
British Standard Specification for
**Radio interference suppression
filters of assessed quality:
Generic data and methods of test**

Filtres de qualité assurée pour l'antiparasitage: données génériques et méthodes d'essai

Gütebestätigte Funkentstörfilter: Fachgrunddaten und Prüfverfahren

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Foreword

This revised British Standard, which supersedes BS 9120 : 1984, has been prepared under the direction of the Electronic Components Standards Committee and is the generic specification for radio interference suppression filters in the BS 9000 series of standards for electronic components of assessed quality. The revision is necessary to

incorporate additional requirements applicable to mains filter units.

Appendix F describes tests on cables and cords and their anchorage to filter units, which may be required in detail specifications.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Documents

Document Sharing Hub

Amendment No. 1
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to BS 9120 : 1988

Specification for radio interference suppression
filters of assessed quality: Generic data and
methods of test

Revised text

AMD 7509
February 1993

Clause 1.1.9 Delayed delivery

In line 1, delete '2 years' and substitute '3 years'.

AMD 7509
February 1993

Table 10. Inspection procedure for filters. Group A tests

In the entry for subgroup A4, in column 5, headed 'Full assessment', under 'AQL', delete '0.40 %' and substitute '4.0 %'.

AMD 7509
February 1993

Table 11. Inspection procedure for filters. Group B tests

In the entry for subgroup B1, in column 2, headed 'Inspection' and column 3, headed 'Clause no.', delete line 2.

After the entry for subgroup B1, insert the following new entry.

B2	Solderability (note 1)	1.2.7.3.1	S3	2.5 %	S3	2.5 %
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In the entry for subgroup B8, line 2, delete 'B1 and B4' and substitute 'B1, B2 and B4'.

AMD 7509
February 1993

Appendix A. Example of a certified test record

In the table headed 'Attributes information', in the entry for subgroup B1, delete line 2 entirely.

After the entry for subgroup B1, insert the following new entry.

B2	Solderability	24	0	240	1
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British Standard Specification for

Radio interference suppression filters of assessed quality: Generic data and methods of test

Section one. Principles and mandatory procedures

1.1 General matters

1.1.1 Scope

This British Standard establishes terms, methods of test and inspection procedures for radio interference suppression filters of assessed quality for use in electronic equipment and in the electrical power supply to equipment, appliances, machines and apparatus. It includes safety requirements and tests which may be mandatory, according to the application.

NOTE. The filter may form part of equipment to which other safety requirements apply, e.g. BS 415, BS 3456.

This standard is intended to be used in conjunction with BS 9000 and with related detail specifications in which are stated the dimensions, ratings, tests and requirements applicable to individual filters or series of filters.

1.1.2 Related documents

BS 415	Specification for safety requirements for mains-operated electronic and related apparatus for household and similar general use
BS 923	Guide on high-voltage testing techniques Part 2 Test procedures
BS 1701	Specification for air filters for air supply to internal combustion engines and compressors other than for aircraft
BS 1852	Specification for marking codes for resistors and capacitors
BS 2011	Basic environmental testing procedures
BS 2045	Preferred numbers
BS 3042	Specification for standard test fingers and probes for checking protection against electrical, mechanical and thermal hazard
BS 3456	Specification for safety of household and similar electrical appliances
BS 3939	Guide for graphical symbols for electrical power, telecommunication and electronics diagrams
BS 4727	Glossary of electrotechnical, power, telecommunications, electronics, lighting and colour terms
BS 5775	Specification for quantities, units and symbols
BS 6001	Sampling procedures for inspection by attributes Part 1. Specification for sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

BS 6217	Guide to graphical symbols for use on electrical equipment
BS 6299	Methods of measurement of the suppression characteristics of passive radio interference filters and suppression components
BS 6500	Specification for insulated flexible cords and cables
BS 9000	General requirements for a system for electronic components of assessed quality Part 1 Specification of basic rules and procedures
BS 9070	Specification for fixed capacitors of assessed quality: generic data and methods of test Section 1 Principles and mandatory procedures Section 2 General rules for drafting detail specifications

1.1.3 Terminology

For the purposes of this British Standard the general electrical and telecommunication terms and definitions given in the appropriate Part of BS 4727 apply.

In addition the following specific terms and their definitions are applicable to the family of filters covered by this generic specification.

The basic terms are inter-related and are used in the order shown below.

1.1.3.1 family. See 6.2.1 of BS 9000 : Part 1 : 1981.

1.1.3.2 filter unit. A component or an assembly of components intended to be connected in electric circuits for the purpose of reducing unwanted currents and voltages.

1.1.3.3 type. A basic shape or form of *filter unit*, e.g. lead-through filter.

1.1.3.4 series. A design of *filter unit* or inter-related *filter unit* covered by an individual detail specification.

1.1.3.5 variant. An individual *filter unit* within a series but having a feature or features different from the standard *filter unit*.

1.1.3.6 specimen. An individual *filter unit* in a sample.

1.1.3.7 sealed filter unit. A *filter unit* in which the resistive, capacitive and inductive elements are housed in a casing or encapsulation.

NOTE. Unless otherwise stated in the detail specification the resistive, capacitive and inductive elements will not have been subjected to separate qualification approval.

1.1.3.7(a) mains filter unit. A *filter unit* intended for direct electrical connection to the electrical supply mains. This unit may form part of an equipment.

1.1.3.8 unsealed filter unit. An unprotected *filter unit* assembly, or one having only a simple protective casing.

NOTE. Unless otherwise stated in the detail specification, the resistive, capacitive and inductive elements will have been separately subjected to qualification approval to a BS 9000 detail specification.

1.1.3.9 insertion loss. The ratio of the voltage appearing across the line immediately beyond the point of insertion of a component or *filter unit* into a given transmission system, before and after the insertion. This ratio is expressed in decibels, dB, at a stated frequency or range of frequencies.

1.1.3.10 class I filter unit. A *mains filter unit* in which protection against electric shock does not rely on *basic insulation* only but which includes an additional safety precaution in such a way that means are provided for the connection of conductive *accessible parts* to the protective (earthing) conductor in the fixed wiring of the installation ensuring that the conductive accessible parts cannot become live in the event of a failure of the basic insulation.

NOTE. For filters intended for use with a flexible cord or cable, this provision includes a protective conductor as part of the flexible cord or cable.

1.1.3.11 class II filter unit. A *mains filter unit* in which protection against electric shock does not rely on *basic insulation* only, but in which additional safety precautions such as *double insulation* or *reinforced insulation* are provided, there being no provision for protective earthing or reliance upon installation conditions.

NOTE. Class II filters may be provided with means for maintaining the continuity of protective circuits, provided that such means are within the filters and are insulated from accessible surfaces within the definition of class II filters.

1.1.3.12 class III filter unit. A filter, mounted inside other modules, for which the protection against electric shock relies on the protection afforded by such existing modules.

1.1.3.13 class X1 capacitor. A capacitor suitable for use in a *mains filter unit* where failure of the capacitor would not lead to danger of electric shock and having a peak pulse voltage in service as given in table 1.

1.1.3.14 class X2 capacitor. A capacitor similar to a *class X1 capacitor* except rated for a lower peak pulse voltage in service as given in table 1.

Table 1. Peak pulse voltages

Class	Peak pulse voltage in service	Application	Peak pulse voltage up to which safety requirements are met
X1	> 1200	High-pulse application	4000 V (when $C \leq 0.33 \mu\text{F}$) 4000 exp (0.33 - C) (when $C > 0.33 \mu\text{F}$)
X2	≤ 1200	General purpose	1400

1.1.3.15 class U capacitor. A capacitor suitable for use in a *mains filter unit* where failure of the capacitor could lead to danger of electric shock and rated for normal insulation requirements in countries where mains voltages up to 125 V are standard.

1.1.3.16 class Y capacitor. A capacitor similar to *class U* except that it is rated for normal insulation requirements in countries where mains voltages greater than 125 V and up to 250 V are standard.

1.1.3.17 mains frequency. 50 Hz unless otherwise stated.

1.1.3.18 leakage current. The maximum current that can flow to earth from a *mains filter unit* connected to the power supply in accordance with the manufacturer's instructions.

1.1.3.19 live part. A conductor that has a voltage relative to earth exceeding 34 V peak to peak.

1.1.3.20 accessible part. A part that can be touched by a test finger, including cases where a moderate force is necessary.

1.1.3.21 creepage distance in air. The shortest distances measured in air over the surface of insulation between conductive parts.

1.1.3.22 clearance. The shortest distance measured in air between conductive parts.

1.1.3.23 earth terminal. A terminal provided as a termination for the earth protective conductor in the mains lead, to which can be connected such parts as are required to be connected to earth.

1.1.3.24 permanent earthing. An object is said to be permanently earthed when its electrical connection to an earthed electrode is rigidly and permanently secured throughout its whole length without the intervention of any circuit interrupting device and is protected from mechanical damage and corrosion, unless by its nature and construction such protection is unnecessary.

NOTE. Appliances earthed through the earth conductor of a flexible cable or cord terminating in a 3-pin plug are not regarded as permanently earthed.

1.1.3.25 extra low voltage (e.l.v.). A voltage that does not exceed 50 V a.c., r.m.s., between conductors or between any conductor and earth.

1.1.3.26 rated system voltage. The rated voltage of the supply to the apparatus in which a *mains filter unit* is intended to be fitted.

1.1.3.27 lower category temperature. The minimum temperature of the external surface for which the *filter unit* has been designed to operate.

NOTE. Terminations are considered to be part of the external surface.

1.1.3.28 upper category temperature. The maximum temperature of the external surface for which the *filter unit* has been designed to operate continuously.

NOTE. Terminations are considered to be part of the external surface.

1.1.3.29 rated current. The current assigned by the manufacturer to a *filter unit*.

NOTE. More than one value of rated current may be assigned to a *filter unit*, depending upon the heat dissipation characteristics of the specified mountings.

1.1.3.30 rated temperature. The maximum ambient temperature at which a *filter unit* is intended to carry its *rated current*.

1.1.3.31 functional insulation. The insulation necessary for the proper functioning of the filter.

1.1.3.32 basic insulation. Insulation applied to live parts to provide basic protection against electric shock.

1.1.3.33 supplementary insulation. Independent insulation applied in addition to *basic insulation* in order to provide protection against electric shock in the event of failure of *basic insulation*.

1.1.3.34 double insulation. Insulation comprising both *basic insulation* and *supplementary insulation*.

1.1.3.35 reinforced insulation. A single insulation system, applied to live parts, that provides a degree of protection against electric shock equivalent to *double insulation* under the conditions specified in the relevant detail specification.

NOTE. The term 'insulation system' does not imply that the insulation has to be one homogeneous piece. It may comprise several layers that cannot be tested singly as *supplementary* or *basic insulation*.

1.1.3.36 all-insulated equipment (also known as insulation encased equipment). Equipment in which a durable and substantially continuous enclosure of insulating material envelops all metal parts, excepting small parts such as nameplates, screws or rivets that are isolated from other metal parts by insulation material providing a degree of insulation at least equivalent to *reinforced insulation*.

1.1.3.37 dust. Particulate matter of *particle size* up to 150 µm.

1.1.3.38 sand. Grains of quartz ranging in *particle size* from 100 µm to 1000 µm.

1.1.3.39 particle size. The apparent maximum linear dimension (or diameter) of the particle.

1.1.4 Letter symbols, signs and abbreviations

The letter symbols, signs and abbreviations employed in all documents applicable to electronic components covered by this specification shall comply with BS 5775 or shall be derived in accordance with the principles of that standard.

1.1.5 Graphical symbols

The graphical symbols employed in all documents applicable to electronic components covered by this specification shall comply with BS 3939 or shall be derived in accordance with the principles of that standard.

1.1.6 Marking

1.1.6.1 Filter unit. The information given for marking the filter shall be selected from the following list; the relative importance of each item is indicated by its position in the list:

- (a) rated voltage;
- (b) rated current;
- (c) climatic category;
- (d) manufacturer's name, trade mark or factory code;
- (e) manufacturer's type designation;
- (f) year and week of manufacture (this may be in code form as given in BS 1852);
- (g) a circuit diagram of internal wiring showing all capacitance values and classes, all inductance values, and all resistance values;

(h) reference to the relevant detail specification and/or national specification;

The filter unit shall, where possible, be marked with (a), (b), (c) and (d) above and with as many as possible of the remaining items. However, when space is limited the filters may be marked with (d) and (e) only.

1.1.6.2 Package. The package containing the filter unit(s) shall be clearly marked with all the information listed in 1.1.6.1 as appropriate with any additional marking required by the detail specification.

1.1.6.3 Identification of filter unit terminations. All terminations of filter units shall be plainly marked as necessary to avoid any confusion as to their use.

Where an earth terminal is fitted, the symbol '⏏' shall be marked adjacent to this terminal. This marking shall be visible when a connection is being made to the terminal.

The mains input and output terminations of a mains filter unit shall be identified as such by durable marking. Additionally, terminals intended to be connected both to the mains electrical power supply and to the equipment shall be marked as shown in table 2.

When a mains filter unit has an integral mains input and/or output connector it shall be identified as such by durable marking. The disposition and marking of the live neutral and earth contacts shall be as shown in table 2.

When a mains filter unit incorporates an integral flexible cord, unless otherwise required by the detail specification, the cord shall comply with the relevant requirements of BS 6500. In the latter case, the colours of the cores to be connected to the internal live, neutral and earth terminals shall be brown, light blue and green/yellow respectively.

1.1.7 Eligibility for qualification approval

The primary stage of manufacture of an interference suppression filter is the assembly of the piece-parts and the inductive, capacitive or resistive elements comprising the filter assembly. For those filters where the formation of the capacitive, inductive or resistive elements is an integral part of the assembly, then the primary stage of manufacture shall be the manufacture of the capacitive, inductive or resistive element.

Clause 14.3.2 of BS 9000 : Part 1 : 1981 is not applicable.

1.1.8 Structurally similar components

See appendix G of BS 9070 : Sections 1 and 2.

Table 2. Filter unit terminations

Power supply	Point of connection	Input identification	Output identification
Single-phase	Live pole Neutral pole Earth	'L' or brown 'N' or light blue 'E' or green/yellow	Red Black —
Three-phase	Phase 1 Phase 2 Phase 3 Neutral Earth	'L1' 'L2' 'L3' 'N' 'E' or '⏏'	As stated in detail specification

1.1.9 Delayed delivery

Filter units held for a period of more than 2 years following acceptance inspection shall be re-examined for solderability when this is applicable.

1.1.10 Supplementary procedures for qualification approval

Not applicable.

1.1.11 Certified test records

Certified test records (CTRs) shall be prepared by the manufacturer for full assessment level, if required by the detail specification.

NOTE 1. They are not required for the basic assessment level.

When the relevant detail specification requires that attributes information shall be recorded, the total number of rejected filters shall be recorded, without reference to the parameter for which the rejection was made.

NOTE 2. An example of a certified test record is shown in appendix A.

1.1.12 Ratings and characteristics

Preferred values of ratings and characteristics are as follows. If additional items are included in a detail specification, the values and conditions under which they apply shall be stated. Any interdependence of ratings and characteristics and any limiting conditions of use shall be stated.

(a) **Rated current.** The preferred values of rated current (in A) are as follows:

1, 2, 3, 5, 10, 15, 25, 35, 50 and 100.

(b) **Rated voltage.** The preferred values are as follows:

for a.c. filter units 50, 125, 250, 380 and 440 V r.m.s.;
for d.c. filter units 30, 50, 160, 250 and 500 V.

(c) **Climatic categories.** The system of climatic classification codes as described in appendix A of BS 2011 : Part 1.1 : 1983 shall be used. The preferred severities are as follows:

LCT (in °C): -55, -40, -25 and -10;
UCT (in °C): 155, 125, 100, 85 and 70;
DHSS (in days): 56, 21, 10 and 4.

(d) **Severities for environmental tests.** When these tests are applicable, the preferred conditioning is that selected from the preferred severities given in the appropriate Part of BS 2011.

(e) **Insertion loss.** The preferred values of test frequency (in MHz) are as follows:

0.16, 0.24, 0.55, 1.0, 1.4, 2.0, 3.5, 6.0, 13, 22, 45, 65, 90, 150, 180, 220, 500 and 1000.

For mains filters the change in insertion loss for frequencies below 50 MHz after complete environmental conditioning shall be limited to the values given in table 3; otherwise the limits of change shall be stated in the detail specification.

Table 3. Insertion loss limits

Initial value	Permitted change
dB	dB
Up to 100	± 6
Over 100	Shall not fall below 94

(f) **Minimum values of insulation resistance.**

The preferred values (in MΩ) are as follows:

10, 30, 50, 100, 500, 1000, 5000, 10 000, 50 000 and 100 000.

(g) **Maximum values of resistance for connector contacts.**

The preferred values (in mΩ) are as follows:

2, 5, 10, 15 and 25.

(h) **Limits of change in connector contact resistance.**

The preferred values (in mΩ) are as follows:

2, 5 and 10.

1.1.13 Unchecked parameters

Detail specifications prepared in accordance with this specification do not necessarily give information on the operation of filters under special conditions, e.g. under pulse conditions. Unchecked parameters are not used for inspection purposes and consistent performance under such conditions cannot be relied upon.

Where a requirement exists for operation under such conditions it shall be given in a detail specification prepared by the manufacturer. The test method shall be fully described and appropriate limits, acceptable quality levels and inspection levels specified.

1.1.14 Procedure to be followed in the event of a failure in a periodic test

See 20.11.1 and 20.11.2 of BS 9000 : Part 1 : 1981.

1.1.15 Release for delivery before completion of group B tests

When the conditions for reduced inspection of BS 6001 have been satisfied for all group B tests, the manufacturer is permitted to release components before the completion of such tests.

1.1.16 Component parts of filter assemblies

All components, materials, etc. specified and used in unsealed filter assemblies submitted for approval to this specification shall be approved to the relevant British Standard specification and be compatible with the performance requirements of the filter assembly.

When components are not approved to such British Standard specifications, a suitable programme for initial assessment and 'on-receipt' testing of such items shall be made available on request to the Supervising Inspectorate.

1.1.17 Capability approval

The requirements for the capability approval of manufacturers of radio interference suppression filters shall be given in the appropriate sectional specification, which may, where applicable, invoke test procedures given in this generic specification.

1.2 Test procedures

1.2.1 General

The tests described in 1.2.4 to 1.2.7 have been listed under the headings 'Dimensions and gauging', 'Electrical', 'Mechanical' and 'Environmental' for convenience of reference. It is not intended that they shall be applied either in their entirety or in the order listed, but as shown in 2.2 and the relevant detail specification.

1.2.2 Measurement conditions

Unless otherwise specified in the detail specification, all tests shall be carried out under the standard atmospheric conditions for testing specified in BS 2011 : Part 1.1 : 1983.

When filter units incorporate a connector, a mating connector shall be specified for engagement with the filter unit under test. The dimensions of the mating connector shall conform to the requirements of the appropriate drawings which shall be included or referred to in the detail specification.

1.2.3 Visual examination

The specimens shall be examined visually for the following characteristics. Where magnification is needed, this shall be defined in the detail specification.

- (a) workmanship and finish, which shall be satisfactory;
- (b) marking, which shall be in accordance with 1.1.6;
- (c) mechanical damage, movement or displacement of parts such as would impair proper operation.

1.2.4 Dimensions and gauging

The following dimensions shall be checked.

- (a) **Outline dimensions.** Those dimensions affecting interchangeability shall comply with those given in the detail specification.
- (b) **Detail dimensions.** All dimensions specified shall comply with those given in the detail specification.
- (c) **Creepage and clearance.** For mains filters, creepage distances and clearances between live parts and a metal case shall be not less than the appropriate values given in table 4. For other applications, the distances shall be as specified in the detail specification.
- (d) **Connector gauging procedure** (for filter units with integral connectors). Where mechanical compatibility gauges are required to be used by the detail specification, the relevant specimens shall accept the gauge. Where compatibility gauges are not so required, a compatibility assurance test shall be applied. For this test the specimens shall be checked by a method approved by the National Supervising Inspectorate (NSI). The specimens shall comply with the compatibility requirements of the control drawing.

1.2.5 Electrical test procedures

1.2.5.1 Voltage proof. Filter units shall be tested in accordance with the procedures and requirements of appendix B as indicated in the detail specification.

The period of electrification for mains filters shall normally be 1 min for qualification approval and 10 s for acceptance testing. For other filters the period of electrification shall be 1 min for qualification approval and 2 s for acceptance testing.

1.2.5.2 Electrical continuity. Using a d.c. ohm-meter with an applied voltage of less than 10 V, the electrical continuity shall be checked between all pairs of terminals where the circuit diagram indicates there should be continuity. No open circuit shall occur. The d.c. resistance shall comply with the limit, if any, required in the detail specification. If required in the detail specification, the d.c. resistance shall be recorded.

In the case of filter units fitted with cords or connectors, the electrical continuity test shall include a check of the core colours or contact identification. The colours of the cores connected to the earth, live and neutral terminals and the connector contact identification shall be in accordance with 1.1.6.3.

1.2.5.3 Insulation resistance. The insulation resistance shall be measured between the terminals of each line in turn, and the terminals of all lines and earth together. The test voltage shown in table 5 shall be applied either until a steady reading is obtained or for 60 s, whichever is sooner. The value obtained shall be as stated in the detail specification. (See also item (f) of 1.1.12.)

Table 5. Test voltages for insulation resistance

Rated voltage		Test voltage, d.c.
a.c.	d.c.	
V r.m.s.	V	V
—	Up to and including 100	10 ± 1
Up to and including 250	100 up to and including 500	100 ± 15
Greater than 250	Greater than 500	500 ± 50

NOTE. This test is not required between pairs of terminals to which a discharge resistor is fitted.

The insulation resistance shall be not less than that specified in the detail specification.

1.2.5.4 Leakage current mains filter units only.

When required by the detail specification, the leakage current shall be measured in accordance with the procedure given in appendix C.

Table 4. Creepage and clearance limits

Rated voltage	Protected against deposition of dirt		Not protected against deposition of dirt	
	Creepage distance	Clearance	Creepage distance	Clearance
V	mm	mm	mm	mm
Up to and including 60	1	1	2	1.5
Over 60 up to and including 250	2	2	3	2.5
Over 250 up to and including 380	2	2	4	3
Over 380 up to and including 500	3	3	5	5

The leakage current shall be not greater than that required by the detail specification.

1.2.5.5 Endurance tests. Sealed mains filters and unsealed mains filters in which the capacitive and inductive elements have not been separately qualified shall be submitted to the test of the appropriate procedure and severity indicated in appendix D. Other filters shall be submitted to the following tests:

(a) an endurance test in accordance with that Section of BS 9070 appropriate to the capacitor dielectric concerned;

(b) a current endurance test in accordance with D.3.5.

The number of specimens to be tested shall be as given in table 12, 13 or 16 and the requirements shall be those of the appropriate part of BS 9070 or appendix D of this standard.

1.2.5.6 Electrical shock hazard under normal conditions.

When filter units are designed to be located in an accessible position, either secured to equipment or unattached, protection against accidental contact of live parts shall be tested as described in appendix E.

Compliance with these requirements shall be checked by inspection against the requirements indicated in appendix E.

1.2.5.7 Temperature rise at rated current. When required by the detail specification, filter units shall be tested in accordance with appendix G.

The maximum temperature shall be that specified in the detail specification.

1.2.5.8 Voltage drop at rated current. The rated d.c. current, unless otherwise specified in the detail specification, shall be passed through the filter unit between all pairs of terminals where the circuit diagram indicates there should be continuity.

After thermal stability has been achieved, the voltage drop shall be measured and shall not exceed that permitted by the detail specification.

1.2.5.9 Spike test. This test is intended to check the capability of filter units to deal with d.c. mains-borne high-frequency oscillation produced when reactive loads are switched. Details of this test procedure and requirements are given in appendix H of this specification. For filters used with a.c. power supplies, the test sequence in 1.2.5.5 and appendix D includes a spike or impulse test. When tested in accordance with appendix H, filter units shall comply with the detail specification and the requirements of H.5.

1.2.5.10 Connector contact resistance. The contact resistance of connector contacts and its variation shall be measured in accordance with appendix J.

The contact resistance shall be not greater than that permitted by the detail specification.

1.2.5.11 Insertion loss. When measured in accordance with BS 6299, the insertion loss shall be not less than that required by the detail specification and, when required by the detail specification, the following shall be specified:

- (a) frequencies at which measurements are to be made;
- (b) the minimum attenuation to be achieved at each frequency;
- (c) whether measurements are to be made with the filter on 'full load' or 'no load';
- (d) the temperature(s) at which the measurements are to be made if other than ambient;

(e) whether measurements are to be made in the asymmetric or symmetric mode;

(f) test methods for three-phase filters.

1.2.6 Mechanical test procedures

1.2.6.1 Mass. The mass of the specimen shall be measured and shall be within the limits stated in the detail specification.

1.2.6.2 Connector engaging and separating force for filter units with integral connectors. The mating pairs of the connector and the gauge specified in the detail specification shall be fully engaged and separated in the normal manner. The force for engaging and separating shall be measured and shall be within the limits specified in the detail specification.

Where the force limit is not specified, engaging and separating shall be achieved by hand or by special tools as prescribed in the detail specification.

1.2.7 Environmental testing procedures

1.2.7.1 General. For tests involving shock, vibration, bump and acceleration conditions, filter units shall be mounted in their normal manner on plates or jigs of such strength and rigidity that the specimens experience the force specified in the test conditions. The filter units shall also be wired in the normal manner, using connectors if so designed. Details both of mounting and wiring shall be given in the detail specification.

In tests where filter units are subjected to environmental conditions in test chambers, e.g. dry heat, cold, damp heat or low pressure, the disposition of the filter units shall be such as to permit free circulation of air so that the filter units do not shield each other from the environment.

1.2.7.2 Robustness of terminations. Tests U_{a1} , U_b , U_c and U_d of BS 2011 : Part 2.1U : 1984 shall be applied as appropriate with the following severities and special considerations.

- (a) *Test U_{a1} (tensile).* The force to be applied shall be 20 N for all types of terminations except wire terminations. For wire terminations see table 6.
- (b) *Test U_b (bending).* Two consecutive bends shall be applied.
- (c) *Test U_c (torsion).* Two consecutive rotations shall be applied.
- (d) *Test U_d (torque).* For use on nuts or threaded terminations only.

Table 6. Tensile test force for wire terminations

Cross-sectional area of the wire	Corresponding diameter of round wire	Force
mm ²	mm	N
Up to and including 0.2	Up to and including 0.5	5
Exceeding 0.2 and up to and including 0.5	Exceeding 0.5 and up to and including 0.8	10
Exceeding 0.5	Exceeding 0.8	20

After completing each of these tests the filter unit shall be visually examined. There shall be no visible damage or loosening of parts.