
**Road vehicles — Fuse-links with
axial terminals for use in 48V
networks — Types SF36-70V, SF51-
70V and SF56-70V**

*Véhicules routiers — Liaisons fusibles avec languettes axiales pour
réseaux 48V — Types SF36-70V, SF51-70V et SF56-70V*

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

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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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 32, *Electrical and electronic components and general system aspects*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Road vehicles — Fuse-links with axial terminals for use in 48V networks — Types SF36-70V, SF51-70V and SF56-70V

1 Scope

This document specifies fuse-links with axial terminals (Strip fuse-links) Types SF36-70V, SF51-70V and SF56-70V used 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 70 V DC, a rated current of 30 A to 500 A, and a breaking capacity of 2 500 A intended for use in the electrical system of road vehicles with a nominal voltage of 48 V DC.

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 6722-1, *Road vehicles — 60 V and 600 V single-core cables — Part 1: Dimensions, test methods and requirements for copper conductor cables* [ISO 20934:2019](https://standards.iteh.ai/catalog/standards/sist/eb6fb912-d4db-4daf-9156-)

ISO 8820-1:2014, *Road vehicles — Fuse-links — Part 1: Definitions and general test requirements*

ISO 16750-3:2012, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 3: Mechanical loads*

ISO 16750-5:2010, *Road vehicles — Environmental conditions and testing for electrical and electronic equipment — Part 5: Chemical loads*

IEC 60068-2-14:2009, *Environmental testing — Part 2-14: Tests — Test N: Change of temperature*

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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Marking, labelling and colour coding

See ISO 8820-1. The fuse-link shall be additionally marked with U_R "70 V", the colour coding given in [Table 1](#) shall apply.

Table 1 — Fuse-link colour coding

Fuse-link rated current A	Fuse-link type SF36-70V	Fuse-link types SF51-70V and SF56-70V	
30	orange	—	
40	green		
50	red		
60	yellow	light blue	
70	brown	dark grey	
80	white	red	
100	blue	yellow	
125	pink	green	
150	grey	orange	
175	light brown (tan)	white	
200	violet	blue	
225	—	light brown (tan)	
250		pink	
300		light grey	
350		dark green	
400		violet	
450		gold/dark yellow	
500		—	brown

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5 Design and test requirements

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5.1 General

5.1.1 General test conditions

See ISO 8820-1 and the following:

- Install the fuse-link in the test fixture with a torque of 9 Nm ± 1 Nm for M6 bolts and a torque of 20 Nm ± 1 Nm for M8 bolts. For a method to conduct retightening torque and setting behaviour, see [Annex A](#).
- The bolt-down fuse-link validation shall apply to the clinchable version.
- If clinchable fuse-links need to be tested on the test fixtures shown in [Figures 10, 11, or 12](#) for the tests, then a hole should be produced into the clinch-terminal to fit the bolt-down test fixture.

Perform the tests according to the test sequence in [Table 2](#).

Fuse-link types SF51-70V and SF56-70V with a rated current between 300 A and 500 A shall only be used for short circuit protection.

5.1.2 General performance requirements

See ISO 8820-1 and the following:

- After the tests, the insulator shall be intact, visible cracks are not permitted.

5.1.3 General fuse-link requirements

The general fuse-link requirements are as follows:

- The terminals shall be made out of a copper material.
- The surface of the terminals shall be tin coated with a thickness of 0,5 µm to 6 µm.
- The insulator shall enclose the fuse-element completely.

5.1.4 Test sequence

Table 2 — Test sequence

No.	Test	Clause	Breaking capacity, I ² t-value	Operating time rating	Current steps	Current cycling	Chemical loads	Climatic loads	Temperature shock	Shock, & Vibration	Derating (optional)	Mechanical stability	Dimensions
	Sample group		A	B	C	D	E	F	G	H	J	K	L
	Number of samples		6	a	6	12	6	12	12	12	6	12	10
1	Dimensions	6											X
2	Marking	4					X	X	X				
3	Cold resistance	5.10	X	X	X	X		X	X	X	Z	X	
4	Retightening torque	A.1				Z		Z	Z	Z	Z		
5	Temperature shock	5.4.5							X				
6	Climatic loads	5.4.2						X					
7	Chemical loads	5.4.3					X						
8	Shock & Vibration	5.4.4								X			
9	Current cycling	5.3				X							
10	Derating	A.3									Z		
11	Current steps	5.6											
12	Breaking capacity	5.7	X										
13	Mechanical stability	5.8										X	
14	Cold resistance	5.10				X		X	X	X		X	
15	Retightening torque	A.1							Z				
16	Overload test	1,35 I _R ^b	5.11			Y		Y	Y	Y		Y	
		2,0 I _R				Y		Y	Y	Y		Y	
17	Operating time rating	0,75 I _R or I _R (with voltage drop measurement)	5.5 5.2		Y								
		1,35 I _R ^b			Y								
		1,5 I _R ^b			Y								
		2,0 I _R			Y								
		3,0 I _R or 3,5 I _R			Y								
		5,0 I _R ^b			Y								
6,0 I _R ^b		Y											
18	I ² t-value	A.2	Z										
19	Insulation resistance	5.9	X	X	X	X		X	X	X			
20	Retightening torque	A.1				Z		Z		Z	Z		
21	Marking	4	X				X	X	X	X			

^a Use at least 6 samples for each test current in the overload test.

^b If applicable.

Y Each rated current shall be divided equally on these tests. The fuses are intended for a single operation only.

Z These tests are optional.

5.1.5 Test cable size

Test cable sizes shall be as given in [Table 3](#). All tests for a particular fuse-link rating shall be performed using the same cable size.

Use thin-wall cables, temperature class C, according to ISO 6722-1, silicone insulation is not permitted.

Use a tubular cable lug, Cu-HCP with Sn coating and hexagonal or W-crimp style.

Table 3 — Test cable sizes

I_R A	Conductor cross sectional area mm ²
30	2,5
40	4,0
50	6,0
60	
70	10,0
80	
100	
125	16,0
150	25,0
175	
200	35,0
225	
250	ISO 20934:2019
300	50,0
350	70,0
400	
450	
500	

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5.2 Voltage drop

5.2.1 Purpose

This test defines and measures the energy consumption of the fuse-link which creates a temperature rise.

5.2.2 Test

This test shall be performed at rated current. For SF51-70V and SF56-70V rated 300 A to 500 A fuse-links the test shall be performed at 0,75 I_R .

Record the voltage drop after the values are stabilized, i.e., the values do not change more than 2 % within a 10 min period. Measure at the points indicated (see [Figure 3](#) to [Figure 5](#)) using the test fixtures of [Clause 7](#).

NOTE This test can be performed during the operating time rating.

5.2.3 Requirement

The requirements given in [Table 4](#) shall apply.

Table 4 — Voltage drop

Rated current A	Maximum voltage drop mV	
	for fuse-link type SF36-70V	for fuse-link types SF51-70V and SF56-70V
30	120	—
40		
50		
60	110	110
70		
80		
100	100	
125		
150		
175		
200		
225	80	
250		
300		
350		
400		
450	80	
500		

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5.3 Current cycling

5.3.1 Purpose

This test evaluates the ability of the fuse-link to withstand the energy volume of transient pulses.

5.3.2 Test

Apply a cyclic current as displayed in [Figure 1](#) to the fuse-link, perform 10 000 cycles. The rectangular current shall have a rise time of <0,01 s.