PREFACE

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The objective of this Standard is to demonstrate that low-voltage current-limiting fuses are easy to apply to protect today's complex and sensitive electronic equipment.

This Standard is identical with, and has been reproduced from IEC/TR 61818 Ed. 1.0 (2003), *Application guide for low-voltage fuses*.

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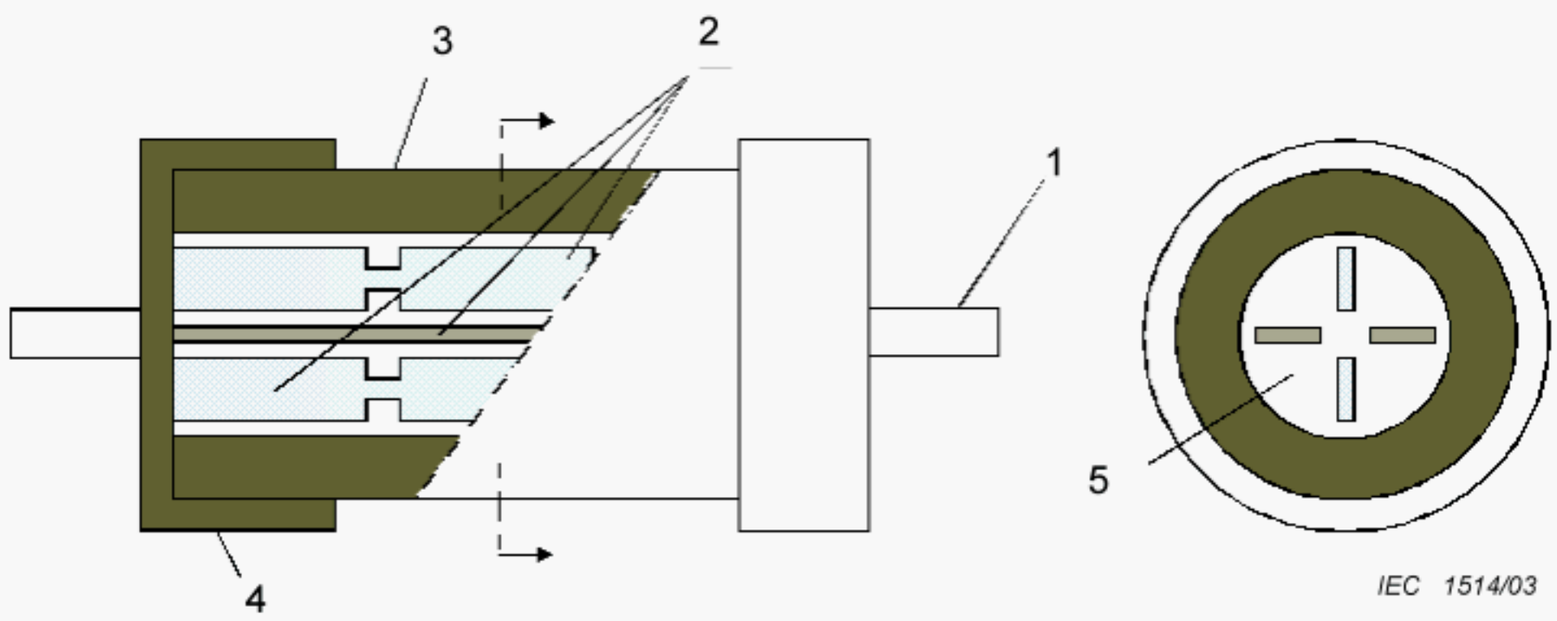
The fuse-element is usually made of flat silver or copper with restrictions in the cross-section. This restriction pattern is one of the important features of fuse design, normally achieved by precision stamping.

M-effect material is added to the fuse-element to achieve controlled fuse operation in the overload range. The purity of the fuse-element materials and their precise physical dimensions are of vital importance for reliable fuse operation.



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3 Fuse body
4 End cap
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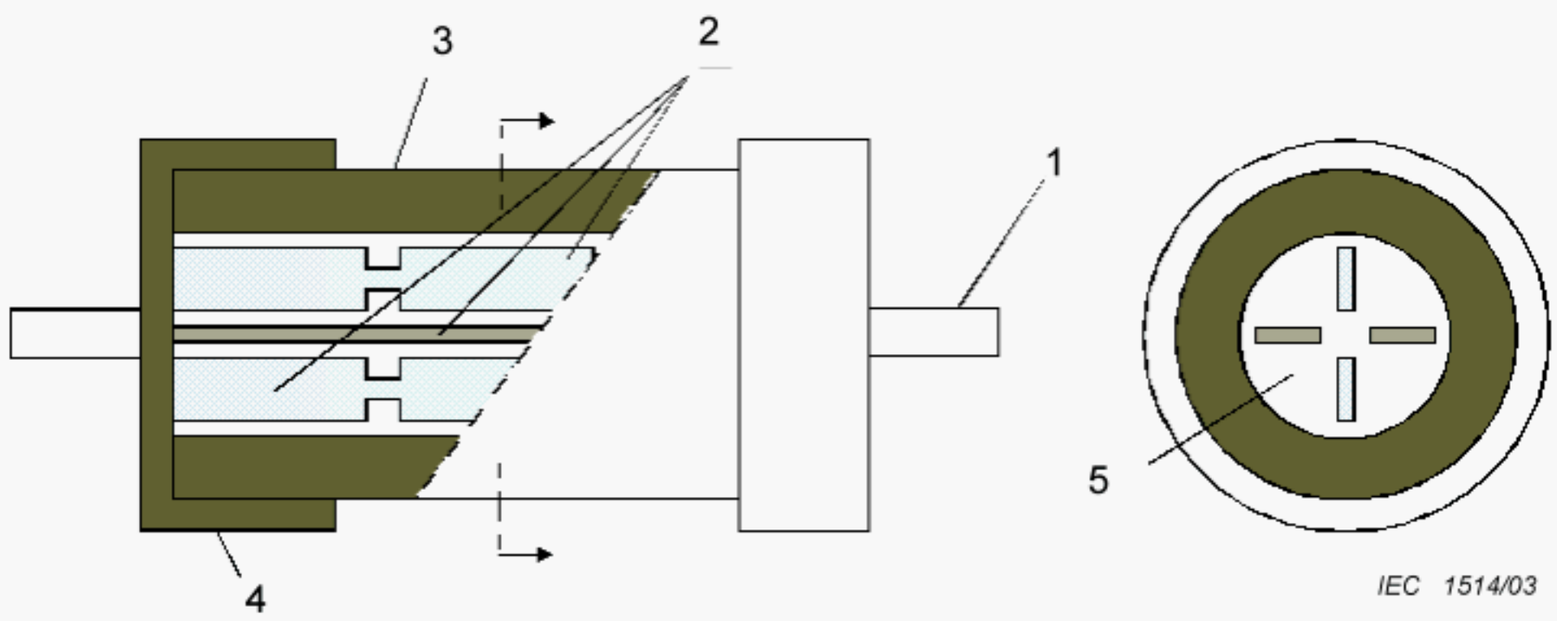

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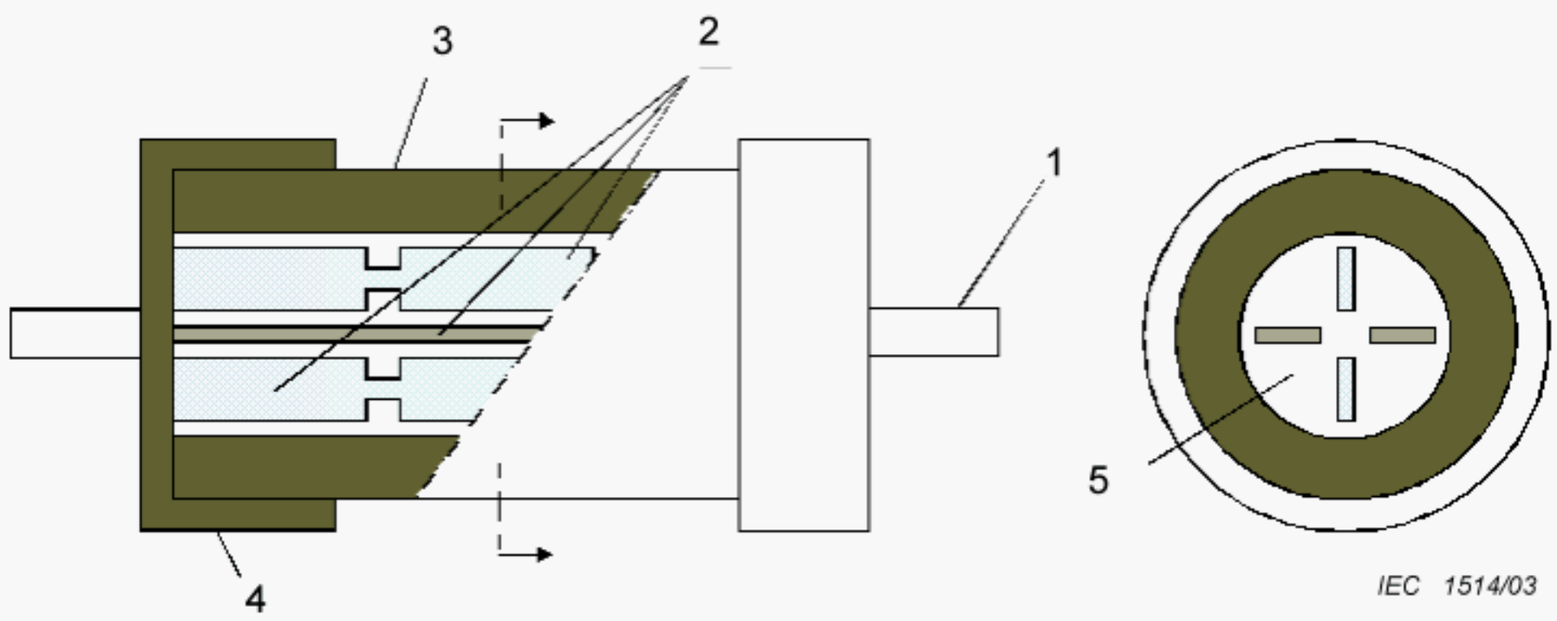

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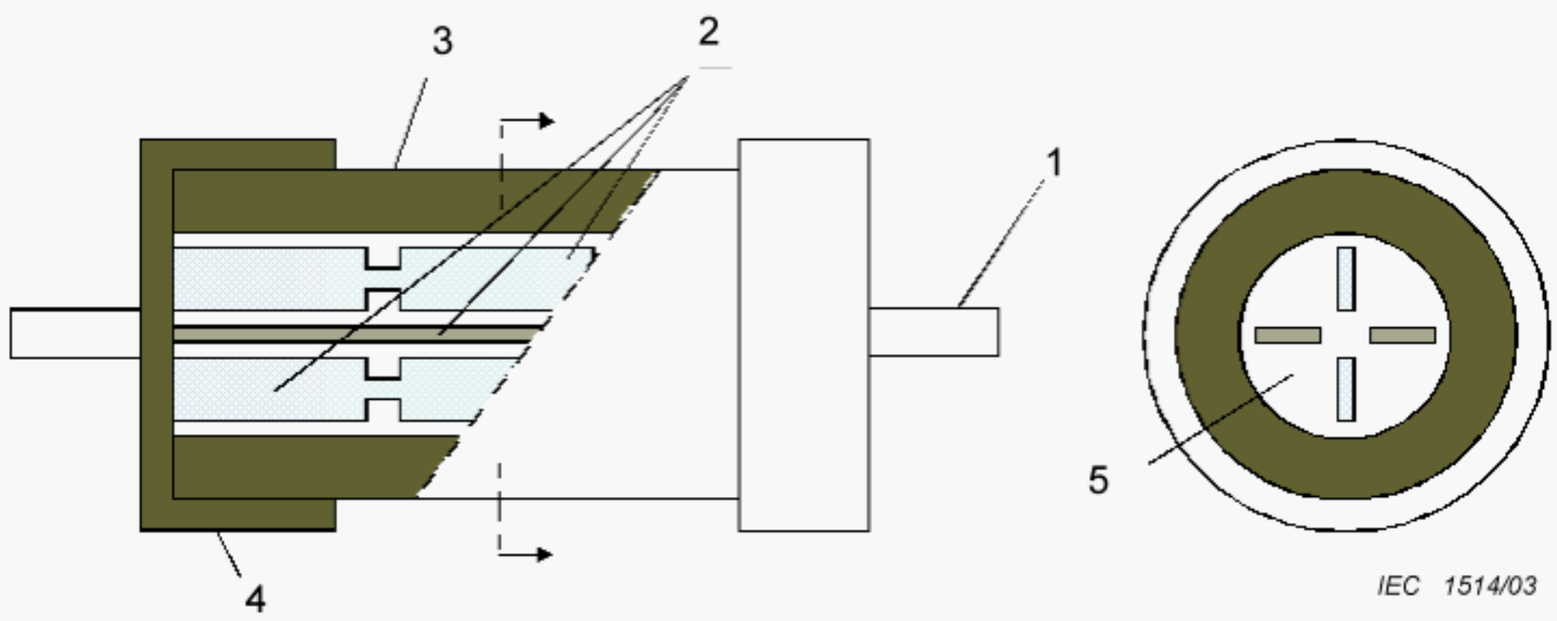

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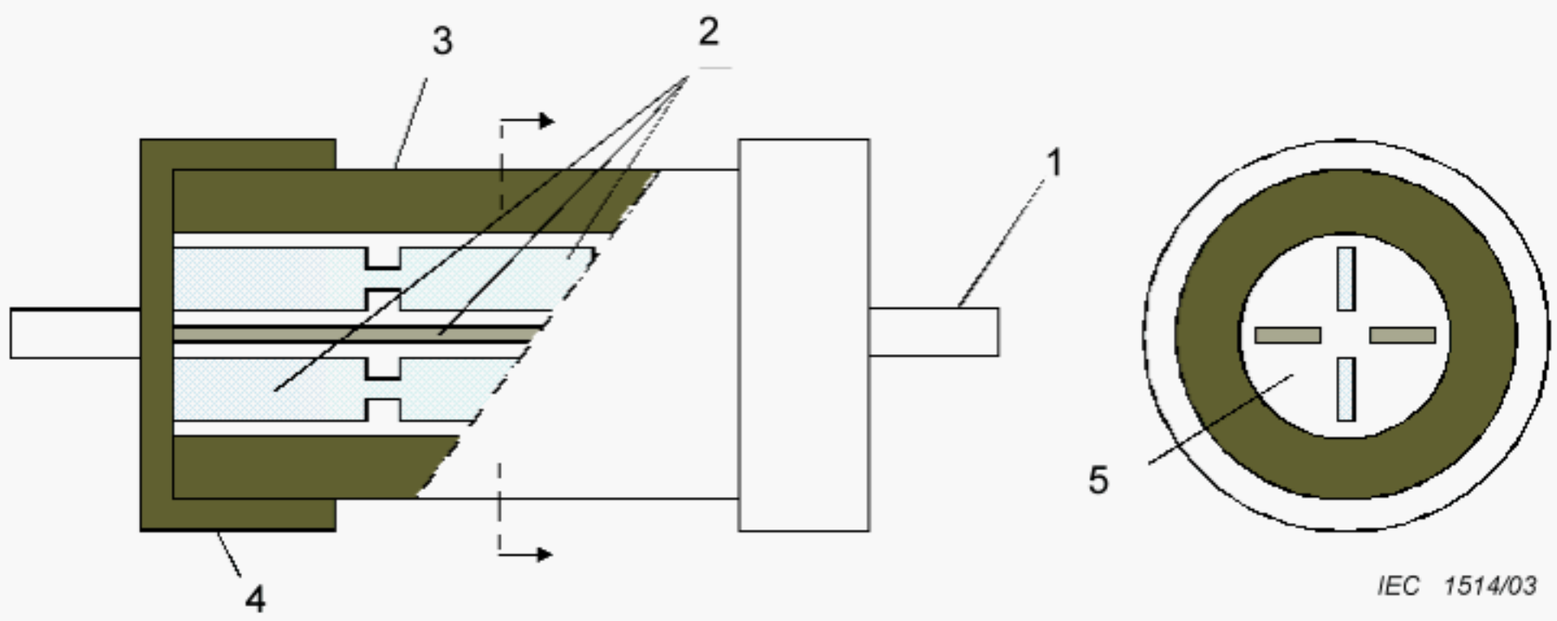

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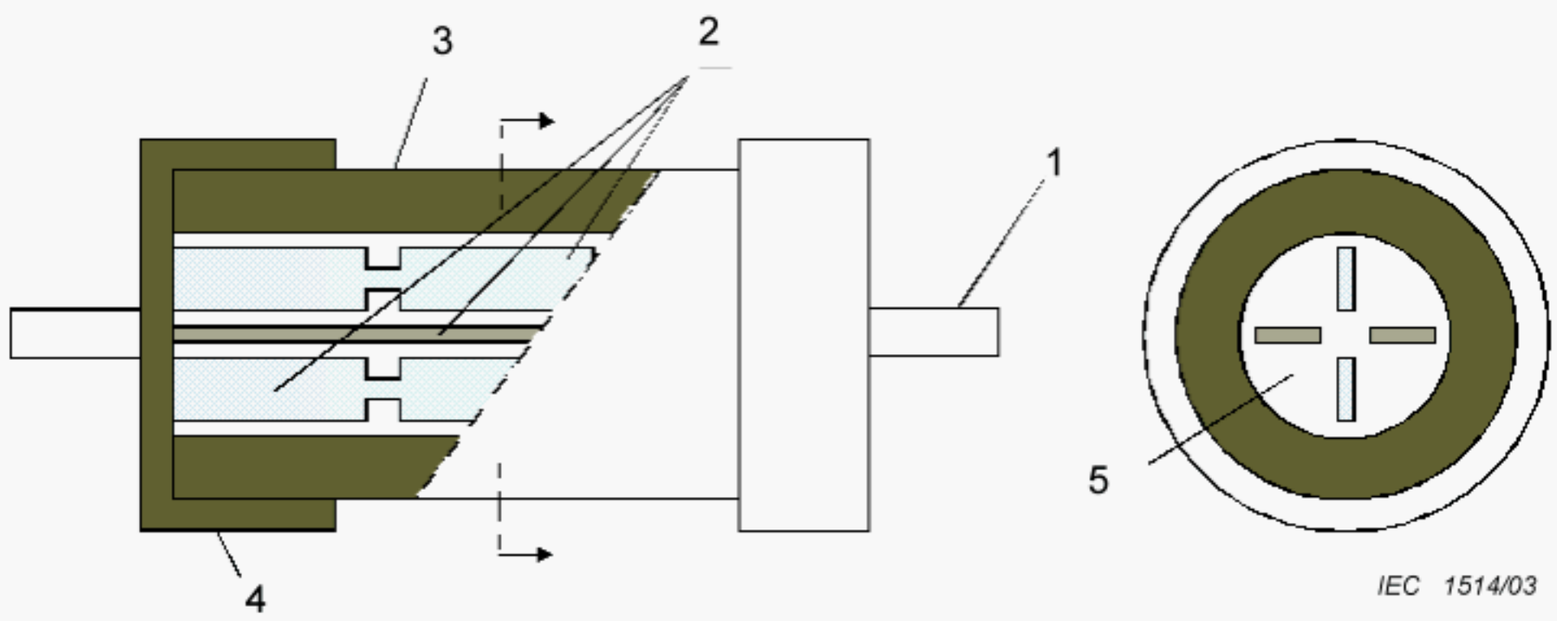

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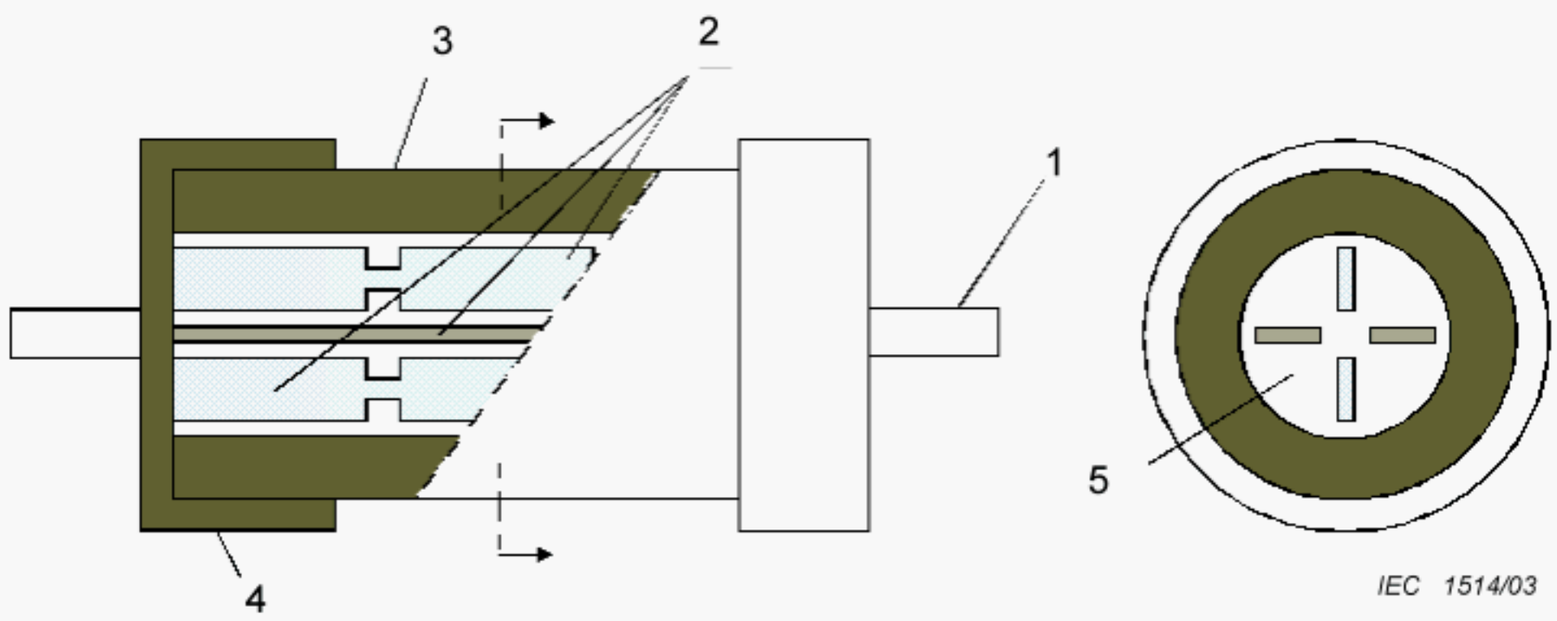

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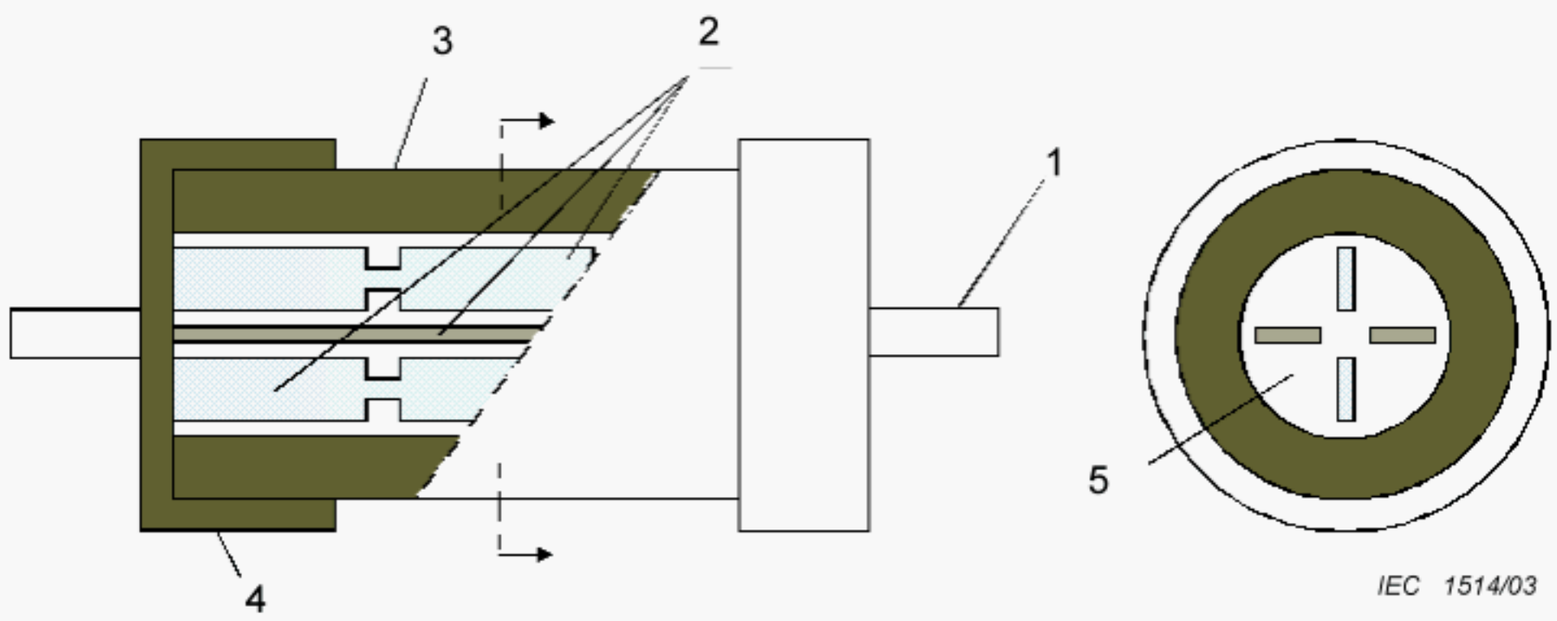

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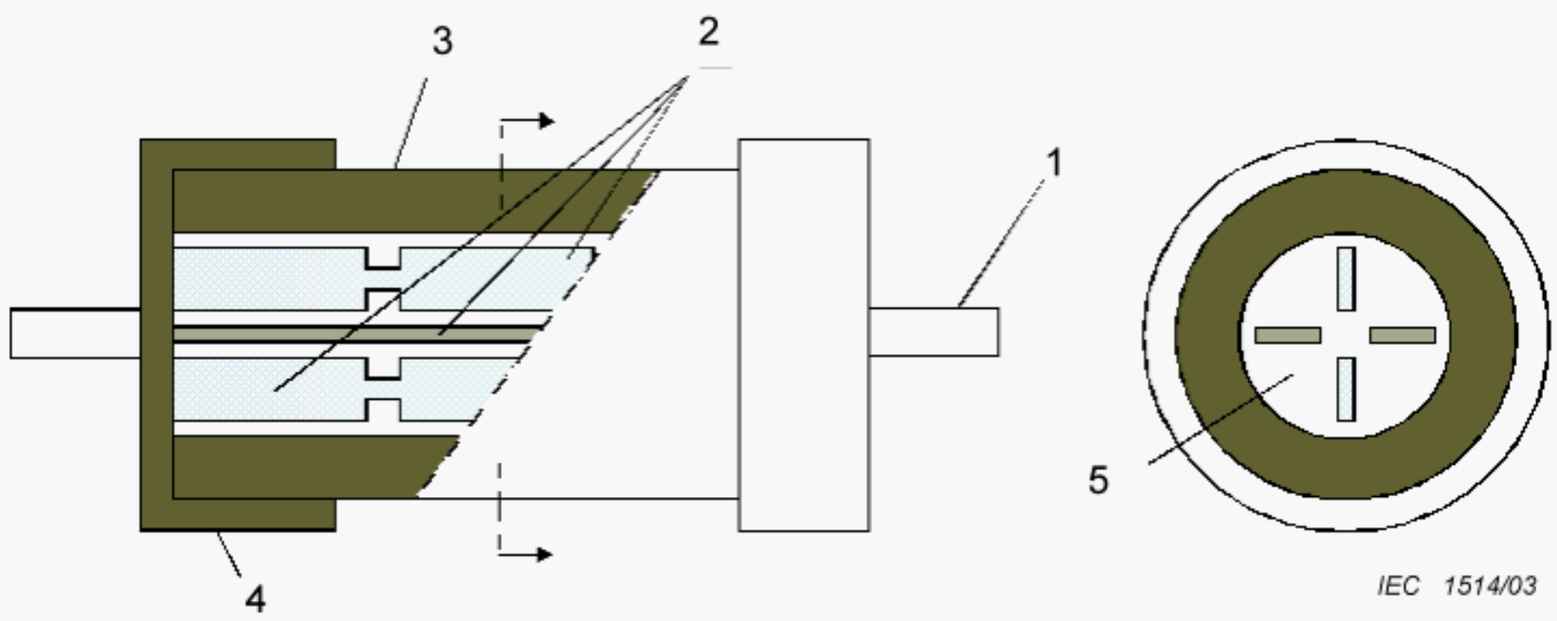

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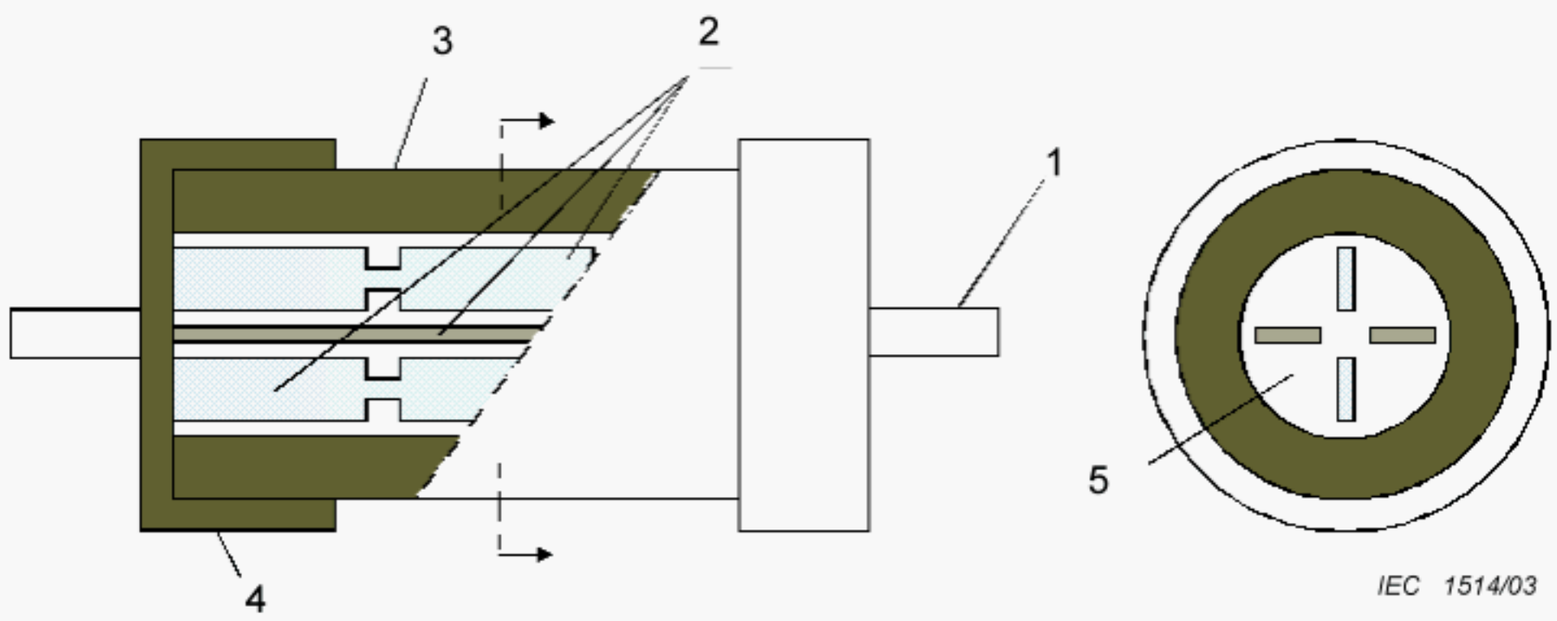

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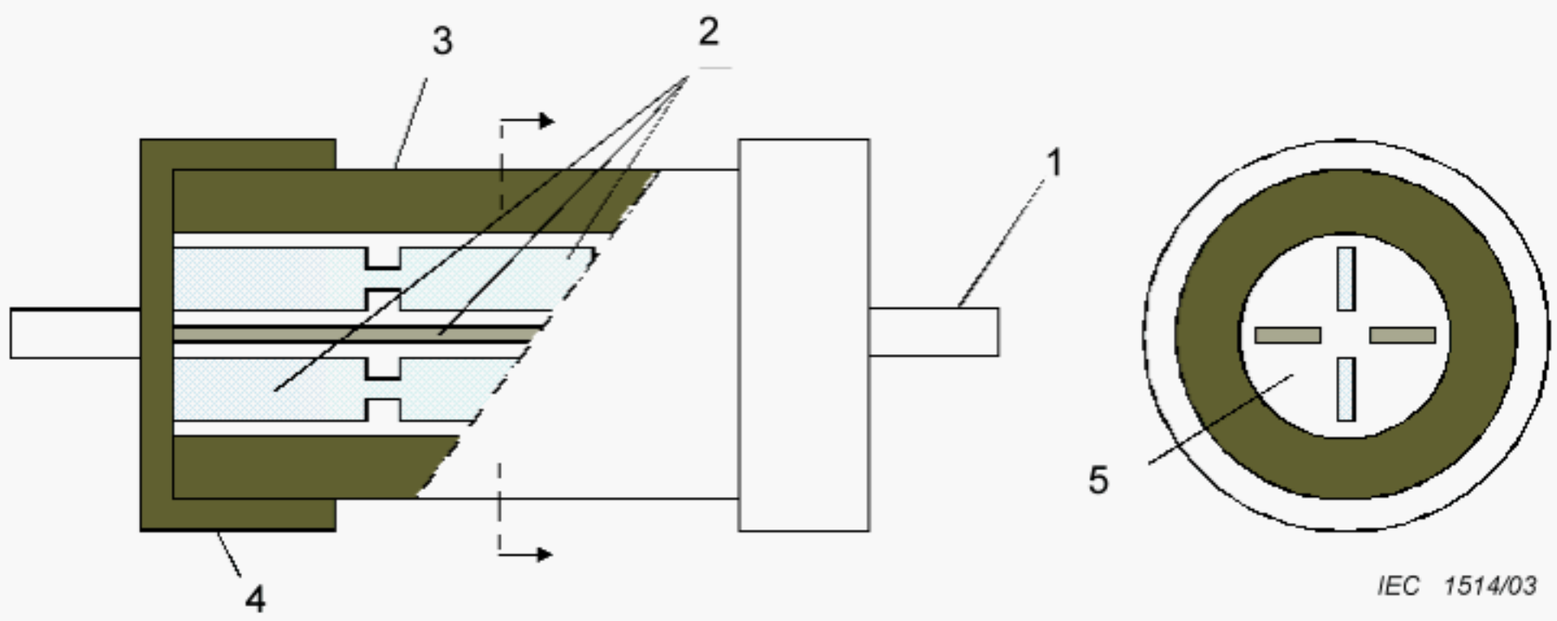

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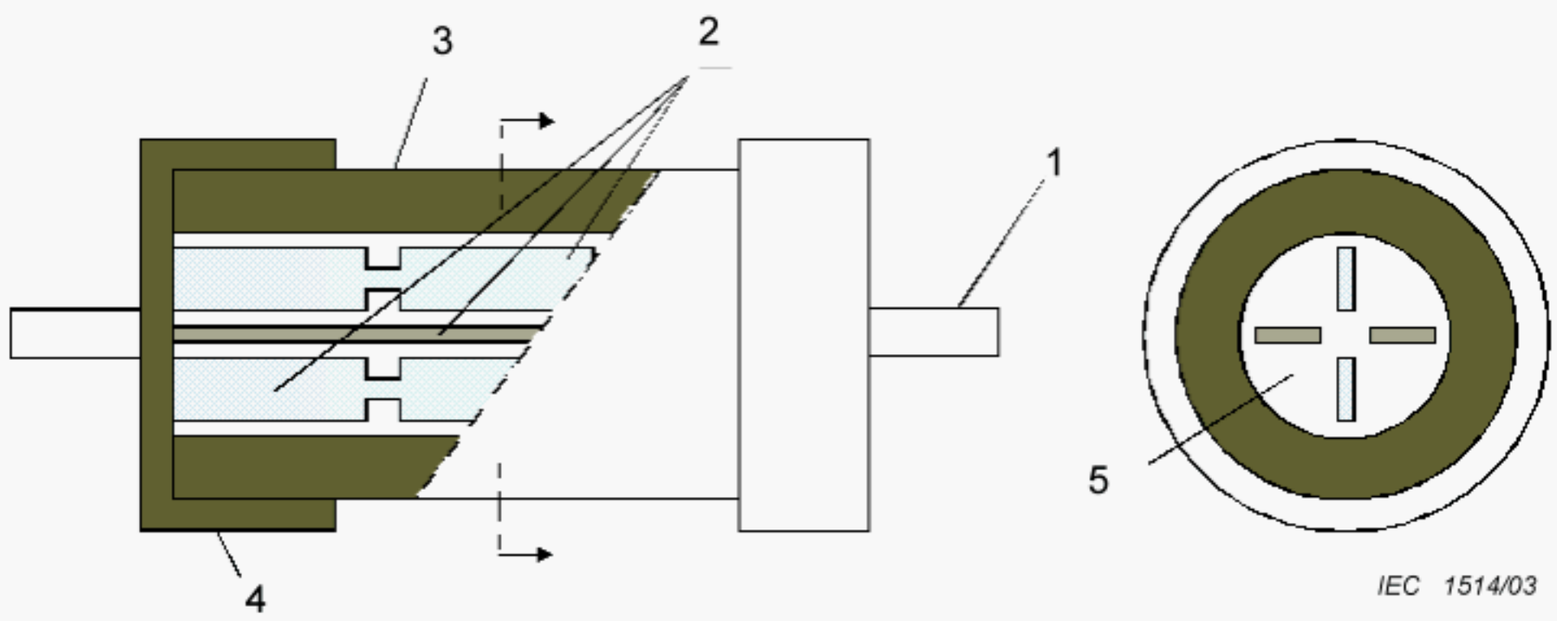

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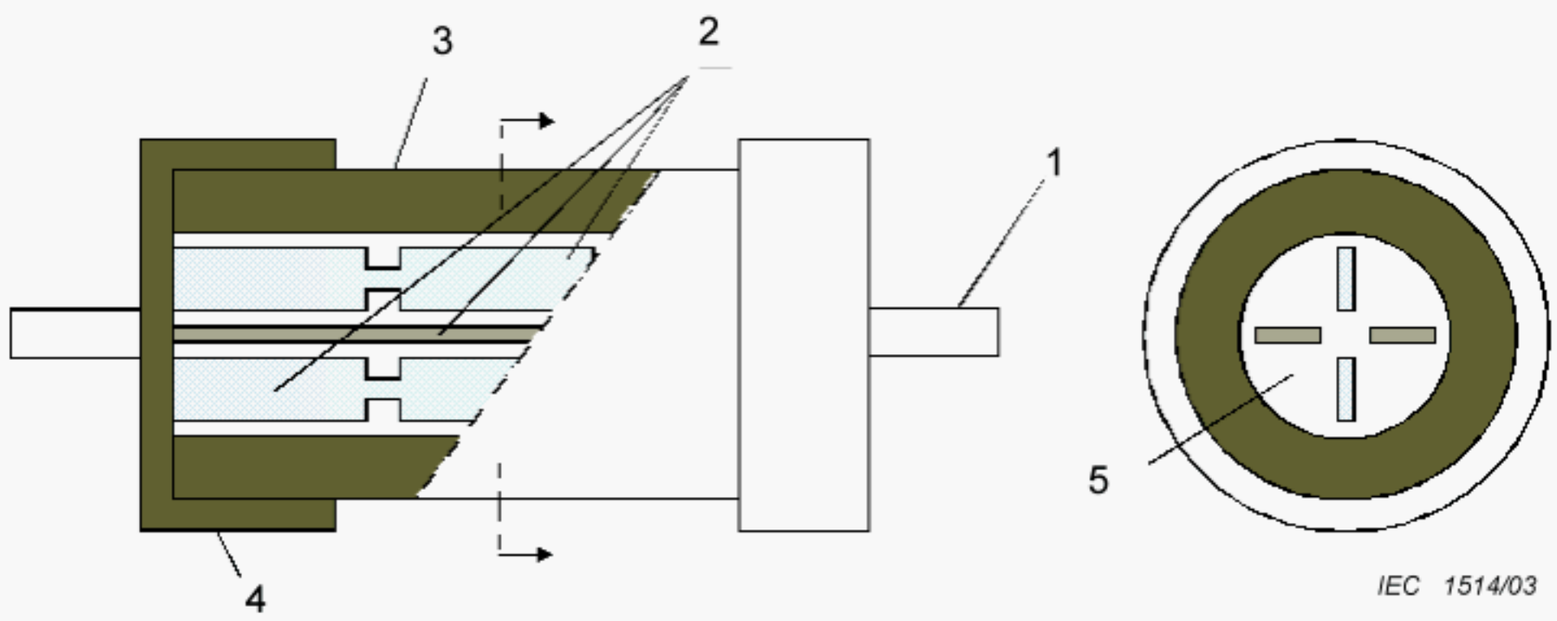

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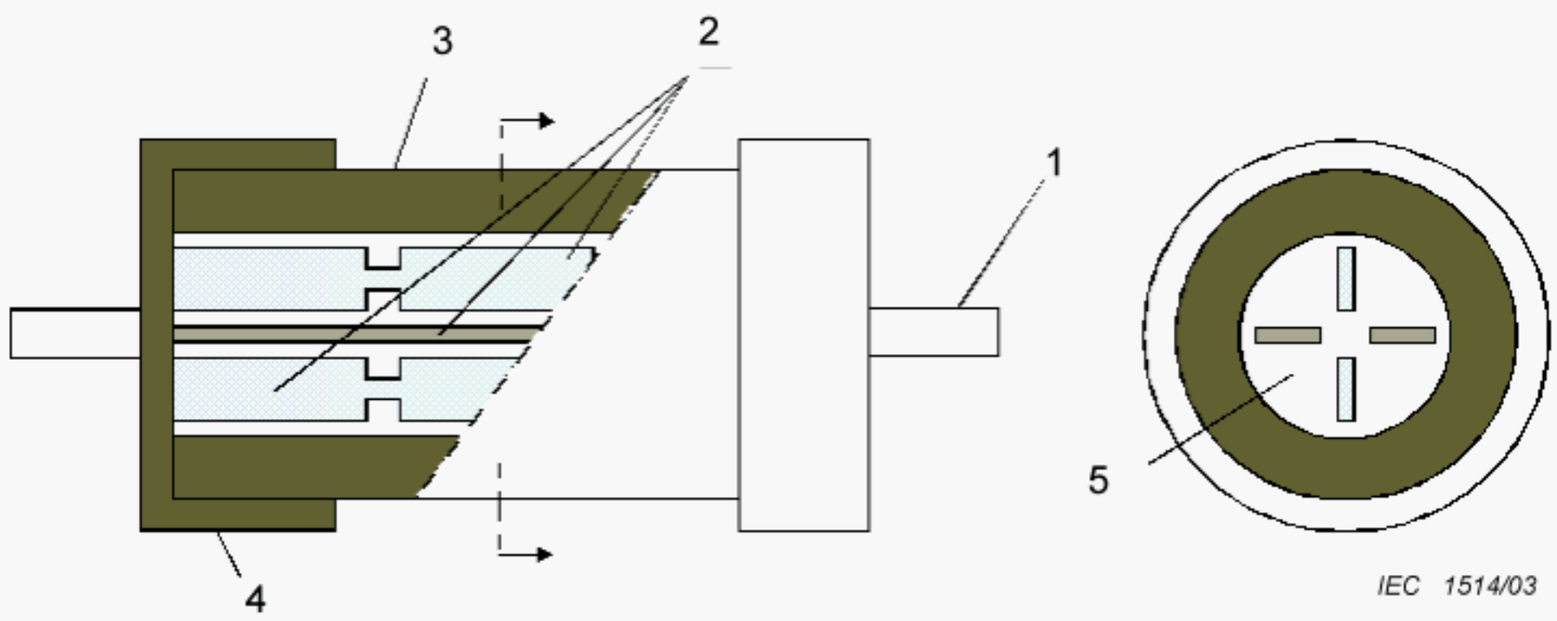

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The peak let-through current shall not exceed the maximum withstand of the starter or its elements.

Additional fuse application information can be found in IEC 61459.

14 Circuit-breaker protection

Circuit-breakers with breaking capacities lower than the prospective short-circuit current shall be protected by another short-circuit protective device (SCPD) having a sufficiently high breaking capacity. Fuse-links offer a cost-effective solution for this application (see Figure 4, F_1 and C_1).

The fuse can be of the general purpose type (gG and gN), the back-up (aM), or full range (gD and gM) motor circuit type.

15 Semiconductor protection

See IEC 60146-6.

16 Fuses in enclosures

When fuses are installed in enclosures having restricted heat dissipation, their operating temperature may reach a level that changes their standardized characteristics. The conditions for operation in service according to IEC 60269-1 consider free air with ambient temperature up to 40 °C.

There is no general rule to determine the limits for the use of fuses in practical installations, with a confined space and whose fluid environment temperature is above 40 °C. In such cases, consult the fuse and equipment manufacturers.

16.1 Fuse-links of type gG according to IEC 60269-2-1, section I

Preliminary investigations show that the limiting blade temperature of 130 °C is appropriate. It is suggested to use this temperature limit to verify the temperature rise test in fuse gear assemblies.

This gives satisfactory results for gG fuse-links according to IEC 60269-2-1, section I. The advantages of measuring the blade contact temperature against ambient air or terminal temperature are as follows:

– closest accessible test point to fuse-element;

– dependable temperature measurement on solid metal contacts;

– applicable to all fuse gear designs.

Fuse life may be reduced if blades are operating continuously at 130 °C. If this blade temperature is expected to occur continuously, a temperature limit of 100 °C is recommended.

16.2 Other fuse-links

For other fuse-links or unusual service conditions, the user should consult the fuse manufacturer.

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Additional fuse application information can be found in IEC 61459.

14 Circuit-breaker protection

Circuit-breakers with breaking capacities lower than the prospective short-circuit current shall be protected by another short-circuit protective device (SCPD) having a sufficiently high breaking capacity. Fuse-links offer a cost-effective solution for this application (see Figure 4, F_1 and C_1).

The fuse can be of the general purpose type (gG and gN), the back-up (aM), or full range (gD and gM) motor circuit type.

15 Semiconductor protection

See IEC 60146-6.

16 Fuses in enclosures

When fuses are installed in enclosures having restricted heat dissipation, their operating temperature may reach a level that changes their standardized characteristics. The conditions for operation in service according to IEC 60269-1 consider free air with ambient temperature up to 40 °C.

There is no general rule to determine the limits for the use of fuses in practical installations, with a confined space and whose fluid environment temperature is above 40 °C. In such cases, consult the fuse and equipment manufacturers.

16.1 Fuse-links of type gG according to IEC 60269-2-1, section I

Preliminary investigations show that the limiting blade temperature of 130 °C is appropriate. It is suggested to use this temperature limit to verify the temperature rise test in fuse gear assemblies.

This gives satisfactory results for gG fuse-links according to IEC 60269-2-1, section I. The advantages of measuring the blade contact temperature against ambient air or terminal temperature are as follows:

– closest accessible test point to fuse-element;

– dependable temperature measurement on solid metal contacts;

– applicable to all fuse gear designs.

Fuse life may be reduced if blades are operating continuously at 130 °C. If this blade temperature is expected to occur continuously, a temperature limit of 100 °C is recommended.

16.2 Other fuse-links

For other fuse-links or unusual service conditions, the user should consult the fuse manufacturer.

The I^2t let-through shall not exceed the withstand values of the starter or contactor overload-relay or motor circuit components.

The peak let-through current shall not exceed the maximum withstand of the starter or its elements.

Additional fuse application information can be found in IEC 61459.

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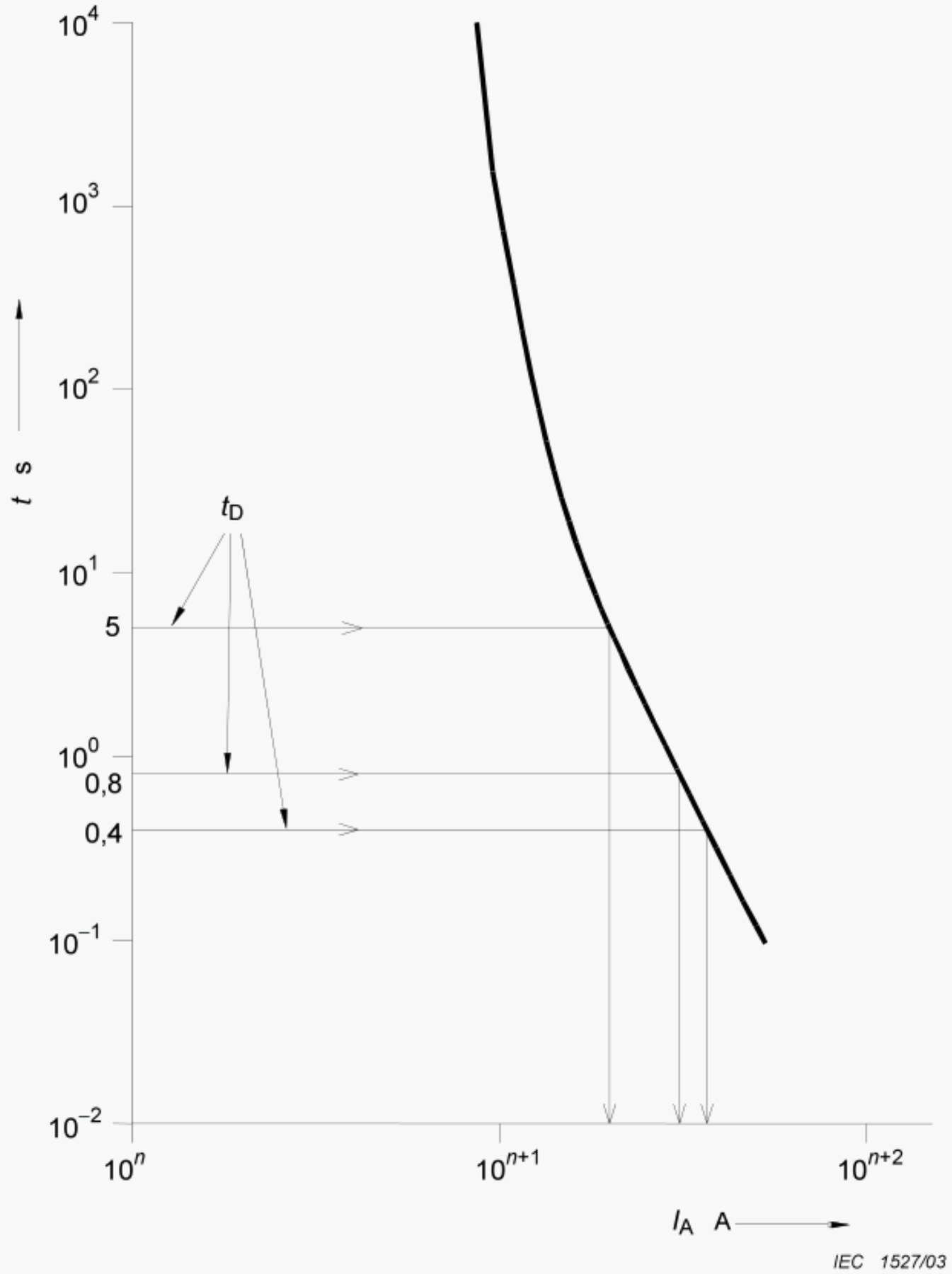


Key

t Maximum operating time

I_a Prospective current

t_D Disconnecting times

Figure 13 – Time-current characteristic for U_o

18.3 Examples

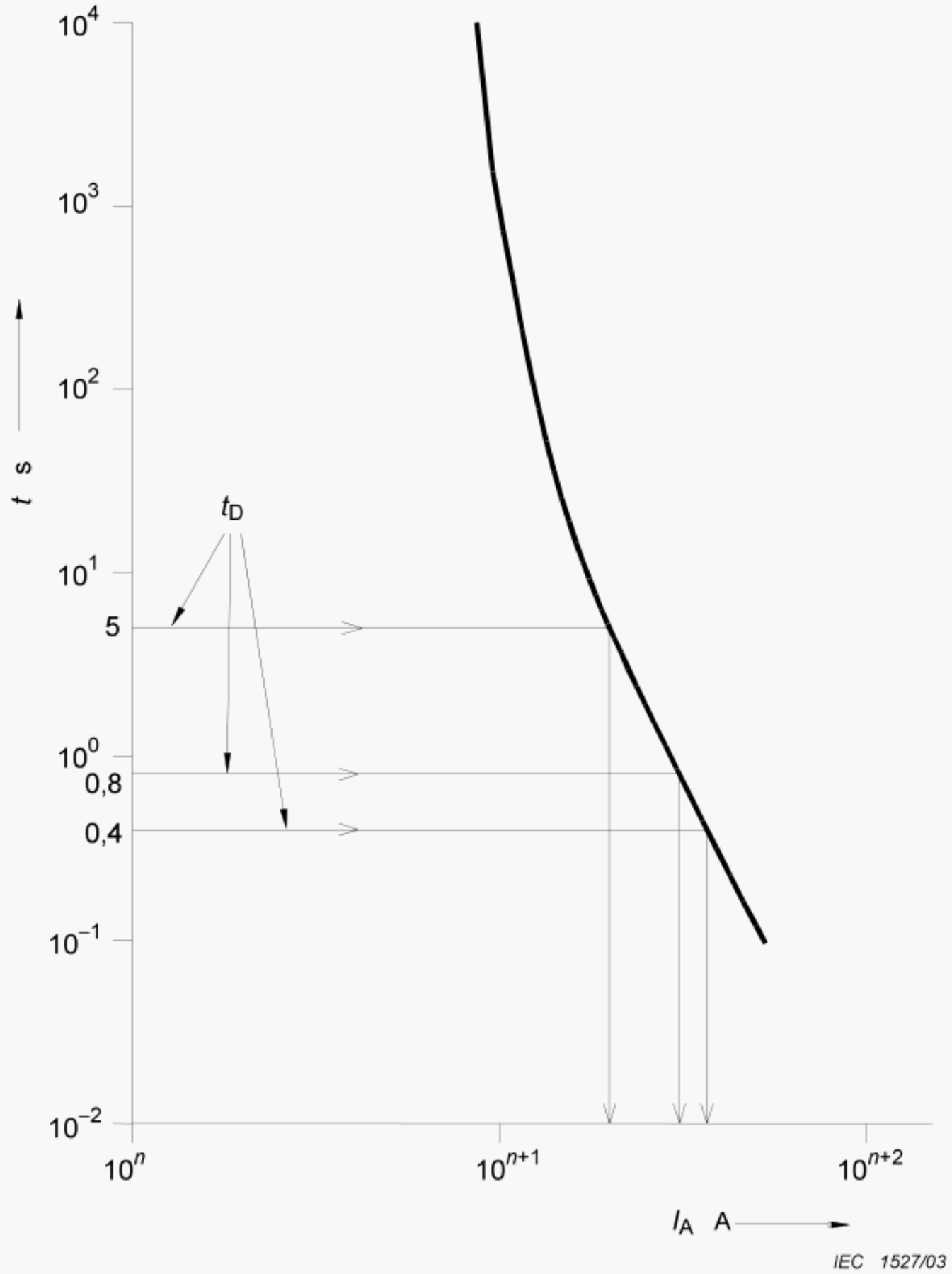
Example 1: System TN, 230/400 V

Procedure: Using Table 41A (IEC 60364-4-41) for U_o = 230 V, read the time for necessary automatic disconnection: 0,4 s. Then find the current I_a in Figure 13. The impedance of the fault loop can then be calculated according to the following formula:

$$Z_s \leq \frac{U_o}{I_a}$$

where

Z_s is the fault loop impedance including the source, the live conductor up to the point of the fault and the protective conductor between the point of the fault and the source;



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Bibliography

IEC 60050(441):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

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