

Blade type electric fuse-links for automobiles

1. Scope

This standard specifies the standard and mini blade type fuse-links (hereinafter referred to as "fuse-links") used for electrical equipments and circuits of automobiles, with rated voltage of 32 V or less and rated current of 30 A or less.

Remarks 1. Fuse-links of 20 A or more, some of which have the same rated current with those specified in **JASO D 614**, are different in electrical characteristics and types from them.

2. Applicable standards for this standard are (shown) as follows:

- JIS C 3406** Low-voltage cables for automobiles
JIS H 3100 Copper and copper alloy - Sheets, plates and strips
JIS K 6301 Physical testing methods for vulcanized rubber
JASO D 611 Low-tension cables with reduced outside diameter for automobiles
ISO 6722-4 Road vehicles - Unscreened low-tension cables - Part 4: Conductor sizes and dimensions for thin wall insulated cables

3. Corresponding International Standards:

- ISO/CD 8820-1:1996** Road vehicles - Fuses - Part 1: Definitions general test requirements
ISO/CD 8820-3:1996 Road vehicles - Fuses - Part 3: Fuse-links with tabs (blade type)

2. Classification

The fuse-links of each rated current shall be classified by housing colour and type as shown in **Table 1**.

Table 1 Classification

Rated current	Housing colour	Type	
		Standard type	Mimi type
1	Black	○	○
2	Grey	○	○
3	Voilet	○	○
4	Pink	○	○
5	Tan	○	○
7.5	Brown	○	○
10	Red	○	○
15	Blue	○	○
20	Yellow	○	○
25	Natural(White)	○	○
30	Green	○	○

3. Performance requirements

Fuse-links, when tested in accordance with the test methods specified in Clause 6, shall meet the following performance requirements shown in Table 2.

Table 2 Performance requirements

Items		Performance requirements	Test method
(1)	Maximum voltage drop	Shall be in accordance with Table 3.	6.2 and 6.11
(2)	Operating time rating	Shall be in accordance with Table 4.	6.3 and 6.11
(3)	Transient current cycling	Shall meet the requirements for (1) maximum voltage drop, (2) operating time rating, (10) removability and (11) terminal strength after each item has been tested.	6.4 and 6.11
(4)	Vibration		6.5 and 6.11
Environmental exposure	(5) Temperature/humidity		6.6.1 and 6.11
	(6) Resistance to oil		6.6.2 and 6.11
	(7) Resistance to fuel		6.6.3 and 6.11
(8)	Maximum current characteristic	The leakage current flow through terminals shall not exceed 0.5 mA.	6.7 and 6.11
(9)	Breaking capacity	Permanent arc shall not occur after fusing and the leakage current flow through the fuse-links shall not exceed 0.5 mA. The pierced holes of housing and the terminals shall not melt.	6.8 and 6.11
(10)	Removability	Shall be removable from the test jig intactly and the markings and housing colour shall not illegible and unrecognizable, respectively.	6.9 and 6.11
(11)	Strength of terminals	The dimensional displacement of the terminals shall not exceed 0.5 mm.	6.10 and 6.11

Table 3 Maximum voltage drop

Rated current A	Maximum voltage drop mV	Rated current A	Maximum voltage drop mV
1	250	10	140
2	225	15	125
3	200	20	
4		25	
5	175	30	120
7.5	150		

Table 4 Operating time

Test current	Operating time	
	Minimum	Maximum
110% of rated current	100 h	—
135% of rated current	0.75 s	1800 s
200% of rated current	0.15 s	5 s
350% of rated current	0.04 s	0.5 s
600% of rated current	0.02 s	0.2 s

4. Dimensional requirements

The dimensional requirements for the fuse-links shall be as shown in Figs.1 and 2.

Fig. 1 Standard type

Unit: mm

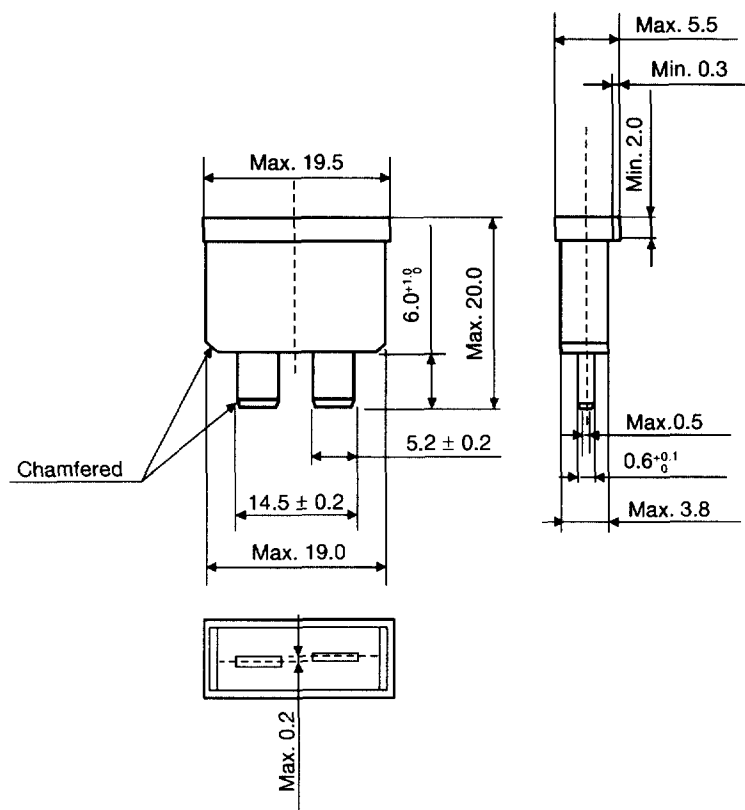
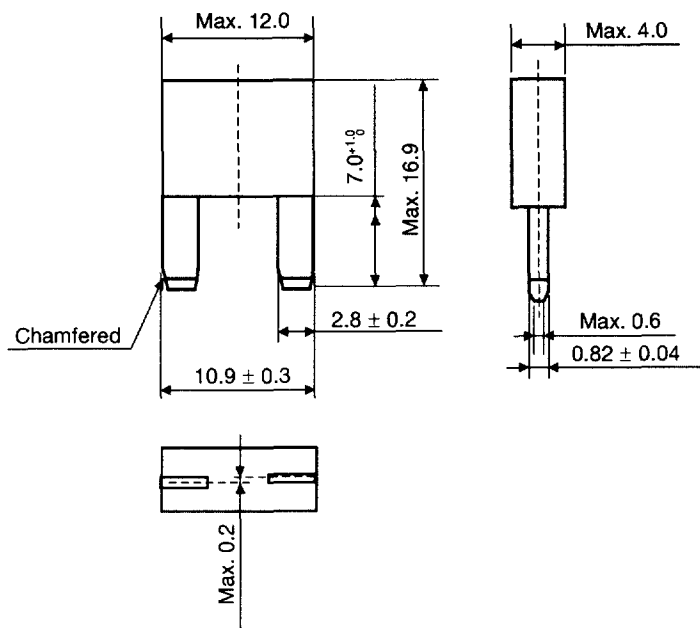


Fig. 2 Mini type

Unit: mm



5. Appearance

The appearance of fuse-links shall be free from defects harmful to use and the inside fusible part shall be visible from the outside.

6. Test method

6.1 Test conditions

The test(s) of the fuse-links shall be conducted under the following conditions unless otherwise specified.

- (1) Any tests other than the vibration and temperature/humidity cycle tests shall, in general, be performed in such a manner that the terminal face of the fuse-link is mounted in the horizontal plane.
- (2) All electrical tests shall conform to the testing arrangement shown in Fig.3 and be made with direct current maintained within tolerance of $\pm 1\%$ at a temperature of $(23 \pm 5)^\circ\text{C}$, unless the current and voltage tolerances are otherwise stated.

(3) The connecting cables used in the electrical tests shall conform to JIS C 3406, JASO D 611 and ISO 6722-4.

(4) Connections to the fuse-link shall be made using the connecting cable of not less than 600 mm in length specified in Table 5. When two or more fuse-links are tested in series, they shall be mounted not less than 150 mm apart.

(5) Make vibration and environmental exposure tests without current passing through the fuse-links.

(6) The voltage drop (V_{cd-Vab}) and full-voltage drop (V_{ef}) of the test jig shall be 2 mV/A or less and 4 mV/A or less, respectively. They shall be measured by allowing 10 A electric current to flow through a dummy fuse-link as shown in Fig.4.

Remark: The (V_{cd-Vab}) and (V_{ef}) shall be measured at the measuring points shown in Fig.3.

Fig.3 Testing arrangement

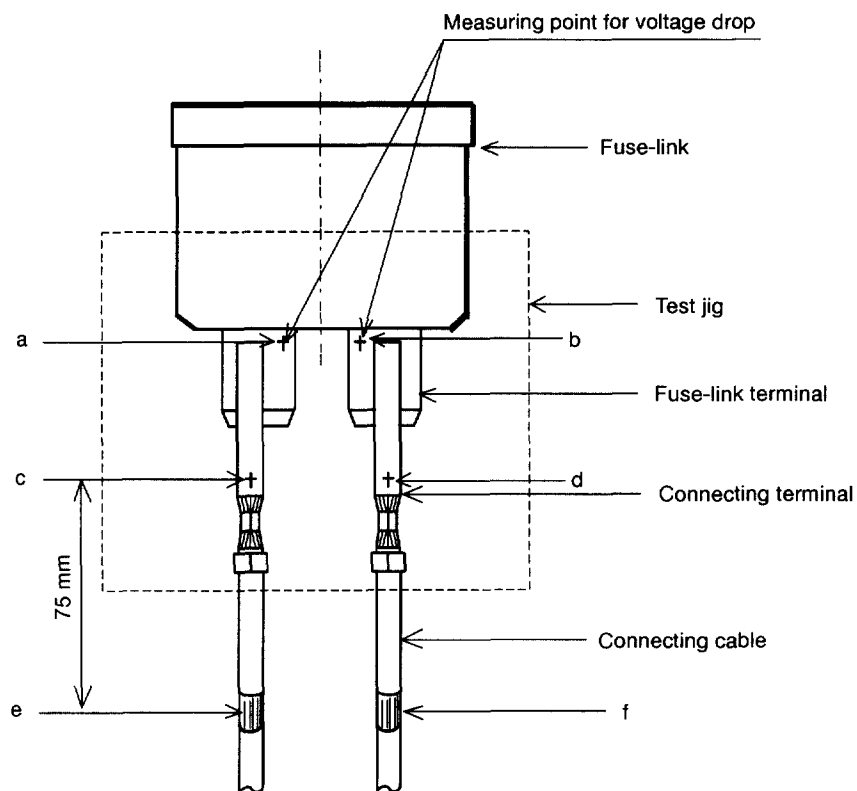
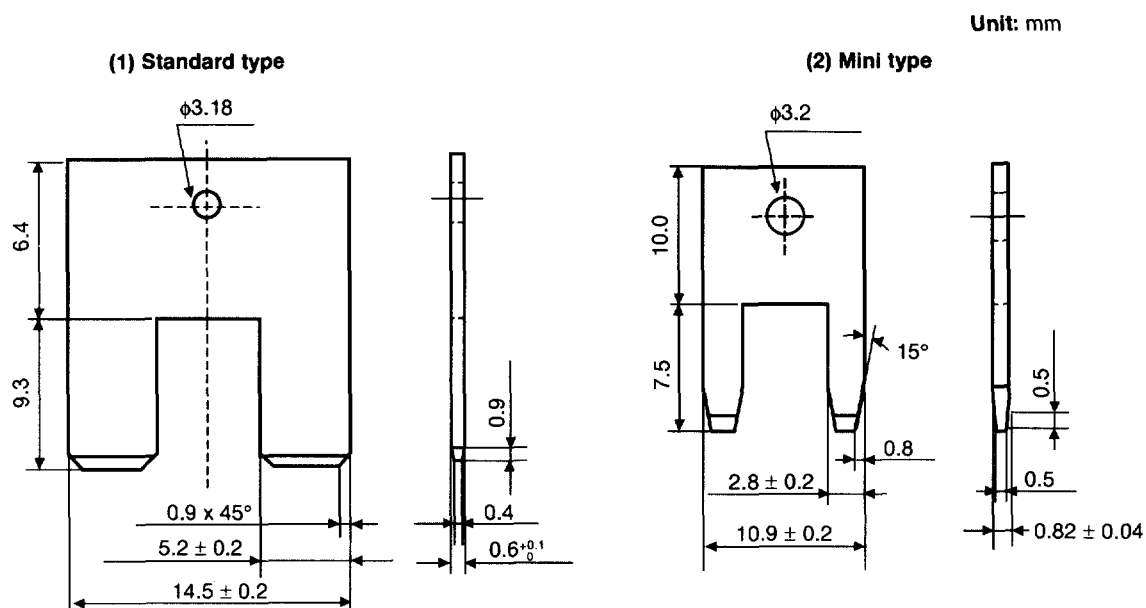


Fig.4 Dummy fuse-links



Remark: The material shall be C1100PC or C1100RC given under JIS H 3100.

Table 5 Connecting cables

Rated current	Connecting cable (Nominal cross-sectional area mm ²)
1	1.5 – 2.0
2	
3	
4	
5	
7.5	
10	4.0 – 5.0
15	
20	
25	
30	

6.2 Voltage drop test

Measure the voltage drop (mV) at points "a" and "b" across the fuse-link terminals as shown in Fig.3 after 15 min. of applied rated current.

6.3 Operating time rating test

Prior to testing stabilize the test jig and fuse-link at a temperature of $(23 \pm 5)^{\circ}\text{C}$. Apply the test current specified in **Table 4** to flow through the fuse-link and then measure the time it takes the fuse-link to melt.

Repeat this procedure for each sample. Especially when testing a large number of fuse-links, allow sufficient cooling time to prevent excessive temperature build-up of the test jig. Power supplies used shall have a time constant of 2 ms or less with direct current of not more than 32V d.c.

6.4 Transient current cycling test

As shown in **Fig.5**, apply the transient current to the fuse-link 50,000 times intermittently, which varies in one cycle as follows: the transient current measures 460% to 500% of rated current for 5 A or less fuse-link and 560% to 600% of rated current for over 5 A fuse-link at the start of the cycle, decreases to 165% and 250% of rated current for the former and the latter respectively 0.025 second later, continues to lower, and is kept to be 100% of rated current for both 0.1 second to 4.5 seconds after the start of the cycle.

6.5 Vibration test

Subject suitably mounted a fuse-link sample on the table of the vibration testing system to a simple harmonic motion having an amplitude of 0.75 mm travel (1.5 mm peak-to-peak). The entire range increasing from 10 Hz to 55 Hz and returning to 10 Hz shall be traversed in approximately 1 min, and varying the frequency uniformly. Apply the said motion to the fuse-link sample for two hours in each of the three mutually perpendicular directions to one another (two of which shall be horizontal).

6.6 Environmental exposure test

6.6.1 Temperature/humidity cycle test

Subject the fuse-links to a temperature/humidity cycling test 10 times, as shown in **Fig.6**.

- (1) Hold the samples at room (chamber) temperature (t_c) $(23 \pm 5)^{\circ}\text{C}$ for 4 hours at 45% to 75% relative humidity (RH).
- (2) Raise t_c to $(55 \pm 2)^{\circ}\text{C}$ at 95% to 99% RH within 0.5 hours.
- (3) Hold t_c at $(55 \pm 2)^{\circ}\text{C}$ at 95% to 99% RH for 10 hours.
- (4) Lower t_c to $(-40 \pm 2)^{\circ}\text{C}$ within 2.5 hours.
- (5) Hold t_c at $(-40 \pm 2)^{\circ}\text{C}$ for 2 hour.
- (6) Raise t_c to $(120 \pm 2)^{\circ}\text{C}$ within 1.5 hours.
- (7) Hold t_c at $(120 \pm 2)^{\circ}\text{C}$ for 2 hours.
- (8) Allow to return to room temperature $(23 \pm 5)^{\circ}\text{C}$ within 1.5 hours.

Remark: The relative humidity shall not be uncontrolled for a period from 16.5 hours after the start to the end of a cycle of 24 hours.

Fig. 5 Transient current

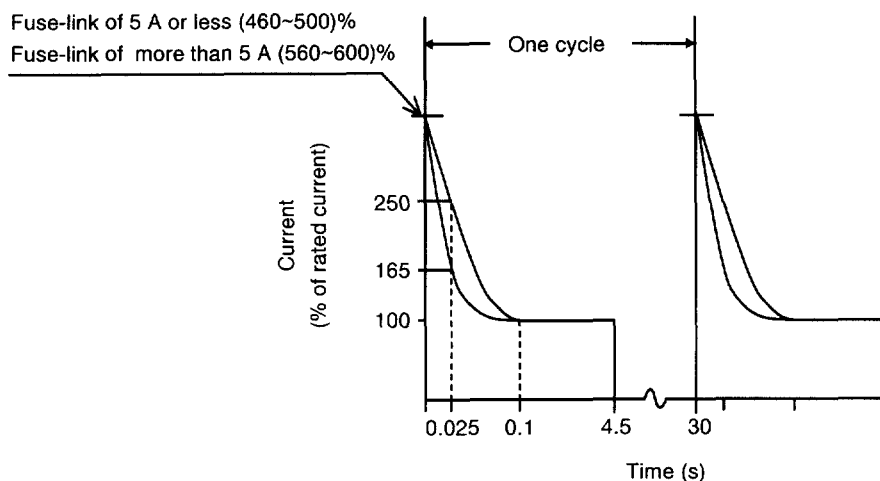
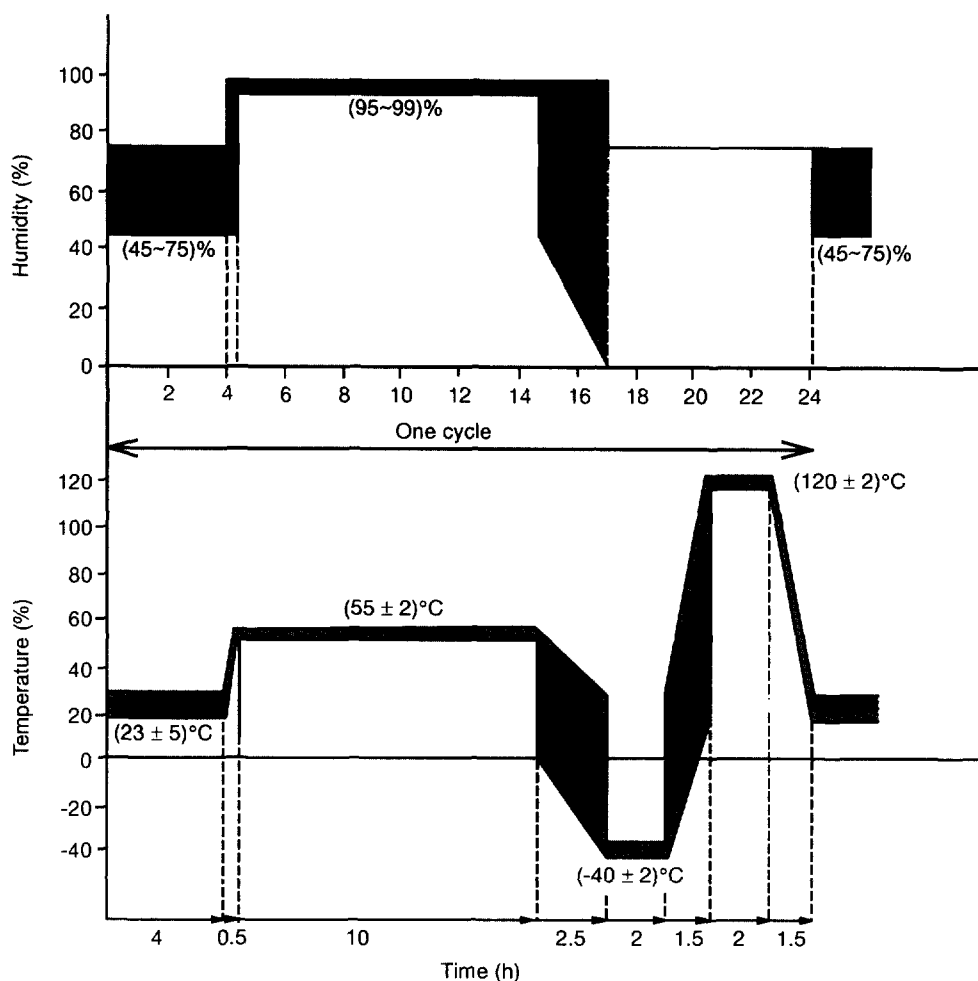


Fig.6 Temperature/humidity cycle



6.6.2 Resistance to oil

The lubricating oil resistance test shall be performed in the following procedure:

- (1) Immerse a fuse-link sample in the test oil No.1 (lubricating oil) given under Clause 12.3 (Testing equipment) of JIS K 6301 for one minute.
- (2) Remove the fuse-link sample from the oil and subject it to a temperature of $(90 \pm 2)^{\circ}\text{C}$ for one hour.
- (3) Drain all liquid from the fuse-link sample.

6.6.3 Resistance to fuel

The fuel oil resistance test shall be performed in the following procedure:

- (1) Immerse a fuse-link sample in the test oil Type C (fuel oil) given under Clause 12.3 (Testing equipment) of JIS K 6301 for one minute.
- (2) Remove the fuse-link sample from the oil and dry it at a temperature of $(90 \pm 2)^{\circ}\text{C}$ for one hour.
- (3) Drain all liquid from the fuse-link sample.

6.7 Maximum current test

The maximum current test shall be performed in the following procedure:

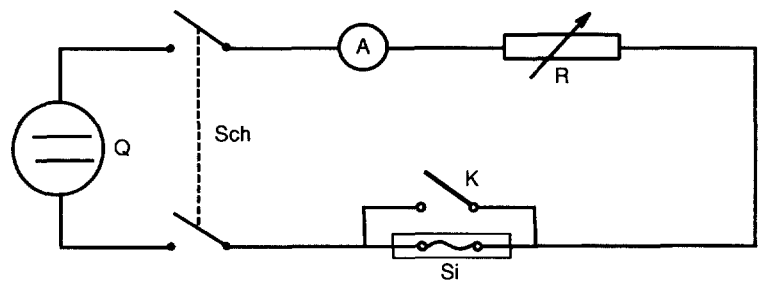
- (1) Apply a current equivalent in value to the rating of the fuse-link on test for a duration of 5 min.
- (2) Increase the current value in steps of 2.5% of the fuse-link rating each five minutes until the fuse-element melts.
- (3) Apply a 32 V voltage after fusion and measure the leakage current.

6.8 Breaking capacity

The breaking capacity test shall be performed in the following procedure:

- (1) A current of $(1000 \pm 50)\text{A}$ shall be applied at $(32 + 2.0/-0)\text{VDC}$ with a $(2.0 \pm 0.5)\text{ms}$ time constant to the fuse-link in the circuit as shown in Fig. 7. Connections shall be made to the fuse-link by not less than 600 mm of the connecting cables in Table 5.
- (2) Apply a 32 V voltage after fusion, measure the leakage current and check the appearance of the fuse-link for abnormalities.

Fig.7 Breaking capacity test circuit



Remark: The symbols in the figure refers to the folloing:
Q : Power source
Sch : Switch
A : Ammeter
R : Adjusting resistor
K : Fuse short circuiting switch
Si : Fuse (-link mounted on the test jig)

6.9 Dismountability inspection

Pull out a fuse-link sample from the test jig two minutes after it fused.

6.10 Strength of terminals

Apply the force shown in **Table 6** to a fuse-link sample in the way as shown in **Fig.8** and measure the displacement amount.

Fig.8 Terminal strength test

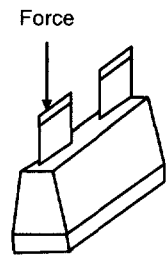


Table 6 Force to be applied to terminal
Unit: N

Type of fuse-link	Force
Standard type	70
Mini type	50

6.11 Test sequence and number of test samples

The test sequence and number of test samples shall be as specified on Table 7.

Table 7 Test sequence and number of test samples

Test sequence No.	Test item	Requirements	Test method	Test sample groups						
				1	2	3	4	5	6	7
1	Appearance, (shape and) dimensions	4 and 5	4 and 5	8	8					
2	Voltage drop test	3 (1)	6.2	8						
3	Strength of terminals	3 (11)	6.10	8	8	8				
4	Temperature/humidity cycling test	3 (5)	6.6.1				8			
5	Tests for resistance to oil and fuel	3 (6)	6.6.2					8		
		3 (7)	6.6.3							
6	Vibration	3 (4)	6.5						8	
7	Transient current cycling test	3 (3)	6.4							8
8	Voltage drop test	3 (1)	6.2				8	8	8	8
9	Maximum current test	3 (8)	6.7			8				
10	Breaking capacity test	3 (9)	6.8	8						
11	Operating time rating test	3 (2)	6.3		8		8	8	8	8
	110%		6.3		2		2	2	2	2
	135%		6.3		2		2	2	2	2
	200%		6.3		2		2	2	2	2
	350%		6.3		2		2	2	2	2
	600%		6.3		2		2	2	2	2
12	Dismountability inspection	3 (10)	6.9	8	8	8	8	8	8	8
13	Strength of terminals	3 (11)	6.10	8	8	8	8	8	8	8

Remarks 1: Each test sample group shall contain eight fuse-links.

2: "8" means that all of eight fuse-links are used at a time.

3: "2" means that eight fuse-links are used by twos.

4: Percentage (%) of the operating time rating test refers to the ratio to the rated current.

7. Designation (of Product)

The designation of fuse-link shall be in accordance with the order of "standard name, type and rated current " or "standard number, type and rated current."

(Example)

Blade type (electric) fuse-links (for automobiles), standard type, 10 A

JASO D 612, mini type, 10 A

8. Marking

The rated current, manufacturer's name or symbol and rated voltage 32 V shall be permanently marked on the fuse-link body.

Reference standard: JASO D 614 High current time rag fuse links for automobiles

In the event of any doubt, the original
standards in Japanese should be referred.

SI : THIRD PHASED STANDARD

(The standard where SI units and newly values are given and do not using
customary units, but it is excepted that the standards are represented in only
accustomed metric units as m, A, Hz etc.)

Established by the Standard Council of JSAE

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