भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS

पश्चिम क्षेत्रीय कार्यालय : 'मानकालय', ई-9, एम. आय. डी. सी., रोड नं. 8, अंधेरी (पूर्व), मुंबई - 400093.
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Our Ref : WROL/ 3 :40

Mumbai,
2007 01 17
Page 1 of 1

Subject : Inviting Sealed Quotation for supply of "**Normal Operation as well as Making Breaking Capacity Test Equipment**"

To,

Manufacturers & suppliers of "**Normal Operation as well as Making Breaking Capacity Test Equipment**" used for **Testing of Switches for Domestic and Similar Purposes, Ref : IS 3854 : 1997 (including three amendments)**

Dear Sirs,

Technical & Commercial Bids are invited for the supply of - **Normal Operation as well as Making Breaking Capacity Test Equipment**" used for **Testing of Switches for Domestic and Similar Purposes,** in SEPARATE SEALED covers, which should reach the undersigned latest by **1700 h**, on **15 February 2007,** at the following address.

Scientist F & Head
WRO Laboratory, "Manakalaya"
Bureau of Indian Standards
E-9, M.I.D.C., Behind Marol Telephone Exchange.
Andheri (East),
Mumbai 400 093

1. The detailed specification(s) of the above mentioned equipment(s)/item(s) are given in Annex-**I**
2. Terms and conditions of supply are given in **Annex-II**
3. The technical Bids shall be opened in the chamber of Sc. F & Head, WRO Laboratory at the address mentioned above at **1500 h on 16 February 2007** and in the presence of such tenderers or their duly authorized representatives, who may like to attend.
4. Please note that the envelopes containing **Technical & Commercials Bids are sealed properly i.e. either wax sealed or with adhesive cello tape on both ends. Unsealed and stapled envelopes shall not be accepted.**
5. The specification and terms & conditions can also be downloaded from BIS Website –www.bis.org.in

Thanking you,

Yours faithfully,

(B.R. Kulkarni)
for **Sc.E & OIC Purchase**
Ph: 022-2832 7856

Encls: as above
c.c : BIS Web Site

ANNEX-1

BUREAU OF INDIAN STANDARDS
(WRO Laboratory - Purchase Cell)

EQUIPMENT/SPECIFICATION:

NAME OF THE EQUIPMENT : Normal Operation as well as Making Breaking Capacity Test Equipment used for **Testing of Switches for Domestic and Similar Purposes, Ref : IS 3854 : 1997 (including three amendments)**

WHERE REQUIRED : ELECTRICAL LAB, BIS WESTERN REGION

TOTAL QUANTITY REQUIRED: ONE UNIT

PURPOSE : Testing of Switches for Domestic and Similar Purposes Ref : IS 3854 : 1997 (including three amendments)

Details of Specification : A) <u>Basic Testing Device /Unit (minimum requirements)</u>

The machine shall be capable of

i) Operating on normal supply of voltage of 240 V AC, Single Phase
ii) Testing three switches at a time, i.e. mounting arrangement shall be made for mounting six switches at a time of same type.
iii) Testing Single Pole, Two Pole, Two-way switches and also Tumbler, Rocker, Push Button, Cord Operated switches of Surface/Flush/ Semi-flush mounting type.
iv) Measuring ON - OFF i.e. operating cycles through digital counter capable to measure upto 5 digits, i.e. 0 to 99999
The counters shall be such that in the event of shorting of the switch or open circuiting of the switch under test, the counters will stop further counting individually.
v) Electronic time controller to adjust operating cycle time from 0.5 sec to time in seconds/minutes/hours required during testing of switches.
vi) adjusting operating time independently for ON as well as OFF operation. The device for operation of switches for ON - OFF shall be separate and shall be such that it should be possible to exert required force to operate the same.
It shall be possible to adjust the operating time in three ways :
a) ON - OFF time shall be equal,
b) ON period 25 % + (0 to 5) % of the total cycle and
c) OFF period 75 % - (0 to 5) % of the total cycle.
For rate of operation see '**C**' below

vii) Other necessary controls and indicators - cum - controllers for safe use as well as easy handling of the equipment

ANNEX-1 (contd...)
EQUIPMENT/SPECIFICATION:

Normal Operation as well as Making Breaking Capacity Test Equipment for Testing of Switches for Domestic and Similar Purposes
Ref : IS 3854 : 1997 (including three amendments)

B) Load Requirements (Load Panel)

i) Voltage : 230V/240V/250V AC & shall have means to give voltage upto 110 % of the rated with suitable VA capacity.

ii) Current : Shall be suitable to give 6/10/16/20/25/32A (basic loads in multiples of 1A, 2A, 4A, 8A, 16A & 32A in suitable sets may be designed which can be added as per requirement of the switches under test) with a power factor of 0.6 ± 0.05 lag. Load shall be arranged such that it shall be possible to give 6A load at rated voltage of either 230/240/250V to three switches of the same rating independently (similar is the requirement for other ratings too).

iii) The load panel shall be such that it shall be possible to raise the current to 130 % of the rated as indicated above. This increased load current shall be at a voltage of 110 % of the rated and at a power factor of 0.3 ± 0.05 lag.

iv) The load shall be such that resistors and inductors are not connected in parallel, except that if an air-core inductor is used, a resistor taking approximately 1 % of the current through the inductor is connected in parallel with it. Iron-core inductors may be used provided the current has substantially sine-wave form.

v) For X rated switches, incandescent lamp as given in IS 3854 : 1997 shal be provided. Switch with a rated current not exceeding 16 A except switches of pattern numbers 3 & 03 and momentary contact switches, should have fluorescent lamp current rating equal to the rated current (Fig. 14).

vi) The panel shall have following meters mounted on it:
   a) Digital ac volt meter : Range 0 - 600 V; LC 0.1V, Accuracy 1 % or better
   b) Digital ac ammeter : Range 0 - 100 A; LC 0.1 A; Accuracy 1 % or better
   c) Digital power factor meter : Range 0.3 lead to 0.3 lag, LC 0.05 Hz.

C) Rate of Operation :

a) 30 operations per minute if the rated current does not exceed 10 A
b) 15 operations per minute is the rated current exceeds 10 A, but is less than 25 A.
c) 7.5 operations per minute is the rated current is more than 25 A.

D) Drawings and Guiding Figures:

Relevant drawing and figures from IS 3854 : 1997 as well as detailed description of the test is enclosed (Fig 10, Fig 13 & Fig 14)

ANNEX-1 (contd...)

Normal Operation as well as Making Breaking Capacity Test Equipment for Testing of Switches for Domestic and Similar Purposes Ref : IS 3854 : 1997 (including three amendments)

Note:-

a. Service/repair back up of the equipment shall be available in and around Mumbai

b. The supplier shall give comprehensive warranty of one year from the date of supply/ satisfactory commissioning
of the equipment

c. The supply of material should accompany operational manual and valid calibration certificates traceable to National Standards in respect of all the measuring devices installed on the equipment which give numerical output, e.g. Voltmeter, Ammeter, Timer, Digital Counter, power factor meter, etc,.

d. Buy back arrangements offer.

f. Applicable taxes, if any, must be quoted separately

(M.D.Chilakwad)
Sc.E & OIC, Electrical

TERMS & CONDITIONS

1. The BUREAU gives FIRST PREFERENCE in its purchase to goods bearing ISI CERTIFICATION MARK and second preference to those which conform to the relevant Indian Standard Specifications.

2. The delivery of the equipment is required to be made within 30 days of receipt of order. If, it is not possible for you to effect delivery within the period, you are required to specify the date by which you can guarantee delivery of the equipment.

3. The Technical & Commercial Bids should be sealed and sent separately in sealed envelopes. Such Bids shall remain valid for a period of 90 days from the date of opening.

4. Quotations/Bids, qualified by indefinite expressions as "Subject to immediate acceptance, Subject to prior sale" etc. and incomplete quotations are liable to be summarily rejected.

5. The Bids should clearly give break-up of cost of each equipment. The rates quoted should separately indicate Basic Cost, Excise Duty, Sales Tax, P&F charges, Freight, Insurance, VAT etc. Rates quoted should specifically state Sales Tax, Excise Duty or any other taxes/charges. In absence of any such stipulation, it will be presumed that the prices include all such charges and no claim for the same shall be entertained.

6. Each tender document shall be accompanied with **EMD of 3% of cost of the equipment.** The demand draft for the EMD amount shall be drawn in favour of BUREAU OF INDIAN STANDARDS payable at Mumbai. The sealed envelope containing EMD should be super scribed **"EMD"** and stapled separately with the envelope containing the Technical Bid.

7. Bid security (EMD) of the successful bidder shall be refunded on receipt of the equipment.

8. Bid security (EMD) of unsuccessful bidders shall be returned to them at the earliest after expiry of the final bid validity and latest on or before the 30th day after award of the contract.

9. BIS shall pay 90% of the cost after satisfactory installation & commissioning and the Balance of **10%** as **contract performance security** would be paid after expiry of warranty period. However other terms of payment for contract performance security can also be considered, if so stated clearly.

10. The warranty period of the equipments may be stated clearly in the Technical Bids. In case the same is not found stated, it will be presumed that warranty period as mentioned in their respective specifications of the quotation document (if specified), is applicable

11. Please mention clearly in the Technical Bids regarding address of **arrangements for service/repair** of the equipments is available. Suppliers having such arrangements near Mumbai would be preferred.

12. All goods received would be subjected to inspection, by BIS before or after receipt or commissioning (as applicable) and the decision of BIS shall be final & binding. Rejected items/goods/stores shall be removed by the supplier at his own cost and risk, within 30 days of receipt of notice for the removal of such goods, and no liability, whatsoever, on the Bureau shall be attached for the rejected/disapproved goods/items/stores.

13. The Bureau reserves the right to accept or reject summarily and or all quotations/s in whole or part without assigning any reason whatsoever.

14. The Bureau takes no responsibility for delay, loss or non-receipt of quotations after despatch.

15. In case of non compliance with the Terms & Conditions of the contract, the Bureau reserves its right to:

a) Cancel/rescind/revoke the order if supply is not made in time and is not conforming to the required specifications.

b) Impose Penalty up to 1% of the total value of the order for a delay of every seven days after the schedule date subject to the ceiling of a maximum of 10% of the total value of the order.

16. All questions, disputes or difference arriving under, out of or in connection with this tender enquiry shall be subject to the exclusive jurisdiction of Mumbai Courts.

17. Signature on each page of the quotation submitted as token of acceptance.

Guideline Document

EXTRACT FROM IS 3854:1997 (3 Amds)
(Clauses 18 & 19)

Clause 18 : MAKING AND BREAKING CAPACITY

Switches shall have adequate making and breaking capacity.

Compliance is checked by the test of 18.1 and for, switches having a rated current not exceeding 16A and having a rated voltage up to and including 250V and for switches of pattern No 3 and No 03 and rated voltage over 250V, by the additional tests of 18.2.

Cord-operated switches shall be tested mounted as in normal use and with a pull of a value adequate to operate the cord-operated switch, but not exceeding 50N, on the cord throughout the test, at 30+5 to the vertical in a plane perpendicular to the mounting surface.

The tests are made by means of an apparatus the principle of which is as shown in Fig 10.

The connections are shown in Fig 13.

18.1 Switches are tested at 1.1 times rated voltage and 1.25 times rated current. They are subjected to 200 operations at a uniform rate ON-OFF period being almost equal.
--- 30 operations per minute, if the rated current does not exceed 10A
--- 15 operations per minute if rated current exceeds 10A , but is less than 25A
--- 7.5 operations per minute if rated current is 25A or more.

For rotary switches intended to be operated in either direction, the actuating member is turned in one direction for half the total number of operations and in the reverse direction for the remainder.

Switches for a.c. only are tested with a.c. (cos 0.3+0.05). Resistors and inductors are not connected in parallel, except that, if an air-core inductor is used, a resistor taking approximately 1% of the current through the inductor is connected in parallel with it.

Iron-core inductors may be used provided the current has substantially sinewave form.

The metal support of the switch, if any, on which the switch is mounted and the accessible metal parts of the switch, if any, shall be earthed through a fuse which shall not blow during the test. The fuse shall consist of a copper of 0.1 mm diameter and not less than 50 mm in length.

For switches of pattern No 6, 6/2 and 7, the selector switch "S"shown in Fig 13 is moved after the fraction of the total number of operations indicated in the Table 15.

Table 15

Pattern Number	Type of Switch	Fraction of Switches
1, 2, 4 or 5	Rotary, both directions & other types	----
3 or 03	Rotary, both directions & other types	-----
6, 6/2 or 7	Rotary, both directions & Other types	¼ and ¾ ½

Switches of pattern number 5 with a single mechanism are operated 200 times with one circuit loaded with rated current (I) and the other with 0.25I and 200 times with each circuit loaded with 0.625I .

Switches of pattern 5 with two independent mechanisms are tested as two switches of pattern number 1, the tests being made consecutively.

While testing one part, the other part is in "Off" position.

During the test, no sustained arcing shall occur.

After the test, the samples shall show no damage which may impair their further use.

Breakage of the replaceable pull cord, not involving the part entering the cord-operated switch, shall not be considered a failure to pass the test.

Notes : 1. Care is taken that the test apparatus causes the actuating member of the switch to operate smoothly and does not interfere with the normal action of the switch mechanism and the free movement of the actuating member.

2. During the test, the specimens are not lubricated.

Switches are normally tested at rated voltage and 1.2 times the rated current.

18.2 Test is carried out using a number of tungsten filament lamps at a load current not less than 1.2 times the rated current of the switch at a voltage not less than 95% of the voltage.

Available short circuit current shall be at least 1500A. The other conditions shall be as specified in 18.1.

During the test, no sustained arcing shall occur.

Note : Sticking of the contacts, which does not prevent the next operation of the switch is not considered as welding.

After the test, the sample shall show no damage which may impair its further use.

Note : Example – 10A, 250V switches have to tested. The largest available rated voltage of 200W tungsten filament lamps is 240V.

The test voltage shall then be 240V and the number of lamps: $240 \times 1.2 \times 10/200 = 14.4$ i.e. 15.

See note given for amd 1

19 NORMAL OPERATION

19.1 Switches shall withstand, without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use. Compliance is checked by the following test:

The switches are tested at rated voltage and rated current in the apparatus and with the connections specified in **18.1**. The tolerances for the test voltage is $+^{5}_{0}$ percent.

The circuit details and the manner of operation of the selector switches are as described in **18** unless otherwise specified.

The number of operations is as shown in Table 16.

Table 16

Rated Current	Number of Operations
Up to and including 16 A, for switches having a rated voltage not exceeding 250 V a.c. except pattern numbers 3 and 03.	40 000
Up to and including 16 A, for switches having a rated voltage exceeding 250 V a.c. and for pattern numbers 3 and 03	20 000
Over 16 A up to and including 40 A	10 000
Over 40 A	5 000

The rate of operations is as specified in **18.1**.

The period shall be 25 percent $^{+5}_{0}$ percent of the total cycle and the off period 75 percent $^{0}_{-5}$ percent.

For rotary switches of pattern number 5 intended to be operated in either direction, the actuating member is turned in one direction for half the total number of operations and in the reverse direction for the remainder.

For rotary switches of pattern numbers 1, 2 and 4 intended to be operated in either direction, the selector switch *S* is moved after 3/8 and 7/8 of the total number of operations.

For other rotary switches intended to be operated in either direction, 3/4 of the total number of operations is effected in the clockwise direction, and the remainder in the reverse direction.

Cord operated switches shall be tested mounted as in normal use and with a pull of a value adequate to operate the cord-operated switch but not exceeding 50 N, on the cord through out the test at $30 \pm 5^{\circ}$ to the vertical and in a plane perpendicular to the surface.

Switches are tested with a.c. ($\cos \Phi$ 0.6 ± 0.05).

Switches of pattern No. 2 are tested for the first set of three specimens with the poles connected in series.

For the second set of three specimens only one pole is tested at full load at half the number of operations. If the two poles are not identical, the test has to be repeated for the other pole.

The two poles of switches of pattern No. 4 and No. 5 are tested as two switches of pattern No. 1. If the two poles are identical, only one pole needs to be tested.

For switches of pattern No. 5 with a single mechanism, each circuit is loaded with 0.5 times rated current.

Switches of pattern No. 6 shall be tested for half the number of operations on one pole and half the number of operations for the other pole.

Switches of pattern No. 6/2 are tested as one switch of pattern No. 6. if the two pairs of poles are identical. Otherwise, as two switches of pattern No. 6.

Switches of pattern No. 7 are tested as a double switch of pattern No. 6 while testing one part, the other part is in the 'off' position.

The test specimens shall be connected to the test circuit with cables of length 0.3 ± 0.015 m so that the temperature rise measurement can be made without disturbing the terminals.

During the test, the specimens shall function correctly.

After the test, the specimens shall withstand an electric strength test as specified in **16**, the test voltage of a nominal 4 000 V being reduced by a nominal 1 000 V, and the other test voltages by a nominal 500 V, and a temperature rise test as specified in **17**, the test current being however reduced to the value of the rated current.

Specimen shall then not show:

- Wear impairing their further use;
- discrepancy between the position of the actuating member and that of the moving contacts, if the position of the actuating member is indicated;
- deterioration of enclosures, insulating linings or barriers to such an extent that the switch can not be further operated or that the requirements of 10 are no longer complied with;
- loosening of electrical or mechanical connections;
- seepage of sealing compound; and
- relative displacement of the moving contacts of switches of pattern numbers 2,3 or 03, 6/2.

NOTES

1 The humidity treatment as per **16.2** is not repeated before the electric strength test of this sub-clause.

2 During the test, the samples are not lubricated.

The test is followed by the test of **14.3.**

19.2 Switches intended for fluorescent lamp loads shall withstand, without exceesive wear or other harmful effect, the electrical and thermal stresses occurring when controlling fluorescent lamp circuits with power factor correction, with load inserted between the test circuit terminals as indicated in Fig. 14.

Compliance is checked by the following test.

For the test, new specimens are used.

The switches, except switches of pattern No. 3 and 03, are tested at rated voltage and rated current in the apparatus and with the connections specified in 18.1.

The tolerance for the test voltage is $^{+5}_{0}$ percent and for test current is $^{+5}_{0}$ percent. The circuit details and the manner of operations of the selector switches S_1 and S_2 are as described in **18.1**, unless otherwise specified. However, for rotary switches of pattern No. 1, 2 and 4 intended to be operated in either direction, the selector swicth S_1 is moved after 3/8 and 7/8 of the total number of operations.

The number of operations is as follows.

For switches with a rated fluorescent lamp current of 6 A up to and including 10 A : 10 000 operations with 30 operations per minute.

For switches with rated current above 10 A up to and including 20 A : 5 000 operations with 15 operations per minute.

For rotary switches of pattern No. 5 intended to be operated in either direction, the actuating member is turned in one direction for half the total number of operations and in the reverse direction for remainder.

For other rotary switches intended to be operated in either direction, 3/4 of the total number of operations is effected in the clockwise direction, and the remainder in the reverse direction.

Cord-operated switches shall be tested mounted as in normal use and with a pull of a value adequate to operate the cord-operated switch but not exceeding 50 N, on the cord throughout the test at $30 \pm 5^{\circ}$ to the vertical and in a plane perpendicular to the mounting surface.

Switches of pattern No. 2 are tested for the first set of three specimens with the poles connected in series.

For the second set of three specimens only one pole is tested for the full load at half the number of operations.

If the two poles are not identical the test has to be repeated for the other pole.

The two poles of switches of pattern No. 4 and 5 are tested as two switches of pattern No. 1. If the poles are identical, only one pole needs to be tested.

Switches of pattern No. 6 shall be tested for half the number of operations on one pole and half of the number of operations for the other pole.

Switches of pattern No. 6/2 are tested as one switch of pattern No. 6, If the two pairs of poles are identical. Otherwise, as two switches of pattern No. 6.

Switches of pattern No. 7 are tested as a double switch of pattern No. 6.

The sample shall be connected to the test circuit with cables of length 0.3 ± 0.015 m so that the temperature rise measurement can be made without disturbing the terminals. The load shall be as specified in Fig. 14, load *A*.

The load shall, after the specified number of operations, be substituted by load *B* in Fig. 14 and the switches shall be tested with 100 operations in that circuit at the rated voltage.

All the conductive parts of the switch normally earthed in service, including the metal support on which the switch is mounted or any accessible part shall be connected to one supply conductor for half the number of operations and the other supply conductor for the rest.

This connection shall include a copper wire, *F*, of 0.1 mm nominal diameter and not less than 50 mm in length for the detection of the fault current, and, if necessary, a resistor R_1 limiting the value of the prospective fault current to about 100 A.

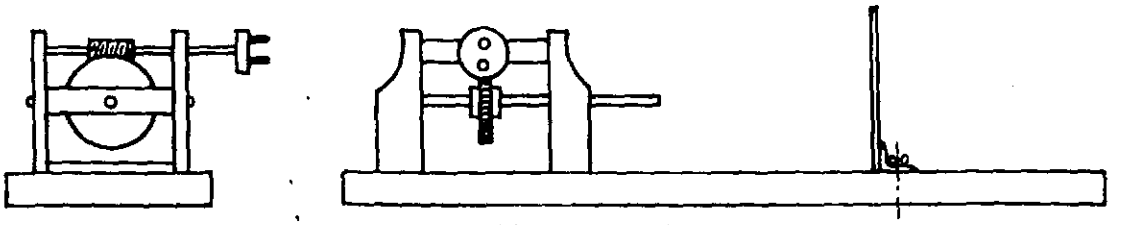
During this test, the switch shall be operated so that the test apparatus does not interfere with the normal action of the switch mechanism and the free movement of the actuating member. There shall be no forced actuation. The on-period shall be 25^{+5}_{0} percent of the total cycle and the off-period 75^{+5}_{0} percent.

During the test the copper wire, F, shall not melt and the specimens shall function correctly. No sustained arcing nor welding of the contacts shall occur.

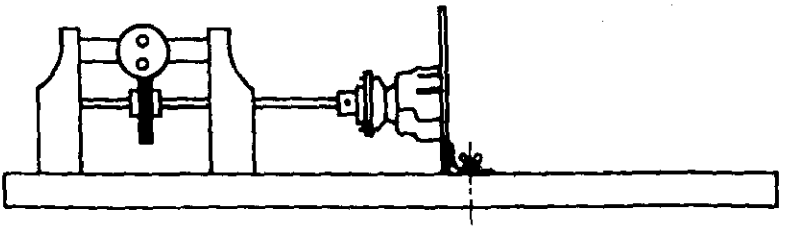
Sticking of contacts is permitted if the contacts can be separated with a force applied to the actuator of a value which does not damage the switch mechanically.

After the test, without disturbing the connections of the specimen under test, a temperature rise measurement is performed as specifed in **17**, using a test current with a value equal to the value of the rated current. The temperature rise of the terminals shall not exceed 45 K. After the tests, it shall also be possible to make and break the switch by hand in the test circuit and the specimen shall not show:

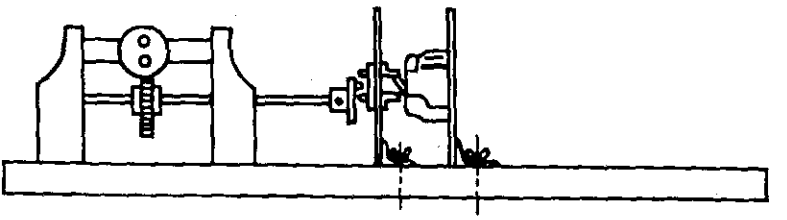
- wear impairing further use
- discrepancy between the position of the actuating member and that of the moving contacts, if the position of the. actuating member is indiacted
- deterioration of the enclosures, insulating lining or barriers to such an extent that the switch cannot be further operated or that the requirements of **10** are no longer complied with
- loosening of electrical or mechanical connections
- seepage of sealing compound
- relative displacement of the moving contacts of switches of pattern No. 2, 3 or 6/2



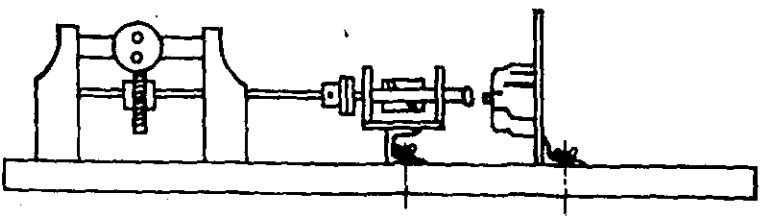
Driving Mechanism



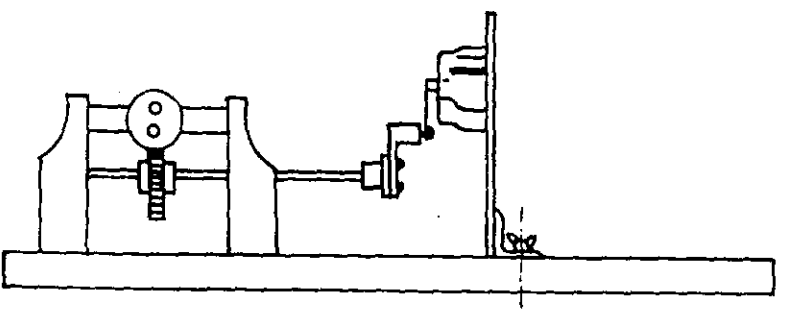
Arrangement for Rotary Switches



Arrangement for Tumbler Switches



Arrangement for Rocker Switches and Push-Button Switches

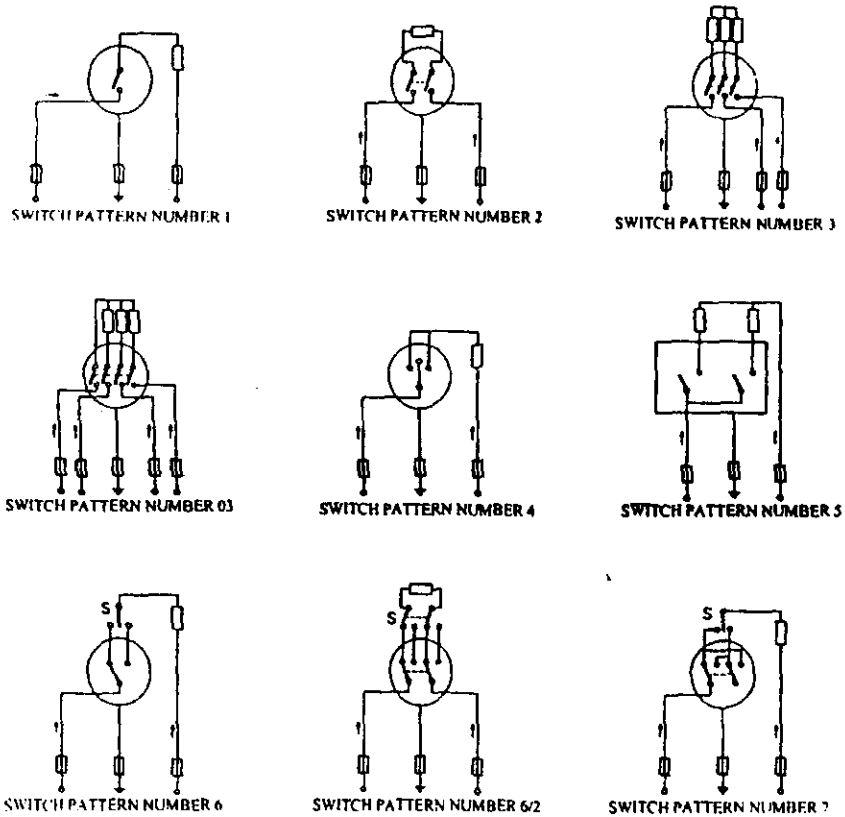


Arrangement for Cord-operated Switches

FIG. 10 APPARATUS FOR MAKING AND BREAKING CAPACITY AND NORMAL OPERATION TESTS

(*Page* 52, *Fig.* 23) — Substitute '100 MIN' *for* '10 MIN'.

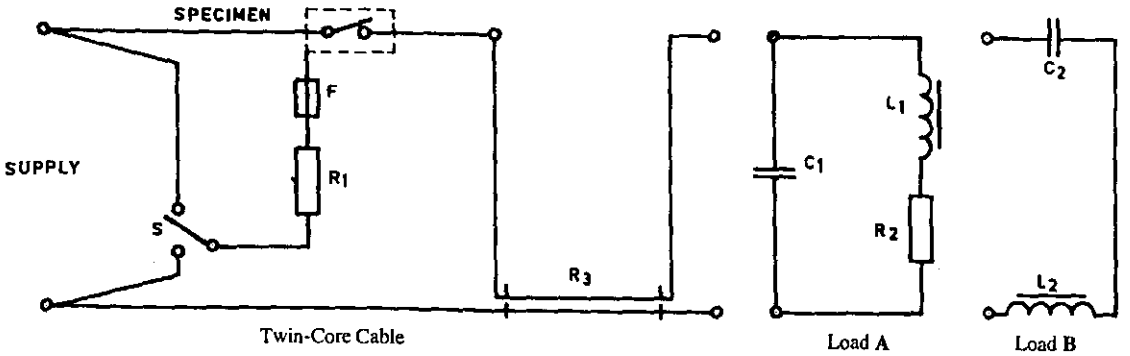
(*Page* 52, *Fig.* 25) — Insert the following new Fig. 26 after Fig. 25:



NOTE — Care should be taken that the bushing hole is made in a way which ensures that the force extended to the cable is a pure pulling force and that the transmission of any torque to the connection in the clamping means is avoided.

FIG. 26 TEST APPARATUS FOR CHECKING DAMAGE TO CONDUCTORS

Fig 13. Circuit Diagram for Making & Breaking Capacity and Normal Operation Test



The prospective short-circuit current of the supply shall be between 3 and 4 kA at cos $\varphi = 0.9 \pm 0.05$ (lagging).

F is a copper-wire fuse of 0.1 mm nominal diameter.

R_1 is a resistor limiting the current to about 100 A.

S is a switch connecting the copper wire fuse, F, to either the phase or the neutral conductor.

The twin-core cable shall have a suitable length to give a resistance R equal to 0.25 R_3 in the test circuit to the load. It shall have a cross-sectional area of 1.5 mm^2 when switches with rated current up to and including 10 A are being tested and 2.5 mm^2 when switches with rated current over 10 A up to and including 20 A are being tested.

Load A shall consist of:

— a capacitor bank, C, giving the capacitance 70μF ± 10 percent for 6 A switches and 140μF ± 10 percent for other switches. The capacitors shall be connected with the shortest possible length of 2.5 mm^2 conductors;

— an inductor, L, and a resistor, R, adjusted to give the power factor 0.9 ± 0.05 (lagging) and the test current In $^{+5}_{0}$ percent through the specimen.

Load B shall consist of:

— a capacitor, C_2, of 7.3μF ± 10 percent;

— and inductor, L_2, of 0.5 H ± 0.1 H having a resistance of not more than 15 Ω measured using d.c.

NOTE — The circuit parameters have been chosen to represent the fluorescent lamp loads used in most practical applications.

FIG. 14 CIRCUIT DIAGRAMS FOR TESTING SWITCHES FOR USE ON FLUORESCENT LAMP LOADS