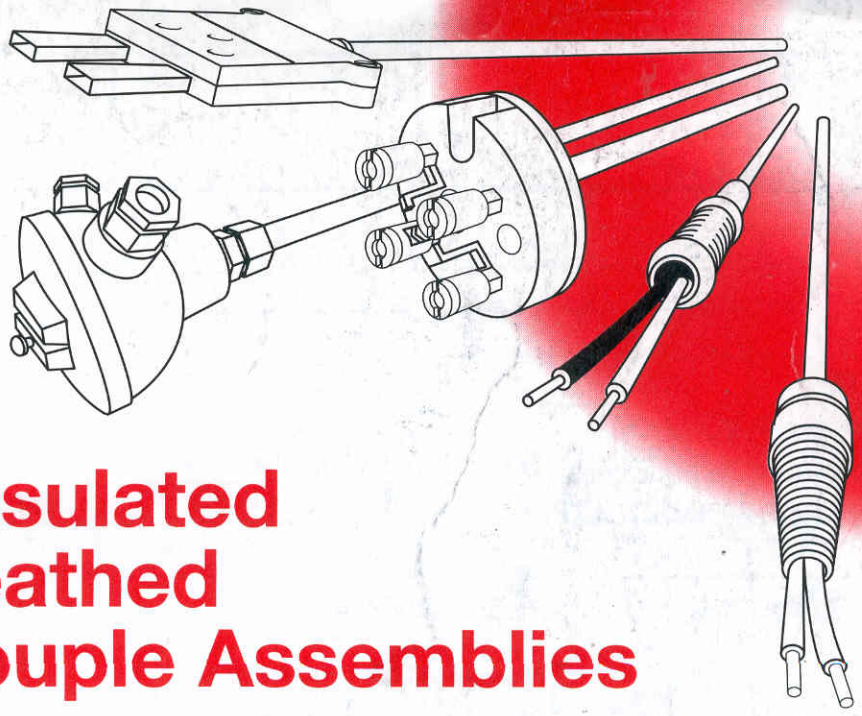
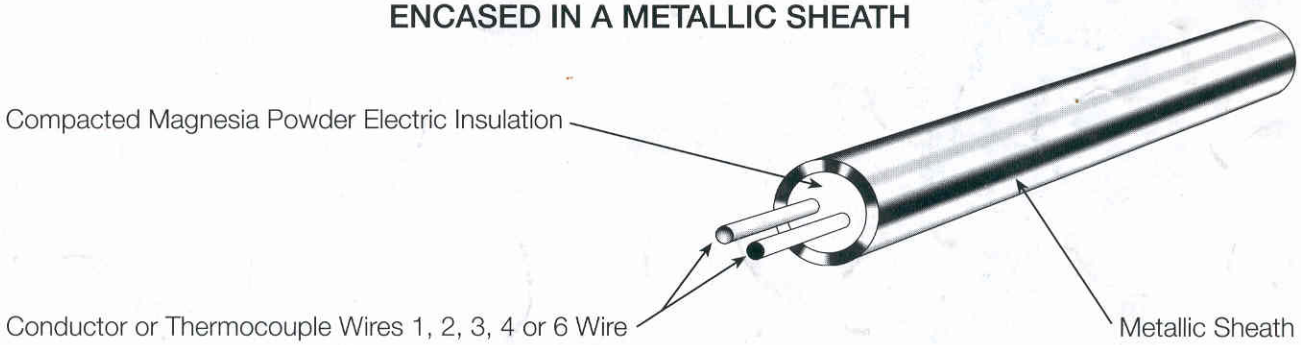


Mineral Insulated Metal Sheathed Thermocouple Assemblies

- RUGGED CONSTRUCTION
- WIDE OPERATING TEMPERATURE RANGES FROM – 200° TO + 1100° C
- FAST RESPONSE
- WIDE VARIETY OF TERMINATION OPTIONS
- SHEATHS CAN BE BENT OR SHAPED TO SUIT APPLICATION WITHOUT IMPAIRING PERFORMANCE

THERMOCOUPLE AND CONDUCTOR WIRE IN COMPACTED CERAMIC INSULATION ENCASED IN A METALLIC SHEATH



- Carefully cleaned metal tubing and wires combined with high purity Magnesium Oxide crushable ceramic insulation. Processed under controlled conditions to yield consistently high quality cable.
- Can be used under severe conditions that may destroy other types of insulated cable.
- Withstands temperatures up to metal melting point.
- Withstands corrosive conditions that are limited only by choice of the outer sheath material.
- Can be formed around a solid mandrel that is twice the sheath diameter without loss of integrity.
- Can be welded, brazed or soldered to the other metals when proper techniques are used.

The complete assembly is a compact, self armoured, hermetically sealed, semi-flexible probe providing the conductors with complete protection against oxidation and corrosion. They are ideally suited for use in extreme environmental conditions of high vibration, high pressure or vacuum and wide operational temperatures.

Lengths of these assemblies can vary from 50mm to lengths often in excess of 100 metres.

The sheaths are available in a variety of materials, as listed wihin the tables of this data sheet.

A | B | C | D | E

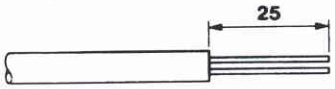
A

SUFFIX
G - General Purpose T/C
Maximum Temperature 400° C
NOT MINERAL INSULATED

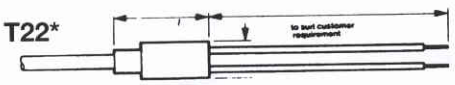
B

COLD END THERMOCOUPLE TERMINATIONS

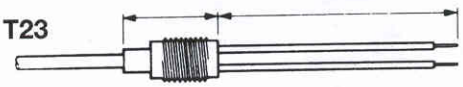
T14



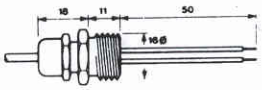
T22*



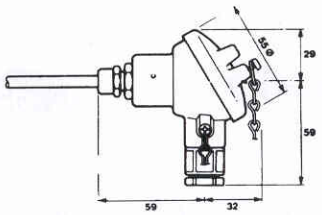
T23



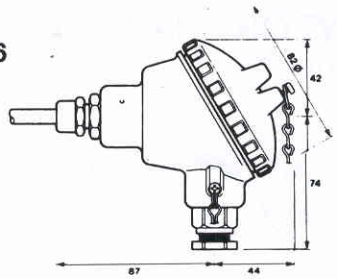
T25



T95 WEATHERPROOF DIECAST ALLOY HEADS

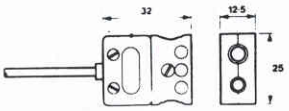


T96

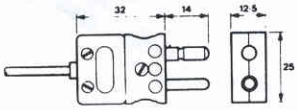


OR ANY STANDARD FITTING

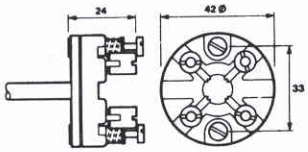
T90



T91



T92



TX - 96 (Transmitter installed)
N.B.: BAKELITE HEADS ALSO AVAILABLE T97

*T22 STYLE ALSO AVAILABLE AS:
T26 - With sprague tubing
T99 - SS braided tails
T77 - With male connector

C

2 – SIMPLEX ASSEMBLY
4 – DUPLEX ASSEMBLY
6 – TRIPLEX ASSEMBLY

D

LENGTH IN MM

E

SYMBOL	L	A	BM	DM	E	FM	G	I
SHEATH DIAMETER (mm)	0.5	1,0	1.5	3,0	4,75	6,0	8,0	9.52

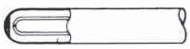
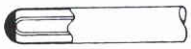
FOR IMPERIAL EQUIVALENTS REMOVE SUFFIX "M" i.e. F=6,35mm O.D.

F G H I J

F STANDARD THERMOCOUPLE ALLOY CONDUCTOR COMBINATIONS

CODE	CODUCTOR COMBINATION	Recommended operating temperature range conductor combinations Continuous ° C	Short term ° C
K	Nickel Chromium vs Nickel Aluminium	0 to +1 100	-180 to +1 350
T	Copper vs Constantan	-185 to +300	-250 to +400
J	Nickel Chromium vs Nickel Aluminium	+20 to +700	-180 to +750
E	Nickel Chromium vs Nickel Aluminium	0 to +800	–
N	Nickel-Chromium-Silicon vs Nickel Silicon-Magnesium	0 to + 1 100	0 to +1 300

G TYPES OF MEASURING JUNCTION CONFIGURATION

TYPE 9		**INSULATED:** Hot junction insulated from sheath. Gives floating output with typical insulation resistance in excess of 100 megohms.
TYPE 8		**GROUNDED:** Hot junction insulated to sheath tip giving earthed output and faster response to temperature changes.
TYPE 7		**EXPOSED:** Fastest response mainly for the measurement of air temperature in ducts and continuous ovens. Restricted to a maximum operating temperature or 500°C.

To suit particular attachment requirements thermocouples with measuring junction configurations 2I or 2G can be supplied with extended tip or welding pad. (Contact the company for details of standard welding pad and extension tip configurations.) Other special measuring junction configuration requirements can be met upon request.

H STANDARD METAL SHEATH MATERIALS

Thermocouples are available as standard as Single, Duplex and Triplex assemblies in a wide variety of sheath materials and diameters as follows:

Type	Sheath Specfications	Operational Properties	Max. Operating Temp. of Sheath (Approx. °C)
C	Stainless Steel 316SS	Very good corrosion resistance throughout the operating temperature range. Suited to a wide range of industrial applications. Enjoy high ductity.	800
D	25/20 Chromium/Nickel stainless steel. To BS 970 Part 4: 1970 Grade 310S24	Good high temperature corrosion resistance and suitable for use in sulphur bearing atmospheres. Has high oxidation resistance which is maintained if subsequent manipulation is strictly limited.	1 100
B	Inconel 600*. Nickel/Chromium/iron alloy BS3074: 1974 Grade NA14, ASTM, B 167, ASME S8167, Din NiCr 15 Fe, Werkstoff No. 2 4816	Suitable for use in severely corrosive environments to elevated temperature. Good resistance to oxidation. Do not use in sulphur bearing atmospheres above 550°C	1 100
E	Chrome Iron to A1S1 446 ASTM TP 446; Din X 18CrN28 Werkstoff No: 1.4749	Suitable for use in severely corrosive atmospheres to elevated temperatures. Particularly suited for use in use in high concentration sulphur bearing atmospheres at high temperatures. *Should be mounted vertically at temperature above 700°C*	1 150
V	Hastelloy X*	Has improved high temperature resistance to oxidation and attack by sulphur. Retains excellent tensile strength at high temperature. This sheath is applicable to reducing neutral and inert atmospheres. Developes a tightly adherent oxide film which does not spoil at high temperatures.	1 220

Normal minimum bending radius is 12 times the sheath diameter. This can be reduced to 4 times given the careful use of a mandrel and bending in one set. *Trade name. Other sheath materials can be supplied to special order.

I TAIL LENGTH IN MM FOR T22,T23, T25, T26, T77 & T99 ASSEMBLIES

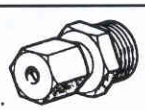
Add suffix as follows:

P = PVC G = Glass fibre T = Teflon

i.e. 1000 P = 1 metre PVC tails

J BRASS ADJUSTABLE COMPRESSION FITTINGS

These sliding glands are three part fittings comprising body, ferrule and cap are available in both stainless steel and brass with either BSP taper or NPT/API threads.



4FI – 1/8" NPT **4FI – 1/4" NPT** **4F4 – 1/2" NPT**

For SS fittings add suffix 'S' i.e. 4F4S

OTHER SIZES AVAILABLE ON REQUEST

THERMOCOUPLES TYPES • CONDUCTOR COMBINATIONS • CHARACTERISTICS • NATIONAL & INTERNATIONAL STANDARDS

CODE	CONDUCTOR COMBINATIONS		APPROXIMATE WORKING TEMPERATURE RANGE OF MEASURING JUNCTION. NB: not related to wire diameters and conductor insulating materials		NOTES
	+ LEG	- LEG	CONTINUOUS °C	SHORT TERM	
K	**NICKEL - CHROMIUM** Also known as Chromel* Thermokanthal KP*, Ni-Cr, T1*, Tophel*	**NICKEL - ALUMINIUM** (Magnetic) Also known as Ni-Al, Alumel* Thermokanthal KN*, T2*, Nial*	0 to +1100	-180 to +1350	Most suited to oxidising atmospheres, it has a wide temperature range and is the most commonly used.
T	**COPPER**	**COPPER-NICKEL** Also known as Constantan, Advance*, Cupron*	-185 to +300	-250 to +400	Excellent for low temperature and cryogenic applications. Good for when moisture may be present.
J	**IRON** (Magnetic) Also known as Fe	**COPPER-NICKEL** Also known as Nickel-Copper, Constantan, Advance*, Cupron*	+20 to +700	-180 to +750	Commonly used in the plastics moulding industry. Used in reducing atmospheres as an unprotected thermocouple sensor. NB. Iron oxidises (rusts) at low and at high temperatures.
N	**NICKEL-CHROMIUM-SILICON** Also known as Nicrosil	**NICKEL-SILICON-MAGNESIUM** Also known as Nisil	0 to +1100	-270 to +1300	Very stable output at high temperatures, it can be used up to 1300°C. Good oxidation resistance. Type N stands up to temperature cycling extremely well.
E	**NICKEL-CHROMIUM** Also known as Chromel*, Tophal*, Chromium, Nickel	**COPPER-NICKEL** Also known as Nickel-Copper, Constantan, Advance*, Cupron*	0 to +800	-40 to +900	Has the highest thermal EMF output change per °C. Suitable for use in a vacuum or mildly oxidising atmosphere as an unprotected thermocouple sensor.
R	**PLATINUM-13% RHODIUM**	**PLATINUM**	0 to +1600	-50 to +1700	Used for very high temperature applications. Used in the UK in preference to Type S for historical reasons. Has a high resistance to oxidation and corrosion. Easily contaminated, it normally requires protection.
S	**PLATINUM-10% RHODIUM**	**PLATINUM**	0 to +1550	-50 to +1750	Type S has similar characteristics to Type R as shown directly above.
B	**PLATINUM-30% RHODIUM**	**PLATINUM-6% RHODIUM**	+100 to +1600	0 to +1820	Type B has similar characteristics to Types R and S but is not so popular. Generally used in the glass industry.
G* (Formerly Code W)	**TUNGSTEN**	**TUNGSTEN-26% RHENIUM**	+20 to +2320	0 to +2600	Formerly known as Code W. Tungsten Rhenium alloy combinations offer reasonably high and relatively linear EMF outputs for high temperature measurement up to 2600°C and good chemical stability at high temperatures in hydrogen, inert gas and vacuum atmospheres. They are not practicable for use below 400°C. Not recommended for use in oxidising conditions.
C* (Formerly Code W5)	**TUNGSTEN-5% RHENIUM**	**TUNGSTEN-26% RHENIUM**	+50 to +1820	+20 to +2300	Formerly known as Code W5. See technical notes for Type G directly above.
D* (Formerly Code W3)	**TUNGSTEN-3% RHENIUM**	**TUNGSTEN-25% RHENIUM**	0 to +2100	0 to +2600	Formerly known as Code W3. See technical notes for Type G directly above.

* Codes G,C and D and the tolerance values shown above are not officially recognised symbols or standards.

* Trade names.