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**Road vehicles — Fuse-links —**

Part 5:

**Fuse-links with axial terminals (Strip  
fuse-links) Types SF 30 and SF 51 and  
test fixtures**

*Véhicules routiers — Liaisons fusibles —*

*Partie 5: Liaisons fusibles avec languettes axiales (liaisons fusibles  
électriques) des types SF 30 et SF 51, et montages d'essai*



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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 8820-5 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

ISO 8820 consists of the following parts, under the general title *Road vehicles — Fuse-links*:

- *Part 1: Definitions and general test requirements*
- *Part 2: User's guide*
- *Part 3: Fuse-links with tabs (blade type)*
- *Part 4: Fuse-links with female contacts (type A) and bolt-in contacts (type B) and their test fixtures*
- *Part 5: Fuse-links with axial terminals (Strip fuse-links) Types SF 30 and SF 51 and test fixtures*
- *Part 6: Single-bolt fuse-links*
- *Part 7: Fuse-links with tabs (Type G) with rated voltage of 450 V*

## Road vehicles — Fuse-links —

### Part 5:

## Fuse-links with axial terminals (Strip fuse-links) Types SF 30 and SF 51 and test fixtures

### 1 Scope

This part of ISO 8820 specifies fuse-links with axial terminals (Strip fuse-links) Type SF 30 and SF 51 and test fixtures for fuses in road vehicles. It establishes, for these fuse-link types, the rated current, test procedures, performance requirements and dimensions.

This part of ISO 8820 is applicable to fuse-links with a rated voltage of 32 V, a current rating of 30 A to 500 A and a breaking capacity of 2 000 A intended for use in the electrical system of road vehicles with a nominal voltage of 12 V and/or 24 V.

This part of ISO 8820 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 part of ISO 8820.

### 2 Normative references

The following referenced documents are indispensable for the application 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 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 4017, *Hexagon head screws — Product grades A and B*

ISO 4032, *Hexagon nuts, style 1 — Product grades A and B*

ISO 6722, *Road vehicles — 60 V and 600 V single-core cables — Dimensions, test methods and requirements*

ISO 7089, *Plain washers — Normal series — Product grade A*

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

ISO 8820-2, *Road vehicles — Fuse-links — User's guide*

### 3 Terms and definitions

The requirements given in Table 1 and ISO 8820-1 shall apply.

#### 4 Marking, labelling and colour coding

The requirements given in Table 1 and ISO 8820-1 shall apply.

**Table 1 — Fuse-link colour coding**

Fuse-link current rating A	Fuse-link type SF 30	Fuse-link type SF 51
30	orange	X
40	green	
50	red	
60	yellow	
70	brown	
80	white	red
100	blue	yellow
125	pink	green
150	grey	orange
175	light brown (tan)	white
200	violet	blue
225	X	light brown (tan)
250		pink
300		grey
350		dark green
400		violet
450		gold / dark yellow
500		brown

#### 5 Tests and requirements

##### 5.1 General

##### 5.1.1 General test conditions

In addition to carrying out the test procedures in accordance with ISO 8820-1, the following criteria shall apply:

- Tests shall be performed following the test sequences in Table 2.
- The test fixtures for electrical tests shall be designed in accordance with Figures 4, 5, 6 and 7. The connection resistance shall be a maximum of 1,0 mΩ for SF 30 fuse-links and 0,35 mΩ max. for SF 51 fuse-links to ensure the proper function of the test fixture.
- Terminals shall have a suitable finish which will ensure corrosion protection, and shall have satisfactory mechanical and electrical properties.

Fuse-link type SF 30 with a rated current of 150 A and 200 A and fuse-link type SF 51 with a rated current of 300 A ... 500 A shall only be used for short circuit protection and have to be tested with a cable, the insulation of which will withstand the test without deterioration.

5.1.2 Test sequence

Table 2 — Test sequences

No.	Test	Clause	Sample groups <sup>a</sup>						
			1	2	3	4	5	6	7
1	Dimensions	6	X	X	X				
2	Marking, labelling and colour coding	4	X	X	X	X	X	X	X
3	Terminal strength	5.8	X	X	X	X	X	X	X
4	Fuse-link voltage drop	5.2	X	X	X				
5	Climatic load	5.4				X			
6	Chemical load	5.4					X		
7	Mechanical load	5.4						X	
8	Transient current cycling	5.3							X
9	Fuse-link voltage drop	5.2				X	X	X	X
10	Current step	5.6			X				
11	Breaking capacity	5.7	X						
12	Operating time rating	5.5		X		X	X	X	X
				Y <sup>b</sup>		Y	Y	Y	Y
				Y		Y	Y	Y	Y
				Y		Y	Y	Y	Y
				Y		Y	Y	Y	Y
13	Terminal strength (removal)	5.8	X	X	X	X	X	X	X

<sup>a</sup> Each sample group shall contain a minimum of 8 fuse links.

<sup>b</sup> For these operating time tests noted with a Y, the sample groups 2, 4, 5, 6 and 7 for each current rating shall be divided equally. These fuses are intended to be subjected to a single operating time test only.

5.1.3 Test cable sizes

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.

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

Current rating A	Conductor cross sectional area <sup>a</sup> mm <sup>2</sup>	
	for fuse-link types SF 30	for fuse-link types SF 51
30	2,5	X
40	4,0	
50	6,0	
60		
70	10,0	
80		
100	16,0	10,0
125	25,0	16,0
150		25,0
175		35,0
200		50,0
225	X	70,0
250		
300		
350		
400		
450		
500		

<sup>a</sup> Conductor material according ISO 6722.

5.2 Voltage drop

5.2.1 Test

The test given in ISO 8820-1 shall apply. Measure the voltage drop at the points as indicated (see Figures 4, 5 and 6), using the test fixtures of Clause 7.

This test shall be performed at 0,75 I<sub>R</sub> for:

- SF 30 - 150 A ... 200 A, and
- SF 51 - 300 A ... 500 A.

### 5.2.2 Requirement

The requirements given in Table 4 shall apply.

Table 4 — Voltage drop

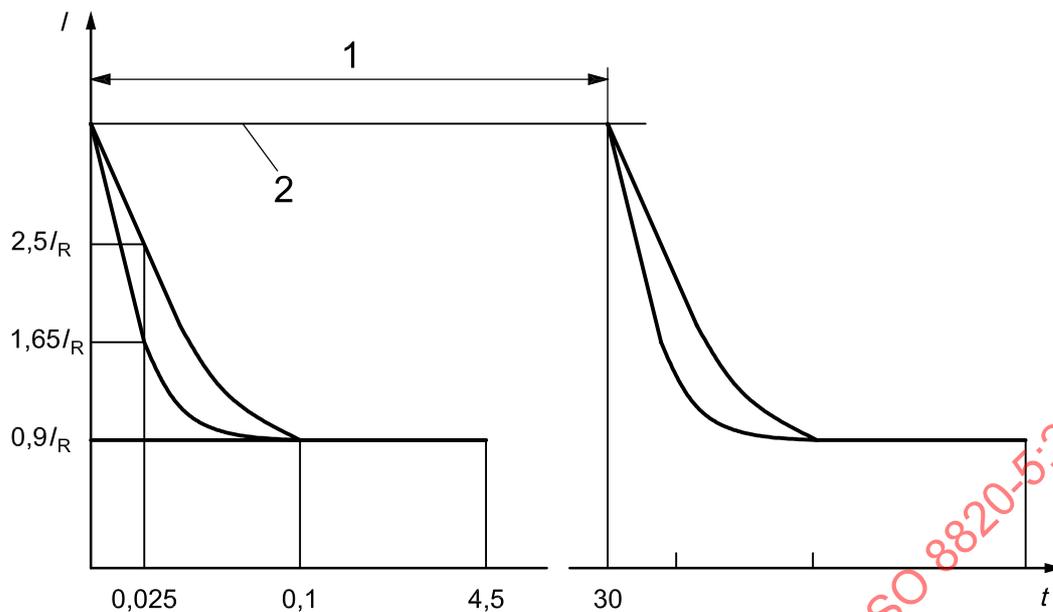
Fuse-link current rating A	Max. voltage drop mV	
	for fuse-link types SF 30	for fuse-link types SF 51
30	105	
40	90	
50	80	
60		
70		
80	75	110
100		
125		
150		
175		
200	70	
225		
250		
300		
350		
400		80
450		
500		

### 5.3 Transient current cycling

#### 5.3.1 Test

Figure 1 and the test given in ISO 8820-1 shall apply. At an elapsed time of 0,025 s on-time, the current shall fall to a value between  $1,65 I_R$  and  $2,5 I_R$ . At no time shall the steady state current fall below  $0,9 I_R$ .

This test does not apply to fuse-links type SF 30 current ratings of 150 A and above, and type SF 51 current ratings of 300 A and above. For those fuse-links, agreements shall be taken between manufacturer and supplier.



**Key**

- 1 one cycle
- 2  $4 I_R$
- $I$  current
- $t$  time in s

**Figure 1 — Transient current cycling**

**5.3.2 Requirement**

The requirements given in ISO 8820-1 shall apply.

**5.4 Environmental conditions**

The tests and requirements given in ISO 8820-1 shall apply.

**5.5 Operating time rating**

**5.5.1 Test**

The test given in ISO 8820-1 shall apply.

**5.5.2 Requirements**

The requirements given in Table 5 shall apply.

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

Table 5 — Operating times

Test currents	Operating times s							
	SF 30				SF 51			
	30 A ... 125 A		150 A ... 200 A		80 A ... 250 A		300 A ... 500 A	
	min.	max.	min.	max.	min.	max.	min.	max.
0,75 $I_R$	— <sup>b</sup>	—	360 000	$\infty$	—	—	14 400	$\infty$
$I_R$	360 000	$\infty$	—	—	14 400	$\infty$	—	—
1,1 $I_R$	14 400	$\infty$	—	—	—	—	—	—
1,35 $I_R$	—	—	—	—	120	1 800	—	—
1,5 $I_R$	90	3 600	—	—	—	—	—	—
2,0 $I_R$	3	100	1	15	1	15	1	15
3,0 $I_R$	0,3	3	—	—	—	—	—	—
3,5 $I_R$	—	—	0,3	5	0,3	5	0,5	5
5,0 $I_R$	0,1	1	—	—	—	—	—	—
6,0 $I_R$ <sup>a</sup>	—	—	0,1	1	0,1	1	0,1	1

<sup>a</sup> Not for  $\geq 350$  A.

<sup>b</sup> Not specified, where noted with “—”.

## 5.6 Current steps

### 5.6.1 Test

The test given in ISO 8820-1 shall apply.

NOTE This test does not apply for fuse types SF 30 – 150 A to 200 A ... SF 51 – 300 A ... 500 A.

### 5.6.2 Requirements

The requirement given in ISO 8820-1 shall apply. After activation, the current through the fuse-link shall not exceed 0,5 mA at the rated voltage of the fuse-link.

## 5.7 Breaking capacity

### 5.7.1 Test

The test given in ISO 8820-1 shall apply.

Test at 2 000 A with cable sizes as shown in Table 3.

### 5.7.2 Requirement

The requirement given in ISO 8820-1 shall apply. After the test, the current through the fuse-link shall not exceed 0,5 mA at the rated voltage of the fuse-link.

5.8 Strength of terminals

5.8.1 Test

Install the fuse-links in the test fixture (see Figures 4, 5 and 6) with the mounting torque according to Table 6. This test is performed without cables and terminals.

Table 6 — Mounting torque

Fuse-link type	Mounting torque Nm
SF 30 – for M5 bolts	4,5 ± 1
SF 30 – for M6 bolts	6 ± 1
SF 51 – for M8 bolts	12 ± 1

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

NOTE Test number 13 in Table 2 “test sequence” is just a removal from the test fixture.

5.8.2 Requirement

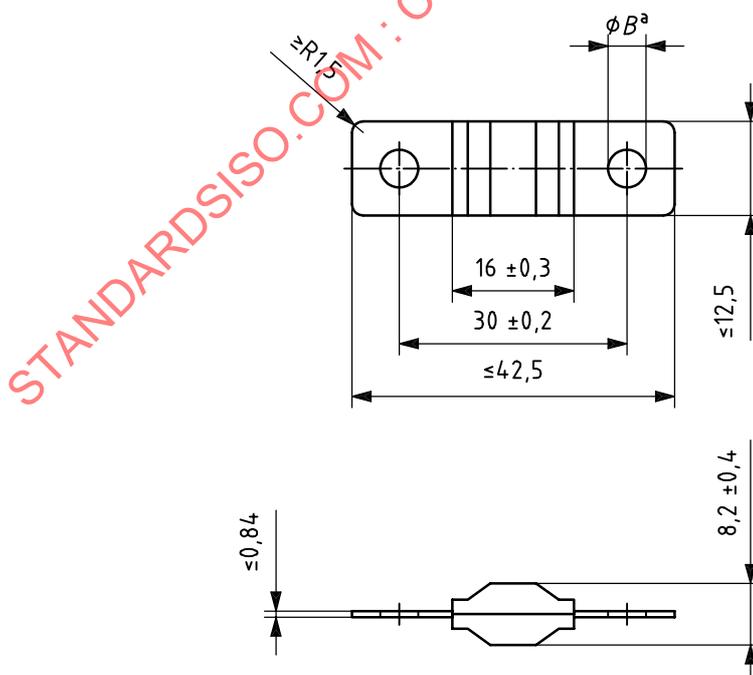
Fuse-links shall remain physically intact.

6 Dimensions and designation examples

6.1 Type SF 30

6.1.1 Dimensions

Dimensions in millimetres



<sup>a</sup> For fuse links with rated current ≤ 125 A the hole, B, is for a bolt diameter of M5 and/or M6, and for fuse-links with a rated current > 125 A the hole B is for a bolt diameter of M6.

Figure 2 — Fuse-link type SF 30

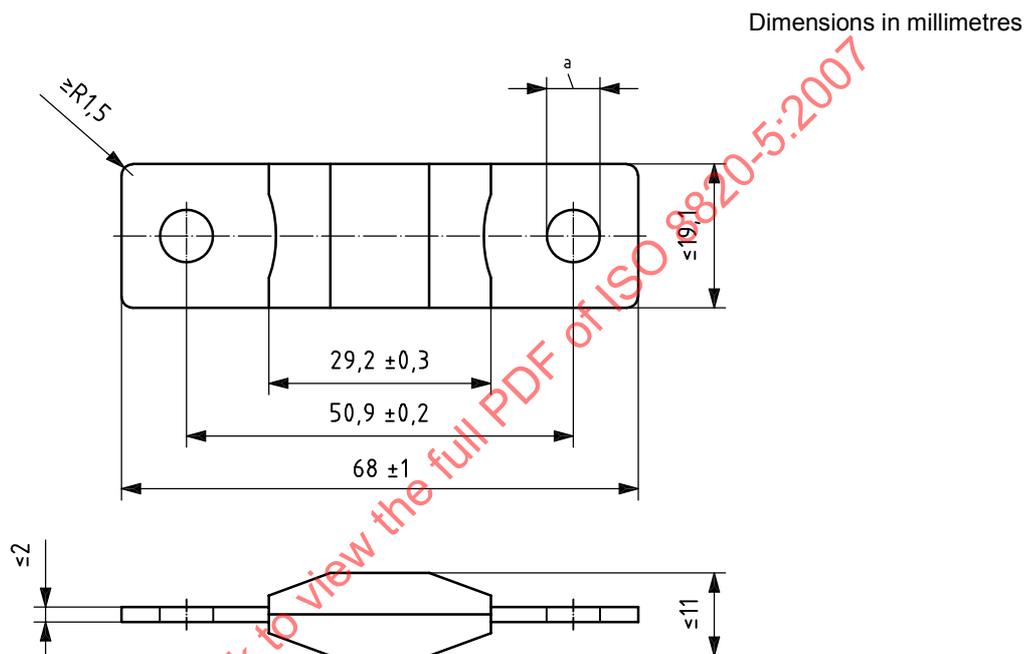
### 6.1.2 Designation example

An example of the designation of a fuse-link, type SF 30 for a rated current of 100 A and M6 bolt is:

**Fuse ISO 8820 – SF 30-100 – M6**

## 6.2 Type SF 51

### 6.2.1 Dimensions



<sup>a</sup> Bolt M8.

**Figure 3 — Fuse-link type SF 51**

### 6.2.2 Designation example

An example of the designation of a fuse-link, type SF 51 for a rated current of 150 A is:

**Fuse ISO 8820 – SF 51-150**

## 7 Test fixture

### 7.1 General

This clause establishes the overall dimensions, materials, finish and coatings for the test fixture to perform electrical tests on fuse-links as specified herein.

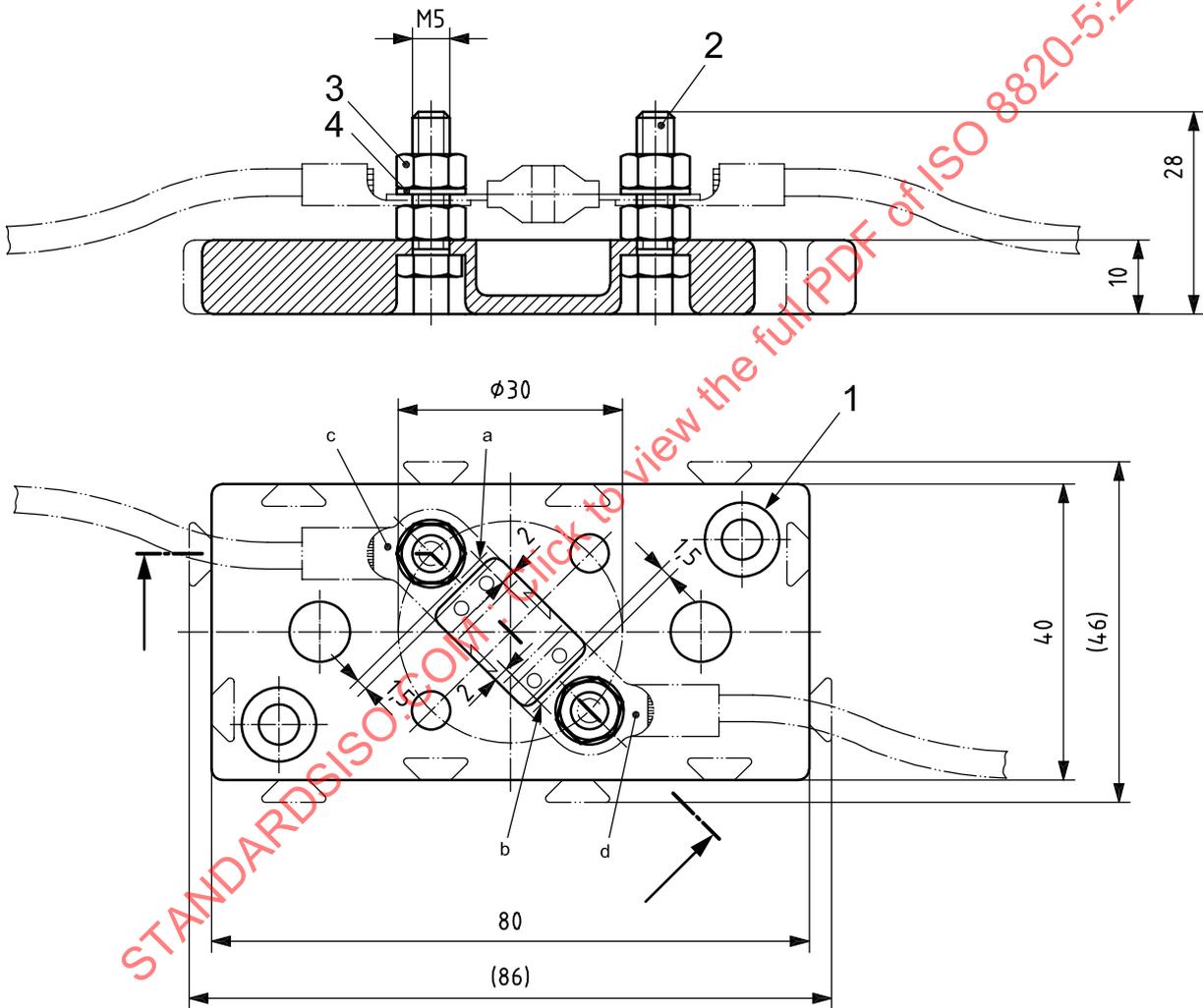
### 7.2 Materials and dimensions

The test fixture shall conform to the material requirements and dimensions shown in Tables 7, 8 and 9 and Figures 4, 5, 6 and 7. Alternative designs of test fixtures are allowed in the case that the electrical and mechanical properties are equivalent.

Table 7 — Parts list and material specifications for M5 bolts

Reference No. in Figure 4	Description	Dimensions see Figure	Material specifications, finish and coating	Quantity
1	Test fixture insulating body	7	Thermoset plastic	1
2	Bolt: ISO 4017-M5×20-8.8	—	Steel, gal. Zn	2
3	Nut: ISO 4032-M5-8	—	Steel, gal. Zn	4
4	Washer: ISO 7089-5-200 HV	—	Steel, gal. Zn	2

Dimensions in millimetres  
Tolerances in accordance with ISO 2768



Key

- 1 Test fixture insulating body
- 2 Bolt: ISO 4017-M5×20-8.8
- 3 Nut: ISO 4032-M5-8
- 4 Washer: ISO 7089-5-200 HV

NOTE 1 Points a and b are the measuring points for the voltage drop.

NOTE 2 Points a, b, c and d are the measuring points for connection resistance.

Figure 4 — Test fixture with M5 bolts for type SF 30 fuse-links