tube Standard
- Compacted MgO Insulation
- Grounded Junction (W2) Standard
- Industry Standard Color Coded Disconnect



Enter a selection for each item, please fax your inquiry to TCP.

Example: 1500 - - - -

1500 - - - -

CODE	WIRE CALIBRATION
J	Iron/Constantan
K	Chromel/Alumel
T	Copper/ Constantan

For duplex calibrations, please indicate double letters, example EE.

CODE	OTHER PERTINENT DATA
0	NONE
999	Special Request Consult Factory

LENGTH "L"
Specify in inches 01 to 99

CODE	SHEATH DIAMETER	A	B	C Thd	Mating Port Numbers		
					Autoclave	H.I. P.	P.P.I.
C	.062"	.250"	.125"	9/16 - 18 NF	F250C	HF4	1/4 HP
D	.125"	.375"	.218"	3/4 - 16 NF	F375C	HF6	3/8 HP
E	.187"	.562"	.281"	1-1/8 - 12NF	F562C	HF9	9/16 HP

Suggested High Pressure Fitting Manufacturers	
Autoclave	- Auto Engineers, Inc., Erie, PA.
H.I.P	- High Pressure Equipment Co., Inc., Erie, PA
P.P.I	- Pressure Products Industries, Hatboro, PA

Metric Orders Welcome

Place an **mm** in the appropriate selection box:

Proprietary Brazing Process

On All High Pressure Thermocouples



Thermo-Couple Products Co.

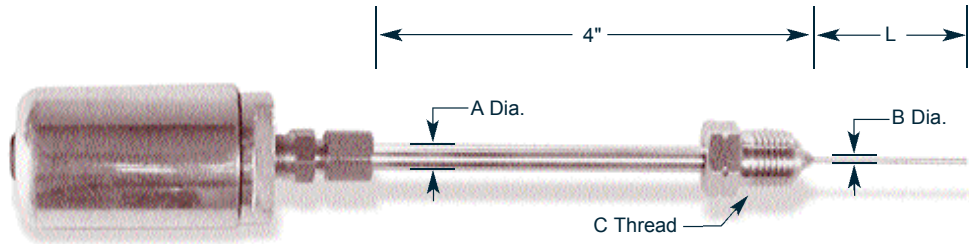
www.tcproducts.com

a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

HIGH PRESSURE THERMOCOUPLE

Series 1600

- Temperature Sensing at Pressures Up to 60,000 PSI (PSI Rating Limited Only By High Pressure Fitting)
- 316 Stainless Steel Sheath Material and Support Tube Standard
- Compacted MgO Insulation
- Grounded Junction (W2) Standard
- Supplied with a Light Weight Screw-Cover Head



Enter a selection for each item, please fax your inquiry to TCP.

Example: 1600 - - - -

1600 - - - -

CODE	WIRE CALIBRATION
J	Iron/Constantan
K	Chromel/Alumel
T	Copper/ Constantan

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CODE	SHEATH DIAMETER	A	B	C Thd	Mating Port Numbers		
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High Pressure