THERMOCOUPLES

INTRODUCTION

Thermocouple basically consists of two dissimilar metals that are weld to form a pure junction which when heated produce a small unique voltage. This voltage changes as temperature increase or decrease.

CONSTRUCTION

Thermocouple are constructed to resist to most various harsh environments or atmosphere conditions. They are insulated and protected with different materials and sizes depending on the process conditions. They are two types of fabricated standard

- Thermocouples wire with ceramic insulator.
- Thermocouples with Magnesium oxide powder.

PHYSICAL SPECIFICATIONS

Temperature Range: - 200°C to +1600°C

Sheath

- 316 Stainless Steel maximum to 500°C max (ISA Type J, E, T).
- Inconel 600 maximum to 1100°C max (ISA Type K).
- Alumina tube maximum to 1600 °C max (ISA Type R, S, B).

Temperature Sensors Services manufactured all thermocouples using ISA type J, K, T, E, R, S, B uninsulated base metal wire to meet standard tolerances and limits of error conform to IEC 584 and ANSI C96-1.

A wide variety of thermocouple are available as individual probe or complete assemblies including connection heads, thermowell and extension nipple union, spring loaded and quick disconnect plug. Design for direct mounting in a liquid or gas, installation in thermowells or immersion through pipe or vessel walls.

TYPES OF MEASURING JUNCTIONS - AVAILABLE IN SINGLE OR DUAL ELEMENTS

Exposed Junction (E)

The junction extends beyond the protective metallic sheath to give accurate fast response. The sheath insulation is sealed where the junction extends to prevent penetration of moisture or gas which could cause errors. Recommended for the measurement of static or flowing non-corrosion gas temperatures where fast response time is required

Grounded Junction (G)

The junction of a grounded thermocouple is welded to the protective sheath giving faster response than the ungrounded junction type. Recommended for the measurement of static or flowing corrosive gas and liquid temperatures and for high pressure application

Ungrounded Junction (U)

The welded wire thermocouple is physically insulated from the thermocouple sheath by MgO powder. Recommended for measurements in corrosive environments where it is desirable to have the thermocouple electronically isolated from and shielded by the sheath.

CHARACTERISTICS OF THERMOCOUPLE

ISA TYPE	THERMOCOUPLE ANSI SYMBOL		TEMPERATURE RANGE	LIMITS OF ERRORS STANDARD	LIMITS OF ERRORS SPECIAL	COMMENTS
J	IRON CONSTANTAN	(+) (—)	0 ~ 750°C 32 ~ 1382°F	±2.2°C ±0.75%	±1.1°C ±0.4%	Reducing atmosphere recommended. Iron leg subject to oxidation at elevated temperatures - use larger gauge to compensate.
K	CHROMEL ALUMEL	(+) (—)	0 ~ 1250°C 32 ~ 2282°F	±2.2°C ±0.75%	±1.1°C ±0.4%	Well suited for oxidation atmospheres. Most commonly used calibration type.
T	COPPER CONSTANTAN	(+) (—)	0 ~ 350°C 32 ~ 662°F	±1.0°C ±0.75%	±0.5°C ±0.4%	Most stable at cryogenic temperature ranges. Excellent in oxidizing and reducing atmospheres within temperature range.
E	CHROMEL CONSTANTAN	(+) (—)	0 ~ 900°C 32 ~ 1652°F	±1.7°C ±0.5%	±1.0°C ±0.4%	Highest output base metal thermocouples. Not subject to corrosion at cryogenic temperatures.
R	PLAT. 13% RHOD PLATINUM	(+) (—)	0 ~ 1450°C 32 ~ 2642°F	±1.5°C ±0.25%	±0.6°C ±0.1%	Oxidizing atmosphere recommended. Easily contaminated, required protection.
S	PLAT. 13% RHOD PLATINUM	(+) (—)	0 ~ 1450°C 32 ~ 2642°F	±1.5°C ±0.25%	±0.6°C ±0.1%	Laboratory standard, highly reproducible. Easily contaminated, required protection.
B	PLAT. 30% RHOD PLAT. 6% RHOD	(+) (—)	870 ~ 1700°C 1598 ~ 3092°F	±0.5°C	-	Easily contaminated, requires protection.