# TEST REPORT
## IEC 60269-1：2006/A2：2014
## Low-voltage fuses
## Part 1: General requirements
## IEC 60269-2:2016
## Semiconductor devices -
## Part 2: Discrete devices - Rectifier diodes

**Report**

Reference No.....:JDT2021KD047-LVD

Compiled by (+ signature).....: Tom Zhu

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Contents.....: 33

Date of issue.....: May. 31, 2021

**Testing laboratory**

Name..... : Shenzhen Jiace Detection Technology Co., Ltd.

Address ..... : No. 9, Shunda Industrial Park, Guangming New District, Shenzhen, Guangdong, China

Testing location ..... : As above

**Client**

Name ..... : HIMEL HONG KONG LIMITED

Address ..... : 11/F KERRY CTR 683 KING'S RD QUARRY BAY – Hong Kong

**Maufacturer**

Name ..... : DELIXI GROUPCO.,LTD.

Address ..... : No. 155 East Zhandong Road, Dianhou village, Liushi town, Leqing City, Zhejiang Province,China.

**Test specification**

Standard..... : IEC 60269-1：2006+A1:2009+A2：2014, IEC 60269-2:2016

Test procedure ..... : LVD (2014/35/EU)

Procedure deviation..... : N.A.

Non-standard test method..... : N.A.

**Test Report Form/blank test report**

Test Report Form No. .....: 60269 D/01-08

TRF originator. ..... : JDT/ITD/KD

Master TRF ..... : reference No. 60269 D, dated 01

**Test item**

Description ..... : FUSE

Trademark..... :/

Tess model and/or type reference..... : HRT18-125/ $\phi$ 22 $\times$ 58 125A

Ratings.....: 500V~1250A 50Hz

**Particulars: test item vs. test requirements**

Equipment mobility..... : Stationary

Operating condition ..... : Continuous

IT testing, phase-phase voltage (V) ..... : N.A.

Class of equipment ..... : Class I

**Test case verdicts**

Test case does not apply to the test object..... : N(.A.)

Test item does meet the requirement ..... : P(ass)

Test item does not meet the requirement ..... : F(ail)

**Testing**

Date of receipt of test item ..... : May.31, 2021

Date(s) of performance of test..... : May. 06, 2021 to May. 31, 2021

**General remarks**

This test report shall not be reproduced except in full without the written approval of the testing laboratory.

The test results presented in this report relate only to the itemtested.

"(see remark #)" refers to a remark appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

**Brief description of the tested sample(s)**

Ambient temperature: 25℃ humidity: 55% Complete test was conducted on HRT18-125/ $\phi$ 22 $\times$ 58 125A , HRT18-32(X)/ $\phi$ 10 $\times$ 38, HRT18-63(X )/ $\phi$ 14 $\times$ 51, HRT18-125(X)/ $\phi$ 22 $\times$ 58.

**Summary of testing:**



Survey of tests on fuse-links and number of fuse-links to be tested

| Test according to subclause | In=63A, “g”fuse-links | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of samples | | | | | | | | | | | | | | | | |
| | #1 | #2 | #3 | #4 #119 | #5 #120 | #6 #121 | #7~9 #110~112 #122~124 | #10~12 #113~115 #125~127 | #13 | #14~16 | #17 | #18 | #19 | #20 | #21~24 | #25~27 | #131 |
| 8.1.4 Dimensions | x | x | x | | | | | | | | | | | | | | |
| 8.1.5.1 Resistance | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| 8.3 Temperature rise, powerdissipation | x | | | | | | | | | | | | | | | | |
| 8.4.3.1a) Conventional non-fusing current | x | | | | | | | | | | | | | | | | |
| 8.4.3.1b) Conventional fusing current | | | x | | | | | | | | | | | | | | |
| 8.4.3.2 Ratedcurrent | | x | | | | | | | | | | | | | | | |
| 8.4.3.3 Time-current characteristics, gates | | | | | | | | | | | | | | | | | |
| Gates, “g” fuse-links a) $I_{min}$ (10s) | | | | | | | | | | | x | | | | | | |
| b) $I_{max}$ (5s) | | | | | | | | | | | | x | | | | | |
| c) $I_{min}$ (0,1s) | | | | | | | | | | | | | x | | | | |
| d) $I_{max}$ (0,1s) | | | | | | | | | | | | | | x | | | |
| Gates, “a” fuse-links | | | | | | | | | | | | | | | | | |
| 8.4.3.4 Overload | | | | | | | | | | x | | | | | | | |
| 8.4.3.5 Conventional cable overloadprotection | | | | | | | | | x | | | | | | | | |
| 8.4.3.6 Indicatingdevice | | | | | | | | | | | | | | | | | |
| Striker | | | | | | | | | | | | | | | | | |
| 8.5 no.5 Breakingcapacity | | | | x | | | | | | | | | | | | | |
| 8.5 no.4 Breakingcapacity | | | | | x | | | | | | | | | | | | |
| 8.5 no.3 Breakingcapacity | | | | | | x | | | | | | | | | | | |
| 8.5 no.2 Breakingcapacity | | | | | | | x | | | | | | | | | | |
| 8.5 no.1 Breakingcapacity | | | | | | | | x | | | | | | | | | |
| 8.6 Cut-off current characteristic | | | | | | | | | | | | | | | | | |
| 8.7 $I^2t$ characteristic | | | | | | | x | | | | | | | | x | | |
| 8.8 Degree ofprotection | | | | | | | | | | | | | | | | | |
| 8.9 Resistance to heat | | | | | | | | | | | | | | | | | |
| 8.10 Non-deteriorationof contacts | | | | | | | | | | | | | | | | | |

Survey of tests on fuse-links and number of fuse-links to be tested

| Test according to subclause | In=63A, “g”fuse-links | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of samples | | | | | | | | | | | | | | | | |
| | #1 | #2 | #3 | #4<br>#119 | #5<br>#120 | #6<br>#121 | #7~9<br>#110~112<br>#122~124 | #10~12<br>#113~115<br>#125~127 | #13 | #14~16 | #17 | #18 | #19 | #20 | #21~24 | #25~27 | #131 |
| 8.11.1 Mechanicalstrength | | | | | | | | | | | | | | | | | |
| 8.11.2.1 Freedom from season cracking | | | | | | | | | | | | | | | | | |
| 8.11.2.2 Resistance to abnormal heat and fire | | | | | | | | | | | | | | | x | | |
| 8.11.2.3 Resistance to rusting | | | | | | | | | | | | | | | | | x |
| 8,11.2.4 Non-deterioration of insulating parts of fuse-links and fuse-base | | | | | | | | | | | | | | | | x | |

Survey of tests on fuse-links of smallest rated current of homogeneous series and number of fuse-links to be tested

| Test according to subclause | In=32A, “g”fuse-links | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of samples | | | | | | | | | | | |
| | #28 | #29 | #30 | #31 | #32 | #33~35 #116~118 #128~130 | #36~38 | #39 | #40 | #41 | #42 | #43~46 |
| 8.1.4 Dimensions | x | x | x | | | | | | | | | |
| 8.1.5.1 Resistance | x | x | x | x | x | x | x | x | x | x | x | x |
| 8.4.3.1a) Conventional non-fusing current | | | | | x | | | | | | | |
| 8.4.3.1b) Conventional fusing current | | | | | x | | | | | | | |
| 8.4.3.2 Ratedcurrent | | | | x | | | | | | | | |
| 8.4.3.3.2 Gates, “g” fuse-links a) $I_{min}$ (10s) | | | | | | | | x | | | | |
| b) $I_{max}$ (5s) | | | | | | | | | x | | | |
| c) $I_{min}$ (0,1s) | | | | | | | | | | x | | |
| d) $I_{max}$ (0,1s) | | | | | | | | | | | x | |
| Gates, “a” fuse-links | | | | | | | | | | | | |
| 8.4.3.4 Overload | | | | | | | x | | | | | |
| 8.4.3.5 Conventional cable overloadprotection | | | | | | | | | | | | |
| 8.4.3.6 Indicatingdevice | | | | | | | | | | | | |
| Striker | | | | | | | | | | | | |
| 8.5 no.1 Breaking capacity | | | | | | x | | | | | | |
| 8.6 Cut-off current characteristic | | | | | | | | | | | | |
| 8.7 $I^2t$ characteristic | | | | | | | | | | | | x |
| 8.8 Degree ofprotection | | | | | | | | | | | | |
| 8.9 Resistance to heat | | | | | | | | | | | | |
| 8.10 Non-deteriorationof contacts | | | | | | | | | | | | |
| 8.11.1 Mechanical strength | | | | | | | | | | | | |
| 8.11.2.1 Freedom from season cracking | | | | | | | | | | | | |
| 8.11.2.2 Resistance to abnormal heat and fire | | | | | | | | | | | | |
| 8.11.2.3 Resistance to rusting | | | | | | | | | | | | |
| 8,11.2.4 Non-deterioration of insulating parts of fuse-links and fuse-base | | | | | | | | | | | | |

| IEC 60269-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 5 | CHARACTERISTICS OF FUSES | | |
| 5.2 | Rated voltage (V) as specified .....: | AC500V | P |
| 5.3.1 | Rated current (A) of the fuse-link in accordance with specified values ..... : | 125A | P |
| 5.3.2 | Rated current (A) of the fuse-holder .....: | 125A | P |
| 5.4 | Rated frequency (Hz) ..... : | | N/A |
| 5.5 | Max. rated power dissipation (VA) of fuse-link ..... : | See IEC 60269-2 | N/A |
| | Rated acceptable power dissipation (VA) of fuse-holder ..... : | See IEC 60269-2 | N/A |
| 5.6 | Limits of time-current characteristics based on reference ambient air temperature Ta of +20°C | | |
| 5.6.1 | Time-current zones deviated from standardized, or available in manufacturers documentation (with tolerances) ..... : | Figure 4 of IEC 60269-2 | P |
| 5.6.2 | Conventional times and currents see Table 2....: | Table 2 of IEC 60269-1<br>Table 101 of IEC 60269-2 | P |
| 5.6.3 | Gates..... : | Table 3 of IEC 60269-1<br>Table 102 of IEC 60269-2 | P |
| 5.7 | Breaking range and breaking capacity | | |
| 5.7.1 | Breaking range and utilization category..... : | gG | P |
| 5.7.2 | Rated breaking capacity (A) of fuse-link corresponds to the rated voltage (V), and is equal or higher than given minimum (A) in subsequent part of this standard .....: | AC500V<br>100kA | P |
| 5.8 | Cut-off current and $I^2t$ characteristics are referred to the values of voltage, frequency and power factor | | |
| 5.8.1 | Cut-off current characteristics, if required, given by the manufacturer according to Figure 4 ..... : | | P |
| 5.8.2 | Pre-arcing $I^2t$ characteristics for pre-arcing times of less than 0,1 s down to a time corresponding to the rated breaking capacity given by the manufacturer : | | P |
| | The operating $I^2t$ characteristics with specified voltages as parameter for pre-arcing times less than 0,1 s given by the manufacturer ..... : | | P |
| 6 | MARKINGS | | |
| | Markings are durable and easily legible | | P |
| 6.1 | Fuse-holders marked by: | | |
| | - name of manufacturer or trade mark which enable identification of fuse-holder .....: | | P |
| | - manufacturer's identification reference enabling to find all characteristics listed in 5.1.1 .....: | | P |
| | - rated voltage (V) .....: | AC500V | P |
| | - rated current (A) .....: | 125A | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - kind of current and rated frequency (Hz) .....: | AC | P |
| 6.2 | Fuse-link(s) except small fuse-link(s) marked by: | | |
| | - name of manufacturer or trade mark which enable identification of fuse-links.....: | | P |
| | - manufacturer's identification reference enabling to find all characteristics listed in 5.1.2 .....: | | P |
| | - rated voltage (V) .....: | AC500V | P |
| | - rated current (A) .....: | 125A | P |
| | - breaking range and utilization category (if applicable) (5.7.1) .....: | gG | P |
| | - kind of current .....: | AC | P |
| | - rated frequency (Hz), if applicable (5.4) | | N/A |
| | Small fuse-links marked by: | | |
| | - trademark .....: | | N/A |
| | - list reference of manufacturer .....: | | N/A |
| | - rated voltage (V) .....: | | N/A |
| | - rated current (A) .....: | | N/A |
| 6.3 | Symbols for the kind of current and frequency in accordance with EN 60417 | | P |
| 7 | STANDARD CONDITIONS FOR CONSTRUCTION | | |
| 7.1 | Mechanical design | | |
| 7.1.1 | Replacement of fuse-links easily and safely | | P |
| 7.1.2 | Connections, including terminals | | |
| | Contact force is not transmitted through insulating material other than ceramic or other material with characteristics not less suitable, unless | | P |
| | there is sufficient resilience in the metallic parts to compensate any possible shrinkage or other deformation of the insulating material | | P |
| | Terminals cannot turn or be displaced when the connecting screws are tightened | | P |
| | Terminals shall be such, that the conductors cannot be displaced | | P |
| | Parts gripping the conductors are of metal | | P |
| | Gripping parts cannot unduly damage conductors | | P |
| | Terminals readily accessible under the intended conditions of installation | | P |
| 7.1.3 | Fuse-contacts | | |
| | Fuse-contacts are such that necessary contact force is maintained under the conditions of service and operation | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Contact is such that electromagnetic forces occurring during operation under conditions in accordance with 7.5 not impair electrical connections between | | |
| | a) fuse-base and fuse-carrier | | N/A |
| | b) fuse-carrier and fuse-link | | N/A |
| | c) fuse-link and fuse-base | | P |
| | Fuse contacts are so constructed and ofsuch material that, when fuse is properly installed and service conditions are normal, adequate contact is maintained | | |
| | a) after repeated engagement and disengagement | | P |
| | b) after being left undisturbed in service for long period | | P |
| 7.1.4 | Construction of a gauge-pENe | | |
| | Gauge-pENe is so designed that it withstands normal stresses occurring during use | | P |
| 7.1.5 | Mechanical strength of fuse-link | | |
| | Fuse-link have adequate mechanical strength and its contacts are securely fixed | | P |
| 7.2 | Insulating properties and suitability for isolation | | |
| | Fuses are such that they do not lose insulating properties at voltages to which they are subjectedin normal service | | P |
| | Fuse passes the tests for verification of insulating properties and suitability for isolation in accordance with 8.2 | | P |
| 7.3 | Temperature rise, power dissipation of the fuse-link and acceptable power dissipation of the fuse-holder | | |
| | See Table 5 ..... : | | P |
| | Requirements are verified by tests according to 8.3 | | P |
| 7.4 | Operation | | |
| | Fuse-link is so designed and proportioned that, when tested in its appropriate test arrangement at rated frequency and ambient air temperature of (20±5)°C | | P |
| | - is able to carry continuously any currentnot exceeding its rated current | | P |
| | - is able to withstand overload conditions as they may occur in normal service (see 8.4.3.4) | | P |
| | Fuse-link satisfy these conditions if it passes the tests prescribed in 8.4 | | P |
| 7.5 | Breaking capacity | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Fuse is capable of breaking, at rated frequency and at voltage not exceeding the recovery voltage specified in 8.5, any circuit having prospective current between | | P |
| | - current $I_f$ (for “g” fuse-links) .....: | | P |
| | - current $k_2I_n$ (for “a” fuse-links) .....: | | N/A |
| | - for a.c., rated breaking capacity at power factors not lower than those in Table 20 .....: | | P |
| | - for d.c., rated breaking capacity at time constants not greater than those limits in Table 21 .....: | | P |
| | Arc voltage not exceed values given in Table 6 .....: | | P |
| | Fuse satisfy these conditions if it passes the tests prescribed in 8.5 | | P |
| 7.6 | Cut-off current characteristic | | |
| | Values of cut-off current measured as specified in 8.6 are less than, or equal to, the values corresponding to cut-off current characteristics assigned by the manufacturer | | P |
| 7.7 | $I^2t$ characteristics | | |
| | Pre-arcing $I^2t$ values verified according to 8.7 (Table 7) ..... : | | P |
| | Operating $I^2t$ values verified according to 8.7 ..... : | | P |
| 7.8 | Overcurrent discrimination of fuse-links ..... : | | P |
| 7.9 | Protection against electric shock | | |
| | The degree of protection when the fuse is under normal service conditions: ..... : | IP20 | P |
| | The degree of protection when replacing the fuse-link: ..... : | IP20 | P |
| | The degree of protection when the fuse-link and fuse-carrier is removed: ..... : | IP20 | P |
| 7.9.1 | Clearances and creepage distances | | |
| | Clearances are not less than the values given in Table 9 ..... : | | P |
| | Creepage distances correspond to material group, as defined in 2.7.1.3 of EN 60664-1, corresponding with rated voltage given in Table 10 ..... : | | P |
| 7.9.2 | Leakage currents of equipment suitable for isolation | | |
| | Value of leakage current (mA) not exceed | | |
| | - 0,5 mA per pole for fuses in new conditions ..... : | | P |
| | - 2 mA per pole for fuses having been submitted to test according to 8.5 ..... : | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 7.9.3 | Additional constructional requirements for fuses with non-separable fuse-carriers, suitable for isolation | | N/A |
| | Fuse-holder are marked with the symbol EN 60617-S00369 | | N/A |
| | When fuse is in open position, with fuse-link remaining inside the fuse-carrier, isolating distance between the fuse contacts in accordance with the isolating function are provided | | N/A |
| | Indication of this position is provided by the position of the fuse-carrier | | N/A |
| | There exists a locking means in order to lock the fuses in the isolated position, locking is possible only in this position | | N/A |
| | Fuses are designed so that the fuse-carrier remains attached to the fuse-base giving correct indication of the open position, and of locking | | N/A |
| 7.10 | Resistance to heat | | |
| | All components are sufficiently resistant to heat which may occur in normal use (see 8.9 and 8.10) | | P |
| 7.11 | Mechanical strength | | |
| | All components of fuse are sufficiently resistant to mechanical stresses which may occur in normal use (see 8.3 to 8.5 and 8.11.1) | | P |
| 7.12 | Resistance to corrosion | | |
| | All metallic components of fuse are resistant to corrosive influences which may occur in normal use | | P |
| 7.12.1 | Resistance to rusting | | |
| | Ferrous components are so protected that they meet relevant tests (see 8.2.4.2 and 8.11.2.3) | | P |
| 7.12.2 | Resistance to season cracking | | |
| | Current-carrying parts are sufficiently resistant to season cracking (see 8.2.4.2 and 8.11.2.1) | | N/A |
| 7.13 | Resistance to abnormal heat and fire | | |
| | All components of fuse are sufficiently resistant to abnormal heat and fire (see 8.11.2.2) | | P |
| 7.14 | Electromagnetic compatibility | | |
| | Fuses within the scope of this standard are not sensitive to normal electromagneticdisturbances | | P |
| | No immunity tests are required | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 8 | TESTS | | |
| 8.1.2 | At the beginning of each test, the fuseis approximately at the ambient temperature | | P |
| 8.1.3 | Tests made on fuses in clean and drycondition | | P |
| 8.1.4 | Arrangement of the fuse and dimensions | | |
| | Except for degree of protection test (see 8.8), fuse are mounted in free air in draught-freesurroundings in the normal operation position and on insulating material of sufficient rigidity | | P |
| | Before tests are started, specified external dimensions are measured and results compared with dimensions specified in the relevant data sheet of the manufacturer or specified in subsequentparts | Part 2 (IEC 60269-2) | P |
| 8.1.5 | Testing of fuse-links | | |
| | Fuse-links tested with the kind(s) of current for which they are rated | AC | P |
| | Fuse-links tested for a.c. with frequency for which they are rated | | N/A |
| 8.1.5.1 | Complete tests | | |
| | Internal resistance R measured by a current ≤ 0,1 In | (see appended table) | P |
| | Measuring current (A) .....: | (see appended table) | P |
| | Ambient air temperature in range of 20 ± 5 °C | 24°C | P |
| | The values of resistance | (see appended table) | P |
| 8.1.5.2 | Testing of fuse-links of a homogeneous series | | |
| | Fuse-links tested like a homogeneous series ..... : | ~~Y~~es/No | P |
| | If yes: fuse-links have identical enclosures in form and construction (except of fuse-elements and contacts) | | P |
| | - the same arc-extinguishing medium and same completeness of filling | | P |
| | - fuse-elements of identical materials | | P |
| | - their cross-section of fuse-elements not exceed the cross-section of fuse-links having the highest rated current | | P |
| | - number of fuse-elements do not exceed number of fuse-elements of fuse-links with the highest rated current | | P |
| | - minimum distances between adjacent fuse-elements and between the fuse-elements and the inner surface of the cartridge is not less than those in the fuse-link with the highest rated current | | P |
| | - fuse-links used with a given fuse-holder, or | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - fuse-links intended to be used in an arrangement identical for all rated currents of the homogeneous series | | P |
| | - value of $RI_n$ does not exceed the value forthe fuse-link with largest rated current of the homogeneous series (R measured as indicated in 8.1.5.1) | | P |
| | the rated breaking capacity of fuse-links not greater than that of the fuse-link with the largest rated current within the homogeneous series | | P |
| | - if not, the fuse-links with greater breaking capacity subjected to tests no. 1 and no. 2 | | N/A |
| | The fuse-link having the largest rated current tested completely according to Table 11 | | P |
| | The fuse-link having the smallest rated current tested only according to Table 12 | | P |
| | The fuse-links between the largest and smallest rated current tested according to Table 13 | | P |
| 8.1.6 | Testing of fuse-holders | | |
| | The fuse-holders are subjected to thetests according to Table 14 | | P |
| 8.2 | Verification of the insulating properties and of the suitability for isolation | | |
| 8.2.1 | Arrangement of the fuse-holder | | |
| | The fuse-holder fitted with a fuse-links of the largest dimensions for the type of fuse-holder concerned | | P |
| | The fuse-base fixed to a metal plate, unless otherwise specified | | P |
| | Fuse-link is replace while live - surfaces of fuse-link, of device for replacing it or of fuse-carrier, if of insulating material, are provided with metal coverings connected during tests to the frame of the apparatus; if of metal, they are connected direct to the frame | | P |
| 8.2.2 | Verification of the insulating properties | #1 (fuse-base) | |
| | Points of application of the test voltage | | |
| | The test voltage is applied between: | | |
| | a) live parts and the frame with the fuse-link and the device for replacing it, or | | P |
| | the fuse-carrier, if any, in position | | N/A |
| | no breakdown of insulation or flashover during 1 min of the applying test voltage | | P |
| | b) the terminals without fuse-link, device for replacing or the fuse-carrier | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | no breakdown of insulation or flashover during 1 min of the applying test voltage | | P |
| | c) live parts of different polarity in the case of multipole fuse-holder with fuse-links, fuse-carrier(s) or device(s) for replacing the fuse-links | | N/A |
| | no breakdown of insulation or flashover during 1 min of the applying test voltage | | N/A |
| | d) live parts which in the case of a multipolefuse-holder reach different potential after the fuse-link operates (equipped by fuse-carrier or device for replacing without fuse-link) | | N/A |
| | no breakdown of insulation or flashover during 1 min of the applying test voltage | | N/A |
| | The r.m.s. value of test voltage (V) as specified in Table 15 .....: | AC690V | P |
| 8.2.2.3.2 | Fuse-holder is subjected to humid atmospheric conditions | | |
| | Relative humidity of ambient air (%) .....: | 94% | P |
| | Ambient air temperature (°C) ..... : | 25°C | P |
| | Duration of treatment (h) .....: | 48h | P |
| | Insulation resistance is measured between the points prescribed in 8.2.2.1 by applying d.c. voltage of approximately 500 V | | |
| | Points of measuring: | | |
| | a) min. measured value (MΩ) ..... : | | P |
| | b) min. measured value (MΩ) ..... : | | P |
| | c) min. measured value (MΩ) ..... : | | N/A |
| | d) min. measured value (MΩ) ..... : | | N/A |
| | The insulation resistance not less than MΩ ..... : | ⩾1MΩ | P |
| 8.2.3 | Verification of the suitability for isolation | #1(fuse-base) | |
| | Clearances larger than values given in Table 9 are verified by dimensional measurement or by voltage test | | |
| | Points of application of the test voltage | | |
| | The test voltage is applied between: | | |
| | - terminals when the fuse-link and device for replacing it, are removed | | P |
| | Test voltage (kV) for verification of the ratedimpulse withstand voltage is given in Table 16 ..... : | 9,8kV | P |
| | The 1,2/50 µs impulse voltage applied 5 times for each polarity at intervals of 1 s minimum | | P |
| | no breakdown of insulation or flashover during of the applying test voltage | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | no disruptive discharge during the test | | P |
| 8.2.4.2 | Fuse-holder is subjected to humid atmospheric conditions | See 8.2.2.3.2 | |
| | Relative humidity of ambient air (%) ..... : | | N/A |
| | Ambient air temperature (°C) ..... : | | N/A |
| | Duration of treatment (h) .....: | | N/A |
| | Insulation resistance is measured between the points prescribed in 8.2.2.1 by applying d.c. voltage of approximately 500 V | | N/A |
| | Points of measuring: | | |
| | a) min. measured value (MΩ) ..... : | | N/A |
| | b) min. measured value (MΩ) ..... : | | N/A |
| | c) min. measured value (MΩ) ..... : | | N/A |
| | d) min. measured value (MΩ) ..... : | | N/A |
| | The insulation resistance not less than 1 MΩ .....: | | N/A |
| 8.3 | Verification of temperature rise and power dissipation | | |
| 8.3.1 | One fuse used for test (unless otherwise stated by the manufacturer) mounted in free air | | |
| | Test performed at an ambient air temperature of (20±5) °C | 21°C | P |
| | Ambient air temperature during the test (°C) ..... : | 21°C | P |
| | Cross-sectional area (see Table17) ($mm^2$ or mm x mm).....: | 70 $mm^2$x1m | – |
| | Tightened by torque; torque (Nm) ..... : | 10 Nm | – |
| 8.3.2 | The temperature of the fuse measured by method of measuring .....: | Thermal couple | P |
| 8.3.3 | Measurement of the power dissipation of thefuse-link | | |
| | One fuse used for test (unless otherwise stated by the manufacturer) mounted in free air | | P |
| | Test performed at an ambient air temperature of (20±5) °C | 21°C | P |
| | Ambient air temperature during the test (°C) ..... : | 21°C | P |
| | Cross-sectional area (see Table17) ($mm^2$ or mm x mm).....: | 70 $mm^2$x1m | – |
| | Tightened by torque; torque (Nm) ..... : | 10 Nm | – |
| 8.3.4.1 | Temperature rise of the fuse-holder | #2(fuse-base) | |
| | Applied a.c. current (A) for test equal to therated current of the fuse-holder .....: | 125A | P |
| | Test made with fuse-link (A), or ..... : | 125A | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | with a dummy fuse-link specified in subsequent parts .....: | Part 2 | P |
| | Temperature rise limits T for contacts and terminals (Table 5): | | |
| | spring loaded contacts; limit (K) .....: | | N/A |
| | bolted contacts; limit (K) .....: | | N/A |
| | terminals; limit (K) ≤65K ..... : | 30K (Max.) | P |
| 8.3.4.2 | Power dissipation of a fuse-link | #1 (fuse) | |
| | The test made with a.c. at the current (A) equal to the rated current of the fuse-link .....: | 125A | P |
| | The points of measuring ..... : | | P |
| | Measured value of power (W) dissipation in limits (W) specified in subsequent parts ..... : | Part 2(IEC 60269-2) 10,3W | P |
| 8.3.5 | The acceptable power dissipation (W) of fuse-holder not less than the rated power dissipation of the corresponding fuse-links ..... : | | P |
| | After the tests prescribed in 8.3, the insulating parts of the fuse-holders cooled down to ambient temperature withstood the test voltage according to 8.2 .....: | | P |
| | No deformation after tests of 8.3 | | P |
| 8.4 | Verification of operation | | |
| 8.4.1 | The test arrangement as specified in 8.1.4 | | |
| | Length (m) of conductors (see 8.3.1).....: | 1m | P |
| | their cross-sectional area ($mm^2$) as specified in Table 17 .....: | 70 $mm^2$ | P |
| 8.4.2 | Ambient air temperature during test within (20±5) °C | 21°C | P |
| 8.4.3.1 | Verification of conventional non-fusing and fusing current | | |
| | a) the fuse-link subjected to the conventionalnon-fusing current ($I_{nf}$) (see Table 2) ..... : | (see appended table) | |
| | the fuse-link did not operate within theconventional time of (h) (Table 2) .....: | (see appended table) | P |
| | b) the same fuse-link, after cooled down to ambient temperature, subjected to the conventional fusing current ($I_f$) (see Table 2) ..... : | (see appended table) | |
| | the fuse-link operated within the conventional time of (minutes) (Table 2) .....: | (see appended table) | P |
| 8.4.3.2 | Verification of rated current of “g” fuse-links | | |
| | One fuse-link submitted to a pulse test for 100 h | 100h | P |
| | On-period equal to conventional time (h) ..... : | (see appended table) | P |
| | Off-period of 0,1 of the conventional time ..... : | (see appended table) | P |
| | Test current (A) equal to 1,05 of the rated current .: | (see appended table) | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | After the test, the fuse-link not have changed its characteristics | | P |
| 8.4.3.1 | a) the fuse-link subjected to the conventionalnon-fusing current ($I_{nf}$) (see Table 2) ..... : | (see appended table) | – |
| | the fuse-link did not operate within theconventional time of (h) (Table 2) .....: | (see appended table) | P |
| 8.4.3.3 | Verification of time-current characteristics and gates | | |
| 8.4.3.3.1 | The time-current characteristics verified on the basis of the test according to 8.5 | | |
| | Values of pre-arcing and operating times within the time-current zones: | | |
| | - indicated by the manufacturer | | N/A |
| | - specified in subsequent parts ..... : | Part 2 | N/A |
| | Verification for smaller current ratings, if only one largest rated current fuse-link is subjected to the test according to 8.5 (in case of homogeneous series): | | |
| | "g" fuse-links (except “gD”, "gG" and "gM") | | |
| | Tests made in connection with verification of the gates (see8.4.3.3.2) | | |
| | Ambient air temperature within (20±5) °C ..... : | | N/A |
| | rated current In (A) of the fuse-link .....: | | |
| | test performed at voltage (V) ..... : | | |
| | test 3a) prospective current (A) equal to kIn ($10 \leq k \leq 20$) .....: | | N/A |
| | pre-arcing time (s) .....: | | |
| | specified pre-arcing time (s) max./min. .....: | | N/A |
| | test 4a) prospective current (A) equal to kIn ($5 \leq k \leq 8$) .....: | | N/A |
| | pre-arcing time (s) .....: | | |
| | specified pre-arcing time (s) max./min. .....: | | N/A |
| | test 5a) prospective current (A) equal to kIn ($2,5 \leq k \leq 4$) .....: | | N/A |
| | pre-arcing time (s) .....: | | |
| | specified pre-arcing time (s) max./min. .....: | | N/A |
| | Verification for smaller current ratings, if only one largest rated current fuse-link is subjected to the test according to 8.5 (in case of homogeneous series): | | |
| | "a" fuse-links | | N/A |
| | Ambient air temperature within (20±5) °C ..... : | | N/A |
| | rated current In (A) of the fuse-link .....: | | |
| | test performed at voltage (V) ..... : | | |
| | test 3a) prospective current (A) equal to $nk_2$ In ($5 \leq n \leq 8$) .....: | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| | pre-arcing time (s) .....: | | | | |
| | specified pre-arcing time (s) max./min. .....: | | | | N/A |
| | test 4a) prospective current (A) equal to $nk_2$ In ($2 \leq n \leq 3$) .....: | | | | N/A |
| | pre-arcing time (s) .....: | | | | |
| | specified pre-arcing time (s) max./min. .....: | | | | N/A |
| | test 5a) prospective current (A) equal to $nk_2$ In ($1 \leq n \leq 1,5$) .....: | | | | N/A |
| | pre-arcing time (s) .....: | | | | |
| | specified pre-arcing time (s) max./min. .....: | | | | N/A |
| 8.4.3.3.2 | Verification of gates | | | | |
| | “gG” and “gM” fuse-links | “gG” | | | P |
| | rated current of the fuse-link (A)..... : | (see appended table) | | | |
| | test performed at voltage (V) ..... : | (see appended table) | | | |
| | a) testing current (A); pre-arcing time (s) higher than 10 s .....: | (see appended table) | | | P |
| | b) testing current (A); pre-arcing time (s) less than 5 s .....: | (see appended table) | | | P |
| | c) testing current (A); pre-arcing time (s) higher than 0,1 s.....: | (see appended table) | | | P |
| | d) testing current (A); pre-arcing time (s) less than 0,1 s.....: | (see appended table) | | | P |
| | “aM” fuse-links | | | | N/A |
| | rated current of the fuse-link (A)..... : | | | | |
| | test performed at voltage (V) ..... : | | | | |
| | Cross-sectional area (see Table18) ($mm^2$ or mm x mm).....: | | | | |
| | e) testing current (A); pre-arcing time (s) higher than 60 s .....: | | | | N/A |
| | f) testing current (A); pre-arcing time (s) less than 60 s .....: | | | | N/A |
| | g) testing current (A); pre-arcing time (s) higher than 0,2 s.....: | | | | N/A |
| | h) testing current (A); pre-arcing time (s) less than 0,10 s.....: | | | | N/A |
| 8.4.3.4 | Overload | In=125A | | | |
| | | #14 | #15 | #16 | |
| | The test arrangement is same as that forthe temperature rise test (see 8.3.1) | | | | P |
| | Three fuse-links submitted to 50 pulses having the same duration and test current .....: | 50 | | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| | test performed at voltage (V) ..... : | AC500V | | | |
| | “g” fuse-links: | gG | | | P |
| | test current (A) equal to 0,8 times the currentstated for a pre-arcing time of 5 s .....: | 125A | | | P |
| | duration of each pulse 5 s | 5s | | | P |
| | time (s) interval between pulses equal to 20 % ofthe conventional time (s) specified in Table 2 ..... : | 1440s | | | P |
| | “a” fuse-links: | | | | N/A |
| | rated current In (A) of fuse-link ..... : | | | | N/A |
| | test current (A) equal to $k_1I_n$ ± 2% ..... : | | | | N/A |
| | the pulse duration (s) corresponds to that indicated on the overload curve for $k_1I_n$ stated by manufacturer .....: | | | | N/A |
| | time (s) intervals between pulses equal to 30 times the pulse duration .....: | | | | N/A |
| | fuse-links having ambient air temperature subjected to a current (A) equal to current for the overload test | 125A | | | P |
| | pre-arcing time (s) of sample lies within the manufacturers time-current zone ..... : | 29s | 33s | 37s | P |
| 8.4.3.4 | Overload | In=32A | | | |
| | | #36 | #37 | #38 | |
| | The test arrangement is same as that forthe temperature rise test (see 8.3.1) | | | | P |
| | Three fuse-links submitted to 50 pulses having the same duration and test current .....: | 50 | | | P |
| | test performed at voltage (V) ..... : | AC500V | | | |
| | “g” fuse-links: | gG | | | P |
| | test current (A) equal to 0,8 times the currentstated for a pre-arcing time of 5 s .....: | 12A | | | P |
| | duration of each pulse 5 s | 5s | | | P |
| | time (s) interval between pulses equal to 20 % ofthe conventional time (s) specified in Table 2 ..... : | 720s | | | P |
| | “a” fuse-links: | | | | N/A |
| | rated current In (A) of fuse-link ..... : | | | | N/A |
| | test current (A) equal to $k_1I_n$ ± 2% ..... : | | | | N/A |
| | the pulse duration (s) corresponds to that indicated on the overload curve for $k_1I_n$ stated by manufacturer .....: | | | | N/A |
| | time (s) intervals between pulses equal to 30 times the pulse duration .....: | | | | N/A |
| | fuse-links having ambient air temperature subjected to a current (A) equal to current for the overload test | 12A | | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| | pre-arcing time (s) of sample lies within the manufacturers time-current zone ..... : | 34s | 39s | 40s | P |
| 8.4.3.5 | Conventional cable overload protection (for "gG" fuse-links only) | #13 | | | |
| | | In=63A | | | |
| | fuse-link mounted as specified in 8.4.1 | | | | P |
| | provided with PVC insulated copper conductors of cross-sectional area ($mm^2$) (see Table 19) ..... : | $50mm^2$x1m | | | P |
| | fuse and conductor connected to it, preheated with rated current (A) of fuse-link ..... : | 125A | | | P |
| | for a time (h) equal to the conventional time.....: | 2h | | | P |
| | test current increased to 1,45 $I_z$ (A) ($I_z$ specified in Table 19) .....: | 2432A | | | P |
| | the fuse-link operated in time (s) less than the conventional time (s) .....: | $1,80x10^3$s | | | P |
| 8.4.3.6 | Operation of indicating devices and strikers, if any | | | | |
| | Operation of indicating device verified in combination with the verification of breaking capacity (see 8.5.5) | | | | N/A |
| | The verification of striker operation: | | | | N/A |
| | "g" fuse-link tested at current (A) equal tocurrent $I_4$ (see Table 20 abd 21) ..... : | | | | N/A |
| | recovery voltage (V) .....: | | | | N/A |
| | stated recovery voltage (V) ..... : | | | | N/A |
| | “a" fuse-link tested at current (A) equal tocurrent $2k_1I_n$ (A) (see Figure 2) .....: | | | | N/A |
| | recovery voltage (V) .....: | | | | N/A |
| | stated recovery voltage (V) ..... : | | | | N/A |
| | Striker operate during all tests made at recovery voltage of at least 20 V | | | | N/A |
| | No failure of indicating device or striker | | | | N/A |
| 8.5 | Verification of the breaking capacity | | | | |
| 8.5.1 | The test arrangements as specified in 8.1.4 | | | | P |
| 8.5.2 | Characteristics of the test circuit as specified | | | | |
| | Scheme of test circuit (see Figure 5) | | | | P |
| | Deviations form specified characteristics of test circuit .....: | | | | N/A |
| 8.5.3 | Measuring instruments | | | | P |
| 8.5.4 | Calibration of test circuit | | | | |
| | Calibration oscillograms and their evaluation | | | | P |
| 8.5.6 | The breaking-capacity tests made at an ambient air temperature of (20 ± 5) °C | 21°C | | | P |
| | Breaking-capacity tests on a.c. fuses | | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| 8.5.5.1 | Table 20, test No. 1 for "g" and "a"fuse-links | In=63A, Un=500V | | | |
| | | #10 | #11 | #12 | |
| | Rated breaking capacity of the fuse-links (kA), at voltage (V) .....: | 100kA / AC500V | | | |
| | Rated current (A) of the fuse-links .....: | 63A | | | P |
| | Prospective current $I_1$ (kA) equal to rated breaking capacity within a tolerance of + 10%, - 0% ..... : | 120,4kA | | | P |
| | Power factor .....: | 0,17 | | | P |
| | Initiation of arcing after voltage zero: within 40° - 65°for sample 1 and within 65° - 90° for sample 2 and 3, | 61° | 76° | 76° | P |
| | for sample 1) arcing after voltage zero within 0° + 10°, - 0° .....: | | | | N/A |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 568V | | | P |
| | Cut-off current (A) .....: | | | | P |
| 8.5.8 | Acceptability of No. 1 test results | | | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 912V | 949V | 995V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | | | P |
| | d) no damage of fuse components hindering from their further use | | | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | | | P |
| 8.5.5.1 | Table 20, test No. 2 for "g" and "a"fuse-links | In=63A, Un=500V | | | |
| | | #7 | #8 | #9 | |
| | Prospective current $I_2$ (kA) ..... : | 12kA | | | P |
| | Test made under conditions which approximate those giving maximum arc energy | | | | P |
| | Power factor .....: | 0,28 | | | P |
| | Making angle after voltage zero: within tolerance 0° + 20°, - 0° .....: | 12,2° | 11° | 9,4° | P |

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| Clause | Requirement + Test | Result - Remark | Verdict |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 568V | P |
| | Recovery voltage maintained at a value (V); duration (s) for sample (No.) .....: | | N/A |
| | For other samples duration 15 s (8.5.5.2) | | N/A |
| 8.5.8 | Acceptability of No. 2 test results | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 1830V / 1810V / 1810V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | P |
| | d) no damage of fuse components hindering from their further use | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | P |
| 8.5.5.1 | Table 20, test No. 2* for "g" and "a" fuse-links, for $I_2 \geq I_1$ | (see appended table) | N/A |
| | Prospective current $I_2$ (kA) for test No. 2 greater than the rated breaking capacity (kA) ..... : | | N/A |
| | Test made on six samples replacing tests of Nos.1 and 2. Test made with current $I_1$ (kA) ..... : | | N/A |
| | Making angels differ approximately 30° between each test | | N/A |
| | Power factor .....: | | N/A |
| 8.5.8 | Acceptability of No. 2 test results | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | | N/A |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | N/A |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | N/A |
| | d) no damage of fuse components hindering from their further use | | N/A |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | N/A |

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| Clause | Requirement + Test | Result - Remark | Verdict |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | N/A |
| 8.5.5.1 | Table 20, test No. 3 for "g" and "a"fuse-links | In=63A, Un=500V | |
| | | #6 | |
| | Prospective current for "g" fuse-link $I_3$ (A) equal to 3,2 $I_f$ .....: | 819,2A | P |
| | Prospective current for "a" fuse-link $I_3$ (A) equal to 2,5 $k_2 I_n$ .....: | | N/A |
| | Power factor .....: | 0,41 | P |
| | Tolerance on current ± 20% | 978A | P |
| | Recovery voltage (V) maintained for 15 s(8.5.5.2) | 568V | P |
| 8.5.8 | Acceptability of No. 3 test results | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 872V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | P |
| | d) no damage of fuse components hindering from their further use | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | P |
| 8.5.5.1 | Table 20, test No. 4 for "g" and "a"fuse-links | In=63A, Un=500V | |
| | | #5 | |
| | Prospective current for "g" fuse-link $I_4$ (A) equal to 2,0 $I_f$ .....: | 512A | P |
| | Prospective current for "a" fuse-link $I_4$ (A) equal to 1,6 $k_2 I_n$ .....: | | N/A |
| | Power factor .....: | 0,43 | P |
| | Tolerance on current + 20%, - 0% | 568A | P |
| | Recovery voltage (V) maintained for 15 s (8.5.5.2): | 568V | P |
| 8.5.8 | Acceptability of No. 4 test results | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 133V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | P |

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| Clause | Requirement + Test | Result - Remark | Verdict |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | P |
| | d) no damage of fuse components hindering from their further use | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | P |
| 8.5.5.1 | Table 20, test No. 5 for "g" and "a"fuse-links | In=63A, Un=500V | |
| | | #4 | |
| | Prospective current for "g" fuse-link $I_5$ (A) equal to 1,25 $I_f$ .....: | 320A | P |
| | Prospective current for "a" fuse-link $I_5$ (A) equal to $k_2 I_n$ .....: | | N/A |
| | Power factor .....: | 0,47 | P |
| | Tolerance on current + 20%, - 0% | 382A | P |
| | Recovery voltage (V) maintained for 15 s (8.5.5.2): | 568V | P |
| 8.5.8 | Acceptability of No. 5 test results | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 162V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | P |
| | d) no damage of fuse components hindering from their further use | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | P |
| | Breaking-capacity tests on a.c. fuses | | |
| 8.5.5.1 | Table 20, test No. 1 for "g" and "a"fuse-links | In=63A, Un=500V | |
| | | #113 / #114 / #115 | |
| | Rated breaking capacity of the fuse-links (kA), at voltage (V) .....: | 50kA / AC500V | |
| | Rated current (A) of the fuse-links .....: | 63A | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| | Prospective current $I_1$ (kA) equal to rated breaking capacity within a tolerance of + 10%, - 0% ..... : | 50,5kA | | | P |
| | Power factor .....: | 0,18 | | | P |
| | Initiation of arcing after voltage zero: within 40° - 65°for sample 1 and within 65° - 90° for sample 2 and 3, | 60° | 79° | 79° | P |
| | for sample 1) arcing after voltage zero within 0° + 10°, - 0° .....: | | | | N/A |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 740V | | | P |
| | Cut-off current (A) .....: | | | | P |
| 8.5.8 | Acceptability of No. 1 test results | | | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 1010V | 1030V | 1030V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | | | P |
| | d) no damage of fuse components hindering from their further use | | | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | | | P |
| 8.5.5.1 | Table 20, test No. 2 for "g" and "a"fuse-links | In=63A, Un=500V | | | |
| | | #110 | #111 | #112 | |
| | Prospective current $I_2$ (kA) ..... : | 12kA | | | P |
| | Test made under conditions which approximate those giving maximum arc energy | | | | P |
| | Power factor .....: | 0,29 | | | P |
| | Making angle after voltage zero: within tolerance 0° + 20°, - 0° .....: | 6,2° | 7,1° | 5,8° | P |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 740V | | | P |
| | Recovery voltage maintained at a value (V); duration (s) for sample (No.) .....: | | | | N/A |
| | For other samples duration 15 s (8.5.5.2) | | | | N/A |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| 8.5.8 | Acceptability of No. 2 test results | | | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 1810V | 2310V | 2420V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | | | P |
| | d) no damage of fuse components hindering from their further use | | | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | | | P |
| | Breaking-capacity tests on a.c. fuses | | | | |
| 8.5.5.1 | Table 20, test No. 1 for "g" and "a"fuse-links | In=32A, Un=500V | | | |
| | | #33 | #34 | #35 | |
| | Rated breaking capacity of the fuse-links (kA), at voltage (V) .....: | 100kA / AC500V | | | |
| | Rated current (A) of the fuse-links .....: | 32A | | | P |
| | Prospective current $I_1$ (kA) equal to rated breaking capacity within a tolerance of + 10%, - 0% ..... : | 120,4kA | | | P |
| | Power factor .....: | 0,17 | | | P |
| | Initiation of arcing after voltage zero: within 40° - 65°for sample 1 and within 65° - 90° for sample 2 and 3, | 54° | 72° | 70° | P |
| | for sample 1) arcing after voltage zero within 0° + 10°, - 0° .....: | | | | N/A |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 568V | | | P |
| | Cut-off current (A) .....: | | | | P |
| 8.5.8 | Acceptability of No. 1 test results | | | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 788V | 808V | 799V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | | | P |
| | d) no damage of fuse components hindering from their further use | | | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | | | P |
| | Breaking-capacity tests on a.c. fuses | | | | |
| 8.5.5.1 | Table 20, test No. 1 for "g" and "a"fuse-links | In=32A, Un=500V | | | |
| | | #116 | #117 | #118 | |
| | Rated breaking capacity of the fuse-links (kA), at voltage (V) .....: | 50kA / AC500V | | | |
| | Rated current (A) of the fuse-links .....: | 32A | | | P |
| | Prospective current $I_1$ (kA) equal to rated breaking capacity within a tolerance of + 10%, - 0% ..... : | 50,5kA | | | P |
| | Power factor .....: | 0,18 | | | P |
| | Initiation of arcing after voltage zero: within 40° - 65°for sample 1 and within 65° - 90° for sample 2 and 3, | 64° | 78° | 78° | P |
| | for sample 1) arcing after voltage zero within 0° + 10°, - 0° .....: | | | | N/A |
| | Power-frequency recovery voltage: voltage (V) i.e (%) of rated voltage within 105% + 5%, - 0% of the rated voltage or 110% + 5%, - 0% of the rated voltage .....: | 740V | | | P |
| | Cut-off current (A) .....: | | | | P |
| 8.5.8 | Acceptability of No. 1 test results | | | | |
| | a) max. arc voltage (V) did not exceed stated values of 7.5 (Table 6) .....: | 1040V | 1110V | 1130V | P |
| | b) fuse-links operated without external effects or damage to the components of the complete fuse | | | | P |
| | c) no permanent arcing, flashover or ejection of dangerous flames | | | | P |
| | d) no damage of fuse components hindering from their further use | | | | P |
| | e) no damage of fuse-link such, that it is difficult or dangerous to replace them | | | | P |
| | f) fuse-link remains in one pENe before its removal from the fuse- carrier | | | | P |
| | g) resistance (MΩ) between contacts of fuse-links after test not less than 50 000 Ω for the rated voltage of fuse-links to 250 V, 100 000 Ω in all othercases: | | | | P |
| | Breaking-capacity tests on d.c. fuses | | | | |
| 8.6 | Verification of the cut-off current characteristics | | | | |

| IEC 60269-1 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| 8.6.2 | The values measured did not exceed cut-off characteristics indicated by the manufacturer (see 5.8.1) | | | | P |
| 8.7 | Verification of $I^2t$ characteristics and overcurrent discrimination | In=63A | In=32A | | |
| | | #21~24(fuse) | #43~46(fuse) | | |
| 8.7.2 | The operating $I^2t$ values measured not exceed the values indicated by the manufacturer, or | | | | N/A |
| | those specified in subsequent parts | Part 2 (IEC 60269-2) | | | P |
| | The pre-arcing $I^2t$ values not less than minimumpre-arcing values given by the manufacturer, or | | | | N/A |
| | they lie within the limits indicated in Table 7 | | | | P |
| 8.7.3 | Verification of compliance for fuse-links at 0,01 s | | | | |
| | "gG" and "gM" fuse-links at 0,01 s comply with Table 7 | | | | P |
| 8.7.4 | Verification of overcurrent discrimination | | | | |
| | The discrimination of the fuse-links verified by means of the time-current characteristics and the pre-arcing and operating $I^2t$ values | Part 2 (IEC 60269-2) | | | N/A |
| 8.8 | Verification of the degree of protection of enclosures | | | | |
| | Degree of protection IP .....: | IP | | | N/A |
| | Verification by test under conditions specified in EN 60529 .....: | | | | N/A |
| 8.9 | Verification of resistance to heat | #2 (fuse-base) | #10(fuse) | | |
| | No damage impaired by heat during the previous tests (in particular with respect to 8.3, 8.4, 8.5 and 8.10) | | | | P |
| 8.10 | Verification of non-deterioration ofcontacts | | | | |
| 8.10.1 | Three samples provided with standardized dummy fuse-links of the highest current rating (A) intended to be used in the fuse-holder (see subsequentparts) .....: | Part 2 (IEC 60269-2) | | | P |
| 8.10.2 | Test current (A) for load period .....: | | | | N/A |
| | Duration (s) of load period ..... : | | | | N/A |
| | Duration (s) of no-load period ..... : | | | | N/A |
| | a) Test of 250 cycles, measured values notexceed the limits given in subsequent parts | | | | N/A |
| | b) Test of 750 cycles, measured values notexceed the limits given in subsequent parts | | | | N/A |
| 8.11 | Mechanical and miscellaneous tests | | | | |
| 8.11.1 | Mechanical strength | #6 | #7 | #8 | |
| | | Fuse-base | | | |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Mechanical characteristics of fuse and its parts judged in the context of normal handling and mounting as well as with results shown after breaking-capacity test (see 8.5), if not otherwise specified in the subsequent parts | | P |
| 8.11.2 | Miscellaneous tests | | |
| 8.11.2.1 | Verification of freedom from season cracking | | |
| | Current-carrying parts made of rolled copper alloy with less than 83% copper content and with all grease removed, placed for 4 h in test cabinet having temperature of (30 ± 10) °C | | P |
| | After this, samples placed for 8 h in test cabinet, on the bottom of which is ammonium chloride solution having pH value 10 - 11 | | P |
| | After test no cracks visible to the unaidedeye | | P |
| 8.11.2.2 | Verification of resistance to abnormal heat and fire | | |
| 8.11.2.2.1 | Parts of insulating material, except ceramic, have a limited duration of burning without spreading fire by flames or burning droplets or glowing particles falling from the specimen | | P |
| 8.11.2.2.5 | Glow-wire test: (650 ± 10) °C | | |
| | Parts of insulating materials not necessary to retain current-carrying parts in position even though they are in contact with them, made the glow-wire test (650 ± 10) °C | | N/A |
| | No visible flame, or burning or glowing of the specimen extinguish within max. (s) after removal of the glow-wire. Limit (30 ± 1) s ..... : | | N/A |
| | No burning of the tissue paper | | N/A |
| | No scorching of the pinewood board | | N/A |
| | Glow-wire test: (960 ± 10) °C | | |
| | Parts of insulating materials necessary to retain current-carrying parts and parts of the earthing circuit, if any, in position , made the glow-wiretest (960 ± 10) °C | | P |
| | No visible flame, or burning or glowing of the specimen extinguish within max. (s) after removal of the glow-wire. Limit (30 ± 1) s ..... : | | P |
| | No burning of the tissue paper | | P |
| | No scorching of the pinewood board | | p |
| 8.11.2.3 | Verification of resistance to rusting | #131(fuse) #2(fuse-base) | |
| | Tested parts after degreasing (10 min in specified solution) placed for 10 min in air saturated with moisture and after that dried 10 min in an ambient temperature (100 ± 5) °C | | P |

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|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Surface of tested parts show no signs of rust | | P |

**APPENDIX 1**

| 8.1.5.1 | TABLE: Internal resistance of the fuse-links | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a) rated current (A) of the fuse-link: | | | 63A | | | | | | | | |
| | measuring current (A) : | | | 16A | | | | | | | | |
| | ambient air temperature (°C) : | | | 24°C | | | | | | | | |
| internal resistance | sample No. | | | | | | | | | | | |
| | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 | #9 | #10 | #11 | #12 |
| R (mΩ) | 0,40 | 0,36 | 0,39 | 0,36 | 0,36 | 0,37 | 0,37 | 0,37 | 0,38 | 0,38 | 0,39 | 0,40 |
| internal resistance | sample No. | | | | | | | | | | | |
| | #13 | #14 | #15 | #16 | #17 | #18 | #19 | #20 | #21 | #22 | #23 | #24 |
| R (mΩ) | 0,37 | 0,38 | 0,37 | 0,37 | 0,37 | 0,37 | 0,37 | 0,38 | 0,38 | 0,37 | 0,37 | 0,37 |
| internal resistance | sample No. | | | | | | | | | | | |
| | #25 | #26 | #27 | #110 | #111 | #112 | #113 | #114 | #115 | #119 | #120 | #121 |
| R (mΩ) | 0,37 | 0,36 | 0,36 | 0,34 | 0,34 | 0,36 | 0,36 | 0,34 | 0,32 | 0,34 | 0,36 | 0,34 |
| internal resistance | sample No. | | | | | | | | | | | |
| | #122 | #123 | #124 | #125 | #126 | #127 | #131 | | | | | |
| R (mΩ) | 0,37 | 0,36 | 0,35 | 0,35 | 0,34 | 0,34 | 0,35 | | | | | |

| | b) rated current (A) of the fuse-link : | | | 32A | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | measuring current (A) : | | | 0,32A | | | | | | | | |
| | ambient air temperature (°C) : | | | 21°C | | | | | | | | |
| internal resistance | sample No. | | | | | | | | | | | |
| | #28 | #29 | #30 | #31 | #32 | #33 | #34 | #35 | #36 | #37 | #38 | #39 |
| R (mΩ) | 56,9 | 58,0 | 58,2 | 57,4 | 57,3 | 58,2 | 58,9 | 61,1 | 55,6 | 57,7 | 56,8 | 57,9 |
| internal resistance | sample No. | | | | | | | | | | | |
| | #40 | #41 | #42 | #43 | #44 | #45 | #46 | #116 | #117 | #118 | #128 | #129 |
| R (mΩ) | 56,7 | 70,0 | 70,2 | 68,2 | 66,7 | 65,8 | 68,7 | 72,0 | 68,0 | 66,6 | 57,3 | 58,2 |
| internal resistance | sample No. | | | | | | | | | | | |
| | #130 | | | | | | | | | | | |
| R (mΩ) | 70,0 | | | | | | | | | | | |

| 8.4.3.1 | TABLE: Verification of conventional non-fusing and fusing current | | | | | | |
|---|---|---|---|---|---|---|---|
| a) the fuse-link subjected to the conventional non-fusing current ($I_{nf}$) | | | | | | | |
| ambient air temperature: 24°C | | | | | | | |
| Sample No.: | #1 | #32 | | | | | |
| $I_n$(A): | 63A | 32A | | | | | |
| $I_{nf}$ (A): | 200A | 6A | | | | | |
| $T_{nf}$(h): | >2h | >1h | | | | | |
| | | | | | | | |
| Sample No.: | #74 | #79 | | | | | |
| $I_n$(A): | 40A | 32A | | | | | |
| $I_{nf}$ (A): | 50A | 40A | | | | | |
| $T_{nf}$(h): | >1h | >1h | | | | | |
| | | | | | | | |
| b) the same fuse-link, after cooled down to ambient temperature, subjected to the conventional fusing current ($I_f$) | | | | | | | |
| ambient air temperature: 24°C | | | | | | | |
| Sample No.: | #1 | #32 | | | | | |
| $I_n$(A): | 63A | 32A | | | | | |
| $I_f$ (A): | 256A | 8,32A | | | | | |
| $T_f$(s): | 1h3min19s | 11min22s | | | | | |

| 8.4.3.2 | TABLE: Verification of rated current of “g” fuse-links | | | | | | |
|---|---|---|---|---|---|---|---|
| ambient air temperature: 24°C | | | | | | | |
| Sample No.: | #2 | #57 | | | | | |
| $I_n$(A): | 63A | 32A | | | | | |
| Test current (A) | 168A | 832A | | | | | |
| conventional time (h) | 2h | 2h | | | | | |
| 0,1 of the conventional time(min) | 12min | 12min | | | | | |
| 8.4.3.1a) the fuse-link subjected to the conventional non-fusing current ($I_{nf}$) | | | | | | | |
| $I_n$(A): | 63A | 32A | | | | | |
| $I_{nf}$ (A): | 200A | 100A | | | | | |
| $T_{nf}$(h): | >2h | >2h | | | | | |
| | | | | | | | |
| Sample No.: | #74 | #95 | | | | | |
| $I_n$(A): | 40A | 16A | | | | | |
| Test current (A) | 42A | 16,8A | | | | | |
| conventional time (h) | 1h | 1h | | | | | |
| 0,1 of the conventional time(min) | 6min | 6min | | | | | |

| 8.4.3.3.2 | | TABLE: Verification of gates | | | |
|---|---|---|---|---|---|
| In (A): | | 63A | | | |
| Sample No.: | | #17 | #18 | #19 | #20 |
| | | Time of Operation | | | |
| Imin (10s): | 460A | >10s | | | |
| Imax (5s): | 950A | | 4,1s | | |
| Imin (0,1s): | 1450A | | | >0,1s | |
| Imax (0,1s): | 2590A | | | | 52ms |
| | | | | | |
| In (A): | | 32A | | | |
| Sample No.: | | #58 | #59 | #60 | #61 |
| | | Time of Operation | | | |

| 8.4.3.3.2 | | TABLE: Verification of gates | | | |
|---|---|---|---|---|---|
| Imin (10s): | 215A | >10s | | | |
| Imax (5s): | 425A | | 4,5s | | |
| Imin (0,1s): | 610A | | | >0,1s | |
| Imax (0,1s): | 1100A | | | | 64ms |

# Photo of the sample