

# THERMOCOUPLE IDENTIFICATION

ANSI CODE	ALLOY COMPOSITION		COLOR OF INSULATION											
			AMERICAN: ISA-RP1 (ASA-C96-1)			BRITISH (BS 1843)			GERMAN DIN43714			JAPANESE JIS C 1610-1981		
			OUTER SHEATH	+ WIRE	- WIRE	OUTER SHEATH	+ WIRE	- WIRE	OUTER SHEATH	+ WIRE	- WIRE	OUTER SHEATH	+ WIRE	- WIRE
J	IRON Fe	CONSTANTAN Cu-Ni	BLACK	WHITE	RED	BLACK	YELLOW	BLUE	BLUE	RED	BLUE	YELLOW	RED	WHITE
K	CHROMEL Ni-Cr	ALUMEL Ni-Al	BROWN	YELLOW	RED	RED	BROWN	BLUE	GREEN	RED	GREEN	BLUE	RED	WHITE
T	COPPER Cu	CONSTANTAN Cu-Ni	BROWN	BLUE	RED	BLUE	WHITE	BLUE	BROWN	RED	BROWN	BROWN	RED	WHITE
E	CHROMEL Ni-Cr	CONSTANTAN Cu-Ni	BROWN	PURPLE	RED	BROWN	BROWN	BLUE	BLACK	RED	BLACK	PURPLE	RED	WHITE
B	PLATINUM-30% RHODIUM Pt-30%Rh	PLATINUM-6% RHODIUM Pt-13%Rh	GREY	GREY	RED	—	—	—	GREY	RED	GREY	GREY	RED	GREY
R	PLATINUM-13% RHODIUM Pt-13%Rh	PLATINUM Pt	GREEN	BLACK	RED	GREEN	WHITE	BLUE	WHITE	RED	WHITE	BLACK	RED	BLACK
S	PLATINUM-10% RHODIUM Pt-10%Rh	PLATINUM Pt	GREEN	BLACK	RED	GREEN	WHITE	BLUE	WHITE	RED	WHITE	BLACK	RED	BLACK
N	NICROSIL Ni-Cr-Si	NISIL Ni-Si-Mg	BROWN	ORANGE	RED	—	—	—	—	—	—	—	—	—

## INPUT SPECIFICATIONS

Sensor	Input Type	Max. Range F	Accuracy F	Max. Range C	Accuracy C
J	Iron-Constantan	-58 to 1830°F	±3.6°F	-50 to 999°C	±2°C
K	Chromel-Alumel	-58 to 2500°F	±3.6°F	-50 to 1370°C	±2°C
T	Copper-Constantan	-454 to 752°F	±3.6°F	-270 to 400°C	±2°C
E	Chromel-Constantan	-58 to 1382°F	±3.6°F	-50 to 750°C	±2°C
B	Pt 30% RH/Pt 6% RH	572 to 3272°F	±5.4°F	300 to 1800°C	±3°C
R	Pt 10% RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
S	Pt 10% RH/Pt	32 to 3182°F	±3.6°F	0 to 1750°C	±2°C
N	Nicrosil-Nisil	-58 to 2372°F	±3.6°F	-50 to 1300°C	±2°C
RTD	PT 100 ohms (DIN)	-328 to 932°F	±0.72°F	-200 to 500°C	±0.4°C
RTD	PT 100 ohms (JIS)	-328 to 932°F	±0.72°F	-200 to 500°C	±0.4°C
Linear	-10mV to 60MV	-1999 to 9999	±0.05%	-1999 to 9999	±0.05%

## SENSOR COMPARISON TABLE

	THERMISTOR	PLATINUM RTD	THERMOCOUPLE
Temperature range	-40°C/260°C	-190°C/650°C	-150°C/2400°C
Response speed	Medium	Medium	Very Fast
Ruggedness	Good	Good	Excellent
Sensor accuracy	±25°C	±25°C	±2°C
System accuracy	Excellent	Very good	Fair
Sensor stability	Excellent	Excellent	Fair
System stability	Excellent	Very good	Fair
Sensor sensitivity	40 MV/°C	2 MV/°C	.05 MV/°C
Sensor cost	Very low	Medium	Low
System cost	Very low	Low	Medium

Thermister electrical resistance values can range from 100 to 1,000,000 ohms at 25°C. The resistance change is approximately -4.4% per °C at 25°C. The large resistance change limits thermistors to narrow temperature ranges and low temperatures. However, in these situations, thermistors have greater accuracy and ambient temperature stability than RTDs or thermocouples. Lead wire can be as long as 1,000 feet without significant error.

Platinum RTD's electrical resistance values change approximately .385% per °C. The DIN standard element is 100 ohms at 0°C, showing a nearly linear change of + 38.5 ohms between 0 and 100°C. Platinum RTDs provide very good system accuracy at very low temperatures to 1000°F. Two wire RTDs have significant errors when over 10 feet long. However, these errors can be eliminated by using 4 wire RTDs.

Thermocouples are constructed of two wires of dissimilar metals that generate .05 MV per °C at the "hot" junction. The "cold" junction must be maintained temperature constant by electronic means to avoid signal errors. Low signals and linear complexities make system accuracy and integrity difficult. However, thermocouples respond to temperature changes very quickly, are virtually impervious to vibration or other mechanical conditions, have a wide range and high temperature capability.

## ADAPTOR PLATES FOR MOUNTING SMALLER SIZE CONTROLS IN LARGER OPENINGS

PMAE-1: ¼ DIN opening to 72MM

PMAE-2: ¼ DIN opening to ½ DIN

PMAE-3: ¼ DIN opening to ¾ DIN

PMAE-4: ½ DIN opening to ¾ DIN

PMAE-5: B/C 520- to ¾ DIN

PMAE-6: 72mm opening to ¾ DIN

Other size adaptors available—Consult Ogden