INTERNATIONAL STANDARD

ISO 8820-2

Third edition
2014-02-15

Road vehicles — Fuse-links —

Part 2: User guidelines

Véhicules routiers — Liaisons fusibles —

Partie 2: Guide de l'utilisateur

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Foreword

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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).

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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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electrical and electronic equipment*.

This third edition cancels and replaces the second edition (ISO 8820-2:2005), which has been technically revised.

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 guidelines*

— *Part 3: Fuse-links with tabs (blade type) Type C (medium), Type E (high currents) and Type F (miniature)*

— *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 SF30 and SF51 and test fixtures*

— *Part 6: Single-bolt fuse-links*

— *Part 7: Fuse-links with tabs (Type G) with rated voltage of 450 V*

— *Part 8: Fuse-links with bolt-in contacts (Types H and J) with a rated voltage of 450 V*

— *Part 9: Fuse-links miniature low profile (Type K)*

— *Part 10: Road vehicles — Fuse — Part 10: Fuse-links with tabs Type L (high current miniature)*[1)]

1) To be published.

Road vehicles — Fuse-links —

Part 2: User guidelines

1 Scope

This part of ISO 8820 gives guidance for the choice and application of automotive fuse-links which are defined in the other parts of this International Standard. It describes the various parameters which have to be taken into account when selecting fuse-links.

Fuse-links according to ISO 8820 are intended for electrical cable protection. If these types of fuse-links are to be used for electrical component protection, it should be agreed between customer and supplier.

It is intended to be used in conjunction with the other parts of ISO 8820.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 in ISO 8820-1 apply.

4 Rated voltage and system voltage

The fuse rated voltage shall always be higher than the nominal voltage of the electrical system of the vehicle to allow for possible overvoltage conditions.

5 Rated current and continuous current

The rated current (I_R) is the current used for identifying the fuse-link.

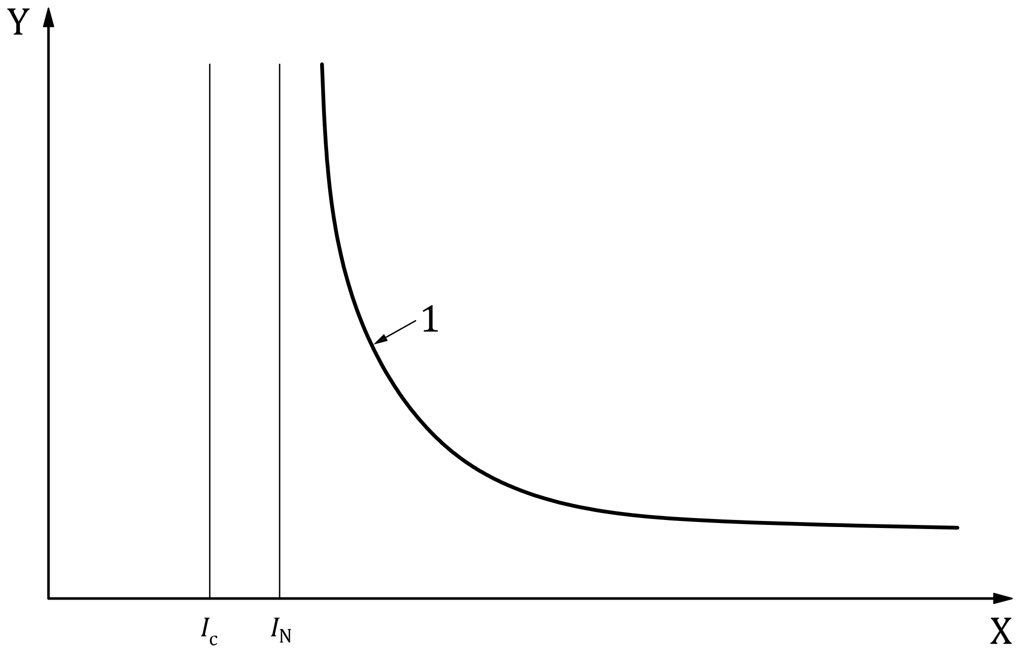
The continuous current (I_C) in Figure 1 is the maximum current flowing continuously through the circuit (fuse-link, terminals, holder, and cables) at a maximum ambient temperature. The continuous current is lower than the rated current.

6 Cold resistance

The cold resistance is the resistance of a fuse-link without self-heating at room temperature (RT). It can be calculated by the drop voltage measured, between the measuring points of the fuse-link (specified in the appropriate part of ISO 8820 according to the type of the fuse), at a certain current, typically measured at 10 % of fuse rated current.

The spread of fuse-link cold resistance due to volume production results in a spread in power dissipation and a spread in time-current characteristic (see Figure 2).

Figures 2 and 3 show the variation of operating time and voltage drop versus cold resistance for a given test current.



Key

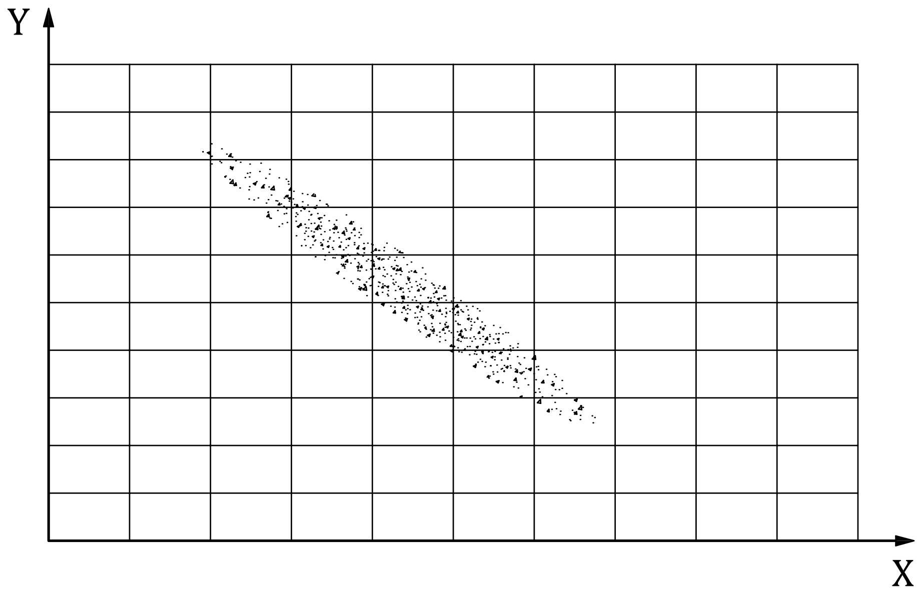
Y operating time (t)

X current (I)

1 time-current characteristic

Figure 1 — Rated current, continuous current, and time-current characteristic

The rise of the temperature in the circuit depends on the current and time.

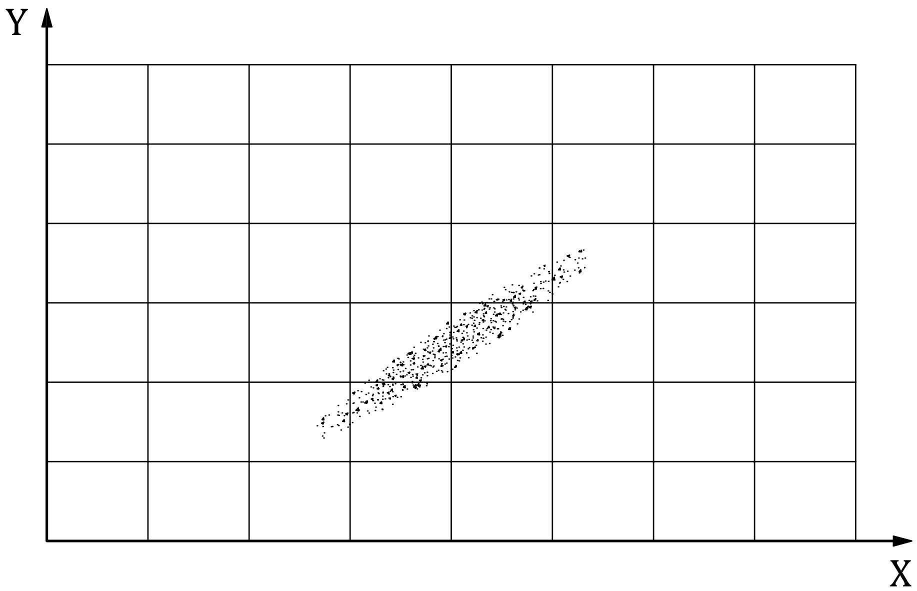


Key

Y operating time

X cold resistance

Figure 2 — Cold resistance versus operating time



Key

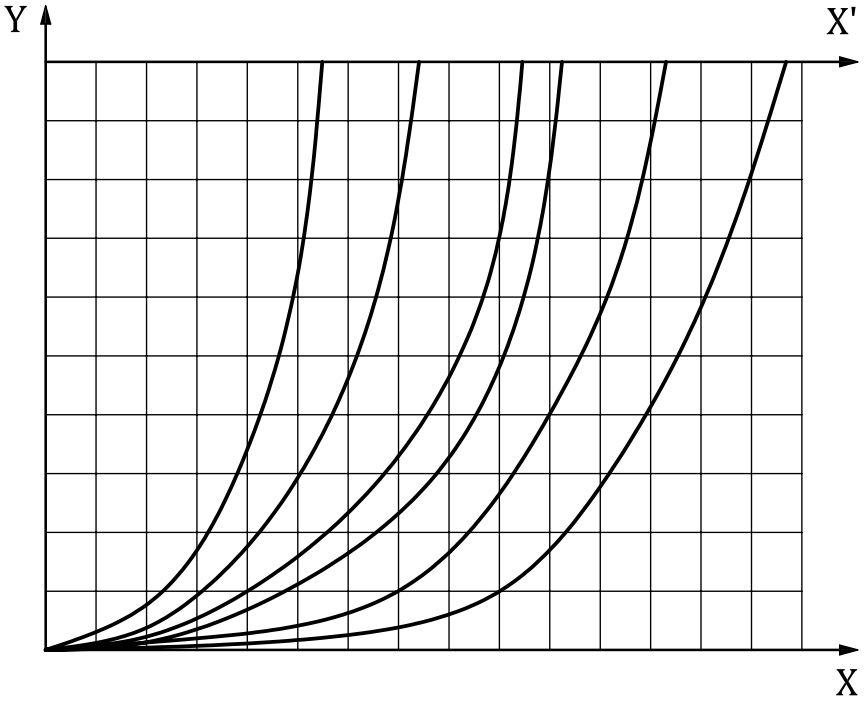
Y voltage drop

X cold resistance

Figure 3 — Cold resistance versus voltage drop

7 Current and conductors

The temperature rise of a conductor is a function of current, conductor cross section, and time duration. For system application, other influences, e.g. ambient temperature, conducting and isolating material, strands, have to be taken into account also. Figure 4 shows stabilized temperature rise for various conductor cross sections.



Key

Y conductor temperature
X' conductor session section
X current (*I*)

Figure 4 — Conductor temperatures for different conductor cross sections versus current

8 Current and contact resistance

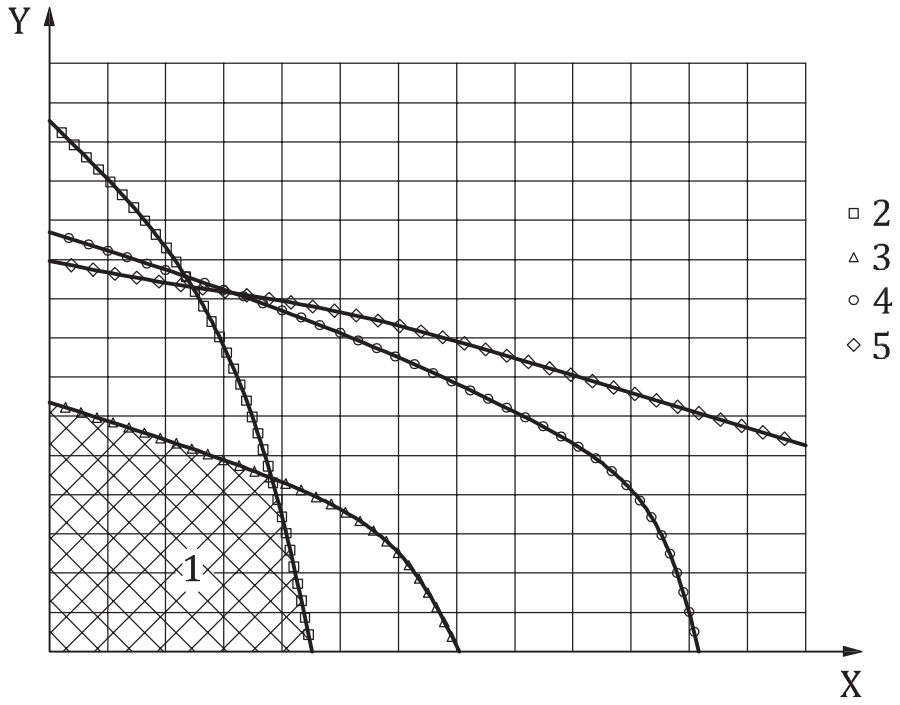
A higher contact resistance of mated terminals leads to a temperature rise and reduced thermal conduction from the fuse-link. The temperature of the fuse-link terminal will increase and the continuous current for the application has to be derated.

A temperature rise test can be conducted using fuse-links, fuse holders, and connections as specified by the vehicle manufacturer. At a specified test current, the temperature of the connections shall be measured at the points specified in the appropriate part of the ISO 8820 according to the type of the fuse. After thermal equilibrium has been achieved, the temperature rise of the connection shall not exceed the limits as specified for terminals and cable.

9 Current and ambient temperature

All components of a circuit and their parts have their own characteristic thermal curve as shown in Figure 5.

Each component in a circuit has an upper temperature limit. An increase of temperature beyond this limit can result in increased resistance, which can by itself increase the temperature. As a result, the fuse-link can open.



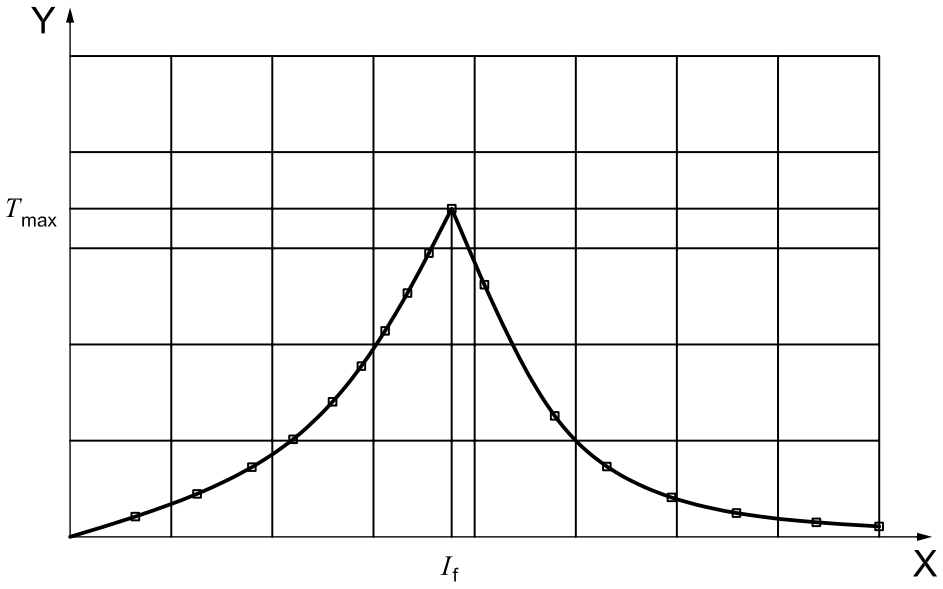
Key

Y current
X ambient temperature
1 application area of the system
2 cable
3 connection
4 insulator
5 fuse element

Figure 5 — Maximum continuous currents of circuit components versus ambient temperature

10 Cable protection versus time-current characteristics

To ensure satisfactory cable protection, fuse-links shall be chosen such that they will always open before the maximum allowed cable temperature T_{max} is exceeded. Figure 6 shows the correct fuse-link selection. The maximum allowed temperature is never exceeded because above a certain minimal fusing current (I_f), the fuse-link will open the circuit before the maximum permitted temperature of the cable is exceeded.



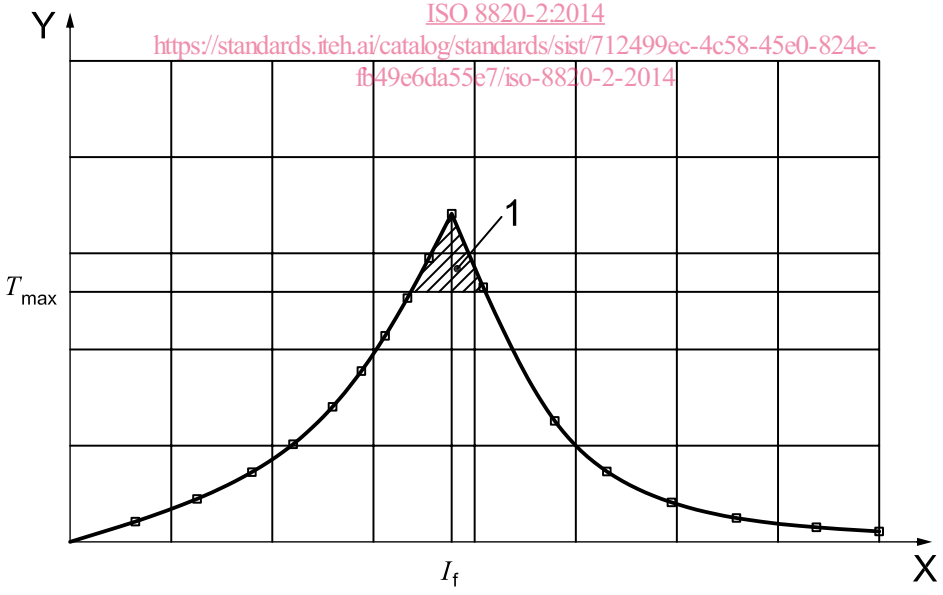
Key

Y cable temperature

X current (I)

Figure 6 — Correct fuse selection

[Figure 7](#) shows incorrect fuse selection. The fuse-link allows some potentially damaging current to flow for too long, causing the cable to overheat.



Key

Y cable temperature

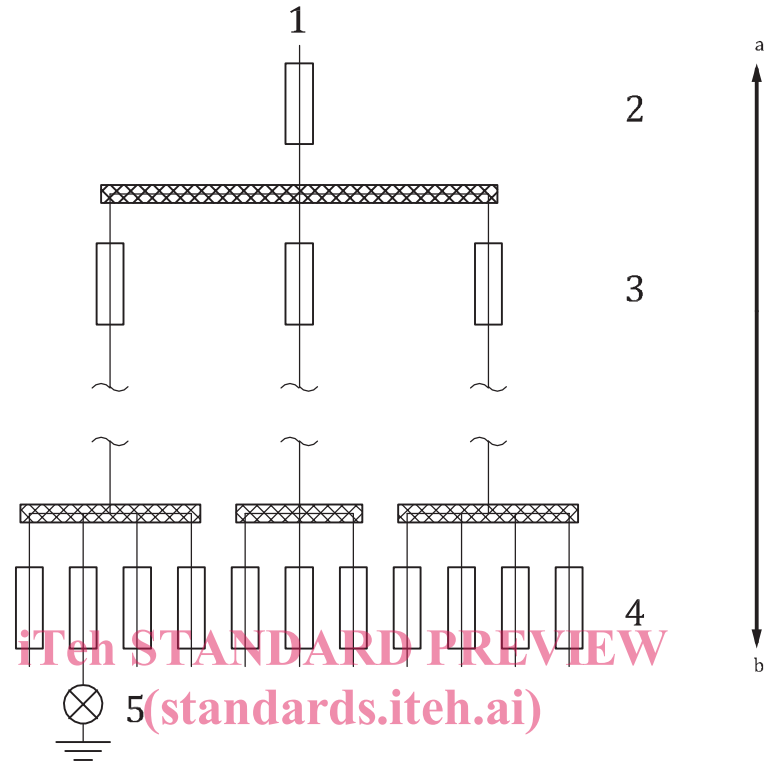
X current (I)

1 unprotected region

Figure 7 — Incorrect fuse selection

11 Selectivity

It shall be ensured that higher level fuse-links do not open when lower level fuse-links are opening (see Figure 8).



Key

1	battery	5	load
2	fuse-link level 1	a	higher level
3	fuse-link level 2	b	lower level
4	fuse-link level n		

NOTE Fuse-link level 1 is the highest level.

Figure 8 — Example for selectivity

12 Replacement of fuse-links

The replacement of fuse-links in a circuit shall be performed with the circuit de-energised.

13 Voltage peaks during opening of fuse-links

When a fuse-link opens, voltage peaks can occur. The peaks can approach 10 times the rated voltage, depending on the load and the supply.

14 Inrush withstand characteristics of fuse-links

In selecting a fuse-link, not only the continuous current and the rated current are to be considered but also the inrush characteristics of electrical devices.

The inrush characteristic describes the time-current behaviour of electrical devices until the stabilized continuous current has been attained.