Ministry of Defence



Defence Standard

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# TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

OBSOLESCENT THIS DEFENCE STANDARD WILL NOT BE UPDATED AND IS NOT TO BE USED FOR THE PURCHASE OF NEW EQUIPMENT

# AMENDMENT RECORD

AMENDMENT NUMBER	DATE	SIGNATURE

# TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

1. This Defence Standard specifies a high sensitivity safety test set, for measuring the resistance of electrically initiated explosive devices, both wire bridge and conducting composition types, and for indicating the presence of any spurious ac or dc voltages in a firing circuit. The equipment is for use by the Navy, Army and Air Force.

2. <u>This Standard contains all necessary technical information and it is the</u> <u>definitive specification for this item.</u> It must be invoked for all tender and <u>contract purposes.</u>

3. All Authorities concerned are to implement this Standard from the date of issue.

4. This Standard has been agreed by all authorities concerned. If it should be unsuitable for a particular requirement, the Director of Standardization should be informed of the circumstances. Any enquiries regarding this Standard in relation to any invitation to tender or a contract in which it is invoked should be addressed to the Quality Assurance Authority named in that invitation to tender or contract.

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## SPECIFICATION FOR

# TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

## SCOPE

a. This Standard specifies the technical requirements for a high sensitivity general purpose safety test set, safe to use in the presence of explosives, for measuring the resistance of electrically initiated explosive devices (EED) (wire bridge and conducting composition types) either individually or connected in circuit and for indicating the presence of any spurious a.c/d.c voltages that may appear in a firing circuit.

b. Accuracy shall be maintained over a wide temperature and humidity range.

c. The equipment shall be safe to use in the presence of strong electromagnetic and/or electrostatic fields, providing that appropriate connectors and associated leads are used.

d. It shall be possible at any time to prove that the circuit under test is connected and that the test set is serviceable, without disturbance of the connections.

#### RELATED SPECIFICATIONS AND DOCUMENTS

- a. Reference is made in this Standard to the following:
- BS 89 'Electrical indicating instruments'
- BS 2050 'Electrical resistance of conductive and anti-static products made from flexible polymeric material'
- BS 381C 'Colours for specific purposes'
- BS 3693A & B 'Recommendations for the design of scales and indexes'
- BS 3888 'Copper-clad synthetic-resin bonded laminated sheet'
- BS 4025 'The general requirements and methods of test for printed circuits'

DEF STAN 59-48 'Panels, printed circuit. Test requirements for single (Part 1) and double-sided printed wiring boards'

DEF STAN 61-12 'Wires cords and cable electric - metric units - small (Part 5) multicore cables'

- DEF STAN 61-12 'Wires cords, and cable electric metric units equipment (Part 6) wires'
- DEF-33 'Drawing procedure'
- DEF-133 'Climatic, shook and vibration testing of Service equipment'
- DEF-5000 'General requirements for Service telecommunication equipment'

CS 3106 'Fluid hydraulic OX-8'

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- 2. b. These documents and facilities are available from:
  - British Standards The British Standards Institution Sales Branch Newton House 101 Pentonville Road London N1 Defence Specifications Her Majesty's Stationery Office CS Specifications MOD (Army Dept) Director of Quality Assurance (Materials) Headquarters Buildings Royal Arsenal East Woolwich, SE18 Details of vibration E F Mov Ltd test machine RAE Mk 111 134 Bayham Street

London NW1

c. Where the requirements of this specification conflict with those of the above mentioned documents, the requirements of this specification shall take precedence.

d. Reference in this Standard to any document listed above means, in any tender or contract, the edition and any amendments current at the date of such tender or contract. If any document has been superseded by another document, the edition of the superseding document current at that date shall apply.

#### 3. <u>DEFINITIONS</u>

#### a. <u>Temperature category</u>.

There shall be no derangement when subjected to a storage temperature range -40 to +70 °C. The equipment shall function satisfactorily over the temperature range of -10 to +55 °C.

b. <u>Standard ambient temperature</u>.

The standard ambient temperature shall be 20°C. Test results shall be corrected to this temperature.

# c. <u>Normal test conditions</u>.

Unless otherwise stated all tests shall be carried out at a temperature between 15 and 30°C, am air pressure between 600 and 800 mm of mercury (800 and 1067 mbars) and a relative humidity between 45 and 80%.

# 4. <u>RANGES</u>

# a. <u>Resistance measurement.</u>

- (1) 0.1 to 10 ohms
- (2) 10 to 1000 ohms
- (3) 1000 to 100 000 ohms
- (4) 100 000 to 10 Megohms

- <u>Note:</u> The excursion of the instrument pointer shall be from left to right over the dial. Bridge balance shall be achieved by adjusting for minimum deflection.
- 4. b. <u>Voltage detection</u>.
  - (1) Either polarity of d.c. voltage
  - (2) A.C. voltage to a maximum frequency of 10 kHz without recourse to stitching.
  - <u>Note:</u> The input impedance of the voltage detection circuit shall be not less than 100 kilohms from d.c. to 2.5 kHz
  - (3) The excursion of the instrument pointer shall be from left to right over the dial with an approximately logarithmic characteristic, reaching maximum deflection for an input of 1 V.
  - (4) 10 mV input d.c. or equivalent a.c. corresponds approximately to a 3 mm excursion of the instrument pointer.
  - (5) 50 mV input d.c. or equivalent a.c. corresponds to approximately 25% of the scale length.
  - (6) 100 mV input d.c. or equivalent a.c. (approximately average log sine), corresponds to approximately 40% of the scale length.
  - (7) For inputs of 1 V up to 250 V automatic electrical protection shall be provided such that it is possible to apply 250 V d.c. of either polarity or 250 V r.m.s. for 30 seconds without altering the characteristics of the equipment. The instrument indicates the presence of this voltage.
  - (8) A switch shall be provided to enable voltage detection to be made across any 2 of 3 incoming lines.

# 5. CIRCUIT CHECKING FACILITIES

Built in facilities shall exist for the checking of the correct operation of the voltage detector and resistance measuring circuit including test leads. A mechanical interlock (safety locking lever, see Fig 3) and line discharge facilities are to be provided.

## 6. DESIGN SAFETY REQUIREMENTS

a. The equipment shall comply with the safety principles of the Ordnance Board.

- b. Screening and external insulation.
  - (1) All components and circuits shall be contained within a metal screen, the external surface of which is to be insulated to the requirements of Annex A, clause 6. All knobs, plugs, sockets, switch spindles, and dollies passing through the screen must not degrade the screening. This requirement also applies to the glass window of the meter. All exposed parts of such knobs etc shall be insulated to the requirements of Annex A, clause 6.
  - (2) Connections between the screen of the test equipment and the screen of the system under test, shall be established via the screening of the connector. The screening shall be continuous and effective 360° around all cables, connectors, and adaptors.

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- 6. b. (3) The screen shall not be used in place of a test lead for any tests except for continuity of screening or as a bond for earthing purposes.
  - C. <u>Power sources</u>.
    - (1) The equipment shall be self-powered and electrical supplies obtained from approved primary cells having a maximum open circuit voltage of 1.5 V and from which the short-circuit current is limited to 10 mA. Such cells shall be used both for the meter functions and for setting up and self checking the equipment.
    - (2) The current limiting resistors shall be encapsulated with each cell as a unit and each such unit shall be non-reversible and have its polarity clearly marked.
    - (3) The approved safety cell unit is: Battery, dry; NATO Stock Number 6135-99-428-2343.
    - (4) If more than one independent cell unit is required it shall not be possible for the outputs to become connected in series or in parallel under any circumstances.
    - (5) Each cell unit used shall be contained in a separate compartment in the equipment so constructed that it will fit only when the polarity is correctly orientated. This compartment shall be readily accessible from the outside so that the unit can be replaced without having to open up the main body of the equipment. The cell unit and its compartment shall be designed so as to preclude the replacement of the unit by an incorrect power source. The type of power source used shall be indicated near to its compartment, (see clause 10.b.)
    - (6) Any open circuit voltage (generated from the d.c. power supplies) shall not exceed 1.5 V, or 1.5 V peak a.c. and the closed circuit current that can be taken from such a supply shall not exceed 10 mA, or 10 mA r.m.s. a.c. This shall include any transients or parasitic oscillations that may be generated in the equipment.
    - (7) No single fault of either electrical or mechanical origin shall degrade any of the above power supply requirements.

# d. <u>Radio frequency rejection.</u>

The equipment shall not indicate more than 1% of full scale voltage when swept by signals under the following conditions:

- (1) When signals of amplitude 1 V r.m.s. swept within the frequency range 80 kHz to 2.5 GHz are injected as an input signal.
- (2) When irradiated by signals swept over frequencies within the L band and J band, of field strength not less than 10 mW/cm<sup>2</sup>, the input plug being screened.
- (3) When irradiated by signals swept over frequencies within the C, S, and X bands of a field strength not less than 10 mW/cm<sup>2</sup>, a resonant dipole being connected to the input plug (See Annex C Fig 5).

# e. Common mode rejection.

The equipment shall not indicate more than 1% of full scale voltage when signals of amplitude 1 V d.c. or a.c. (r.m.s.) up to 18 GHz are injected as a common mode signal across the voltage detector strapped inputs and strapped internal earthing/external screening.

- f. The equipment shall:
  - (1) Accept voltages at the voltage detection unit within the pass band d.c. to approximately 10 kHz, without significant degradation of calibration.
  - (2) Incorporate a line discharge (guard) resistance of 220 ohms (see Annex A, clause 6.b.)
  - (3) Have an insulation resistance between the test inputs and case of not less than 100 Megohms.

#### 7. <u>CONSTRUCTION</u>

a. <u>Panel layout.</u>

Front panel components shall be disposed generally as shown in Annex C, Fig 3.

- b. <u>General.</u> The equipment shall:
  - (1) Be designed to provide for ease of maintenance and repair of all parts.
  - (2) Have permanently fixed to it a warning plate and an instruction plate in such a position that these will not become defaced by normal usage, (see clauses 10.f. and g.)
  - (3) Incorporate components (resistors etc) of Preferred Joint Services or approved types which will ensure stability of calibration.
- c. <u>Weight</u>.

The weight of the equipment shall not exceed 20 lb (9.1 kg).

#### d. Workmanship and finish.

The workmanship and finish of the equipment and all component parts thereof shall be to the satisfaction of the Quality Assurance Authority and shall be such as to ensure that the equipment will satisfactorily pass the tests called for in the specification.

e. Locking of nuts and screws.

All nuts and screws, except external terminal connection nuts, shall be efficiently locked or secured so that they will not loosen when the equipment is subjected to the vibration and bump tests.

- f. <u>Scale plate.</u>
  - (1) The indicating instrument scale plate shall be marked as shown in Annex C, Fig 1.

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- 7. f. (2) The resistance measurement dial shall be of an insulating laminate with 2 scales, one printed in black, the other in dark green on a white background. It shall be calibrated as shown in Annex C, Fig 2.
  - q. <u>Controls.</u>
    - (1) <u>Range Switch</u>. Setting up, resistance measurement, guard resistance, and voltage detection shall be by means of a rotary switch. Indication of function shall be shown in a gated aperture which also exposes the appropriate trim control for the selected function, (see Annex C, Fig 3).
    - (2) The self-test switch shall be spring loaded to the 'OFF' position. The normal/line test positions are to be selected by means of a rotary switch, (see Annex C, Fig 3).
    - (3) The on/off switch positions shall be boldly marked indicating the mode ('OFF' in black on a white background, 'ON' in black on an orange background, (see Annex C, Fig 3).
    - (4) Line selector switch positions shall be marked 'LINE TEST 1', 'NORMAL', 'LINE TEST. 2', in black on a white background, (see Annex C, Fig 3).

# h. <u>Operating knobs</u>.

Knobs for all operations shall be fluted around the periphery and of such a size to give ease of operation with a gloved hand.

# j. <u>Input pluq</u>.

Shall be a 3-pin brass Pattern 104 plug, set to orientation 0. Internal connection to the circuits shall be such that in the normal position of the line selector switch, pins A and C are selected for test; turning the line selector switch anti-clockwise to position 'LINE TEST 1' selects pins A and B and turning the control clockwise to 'LINE TEST 2' selects pins B and C.

# 8. MATERIALS AND COMPONENTS

a. The case and cover shall be of metal, insulated externally to comply with the appropriate safety clauses (clause 6 and Annex A, clause 6.a).

b. With the lid removed there shall be no uninsulated projecting metal parts, except for the input plug shell (see clause 7.j.). All other surfaces shall be covered with a material approved by the Type Approval Authority.

c. All internal wiring shall be carried out using cables complying with DEF STAN 61-12 (Part 5), 'Wires, cords and cable electric - metric units - small multicore cables', and DEF STAN 61-12 (Part 6), 'Wires, cords and cable electric - metric units - equipment wires'.

d. Printed circuits shall comply with BS 3888, BS 4025 (excluding matrix ref - clause 5), and DEF STAN 59 - 48 (Part 1).

e. The indicating instrument used shall meet the general requirements of BS 89. A zero adjuster accessible from the front of the panel of the equipment shall be fitted, (see Annex C, Fig 3.)

f. Sealing gasket material shall be resistant to attack by hydraulic fluid to QAD (Mats) specification CS 3106. Joint Service designation OX-8, NATO code H-542.

8. g. Desiccant: Silica gel retained in a standard desiccator assembly. An approved desiccator is type IDA2 manufactured by Silica Gel Ltd.

<u>Note:</u> All soldered joints, crimped connections, and other finishes not dealt with above shall be in accordance with DEF-5000.

- 9. EQUIPMENT CASE
  - a. General.

The case shall be of the form shown in Annex C, Fig 4.

b. Filling and sealing of case.

The equipment shall be capable of being thoroughly dried out, filled with dry air, dry nitrogen, or other approved dry gas at atmospheric pressure and sealed.

- c. Carrying handles and harness.
  - (1) A hinged rigid handle shall be provided for carrying purposes, (see Annex C, Fig 4).
  - (2) A pair of rigid carrying handles shall be provided on the panel of the equipment, (see Annex C, Fig 3).
  - (3) 4 metal studs shall be provided (see Annex C, Fig 4) for the attachment of a webbing harness, which shall be manufactured from Maxwebb or other approved material.

## d. Feet.

The case shall be provided with 4 resilient feet on each of faces A and B (see Annex C, Fig 4) which shall be of a material resistant to attack by hydraulic fluid to QAD (Mats) Specification CS 3106 (Joint Service designation OX-8, NATO Code H-542).

e. Windows.

Shall be of glass, with conductive transparent coating on the back to prevent static build up influencing the instrument reading.

f. Dimensions.

The overall dimensions of the complete equipment measured over all external protuberances excluding the carrying handle at clause 9.c. (1) above, shall not exceed 13 x 12 x  $7\frac{3}{4}$  inches (330 x 305 x 197 mm).

g. <u>Cover</u>.

The cover when in position shall be secured by 2 clips on the front side and 2 on the rear side, so spaced that the cover can only be fitted one way round.

## 10. MARKING

a. General.

All marking shall be clear, legible and permanent.

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# 10. b. <u>NATO Stock Numbers, including that for the batteries, and pheon.</u>

These shall be in the positions indicated, (see Annex C, Fig 3).

#### c. <u>Manufacturer's name.</u>

The manufacturer shall insert his approved Joint Services 3 letter code or registered trade mark (see Annex C, Fig).

# d. Manufacturer's serial number.

The manufacturer shall mark the serial number of the general purpose safety test set on the case and panel, (see Annex C, Fig 3).

# e. <u>Date</u>.

The year of manufacture shall be marked in an approved position on the panel.

# f. <u>Warning plate</u>.

A plate shall be fitted inside the cover to give the following warnings:

- (1) Use only approved safety battery NATO Stock Number 6135-99-428-2343.
- (2) To maintain safety in magnetic fields, equalise electrostatic charges, and prevent contact with live conductors, the test leads used must have been approved for use with the system under test.

# q. <u>Instruction plate.</u>

The manufacturer shall include an instructional plate on the inside of the cover detailing the operating procedure for the equipment, (see Annex C, Fig 4).

#### h. <u>Modification label.</u>

An approved label shall be fitted on the panel, (see Annex C, Fig 3).

#### 11. TYPE APPROVAL

a. <u>General</u>.

The Type Approval Authority fur items to this specification is the DMSC Sub-committee for Electrical Indicating Instruments. Type Approval must be obtained by a manufacturer before he is permitted to offer items for acceptance against a contract. The manufacturer shall produce the Type Approval Certificate to the Quality Assurance Authority on demand.

- b. <u>Procedure</u>.
  - (1) A manufacturer wishing to obtain Type Approval to this specification shall apply in the first instance to:

The Secretary DMSC Sub-Committee - Electrical Indicating Instruments MOD (Procurement Executive) SAE Stuart House 23/25 Soho Square London W1

He will then be informed of the further action required on his part.

- 11. b. (2) The procedure for carrying out Type Approval testing to this specification is as follows:
  - (a) The manufacturer will require the prior approval of the Type Approval Authority both in respect of his test facilities, and of the nature of the supervision to be employed.
  - (b) The manufacturer shall carry out his own Type Approval testing and produce a test report (see clause 11.e.) for submission to the Type Approval Authority. Should the manufacturer have insufficient facilities for carrying out the full range of tests, approval may be given to have the balance of testing undertaken at a Government Establishment or an approved Commercial Test House.
  - c. Drawings and information for Type Approval purposes.
    - (1) Drawings shall be in accordance with DEF-33.
    - (2) The following drawings and information shall be supplied by the manufacturer before any testing is commenced:
      - (a) A general assembly drawing with issue number and date. The drawing shall be to such a scale and so dimensioned as to enable the Authority to form a clear idea of the item and its internal construction. The drawings shall refer to, or include, a drawing list. The drawing list shall show the drawing numbers, issue numbers, and dates of all details referred to on the general assembly drawing.
      - (b) Any such additional information as may be required by the Type Approval Authority. The drawings and other information shall be addressed to The Secretary of the DMSC Sub-Committee -Electrical Indicating Instruments.
    - (3) If all the information required above is not supplied, or if it is incorrect in that the samples submitted do not conform or if the information is insufficient to define completely the item for which Type Approval is desired, Type Approval may not be proceeded with. All information will be treated in confidence. A complete set of the drawings and other information covered by this clause shall be made available on demand for use by authorised representatives of Her Majesty's Government, eg the appropriate Quality Assurance Authority.
  - d. <u>Samples for Type Approval.</u>
    - (1) For Type Approval purposes 2 samples of the instrument movement and 2 samples of the equipment will be required.
    - (2) These samples shall be manufactured from materials and by methods identical to those adopted for production unless otherwise stated at the time of submission.
    - (3) All samples for Type Aproval testing shall be supplied at the manufacturer's expense, and shall be retained by the manufacturer on completion of the Type Approval test programme.

Test reports.

(1) If Type Approval testing is carried out by the manufacturer (with or without assistance from an approved test house), 8 copies of each test report shall be forwarded to the Type Approval Authority.

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- 11. e. (2) If Type Approval testing is undertaken by a Government Department, a copy of each test report shall be issued to the manufacturer concerned.
  - (3) The contents of Type Approval test reports shall be regarded by the Type Approval Authority as confidential. They shall not be circulated by them outside Government Departments.
  - f. <u>Type Approval Certificates.</u>
    - (1) Type Approval Certificates will be issued to successful firms by the Type Approval Authority.
    - (2) When a Type Approval Certificate is granted, control samples may be retained by the Type Approval Authority. The remainder of the samples submitted shall be returned to the manufacturer. Samples submitted that fail to meet the required standard shall be returned to the manufacturer.
    - (3) If, after receiving Type Approval, a manufacturer wishes to introduce any change in the materials, construction, processes, finish, or place of manufacture of the Type Approved item, he shall first notify the Type Approval Authority, who will decide whether a repetition of any or all of the Type Approval tests is necessary, and the number of samples to be tested before the change is approved.

# q. <u>Quality maintenance</u>.

If at any time Service defect reports or reports from the Quality Assurance Authority indicate that the original design standard is not being maintained, the right is reserved to demand a repetition of the full Type Approval Tests.

# h. Withdrawal of Type Approval.

Should the results of repeat Type Approval tests be unsatisfactory, the right is reserved by the Type Approval Authority to withdraw Type Approval.

# 12. <u>APPROVAL TESTING</u>

# a. <u>Type Approval.</u>

Equipments submitted for Type Approval shall satisfy all the requirements of this specification (see Table A, column 4 for sequence of testing).

b. <u>Production inspection and testing.</u>

## (1) <u>Acceptance</u>.

Equipment for acceptance against a contract shall satisfy the specified requirements of this specification and the tests detailed in Table A, column 2.

- (2) Tests detailed in Table A shall be carried out in the order shown.
- (3) Tests detailed in Table A, column 3, shall be carried out in the order shown, on equipments taken at random.

- 12. b. (4) The number of equipments taken shall be 2 for batches up to 50, and 4%, with a maximum of 10 equipments, for batches above 50. For batches of 25 equipments, the batch sampling requirement shall be waived if the manufacturer has satisfactory evidence of batch sampling test results obtained within the previous 12 months period.
  - (5) All batch sample test reports shall bear the signature of the supervising Government Inspector.
  - Note: A batch is defined as the number of equipments submitted at any one time from one contract.

TABLE A

COLUMN 1 TESTS	COLUMN 2 PRODUCTION	COLUMN 3 BATCH SAMPLING	COLUMN 4 TYPE APPROVAL
	See An	nex A, clause	number
Visual examination	1	1	1
Dimensions	-	2	2
Weight	-	3	3
Balance	4	4	4
Limit of resolution	5	5	5
Safety	-	6 (excluding 6a and 6j)	6
Line discharge (guard) resistance	6b		
Self check facility (resistance)	6d		
Self check facility (voltage detection)	бе		
Applied external voltages	бg		
External bleed resistance Test facility	6h		
Calibration accuracy (resistance)	7	7	7
Insulation resistance	8	8	8
Performance at low and high temperature	-	9	9
Sealing	10	10	10
Toppling	-	-	11
Bump	-	_	12
Vibration	-	-	13
Climatic	_	-	14

# 12. c. Failures.

- (1) An equipment which fails any one of the tests in Table A, column 2 may be re-submitted for these tests only after the cause of the defect, and the action taken to remedy the defect, has been shown to the satisfaction of the Quality Assurance Authority. Equipments which fail re-test may not be resubmitted.
- (2) In the event of failure of any equipment tested in accordance with sub-clauses 12.b. (3) and (4) above, an equal number of equipments will again be selected and subjected to the tests in Table A, column 3. Failure of any equipment from the second selection will involve rejection of the batch.

# APPROVAL TESTS

#### 1. VISUAL EXAMINATION

a. The workmanship, finish, and marking shall be to the satisfaction of the Quality Assurance Authority.

b. The equipment shall be inspected to the sealed drawings to ensure all design requirements are met.

# 2. <u>DIMENSIONS</u>

The dimensions shall be in accordance with clause 9.f. of the specification.

# 3. WEIGHT

The weight of the equipment shall not exceed that laid down in clause 7.b. of the specification.

## 4. BALANCE (Variation of indication due to effect of level)

The departure from zero due to want of balance shall not exceed 1% of scale length when the instrument is moved in any direction within an angle of 45° from the horizontal. The scale length shall be taken as that distance the tip of the pointer travels in passing from one end of the scale to the other.

# 5. LIMIT OF RESOLUTION

During this test, care must be taken to ensure that the equipment is not subjected to any vibration, or the test shall be rendered void and must be recommenced.

a. The equipment shall be placed in its normal operating position with the indicator dial in the horizontal plane, on a firm, stable, and flat surface.

b. Set up the equipment in accordance with Annex B. Do not connect any external leads.

c. With the resistance dial set to its fully anti-clockwise position and the range switch set to the 0.1-10 ohms position, carry out a 1 ohm resistance check, using the internal standard brought into circuit by the self-check switch when turned to 'SELF TEST OHMS AND VOLTAGE 1'. Note the value of resistance measured. Check also that this lies within the accuracy given in Table B.

d. Rotate the resistance dial fully clockwise, and using the internal standard resistor, repeat the 1 ohm resistance check (5.c. above). Note the value of resistance measured.

 $_{\mbox{e.}}$  The difference between the 2 values of resistance noted shall not be greater than 0.2 ohms.

# 6. <u>SAFETY</u>

# a. <u>Case finish resistance</u>.

The insulation resistance (IR) of the anti-static external covering of the equipment case shall be measured at 5 widely spaced positions on the equipment case using the electrode system described in BS 2050 (omitting potassium chloride). The IR shall not be less than  $5 \ge 10^4$  ohms when measured at 500 V d.c. and it shall not exceed  $5 \ge 10^{12}$  ohms.

# <u>Note</u>:

The acceptance of this upper limit does not imply that the case will be free from static hazards to the system under test. This requirement is only covered by the use of the approved screened connectors and leads as in clauses 1.c. (page 3) and 6.b.(2) (page 5). In the absence of these screening facilities separate protection against the possibility of ignition must be provided since electrostatic charges can be introduced into the system should the case become charged. In order to minimise this an upper limit of  $5 \times 10^{12}$  ohms is included in the specification.

# b. Line discharge (guard) resistance.

- (1) With the range switch set at the 'GUARD' position and the line selector switch at 'NORMAL' position measure the resistance across pins A-C of the input plug.
- (2) With the range switch set to the 'GUARD' position and the line selector switch set to 'LINE TEST 1' position measure the resistance across pins A-B.
- (3) With the range switch set to the 'GUARD' position and the line selector switch set to 'LINE TEST 2' position measure the resistance across pins B-C.
- (4) The resistance measurements obtained from tests 6.b.(1), (2), and
  (3) above shall be 220 ohms ± 5% when tested with a d.c. voltage not exceeding 10 V.

# c. <u>Hazardous output signals.</u>

With the equipment set up in accordance with Annex B, carry out the following tests:

- (1) With the line selector switch set at 'NORMAL' use an oscilloscope having an input impedance of nominally one megohm and total circuit stray capacitance not greater than 50 pF and a band width of not less than 1 MHz to check that at every position and while progressing from position to position of the range switch the combined d.c. a.c. peek and peak pulse voltage appearing across pins A-C of the input plug shall not exceed 1.5 V. These measurements shall also be made with the self-test switch in the 'OFF', 'VOLTAGE 1' and 'VOLTAGE 2' positions.
- (2) Repeat test 6.c.(1) above, but using a 10 ohm non-inductive resistance across the input of the oscilloscope. The combined d.c. a.c. peak and peak pulse current passing through the resistor shall not exceed 10 MA.
- (3) If any transient peak in tests 6.c.(1) or (2) above exceeds the stated maximum, then measure the energy of transient pulses present. The maximum energy contained in any one pulse shall not exceed 100 microjoules.

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# 6. d. Self check facility (resistance).

- (1) Set up equipment in accordance with Annex B.
- (2) Select by means of the range switch each of the 4 resistance ranges in turn. For each resistance range selected, move self-test switch to 'OHMS' position and balance bridge for minimum deflection of meter pointer.

The value indicated on the resistance measuring dial for each range respectively shall be as Table B.

RANGE :		2:	VALUE OF CHECK RESISTANCE:	IND V	ICATED ALUE:	
	ohm	S	ohms	ohms		
0 1	_	10	1 0	1	+ 158	
10	_	1 k	100	100	± ±5% + 5%	
1 k	-	100k	10 k	10 k	_ 5° ± 5%	
100k	-	10 M	1 M	1 M ± 5%		

## TABLE B

# e. <u>Self check facility (voltage detection).</u>

- (1) Set up equipment in accordance with Annex B.
- (2) Set the range stitch to the 'TEST' position.
- (3) Move self-test switch to the 'VOLTAGE 1' and 'VOLTAGE 2' positions in turn and note indications of meter pointer. In each case the pointer shall indicate 50 mV ± 50% on the meter dial.

#### f. Input impedance measurements.

- (1) Set up the equipment according to Annex B, clauses 1 and 2.
- (2) Apply to pins A and C of the input plug a signal at the chosen frequency (see 6.f.(4) below) from a suitable signal generator, adjust its level until a reading of 100 mV is obtained on the equipment under test.

<u>Note:</u> The equipment case shall not be connected to any part of the test system.

(3) Then insert a 100 kilohms, ± 1% non-inductive resistor between the live terminal of the signal generator and the equipment, as close to the equipment as possible. Increase the output of the signal generator by 6 db (or alternatively increase the output voltage reading to twice its previous value). The instrument shall now indicate not less than 100 mV. 6. f. (4) Carry out the above test at the following frequencies:

1.0 kHz, 1.5 kHz, 2.0 kHz, and 2.5 kHz.

- q. Applied external voltages.
  - (1) Set up the equipment for voltage tests according to clauses 1 and 2 of Annex B.
  - (2) Apply accurately monitored d.c. voltages, from a supply of source impedance not greater than 500 ohms, to pins A and C, to produce the following pointer deflections:
    - (a) With pin C positive to pin A, deflect the pointer to the 10 mV mark. The applied voltage shall be 10 mV + 20 -50%.
    - (b) With pin C positive to pin A deflect the pointer to the 50 mV mark. The applied voltage shall be 50 mV ± 50%.
    - (c) With pin C positive to pin A, deflect the pointer to the 100 mV mark. The applied voltage shall be 100 mV ± 10%.
    - (d) With pin C positive to pin A, deflect the pointer to the 1 V mark. The applied voltage shall be 1 V + 20-10%.
    - (e) With pin A positive to pin C, deflect the pointer to the 10 mV mark. The applied voltage shall be between 10 mV + 20 -50%.
    - (f) With pin A positive to pin C, deflect the pointer to the 50 mV mark. The applied voltage shall be 50 mV ± 50%.
    - (g) With pin A positive to pin C, apply 100 mV. The pointer shall lie within the black hatched zone on the scale.
    - (h) With pin A positive to pin C, deflect the pointer to the 1 V mark. The applied voltage shall be 1 V + 20-10%.
  - (3) Apply across pins A and C, the output from a signal generator of adjustable frequency and adjustable output level. The signal generator must present the equipment with a signal source impedance less than 500 ohms. Connect the equipment case to the 'earthy' output terminal of the signal generator.
    - (a) With the output frequency set to 80 Hz, adjust the output level to give a pointer deflection of 100 mV. The signal level required to accomplish this must be in the region 130 mV  $\pm$  20 mV r.m.s. Note its value.
    - (b) Reverse the connections to pins A and C (ie so that the other pin is now 'earthy') and repeat the above test. The voltage required for deflection to the 100 mV mark shall be the same as previously within ± 5%.
    - (c) With the output level of the signal generator set to maintain the 100 mV deflection, sweep the frequency from 50 Hz to 30 kHz. The pass band of the equipment is defined as being from d.c. to the upper frequency limit, where the response is 3 db down relative to that at 80 Hz, and is further attenuated for all higher frequencies. The upper frequency limit shall lie between 6 and 10 kHz.

# DEF STAN 66 - 11/1 ANNEX A(CONTD)

- 6. g. (3) (d) Search the pass band for 'peaks' and 'troughs' in the frequency response. The voltage at any such 'peaks' and 'troughs' shall not differ from that at 80 Hz by more than ± 3db.
  - (e) For frequencies higher than 15 kHz, the rate of attentuation must be greater than 12 db per octave.

# h. <u>External bleed resistance test facility.</u>

- (1) Set up equipment in accordance with Annex B.
- (2) Connect two nominal 5 Megohm resistors matched to within 0.5% between pins A-B and C-B of the 'input' plug respectively and strap pin B to shell.
- (3) With the range switch set to 100 K to 10 Megohms position and the line selector switch at 'LINE TEST 1' adjust the resistance measuring scale for minimum deflection of the instrument pointer. Note the value of resistance indicated on the resistance measuring scale. Repeat this measurement with the line selector switch at 'LINE TEST 2'. The 2 values of resistance noted shall not differ by more than 10%.

# j. <u>RF rejection</u>.

At the commencement of each test the equipment shall be set up in accordance with the requirements of Annex B. Any subsequent zero drift of the instrument pointer should be corrected. Whilst carrying out any of the tests the instrument pointer shall not register voltages in excess of 10 mV. To avoid suppressing any meter indications care must be taken not to sweep the frequency bands too rapidly.

(1) <u>80 kHz to 2.5 GHz</u>.

Set the range switch to 'TEST' end the line selector switch to 'NORMAL'. Apply a RF signal of magnitude 1 V r.m.s. across pins A-C of theinput plug and sweep over the frequency band 80 kHz to 2.5 GHz. Repeat the 50 mV self test check, see Annex B clause 2f.

(2) <u>1.1 GHz to 18 GHz</u>.

The equipment shall be placed on a non-metallic stand in an anechoic RF radiation chamber at an angle of  $45^{\circ}$  to the horizontal and vertical planes with the panel towards the radiating source. Where difficulties are experienced in carrying out this test the details should be referred to the Type Approval Authority. The appropriate test aerial (see Annex C. Fig 5) shall be connected to the input plug of the equipment for tests (b), (c), (d), (e), (f), and (g), and for tests (a) and (h) a Pattern 104 screening cap should be fitted to the input plug.

(a) The equipment shall be set up in accordance with clause 6.j. above. Set the range switch to 'TEST' and the line selector switch to 'NORMAL'. Irradiate the equipment by sweeping over the frequency band 1.1 GHz to 1.4 GHz at a field strength of not less than 20 mW/cm<sup>2</sup>. Where a change of reading is found the frequency sweep shall continue until a peak is found (indicated by maximum meter reading). Irradiation at this peak frequency shall be maintained at a field strength of 10 mWcm<sup>2</sup> whilst the equipment is re-orientated to optimise the peak already found. Repeat the 50 mV self check test, see Annex B, clause 2.f.

- 6. j. (2) (b) Repeat (a) above using test aerial Type 1(a) over the frequency band 2.8 GHz to 3.8 GHz.
  - (c) Repeat (b) above using test aerial Type 1(b).
  - (d) Repeat (a) above using test aerial Type 2(a) over the frequency band 5.0 GHz to 6.0 GHz.
  - (e) Repeat (d) above using test aerial Type 2(b).
  - (f) Repeat (a) above using test aerial Type 3(a) over the frequency band 8.9 GHz to 10.3 GHz.
  - (g) Repeat (f) above using test aerial Type 3(b).
  - (h) Repeat (a} above with the input plug covered with a pattern 104 screened cap, over the frequency band 15 GHz to 18 GHz.

# k. <u>Common mode rejection</u>.

- (1) Set up the equipment in accordance with Annex B.
- (2) With the range switch set at 'TEST' and the line selector switch at 'NORMAL' apply a low frequency signal across pins A-C strapped together, and pin B strapped to shell of the input plug, having a voltage of 1 V (r.m.s) and sweep the frequency band d.c. to 80 kHz.
- (3) The instrument pointer shall not give an indication greater than 10 mV.

# 1. Overload protection.

- (1) Set up equipment in accordance with Annex B.
- (2) With the range switch set at 'TEST' and the line selector switch set to 'NORMAL' apply to pins A-C of the input plug 250 V (nominal) a.c. r.m.s. 50 Hz for 30 seconds. Throughout the period, the instrument pointer shall indicate a voltage in excess of 1 V.
- (3) <u>Remove the input connector from the equipment</u> and carry out the voltage detection self check detailed in clause 6.e. above.

# 7. CALIBRATION ACCURACY (RESISTANCE)

a. Set up the equipment in accordance with Annex B.

b. Connect a decade resistance box, accurate to within  $\pm$  0.5% across pins A-C of the input plug.

c. Three values of resistance in each of the ranges shall be set on the resistance dial. Readings obtained (at balance as indicated by the instrument) from the decade resistance box shall not deviate from the dial settings by more than the amounts specified in Table C.

<u>Note:</u> To ensure a correct datum, set up the equipment according to Annex B prior to measurement of resistance in each range.

# TABLE C

RESISTANCE RANGE: ohms	RESISTANCE DIAL SETTING: ohms	MAX. PERMISSIBLE DEVIATION FROM RESISTANCE DIAL SETTING
0.1 to 10	0.4 1.0 3.0	± 25% ± 15% ± 10%
10 to 1 k	40 100 300	± 5%
1 k to 100 k	4 k 10 k 30 k	± 5%
100 k to 10 M	400 k 1 M 3 M	± 5%

- <u>Notes:</u> 1 When carrying out calibration checks in the 0.1 to 10 ohms range due consideration must be given to the effect of contact resistance and temperature co-efficient of test leads, connectors and instrumentation used.
  - 2 Screened leads and a screened resistance box should be used when measuring the higher values of resistance to avoid errors due to a.c. pick up.

#### 8. **INSULATION RESISTANCE**

With the range switch set to 'TEST' and the line selector switch set to 'NORMAL' measure the earth leakage resistance at 250 V d.c. between the 3 pins of the input plug connected together and the metal screen of the case. The value of resistance measured shall be 100 Megohms minimum.

#### 9. PERFORMANCE AT LOW AND HIGH TEMPERATURE

The calibration accuracy shall be tested at the temperature stated below in the sequence shown and unless otherwise specified shall be within the tolerance stated in Annex A, clause 6.g.(2) sub-clauses (b), (c), (f), and clause 7.

a. At normal ambient temperature.

b. At -10  $\pm$  2°C after being maintained at this temperature for a period of 6 hours. The resistance calibration accuracy limits in clause 7 Table C shall be increased as follows:

		( 0.4 ohms	± 50%
Resistance	Range	( 1.0 "	± 40%
0.1 - 10	ohms	( 3.0 "	± 30%

Other ranges in Table C remain unchanged.

9. C. At + 55 ± 2°C after being maintained at this temperature for a period of 6 hours.

d. When returned to normal ambient temperature and maintained at this temperature for a period of at least 4 hours.

 $\underline{\text{Note:}}$  Immediately before each test the equipment shall be set up in accordance with Annex B.

#### 10. <u>SEALING</u>

The equipment connected internally to a dry air pressure line shall be immersed in an approved wetting agent and then transferred to a bath containing a mixture of water and the wetting agent in such proportions that the surface tension is reduced to less than 0.03 N/m at standard ambient temperature. Air at a gauge pressure of at least 345 mbar will be applied to the interior of the case for a period of 5 minutes during which no evidence of leakage shall occur.

Note: 1 bar =  $10^5 \text{ N/m}^2$ 

# 11. <u>TOPPLING</u>

The equipment shall be tested in accordance with issuse 7.4 of DEF-133 and shall be made to topple once on each face. At the conclusion of this test a visual examination shall reveal no defects and after being set-up in accordance with Annex B the equipment shall satisfactorily meet the requirements of clauses 6.d and 6.e. 'Self-check facility' (resistance and voltage detection) respectively.

# 12. BUMP

The equipment shall be tested in accordance with DEF-133 clause 7.0. Test A, being mounted on the bump table in such a manner that the protective function of the rubber feet will not be nullified. At the conclusion of this test a visual examination shall reveal no defects and after being set up in accordance with Annex B shall satisfactorily meet the requirements of clauses 6.d. and 6.e. 'Self-check facility' (resistance and voltage detection) respectively.

# 13. VIBRATION

a. <u>Instrument movement assembly</u>. Before carrying out this test the instrument shall be checked for calibration accuracy, balance and movement hysteresis (pivot friction). The limits of error shall not exceed 2% of fsd for calibration, 1% of fsd for balance and 2% of fsd for movement hysteresis.

# (1) <u>Resonance search/functioning</u>.

 (a) The instrument shall be subjected to the following tests on a machine capable of producing circular vibration (see clause 2b at page 4 ) at all frequencies from 10 to 150 Hz and of the amplitude specified in Table D. The instrument shall be mounted in the same manner as that used in the equipment.

# TABLE D

FREQUENCY RANGE: Hz	AMPLITUDE OF VIBRATION INCH (mm)
10 to 45 45 to 70 70 to 100 100 to 140 140 to 150	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$

<u>Note:</u> The instrument shall be tested in the horizontal and vertical plane during the resonance search test, but in the horizontal plane only for the functioning test.

- 13. a. (1) (b) The vibration/frequency range shall be swept in both directions at a rate not exceeding one octave in 2 minutes, the total frequency range covered shall be as Table D.
  - (c) During the vibration frequency sweep the instrument shall be tested for correct functioning at zero and at the 100 mV position.
  - (d) The vibration frequency sweep shall be momentarily stopped at any time when a steady deflection exceeding 2% from the required reading is observed and the frequency noted. At no time shall this steady deflection exceed 8% of fsd.
  - (2) <u>Endurance</u>.
    - (a) The instrument shall be subjected to 24 000 000 cycles or 100 hours whichever is the lesser in time at the frequency of vibration at which the worst resonance occurred.
    - (b) If no marked resonance occurs the instrument shall be subjected to the amplitudes/frequencies/times specified in Table E.

TIME:	AMPLITUDE OF VIBRATION	FREQUENCY
Hours	Inch (mm)	Hz
40	± 0.018 (0.457)	40
27	± 0.008 (0.203)	60
19	± 0.004 (0.102)	85
14	± 0.002 (0.051)	120

# TABLE E

-24-

- 13. a. (2) (c) At the conclusion of this test a visual examination shall reveal no defects, and the test for calibration accuracy, balance and movement hyeteresis shall be repeated and shall not exceed 3% of fsd for calibration accuracy, 3% of fsd for balance and 4% of fsd for movement hysteresis.
  - b. Complete equipment (with a previously untested instrument movement).
    - (1) <u>Resonance search/functioning</u>.
      - (a) The equipment shall be subjected to the following tests on a machine capable of producing linear vibration (see DEF-133, Appendix 4) at all frequencies between and 150 Hz and of the amplitude to give an acceleration of 2 g (19.6 m/s<sup>2</sup>) or  $\pm$  0.1 in (2.54 mm) whichever is the lesser.
      - (b) The test shall be carried out generally in accordance with the requirements of DEF-133, clause 8.
      - (c) The equipment shall be mounted in such a manner that all internal components may be observed. During the vibration frequency sweep the equipment shall be tested for correct functioning at zero and at the set + 100 mV position.
    - (2) Endurance.
      - (a) The equipment shall be mounted in its normal position of use, (ie with the front panel in the horizontal plane) and subjected to Test A, clause 8.3 of DEF-133 with an amplitude of 2 g (19.6  $m/s^2$ )
      - (b) At the conclusion of this test a visual examination shall reveal no defects.
      - (c) The equipment shall be set up in accordance with Annex B and shall satisfactority meet the requirements of clauses 6.d. and 6.e. above, self-check facility (resistance and voltage detection respectively).

# 14. CLIMATIC

The equipment shall be subjected in the order stated to the climatic tests in accordance with DEF-133 as detailed in Table F. At the conclusion of each climatic test the equipment shall be visually examined, and shall show no signs of deterioration.

DEF-133 CLAUSE NUMBER	TEST
11.0	Dry heat 'test B'
11.1	Damp heat
12.0	Low temperature 'test B'
12.2	Low temperature/low pressure 'test C'
11.1	Damp heat
11.0	Dry heat 'test B'
11.2	Tropical life

<u>TABLE F</u>

- At the conclusion of the series of tests in Table F the equipment shall:
  - a. be set up in accordance with Annex B,
  - b. meet the requirements of clause 7 calibration accuracy (resistance),
  - c. meet the requirements of clause 6.g. applied external voltages.
  - d. meet the requirements of clause 6.j. RF rejection.

#### TYPICAL SETTING UP PROCEDURE

#### 1. <u>PRELIMINARY</u>

Before starting to use the equipment check the following:

a. The battery switch at the top of the equipment should be in the 'OFF' position.

b. The line selector switch, situated approximately at the centre of the equipment should be in the 'NORMAL' position.

c. The range switch in the lower right hand corner of the equipment should be in its fully anti-clockwise position, showing 'SET MIN' in the window. When checking this, it is advisable to hold the mechanical locking lever, situated underneath the control, over to the left so that a false position of the control is not inadvertently obtained.

d. With the controls set as above check that the instrument pointer lies over the mechanical zero mark. Adjust, if necessary, using the indicator zero adjuster situated immediately below the indicating instrument.

e. At this stage it may be required to insert the input cable. This would not affect the following measurement procedure but might affect the self-test readings.

# 2. PROCEDURE FOR VOLTAGE TESTS

a. Turn the battery switch to 'ON'.

b. Using the control exposed by the mechanism associated with the range switch, adjust the instrument pointer for minimum up-scale deflection. With the controls set as above check that the instrument pointer lies within the solid black area at the left hand end of the scale.

c. Rotate the range switch clockwise to the next position marked 'CHECK' and check that the instrument pointer position has not altered.

d. With the range switch set to the next clockwise position and with the aid of the second control now exposed, set the instrument pointer to the 100 mV mark on the scale, in accordance with the instruction 'SET + 100 mV' now appearing in the window.

e. Rotate the range switch to next position, this carries the instruction 'CHECK-100 mV'. In this position, it should now be ascertained that the instrument pointer lies within the black hatched band immediately below the 100 mV mark.

f. Turn the range switch clockwise to the next position marked 'TEST'. The indicating instrument is then in circuit to test for the existence of voltage across the pair of lines selected by the line selector switch. In use the line selector switch would now normally be operated to check for the existence of voltage between any pair of the three incoming lines. In this position of the range switch the self-check switch located immediately below the line selector switch may be operated to apply an internally generated test voltage of 50 mV to the voltage detector. Turning this spring-return switch from its normally central position to the left applies 50 my d.c. in one direction and turning it to the right reverses the polarity of this applied test voltage.

<u>Note:</u> This test voltage has a source impedance of approximately 1 kilohm and since it is applied across the incoming lines its value could be modified by the characteristics of the lines under test.

#### 3. PROCEDURE FOR RESISTANCE MEASUREMENTS

a. Clockwise rotation of the range switch (past the 'TEST' position) is prevented by a mechanical lock. This can be released by a small lever situated below the range switch. Holding this over to the left against the action of the spring allows the range switch to be turned to the positions associated with resistance measurements.

b. Turn the range switch clockwise to the first position past the mechanical lock, marked 'GUARD'.

c. Turn the range switch clockwise to the next position, where the instruction 'SET MIN' should be carried out, using the third control, now exposed for use.

d. Further rotation of the range switch brings in the four resistance ranges in the following sequence:

- (1) 0.1 to 10 ohms
- (2) 10 to 1000 ohms
- (3) 1 k to 100 kilohms
- (4) 100 k to 10 Mohms

Each range is clearly marked in the range switch window. The appropriate range should be selected and the bridge adjusted for balance by the use of the resistance measurement control in the lower left hand corner of the equipment. Balance is shown on the indicating instrument when the pointer is at minimum deflection. The resistance is then read from the calibrated scale on the potentiometer in conjunction with the resistance range in use. The accuracy with which this setting is carried out ensures that the equipment can be used to within its stated tolerance on the lowest resistance range (0.1 to 10 ohms), which has its own special scale on the potentiometer, coloured green (see Annex C, Fig 2).

e. To facilitate adjustment of the second set min.control and also the bridge balance position on the 0.1 to 10 ohm range, a small arc carrying eight triangles is included on the left hand side of the scale plate below the meter scale. By observing movement of the instrument pointer relative to the triangles the minimum position may be more readily determined.

f. In the case of a series of measurements extended over a period of time, it is possible that drift may have occurred within the equipment which would exceed the range of compensation afforded by the set min. control. In such a case it is necessary to return the range switch, past the mechanical interlock fully anti-clockwise, to the first set min. position and then to carry out the full setting-up procedure again. 4. Upon completing a series of tests, the equipment controls should be returned to the positions as detailed in clauses 1.a, 1.b, and 1.c. above. The 'RANGE' switch should be returned to its fully anti-clockwise position through all other positions, ie 11, 10, 9, 8, etc. It will be necessary to hold over the mechanical interlock to pass position 6, 'GUARD'. At this position the lines are disconnected from the Voltage Detector Unit (which is shorted out), and the 220 ohm resistor, placed across the lines at position 6 during clockwise rotation of the 'RANGE' switch is in circuit. If the lines present a virtually infinite resistance to the bridge circuit during resistance measurements, then the capacitance of the lines will be charged up to approximately the cell voltage. The charge must be removed before reaching position 5 and at position 6 the 220 ohm resistor ensures that the current flowing from the lines when discharging is still less than the 10 mA load specified by the safety requirements, at the same time it allows discharge to be reasonably rapid.

SCALE CALIBRATION	DATA
MARKING	DEFLECTION CURRENT
BLACK ARC	0 - 1.0µA
10mV SCALE MARK	2.5µA
25mV SCALE MARK	7.6μΑ
50mV SCALE MARK	13.3µA
75mV SCALE MARK	17.2µA
HATCHED ARC AT 100mV	17.5µA - 22.5µA
100mV SCALE MARK	20µA
*SCALE MARK ONLY AT 500mV	38.5µA
1V SCALE MARK	50µA

NOTES

GRADUATIONS, ARCS & CHARACTERS TO BE PERMANENTLY MARKED BLACK CHARACTERS TO BE 3/32 (2.4) HIGH EXCEPT THE V (OF 'mV') AND '50' WHICH ARE TO BE 9/64 (3.6) HIGH

DIMENSIONS ARE SHEWN IN INCHES (mm)



MARK FOR MECHANICAL ZERO



CALIE	BRATION FO	R	OUTSID	E SCALE
RATIO	DEGREES ON DIAL		RATIO	DEGREES ON DIAL
0.09	0.25		0.9	126.5
0.10	2.46		1.0	135.0
0.12	7.72		1.2	149.7
0.14	12.6		1.4	162.0
0.16	17.7		1.6	172.3
0.18	22.4		1.8	181.3
0.2	27.0		2	189.0
0.25	37.8		2.5	204.4
0.3	47.8		3	216.0
0.35	56.9		3.5	225.0
0.4	65.5		4	232.2
0.45	73.6		4.5	238.1
0.50	80.9		5	243.0
0.55	87.9		6	250.7
0.6	94.3		7	256.5
0.65	100.7		8	261.0
0.7	106.5		9	264.6
0.75	112.0		10	267.5
0.8	117.0		11	270.0
NOTE INSIDE SCALE IS DISPLACED ANTICLOCKWISE AS SHOWN BY 0.3 INITS FROM THE OUTSIDE SCALE				

DIMENSIONS ARE SHEWN IN INCHES (mm)

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STAN 66 - 1 EX C FIGURE

<u>11/1</u> 2

NEX

Fig. 2 Resistance Measurement Dial

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Fig. 3 Panel Layout and Marking





SOCKET FREE 3 WAY (NORMAL ORIENTATION) 5935-99-013-1516 DIMENSIONS ARE IN INCHES

FRACTIONAL DIMENSIONS ±1/64

FREQUENCY RANGE OF		AERIAL USED	AERIAL DIMENSIONS (INCHES)			
DAND	SWEEP (GHZ) OSED	0010	V	W	Y	Z
S	2.8 TO 3.8	1(a)	6.5/16	1.3/4	.043	4.1/8
		1(b)	7.1/4	1.13/16	.043	5.1/16
С	5.0 TO 6.0	2(a)	5.9/16	1	.0.24	3.3/8
		2(b)	6.1/16	1.1/16	.024	3.7/8
Х	8.9 TO 10.3	3(a)	5.1/4	5/8	.0145	3.1/16
		3(b)	5.1/2	5/8	.0145	3.5/16

Fig. 5 RF. Rejection Test Aerials

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Your Reference :

Our Reference : D/DStan/11/11/2

Date : 9 November 1998

# **Removal of Product Qualification Approval**

# **IMPORTANT ANNOUNCEMENT**

1. This Standard contains a Product Qualification Approval (PQA) scheme. <sup>i</sup>MOD policy requires that all PQA schemes are removed from Defence Standards called up in contracts placed after 1<sup>st</sup> January 1998.

2. Users of this Standard are to contact the Project Manager (PM), Equipment Support Manager (ESM) or Technical Service Authority (TSA) named in the contract or order, to identify whether there is a continuing need for an approvals scheme.

3. <sup>ii</sup>Product Conformity Certification (PCC) is a risk based process that replaces PQA. Once a risk has been identified PCC can be included as a contract clause. In exceptional circumstances agreement can be sought from AD/Stan for PCC to be included in a Defence Standard.

4. At the next revision of this Standard the PQA scheme will be removed.

K paint

T R Leaver Head of Standards Programme Management

<sup>&</sup>lt;sup>i</sup> Defence Council Instruction (General) 197/97; Quality Temporary Memorandum 5/98; Chief of Defence Procurement Instruction CDPI/TECH/250 (draft)

<sup>&</sup>lt;sup>ii</sup> PCC is certification that a product meets its specification. When PC is required by the contract, the contractor is responsible for obtaining the necessary PCC. Certification shall be provided from a NAMAS accredited laboratory when appropriate. PCC shall apply where a Risk Assessment has been identified by the PM; ESM or TSA.

# DIRECTORATE OF STANDARDIZATION



# MINISTRY OF DEFENCE

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Your Ref:

Our Ref: D/D Stan/66/5/1/11

Date: 11 October 1996

OBSOLESCENCE NOTICE

Def Stan 66-11/Issue 1

TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

This notice has been agreed by the authorities concerned with the use of the above Standard.

This Standard is obsolescent because it is no longer required for the procurement of new equipment but is retained for maintenance purposes in support of existing in-service equipment.

W P Gorman for Director of Standardization

D/D STAN/66/5/1/11 (STAN 3)

DEF STAN 66-11/1

AL/218/05 AD/RS(PE)

# TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

# AMENDMENT 1

1. Page 1, top left-hand corner reference

Delete: (STAN 7)

Substitute: (STAN 3)

Delete: (AD/RS)

Substitute: (AD/RS(PE))

2. Page 3 main heading

 $\underline{Under}$  the main heading 'SPECIFICATION FOR TEST SET, SAFETY, GENERAL PURPOSE (VOLT/OHMS)'

Insert the NATO Stock Number as follows:

(NSN 6625-99-014-9531)

3. Make a note of this amendment on the Amendment Record.

10th JANUARY 1974, DIRECTORATE OF STANDARDIZATION MINISTRY OF DEFENCE LONDON.

# DEF STAN 66-11/1

# TEST SET, SAFETY, GENERAL PURPOSE (VOLTS/OHMS)

# AMENDMENT 2

1 Page 6, sub-clause 6.c.(3), after Number

<u>Delete</u>: 6135-99-428-2343

<u>Substitute:</u> 6135-99-661-3325

2 Page 10, sub-clause 10.f.(1), after Number

Delete: 6135-99-428-2343

Substitute: 6135-99-661-3325

3 Make a note of this amendment on the Amendment Record.

16 NOVEMBER 1981 DIRECTORATE OF STANDARDIZATION MINISTRY OF DEFENCE LONDON

D/D STAN/66/5/1/11(STAN 8) AL/218/05**/A**D/RS(PE)**7** 

# DEF STAN 66-11/1

# TEST SET, SAFETY, GENERAL PURPOSE, (VOLTS/OHMS)

AMENDMENT 3 (Additional subclause)

1. <u>Page 9, Clause 9</u>

Insert: h. Case protection

The case shall be protected by a rubber cover, made from a suitably conductive material, to a pattern approved by the Qualification Approval Authority.

2. Make a note of this amendment on the Amendment Record.

D/D Stan/331/4/4 (Stan 8)

31 December 1986. Ministry of Defence Directorate of Standardisation Kentigern House 65 Brown Street GLASGOW G2 8EX