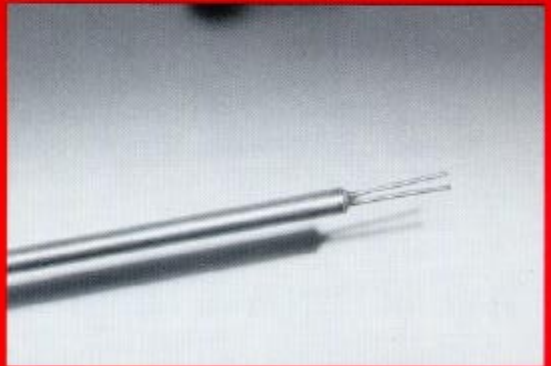
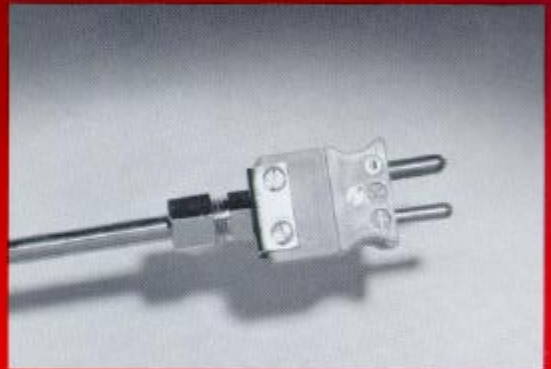




**MARSHALL
THERMOCOUPLES**



Thermocouples
and Accessories



Thermocouple Application

ANSI Type	Wire Alloys	Temperature Range °F	Limits of Error	
			Standard	Special
J	Iron (+) vs. Constantan (-)	32 to 530 530 to 1400	± 4° F ± 3/4%	± 2° F ± 3/8 %
K	Chromel (+) vs. Alumel (-)	32 to 530 530 to 2300	± 4° F ± 3/4 %	± 2° F ± 3/8%
T	Copper (+) vs. Constantan (-)	- 300 to - 75 -150 to -75 - 75 to 200 200 to 700	— ± 2% ± 1 1/2° F ± 3/4%	± 1% ± 1% ± 3/4° F ± 3/8%
E	Chromel (+) vs. Constantan (-)	32 to 600 600 to 1600	± 3° F ± 1/2%	— —
R	Platinum (-) vs. Pt. 13% Rhodium (+)	32 to 1000 1000 to 2700	± 5° F ± 1/2%	± 2 1/2° F ± 1/4%
S	Platinum (-) vs. Pt. 10% Rhodium(+)	32 to 1000 1000 to 2700	± 5° F ± 1/2%	± 2 1/2° F ± 1/4%
B	Pt. 6% Rhodium (-) vs. Pt. 30% Rh (+)	1600 to 3100	± 1/2%	—
C	Tungsten 26% Rhenium (-) vs. Tungsten 5% Rhenium (+)	800 to 4200	± 1 %	—

Although some of the thermocouples listed above can be used at higher temperatures than those shown, these are generally considered to be maximum reliable operating temperatures.

Type J (Iron vs. Constantan) Can be used protected or unprotected. Reducing atmosphere recommended. Iron wire oxidizes rapidly above 1000° F.

Type K (Chromel-Alumel*) Recommended for oxidizing atmospheres. Should be used in suitable protection tube when in a reducing or sulphurous atmosphere.

Type T (Copper-Constantan) Useable in oxidizing, reducing or inert atmospheres.

Type E (Chromel*-Constantan) Oxidizing atmospheres recommended. Highest EMF of common base metal thermocouples.

Type R (Platinum vs. Platinum 13% Rhodium) Oxidizing atmosphere recommended. Should be protected with ceramic protection tube. Higher EMF output than Type S.

Type S (Platinum vs. Platinum 10% Rhodium) Same general conditions as Type R.

Type B (Platinum 6% Rhodium vs. Platinum 30% Rhodium) Same general conditions as Type R & S. EMF output is lower than Type R & S.

Type C (Tungsten 26% Rhenium vs. Tungsten 5% Rhenium) For use in vacuum or inert gas applications.

*Chromel-Alumel trade name Hoskins Mfg. Co.

Special Purpose Thermocouples

L.H. Marshall Co. has been making thermocouples since 1927 with emphasis on types used worldwide for the taking of molten nonferrous metal temperatures.

Today our expertise extends even further into foundry, plastic injection molding and other industrial and commercial thermocouple applications.

Our knowledge in all phases of thermocouple design and manufacture is available to you; both to assist you

in answering questions of application and to develop custom thermocouples tailored to your own special needs. Give us a call, or send your specifications for prompt, courteous attention. Call toll-free 1-800-THER-MOC. Or FAX (614) 294-0297. In Ohio, call (614) 294-6433 collect. L. H. Marshall Company, Box 02226, Columbus, Ohio 43202.

Emergency Shipping Service

In emergency situations L.H. Marshall Co. will ship small quantities of in-stock thermocouples within 24 hours at no additional charge.

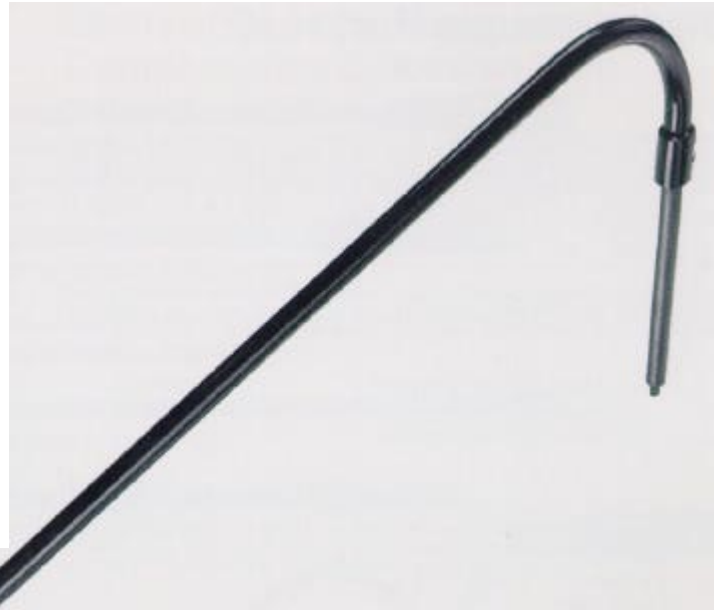


Porta-Probe™ Pyrometer

The Porta-Probe pyrometer is a new approach to high accuracy digital temperature measurement for nonferrous melts.

Porta-Probe combines the Marshall thermocouple, a 43" curved Marshall lance and a highly sensitive digital thermometer into one portable, hand-held unit. It measures temperatures from -328° F to + 2498° F (-200° C to + 1370° C) with an accuracy of ± 0.10% to the nearest degree. The Porta-Probe provides °F readings with 1° or 0.2° resolution, °C resolution of 1° or .1°. Conversion between °F and °C is instantaneous and requires no recalibration.

Sixteen gauge Type K thermocouple wires are swaged directly into a chrome-iron protection tube, providing a rapid response hot junction. The wires are completely protected from contamination. The thermometer is housed in a custom molded, high-impact plastic case.



The Porta-Probe can operate for more than 1,200 hours continuously on a single 9-volt transistor radio battery. The 0.30" LCD display indicates temperature, scale in use (°F or °C), low battery and overranged or "open" sensor.

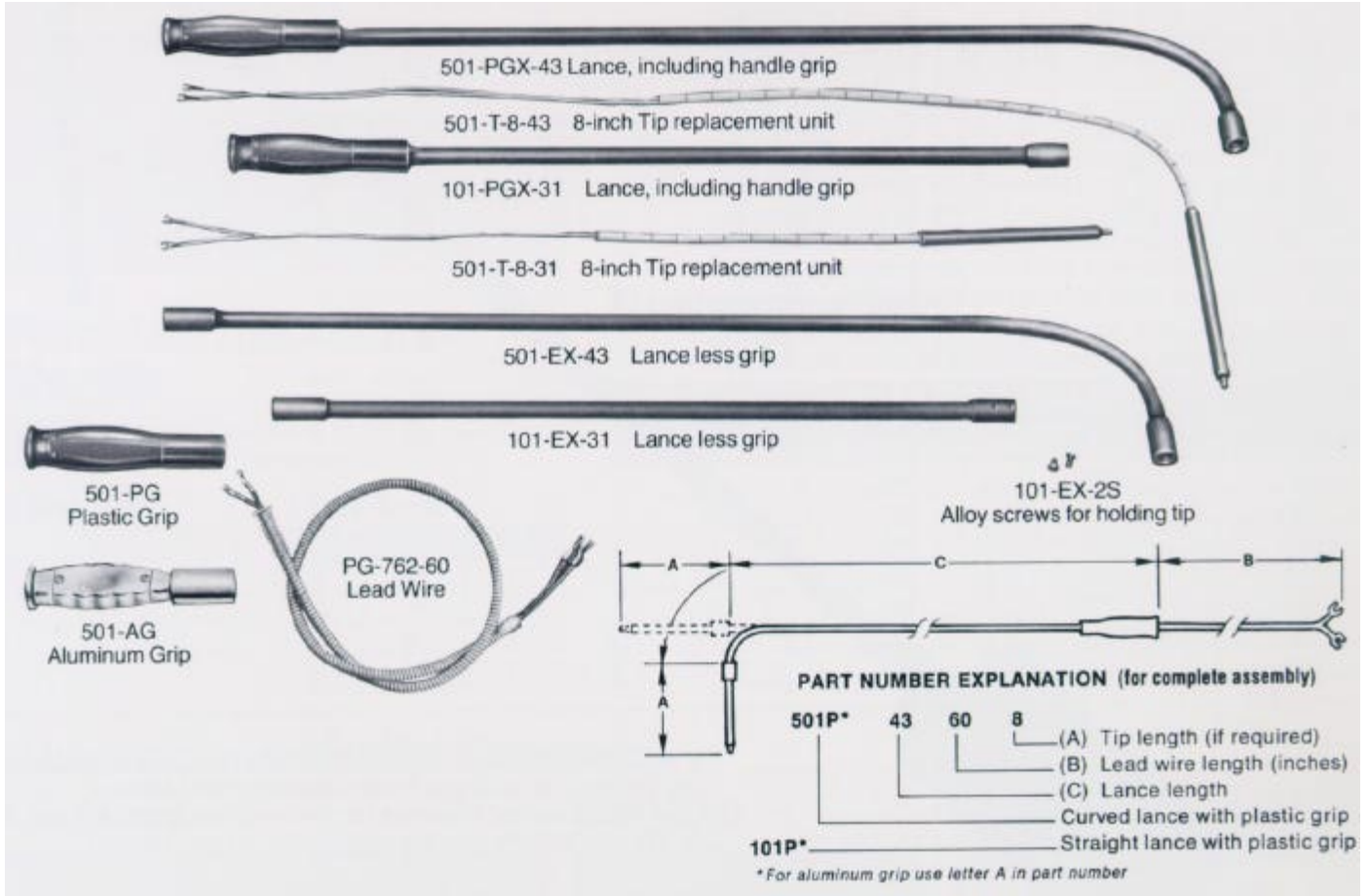
Thermometer Specifications

Temperature Range	-328° F to + 2498° F (- 200° C to + 1370° C)
Display	0.30" LCD
Accuracy	± 1° F, ± 0.10° F rdg
Resolution	High: 0.2°F, 0.1°C Low: 1°F, 1°C
Indication	°F / °C selectable
Operating Range	0° to 50° C
Accuracy with Time	90 days: add ± 0.05% rdg 1 year: add 0.1% rdg
Temperature Drift	zero: ± 2µ V° C span: ± 0.02% / °C
Probe Connection	Standard mini-connector Type K
Storage Temperature	-20° C to + 70° C
Normal Mode Rejection	50 db at 50 or 60 Hz
Common Mode Rejection	140 db at 50 or 60 Hz

Maximum Common Mode Voltage Measurement Technique Linearization	1000 VAC, ± 2000 V peak Dual-slope A/D conversion 100% digital. Typically 100 segments depending on range selected.
Reference Junction Stability with Temperature Input Resistance Update Rate Battery	Thermocouple: ± 0.7°C from 5°C to 45°C ± 1.3°F from 41°F to 113°F Thermocouple: 13M Ω 1 reading / second typical
Battery Life	9 volt transistor NEDA #1604 In excess of 1200 continuous hours for thermocouple. Low battery indicator.
Warranty	1 year



Thermocouple Parts List



Curved Lance (90° Bend*)

with grip		without grip	
501-PGX-31	31 inch model	501-EX-31	
501-PGX-43	43 inch model	501-EX-43	
501-PGX-55	55 inch model	501-EX-55	
501-PGX-72	6 foot model	501-EX-72	
501-PGX-96	8 foot model	501-EX-96	
501-PGX-120	10 foot model	501-EX-120	

*Special bends available on request.

Lead wires**

PG-762-40	40 inch
PG-762-60	5 foot
PG-762-120	10 foot
PG-762-180	15 foot

**Other lengths available on request.

Straight Lance

with grip		without grip	
101-PGX-31	31 inch model	101-EX-31	
101-PGX-43	43 inch model	101-EX-43	
101-PGX-55	55 inch model	101-EX-55	
101-PGX-72	6 foot model	101-EX-72	
101-PGX-96	8 foot model	101-EX-96	
101-PGX-120	10 foot model	101-EX-120	

PG-762-240	20foot
PG-762-300	25 foot
PG-762-360	30 foot

Lead wire assemblies for use with aluminum grip (501-AG) use Part No. R-762 plus length.

Typical tip replacement units

No. 501-T series are 8" tips	"A" Inches	"B" Inches	for use in lance length
501-T-8-31	.8	.36	31 in.
501-T-8-43	.8	.49	43 in.
501-T-8-55	.8	.61	55 in.
501-T-8-72	.8	.79	6 ft.
501-T-8-96	.8	1.03	8 ft.
501-T-8-120	.8	1.27	110H.
No. 701-T series are the longer tips: 12", 15", 24" and 30". Specify 701-T plus tip length followed by lance length in inches, as shown in examples below:			
701-T-12-72	12	.83	6 ft.
701-T-15-55	15	.68	55 in.
701-T-20-43	20	.61	43 in.
701-T-24-96	24	1.19	8 ft.

