BRITISH STANDARD

BS 5057:1992
IEC 760:1989
Incorporating
Amendment No. 1

Specification for

Flat, quick-connect terminations

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Components Standards Policy Committee (ECL/-) to Technical Committee ECL/21, upon which the following bodies were represented:

British Telecommunications plc

Electronic Components Industry Federation

EEA (The Association of Electronics Telecommunications and Business Equipment Industries)

Ministry of Defence

National Supervising Inspectorate

Society of British Aerospace Companies Ltd.

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)

This British Standard, having been prepared under the direction of the Electronic Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on
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The following BSI references relate to the work on this standard:
Committee reference ECL/21
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Amendments issued since publication

Amd. No.	Date	Comments
8056	February 1994	Indicated by a sideline in the margin

Contents

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee. It is identical with IEC 760:1989 *Flat, quick-connect terminations* including Amendment 1:1993 published by the International Electrotechnical Commission (IEC). It supersedes BS 5057:1988, which was identical with IEC 760:1983 and which is withdrawn.

IEC 760:1989 was prepared by IEC Sub-Committee 48B: Connectors, of IEC Technical Committee No. 48: Electromechanical components for electronic equipment. The United Kingdom participation in the drafting was provided by Sub-Committee ECL/21/2 "LF Connectors" of Technical Committee ECL/21 "Electromechanical components for electronic equipment."

Any reference to IEC page numbers in the text should be ignored. Refer to the contents on pages i and ii for the page numbers of the tables and figures.

Cross-references

International standard	Corresponding British Standard
	BS 2011 *Environmental testing*
IEC 68-1:1988	Part 1.1:1989 *General and guidance* (Identical)
IEC 68-2-20:1979	Part 2.IT:1981 *Test T. Soldering* (Identical)
	BS 5772 *Basic testing procedures and measuring methods for electromechanical components for electronic equipment*
IEC 512-3:1976	Part 3:1979 *Current-carrying capacity tests* (Identical)
IEC 512-5:—	Part 5:1979 *Impact tests (free components), static load tests (fixed components), endurance tests and overload tests* (Identical)
IEC 512-8:1984	Part 8:1985 *Connector tests (mechanical) and mechanical tests on contacts and terminations* (Identical)

The Technical Committee has reviewed the provisions of IEC 512-2:1985 and IEC 512-7:1988, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

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 to iv, pages 1 to 28, an inside back cover 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.

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1 Scope

This International Standard is applicable to flat quick-connect terminations consisting of male tabs with hole or dimple detents and the mating female connectors. For reasons of safety, it is recommended that quick-connect terminations beyond the scope of this standard shall not be interchangeable with those listed in Clause 4. This standard establishes uniform requirements for the dimensions, performance characteristics and test program.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 68-1(1988), *Environmental testing, Part 1: General and guidance.*

IEC 68-2-20(1979), *Basic environmental testing procedures, Part 2: Tests–Test T: Soldering.*

IEC 512-2(1985), *Electromechanical components for electronic equipment; basic testing procedures and measuring methods, Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests.*

IEC 512-3(1976), *Part 3: Current-carrying capacity tests.*

IEC 512-5(—), *Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests.*

IEC 512-7(1988), *Part 7: Mechanical operating tests and sealing tests.*

IEC 512-8(1984), *Part 8: Connector tests (mechanical) and mechanical tests on contacts and terminations.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1
quick-connect terminations

an electrical connection consisting of a male tab and female connector which can be readily inserted and withdrawn without the use of tools

3.2
test tab

a male tab manufactured to close tolerances for the specific purpose of conducting mechanical tests with production female connectors. The use of test tabs has been found to produce more consistent test results

3.3
male tab

that portion of a quick-connect termination which receives the female connector

3.4
female connector

that portion of a quick-connect termination which is pushed onto the male tab

3.5
detent

a dimple (depression) or hole in the male tab which acts to engage a raised portion on the female connector, thus providing a latch for the mating parts

3.6
reference point

a specially marked point, used when making electrical test measurements

4 Classification into groups

Flat quick-connect terminations are classified into groups according to the nominal width of the male tabs. This standard covers the following groups:

2.8 mm (0.110 in) series.

4.8 mm (0.187 in) series.

5.2 mm (0.205 in) series (not recommended for new designs).

6.3 mm (0.250 in) series.

9.5 mm (0.375 in) series.

5 Values of current

The currents shown in Figure 8, are for test purposes only. Operating values depend upon the application and can be estimated through an analysis of the curves shown on Figure 14, Figure 15, Figure 16, Figure 17, Figure 18 and Figure 19.

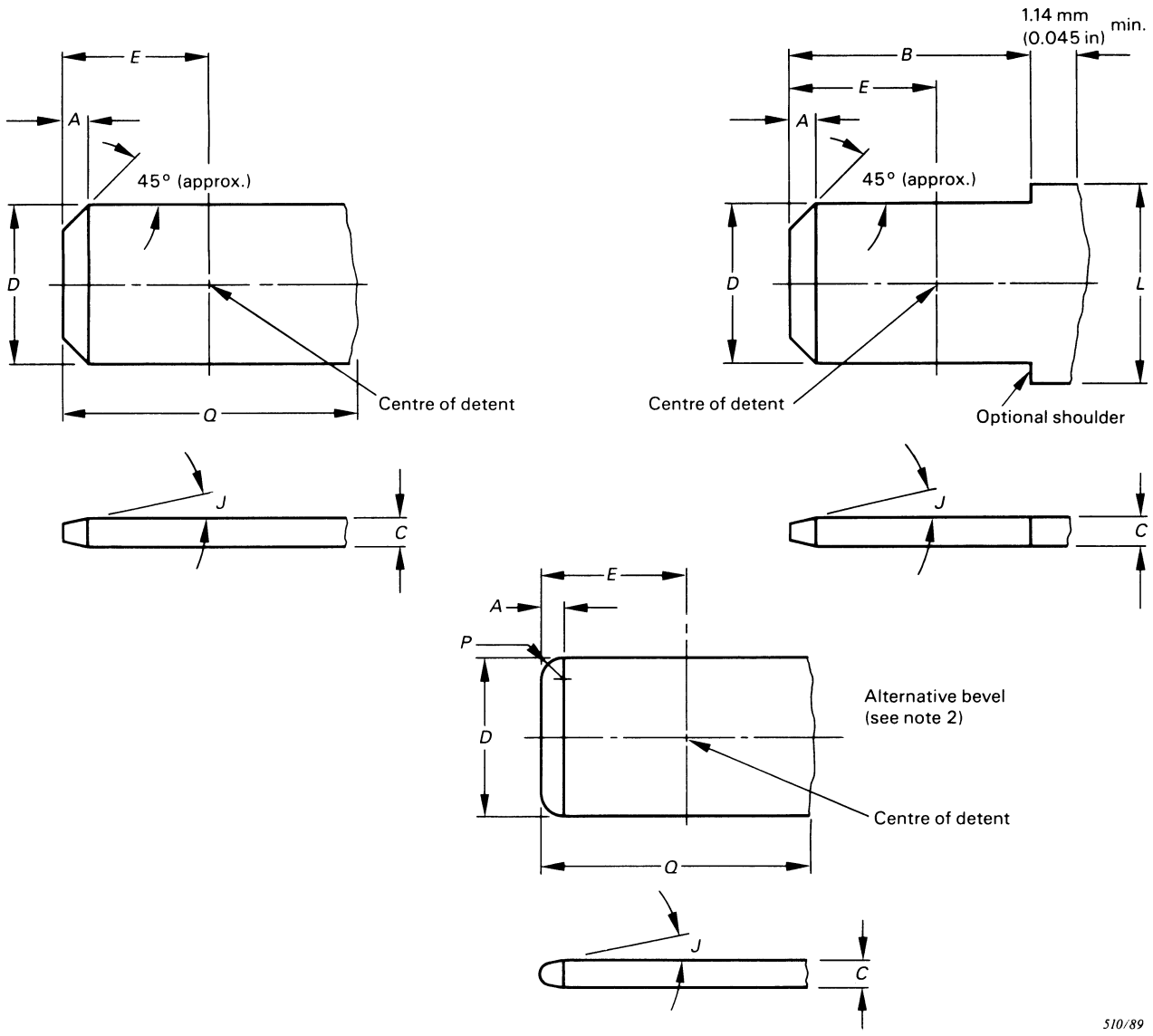
6 Marking

Each male tab or female connector shall have the following information clearly and indelibly marked upon it:

Mark of origin (manufacturer's name or trade mark).

7 Dimensions

The dimensions of the male tabs and female connectors shall comply with those specified herein. Dimensions for male tabs are presented in Figure 1, Figure 2a, Figure 2b and Figure 3. Dimensions for the female connectors are given in Figure 4 and Figure 4a. The shape of the various parts may deviate from those given in the figures, provided that the specified dimensions are not influenced. The dimensions are intended to permit production in either the millimetre or inch system of units.



NOTE 1 For detent dimensions *ØF, M* and *N*, see Figure 2a, Figure 2b and Figure 3.

NOTE 2 Bevel $A \times 45°$ need not be a straight line if it is within the confines shown, or it may be a segment of a circle having a radius *P* and a segment altitude *A*.

NOTE 3 All portions of the tabs shown shall be flat and free of burrs or raised plateaus, except that there may be a raised plateau over the stock thickness of 0.025 mm (0.001 in) per side, in an area defined by a line surrounding the detent and distant from it by 1.3 mm (0.051 in).

NOTE 4 Dimension *L* is not specified and may vary as required by the application.

NOTE 5 The material shall be half-hard cartridge brass, hardness 62 ± 7 Rockwell 30T, or other material of equivalent hardness.

Figure 1 — Dimensions of male tabs (see also Figure 2a, Figure 2b and Figure 3)

Table Ia — Dimensions of male tabs (millimetres)

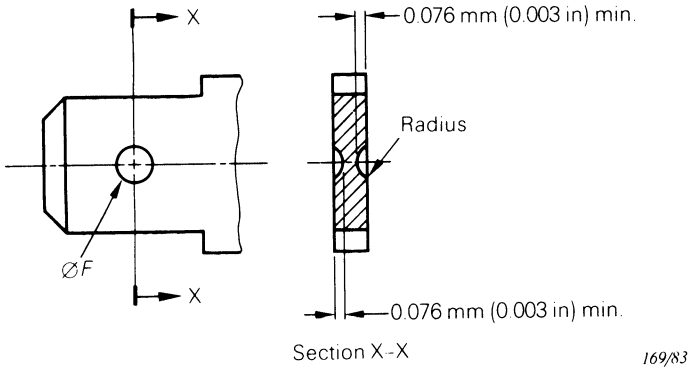
Nominal size	A	B (min.)	C	D	E	ØF	J	M	N	P	Q (min.)
2,8 × 0,5	0,6		0,54	2,90	1,8	1,3	12°	1,7	1,4	1,4	
with dimple	0,3	7,0	0,47	2,70	1,3	1,1	8°	1,4	1,0	0,3	8,1
2,8 × 0,5	0,6		0,54	2,90	1,8	1,3	12°			1,4	
with hole	0,3	7,0	0,47	2,70	1,3	1,1	8°	—	—	0,3	8,1
2,8 × 0,8	0,6		0,84	2,90	1,8	1,3	12°	1,7	1,4	1,4	
with dimple	0,3	7,0	0,77	2,70	1,3	1,1	8°	1,4	1,0	0,3	8,1
2,8 × 0,8	0,6		0,84	2,90	1,8	1,3	12°			1,4	
with hole	0,3	7,0	0,77	2,70	1,3	1,1	8°	—	—	0,3	8,1
4,8 × 0,5	0,9		0,54	4,80	2,8	1,5	12°	1,7	1,5	1,7	
with dimple	0,6	6,2	0,47	4,60	2,3	1,3	8°	1,4	1,2	0,6	7,3
4,8 × 0,5	0,9		0,54	4,90	3,4	1,5	12°			1,7	
with hole	0,6	6,2	0,47	4,67	3,0	1,3	8°	—	—	0,6	7,3
4,8 × 0,8	1,0		0,84	4,80	2,8	1,5	12°	1,7	1,5	1,8	
with dimple	0,7	6,2	0,77	4,60	2,3	1,3	8°	1,4	1,2	0,7	7,3
4,8 × 0,8	1,0		0,84	4,90	3,4	1,5	12°			1,8	
with hole	0,6	6,2	0,77	4,67	3,0	1,3	8°	—	—	0,7	7,3
5,2 × 0,5[a]	1,0		0,54	5,30	2,8	1,9	12°	2,5	2,0	1,7	
with dimple	0,7	6,2	0,47	5,10	2,3	1,6	8°	2,2	1,8	0,6	7,3
5,2 × 0,5[a]	1,0		0,54	5,30	3,4	1,9	12°			1,7	
with hole	0,7	6,2	0,47	5,10	3,0	1,6	8°	—	—	0,6	7,3
5,2 × 0,8[a]	1,0		0,84	5,30	2,8	1,9	12°	2,5	2,0	1,8	
with dimple	0,7	6,2	0,77	5,10	2,3	1,6	8°	2,2	1,8	0,7	7,3
5,2 × 0,8[a]	1,0		0,84	5,30	3,4	1,9	12°			1,8	
with hole	0,7	6,2	0,77	5,10	3,0	1,6	8°	—	—	0,7	7,3
6,3 × 0,8	1,0		0,84	6,40	4,1	2,0	12°	2,5	2,0	1,8	
with dimple	0,7	7,8	0,77	6,20	3,6	1,6	8°	2,2	1,8	0,7	8,9
6,3 × 0,8	1,0		0,84	6,40	4,7	2,0	12°			1,8	
with hole	0,5	7,8	0,77	6,20	4,3	1,6	8°	—	—	0,7	8,9
9,5 × 1,2	1,3		1,23	9,60	5,5	2,0	14°			2,0	
with hole	0,7	12,0	1,17	9,40	4,5	1,7	6°	—	—	1,0	13,1

[a] Not recommended for new designs.

Table Ib — Dimensions of male tabs (inches)

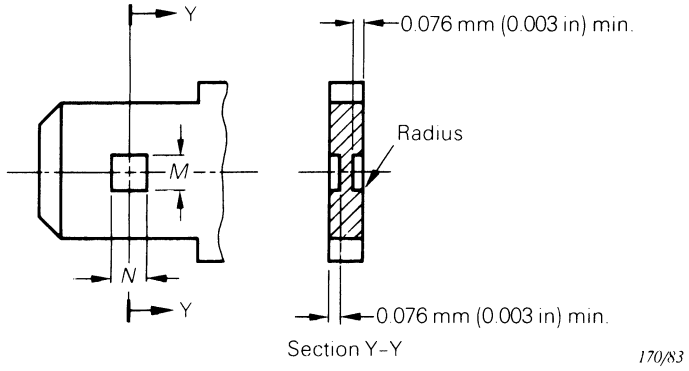
Nominal size	A	B (min.)	C	D	E	ØF	J	M	N	P	Q (min.)
0,110 × 0,020	0,024		0,021	0,114	0,071	0,051	12°	0,067	0,055	0,055	
with dimple	0,012	0,275	0,019	0,106	0,051	0,043	8°	0,055	0,039	0,012	0,319
0,110 × 0,020	0,024		0,021	0,114	0,071	0,051	12°			0,055	
with hole	0,012	0,275	0,019	0,106	0,051	0,043	8°	—	—	0,012	0,319
0,110 × 0,032	0,024		0,033	0,114	0,071	0,051	12°	0,067	0,055	0,055	
with dimple	0,012	0,275	0,030	0,106	0,051	0,043	8°	0,055	0,039	0,012	0,319
0,110 × 0,032	0,024		0,033	0,114	0,071	0,051	12°			0,055	
with hole	0,012	0,275	0,030	0,106	0,051	0,043	8°	—	—	0,012	0,319
0,187 × 0,020	0,035		0,021	0,190	0,110	0,060	12°	0,067	0,059	0,067	
with dimple	0,024	0,244	0,019	0,181	0,091	0,050	8°	0,055	0,047	0,024	0,287
0,187 × 0,020	0,035		0,021	0,193	0,134	0,060	12°			0,067	
with hole	0,024	0,244	0,019	0,184	0,117	0,050	8°	—	—	0,024	0,287
0,187 × 0,032	0,040		0,033	0,190	0,110	0,060	12°	0,067	0,059	0,071	
with dimple	0,027	0,244	0,030	0,181	0,091	0,050	8°	0,055	0,047	0,027	0,287
0,187 × 0,032	0,040		0,033	0,193	0,134	0,060	12°			0,071	
with hole	0,024	0,244	0,030	0,184	0,117	0,050	8°	—	—	0,027	0,287
0,205 × 0,020[a]	0,040		0,021	0,210	0,110	0,075	12°	0,098	0,080	0,067	
with dimple	0,027	0,244	0,019	0,201	0,091	0,063	8°	0,086	0,070	0,024	0,287
0,205 × 0,020[a]	0,040		0,021	0,210	0,134	0,075	12°			0,067	
with hole	0,027	0,244	0,019	0,201	0,117	0,063	8°	—	—	0,024	0,287
0,205 × 0,032[a]	0,040		0,033	0,210	0,110	0,075	12°	0,098	0,080	0,071	
with dimple	0,027	0,244	0,030	0,201	0,091	0,063	8°	0,086	0,070	0,027	0,287
0,205 × 0,032[a]	0,040		0,033	0,210	0,134	0,075	12°			0,071	
with hole	0,027	0,244	0,030	0,201	0,117	0,063	8°	—	—	0,027	0,287
0,250 × 0,032	0,040		0,033	0,253	0,161	0,080	12°	0,098	0,080	0,071	
with dimple	0,027	0,307	0,030	0,244	0,142	0,063	8°	0,086	0,070	0,027	0,350
0,250 × 0,032	0,040		0,033	0,253	0,186	0,080	12°			0,071	
with hole	0,020	0,307	0,030	0,244	0,169	0,063	8°	—	—	0,027	0,350
0,375 × 0,047	0,051		0,048	0,379	0,217	0,080	14°			0,080	
with hole	0,027	0,472	0,046	0,370	0,177	0,067	6°	—	—	0,039	0,516

[a] Not recommended for new designs.



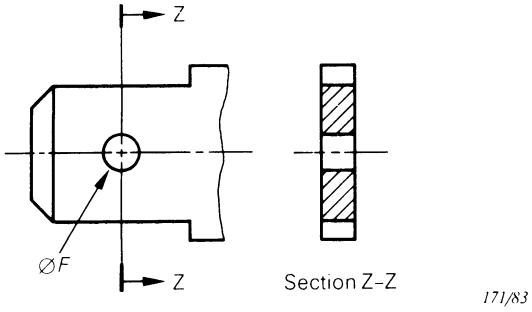
Detent shall be located within 0.076 mm (0.003 in) of the centre-line of the tab.

Figure 2a — Dimensions of round dimple detents (see Figure 1)



Detent shall be located within 0.13 mm (0.005 in) of the centre-line of the tab.

Figure 2b — Dimensions of rectangular dimple detents (see Figure 1)



Detent shall be located within 0.076 mm (0.003 in) of the centre-line of the tab.

Figure 3 — Dimensions of hole detents (see Figure 1)

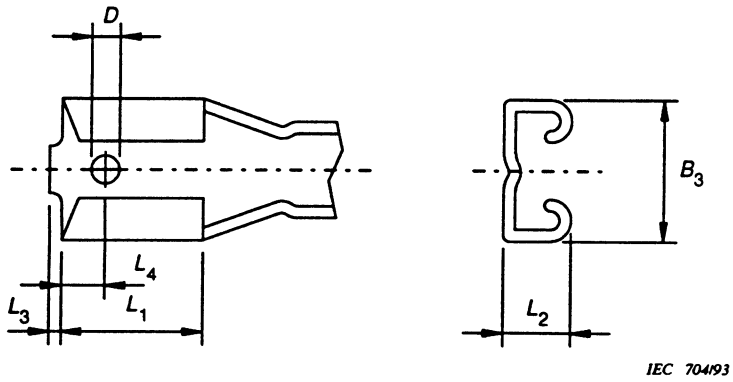


Figure 4 — Dimensions of female connectors

Table IIa — Dimensions of female connectors (millimetres) (see Figure 4)

Connector for tab size	D (max.)	B_3 (max.)	L_1 (max.)	L_2 (max.)	L_3 (max.)	L_4
2,8 × 0,5	1,2	3,8	6,6 6,0	2,3	0,5	b
2,8 × 0,8	1,2	3,8	6,6 6,0	2,3	0,5	b
4,8 × 0,5	1,2	6,0	6,6 6,0	2,9	0,5	b
4,8 × 0,8	1,2	6,0	6,6 6,0	2,9	0,5	b
5,2 × 0,5[a]	1,6	6,5	6,6 6,0	2,9	0,5	b
5,2 × 0,8[a]	1,6	6,5	6,6 6,0	2,9	0,5	b
6,3 × 0,8	1,6	7,8	8,1 7,5	3,5	0,5	b
9,5 × 1,2	1,6	11,1	12,2 10,9	4,0	0,5	b

[a] Not recommended for new designs.
[b] Dimension L_4 at the manufacturer's discretion.

Table IIb — Dimensions of female connectors (inches) (see Figure 4)

Connector for tab size	D (max.)	B_3 (max.)	L_1	L_2 (max.)	L_3 (max.)	L_4
0,110 × 0,020	0,048	0,150	0,260 0,236	0,091	0,020	b
0,110 × 0,032	0,048	0,150	0,260 0,236	0,091	0,020	b
0,187 × 0,020	0,047	0,236	0,260 0,236	0,115	0,020	b
0,187 × 0,032	0,047	0,236	0,260 0,236	0,115	0,020	b
0,205 × 0,020[a]	0,063	0,256	0,260 0,236	0,115	0,020	b
0,205 × 0,032[a]	0,063	0,256	0,260 0,236	0,115	0,020	b
0,250 × 0,032	0,063	0,307	0,319 0,295	0,138	0,020	b
0,375 × 0,047	0,063	0,438	0,480 0,429	0,157	0,020	b

[a] Not recommended for new designs.
[b] Dimension L_4 is at the manufacturer's discretion.

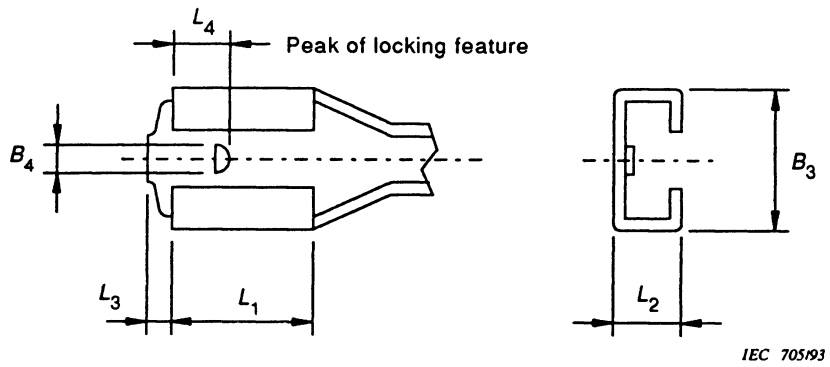


Figure 4a — Dimensions of female connectors, alternative design

Table IIIa — Dimensions of alternative design female connectors (millimetres) (see Figure 4a)

Connector for tab size	B_3 (max.)	B_4 (max.)	L_1	L_2 (max.)	L_3 (max.)	L_4 (max.)
2,8 × 0,5			(Under consideration)			
2,8 × 0,8			(Under consideration)			
4,8 × 0,5[a]	6,2	1,3	6,6 6,1	1,9	1,4	b
4,8 × 0,8	6,2	1,3	6,6 6,1	2,3	1,4	b
5,2 × 0,5[a]			(Under consideration)			
5,2 × 0,8[a]			(Under consideration)			
6,3 × 0,8	7,8	1,7	8,2 7,7	2,3	1,4	b
9,5 × 1,2			(Under consideration)			

[a] Not recommended for new designs.
[b] Dimension L_4 is at the manufacturer's discretion

Table IIIb — Dimensions of alternative design female connectors (inches) (see Figure 4a)

Connector for tab size	B_3 (max.)	B_4 (max.)	L_1	L_2 (max.)	L_3 (max.)	L_4 (max.)
0,110 × 0,020			(Under consideration)			
0,110 × 0,032			(Under consideration)			
0,187 × 0,020[a]	0,245	0,051	0,260 0,240	0,075	0,055	[b]
0,187 × 0,032	0,245	0,051	0,260 0,240	0,091	0,055	[b]
0,205 × 0,020[a]			(Under consideration)			
0,205 × 0,032[a]			(Under consideration)			
0,250 × 0,032	0,307	0,067	0,323 0,307	0,091	0,055	[b]
0,375 × 0,047			(Under consideration)			

[a] Not recommended for new designs.
[b] Dimension L_4 is at the manufacturer's discretion.

8 Type tests

The following tests from IEC 512 shall be carried out for type testing of products designed to conform to the requirements of this standard.

Table IV — Type tests

Title of test	Test No.	IEC Standard No.
Visual examination	1a	512-2
Examination of dimension and mass	1b	512-2
Contact resistance — Specified test current method	2b	512-2
Temperature rise	5a	512-3
Current loading, cyclic	9e[a]	512-5
Insertion and withdrawal forces	13b	512-7
Tensile strength (crimped connection)	16d	512-8

[a] This test is in preparation and will be part of IEC 512-5.

9 Test conditions

Unless otherwise specified, all tests shall be carried out under standard atmospheric conditions for testing as specified in IEC 68-1.

Temperature rise, contact resistance and current loading, cyclic tests shall be conducted in still air, i.e. airflow less than 10 m/min at room temperature.

Before the measurements are made, the test specimens shall be preconditioned under standard atmospheric conditions for testing for a time sufficient to allow the entire component to reach thermal stability.

The ambient temperature and the relative humidity at which the measurements are made shall be stated in the test report.

10 Test specimens

10.1 The tests shall be carried out with male tabs and female connectors as received from the supplier. In no case shall the test specimens be cleaned or otherwise prepared prior to test unless explicitly required.

10.2 Male tabs and female connectors shall preferably be made from the same material. When different materials are used, reference shall be made to the figures for applicable values.

10.3 Crimp terminations shall be crimped to the associated wire with a crimping tool which has been adjusted in accordance with the manufacturer's recommendations.

10.4 Sixty-four test specimens are required for each tab size and wire size. All test specimens are to be subjected to visual and dimensional examination prior to wiring. Ten test specimens of each tab size to be tested for insertion and withdrawal force need not be wired. Test specimens for contact resistance, temperature rise, current loading, cyclic and tensile testing shall be crimped in a normal manner on each end of a 165 mm (6.5 in) length of tin-plated or unplated copper wire having polyvinyl chloride (p.v.c.) insulation 0.8 mm (0.031 in) thick. The wire used shall be as specified by the terminal manufacturer for use with the termination.

10.4.1 Twenty test specimens of each tab size and wire size to be subjected to the contact resistance test shall have a section in the centre of the lead assembly approximately 6 mm (0.25 in) long, stripped and soldered with 60/40 tin lead solder in accordance with Appendix B of IEC 68-2-20. Reference points shall be marked on each double-ended male tab in the positions shown in Figure 5.

10.4.2 Twelve test specimens of each tab size and wire size to be subjected to the temperature rise test shall be fitted with a 0.05 mm^2 (30 AWG[1)]) iron-constantan or other type of thermocouple, placed as shown in Figure 6. The thermocouple junctions shall be joined to the terminals by means of welding or a small amount of solder. Approximately 25 mm (1 in) of the thermocouple wire shall be secured to the test lead for mechanical support. The test specimens shall be arranged and connected as shown in Figure 7.
A 305 mm (12 in) length of the same wire crimped to the connectors shall be included in the circuit as shown in Figure 7.

10.4.3 Twelve test specimens of each tab size and wire size to be subjected to the current loading, cyclic test shall be prepared in accordance with Sub-clauses **10.4.1** and **10.4.2**.

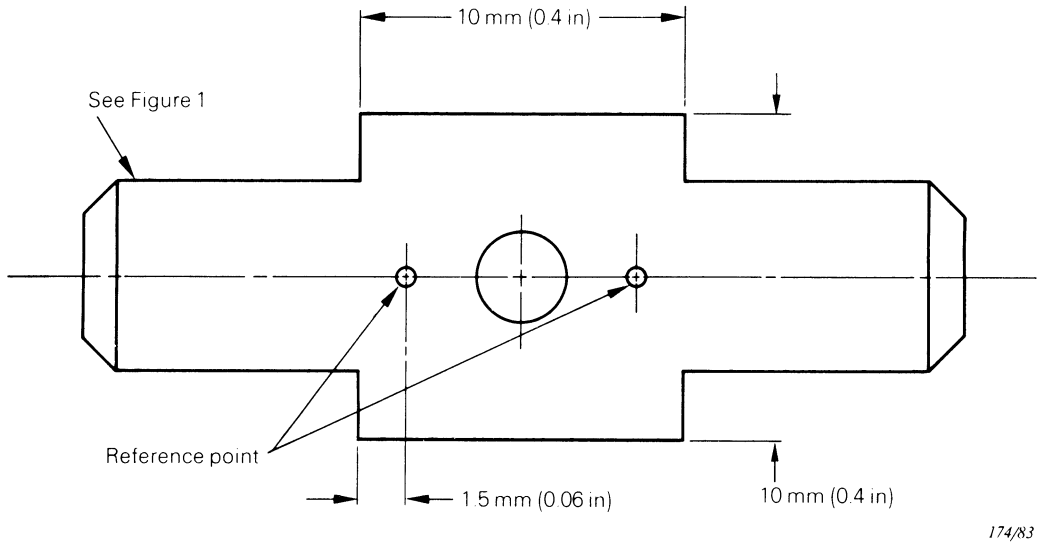


Figure 5 — Double-end tab

[1)] AWG = American Wire Gauge.

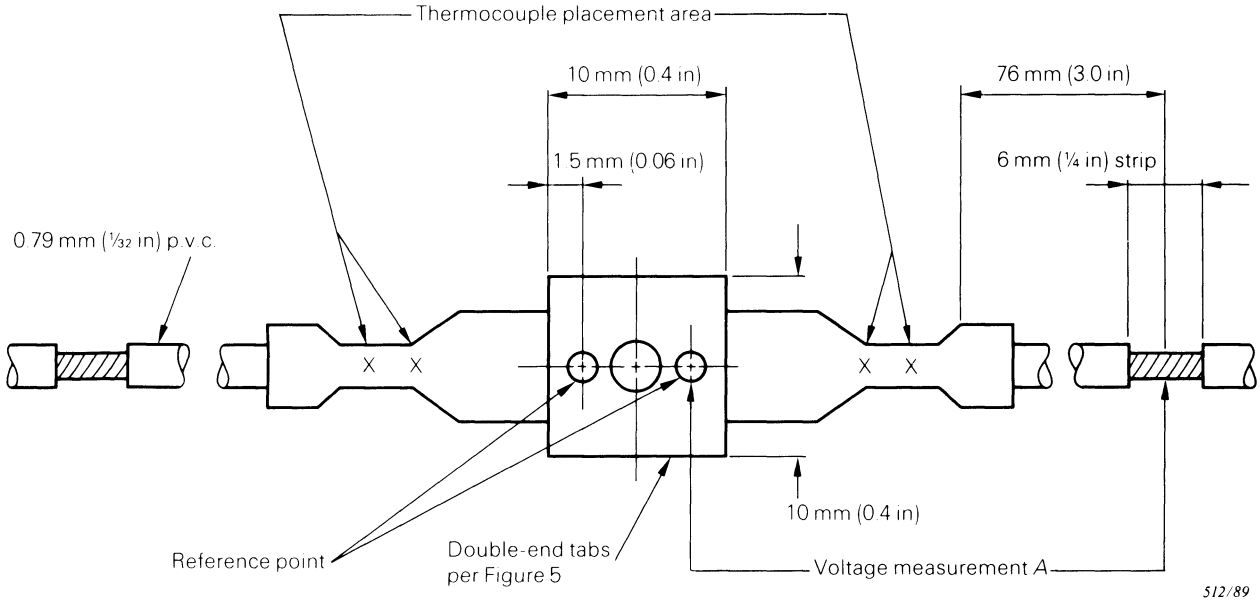


Figure 6 — Location of test points and thermocouples

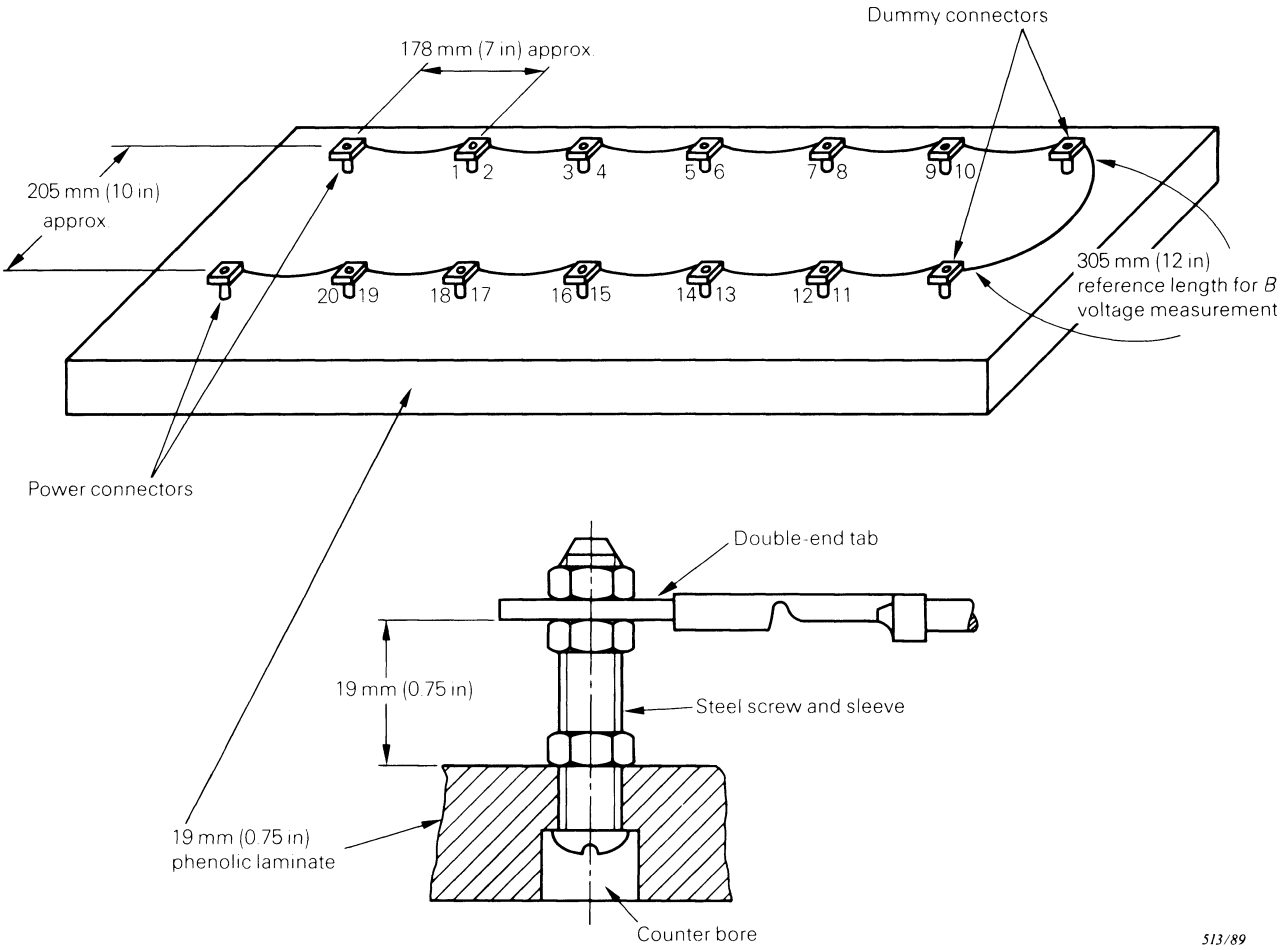


Figure 7 — Connections for electrical tests

11 Visual examination

Visual examination shall be performed in accordance with Test 1a of IEC 512-2, and shall include the following:

11.1 Marking

The marking shall be in accordance with Clause **6** and it shall be legible after any of the specified tests.

11.2 Workmanship

The parts shall be finished in a careful and workmanlike manner.

12 Examination of dimension and mass

This test shall be performed in accordance with Test 1b of IEC 512-2. The dimensions shall be checked and shall comply with Clause **7**.

13 Contact resistance — Specified test current method

13.1 The resistance of each termination (friction joint plus crimp joint) shall be measured in accordance with Test 2b of IEC 512-2 and the following details. The test overload current shall be twice the test current specified in Figure 8. The voltage drop at this overload specified test current shall be measured when thermal equilibrium is reached from the stripped portion of each lead to the reference point on the tab. This is shown as voltage measurement *A* in Figure 6. Twenty measurements are required for each wire size and tab size. The voltage drop at the overload test current shall be measured across the 305 mm (12 in) reference length of lead wire. This is shown as measurement *B* in Figure 7. The resistance of each termination shall be calculated as follows:

measurement A – ¼ measurement B = voltage drop

$$\frac{\text{voltage drop}}{\text{overload test current}} = \text{resistance of termination}$$

13.2 The resistance values derived from these measurements shall not exceed the applicable limits specified in Figure 9, Figure 10, Figure 11 or Figure 12.

14 Temperature rise

This test shall be performed in accordance with Test 5a of IEC 512-3. The 12 test specimens are to be tested as follows:

14.1 The test current shown in Figure 8 shall be passed through the terminations until thermal equilibrium has been established. The temperatures of the connectors and the room temperature shall be measured and recorded.

14.2 The temperature rise of any individual termination shall be calculated as follows and shall not exceed 30 °C;

temperature of connectors – room temperature = temperature rise

15 Current loading, cyclic

This test shall be performed in accordance with Test 9e of IEC 512-5 (see note to Table IV).

15.1 The prepared test specimens shall be subjected to 500 cycles of operation. Each cycle shall consist of 45 min under an overload test current of twice the test current specified in Figure 8, and 15 min at no load. During this test, the following data shall be taken after 24 cycles and at the completion of 500 cycles:

a) Voltage drop at the overload test current measured from the stripped portion of the lead to the reference point on the tab (measurement *A* in Figure 6, page 27).

b) Voltage drop at the overload test current measured across a 305 mm (12 in) section of lead wire (measurement *B* in Figure 7).

c) Temperature of the connectors.

d) Room temperature.

15.2 The resistance of each termination shall be determined as specified in Sub-clause **13.1** and shall not exceed the applicable limits shown in Figure 9, Figure 10, Figure 11 or Figure 12.

15.3 The temperature rise of each termination shall be determined as specified in Sub-clause **14.2** and shall not exceed 85 °C.

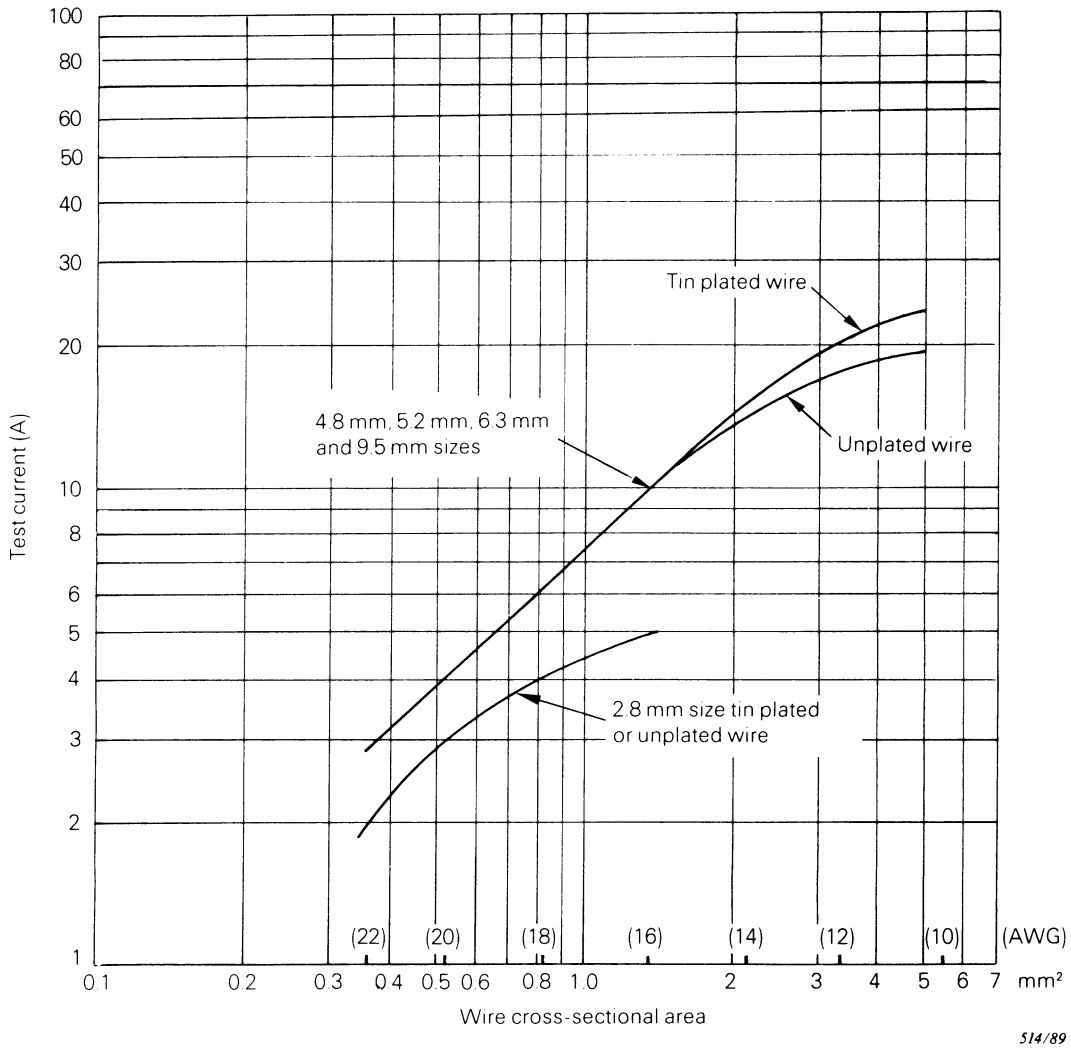


Figure 8 — Test currents for temperature-rise test

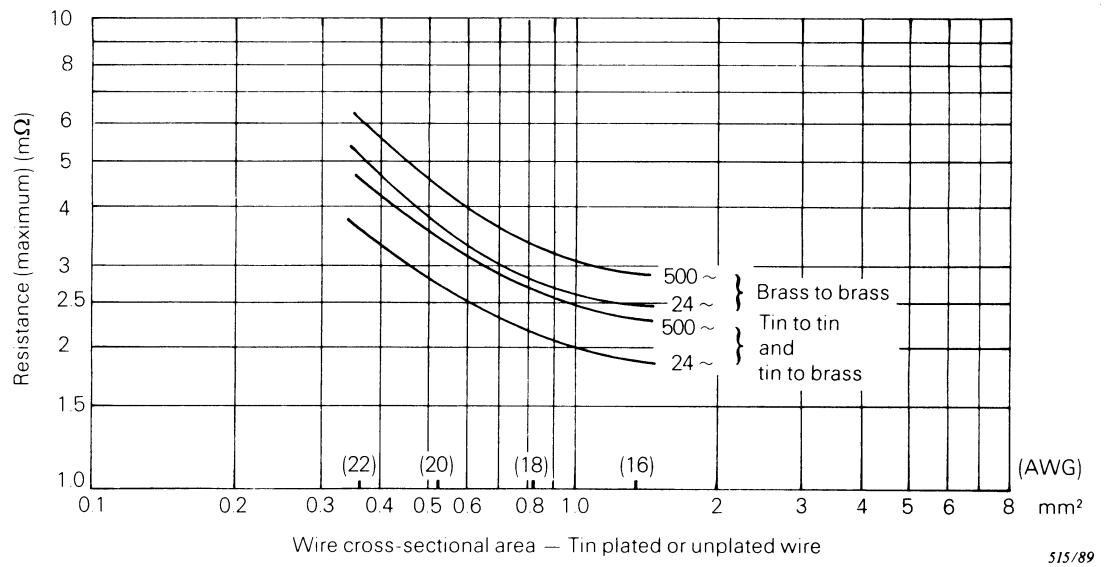


Figure 9 — Contact resistance — 2.8 mm size

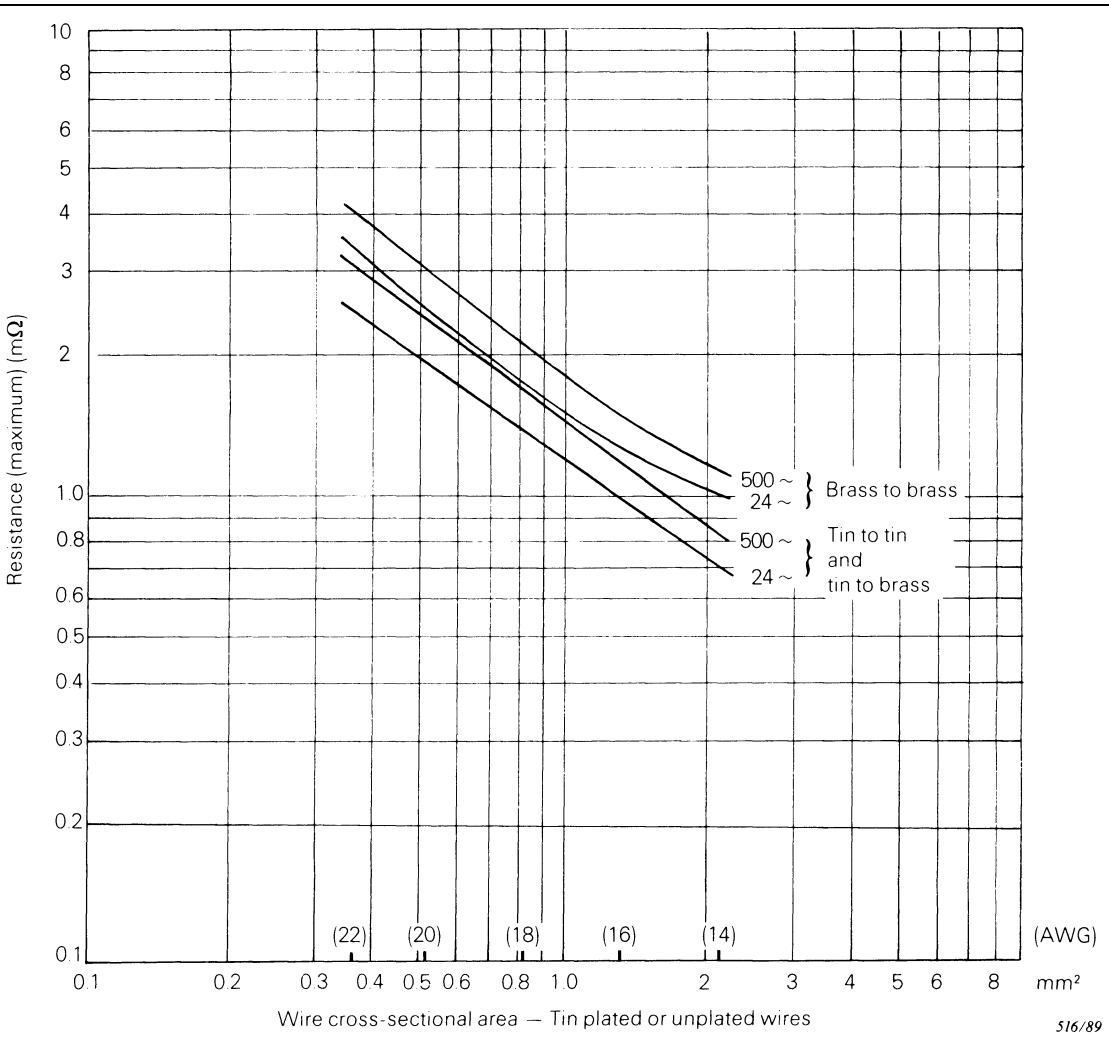


Figure 10 — Contact resistance — 4.8 mm and 5.2 mm sizes

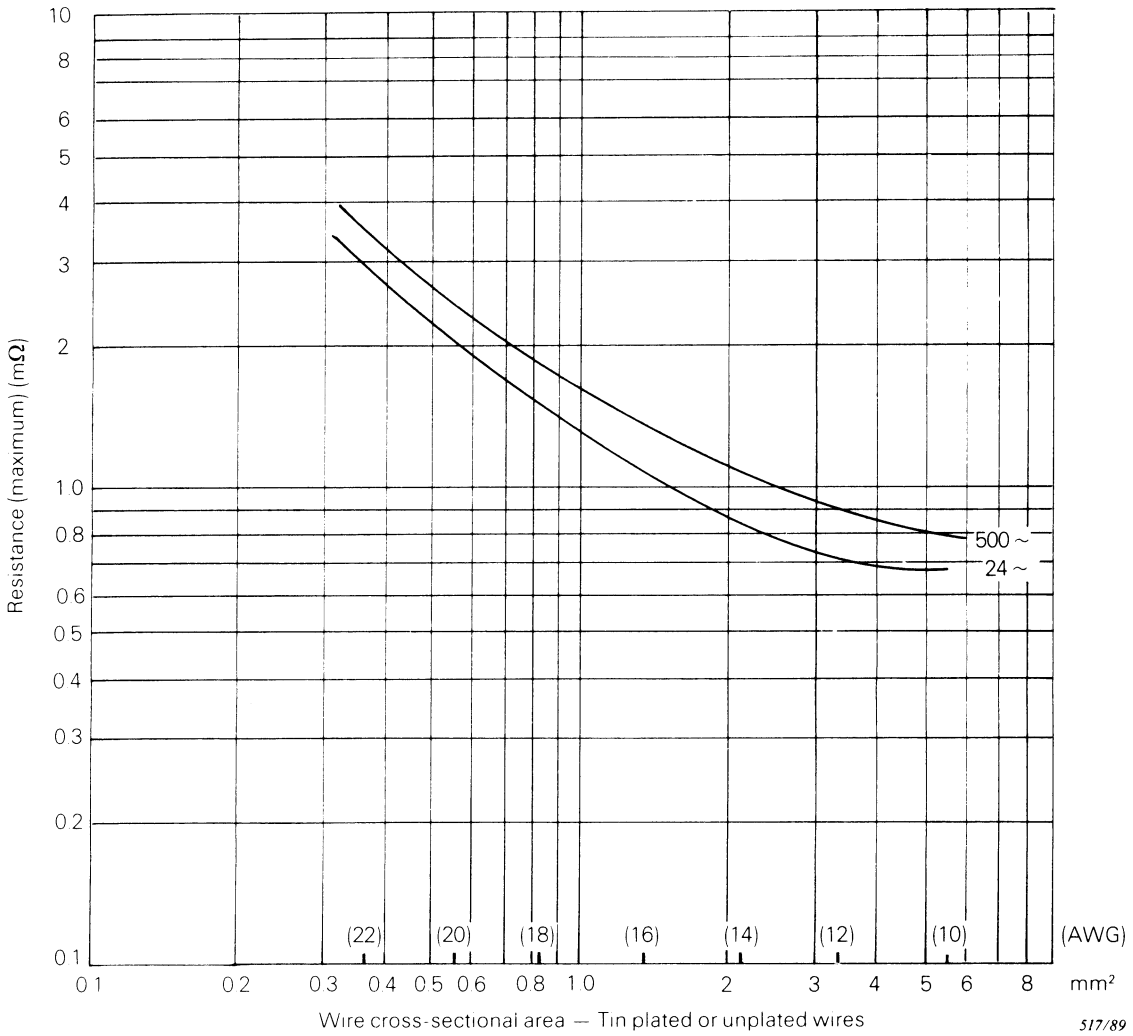


Figure 11 — Contact resistance — 6.3 mm and 9.5 mm sizes. Brass-to-brass

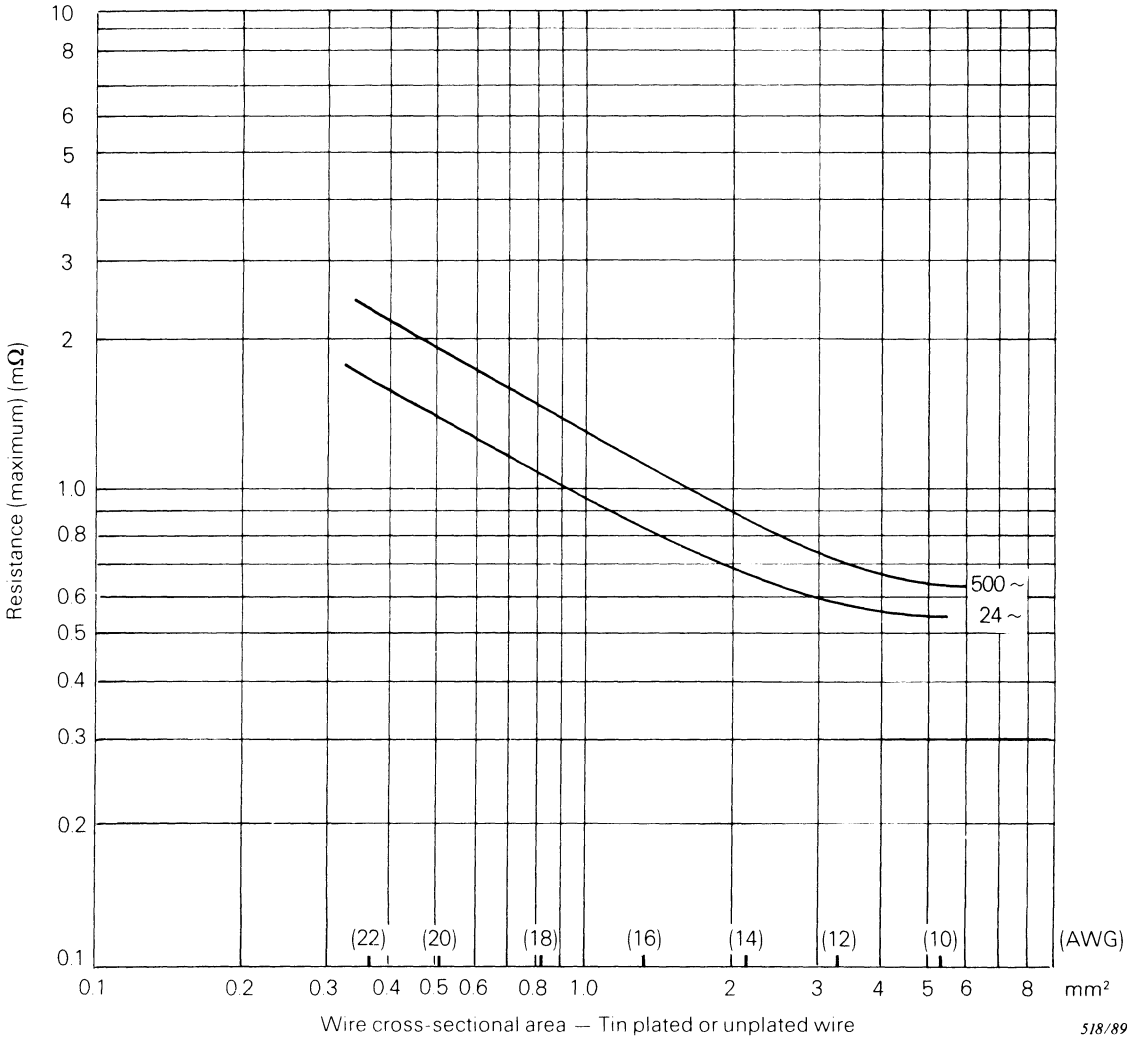


Figure 12 — Contact resistance — 6.3 mm and 9.5 mm sizes. Tin-to-tin and tin-to-brass

16 Insertion and withdrawal forces

This test shall be performed in accordance with Test 13b of IEC 512-7. New untested test specimens are required for this test. Ten male tabs and 10 female connectors of each size are required. The male tabs may be special test tabs manufactured to close tolerances for the specific purpose of conducting this test.

16.1 Male test tabs, if used, shall be fabricated from half-hard brass and shall conform to Figure 1, except that the *C* dimension tolerance shall be as indicated below and raised plateaus around the detent shall be limited to a total of 0.025 mm (0.001 in) over the stock thickness. The test tabs are not to be plated.

Table V

Nominal tab thickness	C dimension
0.5 mm (0.020 in)	0.516 mm (0.0203 in) 0.500 mm (0.0197 in)
0.8 mm (0.032 in)	0.820 mm (0.0323 in) 0.805 mm (0.0317 in)
1.2 mm (0.047 in)	1.201 mm (0.0473 in) 1.186 mm (0.0467 in)

16.2 A new male test tab or a production tab shall be used for each female connector tested. A male tab having a hole or dimple detent can be used. Indication of the type of male tab shall be included with the test results. Each combination of male tab and female connector shall be slowly and steadily inserted and withdrawn six times at a rate of travel of approximately 1 mm/s (0.04 in/s).

16.3 Force measurements shall be made using any suitable testing device providing accurate alignment and being capable of holding the reading. An example of a suitable device is shown in Appendix A. The test specimens shall exhibit the force characteristics shown in Table VI. Test tabs are not required if the force limits specified can be met with production tabs.

Table VI — Insertion and withdrawal force limits

Tab size	First insertion		First withdrawal				Sixth withdrawal			
	Maximum individual force		Maximum individual force		Minimum force				Minimum force	
					Average		Individual		Average		Individual	
Unplated brass tab and brass connector	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)
9.5 mm (0.375 in)	100	22.5	80	18	30	6.75	20	4.5	30	6.75	20	4.5
6.3 mm (0.250 in)	80	18	80	18	27	6	18	4	22	5	18	4
5.2 mm (0.205 in)	67	15	89	20	22	5	13	3	13	3	9	2
4.8 mm (0.187 in)	67	15	89	20	22	5	13	3	13	3	9	2
2.8 mm (0.110 in)	53	12	44	10	13	3	9	2	9	2	5	1
Unplated brass tab and tin-plated connector	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)	(N)	(lbf)
9.5 mm (0.375 in)	100	24.75	80	18	40	9	23	5	40	9	23	5
6.3 mm (0.250 in)	76	17	76	17	22	5	13	3	18	4	13	3
5.2 mm (0.205 in)	67	15	89	20	22	5	13	3	13	3	9	2
4.8 mm (0.187 in)	67	15	89	20	22	5	13	3	13	3	9	2
2.8 mm (0.110 in)	53	12	44	10	13	3	9	2	9	2	5	1

Forces in pounds are original.

17 Tensile strength (crimped connection)

This test shall be performed in accordance with Test 16d of IEC 512-8. Ten new test specimens shall be used for each male tab size, female connector and wire size to be tested. Each test specimen shall be crimped to its associated wire with the appropriate crimping tool, properly adjusted, as specified by the connector manufacturer. If the connector has a wire insulation support, it shall be rendered mechanically ineffective. The force required to separate a connector from its attached wire shall be not less than the applicable value shown in Figure 13.

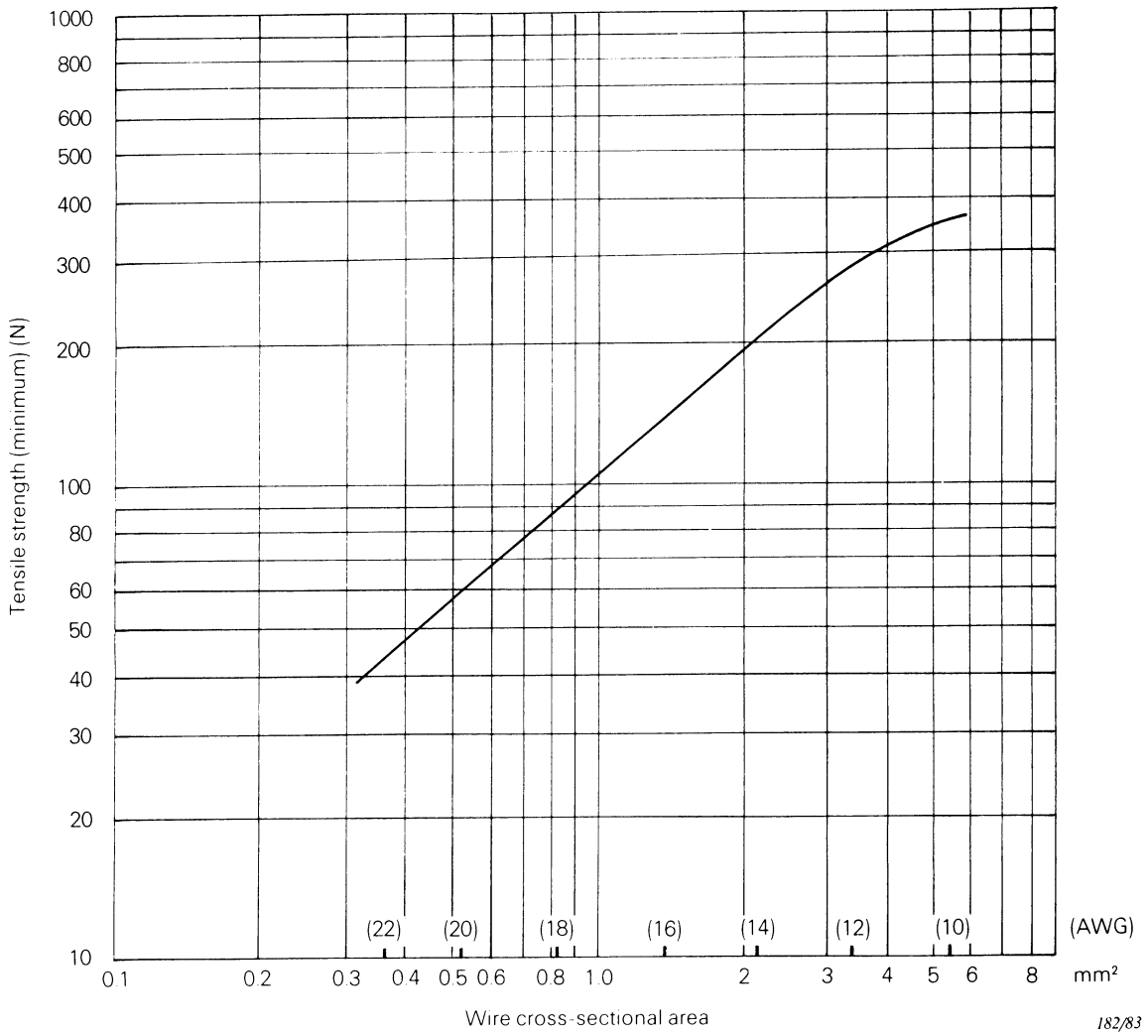


Figure 13 — Tensile strength — Crimped connections

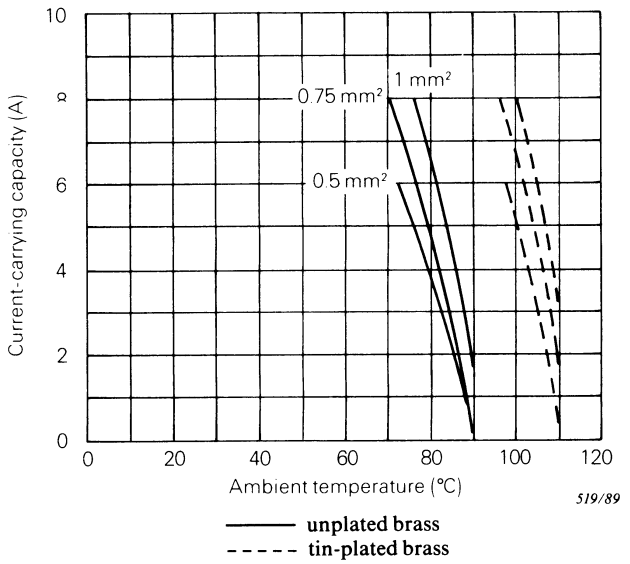


Figure 14 — Series 2.8

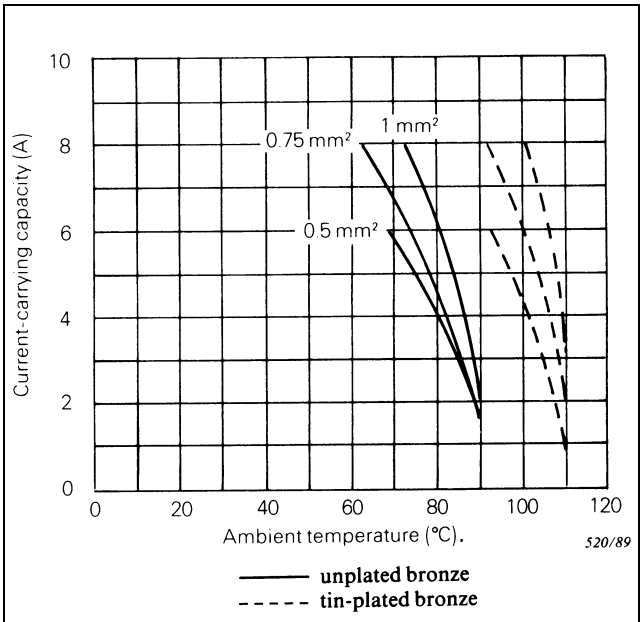


Figure 15 — Series 2.8

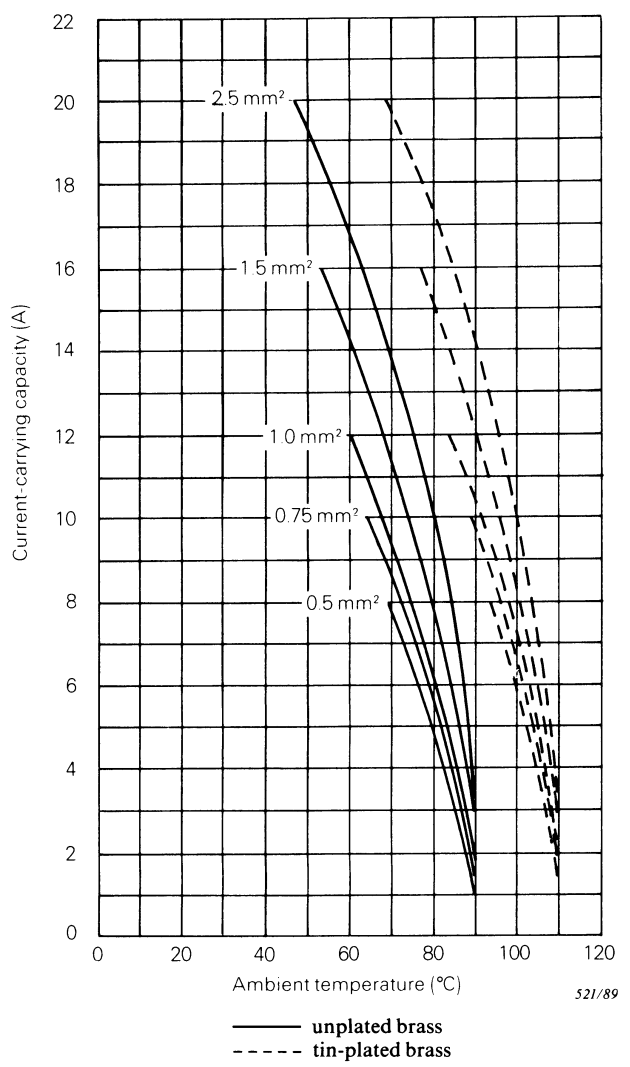


Figure 16 — Series 4.8

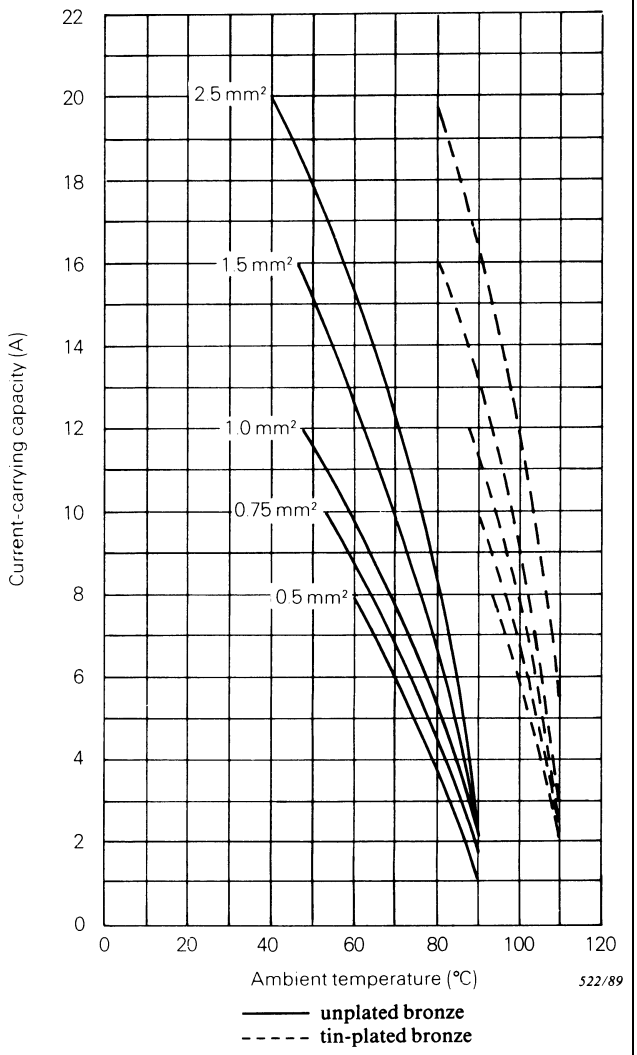


Figure 17 — Series 4.8

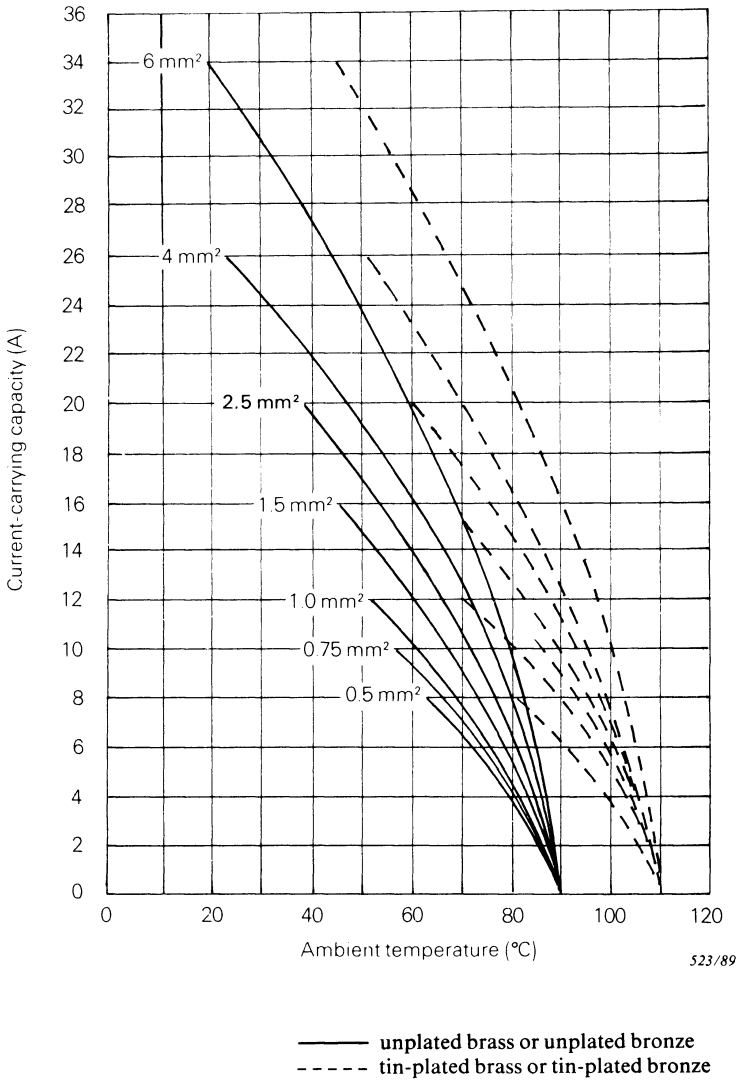


Figure 18 — Series 6.3

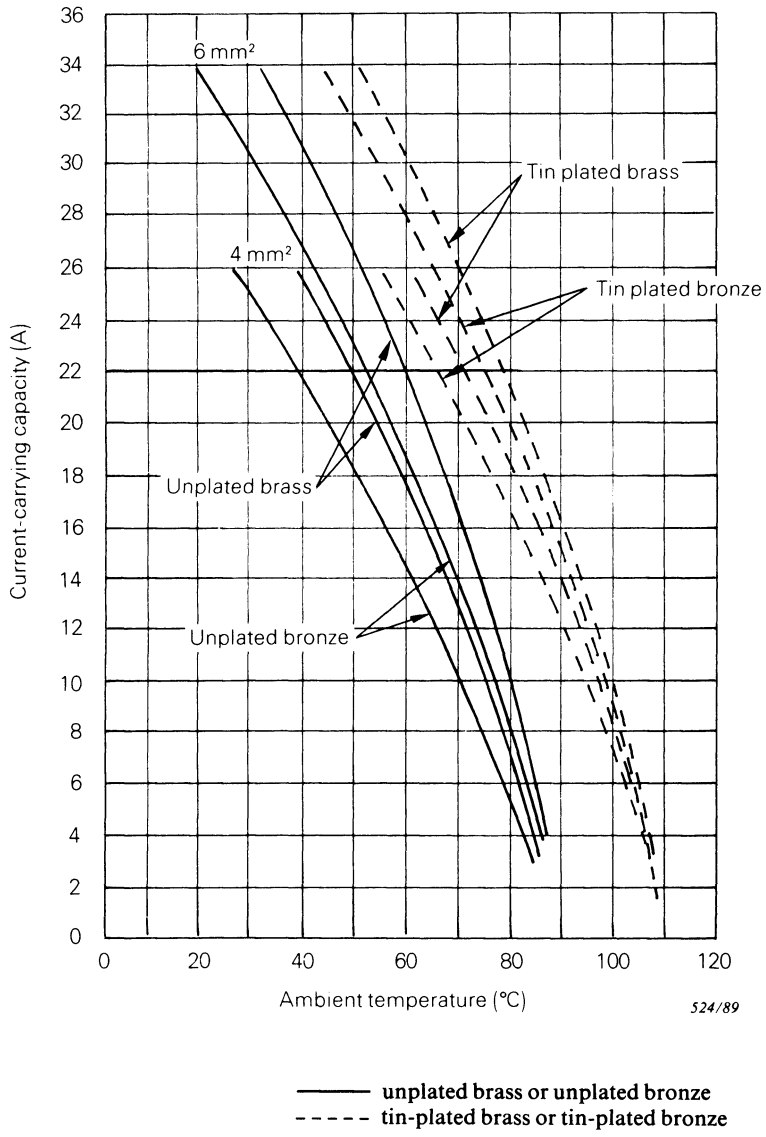


Figure 19 — Series 9.5

Appendix A Force gauge for testing quick-connect female connectors

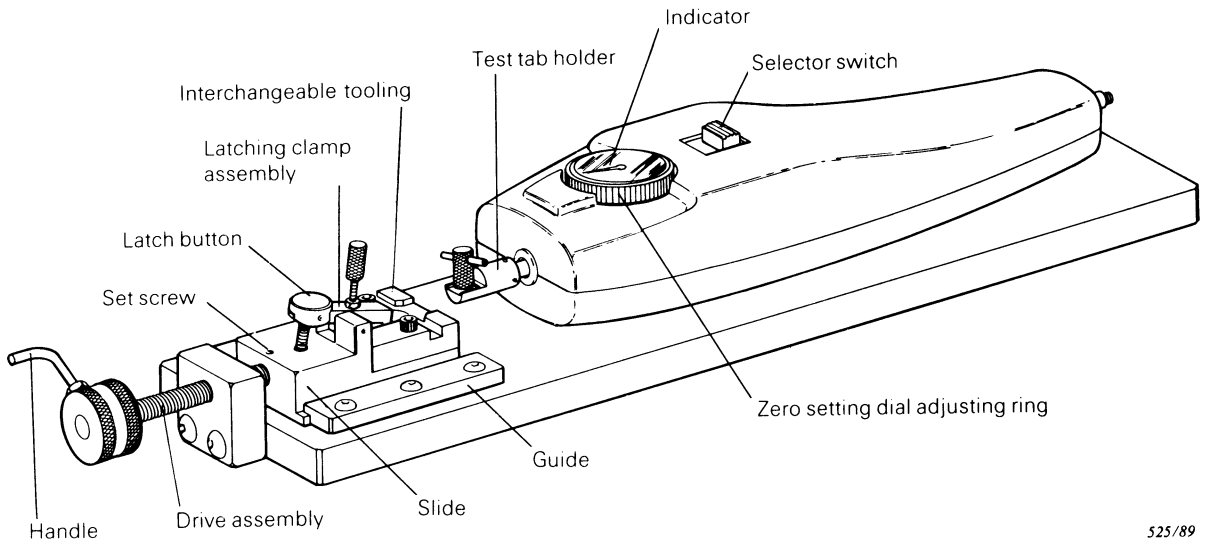


Figure A1

A.1 Introduction

The following method is intended as an example only and its use is not mandatory.

An insertion/extraction force gauge is recommended for measuring the force necessary to insert and extract test tabs into and from quick-connect female connectors. Force gauges are available having test ranges of 45 N, 111 N, 222 N (10 lbf, 25 lbf, 50 lbf). The force gauge used depends on the known range of the female connector to be tested [for example a female connector having a known range between 22 N and 36 N (5 lbf and 8 lbf) would require a force gauge having a 45 N (10 lbf) range, while a female connector having a known range between 36 N and 53 N (8 lbf and 12 lbf) would require a force gauge having 111 N (25 lbf) range, etc.].

Interchangeable tooling, unique for each female connector series, is used to adapt the force gauge for any of the female connectors. In some cases, inserts for testing crimped female connectors can be used in the tooling specified for testing uncrimped female connectors.

It is recommended that the end of the brass male test tab, which is held in the test tab holder, be slotted to permit quick installation and removal of the test tabs. A new male test tab shall be used for testing each female connector to ensure an accurate reading.

The male tab and female connector holder dimensions and their location on the base plate shall provide a 0.051 mm (0.002 in) alignment accuracy in both the vertical and horizontal directions with respect to the male tab centreline and the female connector slot centreline.

The retaining cavity of the female connector holder should allow the female connector a 0.127 mm (0.0054 in) lateral movement to provide for alignment during the insertion and extraction process.

A.2 Installation of tooling

Check Figure A1 and proceed as follows:

A.2.1 Remove the two socket head screws used to hold the tooling in place.

NOTE It may be necessary to back off the adjustment screw and depress the latch button to facilitate installation and removal of the tooling. Do not remove any of these components from the apparatus.

A.2.2 Place the tooling on the slide and align the holes in the tooling with those in the slide.

A.2.3 Install the socket head screws in the tooling. Make certain that the tooling is aligned with the test tab holder before securing the screws. This can be accomplished by placing a straight edge rule or an equivalent piece of flat stock material against the slide and tooling, and holding it in position until the screws are secured in the base. See Figure A2.

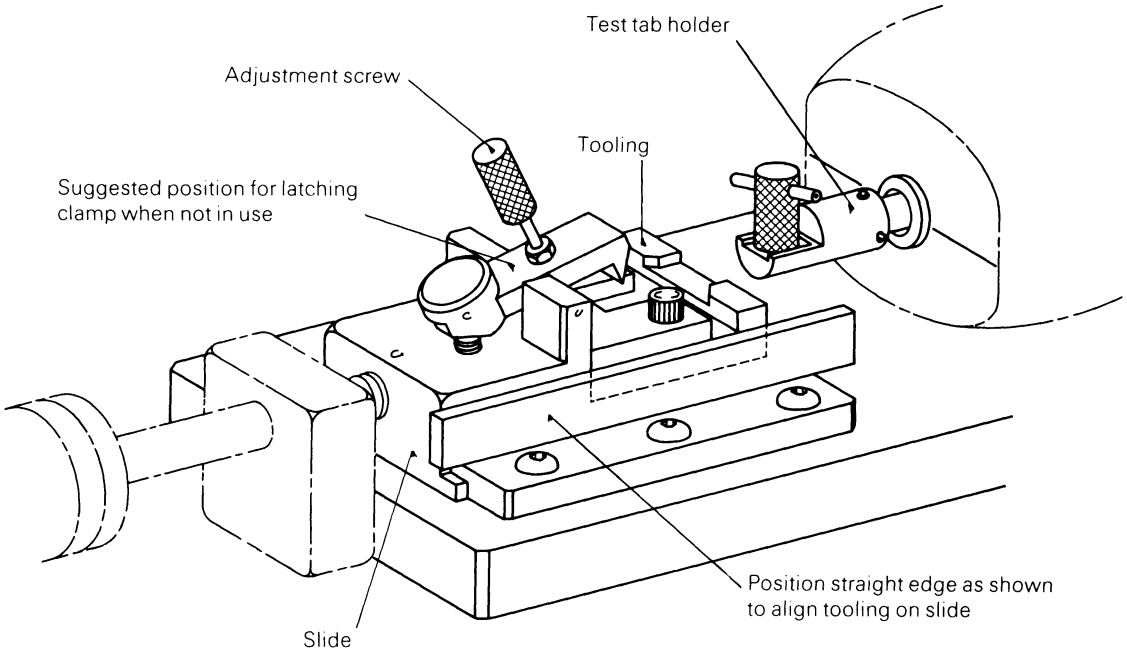


Figure A2

A.2.4 Check the alignment by placing a test tab in the tab holder. Advance the slide until the tooling is directly under the test tab. The test tab should be centred over the terminal slot in the tooling. See Figure A3.

CAUTION: Make certain that the test tab is bottomed and centred in the test tab holder before securing the test tab holding screw.

The apparatus is now ready for testing the female connector.

A.3 Latching clamp

The latching clamp is primarily designed to hold female connectors having in-line connecting tabs (see Figure A4) in the tooling during withdrawal tests. Generally, it is not necessary to use a latching clamp when testing female connectors having lateral connecting tabs. Adjust the clamp according to the following procedures.

NOTE When the latching clamp is not in use, the adjustment screw can be positioned as shown in Figure A2, to prevent interference during testing. When the tooling does not butt against the slide, a suitable piece of stock material can be positioned between the tooling and the slide to provide a resting surface for the adjustment screw (see Figure A3). Do not remove the latching clamp assembly from the apparatus.

A.3.1 Place the in-line female connector in the appropriate tooling. Position the clamp between the insulation barrel and the wire barrel. (For female connectors without an insulation barrel, place the clamp between the tab receiver and the wire barrel.) Allow the clamp to bottom in the female connector.

NOTE Remove in-line connecting tabs if they interfere with positioning the female connectors in the tooling. If possible, allow lateral connecting tabs to remain on the applicable terminal during the testing procedure. See Figure A4.

A.3.2 Back-off the adjustment screw to release the pressure on the female connector. Use the locking nut to lock the screw in position. The adjustment should be such that the female connector is retained in the tooling, yet loose enough to facilitate self-alignment during the inserting test. See Figure A5.

Depress the latch button to install and extract the female connector from the tooling.

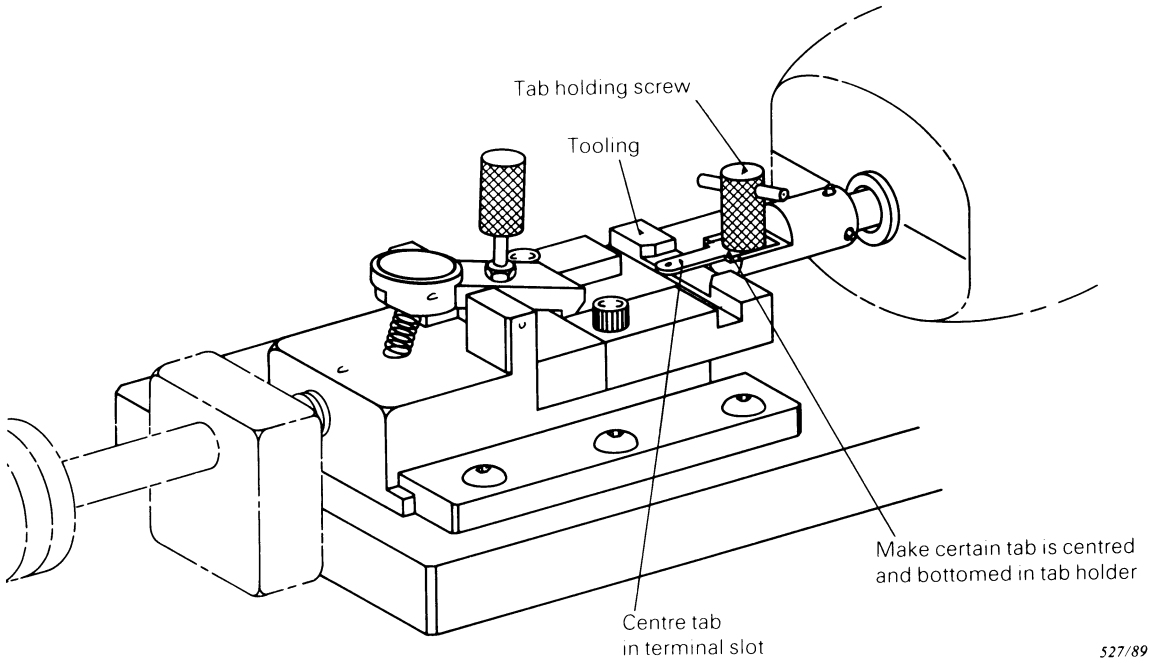


Figure A3

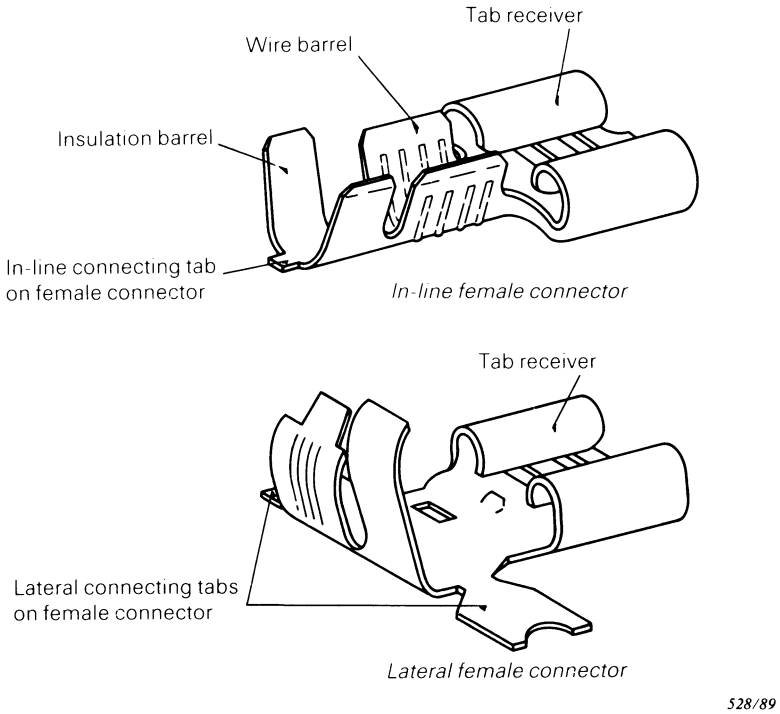


Figure A4

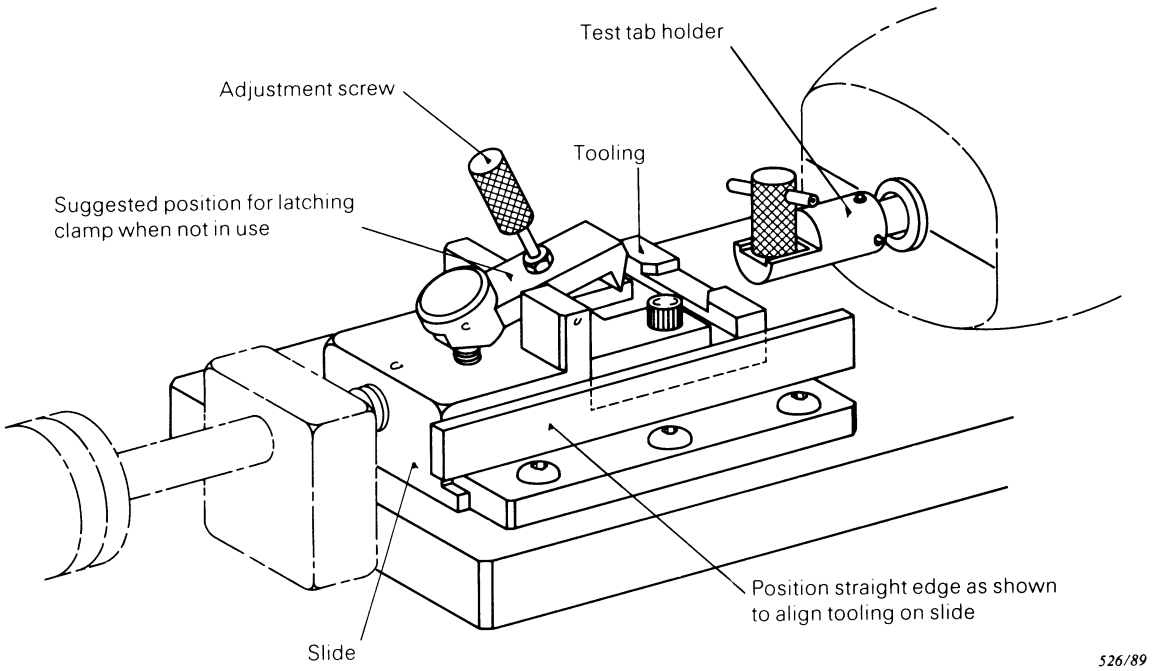


Figure A5

A.4 Testing procedure

Centre the selector switch and gently tap the side of the force gauge with a finger to ensure that the indicator is at rest. Turn the zero-setting dial adjusting ring until the indicator points to zero. Select the appropriate female connector and test tab and proceed as follows.

A.4.1 Place the test tab in the test tab holder and be sure that the test tab is fully inserted before tightening the test tab holding screw.

A.4.2 Place the female connector in the tooling and position the selector switch in the forward position. Advance the slide with a slow and uniform movement to ensure that the test tab and female connector mate properly.

NOTE If the female connector begins to lift up, apply light finger pressure to hold the components in line. Release the finger pressure when the test tab begins to penetrate the female connector. Be sure that the finger pressure does not affect the test reading.

A.4.3 Stop the slide when the dimples of the test tab and female connector have engaged. Do not over-insert the test tab into the female connector.

A.4.4 Record the force indicated on the dial, then reposition the selector switch to the rear position and back the slide away from the test tab holder to obtain the extraction value.

A.4.5 Install a new test tab for the next female connector and repeat test procedures.

List of references

See national foreword.

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