BS 88-2:2007

Low-voltage fuses —

Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) — Examples of standardized systems of fuses A to I

ICS 29.120.50

British Standards

National foreword

This British Standard is the UK implementation of HD 60269-2:2007. It is derived from but not identical with IEC 60269-2:2007. It supersedes BS 88-2.2:1988, BS 88-5:1988 and BS 88-6:1988 which will be withdrawn on 1 March 2010. Together with BS 88-1:2007 it supersedes BS EN 60269-2:1995 which will be withdrawn on 1 March 2010.

This standard is part of a restructured series of British Standards for Low Voltage Fuses. These cover the related parts and examples of systems of fuses given in the associated IEC 60269:2006 series of standards.

These British Standards together with their IEC counterparts are:

BS 88-1:2007 — *General requirements* (IEC 60269-1)
BS 88-2:2007 — *Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application)* (IEC 60269-2, Fuse systems E, G and I)
BS 88-3:2007 — *Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household and similar applications)* (IEC 60269-3, Fuse system C)
BS 88-4:2007 — *Supplementary requirements for fuse-links for the protection of semiconductor devices* (IEC 60269-4)

This standard covers the following British Fuse systems that are included in HD 60269-2:2007:

Fuse system E — Fuses with fuse-links for bolted connections (BS bolted fuse system)
Fuse system G — Fuses with fuse-links with offset blade contacts (BS clip-in fuse system)
Fuse system I — gU fuse-links with wedge tightening contacts

The text for BS 88-2:2007 has been extracted from IEC 60269-2:2006 and is identical to the text for sections E, G, and I. However, wherever a reference is made to IEC 60269-1 in the text this should be taken as a reference to BS 88-1 (BS EN 60269-1).

The UK participation in its preparation was entrusted to Technical Committee PEL/32, Fuses.

A list of organizations represented on PEL/32 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 June 2007

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HARMONIZATION DOCUMENT

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HARMONISIERUNGSDOKUMENT

HD 60269-2

May 2007

ICS 29.120.50

Partially supersedes EN 60269-2:1995 + A1:1998 + A2:2002
and supersedes HD 60269-2-1:2005

English version

Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) - Examples of standardized systems of fuses A to I

(IEC 60269-2:2006, modified)

Fusibles basse tension -
Partie 2: Exigences supplémentaires pour les fusibles destinés à être utilisés par des personnes habilitées (fusibles pour usages essentiellement industriels) -
Exemples de systèmes de fusibles normalisés A à I
(CEI 60269-2:2006, modifiée)

Niederspannungssicherungen -
Teil 2: Zusätzliche Anforderungen an Sicherungen zum Gebrauch durch Elektrofachkräfte bzw. elektronisch unterwiesene Personen (Sicherungen überwiegend für den industriellen Gebrauch) -
Beispiele für genormte Sicherungssysteme A bis I
(IEC 60269-2:2006, modifiziert)

This Harmonization Document was approved by CENELEC on 2007-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

Up-to-date lists and bibliographical references concerning such national implementations may be obtained on application to the Central Secretariat or to any CENELEC member.

This Harmonization Document exists in three official versions (English, French, German).

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. HD 60269-2:2007 E

Foreword

The text of document 32B/487/FDIS, future edition 3 of IEC 60269-2, prepared by SC 32B, Low-voltage fuses, of IEC TC 32, Fuses, was submitted to the IEC-CENELEC parallel vote.

A draft amendment, containing common modifications to document 32B/487/FDIS that are technically identical to the common modifications in HD 60269-2-1:2005, was prepared by Reporting Secretariat CLC/SR 32B, Low-voltage fuses, and was submitted to the formal vote.

The combined texts were approved by CENELEC as HD 60269-2 on 2007-03-01.

This Harmonization Document partially supersedes EN 60269-2:1995 + A1:1998 + A2:2002 and also supersedes HD 60269-2-1:2005.

This document is to be used in conjunction with EN 60269-1:2007.

This Part 2 supplements or modifies the corresponding clauses or subclauses of Part 1.

Where no change is necessary, this Part 2 indicates that the relevant clause or subclause applies.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2008-03-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-03-01

Tables and figures which are additional to those in Part 1 are numbered starting from 101.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60269-2:2006 was approved by CENELEC as a Harmonization Document with agreed common modifications.

INTERNATIONAL STANDARD

IEC 60269-2

Third edition
2006-11

Low-voltage fuses –

Part 2: Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application) – Examples of standardized systems of fuses A to I

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

Reference number
IEC 60269-2:2006(E)

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Fuse system E – Fuses with fuse-links for bolted connections (BS bolted fuse system)

Fuse system G – Fuses with fuse-links with offset blade contacts (BS clip-in fuse system)

Fuse system I – gU fuse-links with wedge tightening contacts

Fuse system E –
Fuses with fuse-links for bolted connections
(BS bolted fuse system)

Remark: previously this system was described in Section II of IEC 60269-2-1

1 General

IEC 60269-1 applies with the following supplementary requirements.

1.1 Scope

The following additional requirements apply to fuses with fuse-links having bolted connections. Such fuses have rated currents up to and including 1 250 A and rated voltages up to and including 690 V a.c. and up to and including 500 V d.c.

The following characteristics of the fuses are specified in addition to the IEC 60269-1:

- minimum rated breaking capacities;
- time-current characteristics;
- I^2t characteristics;
- standard conditions of construction;
- power dissipation and acceptable power dissipation.

2 Terms and definitions

IEC 60269-1 applies.

3 Conditions for operation in service

IEC 60269-1 applies.

4 Classification

IEC 60269-1 applies.

5 Characteristics of fuses

IEC 60269-1 applies with the following supplementary requirements.

5.3.1 Rated current of the fuse-link

The maximum preferred rated currents are given in Figures 501 and 502.

5.3.2 Rated current of the fuse-holder

The maximum preferred rated currents for the fuse-holder are given in Figure 503.

5.5 Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder

The maximum values of power dissipation of fuse-links are given in Figure 501.

The values of rated acceptable power dissipation of fuse-holders at rated current when tested in accordance with 8.3.1 are given in Figure 503.

5.6 Limits of time-current characteristics

5.6.1 Time-current characteristics, time-current zones and overload curves

In addition to the limits of pre-arcing time given by the gates and the conventional times and currents, the time-current zones, excluding manufacturing tolerances, are given in Figures 504 and 505. The tolerance on time-current characteristics shall not deviate by more than ±10 % in terms of current.

5.6.2 Conventional times and currents

The conventional times and currents, in addition to the values of IEC 60269-1, are given in Table 501.

Table 501 – Conventional time and current for "gG" fuse-links

Remark: this table refers to Table 2 in IEC 60269-1
and was previously Table II in IEC 60269-2-1, Section II

Rated current I_n A	Conventional time h	Conventional current I_{nf}	 I_f
I_n < 16	1	1,25 I_n	1,6 I_n

5.6.3 Gates

For "gG" fuse-links the gates given in Table 502 and in IEC 60269-1 apply.

Table 502 – Gates for specified pre-arcing times of "gG" fuse-links

Remark: this table refers to Table 3 in IEC 60269-1
and was previously Table III in IEC 60269-2-1, Section II

I_n A	I_{min} (10 s) A	I_{max} (5 s) A	I_{min} (0,1 s) A	I_{max} (0,1 s) A
2	3,4	5,0	4,6	7,5
4	6,5	10,5	10,0	18,5
6	10,0	18,0	17,0	35,0
10	18,0	36,0	35,0	60,0

5.7.2 Rated breaking capacity

The rated breaking capacity shall be a minimum of 80 kA a.c. and 40 kA d.c.

6 Markings

IEC 60269-1 applies with the following supplementary requirements.

6.1 Markings of fuse-holders

In addition to IEC 60269-1, the following marking applies:

- size.

The marking of the rated current and the rated voltage shall be discernible from the front when a fuse-link has not been fitted.

6.2 Markings of fuse-links

In addition to IEC 60269-1, the following marking applies:

- size or reference
- rated breaking capacity

7 Standard conditions for construction

IEC 60269-1 applies with the following supplementary requirements.

7.1 Mechanical design

The dimensions of fuse-links and fuse-bases are given in Figures 501 and 503.

7.1.2 Connections including terminals

Under consideration.

7.9 Protection against electric shock

Where standardized fuse-holders according to Figure 503 are used, the degree of protection against electric shock shall be at least IP2X for all three stages.

8 Tests

IEC 60269-1 applies with the following supplementary requirements.

8.3 Verification of temperature rise and power dissipation

8.3.1 Arrangement of the fuse

The test arrangement for fuse-links is given in Figure 506. The test arrangement shall be mounted vertically.

8.3.3 Measurement of the power dissipation of the fuse-link

The points of measurement of power dissipation are given in Figure 506.

8.4 Verification of operation

8.4.1 Arrangement of the fuse

The test arrangement of the fuse-link is given in Figure 506. The test arrangement shall be mounted vertically.

8.5 Verification of breaking capacity

8.5.1 Arrangement of the fuse

The test arrangement of the fuse-link is given in Figure 507.

8.5.8 Acceptability of test results

The requirements of IEC 60269-1 apply and in addition fuse-links shall operate without the melting of the fine fuse wire and without mechanical damage to the rig.

8.9 Verification of resistance to heat

Fuse-holders fitted with fuse-links having the maximum power dissipation corresponding to the acceptable power dissipation of the fuse-holder shall be cyclically loaded as pre-treatment. The pre-treatment is specified in 8.4.3.2 of IEC 60269-1. After cooling to normal temperature, the breaking capacity shall be tested at I_1 in accordance with 8.5.

Fuse-links containing organic material in the body or filler shall be subjected to the same test as described above. These fuse-links shall interrupt the test currents I_1 and I_5.

8.10 Verification of non-deterioration of contacts

Subclause 8.10 of IEC 60269-1 applies.

8.10.1 Arrangement of the fuse

Subclause 8.10.1 of IEC 60269-1 applies with the following addition.

The dummy fuse-links shall have dimensions that comply with Figure 501 for those references that are accommodated in the standardized fuse-holders in Figure 503.

The power dissipation of the dummy fuse-links shall be the rated acceptable power dissipation of the fuse-holders given in Figure 503 when tested in the standardized power dissipation test rig given in Figure 506.

The dummy fuse-links shall be so constructed that they do not operate during the passage of the overload current I_{nf}.

8.10.2 Test method

The following wording is added after the first paragraph of 8.10.2 in IEC 60269-1.

The following test values have to be applied:

Test current: conventional non-fusing current I_{nf}

Load period: 25 % of the conventional time

No-load period: 10 % of the conventional time

A test voltage lower than the rated voltage may be used.

8.10.3 Acceptability of the results

After 250 cycles, the measured temperature-rise values shall not exceed the temperature rise measured at the beginning of the tests by more than 15 K.

After 750 cycles, if necessary, the temperature shall not exceed the values measured before the beginning of the tests by more than 20 K.

8.11 Mechanical and miscellaneous tests

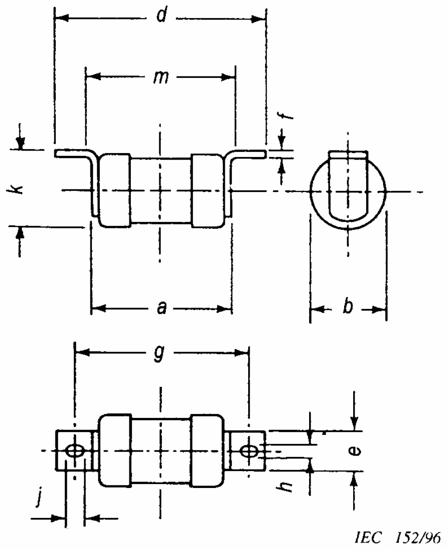
8.11.1.1 Mechanical strength of fuse-holders

The fuse-holder, fitted with a fuse-link of the largest rated current and power dissipation that can be accommodated by the fuse-holder, shall be subjected to a temperature rise test at rated current.

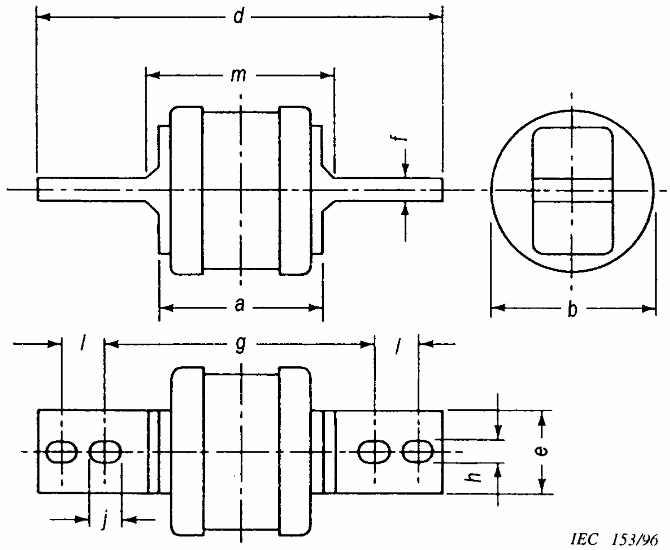
At the conclusion of the temperature rise test, the fuse-link or the fuse-carrier as appropriate, shall be withdrawn and inserted into the fuse-base 100 times.

At the conclusion of these tests, all parts shall be intact and shall function normally.

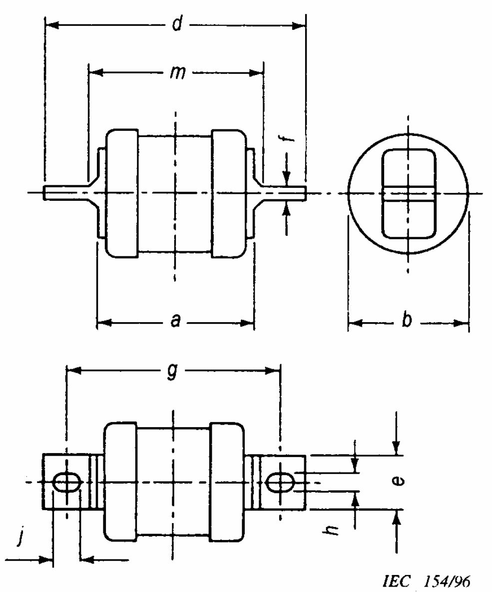
Compliance shall be verified by a further temperature rise test at rated current at the conclusion of which the values obtained shall be not more than 5 K or 15 % (whichever is greater) above the values obtained from the temperature-rise test prior to the commencement of the mechanical test.



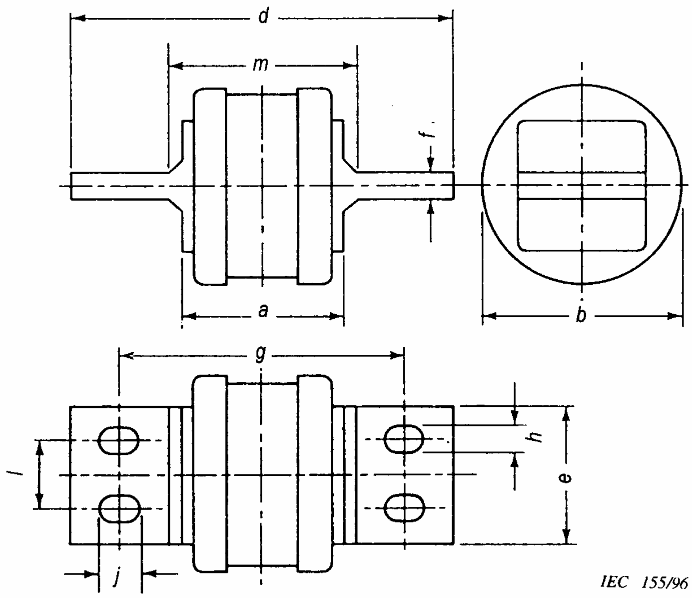
Size A fuse-link



Size C fuse-link



Size B fuse-link



Size D fuse-link

The drawings are not intended to govern the design of fuse-links except as regards the notes and dimensions shown.

Figure 501 – Fuse-links for bolted connection – Sizes A, B, C and D
(*figure continued on page 193*)

Remark: this figure was previously Figure 1 (II) in IEC 60269-2-1, Section II

Dimensions in millimetres

Size	Maximum rated current A	Maximum power dissipation W	*a* (max.) 1)2)	*b* (max.)	*d* (max.)	*e* (max.) 3)	*f* (max.) 3)		*g* (nom.)	*h* (nom.)	*j* (min.) 2)4)	*k* (max.)	*l* (nom.) 1)	*m* (max.)
A1	20	2,7	36,5	14,5	56	11,2	0,8	1,5	44,5	4,2	5,5	14,5	–	36,5
A2	32	4,4	57	24	86	9,2	0,8	1,5	73	5,5	7	25,5	–	60
A3	63	6,9	58	27	91	13	1,2	1,6	73	5,5	7	28	–	61
A4	100	9,1	70	37	111	20	2,4	3,2	94	8,7	9,5	38,5	–	74
B1	100	9,1	70	37	138	20	3,2	4	111	8,7	11	–	–	82
B2	200	17	77	42	138	20	3,2	4	111	8,7	11	–	–	82
B3	315	32	77	61	138	26	3,2	4,8	111	8,7	11	–	–	82
B4	400	40	83	66	138	26	4,8	6,6	111	8,7	11	–	–	89
C1	400	40	83	66	212	26	4,8	6,6	133	10,3	11	–	25,4	95
C2	630	55	85	77	212	26	6,3	7,8	133	10,3	11	–	25,4	95
C3	800	70	89	84	212	39	9,5	11,1	133	10,3	12,5	–	25,4	101
D1	1 250	100	89	102	200	64	9,5	12,7	149	14,3	16,5	–	31,8	95

1) In all sizes, dimension *a* includes any projections such as rivet heads, but the design of the tags between dimensions *a* and *m* is limited by a line drawn at 45° to the contact surface.

2) All fixing holes are elongated as indicated by *j*, to allow for manufacturing tolerances on dimension *a*.

3) Dimensions *e* and *f*, are nominal material sizes and subject to manufacturing tolerances as specified in the relevant standards for the raw materials.

4) For A1 to A4 size fuse-links, the fixing slots may be extended either axially or laterally to form open-ended slots.

Figure 501 – *(concluded)*

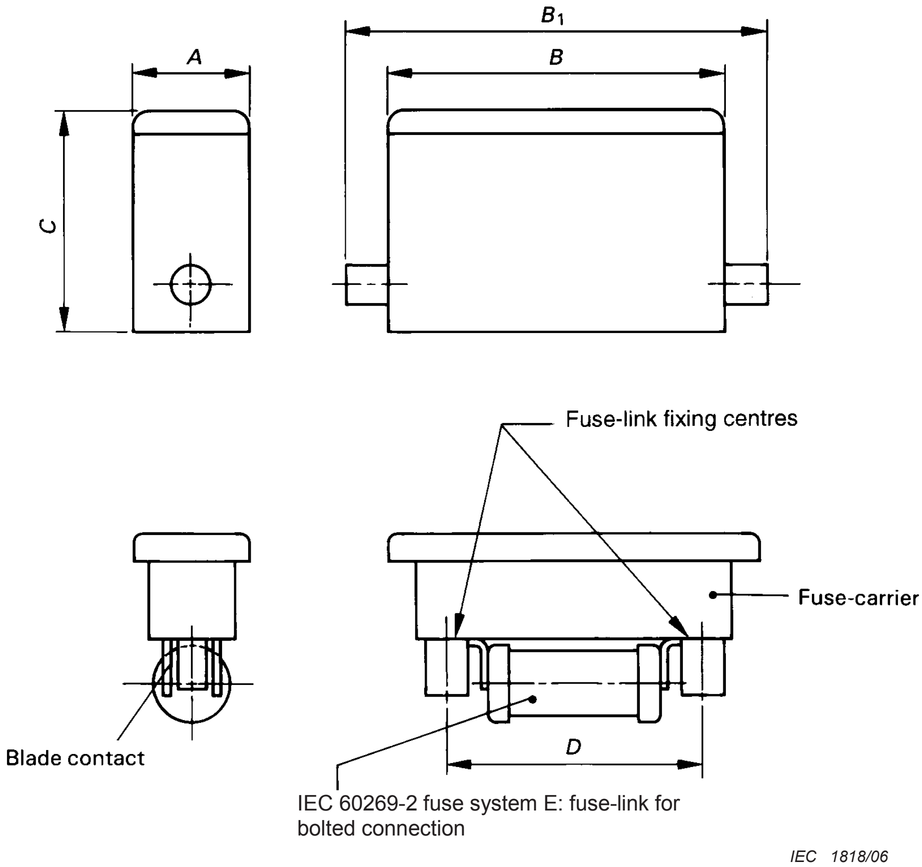
Standardized "gM" fuse-links

Size	Standardized ratings	Current rating A	Characteristic rating A
A1	20M25	20	25
A1	20M32	20	32
A2	32M40	32	40
A2	32M50	32	50
A2	32M63	32	63
A3	63M80	63	80
A3	63M100	63	100
A4 and B1	100M125	100	125
A4 and B1	100M160	100	160
A4 and B1	100M200	100	200
B2	200M250	200	250
B2	200M315	200	315

The power dissipation of "gM" fuse-links is lower than the values given for "gG" fuse-links in the same dimensional references.

Figure 502 – Fuse-links for bolted connection – Sizes A and B

Remark: this figure was previously Figure 1a (II) in IEC 60269-2-1, Section II

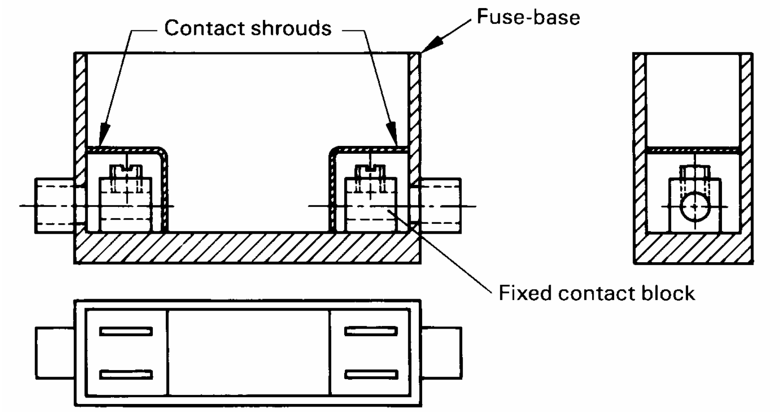


Dimensions in millimetres

NOTE The fuse-carrier may accommodate centre tag or offset tag fuse-links.

Figure 503 – Typical fuse-holder (*figure continued on page 197*)

Remark: this figure was previously Figure 2 (II) in IEC 60269-2-1, Section II



Dimensions in millimetres

NOTE Apertures in shrouds to give a degree of protection of IP2X (IEC 60529).

Maximum rated current **A**	**Rated acceptable power dissipation** **W**	***A*** max.	***B*** max.	***B1*** max. 2	***C*** max.	***D***	**Fuse-link accommodated, size**
20	2,7	30	91	110	62	44,5	A1
32	4,4	35	114	134	75	73	A2
63	6,9	47	140	140	91	73	A3
100	9,1	61	175	175	121	94	A4
200	17,0	86	233	310	159	111	B1 + B2

This drawing is included by way of illustration only and does not prejudice the use of other shapes or forms provided they fall within the dimensions listed above.

Figure 503 – *(concluded)*

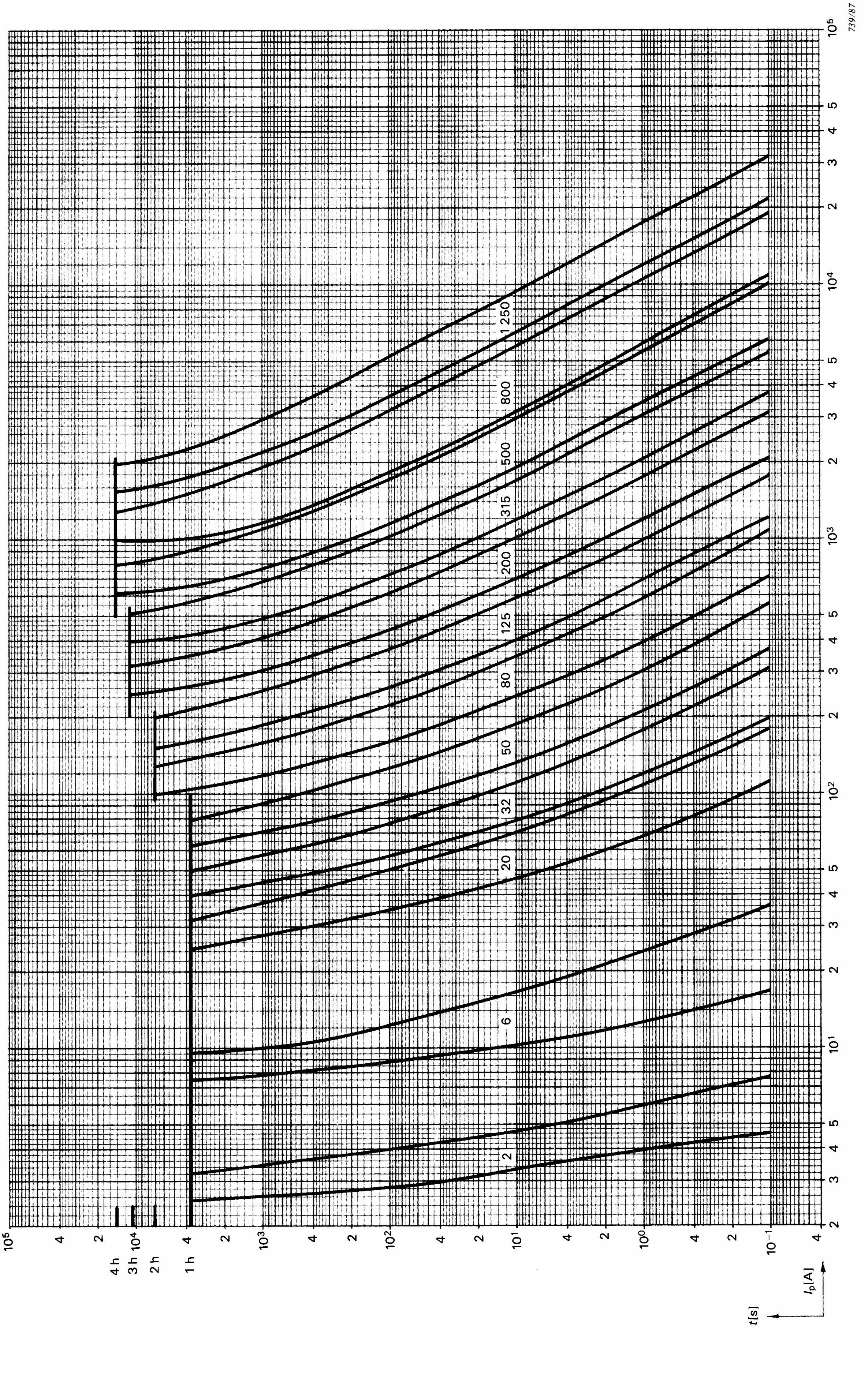


Figure 504 – Time-current zones for "gG" fuse-link

Remark: this figure was previously Figure 3 (II) in IEC 60269-2-1, Section II

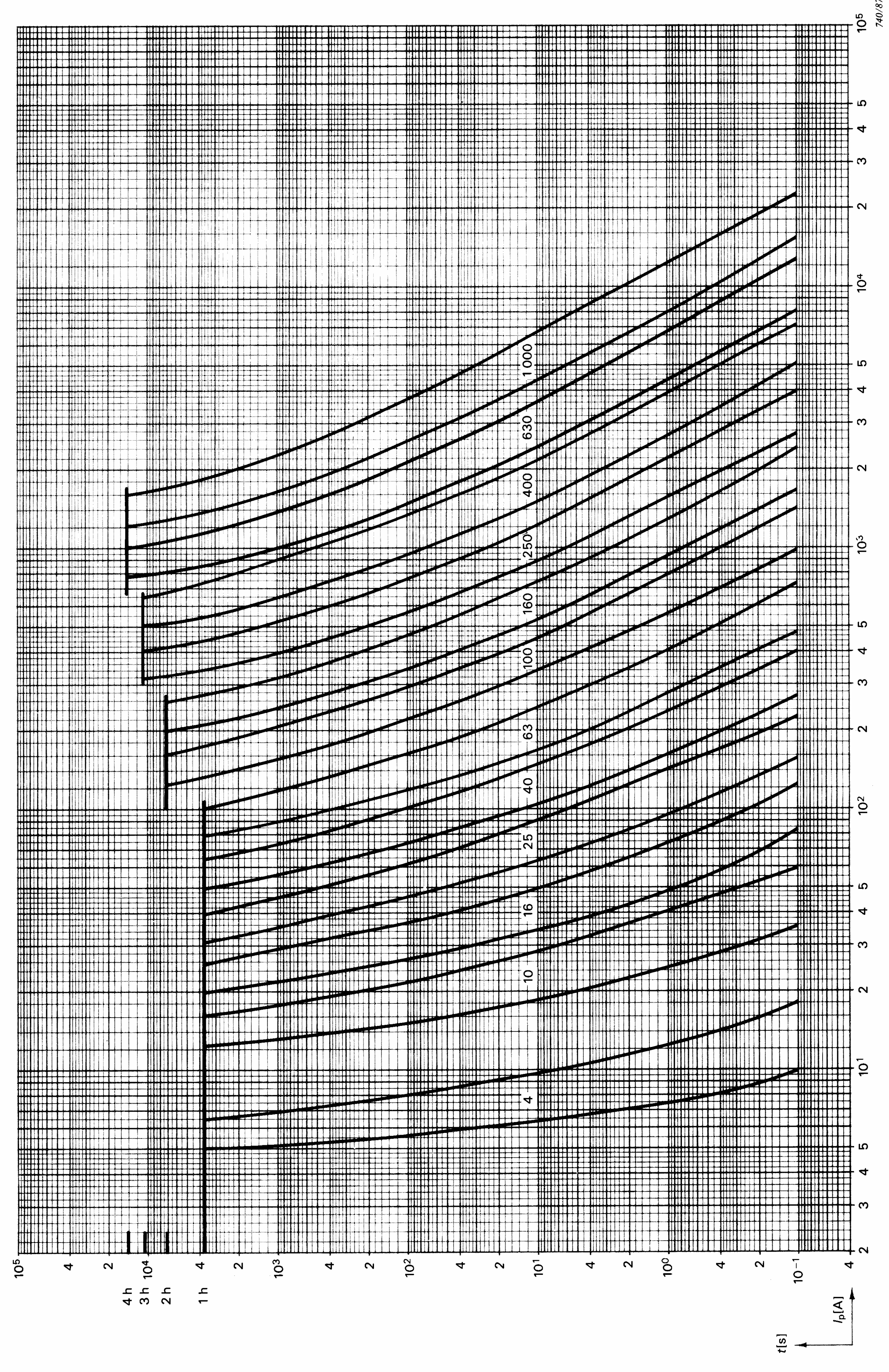
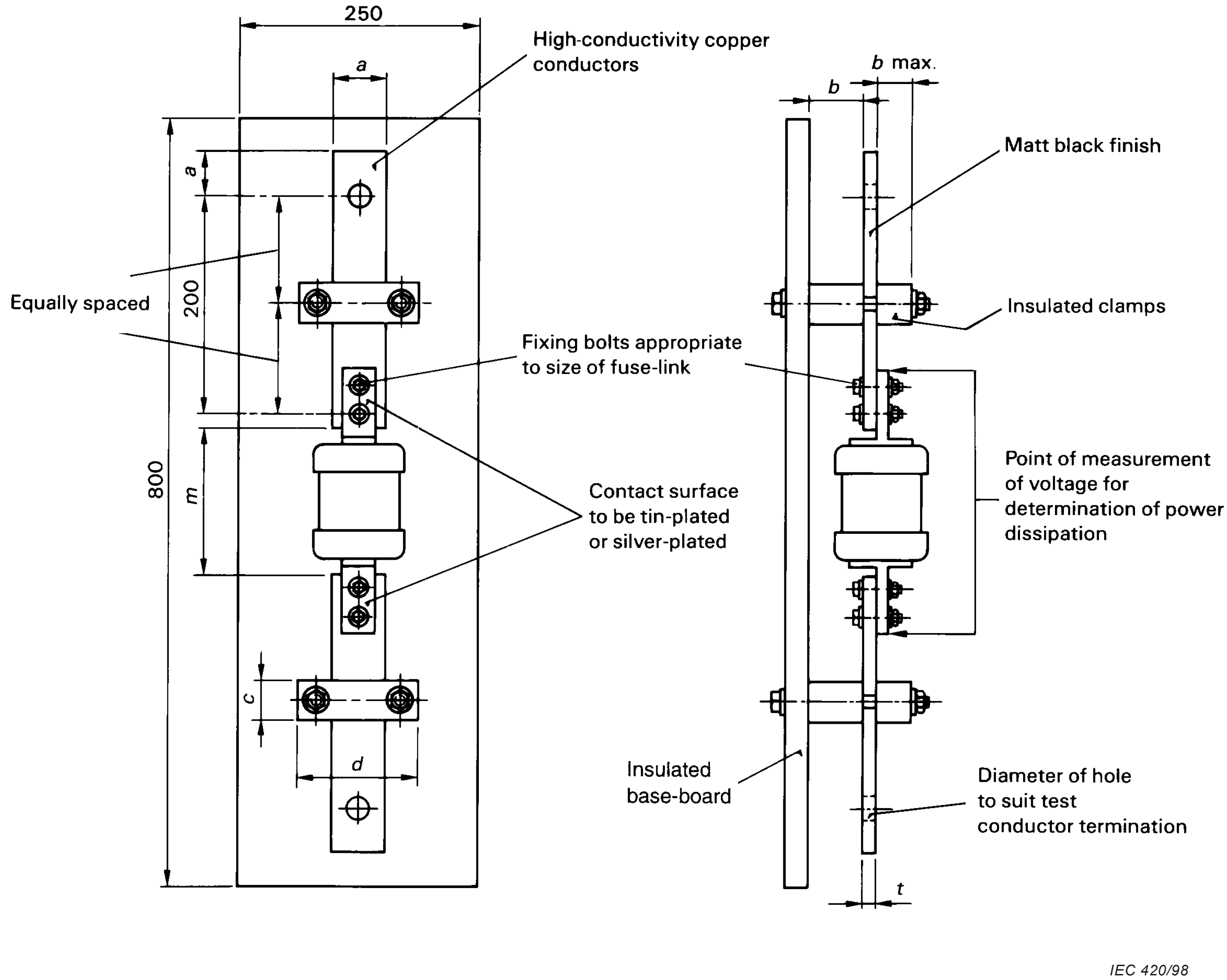


Figure 505 – Time-current zones for "gG" fuse-link

Remark: this figure was previously Figure 4 (II) in IEC 60269-2-1, Section II



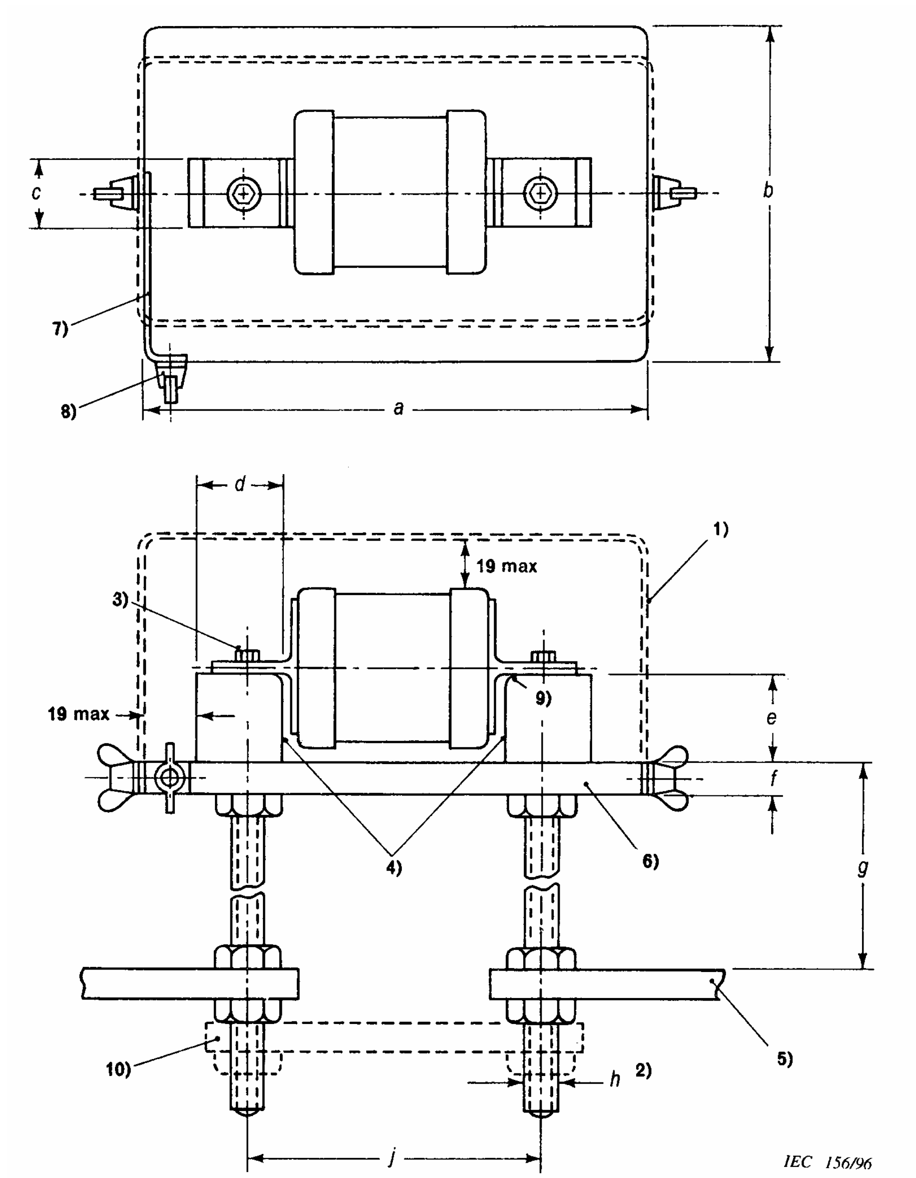
Dimensions in millimetres

NOTE Approximate dimensions are acceptable.

Fuse-link Size	Dimensions						Current rating in A up to
	a	*b*	*c*	*d*	*m*	*t*	
A1	10	12,5	16	50	38	0,5	20
A2	10	12,5	16	50	61	0,5	32
A3	16	12,5	16	50	62	1,0	63
A4	20	25	25	70	75	1,6	100
B1	20	25	25	70	83	1,6	100
B2	20	25	25	70	83	5	200
B3	25	38	25	80	83	8	315
B4	25	38	25	80	90	10	400
C1	25	38	25	80	96	10	400
C2	32	38	25	80	96	12	630
C3	40	45	32	100	101	12	800
D1	80	60	45	160	96	10	1 250

Figure 506 – Power dissipation test rig

Remark: this figure was previously Figure 5 (II) in IEC 60269-2-1, Section II



Dimensions in millimetres

Fuse-link, size	**Current rating up to**	**Dimensions**								
	A	***a***	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***j***
A1 to A4 B1 to B4	400	187	127	25	36,5	38	12	114	M12	111
C1 to C3	800	248	140	38	51	50	20	114	M20	159
D1	1 250	305	152	63	83	57	20	114	M24	159

Figure 507 – Breaking capacity test rig for fuse-links for bolted connection
(*figure continued on page 207*)

Remark: this figure was previously Figure 6 (II) in IEC 60269-2-1, Section II

1) Detachable cover fabricated from woven wire cloth, mild steel sheet or perforated mild steel sheet of such thickness as to ensure reasonable rigidity. Individual apertures in the wire cloth or perforated steel sheet shall not exceed 8,5 mm2 in area. The cover may differ in section from that shown on the drawings provided that the clearance of 19 mm between the cover and live metal parts is not exceeded.

2) Connecting studs of high conductivity copper.

3) Fixing centres; for A1 to A3 fuse-links, suitable adapters of minimum section 25 mm × 6,3 mm shall be used.

4) A visible gap at this position is essential to ensure that the end caps are not supported by the contact blocks.

5) The arrangement of the test connections beyond the test rig is not specified (the second paragraph of 8.5.1 of IEC 60269-1 does not apply).

The size of the copper conductors shall be selected according to the rated breaking capacity.

6) The base shall be made from phenolic resin bonded laminated sheet having a cross-breaking strength of not less than 85 MPa.

7) Copper strip.

8) Terminal for fine fuse-wire. Fine copper fuse wire of approximately 0,1 mm diameter, with a free length not less than 50 mm long connected between this terminal and one pole of the test supply.

9) Chamfer.

10) Short-circuiting link required for prospective current test. This may be slotted for easy disconnection.

The size of the copper link shall be selected according to the rated breaking capacity.

Figure 507 – *(concluded)*

Remark: this figure was previously Figure 6 (II) in IEC 60269-2-1, Section II

Fuse system G –
Fuses with fuse-links with offset blade contacts
(BS clip-in fuse system)

Remark: previously this system was described in Section IV of IEC 60269-2-1

1 General

IEC 60269-1 applies with the following supplementary requirements.

1.1 Scope

The following requirements apply to fuses with fuse-links having offset blade contacts. Such fuses have rated currents up to and including 125 A and rated voltages up to and including 400 V a.c.

NOTE These fuses are intended for use on systems employing the future standardized voltage of 230/400 V a.c. However, many countries are still using the higher voltage of 240/415 V in the interim period, and, therefore, these fuses will continue to be supplied and tested as 240 V a.c. or 415 V a.c. rating until such time as all supplies are brought down to the lower level of voltage.

The following characteristics of the fuses are specified in addition to the IEC 60269-1:

- minimum rated breaking capacities;
- time-current characteristics;
- I^2t characteristics;
- standard conditions of construction;
- power dissipation and acceptable power dissipation.

2 Terms and definitions

IEC 60269-1 applies.

3 Conditions for operation in service

IEC 60269-1 applies.

4 Classification

IEC 60269-1 applies.

5 Characteristics of fuses

IEC 60269-1 applies with the following supplementary requirements.

5.2 Rated voltage

The values of standardized rated voltages given in Table 1 of IEC 60269-1 applicable to this standard are:

Fuse-link size E1 230 V a.c.

Fuse-link sizes F1, F2, F3 400 V a.c.

(Refer also to the note in 1.1).

5.3.1 Rated current of the fuse-link

For each size, the maximum rated currents are given in Figure 701. Ratings of 8 A and 12 A are not included in this fuse system.

5.3.2 Rated current of the fuse-holder

Maximum rated currents for the fuse-holder are given in Figure 702.

5.5 Rated power dissipation of a fuse-link and rated acceptable power dissipation of a fuse-holder

The maximum values of power dissipation permitted for fuse-links when tested in accordance with 8.3.1 are specified in Figure 701 when measured on the standard rig shown in Figure 705.

The values of rated acceptable power dissipation of fuse-holders at rated current when tested in accordance with 8.3.1 are given in Figure 702.

NOTE The point of measurement of voltage for the determination of the acceptable power dissipation of a fuse-holder is shown in Figure 702.

5.6.1 Time-current characteristics, time-current zones

In addition to the limits of pre-arcing time given by the gates and the conventional times and currents, the time-current zones, excluding manufacturing tolerances, are given in Figures 703 and 704. The tolerance on time-current characteristics shall not deviate by more than 10 % in terms of current.

5.6.2 Conventional times and currents

The conventional times and currents in addition to the values of IEC 60269-1 are given in Table 701.

Table 701 – Conventional time and current for "gG" fuse-links

Remark: this table refers to Table 2 in IEC 60269-1 and was previously Table II in IEC 60269-2-1, Section IV

Rated current I_n	Conventional time	Conventional current	
A	h	I_{nf}	I_f
$4 < I_n < 16$	1	1,25 I_n	1,6 I_n
$I_n \leq 4$	1	1,25 I_n	2,1 I_n

5.6.3 Gates

For "gG" fuse-links the gates given in Table 702 and in IEC 60269-1 apply.

Table 702 – Gates for specified pre-arcing times of "gG" fuse-links

Remark: this table refers to Table 3 in IEC 60269-1
and was previously Table III in IEC 60269-2-1, Section IV

I_n A	I_{min} (10 s) A	I_{max} (5 s) A	I_{min} (0,1 s) A	I_{max} (0,1 s) A
2	3	6	4	8
4	6	12	9	20
6	9	20	16	36
10	16	36	33	70

5.7.2 Rated breaking capacity

The rated breaking capacities shall be

a) 50 kA for size E1 fuse-links;

b) 80 kA for sizes F1, F2 and F3 fuse-links.

6 Markings

IEC 60269-1 applies with the following supplementary requirements.

6.1 Markings of fuse-holders

In addition to IEC 60269-1, the following marking applies:

- size.

6.2 Markings of fuse-links

In addition to IEC 60269-1, the following marking applies:

- size or reference
- rated breaking capacity

7 Standard conditions for construction

IEC 60269-1 applies with the following supplementary requirements.

7.1 Mechanical design

Dimensions of fuse-links and fuse-holders are given in Figures 701 and 702.

7.1.2 Connections including terminals

Terminals of fuse-holders shall accept stranded or solid copper conductors with cross-sectional areas as given in Table 703.

Table 703 – Sizes of copper conductors

Remark: this table was previously Table U in IEC 60269-2-1, Section IV

Rated current of fuse-holder A	Cross-sectional area of conductor mm^2	Size
20	4	E1
32	10	F1
63	25	F2
125	70	F3

7.7 I^2t characteristics

In addition to the values given in Table 7 of IEC 60269-1, the values for rated currents lower than 16 A are given in Table 704.

Table 704 – Pre-arcing I^2t values at 0,01 s for "gG" fuse-links

Remark: this table refers to Table 7 in IEC 60269-1 and was previously Table VI in IEC 60269-2-1, Section IV

I_n A	I^2t_{min} A^2s	I^2t_{max} A^2s
2	0,30	2,5
4	2,0	15
6	5	45
10	25	200

7.9 Protection against electric shock

Where standardized fuse-holders according to Figure 702 are used, the degree of protection against electric shock shall be at least IP2X for all three states.

8 Tests

IEC 60269-1 applies with the following supplementary requirements.

8.3.3 Measurement of the power dissipation of the fuse-link

The fuse-link shall be mounted on the test rig shown in Figure 705. The points of measurement of power loss are given in Figure 705.

8.3.4.1 Temperature rise of the fuse-holder

The dummy fuse-links shall have dimensions that comply with Figure 701 for testing in the corresponding fuse-holder of Figure 702. The power dissipation of the dummy fuse-links shall be the rated acceptable power dissipation of the fuse-holder as given in Figure 702 when tested in the standardized power dissipation test rig given in Figure 705.

8.4.1 Arrangement of the fuse

The test arrangement of the fuse-link is given in Figure 705.

8.5.1 Arrangement of the fuse

Fuse-links shall be tested for breaking capacity in fuse-holders which comply with this standard. The fuse-holder shall be rigidly supported. Any conductor for the connection of the fuse-holder to the main-circuit test connections shall have a cross-section appropriate to the fuse-holder terminal given in Table 703. These conductors may be up to 0,2 m on either side of the complete fuse in the plane of the connecting device and in the direction of the connecting line between the terminals of the fuse.

The disposition of the test connections beyond the test rig, i.e. the fuse-holder and any conductors connecting it to the test connections, is not specified.

8.7.4 Verification of overcurrent discrimination

For current ratings of 16 A and above, 8.7.4 of IEC 60269-1 applies.

For current ratings less than 16 A, discrimination is determined from the manufacturer's data as verified in accordance with 8.7.1 of IEC 60269-1.

8.9 Verification of resistance to heat

Fuse-holders fitted with fuse-links having the maximum power dissipation corresponding to the power acceptance of the fuse-holder shall be cyclically loaded as pre-treatment. The pre-treatment is specified in 8.4.3.2 of IEC 60269-1. After cooling to normal temperature the breaking capacity shall be tested at I_1 in accordance with 8.5.

Fuse-links containing organic material in the body or filler shall be subjected to the same test as described above. These fuse-links shall interrupt the test currents I_1 and I_5.

8.10 Verification of non-deterioration of contacts

Subclause 8.10 of IEC 60269-1 applies.

8.10.1 Arrangement of the fuse

Subclause 8.10.1 of IEC 60269-1 applies with the following addition:

The dummy fuse-links shall have dimensions that comply with Figure 701 for testing in the corresponding fuse-holder of Figure 702.

The power dissipation of the dummy fuse-links shall be the maximum rated acceptable power dissipation of the fuse-holder as given in Figure 702 when tested in the standardized power dissipation test rig given in Figure 705.

8.10.2 Test method

The following wording is added after the first paragraph of 8.10.2 in IEC 60269-1.

The following test values shall be applied:

– Test current non-fusing current I_{nf}
– Load period 25 % of the conventional time
– No-load period 10 % of the conventional time

A test voltage lower than the rated voltage may be used.

8.10.3 Acceptability of test results

After 250 cycles, the measured temperature-rise values shall not exceed the temperature rise measured at the beginning of the tests by more than 15 K.

After 750 cycles, if necessary, the temperature shall not exceed the values measured at the beginning of the tests by more than 20 K.

8.11 Mechanical and miscellaneous tests

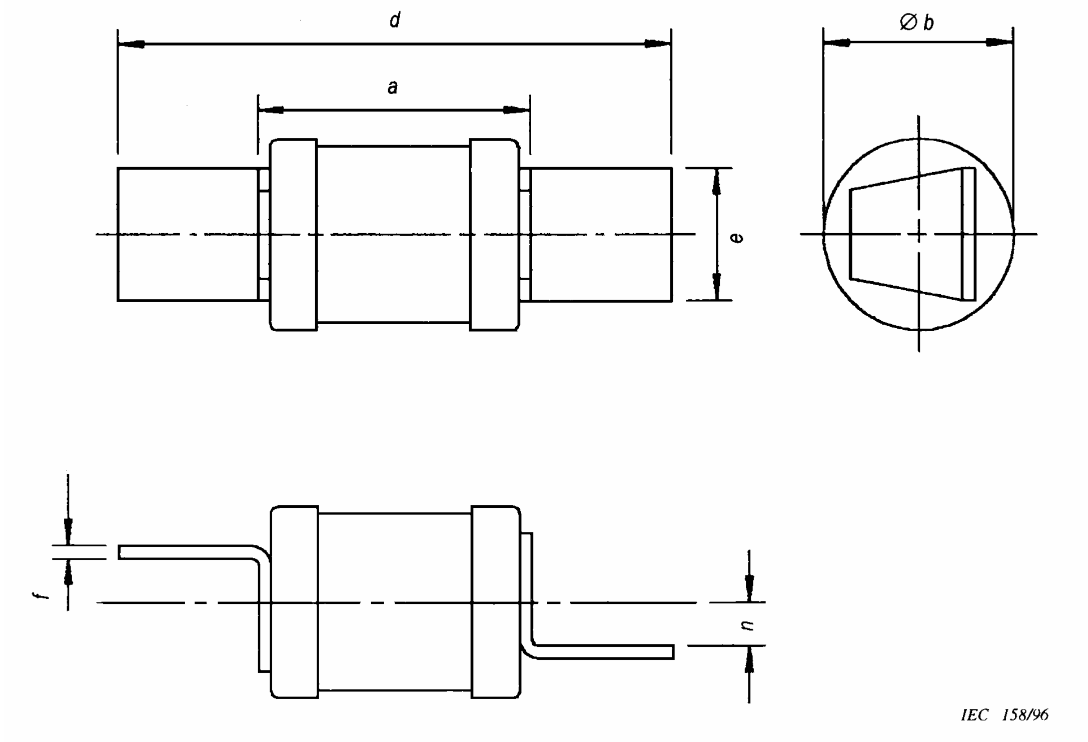
8.11.1.1 Mechanical strength of fuse-holders

The fuse-holder, fitted with a fuse-link of the largest rated current and power dissipation that can be accommodated by the fuse-holder, shall be subjected to a temperature-rise test at rated current.

At the conclusion of the temperature-rise test, the fuse-link or the fuse-carrier as appropriate, shall be withdrawn and inserted into the fuse-base 100 times.

At the conclusion of these tests, all parts shall be intact and shall function normally.

Compliance shall be verified by a further temperature rise test at rated current at the conclusion of which the values obtained shall be not more than 5 K or 15 % (whichever is greater) above the values obtained from the temperature rise test prior to the commencement of the mechanical test.



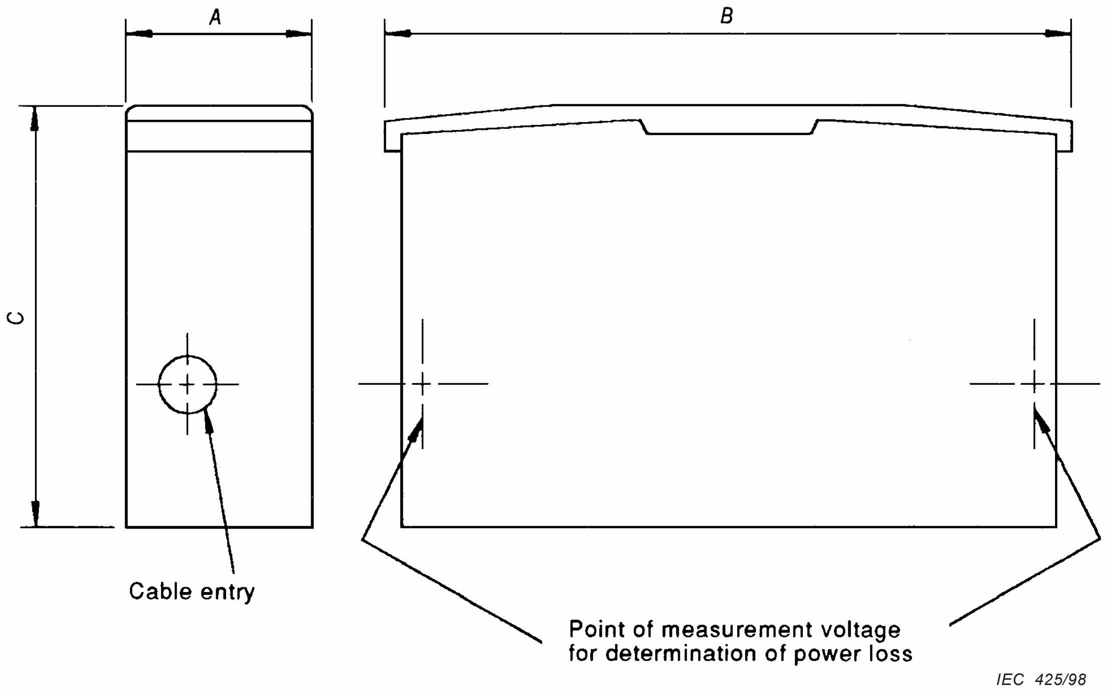
Dimensions in millimetres

Size	Maximum rated current A	Maximum power dissipation W	*a*[1)] Max.	*b* Max.	*d* Max.	 Min.	*e* Max.	 Min.	*f* Max.	 Min.	*n* Max.	 Min.
E1	20	1,8	25	14,5	51	47	13	11	1,5	0,8	3,8	3,2
F1	32	3,2	35,5	14,5	62	58	131	11	1,5	0,8	3,8	3,2
F2	63	4,8	39	17,5	69	65	15,5	14,5	1,6	1,2	3,8	3,2
F3	125	7,5	39	27	80	76	20	19	2,0	1,6	3,8	3,2

1) Dimension "*a*" may be up to 0,5 mm more than the stated value to allow for projecting rivet heads at the centre of tag faces.

Figure 701 – Fuse-links having offset blade contacts, sizes E1, F1, F2 and F3

Remark: this figure was previously Figure 1 (IV) in IEC 60269-2-1, Section IV



Dimensions in millimetres

Size of fuse-link	Maximum rated current A	Rated acceptable power dissipation W	*A* Max.	*B* Max.	*C* Max.
E1	20	2	26	71	59
F1	32	3,5	26	81	59
F2	63	5	32	96	68
F3	125	7,5	40,5	110	81
NOTE The above illustration does not prejudice the use of other shapes or forms provided they fall within the maximum dimensions listed.					

Figure 702 – Typical fuse-holder

Remark: this figure was previously Figure 2 (IV) in IEC 60269-2-1, Section IV

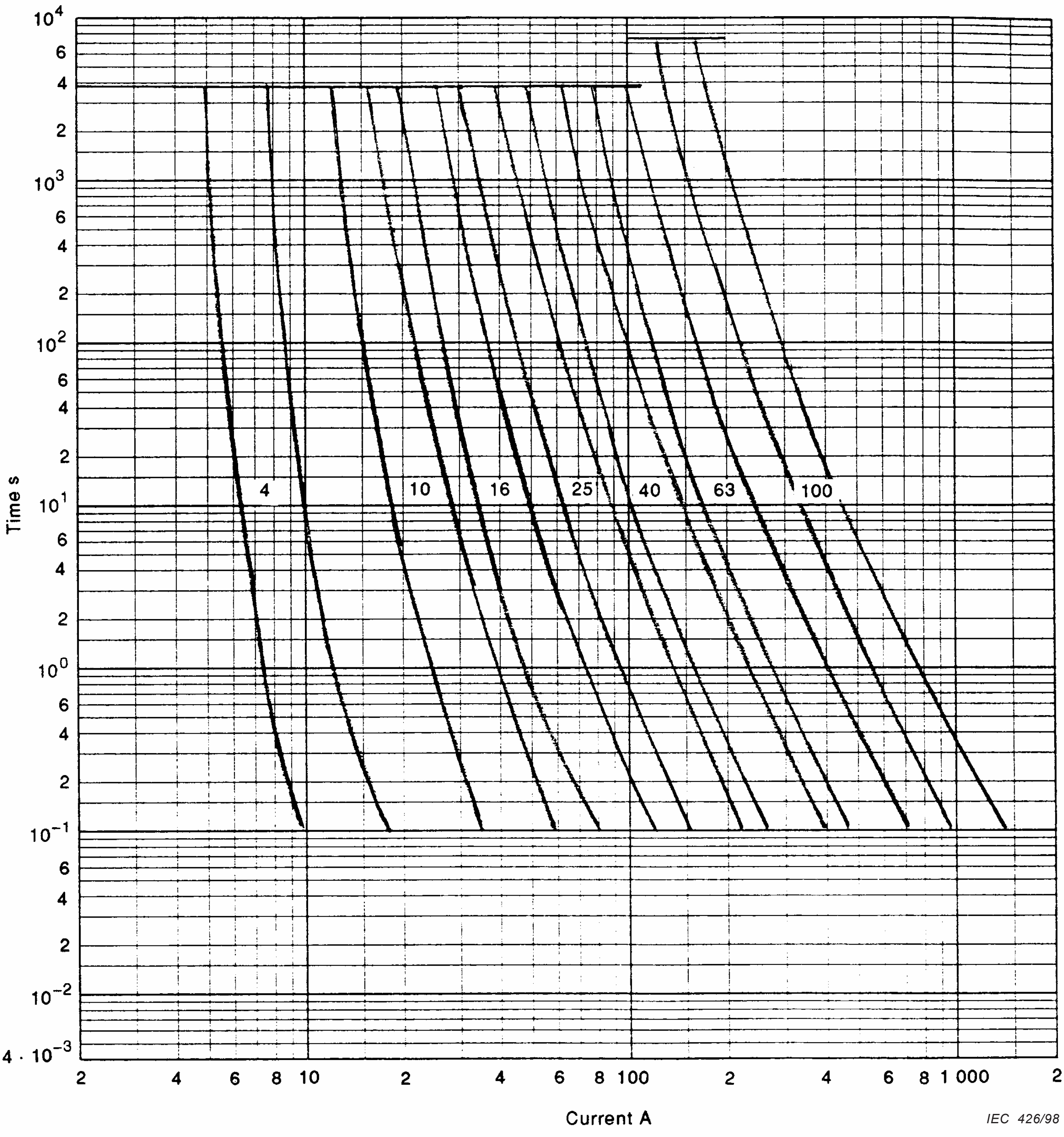
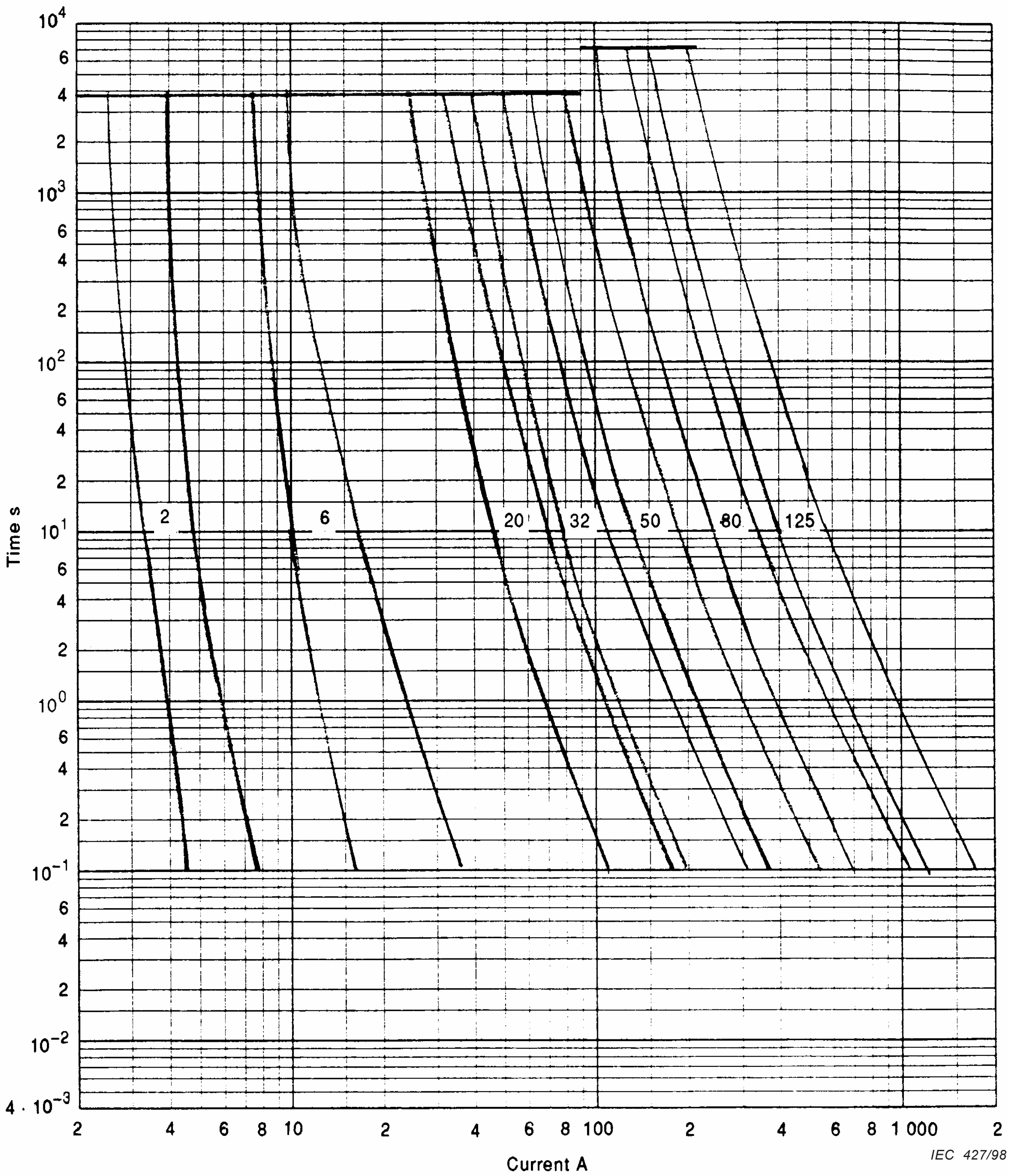


Figure 703 – Time-current zones for "gG" fuse-links

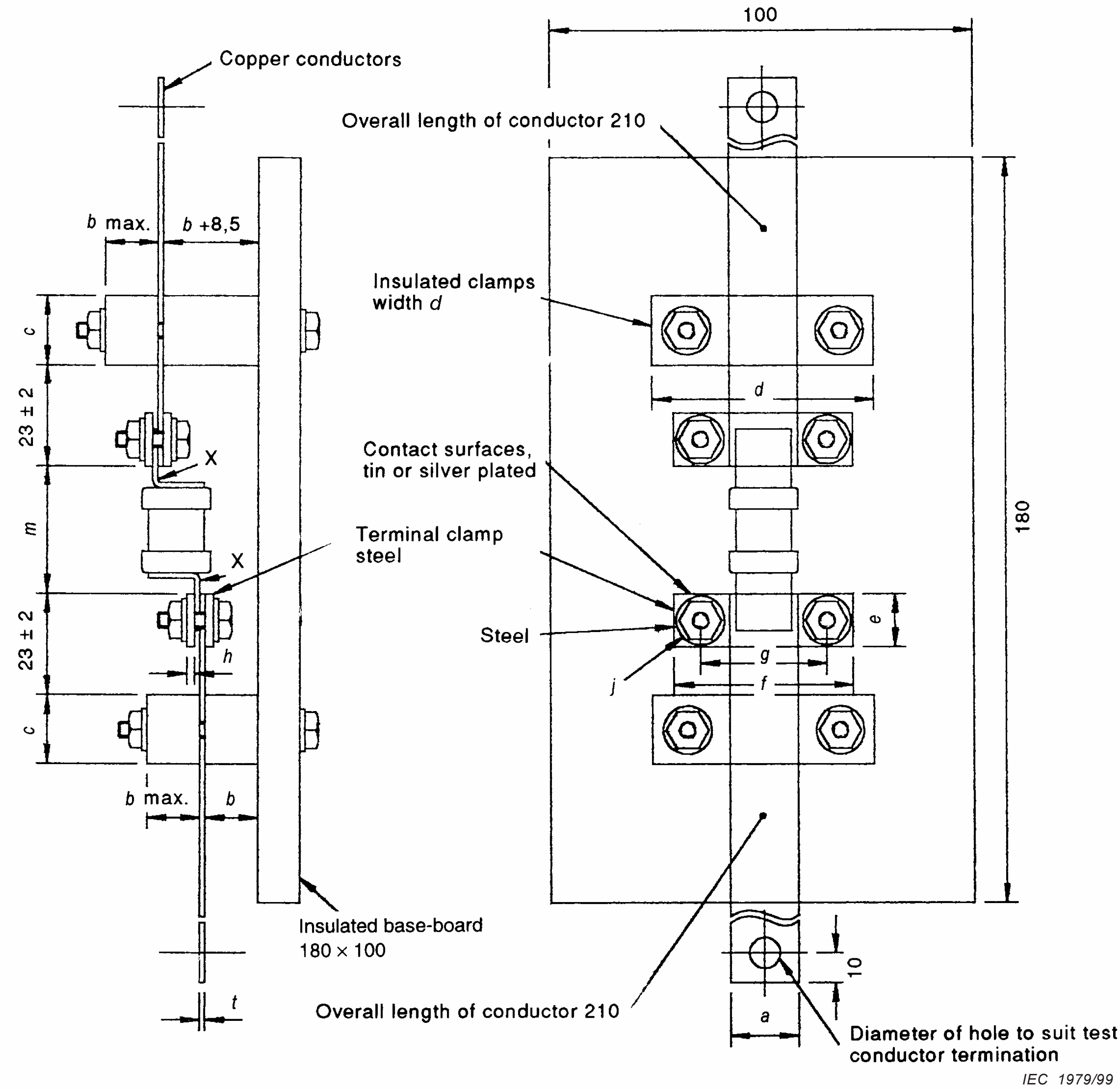
Remark: this figure was previously Figure 3 (IV) in IEC 60269-2-1, Section IV



Dimensions in millimetres

Figure 704 – Time-current zones for "gG" fuse-links

Remark: this figure was previously Figure 4 (IV) in IEC 60269-2-1, Section IV



X – X indicates point of measurement of voltage for determination of power dissipation.

Size	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*j*	*m*	*t*	Rated current in A, up to
E1	10	12,5	16	50	12,5	40	28	1,6	M4	30	0,5	20
F1	10	12,5	16	50	12,5	40	28	1,6	M4	30	0,5	32
F2	16	12,5	16	50	15	45	28	1,6	M5	45	1,0	63
F3	20	25	25	50	15	50	35	2	M5	45	1,6	125

Dimensions in millimetres

Figure 705 – Power dissipation test rig

Remark: this figure was previously Figure 5 (IV) in IEC 60269-2-1, Section IV

Fuse system I –
gU fuse-links with wedge tightening contacts

Remark: previously this system was described in Section VI of IEC 60269-2-1

1 General

IEC 60269-1 applies with the following supplementary requirements.

1.1 Scope

The following additional requirements apply to fuse-links having wedge-tightening contacts of standardized dimensions and performance intended for use in a.c. electricity supply networks where they are accessible to, and may be replaced by, suitable authorized persons only. Such fuse-links have rated currents up to and including 630 A and a rated voltage of 400 V a.c. Requirements for fuse-links for use in d.c. networks and for fuse-links incorporating integral indicating devices are not included.

NOTE 1 These fuse-links are intended for use on systems employing the future standardized voltage of 400 V a.c. However, in the interim period, many countries are still using associated distribution transformers with a designed open-circuit voltage of 433 V a.c. and a desired on-load voltage of 415 V a.c. Therefore, these fuse-links will continue to be supplied and tested as 415 V a.c. until such time as all supplies are brought down to the lower voltage. The fuse-links are therefore tested at a minimum recovery voltage of 457 V a.c., i.e. 415 V a.c. + 10 %.

NOTE 2 Whilst these fuse-links are very similar to the standardized "gG" types they require faster performance characteristics, especially at short times, in order to ensure good discrimination with h.v. fuse-links on the primary side of the transformer. It is intended that the performance of these fuse-links should be aligned with the requirements of gG. In the interim period, the breaking range and utilisation category as described in fuse system I should be defined as gU.

NOTE 3 Non-interchangeability and protection against accidental contact with live parts are not necessarily ensured by constructional means.

NOTE 4 In most cases, a part of the associated equipment serves the purpose of a fuse-base. Owing to the great variety of equipment, no general rules can be given; the suitability of the associated equipment to serve as a fuse-base should be subject to agreement between the manufacturer and the user. However, if separate fuse-bases or holders are used, they should comply with the appropriate requirements of IEC 60269-1.

The following characteristics of the fuses are specified in addition to the IEC 60269-1:

- minimum rated breaking capacities;
- time-current characteristics;
- I^2t characteristics;
- standard conditions of construction;
- power dissipation and acceptable power dissipation.

2 Terms and definitions

IEC 60269-1 applies.

3 Conditions for operation in service

IEC 60269-1 applies with the following supplementary requirements.

3.9 Discrimination of fuse-links

Subclause 3.9 of IEC 60269-1 does not apply. In the case of these fuse-links, correct discrimination is ensured by adherence to Table 2 of IEC 60269-1 and the standard zones for time/current characteristics as specified in 5.6.1 and given in Figures 901, 902, 903 and 904, together with compliance with the values given in Table 903 of 7.7.

4 Classification

IEC 60269-1 applies.

5 Characteristics of fuses

IEC 60269-1 applies with the following supplementary requirements.

5.2 Rated voltage

The value of standardized rated voltage given in Table 1 of IEC 60269-1 applicable to this standard is 400 V a.c. (refer also to Note 1 of 1.1).

5.3.1 Rated current of the fuse-link

The standardized current ratings of fuse-links with centres at 82 mm are 100 A, 160 A, 200 A, 250 A, 315 A, 355 A and 400 A. The standardized current ratings of fuse-links with centres at 92 mm are 100 A, 160 A, 200 A, 250 A, 315 A, 355 A, 400 A, 500 A and 630 A. Other current ratings, including and exceeding 20 A, may be selected from the values given in 5.3.1 of IEC 60269-1. Performance values for these other ratings are not standardized but shall not exceed those applying to the next highest standardized current rating nor be less than those applying to the next lowest standardized current rating. All ratings shall comply with the standardized dimensions shown in Figure 905.

5.5 Rated power dissipation of a fuse-link

The maximum values of power dissipation permitted for fuse-links when tested in accordance with 8.3.1 are specified in Table 901 when measured on the standard test rig shown in Figure 906.

Table 901 – Maximum power dissipation values

Remark: this table was previously Table LL in IEC 60269-2-1, Section VI

Rated current (A)	100	160	200	250	315	355	400	500	630
Power dissipation (W)	10	14	18	22	29	29	33	38	46

NOTE The point of measurement of voltage for determination of power dissipation is shown in Figure 906.

5.6.1 Time-current characteristics, time-current zones

The time-current zones, excluding manufacturing tolerances, are given in Figures 901, 902, 903 and 904. The tolerance on time-current characteristics shall not deviate by more than 10 % in terms of current.

5.6.2 Conventional times and currents

The conventional times and currents are given in Table 2 of IEC 60269-1.

5.6.3 Gates

Subclause 5.6.3 of IEC 60269-1 does not apply to these fuse-links.

Correct discrimination is ensured by adherence to the standardized zones for time-current characteristics as specified in 5.6.1 and given in Figures 901, 902, 903 and 904.

5.7.2 Rated breaking capacity

The minimum breaking capacities are specified in Table 902.

Table 902 – Minimum rated breaking capacities

Remark: this table was previously Table B in IEC 60269-2, Edition 2

Rated voltage	Minimum rated breaking capacities
≤ 690 V a.c.	50 kA
≤ 750 V d.c.	25 kA

5.8 Cut-off current and I^2t characteristics

Subclause 5.8 of IEC 60269-1 applies; I^2t characteristics may alternatively be represented as a graph showing pre-arcing and total operating values as a function of rated current.

6 Markings

IEC 60269-1 applies with the following supplementary requirements.

6.1 Markings of fuse-holders

In addition to IEC 60269-1, the following marking applies:

- size.

6.2 Markings of fuse-links

In addition to IEC 60269-1, the following marking applies:

- size or reference
- rated breaking capacity.

7 Standard conditions for construction

IEC 60269-1 applies with the following supplementary requirements.

7.1 Mechanical design

Dimensions of the fuse-links are given in Figure 905.

7.5 Breaking capacity

The maximum arc voltages specified in Table 6 of IEC 60269-1 apply, with the following additional note.

NOTE For a.c., the arc voltage may reach up to $\sqrt{2}$ times the values given, provided that the period of excess does not exceed 1 ms.

7.7 I^2t characteristics

Subclause 7.7 of IEC 60269-1 applies with the values in Table 7 of IEC 60269-1 replaced by the values given in Table 903 for gU fuse-links. Values for other ratings are not specified but shall comply with the performance requirements for non-standardized current ratings given in 5.3 of IEC 60269-1.

Table 903 – Pre-arcing I^2t values for gU fuse-links at 0,01 s

Remark: this table was previously Table MM in IEC 60269-2-1, Section VI

I_n A	I^2t min. $10^3 \times (A^2s)$	I^2t max. $10^3 \times (A^2s)$
100	12,0	33,0
160	40,0	130,0
200	67,0	200,0
250	100,0	380,0
315	160,0	520,0
355	280,0	1 000,0
400	420,0	1 400,0
500	800,0	2 400,0
630	1 400,0	4 000,0

7.8 Overcurrent discrimination of the fuse-links

Correct discrimination is ensured by adherence to the standard zones for time-current characteristics as specified in 5.6.1 and given in Figures 901, 902, 903 and 904.

8 Tests

IEC 60269-1 applies with the following supplementary requirements.

8.1.1 Kind of tests

Subclause 8.1.1 of IEC 60269-1 applies, but where fuse-links of standardized dimensions and performance have been tested in accordance with this fuse system, the results of such tests shall also be regarded as comprising fuse-links of identical construction but having different contact dimensions and fixing centres, provided that the changes are not likely to result in inferior performance.

8.3.1 Arrangement of the fuse

Fuse-links shall be mounted in an appropriate carrier and tested in the test rig shown in Figure 906. For the connections to the fuse, Table 17 of IEC 60269-1 does not apply and for standardized ratings the connections on either side of the test rig shall be copper bars each not less than 1 m in length and selected in accordance with Table 904. For other ratings, the cross-section of the conductors shall be that applying to the next highest standardized current rating.

Table 904 – Cross-sectional area of conductors for power dissipation and temperature- rise tests

Remark: this table was previously Table NN in IEC 60269-2-1, Section VI

Rated current of fuse-links A	Cross-section[1)] of conductors mm
100	20 × 1,6
160	20 × 2,5
200	20 × 3,15
250	20 × 5
315	25 × 5
355	25 × 6
400	25 × 8
500	40 × 6
630	40 × 10

1) Approximate equivalents for these conductor sizes are acceptable.

8.3.3 Measurement of the power dissipation of the fuse-link

Subclause 8.3.3 of IEC 60269-1 applies. The points of measurement of the power dissipation are given in Figure 906.

8.4.1 Arrangement of the fuse

Fuse-links shall be mounted in an appropriate carrier and tested for time-current characteristics in the test rig shown in Figure 906.

8.4.3.3.2 Verification of gates

Correct discrimination is ensured by adherence to the standard zones for time-current characteristics for gU fuse-links as specified in 5.6.1 and given in Figures 901, 902, 903 and 904 verified as in 8.4.3.3.1 of IEC 60269-1.

8.5.1 Arrangement of the fuse

Fuse-links shall be tested for breaking capacity in the test rig shown in Figure 907. The arrangement of the test connections beyond the test rig is not specified.

8.5.2 Characteristics of the test circuit

Subclause 8.5.2 of IEC 60269-1 applies except that the d.c. tests are omitted.

8.5.5 Test method

Subclause 8.5.5.1 of IEC 60269-1 applies, except that the tests for d.c. shall be omitted. Where test facilities do not permit direct testing (for example, for $I_n \geq 200$ A), two-part testing may be used.

Subclause 8.5.5.2 of IEC 60269-1 applies, except that the tests for d.c. shall be omitted.

8.5.8 Acceptability of test results

Subclause 8.5.8 of IEC 60269-1 applies, and, in addition, fuse-links shall operate without melting of the fine-wire fuse which indicates arcing to the metal enclosure, and without mechanical damage to the test rig.

8.7.3 Verification of compliance for fuse-links at 0,01 s

Subclause 8.7.3 of IEC 60269-1 applies, except that compliance with Table 7 of IEC 60269-1 is replaced by compliance with Table 903 of this standard.

8.9 Verification of resistance to heat

Fuse-holders fitted with fuse-links having the maximum power dissipation corresponding to the power acceptance of the fuse-holder shall be cyclically loaded as pre treatment. The pre-treatment is specified in 8.4.3.2. of IEC 60269-1. After cooling to normal temperature, the breaking capacity shall be tested at I_1 in accordance with 8.5.

Fuse-links containing organic material in the body or filler shall be subjected to the same test as describe above. These fuse-links shall interrupt the test currents I_1 and I_5.

8.11 Mechanical and miscellaneous tests

8.11.1.1 Mechanical strength of fuse-holders

The fuse-holder, fitted with a fuse-link of the largest rated current and power dissipation that can be accommodated by the fuse-holder, shall be subjected to a temperature-rise test at rated current.

At the conclusion of the temperature-rise test, the fuse-link or the fuse-carrier as appropriate, shall be withdrawn and inserted into the fuse-base 100 times.

At the conclusion of these tests, all parts shall be intact and shall function normally.

Compliance shall be verified by a further temperature rise test at rated current at the conclusion of which the values obtained shall be not more than 5 K or 15 % (whichever is greater) above the values obtained from the temperature rise test prior to the commencement of the mechanical test.

8.11.2.2 Verification of resistance to abnormal heat and fire

Subclause 8.11.2.2 of IEC 60269-1 does not apply.

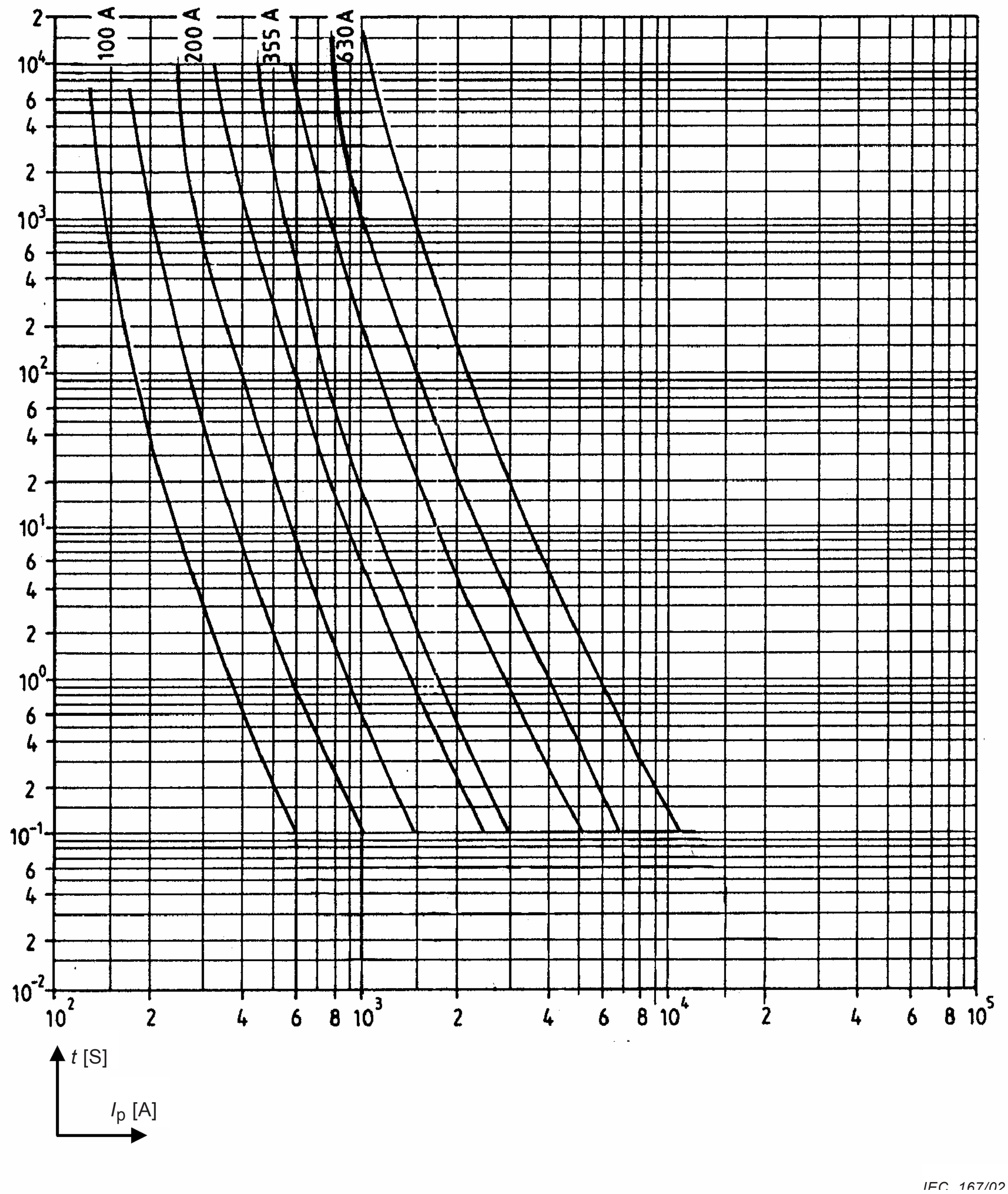


Figure 901 – Time-current zones for current ratings 100 A, 200 A, 355 A and 630 A

Remark: this figure was previously Figure 1a (VI) in IEC 60269-2-1, Section VI

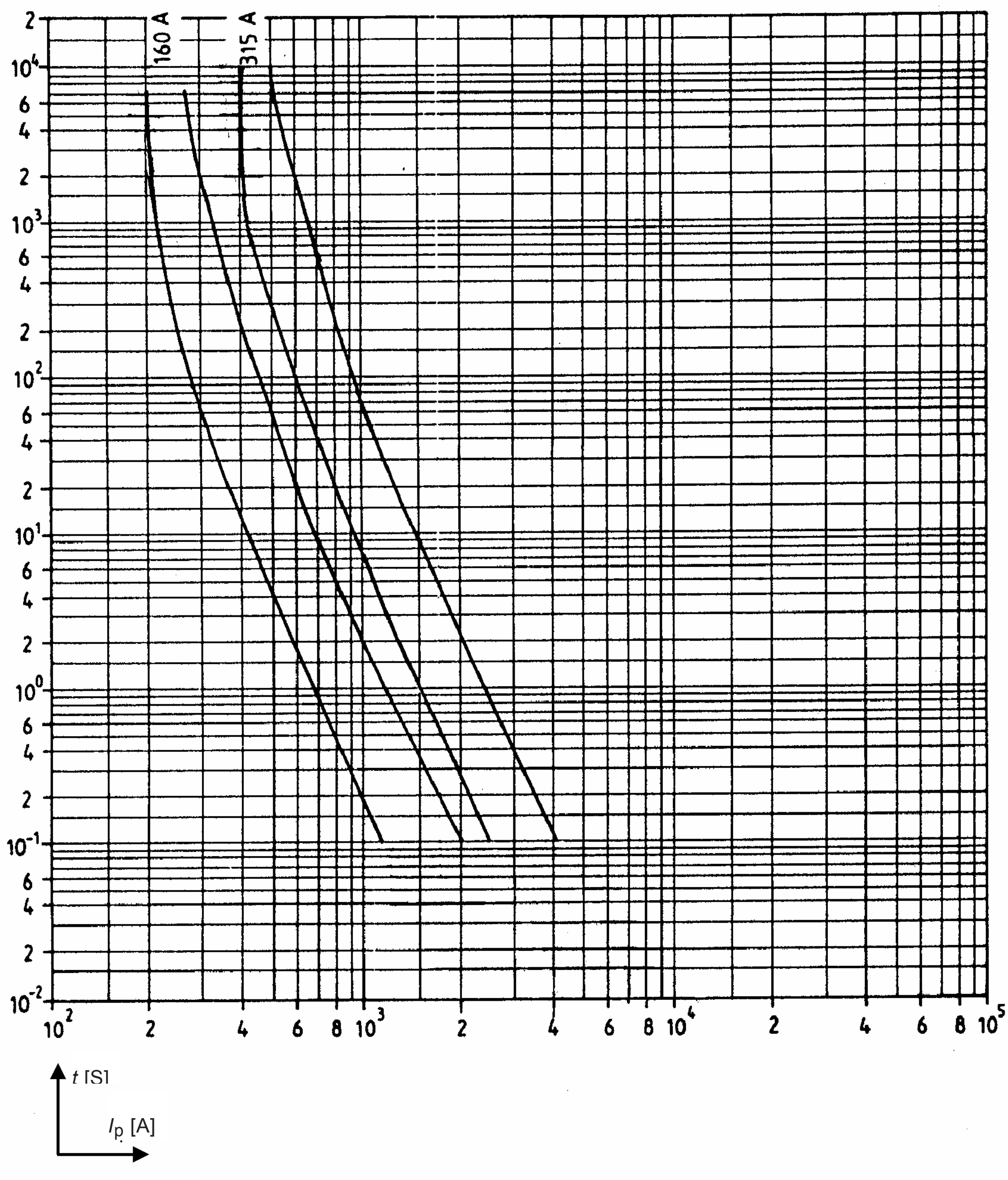


Figure 902 – Time-current zones for current ratings 160 A and 315 A

Remark: this figure was previously Figure 1b (VI) in IEC 60269-2-1, Section VI

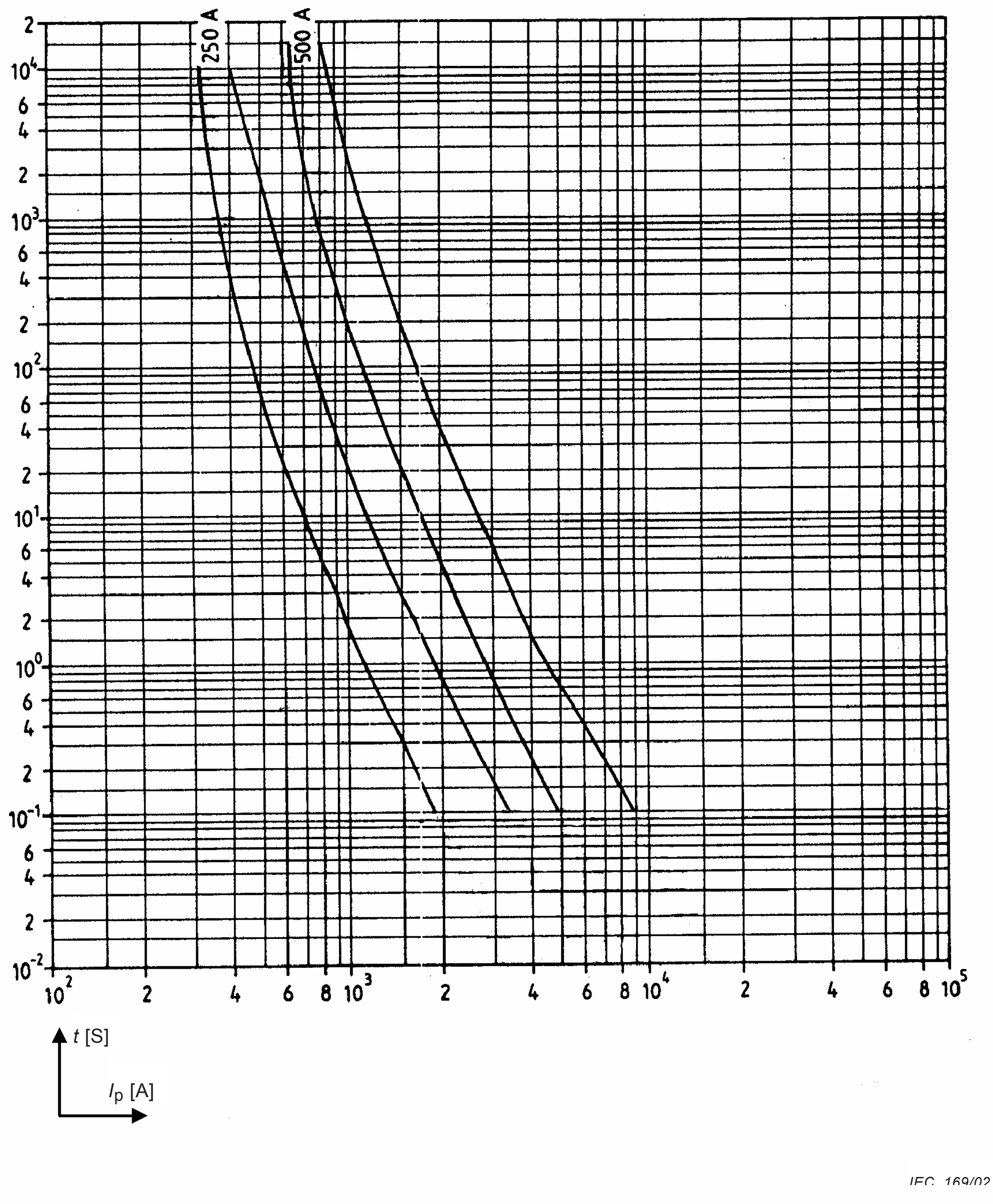


Figure 903 – Time-current zones for current ratings 250 A and 500 A

Remark: this figure was previously Figure 1c (VI) in IEC 60269-2-1, Section VI

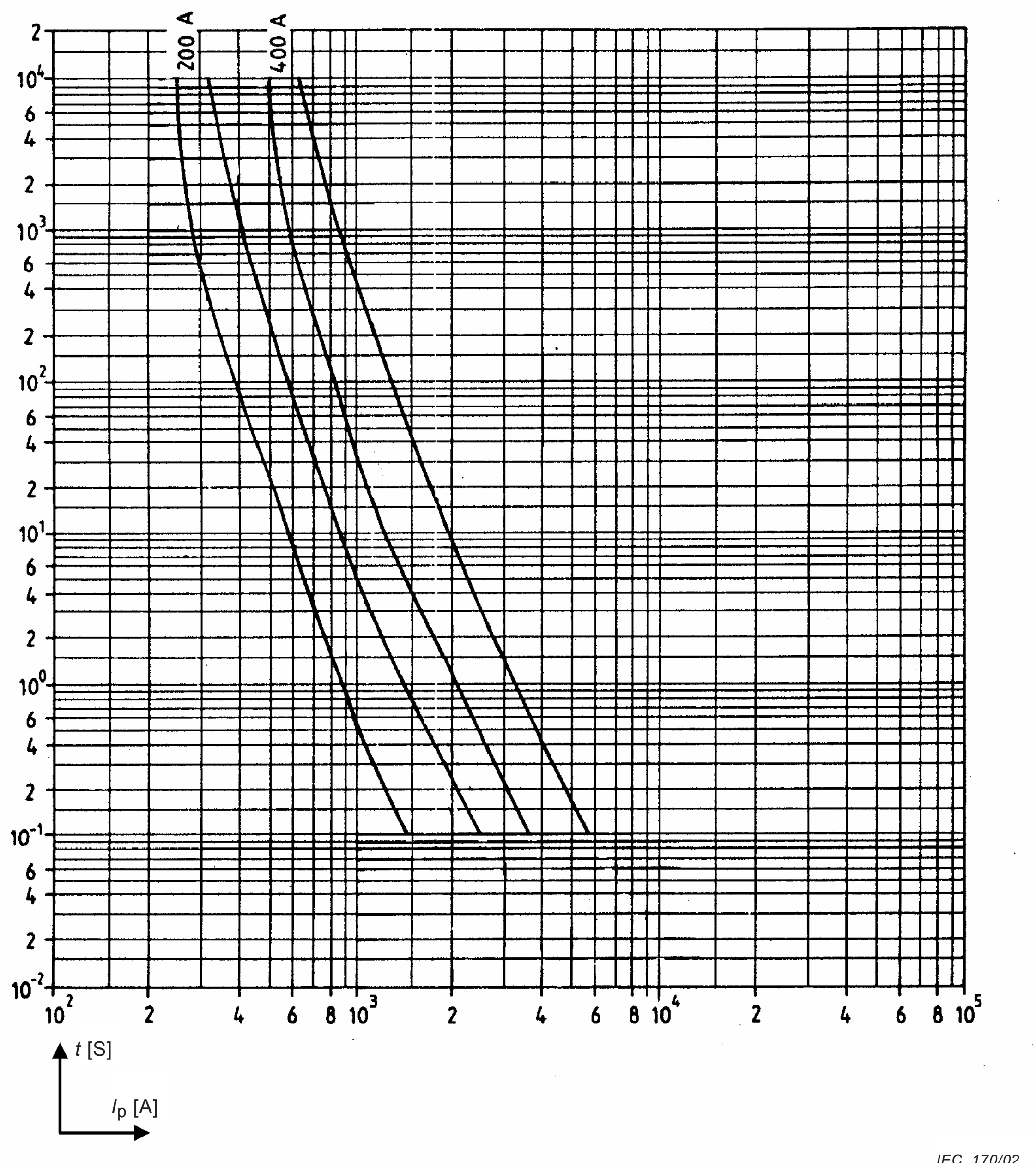
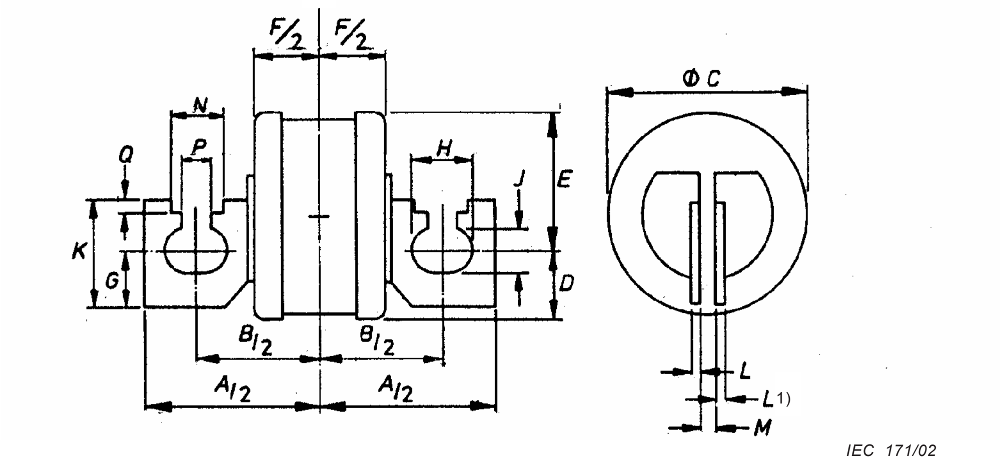


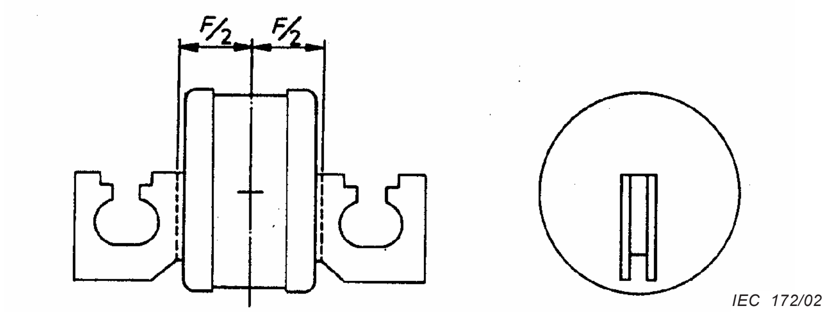
Figure 904 – Time-current zones for current ratings 200 A and 400 A

Remark: this figure was previously Figure 1d (VI) in IEC 60269-2-1, Section VI



Fuse-links with L type tags Typical form of tag construction

NOTE 1 *M* at 7 mm from surface of end cap.



Fuse-links with U type tags Typical form of tag construction

NOTE 2 The tags should be of the form shown to ensure compliance with the note below relating to dimension *F*.

Dimensions in millimetres

Maximum current rating A	Fixing centres at 82 mm														
	A Max.	*B* Nom.	*C* Max.	*D* Max.	*E* Max.	*F* [1] Max.	*G* Nom.	*H* Nom.	*J* Nom.	*K* Max.	*L* Nom.	*M* [2]	*N* Nom.	*P* Nom.	*O* Nom.
400	112	82	61	25	36	48	19	17	14	35	2,4	6,53 6,45	13	10	3

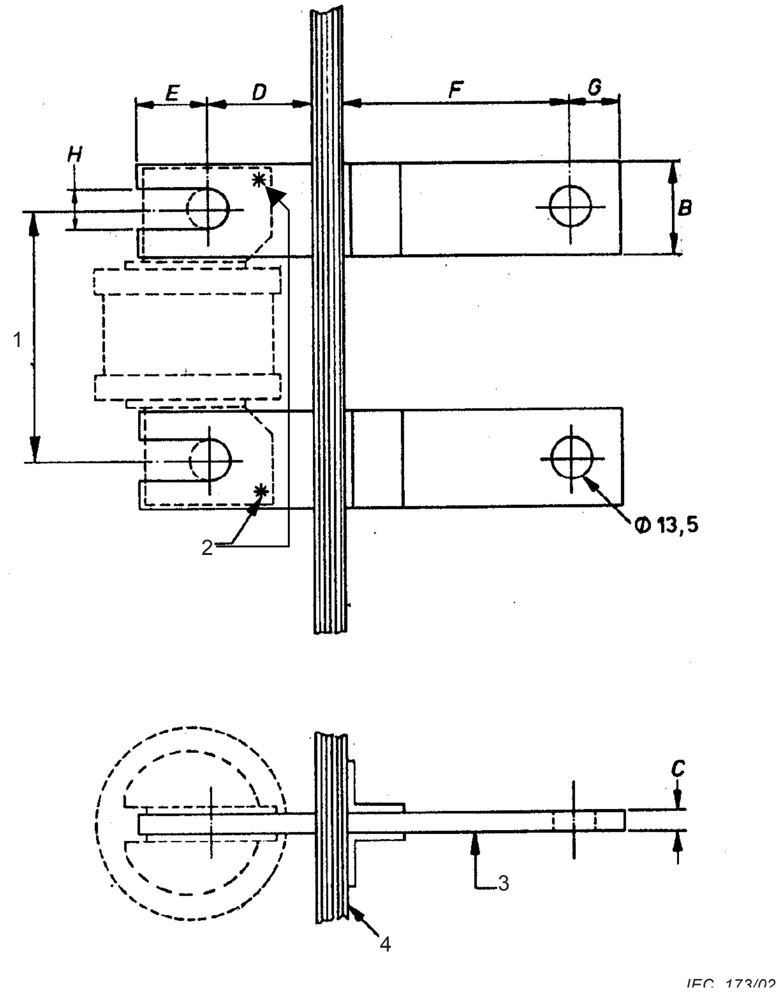
[1] *F* represents the maximum dimension of the effective body length including rivet heads.
[2] *M* represents the maximum and minimum dimensions.

Maximum current rating A	Fixing centres at 92 mm														
	A Max.	*B* Nom.	*C* Max.	*D* Max.	*E* Max.	*F* [1] Max.	*G* Nom.	*H* Nom.	*J* Nom.	*K* Max.	*L* Nom.	*M* [2]	*N* Nom.	*P* Nom.	*O* Nom.
630	132	92	75	25	50	48	24	20	17	42	3,2	8,13 8,05	16	11	3

[1] *F* represents the maximum dimension of the effective body length including rivet heads.
[2] *M* represents the maximum and minimum dimensions.

Figure 905 – Dimensions for fuse-links with L type and U type tags

Remark: this figure was previously Figure 2 (VI) in IEC 60269-2-1, Section VI



Key

1 A (fixing centres)
2 Points for measuring voltage drop
3 Tinned copper
4 Insulating board

NOTE 1 Fixing bolts for external conductors as appropriate.

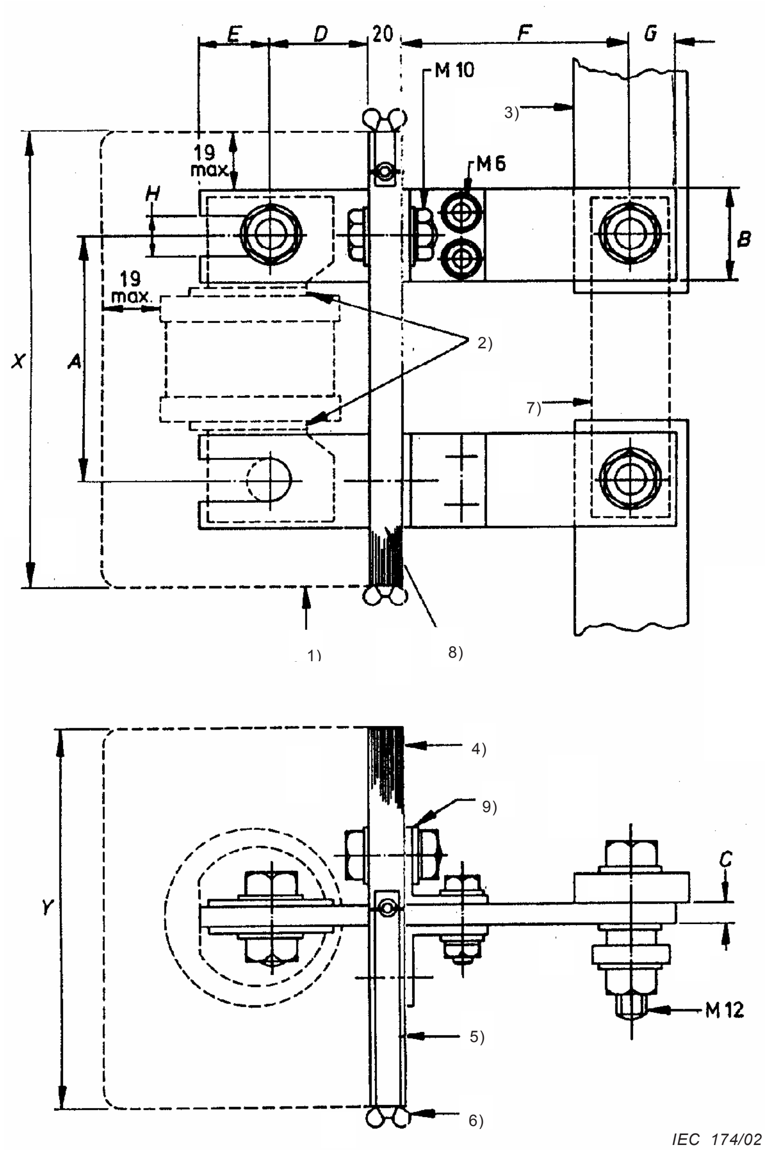
NOTE 2 Fuse-carrier omitted for clarity.

Dimensions in millimetres

Maximum current rating A	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***
400	82,0	31,5	6,3	35,0	24,0	76,2	16,0	13,5
630	92,0	40,0	8,0	41,3	28,6	76,2	22,3	17,5

Figure 906 – Power dissipation test rig

Remark: this figure was previously Figure 3 (VI) in IEC 60269-2-1, Section VI



1) Detachable cover fabricated from woven wire cloth, mild sheet, or perforated mild steel sheet of such thicknesses as to ensure reasonable rigidity. Individual apertures in the wire cloth or perforated steel sheet not to exceed 8,5 mm^2 in area. The section of cover shown on the drawing is included by way of illustration only, and does not prejudice the use of other shapes or forms, provided that the minimum clearance between the cover and any live metal parts does not exceed 19 mm.

2) A visible gap at this position is essential to ensure that the end caps are not supported by the test rig contacts.

3) The size of the copper conductors is to be chosen by the testing laboratory and shall be appropriate to the breaking capacity.

4) The base, and the fixing of the test contacts to it, shall be of sufficient rigidity to withstand the forces encountered without applying external load to the fuse-link under test. A suitable material for the base is phenolic resin bonded paper laminated sheet.

5) Copper strip.

Figure 907 – Breaking capacity test rig *(figure continued on page 327)*

Remark: this figure was previously Figure 4 (VI) in IEC 60269-2-1, Section VI

6) Terminal for fine wire fuse. Fine wire fuse of copper wire approximately 0,1 mm in diameter, with a free length not less than 75 mm long connected between this terminal and one pole of the test supply.

7) Short-circuit link required for prospective current test. This may be slotted for easy connection. The size of the copper link is to be chosen by the test laboratory and shall be appropriate to the breaking capacity.

8) Insulating base board.

9) Mild steel angle bracket 32 × 32 × 5.

Dimensions in millimetres

Maximum current rating A	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***X***	***Y***	**Fuse-link fixing bolts**
400	82,0	31,5	6,3	35,0	24,0	76,2	16,0	13,5	152	124	M12
630	92,0	40,0	8,0	41,3	28,6	76,2	22,3	17,5	170	138	M16

Figure 907 – *(concluded)*

BIBLIOGRAPHY

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*
Harmonized as EN 60060-2 1994 (not modified).

IEC 60060-3, *High-voltage test techniques – Part 3: Definitions and requirements for on-site testing*
Harmonized as EN 60060-3:2006 (not modified).

IEC 60060-4, *High-voltage test techniques – Part 4: Application guide for measuring devices*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*
Harmonized as EN 60529:1991 (not modified).

ISO 1207:1992, *Slotted cheese head screws – Product grade A*
Harmonized as EN ISO 1207:1994 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60060-1	- [1]	High-voltage test techniques - Part 1: General definitions and test requirements	HD 588.1 S1	1991 [2]
IEC 60112	- [1]	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	2003 [2]
IEC 60269-1	- [1]	Low-voltage fuses - Part 1: General requirements	EN 60269-1	2007 [2]
IEC 60664-1	- [1]	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2003 [2]
IEC 60999	Series	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units	EN 60999	Series
ISO 6988	- [1]	Metallic and other non organic coatings - Sulfur dioxide test with general condensation of moisture	EN ISO 6988	1994 [2]

[1] Undated reference.

[2] Valid edition at date of issue.

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