

**Rules for the preparation of
Detail specifications for**

**Two-part printed board
electrical connectors
and board-mounted
transition devices of
assessed quality for
D.C. and L.F.
applications: Full and
basic assessment levels**

Foreword

This revised British Standard prescribes the rules for the preparation of detail specifications for two-part printed board electrical connectors and board-mounted transition devices for d.c. and l.f. applications. It is supplementary to BS 9520 “*Specification for electrical connectors of assessed quality for d.c. and low frequency application: Generic data and methods of test*”. Examples of detail specifications in the BS 9525 range are BS 9525 N0001 and BS 9525 F0004.

This revision updates the rules document following changes in test requirements for connectors for electronic equipment.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 23 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

Amd. No.	Date of issue	Comments
6609	September 1991	Indicated by a sideline in the margin

Contents

	Page
Foreword	Inside front cover
1 Scope	1
2 General	1
3 Quality assessment procedure	5
4 Inspection requirements	6
Table 1 — Mandatory inspection requirements for full assessment level	6
Table 2 — Mandatory inspection requirements for basic assessment level	15
Table 3 — Comparative table of tests	18

1 Scope

This British Standard prescribes those special rules which, in conjunction with the general rules contained in section 2 of BS 9520:1983, are required for the preparation of detail specifications for two-part printed board electrical connectors and board-mounted transition devices of assessed quality for d.c. and l.f. applications at the full and basic assessment levels.

NOTE A board-mounted transition device provides insulation displacement connection between ribbon cable or discrete wires and printed boards, using non-removable through-board solder terminations having in-line or staggered pitch configurations.

2 General

2.1 Contacts. Connectors designed to intermate, but which differ in having removable or non-removable contacts with solder, crimp, wire-wrap, push-on, insulation displacement, press-fit, etc., terminations, may be included in one detail specification. The types of contact shall be indicated in the title of the connector specification, and for removable contacts the direction of release and removal from the connector e.g. front release, rear removable, shall be stated.

Removable contacts shall be defined in connector detail specifications by means of outline drawings and shall be identified either:

- a) by reference to the contact detail specification to which the contacts are qualified in the series BS 9521 "*Specification for removable contacts of assessed quality for electrical connectors*" as defined in BS 9520 "*Generic data, methods of test and rules for the preparation of detail specifications*", e.g. BS 9521 F0001; or
- b) by means of digits indicating contact size (if applicable), wire accommodation and contact/termination style, preceded by the connector pattern number, e.g. 9525 F000X/20-20M; or
- c) where a) or b) cannot be applied, by an accessory style number.

2.2 Assessment level. The detail specification shall show the relevant assessment level, basic, full etc., (see 2.1.4 of BS 9520). Each detail specification shall refer to only one assessment level.

The performance of connectors is normally only assessed with mated pairs from the same manufacturer and in such cases the detail specification shall include a statement to this effect.

However, when enhanced compatibility assessment is required by a detail specification, the following additional design criteria shall be incorporated in the appropriate drawings of that detail specification.

a) **Female contact holding force.**

- 1) Both a maximum value and a minimum value shall be specified.
- 2) The sizing and holding force gauges shall be finished to the standard specified in the detail specification for the male contact.
The method for control of the gauges shall be stated on the drawing, e.g. calibration etc.
- 3) The number of samples subjected to the test shall be 10 % of the total number of contacts, with a minimum of 20 contacts.
- 4) The surface finish of the sizing gauge shall be equal to the maximum permitted for a male contact.
- 5) The surface finish of the holding gauge shall be equal to the minimum permitted for a male contact.

b) **Contact tip profile definition.**

- 1) **Male contacts.** The tip radius or chamfer and the length over which it acts shall be specified.
- 2) **Female contacts.** When the male contact may come into contact with the entry of the female contact, then a minimum chamfer or radius of the female contact entry shall be specified.

c) **Contact active zone profile.**

- 1) The design of the active zones of the male and female contacts shall be such as to avoid regions of localized high pressure, e.g. edge contact, produced by burrs, lack of alignment of mating faces.
- 2) The wiped active zone of both male and female contacts shall be specified for minimum and maximum material conditions.
- 3) The surface finish of the wiped active zone of male contacts shall be specified.

d) **Contact active zone finish.**

In addition to specifying "hard acid gold alloy of 98 % purity or approved compatible alternative", for plated finishes there shall also be control of the hardening agent.

Example. (Co, Ni, or Fe) shall be 0.15 % to 0.3 % by weight, of one of the three quoted elements. The total content of the other two quoted elements shall be less than 0.01 % by weight. Potassium shall be 0.15 % by weight minimum.

This “enhanced compatibility” feature shall be specified on the page 5 of the detail specification, and may be applied to either basic or full assessment.

In cases where a manufacturer produces only one half of a mated connector, such connectors may be tested with an approved mating part to demonstrate functional compatibility. In such cases, the detail specification shall include a statement to this effect.

In cases where two or more manufacturers wish to include a claim of functional compatibility of differing connector styles, and their connectors are tested to demonstrate such compatibility, the detail specification shall identify the appropriate agreed tests and include a statement to this effect.

2.3 Title. Connectors to detail specifications in this series have the following titles.

“Multi-contact two-part printed board electrical connectors”

“Multi-termination board-mounted transition devices”

Typical supplementary information in a title is as follows.

(For two-part connectors): “Non-removable contacts, and through-board, solder and wire-wrap terminations”

(For transition devices): “Non-removable through-board solder terminations”

See the detail specifications quoted in the foreword as examples for the method of presentation of information required to be shown on the page 5.

(See also BS 9000-1 and PD 9004, Circular Letters No. 15 and 16.)

2.4 Pattern number. The pattern number of a connector or range of connectors shall consist of the relevant detail specification number without the letters BS e.g. 9525 F0004.

2.5 Description of the connector and intended application. The description of the connector shall make reference to the method of coupling, polarization, contact type (crimp, solder, etc., removable, non-removable), material or finish, and range of wire and insulation sizes.

For connectors having removable contacts the manner of insertion, release and removal of the contacts shall be stated. Where compliance with the detail specification is dependent on a full complement of contacts being fitted and/or by the use of dummy contacts or unwired contacts with filler plugs, this shall be stated.

The description of intended application shall make reference to the major performance characteristics of the connector, such as non-sealed or sealed, e.g. barrier or barrier and panel sealed, environment resistant, screened or unscreened, etc., and attention may also be drawn to particular uses, e.g. rack and panel or inter-chassis applications.

(See also 2.1.4 of BS 9520.)

2.6 Marking of the connector and package. The detail specification shall state that the marking shall be in accordance with 1.1.6 of BS 9520. The individual reference number required by 1.1.6 c) of BS 9520 consists of abbreviations to identify individual connectors, accessories and tools. It is not intended that this reference number shall describe every feature of the connector. An explanation of the reference shall be included in each detail specification similar to the following:

2.6.1 Connector reference numbers

	<u>B</u> <u>5XXX</u> <u>XXX</u> <u>X</u> <u>X</u> <u>X</u> <u>X</u>
Style number	_____
Contact arrangement	_____
Contact style	_____
Termination style	_____
Polarization (coding)	_____
Variant	_____

Style number:	A letter B, denoting two-part printed board connector, followed by four digits. A typical description of a style is B 5100: Connector, fixed. (The detail specification shall designate style and shall relate this number to a control drawing in the CC or FC series, e.g. CC/B 5100)
Contact arrangement:	Digits denoting the number of contact positions in a connector, e.g. 017, 096 etc. These arrangements shall be shown in the outline drawing section of the detail specification.
Contact:	M = male contact F = female contact H = hermaphrodite contact
Termination style:	C = crimp L = through-board solder (90°) E = through-board solder (90°, extra long tail) S = solder for wire T = through-board solder V = solder for double-sided board, edge mounted W = wire wrap (3 wraps) Z = wire wrap (2 wraps) X = hybrid arrangement to user's requirement
Polarization (coding):	A letter or digit denoting a particular arrangement of a polarizing feature. This shall be omitted where no alternative exists.
Variant:	A digit to denote any variation from the basic specification, e.g. termination style, contact finish, moulding etc. Detail specification shall designate variants. Where no variant exists 0 shall be used. "X" shall be used to denote special user requirement.
Example connector reference number:	B 5003 041 M W A O

NOTE Application of the above letter references is mandatory but not exhaustive, and additional letters may be used in the detail specification if necessary. Also, the above primary tabulation form shall be used wherever possible. However, if additional characteristics have to be specified, e.g. termination length/diagonal/cross-section, contact pitch, contact loading etc., see detail specification BS 9525 F0004 as an example of an approved alternative form.

2.6.2 Accessory and tool reference numbers

A(orT) XXXX XX X

Style number _____

Housing shell size _____
or contact size

Variant _____

Style number:	A letter A denoting accessory or letter T denoting tool, followed by the prescribed digits. A typical description of a style is A2468 mounting accessory or T3579/2 contact removal tool. (The detail specification shall designate styles and shall relate this number to a control drawing in the CC or FC series, e.g. CC/A2468 CC/T2018.)
Termination style/size:	Two digits (quoted for accessories where applicable).
Contact size:	Two digits (quoted for tools where applicable).
Variant:	Quoted for accessories. Digit as for connector in 2.6.1.
Example accessory tool reference numbers:	A 2468 18 0 T 3579/2
Example removable contact reference numbers:	BS 9521 F000X 20 20 M [See 2.1 a)] BS 9525 F000X 20 20 M [see 2.1 b)] A2466 [See 2.1 c)]

2.6.3 Connector supplied complete with accessory. Where a connector is supplied complete with an accessory, the accessory reference number is added to that of the connector, e.g. C1234 20 41 MNO A 2468.

2.6.4 Packaging. Packaging shall include upon request the manufacturer's assembly instructions, including wire preparation crimping and contact insertion details.

2.7 Ordering information. For ordering information see 2.4 of BS 9520.

2.8 Drawings. The detail specification shall contain drawings in appendices as required by 2.1.5 and Appendix A of BS 9520.

2.9 Ratings (including limiting conditions of use). The following ratings shall be stated (in accordance with 1.1.12 of BS 9520) and the applicability requirements of Table 1 and Table 2 of this specification.

2.9.1 Electrical. A recommended maximum working current per individual contact size (in isolation) at a specified ambient temperature.

Maximum current per contact (for each contact size) through all contacts simultaneously at a specified ambient temperature.

Working and proof voltages shall be given for stated air pressure(s).

2.9.2 Environmental

- a) Climatic classification
- b) Low air pressure severity
- c) Vibration severity
- d) Bump severity
- e) Shock severity
- f) Acceleration severity¹⁾

¹⁾ Where applicable.

2.9.3 Endurance

- a) Mechanical operation²⁾
- b) Electrical load and temperature: long term (at stated current and temperature)
- c) Electrical load and temperature: short term (no electrical load and at upper temperature severity)

2.10 Characteristics. The following characteristics shall be stated (in accordance with 1.1.12 of BS 9520), and the conditions under which they apply. Initial and final values shall both be stated where differences after conditioning are permitted.

2.10.1 Electrical

- a) Maximum contact resistance
- b) Minimum insulation resistance

2.10.2 Mechanical

- a) Connector maximum engaging and separating forces, and minimum separating forces
- b) Contact retention (in insert) (moulding): test load
- c) Contact holding force
- d) Wire accommodation

2.10.3 Resistance to fluids. The detail specification shall state the fluids to which resistance is claimed. See BS 2011-2.1R, Tables 1 and 2.

2.11 Certified test records (for full assessment level only). See Appendix C of BS 9000 for an example layout.

2.12 Additional information. Additional drawings, notes etc., needed for the clarification of the detail specification may be given. This information is not required to be verified by the inspection requirements.

3 Quality assessment procedure

3.1 Selection of specimens

The specimens for each subgroup should contain representative styles and the smallest, medium and largest size for which approval is sought. The overall sample shall include the greatest contact density for each voltage and current rating for which approval is sought in these sizes. For group D the detail specification shall include a table which indicates the combinations of connectors and accessories to be used in each set and which set is to be tested in which subgroup(s).

3.1.1 Full assessment level

- a) For subgroup D0, one specimen of each piece part of the connector range submitted for approval. For subgroup D1, three specimens of connector for each reference number. However, this may be modified provided a sampling plan, agreed with the National Supervising Inspectorate (NSI), is appended to the detail specification. The layout of this should preferably be similar to that in Appendix C of the detail specifications quoted as examples (BS 9525 N0001 or F0004).
- b) The minimum sample for subgroups D2 to D9³⁾ inclusive is sixty specimen mated pairs complete with appropriate accessories. The minimum number of specimens for each of the subgroups D2, D3, D4, D5 and D6 is fifteen pairs, subgroup D3 samples may be used for subgroup D4. For subgroups D7 and D9³⁾ it is five mated pairs; for subgroup D8(i) it is three mated pairs and these can be taken from the subgroup D2 test samples. For subgroup D8(ii) it is two mated pairs and these shall be selected from the larger sizes of subgroup D2 test samples. Alternatively, separate samples may be used for subgroup D8(ii) tests.

3.1.2 Basic assessment level

- a) For subgroup D0, one specimen of each piece part required for the connector range submitted for approval. For subgroup D1, three specimens of connector for each reference number. However, this may be modified provided that a sampling plan, agreed with the NSI, is appended to the detail specification. The layout of this should preferably be similar to that in Appendix C of the detail specification (BS 9525 N0001 or F0004).

²⁾ A separate lower endurance level may be set for coupling/locking devices.

³⁾ For subgroup D9, one specimen pair is required for each fluid specified, and a larger sample will be required if more than five fluids are specified. The extra specimens may be taken from those used for subgroup D5.