FEDERAL ELEKTRİK®

EC Declaration Of Conformity

Manufacturer *Uretici*	:	***FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş.***
Address *Adres*	:	***1. Organize Sanayi Bölgesi*** ***1. Yanyol No : 25 Hanlı Beldesi*** ***Adapazarı / TURKEY***

The undersigned Company certifies under its sole responsibility that the product specified below satisfies the requirements of the Low Voltage Directive 2006/95/EC which is apply to it.
Aşağıda tanımlanmış ürünler için Alçak Gerilim Yönetmeliği 2006/95/AT 'nin gerekliliklerinin yerine getirildiğini ve sorumluluğun alınmış olduğunu beyan ederiz.

Product Description *Urun Tanımı*	:	***Vertical - Horizontal Type Fuse Switch Disconnector*** *Dikey - Yatay Tip Sigortalı Yük Ayırıcıları*
Product Type & Ratings *Ürün Tipi&Sınıfı*	:	***FVS 160 (160 A)*** | ***FHS 160 (160A)*** ***FVS 250 (250 A)*** ***FVS 400 (400 A)*** ***FVS 630 (630 A)***
Harmonized Standards *Uyumlaştırılmış Standartlar*	:	***EN 60947-3:2009*** ***EN 60947-3:2009/A1:2012***
Applicable EU Directives *Uygulanabilir Yönetmelikler*	:	***2006 / 95 / EC Low Voltage Directive*** *2006 / 95 / AT Belirli Gerilim Sınırları Dahilinde Çalışmak Üzere Tasarlanmış Elektrikli Teçhizat Yönetmeliği*
Affixing of CE Marking *CE Markası Uygulaması*	:	***2003***
Representative for Comformity : *Uygunluğu Beyan Eden*		***Mustafa NURDOĞAN*** *(General Manager)*
Signature *Imza*	:	M. Nurdoğan
Decleration No. *Deklarasyon No*	:	***CE - 03***
Date *Tarih*	:	***23 . 12 . 2014***

This declaration certifies compliance with the indicated directives but impliens no warrantyof properties and validity only under conditions to obey the rules related to assembling, operating and maintain directions.
Bu beyan belirtilen talimatlara uygunluğu belgeler, özellikler ile ilgili garanti hakkı içermez ve ancak montaj,çalıştırma ve bakım talimatlarına uyulması şartıyla geçerlidir.

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Manufacturer *Üretici*	:	***FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş.***
Address *Adres*	:	***1. Organize Sanayi Bölgesi 1. Yanyol No: 25 Hanlı /Arifiye Sakarya / TURKEY***

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Product Description *Ürün Tanımı*	:	***Vertical - Horizontal Type Fuse Switch Disconnector*** *Dikey - Yatay Tip Sigortalı Yük Ayırıcıları*
Product Type & Ratings *Ürün Tipi&Sınıfı*	:	***FVS 160 (Ith: 160 A)*** | ***FHS1 160 (Ith: 160A)*** | ***FHS160 (Ith: 160A)*** ***FVS 250 (Ith: 250 A)*** | ***FHS1 250 (Ith: 250A)*** ***FVS 400 (Ith: 400 A)*** | ***FHS1 400 (Ith: 400A)*** ***FVS 630 (Ith: 630 A)*** | ***FHS1 630 (Ith: 630A)***
Harmonized Standards *Uyumlaştırılmış Standartlar*	:	***EN 60947-1:2007*** ***EN 60947-3:2009*** ***EN 60947-3:2009/A1:2012***
Applicable EU Directives *Uygulanabilir Yönetmelikler*	:	***2006 / 95 / EC Low Voltage Directive*** *2006 / 95 / AT Belirli Gerilim Sınırları Dahilinde Çalışmak Üzere Tasarlanmış Elektrikli Teçhizat Yönetmeliği*
Affixing of CE Marking *CE Markası Uygulaması*	:	***2003***
Representative for Comformity *Uygunluğu Beyan Eden*	:	***Mustafa NURDOĞAN*** *(General Manager)*
Signature *İmza*	:	
Decleration No. *Deklarasyon No.*	:	***CE - 03***
Date *Tarih*	:	***03 . 03 . 2015***

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FEDERAL ELEKTRİK®

EC Declaration Of Conformity

Manufacturer *Üretici*	:	***FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş.***
Address *Adres*	:	***1. Organize Sanayi Bölgesi 1. Yanyol No: 25 Hanlı /Arifiye Sakarya / TURKEY***

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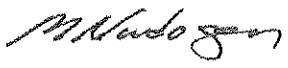
Aşağıda tanımlanmış ürünler için Alçak Gerilim Yönetmeliği 2006/95/AT 'nin gerekliliklerinin yerine getirildiğini ve sorumluluğun alınmış olduğunu beyan ederiz.

Product Description *Ürün Tanımı*	:	***Load Break Switches With and Without Fuse*** *Sigortalı ve Sigortasız Yük Ayırıcı*
Product Type & Ratings *Ürün Tipi&Sınıfı*	:	***FLS 160 (Ith: 160A) | FLS 800 (Ith: 800A) | FSF 160 (Ith: 160A)*** ***FLS 250 (Ith: 250A) | FLS 1000 (Ith: 1000A) | FSF 250 (Ith: 250A)*** ***FLS 400 (Ith: 400A) | FLS 1250 (Ith: 1250A) | FSF 400 (Ith: 400A)*** ***FLS 630 (Ith: 630A) | FLS 1600 (Ith: 1600A) | FSF 630 (Ith: 630A)***
Harmonized Standards *Uyumlaştırılmış Standartlar*	:	***EN 60947 - 1 : 2007*** ***EN 60947 - 3 : 2009*** ***EN 60947 - 3 : 2009/A1:2012***
Applicable EU Directives *Uygulanabilir Yönetmelikler*	:	***2006 / 95 / EC Low Voltage Directive*** *2006 / 95 / AT Belirli Gerilim Sınırları Dahilinde Çalışmak Üzere Tasarlanmış Elektrikli Teçhizat Yönetmeliği*
Affixing of CE Marking *CE Markası Uygulaması*	:	***2003***
Representative for Comformity *Uygunluğu Beyan Eden*	:	***Mustafa NURDOĞAN*** *(General Manager)*
Signature *İmza*	:	
Decleration No. *Deklarasyon No.*	:	***CE - 04***
Date *Tarih*	:	***03 . 03 . 2015***

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IHP INTERNATIONAL HIGH POWER TEST LABORATORY LTD.	**TEST REPORT** **IEC 60947-3**	

Request No: 0414.32	Report No: 0414.32-1
Income Date: 14.04.2014	Report Date: 29.04.2014
Test Date: 14.04.2014 – 28.04.2014	Page: 1 / 29

Name and address of customer	FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş. 1.Organize Sanayi Bölgesi 1.Yol No: 25 Hanlı Beldesi Adapazarı / SAKARYA
Test Object	**Switch-Disconnector-Fuse**
Type	**FHS00**
Manufacturer's name or trademark	**FEDERAL**
Rated characteristics of test object	Number of pole : 3p Rated operation voltage (Ue) : 415 V AC Rated operation current (Ie) : 160 A Utilization category : AC-22B Rated conditional short-circuit current : 70 kA Rated operation frequency : 50 / 60 Hz
Person admitted the sample	Yunus CİRİŞ
Person sent the sample	Ruhi ŞENOĞLU
Sample receiving procedure	-
Condition of sample	New
Applied Standard, specification or procedure	**IEC 60947-3: 2008 + A1: 2012**
Deviation Standard / Specification	-
Result and opinions	**Positive. Test sample fulfill the requirement.**

Detail information of test is at enclosed.

Seal	Person made test	Approving
IHP ULUSLARARASI YÜKSEK GÜÇ TEST LABORATUVARI LTD. ŞTİ.	Kerem ÇELİK Test Engineer	İsmail TAŞCI Laboratory Manager

This report is valid just for the samples, which are tested. The reports without seal and signature are not valid. These reports are not copied, pressed without permission of the initial laboratory.

Address: 1.OSB 2. Yol No: 13 Adapazarı / TÜRKİYE Tel: (0264) 291 45 30 Fax: (0264) 291 45 31

Content

Participants in the test

İsmail TAŞCI	IHP test engineer in charge
Kerem ÇELİK	IHP test engineer
Yunus CİRİŞ	IHP test technician

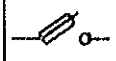
Applied standard and tests

IEC 60947- 3: 2008
Low voltage switchgear and controlgear – Part 3: Switches, disconnector, switch-disconnector and fuse-combination units.

1. Constructional and performance requirements
2. Test Sequence I: General Performance Characteristic
3. Test Sequence II: Operational Performance Capability.
4. Test Sequence IV: Conditional short-circuits current.
5. Test Sequence V: Over-load Performance Capability.

Note: Since Test Sequence IV was applied Test Sequence III short circuit performance test was not applied.

Test items particulars:	
- method of operation	Dependent manual operation
- suitability for isolation	Suitable
- degree of protection	IP 30
- number of poles	3
- kind of current	AC
- in the case of a.c., number of phases and rated frequency	3 phases, 50-60 Hz
- number of positions of the main contacts (if more than two)	2 (on, off)
-breaking arrangement for fused devices	single break
Rated and limiting values, main circuit:	
- rated operational voltage U_e (V)	415 V
- rated insulation voltage U_i (V)	1000 V
- rated impulse withstand voltage U_{imp} (kV)	8 kV
- conventional free air thermal current I_{th} (A)	160 A
- conventional enclosed thermal current I_{the} (A)	160 A
- rated operational current I_e (A)	160 A
- rated uninterrupted current I_u (A)	I_e
- rated frequency (Hz)	50-60Hz
- utilization category:	AC-22B/415 V
Short Circuit characteristic	
- rated short-time withstand current I_{cw}(kA)	-
- rated short-time making capacity I_{cm} (kA)	-
- rated conditional short-circuit current: (kA)	70 kA
- Control circuits	-
- Auxiliary circuit	-
- Relays and releases	-
Co-ordination of short-circuit protective devices:	
- kind of protective device :	gL/gG type fuse

Clause	Requirement-Test	Result-Remark	Verdict
5.2	**MARKING**		
	Marking on equipment itself or on nameplate or nameplates attached to the equipment and legible from the front after mounting		
	- indication of the open and closed position	Visible clearances between contacts in open position	P
	- suitability for isolation		P
	- disconnectors AC-20 and DC-20 only: marked "Do not operate under load"		NA
	Following marking is visible after mounting:		
	- direction of movement of the actuator (see 7.1.5.2)		P
	- indication of the position of the actuator (see also 7.1.6.1 and 7.1.6.2)		P
	- approval or certification mark, if applicable		NA
	- for miniaturized equipment, symbol, colour code or letter code		NA
	- terminal identification and marking (see 7.1.8.4)		NA
	- IP code and class of protection against electric shock, when applicable (marked preferably on the equipment as far as possible)	IP30	P
	- suitability for isolation, where applicable, with the isolation function symbol according to IEC 60617-7, reference 07-01-03, combined with the appropriate function symbol for the equipment		P
	- this symbols are clearly and unmistakably marked		P
	- this symbols are visible when the equipment is installed as in service and the actuator is accessible		P
	In the case of electronically controlled electromagnets, information other than that given in 5.1 may also be necessary (see also 4.5 and Annex U)		NA
	The indication "s", "sol", "r" or "f" for non-universal screwless terminals shall be marked on the device or, if the space available is not sufficient, on the smallest package unit or in technical information provided with the product		NA
	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark	FEDERAL	P
	- type designation or serial number	FHS00	P
	- rated operational currents or rated powers	160 A	P
	- rated operational voltage	415 V	P
	- utilization category	AC-22B	P
	- rated frequency or the indication "DC"	50-60 Hz	P

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	- manufacturer's claim for compliance with IEC 60947-3	IEC / EN 60947-3	P
	- degree of protection		NA
	Marking on fuse-combination units:		
	- fuse type	gL/gG	P
	- maximum rated current	160 A	P
	- power loss of the fuse-link	12 W	P
	Identification of terminals:		
	- line terminals, unless connection is immaterial		NA
	- load terminals, unless connection is immaterial		NA
	- neutral pole terminal		NA
	- protective earth terminal		NA
	Data in the manufacturer's published information:		
	- rated insulation voltage	1000 V	P
	- rated impulse withstand voltage for equipment suitable for isolation or when determined	8 kV	P
	- pollution degree, if different from 3	3	P
	- rated duty	Uninterrupted	P
	- rated short-time withstand current and duration	-	NA
	- rated short-circuit making capacity	-	NA
	- rated conditional short-circuit current	70 kA	P
5.3	Instructions for installation, operation and maintenance		P
6	**NORMAL SERVICE, MOUNTING AND TRANSPORT CONDITIONS**		
6.1	Normal service conditions		
6.1.1	Ambient air temperature	-25.... +60 °C	P
6.1.2	Altitude	Max. 2000 m	P
6.1.3	Atmospheric conditions		
6.1.3.1	Humidity	Max. 90% humidity (55°C)	P
6.1.3.2	Pollution degree	3	P
6.1.4	Shock and vibration		NA
6.2	Conditions during transport and storage		NA
6.3	Mounting		P
7	**CONSTRUCTIONAL AND PERFORMANCE REQUIREMENTS**		
7.1	Constructional requirements		
7.1.1	General		
7.1.2	Materials		

Clause	Requirement-Test	Result-Remark	Verdict
7.1.2.1	General material requirements		
	Parts of insulating materials which might be exposed to thermal stresses due to electrical effects within the equipment shall not be adversely affected by abnormal heat and by fire.		P
	The manufacturer specifies which test method, 7.1.2.2 or 7.1.2.3, is to be used:	7.1.2.2	P
7.1.2.2	Glow wire Testing		
	The suitability of materials used is verified by making tests on: or	- the equipment **- sections taken from the equipment** - samples of identical material	P
	- providing data from the insulating material supplier fulfilling the requirements according to IEC 60695-2-12		NA
	Glow-wire test according to IEC 60695-2-10 and IEC 60695-2-11		
	Parts made of insulating material necessary to retain current-carrying parts in position: test temperature 960 °C		
	No visible flame and no sustained glowing		NA
	Flames and glowing extinguish within 30 s	10 s	P
	No ignition of the tissue paper	No ignition	P
	Parts of insulating material not necessary to retain current-carrying parts in position, even though in contact with them: test temperature 650 °C		
	No visible flame and no sustained glowing	No flame	P
	Flames and glowing extinguish within 30 s	-	P
	No ignition of the tissue paper	No ignition	P
7.1.2.3	Test based on flammability category		
	For parts of insulating materials, hot wire ignition and, where applicable, arc ignition tests as specified in 8.2.1.1.2, shall be made based on flammability category		NA
	Tests on materials are made in accordance with Annex M		NA
	The hot wire ignition (HWI) and arc ignition (AI) test value requirements related to the material flammability category shall conform to Table M.1 or M.2		NA
	Alternatively, the manufacturer may provide data from the insulating material supplier fulfilling the requirements given in Annex M		NA
7.1.3	Current-carrying parts and their connections		
	Current-carrying parts have the necessary mechanical strength and current-carrying capacity for their intended use		P

Clause	Requirement-Test	Result-Remark	Verdict
	For electrical connections, no contact pressure is transmitted through insulating material other than ceramic or other material with characteristics not less suitable, unless there is sufficient resiliency in the metallic parts to compensate for any possible shrinkage or yielding of the insulation material		P
7.1.4	Clearances:	21 mm (Poles-Earth) 32 mm (Between poles)	P
	Creepage distances:	52 mm (Poles-Earth) 51 mm (Between poles)	P
	Pollution degree:	3	
	Comparative tracking index (V):	-	
	Material group:	IIIa	
7.1.5	Actuator		
7.1.5.1	Insulation		
	Actuator insulated from live parts for		
	- rated insulation voltage	1000 V	P
	- rated impulse withstand voltage	8 kV	P
	Actuator made of metal		
	- connected to a protective conductor or provided with an additional insulation		NA
	Actuator made of or covered by insulating material		
	- internal metal parts, which might become accessible in the event of an insulation failure, are also insulated from live parts for the rated insulation voltage		NA
7.1.5.2	Direction of movement		
	The direction of operation for actuators shall where applicable conform to IEC 60447		P
	There is no doubt of the "I" and "O" position and the direction of operation		NA
7.1.6	Indication of contact position		
7.1.6.1	Indicating means		NA
7.1.6.2	Indication by the actuator		P
7.1.7	Additional safety requirements for equipment suitable for isolation		
7.1.7.1	Additional constructional requirements		
	- marking according to 5.2.1b		P
	- indication of the position of the contacts		P
	- construction of the actuating mechanism		P
	- minimum clearances across open contacts (see Table 13, Part 1) (mm):	8 mm	

Clause	Requirement-Test	Result-Remark	Verdict
	- measured clearances (mm):	> 20 mm	P
	- test Uimp across gap (kV):	-	--
7.1.7.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
	Auxiliary switch is rated according to IEC 60947-5-1 (unless the equipment is rated AC-23)		NA
	Time interval between opening of the contacts of the auxiliary contact and the contacts of the main poles: ≥20 ms :		
	Measured time interval (ms):		NA
	During the closing operation the contacts of the auxiliary switch closes after or simultaneously with the contacts of the main poles		NA
7.1.7.3	Supplementary requirements for equipment provided with means for padlocking the open position:		
	The locking means is so designed that it cannot be removed with the appropriate padlock(s) installed		NA
	Test force F applied to the actuator in an attempt to operate to the closed position (N):		NA
	Rated impulse withstand voltage (kV):		NA
	Test Uimp on open main contacts at the test force		NA
7.1.8	Terminals		
7.1.8.1	All parts of terminals which maintain contact and carry current are of metal having adequate mechanical strength	(see 8.2.4 below)	P
	Terminal connections are such that necessary contact pressure is maintained	(see 8.2.4 below)	P
	Terminals are so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	P
	Terminals do not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage is not reduced below the rated value	(see 8.2.4 below)	P
	Screwless-type clamping units, unless otherwise specified by the manufacturer, shall accept rigid and flexible conductors as indicated in Table 1		NA
	On screwless-type clamping unit, the connection or disconnection of conductors shall be made as follows:		
	– on universal clamping units by the use of a general purpose tool or a convenient device, integral with the clamping unit to open it for the insertion or withdrawal of the conductors		NA

Clause	Requirement-Test	Result-Remark	Verdict
	-- on push-wire clamping units by simple insertion. For the disconnection of the conductors an operation other than a pull only on the conductor shall be necessary. The use of a general purpose tool or of a convenient device, integral with the clamping unit is allowed in order to "open" it and to assist the insertion or the withdrawal of the conductor		NA
8.2.4	Mechanical properties of terminals		
	Mechanical strength of terminals		
	Maximum cross-sectional area of conductor (mm^2):	95 mm^2 (cable lug)	
	Diameter of thread (mm) :	7,8 mm	
	Torque (Nm) :	11 Nm	
	5 times on 2 separate clamping units	5 times	P
	Testing for damage to and accidental loosening of conductor (flexion test)		
	Conductor of the smallest cross-sectional area (mm^2) :		NA
	Number of conductor of the smallest cross section:		NA
	Diameter of bushing hole (mm) :		NA
	Height between the equipment and the platen:		NA
	Mass at the conductor(s) (kg):		NA
	135 continuous revolutions: the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
	Pull-out test		
	Force (N), applied for 1 min.:		NA
	During the test, the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
	Conductor of the largest cross-sectional area (mm^2):		NA
	Number of conductor of the largest cross section :		NA
	Diameter of bushing hole (mm):		NA
	Height between the equipment and the platen:		NA
	Mass at the conductor(s) (kg):		NA
	135 continuous revolutions: the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
	Pull-out test		
	Force (N), applied for 1 min.:		NA
	During the test, the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
	Conductor of the largest and smallest cross-sectional area (mm^2):		NA
	Number of conductor of the smallest cross section, number of conductor of the largest cross section:		NA

Clause	Requirement-Test	Result-Remark	Verdict
	Diameter of bushing hole (mm) :		NA
	Height between the equipment and the platen:		NA
	Mass at the conductor(s) (kg) :		NA
	135 continuous revolutions: the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
	Pull-out test		
	Force (N), applied for 1 min:		NA
	During the test, the conductor neither slips out of the terminal nor breaks near the clamping unit		NA
7.1.8.2	Connection capacity		
	Type of conductors:	Busbar or cable plug	
	Minimum cross-sectional area of conductor (mm^2):	25 mm^2	
	Maximum cross-sectional area of conductor (mm^2):	95 mm^2	
	Number of conductors simultaneously connectable to the terminal:	1	
7.1.8.3	Connection		
	Terminals for connection to external conductors are readily accessible during installation		P
	Clamping screws and nuts do not serve to fix any other component		P
7.1.8.4	Terminal identification and marking		
	Terminal intended exclusively for the neutral conductor		NA
	Protective earth terminal		NA
	Other terminals		NA
7.1.9	Additional requirements for equipment provided with a neutral pole		
	Equipment provided with a pole intended for the connection of neutral, this pole shall be clearly marked by the letter "N"		NA
	The switched neutral pole does not break before and does not make after the other poles except		NA
	- a pole having the appropriate short-circuit breaking and making capacity is used as neutral pole, all poles may operate together		NA
	Conventional thermal current of neutral pole		NA
7.1.10	Provisions for protective earthing		
7.1.10.1	The exposed conductive parts are electrically interconnected and connected to a protective earth terminal		NA
7.1.10.2	Protective earth terminal is readily accessible		NA

Clause	Requirement-Test	Result-Remark	Verdict
	Protective earth terminal is suitably protected against corrosion		NA
	Electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		NA
	Protective earth terminal has no other functions		NA
7.1.10.3	Protective earth terminal marking and identification		NA
7.1.11	Enclosure for equipment		
7.1.11.1	Design		
	When the enclosure is opened, all parts requiring access for installation and maintenance are readily accessible		NA
	Sufficient space is provided inside the enclosure		NA
	The fixed parts of a metal enclosure are electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		NA
	Under no circumstances a removable metal part of the enclosure is insulated from the part carrying the earth terminal when the removable part is in place		NA
	The removable parts of the enclosure are firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		NA
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means is provided to prevent loss of the fastening devices		NA
	If the enclosure is used for mounting push-buttons, it is not possible to remove the buttons from the outside of the enclosure		NA
7.1.11.2	Insulation		
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining is securely fixed to the enclosure		NA
7.1.12	Degree of protection of enclosed equipment		
	Degree of protection:	IP	NA
7.1.13	Conduit pull-out, torque and bending with metallic conduits		
	Withstand the stress occurring during its installation:	IP	NA
8.3.3	**TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS**		
8.3.3.1	Temperature-rise		
	ambient temperature 10-40 °C:	20°C	P

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	test enclosure W x H x D (mm x mm x mm):		NA
	material of enclosure:		NA
	Main circuits, test conditions:		
	- rated operational current Ie (A):	160 A	
	- cable/busbar cross-section (mm²) / length (mm)..:	70 mm²/ 2 m	
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	Measured temperature-rise:	see appended table 8.3.3.1	P
	Auxiliary circuits, test conditions:		
	- rated operation current (A):		
	- cable cross-section (mm²):		
	Measured temperature-rise:	see appended table 8.3.3.1	NA
8.3.3.2	Test of dielectric properties		
	Rated impulse withstand voltage (kV):	8 kV	
	- test Uimp main circuits (kV):	9,8 kV	P
	- test Uimp auxiliary circuits (kV):		NA
	- test Uimp on open main contacts (equipment suitable for isolation) (kV):		--
	Power-frequency withstand voltage (V):	2200 V	
	- main circuits, test voltage for 5 sec. (V):	2200 V	P
	- control and auxiliary circuits, test voltage for 5 sec. (V):		NA
	Devices, which have been disconnected for the power-frequency withstand voltage test.		P
	Equipment suitable for isolation, leakage current not exceed 0,5 mA		
	Test voltage 1,1 Ue (V):	460 V	P
	Measured leakage current (mA):	L1: < 0,1 mA L2: < 0,1 mA L3: < 0,1 mA	P
8.3.3.3	Making and breaking capacity		
	- utilization category:	AC22-B	
	- rated operational voltage Ue (V):	415 V	

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	- rated operational current Ie (A) or power (kW):	160 A	
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	Conditions for make/break operations or make operation, AC-23A and AC-23B only:		
	- test voltage, U = 1,05 Ue (V):		NA
	- test current, I = x Ie (A):		NA
	- power factor:		NA
	Conditions for break operation, AC-23A and AC-23B only:		
	- test voltage, U = 1,05 Ue (V):		NA
	- test current, I = x Ie (A):		NA
	- power factor:		NA
	Conditions for make/break operations, other than AC-23A/B:		
	- test voltage, U = 1,05 Ue (V):	L1: 252 V L2: 252 V L3: 253 V	P
	- test current, I = x Ie (A):	L1: 491 A L2: 496 A L3: 489 A	P
	- power factor/ time constant:	L1: 0,63 L2: 0,63 L3: 0,63	P
	Number of make/break or make and break operations:	5 cycles	P
	- recovery voltage duration (≥ 50 ms)	30 s	P
	- current duration (ms):	200 ms	
	- time interval between operations:	30 s	P
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	- oscillatory frequency (kHz):	55,3 kHz	
	- measured oscillatory frequency (kHz):	L1: 57 kHz L2: 57 kHz L3: 57 kHz	P
	- factor γ:	L1: 1,12 L2: 1,12 L3: 1,12	P
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		
	Test performed without:		

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 17 of IEC 60947-1	120 N (< 450 N)	P
	- equipment is able to carry its rated current after normal closing operation		P
8.3.3.4	Dielectric verification		
	test voltage: 2*Ue with a minimum of 1000V~:	1000 V	P
	No flashover or breakdown		P
8.3.3.5	Leakage current		
	test voltage (1,1 Ue) (V):	460 V	P
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B): ≤ 0,5 mA/pole:	-	NA
	Leakage current (other utilization categories): ≤ 2 mA/pole):	L1: < 0,1 mA L2: < 0,1 mA L3: < 0,1 mA	P
8.3.3.6	Temperature-rise verification		
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	- conductor cross-section (mm²):	70 mm²	
	- test current Ie (A):	160 A	
	Measured temperature-rise:	see appended table 8.3.3.6	P
8.3.3.7	Strength of actuator mechanism		
8.2.5	Verification of the strength of actuator mechanism and position indicating device		
	- actuator type (fig.):	Figure 1e	
8.2.5.2.1	Dependent and independent manual operation		
	- actuating force for opening (N):	110 N	P

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	- test force with blocked main contacts (N):	330 N	P
	- used method to keep the contact closed:	Contacts were kept closed by tying up with wire	P
	During and after the test, open position not indicated:		P
	Equipment with locking mean, no locking in the open position while test force is applied:		NA
8.2.5.2.2	Dependent power operation		
	- main contacts fixed together in the closed position:		NA
	- used method to keep the contact closed:		NA
	- 110% of the rated supply voltage applied to the equipment (3 times):		NA
	During and after the test, open position not indicated:		NA
	Equipment show no damage impairing its normal operation:		NA
	Equipment with locking mean, no locking in the open position while test force is applied:		NA
8.2.5.2.3	Independent power operation		
	- main contacts fixed together in the closed position:		NA
	- used method to keep the contact closed:		NA
	- stored energy of the power operator released (3 times):		NA
	During and after the test, open position not indicated:		NA
	Equipment show no damage impairing its normal operation:		NA
	Equipment with locking mean, no locking in the open position while test force is applied:		NA
8.3.4	**TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY**		
8.3.4.1	Operational performance test		
	- utilization category:	AC22-B	
	- rated operational voltage (V):	415 V	
	- rated operational current (A):	160 A	
	Test conditions for electrical operation cycles:		
	- test voltage (V):	L1: 242 V L2: 241 V L3: 242 V	P
	- test current (A):	L1: 170 A L2: 168 A L3: 171 A	P
	- power factor/time constant:	L1: 0,78 L2: 0,78 L3: 0,78	P

Clause	Requirement-Test	Result-Remark	Verdict
	Number of cycles with current:	200 cycles	P
	Number of cycles without current:	1400 cycles	P
	First test sequence (with/without current):	With current	P
	Second test sequence (with/without current):	Without current	P
	- time interval between first and second test sequence:	30 s	P
8.3.4.1.5	Behaviour of the equipment during the operational performance test		
	Test performed without:		
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.4.1.6	Condition of the equipment after making and breaking capacity tests		
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 17 of IEC 60947-1	110 N (< 450 N)	P
	- equipment is able to carry its rated current after normal closing operation		P
8.3.4.2	Dielectric verification		
	test voltage: 2*Ue with a minimum of 1000V~:	1000 V	P
	No breakdown or flashover		P
8.3.4.3	Leakage current		
	test voltage (1,1 Ue) (V):	460 V	P
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA/pole:	-	NA
	Leakage current (other utilization categories) ≤ 2 mA/pole:	L1: < 0,1 mA L2: < 0,1 mA L3: < 0,1 mA	P
8.3.4.4	Temperature-rise verification		
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	- conductor cross-section (mm²):	70 mm²	

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	- test current Ie (A):	160 A	
	Measured temperature-rise:	see appended table 8.3.4.4	P
8.3.5	**TEST SEQUENCE III: SHORT-CIRCUIT PERFORMANCE CAPABILITY**		**NA**
8.3.6	**TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT**		
	Protective device details:		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated voltage (V):	500 V	
	- rated current (A):	160 V	
	- rated breaking capacity (kA):	120 kA	
8.3.6.2	Fuse protected short-circuit withstand		
	test voltage (1,05 x Ue) (V):	L1: 251 V L2: 253 V L3: 252 V	P
	test current (kA):	L1: 70,53 kA L2: 71,22 kA L3: 71,44 kA	P
	rated frequency (Hz):	50 Hz	P
	power factor:	0,19	P
	Time constant (ms):		NA
	Fuse protected short-circuit withstand (equipment in closed position)		
	- max. let-through current (kA):	L1: 12,31 kApeak L2: 20,38 kApeak L3: 31,60 kApeak	P
	- Joule integral I^2dt (A^2s):	L1: 65 kA^2s L2: 126 kA^2s L3: 228 kA^2s	P
	Fuse protected short-circuit making		
	- mean velocity of 15 manually under no-load conditions operations (m/s):	0,25 m/s	
	- point at which the measurement is made:	On contacts	
	- test speed during the fuse protected short-circuit making (m/s):	0,25 m/s	
	- max. let-through current (kA):	L1: 35,74 kApeak L2: 0 kApeak L3:35,74 kApeak	P
	- Joule integral I^2dt (A^2s):	L1: 215 kA^2s L2: 0 kA^2s L3: 215 kA^2s	P
8.3.6.2.5	Behaviour of the equipment during the test		

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	Test performed without:		
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.6.2.6	Condition of the equipment after making and breaking capacity tests		
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 17 of IEC 60947-1		P
	- equipment is able to carry its rated current after normal closing operation		P
8.3.6.3	Dielectric verification		
	test voltage: 2*Ue with a minimum of 1000V~:	1000 V	P
	No flashover or breakdown		P
8.3.6.4	Leakage current		
	test voltage (1,1 Ue) (V):	460 V	P
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA/pole:		NA
	Leakage current (other utilization categories) ≤ 2,0 mA/pole:	L1: < 0,1 mA L2: < 0,1 mA L3: < 0,1 mA	P
8.3.6.5	Temperature-rise verification		
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	- conductor cross-section (mm²):	70 mm²	
	- test current Ie (A):	160 A	
	Measured temperature-rise:	see appended table 8.3.6.5	P
8.3.7	**TEST SEQUENCE V: OVERLOAD PERFORMANCE CAPABILITY**		
8.3.7.1	Overload test		
	ambient temperature 10-40 °C:	20 °C	
	test enclosure W x H x D (mm x mm x mm):		

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	material of enclosure:		
	test current 1,6xIthe or 1,6xIth (A):	256 A	
	cable/busbar cross-section (mm²) / length (mm):	70 mm²/ 2 m	
	Fuse-link details:		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	- time duration of the overload test (s):	(Until the fuse operated) 28 min	P
	Within 3 to 5 min after the fuse(s) has(have) operated (or 1 h), the equipment has been operated once, i.e. opened and closed	After 4 min, equipment was opened and closed	P
	Required opening force not greater than the test force of 8.2.5.2 and table 17 of IEC 60947-1	100 N (< 450 N)	P
	The equipment has not undergone any impairment hindering such operation		P
8.3.7.2	Dielectric verification		
	test voltage: 2*Ue with a minimum of 1000V~:	1000 V	P
	No flashover or breakdown	No	P
8.3.7.3	Leakage current		
	test voltage (1,1 Ue) (V):	460 V	P
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA/pole:		NA
	Leakage current (other utilization categories) ≤ 2 mA)/pole:	< 0,1 mA	P
8.3.7.4	Temperature-rise verification		
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark:	FEDERAL	
	- manufacturer's model or type reference:	NH00-FB	
	- rated current (A):	160 A	
	- power loss (W):	12 W	
	- rated breaking capacity (kA):	120 kA	
	Fuse links aged during the overload test are replaced by new fuse-links:	New one	P
	- conductor cross-section (mm²):	70 mm²	
	- test current Ie (A):	160 A	

P: Pass F: Fail NA: Not applicable --: Not Applied

Clause	Requirement-Test	Result-Remark	Verdict
	Measured temperature-rise:	see appended table 8.3.7.4	P
8.4	**ELECTROMAGNETIC COMPATIBILITY TESTS**		**NA**
	Annex A (normative)		**NA**
A	Equipment for direct switching of a single motor		NA
	Annex C (normative)		**NA**
C	Single pole operated three pole switches		NA

8.3.3.1	**TABLE: Temperature-rise (measurements)**	
Temperature rise dT of part:	dT (K) measured	dT (K) required
Terminals	44 K	70 K
Manual operating means: metallic / non-metallic	8 K	25 K
Parts intended to be touched but not hand-held: metallic / non-metallic	13 K	25 K
Parts which need not be touched during normal operation	17 K	50 K
supplementary information:		

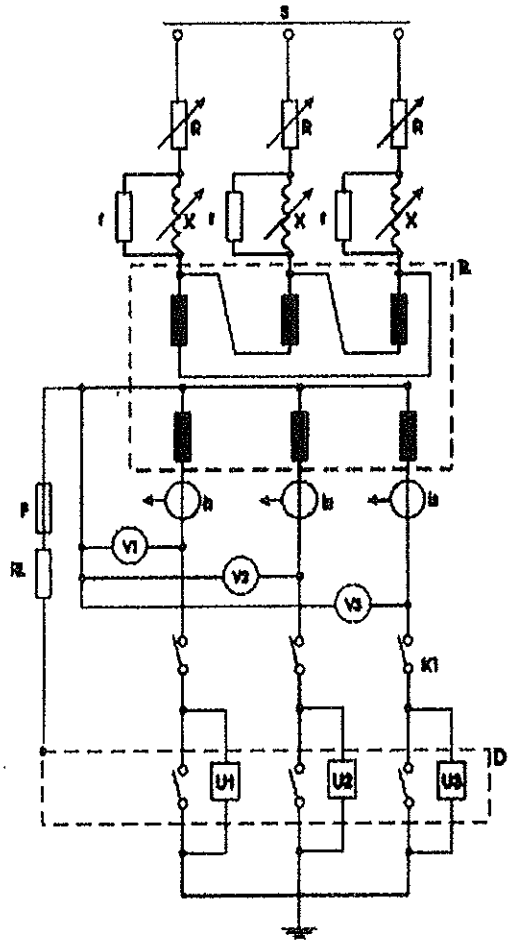
8.3.3.6	**TABLE: Temperature-rise (measurements)**	
Temperature rise dT of part:	dT (K) measured	dT (K) required
Terminals	55 K	80 K
Manual operating means: metallic / non-metallic	10 K	25 K
Parts intended to be touched but not hand-held: metallic / non-metallic	17 K	25 K
Parts which need not be touched during normal operation	25 K	50 K
supplementary information:		

8.3.4.4	TABLE: Temperature-rise (measurements)		
Temperature rise dT of part:		dT (K) measured	dT (K) required
Terminals		45 K	80 K
Manual operating means: metallic / non-metallic		8 K	25 K
Parts intended to be touched but not hand-held: metallic / non-metallic		13 K	25 K
Parts which need not be touched during normal operation		18 K	50 K
supplementary information:			

8.3.6.5	TABLE: Temperature-rise (measurements)		
Temperature rise dT of part:		dT (K) measured	dT (K) required
Terminals		54 K	80 K
Manual operating means: metallic / non-metallic		10 K	25 K
Parts intended to be touched but not hand-held: metallic / non-metallic		17 K	25 K
Parts which need not be touched during normal operation		24 K	50 K
supplementary information:			

8.3.7.4	TABLE: Temperature-rise (measurements)		
Temperature rise dT of part:		dT (K) measured	dT (K) required
Terminals		45 K	80 K
Manual operating means: metallic / non-metallic		8 K	25 K
Parts intended to be touched but not hand-held: metallic / non-metallic		14 K	25 K
Parts which need not be touched during normal operation		18 K	50 K
supplementary information:			

Test Circuit of Short Circuit:



Used Equipment:

S: Supply 34,5 kV, 100 MVA

R: Adjustable resistance (RY 01-03): 38Ω

X: Adjustable reaktans (EY 01-12): 132Ω

r: Shunt Resistance (%0.6)

K1: Making switch (KK 01-03)

D: Sample

F: Residual current fuse
(50 mm length 0,8 mm diameter copper wire)

RL: Residual current resistance (1500 A)

Tr: Test transformer (TT 01)
5 MVA, 34,5 / 0,4 - 0,44 - 0,66 kV

I1, I2, I3: Current measuring Equipment.

-Rogowski (RG 05- 07) 150 kA / 2 V

-L 500 TC (AO 01-03)

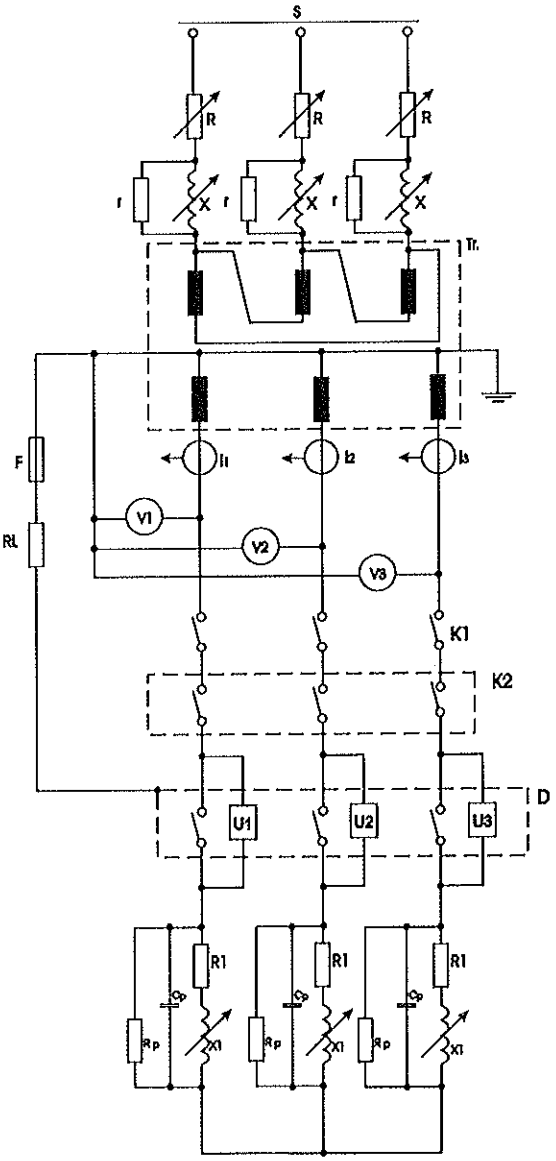
U1, U2, U3 Voltage measuring Equipment :
-L 500 TV (GO 01-03) ± 1024 V, 40 Hz, 2 MΩ

V1, V2, V3: Voltmeter (V 01 - 03)

Measuring system software:

-Rogowski. dbs (2-150 kA)

Making – Breaking Capacity and Operational Performance Test Circuit:



Used Equipment:

S: Supply 34,5 kV, 100 MVA

R: Adjustable resistance (RY 01-03): 38Ω

X: Adjustable reaktans (EY 01-12): 132Ω

r: Shunt Resistance (%0.6)

R1: Adjustable resistance (AY 01): 2,375 mΩ

X1: Adjustable reaktans (AY 01): 6000 µH

Rp: Adjustable resistance (DK 01): 1650 Ω

Cp: Adjustable condensate (DK 01): 37 nF

K1: Making switch (KK 01-03)

K2: NH fuse

D: Sample

F: Residual current fuse
(50 mm length 0,8 mm diameter copper wire)

RL: Residual current resistance (1500 A)

Tr: Test transformer (TT 01)
5 MVA, 34,5 / 0,4 - 0,44 - 0,66 kV

I1, I2, I3: Current measuring Equipment.

-Fluke current coil (FL 01- 03) 0,2 / 2 kA / 2

-L 500 TC (AO 01-03)

U1, U2, U3 Voltage measuring Equipment :
-L 500 TV (GO 01-03) ± 1024 V, 40 Hz, 2 M Ω

V1, V2, V3: Voltmeter (V 01 - 03)

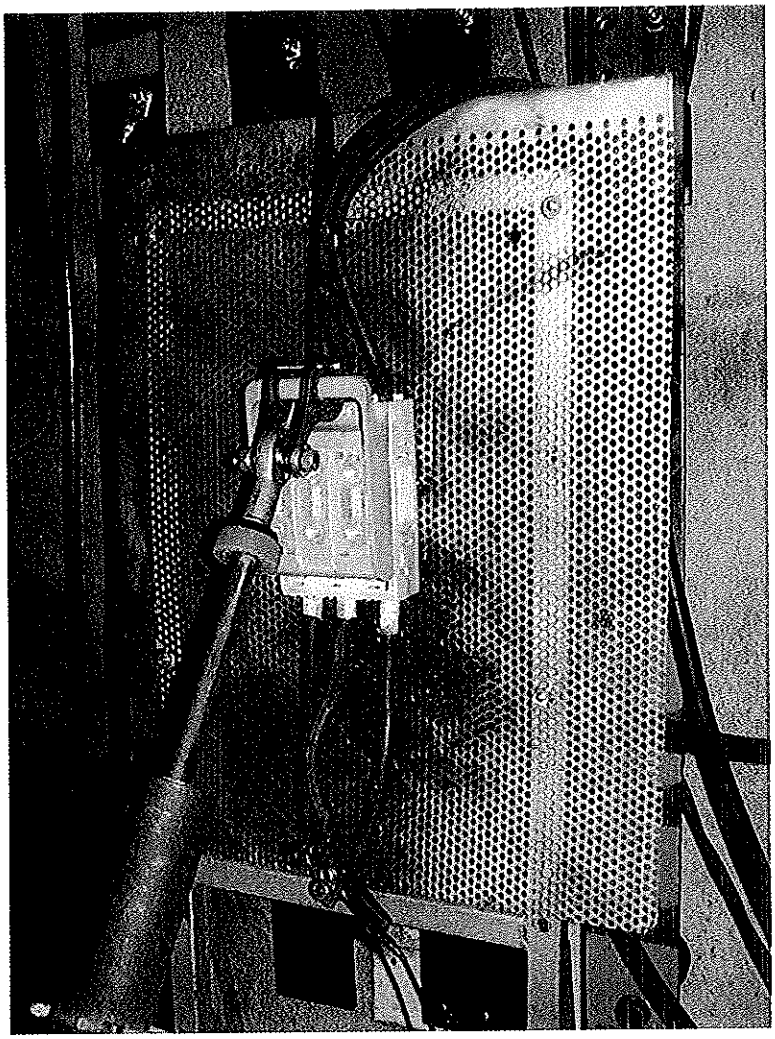
Measuring system software:

-Fluke 2000. dbs (200-2000 A)

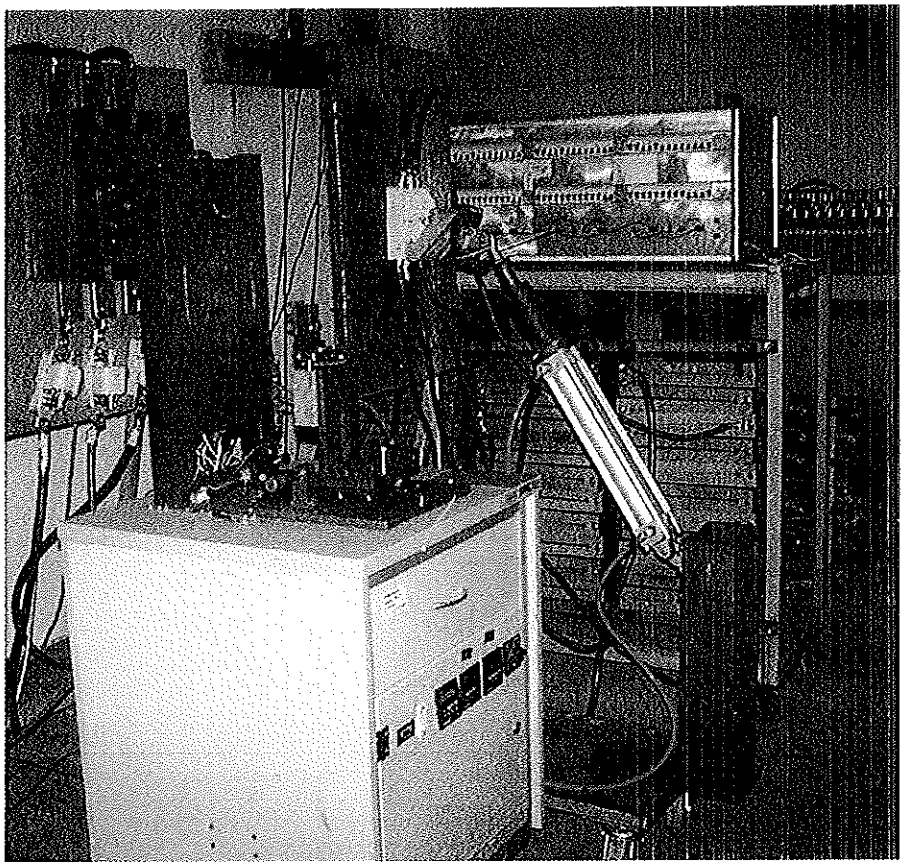
Used Test Equipments			
Equipment Name - No	**Manufacturer - Type**	**Features**	**Traceability**
Test transformer (TT01)	Best	440 V 65 kA, 660 V 5 kA	
Resistive load (RY01-03)	Hilkar	38 ohm, 1300 A / sn	
Inductive load (EY01-12)	BEST	128 ohm	-
Resistive and inductive load (AY01)	FEDERAL	2,3 ohm, 6 mH	
Resistive and inductive load (AY03)	IHP	50 mohm, 380 µH	
Current measuring system (AO01-03)	DİMES L 500 TC	143,29 kA / 2,8763 V	IHP 1014.01
Voltage measuring system(GO01-03)	DİMES L 500 TV	± 1024 V	IHP 1014.02
Rogowski coil (RG02-04)	HEBEMUS 100 K	100 kA / 2 Volt	IHP 0712.01
Rogowski coil (RG05-07)	HEBEMUS 150 K	150 kA / 2 Volt	IHP 0712.01
Fluke current coil (FL01-03)	Fluke 2000 flex	200 A / 2000 A	IHP 0814.02
Voltmeter (V01-03)	Federal FYV - 72	0-500 V	IHP 1014.03
Making breaker (KK01-03)	Preussag NVL 82DA	12 kV, 1250 A Icn=80 kA	-
Making breaker (KK04)	Federal F112E	2500 A, 400 V	-
Making breaker (KK06)	Federal F121E	2000 A, 400 V	-
Make-break test equipment (AK10)	IHP	Switch	-
Current supply (TT05)	Mersan	5000 A	
Transformer-Ampermeter (AA01-03)	Federal FAT100-FYA96	3000 / 5 A	IHP 0814.05
Current transformer (AS08)	FEDERAL	6000 / 5 A	IHP 0814.01
Clamp meter (P03)	CIE	1000 A RMS	IHP 0413.02
Isolation test equipment (IT04)	GW instek GPI 825	5 kV AC, 1000 VDC Meger	IHP 0413.01
Oscilloscope (O02)	Textronik TDS 460 A	400 MHz, 4 canal	IHP 0713.02
Dynamometer (KO01)	Lutron FG 5100	100 Kg	UMS M3998
Thermometer (SO01)	CIE 306	200 °C	UMS S24128
Temperature measuring eq. (SO04)	Agilent 34970A	60 canal, T type termokupl	UMS S3315
Multimetre (M02)	Fluke 87	10 A, 1000 V	IHP 0914.02
Caliper (KU01) 30483306	Mitutoyo	150 mm, 0,01 mm	IHP 1110.02
Torquemeter (TO 01)	Torqueleader	6-80 Nm	IHP 0114.01
Impulse test device (DT01)	HİLO PG1012C	0-10 kV, 1,2/50 ms	IHP 0314.01
Signal supply (OS01)	Goldstar	0-2 MHz	-
Calibrator (K01)	Wavetek	1050 V, 20A,	METKAL 10-34551
Red-hot wire test device (KT01)	Federal	960°C	-
Terminal test device (KL01)	Federal	-	-

Photographs:

Short circuit test:

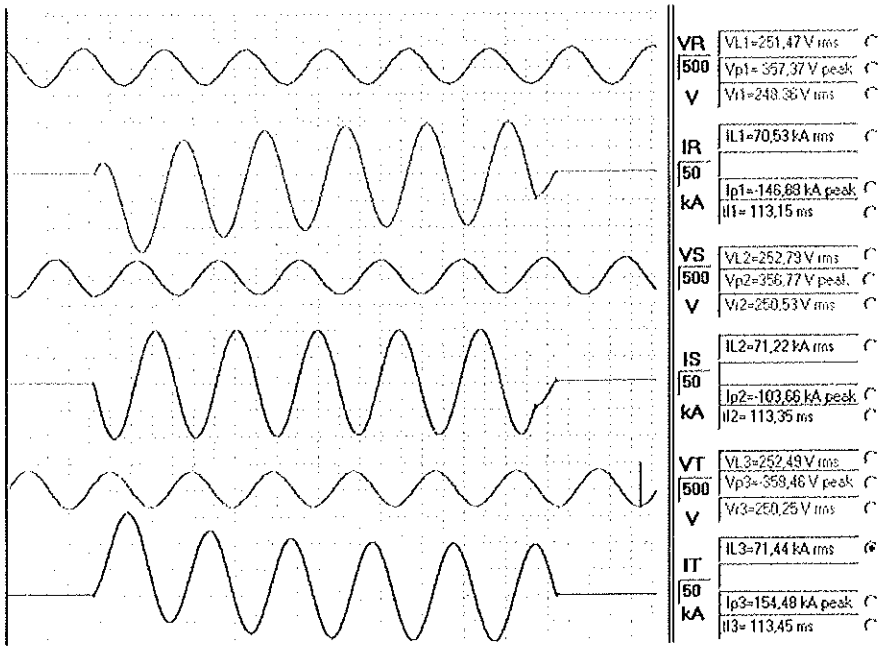


Making-breaking test:

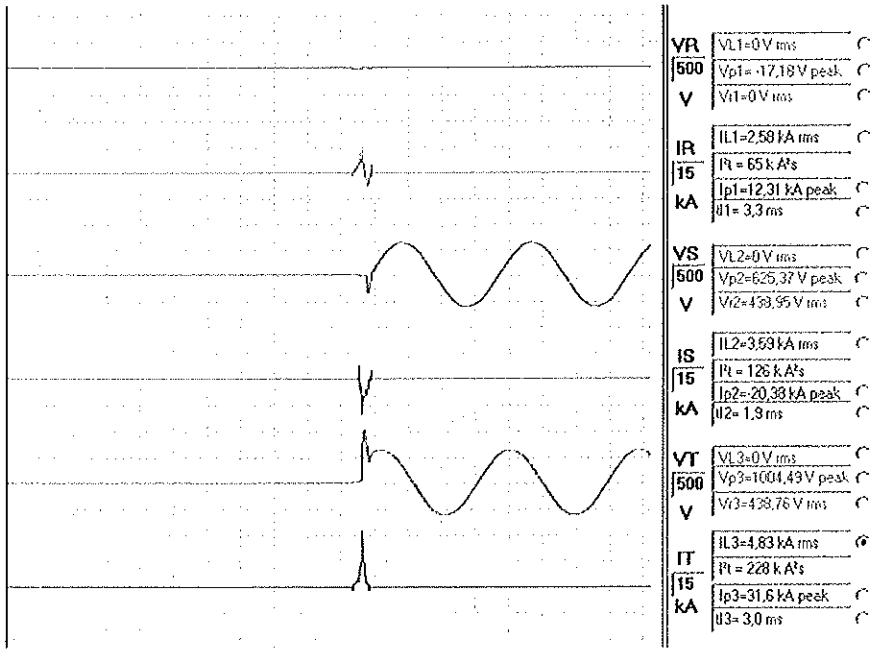


Oscillograms:

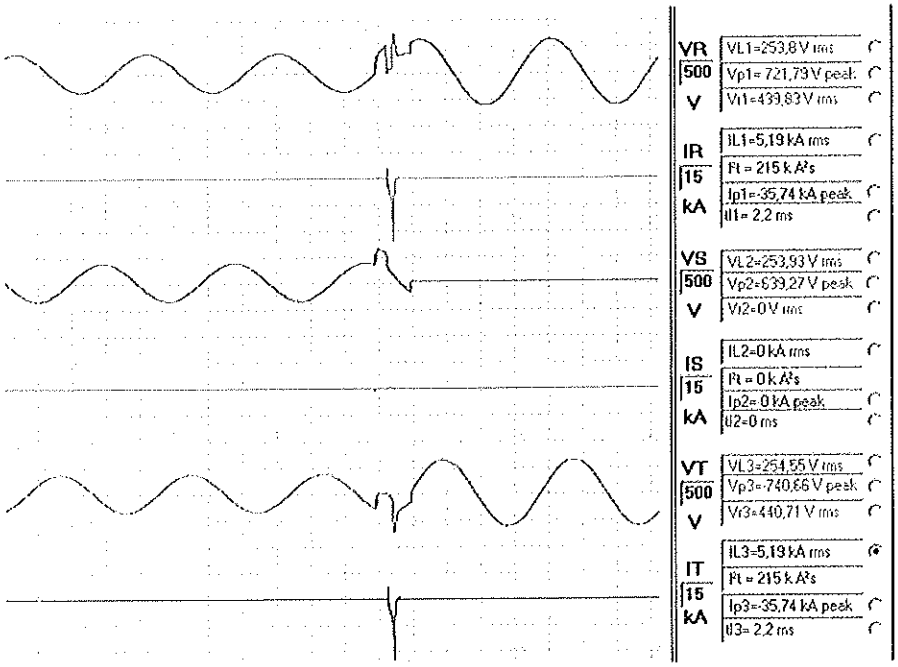
70 kA Prospective Current:



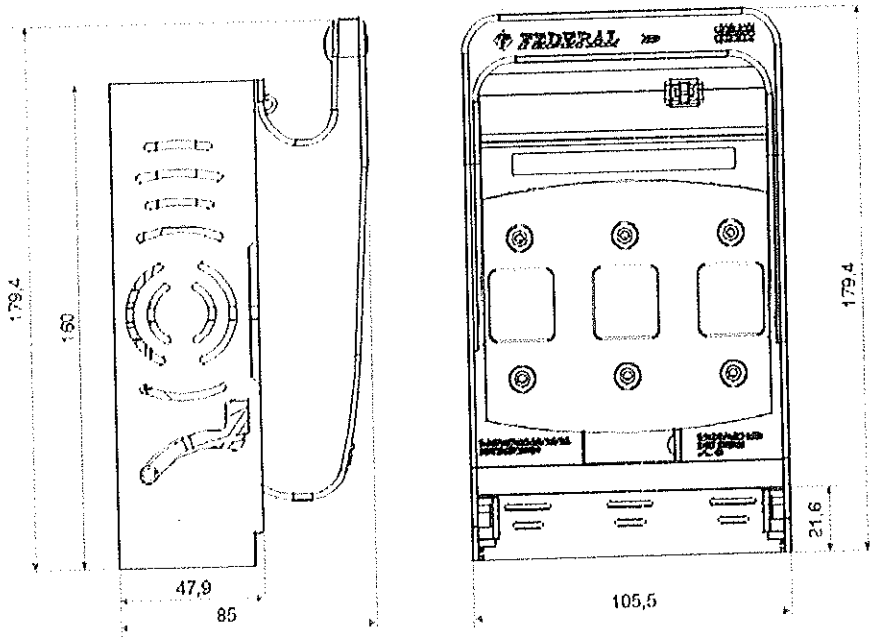
Open Shot:

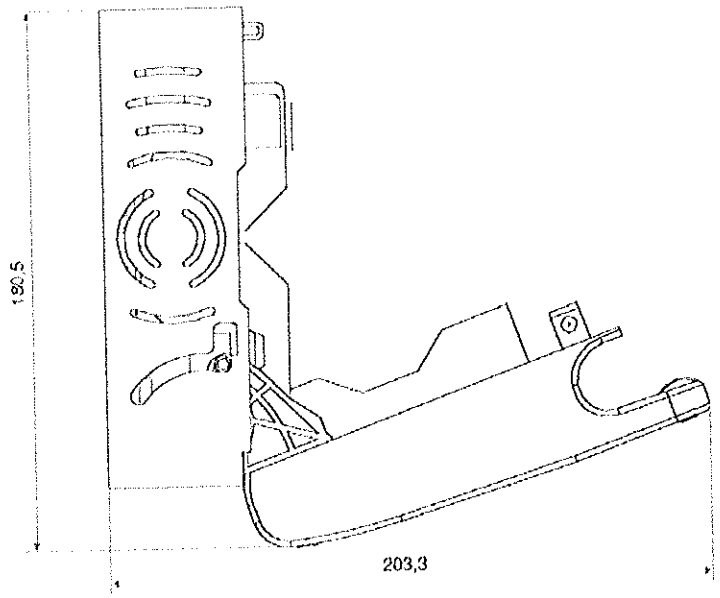


Close- Open Shot:



Drawings:





INTERNATIONAL HIGH POWER TEST LABORATORY LTD.	**TEST REPORT** **IEC 60947-3**	

Request No: 1114.39	Report No: 1114.39-1
Income Date: 26.11.2014	Report Date: 05.12.2014
Test Date: 26.11.2014 – 27.11.2014	Page: 1 / 5

Name and address of customer	FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş. 1.Organize Sanayi Bölgesi 1.Yol No: 25 Hanlı Beldesi Adapazarı / SAKARYA
Test Object	**Switch-Disconnector-Fuse**
Type	**FHS00**
Manufacturer's name or trademark	**FEDERAL**
Rated characteristics of test object	Number of pole : 3p Rated operation voltage (Ue) : 415 V AC Rated operation current (Ie) : 160 A Utilization category : AC-22B Rated conditional short-circuit current : 70 kA Rated operation frequency : 50 / 60 Hz
Person admitted the sample	Yunus CİRİŞ
Person sent the sample	Ruhi ŞENOĞLU
Sample receiving procedure	-
Condition of sample	New
Applied Standard, specification or procedure	**IEC 60947-3: 2008**
Deviation Standard / Specification	-
Result and opinions	**Positive. Test sample fulfill the requirement.**

Detail information of test is at enclosed.

Seal	Person made test	Approving
IHP ULUSLARARASI YÜKSEK GÜÇ TEST LABORATUVARI LTD. ŞTİ.	Kerem ÇELİK Test Engineer	İsmail TAŞCI Laboratory Manager

This report is valid just for the samples, which are tested. The reports without seal and signature are not valid. These reports are not copied, pressed without permission of the initial laboratory.

Address: 1.OSB 2. Yol No: 13 Adapazarı / TÜRKİYE Tel: (0264) 291 45 30 Fax: (0264) 291 45 31

Content

Participants in the test

İsmail TAŞCI	IHP test engineer in charge
Kerem ÇELİK	IHP test engineer
Yunus CİRİŞ	IHP test technician

Applied standard and tests

IEC 60947- 3: 2008
Low voltage switchgear and controlgear – Part 3: Switches, disconnector, switch-disconnector and fuse-combination units.

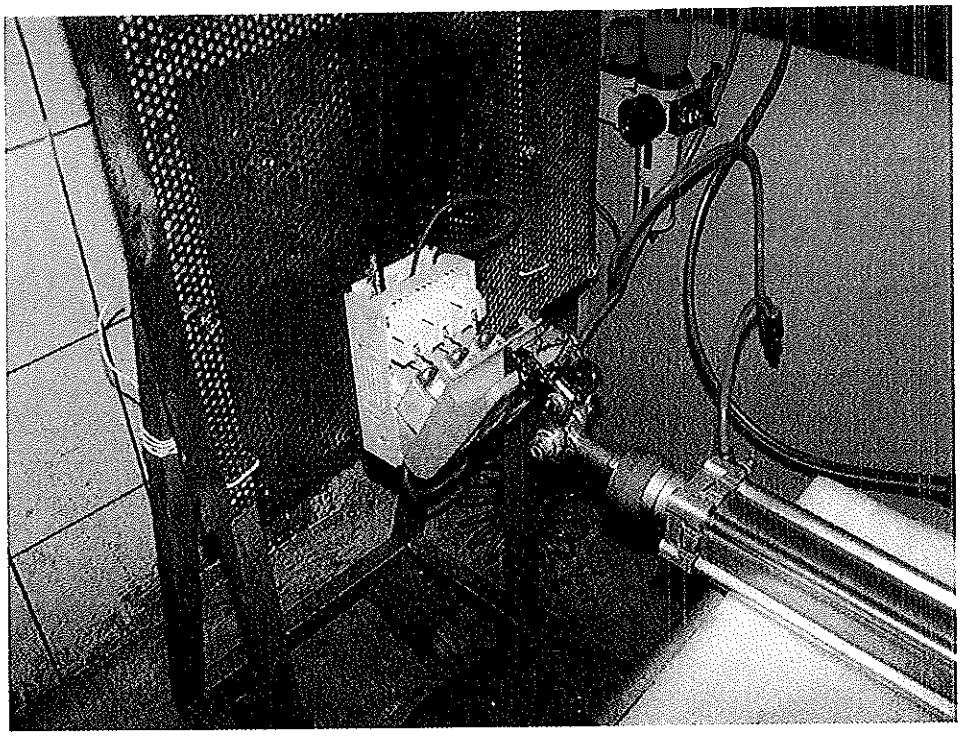
- Mechanical durability (Clause 8.5.1)

Clause	Requirement-Test	Result-Remark	Verdict
	Test Sample	**1 (FHS00 160A)**	
8.5.1	**Mechanical durability**		
	The mechanical durability test (see 7.2.4.3 and 8.1.5), where required, is made in accordance with the appropriate requirements of 8.3.4.1, except that for equipment suitable for isolation, the maximum value of leakage current shall not exceed 6 mA per pole for all utilization categories.	Leakage current after the test < 0,1 mA	P
	The total number of operating cycles shall be as declared by the manufacturer.	20000 cycles	P
	Ambient temperature: (10-40°C)	19 °C	P
	Fuse-link details (Manufacturer / type reference / rated current / power dissipation)	Federal NH00-FB 160 A NH, 12 W	P
	Switching velocity of the equipment dependent manual operation	0,7 m/s	P
	Number of operating cycles per hour	1200 cycles	P
	The equipment shall remain mechanically operable.	Operable	P
	The force required for opening shall not be greater than the test force of 8.2.5.2 and Table 8.	120 N	P

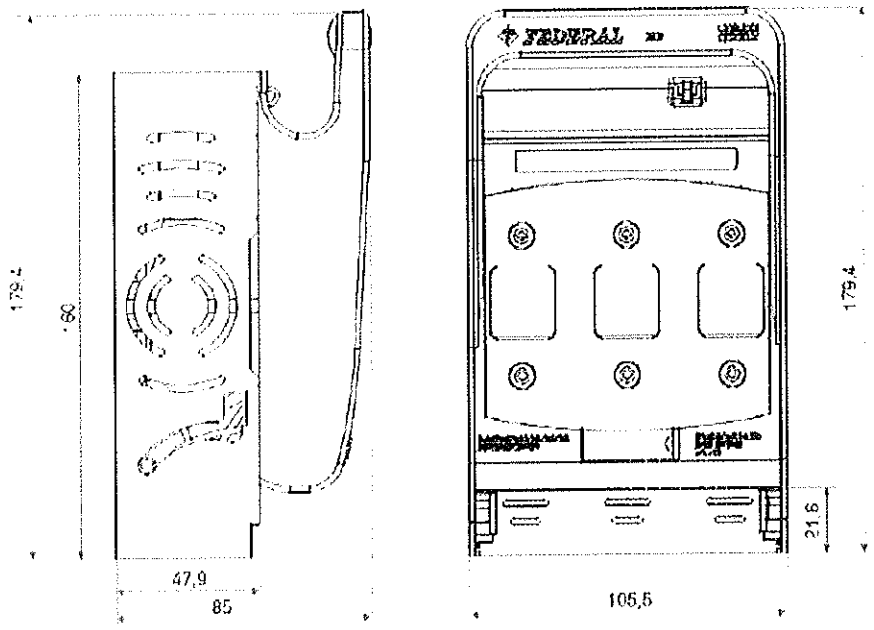
Used test Equipment:

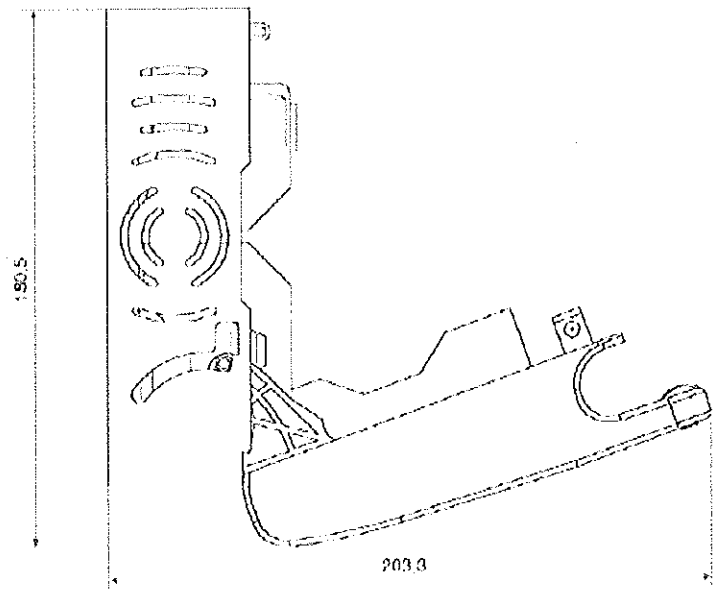
Equipment Name - No	Manufacturer - Type	Features	Traceability
Make-break test equipment (AK07)	IHP	Vertical switch	-
Current-voltage supply (AGK 02)	GW instek	30 Vdc, 3 A	-
Multimetre (M02)	Fluke 87	10 A, 1000 V	IHP 0914.02
Dynamometer (KO01)	Lutron FG 5100	100 Kg	UMS M3998

Photographs:



Drawings:





INTERNATIONAL HIGH POWER TEST LABORATORY LTD.	**TEST REPORT** **IEC 60947-3**	

Request No: 0814.17	Report No: 0814.17-1
Income Date: 12.08.2014	Report Date: 21.08.2014
Test Date: 12.08.2014 – 16.08.2014	Page: 1 / 4

Name and address of customer	FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş. 1.Organize Sanayi Bölgesi 1.Yol No: 25 Hanlı Beldesi Adapazarı / SAKARYA
Test Object	**Switch-Disconnector-Fuse**
Type	**FHS1 160**
Manufacturer's name or trademark	**FEDERAL**
Rated characteristics of test object	Number of pole : 1p Rated operation voltage (Ue) : 400 V AC Rated operation current (Ie) : 160 A Utilization category : AC-21B/400V, AC-22B/240V Rated conditional short-circuit current : 70 kA Rated operation frequency : 50 / 60 Hz
Person admitted the sample	Yunus CİRİŞ
Person sent the sample	Ruhi ŞENOĞLU
Sample receiving procedure	-
Condition of sample	New
Applied Standard, specification or procedure	**IEC 60947-3: 2008**
Deviation Standard / Specification	-
Result and opinions	**Positive. Test sample fulfill the requirement.**

Detail information of test is at enclosed.

Seal	Person made test	Approving
IHP ULUSLARARASI YÜKSEK GÜÇ TEST LABORATUVARI LTD. ŞTİ.	Kerem ÇELİK Test Engineer	İsmail TAŞCI Laboratory Manager

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Address: 1.OSB 2. Yol No: 13 Adapazarı / TÜRKİYE Tel: (0264) 291 45 30 Fax: (0264) 291 45 31

Content

Participants in the test

İsmail TAŞCI	IHP test engineer in charge
Kerem ÇELİK	IHP test engineer
Yunus CİRİŞ	IHP test technician

Applied standard and tests

IEC 60947- 3: 2008
Low voltage switchgear and controlgear – Part 3: Switches, disconnector, switch-disconnector and fuse-combination units.

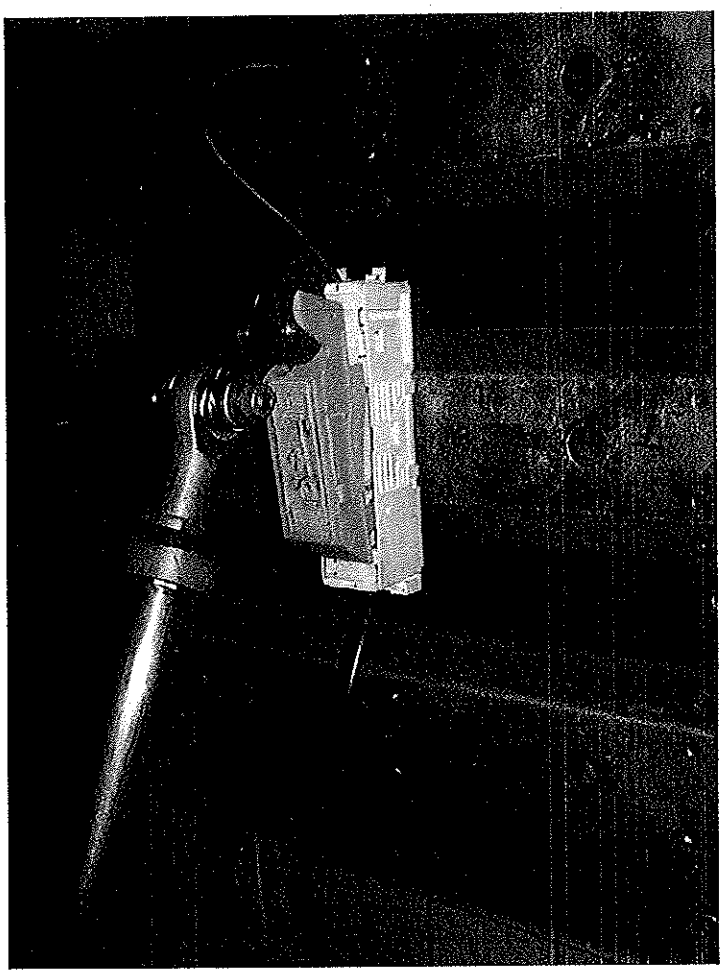
- Mechanical durability (Clause 8.5.1)

Clause	Requirement-Test	Result-Remark	Verdict
	Test Sample	**1 (FHS1 160A)**	
8.5.1	**Mechanical durability**		
	The mechanical durability test (see 7.2.4.3 and 8.1.5), where required, is made in accordance with the appropriate requirements of 8.3.4.1, except that for equipment suitable for isolation, the maximum value of leakage current shall not exceed 6 mA per pole for all utilization categories.	Leakage current after the test < 0,1 mA	P
	The total number of operating cycles shall be as declared by the manufacturer.	20000 cycles	P
	Ambient temperature: (10-40°C)	25 °C	P
	Fuse-link details (Manufacturer / type reference / rated current / power dissipation)	Federal NH00-FB 160 A NH, 12 W	P
	Switching velocity of the equipment dependent manual operation	0,7 m/s	P
	Number of operating cycles per hour	1200 cycles	P
	The equipment shall remain mechanically operable.	Operable	P
	The force required for opening shall not be greater than the test force of 8.2.5.2 and Table 8.	45 N	P

Used test Equipment:

Equipment Name - No	Manufacturer - Type	Features	Traceability
Make-break test equipment (AK07)	IHP	Vertical switch	-
Current-voltage supply (AGK 02)	GW instek	30 Vdc, 3 A	-
Multimetre (M02)	Fluke 87	10 A, 1000 V	IHP 0313.02
Dynamometer (KO01)	Lutron FG 5100	100 Kg	UMS M3998

Photographs:



FEDERAL ELEKTRİK

EC Declaration Of Conformity

Manufacturer *Üretici*	:	***FEDERAL ELEKTRİK Yatırım ve Ticaret A.Ş.***
Address *Adres*	:	***1. Organize Sanayi Bölgesi*** ***1. Yanyol No : 25 Hanlı Beldesi*** ***Adapazarı / TURKEY***

The undersigned Company certifies under its sole responsibility that the product specified below satisfies the requirements of the Low Voltage Directive 2006/95/EC which is apply to it.
Aşağıda tanımlanmış ürünler için Alçak Gerilim Yönetmeliği 2006/95/AT 'nin gerekliliklerinin yerine getirildiğini ve sorumluluğun alınmış olduğunu beyan ederiz.

Product Description *Ürün Tanımı*	:	***Low Voltage NH Fuses & Bases*** *Alçak Gerilim NH Sigorta ve Altlıkları*
Product Type & Ratings *Ürün Tipi&Sınıfı*	:	***NHC00 - FB (6 A - 100 A)*** ***NHC2 - FB (50 A - 250A)*** ***NH00 - FB (6 A - 160 A)*** ***NH0 - FB (25 A - 160 A)*** ***NH1 - FB (50 A - 250 A)*** ***NH2 - FB (80 A - 400 A)*** ***NH3 - FB (250 A - 630 A)*** ***NH00 - FA (160 A)*** ***NH0 - FA (160 A)*** ***NH1 - FA (250 A)*** ***NH2 - FA (400 A)*** ***NH3 - FA (630 A)***
Harmonized Standards *Uyumlaştırılmış Standartlar*	:	***EN 60269-1 : 2007*** ***HD 60269-2 : 2013***
Applicable EU Directives *Uygulanabilir Yönetmelikler*	:	***2006 / 95 / EC Low Voltage Directive*** *2006 / 95 / AT Belirli Gerilim Sınırları Dahilinde Çalışmak Üzere Tasarlanmış Elektrikli Teçhizat Yönetmeliği*
Affixing of CE Marking *CE Markası Uygulaması*	:	***2003***
Representative for Comformity *Uygunluğu Beyan Eden*	:	***Mustafa NURDOĞAN (General Manager)***
Signature *İmza*	:	
Decleration No. *Deklarasyon No.*	:	***CE - 10***
Date *Tarih*	:	***02.07.2014***

This declaration certifies compliance with the indicated directives but implies no warrantyof properties and validity only under conditions to obey the rules related to assembling, operating and maintain directions.
Bu beyan belirtilen talimatlara uygunluğu belgeler, özellikler ile ilgili garanti hakkı içermez ve ancak montaj,çalıştırma ve bakım talimatlarına uyulması şartıyla geçerlidir.

INTERNATIONAL HIGH POWER TEST LABORATORY LTD.	**TEST REPORT** **IEC 60269-1**	Deutscher Akkreditierungs Rat DAR DAT-PL-195/05-01

Request no: 0211.02	Report no: 0211.02-6
Income date: 09.02.2011	Report date: 10.04.2011
Test date: 09.02.2011 – 25.03.2011	Page: 1 / 61

Name and address of client	FEDERAL ELEKTRİK 1.Organize Sanayi Bölgesi 1.Yol No 25 Hanlı Beldesi Sakarya / TÜRKİYE
Test object	**Low Voltage Fuse-Link and Fuse-Base**
Type	**NH00-FB and NH00-FA**
Manufacturer's name or trademark	**FEDERAL**
Rated characteristics of test object	Rated operating voltage (Un) : 500 V Rated current (In) : 25- 160 A Rated operating frequency : 50- 60 Hz Rated short circuit breaking capacity: : 120 kA Utilization category : gG
Person admitted the sample	Kerem ÇELIK
Person sent the sample	Ender VARDAR
Sample receiving procedure	-
Condition of sample	New
Applied standard, specification or procedure	**IEC 60269-1: 2006 + A1: 2009** **IEC 60269-2: 2010**
Deviation Standard / Specification	-
Result	POSITIVE. Test sample passed the requested test.

Detail information of tests is at enclosed

Seal	Person made test	Approving
IHP ULUSLARARASI YÜKSEK GÜÇ TEST LABORATUVARI LTD. ŞTİ.	Kerem ÇELİK Test Engineer	İsmail TAŞCI Laboratory Manager

Independent International High Power Test Laboratory accredited according to DIN EN ISO/IEC 17025 by DGA Deutsche Gesellschaft für Akkreditierung mbH In the field of low voltage switchgear and controlgear equipments.
This report is valid just for the samples, which are tested. The reports without seal and signature are not valid. These reports are not copied, pressed without permission of the initial laboratory.

Address: 1.OSB 2. Yol No: 13 Adapazarı / TÜRKİYE Phone: (0264) 291 45 30 Fax: (0264) 291 45 31

Contents

Participants in the tests

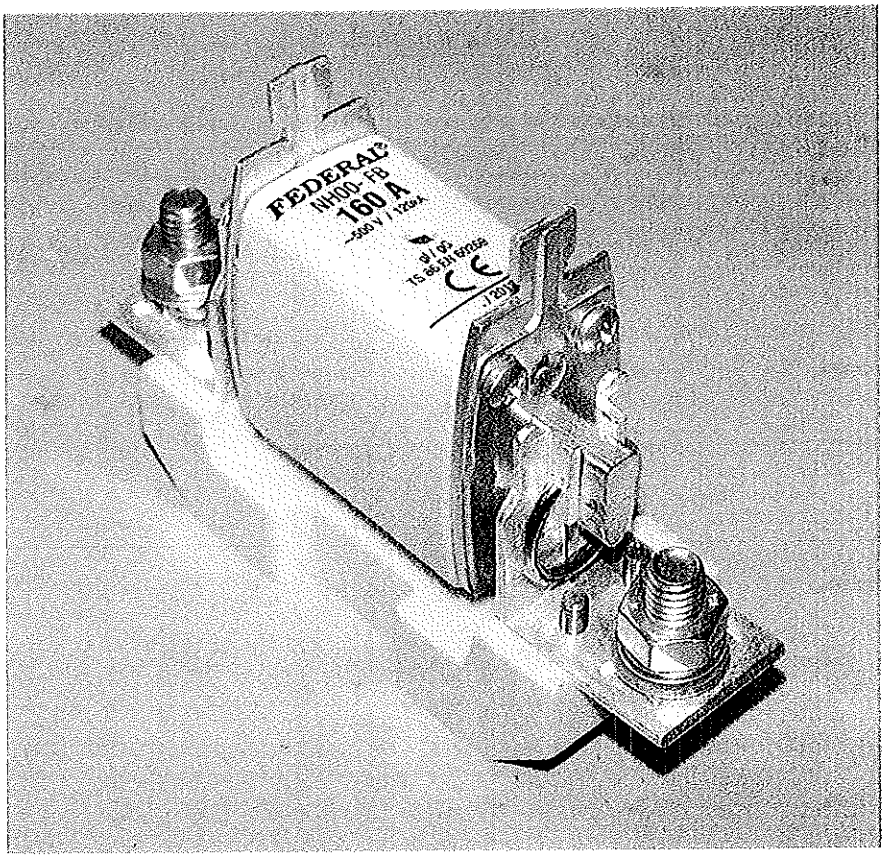
Mr. Ismail TASCI	IHP test engineer in charge
Mr. Kerem ÇELİK	IHP test engineer
Mr. Samet KORKAN	IHP test technicians

Applied standards and tests.

IEC 60269-1: 2006 + A1: 2009: Low-voltage fuses – Part 1: General requirements

IEC 60269-2: 2010: 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 J

Test samples



Clause	Requirement – Test	Result-Remark	Verdict
5.1	**Summary of characteristics**		
5.2	Rated voltage	AC 500 V	P
5.3.1	Rated current of the fuse-link(s)	25, 32, 40, 50, 63, 80, 100, 125, 160 A	P
5.3.2	Rated current of the fuse-holder	160 A	P
5.4	Rated frequency	45- 62 Hz	P
5.5	Rated power dissipation of fuse-link	12 W	P
	Rated acceptable power dissipation of fuse-holder	12 W	P
5.6	The limits are based on a reference ambient air temperature *Ta* of +20 °C.	20°C	P
5.6.1	Time-current characteristics, time-current zones		
	For fuse-links not complying with the standardized time-current zones as specified in the subsequent parts, the manufacturer should keep available (with their tolerances): – the pre-arcing and operating time-current characteristics; or – the time-current zone.		P
5.7.2	The rated breaking capacity of a fuse-link is given by the manufacturer corresponding to the rated voltage. Values of minimum rated breaking capacity are given in subsequent parts.	120 kA / 500 V	P
5.8	The value for cut-off and I^2t characteristics shall take into account manufacturing tolerances and shall refer to the service conditions as specified in subsequent parts, for example, the values of voltage, frequency and power factor.		P
5.8.1	Where the cut-off current characteristics are required, and unless specified in subsequent parts, they should be given by the manufacturer according to the example shown in Figure 4, in a double logarithmic presentation with the prospective current as abscissa.		P
5.8.2	The 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 shall be given by the manufacturer.		P
	The operating I^2t characteristics with specified voltages as parameters shall be given by the manufacturer for pre-arcing times less than 0,1 s.		P
6	**Markings**		
	The marking shall be durable and easily legible.		P
	Compliance is checked by inspection and by the following test.		P
	The marking is rubbed by hand for 5 s with a piece of cloth soaked with water and again for 5 s with a piece of cloth soaked with petroleum spirit.	5 s - water 5 s - petroleum spirit	P
6.1	**Markings of fuse-holders**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	The following information shall be marked on all fuse-holders:		
	name of the manufacturer or a trade mark by which he may be readily identified;	FEDERAL	P
	manufacturer's identification reference enabling all the characteristics listed in 5.1.1 to be found;	NH00 - FA	P
	Rated voltage;	500 V	P
	Rated current;	160 A	P
	Kind of current and rated frequency, when applicable.	~	P
Part 2 6.1	Size.	00	P
	The marking of the rated current and the rated voltage shall be discernible from the front when a fuse-link has not been fitted.		P
6.2	**Markings of fuse-links**		
	The following information shall be marked on all fuse-links except small fuse-links where this is impracticable:		P
	Name of the manufacturer or a trade mark by which he may be readily identified;	FEDERAL	P
	Manufacturer's identification reference, enabling all the characteristics listed in 5.1.2 to be found;	NH00 - FB	P
	Rated voltage;	500 V	P
	Rated current (for "gM" type see 5.7.1);	25, 32, 40, 50, 63, 80, 100, 125, 160 A	P
	Breaking range and utilization category (letter code), where applicable (see 5.7.1);	gL / gG	P
	Kind of current and, if applicable, rated frequency (see 5.4).	~	P
	For small fuse-links, where it is impracticable to include all the specified information on the fuse-link, the trade mark, list reference of the manufacturer, rated voltage and the rated current shall be marked.		NA
Part 2 6.2	Size or reference;	00	P
	Rated breaking capacity.	120 kA	P
	The marking of the rated current and the rated voltage shall be discernible from the front. Furthermore, fuse-links shall be marked as described in Table 104.	500 V, 160 A	P
	Fuse-links with isolated gripping-lugs may be marked in a place easily visible from the front with the graphical symbol of a gripping-lug in a square. If marked, conformity of these fuse links is verified according to 8.2.		NA
6.3	**Marking symbols**		
	For the kind of current and frequency, use symbols in accordance with IEC 60417.		P

Clause	Requirement – Test	Result-Remark	Verdict
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
	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		NA
	b) fuse-carrier and fuse-link		NA
	c) fuse-link and fuse-base		P
	Fuse contacts are so constructed and of such 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-piece		
	Gauge-piece is so designed that it withstands normal stresses occurring during use		NA
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 subjected in normal service		P
	Fuse passes the tests for verification of insulating properties and suitability for isolation in accordance with 8.2		P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
7.3	Temperature rise, power dissipation of the fuse-link and acceptable power dissipation of the fuse-holder		
	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) ℃		
	- is able to carry continuously any current not 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		
	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		
	- current I_f (for "g" fuse-links) :		P
	- current $k_2 I_n$ (for "a" fuse-links) :		NA
	- for a.c., rated breaking capacity at power factors not lower than those in Table 20:	120 kA	P
	- for d.c., rated breaking capacity at time constants not greater than those limits in Table 21:		NA
	Arc voltage not exceed values given in Table 6:		P
	Fuse satisfy these conditions if it passes the tests prescribed in 8.5	Report no: IPH 1211.0251.1.190	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:	IP	NA
	The degree of protection when replacing the fuse-link: :	IP	NA
	The degree of protection when the fuse-link and fuse-carrier is removed:	IP	NA
7.9.1	Clearances and creepage distances		
	Clearances are not less than the values given in Table 9:	See clause 8.2.3	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Creepage distances correspond to material group, as defined in 2.7.1.3 of IEC 60664-1, corresponding with rated voltage given in Table 10:	See clause 8.2.3	P
7.9.2	Leakage currents of fuses suitable for isolation		
	Value of leakage current (mA) not exceed		
	- 0,5 mA per pole for fuses in new conditions:	< 0,05 mA	P
	- 2 mA per pole for fuses having been submitted to test according to 8.5 :		--
7.9.3	Additional constructional requirements for fuses for linked fuse-carriers, suitable for isolation		
	Fuse-holder are marked with the symbol IEC 60617-S00369		NA
	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		NA
	Indication of this position is provided by the position of the fuse-carrier		NA
	There exists a locking means in order to lock the fuses in the isolated position, locking is possible only in this position		NA
	Fuses are designed so that the fuse-carrier remains attached to the fuse-base giving correct indication of the open position, and of locking		NA
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 8.2.2.3.2 and 8.11.2.3)		P
7.12.2	Resistance to season cracking		
	Current-carrying parts are sufficiently resistant to season cracking (see 8.2.2.3.2 and 8.11.2.1)		P
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		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Fuses within the scope of this standard are not sensitive to normal electromagnetic disturbances		P
	No immunity tests are required		P
	Test sample: (Fuse-links)	**NH00 - FB / 160 A**	
8.1.2	At the beginning of each test, the fuse shall be approximately at the ambient air temperature.		P
8.1.3	Tests shall be made on fuses in a clean and dry condition.		P
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5	**Testing of fuse-links**		
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.1.5.2	**Testing of fuse-links of a homogeneous series**		
	Fuse-links of different rated currents are considered to form a homogeneous series provided		
	–they have enclosures identical in form and construction, and with the exception of fuse elements, in dimension. This condition is also met when only the fuse-link contacts differ, in which case tests are performed with the fuse-link having the fuse-link contacts most likely to produce the least favourable test results;		P
	–they have the same arc-extinguishing medium and the same completeness of filling;		P
	–their fuse-elements consist of identical materials. They shall have the same length and form;		P
	–their cross-section, which may vary along the length of fuse-elements, as well as the number of fuse-elements, shall not exceed the cross-section and the number of fuse elements, respectively, of those fuse-links having the highest rated current;		P
	–the 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 having the highest rated current;		P
	–they are suitable to be used with a given fuse-holder, or are intended to be used without a fuse-holder, but in an arrangement identical for all rated currents of the homogeneous series.		P

Clause	Requirement – Test	Result-Remark	Verdict
	–With respect to the temperature-rise test, the product RIn 3/2 does not exceed the corresponding value for the fuse-link which has the largest rated current of the homogeneous series. The resistance *R* shall be measured with the fuse-link as indicated in 8.1.5.1.		P
	–With respect to the breaking-capacity test, the rated breaking capacity is not greater than that of the fuse-link having the largest current within the homogeneous series. Otherwise the fuse-link of the largest rated current among those having the greater rated breaking capacity shall be subjected to tests no. 1 and no. 2.		P
8.3	**Verification of temperature rise and power dissipation**		
8.3.1	The test shall be performed at an ambient air temperature of (20 ± 5) °C.	20 °C	P
	The connections on either side of each single fuse shall be not less than 1 m in length.	2 m	P
	Unless specified in subsequent parts, the cross-sectional area shall be selected in accordance with Table 17.	70 mm^2	P
Part 2 8.3.1	If not, the screws or nuts of the terminals shall be fastened in accordance with Table 111.	10 Nm	P
8.3.4.2	Power dissipation of a fuse-link		
	The test shall be made with a.c. at the rated current of the fuse-link.	160 A	P
8.3.5	The power dissipation of the fuse-link shall not exceed its rated power dissipation or the value specified in subsequent parts.	10,8 W	P
	After the test, the fuse shall be in a satisfactory condition.		P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	2 m, 70 mm^2 cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	21 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (*Inf*) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x160 A – 2h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (*If*). It shall operate within the conventional time as specified in Table 2.	1,6x160 A – 40 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x160 A - 2h Without current - 12 min. Total: 100 h	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x160 A – 2h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	The time-current characteristics may be verified on the basis of the results obtained from the oscillographic records taken during the performance of the test according to 8.5.		P
	The values of pre-arcing and operating times so determined, referred to the abscissa corresponding to the value of prospective current, shall be within the time-current zone indicated by the manufacturer, or specified in subsequent parts.		P
	When for the fuse-links of a homogeneous series (see 8.1.5.2) the complete test according to 8.5 is only made on that fuse-link having the largest rated current, it shall be sufficient for the smaller current ratings to verify only the pre-arcing time. In this case, the supplementary tests shall be made at an ambient air temperature of (20 ± 5) °C and at the following values of prospective current only:		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	460 A – 80 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	950 A – 3,3 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	1450 A – 670 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	2590 A – 65 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.4	**Overload**		
	The test arrangement is the same as that for the temperature-rise test (see 8.3.1). Three fuse links shall be submitted to 50 pulses having the same duration and the same test current.	50 pulses	P
	For "g" fuse-links, the test current shall be 0,8 times the current determined from the manufacturer's minimum pre-arcing time-current characteristics for a pre-arcing time of 5s. The duration of each pulse shall be 5 s and the time interval between pulses shall be 20 % of the conventional time specified in Table 2.	0,8x880 A - 5 s Without current -- 24 min.	P
	For "a" fuse-links, the test current shall be equal to $k1In$ ± 2 %. The pulse duration shall correspond to that indicated on the overload curve for $k1In$ as stated by the manufacturer. The intervals between pulses shall be 30 times the pulse duration.		NA
	After having been allowed to cool down to ambient air temperature, the fuse-links shall be subjected to a current equal to that used during the overload test. The pre-arcing time, when passing this current, shall be shown to lie within the manufacturer's time-current zone.	0,8x880 A - 1: 15 s 2: 14 s 3: 14 s	P
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.	50 mm^2 160 A - 2 h	P
	The test current is then increased to a value of 1,45 Iz (Iz being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.	1,45x168 A – 33 min.	P
	NOTE It is not necessary to perform this test if the product 1,45 Iz is greater than the conventional fusing current.		NA
8.4.3.6	**Operation of indicating devices and striker, if any**		
	The correct operation of indicating devices is verified in combination with the verification of breaking capacity	Clause 8.7.4	P
	For verifying the operation of strikers, if any, an additional test sample shall be tested at a current: - I_4 in the case of "g" fuse-links; - 2 k_1In in the case of "a" fuse-links;		NA
	and at a recovery voltage of: - 20 V for rated voltages not exceeding 500 V; - 0,04 Un for rated voltages exceeding 500 V. The values of the recovery voltage may be exceeded by 10%.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	The striker shall operate during all tests made at a recovery voltage of - at least 20 V.		NA
8.5	**Verification of the breaking capacity**	Report no: IPH 1211.0251.1.190	--
8.6	**Verification of the cut-off current characteristics**		
8.6.1	If the manufacturer has stated the cut-off current characteristic, this characteristic shall be verified for the prospective current in connection with test no. 1 (see 8.5), and the corresponding value shall be computed from the oscillograms.		P
8.6.2	The values measured shall not exceed those indicated by the manufacturer (see 5.8.1).	Report no: IPH 1211.0251.1.190	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Report no: IPH 1211.0251.1.190	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.	Max. operating I_1 - 372 kA^2s I_2 – 338 kA^2s	P
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Min. pre-arcing I_1 – 90,4 kA^2s I_2 – 93,9 kA^2s	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 160 A: 86- 250 kA^2s)	$I_{0,1s}$ – 484 kA^2s $I_{0,01s}$ – 148 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.		NA
8.7.4	**Verification of overcurrent discrimination**		
	The discrimination of the fuse-links is verified by means of the time-current characteristics and the pre-arcing and operating I^2t values.		P
Part 2 8.7.4	Four samples are tested, two samples are tested at the r.m.s. prospective test current *I*, corresponding to the minimum pre-arcing I^2t values, the other samples at the r.m.s. prospective test current *I*, corresponding to the operating I^2t values.	Test1: 4 kA, Pf: 0,25 Test2: 6,8 kA, Pf: 0,25	P
	The test voltage for 690 V fuses is $1{,}05 \times \frac{U_n}{\sqrt{3}}$.		NA

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	The test voltage for all other fuses is $1{,}1 \times \frac{U_n}{\sqrt{3}}$.	400 V (Measured values were calculated for 320 V according to Annex B3)	P
	The evaluated I^2t values shall lie within the corresponding I^2t limits specified in Table 113. (For 160 A: Test1: Pre-arcing: > 64 kA^2s) (For 160 A: Test2: Operating: < 185 kA^2s)	Test1: 1: 100 kA^2s 2: 111 kA^2s Test2: 3: 146 kA^2s 4: 161 kA^2s	P
8.8	**Verification of the degree of protection of enclosures**		
	If the fuse is fitted in an enclosure, the degree of protection as specified in 5.1.3 shall be verified under the conditions stated in IEC 60529.		NA
8.9	**Verification of resistance to heat**		
	If not otherwise specified in subsequent parts, the resistance to heat is judged by the results of all operating tests, in particular with respect to 8.3, 8.4, 8.5 and 8.10.		P
Part 2 8.9	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 pretreatment. 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.		NA
8.10	**Verification of non-deterioration of contacts**		NA
8.11	**Mechanical and miscellaneous tests**		
8.11.1	**Mechanical strength**		
	If not otherwise specified in the subsequent parts, the mechanical characteristics of a fuse and its parts are judged in the context of normal handling and mounting as well as with the results shown after the breaking-capacity test (see 8.5).		P
Part 2 8.11.1.8	Impact resistance of gripping-lugs of moulded material or of metal fixed in moulded material		NA
8.11.2	**Miscellaneous tests**		
8.11.2.1	**Verification of freedom from season cracking**		
	In order to verify that current-carrying parts made of rolled copper alloy with less than 83 % copper content are free from season cracking, the following test is performed.		P
	All grease is removed from three samples by immersing them for 10 min in a suitable solution. Fuse-links are tested individually, while fuse-holders are only tested with the complete fuse.	3 Fuse-links	P
	The samples shall be placed for 4 h in a test cabinet having a temperature of (30 ± 10) °C.	30°C – 4 h	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	After this, samples are placed for 8 h in a test cabinet, on the bottom of which is an ammonium chloride solution having a pH value of 10-11.	8 h	P
	The samples shall show no cracks visible to the unaided eye when any bluish film is removed by means of a dry cloth. Contact caps of fuse-links shall not be removable by hand.		P
8.11.2.2	**Verification of resistance to abnormal heat and fire**		
	If not otherwise specified in subsequent parts, the following applies. Parts of insulating materials, except ceramic, not necessary to retain current-carrying parts in position even though they are in contact with them are tested according to item a) of 8.11.2.2.5.	8.11.2.2.5.a)	P
	Parts of insulating materials, except ceramic, necessary to retain current-carrying parts and parts of the earthing circuit, if any, in position are tested according to item b) of 8.11.2.2.5.		NA
8.11.2.2.3	The specimen is stored for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 35 % and 75 % before starting the test.	20°C - 50% humidity 24 h	P
8.11.2.2.5	a) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (650 ± 10) °C and (30 ± 1) s.	650°C – 30 s	P
	b) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (960 ± 10) °C and (30 ± 1) s.		NA
	The time at which the specimen ignites and the time when flames extinguish during or after the period of application are noted.	No ignition	P
	The maximum height of any flame is measured and noted, the start of the ignition, which might produce a high flame for a period of approximately 1 s, being disregarded.		NA
	The specimen is considered to have withstood the glow-wire test: – if there is no visible flame and no sustained glowing; – if flames or glowing of the specimen extinguish within 30 s after removal of the glow-wire.	No flame and no sustained glowing	P
	There shall be no burning of the tissue paper or scorching of the pinewood board.		P
8.11.2.3	**Verification of resistance to rusting**		
	All grease is removed from the parts to be tested by immersion in a suitable degreasing agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water, at a temperature of (20 ± 5) °C.	10 min. - 10 % solution of ammonium chloride in water	P
	Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.	10 min.	P

Clause	Requirement – Test	Result-Remark	Verdict
	After the parts have been dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C, their surface shall show no signs of rust.	10 min – 100°C	P
	Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.	No rust	P
Part 2 8.11.2.4	**Non-deterioration of insulating parts of fuse-link and fuse-base**		
Part 2 8.11.2.4.1	Three fuse-links and three fuse-bases to be tested shall be exposed to the following temperatures:	3 Fuse-links	P
	For a period of 168 h: (150 ± 5) °C for fuse-links and fuse-bases comprising moulded elements intended to support live parts,	150°C – 168h	P
	For a period of 168 h: (100 ± 5) °C for covers,		NA
	for a period greater than 1 h: (150 ± 5) °C over 1 h for sealing compounds; stability of the marking.	150°C – 1h	P
	After cooling to ambient temperature the following shall be tested.		
	Fuse-links: verification of the breaking capacity with I_1 and I_2 in accordance with 8.5 of IEC 60269-1.		--
	Fuse-base: verification of the mechanical strength in accordance with 8.11.1.2.		NA
	Sealing compounds shall not have shifted to an extent permitting live parts to be exposed.		P
	The fuse-links shall operate correctly.		P
	The marking shall be durable and easily legible.		P
	Test sample: (Fuse-links)	**NH00 – FB / 125 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	50 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	20 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	a) The fuse-link is subjected to its conventional non-fusing current (*Inf*) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x125 A - 2h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (*If*). It shall operate within the conventional time as specified in Table 2.	1,6x125 – 30 min	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x125 A - 2h Without current - 12 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x125 A - 2h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	-- for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	355 A – 68 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	715 A – 2,8 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	1100 A – 350 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	1910 A – 25 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.		NA
	The test current is then increased to a value of 1,45 *Iz* (*Iz* being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.		NA
	NOTE It is not necessary to perform this test if the product 1,45 *Iz* is greater than the conventional fusing current.	1,45x138 > 1,6x125	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 125 A: 46- 140 kA^2s)	$I_{0,1s}$ – 199 kA^2s $I_{0,01s}$ – 61,4 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 39 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 100 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	35 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	21 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (I_{nf}) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x100 A - 2h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (I_f). It shall operate within the conventional time as specified in Table 2.	1,6x100 A – 28 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x100 A - 2h Without current - 12 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x100 A - 2h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	290 A – 42 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	580 A – 2 s	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	820 A – 320 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	1450 A – 25 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.		NA
	The test current is then increased to a value of 1,45 I_Z (I_Z being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.		NA
	NOTE It is not necessary to perform this test if the product 1,45 I_Z is greater than the conventional fusing current.	1,45x112 > 1,6x100	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 100 A: 27- 86 kA^2s)	$I_{0,1s}$ – 121 kA^2s $I_{0,01s}$ – 37,3 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 24 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 80 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance *R* of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 *In*. The value *R* shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	25 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	21 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (*Inf*) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x80 A - 2h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (*If*). It shall operate within the conventional time as specified in Table 2.	1,6x80 A – 31 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x80 A - 2h Without current - 12 min. Total: 100h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x80 A - 2h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		

Clause	Requirement – Test	Result-Remark	Verdict
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	215 A – 45 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	425 A – 2,1 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	610 A – 420 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	1100 A – 30 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.	16 mm^2 80 A – 2 h	P
	The test current is then increased to a value of 1,45 I_Z (I_Z being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.	1,45x85 A – 44 min.	P
	NOTE It is not necessary to perform this test if the product 1,45 I_Z is greater than the conventional fusing current.		NA
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 80 A: 16- 46 kA^2s)	$I_{0,1s}$ – 71,6 kA^2s $I_{0,01s}$ – 22,1 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 13,9 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 63 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	16 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	21 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (I_{nf}) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x63 A - 1h	P

Clause	Requirement – Test	Result-Remark	Verdict
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (I_f). It shall operate within the conventional time as specified in Table 2.	1,6x63 A – 25 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x63 A - 1h Without current - 6 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x63 A - 1h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	160 A – 55 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	320 A – 2,2 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	450 A – 400 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	820 A – 25 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.	10 mm^2 63 A - 1 h	P
	The test current is then increased to a value of 1,45 *Iz* (*Iz* being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.	1,45x63 A – 42 min.	P
	NOTE It is not necessary to perform this test if the product 1,45 *Iz* is greater than the conventional fusing current.		NA
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 63 A: 9- 27 kA^2s)	$I_{0,1s}$ – 40,3 kA^2s $I_{0,01s}$ – 12,4 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 7,8 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH0 – FB / 50 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		

Clause	Requirement – Test	Result-Remark	Verdict
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	10 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	20 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (I_{nf}) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x50 A - 1h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (I_f). It shall operate within the conventional time as specified in Table 2.	1,6x50 A – 24 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x50 A - 1h Without current - 6 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x50 A - 1h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	125 A – 39 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	250 A – 1,5 s	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	350 A – 350 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	610 A – 20 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.		NA
	The test current is then increased to a value of 1,45 *Iz* (*Iz* being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.		NA
	NOTE It is not necessary to perform this test if the product 1,45 *Iz* is greater than the conventional fusing current.	1,45x63 > 1,6x50	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		

Clause	Requirement – Test	Result-Remark	Verdict
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 50 A: 5- 16 kA^2s)	$I_{0,1s}$ – 17,9 kA^2s $I_{0,01s}$ – 5,5 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 3,5 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 40 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance *R* of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 *In*. The value *R* shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	10 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	21 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (*Inf*) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x40 A - 1h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (*If*). It shall operate within the conventional time as specified in Table 2.	1,6x40 A – 22 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x40 A - 1h Without current - 6 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x40 A - 1h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		

Clause	Requirement – Test	Result-Remark	Verdict
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	95 A – 44 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	190 A – 2,2 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	260 A – 420 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	450 A – 40 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.		NA
	The test current is then increased to a value of 1,45 I_z (I_z being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.		NA
	NOTE It is not necessary to perform this test if the product 1,45 I_z is greater than the conventional fusing current.	1,45x46 > 1,6x40	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 40 A: 3- 9 kA^2s)	$I_{0,1s}$ – 13,4 kA^2s $I_{0,01s}$ – 4,1 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 2,6 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 32A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	6 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ±5) °C.	20 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (I_{nf}) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x32 A - 1h	P

Clause	Requirement – Test	Result-Remark	Verdict
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (I_f). It shall operate within the conventional time as specified in Table 2.	1,6x32 A – 20 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x32 A - 1h Without current - 6 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x32 A - 1h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	75 A – 33 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	150 A – 2,3 s	P
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	200 A – 400 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	350 A – 40 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.		NA
	The test current is then increased to a value of 1,45 *Iz* (*Iz* being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.		NA
	NOTE It is not necessary to perform this test if the product 1,45 *Iz* is greater than the conventional fusing current.	1,45x36 > 1,6x32	P
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 32 A: 1,8- 5 kA^2s)	$I_{0,1s}$ – 8,0 kA^2s $I_{0,01s}$ – 2,5 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 1,5 kA^2s (Annex B2)	P
	Test sample: (Fuse-links)	**NH00 – FB / 25 A**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 101	P
8.1.5.1	**Complete tests**		

Clause	Requirement – Test	Result-Remark	Verdict
	Before the tests are commenced, the internal resistance R of all samples shall be measured at an ambient-air temperature of (20 ± 5) °C with a measuring current of not more than 0,1 I_n. The value R shall be recorded in the test report.	Table 8.1.5.1	P
8.4	**Verification of operation**		
8.4.1	Length and cross-sectional area of conductors connected shall correspond to those specified in 8.3.1 and shall be selected according to the rated current of the fuse-link. See Table 17.	4 mm^2 2 m cable	P
8.4.2	The ambient air temperature during these tests shall be (20 ± 5) °C.	20 °C	P
8.4.3.1	**Verification of conventional non-fusing and fusing current**		
	a) The fuse-link is subjected to its conventional non-fusing current (I_{nf}) for a time equal to the conventional time specified in Table 2. It shall not operate during this time.	1,25x25 A - 1h	P
	b) The fuse-link, after having cooled down to ambient temperature, is subjected to the conventional fusing current (I_f). It shall operate within the conventional time as specified in Table 2.	1,6x25 A – 22 min.	P
8.4.3.2	**Verification of rated current of "g" fuse-links**		
	One fuse-link is submitted to a pulse test for 100 h, in which the fuse-link will be cyclically loaded. Each cycle with an on-period of the conventional time and an off-period of 0,1 of the conventional time, the test current being equal to 1,05 of the rated current of the fuse-link.	1,05x25 A - 1h Without current - 6 min. Total: 100 h	P
	After the test the fuse-link shall not have changed its characteristics. Verification shall be carried out by the test as described in item a) of 8.4.3.1.	1,25x25 A - 1h	P
8.4.3.3	**Verification of time-current characteristics and gates**		
8.4.3.3.1	**Time-current characteristics**		
	– for "g" fuse-links, with the exception of "gD", "gG" and "gM", as adequate tests are carried out in connection with verification of the gates (see 8.4.3.3.2): test 3a) between 10 and 20 times; test 4a) between 5 and 8 times; test 5a) between 2,5 and 4 times the rated current of the fuse-link;		NA
	– for "a" fuse-links: test 3a) between 5 k_2 and 8 k_2 times; test 3b) between 2 k_2 and 3 k_2 times; test 5a) between k_2 and 1,5 k_2 times the rated current of the fuse-link (see Figure 2).		NA
8.4.3.3.2	**Verification of gates**		
	a) A fuse-link is subjected to the current of Table 3, column 2 for 10 s. It shall not operate.	52 A – 134 s	P
	b) A fuse-link is subjected to the current of Table 3, column 3. It shall operate within 5 s.	110 A – 2,1 s	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	c) A fuse-link is subjected to the current of Table 3, column 4 for 0,1 s. It shall not operate.	150 A – 400 ms	P
	d) A fuse-link is subjected to the current of Table 3, column 5. It shall operate within 0,1 s.	260 A – 35 ms	P
	Additional to the tests of 8.4.3.3.1, "aM" fuse-links shall comply the following tests which can be made at a reduced voltage.		NA
	e) A fuse-link is subjected to the current of Table 4, column 2, for 60 s. It shall not operate.		NA
	f) A fuse-link is subjected to the current of Table 4, column 3. It shall operate within 60 s.		NA
	g) A fuse-link is subjected to the current of Table 4, column 5, for 0,2 s. It shall not operate.		NA
	h) A fuse-link is subjected to the current of Table 4, column 7. It shall operate within 0,10 s.		NA
	These tests for « aM » fuses shall be conducted with the conductor cross-section areas defined in Table 18.		NA
8.4.3.4	**Overload**		
	The test arrangement is the same as that for the temperature-rise test (see 8.3.1). Three fuse links shall be submitted to 50 pulses having the same duration and the same test current.	50 pulses	P
	For "g" fuse-links, the test current shall be 0,8 times the current determined from the manufacturer's minimum pre-arcing time-current characteristics for a pre-arcing time of 5s. The duration of each pulse shall be 5 s and the time interval between pulses shall be 20 % of the conventional time specified in Table 2.	0,8x85 A - 5 s Without current - 12 min.	P
	After having been allowed to cool down to ambient air temperature, the fuse-links shall be subjected to a current equal to that used during the overload test. The pre-arcing time, when passing this current, shall be shown to lie within the manufacturer's time-current zone.	0,8x85 A 1: 16 s 2: 15 s 3: 17 s	P
8.4.3.5	**Conventional cable overload protection (for "gG" fuse-links only)**		
	The fuse-link is mounted in its appropriate fuse holder or test rig as specified in 8.4.1, but provided with PVC insulated copper conductors of a cross-sectional area as specified in Table 19. The fuse and the conductor connected to it shall be preheated with the rated current of the fuse-link for a time equal to the conventional time.	2,5 mm^2 25 A - 1 h	P
	The test current is then increased to a value of 1,45 *Iz* (*Iz* being specified in Table 19). The fuse-link shall operate in a time less than the conventional time.	1,45x27 A – 27 min.	P
	NOTE It is not necessary to perform this test if the product 1,45 *Iz* is greater than the conventional fusing current.		NA
8.4.3.6	**Operation of indicating devices and striker, if any**		
	The correct operation of indicating devices is verified in combination with the verification of breaking capacity	Clause 8.7.4	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	For verifying the operation of strikers, if any, an additional test sample shall be tested at a current: —I_4 in the case of "g" fuse-links; —2 k_1In in the case of "a" fuse-links;		NA
	and at a recovery voltage of: —20 V for rated voltages not exceeding 500 V; —0,04 *Un* for rated voltages exceeding 500 V. The values of the recovery voltage may be exceeded by 10%.		NA
	The striker shall operate during all tests made at a recovery voltage of —at least 20 V.		NA
8.5	**Verification of the breaking capacity**	Report no: IPH 1211.0251.1.191	--
8.6	**Verification of the cut-off current characteristics**		
8.6.1	If the manufacturer has stated the cut-off current characteristic, this characteristic shall be verified for the prospective current in connection with test no. 1 (see 8.5), and the corresponding value shall be computed from the oscillograms.	Report no: IPH 1211.0251.1.191	--
8.6.2	The values measured shall not exceed those indicated by the manufacturer (see 5.8.1).		--
8.7	**Verification of I^2t characteristics and overcurrent discrimination**		
8.7.1	The I^2t characteristics indicated by the manufacturer shall be verified from the results of the breaking-capacity test, or can be given by a calculation based on measured values taking into account service conditions (see Annex B).	Annex B	P
8.7.2	The operating I^2t values measured shall not exceed the values indicated by the manufacturer or specified in subsequent parts.		NA
	The pre-arcing I^2t values shall be not less than the minimum pre-arcing values given by the manufacturer, or they shall lie within the limits indicated in Table 7 (see 5.8.2 and Annex B).	Clause 8.7.3	P
	The operating I^2t values given by the breaking capacity tests can be used to calculate values for other voltages using the formula in Clause B.3.		NA
8.7.3	**Verification of compliance for fuse-links at 0,01 s**		
	Compliance with Table 7 is determined from the pre-arcing I^2t values obtained from the test during I2 and the pre-arcing I^2t values at 0,1 s. (For 25 A: 1- 3 kA^2s)	$I_{0,1s}$ – 4,5 kA^2s $I_{0,01s}$ – 1,4 kA^2s (Annex B1)	P
	The pre-arcing I^2t values for test duty I2 for the smaller current ratings of a homogeneous series can be calculated from the formula given in Annex B.	Min. pre-arcing I_2 – 0,9 kA^2s (Annex B2)	P
8.7.4	**Verification of overcurrent discrimination**		
	The discrimination of the fuse-links is verified by means of the time-current characteristics and the pre-arcing and operating I^2t values.		P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
Part 2 8.7.4	Four samples are tested, two samples are tested at the r.m.s. prospective test current I, corresponding to the minimum pre-arcing I^2t values, the other samples at the r.m.s. prospective test current I, corresponding to the operating I^2t values.	Test1: 550 A, Pf: 0,25 Test2: 1000 A, Pf: 0,25	P
	The test voltage for 690 V fuses is $1{,}05 \times \frac{U_n}{\sqrt{3}}$.		NA
	The test voltage for all other fuses is $1{,}1 \times \frac{U_n}{\sqrt{3}}$.	400 V (Measured values were calculated for 320 V according to Annex B3)	P
	The evaluated I^2t values shall lie within the corresponding I^2t limits specified in Table 113. (For 25 A: Test1: Pre-arcing: > 1,21 kA^2s) (For 25 A: Test2: Operating: < 4 kA^2s)	Test1: 1: 1,98 kA^2s 2: 1,76 kA^2s Test2: 3: 3,0 kA^2s 4: 3,1 kA^2s	P
8.8	**Verification of the degree of protection of enclosures**		
	If the fuse is fitted in an enclosure, the degree of protection as specified in 5.1.3 shall be verified under the conditions stated in IEC 60529.		NA
8.9	**Verification of resistance to heat**		
	If not otherwise specified in subsequent parts, the resistance to heat is judged by the results of all operating tests, in particular with respect to 8.3, 8.4, 8.5 and 8.10.		P
Part 2 8.9	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 pretreatment. 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.		NA
	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.		NA
8.10	**Verification of non-deterioration of contacts**		NA
8.11	**Mechanical and miscellaneous tests**		
8.11.1	**Mechanical strength**		
	If not otherwise specified in the subsequent parts, the mechanical characteristics of a fuse and its parts are judged in the context of normal handling and mounting as well as with the results shown after the breaking-capacity test (see 8.5).		P
Part 2 8.11.1.8	Impact resistance of gripping-lugs of moulded material or of metal fixed in moulded material		NA
8.11.2	**Miscellaneous tests**		
8.11.2.2	**Verification of resistance to abnormal heat and fire**		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	If not otherwise specified in subsequent parts, the following applies. Parts of insulating materials, except ceramic, not necessary to retain current-carrying parts in position even though they are in contact with them are tested according to item a) of 8.11.2.2.5.	8.11.2.2.5.a)	P
	Parts of insulating materials, except ceramic, necessary to retain current-carrying parts and parts of the earthing circuit, if any, in position are tested according to item b) of 8.11.2.2.5.		NA
8.11.2.2.3	The specimen is stored for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 35 % and 75 % before starting the test.	20°C - 50% humidity 24 h	P
8.11.2.2.5	a) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (650 ± 10) °C and (30 ± 1) s.	650°C – 30 s	P
	b) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (960 ± 10) °C and (30 ± 1) s.		NA
	The time at which the specimen ignites and the time when flames extinguish during or after the period of application are noted.	No ignition	P
	The maximum height of any flame is measured and noted, the start of the ignition, which might produce a high flame for a period of approximately 1 s, being disregarded.		NA
	The specimen is considered to have withstood the glow-wire test: – if there is no visible flame and no sustained glowing; – if flames or glowing of the specimen extinguish within 30 s after removal of the glow-wire.	No flame and no sustained glowing	P
	There shall be no burning of the tissue paper or scorching of the pinewood board.		P
8.11.2.3	**Verification of resistance to rusting**		
	All grease is removed from the parts to be tested by immersion in a suitable degreasing agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water, at a temperature of (20 ± 5) °C.	10 min. - 10 % solution of ammonium chloride in water	P
	Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.	10 min.	P
	After the parts have been dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C, their surface shall show no signs of rust.	10 min – 100°C	P
	Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.	No rust	P
Part 2 8.11.2.4	**Non-deterioration of insulating parts of fuse-link and fuse-base**		
Part 2 8.11.2.4.1	Three fuse-links and three fuse-bases to be tested shall be exposed to the following temperatures:	3 Fuse-links	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	For a period of 168 h: (150 ± 5) °C for fuse-links and fuse-bases comprising moulded elements intended to support live parts,	150°C – 168h	P
	For a period of 168 h: (100 ± 5) °C for covers,		NA
	for a period greater than 1 h: (150 ± 5) °C over 1 h for sealing compounds; stability of the marking.	150°C – 1h	P
	After cooling to ambient temperature the following shall be tested.		
	Fuse-links: verification of the breaking capacity with I_1 and I_2 in accordance with 8.5 of IEC 60269-1.		--
	Sealing compounds shall not have shifted to an extent permitting live parts to be exposed.		P
	The fuse-links shall operate correctly.		P
	The marking shall be durable and easily legible.		P
	Test sample: (Fuse-Base)	**NH00 - FA / 160 A (bmc)**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 102	P
8.2	**Verification of the insulating properties and of the suitability for isolation**		
8.2.1	Arrangement of the fuse-holder		
	In addition to the conditions of 8.1.4, the fuse-holder shall be fitted with fuse-links of the largest dimensions envisaged for the type of fuse-holder concerned.	160 A	P
	Unless otherwise specified by the manufacturer, the fuse-base shall be fixed to a metal plate.		P
8.2.2	Verification of the insulating properties		
	The test voltage for the verification of the insulating properties shall be applied		
	a) between live parts and the frame with the fuse-link and the device for replacing it or the fuse-carrier, if any, in position;	1890 V	P
	b) between the terminals when the fuse is in normal open position, the fuse-link remaining inside the fuse-carrier, or when the fuse-link and the device for replacing it or the fuse carrier, if any, are removed;	1890 V.	P
	c) between live parts of different polarity in the case of a multipole fuse-holder with fuse-links of the maximum dimensions intended for that fuse-holder inserted and the device(s) for replacing the fuse-link(s) or the fuse-carrier(s), if any, in position;		NA
	d) between live parts which, in the case of a multipole fuse-holder, can reach different potentials after the fuse-link has operated, with the fuse-carrier(s) or the device(s) for replacing the fuse-link(s) alone (without fuse-links) in position.		NA

Clause	Requirement – Test	Result-Remark	Verdict
Part 2 8.2.2.1	e) between isolated metal gripping-lugs and the terminals of the test fuse-base.		NA
8.2.2.2	The values of test voltage are shown in Table 15 as a function of the rated voltage of the fuse-holder.	1890 V	P
8.2.2.3.1	The test voltage shall be applied progressively and maintained at its full value given in Table 15 for 1 min.	1 min.	P
8.2.4.1	Throughout the application of the test voltage according to Table 15, there shall be no breakdown of insulation or flashover. Glow discharges unaccompanied by a drop in voltage can be neglected.	No	P
8.2.2.3.2	The fuse-holder shall be subjected to humid atmospheric conditions.		P
	The humidity treatment shall be performed in a humidity cabinet containing air with a relative humidity maintained between 91 % and 95 %.	% 95	P
	The temperature of the air, at the place where the sample is located, shall be maintained within 2 K of any convenient value T between 20 °C and 30 °C.	25 °C	P
	The sample shall be kept in the cabinet for 48 h.	48 h	P
	Immediately after this treatment, and after wiping off any drops of water that result from condensation, the insulation resistance shall be measured between the points prescribed in 8.2.2.1 by applying a d.c. voltage of approximately 500 V.	500 Vdc	P
8.2.4.2	The insulation resistance measured according to 8.2.2.3.2 shall be not less than 1 MΩ.	> 1 MΩ	P
8.2.3	Verification of the suitability for isolation		
	Clearances and creepage distances shall be verified by dimensional measurement and by voltage test.		
	Rated impulse withstand voltage (Uimp):	8 kV	P
	Minimum clearances (Table 9: > 8 mm)	9 mm	P
	Rated voltage:	500 V	P
	Material group:	II	P
	Minimum creepage distances (Table 10: > 9 mm)	10 mm	P
8.2.3.1	The test voltage for the verification of the suitability for isolation shall be applied between the terminals when the fuse-link and the device for replacing it or the fuse-carrier, if any, are removed, or the equipment is in its normal open position with the fuse-link remaining inside the fuse-carrier.	Between the terminals	P
8.2.3.2	The test voltage for the verification of the rated impulse withstand voltage is given in Table 16.	12,3 kV	P
8.2.3.3	The 1,2/50 µs impulse voltage according to Table 16 shall be applied five times for each polarity at intervals of 1 s minimum.	5 s - 5 times	P
8.2.4.1	There shall be no disruptive discharge during the test with the impulse voltage.	No disruptive discharge	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
Part 2 8.2.3.2	The insulating properties of isolated metal gripping-lugs may optionally be verified by an impulse withstand voltage test. The relevant rated impulse withstand voltage is given in Table 110 with reference to the rated voltage of the fuse-link.		NA
Part 2 8.2.3.3	Five impulses of both polarities and of the shape 1,2/50 µs according to IEC 60060-1 and at the rated withstand voltage level according to Table 110 are applied to the test object. The minimum period between the impulses shall be 1 s.		NA
Part 2 8.2.4.3	No flash-over or puncture shall occur during the test. Partial discharges are ignored.		NA
	Fuse-links with metal gripping-lugs without electrical contact to the blade contacts which do not comply with the requirements of 7.2 are not considered as isolated in service. They need, however, to fulfil the requirements of 8.9.2 and 8.11.1.8.		NA
Part 2 8.2.5	**Resistance to tracking**		
	The test of insulating parts supporting live parts of the fuse-links (fuse body) and fuse-bases is carried out according to IEC 60112 using test solution A. Five specimens shall be tested and shall pass at PTI 400. Ceramic isolators need not to be tested.		NA
8.3	**Verification of temperature rise and power dissipation**		
	The test shall be performed at an ambient air temperature of (20 ± 5) °C.	22°C	P
	The connections on either side of each single fuse shall be not less than 1 m in length.	2 m	P
	Unless specified in subsequent parts, the cross-sectional area shall be selected in accordance with Table 17.	70 mm² cable	P
Part 2 8.3.1	If not, the screws or nuts of the terminals shall be fastened in accordance with Table 111.	10 Nm	P
8.3.4.1	Temperature rise of the fuse-holder		
	The test for temperature rise shall be made with a.c. by using a fuse-link which, at the rated current of the fuse-holder, attains a power dissipation equivalent to the rated acceptable power dissipation of the fuse-holder or with a dummy fuse-link where specified in subsequent parts. The current applied shall be the rated current of the fuse-holder.	160 A 12 W dummy fuse-link	P
Part 2 8.3.4.1	The dummy is given in Figure 105. The point at which the temperature rise is measured is marked with E in Figure 106.		P
8.3.5	The temperature rises shall not exceed the values specified in Table 5.		
	Spring loaded contacts (Unenclosed, silver-plated: Limited only by the necessity of not causing any damage to adjacent parts)	58 K	P
	Terminals (Unenclosed, silver plated: ≤ 70 K)	50 K	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	The acceptable power dissipation of the fuse-holder shall be not less than the rated power dissipation of the fuse-links intended to be used in that fuse-holder, or the values specified in subsequent parts.	12 W	P
	After the test, the fuse shall be in a satisfactory condition. In particular, the insulating parts of the fuse-holders shall withstand the test voltage according to 8.2 after having cooled down to ambient temperature (see Table 15); in addition, they shall not have suffered any deformation that would impair their correct operation.	1890 V	P
Part 2 8.5.5.1	**Verification of the peak withstand current of a fuse-base**		
	The verification of the peak withstand current of a fuse-base need not be carried out, if this has already been verified during the breaking capacity test of the fuse-links with the highest rating of the size or if the minimum withdrawal forces according to 8.11 are exceeded.	See Part 2 8.11.1.2	P
8.8	**Verification of the degree of protection of enclosures**		
	If the fuse is fitted in an enclosure, the degree of protection as specified in 5.1.3 shall be verified under the conditions stated in IEC 60529.		NA
8.9	**Verification of resistance to heat**		
	If not otherwise specified in subsequent parts, the resistance to heat is judged by the results of all operating tests, in particular with respect to 8.3, 8.4, 8.5 and 8.10.		P
Part 2 8.9	These tests apply to fuse-links and fuse-bases.		--
	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 pretreatment. 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.		NA
Part 2 8.9.1	Fuse-base		
Part 2 8.9.1.1	A dummy fuse-link according to Figure 105 is fitted into a fuse-base and also suspended from a measuring device as shown, for example, in Figure 108.	Figure 105	P
	The conductor cross-section depends upon the rated current (see IEC 60269-1, Table 17), and the connections outside the heating chamber shall be at least 1 m long.	70 mm^2 2 m cable	P
Part 2 8.9.1.2	The temperature in the heating chamber is raised to 80 °C, and maintained for 2 h. The dummy is then loaded with approximately 160 % rated current with a tolerance of ±2 % for 2 h. The test may be carried out at reduced voltage.	80 °C Without current: 2 h With current: 2 h – 256 A	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	After loading and 3 min after switching off, a tensile force Fmax (see Table 118) is applied smoothly to the dummy. The force Fmax is exerted for a period of 15 s.	250 N, 15 s	P
Part 2 8.9.1.3	After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. After pulling out of the dummy the dimensions of Figure 102 are to be considered. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.		P
Part 2 8.9.2	Fuse-links with gripping lugs of moulded material or of metal fixed in moulded material		NA
8.10	**Verification of non-deterioration of contacts**		
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 subsequent parts)	160 A Dummy fuse-links (12 W)	P
Part 2 8.10.1	The dummy fuse-link is given in Figure 105.	Part 2: Figure 105	P
	For lug terminals, the torques are given in Table 111.	10 Nm	P
	The insulation of the conductors shall be removed over the whole length.	2 m	P
	All covers of contacts and terminals shall be removed for this test only.		P
Part 2 8.10.1.2	Direct terminal clamps		NA
8.10.2	Test method		
	The test samples are submitted to a first test of 250 cycles. If the test results are satisfactory after this, the test is stopped. If the test results exceed the specified limits, the test is continued up to 750 cycles.		
	Before the beginning of the cycling test, the temperature rise and/or the voltage drop of the contacts as specified in subsequent parts shall be measured at rated current when steady state conditions have been obtained. The test shall be repeated after 250 cycles and, if necessary, after 750 cycles.	Before the cycling test 1) 59 K 2) 59 K 3) 58 K	P
Part 2 8.10.2	Test current: conventional non-fusing current I_{nf}	1,25 x 160 = 200 A	P
	Load period: 25 % of the conventional time	120 x 0,25 = 30 min.	P
	No-load period: 10 % of the conventional time	120 x 0,1 = 12 min	P
	A test voltage lower than the rated voltage may be used.		P
	During the no-load period the samples are cooled down to a temperature lower than 35 °C; additional cooling (for example, a fan) is allowed.	Cooled down by a fan	P
	The voltage drop shall be measured after 50 cycles and 250 cycles and, if necessary, after 500 cycles and 750 cycles.	50, 250	P

Clause	Requirement – Test	Result-Remark	Verdict
	The voltage drop is measured at direct current of I_m = (0,05 to 0,20) I_{nf}. However, the current I_m shall be chosen so as to give a voltage drop of at least 100 µV. If it is necessary, the upper limit of I_m may be increased to 0,30 I_{nf}.	20 A DC	P
Part 2 8.10.2.1	Contacts		
	The points between which the voltage drop is measured are marked as A and B in Figure 106.	Figure 106: A and B	P
	Withdrawal force measured force after 250 cycles (N)	1) 130 N 2) 130 N 3) 140 N	P
	Withdrawal force measured force after 750 cycles (N)	1) 2) 3)	NA
	The withdrawal forces shall be within the limits of Table 118. If the measured values are too low, the dynamic test in accordance with 8.5.5.1 shall be performed.	Table118: 80- 250 N	P
Part 2 8.10.2.2	Direct terminal clamps		NA
Part 2 8.10.3	Acceptability of test results		
Part 2 8.10.3.1	Contacts		
	If at the end of the 250th cycle the measured values do not exceed the following limit, the fuse-base is considered to have passed the test and the test may be stopped: $(R_{250}-R_{50})/R_{50} \leq 15\%$	R_{50} R_{250} 1) 105,2 110,8 µΩ 2) 102,4 108,1 µΩ 3) 100,3 108,2 µΩ	P
	If at the end of the 250th cycle the above limit is exceeded, the test is continued. After 500 cycles the following limit shall not be exceeded: $(R_{500}-R_{250})/R_{250} \leq 30\%$		NA
	If the limit is exceeded, the test is not satisfied. If the limit is not exceeded, the test is continued up to 750 cycles. At the end of the 750th cycle the following limit shall not be exceeded: $(R_{750}-R_{50})/R_{50} \leq 40\%$		NA
	The difference of the temperature rise between the last and the first measurement shall be less than 20 K.	After the cycling test 1) 60 K 2) 59 K 3) 59 K	P
8.11	**Mechanical and miscellaneous tests**		
8.11.1	**Mechanical strength**		
	If not otherwise specified in the subsequent parts, the mechanical characteristics of a fuse and its parts are judged in the context of normal handling and mounting as well as with the results shown after the breaking-capacity test (see 8.5).		--
Part 2 8.11.1.1	Mechanical strength of fuse-holders		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	The fuse-holder, fitted with a dummy fuse-link of Figure 105 or 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.	Dummy fuse-links (Part 2: Figure 105) Terminal: 49 K	P
	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.	100 times	P
	At the conclusion of these tests, all parts shall be intact and shall function normally.		P
	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.	Terminal: 50 K Difference: 1 K	P
Part 2 8.11.1.2	Mechanical strength of the fuse-base		
	The test to verify the contact force of fuse-bases is performed with three unused fuse-bases as supplied. A test-link made of hardened steel with polished and chrome-plated surfaces is inserted three times in the fuse-base. The dimensions of the blade contacts of the fuse-link are identical with the dimensions according to Figure 101.	Figure 101	
	When pulling steadily by means of suitable test equipment, the withdrawal force F measured (see Figure 108) shall be found to lie within the limits as specified in Table 118. (NH0: 80- 300 N)	1) 130 N 2) 140 N 3) 140 N	P
	In order to verify that the fuse-base contacts are firmly seated, steel screws (class 8.8) are fastened at the terminals. They are fastened three times by applying a torque of 1,2 times the value specified by the manufacturer or, where no value is specified, 1,2 times the value of Table 111. For flat connections requiring a nut, steps shall be taken to prevent, by suitable means, the nut from turning round.	10 x 1,2 = 12 N	P
	After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.		
Part 2 8.11.1.8	Impact resistance of gripping-lugs of moulded material or of metal fixed in moulded material		NA
8.11.2	**Miscellaneous tests**		
8.11.2.1	**Verification of freedom from season cracking**		
	In order to verify that current-carrying parts made of rolled copper alloy with less than 83 % copper content are free from season cracking, the following test is performed.		NA

Clause	Requirement – Test	Result-Remark	Verdict
	All grease is removed from three samples by immersing them for 10 min in a suitable solution. Fuse-links are tested individually, while fuse-holders are only tested with the complete fuse.		NA
	The samples shall be placed for 4 h in a test cabinet having a temperature of (30 ± 10) °C.		NA
	After this, samples are placed for 8 h in a test cabinet, on the bottom of which is an ammonium chloride solution having a pH value of 10-11.		NA
	The samples shall show no cracks visible to the unaided eye when any bluish film is removed by means of a dry cloth. Contact caps of fuse-links shall not be removable by hand.		NA
8.11.2.2	**Verification of resistance to abnormal heat and fire**		
	If not otherwise specified in subsequent parts, the following applies. Parts of insulating materials, except ceramic, not necessary to retain current-carrying parts in position even though they are in contact with them are tested according to item a) of 8.11.2.2.5.		NA
	Parts of insulating materials, except ceramic, necessary to retain current-carrying parts and parts of the earthing circuit, if any, in position are tested according to item b) of 8.11.2.2.5.		P
8.11.2.2.3	The specimen is stored for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 35 % and 75 % before starting the test.	24 h, 20 °C 55% humidity	P
8.11.2.2.5	a) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (650 ± 10) °C and (30 ± 1) s.		NA
	b) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (960 ± 10) °C and (30 ± 1) s.	960 °C, 30 s	P
8.11.2.2.6	During application of the glow-wire and during a further period of 30 s, the specimen, the parts surrounding the specimen, and the layer of tissue paper placed below it shall be observed.	No ignition	P
	The time at which the specimen ignites and the time when flames extinguish during or after the period of application are noted.	No ignition	P
	The maximum height of any flame is measured and noted, the start of the ignition, which might produce a high flame for a period of approximately 1 s, being disregarded.		NA
	The specimen is considered to have withstood the glow-wire test: – if there is no visible flame and no sustained glowing; – if flames or glowing of the specimen extinguish within 30 s after removal of the glow-wire.	No visible flame, No sustained glowing	P
	There shall be no burning of the tissue paper or scorching of the pinewood board.		P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
8.11.2.3	**Verification of resistance to rusting**		
	All grease is removed from the parts to be tested by immersion in a suitable degreasing agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water, at a temperature of (20 ± 5) °C.	10 min. - 10 % solution of ammonium chloride in water	P
	Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.	10 min - 98% humidity	P
	After the parts have been dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C, their surface shall show no signs of rust.	10 min – 100°C	P
	Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.	No rust	P
Part 2 8.11.2.4	**Non-deterioration of insulating parts of fuse-link and fuse-base**		
Part 2 8.11.2.4.1	Three fuse-links and three fuse-bases to be tested shall be exposed to the following temperatures:	3 fuse-bases	P
	For a period of 168 h: (150 ± 5) °C for fuse-links and fuse-bases comprising moulded elements intended to support live parts,	168 h, 150°C	P
	For a period of 168 h: (100 ± 5) °C for covers,		NA
	for a period greater than 1 h: (150 ± 5) °C over 1 h for sealing compounds; stability of the marking.	3 h, 150°C	P
	After cooling to ambient temperature the following shall be tested.		
	Fuse-base: verification of the mechanical strength in accordance with 8.11.1.2.		P
Part 2 8.11.2.4.2	The positions of the fuse-base contacts taking the fuse-link shall not have changed in a manner likely to affect its correct functioning. The insulating body on which the terminals are fixed shall neither fracture nor show any signs of a fracture. The mechanical strength of cemented joints shall not have been impaired.		P
	Sealing compounds shall not have shifted to an extent permitting live parts to be exposed.		NA
	The marking shall be durable and easily legible.		P
	Test sample: (Fuse-Base)	**NH00 - FA / 160 A (steatit)**	
8.1.4	**Arrangement of the fuse and dimensions**		
	Before the tests are started, the specified external dimensions shall be measured and the results compared with the dimensions specified in the relevant data sheets of the manufacturer or specified in subsequent parts.	Part 2: Figure 102	P
8.2	**Verification of the insulating properties and of the suitability for isolation**		
8.2.1	Arrangement of the fuse-holder		
	In addition to the conditions of 8.1.4, the fuse-holder shall be fitted with fuse-links of the largest dimensions envisaged for the type of fuse-holder concerned.	160 A	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Unless otherwise specified by the manufacturer, the fuse-base shall be fixed to a metal plate.		P
8.2.2	Verification of the insulating properties		
	The test voltage for the verification of the insulating properties shall be applied		
	a) between live parts and the frame with the fuse-link and the device for replacing it or the fuse-carrier, if any, in position;	1890 V	P
	b) between the terminals when the fuse is in normal open position, the fuse-link remaining inside the fuse-carrier, or when the fuse-link and the device for replacing it or the fuse carrier, if any, are removed;	1890 V	P
	c) between live parts of different polarity in the case of a multipole fuse-holder with fuse-links of the maximum dimensions intended for that fuse-holder inserted and the device(s) for replacing the fuse-link(s) or the fuse-carrier(s), if any, in position;		NA
	d) between live parts which, in the case of a multipole fuse-holder, can reach different potentials after the fuse-link has operated, with the fuse-carrier(s) or the device(s) for replacing the fuse-link(s) alone (without fuse-links) in position.		NA
Part 2 8.2.2.1	e) between isolated metal gripping-lugs and the terminals of the test fuse-base.		NA
8.2.2.2	The values of test voltage are shown in Table 15 as a function of the rated voltage of the fuse-holder.	1890 V	P
8.2.2.3.1	The test voltage shall be applied progressively and maintained at its full value given in Table 15 for 1 min.	1 min.	P
8.2.4.1	Throughout the application of the test voltage according to Table 15, there shall be no breakdown of insulation or flashover. Glow discharges unaccompanied by a drop in voltage can be neglected.	No	P
8.2.2.3.2	The fuse-holder shall be subjected to humid atmospheric conditions.		P
	The humidity treatment shall be performed in a humidity cabinet containing air with a relative humidity maintained between 91 % and 95 %.	% 95	P
	The temperature of the air, at the place where the sample is located, shall be maintained within 2 K of any convenient value T between 20 °C and 30 °C.	25 °C	P
	The sample shall be kept in the cabinet for 48 h.	48 h	P
	Immediately after this treatment, and after wiping off any drops of water that result from condensation, the insulation resistance shall be measured between the points prescribed in 8.2.2.1 by applying a d.c. voltage of approximately 500 V.	500 Vdc	P
8.2.4.2	The insulation resistance measured according to 8.2.2.3.2 shall be not less than 1 MΩ.	> 1 MΩ	P
8.2.3	Verification of the suitability for isolation		

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	Clearances and creepage distances shall be verified by dimensional measurement and by voltage test.		
	Rated impulse withstand voltage (Uimp):	8 kV	P
	Minimum clearances (Table 9: > 8 mm)	13,5 mm	P
	Rated voltage:	500 V	P
	Material group:	II	P
	Minimum creepage distances (Table 10: > 9 mm)	14 mm	P
8.2.3.1	The test voltage for the verification of the suitability for isolation shall be applied between the terminals when the fuse-link and the device for replacing it or the fuse-carrier, if any, are removed, or the equipment is in its normal open position with the fuse-link remaining inside the fuse-carrier.	Between the terminals	P
8.2.3.2	The test voltage for the verification of the rated impulse withstand voltage is given in Table 16.	12,3 kV	P
8.2.3.3	The 1,2/50 µs impulse voltage according to Table 16 shall be applied five times for each polarity at intervals of 1 s minimum.	5 s - 5 times	P
8.2.4.1	There shall be no disruptive discharge during the test with the impulse voltage.	No disruptive discharge	P
Part 2 8.2.3.2	The insulating properties of isolated metal gripping-lugs may optionally be verified by an impulse withstand voltage test. The relevant rated impulse withstand voltage is given in Table 110 with reference to the rated voltage of the fuse-link.		NA
Part 2 8.2.3.3	Five impulses of both polarities and of the shape 1,2/50 µs according to IEC 60060-1 and at the rated withstand voltage level according to Table 110 are applied to the test object. The minimum period between the impulses shall be 1 s.		NA
Part 2 8.2.4.3	No flash-over or puncture shall occur during the test. Partial discharges are ignored.		NA
	Fuse-links with metal gripping-lugs without electrical contact to the blade contacts which do not comply with the requirements of 7.2 are not considered as isolated in service. They need, however, to fulfil the requirements of 8.9.2 and 8.11.1.8.		NA
Part 2 8.2.5	**Resistance to tracking**		
	The test of insulating parts supporting live parts of the fuse-links (fuse body) and fuse-bases is carried out according to IEC 60112 using test solution A. Five specimens shall be tested and shall pass at PTI 400. Ceramic isolators need not to be tested.		NA
8.3	**Verification of temperature rise and power dissipation**		
	The test shall be performed at an ambient air temperature of (20 ± 5) °C.	21°C	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	The connections on either side of each single fuse shall be not less than 1 m in length.	2 m	P
	Unless specified in subsequent parts, the cross-sectional area shall be selected in accordance with Table 17.	70 mm² cable	P
Part 2 8.3.1	If not, the screws or nuts of the terminals shall be fastened in accordance with Table 111.	10 Nm	P
8.3.4.1	Temperature rise of the fuse-holder		
	The test for temperature rise shall be made with a.c. by using a fuse-link which, at the rated current of the fuse-holder, attains a power dissipation equivalent to the rated acceptable power dissipation of the fuse-holder or with a dummy fuse-link where specified in subsequent parts. The current applied shall be the rated current of the fuse-holder.	160 A 12 W dummy fuse-link	P
Part 2 8.3.4.1	The dummy is given in Figure 105. The point at which the temperature rise is measured is marked with E in Figure 106.		P
8.3.5	The temperature rises shall not exceed the values specified in Table 5.		
	Spring loaded contacts (Unenclosed, silver-plated: Limited only by the necessity of not causing any damage to adjacent parts)	57 K	P
	Terminals (Unenclosed, silver plated: ≤ 70 K)	48 K	P
	The acceptable power dissipation of the fuse-holder shall be not less than the rated power dissipation of the fuse-links intended to be used in that fuse-holder, or the values specified in subsequent parts.	12 W	P
	After the test, the fuse shall be in a satisfactory condition. In particular, the insulating parts of the fuse-holders shall withstand the test voltage according to 8.2 after having cooled down to ambient temperature (see Table 15); in addition, they shall not have suffered any deformation that would impair their correct operation.	1890 V	P
Part 2 8.5.5.1	**Verification of the peak withstand current of a fuse-base**		
	The verification of the peak withstand current of a fuse-base need not be carried out, if this has already been verified during the breaking capacity test of the fuse-links with the highest rating of the size or if the minimum withdrawal forces according to 8.11 are exceeded.	See Part 2 8.11.1.2	P
8.8	**Verification of the degree of protection of enclosures**		
	If the fuse is fitted in an enclosure, the degree of protection as specified in 5.1.3 shall be verified under the conditions stated in IEC 60529.		NA
8.9	**Verification of resistance to heat**		
	If not otherwise specified in subsequent parts, the resistance to heat is judged by the results of all operating tests, in particular with respect to 8.3, 8.4, 8.5 and 8.10.		P
Part 2 8.9	These tests apply to fuse-links and fuse-bases.		--

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	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 pretreatment. 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.		NA
Part 2 8.9.1	Fuse-base		
Part 2 8.9.1.1	A dummy fuse-link according to Figure 105 is fitted into a fuse-base and also suspended from a measuring device as shown, for example, in Figure 108.	Figure 105	P
	The conductor cross-section depends upon the rated current (see IEC 60269-1, Table 17), and the connections outside the heating chamber shall be at least 1 m long.	70 mm^2 2 m cable	P
Part 2 8.9.1.2	The temperature in the heating chamber is raised to 80 °C, and maintained for 2 h. The dummy is then loaded with approximately 160 % rated current with a tolerance of ±2 % for 2 h. The test may be carried out at reduced voltage.	80°C Without current: 2 h With current: 2 h -- 256 A	P
	After loading and 3 min after switching off, a tensile force Fmax (see Table 118) is applied smoothly to the dummy. The force Fmax is exerted for a period of 15 s.	250 N, 15 s	P
Part 2 8.9.1.3	After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. After pulling out of the dummy the dimensions of Figure 102 are to be considered. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.		P
Part 2 8.9.2	Fuse-links with gripping lugs of moulded material or of metal fixed in moulded material		NA
8.10	**Verification of non-deterioration of contacts**		
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 subsequent parts)	160 A Dummy fuse-links (12 W)	P
Part 2 8.10.1	The dummy fuse-link is given in Figure 105.	Part 2: Figure 105	P
	For lug terminals, the torques are given in Table 111.	10 Nm	P
	The insulation of the conductors shall be removed over the whole length.	2 m	P
	All covers of contacts and terminals shall be removed for this test only.		P
Part 2 8.10.1.2	Direct terminal clamps		NA
8.10.2	Test method		

Clause	Requirement – Test	Result-Remark	Verdict
	The test samples are submitted to a first test of 250 cycles. If the test results are satisfactory after this, the test is stopped. If the test results exceed the specified limits, the test is continued up to 750 cycles.		
	Before the beginning of the cycling test, the temperature rise and/or the voltage drop of the contacts as specified in subsequent parts shall be measured at rated current when steady state conditions have been obtained. The test shall be repeated after 250 cycles and, if necessary, after 750 cycles.	Before the cycling test 1) 56 K 2) 57 K 3) 56 K	P
Part 2 8.10.2	Test current: conventional non-fusing current I_{nf}	1,25 x 160 = 200 A	P
	Load period: 25 % of the conventional time	120 x 0,25 = 30 min.	P
	No-load period: 10 % of the conventional time	120 x 0,1 = 12 min	P
	A test voltage lower than the rated voltage may be used.		P
	During the no-load period the samples are cooled down to a temperature lower than 35 °C; additional cooling (for example, a fan) is allowed.	Cooled down by a fan	P
	The voltage drop shall be measured after 50 cycles and 250 cycles and, if necessary, after 500 cycles and 750 cycles.	50, 250	P
	The voltage drop is measured at direct current of I_m = (0,05 to 0,20) I_{nf}. However, the current I_m shall be chosen so as to give a voltage drop of at least 100 µV. If it is necessary, the upper limit of I_m may be increased to 0,30 I_{nf}.	20 A DC	P
Part 2 8.10.2.1	Contacts		
	The points between which the voltage drop is measured are marked as A and B in Figure 106.	Figure 106: A and B	P
	Withdrawal force measured force after 250 cycles (N)	1) 120 N 2) 125 N 3) 120 N	P
	Withdrawal force measured force after 750 cycles (N)	1) 2) 3)	NA
	The withdrawal forces shall be within the limits of Table 118. If the measured values are too low, the dynamic test in accordance with 8.5.5.1 shall be performed.	Table118: 80- 250 N	P
Part 2 8.10.2.2	Direct terminal clamps		NA
Part 2 8.10.3	Acceptability of test results		
Part 2 8.10.3.1	Contacts		
	If at the end of the 250th cycle the measured values do not exceed the following limit, the fuse-base is considered to have passed the test and the test may be stopped: $(R_{250}-R_{50})/R_{50} \leq 15\%$	R_{50} R_{250} 1) 103,2 109,5 µΩ 2) 106,4 109,1 µΩ 3) 101,3 105,2 µΩ	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	If at the end of the 250th cycle the above limit is exceeded, the test is continued. After 500 cycles the following limit shall not be exceeded: $(R_{500}-R_{250})/R_{250} \leq 30\%$		NA
	If the limit is exceeded, the test is not satisfied. If the limit is not exceeded, the test is continued up to 750 cycles. At the end of the 750th cycle the following limit shall not be exceeded: $(R_{750}-R_{50})/R_{50} \leq 40\%$		NA
	The difference of the temperature rise between the last and the first measurement shall be less than 20 K.	After the cycling test 1) 58 K 2) 59 K 3) 57 K	P
8.11	**Mechanical and miscellaneous tests**		
8.11.1	**Mechanical strength**		
	If not otherwise specified in the subsequent parts, the mechanical characteristics of a fuse and its parts are judged in the context of normal handling and mounting as well as with the results shown after the breaking-capacity test (see 8.5).		--
Part 2 8.11.1.1	Mechanical strength of fuse-holders		
	The fuse-holder, fitted with a dummy fuse-link of Figure 105 or 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.	Dummy fuse-links (Part 2: Figure 105) Terminal: 48 K	P
	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.	100 times	P
	At the conclusion of these tests, all parts shall be intact and shall function normally.		P
	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.	Terminal: 50 K Difference: 2 K	P
Part 2 8.11.1.2	Mechanical strength of the fuse-base		
	The test to verify the contact force of fuse-bases is performed with three unused fuse-bases as supplied. A test-link made of hardened steel with polished and chrome-plated surfaces is inserted three times in the fuse-base. The dimensions of the blade contacts of the fuse-link are identical with the dimensions according to Figure 101.	Figure 101	
	When pulling steadily by means of suitable test equipment, the withdrawal force F measured (see Figure 108) shall be found to lie within the limits as specified in Table 118. (NH0: 80- 300 N)	1) 120 N 2) 110 N 3) 120 N	P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	In order to verify that the fuse-base contacts are firmly seated, steel screws (class 8.8) are fastened at the terminals. They are fastened three times by applying a torque of 1,2 times the value specified by the manufacturer or, where no value is specified, 1,2 times the value of Table 111. For flat connections requiring a nut, steps shall be taken to prevent, by suitable means, the nut from turning round.	10 x 1,2 = 12 N	P
	After this test the contact pieces of the fuse-base shall not have moved to such an extent as to affect the further use of the fuse-base. The insulating mounting part of the fuse-base shall neither be broken nor shall it show any signs of cracks.		
Part 2 8.11.1.8	Impact resistance of gripping-lugs of moulded material or of metal fixed in moulded material		NA
8.11.2	**Miscellaneous tests**		
8.11.2.1	**Verification of freedom from season cracking**		
	In order to verify that current-carrying parts made of rolled copper alloy with less than 83 % copper content are free from season cracking, the following test is performed.		NA
	All grease is removed from three samples by immersing them for 10 min in a suitable solution. Fuse-links are tested individually, while fuse-holders are only tested with the complete fuse.		NA
	The samples shall be placed for 4 h in a test cabinet having a temperature of (30 ± 10) °C.		NA
	After this, samples are placed for 8 h in a test cabinet, on the bottom of which is an ammonium chloride solution having a pH value of 10-11.		NA
	The samples shall show no cracks visible to the unaided eye when any bluish film is removed by means of a dry cloth. Contact caps of fuse-links shall not be removable by hand.		NA
8.11.2.2	**Verification of resistance to abnormal heat and fire**		
	If not otherwise specified in subsequent parts, the following applies. Parts of insulating materials, except ceramic, not necessary to retain current-carrying parts in position even though they are in contact with them are tested according to item a) of 8.11.2.2.5.		NA
	Parts of insulating materials, except ceramic, necessary to retain current-carrying parts and parts of the earthing circuit, if any, in position are tested according to item b) of 8.11.2.2.5.		NA
8.11.2.2.3	The specimen is stored for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 35 % and 75 % before starting the test.		NA
8.11.2.2.5	a) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (650 ± 10) °C and (30 ± 1) s.		NA

P : Pass F : Fail NA : Not applicable -- : Not Applied

Clause	Requirement – Test	Result-Remark	Verdict
	b) The temperature of the tip of the glow-wire and the duration of its application to the specimen shall be (960 ± 10) °C and (30 ± 1) s.		NA
8.11.2.2.6	During application of the glow-wire and during a further period of 30 s, the specimen, the parts surrounding the specimen, and the layer of tissue paper placed below it shall be observed.		NA
	The time at which the specimen ignites and the time when flames extinguish during or after the period of application are noted.		NA
	The maximum height of any flame is measured and noted, the start of the ignition, which might produce a high flame for a period of approximately 1 s, being disregarded.		NA
	The specimen is considered to have withstood the glow-wire test: – if there is no visible flame and no sustained glowing; – if flames or glowing of the specimen extinguish within 30 s after removal of the glow-wire.		NA
	There shall be no burning of the tissue paper or scorching of the pinewood board.		NA
8.11.2.3	**Verification of resistance to rusting**		
	All grease is removed from the parts to be tested by immersion in a suitable degreasing agent for 10 min. The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water, at a temperature of (20 ± 5) °C.	10 min. - 10 % solution of ammonium chloride in water	P
	Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.	10 min - 98% humidity	P
	After the parts have been dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C, their surface shall show no signs of rust.	10 min – 100°C	P
	Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.	No rust	P
Part 2 8.11.2.4	**Non-deterioration of insulating parts of fuse-link and fuse-base**		
Part 2 8.11.2.4.1	Three fuse-links and three fuse-bases to be tested shall be exposed to the following temperatures:	3 fuse-bases	P
	For a period of 168 h: (150 ± 5) °C for fuse-links and fuse-bases comprising moulded elements intended to support live parts,	168 h, 150°C	P
	For a period of 168 h: (100 ± 5) °C for covers,		NA
	for a period greater than 1 h: (150 ± 5) °C over 1 h for sealing compounds; stability of the marking.	3 h, 150°C	P
	After cooling to ambient temperature the following shall be tested.		
	Fuse-base: verification of the mechanical strength in accordance with 8.11.1.2.		P

P : Pass F : Fail NA : Not applicable -- : Not Applied

Part 2 8.11.2.4.2	The positions of the fuse-base contacts taking the fuse-link shall not have changed in a manner likely to affect its correct functioning. The insulating body on which the terminals are fixed shall neither fracture nor show any signs of a fracture. The mechanical strength of cemented joints shall not have been impaired.		P
	Sealing compounds shall not have shifted to an extent permitting live parts to be exposed.		NA
	The marking shall be durable and easily legible.		P

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						160 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	0,354	0,355	0,340	0,358	0,355	0,345	0,354	0,361	0,358	0,360	0,355	0,354
Sample No.	13	14	15	16	17	18	19	20	21	22	23	24
R (mΩ)	0,352	0,362	0,355	0,357	0,355	0,348	0,360	0,354	0,352	0,356	0,355	0,349

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						125 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	0,491	0,506	0,499	0,498	0,504	0,492	0,506	0,504	0,498	0,498	0,504	0,499

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						100 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	0,682	0,685	0,678	0,701	0,679	0,702	0,684	0,698	0,705	0,699	0,684	0,692

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						80 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	0,785	0,765	0,780	0,775	0,780	0,792	0,788	0,794	0,794	0,784	0,772	0,788

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						63 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	0,982	1,030	0,994	1,050	1,020	0,988	0,994	1,008	1,034	0,994	1,012	1,002

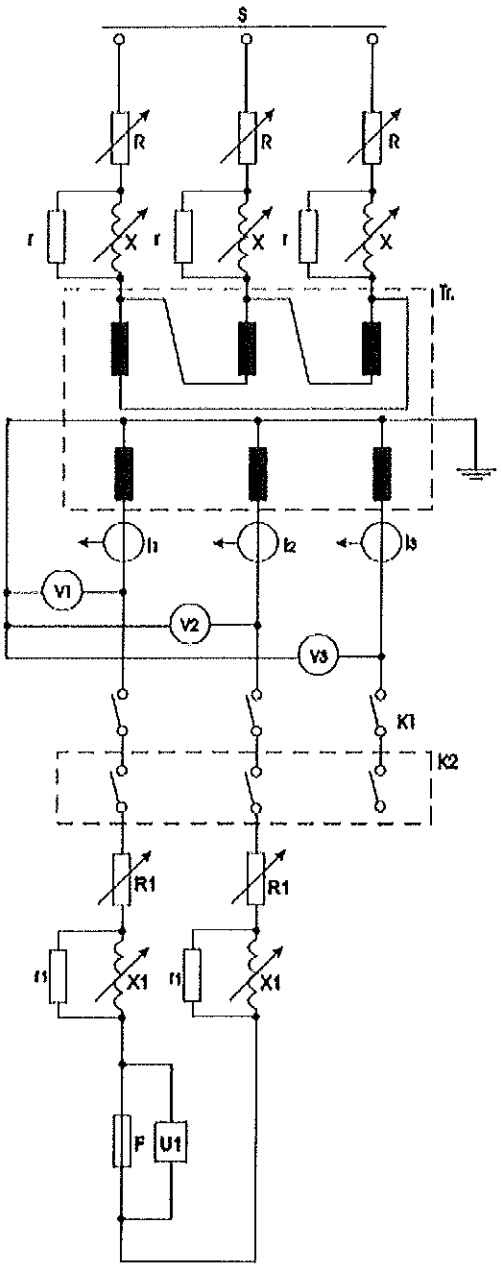
8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						50 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	1,390	1,442	1,450	1,448	1,386	1,394	1,418	1,386	1,422	1,398	1,414	1,396

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						40 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	1,750	1,816	1,840	1,790	1,855	1,784	1,868	1,710	1,765	1,758	1,800	1,716

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						32 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	2,45	2,39	2,48	2,36	2,41	2,36	2,38	2,36	2,45	2,42	2,43	2,41

8.1.5.1	Table: Internal resistance of the fuse-links											
	Rated current (A) of the fuse-link						25 A					
	Measuring current (A)						2 A					
	Ambient air temperature (°C)						21 °C					
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12
R (mΩ)	2,91	3,12	3,68	2,99	3,14	2,98	3,15	2,97	3,10	3,26	2,98	2,95

Test Circuit of Short Circuit



S: Supply 34,5 kV, 100 MVA
R: Adjustable resistance: 0,25 - 38 Ω
X: Adjustable reaktans 1-132 Ω
r: Shunt Resistance (%0.6)
Tr: Test transformer: 5 MVA, 34,5 / 0.44, 0.66 kV

I1, I2, I3: Current measuring Equipment.
- Rogowski coil: Habemus-Rometer 100 kA/2V
- Current coil: Fluke - 2000 flex - 0,2/2 kA / 2 V
- Current measuring syst. (AO 01-03): Dimes - L 500 TC

V1, V2, V3: Voltmeter (V 01-03): Federal – FDV 72

K1: Making switch: Preussag - NVL 82 DA
K2: Making switch: Federal F121E

R1: Adjustable resistance: 2,375 mΩ
X: Adjustable reaktans 6000 µH
r1: Shunt Resistance (%0.6)
F: Sample

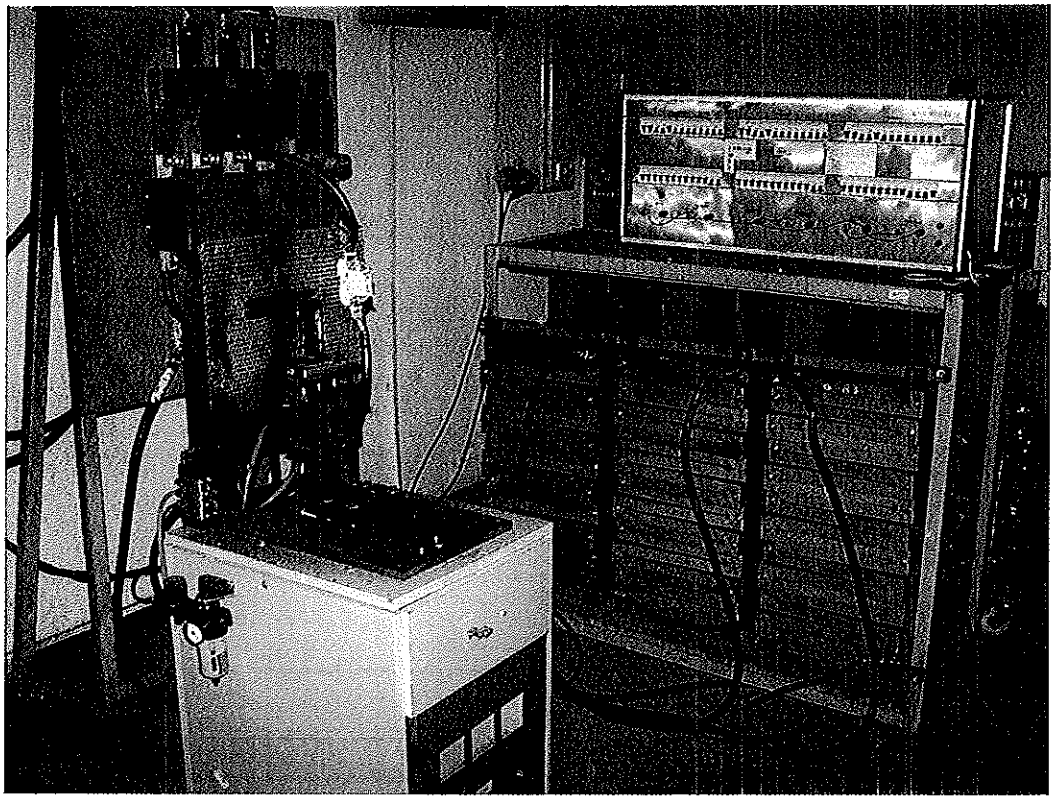
U1: Voltage measuring Equipment
- L 500 TV (GO 01-03) - ± 1024 V, 40 Hz, 2 MΩ

Measuring system software:
-Rogowski.dbs (2-100 kA)
-Fluk 2000. dbs (200-2000 A)
-IHP/Poztest.exe

Test Equipment			
Equipment Name - No	**Manufacturer - Type**	**Features**	**Traceability**
Test transformer (TT01)	Best	440 V 65 kA, 660 V 5 kA	
Resistive load (RY01-03)	Hilkar	38 ohm, 1300 A / sn	
Inductive load (EY01-12)	BEST	128 ohm	-
Resistive and inductive load (AY01)	FEDERAL	2,3 ohm, 6 mH	
Resistive and inductive load (AY03)	IHP	50 mohm, 380 µH	
Current measuring system (AO01-03)	DİMES L 500 TC	143,29 kA / 2,8763 V	IHP 0211.09
Voltage measuring system(GO01-03)	DİMES L 500 TV	± 1024 V	IHP 0211.10
Rogowski coil (RG02-04)	HEBEMUS 100 K	100 kA / 2 Volt	IHP 0310.03
Fluke current coil (FL01-03)	Fluke 2000 flex	200 A / 2000 A	IHP 0211.07
Voltmeter (V01-03)	Federal FYV - 72	0-500 V	IHP 0211.11
Making breaker (KK01-03)	Preussag NVL 82DA	12 kV, 1250 A Icn=80 kA	-
Making breaker (KK06)	Federal F121E	2000 A, 400 V	-
Current supply (TT04)	Mersan	300 A, 1p	-
Current supply (TT07)	Alnal	2000 A, 1p	-
Current supply (TT05)	Mersan	5000 A, 3p	-
Current supply (TT08)	Alnal	100 A, 1p	-
Current supply (TT09)	Alnal	100 A, 5 V	-
Current-voltage supply (AGK 02)	GW instek	30 Vdc, 3 A	-
Transformer-Ampermeter (AA01-03)	Federal FAT100-FYA96	3000 / 5 A	IHP 0211.02
Current transformer (AS08)	Federal	6000 / 5 A	IHP 0211.08
Clamp meter (P03)	CIE	1000 A RMS	IHP 0211.01
Clamp meter (P04)	Lutron	40 mA - 120 A	IHP 0211.02
Isolation test equipment (IT04)	GW instek GPI 825	5 kV AC, 1000 VDC Meger	IHP 0311.01
Oscilloscope (O02)	Textronik TDS 460 A	400 MHz, 4 canal	IHP 0211.05
Dynamometer (KO01)	Lutron FG 5100	100 Kg	UMS M3998
Thermometer (SO01)	CIE 306	200 °C	UMS S24128
Temperature measuring eq. (SO04)	Agilent 34970A	60 canal, T type termokupl	UMS S20134
Multimetre (M01)	HP 3444001A	1000 V, 3 A	IHP 0111.01
Multimetre (M02)	Fluke 87	10 A, 1000 V	IHP 0111.02
Caliper (KU01) 30483306	Mitutoyo	150 mm, 0,01 mm	IHP 1110.02
Torquemeter (TO 01)	Torqueleader	6-80 Nm	IHP 0410.01
Torquemeter (TO03)	Tronic AT 1502 LDIN	0-18 Nm	IHP 0410.03
Impulse test device (DT01)	HİLO PG1012C	0-10 kV, 1,2/50 ms	IHP 0311.02
Impulse test device	Multitech – GC 18	15 kV - 1,2 / 50 5 µs	-
High Voltage Probe (YG01)	Textronik P6016A	40 kV, x 1000 prob	IHP 0310.03
Climatic chamber (ID01)	Angelantoni CH 600 C	-40+180 °C, 10 - 98 %RH	UMS S26189
Red-hot wire test device (KT01)	IHP	960°C	-

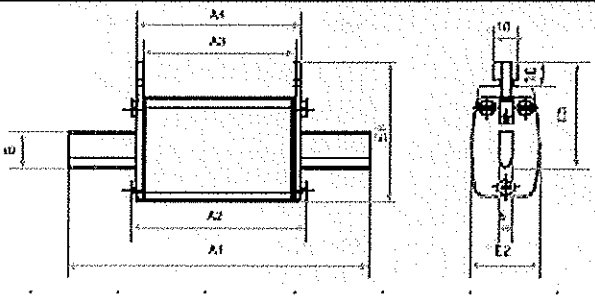
Photographs:

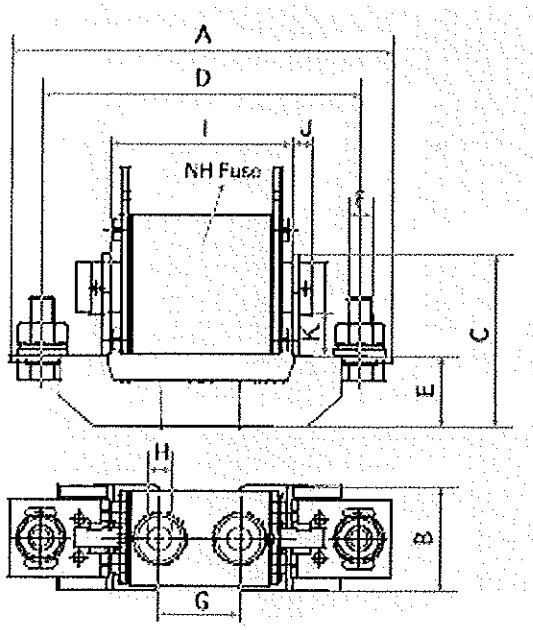
Verification of overcurrent discrimination:



Drawing:

Dimensions (mm)							
A1	A2	A3	A4	B	E1	E2	E3
78.5	54	45	49	15	48	29.5	44.5





Type	Dimension (mm)										
	A	B	C	D	E	F	G	H	I	J	K
NH00	120	32,5	54	107	23,5	M8	25	7,5	67	2	13
NH0	170	32	64,5	130	30,5	M8	25	7,5	76	2	13