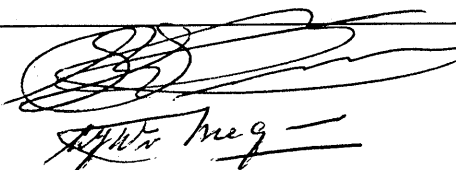


TEST REPORT
IEC 60 947-2
Low-voltage switchgear and controlgear
Part 2: Circuit - breakers

Report reference No.: 2023111.50
Compiled by (+ signature).....: H.L. Schendstok
Approved by (+ signature).....: L.J.W. van Megen
Date of issue: 2003-11-03



CB Testing Laboratory: KEMA Quality B.V.
Address.....: Utrechtseweg 310 Arnhem The Netherlands
Testing location/procedure: CBTL ☐ SMT ☐ TMP ☒
Address.....: GE Power Controls France
 1572 route de Guise
 02100 Harly

Applicant's Name: **GE Power Controls**
Address: Berliner Platz 2-6
 Neumünster 24534 (Germany)

Test specification

Standard: IEC 60 947-2:95 + A1:97 + A2:01
 see also IEC 60 947-1:99 + A1:00 + A2:01
Test procedure: CB
Non-standard test method: GB/T 14048-1-2000, K1.2, Db test: see page 100

Test Report Form IEC60947_2B

TRF originator.:
Master TRF: Dated 2002-11

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Test item description: Moulded Case Circuit Breaker
Trade Mark: GE
Model Type reference: RECORD PLUS G Frame FGN 400 and FGN 630
Ratings: 400 and 630 A

Particulars: test item vs. test requirements					
3. Classification					
3.1. Utilization category: (A or B)	A				
3.2. Interruption medium: (air, vacuum, gas Break).....	air				
3.3. Design: (open construction, moulded case).....	moulded case				
3.4. Method of controlling the operation mechanism: (dependent manual operation, independent manual operation, dependent power operation, independent power operation)	independent manual operation				
3.5. Suitability for insulation: (suitable, not -suitable).....	suitable				
3.6. Provision for maintenance: (maintainable, non maintainable).....	non maintainable				
3.7. Method of installation: (fixed, plug in, withdrawable:	fixed				
3.8. Degree of protection: (IP code)	IP20 for front side				
4.8. Integral fuses (integrally fused circuit-breakers) Type and characteristics of SCPD.....	N/A				
4.9. Switching overvoltages: (when Uimp. is declared).	< 2 000 V				
7.3 Electromagnetic compatibility (EMC) Environment A or B	A & B				
Circuit-breaker for use on phase-earthed systems	Max 500 V				
Circuit-breaker for use in IT systems.....	Max 500 V				
Rated and limiting values, main circuit :					
- rated operational voltage: Ue (V).....	690				
- rated insulation voltage: Ui (V).....	750				
- rated impulse withstand voltage: Uimp (kV).....	8 kV				
- rated operational current: Ie (A).....	630				
- kind of current	AC				
- conventional free air thermal current: Ith (A).....	630				
- conventional enclosed thermal current: Ithe (A)	N/A				
- current rating for four-pole circuit-breakers: (A)	630				
- number of poles	3P and 3P + Neutral				
- rated frequency: (Hz)	50 / 60 Hz				
- integral fuses (rated values)	N/A				
- suitability for environment (A or B)	A & B				
Rated duty :					
- eight-hour duty	N/A				
- uninterrupted duty: Iu (A)	N/A				
Short-circuit characteristic :					
rated operational voltage: Ue (V)	240	415	440	500	690
rated short-time making capacity: Icm (kA).....	187	105	88.2	63	17
rated ultimate short-circuit breaking capacity: Icu (kA)	85	50	42	30	10
rated service short-circuit breaking capacity: Ics (kA).....	85	50	42	30	10
rated short-time withstand current: Icw (kA/s).....	---	---	---	---	---

Control circuits :	
Electrical control circuits :	
- kind of current: (AC, DC)	N/A
- rated frequency: (Hz)	N/A
- rated control circuit voltage: Uc (nature, frequency, V) ..	N/A
- rated control supply voltage: Us (nature, frequency V):	N/A
Air supply control circuits: (pneumatic or electro-pneumatic) :	
- rated pressure and its limit.....	N/A
- volumes of air, at atmospheric pressure, required for each closing and each opening operation	N/A
Auxiliary circuits :	
Rated and limiting values, auxiliary circuits	N/A
- rated operational voltage Ue (V).....	N/A
- rated insulation voltage: Ui (V).....	N/A
- rated operational current: Ie (A).....	N/A
- kind of current	N/A
- rated frequency: (Hz)	N/A
- number of circuits	N/A
- number and kind of contact elements	N/A
- rated uninterrupted current: Iu (A)	N/A
- utilization category: (AC, DC, current and voltage)	N/A
Short-circuit characteristic :	
Rated conditional short-circuit current: Icn (kA)	N/A
Co-ordination of short-circuit protective devices :	
- kind of protective device	N/A
Releases :	
1) shunt release	Yes
2) Over current release	Short-circuit release
a) instantaneous.....	N/A
b) definite time delay	N/A
c) inverse time delay	400 & 630 A
- independent of previous load	Yes
- dependent on previous load; (for example thermal type release)	No
3) Undervoltage release (for opening).....	Yes
4) Other releases	Actuator
Characteristics :	
1) Shunt release and undervoltage release (for opening) ..	Yes
- rated control circuit voltage: Uc (nature, frequency, V) ..	24 / 240 V AC & 12 / 250 V DC
- kind of current	AC
-rated frequency: (if AC).....	50 Hz

2) Overcurrent release	: Short-circuit release
- rated current.....	: 400 and 630 A
- kind of current	: AC
- rated frequency: (if AC).....	: 50 / 60 Hz
- current setting (or range of settings)	: 2 to 10 I _r with I _r [250 & 400] and [400 & 630]
- time settings (or range of settings).....	: N/A

Test case verdicts

Test case does not apply to the test object :	N/A
Test item does meet the requirement :	P(ass)
Test item does not meet the requirement :	F(ail)

Testing

Date of receipt of test item :	August 2002
Date(s) of performance of test :	August to October 2002

General remarks

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IEC 60947-2.

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

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

"(see Enclosure #)" refers to additional information appended to the report.

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

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

General product information:					
FGN 400 and FGN 630					
Rated insulation voltage (V)	Ui	750			
Rated impulse voltage (kV)	Uimp	8			
Rated operational voltage (V)	Ue	690			
Utilization category		A			
Suitable for insulation		Yes			
Number of poles		3 Poles and 3 Poles & Neutral			
Sensor (Current transformer)		FGN 400	FGN 630		
		CT 400	CT 630		
Thermal current at 40°C (A)	Ith	400	630		
Overcurrent releases		2 Positions: 250 & 400 Adjustable 0.625 to 1	2 Positions: 400 & 630 Adjustable 0.625 to 1		
Rated Current (A) Ambient temperature compensation between – 5 °C and + 40 °C Tested Version: Line Protection					
Tripping Curves	Page:	105	106		
Adjustable Short-circuit releases (A)		2 Positions: 250 & 400 Adjustable 2 to 10	2 Positions: 400 & 630 Adjustable 2 to 10		
Short-circuit Capacity (kA)		FGN 400 and FGN 630			
		I _{cm}	I _{cu} = I _{cs}	Phase / Neutral	I _{TT}
	240 V AC	187	85	50	---
	415 V AC	105	50	50	---
	440 V AC	88.2	42	50	---
	500 V AC	63	30	50	9.9
	690 V AC	17	10	10	N/A
		FGN 400 and FGN 630			
Drawing	Page:	107			
Photos	Page:	108			
Summary of testing	Page :	7			
The difference between FG400 and FG630 is only the coil of the current transformer that supply the trip-unit.					

Copy of marking plate and summary of test results (information/comments):

FGN 400



400A

Ui: 750V In=lthe: 400A
40°C

Ue	50/60/Hz	Icu/Ics
240V ~	85kA	
415V ~	50kA	
440V ~	42kA	
500V ~	30kA	
690V ~	10kA	
690V	⊗	

CPD0550002P063
BS CEI JIS UNE VDE
IEC60947-2
cat. A

Record Plus™

Circuit Breaker

431536
Catalogue No.
FGN46AA400LLF

FGN 630



630A

Ui: 750V In=lthe: 630A
40°C

Ue	50/60/Hz	Icu/Ics
240V ~	85kA	
415V ~	50kA	
440V ~	42kA	
500V ~	30kA	
690V ~	10kA	
690V	⊗	

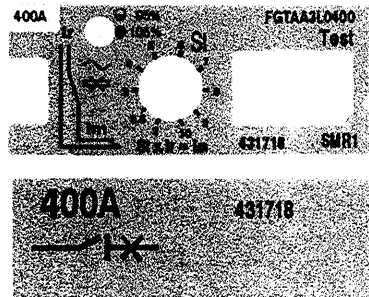
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IEC60947-2
cat. A

Record Plus™

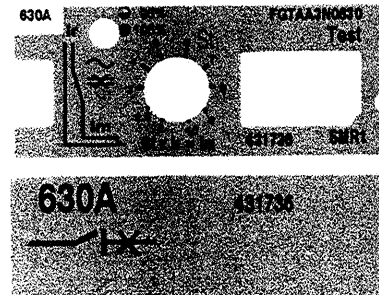
Circuit Breaker

431461
Catalogue No.
FGN36AA630NNF

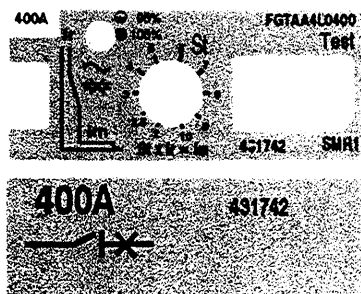
400 A 3 Poles



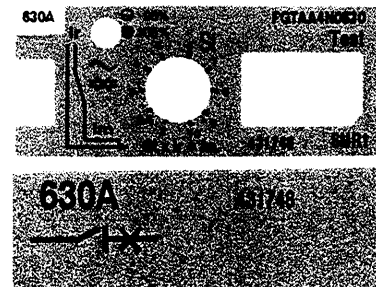
630 A 3 Poles



400 A 4 Poles

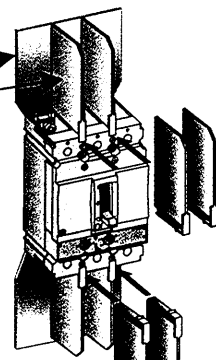





630 A 4 Poles




Tested Short-Circuits						
Test	Icc	Poles	Rating (A)	Sequence	Sample No	Results Page
3~	85 kA / 240 V	3P	630	Ics = Icu	29068-065	60
		3P	400 x 0.4 (min)	Ics = Icu	29068-100	64
		4P (1,2,3)	630	Ics = Icu	29068-128	68
	50 kA / 415 V	3P	630	Ics = Icu	29068-070	72
	42 kA / 440 V	3P	630	Ics = Icu	29068-069	76
	30 kA / 500 V	3P	630	Ics = Icu	29068-154C	80
	10 kA / 690 V	3P	630	Ics = Icu	29068-106	84 (Reverse)
1~	50 kA / 289 V	4P (Ph./N)	630	O-t-CO	29068-126	88
1~	10 kA / 415 V	4P (Ph./N)	630	O-t-CO	29068-144	91
Annex H 1~	9.9 kA / 500 V	3 P	630	O-t-CO	29068-066	94

Comments				
Voltages	Safety perimeter		Phases Separator	Back Plate
	Sides	Top		
Up to 480 V	5 mm	60 mm	No	No
500 V	10 mm	100 mm	Yes	Yes
690 V	20 mm	100 mm	Yes	Yes



IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
5.2	MARKING		
a)	The following data shall be marked on the circuit-breaker itself or on a name plate or nameplates attached to the circuit-breaker, and located in a place such that they are visible and legible when the circuit-breaker is installed.		
	- rated current:	400 and 630	P
	- suitability for isolation, if applicable, with the symbol 		P
	- indication of the open and closed position: with \bigcirc and I respectively, if symbols are used		P
b)	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark		P
	- type designation or serial number	type designation FGN 400 and FGN 630	P
	- IEC 60947-2 if the manufacturer compliance with this standard.		P
	- utilization category	A	P
	- rated operational voltage(s) U_e	690 V	P
	- Circuit-breaker for use in IT systems: Circuit-breaker for which all values of rated voltage have not been tested according to annex H or are not covered by such testing, shall be identified by the symbol  which shall be marked on the circuit-breaker immediately following these values of rated voltage	500 V Max 690 V 	P
	- value (or range) of the rated frequency and/or the indication DC (or symbol)	50 / 60 Hz	P
	- rated service short-circuit breaking capacity. I_{cs}		P
	- rated ultimate short-circuit breaking capacity. I_{cu}		P
	- rated short-time withstand current, (I_{cw}) and associated short-time delay, for utilization category B		N/A
	- line and load terminals, unless their connection is immaterial		N/A
	- neutral pole terminals, if applicable, by the letter N	N on Left	P
	- protective earth terminal, where applicable, by the symbol acc. 7.1.9.3 of part 1		N/A
	- ref. temperature for non-compensated thermal releases, if different from 30°C		N/A

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
c)	Marked on the circuit-breaker as specified in item b), or shall be made available in the manufacturer's published information:		
	- rated short-circuit making capacity (I _{cm}) (if higher than specified in 4.3.5.1)		N/A
	- rated insulation voltage. (U _i) if higher than the maximum rated operational voltage)	750 V	P
	- rated impulse withstand voltage (U _{imp}), when declared.	8 kV	P
	- pollution degree if other than 3	3	P
	- conventional enclosed thermal current (I _{the}) if different from the rated current:		N/A
	- IP Code, where applicable:		N/A
	- minimum enclosure size and ventilation data (if any) to which marked ratings apply:		N/A
	- details of minimum distance between circuit-breaker and earthed metal parts for circuit-breaker intended for use without enclosure:	See page 7	P
	- r.m.s sensing if applicable, according to F.4.1.1		P
	- suitability for environment A or B	A & B	P
d)	The following data concerning the opening and closing devices of the circuit-breaker shall be placed either on their own nameplates or on the nameplate of the circuit-breaker:		
	- rated control circuit voltage of the closing device, and rated frequency for AC:		N/A
	- rated control circuit voltage of the shunt release and/or of the under-voltage release, and rated frequency:		P
	- rated current of indirect over-current releases:		N/A
	- number and type of auxiliary contacts and kind of current, rated frequency (if AC) and rated voltages of the auxiliary switches, if different from those of the main circuit.		P
e)	Terminal shall be clearly and permanently identified in acc. with IEC 60445 and annex L :		
	- line terminal		N/A
	- load terminal		N/A
	- neutral pole terminal "N"	N on the Left	P
	- protective earth terminal 		N/A
	- terminal of coils (A/B)		N/A
	- terminal of shunt release (B)	(C1 and C2)	P
	- terminals of under-voltage release (D)		P

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- terminals of interlocking electromagnets (E)		N/A
	- terminals of indicated light devices (X)		N/A
	- terminals of contact elements for switching devices (no)		N/A

7.1	CONSTRUCTION		
7.1.1	Withdrawable circuit-breaker		N/A
	In the disconnected position (main- and auxiliary circuits)		
	Isolating distances for circuit-breaker suitable for isolating warranted:		N/A
	Mechanism fitted with a reliable indicating device with indicates the position of the isolating contacts.		N/A
	Mechanism fitted with interlocks witch only permit the isolating contacts to be separate or re-closed when main contacts are open		N/A
	Mechanism fitted with interlock witch only permit the main contacts to be closed when the isolating contacts are fully closed.		N/A
	Mechanism fitted with interlock witch only permit the main contacts to be closed when in disconnected position.		N/A
	The isolating distances between the isolating contacts cannot be inadvertently reduced.		N/A
7.1.1.1	Resistance to abnormal heat and fire	960°C and 650°C	P
7.1.2	Current-carrying parts and their connection		P
7.1.3	Clearences and creepage distances:		
	For circuit-breakers for which the manufacturer has declared a value of rated impulse withstand voltage. (Uimp.)		
	Clearances distances:		
	- Uimp is given as:	8 kV	
	- max. value of rated operational voltage to earth	500 V	
	- nominal voltage of supply system:	690 V	
	- overvoltage category:	IV	
	- pollution degree:	3	
	- field-in or homogeneous:	inhomogeneous	
	- minimum clearances (mm):	8 mm	
	- measured clearances (mm):	18 mm	P
	Creepage distances:		
	- rated insulation voltage Ui (V)	750 V	


IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- pollution degree	3	
	- comparative tracking index (V)	175	
	- material group	IIIa	
	Minimum creepage distances (mm)	12.5	
	Measured creepage distances (mm)	18 mm	P
7.1.4	Requirement for the safety of the operator		
	Manual operation means in any position, music wire of 0,26 mm can not/ can be inserted so as to reach the arc chamber		P
	If can be inserted, low density polyethylene sheet is mounted for each "O" test	low density polyethylene sheet is mounted for each "O" test	P
7.1.4 part 1	Actuator		
7.1.4.1	Insulation		
part 1	The actuator of the equipment shall be insulated from the live parts for the rated insulation voltage and, if applicable, the rated impulse withstand voltage		P
	If it is made of metal, it shall be capable of being satisfactorily connected to a protective conductor unless it is provided with additional reliable insulation		N/A
	If it is made of or covered by insulating material, any internal metal part, which might become accessible in the event of insulation failure, shall also be insulated from live parts for the rated insulation voltage		N/A
7.1.4.2	Direction of movement		
	The direction of operation for actuators of devices shall normally conform to IEC 60447.		P
	Where devices cannot conform to these requirements, e.g. due to special applications or alternative mounting positions, they shall be clearly marked such that there is no doubt as to the "I" and "O" positions and the direction of operation		N/A
7.1.5	List of construction breaks		
	For construction breaks, see:		
7.1.5 part 1	Indication of contact position		
7.1.5.1 part 1	Indicating means		
part 1	When an equipment is provided with means for indicating the closed and open positions, these positions shall be unambiguous and clearly indicated		P

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	This is done by means of a position indicating device (see 2.3.18)		P
	If symbols are used, they shall indicate the closed and open position respectively, in accordance with IEC 60417-2:		
	- 60417-2-IEC-5007 I On (power)		P
	- 60417-2-IEC-5007 O Off (power)		P
	For equipment operated by means of two push-buttons, only the push-button designated for the opening operation shall be red or marked with the symbol "O"		N/A
	Red colour shall not be used for any other push-button		P
	The colours of other push-buttons, illuminated push-buttons and indicator lights shall be in accordance with IEC 60073		N/A
7.1.5.2	Indication by the actuator		
part 1	When the actuator is used to indicate the position of the contacts, it shall automatically take up or stay, when released, in the position corresponding to that of the moving contacts; in this case, the actuator shall have two distinct rest positions corresponding to those of the moving contacts, but for automatic opening a third distinct position of the actuator may be provided		P
7.1.6	Additional safety requirements for equipment suitable for isolation		
7.1.6.1	Additional constructional requirements for equipment suitable for isolation (U _e > 50 V):		
	Equipment suitable for isolation shall provide in the open position an isolation distance in acc. with the requirements necessary to satisfy the isolating function. Indication of the main contacts shall be provide by one or more of the following means:		
	- the position of the actuator		P
	- a separate mechanical indicator		N/A
	- visibility of the moving contacts		N/A
	When means are provided or to lock the equipment in the open position, locking only be possible when contacts are in the open position		N/A
	Actuator front-plate fitted to the equipment in a manner witch ensures correct contact position indication and locking		N/A
	The indicated open position is the only position in witch the specified isolation distances between the contacts is ensured.		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) :	14	

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- measured clearances (mm) :	2 contact gaps of 14.5 mm	P
	- test Uimp across gap (kV) :	12.1 kV	P
7.1.6.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		
	auxiliary switch shall be rated according to IEC 60 947-5-1		N/A
	If equipment suitable for isolation is provided with an auxiliary switch for the purpose of electrical interlocking with contactor (s) or circuit-breaker(s) and intended to be used in motor circuits, the following requirements shall apply unless the equipment is rated for AC-23 utilization category		N/A
	The time interval between the opening of the contacts of the auxiliary switch and the contacts of the main poles shall be sufficient to ensure that the associated contactor or circuit-breaker interrupts the current before the main poles of the equipment open		N/A
	Unless otherwise stated in the manufacturer's technical literature, the time interval shall be not less than 20 ms when the equipment is operated according to the manufacturer's instructions		N/A
	Compliance shall be verified by measuring the time interval between the instant of opening of the auxiliary switch and the instant of opening of the main poles under no-load conditions when the equipment is operated according to the manufacturer's instructions		N/A
	During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles		N/A
	A suitable opening time interval may also be provided by an intermediate position (between the ON and OFF position) at which the interlocking contact(s) is (are) open and the main poles remain closed		N/A
7.1.6.3	Supplementary requirements for equipment provided with means for padlocking the open position:		
	the locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed		N/A
	Alternatively, the design may provide padlockable means to prevent access to the actuator		N/A
	test force F applied to the actuator in an attempt to operate to the closed position (N) :		N/A
	rated impulse withstand voltage (kV) :		N/A
	test Uimp on open main contacts at the test force		N/A

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
7.1.7	Terminals		
7.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength		P
	Terminal connections shall be such that necessary contact pressure is maintained		P
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal		P
	Terminal shall 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 shall not be reduced below the rated value		P
7.1.7.2	Connection capacity		
	type of conductors :	Bare Copper	P
	minimum cross-sectional area of conductor (mm ²) :	Cable of 25 mm ²	P
	maximum cross-sectional area of conductor (mm ²) :	FGN 630 A : Copper Bar 2 x (40 x 5) mm (400 mm ²) FGN 400 A : Cable 240 mm ²	P
	number of conductors simultaneously connectable to the terminal :		N/A
7.1.7.3	Connection		
	terminals for connection to external conductors shall be readily accessible during installation		P
	clamping screws and nuts shall not serve to fix any other component		P
7.1.7.4	Terminal identification and marking		
	terminal intended exclusively for the neutral conductor	N on the Left	P
	protective earth terminal		N/A
	other terminals		N/A
7.1.8	Additional requirements for equipment provided with a neutral pole		
part 1	When an equipment is provided with a pole intended only for connecting the neutral, this pole shall be clearly identified to that effect by the letter N (see 7.1.7.4.).	N on the Left Pole	P
	A switched neutral pole shall break not before and shall make not after the other poles	Simultaneous	P
	For equipment having a value of conventional thermal current (free air or enclosed, see 4.3.2.1 and 4.3.2.2) not exceeding 63 A, this value shall be identical for all poles		N/A

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	For higher conventional thermal current values, the neutral pole may have a value of conventional thermal current different from that of the other poles, but not less than half that value or 63 A, whichever is the higher	400A for FGN400 630A for FGN630	P
	if a pole with a appropriate making and breaking capacity is used as a neutral pole, then all poles, incl. the neutral pole, shall operate substantially together.		P
7.1.9	Provisions for protective earthing		
7.1.9.1	The exposed conductive parts (e.g. chassis, framework and fixed parts of metal enclosures) other than those which cannot constitute a danger shall be electrically interconnected and connected to a protective earth terminal for connection to an earth electrode or to an external protective conductor		N/A
part 1	This requirement can be met by the normal structural parts providing adequate electrical continuity and applies whether the equipment is used on its own or incorporated in an assembly		N/A
	Exposed conductive parts are considered not to constitute a danger if they cannot be touched on large areas or grasped with the hand or if they are of small size (approximately 50 mm x 50 mm) or are so located as to exclude any contact with live parts		N/A
7.1.9.2	Protective earth terminal		
part 1	The protective earth terminal shall be readily accessible and so placed that the connection of the equipment to the earth electrode or to the protective conductor is maintained when the cover or any other removable part is removed		N/A
	The protective earth terminal shall be suitably protected against corrosion		N/A
	In the case of equipment with conductive structures, enclosures, etc., means shall be provided, if necessary, to ensure electrical continuity between the exposed conductive parts the equipment and the metal sheathing of connecting conductors		N/A
	The protective earth terminal shall have no other function, except when it is intended to be connected to a PEN conductor (see 2.1.1.5 – Note). In this case, it shall also have the function of a neutral terminal in addition to meeting the requirements applicable to the protective earth terminal		N/A
7.1.9.3	Protective earth terminal marking and identification		

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	The protective earth terminal shall be clearly and permanently identified by its marking		N/A
	The identification shall be achieved by colour (green-yellow mark) or by the notation PE, or PEN, as applicable, in accordance with IEC 60445, subclause 5.3, or, in the case of PEN, by a graphical symbol for use on equipment		N/A
	Graphical symbol to be used: 60417-2-IEC-5019  Protective earth (ground) in accordance with IEC 60417-2		N/A
7.1.10	Enclosure for equipment		
7.1.10.1	Design		
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N/A
	Sufficient space shall be provided inside the enclosure		N/A
	The fixed parts of a metal enclosure shall be 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		N/A
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N/A
	The removable parts of the enclosure shall be 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		N/A
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N/A
	If the enclosure is used for mounting push-buttons, it shall not be possible to remove the buttons from the outside of the enclosure		N/A
7.1.10.2	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 shall be securely fixed to the enclosure		N/A
7.1.11	Degree of protection of enclosed equipment		
	Degree of protection.	IPXX	

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test for first characteristic.	IPXX	
	Test for first numeral:	1 2 3 4 5 6	N/A
	Test for second characteristic	IPXX	
	Test for second numeral:	1 2 3 4 5 6 7 8	N/A
7.1.12	Conduit pull-out, torque and bending with metallic conduits		
part 1	Polymeric enclosures of equipment, whether integral or not, provided with threaded conduit entries, intended for the connection of extra heavy duty, rigid threaded metal conduits complying with IEC 60981, shall withstand the stresses occurring during its installation such as pull-out, torque, bending		N/A
7.2	Performance requirements		
7.2.1	Operating condition		
7.2.1.1	Closing		
	For a circuit-breaker to be closed safely on to the making current corresponding to its rated short-circuit making capacity, it is essential that it should be operated with the same speed and the same firmness as during the type test for proving the short-circuit making capacity		P
7.2.1.1.1	Dependent manual closing		
	For a circuit-breaker having a dependent manual closing mechanism, it is not possible to assign a short-circuit making capacity rating irrespective of the conditions of mechanical operation		N/A
	Such a circuit-breaker should not be used in circuits having a prospective peak making current exceeding 10 kA		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	However, this does not apply in the case of a circuit-breaker having a dependent manual closing mechanism and incorporating an integral fast-acting opening release which causes the circuit-breaker to break safely, irrespective of the speed and firmness with which it is closed on to prospective peak currents exceeding 10 kA; in this case, a rated short-circuit making capacity can be assigned		N/A
7.2.1.1.2	Independent manual closing		
	A circuit-breaker having an independent manual closing mechanism can be assigned a short-circuit making capacity rating irrespective of the conditions of mechanical operation		P
7.2.1.1.3	Dependent power closing		
	At 110% of the rated control supply voltage, the closing operation performed on no-load shall not cause any damage to the circuit-breaker.		N/A
	At 85% of the rated control supply voltage, the closing operation shall be performed when the current established by the circuit-breaker is equal to its rated making capacity within the limits allowed by the operation of its relays or releases and, if a maximum time is stated for the closing operation, in a time not exceeding this maximum time limit.		N/A
7.2.1.1.4	Independent power closing		
	A circuit-breaker having an independent power closing operation can be assigned a rated short-circuit making capacity irrespective of the conditions of power closing		N/A
	Means for charging the operating mechanism, as well as the closing control components, shall be capable of operating in accordance with the manufacturer's specification		N/A
7.2.1.1.5	Stored energy closing		
	Capable ensuring closing of the circuit-breaker in any condition between no-load and its rated making capacity		N/A
	- when the stored energy is retained within the circuit-breaker, a device is provided which indicates when the storing mechanism is fully charged.		N/A
	- means for charging the operating mechanism and closing control components operates when auxiliary supply voltage is between 85% and 110% of the rated control supply voltage.		N/A
	- not possible for the moving contacts to move from the open position, unless the charge is sufficient for satisfactory completion of the closing operation.		N/A

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Clause	Requirement – Test	Result – Remark	Verdict
	- by manually operated circuit-breaker is the direction of operation indicated. (not for circuit-breaker with an independent manual closing operation.)		N/A
	- For trip free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the release is in the position to trip the circuit-breaker.		N/A
7.2.1.2	Opening		
7.2.1.2.1	Circuit-breakers which open automatically shall be trip-free and, unless otherwise agreed between manufacturer and user, shall have their energy for the tripping operation stored prior to the completion of the closing operation		
7.2.1.2.2	Opening by undervoltage releases		
7.2.1.3. a part 1	Operating voltage		
	An under-voltage relay or release, when associated with a switching device, shall operate to open the equipment even on a slowly falling voltage within the range between 70% and 35% of its rated voltage	See appendix table page 101	P
	An under-voltage relay or release shall prevent the closing of the equipment when the supply voltage is below 35% of the rated voltage of the relay or release; it shall permit closing of the equipment at supply voltages equal to or above 85% of its rated value	See appendix table page 101	P
	Unless otherwise stated in the relevant product standard, the upper limit of the supply voltage shall be 110% of its rated value	See appendix table page 101	P
7.2.1.3. b part 1	Operating time		
	For a time-delay under-voltage relay or release, the time-lag shall be measured from the instant when the voltage reaches the operating value until the instant when the relay or release actuates the tripping device of the equipment		N/A
7.2.1.2.3	Opening by shunt releases	15 ms	P
7.2.1.4 part 1	Limits of operation of shunt releases		
	A shunt release for opening shall cause tripping under all operating conditions of an equipment when the supply voltage of the shunt release measured during the tripping operation remains between 70% and 110% of the rated control supply voltage and, if a.c., at the rated frequency	See appendix table page 102	P

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
7.2.1.5 part 1	Limits of operation of current operated relays and released		
	Limits of operation of current operated relays and releases shall be stated in the relevant product standard		N/A
7.2.1.2.4	Opening by over-current releases		
a)	Opening under short-circuit conditions		
	The short-circuit release shall cause tripping of the circuit-breaker with an accuracy of 20% of the tripping current value of the current setting for all values of the current setting of the short-circuit current release		P
	Where necessary for over-current co-ordination the manufacturer shall provide information (usually curves) showing		P
	- maximum cut-off (let-through) peak current as a function of prospective current (r.m.s. symmetrical)	See curves page 103	P
	- I^2t characteristics for circuit-breakers of utilization category A and, if applicable, B for circuit-breakers with instantaneous override (see not to 8.3.5)	See curves page 104	P
b)	Opening under overload conditions		
1)	Instantaneous or definite time-delay operation		N/A
	The release shall cause tripping of the circuit-breaker with an accuracy of $\pm 10\%$ of the tripping current value of the current setting for all values of current setting of the overload release		N/A
2)	Inverse timer-delay operation		
	At the reference temperature and at 1,05 times the current setting with the conventional non-tripping current, the opening release being energized on all poles, tripping shall not occur in less than the conventional time from the cold state, i.e. with the circuit-breaker at the reference temperature		P
	Moreover, when at the end of the conventional time the value of current is immediately raised to 1,30 times the current setting, i.e. with the conventional tripping current, tripping shall then occur in less than the conventional time later		P
	If a release is declared by the manufacturer as substantially independent of ambient temperature, the current values of table 6 shall apply within the temperature band declared by the manufacturer, within a tolerance of 0,3%/K		P
	The width of the temperature band shall be at least 10 K on either side of the reference temperature		P

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
7.2.4.2	Operational performance capability		
7.2.4.2 part 1	The operational performance off-load for which the tests are made with the control circuits energized and the main circuit not energized, in order to demonstrate that the equipment meets the operating conditions specified at the upper and lower limits of supply voltage and/or pressure specified for the control circuit during closing and opening operations		N/A
	The operational performance on-load during which the equipment shall make and break the specified current corresponding, where relevant, to its utilization category for the number of operations stated in the relevant product standard		P

8	TESTS		
8.2.4	Mechanical properties of terminals		
	<u>Mechanical strength of terminals FGN 630 with Busbars</u>		
	maximum cross-sectional area of conductor (mm ²) :	Busbar: 2 x (40 x 5) = 400 mm ²	
	diameter of thread (mm) :	12	
	torque (Nm) :	42 Nm + 10%	
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test)		N/A
	conductor of the smallest cross-sectional area (mm ²) :		
	number of conductor of the smallest cross section :		
	diameter of bushing hole (mm) :		
	height between the equipment and the platen :		
	mass at the conductor(s) (kg) :		
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	Pull-out test		N/A
	force (N) :		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	conductor of the largest cross-sectional area (mm ²) :	BusBar (40 x 5) = 200 mm ²	
	number of conductor of the largest cross section :	2	
	diameter of bushing hole (mm) :	N/A	

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	height between the equipment and the platen :	N/A	
	mass at the conductor(s) (kg) :	N/A	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	Pull-out test		
	force (N) :	280	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	<u>Mechanical strength of terminals FGN 400 with Lug Terminals</u>		
	maximum cross-sectional area of conductor (mm ²) :	Cable 240 mm ²	
	diameter of thread (mm) :	12	
	torque (Nm) :	42 Nm + 10%	
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test)		N/A
	conductor of the smallest cross-sectional area (mm ²) :		
	number of conductor of the smallest cross section :		
	diameter of bushing hole (mm) :		
	height between the equipment and the platen :		
	mass at the conductor(s) (kg) :		
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	Pull-out test		N/A
	force (N) :		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	conductor of the largest cross-sectional area (mm ²) :	Cable 240 mm ² Stranded	
	number of conductor of the largest cross section :	1	
	diameter of bushing hole (mm) :	N/A	
	height between the equipment and the platen :	N/A	
	mass at the conductor(s) (kg) :	N/A	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Pull-out test		
	force (N) :	280	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	<u>Mechanical strength of terminals FGN 400/630 with optional pillar terminals</u>		
	maximum cross-sectional area of conductor (mm ²) :	Cable 240 mm ² Stranded	
	diameter of thread (mm) :	17	
	torque (Nm) :	42 Nm + 10%	
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test)		
	conductor of the smallest cross-sectional area (mm ²) :	Cable 25 mm ² Stranded	
	number of conductor of the smallest cross section :	1	
	diameter of bushing hole (mm) :	12.7	
	height between the equipment and the platen :	298	
	mass at the conductor(s) (kg) :	4.5	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) :	135	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	conductor of the largest cross-sectional area (mm ²) :	Cable 240 mm ²	
	number of conductor of the largest cross section :	2	
	diameter of bushing hole (mm) :	28.6	
	height between the equipment and the platen :	464	
	mass at the conductor(s) (kg) :	20	
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		P
	Pull-out test		
	force (N) :	578	
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		P

IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	<u>Mechanical strength of terminals FGN 400 and 630</u>		
	conductor of the largest and smallest cross-sectional area (mm ²) :	N/A	
	number of conductor of the smallest cross section, number of conductor of the largest cross section :		
	diameter of bushing hole (mm) :		
	height between the equipment and the platen :		
	mass at the conductor(s) (kg) :		
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A
	Pull-out test		
	force (N) :		
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		N/A

Test Sequence I: FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS		
8.3.3.1	Tripping limits and characteristic		
8.3.3.1.2	Opening under short-circuit conditions		
	Manufacturer's name or trademark	GE Power Controls	
	Type designation or serial number	FGN 630	
	Sample no:	N° D02023-74	
	Rated operational voltage: Ue (V)	690 V	
	Rated current: In (A)	630 A	
	Ambient temperature 10 - 40 °C :	20 °C	
	Value of the tripping current declared by the manufacturer for a single pole, at witch value they shall operate.	Between 80% and 120% (Idem for 1 or 2 poles)	P
	Range of adjustable setting current. (A)	(2 x pos.400 x 0.625 to 10 x Pos.630) 500 to 6300 A	P
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 80% of the rated, or minimum adjustable setting current: (A)	400	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	> 300 ms > 300 ms > 300 ms	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 80% of the maximum adjustable setting current: (A)	5040	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	> 300 ms > 300 ms > 300 ms	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 120% of the rated, or minimum adjustable setting current: (A)	600	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	157 ms 145 ms 131 ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 120% of the maximum adjustable setting current: (A)	7560	P
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	101 ms 96 ms 98 ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: tripping current declared for single pole operation (A)	120% of the minimum adjustable setting current = 600 A	P
	Operating time: < 0.2s in case of instantaneous release: L1: L2: L3:	150 ms 153 ms 158 ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases: L1: L2: L3:		N/A
	Test current: tripping current declared for single pole operation (A)	120% of the maximum adjustable setting current = 7560 A	P
	Operating time: < 0.2s in case of instantaneous release: L1: L2: L3:	102 ms 96 ms 115 ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases: L1: L2: L3:		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.3.1.3	Opening under overload conditions		
à)	Instantaneous or definite time-delay releases		N/A
	Manufacturer's name or trademark		N/A
	Type designation or serial number		N/A
	Sample no:		N/A
	Rated operational voltage: Ue (V)		N/A
	Rated current: In (A)		N/A
	Ambient temperature 10-40 °C :		N/A
	Value of the tripping current declared by the manufacturer for a single pole, at witch value they shall operate.		N/A
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the maximum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the rated, or minimum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the maximum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
b)	Inverse time delay releases		
	Manufacturer's name or trademark	GE Power Controls	
	Type designation or serial number	Type Designation: FGN 630	
	Sample no:	D02023 N° 74	
	Rated operational voltage: Ue (V)	690 V	
	Rated current: In (A)	630 A	
	For releases dependent of ambient air temperature: Reference temperature		N/A
	Test ambient temperature (°C)		N/A
	If test made at a difference ambient temperature: Acc. manufacturer's correction temperature/current data:		N/A
	Range of adjustable setting current: (A)	0.625 Pos 400A to 1 x Pos.630A 250 to 630A	P
	For releases independent of ambient temperature: Test made at 30°C and/or at 20/40°C	Test made at 30°C and 40°C Without correction	P
	Test ambient air temperature:		N/A
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	2h	P
	Test current: 130% of the rated, or minimum adjustable setting current: (A)	325	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	22 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	2h	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test current: 130% of the maximum adjustable setting current: (A)	819	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	24 s	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	2h	P
	Test current: 130% of the rated, or minimum adjustable setting current: (A)	325	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	23 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	2h	P
	Test current: 130% of the maximum adjustable setting current: (A)	819	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	23 s	P
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I_r min = 625 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	23 s 24 s \pm 6 s	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r max = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	22 s 24 s ± 6 s	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r min = 625 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	24 s 24 s ± 6 s	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r max = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	23 s 24 s ± 6 s	P
8.3.3.1.4	Additional test for definite time-delay releases		N/A
a)	Time delay		N/A
	Test is made at a current equal to 1,5 times the current setting		N/A
	<u>overload releases</u> : (all phase poles loaded)		N/A
	<u>short-circuit releases</u> : two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases</u> : (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Test current: 1,5 times of the maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases</u> : (s) ..L1-L2:L1-L3:L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
b)	Non-tripping duration		N/A
	Firstly, the test current equal to 1,5 times the current setting is maintained for a time interval equal to the non-tripping duration stated by the manufacturer.		N/A
	<u>overload releases</u> : (all phase poles loaded)		N/A
	<u>short-circuit releases</u> : two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Time interval: non-tripping duration stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 1,5 times of maximum adjustable setting current: (A)		N/A
	Time interval: non-tripping duration stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
	Then, the current is reduced to the rated current and maintained at this value for twice the time-delay stated by the manufacturer. The circuit-breaker shall not trip.		N/A
	Test current: of the rated, or minimum adjustable setting current: (A)		N/A
	Time interval: twice the delay-time stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
	Test current: maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
8.3.3.2	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
8.3.3.4 part1	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	8 kV	P
	- sea level of the laboratory:	200m	P
	- test Uimp main circuits (kV) :	9.6 kV	P
	- test Uimp auxiliary circuits (kV) :	9.6 kV	P
	- test Uimp control circuits (kV) :		N/A
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) :	12.1 kV	P
a)	Application of test voltage		P
	i) Between all terminals of the main circuit connected together (incl. control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation.		P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	ii) Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and:		P
	- the main circuit		P
	- other circuits		P
	- exposed conductive parts		P
	- enclosure of mounting plate		P
	iv) equipment suitable for isolation		P
	equipment not suitable for isolation		N/A
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :		N/A
	- main circuits, test voltage for 1 min (V)		N/A
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)		N/A
8.3.3.2.2	Application of test voltage		
1)	with circuit-breaker in the closed position		
	- between all live parts of all poles connected together and the frame of the circuit-breaker .		P
	- between each pole and all the other poles connected to the frame of the circuit-breaker		P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.		P
	- between all live parts of all poles connected together and the frame of the circuit-breaker.		P
	- between the terminals of one side connected together and the terminals of the other side connected together.		P
b)	Control and auxiliary circuits		
1)	- between all the control and auxiliary circuits which are not normally connected to the main circuit, connected together, and the frame of the circuit-breaker.		P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
2)	- where appropriate, between each part of the control an auxiliary circuits which may be isolated from the other parts during normal operation and all the other parts connected together.		P
	No unintentional disruptive discharge during the test's		P
8.3.3.2	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 U _e , and shall not exceed 0,5mA.		P
8.3.3.3	Mechanical operation and operational performance capability		
8.3.3.3.2	Construction and mechanical operation		
a)	Construction		
	A withdrawable circuit-breaker shall be checked for the requirements stated in 7.1.1		N/A
	A circuit-breaker with stored energy operation shall be checked for compliance with 7.2.1.1.5, regarding the charge indicator and the direction of operation of manual energy storing		N/A
b)	Mechanical operation		
	A circuit-breaker with dependent power operation shall comply with the requirements stated in 7.2.1.1.3		N/A
	A circuit-breaker with dependent power operation shall operate with the operating mechanism charged to the minimum and maximum limits stated by the manufacturer		N/A
	A circuit-breaker with stored energy operation shall comply with the requirements stated in 7.2.1.5 with the auxiliary supply voltage at 85% and 110% of the rated control supply voltage.		N/A
	It shall also be verified that the moving contacts cannot be moved from the open position when the operating mechanism is charged to slightly below the full charge as evidenced by the indicating device		N/A
	For a trip-free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the tripping release is in the position to trip the circuit-breaker		P
	If the closing and opening times of a circuit-breaker are stated by the manufacturer, such times shall comply with the stated values		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
c)	Undervoltage releases		
	Undervoltage releases shall comply with the requirements of 7.2.1.3 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum current rating for which the release is suitable		P
i)	Drop out voltage		
	It shall be verified that the release operates to open the circuit-breaker between the voltage limits specified		P
	The voltage shall be reduced from rated voltage at a rate to reach 0 V in approximately 30 s		P
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		P
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		P
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles of the circuit-breaker		P
	This test may be combined with the temperature-rise test of 8.3.3.6		P
	In the case of a release with a range of rated voltages, this test is made at both the minimum and maximum rated control supply voltages		P
ii)	Test for limits of operation		
	Starting with the circuit-breaker open, at the temperature of the test room, and with the supply voltage at 30% rated maximum control supply voltage, it shall be verified that the circuit-breaker cannot be closed by the operation of the actuator	See appendix table page 101	P
	When the supply voltage is raised to 85% of the minimum control supply voltage, it shall be verified that the circuit-breaker can be closed by the operation of the actuator	See appendix table page 101	P
iii)	Performance under overvoltage conditions		
	With the circuit-breaker closed and without current in the main circuit, it shall be verified that the undervoltage release will withstand the application of 110% rated control supply voltage for 4 h without impairing its functions	See appendix table page 101	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
d)	Shunt releases		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		P
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of $+ 55\text{ °C} \pm 2\text{ °C}$ without current in the main poles of the circuit-breaker	See appendix table page 102	P
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage	See appendix table page 102	P
8.3.3.3.3	Operational performance capability without current.		
	Type designation or serial number	Type designation : FGN 630	
	Sample no:	D02023-72	
	Rated current In (A)	630	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt releases: Uc (V)	220 / 240	
	Rated control supply voltage undervoltage releases: Uc (V)	220 / 240	
	Ambient temperature 10-40 °C :	20°C	P
	Number of operating cycles per hour	60	P
	Number of cycles without current (total) (closing mechanism energized at the rated Uc)	4000	P
	Number of cycles without current (without releases)	3600	P
	Applied voltage: closing mechanism (V)		N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated Uc	200	P
	Applied voltage: shunt releases (V)	240	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated U_c	200	P
	10 cycles without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		P
	Applied voltage: undervoltage releases (V)	220	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.3.4	Operational performance capability with current.		
	Rated current: I_n (A)	630	
	Maximum rated operational voltage: U_e (V)	690	
	Conductor cross-sectional area (mm^2) :	$2 \times (40 \times 5) = 400 \text{ mm}^2$	P
	Number of operating cycles per hour	60	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	1000	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		P
	- test voltage $U/U_e = 1,0$ (V)L1:L2:L3:	710 710 710	P
	- test current $I/I_e = 1,0$ (A)L1:L2:L3:	661 654 656	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50	P
	- on-time (ms):	170 ms	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.3.5	Additional test of operational performance capability without current for withdrawable circuit-breaker.		
	Number of operations cycles : 100		N/A

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		N/A
8.3.3.4	Overload performance		
	this test applies to circuit-breaker of rated current up to and including 630 A		
	Type designation or serial number	Type designation: FGN 630	
	Sample no:	D02023-72	
	Rated current I_n (A)	630	
	Maximum Rated operational voltage: U_e (V)	690	
	Rated control supply voltage of closing mechanism: U_c (V)	N/A	
	Rated control supply voltage of shunt releases: U_c (V)	220	
	Rated control supply voltage undervoltage releases: U_c (V)	N/A	
	Ambient temperature 10-40 °C :	20 °C	P
	Number of operating cycles per hour	60	P
	Rated operational voltage: U_e (V)	690	P
	Number of operating cycles per hour	60	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	N/A	N/A
	Applied voltage: closing mechanism (V)	N/A	N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload/short-circuit settings at maximum.		P
	Conditions, overload operations:		P
	- test voltage $U/U_e = 1,05$ (V)L1:L2:L3:	726 726 726	P
	- test current AC/DC: $I/I_e = 6,0/2.5$ (A)L1:L2:L3:	3916 3898 3908	P
	- power factor/time constant:	0.47	P
	- Number of cycles manually opened: 9	12	P
	- Number of cycles automatically opened by an overload release: 3	3 in Low Voltage (interval 60s)	P
	- frequency: (Hz)	50 Hz	P

Test Sequence I : FGN 630 / 630 A 3 Poles			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- on-time max 2s:	60 ms	P
8.3.3.5	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1380 V	P
	- no breakdown or flashover		P
8.3.3.6	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	70.5	P
	conductor cross-sectional area (mm ²) :	2 (40 x 5) = 400 mm ²	P
	test current I _e (A) :	630	P
8.3.3.7	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A	22.5 s	P
8.3.3.8	Verification of undervoltage and shunt releases		
	Circuit-breaker fitted with undervoltage releases. The release shall not operate at 70% of the minimum control supply voltage -	See appendix table page 101	P
	and shall operate at 35% of the maximum control supply voltage.	See appendix table page 101	P
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.	See appendix table page 102	P
8.3.3.9	Verification of the main contact position for circuit-breakers for isolation		P
	actuating force for opening (N) :	150	
	test force with blocked main contacts for 10 s (N) . :	400	
	Dependent power operation		N/A
	Supply voltage of 110% of rated voltage (V)..... :		N/A
	Three attempts of 5 s to operate the equipment at intervals of 5 min.		N/A
	Independent power operation		N/A
	Three attempts to operate the equipment by the stored energy.		N/A
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts :		N/A

<u>Test Sequence I : FGN 630 / 630 A 3 Poles</u>			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS		
8.3.3.1	Tripping limits and characteristic		
8.3.3.1.2	Opening under short-circuit conditions		
	Manufacturer's name or trademark	GE Power Controls	
	Type designation or serial number	FGN 630	
	Sample no:	N° D02023-127	
	Rated operational voltage: Ue (V)	690 V	
	Rated current: In (A)	630 A	
	Ambient temperature 10 - 40 °C :	20 °C	
	Value of the tripping current declared by the manufacturer for a single pole, at witch value they shall operate.	Between 80% and 120% (Idem for 1 or 2 poles)	P
	Range of adjustable setting current. (A)	(2 x pos.400 x 0.625 to 10 x Pos.630) 500 to 6300 A	P
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 80% of the rated, or minimum adjustable setting current: (A)	400	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	> 300 ms > 300 ms > 300 ms	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 80% of the maximum adjustable setting current: (A)	5040	P
	Operating time: >0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	> 300 ms > 300 ms > 300 ms	P
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 120% of the rated, or minimum adjustable setting current: (A)	600	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	146 ms 151 ms 145 ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 120% of the maximum adjustable setting current: (A)	7560	P
	Operating time: <0,2s in case of instantaneous releases: L1-L2: L1-L3: L2-L3:	95 ms 102 ms 97 ms	P
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases: L1-L2: L1-L3: L2-L3:		N/A
	Test current: tripping current declared for single pole operation (A)	120% of the minimum adjustable setting current = 600 A	P
	Operating time: < 0.2s in case of instantaneous release: N: L1: L2: L3:	162 ms 155 ms 159 ms 152 ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases N: L1: L2: L3:		N/A
	Test current: tripping current declared for single pole operation (A)	120% of the maximum adjustable setting current = 7560 A	P
	Operating time: < 0.2s in case of instantaneous release: N: L1: L2: L3:	114 ms 101 ms 102 ms 108 ms	P
	Operating time: < twice time delay stated by manufacturer in case of definite time delay releases N: L1: L2: L3:		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.3.1.3	Opening under overload conditions		
a)	Instantaneous or definite time-delay releases		N/A
	Manufacturer's name or trademark		N/A
	Type designation or serial number		N/A
	Sample no:		N/A
	Rated operational voltage: Ue (V)		N/A
	Rated current: In (A)		N/A
	Ambient temperature 10-40 °C :		N/A
	Value of the tripping current declared by the manufacturer for a single pole, at witch value they shall operate.		N/A
	Range of adjustable setting current. (A)		N/A
	Time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases:		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 90% of the maximum adjustable setting current: (A)		N/A
	Operating time: >0,2s in case of instantaneous releases		N/A
	Operating time: > twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the rated, or minimum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A
	Operating time: <0,2s in case of instantaneous releases:		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
	Test current: 110% of the maximum adjustable setting current: (A) circuit-breaker with neutral pole: 1,2x110% (A)		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time: <0,2s in case of instantaneous releases		N/A
	Operating time: < twice time delay stated by the manufacturer, in the case of definite time delay releases.		N/A
b)	Inverse time delay releases		
	Manufacturer's name or trademark	GE Power Controls	
	Type designation or serial number	Type Designation: FGN 630	
	Sample no:	D02023 N° 127	
	Rated operational voltage: Ue (V)	690 V	
	Rated current: In (A)	630 A	
	For releases dependent of ambient air temperature: Reference temperature		N/A
	Test ambient temperature (°C)		N/A
	If test made at a difference ambient temperature: Acc. manufacturer's correction temperature/current data:		N/A
	Range of adjustable setting current: (A)	0.625 Pos 400A to 1 x Pos.630A 250 to 630A	P
	For releases independent of ambient temperature: Test made at 30°C and/or at 20/40°C	Test made at 30°C and 40°C Without correction	P
	Test ambient air temperature:		N/A
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	2h	P
	Test current: 130% of the rated, or minimum adjustable setting current: (A)	325	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	24 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when In < 63A, 2h when In > 63 A	2h	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test current: 130% of the maximum adjustable setting current: (A)	819	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	22 s	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	2h	P
	Test current: 130% of the rated, or minimum adjustable setting current: (A)	325	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	23 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	2h	P
	Test current: 130% of the maximum adjustable setting current: (A)	819	P
N/A	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	21 s	P
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I_r min = 625 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	24 s 24 s ± 6 s	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r max = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	23 s 24 s ± 6 s	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r min = 625 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	22 s 24 s ± 6 s	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x I _r max = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	22 s 24 s ± 6 s	P
8.3.3.1.4	Additional test for definite time-delay releases		N/A
a)	Time delay		N/A
	Test is made at a current equal to 1,5 times the current setting		N/A
	<u>overload releases</u> : (all phase poles loaded)		N/A
	<u>short-circuit releases</u> : two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases</u> : (s): L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Test current: 1,5 times of the maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : (s)		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
	Operating time, <u>short-circuit releases</u> : (s) L1-L2: L1-L3: L2-L3:		N/A
	Time-delay: between the limits stated by the manufacturer:		N/A
b)	Non-tripping duration		N/A
	Firstly, the test current equal to 1,5 times the current setting is maintained for a time interval equal to the non-tripping duration stated by the manufacturer.		N/A
	<u>overload releases</u> : (all phase poles loaded)		N/A
	<u>short-circuit releases</u> : two poles in series carrying the test current, using successively all possible combinations of poles having a short-circuit release.		N/A
	Test current: 1,5 times of the rated, or minimum adjustable setting current: (A)		N/A
	Time interval: non-tripping duration stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip^: L1-L2: L1-L3: L2-L3:		N/A
	Test current: 1,5 times of maximum adjustable setting current: (A)		N/A
	Time interval: non-tripping duration stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
	Then, the current is reduced to the rated current and maintained at this value for twice the time-delay stated by the manufacturer. The circuit-breaker shall not trip.		N/A
	Test current: of the rated, or minimum adjustable setting current: (A)		N/A
	Time interval: twice the delay-time stated by the manufacturer: (s)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
	Test current: maximum adjustable setting current: (A)		N/A
	Operating time, <u>overload releases</u> : the circuit-breaker does not trip:		N/A
	Operating time, <u>short-circuit releases</u> : the circuit-breaker does not trip: L1-L2: L1-L3: L2-L3:		N/A
8.3.3.2	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
8.3.3.4 part1	The 1,2/50µs impulse voltage shall be applied five times for each polarity at intervals of 1s minimum		
	- rated impulse withstand voltage (kV) :	8 kV	P
	- sea level of the laboratory:	200m	P
	- test Uimp main circuits (kV) :	9.6 kV	P
	- test Uimp auxiliary circuits (kV) :	9.6 kV	P
	- test Uimp control circuits (kV) :		N/A
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) :	12.1 kV	P
a)	Application of test voltage		P
	i) Between all terminals of the main circuit connected together (incl. control and auxiliary circuits connected to the main circuit) and the enclosure or mounting plate, with the contacts in all normal positions of operation.		P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	ii) Between each pole of the main circuit and the other poles connected together and to the enclosure or mounting plate, with the contacts in all normal positions of operation.		P
	iii) Between each control and auxiliary circuit not normally connected to the main circuit and:		P
	- the main circuit		P
	- other circuits		P
	- exposed conductive parts		P
	- enclosure of mounting plate		P
	iv) equipment suitable for isolation		P
	equipment not suitable for isolation		N/A
	- no unintentional disruptive discharge during the test's		P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		
	- rated insulation voltage (V) :		N/A
	- main circuits, test voltage for 1 min (V)		N/A
	- auxiliary circuits, test voltage for 1 min (V)		N/A
	- control circuits, test voltage for 1 min (V)		N/A
8.3.3.2.2	Application of test voltage		
1)	with circuit-breaker in the closed position		
	- between all live parts of all poles connected together and the frame of the circuit-breaker .		P
	- between each pole and all the other poles connected to the frame of the circuit-breaker		P
2)	with the circuit-breaker in the open position and, additionally, in the tripped position, if any.		P
	- between all live parts of all poles connected together and the frame of the circuit-breaker.		P
	- between the terminals of one side connected together and the terminals of the other side connected together.		P
b)	Control and auxiliary circuits		
1)	- between all the control and auxiliary circuits which are not normally connected to the main circuit, connected together, and the frame of the circuit-breaker.		P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
2)	- where appropriate, between each part of the control an auxiliary circuits which may be isolated from the other parts during normal operation and all the other parts connected together.		P
	No unintentional disruptive discharge during the test's		P
8.3.3.2	For circuit-breaker suitable for isolation, the leakage current shall be measured through each pole with the contacts in the open position, at a test voltage of 1,1 Ue, and shall not exceed 0,5mA.		P
8.3.3.3	Mechanical operation and operational performance capability		
8.3.3.3.2	Construction and mechanical operation		
a)	Construction		
	A withdrawable circuit-breaker shall be checked for the requirements stated in 7.1.1		N/A
	A circuit-breaker with stored energy operation shall be checked for compliance with 7.2.1.1.5, regarding the charge indicator and the direction of operation of manual energy storing		N/A
b)	Mechanical operation		
	A circuit-breaker with dependent power operation shall comply with the requirements stated in 7.2.1.1.3		N/A
	A circuit-breaker with dependent power operation shall operate with the operating mechanism charged to the minimum and maximum limits stated by the manufacturer		N/A
	A circuit-breaker with stored energy operation shall comply with the requirements stated in 7.2.1.5 with the auxiliary supply voltage at 85% and 110% of the rated control supply voltage.		N/A
	It shall also be verified that the moving contacts cannot be moved from the open position when the operating mechanism is charged to slightly below the full charge as evidenced by the indicating device		N/A
	For a trip-free circuit-breaker it shall not be possible to maintain the contacts in the touching or closed position when the tripping release is in the position to trip the circuit-breaker		P
	If the closing and opening times of a circuit-breaker are stated by the manufacturer, such times shall comply with the stated values		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
c)	Undervoltage releases		
	Undervoltage releases shall comply with the requirements of 7.2.1.3 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum current rating for which the release is suitable		P
i)	Drop out voltage		
	It shall be verified that the release operates to open the circuit-breaker between the voltage limits specified		P
	The voltage shall be reduced from rated voltage at a rate to reach 0 V in approximately 30 s		P
	The test for the lower limit is made without current in the main circuit and without previous heating of the release coil		P
	In the case of a release with a range of rated voltages, this test applies to the maximum voltage of the range		P
	The test for the upper limit is made starting from a constant temperature corresponding to the application of rated control supply voltage to the release and rated current in the main poles of the circuit-breaker		P
	This test may be combined with the temperature-rise test of 8.3.3.6		P
	In the case of a release with a range of rated voltages, this test is made at both the minimum and maximum rated control supply voltages		P
ii)	Test for limits of operation		
	Starting with the circuit-breaker open, at the temperature of the test room, and with the supply voltage at 30% rated maximum control supply voltage, it shall be verified that the circuit-breaker cannot be closed by the operation of the actuator	See appendix table page 101	P
	When the supply voltage is raised to 85% of the minimum control supply voltage, it shall be verified that the circuit-breaker can be closed by the operation of the actuator	See appendix table page 101	P
iii)	Performance under overvoltage conditions		
	With the circuit-breaker closed and without current in the main circuit, it shall be verified that the undervoltage release will withstand the application of 110% rated control supply voltage for 4 h without impairing its functions	See appendix table page 101	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
d)	Shunt releases		
	Shunt releases shall comply with the requirements of 7.2.1.4 of Part 1. For this purpose, the release shall be fitted to a circuit-breaker having the maximum rated current for which the release is suitable		P
	It shall be verified that the release will operate to open the circuit-breaker at 70% rated control supply voltage when tested at an ambient temperature of $+ 55\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ without current in the main poles of the circuit-breaker	See appendix table page 102	P
	In the case of a release having a range of rated control supply voltages, the test voltage shall be 70% of the minimum rated control supply voltage	See appendix table page 102	P
8.3.3.3.3	Operational performance capability without current.		
	Type designation or serial number	Type designation : FGN 630	
	Sample no:	D02023-122	
	Rated current I_n (A)	630	
	Rated operational voltage: U_e (V)	690	
	Rated control supply voltage of closing mechanism: U_c (V)	N/A	
	Rated control supply voltage of shunt releases: U_c (V)	220 / 240	
	Rated control supply voltage undervoltage releases: U_c (V)	220 / 240	
	Ambient temperature 10-40 $^{\circ}\text{C}$:	20 $^{\circ}\text{C}$	P
	Number of operating cycles per hour	60	P
	Number of cycles without current (total) (closing mechanism energized at the rated U_c)	4000	P
	Number of cycles without current (without releases)	3600	P
	Applied voltage: closing mechanism (V)		N/A
	10% of total cycles for circuit-breaker with fitted shunt release: (50% at the beginning- and 50% at the end of the test.) Energized at the rated U_c	200	P
	Applied voltage: shunt releases (V)	240	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	10% of total cycles for circuit-breaker with undervoltage releases: (50% at the beginning- and 50% at the end of the test.) Energized at the minimum rated U_c	200	P
	10 cycles without applied voltage at the undervoltage releases. (Shall not possible to close the circuit-breaker.)		P
	Applied voltage: undervoltage releases (V)	220	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.3.4	Operational performance capability with current.		
	Rated current: I_n (A)	630	
	Maximum rated operational voltage: U_e (V)	690	
	Conductor cross-sectional area (mm^2) :	$2 \times (40 \times 5) = 400 \text{ mm}^2$	P
	Number of operating cycles per hour	60	P
	Number of cycles with current (total) (closing mechanism energized at the rated U_c)	1000	P
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		P
	- test voltage $U/U_e = 1,0$ (V) L1: L2: L3:	710 710 710	P
	- test current $I/I_e = 1,0$ (A) L1: L2: L3:	661 654 656	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50	P
	- on-time (ms):	170 ms	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.3.3.5	Additional test of operational performance capability without current for withdrawable circuit-breaker.		
	Number of operations cycles : 100		N/A

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	After test, the isolating contacts, withdrawable mechanism and interlocks shall be suitable for further service.		N/A
8.3.3.4	Overload performance		
	this test applies to circuit-breaker of rated current up to and including 630 A		
	Type designation or serial number	Type designation: FGN 630	
	Sample no:	D02023-122	
	Rated current In (A)	630	
	Rated operational voltage: Ue (V)	690	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt releases: Uc (V)	220	
	Rated control supply voltage undervoltage releases: Uc (V)	N/A	
	Ambient temperature 10-40 °C :	20 °C	P
	Number of operating cycles per hour	60	P
	Maximum rated operational voltage: Ue (V)	690	P
	Number of operating cycles per hour	60	P
	Number of cycles with current (total) (closing mechanism energized at the rated Uc)	N/A	N/A
	Applied voltage: closing mechanism (V)	N/A	N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload/short-circuit settings at maximum.		P
	Conditions, overload operations:		P
	- test voltage U/Ue = 1,05 (V)L1:L2:L3:	726 726 726	P
	- test current AC/DC: I/Ie = 6,0/2.5 (A)L1:L2:L3:	3916 3898 3908	P
	- power factor/time constant:	0.47	P
	- Number of cycles manually opened: 9	12	P
	- Number of cycles automatically opened by an overload release: 3	3 in Low Voltage	P
	- frequency: (Hz)	50 Hz	P

Test Sequence I: FGN 630 / 630 A 4 Poles : 3 Ph + Neutral			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- on-time max 2s:	60 ms	P
8.3.3.5	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1380 V	P
	- no breakdown or flashover		P
8.3.3.6	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals ≤ 80 K (K) :	69.6	P
	conductor cross-sectional area (mm ²) :	2 (40 x 5) = 400 mm ²	P
	test current I _e (A) :	630	P
8.3.3.7	Verification of overload releases		
	Test current: 1.45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when I _n < 63A, <2h when I _n > 63 A	21.5 s	P
8.3.3.8	Verification of undervoltage and shunt releases		
	Circuit-breaker fitted with undervoltage releases. The release shall not operate at 70% of the minimum control supply voltage -	See appendix table page 101	P
	and shall operate at 35% of the maximum control supply voltage.	See appendix table page 101	P
	Circuit-breaker fitted with shunt releases. The release shall operate at 70% of the minimum rated control supply voltage. Test made at room temperature.	See appendix table page 102	P
8.3.3.9	Verification of the main contact position for circuit-breakers for isolation		P
	actuating force for opening (N)	150	
	test force with blocked main contacts for 10 s (N) :	400	
	Dependent power operation		N/A
	Supply voltage of 110% of rated voltage (V).....		N/A
	Three attempts of 5 s to operate the equipment at intervals of 5 min.		N/A
	Independent power operation		N/A
	Three attempts to operate the equipment by the stored energy.		N/A
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts		N/A

<u>Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral</u>			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral <u>Additional test on the Neutral Pole</u>			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Additional test for circuit-breakers having an identified neutral pole provided with an overload release. (see 8.3.3.1.1), With the neutral alone, the test currents shall be those given in table 6 except that the test current at the conventional tripping current shall be multiplied by the factor 1,2.		
	Manufacturer's name or trademark	GE Power Controls	
	Type designation or serial number	Type Designation: FGN 630	
	Sample no:	D02023 N° 127	
	Rated current: I_n (A)	630 A	
	For releases dependent of ambient air temperature: Reference temperature		N/A
	Test ambient temperature (°C)		N/A
	If test made at a difference ambient temperature: Acc. manufacturer's correction temperature/current data:		N/A
	Range of adjustable setting current: (A)	$0.625 \times 400 = 250$ and 630	P
	For releases independent of ambient temperature: Test made at 30°C and/or at 20/40°C	Test made at 30°C and 40°C without correction	P
	Test ambient air temperature:		N/A
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>2h	P
	Test current: $1.2 \times 130\%$ of the rated, or minimum adjustable setting current: (A)	390	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	12 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>2h	P
	Test current: $1.2 \times 130\%$ of the maximum adjustable setting current: (A)	982.8	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	14 s	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral <u>Additional test on the Neutral Pole</u>			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	P
	Test current: 105% of the rated, or minimum adjustable setting current: (A)	262.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>2h	P
	Test current: 1.2 x 130% of the rated, or minimum adjustable setting current: (A)	390	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	10 s	P
	Test current: 105% of the maximum adjustable setting current: (A)	661.5	P
	Conventional non-tripping time: 1h when $I_n < 63A$, 2h when $I_n > 63 A$	>2h	P
	Test current: 1.2 x 130% of the maximum adjustable setting current: (A)	982.8	P
	Conventional tripping time: <1h when $I_n < 63A$, <2h when $I_n > 63 A$	13 s	P
	An additional test, at a current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer		
	Releases, dependent of ambient air temperature: Reference temperature (°C)		N/A
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x 250 A = 625 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	24 s (24 s \pm 6 s)	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x 250 A = 625 A	P

Test Sequence I : FGN 630 / 630 A 4 Poles : 3 Ph + Neutral <u>Additional test on the Neutral Pole</u>			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	23 s (24 s \pm 6 s)	P
	Releases, independent of ambient air temperature: at 30°C	30°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x 630 A = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	24 s (24 s \pm 6 s)	P
	Releases, independent of ambient air temperature: at 20°C or 40°C		
	Test ambient air temperature:	40°C	P
	Test current: at current specified by the manufacturer to verify the time/current characteristic of the releases conform to the curves provided by the manufacturer. % at the rated, or minimum adjustable setting current: (% or A)	2.5 x 630 A = 1575 A	P
	Tripping time acc. time/current characteristic of the releases conform to the curves provided by the manufacturer. (within the stated tolerances)	25 s (24 s \pm 6 s)	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A N° 29068-065			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-065	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	240	
	Rated service short-circuit breaking capacity: (kA)	85	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A N° 29068-065			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	2 x (40 x 5)= 400 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	36.1 37 35.9	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	255 255 255	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	89.8 93.2 89	P
	power factor/time constant :	0.13	P
	- Factor "n"	2.2	P
	- peak test current (kA) :	205	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	16.39 24.1 27.5	P
	- Joule integral I²dt (A²s) L1: L2: L3:	845 000 656 000 1 777 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	28 22.2 22.1	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 235 000 1 426 000 1 335 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A N° 29068-065			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	24.8 23.1 34.9	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 668 000 2 120 000 2 090 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	726 726 726	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	666 658 661	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	110	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A N° 29068-065			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	< 1.1 mA / 270 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	74.4	P
	conductor cross-sectional area (mm²) :	2 x (40 x 5) = 400 mm²	P
	test current Ie (A) :	630	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	22 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	22 s 22 s 22 s	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 400 / 400 A x 0.4 (min) N° 29068-100			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 400	
	Sample no:	29068-100	
	Rated current: In (A)	400 x 0.4	
	Rated operational voltage: Ue (V)	240	
	Rated service short-circuit breaking capacity: (kA)	85	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 400 / 400 A x 0.4 (min) N° 29068-100			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	240 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	35.7 36.5 35.5	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	255 255 255	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	89.8 93.2 89	P
	power factor/time constant :	0.13	P
	- Factor "n"	2.2	P
	- peak test current (kA) :	205	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	21.1 23.2 26.9	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 330 000 900 000 1 876 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	18.94 26.9 27.5	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 005 000 1 252 000 1 468 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 400 / 400 A x 0.4 (min) N° 29068-100			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	30 22.7 25.3	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 371 000 1 549 000 1 742 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		N/A
	Rated current: I _n (A)		N/A
	Maximum rated operational voltage: U _e (V)		N/A
	Conductor cross-sectional area (mm ²) :		N/A
	Number of operating cycles per hour		N/A
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)		N/A
	Applied voltage: closing mechanism (V)		N/A
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		N/A
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:		N/A
	- test current I/I _e = 1,0 (A) L1: L2: L3:		N/A
	- power factor/time constant:		N/A
	- frequency: (Hz)		N/A
	- on-time (ms):		N/A
	- off-time (s):		N/A
	Electrical components do not exceed the value indicated in tab. 7.		N/A
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 400 / 400 A x 0.4 (min) N° 29068-100			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	< 0.5 mA / 270 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		N/A
	Temperature rise of main circuit terminals. ≤ 80 K (K) :		N/A
	conductor cross-sectional area (mm²) :	240	P
	test current Ie (A) :	160	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	232 (after 2h at 160 A)	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	23 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	22 23 22	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A 4 Poles N° 29068-128			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-128	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	240	
	Rated service short-circuit breaking capacity: (kA)	85	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A 4 Poles N° 29068-128			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	2 x (40 x 5)= 400 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) N : L1: L2: L3:	36.2 37.3 36.8 36.1	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	255 255 255	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	89.8 93.2 89	P
	power factor/time constant :	0.13	P
	- Factor "n"	2.2	P
	- peak test current (kA) :	205	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	18.44 25.3 27	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 321 000 1 487 000 1 840 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	27.8 20.6 18.44	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 019 000 1 359 000 903 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A 4 Poles N° 29068-128			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	29.1 22.2 22.6	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 123 000 1 430 000 1 121 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	726 726 726	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	630 630 630	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	100	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 85 kA / 240 V FGN 630 / 630 A 4 Poles N° 29068-128			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	< 0.12 mA / 270 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	73.1	P
	conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	P
	test current Ie (A) :	630 A	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	19.5 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s)NL1:L2:L3:	23 22.7 22.9 21.7	P

TEST SEQUENCE II / III (Ics=Icu) : 50 kA / 415 V FGN 630 / 630 A N° 29068-070			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-070	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	415	
	Rated service short-circuit breaking capacity: (kA)	50	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 50 kA / 415 V FGN 630 / 630 A N° 29068-070			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	2 x (40 x 5)= 400 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	36.3 36.3 35.5	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	440 440 440	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	51.2 49.9 49.2	P
	power factor/time constant :	0.24	P
	- Factor "n"	2.2	P
	- peak test current (kA) :	105.8	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	17.46 20.6 31.2	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 528 000 1 210 000 2 360 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	28.5 19.55 18.43	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 645 000 1 707 000 1 152 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (I_{cs}=I_{cu}) : 50 kA / 415 V FGN 630 / 630 A N° 29068-070			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	16.4 28 23.2	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 198 000 1 833 000 1 615 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	726 726 726	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	660 653 656	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	120	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 50 kA / 415 V FGN 630 / 630 A N° 29068-070			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	1.85 mA / 460 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	76	P
	conductor cross-sectional area (mm ²) :	2 x (400 x 5) = 400 mm ²	P
	test current Ie (A) :	630 A	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	20.5 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	23 22 21	P

TEST SEQUENCE II / III (Ics=Icu) : 42 kA / 440 V FGN 630 / 630 A N° 29068-069			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-069	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	440	
	Rated service short-circuit breaking capacity: (kA)	42	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 42 kA / 440 V FGN 630 / 630 A N° 29068-069			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	2 x (40 x 5)= 400 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	36.9 36 36.2	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	465 465 465	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	42.7 43.2 43.4	P
	power factor/time constant :	0.2	P
	- Factor "n"	2.1	P
	- peak test current (kA) :	91	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	19.01 19.41 29.6	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 687 000 1 265 000 2 480 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	28 19.56 20.6	P
	- Joule integral I²dt (A²s) L1: L2: L3:	2 260 000 1 624 000 1 520 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 42 kA / 440 V FGN 630 / 630 A N° 29068-069			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	28 21.7 21.5	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 883 000 2 090 000 1 520 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	726 726 726	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	670 664 667	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	95	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 42 kA / 440 V FGN 630 / 630 A N° 29068-069			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	1.8 mA / 490 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	77.7	P
	conductor cross-sectional area (mm²) :	2 x (400 x 5) = 400 mm²	P
	test current Ie (A) :	630 A	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	22 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	22.5 21.9 21.7	P

TEST SEQUENCE II / III (Ics=Icu) : 30 kA / 500 V FGN 630 / 630 A N° 29068-154C			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-154C	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	500	
	Rated service short-circuit breaking capacity: (kA)	30	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar Back-plate and Phase-separators	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 30 kA / 500 V FGN 630 / 630 A N° 29068-154C			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5)= 400 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	35 35 34	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	525 525 525	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	31.2 31.6 29.5	P
	power factor/time constant :	0.2	P
	- Factor "n"	2.1	P
	- peak test current (kA) :	66.6	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	21.2 19.03 27.2	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	2 290 000 1 552 000 2 160 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	22.2 16.78 24	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	2 140 000 979 000 1 567 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 10 kA / 690 V FGN 630 / 630 A N° 29068-106			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	0.05 mA / 760 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	76.4	P
	conductor cross-sectional area (mm²) :	2 x (40 x 5) = 400 mm²	P
	test current Ie (A) :	630	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	21.7 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	22.8 22.6 22.5	P

TEST SEQUENCE II / III (Ics=Icu) : 30 kA / 500 V FGN 630 / 630 A N° 29068-154C			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	22 25.3 17.67	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 283 000 2 450 000 915 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	710 710 710	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	650 641 644	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	170	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1000	P

TEST SEQUENCE II / III (Ics=Icu) : 30 kA / 500 V FGN 630 / 630 A N° 29068-154C			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<2mA / 1,1 Ue)	0.185 mA / 550 V	P
8.3.4.4	Verification of temperature-rise		
	- the values of temperature-rise do not exceed the those specified in tab. 7.		P
	Temperature rise of main circuit terminals. ≤ 80 K (K) :	74.2	P
	conductor cross-sectional area (mm²) :	2 X (40 X 5) = 400 mm²	P
	test current Ie (A) :	630 A	P
8.3.4.5	Verification of overload releases		
	Test current: 1,45 times the value of their current setting at the reference temperature: (A)	913.5	P
	Conventional tripping time: <1h when In < 63A, <2h when In > 63 A	24 s	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	23.7 23.8 23.3	P

TEST SEQUENCE II / III (Ics=Icu) : 10 kA / 690 V FGN 630 / 630 A N° 29068-106			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.4	TEST SEQUENCE II/III (Ics=Icu):		
8.3.4.1	Test of rated service short-circuit breaking capacity		
	Test sequence of operation: O – t – CO – t – CO		
	Type designation or serial number	Type Designation : FGN 630	
	Sample no:	29068-106	
	Rated current: In (A)	630	
	Rated operational voltage: Ue (V)	690	
	Rated service short-circuit breaking capacity: (kA)	10	
	Rated control supply voltage of closing mechanism: Uc (V)	N/A	
	Rated control supply voltage of shunt release: Uc (V)	N/A	
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated Uc: (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar Back-plate and Phase-separators	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P

TEST SEQUENCE II / III (Ics=Icu) : 10 kA / 690 V FGN 630 / 630 A N° 29068-106			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Circuit is earthed at: (load-star- or supply-star point)	load-star	P
	Conductor cross-sectional area (mm²) :	2 x (40 x 5)= 400 mm²	P
	If terminals unmarked: line connected at: (underside/upside)	underside	P
	Tightening torques: (Nm)	42	P
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	35.2 35.1 35.2	P
	Test sequence of operation: O – t – CO – t – CO		P
	- test voltage U/Ue = 1,05 (V) L1: L2: L3:	726 726 726	P
	- r.m.s. test current AC/DC: (kA) L1: L2: L3:	10.42 10.40 10.27	P
	power factor/time constant :	0.47	P
	- Factor "n"	1.7	P
	- peak test current (kA) :	17.75	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	15.54 14.19 13.99	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 350 000 1 058 000 1 179 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	15.22 14.45 14.01	P
	- Joule integral I²dt (A²s) L1: L2: L3:	1 297 000 1 131 000 1 219 000	P
	Pause, t: (min)	3 min	P

TEST SEQUENCE II / III (Ics=Icu) : 10 kA / 690 V FGN 630 / 630 A N° 29068-106			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak}) L1: L2: L3:	15.19 15.12 12.77	P
	- Joule integral I ² dt (A ² s) L1: L2: L3:	1 372 000 1 149 000 1 191 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.4.2	Operational performance capability with current.		
	Rated current: I _n (A)	630	
	Maximum rated operational voltage: U _e (V)	690	
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	
	Number of operating cycles per hour	60	P
	Number (5% of the number given in column 4, tab. 8) of cycles with current (total) (closing mechanism energized at the rated U _c)	50	P
	Applied voltage: closing mechanism (V)	N/A	P
	For circuit-breaker fitted with adjustable releases, test shall be made with the overload setting at maximum and short-circuit setting at minimum.		P
	Conditions, make/break operations:		
	- test voltage U/U _e = 1,0 (V) L1: L2: L3:	726 726 726	P
	- test current I/I _e = 1,0 (A) L1: L2: L3:	663 654 658	P
	- power factor/time constant:	0.8	P
	- frequency: (Hz)	50 Hz	P
	- on-time (ms):	100	P
	- off-time (s):	60	P
	Electrical components do not exceed the value indicated in tab. 7.		P
8.3.4.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1380	P

Additional Test Sequence III Phase / Neutral : 50 kA / 289 V FGN 630 / 630 A 4 poles N° 29068-126			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.5.2 8.3.6.4 8.3.7.6	ADDITIONAL SEQUENCE OF SHORT-CIRCUIT OPERATIONS ON FOUR POLE CIRCUIT-BREAKERS		
	For four-pole circuit-breakers, an additional sequence of operations on one or more new samples, in accordance with table 10, shall be made on the fourth pole and its adjacent pole, for sequences III and IV, or IV and V, as applicable, at an applied voltage of $U_e / 3$, using the circuit shown in figure 12 of Part 1. The test current shall be agreed between manufacturer and user, but shall be not less than 60 % of I_{cu} or I_{cw} , as applicable.		
	Type designation or serial number	Type designation FGN 630	
	Test made on the same sample as for the three-pole short-circuit or on new sample, (same / new)	New	
	Sample no:	29068-126	
	Rated current: I_n (A)	630	
	Rated operational voltage: U_e (V)	500	
	Test Voltage: $U_e / \sqrt{3}$ (V)	289	
	Recovery voltage: $1.05 \times U_e / \sqrt{3}$ (V)	304	
	Rated ultimate short-circuit breaking capacity: (kA)	50 kA	
	The test current shall be agreed between manufacturer and user, but shall be not less than 60 % of I_{cu} or I_{cw} (%)	100 %	
	Rated control supply voltage of closing mechanism: U_c (V)	N/A	
	Rated control supply voltage of shunt release: U_c (V)	N/A	
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s)N :L1:L2:L3:	36.2 37.2 37.6 36.9	P
8.3.5.2	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P

Additional Test Sequence III Phase / Neutral : 50 kA / 289 V FGN 630 / 630 A 4 poles N° 29068-126			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar Back-plate and Phase-separators	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: <30mm ²	20 mm ²	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	One supply point	P
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5)= 400 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)	upside	P
	Tightening, torques: (Nm)	42	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V)	305	P
	- r.m.s. test current AC/DC: (kA)	50.5	P
	power factor/time constant :	0.21	P
	- Factor "n"	2.1	P
	- peak test current (kA _{max}) :	107.8	P
	Test sequence "O"		
	- max. let-through current: (kA _{peak})	24.2	P
	- Joule integral I^2dt (A ² s)	1 657 000	P
	Pause, t : (min)	3 min	P

Additional Test Sequence III Phase / Neutral : 50 kA / 289 V FGN 630 / 630 A 4 poles N° 29068-126			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak})	12.38	P
	- Joule integral I ² dt (A ² s)	1 254 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.5.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1 000	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	0.86 mA / 550 V	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s)N : L1: L2: L3:	23.7 27.6 23 23	P



Additional Test Sequence III Phase / Neutral : 10 kA / 415 V FGN 630 / 630 A 4 poles N° 29068-144			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
8.3.5.2 8.3.6.4 8.3.7.6	ADDITIONAL SEQUENCE OF SHORT-CIRCUIT OPERATIONS ON FOUR POLE CIRCUIT-BREAKERS		
	For four-pole circuit-breakers, an additional sequence of operations on one or more new samples, in accordance with table 10, shall be made on the fourth pole and its adjacent pole, for sequences III and IV, or IV and V, as applicable, at an applied voltage of $U_e / 3$, using the circuit shown in figure 12 of Part 1. The test current shall be agreed between manufacturer and user, but shall be not less than 60 % of I_{cu} or I_{cw} , as applicable.		
	Type designation or serial number	Type designation FGN 630	
	Test made on the same sample as for the three-pole short-circuit or on new sample, (same / new)	New	
	Sample no:	29068-144	
	Rated current: I_n (A)	630	
	Rated operational voltage: U_e (V)	690	
	Test Voltage: $U_e / \sqrt{3}$ (V)	415	
	Recovery voltage: $1.05 \times U_e / \sqrt{3}$ (V)	440	
	Rated ultimate short-circuit breaking capacity: (kA)	10 kA	
	The test current shall be agreed between manufacturer and user, but shall be not less than 60 % of I_{cu} or I_{cw} (%)	100 %	
	Rated control supply voltage of closing mechanism: U_c (V)	N/A	
	Rated control supply voltage of shunt release: U_c (V)	N/A	
8.3.5.1	The operation of overload releases shall be verified at twice the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s)N : L1: L2: L3:	35.2 35.3 35.2 34.5	P
8.3.5.2	Test of rated ultimate short-circuit breaking capacity		
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P

Additional Test Sequence III Phase / Neutral : 10 kA / 415 V FGN 630 / 630 A 4 poles N° 29068-144			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar Back-plate and Phase-separators	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: $<30\text{mm}^2$	20mm^2	P
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	One supply point	P
	Conductor cross-sectional area (mm^2) :	$2 \times (40 \times 5) = 400\text{mm}^2$	P
	If terminals unmarked: line connected at: (underside/upside)	underside	P
	Tightening, torques: (Nm)	42	P
	Test sequence of operation: O – t – CO		P
	- test voltage $U/U_e = 1,05$ (V)	440	P
	- r.m.s. test current AC/DC: (kA)	10.20	P
	power factor/time constant :	0.44	P
	- Factor "n"	1.7	P
	- peak test current (kA_{max}) :	17.76	P
	Test sequence "O"		
	- max. let-through current: (kA_{peak})	15.24	P
	- Joule integral I^2dt (A^2s)	1 545 000	P
	Pause, t : (min)	3 min	P

Additional Test Sequence III Phase / Neutral : 10 kA / 415 V FGN 630 / 630 A 4 poles N° 29068-144			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Test sequence "CO"		
	- max. let-through current: (kA _{peak})	14.82	P
	- Joule integral I ² dt (A ² s)	2 170 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
8.3.5.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1 380	P
	- no breakdown or flashover		P
	- the leaking current for circuit-breaker suitable for isolation: (<6mA / 1,1 U _e)	1.22 mA / 760 V	P
8.3.5.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2,5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s)N L1: L2: L3:	24 22.5 22.8 22.7	P

ANNEX H 9.9 kA / 500 V on 1 Pole FGN 630 / 630 A N° 29086-066			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
Annex H	Individual pole short-circuit test sequence		
	Circuit-breaker for use in IT systems		
H.2	Test of individual pole short-circuit breaking capacity		
	A short-circuit test is made on the individual poles of a multipole circuit-breaker at a value of prospective current (I_{pr}) equal to 1,2 times the max. setting of the short-time delay release tripping current or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release, or, where relevant 1,2 times the max. setting of the definite time delay release tripping current, but not exceeding 50kA.		
	Type designation or serial number	Type Designation: FGN 630	
	Sample no:	29068-066	
	Rated current: I_n (A)	630	
	Rated operational voltage: U_e (V)	500	
	Rated ultimate short-circuit breaking capacity: (kA)	9.9	
	Rated control supply voltage of closing mechanism: U_c (V)	N/A	
	Rated control supply voltage of shunt release: U_c (V)	N/A	
	The test sequence of operations is O – t – CO		
	For circuit-breaker fitted with adjustable releases, test shall be made with the current and time settings at maximum.		P
	closing mechanism energized with 85% at the rated U_c : (V)		N/A
	The circuit-breaker is mounted complete on its own support or an equivalent support.		P
	Test made in free air:		P
	Distances of the metallic screen's: (all sides)	Front and Rear 0 mm Sides 20 mm Top and Bottom 100 mm With insulated Bus-Bar Back-plate and Phase-separators	P
	The characteristics of the metallic screen:		
	- woven wire mesh		N/A
	- perforated metal		P
	- expanded metal		N/A
	- ratio hole area/total area: 0,45-0,65	0.55	P
	- size of hole: $<30\text{mm}^2$	20 mm^2	P

ANNEX H 9.9 kA / 500 V on 1 Pole FGN 630 / 630 A N° 29086-066			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	- finish: bare or conductive plating	bare	P
	Test made in specified individual enclosure: Details of these tests, including the dimensions of the enclosure:		N/A
	Fuse "F": copper wire: diameter 0,8 mm, 50 mm long		P
	Circuit is earthed at: (load-star- or supply-star point)	One Supply point	P
	Conductor cross-sectional area (mm ²) :	2 x (40 x 5) = 400 mm ²	P
	If terminals unmarked: line connected at: (underside/upside)		N/A
	Tightening torques: (Nm)	42	P
	Test sequence of operation: O – t – CO		P
	Test circuit according figure: 9		P
	- test voltage U/U _e = 1,05 (V)	525	P
	Short-circuit test current (I _{IT}): equal to 1,2 times the max. setting of the short-time delay release tripping current,		N/A
	or, in the absence of such a release, 1,2 time the max. setting of the tripping current of the instantaneous release, (kA)	9.9	P
	or, where relevant 1,2 times the max. setting of the definite time delay release tripping current, but not exceeding 50kA.		N/A
	- r.m.s. test current AC/DC: (kA)	10.22	P
	power factor/time constant :	0.48	P
	- Factor "n"	1.7	P
	- peak test current (kA _{max}) :	17.41	P
	Test sequence "O" L1		
	- max. let-through current: (kA _{peak})L1:	16.19	P
	- Joule integral I ² dt (A ² s)L1:	2 820 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO" L1		
	- max. let-through current: (kA _{peak})L1:	15.38	P
	- Joule integral I ² dt (A ² s)L1:	2 590 000	P
	Test sequence "O" L2		
	- max. let-through current: (kA _{peak})L2:	15.88	P
	- Joule integral I ² dt (A ² s)L2:	2 820 000	P

ANNEX H 9.9 kA / 500 V on 1 Pole FGN 630 / 630 A N° 29086-066			
IEC 60 947-2			
Clause	Requirement – Test	Result – Remark	Verdict
	Pause, t: (min)	3 min	P
	Test sequence "CO" L2		
	- max. let-through current: (kA _{peak})L2:	16	P
	- Joule integral I ² dt (A ² s)L2:	1 759 000	P
	Test sequence "O" L3		
	- max. let-through current: (kA _{peak})L3:	16.04	P
	- Joule integral I ² dt (A ² s)L3:	2 870 000	P
	Pause, t: (min)	3 min	P
	Test sequence "CO" L3		
	- max. let-through current: (kA _{peak})L3:	15.55	P
	- Joule integral I ² dt (A ² s)L3:	2 750 000	P
	Melting of the fusible element	No melting	P
	Holes in the PE-sheet for test sequence "O"	No hole	P
	Cracks observed	No crack	P
H.3	Verification of dielectric withstand		
	- equal to twice the rated operational voltage with a minimum of 1000 V	1 000	P
	- no breakdown or flashover		P
H.4	Verification of overload releases		
	The operation of overload releases shall be verified at 2.5 times the value of their current setting on each pole separately.		
	The operating time shall not exceed the max. value stated by the manufacturer for twice the current setting at the reference temperature, on a pole singly.		
	Time specified by the manufacturer:	≤ 50 s	P
	- Operation time: (s) L1: L2: L3:	21 22 22	P
H.5	Marking		
	Circuit-breaker for which all values of rated voltage have not been tested according to this annex or are not covered by such testing, shall be identified by the symbol  which shall be marked on the circuit-breaker immediately following these values of rated voltage	690 V 	P

Additional tests for circuit-breakers with electronic overcurrent protection Annex F IEC60947-2

F4 Immunity tests

The EMC immunity tests for circuit-breaker type model FG 400 A and FG 630 A are described in KEMA Report No. 2036913-QUA/EMC 03-4846

The circuit-breaker fulfils the requirements

F5 Emission tests

The EMC emissions tests for circuit-breaker type model FG 400 A ETU are described in KEMA-Powertest Report No. 02KPT2147

The circuit-breaker fulfils the requirements.

F6 Suitability for multiple frequencies

The circuit-breaker is rated for 50Hz – 60 Hz only. No tests are required.

F7 Dry heat test

The circuit-breaker with the electronic controls mounted inside was kept for 168 h at an ambient temperature of 40 ° C.

The circuit-breaker was loaded with an a.c current of 160 A in all phase poles.

The circuit-breaker did not trip.

After 168 h the circuit-breaker was loaded for 2 hours with 168 A (1,05 times rated current). The circuit-breaker did not trip. Immediately after the 2 hours the current was raised to 208 A (1,3 times rated current). The circuit-breaker tripped after 136 to 156 seconds. Requirement switch off time within 2 hours.

F8 Damp heat test

The circuit-breaker with the electronic controls was subjected to a damp heat test according IEC60068-2-30. The upper temperature was 55 ° C (variant 1) and the number of cycles was six.

After the six cycles the circuit-breaker was loaded for 2 hours with 168 A (1,05 times rated current). The circuit-breaker did not switch off. Immediately after the 2 hours the current was raised to 208 A (1,3 times rated current) the circuit-breaker switched off after 119 to 145 seconds. Requirement switch off time within 2 hours.

F9 Temperature variation cycles at specified rate of change

The electronic controls were submitted to 28 temperature variation cycles in accordance with figure F.25 of the specification. The rise and fall of the temperature during the rate of variation was $1 \text{ K/min} \pm 0,2 \text{ K/min}$. When the temperature was reached it was maintained for at least 2 hours.

The electronic controls were mounted inside the circuit-breaker. The electronic controls were energized to simulate service conditions and the main circuit was not energized.

During the 28 cycles the electronic controls did not operate to cause the circuit-breaker to trip.

After the 28 cycles the circuit-breaker was loaded for 2 hours with 168 A (1,05 times rated current). The circuit-breaker did not switch off. Immediately after the 2 hours the current was raised to 208 A (1,3 times rated current) the circuit-breaker switched off after 118 to 136 seconds. Requirement switch off time within 2 hours.

IEC 60 947-2								
TABLE: Resistance to fire (Glow wire test)								
no.	Specimen							Verdict
	Description	Colour	Thick (mm)	Temp. °C	burning after t (s)	drops	support burning	
1	3 pole Rotor	White	*	960°C	No flame	No	No	P
2	Cassette	Grey	*	960°C	No flame	No	No	P
3	CT Bar insulator	Black	*	650°C	No flame	No	No	P
4	Cross bar	Black	*	960°C	No flame	No	No	P
5	Strap and Cap	Natural	*	650°C	No flame	No	No	P
6	4 pole Rotor	Natural	*	960°C	Extinct within 2 s	No	No	P
7	Base	Black	*	960°C	No flame	No	No	P
8	Mid Cover	Grey	*	960°C	No flame	No	No	P
9	Top Cover	Grey	*	960°C	No flame	No	No	P
10	Handle	Black	*	650°C	No flame	No	No	P
11	Handle extension	Black	*	650°C	No flame	No	No	P
12	Window	Transparent	*	650°C	No flame	No	No	P
13	Transformer Isolator	Black	*	960°C	No flame	No	No	P

* Part of sample

IEC 60 947-2								
TABLE: Resistance to tracking (tracking test)								
no.	Specimen							Verdict
	Description	Colour	Drops (no.)	Impress (mm)	Burning	Current (A)	Result	
1	3 pole Rotor	White	50	-	No	-	175 V	P
2	Cassette	Grey	50	-	No	-	175 V	P
4	Cross bar	Black	50	-	No	-	175 V	P
6	4 pole Rotor	Natural	50	-	No	-	175 V	P
7	Base	Black	50	-	No	-	175 V	P
8	Mid Cover	Grey	50	-	No	-	175 V	P
13	Transformer Isolator	Black	50	-	No	-	175 V	P

IEC 60 947-2

Additional test on request of manufacturer
Damp-heat test.

Test prescriptions: GB/T 14048-1-2000, K1.2, Db test
Damp-heat environment acc. GB/T 2423.4 (eq. To IEC 60068-2-30)
40°C, 6 cycles followed by dielectric verification at 3 000 V.

Test object: MCCB Record Plus G-Frame 630 A 3Ph + N

Test results: The test object was subjected to 6 cycles of damp heat at max. 40°C according IEC 60068-2-30.

After these 6 cycles, it was subjected to a dielectric verification according IEC 60947-1 § 8.3.3.4.14) at 3 000 V AC ($2 U_i + 1\,000\text{ V}$, $U_i = 1\,000\text{ V}$ for Record Plus G-frame)

- i) Between all the terminals of the main circuit connected together and the mounting plate, with the contacts in all normal positions of operation (On, Trip, Off)
- ii) Between each pole of the main circuit and the other poles connected together and to the mounting plate, with the contacts in all normal positions of operation (On, Trip, Off).
- iii) Across the poles of the main circuit, the line terminals being connected and the load terminals connected together.

In all cases, there occurred no flashover, breakdown of insulation either internally (puncture) or externally (tracking) or any other manifestation of disruptive discharge.

In case iii), the leakage current was less than 0.4 mA.

Conclusion: The test object complies with the test prescription.

Under Voltage Release

N°	Rated Voltage (V)	Between 35 and 70%		Before 85%		Kiss Free (OK-NOK)
		Tripping level in AC (V)	Tripping level in DC (V)	Closing Level in AC (V)	Closing Level in DC (V)	
1	220/240V AC 250V DC	126,5 = 53%	112,5 = 45%	130 = 59%	116 = 46%	OK
2		125 = 52 %	111,4 = 44,5%	126 = 57%	115 = 46%	OK
3		127 = 53%	113 = 45%	144 = 65,5%	117 = 47%	OK
4		127 = 53%	112 = 45%	131 = 59,5%	117 = 47%	OK
6		130 = 54%	111 = 44,5%	148 = 67%	116 = 46,5%	OK
7	24	13,8 = 57,5%	12,3 = 51,2%	14 = 58,3%	12,5 = 52%	OK
8	24	13,8 = 57,5%	12,3 = 51,2%	15 = 58,3%	12,5 = 52%	OK
9	12V DC	N/A	6,3 = 52,5%	N/A	7,3 = 60%	OK
10		N/A	6,3 = 52,5%	N/A	7,4 = 61,6%	OK
11	110/130V AC	61 = 47%	54 = 43,2%	68 = 61,8%	57 = 51,8%	OK
12	110/125V DC	62 = 47%	55 = 43,2%	68 = 61%	56 = 51%	OK
13	48	27 = 56%	24 = 50%	30 = 62,5%	26 = 54%	OK
14	48	28 = 56%	25 = 50%	32 = 66,6%	27 = 54%	OK

Checking after Sequence I

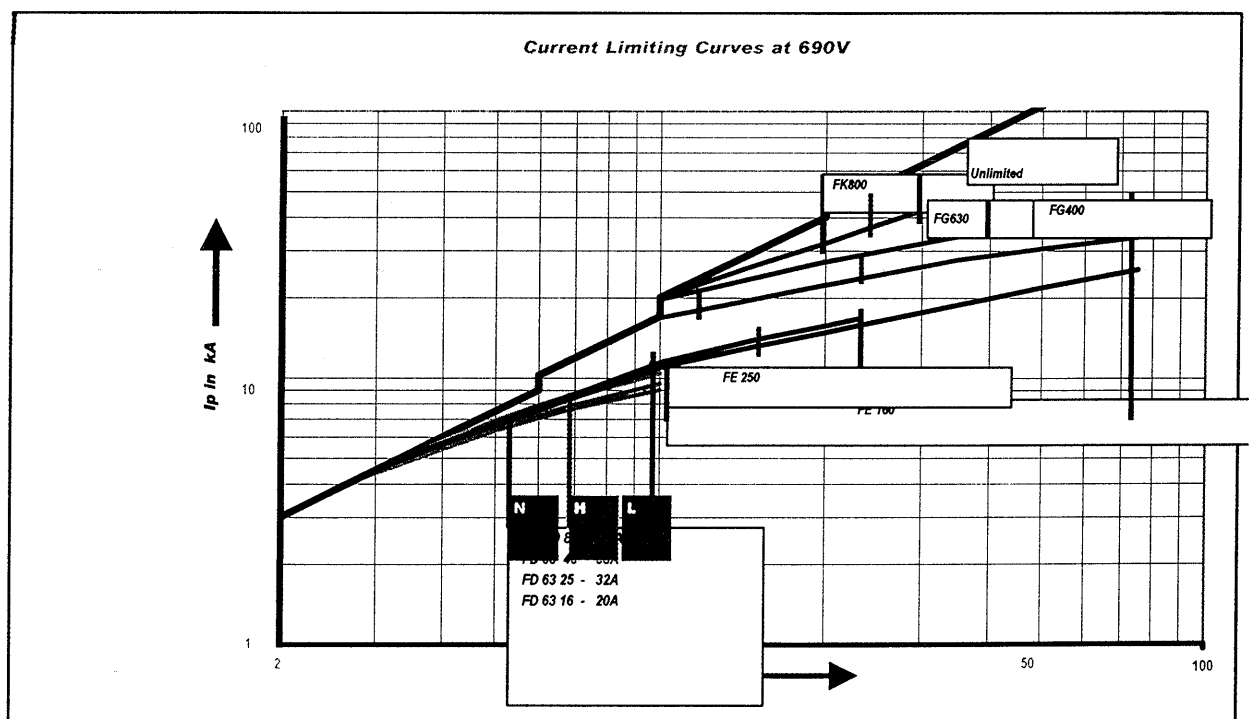
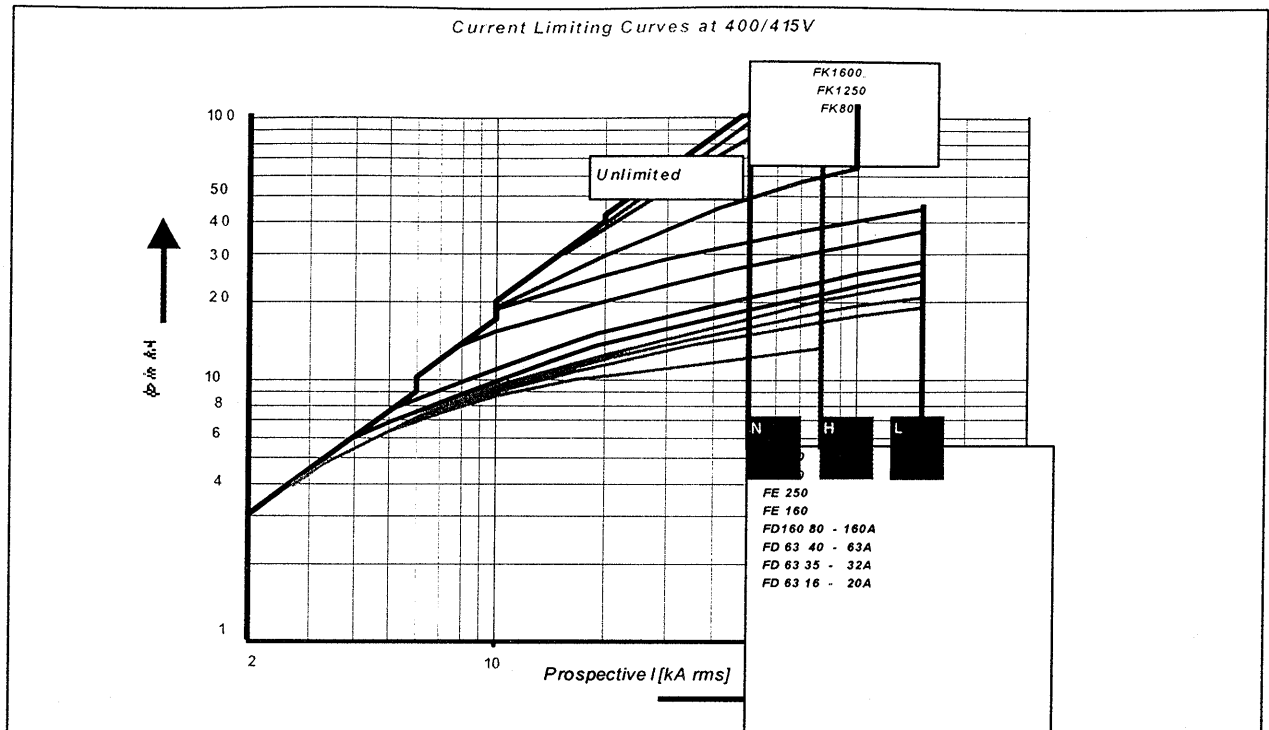
1	220/240V AC 250V DC	126 = 52,5%	112,5 = 45%	128 = 58%	116 = 46%	OK
2		125 = 52%	111,5 = 44,6%	126 = 57%	115 = 46%	OK
3		127 = 53%	113 = 45%	129 = 58,6%	117 = 47%	OK

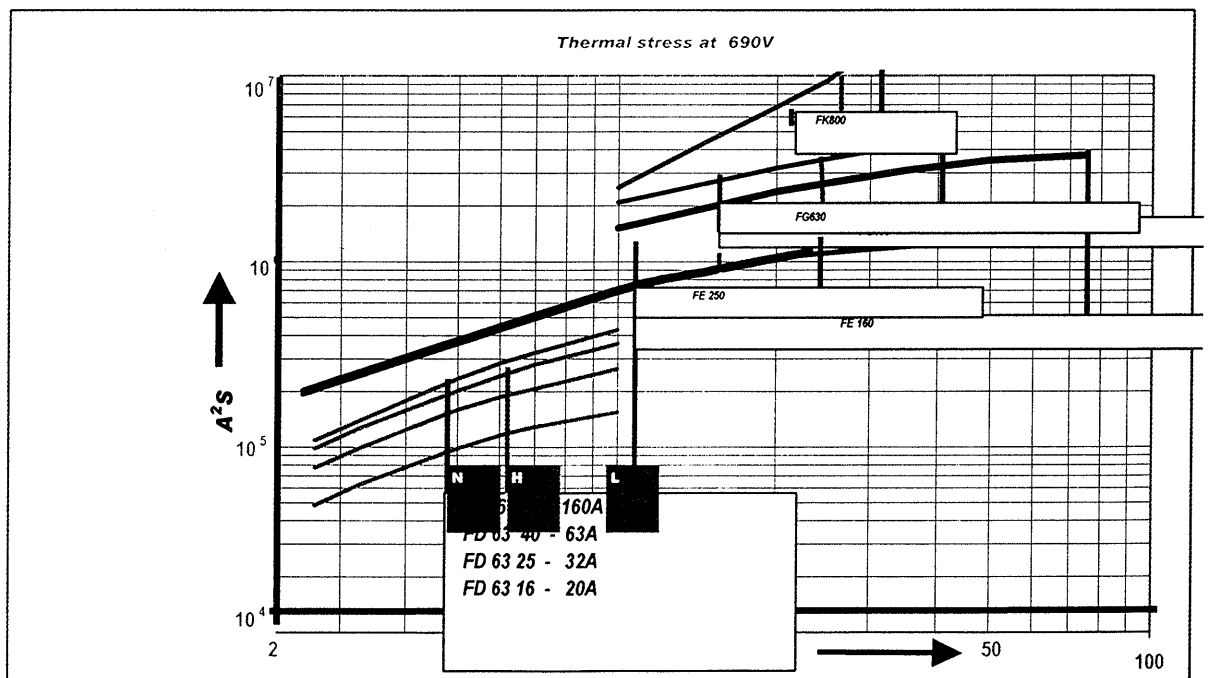
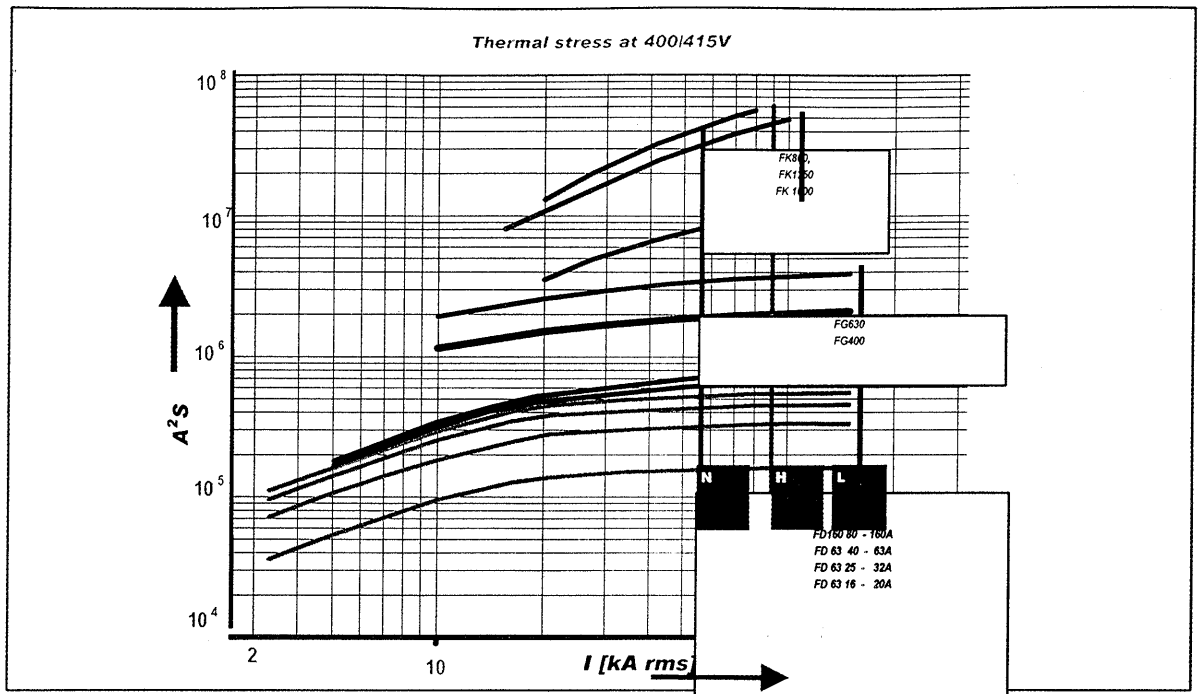
Shunt Trip

						Trip <= 70%			
N°	Rated Voltage (V)	Tripping time AC (ms)	Tripping time DC (ms)	Kiss Free AC (ms)	Kiss Free DC (ms)	AC (V) / %	DC (V) / %		
1	220/240V AC 250V DC	12,2 - 13,7 - 13	10,5 - 10,9 - 10,2	OK	OK	130 130.5 / 54.2 54.4	130 130.5 / 52 52.2		
2		12,6 - 8,5 - 12,2	10,8 - 10,8 - 10,8	OK	OK	125 124.5 / 52.1 51.9	122.8 122.5 / 49.1 49		
3		12 - 12,9 - 13,8	10,2 - 9,4 - 9,9	OK	OK	130 128.8 / 54.2 53.7	122 121.8 / 48.8 48.7		
4		13,5 - 13,6 - 14	10,8 - 11 - 10,4	OK	OK	127 125.5 / 52.9 52.3	121.4 121.7 / 48.6 48.7		
5		13,8 - 13,5 - 12,2	10,1 - 10,4 - 10,5	OK	OK	128 127.8 / 53.3 53.3	122.5 122.6 / 49 49		
6		13,7 - 13,9 - 11,8	10,6 - 10,7 - 10,6	OK	OK	126.8 126.9 / 52.8 52.9	121.5 122 / 48.6 48.8		
7		12,9 - 13,9 - 8,8	10,3 - 9,5 - 10,1	OK	OK	130 131.5 / 54.2 54.8	130 129.5 / 52 51.8		
8		12,4 - 13,1 - 13,7	11,1 - 10,5 - 11,1	OK	OK	131 131.8 / 54.6 54.9	127 129 / 50.8 51.6		
9		12,3 - 12,4 - 12,2	11 - 11 - 10,4	OK	OK	130 131.3 / 54.2 54.7	129 129.5 / 51.6 51.8		
10		12,5 - 11,8 - 12	9,7 - 9,9 - 9,9	OK	OK	129.5 130 / 54.0 54.2	124.5 126.5 / 49.8 50.6		
11	24	9,5 - 10,3 - 10	11,3 - 11,6 - 11,1	OK	OK	12.7 12.8 / 52.9 53.3	12.2 12.2 / 50.8 50.8		
12	24	11,5 - 9,2 - 9,9	11,2 - 11,2 - 10,8	OK	OK	12.8 12.8 / 53.3 53.3	12 12 / 50 50		
13	12V DC	N/A	6,9 - 6,9 - 7,2		OK	N/A	6.6 6.6 / 55 55		
14		N/A	7,4 - 6,2 - 7,4		OK	N/A	6.8 6.8 / 56.7 56.7		
15	48	8 - 7,9 - 8,1	9,5 - 10,2 - 10,3	OK	OK	27.5 27.3 / 57.3 56.9	27.6 27.6 / 57.5 57.5		
16	48	7,9 - 10,2 - 8,4	9,6 - 9,1 - 9,6	OK	OK	27 26.9 / 56.3 56.0	26 26.3 / 54.2 54.8		
17	110/130V AC	11,4 - 11,7 - 11,9	9,3 - 9,6 - 9,6	OK	OK	67 67.2 / 51.5 51.7	65 64.9 / 52 51.9		
18	110/125V DC	8,1 - 7,8 - 9	9,9 - 9,6 - 9,9	OK	OK	69 69.7 / 53.1 53.6	71 71.5 / 56.8 57.2		

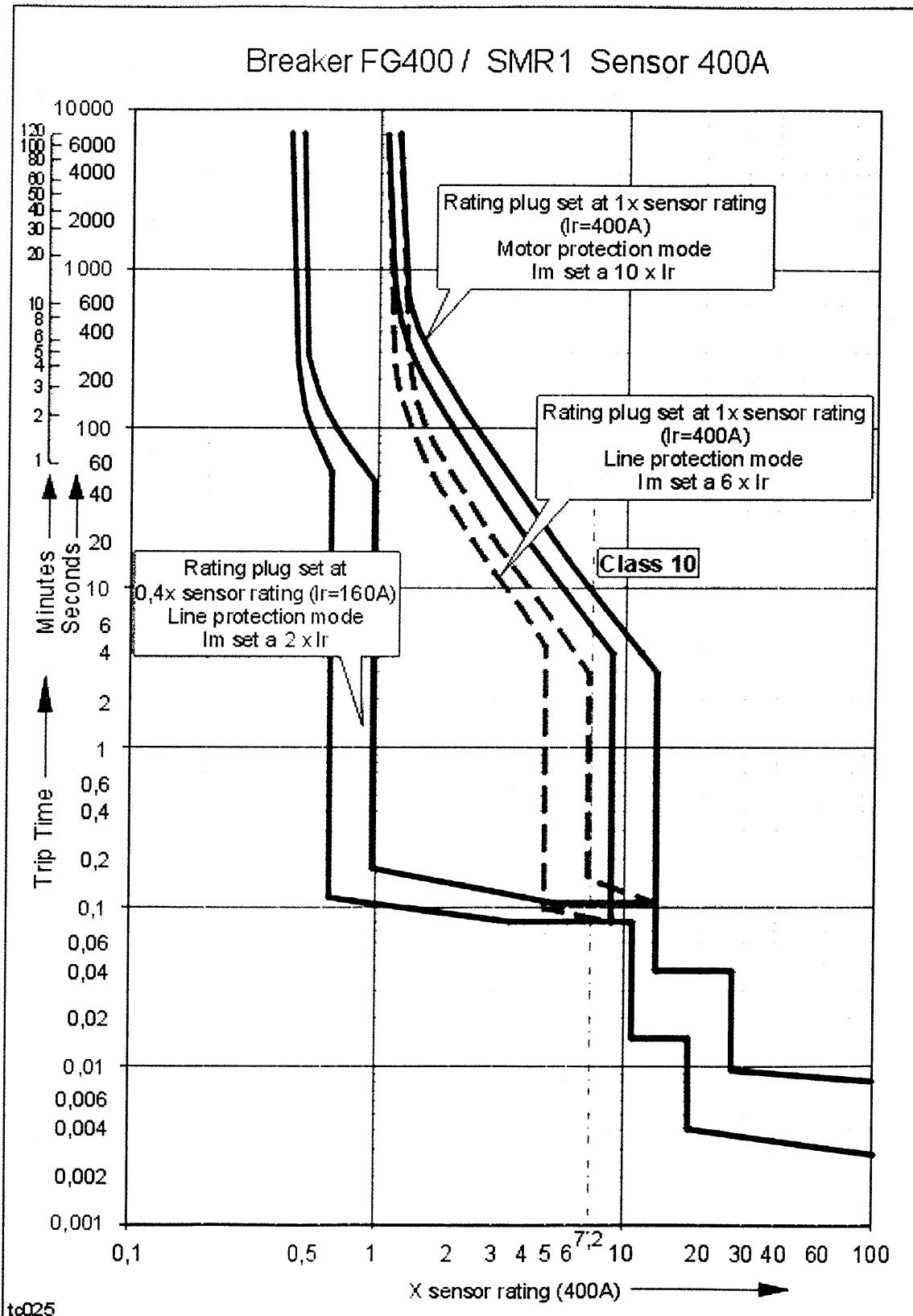
Checking after Sequence I

1	220/240V AC 250V DC	13,3 - 12,3 - 12,3	9,6 - 9,8 - 9,9	OK	OK	130 129.5 / 54.2 54	130 131 / 52 52.4		
2		13,4 - 12,3 - 12,5	9,5 - 8,9 - 9	OK	OK	126 125.5 / 52.5 52	122 122.5 / 48.8 49		
3		13 - 13,2 - 12,8	9,8 - 9,4 - 9,6	OK	OK	126.5 127.5 / 52.7 53	122 121.5 / 48.8 48.6		
4		12,8 - 13,4 - 13	9,5 - 10 - 10,1	OK	OK	128 128.5 / 53.3 54	122 122.5 / 48.8 49		
5		13,5 - 12,2 - 13,6	10,1 - 9,8 - 10	OK	OK	128 129 / 53.3 54	122.5 123 / 49 49.2		

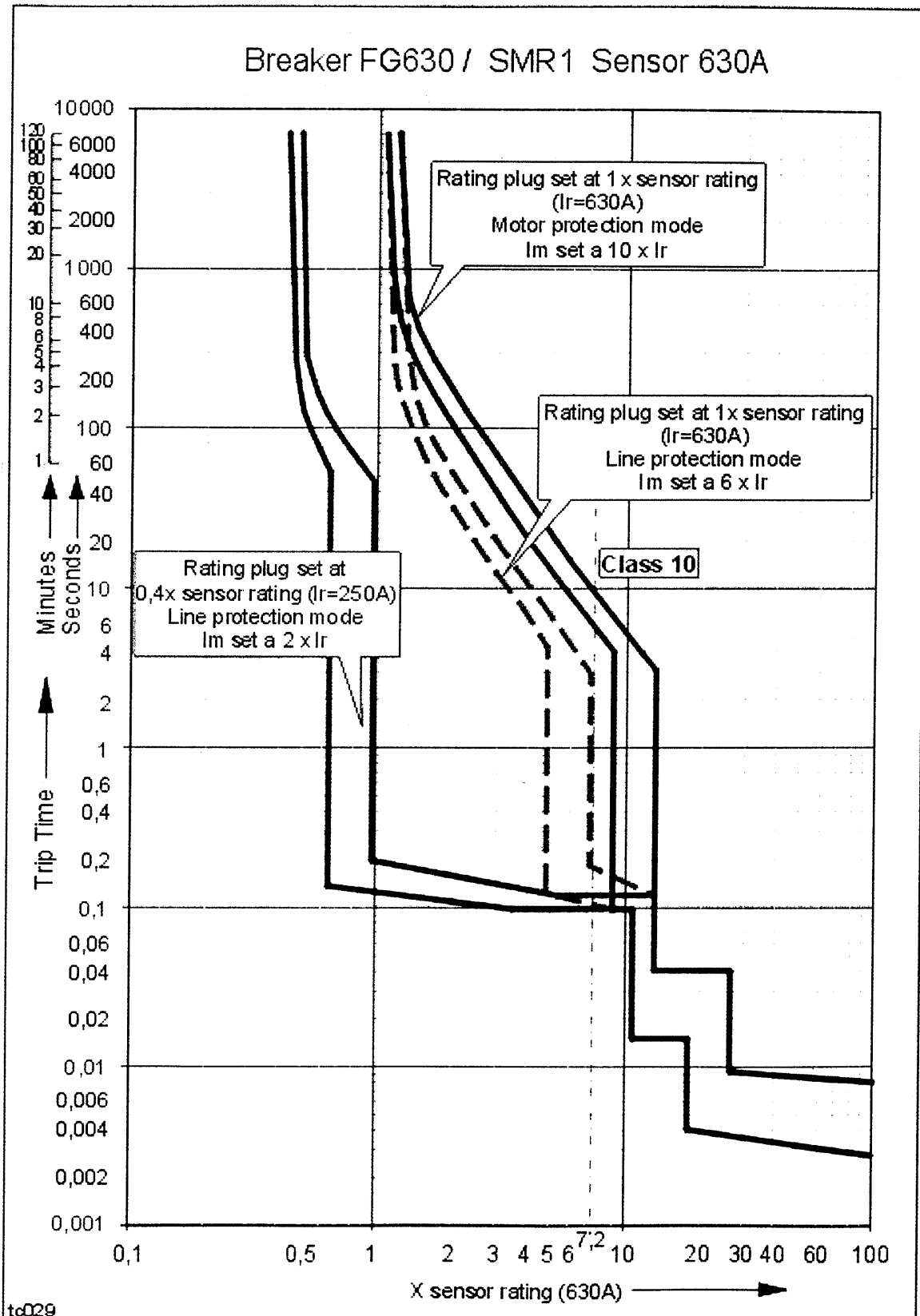




Tripping Curve applicable to FGN 400 A



Tripping Curve applicable to FGN 630 A



to029

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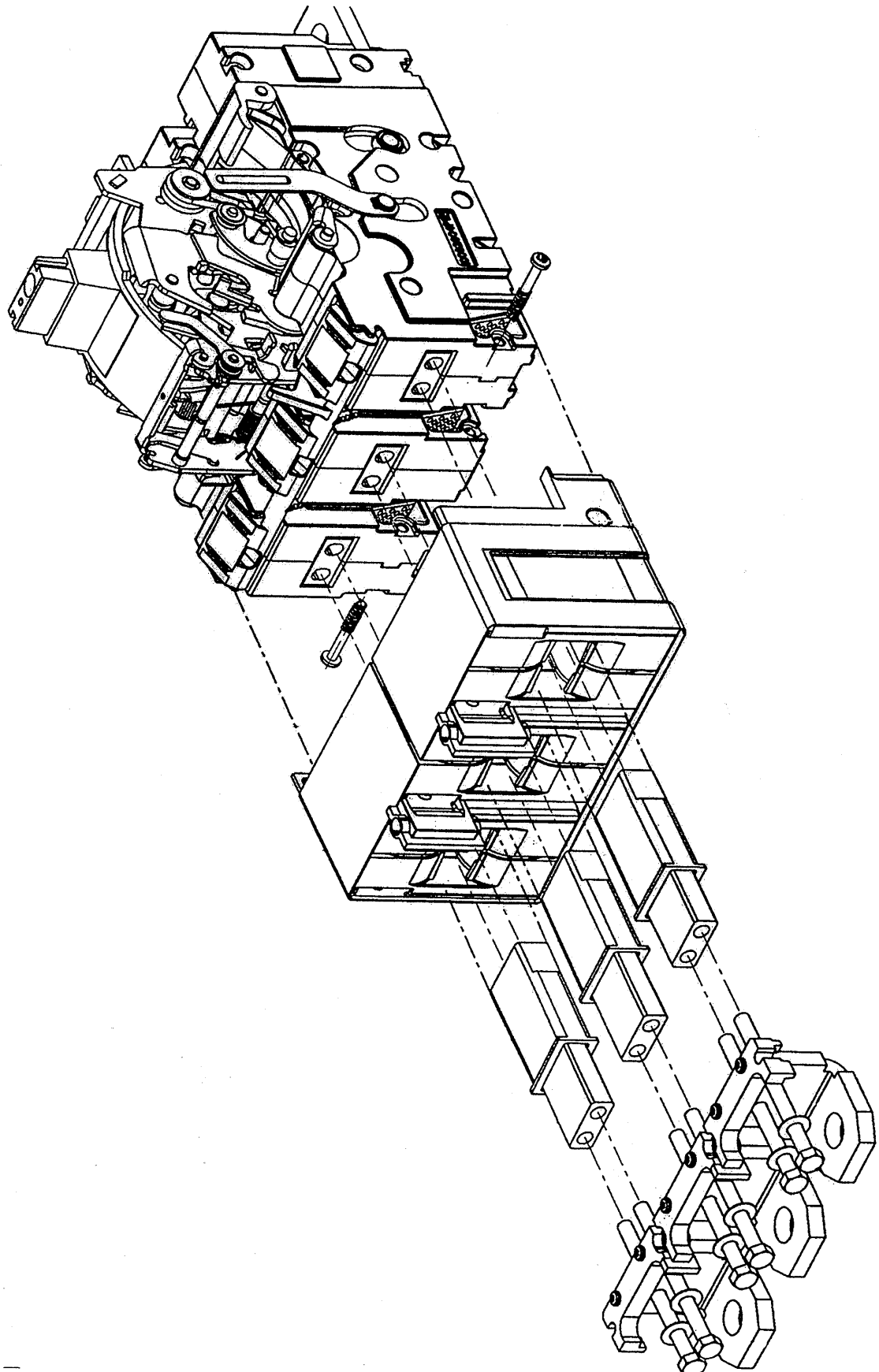


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