AUSTRIAN INSTITUTE OF TECHNOLOGY

Test item

Identification:

Low-voltage switch-disconnector type type BTVC-S

Manufacturer:	PRONUTEC S.A.
Trademark:	pronutec
Device type:	single pole operated three pole device
Busbar system:	185mm
Size:	3
Rated operational voltages:	400V a.c. up to 690V a.c.
Rated operational current:	1000A
Rated frequency:	50Hz

Testing location, Period of testing

Testing location:

Österreichisches Forschungs- und Prüfzentrum Arsenal Ges.m.b.H.
Business Unit Electric Energy Systems
Power Service Center
Giefinggasse 2
A-1210 Vienna
AUSTRIA

Period of testing:

03/2011

Test(s)

Test(s) performed:

Type test

Test standard(s):

IEC 60947-1 Ed. 5.0:2007+A1:2010 and IEC 60947-3 Ed. 3.0:2008
EN 60947-1:2007+A1:2011 and EN 60947-3:2009

Possible test case verdicts:

P (Pass):	Test item does meet the requirement
F (Fail):	Test item does not meet the requirement
N (Not applicable):	Test case does not apply to the test item

Summary of test results

See page 4

Drawing and picture of test item

See page 4

Test performance and test values

See pages 5 to 17

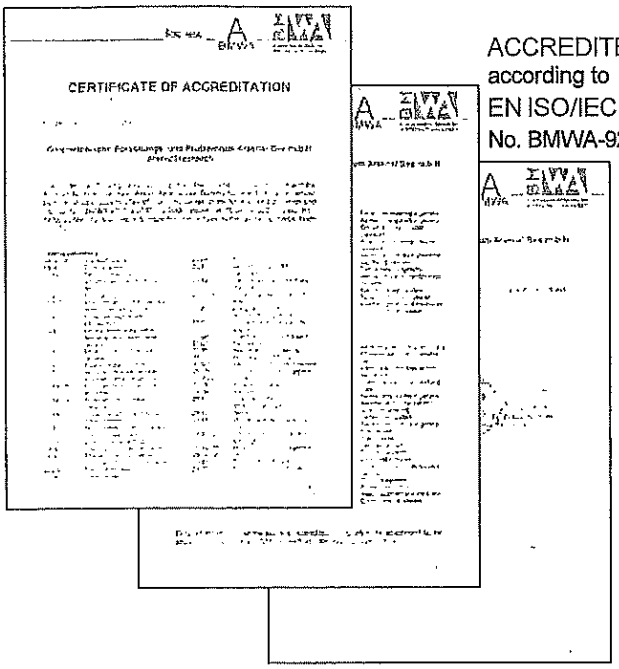
Result

The low-voltage switch-disconnector type BTVC-S mentioned above has passed the type test successfully.

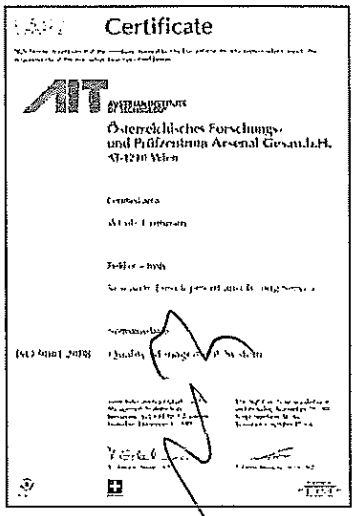
Test Engineer	Project Engineer
на основание чл. 2 от ЗЗЛД	на основание чл. 2 от ЗЗЛД
Ing.J.Ainetter	Ing.K.Farthofer

AUSTRIAN INSTITUTE OF TECHNOLOGY

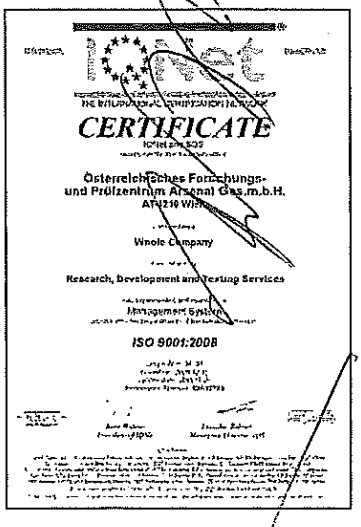
Testing laboratory



ACCREDITED
according to
EN ISO/IEC 17025
No. BMWA-92.714/0504-I/12/2007

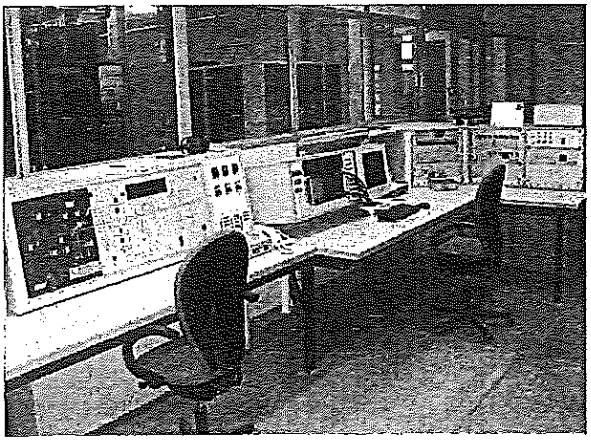


CERTIFICATED
according to
ISO 9001
Reg. No. 12769

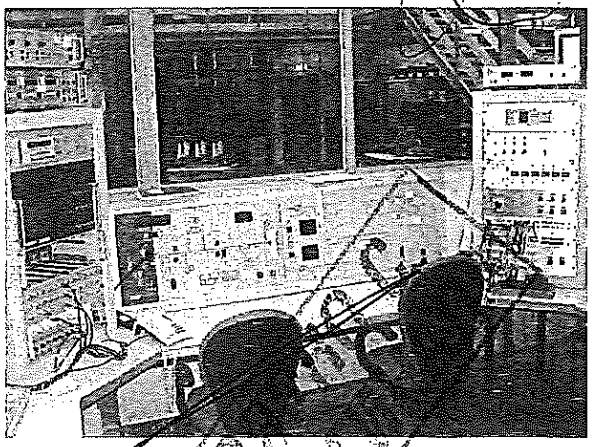


RECOGNIZED
CB TESTING LABORATORY
under the responsibility of OVE
as the National Certification Body

POWER SERVICE CENTER:



Control station for tests up to 15kA



Control station for tests above 15kA

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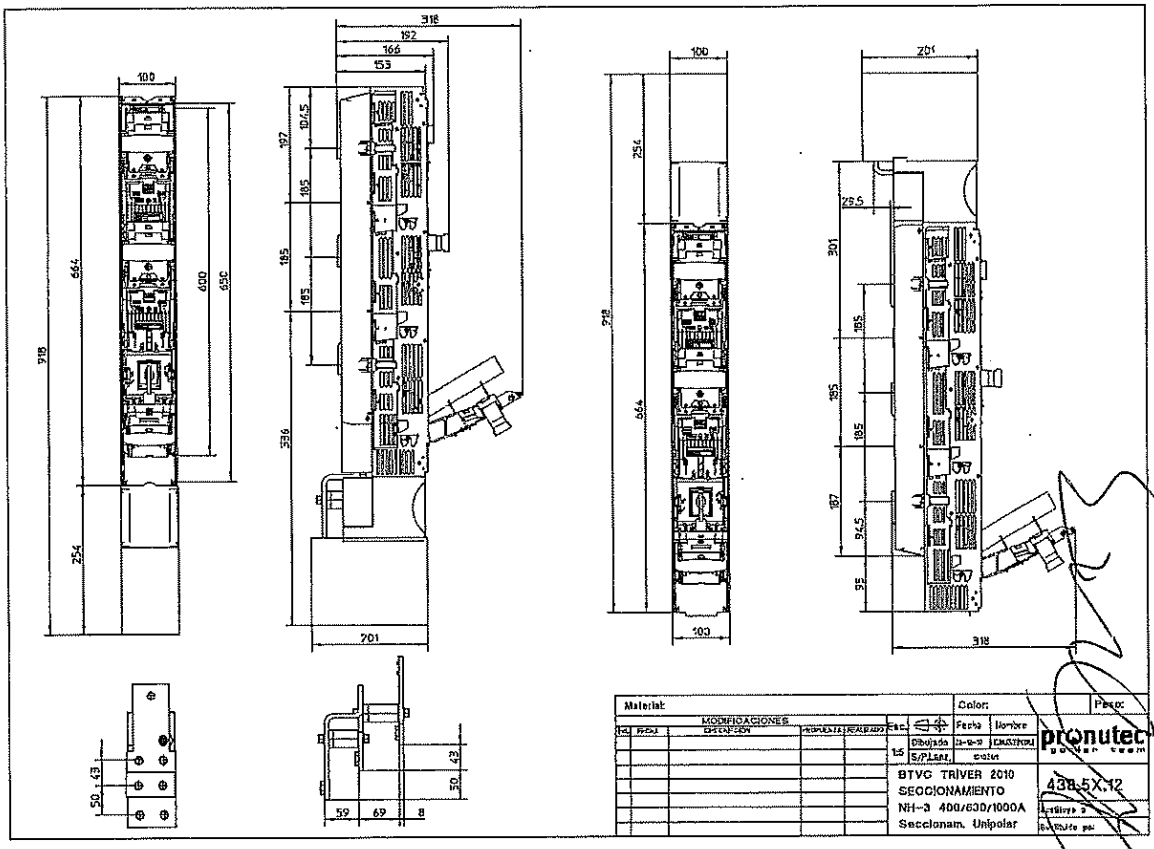
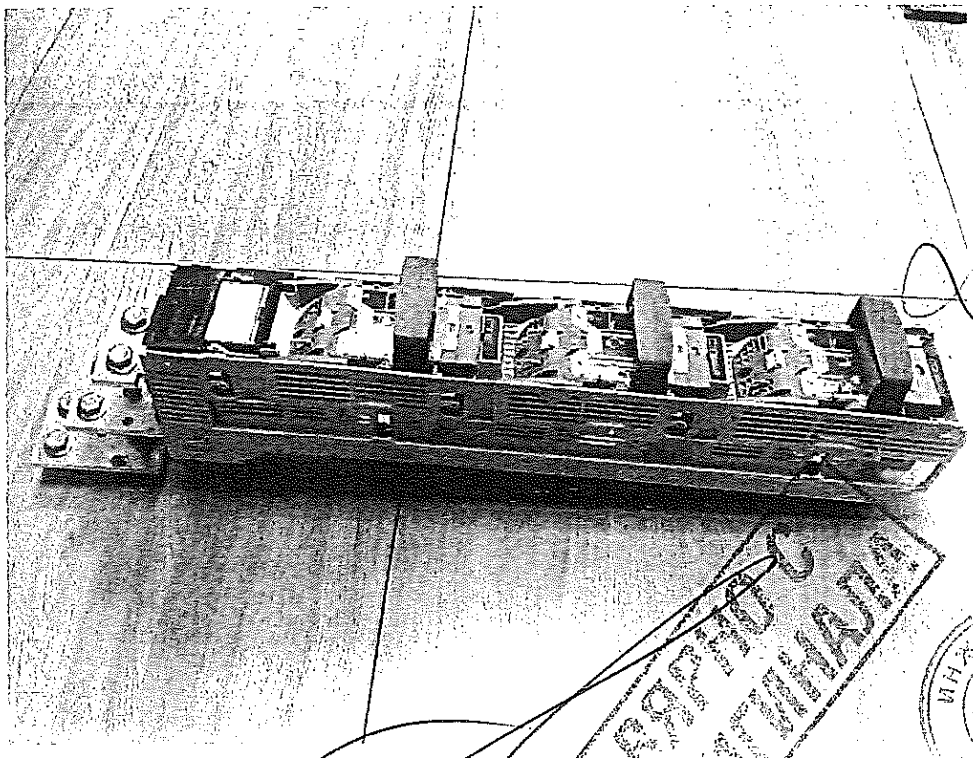
Summary of test results

Constructional requirements:	Passed
Test sequence I	
Temperature-rise:	Passed at 1000A
Dielectric properties:	Passed at Uimp = 12kV and Ui = 1000V
Making and breaking capacity:	AC-21B passed at 690V/1000A
Test sequence II	
Operational performance capability:	AC-21B passed at 690V/1000A
Test sequence III	
Short-time withstand current Icw:	Passed at 12000A r.m.s. / 1s
Short-circuit making capacity Icm:	Passed at 23000A peak
Test sequence IV	
Conditional short-circuit current:	Not applicable
Test sequence V	
Overload:	Not applicable

Drawing and picture of test item





Test performance and test values

IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.3	**TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS**		**P**
8.3.3.1	**Temperature-rise test**		**P**
	ambient temperature 10-40 °C ..... :	24	—
	test enclosure W x H x D (mm x mm x mm) ..... :	-	—
	material of enclosure ..... :	-	—
	Main circuits, test conditions:		—
	- conventional thermal current Ith (A) ..... :	1004	—
	- conventional enclosed thermal current Ithe (A) .... :	-	—
	- cable / bar cross-section (mm²) / (mmxmm) ..... :	Busbars: 60x10 Outgoing: Cu bars 2 x 60x5	—
	- cable / bar length (mm) / (mm) ..... :	Busbars: 600 Outgoing: 2000	—
	Fuse-link details (fuse-combination units only):		—
	- manufacturer's name, trademark or identification mark ..... :	-	—
	- manufacturer's model or type reference ..... :	-	—
	- rated voltage (V) ..... :	-	—
	- rated current (A) ..... :	-	—
	- power loss (W) ..... :	-	—
	- rated breaking capacity (kA) ..... :	-	—
	Measured temperature-rise ..... :	See table on page 17	P
	Auxiliary circuits, test conditions:		N
	- rated operation current (A) ..... :	-	—
	- cable cross-section (mm²) ..... :	-	—
	Measured temperature-rise ..... :	-	N

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict

8.3.3.2	**Test of dielectric properties**		**P**
	Rated impulse withstand voltage (kV) .....:	12	—
	- test Uimp main circuits (kV) .....:	14,8	P
	- test Uimp auxiliary circuits (kV) .....:	-	N
	- test Uimp on open main contacts (equipment suitable for isolation) (kV) .....:	18,5	P
	Power-frequency withstand voltage (V) .....:	1000	—
	- main circuits, test voltage for 5 sec. (V) .....:	2200	P
	- control and auxiliary circuits, test voltage for 5 sec. (V) .....:	-	N
	Devices, which have been disconnected for the power-frequency withstand voltage test.....:	-	N
	Equipment suitable for isolation, leakage current not exceed 0,5 mA		—
	Test voltage 1,1 Ue (V).....:	760	—
	Measured leakage current (mA).....:	< 0,1	P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.3.3	**Making and breaking capacity test** **Test 1: L1 closed, L2 closed, L3 operated; Test 2: L1operated, L2 closed, L3 open**		**P**
	- utilization category.....:	AC-21B	—
	- rated operational voltage Ue (V).....:	690	—
	- rated operational current Ie (A).....:	1000	—
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 729 L2: 730 L3: 729	—
	- test current I/Ie = 1,5 (A) .....:	L1: 1517 L2: 1526 L3: 1512	—
	- power factor / ~~time constant~~ .....:	L1: 0,96 L2: 0,96 L3: 0,96	—
	Conditions, break operation AC-23A and AC-23B only:		N
	- test voltage U/Ue = 1,05 (V) .....:	L1: - L2: - L3: -	—
	- test current I/Ie = ... (A) .....:	L1: - L2: - L3: -	—
	- power factor .....:	L1: - L2: - L3: -	—
	Number of make/break operations .....:	5	P
	Current duration make/break operations (ms) .....:	280	—
	Recovery voltage duration ≥ 50 ms (ms) .....:	90	P
	Time interval between operations (s) .....:	30	P
	Characteristic of transient recovery voltage for AC-22 and AC-23 only:		N
	- oscillatory frequency (kHz) .....:	-	—
	- measured oscillatory frequency (kHz) .....:	L1: - L2: - L3: -	N
	- factor y .....:	L1: - L2: - L3: -	N

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.3.3.5	Behaviour of the equipment during test		P
	Test performed without:		—
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.3.3.6	Condition of the equipment after test		P
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 8		P
	- equipment is able to carry its rated current after normal closing operation		P
8.3.3.4	Dielectric verification		P
	- test voltage 2 Ue with 1000V~ minimum (V) .....:	1380	—
	- no flashover or breakdown		P
8.3.3.5	Leakage current		P
	- test voltage 1,1 Ue (V).....:	760	
	- leakage current ≤ 2 mA / pole (mA).....:	< 1	P
8.3.3.6	Temperature-rise verification		P
	- test current Ie (A).....:	1000	—
	- cable / bar cross-section (mm²) / (mmxmm) .....:	Busbars: 60x10 Outgoing: 3 x 40x5	—
	- cable / bar length (mm) / (mm) .....:	Busbars: 600 Outgoing: 2000	—
	- temperature of main circuit terminals ≤ 80 K (K) ....:	< 80	P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.4	**TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY**		**P**
8.3.4.1	**Operational performance test** **Test 1: L1 closed, L2 closed, L3 operated; Test 2: L1operated, L2 closed, L3 open**		**P**
	- utilization category .....:	AC-21B	—
	- rated operational voltage (V) .....:	690	—
	- rated operational current (A) .....:	1000	—
	Test conditions for electrical operation cycles:		P
	- test voltage (V) .....:	L1: 694 L2: 695 L3: 693	—
	- test current (A) .....:	L1: 1012 L2: 1022 L3: 1009	—
	- power factor / ~~time constant~~ .....:	L1: 0,95 L2: 0,95 L3: 0,96	—
	Number of cycles with current .....:	100	P
	Number of cycles without current .....:	500	P
	First test sequence (with/without current) .....:	With	—
	Second test sequence (with/without current) .....:	Without	—
	- time interval between first and second test sequence .....:	No time interval	—
	- recovery voltage duration at operatons with current ≥ 50 ms (ms).....:	90	P
	- current duration (ms) .....:	280	—
	- time interval between operations (s) .....:	180	P
8.3.4.1.5	Behaviour of the equipment during test		P
	Test performed without:		—
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.4.1.6	Behaviour of the equipment after test		P
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 8		P
	- equipment is able to carry its rated current after normal closing operation		P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.4.2	Dielectric verification		P
	- test voltage 2 Ue with 1000V~ minimum (V) .....:	1380	—
	- no flashover or breakdown		P
8.3.4.3	Leakage current		P
	- test voltage 1,1 Ue (V).....:	760	—
	- leakage current ≤ 2 mA / pole (mA).....:	< 1	P
8.3.4.4	Temperature-rise verification		P
	- test current Ie (A).....:	1000	—
	- cable / bar cross-section (mm²) / (mmxmm) .....:	Busbars: 60x10 Outgoing: 3 x 40x5	—
	- cable / bar length (mm) / (mm) .....:	Busbars: 600 Outgoing: 2000	—
	- temperature of main circuit terminals ≤ 80 K (K) ....:	< 80	P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.5	**TEST SEQUENCE III: SHORT-CIRCUIT PERFORMANCE CAPABILITY**		**P**
8.3.5.1	**Short-time withstand current test** **L1 closed, L2 closed, L3 closed**		**P**
	Rated short-time withstand current Icw (A) .....:	12000 r.m.s. / 1s	P
	- test voltage (V) .....:	L1: 695 L2: 696 L3: 695	—
	- r.m.s. test current (A) .....:	L1: 12020 L2: 12035 L3: 12010	—
	- peak test current (A) .....:	L1: 24380 L2: 17110 L3: 23740	—
	- power factor / ~~time constant~~ .....:	L1: 0,28 L2: 0,28 L3: 0,28	—
	- factor *n* .....:	2,03	—
	Test duration (ms) .....:	1005	—
8.3.5.1.5	Behaviour of the equipment during test		P
	Test performed without:		—
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.5.1.6	Condition of the equipment after test		P
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 8		P
	- equipment is able to carry its rated current after normal closing operation		P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.5.2	**Short-circuit making capacity** **L1 open, L2 closed, L3 operated**		**P**
	Rated short-circuit making capacity Icm (A) .....:	23000 peak	P
	- test voltage U/Ue = 1,05 (V) .....:	L1: 728 L2: 728 L3: 728	—
	- r.m.s. test current (A) .....:	L1: 11490 L2: 11510 L3: 11485	—
	- peak test current (A) .....:	L1: 23150 L2: 18260 L3: 21730	—
	- power factor / ~~time constant~~ .....:	L1: 0,29 L2: 0,28 L3: 0,29	—
	- factor *n* .....:	2,02	—
	Current duration (s) .....:	85	—
	Number of cycles .....:	2	—
	Time interval between the cycles .....:	3	—
8.3.5.2.5	Behaviour of the equipment during test		P
	Test performed without:		—
	- endanger to the operator		P
	- cause damage to adjacent equipment		P
	No permanent arcing		P
	No flash over between poles and poles and frame		P
	No melting of the fuse in the detection circuit		P
8.3.5.2.6	Condition of the equipment after test		P
	Immediately after the test equipment must work satisfactorily		P
	- required opening force not greater than the test force of 8.2.5.2 and table 8		P
	- equipment is able to carry its rated current after normal closing operation		P

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.5.3	Dielectric verification		P
	- test voltage 2 Ue with 1000V~ minimum (V) .....:	1380	—
	- no flashover or breakdown		P
8.3.5.4	Leakage current		P
	- test voltage 1,1 Ue (V).....:	760	—
	- leakage current ≤ 2 mA / pole (mA).....:	< 1	P
8.3.5.5	Temperature-rise verification		P
	- test current Ie (A).....:	1000	—
	- cable / bar cross-section (mm²) / (mmxmm) .....:	Busbars: 60x10 Outgoing: 3 x 40x5	—
	- cable / bar length (mm) / (mm) .....:	Busbars: 600 Outgoing: 2000	—
	- temperature of main circuit terminals ≤ 80 K (K) ....:	< 80	P

IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.6	**TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT**		**N**
	Conditional short-circuit current test		**N**
	Protective device details:		N
	- manufacturer's name, trademark or identification mark .....:	-	—
	- manufacturer's model or type reference .....:	-	—
	- rated voltage (V) .....:	-	—
	- rated current (A) .....:	-	—
	- rated breaking capacity (kA) .....:	-	—
8.3.6.2	Conditional short-circuit current test values		N
	- test voltage (1,05 Ue) (V) .....:	L1: - L2: - L3: -	—
	- test current (A) .....:	L1: - L2: - L3: -	—
	- rated frequency (Hz) .....:	-	—
	- power factor .....:	-	—
	- factor n .....:	-	—
	Fuse protected short-circuit withstand (equipment in closed position)		N
	- max. let-through current (A) .....:	L1: - L2: - L3: -	—
	- Joule integral I^2dt (A^2s) .....:	L1: - L2: - L3: -	—
	Fuse protected short-circuit making (equipment closing on to short-circuit)		N
	- mean velocity of 15 manually under no-load conditions operations (m/s) .....:	-	—
	- point at which the measurement is made .....:	-	—
	- test speed during the fuse protected short-circuit making (m/s) .....:	-	—
	- max. let-through current (A) .....:	L1: - L2: - L3: -	—
	- Joule integral I^2dt (A^2s) .....:	L1: - L2: - L3: -	—

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.6.2.5	Behaviour of the equipment during test		N
	Test performed without:		—
	- endanger to the operator		N
	- cause damage to adjacent equipment		N
	No permanent arcing		N
	No flash over between poles and poles and frame		N
	No melting of the fuse in the detection circuit		N
8.3.6.2.6	Condition of the equipment after test		N
	Immediately after the test equipment must work satisfactorily		N
	- required opening force not greater than the test force of 8.2.5.2 and table 8		N
	- equipment is able to carry its rated current after normal closing operation		N
8.3.6.3	Dielectric verification		N
	- test voltage 2 Ue with 1000V~ minimum (V) .....:	-	—
	- no flashover or breakdown		N
8.3.6.4	Leakage current		N
	- test voltage 1,1 Ue (V).....:	-	—
	- leakage current ≤ 2 mA / pole (mA).....:	-	N
8.3.6.5	Temperature-rise verification		N
	- test current Ie (A).....:	-	—
	- cable / bar cross-section (mm²) / (mmxmm) .....:	-	—
	- cable / bar length (mm) / (mm) .....:	-	—
	- temperature of main circuit terminals ≤ 80 K (K) ....:	-	N

IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict
8.3.7	**TEST SEQUENCE V: OVERLOAD PERFORMANCE CAPABILITY**		**N**
8.3.7.1	**Overload test**		**N**
	ambient temperature 10-40 °C .....:	-	—
	test enclosure W x H x D (mm x mm x mm) .....:	-	—
	material of enclosure .....:	-	—
	test current 1,6 x Ithe or 1,6 x Ith (A) .....:	-	—
	cable / bar cross-section (mm²) / (mmxmm).....:	-	—
	cable / bar length (mm) / (mm) .....:	-	—
	Fuse-link details:		N
	- manufacturer's name, trademark or identification mark .....:	-	—
	- manufacturer's model or type reference .....:	-	—
	- rated voltage (V) .....:	-	—
	- rated current (A) .....:	-	—
	- power loss (W) .....:	-	—
	- rated breaking capacity (kA) .....:	-	—
	Time duration of the overload test (s) .....:	-	—
	Within 3 to 5 min after the fuse(s) has(have) operated (or 1 h), the equipment has been operated once, i.e. opened and closed		N
	Required opening force not greater than the test force of 8.2.5.2 and table 8		N
	The equipment has not undergone any impairment hindering such operation		N
8.3.7.2	Dielectric verification		N
	- test voltage 2 Ue with 1000V~ minimum (V) .....:	-	—
	- no flashover or breakdown		N
8.3.7.3	Leakage current		N
	- test voltage 1,1 Ue (V).....:	-	—
	- leakage current ≤ 2 mA / pole (mA).....:	-	N
8.3.7.4	Temperature-rise verification		N
	- test current Ie (A).....:	-	—
	- cable / bar cross-section (mm²) / (mmxmm) .....:	-	—
	- cable / bar length (mm) / (mm) .....:	-	—
	- temperature of main circuit terminals ≤ 80 K (K) ....:	-	N

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IEC / EN 60947-3			
Clause	Requirement - Test	Result - Remark	Verdict

	TABLE: Temperature-rise			P
Temperature rise dT of part:			dT (K) measured	dT (K) required
Terminals	Busbar terminals: tin-plated copper	L1	49	65
		L2	58	
		L3	54	
	Outgoing terminals: tin-plated copper	L1	57	65
		L2	61	
		L3	64	
Manual operating means: non-metallic			7	25
Parts intended to be touched but not hand-held: non-metallic			25	40
Parts which need not be touched during normal operation: non-metallic			41	50
Supplementary information: ---				

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Akkreditierung Austria

bmwfj

Federal Ministry of
Economy, Family and Youth

Confirmation of Accreditation

The Federal Ministry of Economy, Family and Youth confirms that

AIT Austrian Institute of Technology GmbH

Donau-City-Straße 1, A-1220 Wien

(sites: Giefinggasse 2, A-1210 Wien und
Konrad-Lorenz-Straße 24, A-3430 Tulln)

Identification number: 1

Initial date of Accreditation: December 01, 1993

PL

is accredited as Testing Laboratory and Inspection Body and fulfills the requirements of ÖVE/ÖNORM EN ISO/IEC 17025:2007 and ÖVE/ÖNORM EN ISO/IEC 17020:2004 Type A.

The detailed scope of accreditation is available in the currently valid decree.

The Conformity Assessment Body is published in the list of accredited bodies under www.en.bmwfj.gv.at/accreditation.

Vienna, October 09, 2012

на основание чл. 2 от ЗЗЛД

Norman Brunner

Division I/12 - Accreditation Body
Stubenring 1 | 1011 Vienna | Austria | phone: +43 (0)1 711 00 - 8236 | fax: +43 (0)1 711 00 93 - 8236 | DVR 0037257
e-mail: akkreditierung@bmwfj.gv.at | www.en.bmwfj.gv.at/accreditation

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	DECLARACIÓN DE CONFORMIDAD	DC4381-0 27-Octubre-2010 Pág. 1 de 1

PRONUTEC, S.A.
Parque Empresarial Boroa Parc. 2c-1
48340 Amorebieta – VIZCAYA (SPAIN)
NIF.: ES-A-48/217.962

Declara bajo su responsabilidad que el producto:
Declare under our sole responsibility that the product:
Eigenverantwortliche Erklärung zu unserem Produckt:

Bases tripolares verticales cerradas (BTVC) tamaños 1/2/3, desconexión unipolar y tripolar.
Three poles fuse rails (BTVC) size 1/2/3, one and three pole Switching.
Dreipolige Sicherungslastschaltleisten (BTVC) Größe 1/2/3, ein und dreipolig schalthar.

Referencias 438xxxxxx fabricados según la Especificación Técnica de Pronutec ET-438.
References 438xxxxxx manufactured according Pronutec's ET-438 Technical Specification.
Die Referenznummem 438xxxxxx sind alle gefertigt gemäß den technischen Spezifikationen der Pronutec ET-438.

Son conformes con las exigencias de la Directiva de Seguridad del material eléctrico destinado a ser utilizado bajo determinados límites de tensión 2006/95/EC.
Are in accordance with the requirements of the Low Voltage Directive 2006/95/EC
Diese sind in Übereinstimmung mit den Anforderungen der Niederspannungsanweisung 2006/95/EC.
Y de la Directiva de Compatibilidad Electromagnética 2004/108/CE.
And with the Electromagnetic Compatibility Directive 2004/108/CE.
Und mit der Elektromagnetischen Verträglichkeitsanweisung 2004/108/CE.

De acuerdo a la siguiente norma armonizada:
According to the following harmonised standard:
Gemäß der folgenden Norm:

UNE - EN 60947-3: 2009

Cualquier montaje, ya sea inicial o posterior que no respete las instrucciones generales de puesta en servicio y uso dadas por Pronutec, anula este documento.
Any initial or subsequent installation that will not observe the general instructions given by Pronutec will cancel this document.
Jegliche Änderungs oder Nachinstallationen, die nicht den generellen Anweisungen der Firma Pronutec entspricht, widerruft diese Erklärung.

En Amorebieta / *In Amorebieta*

Fdo. **Diego Martín Imbert**
Director Técnico
Technical Director / Technischer Direktor

Pronutec
LABORATORIO

на основание чл. 2 от ЗЗЛД

1543

DC4381-0

27-Октомври-2010

Декларация за съответствие

Pronutec, S.A.

Parque Empressarial Boroa Parc. 2c-1

48340 Amorebieta-VIZCAYA (SPAIN)

NIF.: ES-A-48/217.962

Декларирам на своя лична отговорност, че продуктите:

Триполюсните основи с предпазители (BTVC) размери 1/2/3, еднополюсните и триполюсни разединители, с референции 438xxxxxx произведени съгласно техническата спецификация на Pronutec *ET-438*

са в съответствие с изискванията на Директива за ниско напрежение *2006/95 / EC*

и с Директива за електромагнитна съвместимост *2004/108 / CE*

в съответствие със следния хармонизиран стандарт: *UNE - EN 60947-3: 2009*

Всяко първоначално или последващо инсталиране, които няма да спазват общите инструкции, дадени от Pronutec ще отмени този документ.

Fdo. Diego Martin Imbert

En Amorebieta

Технически директор

/подпис не се чете/

1544

ДЕКЛАРАЦИЯ

Долуподписаният **Петър Иванов Данчев**, с л. к. на основание чл. 2 от ЗЗЛД

на основание чл. 2 от ЗЗЛД

на основание чл. 2 от ЗЗЛД в качеството си на Изпълнителен Директор и представляващ " **ИНЖЕНЕРИНГ" ЕАД**

ДЕКЛАРИРАМ, ЧЕ :

Предлаганите от "Инженеринг" ЕАД триполюсни вертикални разединители ниско напрежение ,1000А – NH3 са изцяло в съответствие с изискванията на техническата спецификация на стандартите за материала , включително на параграфи „Характеристика на материала" и "Съответствие на предложеното изпълнение с нормативно – техническите документи" по процедура PPD 18-063.

на основание чл. 2 от ЗЗЛД

01.08.2018 г.
гр.Пловдив

Подпис

Петър Данчев

ИНЖЕНЕРИНГ ПЛОВДИВ ЕАД

1645

Инструкция за монтаж и работа с вертикален разединител нн 1000 А с триполюсно управление с монтирани с твърди връзки (ножове – NH3)

Фиг. 1 Сваляне на капака над клемите. Издърпва се нагоре.

Фиг.2 Отваряне на разединителя. Дърпат се рязко с две ръце едновременно ръкохватките на разединителя.

Фиг.3a Инсталиране към шинна система под напрежение. Извършва се само с изолирани инструменти и необходимите защитни средства. Затягането на клемите към шинната система да става с момент 32-35 Nm.

Фиг.3b Инсталиране към шинна система без напрежение. Да се ползват изолирани инструменти. Извършва се само с изолирани инструменти и необходимите защитни средства. Затягането на клемите към шинната система да става с момент 32-35 Nm.

Фиг.4 Присъединяване на кабелите към клемите. Крепежните елементи да се затягат с момент 35 Nm. Да се ползват изолирани инструменти.

Фиг.5 Демонтаж и монтаж на ножове в държачите. Извършва се при отворен разединител. Натиска се жълтият бутон в основата на ножодържача и се задържа. Демонтажа става като ножа се издърпва нагоре . Монтажа става по обратен ред.

Забележка:

Обслужващият персонал трябва да има изискуемата квалификационна група по безопасност при работа ел. съоражения с напрежение до 1000 V (или до и над 1000 V)

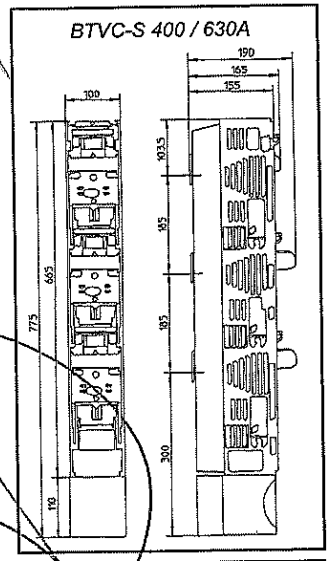
1546

INSTRUCCIONES DE MONTAJE
ASSEMBLY INSTRUCTIONS / MONTAGEANLEITUNG

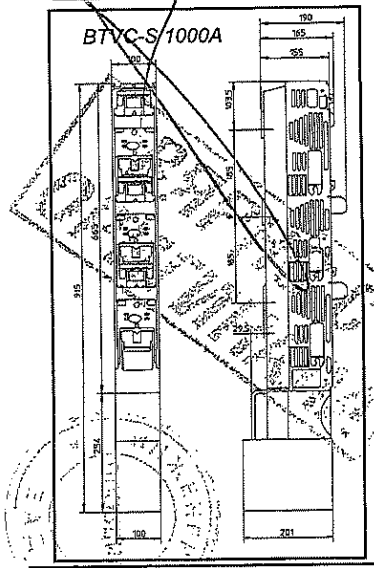
BTVC-S 400 / 630 / 1000A

DESCONEXION UNIPOLAR / *ONE POLE SWITCHING* / EINPOLIG SCHALTBAR
DESCONEXION TRIPOLAR / *THREE POLE SWITCHING* / DREIPOLIG SCHALTBAR

BTVC-S 400 / 630A

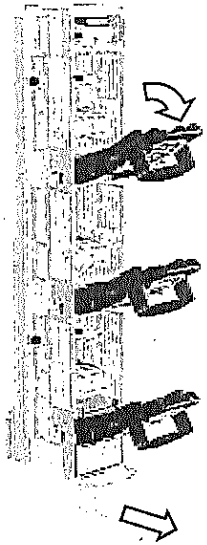


BTVC-S 1000A



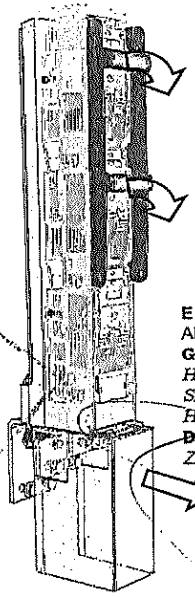
1.

E EXTRAER LA TAPA DE CONEXIONES
GB *REMOVE CONNECTION COVER*
D *ANSCHLUSSRAUMABDECKUNG ABNEHMEN*

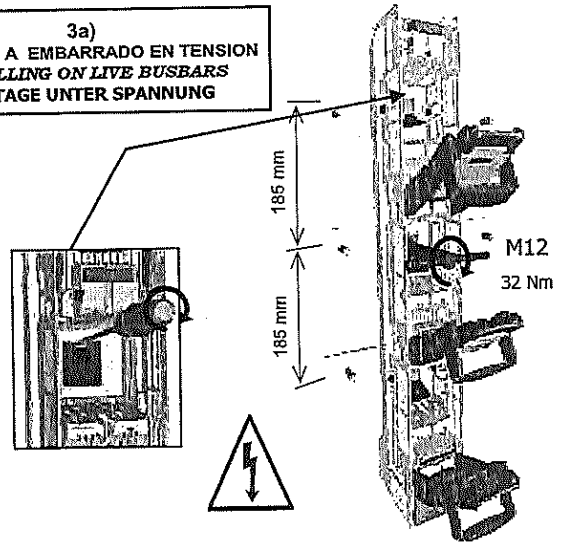


2.

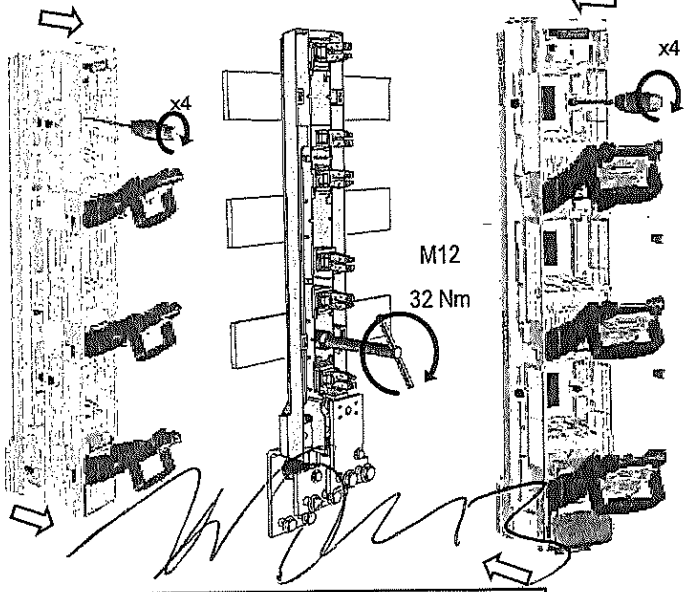
E TIRAR DE LAS 2 ASAS AL MISMO TIEMPO
GB *PULL BOTH HANDLES AT THE SAME TIME THE HANDLES*
D *SCHALTDECKEL ZIEHEN*



3a)
CONEXIÓN A EMBARRADO EN TENSION
INSTALLING ON LIVE BUSBARS
MONTAGE UNTER SPANNUNG



3b) CONEXIÓN A EMBARRADO SIN TENSIÓN
INSTALLING ON CURRENT FREE BUSBARS
SPANNUNGSLOSE MONTAGE AUF SAMMESCHIENEN

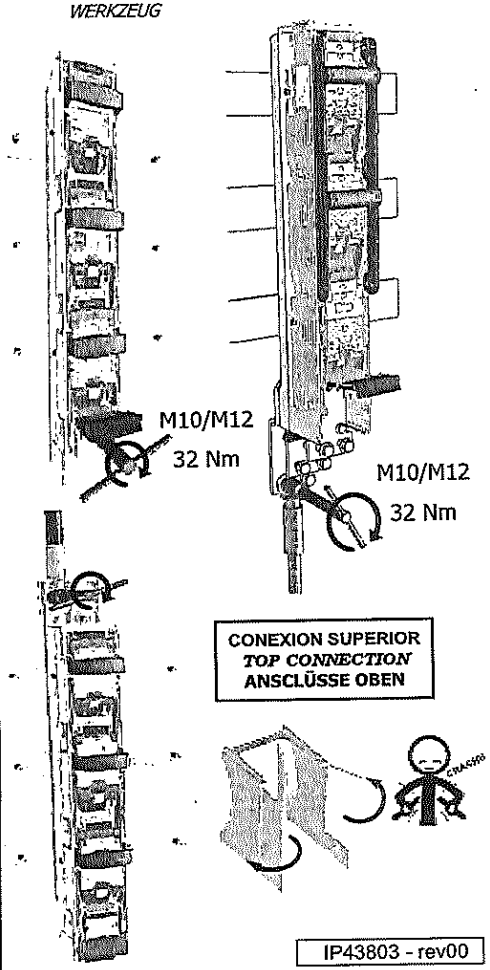


TENER EN CUENTA EL MARCADO DE LAS FASES EN LA ZONA DE CONEXIONES DEL ZOCALO, AL HACER LAS UNIONES ELECTRICAS.

CONSIDER THE PHASES MARKING IN THE TERMINAL ZONE OF THE FUSE RAIL HOLDER, WHEN DOING ELECTRIC UNIONS.

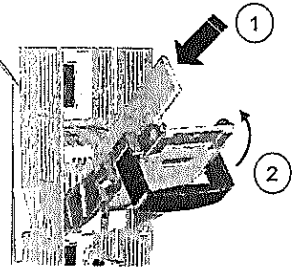
BITTE DIE MARKIERUNG DER PHASENABGÄNGE BEIM KABELANSCHLUSS BEACHTEN:

4 E CONECTAR LOS CABLES UTILIZANDO HERRAMIENTA AISLADA
GB *FASTEN THE CABLE LUGS BY USING AN ISOLATED TOOL*
D *ANSCHLIESSEN DER KABEL MIT ISOLIERTEM WERKZEUG*

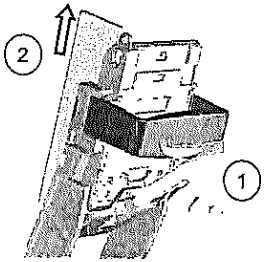


CONEXION SUPERIOR
TOP CONNECTION
ANSCLÜSSE OBEN

INSTALACIÓN / EXTRACCIÓN DE CUCHILLA
INSTALLING / REMOVAL THE SOLID LINK
TRENNMESSER EINLEGEN / ENTFERNEN

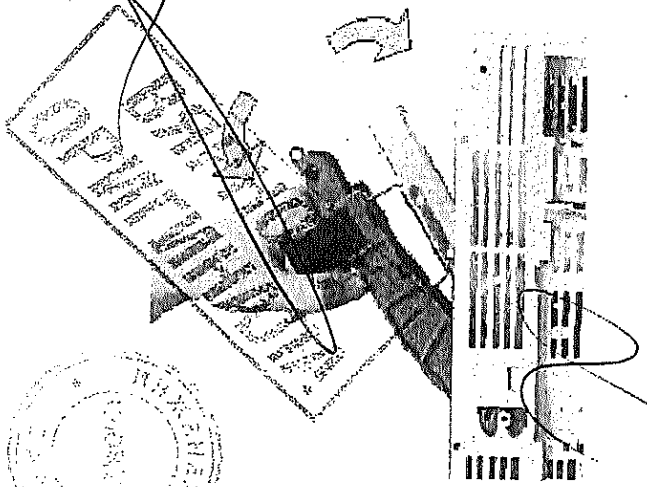


E INSERTAR LAS CUCHILLAS Y CERRAR LA TAPA
GB *INSERT THE SOLID LINKS AND CLOSE THE COVERS*
D *TRENNMESER EINSETZEN UND ZÜGIG SCHALTEN*

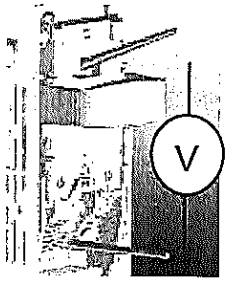


E EXTRACCIÓN DE LA CUCHILLA
GB *REMOVAL OF SOLID LINK*
D *TRENNMESSER ENTFERNEN*

ON / OFF: MANIOBRAR RAPIDAMENTE !
ON / OFF: MOVE LEVER QUICKLY!
EIN-UND AUSSCHALTEN: SCHNELL SCHALTEN!

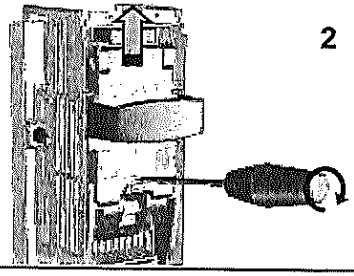


PRESENCIA DE TENSIÓN
VOLTAGE MEASUREMENT
SPANNUNGSPRÜFUNG

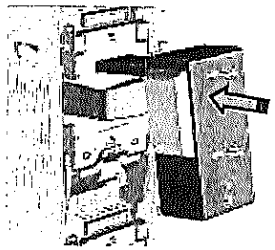


INSTALACIÓN DE SALIDA AUXILIAR PROTEGIDA POR FUSIBLE
INSTALLING A PROTECTED AUXILIAR OUTPUT / HUCKEPACKSICHERUNG

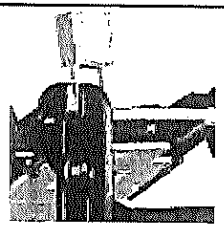
1

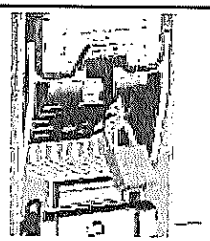


2

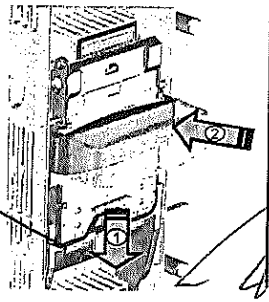


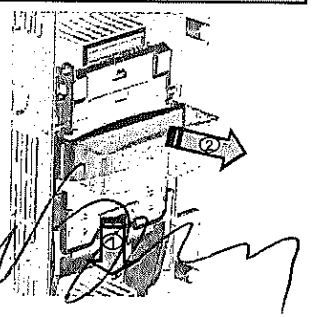
BLOQUEO DE CANDADO *LOCKING DEVICE / ABSPERRVORRICHTUNG*





ASA ESCAMOTEABLE BTVC-E
RETRACTABLE HANDLE BTVC-E / VERSENKBARER GRIFF BTVC-E





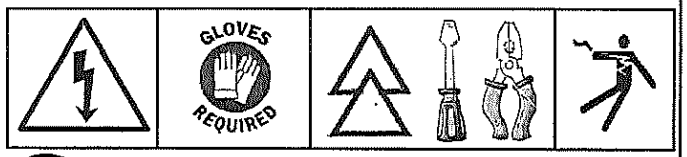
TRIVER+

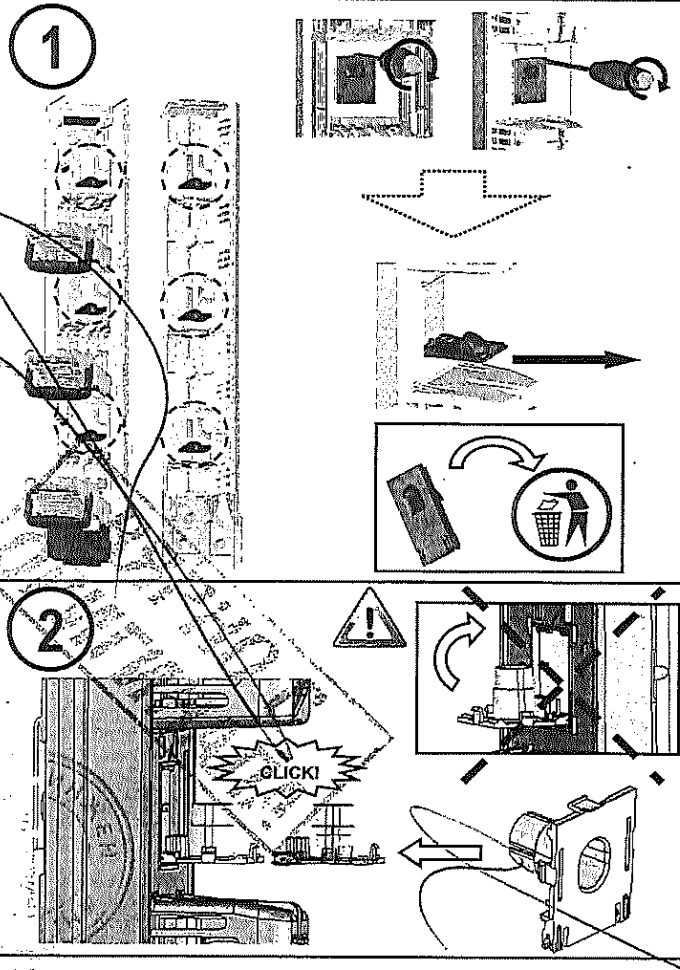
CARACTERÍSTICAS ELÉCTRICAS / MECÁNICAS
ELECTRICAL / MECHANICAL CHARACTERISTICS
ELEKTRISCHE UND MECHANISCHE EIGENSCHAFTEN

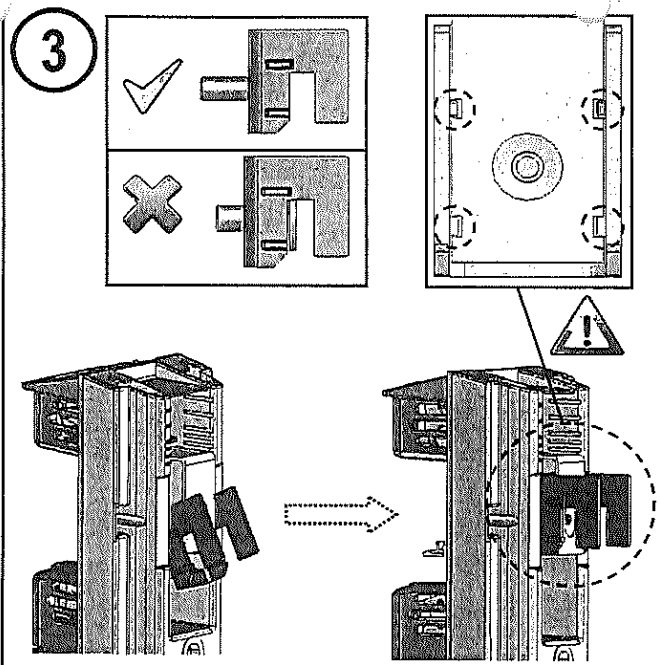
INTENSIDAD NOMINAL Ie (A) RATED OPERATIONAL CURRENT Ie (A) BETRIEBSSTROM Ie (A)	400	630	1000
TENSIÓN NOMINAL Ue (V) RATED OPERATIONAL VOLTAGE Ue (V) BETRIEBSSPANNUNG Ue (V)	690		
TENSIÓN DE AISLAMIENTO Ui (V) RATED INSULATION VOLTAGE Ui (V) ISOLATIONSSPANNUNG Ui (V)	1000		
TENSIÓN DE FRECUENCIA INDUSTRIAL 50 Hz (Kv) TEST VOLTAGE 50 Hz (Kv) ISOLATIONSSPRÜFSPANNUNG (kV) • Entre partes activas y masa - 1 min. Between phases and earth - 1 min. Zwischen Phasen und Erde 50 Hz.-1 min. • Entre partes activas - 1 min. Between phases - 1 min. Zwischen Phasen	10 3.5		
TENSIÓN ONDA DE CHOQUE Uimp (Kv) RATED IMPULSE WITHSTAND VOLTAGE Uimp (Kv) IMPULSSPANNUNGSFESTIGKEIT Uimp (kV)	9		
RESISTENCIA CORTOCIRCUITO Icm (KA) RATED SHORT-CIRCUIT MAKING CAPACITY Icm (KA) KURZSCHLUSS EINSCHALTVERMÖGEN Icm (kA)	9		
RESISTENCIA DE AISLAMIENTO (Mohm) INSULATION RESISTANCE (Mohm) ISOLATIONSWIDERSTAND (MOhm)	>5		
ENDURANCIA MECÁNICA (maniobras) MECHANICAL OPERATING CYCLES MECHANISCHE LEBENSDAUER	800		
CATEGORÍA DE EMPLEO UTILIZATION CATEGORY GEBRAUCHSKATEGORIE • Ue = 400 V • Ue = 500 V • Ue = 690 V	 AC-20B AC-20B AC-20B		
GRADO DE PROTECCIÓN PROTECTION DEGREE SCHUTZART	IP – 20		

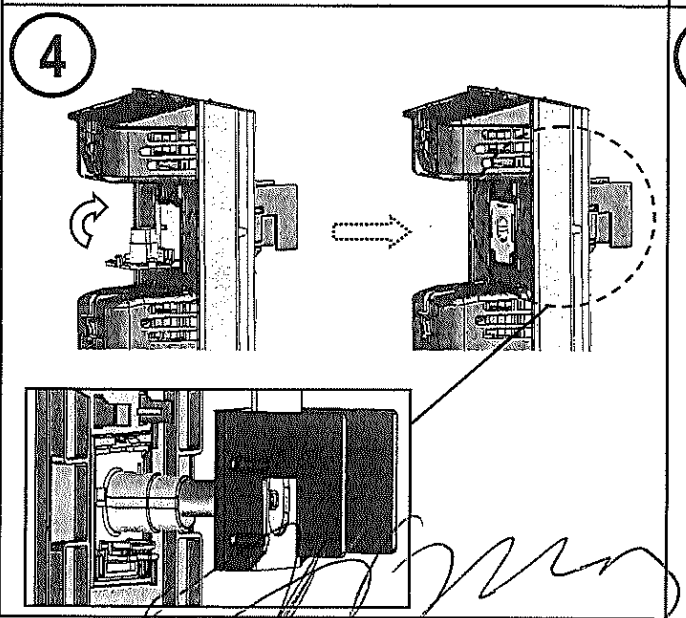
INSTRUCCIONES DE MONTAJE
ASSEMBLY INSTRUCTIONS / MONTAGEANLEITUNG

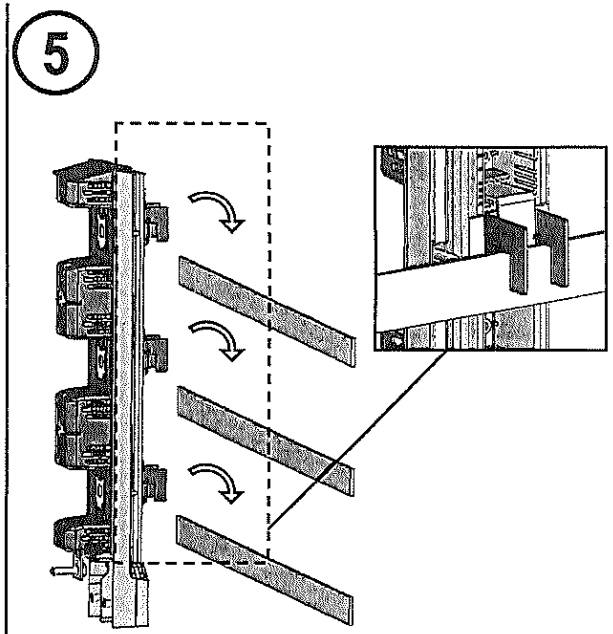
GRAPA DE CONEXIÓN PARA BASES PORTAFUSIBLES
HOOK ON CLAMP FOR FUSE RAILS
KRALLENKLEMMEN FÜR SICHERUNGSLEISTEN
NH1/2/3

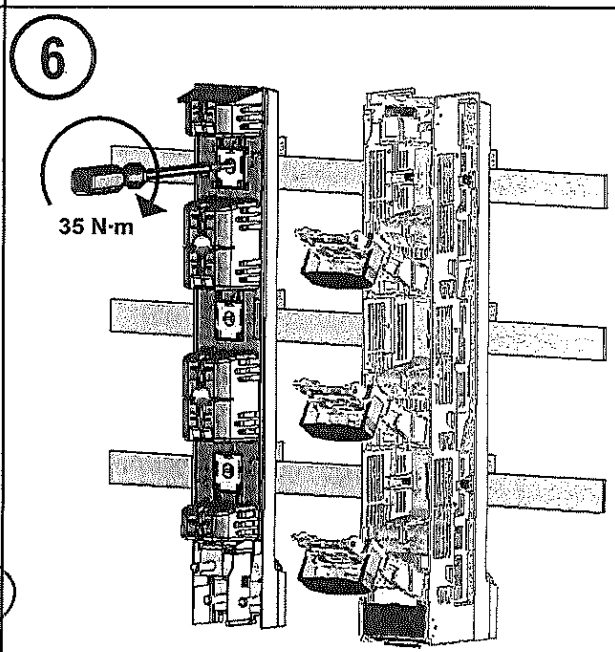










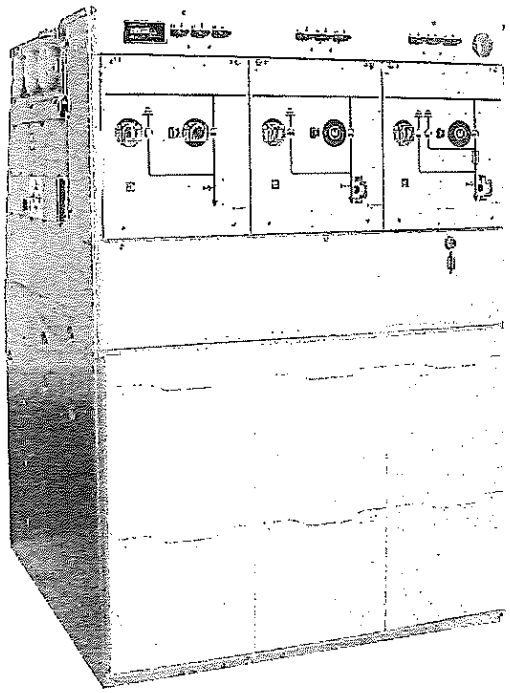


E Pronutec no se hace responsable de cualquier daño causado por un uso incorrecto de este producto. / **GB** *Pronutec is not responsible for any damage caused by a wrong use of this product.* / **D** *Pronutec übernimmt keinerlei Haftung oder Verantwortung bei unsachgemäßer Bdienung oder Anwendung der Produkte.*

Medium Voltage Distribution
Catalogue | 2012

FBX

Gas insulated switchgear up to 24 kV



ВЯРНО С ОРИГИНАЛА

Schneider Electric

1552

General contents

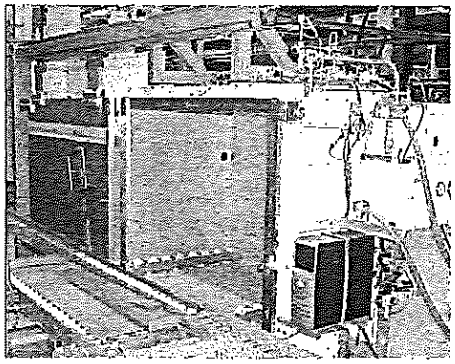
Contents

Standards & quality

Conformity with standards in force

FBX meets the current national or international standards in force:
(IEC, NF, GOST, CNS, IS).
The main electro-technical standards cover:

- The design of the functional units and switchgear
- Medium voltage switchgear (interruption, sectionalizing, insulation)
- Current and voltage transformers
- Low voltage switchgear
- SF6 gas
- Cables and conductors
- Graphs and diagrams
- Tests
- International electro-technical vocabulary.



SF6 leak test

A quality and safety approach

The Mâcon site, in France, has, for many years, been committed to a global quality approach and is certified:

- ISO 9001: 2000
- ISO 14001: 2004
- OHSAS 18001 (since 1999).

Tests on the devices

Various factory tests are carried out on FBX before it is shipped to the customer:

- Tank leak-tightness test
- Mechanical test for control mechanisms
- Dielectric tests.

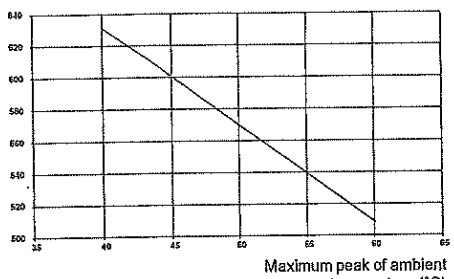
The FBX switchboards comply with the requirements of the following standards and regulations:

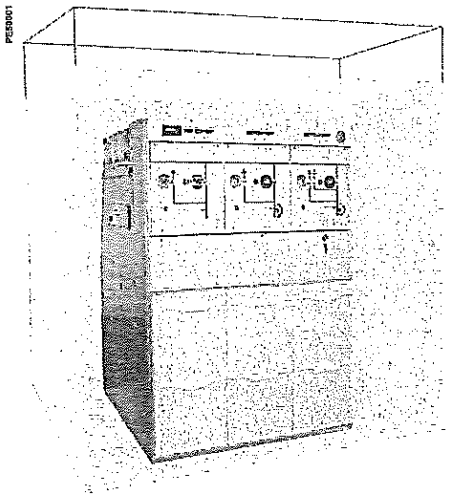
Description	IEC standard	IEC classes	EN standard
Switchboard	IEC 62271-200 IEC 62271-1	LSC partition class PM Continuity of service of the cable connection and fuse compartments: LSC2A (1)	EN 62271-200 EN 62271-1
Behaviour in the event of internal faults	IEC 62271-200		EN 62271-200
Earthing switch (in C, T1, T2, RE, CB, CBb)	IEC 62271-102	E2	EN 62271-102
Disconnector (in T2, CB, CBb)	IEC 62271-102	M0	EN 62271-102
General use switch (C)	IEC 62271-103	M1, E3, C1	
Switch-disconnector fuse combination (T1)	IEC 62271-105	M1, E1	
Circuit-breaker (in T2, CB, CBb)	IEC 62271-100	M1, E2	EN 62271-100
Current transformer	IEC 60044-1		EN 60044-1
Voltage transformer	IEC 60044-2		EN 60044-2
Voltage presence indicators	IEC 61958		EN 61958
Voltage detection systems	IEC 61243-5		EN 61243-5
Protection against accidental contact, foreign bodies and ingress of water	IEC 60529		EN 60529 1
Installation			HD 637 S
Operation of the electrical equipment			EN 50110

(1) The LSC 2A continuity of service may be limited if FBX is used with air insulated metering cubicles (M), depending on the general configuration of the switchgear. However, if the M1 metering cubicle of FBX can be insulated on the left or on the right (the right and left sections of the switchboard can be maintained energized), the LSC 2A continuity of service is guaranteed for the entire switchboard.

Product description

Reduction of the current assigned in continuous service according to the maximum ambient temperature





Operating conditions

- Temperature classification: –5°C indoors (option: –25°C).
- Ambient temperature: from –5°C to +40°C (option: –25°C) (option: up to +55°C for reduced service currents)
- Average value over 24 hours (max.): +35°C
- Maximum altitude for installation (above sea level): 1,000 m. Higher altitudes are possible on request, notably for Type-M metering cubicles and for HV fuse-holders operating in a normal atmosphere.
- Type of insulating gas: sulphur hexafluoride (SF6)
- Rated pressure at +20°C: 0.03 MPa
- Flood proof (option): successfully tested under water for 24 hours at 24 kV 50 Hz.

Protection index (IP)

- Main electrical circuits: IP67
- Fuse compartment: IP65 (option: IP67)
- Operating mechanisms and low voltage compartment: IP2X (option: IP33)
- Cable connection compartment: IP2XC
- Busbar: 1250 A on top of unit: IP67
- Switchgear: IK07.

Internal Arc Classification

FBX is a pressurized sealed-unit system that complies with IEC 62271-1. Its tank is filled with SF6 gas that is used as an insulating and breaking medium. No gas filling is required on site at installation nor during the service life of FBX under normal operating conditions.

FBX internal arc classification as per IEC 62271-200 is detailed in the table below. In the unlikely event of gas overpressure, the gas is discharged via safety valves away from the operator.

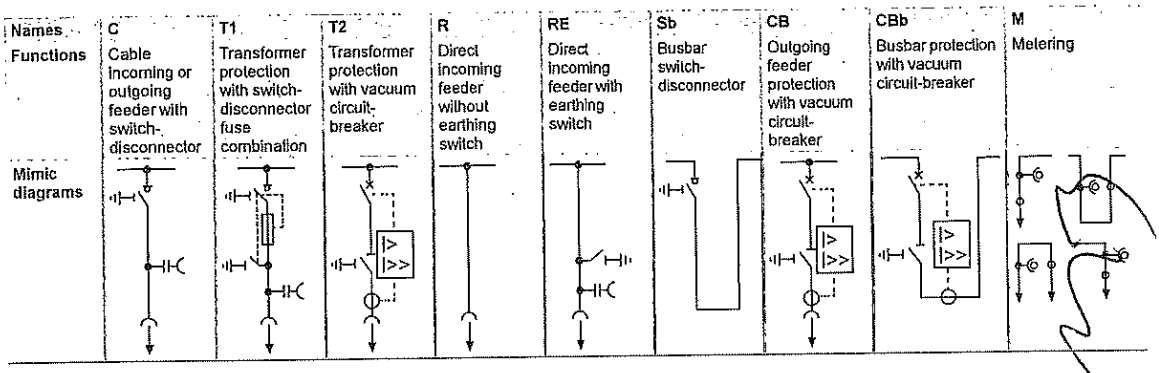
Rated voltage	Functions	12 kV	17.5 kV	24 kV
Internal arc withstand	C - T1 - T2 - R - RE - CB - CBb	AFL 16 kA 1 s AFL 20 kA 1 s AFL 25 kA 1 s (1)	AFL 16 kA 1 s AFL 20 kA 1 s	AFL 16 kA 1 s AFL 20 kA 1 s
	M1 - M2 - M3 - M4 (2)	AF 16 kA 1 s AF 20 kA 1 s	AF 16 kA 1 s AF 20 kA 1 s	AF 16 kA 1 s AF 20 kA 1 s

(1) With exhaust towards the bottom. Nkt cable required for two cables per phase fitting.
(2) Can be considered "AFL" if surrounded on both sides by AFL FBX functions.

Contents

Range of functions

Main functional units



C function

- The interrupting mechanisms are located in the sealed-for-life tank filled with gas.
- The three-position switch is equipped with a spring-loaded closing mechanism for the switch-disconnector function and the earthing switch function.

T1 function

- To make the replacement of HV fuses secure, earthing switches are placed both upstream and downstream from the fuses.
- Both earthing switches are connected mechanically and are activated with a single operating mechanism.
- The switch-disconnector is equipped with a spring-loaded mechanism for the closing operations and a stored energy mechanism for breaking operations, which is mechanically pre-loaded.
- When the striker pin trips on the blowing of one of the HV fuses, the switch-disconnector is opened mechanically on all three phases.
- An indicator on the front panel of the FBX visually signals the interruption due to a fuse blowing.
- A pushbutton for tripping the opening of the switch is available as an option.
- An opening by tripping coil is also possible.
- The earthing function is operated with a separate spring mechanism.

T2 function

- The transformer outgoing feeder with vacuum circuit-breaker can be used for applications where the load current is too high for the use of a switch-disconnector fuse combination.
- A typical application is the protection of distribution transformers and wind farm installations up to 21 MVA.
- The T2 three-phase transformer protection comprises a vacuum circuit-breaker (located upstream) and a 3-position disconnector carrying out the sectionalizing of the line.
- The disconnector and earthing switch with making capacity are activated by a spring-loaded mechanism.
- The vacuum circuit-breaker is equipped with an energy accumulation spring-loaded mechanism.
- The operating sequence in case of the use of a motorized mechanism is the following: O – 3 min. – CO.
- The vacuum circuit-breaker can be tripped manually by a pushbutton or automatically by a motorized mechanism controlled by a DPX-1 protection relay (standard equipment – other relays available on request). The latter analyses the metering data captured by the current transformers on each phase and is triggered at pre-defined threshold levels.
- Fault trips require no auxiliary voltage if an autonomous relay is used.

R function

- This function allows for the direct connection of a cable incoming feeder to the busbar of the FBX switchboard.

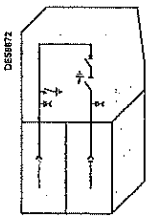
RE function

- This function, which is equipped with an earthing switch, allows for the direct connection of a cable incoming feeder to the busbar of the FBX switchboard.

Available configuration

FBX-C, compact version (non extendable)

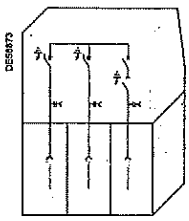
2 functions



Versions

C	C
C	T1
C	T2
RE	T1
RE	T2

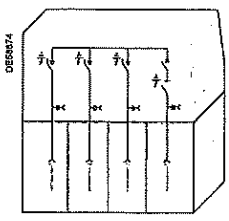
3 functions



Versions

C	C	C
C	C	T1
C	C	T2
C	RE	T1
C	RE	T2
R	RE	T1
R	RE	T2

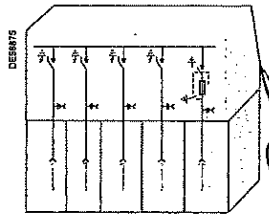
4 functions



Versions

C	C	C	C
C	C	C	T1
C	C	C	T2
C	T1	C	T1
C	T2	C	T2

5 functions (*)

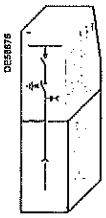


Versions

C	C	C	C	C
C	C	C	C	T1
C	C	T1	C	T1
C	C	C	T1	T1

FBX-E, extendable version

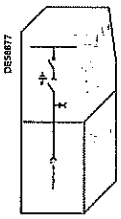
1 function



Versions

C
R
RE

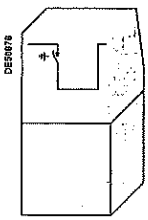
1 function



Versions

T1
T2

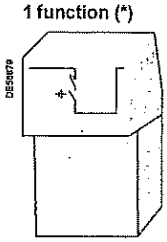
1 function



Version

Sb

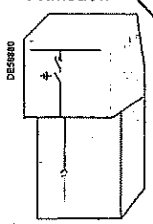
1 function (*)



Version

CBb

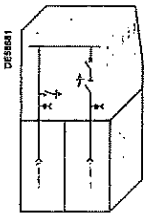
1 function



Version

CB

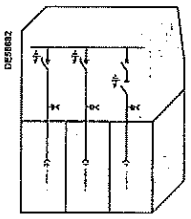
2 functions



Versions

C	C
C	T1
C	T2
T1	T1
T2	T2
RE	T1
RE	T2

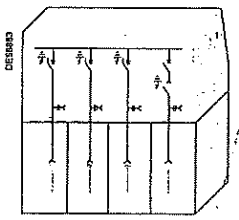
3 functions



Versions

C	C	C
C	C	T1
C	C	T2
C	RE	T1
C	RE	T2
R	RE	T1
R	RE	T2

4 functions

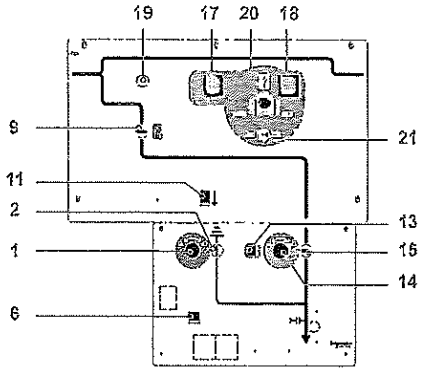


Versions

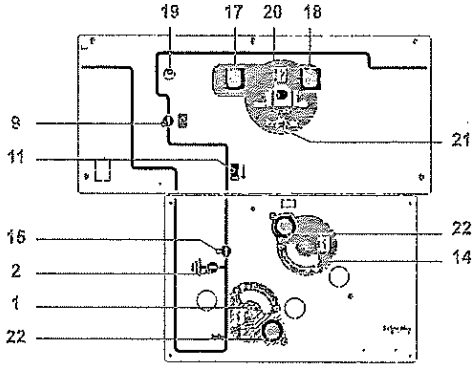
C	C	C	C
C	C	C	T1
C	C	C	T2
C	T1	C	T1
C	T2	C	T2

(*) Please consult us for availability of 5 functions switchboard and CBb function

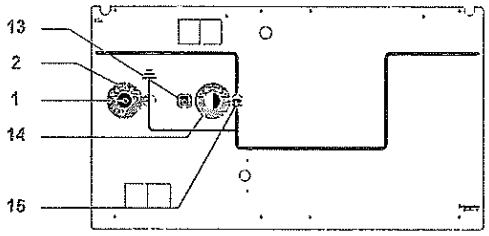
Contents



Feeder cable protection with vacuum circuit-breaker (CB)



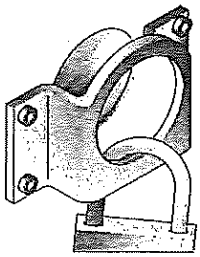
Busbar protection with vacuum circuit-breaker (CBb)



Busbar switch-disconnector (Sb)

Padlocking

The actuator's operating hub can be controlled by padlock (optional).



Obstruction of the lever hub socket by padlock

Extensibility

Extensibility of FBX-E

- FBX-E offers extensible configurations for secondary distribution applications.
- The connection of each functional unit allows for multiple combinations depending on the installation requirements.
- FBX-E permits the connection of additional units on the left or right-hand side, thereby offering greater flexibility in the choice and positioning of the medium voltage switchboard functions.
- The installation and in-line connection of FBX-E does not require any handling of gas.
- Maximum current: 630 A

Erection and assembly

The extension is a very simple process thanks to:

- The A-link device used to connect the busbars of two cubicles.

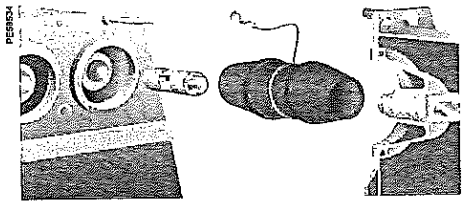
Variations in positioning are compensated by fixed, spherical contacts and mobile couplings that can be adjusted axially and radially.

- Highly secure dielectric seals made with silicone insulating conical connectors adapted to the electrical voltage.

The assembly of the insulating connectors is maintained by a mechanical force generated by:

- Integrated guiding pins for the correct alignment of the cubicles
- An assembly by bolts secured by mechanical stops.

During the assembly of an extension cubicle, an additional space of at least 450 mm is necessary to allow for handling.



A-Link device for the in-line connection of the FBX-E

Cable compartment

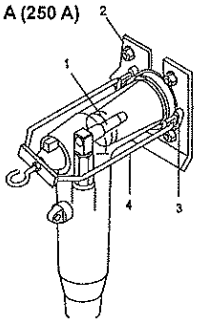
The cables connection compartment has been designed to accept connection systems that are:
- Completely insulated
- In metallic housing
- Partially insulated.

Cable support mountings are adjustable horizontally and vertically to enable installation of various cable systems. The cable mountings are equipped with either round or long holes for standard cable terminals.
Additional support structures can be supplied (available only in the 1,380 mm height version) for the installation of two cables per phase cable plug-in connections or surge arresters.

Bushing connector cones in accordance with NF-EN-50181:

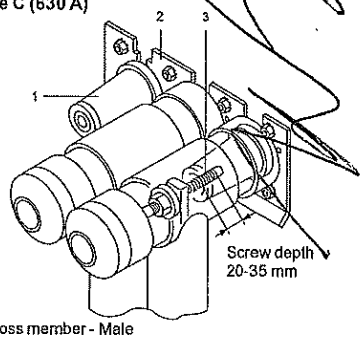
Switchboard function	R / RE	C	T1	T2 / CB
Connector cone Type A (250 A)	–	–	■	–
Connector cone Type C (630 A)	■	■	■ (optional)	■

Type A (250 A)



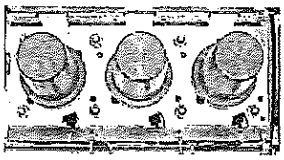
1 - Sliding contact pin
2 - Support plate
3 - Mounting flange
4 - Mounting device

Type C (630 A)



1 - Cross member - Male
2 - Support plate
3 - Screw contact

FBX switchboard is equipped with PF250 or PF630 plug-in bushings:

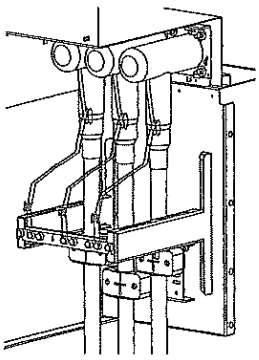


C / T2 / CB / T1 (optional on T1):
PF630 plug-in bushing
NF EN 50181, with C type connection
(Ir: 630 A; Ø M16 mm)

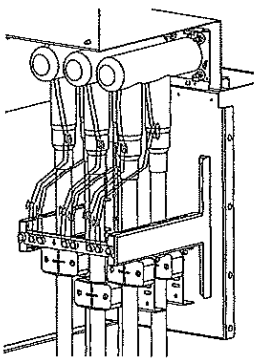
T1 (as standard):
PF250 plug-in bushing
NF EN 50181, with A type connection
(Ir: 250 A; contact finger Ø M7.9 +0.02/-0.05 mm)

Type of connection

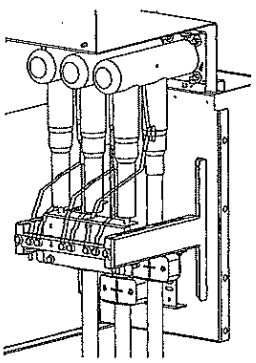
FBX cable compartment is spacious and allows for various connections (cf. § Selection of cables):
- Single cable per phase
- Two cables per phase
- Single cable per phase + surge arresters
- A triple cable per phase connection is also available (please consult us).



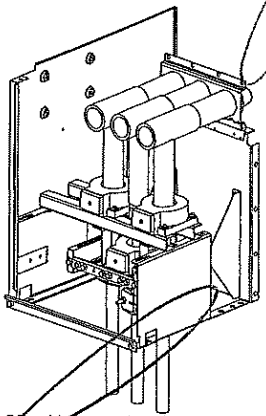
Single cable per phase connection



Two cables per phase (only available in the FBX 1,380 mm height version)



Cables & surge arresters (only available in the FBX 1,380 mm height version)



CB cable compartment with metering CT cores

Contents

T1 function

Characteristics of the T1 function (switch-disconnector/fuses combination)

Rated voltage		kV	12				17.5		24	
Rated frequency		Hz	50/60				50/60		50/60	
Rated lightning impulse withstand voltage										
Directly earthed		kV	75				95		125	
On the sectionalized distance		kV	85				105		145	
Rated power frequency withstand voltage										
Directly earthed		kV	28				38		50	
On the sectionalized distance		kV	32				45		60	
Level of insulation for the SF6 pressure - Pre = 0.00 MPa										
Rated lightning impulse withstand voltage		kV	75				95		95	
Rated power frequency withstand voltage		kV	28				38		50	
Rated current for continual service										
Busbar		A	630 / 1250				630 / 1250		630 / 1250	
Outgoing feeder		A	Refer to the fuses selection table							
Rated peak current, main circuit (prospective current, limited by fuses)		A	40	52.5	52.5	62.5	40	52.5	40	50
Rated short-time current, downstream of fuse protection circuit	1 s	kA	1	1	5	5	1	5	1	5
	3 s	kA	–	–	3	3	–	3	–	3
Rated peak current, downstream of fuse protection circuit		kA	2.5	2.5	13	13	2.5	13	2.5	13
Rated short circuit making current, downstream of fuse protection circuit		kA	2.5	2.5	13	13	2.5	13	2.5	13
Rated short-time current of earthing circuit	1 s	kA	16	21	21	25	16	21	16	20
	3 s	kA	16	21	21	–	16	21	16	20
Rated no-load cable-breaking current		A	60				60		60	
Rated breaking current under earth fault conditions		A	200				200		200	
Rated no-load cable breaking current under earth fault conditions		A	87				87		87	
Rated transfer current in accordance with IEC 62271-105		A	2000				1100		1100	
Opening time in the case of fuse striker tripping T_0		ms	34				34		34	
Number of operating cycles without inspection										
Mechanical: Switch-disconnector/ Earthing switch		M1/–	1000				1000		1000	
Electrical: Rated current E		E1 (1)	10				10		10	
Short circuit making Switch-disconnector		E3	5				5		5	
Earthing switch		E2	5				5		5	

(1) E3 (100 x rated current) on request.

CB, CBb functions

Characteristics of the CB, CBb functions (vacuum circuit-breaker)

Rated voltage		kV	12			17.5		24	
Rated frequency		Hz	50/60			50/60		50/60	
Rated lightning impulse withstand voltage									
Directly earthed		kV	75			95		125	
On the sectionalized distance		kV	85			110		145	
Rated power frequency withstand voltage									
Directly earthed		kV	28			38		50	
On the sectionalized distance		kV	32			45		60	
Level of insulation for the SF6 pressure - Pre = 0.00 MPa									
Rated lightning impulse withstand voltage		kV	75			95		95	
Rated power frequency withstand voltage		kV	28			38		50	
Level of insulation of the sectionalized distance for the cable test									
Energized busbar	Ur	kV	12			17.5		24	
Maximum AC feeder test voltage (30 min)		kV 0.1 Hz	18			26		35	
Maximum DC feeder test voltage (15 min)		kV	48			60		96 (2)	
Rated current for continual service									
Busbar, CB function		A	630 / 1250			630 / 1250		630 / 1250	
Busbar, CBb function		A	630			630		630	
Circuit-breaker		A	630			630		630	
Rated peak current		kA	40	52.5	62.5	40	52.5	40	52.5
Rated short-circuit making capacity		kA	40	52.5	62.5	40	52.5	40	52.5
Rated short time current, main electrical circuit	1 s	kA	16	21	25	16	21	16	21
	3 s	kA	16	21	–	16	21	16	21
Rated short-time current of earthing circuit	1 s	kA	16	21	25	16	21	16	21
	3 s	kA	16	21	–	16	21	16	21
Rated short circuit breaking current		A	16	21	25	16	21	16	21
Percentage of the direct current component		%	40			40		40	
Rated operating sequence (1)			O - 0.3 s - CO - 15 s - CO						
Rated no-load cable-breaking current		A	25			31.5		31.5	
Rated operating time									
Opening with tripping release		ms	40 to 50			40 to 50		40 to 50	
Breaking with tripping release		ms	55 to 65			55 to 65		55 to 65	
Arcing		ms	< 15			< 15		< 15	
Closing		ms	30			30		30	
Number of operating cycles without inspection									
Mechanical: Vacuum circuit-breaker		M1	2000			2000		2000	
Disconnector/ Earthing switch		M0/–	1000			1000		1000	
Electrical: Short circuit making	Disconnector	E2	5			5		5	
	Earthing switch	E2	5			5		5	
Vacuum circuit-breaker		At rated current	2000			2000		2000	
		At rated short circuit breaking current	50			50		50	

(1) Spring-loaded current making and breaking mechanism with stored energy and motor.
(2) For the first cable test on a new unit. Later tests can be carried out at 67 kV.

Choice of mechanisms and equipment

Mechanism operating principles	
SFU or CD 110 (tumbler)	**It is a tumbler mechanism with a dead point passage. The energy is stored by tumbler mechanism.** ■ **Manual:** the opening or closing operation is manual and independent of the operator. The operation is performed without any duration or time constraint ■ **Motorized:** the opening or closing operations are performed by a motor without duration or time constraint.
SF (tumbler with 1 latch for opening)	**It is a tumbler mechanism for closing, with a latch-in feature for opening. The energy needed for opening is stored while closing.** ■ **Manual:** the operator manually closes the switch-disconnector in one single operation, and in the same time loads a spring for next opening. The mechanism is thus ready for a snap opening operation. Tripping can be performed with a coil, a fuse striker or a push-button. ■ **Motorized:** the closing operation is performed by a motor. The opening operating can be done with the motor or with a shutter release.
SU or CD 110 (tumbler)	**It is a tumbler mechanism for closing operation.** The opening is manual and dependent of the operator, a spring is loaded and stores energy for next closing. The closing is independent of the operator, the energy is released from the spring and closes the earthing switch in a snap operation.
C 150 mechanism	**These operating mechanisms use the energy stored by springs to close and open the circuit-breaker on the CB and CBb functions. There are two types:** ■ **Manual:** the operator manually operates to load the control mechanism's spring. The spring is held in place by a latch, freed manually by a mechanical button, causing: □ the release of the spring □ the closing of the CB □ the arming of the trip spring, now held in place by a latch. It is thus possible to open the circuit-breaker by freeing the trip spring latch manually (mechanical button) or electrically (electro-mechanet). Note: with the circuit-breaker closed, it is possible to rearm the closing spring, which authorises a rapid re-closure cycle. ■ **Motorized:** the closing spring is armed by a motor (arming time < 7 s). Opening and closure operations are carried out electrically (magnets). Note: It is possible to manually arm, close and trip the circuit-breakers.

		Functions							
Type of operating mechanism		**C**	**T1**	**T2**	**R**	**Re**	**CB**	**CBb**	**Sb**
Switch-disconnector	SFU or CD 110	■ SFU	–	■ SFU	–	–	■ SFU	■ CD 110	■ SFU
	SF	□	■	–	–	–	–	–	□
Earthing switch	SU or CD 110	■ SU	■ SU	■ SU	–	■ SU	■ SU	■ CD 110	■ SU
Circuit-breaker	SF	–	–	■	–	–	–	–	–
	C150	–	–	–	–	–	■	■	–
Equipment		**C**	**T1**	**T2**	**R**	**Re**	**CB**	**CBb**	**Sb**
Manual opening and closing		■	■	■	–	■	■	■	■
Mechanical position indicator		■	■	■	–	■	■	■	■
Motorization		□	□	□	–	–	□	□	□
Trip coil		□ if SF drive	□	□	–	–	■	■	–
2nd trip coil		–	–	□	–	–	□	□	–
Autonomous tripping device without any auxiliary source (striker)		–	–	–	–	–	□	□	–
Undervoltage tripping coil		–	–	–	–	–	□	□	–
Closing coil		–	–	–	–	–	□	□	–
Operating counter		–	–	□	–	–	□	□	–
Auxiliary contacts		**C**	**T1**	**T2**	**R**	**Re**	**CB**	**CBb**	**Sb**
Switch-disconnector position	Manual: 2 NO + 2 NC Motorized: 2 NO + 2 NC	□	□	–	–	–	–	–	–
Earthing switch position	1 NO and 1 NF	□	□	□	–	□	□	□	–
Vacuum circuit-breaker position	Manual: 2 NO + 2 NC Motorized: 2 NO + 2 NC	–	–	□	–	–	□	□	–
Fuse blown indicators	2 O/C inverters	–	□	–	–	–	–	–	–

Legend: ■ Standard
□ Option

The connection and wiring diagrams for the motorized mechanism, the magnetic tripping devices and auxiliary contacts are supplied in the event of an order.

C 150 operating mechanisms

Electrical characteristics of the C 150 operating mechanisms

Reference standards			IEC	
Type of current			DC	AC
Rated supply voltage		V	24 - 48 - 60(*) - 110 - 125 - 220	120 - 230
Frequency		Hz	–	50/60
Rearming motor				
	Voltage range	% of Un	85 to 110	85 to 110
	Max. absorbed power		100 W	150 VA
	Starting current	A	28.6 A / 24 Vdc 12.8 A / 48 Vdc 6.2 A / 110 Vdc 5.2 A / 125 Vdc 3.1 A / 220 Vdc	8.6 A / 110 Vac 4.4 A / 230 Vac
	Absorbed current	A	8.8 A / 24 Vdc 5.1 A / 48 Vdc 1.7 A / 110 Vdc 2.1 A / 125 Vdc 0.7 A / 220 Vdc	3.5 A / 110 Vac 1.8 A / 230 Vac
	Rearm time	s	< 6.5	< 6.5
Tripping device				
Tripping coil				
	Voltage range	% of Un	70 to 110	85 to 110
	Absorbed power	W/VA	960 W / 24 Vdc 470 W / 48 Vdc 620 W / 110 Vdc 521 W / 125 Vdc 386 W / 220 Vdc	502 VA / 120 Vac 422 VA / 230 Vac
Undervoltage coil				
	Closing voltage range	% of Un	> 35	> 35
	Tripping voltage	% of Un	70 to 35	70 to 35
	Absorbed power	W/VA	240 W - 4.6 W / 24 Vdc 256 W - 4.7 W / 48 Vdc 172 W - 4.0 W / 110 Vdc 166 W - 4.2 W / 125 Vdc 193 W - 3.5 W / 220 Vdc	164 VA - 4.5 VA / 120 Vac 266 VA - 4.1 VA / 230 Vac
Autonomous tripping device without any auxiliary source (striker)			The low energy release type MITOP, trips at 200 µF / 12 V Trip energy ≤18 mJ	
Closing device				
	Voltage range	% of Un	85 to 110	85 to 110
	Absorbed power	W/VA	960 W / 24 Vdc 470 W / 48 Vdc 620 W / 110 Vdc 521 W / 125 Vdc 386 W / 220 Vdc	502 VA / 120 Vac 422 VA / 230 Vac
Auxiliary contacts				
Rated current		A	10	10
Breaking capacity 110 Vdc (L/R = 10 ms)		A	1	–
Breaking capacity 230 Vac Cos φ = 0.4		A	–	10

(*) Please consult us.

Contents

Fuses
Selection tables

Fusarc-CF type as per IEC		Power of transformer (kVA)																	
		25	50	63	80	100	125	160	200	250	315	400	400	500	630	800	1000	1250	1500	1600
		Uk = 4%											Uk = 6%							
Fuse rated voltage (kV)	Transformer service voltage (kV)	Rated current for fuses (A)																		
7.2	3	10	25	25	31.5	40	50	50	80	100	100(2)	–	–	–	–	–	–	–	–	–
7.2	3.3	10	25	25	31.5	40	40	50	63	80	100(2)	–	–	–	–	–	–	–	–	–
7.2	5.5	6.3	16	16	20	25	31.5	31.5	40	50	63	80	80(1)	100 (1) (2)	–	–	–	–	–	–
7.2	6	6.3	10	16	20	25	25	40	40	50	63	80	63	80(1)	100 (1) (2)	–	–	–	–	–
7.2	6.6	6.3	10	16	16	25	25	31.5	40	50	63	63	63(1)	80(1)	80(2)	–	–	–	–	–
12	10	–	–	10	10	16	20	25	25	31.5	40	50	40	50	63(2)	80 (1) (2)	–	–	–	–
12	11	–	6.3	10	10	16	16	25	25	31.5	40	40	40	63(1)	63(1)	80 (1) (2)	–	–	–	–
24	13.8	4	6.3	6.3	10	10	16	16	20	25	31.5	31.5	31.5	40	50 (1) (2)	63 (1) (2)	–	–	–	–
24	15	4	6.3	6.3	10	10	16	20	20	25	31.5	31.5	31.5	40(1)	50 (1) (2)	63 (1) (2)	–	–	–	–
24	20	–	–	6.3	6.3	10(1)	10	16	16	20	25	25	25	31.5 (1)	40(1)	40 (1) (2)	63 (1) (2)	–	–	–
24	22	–	–	6.3	6.3	6.3	10	10	16	16	25	25	25(1)	31.5 (1)	40(1)	40(2)	50 (1) (2)	63 (1) (2)	–	–

(1) With mechanical time-delay device 70 ms.
(2) Without transformer overload.

Schneider Electric HV fuses selection table

Fusarc-CF type as per DINVDE		Power of transformer (kVA)																		
		25	50	63	80	100	125	160	200	250	315	400	500	630	630	800	1000	1250	1500	1600	2000
		Uk = 4%													Uk = 6%						
Fuse rated voltage (kV)	Transformer service voltage (kV)	Rated current for fuses (A)																			
7.2	6	6.3	10	16	20	25	25	40	40	50	63	80	100	100 (2)	100 (1) (2)	–	–	–	–	–	–
12	10	–	–	10	10	16	20	25	25	31.5	40	50	63	80	63(2)	80 (1) (2)	–	–	–	–	–
24	15	4	6.3	6.3	10	10	16	20	20	25	31.5	31.5	50	63	50 (1) (2)	63 (1) (2)	–	–	–	–	–
24	20	–	–	6.3	6.3	10(1)	10	16	16	20	25	25	40	40	40(1)	40 (1) (2)	63 (1) (2)	–	–	–	–

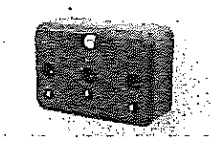
(1) With mechanical time-delay device 70 ms.
(2) Without transformer overload.

HV fuses (SIBA) selection table with mechanical thermal indicator

Type Siba HH-DIN		Power of transformer (kVA)																			
		25	50	63	80	100	125	160	200	250	315	400	500	630	630	800	1000	1250	1500	1600	2000
		Uk = 4%													Uk = 6%						
Rated voltage (kV)	Service voltage (kV)	Rated current for fuses (A)																			
7.2	6	–	–	–	–	25	–	40	–	50	63	80	100	125	100	125	160(1)	–	–	–	–
12	10	–	–	–	–	16	–	25	–	32	40	50	63	80	63	80	100	100	–	160(1)	160
17.5	15	–	–	–	–	16	–	20	–	32	32	40	50	63(1)	50	63(1)	63(1)	80(1)	–	–	–
24	20	–	–	–	–	10	–	16	–	20	25	32	40	40	40	40	50	80(3)	–	100 (1) (3)	125 (1) (3)

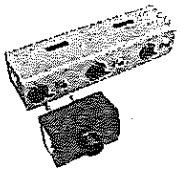
(1) With mechanical time-delay device.
(3) Specific SSK type fuses.
Other HV fuses also available with FBX such as Ferraz fuses or Jean Müller IKUS type fuses.

Low voltage equipment

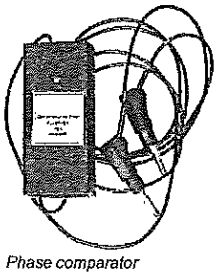


VPIS, Voltage Presence Indicator System

IVIS, Voltage presence detection system (IVIS, Intelligent Voltage Information System)



VDS HR and its removable luminous indicator



Phase comparator

Voltage detection systems

The absence, or presence, of voltage at outgoing feeders level can be checked using 3 types of device:
- VDS-HR
- VDS-LR
- VPIS.

Voltage indicators and any connectors for warning lights can be found to the top of the FBX front panel.
In particular, FBX can be fitted with the VDS-LR IVIS device:
- The integrated IVIS system (Integrated Voltage Detection System) checks for the absence of a voltage.
- Flashing arrow symbols light up on the indicators in case of the presence of a voltage within defined threshold response limits.

The IVIS is equipped with a self-test in order to avoid any electrical tests.
The IVIS system also provides a phase comparison function.
- It is equipped with integrated electronics, protected against bad weather conditions and requires no maintenance. It is auto-supplied. An auxiliary contact is available for remote monitoring (optional).

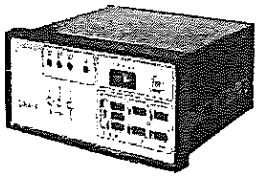
Fault Passage Indicators

Outgoing feeder functions can be equipped with various fault passage indicators integrated in FBX Low Voltage front panel (non-exhaustive list):
- Alpha, Sigma or Opto (Horstmann make)
- IKI20 (Kries make)
- Dax-I (Schneider Electric).

Main characteristics of Dax-I fault passage indicator:
- Earth and phase fault detection
- Earth fault measurement range: 100 to 1000 A
- Phase fault measurement range: 5 to 160 A
- Reaction time: 40 to 999 ms
- Autonomous power supply with 10-year battery
- Remote signalling.

Current sensors of fault passage indicators can be installed either on cables or close to the bushings.

To accompany the rise of distributed power generation on distribution networks, FBX can be equipped with directional fault indicators such as:
- Compass B (Horstmann make)
- IKI20a (Kries make).

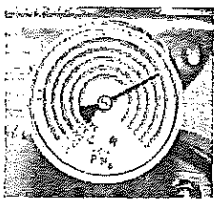


DAX-I fault passage indicator

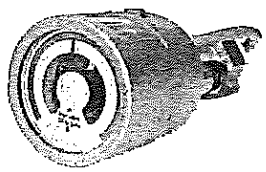
Compass B directional fault passage indicator

Manometer

- The interrupting mechanisms are installed in stainless steel tanks filled with gas. During the service life of the switchboard, the addition of SF6 gas is not necessary.
- The gas pressure in the hermetically sealed tank is indicated, as an option, by a relative or absolute pressure manometer for uses at high altitude.
- An auxiliary contact can be fitted to the manometers (optional).



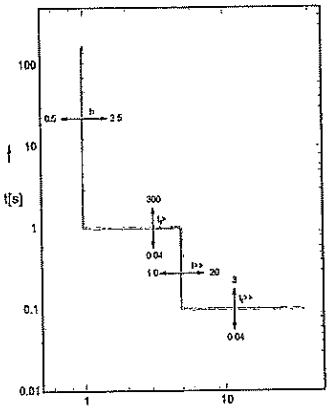
Relative pressure gauge



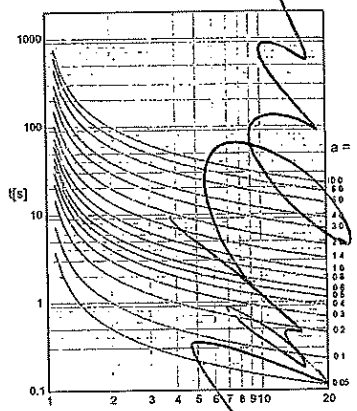
Absolute pressure gauge

DPX-1 characteristics curves

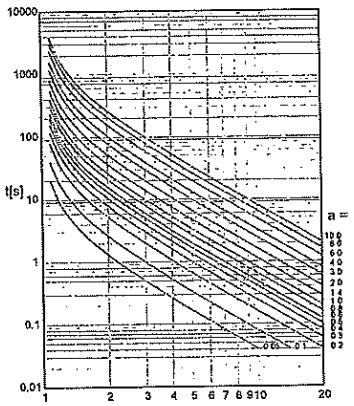
Pre-defined time



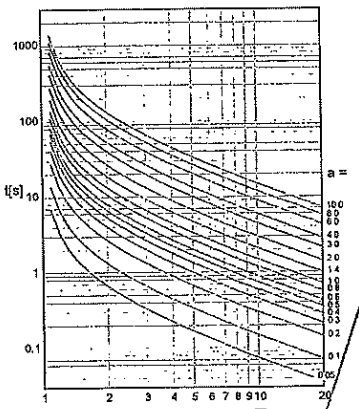
Normal inverse



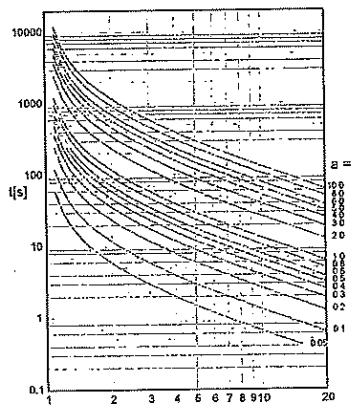
Extremely Inverse



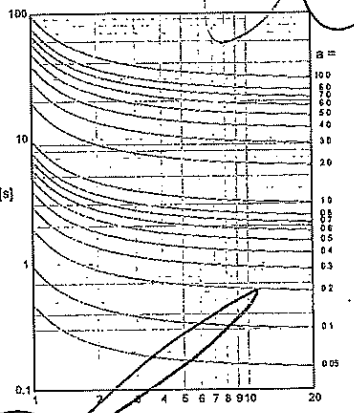
Very Inverse



Long Inverse



RI Inverse



Contents

Selection of cables

Cables with synthetic insulation - Double connection per phase for C, R, RE functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm²	Type of connector	For sections in mm²
Complete insulation	EUROMOLD	630	434 TB/G + 300 PB	300 - 630	434 TB/G + 300 PB	300 - 630
	EUROMOLD	630	430 TB + 300 PB	35 - 300	430 TB + 300 PB	35 - 300
	nkt (1)	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300
	Südkabel	630	SET 12 + SEHDK 13.1	70 - 300	SET 24 + SEHDK 23.1	35 - 240
	Tyco	800	RSTI-58xx + RSTI-CC-58xx	25 - 300	RSTI-58xx + RSTI-CC-58xx	25 - 300
Partially insulated	nkt	630	AB 12/630 + AC 12/630	25 - 300	AB 24/630 + AC 24/630	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300	RICS-57xx with sealing end IXSU-F for one wire cables + RICS-51xx with sealing end IXSU-F for one wire cables	25 - 300
	Tyco	400/630	RICS-57xx with sealing end IXSU-F for three wires cables + RICS-51xx with sealing end IIXSU-F for three wires cables	25 - 300	–	–
Earthing cable						
Partially insulated	Tyco	400/630	RICS-57xx with sealing end IDST-57xx for cables with one or three paper insulated wires	50 - 300	–	–

(1) Obligatory for the IAC 25 kA option
The second cables mounting support must be specified when ordering the FBX.
A surge arrester may be installed instead of a second cable connection. These mounting supports are available on request. Conforming with the manufacturer's technical data and mounting instructions.

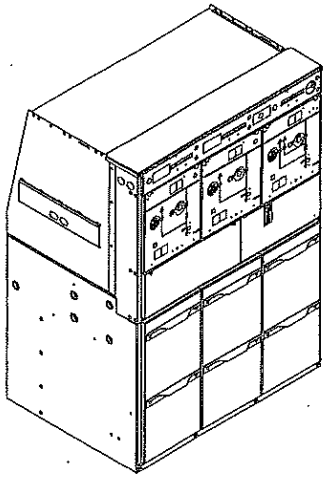
Cables with synthetic insulation - Triple connection per phase for C, R and RE functions

630 A connector, external cone as per EN 50181, C type connector, screw type contact with M16 x 2 internal threading

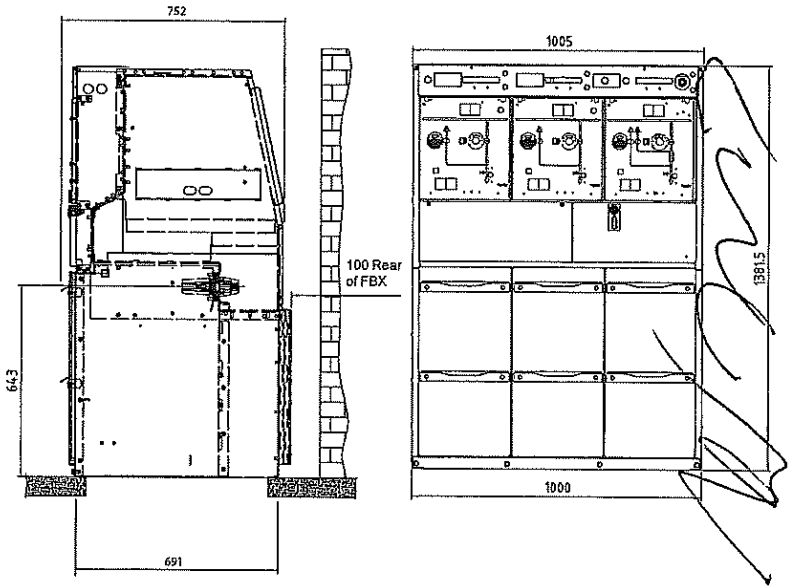
			12 kV		24 kV	
Type of cable	Manufacturer	Rated current	Type of connector	For sections in mm²	Type of connector	For sections in mm²
Complete insulation	nkt	630	CB 12/630 + CC 12/630	25 - 300	CB 24/630 + CC 24/630	25 - 300

Note: the IAC 25 kA option is not available if 3 cables are used per phase.
The cables mounting support must be specified when ordering the FBX.
A surge arrester may be installed instead of a third cable connection. These mounting supports are available on request. Conforming with the manufacturer's technical data and mounting instructions.

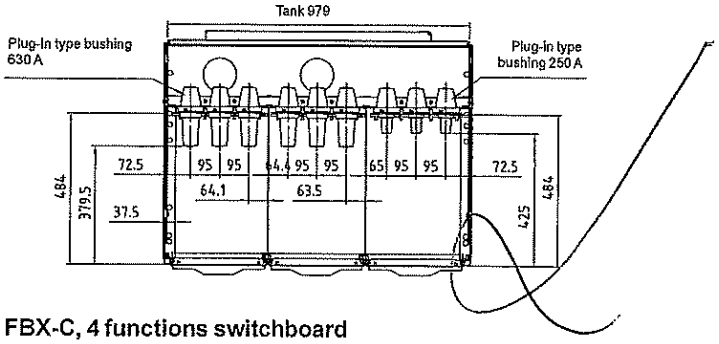
Overall dimension drawings



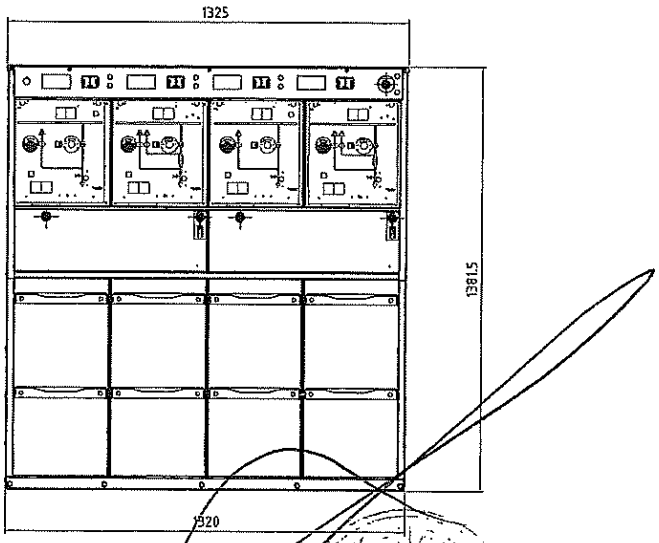
FBX-C, 3 functions switchboard
C-C-T1 configuration



Cable compartment dimensions

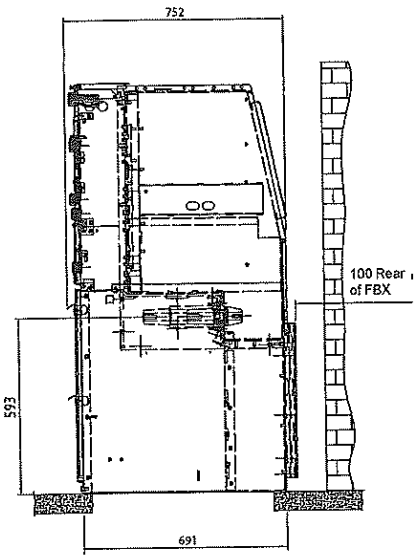


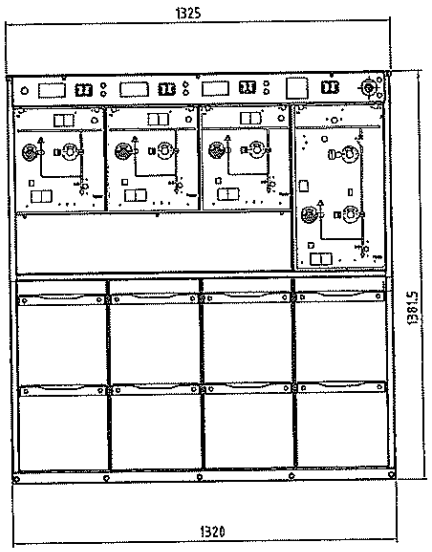
FBX-C, 4 functions switchboard
C-T1-C-T1 configuration



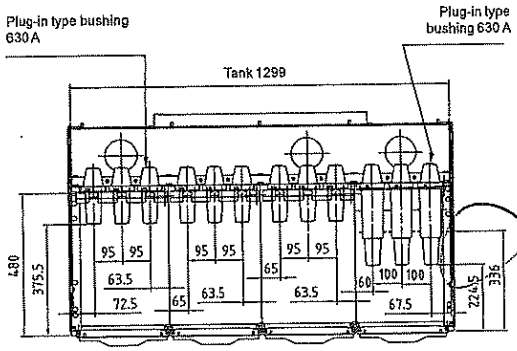
Overall dimension drawings

FBX-C, 4 functions switchboard
C-C-C-T2 configuration



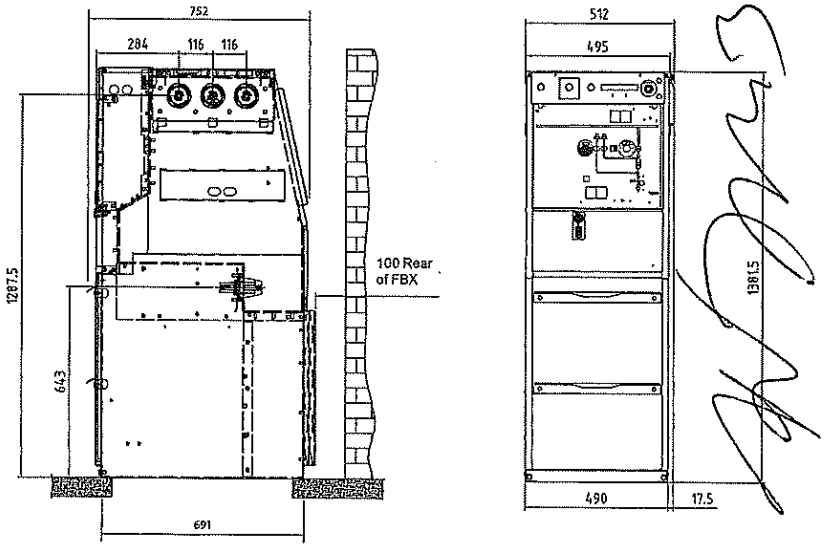


Cable compartment dimensions

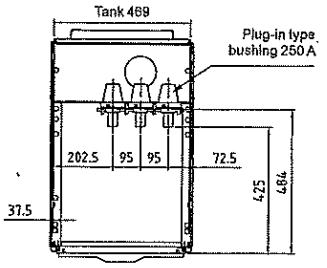


Overall dimension drawings

FBX-E, 1 function switchboard
T1 configuration



Cable compartment dimensions



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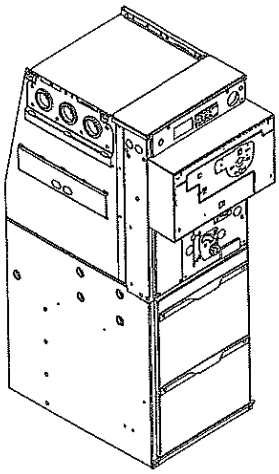
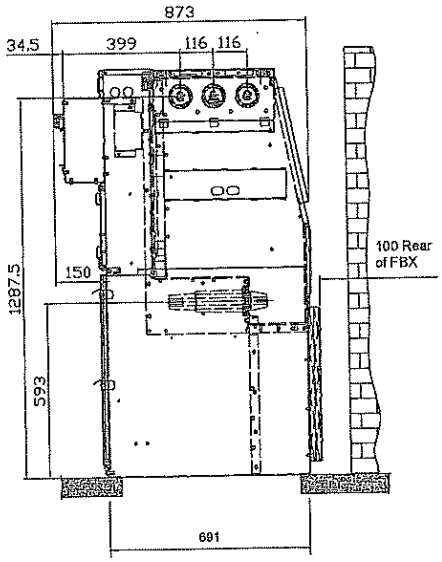
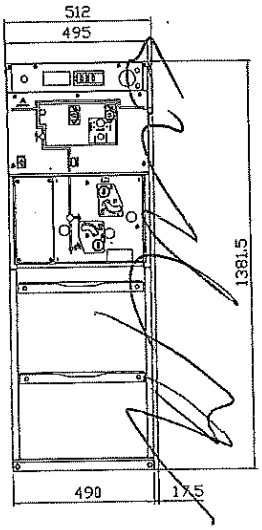
Overall dimension drawings

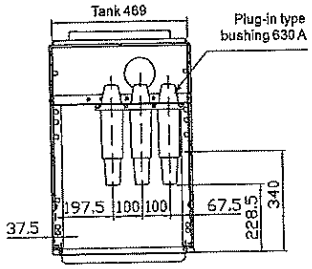
FBX-E, 1 function switchboard
CB configuration



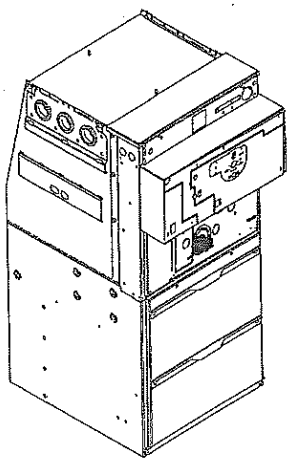




Cable compartment dimensions

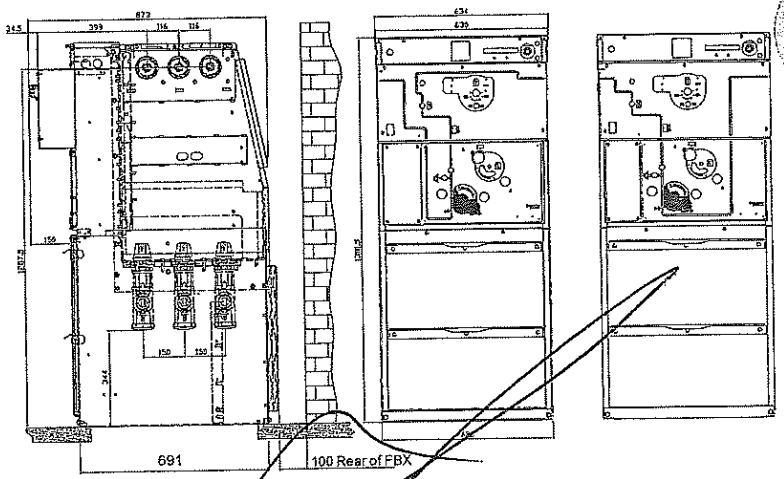


FBX-E, 1 function switchboard
CBb configuration



CBb - right busbar coupling

CBb - left busbar coupling

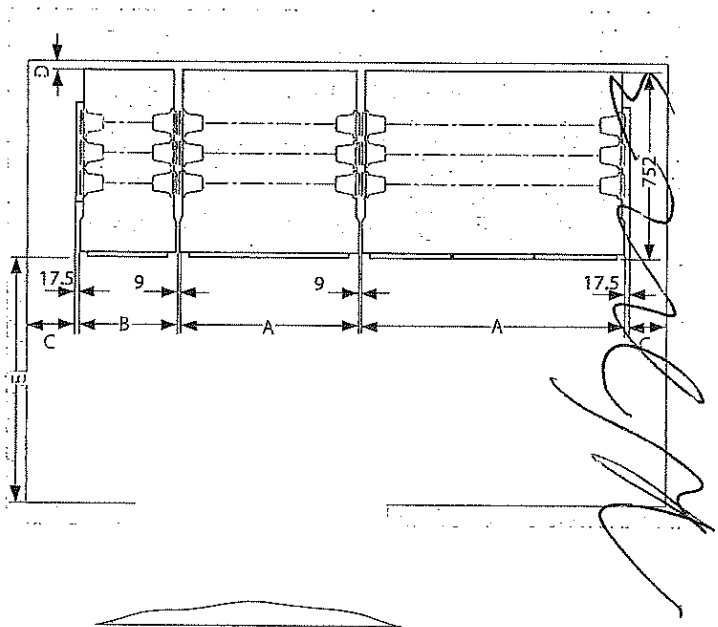


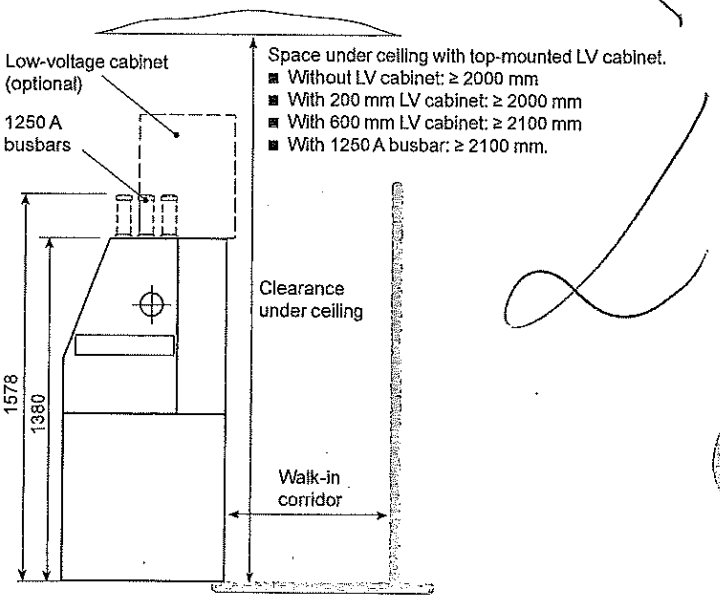
Indoor installation

	Functions and distances		Space (mm)
A	Unit 1 function M1, M2, M3, M4		1000
	Unit 2 functions		680
	Unit 3 functions		1000
	Unit 4 functions		1320
B	Unit 1 function C, R, RE		360
	Unit 1 function T1, T2, CB		490
	Unit 1 function CBb		625
C	Distance with the side wall of the building for extensions at the extremity of the switchboard		450
D	Distance between the rear of the switchboard and the building's wall	Release of overpressures only towards the bottom	20
		Release of overpressures towards the top and the rear	100/140
E	Minimum width of passage in front of the FBX-E switchboard: the national standards/ instructions must be respected! For a subsequent extension to the existing FBX-E: access for assembly E > 950; FBX-C: > 800		

Minimum distances between the FBX-E and the building's walls

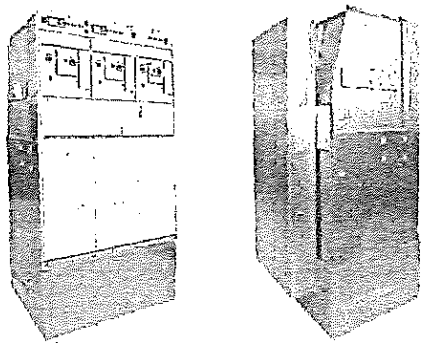
Top view





Indoor installation

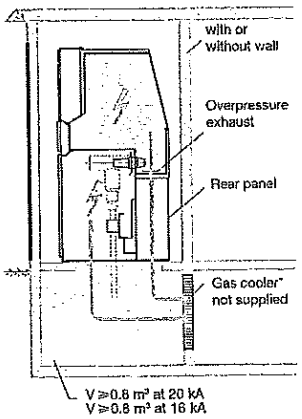
With mounting base and gas exhaust duct



Example of an installation for transformer substations without cable trough or double panel IAC classification as per IEC 62271-200.

■ **IAC class AFL 16/20 kA 1s (25 kA 1 s under 12 kV)**

Without side panel



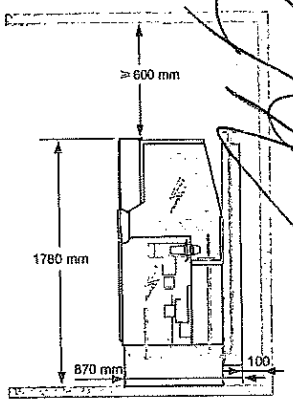
* Duct cross section > 0.3 m² at 16 and 20 kA.

⟶ : *Evacuation of gas in the event of overpressure*

Example of an installation:
FBX-C C-C-T1
Ceiling clearance ≥ 100 mm
Distance to the wall ≥ 30 mm
(Exhaust of the overpressure in the cable duct with gas cooler, with 5 layers of metal deployed, e.g. 66 x 3.4 x 0.5).

■ **IAC class AFL 16/20 kA 1 s**

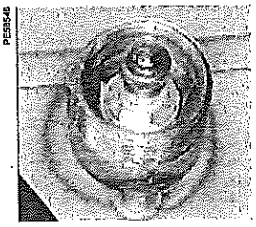
With gas exhaust duct



⟶ : *Evacuation of gas in the event of overpressure*

Contents

End of service life processing



Release valve

At the end of the FBX service life

The dismantling and disassembly of FBX is possible at the end of its service life. The separation of the elements making up the switchgear will be made:

- Either by disconnecting the mechanical connections
- Or, by dismantling, that is to say, by breaking or shearing the connections.

To guarantee efficient and ecological sorting and destruction of the materials, all plastic components have been identified.

- A description of the materials is supplied to customers
- Information on the valorisation process that are supplied to companies in charge of the recycling.

End of service life processing

Schneider Electric can help you in your FBX end of service life processing approach.

SF6 gas recovery

The volume of the insulating gas used in FBX is equivalent to 0.5% of the total weight of the switchboard. At the end of the switchboard's service life, gas can be evacuated via the valve to be recycled thanks to a process developped by gas suppliers.

Composition of materials and valorisation at end of service life

After disassembly (or dismantling), the recovered elements must be forwarded for treatment in the following manner:

Waste processing

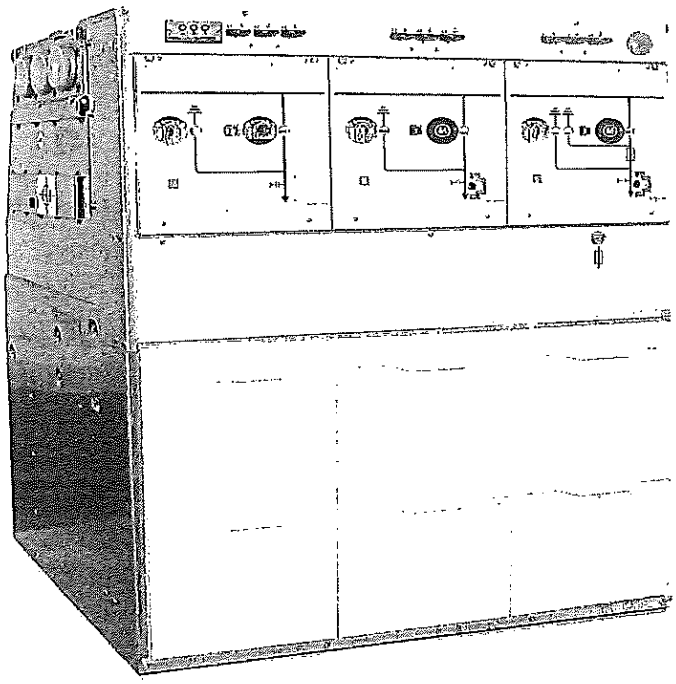
Type of waste	Destination	Recommended processing
SF6 gas	Supplier	Recovery, storage and regeneration
Steel & stainless steel	Local recovery agent	Shredding, sorting and recycling
Non-ferrous metals	Local recovery agent	Shredding, sorting and recycling
Epoxy resin	Cement plant	Revalorisation at a lower added value
Thermoplastics	Local recovery agent	Incineration
Molecular sieve	Authorised network	Elimination
Soiled protective equipment	Authorised network	Incineration
Cables	Local recovery agent	Separation of sheathing and conductors

ВЯРНО С ОРИГИНАЛА

С компактен и иновативен дизайн

FBX

Комутационни апарати средно напрежение с газова изолация, с номинално напрежение до 24 kV



Непрекъснатост на обслужване

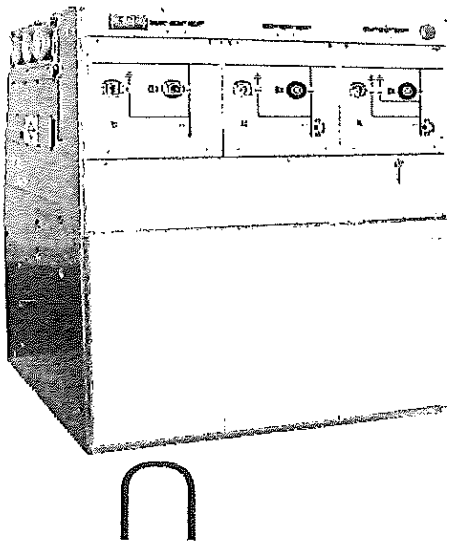
Лесно разширение

Безопасност

Готова интелигентна мрежа

ВЯРНО С ОРИГИНАЛА

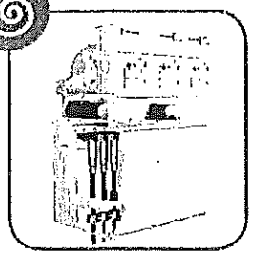
Безопасност чрез иновация



FBX е компактен, иновативен с газова изолация комутационен апарат с номинално напрежение до 24 kV и 630 A, с вътрешна дъга издържаща до 25 kA/1 s. Общо пет функции могат дабъдат комбинирани за максимална гъвкавост.

FBX е наличен в две изключително конфигурируеми. В компактната си версия FBX-C е с най тесен отпечатък на пазара. С разширената си версия, FBX-E, лесно развива потребностите ви разпределение на електро енергия, благодарение на патентованото устройство A-връзка.

Всичко това превръща FBX в логичен избор за голямо разнообразие от съвременните приложения. Било да послужи като основен възел на контура във вторичната публична мрежа за разпределение или като табло за разпределение за промишлени или инфраструктурни мрежи, предоставя високо качествена ефективност с минимални разходи на собственост.



Максимална непрекъснатост на обслужването

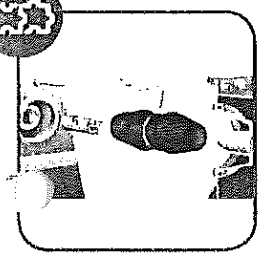
FBX е базиран върху иновативен, елегантен и лесен дизайн, който гарантира максимална непрекъснатост на обслужването.

> LSC2A-клас на продължителност на обслужване.

> Ключовите части са запечатани в корпус от неръждаема стомана, SF_6-напълнен резервоар, което ги прави непромокаеми (непропускливи) за условията на околната среда.

> Без поддръжка на запечатаните части на резервоара през периода на експлоатационен живот на изделието.

> Дизайн устойчив на наводнения.



Лесен за монтаж и експлоатация

С най тесния отпечатък на пазара и възможността за лесно разширяване, FBX понижава необходимото време и усилия за настройка на електрическата мрежа.

> Компактен размер и лесен монтаж.

> Просторно отделение за кабел за MV кабелна връзка.

> Лесна смяна на предпазители

> Лесно за разширяване посредством патентованата A - система за връзка.

Безопасен инженеринг

Дизайна на FBX поставя на първо място безопасността , гарантирайки най- високо ниво на сигурност за персонала и оборудването.

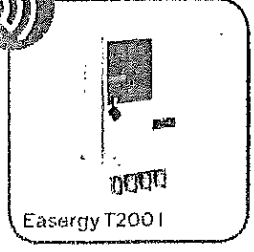
> FBX отговаря на националните и международни действащи стандарти: IEC, NF, GOST, CNS, и IS

> Вътрешна дъга, издържаща до 25 kA/1 сек. (за използване на 12 kV)

> Изпускане на горещ газ далеч от оператора в редките случаи на вътрешна дъга, благодарение на клапаните за налягане и заден канал.

> Интегрирани блокировки осигуряващи пълна херметичност.

> Широка гама от заключващи опции.



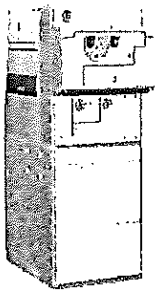
Smart grid-ready

Електрическите мрежи са развити за да обслужват разпределението на генерираната ел. енергия и възобновяемите енергийни източници. FBX е конструиран за да еволюира с тях.

> Дистанционно управление и наблюдение на капацитета, с отворени комуникации и превключвател авто-трансфер, благодарение на Easergy ™ T200 I дистанционен терминал.

> Подобрена възможност за захранване или възстановяване посредством CB630A's O-C-O функция за бързо повторно затваряне.

> Разнообразие от показатели за грешка, включително показатели за насочване на грешка.



FBX непрекъснато се подобрява.

Една то последните иновации е CB630A, бърз вакуумен изключвател за повторно затваряне:

O - 0.3 s - CO - 15 s - CO.

Възела CB630A е широк само 490 mm и може да бъде разширен и в двете страни.

Над 200,000 FBX функции монтирани в целия свят

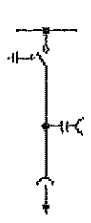
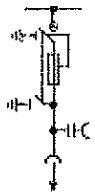
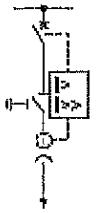
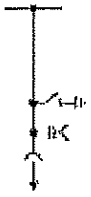
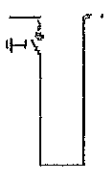
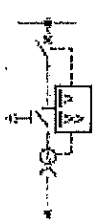
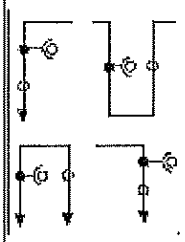
Технически характеристики

Номинално напрежение	kV	12	17.5	24
Издържано номинално напрежение при 50 Hz 1 mn на земята, както и между полюсите.	kV	28	38	50
Издържано номинално напрежение на импулс на мълния на земята и между полюсите.	kV	75	95	125
Текуща стойност на кратко време (1 s)	kA rms	16/21/25	16/21	16/21
Текуща стойност на кратко време (3 s)	kA rms	16/21	16/21	16/21
Кратко време пикова текуща стойност	kAp	40/52.5/62.5	40/52.5	40/52.5
Номинален ток на камерата	A	630	630	630
Номинален ток на шината	A	1 250(1)	1 250(1)	1 250(1)
IAC класификация съгласно IEC 62271-200	kA 1 s	21/25(2)	16/21	16/21

(1)С горна шина 1 250 A

(2)Моля свържете се с нас

Основни функционални единици

Наименование	C	T1	T2	R	RE	Sb	CB	M
Функции	Кабел входящ или изходящ подаване с превключвател прекъсвач	Защита на трансформатор с прекъсвач превключвател комбинация с предпазител	Защита на трансформатор с вакуум прекъсвач	Директно входящо подаване без заземяващ превключвател.	Директно входящо подаване със заземяващ превключвател.	Шина превключвател прекъсвач	Изходящо подаване защита с O-C-O вакуумен прекъсвач на веригата	Измерване
Диаграми симулация								

Приблизителни размери и тегло за избрани конфигурации

Версия	Функция	Брой функционални единици	Височина [1]	Дълбочина	Ширина [2] [3]	Приблизително тегло
			(mm)	(mm)	(mm)	(kg)
FBX-C	C-T1	2	1 380 (1 040 опционално)	752	680	200
	C-C-T1	3	1 380 (1 040 опционално)	752	1 000	330
	C-T1-C-T1	4	1 380 (1 040 опционално)	752	1 320	470
	C-C-C-C-T1	5	1 380 (1 040 опционално)	752	1 685	550
FBX-E	C	1	1 380	752	360	135
	CB	1	1 380	873	490	220
	RE-T2	2	1 380	752	680	250
	C-C-T2	3	1 380	752	1 000	370
	C-C-C-C	4	1 380	752	1 320	450

(1) С 1 250 А шина отгоре, прибавят се 217 mm
(2) Да се прибавят 17.5 mm за защитни капаци на шината (дясно или ляво) от края на таблото.
(3) да се изчисли общата широчина на няколко свързани FBX-E табла, да се прибавят 9 mm между всяко разширение

Направете всичко за Вашата енергия

Дизайн : Глобъл Маркетинг, Комюникейшънс Стратегия и Дизайн.
998-5957_GMA-GB RJED111340EN

ВЯРНО С ОРИГИНАЛА
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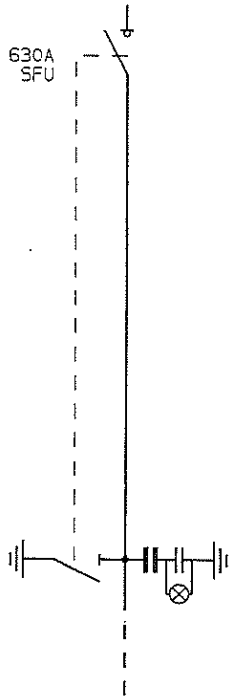

ВЯРНО С ОРИГИНАЛА

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01101
C

devis n° :012123
nom du projet :CEZ TENDER
client :SCHNEIDER ELECTRIC BULGARIA EOOD
ref. client :

FBX-E/24-16/C

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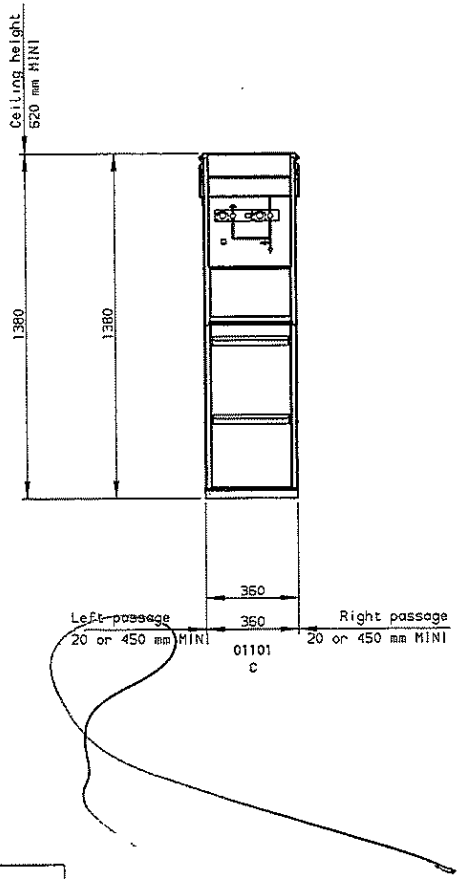
version du devis :00
date :10/05/2011



For details refer to FBX leaflet
Installation - Commissioning - Operation - Maintenance
Civil engineering guide

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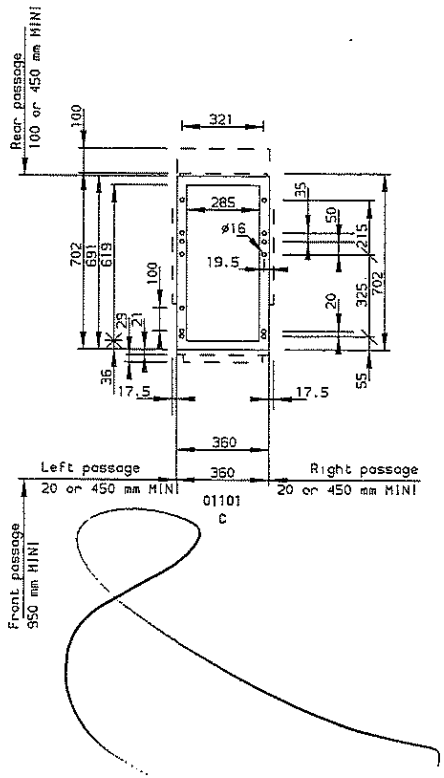

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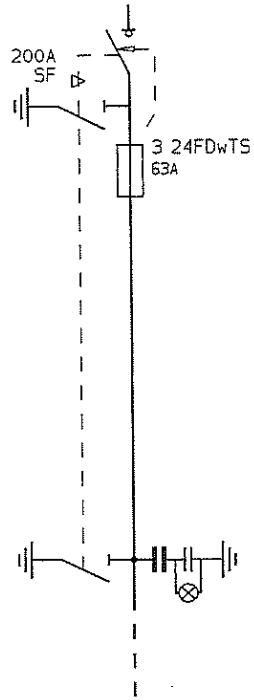

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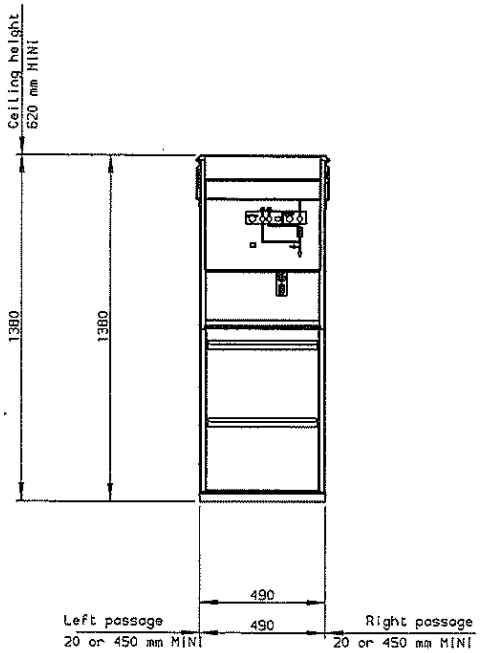

01201
T1

For details refer to FBX leaflet
Installation - Commissioning - Operation - Maintenance
Civil engineering guide

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ref. client :

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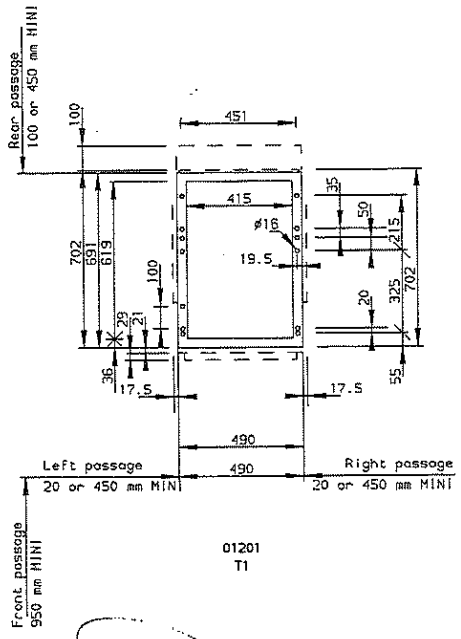

01201
T1

For details refer to FBX Leaflet
Installation - Commissioning - Operation - Maintenance
Civil engineering guide

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FBX-E/24-16/T1

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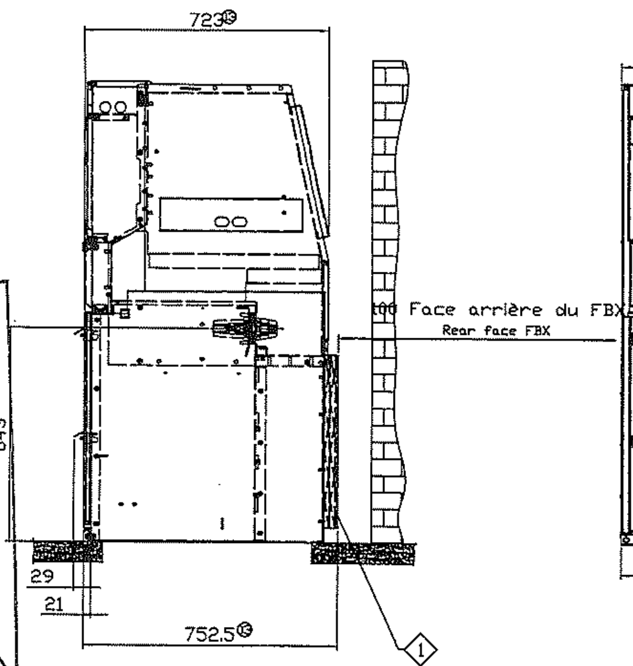
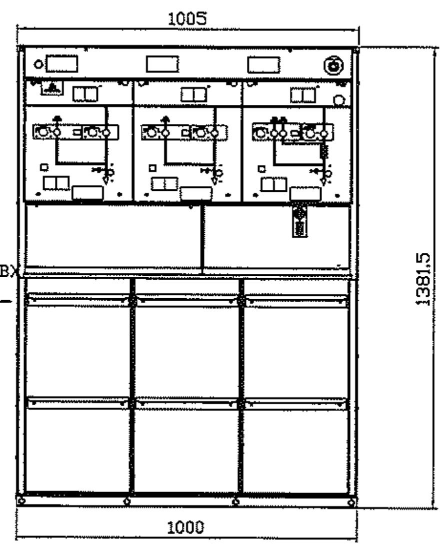
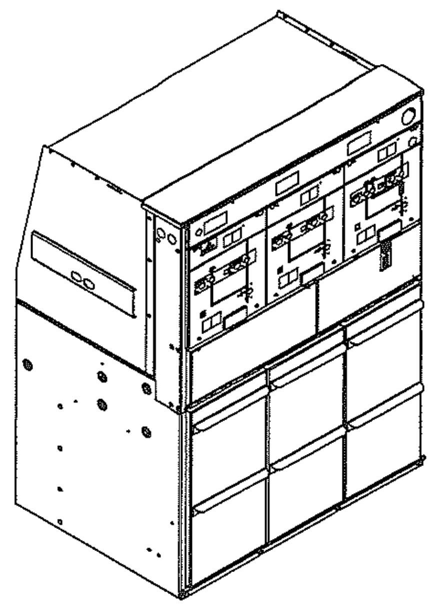
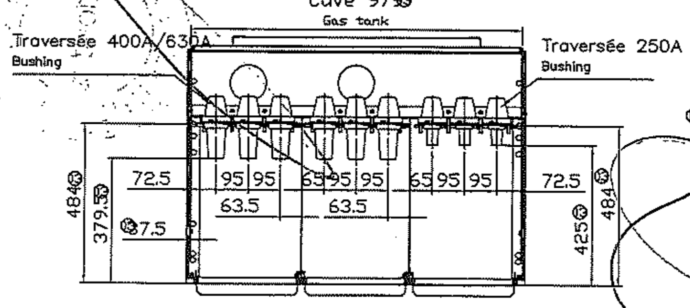
REPRESENTATION C-C-T1





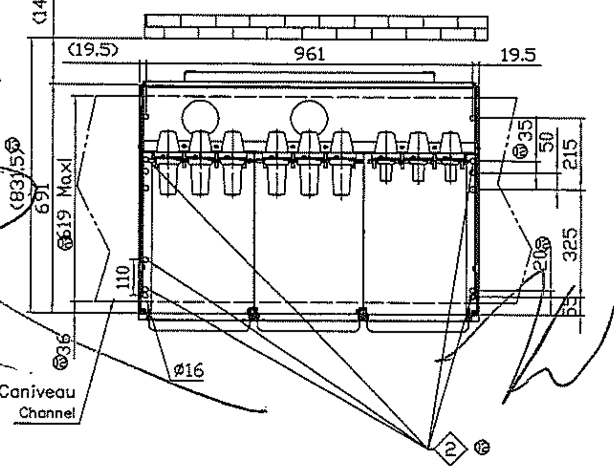


ENCOMBREMENT INTERIEUR DU COMPARTIMENT CABLES
OUTLINE OF CABLE COMPARTMENT INTERIOR



Cotes prises depuis l'Intérieur
Dimensions taken from the interior

IMPLANTATION AU SOL
INSTALLATION FOOT PRINT



1. Option:Panneau arrière avec grilles de refroidissement; échappement des gaz de l'arc interne vers arrière.
   Option:Rear cover with cooling grid, pressure relief to the rear.
2. Trous de fixation optionnelle
   Optional fixing holes

Plan source 3D, voir N° AMT006700-02
Source drawing 3D, see N° AMT006700-02

NOTA
Tableau Compact FBX IS C-C-T1 / C-RE-T1 / R-RE-T1 /C-
Compact unit FBX IS C-C-T1 / C-RE-T1 / R-RE-T1 /C-C-C

Matière / Material / Werkstoffe	Tolerances Generales / General Tolerances / Allgemeine Toleranzen	Traitement de surface / Surface Treatment / Oberflaechenbehandlung	Traitement thermique / Thermic Treatment / Waermebehandlung
Name	Name	Name	Name

Rev.	N°	Date/Datum	Création/Revision	Design	Industrialisation
03	AMT008513M	2008/04/07	Date/Datum: 2008/04/09	Date/Datum: 2008/04/28	Date/Datum: 2008/05/13
02	AMT008119M	2007/11/26	Nom/Name : F. Colles	Nom/Name : M. Naumann	Nom/Name : D. Laurent
01	AMT006965M	2006/12/05			

A2H 3 1/10

UNITE FONCTIONELLE

FUNCTIONAL UNIT

Weight (kg)

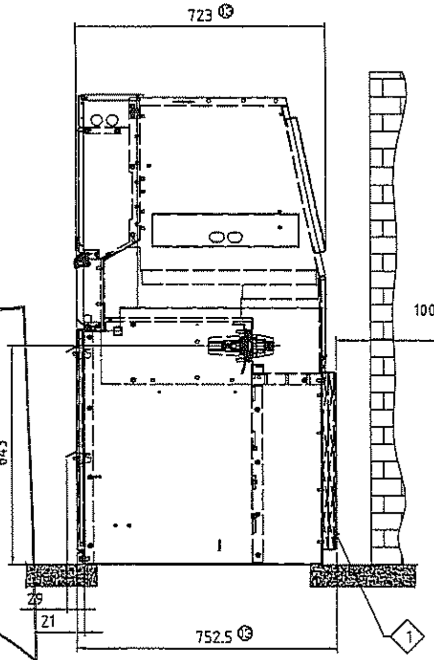
AREVA T&D AMT **AMT006700-01** REVISION 03

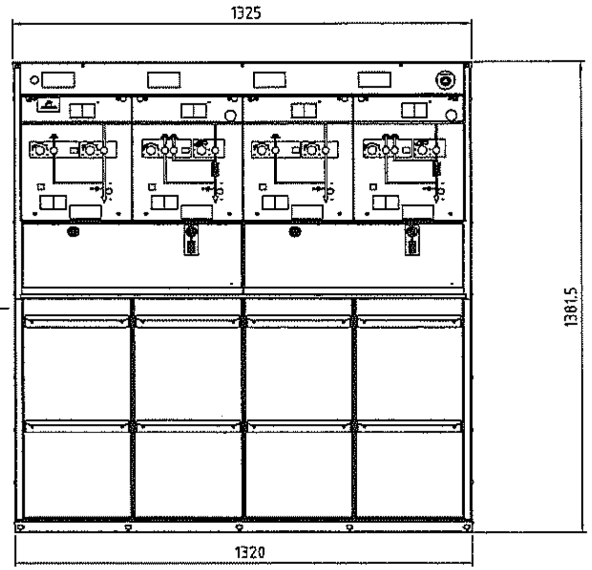
Documenttype: Mechanical Desktop 5.0
Titleblock Version 3 - (04/2006)

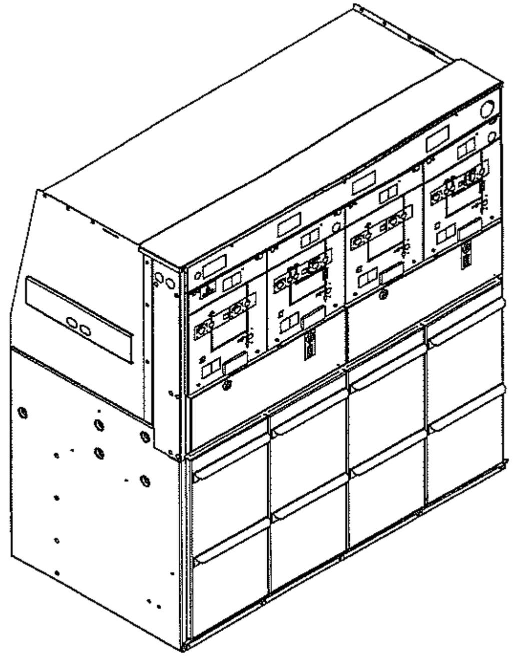
ВЯРНО С ОРИГИНАЛА

1591

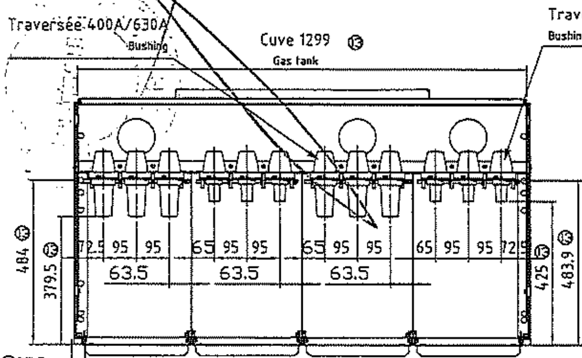
REPRESENTATION C-T1-C-T1





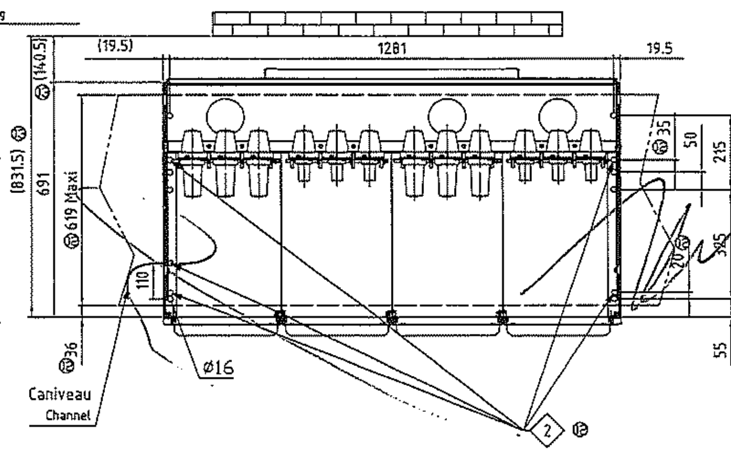


ENCOMBREMENT INTERIEUR DU COMPARTIMENT CABLES
OUTLINE OF CABLE COMPARTMENT INTERIOR



Cotes prises depuis l'intérieur
Dimensions taken from the interior

IMPLANTATION AU SOL
INSTALLATION FOOT PRINT



1. Option:Panneau arrière avec grilles de refroidissement; échappement des gaz de l'arc interne vers arrière.
   Option:Rear cover with cooling grid, pressure relief to the rear.
2. Trous de fixation optionnelle
   Optional fixing holes

Plan source 3D, voir N° AMT006580-02
Source drawing 3D, see N° AMT006580-02

NOTA
Tableau compact FBX IS C-C-C-T1 / C-T1-C-T1 / C-C-C-C
Compact unit FBX IS C-C-C-T1 / C-T1-C-T1 / C-C-C-C

ВЯРНО С ОРИГИНАЛА

Matière / Material / Werkstoffe	Tolerances Generales / General Tolerances / Allgemeine Toleranzen	Traitement de surface / Surface Treatment / Oberflaechenbehandlung	Traitement thermique / Thermic Treatment / Waermebehandlung
NONE	None	None	None

Rev.	N°	Date/Datum			
04	AMT009736M	2009/08/26	Creation/Revision Date/Datum: 2009/08/26 Nom/Name: C. Grech	Design Date/Datum: 2009/09/21 Nom/Name: M. Naumann	Industrialisation Date/Datum: 2009/09/28 Nom/Name: D. Laurent
03	AMT008513M	2008/04/07			
02	AMT008119M	2007/11/28			

UNITE FONCTIONELLE

FUNCTIONAL UNIT

A2H | QA 3 | Echelle/Scale/Massstab 1/10

AREVA | T&D | AMT | AMT006580-01 | REVISION 04 AUSGABE

Documenttype. Mechanical Desktop 5.0
Titleblock Version: 3 - (04/2006)

Schneider Electric

Inspection 228

Year 2013

Serial Number *FBX--1335012/AMT*

Order number S000017881

Customer ID 4151412

Position 011XX Diagram

Type FBX-C/24-16/C-T1		
IEC 62271-200	Instruction AMTNOT131-01 / AMTNOT132-01	
Ur 24 kV	Ir 630 A	fr 50 Hz
Up 125 kV	Ik 16 kA	tk 1s
Ud 50 kV	IAC -	Max. unit weight (kg)
Pre 0.03 Mpa	Pae 0.02 Mpa	220
SF6 1.7 kg	Pme 0.02 Mpa	sealed pressure system
[illegible]	T1 function	
[illegible]-103	IEC 62271-105	
[illegible]	Pref. W	
[illegible]	Ir acc. fuses choice grid	
[illegible]	Type medium	
[illegible]	Ua V	
[illegible]	IEC 62271-102	
[illegible]	[illegible]	

Service

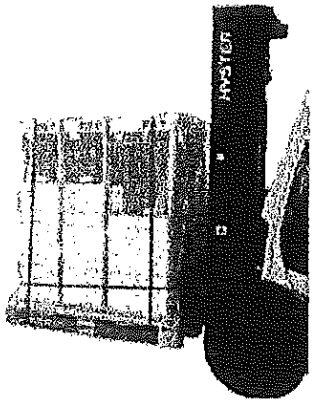
AMT01450T-01

[illegible]

1802

FBX-E

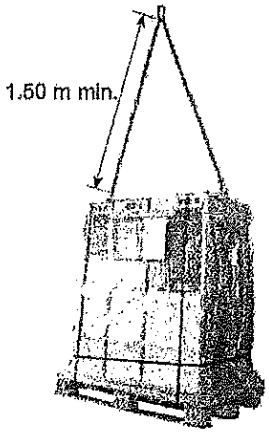
Обслужване на свързани функционални единици



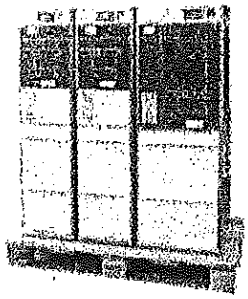
Допълнителна информация към Ръководство на Потребителя AMTNoT131-02.

Процедура за обслужване по време на транспортиране

- с мотокар

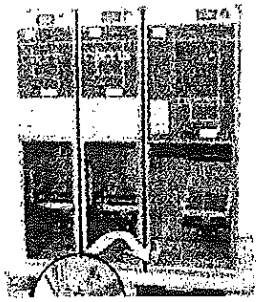


- с такелажна верига по 1,000 кг. всяка

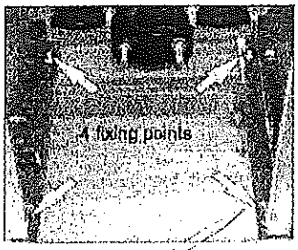


Разопаковане на таблото

- Преместване на таблото, така както е опаковано, възможно най-близо до местоположението му за монтаж.
- Отстранете предпазното покривало .



- Отстранете панелите на вратата .
- Развинтете винтовете за дърво с квадратна глава, фиксиращи таблото към палета (четири точки в краищата на функционалните единици).



- Напасвайте панелите на вратата обратно на местата им.

ВЯРНО С ОРИГИНАЛА

TRAL

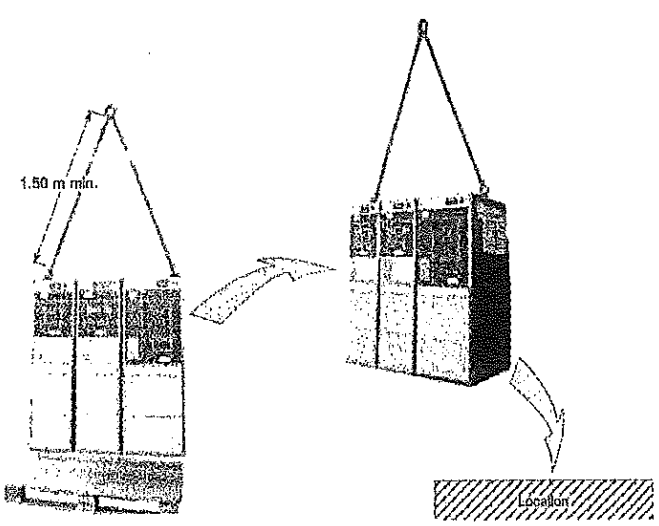
Обслужване на свързани функционални единици

Монтаж на таблото

- Проверете равнината на пода, където разпределителното табло ще бъде монтирано

- Повдигнете таблото посредством такелажните вериги и го спуснете надолу бавно, без резки движения, до окончателните му местоположение

Таблото не бива да се мести като се плъзга по пода.



Проверки

- Заклинете таблото на място, ако е необходимо.
- Уверете се, че функционалните единици от които е изградено разпределителното табло са свързани заедно и съосни (нивелирани)

Въвеждане на разпределителното табло в експлоатация

- Завършете монтажа, и след това въведете в експлоатация съгласно указанията дадени в Ръководство на потребителя AMTNoT131-02.

ВЯРНО С ОРИГИНАЛА

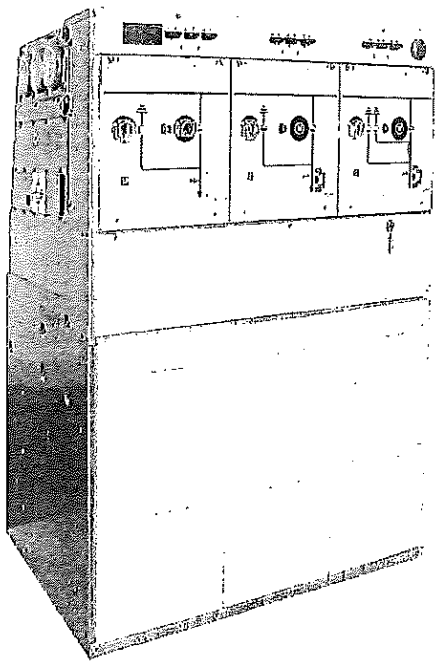
16.95

Secondary Distribution Switchgear

FBX

SF6 Gas-insulated switchboards

Instructions
Guide for Civil Engineering Structures



ВЯРНО С ОРИГИНАЛА

1596

Schneider Electric

Contents

1 Schneider Electric at your service

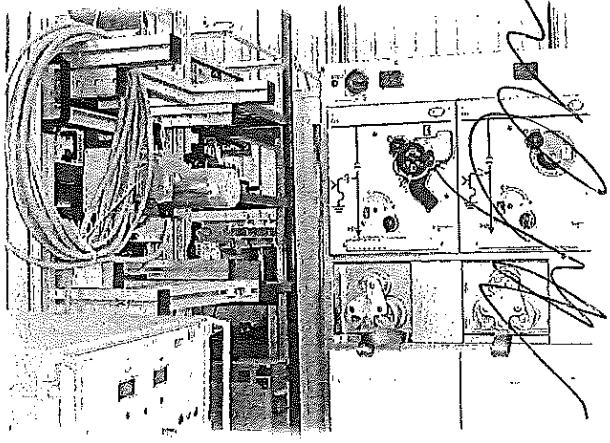
Operations and maintenance may only be carried out by personnel who have received suitable authorization for the operations and manœuvres they are responsible for performing.

If this is not the case, please refer to our Service Unit or Training Centre.

All locking-out operations must be performed according to the "General Safety Instructions booklet for Electrical Applications" UTE C 18 510 (or its equivalent outside FRANCE).

1.1 Our Service Unit: our specialists, and suitably adapted services...

- Guarantee extension contracts in relation to the selling of new equipment,
- Supervision of HVA switchgear installations,
- Technical advice, diagnoses of the facilities, expertise,
- Maintenance contracts adapted to operational constraints,
- Systematic or conditional preventive maintenance,
- Corrective maintenance in case of partial or complete failure,
- Supply of spare parts,
- Overhauling of equipment and requalification of installations in order to benefit from new technologies and extend the life of your switchgear by limited investments.



Contact the Schneider Electric Service Unit for diagnoses and advice:
Working hours

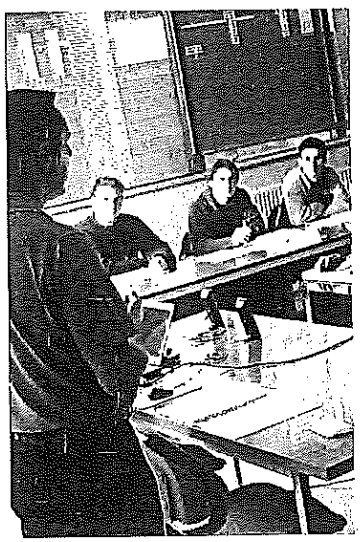
	33 (0)3 85 29 35 00
	33 (0)3 85 29 36 30
or	33 (0)3 85 29 36 43

1.2 Schneider Electric Training: Together, let us develop our skills...

We can place at your disposal all of our trainers' expertise, our teams' pedagogical experience and the wealth of our equipment, to help you face the challenge of encouraging the personal development of each individual through the optimization of their skills.

From a few hours up to several weeks, Schneider Electric Training has the control over all of the teaching processes in order to meet the needs of each customer.

- Specific training, directly operational with practical work on real machines.
- Small groups to facilitate communication.
- Balance between theory and practice.
- Evaluation and management of the skills: Measurement and optimization of the trainees' knowledge.



Faced with the direct and indirect training costs of the operational stoppages and shutdown, training is a real investment

Schneider Electric France
Training Centre

35 rue Joseph Monier - CS 30323 - F-92506 Rueil-Malmaison Cedex

www.schneider-electric.fr/formation

2 With regards to this User Manual

2.1 Use of this User Manual

This User Manual describes the works or arrangements necessary for the installation of a HVA switchboard of the FBX type.

2.2 Responsibilities

Our devices are quality controlled and tested at the factory in accordance with the standards and the regulations currently in force.

Apparatus efficiency and apparatus life depend on the compliance with the installation, commissioning and operation instructions described in this user manual.

Non respect of these instructions is likely to invalidate any guarantee.

The texts in this User Manual refer to international regulations.

Local requirements especially about safety and which are in accordance with the indications given in this document, must be observed.

2.3 Definition of the substations

Amongst substations that are prefabricated or built outdoors, walk-in substations can reach, or even exceed 2.5 m in height. They allow operating personnel to penetrate into the substation and work in them sheltered from bad weather.

The indoor substations with "prefabricated metal-clad bays" are installed in areas that the User reserves in one of the buildings in the factory, or in a building specially built for this purpose for the case of transformer substations for HVA distribution networks.

The recommended minimum volume for the room is: **12 m^3**

2.4 Access to the substation

Substation access must remain free at all times and under any circumstances. It is therefore generally installed on the side of the road.

Passages must be designed to permit easy maintenance for all of the substation's elements (circuit breaker, transformer, etc.).

2.5 Other technical notices to be consulted

- AMTNoT131-02 FBX Installation - Commissioning
- AMTNoT132-02 FBX Operation - Maintenance
- AMTNoT170-02 FBX Function CB Installation - Commissioning - Operation - Maintenance
- AMTNoT174-02 FBX Assembly a 1250A busbar

3 Dimensions of the FBX switchboards

3.1 Description of the functions

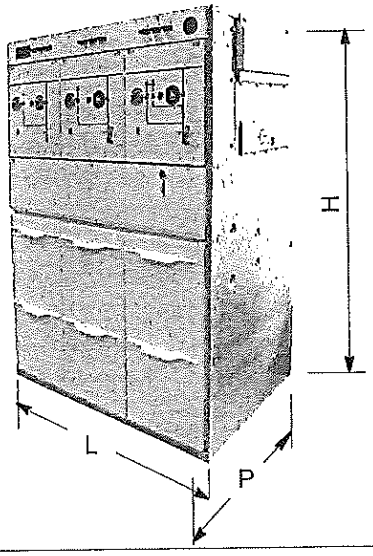
C = Load break switch
T1 = Combined or associated fused interrupter switch
T2 = Transformer protection circuit breaker
CB = Cables protection circuit breaker
CBb = Busbar protection circuit breaker
R = Direct linkage
RE = Direct incoming feeder with earthing switch

M1 = Measurement with cable connections
M2 = Measurement with RHS extension
M3 = Measurement for LHS extension
M4 = Measurement for extension (right or left)
Sb = Busbar isolator

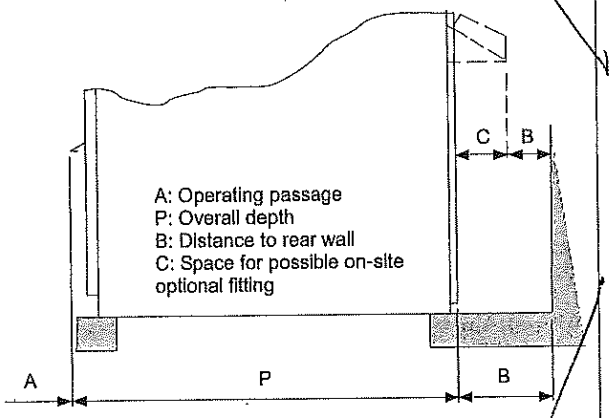
3.2 Overall dimensions

These are used to position the switchboard within the room.

The dimensions for the total switchboard volume (excluding optional extras) are:
- Width
- Depth
- Height.



Example for the depth of a switchboard



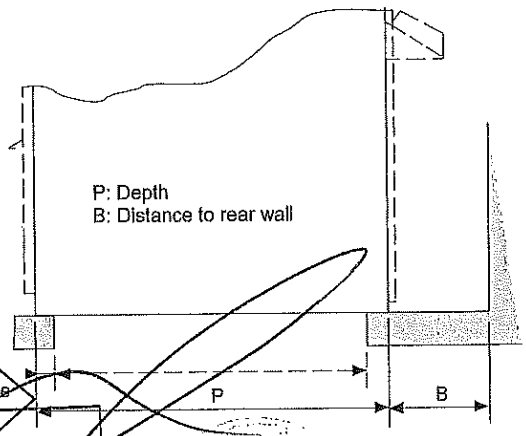
3.3 Ground plan dimensions

These are used for the civil engineering work relating to the switchboard.

In this case, the dimensions of the surfaces touching the ground are given.

The reference face is the front panel as it touches the ground. The sizes are taken from this reference.

Example for the depth of a switchboard



3.4 Dimensions and weights of the FBX-C switchboards (non-extendable model)

Switchboard	Number of modules	Overall Depth (mm)			Floor dimensions (mm)		Weights approximate (kg)
		Height[1]	Depth[2]	Width	Depth	Width	
C-C	2	1380/1040	752	680	691	680	200
RE-T1	2	1380/1040	752	680	691	680	210
RE-T2	2	1380	752	680	691	680	240
C-T1	2	1380/1040	752	680	691	680	200
C-T2	2	1380	752	680	691	680	230
C-C-T1	3	1380/1040	752	1000	691	1000	330
C-C-T2	3	1380	752	1000	691	1000	360
C-C-C	3	1380/1040	752	1000	691	1000	320
C-RE-T1	3	1380/1040	752	1000	691	1000	320
C-RE-T2	3	1380	752	1000	691	1000	360
R-RE-T1	3	1380/1040	752	1000	691	1000	320
R-RE-T2	3	1380	752	1000	691	1000	350
C-C-C-T1	4	1380/1040	752	1320	691	1320	450
C-C-C-T2	4	1380	752	1320	691	1320	480
C-T1-C-T1	4	1380/1040	752	1320	691	1320	470
C-T2-C-T2	4	1380	752	1320	691	1320	500
C-C-C-C	4	1380/1040	752	1320	691	1320	440
C-C-C-C-C	5	1380	752	1675	691	1675	540
C-C-C-C-T1	5	1380	752	1675	691	1675	550
C-C-T1-C-T1	5	1380	752	1675	691	1675	580
C-T1-C-T1-T1	5	1380	752	1805	691	1805	570

1) Add 200 or 600 mm depending on the height of the box
2) Without a cooler at the rear. In the case of a cooler, add 38.5 mm

3.5 Dimensions and weights of the FBX-M switchboards

Module	Number of modules	Overall Depth (mm)			Floor dimensions (mm)		Weights approximate (kg)
		Height	Depth[1]	Width[2]	Depth	Width	
M1	1	1380	720	1000	691	1000	490
M2	1	1380	720	1005	691	1000	490
M3	1	1380	720	1005	691	1000	490
M4	1	1380	720	1010	691	1000	490

1) Without a cooler at the rear. In the case of a cooler, add 38.5 mm
2) Plus 17.5 mm for the busbar cover (on the right or left-hand side) at the far end of the switchboard

3.6 Dimensions and weights of the FBX-E switchboards (extendable model)

Extendable switchboards

Module	Number of modules	Overall Depth (mm)			Floor dimensions (mm)		Weights approximate (kg)
		Height[1]	Depth[2]	Width[3]	Depth	Width	
C-C	2	1380	752	690	691	690	210
C-T1	2	1380	752	690	691	690	210
C-T2	2	1380	752	690	691	690	240
RE-T1	2	1380	752	690	691	690	220
RE-T2	2	1380	752	690	691	690	250
C-C-T1	3	1380	752	1010	691	1010	340
C-C-T2	3	1380	752	1010	691	1010	370
C-C-C	3	1380	752	1010	691	1010	330
C-RE-T1	3	1380	752	1010	691	1010	330
C-RE-T2	3	1380	752	1010	691	1010	360
R-RE-T1	3	1380	752	1010	691	1010	330
R-RE-T2	3	1380	752	1010	691	1010	360
C-C-C-T1	4	1380	752	1330	691	1330	460
C-C-C-T2	4	1380	752	1330	691	1330	490
C-T1-C-T1	4	1380	752	1330	691	1330	480
C-T2-C-T2	4	1380	752	1330	691	1330	510
C-C-C-C	4	1380	752	1330	691	1330	450

1) - Add 200 or 600 mm depending on the height of the box
2) - Without a cooler at the rear. In the case of a cooler, add 38.5 mm
3) - Plus 17.5 mm for the busbar cover (on the right or left-hand side) at the far end of the switchboard
   - To calculate the total width of several connected FBX-E switchboards, add 9 mm between each extension

Functional Unit - Extension

Module	Number of modules	Overall Depth (mm)			Floor dimensions (mm)		Weights approximate (kg)
		Height[1]	Depth[2]	Width[3]	Depth	Width	
C	1	1380	752	370	691	360	135
R	1	1380	752	370	691	360	125
RE	1	1380	752	370	691	360	135
T1	1	1380	752	500	691	490	160
T2	1	1380	752	500	691	490	190
CB	1	1380	873	500	691	490	220
CBb	1	1380	873	635	691	625	250
Sb	1	1380	752	690	691	680	200
T1-T1	2	1380	752	1010	691	1000	310
T2-T2	2	1380	752	1010	691	1000	370

1) - Add 200 or 600 mm depending on the height of the box
   - With a 1250 A busbar on the top, add 217 mm
2) - Without a cooler at the rear. In the case of a cooler, add 38.5 mm
3) - Plus 17.5 mm for the busbar cover (on the right or left-hand side) at the far end of the switchboard
   - To calculate the total width of several connected FBX-E switchboards, add 9 mm between each extension

4 General rules for the installation of FBX switchboards

4.1 Reminder concerning normal installation and service conditions (in accordance with IEC62271-1)

* Permissible ambient temperature

The ambient air temperature should be comprised between - 5°C (on option -15 or -25°C) and + 40°C.

The mean measured value for a 24 hour period must not exceed 35°C.

* Installation altitude

HV equipment is defined in accordance with European Standards and can be used up to an altitude of 1,000 m.

Beyond this, account must be taken of the decrease in dielectric withstand.

For these specific cases, contact the Schneider Electric Sales Department.

* Atmospheric pollution

The ambient air must not contain any dust particles, fumes or smoke, corrosive or flammable gases, vapours or salts.

* Permissible atmospheric humidity level

The average atmospheric relative humidity level measured over a 24-hour period must not exceed 95%.

The average water vapour pressure over a period of 24 hours must not exceed 22 mbar.

The average atmospheric relative humidity value measured over a period of one month must not exceed 90 %.

The average water vapour pressure over a period of one month must not exceed 18 mbar.

Condensation may appear in case of any sharp variation in temperature, due to excessive ventilation, a high atmospheric humidity level or the presence of hot air. This condensation can be avoided by an appropriate lay-out of the room or of the building (suitably adapted ventilation, air driers, heating etc.).

Whenever the humidity level is higher than 90 %, we recommend that you take appropriate corrective measures. For any assistance or advice, contact the Schneider Electric After-Sales department (See § 1.1).

Please consult Schneider Electric for any installation conditions which differ from the standard.

4.2 Substation installation requirements

The substation must be sheltered from flooding and any infiltrations of water. No ducts of any kind must pass through the substation's immediate environment without special protection (sheaths or ducts). Water, snow, or animal salts must not be able to penetrate.

Also prevent any penetration by small animals such as rodents, snakes, lizards, etc. especially in tropical areas.

The room must be equipped with standardised high level and low level ventilation.

Cable troughs and ducts must be blocked up to avoid:
- any draughts of air below the Functional Units,
- any rise in humidity or pollution coming from below ground.

4.3 Installation of the switchboard

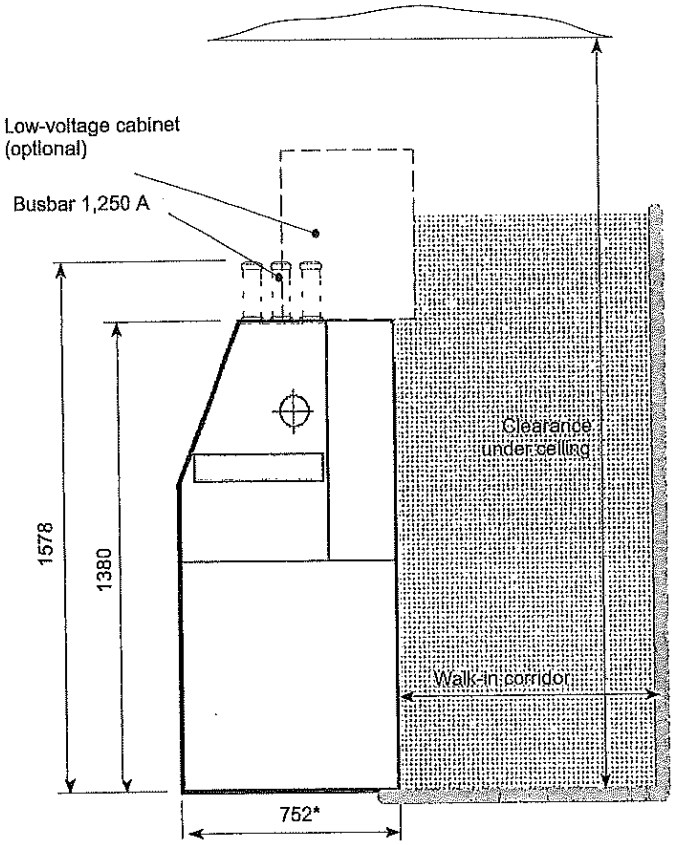
The positioning of the switchboard is paramount for:
- minimum spaces at the front (walk-in corridor for manoeuvering), at the rear and on each side of the switchboard. Certain passages must be sufficient for free movement and execution of operation and maintenance manoeuvres,
- leave the room's access door free,
- Take all measures to prevent all incidence of climatic conditions (humidity, pollution, etc.).

Respect the imposed distances (see following chapter).

Do not place the switchboard below any ventilation grilles, air vents, or air conditioning grilles or in the immediate proximity of glass tile panels in direct contact with the outside.

The switchboard must not be exposed to any solar radiation. A direct exposure can lead to excessive overheating of the low voltage racks.

4.4 Examples of the positioning of an FBX switchboard in a room



Side views

1) Free passages for installation:

Minimum width: 950 mm

Mimimum height: 1,800 mm

2) Walk-in corridor:

FBX-C: ≥ 800 mm for operations

FBX-E: ≥ 950 mm to facilitate the installation of extensible switchboards

3) Clearance under ceiling:

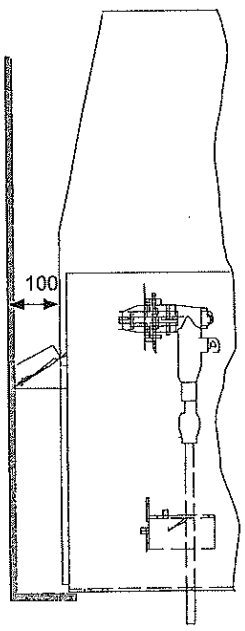
Without LV cabinet: ≥ 2,000 mm

With LV cabinet (200 mm): ≥ 2,000 mm

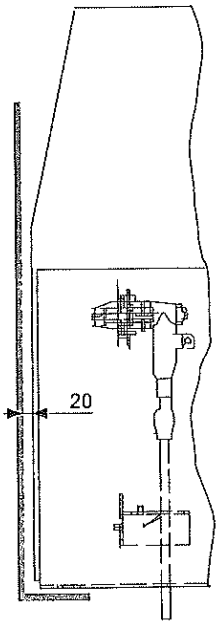
With LV cabinet (600 mm): ≥ 2,100 mm

With 1,250A busbar: ≥ 2,100 mm

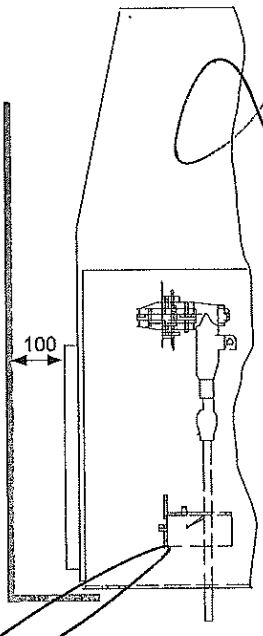
* + 38,5 mm with cooler



With rear deflector



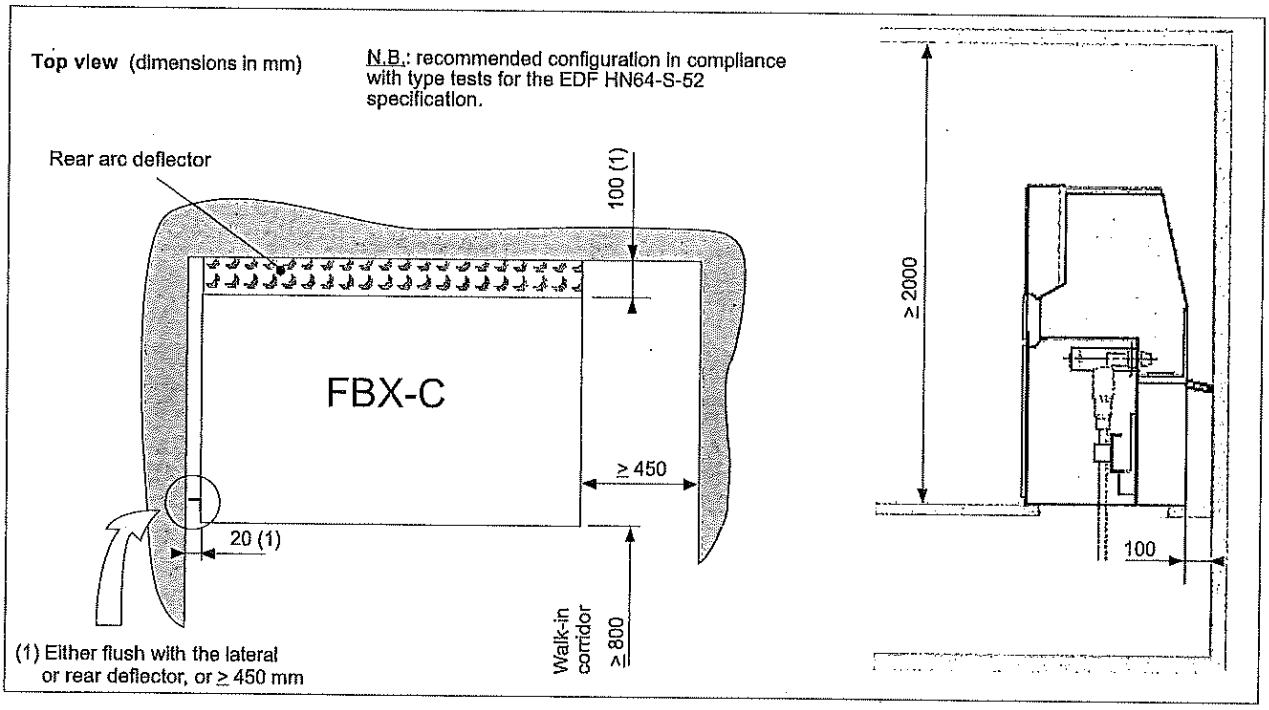
Without rear deflector



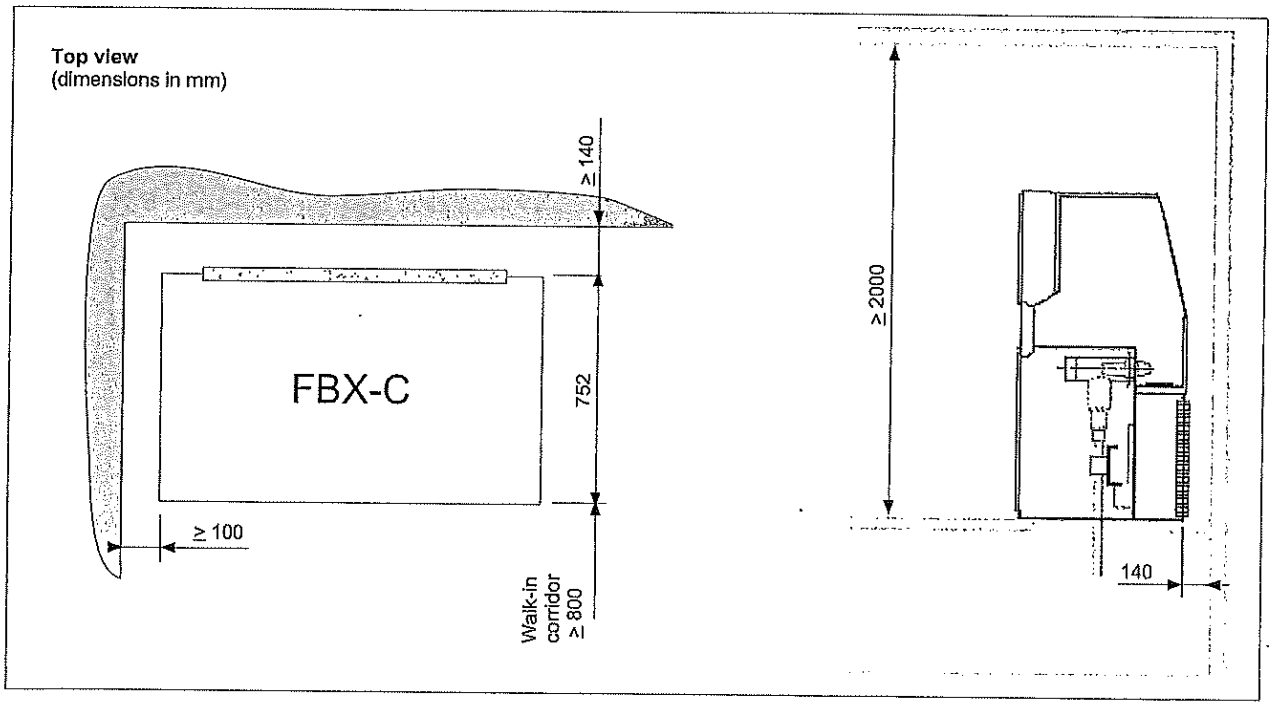
With rear cooler

5 Installation of an FBX-C switchboard

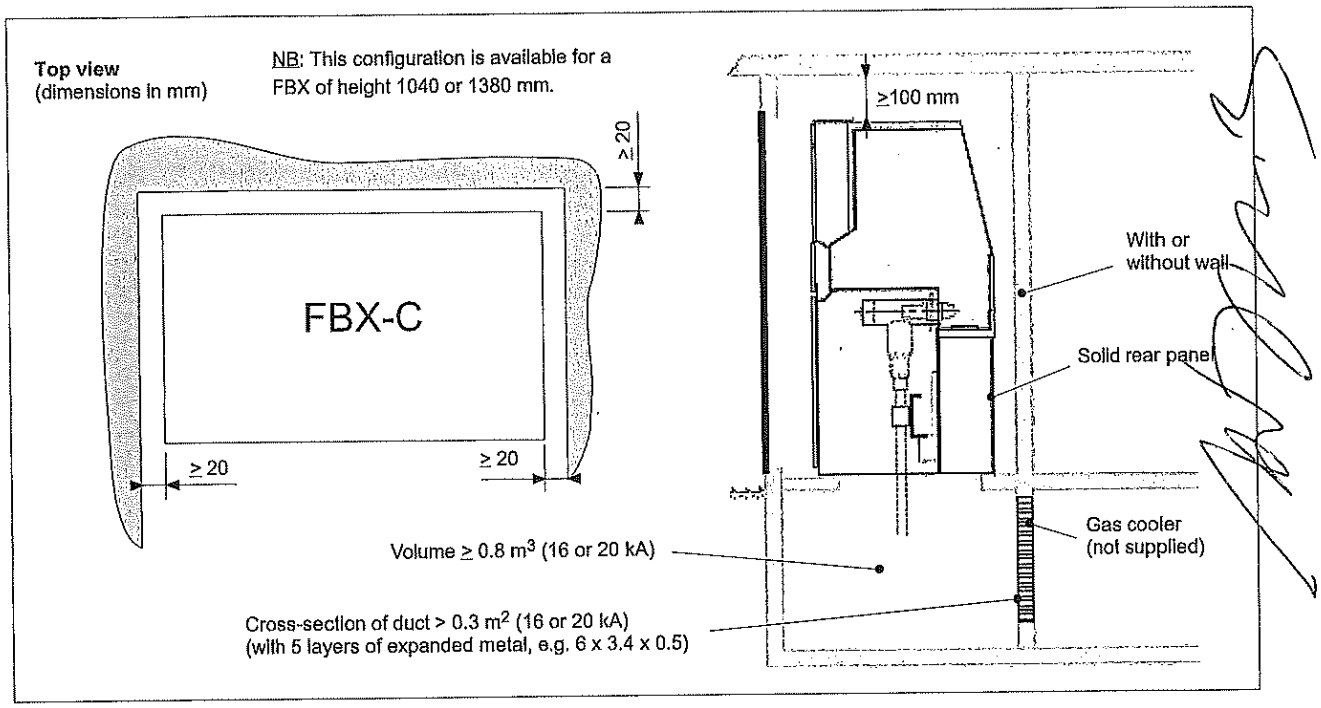
5.1 Switchboard up to 20 kA (AF - 1 s) - Rearward evacuation - Standard Installation



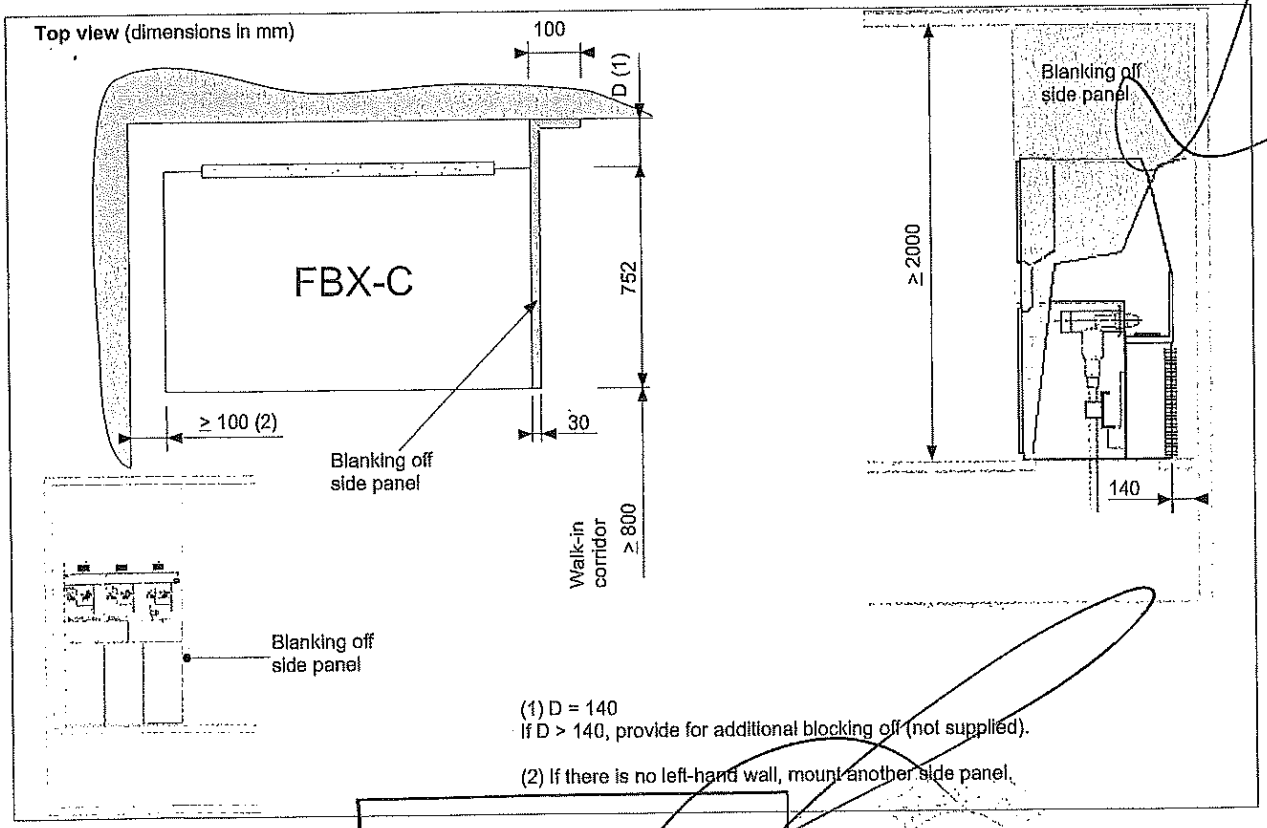
5.2 Switchboard up to 20 kA (AF - 1 s), with gas exhaust cooler towards the rear



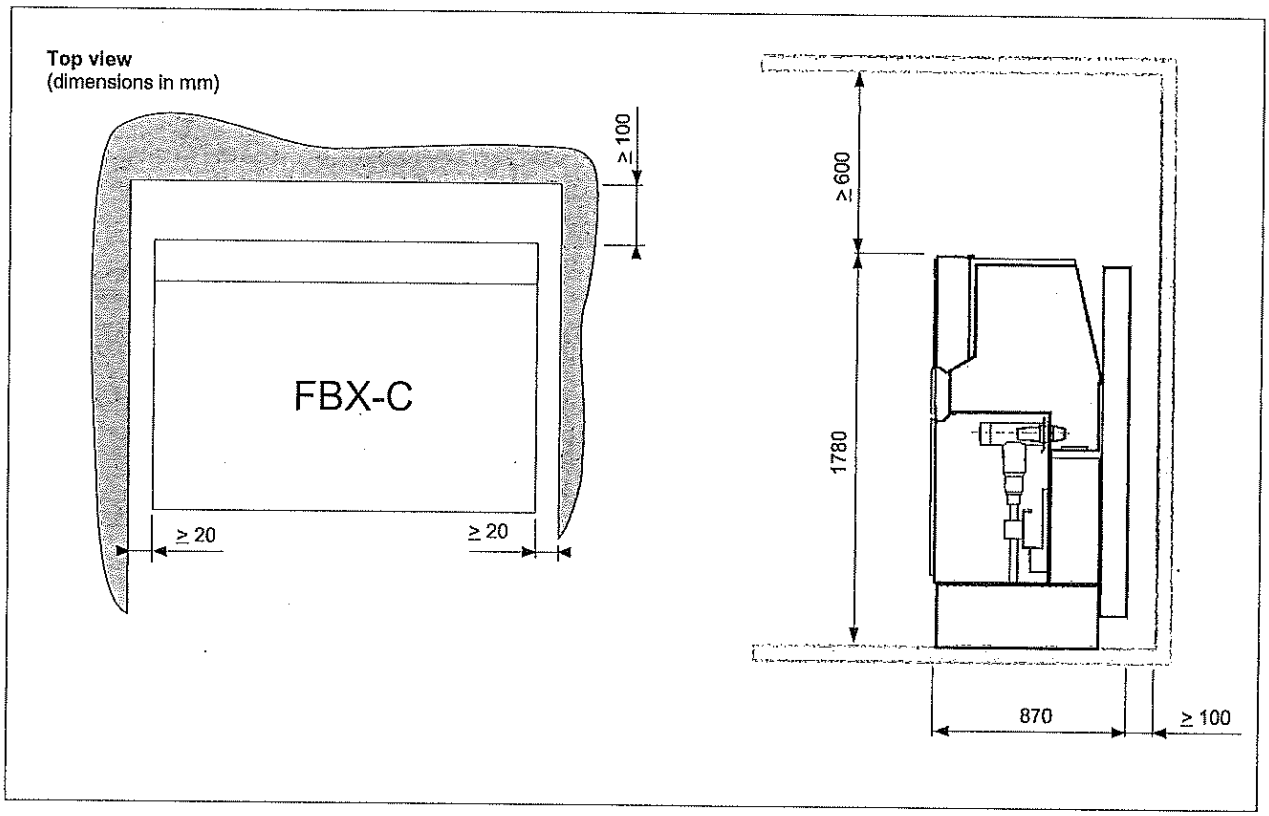
5.3 16, 20 and 25 kA Switchboards (AF/AFL - 1 s), with solid rear panel and gas exhaust towards the bottom



5.4 16 and 20 kA Switchboards (AFL - 1 s), with gas exhaust towards the rear

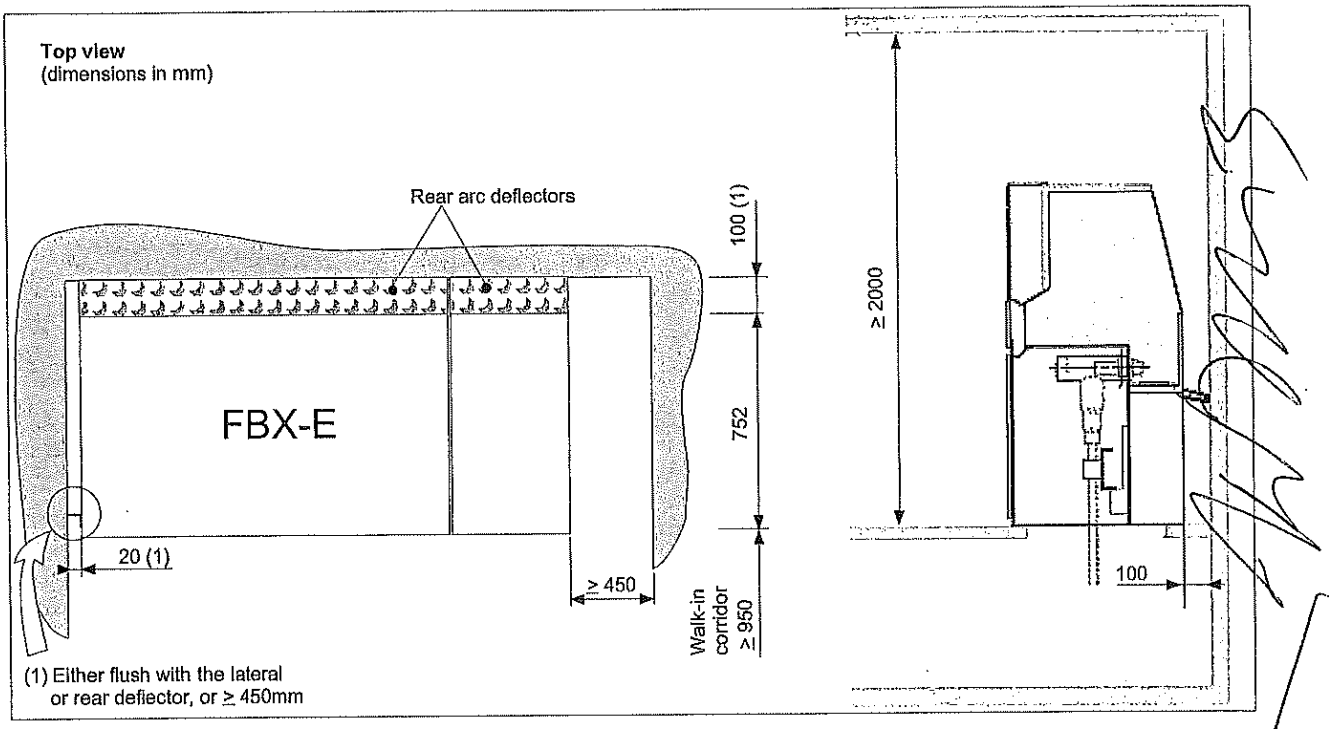


5.5 16 and 20 kA switchboards (AFL - 1S) with rear-mounted chimney

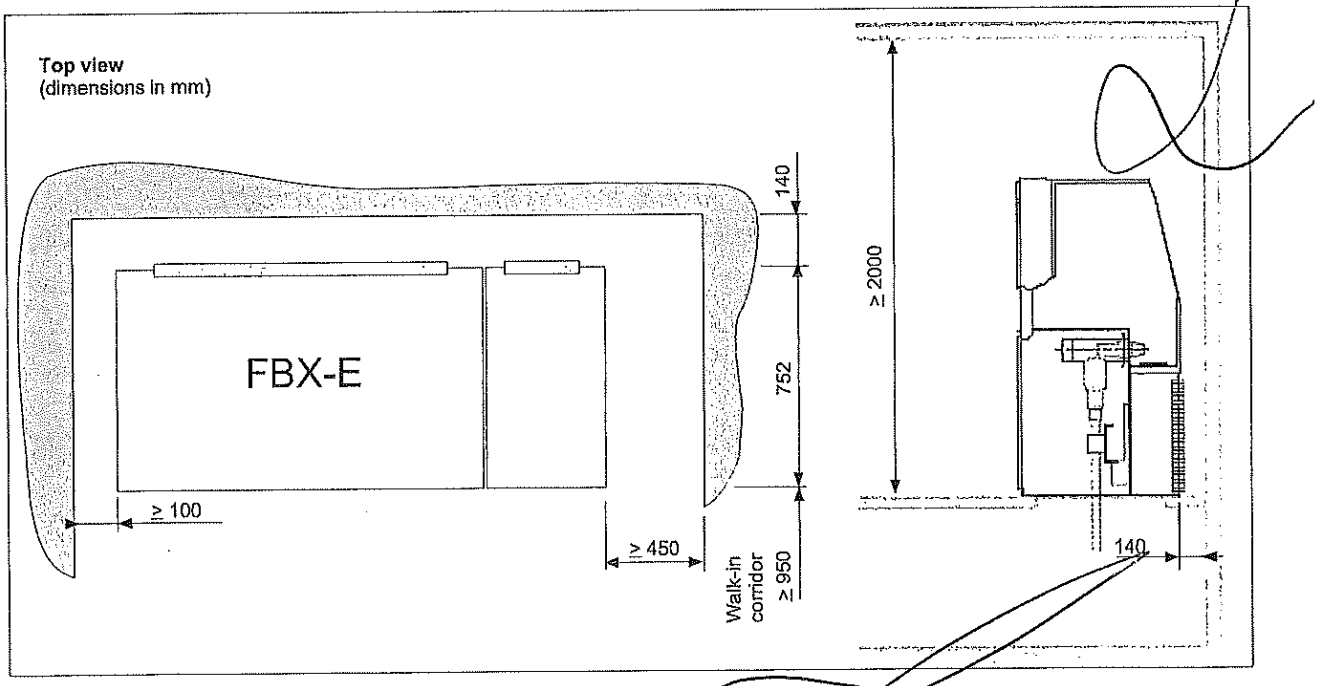


6 Installation of an FBX-E switchboard

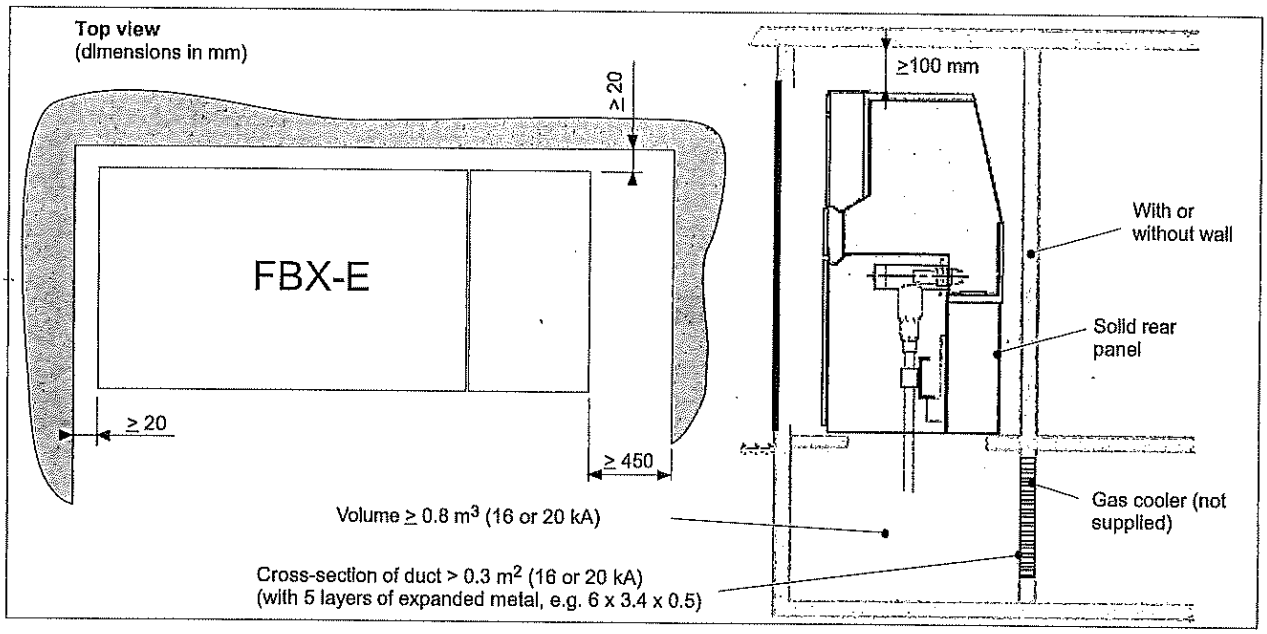
6.1 Switchboard up to 20 kA (AF – 1 s) [except if M or CBb function] - Rearward evacuation - Standard Installation



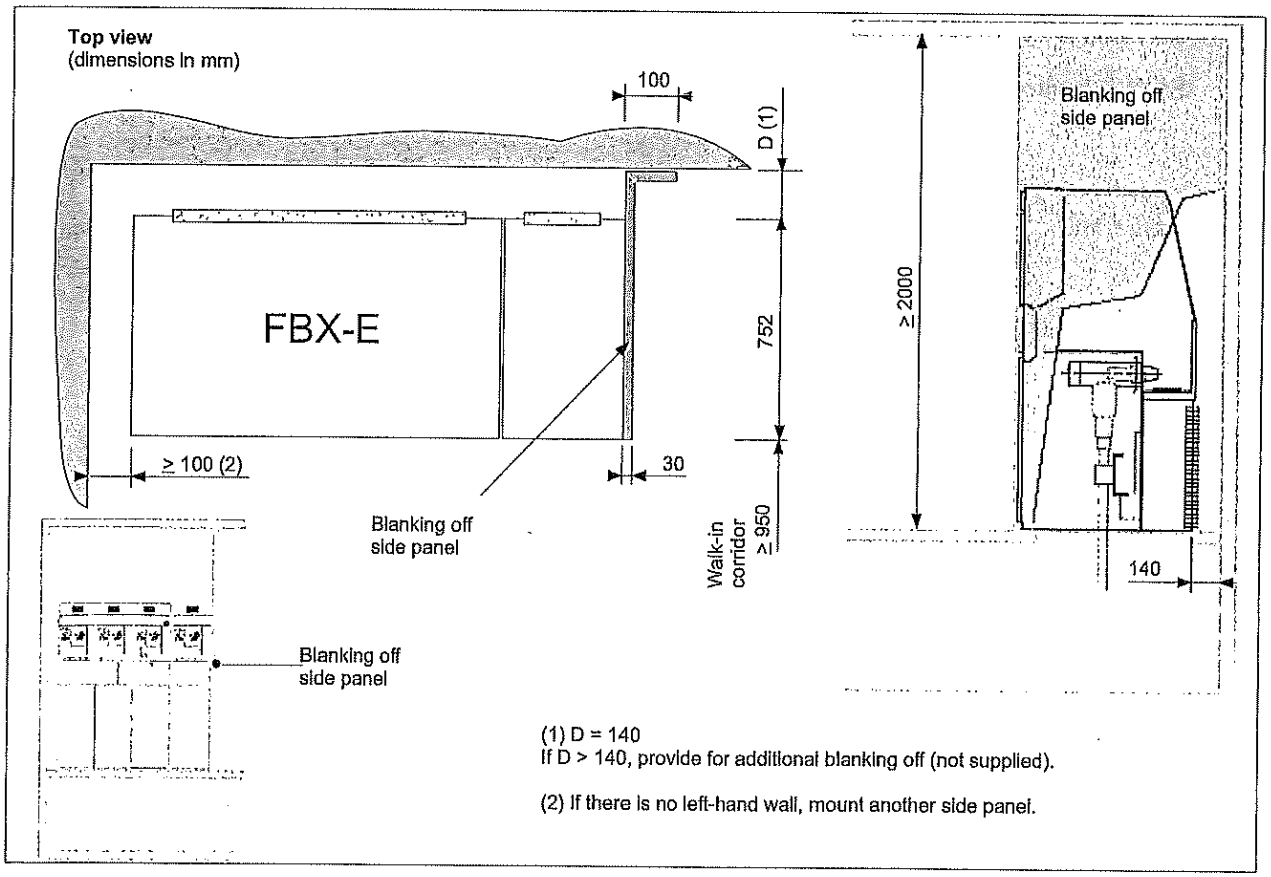
6.2 Switchboard up to 20 kA (AF - 1 s), with gas exhaust cooler towards the rear



6.3 16, 20 and 25 kA Switchboards (AF/AFL - 1 s), with solid rear panel and gas exhaust towards the bottom



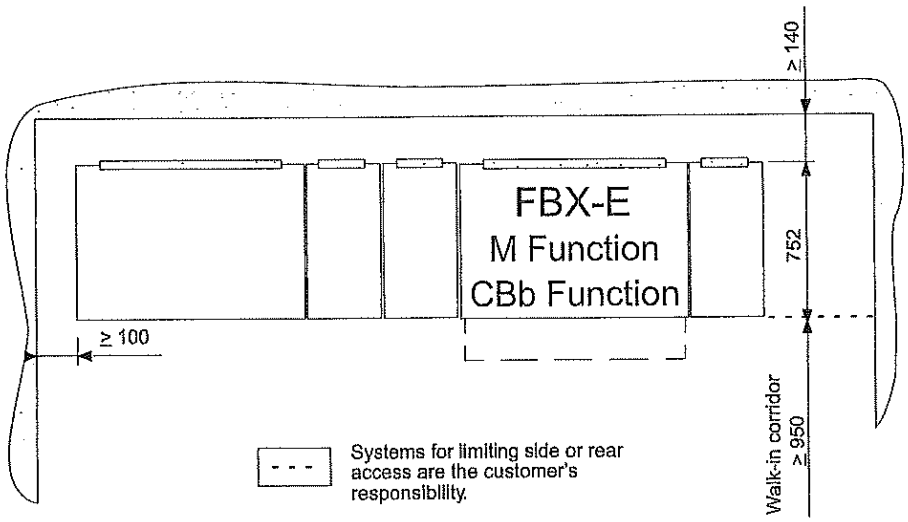
6.4 16 and 20 kA Switchboards (AFL - 1 s), with gas exhaust towards the rear



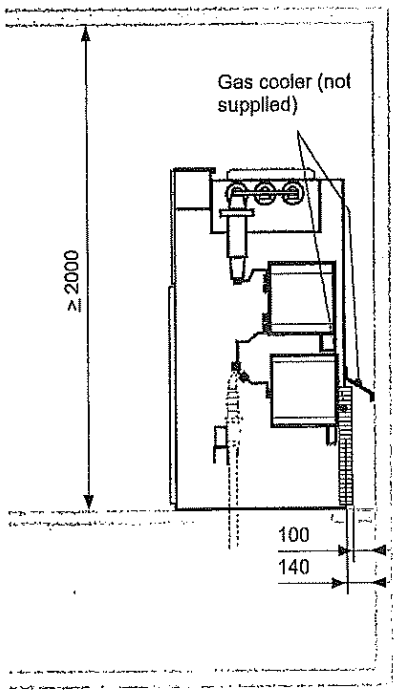
7 Installation of an FBX-E switchboard with M or CBb Function

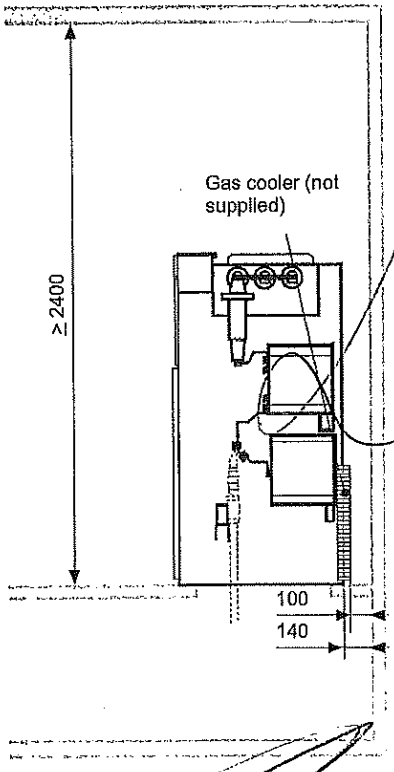
7.1 16 kA and 20 kA Switchboards (AF - 1 s), with gas exhaust towards the rear

Top view
(dimensions in mm)

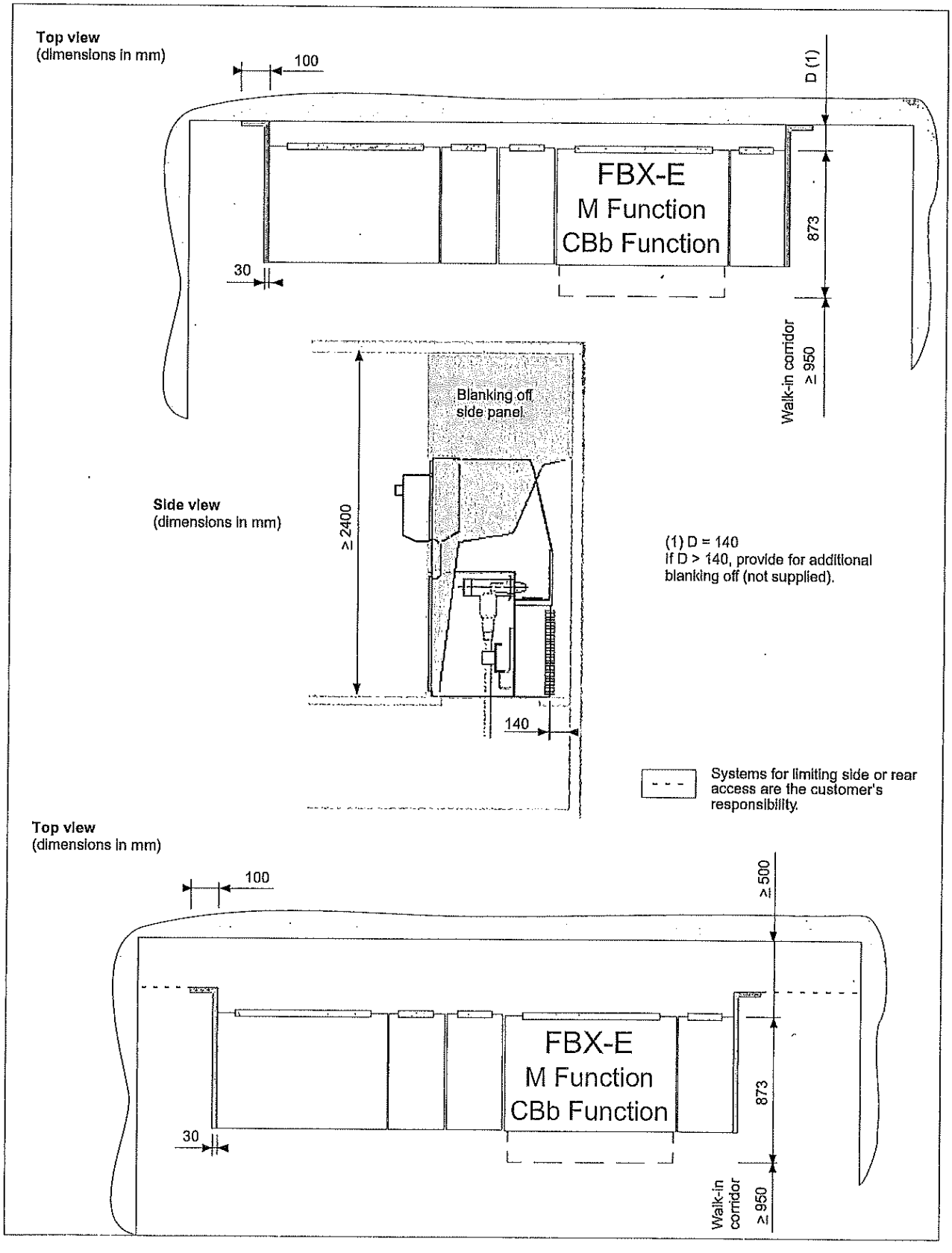


Side view
(dimensions in mm)



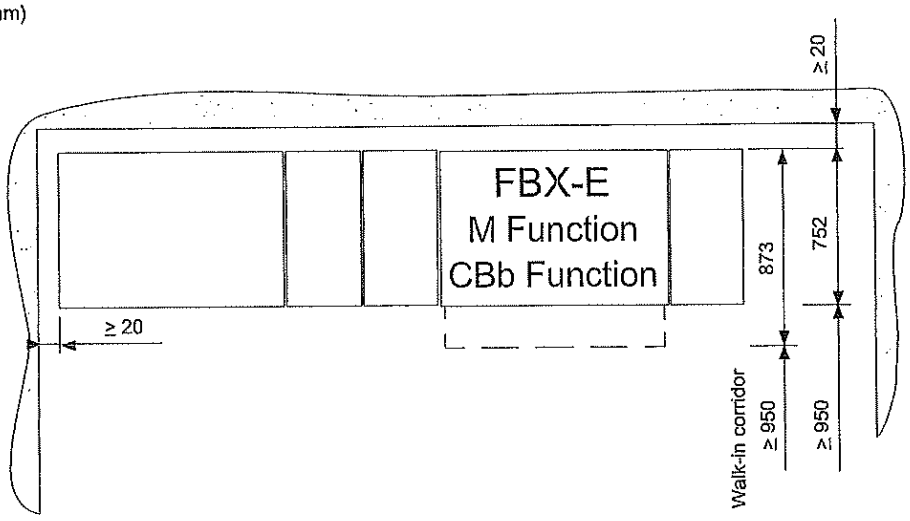


7.2 16 and 20 kA Switchboards (AFL - 1 s), with gas exhaust towards the rear

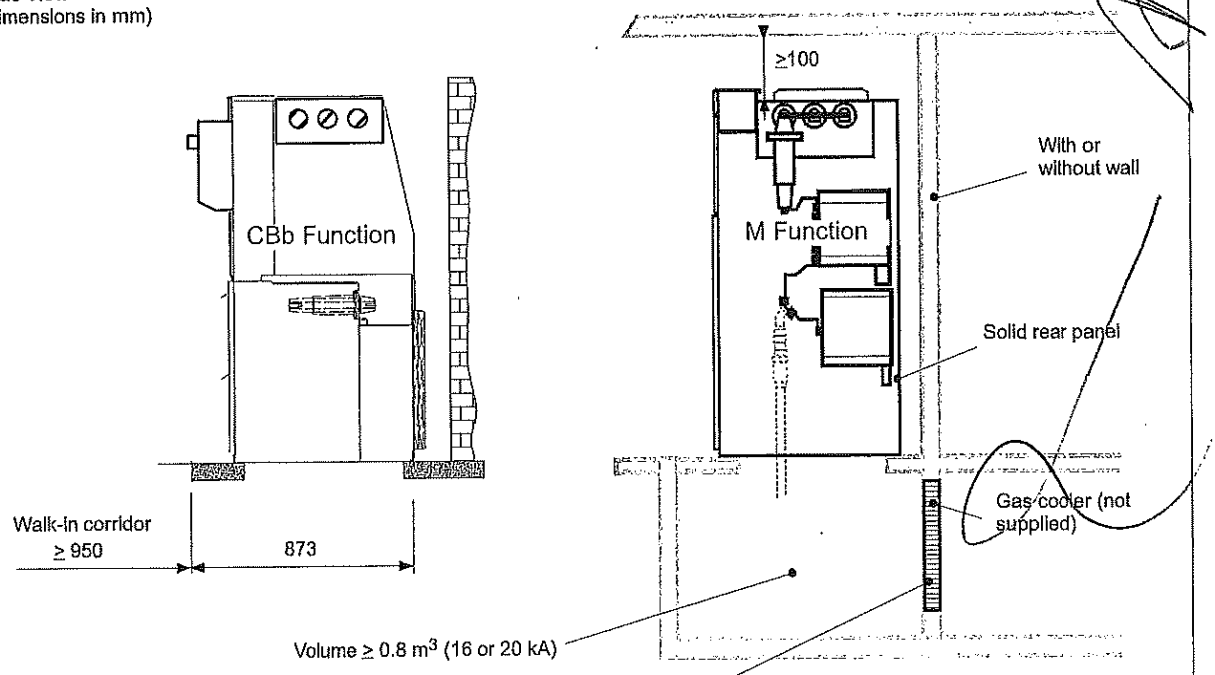


7.3 16 kA and 20 kA Switchboards (AF/AFL - 1 s), with gas exhaust towards the bottom

Top view
(dimensions in mm)



Side view
(dimensions in mm)



8 Installation of an FBX switchboard C or E

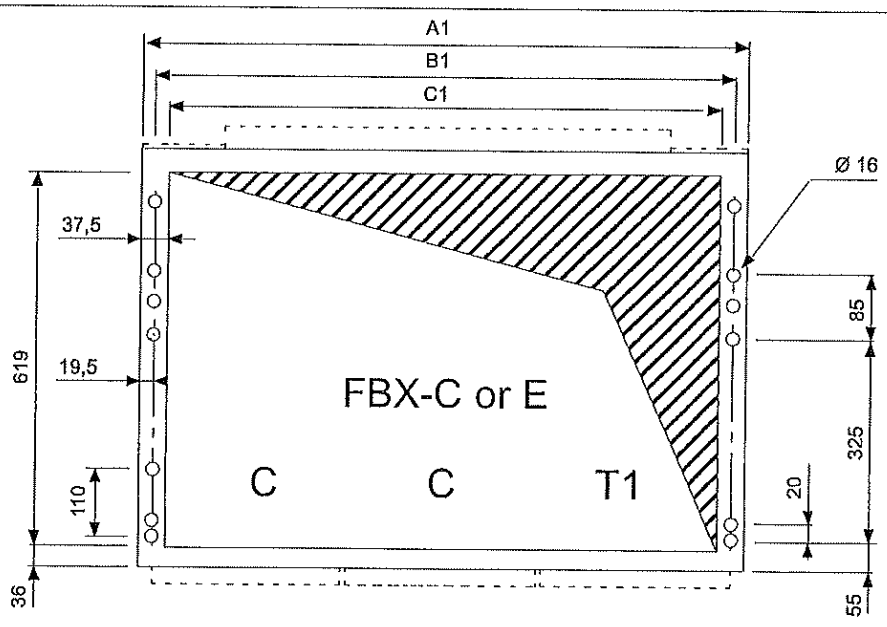
8.1 Dimensions for switchboards

FBX Widths (mm)	A1	B1	C1
C-C	680	641	605
RE-T1	680	641	605
RE-T2	680	641	605
C-C-T1	1000	961	925
C-C-T2	1000	961	925
C-C-C	1000	961	925
C-RE-T1	1000	961	925
C-RE-T2	1000	961	925
R-RE-T1	1000	961	925
R-RE-T2	1000	961	925
C-C-C-T1	1320	1281	1245
C-C-C-T2	1320	1281	1245
C-T1-C-T1	1320	1281	1245
C-T2-C-T2	1320	1281	1245
C-C-C-C	1320	1281	1245
C-C-C-C-C	1675	1636	1600
C-C-C-C-T1	1675	1636	1600
C-C-T1-C-T1	1675	1636	1600
C-T1-C-T1-T1	1805	1766	1730
C-T1-T1-T1-T1	2080	2041	2005

8.2 Geometry of the switchboard and civil engineering structure

Top view
(dimensions in mm)

The profiles, seen from the top, represent the surface of the switchboard borne on the floor.
All the fixing points (standard or optional) are located.



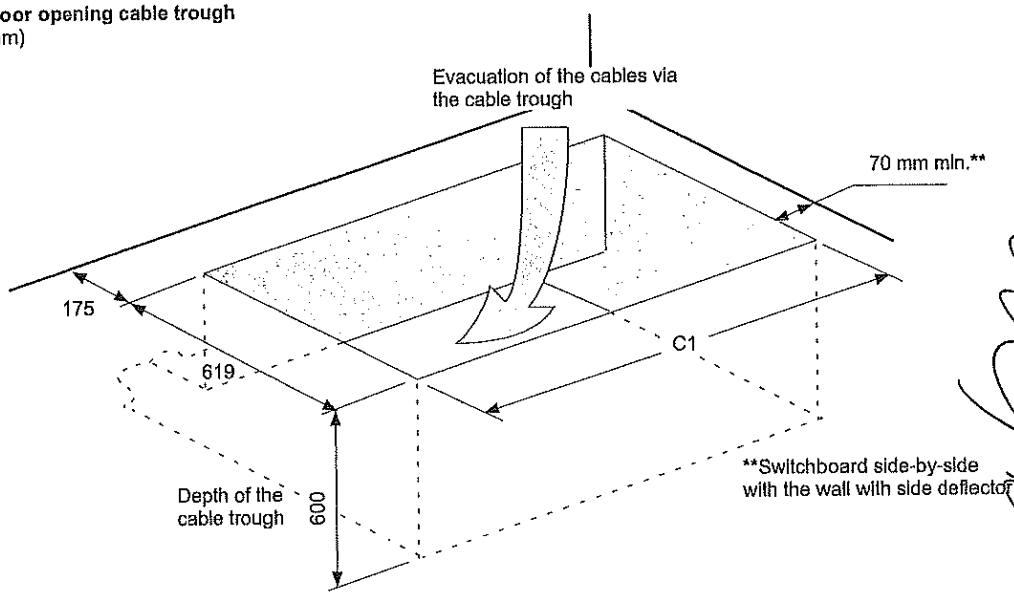
8.3 Installation on the floor (refer to table § 8.1)

The location of the cable trough is defined as a function of the type of FBX to be installed and the position of this switchboard in the room.

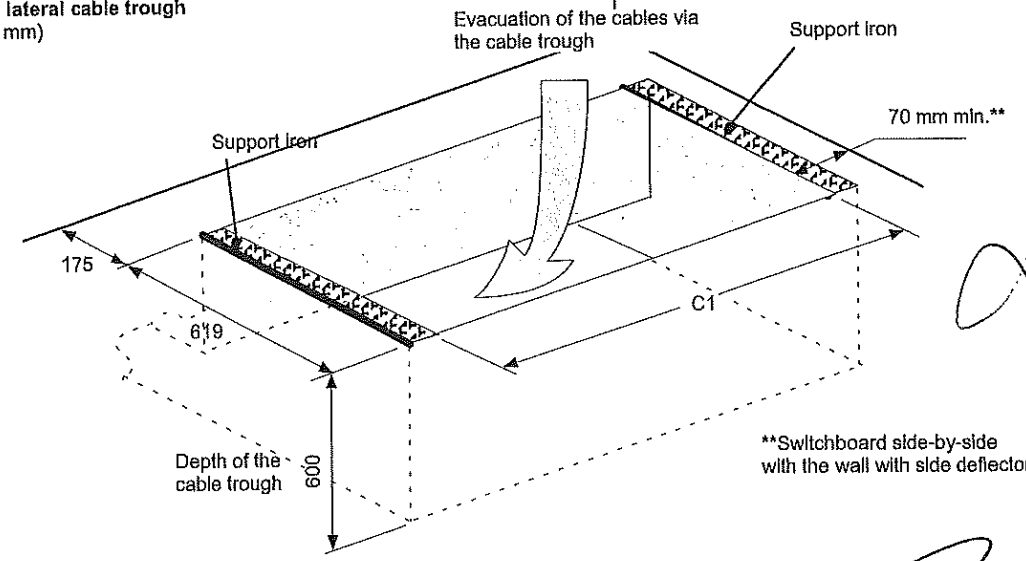
In case of a lateral cable trough, fit longitudinal irons to support the right and left-hand uprights of the switchboard.

The support irons to be used are of the 100 mm min. IPN type.

Example for a floor opening cable trough
(dimensions in mm)



Example for a lateral cable trough
(dimensions in mm)



8.4 Layout and fixing of the FBX-C or E to the floor

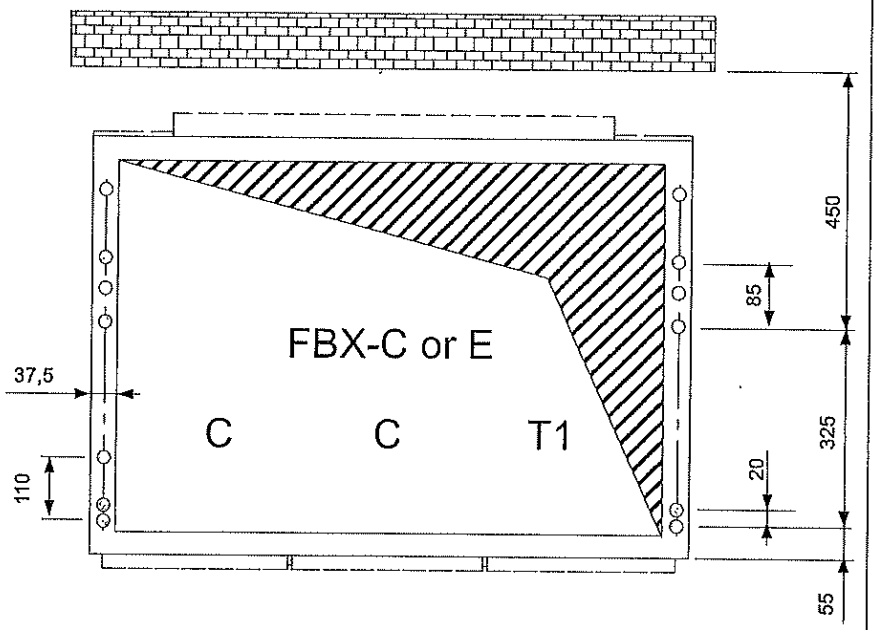
Before any installation of the FBX switchboard in the room in accordance with mounting instructions, check:
- the passages for HV cables, LV cables, and possibly the cable ducts,
- the load limit for the fixing points. It must be compatible with the weight of the switchboard (for indication of the weights, see § 3.4).

Check the evenness of the floor at the fixing points level. Any irregularities on the floor must not exceed 1 mm. If they are greater than that, install sheet metal shims just beside the fixing points.

8.5 Positioning of fixing points

Top view
(dimensions in mm)

Positioning of fixing points in relation to the rear wall



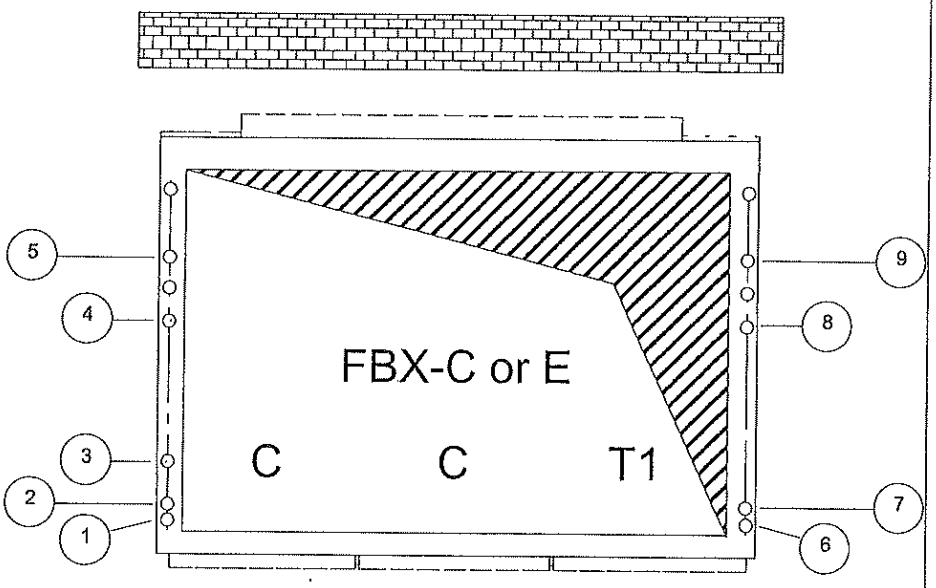
8.6 Fixing to the floor

Top view

1. Fixing to the floor by 4 points:

Fixing	Fixing point
Standard	1 or 3 ; 4 ; 6 ; 8
Option	2 ; 5 ; 7 ; 9
FBX-M	1 ; 4 ; 6 ; 8

2. Fasteners *(not supplied)*
4 H M10x30 bolts (class 8.8)
+ 4 flat washers Ø 30 mm on the exterior, 3 mm thick.



9 Installation of an extension function

9.1 Dimensions for extensions

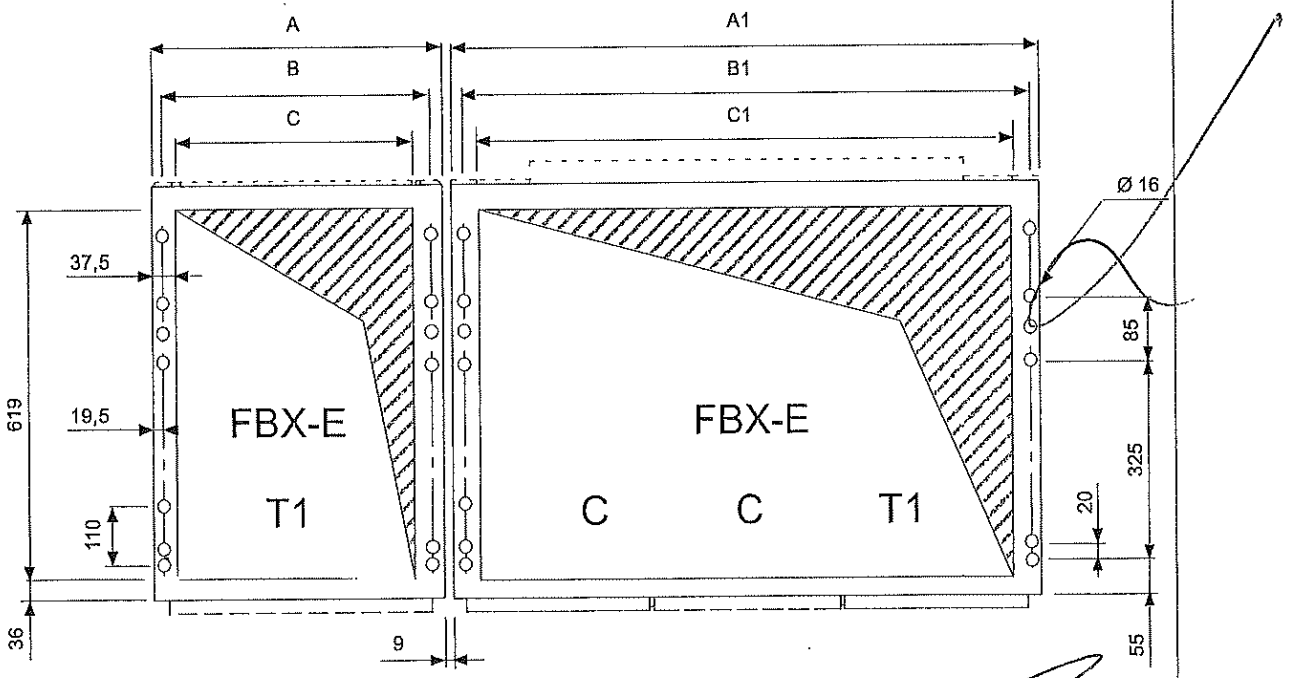
Refer also to table § 8.1.

FBX Widths (mm)	A	B	C
Extension C	360	321	285
Extension T1	490	451	420
Extension T2	490	451	420
Extension CB	490	451	420
Extension CBb	625	586	550
Extension R	360	321	285
Extension RE	360	321	285

9.2 Geometry of the switchboard and civil engineering structure (see Tables § 8.1 & 9.1)

The profiles, seen from the top, represent the surface of the switchboard borne on the floor. All the fixing points (standard or optional) are located.

Top view
(dimensions in mm)



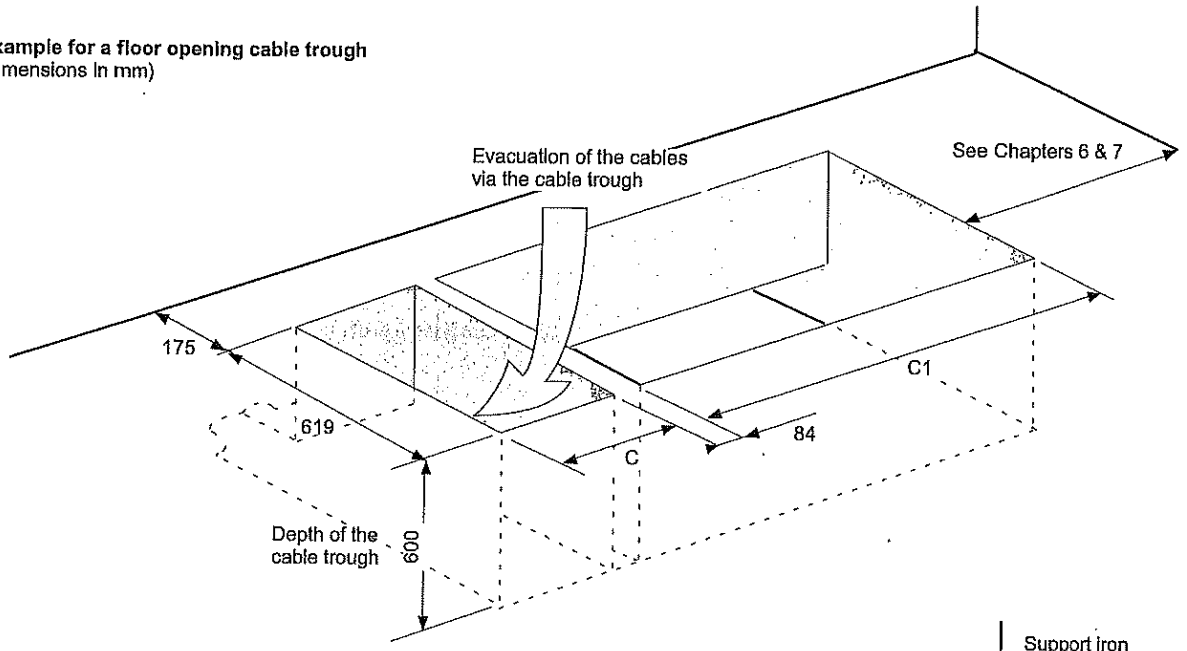
9.3 Installation on the floor (see Tables § 8.1 & 9.1)

The location of the cable trough is defined as a function of the position of the extension in the room.

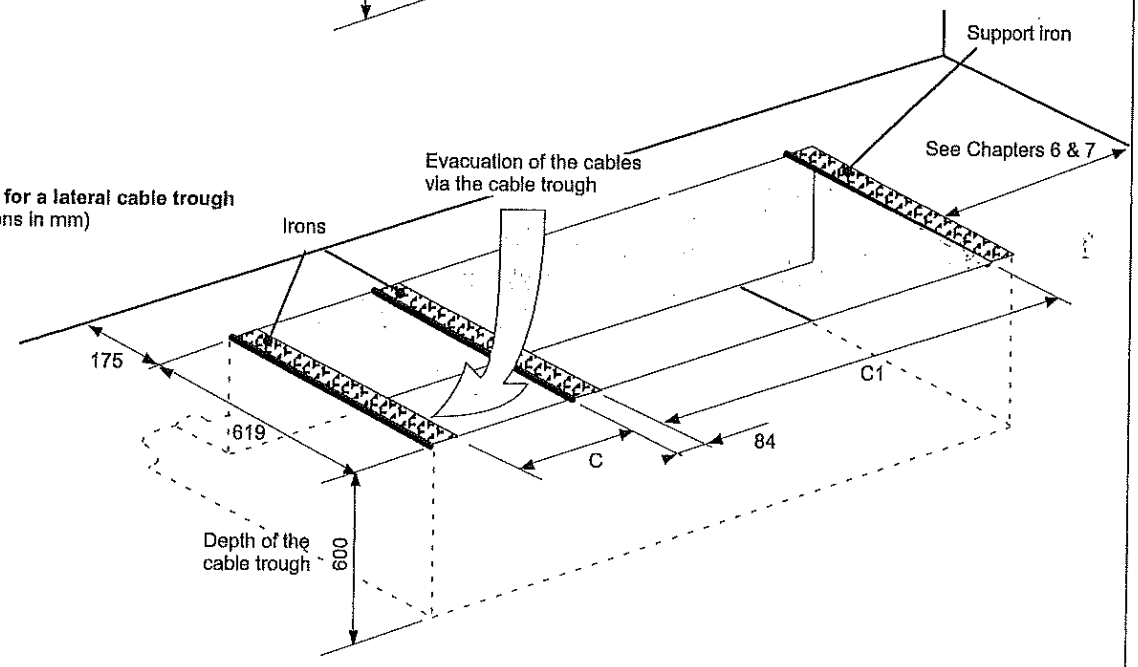
In case of a lateral cable trough, fit longitudinal irons to support the right and left-hand uprights of the extension.

The support irons to be used are of the 100 mm min. IPN type.

Example for a floor opening cable trough
(dimensions in mm)



Example for a lateral cable trough
(dimensions in mm)



9.4 Layout and fixing of the FBX-E to the floor

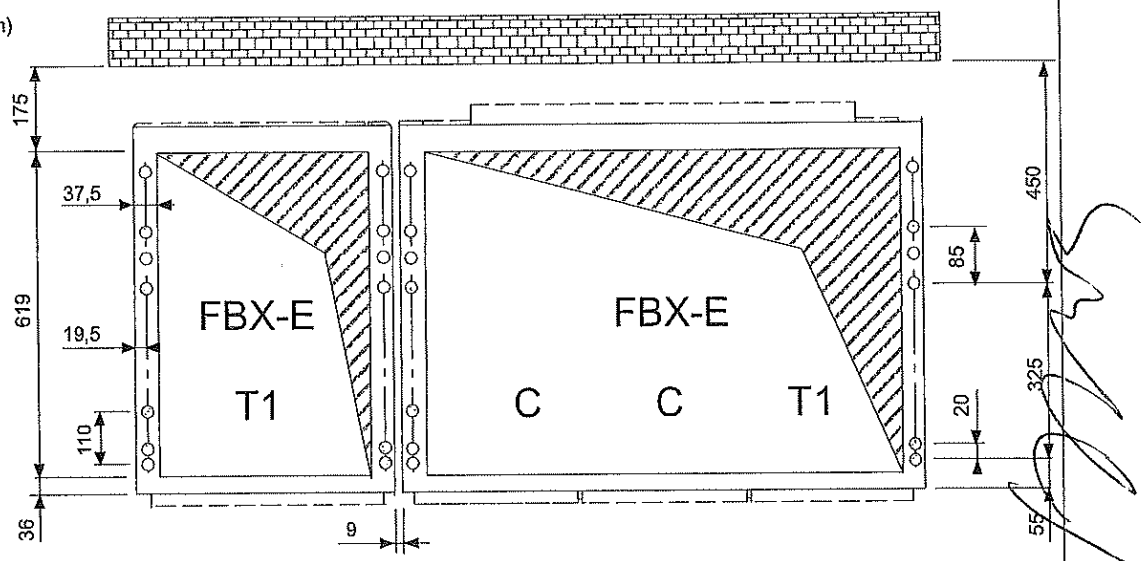
Check than the load limit for the fixing points is compatible with the weight of the extension (for indication of the weights, see § 3.6).

Check the evenness of the floor at the fixing points level. Any irregularities on the floor must not exceed 1 mm. If they are greater than that, install sheet metal shims just beside the fixing points.

9.5 Positioning of an extension and of its fixing points

Top view
(dimensions in mm)

Positioning of fixing points in relation to the rear wall



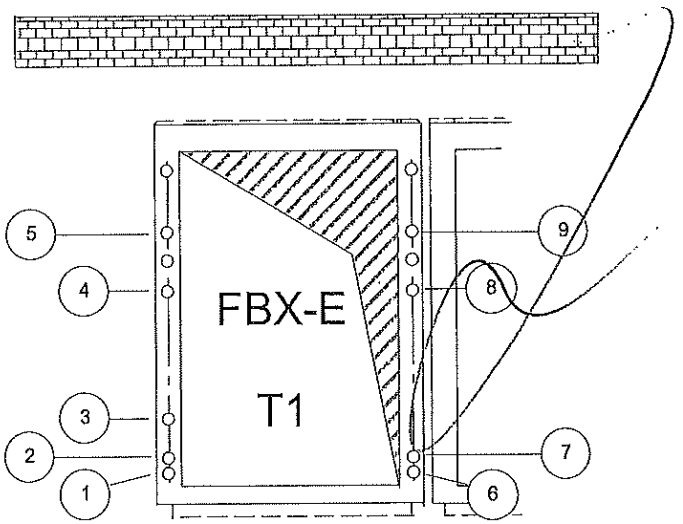
9.6 Fixing to the floor

Top view

1. Fixing to the floor of <u>each</u> extension, by 4 points:

Fixing	Fixing points
Standard	1 or 3 ; 4 ; 6 ; 8
Option	2 ; 5 ; 7 ; 9

2. Fasteners *(not supplied)*
4 H M10x30 bolts (class 8.8)
+ 4 flat washers Ø 30 mm on the exterior, 3 mm thick.



10 Work on the Civil Engineering structure

10.1 Characteristics of the work on the Civil Engineering structure

Overall evenness:
A 2 m rule, moved along the base should not highlight any irregularity of greater than 5 mm.

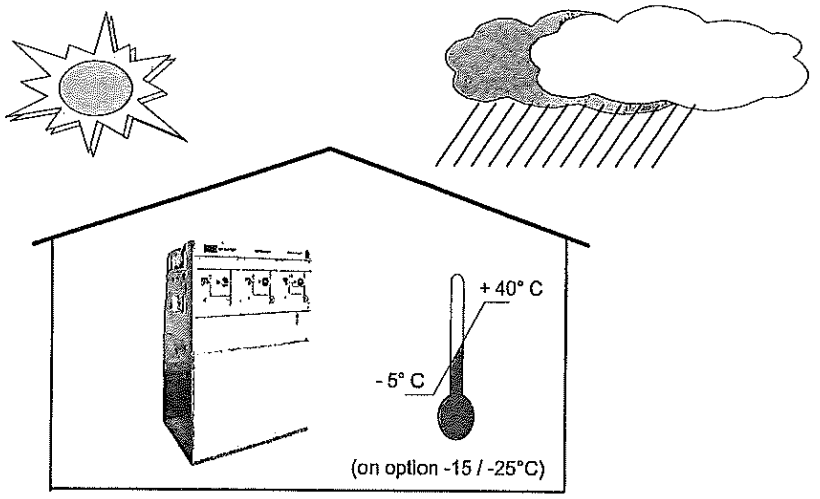
Local evenness:
A 20 cm rule, moved along the base should not highlight any irregularity or deflection of greater than 2 mm.

Any possible rabbets and closing slabs are the responsibility of the supplier of the Civil Engineering work.

10.2 Characteristics of the installation room

The room must be capable of protecting the equipment against any degradation agents such as:

- Water or water vapour.
- Salt-laden air.
- All types of pollution.
- Micro-organisms.



10.3 Characteristics of the storage area

The place of storage, before installation, must respect the same criteria as that for the installation room, with the exception of the temperature: + 50°C, - 25°C.

Contact Schneider Electric for any derogations to these criteria.

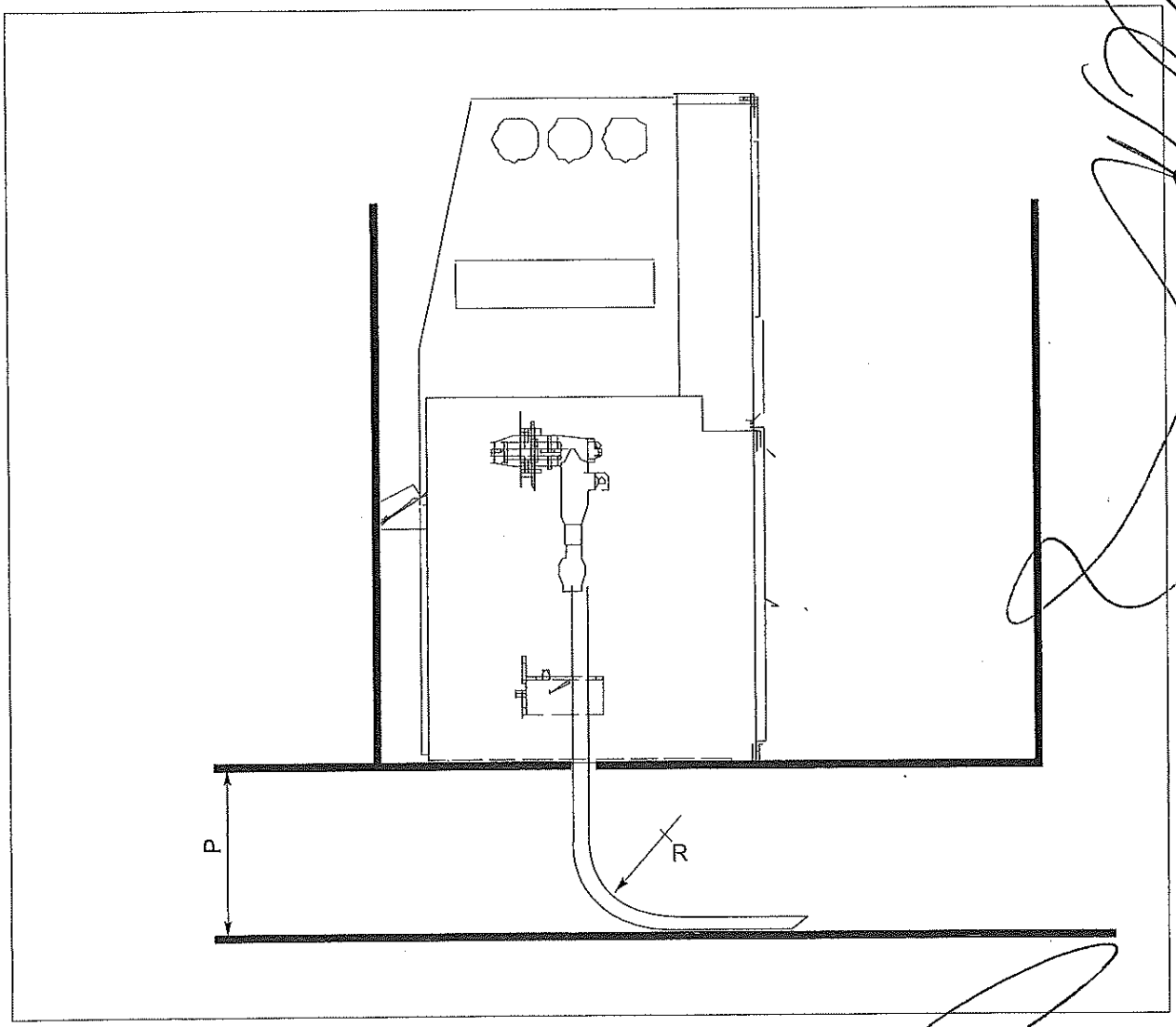
10.4 Geometry of the cable trough

The depth of the cable trough depends on the cross-section of the HV cables.
Generally, this depth [P] is at least equal to (generally higher) than the bend radius of the cables [R].

The length of the cable is calculated as a function of the altitude of the connecting point [see chapter 11].

Refer to the cable manufacturer's recommendations (ambient temperature, etc.).

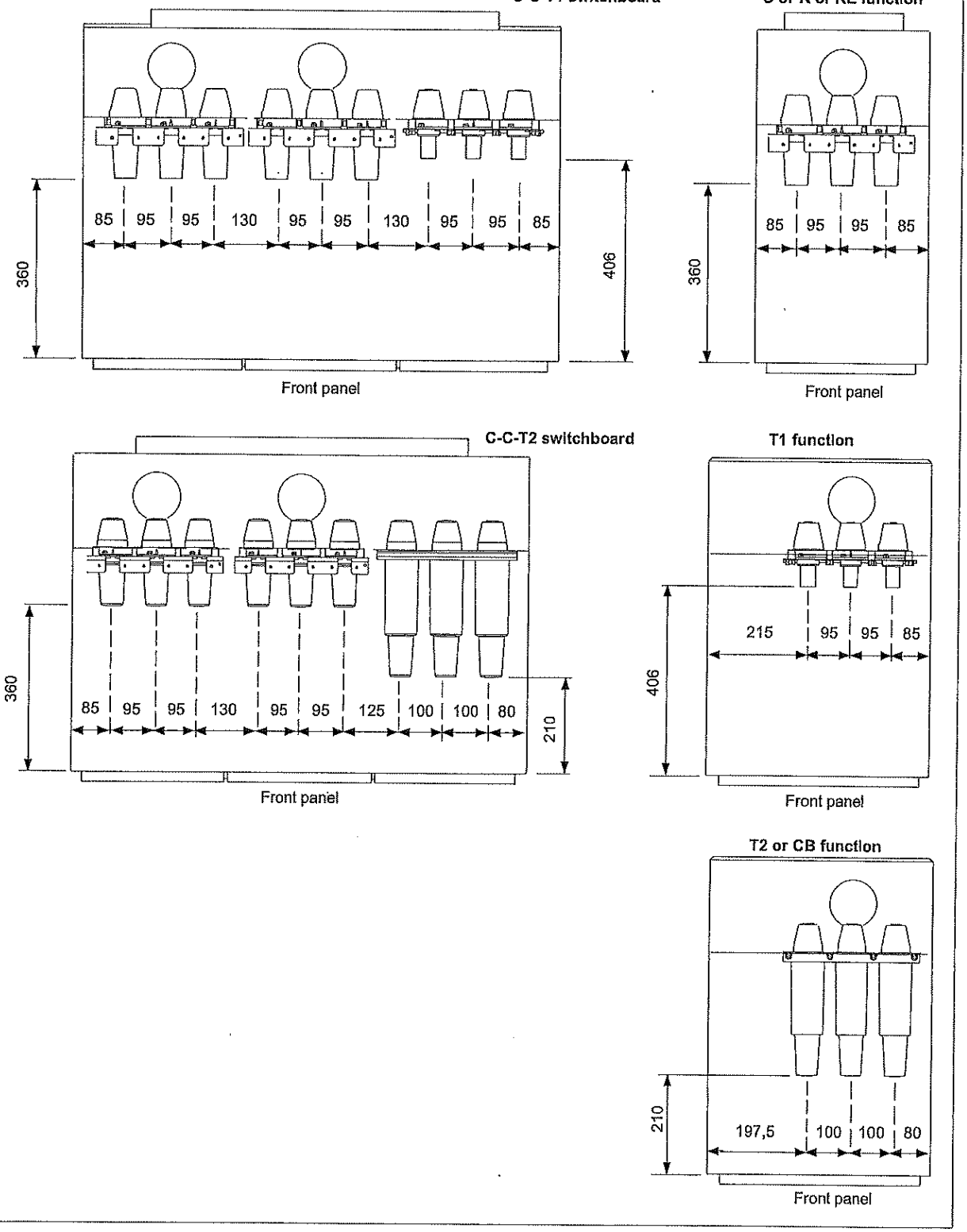
Cable sections (mm^2)	Depth for a single pole cable P (mm)	Depth for a three-pole cable P (mm)
50	450	600
95	450	700
150	600	800
240	600	900
300	600	-
400	600	-



11 LV & HV connections for an FBX switchboard

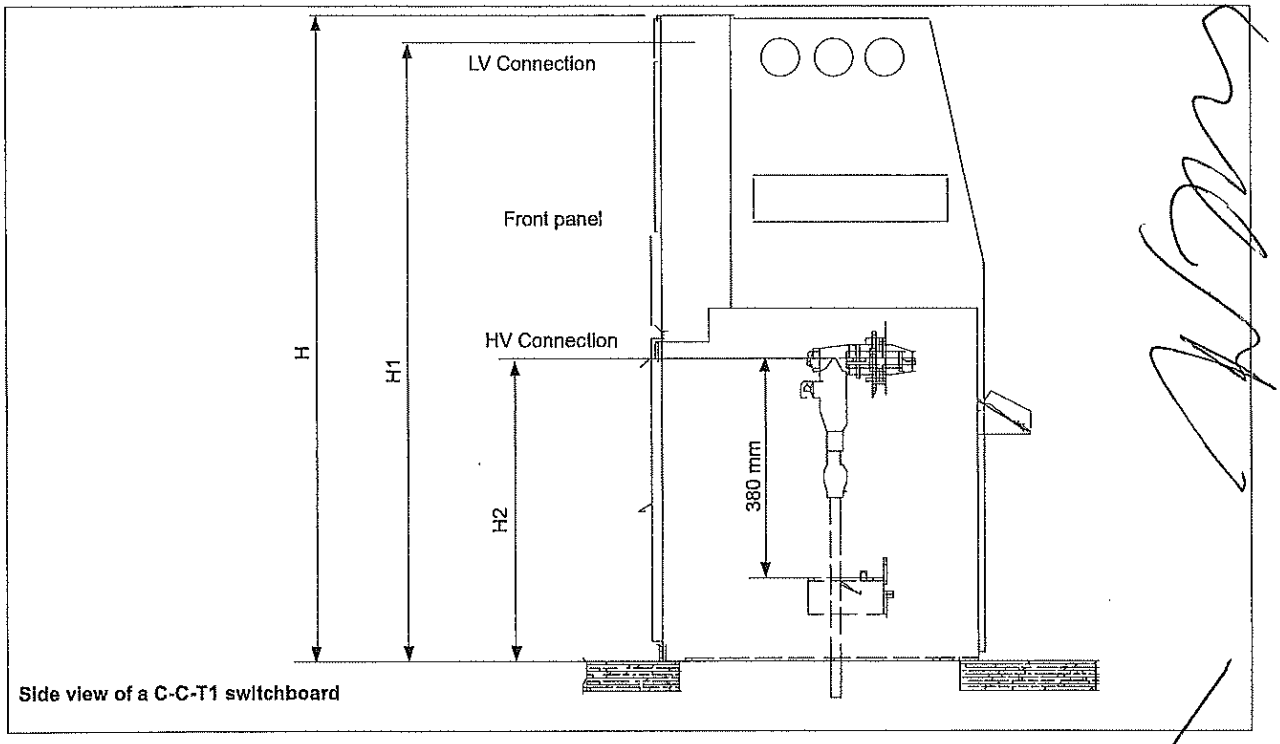
11.1 Distances between phases at HV connections level

Top views
(dimensions in mm)



11.2 Altitudes for the LV & HV connection points

Distances	Functions C – R – RE with T1		Functions C – R – RE with T2 or CB	M1 Function	Functions M2 & M3
H (total height)	1040	1380	1380	1380	1380
H1 (LV connection)	965	1305	1305	1305	1305
H2 (HV connection)	303	643	593	648	580

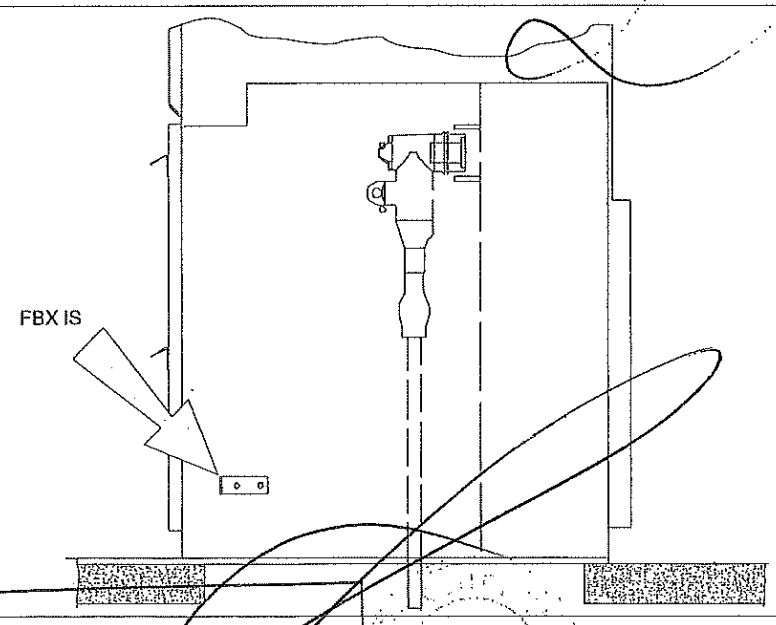


Side view of a C-C-T1 switchboard

11.3 Connection of the switchboard earthing circuit

1. FBX IS: The switchboard's general connection point is on the left, in the cables compartment for the function, located at the left-hand extremity of the switchboard.
2. FBX EDF: The connecting point is located in the upper, rear, right-hand part of he switchboard.

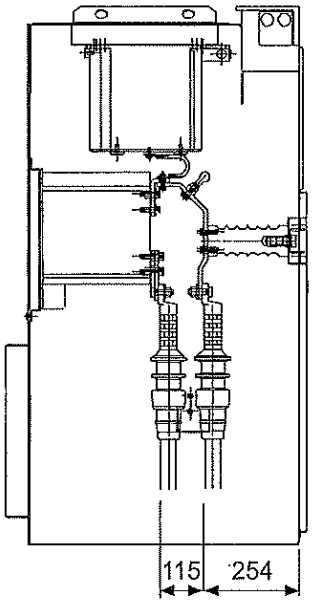
The connecting cable can be routed via the cables compartment. There is no specific reserve opening to be provided for.



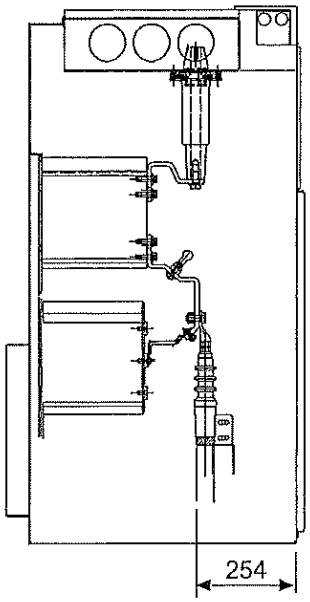
11.4 Disposition of connection point in M functions

Side views
(dimensions in mm)

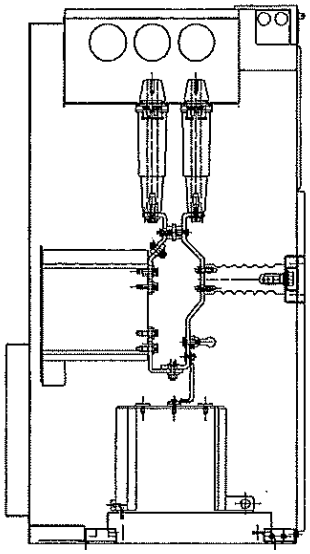
M1



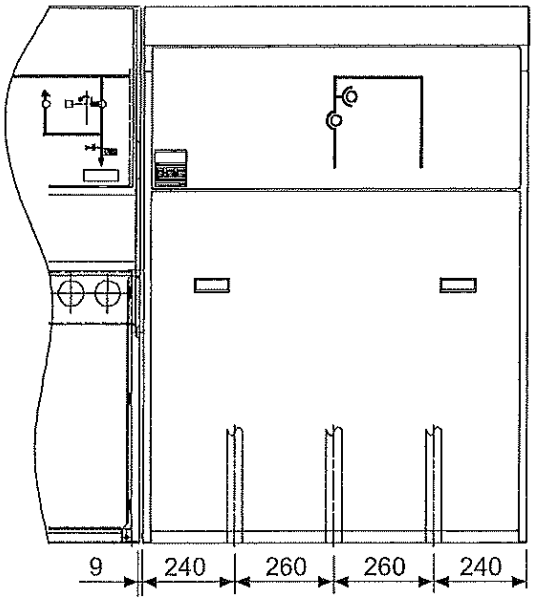
M2-M3



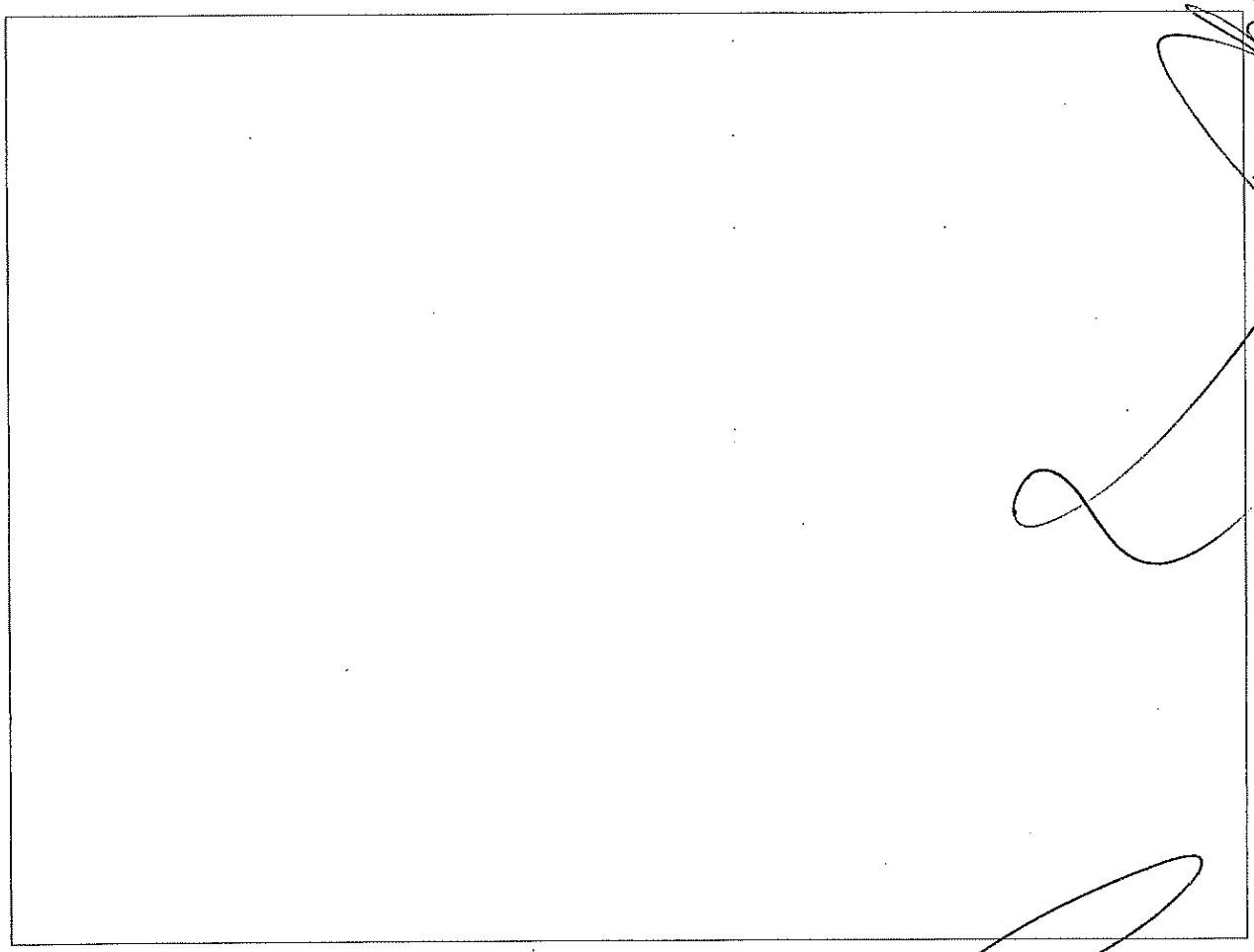
M4



Front view
(dimensions in mm)



12 Notes



If you have any comments on the use of this document or on the use of the equipment and services that are described in it, please send us your remarks, suggestions and wishes to:

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AMTNoT110-02 revision: 10

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Photos: Schneider Electric

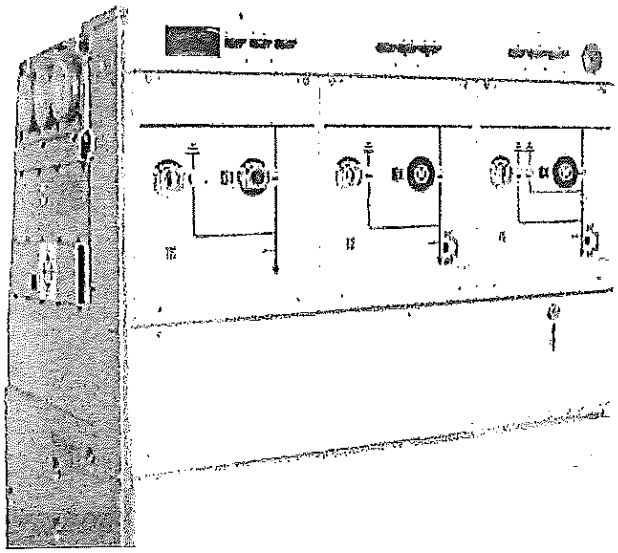
01-2011

Апаратура за комутация за вторично разпределение

FBX

SF6 газово – изолирани табла

Ръководство за Експлоатация



ВЯРНО С ОРИГИНАЛА

Съдържание

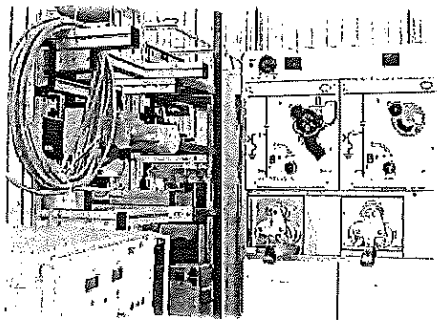
ВЯРНО С ОРИГИНАЛА

1 Шнайдер Електрик на вашите услуги

Експлоатацията и поддръжката могат да се извършват само от персонал, получил подходящо разрешение за експлоатация и маневри, за които са отговорни.
В противен случай, моля да се обърнете към отдела по Обслужване или Центъра за обучение.
Всички операции по заключване (блокиране) следва да бъдат извършвани съгласно "Брошурата за Общи инструкции за Електрическо приложение " UTE C 18 510 (или негов еквивалент извън ФРАНЦИЯ).

1.1 Отделът ни по Обслужване : нашите специалисти, и подходящо адаптирани услуги....

- Договори за удължена във връзка с продажбата на ново об
- Надзор на HVA комутатрони инсталации
- Технически съвети, диагностика на съоръжения, експертиз
- Договори за поддръжка, адаптирани към експлоатационнит ограничения,
- Системна или условно профилактична поддръжка,
- Коригираща поддръжка в случай на частична или пълна по
- Доставка на резервни части
- Преразглеждане на оборудването и преквалификация на
- инсталациите,с оглед възползване от новите
- технологии и удължаване жизнения цикъл на
- вашите комутатори с ограничени инвестиции.



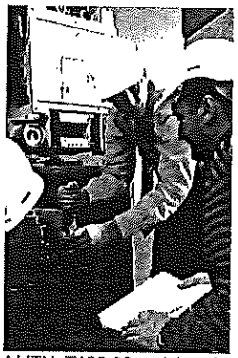
Контакти на Отдела за Обслужване на Шнайдер Електрик за диагноза и съвет :
Работни часове
Тел.: 33 (0)3 85 29 35 00
Факс : 33 (0)3 85 29 36 30
Или : 33 (0)3 85 29 36 43

1.2 Обучение на Шнайдер Електрик: Заедно да развием уменията си ...

Бихме могли да предоставим на ваше разположение професионалният опит на всички наши обучители, педагогическият опит на нашите екипи богатството на нашето оборудване, за да ви помогне да посрещнете предизвикателствата за насърчаване развитието на персонала чрез оптимизиране на уменията им.
Обучителния център на Шнайдер Еелектрик обучение има контрол над всички процеси на обучението, за да отговорина нуждите на всеки клиент, от няколко часа до няколко седмици

- Специфично обучение, пряко свързано с практическа работа с реални машини.
- Малки групи, с оглед улесняване на комуникацията.
- Баланс между теория и практика.
- Оценка и управление на уменията: измерване и оптимизация на знанията на обучаващите се.

Изправени пред преките и непреки разходи за обучени оперативните спирания и изключване, обучението е реална инвестиция



Шнайдер електрик Франция

Център за Обучения

Ул. Жозеф Моние 35 - CS 30323 - F-92506 Рюеьл Малмезон Седекс

www.schneider-electric.fr/formation

2 Относно настоящото Ръководство на потребителя

2.1 Отговорности

Нашите устройства са с контролирано качество и се тестват в фабриката в съответствие с действащите в момента стандарти и разпоредби.

Ефективността и жизненият цикъл на апаратурата зависят от съответствието с инструкциите за монтаж, пускане в експлоатация и работа, описани в настоящето ръководство на потребителя. Неспазване на тези указания е вероятност за обезсилване на която и да е гаранция.

Трябва да се спазват местните изисквания, особено тези за безопасност, и които са в съответствие с указанията в настоящият документ.

Шнайдер Електрик не носи никаква отговорност за последствията:

- поради на неспазване на препоръките в настоящето ръководство, които се позовават на международните правила в сила.
- поради на неспазване указанията на доставчиците на кабели и аксесоари за връзка, по време на инсталирането и монтажните операции,
- От всички възможни агресивни климатични условия (влажност, замърсяване и т.н.) действащи в непосредствената околна среда на материалите, които не са подходящо адаптирани, нито защитени срещу тези въздействия .

Настоящото ръководство на потребителя не съдържа процедурите по заключване, които трябва да се прилагат. Описаните операции (интервенции) се извършват при освободено от електрически заряди оборудване (в хода на монтажа) или заключено (не работещо).

2.2 Специфични инструкции за експлоатация и интервенции върху оборудване под електрическо напрежение

При въвеждане в експлоатация и работа с оборудването при нормални условия на експлоатация, трябва да бъдат спазвани Общите инструкции за безопасност при работа с електрически приложения (защитни ръкавици, изолационни стълба, и т.н.), в допълнение към стандартните инструкции за работа. Всички стартирани манипулации трябва да се бъдат завършени. Времетраенията (за завършване на горепосочените операции) , посочени в таблицата поддръжка са само за индикация и зависят от условията на място.

2.3 Други технически записки, които следва да бъдат консултирани

- AMTNoT131-02 FBX SF6 газово изолирани табла Монтаж – пускане в експлоатация
- AMTNoT170-02 FBX Функционално CB Монтаж - Пускане в експлоатация - Поддръжка

2.4 Инструменти *(не са предмет на доставка) необходими за описаните в настоящето ръководство на потребителя операции.*

плоска, тънка отвертка (4) + средна

Кожени ръкавици

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2.5 Символи & конвенции

Код за продукт, препоръчан и маркиран от Шнайдер Електрик

Стойност на въртящ момент на затягане
Пример : 21 Nm

Знак отговарящ на ключ

ВНИМАНИЕ ! бъдете бдителни ! Да се вземат предпазни мерки за избягване на инциденти или наранявания

ЗАБРАНЕНО! Да не се извършва!

Спазването на това указание е задължително, неспазването на тази разпоредба само може да повреди оборудването.

ИНФОРМАЦИЯ – СЪВЕТ
Вашето внимание се насочва към конкретна точка или операция.

ВНИМАНИЕ!Останете бдителни!
Горещи компоненти и топлина

3. ФУНКЦИОНАЛНИ УСТРОЙСТВА ЗА БЛОКИРАНЕ

3.1 Функционални механични блокировки

Таблото FBX е оборудвано с вътрешни механични блокировки, наречени „функционални", предназначени за избягване на каквато и да е оперативна грешка.

Необходимо е да се познават тези блокировки с оглед правилната работа на апаратурата за комутация.

!

Функция Sb: операцията по разединяване или заземяване може да бъде изпълнявана само от вече подходящо адаптирани операции по заключване (блокиране) внедрени в мрежата.

3.2 Блокировки за функции C и T1

	Позиция	Прекъсвач на товар	Заземител	Люк за достъп да на предпазители за електроди или кабели
Прекъсвач на товар	затворен	-	Заключено отворен	Заключен затворен
	Отворен	-	Свободно	В зависимост от позицията на заземителния прекъсвач
Заземител	затворен	Заключен отворен	-	Free
	Отворен	Свободно	-	Заключено отворен
Люк за достъп да на предпазители за електроди или кабели	Отворен	Заключен отворен	Заключено затворен	-

3.3 Блокировки за функция T2 и CB

	Позиция	Прекъсвач на веригата	Ключ за разединяване	Заземител	Панел за достъп до отделението за кабели
Прекъсвач на веригата	Затворен	-	Заключен (затворен или затворен	Заключен отворен	Заключен затворен
	Отворен		Свободен	В зависимост от позицията на верижният прекъсвач	В зависимост от позицията на заземителя
Ключ за разединяване	Затворен	Free	-	Заключен отворен	Заключен затворен
	Отворен	Свободен (обичайно отворен)	-	Free	зависимост от позицията на заземителя
Заземител	Затворен	Свободен (обичайно отворен)	Заключен отворен		Свободно
	Отворен	Свободен (обичайно отворен)	В зависимост от позицията на верижният прекъсвач		Заключен затворен
Панел за достъп до отделението за кабели	Отворен	Свободен (обичайно отворен)	Заключен отворен	Заключен затворен	

3.4 Блокировки за функция Sb

	Позиция	Ключ за разединяване		Заземител	
Ключ за разединяване	затворен			Заключен отворен	
	Отворен			Свободен	
Заземител	Затворен	Заключен отворен			
	Отворен	Свободен			

4 Аксесоари за работа

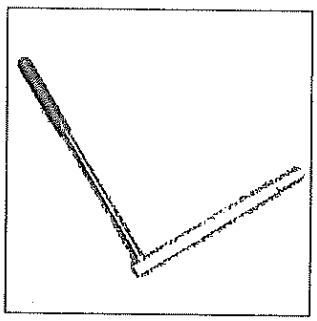
4.1 Напомняне за ръчни операции

ВЯРНО С ОРИГИНАЛА

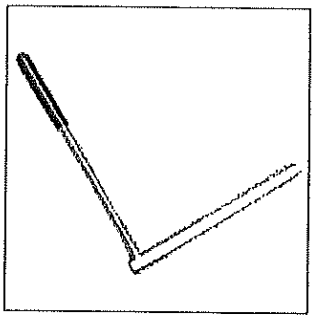
Оперативните маневри се изпълняват без особени усилия. Въпреки това необходимата сила е по-голяма за самозадържащите контроли (T1, T2, CB), отколкото за двупозиционните лостови превключватели (C).

4.2 Оперативни аксесоари

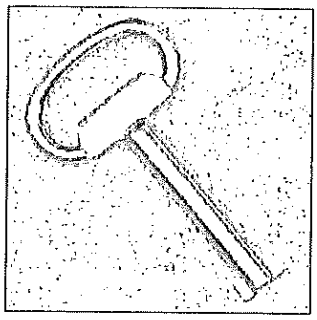
Всички движения на лоста следва да са чист и завършени.
Лоста се мести през приблизително 95°.



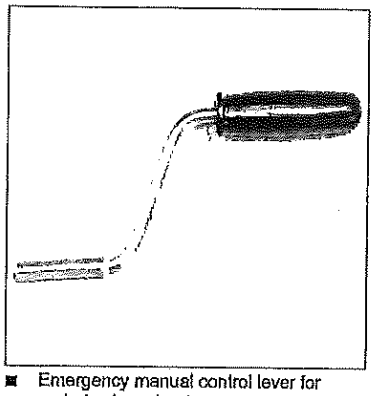
■ Стандартен работен лост за заземителния превключвател (червен край).



■ Стандартен работен лост за товаро прекъсвача (черен край)

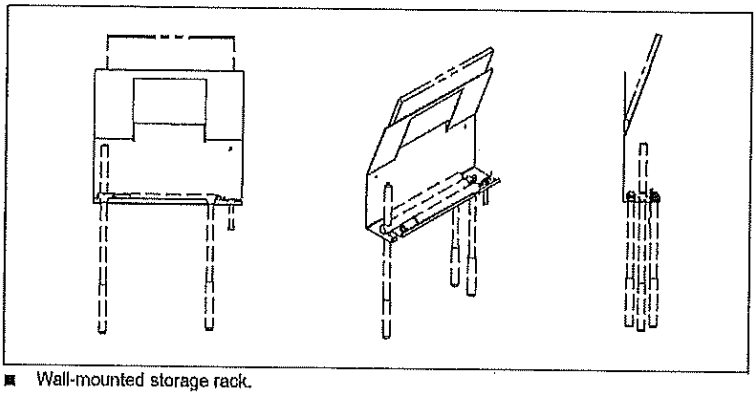


■ ключ за отделението за предпазител на електродите



■ Emergency manual control lever for motorised mechanisms.

■ Аварийен ръчен лост на контролните Моторни механизми .

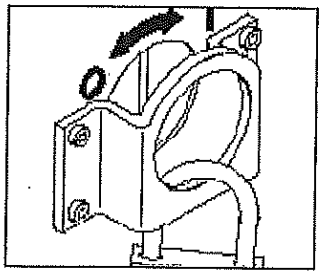


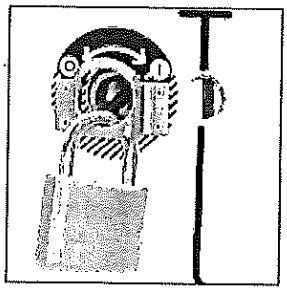
■ Wall-mounted storage rack.

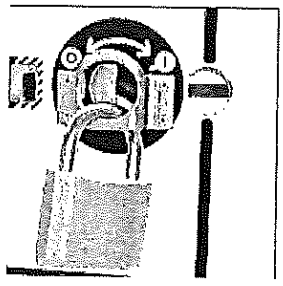
■ стойка за съхранение монтирана на стена

4.3 Блокировки използвайки катинари (опционално)

Опционално: Всеки хъб за механичен контрол може да бъде монтиран, така че да позволява да бъде заключен

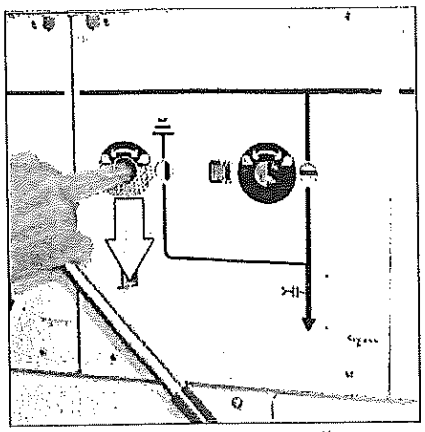


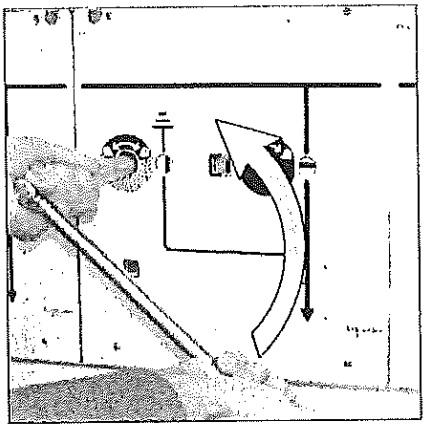


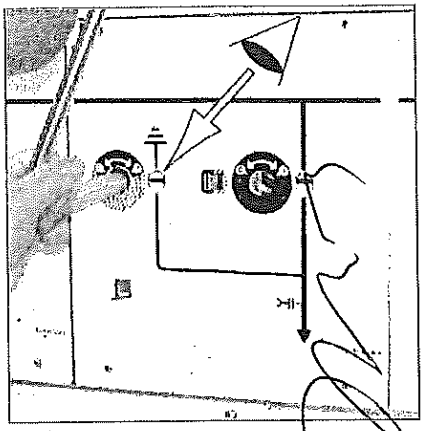


5 Използване на C функцията

5.1 Отваряне на заземителния превключвател







- Проверете, дали накрайника е изцяло спуснат .
- хванете лоста с две ръце.
- Поставете съответният лост (червен край) в гнездото на заземителния превключвател.
- Повдигнете лоста – сега заземителя е в отворено положение.
- Отстранете лоста

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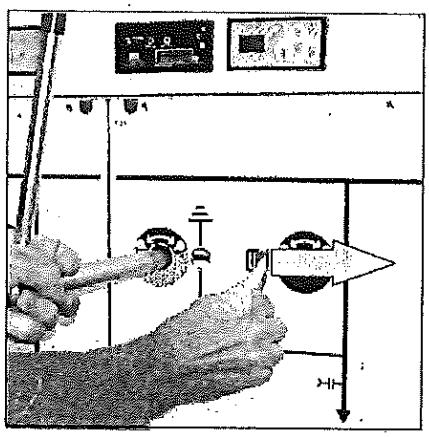
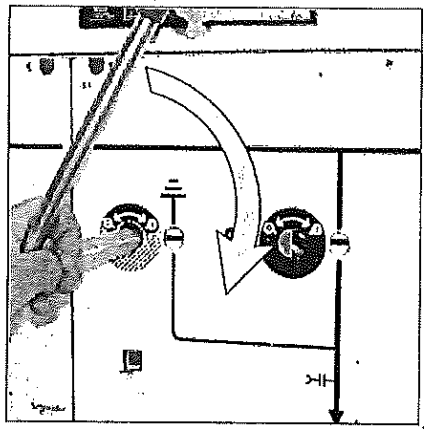
5.2 Затваряне на заемителния превключвател

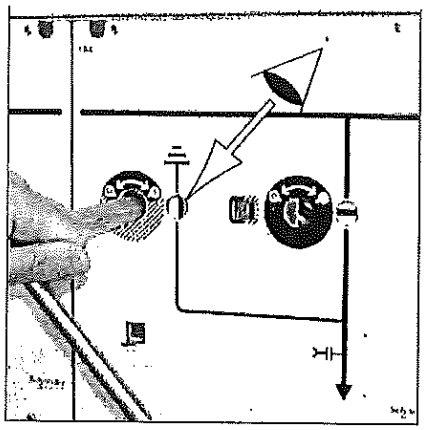
Преди да затворите заземителният превключвател, уверете се , че няма напрежение през индикаторните единици (вж. съответното ръководство - § 2.3).



■ Проверете, че накрайникът е напълно спуснат.
■ Задръжте отворен надясно бутона за заключване
■ Поставете съответният лост (червен край) в гнездото на заземителния превключвател..

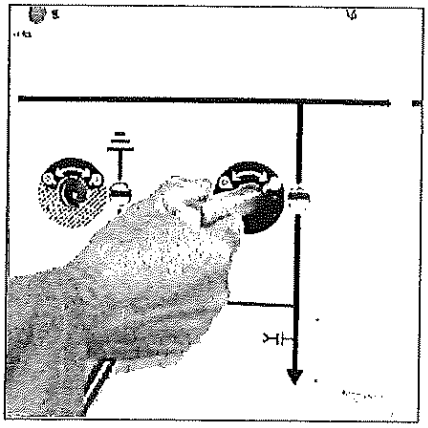


■Хванете лоста с две ръце hands.

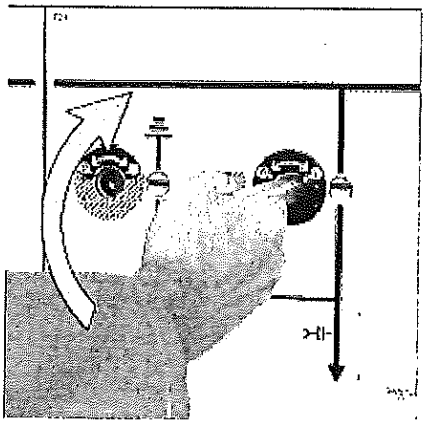


■ Спуснете лоста надолу – сега заземителя е в затворено положение.
■ Отстранете лоста

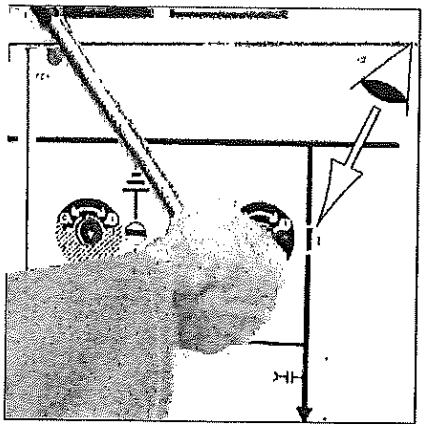
5.3 Затваряне на товаро прекъсвача



■ Поставете съответния лост (черен край) в гнездото на товаро прекъсвача.

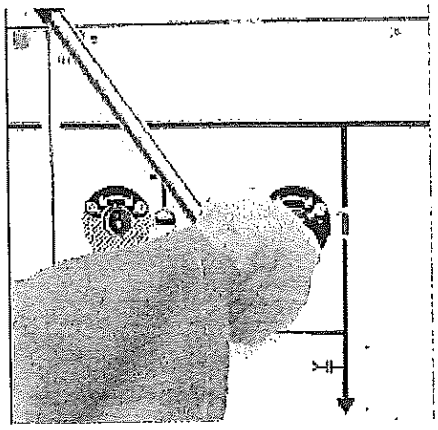


■ Хванете лоста с две ръце

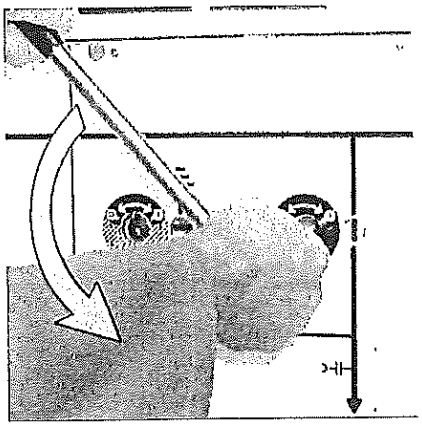


■ Повдигнете лоста — прекъсвача е затворен
■ Отстранете лоста ,

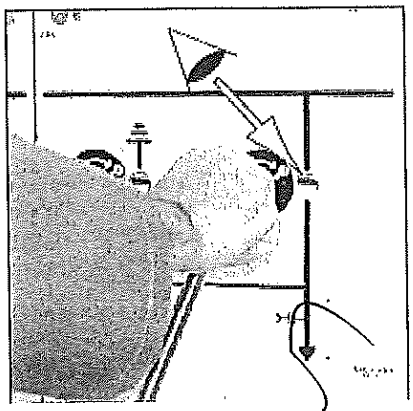
5.4 Отваряне на товаро прекъсвача



■ Поставете съответния лост (черен край) в гнездото на товаро прекъсвача



■ Хванете лоста с две ръце



Спуснете лоста надолу – сега прекъсвача е отворено положение.
■Отстранете лоста

5.5 Движения на моторните контролни механизми

Виж раздел 9.

6 Използване на T1 функция

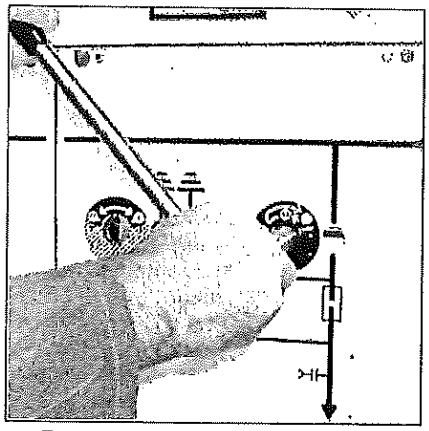
6.1 Отваряне на заземителния прекъсвач

Виж инструкциите на § 5.1.

6.2 Затваряне на заземителния прекъсвач

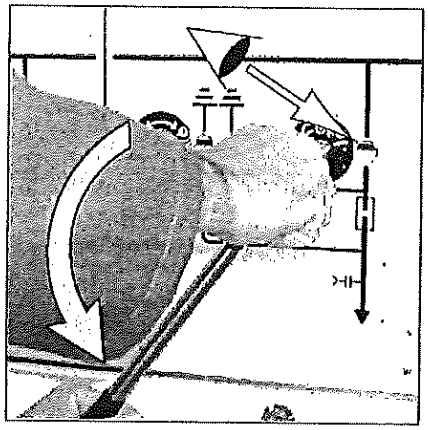
Виж инструкциите от § 5.2.

6.3 Затваряне на товаро прекъсвача

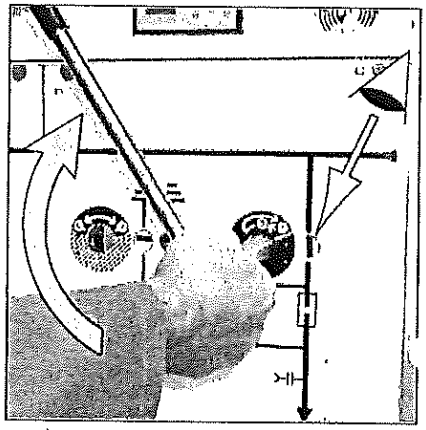


■ Поставете съответния лост (черен край) в гнездото на товаро прекъсвача

■ Хванете лоста с две ръце



■ Смъкнете лоста до най ниската му позиция and и бавно освободете (уверете се, че резето е Зацепено. Сега превкл. е постоянно отворен

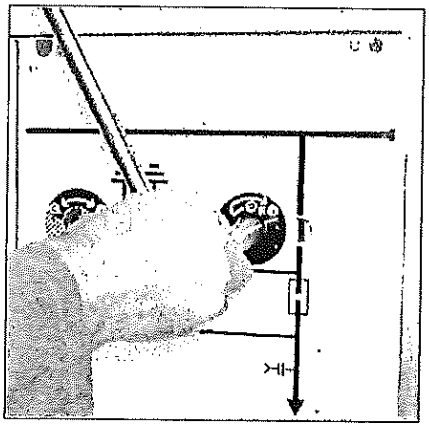


■ Повдигнете лоста изцяло : сега превкл. е затворен .

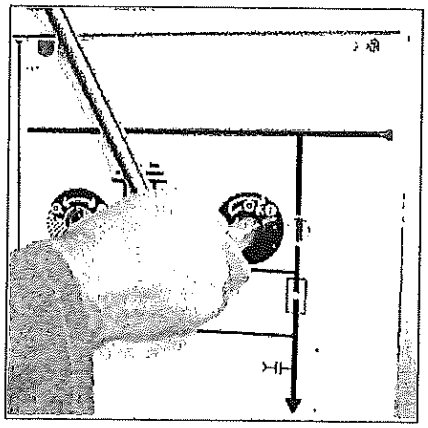
■ отстранете лоста .

6.4 Ръчно отваряне на товаро прекъсвача

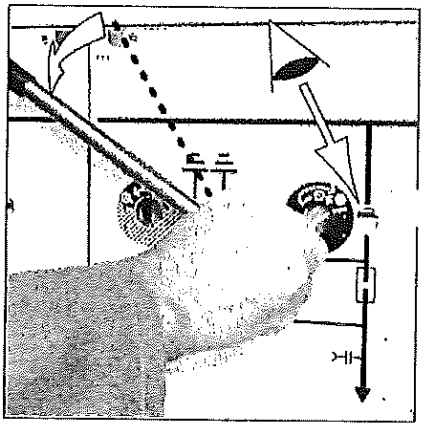
Забележка : Прекъсвача може да бъде отворен използвайки бутон (опционално) или чрез електрически контрол.



■ Поставете съответния лост (черен край) в гнездото на товаро прекъсвача



■ Хванете лоста с две ръце



■ Спуснете лоста през прибл. 20° – сега прекъсвача е отворено положение.

■Отстранете лоста

6.5 Движения на моторните контролни механизми

Виж раздел 9.

7 Използване на T2 функция

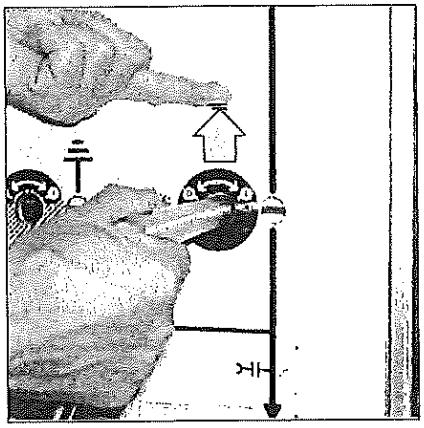
7.1 Отваряне на заземителния превключвател

Виж инструкциите от § 5.1.

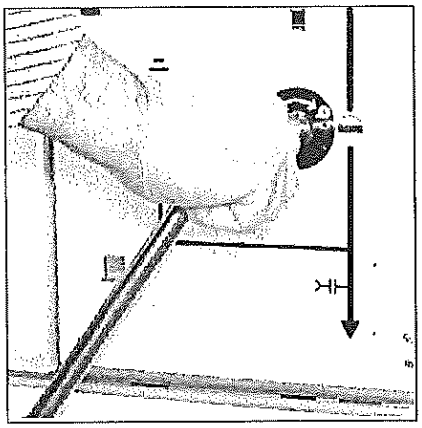
7.2 Затваряне на заземителния превключвател

Виж инструкциите от § 5.2.

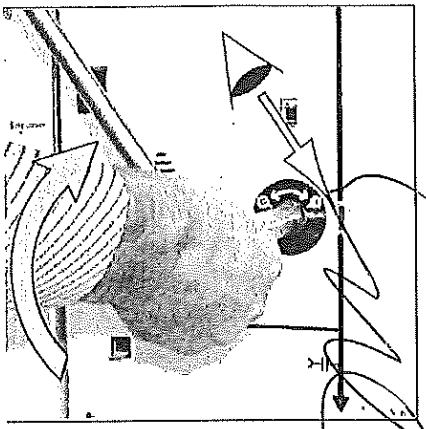
7.3 Затваряне на изолиращият линията прекъсвач [прекъсвач на веригата - отворен]



- Повдигнете заключващата клема.
- Поставете съответния лост в гнездото на разеденителя (черен край)

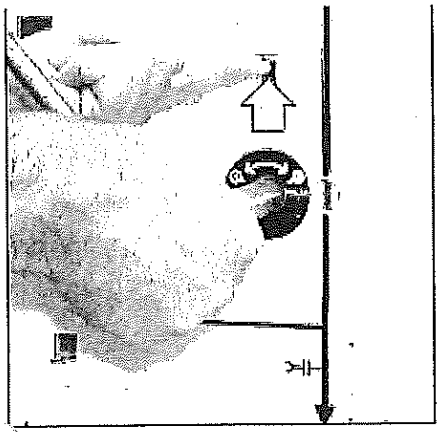


- Хванете лоста с две ръце .

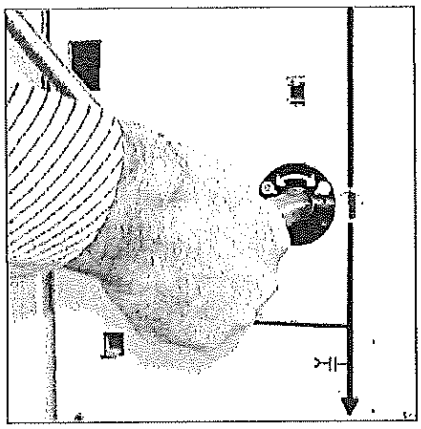


- Повдигнете лоста : прекъсвача на линията сега е затворен
- Отстранете лоста .

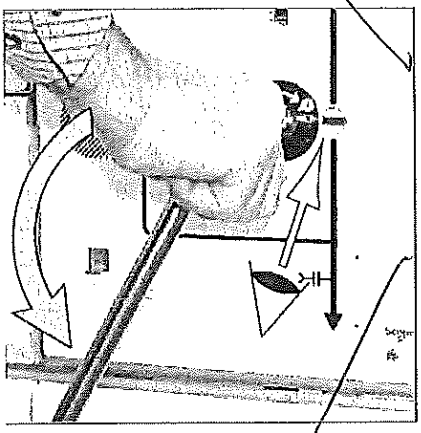
7.4 Отваряне на изолатора на линията [прекъсвач на веригата - отворен]



Поставете съответния лост в гнездото на разединителя (черен край) .

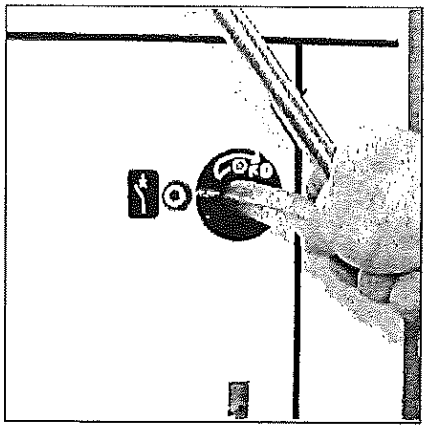


Повдигнете заключващата клема .

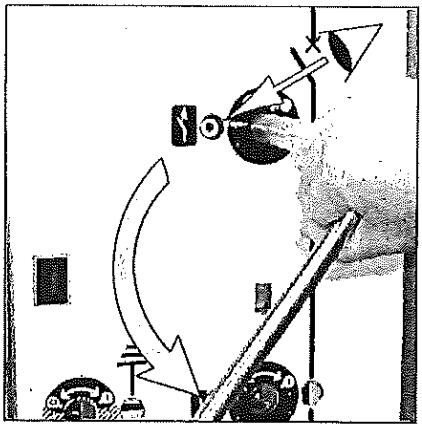


- Смъкнете лоста надолу ; сега изолатора на линията е отворен
- отстранете лоста

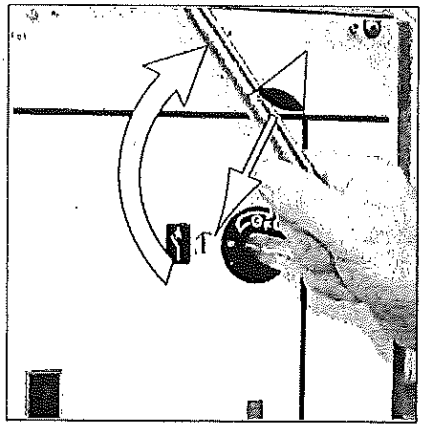
7.5 Затваряне на прекъсвача на веригата [Изолатор на линията затворен]



■Поставете съответния лост в гнездото на разеденителя (черен край)
■ Хванете лоста с две ръце



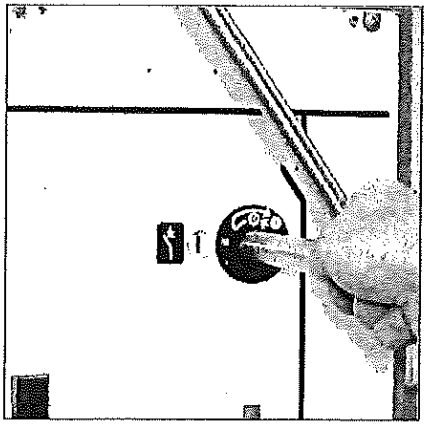
■Смъкнете лоста до най иската му позиция (уверете с е, че отворения отвор на резето е зацепен) -; превключвателя сега е постоянно отворен .



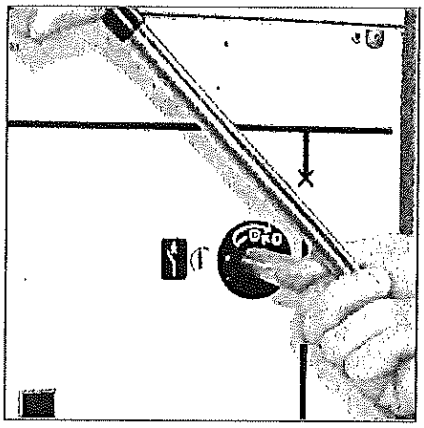
■Повдигнете изцяло лоста: сега верижният прекъсвач е затворен
■ отстранете лоста

7.6 Отваряне на прекъсвача на веригата [Изолатор на линията затворен]

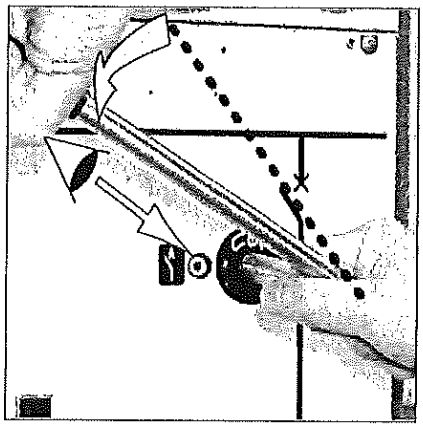
Забележка : Прекъсвача може да бъде отворен използвайки бутон (олционално) или чрез електрически контрол.



■ Поставете съответния лост в гнездото на прекъсвача на веригата (черен край)



■ Хванете лоста с две ръце



■Спуснете лоста през прибл. 20° – сега прекъсвача е отворено положение.
■Отстранете лоста

7.7 Затваряне на прекъсвача на веригата [изолатор на линията отворен]

Възможно е да се работи когато изолатора на линията е отворен.

Тази операция „ без товар" може да бъде използвана за тестване и за да се уверите, че прекъсвача на веригата функционира коректно.

7.8 Движения на моторните контролни механизми

Виж раздел 9.

8 Използване на Sb функция

8.1 Отваряне на заземителния превключвател

Следвайте инструкциите дадени в § 5.1.

8.2 Затваряне на заземителя

Операцията по разединяване или заземяване може да бъде изпълнявана само от вече подходящо адаптирани операции по заключване (блокиране) внедрени в мрежата

Преди затваряне на заземителния превключвател следва да се уверите, че няма наличие на напрежение (или електричество) през въпросната верига (виж съответното ръководство - § 2.3).

Следвайте инструкциите дадени в § 5.2.

8.3 Затваряне на товаро прекъсвача

Следвайте инструкциите дадени в § 5.3.

8.4 Отваряне на товаро прекъсвача

Следвайте инструкциите дадени в § 5.4.

8.5 Движения на моторните контролни механизми

Виж раздел 9.

ВЯРНО С ОРИГИНАЛА

9 използване на моторни функции

9.1 Движения на моторните контролни механизми [опционално]

Ако FBX таблото е оборудвано с моторизирани контроли (по избор), различните функции могат да бъдат захранени / изключени дистанционно в съответствие с диаграмата на веригата, предоставена като част от Договора

За функции, T1, T2 и CB, отварящите операции могат също да се задейства от бутон (по избор) или електрически контроли

! Функция Sb: Операцията по разединяване или заземяване може да бъде изпълнявана само от вече подходящо адаптирани операции по заключване (блокиране) внедрени в мрежата

9.2 Ръчни аварийни движения на моторизираните контроли

В случай на прекъсване на захранващите източници, може да се използва резервна за да завършите маневра/ ход или да се извършват ръчни операции

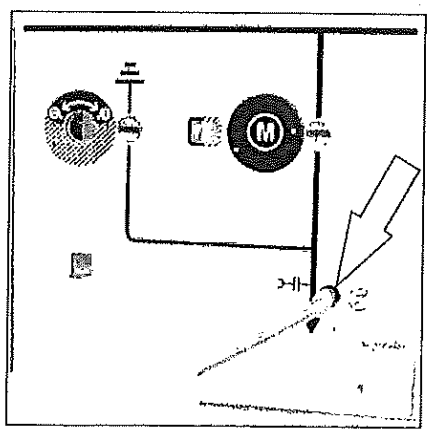
Позицията на индикаторите трябва да се проверява след всяка операция.
Ако захранването е възстановено докато се поставя лост то той ще бъде изтласкан от гнездото.

Когато е затворен параметъра заземителния превключвател, резервния лост за ръчен контрол не може да се поставят (с изключение за CB T2).

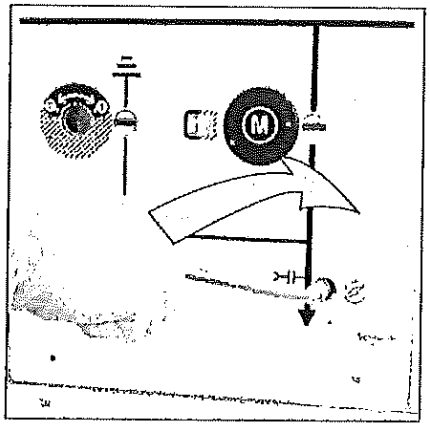
9.3 приблизителен брой на завъртания за резервните ръчни контролни лостове

	Разединителен прекъсвач		Прекъсвач на веригата	
	За да се отвори	да затвори	да отвори	да затвори
Функции C и Sb (виж § 8)	31 оборота	31 оборота		
Функция T1	7 оборота	50 оборота		
Функция T2	31 оборота	31 оборота	7 оборота	50 оборота

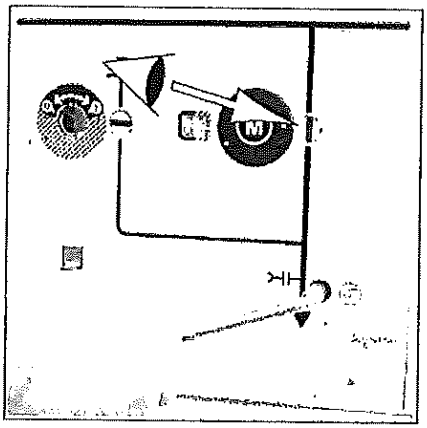
9.4 Ръчни операции включващи функции C, T1 и Sb [заземителен превключвател



■ Поставете задната дръжка за превключвателя отвора



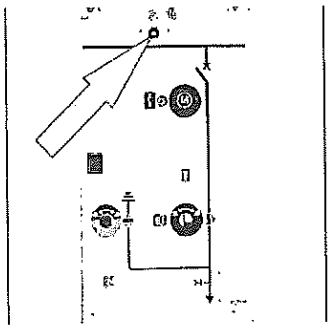
■ за да отворите (или затворите) товаро прекъсвача , завъртете по часовниковата стрелка (виж § 9.3).



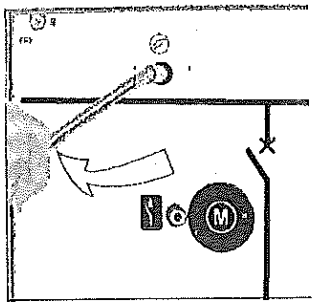
■ продължете докато операцията е завършена (мимичната схема се смени
■ Отстранете коляновата дръжка

отворен]

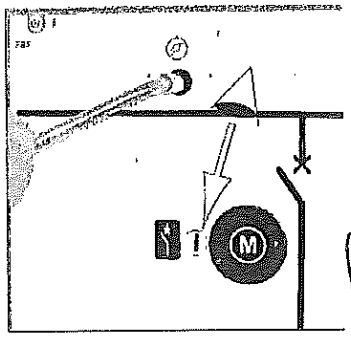
9.5 Ръчни операции включващи функции T2 [заземителен превключвател отворен]



- Поставете задната дръжка за превключвателя в отвора



- за да отворите (или затворите) товаро прекъсвача , завъртете по часовниковата стрелка (виж § 9.3).



- продължете докато операцията завършена (мимичната схема се смени
- Отстранете коляновата дръжка

10 Поддръжка

10.1 Нива на поддръжка

Описание	Нива
Операции, препоръчани в ръководството с инструкциите "инсталиране - операция - поддържане", извършвани от съответно квалифициран персонал, които са получили обучение, което им позволява да се намеси, като се спазват на правилата за безопасност.	1
Комплексни операции, изискващи специфична експертиза и внедряването на резервно оборудване в съответствие с процедурите на Schneider Electric. Те трябва да се извършват от Schneider Electric, или от специализиран техник, обучен от Schneider Electric (виж § 1.2) при започване на процедурите, с подходящото специфично оборудване	2
Всички превантивни и коригиращи операции по поддръжка, всички ремонтни дейности и работи по реконструкция се изпълняват от Шнайдер Електрик.	3

10.2 Профилактична поддръжка

Профилактична поддръжка	Честота	Нива
Препоръчителни операции	6 години	1 2 3
Проверка на наличието и състоянието на аксесоарите (лостове и тн.)	X	~X~ ~X~ ~X~
Визуална външна инспекция (чистота, липса на окисляване , и тн.)	X	X X X
Почистване на външните компоненти с чист, сух парцал.	X	X X X
	X	X X X
	X	X X X
Визуално наблюдение на общия вид на връзките.	X	X X X

10.3 Поддръжка с корективна цел

Поддръжка с корективна цел		Нива
Смяна или модификация	Виж §	1 2 3
Смяна на три предпазителя	10.4	~X~ ~X~
Смяна на индикатор за напрежение [E.g.: тип VPIS]	10.5	X X X

10.4 Смяна на три предпазителя

Действие	Шина	Кабели	Товаро прекъсвач	Заземител
Нормално	Без напрежение	Без напрежение	Отворен	Затворен
Възможно	Под напрежение	Без напрежение	Отворен	Затворен

Заключване на функционалните единици	Необходими инструменти	Необходими части :
Всички операции по заключване следва да бъдат изпълнени	- кожени ръкавици	- 3 предпазителя със същата референция
Съгласно изискванията за съответната мрежа	- ключ за отделението	*(да се проверят стойностите в съответствие с мощността на трансформатора*
	- малка отвертка с плоска глава	

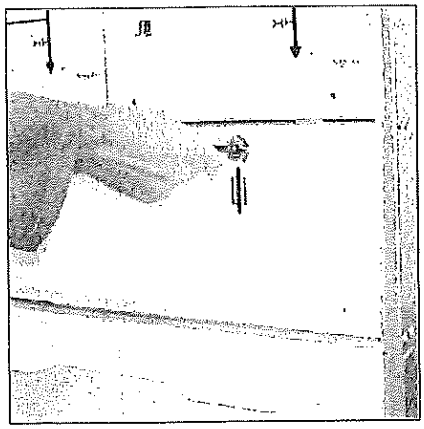
Да се види съответния раздел в Ръководството за монтаж за характеристиките на предпазителите (виж § 2.3).

Смяна на предпазител

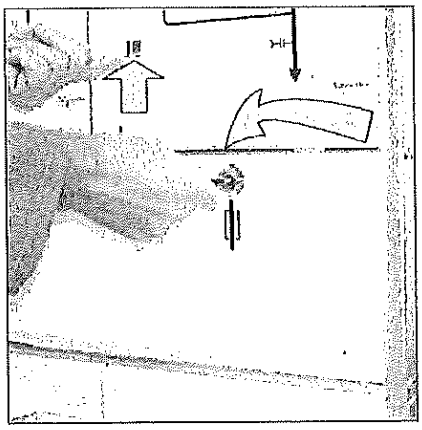
! Наложително да се сменят всички 3 предпазители, при отказ на очевидно една фаза

Корпусът на предпазителя може да стане много горещо след късо съединение. Трябва да се вземат предпазни мерки, стандартни (кожени) ръкавици преди започване на работа.

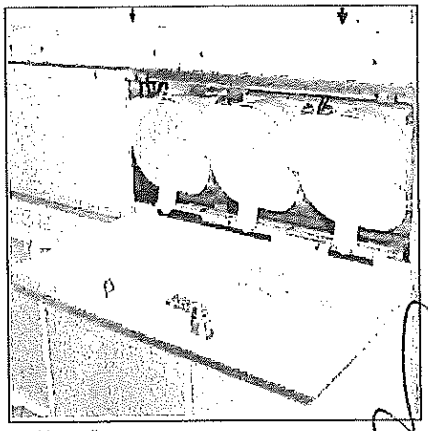
! Независимо дали се извършва смяна или монтаж предпазител, отделението следва да се затвори веднага след това, за да се избегне проникване на прах и влага.



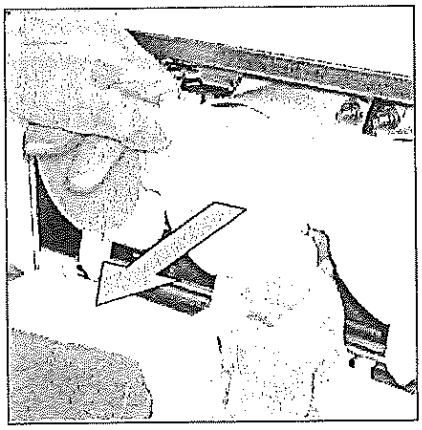
- уверете се, че функционалния заземител е затворен
- Отворете отделението използвайки съответният ключ



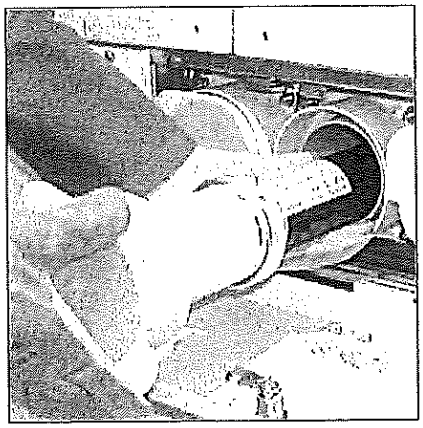
- Повдигнете резето и отворете панела .



- Накрайниците на държателите на предпазителите са достъпни accessible.



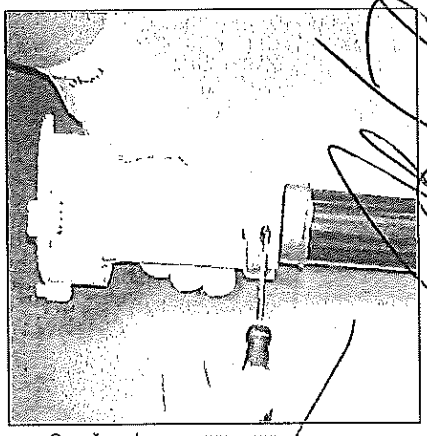
- Използвайте чисти кожени ръкавици
- Дръпнете гнездото на предпазителя към вас , без усукване.



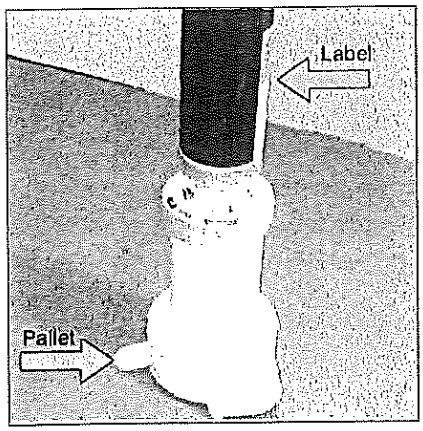
Бавно отстранете сглобката на гнездото/ предпазителя

Внимание!!! Може да е нагорещен. .

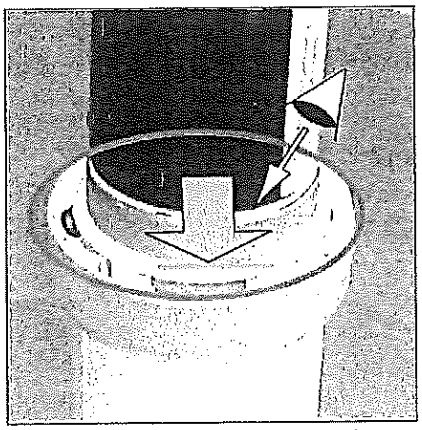
- Поставете сглобката на чиста, плоска повърхност. .



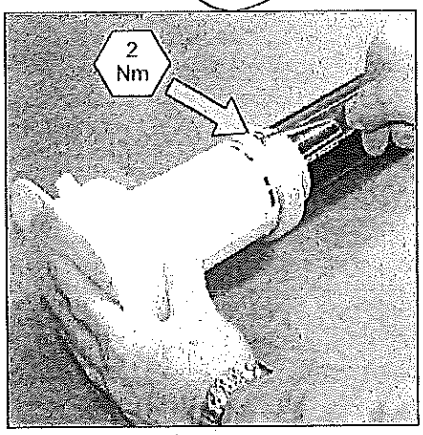
- Отвийте фиксиращия винт.
- отстранете изгорелият предпазител от гнездото.



- Сглобете предпазителя за смяна
  - Надпишете и повдигнете страната на гнездото
  - Надпишете противоположната страна на държателя на предпазителя.



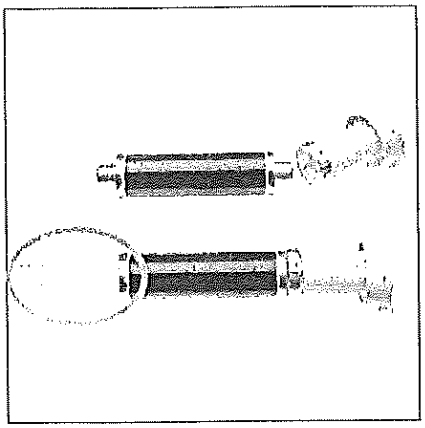
- поставете предпазителя между скобите колкото е възможно по далеч от носещия пръстен.



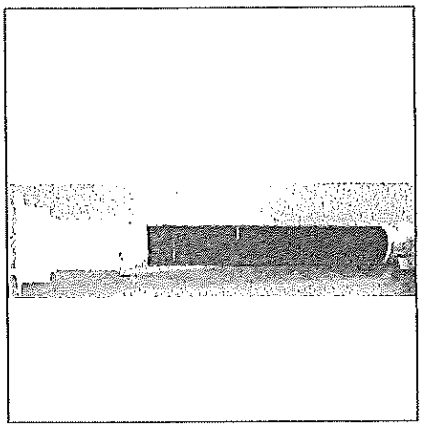
- Поставете сглобката върху равна повърхност, за да улесните затягането на винта на скобата до необходимия въртящ момент на затягане.

За предпазители до 12kV, да се възстанови адаптора включен отзад на предпазителя.

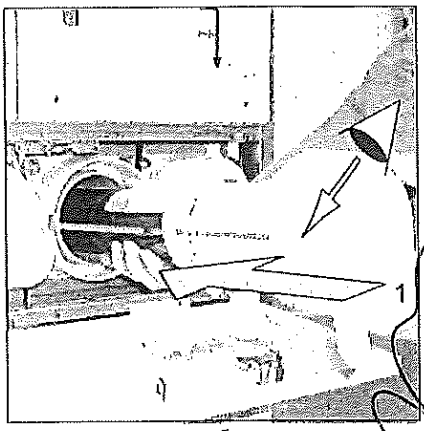
ВЯРНО С ОРИГИНАЛА



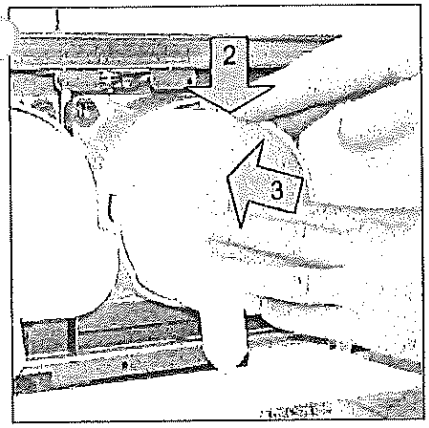
- За предпазители до 12 kV: за се монтира Адаптер на другия край на предпазителя



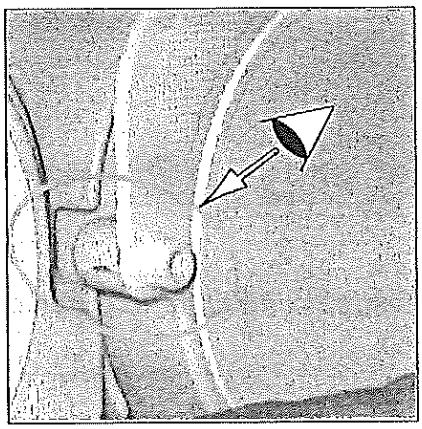
- уверете се , че сглобката куплунг и предпазител) е чиста.



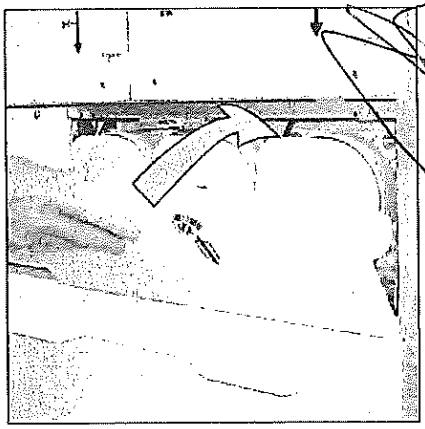
- плъзнете тази сглобка в гнездото на предлазителя като подравните пластинката на куплунга със слота в гнездото
- не усуквайте докато плъзгате



- 2. Когато сглобката е изцяло вмъкната натиснете надолу куплунга .
- 3. Натиснете силно .



- Пластинката на куплунга ще заклини предпазителя в гнездото.



- За да затворите капака на предпазителя:
  - Повдигнете резето ,
  - натиснете капака обратно на мястото му
  - Заключете капака (използвайки ключа)

Сега монтирайте и другите два предпазителя.

Третиране на стари предпазители и опаковане

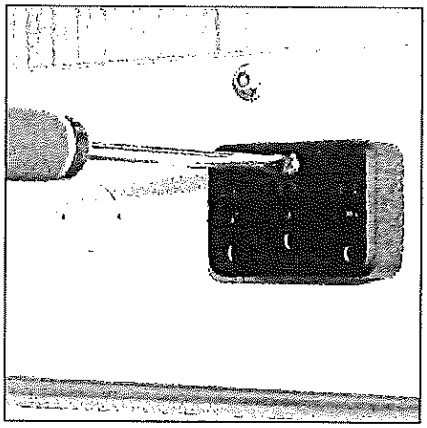
Предпазителите и опаковките трябва да се третират чрез Общите канали за промишлени отпадъци

ВЯРНО С ОРИГИНАЛА

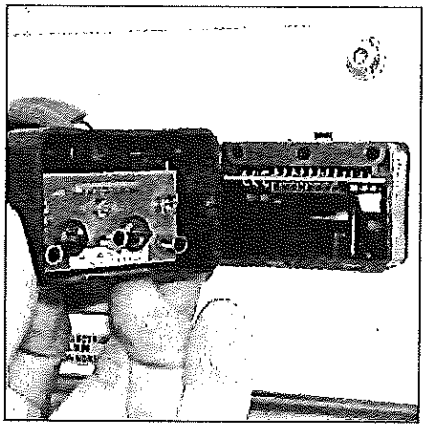
10.5 Смяна на индикатор за напрежение [E.g.: тип VPIS]

Действие	Шина	Кабели	Товаро прекъсвач	Заземител
Нормално	Без напрежение	Без напрежение	Отворен	Затворен
Възможно	Под напрежение	Под напрежение	Затворен	Отворен

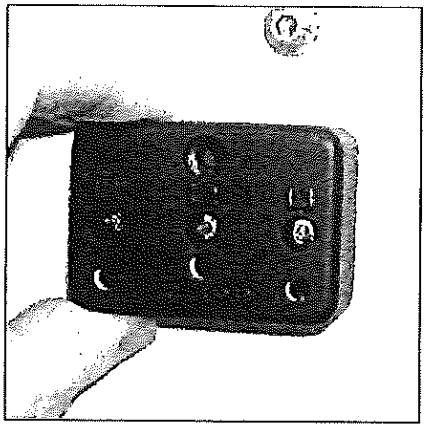
Заключване на функционалните единици	Необходими инструменти	Необходими части :
Всички операции по заключване следва да бъдат изпълнени Съгласно изискванията за съответната мрежа	- Плоска отвертка	- VPIS индикатор



- развийте двата странични винта (Отвертка с плоска глава).



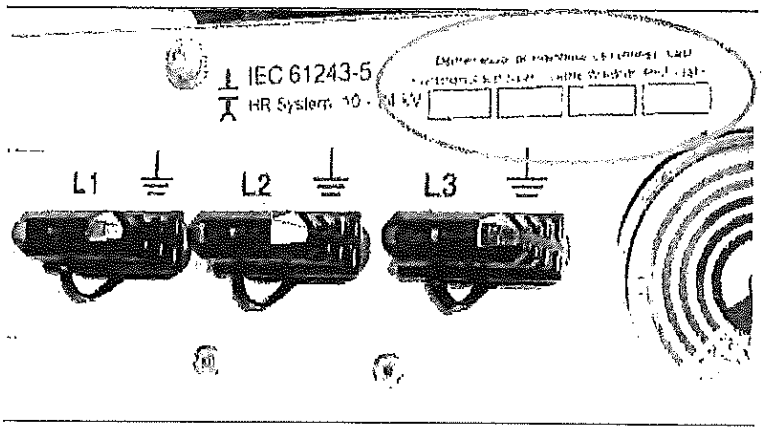
- Извадете индикатора за напрежение



- Свържете новия уред.
- леко затегнете фиксиращия винт .

10.6 Периодична честота на операциите по поддръжка на кутиите VDS

- В непосредствена близост до надписите за напрежение, на указателна табелка се упоменава датата на последната процедура по поддръжка и изпитване



11 Резервни части

11.1 Резервна част

Описва част, предназначена да замести съответната такава
До възстановяване на функционирането на оригиналната
Подмяната на тези части може да се извършва само от подходящо обучен и квалифицирано
персонал за извършване на тези операции.
За обяснение на нивата на поддръжка моля се отнесете към § 10.1.

Планирана подмяна	Описание	Подмяна	Нива		
		Всеки	1	2	3
Това се отнася до износени части, предназначени да бъдат заменени след предварително определен брой употреби. Употреба: запаси за поддръжка, необходими за оптимална поддръжка на всеки 6 години	HV предпазители (по 3)	20 години	X	X	X

Н планувана подмяна	Описание	Нива		
		1	2	3
Описват се резервни части, чиито замяна се налага в хода на коригираща поддръжка	Светлинни индикатори	X	X	X

Подмяна по изключение	Denomination	Нива		
		1	2	3
Описва резервни части или възли, чиито очакван жизнен цикъл най-малко равен на този на оборудването. Използване: Резервни части или възли, съхранявани като гаранционен запас.	Натягане на кабели	X	X	X
	Манометър	X	X	X
	Мотор	X	X	X
	Спомагателни контакти	X	X	X
	Оперативен лост за заземител	X	X	X
	Лост за Товаро прекъсвач	X	X	X
	Авариен лост за ръчен контрол на моторизирани механизми	X	X	X
	Ключ за отделението за предпазителите на електродите	X	X	X
	Механичени контроли	X	X	X

11.2 Идентификация на материалите

© For all orders for spare parts, it is necessary to enclose the equipment characteristics form.

11.3 Условия на съхранение

Компонентите трябва да се съхраняват далеч от прах, влажността или слънчеви лъчи. За да се улесни търсенето, те трябва да бъдат маркирани с референтен номер на Шнайдер Електрик. Някои компоненти са крехки, за предпочитане е те да се съхраняват в оригиналната им опаковка

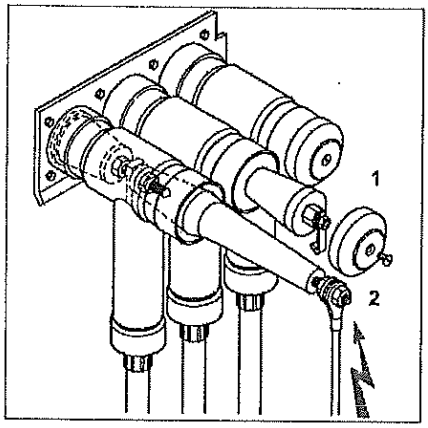
ВЯРНО С ОРИГИНАЛА

12 Тестване на кабели

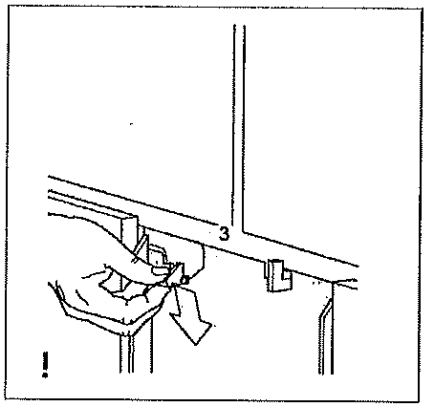
12.1 Подготовка на функцията

Въведете правила за блокиране съгласно разпоредбите, които са специфични за всяка мрежа.
Освободете от напрежение товаро прекъсвача и затворете заземителния превключвател. (виж съответната глава).
Отстранете панела за достъп до отделението за кабели .

12.2 тестване на кабели с куплунг T част конектори (шина под напрежение)

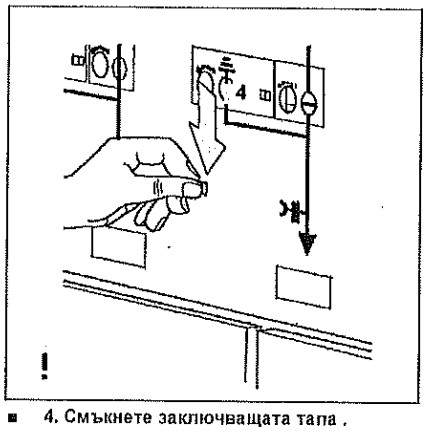


- 1 .Отстранете крайният капак на
- 2. Монтирайте адаптера .



Симулирайте наличието на врата

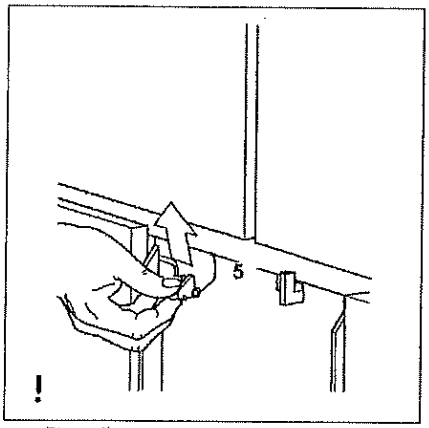
- 3. натиснете ключалката надолу : Сега заземителя не е заключен.
  - В тази позиция прекъсвача може да бъде местен, освен ако не е монтиран с допълнителна блокировка между кабелния панел и товаро прекъсвача (опционално).



- 4. Смъкнете заключващата тапа .
- отворете заземителя (See § 5.1).

Извършете тестовете.

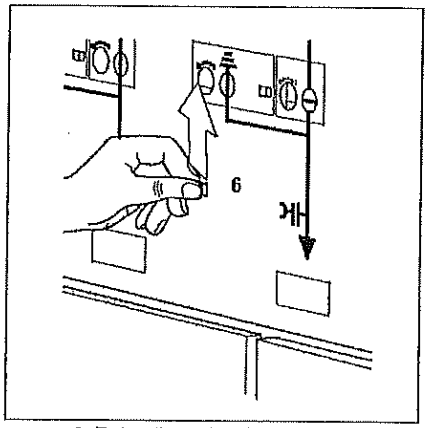
Затворете заземителя. (виж § 5. 2)
5. Дръпнете ключалката нагоре .



- Close the earthing switch (See § 5.2).

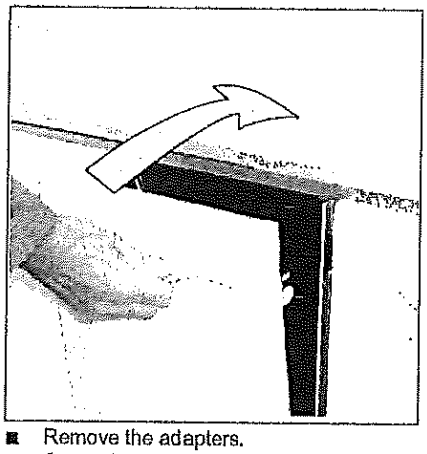
! 5. Pull the lock upwards.

6. Повдигнете с ръка отключващото резе



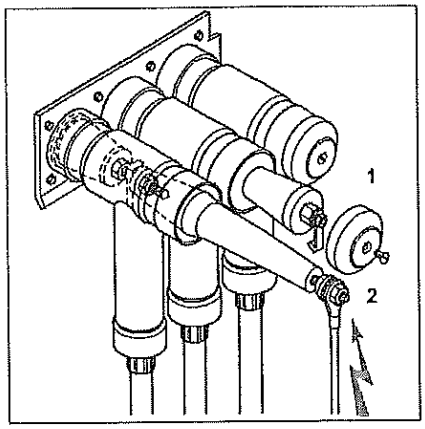
! 6. Raise the unlocking latch by hand.

Отстранете адаптерите
Завинтете капака от краищата
Монтирайте панела на кабелното отделение

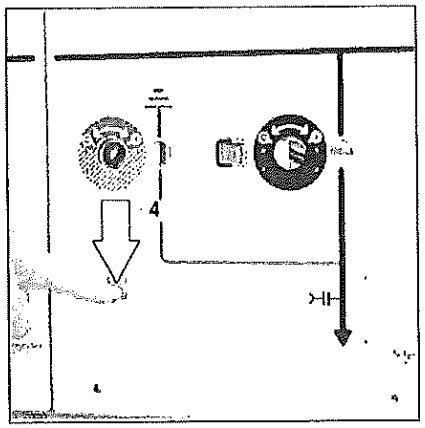


- Remove the adapters.
- Screw the covers onto each extremity.
- Re-fit the cable compartment panel.

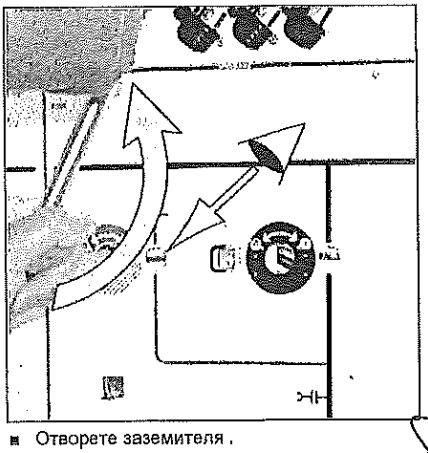
12.3 Кабелни тестове: EON спецификация със конектори 'T' част [шина под напрежение)



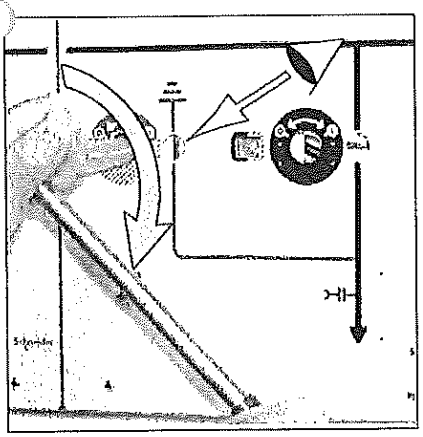
- 1 . отстранете капака на панела .
- 2. Завинтете адаптера за тестове .



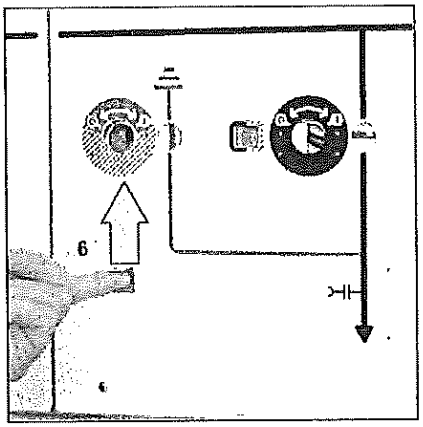
- 3. Смъкнете с ръка заключващото резе .



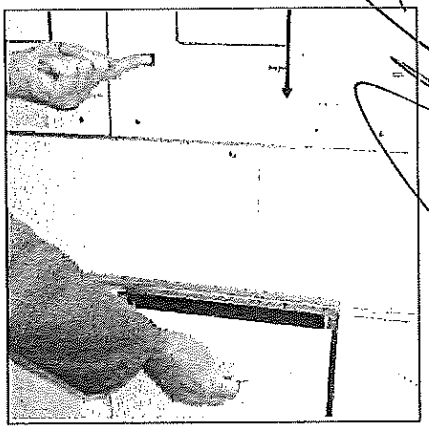
- Отворете заземителя .
- Проведете тестовете .



Затворете заземителя .



- 6. Повдигнете заключващото резе с ръка.

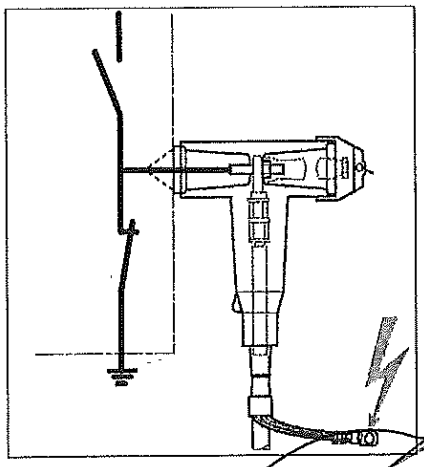


- Отстранете адаптерите.
- завинтете капака от всички страни .
- поставете и закрепете кабелния панел..

12.4 Тестване на корпуса на куплунга на конекторите

Обърнете се към доставчика на куплунгите за конектори за цялата информация и данни, свързани с това изпитание.

- За провеждане на изпитанието: Изключете функцията. . затворете заземителя. , разединете заземителната обшивка
- Пускането на ел.ток е през обшивката
- След теста , свържете отново заземителната обшивка към общата заемителна верига.



13 характеристика и обем на SF6 газ

13.1 Общи характеристики

Тип на изолиращия газ :
Серен хексафлуорид (SF6) - law IEC60376.

Всяко табло се състои от резервоар, напълнен с SF6 газ, предназначен за проектиран като херметична система под налягане в съответствие с изискванията на IEC62271-1.

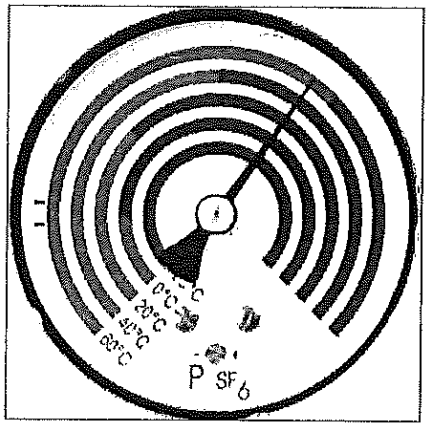
Никога не пробивайте резервоар под налягане

Никога не се опитвайте да отворите резервоара .

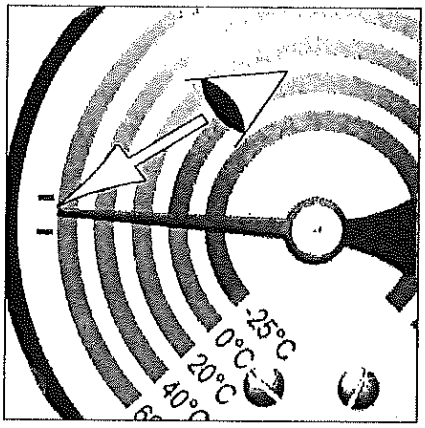
13.2 Налягане на пълнене

- при 20°C налягането на пълнене е 0.030 MPa (0.13 MPa абсолютно).

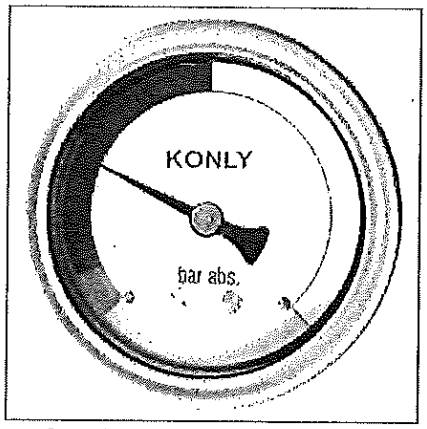
По време на очакваният жизнен цикъл на експлоатационен живот и при нормални работни условия, не би следвало да има необходимост от допълването на газ.



- манометър за налягане (по опция) позволява на газово налягане SF6 да бъде гарантирано, в зависимост от температурата (5 криви).



- 2 те черни линии от ляво ,съответстват на вътрешно налягане, равно на атмосферното налягане (0.1 MPa абсолютно).



- Специфичен манометър (по опция)за над морски височини по високи от 1000 m.

13.3 Оперативни прагове на контактните манометри

Прагове	Температура	Налягане
Високо	20°C	250 ± 30 mbar
Ниско	20°C	140 ± 50 mbar

13.4 FBX функции

Товаро прекъсвача може да бъде опериран само когато стрелката (иглата) е в зеления сектор (от дясно) отговаряща на температурата на околната среда.

В случай на наблюдение на аномалии (напр. стрелката е в червения сектор) моля да се свържете с най близкия представител на .Schneider Electric

14 В края на жизнения цикъл на оборудването

14.1 Валоризация на оборудването

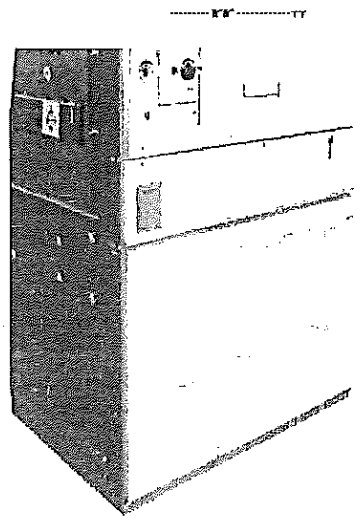
Нашите функционални единици са произведени от рециклиращи се материали. .

Таблица (§ 14.4) дава информация и цифри за типовете материали, тяхното качество и методи на валоризация

Те позволяват следното
- Да си изчисли капацитета на валоризация
- Оптимизиране на процеса на валоризация ,
- Оценка на разходите на валоризация .

Дадените показания в таблиците (§ 14.4) улесняват сътрудничеството между потребителите и Schneider Electric за валоризиране на изделието в края на жизнения цикъл.

FBX-C (IS) C-C-T1 (24 kV - 400 A)



14.2 Инструкции за безопасност

Да не се разглобяват пружините на механичните контролни механизми без устройството за освобождаване

Никога не се опитвайте на отворите херметичен резервоар на функционална единица

14.3 Изваждане на оборудването от работа

Консултирайте се с Schnelder Electric относно всички услуги по извеждане от експлоатация
Възстановяване на SF6 и отваряне на резервоара, могат да бъде извършено само в определено помещение , оборудвано за този вид услуга.

Не се опитвайте да съберете SF6 без определените за това инструменти и в помещение , което не е специално предназначено за това.

14.4 Разпределение и валоризация на използваните материали за FBX (виж § 14.1)

Общо тегло : FBX-C (IS) C-C-T1 + 3 предпазителя =

Метали – вкл, вложки	Тегло (kg)	% of материали	Валоризация
Стомана	155.810 83.854		
Неръждаема стомана	26.5		Да
Мед и сплави базирани на мед	9.8		
Алуминий и сплави на основата на алуминий	0.051		
Сребро			Да
Общо	276.015	88.92	

Термореактивни части	Тегло (kg)	% материали	Валоризация
Епоксидна смола	12.141		Не може да бъде валоризирано (изпратено до технически центрове за зарявяне)
Total	12.141	3.91	

* основно силициев двуокис

Термо пластични материали	Тегло (kg)	% материали	Valorization
Полиестери	7.330		Yes
ароматни полиамиди	2.964		
полиамиди	1.198		
Други	0.152		
Total	11.645	3.75	

Еластомери	Тегло (kg)	% материали	Валоризация
EPDM	0.095	0.03	Не може да се валоризира

Газ	Тегло (kg)	% материали	Валоризация
SF6	2.450	0.79	Да (регенерация)

Други	Тегло (kg)	% материали	Валоризация
Силициев двуокис	3.000		Да
Порцелан	2.993		
Кордиерит	1.097		
Натриев алумосиликат	0.500		
Фенол хартия	0.430		
Грес	0.050		
Общо	8.070	2.60	

15 Бележки

Ако имате коментари относно използването на този документ или за използването на оборудването и услугите, които са описани в него, моля изпратете ни вашите бележки, предложения на :

ВЯРНО С ОРИГИНАЛА

Overview of FBX type test reports

1. 12 kV

1.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102 class M0, E3
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 12 kV
	KEMA	42-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	42-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 12 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	42-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection : IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc: see section below			

1.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch for transformer IEC 62271-102
• Short time and peak withstand current,
  • 5 kA 1s, 13 kAp
• short circuit making current,
  • 13 kAp / 12 kV 5 making operations
	KEMA	40-02	2002

Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002

Making-breaking on combination
• IEC 60420
  • Td1 20kA (Short circuit current: TDisc)
  • Td2 3,2kA
  (Integal of Joule maximal: TDiwmax)
  • Td3 152A
  • Td5 1100A (Take over: TDito)
• IEC 62271-105
  • Transfer current: TDitransfer 1500A
  • 2000A
	KEMA
	
	KEMA
	KEMA
		387-02
		
		261-05
		303-05
			2002
			
			2005
			2005

Mechanical endurance : (manual) M1 • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 12 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	40-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

1.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 28 kV1mn 50HZ • 75 kV lightning impulse voltage • on the insulating distance • 32 kV1mn 50HZ • 85 kV lightning impulse voltage	KEMA	03-1161 see 66-03	2003
Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003
Earthing switch IEC 62271-102 • Short time and peak withstand current, • 16 kA 3s, 42 kAp • short circuit making current, • 5 C at 42 kAp / 12 kV	KEMA	69-03	2003
Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Making-breaking tests: IEC 62271-100 circuit breaker class M1,E1 at 50Hz and 60Hz • STC 42 kAp, 16 kA, 3s • T10-30-60-100s-100a • singlephase16kA double earthfault 13,9kA • STC 52 kAp, 20 kA, 3s • T10-30-60-100/SP	KEMA KEMA	67-03 54-04	2003 2004
Capacitive switching performance IEC62271-100 circuit breaker class C2 60Hz T60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance: (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance: (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection : IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

1.3 Metering range "M"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 28 kV1mn 50HZ
  • 75 kV lightning impulse voltage
• on the insulating distance
  • 32 kV1mn 50HZ
  • 85 kV lightning impulse voltage
	AGS	E3-024/04
		E3-005/04
			2004

Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			
Internal arc see section below			

ВЯРНО С ОРИГИНАЛА

2. 17 kV

2.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 17,5 kV
	KEMA	42-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	42-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 17 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	42-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

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2.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 38 kV1mn 50HZ • 95 kV lightning impulse voltage • on the insulating distance • 45 kV1mn 50HZ • 110 kV lightning impulse voltage	KEMA	02-1192	2002
Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002
Earthing switch for transformer IEC 62271-102 • Short time and peak withstand current, • 5 kA 1s, 13 kAp • short circuit making current, • 13 kAp / 17,5 kV 5 making operations	KEMA	40-02	2002
Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002
Making-breaking on combination • IEC 60420 • Td1 20kA (Short circuit current: TDisc) • Td2 3,2kA (Integal of Joule maximal:TDiwmax) • Td3 152A • Td5 800A (Take over: TDito) • IEC 62271-105 • Transfer current: TDitransfer 1500A • 2000A	KEMA ? ?	44-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations (CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 12 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	42-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

2.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 38 kV1mn 50HZ • 95 kV lightning impulse voltage • on the insulating distance • 45 kV1mn 50HZ • 110 kV lightning impulse voltage	KEMA	03-1161 see 66-03	2003
Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003
Earthing switch IEC 62271-102 • Short time and peak withstand current, • 16 kA 3s, 42 kAp • short circuit making current, • 5 C at 42 kAp / 17,5 kV	KEMA	69-03	2003
Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 52 kAp • TD6a 600 A • TD6b 277 A	KEMA	42-02	2002
Making-breaking tests IEC 62271-100: circuit breaker class M1,E1 at 50Hz and 60Hz • STC 42 kAp, 16 kA, 3s • T10-30-60-100s-100a • singlephase16kA double earthfault 13,9kA • STC 52 kAp, 20 kA, 3s • T10-30-60-100/SP	KEMA KEMA	67-03 54-04	2003 2004
Capacitive switching performance IEC62271-100 circuit breaker class C2 60Hz T60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance: (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance: (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

2.4 Metering range "M"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 38 kV1mn 50HZ
  • 95 kV lightning impulse voltage
• on the insulating distance
  • 45 kV1mn 50HZ
  • 110 kV lightning impulse voltage
	AGS	E3-024/04
		E3-005/04
			2004

Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit: • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			
Internal arc see section below			

ВЯРНО С ОРИГИНАЛА

16.24

3. 24 kV

3.1 Switch-disconnector "C"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	KEMA	02-1192	2002

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 20 kA 3s, 52 kAp
• short circuit making current,
  • 5 C at 52 kAp / 24 kV
	KEMA	41-02	2002

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 16 kA, 42 kAp • TD6a 600 A • TD6b 277 A	KEMA	41-02	2002
Mechanical endurance: (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	41-02	2002
Mechanical endurance: (electrical) • Switch-disconnector 1000 operations(CO)	AMT	AMTR06468-00	2006
Electrical endurance • Switch-disconnector E3 • 100 breaking at 630 A / 24 kV • 5 making operations • Earthing switch E3 • 5 making operations	KEMA	41-02	2002
Temperature rise • 630 A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

3.2 Switch-disconnector with fuse "T1"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 50 kV1mn 50HZ • 125 kV lightning impulse voltage • on the insulating distance • 60 kV1mn 50HZ • 145 kV lightning impulse voltage	KEMA	02-1192	2002
Short time and peak withstand current main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	39-02	2002
Interlock integrity	KEMA	39-02	2002
Earthing switch for transformer IEC 62271-102 • Short time and peak withstand current, • 5 kA 1s, 13 kAp • short circuit making current, • 13 kAp / 24 kV 5 making operations	KEMA	40-02	2002
Making-breaking tests IEC 60265-1: transformer switch class M1,E1 at 50Hz/60Hz • TD1, 200 A • TD4a 60 A • TD6a 200 A • TD6b 87 A	KEMA	40-02	2002
Making-breaking on combination • IEC 60420 • Td1 16kA (Short circuit current : TDisc) • Td2 3,2kA (Integal of Joule maximal:TDiwmax) • Td3 152A • Td5 800A (Take over: TDito) • IEC 62271-105 • Transfer current: TDitransfer 1500A • 2000A	KEMA	43-02	2002
Mechanical endurance : (manual) • Switch-disconnector 1000 operations(CO) • Earthing switch 1000 operations	KEMA	40-02	2002
Electrical endurance • Switch-disconnector • 10 breaking at Ir E1 • 100 breaking at Ir / 24 kV E3 • 5 making operations • Earthing switch E3 • 5 making operations	KEMA on request	43-02	2002
Temperature rise • 37,5A with fuses 63A	KEMA	02-1192	2002
Measurement of resistance	KEMA	02-1192	2002
Partial discharge			
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC	EDF	HM22/07-508/1GB	2005
Internal arc see section below			

3.3 Vacuum circuit breaker "T2"

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test

Dielectric :
• To the earth and between phases
  • 50 kV1mn 50HZ
  • 125 kV lightning impulse voltage
• on the insulating distance
  • 60 kV1mn 50HZ
  • 145 kV lightning impulse voltage
	KEMA	03-1161
		see 66-03
			2003

Short time and peak withstand current, main circuit: • 20 kA 3s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Short time and peak withstand current, earthing circuit: • 20 kA 1s, 52 kAp • 16 kA 3s, 42 kAp	KEMA	66-03	2003
Interlock integrity	KEMA	66-03	2003

Earthing switch IEC 62271-102
• Short time and peak withstand current,
  • 16 kA 3s, 42 kAp
• short circuit making current,
  • 5 C at 42 kAp / 24 kV
	KEMA	69-03	2003

Making-breaking tests IEC 60265-1: cable switch class M1,E3 at 50Hz and 60Hz • TD1, TD2a, 630 A • TD4a 160 A • TD5 20 kA, 42 kAp • TD6a 600 A • TD6b 277 A	KEMA	41-02	2002

Making-breaking tests IEC 62271-100:
circuit breaker class M1,E1 at 50Hz and 60Hz
• STC 42 kAp, 16 kA, 3s
  • T10-30-60-100s-100a
  • singlephase16kA double earthfault 13,9kA
• STC 52 kAp, 20 kA, 3s
  • T10-30-60-100/SP
	KEMA
	
	KEMA
		67-03
		
		54-04
			2003
			
			2004

Capacitive switching performance IEC62271-100 circuit breaker class C2 60HzT60 9,6kA, CC1 8A, CC2 31,5A	KEMA	68-03	2003
Mechanical endurance : (electrical) • Vacuum CB 2000 operations(CO)	KEMA	67-03	2003
Mechanical endurance : (mechanical) • Earthing switch 1000 operations • Switch-disconnector 2000 operations(CO)	KEMA	69-03	2003
Temperature rise • 630 A • 400 A in CB	KEMA	03-1161 see 66-03	2003
Measurement of resistance	KEMA	03-1161 see 66-03	2003
Partial discharge	KEMA	03-1161 see 66-03	2003
Degree of protection: IP • enclosure IP 67 • operating mechanism cover IP 3XC • cable compartment IP3XC			
Internal arc see section below			

3.4 Metering range

Tests in accordance with IEC 60694 and 60298 / 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Dielectric : • To the earth and between phases • 50 kV1mn 50HZ • 125 kV lightning impulse voltage • on the insulating distance • 60 kV1mn 50HZ • 145 kV lightning impulse voltage	AGS	E3-024/04 E3-005/04	2004
Short time and peak withstand current, main circuit: 21 kA 3s, 53 kAp • function M1(U-U) • function M4(O-O) • function M3(U-O)	 IPH IPH IPH	 1374.1000.3.354 1374.0086.4.094 1374.0086.4.093	 2003 2004 2004
Short time current, earthing circuit: • 20 kA 1s • 16 kA 3s			
Temperature rise			
Partial discharge			
Degree of protection: IP • enclosure IP 3XC			

4. Internal Arc Test - Main Range

Tests in accordance with 62271-200

DESIGNATION	Laboratory	Report N°	Year test
IAC AF 16kA-1s Criteria 1-5 In the gas tank – with simplified gas cooler	ZKU	06-131	2006
IAC AF 20kA-1s Criteria 1-5 In the gas tank – with gas cooler	ZKU	06-035	2006
IAC AFL 16kA-1s Criteria 1-5 In the gas tank – with exhaust duct	ZKU	06-093	2006
IAC AFL 20kA-1s Criteria 1-5 In the gas tank – with exhaust duct	ZKU	06-094	2006
IAC AFL 16kA-1s Criteria 1-5 In the cable compartment – with exhaust duct	ZKU	06-057	2006
IAC AFL 20kA-1s Criteria 1-5 In the cable compartment – with exhaust duct	ZKU	06-058	2006
IAC AFL 20kA-1s Criteria 1-5 With chimney	IPH	1803.2080405.156	2008
IAC AFL 20kA-1s Criteria 1-5 In the gas tank – with gas cooler	IPH	2228.20800724.583	2008
IAC AF 16kA-1s Criteria 1-5 In the cable compartment – with closed bottom	IPH	2228.20800724.584	2008

5. MV/LV Stations

Tests in accordance with IEC 61330

DESIGNATION	Laboratory	Report N°	Year test
Acc. IEC61330 in MV/LV stations Annex A, 16kA-1s, Criteria 1-6	IPH	1374.0877.1.39	2001

6. Metering range

Tests in accordance with IEC 62271-200

DESIGNATION	Laboratory	Report N°	Year test
IAC AF 21kA-1s Criteria 1-5 In a M1 (U-U) metering panel	IPH	1374.0086.4.095	2004
IAC AF 21kA-1s Criteria 1-5 In a M4 (O-O) metering panel	IPH	1374.0086.4.096	2004

7. Global Type Test List

8. Other Tests

Tests in accordance with 62271-200

DESIGNATION	Laboratory	Report N°	Year test
Pressure withstand of tank 5 functions	MEVEL	AMTR06469-00	2006
Short time current on busbar 21KA 3s 52,5KAp 5 functions	CERDA	6193	2008

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9. Overview of substations tests

Tests in accordance with IEC IEC62271-202

DESIGNATION	Laboratory	Manufacturer	Type	Client	Report N°	Year test
Acc. IEC62271-202 in MV/LV stations §6.8, **20kA-1s** Criteria 1-6	IPH	Scheidt	NZ150/300	RWE/EnBW	2228.1292.7.529	2007
			NZ173/283	E.ON/EnBW	2228.1292.7.530	
			NZ210/290	EnBW	1352.2090275.0114	2009
			NZ190/210	EnBW	1352.2090275.0115	
			NZ210/240 IAC B	EnBW	1352.2090275.0116	
			NZ210/240 IAC A		XZ268L015 [4]	
	ABB Ratingen		NZ130/290 [1]	E.ON, Vattenfall	XZ268L017 [4] XZ268L018 [4]	
			BEK 250-300 IAC B	„Stadtwerke"	XZ268L019 [4]	
	IPH		BEK 250-300 IAC A		1352.2100474.0261	2010
		Betonbau	UK1100/1L	E.ON/HEW	2228.1291.7.649	2007
			UKL2817	E.ON	2228.1291.7.650	
			UK3015	RWE	2228.1291.7.651	
			UK2820-L	EnBW	1528.2080.590.343	2008
			UF2922	EnBW	1528.2080.590.344	
			UK1700-23	E.ON	1528.2080.590.345	
			UK2820	EnBW	1528.2080.590.346	
			UK 1700-15	E.ON/ RWE/ Vattenfall	3239.2090728.0691	2009
			UK 1700-15 [2] IAC B			
	IPH		UF 2536	„Stadtwerke"	3239.2090728.0690	
Acc. IEC62271-202 in MV/LV stations §6.8, **16kA-1s** Criteria 1-6		AREVA	CLIPPER C27		2228.1291.7	2007
					1803.2080405.154	2008
			CLIPPER M		1803.2080405.155 [4]	2008
Acc. IEC62271-202 in MV/LV stations §6.8, **20kA-1s** Criteria 1-6		Gräper	HKP	E.ON	1549.2080426.182	2008
			MKP 250/400	E.ON	1549.2080426.185	
			GPK S1	E.ON	1549.2080426.186	
		ELBAG	PvTSM-T-C2-250		1197.2101067 [3]	2010
		UESA/ Scheidt	NZ240/310	E.ON	1226.2111229.0680	2011
	ZKU	SGB Lahmeyer	NDV400.6	RWE	08-056	2008

1) Analogies possible for NZ 145/335 (E.ON, ÜWL) and for NZ 240/310 (E.ON, RWE, Vattenfall)
2) Modified: without 2nd cooling system
3) Under full customer responsibility, test report belongs to customer
4) 21KA/1s

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Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07497-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	17, 18/12/2007
Test specifications	IEC 62271-200 (2003)
Tests performed	Lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9

Issue date 10/01/2008

на основание чл. 2 от ЗЗЛД

на основание чл. 2 от ЗЗЛД

S. RATHOIN
Head of Test Laboratories

D PICCOZ
Head of MEVEL

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Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07498-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	17, 18/01/2008
Test specifications	IEC 62271-200 (2003)
Tests performed	lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9

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S. RATHOIN
Head of Test Laboratories

D. PICCOZ
Head of MEVEL

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zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 06 - 057

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-16/C-C-T1
Serial No.	:	FBX—06 12 012 / AMT
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	16.05. 2006

Number of issued copies: 2
Praha 9, Běchovice

Copy No.: E

Tested by: 26.7.06

на основание чл. 2 от ЗЗЛД

Richard Abrahamčík

zkratovna BĚCHOVICE PRAHA 9 004

на основание чл. 2 от ЗЗЛД

Vladimír Mastný
Head of the Laboratory

CTLA

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Bld de la Résistance
BP 84019
71040 MACON Cedex 9
France
Tel : 33 (0) 3 85 29 35 00
Fax : 33 (0) 3 85 29 36 36

TEST REPORT AMTR07499-00

Test object	Extensibility components for metal enclosed switchgear
Type	FBX E
Manufacturer	AREVA T&D
Site of tests	MEVEL dielectric test laboratory
Date of tests	22/01/2008
Test specifications	IEC 62271-200 (2003)
Tests performed	lightning impulse and power frequency voltage dielectric withstand test
Conformity	Requirements according to above specification are met
Issued to	AREVA T&D Bd de la Résistance 71040 MACON CEDEX 9

Issue date 28/01/2008

на основание чл. 2 от ЗЗЛД

S. RATHOIN
Head of Test Laboratories

на основание чл. 2 от ЗЗЛД

D. PICCOZ
Head of MEVEL

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CERDA

Ar0_0/V1

RAPPORT D'ESSAIS
TEST REPORT

N° 6006

Destinataire To	AREVA T&D Mâcon
Appareil Tested equipment	Tableau FBX, type IS C-C-T2 compact Switchboard FBX, type IS C-C-T2 compact
	Ur = 24 kV I_r = 630A *fr* = 50 Hz
Constructeur Manufacturer	AREVA T&D Mâcon
Objet des essais Purpose of tests	Essais au courant de courte durée et la valeur de crête du courant admissible Short-time withstand current and peak withstand current tests
Lieu des essais Site of tests	Laboratoire d'Essais de Puissance du CERDA CERDA High Power Laboratories
Date(s)des essais Date(s) of tests	16 octobre 2007 October, 16th 2007
Essais effectués conformément aux normes : Tests performed according to :	CEI 62271-200 Ed 1 2003/11 et CEI 60694 Ed2.2 2002/01 IEC 62271-200 Ed 1 2003/11 and IEC 60694 Ed2.2 2002/01
Assistait aux essais Tests witnessed by	Mr D. THOMAS
Rapport composé de Report made of	8 pages et pages and 10 feuillets joints attached leaflets
Date d'émission Date of issue	7.11.2007

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Le Responsable des Essais
Responsible for the tests
на основание чл. 2 от ЗЗЛД

C. BOURDIER

Le Chef du CERDA
на основание чл. 2 от ЗЗЛД

M. VITTOZ

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zkratovna
Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 08 - 006

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/CCT1
Serial No.	:	07/69Y19-05
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	SUZHOU Areva T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	04.02. 2008

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на основание чл. 2 от ЗЗЛД

Martin Vaňiš

Vladimír Mastný
Head of the Laboratory

CZECH TESTING LABORATORIES ASSOCIATION CTLA

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Zkušebnictví, a. s.
Podnikatelská 547, 190 11 Praha 9, Běchovice, Czech Republic

TEST REPORT
No. 08 - 007

Test object	:	High-voltage metal-enclosed switchgear and controlgear
Type	:	FBX-C/24-20/CCT1
Serial No.	:	07/69Y19-06
Ratings		
Rated voltage	:	24 kV
Rated normal current	:	630 A
Rated frequency	:	50 Hz
Manufacturer	:	SUZHOU Areva T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Test performed	:	Arcing due to an internal fault
Customer	:	AREVA T&D bld de la Résistance – BP 84019 71040 Mâcon Cedex – 9, France
Date of test	:	05.02. 2008

Copy No.: E

Praha 9, Běchovice
27.2 2008

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Martin Vaníš

на основание чл. 2 от ЗЗЛД

Vladimír Mastný
Head of the Laboratory

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