AEROPAK® THERMOCOUPLES

METALLIC SHEATH, CERAMIC INSULATED THERMOCOUPLES FOR:

Temperatures of −270°C to 1100°C
Pressure Tight to 3 500 kg/cm^2
Fast Response
May be Bent to Any Shape
Exceptionally Long Life
Diameters of 0,63 to 9,5mm
Lengths from 2,54cm to 88 metres.

FOR SERVICE IN:

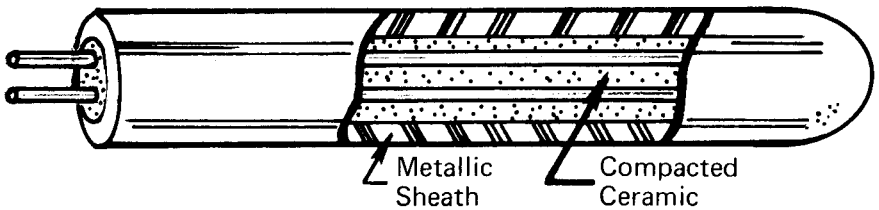
- ☐ LIQUIDS
- ☐ HOT & COLD GASES
- ☐ FOODS
- ☐ KEROSENE
- ☐ OIL
- ☐ ALCOHOL
- ☐ CHEMICAL PROCESSING
- ☐ LIQUID OXYGEN
- ☐ HYDROGEN PEROXIDE
- ☐ FATTY ACIDS
- ☐ NUCLEAR RADIATION
- ☐ SODIUM
- ☐ SURFACE TEMPERATURE MEASUREMENTS

SPECIAL APPLICATION THERMOCOUPLES

ARi Industries, Inc. has a complete line of thermocouples for special applications. Our Engineering Department is staffed by graduate and experienced engineers, competent in mechanical, electrical, and metallurgical aspects of design. Do not hesitate to contact us for your special requirements.

THERMOCOUPLE ASSEMBLIES

AEROPAK® THERMOCOUPLES STANDARD DESIGNS



TIME CONSTANTS

Some typical time constants (time for the thermocouple temperature to reach 63,2% of a step change in gas or liquid temperature) for various sizes are listed for different media.

Cond. A: No. 7 hot junction in water moving at a velocity (V_0) of 1,5m/sec.

Cond. B: No. 8 hot junction in water moving at a velocity (V_0) of 1,5m/sec.

Cond. C: No. 7 hot junction in air moving at a mass velocity (G_0) of 29,3kg/sec.m^2.

Cond. D: No. 8 hot junction in air moving at a mass velocity (G_0) of 29,3kg/sec.m^2.

Table 1

SHEATH DIAMETER (mm)	COND. A	COND. B	COND. C	COND. D
8,0	0,5*	5,5	5,0	55,0
6,35	0,3	4,0	2,5	39,0
4,75	0,2	2,5	2,0	26,0
3,17	0,1	1,5	1,0	14,0
1,67	0,05	0,5	0,5	5,0
1,0	0,01	0,3	0,1	2,5

*** Time in seconds.**

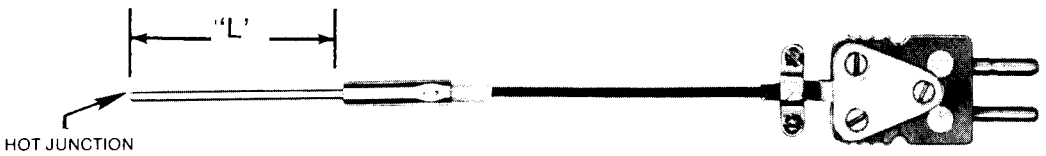
For time constants (τ) at other velocities (V) or mass velocities (G) use the equations below.

$$\tau = \tau_0 \sqrt{\frac{V_0}{V}} \text{ (for liquids)} \quad \text{or} \quad \tau = \tau_0 \sqrt{\frac{G_0}{G}} \text{ (for gases)}$$

The results of these equations will be affected by using liquids other than water and gases other than air. However, the effect is small and can be neglected for many applications.

HOW TO DESIGNATE CATALOGUE NUMBERS
FOR STANDARD DESIGNS

EXAMPLE



CATALOGUE No. T-77M-600(DM) K 8 F 16

DESIGN NUMBER — (see table 1; T-77 in this example)
INSULATION MATERIAL — (see table 2; Industrial Grade in this example)
SHEATH LENGTH 'L' in mm — (600mm in this example)
SHEATH DIAMETER SYMBOL — (see table 3; 3mm in this example)
WIRE CALIBRATION SYMBOL — (see table 4; Chromel-Alumel in this example)
JUNCTION STYLE NUMBER — (see table 5; grounded in this example)
SHEATH MATERIAL SYMBOL — (see table 6; 347 ST/ST in this example)
LENGTH OF LEAD WIRE — Please specify

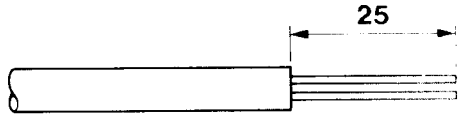
Note: When duplex circuit required add (.4) after the design number.
For example: a (T-14) in duplex circuit would be (T-14.4).

LEAD WIRE LENGTH:	Lengths required, designate in Part Number.
SHEATH LENGTH 'L'	Specified in millimetres in even increments from 25mm to 88 metres. See Table 3 for maximum length for each diameter. Length tolerances to be: ±3,2mm up to 30,5cm ; ±8,0mm up to 244cm; ±50,8mm over 244cm.
INSULATION RESISTANCE:	100 megaohms or more at 500V DC for lengths of 15 metres or less for 1,67 to 8,0mm diameter.10 megaohms or more at 1½V DC for lengths of 15 metres or less for 1,0 and 0,63mm diameters. This measurement is made prior to fabrication of hot junction.
BEND INSULATION RESISTANCE:	Minimum insulation resistance, after bending around a mandrel whose diameter is 4 times the sheath diameter, to be 2,5 megaohms at 1½V DC.
HIGH TEMPERATURE INSULATION RESISTANCE:	ALL AEROPAK thermocouples of length 61cm or less will have a minimum insulation resistance of 10 000 ohms or more at 1½V DC at 1 000°C.
AVAILABILITY:	2 Wire (1 T/C circuit) sheath diameters: 0,63 to 9,52mm. 4 Wire (2 T/C circuit) sheath diameters: 3,17 to 9,52mm. Exposed, grounded, and ungrounded hot junction.
SPECIAL SPECIFICATIONS:	To specify customer specifications, or to Nuclear grade requirements, i.e.: MIL-T-23234A RDT-C7-6T ASTM E-235 with complete testing per above specifications within ARi facilities.
PRESSURE RATING:	AEROPAK® thermocouples using No.8 or 9 hot junctions are pressure tight to 3 500 kg/cm^2 at temperatures up to 649°C. AEROPAK® thermocouples using No. 7 junction are pressure tight to 350 kg/cm^2 if a seal is used at the cold end.

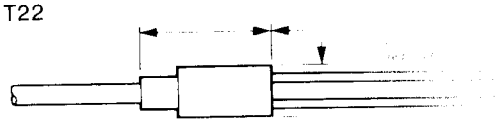
COLD END THERMOCOUPLE TERMINATIONS

Table 1

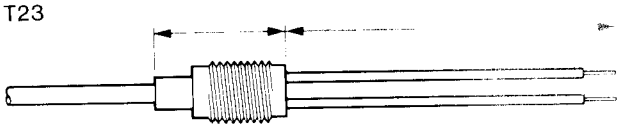
T14



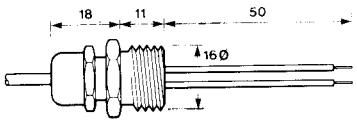
T22



T23

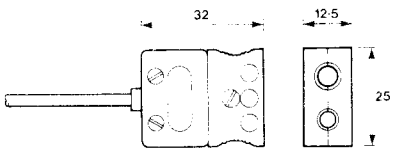


T25

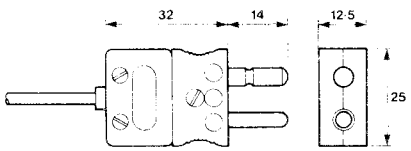


OR ANY STANDARD FITTING

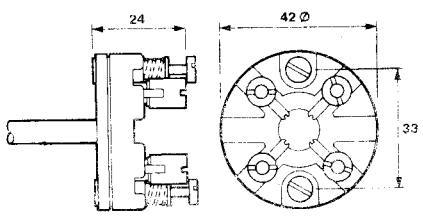
T90



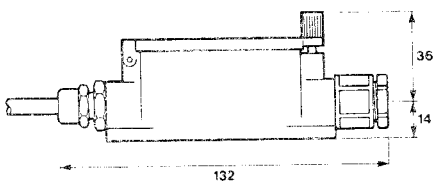
T91



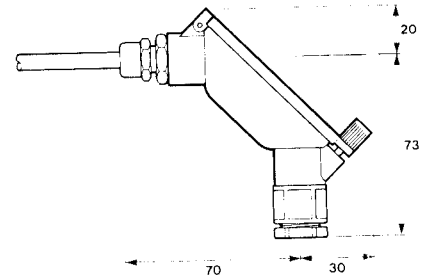
T92



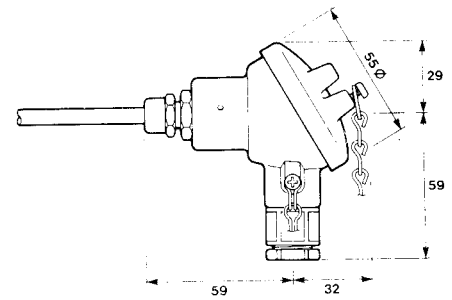
T93 DIE CAST ALLOY HEAD



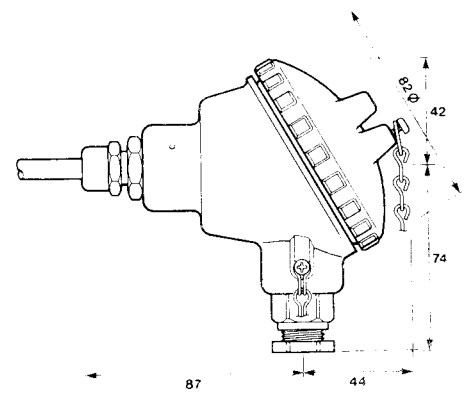
T94 DIE CAST ALLOY HEAD



T95 WEATHERPROOF DIE CAST ALLOY HEADS



T96



TX-96 (Transmitter installed)

N.B.: Nylon heads also available T97.

*T22 style also available as

T26 — with sprague tubing

T99 — SS braided tails

T77 — With male connector

All dimensions subject to change without notice

AEROPAK® THERMOCOUPLES
THE TIME TESTED LINE OF FINE PRODUCTS

The superior qualities of AerOpak® thermocouples are due to the "extrusion method" used at ARi Industries, Inc. This method compacts ceramic insulation around the thermocouple wires, contained in a metallic sheath. It requires 250 000 psi (17 550kg/cm^2) to form this assembly. The results:

1. A thermocouple that is free of sheath cracks and ruptures.
2. Wires that are accurately centered with ceramic insulation solidly packed around them.
3. Outstanding metallurgical properties for the sheath and wires.

AerOpak® quality assures pressure tight performance and long life for applications of strength and requirements, such as, high vibration, high and low temperatures, multiple bends, eroding and corroding environments.

SPECIFICATIONS FOR STANDARD DESIGNS

CERAMIC INSULATION

Table 2

MATERIAL	ARi SYMBOL
High Purity Magnesia Industrial Grade (98% + MgO)	M
High Purity Magnesia Standard Grade (99,4% + MgO)	N

SHEATH & WIRE DIAMETER

Table 3

ARi SYMBOL	L	A	B	D	E	F	G	I
SHEATH DIAMETER (mm)	0,5	1,0	1,67	3,17	4,75	6,35	8,0Ø	9,52
WIRE DIAMETER (mm)	0,1	0,15	0,25	0,5	0,85	1,0	1,45	1,63
MAXIMUM LENGTH (metres)	9	61	88	88	41	25	14	9

For metric equivalents use suffix 'M', i.e. FM = 6,0mm O.D.

WIRE CALIBRATION

Table 4

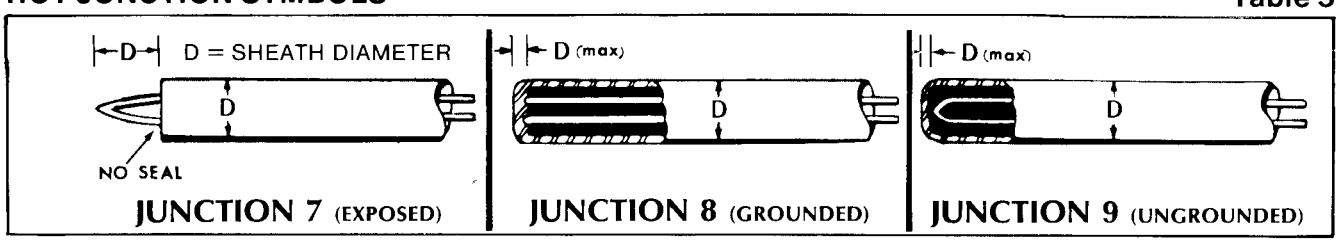
CALIBRATION*	ARi SYMBOL	ASTM E-230-77 SYMBOL	APPROXIMATE SIMILAR CALIBRATIONS
Chromel P-Alumel (1)	K	K	BS 1827, DIN 43710, NFE 18-001, JIS-C1602
Iron-Constantan	J	J	BS 1829, NFE 18-001
Chromel P-Constantan (1)	E	E	—
Copper Constantan	T	T	BS 1828, DIN 43710, NFE 18-001, JIS-C1602

**All calibrations are to standard limits of error*

(1) Registered T.M. of Hoskins Manufacturing Co.

HOT JUNCTION SYMBOLS

Table 5



SHEATH MATERIAL

Table 6

SHEATH	ARi SYMBOL	MELTING POINT (°C)	USABLE TEMPERATURE IN AIR (°C)	EQUIVALENT ANALYSIS
AISI 347 ST/ST	F	1 400	900	BS 3605 832Nb; DIN 4550; UNS S34700
Inconel 600 (3)	B	1 410	1 150 (1)	BS 3074-NA14; DIN 4816; UNS NO6600
AISI 304 ST/ST	A	1 400	900 (2)	BS 3605-801; DIN 4301; UNS S30400
AISI 310 ST/ST	D	1 410	1 150	BS 3605-805; DIN 4878; UNS S31000
AISI 316 ST/ST	C	1 400	900	BS 3605-845; DIN 4401; (2-3% Mo); UNS S31600

(1) Not recommended for use in sulphur atmosphere
(2) Do not use in 427 to 854°C temperature range due to carbon intergranular precipitation
(3) Trademark of International Nickel Corporation.