

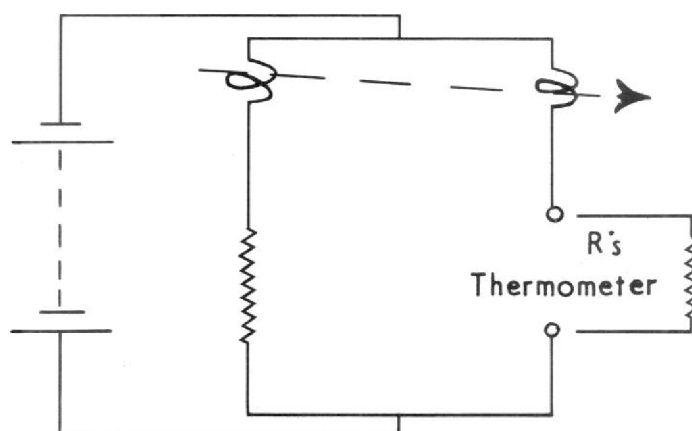
Temperature Indicators

TEMPERATURE INDICATORS

FOR USE WITH
RESISTANCE THERMOMETERS

RATIOMETER TYPE

The resultant indication of a ratiometer movement when used in conjunction with a suitably varying resistance such as a Resistance Thermometer is given by the ratio of the currents passing through two adjacent coils pivoted in permanent but unequal magnetic fields. The coils and varying resistance are connected in a bridge circuit that forms the basis of the ratiometer.



For temperature measurement the circuit is so arranged that the current in one winding of the coil remains comparatively constant, whilst in the other it is varied by changes in the resistance of the sensing Resistance Thermometer. Alternatively the current in both windings may be varied so that the torques developed by the coil windings are in opposition. In both arrangements the temperature range to be covered by a particular indicator determines which of the two circuits is used.

The indicator is designed to operate from the standard 24V d.c aircraft supply and as the resultant indication is a function of the ratio of the currents in a ratiometer, the accuracy of the indicator is substantially independent of normal supply voltage variations (20 - 29V d.c).

Indicators are marked "P.T Law" or "Ni Law" to show whether they have been calibrated for use with platinum or nickel element resistance thermometers.

TEMPERATURE INDICATORS

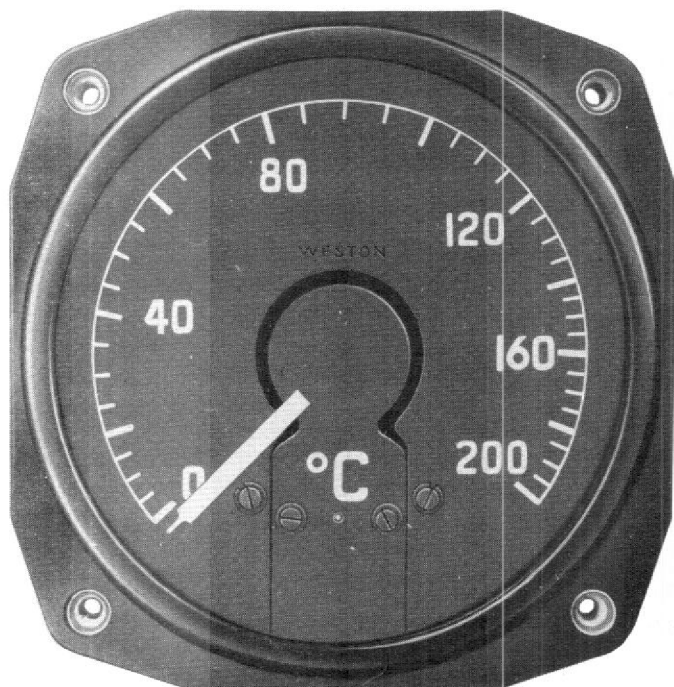
RATIOMETER TYPE

Ratiometer Temperature indicators are fitted with a pointer return unit to return the pointer off scale and lock it in that position when unenergised.

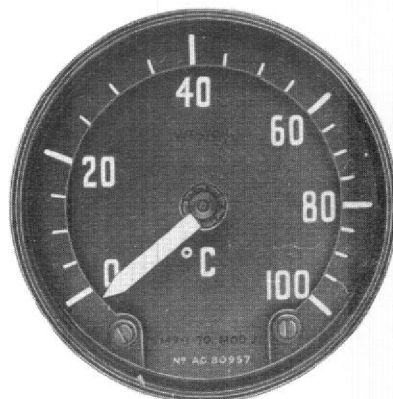
A special version of ratiometer (model S94) is available for use on 115v 400 c/s supply.

Ratiometer type Temperature Indicators are normally compensated for a total indicator-bulb resistance of 0.4 ohm maximum: this corresponds to a length of 20 feet for the 2-core leads listed in Section 19. For longer runs the 3-wire method of connection should be used.

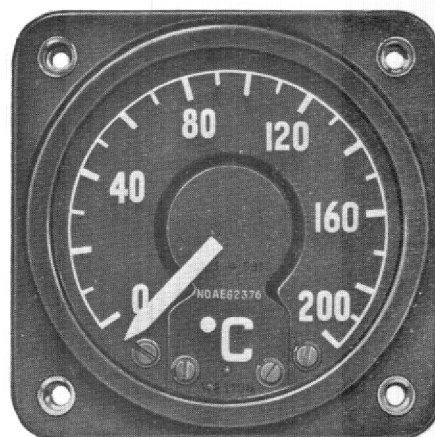
Preferred ranges are shown on Page 5/15.



*Model S 63 Form 5
Typical Presentation*



*Model S 149 Form 1
Typical Presentation*



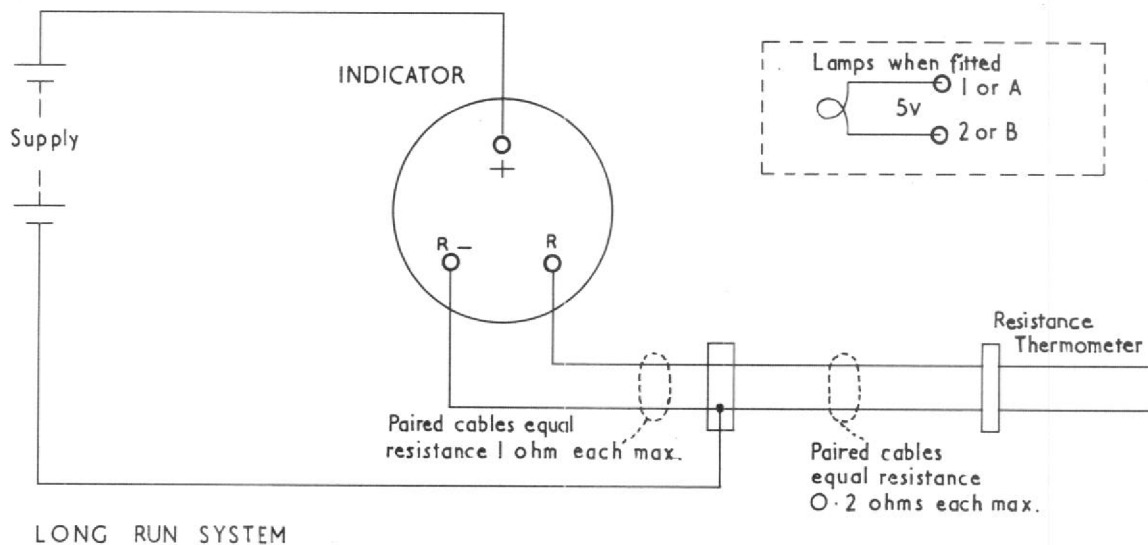
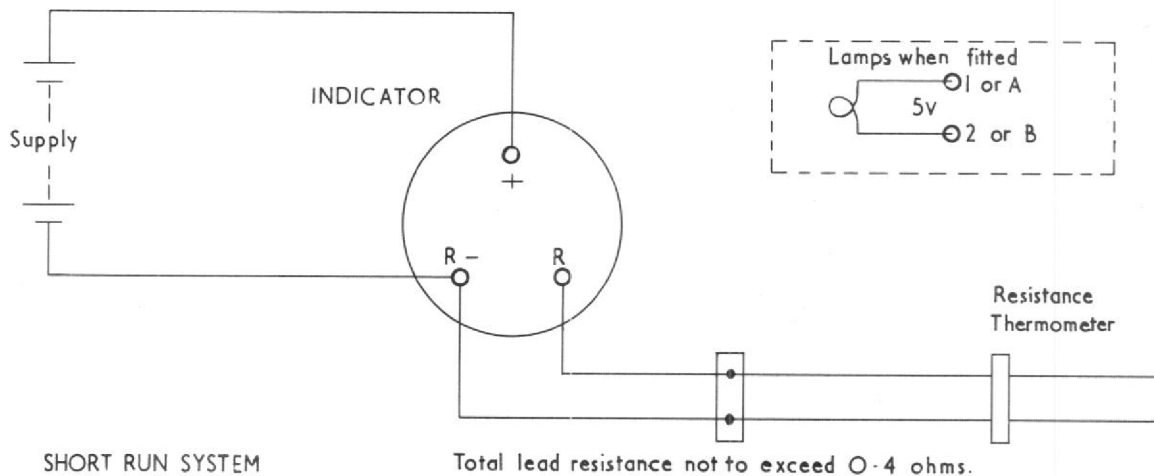
*Model S 63 Form 4
Typical Presentation*

RATIOMETER TYPE TEMPERATURE INDICATORS FOR USE WITH RESISTANCE THERMOMETERS

MODEL	FORM	DESCRIPTION	CASE DEPTH	NOMINAL SCALE ANGLE	SCALE LENGTH	ELECTRICAL CONNECTIONS	NORMAL ACC. OF FSD	APPROX. WEIGHT	F.D.
S62	3	Small S.A.E. shielded bakelite case	1.6 in (41 mm)	90°	1.6 in (41 mm)	A3.B3.	±2%	9 oz (255 g)	687
S62	5	Large S.A.E. shielded bakelite case	2.25 in (57 mm)	90°	2.25 in (57 mm)	A3.B3.	±2%	14 oz (396 g)	775
S63	4	Small S.A.E. shielded bakelite case	3.75 in (96 mm)	260°	3.75 in (96 mm)	A3.B3.	±2%	12 oz (340 g)	684
S63	5	Large S.A.E. shielded bakelite case	5.56 in (142 mm)	260°	5.56 in (142 mm)	A3.B3.	±2%	1 oz (510 g)	777
S127	5	Large S.A.E. shielded bakelite case	1.69 in (43 mm)	100°	1.69 in (43 mm)	A3.B3.	±2%	22 oz (623 g)	784
S149	1	2 in dia. flangeless steel case (Sealed)	3.25 in (83 mm)	260°	3.25 in (83 mm)	A3.B3. C3.C4.C5.	±2%	13 oz (368 g)	814
S181	2	Edgewise metal case, bakelite front 2.75 in (70 mm) x 4.625 in (118 mm)	1.29 in (33 mm)	52°	1.29 in (33 mm)	A5.	±4%	20 oz (567 g)	968
S214	1	2 in dia Flangeless steel case (Sealed) Triple movements	4.1 in (105 mm)	90° 2 Mvts. 85° 1 Mvt.	0.83 in (21 mm) 2 Mvts. 1.375 in (35 mm) 1 Mvt.	C10.	±4%	12 oz (340 g)	993
S216	1	2 in dia Flangeless steel case (Sealed) Dual movements	3.9 in (99 mm)	90°	0.90 in (23 mm)	C6.C7.C8.C9. D1.	±4%	11 oz (312 g)	972
S453	4	Small S.A.E. shielded bakelite case (Flangeless)	2.94 in (75 mm)	260°	3.75 in (96 mm)	A3.B3.	±2%	12 oz (340 g)	1135
S453	5	Large S.A.E. shielded bakelite case (Flangeless)	3.3 in (84 mm)	260°	5.56 in (142 mm)	A3.B3.	±2%	20 oz (566 g)	1136
S454	1	2 in dia Flangeless steel case (Sealed)	3.91 in (100 mm)	90°	1.3 in (33 mm)	A3.B3.C3. C4.C5.	±3%	12 oz (340 g)	1164
S455	5	Large S.A.E. shielded bakelite case (Flangeless)	3.21 in (82 mm)	100°	1.69 in (43 mm)	A3.B3.	±2%	21 oz (595 g)	1137
S483	1	2 in square front steel case with integral lighting	4.32 in (110 mm)	260°	3.3 in (84 mm)	A6.B4.	±2%	20 oz (566 g)	1374
S484	1	2 in square front steel case with integral lighting. Dual movements	4.51 in (115 mm)	90°	0.9 in (23 mm)	A6.B4.	±4%	16 oz (454 g)	1374

SAN CAMO
WESTON

WIRING DIAGRAMS FOR RATIOMETER - TEMPERATURE - INDICATORS

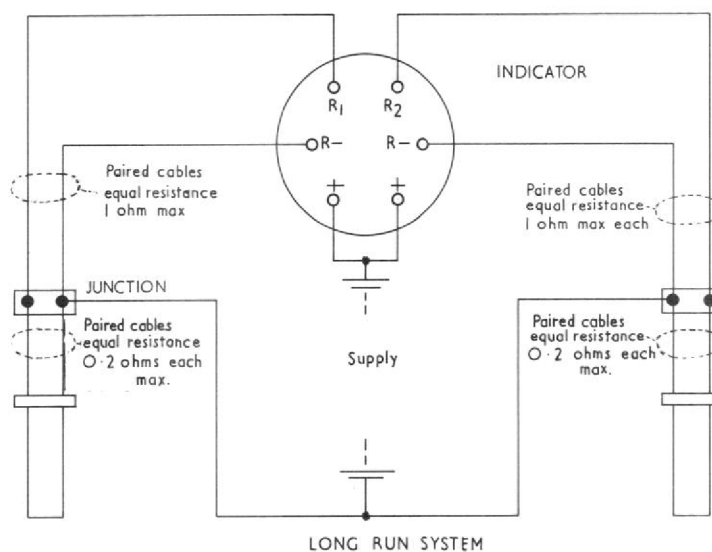
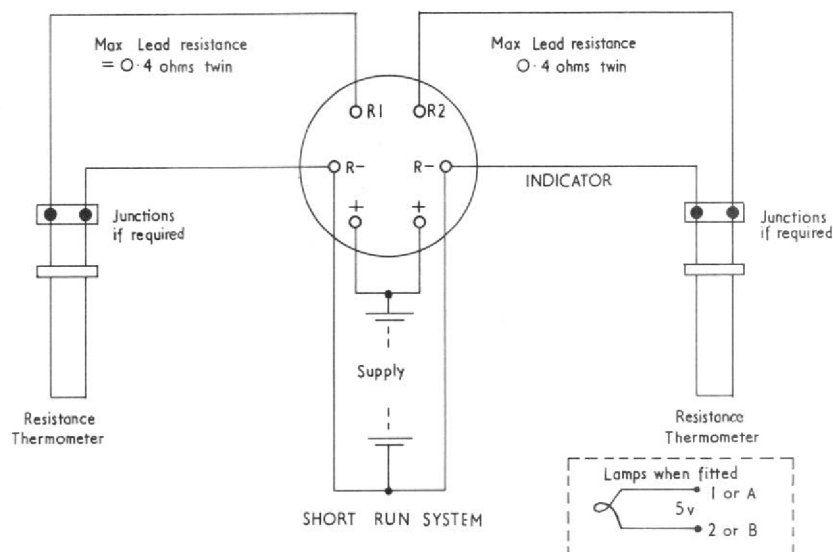


ALTERNATIVE TERMINAL MARKINGS

MODEL	+	R-	R
S 62.3	1	2	3
S 62.5	3	1	2
S 63.4	1	2	3
S 63.5	3	1	2
S149.1	A	C	B

MODEL	+	R-	R
S453.4	1	2	3
S453.5	3	1	2
S454.1	A	C	B
S483.1	3	5	6
S483.1	C	D	E

WIRING DIAGRAMS FOR DUAL-MOVEMENT TEMPERATURE INDICATORS

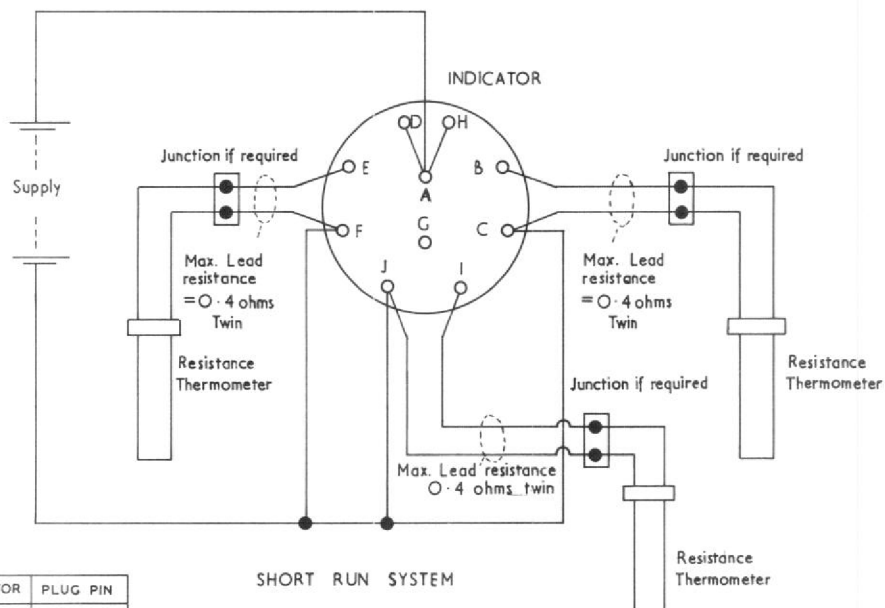


ALTERNATIVE TERMINAL MARKINGS

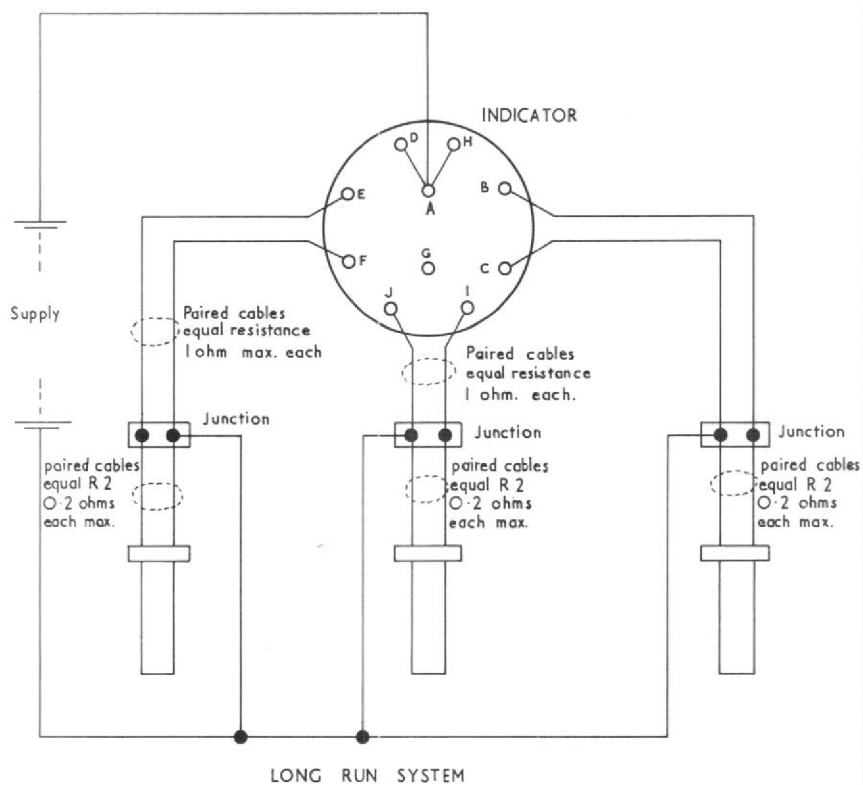
SPEC. NUMBER	LEFT HAND SCALE			RIGHT HAND SCALE		
	+	R-	R ₁	+	R-	R ₂
S127.5	6	4	2	5	3	1
S127.5	D	F	E	A	C	B
S216.1	A	B	C	D	E	F
S455.5	6	4	2	5	3	1
S484.1	3	4	5	6	7	8
S484.1	C	D	E	F	G	H

WIRING DIAGRAMS FOR MULTI-MOVEMENT TEMPERATURE INDICATORS

WIRING DIAGRAMS FOR MODEL S214.



INDICATOR	PLUG PIN
1	D, E, F.
2	A, B, C.
3	H, I, J.



TEMPERATURE INDICATORS FOR USE WITH THERMOCOUPLES

These indicators are basically millivoltmeters calibrated to indicate the hot junction temperature of a thermocouple.

Compensating leads, normally of the same materials as the thermocouple, transfer the cold junction to the instrument where an internal cold junction compensator is effective over an ambient temperature range of -40°C to $+70^{\circ}\text{C}$.

Indicators are calibrated for a definite external resistance value which should include the thermocouple as well as the compensating leads. It is usual for the total circuit resistance to be adjusted to the correct value by means of a Compensating Lead Adjustment Spool (Section 26).

Dial Presentation White marks on black background (Standard)
 Black markings on white background.
 Fluorescent markings on black background.

Indicator Terminals Screw terminals with captive washers are fitted as standard. Sizes may be either No. 4BA or No.6 UNC as required.

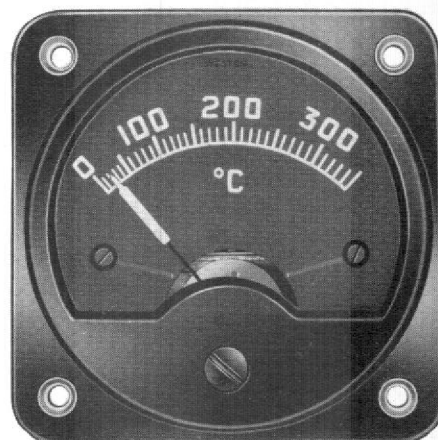
The list on pages 5/11 and 12 refer to minimum temperature ranges and external resistance values for minimum temperature ranges. Indicators with higher temperature ranges can be offered with greater external resistance values, for example, S64.5 - 0.1000°C (Ni.Chr/Ni.Al 30 ohms ext).

Preferred ranges are shown on Page 5/15.

*Model S 196 Form 1
Typical Presentation*



*Model S 218 Form 5
Typical Presentation*



*Model S 64 Form 3
Typical Presentation*

MODELS S 196, S 218, S 452 AND S 485

These indicators are all intended for use with Nickel/Chromium v Nickel/Aluminium Thermocouples or the Encomp system described in Section 17.

They differ from the normal types of J.P. or T.G.T. Indicator in that they have preferred temperature bands enabling certain temperatures to be measured with greater accuracy.

The preferred bands are intended to cover the critical operating temperatures of jet engines and each indicator is set up at a specified temperature within its band.

For general use standard indicators are offered with the preferred bands and set-up points indicated in Table 1.

Table 1

Model	Total Temp. Range	Set-Up Point	Preferred Band	Accuracy Within Preferred Band
S196	60-800°C	500°C	300-700°C	$\pm 15^{\circ}\text{C}$
S196	60-1000°C	600°C	400-800°C	$\pm 15^{\circ}\text{C}$
S196	60-1000°C	700°C	500-900°C	$\pm 15^{\circ}\text{C}$
S218/484/552	60-800°C	500°C	300-700°C	$\pm 10^{\circ}\text{C}$
S218/484/552	60-1000°C	600°C	400-800°C	$\pm 10^{\circ}\text{C}$
S218/484/552	60-1000°C	700°C	500-900°C	$\pm 10^{\circ}\text{C}$

If a higher degree of accuracy is required this can be achieved by limiting the band width and by setting up the indicator at a chosen temperature within the critical range of the engine. Generally the best accuracy is required at maximum take-off temperature and this is used as the set-point but any other temperature, preferably over the upper half of the band, may be selected.

The accurate band can be placed anywhere within the range of the indicator provided that its top end is not above 90% of the maximum scale value.

Table 2 shows the improved accuracy limits obtainable by these special measures but as they also require the greatest possible care and attention in assembly, selection and calibration it is necessary to impose a surcharge.

Table 2

Model	Maximum Band Width	Accuracy	Total Temperature Ranges
S196	160°C	$\pm 5^{\circ}\text{C}$	60-700°C 60-800°C 60-1000°C
S218/452/485	170°C	$\pm 4^{\circ}\text{C}$	

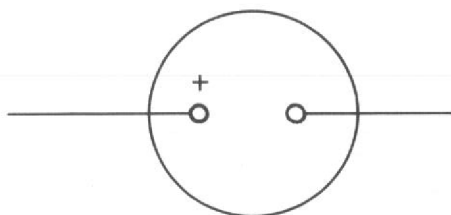
TEMPERATURE INDICATORS FOR USE WITH THERMOCOUPLES

MODEL	FORM	DESCRIPTION	CASE DEPTH	NOMINAL SCALE ANGLE	SCALE LENGTH	MIN. TEMP. RANGE	MAX. EXT. RES. FOR MIN. TEMP. RANGE	ACCURACY	WEIGHT	ELECTRICAL CONNECTIONS	F.D.
S64	3	Small S.A.E. shielded bakelite case	2.03 in (52 mm)	90°	1.6 in (41 mm)	800°C+ 350°C*	25 ohms 8 ohms	±2% of F.S.D.	9 oz (256 g)	A3,B3.	691
S64	5	Large S.A.E. shielded bakelite case	2.51 in (64 mm)	100°	2.25 in (57 mm)	800°C+ 350°C*	25 ohms 8 ohms	±2% of F.S.D.	18 oz (511 g)	A3,B3.	775
S128	5	Large S.A.E. shielded bakelite case	3.1 in (79 mm)	100°	1.76 in (45 mm)	800°C+ 350°C*	25 ohms 8 ohms	±2% of F.S.D.	21 oz (595 g)	A3,B3.	784
S196	1	2 in dia flangeless steel case (Sealed) Platform dial.	4.05 in (103 mm)	240°	2.81 in (72 mm)	700°C	25 ohms	See page 5/10	13 oz (369 g)	A3,B3	971
S218	5	Large S.A.E. shielded bakelite case Platform dial.	3.3 in (84 mm)	240°	4.625 in (118 mm)	700°C	25 ohms	See page 5/10	17 oz (482 g)	A3,B3.	777
S452	5	Large S.A.E. shielded bakelite case Flangeless Similar to S218	3.3 in (84 mm)	240°	4.625 in (118 mm)	700°C	25 ohms	See page 5/10	17 oz (482 g)	A3,B3.	1138
S478	5	Large S.A.E. shielded bakelite case (Flangeless) Similar to S128	3.175 in (81 mm)	100°	1.76 in (45 mm)	800°C+ 350°C*	25 ohms 8 ohms	±2% of F.S.D.	19 oz (539 g)	A3,B3.	1138
S485	1	2 in square front case. With integral lighting.	4.83 in (123 mm)	240°	2.9 in (74 mm)	700°C	25 ohms	See page 5/10	16 oz	A6,B4.	1374

* = Copper V Constantan Thermocouples

+ (Nickel/Chromium V Nickel/Aluminium or Encomp Thermocouples

TERMINAL MARKINGS



Alternative Terminal Markings

	+	-
S64	2	1
S128 Left hand scale	2	4
S128 Right hand scale	1	3
S196	2	1
S218	2	1
S452	2	1
S485	2	4

SANGAMU
WESTON

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