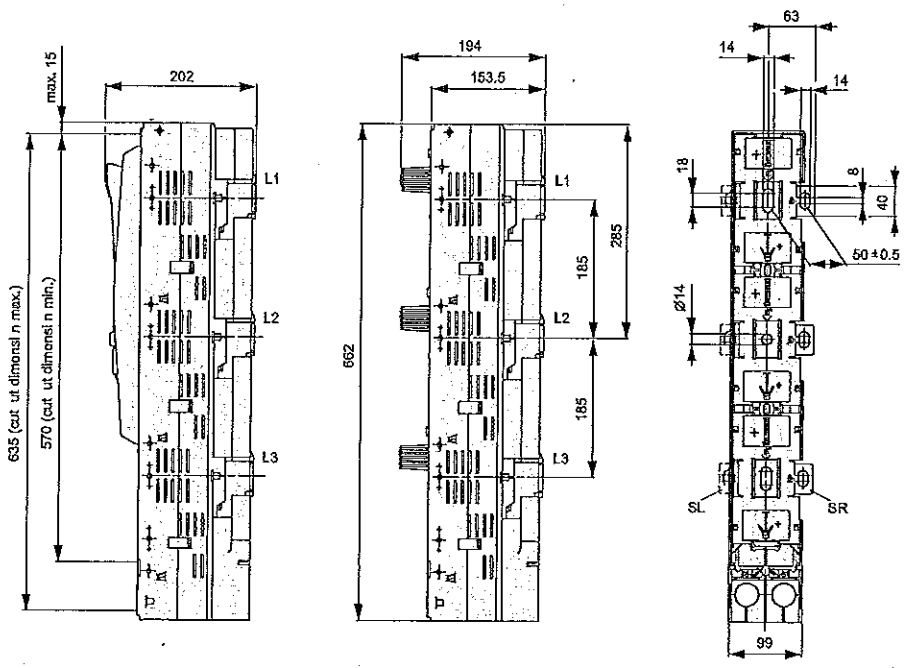
Typ/*Type*					SL3/1000-TM	SL3/1250
Kabelanschluss *Cable terminal*	Flachanschluss *Flat terminal*	Bolzendurchmesser *Bolt diameter*	–	–	2 x M12	3 x M12
		Kabelschuh *Cable lug*	–	mm²	2x 300, 3 x 120	3 x 300, 4 x 185
		Flachschiene *Flat bar*	–	mm	80 x 10	–
		Anzugsdrehmoment *Tightening torque*	M_a	Nm	35-40	35-40
	Klemme *Clamp*	Klemmquerschnitt *Clamping cross-section*	–	mm²	–	–
		Anzugsdrehmoment *Tightening torque*	–	Nm	–	–
		Klemmquerschnitt *Clamping cross-section*	–	mm²	–	–
		Anzugsdrehmoment *Tightening torque*	–	Nm	–	–
Schutzart *Degree of protection*	Frontseitig, Gerät eingebaut mit Klemmen- und Seitenabdeckung *Front side, device fitted with clamp and lateral covers*	Betriebszustand *Operating condition*	–	–	IP30	IP30
		Schaltdeckel geöffnet *Switching element open*	–	–	IP10	IP10
Betriebsbedingungen *Operating conditions*	Umgebungstemperatur[5]/*Ambient temperature*[5]		T_{amb}	°C	-25 bis/*to* +55	
	Bemessungsbetriebsart/*Rated operating mode*		–	–	Dauerbetrieb/*Uninterrupted duty*	
	Betätigung/*Actuation*		–	–	Abhängige Handbetätigung *Dependent manual operation*	
	Einbaulage/*Mounting position*		–	–	Senkrecht, waagerecht *Vertical, horizontal*	
	Höhenlage/*Altitude*		–	m	Bis zu 2000/*Up to 2000*	
	Verschmutzungsgrad/*Pollution degree*		–	–	3	
	Überspannungskategorie/*Overvoltage category*		–	–	IV	

5) 35°C Normaltemperatur, bei 55°C mit reduziertem Betriebsstrom./*35°C Normal temperature, at 55°C with reduced operating current.*

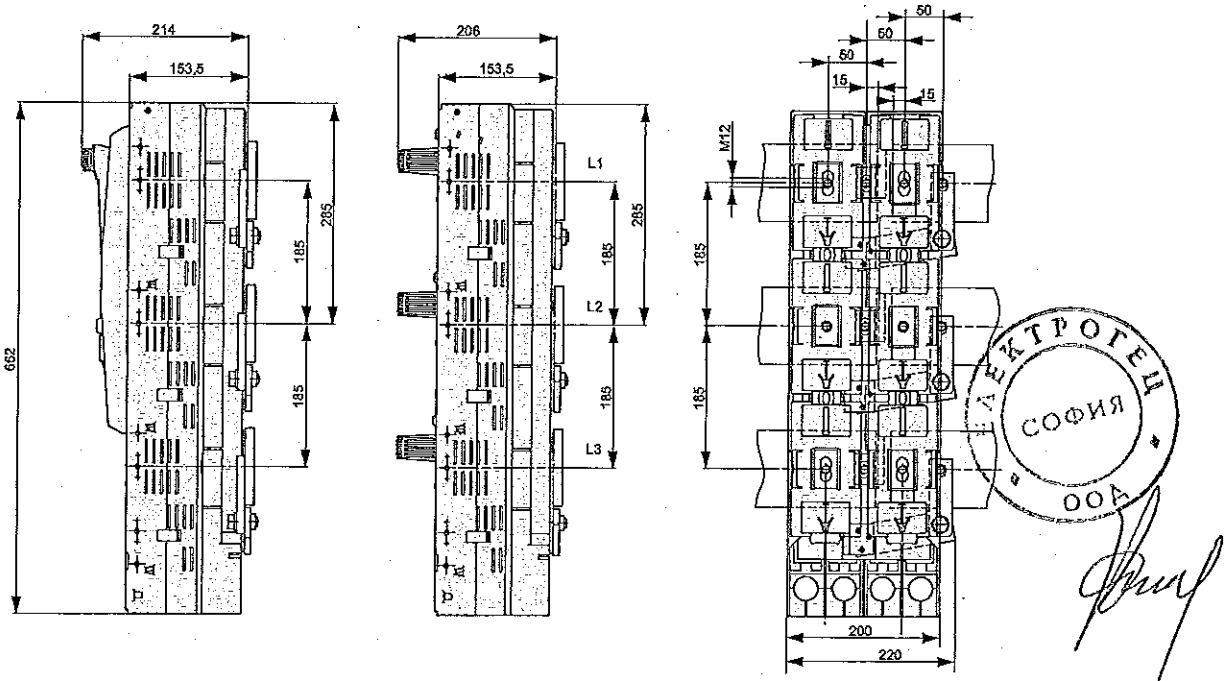
NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Typ/Type	Artikel-Nr./Article No.	Seite/Page	Beschreibung/Description	Artikel-Nr./Article No.	Seite/Page
SLT3-3SL/3X...	L390000..	SL-25	SLT3-3SL/3X3...	L300000...	SL-25
SLT3-3SR/3X...	L390000...	SL-25	SLT3-3SR/3X3...	L300000...	SL-25



Typ/Type	Artikel-Nr./Article No.	Seite/Page	Typ/Type	Artikel-Nr./Article No.	Seite/Page
SLT3-3SR/3X6/2000/TM3	L3000501	SL-25	SLT3-3SR/3X2/2000/TM3	L3900501	SL-25



„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Вертикален разединител НН 1000 А, с триполюсно управление"

Приложение № 2

ЕЛЕКТРОЕЕ СОФИЯ ЕАД

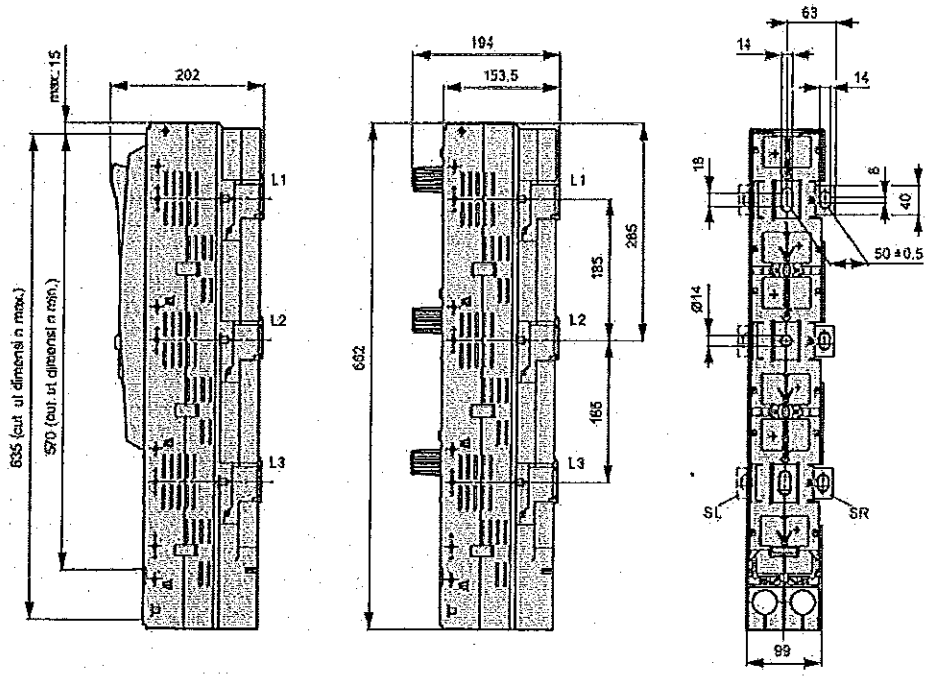
ТЕХНИЧЕСКО ОПИСАНИЕ
на
Вертикален разединител НН 1000А с триполюсно управление

I. Описание

Триполюсните разединители серия SLT-3S са произведени от фирма Jean Muller и са предназначени за включване, изключване, разединяване на шинни системи. Те комбинират три еднополюсни разединителя в един корпус. SLT-3S са с вертикална конструкция с общо управление на полюсите и могат да бъдат включвани и изключвани под товар. Те са за директен монтаж върху събирателни шини с междуосово разстояние 185 mm.

Корпусът на SLT-3S е изработен от високоякостна стъклонапълнена пластмаса. Контактната система със сребърно покритие осигурява малки загуби, оптимални термични характеристики и висока комутационна способност. Тоководещите части остават недостъпни и след премахване на горната част, благодарение на защитните капаци с вградени дъгогасителни камери оставащи в основата.

II. Размери



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РЕФ. № PPD 15-042

"Вертикален разединител НН 1000 А, с триполюсно управление"

Приложение № 3

ЕЛЕКТРОГЕД
СОФИЯ
ОДА

KEMA

CCA
CENELEC CERTIFICATION AGREEMENT
ACCORD DE CERTIFICATION DU CENELEC
CENELEC-ZERTIFIZIERUNGS-ABKOMMEN

Ref.no. NTR-NL 4744

NOTIFICATION OF TEST RESULTS

Product	fuse-switch-disconnectors
Tested by request of	Jean Müller GmbH, Friedrichstrasse 21,
	D-65343 Eltville am Rhein, Germany
Manufactured at (name and place)	Jean Müller GmbH, Friedrichstrasse 21,
	D-65343 Eltville am Rhein, Germany
Rating and principal characteristics	Ui 1000V, Ith 722 A/1000 A
Pre-licence factory inspection carried out by	VDE
Trade mark (if any)	JEAN MÜLLER
Model/Type Ref.	SL 3-3x/1000 and SL 3-3x3/1000
Additional information (if any)	
A sample of product has been tested and found to be in conformity with the current HD/EN and equivalent national standard, (number and edition)	EN 60947-3:1999
as shown in the Test Report (ref.No.)	2001980.54 (36 pages)

This Notification of Test Results is the result of testing a sample of the product submitted, in accordance with the provisions of the relevant specific standard.

This Notification of Test Results has been established by a body which participates in the CENELEC Certification Agreement (CCA) of 11th September 1973 as amended on 29th March 1983. Any other body participating in the CCA will take this Notification as a basis for granting a national mark of conformity or a national approval as specified in the CCA, as long as the standard referred to above is still in force in the country of that body.

N.V. KEMA

Arnhem

Date: December 6, 2000

Internal ref: HLS/Sco

Signature:

B.T.M. Holtus

N.V. KEMA
Utrechtseweg 310, 6812 AR Arnhem
P.O. Box 9035, 6800 ET Arnhem
The Netherlands
Telephone +31 26 3 56 28 50
Telefax +31 26 3 51 49 22

KEMA

TEST REPORT

EN 60 947-3

Low-voltage switchgear and controlgear
Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units

Report

Reference No. ..... : *2001980.54*

Tested by (+ signature) ..... : *H.L. Schendstok*

Approved by (+ signature) ..... : *L.J.W. van Megen*

Date of issue ..... : *2000-11-30*

Contents ..... : *36* pages

..... :

This report is based on a blank test report that was prepared by KEMA using information obtained from the TRF originator (see below).

Testing laboratory

Name ..... : KEMA Registered Quality B.V.

Address ..... : Utrechtseweg 310, 6812 AR Arnhem, The Netherlands

Testing location ..... : as above *and*

..... : *Holec Laagspanning B.V., Hengelo, The Netherlands*
All tests were observed by compiler

Client

Name ..... : *Jean Müller GmbH*

Address ..... : *Friedrichstrasse 21*

..... : *D-65343 ELTVILLE am Rhein, Germany*

Test specification

Standard ..... : EN 60 947-3:99

Test procedure ..... : CCA-scheme

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

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

..... :

Test Report Form/blank test report

Test Report Form No. ..... : 60947-3B/98-09

TRF originator ..... : KEMA

Master TRF ..... : dated 98-05

Test item

Description ..... : *fuse-switch-disconnector*

Trademark ..... : *Jean Müller*

Model and/or type reference ..... : *SL 3-3x/1000 and SL 3-3x3/1000*

Manufacturer ..... : *Jean Müller GmbH, Eltville am Rhein, Germany*

Rating(s)	*UI 1000 V, Ith 722 A / 1000 A*
Particulars: test item vs. test requirements	
- method of operation	*dependent manual operation*
- switching positions	*2 (on and off)*
- number of poles	*3-poles*
- kind of current	*AC*
- number of phases	*3*
- rated frequency (Hz)	*50 Hz*
- number of positions of the main contacts	*2 (on and off)*
Rated and limiting values, main circuit	
- rated operational voltage Ue (V)	*400 V, 500 V and 690 V*
- rated insulation voltage Ui (V)	*1000 V*
- rated impulse withstand voltage Uimp (kV)	*12 kV*
- conventional free air thermal current Ith (A)	*fuse: 722 A* *disconnect knife: 1000 A*
- conventional enclosed thermal current Ithe (A)	
- rated operational current Ie (A)	*fuse: 722 A* *disconnect knife: 1000 A*
- rated uninterrupted current Iu (A)	*fuse: 722 A* *disconnect knife: 1000 A*
- utilization category	*with disconnect knife:* *AC-21B 630 A 690 V* *AC-22B 1000 A 400 V* *AC-22B 800 A 500 V* *with fuse:* *AC-21B 630 A 690 V* *AC-22B 722 A 400 V* *AC-22B 630 A 500 V*
Short-circuit characteristic	
- rated short-time withstand current Icw (kA)	-
- rated short-time making capacity Icm (kA)	-
- rated conditional short-circuit current	*50 kA at 400 V*
Rated and limiting values, auxiliary circuits	*N*
- rated operational voltage (V)	
- rated frequency (Hz)	

- number of circuits	:
- number and kind of contact elements	:
Co-ordination of short-circuit protective devices	:
- kind of protective device	: *fuse-link, M3gTr722 NH3 500 kVA (722 A)*

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

Testing	
Date of receipt of test item	: *2000-02-24*
Date(s) of performance of test	: *2000-03 and 2000-05*
	:

General remarks

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

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

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

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

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

The making and breaking tests and short-circuit tests were carried out with a metallic screen placed at 165 mm at the top and 150 mm from the side of the fuse-switch-disconnector, with the cable terminals at the top.

The fuse-switch-disconnector type SL 3-3x/1000 were tested as follows:

Test sequence I and II: tests were done on phase L2, the load circuit was connected to phase L2, phases L1 and L3 were connected to the supply.

Test sequence IV: tests were done with a 3-phase supply, in the 'O-test' the load circuit was connected to all phases, in the 'CO-test' the load circuit was connected to L1 and L2.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОМ СОФИЯ

Copy of marking plate

JEAN MULLER CE
IEC/EN 60947-3 50Hz
400V -1000A - AC-22B
KEMA KEUR
max. 1000A 51W
SL3-3X3/1000 L3021300
TM3-1000A NH3-722A

JEAN MULLER CE
IEC/EN 60947-3 50Hz
400V -1000A - AC-22B
KEMA KEUR
max. 1000A 51W
SL3-3X/1000 L3921300
TM3-1000A NH3-722A

ВЯРНО С ОРИГИНАЛА
ЕЛЕКТРОГЕЦ СОФИЯ ООД

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
5.2	MARKING		
	Marking on equipment itself or on nameplate or nameplates attached to the equipment and legible from the front after mounting		
	- indication of the open and closed position	*main contacts are visible in the open position*	*P*
	- suitability for isolation		*P*
	- disconnectors AC-20 and DC-20 only: marked "Do not open under load"		*N*
	Marking on equipment not needed to be visible after mounting:		
	- manufacturer's name or trademark	*JEAN MÜLLER*	*P*
	- type designation or serial number	*SL 3-3x/1000 and SL 3-3x3/1000*	*P*
	- rated operational current	*1000 A AC-22B 400 V*	*P*
	- rated operational voltage	*400 V*	*P*
	- utilization category	*AC-22B*	*P*
	- rated frequency	*50* Hz	*P*
	- manufacturer's claim for compliance with IEC 60 947-3	*IEC/EN 60947-3*	*P*
	- degree of protection	IP	*N*
	Marking on fuse-combination units:		
	- fuse type	*NH3-722A*	*P*
	- maximum rated current	*722* A	*P*
	- power loss of the fuse-link	*51 W*	*P*
	Identification of terminals:		
	- line terminals	*immaterial*	*P*
	- load terminals	*L1, L2, L3*	*P*
	- neutral pole terminal		*N*
	- protective earth terminal		*N*
	Data in the manufacturer's published information:		
	- rated insulation voltage	*1000* V	*P*
	- rated impulse withstand voltage for equipment suitable for isolation or when determined	*12* kV	*P*
	- pollution degree, if different from 3	*3*	*P*
	- rated duty	*uninterrupted duty*	

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- rated short-time withstand current and duration		*N*
	- rated short-circuit making capacity		*N*
	- rated conditional short-circuit current	*50* kA	*P*

7.1	CONSTRUCTION		
7.1.2	Current-carrying parts and their connection	*no contact pressure through insulation material*	*P*
7.1.3	Clearances		
	Rated impulse withstand voltage	(see test sequence I)	*P*
	Creepage distances		—
	Pollution degree ....:	*3*	—
	Comparative tracking index (V) ....:	*600* V, *450* V, *375* V	—
	Material group ....:	*I, II, IIIa*	—
	Rated insulation voltage Ui (V) ....:	*1000* V	—
	Minimum creepage distances (mm) ....:	*16* mm	—
	Measured creepage distances (mm) ....:	> *16* mm	*P*
	In case Uimp is not indicated		*N*
7.1.4	Actuator		
7.1.4.1	Insulation		
7.1.4.2	Direction of movement	(IEC 447)	*P*
7.1.5	Indication of contact position		
7.1.5.1.	Indicating means	*by actuator*	*P*
7.1.5.2	Indication by the actuator	*all main contacts are visible in the open position*	*P*
7.1.6	Additional safety requirements for equipment suitable for isolation		
7.1.6.1	Additional constructional requirements for equipment suitable for isolation (Ue > 50 V):		
	- marking according to 5.2b		*P*
	- indication of the position of the contacts	*all main contacts are visible in the open position*	*P*
	- construction of the actuating mechanism		*P*
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm) ....:	*14* mm	
	- measured clearances (mm) ....:	> *14* mm	*P*
	- test Uimp across gap (kV) ....:	*18,5* kV	*P*

ВЯРНО С ОРИГИНАЛА
ЕЛЕКТРОГЕЦ КЕМАФИЯ ООД

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
7.1.6.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		*N*
	auxiliary switch shall be rated according to IEC 60 947-5-1		
	minimum time interval between opening of the contacts of the auxiliary contact and the contacts of the main poles (ms) .....:		–
	measured time interval (ms) .....:		–
—	During the closing operation the contacts of the auxiliary switch shall close after or simultaneously with the contacts of the main poles		
7.1.6.3	Supplementary requirements for equipment provided with means for padlocking the open position:		*N*
	the locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed		
	test force F applied to the actuator in an attempt to operate to the closed position (N) .....:		–
	rated impulse withstand voltage (kV) .....:		–
	test Ulmp on open main contacts at the test force		
7.1.7	Terminals		
7.1.7.1	All parts of terminals which maintain contact and carry current shall be of metal having adequate mechanical strength	(see 8.2.4 below)	*P*
	Terminal connections shall be such that necessary contact pressure is maintained	(see 8.2.4 below)	*P*
	Terminals shall be so constructed that the conductor is clamped between suitable surfaces without damage to the conductor and terminal	(see 8.2.4 below)	*P*
	Terminal shall not allow the conductor to be displaced or to be displaced themselves in a manner detrimental to the operator of equipment and the insulation voltage shall not be reduced below the rated value	(see 8.2.4 below)	*P*
8.2.4	Mechanical properties of terminals		*P*
	Mechanical strength of terminals		
	maximum cross-sectional area of conductor (mm^2) .....:	*(cable lugs or busbars)*	–
	diameter of thread (mm) .....:	*M12*	–
	torque (Nm) .....:	*40 Nm x 110% = 44 Nm*	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	5 times on 2 separate clamping units		P
	Testing for damage to and accidental loosening of conductor (flexion test)		N
	conductor of the smallest cross-sectional area (mm²) ..... :		—
	number of conductor of the smallest cross section ..... :		—
	diameter of bushing hole (mm) ..... :		—
	height between the equipment and the platen .. :		—
	mass at the conductor(s) (kg) ..... :		—
	136 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N
	Pull-out test		N
	force (N) ..... :		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		N
	conductor of the largest cross-sectional area (mm²) ..... :		—
	number of conductor of the largest cross section ..... :		—
	diameter of bushing hole (mm) ..... :		—
	height between the equipment and the platen .. :		—
	mass at the conductor(s) (kg) ..... :		—
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N
	Pull-out test		N
	force (N) ..... :		—
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		N
	conductor of the largest and smallest cross-sectional area (mm²) ..... :		—
	number of conductor of the smallest cross section, number of conductor of the largest cross section ..... :		—
	diameter of bushing hole (mm) ..... :		—
	height between the equipment and the platen .. :		—
	mass at the conductor(s) (kg) ..... :		—

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		*N*
	Pull-out test		*N*
	force (N) ..... :		–
	1 min, the conductor shall neither slip out of the terminal nor break near the clamping unit		*N*
7.1.7.2	Connection capacity		
	type of conductors ..... :	*(cable lugs or busbars)*	–
	minimum cross-sectional area of conductor (mm^2) ..... :		–
	maximum cross-sectional area of conductor (mm^2) ..... :		–
	number of conductors simultaneously connectable to the terminal ..... :		–
7.1.7.3	Connection		
	terminals for connection to external conductors shall be readily accessible during installation		*P*
	clamping screws and nuts shall not serve to fix any other component		*P*
7.1.7.4	Terminal identification and marking		
	terminal intended exclusively for the neutral conductor		*N*
	protective earth terminal		*N*
	other terminals	*L1, L2, L3*	*P*
7.1.8	Additional requirements for equipment provided with a neutral pole		*N*
	Marking of neutral pole		*N*
	The switched neutral pole shall not break before and shall not make after the other poles		*N*
	Conventional thermal current of neutral pole		*N*
7.1.9	Provisions for protective earthing		*N*
7.1.9.1	The exposed conductive parts shall be electrically interconnected and connected to a protective earth terminal		*N*
7.1.9.2	The protective earth terminal shall be readily accessible		*N*
	The protective earth terminal shall be suitably protected against corrosion		*N*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	The electrical continuity between the exposed conductive parts of the protective earth terminal and the metal sheathing of connecting conductors		N
	The protective earth terminal shall have no other functions		N
7.1.9.3	Protective earth terminal marking and identification		N
7.1.10	Enclosure for equipment		N
7.1.10.1	Design		N
	The enclosure, when it is opened: all parts requiring access for installation and maintenance are readily accessible		N
	Sufficient space shall be provided inside the enclosure		N
	The fixed parts of a metal enclosure shall be electrically connected to the other exposed conductive parts of the equipment and connected to a terminal which enables them to be earthed or connected to a protective conductor		N
	Under no circumstances shall a removable metal part of the enclosure be insulated from the part carrying the earth terminal when the removable part is in place		N
	The removable parts of the enclosure shall be firmly secured to the fixed parts by a device such that they cannot be accidentally loosened or detached owing to the effects of operation of the equipment or vibrations		N
	When an enclosure is so designed as to allow the covers to be opened without the use of tools, means shall be provided to prevent loss of the fastening devices		N
	If the enclosure is used for mounting push-buttons, it shall not be possible to remove the buttons from the outside of the enclosure		N
7.1.10.2	Insulation		N
	If, in order to prevent accidental contact between a metallic enclosure and live parts, the enclosure is partly or completely lined with insulating material, then this lining shall be securely fixed to the enclosure		N
7.1.11	Degree of protection of enclosed equipment		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Degree of protection ..... :	IP ..	*N*

8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS		
8.3.3.1	Temperature-rise		
	ambient temperature 10-40 °C ..... :	*23* °C	—
	test enclosure W x H x D (mm x mm x mm) .... :	-	—
	material of enclosure ..... :	-	—
	Main circuits, test conditions:		
	- conventional thermal current Ith (A) ..... :	*722 A with fuse-links* *1000 A with disconnect knives*	—
	- conventional enclosed thermal current Ithe (A) :		—
	- cable/busbar cross-section (mm²) / (mm) ..... :	*fuse-links: 50 x 10 mm busbar and 2 x 240 mm² cable* *disconnect knives: 60 x 10 mm horizontal busbar and 2 x 60 x 5 mm outgoing terminals*	—
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark ..... :	*Jean Müller*	—
	- manufacturer's model or type reference ..... :	*M3gTr722 NH3*	—
	- rated current (A) ..... :	*500 kVA (722 A)*	—
	- power loss (W) ..... :	*51 W*	—
	- rated breaking capacity (kA) ..... :	*100* kA	—
	Temperature-rise	(see appended table)	*P*
	Auxiliary circuits: temperature rise of connecting terminals (K) ..... :		*N*
	idem, requirement (K) ..... :	≤	—
	rated operation current (A) ..... :		—
	cross-section (mm²) ..... :		—
8.3.3.2	Test of dielectric properties, impulse withstand voltage (Uimp indicated):		
	- rated impulse withstand voltage (kV) ..... :	*12* kV	—
	- test Uimp main circuits (kV) ..... :	*14,8* kV	*P*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- test Uimp auxiliary circuits (kV) .....:		*N*
	- test Uimp on open main contacts (equipment suitable for isolating) (kV) .....:	*18,5* kV	*P*
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		*N*
	- rated insulation voltage (V) .....:		—
	- main circuits, test voltage for 1 min (V) .....:		
	- control and auxiliary circuits, test voltage for 1 min (V) .....:		

8.3.3.3	Making and breaking capacity	*fuse-switch-disconnector type SI. 3-3x3/1000*	
	utilization category .....:	*AC-22B*	—
	rated operational voltage Ue (V) .....:	*400* V	—
	rated operational current Ie (A) or power (kW) ..:	*1000* A	—
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: *421 V* L2: *421 V* L3: *420 V*	—
	- test current I/Ie = (A) .....:	L1: *3800 A* L2: *3830 A* L3: *3860 A*	—
	- power factor/time constant .....:	L1: *0,64* L2: *0,64* L3: *0,64*	—
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: L2: L3:	—
	- test current I/Ie = (A) .....:	L1: L2: L3:	—
	- power factor .....:	L1: L2: L3:	—
	transient recovery voltage (V) .....:	L1: *421 V* L2: *421 V* L3: *420 V*	—
	current duration (ms) .....:	*440* ms	—
	time interval between operations .....:	*180 s*	—

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Number of make/break or make and break operations .....:	*5 x make/break*	*P*
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz) .....:	*86,3* kHz	–
	Measured oscillatory frequency (kHz) .....:	L1: *87,1 kHz* L2: *87,1 kHz* L3: *87,1 kHz*	*P*
	Factor y .....:	L1: *1,11* L2: *1,11* L3: *1,11*	*P*
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		*P*
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		*P*
8.3.3.4	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	*2000* V	–
	No flashover or breakdown		*P*
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		*N*
	Leakage current (other utilization categories) ≤ 2 mA) .....:	*< 5 µA*	*P*
	test voltage (1,1 Ue) (V) .....:	*440 V*	–
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*fuse-links: 38 K – 60 K* *disconnect knives:* *52 K – 80 K*	*P*
	conductor cross-sectional area (mm²) .....:	*fuse-links: 50 x 10 mm busbar and 2 x 240 mm² cable* *disconnect knives:* *60 x 10 mm busbar and 4 x 150 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 722 A* *disconnect knives 1000 A*	–
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) .....:	*one-hand operated (e)*	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	actuating force for opening (N) ..... :	*215* N	–
	test force with blocked main contacts (N) ..... :	*400* N	–
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts ..... :		*N*
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		*P*

8.3.3.3	Making and breaking capacity	*fuse-switch-disconnector type SL 3-3x/1000*	
	utilization category ..... :	*AC-22B*	–
	rated operational voltage Ue (V) ..... :	*400* V	–
	rated operational current Ie (A) or power (kW) .. :	*1000* A	–
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) ..... :	L1: L2: *426 V* L3:	–
	- test current I/Ie = (A) ..... :	L1: L2: *3768 A* L3:	–
	- power factor/time constant ..... :	L1: L2: *0,64* L3:	–
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) ..... :	L1: L2: L3:	–
	- test current I/Ie = (A) ..... :	L1: L2: L3:	–
	- power factor ..... :	L1: L2: L3:	–
	transient recovery voltage (V) ..... :	L1: L2: *426 V* L3:	–
	current duration (ms) ..... :	*600* ms	–
	time interval between operations ..... :	*180 s*	–
	Number of make/break or make and break operations ..... :	*5 x make/break*	*P*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz) ..... :	*85,9* kHz	–
	Measured oscillatory frequency (kHz) ..... :	L1: L2: *89,6 kHz* L3:	*P*
	Factor γ ..... :	L1: L2: *1,11* L3:	*P*
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		*P*
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		*P*
8.3.3.4	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ..... :	*2000* V	–
	No flashover or breakdown		*P*
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA ..... :		*N*
	Leakage current (other utilization categories) ≤ 2 mA) ..... :	*4,0 μA – 8,3 μA*	*P*
	test voltage (1,1 Ue) (V) ..... :	*440 V, tested with 800 V*	–
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K ..... :	*fuse-links: 49 K – 72 K* *disconnect knives:* *51 K – 74 K*	*P*
	conductor cross-sectional area (mm²) ..... :	*fuse-links: 50 x 10 mm busbar and 2 x 240 mm² cable* *disconnect knives:* *60 x 10 mm horizontal busbar and 2 x 60 x 5 mm outgoing terminals*	–
	test current Ie (A) ..... :	*fuse-links: 722 A* *disconnect knives 1000 A*	–
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) ..... :	*one-hand operated (e)*	–
	actuating force for opening (N) ..... :	*181* N	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	test force with blocked main contacts (N) .....:	*400* N	—
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts .....:		*N*
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		*P*

8.3.3.3	Making and breaking capacity	*fuse-switch-disconnector type SL 3-3x3/1000*	
	utilization category .....:	*AC-21B*	—
	rated operational voltage Ue (V) .....:	*690* V	—
	rated operational current Ie (A) or power (kW) ..:	*630* A	—
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: *747 V* L2: *747 V* L3: *747 V*	—
	- test current I/Ie = (A) .....:	L1: *974 A* L2: *986 A* L3: *985 A*	—
	- power factor/time constant .....:	L1: *0,95* L2: *0,95* L3: *0,95*	—
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: L2: L3:	—
	- test current I/Ie = (A) .....:	L1: L2: L3:	—
	- power factor .....:	L1: L2: L3:	—
	transient recovery voltage (V) .....:	L1: *741 V* L2: *747 V* L3: *748 V*	—
	current duration (ms) .....:	*460* ms	—
	time interval between operations .....:	*60 s*	—
	Number of make/break or make and break operations .....:	*5 x make/break*	*P*
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	oscillatory frequency (kHz) .....:	kHz	—
	Measured oscillatory frequency (kHz) .....:	L1: L2: L3:	N
	Factor γ .....:	L1: L2: L3:	N
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		P
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		P
8.3.3.4	Dielectric verification		—
	test voltage (2 Ui) for 1 min (V) .....:	2000 V	—
	No flashover or breakdown		P
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		N
	Leakage current (other utilization categories) ≤ 2 mA) .....:	4,6 μA – 8,2 μA	P
	test voltage (1,1 Ue) (V) .....:	759 V, tested with 800 V	—
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	fuse-links: 57 K – 74 K	P
	conductor cross-sectional area (mm²) .....:	fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable	—
	test current Ie (A) .....:	fuse-links: 630 A	—
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) .....:	one-hand operated (e)	—
	actuating force for opening (N) .....:	215 N	—
	test force with blocked main contacts (N) .....:	400 N	—
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts .....:		N
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.3.3	Making and breaking capacity	*fuse-switch-disconnector type SL 3-3x/1000*	
	utilization category .....:	*AC-21B*	–
	rated operational voltage Ue (V) .....:	*690* V	–
	rated operational current Ie (A) or power (kW) ..:	*630* A	–
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: L2: *747 V* L3:	–
	- test current I/Ie = (A) .....:	L1: L2: *991 A* L3:	–
	- power factor/time constant .....:	L1: L2: *0,94* L3:	–
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: L2: L3:	–
	- test current I/Ie = (A) .....:	L1: L2: L3:	–
	- power factor .....:	L1: L2: L3:	–
	transient recovery voltage (V) .....:	L1: L2: *744 V* L3:	–
	current duration (ms) .....:	*360* ms	–
	time interval between operations .....:	*60 s*	–
	Number of make/break or make and break operations .....:	*5 x make/break*	*P*
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz) .....:	kHz	–
	Measured oscillatory frequency (kHz) .....:	L1: L2: L3:	*N*
	Factor γ .....:	L1: L2: L3:	*N*

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Clause	Requirement – Test	Result - Remark	Verdict
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		P
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		P
8.3.3.4	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	2000 V	–
	No flashover or breakdown		P
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		N
	Leakage current (other utilization categories) ≤ 2 mA) .....:	4,4 µA – 8,1 µA	P
	test voltage (1,1 Ue) (V) .....:	759 V, tested with 800 V	–
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	fuse-links: 58 K – 73 K	P
	conductor cross-sectional area (mm²) .....:	fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable	–
	test current Ie (A) .....:	fuse-links: 630 A	–
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) .....:	one-hand operated (e)	–
	actuating force for opening (N) .....:	181 N	–
	test force with blocked main contacts (N) .....:	400 N	–
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts .....:		N
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

8.3.3.3	Making and breaking capacity	fuse-switch-disconnector type SL 3-3x3/1000	
	utilization category .....:	AC-22B	–
	rated operational voltage Ue (V) .....:	500 V	–
	rated operational current Ie (A) or power (kW) ..:	800 A	–
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- test voltage U/Ue = 1,05 (V) .....:	L1: *528 V* L2: *532 V* L3: *533 V*	–
	- test current I/Ie = (A) .....:	L1: *2466 A* L2: *2456 A* L3: *2410 A*	–
	- power factor/time constant .....:	L1: *0,65* L2: *0,65* L3: *0,65*	–
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) .....:	L1: L2: L3:	–
	- test current I/Ie = (A) .....:	L1: L2: L3:	–
	- power factor .....:	L1: L2: L3:	–
	transient recovery voltage (V) .....:	L1: *528 V* L2: *532 V* L3: *533 V*	–
	current duration (ms) .....:	*360* ms	–
	time interval between operations .....:	*60 s*	–
	Number of make/break or make and break operations .....:	*5 x make/break*	*P*
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz) .....:	*65,75* kHz	–
	Measured oscillatory frequency (kHz) .....:	L1: *66,7 kHz* L2: *67,6 kHz* L3: *65,8 kHz*	*P*
	Factor y .....:	L1: *1,12* L2: *1,11* L3: *1,11*	*P*
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		*P*
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		*P*
8.3.3.4	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	*2000* V	–
	No flashover or breakdown		*P*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		N
	Leakage current (other utilization categories) ≤ 2 mA) .....:	*3,9 µA – 8,4 µA*	P
	test voltage (1,1 Ue) (V) .....:	*550 V, tested with 800 V*	–
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*fuse-links: 61 K – 78 K* *disconnect knives: 48 K – 61 K*	P
	conductor cross-sectional area (mm²) .....:	*fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable* *disconnect knives: 50 x 10 mm busbar and 2 x 240 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 630 A* *disconnect knives 800 A*	–
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) .....:	*one-hand operated (e)*	–
	actuating force for opening (N) .....:	*215* N	–
	test force with blocked main contacts (N) .....:	*400* N	–
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts .....:		N
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

8.3.3.3	Making and breaking capacity	*fuse-switch-disconnector type SL 3-3x/1000*	
	utilization category .....:	*AC-22B*	–
	rated operational voltage Ue (V) .....:	*500* V	–
	rated operational current Ie (A) or power (kW) ..:	*800* A	–
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- test voltage U/Ue = 1,05 (V) ..... :	L1: L2: *528 V* L3:	–
	- test current I/Ie = (A) ..... :	L1: L2: *2414 A* L3:	–
	- power factor/time constant ..... :	L1: L2: *0,66* L3:	–
	Conditions, break operation AC-23A and AC-23B only:		
	- test voltage U/Ue = 1,05 (V) ..... :	L1: L2: L3:	–
	- test current I/Ie = (A) ..... :	L1: L2: L3:	–
	- power factor ..... :	L1: L2: L3:	–
	transient recovery voltage (V) ..... :	L1: L2: *532 V* L3:	–
	current duration (ms) ..... :	*480* ms	–
	time interval between operations ..... :	*60 s*	–
	Number of make/break or make and break operations ..... :	*5 x make/break*	*P*
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz) ..... :	*65,75* kHz	–
	Measured oscillatory frequency (kHz) ..... :	L1: L2: *66,7 kHz* L3:	*P*
	Factor γ ..... :	L1: L2: *1,12* L3:	*P*
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		*P*
8.3.3.3.6	Condition of the equipment after making and breaking capacity tests		*P*
8.3.3.4	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ..... :	*2000* V	–
	No flashover or breakdown		*P*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.3.5	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		*N*
	Leakage current (other utilization categories) ≤ 2 mA) .....:	*4,7 µA – 8,3 µA*	*P*
	test voltage (1,1 Ue) (V) .....:	*550 V, tested with 800 V*	–
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*fuse-links: 55 K – 73 K* *disconnect knives: 52 K – 60 K*	*P*
	conductor cross-sectional area (mm²) .....:	*fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable* *disconnect knives: 50 x 10 mm busbar and 2 x 240 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 630 A* *disconnect knives 800 A*	–
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and Ue > 50 V only)		
	actuator type (fig.) .....:	*one-hand operated (e)*	–
	actuating force for opening (N) .....:	*181* N	–
	test force with blocked main contacts (N) .....:	*400* N	–
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts .....:		*N*
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		*P*

8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY ***fuse-switch-disconnector type SL3-3x/1000***		
8.3.4.1	Operational performance test		
	utilization category .....:	*AC-22B*	–
	rated operational voltage (V) .....:	*400 V*	–
	rated operational current (A) .....:	*1000 A*	–
	Test conditions electrical operation cycles:		

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Clause	Requirement – Test	Result - Remark	Verdict
	test voltage (V) ..... :	L1: - L2: *413 V* L3: -	—
	test current (A) ..... :	L1: - L2: *1003 A* L3: -	—
	power factor/time constant ..... :	L1: - L2: *0,81* L3: -	—
	Number of cycles with current ..... :	*100*	*P*
	Number of cycles without current ..... :	*500*	*P*
	First test sequence (with/without current) ..... :	*with current*	—
	Second test sequence (with/without current) ... :	*without current*	—
	time interval between first and second test sequence ..... :	*1 hour*	—
8.3.4.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ..... :	*2000* V	—
	No breakdown or flashover		*P*
8.3.4.3	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA ..... :		*N*
	Leakage current (other utilization categories) ≤ 2 mA ..... :	*5,7* µA – *7,1* µA	*P*
	test voltage (1,1 Ue) (V) ..... :	*440 V, tested with 800 V*	—
8.3.4.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K ..... :	*fuse-links: 59 K – 71 K* *disconnect knives:* *47 K – 57 K*	*P*
	conductor cross-sectional area (mm²) ..... :	*fuse-links: 50 x 10 mm busbar and 2 x 240 mm² cable* *disconnect knives: 60 x 10 mm horizontal busbar and 2 x 60 x 5 mm outgoing terminals*	—
	test current Ie (A) ..... :	*fuse-links: 722 A* *disconnect knives: 1000 A*	—

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY *fuse-switch-disconnector type SL3-3x/1000*		
8.3.4.1	Operational performance test		
	utilization category ..... :	*AC-22B*	—
	rated operational voltage (V) ..... :	*500 V*	—
	rated operational current (A) ..... :	*800 A*	—
	Test conditions electrical operation cycles:		
	test voltage (V) ..... :	L1: - L2: *510 V* L3: -	—
	test current (A) ..... :	L1: - L2: *814 A* L3: -	—
	power factor/time constant ..... :	L1: - L2: *0,80* L3: -	—
	Number of cycles with current ..... :	*200*	*P*
	Number of cycles without current ..... :	*800*	*P*
	First test sequence (with/without current) ..... :	*with current*	—
	Second test sequence (with/without current) ... :	*without current*	—
	time interval between first and second test sequence ..... :	*1 hour*	—
8.3.4.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ..... :	*2000* V	—
	No breakdown or flashover		*P*
8.3.4.3	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA ..... :		*N*
	Leakage current (other utilization categories) ≤ 2 mA ..... :	*4,8* µA – *7,3* µA	*P*
	test voltage (1,1 Ue) (V) ..... :	*550 V, tested with 800 V*	—
8.3.4.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K ..... :	*fuse-links: 56 K – 72 K* *disconnect knives:* *45 K – 60 K*	*P*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	conductor cross-sectional area (mm²) .....:	*fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable* *disconnect knives: 50 x 10 mm busbar and 2 x 240 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 630 A* *disconnect knives: 800 A*	–

8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY *fuse-switch-disconnector type SL3-3x/1000*		
8.3.4.1	Operational performance test		
	utilization category .....:	*AC-21B*	–
	rated operational voltage (V) .....:	*690 V*	–
	rated operational current (A) .....:	*630 A*	–
	Test conditions electrical operation cycles:		
	test voltage (V) .....:	L1: - L2: *689 V* L3: -	–
	test current (A) .....:	L1: - L2: *632 A* L3: -	–
	power factor/time constant .....:	L1: - L2: *0,95* L3: -	–
	Number of cycles with current .....:	*200*	*P*
	Number of cycles without current .....:	*800*	*P*
	First test sequence (with/without current) .....:	*with current*	–
	Second test sequence (with/without current) ...:	*without current*	–
	time interval between first and second test sequence .....:	*1 hour*	–
8.3.4.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	*2000* V	–
	No breakdown or flashover		*P*
8.3.4.3	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		*N*

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Leakage current (other utilization categories) ≤ 2 mA ..... :	*5,6 µA – 7,8 µA*	*P*
	test voltage (1,1 Ue) (V) ..... :	*759 V, tested with 800 V*	–
8.3.4.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K ..... :	*fuse-links: 55 K – 76 K*	*P*
	conductor cross-sectional area (mm²) ..... :	*fuse-links: 40 x 10 mm busbar and 2 x 185 mm² cable*	–
	test current Ie (A) ..... :	*fuse-links: 630 A*	–

8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY *fuse-switch-disconnector type SL3-3x3/1000 only without current*		
8.3.4.1	Operational performance test		
	utilization category ..... :	*AC-22B*	–
	rated operational voltage (V) ..... :	*400 V*	–
	rated operational current (A) ..... :	*1000 A*	–
	Test conditions electrical operation cycles:		
	test voltage (V) ..... :	L1: - L2: L3: -	–
	test current (A) ..... :	L1: - L2: L3: -	–
	power factor/time constant ..... :	L1: - L2: L3: -	–
	Number of cycles with current ..... :		*P*
	Number of cycles without current ..... :	*500 + 100*	*P*
	First test sequence (with/without current) ..... :	*without current*	–
	Second test sequence (with/without current) ... :		–
	time interval between first and second test sequence ..... :		–
8.3.4.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ..... :	*2000 V*	–
	No breakdown or flashover		*P*
8.3.4.3	Leakage current		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		*N*
	Leakage current (other utilization categories) ≤ 2 mA .....:	*4,8* µA – *7,3* µA	*P*
	test voltage (1,1 Ue) (V) .....:	*440 V, tested with 800 V*	–
8.3.4.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*fuse-links: 51 K – 68 K* *disconnect knives: 51 K – 74 K*	*P*
	conductor cross-sectional area (mm²) .....:	*fuse-links: 50 x 10 mm busbar and 2 x 240 mm² cable* *disconnect knives: 60 x 10 mm horizontal busbar and 2 x 60 x 5 mm outgoing terminals*	–
	test current Ie (A) .....:	*fuse-links: 722 A* *disconnect knives: 1000 A*	–

8.3.5	TEST SEQUENCE III: SHORT-CIRCUIT PERFORMANCE CAPABILITY		*N*
8.3.5.1	Short-time withstand current test		
	Rated short-time withstand current Icw (A) .....:		
	test voltage (V) .....:	L1: L2: L3:	–
	r.m.s. test current (A) .....:	L1: L2: L3:	–
	peak test current (A) .....:	L1: L2: L3:	–
	power factor/time constant .....:	L1: L2: L3:	–
	test duration (s) .....:		–
	Equivalent with .....:		
8.3.5.1.5	Behaviour of the equipment during the test		

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.5.1.6	Conditions of the equipment after the test		
8.3.5.2	Short-circuit making capacity		
	Rated short-circuit making capacity Icm (A) ....:		
	test voltage (V) ....:	L1: L2: L3:	—
	r.m.s. test current (A) ....:	L1: L2: L3:	—
	peak test current (A) ....:	L1: L2: L3:	—
	power factor/time constant ....:	L1: L2: L3:	—
	current duration (s) ....:		—
	number of making cycles ....:		—
8.3.5.2.5	Behaviour of the equipment during the test		
8.3.5.2.6	Conditions of the equipment after the test		
8.3.5.3	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) ....:		—
	No flashover or breakdown		
8.3.5.4	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA ....:		
	Leakage current (other utilization categories) ≤ 2,0 mA ....:		
	test voltage (1,1 Ue) (V) ....:		—
8.3.5.5	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K ....:		
	cross-sectional area (mm²) ....:		—
	test current Ie (A) ....:		—

8.3.6	TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT *fuse-switch-disconnector type SL 3-3x3/1000*	
	Protective device details:	

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- manufacturer's name, trademark or identification mark :	*Jean Müller*	–
	- manufacturer's model or type reference :	*M3gTr722 NH3*	–
	- rated voltage (V) :	*400* V	–
	- rated current (A) :	*500 kVA (722 A)*	–
	- rated breaking capacity (kA) :	*100* kA	–
8.3.6.2	Fuse protected short-circuit withstand		
	test voltage (1,05 Ue) (V) :	L1: *420* V L2: *420* V L3: *420* V	–
	test current (kA) :	L1: *50,4* kA L2: *51,8* kA L3: *50,0* kA	–
	rated frequency (Hz) :	*50* Hz	–
	power factor :	*0,22*	–
	Fuse protected short-circuit withstand		
	- max. let-through current (kA) :	L1: *40,4* kA L2: *48,8* kA L3: *40,4* kA	–
	- Joule integral I^2dt (A^2s) :	L1: *3690* kA^2s L2: *3970* kA^2s L3: *3710* kA^2s	–
	Fuse protected short-circuit making		
	- mean velocity of 15 manually under no-load conditions operations (m/s) :	*1,77* m/s	–
	- point at which the measurement is made :		
	- test speed during the fuse protected short-circuit making (m/s) :	*0,65* m/s	–
	- max. let-through current (kA) :	L1: *42,7* kA L2: *42,7* kA L3: *5,50* kA	–
	- Joule integral I^2dt (A^2s) :	L1: *3390* kA^2s L2: *3240* kA^2s L3: *88,2* kA^2s	–
8.3.6.2.5	Behaviour of the equipment during the test		P
8.3.6.2.6	Conditions of the equipment after the test		P
8.3.6.3	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) :	*2000* V	–
	No flashover or breakdown		P

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
8.3.6.4	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		
	Leakage current (other utilization categories) ≤ 2,0 mA .....:	*4,2* µA – *9,3* µA	*P*
	test voltage (1,1 Ue) (V) .....:	*440 V, tested with 800 V*	–
8.3.6.5	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*50* K – *69* K	*P*
	cross-sectional area (mm²) .....:	*50 x 10 mm busbar and 2 x 240 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 722 A*	–

8.3.6	TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT *fuse-switch-disconnector type SL 3-3x/1000*		
	Protective device details:		
	- manufacturer's name, trademark or identification mark .....:	*Jean Müller*	–
	- manufacturer's model or type reference .....:	*M3gTr722 NH3*	–
	- rated voltage (V) .....:	*400* V	–
	- rated current (A) .....:	*722 A*	–
	- rated breaking capacity (kA) .....:	*100* kA	–
8.3.6.2	Fuse protected short-circuit withstand		
	test voltage (1,05 Ue) (V) .....:	L1: *420* V L2: *420* V L3: *420* V	–
	test current (kA) .....:	L1: *50,4* kA L2: *51,8* kA L3: *50,0* kA	–
	rated frequency (Hz) .....:	*50* Hz	–
	power factor .....:	*0,22*	–
	Fuse protected short-circuit withstand		
	- max. let-through current (kA) .....:	L1: *38,1* kA L2: *50,2* kA L3: *38,1* kA	–
	- Joule integral I²dt (A²s) .....:	L1: *3840* kA²s L2: *4160* kA²s L3: *3300* kA²s	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	Fuse protected short-circuit making		
	- mean velocity of 15 manually under no-load conditions operations (m/s) .....:	*1,15* m/s	–
	- point at which the measurement is made .....:		–
	- test speed during the fuse protected short-circuit making (m/s) .....:	*0,65* m/s	–
	- max. let-through current (kA) .....:	L1: *39,7* kA L2: *39,7* kA L3:	–
	- Joule integral I^2dt (A^2s) .....:	L1: *2960* kA^2s L2: *2960* kA^2s L3:	–
8.3.6.2.5	Behaviour of the equipment during the test		*P*
8.3.6.2.6	Conditions of the equipment after the test		*P*
8.3.6.3	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	*2000* V	–
	No flashover or breakdown		*P*
8.3.6.4	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		
	Leakage current (other utilization categories) ≤ 2,0 mA .....:	*4,0* µA – *8,7* µA	*P*
	test voltage (1,1 Ue) (V) .....:	*440 V, tested with 800 V*	–
8.3.6.5	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K .....:	*51* K – *74* K	*P*
	cross-sectional area (mm^2) .....:	*50 x 10 mm busbar and* *2 x 240 mm^2 cable*	–
	test current Ie (A) .....:	*fuse-links: 722 A*	–

8.3.7	TEST SEQUENCE V: OVERLOAD PERFORMANCE CAPABILITY		
8.3.7.1	Overload test		
	ambient temperature 10-40 °C .....:	*23* °C	–
	test enclosure W x H x D (mm x mm x mm) ....:	-	–
	material of enclosure .....:		–
	test current 1,6 Ithe or 1,6 Ith (A) .....:	*1155 A*	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	cable/busbar cross-section (mm²) / (mm) .....:	*busbar 50 x 10 mm* *cable 2 x 240 mm²*	–
	Fuse-link details:		
	- manufacturer's name, trademark or identification mark .....:	*Jean Müller*	–
	- rated current (A) .....:	*500kVA (722 A)*	–
	- power loss (W) .....:	*51* W	–
	- rated breaking capacity (kA) .....:	*100* kA	–
	- time duration of the overload test (s) .....:	*1860 s*	–
	Within 3 min after the fuse(s) has(have) operated (or 1 h), the equipment shall be operated once, i.e. opened and closed		*P*
	The equipment shall not have undergo any impairment hindering such operation		*P*
8.3.7.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V) .....:	*2000* V	–
	No flashover or breakdown		*P*
8.3.7.3	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA .....:		
	Leakage current (other utilization categories) ≤ 2 mA) .....:	*5,9* µA – *7,4* µA	*P*
	test voltage (1,1 Ue) (V) .....:	*440 V, tested with 800 V*	–
8.3.7.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K (K) .....:	*53* K – *70* K	*P*
	cross-sectional area (mm²) .....:	*50 x 10 mm busbar and* *2 x 240 mm² cable*	–
	test current Ie (A) .....:	*fuse-links: 722 A*	–

EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict

	TABLE: temperature rise measurements *with fuse-links*		
temperature rise dT of part:	phase	dT (K)	required dT (K)
terminal to horizontal busbar system (line terminal)	*L1* *L2* *L3*	*48* *53* *62*	*70* *70* *70*
terminal to cable(s) (load terminal)	*L1* *L2* *L3*	*66* *66* *58*	*70* *70* *70*
internal busbar near insulation material	*L1*	*122*	*145*
actuator	-	*3*	*25*

	TABLE: temperature rise measurements *with contact knifes*		
temperature rise dT of part:	phase	dT (K)	required dT (K)
terminal to horizontal busbar system (line terminal)	*L1* *L2* *L3*	*53* *49* *47*	*70* *70* *70*
terminal to cable(s) (load terminal)	*L1* *L2* *L3*	*62* *64* *61*	*70* *70* *70*

Remarks

Additional test:

- Parts of insulation material necessary to retain current carrying parts were subjected to a glow-wire test according EN 60947-1, at 960 °C for the other insulation materials 650 °C.
These tests withstood the requirements.

description:

Type SL 3-3x/1000 : *fuse-switch-disconnector, 3-poles, switching pole after pole*

Type SL 3-3x3/1000 : *fuse-switch-disconnector, 3-poles, switching 3-poles*

СПИСЪК

на типовите изпитвания, проведени от независима изпитвателна лаборатория, за предлаганите вертикални разединители, както следва:

Марка: Jean Muller
Продукт: вертикален предпазител-разединители
Серия: SL3

5.2 Маркировка
7.1 Конструкция
8.3.3 Основни характеристики
8.3.3.1 Повишаване на температурата
8.3.3.2 Диелектрични свойства
8.3.3.3 Работна и гранична изключвателна възможност при късо съединение
8.3.3.4 Проверка на диелектричните свойства
8.3.3.5 Ток на утечка
8.3.3.6 Проверка при повишаване на температурата
8.3.3.7 Експлоатационна възможност на задвижващия механизъм
8.3.4 Работни характеристики
8.3.4.1 Изпитване на експлоатационната възможност
8.3.4.2 Проверка на диелектричните свойства на прекъсвач-разединителя
8.3.4.3 Ток на утечка
8.3.4.4 Проверка при повишаване на температурата
8.3.5 Характеристики при късо съединение
8.3.5.1 Издържан импулсен ток
8.3.5.2 Работна изключвателна възможност при късо съединение
8.3.5.3 Проверка на диелектричните свойства
8.3.5.4 Ток на утечка
8.3.5.5 Проверка при повишаване на температурата
8.3.6 Условен ток на късо съединение
8.3.6.2 Издържан ток на късо съединение със стопяем предпазител
8.3.6.3 Проверка на диелектричните свойства
8.3.6.4 Ток на утечка
8.3.6.5 Проверка при повишаване на температурата
8.3.7 Характеристики при претоварване
8.3.7.1 Изпитване на претоварване
8.3.7.2 Проверка на диелектричните свойства
8.3.7.3 Ток на утечка
8.3.7.4 Проверка при повишаване на температурата

ЕЛЕКТРОТЕСТ ЕООД СОФИЯ

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

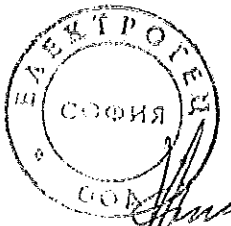
с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Вертикален разединител НН 1000 А, с триполюсно управление"

Приложение № 4



Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

of **DEKRA Certification B.V.**

This annex is valid from: **29-04-2015** to **01-03-2018** Replaces annex dated: **03-11-2014**

Location where activities are performed under accreditation

Head Office

Meander 1051
6825 MJ
Arnhem
The Netherlands

No.	Material or product	Type of activity	Reference number	Remarks
		A. Electrical Safety Tests		
1a	Cables and cords **(CABL)**	Type test of cables and cords according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	HD 21 HD 22 HD 603 HD 604 HD 605 EN 13501, EN 50143; EN 50214; EN 50267; EN 50525; EN 50288; EN 50399; EN 50618 NEN/EN 50200 NEN/EN/IEC 60228 NEN-EN 50525 NEN/EN 50266 NEN/EN 50362 NEN/EN /IEC 61034 IEC 60092; IEC 60227 *; IEC 60245 *; IEC 60331; IEC 60332; IEC 60502-1; IEC 60502-2; IEC 60754; IEC 60800; IEC 60840; IEC 62067	* see note 3

This annex has been approved by:

ir. W.C. van der Poel
Chief Executive

Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

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No.	Material or product	Type of activity	Reference number	Remarks
1a	Cables and cords **(CABL)**	Type test of cables and cords according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	DEKRA K 42; DEKRA K 102 DEKRA K 145; DEKRA K 146 DEKRA K 151; DEKRA K 152 DEKRA K 156; DEKRA K 157 DEKRA K 158; DEKRA K160 DEKRA K 161; DEKRA K 162 DEKRA K 163; DEKRA K 164 DEKRA K 165; DEKRA K 167 DEKRA K 168; DEKRA K 169 DEKRA K 170; DEKRA K 171 DEKRA K 175; DEKRA K 176 DEKRA K 177; DEKRA K 178 DEKRA K 179 BS 6004; BS 6007; BS 4553; BS 5467; BS 6231; BS 6346; BS 6387; BS 6500; BS 6622; BS 6724; BS 6883; BS 7211; BS 7629; BS 7835; BS 7846; BS 7889; BS 8491; BS EN 50288-7 BS EN 50525 DIN VDE0815; DIN VDE0250	* see note 3
		Test methods for non-metallic materials	IEC 60811-201; IEC 60811-202 IEC 60811-203; IEC 60811-401 IEC 60811-402; IEC 60811-403 IEC 60811-404; IEC 60811-405 IEC 60811-406; IEC 60811-408 IEC 60811-409; IEC 60811-411 IEC 60811-412; IEC 60811-501 IEC 60811-502; IEC 60811-503 IEC 60811-504; IEC 60811-505 IEC 60811-506; IEC 60811-507 IEC 60811-508; IEC 60811-509 IEC 60811-510; IEC 60811-511 IEC 60811-605; IEC 60811-606 IEC 60811-607	
		Electrical test methods for low voltage energy cables	NEN-EN 50395	
		Non electrical test methods for low voltage energy cables	NEN-EN 50396	

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No.	Material or product	Type of activity	Reference number	Remarks
1b	Conduits	Type test of conduits according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	NEN/EN/IEC 61386 DEKRA K24 EN 50086	
1c	Installation systems Cable trays Cable ladders	Type test of cable trays and cable ladders, according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	KEMA 55 NEN/EN 50085 NEN/IEC/EN 61537 BS EN 61537	
1d	Boxes and enclosures for electrical installations	Type test of boxes and enclosures for electrical installations, according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	NEN/EN/IEC 60670	
2a	Switches for appliances and automatic controls for electrical household appliances **(CONT)**	Type test of switches according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests.	IEC/EN 60730*, 61095* IEC/EN 60691, 60934, 61058*, 60529 IEC 60265, 62271-1, 62271-100, 62271-101, 62271-102, 62271-105, 62271-110, 62271-200, 62271-201, 62271-202, 62271-203, EN 50152-1 IEEE Std C37.09, C37.081, 37.60, C37.013, C37.34, ANSI C37.41, C37.73, C37.20.2, C37.122 ANSI/IEEE C37.21 ANSI C37.54, C37.55, C37.20.2, C37.72	*** see note 3**

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No.	Material or product	Type of activity	Reference number	Remarks
3	Household and similar equipment **(HOUS)**	Type test of household equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60335* IEC/EN 61770 IEC/EN 62233 EN 50366 IEC/EN 60204 IEC/EN 60730-1/ 2-8 / 2-9 IEC/EN 61558-1/ 2-3 / 2-6 / 2-5 / 2-6 / 2-16 IEC/EN 62061 EN/ISO 13849-1	* see note 3
		Low power measurements	IEC/EN 62301	
4	Installation accessories and connection devices **(INST)**	Type test of installation accessories and connection devices according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60309*, 60320*, 60669*, 60670*, 60799*, 60884*, 60998*, 61058*, 61242*, 61534*, 61984*, 62208*; IEC/EN 60335-2-76, 60974, 61316, 61386, 62094 EN 50075, 50066, 50146, 50250, 50393 NEN 1251, IEC 60884*, 61238, 62080 BS 1363-1, BS 1363-2, BS 1363-3, BS 1363-4 SS 145 BS 546 BS 4573 BS 5733 NEN 1020 NF C61-314 DIN VDE 0620-1 DIN VDE 0620-2-1 CEI 23-50 NBN C 61-112-1 NEK IEC 60884-1 NEK 502 ÖVE/ÖNORM E 8684-1 ÖVE/ÖNORM E 8620-2(-3,-4, -5) SFS 5610 SS 428 08 34 DS 60884-2-D1 SEV 1011 UNE 20315-1-1; UNE 20315-1-2 IEC/EN 61535 EN 50428 required with 60669	* see note 3

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No.	Material or product	Type of activity	Reference number	Remarks
5	Luminaires **(LITE)**	Type test of luminaires according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60155*, 60238*, 60400*, 60570*, 60598*, 60838*, 60921*, 60968*, 60969*, 61347*, 62471* IEC/EN 60929, 61184, 62031, 62035, 60923, 60925, 60927, 61047, 62384, 62560, 61195, 62493	* see note 3
6	Measurement, control and laboratory equipment **(MEAS)**	Type test of measurement-, control- and laboratory equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 61010* IEC/EN 60044 IEC/EN 61243 IEEE Std C57.13	* see note 3
7	Electrical equipment for medical use **(MED)**	Type test of electrical equipment for medical use according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60601* IEC/EN/ISO 80601 HD 395	* see note 3
8	Miscellaneous equipment **(MISC)**	Type test of miscellaneous equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60825*	* see note 3

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No.	Material or product	Type of activity	Reference number	Remarks
9	IT and office equipment **(OFF)**	Type test of IT and office equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60950* IEC/EN 62040* IEC/EN 60825 IEC 62368 EN 41003	* see note 3
10	Low voltage, high power switching equipment **(POW)**	Type test of low voltage, high power switching equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60439*, 61439, IEC/EN 60947* IEC/EN 60282, 62208 EN 50178, IEC 60470, 60549, 60644, EN 60282-1 IEEE Std C37.41, C37.60 ANSI C37.44 IEC 61921	* see note 3
11	Installation protective equipment **(PROT)**	Type test of installation protective equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60127*, 60269*, 60529*, 60898*, 61008*, 61009*, 61643*, 60755, 62019 IEC 60099, 60137, 60168, 60383, 60507, 60660, 61109, 60815 HD 630, 639, 60269 IEEE Std 62.11 ANSI C29 CAN/CSA C411.1	* see note 3
12	Safety transformers and similar equipment **(SAFE)**	Type test of safety transformers and simillar equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60044*, IEC/EN 61558* IEC/EN 62040, IEC/EN 60076, IEC/EN 60353 EN 50091, EN 50464-1 HD 538.1 IEEE Std. C57.12.90, C57.21 NEMA 107 CISPR 16	* see note 3

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No.	Material or product	Type of activity	Reference number	Remarks
13	Electric tools **(TOOL)**	Type test of electric tools according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60745* IEC/EN 61029* IEC/EN 60335* (Gardening) IEC/EN 62233, IEC/EN 60204 EN 50144 EN 50260-2-7 EN 792 EN/ISO 1114 IEC/EN 62061 EN/ISO 13849-1	* see note 3
14	Electronics, entertainment equipment **(TRON)**	Type test according to the tests as mentioned in the standard, except the following tests which are subcontracted: 60065, cl. 20.1.3 Pre-conditioning of printed circuit boards 60065, cl. 12.1.2 Vibration-sine	IEC / EN 60065* IEC / EN 60491 IEC 62368	* see note 3
15	Products within the scope of the EMC Directive 2004/108/EC **(EMC)**	Type test according to the tests as mentioned in the standard	CISPR11; CISPR12; CISPR13; CISPR14-*; CISPR15; CISPR16-*-*; CISPR20; CISPR22; CISPR24; CISPR25; IEC60601-*-*; IEC60945; IEC60947-*-*; IEC61000-*-*; IEC61008-1; IEC61009-1; IEC61131-2; IEC61204-3; IEC61326-*; IEC61543; IEC61547; IEC61800-*; IEC62040-2; IEC62052-*; IEC62053-*; IEC62054-*;	* see note 3

B. Electromagnetic Compatibility (EMC): Automotive tests

1	Vehicles, Motorcycles, Motorboats and Spark-ignited engine-driven devices	Radiated emission 30 to 1000 MHz OATS	European Directives 2004/104/EC, 97/24/EC European regulation ECE-R10.04 EN 55012, CISPR 12	
2	Vehicles, Motorcycles, Motorboats and Spark-ignited engine-driven devices	Radiated immunity up to 30 V/m 20 to 2000 MHz OATS	European Directive 2004/104, 97/24/EC European regulation ECE-R10.04	

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No.	Material or product	Type of activity	Reference number	Remarks
3	Electrical/ electronic sub-assembly	Pulse emission for ESA's along supply lines 12V and 24V	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 7637-1 ISO 7637-2	
4		Conducted emission for ESA's (V–method, LISN) 150 kHz to 108 MHz	European Directive 2004/104/EC European regulation ECE-R10.04 CISPR25	
5		Radiated emission for ESA's Anechoic Chamber method 30 to 1000 MHz	European Directive 2004/104/EC European regulation ECE-R10.04 CISPR25	
6		Radiated immunity for ESA's Anechoic Chamber method and GTEM method 20 to 2000 MHz up to 30V/m	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 11452-1, ISO 11452-2, ISO 11452-3	
7	Electrical/ electronic sub-assembly	Bulk Current Injection for ESA's 20 to 400 MHz up to 100 mA	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 11452-1, ISO 11452-4	
8		Pulse immunity for ESA's along supply lines 12V and 24V	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 7637-1 ISO 7637-2	
		C. Electromagnetic Compatibility (EMC): EMF tests		
1	Electrical and electronic equipment	EMF measurements: 0-400 kHz	EN 62233 EN 62493	

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No.	Material or product	Type of activity	Reference number	Remarks
D. Electromagnetic Compatibility (EMC): Emission tests				
1	Electrical and electronic equipment	Conducted emission 9 kHz to 30 MHz	EN 55011, CISPR 11 EN 55013, CISPR 13 EN 55014-1, CISPR 14-1 EN 55015, CISPR 15 EN 55022, CISPR 22	
2		Radiated Emission Electric (EM) Field 30 MHz to 18 GHz	EN 55011, CISPR 11 EN 55014-1, CISPR 14-1 EN 55022, CISPR 22	
3		Disturbance power 30 MHz to 300 MHz	EN 55014-1, CISPR 14-1	
4		Click disturbances 150 kHz to 30 MHz	EN 55011, CISPR 11 EN 55014-1, CISPR 14-1	
5		Radiated Emission Magnetic Field 9 kHz to 30 MHz	EN 55011, CISPR 11 EN 55015, CISPR 15	
6		Harmonic current emissions 0 Hz to 2 kHz up to 16 A per phase	IEC / EN 61000-3-2	
7		Pulse magnetic field immunity up to 1000 A/m	IEC/EN 61000-4-9	
8		Limitation of voltage fluctuations and flicker up to 16 A per phase	IEC / EN 61000-3-3	
E. Electromagnetic Compatibility (EMC): FCC tests (USA legislation)				
1	Radio-Frequency Devices Industrial, Scientific and Medical Equipment	Emission 9 kHz to 3 GHz	47 CFR FCC Part 15, Part 18 ANSI C63.4 FCC MP-5	
F. Electromagnetic Compatibility (EMC): Immunity test				
1	Electric and electronic equipment	Electrostatic discharge immunity up to 30 kV	IEC/EN 61000-4-2	
2		Radiated EM field immunity up to 2,5 GHz up to 30 V/m	IEC/EN 61000-4-3	
3		EFT Burst immunity up to 4 kV	IEC/EN 61000-4-4	

No.	Material or product	Type of activity	Reference number	Remarks
4	Electric and electronic equipment	Surge immunity up to 10 kV	IEC/EN 61000-4-5	
5		Immunity to conducted RF disturbances up to 230 MHz, up to 30 Vrms	IEC/EN 61000-4-6	
6		Power frequency magnetic field immunity up to 100 A/m	IEC/EN 61000-4-8	
7		Voltage dips and interruptions Single phase equipment up to 16 A	IEC/EN 61000-4-11	
8		Ring wave immunity test	IEC/EN 61000-4-12	
		G. Electromagnetic Compatibility (EMC): MISC		
1	Railway applications - Electromagnetic compatibility	Electromagnetic compatibility testing according the listed product standards	EN 50121-1 to -5	
2	Road traffic signal systems	Electromagnetic compatibility testing according the listed product standard	EN 50293	
		H. Photometric Tests (all tests are in accordance with the reference method)		
1	Headlamps low and high beams and front fog lamps	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Heat tests Plastic tests	ECE Regulations Nos. 1, 5, 8, 19, 20, 31, 56, 57, 72, 76, 82, 98, 112, 113 and 123; European Directives 76/761, 76/762 and 97/24	**Note 1**
2	Signalling lamps	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Heat test	ECE Regulations Nos. 6, 7, 23, 38, 50, 77, 87 and 91 and European Directives 76/757, 76/759, 76/758, 77/538, 77/539, 77/540 and 97/24 ECE Regulation 38 (rear fog lamps only)	
3	Devices for the illumination of rear registration plates	All tests as mentioned in the ECE Regulations stated under Test method Luminance	ECE Regulations Nos. 4 and 50 European Directives 76/760 and 97/24	

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4	Retro-reflective devices	All tests as mentioned in the ECE Regulations stated under Test method Retro-reflection Colorimetry Water resistance test Corrosion Fuel and oil resistance Heat test UV resistance	ECE Regulations Nos. 3, 27, 69, 70, 88 and 104 European Directive 76/757	Note 2
5	Light Sources	All tests as mentioned in the ECE Regulations stated under Test method Geometry Photometry Colorimetry Optical quality Mechanical tests	ECE Regulations Nos. 37, 99 IEC 60809 IEC 60810 IEC 60983 IEC 60061	
6	Special warning lamps (beacons and flash lights)	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Water resistance test	ECE Regulation No. 65	
7	Cornering Lamps	All tests as mentioned in the ECE Regulation stated under Test method Photometry Colorimetry	ECE Regulation No.119	

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No.	Material or product	Type of activity	Reference number	Remarks
		I. Lighting testing: EPA ENERGY STAR Program		
1	Non-directional Fluorescent Luminaires	Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps, Source Run-up Time (ms)	ANSI C78.5:2003	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	

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No.	Material or product	Type of activity	Reference number	Remarks
2	Directional Fluorescent Luminaires	Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps, Source Run-up Time (ms)	ANSI C78.5:2003	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	
		Photometric Testing of Outdoor Fluorescent Luminaires, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-10:2013	
		Approved Method for Photometric Testing of Indoor Fluorescent Luminaries, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-41:2013	
3	Luminaires CSD - Fluorescent Ballasts	Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	

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No.	Material or product	Type of activity	Reference number	Remarks
4	Luminaires CSD - Fluorescent Lamps	Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	
5	Non-Directional HID Luminaires	High-Intensity Discharge (HID)—Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	

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No.	Material or product	Type of activity	Reference number	Remarks
6	Directional HID Luminaires	High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	
		Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps, Efficacy, Output, Zonal Lumen Distribution	IES LM-31:2013	
		Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-46:2004	
7	Luminaires CSD - HID Ballasts	High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	

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No.	Material or product	Type of activity	Reference number	Remarks
8	Luminaires CSD - HID Lamps	Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	
9	Non-directional Solid State Luminaires and Subcomponents	Electrical and Photometric Measurements of Solid-State Lighting Products (section 10 not required for non-directional or subcomponents), Efficacy, Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, CRI	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, Efficacy, Light Output, Lumen Maintenance, CCT , CRI, Color Maintenance, Light Source Life	IES LM-82-2012	
10	Directional Solid State Luminaires	Electrical and Photometric Measurements of Solid-State Lighting Products (Goniophotometer), Zonal Lumen Distribution, Color Angular Uniformity, Luminaire Photometry	IES LM-58:2013	
		Guide to Spectroradiometric Measurements, Color Angular Uniformity		

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No.	Material or product	Type of activity	Reference number	Remarks
10	Directional Solid State Luminaires	Method of Measuring and Specifying Color Rendering of Light Sources, CRI	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Light Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES LM-79:2008	
11	Lumen Maintenance of LED Packages, Arrays, and Modules	Method for Measuring Lumen Maintenance of LED Light Sources, Light Source Life, Lumen Maintenance	IES LM-80:2008	
12	Non-Directional Outdoor Halogen Luminaires	Approved Method for Life Testing of Filament Lamps, Light Source Life Requirements	IES LM-49:2001, IES LM-49:2011	
13	Directional Outdoor Halogen Luminaires	Approved Method for Life Testing of Filament Lamps, Light Source Life Requirements	IES LM-49:2001	
		Photometric Testing of Outdoor Fluorescent Luminaires, Zonal Lumen Distribution	IES LM-10:1996	
		Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps, Zonal Lumen Distribution	IES LM-31:1991	
		Photometric Testing of Indoor Fluorescent Luminaires, Zonal Lumen Distribution	IES LM-41:1998	
		Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps, Zonal Lumen Distribution	IES LM-46:2004	
		Electrical and Photometric Measurements of Solid-State Lighting Products, Zonal Lumen Distribution	IES LM-79:2008 Section 10	

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No.	Material or product	Type of activity	Reference number	Remarks
14	CFL Directional Lamps	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Center beam Intensity, Lumen Maintenance, Lifetime, CCT, CRI	IES LM-66:2011	
		Life Testing of Compact Fluorescent Lamps, Lumen Maintenance, Lifetime, Rapid Cycle Stress Test	IES LM-65:2010	
		IEEE Recommended Practice on Characterization of surges in Low Voltage (1000V and Less) AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Fluorescent Lamp Ballasts, Method of Measurement of Power Factor (included supplements)	ANSI C82.2:2002	
		Specifications for the Chromaticity of Fluorescent lamps, CCT	ANSI C78.376-2001	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Tool for Calculating Minimum Center beam Intensity, Minimum Center Beam Intensity – PAR and MR Lamps	Energy Star Online CBCP Tool	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, ETLOR	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Light Output Ratio	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	

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No.	Material or product	Type of activity	Reference number	Remarks
14	CFL Directional Lamps	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	
15	CFL Omnidirectional and Decorative Lamps	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Center beam Intensity, Lumen Maintenance, Lifetime, CCT, CRI	IES LM-66:2011	
		Life Testing of Compact Fluorescent Lamps, Lumen Maintenance, Lifetime, Rapid Cycle Stress Test	IES LM-65:2010	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Specifications for the Chromaticity of Fluorescent lamps, CCT	ANSI C78.376-2001	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor	ANSI C82.2:2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	

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No.	Material or product	Type of activity	Reference number	Remarks
16	LED Directional Lamps	Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, Lifetime, CCT, CRI, Color Maintenance, Color Angular Uniformity	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002 Sections 6 and 7	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Chromaticity of Solid State Lighting Products, CCT	ANSI C78.377-2011	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Tool for Calculating Minimum Center beam Intensity, Minimum Center Beam Intensity – PAR and MR Lamps	Energy Star Online CBCP Tool	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, ETLOR	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Light Output Ratio	

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No.	Material or product	Type of activity	Reference number	Remarks
16	LED Directional Lamps	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	
17	LED Omnidirectional and Decorative Lamps	Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, Lifetime, CCT, CRI, Color Maintenance, Color Angular Uniformity	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002 Sections 6 and 7	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	

Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

of **DEKRA Certification B.V.**

This annex is valid from: **29-04-2015** to **01-03-2018** Replaces annex dated: **03-11-2014**

No.	Material or product	Type of activity	Reference number	Remarks
		I. Additional Standards related to Energy Star		
1	Reflector type lamps	Photometric Testing	IES LM-35:2002	
2	Floodlights Using Incandescent Filament of Discharge Lamps	Electrical and photometric measurements	IES LM-45:2009	
3	Fluorescent Lamps	Electrical measurements	ANSI C78.375:1997 ANSI C78.375:2014	
4	Fluorescent Lamps	Chromaticity of Fluorescent Lamps	ANSI C78.376-2001	
5	Fluorescent Lamps	Chromaticity of Solid State Lighting Products	ANSI C78.377-2011	
6	Mercury Lamps	Measuring Characteristics	ANSI C78.386:1989	
7	Metal-Halide Lamps	Measuring Characteristics	ANSI C78.387:1987	
8	High Pressure Sodium Lamps	Measuring Characteristics	ANSI C78.388:1990	
9	High-Frequency Fluorescent Lamp Ballast	Measurement of a High-Frequency Fluorescent Lamp Ballast	ANSI C82.11-2002	
10	Light sources	The measurement of luminous flux	CIE 84:1989	
11	Luminaires	The Photometry and goniophotometry of luminaires	CIE121:1996	
12	All LED Products	Measurements of LEDs	CIE127:1997 CIE127:2007	
13	All products	Transient protection	ANSI/IEEE C62.41.1 ANSI/IEEE C62.41.2	
14	Decorative Light Strings	Weathering Test	ASTM G154-06 ASTM G154-12a	
15	Decorative Light Strings	ENERGY STAR Test Method for Decorative Light Strings	ENERGY STAR Test Method for Decorative Light Strings	
16	All products	ENERGY STAR Program requirements Product Specification for Lamps Version 1.0: Final Test Methods and Recommended Practices	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Final Test Methods and Recommended Practices	

Annex to ISO/IEC 17025:2005 declaration of
accreditation for registration number: **L 022**

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Note 1: Weather-beaten tests of synthetic lenses is subcontracted
Note 2: Salt-nebula test is subcontracted
Note 3: See current list of sub set of standards on the IECEE CBTL website

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Вертикален разединител НН 1000 А, с триполюсно управление"

Приложение № 5

ЕЛЕКТРОТЕЗ СОФИЯ ООД

JEAN MÜLLER
THE NAME FOR SAFETY

EG-Konformitätserklärung
EC Conformity Declaration

Dok.-Nr. L_98_01
Doc. No.

Hersteller, Anschrift
Manufacturer, Adress

Jean Müller GmbH Elektrotechnische Fabrik
H.J.-Müller-Straße 7, D-65343 Eltville am Rhein

Produktbezeichnung
Product designation

NH-Sicherungslastschaltleisten Baureihe SL, für Schalttafeleinbau und Schalttafelaufbau inklusive Zubehör.
LV HRC Strip type fuse switch disconnectors, series SL and accessories, for panel board building.
DIN-Size 00 (160A): SL00-3x3/100/; SL00-3x(3); SL00-3x/400A
DIN-Size 1 to 3 (250A/400A/630A):SL123-3x(3)
DIN-Size 3: SL3-3x(3)/1000A (NH-Trennleiste)
(LV HRC Busbar disconnect strip 1-and 3 pole switchable)
DIN-Size 3: SL3-3x2/1.250A or 1.600A
DIN-Size 3: SL3-3x(3)/910A
DIN-Size 3; SL3-3X6/2.000A
DIN-Size 3: SLT3-3SRSL)/3x(3)/50 (NH-Stromschienen-Trennleiste)
(busbar disconnect strip

Jahr der Anbringung der CE-Kennzeichnung : 1998
Affixing of the CE marking

Das bezeichnete Produkt stimmt mit den Vorschriften folgender EG-Richtlinie/n überein:
The designated product conforms to the provisions of the following European directives

2006/95/EG
Richtlinie des Rates vom 12. Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten betreffen elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.

Directive of the European Parliament and of the concil of 12. December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Die Übereinstimmung des bezeichneten Produktes mit den Vorschriften der oben genannten Richtlinie/n wird nachgewiesen durch die Einhaltung folgender Normen:
The conformity of the designated product with the provisions of the above mentioned Directives is proved by full compliance with the following standards

Europäische Normen
Harmonized European standards
EN 60947-3

IEC-Standards
IEC standards

Nationale Normen
National standards
VDE 0660 Teil 107

Aussteller / Issuer G / QM

Ort, Datum / Place, Date Eltville, den 16. Jan. 2008

Rechtsverb. Unterschriften
Legally binding signature

Dr. B. Müller I.V. A. Göttert

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Mitgelieferte Sicherheitshinweise sind zu beachten.
This declaration certifies compliance with the indicated directives but implies no warranty of properties. The safety instructions of the accompanying product documentation shall be observed.

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният Владимир Лазаров,

Управител на фирма "ВиВ Изоматик" ООД, София, ул.Пирин 40А

В качеството си на търговски представители на JEAN MULLER GMBH

Декларираме, че продуктът:

Марка:	JEAN MULLER
Продукт:	Разединител 1000А
Серия:	SLT3-3S

За който се отнася тази декларация, при условие, че е инсталиран, обслужван и използван за приложения, за които е предназначен, е в съответствие със следните стандарти, технически одобрения или други нормативни актове:

IEC/EN 60947-1
IEC/EN 60947-3

София, 14.08.2012

Владимир Лазаров, управител
ВиВ Изоматик ООД

ЕЛЕКТРОГЕЦ СОФИЯ ООД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

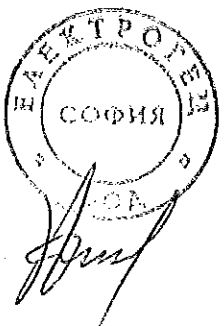
с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Вертикален разединител НН 1000 А, с триполюсно управление"

Приложение № 6



ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният /-ната/ инж. Георги Димитров Георгиев
в качеството ми на Управител на "ЕЛЕКТРОГЕЦ" ООД
със седалище и адрес на управление: гр. София, ул. Майор Горталов 9А, вписано в Търговския регистър към Агенцията по вписванията с ЕИК 130 761 934, за участие в процедура за възлагане на обществена поръчка за Доставка и монтаж на Бетонови комплектни трансформаторни постове /БКТП/, РЕФ. № PPD 15-042,

Д Е К Л А Р И Р А М,

че предлагания материал Вертикален разединител НН 1000 А, с триполюсно управление Jean Muller тип SLT3-3SR/3X3/1000, съответства с изискванията на техническата спецификация на стандарт за материал Вертикален разединител НН 1000 А, с триполюсно управление, вкл. на параграфи „Характеристика на материала" и „Съответствие на предложеното изпълнение с нормативно-техническите документи" от документацията по търг с реф. № РЕФ. № PPD 15-042.

Дата 20.01.2016 г.

Декларатор:

инж. Георги Димитров Георгиев
/име, подпис и печат/

ЕЛЕКТРОГЕЦ
СОФИЯ
ООД

Наименование на материала: Токови измервателни трансформатори НН Х/5 А, проходен тип

Съкратено наименование на материала: ТИТ НН Х/5 А, проходни

Област: Н - Трансформаторни постове

J - Уредби за търговско измерване

Категория: 27 – Измервателни трансформатори

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Сухи неразглобяеми токови измервателни трансформатори НН от проходен тип, в пластмасов корпус, за монтиране на закрито, с клас на точност 0,5 и обявен вторичен ток I_{sn}= 5 А. Токовите трансформатори са преминали през първоначална метрологична проверка и са маркирани със съответния знак, по реда и при условията на Закона за измерванията.

Използване:

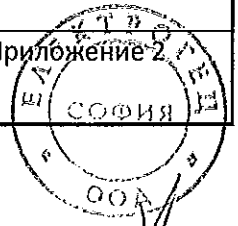
Сухите токови измервателни трансформатори НН от проходен тип са предназначени за трансформиране на тока в първичните вериги във вторичен ток за захранване на токовите вериги на електромерите за търговско измерване на използваните от потребителите количества електрическа енергия и на контролно-измервателните апарати.

Съответствие на предложеното изпълнение със стандартизационните документи:

Токовите измервателни трансформатори трябва да отговарят на БДС EN 60044-1:2001 „Измервателни трансформатори. Част 1: Токови трансформатори (IEC 60044-1:1996, с промени)“ и на неговите валидни изменения и допълнения или еквиваленти.

Изисквания към документацията и изпитванията:

№ по ред	Документ	Приложение № (или текст)
1.	Точно обозначение на типа на токовите измервателни трансформатори (ТИТ), производителя и страна на произход и последно издание на каталога на производителя	СТ-4 1200/5А, Елпром ЕМЗ ООД, България, Приложение 1
2.	Удостоверение за одобряване на типа на ТИТ, издадено по реда и при условията на Закона за измерванията	Приложение 2



№ по ред	Документ	Приложение № (или текст)
3.	Техническо описание на ТИТ, гарантирани параметри и характеристики, включително клас на изолацията, тегло и др.	Приложение 3
4.	Протоколи от типови изпитвания на ТИТ на английски или български език, проведени от независима изпитвателна лаборатория с приложени резултати от изпитванията	Приложение 4
5.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 4.	Типовите изпитания на ТТ НН са проведени в Български Институт по Метрология
6.	Информация за провежданите от производителя контролни (рутинни) изпитвания	Приложение 5
7.	Чертежи с размери	Приложение 6

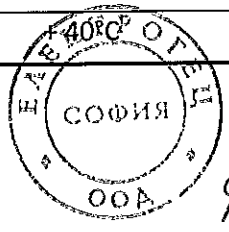
Технически данни

1. Параметри на електрическата разпределителна мрежа

№ по ред	Параметър	Стойност
1.1	Обявено напрежение	400/230 V
1.2	Максимално работно напрежение	440/253 V
1.3	Обявена честота	50 Hz
1.4	Електроразпределителна мрежа	4 - проводникова (L1, L2, L3, PEN)
1.5	Схема на разпределителната мрежа	TN-C
1.6	Ток на късо съединение	15 kA

2. Характеристики на работната среда и място на монтиране

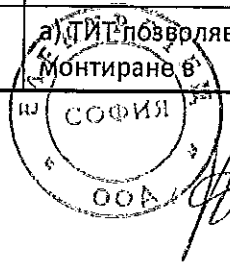
№ по ред	Характеристика /място на монтиране	Стойност/описание
2.1	Максимална околна температура	+40°C



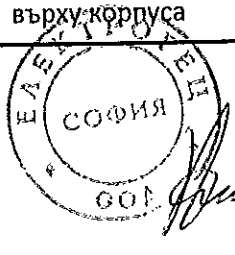
2.2	Минимална околна температура	Минус 5°C
2.3	Относителна влажност	До 95 %
2.4	Замърсяване с прах, пушек, агресивни газове и пари	Умерено
2.5	Надморска височина	До 1000 m
2.6	Място на монтиране	В комплектни комутационни устройства (ККУ) - главни трансформаторни и главни разпределителни табла, електромерни табла и др.

3. Конструктивни характеристики и др. данни.

№ по ред	Характеристика	Изискване	Гарантирано предложение
3.1	Конструкция	а) ТИТ трябва да бъде от проходен тип с отвор за преминаване на тоководещата част на първичната верига - правоъгълни шини или изолирани проводници	а) ТИТ е от проходен тип с отвор за преминаване на тоководещата част на първичната верига - правоъгълни шини или изолирани проводници
		б) Корпусът на ТИТ трябва да бъде: неразглобяем, изграден от синтетична твърда изолация; или разглобяем, надеждно осигурен против разглобяване в процеса на експлоатация и защитен с два противоположно разположени холограмни, саморазрушаващи се при разлепване стикери, съдържащи фабричния номер на трансформатора. (Да се посочи)	б) Корпусът на ТИТ е: -разглобяем, надеждно осигурен против разглобяване е процеса на експлоатация защитен с два противоположно разположени холограмни. саморазрушаващи се при разлепване стикери, съдържащи фабричния номер на ТТ и името на фирмата производител
3.2	Вторични намотки - брой и предназначение	Една вторична намотка за целите на измерването	Една вторична намотка за целите на измерването
3.3	Монтиране	а) ТИТ трябва да позволяват монтиране в произволно	а) ТИТ позволяват монтиране в



№ по ред	Характеристика	Изискване	Гарантирано предложение
		положение.	произволно положение.
		б) ТИТ трябва да бъдат снабдени с приспособление за механично закрепване към тоководещата част на първичната верига.	б) ТИТ са снабдени с приспособление за механично закрепване към тоководещата част на първичната верига.
		в) ТИТ трябва да бъдат снабдени с приспособления за закрепване към монтажна плоча посредством винтови съединения.	в) ТИТ са снабдени с приспособления за закрепване към монтажна плоча посредством винтови съединения.
		г) Приспособленията за закрепване трябва да бъдат устойчиви на корозия.	г) Приспособленията за закрепване са устойчиви на корозия.
3.4	Клемен блок за свързване на вторичните вериги	а) Клемният блок трябва да бъде от винтов тип с възможност за свързване на многожични проводници на вторичните вериги със сечение до 4 mm^2.	а) Клемният блок те от винтов тип с възможност за свързване на многожични проводници на вторичните вериги със сечение до 4 mm^2.
		б) Всеки извод на клемния блок трябва да бъде с min два винта, гарантиращи ниски стойности на контактното съпротивление.	б) Всеки извод на клемния блок е с два винта, гарантиращи ниски стойности на контактното съпротивление.
		в) Клемният блок трябва да бъде защитен с капак с възможност за пломбиране.	в) Клемният блок е защитен с капак с възможност за пломбиране.
		г) Клемният блок и резбовите съединения трябва да бъдат изработени от подходящи некорозиращи метали или метални сплави.	г) Клемният блок и резбовите съединения са изработени от подходящи некорозиращи метали или метални сплави.
3.5	Маркиране на обявените стойности	а) Токовите измервателни трансформатори трябва да бъдат маркирани с информация за	а) Информацията е лазерно гравирана върху корпуса



№ по ред	Характеристика	Изискване	Гарантирано предложение
		обявените стойности, нанесена върху корпуса или табелка от устойчив на корозия материал или самозалепващо се фолио, съгласно изискванията на т. 11.7 от БДС EN 60044-1 или еквивалент.	
		б) Маркировката трябва да бъде нанесена трайно и четливо по начин, по който да не може да бъде заличена или променена.	б) Информацията е лазерно гравирана върху корпуса
		в) Табелката трябва да бъде фиксирана здраво към корпуса на токовите измервателни трансформатори, без възможност за подмяна или запазване на целостта и при демонтиране.	в) Лазерно гравирана
		г) Табелката от самозалепващо се фолио трябва да бъде: • саморазрушаваща се при разлепване; или • защитена с прозрачна капачка с възможност за пломбиране. (Да се посочи)	-
		д) Препоръчително е върху изолацията на токовите измервателни трансформатори допълнително да бъде маркиран с вдлъбнат или релефен печат обявения коефициент на трансформация.	д) Коефициента е лазерно гравиран върху пластмасовата кутийка
3.6	Маркиране на изводите	Изводите на ТИТ трябва да бъдат маркирани трайно и четливо съгласно изискванията на т. 10.1 от БДС EN 60044-1 или еквивалент.	Изводите на ТИТ трябва са маркирани трайно и четливо съгласно изискванията на т. 10.1 от БДС EN 60044-1 или еквивалент.
3.7	Първоначална проверка и знаци за удостоверяване (съгласно разпоредбите на	а) Токовите измервателни трансформатори трябва да бъдат доставени след извършване на първоначална метрологична	а) Токовите измервателни трансформатори ще бъдат доставени след

№ по ред	Характеристика	Изискване	Гарантирано предложение
	Закона за измерванията)	проверка.	извършване на първоначална метрологична проверка.
		б) Първоначална метрологична проверка трябва да бъде удостоверена със знак за първоначална проверка и копието на протокола от проведените изпитвания.	б) Първоначалната метрологична проверка е удостоверена с холограмни стикери и протокол от изпитания
3.8	Транспортна опаковка	ТИТ трябва да бъдат опаковани в подходяща опаковка предпазваща ги от атмосферни влияния и механични повреди.	ТИТ са опаковани в подходяща опаковка предпазваща ги от атмосферни влияния и механични повреди.
3.9	Експлоатационна дълготрайност	min 25 години	25 години

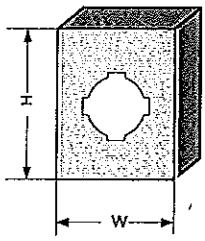
4. Общи технически параметри

№ по ред	Параметър	Изискване	Гарантирано предложение
4.1	Най-високо напрежение за съоръженията - U_m	min 0,72 kV (ефективна стойност)	0,72 kV (ефективна стойност)
4.2	Обявено издържано напрежение с промишлена честота на изолацията	min 3 kV (ефективна стойност)	3kV (ефективна стойност)
4.3	Клас на точност	0,5	0,5
4.4	Обявен продължителен термичен ток	min 1,2 x I_{pn}	1.2 xI_{pn}
4.5	Номинален коефициент на безопасност - FS	5	5

ЕЛЕКТРОГЕЙ СОФИЯ

5. Технически параметри на токовите измервателни трансформатори

5.1 Токов измервателен трансформатор НН, проходен тип, 1200/5 А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 27 1410		Тип СТ-4	
Наименование на материала		Токов измервателен трансформатор НН, проходен тип, 1200/5 А	
Съкратено наименование на материала		ТИТ НН, проходен - 1200/5 А	
№ по ред	**Параметър**	**Изискване**	**Гарантирано предложение**
1.	Обявен първичен ток, I_{pn}	1200 A	1200 A
2.	Обявен първичен ток на термична устойчивост - 1 sec, I_{th}	min 72 kA	72 kA
3.	Обявен първичен ток на динамична устойчивост, I_{dyn}	min 180 kA	180 kA
4.	Обявен вторичен ток, I_{sn}	5 A	5 A
5.	Обявен коефициент на трансформация	1200/5 A	1200/5 A
6.	Обявен вторичен товар	min 5 VA	5VA
7.	Габаритни размери 	H = max 142 mm W = max 124 mm	H= 134mm W = 122mm
8.	Светъл отвор за тоководещата част на първичната верига за: правоъгълно сечение / кръгло сечение	min 60,5x10,5 mm / 2x50,5x10,5 mm / ø44	81x11/ ø73
9.	Тегло, kg	Да се посочи	0.920 kg

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Токови измервателни трансформатори НН Х/5 А, проходен тип"

Приложение № 1

ПРИЛОЖЕНИЕ №1

" ЕЛПРОМ ЕМЗ " ООД ГРАД ШАБЛА

ГАМА ТОКОВИ ИЗМЕРВАТЕЛНИ ТРАНСФОРМАТОРИ НН ТИП СТ-1; СТ-2, СТ-3 И СТ-4

ТЕЛЕФОНИ ЗА КОНТАКТИ:
Управител 05743 / 46 - 68
Гл.счетоводителка 05743 / 42 - 84
Търг. Отдел 05743 / 41 - 84
Факс/телефон/секретар 05743 / 50 - 20
E-mail : elpromemz@mbox.infotel.bg

таблица 1.

Тип Type	Преводно отношение Ipn/Isn Ratet current ratio A / A	Най-високо работно напрежение Ratet voltage power network kV	Клас на точност Class of acuuracy %	Номинална мощност Sn Rated power VA	Номинален ток на терм. устойчивост Rated short-time formal stavility Ith, kA	Номинален ток на дин. устойчивост Rated short-time dinamic stavility Idyn, kA	Номинален коефициент на безоп. Security factor for apparatus Fs	Заводски шифър Serial number
1	2	3	4	5	6	7	8	9
СТ - 1 първичен вторичен	30 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1210302 - XXXX
	50 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1210502 - XXXX
	75 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1210752 - XXXX
	100 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1211002 - XXXX
	150 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1211502 - XXXX
СТ -2 шина 30x10 40X10 кабел ф36	150 / 5	0,72	0.5	5	60 Ipn	2,5 Ith	5 ; 10	1221505 - XXXX
	200 / 5	0,72	0.5	5	60 Ipn	2,5 Ith	5 ; 10	1222005 - XXXX
	250 / 5	0,72	0.5	5	60 Ipn	2,5 Ith	5 ; 10	1222505 - XXXX
	300 / 5	0,72	0.5	5	60 Ipn	2,5 Ith	5 ; 10	1223005 - XXXX
СТ - 3 шина 30x10 40x10 ф36	300 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1233005 - XXXX
	400 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1234005 - XXXX
	500 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1235005 - XXXX
	600 / 5	0,72	0.2; 0.5; 0.5S	5 ; 10	60 Ipn	2,5 Ith	5 ; 10	1236005 - XXXX
СТ - 3 шина 50x10 ф48	500 / 5	0,72	0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1235005 - XXXX
	600 / 5	0,72	0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1236005 - XXXX
	750 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1237505 - XXXX
	800 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1238005 - XXXX
СТ-4 за шина 80x10 или кабел ф73	300 / 5	0,72	0.5; 0.5S	5	60 Ipn	2,5 Ith	5 ; 10	1243005 - XXXX
	400 / 5	0,72	0.5; 0.5S	5	60 Ipn	2,5 Ith	5 ; 10	1244005 - XXXX
	500 / 5	0,72	0.5; 0.5S	5	60 Ipn	2,5 Ith	5 ; 10	1245005 - XXXX
	600 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1246005 - XXXX
	750 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1247505 - XXXX
	800 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	1248005 - XXXX
	1000 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	12410005 - XXXX
	1200 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	12412005 - XXXX
	1250 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	12412505 - XXXX
	1500 / 5	0,72	0.2; 0.5; 0.5S	5; 10; 15	60 Ipn	2,5 Ith	5 ; 10	12415005 - XXXX

УПРАВИТЕЛ: _____
/инж.Д.АРНАУДОВ/

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Токови измервателни трансформатори НН Х/5 А, проходен тип"

Приложение № 2

ЕЛЕКТРОГЕД СОФИЯ ООД

Приложение 2

ДЪРЖАВНА АГЕНЦИЯ
ЗА МЕТРОЛОГИЯ И
ТЕХНИЧЕСКИ НАДЗОР
STATE AGENCY FOR METROLOGY
AND TECHNICAL SURVEILLANCE

РЕПУБЛИКА
БЪЛГАРИЯ

УДОСТОВЕРЕНИЕ

ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ

Measuring Instrument Type-approval Certificate

№ 06.04.4547

Издадено на: *Issued to:*	"ЕЛПРОМ-ЕМЗ" ООД, 9680 Шабла, обл. Добричка, ул. "Нефтяник" № 38
На основание на: *In Accordance with:*	чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г.)
Относно: *In Respect of:*	гама токови измервателни трансформатори, тип CT-x
Производител: *Manufacturer:*	"ЕЛПРОМ-ЕМЗ" ООД, гр. Шабла
Знак за одобрен тип: *Type Approval Mark:*	E BG 06 4547
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване
Срок на валидност: *Valid until:*	03.04.2016 г.
Вписва се в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4547
Дата на издаване на удостоверението за одобрен тип: *Date:*	03.04.2006 г.

ПРЕДСЕДАТЕЛ: [illegible]

страница 1 от 3

…ЕКТРОТЕ… СОФИЯ ООД

Вярно с оригинала

Приложение 2

Приложение към удостоверение за одобрен тип № 06.04.4547

Издадено на: "ЕЛПРОМ-ЕМТ" ООД, гр. Шабла

Относно: гама токови измервателни трансформатори, тип СТ-х.

1. Описание на типа:

Токовите трансформатори тип СТ- х са предназначени за измерване на ток и за защита на разпределителни съоръжения (уредби) във вътрешно изпълнение.

Токовите трансформатори тип СТ- х се състоят от тороидален магнитопровод с първична и вторична намотка, поместени в кутия от пластмаса с клас на възпламеняемост съгласно IEC 707-V-0.

Изолацията спрямо магнитопровода и намотките е суха с клас на топлоустойчивост В.

Трансформаторите тип СТ-х са предназначени за експлоатация при надморска височина до 1000 m за закрит монтаж при температура на въздуха от минус 5° С до + 40° С и относителна влажност на въздуха до 70 % за условия на умерен климат.

1.1. Технически и метрологични характристики:

Номинален първичен ток, А	СТ – 1 СТ – 2 СТ – 3	30, 50, 75, 100, 150 200, 250, 300 400, 500, 600
Номинален вторичен ток, А		5
Клас на точност	СТ – 1 СТ – 2 СТ – 3	0,2; 0,5 0,5 0,5
Коефициент на безопасност - Fs		5, 10
Номинална мощност, VA	СТ – 1 СТ – 2 СТ – 3	5, 10 5, 10 5, 10, 15
Максимално работно напрежение, kV		0,72

Забележка: * Номиналната мощност 10 VA не се отнася за трансформатори с токово отношение 150/5 А.

1.2. Означаване на типа:

Означението на типа е СТ-х (СТ-1, СТ-2 и СТ-3)

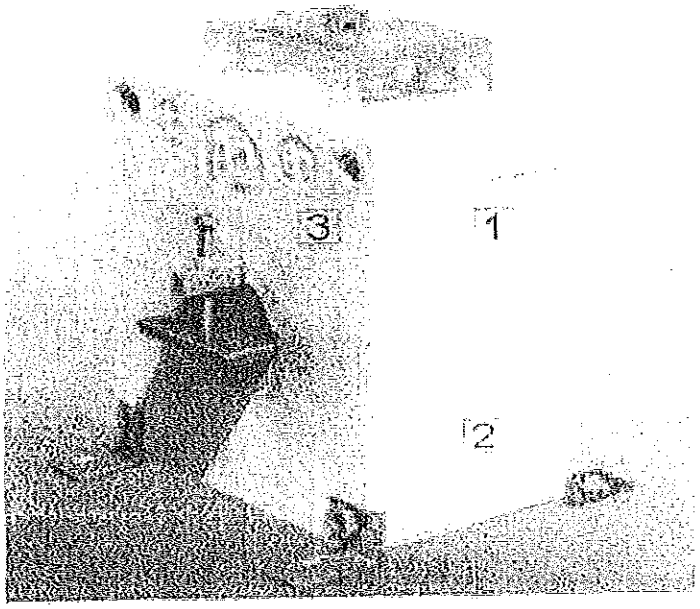
Параметрите като клас наточност, първичен ток, вторичен ток, номинално напрежение и коефициент на сигурност са посочени на табелката на трансформатора.

ЕЛЕКТРОТЕСТ СОФИЯ

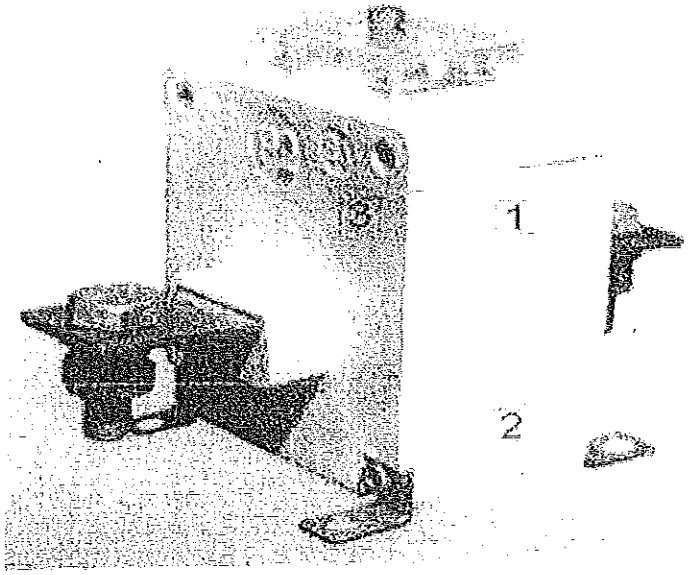
Вярно с оригинала

Приложение към удостоверение за одобрен тип № 06.04.4547

2. Схеми на местата за поставяне на знаците, удостоверяващи резултатите от контрола и места за пломбиране.



1 – Знак за първоначална проверка (марка за залепване)
2 – Знак за последваща проверка (марка за залепване)
3 – Знак за одобрен тип



1 – Знак за първоначална проверка (марка за залепване)
2 – Знак за последваща проверка (марки за залепване)
3 – Знак за одобрен тип

ЕЛЕКТРОТЕЛ СОФИЯ ООД

Вярно с оригинала

Приложение 2

РЕПУБЛИКА
БЪЛГАРИЯ

БЪЛГАРСКИ ИНСТИТУТ ПО МЕТРОЛОГИЯ

BULGARIAN INSTITUTE OF METROLOGY

ДОПЪЛНЕНИЕ № 06.07.4547.1

КЪМ УДОСТОВЕРЕНИЕ ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 06.04.4547

Measuring Instrument Type-approval Certificate-Revision 1

Издадено на: *Issued to:*	"ЕЛПРОМ-ЕМЗ" ООД, 9680 Шабла, обл. Добричка, ул. "Нефтяник" № 38
На основание на: *In Accordance with:*	чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г.)
Относно: *In Respect of:*	токов измервателен трансформатор, тип СТ-х
Производител: *Manufacturer:*	"ЕЛПРОМ-ЕМЗ" ООД, гр. Шабла
Технически и метрологични характеристики: *Technical and metrological characteristics:*	приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване.
Срок на валидност: *Valid until:*	03.04.2016 г.
Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №: *Reference №:*	4547
Дата на издаване на допълнението към удостоверението за одобрен тип: *Date:*	17.07.2006 г.

РЕПУБЛИКА БЪЛГАРИЯ

ПРЕДСЕДАТЕЛ:
К. Катеринов

СОФИЯ ООА

Приложение към Допълнение № 06.07.4547.1 към удостоверение № 06.04.4547

Издадено на: "ЕЛПРОМ-ЕМЗ" ООД, гр. Шабла

Относно: токов измервателен трансформатор, тип СТ-х

Описание на допълнението

1. Към т. 1 Описание на типа, се добавя:

Токовите трансформатори с клас на точност 0,5 S са за специални цели. Свързват се с електромери, които измерват стойности на тока между 50 mA и 6 A, което е от 1 % до 120 % от номиналния ток на трансформатора – 5 A.

Токовата и ъгловата грешка при 1 % от номиналния ток не превишават стойностите, посочени в стандарт БДС EN 60044-1:2001.

2. Към т. 1.1 Технически и метрологични характеристики:

2.1 Включва се токов измервателен трансформатор тип СТ-4 със следните метрологични характеристики:

Номинален първичен ток, A	750, 800, 1000, 1200, 1250 и 1500
Номинален вторичен ток, A	5
Клас на точност	0,5 и 0,5 S
Коефициент на безопасност – Fs	5, 10
Номинална мощност, VA	5, 10 и 15
Максимално работно напрежение, kV	0,72

2.2 Включва се клас на точност 0,5 S за трансформатори тип СТ-1, тип СТ-2 и тип СТ-3;

2.3 Отпада забележката.

ЕЛПРОМ-ЕМЗ ООД СОФИЯ

Приложение 2

РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология

REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology

ДОПЪЛНЕНИЕ № 13.11.4547.2

КЪМ УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ № 06.04.4547

Measuring Instrument Type-approval Certificate-Revision 1

Издадено на производител:
Issued to manufacturer:
„Елпром ЕМЗ" ООД, гр. Шабла

На основание на:
In Accordance with:
чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от 2002 г., изм. бр. 88 от 05 г., изм. и доп. бр. 95 от 2005 г.)

Относно:
In Respect of:
токови измервателни трансформатори тип CT .

Технически и метрологични характеристики:
Technical and metrological characteristics:
приложение, неразделна част от настоящото удостоверение за одобрен тип средство за измерване

Срок на валидност:
Valid until:
03.04.2016 г.

Средството за измерване е вписано в регистъра на одобрените за използване типове средства за измерване под №:
Reference №:
4547

Дата на издаване на допълнението към удостоверението за одобрен тип:
Date:
04.11.2013 г.

И.Д. ПРЕДСЕДАТЕЛ:
Димка Иванова

СОФИЯ
ООД

страница 1 от 2

Вярно с оригинала

Приложение 2

Приложение към Допълнение № 13.11.4547.2 към удостоверение № 06.04.4547

Издадено на производител: „Електром ЕМ" ООД, гр. Шабла

Относно: токови измервателни трансформатори тип СТ-х

Описание на допълнението към удостоверение за одобрен тип № 06.04.4547

В т. 1.1 „Технически и метрологични характеристики" към „Номинален първичен ток, А" в графата за **СТ-2** се добавят следните стойности:

Номинален първичен ток, А	СТ-2	100; 150

Страница 2 от 2

Вярно с оригинала

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Токови измервателни трансформатори НН Х/5 А, проходен тип"

Приложение № 3

ЕЛЕКТРОТЕХ СОФИЯ ООД

ПРИЛОЖЕНИЕ №3

"ЕЛПРОМ ЕМЗ" ООД град ШАБЛА

ТЕЛЕФОНИ ЗА КОНТАКТИ:
Управител 05743 / 45 - 68
Гл.счетоводител 05743 / 42 - 84
Търг. Отдел 05743 / 41 - 84
Факс/тел.секретар 05743 / 50 - 20
E-mail : elpromemz@mbox.infotel.bg

ТЕХНИЧЕСКО ОПИСАНИЕ

ГАМА ТОКОВИ ИЗМЕРВАТЕЛНИ ТРАНСФОРМАТОРИ
тип СТ-1, СТ-2, СТ-3 и СТ-4 за НН до 1000V
ПРОИЗВОДСТВО НА " ЕЛПРОМ ЕМЗ " ООД град ШАБЛА

Токови измервателни трансформатори тип СТ-1; тип СТ-2, тип СТ-3 и тип СТ-4 са за ниско напрежение до 1000V за вътрешен монтаж с клас на точност 0.2; 0.5 или 0.5S и номинална мощност до 50VA в диапазона от номинални токове до 3000А съгласно БДС EN 60044-1:2001 и IEC 60044-1:1999.

- Тип СТ-1 се състои от тороидален магнитопровод с първична и вторична намотки , поместени в кутийка от пластмаса изработена от пластмаса тип Pocan – B4235 с клас на възпламеняемост съгласно IEC 707 – V-0.

  Произвежданите токови трансформатори са в диапазона от 30/5 А до 150/5 А с клас на точност 0.2, 0.5 или 0.5S с мощност 5VA и 10VA.

- Тип СТ-2 Тип, СТ-3 и Тип СТ-4 – са проходни типове токови измерителни трансформатори приподени съответно за шина или кабел – състоят се от тороидален магнитопровод с вторична намотка , поместени в кутийка от пластмаса изработена от пластмаса тип Pocan – B4235 с клас на възпламеняемост съгласно IEC 707 – V-0.

  Произвежданите токови трансформатори са в диапазона от 150/5А до 2000/5А с клас на точност 0.5 или 0.5S и мощност 5VA; 10VA и 15VA.

07.2.2012г.

ЕЛПРОМ ЕМЗ ООД ШАБЛА

ЕЛЕКТРОГЕН СОФИЯ ООД

ТЕХНИЧЕСКИ ДАННИ Тип СТ-1, Тип СТ-2, Тип СТ-3 и Тип СТ-4

Условия на работа: Токовите измервателни трансформатори за средно напрежение се монтират на закрито при температура на околната среда от -35С до +45С и височина над моркото равнище до 1000м.

1. Номинално напрежение	- до 0,75 KV
2. Честота	- 50 Hz
3. Номинален първичен ток Ipn	- до 2000 A
4. Номинален вторичен ток Isn	- 5 A
5. Клас на точност на ядрото за мерене	- 0.2, 0.5, 05S
6. Номинална мощност	- 5, 10, 15VA
7. Номинален ток на термична устойчивост Ith, кА	- 60 Ipn
8. Номинален ток на динамична устойчивост Idyn, кА	- 2,5 Ith
9. Номинален коефициент на безопастност Fs	- 5 или 10
10. Маса, в кг взависимост от преводното отношение от	- 0.485 до 1,070
11. Изолация - суха, клас на топлоустойчивост B	

Стандартизирани документи: Изделието отговаря на БДС EN 60044-1:2001 и IEC 60044-1:1999.

При всичките произвеждани от " ЕЛПРОМ ЕМЗ " ООД град Шабла токови измервателни трансформатори е предвидена възможност за пломбиране както на кутията на трансформатора с цел предотвратяване на неправомерен достъп до магнитопровода и самите намотки, така и на предпазната капачка, която предпазва клемите на вторичната намотка на трансформатора.

УПРАВИТЕЛ : _____
/ инж.Д.Арнаудов /

ЕЛПРОМ • ЕМЗ • ШАБЛА • ЕООД

ЕЛЕКТРОТЕСТ СОФИЯ ООД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Токови измервателни трансформатори НН Х/5 А, проходен тип"

Приложение № 4

ЕЛЕКТРОЕНЕРГИЯ СОФИЯ

Приложение: Н.

БЪЛГАРСКИ ИНСТИТУТ ПО МЕТРОЛОГИЯ

Главна дирекция Мерки и измервателни уреди
отдел "Изследване на типа на средства за измерване"
сектор "Електрични величини"
София, бул. Г.М.Димитров 52 Б, тел. 873-52-98

ПРОТОКОЛ ОТ ИЗПИТВАНЕ

№ 19-ЕВ / 13.07.2006 г.

1. **Обект на изпитването:** Токов измервателен трансформатор тип СТ- Х
2. **Номер и дата на заявката:** АУ-03-654/27.06.2006 г.
3. **Заявител:** " ЕЛПРОМ - ЕМЗ" ООД гр. Шабла
4. **Производител:** " ЕЛПРОМ - ЕМЗ" ООД гр. Шабла
5. **Метод на изпитване:** БДС EN 60044-1 Измервателни трансформатори Част 1: Токови трансформатори.
6. **Период на изпитване:** 07.07.2006 г. до 14.07.2006 г.
7. **Изпитани образци:** ф. № 20218, 33063, 29967, 29477, 34805, 32820
8. **Описание на типа:**

Гамата измервателни токови трансформатори тип СТ-х са за мрежи ниско напрежение.

Токовите трансформатори тип СТ-1 се състоят от тороидален магнитопровод с първична и вторична намотка, а тип СТ-2, тип СТ-3 и тип СТ-4 са проходен тип трансформатори, пригодени за шина или кабел, с вторична намотка.

Резултатите в протокола се отнасят само за изпитваните образци.

Началник отдел ИТСИ:
/инж. Хр. Соколова/

ВЯРНО С ОРИГИНАЛА

Протокола може да бъде разпечатван единствено и само с разрешение на началник отдел "Изследване на типа на средствата за измерване"

Вярно с оригинала

Приложение 4

9. Технически и метрологични характеристики:

Тип на трансформатора	СТ-1	СТ-2	СТ-3	СТ-4
Номинален първичен ток, А	30, 50, 75, 100,150	200, 250, 300	400, 500, 600	1200, 1250, 1500
Номинален вторичен ток, А	5			
Клас на точност	0,5 S			
Максимално работно напрежение, kV	0,72			
Честота, Hz	50			
Номинална мощност, VA	5, 10	5, 10	5, 10, 15	5, 10, 15

10. Технически средства използвани при изпитването:

10.1. Уредба за проверка на токови трансформатори тип АИТ ф. № 45/1972 с еталонен трансформатор тип ТТ 50 ф. № 7210453, свидетелство за калибриране № 037- ЕЕИ/ 16.03.2005 год.

10.2. Уредба за изпитване на диелектрична якост тип РЕО 3/50 ф. № 671897308

10.3. Мегаомметър тип Ф 41/2, ф. № 62862.

11. Резултати от изпитванията:

11.1. Проверка на маркировката

11.1.1. Маркировка на изводите – БДС EN 60044-1 т. 10.1.1 и 10.1.2

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

11.1.2 Означение на полярностите – БДС EN 60044-1 т. 10.1.3

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

11.2. Маркировка на табелките с технически данни – БДС EN 60044-1 т. 10.2 и т. 11.7

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

Съгласно с оригинала

Приложение: 4.

11.3. Проверка на диелектричната якост на първичната намотка – /3 kV за 60 s/ — БДС EN 60044-1 т. 5.1.4

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

11.4. Проверка на диелектричната якост на вторичната намотка – /3 kV за 60 s/ — БДС EN 60044-1 т. 5.1.4

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

11.5. Определяне грешките на трансформаторите – — БДС EN 60044-1 т.11.2

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.
Протокол № 12/12.07.2006 г.

11.6. Проверка – коефициент на безопасност - — БДС EN 60044-1 т.11.6

Протоколи № 01÷ 03 /10.07.2006 г.
Протоколи № 04÷ 06 /11.07.2006 г.

Присъствали на изпитването:

Младши експерт: .....

/инж. Р. Малинова/

Началник сектор "ЕВ":

/инж.Л. Сотирова/

Копието е оригинал

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Токови измервателни трансформатори НН Х/5 А, проходен тип"

Приложение № 5

ЕЛЕКТРОТЕЛ
СОФИЯ
ООД

Приложение №5

" ЕЛПРОМ ЕМЗ " ООД град ШАБЛА

ПАСПОРТ - СЕРТИФИКАТ

ИЗПИТАТЕЛЕН ПРОТОКОЛ

За трансформатор токов измерителен ниско напрежение

Тип СТ – 4 обхват 1200 / 5А

Заводски № 15412005-......................

I. **Условия на работа** . Токовите трансформатори ниско напрежение се монтират на закрито при температура на околната среда от -35° С до +45° С и височина над морското равнище до 1000м

II. **Технически характеристики :**

1	Номинално напрежение	-	0,75 KV
2	Честота	-	50 Hz
3	Номинален първичен ток Iрn	-	1200А
4	Номинален вторичен ток Isn	-	5 А
5.	Клас на точност	-	0,5
6	Номинална мощност	-	15 VA
7	Ток на термична устойчивост	-	60 x Iрn
8	Маса	-	0,920 кг
9	Изолация - суха, клас на топлоустойчивост В		

III. **Стандартизиращ документ** . Изделието отговаря на БДС EN 61869-2:2012 IEC 61869-2:2012.

IV. **Резултати от приемно-предавателните изпитания**

1 Проверка клас на точност - **Отговаря на клас на точност - 0,5**

2 Изпитване на изолацията между първичната и вторичната намотка с приложено напрежение 3 KV за 3 минути , издържал

V. **Сертификат за качество :** Настоящия сертификат за качество се дава въз основа на приемно - предавателните изпитания.

НАСТОЯЩИЯ ТИП ТОКОВ ИЗМЕРИТЕЛЕН ТРАНСФОРМАТОР Е ОДОБРЕН ОТ ДАМТН С УДОСТОВЕРЕНИЕ № 4547 от 05.04.2006 година

VI. **Комплектност на доставката**: Запасни части към изделието не се предвиждат

ИНСТРУКЦИЯ ЗА МОНТАЖ И ЕКСПЛОАТАЦИЯ НА ТОКОВИ ИЗМЕРИТЕЛНИ ТРАНСФОРМАТОРИ ТИП СТ – 4

1 **Място на монтаж**: на закрито

2 **Начин на свързване** : Първичната намотка на токовите трансформатори се свързва последователно към защитаваните проводници на монтажа , а релетата и измервателните последователно към вторичната намотка.

3 **Експлоатационни условия на работа :** При монтаже на токовите трансформатори трябва да се спазват следните условия

А. Трансформаторите да се монтират в закрити помещения.

Б/ Съединителните проводници да са свързани добре към източника и консуматора. Когато изводите са от шинопроводи, съединителните проводници трябва да се затегнат здраво между две месингови шайби или кабелна обувка.

В/ Токът, който се черпи от трансформатора, по специално мощността на трансформатора, да не е по-голяма от мощността, посочена на табелката. Претоварването на трансформаторите се ограничава от допустимите температури на загряване на изолацията.

Г/ Токовите трансформатори трябва да работят при непрекъснат или периодичен контрол.

Д/ При обслужване на токовите трансформатори е задължително да се спазват следните условия:

ПРИ ВКЛЮЧЕНА ВЪВ ВЕРИГАТА ПЪРВИЧНА НАМОТКА ВТОРИЧНАТА НАМОТКА НА ТРАНСФОРМАТОРА НЕ ТРЯБВА ДА ОСТАВА ОТВОРЕНА !

Когато се налага прекъсване на вторичната верига, вторичните клеми на трансформаторите трябва да се свържат на късо с проводник със сечение 2,5 кв. мм. Във вторичната верига на токовия трансформатор предпазители не се поставят.

Е/ При работа на трансформатора единият извод на вторичната намотка се заземява

4. **Безопасност и хигиена на труда :** За осигуряване на безопасна работа на обслужващия персонал е необходимо да се спазват следните условия

А/ Единият извод на вторичната намотка да се заземи

Б/ При включване на първичната намотка във веригата, вторичната намотка да не се оставя отворена.

В След монтирането на кабелите на трансформаторите към таблата и уредите, върху клемите НН на първичната намотка да се постави предпазен капак и да се пломбира

Г/ При ревизия на трансформаторите, същите да не са под напрежение.

Д/ При проверка на трансформаторите нужно е обслужващия персонал да работи с лични предпазни средства.

При добри условия на работа и при периодичен контрол, трансформаторите могат да работят продължително време без повреда.

5. **Опаковка, транспорт и съхранение** . Трансформаторите се поставят в специални кутии от картон - велпапе. Транспортират се във всички видове транспортни средства.

ПРИ НЕСПАЗВАНЕ НА НАСТАВЛЕНИЯТА, ДАДЕНИ В НАСТОЯЩАТА ИНСТРУКЦИЯ, ЗАВОДЪТ ПРОИЗВОДИТЕЛ НЕ ПРИЕМА РЕКЛАМАЦИИ, НАПРАВЕНИ В ГАРАНЦИОННИЯ СРОК НА ИЗДЕЛИЕТО.

ГАРАНЦИОННА КАРТА

"ЕЛПРОМ ЕМЗ" ООД град Шабла се задължава да замени или ремонтира безвъзмездно токов измерителен трансформатор, който в продължение на **36 месеца** от датата на продажбата му от завода, са показали дефекти или повреди с констатирани несъответствия на трансформатора с изискванията на съответния стандарт.

Замяната или ремонтът се извършва при условие, че са спазени изискванията за транспорт, съхранение, монтаж и експлоатация, дадени от предприятието - производител в придружаващата документация и е налице оригиналния паспорт - сертификат с гаранционната карта на съответния трансформатор.

Дата на продажба ....

" ЕЛПРОМ ЕМЗ " ООД град Шабла

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

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РЕФ. № PPD 15-042

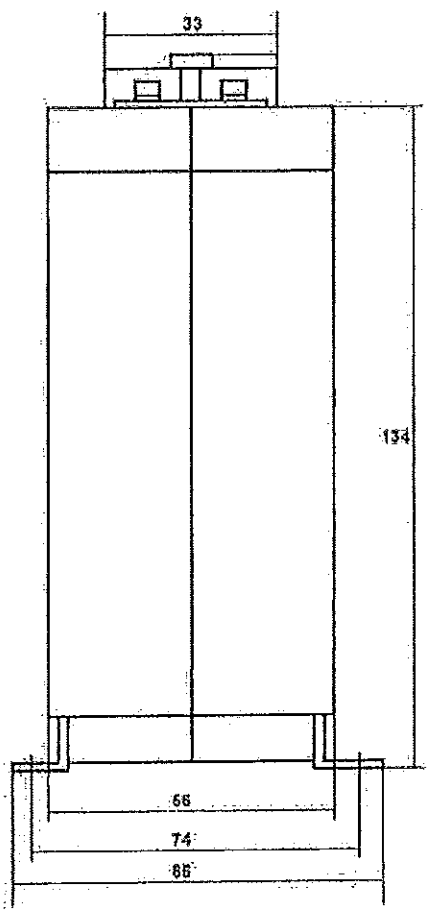
"Токови измервателни трансформатори НН Х/5 А, проходен тип"

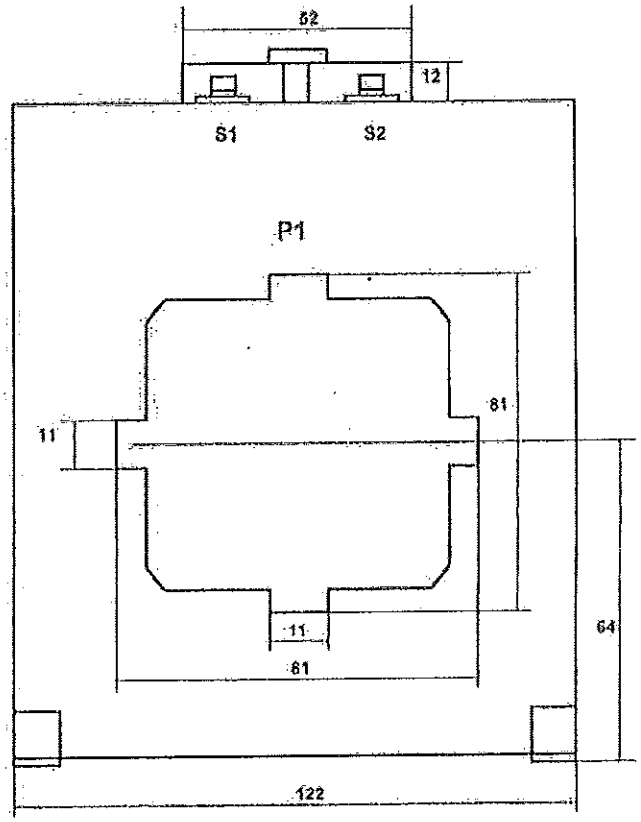
Приложение № 6

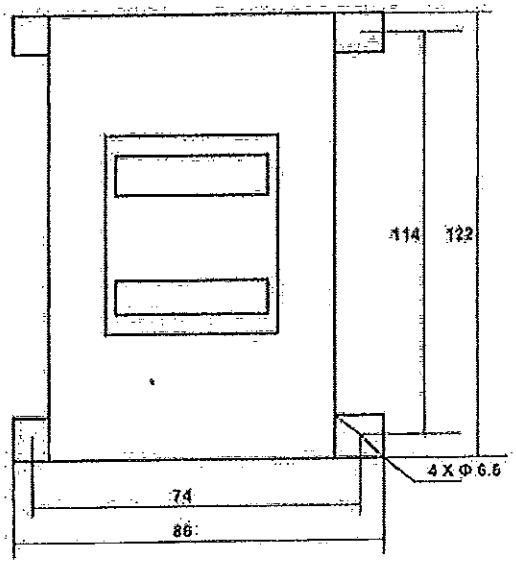
ПРИЛОЖЕНИЕ № 8.

ПРИСЪЕДИНИТЕЛНИ РАЗМЕРИ ЗА ТОКОВИ ИЗМЕРВАТЕЛНИ ТРАНСФОРМАТОРИ

тип СТ- 4, включващи преводните отношения 800/5А, 1000/5А, и 1200/5А







Наименование на материала: Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm

Съкратено наименование на материала: 3P и 1P Цилиндр. П-л П-ч Р-ли, 10x38 mm

Област: H – Електрически уредби СрН/НН
J - Уредби за търговско измерване

Категория: 16 - Предпазители, основи за предпазители

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Триполюсните и еднополюсните стопяем цилиндричен предпазител-прекъсвач-разединители са предназначени за цилиндрични патрони размер 10x38 mm и могат да бъдат пломбирани във включено положение. Закрепването на апаратите към разпределителните табла се извършва посредством шина с DIN-профил с размери 35x7,5 mm.

Използване:

Триполюсните и еднополюсните стопяем цилиндричен предпазител-прекъсвач-разединители са предназначени за защитаване на напреженовите вериги на електромерите и други подобни електрически съоръжения в главните разпределителни табла в трансформаторни постове и в електромерните табла за индиректно измерване на електрическата енергия.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:

Триполюсните и еднополюсните стопяем цилиндричен предпазител-прекъсвач-разединители трябва да отговарят най-малко на посочените по-долу стандарти или еквиваленти.

- БДС EN 60947-1:2007 „Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)";
- БДС EN 60947-1:2007/A1:2011 „Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007/A1:2010)"; и
- БДС EN 60947-3:2009 „Комутационни апарати за ниско напрежение. Част 3: Товарови прекъсвачи, разединители, товаров прекъсвач-разединители и апарати, комбинирани с предпазители (IEC 60947-3:2008)"

и

да бъдат оценени положително по реда и при условията на Наредбата за съществените изисквания и оценяване на съответствието на електрически съоръжения, предназначени за използване в определени граници на напрежението, приета с ПМС № 182 от 6.07.2001 г., обн., ДВ, бр. 62 от 13.07.2001 г. .....

Изисквания към документацията и изпитванията:

№ по ред	Документ	Приложение № или текст
1.	Точно означение на типа, производителя и страната на производство (произход) и последно издание на каталога на производителя	FB01 B .., Lovato, Италия Приложение 1.
2.	Техническо описание и чертежи с нанесени на тях размери	Приложение 2
3.	ЕО декларация за съответствие	Приложение 3
4.	Протоколи от типови изпитвания на английски или български език, проведени от независима изпитвателна лаборатория – заверени копия, с приложен списък на отделните изпитвания на български език	Приложение 4
5.	Сертификат/акредитация на независимата изпитвателна лаборатория, провели типовите изпитвания по т. 4 – заверено копие	Приложение 5

ЕЛЕКТРОСТЕП СОФИЯ ООД

Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. (Каталозите и протоколите от изпитванията могат да бъдат и само на английски език.)

Технически данни

1. Характеристики на работната среда:

№ по ред	Характеристика	Стойност
1.1	Околна среда, в която работи	На закрито
1.2	Максимална околна температура	+ 40°C
1.3	Минимална околна температура	Минус 5°C
1.4	Относителна влажност (при 20 °C)	До 90 %
1.5	Степен на замърсяване	III
1.6	Надморска височина	До 1000 m

2. Параметри на електроразпределителната мрежа НН:

№ по ред	Параметър	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Брой проводници в разпределителната мрежа	4 проводна мрежа (L_1, L_2, L_3, PEN)
2.5	Вид схема на разпределителната мрежа	TN-C

3. Общи технически параметри

№ по ред	Параметър	Изискване	Гарантирано предложение
3.1	Обявено работно напрежение AC, Ue	min 500 V	690V
3.2	Обявена честота	50 Hz	50Hz
3.3	Обявено напрежение на изолацията Ui AC	min 750 V	750V
3.4	Категория по пренапрежение при 400 V AC	III	III
3.5	Обявено издържано импулсно напрежение, Uimp	4 kV	6kV
3.6	Диапазон на температурата на околната среда	min (от минус 5°C до + 40°C)	От минус 5 до +40
3.7	Категория на приложение (при 400V AC)	AC 21 B или по висока	AC21B
3.8	Термичен ток със стопяема вложка, Ith	32 A	32A

ЕЛЕКТРОТЕЕ СОФИЯ ООД

№ по ред	Параметър	Изискване	Гарантирано предложение
3.9	Условен ток на късо съединение (ефективна стойност) при 400 V AC	min 50 kA	100kA
3.10	Размер на цилиндричната стопяема вложка	10 x 38 mm	10x38mm
3.11	Максимална стойност на обявения ток на стопяемата вложка In	32 A	32A
3.12	Максимална мощност на разсейване на стопяемата вложка	3,5 W	3W
3.13	Механична износоустойчивост (комутационни цикли)	min 1 700	min 1700
3.14	Електрическа износоустойчивост (комутационни цикли)	min 300	min 300
3.15	Степен на защита	min IP20	IP20
3.16	Диапазон на сеченията на присъединяваните проводници	min (0,5 до 25 mm^2) за Cu/Al проводници	От 0.5 до 25 mm^2 за Cu/Al проводници

4. Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm

4.1 Триполюсен стопяем цилиндричен предпазител-прекъсвач-разединител, размер 10x38 mm

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 16 6001		FB01 B 3P	
Наименование на материала		Триполюсен стопяем цилиндричен предпазител-прекъсвач-разединител, размер 10x38 mm	
Съкратено наименование на материала		3P Цилиндр. П-л П-ч Р-л 10x38 mm	
№ по ред	**Наименование**	**Изисквана стойност**	**Гарантирано предложение**
4.1.1	Брой на полюсите	3	3
4.1.2	Ширина	max 54 mm	52,5 мм
4.1.3	Тегло, g	Да се посочи	195 g

4.2 Еднополюсен стопяем цилиндричен предпазител-прекъсвач-разединител, размер 10x38 mm

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 16 6101		Да се посочи	
Наименование на материала		Еднополюсен стопяем цилиндричен предпазител-прекъсвач-разединител, размер 10x38 mm	
Съкратено наименование на материала		1P Цилиндр. П-л П-ч Р-л 10x38 mm	
№ по ред	Наименование	Изисквана стойност	Гарантирано предложение
4.2.1	Брой на полюсите	1	1
4.2.2	Ширина	max 18 mm	18 mm
4.2.3	Тегло, g	Да се посочи	65 g

ЕЛЕКТРОГЕЙТ СОФИЯ ООД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

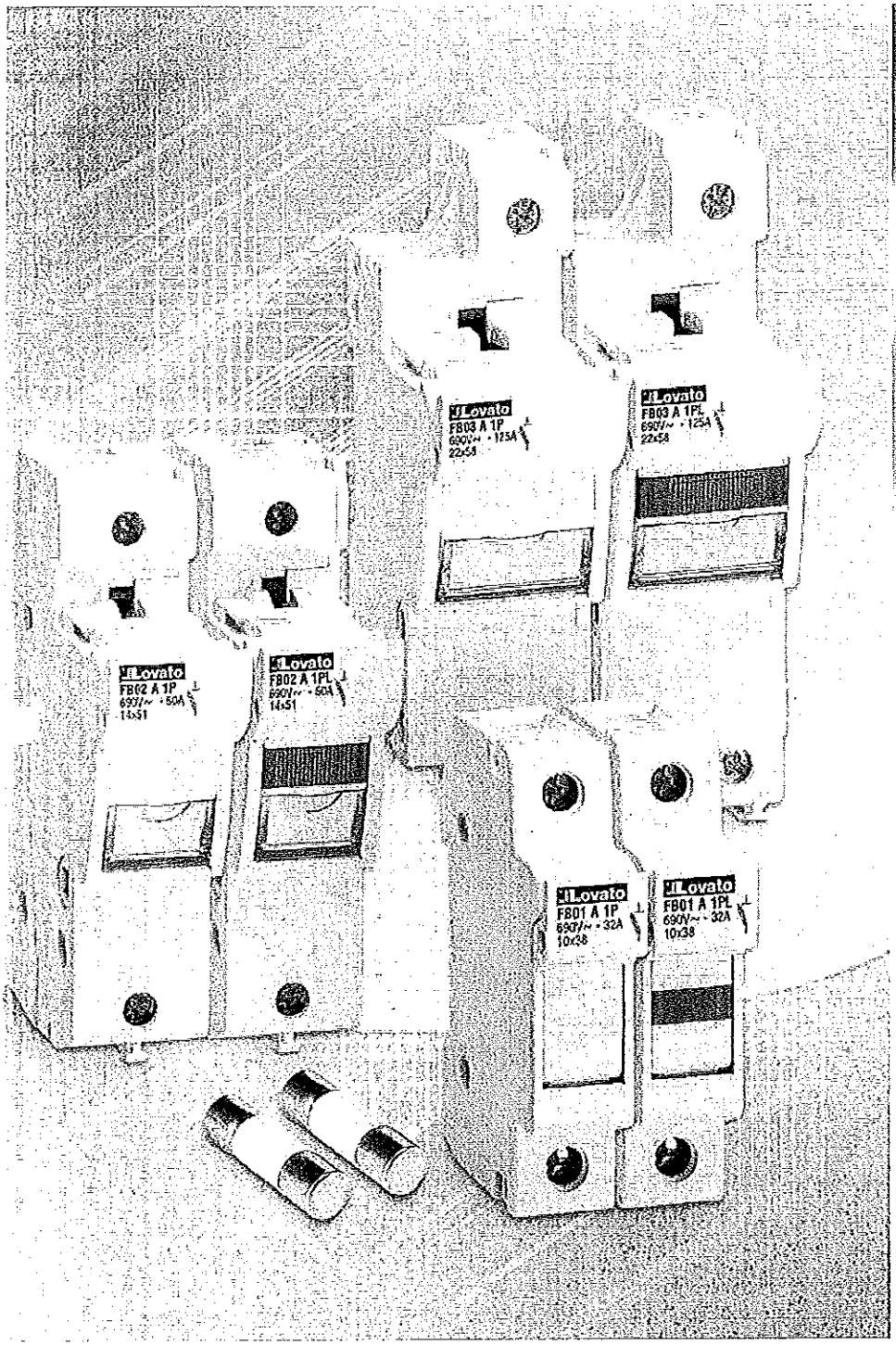
„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

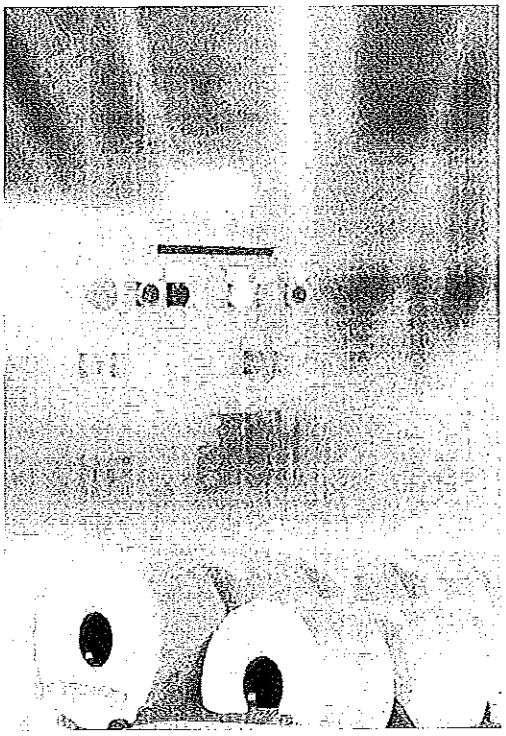
РЕФ. № PPD 15-042

"Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm"

Приложение № 1

ЕЛЕКТРОТЕЦ СОФИЯ ООД



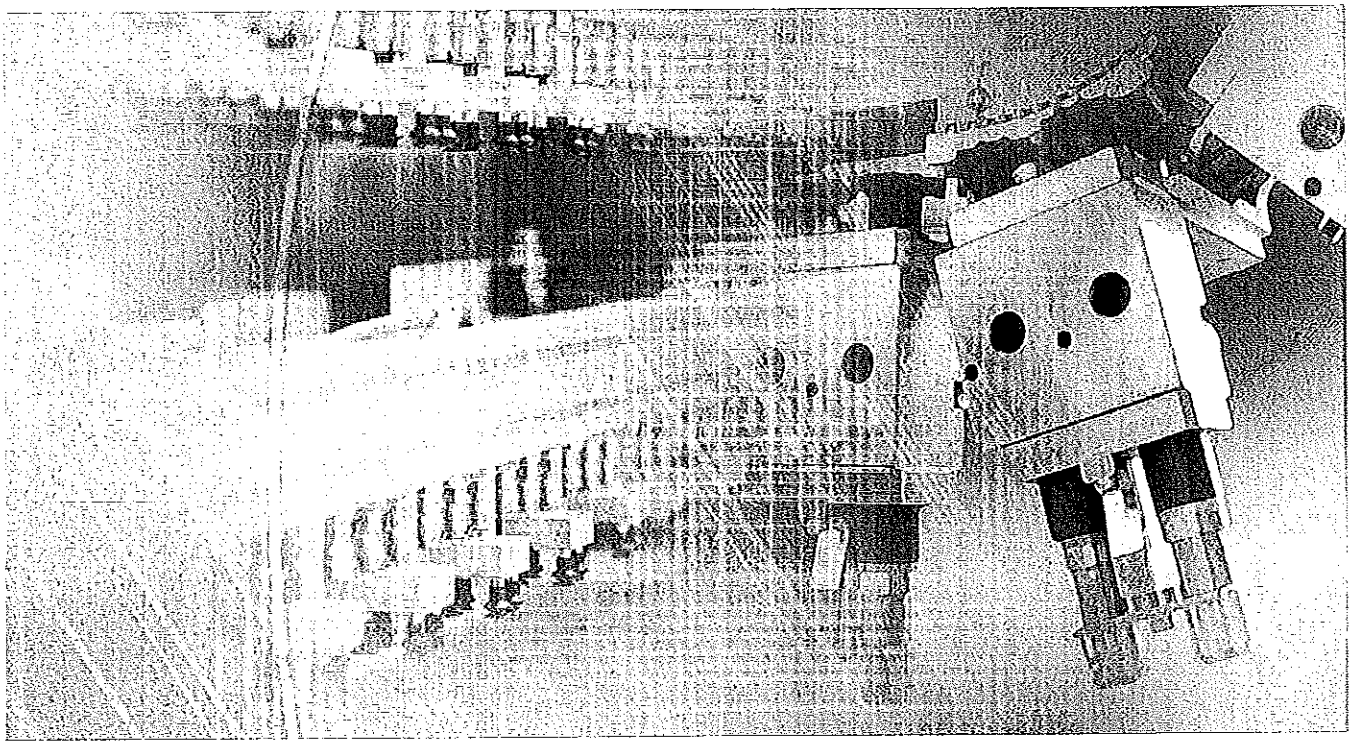


Fuse holders and fuses

Lovato electric

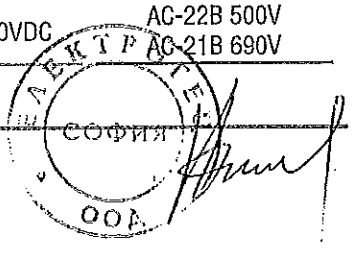
100% electricity

Fuse holders

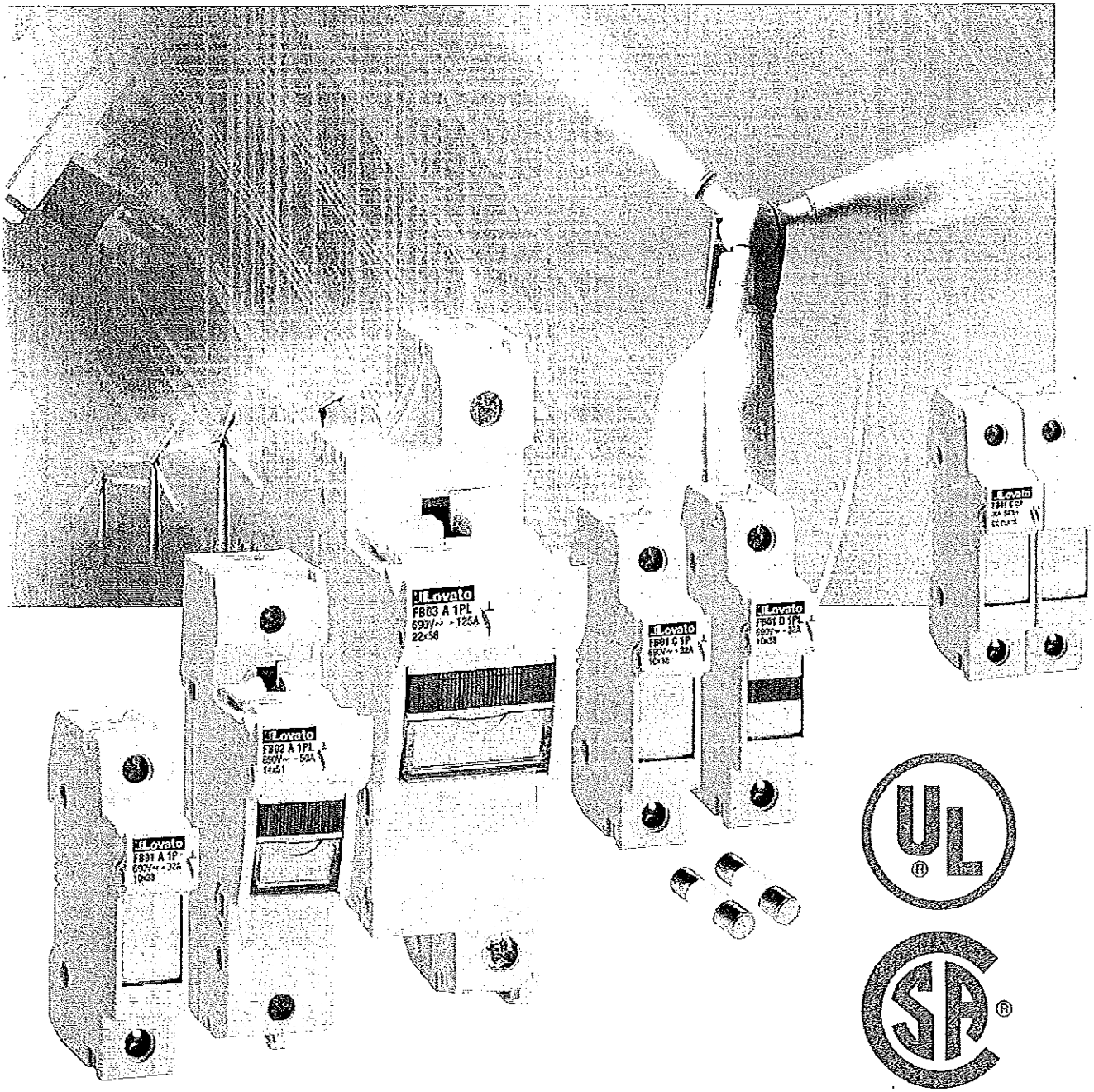


- Modular concept for quick assembly of different versions based on various requirements.
- Compact size compliant with standards for electrical equipment.
- DIN rail mounting and removal ease.
- IP20 protection degree, finger safe.
- Sealable cover in open or closed position to increase user's safety.
- Version with status indicator to quickly determine if the fuse is still operative or needs to be replaced.
- Ergonomic grip for easy cover opening.
- Dedicated cylindrical 10x38 DC fuses for photovolatic systems.
- UL and CSA certified versions.

Range	AC			DC	DC FUSES	CLASS CC
Fuse size	10x38	14x51	22x58	10x38	10x38	10x38
Type	gG or aM			gPV	gPV	Class CC
Rated voltage	690VAC			1000VDC / 690VAC	1000VDC	600VAC
Rated current	32A	50A	125A	32A	20A	30A
Utilisation category	AC-22B 500V AC-21B 690V		–	DC-20B 1000VDC AC-21B 690V	DC-20B 1000VDC	AC-22B 500V AC-21B 690V



and fuses



LOVATO Electric fuse holders can be used to protect against overloads and short circuits of electric lines, for motor protection and control and for the protection of electric installations.

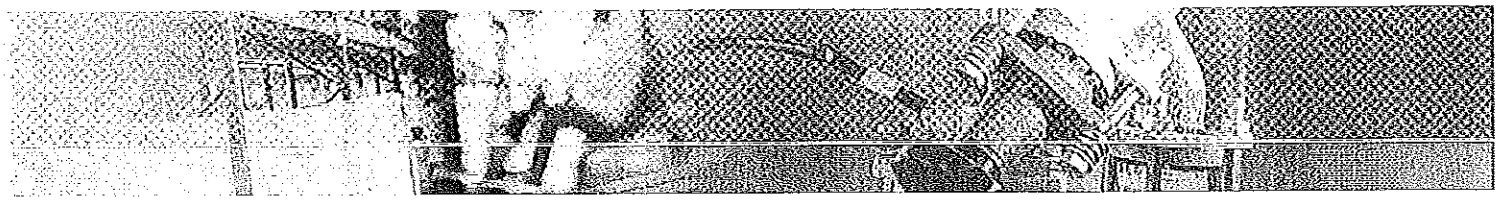
This equipment can assure the disconnect function but is not suitable for isolation so cannot be used as switch disconnector.

The range is available in two versions: with or without fuse status indicator. If the fuse fitted on the holder blows, the failure status is shown by the indicator on the fuse-holder front.

All the fuse holders are certified for the North-American market (UL Listed, UL Recognized and CSA). Furthermore, there is a non-certified version in 10x38mm size available too.

ЕЛЕКТРОТЕХ СОФИЯ ООД

Lovato electric

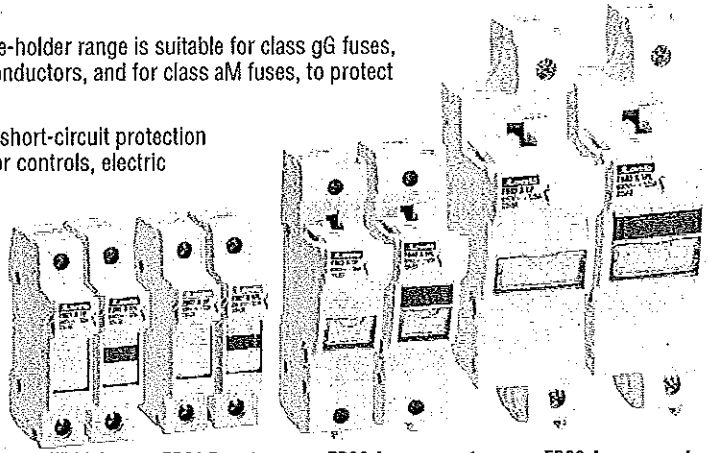


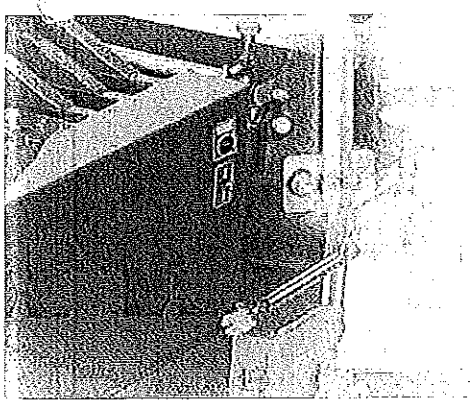
Fuse holders AC
RANGE

LOVATO Electric AC fuse-holder range is suitable for class gG fuses, to protect cables and conductors, and for class aM fuses, to protect motor starting.

Function: Overload and short-circuit protection of control circuits, motor controls, electric installations.

Usage: Service industry, electric panels onboard machinery, electric installations in general.

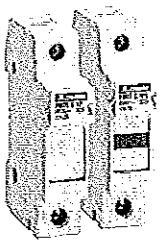




	FB01 A...	FB01 B...	FB02 A...	FB03 A...
Fuse size	10x38		14x51	22x58
Version without indicator	1P, 1P+N, 2P, 3P, 3P+N			
Version with indicator	1P			
Main characteristics				
- Rated voltage	690VAC			
- Rated current	32A		50A	125A
- Utilisation category	AC-22B 500V, AC-21B 690V		AC-22B 500V, AC-21B 690V	AC-21B 690V
- Suitable for fuses	10x38 gG or aM		14x51 gG or aM	22x58 gG or aM
- Maximum conductor cross section	16mm² flexible/stranded; 25mm² rigid/solid		25mm² flexible/stranded; 35mm² rigid/solid	35mm² flexible/stranded; 50mm² rigid/solid
Certifications obtained	UR, CSA	–	cURus	cURus
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3, RoHS directive, UL512, CSA C22.2 n°39			

UR: UL Recognized; cURus: UL Recognized for USA and Canada.

CLASS CC Fuse holders
RANGE

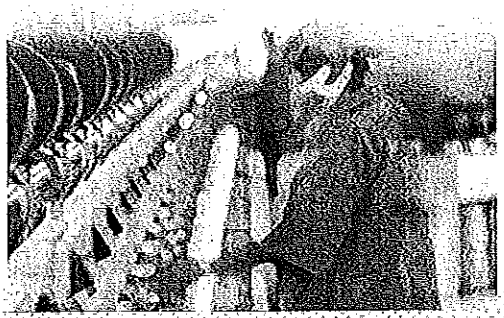


FB01 C...

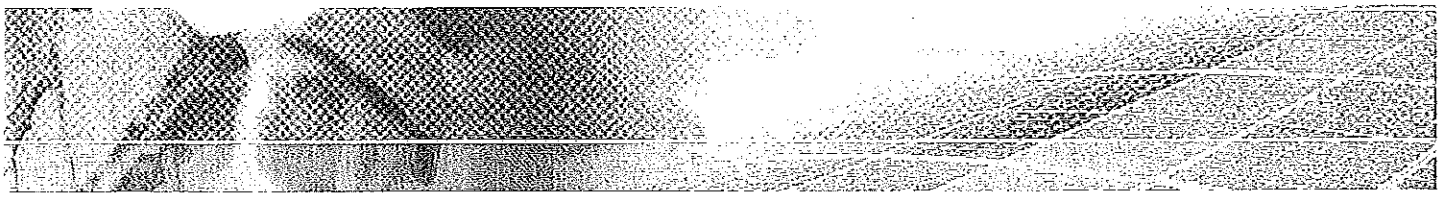
LOVATO Electric fuse holders for class CC fuses are used to protect branch circuits, consisting of conductors and components following the last overcurrent protective device protecting a load, in industrial applications which require high breaking capacity.
Suitable only and exclusively for fitting fuses defined as "class CC", quite common on the North American market.

Usage: Service industry, electric panels onboard machinery, electric installations in general.

Fuse size	**Class CC**
Version without indicator	1P, 2P, 3P
Version with indicator	1P
Main characteristics	
- Rated voltage	600VAC
- Rated current	30A
- Utilisation category	AC-22B 500V, AC-21B 690V
- Suitable for fuses	10x38 class CC
- Maximum conductor cross section	16mm² flexible/stranded; 25mm² rigid/solid
Certifications obtained	UL, CSA
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3UL512, RoHS directives, CSA 22.2 n° 39

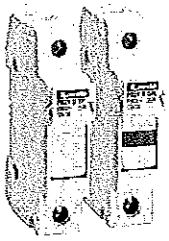


Lovato electric



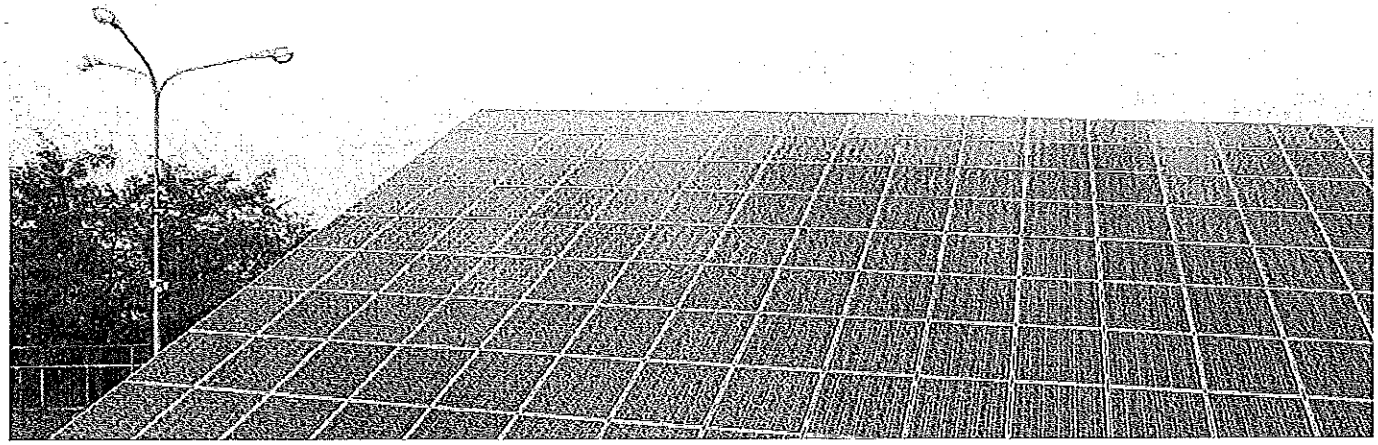
Fuse holders DC

LOVATO Electric DC fuse holder range is suitable for 1000VDC rated voltage and gPV class.
Used for overload and short-circuit protection of photovoltaic modules (strings) and the relative connecting cables.



FB01 D...

Fuse size	10x38
Version without indicator	1P, 2P
Version with Indicator	1P
Main characteristics	
- Rated voltage	1000VDC / 690VAC
- Rated current	32A
- Utilisation category	DC-20B 1000VDC, AC-21B 690V
- Suitable for fuses	10x38 gPV
- Maximum conductor cross section	16mm² flexible/stranded, 25mm² rigid/solid
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3, RoHS directive



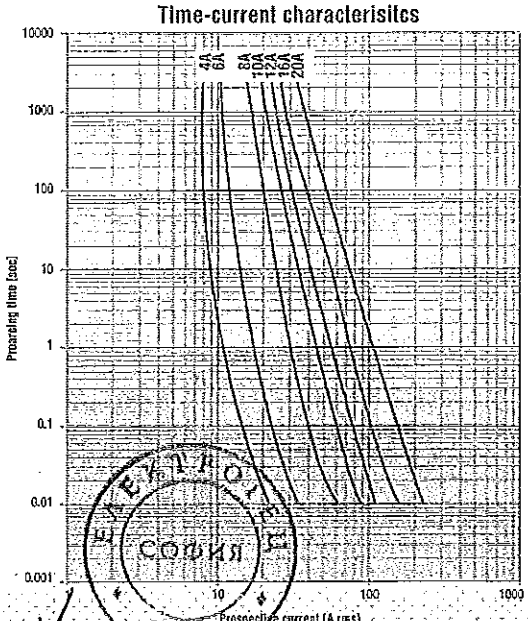
Fuses DC

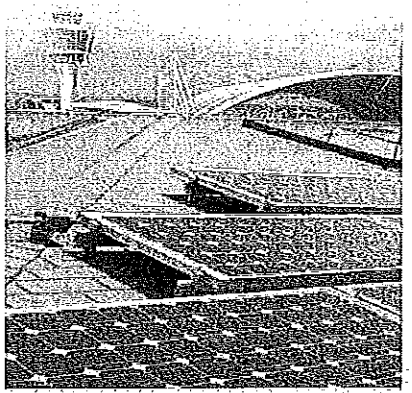
LOVATO Electric offers a range of cylindrical 10x38 fuses dedicated to photovoltaic duty and designed for 1000VDC maximum use.
Contrary to AC type fuses that blow for high overcurrent values, this type of DC fuse is designed to blow with low-intensity overcurrent values, created on photovoltaic cells and panels.

FE01 D 0...

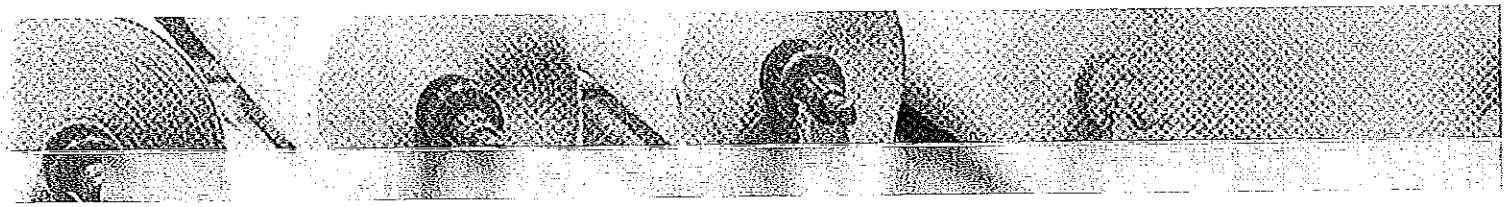
Fuses for photovoltaic application	
Breaking capacity	30kA
Mains characteristics	
- Rated voltage	1000VDC
- Rated current	2...20A

Time-current characterisitcs





Lovato electric

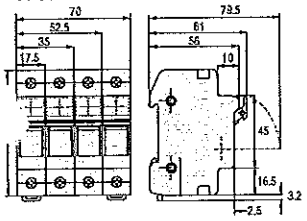


TECHNICAL CHARACTERISTICS

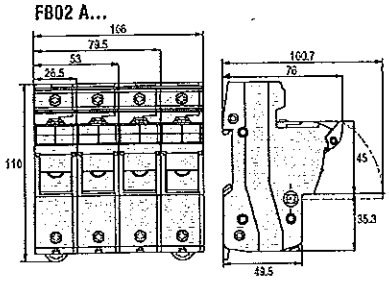
Type		FB01 A...	FB01 B...	FB02 A...	FB03 A...	FB01 C...	FB01 D...
Range		**AC**	**AC**	**AC**	**AC**	**Class CC (AC)**	**DC**
Certifications obtained		UR, CSA	–	cURus	cURus	UL, CSA	–
Maximum power dissipation		3W	3W	5W	9.5W	3W	4W
Derating factor of current Ie for different ambient temperatures	20°C	1	1	1	1	1	1
	30°C	0.95	0.95	0.95	0.95	0.95	0.95
	40°C	0.9	0.9	0.9	0.9	0.9	0.9
	50°C	0.8	0.8	0.8	0.8	0.8	0.8
	60°C	0.7	0.7	0.7	0.7	0.7	0.7
	70°C	0.5	0.5	0.5	0.5	0.5	0.5
Derating factor of current Ie for sid-by-side fuse holders - n° poles	1-3	1	1	1	1	1	1
	4-6	0.8	0.8	0.8	0.8	0.8	0.8
	7-9	0.7	0.7	0.7	0.7	0.7	0.7
	>10	0.6	0.6	0.6	0.6	0.6	0.6
Voltage for status indicator		120...690VAC	120...690VAC	230...690VAC	230...690VAC	120...600VAC	350...1000VDC
CONNECTIONS							
Maximum tightening torque		2.5Nm/22lbin	2.5Nm/22lbin	3Nm/26lbin	4Nm/35lbin	2.5Nm/22lbin	2.5Nm/22ibin
Maximum conductor cross section	flexible/stranded	1-16mm²/8 AWG	1-16mm²/6 AWG	1-25mm²/4 AWG	1-35mm²/2 AWG	1-16mm²/8 AWG	1-16mm²/6 AWG
	rigid/solid	1-25mm²/8 AWG	1-25mm²/4 AWG	1-35mm²/2 AWG	1-50mm²/1 AWG	1-25mm²/10 AWG	1-25mm²/4 AWG
AMBIENT CONDITIONS							
Operating temperature		-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C
Storage temperature		-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C
HOUSING							
Din rail mount version		Yes	Yes	Yes	Yes	Yes	Yes
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20

DIMENSIONS

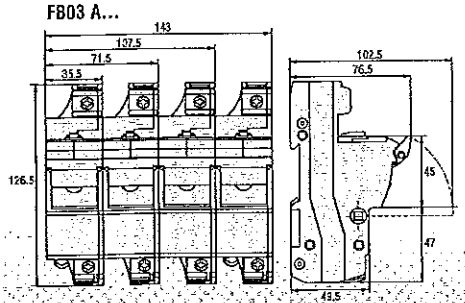
FB01 A... FB01 B... FB01 C... FB01 D...



FB02 A...

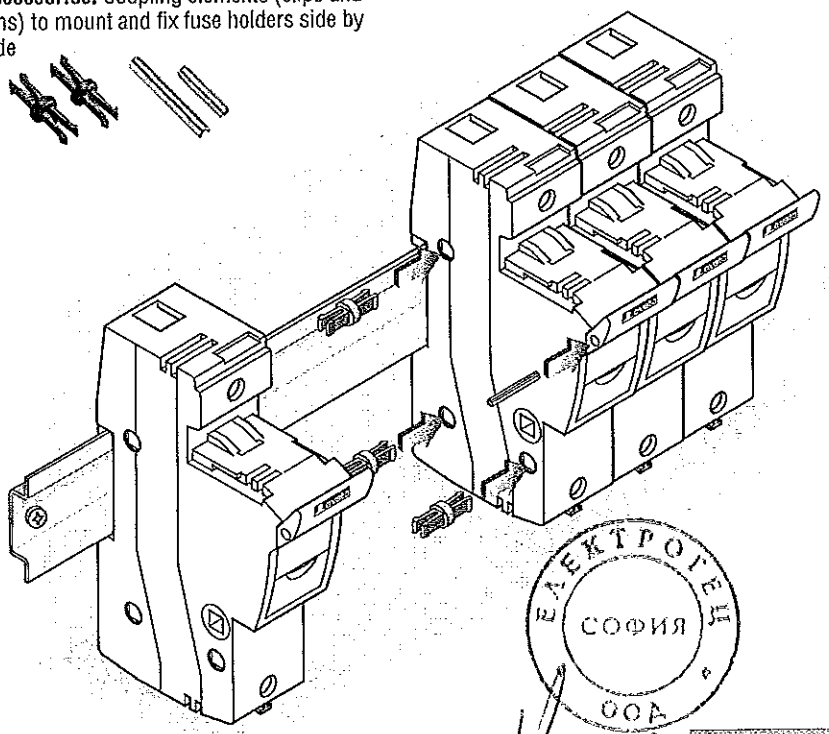


FB03 A...

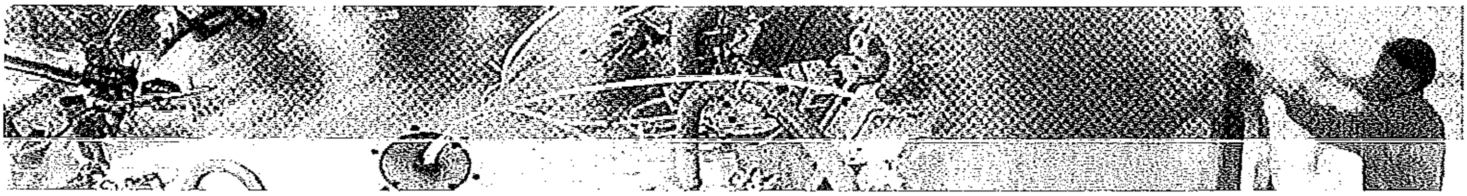


ASSEMBLY

Accessories: Coupling elements (clips and pins) to mount and fix fuse holders side by side



Lovato electric

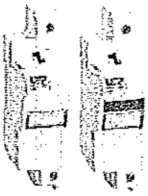


HOW TO ORDER

FUSE HOLDERS

Order code	Pole arrangement	DIN modules	Status Indicator	Rated voltage Ue	Rated nominale Ie	Qty per pkg	Weight
		n°		[V]	[A]	n°	[kg]
Fuse holder (fuse disconnector), 10x38, certified by UR and CSA.							
FB01 A 1P	1 pole	1	–	690VAC	32	12	0.750
FB01 A 1PL	1 pole	1	Yes	690VAC	32	12	0.750
FB01 A 1N	1 pole + N	2	–	690VAC	32	6	0.750
FB01 A 2P	2 poles	2	–	690VAC	32	6	0.750
FB01 A 3P	3 poles	3	–	690VAC	32	4	0.750
FB01 A 3N	3 poles + N	4	–	690VAC	32	3	0.750
Fuse holder (fuse disconnector), 14x51, certified by cURus.							
FB02 A 1P	1 pole	1.5	–	690VAC	50	6	1.000
FB02 A 1PL	1 pole	1.5	Yes	690VAC	50	6	1.000
FB02 A 1N	1 pole + N	3	–	690VAC	50	3	1.000
FB02 A 2P	2 poles	3	–	690VAC	50	3	1.000
FB02 A 3P	3 poles	4.5	–	690VAC	50	2	1.000
FB02 A 3N	3 poles + N	6	–	690VAC	50	1	0.650
Fuse holder (fuse disconnector), 22x58, certified byt cURus.							
FB03 A 1P	1 pole	2	–	690VAC	125	6	1.050
FB03 A 1PL	1 pole	2	Yes	690VAC	125	6	1.050
FB03 A 1N	1 pole + N	4	–	690VAC	125	3	1.050
FB03 A 2P	2 poles	4	–	690VAC	125	3	1.050
FB03 A 3P	3 poles	6	–	690VAC	125	2	1.050
FB03 A 3N	3 poles + N	8	–	690VAC	125	1	0.70c
Fuse holder (fuse disconnector), class CC, certified by UL and CSA.							
FB01 C 1P	1 pole	1	–	600VAC	30	12	0.750
FB01 C 1PL	1 pole	1	Yes	600VAC	30	12	0.750
FB01 C 2P	2 poles	2	–	600VAC	30	6	0.750
FB01 C 3P	3 poles	3	–	600VAC	30	4	0.750
Fuse holder (fuse disconnector), 10x38.							
FB01 B 1P	1 pole	1	–	690VAC	32	12	0.750
FB01 B 1PL	1 pole	1	Yes	690VAC	32	12	0.750
FB01 B 1N	1 pole + N	2	–	690VAC	32	6	0.750
FB01 B 2P	2 poles	2	–	690VAC	32	6	0.750
FB01 B 3P	3 poles	3	–	690VAC	32	4	0.750
FB01 B 3N	3 poles + N	4	–	690VAC	32	3	0.750
Fuse holder (fuse disconnector), 10x38, for photovoltaic applications.							
FB01 D 1P	1 pole	1	–	1000VDC	32	12	0.750
FB01 D 1PL	1 pole	1	Yes	1000VDC	32	12	0.750
FB01 D 2P	2 poles	2	–	1000VDC	32	6	0.750






FUSES FOR PHOTOVOLTAIC APPLICATIONS

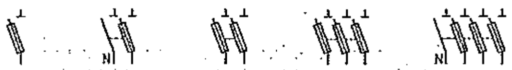
Order code	Rated breaking capacity	Rated voltage Ue	Rated current Ie	Qty per pkg	Weight
	[kA]	[V]	[A]	n°	[kg]
FE01 D 00200	30	1000VDC	2	10	0.130
FE01 D 00400	30	1000VDC	4	10	0.130
FE01 D 00600	30	1000VDC	6	10	0.130
FE01 D 00800	30	1000VDC	8	10	0.130
FE01 D 01000	30	1000VDC	10	10	0.130
FE01 D 01200	30	1000VDC	12	10	0.130
FE01 D 01600	30	1000VDC	16	10	0.130
FE01 D 02000	30	1000VDC	20	10	0.130

ACCESSORIES

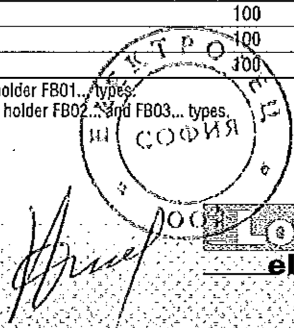
Order code	Description	Qty per pkg	Weight
		n°	[kg]
FBX 00	Coupling clip for 10x38, 14x51 and 22x58 sizes	100	0.050
FBX 01	Coupling pin for 10x38 size	100	0.130
FBX 02	Coupling pin for 14x51 and 22x58 sizes	100	0.150

N.B. Two clips FBX 00 and one pin FBX 01 are needed to couple two fuse holder FB01... types.
Three clips FBX 00 and one pin FBX 02 are needed to couple two fuse holder FB02... and FB03... types.

WIRING DIAGRAMS



1P 1P + N 2P 3P 3P + N



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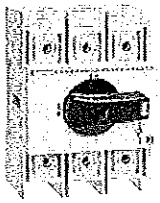
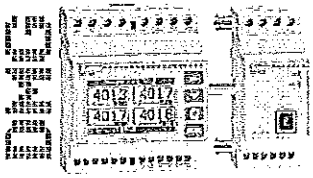
new

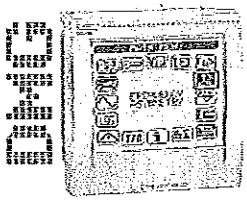
2011



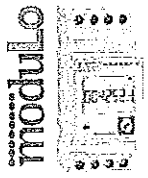
Switch disconnectors
16 to 1600A



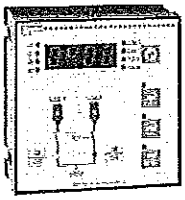
Modular digital multimeters



Flush-mount digital multimeters
and power analyzers



Energy meters

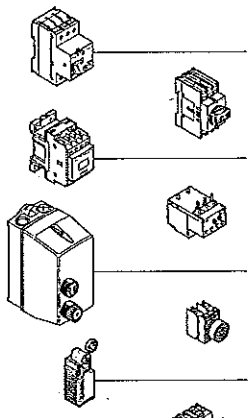


Automatic transfer switch
controllers

Switching power supplies

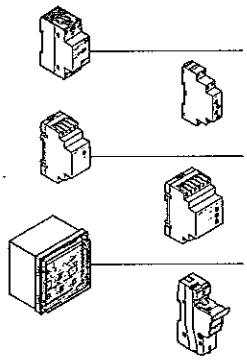
Lovato electric
100% electricity

Power Switch



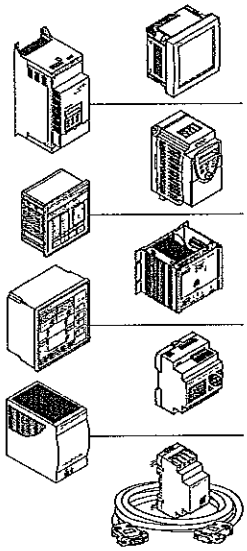
- Motor protection circuit breakers
- Switch disconnectors
- Contactors
- Motor protection relays
- Electromechanical starters
- Control and signalling units
- Limit , micro and foot switches
- Rotary cam switches

Power Data

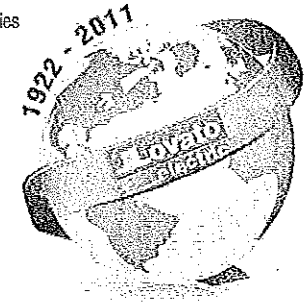


- Modular contactors
- Time relays
- Protection relays
- Level control relays
- Earth leakage relays
- Fuse holders

Power Logic



- Metering instruments and current transformers
- Soft starters
- AC motor drives
- Automatic power factor controllers
- Automatic battery chargers
- Automatic transfer switch controllers
- Programmable logic relays
- Switching power supplies
- Expansion modules and accessories



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PDGT GB 01 11

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

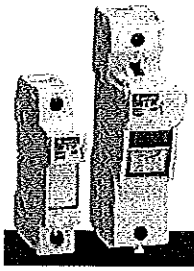
„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm"

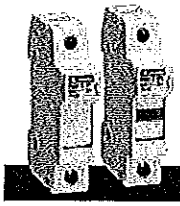
Приложение № 2

ЕЛЕКТРОТЕЛ АД СОФИЯ ООД



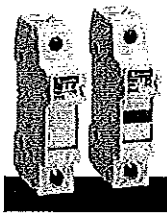
Page 12-2

AC FUSE HOLDERS
- Version without indicator: 1P, 1P+N, 2P, 3P, 3P+N
- Version with indicator: 1P
- For fuses 10x38, 14x51 and 22x58mm IEC class gG or aM.
- Rated current: 32A, 50A, 125A
- Rated voltage: 690VAC.



Page 12-2

AC FUSE HOLDERS CLASS CC FOR NORTH AMERICAN MARKET
- Version without indicator: 1P, 2P, 3P
- Version with indicator: 1P
- For 10x38mm UL/CSA class CC fuses
- Rated current: 30A
- Rated voltage: 600VAC.



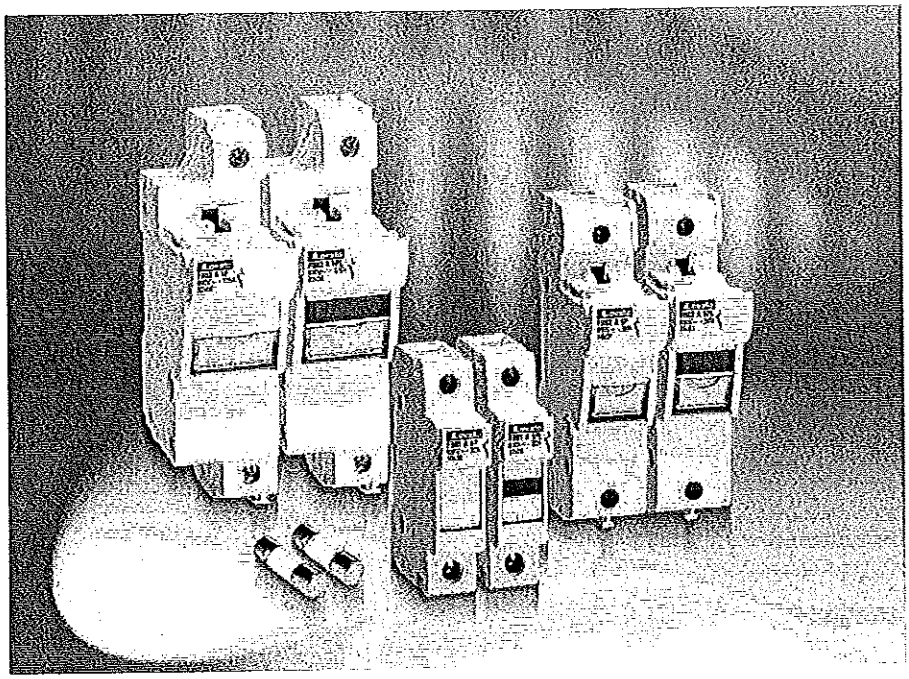
Page 12-3

DC FUSE HOLDERS FOR PHOTOVOLTAIC APPLICATIONS
- Version without indicator: 1P, 2P
- Version with indicator: 1P, 2P
- For 10x38mm IEC class gPV fuses
- Rated current: 32A
- Rated voltage: 1000VDC
- IEC utilisation category: DC20B.

Page 12-3

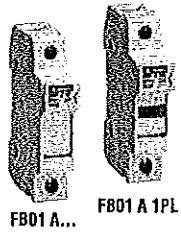
DC FUSES FOR PHOTOVOLTAIC APPLICATIONS
- 10x38mm, IEC class gPV
- Rated current: 20A
- Rated voltage: 1000VDC.

FUSE HOLDERS

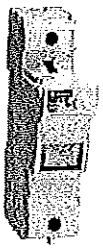


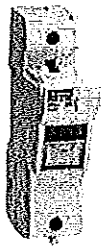
- Modular size for 10x38, 14x51 and 22x58mm fuses
- Finger safe - IP20 IEC degree of protection against accidental contact with live parts and with sealable cover for operators' safety
- Version with status indicator to quickly determine if the fuse is still operative or needs to be replaced
- UL and CSA certified versions.

Fuse holders UL Recognized and CSA certified


FB01 A...

FB01 A 1PL


FB02 A...


FB02 A 1PL


FB03 A...


FB03 A 1PL

Order code	Pole arrange-ment	Status indicator	DIN size	Qty per pkg	Wt
			n°	n°	[kg]
For 10x38mm fuses. 32A rated current at 690VAC.					
FB01 A 1P	1P	—	1	12	0.066
FB01 A 1PL	1P	YES	1	12	0.065
FB01 A 1MO	1P+N	—	1	12	0.062
FB01 A 1N	1P+N	—	2	6	0.134
FB01 A 2P	2P	—	2	6	0.132
FB01 A 3P	3P	—	3	4	0.188
FB01 A 3N	3P+N	—	4	3	0.260
For 14x51mm fuses. 50A rated current at 690VAC.					
FB02 A 1P	1P	—	1	12	0.113
FB02 A 1PL	1P	YES	1	12	0.114
FB02 A 1N	1P+N	—	2	6	0.237
FB02 A 2P	2P	—	2	6	0.224
FB02 A 3P	3P	—	3	4	0.335
FB02 A 3N	3P+N	—	4	3	0.460
For 22x58mm fuses. 125A rated current at 690VAC.					
FB03 A 1P	1P	—	1	12	0.167
FB03 A 1PL	1P	YES	1	12	0.167
FB03 A 1N	1P+N	—	2	6	0.354
FB03 A 2P	2P	—	2	6	0.334
FB03 A 3P	3P	—	3	4	0.500
FB03 A 3N	3P+N	—	4	3	0.720

❶ Not certified.

Operational characteristics
- IEC rated voltage Ue:
  - 690VAC (FB01 A 1M excluded)
  - 400VAC (FB01 A 1M only)
- IEC rated current Ie:
  - FB01 A: 32A
  - FB02 A: 50A
  - FB03 A: 125A
- IEC utilisation category:
  - FB01 A: AC22B 500V, AC21B 690V (except FB01 A 1M: AC22B 400V)
  - FB02 A: AC22B 500V, AC21B 690V
  - FB03 A: AC21B 690V
- Suitable for IEC fuse class: gG and aM
- IEC degree of protection: IP20.

Certifications and compliance
Certifications obtained:

Type	UL Recognized for USA (File E343395)	CSA certified (File 252040 class 6225)	UL Recognized for USA and Canada (File E343395)
FB01 A 1P, FB01 A 1PL, FB01 A 1N	●	●	—
FB02 A...	—	—	●
FB03 A...	—	—	●

● Certification obtained.

"UL Recognized": Products having this type of marking are intended for use as components of complete workshop-assembled equipment.

Compliant with standards: IEC/EN 60269-1, IEC/EN 60269-2, IEC/EN 60947-1, IEC/EN 60947-3, UL 4248-1, UL 4248-4, CSA C22.2 n°4248.1, CSA C22.2 n°4248.4.

Fuse holders


FB01 B...


FB01 B 1PL

Order code	Pole arrange-ment	Status indicator	DIN size	Qty per pkg	Wt
			n°	n°	[kg]
For 10x38mm fuses. 32A rated current at 690VAC.					
FB01 B 1P	1P	—	1	12	0.062
FB01 B 1PL	1P	YES	1	12	0.064
FB01 B 1N	1P+N	—	2	6	0.127
FB01 B 2P	2P	—	2	6	0.128
FB01 B 3P	3P	—	3	4	0.185
FB01 B 3N	3P+N	—	4	3	0.247

Operational characteristics
- IEC rated voltage Ue: 690VAC
- IEC rated current Ie: 32A
- IEC utilisation category: AC22B 500V, AC21B 690V
- Suitable for IEC fuse class: gG and aM
- IEC degree of protection IP20.

Reference standards
Compliant with standards: IEC/EN 60947-1, IEC/EN 60947-3, IEC/EN 60269-1, IEC/EN 60269-2.

Fuse holders UL Listed and CSA certified for class CC fuses for North American market


FB01 C...


FB01 C 1PL

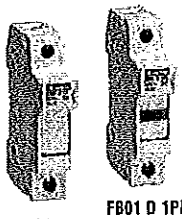
Order code	Pole arrange-ment	Status indicator	DIN size	Qty per pkg	Wt
			n°	n°	[kg]
For 10x38mm fuses, 30A rated current at 600VAC.					
FB01 C 1P	1P	—	1	12	0.070
FB01 C 1PL	1P	YES	1	12	0.072
FB01 C 2P	2P	—	2	6	0.140
FB01 C 3P	3P	—	3	4	0.210

NOTE: UL Listed and CSA certified as "Fuseholders, Cartridge Fuse" for use with Class CC fuses, Interrupting rating 200,000 Amps rms symmetrical. Voltage rating 600V. Current rating 30A.

Operational characteristics
- IEC rated voltage Ue: 600VAC
- IEC rated current Ie: 30A
- IEC utilisation category: AC22B 500V, AC21B 690V
- Suitable for UL/CSA fuse class: CC
- IEC degree of protection IP20.

Certifications and compliance
Certifications obtained: UL Listed (File E343395) and CSA certified (File 252040 class 6225).
Compliant with standards: IEC/EN 60269-1, IEC/EN 60269-2, IEC/EN 60947-1, IEC/EN 60947-3, UL 4248-1, UL 4248-4, CSA C22.2 n°4248.1, CSA C22.2 n°4248.4.

Fuse holders for photovolatic applications


FB01 D...

FB01 D 1PL

Order code	Pole arrangement	Status indicator	DIN size	Qty per pkg	Wt
			n°	n°	[kg]
For 10x38mm fuses. 32A rated current at 1000VDC.					
FB01 D 1P	1P	—	1	12	0.064
FB01 D 1PL	1P	YES	1	12	0.065
FB01 D 2P	2P	—	2	6	0.127
FB01 D 2PL	2P	YES	2	6	0.130

Operational characteristics
- IEC rated voltage Ue: 1000VDC
- IEC rated current Ie: 32A
- IEC utilisation category: DC20B 1000VDC
- Suitable for IEC fuse class: gPV
- IEC degree of protection: IP20.

Reference standards
Compliant with standards: IEC/EN 60269-1, IEC/EN 60269-2, IEC/EN 60947-1, IEC/EN 60947-3.

Fuses for photovoltaic applications


FE01 D...

Order code	Rated current In	Qty per pkg	Wt
	[A]	n°	[kg]
For 10x38mm fuses. 30kA breaking capacity at 1000VDC.			
FE01 D 00200	2	10	0.008
FE01 D 00400	4	10	0.008
FE01 D 00600	6	10	0.008
FE01 D 00800	8	10	0.008
FE01 D 01000	10	10	0.008
FE01 D 01200	12	10	0.008
FE01 D 01600	16	10	0.008
FE01 D 02000	20	10	0.008

Operational characteristics
- IEC rated voltage Ue: 1000VDC
- IEC rated current Ie: 2-20A
- IEC fuse class: gPV.

Reference standards
Compliant with standards: IEC/EN 60269-6.

Accessories


FBX 00


FBX 01
FBX 02


FBX 05


FBX 07


FBX 08


FBX 11

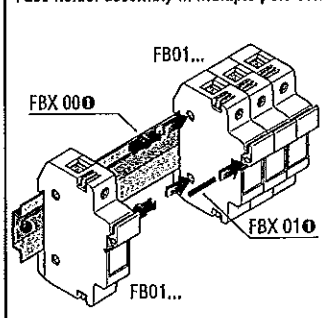
Order code	Description	Qty per pkg	Wt
	[A]	n°	[kg]
FBX 00❶	Coupling clip for 10x38, 14x51 and 22x58mm sizes❶	100	0.003
FBX 01❶	Coupling pin for 10x38mm size❶	100	0.005
FBX 02	Coupling pin for 14x51 and 22x58mm sizes	100	0.008
For FB01 A... and FB01 B... types.			
FBX 05	Three-phase connection busbar, for 57 modules in total, 1m/3.3ft long	10	0.465
FBX 07	One-pole terminal for 25mm² max conductor	25	0.010
FBX 08	One-pole terminal for 50mm² max conductor	25	0.020
FBX 11	End cap for FBX05 busbar	50	0.001

❶ Not suitable for FB01 B1N, FB01 B2P, FB01 B3P and FB01 B3N types.

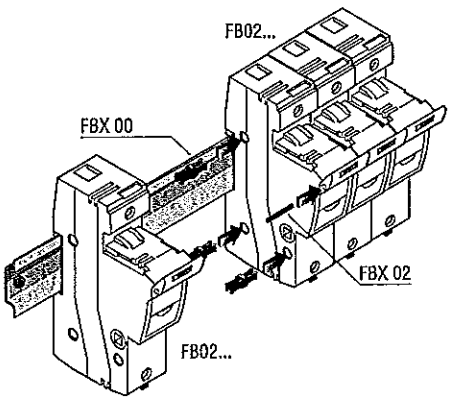
General and operational characteristics
THREE-PHASE BUSBAR
- Central point of power supply: 130A max
- Side point of power supply: 80A max
- Pitch: 18mm/0.7in
- Busbar section: 10mm²
- Number of modules/poles: 57
- For paralleling connection
- Length (standard supplied): 1m/3.3ft which can be cut in shorter sections.

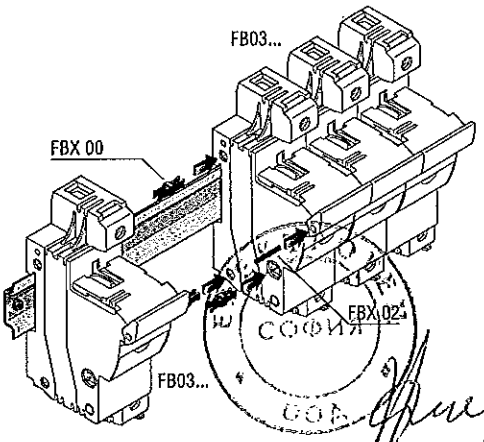
12

Fuse holder assembly in multiple pole configuration



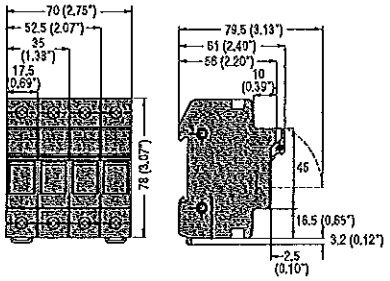
❶ Not suitable for FB01 B1N, FB01 B2P, FB01 B3P and FB01 B3N types.



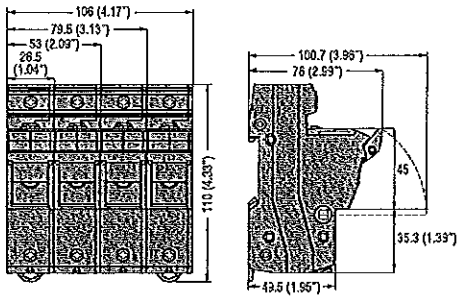


FUSE HOLDERS

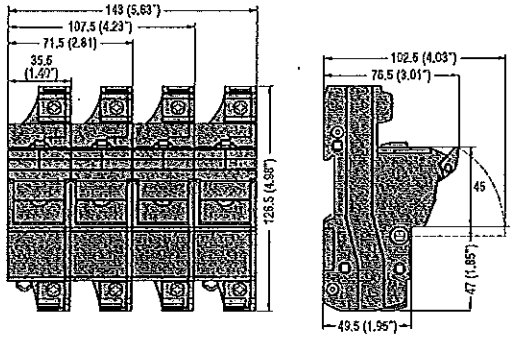
FB01 A... FB01 B... FB01 C... FB01 D...



FB02 A...

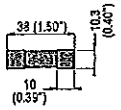


FB03 A...

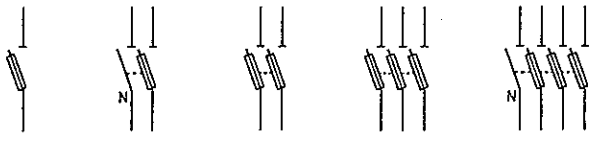


FUSES

FE01 D 0...



Wiring diagrams



1P 1P+N 2P 3P 3P+N

TYPE		FB01 A...	FB01 B...	FB02 A...	FB03 A...	FB01 C...	FB01 D...
Range		AC				Class CC (AC)	DC
IEC maximum rated current In		32A		50A	125A	30A	32A
IEC maximum rated voltage In		690VAC; 400VAC ❶	690VAC			600VAC	1000VDC
IEC utilisation category		AC22B 500V; AC21B 690V; AC22B 400V ❶			AC21B 690V	AC22B 500V; AC21B 690V	DC20B 1000VDC
Maximum power dissipation		3W		5W	9.5W	3W	4W
Derating factor of current In for different ambient temperatures	20°C	1					
	30°C	0.95					
	40°C	0.9					
	50°C	0.8					
	60°C	0.7					
	70°C	0.5					
Derating factor of current In for side-by-side fuse holders - n° poles	1-4	1					
	5-6	0.8					
	7-9	0.7					
	≥10	0.6					
Voltage for status indicator		120...690VAC		230...690VAC		120...600VAC	350...1000VDC

CONNECTIONS						
Maximum tightening torque	2.5Nm; 2Nm ❶ / 22lbin	3Nm / 26lbin	4Nm / 35lbin	2.5Nm / 22lbin		
Maximum conductor cross section	flexible/stranded	1x16mm²; 1-16mm² ❶ / 8AWG	1x25mm² / 6AWG	1x35mm² / 2AWG	1x16mm² / 8AWG	1x16mm² / 6AWG
	rigid/solid	1x25mm²; 1-10mm² ❶ / 8AWG	1x35mm² / 8AWG	1x50mm² / 1AWG	1x25mm² / 10AWG	1x25mm² / 4AWG

AMBIENT CONDITIONS	
Operating temperature	-20...+70°C
Storage temperature	-40...+80°C
Maximum altitude	3,000m
Operation position	Any
Fixing	On 35mm DIN rail (IEC/EN 60715)

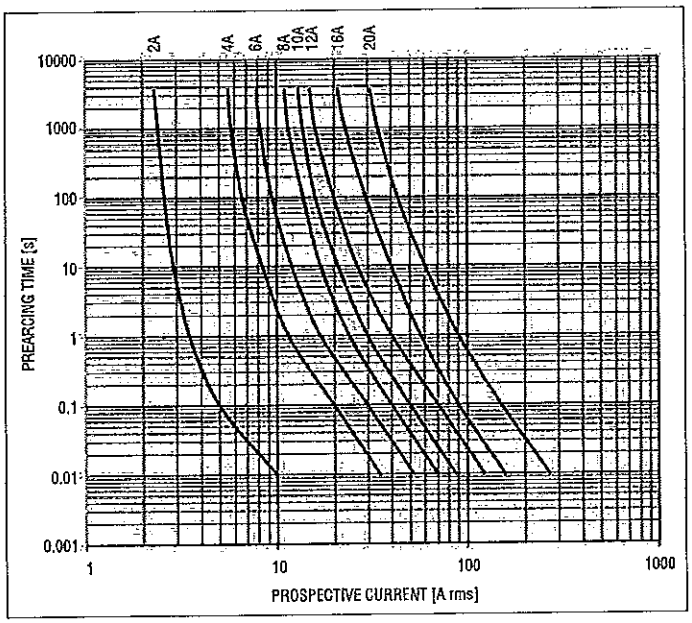
❶ Values valid only for FB01 A 1M type.

12

TECHNICAL CHARACTERISTICS FOR FE01 D... FUSES

TYPE	Rated current [A]	Power consumption at 0.7 In [W]	Power consumption at In [W]	Prearcing I²t [A²s]	Total I²t at 1000VDC [A²s]
FE01 D 00200	2	0.62	1.54	1.78	6.5
FE01 D 00400	4	0.73	1.84	3	11
FE01 D 00600	6	0.96	2.4	8.5	32
FE01 D 00800	8	1.02	2.55	25	93
FE01 D 01000	10	1.03	2.58	11	52
FE01 D 01200	12	1.04	2.6	25	116
FE01 D 01600	16	1.08	2.7	33	152
FE01 D 02000	20	1.16	2.9	85	390

TIME-CURRENT CHARACTERISTICS FOR FE01 D... FUSES



„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm"

Приложение № 3

ЕЛЕКТРОГЕЕ СОФИЯ

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният Владимир Лазаров,

Управител на фирма "ВиВ Изоматик" ООД, София, ул.Пирин 40А

В качеството си на търговски представители на LOVATO Electric

Декларираме, че продуктът:

Марка:	LOVATO
Продукт:	Основа за стопяеми предпазители
Серия:	FB

За който се отнася тази декларация, при условие, че е инсталиран, обслужван и използван за приложения, за които е предназначен, е в съответствие със следните стандарти, технически одобрения или други нормативни актове:

2006/95/EC /LV/
2004/108/EC/EMC/
IEC/EN 60269-1
IEC/EN 60947-1 ; 3

София, 20.10.2015

.....
Владимир Лазаров, управител
ВиВ Изоматик ООД

ЕЛЕКТРОТЕЕ СОФИЯ

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
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РЕФ. № PPD 15-042

"Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm"

Приложение № 4

ЕЛЕКТРОЕ... СОФИЯ ...

DEVICE UNDER TEST..... **Fuse holder *FB01B types***

MANUFACTURER..... Lovato Electric S.p.A.

TYPE OF TEST..... **Temperature rise test on FB01B fuse holders**

DATE OF DEVICE RECEIPT..... 27/04/2011

START / END TESTING ..... 29/04/2011 – 13/05/2011

SAMPLES STORING..... ☒ Eliminated / returned to customer ☐ Storage :

INDEX .....

ISSUE 16/05/2011

COMPILED ..... STAFF LPR

APPROVED ..... RESP. LPR

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕХ СОФИЯ

1. PURPOPSE OF TESTING

Requested test (according to the customer specification):
Temperature rise at 690V – 32A on FB01B fuse holders

Test purpose:
"Verify the good function of FB01B fuse holders ."

Test target:
Pass the test.

2. TEST SAMPLES

N. 1 FB01B1P fuse holder - 32A (10 x 38 mm), batch production number ...[1]
N. 1 FB01B2P fuse holder - 32A (10 x 38 mm), batch production number ...[1]
N. 1 FB01B3P fuse holder - 32A (10 X 38 mm), batch production number ...[1]

3. TEST METHOD

IEC 60947-3 (2008-08) Ed. 3.0 + IEC 60947-1 Ed. 5.1 (2011-03)
Temperature rise (§ 8.3.3.1)

4. TEST PROCEDURES

Temperature rise..... Test instruction LPR 051-1, rev. 4, dated 11/10/2010.

ВЯРНО С ОРИГИНАЛА

[1] not available
[1] not available
[1] not available

ЕЛЕКТРОНЕ СОФИЯ ССА

5. TEST RESULTS

5.1 TEMPERATURE RISE

5.1.1 WITH LEGRAND FUSE 32 A gG 400 V

Sample under test.....N. 1 FB01B1P - 32A
N. 1 FB01B2P - 32A
N. 1 FB01B3P - 32A

Test conditions

Ambient temperature.....21 °C
Relative humidity.....46 %
Installation.....in vertical way, on DIN RAIL 35mm

Data sheet fusible used:
- Supplier .....Legrand
- Code .....cod. 133 32

Test parameters

Wiring of the main circuit
- cables section / length.....6,0 mm^2 / 1,0 m
- screws tightening nominal torque .....2,0 ÷ 2,5 N.m
- screws applied tightening torque .....2,0 N·m

Supply of the main circuit
- rated current.....Ith = 25 - 32 A
- test current.....I = 32 A
- supply frequency.....50 Hz

Test results

See next page.

ВЯРНО С ОРИГИНАЛА

Temperature rise main circuit

	[K]			Standard limit EN60947-1 tab. 2
	One pole fuse holder FB01B1P	2 pole fuse holder FB01B2P	3 pole fuse holder FB01B3P	
Terminal L1	43	54	57	65
Terminal T1	39	51	52	65
Terminal L2	-	55	61	65
Terminal T2	-	49	58	65
Terminal L3	-	-	57	65
Terminal T3	-	-	50	65
Note	Silver plated-brass terminal			

Temperature rise for accessibile parts

	[K]			Standard limit EN60947-1 tab. 3
	One pole fuse holder FB01B1P	2 pole fuse holder FB01B2P	3 pole fuse holder FB01B3P	
Line side	14	24	29	40
Load side	10	19	21	40
Left side	24	30	32	40
Right side	22	30	31	40
On front	18	24	29	40
Lever	9	16	17	40

6. TEST EQUIPMENT AND INSTRUMENTS

6.1. TEST EQUIPMENT

Description	Used for	Full scale	Code
Current supply station	Power supply main circuit	20V – 50A	LPRA 065

6.2. MEASURING INSTRUMENTS

Description	Used to measure	Full scale	Code	Calibration expiration date
Thermohygrometer	Ambient temperature	-5 ÷ 50 °C	LPR 165	27/10/2011
Thermohygrometer	Relative humidity	10 ÷ 90%	LPR 165	27/10/2011
Termometric instrument	Temperature rise	-30 ÷ +200 °C	LPR 201	10/01/2012
Termocouple T type	Temperature rise	-30 ÷ +200 °C	LPR 201	10/01/2012
Termocouple T type	Temperature rise	-30 ÷ +200 °C	LPR 201.13	10/01/2012
Current transformer	Main circuit current	1.004/50 A	LPR 155	11/05/2014
Digital multimeter	Main circuit current	10 A	LPR 55	11/05/2012
Digital multimeter	Drop voltage	mV - Autom.	LPR 125	11/05/2012
Dynamometric screw driver	Main terminal screw tightening	6,0 Nm	LPR 231	07/01/2012

7. REMARKS & ANALYS

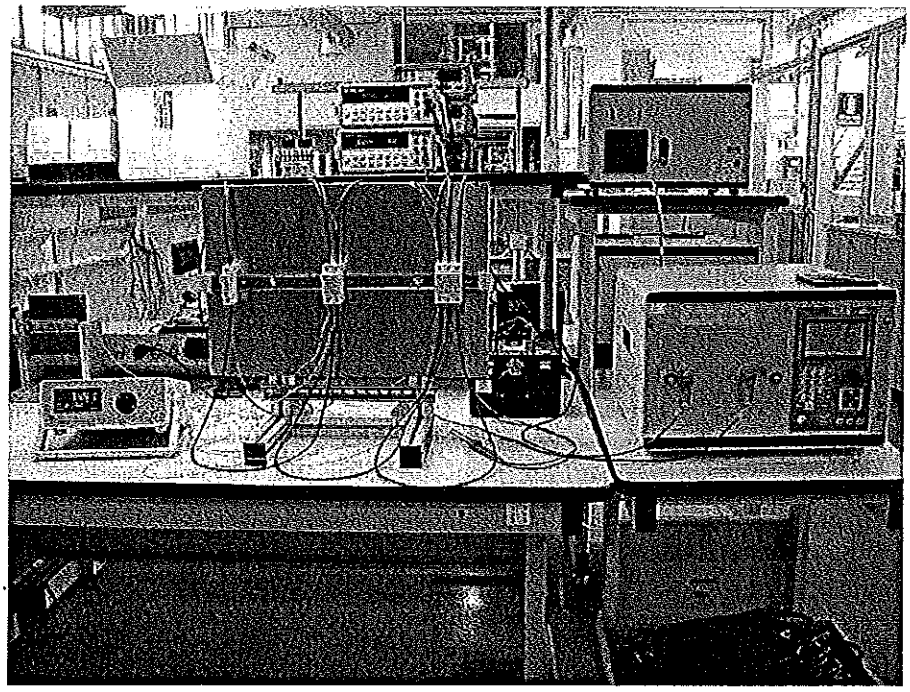
Temperature rise test 690V – 32A: test passed

ВЯРНО С ОРИГИНАЛА

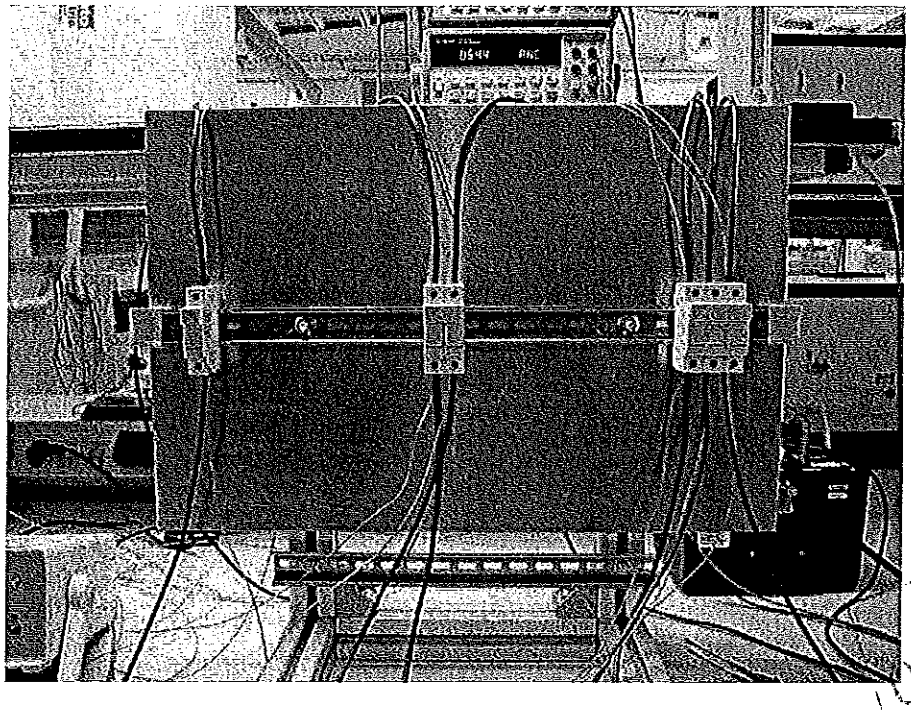
ЕЛЕКТРОТЕХ ... СОФИЯ

8. ANNEX

Picture 1: Temperature rise – test setup



Picture 1a: Temperature rise – test setup

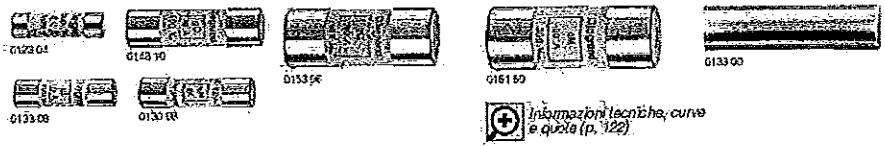


ВЯРНО С ОРИГИНАЛА

Picture 2: Catalogue Legrand fuses

legrand

fusibili cilindrici



Informazioni tecniche, curve e quote (p. 122)

Tipo "gG"

A.C.R. (Alta Capacità di Rottura)
Rispondenti alle norme CEI 32-1, CEI 32-5, EN 60 269-1, EN 60 269-2

Imballo	Articoli		In	Tensione	Potere interruzione
	Senza segnalazione	Con segnalatore	(A)	(V~)	(kA)
			8,5 x 23 mm		
10	0113 02	0114 02 (1)	2	250	6
10	0113 04	0114 04 (1)	4		
10	0113 06	0114 06 (1)	6		
100	0113 10	0114 10	10		
			8,5 x 31,5 mm		
10	0123 01		1	400	20
10	0123 02	0124 02	2		
10	0123 04	0124 04	4		
10	0123 06	0124 06	6		
10	0123 08		8		
10	0123 10	0124 10	10		
10	0123 12		12		
100	0123 16	0124 16	16		
100	0123 20	0124 20	20		
			10,3 x 38 mm		
100	0133 32	0134 32	32	400	20

A.C.R. (Alta Capacità di Rottura)
Conformi alle norme CEI 32-1 e 32-4 - IEC 60 269-1,2 e 2,1 - EN 60 269-1
Approvazioni Bureau Veritas

Imballo	Articoli		In	Tensione	Potere interruzione
	Senza segnalazione	Con segnalatore	(A)	(V~)	(kA)
			10,3 x 38 mm		
10	0153 94		0,5	500	100
10	0153 01		1		
10	0153 02	0134 02	2		
10	0153 04	0134 04	4		
10	0153 06	0134 06	6		
10	0153 08	0134 08	8		
10	0153 10	0134 10	10		
10	0153 12	0134 12	12		
10	0153 16	0134 16	16		
10	0153 20	0134 20	20		
10	0153 25	0134 25	25		
	Senza segnalazione	Con segnalatore			
			14 x 51 mm		
10	0143 02		2	500	100
10	0143 04	0145 04	4		
10	0143 06	0145 06	6		
10	0143 10	0145 10	10		
10	0143 16	0145 16	16		
10	0143 20	0145 20	20		
10	0143 25	0145 25	25		
10	0143 32	0145 32	32		
10	0143 40	0145 40	40		
10	0143 50	0145 50	50	400	
			22 x 58 mm		
10	0163 10	0155 10	10	500	100
10	0163 16	0155 16	16		
10	0163 20	0155 20	20		
10	0163 25	0155 25	25		
10	0163 32	0155 32	32		
10	0163 40	0155 40	40		
10	0163 50	0155 50	50		
10	0163 63	0155 63	63		
10	0163 80	0155 80	80		
10	0163 96	0155 96	100		
10	0163 97	0155 97	125	400	

(1) Tipo g

Tipo "aM"

Rispondenti alla norma IEC EN 60269-1
Approvazione Bureau Veritas.

Imballo	Articoli		In	Tensione	Potere interruzione
	Senza segnalazione	Con segnalatore	(A)	(V~)	(kA)
			8,5 x 31,5 mm		
10	0120 01		1	400	20
10	0120 02		2		
10	0120 04		4		
10	0120 06		6		
10	0120 08		8		
10	0120 10		10		

A.C.R. (Alta Capacità di Rottura)
Conformi alle norme IEC 60269-1,2 e 2-1; EN 60269-1; CEI 32-1 e 32-4
Approvazioni Bureau Veritas

Imballo	Articoli		In	Tensione	Potere interruzione
	Senza segnalazione	Con segnalatore	(A)	(V~)	(kA)
			10,3 x 38 mm		
10	0190 92		0,25	100	
10	0190 93		0,60		
10	0190 01		1		
10	0190 02		2		
10	0190 04		4		
10	0190 06		6		
10	0190 08		8		
10	0190 10		10		
10	0190 12		12		
10	0190 16		16		
10	0190 20		20	400	
10	0190 25		25		
			14 x 51 mm		
10	0140 02	0141 02	2	500	100
10	0140 04	0141 04	4		
10	0140 06	0141 06	6		
10	0140 08	0141 08	8		
10	0140 10	0141 10	10		
10	0140 12	0141 12	12		
10	0140 16	0141 16	16		
10	0140 20	0141 20	20		
10	0140 25	0141 25	25		
10	0140 32	0141 32	32		
10	0140 40	0141 40	40		
10	0140 45	0141 45	45		
10	0140 50		50	400	
			22 x 58 mm		
10	0150 16	0151 16	16	500	100
10	0150 20	0151 20	20		
10	0150 25	0151 25	25		
10	0150 32	0151 32	32		
10	0150 40	0151 40	40		
10	0150 50	0151 50	50		
10	0150 63	0151 63	63		
10	0150 80	0151 80	80		
10	0150 96	0151 96	100		
10	0150 97	0151 97	125	400	

Neutri

10	0123 00	8,5 x 31,5
10	0133 00	10,3 x 38
10	0143 00	14 x 51
10	0153 00	22 x 58

(1) calibro non normalizzato

PHOENIX CONTACT & KABEL Klinkmann Wisolutions

Тестови изпитвания приложени върху предпазител-разединители

Предпазител разединителите FB са изпитани съгласно IEC 60947-3 (2008-08) Ed. 3.0 + IEC 60947-1 Ed. 5.1 (2011-03) + IEC/EN 60269-1, IEC/EN 60269-2

извършените тестове са:

Капацитет за присъединявания проводник

Механична якост

Огъване

Усилие за отделяне на проводника

Изолационно разстояние

Повишено напрежение

Загуба на напрежение

Температурен тест

Тест при ток на късо съединение

Тест за стареене на материала

Точково нагряване

Управител:

Вл. Лазаров

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОГЕО СОФИЯ

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm"

Приложение № 5

A C A E

TESTING AUTHORIZATION

ACAE *(Associazione per la Certificazione delle Apparecchiature Elettriche), Member of* ***LOVAG*** *(Low Voltage Agreement Group)*

authorizes the Laboratory

LOVATO ELECTRIC S.p.A. *Via Don Mazza 12 Gorle (BG)*

Laboratory codification number: IL 01

to carry out the tests *listed in the following, for the purpose to certify the products as stated in the Certificate n° 070B and its enclosure, issued to ACAE by ACCREDIA.*

List of the authorized tests on the low - voltage components:

Verification of dielectric withstand
Verification of temperature – rise
Operation and operating limits
Making and breaking capacities
Overload performance
Mechanical properties of terminals

ACAE will witness the tests according to its Quality Procedure PA 5.2.1 "Test supervision".
The renewal of the authorization is subjected to annual audit.

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ACAE General Secretary
Mr. Virginio Scarioni

Virginio Scarioni

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L'ENTE ITALIANO DI ACCREDITAMENTO
PRD N°070 B
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ЕЛЕКТРОТЕХ СОФИЯ 6 ООД
LOVAG

Наименование на материала: Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV

Съкратено наименование на материала: Щепселни каб. глави за КРУ 10 kV и 20 kV

Област: Н - Електрически уредби СрН/НН

Категория: 11 - Кабелни комплекти, кабелни накрайници, клеми, конектори

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Щепселни глави за проходни изводи на компактни комплектни комутационни устройства с SF_6 изолация с външен конус. Изолиращото тяло на щепселните глави е изработено от устойчив на външни въздействия и на пропълзяване на токове по повърхността еластомерен изолационен материал на силиконова основа. В щепселните глави са включени необходимите елементи и материали за управление на разпределението на електрическото поле, за възстановяване на изолационните характеристики на свързваните кабели и за реализиране на контактното съединение.

В зависимост от типа на проходните изводи на комплектните разпределителни устройства щепселните кабелни глави се доставят в две основни разновидности: кабелни глави за проходни изводи тип „А" - за свързване на кабелите на трансформаторното присъединение; и кабелни глави за проходни изводи тип „С - за свързване на входящите/изходящите кабелни линии.

Щепселните глави за проходни изводи тип „А" се доставят с „Г" - образна форма или прави, а щепселните глави за проходни изводи тип „С" се доставят в две разновидности: щепселни глави с „Г" - образна форма (условно), които се използват самостоятелно за свързване на една кабелна линия; и щепселни глави с „Т" - образна форма, които се използват в комбинация с „Г" - образни глави за свързване на паралелни кабелни линии на един проходен извод на КРУ (или свързване на „сандвич").

Щепселните глави са предназначени за едножилни кабели с полиетиленова изолация с номинални напрежения Uo/U - 6/10 kV и 12/20 kV съгласно БДС HD 620 S1:2003 „Разпределителни кабели с екструдирана изолация за обявено напрежение от 3,6/6 (7,2) kV до 20,8/36 (42) kV или БДС 2581:1986 "Кабели силови за неподвижно полагане с изолация от полиетилен и химически омрежен полиетилен".

Щепселните глави се доставят пакетирани поединично в картонена опаковка с всички необходими крепежни и монтажни елементи, материали и приспособления, вкл. грес/паста и почистващи средства. В комплектуването са включени също така и заземленията с необходимата кабелна обувка за свързване на щепселната глава към заземителния контур на разпределителната уредба.

Щепселните кабелни глави се придружава с подробна добре илюстрирана монтажна инструкция на български език и списък на монтажните елементи и материали, чиито означения съответстват на посочените в списъка.

На картонената опаковка е залепен етикет на български език със следната информация: наименованието и/или логото на производителя; наименованието и означението на

щепселните кабелни глави; сечението на свързваните токопроводими жила, за които са предназначени; датата на производство; датата на изтичане на годността; и референтния номер на стандарта – (БДС) HD 629.1 S2:2006.

Използване:

Щепселните кабелни глави се използват за монтиране на едножилни кабели с полиетиленова изолация с номинални напрежения Uo/U - 6/10 kV и 12/20 kV и присъединяване към проходните изводи (бушинги) с външен конус на комплектните комутационни устройства - тип А или тип С съгласно БДС EN 50181:2001.

Съответствие на предложеното изпълнение със стандартизационните документи:

Щепселните кабелни глави за едножилни кабели с полиетиленова изолация трябва да отговарят на посочените по-долу стандарти или еквиваленти, включително на техните валидни изменения и поправки:

- БДС HD 629.1 S2:2006 "Изисквания за изпитване на аксесоари за използване със силови кабели с обявено напрежение от 3,6/6(7,2) kV до 20,8/36(42) kV. Част 1: Кабели с екструдирана изолация";
- БДС HD 629.1 S2:2006/A1:2008 "Изисквания за изпитване на аксесоари за използване със силови кабели с обявено напрежение от 3,6/6(7,2) kV до 20,8/36(42) kV. Част 1: Кабели с екструдирана изолация"; и
- БДС EN 50181:2001 „Проходни изводи щепселен тип над 1 kV до 36 kV и от 250 A до 3,15 kA за съоръжения, различни от маслени трансформатори".
- БДС HD 620 S2:2010 „Разпределителни кабели с екструдирана изолация за обявено напрежение от 3,6/6 (7,2) kV до 20,8/36 (42) kV

Изисквания към документацията и изпитванията:

№ по ред	Документ	Приложение № (или текст)
1.	Точно означение на типа, производителя и страната на производство (произход) и последно издание на каталога на производителя	CGS 24 kV, 250 A, 25 -95 mm^2; CTS 24 kV, 630 A, 95 - 240 mm^2, CELLPACK, Швейцария Приложение 1
2.	Техническо описание и чертежи с нанесени размери	Приложение 2
3.	Протоколи от типови изпитвания на английски или на български език съгласно таблица 3 от БДС HD 629.1 S2:2006, проведени от независима изпитвателна лаборатория – заверени копия, с приложен списък на отделните изпитвания на български език	Приложение 3

№ по ред	Документ	Приложение № (или текст)
4.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания - заверено копие.	Приложение 4
5.	Декларация за съответствие на предлаганото изпълнение с изискванията на техническата спецификация на този стандарт за материал, вкл. на параграфи „Характеристика на материала" и „Съответствие на предложеното изпълнение със стандартизационните документи" по-горе	Приложение 5
6.	Инструкция за монтиране	Приложение 6
7.	Експлоатационна дълготрайност, min 20 год.	20 години

Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. (Каталозите и протоколите от изпитванията могат да бъдат и само на английски език).

Технически данни

1. Параметри на електрическата разпределителна мрежа

№ по ред	Параметър	Стойност	
1.1	Номинални напрежения	10 000 V	20 000 V
1.2	Максимални работни напрежения	12 000 V	24 000 V
1.3	Номинална честота	50 Hz	
1.4	Брой на фазите	3	
1.5	Заземяване на звездния център	• През активно съпротивление; • през дъгогасителна бобина; или • изолиран звезден център.	

2. Характеристики на работната среда

№ по ред	Характеристика	Стойност/място
2.1	Максимална температура на околната среда	До + 40°C
2.2	Минимална температура на околната среда	Минус 5°C

№ по ред	Характеристика	Стойност/място
2.3	Относителна влажност	До 90 %
2.4	Надморска височина	До 1000 m
2.5	Условия на работа	На закрито

3. Общи технически параметри, характеристики и др. Данни

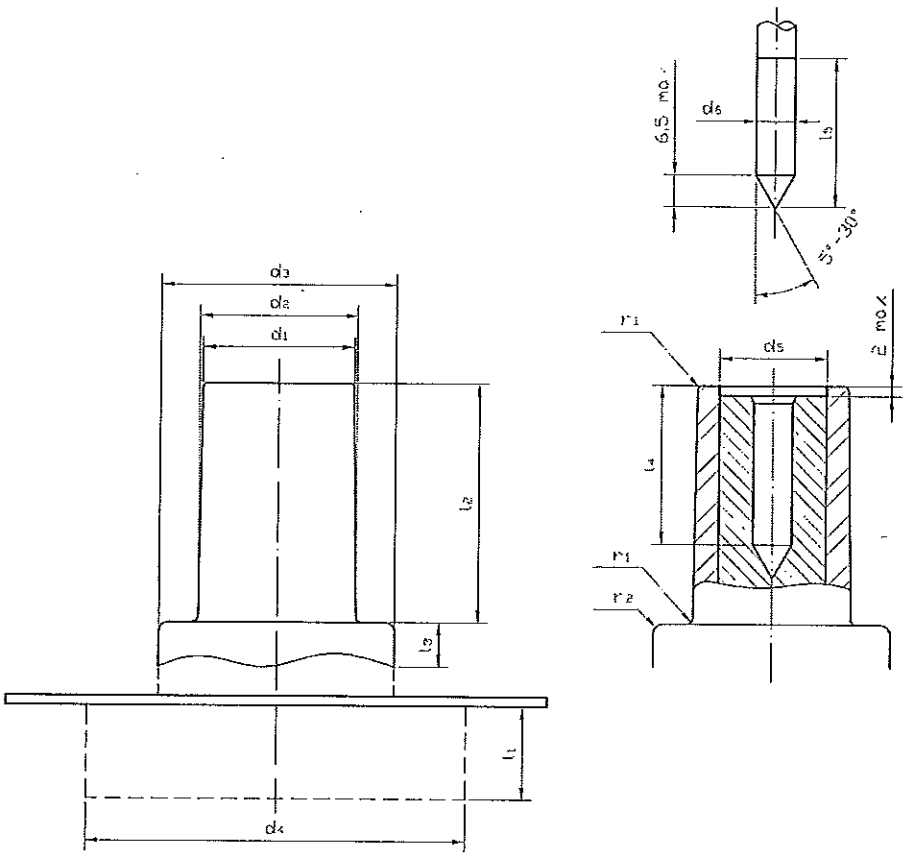
№ по ред	Параметър/характеристика	Изискване	Гарантирано предложение
3.1	Конструкция	Щепселните кабелни глави се състоят от изолиращо тяло и необходимите елементи и материали за: управление на разпределението на електрическото поле; възстановяване на изолационните характеристики на присъединяваните кабели; реализиране на контактното съединение; свързване на тестваща апаратура за изпитване с повишено напрежение на присъединените кабели, без необходимост от демонтиране на щепселната кабелна глава; и свързване към заземителния контур.	Щепселните кабелни глави се състоят от изолиращо тяло и необходимите елементи и материали за: управление на разпределението на електрическото поле; възстановяване на изолационните характеристики на присъединяваните кабели; реализиране на контактното съединение; свързване на тестваща апаратура за изпитване с повишено напрежение на присъединените кабели, без необходимост от демонтиране на щепселната кабелна глава; и свързване към заземителния контур.
3.1.1	Изолиращо тяло	Изолиращото тяло трябва да бъде изработено от устойчив на външни въздействия и на пропълзяване на токове по	Изолиращото тяло трябва е изработено от устойчив на външни въздействия и на

№ по ред	Параметър/характеристика	Изискване	Гарантирано предложение
		повърхността еластомерен изолационен материал на силиконова основа.	пропълзяване на токове по повърхността еластомерен изолационен материал на силиконова основа.
3.1.2	Изолационни и полупроводими материали	Изолационните и полупроводимите материали трябва да осигуряват съответно възстановяването на изолационните характеристики на свързваните кабели и управление на разпределението на електрическото поле.	Изолационните и полупроводимите материали осигуряват съответно възстановяването на изолационните характеристики на свързваните кабели и управление на разпределението на електрическото поле.
3.1.3	Реализиране на контактното съединение	Плъзгащо щепселно съединение за проходни изводи от тип „А" и проходен болт М16 за проходни изводи от тип „С"	Плъзгащо щепселно съединение за проходни изводи от тип „А" и проходен болт М16 за проходни изводи от тип „С"
3.1.4	Свързване към заземителния контур	Заземления с необходимите кабелни обувки за свързване на щепселните глави към заземителния контур на разпределителната уредба	Заземления с необходимите кабелни обувки за свързване на щепселните глави към заземителния контур на разпределителната уредба
3.2	Приложимост на щепселните кабелни глави към:	-	-
3.2.1	вида на кабелите	Едножилни кабели с полиетиленова изолация 10 kV и/или 20 кV	Едножилни кабели с полиетиленова изолация 10 kV и/или 20 кV
3.2.1.1	конструкцията на кабелите	Съгласно БДС 2581-86, БДС HD 620 S2:2010 или еквивалент	Съгласно БДС 2581-86, БДС HD 620 S2:2010

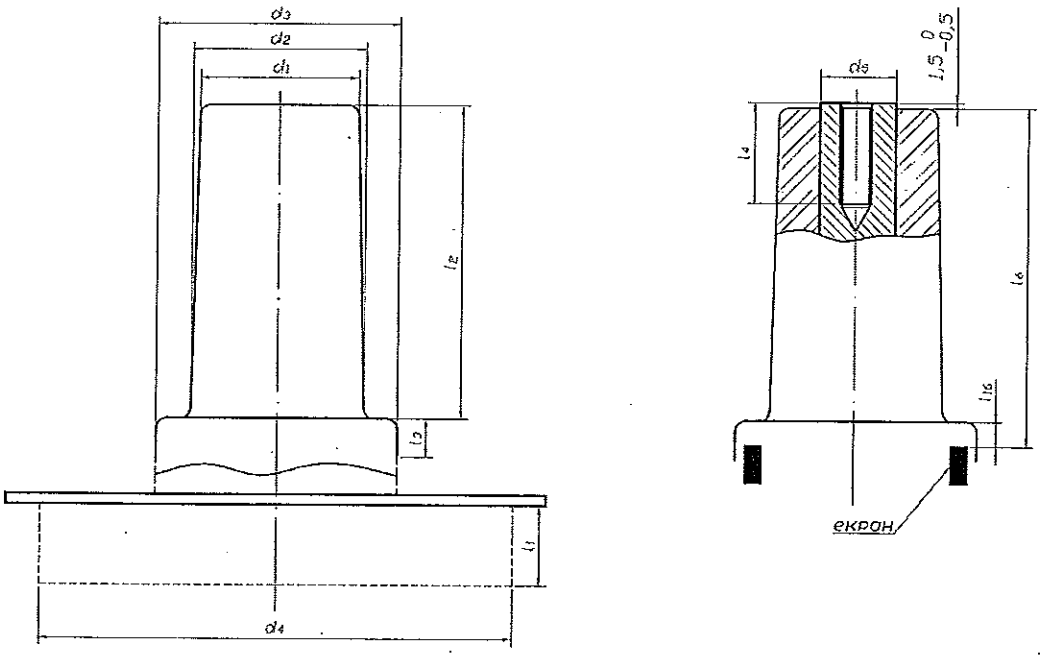
№ по ред	Параметър/характеристика	Изискване	Гарантирано предложение
			или еквивалент
3.2.1.2	материала на токопроводимите кабелни жила	Алуминий/Мед	Алуминий/Мед
3.2.1.3	конструкцията на токопроводимите кабелни жила	Плътни, многожични или многожични уплътнени	Плътни, многожични или многожични уплътнени
3.2.2	типа на проходните изводи на КРУ	Проходни изводи от щепселен тип с външен конус : • тип „A" - 250 A; или • тип „C" - 630 A.	Проходни изводи от щепселен тип с външен конус : • тип „A" - 250 A; или • тип „C" - 630 A.
3.2.2.1	конструкция и размери	Съгласно табл. 1 и табл. 2 от БДС EN 50181:2001 или еквивалент и фиг. 1 и фиг. 2, както са показани по-долу.	Съгласно табл. 1 и табл. 2 от БДС EN 50181:2001 или еквивалент и фиг. 1 и фиг. 2, както са показани по-долу.
3.3	Комплектация	Една щепселна кабелна глава, комплектувана с всички необходими крепежни и монтажни елементи и материали за присъединяване към проходните изводи на КРУ, с кабелни обувки и съоръжения за свързване на щепселната глава към заземителния контур на разпределителната уредба.	Една щепселна кабелна глава, комплектувана с всички необходими крепежни и монтажни елементи и материали за присъединяване към проходните изводи на КРУ, с кабелни обувки и съоръжения за свързване на щепселната глава към заземителния контур на разпределителната уредба.
3.4	Опаковка	Картонена опаковка, на която е залепен етикет на български език със следната информация: наименованието и/или логото на производителя; наименованието и означението на щепселната	Картонена опаковка, на която е залепен етикет на български език със следната информация: наименованието

№ по ред	Параметър/характеристика	Изискване	Гарантирано предложение
		кабелна глава; сечението на свързваните токопроводими жила, за които е предназначена; датата на производство; датата на изтичане на годността; и референтния номер на стандарта – (БДС) HD 629.1 S2:2006 или еквивалент	и/или логото на производителя; наименованието и означението на щепселната кабелна глава; сечението на свързваните токопроводими жила, за които е предназначена; датата на производство; датата на изтичане на годността; и референтния номер на стандарта – (БДС) HD 629.1 S2:2006 или еквивалент
3.5	Монтажна инструкция	На български език във всяка опаковка	На български език във всяка опаковка
3.6	Списък на монтажните елементи и материали	На български език във всяка опаковка	На български език във всяка опаковка
3.7	Означение на монтажните елементи и материали	Да	Да
3.8	Срок на годност (считано от датата на производството), месеци	min 36	36
3.9	Експлоатационна дълготрайност, години	min 20	20

ЕЛЕКТРОГЕЙ СОФИЯ ООД



Фиг. 1. - Проходни щепселни изводи тип „А”

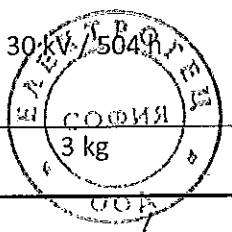


Фиг. 2. - Проходни щепселни изводи тип „С”

4. Щепселни кабелни глави за едножилни полиетиленови кабели 10 kV и 20 kV, за проходни изводи тип „А" и тип „С", на трансформаторни (Т) и кабелни (К) присъединения, на комплектни комутационни устройства

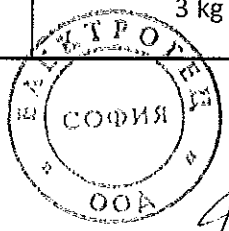
4.1 Щепселна кабелна глава за едножилни полиетиленови кабели 20 kV, 50 mm^2, за трансформаторно присъединение на КРУ – права

Номер на стандарта		**Тип/референтен номер съгласно каталога на производителя**	
20 11 3426		CGS 24 kV, 250 A, 25 -95 mm^2	
Наименование на материала		Щепселна кабелна глава - права, за едножилни полиетиленови кабели 20 kV, 50 mm^2, за трансформаторно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, права, модул „Т", 20 kV, 50 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.1.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.1.2	Обявен ток, I_r	250 A	250 A
4.1.3	Номинално сечение на токопроводимите кабелни жила	50 mm^2	25 -95 mm^2
4.1.4	Приложимост към:	-	-
4.1.4.1	типа на проходните изводи (бушинги) на КРУ	Тип А	Тип А
4.1.4.2	диаметъра на основната кабелна изолация:	-	-
4.1.4.2a	min диаметър	≤ 20,2 mm	14,7 mm
4.1.4.2b	max диаметър	≥ 21,7 mm	≥ 21,7 mm
4.1.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	72 kV / 15 min
4.1.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	54 kV / 5 min
4.1.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 24 kV
4.1.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	30 kV / 504 h
4.1.9	Тегло, kg	Да се посочи	3 kg



4.2 Щепселна кабелна глава за едножилни полиетиленови кабели 20 kV, 95 mm^2, за трансформаторно присъединение на КРУ – права

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 11 3427		CGS 24 kV, 250 A, 25 -95 mm^2	
Наименование на материала		Щепселна кабелна глава - права, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за трансформаторно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, права, модул „T", 20 kV, 95 mm^2	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.2.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.2.2	Обявен ток, I_r	250 A	250 A
4.2.3	Номинално сечение на токопроводимите кабелни жила	95 mm^2	25 -95 mm^2
4.2.4	Приложимост към:	-	-
4.2.4.1	типа на проходните изводи (бушинги) на КРУ	Тип A	Тип A
4.2.4.2	диаметъра на основната кабелна изолация:	-	-
4.2.4.2a	min диаметър	≤ 23,5 mm	14,7 mm
4.2.4.2b	max диаметър	≥ 25,0 mm	≥ 25,0 mm
4.2.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	72 kV / 15 min
4.2.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	54 kV / 5 min
4.2.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 24 kV
4.2.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	30 kV / 504 h
4.2.9	Тегло, kg	Да се посочи	3 kg



4.3 Щепселна кабелна глава за едножилни полиетиленови кабели 20 kV, 50 mm^2, за трансформаторно присъединение на КРУ – „Г" образна

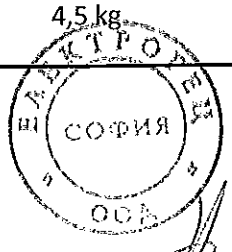
Номер на стандарта		**Тип/референтен номер съгласно каталога на производителя**	
20 11 3420		CWS 24 kV, 250 A, 16 -95 mm^2	
Наименование на материала		Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 50 mm^2, за трансформаторно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Г-обр.,модул „Т", 20 kV, 50 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.3.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.3.2	Обявен ток, I_r	250 A	250 A
4.3.3	Номинално сечение на токопроводимите кабелни жила	50 mm^2	16 -95 mm^2
4.3.4	Приложимост към:	-	-
4.3.4.1	типа на проходните изводи (бушинги) на КРУ	Тип А	Тип А
4.3.4.2	диаметъра на основната кабелна изолация:	-	-
4.3.4.2a	min диаметър	≤ 20,2 mm	14,7 mm
4.3.4.2b	max диаметър	≥ 21,7 mm	≥ 21,7 mm
4.3.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	72 kV / 15 min
4.3.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	54 kV / 5 min
4.3.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 24 kV
4.7.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	30 kV / 504 h
4.3.9	Контактно съединение	Плъзгащо щепселно съединение -ø 7,9 mm	Плъзгащо щепселно съединение -ø 7,9 mm
4.3.10	Тегло, kg	Да се посочи	3,5 kg

4.4 Щепселна кабелна глава за едножилни полиетиленови кабели 20 kV, 95 mm^2, за трансформаторно присъединение на КРУ – „Г" образна

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 11 3421		CWS 24 kV, 250 A, 16 -95 mm^2	
Наименование на материала		Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за трансформаторно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Г-обр., модул „Т", 20 kV, 95 mm^2	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.4.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.4.2	Обявен ток, I_r	250 A	250 A
4.4.3	Номинално сечение на токопроводимите кабелни жила	95 mm^2	16 -95 mm^2
4.4.4	Приложимост към:	-	-
4.4.4.1	типа на проходните изводи (бушинги) на КРУ	Тип А	Тип А
4.4.4.2	диаметъра на основната кабелна изолация:	-	-
4.4.4.2a	min диаметър	≤ 23,5 mm	14,7 mm
4.4.4.2b	max диаметър	≥ 25,0 mm	≥ 25,0 mm
4.4.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	72 kV / 15 min
4.4.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	54 kV / 5 min
4.4.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 24 kV
4.4.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	30 kV / 504 h
4.4.9	Контактно съединение	Плъзгащо щепселно съединение -ø 7,9 mm	Плъзгащо щепселно съединение -ø 7,9 mm
4.4.10	Тегло, kg	Да се посочи	3,5 kg

4.5 Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за кабелно присъединение на КРУ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 11 3422		CTS 24 kV, 630 A, 95 - 240 mm^2	
Наименование на материала		Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за кабелно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Г-обр., модул „К", 20 kV, 95 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.5.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.5.2	Обявен ток, I_r	630 A	630 A
4.5.3	Номинално сечение на токопроводимите кабелни жила	95 mm^2	95 - 240 mm^2
4.5.4	Приложимост към:	-	-
4.5.4.1	типа на проходните изводи (бушинги) на КРУ	Тип С	Тип С
4.5.4.2	диаметъра на основната кабелна изолация:	-	-
4.5.4.2a	min диаметър	≤ 23,5 mm	22 mm
4.5.4.2b	max диаметър	≥ 25,0 mm	≥ 25,0 mm
4.5.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	76 kV / 15 min
4.5.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	57 kV / 5 min
4.5.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 25 kV
4.5.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	32 kV / 504 h
4.5.9	Контактно съединение	Проходен болт M16	Проходен болт M16
4.5.10	Тегло, kg	Да се посочи	4,5 kg

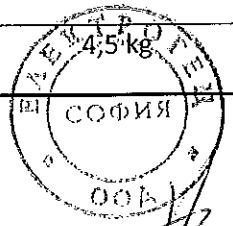


4.6 Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 185 mm^2, за кабелно присъединение на КРУ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 11 3423		CTS 24 kV, 630 A, 95 - 240 mm^2	
Наименование на материала		Щепселна кабелна глава с „Г" - образна форма, за едножилни полиетиленови кабели 20 kV, 185 mm^2, за кабелно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Г-обр., модул „К", 20 kV, 185 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.6.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.6.2	Обявен ток, I_r	630 A	630 A
4.6.3	Номинално сечение на токопроводимите кабелни жила	185 mm^2	95 - 240 mm^2
4.6.4	Приложимост към:	-	-
4.6.4.1	типа на проходните изводи (бушинги) на КРУ	Тип С	Тип С
4.6.4.2	диаметъра на основната кабелна изолация:	-	-
4.6.4.2a	min диаметър	≤ 27,4 mm	22 mm
4.6.4.2b	max диаметър	≥ 30,1 mm	≥ 30,1 mm
4.6.5	Издържано постоянно напрежение - изпитване в сухо състояние	min 72 kV / 15 min	76 kV / 15 min
4.6.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	57 kV / 5 min
4.6.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 25 kV
4.6.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	32 kV / 504 h
4.6.9	Контактно съединение	Проходен болт М16	Проходен болт М16
4.6.10	Тегло, kg	Да се посочи	4,5 kg

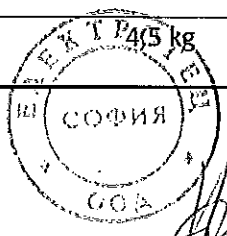
4.7 Щепселна кабелна глава с „Т" - образна форма, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за кабелно присъединение на КРУ

Номер на стандарта		**Тип/референтен номер съгласно каталога на производителя**	
20 11 3424		CTKS 24 kV, 630 A, 95 - 240 mm^2	
Наименование на материала		Щепселна кабелна глава с „Т" - образна форма, за едножилни полиетиленови кабели 20 kV, 95 mm^2, за кабелно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Т-обр., модул „К", 20 kV, 95 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.7.1	Обявено напрежение, $[U_0/U\ (U_m)]$	12/20 (24) kV	12/20 (24) kV
4.7.2	Обявен ток, I_r	630 A	630 A
4.7.3	Номинално сечение на токопроводимите кабелни жила	95 mm^2	95 - 240 mm^2
4.7.4	Приложимост към:	-	-
4.7.4.1	типа на проходните изводи (бушинги) на КРУ	Тип С	Тип С
4.7.4.2	диаметъра на основната кабелна изолация:	-	-
4.7.4.2a	min диаметър	≤ 23,5 mm	22 mm
4.17.4.2b	max диаметър	≥ 25,0 mm	≥ 25,0 mm
4.7.5	Издържано постоянно напрежение -изпитване в сухо състояние	min 72 kV / 15 min	76 kV / 15 min
4.7.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	57 kV / 5 min
4.7.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 25 kV
4.7.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	32 kV / 504 h
4.7.9	Контактно съединение	Проходен болт M16	Проходен болт M16
4.7.10	Тегло, kg	Да се посочи	4,5 kg



4.8 Щепселна кабелна глава с „Т" - образна форма, за едножилни полиетиленови кабели 20 kV, 185 mm^2, за кабелно присъединение на КРУ

Номер на стандарта		**Тип/референтен номер съгласно каталога на производителя**	
20 11 3425		CTKS 24 kV, 630 A, 95 - 240 mm^2	
Наименование на материала		Щепселна кабелна глава с „Т" - образна форма, за едножилни полиетиленови кабели 20 kV, 185 mm^2, за кабелно присъединение на КРУ	
Съкратено наименование на материала		Каб. глава, Т-обр., модул „К", 20 kV, 185 mm^2	
№ по ред	**Технически параметър**	**Изискване**	**Гарантирано предложение**
4.8.1	Обявено напрежение, *[U_0/U (U_m)]*	12/20 (24) kV	12/20 (24) kV
4.8.2	Обявен ток, I_r	630 A	630 A
4.8.3	Номинално сечение на токопроводимите кабелни жила	185 mm^2	95 - 240 mm^2
4.8.4	Приложимост към:	-	-
4.8.4.1	типа на проходните изводи (бушинги) на КРУ	Тип С	Тип С
4.8.4.2	диаметъра на основната кабелна изолация:	-	-
4.8.4.2a	min диаметър	≤ 27,4 mm	22 mm
4.8.4.2b	max диаметър	≥ 30,1 mm	≥ 30,1 mm
4.8.5	Издържано постоянно напрежение -изпитване в сухо състояние	min 72 kV / 15 min	76 kV / 15 min
4.8.6	Издържано напрежение с промишлена честота 50 Hz, изпитване в сухо състояние	min 54 kV / 5 min	57 kV / 5 min
4.8.7	Допустимо ниво на частичния разряд	max 10 pC / 20,8 kV	<10 pC / 25 kV
4.8.8	Издържано напрежение с промишлена честота 50 Hz, изпитване във влажна среда	min 15 kV / 300 h	32 kV / 504 h
4.8.9	Контактно съединение	Проходен болт M16	Проходен болт M16
4.8.10	Тегло, kg	Да се посочи	4,5 kg



ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

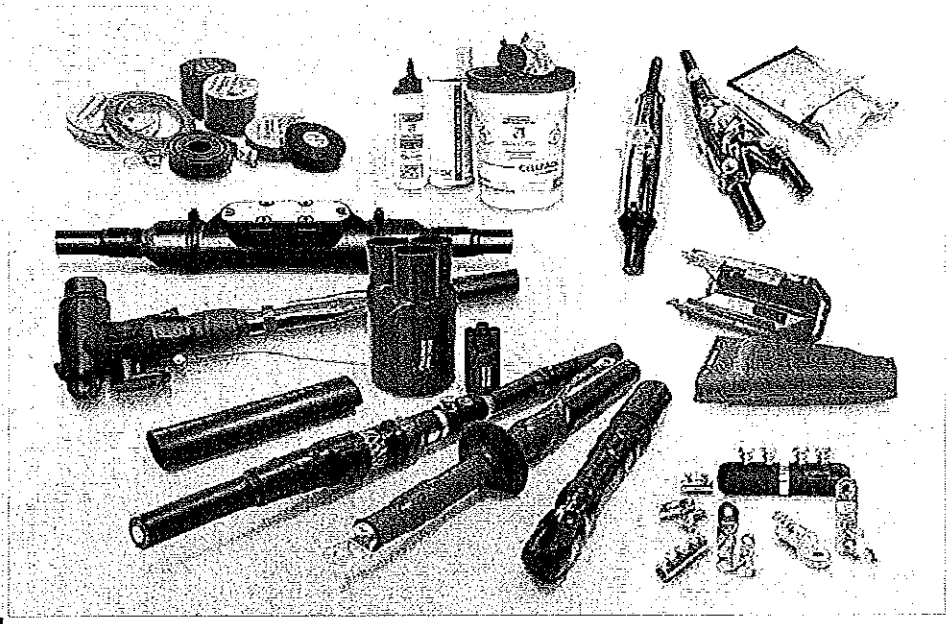
„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 1

ЕЛЕКТРОЕЛ СОФИЯ ЕООД



Cable connecting systems & Accessories

Low and Medium Voltage

PRODUCT CATALOGUE
Portfolio cable connectors

Systems For Professionals

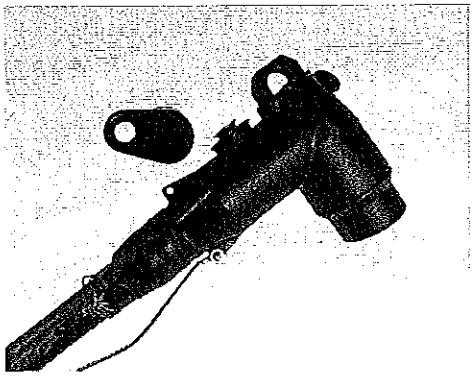
CELLPACK
Electrical Products

A BBC GROUP company

CWS 250A
Elbow separable cable connector

for all 1-core polymeric cables, for outer cone system terminals type A

Cellplux elbow separable cable connectors CWS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen), to switching equipment and transformers having an outer cone system type A, up to maximum network voltage of 24 kV in accordance with EN 50180 and EN 50181.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

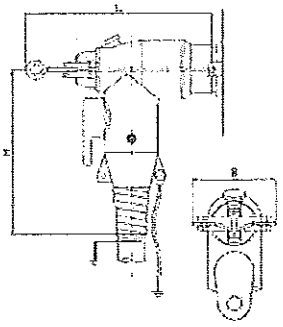
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



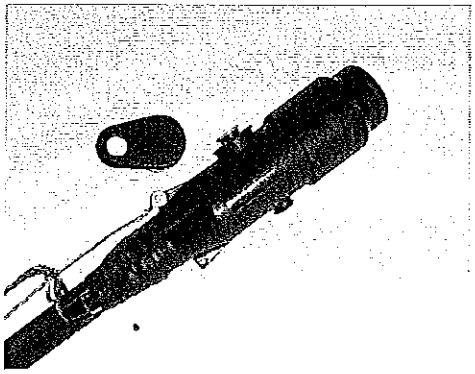
Scope of delivery
Set of 3 separable cable connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, assembly material, assembly instructions

Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

Type		L mm	B mm	H mm	min. Ø over core insulation after removal of the outer conductive layer mm	12 kV Nominal cross section mm²	17.5 kV Nominal cross section mm²	24 kV Nominal cross section mm²	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV									
CWS 250A 24kV	16-95 M EGA	200	80	178	14.7	50 - 95	25 - 95	16 - 95	295167
	70-150 M EGA	200	80	178	19.9	120 - 150	95 - 150	70 - 150	293792

CGS 250A
Straight separable cable connector
for all 1-core polymeric cables, for outer cone system terminals type A

Cellplux straight separable cable connectors CGS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen) for switching equipment and transformers having an outer cone system type A, up to maximum network voltage of 24 kV in accordance with EN 50180 and EN 50181.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

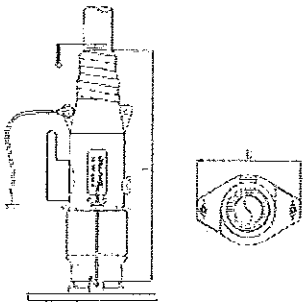
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



Scope of delivery
Set of 3 separable cable connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, assembly material, assembly instructions

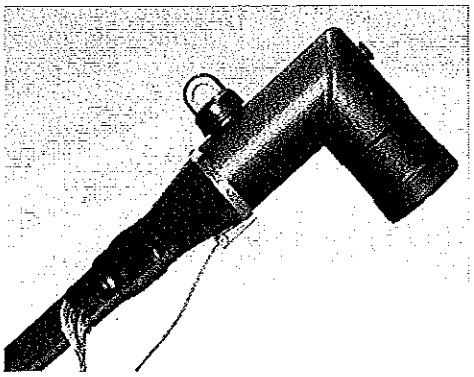
Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

Type		L mm	B mm	min. Ø over core insulation after removal of the outer conductive layer mm	12 kV Nominal cross section mm²	17.5 kV Nominal cross section mm²	24 kV Nominal cross section mm²	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV								
CGS 250A 24kV	25-95 M EGA	248	110	14.7	50 - 95	25 - 95	25 - 95	295283
	70-150 M EGA	248	110	19.9	120 - 150	95 - 150	70 - 150	293797

CWS 400A
Elbow separable cable connector

for all 1-core polymeric cables, for outer cone system terminals type B

Cellplux elbow separable cable connectors CWS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen), to switching equipment and transformers having an outer cone system type B, up to maximum network voltage of 36 kV in accordance with EN 50180 and EN 50181.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

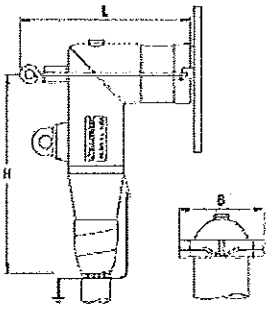
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



Scope of delivery
Set of 3 separable cable connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, assembly material, assembly instructions

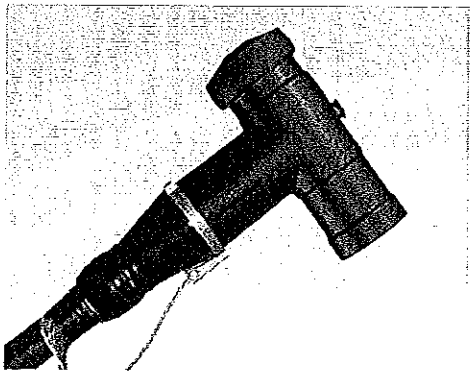
Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

						12 kV	17.5 kV	24 kV	36 kV	
Type		L mm	B mm	H mm	min. Ø over core insulation after removal of the outer conductive layer mm	Nominal cross section mm²				Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV										
CWS 400A 24kV	25-70 EGA	215	107	250	14.7	50 - 95	25 - 95	25 - 70		250720
	95-240 EGA	215	107	250	22.0	150 - 240	120 - 240	95 - 240		246176
U_0/U (U_m) 12/20 (24) kV - 19/33 (36) kV										
CWS 400A 36kV	50-95 EGA	215	107	250	22.0			95 - 95	35 - 95	250726
	150-240 EGA	215	107	250	30.8			240 - 240	150 - 240	247102

CTS 630A
T-shaped separable connector

for all 1-core polymeric cables, for outer cone system terminals type C

Cellplux screwable T-shaped separable connectors CTS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen) to switching equipment and transformers having an outer cone system type C, up to maximum network voltage of 36 kV in accordance with EN 50180 and EN 50181.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

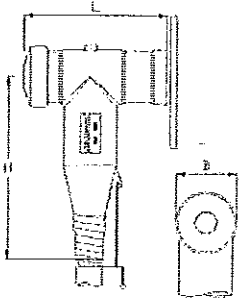
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



Scope of delivery
Set of 3 separable cable connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, screw cable lug for wire screen, assembly material, assembly instructions

Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

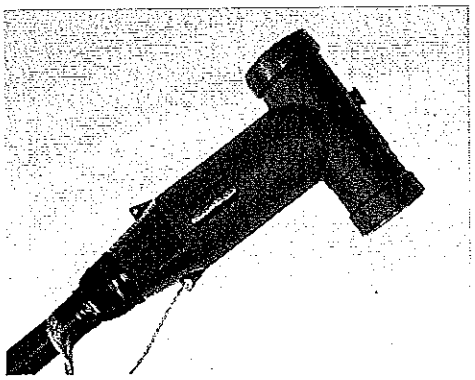
Note: Other T-separable cable connectors available on request.

Type		L mm	B mm	H mm	min. Ø over core insulation after removal of the outer conductive layer mm	12 kV Nominal cross section mm²	17.5 kV Nominal cross section mm²	24 kV Nominal cross section mm²	36 kV Nominal cross section mm²	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV										
CTS 630A 24kV	25-70 EGA	194	85	250	14.7	50 - 95	25 - 95	25 - 70		250711
	95-240 EGA	194	85	250	22.0	150 - 240	120 - 240	95 - 240		220775
	240-300 EGA	194	85	250	23.7	240 - 400	240 - 300	240 - 300		302732
U_0/U (U_m) 12/20 (24) kV - 19/33 (36) kV										
CTS 630A 36kV	50-95 EGA	194	85	250	22.0			95 - 95	35 - 95	250715
	95-150 EGA	194	85	250	22.0			95 - 240	95 - 150	256010
	150-240 EGA	194	85	250	30.8			240 - 240	150 - 240	224826
	240-400 EGA	194	85	265	31.5			300 - 400	240 - 400	256328

CTS 1250A
T-shaped separable connector

for all 1-core polymeric cables, for outer cone system terminals type C

Cellplux screwable T-shaped separable connectors CTS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen) to switching equipment and transformers having an outer cone system type C, up to maximum network voltage of 36 kV in accordance with EN 50180 and EN 50181.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

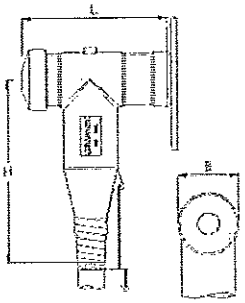
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



Scope of delivery
Set of 3 separable cable connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, screw cable lug for wire screen, assembly material, assembly instructions

Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

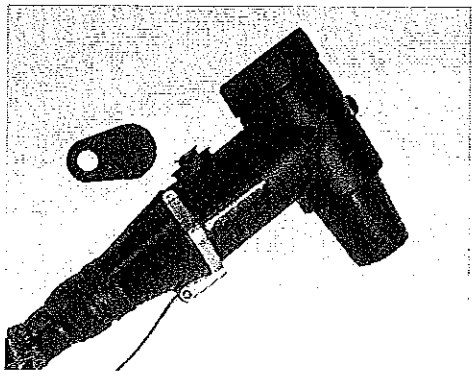
Note: Other T-separable cable connectors available on request.

					12 kV	17.5 kV	24 kV	36 kV	
Type	L mm	B mm	H mm	min. Ø over core insulation after removal of the outer conductive layer mm	Nominal cross section mm²				Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV									
CTS 1250A 24kV 400-630 EGA M12 KS	205	87	310	33.4	500 - 630	400 - 630	400 - 630		309283
U_0/U (U_m) 12/20 (24) kV - 19/33 (36) kV									
CTS 1250A 36kV 400-630 EGA M12 KS	205	87	310	39.1			630	400 - 630	309284

CTKS 630A
T-shaped separable coupling connector

for all 1-core polymeric cables, for separable connector type CTS

Cellplux T-shaped separable coupling connectors CTKS are suitable for connecting all polymeric-insulated 1-core cables (PVC, PE, XLPE, EPR), with different types of semi-conductive layers (graphite-coated or strippable) and screen design (wire or tape screen) to the back of T-shaped separable connectors type CTS.



Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Cable sheath insulation fault test may be performed while under voltage
- For copper and aluminium conductors
- Quick, safe and easy assembly
- Suitable for a wide range of applications due to integrated screw cable lug

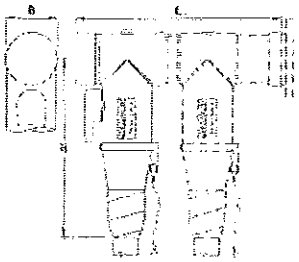
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Test standards
- CENELEC HD 629.1 (DIN VDE 0278, part 629-1)

Storage conditions/Shelf life
- Unlimited shelf life

Dimensions



Scope of delivery
Set of 3 separable coupling connectors, silicone stress control elements, earthing set, screw cable lug for main conductor, assembly material, assembly instructions

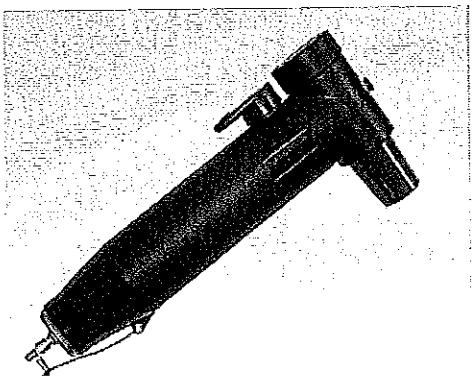
Optional accessory: EGA earthing kit for cables with tape screen (see Connecting technology)

Type		L mm	B mm	H mm	min. Ø over core insulation after removal of the outer conductive layer mm	12 kV	17.5 kV	24 kV	36 kV	Art.-No.
						Nominal cross section mm²				
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV										
CTKS 630A 24kV	25-70 EGA	290	74	250	14.7	50 - 95	25 - 95	25 - 70		256838
	95-240 EGA	290	74	250	22.0	150 - 240	120 - 240	95 - 240		256839
U_0/U (U_m) 12/20 (24) kV - 19/33 (36) kV										
CTKS 630A 36kV	50-95	310	85	250	22.0			95 - 95	35 - 95	257581
	150-240	310	85	250	30.8			240 - 240	150 - 240	257582

CTKSA
Coupling surge arrester

Class 1, for separable connector type CTS

Cellplux coupling surge arresters CTKSA / Class 1 are suitable for the protection of encapsulated medium voltage installations with a maximum operating voltage of U_0 = 24 kV. The compact design allows direct connection to double-row CTS T-shaped separable connectors, in accordance with International Standard IEC 60099-4.



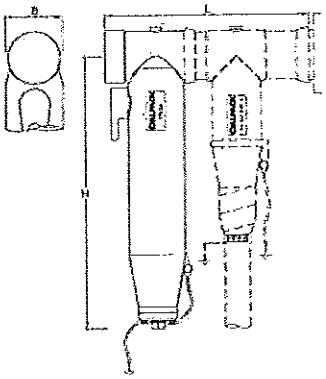
Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Quick, safe and easy assembly

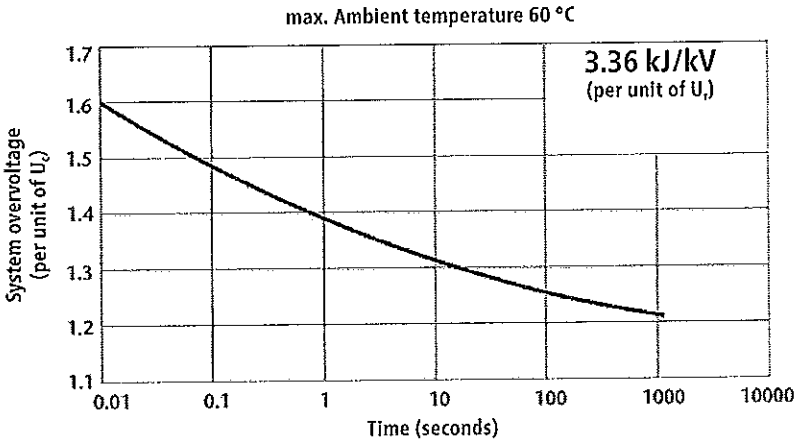
Application/Suitability
- Indoor

Storage conditions/Shelf life
- Unlimited shelf life

Scope of delivery
Set of 3 surge arresters, assembly material, assembly instructions

Dimensions



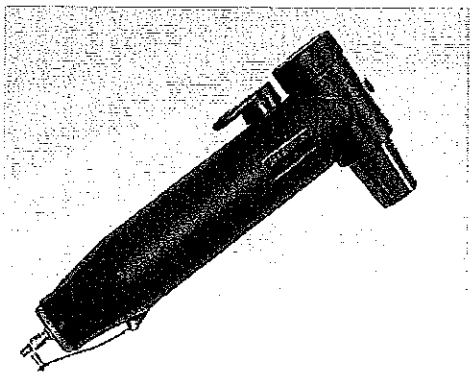


Type		L mm	B mm	H mm	Art.-No.
CTKSA	12kV	290	80	380	262054
	17kV	290	80	380	262055
	19.5kV	290	80	380	262816
	24kV	290	80	380	262056

Technical data	CTKSA 12kV	CTKSA 17kV	CTKSA 19.5kV	CTKSA 24kV
Nominal leakage current I [kA]	10	10	10	10
Rated voltage U_r [kV]	15.0	21.0	24.0	30.0
max. Operating voltage U_c [kV]	12.7	17.0	19.5	24.0
Partial discharge at U_c [pC]	< 5	< 5	< 5	< 5
Residual voltage [kV] at:				
Steep current impulse 1/20 µs	53.0	74.2	84.8	105.9
Switching impulse current 125 A	35.8	50.1	57.3	71.7
Switching impulse current 500 A	38.2	53.5	61.2	76.5
Lightning impulse current 8/20 µs	49.5	69.3	79.2	99.0

CTKSA
Coupling surge arrester
Class 2, for separable connector type CTS

Cellplux coupling surge arresters CTKSA / Class 2 are suitable for the protection of encapsulated medium voltage installations with a maximum operating voltage of U_0 = 34 kV. The compact design allows direct connection to double-row CTS T-shaped separable connectors, in accordance with International Standard IEC 60099-4.



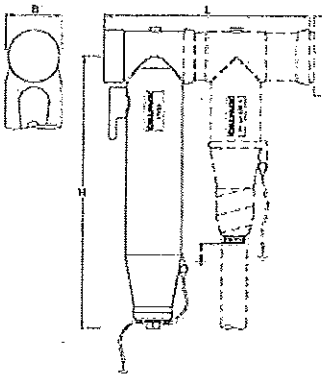
Characteristics
- With capacitive measuring point
- Individually tested
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Quick, safe and easy assembly

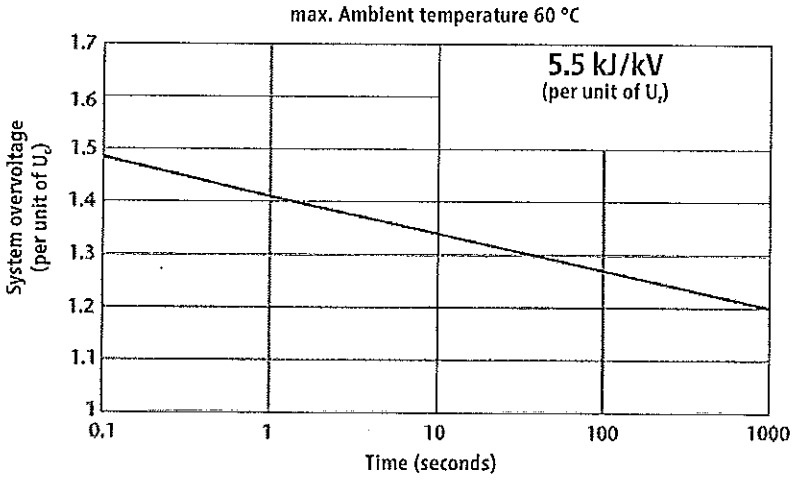
Application/Suitability
- Indoor

Storage conditions/Shelf life
- Unlimited shelf life

Scope of delivery
Set of 3 surge arresters, assembly material, assembly instructions

Dimensions





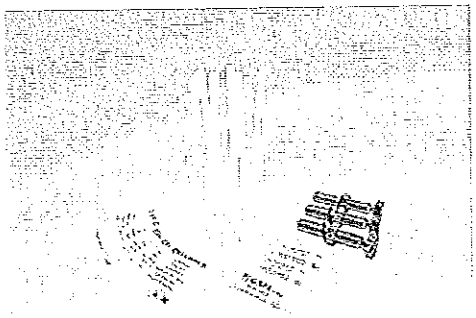
Type		L mm	B mm	H mm	Art.-No.
CTKSA	34kV	290	80	380	301492

Technical data	CTKSA 34 kV
Nominal leakage current I [kA]	10
Rated voltage U_r [kV]	42.0
max. Operating voltage U_c [kV]	34.0
Partial discharge at U_c [pC]	< 5
Residual voltage [kV] at:	
Steep current impulse 1/20 µs	120.4
Switching impulse current 125 A	84.0
Switching impulse current 500 A	89.6
Lightning impulse current 8/20 µs	108.5

ZS-CTS
Accessory kit

for separable connectors type CTS

The ZS-CTS accessory set is designed for the reinstallation of T-shaped separable connectors CTS to switching equipment and transformers having an outer cone system type C, in accordance with EN 50180 and EN 50181. This set includes the proven and tested contact pin with shear head bolt, which eliminates the possibility of faulty assembly of the cable systems.



Characteristics
- Easy assembly

Application/Suitability
- Re-installation of type CTS separable connectors

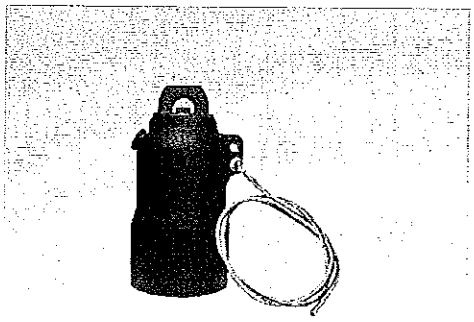
Scope of delivery
Set of 3 contact pins with shear head bolt, assembly material, assembly instructions

Type	Art.-No.
ZS-CTS	257622

CIK
Voltage-resistant insulating cap

for plug-in connections type A 250A and type C 630A

The voltage-resistant insulating caps CIK are suitable for electrical insulations of outer cones type A 250A and type C 630A on encapsulated switching equipment and transformers up to 36 kV, in accordance with EN 50180 and EN 50181.



Characteristics
- Submersible
- Outer semi-conductive layer made of semi-conductive EPDM provides protection from exposed electrical parts
- Easy assembly

Application/Suitability
- Indoor
- Outdoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Storage conditions/Shelf life
- Unlimited shelf life

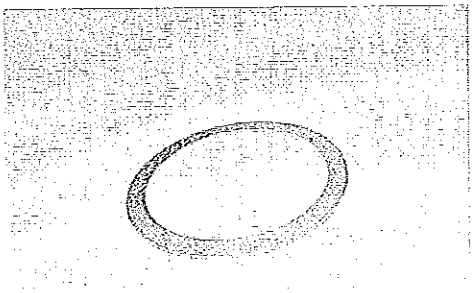
Scope of delivery
Set of 3 voltage resistant insulating caps, assembly material, assembly instructions

Type	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 12.7/22 (24) kV	
CIK 250A 24kV	265023
U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV	
CIK 630A 36kV	265024

Mounting ring
Assembly guide for CWS 250A and CGS 250A

for plug-in connections type A

The mounting ring is suitable to secure the Cellplux separable cable connectors CWS 250A and CGS 250A to a special plug-in connection with outer cone systems type A. It is simply placed in the prefabricated groove in the cable connector. The two components may then be mounted on the bushing together.



Characteristics
- Secure connection to special Type A bushing
- Easy assembly

Application/Suitability
- Indoor

Storage conditions/Shelf life
- Unlimited shelf life

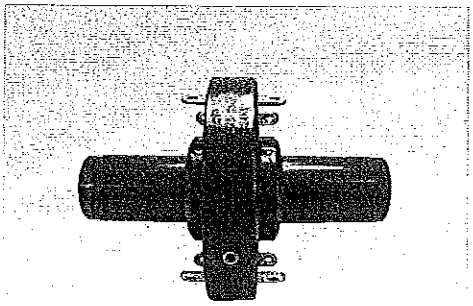
Scope of delivery
Mounting ring

Type	Art.-No.
Mounting ring	264366

CVS 250A
Connecting element up to 24 kV

for separable cable connectors type CWS and type CGS, for outer cone system terminals type A

The connecting element CVS is suitable for connecting two elbow separable cable connectors type CWS 250A and/or straight separable cable connectors CGS up to 24 kV. Its dimensions correspond to outer cone systems type A, in accordance with EN 50180 and EN 50181.



Characteristics
- Individually tested
- Safe and easy to handle
- Easy assembly

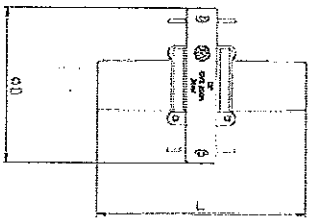
Application/Suitability
- Indoor

Voltage level
- $U_0/U\ (U_m)$ 6/10 (12) kV - 12.7/22 (24) kV

Storage conditions/Shelf life
- Unlimited shelf life

Scope of delivery
Set of 3 connecting elements, assembly material, assembly instructions

Dimensions

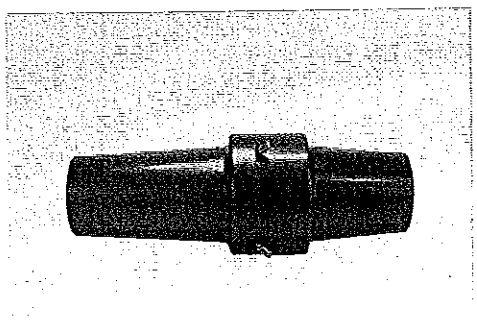


Type	L mm	Ø D mm	Art.-No.
$U_0/U\ (U_m)$ 6/10 (12) kV - 12.7/22 (24) kV			
CVS 250A 24kV	136	100	225844

CKS 630A
Coupling element up to 36 kV

for T-shaped separable connectors type CTS

The coupling element CKS is suitable for connecting two T-shaped separable connectors CTS up to 36 kV. The dimensions of the longer outer cone correspond to the outer cone systems type C, in accordance with EN 50180 and EN 50181.



Characteristics
- Individually tested
- Safe and easy to handle
- Easy assembly

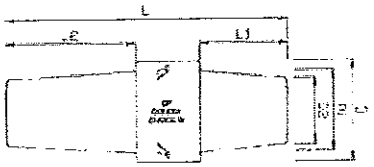
Application/Suitability
- Indoor

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Storage conditions/Shelf life
- Unlimited shelf life

Scope of delivery
Set of 3 coupling elements, assembly material, assembly instructions

Dimensions



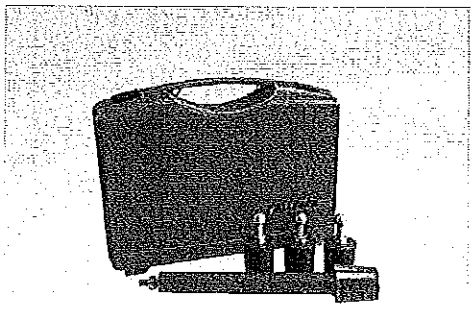
D = Outer diameter

Type	L mm	L1 mm	L2 mm	D mm	D1 mm	D2 mm	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV							
CKS 630A 36kV	196.5	61.5	91	70	56	46	224853

CPES
Test and earthing kit

for Cellplux separable cable connectors type CTS and type CTKS

The test and earthing kit CPES is suitable for the establishment of galvanic connections between cable conductors and ground. The CPES is compatible with all Cellplux T-shaped separable connectors CTS and T-shaped separable coupling connectors CTKS.



Characteristics
- Safe and easy to handle

Application/Suitability
- Cable testing
- Cable fault location
- Earthing for work
- Phase comparison

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

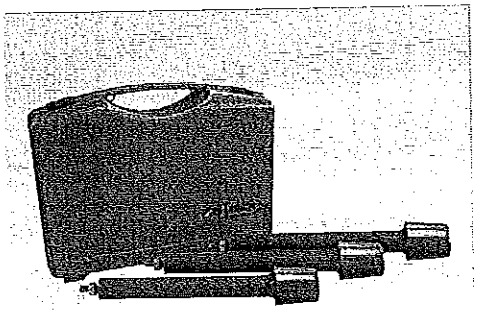
Scope of delivery
Chest, test adapter, set of 3 earthing adapters, assembly material, assembly instructions

Type	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV	
CPES	259101

CPS
Test kit

for Cellplux separable cable connectors type CTS and type CTKS

The test kit CPS is suitable for the establishment of galvanic connections between cable conductors and is compatible with all Cellplux T-shaped separable connectors CTS and T-shaped separable coupling connectors CTKS.



Characteristics
- Safe and easy to handle

Application/Suitability
- Cable testing
- Cable fault location
- Phase comparison

Voltage level
- U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV

Scope of delivery
Chest, set of 3 test adapters, assembly material, assembly instructions

Type	Art.-No.
U_0/U (U_m) 6/10 (12) kV - 19/33 (36) kV	
CPS	302227

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Systems For Professionals

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ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

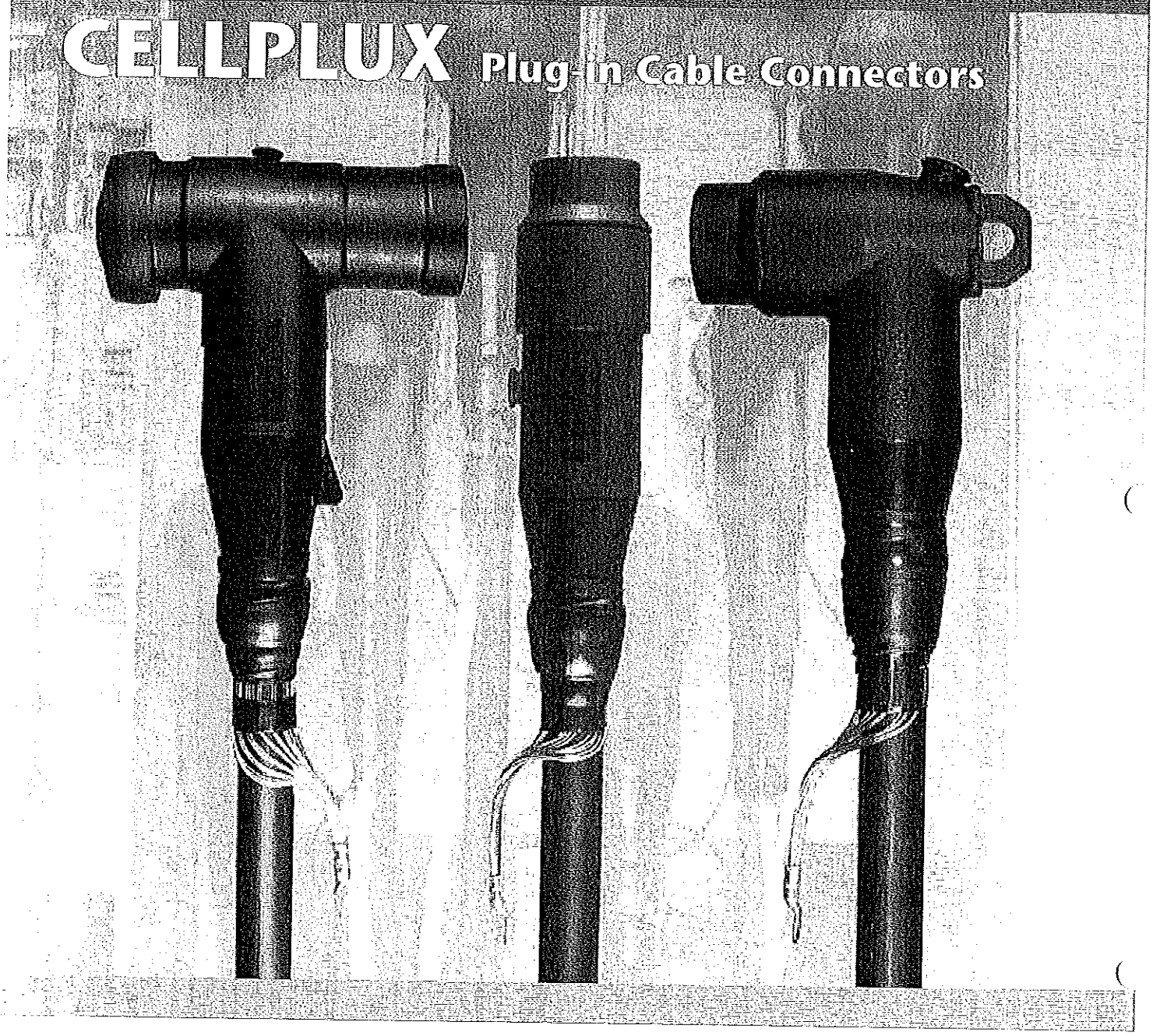
"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 2

ЕЛЕКТРОТЕХ СОФИЯ ООД

Medium Voltage | Plug-in Technology

CELLPLUX Plug-in Cable Connectors



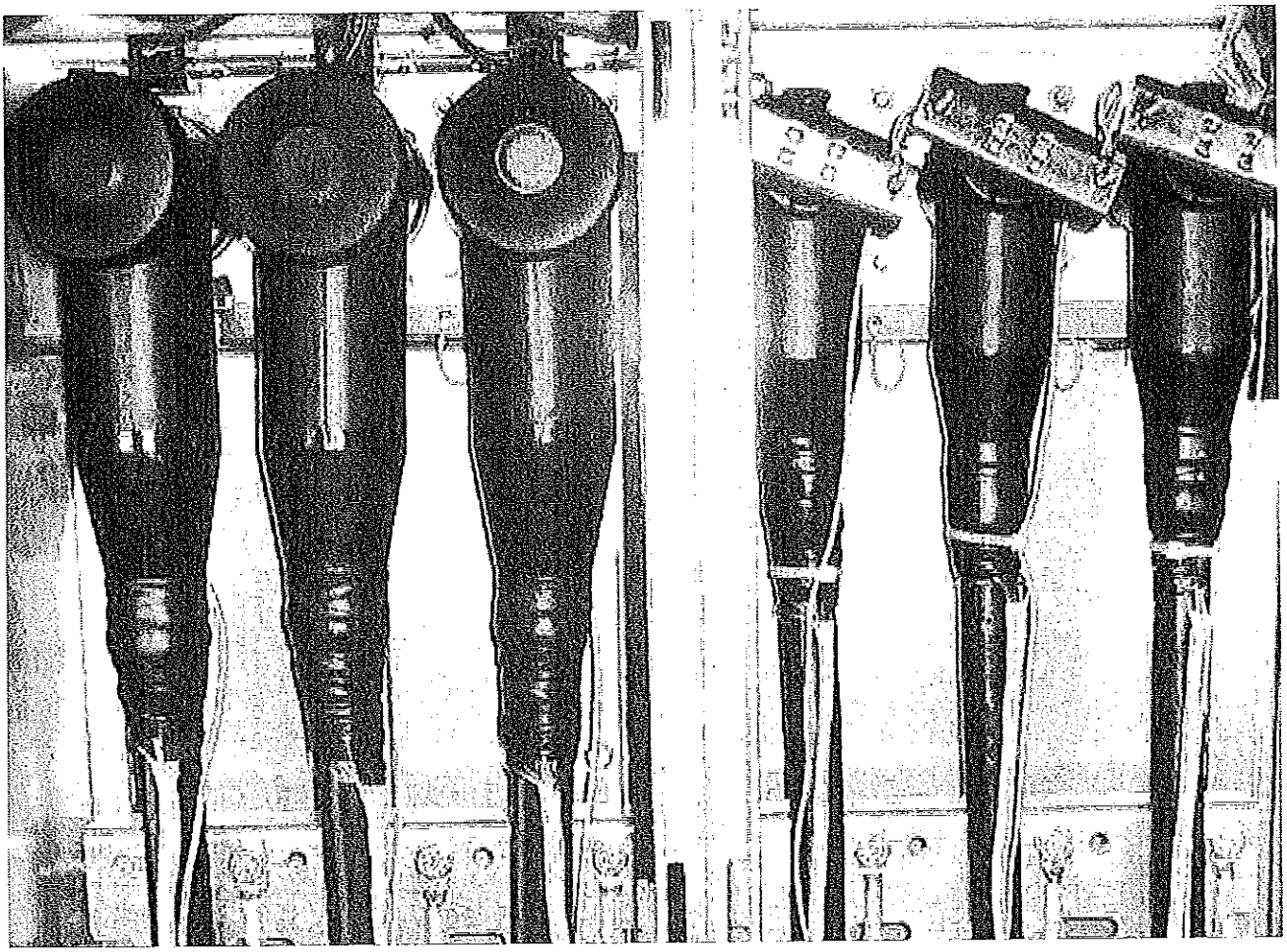
- simple, secure, quick to assemble
- solution for entire cross-section range
- only standard tool required
- unlimited shelf life
- type tested to CENELEC HD 629.1

Systems For Professionals

CELLPACK

Electrical Products

D762 | SAP-No. 206884 | 0910



Perfect connection

Profit from innovation

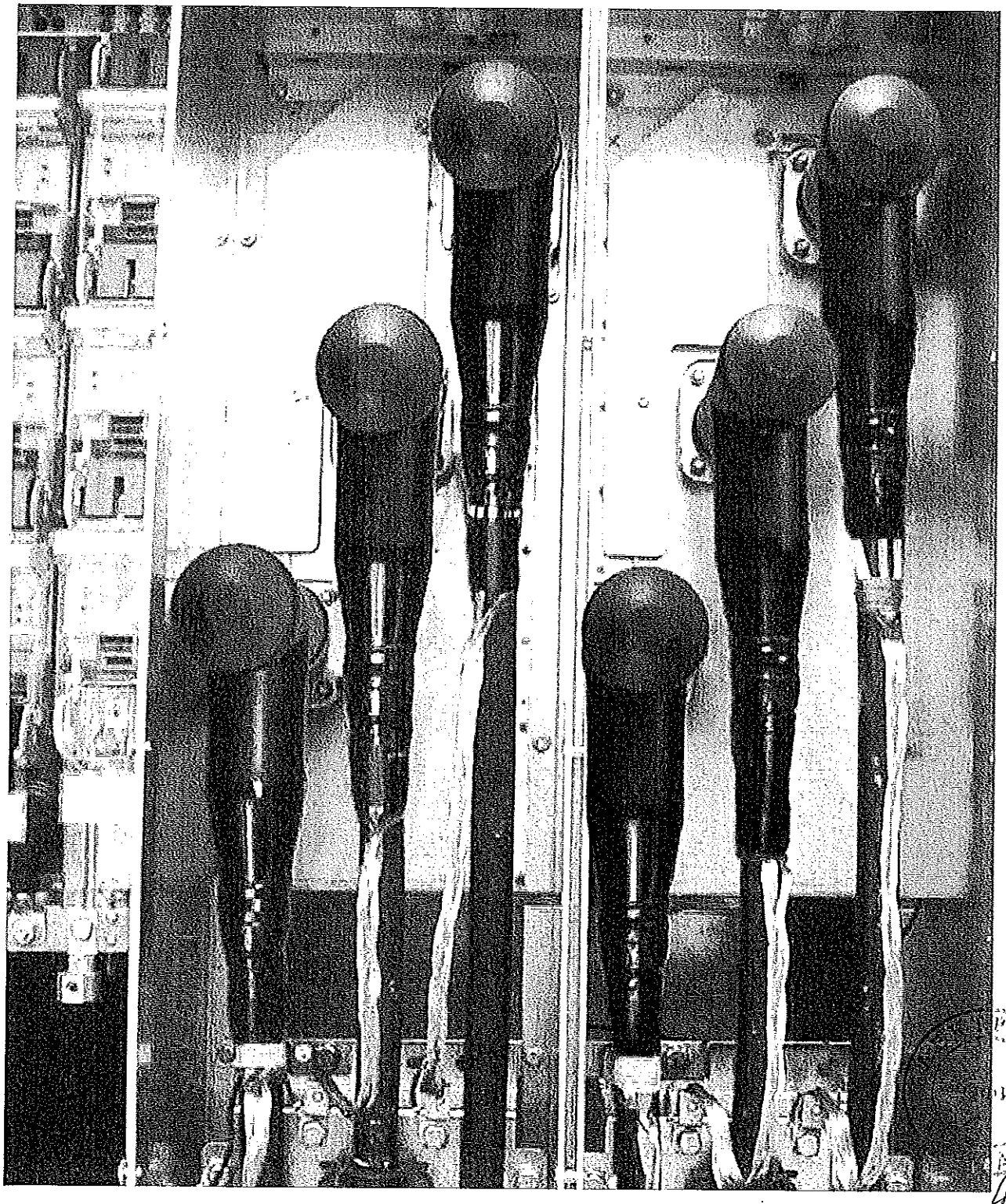
Cable accessories are indispensable for a high quality cable network. They must guarantee the same operational security as the cable itself. Due to the high costs incurred by energy suppliers for their medium voltage networks, outages are to be avoided wherever possible. Therefore it is of utmost importance to energy suppliers that cable accessories are **secure**, **quick** to implement and as **simple** as possible. Innovative solutions are in demand, particularly for medium-voltage networks where assembly defects, resulting in high costs, can be reduced drastically.

Cellplux plug-in cable connectors are the result of over five years of intensive development work at Cellpack and they represent the perfect connector system for the medium voltage field.

They have been especially developed for connecting polymeric-insulated medium-voltage cables. The system components are harmoniously matched to one another so that assembly is very **simple**, **secure** and done **quickly**. The innovative **integration concept** for this type of connector permits the majority of assembly steps (formerly performed at the construction site) to be accomplished in advance, under controlled conditions, at the Cellpack factory where they can be tested electrically. **Only a few remaining assembly steps** are performed on-site by the jointer himself.

Your advantages
- great operational security
- simple, secure and quick to assemble
- only standard tool required
- applicable to tight spaces
- solution for entire cross-section range
- mechanically robust
- unlimited shelf life
- each unit tested electrically

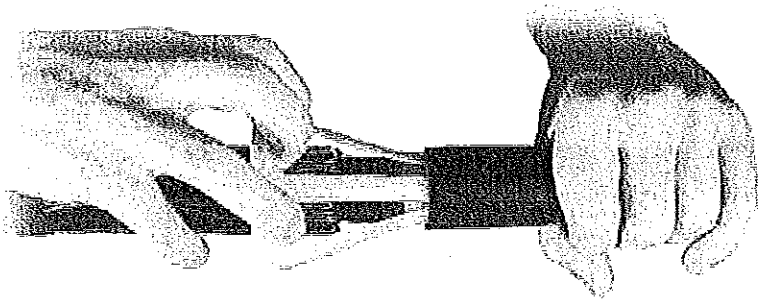
Your profit
- reduced costs for assembly, inventory and transport
- reduced operational costs for the cable network
- security



Proven system

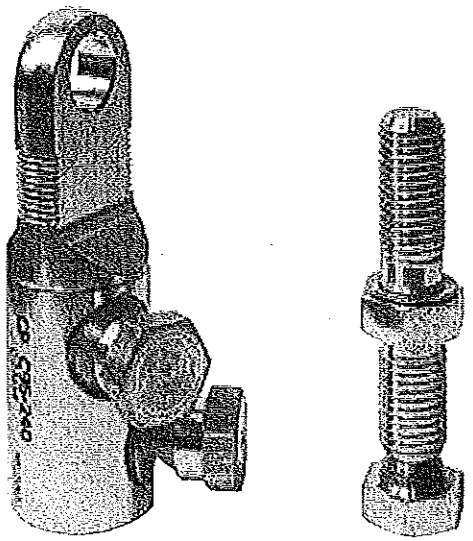
Insulation materials
The insulating materials used in Cellplux cable connectors have outstanding electrical and mechanical characteristics. They are manufactured from high voltage resistant EPDM in a controlled injection moulding process. The individual material components have been subjected to years of electrical and mechanical testing and have proven themselves in actual applications for decades.

Stress control
Our refractive stress control system, proven millions of times around the world, is already integrated in Cellplux. Faulty cable preparation and faulty stress-control body positioning are eliminated, thus drastically reducing the number of potential mounting mistakes.



Shear bolt cable lug and shear bolt contact bolt
Cellplux plug-in cable connectors have a proven shear bolt connection system.
The diameter of the cable lug is designed to ensure a reliable connection for copper conductors as well as aluminium conductors over the entire range of cross-sections. Its contact screws have been optimised so that only a single conventional tool is necessary for assembly throughout the entire cross-section range. This proven system is already integrated into the CTS plug-in contact bolts, thus eliminating incorrect assembly of cable plug-in components.

Contact security
Cellplux plug-in cable connectors have a 3 mm thick shield made of semi-conductive EPDM rubber. All models have successfully passed the «detectable current error« test at 6 kV.



CWS 250 A 24 kV | CGS 250 A 24 kV

Plug-in cable connectors for plastic-insulated single-core cables

Application

Cellplux straight and elbow plug-in cable connectors are advantageous for connecting all polymeric insulated single-conductor cables (PVC, PE, XLPE, EPR) with various types of semi-conductor layers (graphitized, pull-off or peel-off) as well as shield designs (wire or tape shield) to switching equipment and transformers having plug-in connections for Type A outer cone system terminals (per EN 50180, EN 50181 and DIN 47636) up to a maximum network voltage of 24 kV.

Voltage level

- E0/E (Em) 6/10 (12) 12.7/22 (24) kV

Attributes

- simple, secure, quick to assemble
- solution for entire cross-section range
- few components
- touch proof outer sheath
- outer sheath fault test possible in connected state
- applicable for enclosed or exposed installation
- submersible
- each piece pre-tested

Testing

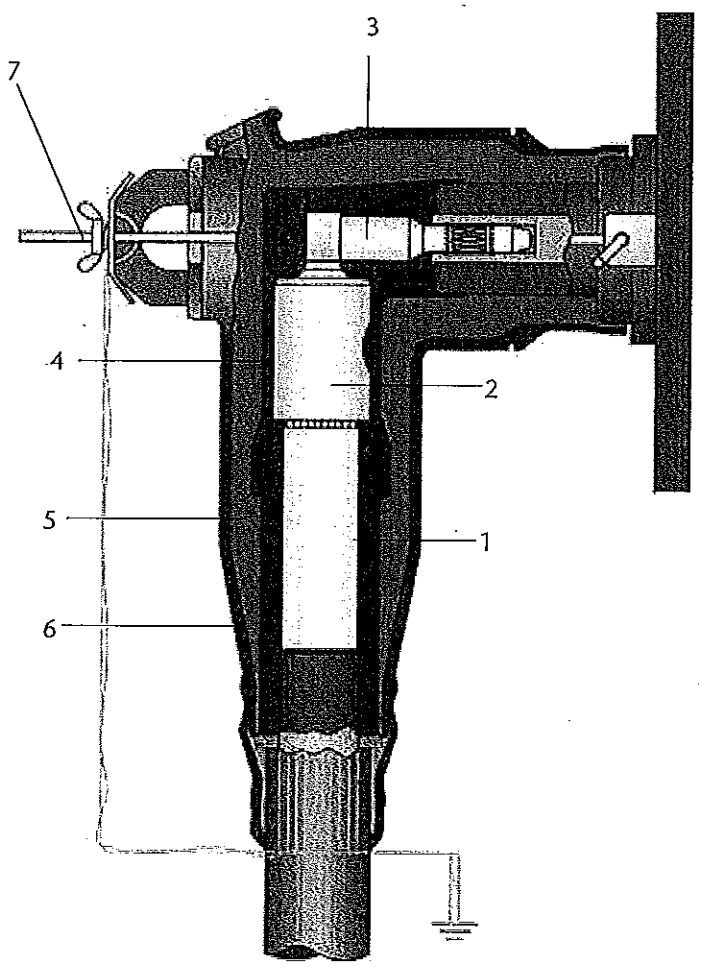
- plug-in connection type-tested per CENELEC HD 629. 1 shear bolt cable lug type-tested per EN/IEC 61238-1

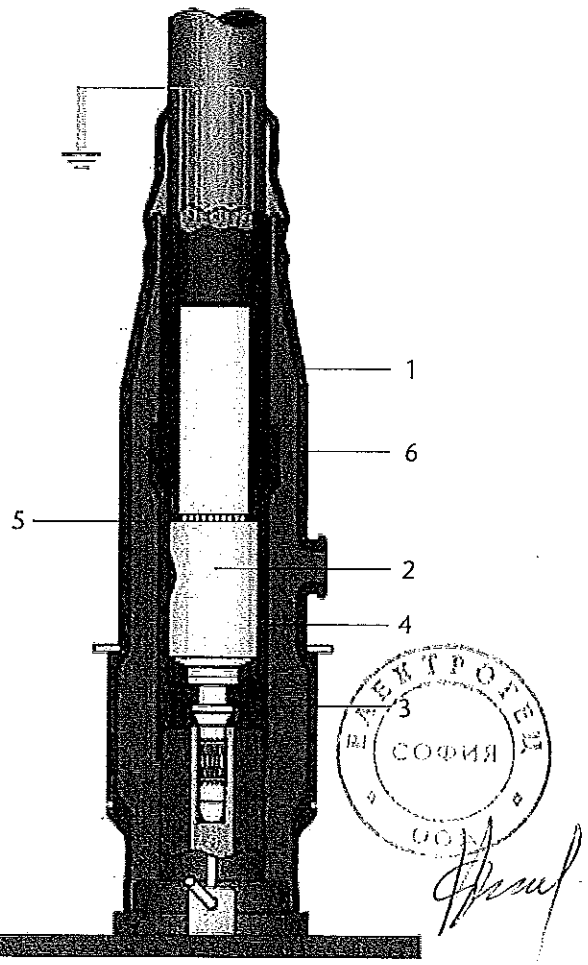
Items included in delivery:

- set of 3 plug-in cable parts, electrically tested
- ancillary components and assembly materials
- illustrated assembly instructions

Primary elements

1. silicone stress control element
2. shear bolt cable lug
3. contact pin (PIN)
4. inner electrode
5. primary insulation
6. shield
7. fastener

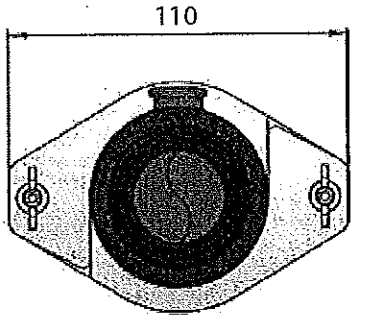


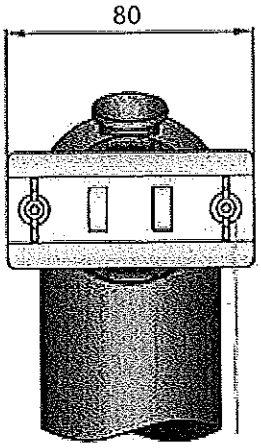


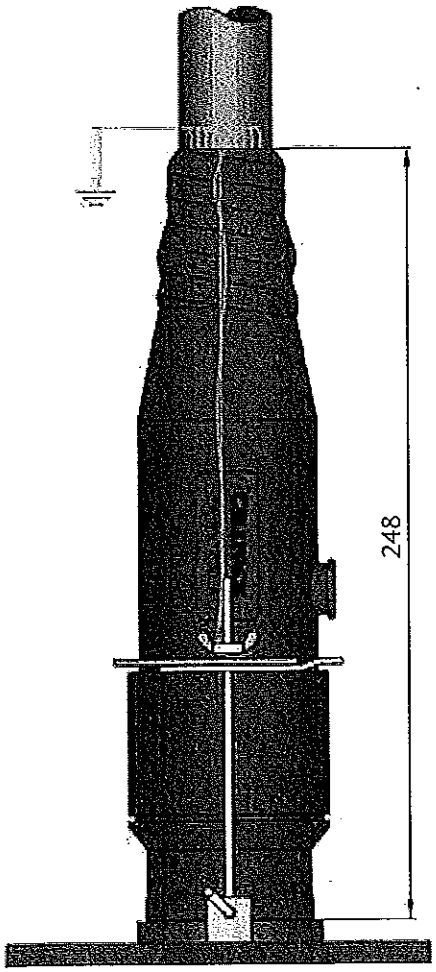
Order data

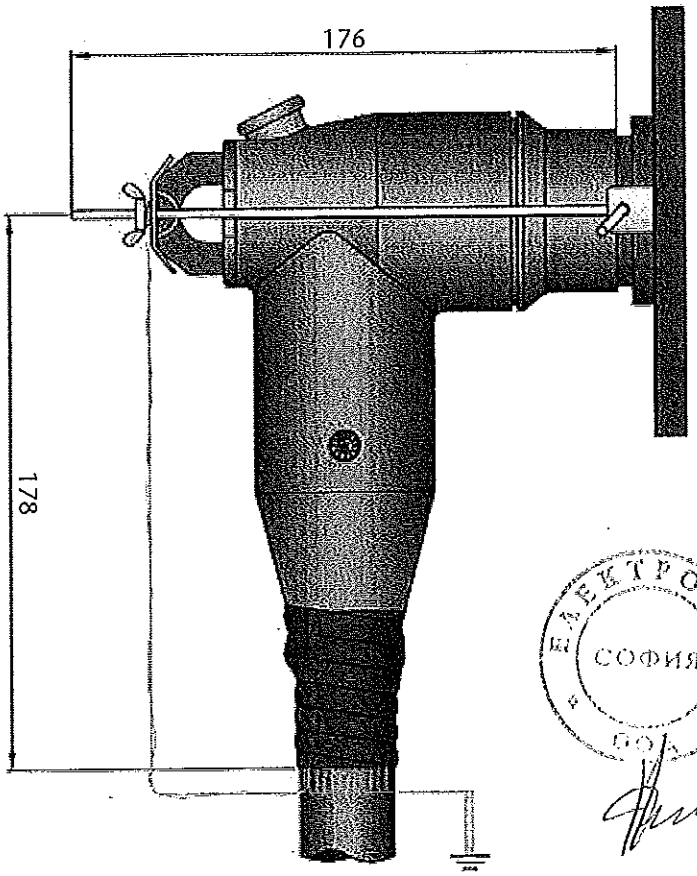
Type	12 kV Q mm²	17,5 kV Q mm²	24 kV Q mm²	Ø1 mm	Art.- No.
CWS 250A 24kV 16-95	50 - 95	25 - 95	16 - 95	14.7	205806
CWS 250A 24kV 70-150	120 - 150	95 - 150	70 - 150	19.9	245677
CWS 250A 24kV 16-95/EGA	50 - 95	25 - 95	16 - 95	14.7	220776
CWS 250A 24kV 70-150/EGA	120 - 150	95 - 150	70 - 150	19.9	245936
CGS 250A 24kV 25-95	50 - 95	25 - 95	25 - 95	14.7	224743
CGS 250A 24kV 70-150	120 - 150	95 - 150	70 - 150	19.9	245706
CGS 250A 24kV 25-95/EGA	50 - 95	25 - 95	25 - 95	14.7	224818
CGS 250A 24kV 70-150/EGA	120 - 150	95 - 150	70 - 150	19.9	245935

Q = nom. cross-section – for specific correlation see insulated diameter
Ø1 = minimum insulated diameter after removal of the outer conducting layer









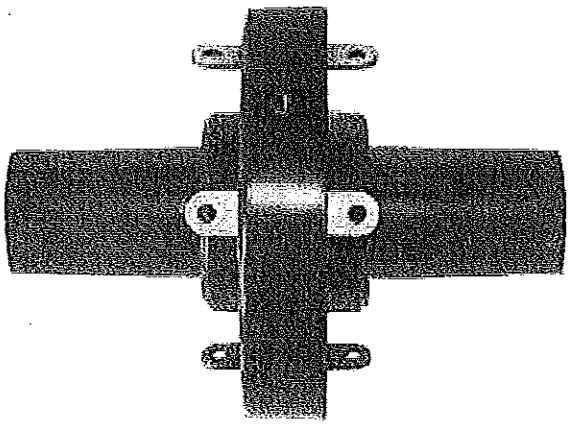
CVS 250 A 24 kV
Plug-in connector piece

Application
The CVS plug-in connector piece is advantageous for connecting two elbow and/or straight plug-in CWS or CGS connectors. Its dimensions correspond to Type A outer cone systems per EN 50180, EN 50181 and DIN 47636.

Voltage level
- E0/E (Em) 6/10 (12) 12.7/22 (24) kV

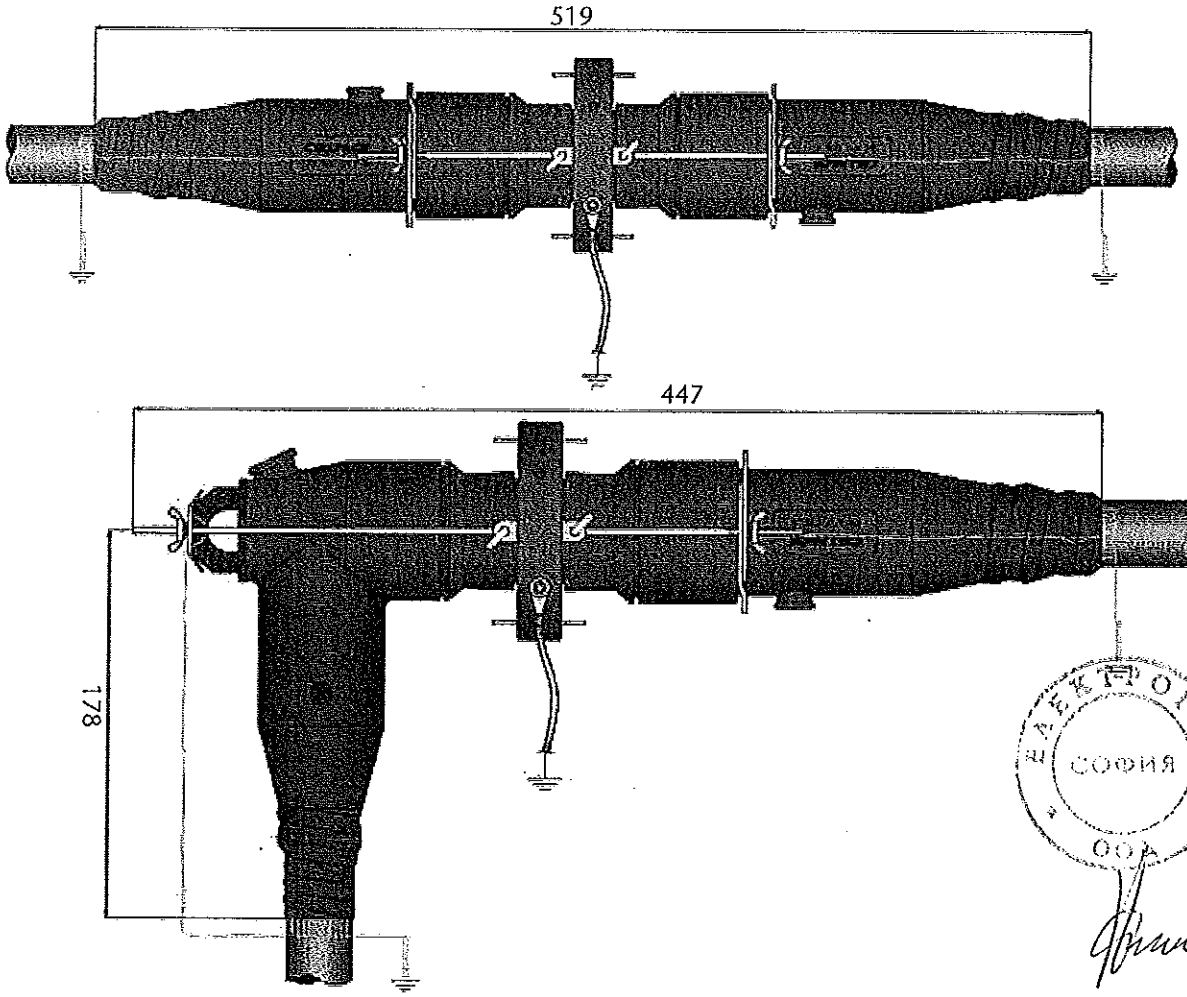
Attributes
- simple, secure, quick to assemble
- few components
- applicable for enclosed or exposed installation
- submersible
- each piece pre-tested

Items included in delivery:
- set of 3 connector pieces, electrically tested
- ancillary components and assembly materials
- illustrated assembly instructions



Order data

Type	Art.- No.
CVS 250 A 24kV	225844



CWS 400A 24kV | CWS 400A 36kV

Plug-in cable connectors for plastic-insulated single-core cables

Application

Cellplux elbow plug-in cable connectors are suitable for connecting all plastic-insulated single-core cables (PVC, PE, XLPE, EPR), with different semi-conducting layers (graphited, pull-off or peelable) and shield designs (wire or strap shield), onto switching devices and transformers up to a maximum mains voltage of 36 kV, with female connectors for type B bushings according to the standards EN 50180, EN 50181 and DIN 47636.

Voltage level

- U0/U (Um) 6/10 (12) 18/30 (36) kV

Attributes

- Simple, safe, fast installation
- One solution for many cross sections
- Few components
- Shockproof
- Sheath fault test possible while connected
- For indoor and outdoor use
- Floodable
- Subjected to routine testing

Testing

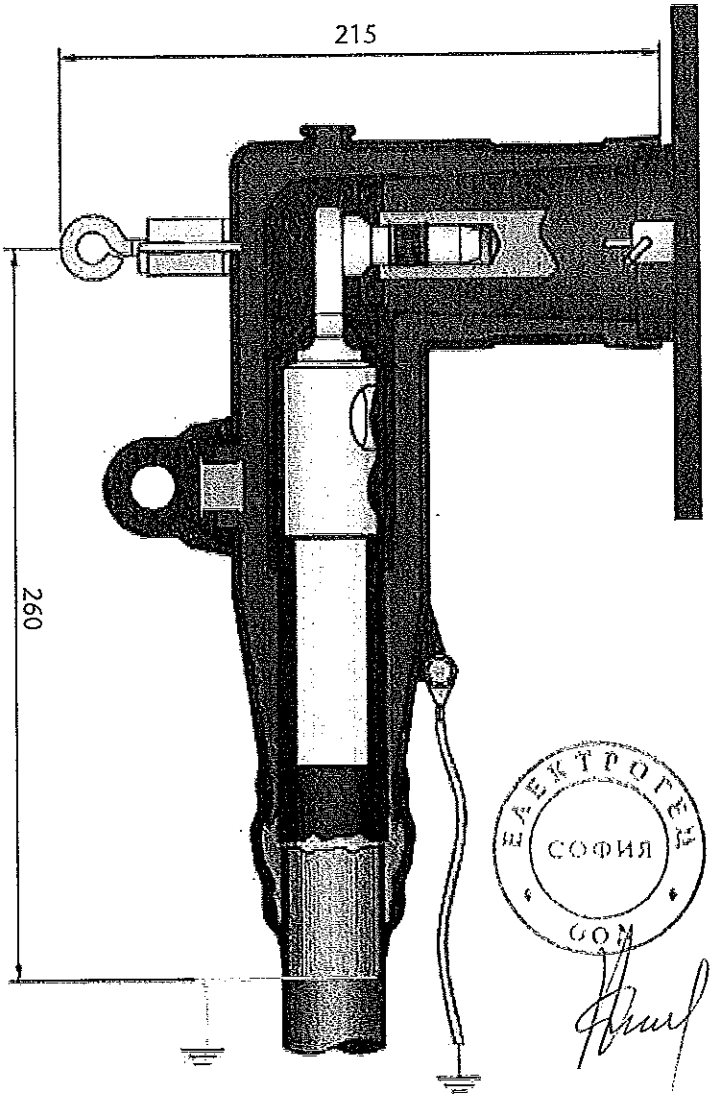
- Plug-in connections, type-tested in accordance with CENELEC HD 629. 1

Delivery scope

- Set of 3 female plug-in connectors, individually electrically tested
- Ancillary components and small installation materials
- Illustrated installation instructions

Primary elements

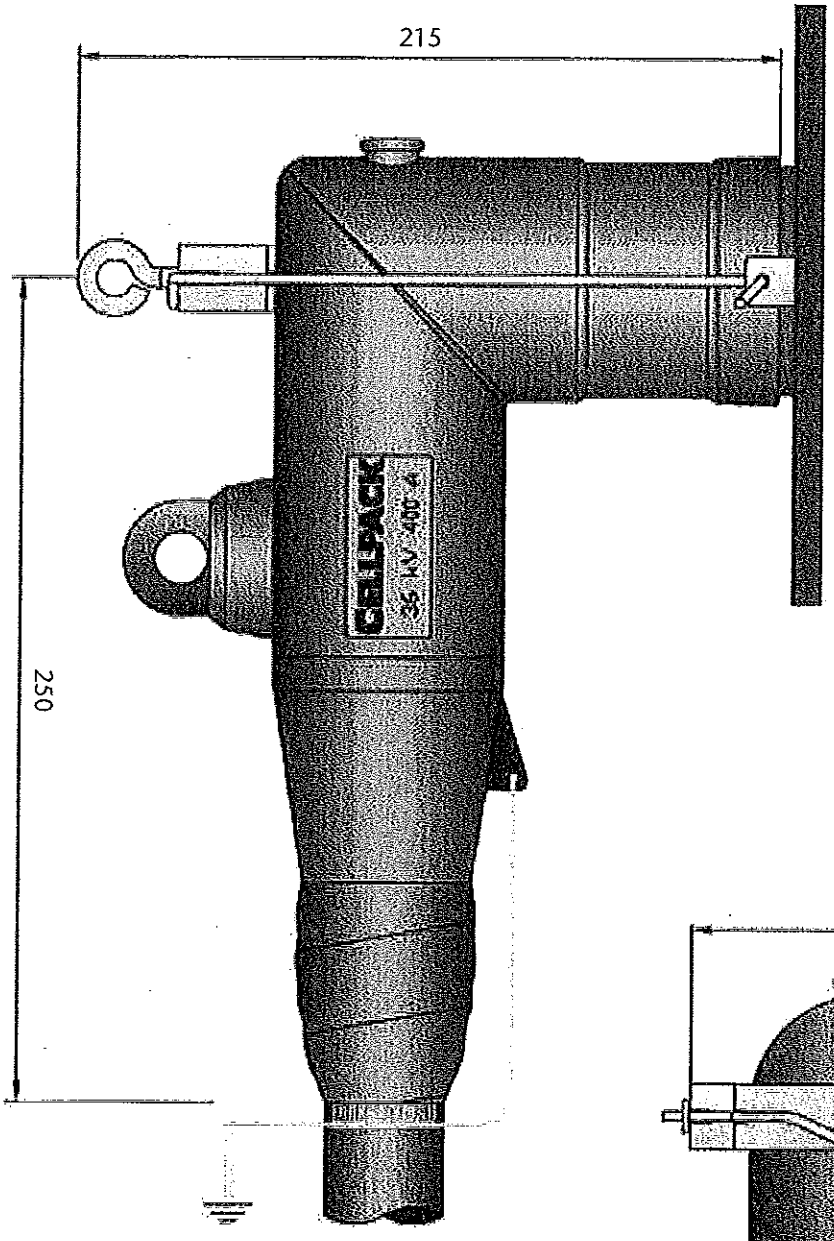
1. silicone stress control element
2. shear bolt cable lug with integrated bracket
3. Contact pin (PIN)
4. Inner semiconducting layer
5. Main insulation body
6. Shielding
7. Fastening device

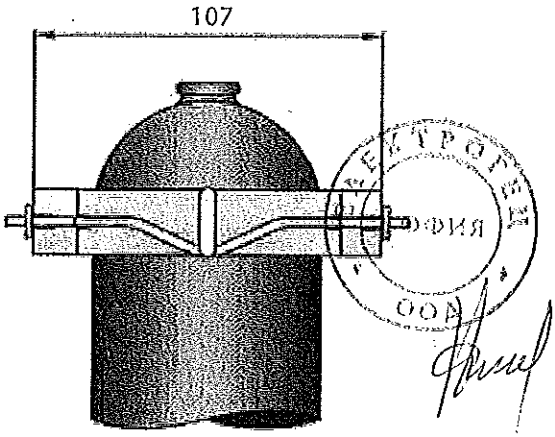


Order data

Type	12 kV Q mm²	17,5 kV Q mm²	24 kV Q mm²	36 kV Q mm²	Ø1 mm	Art.- No.
CWS 400A 24kV 25-70	---	25 - 95	25 - 70	---	14.7	250716
CWS 400A 24kV 95-240	---	120 - 240	95 - 240	---	22	245709
CWS 400A 24kV 25-70/EGA	50 - 95	25 - 95	25 - 70	---	14.7	250720
CWS 400A 24kV 95-240/EGA	150 - 240	120 - 240	95 - 240	---	22	246176
CWS 400A 36kV 50-95	---	---	95	50 - 95	22	250722
CWS 400A 36kV 150-240	---	---	240	150 - 240	30.8	245730
CWS 400A 36kV 50-95/EGA	---	---	95	50 - 95	22	250726
CWS 400A 36kV 150-240/EGA	---	---	240	150 - 240	30.8	247102

Q = nominal cross section – for clear assignment, see diameter over core insulation
Ø1 = minimum diameter over core insulation after removal of the outer semi-conducting layer





CTS 630 A 24 kV and CTS 630 A 36 kV

Shear bolt plug-in cable connectors for polymeric insulated single-conductor cables

Application

CTS shear bolt Cellplux plug-in cable connectors are advantageous for connecting all polymeric insulated single-conductor cables (PVC, PE, XLPE, EPR) with various types of semi-conducting layers (graphitized, fully bonded or peel-off) as well as shield designs (wire or tape shield) to switching equipment and transformers having plug-in connections for Type C outer cone system terminals (per EN 50180, EN 50181) up to a maximum network voltage of 36 kV.

Voltage level

- E0/E (Em) 6/10 (12) – 18/30 (36) kV

Attributes

- simple, secure, quick to assemble
- solution for entire cross-section range
- few components
- touch-proof outer sheath
- outer sheath fault test possible in connected state
- applicable for enclosed or exposed installation
- submersible

Testing

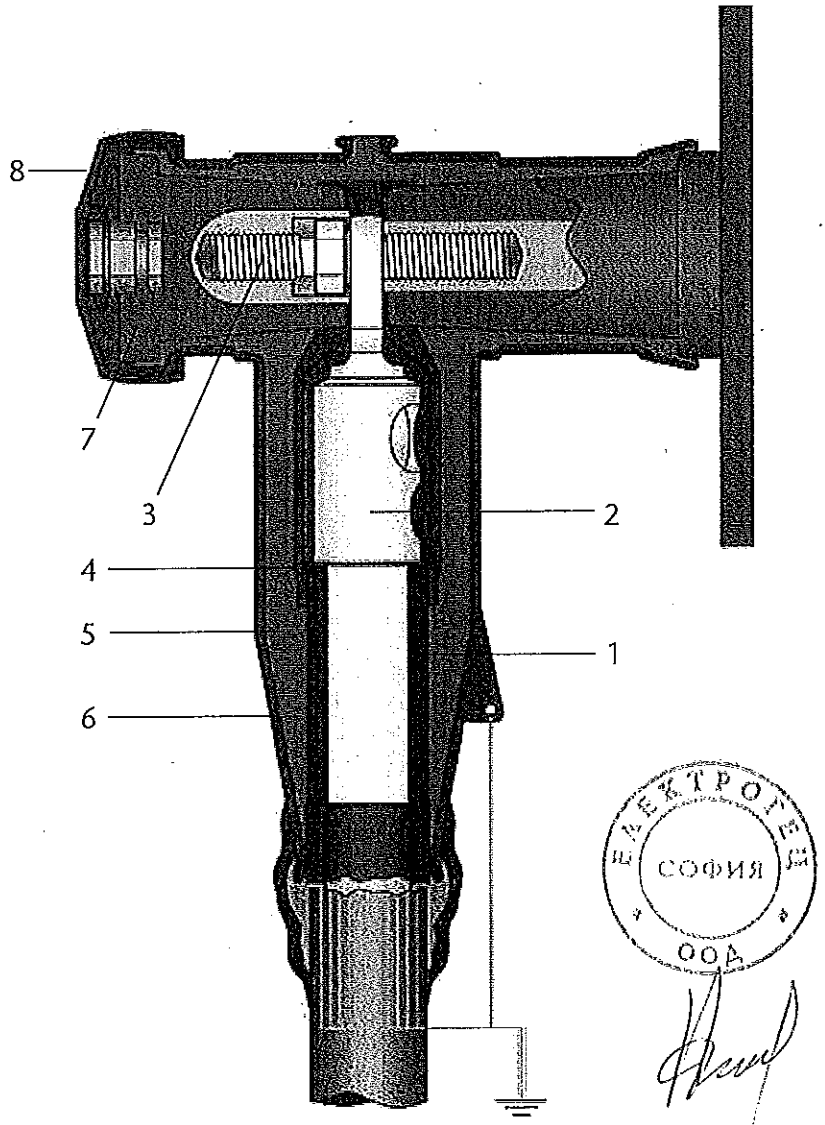
- Plug-in connection type-tested per CENELEC HD 629. 1 shear bolt cable lug type-tested per EN/IEC 61238-1

Items included in delivery:

- set of 3 plug-in cable parts, electrically tested
- ancillary components and assembly materials
- illustrated assembly instructions

Primary elements

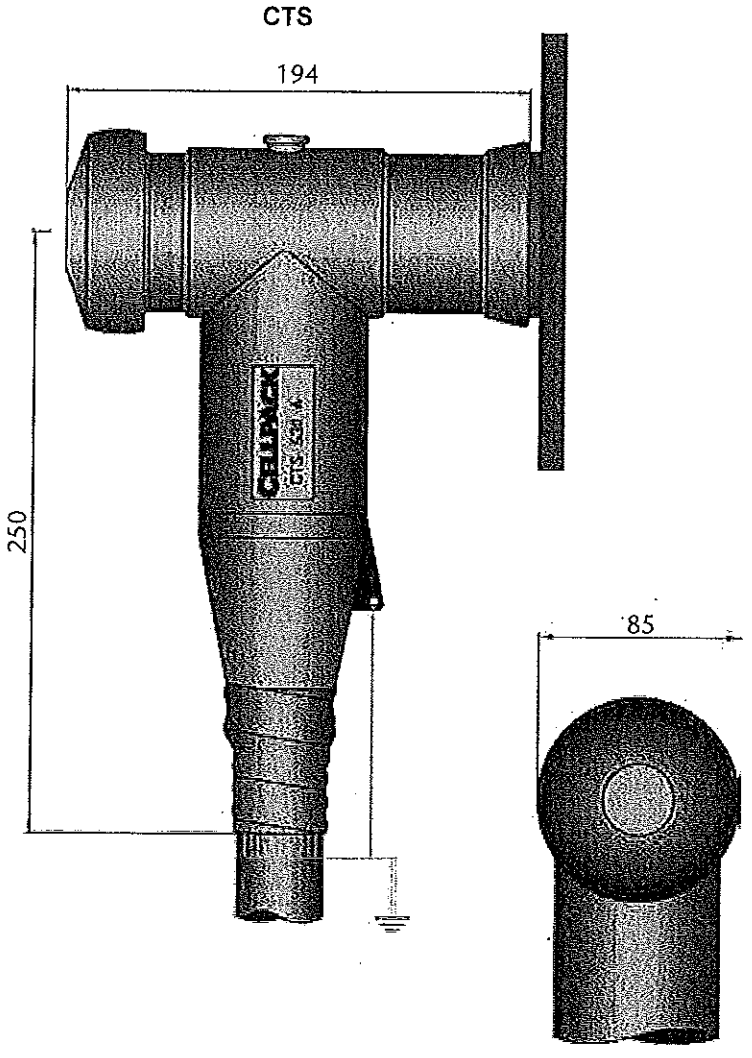
1 silicone stress control element
2 shear bolt cable lug with shear-off screw and integrated holder
3 contact bolt with shear-off screw
4 inner electrode
5 primary insulation
6 shield
7 screw isolating plug with capacitive test point
8 protective cap

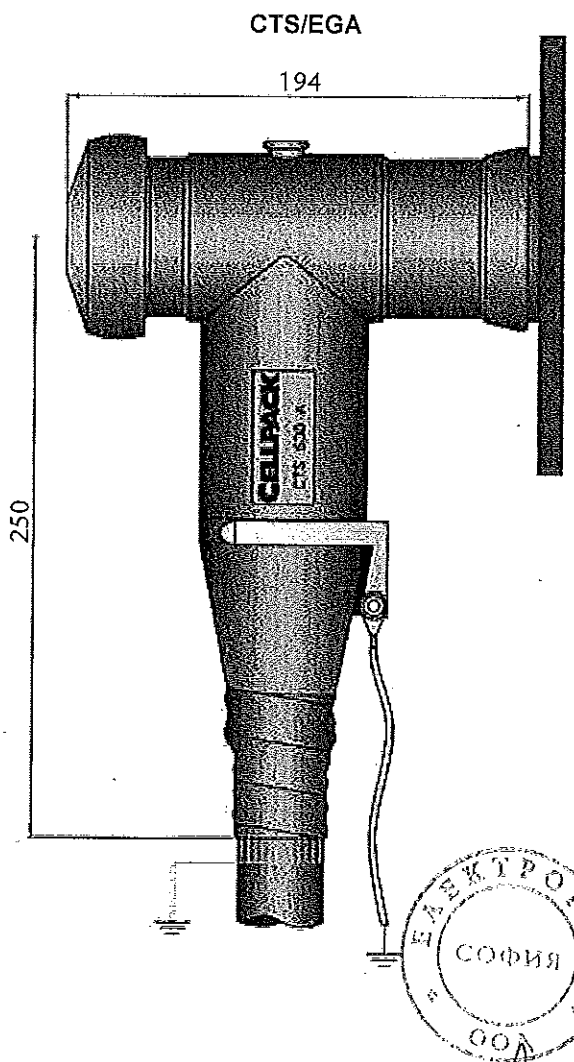


Order data

Type	12 kV Q mm²	17,5 kV Q mm²	24 kV Q mm²	36 kV Q mm²	Ø1 mm	Art.- No.
CTS 630A 24kV 25-70	---	25 - 95	25 - 70	---	14.7	250710
CTS 630A 24kV 95-240	---	120 - 240	95 - 240	---	22	206748
CTS 630A 24kV 25-70/EGA	50 - 95	25 - 95	25 - 70	---	14.7	250711
CTS 630A 24kV 95-240/EGA	150 - 240	120 - 240	95 - 240	---	22	220775
CTS 630A 36kV 50-95	---	---	95	50 - 95	22	250713
CTS 630A 36kV 150-240	---	---	240	150 - 240	30.8	224825
CTS 630A 36kV 240-400	---	---	300 - 400	240 - 400	31.5	252236
CTS 630A 36kV 50-95/EGA	---	---	95	50 - 95	22	250715
CTS 630A 36kV 95-150/EGA	---	---	95 - 240	95 - 150	22	256010
CTS 630A 36kV 150-240/EGA	---	---	240	150 - 240	30.8	224826
CTS 630A 36kV 240-400/EGA	---	---	300 - 400	240 - 400	31.5	256328

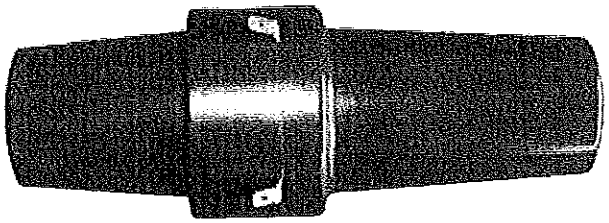
Q = nom. cross-section – for specific correlation see insulated diameter
Ø1 = minimum insulated diameter over insulation after removal of the outer semi-conducting layer





CKS 630 A up to 24 kV
Shear bolt coupling piece

Application
The CKS shear bolt coupling piece is intended for the connection of two CTS plug-in cable connectors up to 24 kV at up to a rated current of 630 A. The dimensions of the longer outer cone corresponds to Type C outer cone systems per EN 50180, EN 50181.



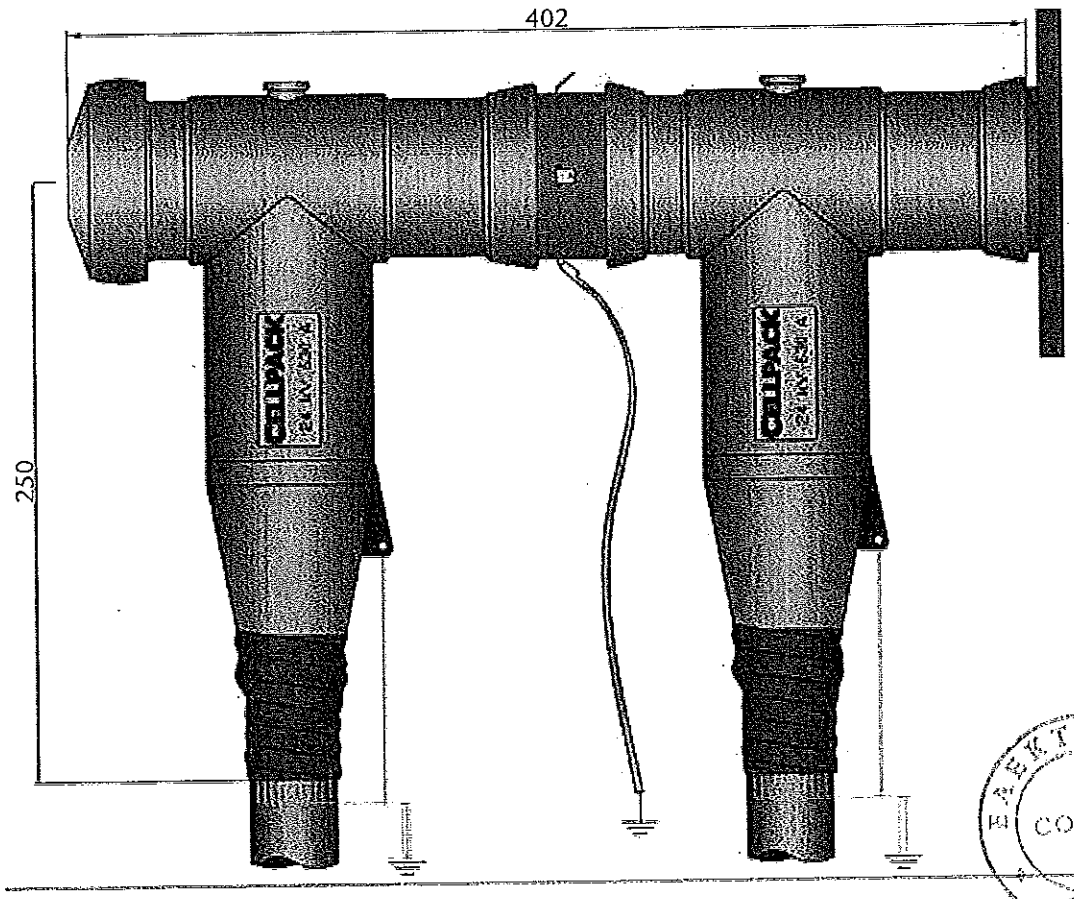
Voltage level
- E0/E (Em) 6/10 (12) 12.7/22 (24) kV

Attributes
- simple, secure, quick to assemble
- few components
- applicable for enclosed or exposed installation
- submersible
- each piece pre-tested

Items included in delivery:
- set of 3 coupling pieces, electrically tested
- ancillary components and assembly materials
- illustrated assembly instructions

Order data

Type	Art.- No.
CKS 630 A 24 kV	224853



CTKS 630A 24kV | CTKS 630A 36kV
Coupling connector

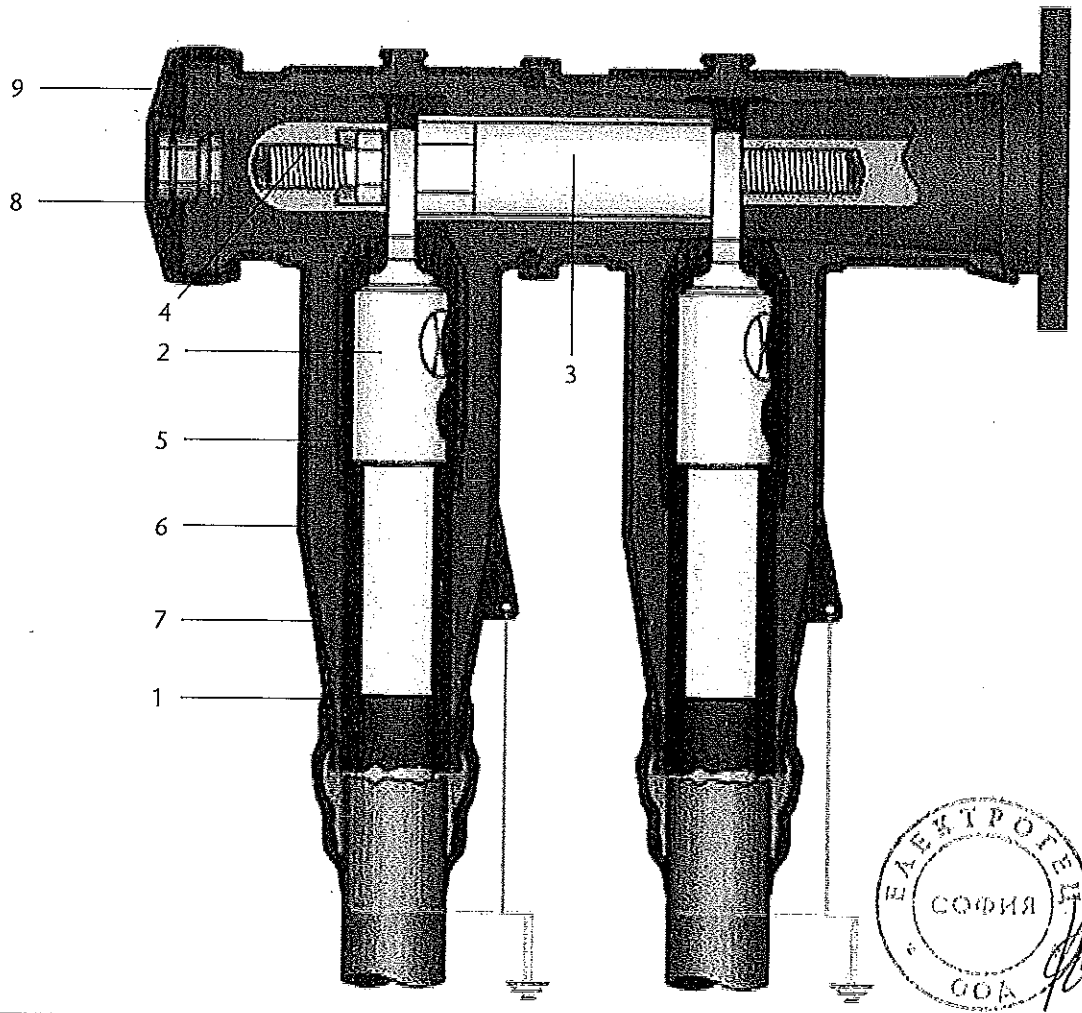
Application
The CTKS coupling connectors are suitable for connecting all plastic-insulated single-core cables (PVC, PE, XLPE, EPR), with different semi-conducting layers (graphited, pull-off or peelable) and shield designs (wire or strap shield), to the back of Cellplux plug-in cable connectors, model CTS 630 A 24 kV and 36 kV.

Voltage level
- U0/U (Um) 6/10 (12) – 18/30 (36) kV

Attributes
- Simple, safe, fast installation
- One solution for many cross sections
- Shallow installation depth
- Shockproof
- Sheath fault test possible while connected
- Floodable
- Subjected to routine testing

Delivery scope
- Set of 3 male cable connectors, electrically tested
- Ancillary components and small installation materials
- Illustrated installation instructions

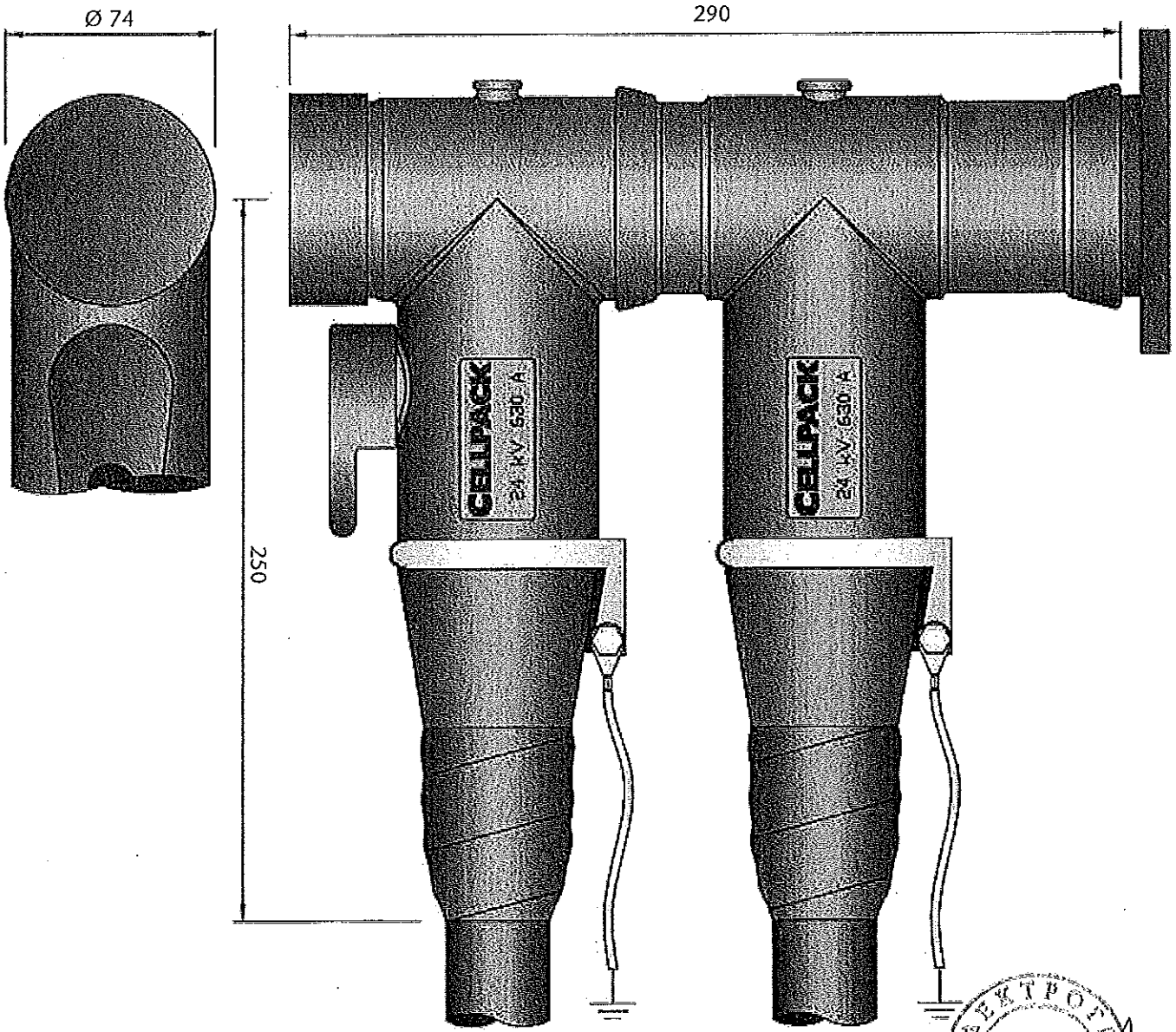
Primary elements
1. silicone stress control element
2. shear bolt cable lug
3. Contact threaded pin
4. Shear bolt Contact pin
5. Internal semi-conductor layer
6. Main insulation
7. Integrated capacitive measuring point
8. Shielding
9. Screw insulation plug with capacitive measuring point



Order data

Type	12 kV Q mm²	17,5 kV Q mm²	24 kV Q mm²	36 kV Q mm²	Ø1 mm	Art.- No.
CTKS 630A 24kV 25-70/EGA	50 - 95	25 - 95	25 - 70	---	14.7	256838
CTKS 630A 24kV 95-240/EGA	150 - 240	120 - 240	95 - 240	---	22	256839
CTKS 630A 36kV 50-95	---	---	95	50 - 95	22	257581
CTKS 630A 36kV 150-240	---	---	240	150 - 240	30.8	257582

Q = nominal cross section – for clear assignment, see diameter over core insulation
Ø1 = minimum diameter over core insulation after removal of the outer semi-conducting layer



CTKSA

Plug- In Surge Arrester

Application

The CTKSA Surge Arrester is designed for the protection of encapsulated medium voltage installations with a maximum operating voltage of 24 kV. Its compact design allows direct connection to double-row CTS 630A screw plugs and complies with International Standard IEC 60099-4.

Voltage Level

- U_0/U (U_m) 6/10 (12) - 12,7/22 (24) kV

Characteristics

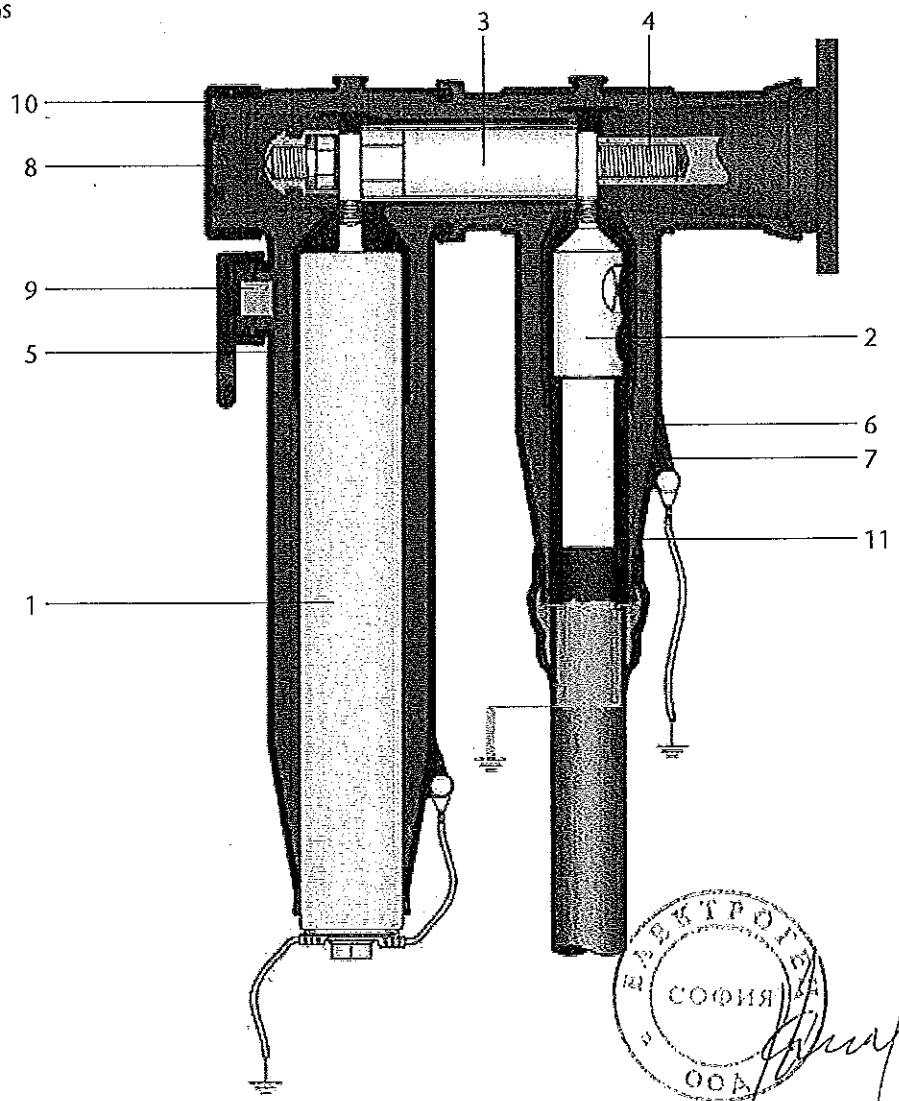
- Safe, quick and easy assembly
- Minimal installation depth
- Protection from exposed electrical parts
- Capacitive test point
- Suitable for indoor and outdoor applications
- Individually tested

Scope of Delivery

- Set of three surge arresters, electrically tested
- Secondary components and assembly accessories
- Assembly instructions with illustrations

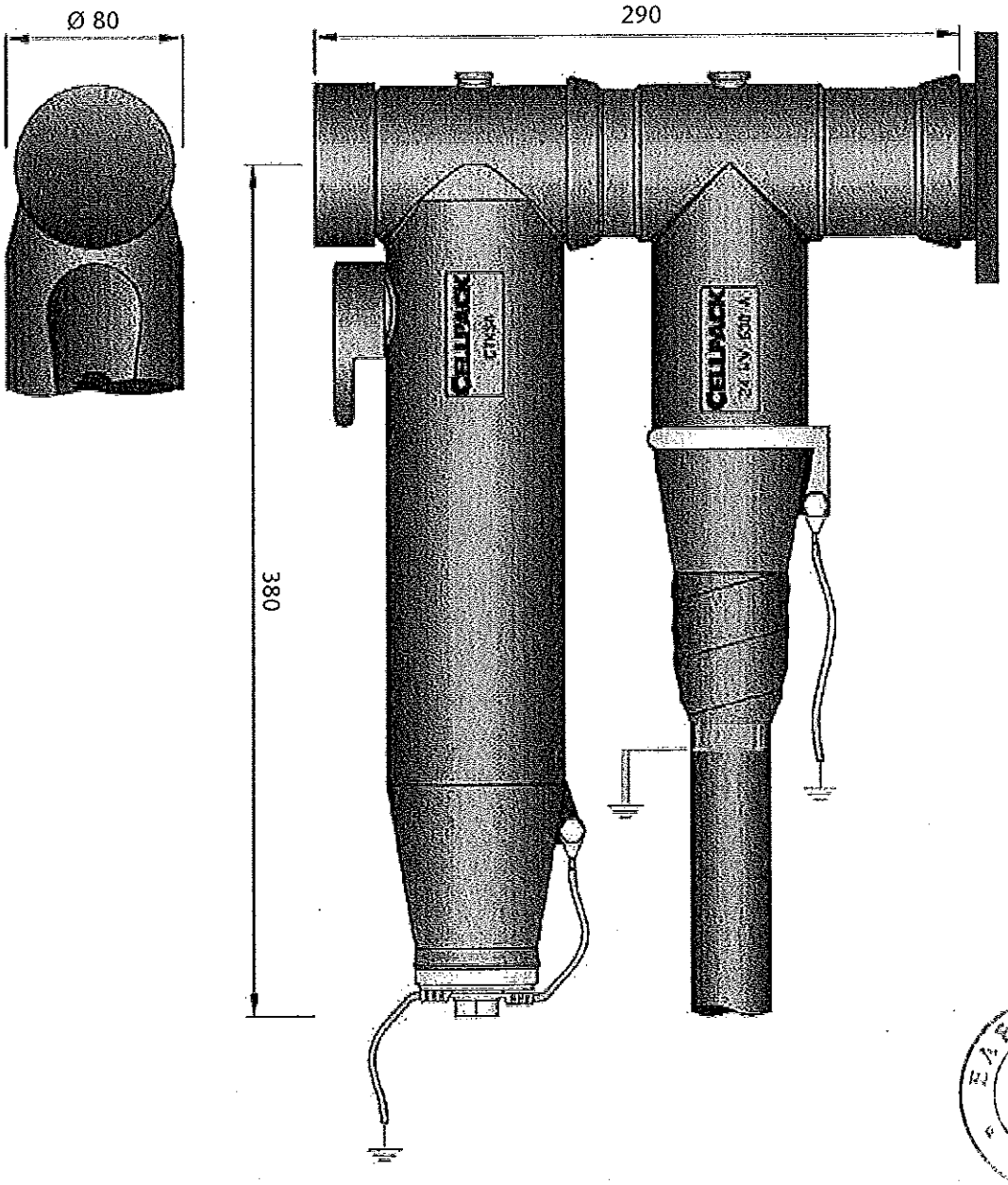
Primary Components

1. Surge arester
2. Screw cable lug with shear bolt
3. Connector element
4. Contact pins with shear bolt
5. Inner semi-conducting layer
6. Main insulation
7. Shielding
8. Screw-in dummy plug
9. Capacitive test point
10. Protective cap
11. Silicon stress control element



Order data

	CTKSA 12kV 10kA	CTKSA 17kV 10kA	CTKSA 19,5kV 10kA	CTKSA 24kV 10kA
Art.- No.	262054	262055	262816	262056
Nominal leakage current I [kA]	10	10	10	10
Rated voltage Ur [kV]	15	21	24	30
Maximum Operating Voltage Uc [kV]	12,7	17	19,5	24
Partial discharge Uc [pC]	< 5	< 5	< 5	< 5
Residual voltage [kV] at:				
Steep current impulse 1/20 µs	53	74,2	84,8	105,9
Switching impulse current 125 A	35,8	50,1	57,3	71,7
Switching impulse current 500A	38,2	53,5	61,2	76,5
Lightning impulse current 8/20 µs	49,5	69,3	79,2	99



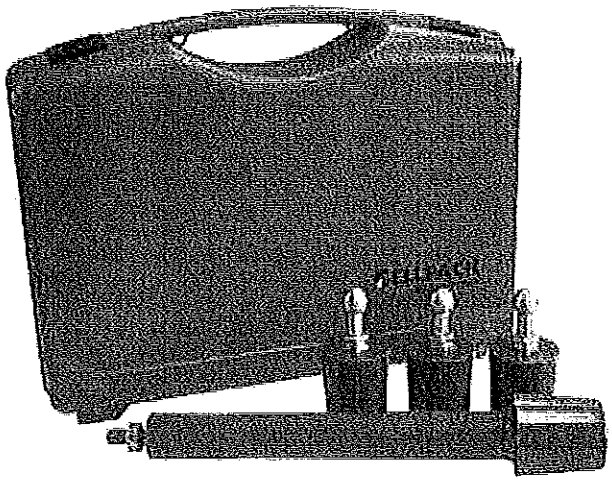
CPES
Test and Earthing Kit

Application
The Test and Earthing Kit is designed for the establishment of galvanic connections between cable conductors and is compatible with all Type CTS and CTKS Cellplux T-plugs.

Voltage Level
- U_0/U (U_m) 6/10 (12) - 18/30 (36) kV

Areas of Application
- Earthing for work
- Cable fault location
- Cable testing
- Phase compensation

Scope of Delivery
- 1x Test adapter
- 3x Earthing adapter
- 1x Case
- Assembly instructions with illustrations



Order data

Type	Art.- No.
CPES	259101

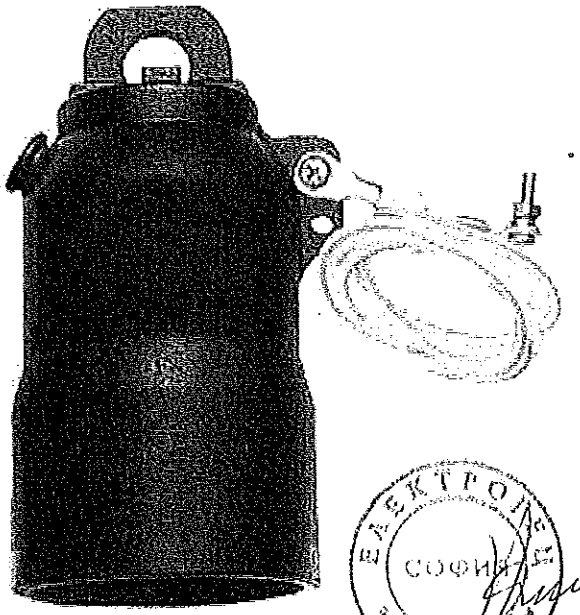
CIK
Voltage-proof Insulating Cap

Application
The CIK Voltage-proof Insulation Cap provides electrical insulation for Types A 250A and C 630A bushings in encapsulated substations and transformers up to 36kV, in compliance with EN 50180 and EN 50181.

Voltage Level
- U_0/U (U_m) 6/10 (12) - 18/30 (36) kV

Characteristics
- Easy assembly
- Protection from exposed electrical parts
- Water-resistant

Scope of Delivery
- 3x Voltage-proof Insulating Caps
- Assembly accessories
- Assembly instructions with illustrations



Order data

Type	Art.- No.
CIK 250A 24kV	265023
CIK 630A 36kV	265024

ZS - CTS

Accessory Kit for Type CTS 630A Cellplux Plug-In Cable Connectors

Application

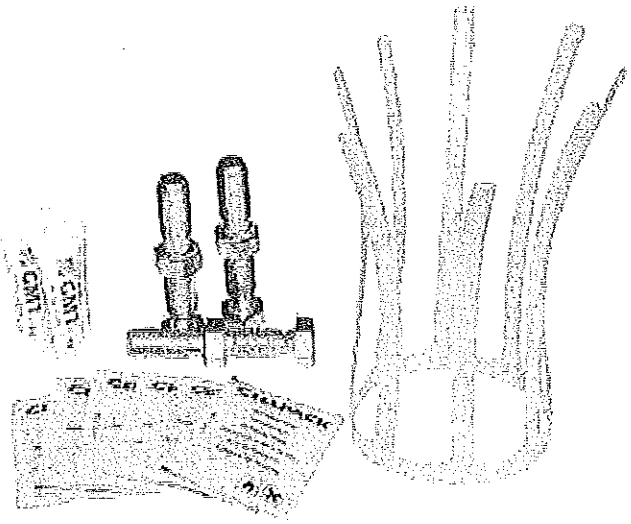
The ZS-CTS Accessory Kit is designed for the reinstallation of plug-in cable connectors in substations and transformers with bushings for Type C outer cone systems complying with EN 50180, EN 50181. The inclusion of the tried and tested contact pin with shear bolt in this kit eliminates the possibility of faulty assembly of cable systems.

Area of Application

- Reinstallation of Type CTS Plug-In Cable Connector

Scope of Delivery

- Set of 3 contact pins with shear bolt
- Assembly accessories
- Assembly instructions with illustrations



Order data

Type	Art.- No.
ZS - CTS	257622

Mounting Ring

Application

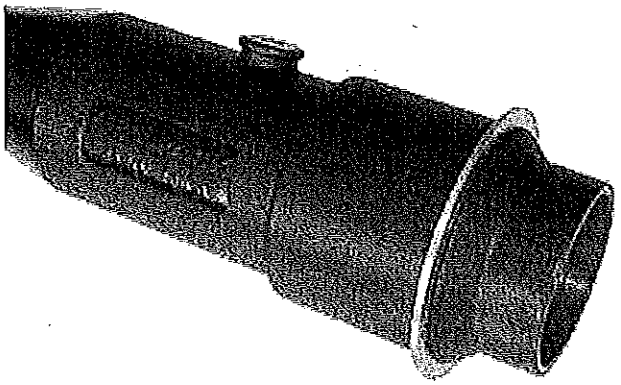
The Mounting Ring is designed to secure CWS 250A and CGS 250A Cellplux Plug-In Cable Connectors to a special bushing for Type A outer cone systems. The Mounting Ring is simply placed in the prefabricated groove in the cable connector. The two components may then be mounted on the bushing together.

Characteristics

- Easy assembly
- Secure connection to special Type A bushing

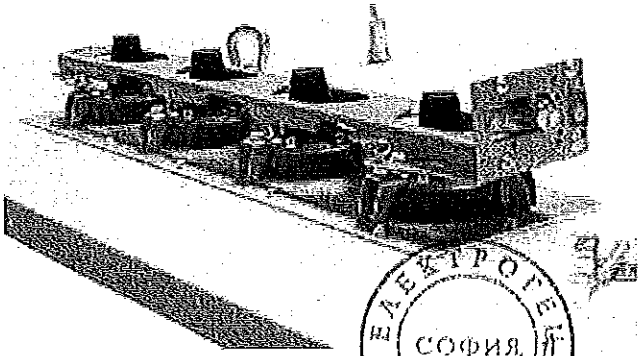
Scope of Delivery

- 1 x Mounting Ring



Order data

Type	Art.- No.
Mounting Ring	264366



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ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

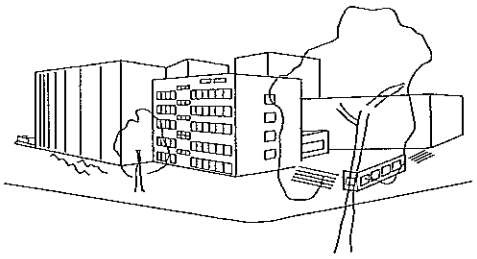
РЕФ. № PPD 15-042

"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 3

Bereich Hochspannungsprüftechnik

Institut für Elektroenergiesysteme und Hochspannungstechnik



Universität Fridericiana (TH) Karlsruhe
76128 Karlsruhe - Kaiserstraße 12
Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report Nº 2007-129

Type Test of

Separable Connectors

Type CELLPLUX-CGS 250 A 24 kV

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

1 Purpose of Test

4 separable connectors for $V_0 / V_n / V_m$ = 12/ 20 / 24 kV were subjected to a type test according to CENELEC HD 629.1 S1 07/1996 and A1 11/2000 table 7 test sequence D1. 2 separable connectors for $V_0 / V_n / V_m$ = 12 / 20 / 24 kV were subjected to additional tests according to CENELEC HD 629.1 S1 07/1996 and A1 11/2000, table 7 test pos. 19-22.

2 Miscellaneous Data

Test object: – 6 *separable connectors* type CELLPLUX-CGS 24 kV 250 A mounted on adapter CVS 24 kV 250 A
V_m = 24 kV,
Drawing no.; MS 0015 Z from 31.05.2007 (seperable connector), Figure 2.1
Drawing no.; MS 0035 Z from 02.07.2007 (adapter), Figure 2.2 - 2.3
Installation instruction no.: 224441/0607/1/6, Figure 2.4 - 2.9
Type of the cable: The test object was mounted on a single-wire XLPE-cable, type:NA2X(F)2Y 1x70RM/25 12/20kV

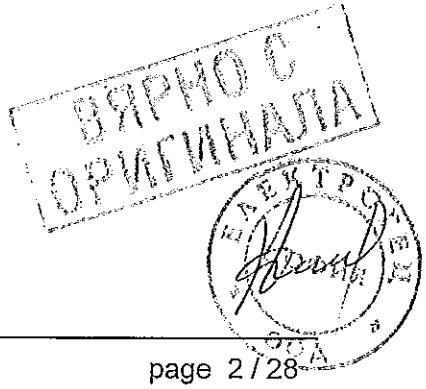
Cable length Connector - sealing end: 3 m

Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

Testing dates: Delivery: 18.06.2007
Mounting: 18.06.2007
Test period: 18.06. - 20.09.2007

Atmospheric conditions: Temperature: 19°C – 24°C
Air pressure: 980 - 1025 mbar
rel. humidity: 35 % – 60 %

Representatives:
Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller



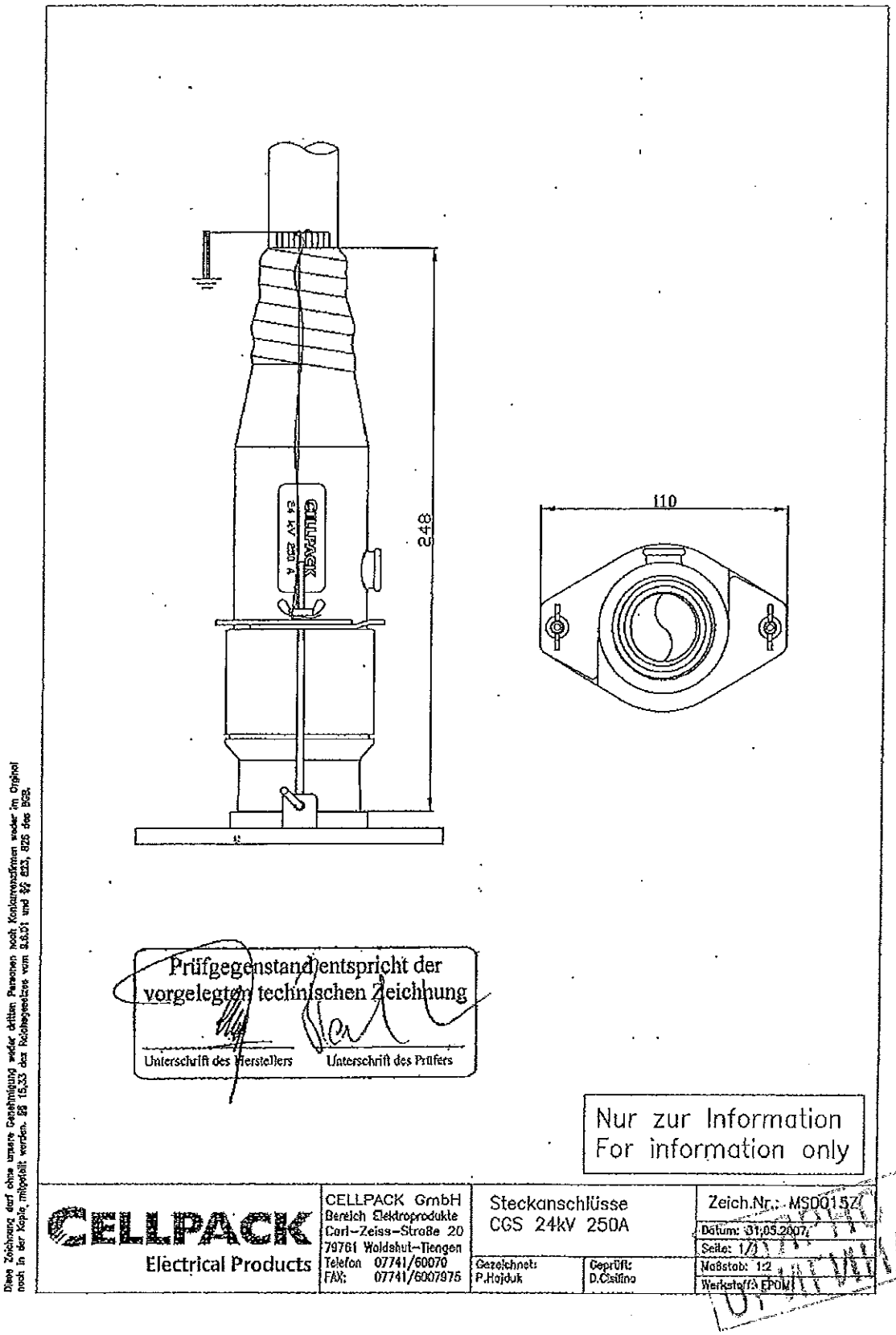


Figure 2.1: Separable connector.

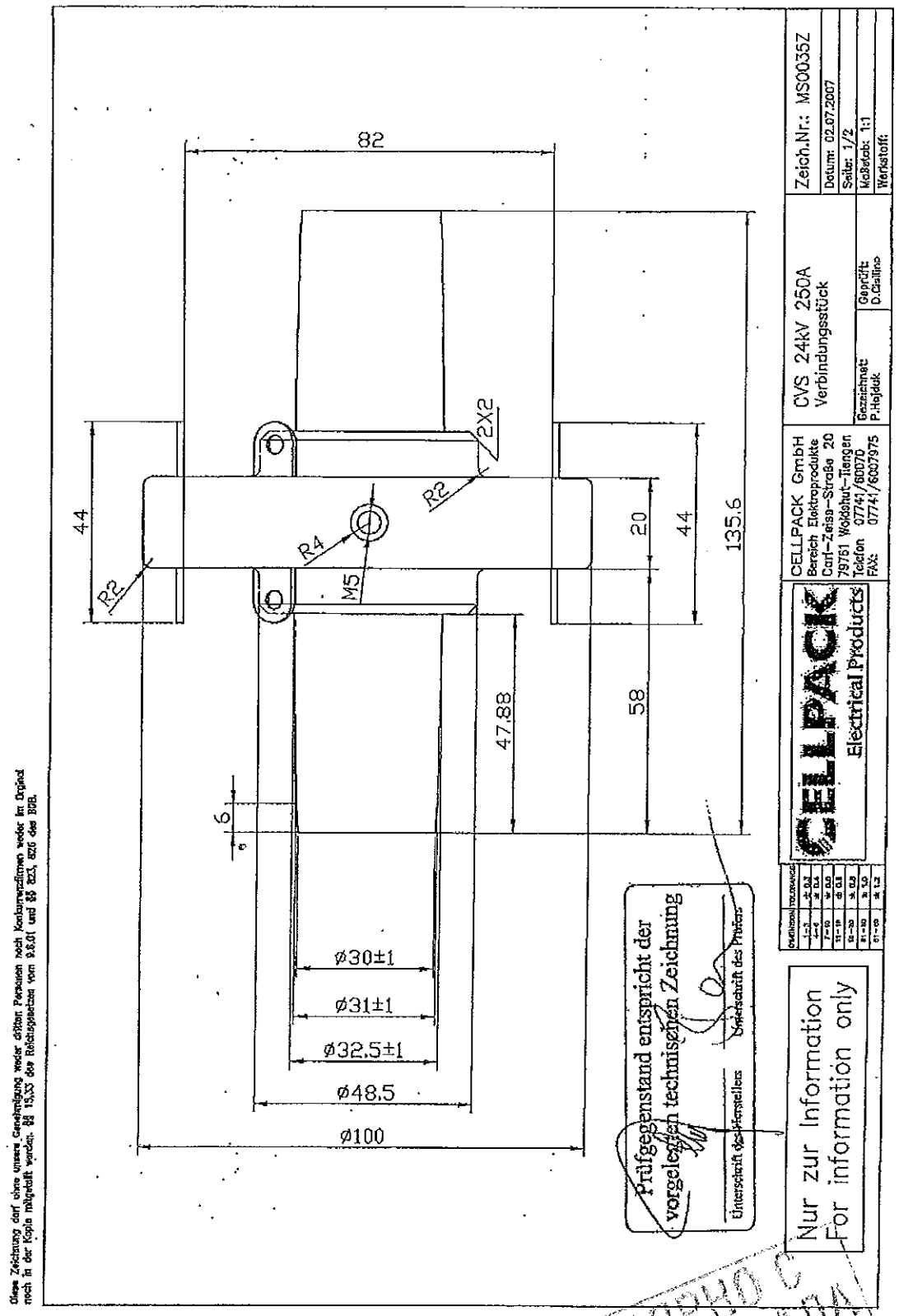


Figure 2.2: Adapter

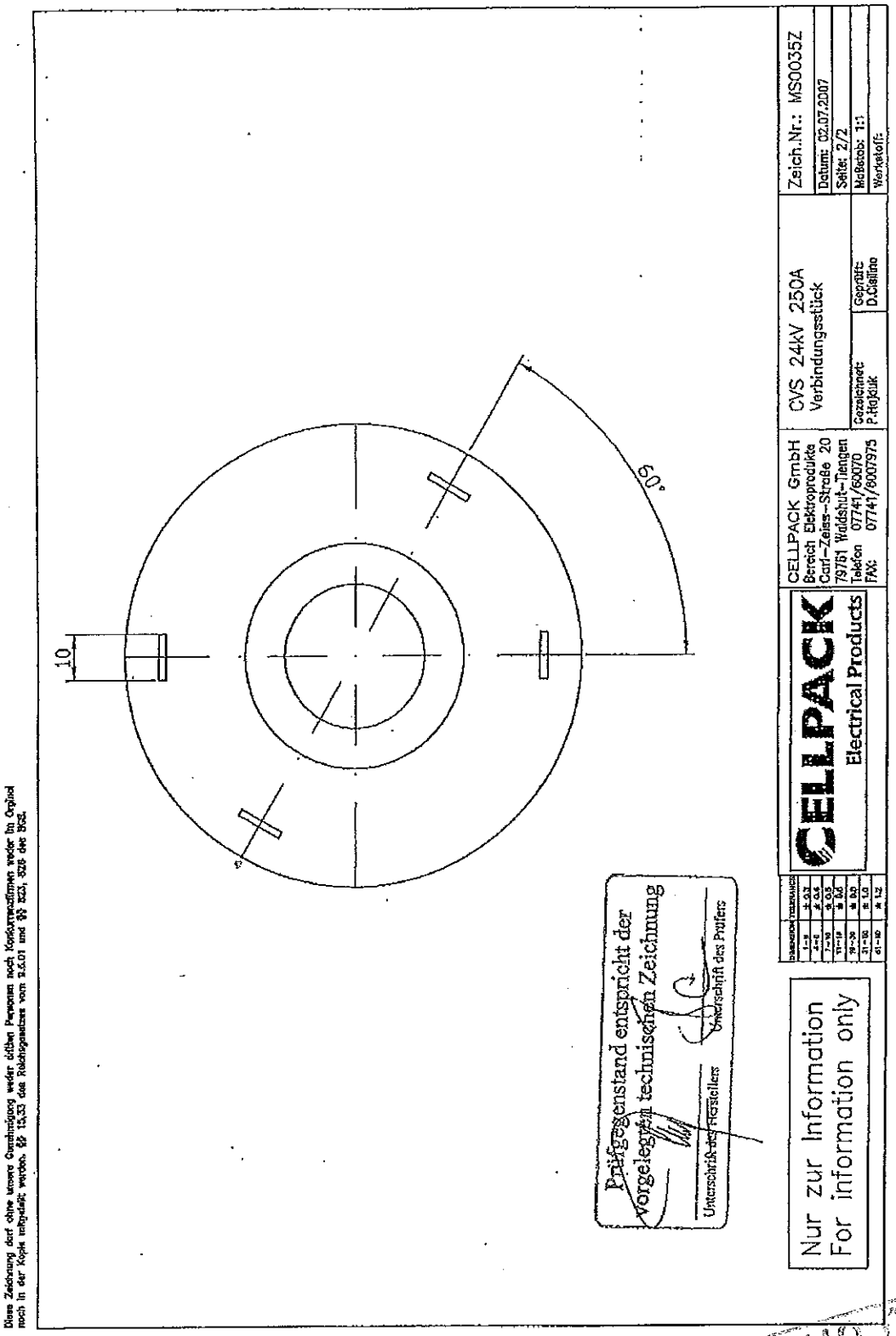
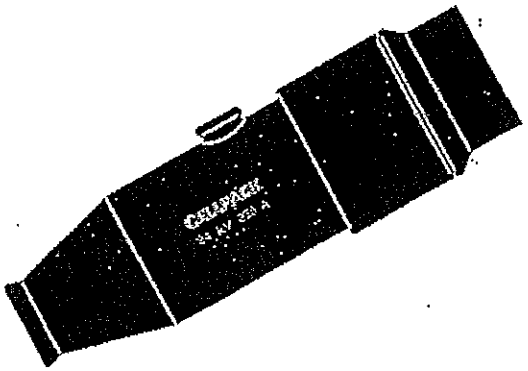


Figure 2.3: Adapter

Mittelspannung **CELLPLUX**



CGS 24kV 250A 25 – 95
$U_o/U(U_m)$ 6/10(12) kV - 12/20(24) kV

Montageanleitung

Gerader-Steckanschluss für
Einleiter Kunststoffkabel
bis 24 kV

224441/0607/1/6

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CELLPACK
Electrical Products

Figure 2.4: Installation Instruction

Vor Montagebeginn beachten:

- Prüfen, ob die Garnitur für die vorhandenen Kabel geeignet ist.
- Material anhand der Packliste auf Vollständigkeit prüfen.
- Montageanleitung sorgfältig lesen.

Die Montage darf nur durch eine fachkundige Person erfolgen.
Für Ausfälle und Folgeschäden aufgrund falscher Montage ist der Hersteller nicht haftbar.

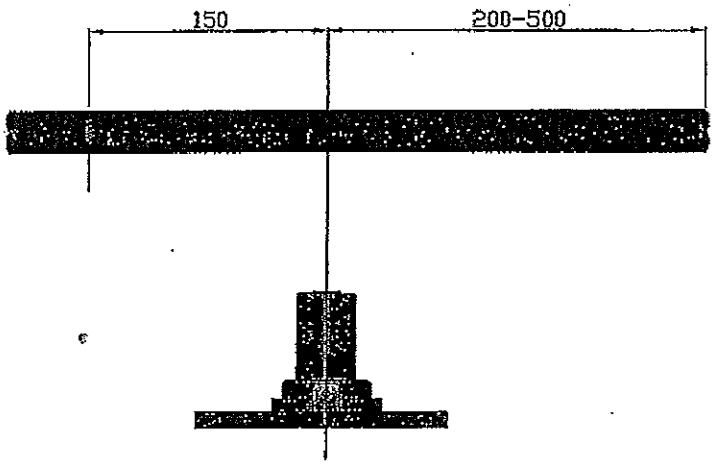
Gerader-Steckanschluss Typ CGS 250A 24kV 25-95

Querschnittzuteilung

Spannung Uo/U(Um) kV	Leiterquerschnitte RM/RE (*) mm²
6/10(12) kV	50 - 95
8,7/15(17,5) kV	25 - 95
12/20(24) kV	25 - 95

(*) Durchmesser über Aderisolierung min. 14,7 mm

Ausrichtung:



- Kabelmantel auf ca. **1 m** Länge gründlich reinigen.
- Kabel ausrichten und mit **200 – 500 mm** Überstand zur Durchführungsmitte anpassen und einkürzen.
- Durchführungsmitte und das Maß **150 mm** auf Kabelmantel markieren.

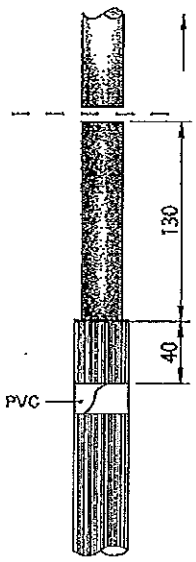
224441 CGS 24kV 250A 25-95 2/6

Figure 2.5: Installation Instruction

Kabelvorbereitung

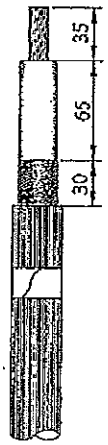
Kabel mit Drahtschirm:

1a)



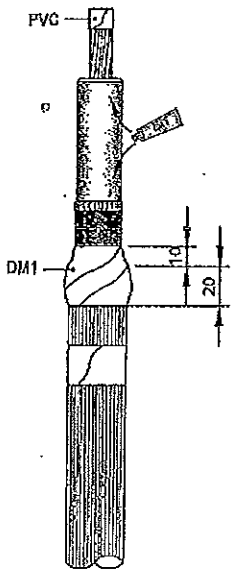
- Kabelmantel bis auf untere Markierung absetzen.
- Schirmdrähte zurücklegen und mit PVC-Band auf dem Kabelmantel festlegen.
- Leiter auf 130 mm einkürzen.

2a)



- Leitschicht sorgfältig bis auf **30 mm** entfernen (auf saubere Absetzkante achten).
- Leiterisolation um **35 mm** absetzen.
- Isolation und Leitschicht gründlich reinigen.

3a)



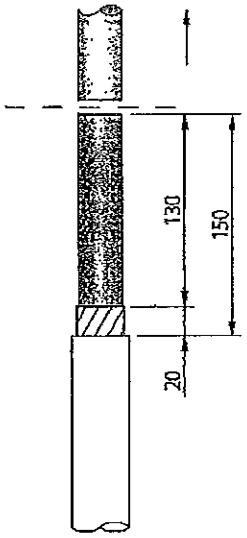
- Am Leiterende einen Schutzwickel aus PVC Band anbringen.
- 2/3 der Länge des Dichtmastiks DM1, gemäß Zeichnung, **10 mm** auf die Leitschicht und **20 mm** auf den Drahtschirm wickeln (50% Dehnung).
- Am Leitschichtende gemäß Zeichnung Gleit– und Füllmittel GM1 aufbringen.
- Isolation gleichmäßig mit Gleit- und Füllmittel GM1 benetzen.

224441 CGS 24kV 250A 25-95

Figure 2.6: Installation Instruction

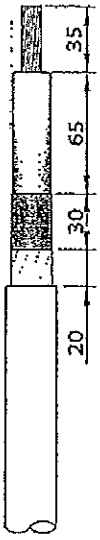
Kabel mit Bandschirm:

1b)



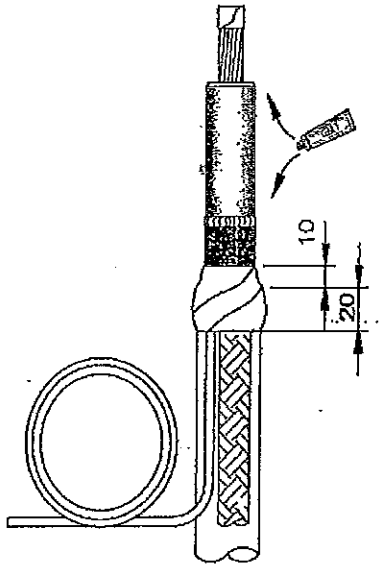
- Kabelmantel 20mm weiter wie bis zur untere Markierung absetzen.
- Leiter gemäß Zeichnung einkürzen.
- Bandschirm bis auf **20 mm** sauber entfernen.

2b)



- Leitschicht sorgfältig bis auf **30 mm** entfernen (auf saubere Absetzkante achten).
- Leiterisolation um **35 mm** absetzen.
- Isolation und Leitschicht gründlich reinigen.

3b)

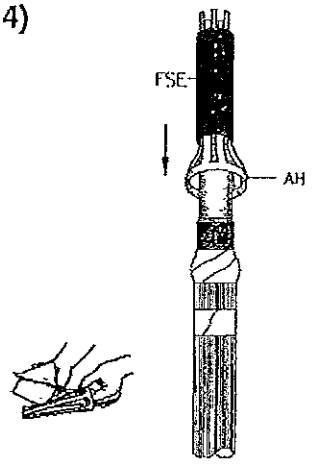


- Am Leiterende Schutzwickel aus PVC-Band anbringen.
- Flachgewalztes Erdseil und Erdlitze (Erdungskit bitte separat bestellen) mittels Rollfeder RF auf dem Bandschirm kontaktieren
- 2/3 der Länge des Dichtmastiks DM1 gemäß Zeichnung, **10 mm** auf die Leitschicht und **20 mm** auf den Bandschirm wickeln.
- Am Leitschichtende gemäß Zeichnung Gleit- und Füllmittel GM1 aufbringen.
- Isolation gleichmäßig mit Gleit- und Füllmittel GM1 benetzen.

224441 CGS 24kV 250A 25-95

Figure 2.7: Installation Instruction

4)

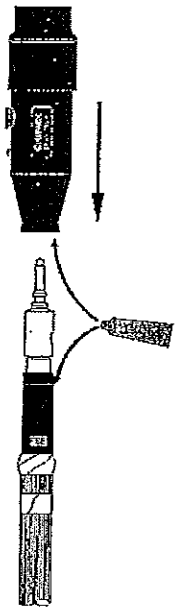


- Zungen der Aufschiebehilfe AH mit Silikontuch einfetten.
- Aufschiebehilfe AH in das Feldsteuerelement einführen und bis vor den Dichtwickel aufschieben.
- Danach Aufschiebehilfe entfernen, dabei Zungen einzeln herausziehen.
- Feldsteuerelement mit leichter Drehung endgültig positionieren.

5)

- Schutzwickel am Leiterende entfernen.
- Schraubkabelschuh nach separater Montageanleitung montieren.
- Oberfläche des Feldsteuerelements gründlich reinigen.

6)

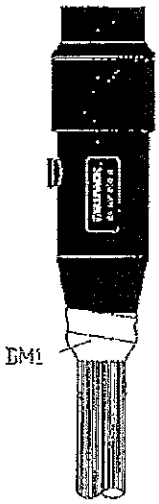


- Steckerkörper und Feldsteuerelement mit Gleit- und Füllmittel GM1 benetzen.
- Steckerkörper auf das Kabelende aufschieben bis der Kontaktstift im Steckkörper einrastet.

224441 CGS 24kV 250A 25-95 5/6

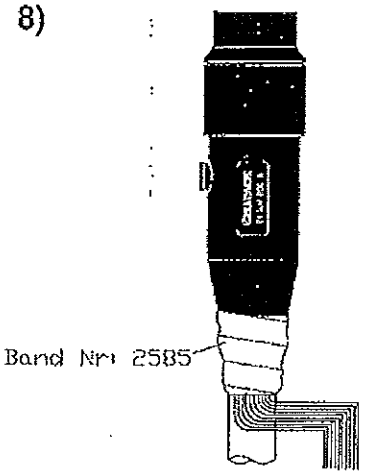
Figure 2.8: Installation Instruction

7)



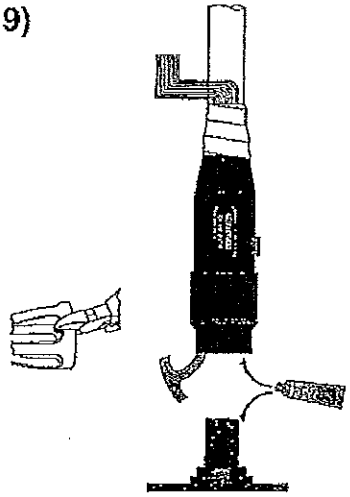
- Zwischen Steckerende und Dichtbereich restliche (1/3) des Dichtmastiks DM1 aufwickeln.

8)



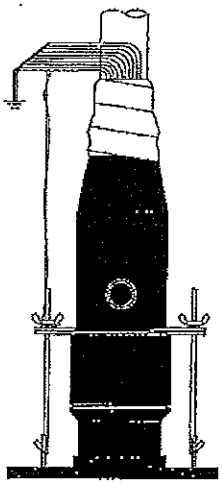
- Band Nr. 2585 ca. 20 mm über Steckerende bis Ende des Dichtbereiches wickeln.

9)



- Durchführung und Steckerinnenseite gleichmäßig mit Gleit- und Füllmittel GM1 benetzen.
- Eine Zunge der Aufschiebehilfe ausschneiden (Entlüftungshilfe).
- Entlüftungshilfe in den Stecker einführen. Stecker gerade auf die Durchführung aufstecken.

10)



- Befestigungsbügel, Halteplatte und Erdungslitze gem. Zeichnung montieren, Flügelmuttern dabei gleichmäßig handfest anziehen
- Entlüftungshilfe herausziehen, überschüssiges Gleit- und Füllmittel entfernen.
- Zwei Schirmdrähte verdrillen (bei Drahtschirm) oder Erdlitze (bei Bandschirm) und gemäß Zeichnung an der Halteplatte montieren.
- Erdungsmaßnahmen gemäß den lokalen Vorschriften durchführen.

224441 CGS 24kV 250A 25-95 6/6

Figure 2.9: Installation Instruction

Tests: Test volume, chronological order and requirements conform to CENELEC HD 629.1 S1 07/1996 and A1 11/2000 test sequence D1, table 7 and additional test pos. 17 - 20.

The PD-test was performed at 2 V_0 The tests were carried out in accordance with the test methods described in CENELEC HD 628 S1 07/1996.

Test sequence D1:

Pos. 1. *DC voltage withstand test*
V = 6 V_0 = -72 kV ; t =15 min

Pos. 2. *AC voltage withstand test*
◊/$\sqrt{2}$ = 4,5 V_0 = 54 kV; t = 5 min

Pos. 3. *Partial discharge test*
◊/$\sqrt{2}$ = 2,0 V_0 = 24 kV ; PD ≤ 10 pC

Pos. 4. *Impulse voltage withstand test, at elevated temperature*
Impulse voltage
◊ = 125 kV; positive and negative polarity each 10 impulses

Pos. 5. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 30 kV
number of cycles: 3

Pos. 6. *Partial discharge test at ambient temperature and elevated teemperature*
û/$\sqrt{2}$ = 2,0 U_0 = 24 kV ; PD ≤ 10 pC

Pos. 10. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 30 kV
number of cycles: 60

Pos. 11. *Electrical heat cycling in water*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 30 kV
number of cycles: 63

Pos. 12 *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 13. *Partial discharge test at ambient temperature and elevated temperature*
$\Diamond/\sqrt{2} = 2{,}0\ V_0 = 24$ kV ; PD ≤ 10 pC

Pos. 14. *Impulse voltage withstand test,*
lightning impulse voltage
$\Diamond = 125$ kV; positive and negative polarity each 10 impulses

Pos. 15. *AC voltage withstand test*
$\Diamond/\sqrt{2} = 2{,}5\ V_0 = 30$ kV; t = 15 min

Additional Tests:

Pos. 19. *Screen resistance measurement*
R ≤ 5000 Ω

Pos. 20. *Leakage current measurement*
$\Diamond/\sqrt{2} = 2{,}0\ V_m = 24$ kV
I ≤ 0,5 mA

Pos. 21. *Screen fault current initiation*
Fault current to flow continuously

Pos. 22. *Operating force test*
F ≤ 900 N

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH

4 Test Setups

4.1 DC Voltage Withstand Test

The DC-voltage was generated according to Figure 4.1. The voltage measurement was carried out with an ohmic-capacitive divider (ratio 2000:1). The measurement uncertainty was 3%.

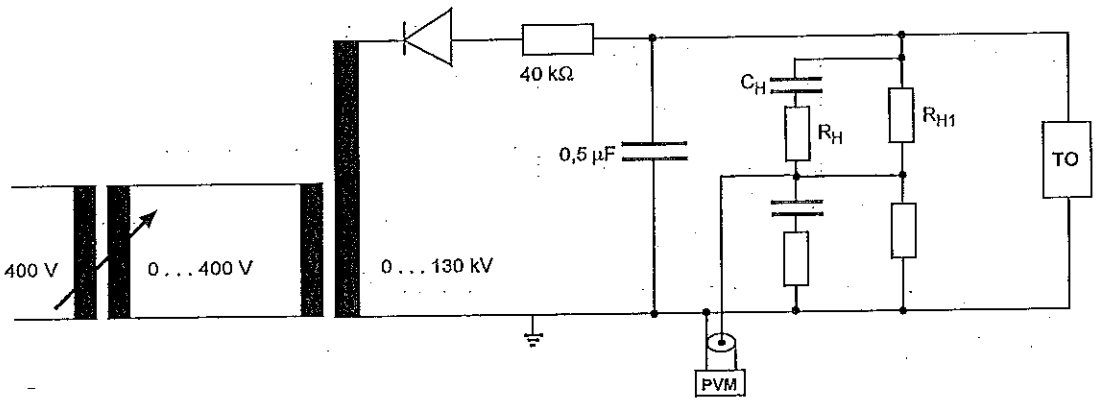


Figure 4.1: Scheme of DC voltage test circuit.
R_H = 3,6 kΩ, R_{H1} = 360 MΩ, C_H = 180 pF, ratio 2.000:1, PVM: Peak Voltmeter, TO: Test object, measurement uncertainty 3%

4.2 AC Voltage Withstand Test

The test voltage was generated by an 60-kVA transformer. The voltage measurement was carried out with a capacitive divider (C_H = 180 pF; ratio = 2.000) and a peak voltmeter calibration $\Diamond/\sqrt{2}$.

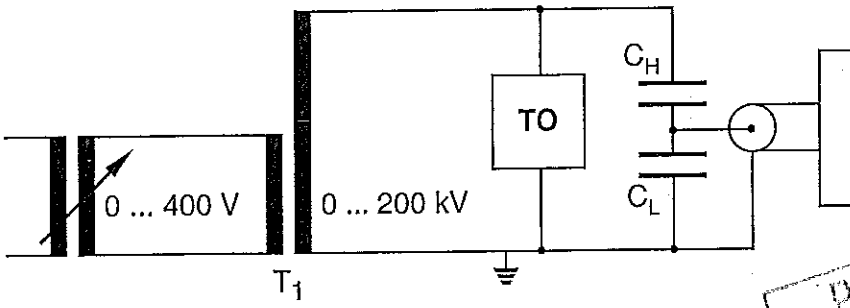


Figure 4.2: Scheme of AC test circuit
T_1 : transformer 400V / 200000V ; 60 kVA ; v_K = 3,5 % ; 50 Hz
C_H: 180 pF ; ratio 2000:1 ; PVM : Peak-Voltmeter
TO: Test object; measurement uncertainty 3 %

4.3 Partial-Discharge Test

The PD-measurement was performed with an analog bridge according to *Kreuger*, Figure 4.3. External PDs producing common mode signals at the detector are rejected by the differential amplifier. Internal PDs represent differential mode signals and are amplified. The background noise level at 24 kV_{rms} was 0,7 pC.

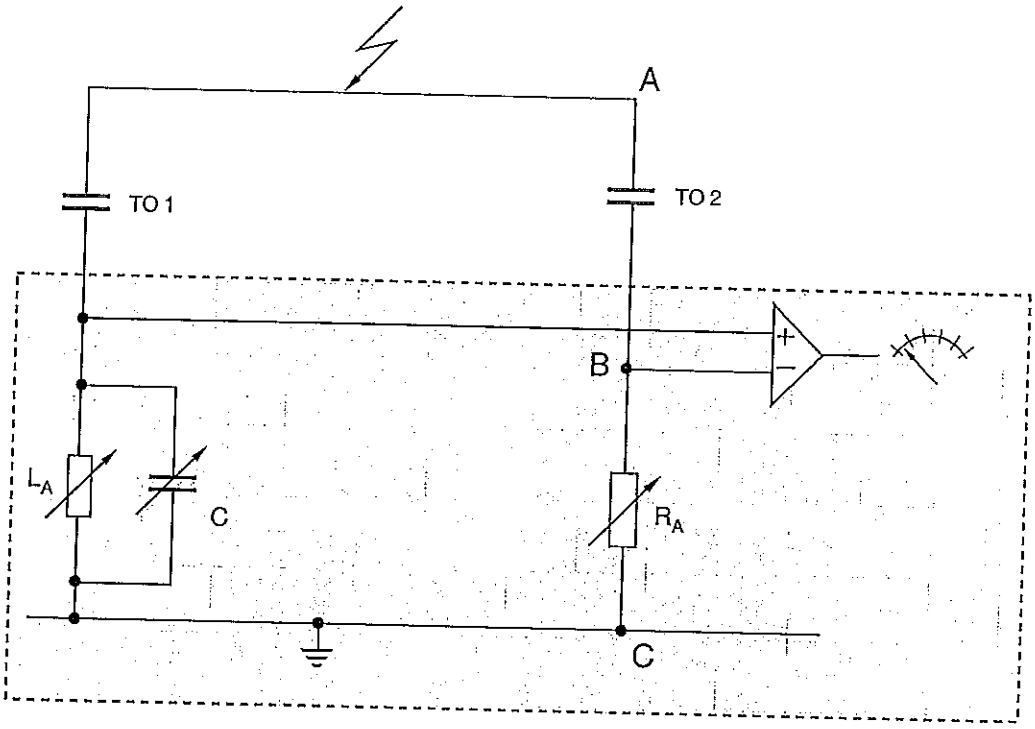


Figure 4.3: Scheme of PD test circuit
TO1: Test object 1
TO2: Test object 2

For balancing the bridge a calibrating impulse with q_A = 10.000 pC is applied between the terminals A (high-voltage) and C (ground) and the amplifier output is minimized. A pulse between the terminals A and C corresponds to an external PD. For the calibration a PD pulse, q_A = 10 pC, is applied between A and B. Subsequently, the amplifier output of the PD measuring unit is adapted to the applied pulse.

Starting from zero the AC-voltage was steadily raised up to 27,0 kV and kept constant for 60 s, then slowly reduced to 24 kV including pd-reading.

4.4 Lightning Impulse Voltage Withstand Test

For impulse testing was used a two-stage Marx generator (Haefely) with a maximum cumulative charging voltage of V = 400 kV and a maximum impulse energy of E_{max} = 20 kWs. At this test, the capacity of the energy storage capacitor was C_S = 0.25 µF. The crest value of the impulse voltage was measured by a damped capacitive divider and a subsequent impulse peak voltmeter (Haefely). The front time and the time to half value were evaluated from the oscillographs.

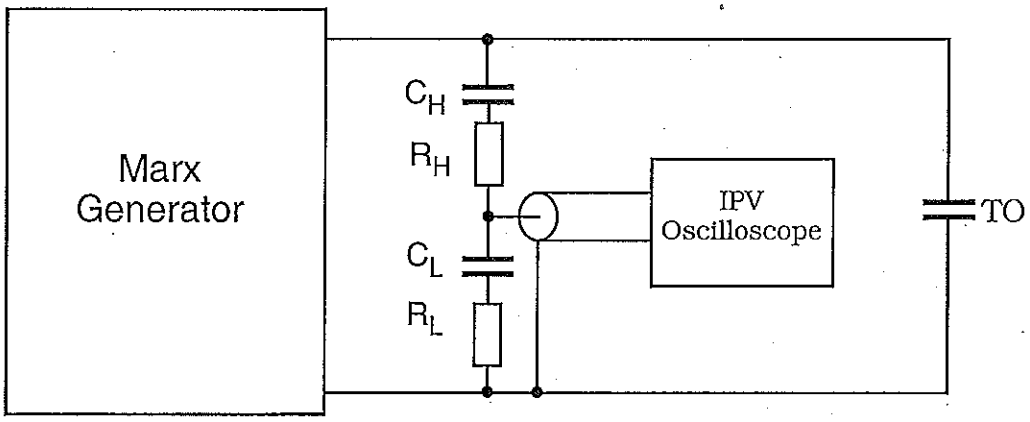


Figure 4.4:Scheme of impulse voltage test circuit
C_H: 1200 pF ; R_H = 70 Ω ; ratio: 3225;
IPV: impulse-peak-voltmeter (Haefely) – measurement uncertainty 3%
Oscilloscope: Tektronix TDS 3044B – measurement uncertainty 2%

The waveform parameters were determined at reduced charging voltage.

Positive impulse:	T_1 = 1.07 µs	T_2 = 48.6 µs
Negative impulse:	T_1 = 1.04 µs	T_2 = 48.0 µs

4.5 Electrical Heat Cycling in Air

The test objects must be heated by a current of I =250 A. Current inception was accomplished by a transformer (V_1 = 400 V; V_2 = 8 V) which used the cable as secondary winding. The current was measured by an current transformer, 1500/5, and a digital multimeter. The measurement uncertainty was 1%.

4.6 Electrical Heat Cycling in Water

The test object were placed in a tank and filled with water. The height of the water was 1000 mm above the test object. The conductivity of the water at 20°C was 63 mS/m.

4.7 Screen Resistance Measurement

Prior to the test silver-painted electrodes were installed. The screen resistance of the plug-in termination was measured at ambient temperature between the two electrodes. Then the test object was subjected to thermal ageing in an air oven at (120±2)°C for 168 h. After thermal ageing the screen resistance at ambient temperature was measured again.

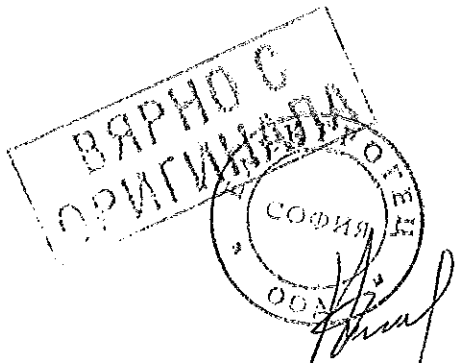
4.8 Leakage Current Measurement

Prior to the testand a metal foil of 25 cm^2 was fixed without any air gap to the outer screen of the plug-in termination. The metal foil was placed at the end of the plug-in termination opposite to the earth bend and earthed through a milliamperemeter and a resistance of 2000 ohms. The leakage current was measured with a test voltage of V_m applied between conductor and earth.

4.9 Screen Fault Current Initiation

Prior to the test a faulting wire of approx. 0.2 mm was placed in the area of the hexagonal connecting bolt through a drilled hole. The wire was connected with the inner and outer screens and did not protrude beyond the outer screen surface.
The test voltage was generated by a 630 kVA-transformer. A capacitor was connected in series to the test object, resulting in a short-circuit current of 10A, Figure 4.9. The sequence of the test was as follows:

1. voltage switched on for 1 s
2. voltage switched off for 2 min
3. voltage switched on for 2 min
4. voltage switched off for 2 min
5. voltage switched on for 1 min
6. voltage switched off



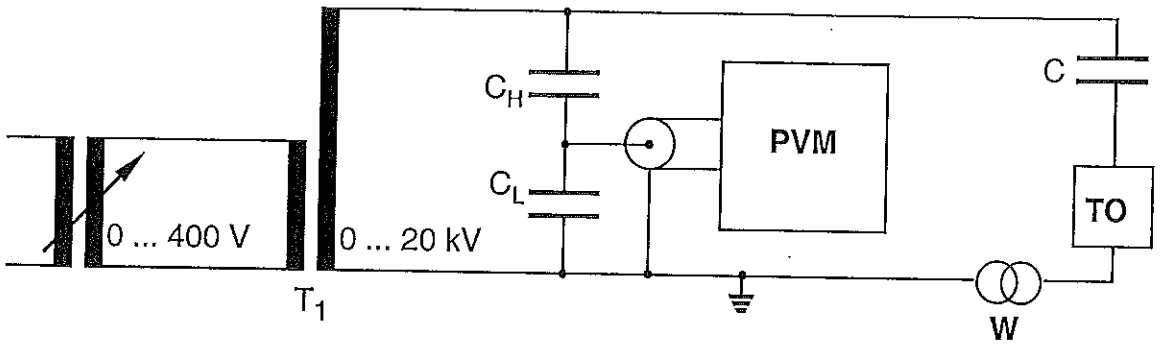


Figure 4.9: Scheme of AC test circuit
T_1: Transformer 400V/20.000V; 630 kVA
C_H: 180 pF; ü = 2000:1; PVM; peak-voltmeter
C = 2,66 µF; W: current transformer; TO: test object

4.10 Operation Force Test

The test object was placed in a climate chamber an conditioned at (-20±2)°C for at least 12h. The test was carried out within 5 min after removal from the climate chamber. The plug-in termination was clamped by means of a tool which allows operation along the axis of the test object. The force was gradually applied to the plug-in termination and measured by means of a tractive dynamometer.

5 Results

5.1 Test Sequence D1

5.1.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 18.06.2007

Test voltage: V = - 72 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.1.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 18.06.2007

Test voltage: $\hat{V}/\sqrt{2}$ = 54 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.1.3 Partial Discharge Test

This test was carried out as described in 4.

Test date: 18.06.2007

Voltage: $\hat{V}/\sqrt{2}$ = 27 kV , t = 60 s thereafter
$\hat{V}/\sqrt{2}$ = 24 kV with pd reading

PD magnitude (24 kV): < 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА
ЕЛЕКТРОСЕН СОФИЯ ОДА

5.1.4 Impulse Voltage Withstand Test at elevated Temperature

This test was carried out as described in 4

Test date:	18.06.2007
Test voltage:	◊ = 125 kV
Heating current:	I = 250 A; t = 5 h
Number of tests:	10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.5 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	2.06. - 21.06.2007
Test voltage:	$◊/\sqrt{2}$ = 30 kV
Heating current:	I = 250 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	3

Neither flashover nor breakdown occurred.

The test was passed successfully.

5.1.6 Partial Discharge Test

5.1.6.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date:	22.06.2007
Voltage:	$◊/\sqrt{2}$ = 27 kV, t = 60 s thereafter $◊/\sqrt{2}$ = 24 kV with pd reading
PD magnitude (24 kV):	< 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕХ СОФИЯ ООД

5.1.6.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date:	22.06.2007
Heating current:	I = 250 A, t = 5 h
Voltage:	$\Diamond/\sqrt{2}$ = 27 kV, t = 60 s thereafter $\Diamond/\sqrt{2}$ = 24 kV with pd reading
PD magnitude (24 kV):	< 10 pC

The test was passed successfully.

5.1.7 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	02.07. - 2207.2007
Test voltage:	$\Diamond/\sqrt{2}$ = 30 kV
Heating current:	I = 250 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	60

Neither flashover nor breakdown occurred.

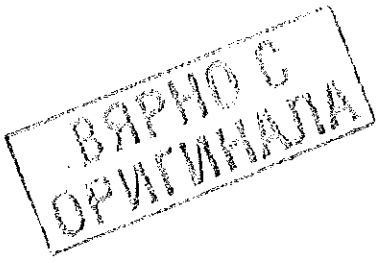
The test was passed successfully.

5.1.8 Electrical Heat Cycling in Water

This test was carried out as described in 4.

Test date:	06.08. - 27.08.2007
Conductivity:	63 mS/m
Test voltage:	$\Diamond/\sqrt{2}$ = 30 kV
Heating current:	I = 250 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63
Heat of water:	1000mm

Neither flashover nor breakdown occurred.
The test was passed successfully.



5.1.9 Disconnection / Connection

Test date: 30.08.2007

Number: 5 complete operations

With each test object there was no visible damage to contact.

The test was passed successfully.

5.1.10 Partial Discharge Test

5.1.10.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date: 05.09.2007

Voltage: $\hat{U}/\sqrt{2}$ = 27 kV, t = 60 s thereafter
$\hat{U}/\sqrt{2}$ = 24 kV with pd reading

PD magnitude (24 kV): < 10 pC

The test was passed successfully.

5.1.10.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date: 05.09.2007

Heating current: I = 630 A, t = 5 h

Voltage: $\hat{U}/\sqrt{2}$ = 40,5 kV, t = 60 s thereafter
$\hat{U}/\sqrt{2}$ = 36 kV with pd reading

PD magnitude (36 kV): < 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕХ София ООД

5.1.11 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date: 05.09.2007

Test voltage: ◊ = 125 kV

Number of tests: 10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.12 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 05.09.2007

Test voltage: $\Diamond/\sqrt{2} = 30$ kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.2 Additional Tests

5.2.1 Screen Resistance Measurement

This test was carried out as described in 4.

Test date: 03.09. - 10.09. 2007

Resistance prior to thermal ageing < 5000 Ω

Resistance after thermal ageing < 5000 Ω

Requirement: resistance ≤ 5000 Ω

The test was passed successfully.

5.2.2 Leakage Current Measurement

This test was carried out as described in 4.

Test date: 17.09.2007

Test voltage: $\Diamond/\sqrt{2} = V_m = 24$ kV

Leakage current: I < 0,5 mA

Requirement: I ≤ 0,5 mA

The test was passed successfully.

5.2.3 Screen Fault Current Initiation

This test was carried out as described in 4.

Test date: 19.09.2007

Test voltage: $\Diamond/\sqrt{2} = V_0 = 12.0$ kV

Short-circuit current: I = 10,8 A

Fault current flow continuously.

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОНЕН СОФИЯ ООД

5.2.4 Operating Force Test

This test was carried out as described in 4.

Test date:	19.09. - 20.09.2007
Temperature:	- 20°C
Duration:	24h
Force:	< 900 N
Requirement:	F < 900 N

The test was passed successfully.

6 Conclusion

The separable connector type CELLPLUX-CGS 24 kV 250 A passed all tests described in clause 2 successfully. The test object fulfilled the requirements according CENELEC HD 629.1 / S1 07/1996 and A1 11/2000, table 7, test sequence D1 and additional tests table 7, pos.19-22.

Karlsruhe, 21.09.2007

Dr.-Ing. R. Badent
Bereichsleiter HPT

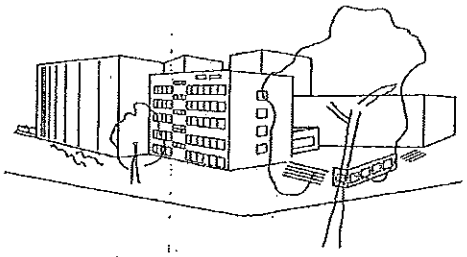
Dr.-Ing. B. Hoferer
stellv. Bereichsleiter HPT

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЕКСПЕРТ АД СОФИЯ ООД

Bereich Hochspannungsprüftechnik

Institut für Elektroenergiesysteme und Hochspannungstechnik



Universität Fridericiana (TH) Karlsruhe
76128 Karlsruhe - Kaiserstraße 12
Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report No 2011-52/1

Type Test of

Separable Connectors Type

CELLPLUX-CGS 250A 24kV 70-150/M/EGA

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

ВЯРНО С ОРИГИНАЛА

СОФИЯ

1 Purpose of Test

One separable connector for U_0 / U_n / U_m = 12 / 20 / 24 kV was subjected to an additional test according to DIN VDE 0278-629-1:2009-07, table 7, test pos. 21.

2 Miscellaneous Data

Test object: – 1 separable connector, type straight separable connector CGS 250A 24kV 70-150/M/EGA, U_m = 24V,
Installation instruction no.: 293799/0511/1/6, Figures 2.1 – 2.6
Packing list: 293797, Figure 2.7
Type of the cable: The test object was mounted on a single-wire XLPE-cable, type NA2XS2Y 1x150 RM/25, Figure 2.8

Cable length Connector - termination: 1 m

Manufacturer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

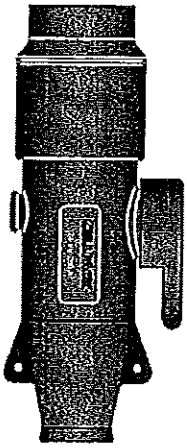
Testing dates: Delivery: 17.03.2011
Mounting: 17.03.2011
Test period: 13.04.2011

Atmospheric conditions:

Temperature:	19°C – 24°C
Air pressure:	980 - 1025 mbar
rel. humidity:	35 % – 60 %

Representatives: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller

Medium Voltage **CELLPLUX**



CGS 250A 24kV 70 – 150/M/EGA
$U_o/U(U_m)$ 6/10(12) kV - 12/20(24) kV

Working instruction

Straight-Separable Connector
for single-core polymeric cables
up to 24 kV

293799/0511/1/6

Prüfgegenstand entspricht der vorgelegten technischen Zeichnung
Unterschrift des Herstellers
Unterschrift des Prüfers

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CELLPACK
Electrical Products

293799 CGS 250A 24kV 70-150/M/EGA

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ВЯРНО С ОРИГИНАЛА

Figure 2.1: Installation Instruction.

General remarks:

- Check the range and size of the cable and the accessories.
- Check the content of the kit as per packing list.
- Thoroughly read the working instruction.

Installation must be executed by competent personnel only.
The manufacturer accepts no liability for breakdowns resulting from incorrect installation.

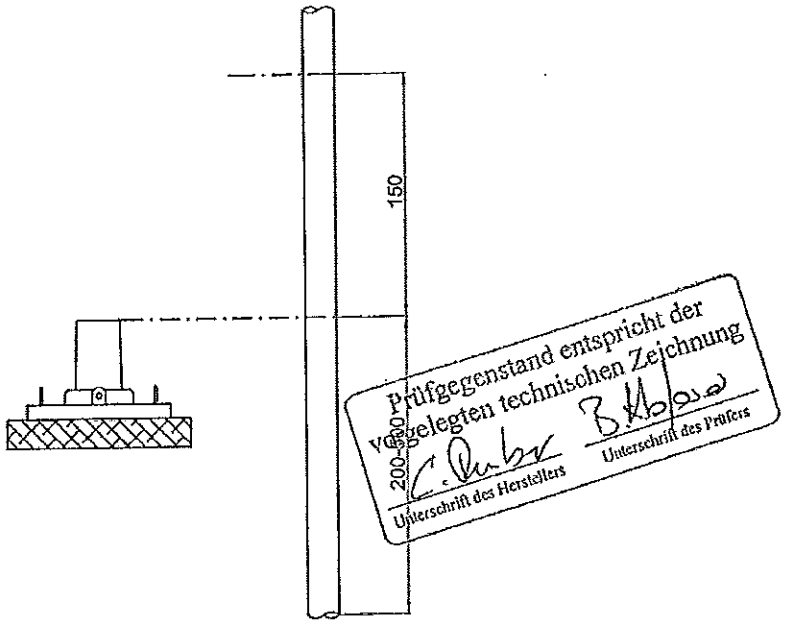
Straight-Separable Connector Type CGS 250A 24kV 70-150/M/EGA

Selection of cable sizes

Voltage Uo/U(Um) kV	Cross-section of the conductor (*) mm²
6/10(12) kV	120 - 150
8,7/15(17,5) kV	95 - 150
12/20(24) kV	70 - 150

(*) Diameter over primary insulation min. 19,9 mm

Adjustment



- Clean thoroughly the cable end up to **1m.**
- Adjust the cable overhanging the middle of the bushing by **200 – 500 mm** and cut it off.
- Make a mark **150 mm** from the centre of the bushing on to the cable sheath.

293799 CGS 250A 24kV 70-150/M/EGA

2/6

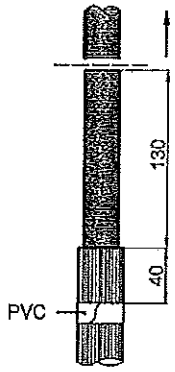
ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОГЕ СОФИЯ ООД

Figure 2.2: Installation Instruction

Cable with wire screen:

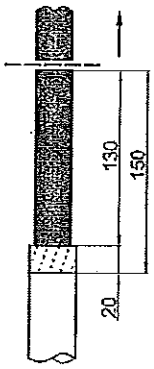
1a)



- Remove the cable sheath up to the mark.
- Bend back the wire of the cable screen and fix it on the cable sheath.
- Cut off the cable at the length of **130 mm.**
- Prepare the cable end according to the template (see **page 4**) and then check the dimensions.
- Clean thoroughly insulation and conductive layer.

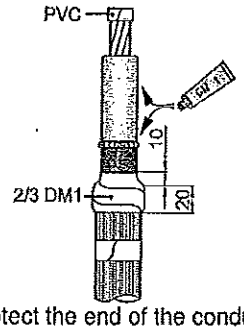
Cable with copper tape screen:

1b)



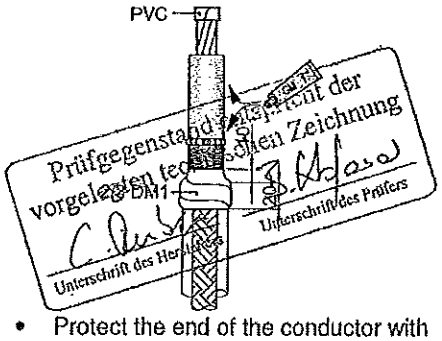
- Remove the cable sheath up to the mark **+20 mm.**
- Cut the cable according to the drawing.
- Prepare the cable end according to the template (see **page 4**) and then check the dimensions.
- Clean thoroughly insulation and conductive layer.

2a)



- Protect the end of the conductor with PVC tape.
- Wrap 2/3 of the length of DM1 mastic **10 mm** on to the conductive layer and **20 mm** on to the wire screen by stretching it 50%.
- Apply at the end of the conductive layer lubricant and filling material GM1 according to the drawing.
- Moisten the conductor insulation with lubricant and filling material GM1.

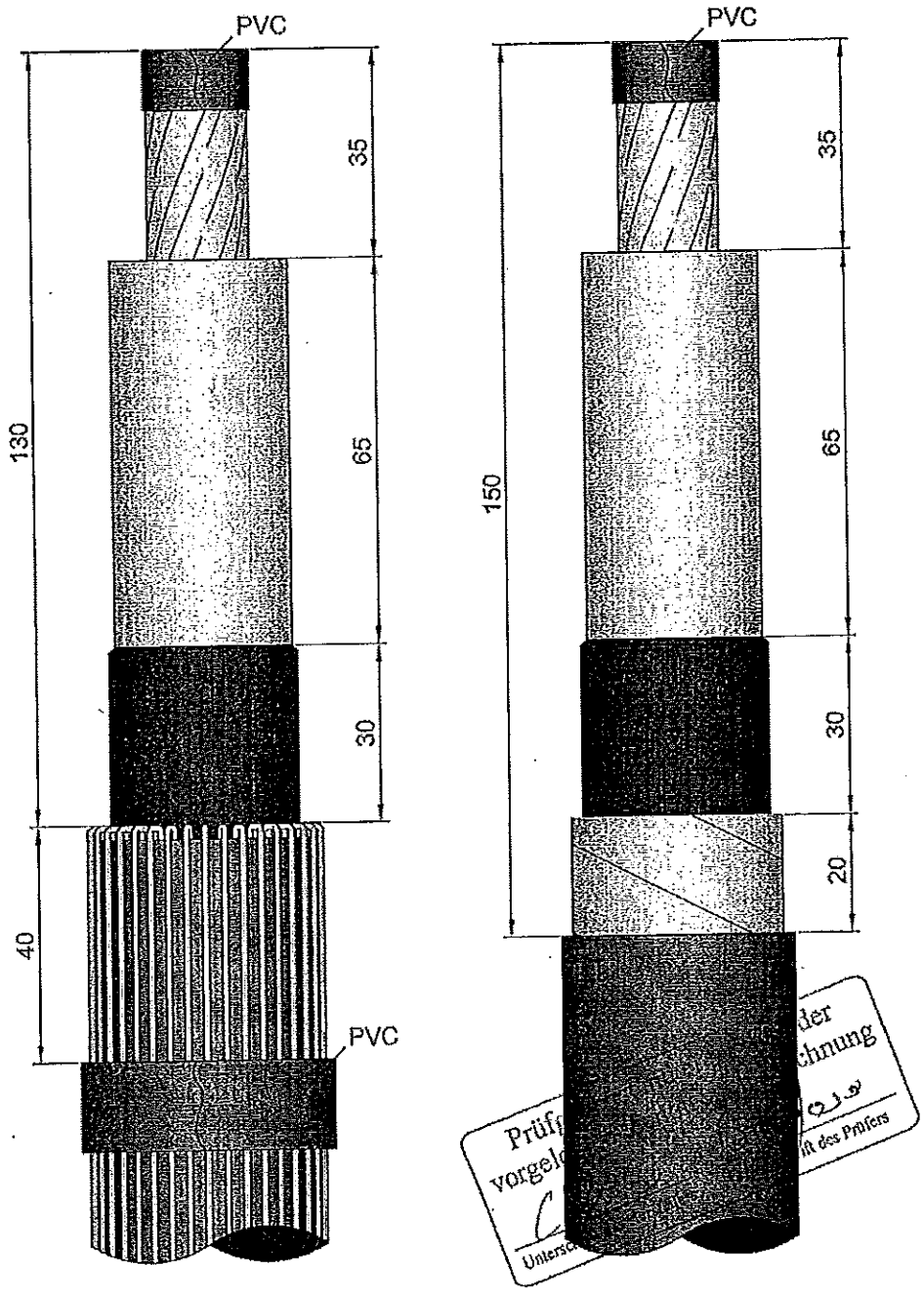
2b)



- Protect the end of the conductor with PVC tape.
- Fix a flat Cu – braid with a pressure spring RF on to the tape screen (order the earthing kit separately).
- Wrap 2/3 of the length of DM1 mastic **10 mm** on to the conductive layer and **20 mm** on to the copper tape screen by stretching it 50%.
- Apply at the end of the conductive layer lubricant and filling material GM1 according to the drawing.
- Moisten the conductor insulation with lubricant and filling material GM1.

293799 CGS 250A 24kV 70-150/M/EGA 3/6

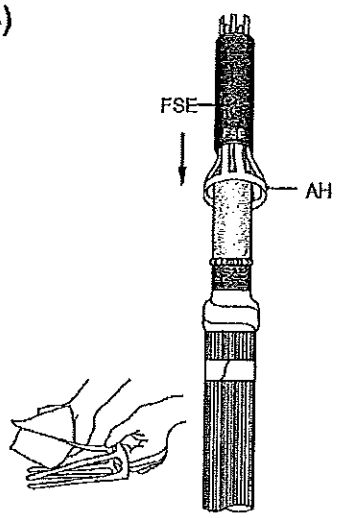
Figure 2.3: Installation Instruction



293799 CGS 250A 24kV 70-150/M/EGA

Figure 2.4: Installation Instruction

3)

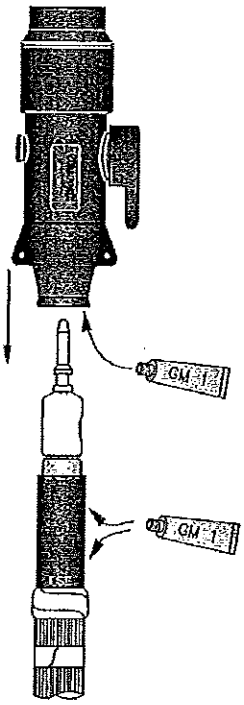


- Moisten the tongues of the applicator with the silicone towel.
- Insert the applicator in to the stress control element and slip in on to the cable down to sealing wrap.
- Remove the applicator by pulling out the tongues one by one.
- Adjust the stress control element in his final position by turning it slightly (see Fig. 4).

4)

- Remove the protection from the end of the conductor.
- Install the shear-head screw according to the separate instruction.
- Clean carefully the surface of the stress control element.

5)

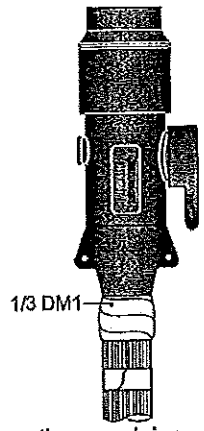


293799 CGS 250A 24kV 70-150/M/EGA

- Moisten the connector body and the stress control element with lubricant and filling material GM1.
- Slip on the connector body onto the end of the cable until the PIN fits into the connector body.

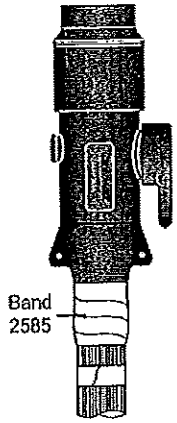
Figure 2.5: Installation Instruction

6)



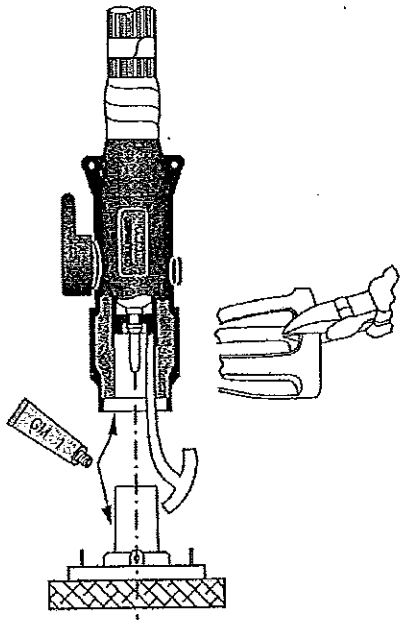
- Wrap the remaining mastic 1/3 DM1 between the end of the connector body and the sealing area.

7)



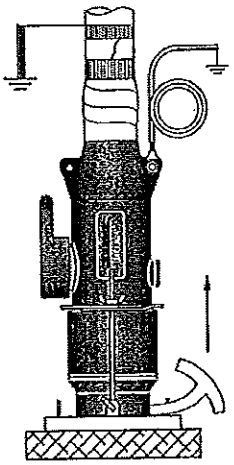
- Wrap the tape Nr. 2585 adhesive side inwards approx. **20 mm** over the end of the connector body up to the end of the sealing area (stretch 20%).

8)



- Moisten accurately the bushing and the connector inside with lubricant and filler GM1.
- Cut out a tongue from the applicator (air release device).
- Insert the air release device into the connector. Attach the connector straight on to the bushing.

9)



- Fix the fastening device and holding plate according to the drawing. Tighten the wing nuts evenly.
- Pull out the air release device and remove remaining lubricant and filler.
- Install the earthing set to the connector body and ground it.
- Further earthing measurements to be carried out according to local regulations

293799 CGS 250A 24kV 70-150/M/EGA

6/6

Figure 2.6: Installation instruction

Packliste / Packing list / Liste d'emballage	293 797	Lista de carga	CELLPACK Electrical Products

MEDIUM VOLTAGE — **CELLPLUX**

	Typ	CGS 250A 24kV 70-150/M/EGA	
Gerader Steckanschluss	$U_o/U(U_m)$	6/10(12)kV	120 - 150 mm²
Straight-Separable Connector		8,7/15(17,5)kV	95 - 150 mm²
Connecteur Séparable à fiche		12/20(24)kV	70 - 150 mm²
Terminal enchufable recto		Isolation min. Ø:19.9mm	
		Version: 01	

Pos		St. Cont.	Dimension			
1		3	CGS 250A	Steckanschluß Plug-in connector		Connecteur séparable Cuerpo terminal
2		3	FSEM 19	Feldsteuerelement Field control element		Contrôleur de champ Elemento de control de campo
3		3	GM1	Gleit- und Füllmittel Lubrificant and filler		Lubrificant Lubrificante
4		3	AH 2	Aufschiebehilfe Applicator		Dispositif d'enfilage Aplicador
5		3	CGS 250A Set	Befestigungs-Set Connecting set		Cintre de fixation Elemento de fijación
6		3	CGS C70-150	Schraubkabelschuh Screw cable lug		Cosse de câble Terminal
7		3	EGA-Set	Erdungs-Set Earthing-kit		Kit de mise á la terre Conjuntos de puesta a tierra
8		3	DM 1 25x150 mm	Dichtband grau Sealing tape grey		Ruban d'étanchéité gris Cinta de estanqueidad gris
9		3	2585 50x300 mm	Polsterband Rubber mastic tape		Ruban mastique Cinta mastik
10		1	N°. 028 5 m	Isolierband PVC tape		Ruban isolant Cinta aislante
11		3	Paar	Handschuhe Gloves		Gants Guante
12		3	ST	Tuch mit Silikonöl Tissue with silicon oil		Tissu siliconé Toalla siliconada
13		6	RT	Reinigungstuch Cleaning tissue		Tissu de nettoyage Toalla de limpieza
14		4	MA de, en, fr, es	Montageanleitung Working instructions		Instructions de montage Instrucciones de montaje

Prüfgegenstand entspricht der vorgelegten technischen Zeichnung

Unterschrift des Herstellers

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Figure 2.7: Packing list

Annex A
(informative)

Identification of test cable
(see 5.1)

Rated voltage U_o/U (U_m): 12/20(24) kV

Construction:	☒ 1-core	☐ 3-core	☒ Individually screened
			☐ Overall screen
Conductors:	☒ Al	☐ Cu	
	☒ Stranded	☐ Solid	
	☒ Circular	☐ Shaped	
	☐ 120 mm²	☒ 150 mm²	☐ 185 mm²
	Other cross-section:	mm²	
Insulation:	☒ XLPE		
	☐ EPR	☐ HEPR	
Insulation screen:	☒ Bonded	☐ Strippable	
Metallic screen:	☒ Wire	☐ Tape	☐ Extruded
Armour:	☐ Wire	☐ Tape	
Oversheath:	☐ PVC	☒ PE (state type)	
Water blocking, if any:	☐ Within conductor	☐ Under oversheath	

Diameters:		
• Conductor	14,2	mm
• Insulation	25,1	mm
• Insulation screen	27,1	mm
• Oversheath	34,1	mm

Cable marking: 2009 +PROTOTHEN X NA2XS2Y 1X150 RM/25 20kV ◁VDE▷ 0276

Prüfgegenstand entspricht der vorgelegten technischen Zeichnung
3.Mo/2012
Unterschrift des Herstellers
Unterschrift des Prüfers

Figure 2.8: Cable data sheet

Tests: Test volume, chronological order and requirements conform to DIN VDE 0278-629-1:2009-07, table 7, additional test pos. 21.

Additional Test:

Pos. 21. *Capacitive test point performance*

$C_{tc} > 1{,}0$ pF

$C_{te} / C_{tc} \leq 12$

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH.

4 Test Setup

Capacitive test point performance

The test was performed with a different bridge. For this test the capacity of test point to the cable conductor C_{tc} and the capacity of test point to earth C_{te} were measured at ambient temperature.

5 Results

Capacitive test point performance

This test was carried out as described in 4.

Test date: 13.04.2011

Capacitance of test point to cable conductor $C_{tc} > 1{,}0pF$

Requirement : $C_{tc} > 1{,}0pF$

Ratio of capacitance of test point to earth C_{te} and capacitance of test point to cable conductor: $C_{tc} : C_{te} / C_{tc} < 12$

Requirement: $C_{tc} : C_{te} / C_{tc} \leq 12$

6 Conclusion

The separable connector type CELLPLUX CGS 250A 24kV 70-150/M/EGA passed all tests described in clause 2 successfully. The test object fulfilled the requirements according DIN VDE 0278-629-1:2009-07, additional test table 7, pos.21.

Karlsruhe, 19.05.2011

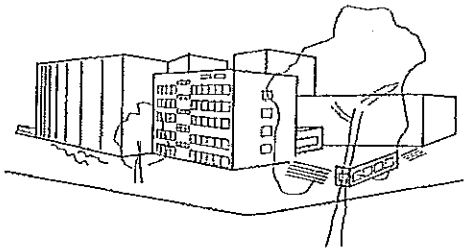
Dr.-Ing. R. Badent
Head of Department
„High Voltage Dielectric Testing"

Dr.-Ing. B. Hoferer
Vice-Head of Department
„High Voltage Dielectric Testing"

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОГЕН СОФИЯ ООД

Bereich Hochspannungsprüftechnik



Universität Fridericiana (TH) Karlsruhe
76128 Karlsruhe - Kaiserstraße 12
Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report No 2005-101

Type Test of

Separable Connectors

Type CELLPLUX-CWS 250 24 kV 250 A

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

1 Purpose of Test

4 resp. 3 resp. 1 separable connectors for V_0 / V_n / V_m = 12 / 20 / 24 kV were subjected to a type test according to CENELEC HD 629.1 S2 02/2006 table 7 test sequence D1 resp. D2 resp. D3. The 3 separable connectors for V_0 / V_n / V_m = 12 / 20 / 24 kV were subjected to additional tests according to CENELEC HD 629.1 S2 02/2006, table 7 test pos. 17-20.

2 Miscellaneous Data

Test object: – 11 *separable connectors* type CELLPLUX-CWS 250 24 kV 250 A
V_m = 24 kV, Figure 2.1
Type of the cable: The test object was mounted on a single-wire XLPE-cable,
type:NA2X(F)2Y 1x70RM/25 12/20kV

Cable length Connector - sealing end: 3 m

Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

Testing dates: Delivery: 06.04.2006
Mounting: 06.04.2006
Test period: 10.04. - 28.09.2006

Atmospheric conditions: Temperature: 19°C – 24°C
Air pressure: 980 - 1025 mbar
rel. humidity: 35 % – 60 %

Representatives:
Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller

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ЕЛЕКТРОЕЕ СОФИЯ ООД

CELLPLUX – CWS 250 24kV 250 A

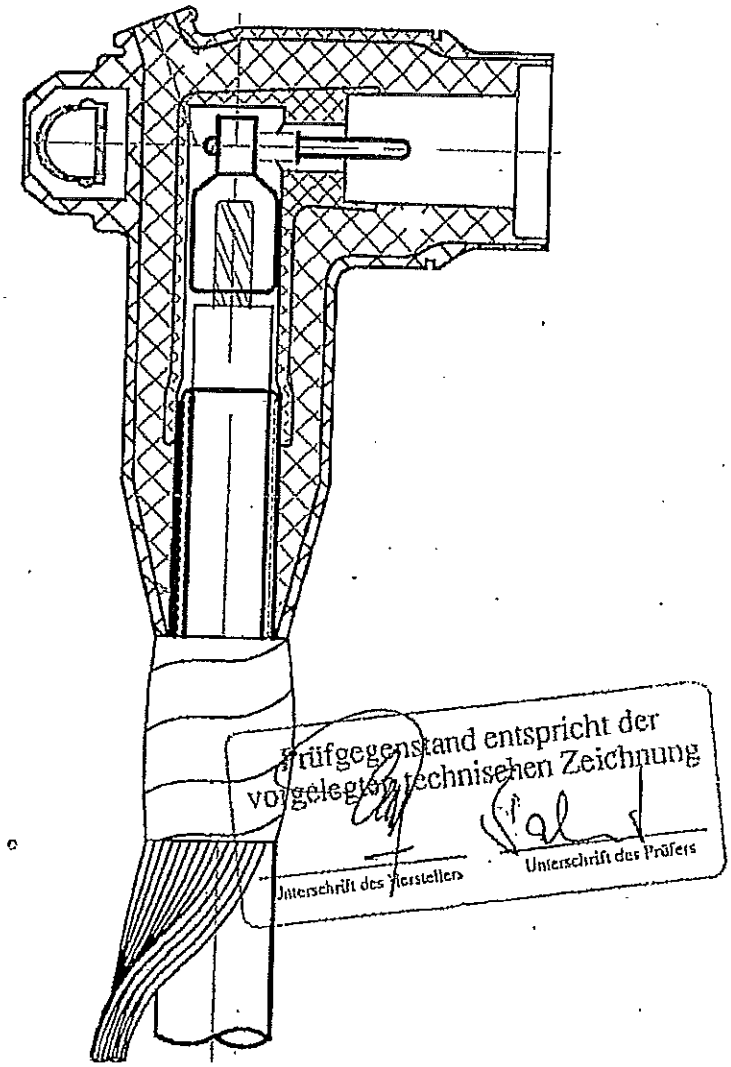

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Figure 2.1: Separable connector.

Tests: Test volume, chronological order and requirements conform to CENELEC HD 629.1 S2 02/2006 test sequence D1, D2 and D3 , table 7 and additional test pos. 17 - 20.

The PD-test was performed at 2 V_0 The tests were carried out in accordance with the test methods described in IEC 61442 03/2005.

Test sequence D1:

Pos. 1. *DC voltage withstand test*
$V = 6\ V_0 = -72$ kV ; t =15 min

Pos. 2. *AC voltage withstand test*
$\Diamond/\sqrt{2} = 4{,}5\ V_0 = 54$ kV; t = 5 min

Pos. 3. *Partial discharge test*
$\Diamond/\sqrt{2} = 2{,}0\ V_0 = 24$ kV ; PD ≤ 10 pC

Pos. 4. *Impulse voltage withstand test, at elevated temperature*
Impulse voltage
$\Diamond = 125$ kV; positive and negative polarity each 10 impulses

Pos. 5. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: $\Diamond/\sqrt{2} = 30$ kV
number of cycles: 63

Pos. 6. *Electrical heat cycling in water*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: $\Diamond/\sqrt{2} = 30$ kV
number of cycles: 63

Pos. 10. *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 11. *Partial discharge test at ambient temperature and elevated temperature*
$\Diamond/\sqrt{2} = 2{,}0\ V_0 = 24$ kV ; PD ≤ 10 pC

Pos. 12. *Impulse voltage withstand test,*
lightning impulse voltage
$\Diamond = 125$ kV; positive and negative polarity each 10 impulses

Pos. 13. *AC voltage withstand test*
$\Diamond/\sqrt{2} = 2{,}5\ V_0 = 30$ kV; t = 15 min

ВЯРНО С ОРИГИНАЛА

Test sequence D2:

Pos. 1. *DC voltage withstand test*
$V = 6\ V_0 = -72$ kV ; t =15 min

Pos. 2. *AC voltage withstand test*
$\Diamond/\sqrt{2} = 4{,}5\ V_0 = 54$ kV; t = 5 min

Pos. 8. *Short circuit test, conductor*
$\theta_{Sc} = 250°C$; 2 stresses

Pos. 10 *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 12. *Impulse voltage withstand test,*
lightning impulse voltage
$\Diamond = 125$ kV; positive and negative polarity each 10 impulses

Pos. 13. *AC voltage withstand test*
$\Diamond/\sqrt{2} = 2{,}5\ V_0 = 30$ kV; t = 15 min

Test sequence D3:

Pos. 14. *Operating eye test*
Axial force 1300N; t = 1 min
Torque 14 Nm

Pos. 15 *Partial discharge test at ambient temperature*
$\Diamond/\sqrt{2} = 2{,}0\ V_0 = 24$ kV ; PD ≤ 10 pC

Additional Tests:

Pos. 17: *Screen resistance measurement*
R ≤ 5000 Ω

Pos. 18. *Leakage current measurement*
$\Diamond/\sqrt{2} = 2{,}5\ V_m = 24$ kV
I ≤ 0,5 mA

Pos. 19 *Screen fault current initiation*
Fault current to flow continuously

Pos. 20 *Operating force test*
F ≤ 900 N

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH

ВЯРНО С
ОРИГИНАЛА

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СОФИЯ

4 Test Setups

4.1 DC Voltage Withstand Test

The DC-voltage was generated according to Figure 4.1. The voltage measurement was carried out with an ohmic-capacitive divider (ratio 2000:1). The measurement uncertainty was 3%.

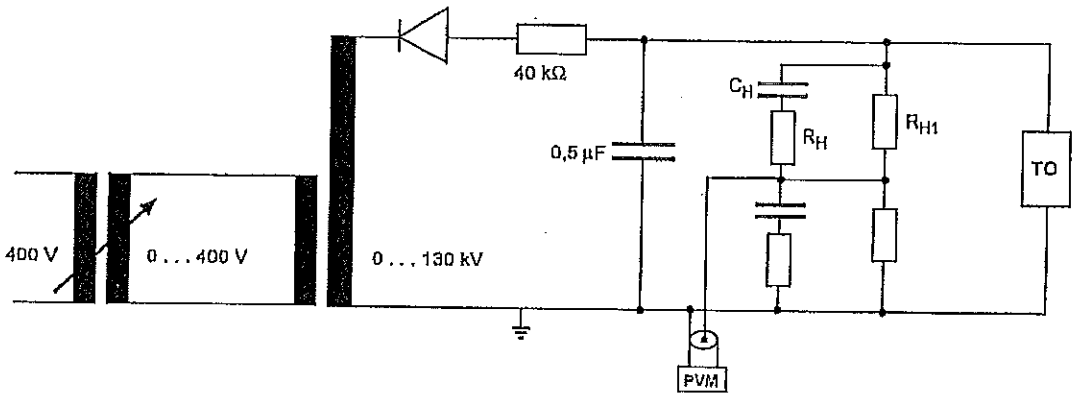


Figure 4.1: Scheme of DC voltage test circuit.
R_H = 3,6 kΩ, R_{H1} = 360 MΩ, C_H = 180 pF, ratio 2.000:1, PVM: Peak Voltmeter, TO: Test object, measurement uncertainty 3%

4.2 AC Voltage Withstand Test

The test voltage was generated by an 60-kVA transformer. The voltage measurement was carried out with a capacitive divider (C_H = 180 pF; ratio = 2.000) and a peak voltmeter calibration $\hat{U}/\sqrt{2}$.

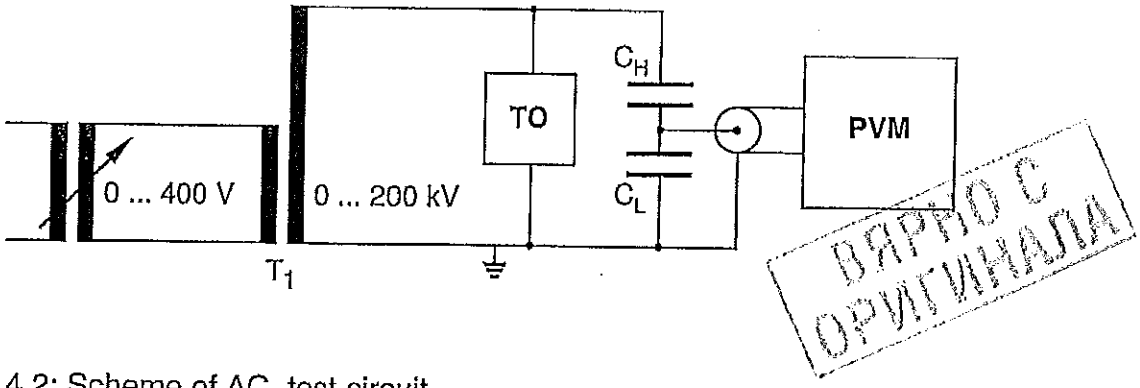


Figure 4,2: Scheme of AC test circuit
T_1 : transformer 400V / 200000V ; 60 kVA ; v_K = 3,5 % ; 50 Hz
C_H: 180 pF ; ratio 2000:1 ; PVM : Peak-Voltmeter
TO: Test object; measurement uncertainty 3 %

4.3 Partial-Discharge Test

The PD-measurement was performed with an analog bridge according to *Kreuger*, Figure 4.3. External PDs producing common mode signals at the detector are rejected by the differential amplifier. Internal PDs represent differential mode signals and are amplified. The background noise level at 24 kV_{rms} was 0,8 pC.

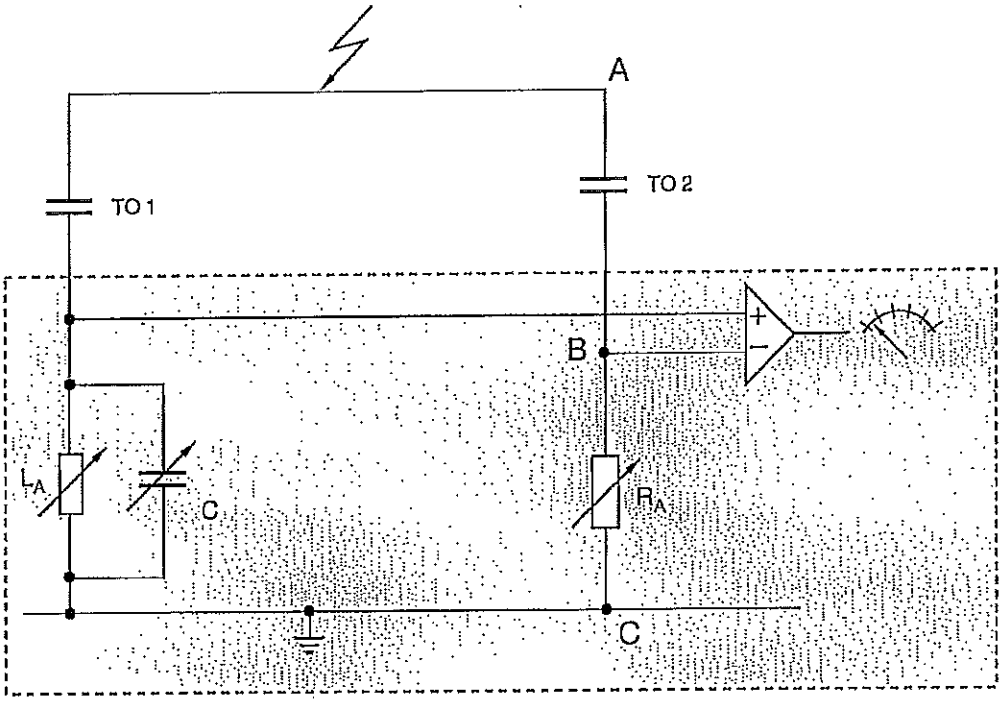


Figure 4.3: Scheme of PD test circuit
TO1: Test object 1
TO2: Test object 2

For balancing the bridge a calibrating impulse with q_A = 10.000 pC is applied between the terminals A (high-voltage) and C (ground) and the amplifier output is minimized. A pulse between the terminals A and C corresponds to an external PD. For the calibration a PD pulse, q_A = 10 pC, is applied between A and B. Subsequently, the amplifier output of the PD measuring unit is adapted to the applied pulse.

Starting from zero the AC-voltage was steadily raised up to 27,0 kV and kept constant for 60 s, then slowly reduced to 24 kV including pd-reading.

4.4 Lightning Impulse Voltage Withstand Test

For impulse testing was used a two-stage Marx generator (Haefely) with a maximum cumulative charging voltage of V = 400 kV and a maximum impulse energy of E_{max} = 20 kWs. At this test, the capacity of the energy storage capacitor was C_S = 0.25 µF. The crest value of the impulse voltage was measured by a damped capacitive divider and a subsequent impulse peak voltmeter (Haefely). The front time and the time to half value were evaluated from the oscillographs.

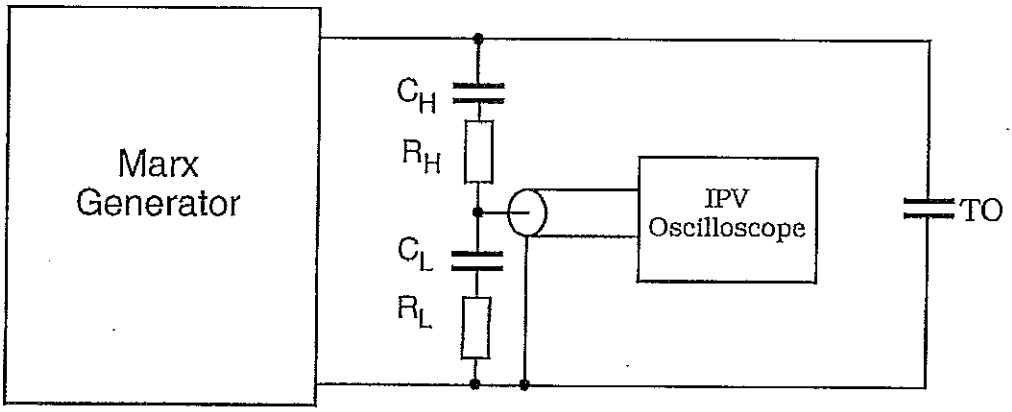


Figure 4.4:Scheme of impulse voltage test circuit
C_H: 1200 pF ; R_H = 70 Ω ; ratio: 3225;
IPV: impulse-peak-voltmeter (Haefely) – measurement uncertainty 3%
Oscilloscope: Tektronix TDS 3044B – measurement uncertainty 2%

The waveform parameters were determined at reduced charging voltage.

Positive impulse:	T_1 = 1.80 µs	T_2 = 50.0 µs
Negative impulse:	T_1 = 1.73 µs	T_2 = 50.4 µs

4.5 Electrical Heat Cycling in Air

The test objects must be heated by a current which provides the permitted service temperature of the tested cable plus 5 K - 10 K, that means 95°C - 100°C, for XLPE-cable. The heating current I was determined with a dummy cable. The same cable as used for the test, with a length of 3 m, was drilled with a diameter of 0.8 mm up to the conductor. The temperature was measured with a thermocouple NiCr-Ni. The measurement uncertainty was ± 2 K.

Figure 4.5 illustrates the temperature rise at the conductor with a heating current of I = 290 A and the temperature of sheath (dummy and test object). Current inception was accomplished by a transformer (V_1 = 400 V; V_2 = 8 V) which used the cable as secondary winding. The current was measured by an current transformer, 1500/5, and a digital multimeter. The measurement uncertainty was 1%.

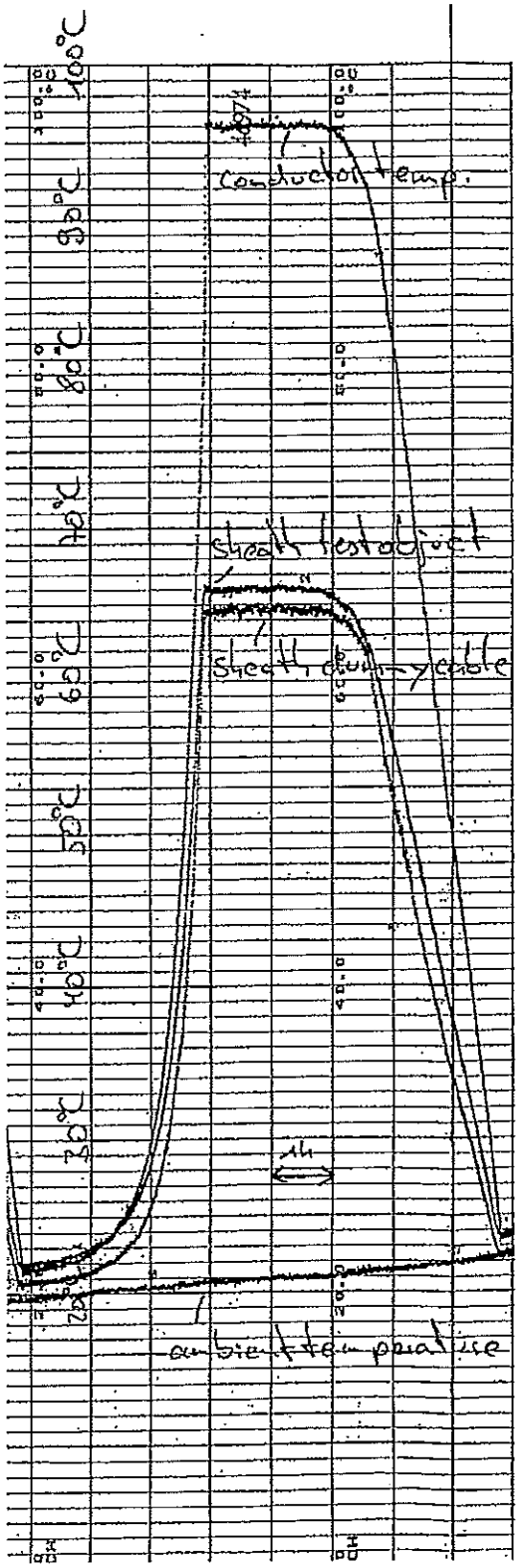


Figure 4.5: Temperature at conductor and sheaths with I = 290 A

4.6 Electrical Heat Cycling in Water

The test object were placed in a tank and filled with water. The height of the water was 1000 mm above the test object. The conductivity of the water at 20°C was 63 mS/m.

4.7 Thermal Short Circuit Current Test

According IEC 986 for Al with q = 70 mm^2 $I^2t = 68{,}25 \cdot 10^6$ A^{2}s with θ_{sc} = 250°C and θ_i = 25°C. That means $I_K(1s)$ = 8,26 kA. The short-circuit during test was I_K = 6,89 kA, resulting in a short-circuit duration of t_K = 1,48 s.The test object was tested with two thermal short-circuit currents. Between two tests the specimen cooled down to ambient temperature. The current was measured with a 10 µΩ-shunt connected to a digital storage oscilloscope (Tektronix 2430 A). The measurement uncertainty was 2%.

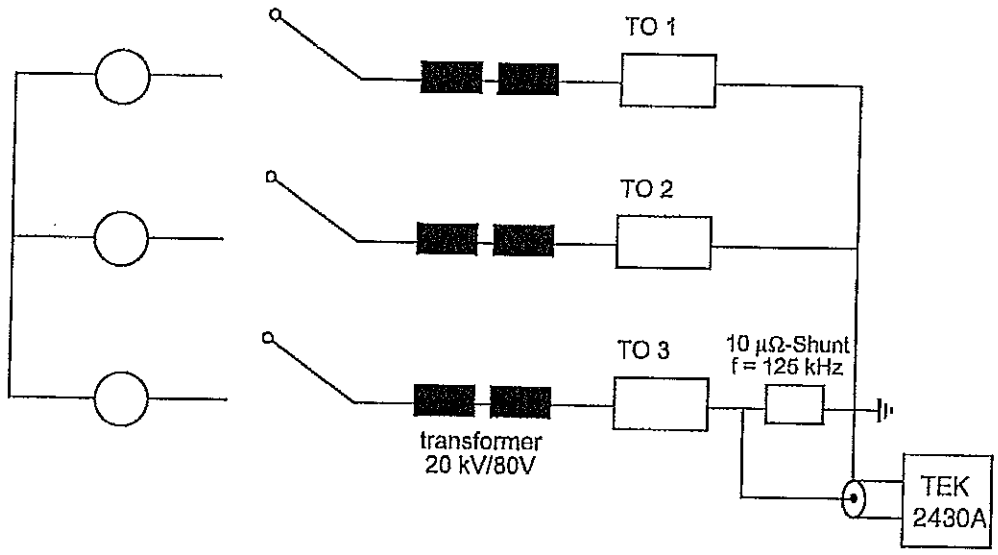


Figure 4.7.1: Scheme of short-circuit test.

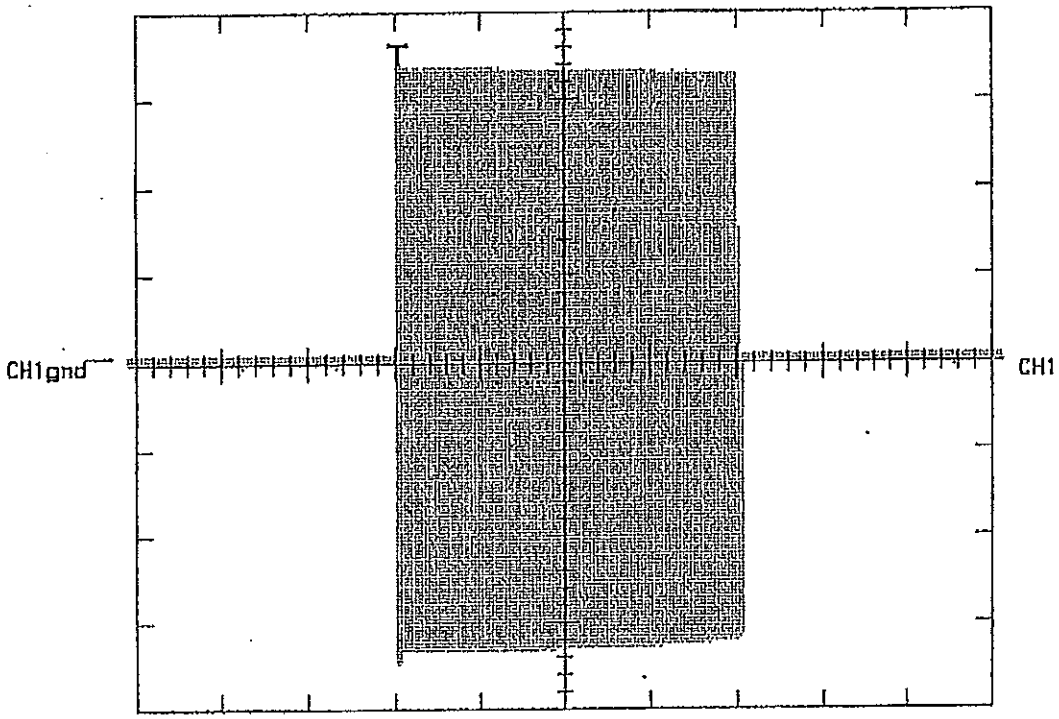


Figure 4.7.2: Short circuit current
Hor: 200 ms/Div; Vert: 10 kA/DIV

4.8 Operating Eye Test

Prior to the test the separable Connector was fixed to the connecting part.
The tractive force was gradually applied to the operating eye along the axis of the bushing. The force was steadily raised up to 1300 N and kept constant for 60 s.

Thereafter a torque of 14 Nm was gradually applied to the test object, at first clockwise then counter clockwise.

4.9 Screen Resistance Measurement

Prior to the test silver-painted electrodes were installed. The screen resistance of the plug-in termination was measured at ambient temperature between the two electrodes. Then the test object was subjected to thermal ageing in an air oven at (120±2)°C for 168 h. After thermal ageing the screen resistance at ambient temperature was measured again.

4.10 Leakage Current Measurement

Prior to the testand a metal foil of 25 cm² was fixed without any air gap to the outer screen of the plug-in termination. The metal foil was placed at the end of the plug-in termination opposite to the earth bend and earthed through a milliamperemeter and a resistance of 2000 ohms. The leakage current was measured with a test voltage of V_m applied between conductor and earth.

4.11 Screen Fault Current Initiation

Prior to the test a faulting wire of approx. 0.2 mm was placed in the area of the hexagonal connecting bolt through a drilled hole. The wire was connected with the inner and outer screens and did not protrude beyond the outer screen surface.
The test voltage was generated by a 630 kVA-transformer. A capacitor bank was connected in series to the test object, resulting in a short-circuit current of 10A, Figure 4.11. The sequence of the test was as follows:

1. voltage switched on for 1 s
2. voltage switched off for 2 min
3. voltage switched on for 2 min
4. voltage switched off for 2 min
5. voltage switched on for 1 min
6. voltage switched off

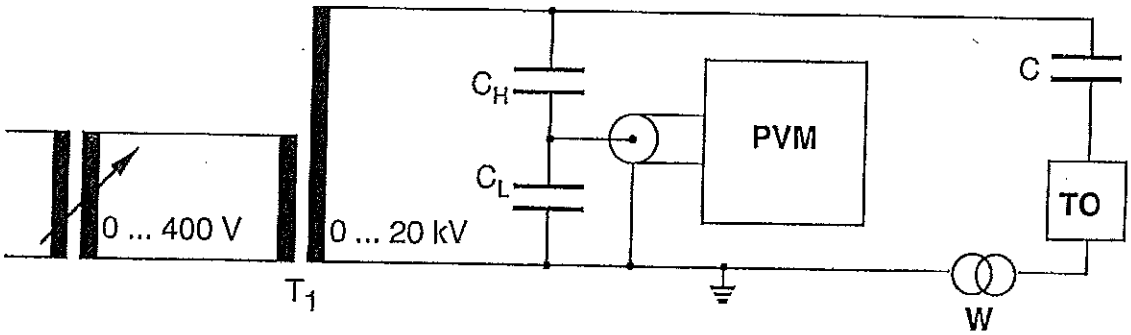


Figure 4.11: Scheme of AC test circuit
T_1: Transformer 400V/20.000V; 630 kVA
C_H: 300 pF; C_L: 300 nF; PVM; peak-voltmeter
C: 2,66 µF; W: current transformer; TO: test object

4.12 Operation Force Test

The test object was placed in a climate chamber an conditioned at (-20±2)°C for at least 12h. The test was carried out within 5 min after removal from the climate chamber. The plug-in termination was clamped by means of a tool which allows operation along the axis of the test object. The force was gradually applied to the plug-in termination and measured by means of a tractive dynamometer.

5 Results

5.1 Test Sequence D1

5.1.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 10.04.2006

Test voltage: V = - 72 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.1.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 10.04.2006

Test voltage: $\hat{U}/\sqrt{2}$ = 54 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.1.3 Partial Discharge Test

This test was carried out as described in 4.

Test date: 10.04.2006

Voltage: $\hat{U}/\sqrt{2}$ = 27 kV , t = 60 s thereafter
$\hat{U}/\sqrt{2}$ = 24kV with pd reading

PD magnitude (24 kV): < 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЕЛ СОФИЯ

5.1.4 Impulse Voltage Withstand Test at elevated Temperature

This test was carried out as described in 4

Test date:	11.04.2006
Test voltage:	$\hat{U}$ = 125 kV
Heating current:	I = 290 A; t = 5 h
Number of tests:	10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.5 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	24.04. - 15.05.20026
Test voltage:	$\hat{U}/\sqrt{2}$ = 30 kV
Heating current:	I = 290A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63

Neither flashover nor breakdown occurred.

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОУЕЛ София

5.1.6 Electrical Heat Cycling in Water

This test was carried out as described in 4.

Test date:	18.05.-10.06.2006
Conductivity:	63 mS/m
Test voltage:	$\Diamond/\sqrt{2}$ = 30 kV
Heating current:	I = 290 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63
Heat of water:	1000mm

Neither flashover nor breakdown occurred.

The test was passed successfully.

5.1.7 Disconnection / Connection

Test date:	16.06.2006
Number:	5 complete operations

With each test object there was no visible damage to contact.

The test was passed successfully.

5.1.8 Partial Discharge Test

5.1.8.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date:	19.06.2006
Voltage:	$\Diamond/\sqrt{2}$ = 27 kV, t = 60 s thereafter $\Diamond/\sqrt{2}$ = 24 kV with pd reading
PD magnitude (24 kV):	< 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЕЛ СОФИЯ ЕООД

5.1.8.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date:	19.06.2006
Heating current:	I = 290 A, t = 5 h
Voltage:	◊/√2 = 27 kV, t = 60 s thereafter ◊/√2 = 24 kV with pd reading
PD magnitude (24 kV):	< 10 pC

The test was passed successfully.

5.1.9 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date:	19.06.2006
Test voltage:	◊ = 125 kV
Number of tests:	10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.10 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date:	19.06.2006
Test voltage:	◊/√2 = 30 kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.2 Test Sequence D2

5.2.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 01.08.2006

Test voltage: V = -72 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.2.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 01.08.2006

Test voltage: $\hat{U}/\sqrt{2}$ = 54 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.2.3 Thermal Short Circuit, Conductor

This test was carried out as described in 4.

Test date:	22.08.2006
current:	I_K = 6,89kA
	t_K = 1,48 s
number of stresses:	2
time between stresses:	2h

The test was passed successfully.

5.2.4 Disconnection / Connection

Test date: 25.08.2006

Number: 5 complete operations

With each test object there were no visible damage to contact.

The test was passed successfully.

5.2.5 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date: 27.08.2006

Test voltage ◊ = 125 kV

number of tests: 10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.2.6 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 27.08.2006

Test voltage: $\Diamond/\sqrt{2}$ = 30 kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЕЛЕ СОФИЯ

5.3 Test Sequence D3

5.3.1 Operating Eye Test

This test was carried out as described in 4.

Test date: 25.09.2006

Force: 1300 N ; t = 1 min

Torque: 14 Nm

The test was passed successfully.

5.3.2 Partial Discharge Test

This test was carried out as described in 4.

Test date: 25.09.2006

Voltage: $\hat{U}/\sqrt{2}$ = 27 kV, t = 60s thereafter
$\hat{U}/\sqrt{2}$ = 24 kV with pd-reading

PD magnitude (24 kV): < 10 pC

The test was passed successfully.

5.4 Additional Tests

5.4.1 Screen Resistance Measurement

This test was carried out as described in 4.

Test date: 21.09. - 28.09.2006

Resistance prior to thermal ageing < 5000 Ω

Resistance after thermal ageing < 5000 Ω

Requirement: resistance ≤ 5000 Ω

The test was passed successfully.

5.4.2 Leakage Current Measurement

This test was carried out as described in 4.

Test date: 26.09.2006

Test voltage: $\hat{U}/\sqrt{2} = V_m = 24$ kV

Leakage current: $I < 0{,}5$ mA

Requirement: $I \leq 0{,}5$ mA

The test was passed successfully.

5.4.3 Screen Fault Current Initiation

This test was carried out as described in 4.

Test date: 26.09.2006

Test voltage: $\hat{U}/\sqrt{2} = V_0 = 12.0$ kV

Short-circuit current: $I = 10{,}6$ A

Fault current flow continuously.

The test was passed successfully.

5.4.4 Operating Force Test

This test was carried out as described in 4.

Test date: 21.09. - 22.09.2206

Temperature: - 20°C

Duration: 24h

Force: < 900 N

Requirement: F < 900 N

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕСТ СОФИЯ ООД

6 Conclusion

The separable connector type CELLPLUX-CWS 250 24 kV 250 A passed all tests described in clause 2 successfully. The test object fulfilled the requirements according CENELEC HD 629.1 / S2 02/2006, Table 7, test sequences D1, D2 and D3 and additional tests table 7, pos.17-20.

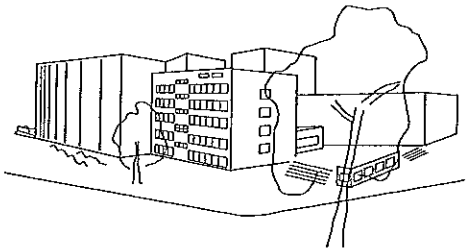
Karlsruhe, 28.09.2006

Dr.-Ing. R. Badent
Bereichsleiter HPT

Dr.-Ing. B. Hoferer
stellv. Bereichsleiter HPT

ВЯРНО С ОРИГИНАЛА

Bereich Hochspannungsprüftechnik



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Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report No 2007-74

Test of Screen Fault Current Initiation of Separable Connectors Type CELLPLUX-CWS 250 24 kV 250 A

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

1 Purpose of Test

1 separable connector for $V_0 / V_n / V_m = 12 / 20 / 24$ kV *was* subjected to a test of screen fault current initiation for reduced system voltage of $V_0 / V_n / V_m = 6 / 10 / 12$ kV according to CENELEC HD 629.1 S2 02/2006 table 7.

2 Miscellaneous Data

Test object:
- 1 *separable connectors* type CELLPLUX-CWS 250 24 kV 250 A,Figure 2.1

Type of the cable: The test object was mounted on a single-wire XLPE-cable, type:NA2X(F)2Y 1x70RM/25 12/20kV

Cable length Connector - sealing end: 1 m

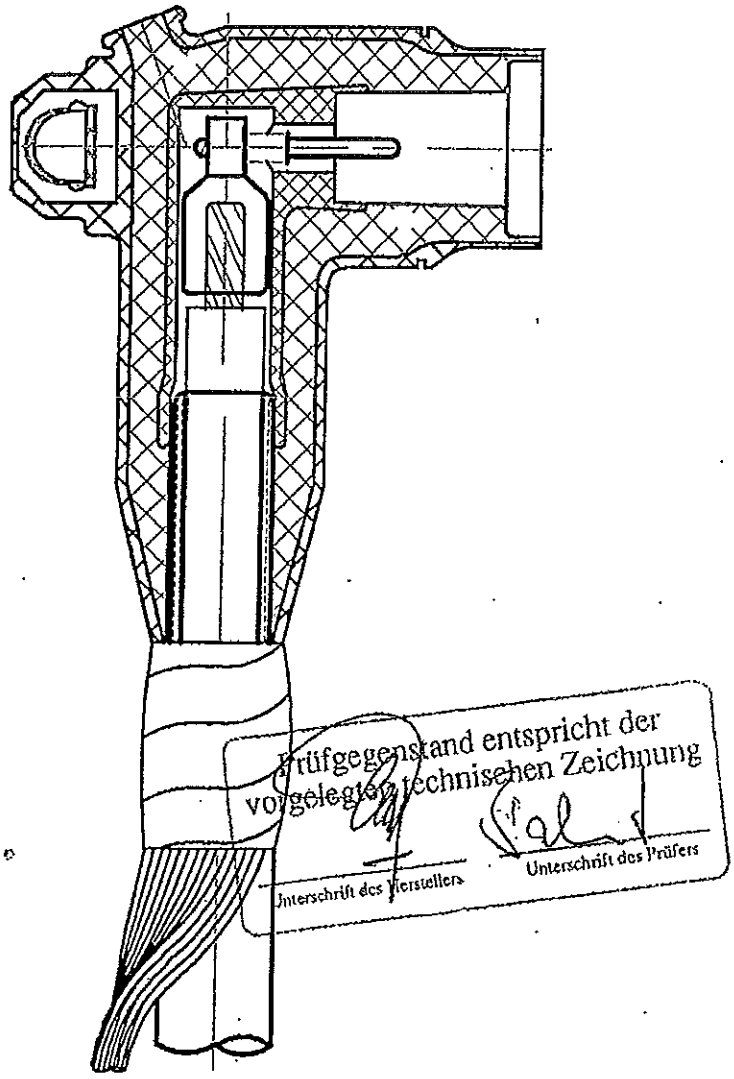
Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

Testing dates:
Delivery: 19.04.2007
Mounting: 19.04.2007
Test period: 19.04.2007

Atmospheric conditions:
Temperature: 20°C
Air pressure: 1010 mbar
rel. humidity: 40 %

Representatives:
Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller

CELLPLUX – CWS 250 24kV 250 A



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ВЯРНО С ОРИГИНАЛА

CELLPACK
Electrical Products

Figure 2.1: Separable connector.

Test: Test volume and requirements conform to CENELEC HD 629.1 S2 02/2006, table 7 and additional test pos. 19.

The test was carried out in accordance with the test methods described in IEC 61442 03/2005.

Pos. 19 *Screen fault current initiation with reduced voltage* $V_0 / V_n / V_m = 6 / 10 / 12$ *kV*
Fault current to flow continuously

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH

4 Test Setup

Screen Fault Current Initiation

Prior to the test a faulting wire of approx. 0.2 mm was placed in the area of the hexagonal connecting bolt through a drilled hole. The wire was connected with the inner and outer screens and did not protrude beyond the outer screen surface.
The test voltage was generated by a 630 kVA-transformer. A resistor was connected in series to the test object, resulting in a short-circuit current of 10A, Figure 4.1. The sequence of the test was as follows:

1. voltage switched on for 1 s
2. voltage switched off for 2 min
3. voltage switched on for 2 min
4. voltage switched off for 2 min
5. voltage switched on for 1 min
6. voltage switched off

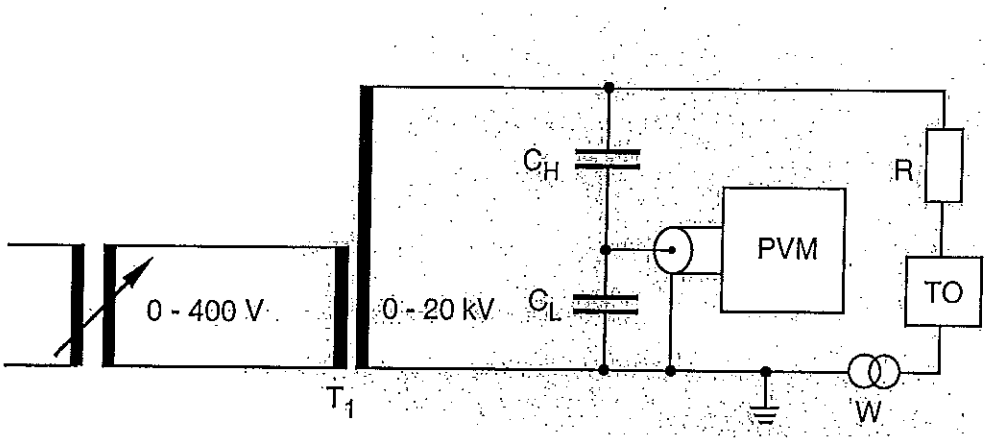

Figure 4.1: Scheme of AC test circuit
T_1: Transformer 400V/20.000V; 630 kVA
C_H: 300 pF; C_L: 300 nF; PVM; peak-voltmeter
R: 600 Ω; W: current transformer; TO: test object

5 Results

Screen Fault Current Initiation

This test was carried out as described in 4.

Test date: 19.04.2007

Test voltage: $\Diamond/\sqrt{2} = V_0 = 6.0$ kV

Short-circuit current: I = 10,0 A

Fault current flow continuously.

The test was passed successfully.

6 Conclusion

The separable connector type CELLPLUX-CWS 250 24 kV 250 A passed all tests described in clause 2 successfully. The test object fulfilled the requirements according CENELEC HD 629.1 / S2 02/2006, additional test table 7, pos.19 at reduced voltage V_0 / V_n / V_m = 6 / 10 / 12 kV.

Karlsruhe, 24.04.2007

Dr.-Ing. R. Badent
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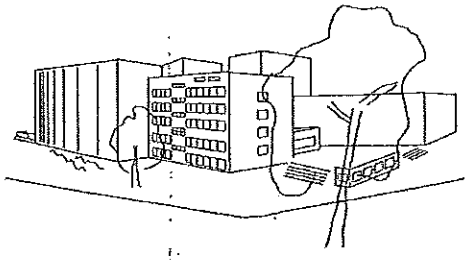
Dr.-Ing. B. Hoferer
stellv. Bereichsleiter HPT

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕХ СОФИЯ ООД

Bereich Hochspannungsprüftechnik

Institut für Elektroenergiesysteme und Hochspannungstechnik



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Test Report No 2011-52/1

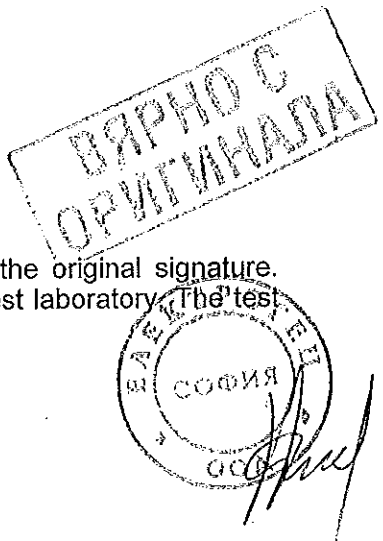
Type Test of

Separable Connectors Type

CELLPLUX-CWS 250A 24kV 70-150/M/EGA

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer



1 Purpose of Test

One separable connector for U_0 / U_n / U_m = 12 / 20 / 24 kV was subjected to an additional test according to DIN VDE 0278-629-1:2009-07, table 7, test pos. 21.

2 Miscellaneous Data

Test object: – 1 separable connector, type elbow separable connector CWS 250A 24kV 70-150/M/EGA, U_m = 24V,
Installation instruction no.: 293795/0511/1/6, Figures 2.1 – 2.6
Packing list: 293792, Figure 2.7
Type of the cable: The test object was mounted on a single-wire XLPE-cable, type NA2XS2Y 1x150 RM/25, Figure 2.8

Cable length Connector - termination: 1 m

Manufacturer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

Testing dates: Delivery: 17.03.2011
Mounting: 17.03.2011
Test period: 13.04.2011

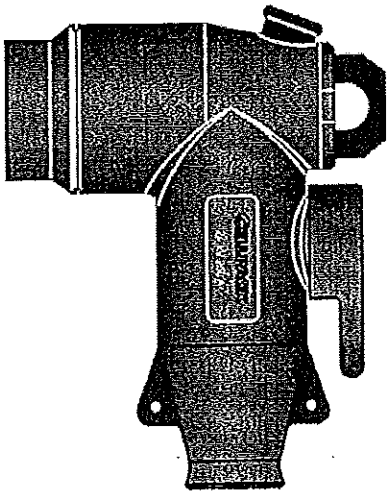
Atmospheric conditions:

Temperature:	19°C – 24°C
Air pressure:	980 - 1025 mbar
rel. humidity:	35 % – 60 %

Representatives: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller

ВЯРНО С ОРИГИНАЛА
СОФИЯ
ООД

Medium Voltage **CELLPLUX**



CWS 250A 24kV 70 – 150/M/EGA
$U_o/U(U_m)$ 6/10(12) kV - 12/20(24) kV

Working instruction

Elbow Separable Connector
for single-core polymeric cables
up to 24 kV

293795/0511/1/6

Prüfgegenstand entspricht der vorgelegten technischen Zeichnung
Unterschrift des Herstellers
Unterschrift des Prüfers

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293795 CWS 250A 24kV 70-150/M/EGA

ЕЛЕКТРОТЕХ 1/6 СОФИЯ ООА

ВЯРНО С ОРИГИНАЛА

Figure 2.1: Installation Instruction.

General remarks:

- Check the range and size of the cable and the accessories.
- Check the content of the kit as per packing list.
- Thoroughly read the working instruction.

Installation must be executed by competent personnel only.
The manufacturer accepts no liability for breakdowns resulting from incorrect installation.

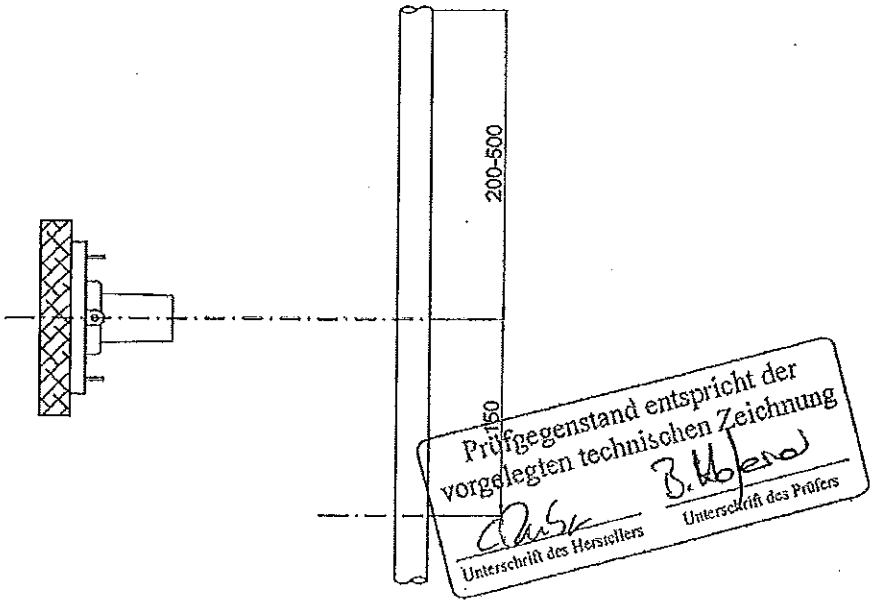
Elbow Separable Connector Type CWS 250A 24kV 70-150/M/EGA

Selection of cable sizes

Voltage Uo/U(Um) kV	Cross-section of the conductor (*) mm²
6/10(12) kV	120 - 150
8,7/15(17,5) kV	95 - 150
12/20(24) kV	70 - 150

(*) Diameter over primary insulation min. 19,9 mm

Adjustment



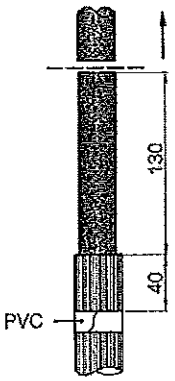
- Clean thoroughly the cable end up to **1m.**
- Adjust the cable overhanging the middle of the bushing by **200 – 500 mm** and cut it off.
- Make a mark **150 mm** from the centre of the bushing on to the cable sheath.

293795 CWS 250A 24kV 70-150/M/EGA

Figure 2.2: Installation Instruction

Cable with wire screen:

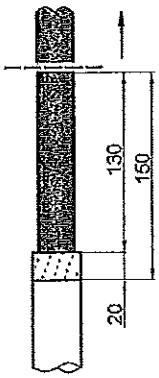
1a)



- Remove the cable sheath up to the mark.
- Bend back the wire of the cable screen and fix it on the cable sheath.
- Cut off the cable at the length of **130 mm.**
- Prepare the cable end according to the template (see **page 4**) and then check the dimensions.
- Clean thoroughly insulation and conductive layer.

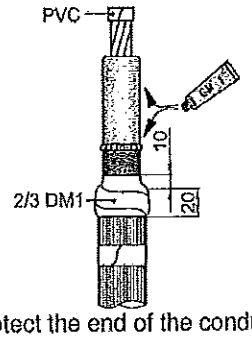
Cable with copper tape screen:

1b)



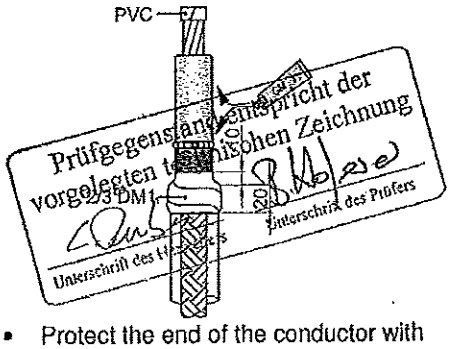
- Remove the cable sheath up to the mark **+20 mm.**
- Cut the cable according to the drawing.
- Prepare the cable end according to the template (see **page 4**) and then check the dimensions.
- Clean thoroughly insulation and conductive layer.

2a)



- Protect the end of the conductor with PVC tape.
- Wrap 2/3 of the length of DM1 mastic **10 mm** on to the conductive layer and **20 mm** on to the wire screen by stretching it 50%.
- Apply at the end of the conductive layer lubricant and filling material GM1 according to the drawing.
- Moisten the conductor insulation with lubricant and filling material GM1.

2b)



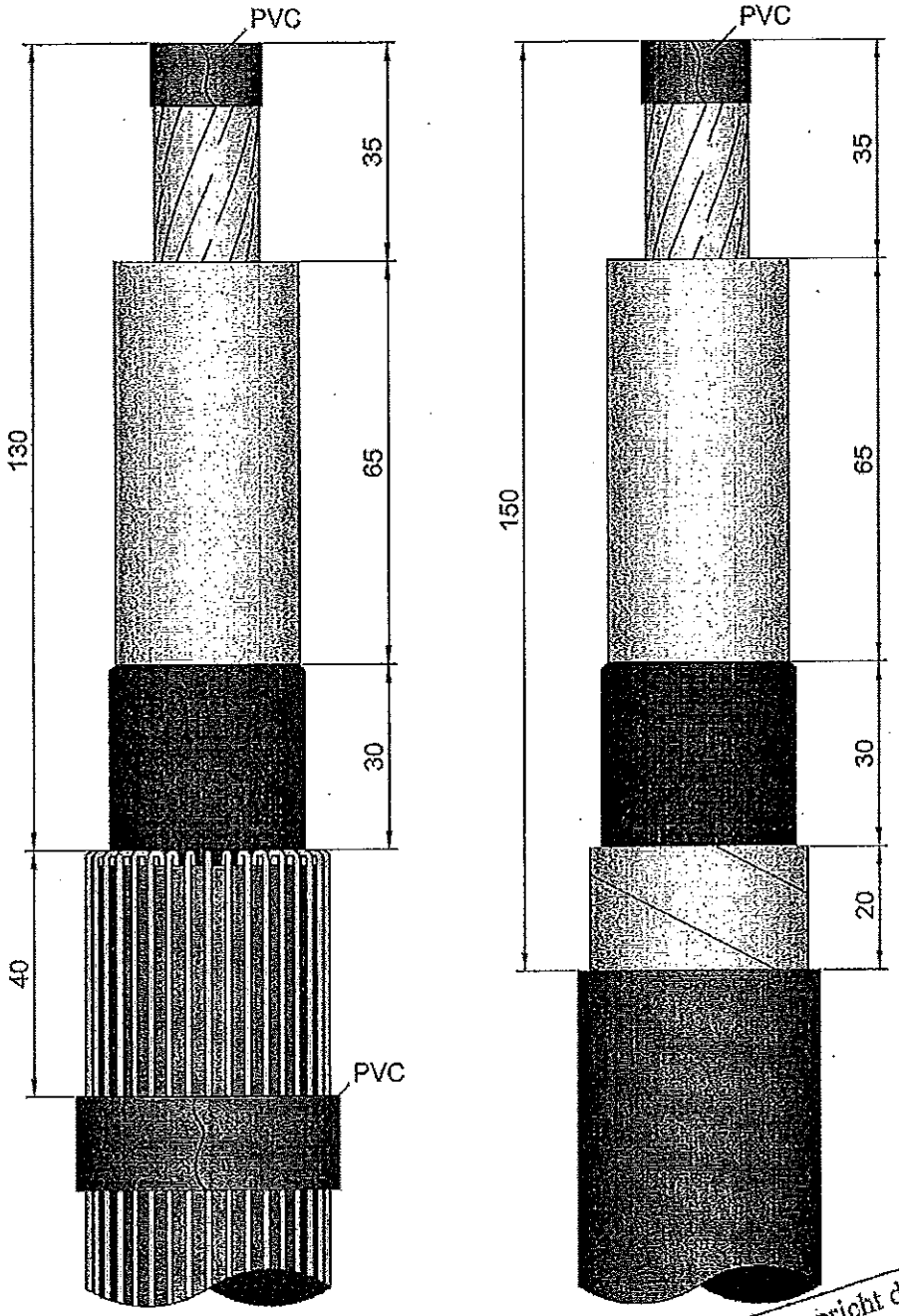
- Protect the end of the conductor with PVC tape.
- Fix a flat Cu – braid with a pressure spring RF on to the tape screen (order the earthing kit separately).
- Wrap 2/3 of the length of DM1 mastic **10 mm** on to the conductive layer and **20 mm** on to the copper tape screen by stretching it 50%.
- Apply at the end of the conductive layer lubricant and filling material GM1 according to the drawing.
- Moisten the conductor insulation with lubricant and filling material GM1.

293795 CWS 250A 24kV 70-150/M/EGA

3/6

ВЯРНО С ОРИГИНАЛА

Figure 2.3: Installation Instruction



293795 CWS 250A 24kV 70-150/M/EGA

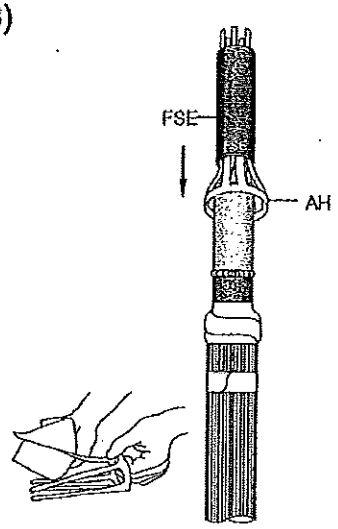
Prüfgegenstand entspricht der vorgelegten technischen Zeichnung

4/6

ВЯРНО С ОРИГИНАЛА

Figure 2.4: Installation Instruction

3)

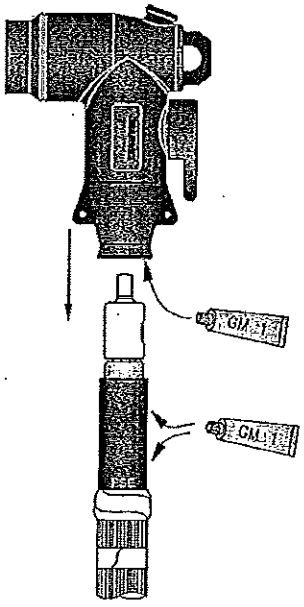


- Moisten the tongues of the applicator with the silicone towel.
- Insert the applicator in to the stress control element and slip in on to the cable down to sealing wrap.
- Remove the applicator by pulling out the tongues one by one.
- Adjust the stress control element in his final position by turning it slightly (see Fig. 4).

4)

- Remove the protection from the end of the conductor.
- Install the shear-head screw according to the separate instruction. Please note that the tapped hole in the ear of the lug is in line with the bushing.
- Clean carefully the surface of the stress control element.

5)



- Moisten the connector body and the stress control element with lubricant and filling material GM1.
- Slip on the connector body on to the end of the cable and adjust it until the tapped hole in the ear of the lug is centred inside the connector body (see Fig. 6).

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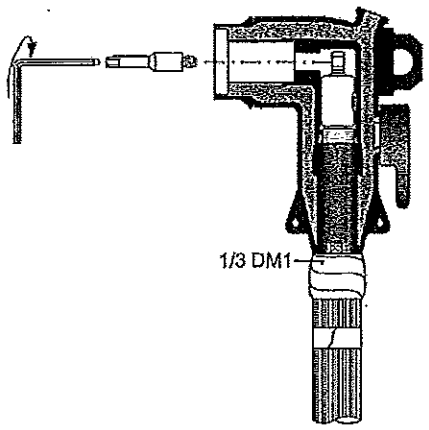
293795 CWS 250A 24kV 70-150/M/EGA 5/6

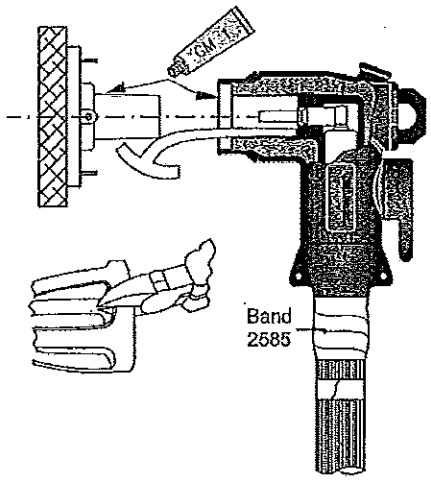
Figure 2.5: Installation Instruction

6)



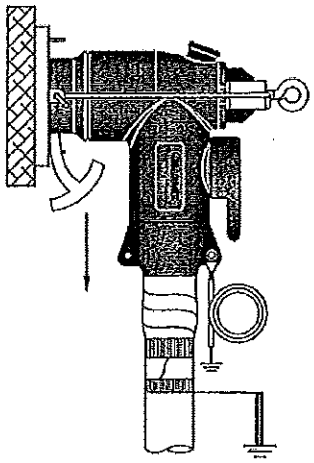
- Screw in the contact pin into the cable lug with an allen key and tighten it manually.
- Wrap the remaining mastic 1/3 DM1 between the end of the connector body and the sealing area.

7)



- Wrap the tape Nr. 2585 adhesive side inwards approx. **20 mm** over the end of the connector body up to the end of the sealing area (stretch 20%).
- Moisten accurately the bushing and the connector inside with lubricant and filler GM1.
- Cut out a tongue from the applicator (air release device).
- Insert the air release device into the connector. Attach the connector straight on to the bushing.

8)



- Fix the fastening device and tighten the nut evenly.
- Pull out the air release device and remove remaining lubricant and filler.
- Install the earthing-set to the connector body and ground it.
- Further earthing measurements to be carried out according to local regulations.

293795 CWS 250A 24kV 70-150/M/EGA 6/6

Figure 2.6: Installation instruction

Packliste 293 792 Lista de carga Packing list Liste d'emballage	CELLPACK Electrical Products

MEDIUM VOLTAGE **CELLPLUX**

	Typ	CWS 250A 24kV 70-150/M/EGA	
Winkel-Steckanschluss	$U_o/U(U_m)$	6/10(12)kV	120 - 150 mm²
Elbow Separable Connector		8,7/15(17,5)kV	95 - 150 mm²
Connecteur Séparable Equerre		12/20(24)kV	70 - 150 mm²
Terminal Enchufable Acodado		Isolation min. Ø: 19,9 mm	
		Version: 01	

Pos		St. Cont.	Dimension			
1		3	CWS 250A	Steckanschluß Plug-in connector		Connecteur séparable Cuerpo terminal
2		3	FSEM 19	Feldsteuerelement Field control element		Contrôleur de champ Elemento de control de campo
3		3	GM1	Gleit- und Füllmittel Lubrificant and filler		Lubrifiant Lubrificante
4		3	AH 2	Aufschiebehilfe Applicator		Dispositif d'enfilage Aplicador
5		3	CWS 250A Set	Befestigungs-Set Connecting set		Cintre de fixation Elemento de fijación
6		3	CWS C70-150	Schraubkabelschuh Screw cable lug		Cosse de câble Terminal
7		1	M 4 60x60 mm	Inbusschlüssel Allen key		Clé six-pans Llave allen
8		3	CWS - Pin	Kontaktstift Pin		Pointe de contact Varilla terminal
9		3	EGA-Set	Erdungs-Set Earthing-kit		Kit de mise á la terre Conjuntos de puesta a tierra
10		3	DM 1 25x150 mm	Dichtband grau Sealing tape grey		Ruban d'étanchéité gris Cinta de estanqueidad gris
11		3	2585 50x300 mm	Polsterband Rubber mastic tape		Ruban mastique Cinta mastik
12		1	N°. 028 5 m	Isolierband PVC tape		Ruban isolant Cinta aislante
13		3	Paar	Handschuhe Gloves		Gants Guante
14		3	ST	Tuch mit Silikonöl Tissue with silicon oil		Tissu silicone Toalla silicónada
15		6	RT	Reinigungstuch Cleaning tissue		Tissu de nettoyage Toalla de limpieza
16		4	MA de, en, fr, es	Montageanleitung Working instructions		Instructions de montage Instrucciones de montaje

Figure 2.7: Packing list

Annex A
(informative)

Identification of test cable
(see 5.1)

Rated voltage U_o/U (U_m): 12/20(24) kV

Construction:	☒ 1-core	☐ 3-core	☒ Individually screened
			☐ Overall screen
Conductors:	☒ Al	☐ Cu	
	☒ Stranded	☐ Solid	
	☒ Circular	☐ Shaped	
	☐ 120 mm²	☒ 150 mm²	☐ 185 mm²
	Other cross-section:	mm²	
Insulation:	☒ XLPE		
	☐ EPR	☐ HEPR	
Insulation screen:	☒ Bonded	☐ Strippable	
Metallic screen:	☒ Wire	☐ Tape	☐ Extruded
Armour:	☐ Wire	☐ Tape	
Oversheath:	☐ PVC	☒ PE (state type)	
Water blocking, if any:	☐ Within conductor	☐ Under oversheath	

Diameters:		
• Conductor	14,2	mm
• Insulation	25,1	mm
• Insulation screen	27,1	mm
• Oversheath	34,1	mm

Cable marking: 2009 +PROTOTHEN X NA2XS2Y 1x150 RM/25 20kV <VDE> 0276

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Figure 2.8: Cable data sheet

Tests: Test volume, chronological order and requirements conform to DIN VDE 0278-629-1:2009-07, table 7, additional test pos. 21.

Additional Test:

Pos. 21. *Capacitive test point performance*

$C_{tc} > 1{,}0$ pF

$C_{te} / C_{tc} \leq 12$

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH.

4 Test Setup

Capacitive test point performance

The test was performed with a different bridge. For this test the capacity of test point to the cable conductor C_{tc} and the capacity of test point to earth C_{te} were measured at ambient temperature.

5 Results

Capacitive test point performance

This test was carried out as described in 4.

Test date: 13.04.2011

Capacitance of test point to cable conductor $C_{tc} > 1,0pF$

Requirement : $C_{tc} > 1,0pF$

Ratio of capacitance of test point to earth C_{te} and capacitance of test point to cable conductor: $C_{tc} : C_{te} / C_{tc} < 12$

Requirement: $C_{tc} : C_{te} / C_{tc} \leq 12$

6 Conclusion

The separable connector type CELLPLUX CWS 250A 24kV 70-150/M/EGA passed all tests described in clause 2 successfully. The test object fulfilled the requirements according DIN VDE 0278-629-1:2009-07, additional test table 7, pos.21.

Karlsruhe, 19.05.2011

Dr.-Ing. R. Badent
Head of Department
„High Voltage Dielectric Testing"

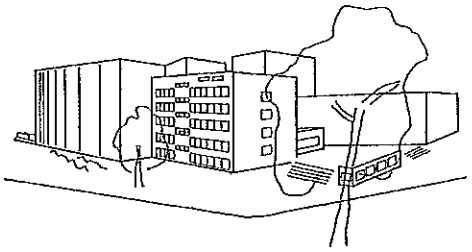
Dr.-Ing. B. Hoferer
Vice-Head of Department
„High Voltage Dielectric Testing"

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОЕЛ СОФИЯ

Bereich Hochspannungsprüftechnik

Institut für Elektroenergiesysteme und Hochspannungstechnik



Universität Fridericiana (TH) Karlsruhe
76128 Karlsruhe - Kaiserstraße 12
Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report No 2006-115

Type Test of

Separable Connectors

Type CELLPLUX-CTS 630 A 24 kV

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

1 Purpose of Test

4 resp. 3 separable connectors for V_0 / V_n / V_m = 12,7 / 22 / 24 kV were subjected to a type test according to CENELEC HD 629.1 S1 06/2002 table 7 test sequence D1 resp. D2. 3 separable connectors for V_0 / V_n / V_m = 12,7 / 22 / 24 kV were subjected to additional tests according to CENELEC HD 629.1 S1 06/2002, table 7 test pos. 19-22.

2 Miscellaneous Data

Test object: – 10 *separable connectors* type CELLPLUX-CTS 630 A 24 kV 95 - 250
V_m = 24 kV, Figure 2.1
Type of the cable: The test object was mounted on a single-wire XLPE-cable, type:N2X(F)2Y 1x185RM/25 12/20kV

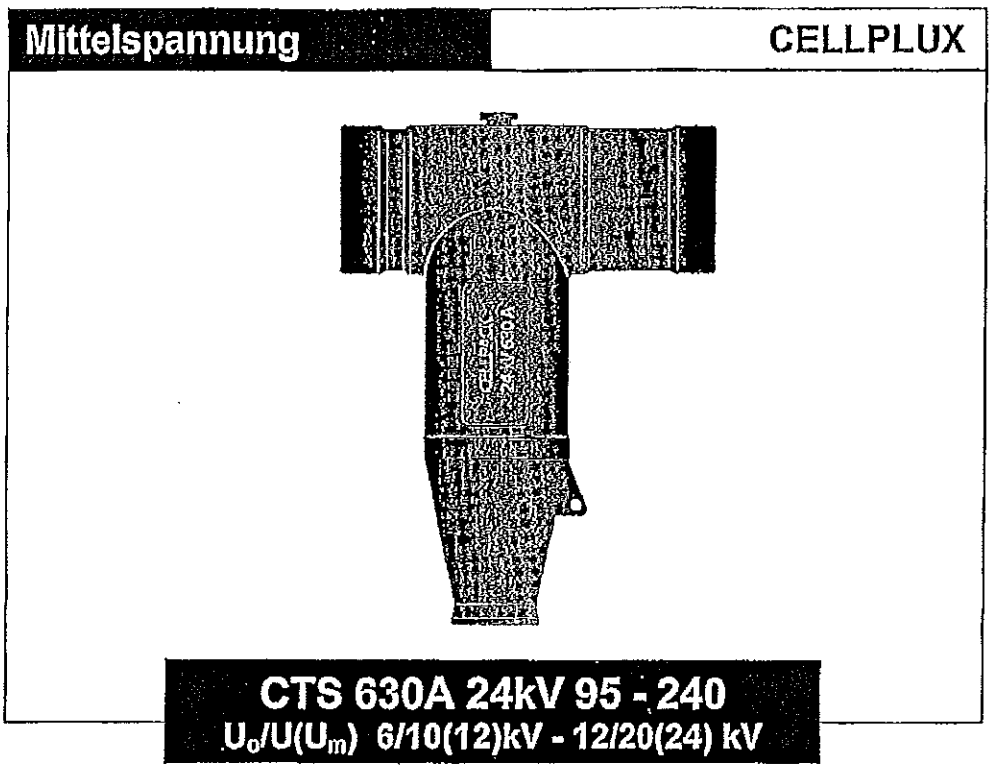
Cable length Connector - sealing end: 3 m

Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

Testing dates: Delivery: 10.10.2006
Mounting: 10.10.2006
Test period: 12.10. - 21.12.2006

Atmospheric conditions: Temperature: 19°C – 24°C
Air pressure: 980 - 1025 mbar
rel. humidity: 35 % – 60 %

Representatives:
Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller



Montageanleitung

T-Steckanschluss für
Einleiter Kunststoffkabel
bis 24 kV

206741/1006/1/7

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Electrical Products
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Fax +41(0)56/618 12 45

CTS 630A 24kV 95-240 206741/1006/1/7

CELLPACK
Electrical Products

Figure 2.1: Separable connector.

Tests: Test volume, chronological order and requirements conform to CENELEC HD 629.1 S1 06/2002 test sequence D1 and D2, table 7 and additional test pos. 19 - 22.

The PD-test was performed at 2 V_0 The tests were carried out in accordance with the test methods described in CENELEC HD 628 S1 06/2002 .

Test sequence D1:

Pos. 1. *DC voltage withstand test*
V = 6 V_0 = -76 kV ; t =15 min

Pos. 2. *AC voltage withstand test*
◊/$\sqrt{2}$ = 4,5 V_0 = 57 kV; t = 5 min

Pos. 3. *Partial discharge test*
◊/$\sqrt{2}$ = 2,0 V_0 = 25 kV ; PD ≤ 10 pC

Pos. 4. *Impulse voltage withstand test at elevated temperature*
◊ = 125 kV; positive and negative polarity each 10 impulses

Pos. 5. *Partial discharge test at ambient temperature and elevated temperature*
◊/$\sqrt{2}$ = 2,5 V_0 = 32 kV ; PD ≤ 10 pC

Pos. 6. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 32 kV
number of cycles: 3

Pos. 10. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 32 kV
number of cycles: 60

Pos. 11. *Electrical heat cycling in water*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊/$\sqrt{2}$ = 32 kV
number of cycles: 63

Pos. 12 *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 13. *Partial discharge test at ambient temperature and elevated temperature*
$\hat{U}/\sqrt{2} = 2{,}0\ \ V_0 = 25$ kV ; PD ≤ 10 pC

Pos. 14. *Impulse voltage withstand test,*
$\hat{U}$ = 125 kV; positive and negative polarity each 10 impulses

Pos. 15. *AC voltage withstand test*
$\hat{U}/\sqrt{2} = 2{,}5\ V_0 = 32$ kV; t = 15 min

Test sequence D2:

Pos. 1. *DC voltage withstand test*
$V = 6\ V_0 = -76$ kV ; t =15 min

Pos. 2. *AC voltage withstand test*
$\hat{U}/\sqrt{2} = 4{,}5\ V_0 = 57$ kV; t = 5 min

Pos. 8. *Short circuit test, conductor*
θ_{Sc} = 250°C; 2 stresses

Pos. 12. *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 14. *Impulse voltage withstand test,*
$\hat{U}$ = 125 kV; positive and negative polarity each 10 impulses

Pos. 15. *AC voltage withstand test*
$\hat{U}/\sqrt{2} = 2{,}5\ V_0 = 32$ kV; t = 15 min

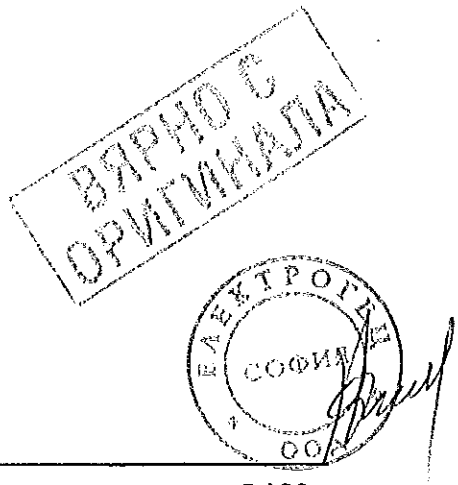
Additional Tests:

Pos. 19. *Screen resistance measurement*
R ≤ 5000 Ω

Pos. 20. *Leakage current measurement*
$\hat{U}/\sqrt{2} = 2{,}5\ V_m = 24$ kV
I ≤ 0,5 mA

Pos. 21. *Screen fault current initiation*
Fault current to flow continuously

Pos. 22. *Operating force test*
F ≤ 900 N



3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH

4 Test Setups

4.1 DC Voltage Withstand Test

The DC-voltage was generated according to Figure 4.1. The voltage measurement was carried out with an ohmic-capacitive divider (ratio 2000:1). The measurement uncertainty was 3%.

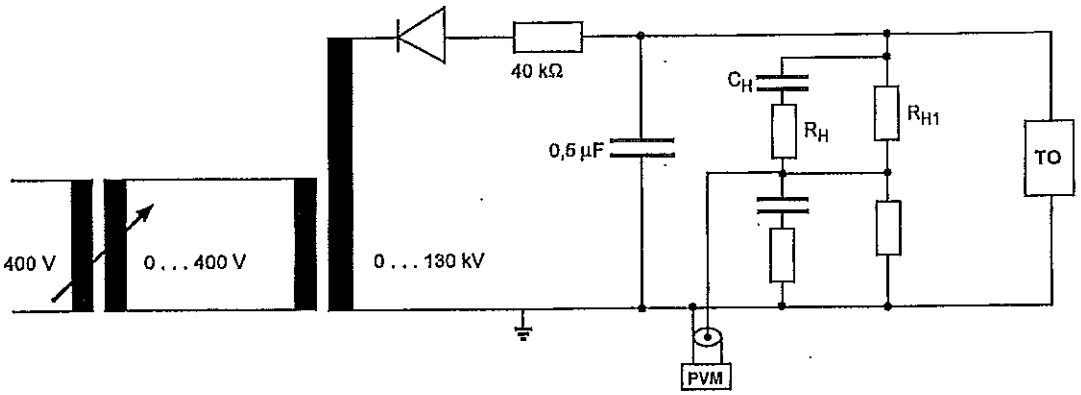


Figure 4.1: Scheme of DC voltage test circuit.
R_H = 3,6 kΩ, R_{H1} = 360 MΩ, C_H = 180 pF, ratio 2.000:1, PVM: Peak Voltmeter, TO: Test object, measurement uncertainty 3%

4.2 AC Voltage Withstand Test

The test voltage was generated by an 60-kVA transformer. The voltage measurement was carried out with a capacitive divider (C_H = 180 pF; ratio = 2.000) and a peak voltmeter calibration $\Diamond/\sqrt{2}$.

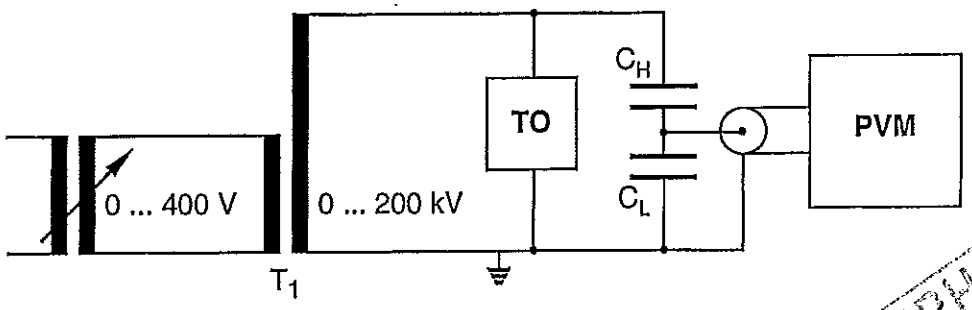


Figure 4,2: Scheme of AC test circuit
T_1 : transformer 400V / 200000V ; 60 kVA ; v_K = 3,5 % ; 50 Hz
C_H: 180 pF ; ratio 2000:1 ; PVM : Peak-Voltmeter
TO: Test object; measurement uncertainty 3 %

4.3 Partial-Discharge Test

The PD-measurement was performed with an analog bridge according to *Kreuger*, Figure 4.3. External PDs producing common mode signals at the detector are rejected by the differential amplifier. Internal PDs represent differential mode signals and are amplified. The background noise level at 25 kV_{rms} was 0,8 pC.

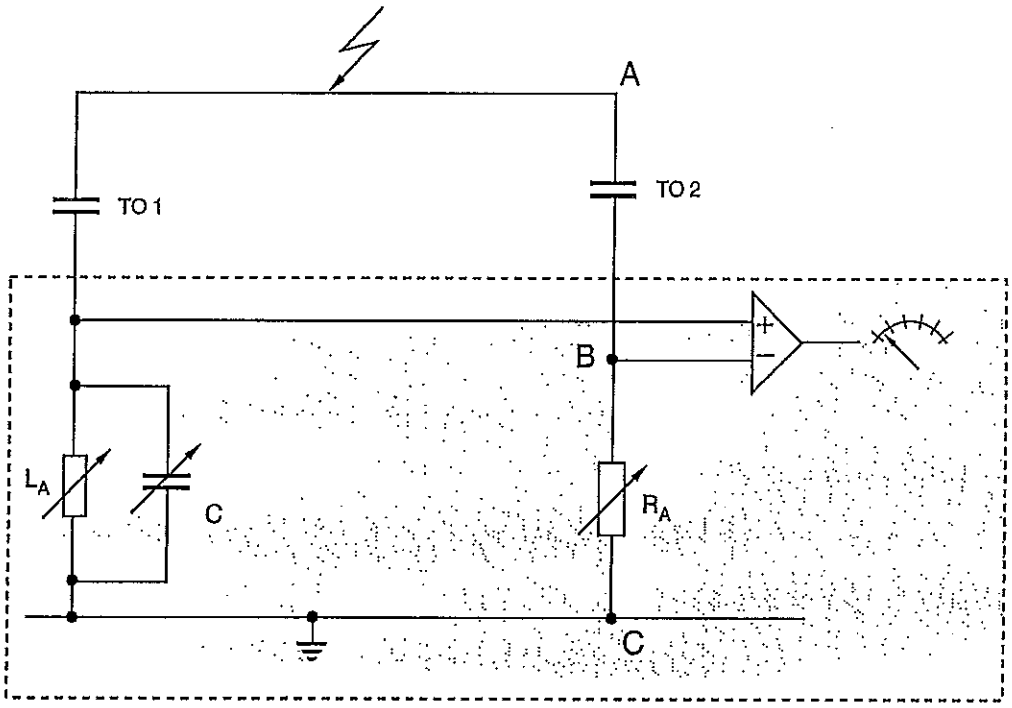


Figure 4.3: Scheme of PD test circuit
TO1: Test object 1
TO2: Test object 2

For balancing the bridge a calibrating impulse with q_A = 10.000 pC is applied between the terminals A (high-voltage) and C (ground) and the amplifier output is minimized. A pulse between the terminals A and C corresponds to an external PD. For the calibration a PD pulse, q_A = 10 pC, is applied between A and B. Subsequently, the amplifier output of the PD measuring unit is adapted to the applied pulse.

Starting from zero the AC-voltage was steadily raised up to 28,1 kV and kept constant for 60 s, then slowly reduced to 25 kV including pd-reading.

4.4 Lightning Impulse Voltage Withstand Test

For impulse testing was used a two-stage Marx generator (Haefely) with a maximum cumulative charging voltage of V = 400 kV and a maximum impulse energy of E_{max} = 20 kWs. At this test, the capacity of the energy storage capacitor was C_S = 0.25 µF. The crest value of the impulse voltage was measured by a damped capacitive divider and a subsequent impulse peak voltmeter (Haefely). The front time and the time to half value were evaluated from the oscillographs.

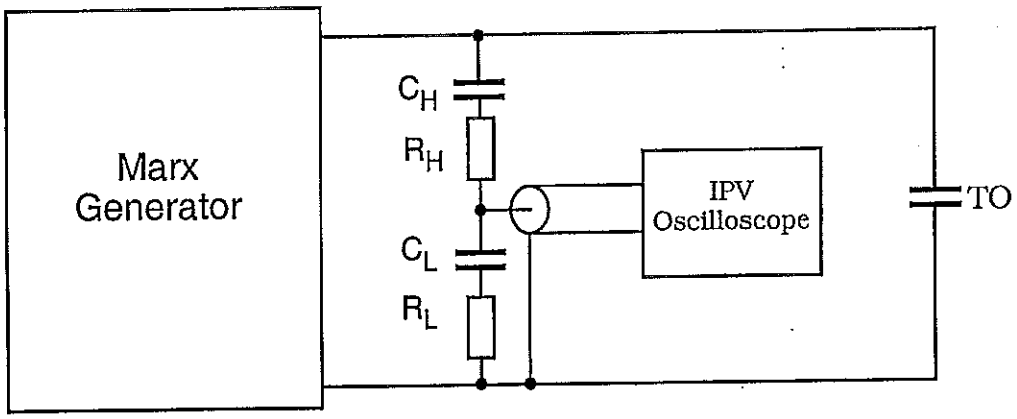


Figure 4.4:Scheme of impulse voltage test circuit
C_H: 1200 pF ; R_H = 70 Ω ; ratio: 3225;
IPV: impulse-peak-voltmeter (Haefely) – measurement uncertainty 3%
Oscilloscope: Tektronix TDS 3044B – measurement uncertainty 2%

The waveform parameters were determined at reduced charging voltage.

Positive impulse: T_1 = 1.35 µs T_2 = 46.8 µs

Negative impulse: T_1 = 1.34 µs T_2 = 47.2 µs

4.5 Electrical Heat Cycling in Air

The test objects must be heated by a current of I = 630 A. Current inception was accomplished by a transformer (V_1 = 400 V; V_2 = 8 V) which used the cable as secondary winding. The current was measured by an current transformer, 1500/5, and a digital multimeter. The measurement uncertainty was 1%.

4.6 Electrical Heat Cycling in Water

The test object were placed in a tank and filled with water. The height of the water was 1000 mm above the test object. The conductivity of the water at 20°C was 63 mS/m.

4.7 Thermal Short Circuit Current Test

According IEC 986 for Cu with q = 185 mm^2 I^2t = 1091,4· 10^6 A^2s with θ_{sc} = 250°C and θ_i = 25°C. That means I_K(1s) = 33,04 kA. The short-circuit during test was I_K = 18,74 kA, resulting in a short-circuit duration of t_K = 3,20 s.The test object was tested with two thermal short-circuit currents. Between two tests the specimen cooled down to ambient temperature. The current was measured with a 10 µΩ-shunt connected to a digital storage oscilloscope (Tektronix 2430 A). The measurement uncertainty was 2%.

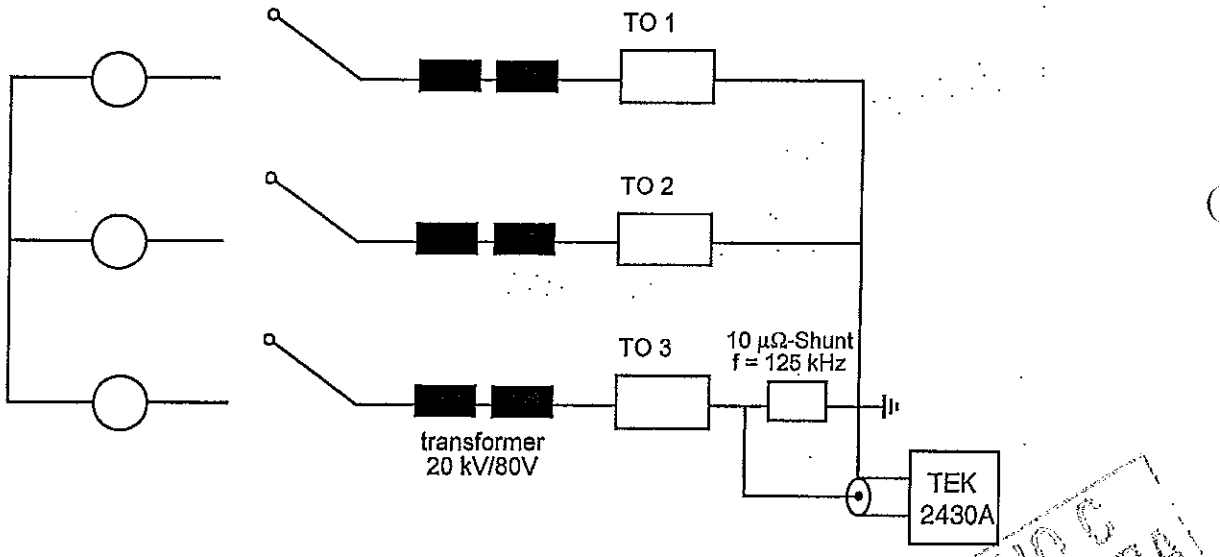


Figure 4.7.1: Scheme of short-circuit test.

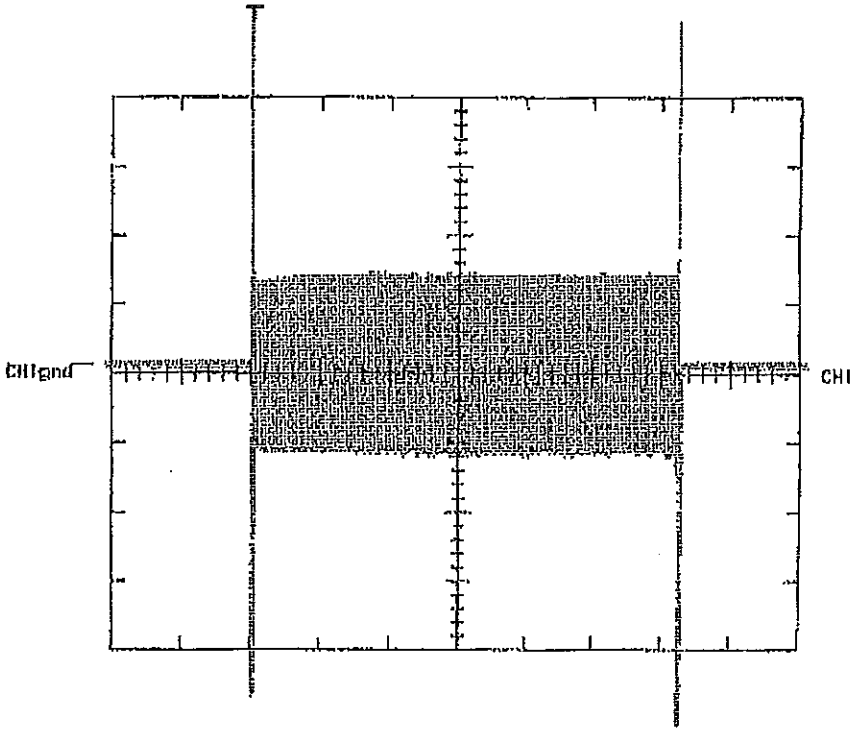


Figure 4.7.2: Short circuit current
Hor: 200 ms/Div; Vert: 20 kA/DIV

4.8 Screen Resistance Measurement

Prior to the test silver-painted electrodes were installed. The screen resistance of the plug-in termination was measured at ambient temperature between the two electrodes. Then the test object was subjected to thermal ageing in an air oven at (120±2)°C for 168 h. After thermal ageing the screen resistance at ambient temperature was measured again.

4.9 Leakage Current Measurement

Prior to the testand a metal foil of 25 cm^2 was fixed without any air gap to the outer screen of the plug-in termination. The metal foil was placed at the end of the plug-in termination opposite to the earth bend and earthed through a milliamperemeter and a resistance of 2000 ohms. The leakage current was measured with a test voltage of V_m applied between conductor and earth.

4.10 Screen Fault Current Initiation

Prior to the test a faulting wire of approx. 0.2 mm was placed in the area of the hexagonal connecting bolt through a drilled hole. The wire was connected with the inner and outer screens and did not protrude beyond the outer screen surface.
The test voltage was generated by a 630 kVA-transformer. A capacitor bank was connected in series to the test object, resulting in a short-circuit current of 10A, Figure 4.10. The sequence of the test was as follows:

1. voltage switched on for 1 s
2. voltage switched off for 2 min
3. voltage switched on for 2 min
4. voltage switched off for 2 min
5. voltage switched on for 1 min
6. voltage switched off

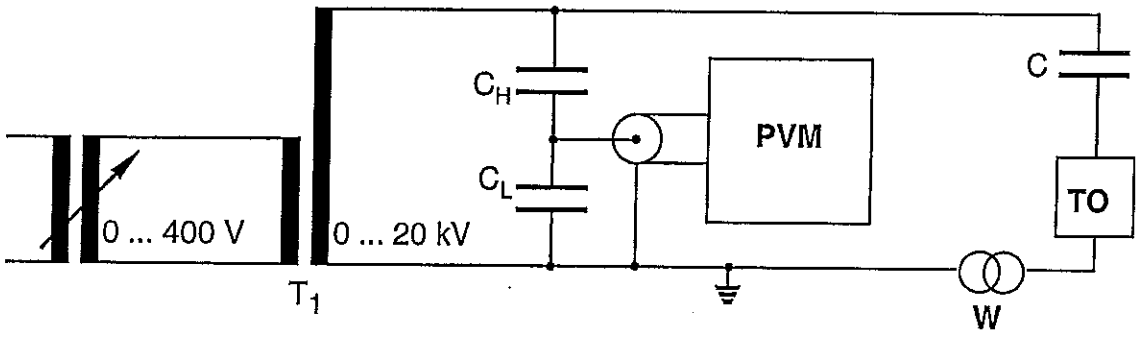


Figure 4.10: Scheme of AC test circuit
T_1: Transformer 400V/20.000V; 630 kVA
C_H: 180 pF; ü = 2000:1; PVM; peak-voltmeter
C: 2,66 µF; W: current transformer; TO: test object

4.11 Operation Force Test

The test object was placed in a climate chamber an conditioned at (-20±2)°C for at least 12h. The test was carried out within 5 min after removal from the climate chamber. The plug-in termination was clamped by means of a tool which allows operation along the axis of the test object. The force was gradually applied to the plug-in termination and measured by means of a tractive dynamometer.

5 Results

5.1 Test Sequence D1

5.1.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 12.10.2006

Test voltage: V = - 76 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.1.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 12.10.2006

Test voltage: $\hat{U}/\sqrt{2}$ = 57 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.1.3 Partial Discharge Test

This test was carried out as described in 4.

Test date: 12.10.2006

Voltage: $\hat{U}/\sqrt{2}$ = 28,1 kV , t = 60 s thereafter
$\hat{U}/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

5.1.4 Impulse Voltage Withstand Test at elevated Temperature

This test was carried out as described in 4

Test date:	13.10.2006
Test voltage:	◊ = 125 kV
Heating current:	I = 630 A; t = 5 h
Number of tests:	10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.5 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	02.11. - 03.11.2006
Test voltage:	$\Diamond/\sqrt{2}$ = 32 kV
Heating current:	I = 630 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	3

Neither flashover nor breakdown occurred.

The test was passed successfully.

5.1.6 Partial Discharge Test

5.1.6.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date:	06.11.2006
Voltage:	$\Diamond/\sqrt{2}$ = 28,1 kV, t = 60 s thereafter $\Diamond/\sqrt{2}$ = 25 kV with pd reading
PD magnitude (25 kV):	< 10 pC

The test was passed successfully.

5.1.6.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date:	06.11.2006
Heating current:	I = 630 A, t = 5 h
Voltage:	$\hat{U}/\sqrt{2}$ = 28,1 kV, t = 60 s thereafter $\hat{U}/\sqrt{2}$ = 25 kV with pd reading
PD magnitude (25 kV):	< 10 pC

The test was passed successfully.

5.1.7 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	07.11. - 27.11.2006
Test voltage:	$\hat{U}/\sqrt{2}$ = 32 kV
Heating current:	I = 630 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	60

Neither flashover nor breakdown occurred.

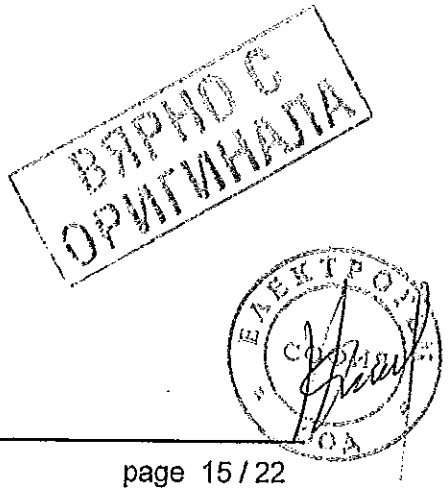
The test was passed successfully.

5.1.8 Electrical Heat Cycling in Water

This test was carried out as described in 4.

Test date:	27.11.-18.12.2006
Conductivity:	63 mS/m
Test voltage:	$\hat{U}/\sqrt{2}$ = 32 kV
Heating current:	I = 630 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63
Heat of water:	1000mm

Neither flashover nor breakdown occurred.
The test was passed successfully.



5.1.9 Disconnection / Connection

Test date: 20.12.2006

Number: 5 complete operations

With each test object there was no visible damage to contact.

The test was passed successfully.

5.1.10 Partial Discharge Test

5.1.10.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date: 21.12.2006

Voltage: $\Diamond/\sqrt{2}$ = 28,1 kV, t = 60 s thereafter
$\Diamond/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

5.1.10.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date: 21.12.2006

Heating current: I = 630 A, t = 5 h

Voltage: $\Diamond/\sqrt{2}$ = 28,1 kV, t = 60 s thereafter
$\Diamond/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

5.1.11 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date: 21.12.2006

Test voltage: $\hat{U}$ = 125 kV

Number of tests: 10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.12 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 21.12.2006

Test voltage: $\hat{U}/\sqrt{2}$ = 32 kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

5.2 Test Sequence D2

5.2.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 11.11.2006

Test voltage: V = -76 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.2.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 11.11.2006

Test voltage: $\hat{U}/\sqrt{2}$ = 57 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.2.3 Thermal Short Circuit, Conductor

This test was carried out as described in 4.

Test date:	04.12.2006
current:	I_K = 18,74 kA
	t_K = 3,20 s
number of stresses:	2
time between stresses:	2h

The test was passed successfully.

5.2.4 Disconnection / Connection

Test date: 20.12.2006

Number: 5 complete operations

With each test object there were no visible damage to contact.

The test was passed successfully.

5.2.5 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date: 21.12.2006

Test voltage ◊ = 125 kV

number of tests: 10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.2.6 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 21.12.2006

Test voltage: $\Diamond/\sqrt{2} = 32$ kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.3 Additional Tests

5.3.1 Screen Resistance Measurement

This test was carried out as described in 4.

Test date: 30.11. - 07.12.2006

Resistance prior to thermal ageing < 5000 Ω

Resistance after thermal ageing < 5000 Ω

Requirement: resistance ≤ 5000 Ω

The test was passed successfully.

5.3.2 Leakage Current Measurement

This test was carried out as described in 4.

Test date: 11.12.2006

Test voltage: $\Diamond/\sqrt{2} = V_m = 24$ kV

Leakage current: I < 0,5 mA

Requirement: I ≤ 0,5 mA

The test was passed successfully.

5.3.3 Screen Fault Current Initiation

This test was carried out as described in 4.

Test date: 15.12.2006

Test voltage: $\Diamond/\sqrt{2} = V_0 = 12.7$ kV

Short-circuit current: I = 10,3 A

Fault current flow continuously.

The test was passed successfully.

5.3.4 Operating Force Test

This test was carried out as described in 4.

Test date:	11.12. - 12.12.2206
Temperature:	- 20°C
Duration:	24h
Force:	< 900 N
Requirement:	F < 900 N

The test was passed successfully.

6 Conclusion

The separable connector type CELLPLUX-CTS 630 A 24 kV passed all tests described in clause 2 successfully. The test object fulfilled the requirements according CENELEC HD 629.1 / S1 06/2002, table 7, test sequences D1 and D2 and additional tests table 7, pos.19-22.

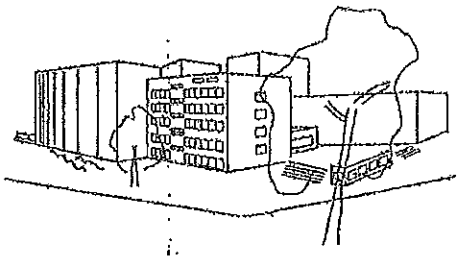
Karlsruhe, 08.01.2007

Dr.-Ing. R. Badent
Bereichsleiter HPT

Dr.-Ing. B. Hoferer
stellv. Bereichsleiter HPT

ВЯРНО С ОРИГИНАЛА

Bereich Hochspannungsprüftechnik
Institut für Elektroenergiesysteme und Hochspannungstechnik



Universität Fridericiana (TH) Karlsruhe
76128 Karlsruhe - Kaiserstraße 12
Telefon (0721) 608 2520 Telefax (0721) 69 52 24

Test Report Nº 2010-77

Type Test of

Separable Connectors

Type CELLPLUX-CTKS 630A 24 kV

Customer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

Reporter: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer

ВЯРНО С ОРИГИНАЛА

1 Purpose of Test

4 separable connectors for V_0 / V_n / V_m = 12,7/ 22 / 24 kV were subjected to a type test according to DIN VDE 0278-629-1:2009-07 table 7, test sequence D1. One separable connector for V_0 / V_n / V_m = 12,7 / 22 / 24 was subjected to additional tests according to CENELEC HD 629.1 S2 02/2006, table 7 test pos. 21.

2 Miscellaneous Data

Test object: – *5 separable connectors*
type T coupling connector CTKS 630A 24 kV
V_m = 24V,
Installation instruction no.: 257258/0910/3/9, Figures 2.1 – 2.9
Packing list: 256839, Figure 2.10
Type of the cable: The test object was mounted on a single-wire XLPE-cable, type N2XSY 1x185/25 12/20kV, Figure 2.11

Cable length Connector - termination: 3 m

Manufacturer: Cellpack GmbH
Carl-Zeiss-Str. 20
79761 Waldshut-Tiengen

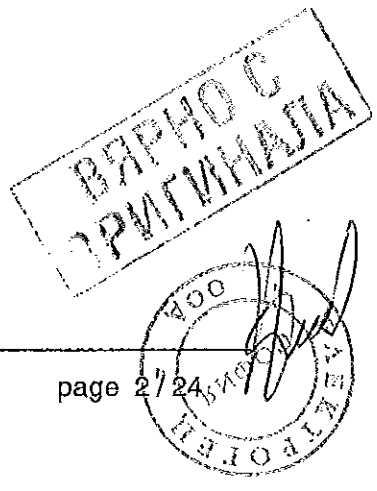
Place of test: *Institute of Electric Energy Systems and High Voltage Technology* – University of Karlsruhe
Kaiserstraße 12 – 76128 Karlsruhe

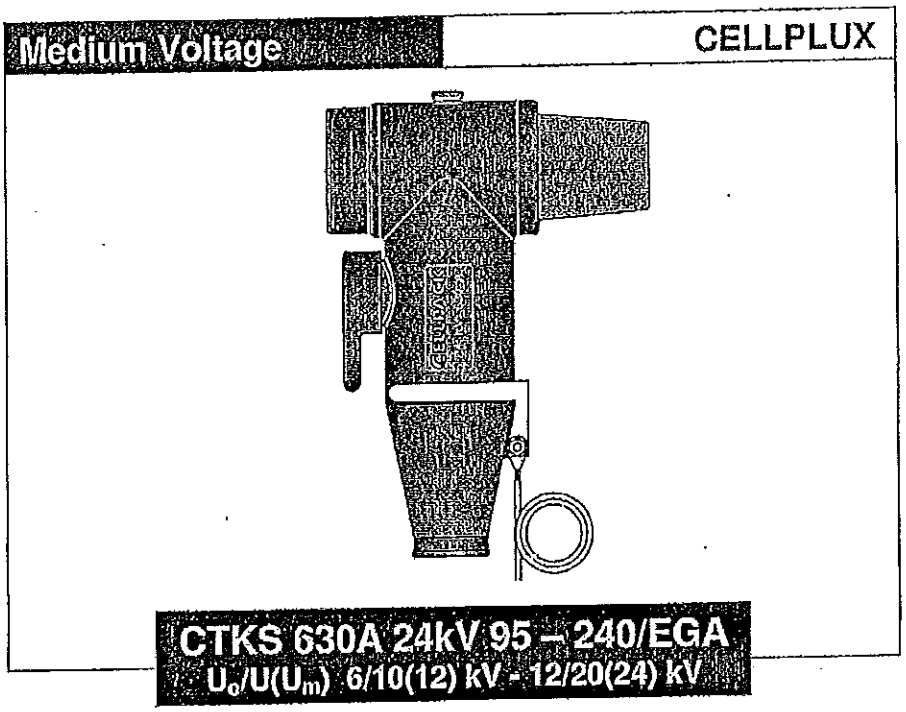
Testing dates: Delivery: 23.09.2010
Mounting: 23.09.2010
Test period: 24.09. - 22.12.2010

Atmospheric conditions:

Temperature:	19°C – 24°C
Air pressure:	980 - 1025 mbar
rel. humidity:	35 % – 60 %

Representatives: Dr.-Ing. R. Badent
Dr.-Ing. B. Hoferer
Mr. O. Müller





Working Instruction

Separable T Coupling Connector for single-core polymeric cables up to 24 kV

257258/0910/3/9

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CELLPACK
Electrical Products

ВЯРНО С ОРИГИНАЛА

Figure 2.1: Installation Instruction.

General remarks:

- Check if the range and size of the accessories is appropriate to the cable.
- Check the content of the kit as per packing list.
- Thoroughly read the working instruction.

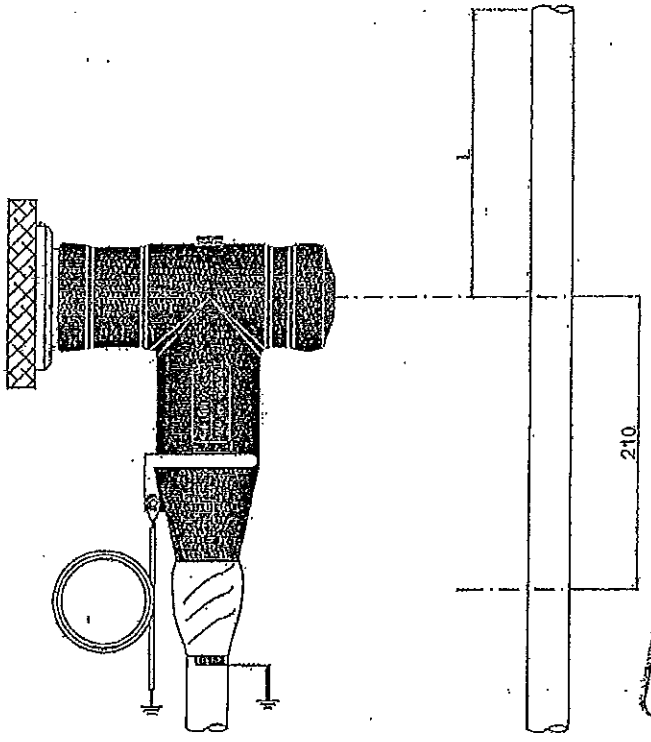
Installation must be executed by competent personnel only.
The manufacturer accepts no liability for breakdowns or damages resulting from an incorrect installation.

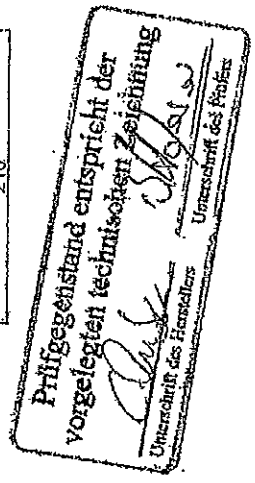
Separable T Coupling Connector CELLPLUX CTKS 630A 24kV 95-240/EGA:

Cross-Section Application

Voltage Uo/U(Um) kV	Cable Cross-Section (*) mm²
6/10(12) kV	150 – 240 *)
8,7/15(17,5) kV	120 – 240 *)
12/20(24) kV	95 – 240 *)

(*) Minimal diameter over cable insulation of 22 mm

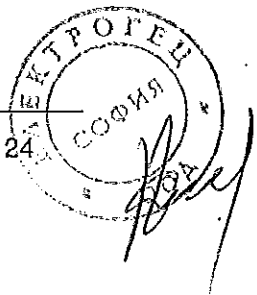




- Clean thoroughly the cable ends up to 1 m.
- Adjust the cable overhanging in the middle of the bushing by L = 200 – 500 mm. Cut-off the excess of cable
- Make a mark **210 mm** from the centre of the bushing onto the cable sheath.

257258 CTKS 630A 24kV 95-240/EGA 2/9

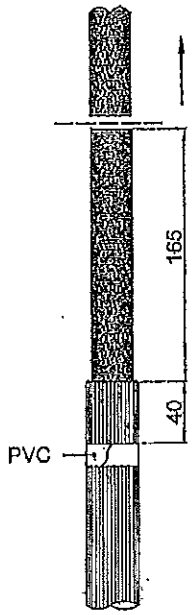
Figure 2.2: Installation Instruction



Preparation of the cable

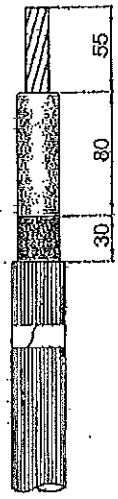
Cable with wire screen:

1a)



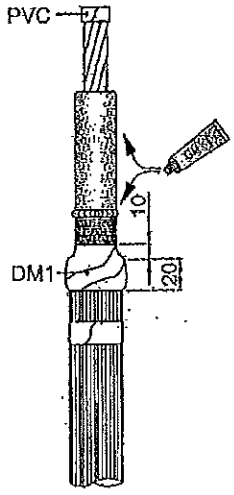
- Remove the cable sheath up to the mark.
- Band back the screen wires of the cable and fix them on the cable sheath with PVC tape (Fig. 1a).
- Cut off the conductor at the length of 165 mm.

2a)



- Remove carefully the outer conductive layer up to 30 mm (mind a clean cut back edge).
- Cut back the cable insulation by 55 mm.
- Clean thoroughly insulation and the outer conductive layer of the cable.

3a)



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- Wrap the tip end of the conductor with PVC tape.
- Wrap 2/3 of the length of DM1 mastic 10 mm on to the conductive layer and 20 mm on to the wire screen (stretch 50%).
- Apply at and around the cut edge of the conductive layer lubricant and filling agent GM1 (forming a ring).
- Moisten the insulation with lubricant and filling agent GM1.

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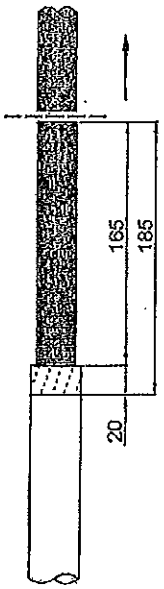
Figure 2.3: Installation Instruction

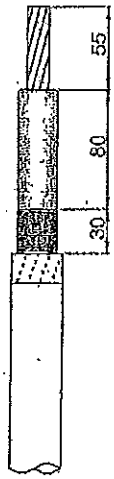
Cable with tape screen:

1b)



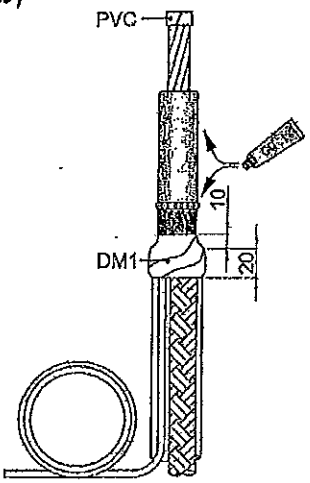
- Remove the cable sheath up to the mark + 20mm.
- Cut the cable according to the drawing.
- Remove carefully the tape screen up to **20 mm.**

2b)



- Remove carefully the outer conductive layer up to **30 mm** (mind a clean cut back edge).
- Cut back the cable insulation by **55 mm.**
- Clean thoroughly the insulation and the conductive layer.

3b)



257258 CTKS 630A 24KV 95-240/EGA

- Wrap the tip end of the conductor with PVC tape.
- Fix the flat Cu-braid and earthing cable with the pressure spring RF on to the tape screen (order the earthing kit separately).
- Wrap 2/3 of the length of mastic tape DM1 **10 mm** on to the conductive layer and **20 mm** on to the copper tape screen (Fig. 3b).
- Apply at and around the cut edge of the conductive layer lubricant and filler agent GM1 (forming a ring).
- Moisten the insulation with lubricant and filling agent GM1.

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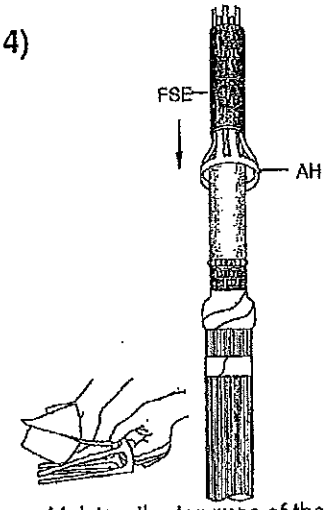
ВЯРНО С ОРИГИНАЛА

Figure 2.4: Installation Instruction

4)

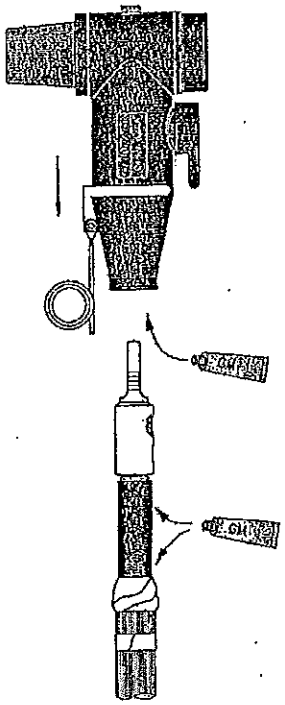


- Moisten the tongues of the applicator AH with the silicon towel.
- Insert the applicator AH in to the stress control element FSE and slip it on to the cable up to the sealing wrap.
- Remove the applicator AH by pulling out the tongues one by one.
- Adjust the position of the stress control element FSE by turning it slightly (Fig. 5).

5)

- Remove the protection wrap from the tip end of the conductor.
- Install the shear-head screw cable lug according to the separate instruction. Please note that the tapped hole of the cable lug is in line with the bushing axle.
- Clean thoroughly the surface of the stress control element FSE.

6)



257258 CTKS 630A 24kV 95-240/EGA

- Moisten the connector body and the surface of the stress control elements FSE with lubricant and filling agent GM1.
  Attention: The cable lug must not be moistured.
- Slip the connector body on to the conductor until the tapped hole of the cable lug is centred inside the connector body.

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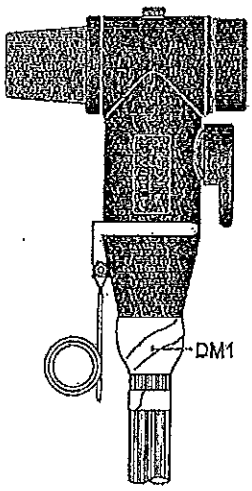
ВЯРНО С ОРИГИНАЛА

Figure 2.5: Installation Instruction

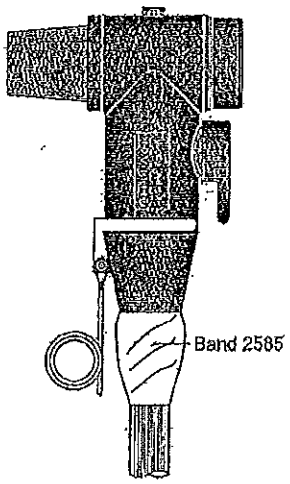
ИЕН ООД София

7)



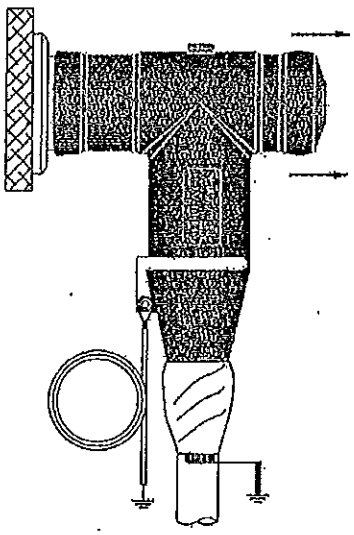
- Wrap the remaining **1/3** of mastic tape DM1 between the end of the connector body and the sealing area.

8)



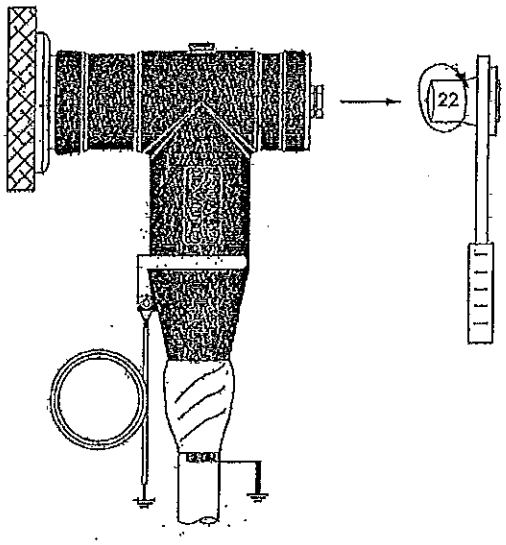
- Wrap the tape Nr. 2585 adhesive side inwards approx. **20 mm** over the end of the connector body up to the end of the sealing area (stretch 20%).

9)



- Take off the conductive protection cup of the T - connector body.

10)



- Unscrew the insulating plug. Use appropriate tool.

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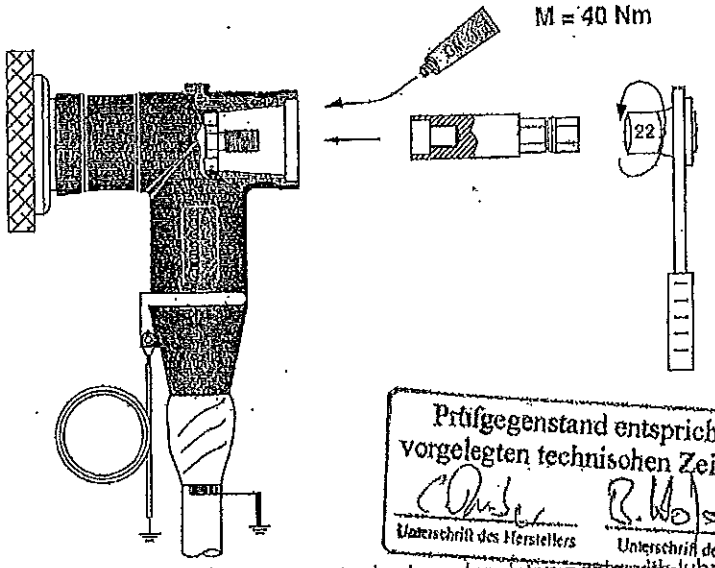
Figure 2.6: Installation Instruction

ВЯРНО С ОРИГИНАЛА

11)



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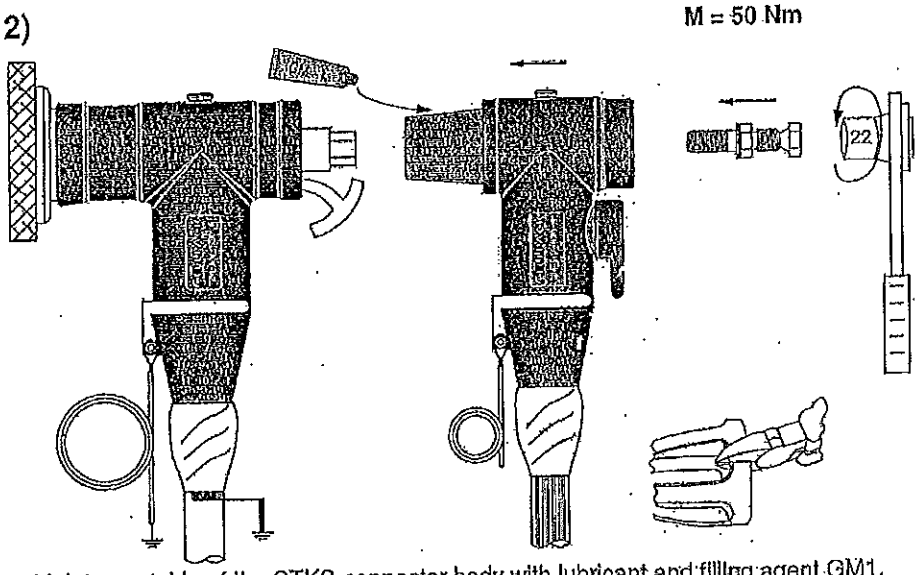
- Clean thoroughly inside of the T-connector body and molsten again with lubricant and filling agent GM1.
- Insert the adaptor plug into the T-connector body and screw the adaptor plug manually. Tighten the adaptor plug with an appropriate tool till the shear head breaks.
  Attention:
  To reuse the adaptor plug it must be tighten with a shear moment „M" of 40 Nm

12)



- Molsten outside of the CTKS-connector body with lubricant and filling agent GM1.
- Cut out a tongue from the applicator AH (air decompression device). Insert the decompression device into the T-connector body.
- Attach the CTKS-connector straight on to the adaptor plug and screw the contact screw manually.
- Tighten the contact screw with an appropriate tool till the shear head breaks.
  Attention:
  To reuse the contact screw it must be tighten with a shear moment „M" of 50 Nm

257258 CTKS 630A 24kV 95-240/EGA

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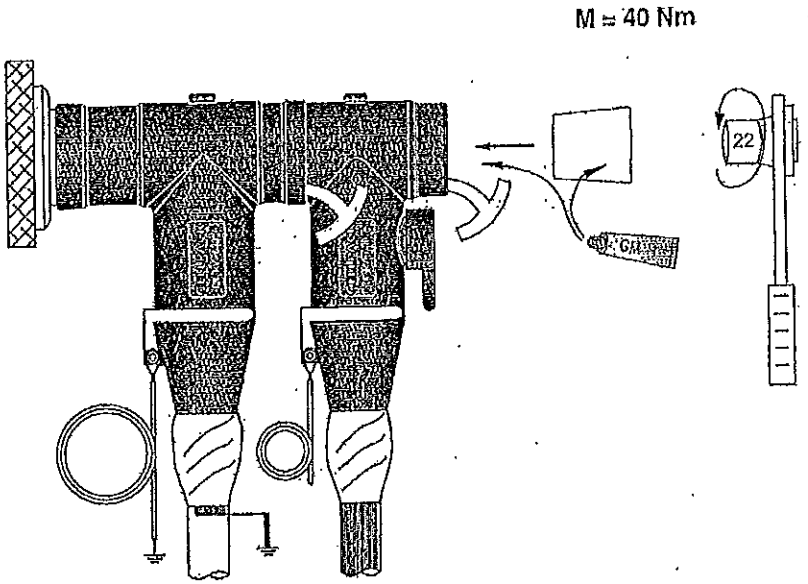
ВЯРНО С ОРИГИНАЛА

Figure 2.7: Installation Instruction

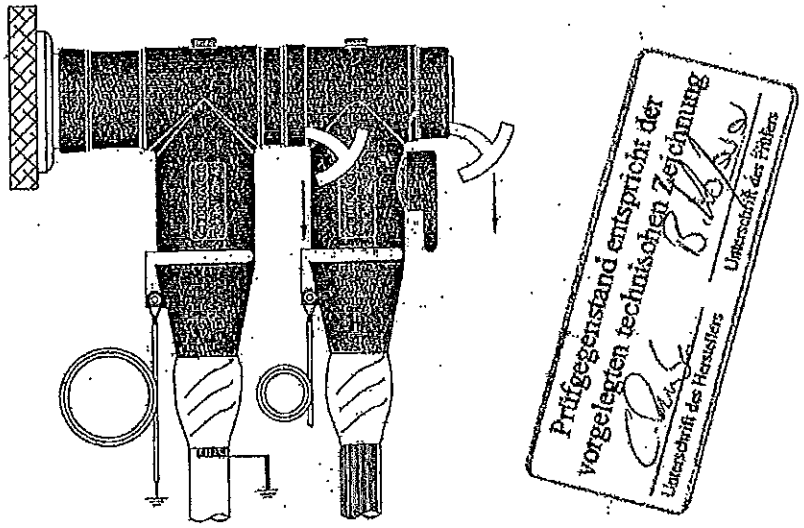
СОФИЯ ООД

13)



- Moisten inside of the CTKS-connector body and the new insulating plug with lubricant and filling agent GM1.
- Cut out a second tongue from the applicator and insert it into the connector body.
- Insert the new insulating plug into the connector body. Tighten the insulating plug with an appropriate tool. Do not apply a shear moment „M" bigger than 40 Nm.

14)



- Pull out gently the decompression devices and remove remaining of lubricant and filling agent GM1.

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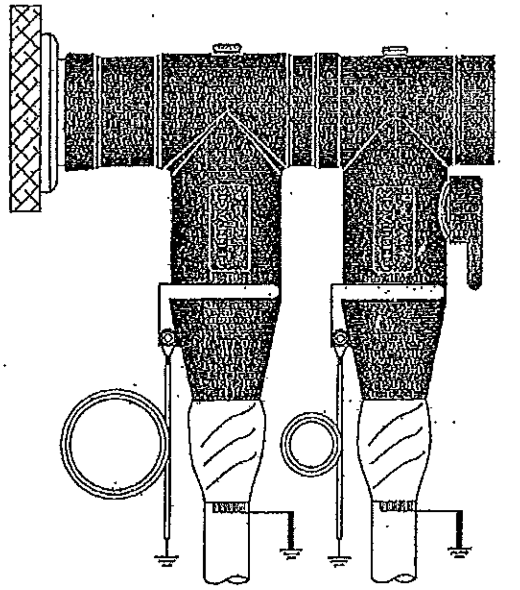
Figure 2.8: Installation Instruction

15)



- Insert the conductive protection cup over the connector body and ground the CTKS-connector body.
- Further earthing measurements have to be carried out according to local regulations.

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Figure 2.9: Installation Instruction

СОФИЯ

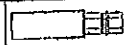
ООД

Packliste Packing list Liste d'emballage	256 839	Lista de carga	CELLPACK Electrical Products

MEDIUM VOLTAGE — CELLPLUX

	Typ		
T-Koppelsteckanschluss T Coupling Connector Connecteur de couplage en T Terminal de acople en T	$U_o/U(U_m)$	CTKS 630A 24kV 95-240/EGA 6/10(12)kV 8,7/15(17,5)kV 12/20(24)kV Isolation min. Ø: 22 mm	150 - 240 mm² 120 - 240 mm² 95 - 240 mm²

Version: 03

Pos		St. Cont.	Dimension			
1		3	CTKS 630A 24 kV	Steckanschluß Plug-in connector		Connecteur Séparable Cuerpo Terminal
2		3	CTKS 630A 24 kV	Isol. Anschluss-Stopfen Insulated plug		Connecteur Isolé Enchufe aislado
3		3	FSE 20	Feldsteuerelement Field control element		Contrôleur de champ Elemento de control de campo
4		4	GM1	Gleit- und Füllmittel Lubrificant and filler		Lubrifiant Lubricante
5		3	AH 3	Aufschiebehilfe Applicator		Dispositif d'enfilage Aplicador
6		3	CTKS(A) 630A	Verbindungsstück Adaptor plug		Raccordement Pieza de conexion
7		3	CTKS 630A 95-240	Schraubkabelschuh + Anschlussbolzen Screw cable lug with connecting bolt		Cintre de fixation Terminal con
8		3	DM 1 25x200 mm	Dichtband grau Sealing tape grey		Ruban d'étanchéité gris Cinta de estanqueidad gris
9		3	2585 50x350 mm	Polsterband Rubber mastic tape		Ruban mastique Cinta Mastik
10		1	N°. 028 5 m	Isolierband PVC tape		Ruban isolant Cinta aislante
11		3	Paar	Handschuhe Gloves		Gants Guante
12		3	ST	Tuch mit Silikonöl Tissue with silicon oil		Tissu siliconé Toalla siliconada
13		9	RT	Reinigungstuch Cleaning tissue		Tissu de nettoyage Toalla de Limpieza
14		4	MA de, en, fr, es	Montageanleitung Working Instructions		Instructions de montage Instrucciones de montaje

Prüfgegenstand entspricht der vorgelegten technischen Zeichnung

Unterschrift des Herstellers — Unterschrift des Prüfers

Figure 2.10: Packing list

DIN VDE 0278-629-1 (VDE 0278-629-1):2009-07
HD 629.1 S2:2006 + A1:2008

Anhang A
(Informativ)

Dokumentation der Prüfkabel (siehe 5.1.1 und 8.2)

Nennspannung U_0 (U_m): 12/20(24) kV

Kabelaufbau:	☒ 1-Leiter	☐ 3-Leiter	☒ einzeln geschirmt
			☐ gemeinsam geschirmt
Leiteraufbau:	☐ Al	☒ Cu	
	☒ mehrdrähtig	☐ massiv	
	☒ Rundleiter	☐ Sektorleiter	
	☐ 120 mm²	☐ 150 mm²	☒ 185 mm²
	anderer Querschnitt:	mm²	
Kabelisolation:	☒ VPE		
	☐ EPR	☐ HEPR	
Äußere Leitschicht:	☒ fest extrudiert	☐ abziehbar	
Metallischer Schirm:	☒ Drähte	☐ Bänder	☐ extrudiert
Armierung:	☐ Draht	☐ Band	
Außenmantel:	☒ PVC	☐ PE (Typ ist anzugeben)	
Wassersperre, wenn vorhanden:	☐ im Leiter	☐ unter Außenmantel	

Durchmesser:
- Leiter 16,2 mm
- Isolierung 28,3 mm
- äußere Leitschicht 29,1 mm
- Außenmantel 36,5 mm

Kabelbezeichnung: TF Kabel 5
N2XSY 1x185 RM/25 20kV

ВЯРНО С ОРИГИНАЛА

Figure 2.9: Cable data sheet

Tests: Test volume, chronological order and requirements conform to DIN VDE 0278-629-1:2009-07 test sequence D1, table 7 and additional test pos. 21.
The PD-test was performed at 2 V_0 The tests were carried out in accordance with the test methods described in DIN EN 61442 01/2006.

Test sequence D1:

Pos. 1. *DC voltage withstand test*
V = 6 V_0 = - 76 kV ; t =15 min

Pos. 2. *AC voltage withstand test*
◊ /√2 = 4,5 V_0 = 57 kV; t = 5 min

Pos. 3. *Partial discharge test*
◊ /√2 = 2,0 V_0 = 25 kV ; PD ≤ 10 pC

Pos. 4. *Impulse voltage withstand test at elevated temperature*
Impulse voltage
◊ = 125 kV; positive and negative polarity each 10 impulses

Pos. 5. *Electrical heat cycling in air*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊ /√2 = 32 kV, number of cycles: 63

Pos. 6. *Electrical heat cycling in water*
each loading cycle had a 5 hour heating period and a 3 hour no-load cooling period;
test voltage: ◊ /√2 = 32 kV, number of cycles: 63

Pos. 10. *Disconnection / Connection*
5 complete operations,
no visible damage to contact

Pos. 11. *Partial discharge test at ambient temperature and elevated temperature*
◊ /√2 = 2,0 V_0 = 25 kV ; PD ≤ 10 pC

Pos. 12. *Impulse voltage withstand test,*
lightning impulse voltage
◊ = 125 kV; positive and negative polarity each 10 impulses

Pos. 13. *AC voltage withstand test*
◊ /√2 = 2,5 V_0 = 32 kV; t = 15 min

Additional Test:

Pos. 21. *Capacitive test point performance*
C_{tc} > 1,0 pF
C_{te} / C_{tc} ≤ 12

3 Mounting

Final assembling of the separable connector was executed in the high-voltage laboratory of the IEH.

4 Test Setups

4.1 DC Voltage Withstand Test

The DC-voltage was generated according to Figure 4.1. The voltage measurement was carried out with an ohmic-capacitive divider (ratio 2000:1). The measurement uncertainty was 3%.

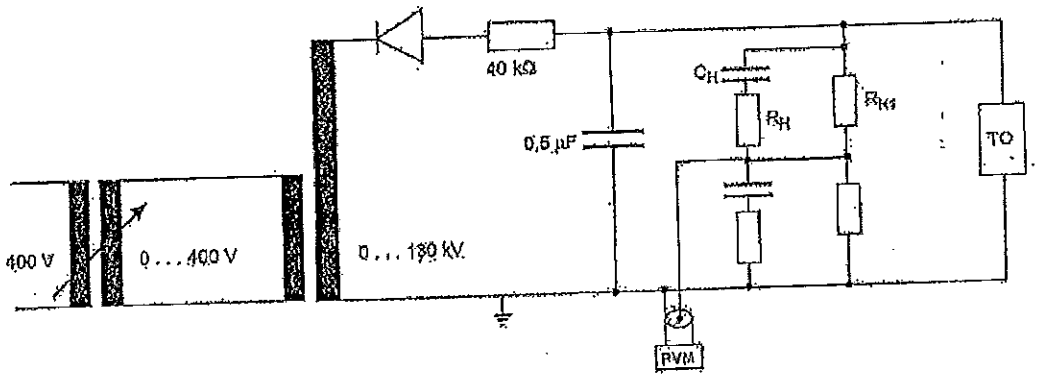


Figure 4.1: Scheme of DC voltage test circuit.
R_H = 3,6 kΩ, R_{H1} = 360 MΩ, C_H = 180 pF, ratio 2.000:1, PVM: Peak Voltmeter, TO: Test object, measurement uncertainty 3%

4.2 AC Voltage Withstand Test

The test voltage was generated by an 60-kVA transformer. The voltage measurement was carried out with a capacitive divider (C_H = 180 pF; ratio = 2.000) and a peak voltmeter calibration $\hat{U}/\sqrt{2}$.

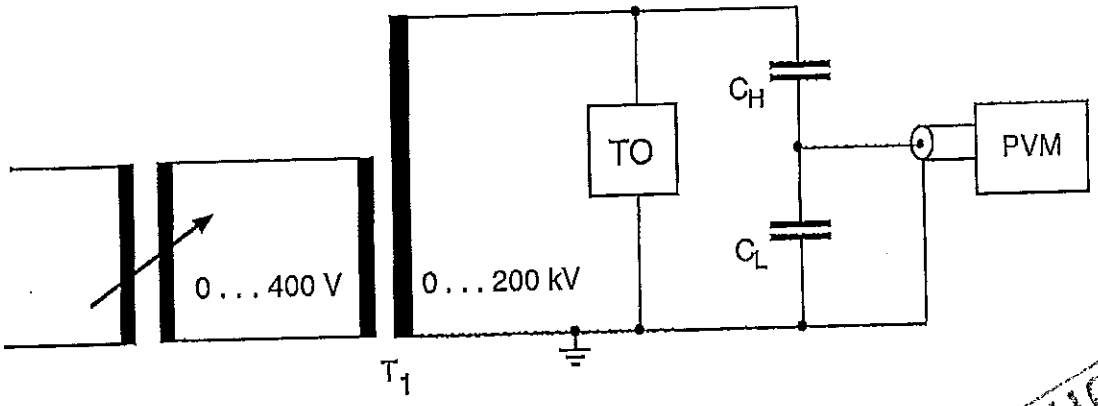


Figure 4.2: Scheme of AC test circuit
T_1 : transformer 400V / 200000V ; 60 kVA ; v_K = 3,5 % ; 50 Hz
C_H: 180 pF ; ratio 2000:1 ; PVM : Peak-Voltmeter
TO: Test object; measurement uncertainty 3 %

4.3 Partial-Discharge Test

The PD-measurement was performed with an analog bridge according to *Kreuger*, Figure 4.3. External PDs producing common mode signals at the detector are rejected by the differential amplifier. Internal PDs represent differential mode signals and are amplified. The background noise level at 25 kV_{rms} was 1,0 pC.

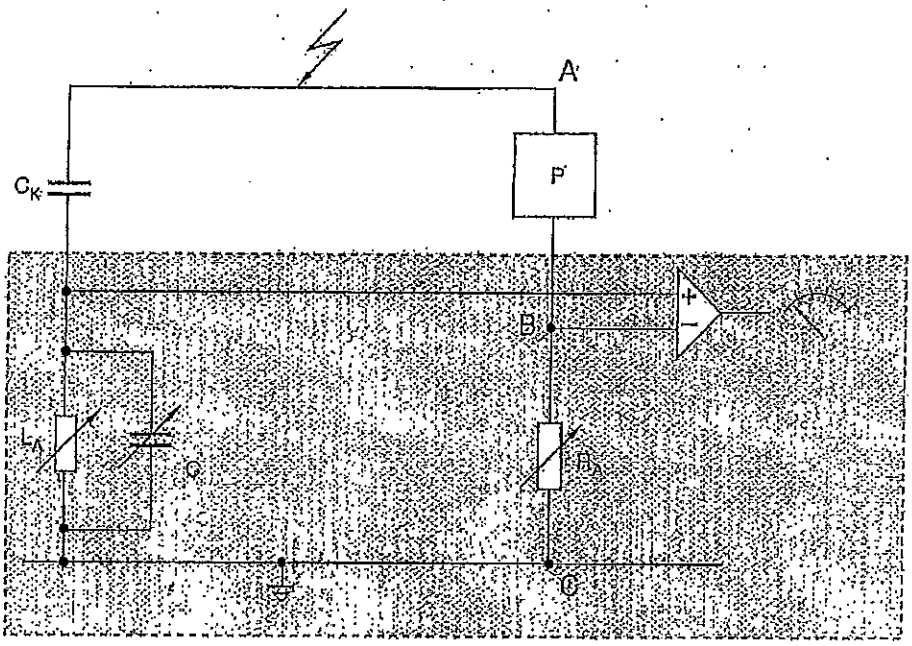


Figure 4.3: Scheme of PD test circuit
TO1: Test object 1
TO2: Test object 2

For balancing the bridge a calibrating impulse with q_A = 10.000 pC is applied between the terminals A (high-voltage) and C (ground) and the amplifier output is minimized. A pulse between the terminals A and C corresponds to an external PD. For the calibration a PD pulse, q_A = 10 pC, is applied between A and B. Subsequently, the amplifier output of the PD measuring unit is adapted to the applied pulse.

Starting from zero the AC-voltage was steadily raised up to 28,1 kV and kept constant for 60 s, then slowly reduced to 25 kV including pd-reading.

4.4 Lightning Impulse Voltage Withstand Test

For impulse testing was used a two-stage Marx generator (Haefely) with a maximum cumulative charging voltage of V = 400 kV and a maximum impulse energy of E_{max} = 20 kWs. At this test, the capacity of the energy storage capacitor was C_S = 0.25 µF. The crest value of the impulse voltage was measured by a damped capacitive divider and a subsequent impulse peak voltmeter (Haefely). The front time and the time to half value were evaluated from the oscillographs.

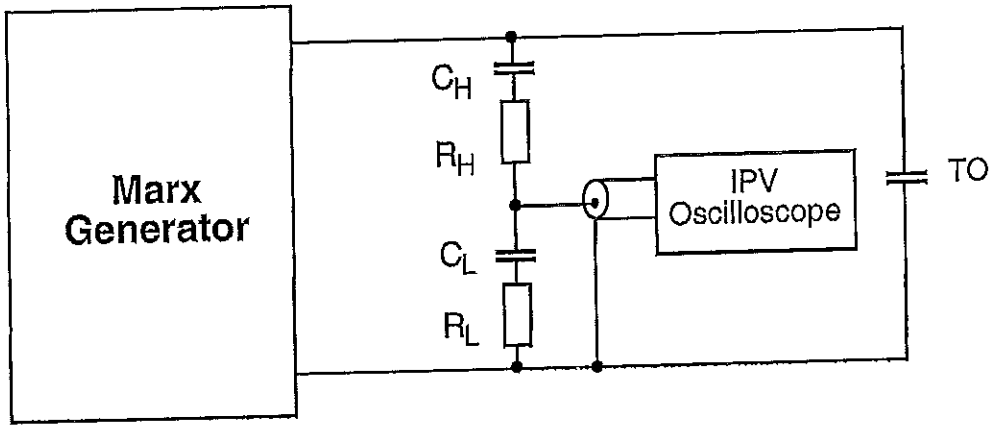


Figure 4.4:Scheme of impulse voltage test circuit
C_H: 1200 pF ; R_H = 70 Ω ; ratio: 3215;
IPV: Impulse-peak-voltmeter (Haefely) – measurement uncertainty 3%
Oscilloscope: Tektronix TDS 3044B – measurement uncertainty 2%

The waveform parameters were determined at reduced charging voltage.

Positive impulse:	T_1 = 3.07 µs	T_2 = 49.6 µs
Negative impulse:	T_1 = 2.87 µs	T_2 = 49.4 µs

4.5 Electrical Heat Cycling in Air

The test objects must be heated by a current which provides the permitted service temperature of the tested cable plus 5 K - 10 K, that means 95°C - 100°C, for XLPE-cable. The heating current I was determined with a dummy cable. The same cable as used for the test, with a length of 3 m, was drilled with a diameter of 0.8 mm up to the conductor. The temperature was measured with a thermo couple NiCr-Ni. The measurement uncertainty was ± 2 K.

The maximum heating current for this test was 760 A. Current inception was accomplished by a transformer (V_1 = 400 V; V_2 = 8 V) which used the cable as secondary winding. The current was regulated by a control unit and measured by a current transformer, 1500/5, and a digital multimeter. The measurement uncertainty was 1%.

4.6 Electrical Heat Cycling in Water

The test object were placed in a tank and filled with water. The height of the water was 1000 mm above the test object. The conductivity of the water at 20°C was 63 mS/m.
At a distance of 100 mm from each side of the accessory, the cable oversheath was removed for a distance of 50 mm.

4.7 Capacitive test point performance

The test was performed with a different bridge. For this test the capacity of test point to the cable conductor C_{tc} and the capacity of test point to earth C_{te} were measured at ambient temperature.

5 Results

5.1 Test Sequence D1

5.1.1 DC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 24.09.2010

Test voltage: V = - 76 kV ; t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the DC voltage withstand test.

The test was passed successfully.

5.1.2 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 24.09.2010

Test voltage: $\hat{U}/\sqrt{2}$ = 57 kV , t = 5 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.1.3 Partial Discharge Test

This test was carried out as described in 4.

Test date: 24.09.2010

Voltage: $\hat{U}/\sqrt{2}$ = 28.1 kV , t = 60 s thereafter
$\hat{U}/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

5.1.4 Impulse Voltage Withstand Test at elevated Temperature

This test was carried out as described in 4

Test date:	24.09.2010
Test voltage:	◊ = 125 kV
Maximum heating current:	I = 760 A; t = 5 h
Number of tests:	10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.5 Electrical Heat Cycling in Air

This test was carried out as described in 4.

Test date:	30.09. - 21.10.2010
Test voltage:	$\Diamond/\sqrt{2}$ = 32 kV
Maximum heating current:	I = 760 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63

Neither flashover nor breakdown occurred.

The test was passed successfully.

5.1.6 Electrical Heat Cycling in Water

This test was carried out as described in 4.

Test date:	28.10. – 18.11.2010
Conductivity:	63 mS/m
Test voltage:	$\Diamond/\sqrt{2}$ = 32 kV
Maximum heating current:	I = 760 A
Cycle:	5 h heating; 3 h cooling
Number of cycles:	63
Heat of water:	1000mm

Neither flashover nor breakdown occurred.
The test was passed successfully.

5.1.7 Disconnection / Connection

Test date: 30.11.2010

Number: 5 complete operations

With each test object there was no visible damage to contact.

The test was passed successfully.

5.1.8 Partial Discharge Test

5.1.8.1 Partial Discharge Test at ambient temperature

This test was carried out as described in 4.

Test date: 09.12.2010

Voltage: $\Diamond/\sqrt{2}$ = 28.1 kV, t = 60 s thereafter
$\Diamond/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

5.1.8.2 Partial Discharge Test at elevated temperature

This test was carried out as described in 4

Test date: 10.12.2010

Maximum heating current: I = 760 A, t = 5 h

Voltage: $\Diamond/\sqrt{2}$ = 28.1 kV, t = 60 s thereafter
$\Diamond/\sqrt{2}$ = 25 kV with pd reading

PD magnitude (25 kV): < 10 pC

The test was passed successfully.

ВЯРНО С ОРИГИНАЛА

5.1.9 Impulse Voltage Withstand Test

This test was carried out as described in 4.

Test date: 10.12.2010

Test voltage: ◊ = 125 kV

Number of tests: 10 positive polarity, 10 negative polarity

Neither flashover nor breakdown occurred at the test objects during all lightning impulse voltage withstand tests.

The test was passed successfully.

5.1.10 AC Voltage Withstand Test

This test was carried out as described in 4.

Test date: 10.12.2010

Test voltage: $\Diamond/\sqrt{2}$ = 32 kV , t = 15 min

With each test object neither flashover nor breakdown occurred at the test objects during the AC voltage withstand test.

The test was passed successfully.

5.2 Additional Tests

Capacitive test point performance

This test was carried out as described in 4.

Test date: 22.12.2010

Capacitance of test point to cable conductor C_{tc} > 1,0pF

Requirement : C_{tc} > 1,0pF

Ratio of capacitance of test point to earth C_{te} and capacitance of test point to cable conductor: $C_{tc} : C_{te} / C_{tc} < 12$

Requirement: $C_{tc} : C_{te} / C_{tc} \leq 12$

6 Conclusion

The separable connector type CELLPLUX CTKS 630A 24 kV passed all tests described in clause 2 successfully. The test object fulfilled the requirements according DIN VDE 0278-629-1:2009-07, table 7, test sequence D1 and additional test table 7, pos.21.

Karlsruhe, 15.01.2011

Dr.-Ing. R. Badent
Bereichsleiter HPT

Dr.-Ing. B. Hoferer
stellv. Bereichsleiter HPT

ВЯРНО С ОРИГИНАЛА

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 4

DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH
Unterzeichner der Multilateralen Abkommen von EA und ILAC zur gegenseitigen Anerkennung

vertreten im

Deutschen AkkreditierungsRat

Akkreditierung

Die TGA GmbH, vertreten durch die DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH, bestätigt hiermit, dass das Prüflaboratorium

Institut für Elektroenergiesysteme und Hochspannungstechnik (IEH) der Universität Karlsruhe Kaiserstraße 12

D-76128 Karlsruhe

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in den Bereichen

Dielektrische und Klimaprüfungen an Hochspannungsgeräten und -Komponenten, Prüfungen an Hochspannungskabeln, -Garnituren und -Leitungen und Elektromagnetische Verträglichkeit (EMV)

nach den in der Anlage aufgeführten Normen und Spezifikationen auszuführen.

Die Akkreditierung ist gültig bis: **20.08.2014**

Die Anlage ist Bestandteil der Urkunde und besteht aus **19** Seiten.

DAR-Registriernummer: **DAT-PL-039/94-03**

Frankfurt/Main, 21.08.2009

I.V. Dipl.-Ing. (FH) R. Egner
Leiter der Akkreditierungsstelle

Mitglied in EA, ILAC, IAF

Siehe Hinweise auf der Rückseite

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

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EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

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Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory

Karlsruher Institut für Technologie (KIT)
Institut für Elektroenergiesysteme und Hochspannungstechnik (IEH)
Engesserstraße 11, 76128 Karlsruhe

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

Electromagnetic Compatibility (EMC), High Voltage, Power Cable

The accreditation certificate shall only apply in connection with the notice of accreditation of 10.07.2014 with the accreditation number D-PL-11068-09 and is valid until 09.07.2019. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 21 pages.

Registration number of the certificate: D-PL-11068-09-00

Frankfurt am Main, 10.07.2014

Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-PL-11068-09-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 10.07.2014 to 09.07.2019 Date of issue: 10.07.2014

Holder of certificate:

Karlsruher Institut für Technologie (KIT)
Institut für Elektroenergiesysteme und Hochspannungstechnik (IEH)
Engesserstraße 11, 76128 Karlsruhe

Tests in the fields:

Electromagnetic Compatibility (EMC), High Voltage, Power Cable

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
High Voltage	IEC 60034-15:2009 DIN EN 60034-15:2010 VDE 0530-15:2010	Rotating electrical machines - Part 15: Impulse voltage withstand levels of form-wound stator coils for rotating a.c. machines	
High Voltage	IEC 60044-3:2002 DIN EN 60044-3:2003 VDE 0414-44-3:2003	Instrument transformers - Part 3: Combined transformers	
High Voltage	IEC 60044-7:1999 DIN EN 60044-7:2000 VDE 0414-44-7:2000	Instrument transformers - Part 7: Electronic voltage transformers	
High Voltage	IEC 60044-8:2002 DIN EN 60044-8:2003 VDE 0414-44-8:2003	Instrument transformers - Part 8: Electronic current transformers	
High Voltage	IEC 60060-1:2010 DIN EN 60060-1:2011 VDE 0432-1:2011	High-voltage test techniques - Part 1: General definitions and test requirements	

Annex to the Accreditation Certificate D-PL-11068-09-00

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
High Voltage	IEC 60060-2:2010 DIN EN 60060-2:2011 VDE 0432-2:2011	High-voltage test techniques – Part 2 Measuring systems	
High Voltage	IEC 60068-2-1:2007 DIN EN 60068-2-1:2008	Environmental testing - Part 2-1: Tests - Test A: Cold	
High Voltage	IEC 60068-2-11:1981 DIN EN 60068-2-11 IEC 60068-2-14:2009 DIN EN 60068-2-14:2010 VDE 0468-2-14:2010	Environmental testing - Part 2: Tests. Test Ka: Salt mist Environmental testing - Part 2-14: Tests - Test N: Change of temperature	
High Voltage	IEC 60068-2-17:1994 DIN EN 60068-2-17:1995	Basic environmental testing procedures - Part 2: Tests - Test Q: Sealing	
High Voltage	IEC 60068-2-2:2007 DIN EN 60068-2-2:2008 VDE 0468-2-2:2008	Environmental testing - Part 2-2: Tests - Test B: Dry heat	
High Voltage	IEC 60068-2-21:2006 DIN EN 60068-2-21:2007	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	
High Voltage	IEC 60068-2-38:2009 DIN EN 60068-2-38:2010 VDE 0468-2-38:2010	Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperature/humidity cyclic test	
High Voltage	IEC 60076-1:2011 DIN EN 60076-1:2012 VDE 0532-76-1:2012	Power transformers - Part 1: General	
High Voltage	IEC 60076-11:2004 DIN EN 60076-11:2005 VDE 0532-76-11:2005	Power transformers - Part 11: Dry-type transformers	
High Voltage	IEC 60076-16:2011 DIN EN 60076-16:2012 VDE 0532-76-16:2012	Power transformers - Part 16: Transformers for wind turbine applications	

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
High Voltage	IEC 60076-3:2013 DIN EN 60076-3:2012 VDE 0532-76-3:2012	Power transformers - Part 3: Insulation levels, dielectric tests and external clearances in air	
High Voltage	IEC 60076-4:2002 DIN EN 60076-4:2003 VDE 0532-76-4:2003	Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing - Power transformers and reactors	
High Voltage	IEC 60076-6:2007 DIN EN 60076-6:2008 VDE 0532-76-6:2009	Power transformers - Part 6: Reactors	
High Voltage	IEC 60099-4:2009 DIN EN 60099-4:2010 VDE 0675-4:2010	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems	
High Voltage	IEC 60137:2008 DIN EN 60137:2009 VDE 0674-5:2009	Insulated bushings for alternating voltages above 1 000 V	
High Voltage	IEC 60143-1:2004 DIN EN 60143-1:2004 VDE 0560-42:2004	Series capacitors for power systems - Part 1: General	
High Voltage	IEC 60156:1995 DIN EN 60156:1996 VDE 0370-5:1996	Insulating liquids - Determination of the breakdown voltage at power frequency - Test method	
High Voltage	IEC 60168:2001 DIN EN 60168:2001 VDE 0674-1:2001	Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V	
High Voltage	IEC 60214-1:2003 DIN EN 60214-1:2003 VDE 0532-214-1:2003	Tap-changers - Part 1: Performance requirements and test methods	
High Voltage	IEC 60243-1:2013 DIN EN 60243-1:1999 VDE 0303-21:1999	Electric strength of insulating materials - Test methods - Part 1: Tests at power frequencies	
High Voltage	IEC 60243-2:2001 DIN EN 60243-2:2001 VDE 0303-22:2001	Electric strength of insulating materials - Test methods - Part 2: Additional requirements for tests using direct voltage	

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
High Voltage	IEC 60243-3:2001 DIN EN 60243-3:2002 VDE 0303-23:2002	Electric strength of insulating materials - Test methods - Part 3: Additional requirements for 1,2/50 µs impulse tests	
High Voltage	IEC 60252-1:2013 DIN EN 60252-1:2011 VDE 0560-8:2011	AC motor capacitors - Part 1: General - Performance, testing and rating - Safety requirements - Guidance for installation and operation	
High Voltage	IEC 60270:2000 DIN EN 60270:2001 VDE 0434:2001	High-voltage test techniques - Partial discharge measurements	
High Voltage	IEC 60273:1990 DIN IEC 60273:1993 VDE 0674-4:1993	Characteristic of indoor and outdoor post insulators for systems with nominal voltages greater than 1000 V	
High Voltage	IEC 60282-1:2009 DIN EN 60282-1:2010 VDE 0670-4:2010	High-voltage fuses - Part 1: Current-limiting fuses	
High Voltage	IEC 60358-1:2013 DIN EN 60358-1:2013 VDE 0560-2:2013	Corrigendum 1 - Coupling capacitors and capacitor dividers - Part 1: General rules	
High Voltage	IEC 60383-1:1993 DIN EN 60383-1:2001 VDE 0446-1:2001	Insulators for overhead lines with a nominal voltage above 1000 V - Part 1: Ceramic or glass insulator units for a.c. systems - Definitions, test methods and acceptance criteria	
High Voltage	IEC 60383-2:1993 DIN EN 60383-2:1995 VDE 0446-4:1995	Insulators for overhead lines with a nominal voltage above 1000 V - Part 2: Insulator strings and insulator sets for a.c. systems - Definitions, test methods and acceptance criteria	
High Voltage	IEC 60433:1998 DIN EN 60433:1999 VDE 0446-7:1999	Insulators for overhead lines with a nominal voltage above 1 000 V - Ceramic insulators for a.c. systems - Characteristics of insulator units of the long rod type	

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
High Voltage	IEC 60437:1997 DIN EN 60437:1998 VDE 0674-6:1998	Radio interference test on high-voltage insulators	
High Voltage	IEC 60507:1991 DIN EN 60507:1994 VDE 0448-1:1994	Artificial pollution tests on high-voltage insulators to be used on a.c. systems	
High Voltage	IEC 60618:1978 EN 60618:1999	Inductive voltage dividers	
High Voltage	IEC 60644:2009 DIN EN 60644:2010 VDE 0670-401:2010	Specification for high-voltage fuse-links for motor circuit applications	
High Voltage	IEC 60660:1999 DIN EN 60660:2000 VDE 0441-3:2000	Insulators - Tests on indoor post insulators of organic material for systems with nominal voltages greater than 1 000 V up to but not including 300 kV	
High Voltage	IEC 60700-1:2008 DIN EN 60700-1:2009 VDE 0553-1:2009	Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing	
High Voltage	IEC 60832-1:2010 DIN EN 60832-1:2010 VDE 0682-211:2010	Live working - Insulating sticks and attachable devices - Part 1: Insulating sticks	
High Voltage	IEC 60832-2:2010 DIN EN 60832-2:2010 VDE 0682-212:2010	Live working - Insulating sticks and attachable devices - Part 2: Part 2: Attachables devices	
High Voltage	IEC 60871-1:2005 DIN EN 60871-1:2006 VDE 0560-410:2006	Shunt capacitors for a.c. power systems having a rated voltage above 1000 V - Part 1: General	
High Voltage	IEC 60871-4:1996 DIN EN 60871-4:1997 VDE 0560-440:1997	Shunt capacitors for AC power systems having a rated voltage above 1000 V - Part 4: Internal fuses	
High Voltage	IEC 60895:2003 DIN EN 60895:2004 VDE 682-304:2004	Live working - Conductive clothing for use at nominal voltage up to 800 kV a.c. and +/- 600 kV d.c.	

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High Voltage	IEC 60900:2012 DIN EN 60900:2013 VDE 0682-201:2013	Live working - Hand tools for use up to 1 000 V a.c. and 1 500 V d.c.	
High Voltage	IEC 60903:2005 DIN EN 60903:1:2005 VDE 0682-311:1:2005	Live working - Gloves of insulating material	
High Voltage	IEC 60947-3:2012 DIN EN 60947-3:2012 VDE 0660-107:2012	Low-voltage switchgear and controlgear - Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units	
High Voltage	IEC 60984:2005 DIN EN 60984:2003 VDE 0682-312:2003	Sleeves of insulating material for live working	
High Voltage	IEC 61071:2007 DIN EN 61071:2008 VDE 0560-120:2008	Capacitors for power electronics	
High Voltage	IEC 61071:2007 DIN EN 61071:2008 VDE 0560-120:2008	Capacitors for power electronics	
High Voltage	IEC 61219:2000 DIN EN 61219:1995 VDE 0683-200:1995	Corrigendum 1 - Live working - Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device - Lance earthing	
High Voltage	IEC 61229:2002 DIN EN 61229/A2:2003 VDE 0682-551/A2:2003	Rigid protective covers for live working on a.c. installations	
High Voltage	IEC 61230:2008 DIN EN 61230:2009 VDE 0683-100:2009	Live working - Portable equipment for earthing or earthing and short-circuiting	
High Voltage	IEC 61236:2010 DIN EN 61236:2011 VDE 0682-651:2011	Live working - Saddles, stick clamps and their accessories	
High Voltage	IEC 61243-1:2009 DIN EN 61243-1:2010 VDE 0682-411:2010	Live working - Voltage detectors - Part 1: Capacitive type to be used for voltages exceeding 1 kV a.c.	

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High Voltage	IEC 61243-2:2002 DIN EN 61243-2/A2:2003 VDE 0682-412/A1:2003	Live working - Voltage detectors - Part 2: Resistive type to be used for voltages of 1 kV to 36 kV a.c.	
High Voltage	IEC 61243-3:2009 DIN EN 61243-3:2011 VDE 0682-401:2011	Live working - Voltage detectors - Part 3: Two-pole low-voltage type	
High Voltage	IEC 61243-5:1997 DIN EN 61243-5:2002 VDE 0682-415:2002	Live working - Voltage detectors - Part 5: Voltage detecting systems (VDS)	
High Voltage	IEC 61284:1997 DIN EN 61284:1998 VDE 0212-1:1998	Overhead lines - Requirements and tests for fittings	
High Voltage	IEC 61325:1995 DIN EN 61325:1996 VDE 0446-5:1996	Insulators for overhead lines with a nominal voltage above 1000 V - Ceramic or glass insulator units for d.c. systems - Definitions, test methods and acceptance criteria	
High Voltage	IEC 61378-1:2012 DIN EN 61378-1:2012 VDE 0532-41:2012	Converter transformers - Part 1: Transformers for industrial applications	
High Voltage	IEC 61378-2:2001 DIN EN 61378-2:2001 VDE 0532-42:2001	Convertor transformers - Part 2: Transformers for HVDC applications	
High Voltage	IEC 61462:2007 DIN EN 61462:2008 VDE 0441-102:2008	Composite hollow insulators - Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1000 V - Definitions, test methods, acceptance criteria and design recommendations	
High Voltage	IEC 61466-1:2007 DIN EN 61466-1:2010 VDE 0441-4:2010	Composite string insulator units for overhead lines with a nominal voltage greater than 1000 V - Part 1: Standard strength classes and end fittings	
High Voltage	IEC 61466-2:2002 DIN EN 61466-2:2002 VDE 0441-5:2002	Composite string insulator units for overhead lines with a nominal voltage greater than 1000 V - Part 2: Dimensional and electrical characteristics	

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High Voltage	IEC 61854:1998 DIN EN 61854:1999 VDE 0212-2:1999	Overhead lines - Requirements and tests for spacers	
High Voltage	IEC 61869-1:2007 DIN EN 61869-1:2010 VDE 0414-9-1:2010	Instrument transformers - Part 1: General requirements	
High Voltage	IEC 61869-2:2012 DIN EN 61869-2:2013 VDE 0414-9-2:2013	Instrument transformers - Part 2: Additional requirements for current transformers	
High Voltage	IEC 61869-3:2011 DIN EN 61869-3:2012 VDE 0414-9-3:2012	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers	
High Voltage	IEC 61869-4:2013 VDE 0414-9-4:2008	Instrument transformers - Part 4: Additional requirements for combined customers	
High Voltage	IEC 61869-5:2011 DIN EN 61869-5:2012 VDE 0414-9-5:2012	Instrument transformers - Part 5: Additional requirements for capacitor voltage transformers	
High Voltage	IEC 61921:2003 DIN EN 61921:2004 VDE 0560-700:2004	Power capacitors - Low-voltage power factor correction banks	
High Voltage	IEC 61952:2008 DIN EN 61952:2009 VDE 0441-200:2009	Insulators for overhead lines - Composite line post insulators for A.C. systems with a nominal voltage greater than 1000 V - Definitions, test methods and acceptance criteria	
High Voltage	IEC 61954:2013 DIN EN 61954:2012 VDE 0553-100:2012	Static var compensators (SVC) - Testing of thyristor valves	
High Voltage	IEC 62146-1:2013	Grading capacitors for high-voltage alternating current circuit breakers	
High Voltage	IEC 62155:2003 DIN 62155:2004 VDE 0674-200:2004	Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V	

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High Voltage	IEC 62217:2012 DIN EN 62217:2013 VDE 0441-1000:2013	Polymeric HV insulators for indoor and outdoor use - General definitions, test methods and acceptance criteria	
High Voltage	IEC 62271-1:2011 DIN EN 62271-1:2012 VDE 0671-1:2012	High-voltage switchgear and controlgear - Part 1: Common specifications	
High Voltage	IEC 62271-100:2012 DIN EN 62271-100:2013 VDE 0671-100:2013	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	
High Voltage	IEC 62271-102:2001 DIN EN 62271-102:2012 VDE 0671-102:2012	High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	
High Voltage	IEC 62271-102:2013 DIN EN 62271-102:2012 VDE 0671-102:2012	Amendment 2 - High-voltage switchgear and controlgear - Part 102: Alternating current disconnectors and earthing switches	
High Voltage	IEC 62271-104:2009 DIN EN 62271-104:2010 VDE 0671-104:2010	High-voltage switchgear and controlgear - Part 104: Alternating current switches for rated voltages of 52 kV and above	
High Voltage	IEC 62271-105:2012 DIN EN 62271-105:2013 VDE 0671-105:2013	High-voltage switchgear and controlgear - Part 105: Alternating current switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV	
High Voltage	IEC 62271-107:2012 DIN EN 62271-107:2013 VDE 0671-107:2013	High-voltage switchgear and controlgear - Part 107: Alternating current fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV	
High Voltage	IEC 62271-108:2005 DIN EN 62271-108:2006 VDE 0671-108:2006	High-voltage switchgear and controlgear - Part 108: High-voltage alternating current disconnecting circuit-breakers for rated voltages of 72,5 kV and above	

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High Voltage	IEC 62271-200:2011 DIN EN 62271-200:2012 VDE 0671-200:2012	High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	
High Voltage	IEC 62271-201:2006 DIN EN 62271-201:2007 VDE 0671-201:2007	High-voltage switchgear and controlgear - Part 201: AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	
High Voltage	IEC 62271-203:2013 DIN EN 62271-203:2012 VDE 0671-203:2012	Corrigendum 1 - High-voltage switchgear and controlgear - Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	
High Voltage	IEC 62271-206:2011 DIN EN 62271-206:2011 VDE 0671-206:2011	High-voltage switchgear and controlgear - Part 206: Voltage presence indicating systems for rated voltages above 1 kV and up to and including 52 kV	
High Voltage	IEC/PAS 60099-7:2004 DIN EN 60099-1:2000 VDE 0675-1:2000	Surge arresters - Part 7: Glossary of terms and definitions from IEC publications 60099-1, 60099-4, 60099-6, 61643-1, 61643-12, 61643-21, 61643-311, 61643-321, 61643-331 and 61643-341	
High Voltage	IEC/TR 61294:1993 DIN VDE 0380-5:1995	Insulating liquids - Determination of the partial discharge inception voltage (PDIV) - Test procedure	
High Voltage	IEC/TR 62271-305:2009	High-voltage switchgear and controlgear - Part 305: Capacitive current switching capability of air-insulated disconnectors for rated voltages above 52 kV	
High Voltage	IEC/TS 61639:1996	Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above	
High Voltage	DIN EN 137000:1998 VDE 0560-800:1998	Generic specification - Fixed aluminium electrolytic a.c. capacitors with non-solid electrolyte for use with motors	

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High Voltage	DIN EN 50089:1994 VDE 0670-806:1994	Cast resin partitions for metal enclosed gas-filled high voltage switchgear and controlgear	
High Voltage	DIN EN 50482:2008 VDE 0414-6:2008	Instrument transformers - Three-phase inductive voltage transformers having Um up to 52 kV	
High Voltage	DIN IEC 60871-2:1993 VDE 0560-420:1993 IEC/TS 60871-2:1996	Shunt capacitors for AC power systems having a rated voltage above 1000 V - Part 1: General	
High Voltage	DIN VDE 0212 Teil 55:1998 VDE 0212-55:1998	Fittings for overhead lines and switchgear; dynamic-mechanical behaviour of antivibration fittings	
High Voltage	DIN VDE 0303 Teil 4:1969 VDE 0303-4:1969	Specification for electrical tests of insulating materials; Determination of the dielectric properties	
High Voltage	DIN VDE 0441-1:1985	Tests on insulators of organic material for systems with nominal alternating voltages greater than 1000 V; tests on materials	
High Voltage	DIN VDE 0532-21:1982 VDE 0532-21:1982 DIN 57532-21:1982	Transformers and reactors; starting transformers and starting reactors [VDE Specification]	
High Voltage	DIN VDE 0560-1:1969 VDE 0560-1:1969 DIN VDE 0560-11:1970	Rules for capacitors; part 11: Rules for capacitors of more than 600 V for the equalizing of pulsating direct voltages	
High Voltage	DIN VDE 0560-3:1968	Regeln für Kondensatoren; Teil 3: Regeln für Kondensatoren für Kopplung, Spannungsmessung und Überspannungsschutz0560-3	
High Voltage	DIN VDE 0660-112:1987	Switchgear and controlgear; additional specification for d.c. air-break switches, air-break disconnectors and air-break switch-disconnectors exceeds 1200 V but not exceeds 3000 V	
High Voltage	DIN VDE 0681-1:1986	Operating, testing and safe-guarding devices for work on electrically energized systems with rated voltages exceeding 1 kV; part 1: general requirements for the parts 2 to 4	

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High Voltage	DIN VDE 0681-2:2013	Live working - Devices for operating, testing and safe-guarding with rated voltages exceeding 1 kV - Part 2: Switching sticks	
High Voltage	DIN VDE 0681-3:2013	Live working - Devices for operating, testing and safe-guarding with rated voltages exceeding 1 kV - Part 3: Fuse tongs	
High Voltage	DIN VDE 0681-6:1985	Operating and testing devices for work and safe guarding on electrically energized systems with rated voltages exceeding 1 kV; voltage detectors to be used for overhead contact systems	
High Voltage	DIN VDE 0682-421:2008	Live working - Voltage detectors - Capacitive type to be used for a.c. systems of 15 kV and 110 kV with a frequency of 16,7 Hz	
High Voltage	DIN VDE 0682-552:2003	Live working - Insulating protective barriers above 1 kV	
High Voltage	DIN VDE 0682-621:2004	Arbeiten unter Spannung - Vorrichtung zum Reinigen durch Absaugen von unter Spannung stehenden Teilen mit emessungsspannungen über 1 kV bis 36 kV	
Power cable	IEC 60141-1:1998	Tests on oil-filled and gas-pressure cables and their accessories - Part 1: Oil-filled, paper or polypropylene paper laminate insulated, metal-sheathed cables and accessories for alternating voltages up to and including 500 kV	
Power cable	IEC 60141-2:1967	Tests on oil-filled and gas-pressure cables and their accessories. Part 2: Internal gas-pressure cables and accessories for alternating voltages up to 275 kV	
Power cable	IEC 60141-3:1967	Tests on oil-filled and gas-pressure cables and their accessories. Part 3: External gas-pressure (gas compression) cables and accessories for alternating voltages up to 275 kV	

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Power cable	IEC 60141-4:1990	Tests on oil-filled and gas-pressure cables and their accessories. Part 4: Oil-impregnated paper-insulated high pressure oil-filled pipe-type cables and accessories for alternating voltages up to and including 400 kV	
Power cable	IEC 60230:1966 DIN EN 60230:2003 VDE 0481-230:2003	Impulse tests on cables and their accessories	
Power cable	IEC 60502-1:2009	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 1: Cables for rated voltages of 1 kV (Um = 1,2 kV) and 3 kV (Um = 3,6 kV)	
Power cable	IEC 60502-2:2005	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)	
Power cable	IEC 60502-4:2010	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 4: Test requirements on accessories for cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)	
Power cable	IEC 60840:2011	Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV) - Test methods and requirements	
Power cable	IEC 60885-2:1987 DIN 60885-2:2004 VDE 0481-885-2:2004	Electrical test methods for electric cables. Part 2: Partial discharge tests	
Power cable	IEC 60885-3:1988 DIN EN 60885-3:2004 VDE 0481-885-3:2004	Electrical test methods for electric cables. Part 3: Test methods for partial discharge measurements on lengths of extruded power cables	

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Power cable	IEC 61238-1:2003 DIN EN 61238-1:2004 VDE 0220-100:2004 IEC/TRF 61238-1:2011	Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV) - Part 1: Test methods and requirements	
Power cable	IEC 61284:1998 DIN EN 61284:1998 VDE 0212-1:1998	Corrigendum 1 - Overhead lines - Requirements and tests for fittings	
Power cable	IEC 61442:2005 DIN EN 61442:2006 VDE 0278-442:2006	Test methods for accessories for power cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)	
Power cable	IEC 61854:1998 DIN EN 61854:1999 VDE 0212-2:1999	Overhead lines - Requirements and tests for spacers	
Power cable	IEC 62067:2011 DIN IEC 62067:2013 VDE 0276-2067:2013	Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um = 170 kV) up to 500 kV (Um = 550 kV) - Test methods and requirements	
Power cable	DIN EN 50393:2006 VDE 0278-393:2006	Test methods and requirements for accessories for use on distribution cables of rated voltage 0,6/1,0 (1,2) kV	
Power cable	HD 620 S2:2010 DIN VDE 0276-620:2010	Power cables - Distribution cables with extruded insulation for rated voltages from 3,6/6 (7,2) kV up to and including 20,8/36 (42) kV; German version HD 620 S2:2010, parts 0, 1 and 10-C	
Power cable	HD 621 S1:1996 DIN VDE 0276-621:1997	Power cables - Part 621: Medium voltage impregnated paper insulated distribution cables; German version HD 621 S1:1996 Parts 1, 2, 3C and 4C	
Power cable	HD 626 S1:1996 DIN VDE 0276-626/A1:1998	Power cables Part 626- Overhead distribution cables of rated voltage $U_0/U(U_m)$:0,6/1 (1,2) kV; German version HD 626 S1 Parts 1, 2 and 4 F-1:1996	
Power cable	HD 629.1 S2:2006 DIN VDE 0278-629-1:2009	Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV - Part 1: Cables with extruded insulation	

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Power cable	HD 629.2 S2:2006 DIN VDE 0278-629-2:2009	Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV - Part 2: Cables with impregnated paper insulation	
Power cable	HD 632 S3:2012 DIN VDE 0276-632-3:2013 VDE 0276-632-3:2013	Power cables with extruded insulation and their accessories for rated voltages above 36 kV (U_m = 42 kV) up to 150 kV (U_m = 170 kV); German version HD 632 S1 Parts 1, 3D, 4D and 5D:1998	
Power cable	HD 633 S1:1997 DIN VDE 0276-633:1999 VDE 0276-633:1999	Prüfungen an Ölkabeln mit einer Isolierung aus Papier oder polypropylenbeschichtetem Papier und Metallmantel und Garnituren für Wechselspannungen bis einschließlich 400 kV (U_m=420 kV)	
Power cable	HD 634 S1:1997 DIN VDE 0276-634:1999 VDE 0276-634:1999	Tests on internal gas-pressure cables and accessories for alternating voltages up to and including 275 kV (U_m=300 kV); German version HD 634 S1 Parts 1 and 3C:1997	
Power cable	HD 635 S1:1997 DIN VDE 0276-635:1999 VDE 0276-635:1999	Tests on external gas-pressure (gas compression) cables and accessories for alternating voltages up to and including 275 kV (U_m=300 kV); German version HD 635 S1 Parts 1 and 3C:1997	
Power cable	DIN VDE 0212 Teil 55:1998 VDE 0212-55:1998	Fittings for overhead lines and switchgear; insulation behaviour of fittings for insulated overhead lines	
Power cable	DIN VDE 0220-1:1971	Specifications for single- and multiple cable clamps with insulating parts in electrical power cable installations up to 1000 V	
Power cable	DIN VDE 0220-2:1971	Bestimmungen für Preßverbinder in Starkstromkabelanlagen bis 1000 V	
Power cable	DIN 57220-3:1977 DIN VDE 0220-3:1977 VDE 0220-3:1997	Specifications for single- and multiple cable clamps with insulating parts in electrical power cable installations up to 1000 V	
Power cable	DIN VDE 0271:2008 VDE 0271:2008	Power cables - Specifications for power cables 0,6/1 kV and above for special applications	

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Power cable	DIN VDE 0276-632:1999 VDE 0276-632:1999	Power cables with extruded insulation and their accessories for rated voltages above 36 kV (U_m = 42 kV) up to 150 kV (U_m = 170 kV); German version HD 632 S1 Parts 1, 3D, 4D and 5D:1998	
Power cable	DIN VDE 0276-634:1999 VDE 0276-634:1999	Tests on internal gas-pressure cables and accessories for alternating voltages up to and including 275 kV (U_m=300 kV); German version HD 634 S1 Parts 1 and 3C:1997	
Power cable	DIN VDE 0472-505:1983 DIN 57472-505:1983 VDE 0472-505:1983	Testing of cables, wires and flexible cords; loss factor, dielectric loss coefficient and leakance [VDE Specification]	
Power cable	DIN VDE 0472-512:1985	Testing of cables, wires and flexible cords; resistance between protective conductor and semi-conductive layer	
Power cable	DIN VDE 0472-603:1989 VDE 0472-603:1989	Prüfung an Kabeln und isolierten Leitungen; Biegeverhalten	
Power cable	IEEE 404:2012	IEEE Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2.5 kV to 500 kV	
Power cable	IEEE 48:2009	Standard for test procedures and requirements for alternating-current cable terminations used on shielded cables having laminated insulation rated 2.5 kV through 765 kV or extruded insulation rated 2.5 kV through 500 kV	
Power cable	CIGRE 415:2010	Test Procedures for HV Transition Joints for Rated Voltages 30 kV up to 500 kV	

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Generic Standards			
EMC	DIN EN 61000-6-1; VDE 0839-6-1:2007	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards -Immunity for residential, commercial and light-industrial environments	Only immunity according to DIN EN 61000-4-3
EMC	EN 61000-6-1:2007	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards -Immunity for residential, commercial and light-industrial environments	Only immunity according to DIN EN 61000-4-3
EMC	IEC 61000-6-1:2005	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards -Immunity for residential, commercial and light-industrial environments	Only immunity according to DIN EN 61000-4-3
EMC	DIN EN 61000-6-2; VDE 0839-6-2:2011	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards -Immunity for residential, commercial and light-industrial environments	Only immunity according to DIN EN 61000-4-3
EMC	EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards -Immunity for residential, commercial and light-industrial environments	Only immunity according to DIN EN 61000-4-3

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EMC	IEC 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments	Only immunity according to DIN EN 61000-4-3
EMC	DIN EN 61000-6-3; VDE 0839-6-3:2012	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Only conducted emission
EMC	EN 61000-6-3:2007 + A1:2011 + A2:2012	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Only conducted emission
EMC	IEC 61000-6-3:2006 + A1:2010	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Only conducted emission
EMC	DIN EN 61000-6-4; VDE 0839-6-4:2011	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments	Only conducted emission
EMC	EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	Only conducted emission

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EMC	IEC 61000-6-4:2006 + A1:2010	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	Only conducted emission
Basic Standards			
EMC	DIN EN 61000-4-3; VDE 0847-4-3:2011	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:2006 + A1:2007 + A2:2010); German version EN 61000-4-3:2006 + A1:2008 + A2:2010	
EMC	EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	
EMC	IEC 61000-6-4:2006 + A1:2010	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments	
EMC	DIN EN 61000-4-8; VDE 0847-4-8:2010	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test (IEC 61000-4-8:2009); German version EN 61000-4-8:2010	
EMC	EN 61000-4-8:2010	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	
EMC	IEC 61000-4-8:2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	

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EMC	DIN EN 61000-4-13; VDE 0847-4-13:2010 IEC 61000-4-13:2002 + A1:2009 EN 61000-4-13:2002 + A1:2009	Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests (IEC 61000-4-13:2002 + A1:2009); German version EN 61000-4-13:2002 + A1:2009	Only single phase
EMC	EN 61000-4-13:2002 + A1:2009	Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests	Only single phase
EMC	IEC 61000-4-13:2002 + A1:2009	Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests	Only single phase
EMC	DIN EN 55014-1; VDE 0875-14-1:2012 CISPR 14-1:2005 + A1:2008 + Cor. :2009 + A2:2011	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission (CISPR 14-1:2005 + A1:2008 + Cor. :2009 + A2:2011); German version EN 55014-1:2006 + A1:2009 + A2:2011	No radiated emission, no toys
EMC	EN 55014-1:2006 + A1:2009 + A2:2011	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission	No radiated emission, no toys
EMC	CISPR 14-1:2005 + A1:2008 + Cor. :2009 + A2:2011	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission	No radiated emission, no toys

Annex to the Accreditation Certificate D-PL-11068-09-00

Department	Standard / in house procedure / Version	Title of standard or in house procedure (deviations / modifications of standard)	Test area / reductions
EMC	DIN EN 55014-2; VDE 0875-14-2:2009	Electromagnetic compatibility - Requirements for household appliances , electric tools and similar apparatus - Part 2: Immunity - Product family standard (IEC/CISPR 14-2:1997 + A1:2001 + A2:2008); German version EN 55014-2:1997 + Corrigendum 1997 + A1:2001 + A2:2008	Only immunity according to DIN EN 61000-4-3
EMC	EN 55014-2:1997 + Corrigendum 1997 + A1:2001 + A2:2008	Electromagnetic compatibility - Requirements for household appliances , electric tools and similar apparatus - Part 2: Immunity - Product family standard	Only immunity according to DIN EN 61000-4-3
EMC	IEC/CISPR 14-2:1997 + A1:2001 + A2:2008	Electromagnetic compatibility - Requirements for household appliances , electric tools and similar apparatus - Part 2: Immunity - Product family standard	Only immunity according to DIN EN 61000-4-3
EMC	IEEE 299:2006	IEEE Standard Method for Measuring the Effectiveness of Electromagnetic Shielding Enclosures	
EMC	VG 95373-15:2004	Elektromagnetische Verträglichkeit - Elektromagnetische Verträglichkeit von Geräten - Teil 15: Messverfahren für Kopplungen und Schirmungen	

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 5

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният /-ната/ инж. Георги Димитров Георгиев
в качеството ми на Управител на "ЕЛЕКТРОГЕЦ" ООД
със седалище и адрес на управление: гр. София, ул. Майор Горталов 9А, вписано в Търговския регистър към Агенцията по вписванията с ЕИК 130 761 934, за участие в процедура за възлагане на обществена поръчка за Доставка и монтаж на Бетонови комплектни трансформаторни постове /БКТП/, РЕФ. № PPD 15-042,

Д Е К Л А Р И Р А М,

че предлагания материал Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV Cellpack тип CGS 250A, CWS 250A, CTS 630A и CTKS 630A съответстват с изискванията на техническата спецификация на стандарт за материал "Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV, вкл. на параграфи „Характеристика на материала" и „Съответствие на предложеното изпълнение с стандартизационните документи" от документацията по търг с реф. № РЕФ. № PPD 15-042.

Дата 20.01.2016 г.

Декларатор:

инж. Георги Димитров Георгиев
/име, подпис и печат/

ЕЛЕКТРОГЕЦ СОФИЯ ООД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Щепселни кабелни глави за КРУ за едножилни полиетиленови кабели 10 kV и 20 kV"

Приложение № 6

ЕЛЕКТРОТЕХ СОФИЯ ООД

CGS 24kV 250A 25 – 95/EGA
$U_o/U(U_m)$ 6/10(12)kV - 12/20(24) kV

Инструкция за монтаж

Кабелна глава щепселна, права за едножилни кабели с полимерна изолация за напрежения до 24 kV

224446/0607/1/6

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CELLPACK Electrical Products

Общи указания:

- Проверете дали обхватът на кабелните аксесоари е подходящи за размера на кабела.
- Проверете съдържанието на комплекта съгласно опаковъчния лист.
- Старателно прочетете инструкциите за монтаж.

Монтажът трябва да се извършва само от компетентен персонал.
Производителят не носи отговорност за повреди, причинени от неправилен монтаж.

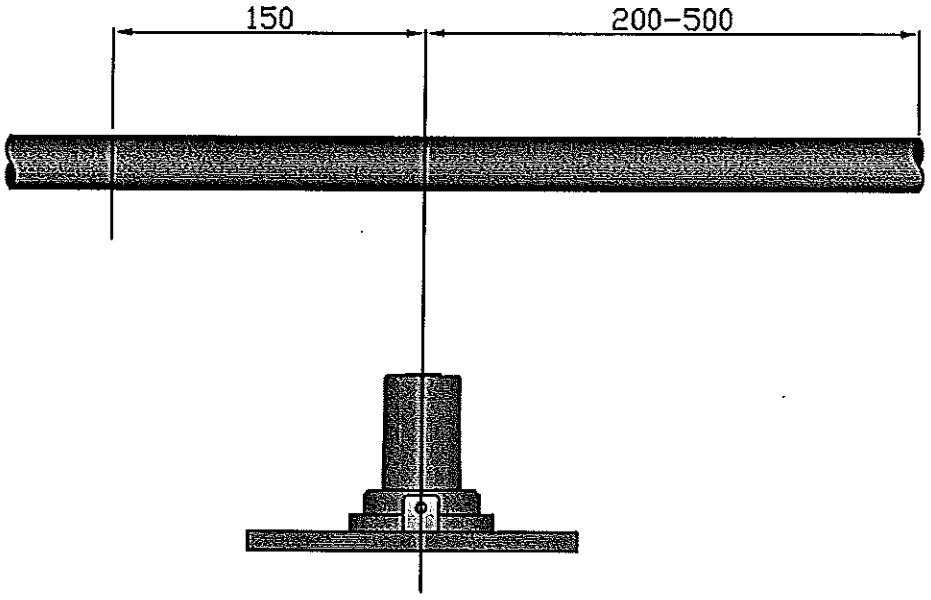
Кабелна глава щепселна, права тип CGS 250A 24kV 25-95/EGA

Сечения:

Напрежение Uo/U(Um) kV	Сечение на кабела RM/RE (*) mm²
6/10(12) kV	50 - 95
8,7/15(17,5) kV	25 – 95
12/20(24) kV	25 - 95

(*)Минимален диаметър над кабелната изолация от 14,7 мм

Нагласяне

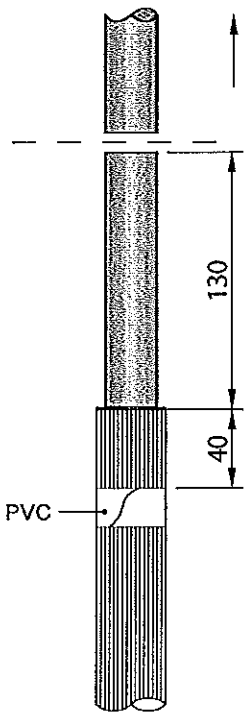


- Почистете грижливо края на кабела до **1м.**
- Нагласете кабела над средата на клемата оставяйки свободна дължина **L = 200-500 мм**. Изрежете излишното.
- Маркирайте кабела на **150 mm** от центъра на клемата.

Подготовка на кабела

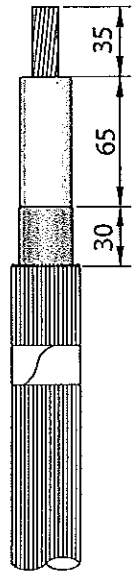
Кабел с екран от медни жички:

1a)



- Отстранете външната изолация на кабела до маркировката.
- Подгънете назад медните жици на екрана и ги фиксирайте към външната изолация на кабела с PVC лента(Fig. 1a).
- Отрежете кабела на дължина **130мм**.
- Внимателно отстранете външния полупроводим слой, така че да остане слой с дължина **30 мм**.

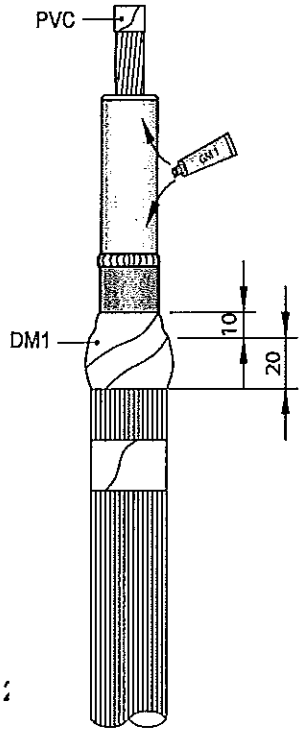
2a)



Уверете се, че ръбът на слоя е гладък.

- Отстранете XLPE изолацията на кабела на размер **35 mm**.
- Почистете старателно XLPE изолацията и външния полупроводим слой на кабела.

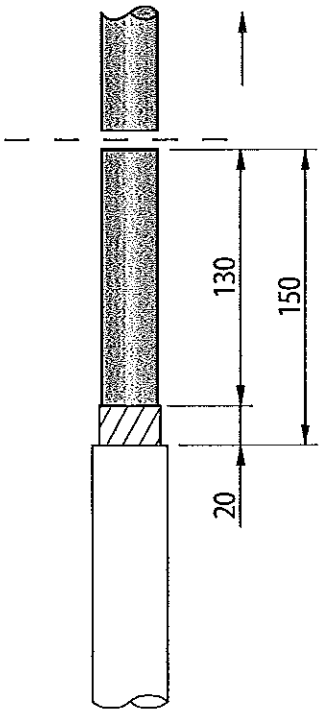
3a)



- Защитете края на жилото с PVC-лента.
- Навийте 2/3 от дължината на уплатняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (с разтягане 50%)
- Нанесете на и около ръба на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

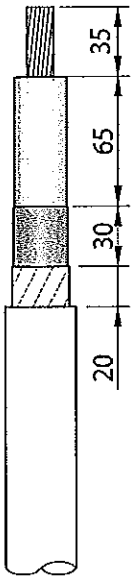
Кабел с лентов екран:

1b)



- Отстранете външната изолация на кабела до маркировката + 20mm.
- Отрежете кабела както е показано на фигурата.
- Отрежете лентовия екран, така че върху кабела да остане **20 мм** от него.
- Внимателно отстранете външния полупроводим слой, така че да остане слой с дължина **30 мм**.

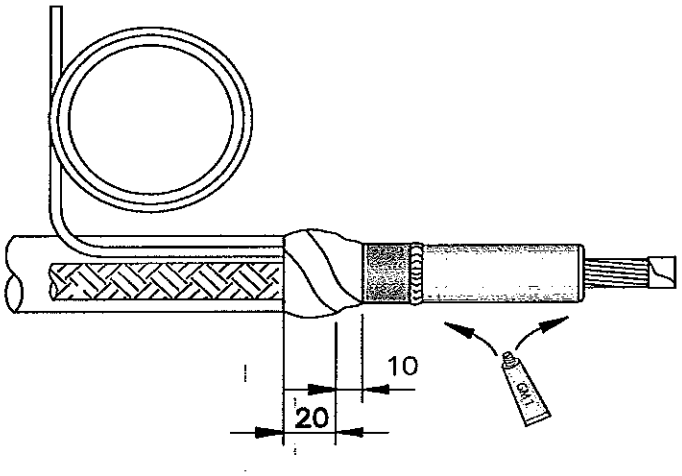
2b)



Уверете се, че ръбът на слоя е гладък.

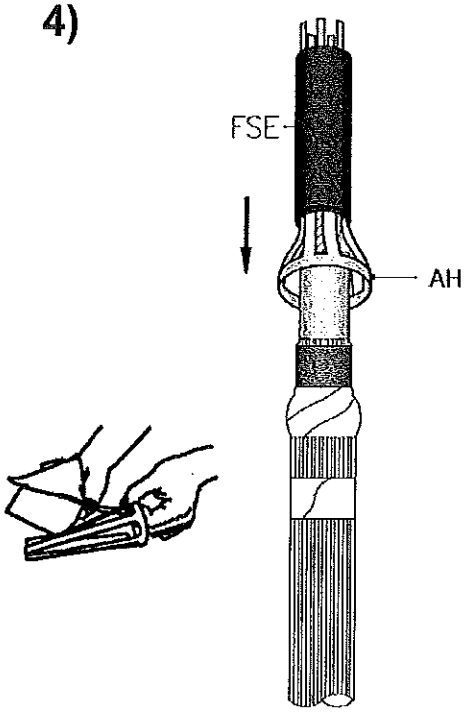
- Отстранете XLPE изолацията на кабела на размер **35 mm**.
- Почистете старателно изолацията и външния полупроводим слой на кабела.

3b)



- Защитете края на жилото с PVC-лента.
- Фиксирайте заземителната оплетка и заземителния проводник чрез ролкова пружина към лентовия екран (заземителния комплект се поръчва отделно).
- Навийте 2/3 от дължината на уплатняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (фиг. 3b).
- Нанесете на и около ръба на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

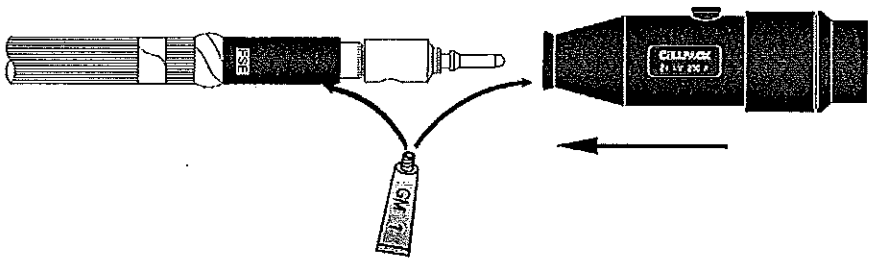
4)



5)

- Навлажнете лентите на апликатора AH със силиконовата кърпичка.
- Вмъкнете апликатора AH в елемента за контрол на полето FSE и ги нахлузете върху кабела до достигане на уплътняващата обвивка.
- Отстранете апликатора, издърпвайки лентите му една по една.
- Позиционирайте елемента за контрол на полето като леко го завъртате (фиг. 5).
- Отстранете PVC лентата от края на жилото на кабела.
- Монтирайте кабелния накрайник с болтове с откъсващи се глави, съгласно отделна инструкция.
- Моля, обърнете внимание, че щифтът на кабелния накрайник трябва да бъде съосен с оста на клемата за присъединяване.
- Почистете старателно повърхността на елемента за контрол на полето FSE.

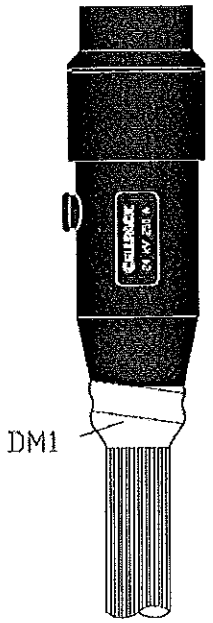
6)



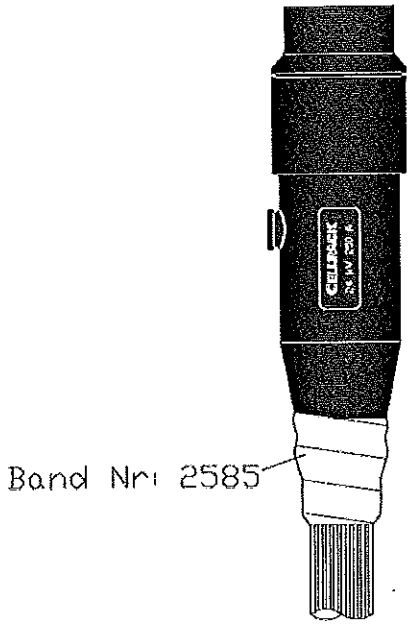
- Навлажнете тялото на щепселна глава и повърхността на елемента за контрол на полето FSE със смазка и пълнеж GM1.
- Нахлузете тялото на щепселна глава върху кабела докато контактната шпилка се вмъкне в тялото.

ЕЛЕКТРОГЕН СОФИЯ ООД

8)

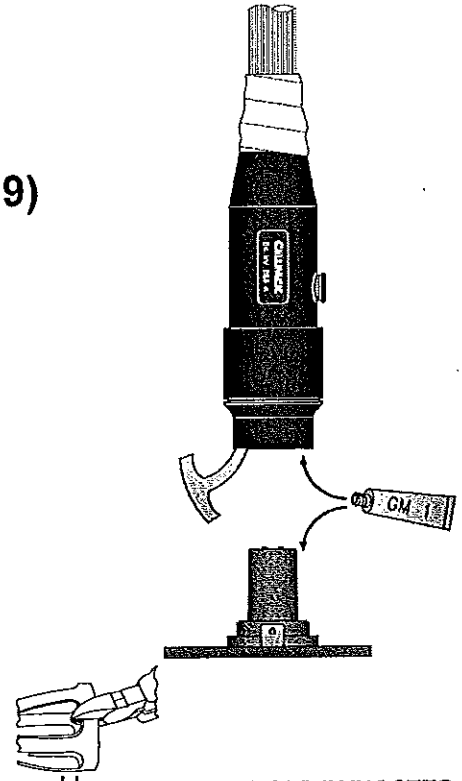


- Навийте останалата **1/3** от лентата DM1 между краят на тялото и зоната за запечатване.



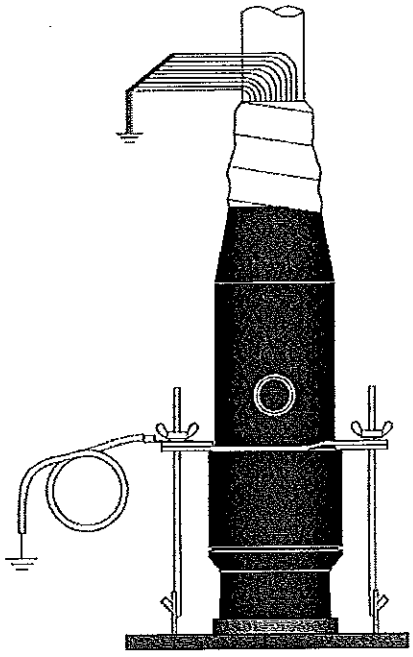
- Навийте лента № 2585 приблизително **20 мм** върху края на тяло до края на зоната за запечатване (с разтягане 20%).

9)



- Навлажнете повърхността на клемата за присъединяване и вътрешността на тялото със смазката и пълнежа GM1.
- Отрежете лента от апликатора AH (приспособление за изтегляне на въздуха).
- Вмъкнете приспособлението за изтегляне на въздуха в тялото.
- Вкарайте тялото върху клемата.
- Закрепете закопчалката, заземителния проводник и

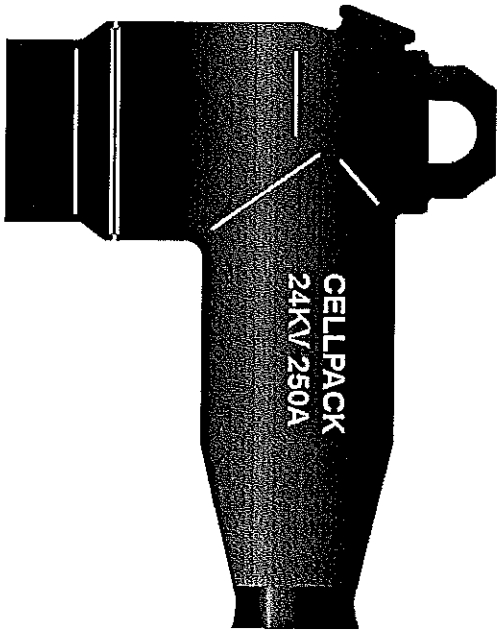
10)



прикрепващата плоча съгласно фигурата.

- Затегнете крилчатите гайки равномерно.
- Издърпайте внимателно приспособлението за изтегляне на въздуха и отстранете остатъците от смазката и пълнежа GM1.
- Допълнителните мерки за заземяване да бъдат съобразени със местните законови разпоредби.

Средно напрежение **CELLPLUX**



CWS 250A 24kV 16 - 95/EGA

$U_o/U(U_m)$ 6/10(12)kV - 12/20(24) kV

Инструкция за монтаж

Кабелна глава, Г-образна щепселна, за едножилни кабели с полимерна изолация за напрежения до 24 kV

221295/0609/3/6

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CELLPACK Electrical Products

Общи указания:

- Проверете дали обхватът на кабелните аксесоари е подходящ за размера на кабела.
- Проверете съдържанието на комплекта съгласно опаковъчния лист.
- Старателно прочетете инструкциите за монтаж.

Монтажът трябва да се извършва само от компетентен персонал.
Производителят не носи отговорност за повреди, причинени от неправилен монтаж.

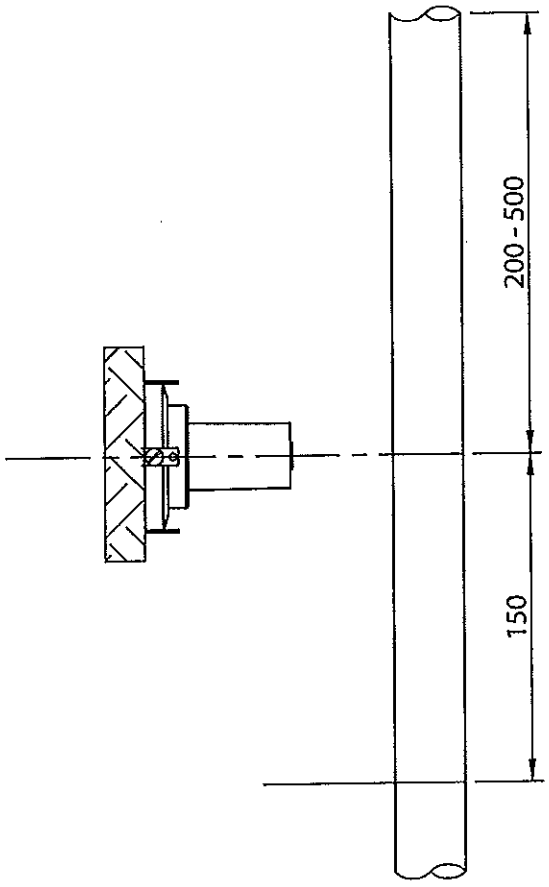
Кабелна глава, Г-образна, щепселна CWS 250A 24kV 16-95/EGA

Сечения:

Напрежение Uo/U(Um) kV	Сечение на кабела RM/RE (*) mm²
6/10(12) kV	50 - 95
8,7/15(17,5) kV	25 – 95
12/20(24) kV	16 - 95

(*)Минимален диаметър над кабелната изолация от 14.7 мм

Нагласяне

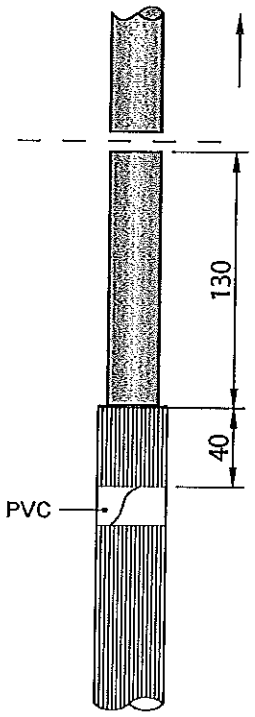


- Почистете грижливо краищата на кабела до **1м**.
- Нагласете кабела спрямо оста на клемата за присъединяване, оставяйки свободна дължина **L = 200-500 мм**. Изрежете излишното.
- Маркирайте кабела на **150 mm** от центъра на клемата.

Подготовка на кабела

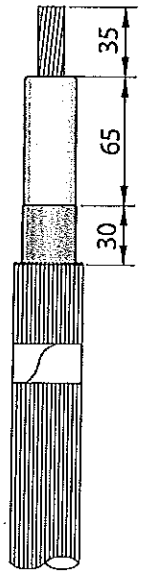
Кабел с екран от медни жички:

1a)



- Отстранете външната изолация на кабела до маркировката.
- Подгънете назад медните жици на екрана и ги фиксирайте към външната изолация на кабела с PVC лента(Fig. 1a).
- Отрежете кабела на дължина **130 mm**.
- Внимателно отстранете външния полупроводим слой, така че да остане слой с дължина **30 мм**.

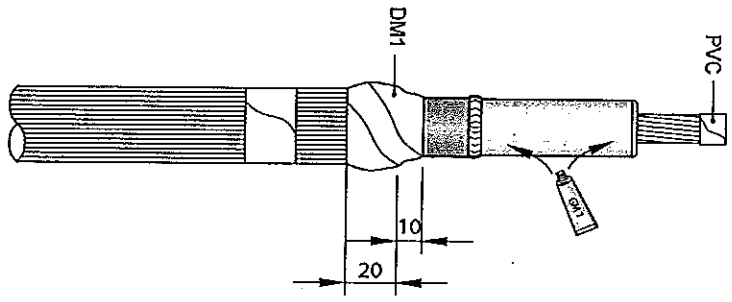
2a)



Уверете се, че ръбът на слоя е гладък.

- Отстранете XLPE изолацията на кабела на размер 3**5 mm**.
- Почистете старателно XLPE изолацията и външния полупроводим слой на кабела.

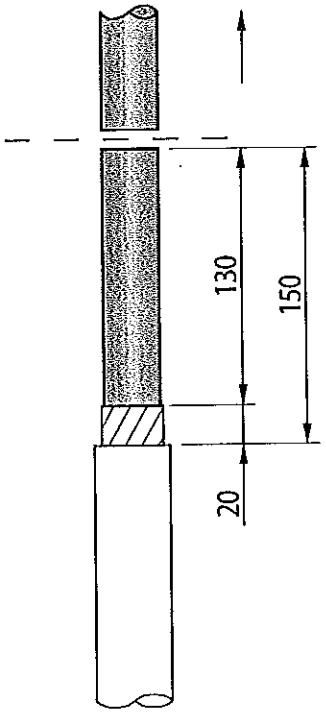
3a)



- Защитете края на жилото с PVC-лента.
- Навийте 2/3 от дължината на уплътняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (с разтягане 50%)
- Нанесете на и около ръба на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

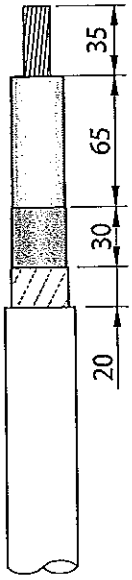
Кабел с лентов екран:

1b)



- Отстранете външната изолация на кабела до маркировката + 20mm.
- Отрежете кабела както е показано на фигурата.
- Отрежете лентовия екран, така че върху кабела да остане **20** мм от него.
- Внимателно отстранете външния полупроводим слой, така че да остане слой с дължина **30** мм.

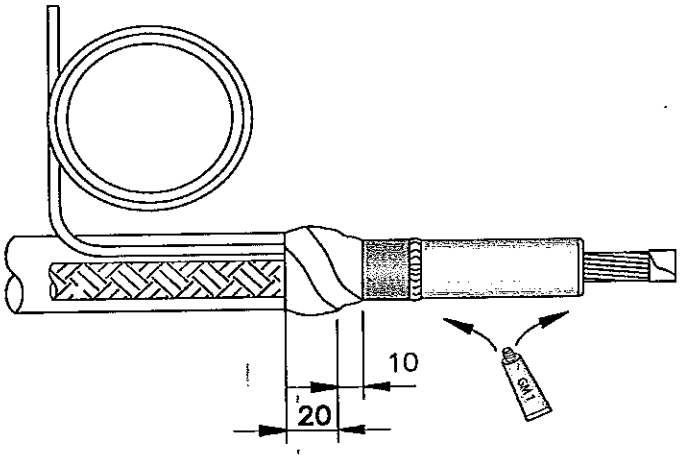
2b)



Уверете се, че ръбът на слоя е гладък.

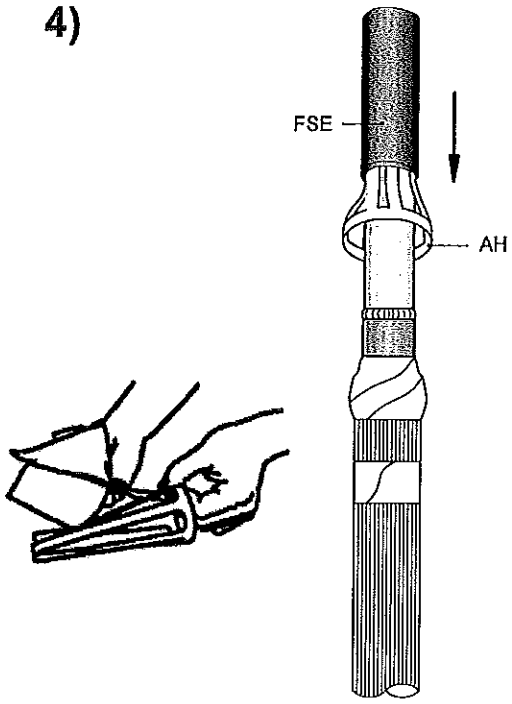
- Отстранете XLPE изолацията на кабела на размер **35 mm**.
- Почистете старателно изолацията и външния полупроводим слой на кабела

3b)

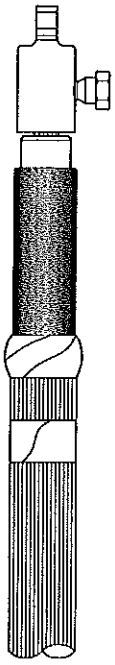


- Защитете края на жилото с PVC-лента.
- Фиксирайте заземителната оплетка и заземителния проводник чрез ролкова пружина към лентовия екран (заземителният комплект се поръчва отделно).
- Навийте 2/3 от дължината на уплътняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (фиг. 3b).
- Нанесете на и около ръба на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

4)

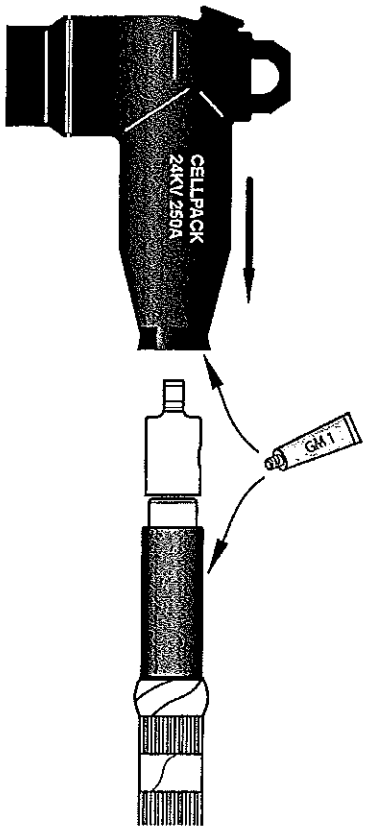


5)



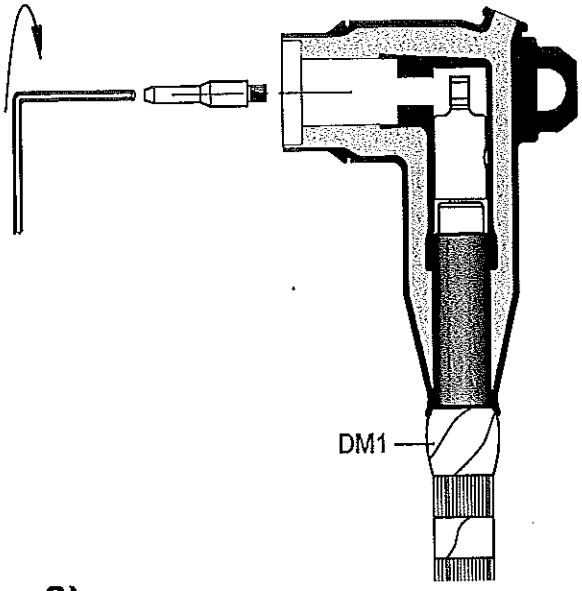
- Навлажнете лентите на апликатора AH със силиконовата кърпичка.
- Вмъкнете апликатора AH в елемента за контрол на полето FSE и ги нахлузете върху кабела до достигане на уплътняващата обвивка.
- Отстранете апликатора, издърпвайки лентите му една по една.
- Позиционирайте елемента за контрол на полето като леко го завъртате (фиг. 5).
- Отстранете PVC лентата от края на жилото на кабела.
- Монтирайте кабелна обувка с болтове с откъсващи се глави, съгласно отделна инструкция.
  Моля, обърнете внимание, че отворът на кабелната обувка трябва да бъде съосен с оста на клемата за присъединяване.
- Почистете старателно повърхността на елемента за контрол на полето FSE

6)



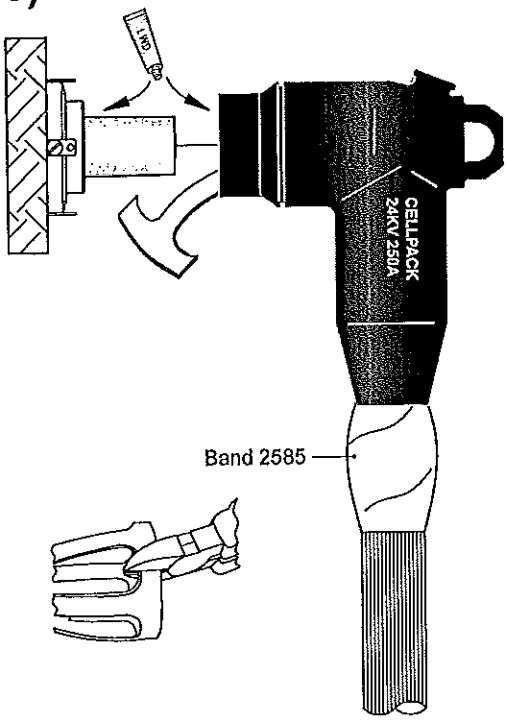
- Навлажнете тялото на щепселната глава и повърхността на елемента за контрол на полето FSE със смазка и пълнеж GM1.**Внимание: Кабелната обувка да не се навлажнява.**
- Нахлузете тялото на щепселната глава върху кабела докато отвора на кабелната обувка се центрира в него.

7)

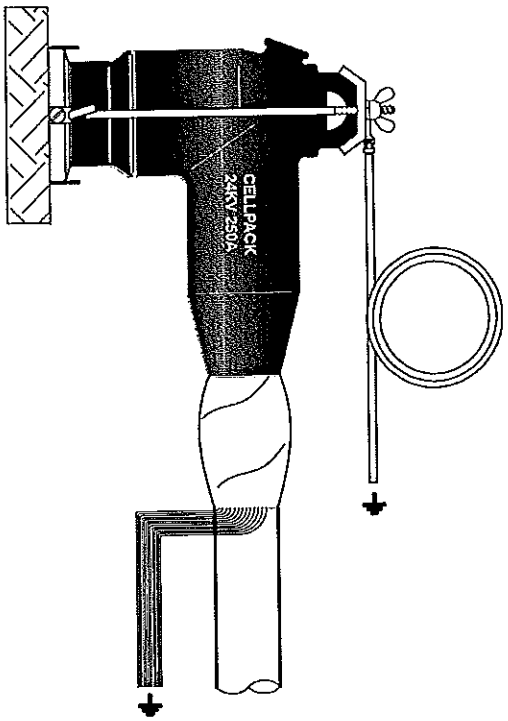


- Затегнете контактната шпилка в кабелната обувка със шестостенния ключ и я стягайте ръчно.
- Навийте останалата **1/3** от лентата DM1 между краят на тялото и зоната за запечатване.

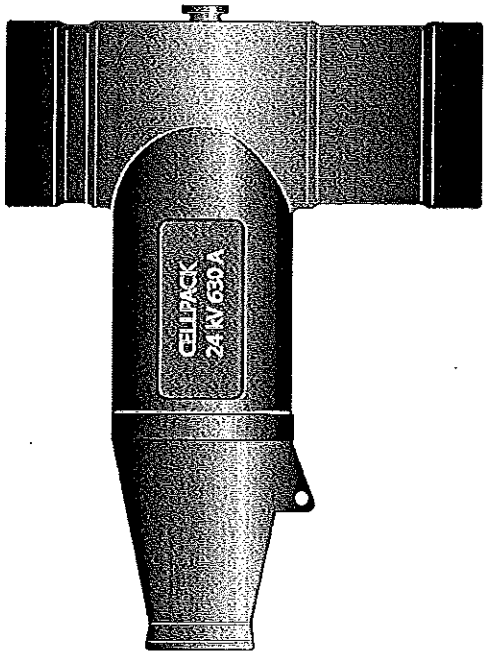
8)



9)



- Навийте лента № 2585 приблизително **20 мм** върху края на тялото до края на зоната за запечатване (с разтягане 20%).
- Навлажнете повърхността на клемата за присъединяване и вътрешността на щепселната глава със смазката и пълнежа GM1.
- Отрежете лента от апликатора АН (приспособление за изтегляне на въздуха).
- Вмъкнете приспособлението за изтегляне на въздуха в тялото.
- Закрепете тялото върху клемата.
- Закрепете закопчалката, заземителния проводник и прикрепващата плоча съгласно фигурата.
- Затегнете крилчатите гайки равномерно.
- Издърпайте внимателно приспособлението за изтегляне на въздуха и отстранете остатъците от смазката и пълнежа GM1.
- Допълнителните мерки за заземяване да бъдат съобразени със местните законови разпоредби.



CTS 630A 24kV 95 - 240

$U_o/U(U_m)$ 8,7/15(17,5) kV – 12,7/22(24) kV

Инструкция за монтаж

Кабелна глава щепселна,Т-образна за едножилни кабели с полимерна изолация за напрежения до 24 kV

206742/0908/4/7

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CELLPACK
Electrical Products

Общи указания:

- Проверете дали обхватът на кабелните аксесоари е подходящи за размера на кабела.
- Проверете съдържанието на комплекта съгласно опаковъчния лист.
- Старателно прочетете инструкциите за монтаж.

Монтажът трябва да се извършва само от компетентен персонал.
Производителят не носи отговорност за повреди, причинени от неправилен монтаж.

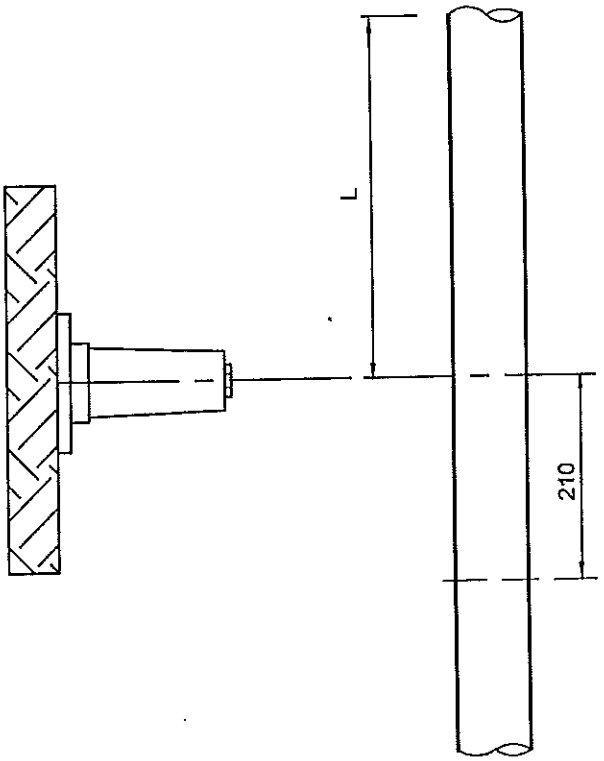
Кабелна глава щепселна,Т-образна тип CELLPLUX CTS 630A 24kV 95-240 :

Сечения:

Напрежение Uo/U(Um) kV	Сечение на кабела (*) mm²
8,7/15(17,5) kV	120 – 240 *)
12/20(24) kV	95 – 240 *)

(*) Минимален диаметър над кабелната изолация от 22 мм

Нагласяне

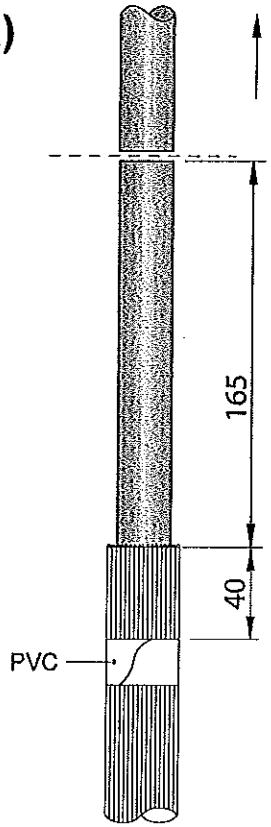


- Почистете грижливо краищата на кабела до **1м**.
- Нагласете кабела спрямо оста на клемата за присъединяване, оставяйки свободна дължина **L = 200-500 мм**. Изрежете излишното.
- Маркирайте кабела на **210 mm** от центъра на клемата.

Подготовка на кабела

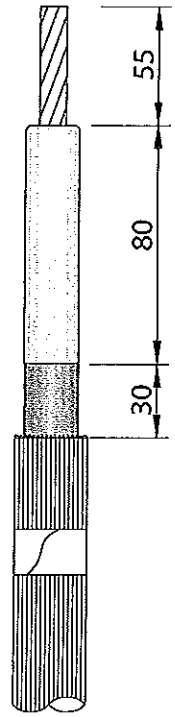
Кабел с екран от медни жички:

1a)



- Отстранете външната изолация на кабела до маркировката.
- Подгънете назад медните жици на екрана и ги фиксирайте към външната изолация на кабела с PVC лента(Fig. 1a).
- Отрежете кабела на дължина **165 mm**.
- Внимателно отстранете външния полупроводим слой, така че да

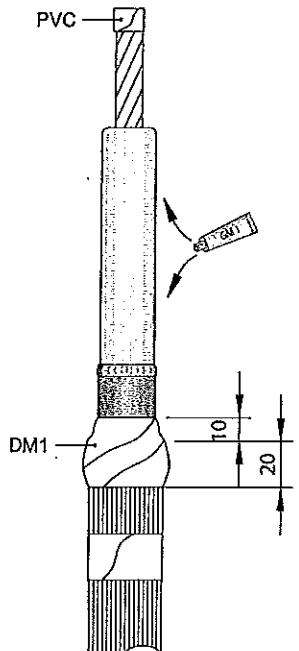
2a)



остане слой с дължина 30 мм. Уверете се, че ръбът на слоя е гладък.

- Отстранете XLPE изолацията на кабела на размер **55 mm**.
- Почистете старателно XLPE изолацията и външния полупроводим слой на кабела.

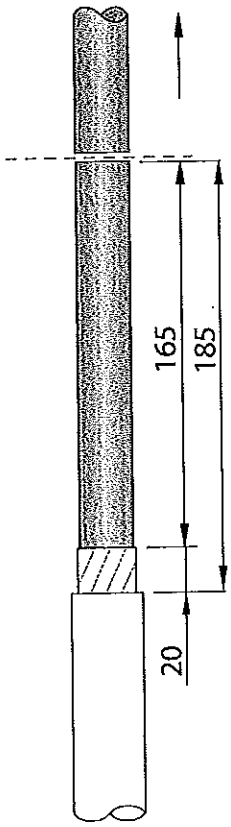
3a)



- Защитете края на жилото с PVC-лента.
- Навийте 2/3 от дължината на уплатняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (с разтягане 50%)
- Нанесете на и около ръбът на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

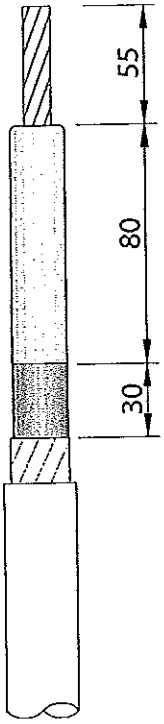
Кабел с лентов екран:

1b)



- Отстранете външната изолация на кабела до маркировката + 20mm.
- Отрежете кабела както е показано на фигурата.
- Отрежете лентовия екран, така че върху кабела да остане 20 мм от него.
- Внимателно отстранете външния полупроводим слой, така че да остане слой с дължина 30 мм.

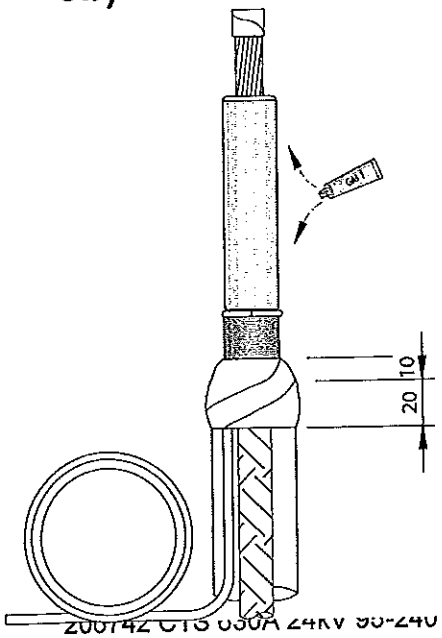
2b)



Уверете се, че ръбът на слоя е гладък.

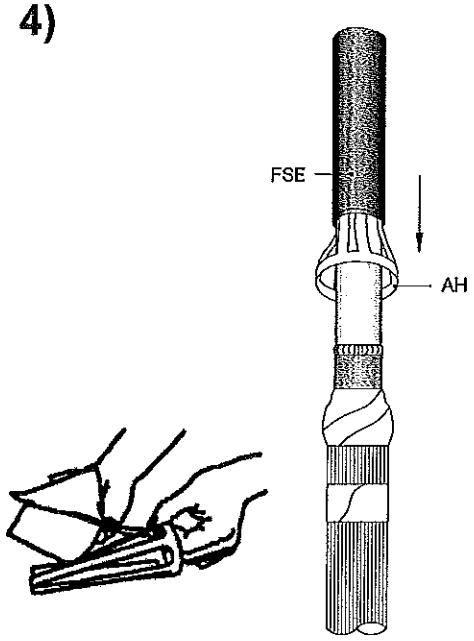
- Отстранете XLPE изолацията на кабела на размер **55 mm**.
- Почистете старателно изолацията и външния полупроводим слой на кабела.

3b)



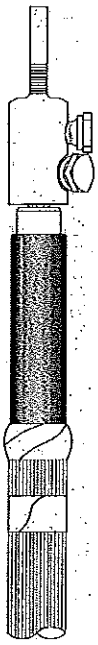
- Защитете края на жилото с PVC-лента.
- Фиксирайте заземителната оплетка и заземителния проводник чрез ролкова пружина към лентовия екран (заземителния комплект се поръчва отделно).
- Навийте 2/3 от дължината на уплатняващата лента DM1 върху **20 mm** от екрана и върху **10 mm** от полупроводящия слой (фиг. 3b).
- Нанесете на и около ръбът на полупроводящия слой смазка и пълнеж GM1 (оформете пръстен).
- Навлажнете изолацията със смазка и пълнеж GM1.

4)



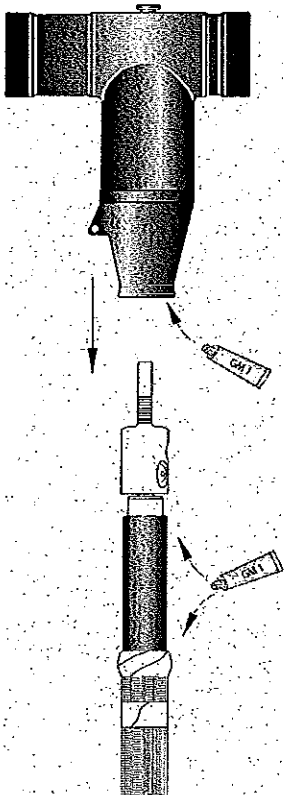
- Навлажнете лентите на апликатора АН със силиконовата кърпичка.
- Вмъкнете апликатора АН в елемента за контрол на полето FSE и ги нахлузете върху кабела до достигане на уплътняващата обвивка.
- Отстранете апликатора, издърпвайки лентите му една по една.
- Позиционирайте елемента за контрол на полето като леко го завъртате (фиг. 5).
- Отстранете PVC лентата от края на жилото на кабела.

5)



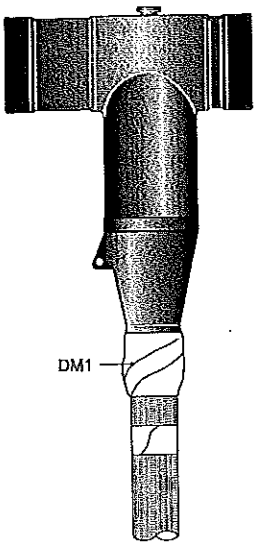
- Монтирайте кабелна обувка с болтове с откъсващи се глави, съгласно отделна инструкция. Моля, обърнете под внимание, че отвора на кабелната обувка трябва да бъде съосен оста на клемата за присъединяване.
- Почистете старателно повърхността на елемента за контрол на полето FSE.

6)



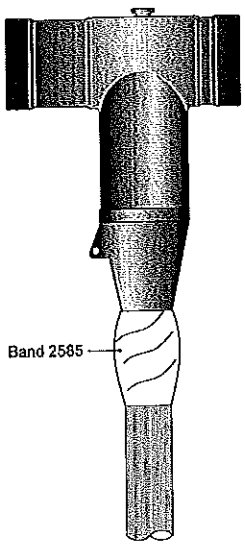
- Навлажнете тялото на Т-образната щепселна глава и повърхността на елемента за контрол на полето FSE със смазка и пълнеж GM1. **Внимание: Кабелната обувка да не се навлажнява.**
- Нахлузете тялото на Т-образна щепселна глава върху кабела докато отвора на кабелната обувка се центрира в него

7)



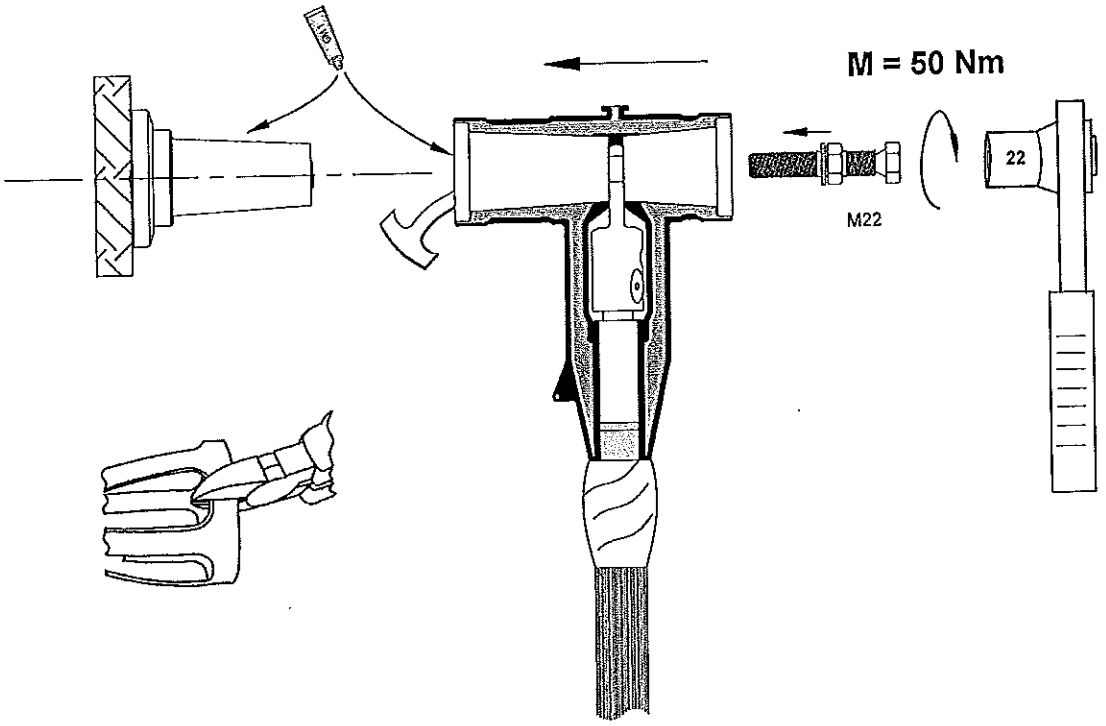
- Навийте останалата **1/3** от лентата DM1 между краят на Т-образното тяло и зоната за запечатване.

8)



- Навийте лента № 2585 приблизително **20 мм** върху края на Т-образното тяло до края на зоната за запечатване (с разтягане 20%).

9)

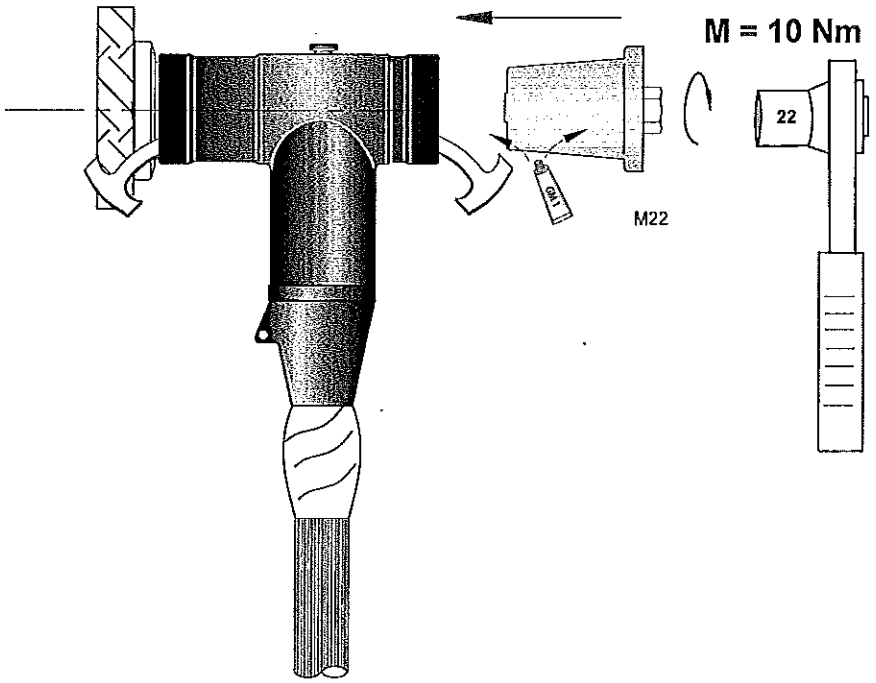


- Навлажнете повърхността на клемата за присъединяване и вътрешността на Т-образното тяло със смазката и пълнежа GM1.
- Отрежете лента от апликатора AH (приспособление за изтегляне на въздуха).
- Вмъкнете приспособлението за изтегляне на въздуха в Т-образното тяло.
- Закрепете Т-образното тяло право върху клемата за присъединяване и завийте контактния болт ръчно.
- Затегнете контактния болт с подходящ инструмент до скъсване на главата му.

Внимание:

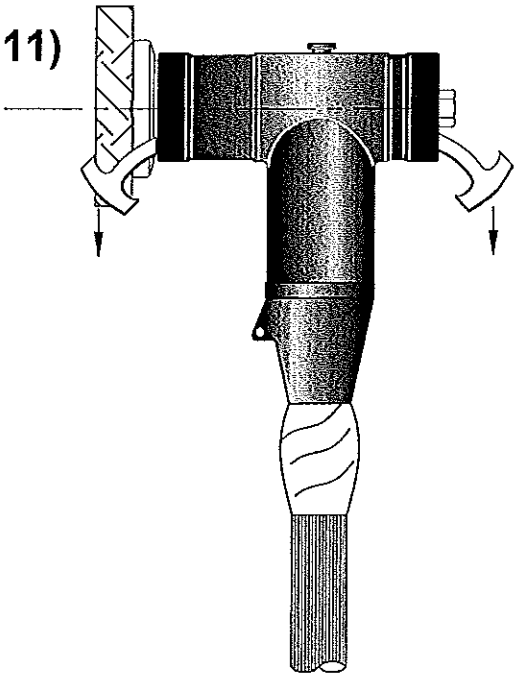
За повторно използване на контактния болт, при затягане на последния, трябва да бъде приложен срязващ момент от 50 Nm.

10)

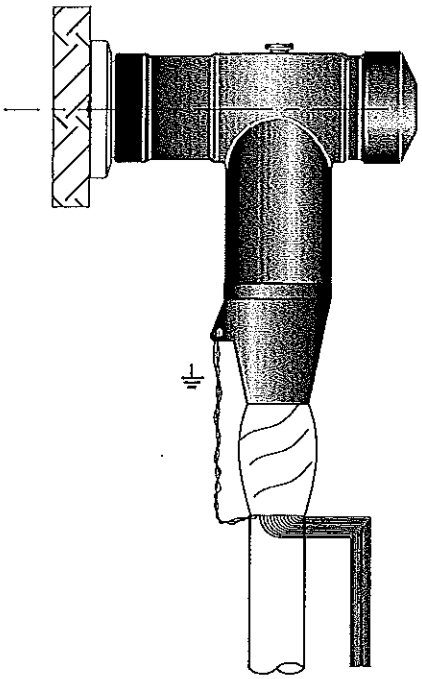


- Навлажнете Т-образното тяло и екранирания изолационен конус със смазката и пълнежа GM1.
- Отрежете втора лента от апликатора АН и го поставете в Т-образното тяло.
- Вкарайте екранирания изолационен конус в Т-образното тяло. Затегнете го с подходящ инструмент. Не прилагайте срязващ момент по-голям от 10 Nm.

11)



12a)



- Издърпайте внимателно приспособлението за изтегляне на въздуха и отстранете остатъците от смазката и пълнежа GM1.

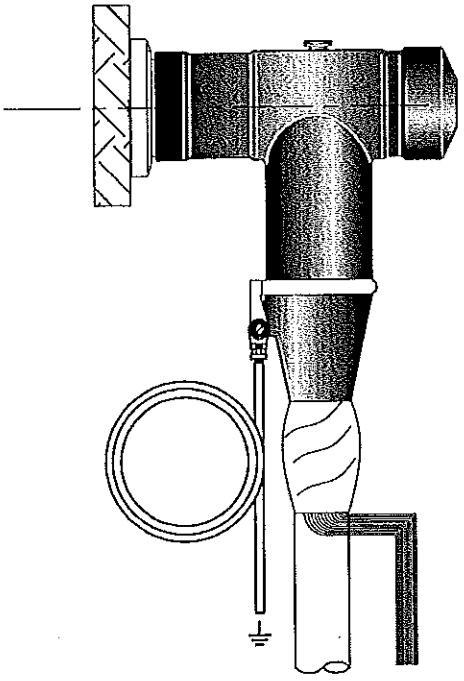
- Поставете полупроводящата защитна капачка върху Т-образното тяло.

Версия без заземителен комплект

- Усучете 3 жички от екрана и ги фиксирайте към отвора на Т-образното тяло.

Версия със заземителен комплект – версия EGA

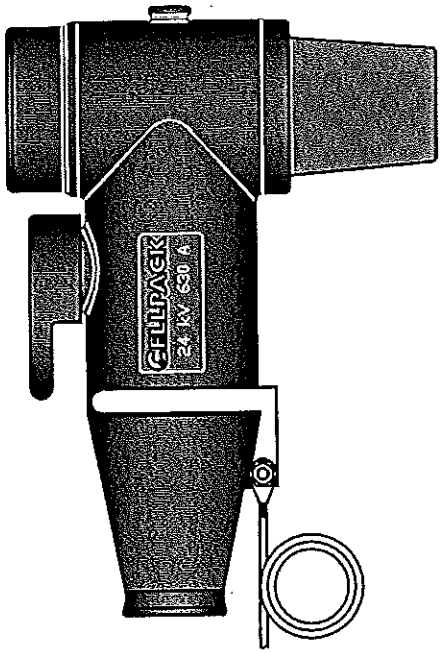
12b)



- Инсталирайте заземителния комплект към Т-образното тяло и го заземете(съгласно фиг. 12b).

- Допълнителните мерки за заземяване да бъдат съобразени със местните законови разпоредби.

Medium Voltage | **CELLPLUX**



CTKS 630A 24kV 95 – 240/EGA

$U_o/U(U_m)$ 6/10(12) kV - 12/20(24) kV

Working Instruction

Separable T Coupling Connector for single-core polymeric cables up to 24 kV

257258/0910/3/9

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CELLPACK
Electrical Products

General remarks:

- Check if the range and size of the accessories is appropriate to the cable.
- Check the content of the kit as per packing list.
- Thoroughly read the working instruction.

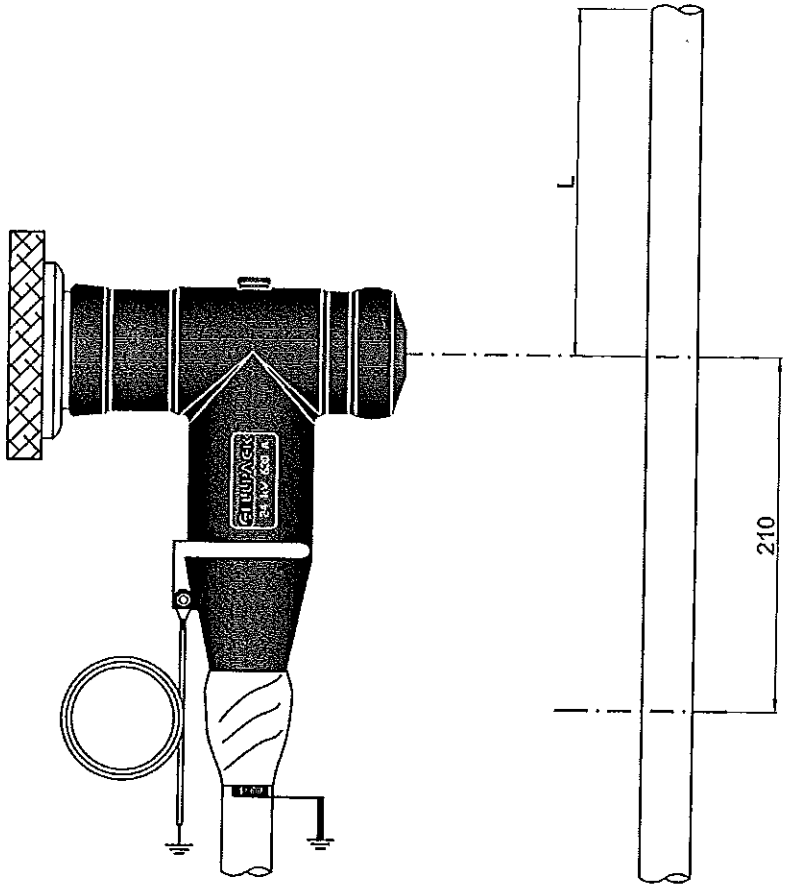
Installation must be executed by competent personnel only.
The manufacturer accepts no liability for breakdowns or damages resulting from an incorrect installation.

Separable T Coupling Connector CELLPLUX CTKS 630A 24kV 95-240/EGA:

Cross-Section Application

Voltage Uo/U(Um) kV	Cable Cross-Section (*) mm²
6/10(12) kV	150 – 240 *)
8,7/15(17,5) kV	120 – 240 *)
12/20(24) kV	95 – 240 *)

(*) Minimal diameter over cable insulation of 22 mm

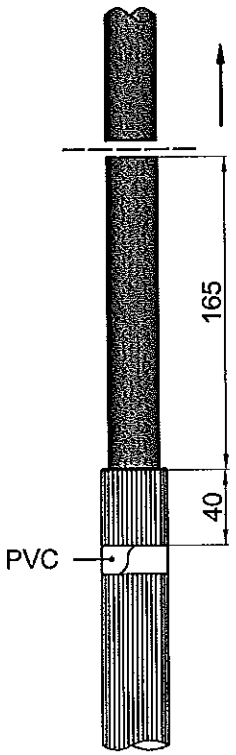


- Clean thoroughly the cable ends up to **1 m.**
- Adjust the cable overhanging in the middle of the bushing by **L = 200 – 500 mm.** Cut-off the excess of cable.
- Make a mark **210 mm** from the centre of the bushing onto the cable sheath.

Preparation of the cable

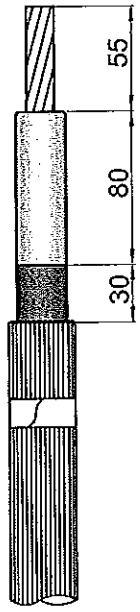
Cable with wire screen:

1a)



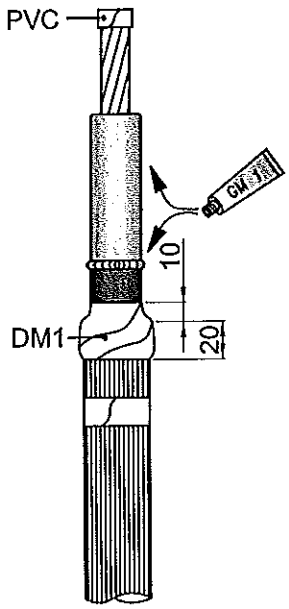
- Remove the cable sheath up to the mark.
- Band back the screen wires of the cable and fix them on the cable sheath with PVC tape (Fig. 1a).
- Cut off the conductor at the length of **165 mm.**

2a)



- Remove carefully the outer conductive layer up to **30 mm** (mind a clean cut back edge).
- Cut back the cable insulation by **55 mm.**
- Clean thoroughly insulation and the outer conductive layer of the cable.

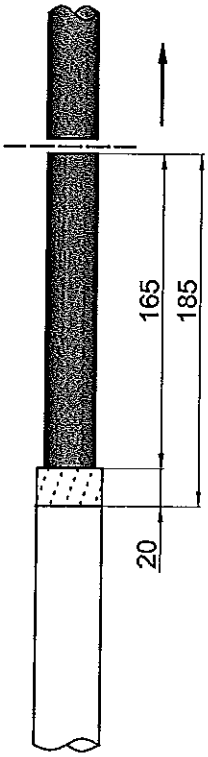
3a)



- Wrap the tip end of the conductor with PVC tape.
- Wrap 2/3 of the length of DM1 mastic **10 mm** on to the conductive layer and **20 mm** on to the wire screen (stretch 50%).
- Apply at and around the cut edge of the conductive layer lubricant and filling agent GM1 (forming a ring).
- Moisten the insulation with lubricant and filling agent GM1.

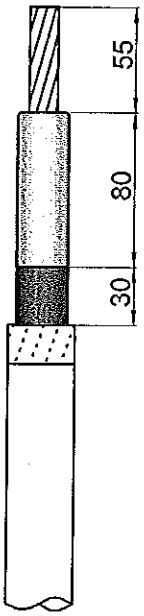
Cable with tape screen:

1b)



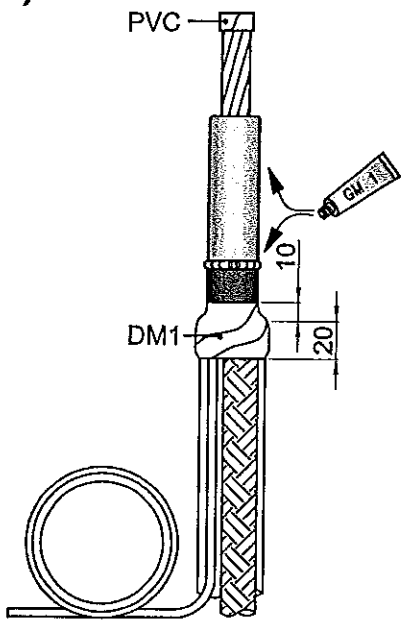
- Remove the cable sheath up to the mark + 20 mm.
- Cut the cable according to the drawing.
- Remove carefully the tape screen up to **20 mm.**

2b)



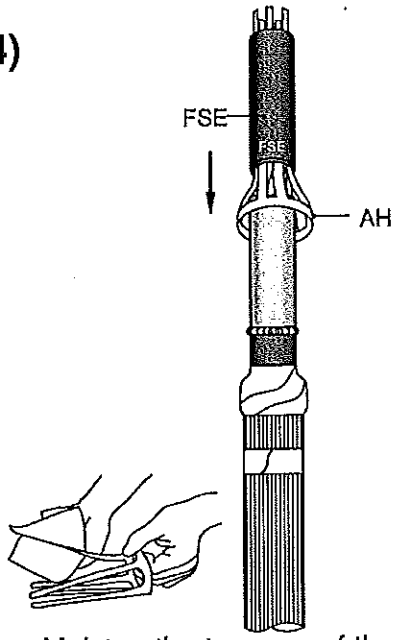
- Remove carefully the outer conductive layer up to **30 mm** (mind a clean cut back edge).
- Cut back the cable insulation by **55 mm.**
- Clean thoroughly the insulation and the conductive layer.

3b)



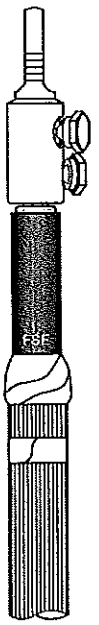
- Wrap the tip end of the conductor with PVC tape.
- Fix the flat Cu-braid and earthing cable with the pressure spring RF on to the tape screen (order the earthing kit separately).
- Wrap 2/3 of the length of mastic tape DM1 **10 mm** on to the conductive layer and **20 mm** on to the copper tape screen (Fig. 3b).
- Apply at and around the cut edge of the conductive layer lubricant and filler agent GM1 (forming a ring).
- Moisten the insulation with lubricant and filling agent GM1.

4)



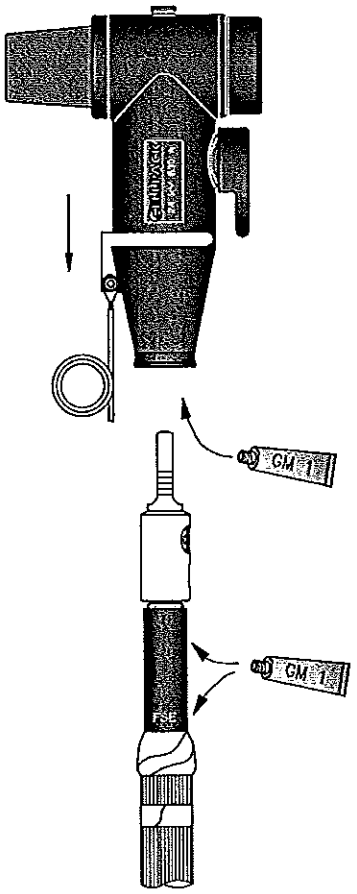
- Moisten the tongues of the applicator AH with the silicon towel.
- Insert the applicator AH in to the stress control element FSE and slip it on to the cable up to the sealing wrap.
- Remove the applicator AH by pulling out the tongues one by one.
- Adjust the position of the stress control element FSE by turning it slightly (Fig. 5).

5)



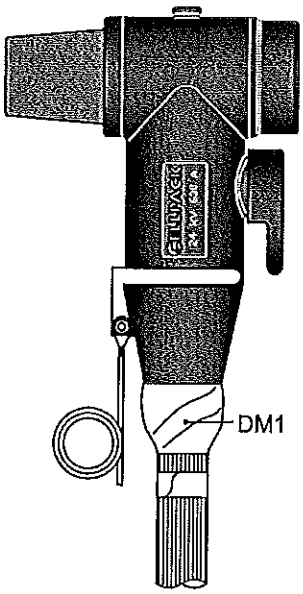
- Remove the protection wrap from the tip end of the conductor.
- Install the shear-head screw cable lug according to the separate instruction. Please note that the tapped hole of the cable lug is in line with the bushing axle.
- Clean thoroughly the surface of the stress control element FSE.

6)



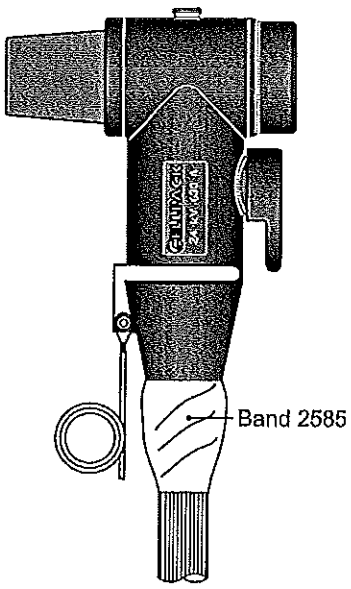
- Moisten the connector body and the surface of the stress control elements FSE with lubricant and filling agent GM1.
  Attention: The cable lug must not be moistured.
- Slip the connector body on to the conductor until the tapped hole of the cable lug is centred inside the connector body.

7)



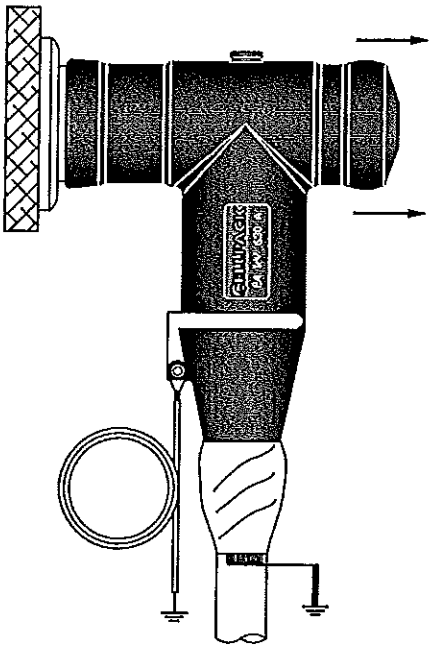
- Wrap the remaining **1/3** of mastic tape DM1 between the end of the connector body and the sealing area.

8)



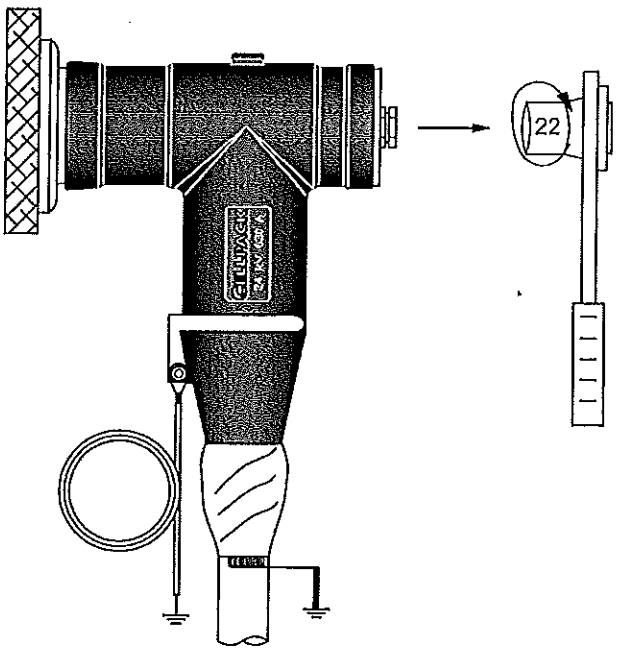
- Wrap the tape Nr. 2585 adhesive side inwards approx. **20 mm** over the end of the connector body up to the end of the sealing area (stretch 20%).

9)



- Take off the conductive protection cup of the T - connector body.

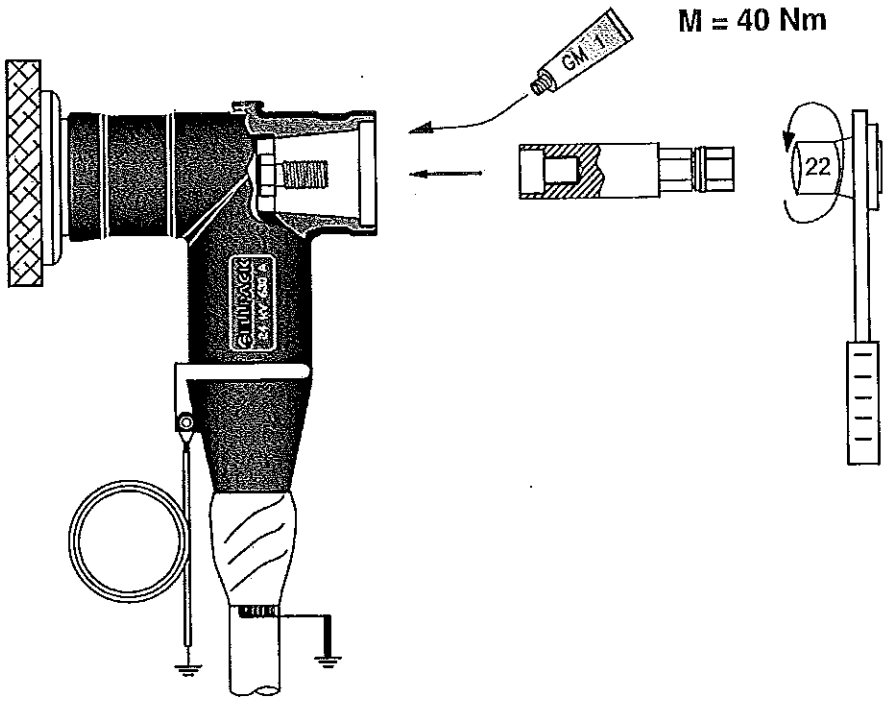
10)



- Unscrew the insulating plug. Use appropriate tool.

11)

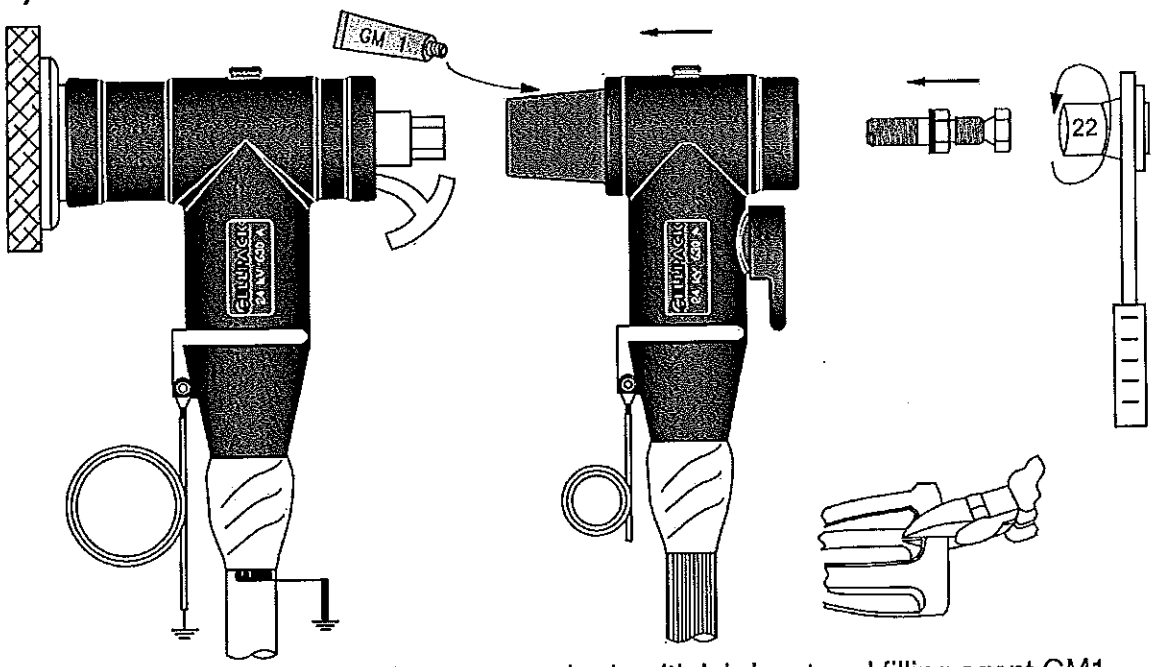
M = 40 Nm



- Clean thoroughly inside of the T-connector body and moisten again with lubricant and filling agent GM1.
- Insert the adaptor plug into the T-connector body and screw the adaptor plug manually. Tighten the adaptor plug with an appropriate tool till the shear head breaks.
  Attention:
  To reuse the adaptor plug it must be tighten with a shear moment „M" of 40 Nm.

12)

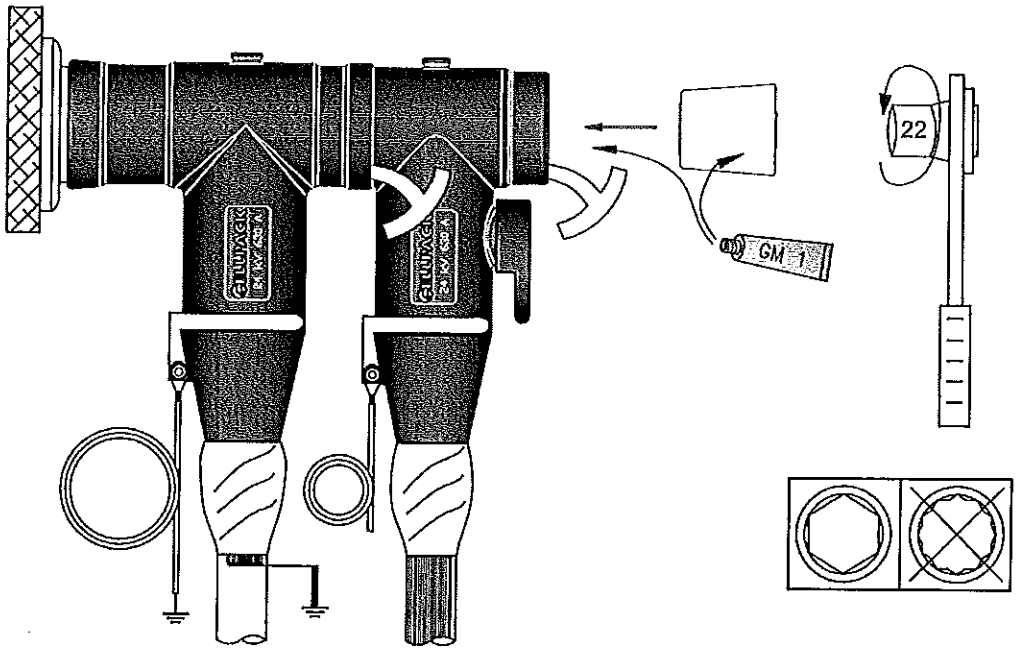
M = 50 Nm



- Moisten outside of the CTKS-connector body with lubricant and filling agent GM1.
- Cut out a tongue from the applicator AH (air decompression device).
  Insert the decompression device into the T-connector body.
- Attach the CTKS-connector straight on to the adaptor plug and screw the contact screw manually.
- Tighten the contact screw with an appropriate tool till the shear head breaks.
  Attention:
  To reuse the contact screw it must be tighten with a shear moment „M" of 50 Nm.

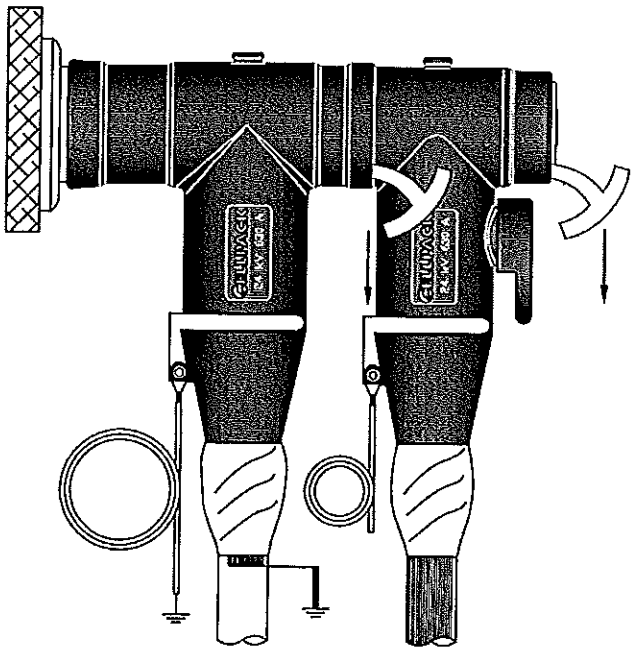
13)

M = 40 Nm



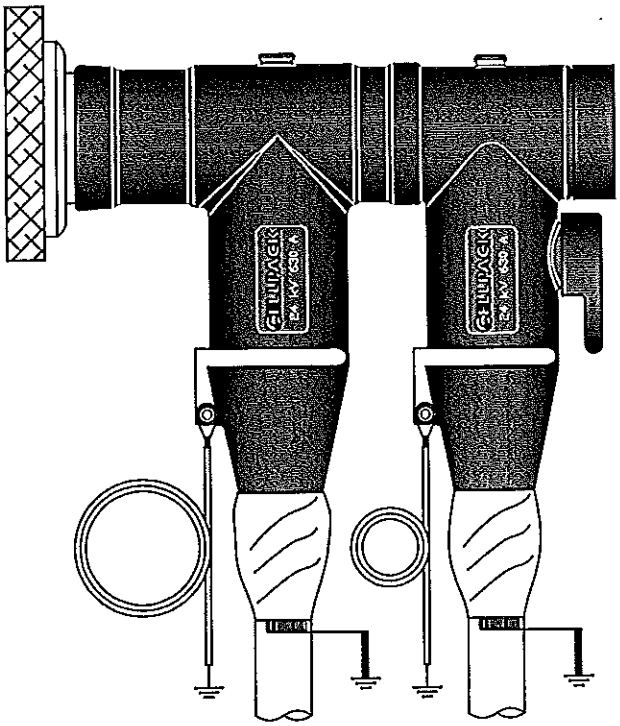
- Moisten inside of the CTKS-connector body and the new insulating plug with lubricant and filling agent GM1.
- Cut out a second tongue from the applicator and insert it into the connector body.
- Insert the new insulating plug into the connector body. Tighten the insulating plug with an appropriate tool. Do not apply a shear moment „M" bigger than 40 Nm.

14)



- Pull out gently the decompression devices and remove remaining of lubricant and filling agent GM1.

15)



- Insert the conductive protection cup over the connector body and ground the CTKS-connector body.
- Further earthing measurements have to be carried out according to local regulations.

Наименование на материала: Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители

Съкратено наименование на материала: Клемен блок с Цилиндрични П-л П-ч Р-ли

Област: G - Инсталации

Категория: 14 - Инсталационни тръби, кутии, клемни кутии, клеми, планки

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Клемен блок комплектуван с делими измервателни клеми от проходен тип, за монтаж на DIN шина, с резбови контактни съединения за медни токопроводими жила с класове 1,2 и 5 съгласно БДС EN 60228:2006 или еквивалент със сечения от от 2,5 mm^2 до min 6 mm^2 (max 16 mm^2) и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители. Клеморедът е защитен от неправомерен достъп посредством прозрачен устойчив на деформации капак с възможност за пломбиране.

Използване:

Клемният блок, комплектуван с делими измервателни клеми и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители е предназначен за присъединяване на медни токопроводими жила при опроводяване на системи за измерване на използваните от потребителите количества електрическа енергия, еталонна апаратура за проверка и аналогични инсталации.

Съответствие на предложеното изпълнение със стандартизационните документи:

Клемният блок, комплектуван с делими измервателни клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители, трябва да бъдат в съответствие с изискванията на посочените стандарти или еквиваленти, включително на техните валидни изменения и поправки:

- БДС EN 60947-7-1:2009 "Комутационни апарати за ниско напрежение. Част 7-1: Спомагателни принадлежности. Клемни блокове за медни проводници (IEC 60947-7-1:2009)";
- БДС EN 60947-1:2007 „Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)"; и
- БДС EN 60947-3:2009 „Комутационни апарати за ниско напрежение. Част 3: Товарови прекъсвачи, разединители, товаров прекъсвач-разединители и апарати, комбинирани с предпазители (IEC 60947-3:2008)" и

да бъдат оценени положително по реда и при условията на Наредбата за съществените изисквания и оценяване на съответствието на електрически съоръжения, предназначени за използване в определени граници на напрежението, приета с ПМС № 182 от 6.07.2001 г., обн., ДВ, бр. 62 от 13.07.2001 г. .....

Изисквания към документацията и изпитванията

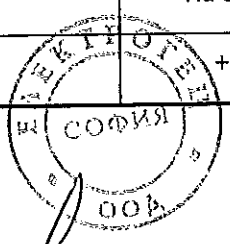
№ по ред	Документ	Приложение № или текст
1.	Точно означение на типа, производителя и страната на производство (произход) и последно издание на каталога на производителя	URTK/S, Phoenix Contact, Германия Приложение 1
2.	Техническо описание и чертежи с нанесени на тях размери	Приложение 2
3.	ЕО декларация за съответствие	Приложение 3
4.	Протоколи от типови изпитвания на английски или български език съответно за 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители и клемните блокове, проведени от независима изпитвателна лаборатория – заверени копия, с приложен списък на отделните изпитвания на български език	Приложение 4
5.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 4 – заверено копие	Приложение 5

Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. Каталозите и протоколите от проверките и изпитванията могат да бъдат и само на английски език.

Технически данни

1. **Характеристики на работната среда**

№ по ред	Характеристика	Стойност
1.1	Околна среда, в която работи	На закрито
1.2	Максимална околна температура	+ 40°C



1.3	Минимална околна температура	Минус 5°C
1.4	Относителна влажност (при 20 °C)	До 90 %
1.5	Степен на замърсяване	III
1.6	Надморска височина	До 1000 m

2. Параметри на електроразпределителната мрежа

№ по ред	Параметър	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално работно напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Брой на фазите	3
2.5	Заземяване на звездния център	Директно заземен

3. Технически характеристики

№ по ред	Характеристика	Изискване	Гарантирано предложение
3.1	Клемен блок	-	-
3.1.1	Конструкция	а) Клемният блок трябва да бъде комплектуван с делими измервателни клеми от проходен тип с резбови контактни съединения, за монтаж на DIN шина	а) Клемният блок трябва е комплектуван с делими измервателни клеми от проходен тип с резбови контактни съединения, за монтаж на DIN шина
		б) Клемите за началата и краищата на отделните токови вериги трябва да бъдат монтирани една до друга.	б) Клемите за началата и краищата на отделните токови вериги са монтирани една до друга.
		в) Клемният блок трябва да осигурява	в) Клемният блок

№ по ред	Характеристика	Изискване	Гарантирано предложение
		възможност за независимо шунтиране и разкъсване на токовите вериги на всяка от фазите	осигурява възможност за независимо шунтиране и разкъсване на токовите вериги на всяка от фазите
		г) Клемният блок трябва да бъде комплектуван с разделителни стени между нееднородните фази и клемата за неутралния проводник	г) Клемният блок е комплектуван с разделителни стени между нееднородните фази и клемата за неутралния проводник
		д) Клемният блок ведно със стопяемите цилиндрични предпазител-прекъсвач-разединители трябва да бъдат защитени срещу неправомерен достъп с прозрачен монолитен капак с възможност за пломбиране	д) Клемният блок ведно със стопяемите цилиндрични предпазител-прекъсвач-разединители са защитени срещу неправомерен достъп с прозрачен монолитен капак с възможност за пломбиране
		е) Защитният монолитен капак трябва бъде изработен от поликарбонат или еквивалентен прозрачен материал с дебелина на стените min 2 mm и да осигурява клас на защита на клемния блок IP 4X съгласно БДС EN 60529+A1:2004 до ниво монтажна плоча от всички страни или еквивалент.	е) Защитният монолитен капак е изработен от поликарбонат или еквивалентен прозрачен материал с дебелина на стените min 2 mm и осигурява клас на защита на клемния блок IP 4X съгласно БДС EN 60529+A1:2004 до ниво монтажна плоча от всички страни или еквивалент.
3.1.2	Размери	-	

ЕЛЕКТРОГЕН СОФИЯ ООД

№ по ред	Характеристика	Изискване	Гарантирано предложение
3.1.2a	Височина	max 140 mm	140 mm
3.1.2b	Широчина	max 170 mm	150 mm
3.1.2c	Дълбочина	80 mm (препоръчително)	78 mm
3.2	Проходни делими клеми	-	-
3.2.1	Конструкция	а) Клемите с резбови контактни съединения трябва да позволяват присъединяване на медни токопроводими жила с класове 1,2 и 5 съгласно БДС EN 60228 или еквивалент със сечения от от 2,5 mm^2 до min 6 mm^2 (max 16 mm^2)	а) Клемите с резбови контактни съединения позволяват присъединяване на медни токопроводими жила с класове 1,2 и 5 съгласно БДС EN 60228 или еквивалент със сечения от от 0,5 mm^2 до 10 mm^2
		б) Клемите трябва да бъдат окомплектовани със съответните аксесоари, позволяващи свързване на измервателна апаратура	б) Клемите са окомплектовани със съответните аксесоари, позволяващи свързване на измервателна апаратура
3.2.2	Съответствие със стандарти	БДС EN 60947-7-1 или еквивалент	БДС EN 60947-7-1 или еквивалент
3.2.3	Обявено работно напрежение AC, U_e	min 500 V	500V
3.2.4	Обявен продължителен ток, I_n	min 10 A	41A
3.2.5	Сравнителен показател за устойчивост срещу пропълзяващи токове - CTI	min 600	600
3.2.6	Минимален работен температурен	От минус 30°C до + 90°C	От минус 60°C до +90°C

№ по ред	Характеристика	Изискване	Гарантирано предложение
	диапазон		
3.2.7	Категория на горимост	min V-0	V-0
3.2.8	Закрепване	Към шина с DIN – профил с размери 35x7.5 mm	Към шина с DIN – профил с размери 35x7.5 mm
3.2.9	Клеми за токовите вериги	6 бр. токови клеми, позволяващи: o независимо свързване на късо (шунтиране) на токовите вериги на електромера на всяка фаза посредством мостова връзка; o видимо разкъсване на токовите вериги.	6 бр. токови клеми, позволяващи: o независимо свързване на късо (шунтиране) на токовите вериги на електромера на всяка фаза посредством мостова връзка; o видимо разкъсване на токовите вериги.
3.2.10	Клема за неутралния проводник	1 бр. с възможност за видимо разкъсване на веригите. (Не се изисква при използване на 3P+N цилиндрични предпазител-прекъсвач-разединители)	1 бр. с възможност за видимо разкъсване на веригите
3.2.11	Разделителна стена между неоднородните фази и неутралния проводник	Клемният блок трябва да бъде комплектуван с разделителни стени за предотвратяване на неволно шунтиране или късо съединение	Клемният блок е комплектуван с разделителни стени за предотвратяване на неволно шунтиране или късо съединение
3.2.12	Крайна капачка	1 бр. или 2 бр. (в зависимост от конструкцията)	1бр
3.2.13	Краен притискач с винтове	2 бр.	2бр
3.2.14	Маркировка на клемите	а) Токовите клемите трябва да бъдат маркирани с буквено-цифрени означения за фаза и начало и край на съответните фази	а) Токовите клемите са маркирани с буквено-цифрени означения за фаза и начало и край на съответните фази
		б) Цветова маркировка –	б) Цветова маркировка

№ по ред	Характеристика	Изискване	Гарантирано предложение
		препоръчително	- на тест буксите
3.3	Спецификация 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители		-
3.3.1		а) 3 броя еднополюсни (1P) или 1 брой триполюсни (3P или 3P+N) стопяемите цилиндрични предпазител-прекъсвач-разединители	3 бр еднополюсни
		б) Еднополюсни (1P) или триполюсните (3P) стопяемите цилиндрични предпазител-прекъсвач-разединители са съгласно стандарт 20 16 6zzz в Приложение 1 с предпазители 10x38 mm от категория на приложение gG с обявен ток на стопяемата вложка 4 A	б) Еднополюсните (1P) стопяеми цилиндрични предпазител-прекъсвач-разединители са съгласно стандарт 20 16 6zzz в Приложение 1 с предпазители 10x38 mm от категория на приложение gG с обявен ток на стопяемата вложка 4 A
		в) Съответствието на 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители с изискванията на стандартизационните документи се доказва с последно издание на каталога на производителя и със заверени копия на протоколи от типови изпитвания, проведени от независима акредитирана лаборатория.	в) Съответствието на 1P стопяеми цилиндрични предпазител-прекъсвач-разединители с изискванията на стандартизационните документи е доказано с последно издание на каталога на производителя и със заверени копия на протоколи от типови изпитвания, проведени от независима акредитирана лаборатория - Приложение 6

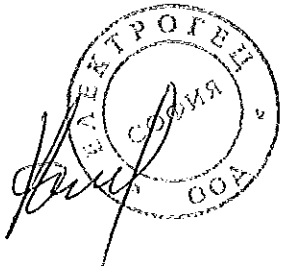
№ по ред	Характеристика	Изискване	Гарантирано предложение
3.3.2	Технически изисквания за 3P+N триполюсен стопяем цилиндричен предпазител-прекъсвач-разединител, размер 10x38 mm		-
3.3.2.1	Брой на полюсите	3+N	3 бр. еднополюсни
3.3.2.2	Широчина	max 54 mm	3x18 mm (54 mm общо)
3.3.2.3	Обявено работно напрежение AC, Ue	min 500 V	690V
3.3.2.4	Обявена честота	50 Hz	50Hz
3.3.2.5	Обявено напрежение на изолацията Ui AC	min 750 V	750V
3.3.2.6	Категория по пренапрежение при 400 V AC	III	III
3.3.2.7	Обявено издържано импулсно напрежение, Uimp	4 kV	6kV
3.3.2.8	Категория на приложение (при 400V AC)	AC 21 B	AC21B
3.3.2.9	Термичен ток със стопяема вложка, Ith	32 A	32A
3.3.2.10	Условен ток на късо съединение (ефективна стойност) при 400 V AC	min 50 kA	100kA
3.3.2.11	Размер на цилиндричната стопяема вложка	10 x 38 mm	10x38mm
3.3.2.12	Максимална стойност на обявения ток на стопяемата вложка In	32 A	32A
3.3.2.13	Ток на приложената стопяема вложка	4 A	4 A
3.3.2.14	Максимална мощност на разсейване на	3,5 W	3W

№ по ред	Характеристика	Изискване	Гарантирано предложение
	стопяемата вложка		
3.3.2.15	Механична износоустойчивост (комутационни цикли)	min 1 700	min 1700
3.3.2.16	Електрическа износоустойчивост (комутационни цикли)	min 300	min 300
3.3.2.17	Степен на защита	min IP20	IP20
3.3.2.18	Диапазон на сеченията на присъединяваните проводници	От 2,5 до 10 mm2 за Cu проводници	От 0.5 до 25 mm^2 за Cu/Al проводници
3.3.2.19	Тегло, g	Да се посочи	3x65 g (195 g общо)
3.4	DIN-шина	а) Шината с DIN – профил за закрепване на клемореда трябва да бъде с размери 35x7,5 mm и да съответства на изискванията на DIN 46277 P3 или еквивалент.	а) Шината с DIN – профил за закрепване на клеморе е с размери 35x7,5 mm и да съответства на изискванията на DIN 46277 P3 или еквивалент.
		б) DIN шината трябва да бъде изработена от стомана и да бъде защитена от корозия чрез поцинковане или друго еквивалентно антикорозионно покритие.	б) DIN шината е изработена от стомана и е защитена от корозия чрез поцинковане или друго еквивалентно антикорозионно покритие.
		в) DIN шината не трябва да се показва извън капака, покриващ целия клемен блок	в) DIN шината не се показва извън капака, покриващ целия клемен блок

4. Свързани документи

В техническата спецификация на стандарта за „Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители“ е направено позоваване на следните технически спецификации на стандарти за материали с йерархична съподчиненост, които са неразделна част от документа, както следва:

№ по ред	Номер на техническа спецификация на стандарт	Наименование на материала
4.1	20 16 6zzz	Триполюсни и еднополюсни стопяем цилиндричен предпазител-прекъсвач-разединители, размер 10x38 mm



„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители"

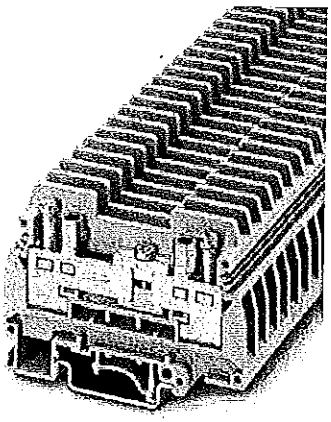
Приложение № 1

PHOENIX CONTACT

Extract from the online catalog

URTK/S

Order No.: 0311087



http://eshop.phoenixcontact.net/phoenix/treeViewClick.do?UID=0311087

Test disconnect terminal block, Connection method: Screw connection, Cross section: 0.5 mm² - 10 mm² , AWG: 20 - 10, Width: 8.2 mm, Mounting type: NS 35/7.5, NS 35/15, NS 32, Color: gray

Commercial data

EAN	4 017918 001292
Pack	50 pcs.
Customs tariff	85369010
Gross weight in pieces	0.035996 KG
Net weight per piece (exclusive packing)	0.03581 KG
Catalog page information	Page 463 (CL1-2011)

Product notes

WEEE/RoHS-compliant since: 01/01/2003

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Number of levels	1
Number of connections	2
Color	gray

Insulating material	PA
Inflammability class according to UL 94	V0

Dimensions

Length	72 mm
Width	8.2 mm
Height NS 35/7,5	51.5 mm
Height NS 35/15	59 mm
Height NS 32	56 mm

Technical data

Rated surge voltage	6 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I_N	41 A
Nominal voltage U_N	400 V
Open side panel	ja
Shock protection test specification	DIN EN 50274 (VDE 0660-514):2002-11
Back of the hand protection	guaranteed
Surge voltage test setpoint	7.3 kV
Result of surge voltage test	Test passed
Power frequency withstand voltage setpoint	1.89 kV
Result of power-frequency withstand voltage test	Test passed
Checking the mechanical stability of terminal points (5 x conductor connection)	Test passed
Bending test rotation speed	10 rpm
Bending test turns	135
Bending test conductor cross section/weight	0.5 mm² / 0.3 kg
	6 mm² / 1.4 kg
	10 mm² / 2 kg
Result of bending test	Test passed
Conductor cross section tensile test	0.5 mm²
Tractive force setpoint	20 N
Conductor cross section tensile test	6 mm²
Tractive force setpoint	80 N

Conductor cross section tensile test	10 mm²
Tractive force setpoint	90 N
Tensile test result	Test passed
Tight fit on carrier	NS 32/NS 35
Setpoint	5 N
Result of tight fit test	Test passed
Result of voltage drop test	Test passed
Temperature-rise test	Test passed
Conductor cross section short circuit testing	6 mm²
Short-time current	0.72 kA
Conductor cross section short circuit testing	10 mm²
Short-time current	1.2 kA
Short circuit stability result	Test passed
Proof of thermal characteristics (needle flame) effective duration	30 s
Result of thermal test	Test passed
Temperature index, insulating material (DIN EN 60216-1 (VDE 0304-21))	130 °C
Static insulating material application in cold	-60 °C

Connection data

Conductor cross section solid min.	0.5 mm²
Conductor cross section solid max.	10 mm²
Conductor cross section stranded min.	0.5 mm²
Conductor cross section stranded max.	6 mm²
Conductor cross section AWG/kcmil min.	20
Conductor cross section AWG/kcmil max	8
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.5 mm²
Conductor cross section stranded, with ferrule without plastic sleeve max.	6 mm²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.5 mm²
Conductor cross section stranded, with ferrule with plastic sleeve max.	4 mm²
2 conductors with same cross section, solid min.	0.5 mm²
2 conductors with same cross section, solid max.	2.5 mm²
2 conductors with same cross section, stranded min.	0.5 mm²

2 conductors with same cross section, stranded max.	6 mm²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	4 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	4 mm²
Connection method	Screw connection
Stripping length	13 mm
Internal cylindrical gage	A5
Screw thread	M4
Tightening torque, min	1.2 Nm
Tightening torque max	1.5 Nm

Certificates / Approvals

Certification — CSA, cULus Recognized, GOST, KEMA-KEUR, DNV, LR, PRS, RS, CCA

Certifications applied for:

Certification Ex:

Accessories

Item	Designation	Description
Assembly		
3034361	AP-ME METER	Cover profile, for covering terminal strips, snapped onto APT-ME cover profile carrier or APH-ME end bracket. A cover profile carrier should be positioned at the ends and at intervals of around 40 cm. Length supplied: 1 m
3034374	APH-ME	Cover profile carrier for mounting on NS 35/7.5 DIN rail for attaching the cover profile AP-ME
3034358	APT-ME	Cover profile carrier for mounting on NS 35/7.5 DIN rail for attaching the cover profile AP-ME

0310224	ATS-RTK	Partition plate, Length: 72 mm, Width: 0.8 mm, Height: 51.5 mm, Color: gray
3022218	CLIPFIX 35	Snap-on end bracket, for 35 mm NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 8 and ZB 8/27, terminal strip marker KLM 2 and KLM, width: 9.5 mm, color: gray
3022276	CLIPFIX 35-5	Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, can be fitted with ZB 5 and ZBF 5 zack marker strip, KLM 2, KLM3, and KML3L terminal strip marker, parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm, color: gray
0310020	D-URTK	End cover, Length: 72 mm, Width: 2.2 mm, Height: 41.5 mm, Color: gray
1201442	E/UK	End clamp, for assembly on NS 32 or NS 35/7.5 DIN rail
1201413	E/UK 1	End clamps, for supporting the ends of double-level and three-level terminal blocks, width: 10 mm, color: gray
1201002	NS 32 PERF 2000MM	G-profile DIN rail, material: Steel, perforated, height 15 mm, width 32 mm, length 2 m
1201015	NS 32 UNPERF 2000MM	G-profile DIN rail, material: Steel, unperforated, height 15 mm, width 32 mm, length 2 m
0801704	NS 35/ 7,5 AL UNPERF 2000MM	DIN rail, material: Aluminum, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1206560	NS 35/ 7,5 CAP	DIN rail end piece, for DIN rail NS 35/7.5
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2000 mm
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1204119	NS 35/ 7,5 WH PERF 2000MM	DIN rail 35 mm (NS 35)
1204122	NS 35/ 7,5 WH UNPERF 2000MM	DIN rail 35 mm (NS 35)
1206421	NS 35/ 7,5 ZN PERF 2000MM	DIN rail, material: Galvanized, perforated, height 7.5 mm, width 35 mm, length: 2 m
1206434	NS 35/ 7,5 ZN UNPERF 2000MM	DIN rail, material: Galvanized, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm, width 35 mm, length 2000 mm
1206573	NS 35/15 CAP	DIN rail end piece, for DIN rail NS 35/15
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 PERF 2000MM	DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm, width 35 mm, length: 2000 mm
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m

0806602	NS 35/15 WH PERF 2000MM	DIN rail 35 mm (NS 35)
1204135	NS 35/15 WH UNPERF 2000MM	DIN rail 35 mm (NS 35)
1206599	NS 35/15 ZN PERF 2000MM	DIN rail, material: Galvanized, perforated, height 15 mm, width 35 mm, length: 2 m
1206586	NS 35/15 ZN UNPERF 2000MM	DIN rail, material: Galvanized, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
0310211	TS-RTK	Separating plate, Length: 72 mm, Width: 0.8 mm, Color: gray

Bridges

0311281	ASB 2-RTK/S	Switching jumper, Number of positions: 2, Color: silver
0202154	EB 2- 8	Insertion bridge, Number of positions: 2, Color: gray
0202141	EB 3- 8	Insertion bridge, Number of positions: 3, Color: gray
0202142	EB 4- 8	Insertion bridge, Number of positions: 4, Color: gray
0202138	EB 10- 8	Insertion bridge, Number of positions: 10, Color: gray
0311171	FB 10- RTK/S	Fixed bridge, Number of positions: 10, Color: silver
0308359	S	Switching lock, Length: 12 mm, Width: 8.2 mm, Color: white
0311236	SB 2-RTK/S	Switching jumper, Number of positions: 2, Color: silver
0311265	SB 4-RTK/S	Switching jumper, Number of positions: 4, Color: silver
0311278	USB 2-RTK/S	Switching jumper, Number of positions: 2, Color: silver

General

0800886	E/NS 35 N	End clamp, width: 9.5 mm, color: gray

Marking

1007235	SBS 8:UNBEDRUCKT	Marker cards, Card, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, Snap into flat marker groove, For terminal block width: 8.2 mm, Lettering field: 6 x 8.1 mm
0818072	UC-TM 8	Marker for terminal blocks, Sheet, white, Unlabeled, Can be labeled with: BLUEMARK CLED, Bluemark, Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 7.6 x 10.5 mm
0824597	UC-TM 8 CUS	Marker for terminal blocks, Can be ordered: By sheet, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 7.6 x 10.5 mm
0828740	UCT-TM 8	Marker for terminal blocks, Sheet, white, Unlabeled, Can be labeled with: Thermomark C+, Thermomark C, BLUEMARK CLED, Bluemark, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 7.6 x 10.5 mm

0829616	UCT-TM 8 CUS	Marker for terminal blocks, Can be ordered: By sheet, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 7.6 x 10.5 mm
0825011	ZB 8 CUS	Zack marker strip, Can be ordered: Strip, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 10.5 x 8.15 mm
1052002	ZB 8:UNBEDRUCKT	Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm, Lettering field: 10.5 x 8.15 mm

Plug/Adapter

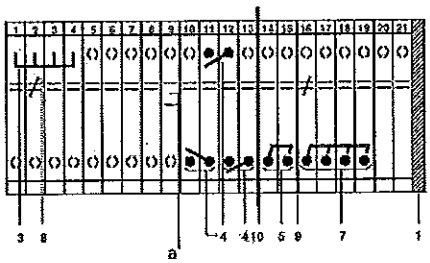
0311728	PSBJ-URTK/S BK	Female test connector, Color: black
0311757	PSBJ-URTK/S BU	Female test connector, Color: blue
0311760	PSBJ-URTK/S GN	Female test connector, Color: green
0311744	PSBJ-URTK/S RD	Female test connector, Color: red
0311773	PSBJ-URTK/S VT	Female test connector, Color: violet
0311731	PSBJ-URTK/S YE	Female test connector, Color: yellow

Tools

1205066	SZS 1,0X4,0 VDE	Screwdriver, bladed, VDE insulated, size: 1.0 x 4.0 x 100 mm, 2-component grip, with non-slip grip

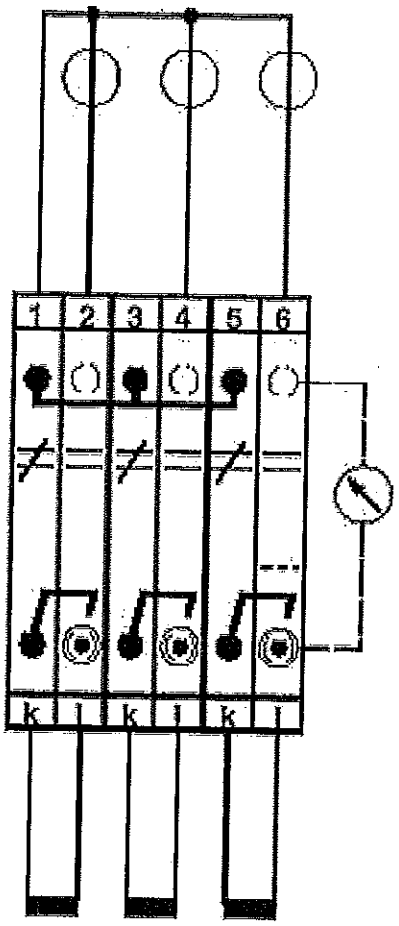
Diagrams/Drawings

Circuit diagram

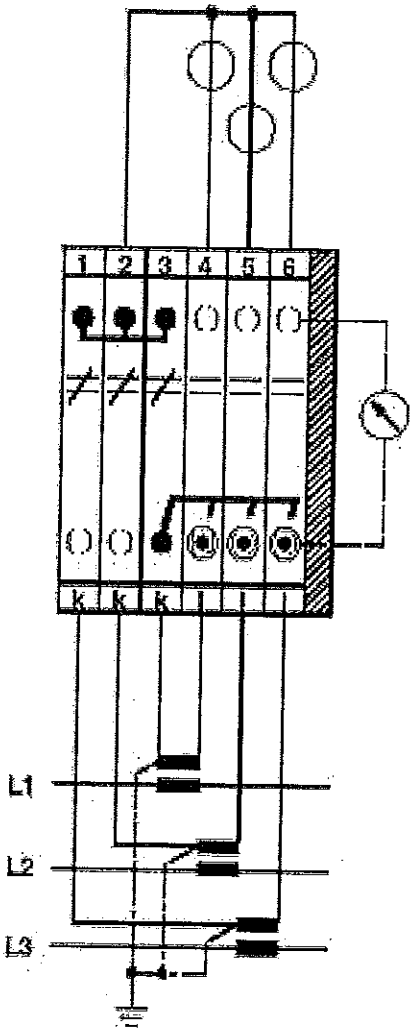


a = open
1 = cover
3 = fixed bridge
4 = switch bar, for 2 terminal blocks, useable on both sides of the disconnect point, inward switching motion
5 = switch bar, for 2 terminal blocks, useable on both sides of the disconnect point, outward switching motion
7 = switch bar, for 3-phasige short-circuiting of linked current transformer sets, only on the right
8 = switching lock, prevents disconnect slide from being actuated
9 = separating plate, for electrical separation of neighboring bridges in terminal center
10 = partition plate

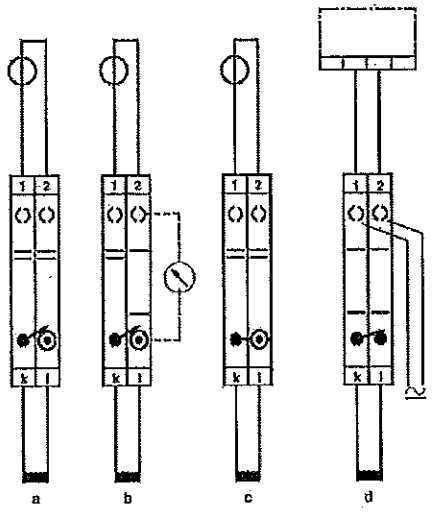
Schematic diagram



Three-phase transducer test set



Three-phase linked transducer test set



Simple current transformer test circuit
a = normal operation
b = measured value testing
c = transformer short-circuit
d = relay testing

Address

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstr. 8
32825 Blomberg,Germany
Phone +49 5235 3 00
Fax +49 5235 3 41200
http://www.phoenixcontact.com

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1Р, 3Р или 3Р+N стопяеми цилиндрични предпазител-прекъсвач-разединители"

Приложение № 2

V&V isoMatic
INDUSTRIAL CONTROL & COMMUNICATIONS

ВиВ Изоматик ООД
София 1404, ул."Деян Белишки" 68
София 1505, ПК 59
Телефон: (+359 2) 958 3111, 958 6344, 958 6340
Факс: (+359 2) 958 2270
E-mail: v.v@techno-link.com
http://www.viv-isomatic.com

Банкова сметка 1004521117, Булбанк София 62196214

ТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ

Предлаганите клеми са производство на фирма Phoenix Contact – Германия. Фирмата е сертифицирана по ISO 9001. Клемите са тествани и са в съответствие с IEC 60 947-7-1, IEC 60947-1, IEC 60695-2-2, EN 50019, а също така притежават и други сертификати, които са дадени за всяка клема в каталога.
Клемите на Phoenix Contact са с универсална основа за закрепване както към симетрична шина NS 35/7,5, NS 35/15, така и към несиметрична - NS 32. Кабелните входове на клемата са затворени фунии, което улеснява въвеждането на проводника. Всички клеми имат гнезда за индивидуално и рационално маркиране.
Предлаганите клеми, производство на Phoenix Contact притежават следните по-важни качества:

- **всички метални части са устойчиви на електролитна корозия и ръжда**

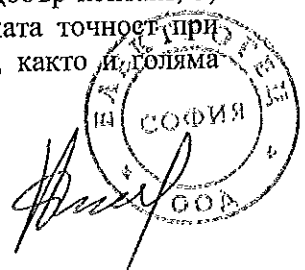
Всички метални елементи на клемите са изработени от медна сплав, с високо съдържание на мед, като напълно се избягва използването на стомана. Това елиминира две възможни причини за корозия: Едната е електролитна корозия, която възниква между медния проводник и стоманата, при наличие на влага. Втората е ръждата и последиците от нея – ненадежден електрически контакт, блокирани винтчета. Използването само на медна сплав има и допълнителни предимства като: 1) ниско температурно повишение, поради високата електрическа проводимост и 2) по-малко вероятно е разхлабване на винтчетата, тъй като практически няма относително термично разширение между проводника и притискащата част.
Повърхността на металните части е защитена с калаено или никелово галванично покритие.

- **блокиране на винтчетата срещу саморазвиване**

Phoenix Contact притежава патент, наречен "Reakdyn principle" за предпазване на винтчетата от саморазвиване. Конструкцията на притискащата част е на приципа на движеща се клетка. При завъртане на винта, той натиска тоководещата част и издърпва проводника в клетката към тоководещата част. Поради високата притискаща сила проводника се интегрира в мекото калаено покритие на тоководешата част. Така се постига контактно съпротивление което превишава изискванията на IEC 60 947-7-1, като за клема 4 mm^2 то е 0,3mΩ.
Поради специалната си форма при затягане на винтчето горната част на клетката се деформира еластично и предизвиква нарастваща триеща сила в главата на винтчето, която не му позволява да се саморазвие.

- **надежна механична и електрическа връзка, съгласно IEC 60 947-7-1**

Конструкцията на притискащата част на клемата не само удовлетворява тези изсквания, но дори ги надвишава, поради следните качества: 1) Равната основа на притискащата част гарантира, че дори и най тънкия проводник ще бъде стегнат както трябва., 2) напречните жлебове на тоководещата част гарантират нарушаване оксидацията по проводника, без да го извиват и така осигуряват добър контакт, 3) стабилната конструкция на притискащите части, заедно с високата точност при изработка, осигуряват връзка, недопускаща проникването на газ, както и соляма



сила на притискане. Това означава, че условията за контакт могат да се поддържат стабилни за дълъг период от време, дори в агресивна атмосфера.

- **качества на изолационния материал**

Изолационния материал на клемите, които са предмет на настоящия търг е Полиамид 6.6. Този материал е одобрен от всички оторизирани лаборатории като CSA, NEMKO, KEMA, VDE и др. Той има отлични електрически, механични, химически и други качества, дори при високи температури. Позволени са кратковременно температури до 200° С. Полиамида абсорбира вода до 2,8%, но тази влага не е във формата на кристализирана вода в пластмасата, а е химически свързана в молекулната структура. Това прави пластмасата гъвкава и нечуплива, дори при ниски температури от -40° С. Полиамида има клас на негоримост V0, съгласно UL 94.

Максималния допустим ток на клемите зависи от максимално допустимото сечение на проводника и е в съответствие с IEC 60947-7-1.

Съответствие на техническите изисквания

Съгласно горното, предлаганите клеми притежават следните характеристики в съответствие с техническите изисквания:

1. Проводниците се присъединяват към клемите чрез винтова връзка, осигуряваща необслабваща електическа връка при вибрации и стареене;
2. Проводимите и притискащи части са устойчиви срещу електролитна корозия и ръжда. Гарантиран клас на негоримост – V0 съгласно UL 94;
3. Повишена механична устойчивост;
4. Изолационният материал не абсорбира влага;
5. Клемите са с гнезда за поставяне на етикети от двете страни;
6. Клемите се монтират върху универсална монтажна рейка. Възможен е монтаж както както към симетрична шина NS 35/7,5, NS 35/15, така и към несиметрична - NS 32
7. Токови клеми:
   - Пофазно шунтиране на токовите вериги към ТТ с подвижни (фиксирани към клемата) или преносими изолирани мостове, съгласно приложената схема;
   - Видимо разкъсване на токовите вериги след шунтиране;
   - Включване на товарно устройство за тестване – монтирана или с възможност за монтаж на тест букса с диаметър 4mm;
   - Видимо разделяне на токовите вериги по предназначение (ядра);
8. Напреженови вериги:
   - Видимо разкъсване ;
   - Включване на товарно устройство за тестване – монтирана или с възможност за монтаж на тест букса с диаметър 4mm;
   - Възможност за видимо разделяне на напреженовите вериги по фази и предназначение;
   - Възможност за включване на измервателни уреди от двете страни на клемата;

Кратко описание на предложените клеми и аксесоари към тях

1. **URTK/S**

Клеми с винтова връзка за присъединяване на кръгъл твърд проводник до $10mm^2$ или гъвкав проводник с/без накрайник до $6mm^2$. Клемата е с възможност за фиксирано разкъсване на връзката, с гнезда за присъединяване на тестови проводници или за поставяне на шунтиращи мостчета от двете страни на клемата - щифт 4mm. Тази клема е универсална и удовлетворява всички изисквания за яснота на веригата, удобства за превключване. Клемата предлага няколко типа на замостване: чрез конектори с изолирана ръкохватка (2, 4 поз.), превключващи мостове (2, 4 поз.) за окъсяване на трансформаторни вериги, фиксиран мост – 10 позиционен, делим, окомплектован с винтове. Гнездата за тестови проводник или шунтиращ конектор всяка страна са независими от винта за присъдиняване на проводника.

2. **URTK/SP**

Клеми с винтова връзка за присъединяване на кръгъл твърд проводник до $10mm^2$ или гъвкав проводник с/без накрайник до $6mm^2$. Клемата е с възможност за фиксирано разкъсване на връзката, с гнезда за присъединяване на тестови проводници или за поставяне на шунтиращи мостчета от двете страни на клемата - щифт 4mm. Тази клема е универсална и удовлетворява всички изисквания за яснота на веригата, удобства за превключване и защита от допир до тоководещи части. Клемата предлага няколко типа на замостване: чрез изолирани превключващи мостове (2, 3, 4, 10 поз.), неизолиран фиксиран мост, конектори с изолирана ръкохватка (2, 4 поз.) Гнездата за тестови проводник или шунтиращ конектор са напълно изолирани.

3. **D-URTK**

Крайна капачка за клема URTK/S.

4. **Разделителна пластина ATP-URTK/SP.**

Секционна разделителна пластина за визуално и електрическо разделяне на клемни групи за директен монтаж на DIN шина. Дебелина: 2 мм.

Подходяща за използване с всички токови и напреженови клеми.

5. **Шунтиращ мост SB 2-RTK/S.**

Двупозиционен подвижен, шунтиращ мост за клеми URTK/S.

6. **Шунтиращ мост SB 2-URTK/SP.**

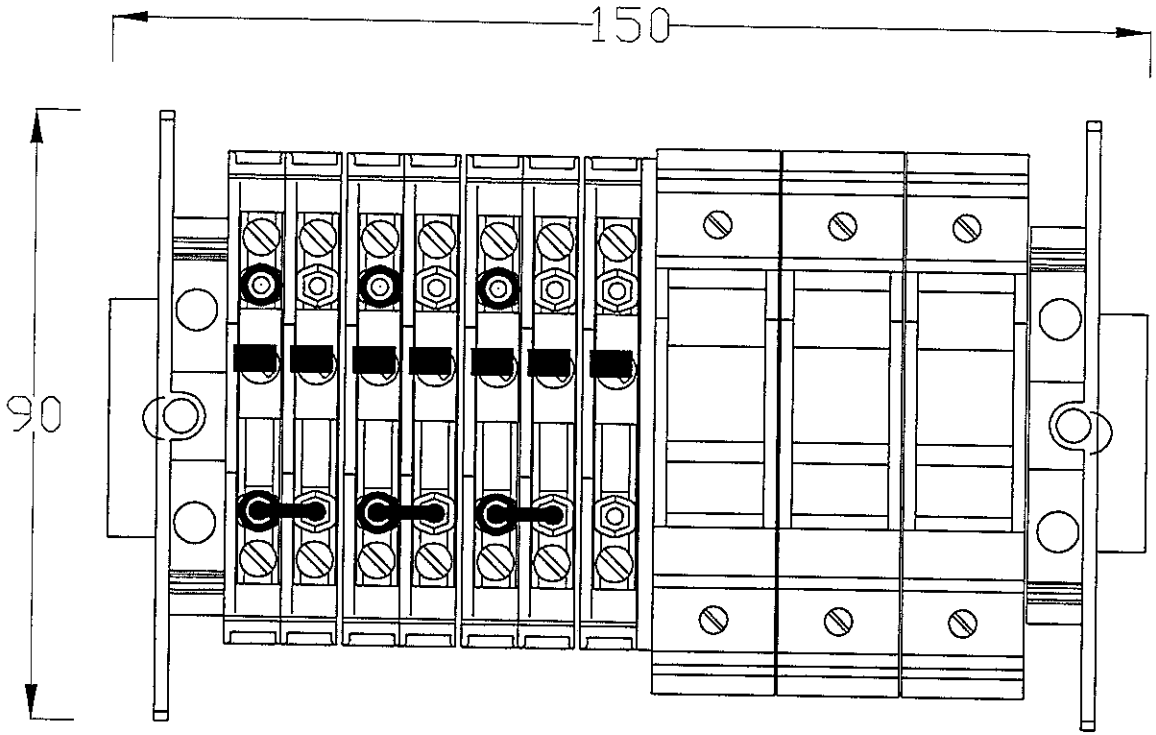
Двупозиционен изолиран, подвижен, шунтиращ мост за клеми URTK/SP.

7. **Фиксатор за клемен пакет CLIPFIX 35.**

Фиксатор със защипване за симетрични шини 35/7,5 мм, 35/15 мм.
Ширина: 9,5 мм. Материал: полиамид.
Клас на запалимост: V0. Цвят: сив.
Може да се маркира със стантартни клемни маркировки ZB, маркировки: KLM, KLM 2.

Съставил:

Инж. Владимир Лазаров
"ВиВ Изоматик" ООД



ВиВ Изоматик ООД
1680 София, ул. "Пирин" No40A
тел. 02 958 63 40, 958 63 44, 958 31 11, факс 958 22 70

ОБЕКТ:Измервателен клеморед ЧЕ3

СЪГЛАСУВАЛИ:

ВЪЗЛОЖИТЕЛ:

част:	лист No: 1/ 1
фаза: РП	мащаб: ~

Чертал:

Р-л фирма: инж. Вл. Лозаров

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

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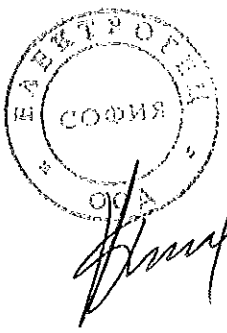
РЕФ. № PPD 15-042

"Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители"

Приложение № 3



PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg, Germany
Telefon: ++49 / (0) 52 35/300
Telefax: ++49 / (0) 52 35/34 12 00
Internet: http://www.phoenixcontact.com
USt-Id-Nr.: DE124613250

PHOENIX CONTACT GmbH & Co. KG · 32823 Blomberg

TO WHOM IT MAY CONCERN

Development Quality Laboratory
Business Unit
Industrial Connection Technology

Telefon: ++49 / (0) 52 35/34 20 71
++49 / (0) 52 35/34 10 97
Telefax: ++49 / (0) 52 35/34 12 06

04st of Decembre 2009

Certification regarding the static use of modular terminal blocks in the temperature range from -60°C to +120°C

Dear Sir or Madam,

Based on the available documentation of our plastic suppliers, we herewith certify for the non-reinforced polyamide plastics used in the area of CLIPLINE (Industrial Connection Technology) as follows:

Considering self-heating, articles made of the above materials can be used in static operation from -60°C to +120°C.

Best regards

PHOENIX CONTACT GmbH & Co. KG

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg, Germany
Development Quality Laboratory
Business Unit
Industrial Connection Technology

i.V. Dipl.-Phys. Ing. Alessandro Alberani
Head of Development
Quality Laboratory
Business Unit ICT

i.V. Dipl.-Phys. Ing. Alessandro Alberani

ВЯРНО С ОРИГИНАЛА

i.A. Dipl.-Chem. Ing. J. Jacke

ЕЛЕКТРОН ИМПЕКС СОФИЯ

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg, Germany
Telefon: +49 5235 300
Telefax: +49 5235 3-41200
Internet: http://www.phoenixcontact.com
USt-Id-Nr.: DE124613250
WEEE-Reg.-Nr.: DE50738265

PHOENIX CONTACT GmbH & Co. KG · 32823 Blomberg

TO WHOM IT MAY CONCERN

Development Quality Laboratory
Business Unit
Industrial Connection Technology

Phone: ++49 / (0) 52 35/34 20 71
Fax: ++49 / (0) 52 35/341 2 06

04st of Decembre 2009

Confirmation

Dear Sir or Madam,

We hereby confirm that the universal test disconnect terminal block URTK/S (0311087) is applicable at the rated insulation voltage up to 500 V in accordance to IEC 60947-7-1:2002-07 (partly)

Yours sincerely

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg, Germany
Development Quality Laboratory
Business Unit
Industrial Connection Technology

i.V. Dipl.-Phys. Ing. Alessandro Alberani
Head of Development
Quality Laboratory
Business Unit ICT

i.V. Dipl.-Phys. Ing. Alessandro Alberani

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният, Владимир Лазаров- Управител на ВИВ-ИЗОМАТИК ООД,

Декларирам че, материалите, с които се асемблират клемореди тип ИК7ТК3Р, отговарят на следните стандарти и нормативни актове:

-Клеми тип URTK/S и аксесоари за тях, производство на Phoenix Contact GmbH отговарят на следните технически одобрения и нормативни актове
IEC 60947-7-1

-Разединяеми предпазител-разединители тип FB, производство на Lovato Electric отговарят на следните технически одобрения и нормативни актове :
IEC/EN 60269-1, IEC/EN 60269-2, IEC/EN 60947-1, IEC/EN 60947-3.

25.10.2013

Владимир Лазаров

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОТЕХ ООД СОФИЯ

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

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РЕФ. № PPD 15-042

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Приложение № 4

ВЯРНО С ОРИГИНАЛА

ЕЛЕКТРОРЕЙ София ООД

KEMA
REGISTERED QUALITY

KEMA KEUR

CERTIFICATE

KEMA No. 97.4117.13

Issued to:
Applicant:
Phoenix Contact GmbH & Co.
Flachsmarktstrasse 8-28
BLOMBERG, Germany

Manufacturer/Licensee:
Phoenix Contact GmbH & Co.
Flachsmarktstrasse 8-28
BLOMBERG, Germany

Product : terminal blocks

Trade name : PHOENIX CONTACT
Types/models : URTK/S-BEN BU, URTK/S-BEN, URTK/S, URTK/SP, USLKG 10, USLKG 6N

The product and any acceptable variation thereto is specified in the Annex to this certificate and the documents therein referred to.

KEMA hereby declares that the above-mentioned product has been certified on the basis of:

- a type test according to the standard EN 60947-7-1:1991,EN 60947-7-2:1995
- an inspection of the production location according to CCA Group Operational Document CCA 204
- a certification agreement with the number 900469

KEMA hereby grants the right to use the KEMA certification mark

KEMA KEUR

The KEMA-KEUR certification mark may be applied to the product as specified in this certificate for the duration of the KEMA-KEUR certification agreement and under the conditions of the KEMA-KEUR certification agreement.

This certificate is issued on: August 6, 1999

C.M. Boschloo
Certification Manager

© Integral publication of this certificate is allowed

N.V. KEMA
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 9035, 6800 ET Arnhem, The Netherlands
Telephone +31 26 3 56 28 50, Telefax +31 26 3 51 49 22

ACCREDITED BY
THE DUTCH COUNCIL
FOR ACCREDITATION

SPECIFICATION OF THE CERTIFIED PRODUCT

Product data

product	:	terminal blocks
trade name	:	PHOENIX CONTACT
types	:	URTK/S-BEN BU, URTK/S-BEN, URTK/S, URTK/SP, USLKG 10, USLKG 6N
material	:	thermoplastic material
mounting	:	top hat rail 35 mm (EN 50022) and G-profile rail 32 mm (EN 50035)

Additional information

Markings

Trademark, type designation, rated connection capacity and rated insulation voltage are indented in the insulation material.

Product data – type USLKG 6N

rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,2 - 10 mm² solid 0,2 - 6 mm² flexible without ferrule 0,25 - 6 mm² flexible with ferrule two conductors 0,2 - 2,5 mm² solid 0,2 - 2,5 mm² flexible without ferrule 0,25 - 1,5 mm² flexible with ferrule
description	:	protective conductor terminal block with 2 screw-type clamping units, 1-pole

Product data – type URTK/S

rated voltage	:	400 V
rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,5 - 10 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 10 mm² flexible with ferrule two conductors 0,5 - 2,5 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 4 mm² flexible with ferrule
rated impulse withstand voltage	:	6 kV
description	:	disconnect terminal block with 2 screw-type clamping units, 1-pole

N.V. KEMA
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 9035, 6800 ET ARNHEM, The Netherlands
Telephone +31 26 3562850, Telefax +31 26 3514922

Product data – type USLKG 10

rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,5 - 10 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 6 mm² flexible with ferrule two conductors 0,5 - 2,5 mm² solid 0,5 - 2,5 mm² flexible without ferrule 0,5 - 2,5 mm² flexible with ferrule
description	:	protective conductor terminal block with 2 screw-type clamping units, 1-pole

Product data – type URTK/S-BEN

rated voltage	:	500 V
rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,5 - 10 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 10 mm² flexible with ferrule two conductors 0,5 - 2,5 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 4 mm² flexible with ferrule
rated impulse withstand voltage	:	6 kV
description	:	disconnect terminal block with 2 screw-type clamping units, 1-pole

Product data – type URTK/S-BEN BU

rated voltage	:	500 V
rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,5 - 10 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 10 mm² flexible with ferrule two conductors 0,5 - 2,5 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 4 mm² flexible with ferrule
rated impulse withstand voltage	:	6 kV
description	:	disconnect terminal block with 2 screw-type clamping units, 1-pole

N.V. KEMA
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 9035, 6800 ET ARNHEM, The Netherlands
Telephone +31 26 3562850, Telefax +31 26 3514922

Product data – type URTK/SP

rated voltage	:	500 V
rated connection capacity	:	6 mm²
connectable conductors	:	one conductor 0,5 - 10 mm² solid 0,5 - 6 mm² flexible without ferrule 0,5 - 6 mm² flexible with ferrule two conductors 0,5 - 2,5 mm² solid 0,5 - 4 mm² flexible without ferrule 0,5 - 2,5 mm² flexible with ferrule
rated impulse withstand voltage	:	6 kV
description	:	disconnect terminal block with 2 screw-type clamping units, 1-pole

TESTS

Test requirements

EN 60947-7-1:1991 + C:1997-06 + A11:1997
EN 60947-7-2:1995 + C:1996-01

Test results
The test results are laid down in KEMA test file 97.4117.13.

Conclusion
The examination proved that all test requirements were met.

Tested by : H.L. Schendstok

Checked by : L.J.W. van Megen b.a.

FACTORY-LOCATION(S)

Phoenix Contact GmbH & Co.
Flachsmarktstrasse 8-28, BLOMBERG, Germany

N.V. KEMA
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
P.O. Box 9035, 6800 ET ARNHEM, The Netherlands
Telephone +31 26 3562850, Telefax +31 26 3514922

PHOENIX CONTACT KABEL

Тестови изпитвания приложени върху клемите

Клемите са изпитани съгласно IEC60947-7-1,

извършените тестове са:

Капацитет за присъединявания проводник

Механична якост

Огъване

Усилие за отделяне на проводника

Изолационно разстояние

Повишено напрежение

Загуба на напрежение

Температурен тест

Тест приток на късо съединение

Тест за стареене на материала

Точково нагряване

Управител:

Вл. Лазаров

ВЯРНО С ОРИГИНАЛА

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

с предмет:

„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители"

Приложение № 5

ЕЛЕКТРОГЕН СОФИЯ

Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

of **DEKRA Certification B.V.**

This annex is valid from: **29-04-2015** to **01-03-2018** Replaces annex dated: **03-11-2014**

Location where activities are performed under accreditation

Head Office

Meander 1051
6825 MJ
Arnhem
The Netherlands

No.	Material or product	Type of activity	Reference number	Remarks
		A. Electrical Safety Tests		
1a	Cables and cords **(CABL)**	Type test of cables and cords according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	HD 21 HD 22 HD 603 HD 604 HD 605 EN 13501, EN 50143; EN 50214; EN 50267; EN 50525; EN 50288; EN 50399; EN 50618 NEN/EN 50200 NEN/EN/IEC 60228 NEN-EN 50525 NEN/EN 50266 NEN/EN 50362 NEN/EN /IEC 61034 IEC 60092; IEC 60227 *; IEC 60245 *; IEC 60331; IEC 60332; IEC 60502-1; IEC 60502-2; IEC 60754; IEC 60800; IEC 60840; IEC 62067	* see note 3

This annex has been approved by:

Ir. J.C. van der Poel
Chief Executive

Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

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No.	Material or product	Type of activity	Reference number	Remarks
1a	Cables and cords **(CABL)**	Type test of cables and cords according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	DEKRA K 42; DEKRA K 102 DEKRA K 145; DEKRA K 146 DEKRA K 151; DEKRA K 152 DEKRA K 156; DEKRA K 157 DEKRA K 158; DEKRA K160 DEKRA K 161; DEKRA K 162 DEKRA K 163; DEKRA K 164 DEKRA K 165; DEKRA K 167 DEKRA K 168; DEKRA K 169 DEKRA K 170; DEKRA K 171 DEKRA K 175; DEKRA K 176 DEKRA K 177; DEKRA K 178 DEKRA K 179 BS 6004; BS 6007; BS 4553; BS 5467; BS 6231; BS 6346; BS 6387; BS 6500; BS 6622; BS 6724; BS 6883; BS 7211; BS 7629; BS 7835; BS 7846; BS 7889; BS 8491; BS EN 50288-7 BS EN 50525 DIN VDE0815; DIN VDE0250	* see note 3
		Test methods for non-metallic materials	IEC 60811-201; IEC 60811-202 IEC 60811-203; IEC 60811-401 IEC 60811-402; IEC 60811-403 IEC 60811-404; IEC 60811-405 IEC 60811-406; IEC 60811-408 IEC 60811-409; IEC 60811-411 IEC 60811-412; IEC 60811-501 IEC 60811-502; IEC 60811-503 IEC 60811-504; IEC 60811-505 IEC 60811-506; IEC 60811-507 IEC 60811-508; IEC 60811-509 IEC 60811-510; IEC 60811-511 IEC 60811-605; IEC 60811-606 IEC 60811-607	
		Electrical test methods for low voltage energy cables	NEN-EN 50395	
		Non electrical test methods for low voltage energy cables	NEN-EN 50396	

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No.	Material or product	Type of activity	Reference number	Remarks
1b	Conduits	Type test of conduits according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	NEN/EN/IEC 61386 DEKRA K24 EN 50086	
1c	Installation systems Cable trays Cable ladders	Type test of cable trays and cable ladders, according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	KEMA 55 NEN/EN 50085 NEN/IEC/EN 61537 BS EN 61537	
1d	Boxes and enclosures for electrical installations	Type test of boxes and enclosures for electrical installations, according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	NEN/EN/IEC 60670	
2a	Switches for appliances and automatic controls for electrical household appliances **(CONT)**	Type test of switches according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests.	IEC/EN 60730*, 61095* IEC/EN 60691, 60934, 61058*, 60529 IEC 60265, 62271-1, 62271-100, 62271-101, 62271-102, 62271-105, 62271-110, 62271-200, 62271-201, 62271-202, 62271-203, EN 50152-1 IEEE Std C37.09, C37.081, 37.60, C37.013, C37.34, ANSI C37.41, C37.73, C37.20.2, C37.122 ANSI/IEEE C37.21 ANSI C37.54, C37.55, C37.20.2, C37.72	*** see note 3**

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No.	Material or product	Type of activity	Reference number	Remarks
3	Household and similar equipment **(HOUS)**	Type test of household equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60335* IEC/EN 61770 IEC/EN 62233 EN 50366 IEC/EN 60204 IEC/EN 60730-1/ 2-8 / 2-9 IEC/EN 61558-1/ 2-3 / 2-6 / 2-5 / 2-6 / 2-16 IEC/EN 62061 EN/ISO 13849-1	*** see note 3**
		Low power measurements	IEC/EN 62301	
4	Installation accessories and connection devices **(INST)**	Type test of installation accessories and connection devices according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60309*, 60320*, 60669*, 60670*, 60799*, 60884*, 60998*, 61058*, 61242*, 61534*, 61984*, 62208*; IEC/EN 60335-2-76, 60974, 61316, 61386, 62094 EN 50075, 50066, 50146, 50250, 50393 NEN 1251, IEC 60884*, 61238, 62080 BS 1363-1, BS 1363-2, BS 1363-3, BS 1363-4 SS 145 BS 546 BS 4573 BS 5733 NEN 1020 NF C61-314 DIN VDE 0620-1 DIN VDE 0620-2-1 CEI 23-50 NBN C 61-112-1 NEK IEC 60884-1 NEK 502 ÖVE/ÖNORM E 8684-1 ÖVE/ÖNORM E 8620-2(-3,-4, -5) SFS 5610 SS 428 08 34 DS 60884-2-D1 SEV 1011 UNE 20315-1-1; UNE 20315-1-2 IEC/EN 61535 EN 50428 required with 60669	*** see note 3**

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No.	Material or product	Type of activity	Reference number	Remarks
5	Luminaires **(LITE)**	Type test of luminaires according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60155*, 60238*, 60400*, 60570*, 60598*, 60838*, 60921*, 60968*, 60969*, 61347*, 62471* IEC/EN 60929, 61184, 62031, 62035, 60923, 60925, 60927, 61047, 62384, 62560, 61195, 62493	*** see note 3**
6	Measurement, control and laboratory equipment **(MEAS)**	Type test of measurement-, control- and laboratory equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 61010* IEC/EN 60044 IEC/EN 61243 IEEE Std C57.13	*** see note 3**
7	Electrical equipment for medical use **(MED)**	Type test of electrical equipment for medical use according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60601* IEC/EN/ISO 80601 HD 395	*** see note 3**
8	Miscellaneous equipment **(MISC)**	Type test of miscellaneous equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60825*	*** see note 3**

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No.	Material or product	Type of activity	Reference number	Remarks
9	IT and office equipment **(OFF)**	Type test of IT and office equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60950* IEC/EN 62040* IEC/EN 60825 IEC 62368 EN 41003	* see note 3
10	Low voltage, high power switching equipment **(POW)**	Type test of low voltage, high power switching equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60439*, 61439, IEC/EN 60947* IEC/EN 60282, 62208 EN 50178, IEC 60470, 60549, 60644, EN 60282-1 IEEE Std C37.41, C37.60 ANSI C37.44 IEC 61921	* see note 3
11	Installation protective equipment **(PROT)**	Type test of installation protective equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60127*, 60269*, 60529*, 60898*, 61008*, 61009*, 61643*, 60755, 62019 IEC 60099, 60137, 60168, 60383, 60507, 60660, 61109, 60815 HD 630, 639, 60269 IEEE Std 62.11 ANSI C29 CAN/CSA C411.1	* see note 3
12	Safety transformers and similar equipment **(SAFE)**	Type test of safety transformers and simillar equipment according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60044*, IEC/EN 61558* IEC/EN 62040, IEC/EN 60076, IEC/EN 60353 EN 50091, EN 50464-1 HD 538.1 IEEE Std. C57.12.90, C57.21 NEMA 107 CISPR 16	* see note 3

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No.	Material or product	Type of activity	Reference number	Remarks
13	Electric tools **(TOOL)**	Type test of electric tools according to the tests in the standard, among others: - electrical safety tests - mechanical tests - environmental tests	IEC/EN 60745* IEC/EN 61029* IEC/EN 60335* (Gardening) IEC/EN 62233, IEC/EN 60204 EN 50144 EN 50260-2-7 EN 792 EN/ISO 1114 IEC/EN 62061 EN/ISO 13849-1	* see note 3
14	Electronics, entertainment equipment **(TRON)**	Type test according to the tests as mentioned in the standard, except the following tests which are subcontracted: 60065, cl. 20.1.3 Pre-conditioning of printed circuit boards 60065, cl. 12.1.2 Vibration-sine	IEC / EN 60065* IEC / EN 60491 IEC 62368	* see note 3
15	Products within the scope of the EMC Directive 2004/108/EC **(EMC)**	Type test according to the tests as mentioned in the standard	CISPR11; CISPR12; CISPR13; CISPR14-*; CISPR15; CISPR16-*-*; CISPR20; CISPR22; CISPR24; CISPR25; IEC60601-*-*; IEC60945; IEC60947-*-*; IEC61000-*-*; IEC61008-1; IEC61009-1; IEC61131-2; IEC61204-3; IEC61326-*; IEC61543; IEC61547; IEC61800-*; IEC62040-2; IEC62052-*; IEC62053-*; IEC62054-*;	* see note 3
	B. Electromagnetic Compatibility (EMC): Automotive tests			
1	Vehicles, Motorcycles, Motorboats and Spark-ignited engine-driven devices	Radiated emission 30 to 1000 MHz OATS	European Directives 2004/104/EC, 97/24/EC European regulation ECE-R10.04 EN 55012, CISPR 12	
2	Vehicles, Motorcycles, Motorboats and Spark-ignited engine-driven devices	Radiated immunity up to 30 V/m 20 to 2000 MHz OATS	European Directive 2004/104, 97/24/EC European regulation ECE-R10.04	

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No.	Material or product	Type of activity	Reference number	Remarks
3	Electrical/ electronic sub-assembly	Pulse emission for ESA's along supply lines 12V and 24V	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 7637-1 ISO 7637-2	
4		Conducted emission for ESA's (V–method, LISN) 150 kHz to 108 MHz	European Directive 2004/104/EC European regulation ECE-R10.04 CISPR25	
5		Radiated emission for ESA's Anechoic Chamber method 30 to 1000 MHz	European Directive 2004/104/EC European regulation ECE-R10.04 CISPR25	
6		Radiated immunity for ESA's Anechoic Chamber method and GTEM method 20 to 2000 MHz up to 30V/m	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 11452-1, ISO 11452-2, ISO 11452-3	
7	Electrical/ electronic sub-assembly	Bulk Current Injection for ESA's 20 to 400 MHz up to 100 mA	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 11452-1, ISO 11452-4	
8		Pulse immunity for ESA's along supply lines 12V and 24V	European Directive 2004/104/EC European regulation ECE-R10.04 ISO 7637-1 ISO 7637-2	
		C. Electromagnetic Compatibility (EMC): EMF tests		
1	Electrical and electronic equipment	EMF measurements: 0-400 kHz	EN 62233 EN 62493	

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No.	Material or product	Type of activity	Reference number	Remarks
D. Electromagnetic Compatibility (EMC): Emission tests				
1	Electrical and electronic equipment	Conducted emission 9 kHz to 30 MHz	EN 55011, CISPR 11 EN 55013, CISPR 13 EN 55014-1, CISPR 14-1 EN 55015, CISPR 15 EN 55022, CISPR 22	
2		Radiated Emission Electric (EM) Field 30 MHz to 18 GHz	EN 55011, CISPR 11 EN 55014-1, CISPR 14-1 EN 55022, CISPR 22	
3		Disturbance power 30 MHz to 300 MHz	EN 55014-1, CISPR 14-1	
4		Click disturbances 150 kHz to 30 MHz	EN 55011, CISPR 11 EN 55014-1, CISPR 14-1	
5		Radiated Emission Magnetic Field 9 kHz to 30 MHz	EN 55011, CISPR 11 EN 55015, CISPR 15	
6		Harmonic current emissions 0 Hz to 2 kHz up to 16 A per phase	IEC / EN 61000-3-2	
7		Pulse magnetic field immunity up to 1000 A/m	IEC/EN 61000-4-9	
8		Limitation of voltage fluctuations and flicker up to 16 A per phase	IEC / EN 61000-3-3	
E. Electromagnetic Compatibility (EMC): FCC tests (USA legislation)				
1	Radio-Frequency Devices Industrial, Scientific and Medical Equipment	Emission 9 kHz to 3 GHz	47 CFR FCC Part 15, Part 18 ANSI C63.4 FCC MP-5	
F. Electromagnetic Compatibility (EMC): Immunity test				
1	Electric and electronic equipment	Electrostatic discharge immunity up to 30 kV	IEC/EN 61000-4-2	
2		Radiated EM field immunity up to 2,5 GHz up to 30 V/m	IEC/EN 61000-4-3	
3		EFT Burst immunity up to 4 kV	IEC/EN 61000-4-4	

No.	Material or product	Type of activity	Reference number	Remarks
4	Electric and electronic equipment	Surge immunity up to 10 kV	IEC/EN 61000-4-5	
5		Immunity to conducted RF disturbances up to 230 MHz, up to 30 Vrms	IEC/EN 61000-4-6	
6		Power frequency magnetic field immunity up to 100 A/m	IEC/EN 61000-4-8	
7		Voltage dips and interruptions Single phase equipment up to 16 A	IEC/EN 61000-4-11	
8		Ring wave immunity test	IEC/EN 61000-4-12	
		G. Electromagnetic Compatibility (EMC): MISC		
1	Railway applications - Electromagnetic compatibility	Electromagnetic compatibility testing according the listed product standards	EN 50121-1 to -5	
2	Road traffic signal systems	Electromagnetic compatibility testing according the listed product standard	EN 50293	
		H. Photometric Tests (all tests are in accordance with the reference method)		
1	Headlamps low and high beams and front fog lamps	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Heat tests Plastic tests	ECE Regulations Nos. 1, 5, 8, 19, 20, 31, 56, 57, 72, 76, 82, 98, 112, 113 and 123; European Directives 76/761, 76/762 and 97/24	**Note 1**
2	Signalling lamps	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Heat test	ECE Regulations Nos. 6, 7, 23, 38, 50, 77, 87 and 91 and European Directives 76/757, 76/759, 76/758, 77/538, 77/539, 77/540 and 97/24 ECE Regulation 38 (rear fog lamps only)	
3	Devices for the illumination of rear registration plates	All tests as mentioned in the ECE Regulations stated under Test method Luminance	ECE Regulations Nos. 4 and 50 European Directives 76/760 and 97/24	

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No.	Material or product	Type of activity	Reference number	Remarks
4	Retro-reflective devices	All tests as mentioned in the ECE Regulations stated under Test method Retro-reflection Colorimetry Water resistance test Corrosion Fuel and oil resistance Heat test UV resistance	ECE Regulations Nos. 3, 27, 69, 70, 88 and 104 European Directive 76/757	**Note 2**
5	Light Sources	All tests as mentioned in the ECE Regulations stated under Test method Geometry Photometry Colorimetry Optical quality Mechanical tests	ECE Regulations Nos. 37, 99 IEC 60809 IEC 60810 IEC 60983 IEC 60061	
6	Special warning lamps (beacons and flash lights)	All tests as mentioned in the ECE Regulations stated under Test method Photometry Colorimetry Water resistance test	ECE Regulation No. 65	
7	Cornering Lamps	All tests as mentioned in the ECE Regulation stated under Test method Photometry Colorimetry	ECE Regulation No.119	

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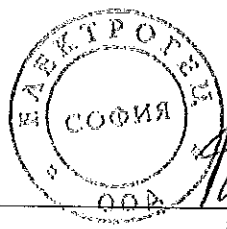
No.	Material or product	Type of activity	Reference number	Remarks
		I. Lighting testing: EPA ENERGY STAR Program		
1	Non-directional Fluorescent Luminaires	Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps, Source Run-up Time (ms)	ANSI C78.5:2003	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	



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No.	Material or product	Type of activity	Reference number	Remarks
2	Directional Fluorescent Luminaires	Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps, Source Run-up Time (ms)	ANSI C78.5:2003	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	
		Photometric Testing of Outdoor Fluorescent Luminaires, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-10:2013	
		Approved Method for Photometric Testing of Indoor Fluorescent Luminaries, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-41:2013	
3	Luminaires CSD - Fluorescent Ballasts	Method of Measurement of Fluorescent Lamp Ballasts, Power Factor, Operating Frequency	ANSI C82.2:2002	

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No.	Material or product	Type of activity	Reference number	Remarks
4	Luminaires CSD - Fluorescent Lamps	Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electric and Photometric Measurements of Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-9:2009	
		Life Testing of Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-40:2010	
		Life Testing of Compact Fluorescent Lamps, Light Source Life, Lumen Maintenance	IES LM-65:2010	
		Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Lumen Maintenance, CCT, CRI	IES LM-66:2011	
5	Non-Directional HID Luminaires	High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	

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No.	Material or product	Type of activity	Reference number	Remarks
6	Directional HID Luminaires	High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	
		Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps, Efficacy, Output, Zonal Lumen Distribution	IES LM-31:2013	
		Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps, Efficacy, Light Output, Zonal Lumen Distribution	IES LM-46:2004	
7	Luminaires CSD - HID Ballasts	High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		High-Intensity Discharge (HID)— Methods of Measuring Characteristics, Operating Frequency	ANSI C78.389:2004 (R2009)	
		Ballasts for High Intensity Discharge (HID) Lamps - Methods of Measurement, Power Factor, Lamp Current Crest Factor	ANSI C82.6:2005	

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No.	Material or product	Type of activity	Reference number	Remarks
8	Luminaires CSD - HID Lamps	Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering	CIE Pub. No.13.3:1995	
		Life Testing of High Intensity Discharge (HID) Lamps, Light Source Life, Lumen Maintenance	IES LM-47:2012	
		Electrical and Photometric Measurements of High Intensity Discharge Lamps, Efficacy, Light Output, CCT, CRI	IES LM-51:2013	
9	Non-directional Solid State Luminaires and Subcomponents	Electrical and Photometric Measurements of Solid-State Lighting Products (section 10 not required for non-directional or subcomponents), Efficacy, Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002	
		Method of Measuring and Specifying Color Rendering of Light Sources, CRI	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature, Efficacy, Light Output, Lumen Maintenance, CCT , CRI, Color Maintenance, Light Source Life	IES LM-82-2012	
10	Directional Solid State Luminaires	Electrical and Photometric Measurements of Solid-State Lighting Products (Goniophotometer), Zonal Lumen Distribution, Color Angular Uniformity, Luminaire Photometry	IES LM-79:2008 sections 10 and 12	
		Guide to Spectroradiometric Measurements, Color Angular Uniformity	IES LM-58:2013	

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No.	Material or product	Type of activity	Reference number	Remarks
10	Directional Solid State Luminaires	Method of Measuring and Specifying Color Rendering of Light Sources, CRI	CIE Pub. No.13.3:1995	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Light Output, Lumen Maintenance, CCT, CRI, Color Maintenance	IES LM-79:2008	
11	Lumen Maintenance of LED Packages, Arrays, and Modules	Method for Measuring Lumen Maintenance of LED Light Sources, Light Source Life, Lumen Maintenance	IES LM-80:2008	
12	Non-Directional Outdoor Halogen Luminaires	Approved Method for Life Testing of Filament Lamps, Light Source Life Requirements	IES LM-49:2001, IES LM-49:2011	
13	Directional Outdoor Halogen Luminaires	Approved Method for Life Testing of Filament Lamps, Light Source Life Requirements	IES LM-49:2001	
		Photometric Testing of Outdoor Fluorescent Luminaires, Zonal Lumen Distribution	IES LM-10:1996	
		Photometric Testing of Roadway Luminaires Using Incandescent Filament and High Intensity Discharge (HID) Lamps, Zonal Lumen Distribution	IES LM-31:1991	
		Photometric Testing of Indoor Fluorescent Luminaires, Zonal Lumen Distribution	IES LM-41:1998	
		Photometric Testing of Indoor Luminaires Using High Intensity Discharge or Incandescent Filament Lamps, Zonal Lumen Distribution	IES LM-46:2004	
		Electrical and Photometric Measurements of Solid-State Lighting Products, Zonal Lumen Distribution	IES LM-79:2008 Section 10	

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No.	Material or product	Type of activity	Reference number	Remarks
14	CFL Directional Lamps	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Center beam Intensity, Lumen Maintenance, Lifetime, CCT, CRI	IES LM-66:2011	
		Life Testing of Compact Fluorescent Lamps, Lumen Maintenance, Lifetime, Rapid Cycle Stress Test	IES LM-65:2010	
		IEEE Recommended Practice on Characterization of surges in Low Voltage (1000V and Less) AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Fluorescent Lamp Ballasts, Method of Measurement of Power Factor (included supplements)	ANSI C82.2:2002	
		Specifications for the Chromaticity of Fluorescent lamps, CCT	ANSI C78.376-2001	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Tool for Calculating Minimum Center beam Intensity, Minimum Center Beam Intensity – PAR and MR Lamps	Energy Star Online CBCP Tool	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, ETLOR	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Light Output Ratio	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	

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No.	Material or product	Type of activity	Reference number	Remarks
14	CFL Directional Lamps	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	
15	CFL Omnidirectional and Decorative Lamps	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Center beam Intensity, Lumen Maintenance, Lifetime, CCT, CRI	IES LM-66:2011	
		Life Testing of Compact Fluorescent Lamps, Lumen Maintenance, Lifetime, Rapid Cycle Stress Test	IES LM-65:2010	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Specifications for the Chromaticity of Fluorescent lamps, CCT	ANSI C78.376-2001	
		Method of Measurement of Fluorescent Lamp Ballasts, Power Factor	ANSI C82.2:2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Run-up Time	

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No.	Material or product	Type of activity	Reference number	Remarks
16	LED Directional Lamps	Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, Lifetime, CCT, CRI, Color Maintenance, Color Angular Uniformity	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002 Sections 6 and 7	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Chromaticity of Solid State Lighting Products, CCT	ANSI C78.377-2011	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		Tool for Calculating Minimum Center beam Intensity, Minimum Center Beam Intensity – PAR and MR Lamps	Energy Star Online CBCP Tool	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, ETLOR	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Light Output Ratio	

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No.	Material or product	Type of activity	Reference number	Remarks
16	LED Directional Lamps	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	
17	LED Omnidirectional and Decorative Lamps	Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, Lifetime, CCT, CRI, Color Maintenance, Color Angular Uniformity	IES LM-79:2008	
		Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment, Power Factor	ANSI C82.77:2002 Sections 6 and 7	
		IEEE Recommended Practice on Characterization of surges in Low Voltage AC Power Circuits, Transient Protection	ANSI/IEEE C62.41.2-2002	
		Colorimetry, CCT	CIE Pub No. 15:2004	
		Method of Measuring and Specifying Color Rendering of Light Sources, Color Rendering (CRI)	CIE Pub. No.13.3:1995	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Elevated Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing, Lumen Maintenance, Lifetime	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Ambient Temperature Life Testing	
		ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Start Time	

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No.	Material or product	Type of activity	Reference number	Remarks
		I. Additional Standards related to Energy Star		
1	Reflector type lamps	Photometric Testing	IES LM-35:2002	
2	Floodlights Using Incandescent Filament of Discharge Lamps	Electrical and photometric measurements	IES LM-45:2009	
3	Fluorescent Lamps	Electrical measurements	ANSI C78.375:1997 ANSI C78.375:2014	
4	Fluorescent Lamps	Chromaticity of Fluorescent Lamps	ANSI C78.376-2001	
5	Fluorescent Lamps	Chromaticity of Solid State Lighting Products	ANSI C78.377-2011	
6	Mercury Lamps	Measuring Characteristics	ANSI C78.386:1989	
7	Metal-Halide Lamps	Measuring Characteristics	ANSI C78.387:1987	
8	High Pressure Sodium Lamps	Measuring Characteristics	ANSI C78.388:1990	
9	High-Frequency Fluorescent Lamp Ballast	Measurement of a High-Frequency Fluorescent Lamp Ballast	ANSI C82.11-2002	
10	Light sources	The measurement of luminous flux	CIE 84:1989	
11	Luminaires	The Photometry and goniophotometry of luminaires	CIE121:1996	
12	All LED Products	Measurements of LEDs	CIE127:1997 CIE127:2007	
13	All products	Transient protection	ANSI/IEEE C62.41.1 ANSI/IEEE C62.41.2	
14	Decorative Light Strings	Weathering Test	ASTM G154-06 ASTM G154-12a	
15	Decorative Light Strings	ENERGY STAR Test Method for Decorative Light Strings	ENERGY STAR Test Method for Decorative Light Strings	
16	All products	ENERGY STAR Program requirements Product Specification for Lamps Version 1.0: Final Test Methods and Recommended Practices	ENERGY STAR Program Requirements Product Specification for Lamps Version 1.0: Final Test Methods and Recommended Practices	

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Note 1: Weather-beaten tests of synthetic lenses is subcontracted
Note 2: Salt-nebula test is subcontracted
Note 3: See current list of sub set of standards on the IECEE CBTL website

„ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД

ДОКУМЕНТАЦИЯ

за участие в процедура на договаряне с обявление
за сключване на рамково споразумение за възлагане на обществени поръчки

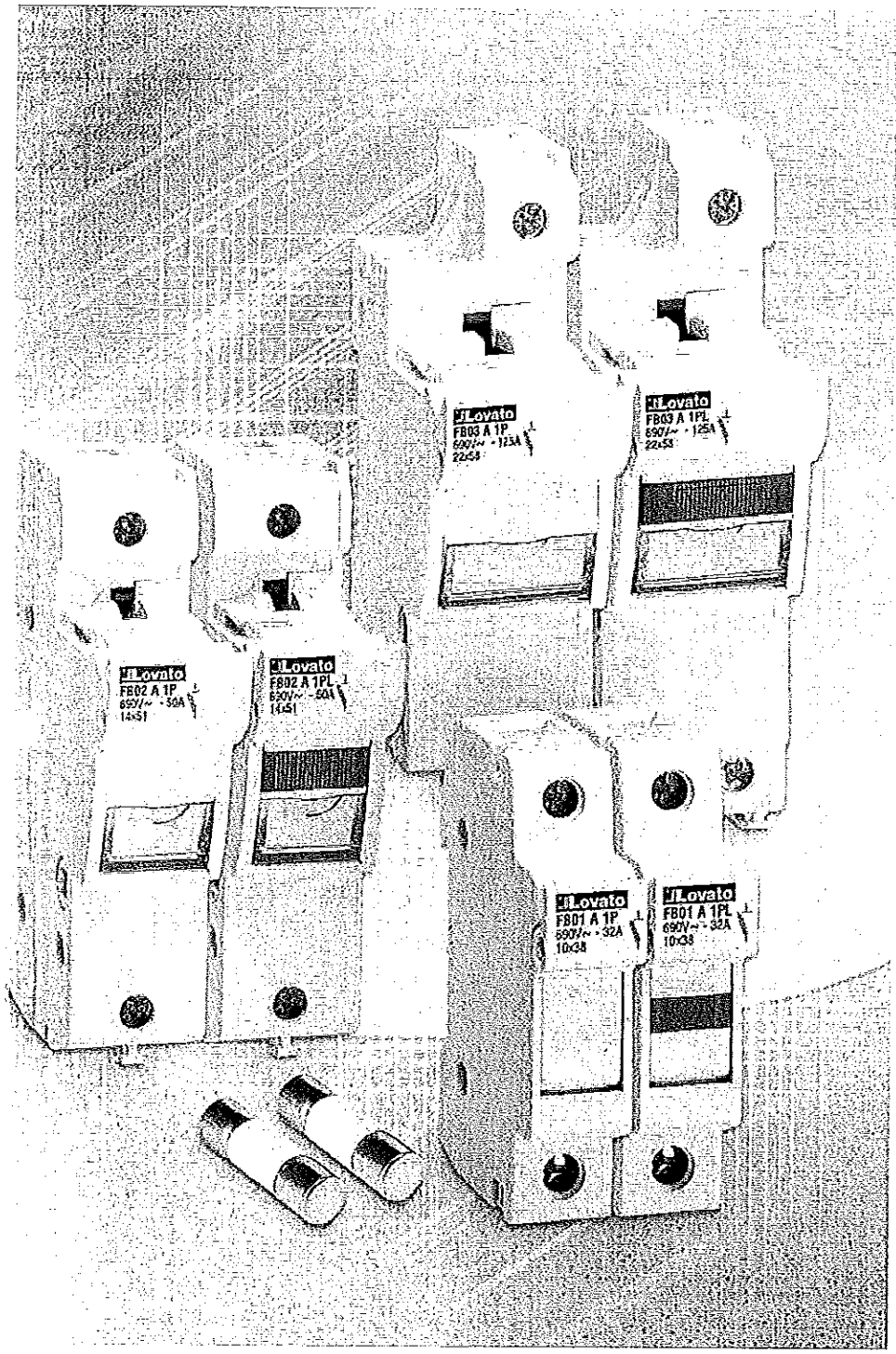
с предмет:

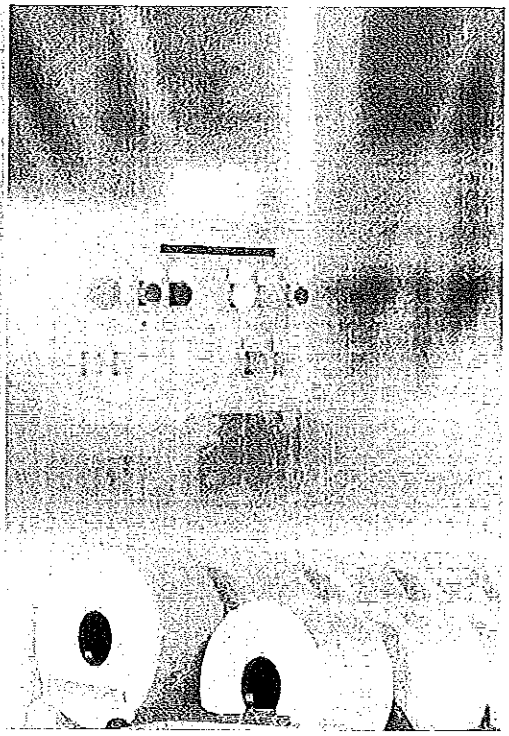
„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/"

РЕФ. № PPD 15-042

"Комплект измервателен клемен блок с клеми за медни проводници от проходен тип и 1P, 3P или 3P+N стопяеми цилиндрични предпазител-прекъсвач-разединители"

Приложение № 6



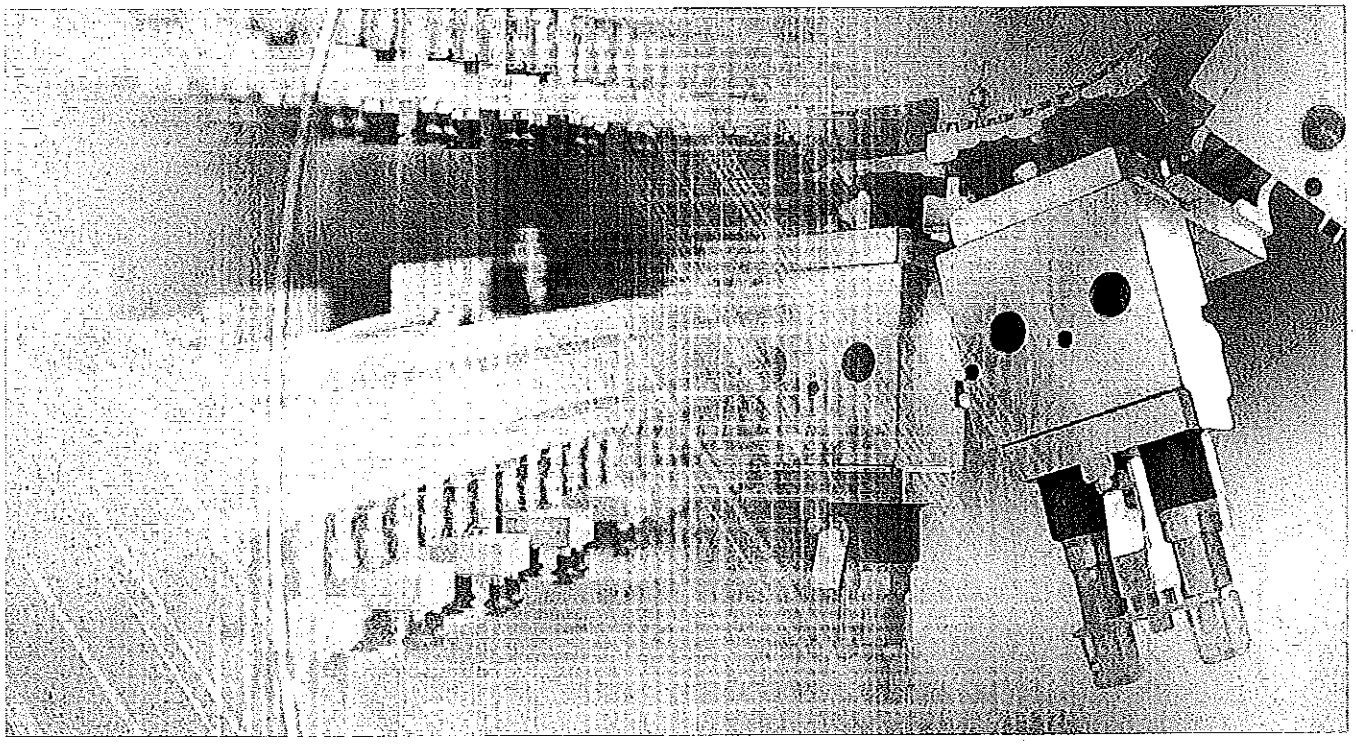


Fuse holders and fuses

Lovato electric

100% electricity

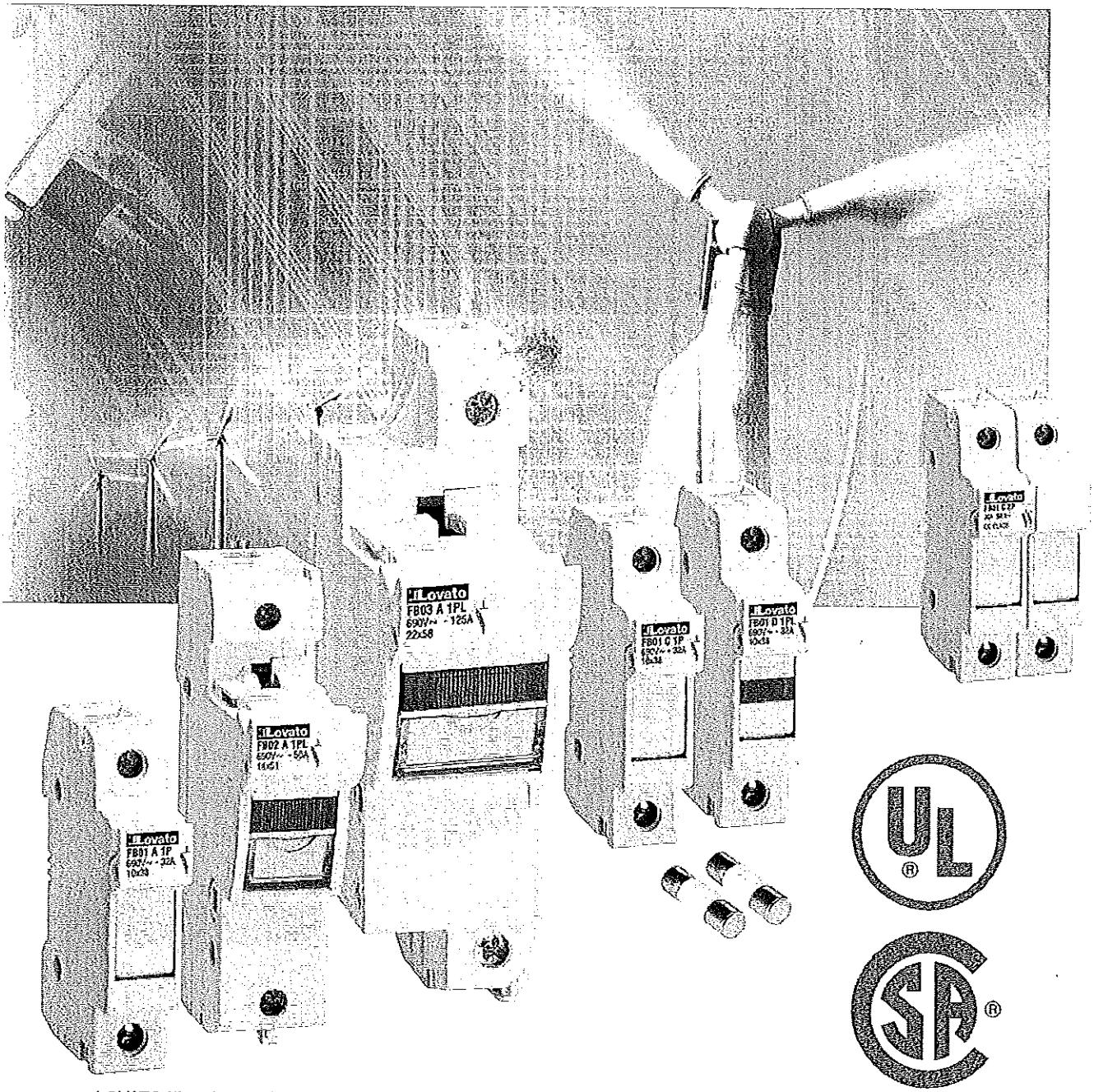
Fuse holders



- Modular concept for quick assembly of different versions based on various requirements.
- Compact size compliant with standards for electrical equipment.
- DIN rail mounting and removal ease.
- IP20 protection degree, finger safe.
- Sealable cover in open or closed position to increase user's safety.
- Version with status indicator to quickly determine if the fuse is still operative or needs to be replaced.
- Ergonomic grip for easy cover opening.
- Dedicated cylindrical 10x38 DC fuses for photovolatic systems.
- UL and CSA certified versions.

Range	AC			DC	DC FUSES	CLASS CC
Fuse size	10x38	14x51	22x58	10x38	10x38	10x38
Type	gG or aM			gPV	gPV	Class CC
Rated voltage	690VAC			1000VDC / 690VAC	1000VDC	600VAC
Rated current	32A	50A	125A	32A	20A	30A
Utilisation category	AC-22B 500V AC-21B 690V		–	DC-20B 1000VDC AC-21B 690V	DC-20B 1000VDC	AC-22B 500V AC-21B 690V

and fuses



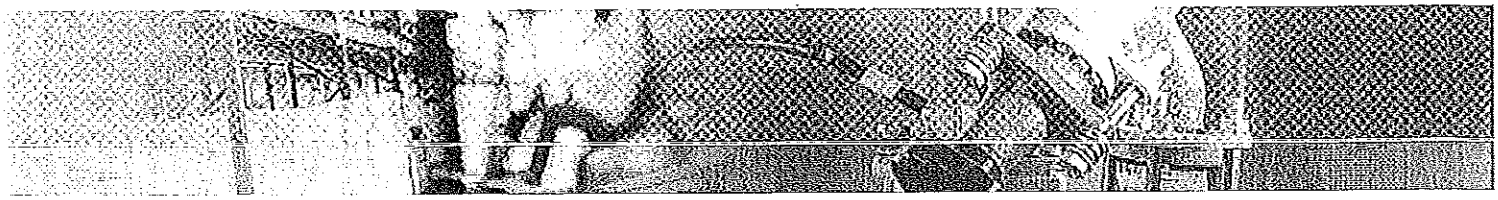
LOVATO Electric fuse holders can be used to protect against overloads and short circuits of electric lines, for motor protection and control and for the protection of electric installations.

This equipment can assure the disconnect function but is not suitable for isolation so cannot be used as switch disconnector.

The range is available in two versions: with or without fuse status indicator. If the fuse fitted on the holder blows, the failure status is shown by the indicator on the fuse-holder front.

All the fuse holders are certified for the North-American market (UL Listed, UL Recognized and CSA). Furthermore, there is a non-certified version in 10x38mm size available too.

Lovato electric

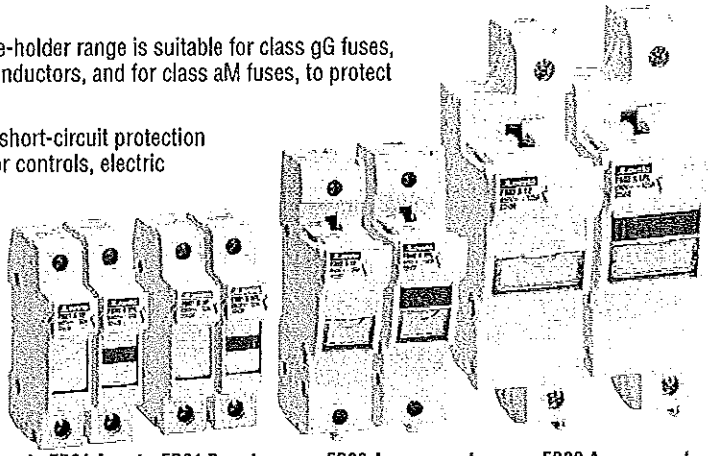


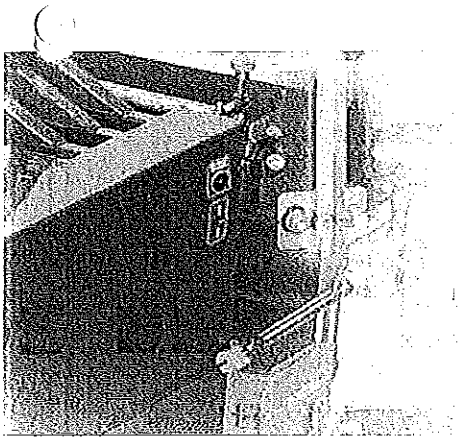
Fuse holders AC RANGE

LOVATO Electric AC fuse-holder range is suitable for class gG fuses, to protect cables and conductors, and for class aM fuses, to protect motor starting.

Function: Overload and short-circuit protection of control circuits, motor controls, electric installations.

Usage: Service industry, electric panels onboard machinery, electric installations in general.

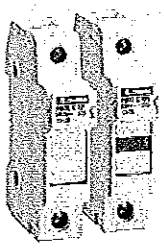




	FB01 A...	FB01 B...	FB02 A...	FB03 A...
Fuse size	10x38		14x51	22x58
Version without indicator	1P, 1P+N, 2P, 3P, 3P+N			
Version with indicator	1P			
Main characteristics				
- Rated voltage	690VAC			
- Rated current	32A		50A	125A
- Utilisation category	AC-22B 500V, AC-21B 690V		AC-22B 500V, AC-21B 690V	AC-21B 690V
- Suitable for fuses	10x38 gG or aM		14x51 gG or aM	22x58 gG or aM
- Maximum conductor cross section	16mm² flexible/stranded; 25mm² rigid/solid		25mm² flexible/stranded; 35mm² rigid/solid	35mm² flexible/stranded; 50mm² rigid/solid
Certifications obtained	UR, CSA	--	cURus	cURus
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3, RoHS directive, UL512, CSA C22.2 n°39			

UR: UL Recognized; cURus: UL Recognized for USA and Canada.

CLASS CC Fuse holders RANGE

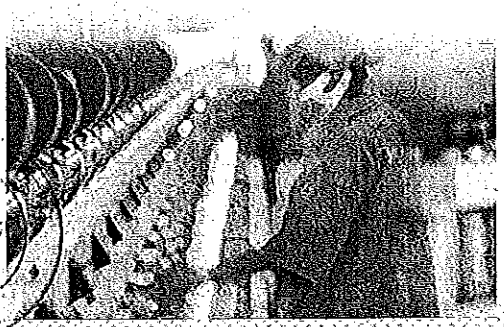


FB01 C...

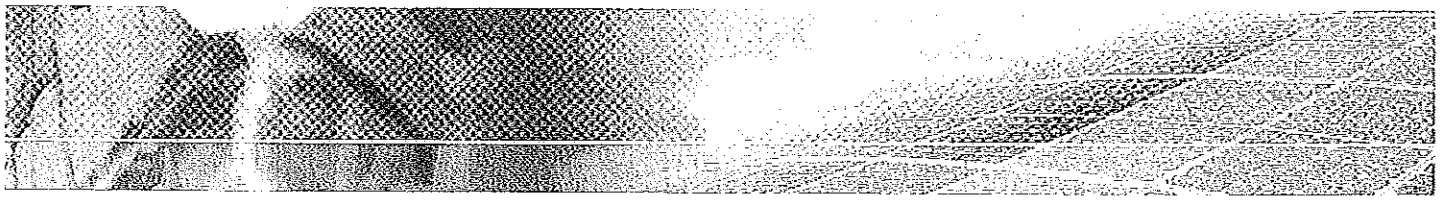
LOVATO Electric fuse holders for class CC fuses are used to protect branch circuits, consisting of conductors and components following the last overcurrent protective device protecting a load, in industrial applications which require high breaking capacity.
Suitable only and exclusively for fitting fuses defined as "class CC", quite common on the North American market.

Usage: Service industry, electric panels onboard machinery, electric installations in general.

Fuse size	Class CC
Version without indicator	1P, 2P, 3P
Version with indicator	1P
Main characteristics	
- Rated voltage	600VAC
- Rated current	30A
- Utilisation category	AC-22B 500V, AC-21B 690V
- Suitable for fuses	10x38 class CC
- Maximum conductor cross section	16mm² flexible/stranded; 25mm² rigid/solid
Certifications obtained	UL, CSA
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3UL512, RoHS directives, CSA 22.2 n° 39

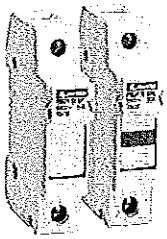


Lovato electric



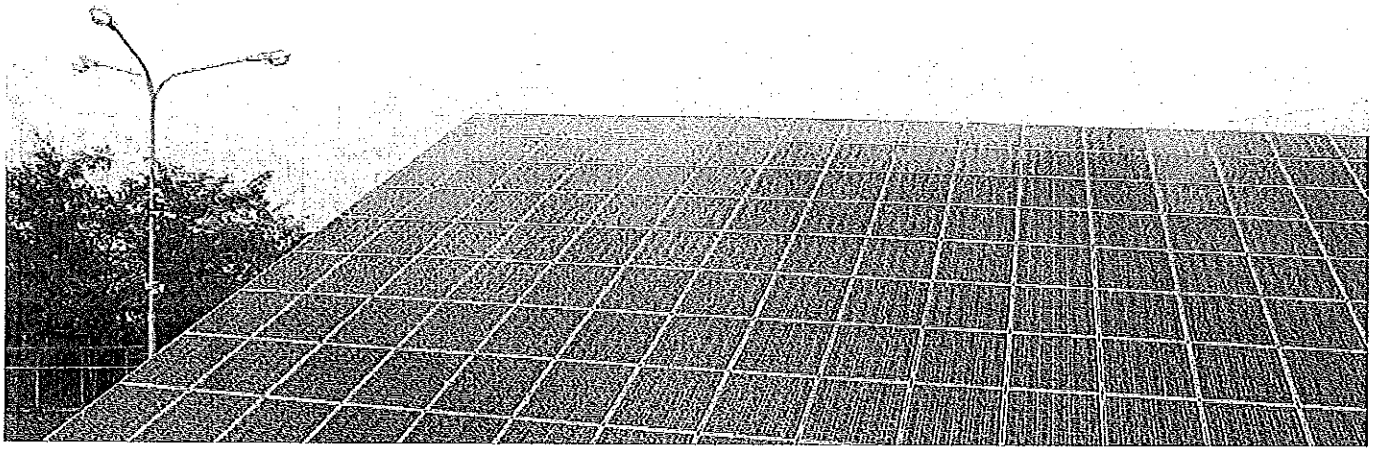
Fuse holders DC

LOVATO Electric DC fuse holder range is suitable for 1000VDC rated voltage and gPV class.
Used for overload and short-circuit protection of photovoltaic modules (strings) and the relative connecting cables.



FB01 D...

Fuse size	10x38
Version without indicator	1P, 2P
Version with indicator	1P
Main characteristics	
- Rated voltage	1000VDC / 690VAC
- Rated current	32A
- Utilisation category	DC-20B 1000VDC, AC-21B 690V
- Suitable for fuses	10x38 gPV
- Maximum conductor cross section	16mm² flexible/stranded, 25mm² rigid/solid
Compliant with standards	IEC/EN 60947-1, IEC/EN 60947-3, RoHS directive



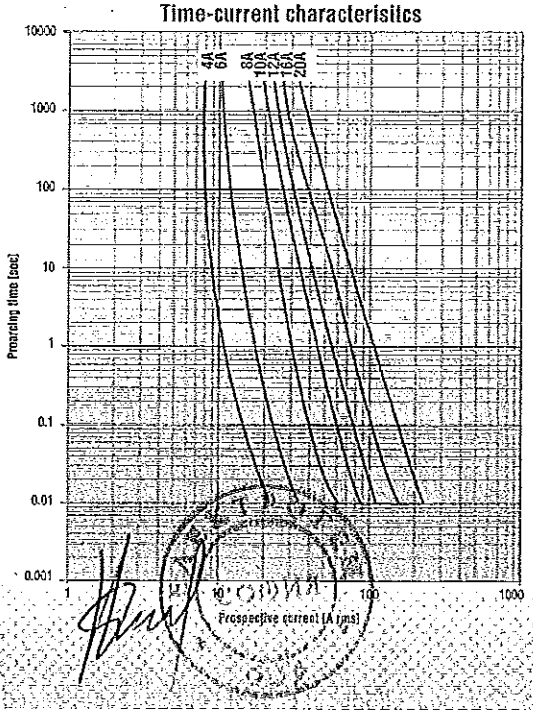
Fuses DC

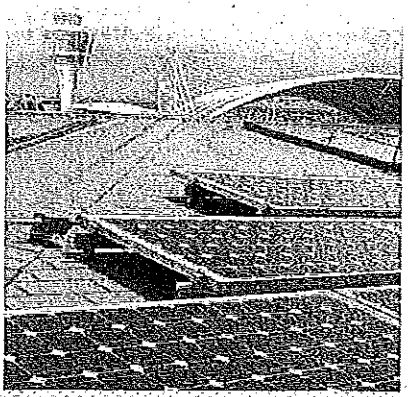
LOVATO Electric offers a range of cylindrical 10x38 fuses dedicated to photovoltaic duty and designed for 1000VDC maximum use.
Contrary to AC type fuses that blow for high overcurrent values, this type of DC fuse is designed to blow with low-intensity overcurrent values, created on photovoltaic cells and panels.

FE01 D 0...

Fuses for photovoltaic application	
Breaking capacity	30kA
Mains characteristics	
- Rated voltage	1000VDC
- Rated current	2...20A

Time-current characteristics





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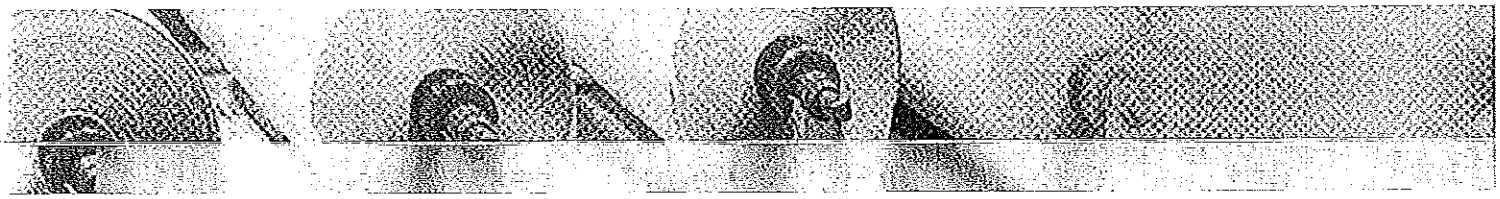
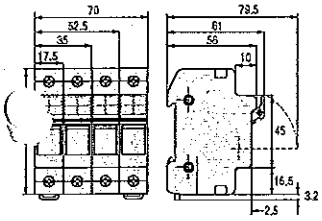


TECHNICAL CHARACTERISTICS

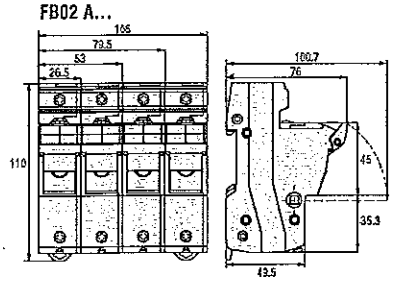
Type		FB01 A...	FB01 B...	FB02 A...	FB03 A...	FB01 C...	FB01 D...
Range		**AC**	**AC**	**AC**	**AC**	**Class CC (AC)**	**DC**
Certifications obtained		UR, CSA	–	cURus	cURus	UL, CSA	–
Maximum power dissipation		3W	3W	5W	9.5W	3W	4W
Derating factor of current Ie for different ambient temperatures	20°C	1	1	1	1	1	1
	30°C	0.95	0.95	0.95	0.95	0.95	0.95
	40°C	0.9	0.9	0.9	0.9	0.9	0.9
	50°C	0.8	0.8	0.8	0.8	0.8	0.8
	60°C	0.7	0.7	0.7	0.7	0.7	0.7
	70°C	0.5	0.5	0.5	0.5	0.5	0.5
Derating factor of current Ie for sid-by-side fuse holders - n° poles	1-3	1	1	1	1	1	1
	4-6	0.8	0.8	0.8	0.8	0.8	0.8
	7-9	0.7	0.7	0.7	0.7	0.7	0.7
	>10	0.6	0.6	0.6	0.6	0.6	0.6
Voltage for status indicator		120...690VAC	120...690VAC	230...690VAC	230...690VAC	120...600VAC	350...1000VDC
CONNECTIONS							
Maximum tightening torque		2.5Nm/22lbin	2.5Nm/22lbin	3Nm/26lbin	4Nm/35lbin	2.5Nm/22lbin	2.5Nm/22ibin
Maximum conductor cross section	flexible/stranded	1-16mm²/8 AWG	1-16mm²/6 AWG	1-25mm²/4 AWG	1-35mm²/2 AWG	1-16mm²/8 AWG	1-16mm²/6 AWG
	rigid/solid	1-25mm²/8 AWG	1-25mm²/4 AWG	1-35mm²/2 AWG	1-50mm²/1 AWG	1-25mm²/10 AWG	1-25mm²/4 AWG
AMBIENT CONDITIONS							
Operating temperature		-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C	-20...+70°C
Storage temperature		-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C	-40...+80°C
HOUSING							
Din rail mount version		Yes	Yes	Yes	Yes	Yes	Yes
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20

DIMENSIONS

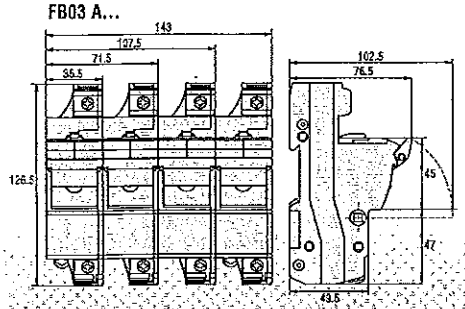
FB01 A... FB01 B... FB01 C... FB01 D...



FB02 A...

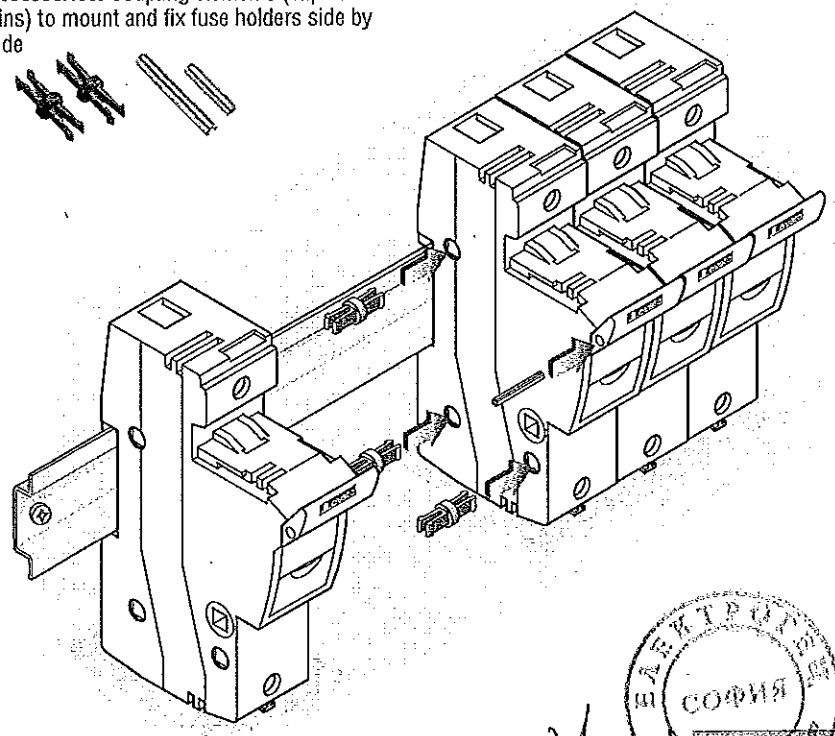


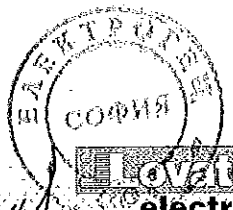
FB03 A...

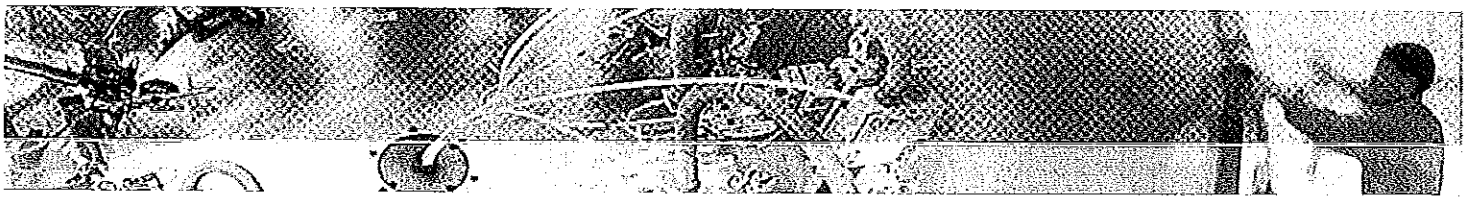


ASSEMBLY

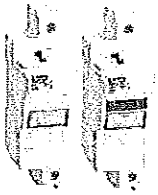
Accessories: Coupling elements (clips and pins) to mount and fix fuse holders side by side







HOW TO ORDER



FUSE HOLDERS

Order code	Pole arrangement	DIN modules	Status indicator	Rated voltage Ue	Rated nominale Ie	Qty per pkg	Weight
		n°		[V]	[A]	n°	[kg]
Fuse holder (fuse disconnector), 10x38, certified by UR and CSA.							
FB01 A 1P	1 pole	1	–	690VAC	32	12	0.750
FB01 A 1PL	1 pole	1	Yes	690VAC	32	12	0.750
FB01 A 1N	1 pole + N	2	–	690VAC	32	6	0.750
FB01 A 2P	2 poles	2	–	690VAC	32	6	0.750
FB01 A 3P	3 poles	3	–	690VAC	32	4	0.750
FB01 A 3N	3 poles + N	4	–	690VAC	32	3	0.750
Fuse holder (fuse disconnector), 14x51, certified by cURus.							
FB02 A 1P	1 pole	1.5	–	690VAC	50	6	1.000
FB02 A 1PL	1 pole	1.5	Yes	690VAC	50	6	1.000
FB02 A 1N	1 pole + N	3	–	690VAC	50	3	1.000
FB02 A 2P	2 poles	3	–	690VAC	50	3	1.000
FB02 A 3P	3 poles	4.5	–	690VAC	50	2	1.000
FB02 A 3N	3 poles + N	6	–	690VAC	50	1	0.650
Fuse holder (fuse disconnector), 22x58, certified byt cURus.							
FB03 A 1P	1 pole	2	–	690VAC	125	6	1.050
FB03 A 1PL	1 pole	2	Yes	690VAC	125	6	1.050
FB03 A 1N	1 pole + N	4	–	690VAC	125	3	1.050
FB03 A 2P	2 poles	4	–	690VAC	125	3	1.050
FB03 A 3P	3 poles	6	–	690VAC	125	2	1.050
FB03 A 3N	3 poles + N	8	–	690VAC	125	1	0.70c
Fuse holder (fuse disconnector), class CC, certified by UL and CSA.							
FB01 C 1P	1 pole	1	–	600VAC	30	12	0.750
FB01 C 1PL	1 pole	1	Yes	600VAC	30	12	0.750
FB01 C 2P	2 poles	2	–	600VAC	30	6	0.750
FB01 C 3P	3 poles	3	–	600VAC	30	4	0.750
Fuse holder (fuse disconnector), 10x38.							
FB01 B 1P	1 pole	1	–	690VAC	32	12	0.750
FB01 B 1PL	1 pole	1	Yes	690VAC	32	12	0.750
FB01 B 1N	1 pole + N	2	–	690VAC	32	6	0.750
FB01 B 2P	2 poles	2	–	690VAC	32	6	0.750
FB01 B 3P	3 poles	3	–	690VAC	32	4	0.750
FB01 B 3N	3 poles + N	4	–	690VAC	32	3	0.750
Fuse holder (fuse disconnector), 10x38, for photovoltaic applications.							
FB01 D 1P	1 pole	1	–	1000VDC	32	12	0.750
FB01 D 1PL	1 pole	1	Yes	1000VDC	32	12	0.750
FB01 D 2P	2 poles	2	–	1000VDC	32	6	0.750

FUSES FOR PHOTOVOLTAIC APPLICATIONS

Order code	Rated breaking capacity	Rated voltage Ue	Rated current Ie	Qty per pkg	Weight
	[kA]	[V]	[A]	n°	[kg]
FE01 D 00200	30	1000VDC	2	10	0.130
FE01 D 00400	30	1000VDC	4	10	0.130
FE01 D 00600	30	1000VDC	6	10	0.130
FE01 D 00800	30	1000VDC	8	10	0.130
FE01 D 01000	30	1000VDC	10	10	0.130
FE01 D 01200	30	1000VDC	12	10	0.130
FE01 D 01600	30	1000VDC	16	10	0.130
FE01 D 02000	30	1000VDC	20	10	0.130

ACCESSORIES

Order code	Description	Qty per pkg	Weight
		n°	[kg]
FBX 00	Coupling clip for 10x38, 14x51 and 22x58 sizes	100	0.050
FBX 01	Coupling pin for 10x38 size	100	0.130
FBX 02	Coupling pin for 14x51 and 22x58 sizes	100	0.150

N.B. Two clips FBX 00 and one pin FBX 01 are needed to couple two fuse holder FB01... types.
Three clips FBX 00 and one pin FBX 02 are needed to couple two fuse holder FB02... and FB03... types.

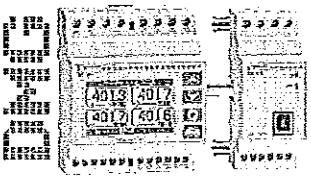
WIRING DIAGRAMS

Lovato electric

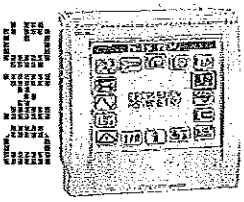
new

2011

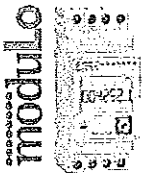
Switch disconnectors
16 to 1600A



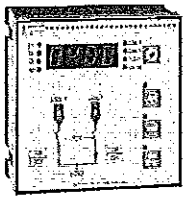
Modular digital multimeters



Flush-mount digital multimeters
and power analyzers



Energy meters



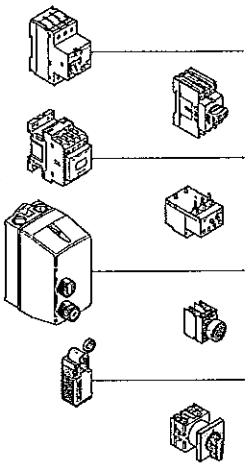
Automatic transfer switch
controllers

Switching power supplies

Lovato electric

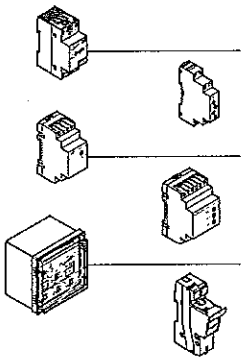
100% electricity

Panel Switch



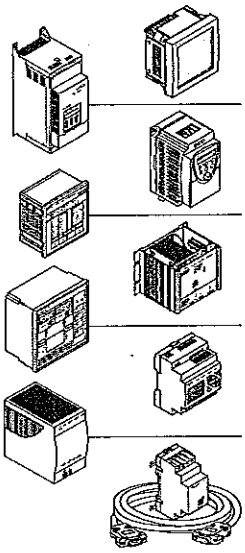
- Motor protection circuit breakers
- Switch disconnectors
- Contactors
- Motor protection relays
- Electromechanical starters
- Control and signalling units
- Limit , micro and foot switches
- Rotary cam switches

Panel Bus



- Modular contactors
- Time relays
- Protection relays
- Level control relays
- Earth leakage relays
- Fuse holders

Panel Logic



- Metering instruments and current transformers
- Soft starters
- AC motor drives
- Automatic power factor controllers
- Automatic battery chargers
- Automatic transfer switch controllers
- Programmable logic relays
- Switching power supplies
- Expansion modules and accessories

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PD67 GB 01 11

DEVICE UNDER TEST..... **Fuse holder *FB01B types***

MANUFACTURER..... Lovato Electric S.p.A.

TYPE OF TEST..... **Temperature rise test on FB01B fuse holders**

DATE OF DEVICE RECEIPT..... 27/04/2011

START / END TESTING..... 29/04/2011 – 13/05/2011

SAMPLES STORING..... ☒ Eliminated / returned to customer ☐ Storage :

INDEX.....

ISSUE..... 16/05/2011

COMPILED..... STAFF LPR

APPROVED..... RESP. LPR

1. PURPOPSE OF TESTING

Requested test (according to the customer specification):
Temperature rise at 690V – 32A on FB01B fuse holders

Test purpose:
"Verify the good function of FB01B fuse holders ."

Test target:
Pass the test.

2. TEST SAMPLES

N. 1 FB01B1P fuse holder - 32A (10 x 38 mm), batch production number ...[1]
N. 1 FB01B2P fuse holder - 32A (10 x 38 mm), batch production number ...[1]
N. 1 FB01B3P fuse holder - 32A (10 X 38 mm), batch production number ...[1]

3. TEST METHOD

IEC 60947-3 (2008-08) Ed. 3.0 + IEC 60947-1 Ed. 5.1 (2011-03)
Temperature rise (§ 8.3.3.1)

4. TEST PROCEDURES

Temperature rise..... Test instruction LPR 051-1, rev. 4, dated 11/10/2010.

ВЯРНО С ОРИГИНАЛА

[1] not available
[1] not available
[1] not available

5. TEST RESULTS

5.1 TEMPERATURE RISE

5.1.1 WITH LEGRAND FUSE 32 A gG 400 V

Sample under test.....N. 1 FB01B1P - 32A
N. 1 FB01B2P - 32A
N. 1 FB01B3P - 32A

Test conditions

Ambient temperature.....21 °C
Relative humidity.....46 %
Installation.....in vertical way, on DIN RAIL 35mm

Data sheet fusible used:
- Supplier.....Legrand
- Code.....cod. 133 32

Test parameters

Wiring of the main circuit
- cables section / length.....6,0 mm^2 / 1,0 m
- screws tightening nominal torque.....2,0 ÷ 2,5 N.m
- screws applied tightening torque.....2,0 N·m

Supply of the main circuit
- rated current.....Ith = 25 - 32 A
- test current.....I = 32 A
- supply frequency.....50 Hz

Test results

See next page.

ВЯРНО С ОРИГИНАЛА

Temperature rise main circuit

	[K]			Standard limit EN60947-1 tab. 2
	One pole fuse holder FB01B1P	2 pole fuse holder FB01B2P	3 pole fuse holder FB01B3P	
Terminal L1	43	54	57	65
Terminal T1	39	51	52	65
Terminal L2	-	55	61	65
Terminal T2	-	49	58	65
Terminal L3	-	-	57	65
Terminal T3	-	-	50	65
Note	Silver plated-brass terminal			

Temperature rise for accessibile parts

	[K]			Standard limit EN60947-1 tab. 3
	One pole fuse holder FB01B1P	2 pole fuse holder FB01B2P	3 pole fuse holder FB01B3P	
Line side	14	24	29	40
Load side	10	19	21	40
Left side	24	30	32	40
Right side	22	30	31	40
On front	18	24	29	40
Lever	9	16	17	40

ВЯРНО С ОРИГИНАЛА

The test results are related only to the exemplary tested and listed under the "test samples".

6. TEST EQUIPMENT AND INSTRUMENTS

6.1. TEST EQUIPMENT

Description	Used for	Full scale	Code
Current supply station	Power supply main circuit	20V – 50A	LPRA 065

6.2. MEASURING INSTRUMENTS

Description	Used to measure	Full scale	Code	Calibration expiration date
Thermohygrometer	Ambient temperature	-5 ÷ 50 °C	LPR 165	27/10/2011
Thermohygrometer	Relative humidity	10 ÷ 90%	LPR 165	27/10/2011
Termometric instrument	Temperature rise	-30 ÷ +200 °C	LPR 201	10/01/2012
Termocouple T type	Temperature rise	-30 ÷ +200 °C	L PR 201	10/01/2012
Termocouple T type	Temperature rise	-30 ÷ +200 °C	L PR 201.13	10/01/2012
Current transformer	Main circuit current	1.004/50 A	LPR 155	11/05/2014
Digital multimeter	Main circuit current	10 A	LPR 55	11/05/2012
Digital multimeter	Drop voltage	mV - Autom.	LPR 125	11/05/2012
Dynamometric screw driver	Main terminal screw tightening	6,0 Nm	LPR 231	07/01/2012

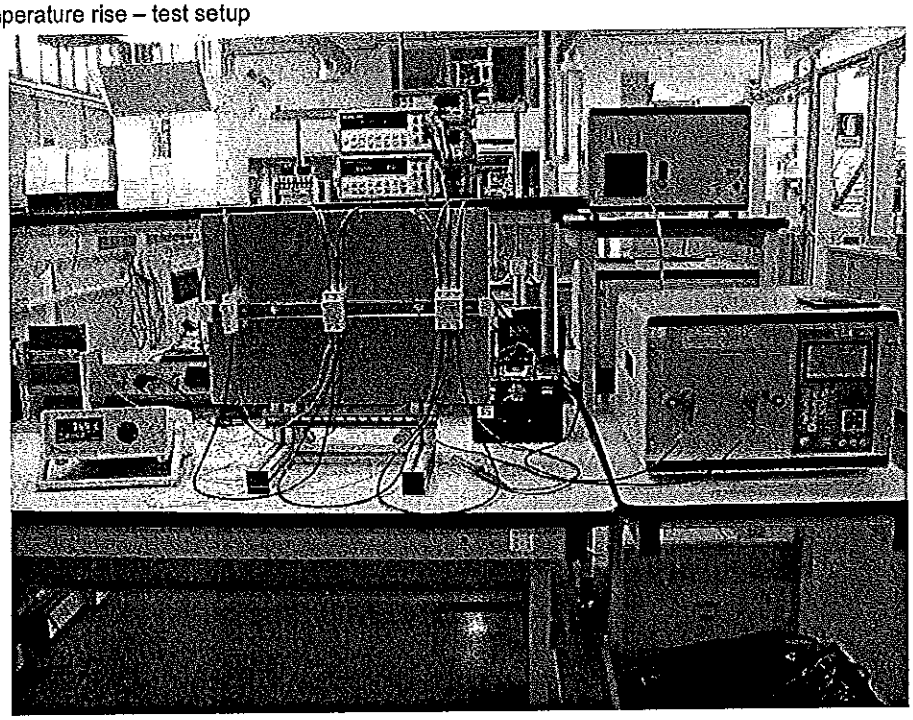
7. REMARKS & ANALYS

Temperature rise test 690V – 32A: test passed

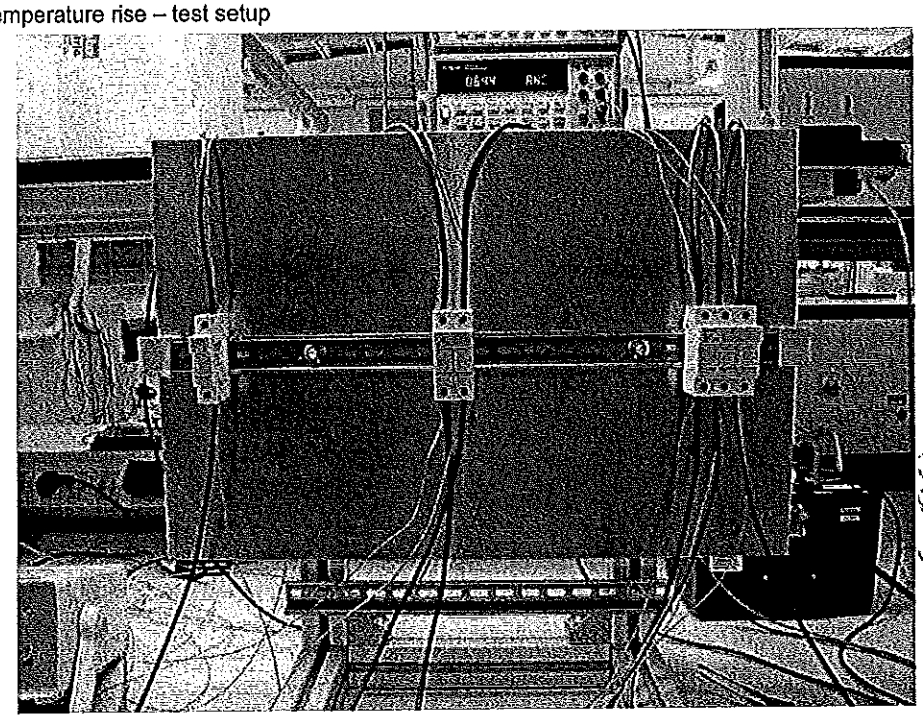
ВЯРНО С ОРИГИНАЛА

8. ANNEX

Picture 1: Temperature rise – test setup



Picture 1a: Temperature rise – test setup



The test results are related only to the exemplary tested and listed under the "test samples".

Picture 2: Catalogue Legrand fuses

legrand

fusibili cilindrici

Informazioni tecniche, curve e quote (p. 122)

Tipo "gG"

B.C.R. (Bassa Capacità di Rottura)
Rispondenti alle norme CEI 32-1; CEI 32-5
EN 60 269-1; EN 60 269-3

Imballo	Articoli Senza segnalatore	Articoli Con segnalatore	I nominale (A)	Tensione (V~)	Potere interruzione (KA)
			6,5 x 23 mm		
10	(1) 0113 02	0114 02 (1)	2	250	6
10	(1) 0113 04	0114 04 (1)	4		
10	(1) 0113 06	0114 06 (1)	6		
100	0113 10	0114 10	10		
			8,5 x 31,5 mm		
10	0123 01		1	400	20
10	0123 02	0124 02	2		
10	0123 04	0124 04	4		
10	0123 06	0124 06	6		
10	0123 08		8		
10	0123 10	0124 10	10		
10	0123 12		12		
100	0123 16	0124 16	16		
100	0123 20	0124 20	20		
			10,3 x 38 mm		
10/50	0133 32	0134 32	32	400	20

A.C.R. (Alta Capacità di Rottura)
Conformi alle norme CEI 32-1 e 32-4 - IEC 60 269.1,2 e 2,1 - EN 60 269.1
Approvazioni Bureau Veritas

Imballo	Senza segnalatore	Con segnalatore	I nominale (A)	Tensione (V~)	Potere interruzione (KA)
			10,3 x 38 mm		
10	0133 94		0,5	500	100
10	0133 01		1		
10	0133 02	0134 02	2		
10	0133 04	0134 04	4		
10	0133 06	0134 06	6		
10	0133 08	0134 08	8		
10	0133 10	0134 10	10		
10	0133 12	0134 12	12		
10	0133 16	0134 16	16		
10	0133 20	0134 20	20		
10	0133 25	0134 25	25		
	Senza percussore	Con percussore	**14 x 51 mm**		
10	0143 02		2	500	100
10	0143 04	0145 04	4		
10	0143 06	0145 06	6		
10	0143 10	0145 10	10		
10	0143 16	0145 16	16		
10	0143 20	0145 20	20		
10	0143 25	0145 25	25		
10	0143 32	0145 32	32		
10	0143 40	0145 40	40		
10	0143 50	0145 50	50	400	
			22 x 58 mm		
10	0153 10	0155 10	10	500	100
10	0153 16	0155 16	16		
10	0153 20	0155 20	20		
10	0153 25	0155 25	25		
10	0153 32	0155 32	32		
10	0153 40	0155 40	40		
10	0153 50	0155 50	50		
10	0153 63	0155 63	63		
10	0153 80	0155 80	80		
10	0153 96	0155 96	100		
10	0153 97	0155 97	125	400	

(1) Tipo g

Tipo "aM"

Rispondenti alla norma IEC EN 60269-1
Approvazione Bureau Veritas

Imballo	Articoli Senza percussore	Articoli Con percussore	I nominale (A)	Tensione (V~)	Potere interruzione (KA)
			8,5 x 31,5 mm		
10	0120 01		1	400	20
10	0120 02		2		
10	0120 04		4		
10	0120 06		6		
10	0120 08		8		
10	0120 10		10		

A.C.R. (Alta Capacità di Rottura)
Conformi alle norma IEC 60269-1,2 e 2-1; EN 60269-1; CEI 32.1 e 32.4
Approvazioni Bureau Veritas

Imballo	Senza percussore	Con percussore	I nominale (A)	Tensione (V~)	Potere interruzione (KA)
			10,3 x 38 mm		
10	0130 92		0,25		
10	0130 95		0,60		
10	0130 01		1		
10	0130 02		2		
10	0130 04		4		
10	0130 06		6	500	100
10	0130 08		8		
10	(1) 0130 10		10		
10	(1) 0130 12		12		
10	0130 16		16		
10	0130 20		20	400	
10	0130 25		25	400	
			14 x 51 mm		
10	0140 02	0141 02	2	500	100
10	0140 04	0141 04	4		
10	0140 06	0141 06	6		
10	0140 08	0141 08	8		
10	0140 10	0141 10	10		
10	0140 12	0141 12	12		
10	0140 16	0141 16	16		
10	0140 20	0141 20	20		
10	0140 25	0141 25	25		
10	0140 32	0141 32	32		
10	0140 40	0141 40	40		
10	0140 45	0141 45	45		
10	0140 50		50	400	
			22 x 58 mm		
10	0150 16	0151 16	16	500	100
10	0150 20	0151 20	20		
10	0150 25	0151 25	25		
10	0150 32	0151 32	32		
10	0150 40	0151 40	40		
10	0150 50	0151 50	50		
10	0150 63	0151 63	63		
10	0150 80	0151 80	80		
10	0150 96	0151 95	100		
10	0150 97	0151 97	125	400	

Neutri

Imballo	Articoli	
10	0123 00	8,5 x 31,5
10	0133 00	10,3 x 38
10	0143 00	14 x 51
10	0153 00	22 x 58

(1) calibro non normalizzato

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ВЯРНО С ОРИГИНАЛА

The test results are related only to the exemplary tested and listed under the "test samples".

СОФИЯ

A C A E

TESTING AUTHORIZATION

ACAE *(Associazione per la Certificazione delle Apparecchiature Elettriche), Member of* ***LOVAG*** *(Low Voltage Agreement Group)*

authorizes the Laboratory

LOVATO ELECTRIC S.p.A. *Via Don Mazza 12 Gorle (BG)*

Laboratory codification number: IL 01

to carry out the tests *listed in the following, for the purpose to certify the products as stated in the Certificate n° 070B and its enclosure, issued to ACAE by ACCREDIA.*

List of the authorized tests on the low - voltage components:

Verification of dielectric withstand
Verification of temperature – rise
Operation and operating limits
Making and breaking capacities
Overload performance
Mechanical properties of terminals

ACAE will witness the tests according to its Quality Procedure PA 5.2.1 "Test supervision".
The renewal of the authorization is subjected to annual audit.

First issue date: 2013-05-14 ***Current issue date: 2014-12-01***

ACAE General Secretary
Mr. Virginio Scarioni

Virginio Scarioni

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
PRD N°070 B
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

A C A E
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Tel: +39 035 4175244 Fax: +39 035 4534662
e-mail: acae@acaecert.it www.acaecert.it
C.F. 03260610104 P.IVA IT 02911610166
R.E.A. N. 333322 C.C.I.A. BG

LOVAG

HIDROBETON

СЕРТИФИКАТ по ISO 9001: 2008
BG120619Q /16.10.2015год.
издаден от Bureau Veritas Certification

Декларация за характеристиките на строителен продукт

№ 5-11

1. Идентификационен код на продукта:
Обикновен бетон с рецептурен състав ХБ -27а

2. Национални изисквания /заповед на министъра на регионалното развитие и благоустройство, национален нормативен акт / техническа спецификация /национален стандарт,българско техническо одобрение / приложим за строителния продукт:

БДС EN 206-1:2002, БДС EN 206-1:2002/НА:2008 / БДС EN206-1:2002/А1:2006,БДС EN206-1:2002/А2:2006

3.Предвидена употреба или употреби на строителния продукт в съответствие с националните изисквания, както е предвидено от производителя
Обикновен бетон за влагане в бетонни и стоманобетонни конструкции и изделия

4.Име,регистрирано търговско наименование или регистрирана търговска марка ,адрес за контакт на производителя и мястото на производство :
„ХИДРОБЕТОН" ООД ,гр. София – кв. Казичене, ул. „Л.Каравелов" №16
Място на производство: „ХИДРОБЕТОН"- БВ „ИЛИЯНЦИ"

5.Име и адрес за контакт на упълномощения представител
/когато е приложимо /: Не

6.Наименование на лицето за оценяване на съответствието с националните изисквания /когато е приложимо/:
„НИСИ" ЕООД ,бул. „Н.Петков"86,с рег.№07 от регистъра на МРРБ
Сертификат №07-НСИСОССП – 09.80Б/28.03.2013год.
/Сертификат за съответствие ,протоколи от изпитвания/в зависимост от приложимото/

7. Декларирани показатели на характеристиките на строителния продукт:

Характеристика	Показатели	Метод за изпитване/изчисление /определяне
Клас по якост на натиск	C 32/40	БДС EN12390-3:2009
Клас по консистенция	S3	БДС EN12350-2:2009
Клас по водонепропускливост	NPD	БДС EN206-1 /NA:2008
Клас по мразоустойчивост	NPD	БДС EN206-1 /NA:2008
Максимален размер на добавъчния материал	D max 16mm	БДС EN 933-1 Д-я на производителя на доб. м-л.
Клас по съдържание на хлориди	CI 0,1	БДС EN 206-1 т 5.2.7
Класове по въздействие на околната среда	XC4	БДС EN 206-ТаблицаF1

8. Характеристиките на строителния продукт ,посочен в т.1,имат показатели , съответстващи на декларираните съгласно т.7.

Тази декларация за характеристиките на строителния продукт се издава изцяло на отговорността на производителя съгласно т.4 и се отнася за бетон , произведен от 19.11.2015г.
За фирма : „ЕЛЕКТРОГЕЦ "ООД
Строеж: ИЛИЯНЦИ
Неразделна част от декларацията е приложената справка декларация от записите на действащата в фирмата система за производствен контрол.
Декларирам ,че ми е известна отговорността, която нося съгласно чл. 313 от НК.
Подписано за и от името на производителя:

Управител:
Росен Николов

18. 01.2016г.
гр. София

ВЯРНО С ОРИГИНАЛА

СПРАВКА – ИЗВЛЕЧЕНИЕ

От Записите на Системата за производствен контрол
на БЦ "ИЛИЯНЦИ "

От произведените през месец Ноември 2015год. бетонни смеси от дата 19.11.2015г. на Фирма „ЕЛЕКТРОГЕЦ " ООД са доставени следните количества бетонна смес, за които вероятният клас на бетона се определя от посочените резултати въз основа на произведените планови изпитвания за окачествяването им:

Наименование на продукта	Количество / m³ /	Технически характеристики			Забележки
Бетонна смес		Rcp. / MPa /	Rмин / MPa /	Други	
C32/40	3,00	49,3	48,4	-	-

Посочените данни са извадка на заявените - експедирани бетонни смеси за месец 11/2015год. и резултатите от изпитването на контролните пробни тела, в акредитирана лаборатория на НИСИ- ЕООД
с протокол № 1060-1-623 /28.12.2015год.

София
18.01.2016г.

Управител :
/ Р. Николов /

ВЯРНО С ОРИГИНАЛА