GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)
INDIAN RAILWAY

STANDARD SPECIFICATION
for
FILTER UNIT FOR USE IN CONJUNCTION WITH BLOCK INSTRUMENT IN 25KV, 50 HZ, AC TRACTION AREAS

0. FOREWARD

0.1 This specification is issued under the fixed serial No. 68 followed by the year or original adoption as standard or in the event of revision, the year of last revision.

ADOPTED 1989

0.2 This specification requires reference to the following specifications:-

IRS:S 23	Electrical signalling and interlocking equipment.
IRS: TC 5	Lighting Dischargers for Railway Telecommunication Plant.
IS: 539	Basic climatic and Mechanical Durability Tests for Electronic and Electrical Equipment.
IS:1554 (Pt. I)	PVC insulated (heavy duty) electric cables for working voltages up to and including 1100V.
IS:2036-1974	Phenolic Laminated Sheets.

0.3 Whenever in this specification, any of the above mentioned specification is referred to by number only without mentioning the year of issue, the latest issue of that specification is implied otherwise, the particular issue referred to is meant.

0.4 This specification is intended chiefly to cover the technical provisions and the provisions relating to supply of the equipment and does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This specification lays down the requirements and tests for filter units used in conjunction with single line and double line block instruments in 25KV, 50 Hz electrified sections.

1.2 Filter units are employed in single line and double line block circuits for the protection of instruments as well as the staff operating them from the influence of induced voltage in 25 KV AC electrified sections.

1.3 The filter units consist of chokes, 4-terminal condensers and lightning dischargers wired as shown in Sketch I. The condensers are of 4-terminal-type, and the connections are so made that the DC block circuit current passes through the foils of the condensers in order to ensure that if there is any break in the continuity of the foil, the D.C. block circuit current gets interrupted.

2. TERMINOLOGY

2.1 For the purpose of this specification, terminology given in IRS:S 23 shall apply.

3. REQUIREMENTS

3.1 The equipment comprises of the following:

i) Protective chokes-L1, L2, L3 and L4.
ii) 4-terminal condensers C1 and C2.
iii) Rare gas lightning dischargers N1 & N2.

3.2 The unit shall be capable of being mounted on the wall and shall generally conform to the approved drawing supplied by the Purchaser.

3.3 The equipment shall be of tropical finish and shall be capable of working satisfactorily under conditions of temperature, humidity and dust normally encountered in service conditions.

3.4 All exposed metal parts shall be plated, painted or otherwise protected against corrosion.

3.5 Unless otherwise specified, copper wire conforming to IS:4800 (Pt. l) shall be used for winding of the chokes.

3.6 The chokes shall consist of winding on stalloy laminations and the whole coil-assembly shall be impregnated and sealed in a metallic box, hermetically sealed against dust and humidity.

3.7 Condensers used shall be enclosed in a metal box tightly closed and hermetically sealed.

3.8 The rare gas lightning dischargers shall conform to specification IRS:TC 5 with striking voltage of 150V.

3.9 The filter unit shall be wired as shown in Sketch I. The wires used for wiring shall conform to IS: l554 (Pt .1) and the size of the conductor shall not be less than 1.5 sq.mm.

3.10 The insulating components for terminals shall conform to IS: 2036-1974 for phenolic laminated sheet, paper base, thermosetting, synthetic resin-bonded laminated sheet-Grade P3.

3.2 Electrical

3.2.1 The winding of the choke shall be made out of copper wire of not less than 25 SWG size. The D.C. resistance of chokes L1 & L2 shall be less than 50 ohms, and

the impedance at 50 Hz shall be greater than 40K ohms at 600 V. The impedance of the chokes at 50 Hz shall be greater than 30 K.ohms with the superimposition of DC current of 20 ma.

3.2.2 The D.C. resistance of chokes L3 and L4 shall be less than 40 ohms, and the impedance at 50 Hz shall be greater than 15 K.ohms at 600 V and shall be greater than 12 K.ohms with DC super-imposition of 20 ma.

3.2.3 The condenser used shall be of 10 mfd ±7%(500 V working) and shall have 4 terminals, Terminals marked A+ and E+ and connected to the two ends of one plate, and the terminals marked A and B are connected to the ends of the other plate of the condenser. The terminals shall be taken out on the top of the metal casing.

3.2.4 The condenser shall consist of aluminium and insulating paper wrapping rolled together and immersed in insulating compound, and the assembly shall finally be enclosed in an air/water tight metal casing. The insulating compound shall not get decomposed within the temperature range of $-10^{o}C$ to $+75^{o}C$ and there shall be no change in its dielectric properties within this temperature range.

3.2.5 Details of inter-wiring between chokes, condensers and the lightning dischargers are shown in Sketch I.

4. MAKING

4.1 In addition to the marking shown in the approved drawing, line terminals and earth terminals shall be distinctly marked thus:- **"DANGER. HIGH VOLTAGE. REMOVE PLUGS BEFORE TOUCHING TERMINALS".**

4.2 The rating of condenser and chokes shall be marked individually on them.

4.3 In addition, the following shall be firmly and conspicuously marked on the cover of the filter unit:-

(a) Name or trade mark of the manufacturer
(b) Description as "FILTER UNIT"
(c) IRS No.
(d) Serial No.
(e) Year or manufacture.

5. TEST AND PERFORMANCE REQUIREMENTS

5.1 Unless otherwise specified, all the electrical tests shall be carried out under ambient atmospheric conditions.

5.2 Type Tests

5.2.1 The following shall constitute type tests. A minimum number of 2 samples shall be required for the type tests.

(a)	Visual inspection	-	Cl. 5.5
(b)	Applied high voltage test	-	Cl. 5.6
(c)	Insulation resistance test	-	Cl. 5.7
(d)	Test for the compliance of electrical parameters of	-	Cl. 5.8

	lightning dischargers, chokes, condensers.		
(e)	Test for AC immunity	-	Cl. 5.9
(f)	Tests for insulation resistance of filter unit	-	Cl. 5.10
(g)	Induced high voltage test	-	Cl. 5.11
(h)	Drop test	-	Cl. 5.12
(i)	Climatic severity test	-	Cl. 5.13

5.2.2 All the samples shall successfully pass all the type tests for proving conformity with the requirements of this specification. If any of the samples fails in any of the type tests, the purchaser or his nominee at the discretion may cell for fresh samples not exceeding twice the original number and subject them again to all tests or to the test(s) in which failure(s) occurred. No single failure shall be permitted in the repeat test(s) for proving conformity with the requirements of this specification.

5.2.3 The type approval once accorded shall be valid for a period of three years provided that there is no change in method of manufacture or in the material used.

5.3 Acceptance test (as per sampling plan in Cl. 7)

5.3.1 The following shall constitute acceptance tests and shall be carried out in the sequence given below:-

(a)	Visual inspection	-	Cl. 5.5
(b)	Applied high voltage test	-	Cl. 5.6
(c)	Insulation resistance test	-	Cl. 5.7
(d)	Measurement of the electrical parameters of chokes, condensers, lightning dischargers.	-	Cl. 5.8 (except Cl. 5.8.2.2, 5.8.2.3, 5.8.2.4)
(e)	Test for AC immunity	-	Cl. 5.9
(f)	Tests for insulation resistance of filter unit	-	Cl. 5.10

5.4 Routine test

5.4.1 The following shall constitute routine tests:-

(a)	Visual inspection	-	Cl. 5.5
(b)	Applied high voltage test	-	Cl. 5.6
(c)	Insulation resistance test	-	Cl. 5.7
(d)	Test for AC immunity	-	Cl. 5.9

5.4.2 The manufacturer shall certify that all the routine tests have been successfully carried out in all the filter units offered for inspection.

5.5 Visual inspection

5.5.1 The filter unit shall be visually inspected for checking conformity with the requirement of Cl. 3.1 & 4 of this specification.

5.6 Applied High Voltage Test

5.6.1 Choke:- The chokes shall withstand without any damage a test voltage of 2 KV AC 50 Hz r.m.s. applied across one of the terminals and the core/case for a period of one minute.

5.6.2 Condenser:- The condensers shall withstand for 15 seconds a test voltage of 2KV DC applied between:-

(i) (A+ and B+) and (A- and B-); and
(ii) All terminals and metal casing

5.7 Insulation resistance test

5.7.1 Choke:- The insulation resistance measured with 500V DC between the winding and core/case shall not be les than 100 megohm.

5.7.2 Condensers :- The insulation resistance measured with 500V DC between

(i) (A+ and B+) and (A- and B-); and
(ii) All terminals and metal casing shall not be less than 200 meg.ohm.

5.7.3 Lightning dischargers:- The insulation resistance measured with 100V D.C. shall be as per the values specified in Cl. 3.8 of TC5.

5.8 Test for the measurement of electrical parameters:

5.8.1 Choke

5.8.1.1 The D.C. resistance of the chokes shall be determined with the help of a bridge and shall be within limits specified in clauses 3.2.1 and 3.2.2.

5.8.1.2 The impedance of the chokes with and without D.C. super imposition shall be determined in accordance with the test circuit shown in Sketch II and shall be within limits as specified in clauses 3.2.1 and 3.2.2.

5.8.2 Condenser

5.8.2.1 Measurement of capacitance:- The capacitance shall be measured using Sanky's Bridge with the help of a standard capacitance and non-inductive resistance of accurate values so that the capacitance can be determined within ±0.5%. The value of capacitance thus measured shall be 10 mfd ±7%. A sinusoidal 1 KHz AC voltage of 100V (rms value) shall be used for above measurement and the measurements shall be taken at the ambient temperature.

Any other equivalent method suggested by the manufacturer/supplier may also be used, provided it is agreed to by the purchaser.

5.8.2.2 Verification of water/air-tightness of the casing:- The condenser shall be placed in

an enclosure of 95% relative humidity saturated with moisture at a temperature of 40°C for 2 hrs. At the end of this period, the insulation of the capacitor shall not be less than 75% of the specified value.

5.8.2.3 Steady current carrying capacity:- Terminals A+ and A- shall be connected to a 2V DC source and an adjustable resistance shall be connected across terminal B+ and B- for 20 ma current flow in the circuit. After an hour of sustained passing of this current, the circuit shall be interrupted thrice.

The value of the capacitance and the insulation resistance measured after the above test shall remain within the values specified in Cl. 5.8.2.1 and 5.7.2 respectively.

5.8.2.4 Variation in capacitor parameters with temperature:- The capacitor shall be placed in an enclosure at +10°C for one hour. The capacitance and the insulation measured at the end of this period shall be within the values specified in Cl. 5.8.2.1.and 5.7.2 respectively. The capacitor shall then be placed in an enclosure at 70°C for one hour. The values of capacitance and the insulation measured at the end of this period shall be within the values specified in Cl. 5.8.2.1 and 5.7.2 respectively.

5.8.2.5 Verification regarding the termination from the extreme ends of plates of the 4-terminal condenser.
One condenser from a lot of 50 filter units or less shall be selected and the inductance value between A+ and B+ as also the inductance value between A- and B-shall be measured which shall not vary by more than 10%. Then the sample shall be dissected to verify physically that the terminals are taken from the extreme ends of the plates. Measurement of these inductance values shall be made on the samples selected which shall not vary by more than 20% of the values of the dissected sample.

5.8.3 The lightning dischargers shall conform to TC5 and shall have a nominal DC striking voltage of 150V.

5.9 Test for AC immunity

5.9.1 After the complete assembly of the filter unit with inter wiring, a test voltage of 600V 50 Hz, AC shall be applied between TS1 and 2(ME) of terminal strip, the A.C. voltage measured across the impedance (600 OHMS) connected between TS2 and l(IE) of terminal strip shall be less than 2.5V. Similarly when 600V, 50 Hz AC applied between TS3 and 4(ME) of terminal strip, the AC voltage measured across the impedance (600 ohms) connected between TS4 and 3(IE) of terminal strip shall be less than 2.5V.

5.10 Test for insulation resistance of filter unit

5.10.1 The insulation resistance of the completely assembled filter unit measured with 500V DC between the current carrying parts and the parts insulated therefrom shall not be less than 100 meg.ohms with the discharger tube removed.

5.11 Induced high voltage test

5.11.1 The chokes shall be subjected to induced high voltage between turns 1200V, 100 Hz sinusoidal AC voltage shall be applied between the terminals of the choke. The voltage shall be raised from one third of the maximum value (1200V) to the full value so rapidly as to be consistent with accurate reading of the indicating instrument. The full test voltage shall be maintained for one minute and shall then be reduced rapidly to one third of the value before being switched off. The insulation resistance of the choke shall then be tested as per Cl. 5.7.l and the value shall not be less than 100 meg.ohm.

5.12 Drop Test

5.12.1 Drop test shall be carried out on one sample as per IS:589 distance of drop being 50 mm. The tests for insulation resistance (Cl. 5.7) test for AC immunity Cl. 5.9 and visual inspection (Cl. 5.5) shall be done before and after the drop test. There shall be no apparent damage and the value of insulation resistance and AC immunity shall within 10% of the initial value.

5.13 Climatic severity test

5.13.1 The climatic severity test shall be done in accordance with IS:589 as per the sequence and severity indicated below:-

Climatic cycle	**Severity**		**Test to be done**	**Required result**
	Temp.	**Duration**		
1. Dry heat	70±2°C	16 hrs.	1. Dielectric strength (Cl. 5.6). 2. Insulation resistance (Cl. 5.7).	Shall withstand. Shall be greater than 50 meg.ohms.
2. First damp heat (accelerated)	55±2°C (RH 90-95%)	16 hrs. +2 hrs.	Insulation resistance (Cl. 5.7)	Shall be greater than 10 meg.ohms.
3. Cold	-10°C	2 hrs.	-do-	-do-
4. Five cycles of damp heat RH 90-95% (accelerated)	55±2°C RH 90-95%	16 hrs.	-do-	Shall be greater than 1 meg.ohm after recovery period of 24 hour. Insulation resistance shall be greater than 10 Meg.ohms.

6. PACKING

6.1 The filter unit shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

7. SAMPLING PLAN

7.1 Acceptance tests shall be carried out on filter units selected at random as per the sampling plan given in the table below. N1 is the size of the first sample. In case the number of filter units failing in one or more tests is less than or equal to the corresponding acceptance number (C1), the lot shall be considered as conforming to the requirements. If the number of failure is greater than or equal to rejection number (C2), the lot shall be rejected. If the number of failure is between C1 and C2, further samples of N2 pieces shall be taken and subjected to all the tests. If the total number of failures in the two samples is less than C2, the lot shall be accepted, otherwise, the lot shall be rejected.

TABLE

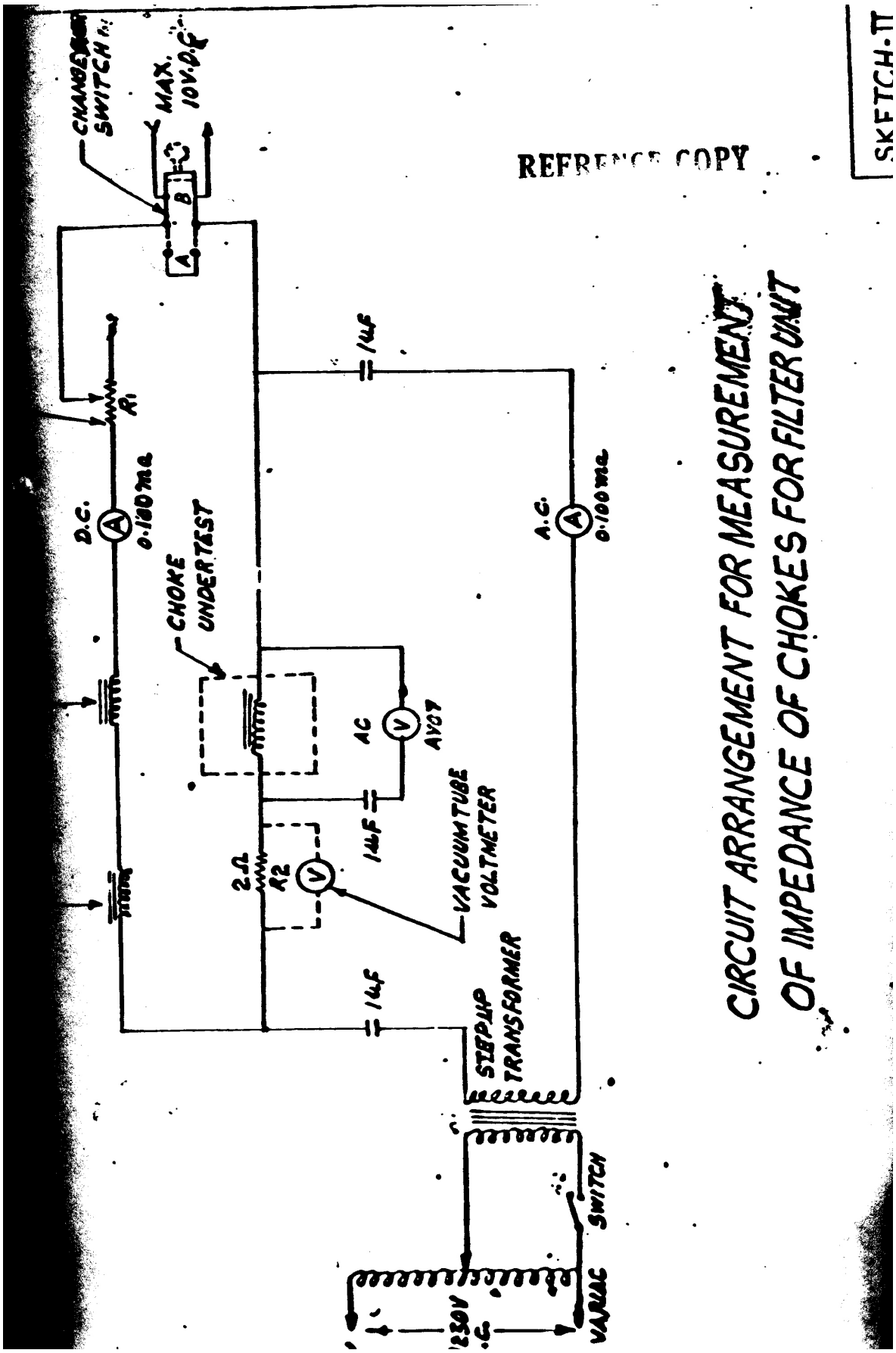
Lot size	First sample N1	Second sample N2	Combined sample N1+N2	Acceptance No. C1	Rejection No. C2
Under 25	3	6	9	0	2
25 to 50	7	14	21	0	3
51 to 100	10	20	30	0	3
101 to 200	13	26	39	0	5

8. CONDITIONS OF SUPPLY

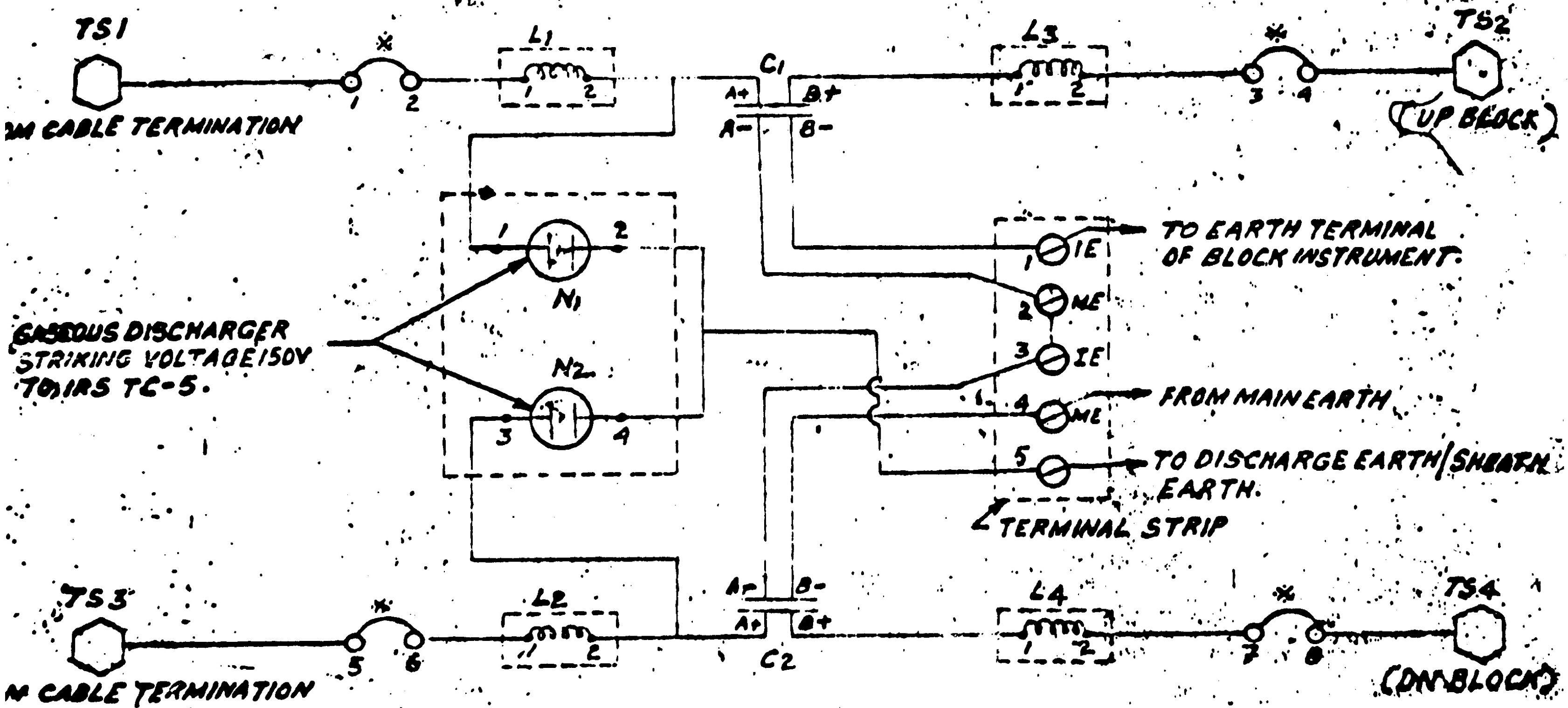
8.1 The manufacturer shall submit two samples to enable type test be carried out for assessing the conformity to the specifications and get them approved before taking-up bulk manufacture.

8.2 Facility shall be available at the manufacturer's premises to conduct the acceptance tests given in Cl. 5.3.

******


REFRENCE COPY
SKETCH-II
CIRCUIT ARRANGEMENT FOR MEASUREMENT OF IMPEDANCE OF CHOKES FOR FILTER UNIT
CHANGE OVER SWITCH
MAX. 10V D.C.
A
B
R1
D.C.
0-100 MA
CHOKE UNDER TEST
1 MF
A.C.
0-100 MA
AC AVOT
1 MF
2 Ω
R2
VACUUM TUBE VOLTMETER
1 MF
STEP UP TRANSFORMER
230 V A.C.
VARIAC
SWITCH

WIRING OF FILTER UNIT (DOUBLE LINE BLOCK)
(CLAUSE 3·1·9)



TAKE OFF THE PLUGS BEFORE TOUCHING ANY TERMINALS
FOR CONNECTING TWO NEALES TOKEN INSTRUMENTS WITH EARTH RETURN:-
a) DISCONNECT STRAP BETWEEN 2 & 3 OF THE TERMINAL STRIP
b) CONNECT UP BLOCK EARTH TO TERMINAL 2 & DN BLOCK EARTH TO TERMINAL 4.
WIRES USED SHALL BE P.V.C INSULATED COPPER WIRE OF 1.5 SQ mm.

SKETCH-I