

BRITISH STANDARD 9200 : 1972

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**SPECIFICATION FOR
REED CONTACT UNITS
OF ASSESSED QUALITY : GENERIC
DATA AND METHODS OF TEST**

Amendment Slip No. 1, published, 10 May, 1974

to BS 9200 : 1972

Reed contact units of assessed quality:
Generic data and methods of test

Revised text

1.1.12.8 Preferred environmental severities. In the second line of (1) delete 'Frequency 10-2000 Hz,'. In the fifth line of (1) delete 'Frequency 10-2000 Hz,'.

1.2.4 Electrical test procedures. In the fifth line delete 'current' and substitute 'content'. In the same line delete 'of the supply voltage'.

Electrical test procedure 1005. Operate, bounce and release times. Procedure. In the third line delete 'The voltage applied to the test coil terminals shall not vary by more than 10 % from the open to the closed circuit condition.' and substitute 'The source impedance of the supply, V_s shall not exceed 10 % of the resistance of the test coil.'

1.2.6.8.3 Conditions prescribed in the detail specification. After item (3) add '(4) Frequency range.'

2.1.5 Ratings (including limiting conditions of use). After item (4) add '(5) Environmental severities (see 1.1.12.8).'

Amendment Slip No. 2, published 30 July 1976
to BS 9200 : 1972

Reed contact units of assessed quality:
Generic data and methods of test

Instructions for the insertion of new and revised pages in BS 9200

Remove contents page and insert revised contents page.
Remove page marked 1.1.3(27) and insert revised page marked 1.1.3 (27).
Remove page marked 1.2.2 and insert revised page marked 1.2.2.
Remove Test Procedure 1003 and insert revised Test Procedure 1003.
Remove Test Procedure 1005 and insert revised Test Procedure 1005 with additional figure 1005/2.
Remove Test Procedure 1006 and insert new Test Procedures 1006, 1007 and 1008.
Remove pages marked 1.2.7.1.3 and 2.3 and insert revised pages marked 1.2.7.1.3, 2.1.8 and Table 1, Group A.
Insert new appendix (Appendix E) after Appendix D.

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BRITISH STANDARD SPECIFICATION FOR REED CONTACT UNITS OF ASSESSED QUALITY : GENERIC DATA AND METHODS OF TEST

FOREWORD

This British Standard which has been prepared under the authority of the Telecommunication Industry Standards Committee, is the generic specification for reed contact units in the system of standards for electronic components of assessed quality. It has been issued in the United Kingdom, where it is urgently required, but if a similar procedure is adopted in other countries changes in the specification will be considered for the purposes of harmonization.

SPECIFICATION

SECTION 1. PRINCIPLES AND MANDATORY PROCEDURES

1.1 GENERAL MATTERS

1.1.1 Scope. This British Standard covers the general requirements for reed contact units of assessed quality. The reed contact unit may be actuated either by varying current through a coil or by induction from a magnet. It may be used with resistive or other contact loads. Since tests using a standard coil and resistive contact loads are more definitive, this specification only details such tests.

General rules for the preparation of detail specifications for use by BSI Technical Committees or components manufacturers are given in Section 2.

1.1.2 Related documents

- BS 1991. Letter symbols, signs, and abbreviations. (IEC 27).
- BS 2011. Methods for the environmental testing of electronic components and electronic equipment. (IEC 68).
- BS 3939. Graphical symbols for electrical power, telecommunications and electronics diagrams. (IEC 117).
- BS 4000. Sizes of paper and board. (ISO/R 101).
- BS 4727. Glossary of electrotechnical power, telecommunication, electronics, lighting and colour terms. (IEC 50).
- BS 6001. Sampling procedures and tables for inspection by attributes. (BS 9001 has the same Technical content).
- BS 9000. General requirements for electronic components of assessed quality.

NOTE. When reference to an IEC Publication or an ISO Recommendation is given in parentheses the British Standard is identical in technical content with the IEC Publication or ISO Recommendation except where deviation(s) are indicated in the British Standard.

1.1.3 Terminology. The terms and their definitions which are used in this British Standard are in accordance with BS 4727.

In addition to the terms in BS 4727, the following specific terms and their definitions shall apply, for the purposes of this standard.

(1) *Reed contact unit.* An assembly containing contact reeds, some or all of magnetic material, sealed in an insulating tube.

[1.1.3(2)]

- (2) *Contact reed*. A metal blade, provided with a suitable contact, forming part of a reed contact unit.
- (3) *Type*. Reed contact units of the following contact forms:
- Dry.
 - Wetted.
- (4) *Pattern*. Reed contact units of one type having a stated contact rating and functional performance.
- (5) *Style*. Reed contact units of one type and one pattern having one of the following classes of termination:
- Solderable.
 - Push-on.
 - Weldable.
- (6) *Rated value*. The value assigned to a given characteristic of the reed contact unit.
- (7) *Operate value*. The limit value at which the reed contact unit shall operate.
- (8) *Release value*. The limit value at which the operated reed contact unit shall release.
- (9) *Non-operate value*. The limit value at which the reed contact unit shall not operate.
- (10) *Hold value*. The limit value at which the operated reed contact unit shall remain operated.
- (11) *Saturation*. The magnetic condition, arbitrarily defined, at which the performance of the reed contact unit is unaffected by further increase in the test coil current.
- (12) *Saturate value*. The stated value at which the reed contact unit reaches saturation.
- (13) *Contact action*
- Make reed contact unit*. A reed contact unit in which the contact circuit is open when the test coil is not energized.
 - Break reed contact unit*. A reed contact unit in which the contact circuit is closed when the test coil is not energized.
- (14) *Changeover reed contact unit*. A reed contact unit having a contact member common to two contact circuits one of which opens and the other closes when the test coil is energized.
- Break-before-make reed contact unit*. A changeover reed contact unit in which there is a transitory intermediate condition during which both contact circuits are open.
 - Make-before-break reed contact unit*. A changeover reed contact unit in which there is a transitory intermediate condition during which both contact circuits are closed.
- (15) *Latching reed contact unit*. A reed contact unit in which the contact circuit remains in a stated condition until reset by a specified energization.
- (16) *Bounce*. Momentary reopening of a contact after initial closing, or reclosing after initial opening.
- (17) *Physically-wetted reed contact units*. The state of reed contact units when one or more electrically conducting liquids are interposed between the surfaces of the contacts in a contact circuit to improve the characteristics of the reed contact unit, in particular, its conductivity and its capability to make or break the electrical load circuit.
- (18) *Operate time*. The time between the connection of a stated voltage source to the test coil and the first closing (or opening) of a specific contact circuit. The operate time does not include bounce time.
- (19) *Release time*. The time between the disconnection of a stated voltage from the test coil and the first opening (or closing) of a specific contact circuit. The release time does not include bounce time.
- (20) *Transit time*. The interval of time during which both contact circuits of a changeover break-before-make reed contact unit are open.
- (21) *Bridging time*. The interval of time during which both contact circuits of a changeover make-before-break reed contact unit are closed.
- (22) *Bounce time*. The interval of time between the first closing (or opening) and the final closing (or opening) of a specific contact circuit.
- (23) *Duty*. The ratio of the duration of energization to the interval between commencements of successive energizations, expressed as a percentage.
- (24) *Contact noise*. The spurious peak-to-peak voltage which is generated across the reed contact unit.
- (25) *Contact circuit*. The whole of the electrically conductive parts of a reed contact unit which are intended to be connected in an external circuit.
- (26) *Contact circuit resistance*. The resistance of the contact circuit under specified conditions of measurement.

[1.1.3(27)]

(27) *Failure to make*. A fault condition of the contacts, indicated by the contact resistance of the unit exceeding a specified value, when the test coil is energized at the specified level.

(28) *Failure to break*. A fault condition of the contacts, indicated by the contact resistance of the unit failing to exceed a specified value, when the test coil is energized at the specified level.

(29) *Thermal e.m.f.* An e.m.f. generated when the reed contact unit terminations are connected to an external circuit and subjected to a temperature differential.

1.1.4 Letter symbols, signs and abbreviations. Letter symbols, signs and abbreviations are in conformity with BS 1991.

1.1.5 Graphical symbols. Graphical symbols are in conformity with BS 3939.

1.1.6 Marking of the component and package

1.1.6.1 Each reed contact unit shall be marked with the following information in the order of preference given below, as far as is practicable:

- (1) Manufacturer's factory identification code.
- (2) Date code (see 2.6.8 of BS 9000: Part 1).
- (3) BS number of the detail specification.
- (4) Additional marking as required by the detail specification.

1.1.6.2 All the information listed in 1.1.6.1 shall be marked on the package.

1.1.7 Eligibility for qualification approval. For the purposes of this British Standard, the first stage of factory processing is defined as the preparation of the contact reed (see 1.1.3(2)).

1.1.8 Structurally similar components. All components within a rated range shall be regarded as structurally similar (see 1.3(23) of BS 9000: Part 1).

1.1.9 Delayed delivery. Contact units held by a manufacturer or stockist 12 months after acceptance inspection shall be re-inspected for the tests in Group A and Subgroup B2 inspection as described in the detail specification, unless otherwise specified in the detail specification.

1.1.10 Supplementary procedure for qualification approval. Not applicable.

1.1.11 Certified test records. The procedure given in 2.8 of BS 9000: Part 1 and 2.3 of this standard shall be applied. The detail specification shall state where the results of tests are to be recorded separately for certified test record (CTR) purposes.

1.1.12 Standard ratings and characteristics. The following preferred values shall be used, unless otherwise stated in the detail specification.

1.1.12.1 Switching rate

1, 2, 5, 10, 20, 50, 100 operations per second.

1.1.12.2 Duty

15, 25, 33, 40, 50, 60 %.

1.1.12.3 Open circuit voltage across contacts

- (1) 0.01, 50, 150, 250, 500 V a.c. (r.m.s.).
- (2) 0.01, 6, 12, 30, 50, 110, 250, 440 V d.c.

1.1.12.4 Current rating

- (1) 0.01, 0.1, 1, 2, 3, 5, 10 A a.c. (r.m.s.).
- (2) 0.01, 0.1, 0.5, 1, 2, 3, 5, 10 A d.c.

[1.1.12.5

1.1.12.5 Load ratings

3, 6, 15, 50, 100, 150, 250, 500 V A.

1.1.12.6 Number of operations

5 000, 10 000, 20 000, 50 000, 100 000, 200 000, 500 000, 10^6 , 10^7 , 10^8 .

1.1.12.7 Environmental category. The environmental category (see Appendix A of BS 2011: Part 1 (IEC 68-1)) of a reed contact unit, both steady state and cyclic, shall be established by a selection from the standard values of lower and upper ambient temperatures and durations of damp heat test taken from tests A, B and C respectively of BS 2011 (IEC 68).

The preferred environmental categories are:

65/125/56
40/100/56
40/085/56
40/070/21
10/040/A4
10/055/04

1.1.12.8 Preferred environmental severities

(1) Vibration (BS 2011: Part 2F, Test Fc)

Severity I: vibration amplitude 0.75 mm or 98 m/s^2 whichever is the less, sweep endurance 6 h.
or

Severity II: vibration amplitude 1.5 mm or 196 m/s^2 whichever is the less, sweep endurance 6 h.

(2) Bump (BS 2011: Part 2Eb, Test Eb): 1000 bumps at 390 m/s^2 and 6 ms duration.

(3) Low air pressure (BS 2011: Part 2M, Test M): 85 mbar.

1.1.13 Unchecked parameters. The manufacturer may quote additional parameters to those given in the relevant detail specification. If quoted, these parameters shall not be used for inspection purposes, and cannot be guaranteed.

1.1.14 Procedure to be followed in the event of failures at Group C or Group D inspection. Where failures occur on long term Group C or D tests, the provisions of 2.6.4 of BS 9000: Part 1 and the procedures specified in 1.1.14.1 and 1.1.14.2 shall apply.

1.1.14.1 Endurance tests. Tests of duration such that they can be performed within a week shall be carried out at weekly intervals until two successive lots pass the test requirements.

1.1.14.2 Damp heat tests. Any damp heat tests already included in Group C shall be carried out on tightened inspection at the specified acceptable quality level.

1.1.15 Ordering information. The number of the detail specification shall be given.

1.1.16 Release prior to completion of Group B tests. When the conditions of BS 9001 for reduced inspection have been satisfied for all Group B tests, the manufacturer is permitted to release components before the completion of such tests.

1.2 TEST PROCEDURES

For those measurements that require the reed contact unit to be energized, the reed contact unit shall be positioned in its test coil, as specified in the detail specification. Standard test coils are listed in Appendix B.

1.2.1 Measurement conditions. Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in BS 2011: Part 1 (IEC Publication 68-1).

Test coils shall be selected where possible from those listed in Appendix B. In all other cases the detail specification shall give details of the test coil.

The test coil should be substantially free from the influence of magnetic fields.

[1.2.2

1.2.2 Visual inspection. Unless otherwise specified, inspection shall be performed under normal visual conditions. The workmanship, finish and marking shall be satisfactory.

1.2.3 Dimensioning and gauging procedures

1.2.3.1 Outline dimensions. The outline dimensions shall be checked and shall comply with those given in the detail specification.

1.2.3.2 Mass. The mass shall be not greater than that stated in the detail specification.

1.2.4 Electrical test procedures. Reed contact units shall satisfy those of the following electrical tests which are prescribed in the detail specification.

The test equipment shall be so located as to be substantially free from the influence of external magnetic fields or of adjacent magnetic materials.

The ripple of the d.c. test supply shall not exceed 1 % of the supply voltage.

The following electrical test procedures are given on separate pages to facilitate revision.

- 1001 Functional tests.
- 1002 Contact resistance.
- 1003 Voltage proof.
- 1004 Insulation resistance.
- 1005 Operate, release and bounce times.
- 1006 Contact sticking I
- 1007 Contact sticking II
- 1008 Thermal e.m.f.

VOLTAGE PROOF

Procedure. For both methods, the proof voltage shall be held between the terminations for one of the stated durations shown below:

- (1) For 60 ± 5 s.
- (2) For not less than 1 s.

Where prescribed by the detail specification the leakage current shall be measured.

Any pre-ionization conditioning shall be prescribed in the detail specification.

Method 1. (All parts to mounting device.) The reed contact unit shall be firmly clamped in the trough of a 90° , metallic V-block of such size that the body of the reed contact unit does not extend beyond the extremities of the block. The reed contact unit terminations shall be so positioned that the distance between the terminations and any part of the V-block is not less than the radius of the reed contact unit minus the radius of the terminations. Any minor eccentricity at the root of the termination shall be ignored.

All parts shall be electrically connected and the test voltage as in the table below shall be applied between the V-block and all parts.

Rated voltages of 115 V or less		Rated voltages of more than 115 V and not exceeding 250 V		Rated voltages of more than 250 V and not exceeding 500 V	
Voltage for a.c. test	Voltage for d.c. test	Voltage for a.c. test	Voltage for d.c. test	Voltage for a.c. test	Voltage for d.c. test
500 V r.m.s.	700 V	1000 V r.m.s.	1400 V	2000 V r.m.s.	2800 V

The voltage used for duration (2) shall be 1.1 times the values given in the above table.

Method 2. (Between contacts.) The reed contact unit shall be mounted in its test coil and the specified test voltage shall be applied between the terminations of normally open contact circuits. Reed contact units having 'break' contact circuits shall be tested with these circuits 'open' by application of the saturate current to the test coil.

Requirements. There shall be no breakdown or flashover. Where the maximum leakage current is prescribed the value shall not be exceeded.

Conditions prescribed in the detail specification

- (1) Method 1 and/or Method 2.
- (2) Voltage between normally open contact circuits.
- (3) Duration of test voltage.
- (4) Pre-ionization conditions.

OPERATE, BOUNCE AND RELEASE TIMES

Circuit. The test circuit shown in Fig. 1005/1 shall be used.

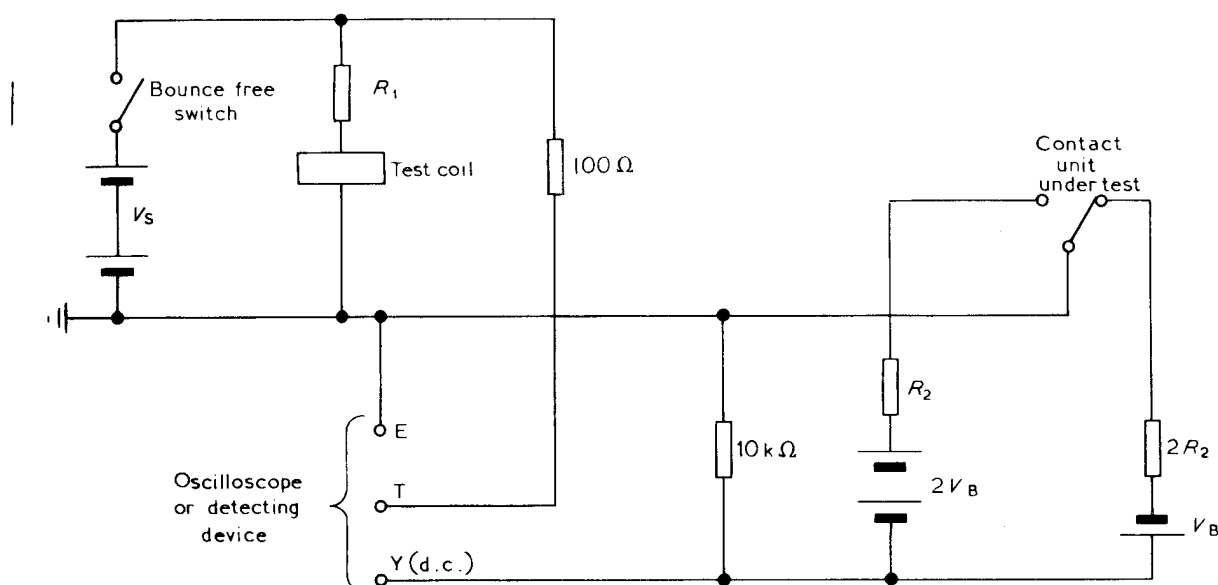


Fig. 1005/1. Test circuit for the measurement of operate, bounce and release times

Test mode

- (1) *Operate time, operate bounce time.* Oscilloscope trigger positive.
- (2) *Release time, release bounce time.* Oscilloscope trigger negative. For accurate timing, the oscilloscope shall trigger at not more than 1 % of the adjustable d.c. supply voltage.

NOTE. Values of potentials and resistances are given in the detail specification.

Procedure. The test coil shall be energized from an adjustable d.c. supply via a bounce-free (e.g. mercury-wetted) switch. The energy supplied to the test coil shall be such that the specified saturate value for the contact unit is not exceeded.

Operate time. The d.c. supply shall be set to provide a steady current equivalent to 150 % of the operate value. This shall be applied to the test coil and the operate time of the reed contact unit shall be measured.

Bounce time (operate). The bounce time (operate) shall be measured, where specified. The measurement shall be within the limits specified. Discontinuities of less than 5 μ s (or as otherwise specified in the detail specification) shall be ignored.

Release time. The d.c. supply shall be set to the saturate value and maintained for a minimum period of 20 ms. The release time shall be measured as the interval of time between the disconnection of the saturate value and the first opening (or closing) of the contacts of the reed contact unit.

Bounce time (release). The bounce time (release) shall be measured, where specified. The measurement shall be within the limits specified. Discontinuities of less than 5 μ s (or as otherwise specified in the detail specification) shall be ignored.

Requirements. Each measured time shall not exceed the maximum given in the detail specification.

Conditions prescribed in the detail specification

- (1) Saturate value.
- (2) Operate value.
- (3) Test circuit potentials and resistances.

The circuit of Fig. 1005/1 enables a changeover waveform to be interpreted:

break contact closed +1.5 V
both contacts open 0 V
both contacts closed -1.5 V
make contacts closed -3 V

t_1 —Operate time

t_2 —Operate bounce time

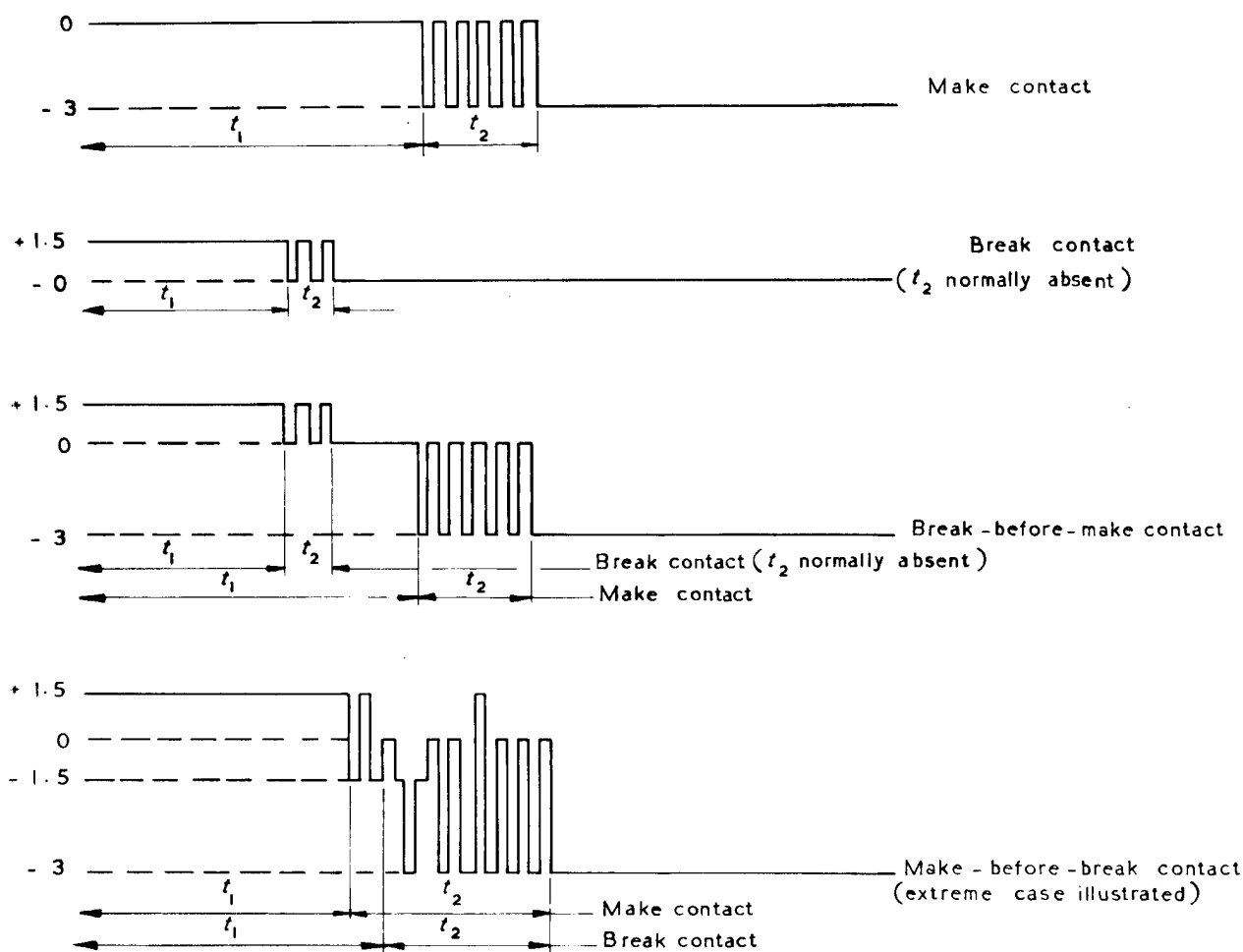


Fig. 1005/2. Examples of oscilloscope waveforms: operate time and operate bounce time

CONTACT STICKING I

Circuit. The test circuit shown in Fig. 1005/1 shall be used except that a specified voltage shall be applied to the test coil.

Procedure

Make reed contacts. The reed contact under test shall be mounted in a test coil and the coil energized at 150 % of the specified operate value, and then while at room ambient temperature, the release time t_1 shall be measured. (See Test Procedure 1005.) The maximum contact test voltage at any time shall be 100 mV.

With the coil energization maintained, the ambient temperature shall be raised to the upper category temperature within 1 h and the release time t_2 shall be measured while at that temperature. The reed contact unit shall be held operated at 150 % of the operate value at this temperature for not less than 24 h. The coil energization shall then be disconnected without any physical disturbance to the contact unit under test and the release time t_3 shall be measured while still at the upper category temperature.

Providing the difference between t_1 and t_2 does not exceed the value prescribed by the detail specification, the difference between t_2 and t_3 indicates the degree of contact sticking.

Break reed contacts. The break reed contact under test shall be mounted in a test coil which is de-energized. The release times on coil energization shall be measured at ambient temperature (t_1), on reaching the upper category temperature (t_2) and after 24 h at the upper category temperature (t_3). (See Test Procedure 1005.)

Requirements. The value $t_2 - t_1$ shall not exceed the value prescribed by the detail specification.

The value $t_3 - t_2$ shall not exceed the value prescribed by the detail specification.

Conditions prescribed in the detail specification

- (1) The maximum permitted values of $t_2 - t_1$ (may be zero) and $t_3 - t_2$.
- (2) Test circuit potentials and resistances.
- (3) Test period if longer than 24 h.

CONTACT STICKING II

Procedure. The reed contact unit under test shall be mounted in a test coil energized with a square wave pulse alternating in value between the operate value and the saturate value at a specified pulsing rate, for 2000 pulses. The coil energization shall then be disconnected at the saturate value without any physical disturbance of the reed contact unit under test and the unit shall be checked for failure-to-break.

The checking voltage shall be removed before the test coil is re-energized.

The above cycle of tests shall be carried out at least five times.

A failure shall be any occasion on which the contact fails to break, measured within a specified period after the disconnection of the energization of the test coil.

Requirements. The total number of failures-to-break shall not exceed that prescribed by the detail specification.

Information to be stated in the detail specification.

- (1) Duty cycle.
- (2) Pulsing rate.
- (3) Number of test cycles if exceeding five.
- (4) Acceptable number of failures-to-break.
- (5) Minimum contact circuit resistance defining failure-to-break.
- (6) Open circuit contact test voltage.

THERMAL E.M.F.

Circuit and test apparatus

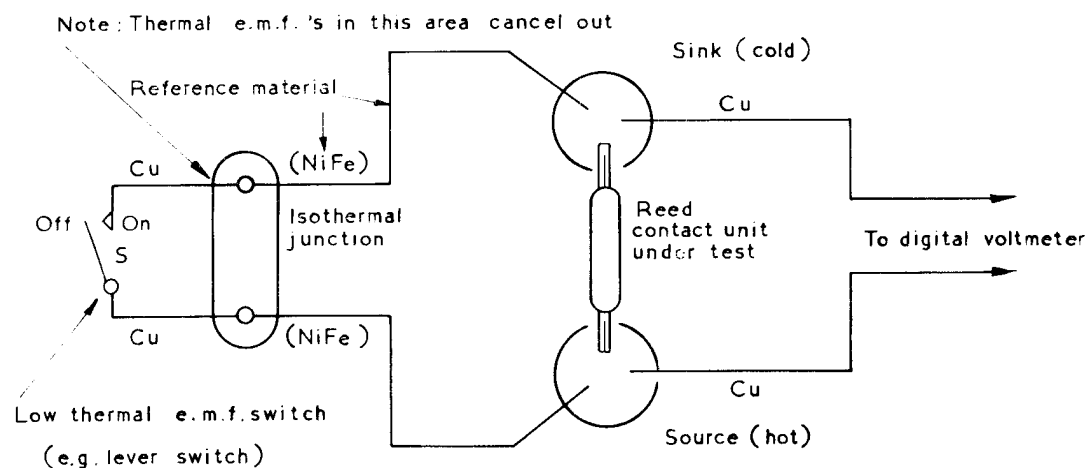


Fig. 1008/1. Test circuit for the measurement of thermal e.m.f.

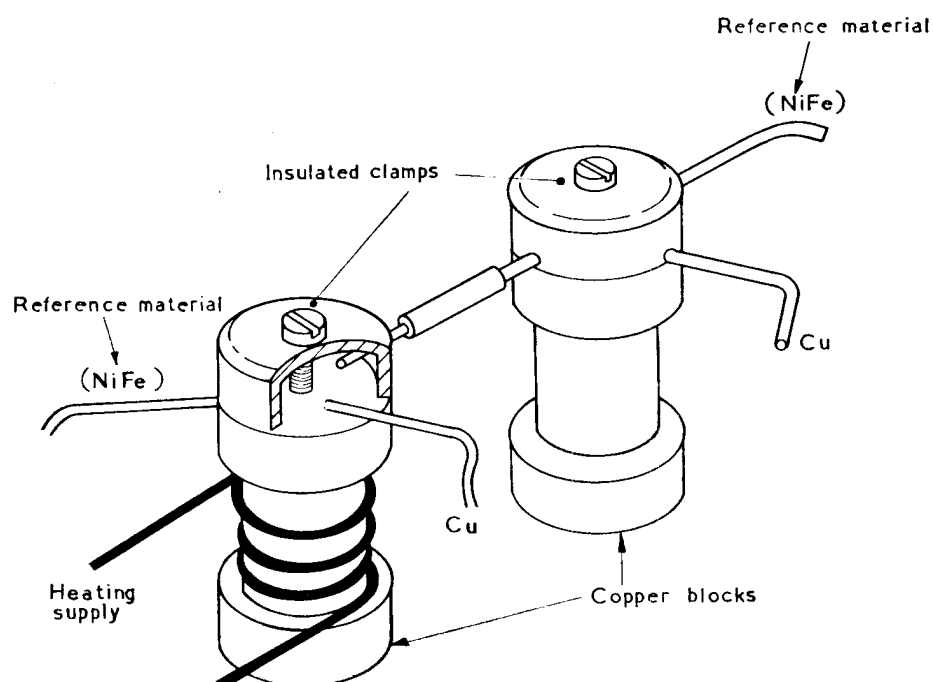


Fig. 1008/2. Apparatus for the measurement of thermal e.m.f.