



PLANT PURCHASING SPECIFICATION
HEEP - HARDWAR

0563.001.

PAGE 1 OF 9

SIGN & DATE

SUPERSEDES INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company

SIGN & DATE

INVENTORY NO.

: COPPER RESISTANCE TEMPERATURE DETECTORS :

1. SCOPE

This standard specifies the requirements of 2 wire/3-wire, simplex/Duplex Copper resistance temperature detectors for temperature measurement in rotating electrical machines from 0° to 150° C.

2. DESIGNATION.

The designation of various types of RTDs should be specified as illustrated below :

- 2.1. Copper resistance temperature detector type CRT-01 of this specification with simplex element and 2-wire connection shall be designated as: CRTD SIMPLEX 2WR Type CRT-01, P.S.: 0563.001.
- 2.2. Copper resistance temperature detector type CRT-02 of this specification with simplex element and 2-wire connection, working length 120 mm and threading connection M 27x2 shall be designated as: CRTD SMPLX 2WR L 120 M 27x2, Type CRT-02, P.S.: 0563.001.
- 2.3. Copper resistance temperature detector type CRT-03 of this specification with simplex element and 2-wire connection, overall length 1000 mm shall be designated as: CRTD SMPLX 2 WR L1000 Type: CRT-03, P.S.: 0563.001.
- 2.4. Copper resistance temperature detector Type CRT-04 of this specification with Duplex element and 3-wire connection, working length 120 mm and threading connection M33x2 shall be designated as: CRTD DPLX 3WR L120 M 33x2, Type CRT-04, P.S.: 0563.001.
- 2.5. Copper resistance temperature detector Type CRT-05/CRT-06, of this specification with Simplex element and 2-wire connection shall be designated as : CRTD SMPLX 2 WR Type- CRT-05/CRT-06, P.S.: 0563.001.

3. TECHNICAL REQUIREMENTS:

3.1. GENERAL

The temperature detector shall be suitable for operation in humid, dusty and tropical climate.

THIS SPECIFICATION
SUPERSEDES UNDER THE
SAME SPEC. NO.
CH. AD. NO.
TSX-82-106

AGREED DEPTT.	NAME	SIGN & DATE	DRAWN	NAME	SIGN & DATE
			WORKED	D.R. DANDRIYAL	
			CHECKED	G.D. SHARMA	
			SUPERVISED	DEWENDRA KUMAR	
			APPROVED	N.L. GUPTA	
REVISION	REAFFIRMED 31.3.05		PLANT		
			STANDARDIZATION COMMITTEE 3.50		
	Prepared	Issued	DATE		
S.KUMAR	N-CHANDRA	PRARASH SINGH	GAX/TGE	STANDARDS DIVISION	9-10-82



PLANT STANDARD

HEEP - HARDWAR

0563-001

PAGE 2 OF 3

SIGN & DATE

SUPERSEDES INVENTORY No.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.

SIGN & DATE

INVENTORY No.

3.2. DIMENSIONS & CONSTRUCTION:

- 3.2.1. Temperature detectors type CRT-01 shall be suitable for temperature measurement of hydrogen and air, type CRT-02 & CRT-04 for liquid media and type CRT-02 and CRT-03 for bearing babbit. Temperature detectors Type CRT-05 and CRT-06 shall be suitable for temperature measurement of stator core and winding in electrical machines.
- 3.2.2. All above temperature detectors shall be of such a connection that these can be installed in any position. The thermometer casing in case of types CRT-01, CRT-02, CRT-03 & CRT-04 should protect the resistance element and terminals for terminating conductors from possible mechanical damage. For the same reason, the RTD elements of all types shall be suitably insulated.
- 3.2.3. The leads of these temperature detectors shall be made out of 19/0.15 mm silver clad annealed copper, teflon insulated, covered with glass braided sleeve. (Cross Section of leads as given in Fig. 5). The surface of RTDs type CRT-05 and CRT-06 shall be smooth, uniform and free from visual defects. The leads for CRT-02 should be oil and petrol resistant. In addition the PVC sheathing upto a length of 300 mm as shown in figure-2, should also be oil and petrol resistant.
- 3.2.4. Dimensions, constructional details and materials of the temperature detectors shall be as per Appendix-I.

(d) flexible

3.3. RESISTANCE ELEMENT:

- 3.3.1. Resistance element shall be manufactured from copper wire having temperature co-efficient of resistance of 0.00426 per °C. The resistance element shall be insulated by varnish resistant enamel and a single layer of wound natural silk with overall dia. 0.08 mm.
- 3.3.2. The element shall be wound on to a bobbin or a former. The technique of supports shall be such that it avoids strain in the element both during fabrication and use. The element shall be so constructed that no thermoelectric voltage is generated within it.
- 3.3.3. Resistance of the element including the two terminating conductors as shown in Appendix-I shall be within 53 ± 0.05 ohms at 0°C. Ratio of the element resistance at 100°C (R100) to its resistance at 0°C (R0) shall be within 1.426 ± 0.002.
- 3.3.4. Variation of resistance with temperature shall be as per Appendix - II.

3.4. INSULATION:

- 3.4.1. The insulation provided for the element must withstand 2000 volts AC (sinusoidal) at 50 Hz for one minute at a temperature of 20 ± 5°C and relative humidity upto -80%.

The electrical insulation resistance to be measured before and after H.V. Test and should not be less than 20 M Ohms when measured with 250V meggar.

REVISION

01

WORKED BY	S. C. BAHUGUNA	9.5.85
CHECKED BY	S. KUMAR	9.5.85



PLANT PURCHASING SPECIFICATION

- 0563.001.

HEEP - HARDWAR

PAGE 3 OF 9

SIGN & DATE

SUPERSEDES INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company

SIGN & DATE

INVENTORY NO.

3.4.2. The insulation resistance shall not be less than 2 M Ohms at 150°C when measured after conducting H.V. Test.

4. TESTS:

4.1. ROUTINE TESTS:

Each resistance element shall be subjected to the following routine tests:

- a) Insulation resistance tests: As per Clause 3.4 of this specification).
- b) Resistance accuracy tests: (As per Clause 3.3 of this specification). The resistance calibration of the thermometer element shall be made with the element inserted at least to the calibration immersion depth stated by the manufacturer. The test shall be conducted at not fewer than two suitably spaced points (viz. 0°C & 100°C) over the declared working range of temperature.

4.2. TYPE TESTS:

Atleast 5% of each consignment selected at random shall be subjected to the following type tests as per the relevant clauses mentioned against each test :

- a) Thermal response time test (Clause 9.4 of I.S:2848).

Thermal response time for Type CRT-01 shall not exceed 10mints.						
" " " " " "	CRT-02	"	"	4	minutes.	
" " " " " "	CRT-03	"	"	1.5	"	
" " " " " "	CRT-04	"	"	4	"	
" " " " " "	CRT-05	"	"	15	Seconds.	
" " " " " "	CRT-06	"	"	15	"	

- b) Self heating test (Clause 9.5 of I.S:2848).

But the temperature-rise equivalent to the measured increase in resistance shall not exceed 0.4°C.

- c) Vibration test - (Clause 9.11 of I.S:2848).
- d) Drop test (Clause 9.10 of I.S:2848).
- e) Pull out test: (for temperature detectors types - CRT-05 and CRT-06 only).

The leads of thermometers should be able to withstand a Pulling force of 5 Kg. when applied to each of them.

- f) Compression test: (for RTDs type CRT-05 & CRT-06 only).

The RTDs shall be subjected to compression test by applying a pressure of 3 Kg/Cm² in a suitable fixture for one hour minimum. The element must conform to Clause 4.1(a) and 4.1(b) after subjecting to test as per Clauses 4.2(c),4.2(d),4.2(e) and 4.2 (f).


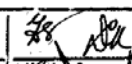
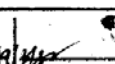


5. INSPECTION:

The supplier shall provide all facilities to the BHEL inspector or their authorised representative to witness the inter-stage and final tests.

Revision: 01

WORKED BY GDS/DK

CHECKED BY NLG/ACC

SIGN & DATE		PLANT PURCHASING SPECIFICATION		-0563.001.
		HEEP - HARDWAR		PAGE 4 OF 9
SIGN & DATE	SUPERSEDES INVENTORY NO.	<p>6. <u>TEST CERTIFICATES:</u></p> <p>Three copies of the following certificates shall be produced by the supplier :</p> <p>6.1. Calibration certificate for each detector.</p> <p>6.2. Material certificate for the thermo-element.</p> <p>6.3. Test certificate covering the routine tests specified in Clause 4.2 for each detector.</p> <p>6.4. Test certificate covering the type tests specified in Clause-4.2 for 5% of the consignment.</p> <p>6.5. There should be proper co-relation of RTDs with their corresponding test certificates.</p> <p>7. <u>GUARANTEE CE-RTIFICATES:</u></p> <p>A guarantee certificate for 24 months of trouble free performance from the date of shipment or 12 months from the date of commissioning whichever is earlier, shall be supplied.</p> <p>8. <u>DOCUMENTS:</u></p> <p>5 sets of descriptive leaflets/catalogues giving full details of the temperature/detector shall be furnished with the offer. 5 sets of final operating/trouble shooting and maintenance manuals shall be supplied within 4 weeks after placement of the order.</p> <p>9. <u>PACKING:</u></p> <p>Each temperature detector shall be wrapped individually in a bubbled polythene sheet and packed in a thermocole box. Such boxes shall be packed in a carton or a case with adequate cushioning material to withstand normal transit risks.</p> <p>10. <u>MARKING:</u></p> <p>10.1. Each detector shall be marked permanently using indelible ink for with the following details :</p> <p>a) Supplier's name or trade mark.</p> <p>b) Sl. No. of RTD for identification/co-relation with test certificates.</p> <p>c) Temperature range of the RTD.</p> <p>d) Type of RTD and number of this specification.</p> <p>10.2. Following details shall be marked on the packing case :</p> <p>a) Supplier's name or trade mark.</p> <p>b) BHEL order No.</p> <p>c) Net and gross weight.</p> <p>d) Indication of top of the box.</p>		
		INVENTORY NO.	The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company	Revision : 01
WORKED BY GDS/DK				
INVENTORY NO.		CHECKED BY NLG/ACC		



PLANT PURCHASING SPECIFICATION

0563.001.

HEEP - HARDWAR

PAGE 5 OF 9

SIGN & DATE

SUPERSEDES
INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd.
It must not be used directly or indirectly in any way detrimental to the interest of the company

SIGN & DATE

INVENTORY NO.

- 10.3. Enclosed in each box there shall be a packing list specifying :
- e) Caution sign against over-turning.
 - f) Size and no. of items.
 - g) Sign indicating precision instrument on top of the box.
- a) Manufac-turer's name or trade mark.
 - b) Designation of RTDs and their number against each type.
 - c) Date of manufacture of RTDs.
 - d) Net and gross weights.
 - e) BHEL purchase order No.
 - f) No. of this specification.

11. REJECTION:

BHEL reserves the right to reject the thermometers not conforming to the requirements of this purchase specifications.

The acceptance inspections of RTDs at works shall be carried out as per sampling plans which shall be acceptable to the suppliers.

Revision :
01

WORKED BY GDS/DK

CHECKED BY NLG/ACC

[Handwritten signatures and initials]



PLANT PURCHASING SPECIFICATION

0563-001

HEEP - HARDWAR

PAGE 6 OF 9

SIGN & DATE

SUPERSEDES INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company

SIGN & DATE

INVENTORY NO.

APPENDIX-1

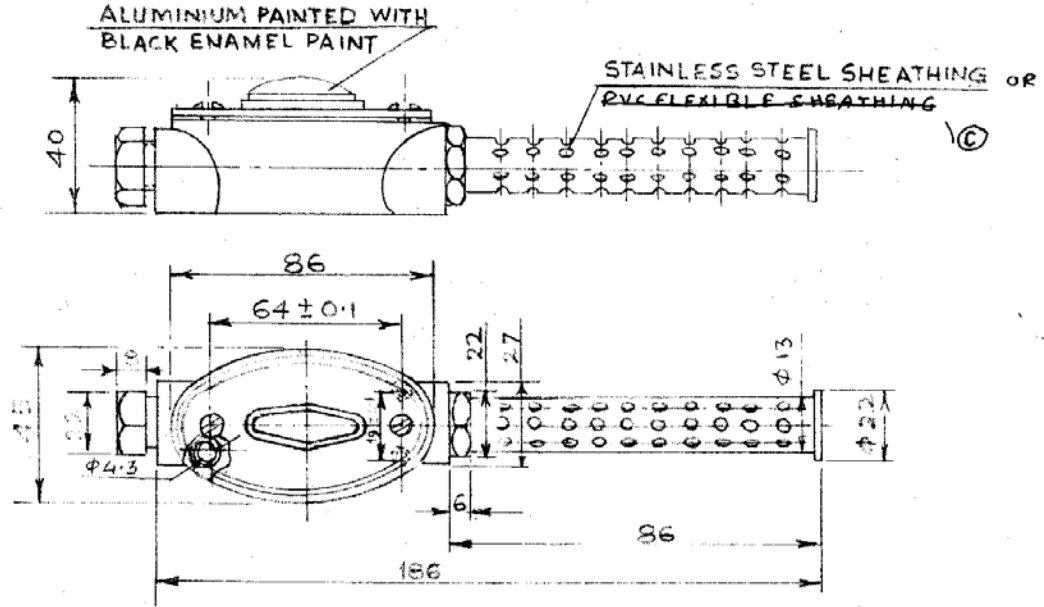


FIG.1. RESISTANCE TEMPERATURE DETECTOR TYPE CRT-01

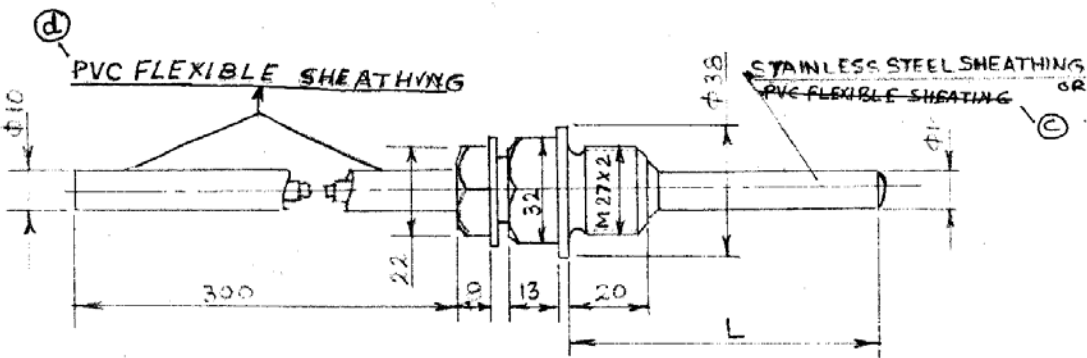


FIG. 2. RESISTANCE TEMPERATURE DETECTOR TYPE CRT-02

TYPE OF THERMOMETER	WORKING LENGTH L IN mm									
CRT-02	120	160	220	250	270	320	370	400	500	

Revision :

01

WORKED BY GDS/DK

CHECKED BY NLG/ACC

[Handwritten signatures and dates]



PLANT PURCHASING SPECIFICATION

HEEP - HARDWAR

FORM DG-30

0563-001

PAGE 7 OF 9

SIGN & DATE

SUPERSEDES INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company.

SIGN & DATE

INVENTORY NO.

P-2564

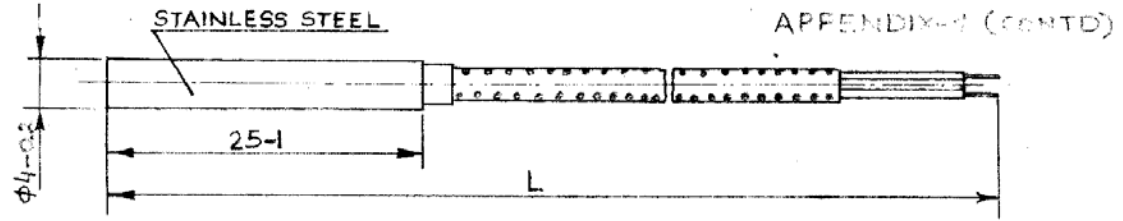


FIG. 3

RESISTANCE TEMPERATURE DETECTOR
TYPE- CRT-03

L	1000	1600	2000
---	------	------	------

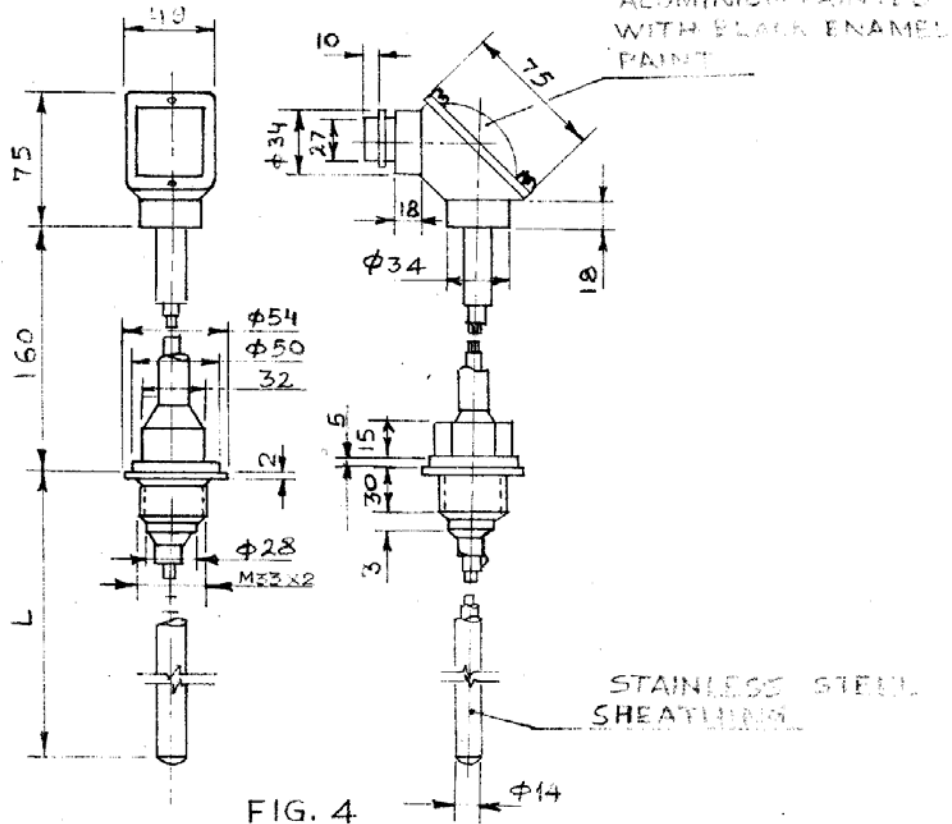


FIG. 4

RESISTANCE TEMPERATURE DETECTOR TYPE CRT-04

TYPE OF THERMOMETER	WORKING LENGTH L IN MM		
CRT-04	120	160	200

Revision :

01

WORKED BY GDS/DK

CHECKED BY NLG/ACC



PLANT PURCHASING SPECIFICATION
HEEP - HARDWAR

HW 0563'001

PAGE 8 OF 9

SIGN & DATE

SUPPLIERS INVENTORY NO.

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of Bharat Heavy Electricals Ltd. It must not be used directly or indirectly in any way detrimental to the interest of the company

SIGN & DATE

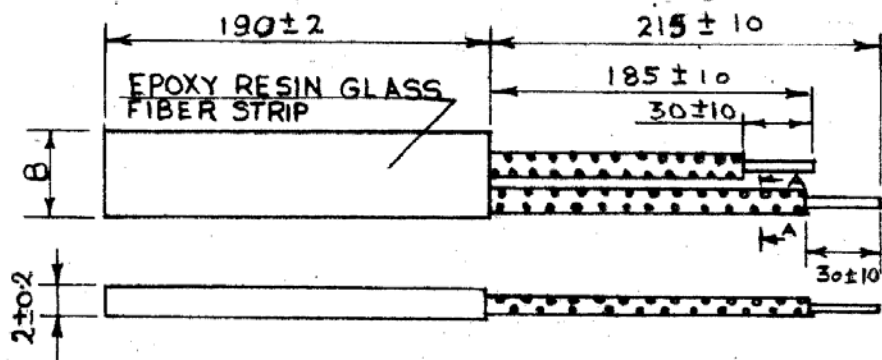
INVENTORY NO.

P-2564

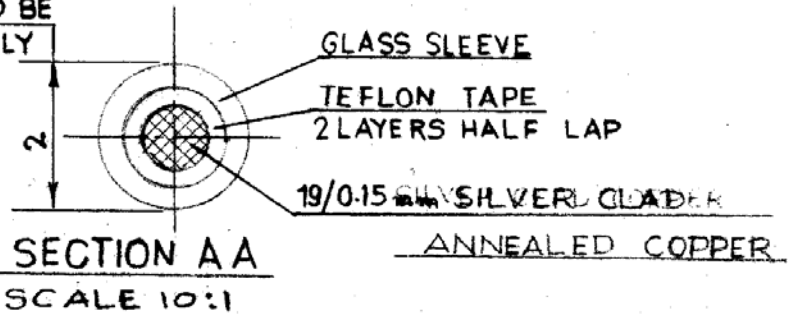
Revision: 01

WORKED BY GDS/DK
CHECKED BY NLG/ACC

APPENDIX-1 (CONTD.)



LESS THAN 1:7 SHOULD BE POSSIBLE WHEN LIGHTLY PRESSED



TYPE OF THERMOMETER	DIMENSION IN mm. B
CRT-05	17
CRT-06	10

FIG. 5

RESISTANCE TEMPERATURE DETECTORS TYPE - CRT-05 & CRT-06

INVENTORY NO. P-2564 SIGN & DATE _____ SUPERSEDES INVENTORY NO. _____ SIGN & DATE _____

COPYRIGHT AND CONFIDENTIAL
 The information on this document is the property of Bharat Heavy Electricals Ltd.
 It must not be used directly or indirectly in any way detrimental to the interest of the company



PLANT PURCHASING SPECIFICATION
HEEP - HARDWAR

0563'001
 PAGE 9 OF 9

APPENDIX-2:

CALIBRATION TABLE FOR RESISTANCE THERMOMETER TYPE CRT
 $R_0 = 53.00 \text{ Ohms}$, $\alpha = 4.26 \times 10^{-3} \text{ PER } ^\circ\text{C}$.
 RESISTANCE IN Ohms. FOR TEMPERATURES 0 TO + 150 $^\circ\text{C}$.

$^\circ\text{C}$	0	1	2	3	4	5	6	7	8	9
0	53.00	53.23	53.45	53.68	53.90	54.13	54.36	54.58	54.81	55.03
10	55.26	55.48	55.71	55.94	56.16	56.39	56.61	56.84	57.06	57.29
20	57.52	57.74	57.97	58.19	58.42	58.65	58.87	59.10	59.32	59.55
30	59.77	60.00	60.23	60.45	60.68	60.90	61.13	61.35	61.58	61.81
40	62.03	62.26	62.48	62.71	62.93	63.16	63.39	63.61	63.84	64.06
50	64.29	64.52	64.74	64.97	65.19	65.42	65.64	65.87	66.10	66.32
60	66.55	66.77	67.00	67.22	67.45	67.68	67.90	68.13	68.35	68.58
70	68.81	69.03	69.26	69.48	69.71	69.93	70.16	70.39	70.61	70.84
80	71.06	71.29	71.51	71.74	71.97	72.19	72.42	72.64	72.87	73.09
90	73.32	73.55	73.77	74.00	74.22	74.45	74.68	74.90	75.13	75.35
100	75.58	75.80	76.03	76.26	76.48	76.71	76.93	77.15	77.38	77.61
110	77.84	78.06	78.29	78.51	78.74	78.97	79.19	79.42	79.64	79.87
120	80.09	80.32	80.55	80.77	81.00	81.22	81.45	81.67	81.90	82.13
130	82.35	82.58	82.80	83.03	83.26	83.48	83.71	83.93	84.16	84.38
140	84.61	84.84	85.06	85.29	85.51	85.74	85.96	86.19	86.42	86.64
150	86.87									

Note: - The value of element resistance at any other specific temperature and permissible tolerance thereon shall be calculated by interpolation.

Revision: 0

WORKED BY GDS/DK
 CHECKED BY NLG/ACC