INTERNATIONAL STANDARD

ISO 8820-4

Third edition
2016-11-15

Road vehicles — Fuse-links —

Part 4: Fuse-links with female contacts (type A) and bolt-in contacts (type B) and their test fixtures

Véhicules routiers — Liaisons fusibles —

Partie 4: Liaisons fusibles avec contacts femelles (type A) et contacts boulonnés (type B) et leurs montages d'essai

Reference number
ISO 8820-4:2016(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

This third edition cancels and replaces the second edition (ISO 8820-4:2010), which has been technically revised.

A list of all parts in the ISO 8820 series can be found on the ISO website.

Road vehicles — Fuse-links —

Part 4:
Fuse-links with female contacts (type A) and bolt-in contacts (type B) and their test fixtures

1 Scope

This document specifies fuse-links with female contacts (type A) and bolt-in contacts (type B) for use in road vehicles. It establishes, for these fuse-link types, the rated current, test procedures, performance requirements and dimensions.

This document is applicable to fuse-links with a rated voltage of 32 V or 58 V, a current rating ≤140 A and a breaking capacity of 1 000 A intended for road vehicles.

This document is intended to be used in conjunction with ISO 8820-1 and with ISO 8820-2. The numbering of its clauses corresponds to that of ISO 8820-1 whose requirements are applicable, except where modified by requirements particular to this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8820-1, *Road vehicles — Fuse-links — Part 1: Definitions and general test requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8820-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Marking, labelling and colour coding

See ISO 8820-1 and Table 1.

Table 1 — Fuse-link colour coding

Fuse rating A	Colour
15	Grey
20	Light blue
25	White
30	Pink
35	Dark green
40	Green
50	Red
60	Yellow
70	Brown
80	Black
100	Blue
120	White
140	Red-brown

5 Tests and requirements

5.1 General

In addition to carrying out the test procedures in accordance with ISO 8820-1, the following criteria shall be observed.

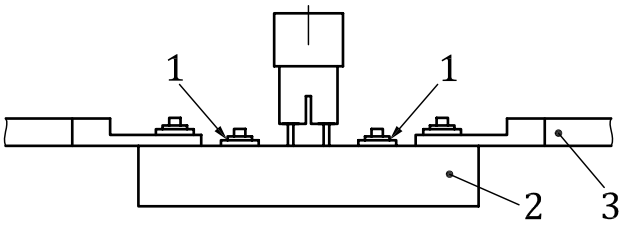
Tests shall be performed following the test sequences in Table 2.

The test fixtures for electrical tests (see Annex A) shall be designed in accordance with Figure 1. The connection resistance shall be for type A ≤1,0 mΩ and for type B ≤0,35 mΩ to ensure the proper functioning of the test fixture.

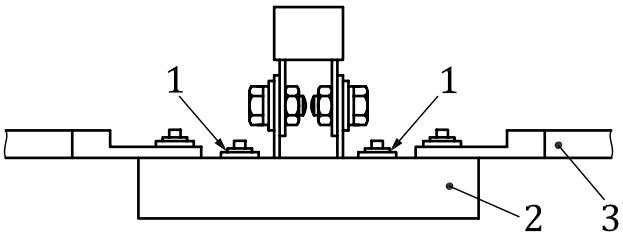
Fuse-links in accordance with this document shall provide for visible evidence of an open fuse element.

For measuring the contact resistance of type A, the body of the fuse-link may require modification or resistance of the fuse element should be subtracted from the one of whole fuse (see Figure 1, points labelled “1”).

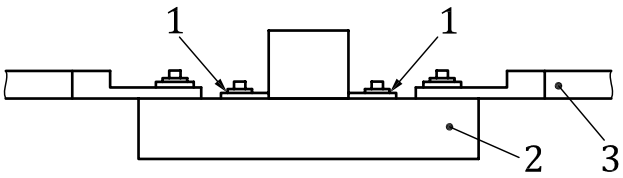
Dimensions in millimetres



a) Test fixture for types A1, A1S, A2, A3 and A4



b) Test fixture for type B1



c) Test fixture for type B2

Key

1 measuring points for the voltage drop (see 7.1, 7.2 and 7.3)
2 test fixture
3 cable size according to Table 3

Figure 1 — Test schematic

5.2 Test sequence

Table 2 — Test sequence

No.	Test		(Sub-) Clause	Sample groups[a]							
				1	2	3	4	5	6	7	8
1	Dimensions		Clause 6	X	X	X	—	—	—	—	—
2	Marking, labelling and colour coding		Clause 4	X	X	X	X	X	X	X	X
3	Fuse-link voltage drop		5.4	X	X	X	—	—	—	—	—
4	Strength of terminals		5.10	X	X	X	—	—	—	—	—
5	Environmental conditions	Climatic load	5.6	—	—	—	X	—	—	—	—
		Chemical load		—	—	—	—	X	—	—	—
		Mechanical load		—	—	—	—	—	X	—	—
6	Transient current cycling		5.5	—	—	—	—	—	—	X	—
7	Temperature rise		5.11	—	—	—	—	—	—	—	X
8	Rapid change of temperature with specified transition duration		5.12	—	—	—	—	—	—	—	X
9	Fuse-link voltage drop		5.4	—	—	—	X	X	X	X	X
10	Current steps		5.8	—	—	X	—	—	—	—	—
11	Breaking capacity		5.9	X	—	—	—	—	—	—	—
12	Operating time-rating test	1,1 I_R	5.7	—	X	—	X	X	X	X	—
		1,35 I_R or 1,5 I_R		—	Y	—	Y	Y	Y	Y	—
		2,0 I_R		—	Y	—	Y	Y	Y	Y	—
		3,5 I_R		—	Y	—	Y	Y	Y	Y	—
		6,0 I_R		—	Y	—	Y	Y	Y	Y	—
13	Strength of terminals		5.10	X	X	X	X	X	X	X	X

[a] Each sample group shall contain a minimum of eight fuse-links.

Y For these operating time tests, the sample groups 2, 4, 5, 6 and 7 shall be divided equally. These fuses are intended to be subjected to a single operating time test only.

— Not required.

5.3 Test cable sizes

Test cable sizes shall be as shown in Tables 3. All tests for a particular fuse-link rating shall be performed using the same cable size.

Test cable sizes are specified to allow comparative fuse-link tests to be carried out. The cable size specified does not necessarily indicate the size of cable to be used in the vehicle application.

Table 3 — Test cable sizes

<table>
<tr><th rowspan="3">Fuse-link rating
A</th><th rowspan="3">Type A1, A1S, A2, A4</th><th rowspan="3">Type A3</th><th rowspan="3">Type B</th><th colspan="4">Conductor cross-sectional area[a]
mm²</th><th rowspan="3">Length
mm</th></tr>
<tr><th colspan="2">Type A</th><th colspan="2">Type B</th></tr>
<tr><th>I</th><th>II</th><th>I</th><th>II</th></tr>
<tr><td>15</td><td>X</td><td rowspan="6">—</td><td rowspan="3">—</td><td rowspan="2">1,5</td><td rowspan="3">2,0</td><td colspan="2" rowspan="3">—</td><td rowspan="12">500 ± 50</td></tr>
<tr><td>20</td><td>X</td></tr>
<tr><td>25</td><td>X</td><td rowspan="2">2,5</td></tr>
<tr><td>30</td><td>X</td><td>X</td><td rowspan="2">3,0</td><td>4,0</td><td>3,0</td></tr>
<tr><td>35</td><td>X</td><td>—</td><td rowspan="2">4,0</td><td colspan="2">—</td></tr>
<tr><td>40</td><td>X</td><td>X</td><td rowspan="3">5,0</td><td rowspan="3">6,0</td><td rowspan="3">5,0</td></tr>
<tr><td>50</td><td>X</td><td>X</td><td>X</td><td rowspan="2">6,0</td></tr>
<tr><td>60</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>70</td><td rowspan="5">—</td><td>—</td><td>X</td><td colspan="2">—</td><td colspan="2" rowspan="2">10,0</td></tr>
<tr><td>80</td><td>X</td><td>X</td><td colspan="2">10,0</td></tr>
<tr><td>100</td><td rowspan="3">—</td><td>X</td><td colspan="2" rowspan="3">—</td><td rowspan="2">16,0</td><td rowspan="2">15,0</td></tr>
<tr><td>120</td><td>X</td></tr>
<tr><td>140</td><td>X</td><td>25,0</td><td>20,0</td></tr>
</table>

[a] Conductor material in accordance with ISO 6722-1.

5.4 Voltage drop

5.4.1 Tests

The voltage drop U_{ab} shall be measured at points labelled “1” across the fuse-link tabs as shown in Figure 1.

5.4.2 Requirements

See Table 4.

Table 4 — Fuse-link voltage drop

Fuse-link rating A	Maximum voltage drop mV		
	A1, A1S, A4	A2, A3	B1, B2
15	125	—	—
20		180	
25		—	
30	120	180	140
35		—	
40		180	130
50		160	120
60	115		
70	—	—	
80		160	
100		—	
120			
140			

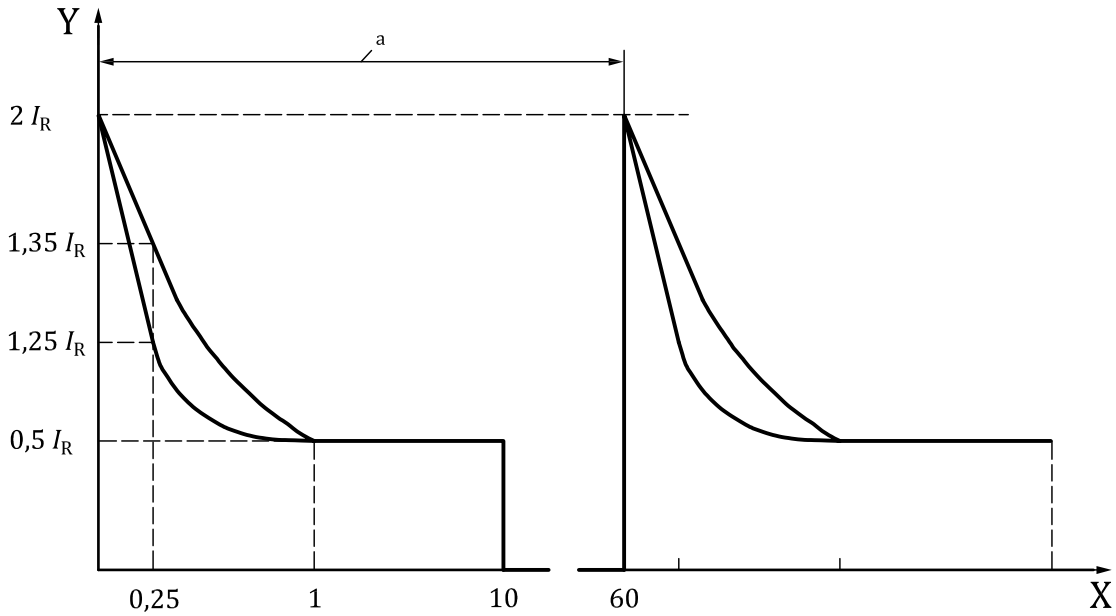
5.5 Transient current cycling

5.5.1 Test

See Figure 2 and ISO 8820-1. At an elapsed time of 0,25 s on-time, the current shall fall to a value between 1,25 I_R and 1,35 I_R. During the first 10 s of each cycle, the steady state current shall never fall below 0,5 I_R.

5.5.2 Requirements

See ISO 8820-1.



Key

X time in seconds

Y rated current

a One cycle.

Figure 2 — Transient current cycling

5.6 Environmental condition

See ISO 8820-1.

5.7 Operating time-rating

5.7.1 Test

See ISO 8820-1.

5.7.2 Requirements

See Table 5.

Table 5 — Operating times

Test current A	Operating times s					
	A1, A1S, A4		A2, A3		B1, B2	
	min.	max.	min.	max.	min.	max.
1,10 I_R	14 400	∞	14 400	∞	14 400	∞
1,35 I_R	60	1 800	—		—	
1,50 I_R	—		30	3 600	30	3 600
2,0 I_R	2	60	5	100	5	100
3,5 I_R	0,2	7	0,2	7	0,2	7
6,0 I_R	0,04	1	0,04	1	0,04	1

5.8 Current steps

5.8.1 Test

See ISO 8820-1.

5.8.2 Requirements

See ISO 8820-1.

5.9 Breaking capacity

5.9.1 Test

See ISO 8820-1.

Test at 1 000 A with cable sizes as shown in Table 3.

5.9.2 Requirements

See ISO 8820-1.

After the test, the current through the fuse-link shall not exceed 0,5 mA at the rated voltage.

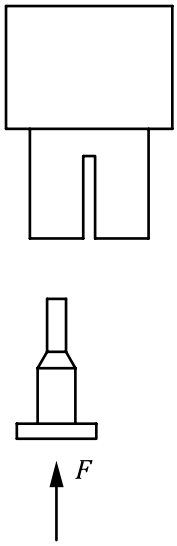
5.10 Strength of terminals

5.10.1 Test for fuse-links of types A1, A1S, A2, A3 and A4

The following force (see Table 6) shall be applied sequentially to each terminal of the fuse-link as shown in Figure 3.

Table 6 — Forces

Fuse-link type	Force in N
A1, A1S, A4	50 ± 1
A2	60 ± 1
A3	



Key

F force

Figure 3 — Strength of terminals

5.10.2 Requirements

After the test, the insulator shall be intact and the terminals shall not be bent and/or removed from the insulator.

5.10.3 Test for fuse-links of types B1 and B2

Install the fuse-links in the test fixture with the mounting torque according to Table 7. This test is performed without cables and terminals.

Table 7 — Mounting torque and bolt size

Fuse-link type	Mounting torque N·m	Bolt size
B1	6 ± 1	M6
B2	4,5 ± 1	M5

NOTE For mounting in the vehicle, the specific procedure (greasing, surface materials, surface roughness, etc.) has to be agreed upon between the fuse manufacturer, the fuse-box manufacturer and the vehicle manufacturer.

5.10.4 Requirements

Fuse-links shall remain physically intact.

5.11 Temperature rise

5.11.1 Test

The temperature rise shall be measured at the temperature-rise measuring point in the standard test fixtures as shown in Figures 8, 9 and 10 after supplying a current equal to 0,50 I_R after the temperature is stabilized.

5.11.2 Requirements

See Table 8.

Table 8 — Temperature rise

Fuse-link rating A	Temperature rise °C
15	50
20	
25	
30	
35	
40	
50	
60	
70	
80	70
100	
120	
140	

5.12 Rapid change of temperature with specified transition duration

See ISO 16750-4.

The test temperature shall be code J and the temperature holding time is 20 min.

Perform the test for 48 cycles.

6 Dimensions

6.1 Fuse-links types A1, A2 and A3

See Figure 4 and Table 9.

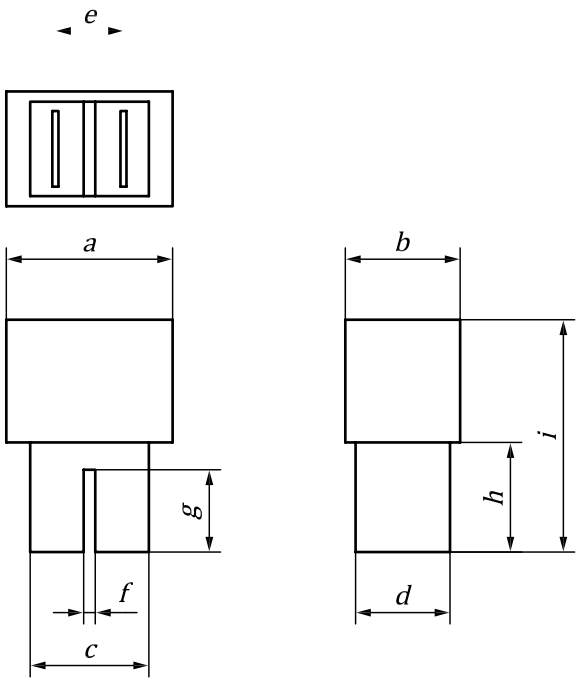
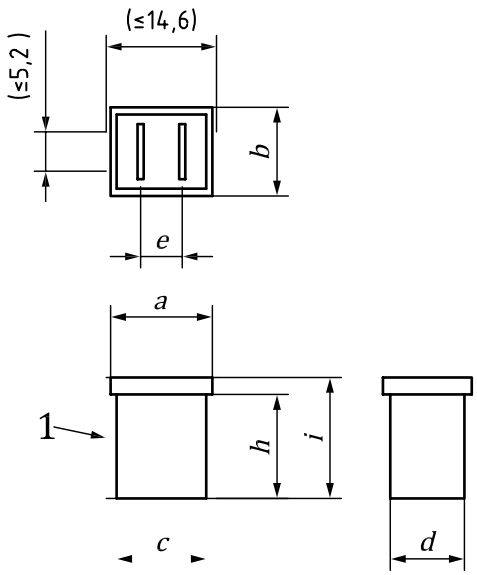


Figure 4 — Fuse-link with female contacts A1, A2 and A3

6.2 Fuse-links types A1S and A4

See Figure 5 and Table 9.

Dimensions in millimetres



Key

1 represents optional feature

Figure 5 — Fuse-link with female contacts A1S and A4

Table 9 — Fuse-links with female contacts A1, A1S, A2, A3 and A4

Dimensions in millimetres

Dimension	A1		A1S		A2		A3		A4	
	Value	Tolerance	Value	Tolerance	Value	Tolerance	Value	Tolerance	Value	Tolerance
a	13,45	±1,15	13,45	±1,15	22,0	±0,5	22,25	±0,75	10,7	±0,3
b	11,75	±0,75	11,75	±0,75	15,2	±0,5	15,25	±0,55	7,0	±1,1
c	11,85	±0,35	11,85	±0,35	15,7	±0,5	18,55	±0,25	9,65	±0,2
d	9,8	±0,3	9,8	±0,3	12,5	±0,5	13,6	±0,3	6,15	±0,2
e	5,5	±0,1	5,5	±0,1	9,0	±0,2	12,4	±0,1	4,6	±0,1
f	—	—	—	—	1,55	±0,35	—	—	—	—
g	—	—	—	—	10,9	±4,1	—	—	—	—
h	18,1	±0,8	13,75	±0,55	14,5	±0,5	21,3	±1	13,8	±1,6
i	27,0	±0,5	16,0	±0,5	30,75	±1,25	31,0	±0,5	16,3	±1,6

— Not applicable.

NOTE These values are for fuse-links only.

6.3 Fuse-links types B1 and B2

See Figures 6 and 7, and Table 10.

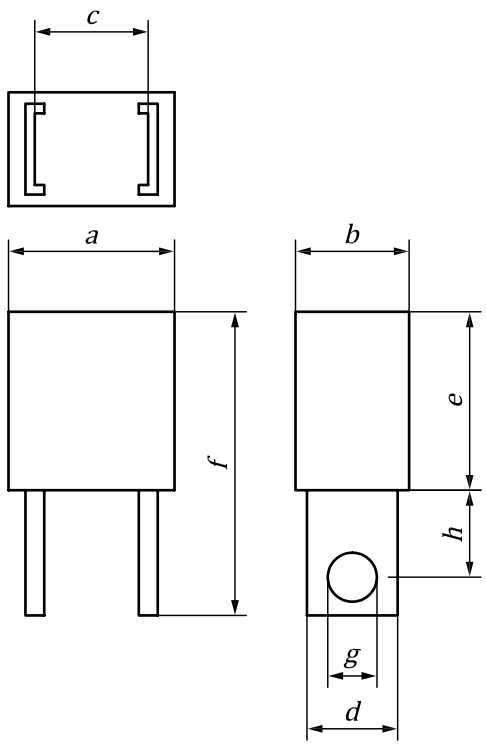


Figure 6 — Fuse-link with bolt-in contacts B1

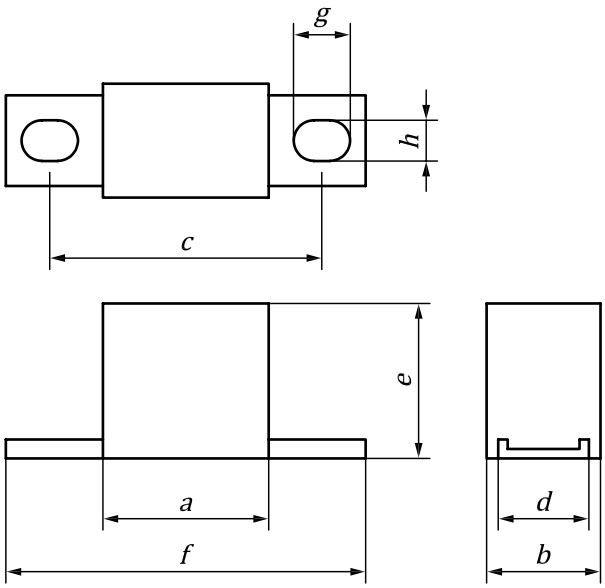


Figure 7 — Fuse-link with bolt-in contacts B2

Table 10 — Fuse-links with bolt-in contacts B1 and B2

Dimensions in millimetres

Dimension	B1		B2	
	Value	Tolerance	Value	Tolerance
a	21,95	±0,45	21,95	±0,45
b	15,05	±0,35	15,05	±0,35
c	15,0	±0,1	36,0	±0,5
d	12,0	±0,2	12,0	±0,2
e	23,6	±1,1	20,50	±1,5
f	40,15	±3,55	47,6	±0,9
g	6,5	±0,2	7,5	±0,3
h	11,5	±0,2	5,4	±0,2
NOTE These values are for fuse-links only.				

6.4 Designation

A fuse-link Type A1 in accordance with this document for a nominal current of 25 A is designated as follows:

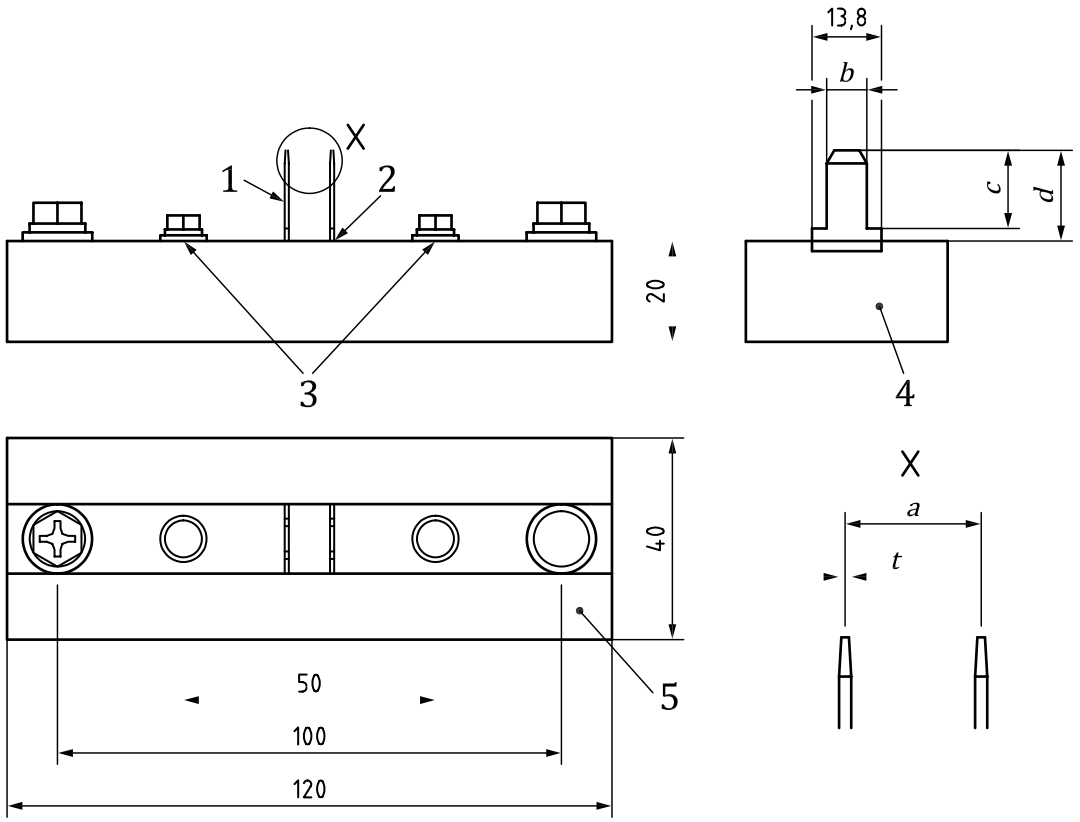
Fuse-link ISO 8820 - A1 - 25

7 Test fixtures

7.1 Test fixture for fuse-links types A1, A1S, A2, A3 and A4

See Figure 8 and Table 11.

Dimensions in millimetres



Key

1 terminal for fuse-link connection (made of copper alloy)
2 temperature measuring point (thermocouple)
3 voltage drop measuring point (millivolts)
4 terminal size
5 fixture body

Figure 8 — Test fixture for fuse-links types A1, A1S, A2, A3 and A4

Table 11 — Dimensions

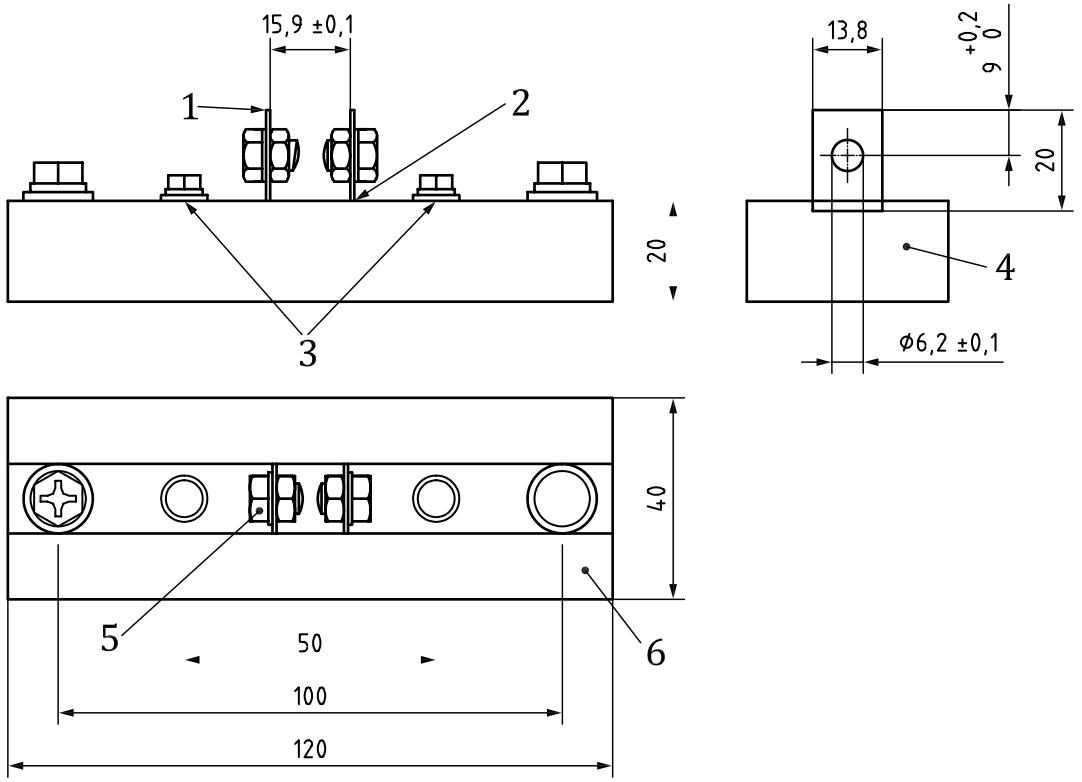
Dimensions in millimetres

Type	*a* ±0,1	*b* ±0,1	*c* $^{+0,2}_{0}$	*d*	*t*
A1	5,5	6,3	10,2	17,2	0,8 $^{+0,04}_{-0,03}$
A1S			8,4		
A2	9,0	8,0	15,5	18,0	
A3	12,4	9,5	14,5	19,8	1,2 ± 0,03
A4	4,6	2,8	8,0	17,2	0,8 ± 0,03

7.2 Test fixture for fuse-links type B1

See Figure 9 and Table 12.

Dimensions in millimetres



Key

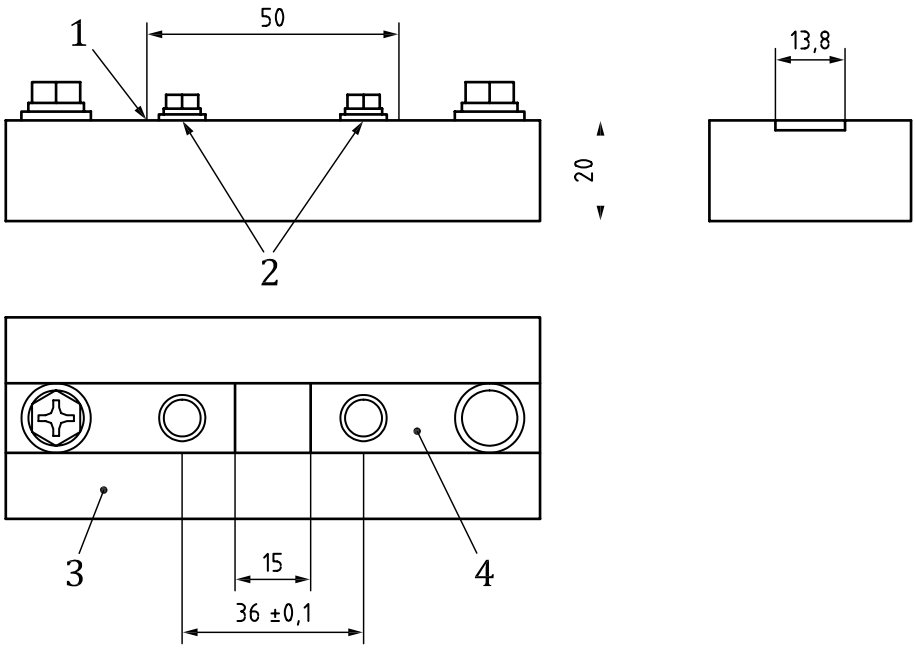
1 terminal for fuse-link; plate thickness (0,8 ± 0,04) mm
2 temperature measuring point (thermocouple)
3 voltage drop measuring points (millivolts)
4 terminal size
5 screw, washer and nut M6
6 fixture body

Figure 9 — Test fixture for fuse-links with bolt-in contacts B1

7.3 Test fixture for fuse-links type B2

See Figure 10 and Table 12.

Dimensions in millimetres



Key

1 temperature measuring point (thermocouple)
2 voltage drop measuring points
3 fixture body
4 terminal for fuse-link; plate thickness (0,8 ± 0,04) mm

Figure 10 — Test fixture for fuse-links with bolt-in contacts B2

Table 12 — Recommended mounting torque

Fuse-link type	Recommended mounting torque N·m
B1 – M6 bolt	6 ± 1
B2 – M5 bolt	4,5 ± 1

Annex A
(informative)

Tab dimensions for fuse-boxes

A.1 Tab dimensions for fuse-boxes

See Figure A.1 and Table A.1.

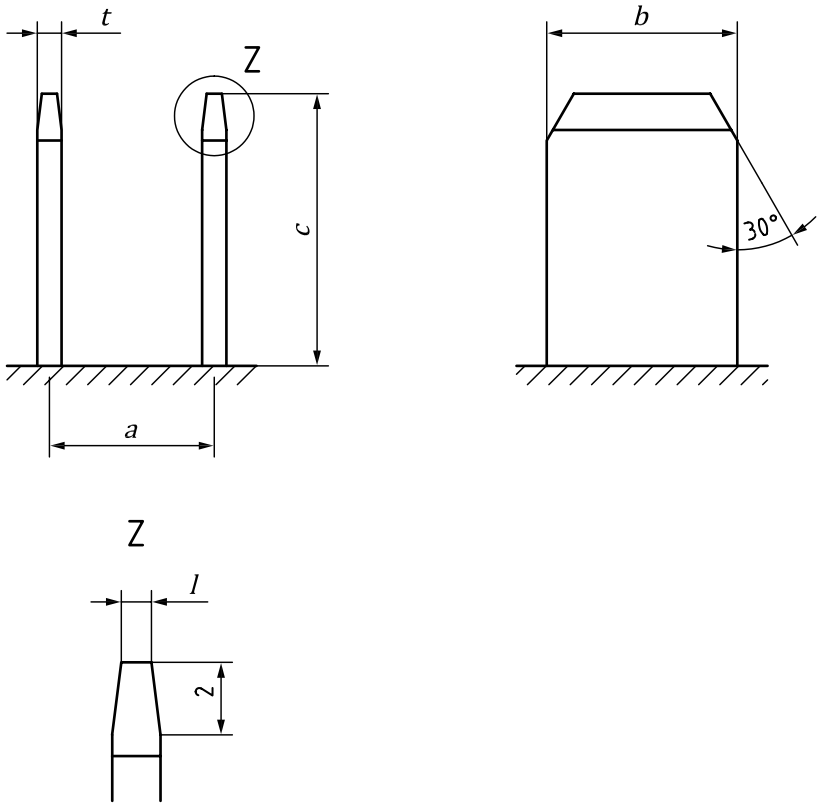


Figure A.1 — Tab dimensions for fuse-boxes

Table A.1 — Dimensions

Dimensions in millimetres

Type	*a*	*t*	*l*	*b*	*c*
A1	5,5 ± 0,1	0,8 ± 0,03	max. 0,5	6,3 ± 0,1	10,3 ± 0,1
A1S					$9{,}0\ ^{+0{,}2}_{-0{,}6}$
A2	9,0 ± 0,1			$8{,}0\ ^{+0{,}1}_{-0{,}5}$	$15{,}5\ ^{+0{,}2}_{0}$
A3	12,4 ± 0,1	1,2 ± 0,03	max. 0,7	9,5 ± 0,1	15 ± 0,5
A4	4,6 ± 0,1	0,8 ± 0,03	max. 0,5	2,8 ± 0,1	8,0 ± 0,4

Bibliography

ISO 6722-1, Road vehicles — 60 V and 600 V single-core cables — Part 1: Dimensions, test methods and requirements for copper conductor cables

ISO 16750-4, Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 4: Climatic loads

ICS 43.040.10

Price based on 18 pages