

ПРЕДЛОЖЕНИЕ ЗА ИЗПЪЛНЕНИЕ НА ПОРЪЧКАТА

„Доставка и монтаж на бетонови комплектни трансформаторни
постове /БКТП/“, РЕФ. № PPD 15-042, Обособена позиция 2

02

„Електрогец“ ООД, www.electrogetz.com

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Наименование на материала: Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 kA,

с SF₆ изолация, с товари прекъсвачи

Съкратено наименование на материала: Компактни КРУ с SF₆, 12/24(25) kV, 630A, 16kA, с тов. прек.

Област: Н – Електрически уредби СрН/НН

Категория: 24 - Разпределителни уредби

Мерни единици: Брой

Аварийни запаси: Да

Характеристика на материала:

Триполюсни затворени в метален шкаф фабрично произведени за работа на закрито компактни комплектни комутационни устройства (КРУ) с обявено напрежение 24/25 kV с единична шинна система с товари прекъсвачи¹ и заземители в обща за по-голямата част от функционалните единици херметична обвивка, запълнена със серен хексафлуорид (SF₆). КРУ са съоръжени допълнително със средства за управление, измерване и сигнализация.

Всички функционални отделения на КРУ са фиксирани неподвижно към носеща конструкция. Отделенията за кабелите СрН и за предпазителите ВН са защитени с механично блокирани предпазни капацы (щитове) с възможност за заключване.

Компактните КРУ съответстват на категория на непрекъснатост на работа LSC2A-PI(PM) с дефиниран клас на устойчивост на вътрешна електрическа дъга IAC съгласно БДС EN 62271-200. Струята от горещи газове, пари и нагорещени частици в случаите на вътрешна електрическа дъга при късо съединение се отвежда в пространството под комплектното комутационно устройство.

Задвижването на контактната система на товарите прекъсвачи представлява самостоятелна или интегрирана конструктивна част, с ръчно управление, с мигновено действие, със сигурно блокиране/заключване (в положения „Заземено“, „Включено“ и „Изключено“, изобразени еднозначно (по недвусмислен начин) на еднолинейната схема на челния панел за управление), и автоматично изключване на товарите прекъсвачи за трансформаторните присъединения с акумулирана в задвижващия механизъм енергия.

Главната и заземителната вериги на товарите прекъсвачи са блокирани механично срещу едновременно включване. Предпазните капацы (щитове) на отделенията за кабелните присъединения са блокирани механично, в случаите когато заземителната верига е отворена.

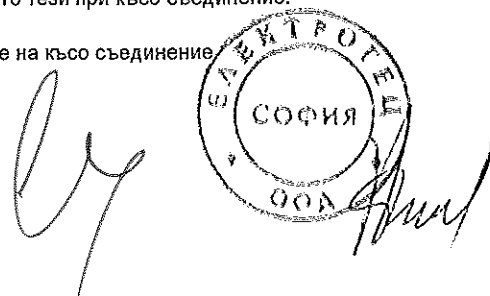
КРУ позволяват възможност за замяна на ръчното задвижване с моторно задвижване в условията на експлоатация.

КРУ са съоръжени със светлинна индикация, захранвана от капацитивни делители на изводите, на всички присъединения на всички полюси (фази), включително гнезда (букси) за проверка за напрежение и за уеднаквяване на фазовия ред (сфазировка) на присъединяваните кабелни линии. *В случай на*

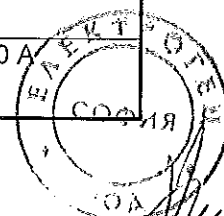
¹ БДС IEC 60050 (441) „Международен електротехнически речник Глава 441: Комутационни апарати за разпределение, комутационни апарати за управление и стопяеми предпазители“

Определение 441-14-10 Товаров прекъсвач - механичен комутационен апарат, способен да включва, провежда и изключва токове при нормални условия във веригата, които могат да включват и предписани условия с претоварване, а също така да провежда за определено време токове при предписани ненормални условия във веригата, такива като тези при късо съединение.

Забележка: Един прекъсвач може да е способен да включва, но не и да изключва токове на късо съединение



№ по ред	Параметър	Изискване	Гарантирано предложение
3.14	Обявена честота, f_r	50 Hz	50 Hz
3.15	Обявен краткотраен издържан ток (1 s)	16 kA	16 kA
3.16	Обявен върхов издържан ток	40 kA	40 kA
3.17	Клас на устойчивост на вътрешна електрическа дъга (IAC) AFL	16 kA (1 s)	16 kA (1 s)
3.18	Обявено краткотрайно (1 min) издържано напрежение с промишлена честота (50 Hz), U_d (ефективна стойност): спрямо земя, между полюси и между отворени контакти	50 kV	50 kV
3.19	Обявено краткотрайно (1 min) издържано напрежение с промишлена честота (50 Hz) U_d (ефективна стойност): върху разделящо разстояние	60 kV	60 kV
3.20	Обявено издържано мълниев импулсно напрежение U_p (върхова стойност): спрямо земя, между полюси и между отворени контакти	125 kV	125 kV
3.21	Обявено издържано мълниев импулсно напрежение U_p (върхова стойност): върху разделящо разстояние	145 kV	145 kV
3.22	Обявен ток на шинната система	min 630 A	630 A
3.23	Обявен ток I_r на кабелните присъединения	min 630 A	630 A
3.24	Обявен ток I_r на трансформаторните присъединения	min 200 A	200 A
3.25	Еднополюсна схема на челния панел, изобразяваща главните и заземителните вериги, в която са интегрирани устройствата за индициране на положението на контактните системи	Да	Да
Функционална единица - Товаров прекъсвач за кабелна линия (съгласно БДС EN 60265-1)			
3.26	Обявен краткотраен издържан ток, I_k (1 s)	16 kA	16 kA
3.27	Обявен ток на включване при късо съединение, I_{ma}	40 kA	40 kA
3.28	Обявен ток на изключване на преобладаващ активен товар, I_1	min 630 A	630 A
3.29	Обявен ток на изключване на затворена верига, I_{2a}	min 630 A	630 A
3.30	Обявен ток на изключване на работещ на празен ход трансформатор, I_3	min 16 A	16 A
3.31	Обявен ток на изключване на работеща без товар кабелна електропроводна линия, I_{4a}	min 25 A	50 A
3.32	Обявен ток на изключване на земно съединение, I_{6a}	min 16 A	300 A



използване на КРУ в електроразпределителни мрежи с по-ниски напрежения системите за индикация на напрежението са приспособени за работа съобразно номиналното напрежение на електроразпределителната мрежа.

КРУ позволяват присъединяване на кабелните линии и кабелните изводи за трансформаторите посредством стандартни прави или ъглови конусни конектори (адаптори) с подходящи кабелни скоби - за кабелните линии с диаметър до 50 mm; и за кабелните изводи за трансформаторите с диаметър до 40 mm.

Отделенията за присъединяване на кабелните линии позволяват да бъдат монтирани допълнително в експлоатационни условия металоокисни вентилни отводи с обявен разряден ток $I_n = 10$ kA, без необходимостта от замяна на предпазните щитове/капацити на отделенията.

Защитата от къси съединения на кабелния извод на трансформаторното присъединение CrH се осъществява посредством стопяеми предпазители високо напрежение с дължина 442 mm и диаметър на контактната част 45 ± 1 mm. При задействане на който и да е от ударните щифтове на предпазителите, се изключват и трите полюса на товаровия прекъсвач.

Светлинната сигнализация и лостът или комплектът лостове за управление на КРУ са включени в доставката.

(При по-сложните комбинации на кабелни и трансформаторни присъединения КРУ могат да бъдат от разширяем тип.)

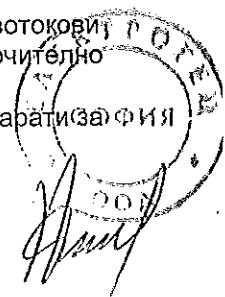
Използване:

Компактните КРУ в метален шкаф 12/24(25) kV, с SF₆ изолация, с товарови прекъсвачи се използват главно за съоръжаване на непроходими (обслужвани отвън) самостоятелни комплектни трансформаторни постове или на вградени в сгради трансформаторни постове, в които е възможно да бъдат монтирани, в електроразпределителни мрежи с номинални напрежение 20 kV и 10 kV. (Компактните КРУ се използват в електроразпределителни мрежи с номинално напрежение 10 kV, ако съответно системата за индикация на напрежението е преработена).

Съответствие на предложеното изпълнение със стандартизационните документи:

Компактните КРУ 12/24(25) kV, с SF₆ изолация, с товарови прекъсвачи трябва да отговарят на приложимите български и международни стандарти или еквиваленти и на техните валидни изменения и поправки:

- БДС EN 60099-4:2006 Вентилни отводи. Част 4: Метало-окисни вентилни отводи без разрядници за електрически системи за променливо напрежение (IEC 60099-4:2004, с промени)
- БДС EN 60265-1:2003 Превключватели високо напрежение. Част 1: Превключватели за обявени напрежения над 1 kV и по-ниски от 52 kV (IEC 60265-1:1998)
- БДС EN 60282-1:2010 Предпазители за високо напрежение. Част 1: Токоограничаващи предпазители (IEC 60282-1:2009)
- БДС EN 60529:1991/A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989 + A1:1999)
- БДС EN 62271-1:2008 Комутационни апарати за високо напрежение. Част 1: Общи технически изисквания
- БДС EN 62271-102:2007 Комутационни апарати за високо напрежение. Част 102: Разединители и заземителни разединители за променлив ток (IEC 62271-102:2001 + поправка 1, април 2002 + поправка 2, май:2003)
- БДС EN 62271-105:2003 „Комутационни апарати високо напрежение. Част 105: Комутационни апарати за променливо напрежение комбинирани с предпазител (IEC 62271-105:2002)“.
- БДС EN 62271-200:2006 „Комутационни апарати за високо напрежение. Част 200: Променливотокови комутационни апарати в метална обвивка за обявени напрежения над 1 kV и по-високи, включително 52 kV (IEC 62271-200:2003)“;
- БДС IEC 60050 (441) „Международен електротехнически речник Глава 441: Комутационни апарати за управление и стопяеми предпазители



Изисквания към документацията и изпитванията:

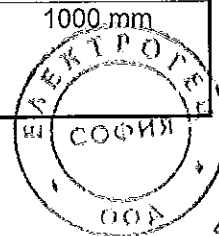
№ по ред	Документ	Приложение № (или текст)
1.	Точно обозначение на типовете на компактните комплектни комутационни устройства, производителя, страна на произход и последно издание на каталога на производителя	Приложение 1 (каталог)
2.	Техническо описание на компактните комплектни комутационни устройства, включително аксесоари и гарантирани параметри, пространствени чертежи, включително чертежи за минимално допустимите вертикални и хоризонтални разстояния съответно до тавана и до стените на закритата разпределителна уредба, гарантиращи сигурността на работа на компактните комплектни комутационни устройства и тяхното обслужване, броя и размера на винтовете за фиксиране, размерите на отворите в пода и т.н.	Приложение 2 (инструкция)
3.	Еднолинейни схеми на главните и заземителните вериги, вкл. капацитивните делители на отделните видове компактни комплектни комутационни устройства	Приложение 3
4.	Дизайн на табелката за обявените данни на компактното комплектно комутационно устройство на български език	Приложение 2 (инструкция)
5.	Експлоатационна дълготрайност, години	30
6.	Инструкции за обслужване и поддържане на компактните комплектни комутационни устройства	Приложение 2 (инструкция)
7.	Списък на проведените типови изпитвания на английски или на български език съгласно БДС EN 62271-200 с приложени резултати.	Приложение 4
8.	Протоколи от типови изпитвания на английски или на български език за устойчивост на вътрешна електрическа дъга за клас IAC – AB с бетонова обвивка.	Приложение 5
9.	Препоръчан тип на устройство за уеднаквяване на фазовия ред (сфазирание) на присъединяваните кабелни линии за предложеното изпълнение на системата за индикация на напрежение на компактните комплектни комутационни устройства, единична цена, която не се включва в цената на изделието, и срок на доставка	Приложение 6
10.	Възможност за съоръжаване на компактните комплектни комутационни устройства с моторно задвижване, изключвателни бобини и индикатори на къси и земни съединения и др.	ДА
11.	Декларация за съответствие на предлаганото изпълнение с изискванията на стандартите, посочени по-горе в параграф „Съответствие на предложеното изпълнение със стандартизационните документи“	Приложение 7
12.	Препоръки от производителя за постигане на необходимата сеизмична устойчивост.	Приложение 8

Изисквания за допълнителна информация от производителя



№ по ред	Наименование	Гарантирано предложение
1.	Категория на непрекъснатост на работа LSC2A-PM / LSC2A-PI	LSC2A-PM
2.	Вътрешна електрическа дъга min 16 kA/1s за всички достъпни функционални отделения	ДА
3.	Товарови прекъсвачи и заземителни разединители – самостоятелни/интегрирани	Интегрирани, три-позиционни
4.	Материал на контактната система на товарите прекъсвачи	Мед
5.	Брой комутационни цикли в зависимост от комутирания ток	100 бр. при номинален ток T100(E3) съгласно IEC 62271-103 5 бр. при включване на ток на к.с. (5-E3)
6.	Обявена максимална сила, която е необходимо да се приложи от оператора върху лоста/лостовете на ръчното задвижване [N]	150 N
7.	Обявено съпротивление на главната верига на товарите прекъсвачи в комплектните комутационни устройства за кабелни присъединения и допустим толеранс в експлоатационни условия [$\mu\Omega$]	110 $\mu\Omega$
8.	Обявено съпротивление на главната верига на товарите прекъсвачи в комплектните комутационни устройства за трансформаторни присъединения и допустим толеранс в експлоатационни условия [$\mu\Omega$]	850 $\mu\Omega$
9.	Функционална единица – Трансформаторно присъединение – товар прекъсвач, комбиниран с предпазители (съгласно БДС EN 62271-105)	ДА
10.	Обявен краткотраен издържан ток (с предпазители), I_k	16 kA
11.	Обявен ток на включване при късо съединение (с предпазители), I_{ma}	40 kA
12.	Обявен ток съгл. IEC 420 (реална стойност на тока ограничена от предпазител)	125 A (20 kV) 160 A (10 kV)
13.	Заземяване на предпазителите – едностранно/ двустранно	двустранно
14.	Извеждане на предпазителите – хоризонтално/вертикално	хоризонтално
15.	Брой години без поддържане на комплектните комутационни устройства при нормални експлоатационни условия	30 год.
16.	Начин на херметизиране в мястото за поставяне на лоста за управление	Специална О-ринг херметизираща технология, разработена от ORMAZABAL
17.	Необходимо свободно пространство за манипулиране с лоста/лостовете за управление, измерено от челния панел на комплектните комутационни устройства [mm]	1000 mm

Ср



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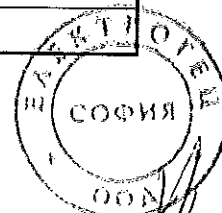
№ по ред	Наименование	Гарантирано предложение
18.	Възможност за визуален контрол на положението на контактите на заземителния разединител, Да/Не	Не
19.	Брой на лостовете за управление	1 бр.
20.	Обявено налягане на серния хексафлуорид - SF ₆ в експлоатационни условия [bar]	1.3 bar
21.	Обявено свръхналягане на газа в херметизираните секции	30 kPa (0.3 bar)
22.	Характеристики на херметичност на запълнените с газ секции	Херметизиран контейнер от неръждаема стомана, IP 67
23.	Индикатор за налягането на SF ₆ газа в херметичната обвивка с пряко/непряко измерване	Манометър с пряко измерване, с възможност за допълнително оборудване с помощни контакти за дистанционно измерване
24.	Наличие на индикатор на контролния панел за състоянието на предпазителите –Да/Не	ДА
25.	Тестване на изолацията на кабели без разединяване на кабелните щепселни глави - Да/Не	ДА
26	Максимална стойност на тестващото напрежение без разединяване на кабелните глави - kV(DC) / kV 0,1 Hz	96kV (8xU ₀)

Технически данни

1. Характеристики на работната среда

№ по ред	Характеристика	Стойност
1.1	Максимална околна температура	+ 45°C
1.2	Минимална околна температура	Минус 5°C
1.3	Максимална средна околна температура за период от 24 ч.	+ 35°C
1.4	Относителна влажност	До 95 % (2,2 kPa)
1.5	Надморска височина	До 1000 m
1.6	Земетръсна устойчивост	0,3 g

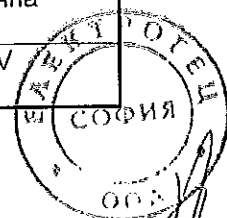
2. Параметри на електроразпределителната мрежа



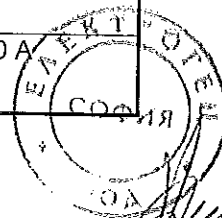
№ по ред	Параметър	Стойност	
2.1	Номинално напрежение	3~10 000 V	3~20 000 V
2.2	Най-високо напрежение на мрежата	12 000 V	24 000 V
2.3	Обявена честота	50 Hz	
2.4	Брой на фазите	3	
2.5	Заземяване на звездния център	<ul style="list-style-type: none"> • през активно съпротивление; • през дъгогасителна бобина; • изолиран звезден център 	

3. Общи технически параметри

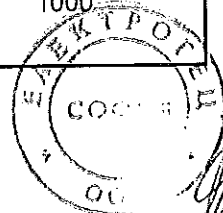
№ по ред	Параметър	Изискване	Гарантирано предложение
3.1	Степен на защита на херметичната обвивка	IP 6X	IP 67
3.2	Степен на защита на отделенията за кабелите СрН и за предпазители ВН	min IP 2X	IP 3X
3.3	Степен на защита на отделенията за задвижващите механизми	min IP 2X	IP 3X
3.4	Максимално изтичане (загуба) на серен хексафлуорид - SF ₆ от херметичната обвивка	max 1% / год.	≤0.1%/год.
3.5	Материал на херметичната обвивка	PM/PI	PM
3.6	Възможност за допълнително монтиране на моторно задвижване и окомплектоване с изключвателна бобина при заявка	Да	Да
3.7	Експлоатационна дълготрайност	min 30 години	30 год.
3.8	Възможност за допълнително монтиране на челния панел на индикатори на къси и земни съединения по кабелните линии	Да	Да
3.9	Отделенията на кабелните изводи и защитните капацитивности позволяват допълнително монтиране в експлоатационни условия на металоокисни вентилни отводи с обявен разряден ток I _n = 10 kA	Да	Да
3.10	Изпълнение	За монтиране на закрито	За монтиране на закрито
3.11	Брой на полюсите (фазите)	3	3
3.12	Шинна система	Единична	Единична
3.13	Обявено напрежение, U _r	24/25 kV	24 kV



№ по ред	Параметър	Изискване	Гарантирано предложение
3.14	Обявена честота, f_r	50 Hz	50 Hz
3.15	Обявен краткотраен издържан ток (1 s)	16 kA	16 kA
3.16	Обявен върхов издържан ток	40 kA	40 kA
3.17	Клас на устойчивост на вътрешна електрическа дъга (IAC) AFL	16 kA (1 s)	16 kA (1 s)
3.18	Обявено краткотрайно (1 min) издържано напрежение с промишлена честота (50 Hz), U_d (ефективна стойност): спрямо земя, между полюси и между отворени контакти	50 kV	50 kV
3.19	Обявено краткотрайно (1 min) издържано напрежение с промишлена честота (50 Hz) U_d (ефективна стойност): върху разделящо разстояние	60 kV	60 kV
3.20	Обявено издържано мълниев импулсно напрежение U_p (върхова стойност): спрямо земя, между полюси и между отворени контакти	125 kV	125 kV
3.21	Обявено издържано мълниев импулсно напрежение U_p (върхова стойност): върху разделящо разстояние	145 kV	145 kV
3.22	Обявен ток на шинната система	min 630 A	630 A
3.23	Обявен ток I_r на кабелните присъединения	min 630 A	630 A
3.24	Обявен ток I_r на трансформаторните присъединения	min 200 A	200 A
3.25	Еднополюсна схема на челния панел, изобразяваща главните и заземителните вериги, в която са интегрирани устройствата за индициране на положението на контактните системи	Да	Да
Функционална единица - Товаров прекъсвач за кабелна линия (съгласно БДС EN 60265-1)			
3.26	Обявен краткотраен издържан ток, I_k (1 s)	16 kA	16 kA
3.27	Обявен ток на включване при късо съединение, I_{ma}	40 kA	40 kA
3.28	Обявен ток на изключване на преобладаващ активен товар, I_1	min 630 A	630 A
3.29	Обявен ток на изключване на затворена верига, I_{2a}	min 630 A	630 A
3.30	Обявен ток на изключване на работещ на празен ход трансформатор, I_3	min 16 A	16 A
3.31	Обявен ток на изключване на работеща без товар кабелна електропроводна линия, I_{4a}	min 25 A	50 A
3.32	Обявен ток на изключване на земно съединение, I_{6a}	min 16 A	300 A



№ по ред	Параметър	Изискване	Гарантирано предложение
3.33	Брой на комутационните цикли при изключване на преобладаващ активен товар I_1	min 100	100
3.34	Брой на комутационните цикли при включване на обявения ток на късо съединение I_{ma}	min 5	5
3.35	Брой на СО комутационни цикли – механична износоустойчивост	M1 (min 1000)	1000
3.36	Вид на задвижването	Ръчно, с мигновено действие	Ръчно, с мигновено действие
3.37	Дъгогасяща камера	SF ₆	SF6
Функционална единица - Товаров прекъсвач, комбиниран с предпазители, за трансформаторни присъединения (съгласно БДС EN 62271-105)			
3.38	Обявен краткотраен издържан ток, I_k (с предпазители)	16 kA	16 kA
3.39	Обявен ток на включване при късо съединение, I_{ma} (с предпазители)	40 kA	40 kA
3.40	Брой на комутационните цикли при включване на обявения ток на късо съединение I_{ma}	min 5	5
3.41	Заземяване на контактните части на предпазителите	Да	Да
3.42	Брой на СО комутационни цикли – механична износоустойчивост	M1 (min 1000)	1000
3.43	Задвижване	Ръчно, с мигновено действие с акумулирана енергия и автоматично изключване при наличие на изключвателна бобина	Ръчно, с мигновено действие с акумулирана енергия и автоматично изключване при наличие на изключвателна бобина
3.44	Дъгогасяща камера	SF ₆	SF6
Функционална единица - Заземителен разединител (заземител) на товарите прекъсвачи за кабелни и трансформаторни присъединения (съгласно БДС EN 62271-102)			
3.45	Обявен краткотраен издържан ток, I_k	16 kA	16 kA
3.46	Обявен ток на включване при късо съединение	40 kA	40 kA
3.46	Брой на комутационните цикли при включване на обявения ток на късо съединение	min 5	5
3.47	Брой на СО комутационни цикли – механична износоустойчивост	min 1000	1000



№ по ред	Параметър	Изискване	Гарантирано предложение
3.48	Задвижване	Ръчно, с мигновено действие	Ръчно, с мигновено действие
3.49	Дъгогасяща камера	SF6	SF6



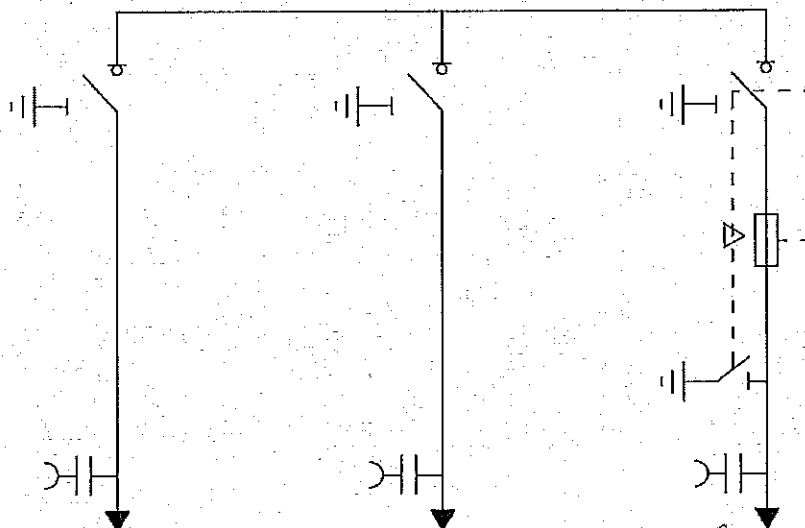
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4. Технически параметри и др. данни на компактни КРУ 24/25 kV

4.1 Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF₆, с товарови прекъсвачи за две кабелни присъединения и едно трансформаторно присъединение - ККТ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 24 2202		Да се посочи CGMCOSMOS-2LP	
Наименование на материала		Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF ₆ , с товарови прекъсвачи - ККТ	
Съкратено наименование на материала		Комп. КРУ 24(25)/630/16, SF ₆ , тов. прекъсв. - ККТ	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.1.1	Модул	2xК (кабел) + 1xТ (трафо)	2xК (кабел) + 1xТ (трафо)
4.1.2	Обявено напрежение, U _r	24/25 kV	24 kV
4.1.3	Обявен ток, I _r	min 630 A	630 A
4.1.4	Височина	max 1500 mm	1300 mm
4.1.5	Дълбочина	max 780 mm	735 mm
4.1.6	Широчина	max 1200 mm	1200 mm
4.1.7	Лост/комплект лостове за управление	1 бр.	1 бр.
4.1.8	Общо тегло, kg	Да се посочи	290 kg

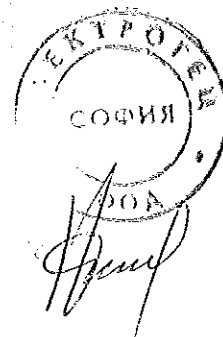
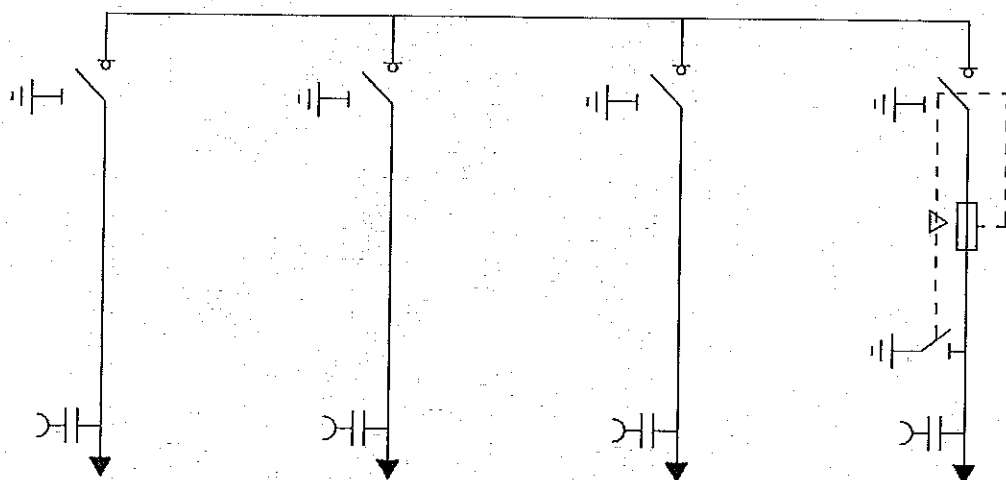
Фиг. 1 – Компактно КРУ с SF₆, с товарови прекъсвачи за две кабелни присъединения и едно трансформаторно присъединение – ККТ



4.2 Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF₆, с товарови прекъсвачи за три кабелни присъединения и едно трансформаторно присъединение - КККТ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 24 2203		Да се посочи CGMCOSMOS-3LP	
Наименование на материала		Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF ₆ , с товарови прекъсвачи - КККТ	
Съкратено наименование на материала		Комп. КРУ 24(25)/630/16, SF ₆ , тов. прекъсв. - КККТ	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.2.1	Модул	3xК (кабел) + 1xТ (трафо)	3xК (кабел) + 1xТ (трафо)
4.2.2	Обявено напрежение, U _r	24/25 kV	24 kV
4.2.3	Обявен ток, I _r	min 630 A	630 A
4.2.4	Височина	max 1500 mm	1300 mm
4.2.5	Дълбочина	max 780 mm	735 mm
4.2.6	Широчина	max 1620 mm	1565 mm
4.2.7	Лост/комплект лостове за управление	1 бр.	1 бр.
4.2.8	Общо тегло, kg	Да се посочи	355 kg

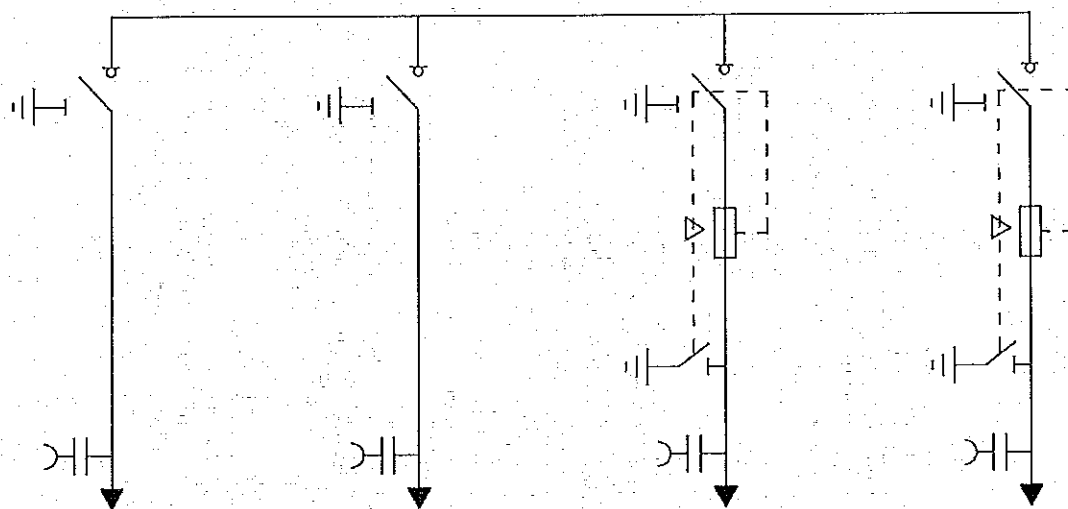
Фиг. 2 – Компактно КРУ с SF₆, с товарови прекъсвачи за три кабелни присъединения и едно трансформаторно присъединение – КККТ



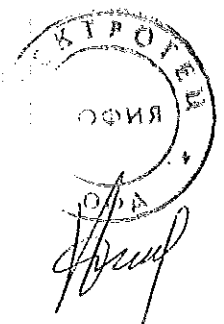
4.3 Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF₆, с товарови прекъсвачи за две кабелни присъединения и две трансформаторни присъединения - ККТТ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 24 2204		Да се посочи CGMCOSMOS-2L2P	
Наименование на материала		Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF ₆ , с товарови прекъсвачи - ККТТ	
Съкратено наименование на материала		Комп. КРУ 24(25)/630/16, SF ₆ , тов. прекъсв. - ККТТ	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.3.1	Модул	2xК (кабел) + 2xТ (трафо)	2xК (кабел) + 2xТ (трафо)
4.3.2	Обявено напрежение, U _r	24 kV	24 kV
4.3.3	Обявен ток, I _r	min 630 A	630 A
4.3.4	Височина	max 1500 mm	1300 mm
4.3.5	Дълбочина	max 780 mm	735 mm
4.3.6	Широчина	max 1850 mm	1670 mm
4.3.7	Лост/комплект лостове за управление	1 бр.	1 бр.
4.3.8	Общо тегло, kg	Да се посочи	400 kg

Фиг. 3 – Компактно КРУ с SF₆, с товарови прекъсвачи за две кабелни присъединения и две трансформаторни присъединения – ККТТ



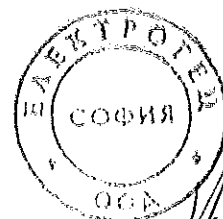
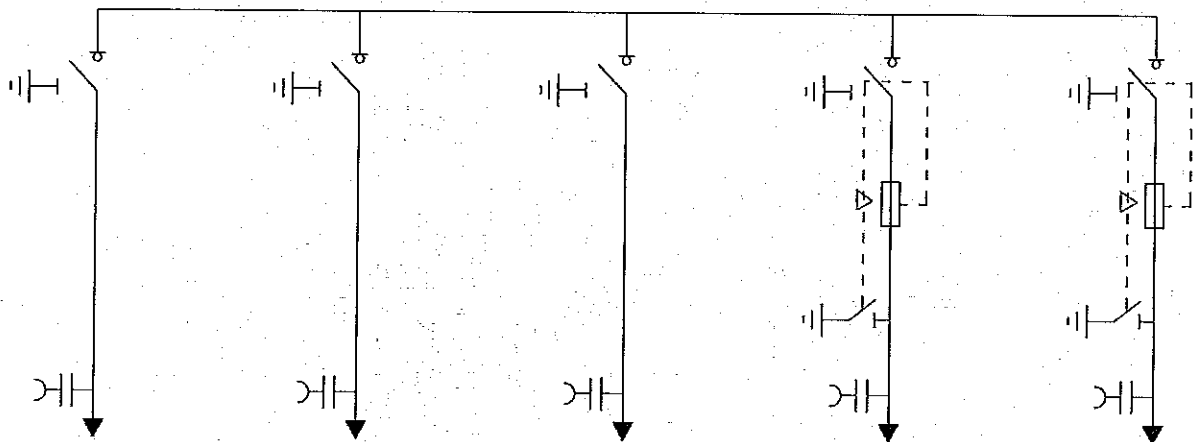
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4.4 Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF₆, с товарови прекъсвачи за три кабелни присъединения и две трансформаторни присъединения - КККТТ

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 24 2205		Да се посочи CGMCOSMOS-3L2P	
Наименование на материала		Компактно КРУ в метален шкаф 24/25 kV, 630 A, 16 kA с SF ₆ , с товарови прекъсвачи - КККТТ	
Съкратено наименование на материала		Комп. КРУ 24(25)/630/16, SF ₆ , тов. прекъсв. - КККТТ	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.4.1	Модул	3xК (кабел) + 2xТ (трафо)	3xК (кабел) + 2xТ (трафо)
4.4.2	Обявено напрежение, U _r	24/25 kV	24 kV
4.4.3	Обявен ток, I _r	min 630 A	630 A
4.4.4	Височина	max 1500 mm	1300 mm
4.4.5	Дълбочина	max 780 mm	735 mm
4.4.6	Широчина	max 2200 mm	2035 mm
4.4.7	Лост/комплект лостове за управление	1 бр.	1 бр.
4.4.8	Общо тегло, kg	Да се посочи	490 kg

Фиг. 4 – Компактно КРУ с SF₆, с товарови прекъсвачи за три кабелни присъединения и две трансформаторни присъединения – КККТТ



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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

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 kA, с SF₆ изолация, с товарови прекъсвачи”

Приложение № 1





MV switchgear for
Distribution Network Solutions

cgmcosmos

Fully gas insulated modular
and compact (RMU) system

Up to 24 kV
Up to 27 kV

IEC Standards
ANSI / IEEE Standards



Reliable innovation. Personal solutions.

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The quality of the products designed, manufactured and installed by Ormazabal is backed by the implementation and certification of a quality management system, based on international standard ISO 9001:2008.

Our commitment to the environment is reaffirmed with the implementation and certification of an environmental management system as laid down in international standard ISO 14001.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this catalogue are subject to change without prior notification. These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal.





Introduction

Preface

Getting its DNAs from decades of experience in research, design, develop, manufacture and installation of Medium Voltage (MV) apparatus and switchgear, is now one of the world's biggest suppliers of MV gas insulated switchgear (GIS). Today around 1,300,000 **Ormazabal** MV functional units have been installed in the electrical networks of over 100 electrical utilities and 600 wind farms in more than 110 countries.

Following the success of our well known **ga**, **cgm**, **cgc** and **gae** type fully GIS systems, the first **cgmcosmos** was launched in 2000, as the most flexible modular and compact ring main unit (RMU) range for secondary distribution networks up to 24 kV. Thanks to our Spanish and German R&D teams' spirit of continuous innovation, **cgmcosmos** system has been continuously evolving into a more extended range with higher ratings based on our customers' demands. Being manufactured 100% in Europe, **cgmcosmos** system has already been integrated into several Smart Grid applications. Currently more than 350,000 **cgmcosmos** functional units have been in service in more than 60 countries.

cgmcosmos system provides you reliable and efficient distribution network solutions (DNS) for all kind of MV installations from electrical utilities to infrastructures, from leisure facilities to industrial installations, and from wind farms to PV solar farms.

Ormazabal is the leading provider of personalized solutions to electrical utilities, to energy end users as well as renewable energy systems applications based on our own technology.

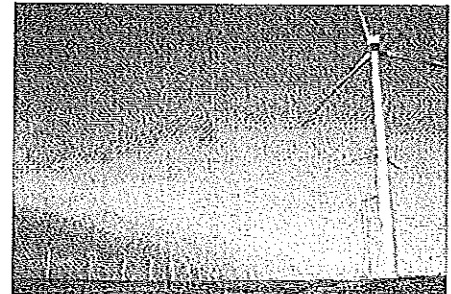
We encourage the **development of the electrical sector** concerning the challenges of the future energy needs. We cooperate with the world's leading local, regional and global companies in the electrical sector with a strong commitment to **innovation for personal safety, network reliability, energy efficiency and sustainability.**

Our highly qualified and focused team of professionals thrilled by innovation have developed our own products and solutions during our more than a century long consolidated history, always by establishing close relationship with our clients towards achieving mutual long term benefits.

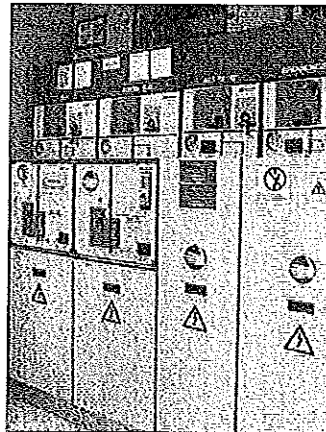
Velatia is an international industrial and technological group which operates in the areas of electrical networks, electronics and communication networks as well as in the consulting, security and aviation sectors, where security, efficiency and reliability are valued.

Grupo Ormazabal is now called **Velatia**. We have combined our forces to transform ourselves into a stronger group. Made up of companies with more than a hundred years of experience and committed to innovation to meet the present and future needs of our customers, wherever they may be.

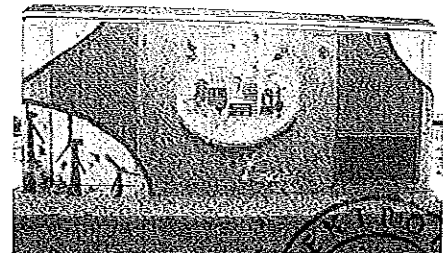
The solutions of the companies in **Velatia** seek to make the world a more connected, more sustainable, smarter, better connected, safer, more humane place.



Red Hills windfarm
(Oklahoma, USA)



Gotthard Tunnel
(Switzerland)

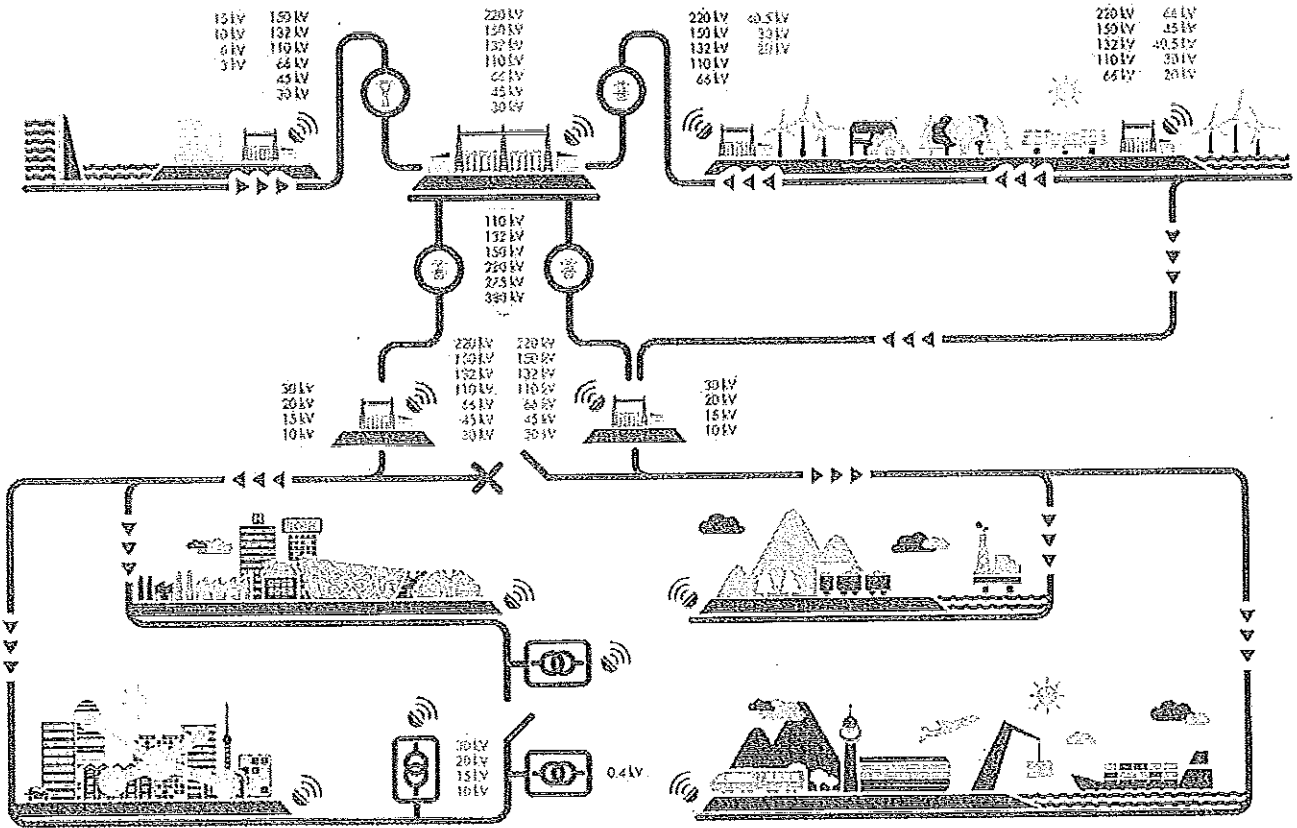


Smart-city Málaga
(Spain)



Your Electrical Network

"Your dedicated partner for reliable and intelligent electrical network"



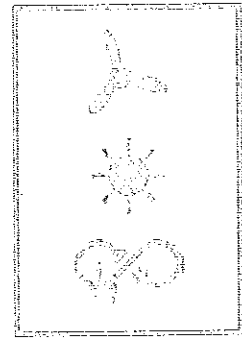
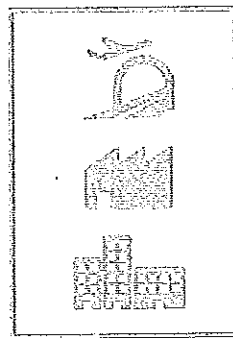
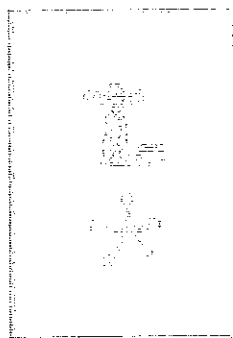
Your Business and DNS Applications

Close relationship with our customers and the profound knowledge of the electrical business are the keys to success that enable us to offer Distribution Network Solutions (DNS) based on high added value products and services adapted to the needs of the electrical utilities, electrical energy end users and renewable energies.

PUBLIC DISTRIBUTION
T&D
Smart Grid

END USERS
Infrastructures
Industrial
Tertiary

RES
Wind
Solar
Dispatchable RES





Our Product Map (SSS & DNS)

We believe that excellence does not lie solely in offering effective products and services, but also in the ability to respond to individual requirements and demands.

We provide our clients with personalised projects for efficient energy management via Primary and Secondary Distribution equipment and solutions.

Our Business Lines



SSS: Substation Solution for primary distribution



DNS: Distribution Network Solutions for secondary distribution

Our products for your segment

cpg.1	cpg.0	gae1250kmax	amc	cibor nvl.cibor	transforma Power transformers	ormaccontainer	Prefabricated substations
cgm.3	gae	ga	cgmcosmos (IEC - ANS/IEEE)		cgmcosmos (HN)	ea	
ekorsys family			transforma Distribution transformers				
Protection, automation and control			Oil	Conventional	Non-conventional		
				transforma.tpc	transforma.fine	Extended range solutions	
CURRENT® family		Low voltage board		organic			
Advanced metering, sensing & analytics, monitoring and communications			Biodegradable dielectric liquid				
Concrete prefabricated transformer substations (TS)				Metallic prefabricated TS	CEADS	Switching nodes	
Underground	Walk-in	Compact					
Concrete enclosure for transformer substations (TS)				Metallic enclosure for TS	Photovoltaic substation	Mobile substation	
Underground	Walk-in	Modular					

Main features

Safety

Protection for people, environment and your electrical installations.

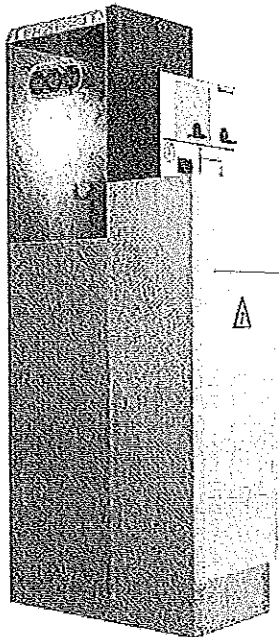
Special attention paid to the **personal safety** of the operators and the general public, even **under fault conditions**.

Internal arc

The **cgmcosmos** cubicles have been designed to withstand the effects of an internal arc according to IEC 62271-200 (IAC class) / IEEE Std C37.20.7 (1D-S class).

Hermetically sealed

All live components are inside a hermetically sealed for life stainless steel gas tank. This provides resistance to normal service conditions for indoor switchgear in accordance with standard IEC 62271-1.



Interlocks

cgmcosmos cubicles have mechanical and electrical interlocks as standard in accordance to IEC 62271-200 to enable safe and reliable service.

Interlocks prevent unsafe operations:

- It makes impossible to close the switch-disconnector and the earthing (grounding) switch at the same time.
- It permits the opening of the access cover to the MV cables when the earthing (grounding) switch is closed.

Optional locks, key interlocks and electrical locks based on customers' specifications are available.

Indicators

Additional safety by using:

- **Switchgear position indicators:** Visual indication on the mimic diagram, validated by the **kinematic chain test** in accordance with current standards (IEC 62271-102).
- **Capacitive voltage indicators:**
 - ekor.vpis:** a self-powered indicator that displays the voltage presence in the phases via three permanent light signals (IEC 62271-206).
 - ekor.ivds:** light signalling voltage presence / absence indicator (IEC 61243-5).
- **Acoustic alarm:** **ekor.sas** alarm that warns against earthing (grounding) when MV cables are energized. It works in association with **ekor.vpis** / **ekor.ivds**.
- **Phase comparator:** **ekor.spc**



Reliability

Help to maintain uninterrupted supply of your electrical network

Sealed for life insulation

Insulation inside a stainless steel gas tank provides long service life (30 years) and absence of maintenance in live parts.

Environmental suitability

Resistance according to the environmental conditions specified in standard IEC 62271-1*.

Ⓢ (*) Please consult **Ormazabal** for other specific conditions.

Immersion tested for 24 hours

cgmcosmos system passes the immersion test at a pressure of 3 m high water column during 24 hours at rated voltage and power frequency insulation test.

100% Routine tested

All the switchgear is subject to 100% electrical and mechanical routine tests according to the relevant standards. Also gas tightness test has been carried out 100% of our switchgear as a routine test to guarantee the reliability throughout its operational life.

- Gas tightness test
- Power-frequency test
- Measurement of the resistance of the main circuit
- Mechanical endurance test
- Measurement of the partial discharge (Optional)





Efficiency

High valuable features that make your task easier

Modularity

cgmcosmos design is totally modular. It offers flexible diagram configurations, easy extension to both sides and minimal surface occupation.

Additionally, this equipment is adaptable to the evolution of the network.

Extensibility and replaceability

The **ormalink** connecting set allows effortless mechanical and electrical connection between two cubicles without gas handling and future extensibility.

The driving mechanisms interchangeability and their motorization without interrupting supply help to improve the quality of the electrical supply.

Smart Grid ready

cgmcosmos system has already been integrated into several Smart Grid applications.

Ormazabal supplies complete Medium Voltage installations that include protection, control, automation and advanced Meter Management functions according to the most demanding needs of the intelligent networks.

Ergonomics

cgmcosmos presents the following user-friendly features:

- Front access to install MV cables and fuses
- Easy connection and testing cables
- Optimal interface with operators
- Horizontal fuse holders
- Simple operation of driving mechanisms
- Small size and light weight

Sustainability

Continuous efforts in gas emission reduction

Commitment to the environment

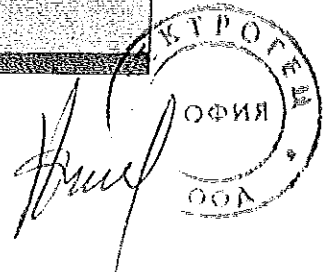
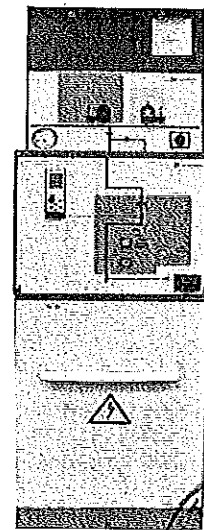
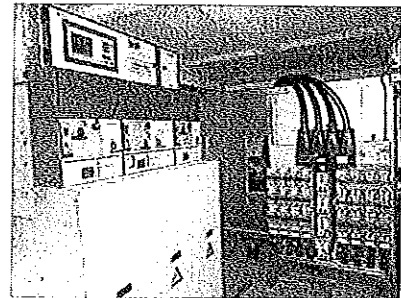
- Incessant decrease in use of greenhouse gases
- Negligible SF₆ emission in manufacturing processes
- Switchgear gas leakage rates reduction
- No SF₆ gas use during installation
- Unceasing measures to reduce our environmental footprint
- End-of-life management
- Use of highly recyclable materials
- Constant research investment in alternative materials and own technology
- Provide self-powered relays and devices to avoid extra energy consumption

Continuous innovation

Help to maintain uninterrupted supply of your electrical network

A focused team of professionals dedicated to innovation leads to a constant offer of new developments and upgrades, such as:

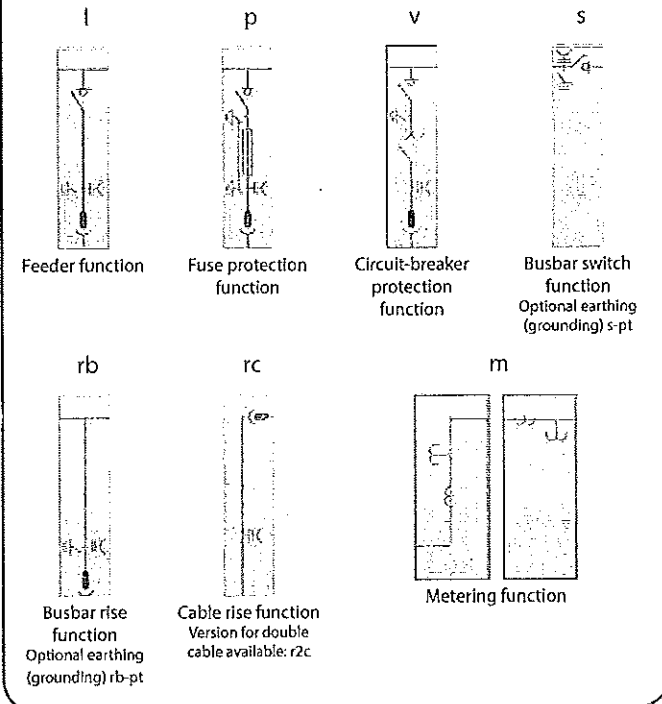
- Modules operating in -30°C
- New metering cubicles tested according to IEC62271-200, included IAC requirements
- Evolution in driving mechanisms
- Integrated in cubicle own protection and automation units
- Smart grid ready system
- Voltage and current sensors
- Preventive cable fault diagnosis
- Partial discharge (PD) detection for network diagnosis



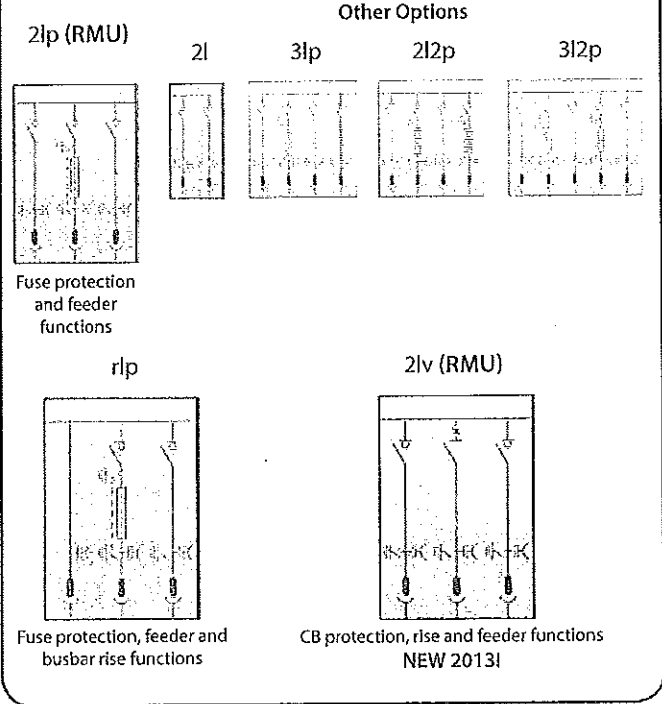
Technical details

Family

Modular cubicles



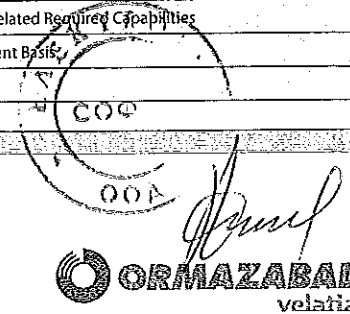
Compact cubicles



Applicable electrical standards

IEC	
IEC 62271-1	Common specifications for high voltage switchgear and controlgear standards.
IEC 62271-200	Alternating current metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.
IEC 62271-103	Switches for rated voltages above 1 kV up to and including 52 kV.
IEC 62271-102	Alternating current disconnectors and earthing switches.
IEC 62271-105	High voltage alternating current switch-fuse combinations.
IEC 62271-100	High voltage alternating current circuit-breakers.
IEC 60255	Electrical relays.
IEC 60529	Degrees of protection provided by enclosures.
IEC 62271-206	Voltage presence indicating systems (vpls).
IEC 61243-5	Voltage detecting systems (vds).
IEEE / ANSI	
IEEE C37.74	IEEE Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems Up to 38 kV
IEEE C37.20.3	IEEE Standard for Metal-Enclosed Interrupter Switchgear
IEEE 1247	Standard for Interrupter Switches for Alternating Current, Rated Above 1000 Volts
IEEE C37.123	IEEE Guide to Specifications for Gas-Insulated, Electric Power Substation Equipment
IEEE Std C37.20.4	IEEE Standard for Indoor AC Switches (1 kV-38 kV) for Use in Metal-Enclosed Switchgear
IEEE C37.04	IEEE Standard Rating Structure for AC High-Voltage Circuit Breakers
IEEE C37.06	AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities
IEEE Std C37.09	IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
IEEE Std C37.20.7	IEEE Guide for Testing Medium-Voltage Metal-Enclosed Switchgear for Internal Arcing Faults

(*): Others: SANS, HN, GB, SDMS...





Technical data

Electrical characteristics			IEC		ANSI / IEEE	
	U _d	[kV]	12	24	15.5	27
Rated Voltage	f _r	[Hz]	50 / 60		50 / 60	
Rated frequency	I _r	[A]	400 / 630		600	
Rated normal current		[A]	400 / 630		600	
Busbars and cubicle interconnection		[A]	200		200	
Feeder	I _k	[kA]	16 / 20 ¹⁾ / 25	16 / 20 ¹⁾ / 25 ²⁾	20 ¹⁾	
Output to transformer	I _p	[kA]	40 / 52 ¹⁾ / 62.5	40 / 52 ¹⁾ / 62.5 ²⁾	52 ¹⁾	
Rated short-time withstand current	U _d	[kV]	28 / 32	50 / 60	35 / 60	
With tk = 1 s – 3 s	U _p	[kV]	75 / 85	125 / 145	95 / 125	
Peak value	IAC		AFL 16 kA 1 s / 20 ¹⁾ kA 1 s AFL[R] 20 ¹⁾ kA 1 s / 25 ²⁾ kA 1 s		AFL ²⁾ 20 ¹⁾ kA 1 s	
Rated insulation level						
Rated power-frequency withstand voltage [1 min]						
Rated lightning impulse withstand voltage						
Internal arc classification according to IEC 62271-200						
Degree of protection: Gas tank					IP67	
Degree of protection: External enclosure					IP3X / IP4X	
Colour of equipment	RAL				Grey 7035 / Blue 5005	
Loss of service continuity category	LSC				LSC2	
Partition class					PM	

¹⁾ Tests conducted at 21 kA / 52.5 kA. ²⁾ Consult availability ³⁾ Equivalent to IEEE C37.20.7 for 1D-S

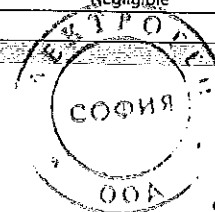
Driving mechanism	Three position switch disconnector					Vacuum circuit breaker			
	B	BM	BR	AR	ARM	AV	AMV	RAV	RAMV
Auxiliary circuits									
Internal insulation [kV]	2	2	10	10	2	2	2	2	2
Tripping coil									
Rated voltage [V]	n/a	n/a	24 ¹⁾ / 48 / 110 ¹⁾ / 220 Vdc 110 / 230 Vac			24 / 48 / 60 / 110 / 220 Vdc 110 / 230 Vac			
Max. consumption [W]	n/a	n/a	80			<56			
Motorised units									
Rated voltage [V]	n/a	⁴⁾	n/a	n/a	48 Vdc / 230 Vac	n/a	³⁾	n/a	³⁾
Max. consumption [A]	n/a	4 ⁵⁾	n/a	n/a	4	n/a	10	n/a	10
Motor operation time [s]	n/a	<7	n/a	n/a	<7	n/a	<15	n/a	<15
Peak current [A]	n/a	<12 ⁶⁾	n/a	n/a	<12	n/a	<8	n/a	<8
Indicating contacts									
Switch Earthing (grounding)	2NO + 2NC 1NO + 1NC					2NO + 2NC 1NO + 1NC			
Circuit breaker	n/a					9 NO + 9 NC			
Rated voltage [V]	250					250			
Rated current [A]	16					16			

¹⁾ Consult availability for ARM ²⁾ 24 / 48 / 110 / 230 Vdc 110 / 230 Vac ³⁾ 24 / 48 / 60 / 110 / 230 Vdc 230 Vac ⁴⁾ 24 / 48 / 110 / 210 Vdc ⁵⁾ 10 A (24 Vdc) ⁶⁾ 21 A (24 Vdc)

Service conditions	IEC		ANSI / IEEE	
	Indoor			
Ambient temperature	-40 °C * ±40 °C **		-40 °F * 104 °F **	
Minimum Maximum	+35 °C		95 °F	
Maximum average ambient temperature, measured over a 24-hour period	-50 °C		-58 °F	
Minimum storage temperature				
Relative humidity				
Maximum average relative humidity, measured over a 24-hour period			<95 %	
Vapour pressure				
Maximum average vapour pressure, measured over a 24-hour period 1-month period	22 mbar 18 mbar			
Maximum height above sea level	2,000 m **		6,500 feet **	
Solar radiation			Negligible	
Environmental air pollution (dust, salinity, etc.)			Acc. to normal service conditions of IEC 62271-1	
Vibrations (seismicity)			Negligible **	

* Consult availability and other values.

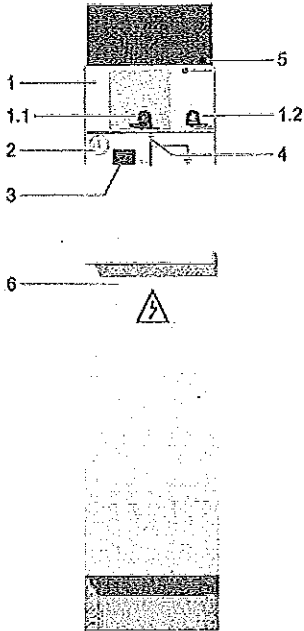
** For special conditions, altitudes, please consult Ormazabal.



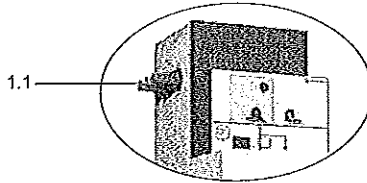
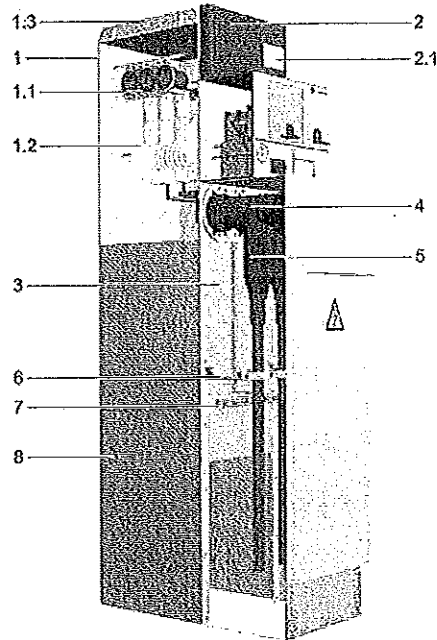
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Constructive structure

Front view



Side view

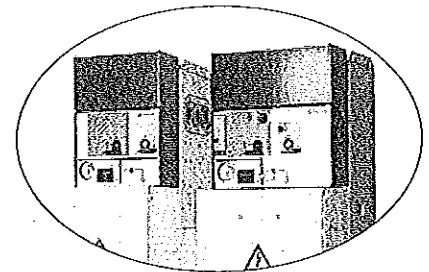


Worldwide certification and use

Application examples

Worldwide application / use

- Public distribution: urban and rural areas
- Smart Grids
- Renewable energies: Wind on & off-shore, photovoltaic solar plants ...
- Hotels, stadiums, shopping centers
- Industrial areas
- Oil & Gas industry
- Airports, seaports, tunnels



- | | |
|--|--|
| <ul style="list-style-type: none"> 1 Mimic & driving mechanism cover: 1.1 Switch-disconnector (Padlockable) 1.2 Earthing-switch (Padlockable) 2 Manometer 3 Voltage indicator (ekor.vpis) 4 Switch-disconnector indication 5 Acoustic alarm (ekor.sas) 6 Cable compartment cover | <ul style="list-style-type: none"> 1 Gas tank 1.1 Busbar connection (side bushings) 1.2 Switch-disconnector 1.3 Lifting lugs 2 Upper cover / Control box location 2.1 Name plate + operating sequence 3 Cable compartment 4 Front bushings 5 Connector and cable 6 Cable clamp 7 Earthing bars 8 Gas relief duct |
|--|--|

cgmcosmos
ANSI / IEEE type




Design characteristics

Key components

Ormalink connecting set

Pioneers in extensible connecting set:

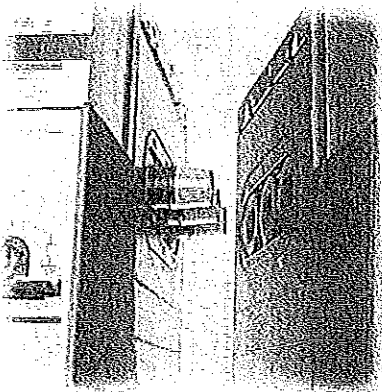
The **ormalink** connecting set, patented by **Ormazabal** in 1991, allows for the electrical connection between different modules of the **cgmcosmos** system. It maintains the rated insulation values as well as the rated and short-circuit currents. It also controls the electric field.

Extensible on both sides of the cubicles.

The extensible cubicles have side female bushings that make easier the connection between the main busbars.



ormalink
connecting set



Presentation
of **ormalink**

Load break switch (LBS)

Puffer type high duty load break switch designed and developed by **Ormazabal**.

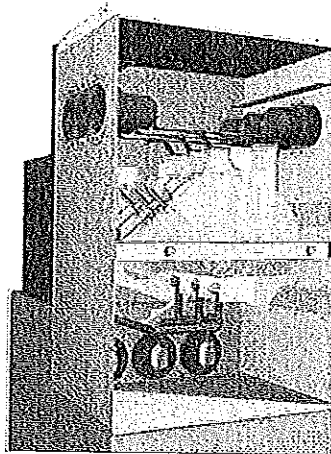
The switch-disconnector includes the functions of switch, disconnecter and earthing (grounding) switch in a single three-position unit.

Features:

- 3 position switch-disconnector:
Open - Close - Earth (Ground)
- Operator independent operation
- Switch category
Mechanical endurance:
 - 1000-M1 (manual)
 - 5000-M2 (motor)
- Electrical endurance certification:
5-E3
- Earthing (grounding) switch category:

Mechanical endurance:

- 1000-M0 (manual)
- Electrical endurance certification:
5-E2

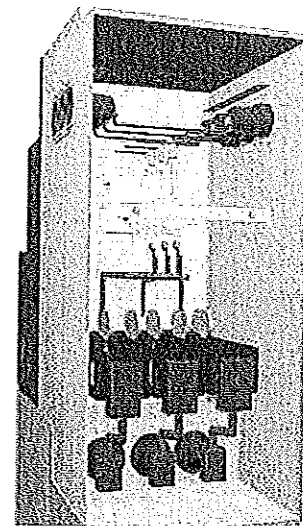


Vacuum circuit breaker (VCB)

Circuit-breaker with vacuum breaking technology, compact and with excellent reliability, certified in accordance to IEC 62271-100 standard, including extended electrical endurance (class E2) with rapid reclosing cycle and hence maintenance-free during its whole service life.

Features:

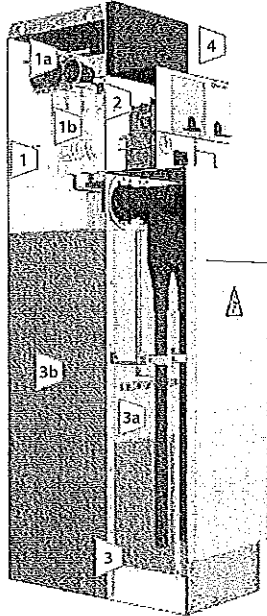
- Mechanical endurance:
 - M2:10000 operations
 - M1: 2000 operations
- Operating sequence without reclosing
 - CO-15 s-CO
 - CO-3 min-CO
- Operating sequence with reclosing
 - O-0.3 s-CO-15 s-CO
 - O-0.3 s-CO-3 min-CO
- Associated with switch-disconnector



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Main compartments

The **cgmcosmos** presents a structure divided into independent compartments:



1. Gas tank
 - a) Busbar connection
 - b) Switching devices
2. Driving mechanism
3. Base
 - a) Cable compartment
 - b) Gas relief duct
4. Control box

Gas tank

The **tank**, sealed and SF₆ gas-insulated, contains the busbar, as well as the switching and breaking devices. The dielectric used acts both as an insulating and extinguishing medium. The tank is equipped with a diaphragm to safely direct the output of the gases in the event of an internal arc, and a manometer to control the pressure of the insulating gas.

The **busbar** connects the single-phase bushings from the outside of the cubicle to the breaking elements within. The electrical connection between the different modules of the **cgmcosmos** system is through the **ormalink** connecting set.

The **protection fuses** are kept horizontally in phase-independent compartments and are installed in a fuse holder carriage. The fuse holder compartments provide insulation and sealing against pollution, temperature changes and adverse weather conditions. From the inside, the movement of the fuse striker is transmitted to the tripping mechanism.

Features:

- Sealed-for-life insulation system (30 years)
- Internal arc tested
- Stainless steel – IP67 rating
- Robotic welding
- Switching, breaking and main circuit devices:
 - Switch-disconnector
 - Circuit-breaker
 - Fuse holders
- Outer-cone bushing plug-in type terminal
- Manometer
- Pressure relief diaphragm valve
- Direct busbar connection through single-phase side bushings

Driving mechanism

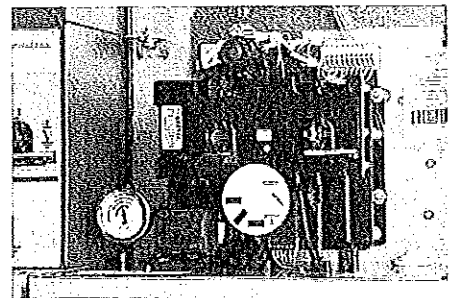
The **driving mechanism** is used to perform making and breaking operations in the MV circuits.

The front layout of the driving mechanisms and the use of anti-reflex levers permits safe, comfortable, simple operations with a minimum of effort.

The front **mimic diagrams** include the position indicating devices. Maximum reliability verified using the kinematic chain test of the signalling mechanism in accordance with IEC 62271-102.

Features:

- Mimic diagram and pushbuttons
- Position display (Kinematic chain)
 - Switching devices
 - Fuse tripping
- Capacitive voltage indicator (**ekor.vpis** / **ekor.ivds**)
- Interlocks (electrical and mechanical)
- Motorization without interrupting supply
- Replaceability and motorization at site



Types of driving mechanisms

Depending on the operating mechanism (3-position switch or circuit breaker), there are different models:

Three-position switch-disconnector

- B and BM
- Basic driving mechanism with independent manual operation (B) or motorised (BM).
- Local or remote controlled operations.
- Applicable to feeder and busbar functions.
- BR / AR and ARM
- Driving mechanism with manual (BR / AR) or motorised operation (ARM) and with opening toggle.
- Applicable to fuse protection functions.

Ⓢ These may be replaced live in any of the positions (closed, open or earthed).

Circuit-breaker

- AV and AMV (without reclosing) / RAV and RAMV (with reclosing)
- Spring loaded driving mechanism for circuit breaker function.
- This mechanism is installed in series with a B type mechanism.
- The spring set is reloaded manually (AV-RAV) or motorised (AMV - RAMV).

Base

Cable compartment

The **cable compartment**, located in the lower front section of the cubicle, has a cover interlocked with the earthing (grounding) switch, thus allowing front access to the Medium Voltage cables.

The insulated MV cables coming from the outside are connected using **bushings** which admit plug-in or screw-in terminals insulated with or without equipotential screens.

Features:

- Available up to two connectors per phase. Consult compatibilities.
- More cable connectors or surge arresters with special cover
- Effortless connections (plug-in or screw-in)
- Suitable bushing height for 3-core / big size cables
- Outer-cone bushing plug-in type terminal
- Easy cable earthing (grounding)
- Cable test
- Front cover interlocked with the earthing (grounding) switch
- Protected ducts for low voltage cables

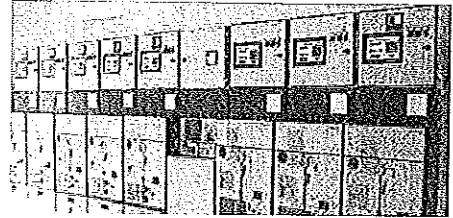
Control box

The **control box**, placed in the upper part of the cubicle and independent of the MV compartments, is defined for installing protection relays, as well as metering and control devices.

Features:

- Independent compartment from MV area
- Ready for installing protection relays, control and metering equipment
- Factory assembled and tested according to customer needs
- Standard and compact design for installing **Ormazabal's** protection relays and automation units
- High adaptation capabilities for other manufacturers' protection relays, control and metering units as well as customers' provided equipment
- Customized size and design

Ⓢ Attachable control boxes can be supplied optionally, for the location of signalling elements and the activation of motorised functions.



Gas tank internal arc
20 kA 0.5



IAC AFLR with rear chimney



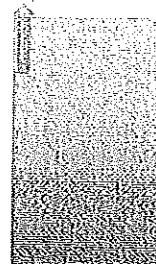
Pressure relief duct

The **pressure relief duct** situated on the back side of the base channels through a diaphragm valve the generated gases as a result of an internal arc.

Features:

- Expansion of gases in case of internal arc
- Rear conduction of exhaust gases
- Metal separation from the cable compartment
- Optional: Chimney for rear internal arc protection

Gas tank internal arc
20 kA 1 s / IAC class AFL





Smart Grids

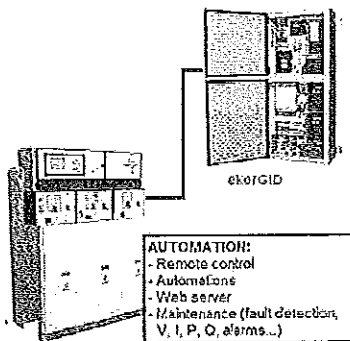
The aim of the intelligent networks or Smart Grids leads to generate and share electrical energy in a more efficient, reliable, cleaner and safer way.

In the value chain of the Smart Grids it converges and coexists the sectors of the electrical energy, telecommunications and information and communications technology.

Ormazabal collaborates in innovative projects and provides solutions and products focused on improving the energy distribution efficiency in a continuous changing environment as driver and dynamic factor for Smart Grids.

The **Ormazabal** technology specifically developed for the intelligent networks promotes, among others, the following benefits:

1. It allows the integration of new users in the network
2. It drives the efficiency of the network operation
3. It reinforces the safety of the grid, the control and the quality of supply
4. It optimizes the plan of investments for the electrical network improvement
5. It improves the market working and the customer service
6. It promotes the consumer participation in the energy management



References

- Iberdrola Star project. Spain (Castellón, Bilbao...)
- Endesa project. Spain (Malaga)
- Gas Natural Fenosa project. Spain (Madrid)

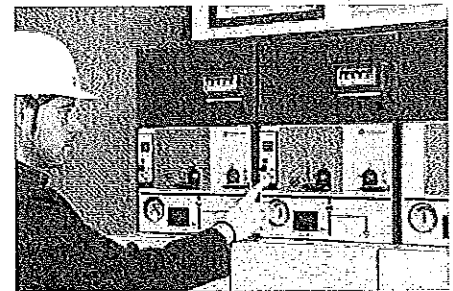


Protection & Automation

ekorsys family

Ormazabal supplies complete Medium Voltage installations that include protection, control and automation functions.

Ormazabal, have a wide portfolio of applications and services to respond to the needs of the distribution network.



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Protection

- Supply to Medium Voltage customers

- ekor.rpg
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns

Powers to protect with Circuit Breaker and ekor.rpg

Network voltage	Minimum power	Maximum power
[kV]	[kVA]	[kVA]
6.6	50	5000
10	100	7500
12	100	10000
13.2	100	10000
15	100	12000
20	160	15000

- ekor.rpt
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns

Powers to protect with fuses and ekor.rpt

Network voltage	Fuse rated voltage	Minimum power		Maximum power	
		Fuse rating	[kVA]	Fuse rating	[kVA]
[kV]	[kV]	[A]	[kVA]	[A]	[kVA]
6.6	3 / 7.2	16	50	160*	1250
10	6 / 12	16	100	160*	1250
12	10 / 24	16	100	100	1250
13.2	10 / 24	16	100	100	1250
15	10 / 24	16	125	125**	1600
20	10 / 24	16	160	125	2000

* 442 mm cartridge

** SIBA SSK 125 A fuse

- Protection of switching substations and industrial customers

- ekor.rps
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns + 67+49+81+27+59N... + control

- ekor.rpg-ci
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns + integrated control

- ekor.rpt-ci
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns + integrated control

- Protection of rural transformer substations (CTR)

- ekor.rpt-k
3 x 50 / 51 + 50N / 51N + 49T + integrated control

- Generator set protection unit

- ekor.upg

- Substation protection

- ekor.rps-tcp:
3 x 50 / 51 + 50N / 51N + 50Ns / 51Ns + 67+49+81+27+59N+50BF... + control

Automation and remote control

- Remote control

- ekor.uct
 - ekor.ccp
 - ekor.rci
 - cgmcosmos-2lpt

- Automatic transfer

- ekor.stp
 - ekor.ccp
 - ekor.nk

- Fault detection

- ekor.rci

- Voltage presence acoustic alarm

- ekor.sas

- Second operation points

Advanced Meter Management and communication

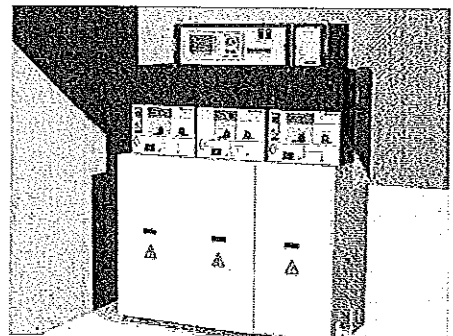
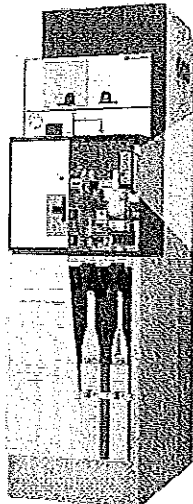
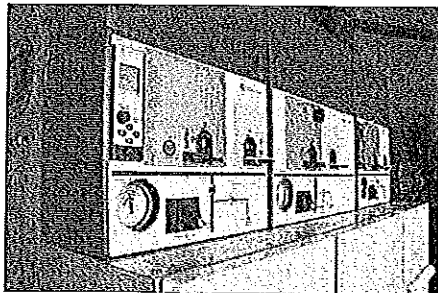
- ekor.gid

Dispatching center

Software

- ekor.soft

For further information, please refer to Ormazabal or visit www.ormazabal.com





Type of modules

cgmcosmos-I

Feeder function

Feeder modular cubicle, equipped with a three-position switch-disconnector: closed, open or earthed (grounded).

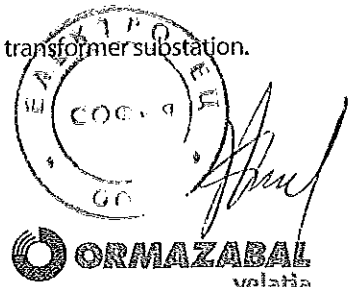
Extensibility: right, left and both sides.

Electrical characteristics		IEC		ANSI / IEEE	
Rated voltage	U_r [kV]	12*	24	15.5	27
Rated frequency	f_r [Hz]	50 / 60		50 / 60	
Rated current					
General busbar and cubicle interconnection	I_r [A]	400 / 630		600	
Feeder	I_r [A]	400 / 630	400 / 630	600	
Rated short-duration power frequency withstand voltage (1 min)					
Phase-to-earth (ground) and between phases	U_d [kV]	28	50	35	60
Across isolating distance	U_d [kV]	32	60	38.5	66
Rated lightning impulse withstand voltage					
Phase-to-earth (ground) and between phases	U_p [kV]	75	125	95	125
Across isolating distance	U_p [kV]	85	145	104.5	137.5
Internal arc classification	IAC	AFL 16 kA 1 s / 20** kA 1 s AFL[R] 20** kA 1 s / 25** kA 1 s		AFL 20** kA 1 s	
DC withstand voltage	[kV]	n/a		53	78
Switch-disconnector		IEC 62271-103 + IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (main circuit)					
Value $t_s = 1$ s or 3 s	I_k [kA]	16 / 20** / 25†	16 / 20** / 25**	20**	
Peak value	I_p [kA]	40 / 52** / 62.5†	40 / 52** / 62.5**	52**	
Mainly active load-breaking current	I_l [A]	400 / 630		600	
Cable charging-breaking current	I_{ca} [A]	50 / 1.5		15	
Closed-loop breaking current	I_{ca} [A]	400 / 630		600	
Earth (ground) fault breaking current	I_{sa} [A]	300		n/a	
Cable- & line-charging breaking current under earth (ground) fault conditions	I_{sb} [A]	100		n/a	
Main switch making capacity (peak value)	I_{ma} [kA]	40 / 52** / 62.5†	40 / 52** / 62.5**	52**	
Switch category					
Mechanical endurance		1000-M1 (manual) / 5000-M2 (motor)		1000 (manual) / 5000 (motor)	
Cycles of operations (Short-circuit making current)- class		5-E3		3	
Earthing (grounding) Switch		IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (earthing circuit)					
Value $t_s = 1$ s or 3 s	I_k [kA]	16 / 20** / 25†	16 / 20** / 25**	20**	
Peak value	I_p [kA]	40 / 52** / 62.5†	40 / 52** / 25**	52**	
Earthing (grounding) switch making capacity (peak value)	I_{ma} [kA]	40 / 52** / 62.5†	40 / 52** / 62.5**	52**	
Earthing (grounding) Switch Category					
Mechanical endurance (manual)		1000-M0		1000	
Cycles of operations (Short-circuit making current)- class		5-E2		3	

* Also available with $U_r = 7.2$ kV on request
 ** Tests conducted at 21 kA / 52.5 kA
 † Value only valid for $t_s = 1$ s
 ‡ Consult availability

Applications

Input or output of the Medium Voltage cables, enabling communication with the main busbar of the transformer substation.



Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1 s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1 s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

(*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Driving mechanism

- Actuating levers
- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis**
- Capacitive voltage presence / absence indicator **ekor.ivds**
- Other capacitive voltage indicators
- Integrated control and monitoring unit **ekor.rci**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

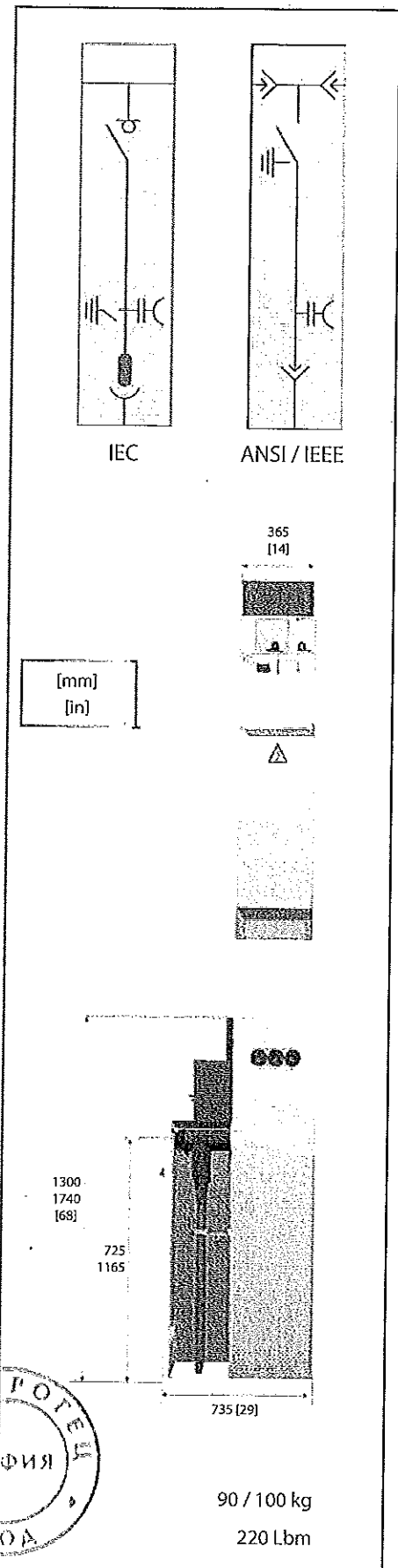
Pressure relief duct

- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions





cgmcosmos-p

Fuse protection function

Fuse protection modular cubicle, equipped with a three-position switch-disconnector: closed, open or earthed (grounded) and protection with limiting fuses.

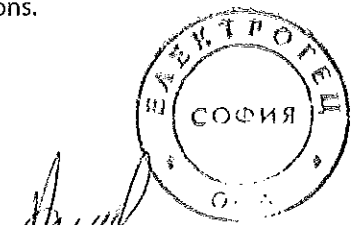
Extensibility: right, left and both sides.

Electrical characteristics			IEC		ANSI / IEEE	
Rated voltage	U_r	[kV]	12*	24	15.5	27
Rated frequency	f_r	[Hz]	50 / 60		50 / 60	
Rated current						
General busbar and cubicle interconnection	I_r	[A]	400 / 630		600	
Output to transformer	I_t	[A]	200		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth (ground) and between phases	U_d	[kV]	28	50	35	60
Across isolating distance	U_d	[kV]	32	60	38.5	66
Rated lightning impulse withstand voltage						
Phase-to-earth (ground) and between phases	U_p	[kV]	75	125	95	125
Across isolating distance	U_p	[kV]	85	145	104.5	137.5
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL[R] 20** kA 1 s / 25** kA 1 s		AFL 20** kA 1 s	
DC withstand voltage		[kV]	n/a		53	78
Switch-disconnector			IEC 62271-103 + IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (main circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20** / 25*	16 / 20** / 25**	20**	
Peak value	I_p	[kA]	40 / 52** / 62.5*	40 / 52** / 62.5**	52**	
Mainly active load-breaking current	I_l	[A]	200		200	
Main switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5*	40 / 52** / 62.5**	52**	
Switch category						
Mechanical endurance			1000-M1 (manual) 5000-M2 (motor)		1000 (manual) / 5000 (motor)	
Cycles of operations (Short-circuit making current)- class			5-E3		3	
Combined switch-relay (ekor.rpt) take-over current						
Breaking $I_{max acc. TD_{co}}$ IEC 62271-105		[A]	1700	1300	n/a	n/a
Switch-fuse combination transfer current						
Breaking $I_{max acc. TD_{transfer}}$ IEC 62271-105		[A]	2300	1600	n/a	n/a
Earthing (grounding) Switch			IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (earthing circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	1 / 3		1 / 3	
Peak value	I_p	[kA]	2.5 / 7.5		2.5 / 7.5	
Earthing (grounding) switch making capacity (peak value)	I_{ma}	[kA]	2.5 / 7.5		2.5 / 7.5	
Earthing (grounding) Switch Category						
Mechanical endurance (manual)			1000-M0		1000	
Cycles of operations (Short-circuit making current)- class			5-E2		3	

* Also available with $U_r = 7.2$ kV on request
 ** Tests conducted at 21 kA / 52.5 kA
 * Value only valid for $t_k = 1$ s
 ** Consult availability

Applications

General and transformer protection, as well as connection or disconnection operations.



Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1s 20 kA 1 s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

(*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Fuse tripping:

- Via combined fuses
- Via associated fuses

Fuse holder:

- 24 kV
- 12 kV

Driving mechanism

- Actuating levers
- BR type manual mechanism
- AR type manual mechanism
- ARM type motorized mechanism
- Tripping coil
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis**

- Capacitive voltage presence / absence indicator **ekor.ivds**
- Other capacitive voltage indicators
- Transformer protection unit **ekor.rpt**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Plug-in type IEC bushings
- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

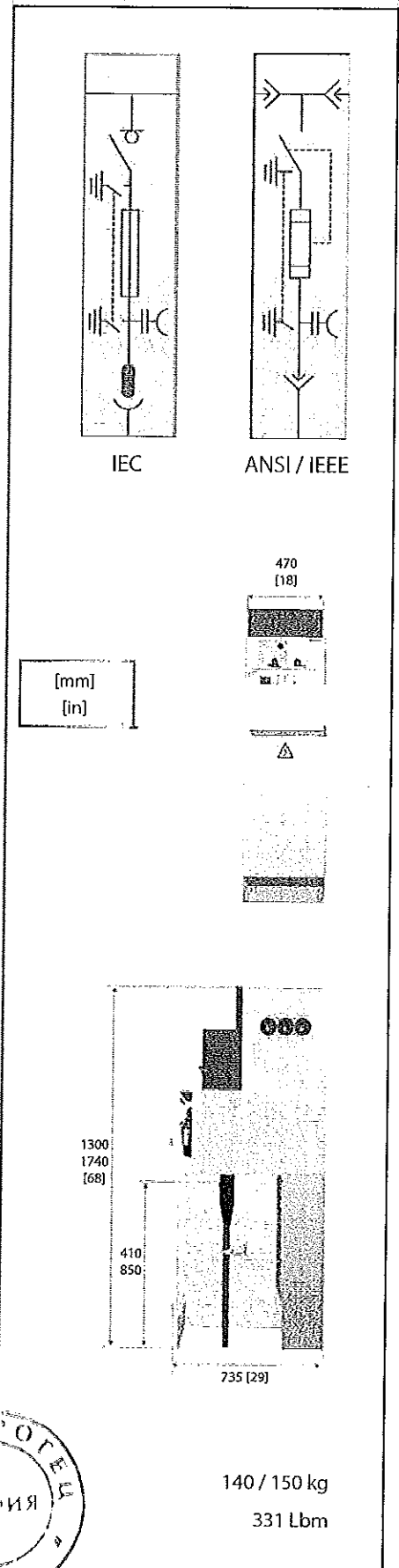
Pressure Relief Duct

- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions



cgmcosmos-V

Circuit-breaker protection function

Circuit breaker protection modular cubicle, equipped with a vacuum circuit-breaker in series with a three-position switch-disconnector.

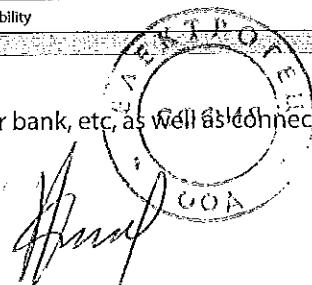
Extensibility: right, left and both sides.

Electrical characteristics			IEC	ANSI / IEEE
Rated voltage	U_r	[kV]	24	27
Rated frequency	f_r	[Hz]	50 / 60	50 / 60
Rated current				
General busbar and cubicle interconnection	I_r	[A]	400 / 630	600
Feeder	I_r	[A]	400 / 630	600
Rated short-duration power frequency withstand voltage (1 min)				
Phase-to-earth (ground) and between phases	U_d	[kV]	50	60
Across isolating distance	U_d	[kV]	60	66
Rated lightning impulse withstand voltage				
Phase-to-earth (ground) and between phases	U_p	[kV]	125	125
Across isolating distance	U_p	[kV]	145	137.5
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL(R) 20** kA 1 s / 25** kA 1 s	AFL 20* kA 1 s
DC withstand voltage		[kV]	n/a	53 78
Circuit-breaker			IEC 62271-100	IEEE C37.20.3
Rated short-time withstand current (main circuit)				
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20* / 25* kA 1 s	20**
Peak value	I_p	[kA]	40 / 52* / 62.5*	52**
Rated breaking capacity and making capacity				
Mainly active current rated breaking capacity	I_b	[A]	400 / 630	600
Short-circuit breaking capacity	I_{sc}	[kA]	16 / 20* / 25* kA 1 s	20
Main switch making capacity (peak value)	I_{ms}	[kA]	40 / 50* / 62.5*	32
Capacitive current capacity (50 Hz). Capacitor banks		[A]	400	n/a
Rated operating sequence				
Without reclosing			CO-15 s-CO CO-3 min-CO	CO-15 s-CO CO-3 min-CO
With reclosing			O-0,3 s-CO-15 s-CO O-0,3 s-CO-3 min-CO	O-0,3 s-CO-15 s-CO O-0,3 s-CO-3 min-CO
Circuit-breaker category				
Mechanical endurance (operations-class)			10000 - M2 2000 - M1	10000 - M2 2000 - M1
Electrical endurance (class)			E2-C2	E2-C2
Switch-disconnector			IEC 62271-103 + IEC 62271-102	IEEE C37.74
Rated short-time withstand current (main circuit)				
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20* / 25*	20*
Peak value	I_p	[kA]	40 / 50* / 62.5*	52*
Mainly active current rated breaking capacity	I_b	[A]	400 / 630	600
Main switch making capacity (peak value)	I_{ms}	[kA]	40 / 52* / 62.5*	52
Switch-disconnector Category				
Mechanical endurance			1000-M1 (manual) / 5000-M2 (motor)	1000 (manual) / 5000 (motor)
Cycles of operations (Short-circuit making current)- class			5-E3	3
Earthing (grounding) Switch			IEC 62271-102	IEEE C37.74
Rated short-time withstand current (earthing circuit)				
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20* / 25*	20*
Peak value	I_p	[kA]	40 / 50* / 62.5*	52*
Main switch making capacity (peak value)	I_{ms}	[kA]	40 / 50* / 62.5*	20*
Earthing (grounding) Switch Category				
Mechanical endurance			2000-M1	2000
Cycles of operations (Short-circuit making current)- class			5-E2	3

* Tests conducted at 21 kA / 52.5 kA ** More breaking values: see table cgmcosmos-I * Consult availability

Applications

General protection and protection of transformer, feeder, capacitor bank, etc, as well as connection or disconnection operations.



Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1 s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1 s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle

☞ (*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Driving mechanism

- Actuating levers
- B type switch mechanism
- BM type motorized mechanism
- AV type manual mechanism
- RAV type manual mechanism with re-closing
- AVM type motorized mechanism
- RAVM type motorized mechanism for re-closing
- Tripping coil
- Bistable coil
- 2nd Tripping coil
- Closing coil

- Undervoltage coil
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis**
- Capacitive voltage presence / absence indicator **ekor.ivds**
- Protection unit **ekor.rpg**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Screw type IEC bushings
- Plug-in type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

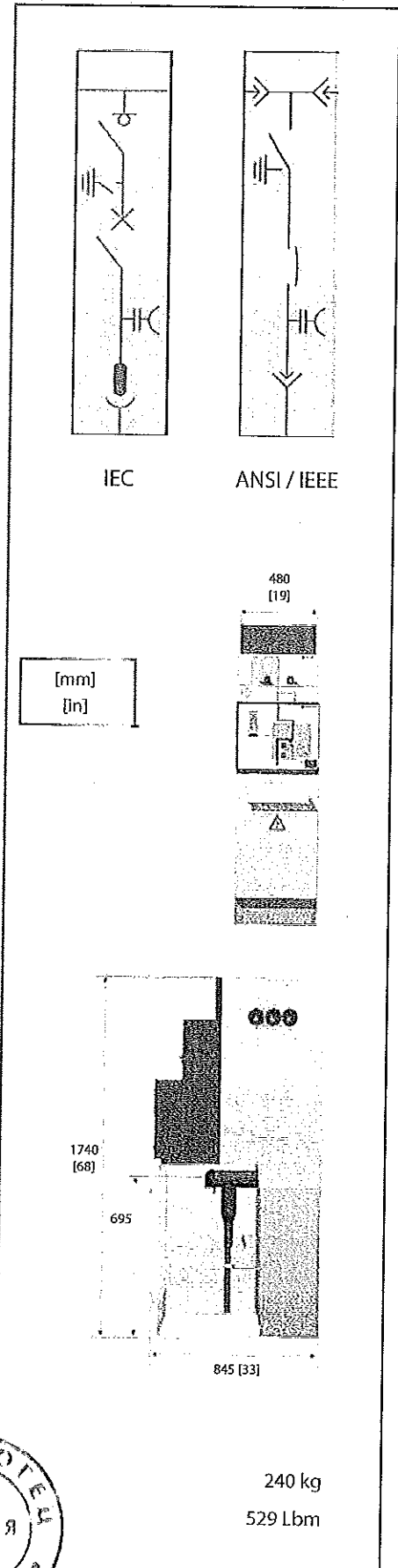
Pressure Relief Duct

- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions





cgmcosmos-S

Busbar switch function

Busbar switch modular cubicle, equipped with a two-position switch-disconnector (closed and open) Optional earthing (grounding) switch (s-pt).

Extensibility: both sides.

Electrical characteristics			IEC		ANSI / IEEE	
Rated voltage	U_r	[kV]	12*	24	15.5	27
Rated frequency	f_r	[Hz]	50 / 60		50 / 60	
Rated current						
General busbar and cubicle interconnection	I_r	[A]	400 / 630		600	
Feeder	I_r	[A]	400 / 630		600	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth (ground) and between phases	U_d	[kV]	28	50	35	60
Across isolating distance	U_d	[kV]	32	60	38.5	66
Rated lightning impulse withstand voltage						
Phase-to-earth (ground) and between phases	U_p	[kV]	75	125	95	125
Across isolating distance	U_p	[kV]	85	145	104.5	137.5
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL(R) 20** kA 1 s / 25** kA 1 s		AFL 20** kA 1 s	
DC withstand voltage		[kV]	n/a		53	78
Switch-disconnector			IEC 62271-103 + IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (main circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20** / 25 [†]	16 / 20** / 25 [†]	20**	
Peak value	I_p	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	52**	
Mainly active load-breaking current	I_l	[A]	400 / 630		600	
Cable charging-breaking current	I_{cs}	[A]	50 / 1.5		15	
Rated closed loop breaking capacity	I_{ca}	[A]	400 / 630		600	
Earth fault breaking current	I_{sa}	[A]	300		n/a	
Cable- & line-charging breaking current under earth fault conditions	I_{sb}	[A]	100		n/a	
Main switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	52**	
Switch category						
Mechanical endurance			1000-M1 / 5000-M2 (motor)		1000 (manual) / 5000 (motor)	
Cycles of operations (Short-circuit making current)- class			5-E3		3	
Earthing (grounding) Switch [Optional]			IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (earthing circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20** / 25 [†]	16 / 20** / 25 [†]	20**	
Peak value	I_p	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	52**	
Earthing (grounding) switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	52**	
Earthing (grounding) Switch Category						
Mechanical endurance (manual)			1000-M0		1000	
Cycles of operations (Short-circuit making current)- class			5-E2		3	

* Also available with $U_r = 7.2$ kV on request
 ** Tests conducted at 21 kA/52.5 kA
[†] Value only valid for $t_k = 1$ s
 ** Consult availability

Applications

Load breaking of the main busbar of the transformer substation and its earthing on the right (ptd) or left (pti) of the breaking point.





Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle

☞ (*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Side connection:

- Two side extensibility

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Earthing (grounding):

- With earthing (grounding) switch on left. s-pti type
- With earthing (grounding) switch on right s-ptd

Driving mechanism

- Actuating levers
- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis** (with earthing)
- Capacitive voltage presence / absence indicator **ekor.ivds** (with earthing)
- Other capacitive voltage indicators
- Integrated control and monitoring unit **ekor.rci**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Partial discharge (PD) detection for network diagnosis

Pressure Relief Duct

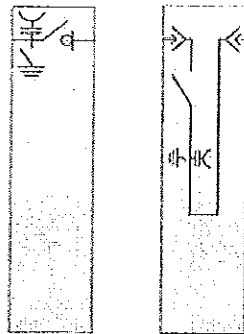
- Rear chimney

Control box

- Other relays
- Other metering and automation components

Options

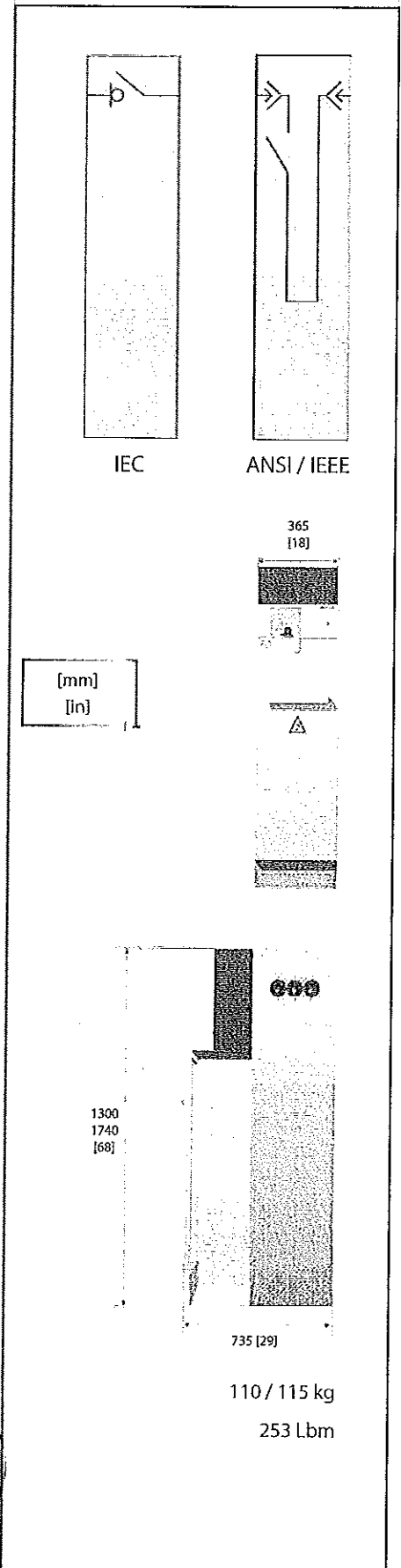
cgmcosmos-s-pt



IEC

ANSI / IEEE

Dimensions





cgmcosmos-rb

Busbar rise function

Busbar rise gas insulated modular cubicle. Optional earthing (grounding) switch (rb-pt).

Extensibility: right and both sides.

Electrical characteristics			IEC		ANSI / IEEE	
Rated voltage	U_r	[kV]	12*	24	15.5	27
Rated frequency	f_r	[Hz]	50 / 60		50 / 60	
Rated current						
General busbar and cubicle interconnection	I_r	[A]	400 / 630		600	
Feeder	I_r	[A]	400 / 630		600	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth (ground) and between phases	U_d	[kV]	28	50	35	60
Rated lightning impulse withstand voltage						
Phase-to-earth (ground) and between phases	U_p	[kV]	75	125	95	125
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL(R) 20** kA 1 s / 25** kA 1 s		AFL 20** kA 1 s	
Earthing (grounding) Switch [Optional]			IEC 62271-102		IEEE C37.74	
Rated short-time withstand current (main circuit)						
Value $t_k = 1$ s	I_k	[kA]	16 / 20** / 25	16 / 20** / 25	20**	
Peak value	I_p	[kA]	40 / 52** / 62.5	40 / 52** / 62.5	52**	
Earthing (grounding) switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5	40 / 52** / 62.5	52**	
Earthing (grounding) Switch Category						
Mechanical endurance			1000-M0		1000	
Cycles of operations (Short-circuit making current)- class			5-E2		3	
* Also available with $U_r = 7.2$ kV on request						
** Tests conducted at 21 kA / 52.5 kA						
** Consult availability						

Applications

Input or output of Medium Voltage cables, enabling communication with the busbar of the transformer substation, on the right (rbd) or on both sides (rba).



Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1 s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1 s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

(*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility: rba
- Right extensibility / left blind: rba

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Earthing (grounding):

- With earthing (grounding) switch on left
- With earthing (grounding) switch on right

Driving mechanism

- B type manual mechanism
- BM type motorized mechanism
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis** (with earthing)
- Capacitive voltage presence / absence indicator **ekor.ivds** (with earthing)

- Other capacitive voltage indicators
- Integrated control and monitoring unit **ekor.rci**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Cover for one cable connector per phase
- Partial discharge (PD) detection for network diagnosis

Pressure Relief Duct

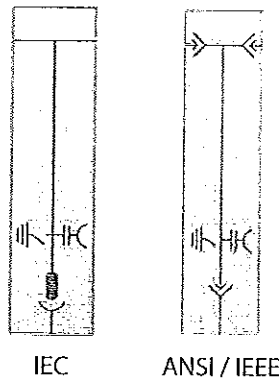
- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

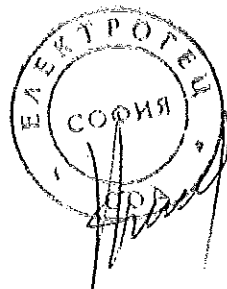
Options

cgmcosmos-rb-pt

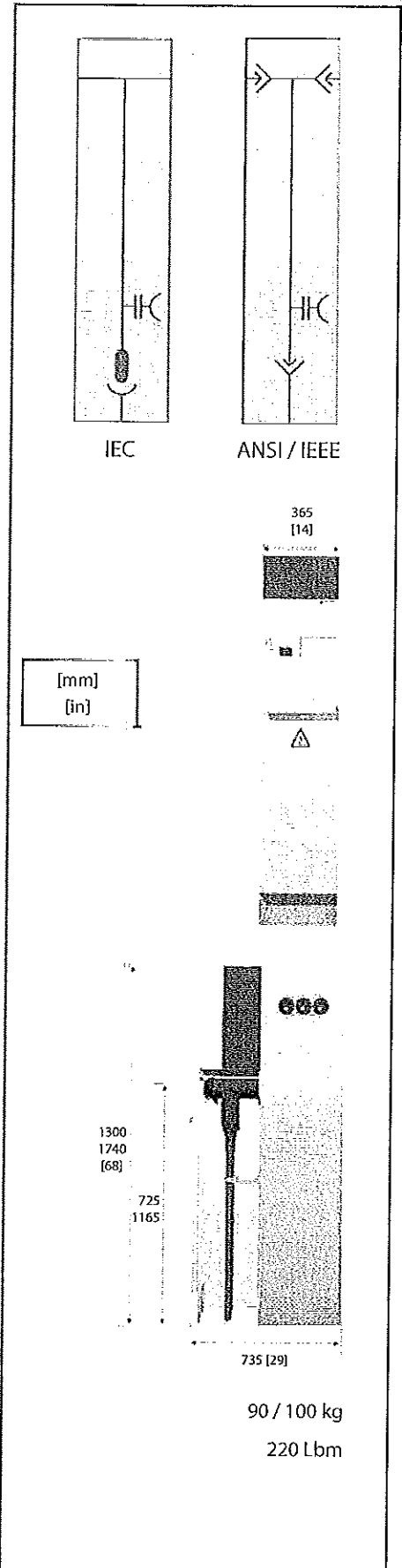


IEC

ANSI / IEEE



Dimensions



cgmcosmos-rc

Cable rise function

Cable rise (up to the main busbar) air insulated modular cubicle. Optional double cable rise function (r2c).

Extensibility: Right or left.

Electrical characteristics		IEC		ANSI / IEEE	
Rated voltage	U _r [kV]	12*	24	15.5	27
Rated frequency	f [Hz]	50 / 60		50 / 60	
Rated current					
Feeder	I _r [A]	400 / 630		600	
Internal arc classification	IAC	AFL 20** kA 1s / 25** kA 1s		AFL 20** kA 1s	

* Also available with U= 7.2 kV on request
** Tests conducted at 21 kA / 52.5 kA
Consult availability

Applications

Housing of the feeder cables up to the main busbar of the transformer substation, on the right (rcd) or on the left (rci).

Configuration

Cubicle

- IAC AFLR 20 kA 1 s
- IAC AFLR 25 kA 1s
- 1740 mm height cubicle

Connectivity

- Extensibility: Right rcd or left rci

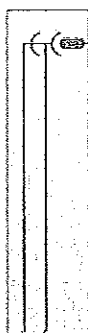
Indicators

- Capacitive voltage indicator **ekor.vips**
- Capacitive voltage indicator **ekor.ivcls**

Options

cgmcosmos-r2c

Double cable rising functional unit
(Width = 550 mm, Weight = 60 kg)

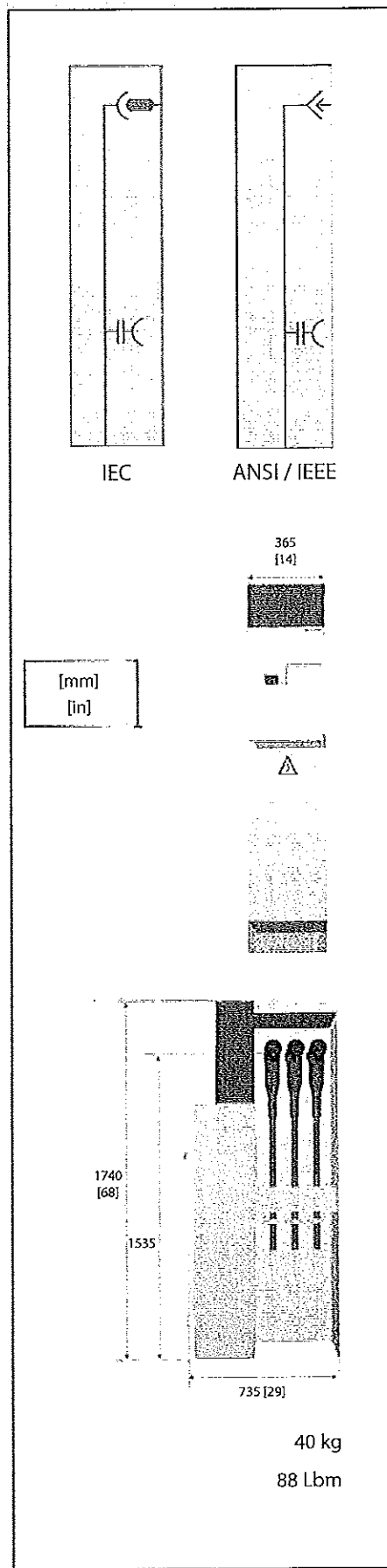


cgmcosmos-cl

Lateral incoming box
(Width = 365 mm, Weight = 20 kg)



Dimensions





cgmcosmos-m

Metering function

Metering air insulated modular cubicle.

Electrical characteristics		IEC	
Rated voltage	U_r [kV]	12*	24
Rated frequency	f_r [Hz]	50 / 60	50 / 60
Rated current			
General busbar and cubicle interconnection	I_r [A]	400 / 630	400 / 630
Rated short-duration power frequency withstand voltage (1 min)			
Phase-to-earth (ground) and between phases	U_d [kV]	28	50
Rated lightning impulse withstand voltage			
Phase-to-earth (ground) and between phases	U_p [kV]	75	125
Internal arc classification		IAC	AFL 20** kA 0.5 s / 20** kA 1 s
Rated short-time withstand current Value $t_k = 3$ s	I_k [kA]	20**	

* Also available with $U_r = 7.2$ kV on request

** Tests conducted at 21 kA / 52.5 kA

Applications

Voltage and current metering transformer housing, enabling communication with the main busbar of the transformer substation, via busbars or dry cables.

Configuration

Cubicle

- IAC AFL 20 kA 0.5 s
- IAC AFL 20 kA 1 s
- Heater
- Protection mesh
- Locks

Busbar connections

- Rigid unscreened top connection
- Rigid unscreened bottom connection

Cable connections

- Cable bottom connection

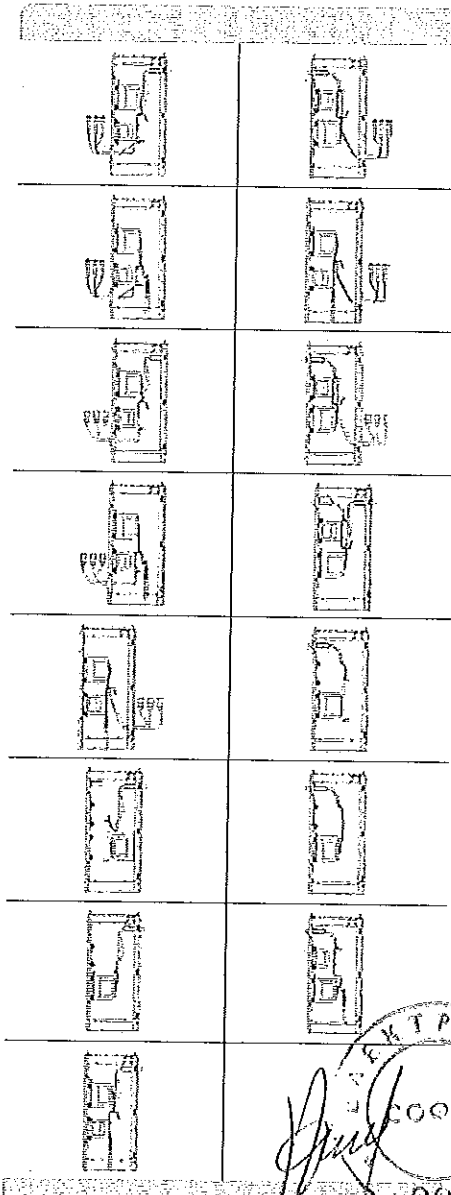
Metering transformers

- Installed current transformers (3CTs)
- Installed voltage transformers (3VTs)
- No transformers

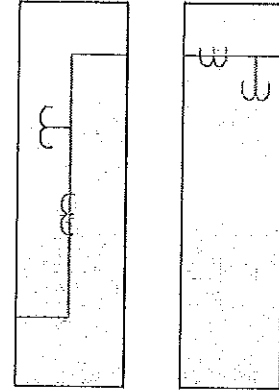
Control box

- Other metering and automation components

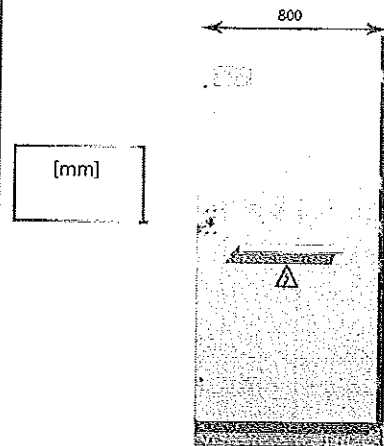
Options



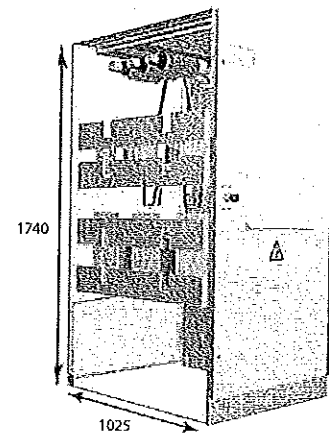
Dimensions



IEC



[mm]



165* kg

(*) Empty enclosure

cgmcosmos-2lp

Fuse protection and feeder functions

Compact cubicle (RMU) with two feeder functions and one fuse protection function, housed in a single gas tank.

Extensibility: right, left, both sides or none.

Electrical characteristics	IEC		I		P	
Rated voltage	U_r	[kV]	12*	24	12	24
Rated frequency	f_r	[Hz]	50 / 60		50 / 60	
Rated current						
General busbar and cubicle interconnection	I_r	[A]	400 / 630		400 / 630	
Feeder	I_r	[A]	400 / 630		-	
Output to transformer	I_r	[A]	-		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth (ground) and between phases	U_d	[kV]	28	50	28	50
Across isolating distance	U_d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
Phase-to-earth (ground) and between phases	U_p	[kV]	75	125	75	125
Across isolating distance	U_p	[kV]	85	145	85	145
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL(R) 20** kA 1 s / 25** kA 1 s			
Switch-disconnector			IEC 62271-103			
Rated short-time withstand current (main circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20** / 25 [†]	16 / 20** / 25 [†]	16 / 20** / 25 [†]	16 / 20** / 25 [†]
Peak value	I_p	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]
Mainly active current rated breaking capacity	I_b	[A]	400 / 630		200	
Rated no-load cable-charging breaking capacity	I_{ca}	[A]	50 / 1.5		-	
Closed-loop breaking current	I_{ca}	[A]	400 / 630		-	
Rated breaking capacity in the event of fault to earth	I_{ca}	[A]	300		-	
Rated breaking capacity of no-load cables / lines in the event of fault to earth	I_{ca}	[A]	100		-	
Main switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	40 / 52**
Switch category						
Mechanical endurance			1000-M1 (manual) / 5000-M2 (motor)			
Cycles of operations (Short-circuit making current)- class			5-E3			
Combined switch-relay (ekor.rpt) take-over current						
Breaking I_{br} acc. TD _{br} IEC 62271-105	[A]				1250	
Switch-fuse combination transfer current						
Breaking I_{br} acc. TD _{transfer} IEC 62271-105	[A]				1500	
Earthing (grounding) Switch			IEC 62271-102			
Rated short-time withstand current (earthing circuit)						
Value $t_k = 1$ s or 3 s	I_k	[kA]	16 / 20** / 25 [†]	16 / 20** / 25 [†]	1 / 3	
Peak value	I_p	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	2.5 / 7.5	
Earthing (grounding) switch making capacity (peak value)	I_{ma}	[kA]	40 / 52** / 62.5 [†]	40 / 52** / 62.5 [†]	2.5 / 7.5	
Earthing (grounding) Switch Category						
Mechanical endurance (manual)			1000-M0			
Cycles of operations (Short-circuit making current)- class			5-E2			

* Also available with $U_r = 7.2$ kV on request

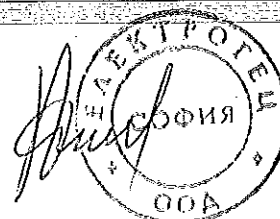
** Tests conducted at 21 kA / 52.5 kA

[†] Value only valid for $t_k = 1$ s

** Consult availability

Applications

RMU which includes the features of the feeder and the protection cubicles.



Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

(*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind
- Blind both sides

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Driving mechanism

- Actuating levers
- B and BR type manual mechanisms
- BM type motorized mechanism
- AR type manual mechanism
- ARM type motorized mechanism
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis**
- Capacitive voltage presence / absence indicator **ekor.ivcls**
- Other capacitive voltage indicators
- Integrated control and monitoring unit **ekor.rci**
- Transformer protection unit **ekor.rpt**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

Pressure Relief Duct

- Rear chimney

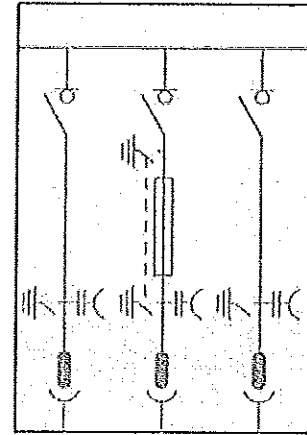
Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Options

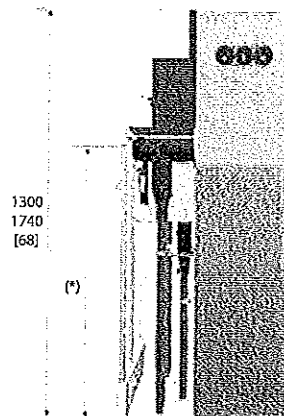
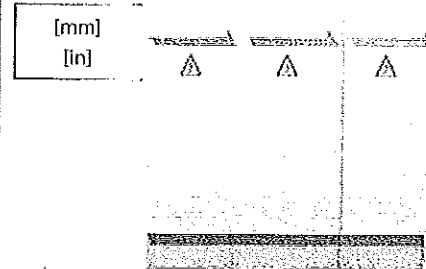
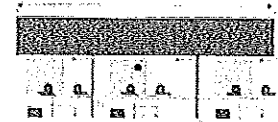
- cgmcosmos-2l**: 2 feeders
Width: 730 mm, Weight: 210 kg
- cgmcosmos-3l**: 3 feeders
Width: 1095 mm, Weight: 400 / 310 kg
- cgmcosmos-3lp**:
3 feeders + 1 fuse protection functions
Width: 1565 mm, Weight: 385 / 355 kg
- cgmcosmos-2l2p**:
2 feeders + 2 fuse protection functions
Width: 1670 mm, Weight: 430 / 400 kg
- cgmcosmos-3l2p**:
3 feeders + 2 fuse protection functions
Width: 2035 mm, Weight: 525 / 490 kg
- cgmcosmos-2lpt**
Compact integral unit with remote control features

Dimensions



IEC

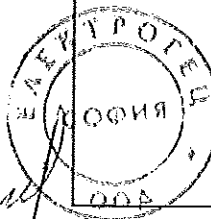
1190
[mm]



735 [29]

(*) (l) 725 / 1165
(p) 410 / 850

290 / 310 kg



cgmcosmos-2lv

New 2013!

Circuit-breaker protection and feeder functions

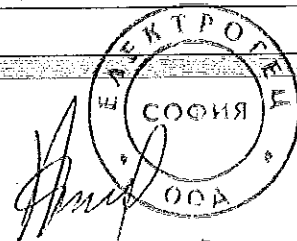
Compact cubicle (RMU) with two feeder functions and one vacuum circuit breaker protection function in a single gas tank.
Extensibility: Right, left, both sides or none.

Electrical characteristics	IEC		I	v
Rated voltage	U _r	[kV]	24	24
Rated frequency	f _r	[Hz]	50 / 60	50 / 60
Rated current				
General busbar	I _r	[A]	400 / 630	400 / 630
Feeder	I _r	[A]	400 / 630	-
Output to transformer	I _r	[A]	-	250
Rated short-duration power frequency withstand voltage (1 min)				
Phase-to-earth and between phases	U _d	[kV]	50	50
Phase-to-earth and between phases	U _d	[kV]	60	60
Rated lightning impulse withstand voltage				
Phase-to-earth and between phases	U _p	[kV]	125	125
Across isolating distance	U _p	[kV]	145	145
Internal arc classification	IAC		AFL(R) 20* kA 1s / 25** kA 1 s	
Circuit-breaker				IEC 62271-100
Rated short-time withstand current (main circuit)				
Value t _k = 1 s or 3 s	I _k	[kA]	-	16 / 20* / 25
Peak value	I _p	[kA]	-	40 / 52* / 62.5
Rated breaking capacity and making capacity				
Mainly active current rated breaking capacity	I _b	[A]	-	400 / 630
Short-circuit breaking capacity	I _{sc}	[kA]	-	16 / 20* / 25
Main switch making capacity (peak value)	I _{ms}	[kA]	-	40 / 52* / 62.5
Rated operating sequence				CO-3 min-CO
Circuit-breaker category				
Mechanical endurance (operations-class)				2000 (M2)
Electrical endurance (class)				E2
Switch-disconnector	IEC 62271-103			IEC 62271-102
Rated short-time withstand current (main circuit)				
Value t _k = 1 s or 3 s	I _k	[kA]	16 / 20* / 25	-
Peak value	I _p	[kA]	40 / 52* / 62.5	-
Mainly active current rated breaking capacity	I _b	[kA]	400 / 630	-
Main switch making capacity (peak value)	I _{ms}	[kA]	40 / 52* / 62.5	-
Switch-disconnector category				
Mechanical endurance	1000-M1 (manual) / 5000-M2 (motor)			-
Cycles of operations (Short-circuit making current)- class	5-E3			-
Disconnecter and Earthing Switch	IEC 62271-102			IEC 62271-102
Rated short-time withstand current (earthing circuit)				
Value t _k = 1 s or 3 s	I _k	[kA]	16 / 20* / 25	16 / 20* / 25
Peak value	I _p	[kA]	40 / 52* / 62.5	40 / 52* / 62.5
Main switch making capacity (peak value)	I _{ms}	[kA]	40 / 52* / 62.5	40 / 52* / 62.5
Earthing switch Category				
Mechanical endurance	2000-M1			2000-M1
Cycles of operations (Short-circuit making current)- class	5-E2			5-E2

* Tests conducted at 21 kA / 52.5 kA
** Consult availability

Applications

RMU which includes the features of the feeder and circuit breaker cubicles.





Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1s 25 kA 1 s*
- 1740 mm height cubicle
- 1300 mm height cubicle

(*) Consult availability

Gas tank

- Stainless steel tank

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind
- Blind both sides

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Driving mechanism

- Actuating levers
- B type switch mechanism
- BM type motorized mechanism
- AV type manual mechanism
- Capacitive voltage presence indicator **ekor.vpis**
- Capacitive voltage presence / absence indicator **ekor.lvds**
- Other capacitive voltage indicators

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Screw type IEC bushings
- Cover for one cable connector per phase

Pressure Relief Duct

- Rear chimney

Control box

- Other voltage indicators
- Other protection relays
- Other metering and automation components

Options

cgmcosmos-2f2v*

2 feeders + 2 CB protection functions

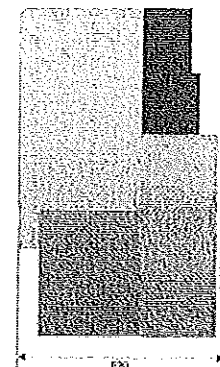
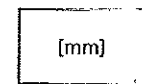
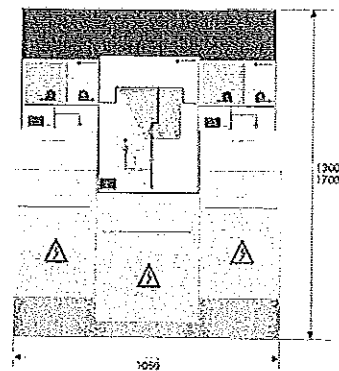
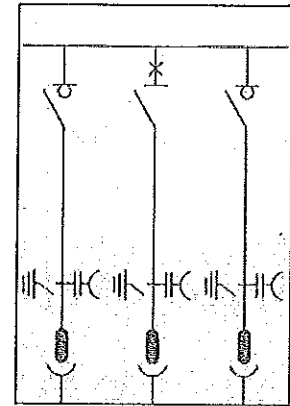
(*) Consult availability

cgmcosmos-2lv (SANS type)

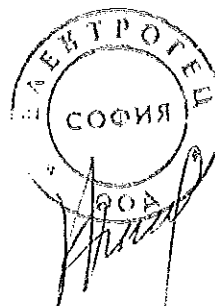
According to SANS standards available.

Consult www.ormazabal.com

Dimensions



420 kg





cgmcosmos-rlp

Fuse protection, feeder and busbar rise functions

Compact cubicle with one busbar rise function, one fuse protection function and one feeder function, fuse protection and feeder cubicles, housed in a single tank.

Extensibility: right, left, both sides or none.

Electrical characteristics	IEC		l-r		p	
Rated voltage	U _r	[kV]	12*	24	12	24
Rated frequency	f _r	[Hz]	50/60		50/60	
Rated current						
General busbar and cubicle interconnection	I _r	[A]	400/630		400/630	
Feeder	I _r	[A]	400/630		-	
Output to transformer	I _r	[A]	-		200	
Rated short-duration power frequency withstand voltage (1 min)						
Phase-to-earth (ground) and between phases	U _d	[kV]	28	50	28	50
Across isolating distance	U _d	[kV]	32	60	32	60
Rated lightning impulse withstand voltage						
Phase-to-earth (ground) and between phases	U _p	[kV]	75	125	75	125
Across isolating distance	U _p	[kV]	85	145	85	145
Internal arc classification	IAC		AFL 16 kA 1 s / 20** kA 1 s AFL(R) 20** kA 1 s / 25** kA 1 s			
Switch-disconnector			IEC 62271-103		IEC 62271-103	
Rated short-time withstand current (main circuit)						
Value t _s = 1 s or 3 s	I _k	[kA]	16/20**/25 [†]	16/20**/25 [†]	16/20**/25 [†]	16/20**/25 [†]
Peak value	I _p	[kA]	40/52**/62.5 [†]	40/52**/62.5 [†]	40/52**/62.5 [†]	40/52**/62.5 [†]
Mainly active current rated breaking capacity	I _l	[A]	400/630		200	
Rated no-load cable-charging breaking capacity	I _{ca}	[A]	50/1.5		-	
Closed-loop breaking current	I _{ca}	[A]	400/630		-	
Rated breaking capacity in the event of fault to earth	I _{ca}	[A]	300		-	
Rated breaking capacity of no-load cables / lines in the event of fault to earth	I _{cb}	[A]	100		-	
Main switch making capacity (peak value)	I _{ma}	[kA]	40/52**/62.5 [†]	40/52**/62.5 [†]	40/52**/62.5 [†]	40/52**/62.5 [†]
Switch category			1000-M1 (manual) / 5000-M2 (motor)			
Cycles of operations (Short-circuit making current)- class					5-E3	
Combined switch-relay (ekor.rpt) take-over current						
Breaking I _{br acc} , TD _{br acc} IEC 62271-105	[A]		-		1250	
Switch-fuse combination transfer current						
Breaking I _{br acc} , TD _{br acc} IEC 62271-105	[A]		-		1500	
Earthing (grounding) Switch			l-r		p	
Rated short-time withstand current (earthing circuit)						
Value t _s = 1 s or 3 s	I _k	[kA]	16/20**/25 [†]	16/20**/25 [†]	1/3	
Peak value	I _p	[kA]	40/52**/62.5 [†]	40/52**/62.5 [†]	2.5/7.5	
Earthing (grounding) switch making capacity (peak value)	I _{ma}	[kA]	40/52**/62.5 [†]	40/52**/62.5 [†]	2.5/7.5	
Earthing (grounding) Switch Category						
Mechanical endurance (manual)					1000-M0	
Cycles of operations (Short-circuit making current)- class					5-E2	

* Also available with U_r = 7.2 kV on request

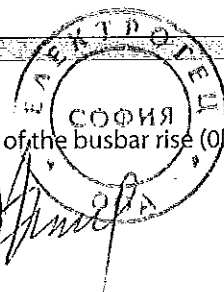
** Tests conducted at 21 kA / 52.5 kA

[†] Value only valid for t_s = 1 s

^{††} Consult availability

Applications

Compact cubicle for RES applications which includes the features of the busbar rise (0), fuse protection (p) and feeder (l) cubicles.





Configuration

Cubicle

- Internal arc IAC AFLR
 - 20 kA 1s 25 kA 1 s*
- Internal arc AFL
 - 16 kA 1 s 20 kA 1s
- Internal arc AF
 - 16 kA 0.5 s 20 kA 0.5 s
 - 16 kA 1 s 20 kA 1 s
- 1740 mm height cubicle
- 1300 mm height cubicle

Ⓢ (*) Consult availability

Gas tank

- Stainless steel tank

Gas pressure indicator:

- Manometer

Frontal connection:

- Cable bushing

Side connection:

- Two side extensibility
- Left extensibility / right blind
- Right extensibility / left blind
- Blind both sides

Type of side connection:

- Female bushing
 - Right Left Both
- Cone bushing
 - Right Left Both

Driving mechanism

- Actuating levers
- B and BR type manual mechanisms
- BM type motorized mechanism
- AR type manual mechanism
- ARM type motorized mechanism
- Acoustic alarm **ekor.sas**
- Capacitive voltage presence indicator **ekor.vpis**
- Capacitive voltage presence / absence indicator **ekor.ivds**
- Other capacitive voltage indicators
- Integrated control and monitoring unit **ekor.rci**

- Transformer protection unit **ekor.rpt**
- Voltage detector unit **ekor.rtk**

Additional interlocks:

- Electrical interlocks
- Key lock interlocks
- Pad locks

Cable compartment

- Screw type IEC bushings
- Screw type ANSI bushings
- Cover for one cable connector per phase
- Extended cable compartment cover for double cable connection
- Extended cable compartment cover for single cable plus surge arrester connection
- Partial discharge (PD) detection for network diagnosis

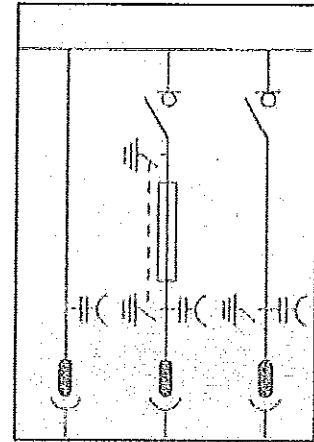
Pressure Relief Duct

- Rear chimney

Control box

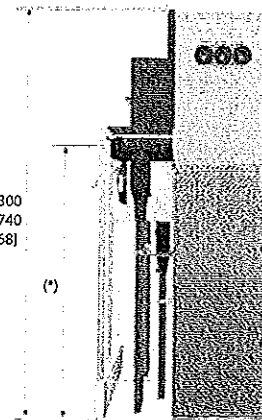
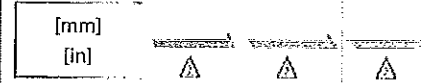
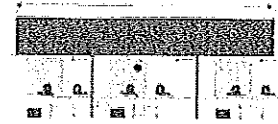
- Other voltage indicators
- Other protection relays
- Other metering and automation components

Dimensions



IEC

1190
(7)



(*) (l) 725 / 1165
(r & p) 410 / 850

275 / 295 kg



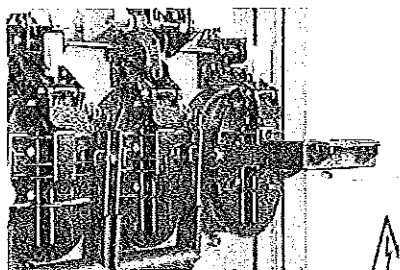


Other components and accessories

HRC Fuses

Features:

- Horizontal fuse holders
- Front access
- Phase-independent compartments
- Protected within the gas tank
- Insulation and sealing against external agents (pollution, temperature changes, adverse weather conditions, including floods)
- Internal interlocks for a safe access to the fuse holder area



Protection with fuses

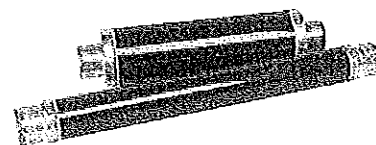
Protection against short circuits in the Medium Voltage network is made by means of the fuse protection functions.

The fuse holder tubes reach a uniform temperature all along the tube when they are placed horizontally inside the gas tank. When the cover is closed, they are fully sealed against floods and external pollution.

In accordance with the IEC 62271-105 standard, the switch-fuse combination may be either the "associated" or "combined" type. In the latter case, the tripping of each of the fuses is indicated on the front mimic diagram of the cubicle.

Protection with fuses and tripping coil

The combined switch-fuse option enables the opening of the switch-disconnector caused by an external signal, as for example that sent by the transformer thermostat in the event of overheating.



Fuse selection according to IEC standards

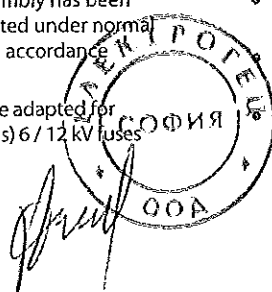
U _{Network} [kV]	U _{Fuse} [kV]	Rated transformer power without overload [kVA]																
		25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
10	6 / 12	6.3	10	16	16	20	20	25	31.5	40	50	63	63	80	100	160	200	-
13.5	10 / 24	6.3	6.3	10	16	16	20	20	25	31.5	40	50	63	63	80	100	-	-
15	10 / 24	6.3	6.3	10	16	16	16	20	20	25	31.5	40	50	63	80	80	-	-
20	10 / 24	6.3	6.3	6.3	10	16	16	16	20	20	25	31.5	40	50	50	63	80	125

Fuse selection according to IEEE standards

U _{Grid} [kV]	U _{Fuse} [kV]	Rated Transformer Power without overload [kVA]																
		25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
7.2	6 / 12	6.3	16	16	20	20	25	40	40	50	63	80	100	160	200	250	-	-
12.5	10 / 24	6.3	6.3	16	16	16	20	20	25	31.5	40	50	63	80	80	125	-	-
13.2	10 / 24	6.3	6.3	10	16	16	20	20	25	31.5	40	50	63	63	80	100	-	-
14.4	10 / 24	6.3	6.3	10	16	16	16	20	20	25	40	40	50	63	80	80	-	-
25	10 / 24	6.3	6.3	6.3	6.3	10	16	16	16	20	20	25	31.5	40	50	50	80	80

Remarks:

- Fuses recommended: SIBA brand with medium type striker, conforming to IEC 60282-1 (low power loss fuses).
- The values for combined fuses are given in blue.
- The fuse-switch assembly has been temperature-rise tested under normal service conditions in accordance with IEC 62271-1.
- A fuse holder carriage adapted for 292 mm (12.49 inches) 6 / 12 kV fuses is available.
- For ratings marked in bold the length is 442 mm (17.40 inches). If any of the fuses blow, we recommend changing all three.
- For overload conditions in the transformer or other brands of fuse, please consult Ormazabal.

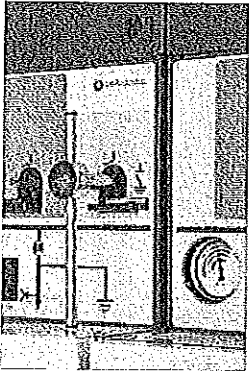


Indicators

ekor.sas acoustic alarm

The **ekor.sas** earthing (grounding) prevention acoustic alarm unit is an acoustic indicator that works in association with the earthing (grounding) switch shaft and the voltage presence indicator, **ekor.vpis**.

The alarm is activated when the earthing (grounding) switch actuation shaft access handle is operated while there is voltage in the cubicle's Medium Voltage incoming line. Then an acoustic alarm warns the operator that a short-circuit may be caused in the network if the operation is carried out, resulting in greater safety for individuals and equipment and the continuity of supply.

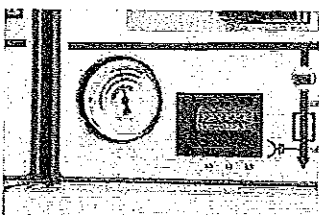


ekor.vpis voltage presence indicator

ekor.vpis is a self-powered indicator incorporated into the cubicles that displays the presence of voltage in the phases via three permanent light signals, designed in accordance with the IEC 62271-206 standard.

It has easily accessible test points for performing the phase balance test.

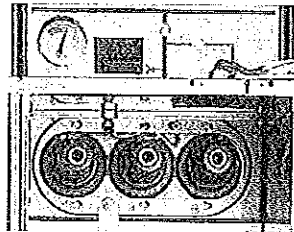
Ormazabal's **ekor.spc** phase comparator and **ekor.ivds** voltage presence / absence detector can be supplied on request.



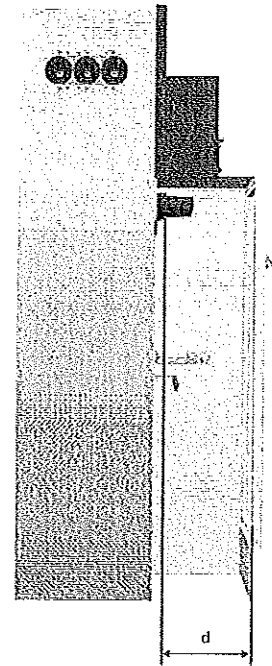
Cable connections

Bushings EN 50181 & IEEE 396

- Manufactured in epoxy resin, they conform to the dielectric and partial discharge tests.
- There are three types:
 - Plug-in up to 250 A (IEC) & 200 A (IEEE)
 - Plug-in up to 400 A
 - Screw-in up to 630 A (IEC) & 600 A (IEEE)
- Located in the cable compartment. Optionally, they may be placed on the side of the cubicles for direct supply to the main busbar.



Bushing



Cable connectors

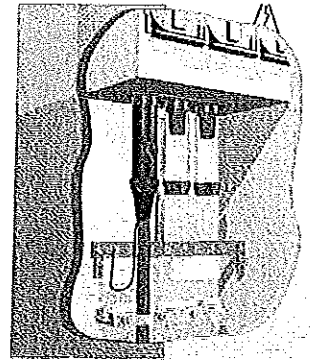
Features:

- For single-core or three core cables.
- For dry cable or impregnated cable.
- Shielded or unshielded.
- Elbow or straight.

Detailed information:

- Direct connection to the bushings located in the cable compartment or on the side via plug-in or screw-in connectors (rated current greater than 400 A or short-circuit current equal to or higher than 16 kA).
- 250 A plug-in connectors (straight or elbow type for rear exit of cable) in outputs to transformer (cable compartment) for fuse protection functions.
- Shielded connectors for circuit-breaker protection functions.

	Distance (d)	
cgmcosmos-l / rb	[mm] (In)	[310] (12.2)
cgmcosmos-v	[mm] (In)	[500] (19.68)
cgmcosmos-p	Vertical	



cgmcosmos-p Bushing position

Accessories

- Plug-in shunt in T
- Plug-in shunt in cross formation
- Insulating plugs
- Reducers
- Connection terminals
- Surge arresters

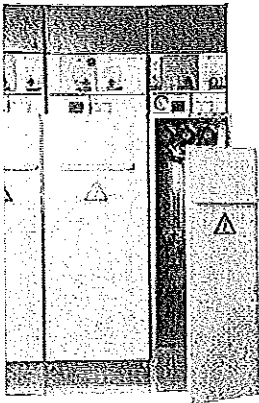
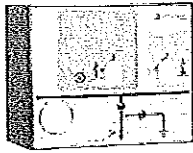
☞ For other types and values, please consult Ormazabal.



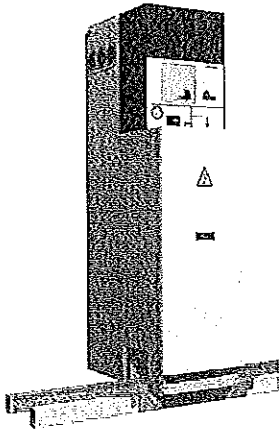
Spare parts

Metal enclosure

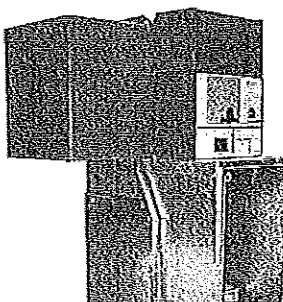
- Covers



- Auxiliary profiles for uneven floors

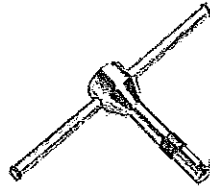


- Lateral incoming box (cgmcosmos-cl)

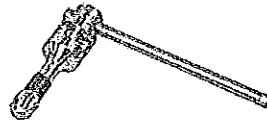


Operating levers

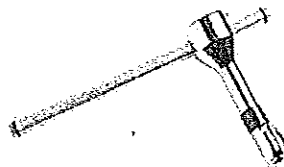
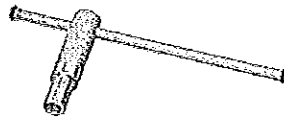
- Switch-disconnector general lever



- Antireflex lever for BR mechanism

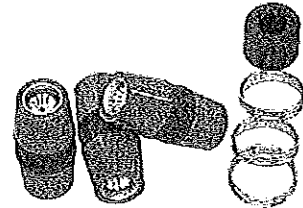


- Levers for Circuit Breaker

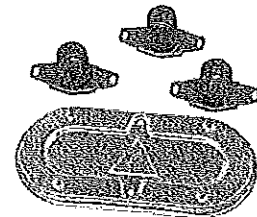


Connectivity

- **ormalink** connecting set
It includes the earthing bar, bolts and nuts, instructions and other elements required for the correct assembly of two modules

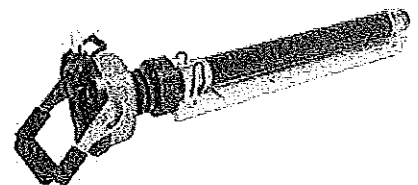


- End assembly kit
It includes end plugs, metal cover to be mounted on the side of one cubicle, instructions and other elements required for assembly.



Fuse protection

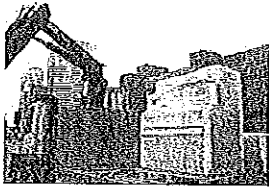
- 12 kV fuse holder carriage
- 24 kV fuse holder carriage
- Carriage adaptor for 292 mm 6 / 12 kV fuses



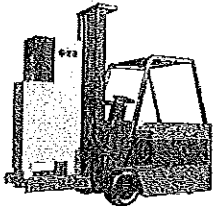
Handling, installation and after sales

Handling

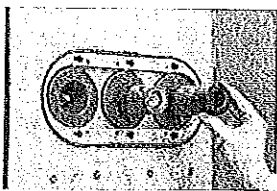
- Reduced size and weight make easier manipulation and installation tasks
- Safe cubicle delivery:
 - Upright position on a pallet, wrapped in protective plastic with polystyrene corner pieces



- Handling methods (up to 5 functional unit assemblies):
 - Lifting: Forklift truck or hand-operated pallet jack
Alternative methods: rollers or rods underneath
 - Raising: Slings & lifting beams



- Ergonomic design for easy cubicle connection and floor fastening

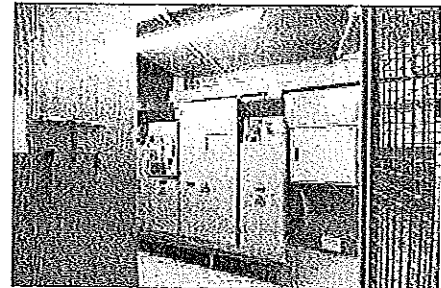
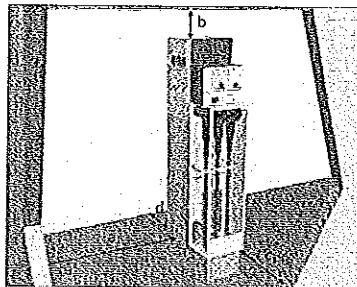


Inside buildings

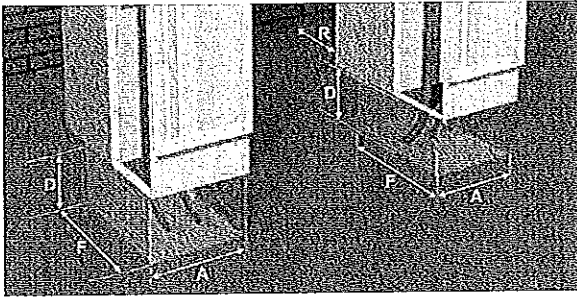
- Easy handling with pallet jack (go through standard doors and elevators)
- Small dimensions: minimum room occupation
- Operation, extensibility and removal in reduced space
- No gas manipulation on site
- Optionally, installation on auxiliary profiles in case of uneven floors or to avoid cable trench works

Installation minimum distances [mm] (inches)	
Side wall (a)	[100] (4)
Ceiling (b)	[500] (20)
Front clearance (c)	[500] (20)
Rear wall (d)	[>100] (>4)**

** Except for **cgmcosmos-v** (> 50 mm / 4 inches) and **cgmcosmos-m** (0 mm / inches).
In case of rear chimney = 0 mm / inches
The space required to extend the assembly with an additional cubicle is 150 mm / 5.90 inches plus the width of the new cubicle.



- For handling and installation instructions request the corresponding manuals to Ormazabal.



**Maximum trench dimensions
for cubicles internal arc tested**

In gastank up to 20 kA 0.5 s. Dry cable

Function	Cubicle height [mm] (inches)	A [mm] (inches)	F [mm] (inches)	(1) D [mm] (inches)		(2) D [mm] (inches)	
				Single Core	3-core	Single Core	3-core
L, RB & RC	[1300] (51)	[285] (11)	[590] (23)	[400] (15)	[350] (13)	[400] (15)	[350] (13)
	[1740] (68)			[600] (23)	[600] (23)	[250] (9.8)	[250] (9.8)
P	[1300] (51)	[390] (15)	[590] (23)	[500] (19) (R*)	Ask	[500] (19) (R*)	Ask
	[1740] (68)			[300] (11) (R*)	[300] (11) (R*)	Ask	Ask
V	[1740] (68)	[520] (20)	[590] (23)	[500] (19)	[850] (33)	[600] (23)	[850] (33)

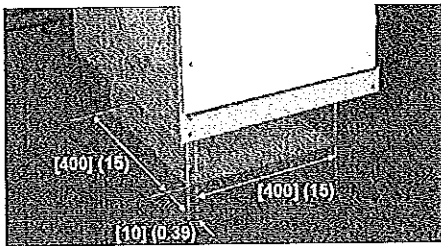
(R*) For rear cable exit R = 500 mm (16.6 in)

IAC class + In gastank up to 20 kA 1 s. Dry cable

Function	Cubicle height [mm] (inches)	A [mm] (inches)	F [mm] (inches)	(1) D [mm] (inches)		(2) D [mm] (inches)	
				Single Core	3-core	Single Core	3-core
L, RB & RC	[1300] (51)	[285] (11)	[590] (23)	[600] (23)	[600] (23)	[600] (23)	[600] (23)
	[1740] (68)			[600] (23)	[600] (23)	[600] (23)	[600] (23)
P	[1300] (51)	[390] (15)	[590] (23)	[500] (19)	Ask	[500] (19)	Ask
	[1740] (68)			[300] (11)	[300] (11)	Ask	Ask
V	[1740] (68)	[520] (20)	[590] (23)	[500] (19)	[850] (33)	[600] (23)	[850] (33)

**Trench dimensions [mm] (inches)
for metering cubicle**

The depth of the trench, suitable for all cable types, is [800 mm] (31 inch)



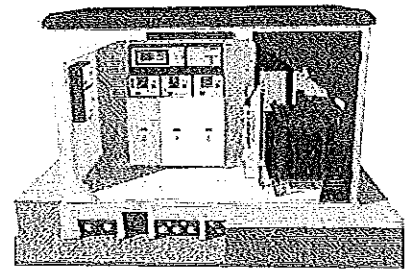
→ The dimensions of the trench depend on the minimum curvature radius of the cables used.

The dimensions given below are for the largest trench.

To dimension the trench with optimum proportions (minimum trench dimensions) for a particular type of cable, please consult Ormazabal.

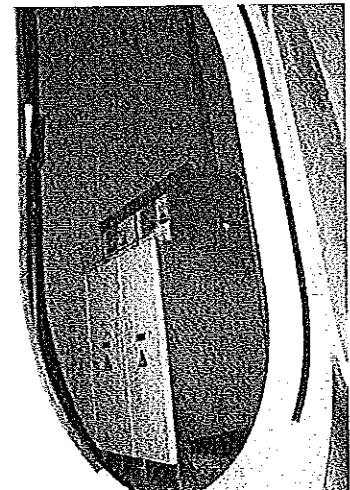
Inside mobile or prefabricated transformer substations

- Turn-key solutions (fully assembling, testing and transportation from factory)
- Uniform quality
- Significant reduction of installation costs and time
- Possibility of cubicle on-site installation
- Wide range of Ormazabal's TS: Walk-in, underground, kiosk, compact...
- Availability of having an operational Transformer Substation in short time



Inside wind turbines

- Off-shore & On-shore wind farms
- Since 1995 supplying MV GIS cubicles for RES commercial generation
- Over 10 years of experience in the offshore wind sector





Commissioning and After Sales

Services



Technical
assistance



FAT



Pick-up &
delivery



Supervision &
Installation



Commissioning



Training



Warranty



Inspection &
maintenance



Spare part



Repair



Retrofitting



Recycling



Engineering



Procurement



EPCM

Recycling and end-of-life

The **Ormazabal** production centres have introduced the corresponding environmental management systems, conforming to the requirements of the international ISO 14001 standard and endorsed by the Environmental Management Certificate among others.

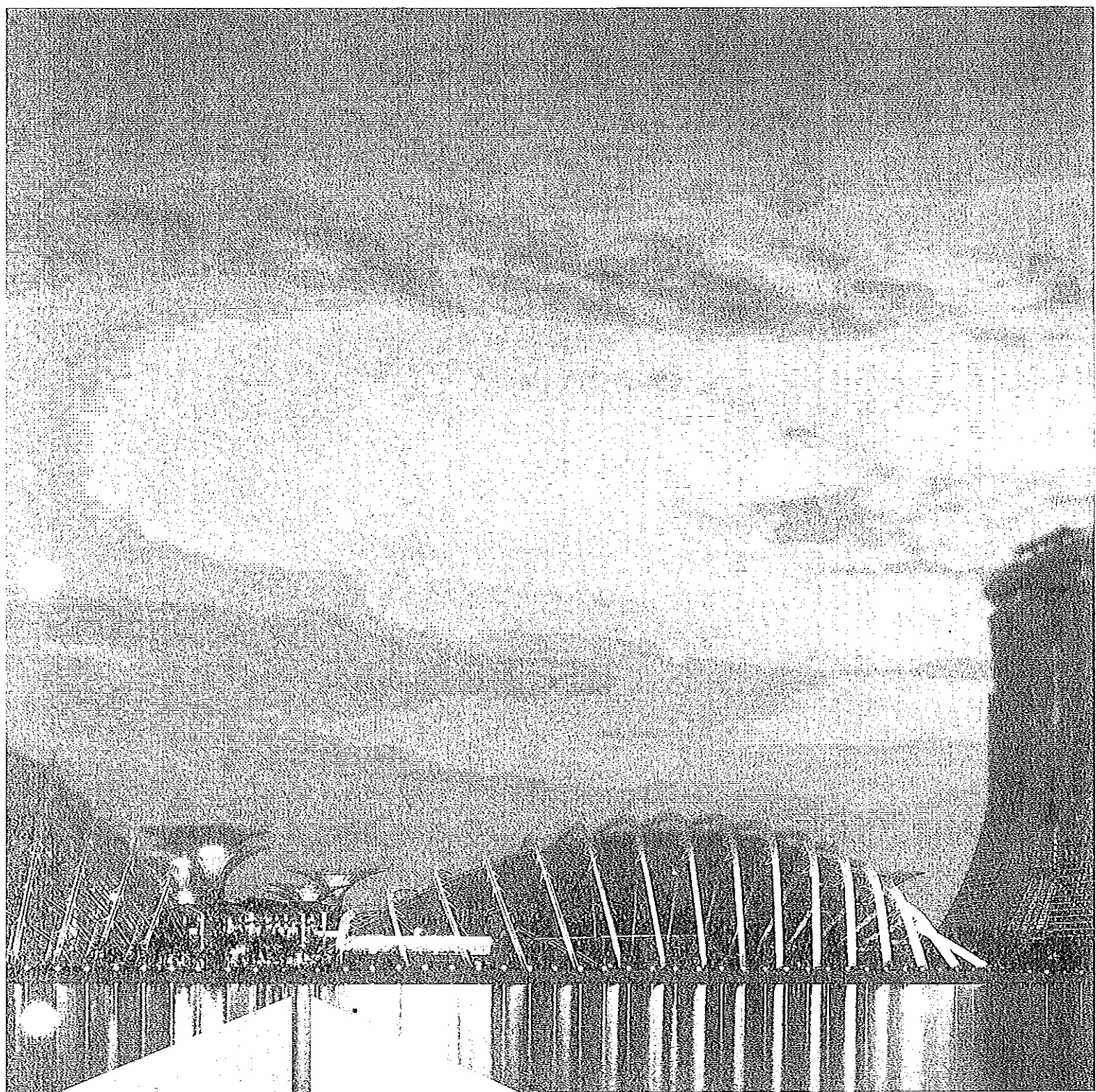
cgmcosmos system cubicles have been designed and manufactured in accordance with the requirements of international IEC and IEEE standards.

By design, and depending on the models, they have a sealed compartment with SF₆ which allows full operation of the equipment throughout its service life (IEC 62271-200).

At the end of the product life cycle, the SF₆ gas content must not be released into the atmosphere. It is recovered and treated for reuse, in accordance with the instructions given in standards IEC 62271-303, IEC 60480 and the CIGRE 117 guide. **Ormazabal** will provide the additional information required to carry out this task correctly, out of respect for the safety of individuals and that of the environment.

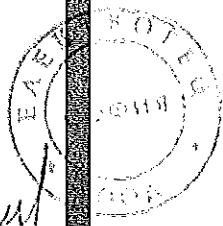


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 **ORMAZABAL**
velafis

www.ormazabal.com



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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

"Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 кА, с SF₆ изолация, с товари прекъсвачи"

Приложение № 2




IG-078-GB
version 05

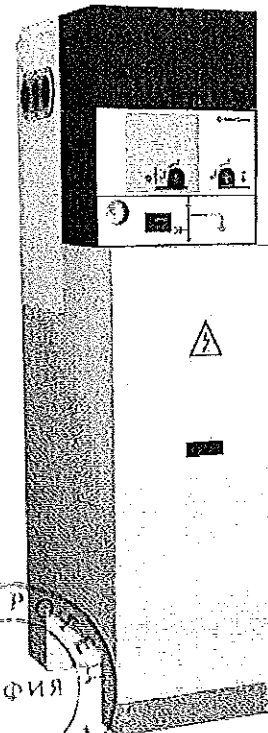
General Instructions

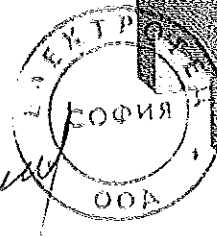
CGMCOSMOS SYSTEM

**MEDIUM VOLTAGE
SF₆ GAS-INSULATED CUBICLES
UP TO 24 kV**

LIB

31.05.2007



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ATTENTION!

During the operation of all MV equipment, some of its components are live, others may be moving, and some parts can reach high temperatures. Subsequently, their use can entail electrical, mechanical, and thermal risks.

Ormazabal, in order to provide an acceptable level of protection for people and property, develops and constructs its products in accordance with the integrated safety principle, based on the following criteria:

- **Eliminating dangers as far as possible.**
- **When it is not technically and/or economically feasible, incorporating appropriate protection devices in the equipment.**
- **Informing of the remaining risks to facilitate the understanding of the operating procedures that prevent them from occurring, training the operating personnel that carry them out, and the use of the appropriate personal protection measures.**

Consequently, only properly trained and supervised personnel can work on the equipment referred to in this manual, or in its surroundings, (EN 50110) who are completely familiar with the instructions and notices in this manual and others of a general nature, applicable derived from the current legislation.

The above should be strictly adhered to as the correct and safe operation of this equipment does not only depend on its design, but also on general circumstances beyond the manufacturer's control and responsibility, in particular that:

- **The transport and handling of the equipment from leaving the factory to arriving at the installation be correctly carried out.**
- **Any intermediate storage is carried out under conditions that do not alter or deteriorate the unit's characteristics or its essential parts.**
- **The service conditions are compatible with the equipment's assigned characteristics.**
- **The manoeuvres and exploitation operations are carried out in strict accordance with the instructions manual and with a clear understanding of the operating and safety principles that are applicable to it.**
- **That the maintenance is carried out properly, taking into account the real service and environmental conditions in the place where the equipment is installed.**

As a result of continually evolving standards and new designs, the characteristics of the components contained in this specification are subject to change without prior warning.


These specifications and the availability of the materials will only be valid if confirmed by our Technical - Commercial Department.



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1. DESCRIPTION AND MAIN FEATURES

The CGMCOSMOS system is made up of a set of modular compact cubicles, with full SF₆ insulation for the configuration of different Medium Voltage secondary electric distribution diagrams up to 24 kV.

This cubicle system is designed to meet the requirements of the following standards⁽¹⁾:

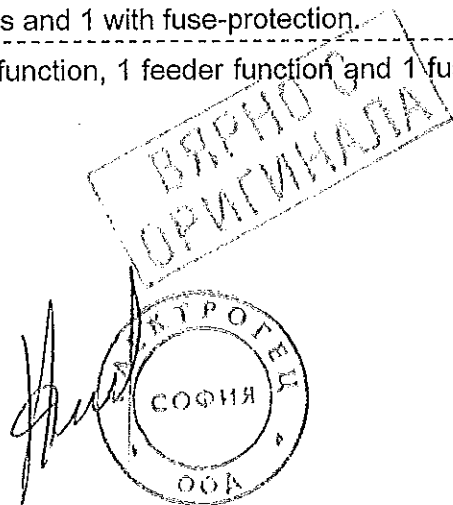
IEC 60694	IEC 62271-105
IEC 62271-200 (IEC 60298)	IEC 62271-100
IEC 60265	IEC 60255
IEC 60129	

The CGMCOSMOS system consists of the following functional units:

- CGMCOSMOS-L: Feeder cubicle.
- CGMCOSMOS-S: Busbar switch cubicle.
- CGMCOSMOS-S-Pt_: Busbar switch cubicle with earthing on the right (Ptd) or on the left (Pti).
- CGMCOSMOS-P: Fuse-protection cubicle.
- CGMCOSMOS-V: Vacuum circuit breaker cubicle.
- CGMCOSMOS-RB_: Busbar rising gas-insulated cubicle.
- CGMCOSMOS-RB_-Pt: Busbar rising gas-insulated cubicle with earthing switch.
- CGMCOSMOS-RC_/R2C_: Cable / double cable rising air-insulated cubicle.
- CGMCOSMOS-M: Metering cubicle.

- CGMCOSMOS-2L: Cubicle with 2 feeder functions.
- CGMCOSMOS-2LP: Cubicle with 2 feeder functions and 1 with fuse-protection.
- CGMCOSMOS-RLP: Cubicle with 1 busbar rising function, 1 feeder function and 1 fuse-protection function.

Modular
Compact



⁽¹⁾ IEC standards are currently being renewed, giving rise to different types of nomenclature in some cases.

1.1. CUBICLE COMPONENTS

The cubicle is made up of a series of independent compartments:

- 1. SF₆ tank
- 2. Operating Mechanism Compartment
- 3. Base
 - 3a. Cable compartment
 - 3b. Gas Outlet Compartment

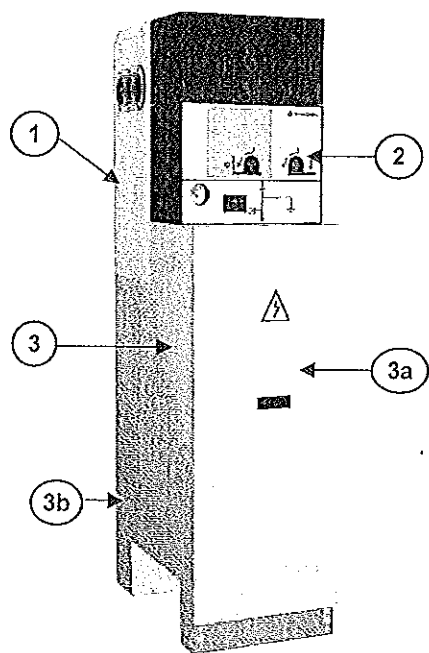


Figure 1.2: Modular CGMCOSMOS Cubicle Main Components

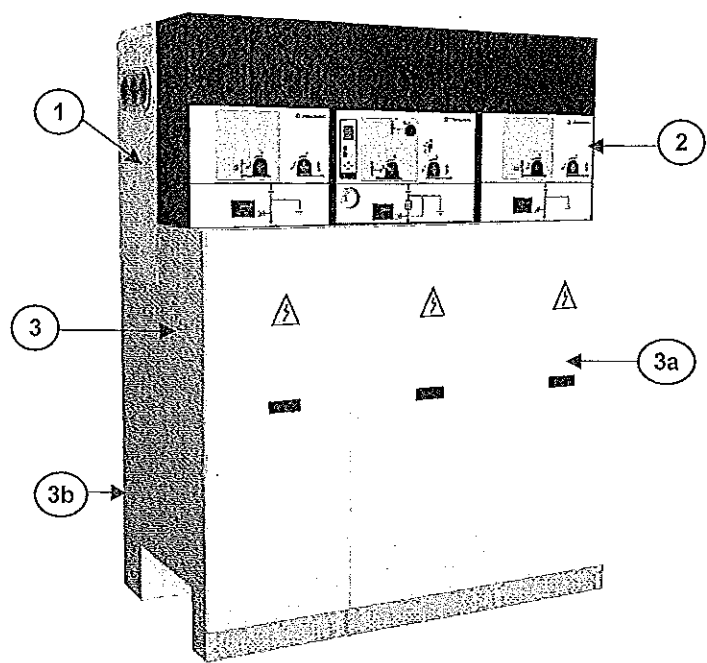


Figure 1.1: Compact CGMCOSMOS Cubicle Main Components

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ЭЛЕКТРОТЕХ
СОБИЯ
ООО

- ① **Tank:** Leak-proof compartment housing the busbars and switching and breaking components, using SF₆ as the isolating medium. Each tank has an indicating pressure gauge for gas pressure checking that is easily seen from outside the cubicle. The pressure gauge scale is divided into different colours: red, grey, and green. For safe operation, the needle must be in the green area of its corresponding temperature band.

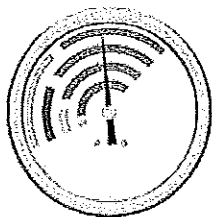


Figure 1.3: Pressure gauge

The tank has a membrane to facilitate the exit of gases in the event of internal arcs.

Switch - Disconnecter and Earthing Switch: The switch in the CGMCOSMOS system has three positions: connected, disconnected and earthed.

This switch is operated with the operating lever on 2 different shafts. One for the switch (switching between the connected and disconnected switch positions); and another for the earthing switch (that switches between the disconnected and earthed positions) of the feeder cables, and in the case of the cubicles with fuse-protection, the fuseholders' six grippers.

These components are independent operations^[2], i.e., the operation speed does not depend on the operation speed of the manual operation.

Vacuum circuit breaker: The CGMCOSMOS-V cubicle circuit breaker uses vacuum technology circuit breaking.

The operation on the circuit breaker is carried by means of a pushbutton station situated at the front of the cubicle. To manually use it, it is necessary to carry out the spring loading using the specific lever for this purpose.

To ensure the switching distance, the cubicle has a disconnecter – earthing switch in series with a circuit breaker. The operation on this component is carried out by a lever with two positions, a black one to go from closed to disconnected and a red one for switching between the disconnected and "prepared for earthing" positions.

- ② **Operating Mechanism Compartment:** The operating mechanism compartment houses the means for operating the switch-disconnector or the circuit breaker, depending on the type of cubicle. The cover of the compartment contains a synoptic diagram of the main circuit or MV.

The position indicating devices of the operating components are totally integrated into the synoptic.

The operating mechanisms can be replaced to achieve greater performance, in any of the three positions of the switch - disconnector. These positions can be blocked with a locking or padlocked fixing device, whether the cubicle is in service or not.

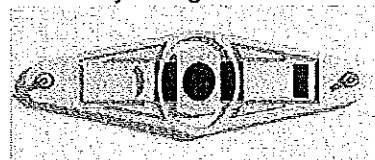


Figure 1.5: Fixing Device



^[2] Applicable CGMCOSMOS system cubicles, except for the CGMCOSMOS-V cubicle disconnector (consult Ormazabal's Technical – Commercial Department).

Components in the Operating Mechanism Area:

CGMCOSMOS-L

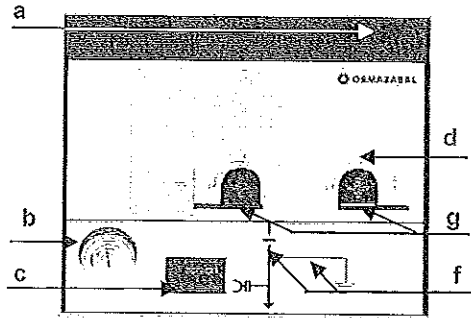


Figure 1.6: CGMCOSMOS-L cubicle synoptic

CGMCOSMOS-P

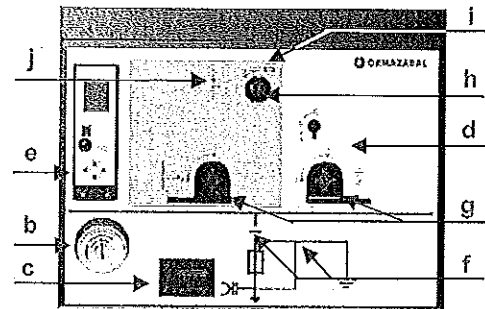


Figure 1.7: CGMCOSMOS-P cubicle synoptic

where:

- a: ekorSAS, Earthing Prevention Acoustic Alarm
- b: Pressure Gauge Sight glass
- c: ekorVPIS, Voltage Presence Detector
- d: Control Zone:
 - GREY for Switch - Disconnecter
 - YELLOW for Earthing Switch
- e: ekorRPT Protection Unit
- f: Status Indicators
 - BLACK for Switch - Disconnecter
 - RED for Earthing Switch

- g: Padlocking
- h: Manual Triggering Handle
- i: Fuse Status indicator
 - GREEN: Normal
 - RED: Striker Triggered
- j: BR driving mechanism Spring Loading Indicator
 - GREEN: No Load
 - RED: Loaded

CGMCOSMOS-S

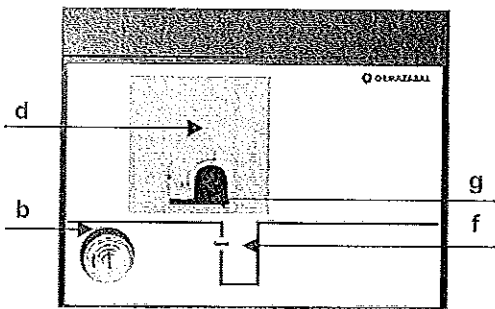


Figure 1.8: CGMCOSMOS-S cubicle synoptic

CGMCOSMOS-S-PT^[3]

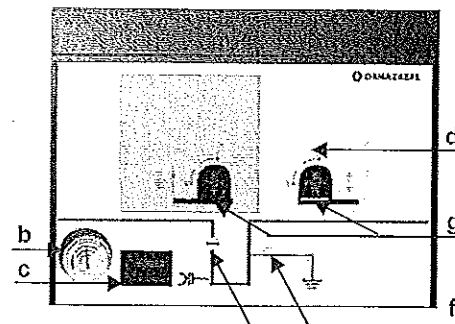


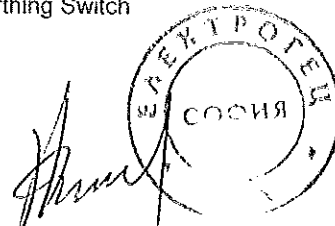
Figure 1.9: CGMCOSMOS-S-PT cubicle synoptic

where:

- b: Pressure Gauge Sight glass
- c: ekorVPIS, Voltage Presence Detector
- d: Control Zone:
 - GREY for Switch - Disconnecter
 - YELLOW for Earthing Switch

- f: Status Indicators
 - BLACK for Switch - Disconnecter
 - RED for Earthing Switch
- g: Padlocking

^[3] Cubicle earthing can be on the right (Ptd) or on the left (Pti).



CGMCOSMOS-V

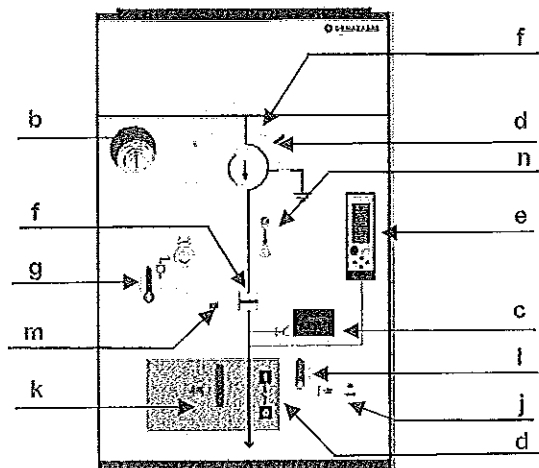


Figure 1.10: CGMCOSMOS-V cubicle synoptic

where:

- b: Pressure Gauge Sightglass
- c: ekorVPIS, Voltage Presence Detector
- d : Control Zone:
 - GREY for Circuit Breaker
 - RED Push-button for Opening
 - GREEN push-button for Closing
 - YELLOW for Disconnecter – Earthing Switch
- e: ekorRPG Protection Unit
- f: Status Indicators
- g: Padlock interlocking of the Earthing system
- j: Spring Loading Indicator
- k: Circuit Breaker manual spring loading
- l: Cable Cover Unlocking
- m: Operation Counter
- n: Disconnecter Interlock

CGMCOSMOS-RB^[4]

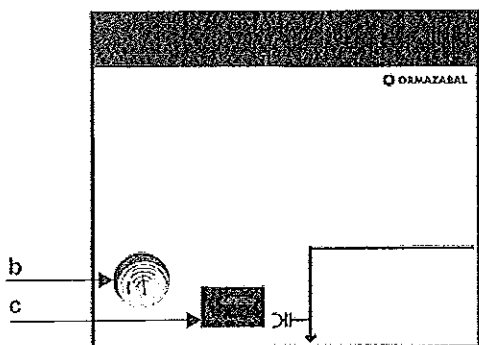


Figure 1.11: CGMCOSMOS-RB cubicle synoptic

where:

- b: Pressure Gauge Sight glass
- c: ekorVPIS, Voltage Presence Detector
- d: Control Zone:
 - YELLOW for Earthing Switch

CGMCOSMOS-RB-PT^[4]

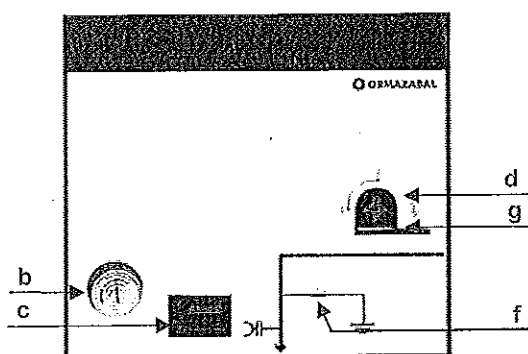


Figure 1.12: CGMCOSMOS-RB-PT cubicle synoptic

- f: Status Indicators
 - RED for Earthing Switch
- g: Padlocking

^[4]The feeder to the cubicle assembly can be from the right (RBd) or from both sides (RBa).



CGMCOSMOS-RC^[5]

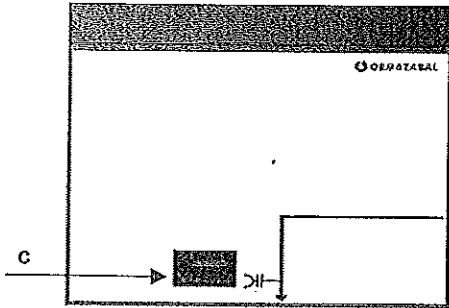


Figure 1.13: CGMCOSMOS-RC
 Cubicle synoptic

CGMCOSMOS-R2C^[5]

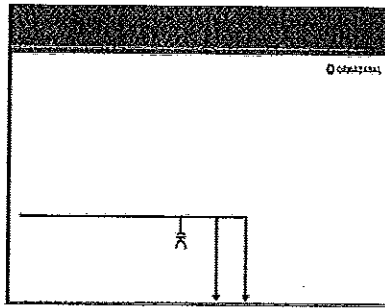


Figure 1.14: CGMCOSMOS-R2C
 Cubicle synoptic

CGMCOSMOS-M

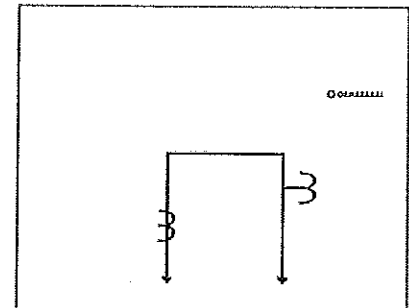


Figure 1.15: CGMCOSMOS-M
 Cubicle synoptic

where:

c: ekorVPIS, Voltage Presence Detector

CGMCOSMOS-2L

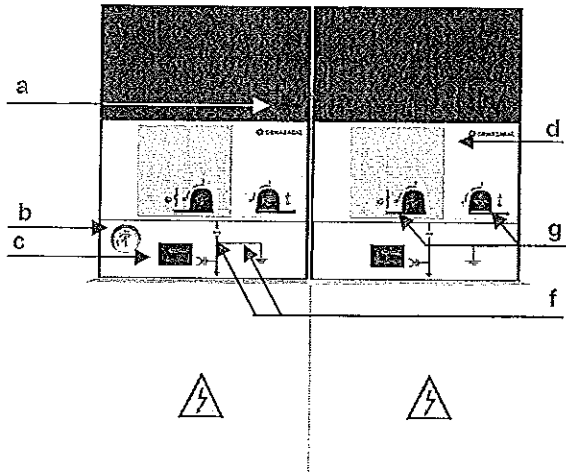


Figure 1.16: CGMCOSMOS-2L cubicle synoptic

where:

- a: ekorSAS, Earthing Prevention Acoustic Alarm
- b: Pressure Gauge Sight glass
- c: ekorVPIS, Voltage Presence Detector
- d: Control Zone:
 - GREY for Switch - Disconnecter
 - YELLOW for Earthing Switch

CGMCOSMOS-2LP

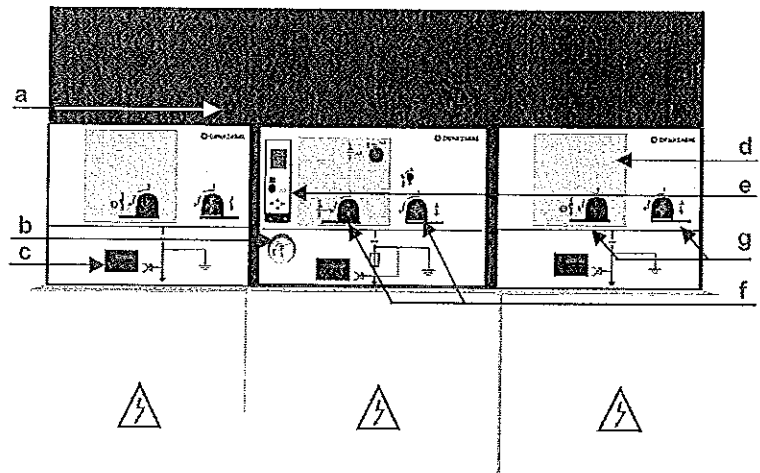
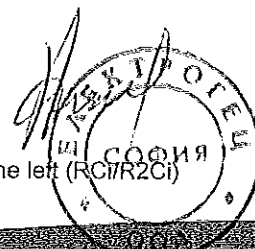


Figure 1.17: CGMCOSMOS-2LP cubicle synoptic

- e: ekorRPT Protection Unit
- f: Status Indicators
 - BLACK for Switch - Disconnecter
 - RED for Earthing Switch
- g: Padlocking

^[5] The feeder to the cubicle assembly can be from the right (RCd/R2Cd) or from the left (RCl/R2Cl)



CGMCOSMOS-RLP

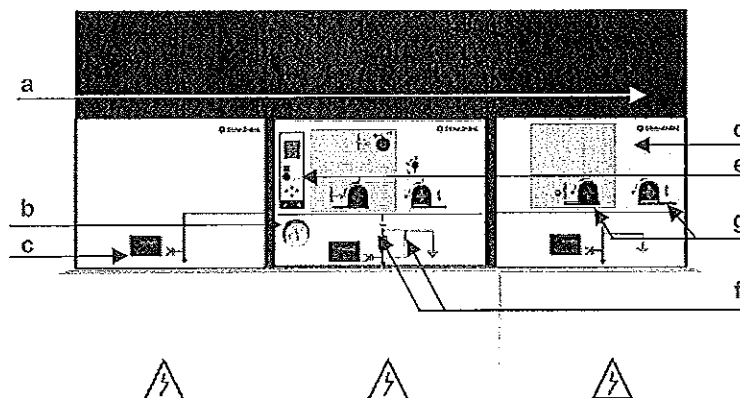


Figure 1.18: CGMCOSMOS-RLP cubicle synoptic

where:

- a: ekorSAS, Earthing Prevention Acoustic Alarm
- b: Pressure Gauge Sight glass
- c: ekorVPIS, Voltage Presence-Absence Detector
- d: Control Zone:
 - GREY for Switch - Disconnecter
 - YELLOW for Earthing Switch

- e: ekorRPT Protection Unit
- f: Status Indicators
 - BLACK for Switch - Disconnecter
 - RED for Earthing Switch
- g: Padlocking

③ **Base:** Made up by the cable compartment and the gas outlet compartment:

③ a **Cable compartment:** This is located in the lower front section of the cubicle and is fitted with a cover, interlocked with the earthing system, thus allowing front access to the Medium-Voltage cables.

It is designed to contain up to:

- Optionally, 2 shielded terminals with bolted connections per phase plus a surge arrester with space for the connection of the corresponding power cables.
- Cable clamps.
- Earthing bars.

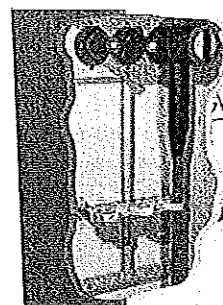


Figure 1.19: Cable compartment

As a special **option**, the base allows for housing a phase segregation box^[6].

③ b **Gas outlet compartment:** Situated in the rear lower part of the cubicle. In the event of an internal ark, the gases produced are sent downwards and backwards, and never go near people, cables or the rest of the switchgear in the Transformer Substation.

^[6] Refer to section 5.8 Terminal Cover Box Assembly Sequence





1.1.1. ekorVPIS - Voltage Presence Indicator Unit

The ekorVPIS unit displays three signals corresponding to each of the phases, with the presence of voltage indicated in each one by means of flashing indicators.

The voltage presence indicator of the ekorVPIS is ensured in the operating range specified in IEC 61958.

The ekorVPIS unit has the following displays:

- L1, L2, L3** **Display each of the indicator phases**
The numbering corresponds to the phase sequence, from left to right, when viewed from the front of the cubicle. Each phase has a test point for checking phase coincidence between the cubicles.
-  **Testing point connected to ground**
Solely used to compare phases.
-  **Voltage presence display**
The flashing light indicates the presence of voltage in this phase.

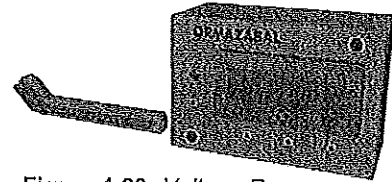


Figure 1.20: Voltage Presence Indicator Unit

The testing points of the three phases and the earth are used to enable the phase concordance^[7] between cubicles. For this operation, Ormazabal's ekorSPC specific phase comparator can be used.

Note: If the indicators do not flash, check the absence of voltage by other means.

1.1.2. ekorSAS - Earthing Prevention Acoustic Alarm Unit

The ekorSAS acoustic alarm is associated with the ekorVPIS voltage presence indication indicator and the earthing shaft actuation. The alarm sounds when there is incoming voltage and the lever is put in the earthing switch shaft. When the lever is placed in this position, a sound indicates that a short circuit or a zero can be made in the network if the operation is done.

In the CGMCOSMOS-V cubicles the alarm sounds when there is line voltage and the "prepared for earthing" operation is carried out (disconnecter in earthed position and circuit breaker open).

The operation of the unit is ensured in the same operating range as the ekorVPIS unit to which it is associated.

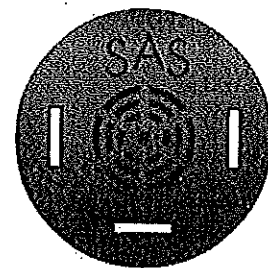


Figure 1.21: ekorSAS Unit

^[7] Refer to section 4.8 ekorSPC Voltage Presence and Phase Concordance Verification.



1.1.3. Characteristics Plate

Each cubicle has a Characteristics Plate indicating some of the following values:

Nº: Cubicle serial number^[8].

Type: Ormazabal cubicle system.

Designation: Cubicle model.

Standard: Standard applied to the equipment.

Denom.: Equipment denomination.

U_r: Rated voltage of the equipment.

U_p: Lightning impulse withstand voltage.

U_d: Power frequency withstand voltage.

f_r: Rated frequency of the equipment.

I_r: Rated current of the equipment.

Class: Operating mechanism class according to IEC 60265-1.

n: Number of mainly active load breaking operations.

I_k / I_p: Rated short time current / Rated short time peak value.

t_k: Internal arc time in tank.

Pre: Gas pressure in the tank (MPa).

SF₆: Mass (g) of insulating fluid.

Año: Year of manufacture.

TC: Thermal class.

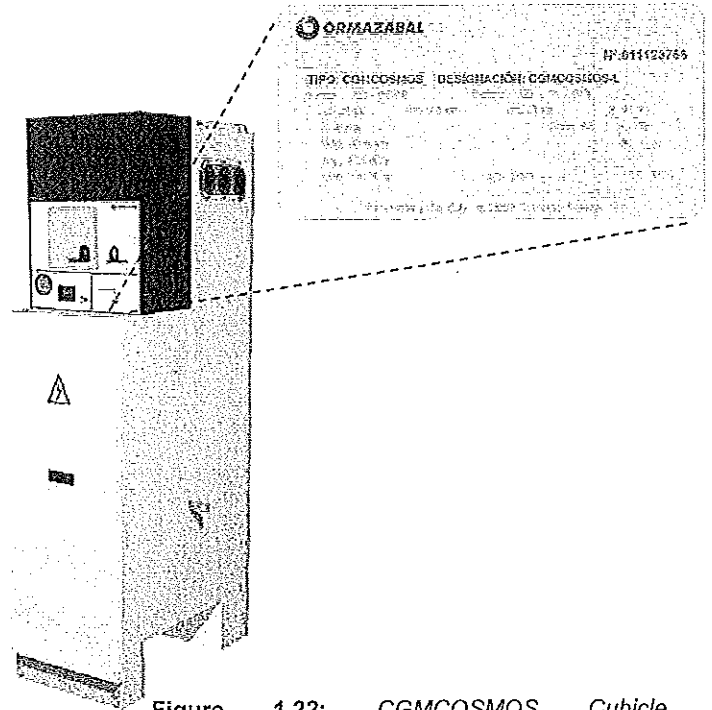


Figure 1.22: CGMCOSMOS Cubicle Characteristics Plate

^[8] In the event of an incident, note down this number and send it to Ormazabal's Technical - Commercial Department.



1.2. SERVICE CONDITIONS

Installation	Indoor
Maximum ambient temperature	+ 40 °C ^(a)
Minimum ambient temperature	- 5 °C ^(b)
Maximum average ambient temperature, measured over a 24 hour period	+ 35 °C
Maximum average relative humidity, measured over a 24 hour period	< 95%
Maximum average steam pressure, measured in a period of 24 months	22 mbar
Maximum average steam pressure, measured in a period of 1 month	18 mbar
Maximum altitude above sea level	2000 m ^(c)
Solar radiation	Negligible
Air pollution (dust, salinity, etc.)	Insignificant
Vibrations (seismicity)	Negligible

^(a) For special operating conditions (maximum ambient temperature above 40 °C) consult Ormazabal's Technical-Commercial Department.

^(b) There are also "less than 15 inner" and "less than 25 inner" class cubicles.

^(c) For higher altitudes, consult Ormazabal's Technical-Commercial Department.

Note: The above specifications refer to section "Normal conditions of service for indoor cubicles" from the IEC 60694 "Common specifications for high-voltage switchgear and control gear" standard.



1.3. MECHANICAL FEATURES: Dimensions and weights

1.3.1. CGMCOSMOS-L: Modular Feeder Cubicle

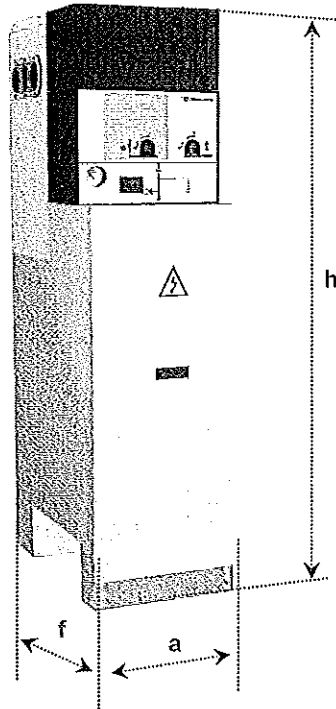


Figure 1.23: CGMCOSMOS-L cubicle dimensions

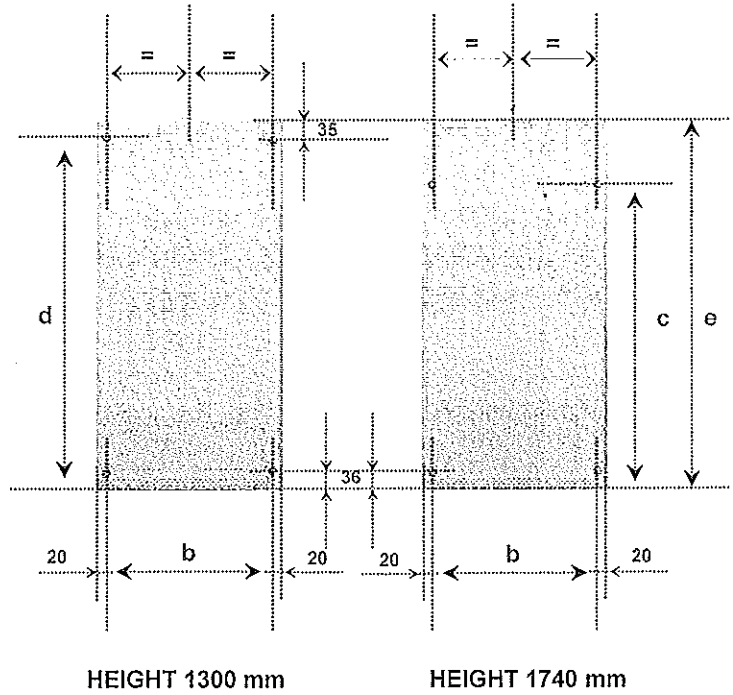


Figure 1.24: CGMCOSMOS-L cubicle anchorage points

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)		365
Depth (f)		735
Height (h)	1300	1740
Anchorages		
Level b		325
Level c		576
Level d		668
Level e		703
Weight [kg]		
Total	86	95



1.3.2. CGMCOSMOS-S: CGMCOSMOS-S: Modular Busbar Switch Cubicle and
 CGMCOSMOS-S-Pt: Modular Busbar Switch Cubicle with Earthing

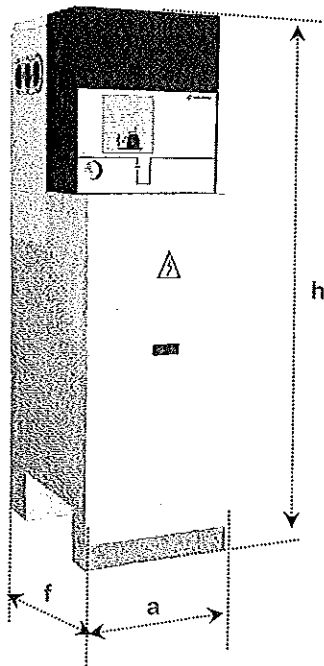


Figure 1.25: CGMCOSMOS-S cubicle dimensions

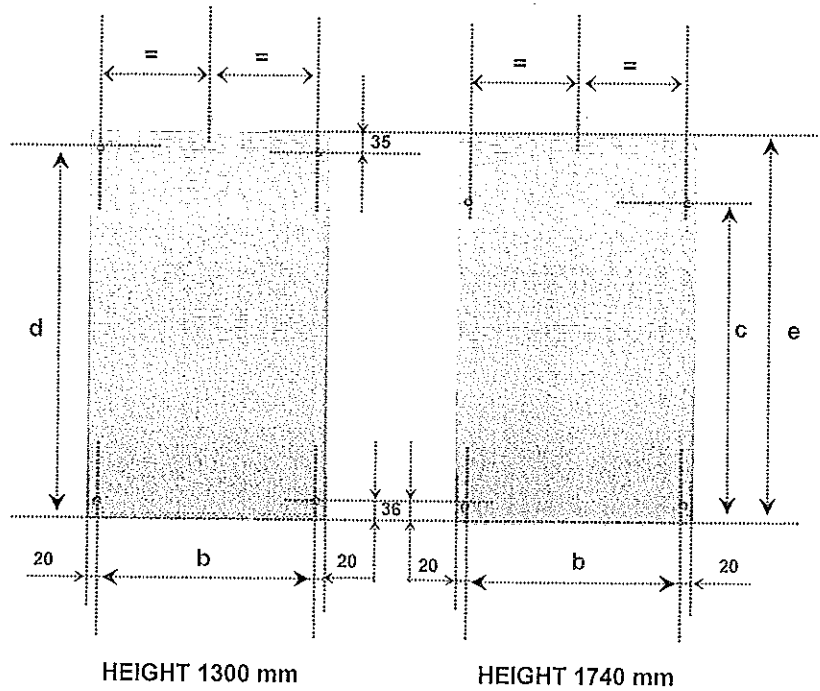


Figure 1.26: CGMCOSMOS-S and CGMCOSMOS-S-PT cubicles anchorage points

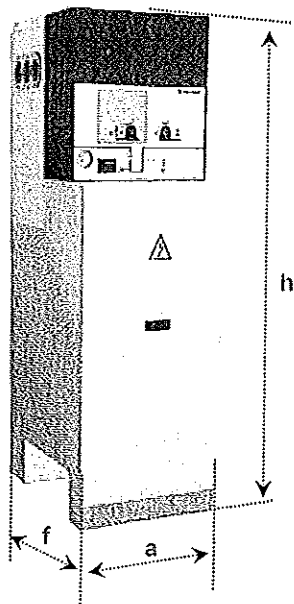


Figure 1.27: CGMCOSMOS-S-PT cubicle dimensions

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)	450	
Depth (f)	735	
Height (h)	1300	1740
Anchorages		
Level b	410	
Level c	576	
Level d	668	
Level e	703	
Weight [kg]		
Total CGMCOSMOS-S	98	105
Total CGMCOSMOS-S-PT	103	110



1.3.3. CGMCOSMOS-P: Modular Fuse-Protection Cubicle

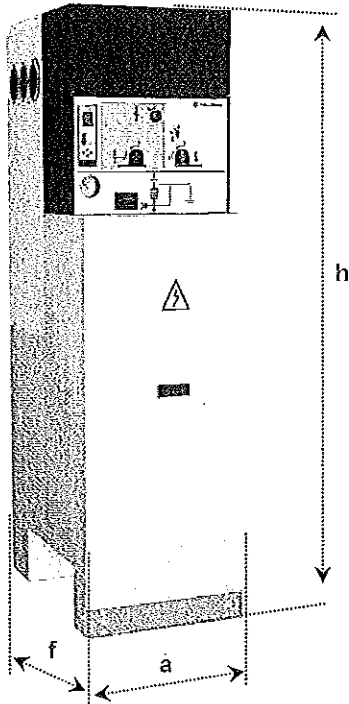


Figure 1.28: CGMCOSMOS-P cubicle dimensions

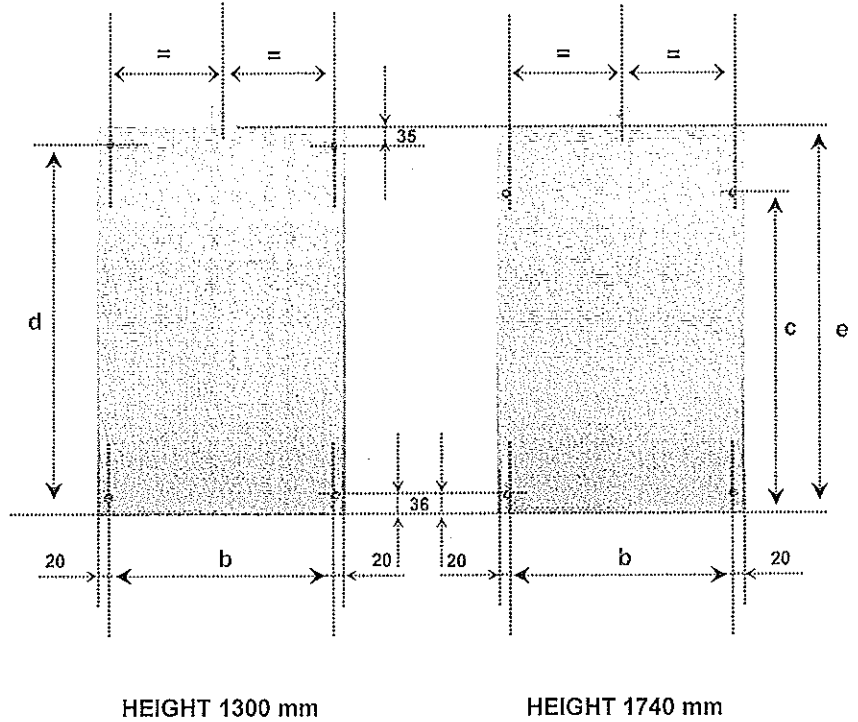


Figure 1.29: CGMCOSMOS-P cubicle anchorage points

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)	470	
Depth (f)	735	
Height (h)	1300	1740
Anchorages		
Level b	430	
Level c	576	
Level d	668	
Level e	703	
Weight [kg]		
Total	129	140



1.3.4. CGMCOSMOS-V: Modular Vacuum Circuit Breaker Cubicle

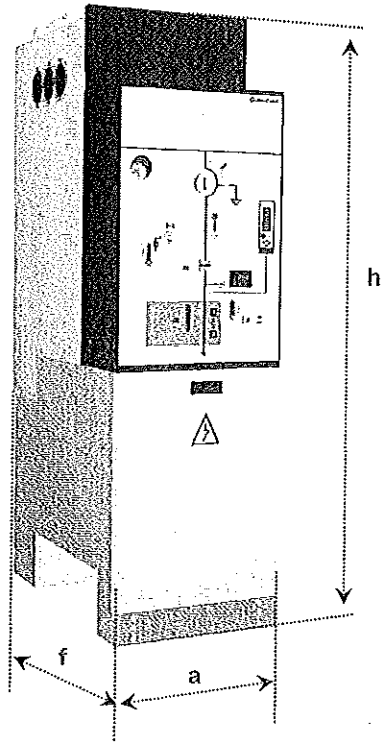


Figure 1.30: CGMCOSMOS-V cubicle dimensions

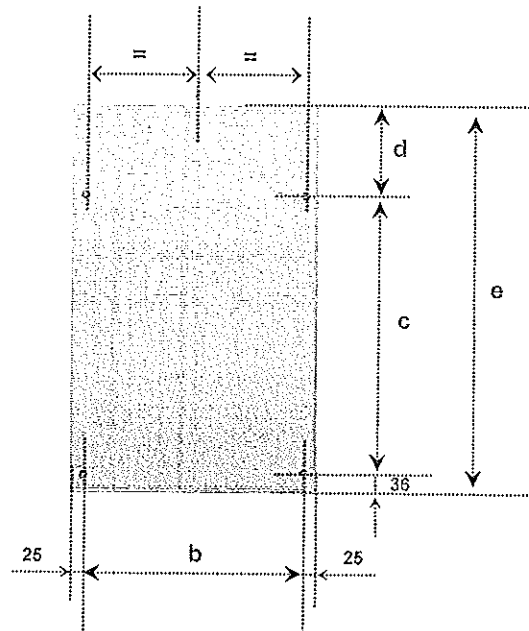


Figure 1.31: CGMCOSMOS-V cubicle anchorage points

Dimensions [mm]	
Cubicle	
Width (a)	480
Depth (f)	850
Height (h)	1740
Anchorage	
Level b	430
Level c	540
Level d	175
Level e	751
Weight [kg]	
Total	218



1.3.5. CGMCOSMOS-M: Modular Metering Cubicle

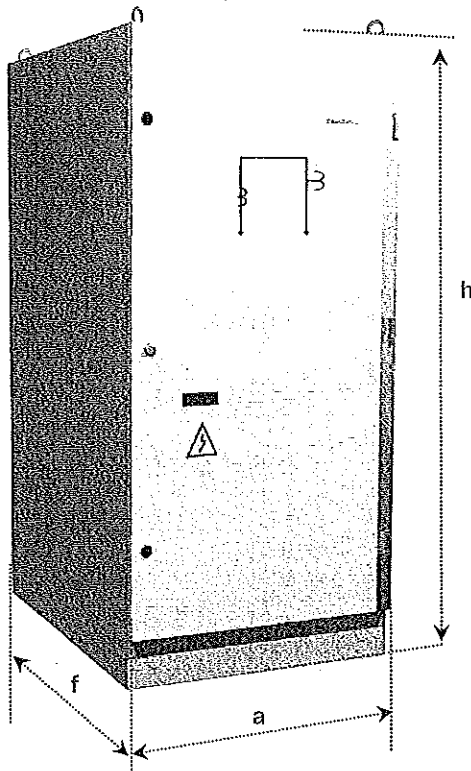


Figure 1.32: CGMCOSMOS-M cubicle dimensions

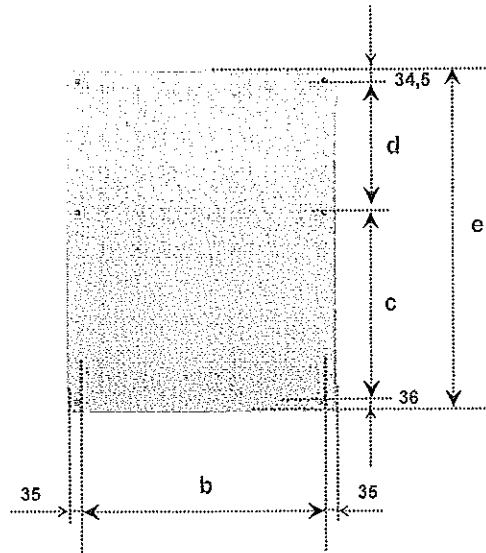


Figure 1.33: CGMCOSMOS-M cubicle anchorage points

Dimensions [mm]	
Cubicle	
Width (a)	800
Depth (f)	1025
Height (h)	1740
Anchorage	
Level b	730
Level c	540
Level d	379,5
Level e	990
Weight [kg]	
Total	165

Note: The weight refers to the cubicle, with no instrument transformer inside



1.3.6. CGMCOSMOS-RB: Modular Busbar Rising Cubicle and
 CGMCOSMOS-RB-Pt: Modular Busbar Rising Cubicle with Earthing

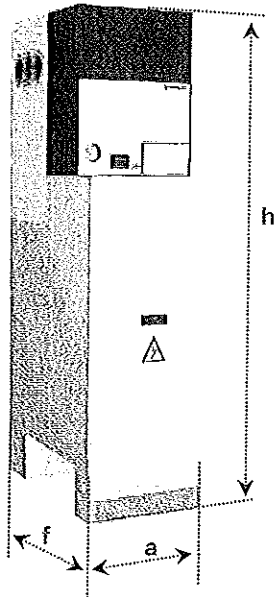
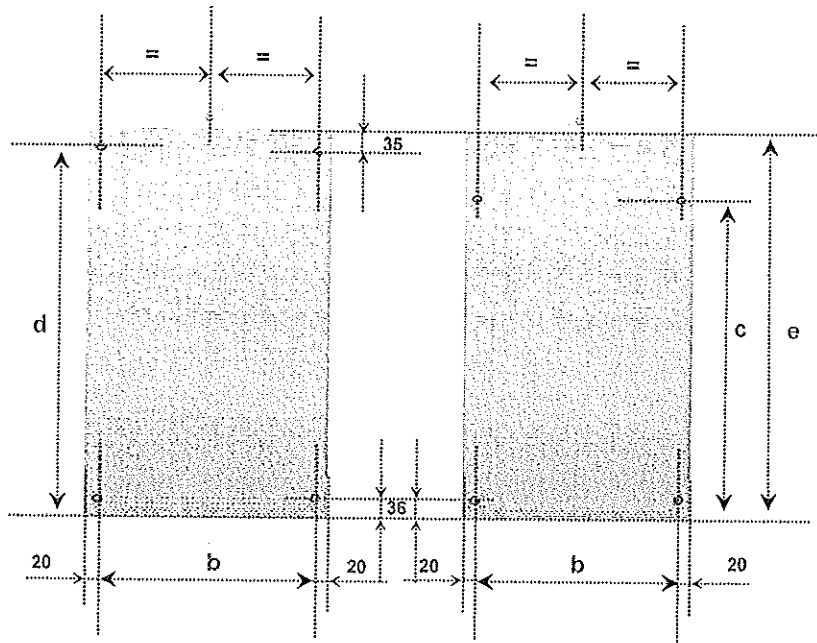


Figure 1.34: CGMCOSMOS-RB cubicle dimensions



HEIGHT 1300 mm

HEIGHT 1740 mm

Figure 1.35: CGMCOSMOS-RB and CGMCOSMOS-RB-Pt cubicles anchorage points

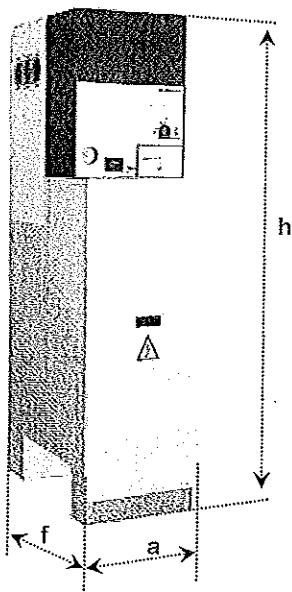
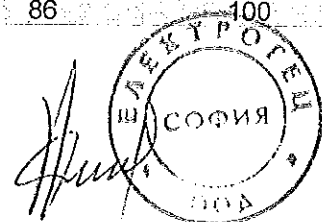


Figure 1.36: CGMCOSMOS-RB-Pt cubicle dimensions

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)	365	
Depth (f)	735	
Height (h)	1300	1740
Anchorages		
Level b	325	
Level c	576	
Level d	668	
Level e	703	
Weight [kg]		
Total CGMCOSMOS-RB	80	95
Total CGMCOSMOS-RB-PT	86	100



1.3.7. CGMCOSMOS-RC: Modular Cable Rising Cubicle

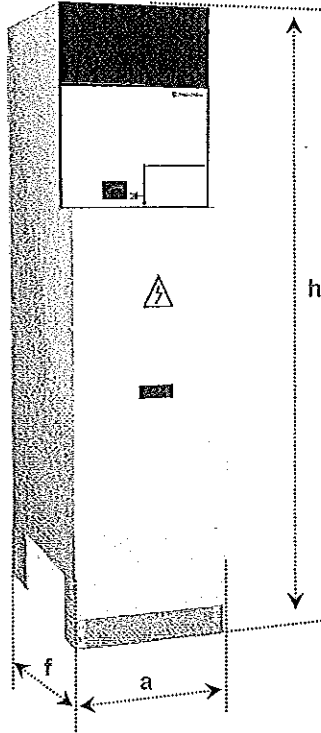


Figure 1.37: CGMCOSMOS-RC cubicle dimensions

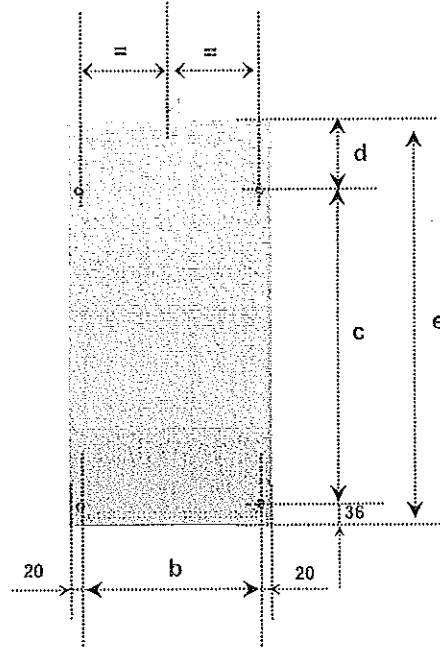
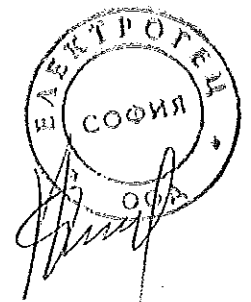


Figure 1.38: CGMCOSMOS-RC cubicle anchorage points

Dimensions [mm]	
Cubicle	
Width (a)	365
Depth (f)	735
Height (h)	1740
Anchorage	
Level b	325
Level c	576
Level d	91
Level e	703
Weight [kg]	
Total	40



1.3.8. CGMCOSMOS-R2C: Modular Double Cable Rising Cubicle

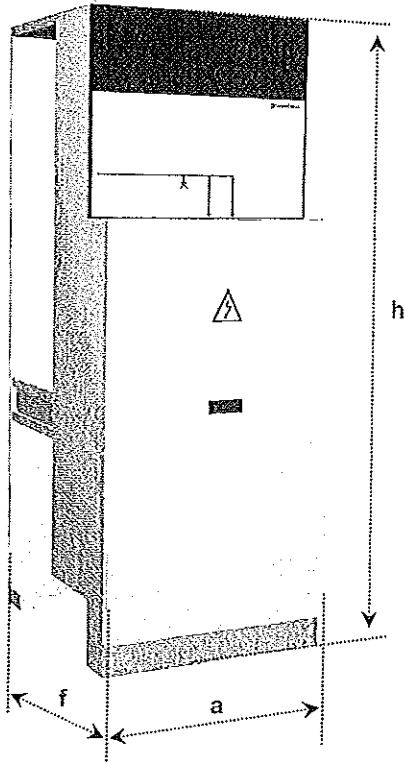


Figure 1.39: CGMCOSMOS-R2C cubicle dimensions

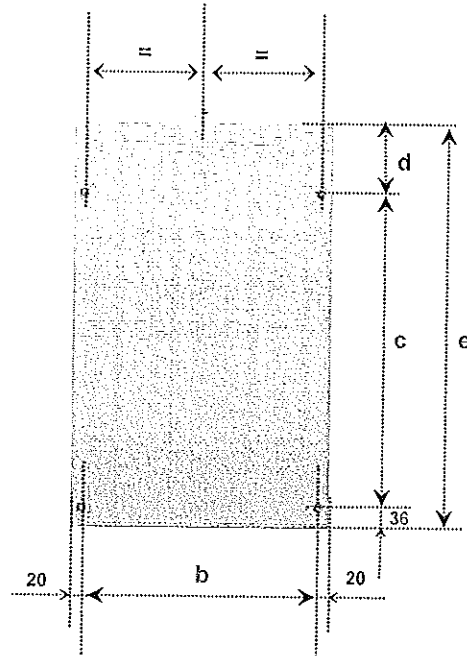


Figure 1.40: CGMCOSMOS-R2C cubicle anchorage points

Dimensions [mm]	
Cubicle	
Width (a)	550
Depth (f)	735
Height (h)	1740
Anchorage	
Level b	510
Level c	576
Level d	91
Level e	703
Weight [kg]	
Total	60



1.3.9. CGMCOSMOS-2L: Compact Double Feeder Cubicle

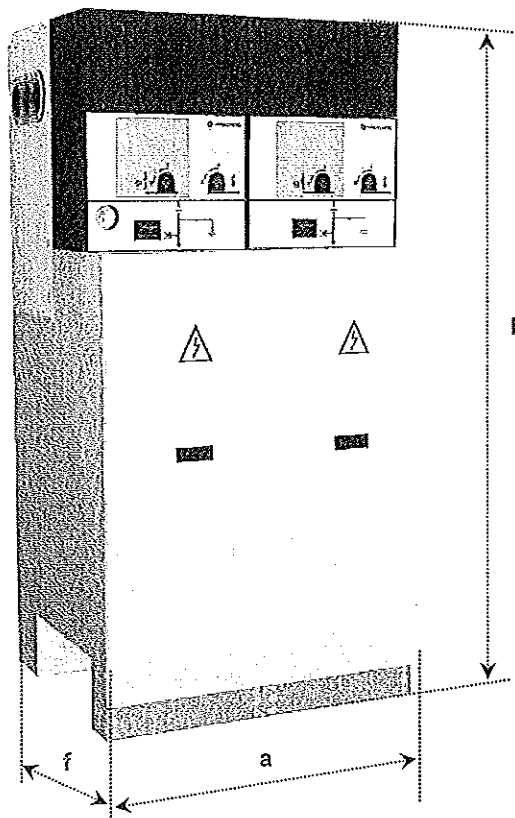


Figure 1.41: CGMCOSMOS-2L cubicle dimensions

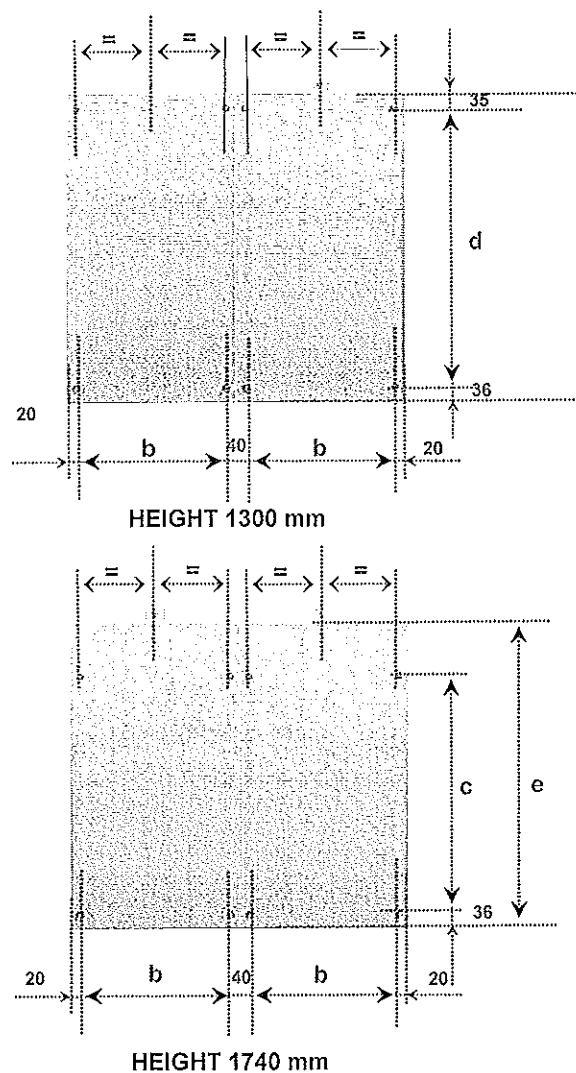
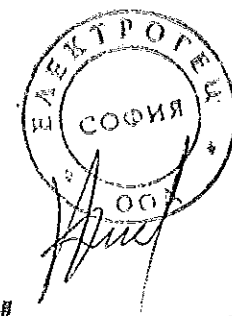


Figure 1.42: CGMCOSMOS-2L cubicle anchorage points

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)		730
Depth (f)		735
Height (h)	1300	1740
Anchorages		
Level b		325
Level c		540
Level d		632
Level e		703
Weight [kg]		
Total	182	200



1.3.10. CGMCOSMOS-2LP: Compact Cubicle Ring Main Unit Type (2 Feeder Functions and 1 Fuse-Protection Function)

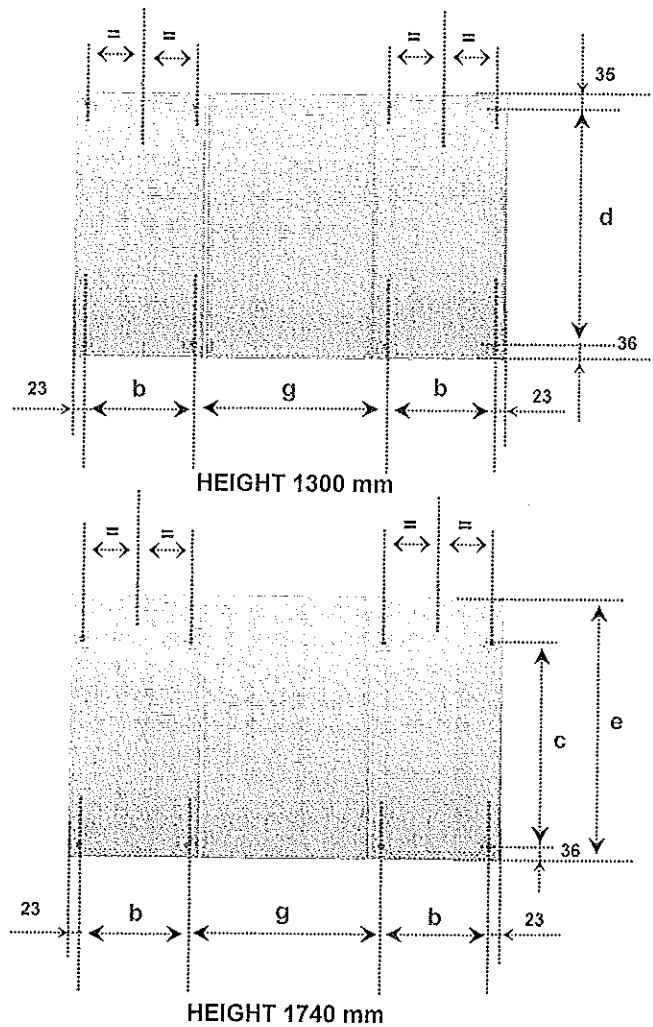
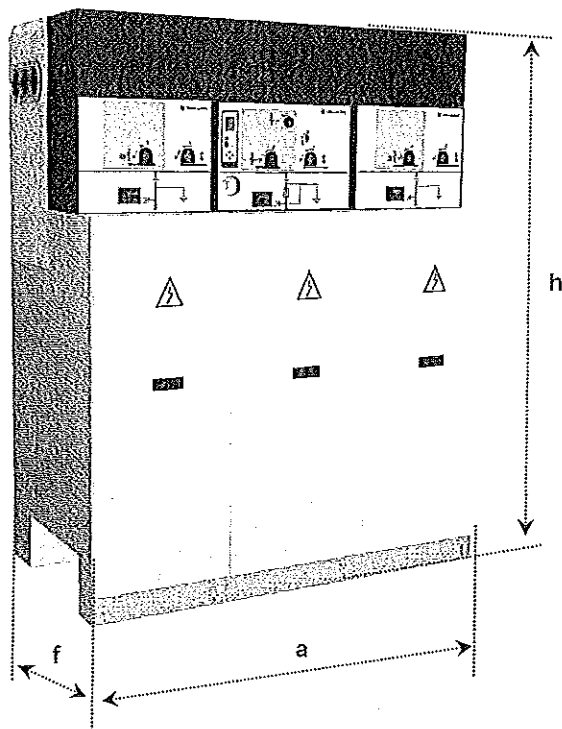
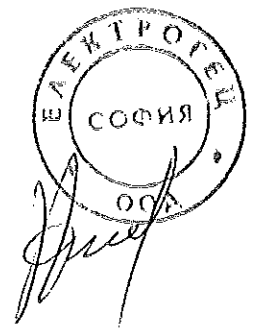


Figure 1.43: CGMCOSMOS-2LP cubicle dimensions

Figure 1.44: CGMCOSMOS-2LP cubicle anchorage points

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)	1190	
Depth (f)	735	
Height (h)	1300	1740
Anchorages		
Level b	317	
Level c	540	
Level d	632	
Level e	703	
Level g	510	
Weight [kg]		
Total	270	290



1.3.11. CGMCOSMOS-RLP: Compact Cubicle with Busbar Rising, Feeder and Fuse-Protection Functions

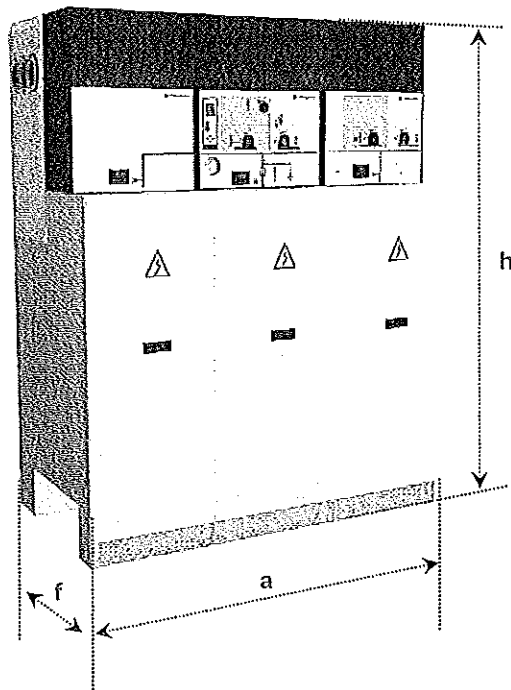


Figure 1.45: CGMCOSMOS-RLP cubicle dimensions

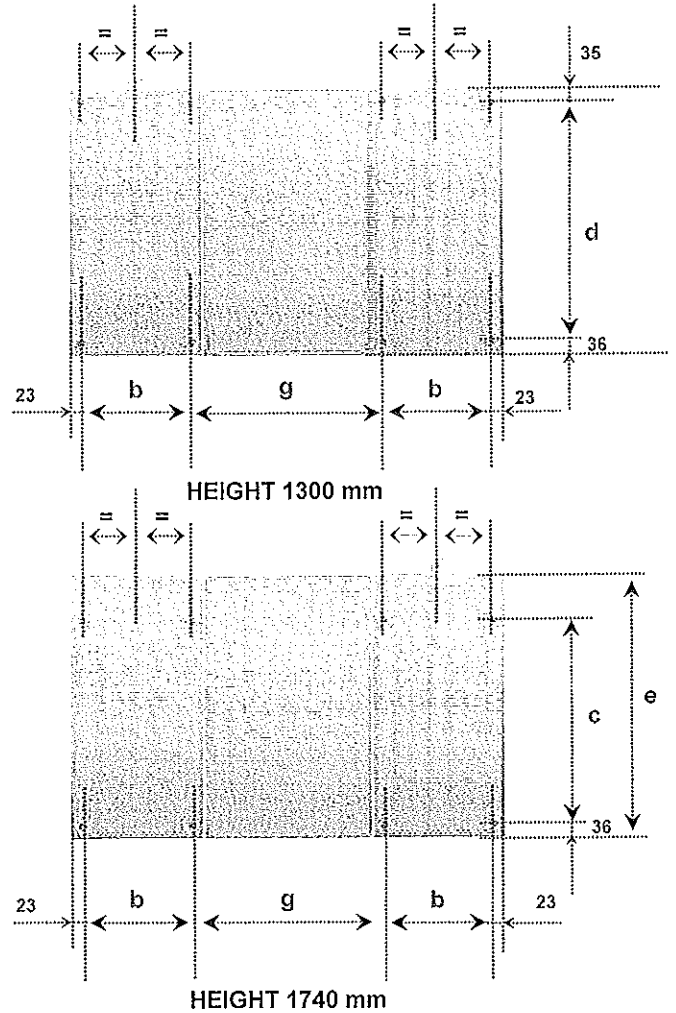
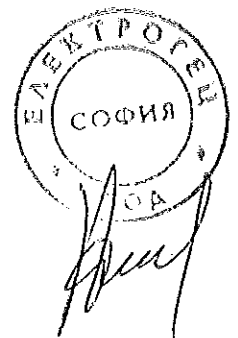


Figure 1.46: CGMCOSMOS-RLP cubicle anchorage points

Dimensions [mm]		
Cubicle	With Low Base	With High Base
Width (a)	1190	
Depth (f)	735	
Height (h)	1300	1740
Anchorage		
Level b	317	
Level c	540	
Level d	632	
Level e	703	
Level g	510	
Weight [kg]		
Total	264	284



1.4. MAIN ELECTRICAL FEATURES

1.4.1. Voltage

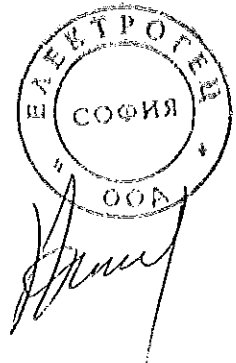
Function	Feeder	
	Fuse-Protection	
	Busbar Switch	
	Busbar Switch with Earthing	
	Circuit Breaker	
Rated [kV]	12	24
Industrial Frequency 1 min [kV]		
Between poles and terminals of the open disconnector	28	50
Isolating distance	32	60
Lightning Impulse [kV]		
Between poles and terminals of the open disconnector	75	125
Isolating distance	85	145

1.4.2. Current

	Feeder	Busbar Switch	Fuse-Protection	Circuit Breaker
	Busbar Rising	Busbar Switch with Earthing		
	Busbar Rising with Earthing			
Rated [A]				
Busbars and cubicle interconnection	400/630	400/630	400/630	400/630
Shunt	400/630	-	200	400/630
Short circuit [kA – 1 s]	16/20*/25#	16/20*/25#	16/20*/25#	16/20
Short circuit [kA – 3 s]	16/20*	16/20*	16/20*	16/20

(*) Tests carried out with 21 kA / 52.5 kA current.

(#) Only for 12 kV. Consult Ormazabal's Technical – Commercial Department.



2. TRANSPORTATION

2.1. LIFTING METHODS

The cubicles must always be vertical, directly on the floor or on a pallet depending on the type of operation to be carried out.

For CGMCOSMOS modular assemblies, handling must be carried out with one of the following methods:

- With rollers underneath the cubicle
- With a forklift truck or pallet lifter^[9]
- Lifting with slings fixed to the side lifting supports on the top of the cubicle. Make sure to lift as vertically as possible (with an angle bracket of more than 60° with respect to horizontal).

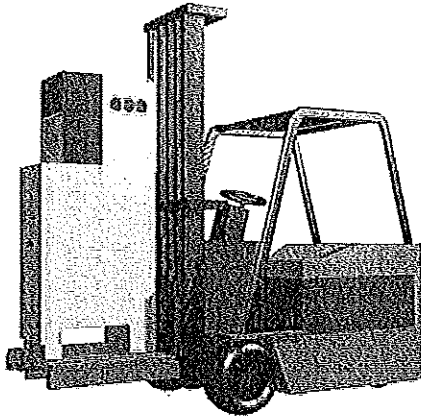


Figure 2.2: CGMCOSMOS cubicle lifting with a forklift truck

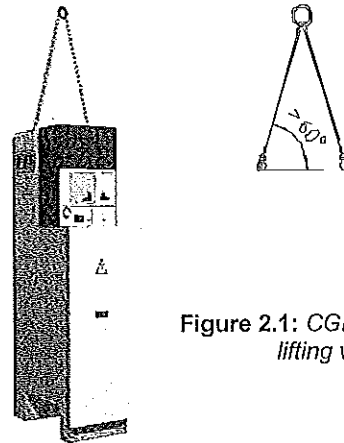


Figure 2.1: CGMCOSMOS cubicle lifting with slings

The use of lifting beams is necessary for handling compact CGMCOSMOS assemblies, or coupled modules with up to four cubicles, with an angle over 65° and under 115°, to prevent possible damage to the cubicles on lifting them.

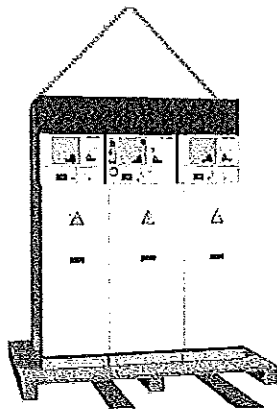


Figure 2.3: CGMCOSMOS cubicle lifting with slings



Figure 2.4: CGMCOSMOS cubicle lifting with a forklift truck

^[9] The rear part of the cubicle must be placed facing the driver, to prevent damages to the front.

2.2. LOCATION OF ACCESSORIES DURING TRANSPORT

During transport, the cubicle must be steady and secure so that it does not move around and become damaged.

Several accessories are supplied with the cubicles, positioned as follows:

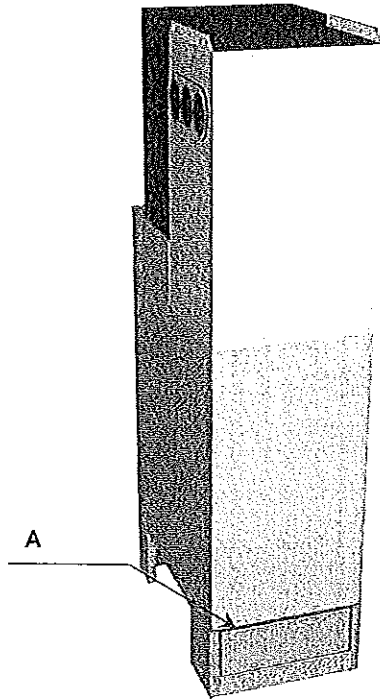


Figure 2.5: Position of the accessories in CGM COSMOS modular cubicles

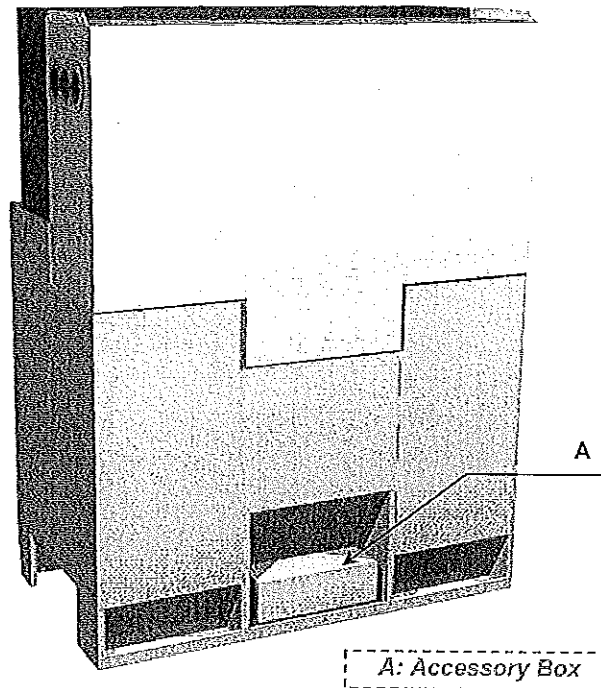


Figure 2.6: Position of the accessories in CGM COSMOS compact cubicles

Depending on the cubicle model, the accessory box contains some of the following components:

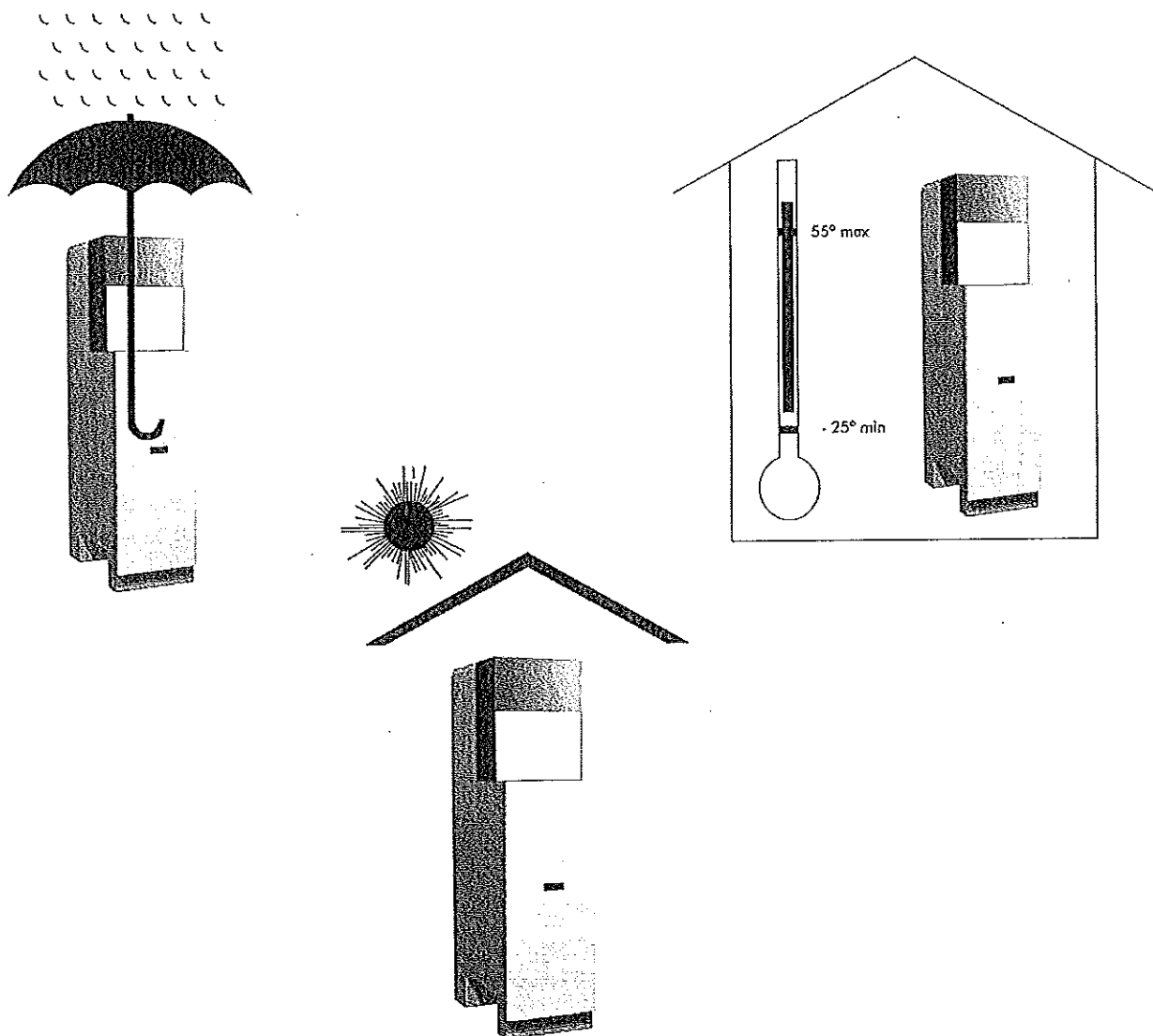
- General Instructions Document IG-078
- Operating lever
- Spring charging lever
- Cubicle connection
 - ORMALINK
 - Springs
 - Silicone grease
 - Earthing bar
- Eng plug kit
 - Cubicle end assembly
 - Nylon thread
 - Plastic plugs
 - Side cover
- Floor anchoring assembly



3. STORAGE

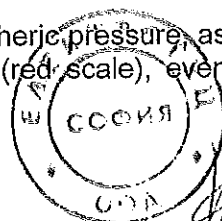
If the material is going to be stored, it must be placed on dry ground or on top of anti-humidity insulation material, always in its original packaging.

After a long period in storage, carefully clean all the insulating parts before commissioning the equipment. The enclosure must be cleaned with a clean and dry lint free cloth.



- Maximum altitude above sea level 2000 m
- Store in non aggressive environments

During installation, the equipment must be regulated to the existing atmospheric pressure, as on the contrary the pressure gauge needle may display a wrong value (red scale), even when the internal pressure is correct.



4. INSTALLATION

4.1. EQUIPMENT UNPACKING

The CGMCOSMOS system cubicles are supplied protected with plastic wrapping.

When the equipment has been received, check that the order and associated documentation match the delivery.

The equipment unpacking process is describes below:

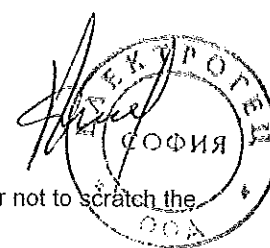
- With a knife, cutter or similar, cut the cellophane wrapped around the cubicle^[10].
- Remove the cellophane.
- Remove the white cork corner pieces.
- Unscrew the fixing elements between the base and the pallet.
- Remove the pallet handling the cubicle as recommended in section 2.1.
- Unpack the accessory box in the rear lower part of the cubicle.
- Detach the protective sticky tape from the cable compartment cover, removing it if necessary.
- Discard the left over materials while being environmentally friendly.

It is advisable to make a visual check of the equipment to see if any damage has occurred during transport. If so, immediately contact Ormazabal's Technical - Commercial Department.

⚠ IMPORTANT:

Not removing the sticky tape from the cable compartment can cause the earthing of the equipment's wrapping not to have the adequate continuity.

^[10] It is advisable to cut the cellophane at the back of the cubicle or at the corner pieces in order not to scratch the surface.



4.2. CIVIL WORK

The minimum distances to the walls and the roof, as well as from the cable trench for the MV cables are the following:

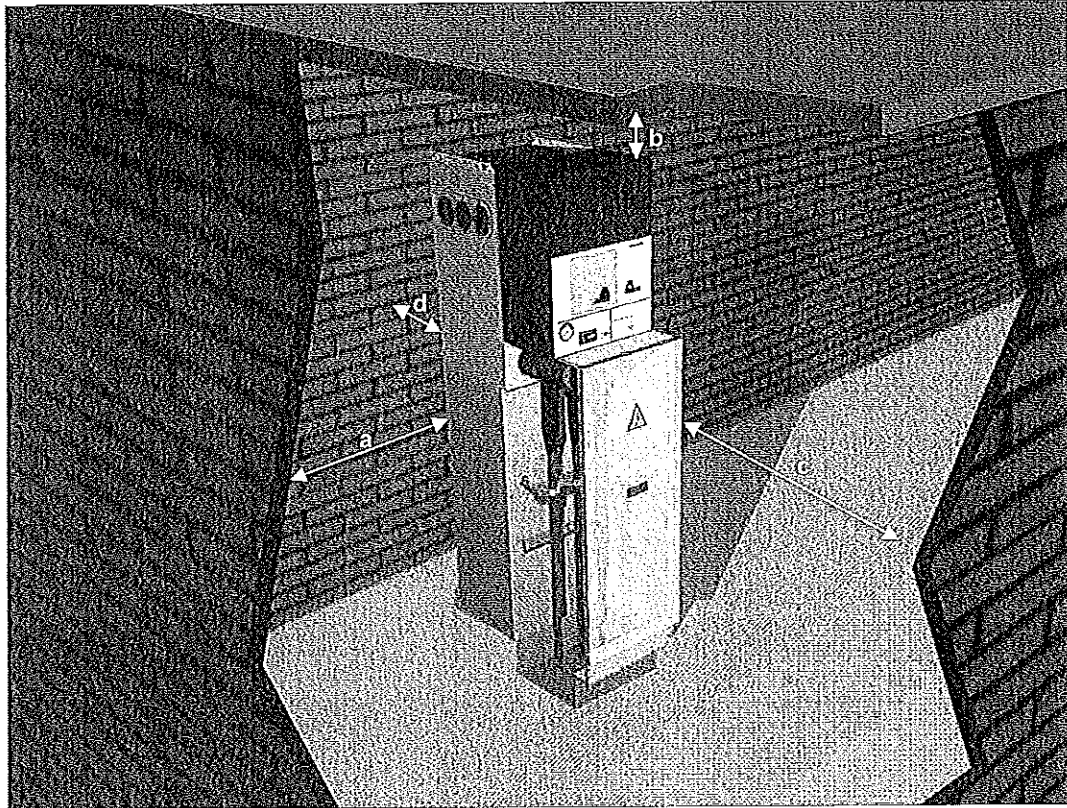


Figure 4.1: Minimum installation distances

Minimum Distances [mm]		
Cubicle		
Side wall (a)	> 100	
Roof (b)	> 600	
Front corridor (c)	Operation:	Cubicle extraction:
	> 1000	> 2000
Rear wall (d)	> 100*	

(*) Except for CGMCOSMOS-V where the measurement will be > 50 mm and 0 mm for CGMCOSMOS-M cubicles.

Note: These measurements have been obtained according to the internal arc tests performed in a room of height 2300 mm, for gas-insulated modules, as per IEC 62271-200, A Appendix.

The dimensions of the trench depend on the minimum curvature radius of the cables used ^[11].

**DIMENSIONS OF CABLE TRENCH FOR FEEDER CUBICLE
 [TERMINAL "L" or "T" 400/630 A]**

CABLE DATA				APPROXIMATE CURVATURE RADIUS [mm]	TRENCH DEPTH CUBICLE HEIGHT				
CABLE INSULATION	CABLE TYPE	CABLE CROSS-SECTION [mm ²]	CABLE DIAMETER [mm]		1300 mm		1740 mm		
					D1	D3	D2	D4	
Dry Insulation	Single core	150	38	500	350	350	(R) 0*	0*	
		185	42		600	400	400		(F) 400
		240	42						
	Three core ^[12]	300	48	750	600	600	(R) 500	250	
		400	48				(F) 600		
		150	85						
		185	85						

D1 and D2 for inlet from the front (F) for from the rear (R).

D3 and D4 for side inlet.

D5 Clearance to rear wall.

(*) Cubicles installed on 65 mm auxiliary section.

Dimensions in mm

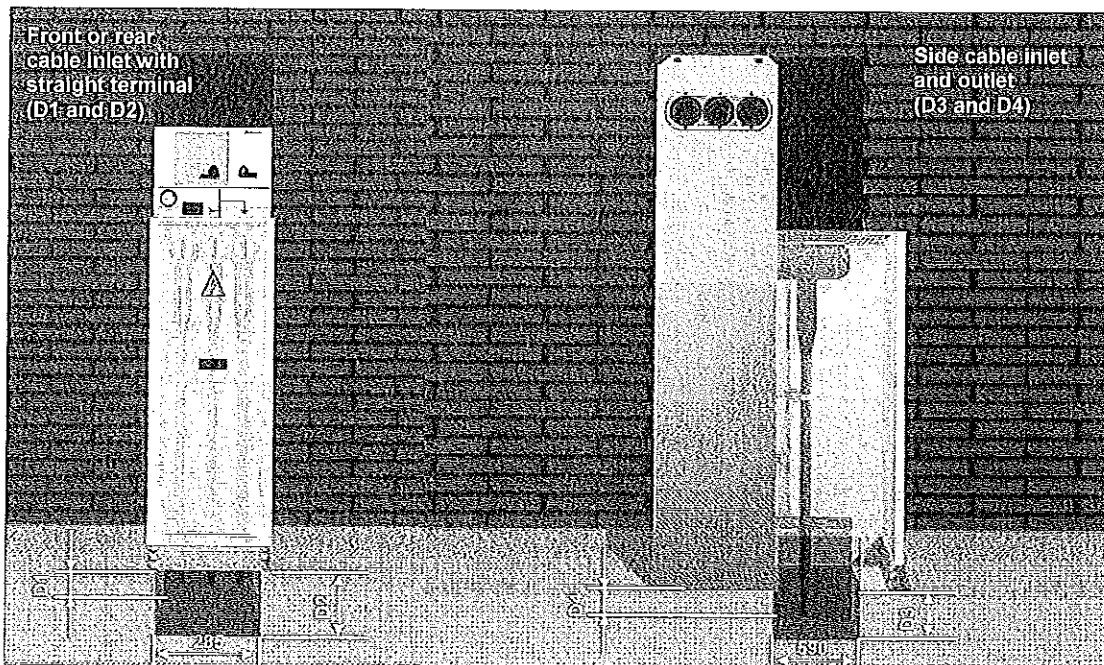
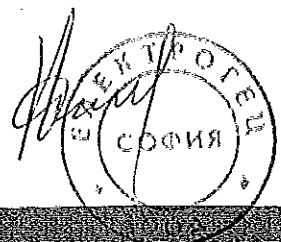


Figure 4.2: Trench distances in CGMCOSMOS-L

^[11] Bear in mind the cable used in each different installation.

^[12] For other cable sections, consult Ormazabal's Technical - Commercial Department.



DIMENSIONS OF CABLE TRENCH FOR FUSE- PROTECTION CUBICLE [HEIGHT 1300 mm]										
CABLE DATA				APPROXIMATE CURVATURE RADIUS [mm]	LOWER OUTLET		REAR OUTLET			
					Straight 250 A	Straight 630 A	TERMINALS			
D1 or D3		D5								
CABLE INSULATION	CABLE TYPE	CABLE CROSS-SECTION [mm ²]	CABLE DIAMETER [mm]			With cable bracket	Without cable bracket	With cable bracket	Without cable bracket	
Dry insulation	Single core	≤50	38	500	500	Seek advice	500	300	500	300
		70	38							
		95	38							
Dry insulation	Three core	≤95	38	750	c.	750	c.	750	c.	
		150	85							
		185	85							

DIMENSIONS OF CABLE TRENCH FOR FUSE- PROTECTION CUBICLE [HEIGHT 1740 mm; WIDTH 470 mm]										
CABLE DATA				APPROXIMATE CURVATURE RADIUS [mm]	LOWER OUTLET		REAR OUTLET			
					Straight 250 A	Straight 630 A	TERMINALS			
D2 or D4		D5								
CABLE INSULATION	CABLE TYPE	CABLE CROSS-SECTION [mm ²]	CABLE DIAMETER [mm]			With cable bracket	Without cable bracket	With cable bracket	Without cable bracket	
Dry insulation	Single core	≤50	38	500	0* (F) 300	Seek advice	500	300	500	300
		70	38							
		95	38							
Dry insulation	Three core	≤95	38	750	c.	750	c.	750	c.	
		150	85							
		185	85							

(*) Each cable should be checked with manufacturer's data.

D1 and D2 for inlet from the front (F) for from the rear (R).

D3 and D4 for side inlet.

D5 Clearance to rear wall.

(*) Cubicles installed on 65 mm auxiliary section.

(c.) Consult Ormazabal's Technical - Commercial Department.

Dimensions in mm

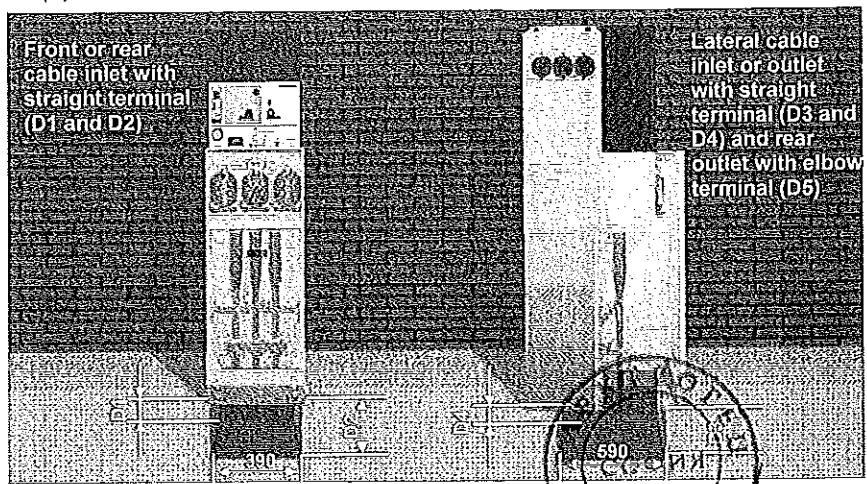


Figure 4.3: Trench distances in CGM COSMOS-P

4.3. FLOOR ANCHORING

The floor must be well levelled for assembling the cubicles in order to prevent distortions that make it difficult to connect it to the rest of the cubicles.

The cubicles can be anchored to the floor in one of two ways:

- a) **On a profile:** If the Transformer Substation floor is not even enough, it is recommended to install the cubicle assembly on an auxiliary profile, which makes it easier to connect it. This profile, which can be ordered, must be anchored to the floor, particularly if there is risk of flooding.

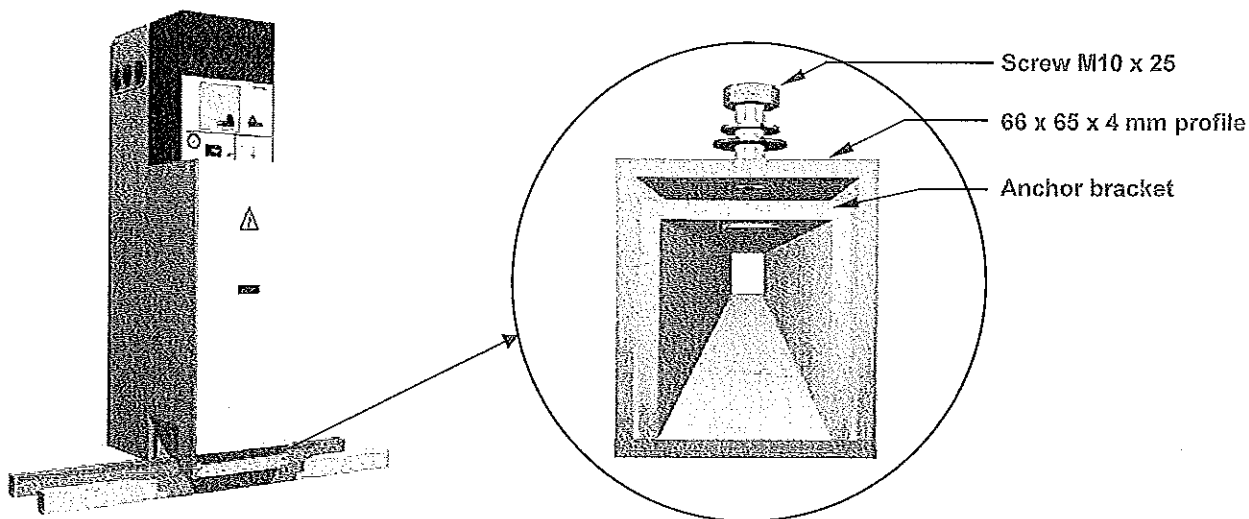


Figure 4.4: Cubicle location on profile

- b) **Without profile:** If the floor is sufficiently even, the cubicles can be directly anchored to it.

The floor anchoring process is as follows:

1. The cubicle switch must be in the earthed position^[13]

Note: The cubicles are delivered with the switch in the Earthed position by default, expect the circuit breaker cubicle.

^[13] Refer to section 5. Operations Sequence.

2. Then remove the lower cover pulling it upwards until it comes off.

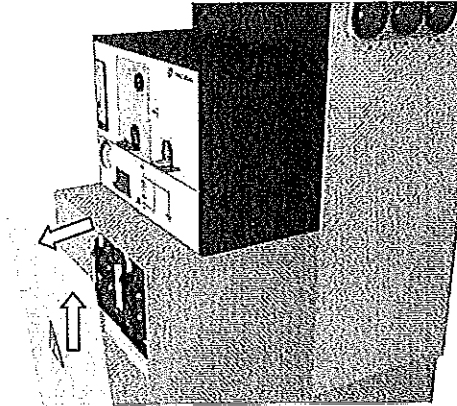


Figure 4.5: Removing the lower cover

3. Position and secure the angle brackets supplied with the equipment and secure to the floor so that, once the anchoring procedure is completed, they lie approximately in the middle of the rear gas outlet. One angle bracket per functional unit is positioned and two in the case of the compact cubicles.

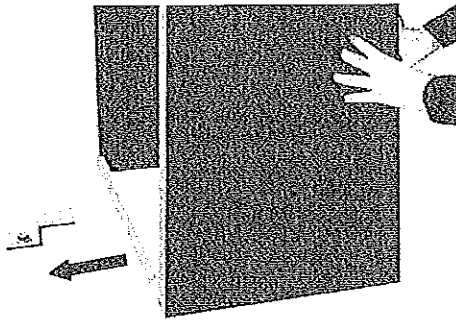


Figure 4.6: Push from the front of the cubicle

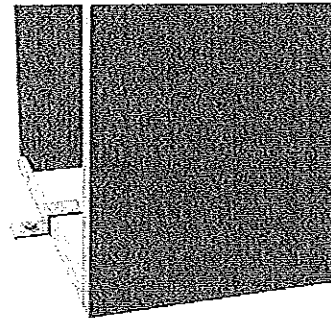


Figure 4.7: Cubicle with the angle bracket in the central position

4. Anchor the first cubicle to the floor of the Transformer Substation with the screws in the points prepared on its base^[14]. In this way, movements or vibrations due to causes such as short circuits, the possible flooding of the Transformer Substation, etc. are avoided.

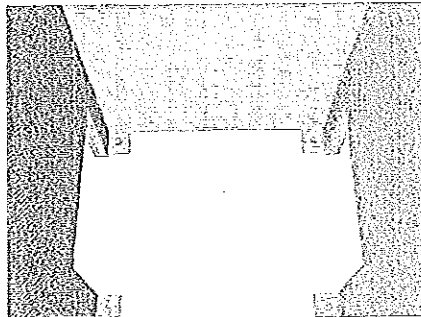


Figure 4.8: Angle bracket point location in CGMCOSMOS cubicles

^[14] Refer to section 1.3. Mechanical Characteristics.



After the levelling, the assembly of the group only requires mechanical and electrical coupling between the cubicles and their subsequent anchoring to the floor as indicated in point 4 of this sequence.

4.4. CONNECTION BETWEEN CUBICLES

The connecting set used for the electrical and mechanical connection of the cubicles is called ORMALINK. This component patented by Ormazabal enables the connection of the CGMCOSMOS system cubicles' busbar without the need for replacing SF₆ gas.

The ORMALINK is composed of three plug-in elastomer adapters that can be mounted between the female bushings (busbar outlets) at the sides of the cubicles being connected, in order to provide continuity to the busbar and seal the connection, monitoring the electric field.

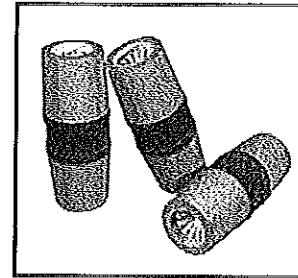


Figure 4.9: ORMALINK connecting set

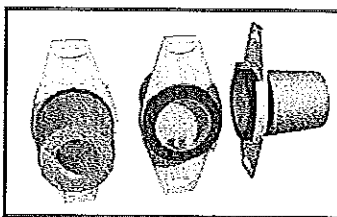


Figure 4.10: End Plugs

As long as the Transformer Substation is not enlarged, the extendable cubicles of the ends of the assembly must have sealing components (end plugs) for the female bushings.

For the correct operation of the cubicle joining or the installation of the CGMCOSMOS system's final plugs, ensure that you have the following basic tools handy:

- 2 12-13 spanners
- 1 Torque wrench with "13" and "10" nozzles
- 1 Rod or sturdy screw
- 1 Bottle of alcohol
- 1 Dry lint free cloth or strong paper
- 1 Plastic mallet

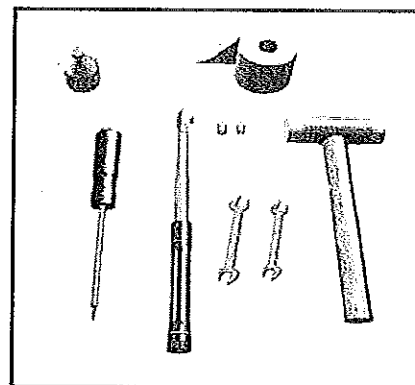


Figure 4.11: Necessary material

4.4.1. Assembly of the Connecting Set

The Connecting Kit is made up of the following components:

- 3 ORMALINK
- 3 Protection rings
- 3 Earthing springs
- ORMALINK positioning tool
- Associated nuts and bolts:
 - 8 x M8 x 20
 - 2 x M8 x 30
- Earthing bar
- Klüber Proba 270 Syntheso Silicone Grease

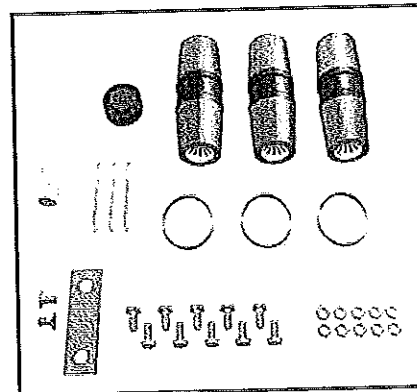


Figure 4.12: Kit contents

To assemble the CGMCOSMOS system cubicles, the cubicle to be connected to the existing assembly (fixed cubicle) must be brought over and the indicated assembly sequence followed:

- 1) Make the inside of the female bushings visible and clean them avoiding any remains of dust or dirt using a cloth soaked in alcohol.

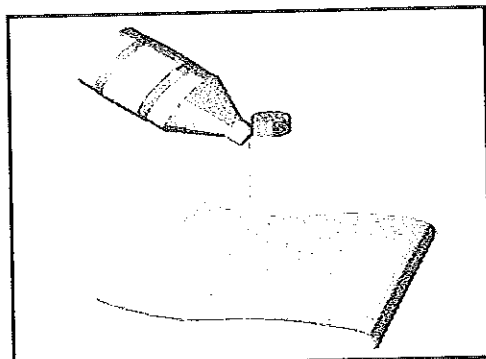


Figure 4.13: Soak the cloth in alcohol

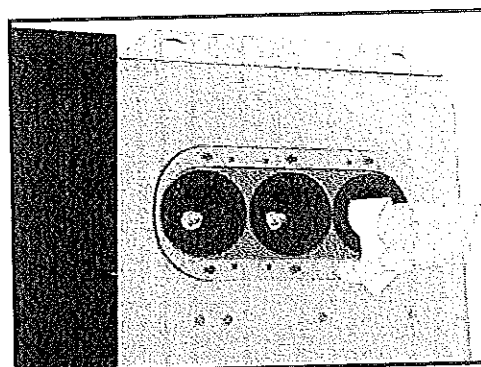


Figure 4.14: Cleaning inside the female bushing

- 2) Repeat this process with the outer conical parts of the ORMALINK, which are subsequently placed inside each female bushing.

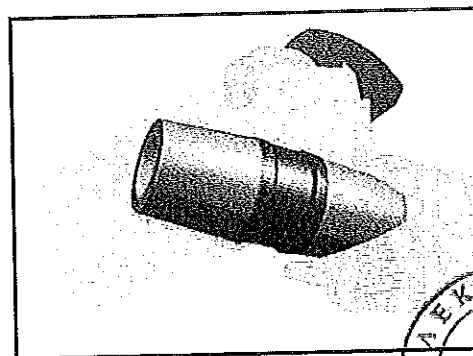
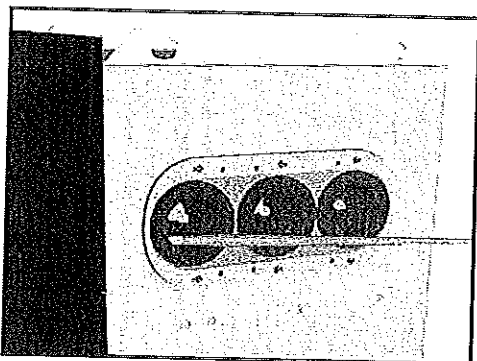


Figure 4.15: ORMALINK cleaning

⚠ IMPORTANT:

Rubbing or scratching the ORMALINK's black semiconductor part of the must be avoided.



3) Apply the silicone grease supplied in the accessory kit (Syntheso Proba 270), on all the inner surface of the female bushings, taking special care to avoid getting it on the busbar connection points.

Figure 4.16: Application of Syntheso Proba 270 silicone grease

4) One spring per female bushing must be used in each fixed cubicle.

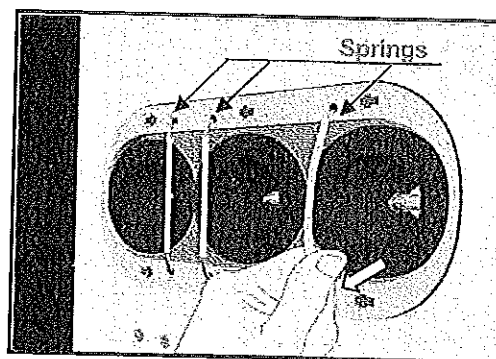
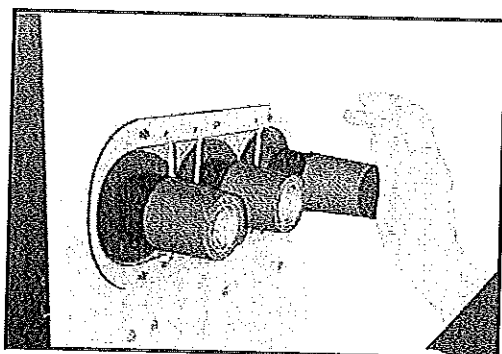


Figure 4.17: Springs



5) Insert an ORMALINK into each female bushing, pushing it with the positioning tool.

Figure 4.18: ORMALINK insertion process

6) Insert the protection ring in the central area of each ORMALINK.

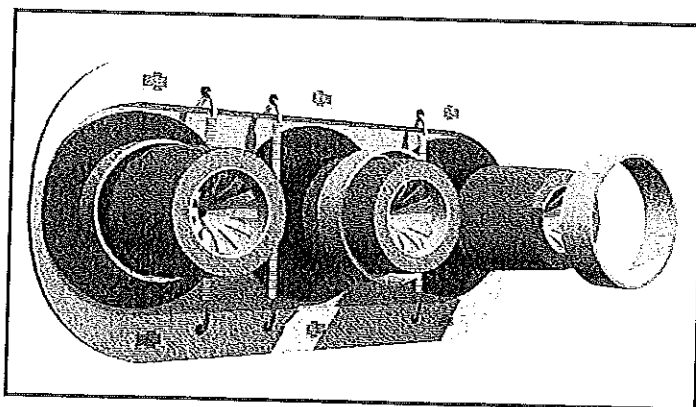


Figure 4.19: Protection ring detail



7) When the cubicles are aligned and perfectly levelled, move the cubicle to be joined toward the cubicle in its final position without forcing, making sure that the ORMALINK enter the three bushings.

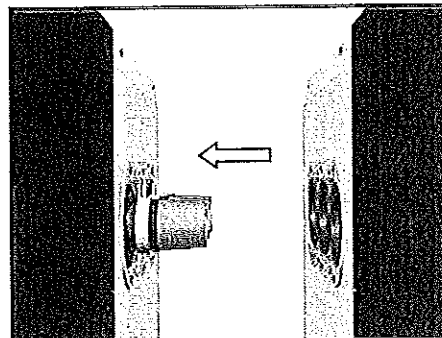


Figure 4.20: Correct cubicle alignment

8) Position the M8 x 20 nuts and bolts for the cubicle anchoring up side down, with the help of a rivet or sturdy screwdriver.

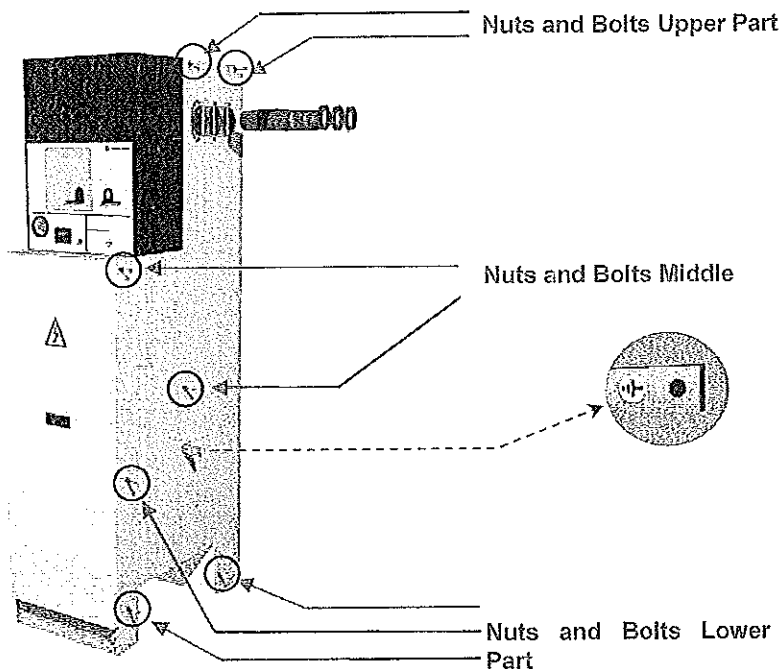


Figure 4.21: Detail of the assembling nuts and bolts points

The M8 x 30 metrics screws are used in the upper part of the cubicle.

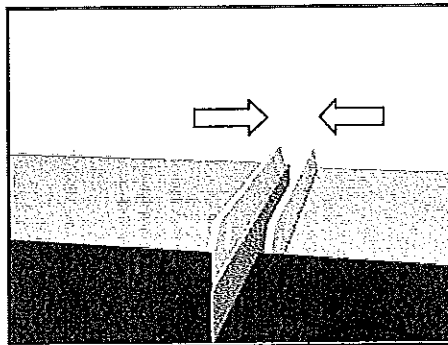


Figure 4.22: Position the upper part screws

9) Connect each cubicle's earthing between the bases, introducing the corresponding interconnection strips in their respective holes, situated on the side of the cubicle's cable compartment, helped with a rivet or sturdy screwdriver (do not position the screws).

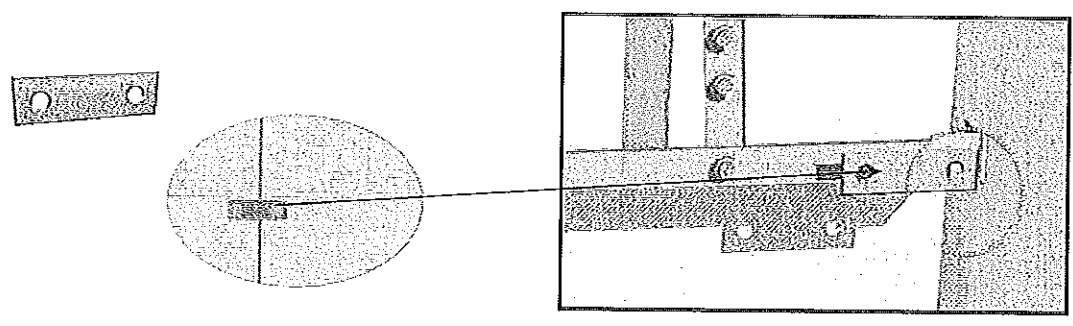


Figure 4.23: Earthing connection bar positioning

10) Tighten the nuts and bolts downwards applying 25 Nm in all the connection points.

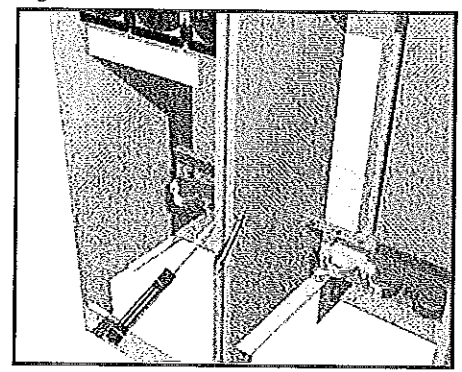


Figure 4.24: Connecting point of the base cubicles

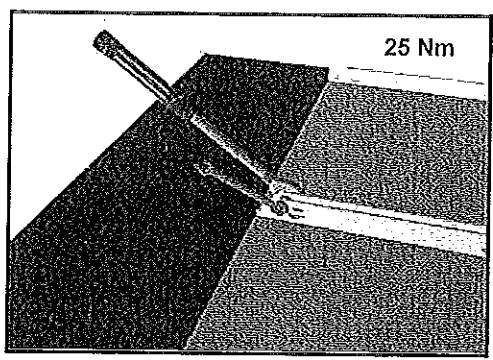


Figure 4.25: Upper part tightening

11) Apply a tightening torque of 25 Nm in all the connection points and earthing bar connection points.



4.4.2. Cubicle End

The end plug kit contains the following components:

- 3 Insulating plugs
- 6 Plastic Plugs
- Nylon thread
- Side cover
- End earthing bar
- Associated nuts and bolts
- Klüber Proba 270 Syntheso Silicone Grease

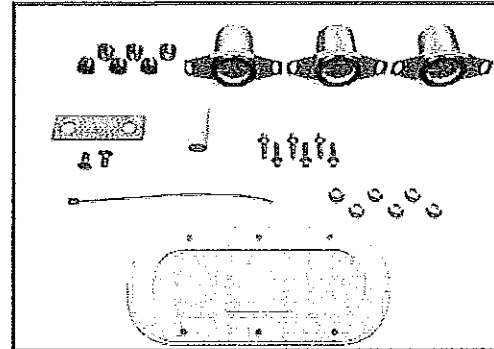


Figure 4.26: Kit contents

The end plugs must be placed in the assembly's last extendable cubicle female bushings if it is not going to be extended.

The end plug positioning process is as follows:

- 1) Make the inside of the female bushings visible and clean them avoiding any remains of dust or dirt using a cloth soaked in alcohol.
- 2) Repeat this process with the outer parts of the insulating plugs, which will subsequently be inserted in each of the female bushings.

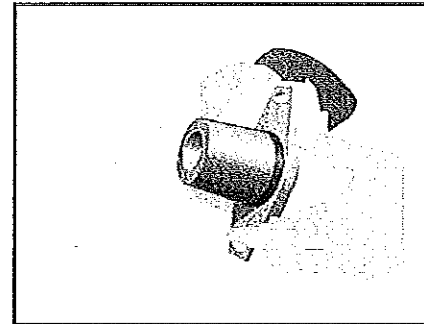


Figure 4.27: Final plugs in CGMCOSMOS cubicles

- 3) Apply the silicone grease supplied in the accessory kit (Syntheso Proba 270), on all the inner surface of the female bushings, paying special attention to not getting it on the busbar connection points. Then position the 6 screws (special head), to secure the plugs in the position indicated in Figure 4.28. Pay special attention to positioning the 2 long screws in the central phase.

- 4) Insert the nylon thread, followed by the end plug, taking the thread out whilst putting pressure on the cover, so extracting the air.

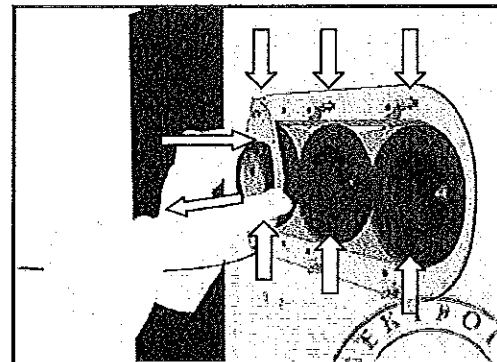
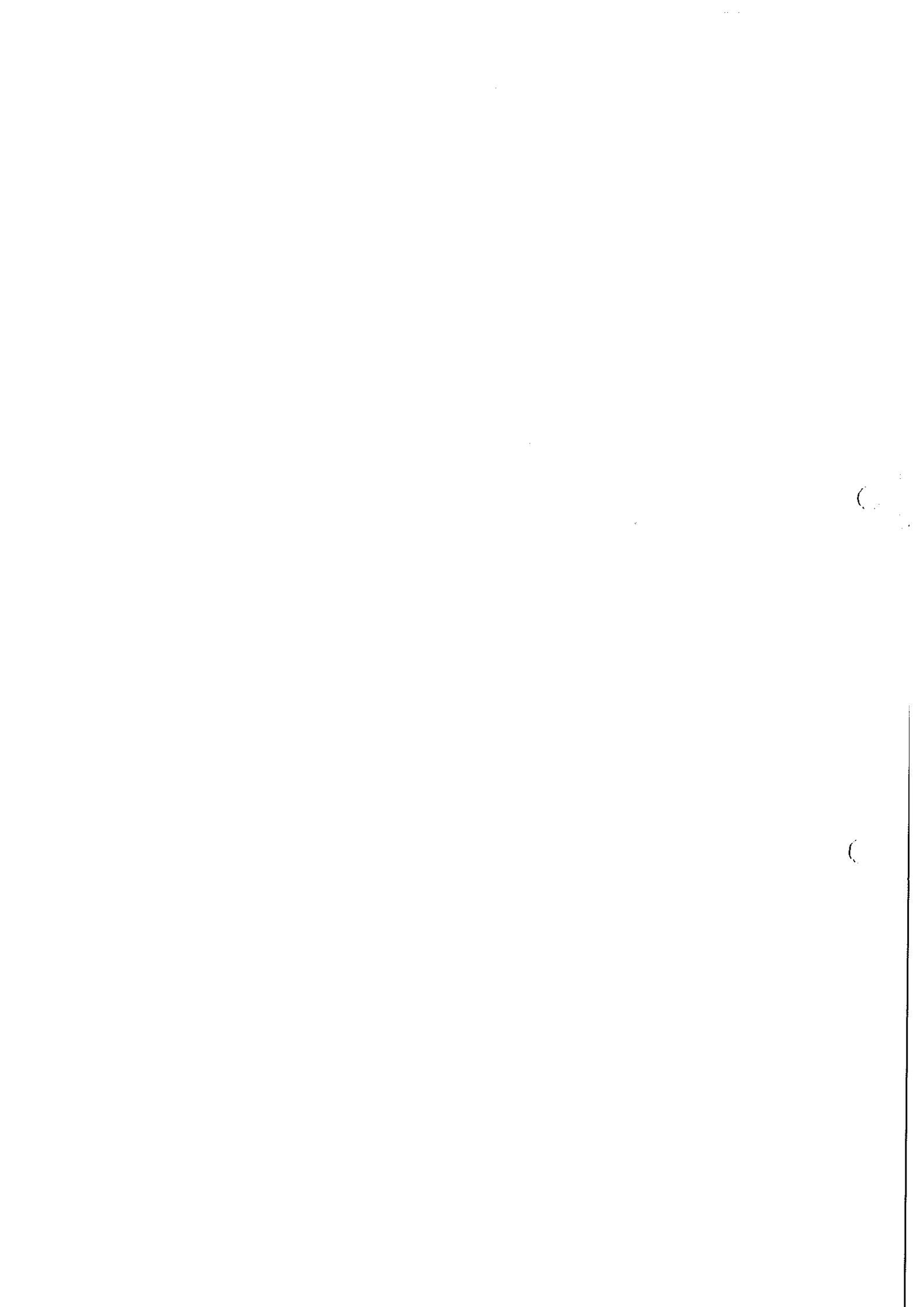


Figure 4.28: Air extraction



5) Screw and fasten the corresponding plugs with M6 screws (special head) and M6 nuts with an incorporated washer, using a tightening torque of 6 Nm.

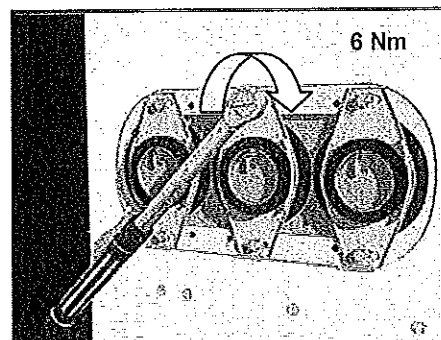
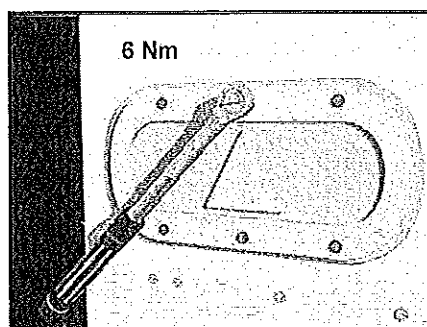


Figure 4.29: Plug tightening



6) Position and secure the end cover with the two M6 nuts with an incorporated washer.

Figure 4.30: Tightening the sealing end covers

7) Position the end earthing bar in the end busbar with an M8x20 screw with an incorporated washer, and use a tightening torque of 25 Nm.

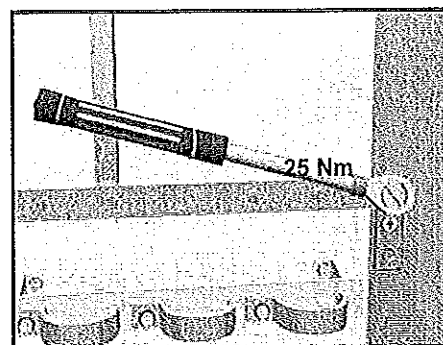


Figure 4.31: End earthing bar positioning

8) Finally, cover the holes for riveting the cubicles with the plastic plugs with the help of a mallet.

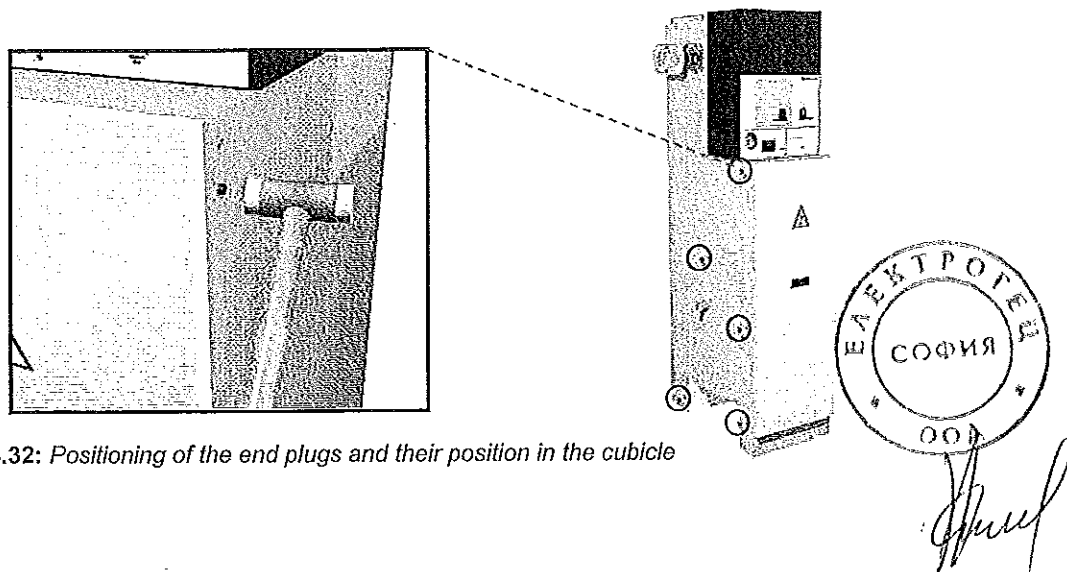


Figure 4.32: Positioning of the end plugs and their position in the cubicle

4.5. EQUIPMENT EARTHING

Connect the general earthing bar as indicated in the following figure.

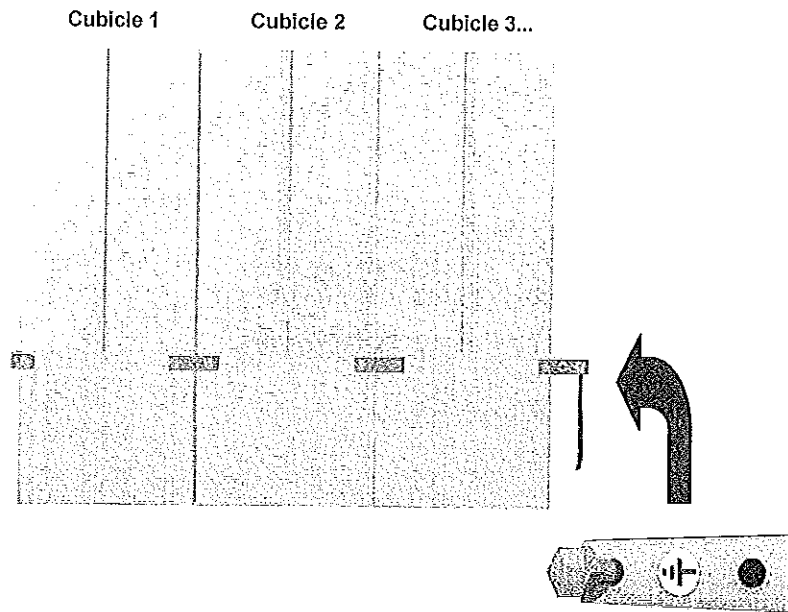


Figure 4.33: Equipment Earthing

Connect the final earthing strip, marked with an ⚡ to the Transformer Substation's general earth connection.

⚠ ATTENTION!
Equipment earthing is an essential condition for safety.



4.6. CABLE CONNECTION

The MV incomings and outgoings to the transformer or, in some cases, to other cubicles must be implemented with cables. These cables can be connected to the respective cable bushings in the CGMCOSMOS system cubicles with either simple (plug-in) or reinforced (bolted) connection terminals, IEC type or complying with IEEE-386^[15].

⚠ ATTENTION:

Energised connectors must never be touched, even in the case of shielded connectors. Shielding does not constitute protection against direct contacts.

When the equipment is in service and a reserve cubicle is left with voltage in the upper busbar and without the cables in the lower bushings, it is necessary to install insulating plugs on the bushings (EUROMOLD type) or position the disconnector in the earthed position and lock this position with a padlock.

4.6.1. Horizontal Front Connection

1. Connect the earthing switch.
2. Remove the cover to access the cable compartment.
3. Connect the terminals on the front cable bushings and secure the cables with the cable bracket and respective clamp.
4. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
5. Put the cable compartment cover back into place.

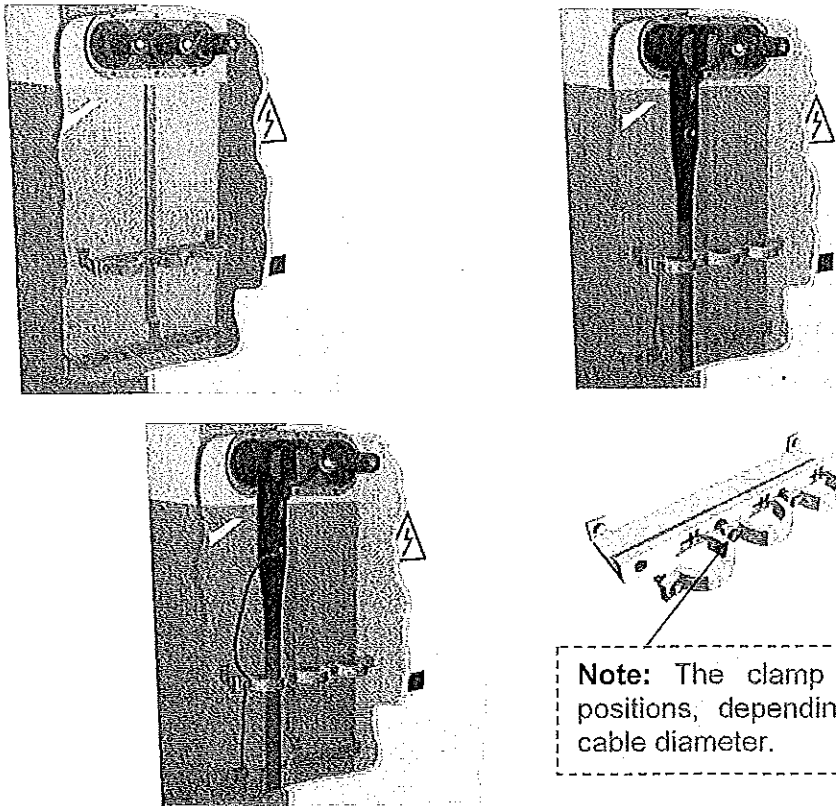


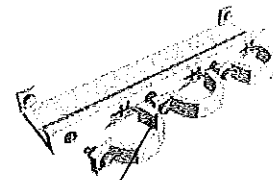
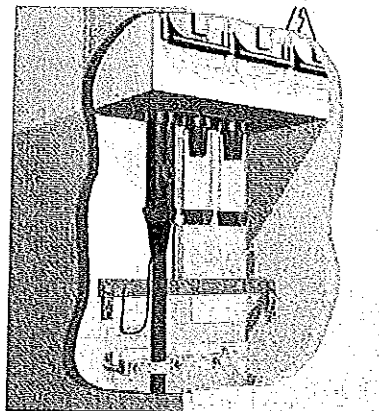
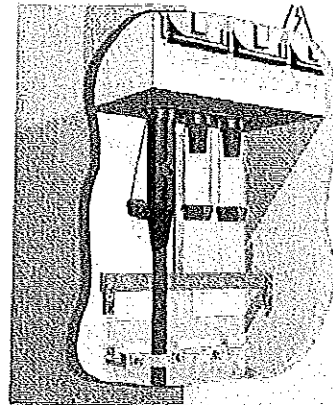
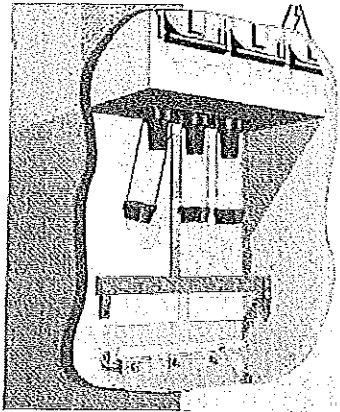
Figure 4.34: Horizontal front connection process

^[15] Refer to section 4.6.3 Types of Bushings.

4.6.2. Vertical Front Connection

▪ Bottom Outlet Connection: Straight Terminal

1. Connect the earthing switch.
2. Remove the cover to access the cable compartment and install the fixing pins used to secure the terminals. Turn them so that the terminals can be installed.
3. Connect the terminals on the bushings and adjust the pins with the tensioner. Then secure the cables with the cable bracket and the clamp.
4. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
5. Put the cable compartment cover back into place.



Note: The clamp has two positions, depending on the cable diameter.

Figure 4.35: Front connection in cubicle protection functional units



▪ Rear Connection in Modular Cubicles

Rear connection in 1300 mm High Modular Cubicles

1. Connect the earthing switch.
2. Remove the front cover to access the cable compartment.
3. Unscrew the four screws of the cable bracket (A) and the rear rack (B). Keep them for subsequent steps.
4. Remove the rear rack and the cable bracket.
5. Anchor the bracket to the rear, using the screws provided (C).
6. Position the terminals' fixing pins (D). Turn the pins so that the terminals can be installed.
7. Connect the terminals on the bushings (E).

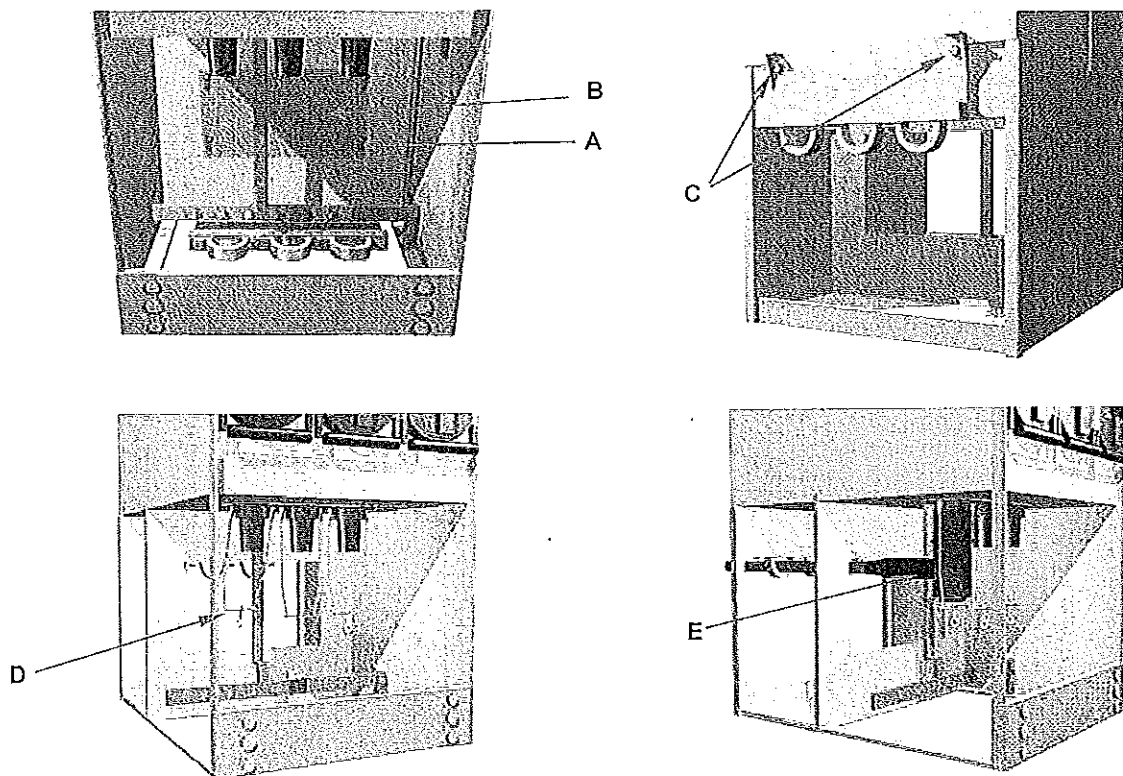


Figure 4.36: Rear connection in 1300 mm high modular cubicles

8. Adjust the pins to the terminals using the tensioner. Likewise, secure the cables with the cable bracket (F).
9. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
10. Install the rear rack removed in step 4, at the front (G), putting it in back to front. The slide slots must fit in the rails of the rack (H). Tighten the screws loosened in step 3.
11. Put the cable compartment cover back into place.



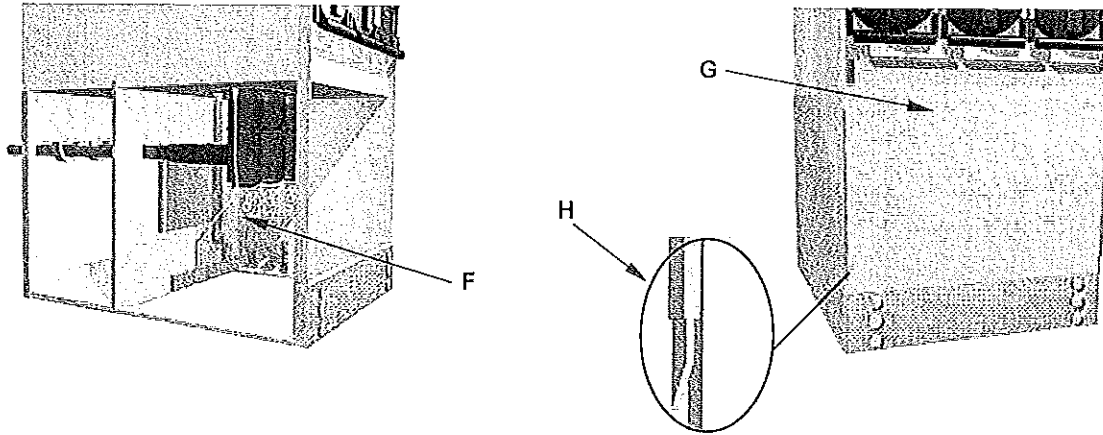


Figure 4.37: Rear connection in 1300 mm high modular cubicles

Rear connection in 1740 mm High Modular Cubicles

1. Connect the earthing switch.
2. Remove the front cover to access the cable compartment.
3. Loosen the rear support rack's (A) screws.
4. Slide the rack to open the holes or dismantle it for easier assembly.

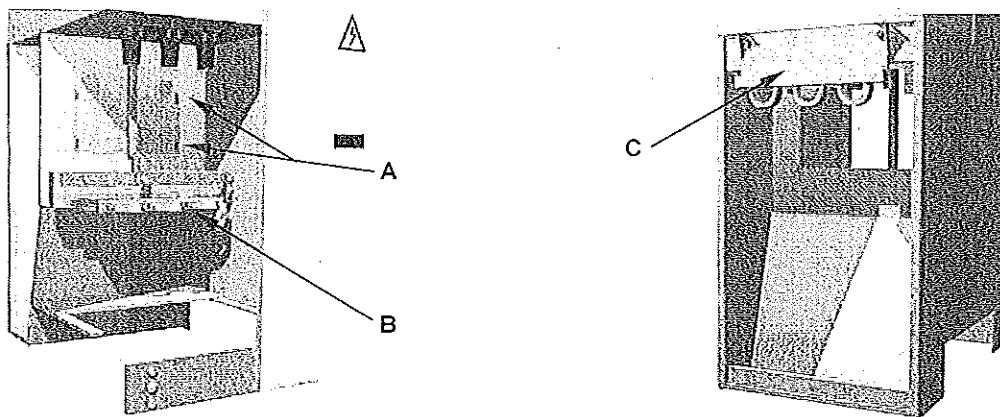


Figure 4.38: Rear connection in 1740 mm high modular cubicles

5. Remove the cable bracket (B) and place it at the rear of the cubicle (C).
6. Position the terminals' fixing pins (D). Turn the pins so that the terminals can be installed.
7. Connect the terminals on the bushings (E).
8. Cinch the pins to the terminals using the tensioner (F).
9. Adjust the two parts of the support rack to the cable size and tighten the screws.
10. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
11. Put the cable compartment cover back into place.



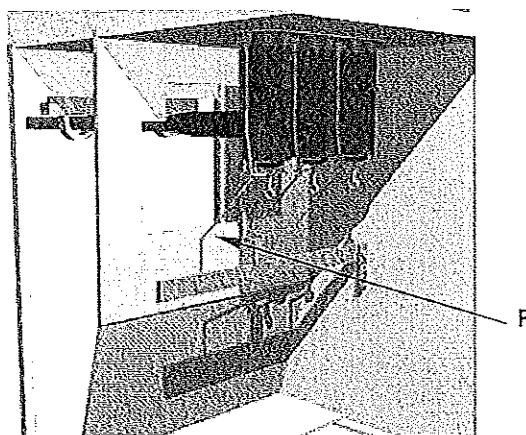
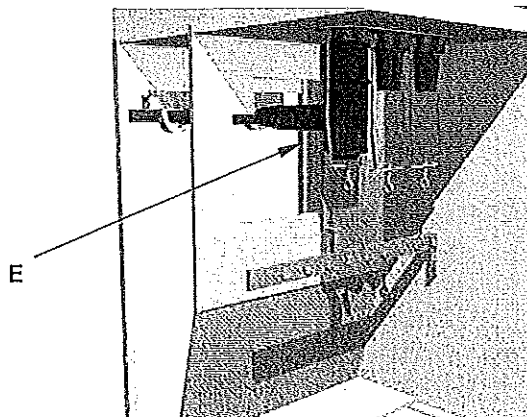
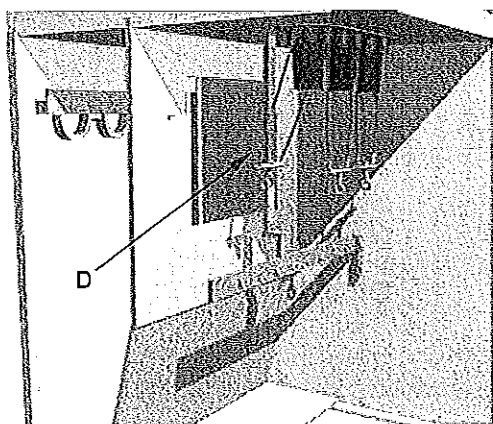
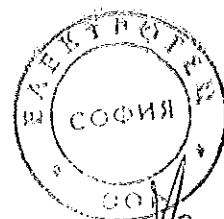


Figure 4.39: Rear connection in 1740 mm high modular cubicles



▪ Rear Connection in Compact Cubicles

Rear Connection in 1300 High Compact Cubicles

1. Connect the earthing switch.
2. Remove the front cover to access the cable compartment.
3. Remove the rear rack (A).
4. Remove the cable bracket (B) and attach it at the rear (C).
5. Place the rear rack in the lower part of the cubicle (D).
6. Position the terminals' fixing pins (E). Turn the pins so that the terminals can be installed.
7. Connect the terminals on the bushings (F).
8. Cinch the pins to the terminals using the tensioner (G).
9. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
10. Put the cable compartment cover back into place.

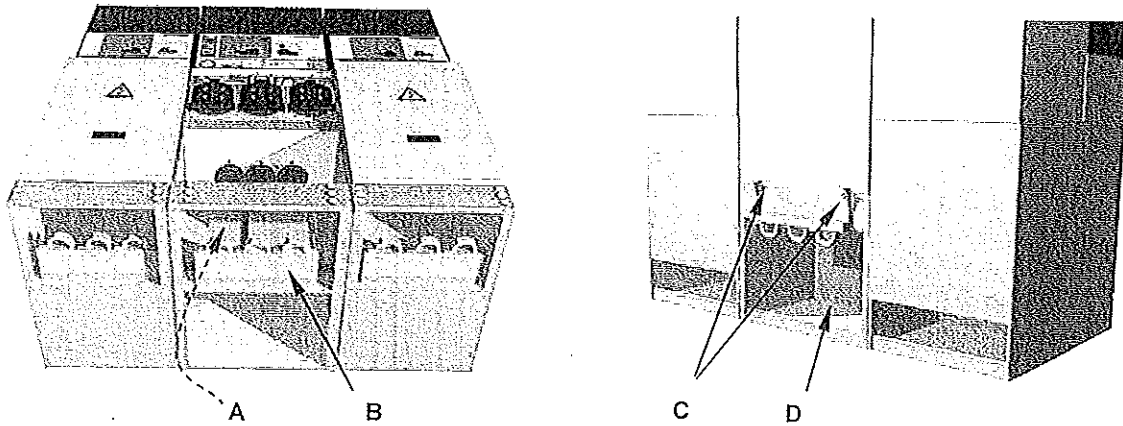


Figure 4.40: Rear connection in 1300 mm high compact cubicles

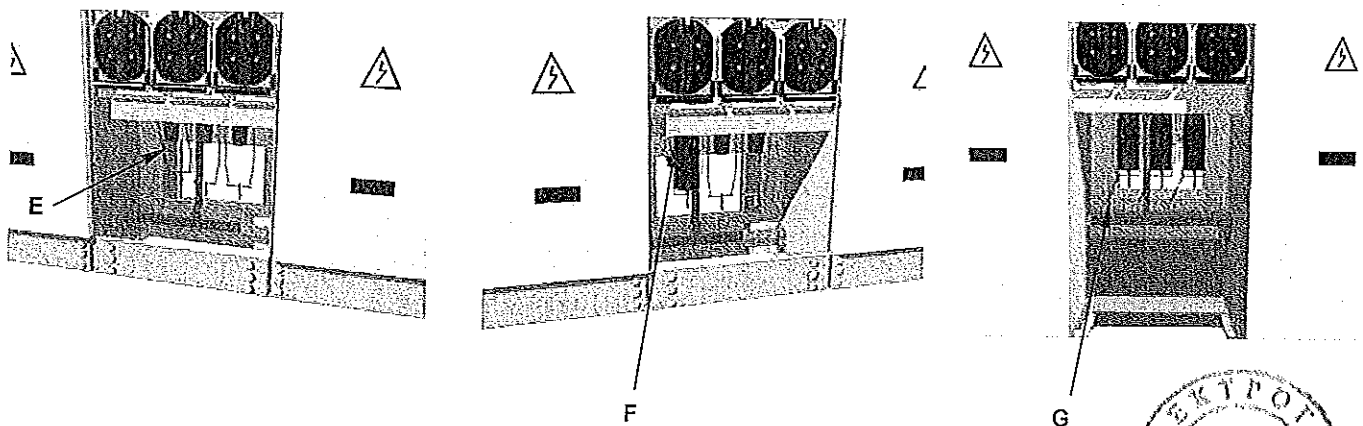


Figure 4.41: Rear connection in 1300 mm high compact cubicles



Rear Connection in 1740 mm High Compact Cubicles

1. Connect the earthing switch.
2. Remove the front cover to access the cable compartment.
3. Remove the rear rack (A).
4. Remove the cable bracket (B) and attach it at the rear (C).
5. Place the rear rack in the rear part of the cubicle (D).
6. Position the terminals' fixing pins (E). Turn the pins so that the terminals can be installed.
7. Connect the terminals on the bushings (F).
8. Cinch the pins to the terminals using the tensioner (G).
9. Connect the terminals' earth connectors, if applicable, and the cable screens' earth connectors.
10. Put the cable compartment cover back into place.

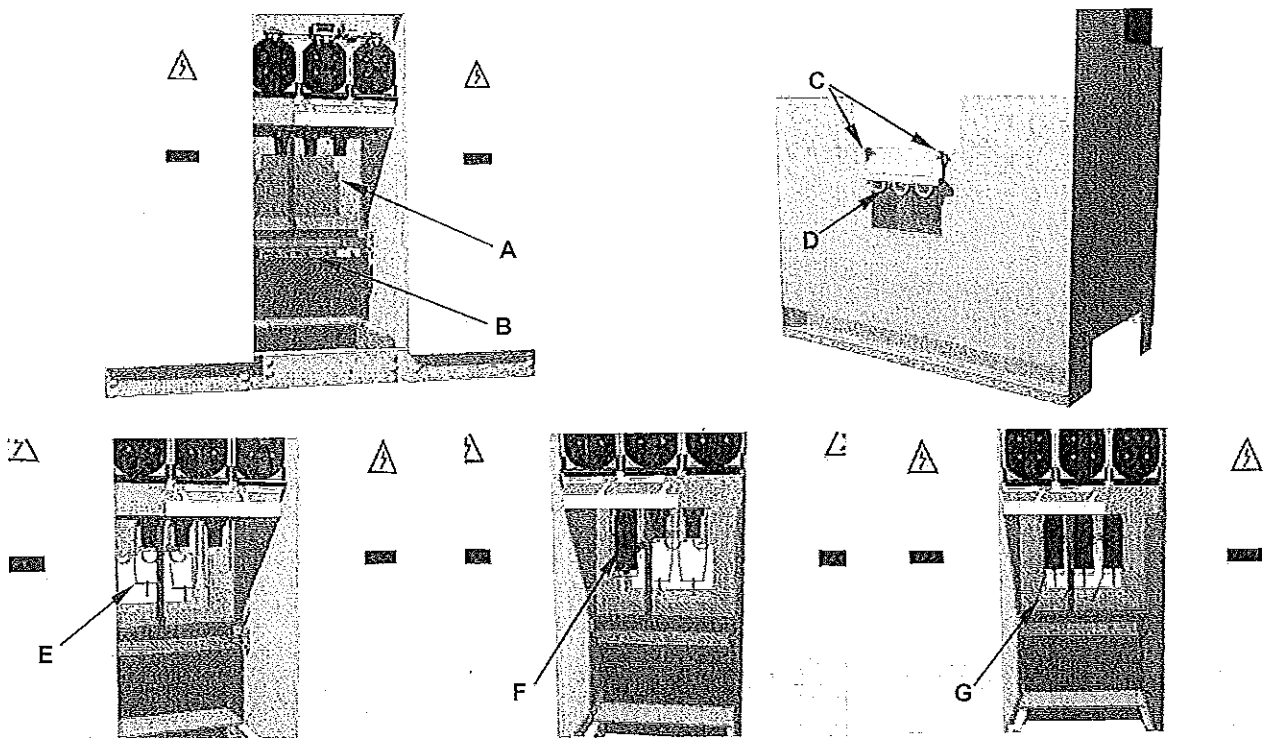


Figure 4.42: Rear connection in 1740 mm high compact cubicles

4.6.3. Types of Bushings

- IEC
- 250 A rated bushings, at 12 and 24 kV, commercial elbow or straight connectors on dry cable. (examples: K158LR, 152SR from Euromold)

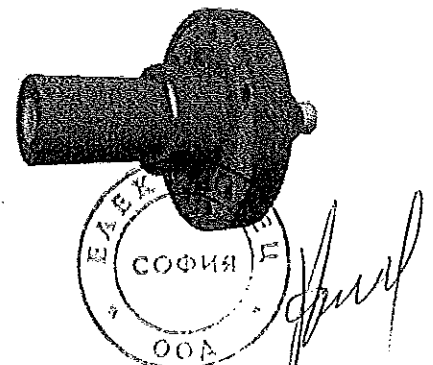


Figure 4.43: 250 A plug bushings

- 400/630 A rated bushings, at 12 and 24 kV, for plugged, shielded and unshielded commercial connectors, on dry cable and oil-impregnated paper insulation cable (examples: K400LR, K400TB from Euromold)

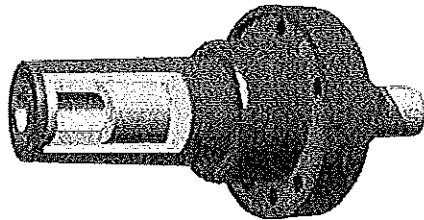


Figure 4.44: 400 A plug bushings

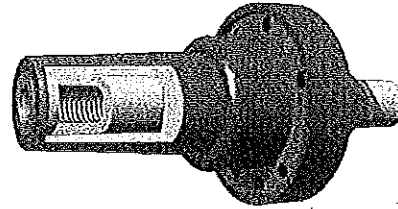


Figure 4.45: 630 A screwable bushings

- **ANSI compatible (IEEE-386 Compliant)**

- 400/630 A rated bushings, at 12 and 24 kV, for commercial elbow or straight connectors on dry cable.

In those cases where connectors are used without earthing between the MV cable and the cubicle, specific adaptors must be requested from Ormazabal^[16].

4.7. METERING TRANSFORMERS

The voltage and current transformers are mounted in the respective position according to the requested diagram, and the types of transformers to be assembled.

The maximum number of transformers that can be installed is 6: three voltage and three current transformers.

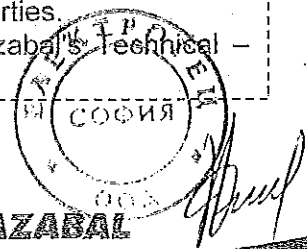
The Metering cubicle accepts the following standard transformers:

	ARTECHE	LABORATORIO ELECTROTÉCNICO	ACTARIS
VOLTAGE	UCH-12 VCL-24 VCJ-24 UCL-24	UCJ-24 UXN-24 UXJ-24 VXJ-24	VKPE-12 VKPE-24 VCF-24
CURRENT	ACD-12 ACF-12 ACD-24 ACF-24 ACJ-24	AED-12 AEB-24P AED-24 AER-24	U24Bha E24Bha U24Bma E24Bma J24BM J24BR J24BQ

⚠ IMPORTANT:

Ormazabal is the manufacturer of this metal enclosure. Ormazabal will not be held responsible for the interconnections or any equipment added by third parties. For any other type of instrument transformers, please contact Ormazabal's Technical – Commercial Department.

^[16] For confirmation, contact Ormazabal's Technical – Commercial department.



4.8. VERIFICATION OF VOLTAGE PRESENCE AND PHASE CONCORDANCE

To verify correct MV cable connection to the Transformer Substation feeder cubicles, Ormazabal's **ekorSPC**^[17] phase comparator must be used.

First, connect the ekorSPC unit's red cables to the same phase test points of the corresponding ekorVPIS^[18] units, and the black cable to the earth test point. This operation must be repeated for all L1, L2 and L3 phases.

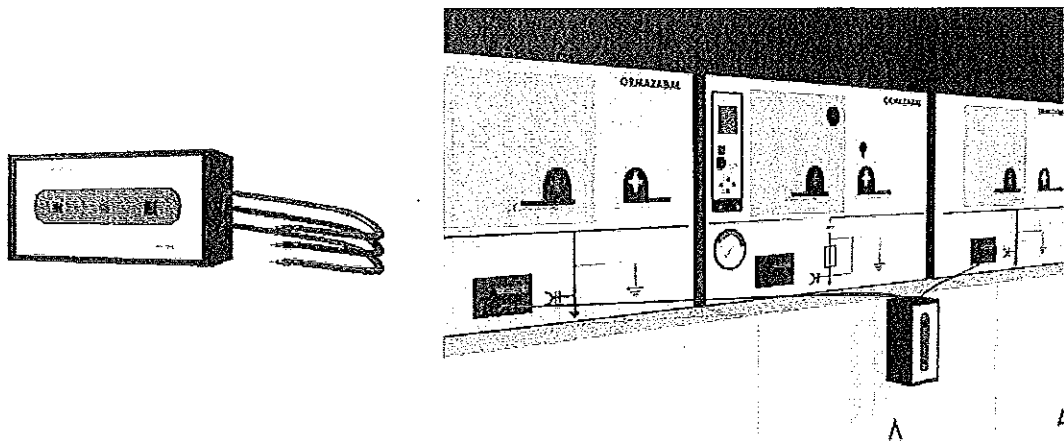
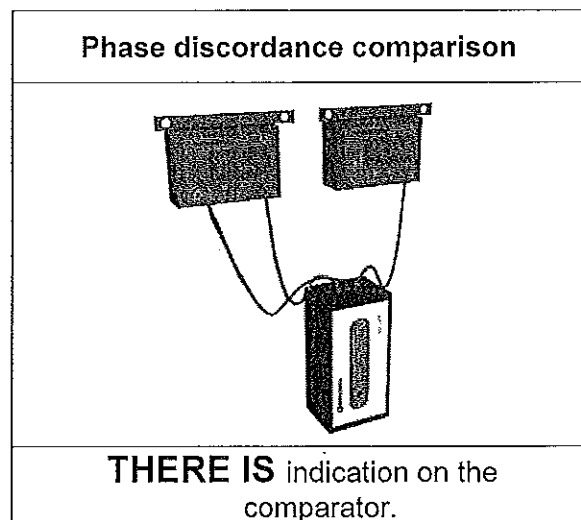
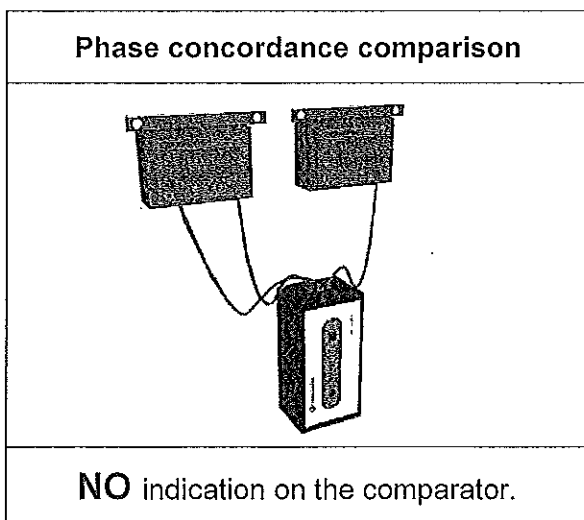


Figure 4.46: ekorSPC



^[17] Optionally, other comparison devices complying with IEC 61958 may be used.

^[18] Refer to section 1.1.1. ekorVPIS – Voltage Presence Indicator Unit.



5. SEQUENCE OF OPERATIONS

⚠ ATTENTION!

Before performing any operation under voltage, check the SF₆ gas using the pressure gauge.

5.1. FEEDER CUBICLE

5.1.1. Disconnection Operation form the Earthing Position

1. Take the yellow slide to its right position (in this way the access for disconnecting the earthing switch is freed).
2. Insert the lever in the earthing switch lever access and turn 90° ANTICLOCKWISE.

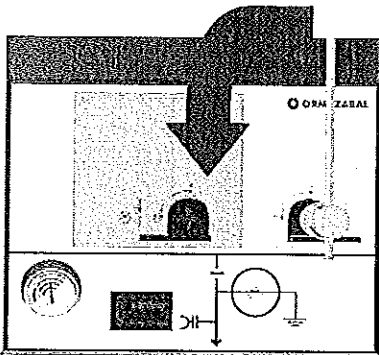


Figure 5.1: Lever Rotation Process

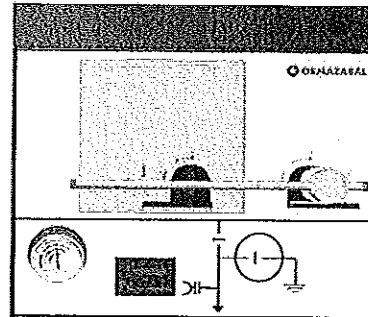


Figure 5.2: Disconnected Earthing Switch

RECOMMENDATION: Although the figure shows the initial moment of the operation with the lever arm vertical, it is advisable to start with the lever arm horizontal and towards the right, in order to make the best use of the force applied by the operator.

5.1.2. Switch Connection Operation from the Disconnected Position

3. Take the black slide from the grey area to its left position (in this way the lever access for connecting the switch is freed).

4. Connection Operation:

4.1. Manual Operation (B Driving Mechanism)

Insert the lever in the switch access (grey area) turn it 90° CLOCKWISE.

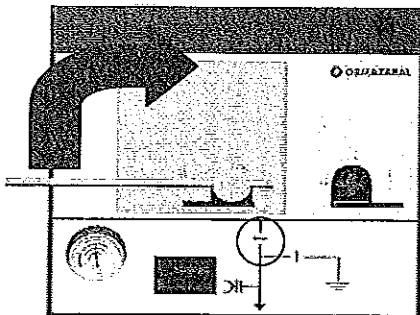


Figure 5.3: Lever Rotation Process

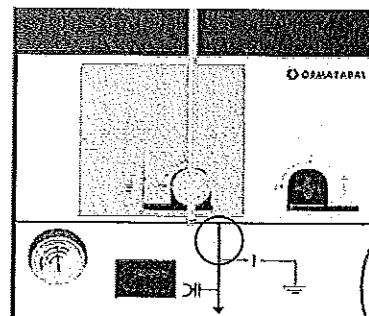


Figure 5.4: Connected Switch-Disconnectör

4.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.

⚠ IMPORTANT:

If for any reason half way through a motorised operation the motor stops, it is essential that the operation be finished manually before starting it up again so that all the mechanism: sensors, controllers, etc. are in a reliable, effective and logical position for the motorisation control system when it is connected again.

5.1.3. Disconnection Operation from Connected Position

5. Take the black slide from the grey area to its left position, in the same way as in the previous situation (in this way the access for connecting the switch is freed).

6. Disconnection Operation

6.1. Manual Operation (B Driving Mechanism)

Insert the lever in the switch access (grey area) turn it 90° ANTICLOCKWISE.

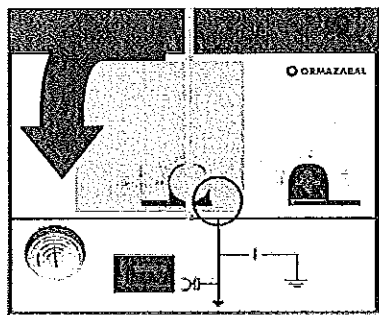


Figure 5.5: Lever Rotation Process

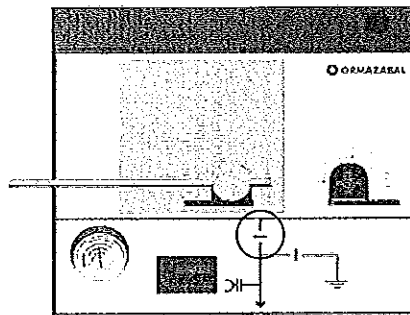


Figure 5.6: Disconnected Switch-Disconnecter

6.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.

5.1.4. Earthing Operation from the Disconnected Position

7. Take the yellow slide in the yellow area to its right position (in this way the lever access for connecting the earthing switch is freed).

8. Insert the lever in the earthing switch lever access and turn 90° CLOCKWISE.

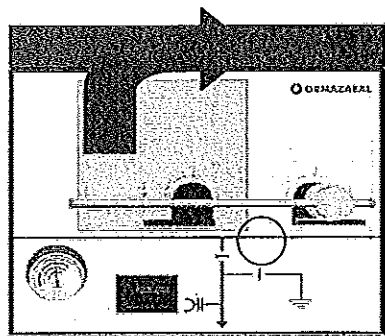


Figure 5.7: Lever Rotation Process

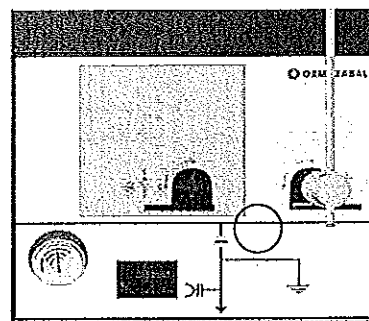


Figure 5.8: Connected Earthing Switch



5.2. BUSBAR SWITCH FUNCTION

5.2.1. Switch Connection Operation from the Disconnected Position

1. Take the black slide from the grey area to its left position (in this way the lever access for connecting the switch is freed).

2. Connection Operation:

2.1. Manual Operation (Driving Mechanism B)

Insert the lever in the Switch access and turn it 90° CLOCKWISE.

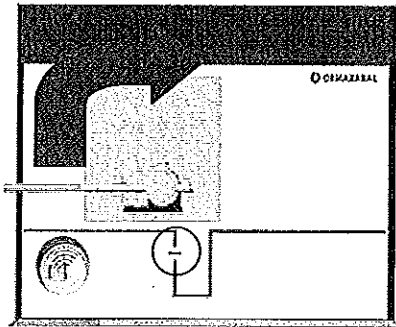


Figure 5.9: Lever Rotation Process

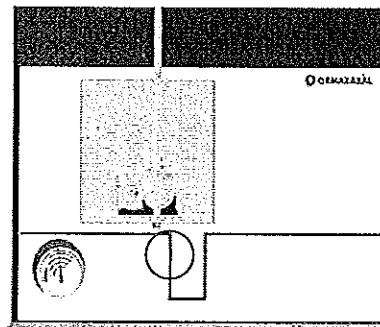


Figure 5.10: Connected Switch-Disconnecter

2.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.

5.2.2. Disconnection Operation from Connected Position

3. Take the black slide from the grey area to its left position (in this way the access for disconnecting the switch is freed).

4. Disconnection Operation

4.1. Manual Operation (B Driving Mechanism)

Insert the lever in the Switch access and turn it 90° ANTI CLOCKWISE.

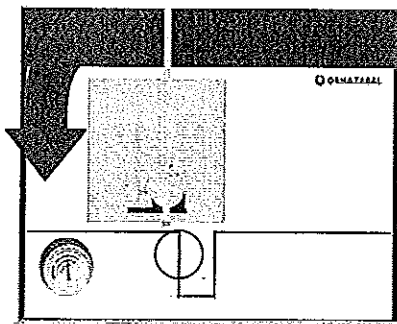


Figure 5.11: Lever Rotation Process

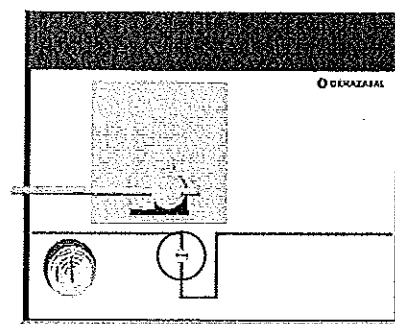
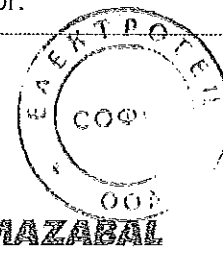


Figure 5.12: Disconnected Switch-Disconnecter

RECOMMENDATION: Although the figure shows the initial moment of the operation with the lever arm vertical, it is advisable to start with the lever arm horizontal and towards the right, in order to make the best use of the force applied by the operator.

4.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.



5.3. BUSBAR SWITCH WITH EARTHING CUBICLE

5.3.1. Disconnection Operation from the Earthing Position

1. Take the yellow slide to its right position (in this way the access for disconnecting the earthing switch is freed).
2. Insert the lever in the earthing switch lever access and turn 90° ANTICLOCKWISE.

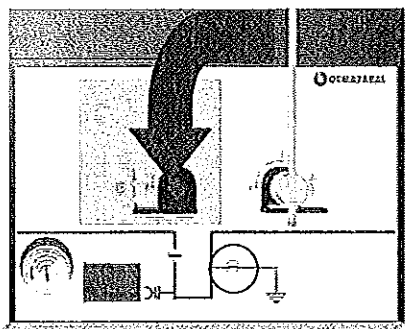


Figure 5.13: Lever Rotation Process

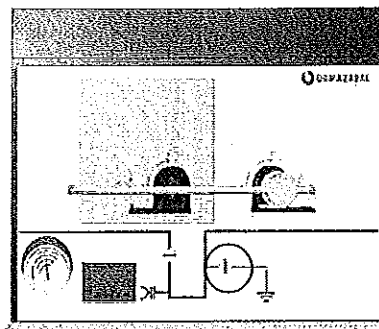


Figure 5.14: Disconnected Earthing Switch

RECOMMENDATION: Although the figure shows the initial moment of the operation with the lever arm vertical, it is advisable to start with the lever arm horizontal and towards the right, in order to make the best use of the force applied by the operator.

5.3.2. Switch Connection Operation from the Disconnected Position

3. Take the black slide from the grey area to its left position (in this way the lever access for connecting the switch is freed).

4. Connection Operation:

4.1. Manual Operation (B Driving Mechanism)

Insert the lever in the switch access (grey area) turn it 90° CLOCKWISE.

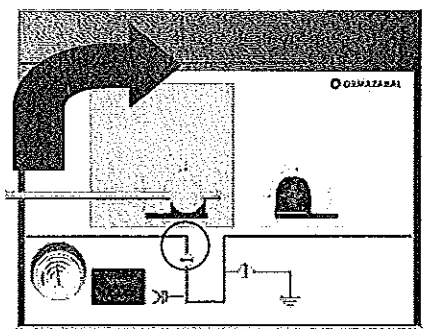


Figure 5.15: Lever Rotation Process

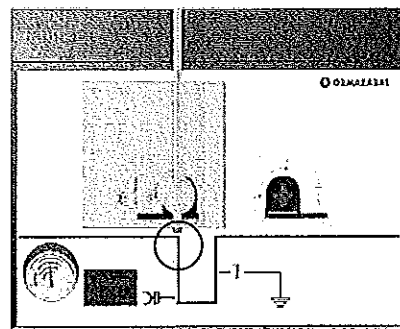


Figure 5.16: Connected Switch-Disconnecter

4.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.



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5.3.3. Disconnection Operation from Connected Position

5. Take the black slide from the grey area to its left position, in the same way as in the previous situation (in this way the access for connecting the switch is freed).

6. Disconnection Operation

6.1. Manual Operation (B Driving Mechanism)

Insert the lever in the switch access (grey area) turn it 90° ANTICLOCKWISE.

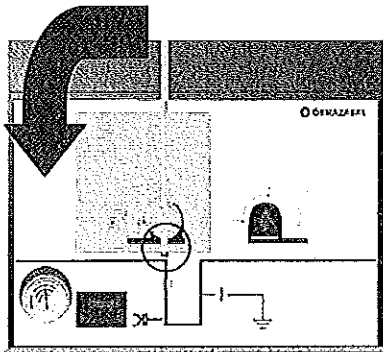


Figure 5.17: Lever Rotation Process

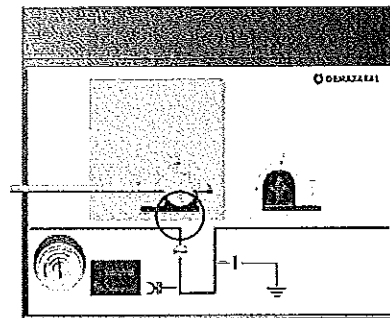


Figure 5.18: Disconnected Switch-Disconnecter

6.2. Motorised Operation (BM Driving Mechanism)

Activate the corresponding operation command.

5.3.4. Earthing Operation from the Disconnected Position

7. Take the yellow slide in the yellow area to its right position (in this way the lever access for connecting the earthing switch is freed).

8. Insert the lever in the earthing switch lever access and turn 90° CLOCKWISE.

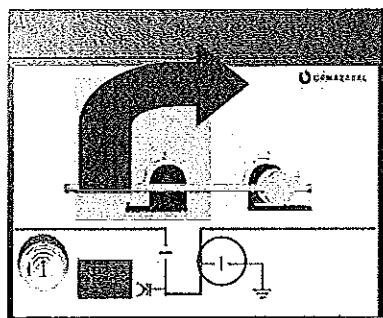


Figure 5.19: Lever Rotation Process

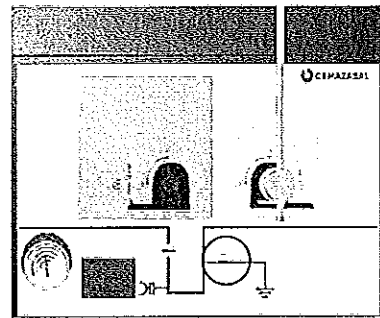


Figure 5.20: Connected Earthing Switch



5.4. FUSE PROTECTION CUBICLE

5.4.1. Disconnection Operation from the Earthing Position

1. Take the yellow slide to its right position (in this way the lever access for disconnecting the earthing switch is freed).
2. Insert the lever in the earthing switch lever access and turn 90° ANTICLOCKWISE.

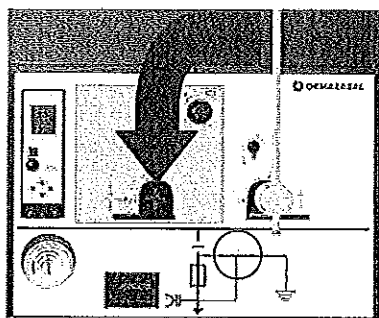


Figure 5.21: Lever Rotation Process

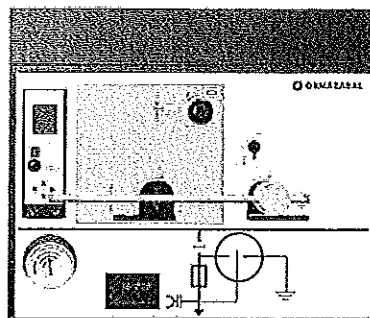


Figure 5.22: Disconnected Earthing Switch

RECOMMENDATION: Although the figure shows the initial moment of the operation with the lever arm vertical, it is advisable to start with the lever arm horizontal and towards the right, in order to make the best use of the force applied by the operator.

5.4.2. Connection Operation from the Disconnected Position

3. Take the black slide from the grey area to its left position (in this way the lever access for connecting the switch is freed)^[19].
4. Carry out the Connection Operation:

4.1. Manual Operation (BR Driving Mechanism)

Insert the lever in the switch access and turn it 90° CLOCKWISE.

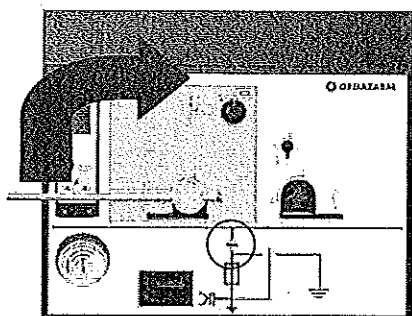


Figure 5.23: Lever Rotation Process

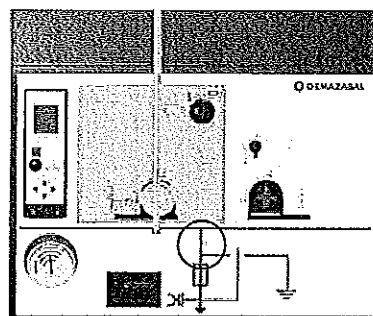


Figure 5.24: Connected Switch-Disconnecter



^[19] The operation of the selector is the same as that of the feeder cubicles.

5.4.3. Spring Charging from the Connected Position

5. The spring charging must be carried out keeping the operating lever in the switch access.

⚠ IMPORTANT:

The access lever cannot be taken out of the switch after connecting it, until the Spring Loading operation has been carried out.

6. Turn the lever ANTICLOCKWISE.

7. Withdraw the switch's access lever.

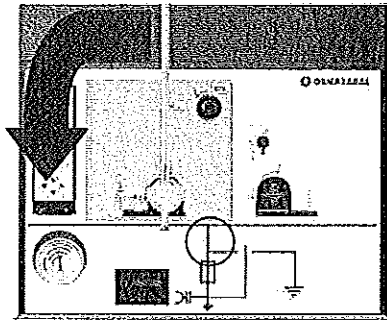


Figure 5.25: Lever Rotation Process

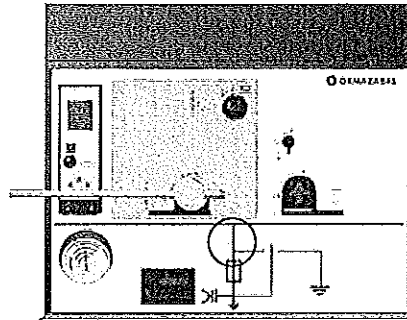


Figure 5.26: Switch Stays Connected

5.4.4. Disconnection Operation from Connected Position

8. With the switch closed and springs loaded.

9. Carry out the Disconnection Operation:

9.1. Manual Operation (BR Driving Mechanism)

Open the switch turning the triggering handle (f), in the position indicated in figure 5.27.

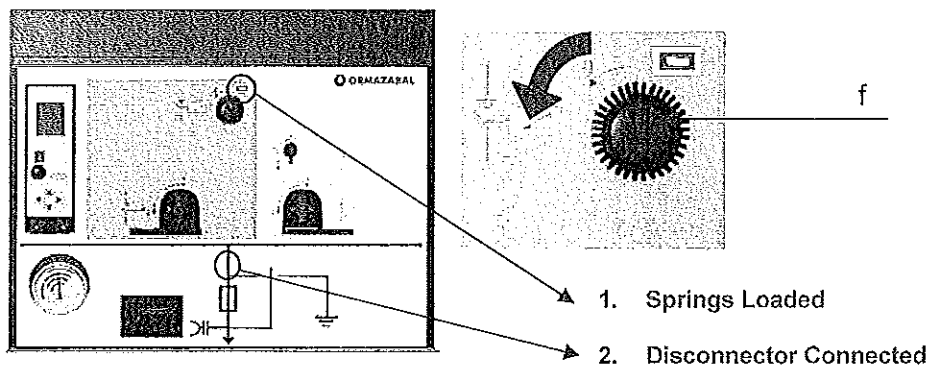


Figure 5.27: Disconnecter Disconnection Operation



5.4.5. Earthing Operation from the Disconnected Position

10. Take the yellow slide to its right position (in this way the lever access for connecting the earthing switch is freed).

11. Insert the lever in the earthing switch access and turn 90° ANTICLOCKWISE.

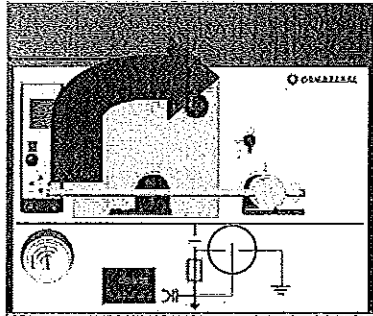


Figure 5.28: Lever Rotation Process

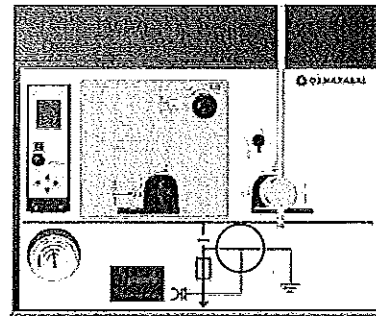


Figure 5.29: Connected Earthing Switch

5.4.6. Selection of Recommended Fuses

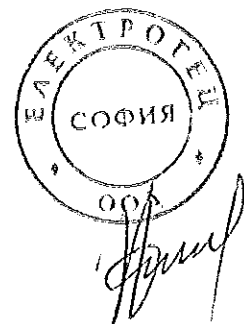
The fuses recommended for use in the CGMCOSMOS-P cubicle are defined according to the trials and tests carried out by the manufacturer. The following table shows the recommended fuse ratings according to the $U_r/P_{transf.}$:

U_r Line [kV]	U_r Cubicle [kV]	U_r Fuse [kV]	Transformer Rated Power WITHOUT OVERLOAD [kVA]																
			25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
			Fuse Rated Current (A) IEC 60282-1																
10	24	6/12	6,3	10	16	16	20	20	25	31,5	40	50	63	63	80	100	160	200	250
13,5	24	10/24	6,3	6,3	10	16	16	20	20	25	31,5	40	50	63	63	80	100	-	-
15	24	10/24	6,3	6,3	10	16	16	16	20	20	25	31,5	40	50	63	80	80	160	-
20	24	10/24	6,3	6,3	6,3	10	16	16	16	20	20	25	31,5	40	50	50	63	80	125

- Recommended SIBA fuses with middle-type striker, as per IEC 60282-1 (low power loss fuses).
- The values for combined fuses, s/ IEC 62271-105 (IEC 60420) appear in bold type.
- The switch-fuse assembly has been tested with heating under normal operating conditions as per IEC 60694.
- There is a fuse holder trolley adapted to the size of the 6/12 kV fuses, which is 292 mm.
- For ratings not in bold type the measurement is 442 mm.
- All three fuses should be changed if any of the fuses blow.
- For overload conditions in the transformer or the use of other makes of fuses, contact Ormazabal's Technical-Commercial department.

Transfer Current in accordance with IEC 60420 (IEC 62271-105):

U_r Fuse [kV]	U_r Cubicle [kV]	$I_{transfer}$ [A]
12	24	2300
24	24	1600



5.4.7. Fuse Replacement Sequence

In order to access the fuse holders, remove the cover of the cable compartment; the earthing switch **must be closed**.

When it is possible to access the fuse holders, perform the following steps:

1. As this is a Combined Switch - Fuse cubicle, if any of the three fuses blows, the Switch - Disconnecter will automatically open.

2. The unmistakable signal for a blown fuse is indicated by the red stripe, which appears on the front of the driving mechanism compartment.

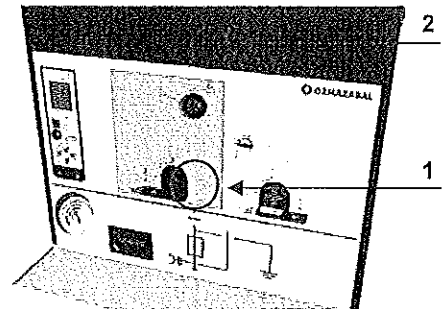


Figure 5.30: Triggering Indication

3. Close the Earthing Switch.

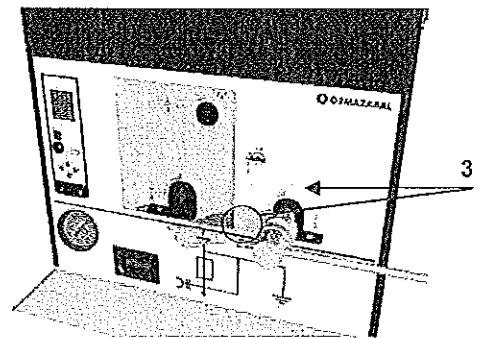


Figure 5.31: Close the Earthing switch

4. Open the access cover to the cable compartment.

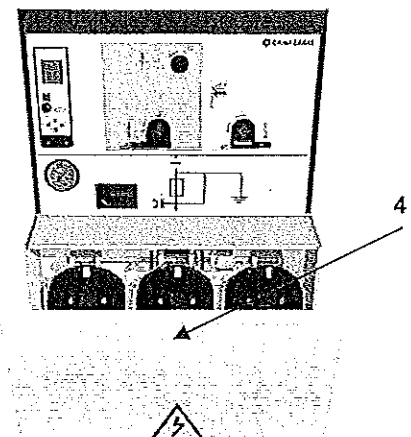


Figure 5.32: Cable compartment cover opening

5. Turn the handle of the fuse-holder cover upwards until the locking clip comes undone and then firmly pull outwards.

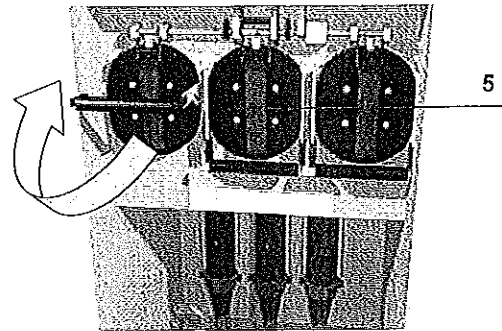


Figure 5.33: Fuse holder opening

6. Press the safety trigger.

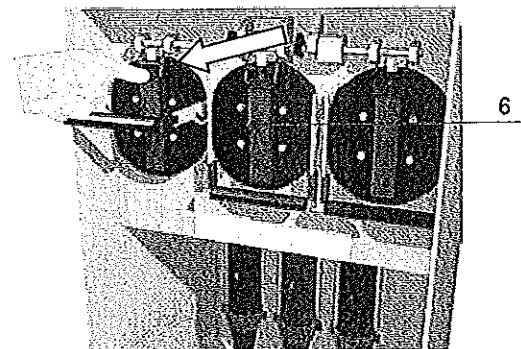


Figure 5.34: Press the safety trigger

7. Pull gently in the horizontal direction until the fuse holder trolley comes out.

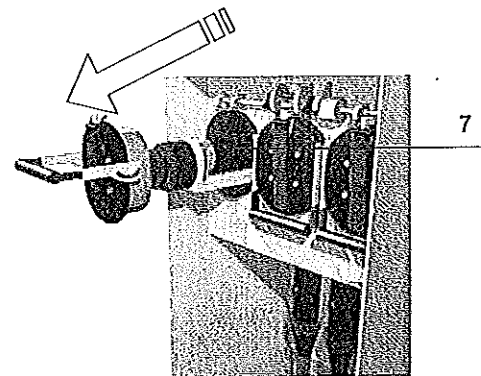


Figure 5.35: Fuse holder trolley withdrawal

8. Replace the blown fuse. Do not rest the trolley on any surface that could soil the rubber seal or the contact.

⚠ IMPORTANT:

Ensure that the side of the new fuse striker pin faces forward (trolley insulator side).
It is advisable to replace the three fuses even though they do not appear to have been damaged.

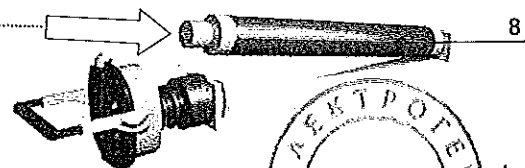


Figure 5.36: MV fuse replacement

9. Insert the fuse-holder trolley.

⚠ IMPORTANT:

Before inserting the trolley, it is important to ensure that both the trolley and the inside of the fuse-holder are clean.

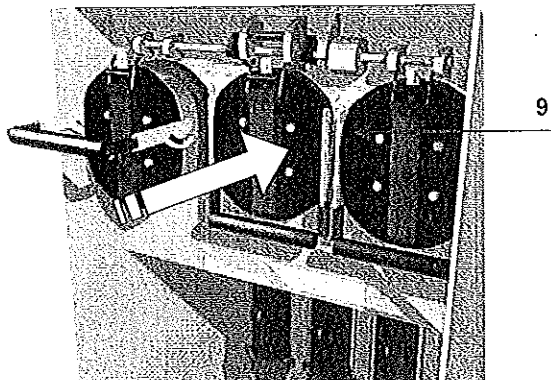


Figure 5.37: Fuse holder trolley insertion

10. Lower the fuse holder handle pushing it until it becomes "attached" to the safety trigger.

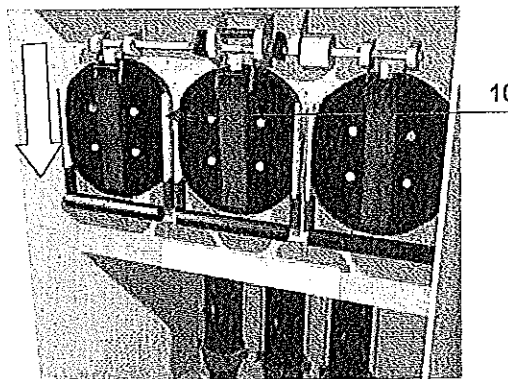


Figure 5.38: Close fuse holder

11. To close the cover, first make sure that the clip is correctly attached and that the fuse holder is correctly positioned. Position the access door to the fuse and cable compartment pulling it upwards until it comes out.

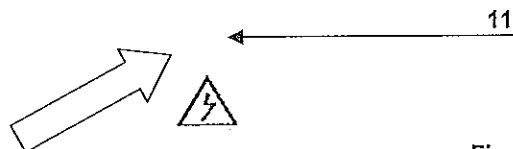
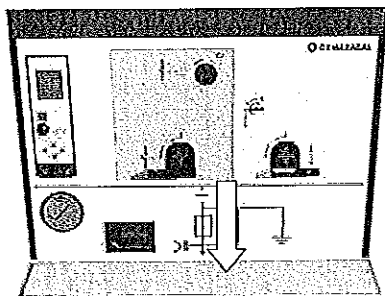
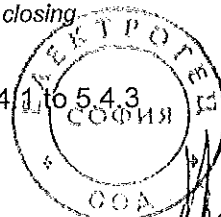


Figure 5.39: Cable compartment cover closing

12. Commission the cubicle following the instructions indicated in sections 5.4.1 to 5.4.3



5.5. CIRCUIT BREAKER CUBICLE

5.5.1. Disconnection Operation form the Earthing Position

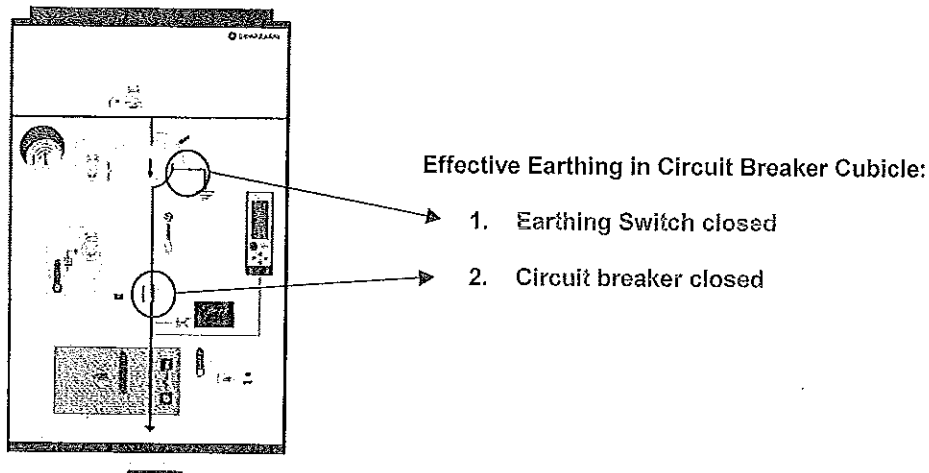


Figure 5.40: CGMCOSMOS-V Cubicle Earthing

▪ Step from the Earthing position to the "Ready for Earthing" position"

1. Open the circuit breaker pressing the opening button (a) and check the status indicator (b). The disconnecter is located in the "Ready for earthing" position".

"Ready for Earthing" Circuit Breaker Cubicle:

1. Earthing Switch closed
2. Circuit Breaker open

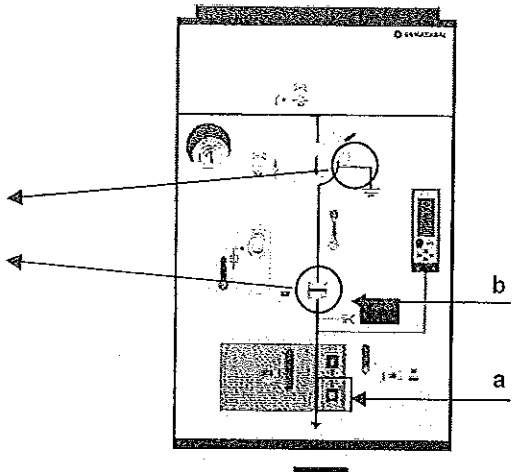


Figure 5.41: CGMCOSMOS-V Cubicle "Ready for Earthing"

⚠ ATTENTION!
If the springs are not charged, charge them manually. If the cubicle has the RAMV motor driven mechanism, this process is carried out automatically.



▪ **Step from the “Ready for earthing” position to the Disconnected position**

2. Start with the circuit breaker in its open position and the disconnecter in the “Ready for Earthing” position.
3. Turn the locking part (c) and slide the knob down to remove the interlock plate. Turn it again to lock it into position (refer to figure 5.42).
4. Push the lever in from the RED side until the pin is released and turn ANTICLOCKWISE as far as it will go, to move the disconnecter to the “Ready for earthing” position.

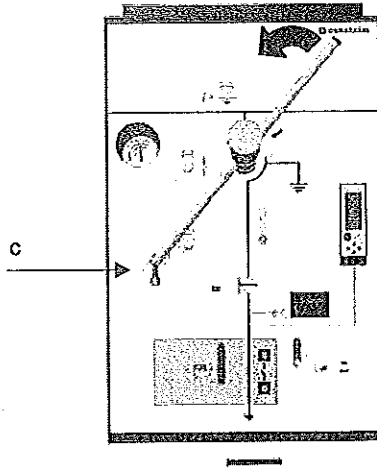


Figure 5.42: Lever Rotation Process

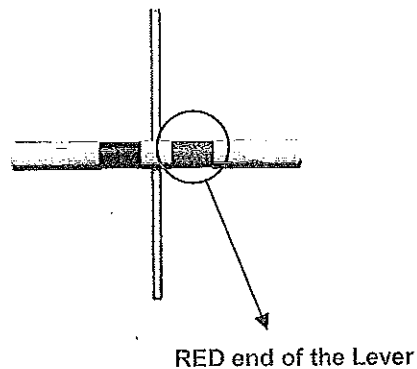


Figure 5.43: Switch-Disconnecter Lever

5. Withdraw the lever. Given its design, it is only possible to withdraw it in a safe position.
6. Turn the part again (c) to cancel the interlock.

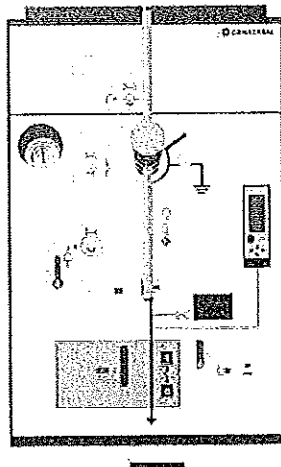


Figure 5.44: End Position of the Lever

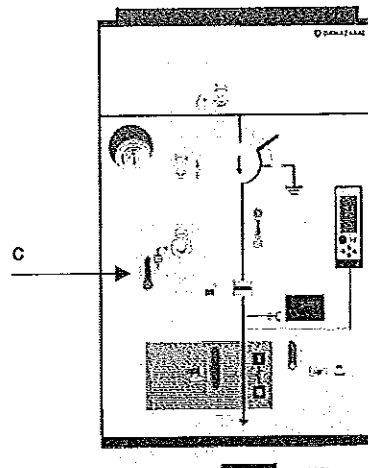
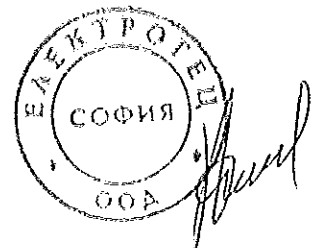


Figure 5.45: Disconnected Circuit Breaker Cubicle



5.5.2. Connection Operation from the Disconnected Position

7. Check that the circuit breaker is open.
8. Turn the locking part (c) and slide it down to remove the interlock plate (refer to figures). Turn it again to lock it in position.
9. Insert the lever from the BLACK side until the pin is released and turn ANTICLOCKWISE as far as it will go, to move the disconnecter from disconnected to connected.

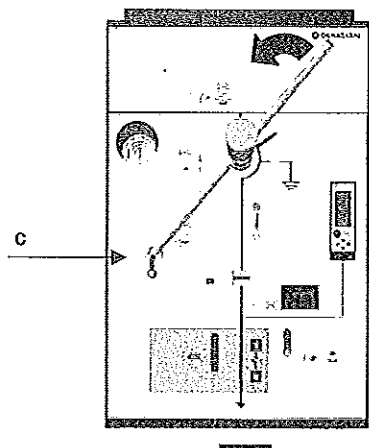


Figure 5.47: Lever Rotation Process

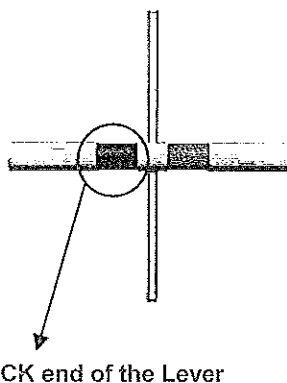


Figure 5.46: Disconnecter Lever

10. Pull the lever completely out to be able to close the circuit breaker. Due to its design, the lever can only be extracted in a safe position.
11. Turn the part (c) again to cancel the interlock (the interlock plate will move up)

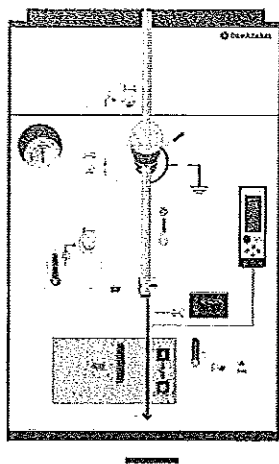


Figure 5.48: Final Disconnecter Position

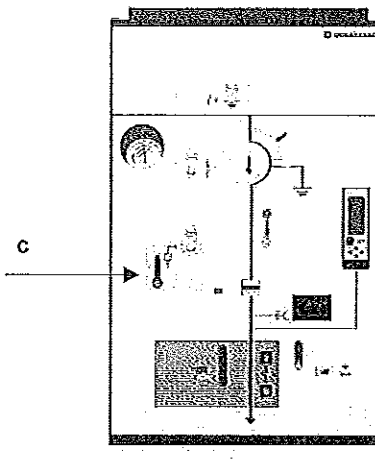


Figure 5.49: End Position of the Lever



12. Close the circuit breaker.

a) Manual driving mechanism (**RAV Driving Mechanism**):

Load springs, operating the loading lever (d) until it is indicated that the closing spring has tightened → Spring load (e).

To close the circuit breaker, press the close button (f).

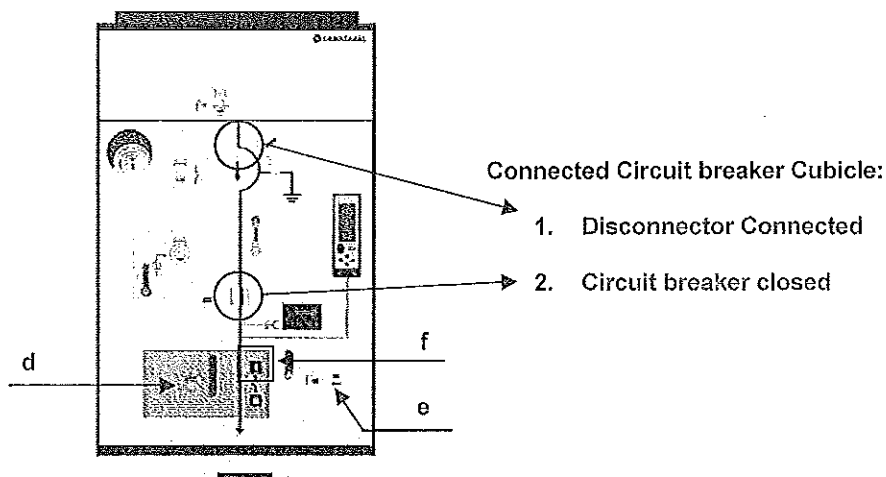


Figure 5.50: Connected CGMCOSMOS-V Cubicle

b) Motor driven mechanism (**RAMV Driving Mechanism**):

Press the circuit breaker close button (f).

13. Check for the presence of voltage (ekorVPIS)

5.5.3. Disconnection Operation from Connected Position

The starting conditions are: Closed circuit breaker and closed earthing switch (refer to figure 5.50).

1. Open the circuit breaker pressing the opening button (a) and check the status indicator (b)

⚠ ATTENTION:

To open the circuit breaker, check the spring loading indication (e), and if it is slack, tighten the spring, with the manual operation^[20]. If the cubicle has the RAMV motor driven mechanism, this process is carried out automatically.

^[20] Refer to point 12 in the commissioning process of the CGMCOSMOS-V cubicle



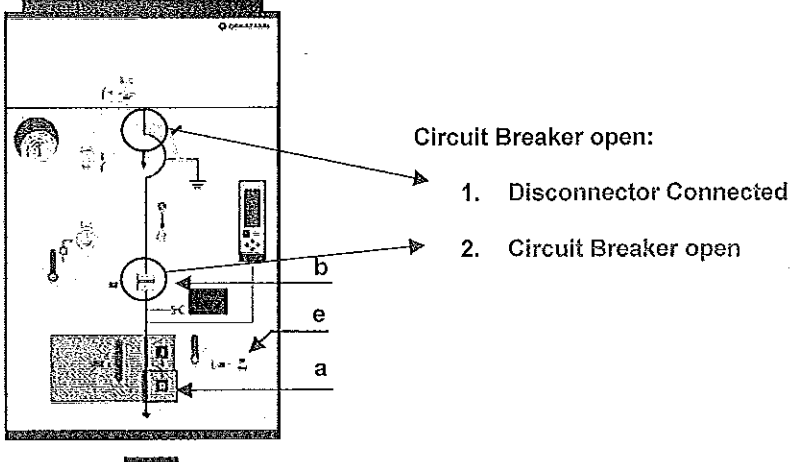


Figure 5.51: Circuit Breaker Opening

2. Check that there is no voltage.
3. Check that the circuit breaker is open.
4. Turn the locking part (c) and slide it down to remove the interlock plate (refer to figure 5.52). Turn it again to lock it in position.
5. Insert the lever from the BLACK side until the pin is released and turn CLOCKWISE as far as it will go, to move the disconnecter from connected to disconnected.

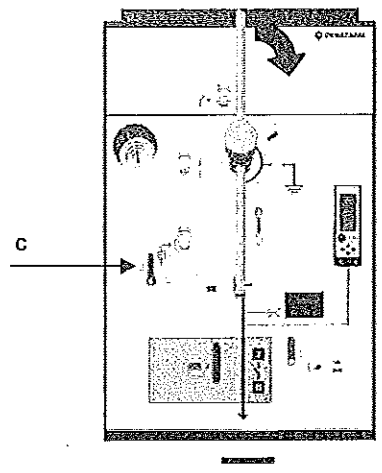


Figure 5.52: Lever Rotation Process

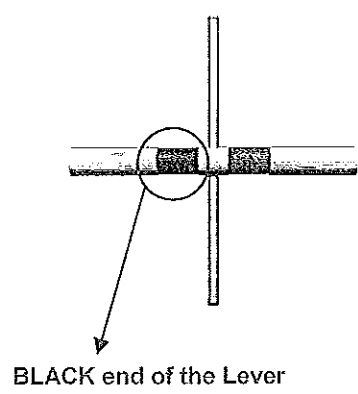


Figure 5.53: Switch-Disconnecter Lever



6. Pull the lever completely out to be able to close the circuit breaker. Due to its design, the lever can only be extracted in a safe position.
7. Turn the part (c) again to cancel the interlock (the interlock plate will move up)

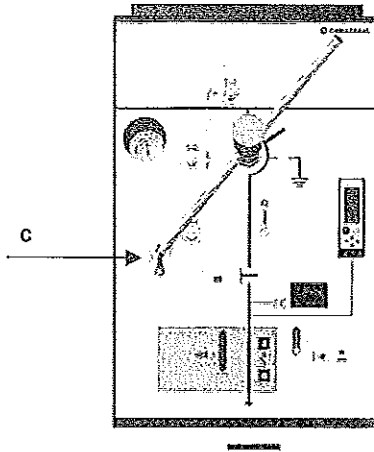


Figure 5.54: End Position of the Lever

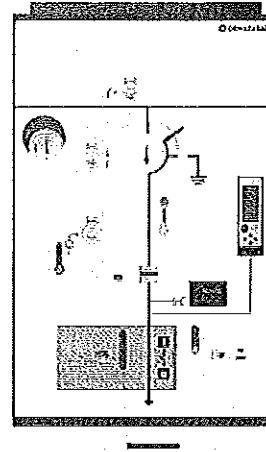


Figure 5.55: Disconnected Circuit Breaker Cubicle

5.5.4. Earthing Operation from the Disconnected Position

- Step from the “Ready for earthing” position to the Disconnected position
8. Start with the circuit breaker in its open position and the disconnector in the “Ready for Earthing” position.
 9. Turn the locking part (c) and slide the knob down to remove the interlock plate. Turn it again to lock it into position (refer to figure 5.56).
 10. Push the lever in from the RED side until the pin is released and turn CLOCKWISE as far as it will go, to move the “Ready for earthing” disconnector to the disconnected position.

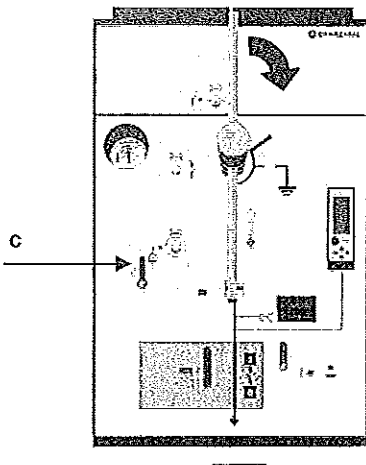


Figure 5.56: Lever Rotation Process

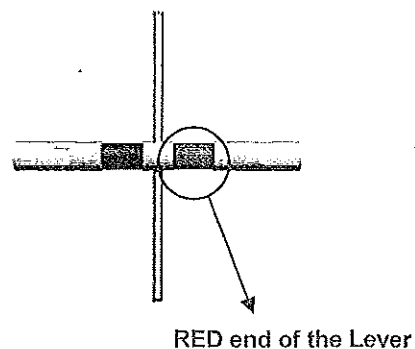


Figure 5.57: Switch-Disconnecter Lever



11. Withdraw the lever. Given its design, it is only possible to withdraw it in a safe position.
12. Turn the part again (b) to cancel the interlock.

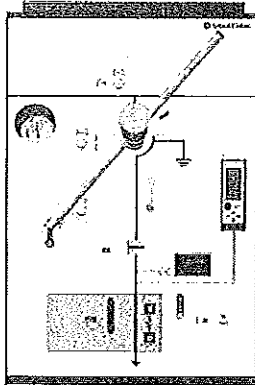


Figure 5.58: End Position of the Lever

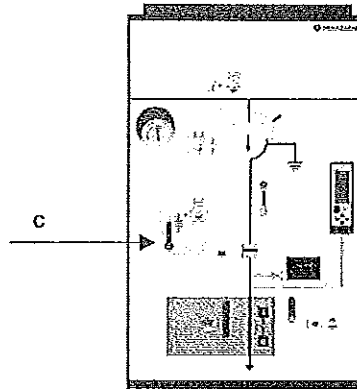


Figure 5.59: "Ready for Earthing" Circuit Breaker Cubicle

⚠ ATTENTION:

For the cable to be properly earthed, the circuit breaker must be closed, as described below.

▪ **Step from the "Ready for Earthing" position to the Earthed Position**

13. Close the circuit breaker pressing the opening button (f) and check the status indicator (b). The disconnector is Earthed.

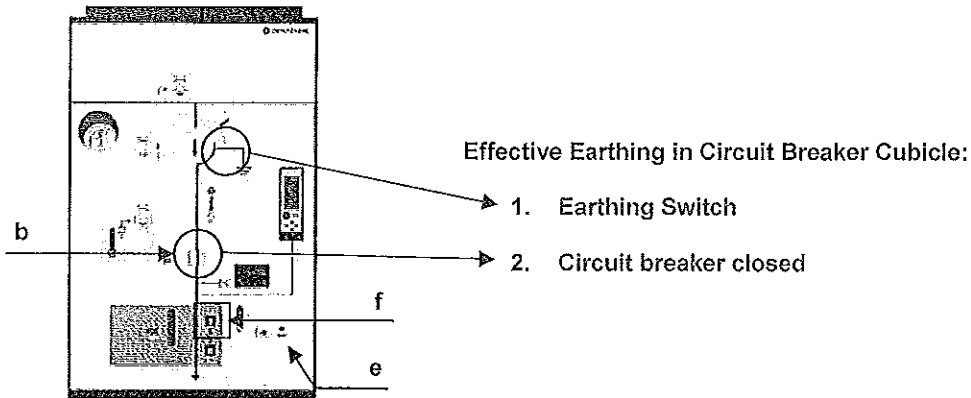


Figure 5.60: CGMCOSMOS-V Cubicle Earthing

14. Check that there is no voltage.

⚠ ATTENTION:

To be able to close the circuit breaker, check the spring loading indication (f), and if it is slack, tighten the spring, with the manual operation ^[21].

For voltage-free work, the earthing switch closed position must be interlocked either with a padlock or with a lock.

^[21] Refer to point 12 of the CGMCOSMOS-V cubicle's commissioning sequence.



5.6. BUSBAR RISER FUNCTIONAL UNIT WITH EARTHING

5.6.1. Disconnection Operation from the Earthing Position

1. Take the yellow slide to its right position (in this way the access for disconnecting the earthing switch is freed).
2. Insert the lever in the Earthing Switch access and turn 90° ANTICLOCKWISE.

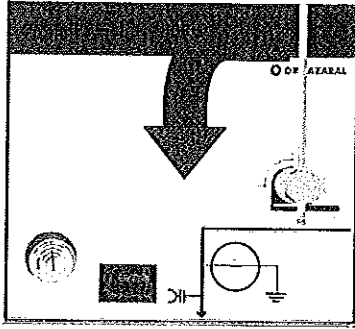


Figure 5.61: Lever Rotation Process

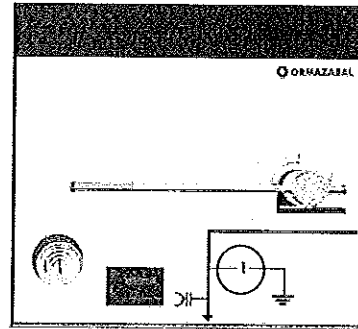


Figure 5.62: Disconnected Earthing Switch

RECOMMENDATION: Although the figure shows the initial moment of the operation with the lever arm vertical, it is advisable to start with the lever arm horizontal and towards the right, in order to make the best use of the force applied by the operator.

5.6.2. Earthing Operation from the Disconnected Position

3. Take the yellow slide to its right position (in this way the lever access for connecting the earthing switch is freed).
4. Insert the lever in the Earthing Switch access and turn 90° CLOCKWISE.

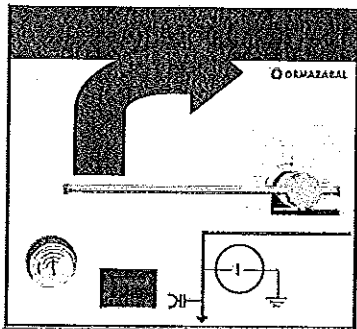


Figure 5.63: Lever Rotation Process

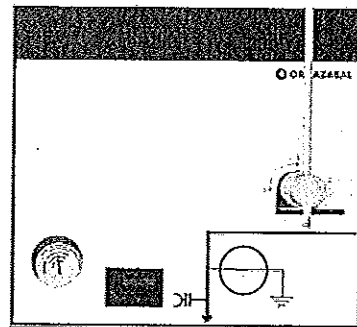


Figure 5.64: Connected Earthing Switch



5.7. POSITIONING THE ACCESS COVER TO CABLE COMPARTMENT

5.7.1. Standard Bases

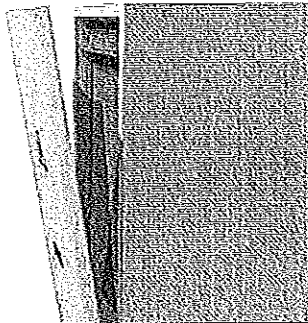


Figure 5.1

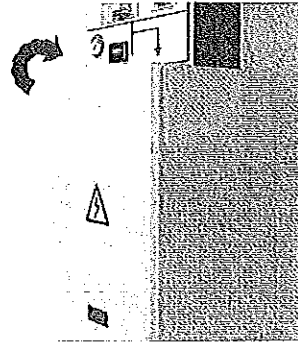


Figure 5.2

Rest the cover on the lower section of the base and push until it fits into its upper part.

5.7.2. Bases for Internal Arc in Cable Compartment

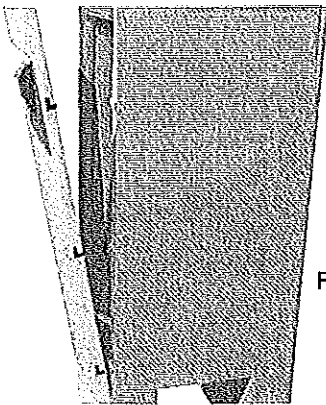


Figure 5.3

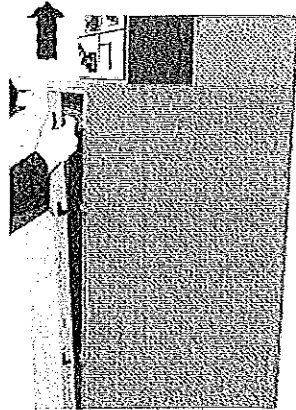


Figure 5.4

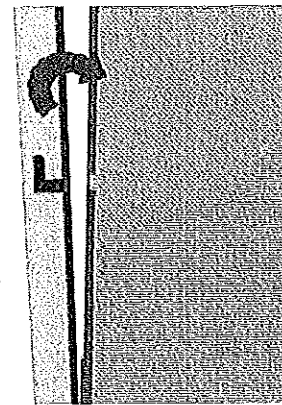


Figure 5.5

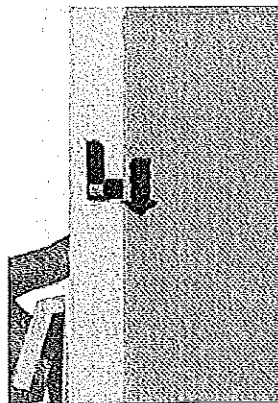


Figure 5.6

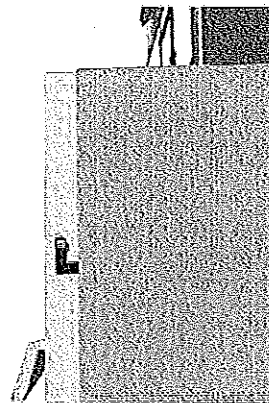
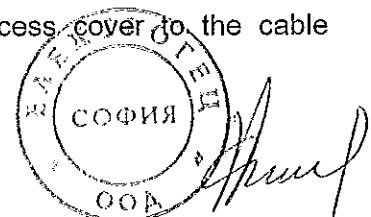


Figure 5.7

Rest the cover on the lower section of the base, lift it slightly until it fits into the base's side inserts, lower it whilst pushing until it fits into its upper part.
Perform the sequence the other way around to unlock the access cover to the cable compartment.



In CGMCOSMOS-P cubicles with fuse protection, on interlocking the access door to the cable compartment the linkage reset is operated **directly** causing it to autocharge.

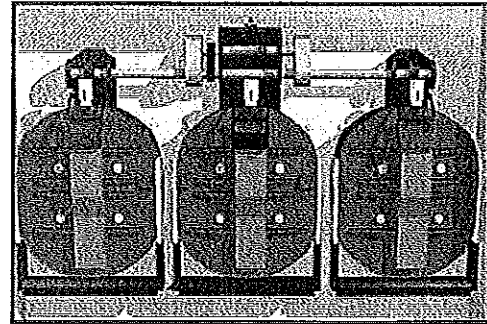


Figure 5.8: Triggering Linkage in CGMCOSMOS-P cubicles

5.8. ASSEMBLY SEQUENCE FOR THE BASE INTERNAL ARC TERMINAL COVER BOX IN THE CABLE COMPARTMENT TYPE 21 kA - 1 s

5.8.1. Withdrawal

1. Open and withdraw the access cover to the cable compartment according to section 5.7.1.
2. Slightly lift the box guard using upper part's handle.
3. Slowly extract the box until it reaches the end of the guide rail.

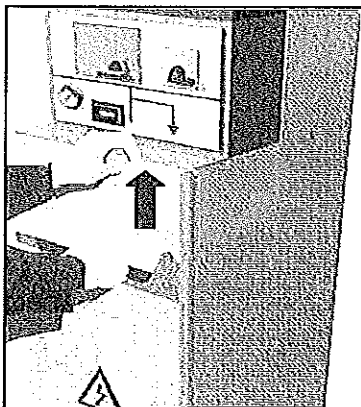


Figure 5.9

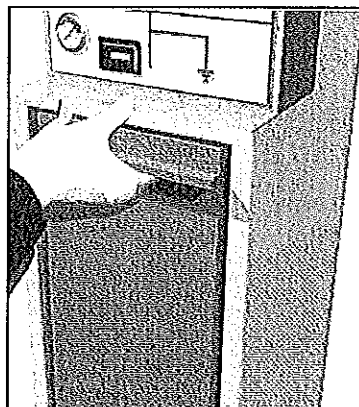


Figure 5.10

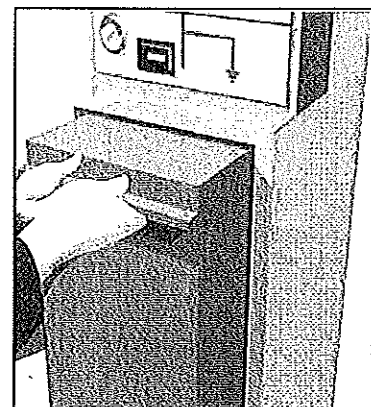


Figure 5.11

4. Holding the upper part of the box with one hand and the lower part with the other, lower the box carefully onto the floor paying attention to its weight.

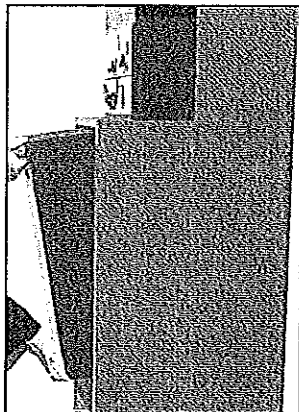


Figure 5.12

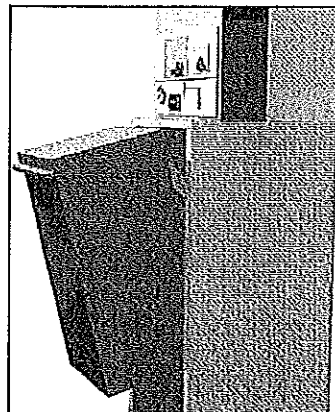


Figure 5.13

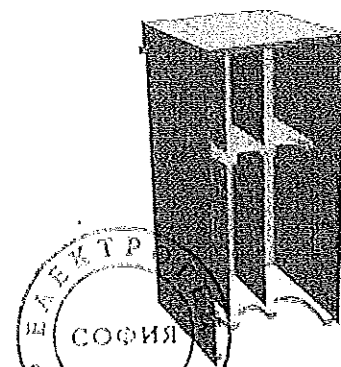


Figure 5.14: Detail of the Base terminal cover box

Handwritten signature

5.8.2. Positioning

1. Lift the box and make it fit into the guide rail in the base.

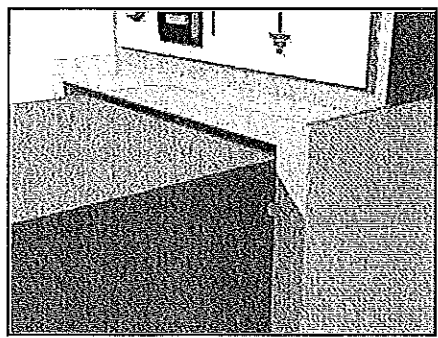


Figure 5.15: Box positioning on the rails

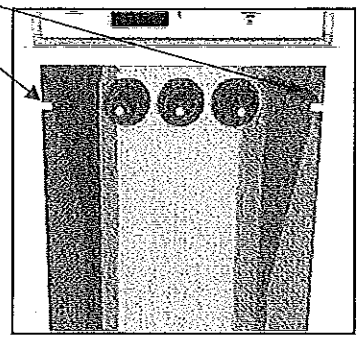


Figure 5.16: Detail guide rails

2. Push it until it comes to a stop.

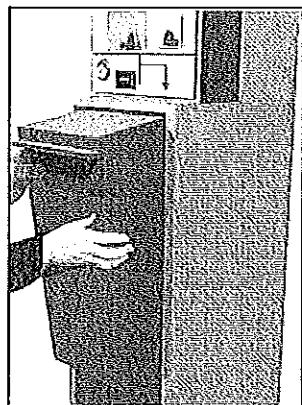


Figure 5.17: Slightly tilt to insert

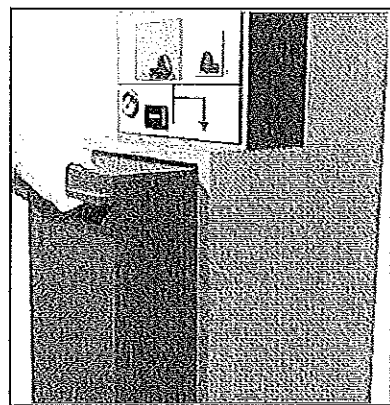


Figure 5.18: Pushing the box inside

3. Finally push until it fits into place and position the upper handle.

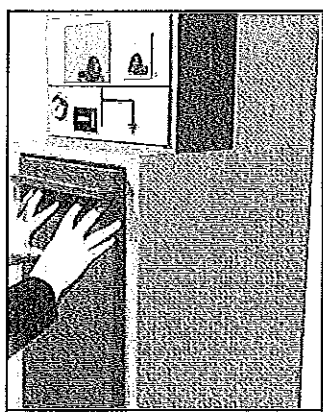


Figure 5.19

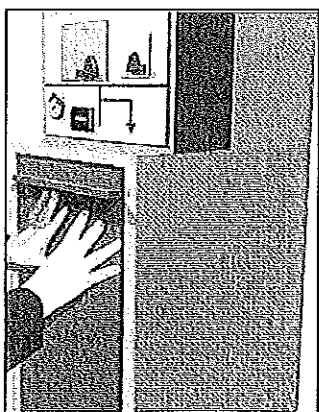


Figure 5.20

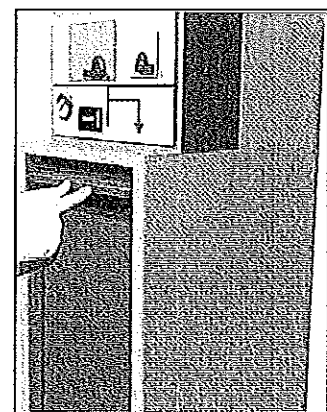


Figure 5.21

4. Place the access cover to the cable compartment.

ЭЛЕКТРОТЕХ
СОФИЯ

5.9. INTERLOCKS

5.9.1. Padlocking

Each operating shaft is padlockable with up to three standard padlocks, with a maximum handle diameter of 8 mm.

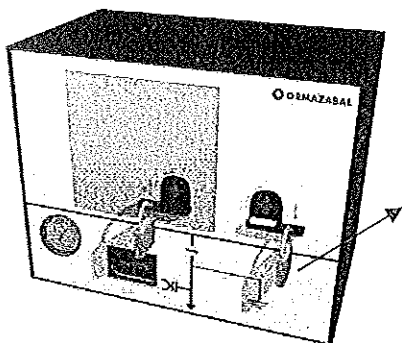


Figure 5.22: Padlocking in Feeder Cubicles

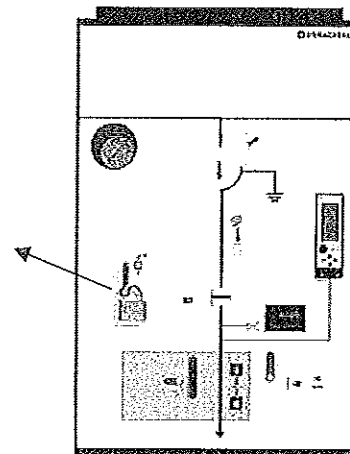
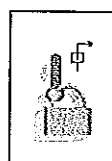
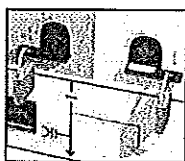


Figure 5.23: Padlocking in Circuit Breaker Cubicles

5.9.2. Locking

The cubicles are prepared for optionally incorporating sets of open and closed locks.

Examples of Locks (optional):

- **Lock 1: Earthing switch, interlocked in open position.** This prevents the switch from being put in the "earthed / ready for earthing" position until the key for the low-voltage switch lock is recovered, but does allow it to be switched to the main position.
- **Lock 2: Earthing switch, interlocked in closed position (MUST ALWAYS BE INTERLOCKED for working under de-energized conditions).** This prevents someone from inadvertently opening the switch, removing the earthing from the cable.
- **Lock 3: Earthing switch Interlocked in Open position.** This prevents the earthing switch from being switched to the "connected" position, but does allow the switch to be operated to the "earthed / ready for earthing" position.

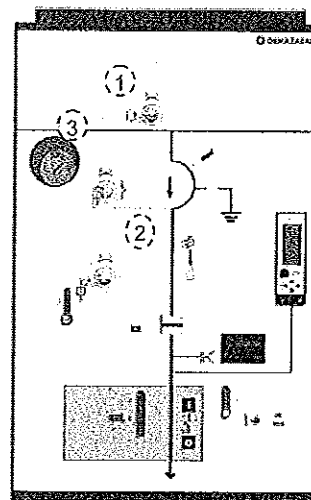


Figure 5.24: Locking in the CGMCOSMOS-V cubicle

Interlocking Lock 1 and Lock 3 together will prevent the switch from being moved from the "disconnected" position.

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6. MAINTENANCE

The active parts of the switching apparatus and main circuit of the CGMCOSMOS cubicles do not need to be inspected or maintained, as they are completely insulated in SF₆ gas and therefore free from any influence on the external environment. The E2-class electrical endurance tests guarantee free maintenance of the interrupting components.

Under the operating conditions specified in IEC 60694, the operating mechanism of the CGMCOSMOS system cubicles does not require any kind of lubrication to ensure proper operation according to the service conditions specified in IEC 60694, over its expected service life.

These mechanisms must be inspected in extreme usage conditions (dust, salt, pollution). It is advisable to carry out at least one operating during these inspections.

The components manufactured in galvanised sheet metal have been subjected to a painting process to guarantee their performance against corrosion. If they are scratched, dented or similar, they must be repaired to prevent corrosion.

6.1. VOLTAGE PRESENCE INDICATOR TEST

To carry out a test on the ekorVPIS voltage presence indicator, connect it to a 230 V_{ac} supply source. To do this, the cubicle should be disconnected and with 4 mm terminals apply the voltage between the phase test point to be checked and the ground test point. There is no polarity for the 230 V_{ac} socket, and therefore either the phase or the neutral can be connected. The indicator is working properly if there is a luminous flashing signal. To test the indicator properly, this check must be carried out in the three phases.

The ekorVPIS indicator can be replaced if necessary. To do so, the two screws on the upper right and lower left side of the indicator must be removed. Subsequently, the indicator can be removed from the base without having to deenergize the cubicle.

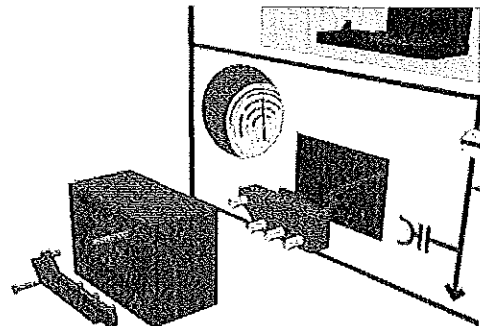


Figure 6.1: ekorVPIS connection mode

6.2. EARTHING PREVENTION ACOUSTIC ALARM CHECK

The proper functionality of the ekorSAS can be tested by connecting the ekorVPIS voltage presence indicator to 230 V_{ac} with 4-mm terminals placed in the indicator between the ground test point and the phase L1 test point. Auxiliary power is maintained for 5 minutes and after this time, the lever is placed in the earthing axis for switching, the alarm starts and stays on for at least 30 seconds. It stops when the lever is pulled out.



If necessary, the **ekorSAS** can be replaced since it is connected to the associated components with two PCB connectors for friction adjustment:

- One 3-pin connector (polarized) for the Voltage Presence Indicator
- One 2-pin connector for the lever microswitch

The process is as follows:

- Loosen the screws holding the upper trim and remove it.
- Remove the operating mechanism cover.
- Lightly press the ekorSAS's lower attaching tabs to remove it.
- Loosen the two connectors and replace the broken unit, then reconnect it to the lever microswitch (2-pin connector) and to the voltage indicator (polarized 3-pin connector).

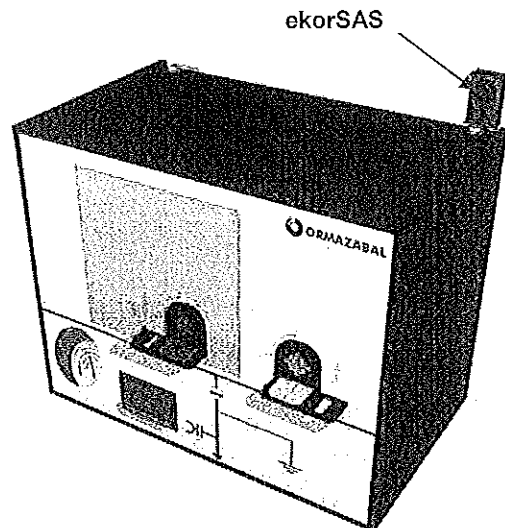


Figure 6.2: *ekorSAS* device positioning in CGMCOSMOS cubicles

➤ **ekorSAS** replacement in CGMCOSMOS-V cubicles:

The process is as follows:

- Loosen the screws holding the upper trim and remove it.
- Remove the operating mechanism cover.
- Unscrew the ekorSAS's lock screws to remove it.
- Loosen the two connectors and replace the unit, then reconnect it to the lever microswitch (2-pin connector) and to the voltage indicator (polarized 3-pin connector).

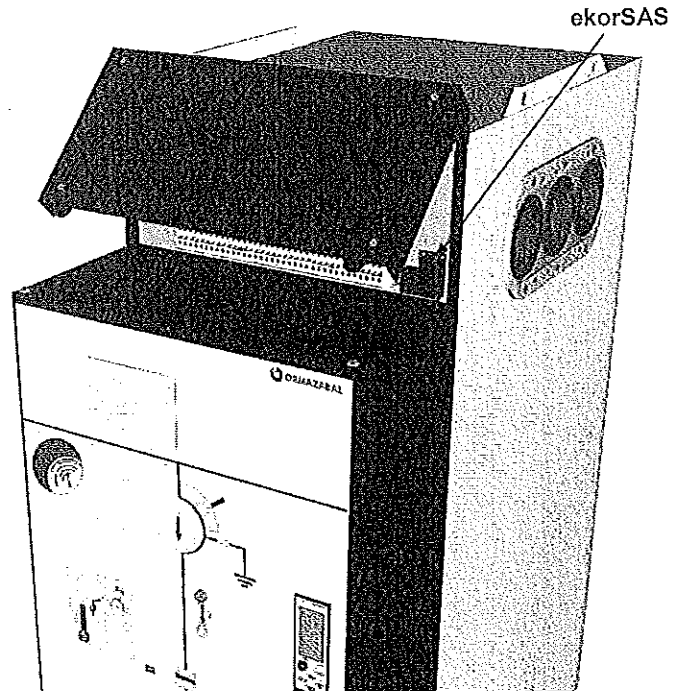


Figure 6.3: *ekorSAS* device positioning in CGMCOSMOS-V cubicles

➤ **ekorSAS connection:**

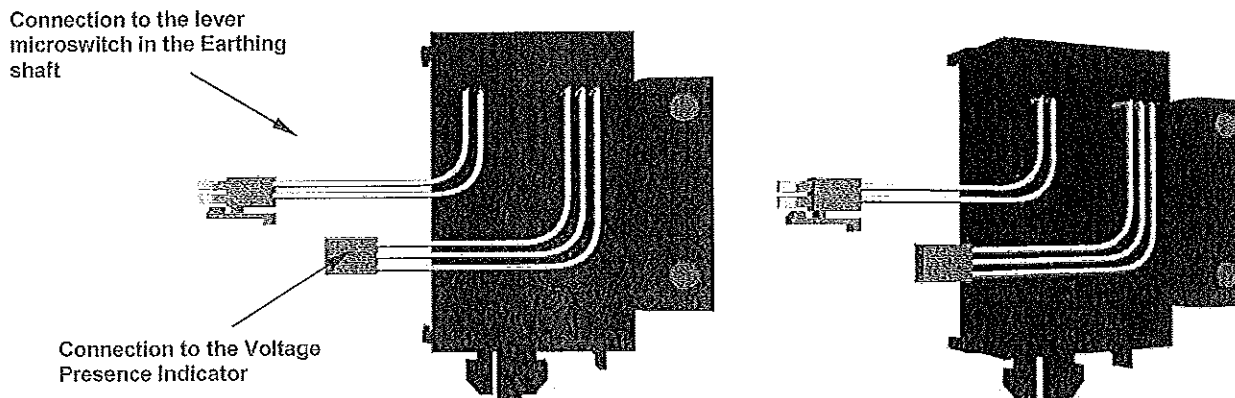


Figure 6.4: ekorSAS connection

6.3. CGMCOSMOS-V CUBICLE PREVENTATIVE MAINTENANCE

The driving mechanisms and other components outside the gas tank may require preventative maintenance, and the intervals will depend on the existing environmental conditions (aggressive environments, dust, extreme temperatures, etc.) and must be established according to the experience and responsibility of the installation.

Maintenance must be carried out every 5 years or 2000 operating cycles, except when considered otherwise by the user together with Ormazabal's Technical – Commercial Department according to the exploitation conditions.

The drive system, considered low maintenance, has a mechanical endurance of 10 000 operations.

- Solvents used with pressurised air must not be used for general cleaning.
- The adjustment components such as: limiting shaft, shock absorber, plugs, nuts and bolts, which have been sealed, must not be manipulated.

The **estimated time** for state of repair check is approximately **one hour** and it is necessary to have the following tools ready beforehand:

- Loctite A-270
- Torque Wrench
- "Super-Lube" lubricant spray
- Antirust spray

Preventative maintenance must be carried out in accordance with the following conditions:

- Circuit breaker open and earthing switch connected.
- Auxiliary circuit supply cut.
- Disconnection of remote control equipments.
- Check opening and closing springs are unloaded.



6.3.1. Visual Inspection

- Check that the interlocking circlips, split pins and interlock retracting pins are correctly in place and have not become loose or detached, paying special attention to those pertaining to the main movement transmission chain.
- Check that the adjustment sealed components are unchanged, in particular the limiting shaft, and the securing nuts of the phase transmission and output shaft.
- Take care that the connection cables are not close to transmission movement areas.
- If the superficial protections are rusty or dusty, get the products indicated above, paying special attention to the parts inside the chassis. transmissions, ratchets and cams, taking into consideration operationability and aesthetics.
- Bear in mind the number of operations on the meter, the installation date and the location characteristics and, if this is the first service, even previous corrective maintenance, for new inspections.

Estimated visual inspection duration: 10 minutes

6.3.2. Verification Checks

The condition of the equipment must be checked carrying out 2 manual operations:

First:

- Manual spring loading.
- Check that it holds on the closing ratchet in a stable position and that the opening retainer "returns" to below the retainer shaft quickly and with a minimum play of 2 mm.
- Close the circuit breaker.
- Check that the opening retaining is stable.
- Open the circuit breaker with the pushbutton station.

Second:

- Load closing spring.
- Close
- Load closing spring
- Open
- Close and Open

If the cubicle is motorised, two motorised operations with coil (or coils) must be carried out

First:

- Load with motorisation
- Check M0 and M1 microswitches



- Check if the NC contacts are open with its control lever activated.
 - Close with closing coil.
 - Open with opening coil.

Second:

- Load closing spring.
- Close with coil.
- Load closing spring.
- Open-Close and Open with coils.

If the cubicle has the ekorRPG protection unit, carry out the following check:

- Energise the relay with 220 V_{ac} (if it is not already energised).
- Bridge terminals G4 and G5 from the relay in accordance with the electrical diagram of the ekorRPG protection unit
- Check that the circuit breaker opens.
- Carry out 2 opening operations.

Estimated time: 20 minutes

6.3.3. Securing Nuts and Bolts Tightening Check

Ensure that all the nuts and bolts are not loose. Pay special attention to the bolted joints supporting the frame, chassis support to the cubicle structure and those, which form the driving mechanism structure.

It is necessary to check (manually with a standard spanner) if the connection needs the application of the assigned tightening torque.

If any loose bolts are found, use Loctite A-270, and apply the rated torque corresponding to its metrics.

Estimated checking time: 10 minutes

6.3.4. Checking Settings

The driving mechanism is set by the manufacturer for the whole service life. Therefore, the settings **which should not be manipulated** are sealed.

Limiting shaft main setting:

- Check that it is not loose or without seal. Do not handle except in the presence of Ormazabal's Technical – Commercial department.

Shock absorber setting:

- Check that this is sealed.

Transmission to phases:

- It is never manipulated. Check that it is sealed.



6.3.5. Lubrification

Lubricate all turning points of: shafts, bearings, bushings, rollers, and generally any sliding components.

Use Super-Lube Teflon-based lubricant spray, with an application tube to ensure the product is applied where it will be effective.

If any non-functional rust is observed on any component, apply antirust spray.

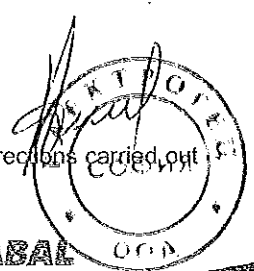
Do not use aggressive liquids such as corrosive solvents, etc., nor pressure air to remove small particles or accumulated dust.

Estimated time: 10 minutes

If any corrections have been made to the driving mechanism, it is necessary to carry out the check operations (section 6.4.4) of the entire cycle twice^[22].

Otherwise, a few operations are sufficient to evenly lubricate the components.

^[22] Ormazabal's Technical – Commercial Department must be notified with a report of any corrections carried out for analysis.



7. ADDITIONAL INFORMATION

7.1. SPARE PARTS AND ACCESSORIES

Although the cubicles are designed for a service life according to the IEC 60298 standard, some components may have to be replaced and installed for different reasons. The following is a list of these components:

- ekorVPIS voltage presence indicators
- Operating Mechanism
- ekorSAS Acoustic Alarm
- Levers

In the event of it being necessary to change any of the auxiliary parts indicated, the relevant order for the spares kit shall be made and the corresponding instructions followed in the corresponding documentation.

Note: Some spare parts and accessories require being installed by specialised staff. Contact Ormazabal's Technical – Commercial Department.

7.2. ENVIRONMENTAL INFORMATION

7.2.1. Sulphur Hexafluoride SF₆^[23]

The CGMCOSMOS cubicles are defined as a pressurised sealed system containing sulphur hexafluoride (SF₆).

SF₆ is included in the Kyoto Protocol's list of greenhouse effect gases list. SF₆ has a GWP of 22,200 units.

At the end of the product's life, the SF₆ content must be recovered for treatment and recycling, preventing it from being freed into the atmosphere. The extraction and handling of the SF₆, must be carried out by specialised staff^[24].

^[23] This information is indicated on a label on the equipment.

^[24] If in doubt, contact Ormazabal's Technical – Commercial department.

7.3. ELECTRICAL CHARACTERISTICS OF THE B DRIVING MECHANISMS

7.3.1. Coils

The electrical ratings of coils and the auxiliary contacts for the switch position are as follows:

ELECTRICAL CHARACTERISTICS		
TRIP COIL	Rated voltage	24 V _{cc} , 48 V _{cc} , 110 V _{cc} 230 V _{ac}
	Maximum consumption	80 W
	Internal insulation	2 kV
SIGNALLING CONTACTS	Switch position signalling contacts	1 NAC, 1 NAC + 2 NA, 2 NA
	Rated voltage	250 V _{ac}
	Rated current	16 A

The BR operating mechanism allows up to 2 NO + 2 NC contacts to be added for switch status and 2 NO contacts for the earthing switch status.

7.3.2. Motorisations

The electrical characteristics are as follows:

ELECTRICAL CHARACTERISTICS		
MOTORISATIONS	Rated voltage	24 V _{cc} , 48 V _{cc} , 110 V _{cc} and 125 V _{cc} , 220 V _{ac}
	Peak current	<5 A
	Motor switching time	3 s
	Switch signalling contacts	2 NA + 2 NC
SIGNALLING CONTACTS	Signalling contacts for earthing	2 NA
	Rated voltage	250 V _{ac}
	Rated current	16 A

Note: The electrical diagrams for each type of cubicle are supplied with the order documentation.



TECHNICAL – COMMERCIAL DEPARTMENT:

www.ormazabal.com



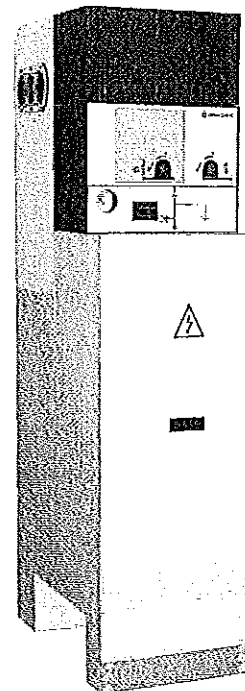
IG-078-GV
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Общи инструкции

СИСТЕМА CGMCOSMOS
ЕЛЕГАЗОВО-ИЗОЛИРАНИ ШКАФОВЕ
ЗА СРЕДНО НАПРЕЖЕНИЕ
ДО 24 kV

LIB

31.05.2007



ВНИМАНИЕ!

По време на експлоатацията на цялото оборудване за СН някои от неговите компоненти са под напрежение, други може да се движат, а някои части могат да достигнат високи температури. Вследствие на това използването им може да е свързано с електрически, механични и топлинни рискове.

Ormazabal, за да осигури приемливо ниво на защита за хората и имуществото, разработва и конструира своите продукти в съответствие с принципа на интегрираната безопасност на базата на следните критерии:

- Елиминирание на опасностите, доколкото е възможно.
- Когато горепосоченото не е технически и/или икономически приложимо, включване в оборудването и на подходящи защитни устройства.
- Информирание за оставащите рискове, за да се улесни разбирането на оперативните процедури, които предотвратяват настъпването на тези рискове; обучаване на оперативния персонал, който осъществява тези процедури; както и използване на подходящите мерки за защита на персонала.

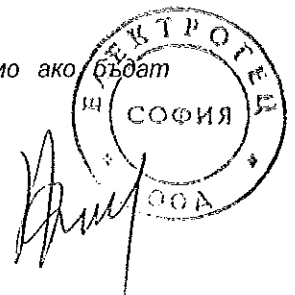
Вследствие на това само подходящо обучен и наблюдаван персонал може да работи по оборудването, описано в това ръководство, както и в непосредствена околност около него, (EN 50110) като персоналят трябва изцяло да познава инструкциите и бележките в това ръководство, както и другите инструкции от общ характер, приложими според текущото законодателство.

Гореспоменатото трябва да се съблюдава стриктно, тъй като правилното и безопасно функциониране на това оборудване не зависи само от неговата конструкция, но също така и от обстоятелства от общ характер, които са извън контрола и отговорността на производителя, а по-специално:

- Транспортването и боравенето с оборудването от напускането на завода до пристигането на мястото за монтаж трябва да се извършват правилно.
- Всякакво междинно съхранение трябва да се осъществява в условия, които не променят или уреждат характеристиките на оборудването или негови важни части.
- Условията при обслужване трябва да са съвместими с определените характеристики на оборудването.
- Преместванията и дейностите по експлоатацията трябва да се извършват при стриктно спазване на ръководството с инструкциите и с ясно разбиране на приложимите за оборудването принципи за експлоатацията и безопасността.
- Поддръжката трябва да се извършва правилно, вземайки предвид реалните условия при обслужването и състоянието на околната среда на мястото, където е монтирано оборудването.

В резултат на непрекъснато развиващите се стандарти и нови конструкции характеристиките на съдържащите се в тази спецификация компоненти могат да бъдат променени без предварително предупреждение.

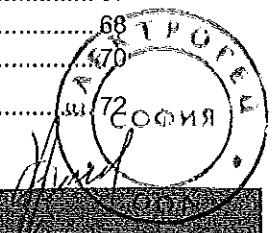
Тези спецификации и наличието на материалите ще бъдат валидни, само ако бъдат потвърдени от нашия Техническо-търговски отдел.



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Системата **CGMCOSMOS** се състои от набор от модулни компактни шкафове с пълна елегазова изолация за конфигурацията на различни схеми за вторично електро-разпределение за средно напрежение до 24 kV.

Тази система от шкафове е проектирана да отговаря на изискванията на следните стандарти^[1]:

IEC 60694	IEC 62271-105
IEC 62271-200 (IEC 60298)	IEC 62271-100
IEC 60265	IEC 60255
IEC 60129	

Системата CGMCOSMOS се състои от следните функционални модули:

- **CGMCOSMOS-L**: Шкаф за захранващи изводи.
- **CGMCOSMOS-S**: Шкаф за шинни изключватели.
- **CGMCOSMOS-S-Pt_i**: Шкаф за шинни изключватели със заземяване отдясно (Pt_d) или отляво (Pt_i).
- **CGMCOSMOS-P**: Шкаф за предпазители.
- **CGMCOSMOS-V**: Шкаф за вакуумни прекъсвачи.
- **CGMCOSMOS-RB_i**: Газово-изолиран шкаф за свързване на шини.
- **CGMCOSMOS-RB_i-Pt**: Газово-изолиран шкаф за свързване на шини със заземителен нож.
- **CGMCOSMOS-RC_i/R2C_i**: Въздушно-изолиран шкаф/двоен шкаф за свързване на кабели.
- **CGMCOSMOS-M**: Шкаф за търговско мерене.

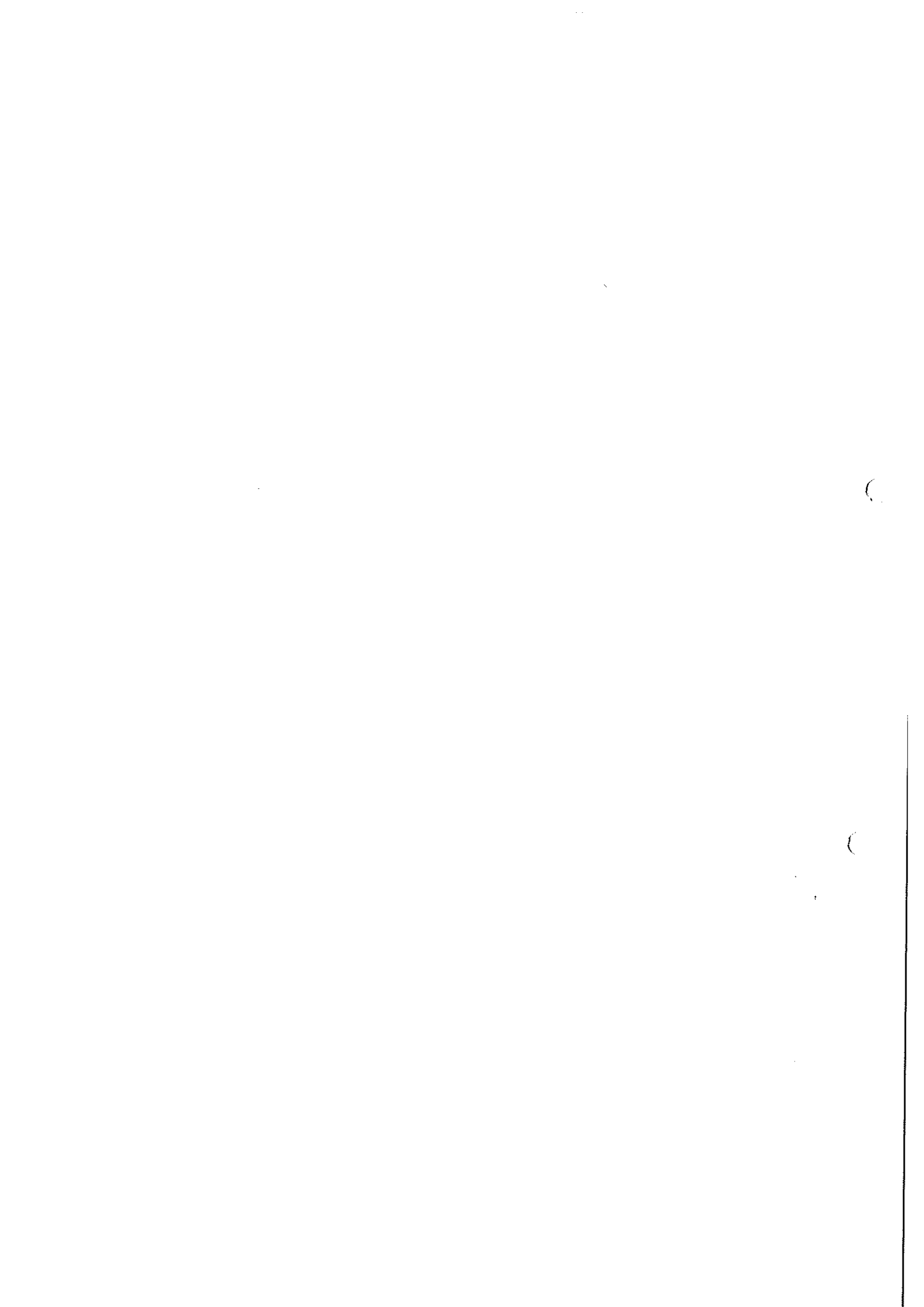
- **CGMCOSMOS-2L**: Шкаф с 2 функционални блока за изводи.
- **CGMCOSMOS-2LP**: Шкаф с 2 функционални блока за изводи и 1 за предпазители.

- **CGMCOSMOS-RLP**: Шкаф с 1 функционален блок за свързване на шини, 1 функционален блок за изводи и 1 функционален блок за предпазители.

Модулни

Компактни

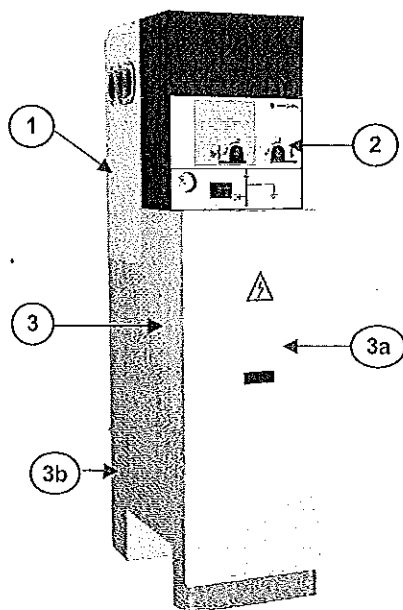
^[1] IEC стандартите понастоящем се обновяват, което в някои случаи поражда различни типове номенклатура.



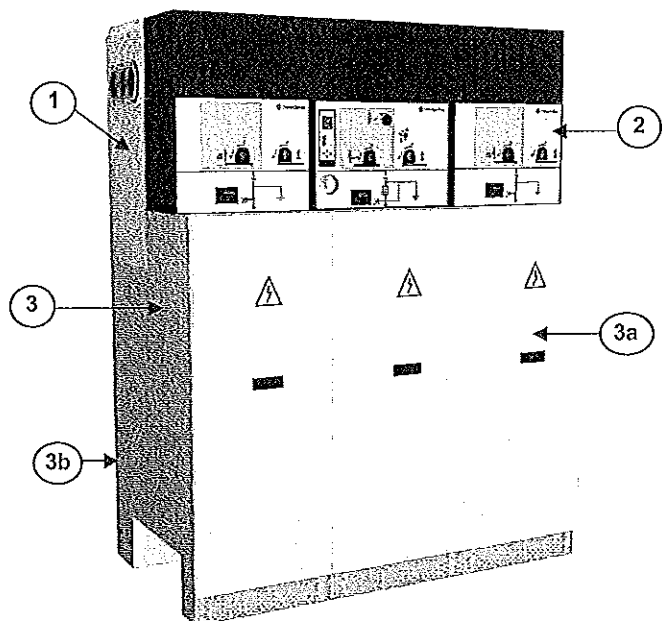
1.1. КОМПОНЕНТИ НА ШКАФА

Шкафът се състои от поредица независими отделения:

1. Казан с елегаз
2. Отделение за задвижващия механизъм
3. Основа
 - 3а. Кабелно отделение
 - 3б. Газоизпускателно отделение

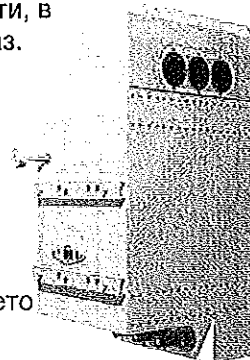
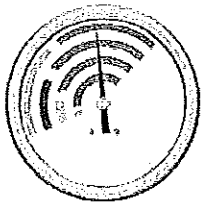


Фигура 1.2: Основни компоненти на модулен шкаф CGMCOSMOS



Фигура 1.1: Основни компоненти на компактен шкаф CGMCOSMOS

- ① **Казан:** Херметизично затворено отделение, помещаващо шините, комутационните и изключвателните компоненти, в което като изолираща среда се използва елегаз. Всеки казан има манометър за индикация на налягането на газа, който лесно се вижда отвън на шкафа. Скалата на манометъра е със зони в различни цветове: червен, сив и зелен. За безопасна експлоатация стрелката трябва да бъде в зелената зона за съответния диапазон на температурата.



Фигура 1.3: Манометър Казанът има мембрана за улеснение изпускането на газове в случай на протичане на вътрешни дъги.

Мощностен разединител и заземителен нож:

Превключвателят в системата CGMCOSMOS има три позиции: присъединена, разединена и заземена.

Фигура 1.4: Казан

Превключвателят се управлява с управляващия лост на 2 различни вала. Единият е за разединителя (превключване между присъединената и разединената комутационни позиции), а другият е за заземителния нож (той превключва между разединената и заземената позиции) на захранващите кабели, а в случая на шкафове с предпазители – на шестте захватни приспособления на техните държатели.

Тези компоненти имат независими задвижвания^[2], т.е., скоростта на задвижване не зависи от скоростта на ръчното задвижване.

Вакуумен прекъсвач: Прекъсвачът в шкаф CGMCOSMOS-V използва вакуумна технология за прекъсването.

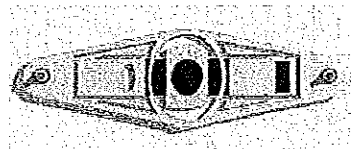
Управлението на прекъсвача се осъществява чрез секция с бутони, разположена отпред на шкафа. За да я използвате ръчно, трябва да заредите пружината, използвайки специалния за тази цел лост.

За да се гарантира комутационната дистанция, шкафът има разединител – заземителен нож наред с прекъсвач. Управлението на този компонент се осъществява чрез лост с две позиции – черна за отиване от затворено към разединено положение и червена за превключване между разединено и “готово за заземяване” положение.

- ② **Отделение за задвижващия механизъм:** Отделението за задвижващия механизъм помещава средставата за управление на мощностния разединител или прекъсвача, в зависимост от типа шкаф. Капакът на отделението съдържа синоптична схема на главната верига или СН.

Устройствата за индикация на позицията на управляващите компоненти са напълно интегрирани в синоптичната схема.

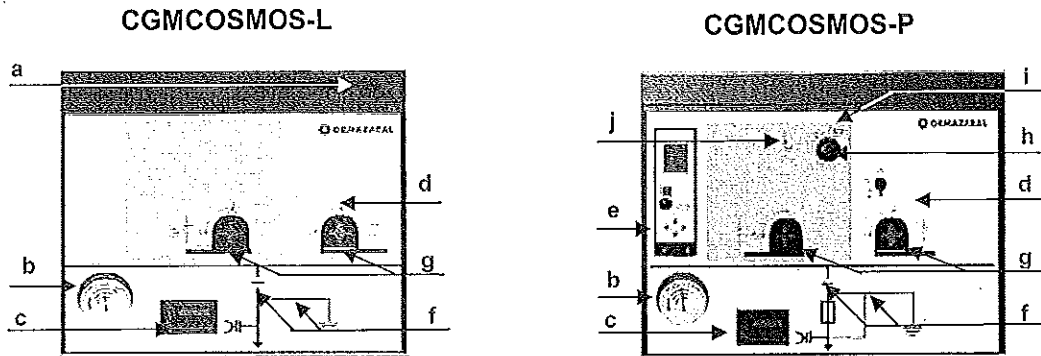
Управляващите механизми могат да се заменят за постигане на по-добра функционалност във всяка от трите позиции на мощностния разединител. Тези позиции могат да се блокират с помощта на фиксиращо устройство с ключалка или катинар, независимо дали шкафът е включен или не.



Фигура 1.5: Фиксиращо устройство

^[2] Приложими шкафове на система CGMCOSMOS, освен за шкаф GMCOSMOS-V за разединители (консултирайте се с Техническо – търговския отдел на Ormazabal).

Компоненти в областта на управляващия механизъм:

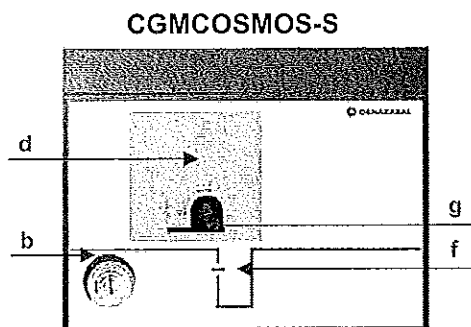


Фигура 1.6: Синоптична схема на шкаф CGMCOSMOS-L Фигура 1.7: Синоптична схема на шкаф CGMCOSMOS-P

където:

- a: ekoSAS, Акустична аларма за предотвр. на заземяване
 b: Циферблат на манометъра
 c: ekoVPIS, Детектор за наличие на напрежение
 d: Зона за управление:
 • СИВА за мощностен разединител
 • ЖЪЛТА за заземителен нож
 e: ekoRPT Защитен модул
 f: Индикатори за състоянието
 • ЧЕРЕН за мощностен разединител
 • ЧЕРВЕН за заземителен нож

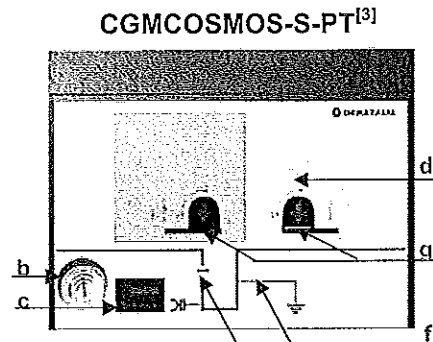
- g: Катинар за блокировка
 h: Ръчка за задействане
 i: Индикатор за състоянието на предпазителите
 • ЗЕЛЕН: Нормално
 • ЧЕРВЕН: Задействан ударник
 j: Индикатор за зареждане на пружината на задвижващия механизъм на прекъсвача
 • ЗЕЛЕН: Незаредена
 • ЧЕРВЕН: Заредена



Фигура 1.8: Синоптична схема на шкаф CGMCOSMOS-S

където:

- b: Циферблат на манометъра
 c: ekoVPIS, Детектор за наличие на напрежение
 d: Зона за управление:
 • СИВА за мощностен разединител
 • ЖЪЛТА за заземителен нож

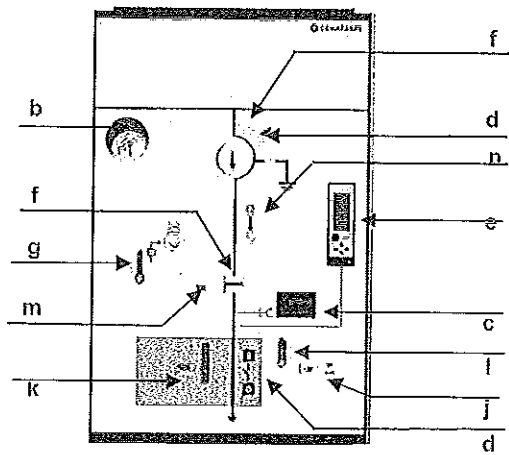


Фигура 1.9: Синоптична схема на шкаф CGMCOSMOS-S-PT

- f: Индикатори за състоянието
 • ЧЕРЕН за мощностен разединител
 • ЧЕРВЕН за заземителен нож
 g: Катинар за блокировка

[3] Заземяването на шкафа може да бъде отдясно (Ptd) или отляво (Ptl).

CGMCOSMOS-V

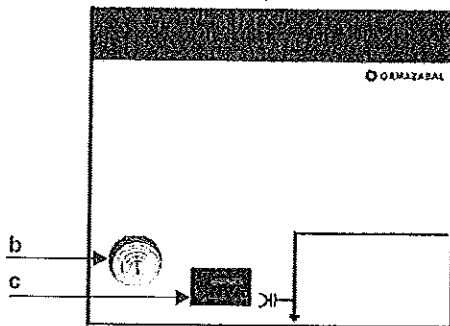


където:

- b: Циферблат на манометъра
- c: eKogVPIS, Детектор за наличие на напрежение
- d: Зона за управление:
 - ЗЕЛЕНА за прекъсвач
 - ЧЕРВЕН бутон за отваряне
 - ЗЕЛЕН бутон за затваряне
 - ЖЪЛТА за разединител – заземителен нож
- e: eKogRPG защитен модул
- f: Индикатори за състоянието
- g: Блокировка с катинар на заземителната система
- j: Индикатор за зареждане на пружината
- k: Ръчно зареждане на пружината за прекъсвача
- l: Отключване на кабелния капак
- m: Брояч на операциите
- n: Блокировка на разединителя

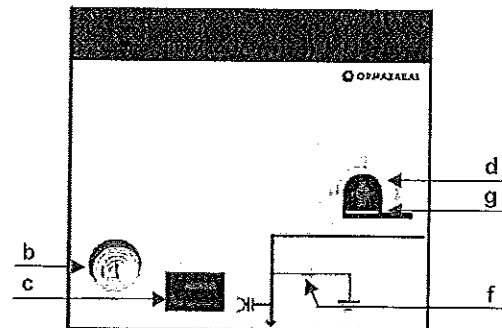
Фигура 1.10: Синоптична схема на шкаф CGMCOSMOS-V

CGMCOSMOS-RB^[4]



Фигура 1.11: Синоптична схема на шкаф CGMCOSMOS-RB

CGMCOSMOS-RB-PT^[4]



Фигура 1.12: Синоптична схема на шкаф CGMCOSMOS-RB-PT

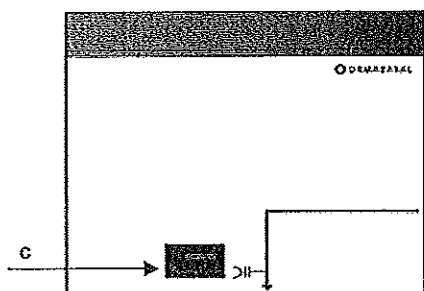
където:

- b: Циферблат на манометъра
- c: eKogVPIS, Детектор за наличие на напрежение
- d: Зона за управление:
 - ЖЪЛТА за заземителен нож

- f: Индикатори за състоянието
 - ЧЕРВЕН за заземителен нож
- g: Катинар за блокировка

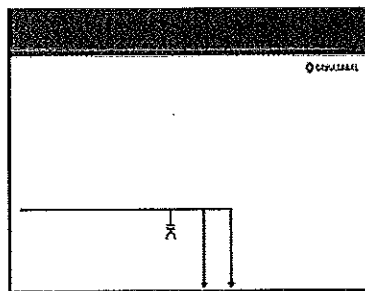
^[4] Захранващият извод за шкафа може да бъде отдясно (RBd) или от двете страни (RBa).

CGMCOSMOS-RC^[5]



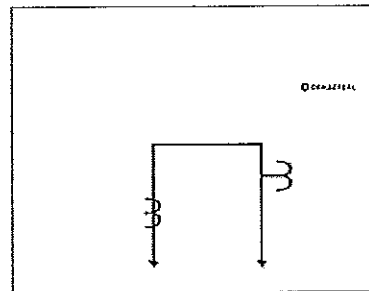
Фигура 1.13: Синоптическа схема на шкаф CGMCOSMOS-RC

CGMCOSMOS-R2C^[5]



Фигура 1.14: Синоптическа схема на шкаф CGMCOSMOS-R2C

CGMCOSMOS-M

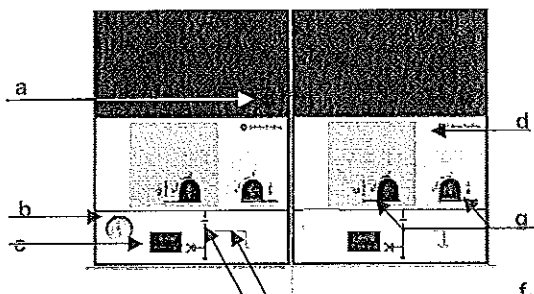


Фигура 1.15: Синоптическа схема на шкаф CGMCOSMOS-M

където:

с: ekoVPIS, Детектор за наличие на напрежение

CGMCOSMOS-2L

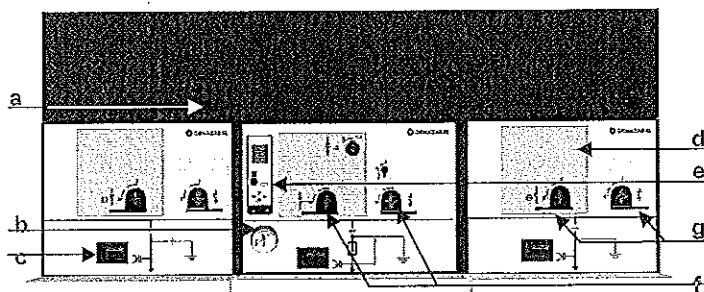


Фигура 1.16: Синоптическа схема на шкаф CGMCOSMOS-2L

където:

- a: ekoSAS, Акустична аларма за предотвр. на заземяване
b: Циферблат на манометъра
c: ekoVPIS, Детектор за наличие на напрежение
d: Зона за управление:
- СИВА за мощностен разединител
 - ЖЪЛТА за заземителен нож

CGMCOSMOS-2LP

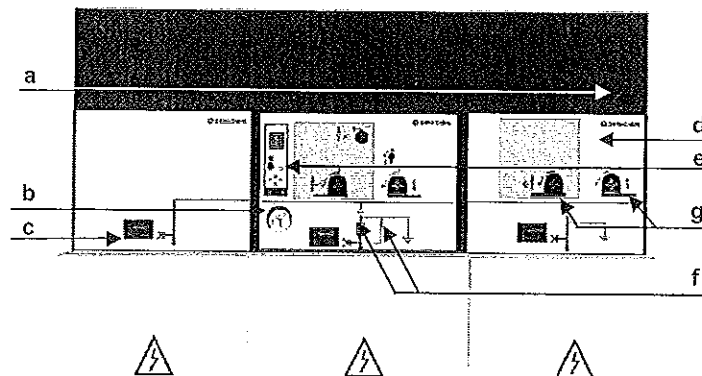


Фигура 1.17: Синоптическа схема на шкаф CGMCOSMOS-2LP

- e: ekoRPT защитен модул
f: Индикатори за състоянието
- ЧЕРЕН за мощностен разединител
 - ЧЕРВЕН за заземителен нож
- g: Катинар за блокировка

^[5] Захранващият извод към шкафа може да бъде отдясно (RCd/R2Cd) или отляво (RCi/R2Ci)

CGMCOSMOS-RLP



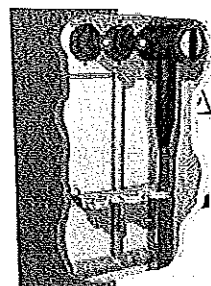
Фигура 1.18: Синоптична схема на шкаф CGMCOSMOS-RLP

където:

- | | |
|---|----------------------------------|
| a: ekorSAS, Акустична аларма за предотвр. на заземяване | e: ekorRPT защитен модул |
| b: Циферблат на манометъра | f: Индикатори за състоянието |
| c: ekorVPIS, Детектор за наличие на напрежение | • ЧЕРЕН за мощностен разединител |
| d: Зона за управление: | • ЧЕРВЕН за заземителен нож |
| • СИВА за мощностен разединител | g: Катинар за блокировка |
| • ЖЪЛТА за заземителен нож | |

3 Основа: Състои се от кабелното и газо-изпускателното отделения:

3a **Кабелно отделение:** Разположено е в долната предна част на шкафа и е снабдено с капак с взаимна блокировка със заземителната система, позволяващ достъп отпред до кабелите за средно напрежение.



То е проектирано да побира до:

- Опционално, 2 екранирани клеми с болтови връзки за всяка фаза плюс вентилен отвод с място за просъединението на съответните силови кабели.
- Кабелни скоби.
- Заземителни шини.

Фигура 1.19: Кабелно отделение

Като специална опция, основата позволява помещаването на кутия за разделяне на фазите^[6].

3b **Газо-изпускателно отделение:** Разположено е в задната долна част на шкафа. В случай на вътрешна дъга генерираните в процеса газове се отвеждат надолу и назад, като никога не преминават близо до хора, кабели или до останалата част от КРУ в трансформаторната подстанция.

^[6] Вж. раздел 5.8 Последователност за сглобяване на клемната кутия

1.1.1. ekorVPIS – Модул за индикация на наличие на напрежение



Модулът ekorVPIS визуализира три сигнала, съответстващи на всяка от фазите, като наличието на напрежение се индикира за всяка фаза чрез премигващи индикатори.

Индикаторът за наличие на напрежение в ekorVPIS гарантира работния диапазон, посочен в IEC 61958.

Модулът ekorVPIS има следните визуализации:



Фигура 1.20: Модул за индикация на наличие на напрежение

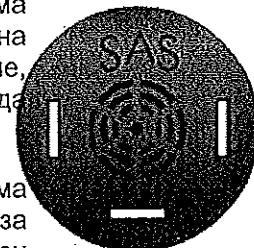
- L1, L2, L3** **Визуализация на всяка индикирана фаза**
Номерирането отговаря на фазовата последователност отляво надясно при поглед отпред на шкафа. Всяка фаза има изпитателна точка за проверка за съвпадане на фази между шкафове.
-  **Изпитателна точка, свързана към земя**
Използва се само за сравняване на фази.
-  **Визуализация за наличие на напрежение**
Премигващата светлина показва наличие на напрежение по тази фаза.

Изпитателните точки по трите фази и земята се използват за съгласуването на фазите^[7] между шкафове. За това действие може да се използва специалният уред за сравняване ekorSPC на Ormazabal.

Забележка: Ако индикаторите не премигват, проверете отсъствието на напрежение с други средства.

1.1.2. ekorSAS – Акустичен алармен модул за предотвратяване на заземяване

Акустичната аларма ekorSAS е асоциирана с индикатора за наличие на напрежение ekorVPIS и задействането на вала за заземяване /чрез ножа/. Алармата генерира звук, когато има входящо напрежение и лостът е свързан към вала на заземителния нож. Когато лостът е поставен в това положение, звук показва, че ако действието се извърши, в мрежата може да възникне късо съединение или зануляване.



В шкафите CGMCOSMOS-V алармата звучи, когато има напрежение по линията и се извърши действието "подготвяне за заземяване" (разединител в заземено положение и отворен прекъсвач).

Функционирането на модула е гарантирано в същия работен диапазон, като при модула ekorVPIS, към който е асоцииран.

Фигура 1.21: Модул ekorSAS

^[7] Вж. раздел 4.8 ekorSPC – проверка за наличие на напрежение и съгласуване на фази.

1.1.3. Информационна табелка с характеристиките

Всеки шкаф има информационна табелка, показваща някои от следните характеристики:

№: Сериен номер на шкафа^[8].

Тип: Система на шкафа от Ormazabal.

Designation: Модел на шкафа.

Стандарт: Приложен за оборудването стандарт.

Depom.: Деноминация на оборудването.

U_r: Ном. напрежение на оборудването.

U_p: Напрежение на устойчивост при импулсна вълна.

U_d: Напрежение на устойчивост при промишлена честота.

f_r: Ном. честота на оборудването.

I_r: Ном. ток на оборудването.

Class: Клас на задвижващия механизъм съгласно IEC 60265-1.

n: Брой на предимно активните операции за изключване на товара.

I_k / I_p: Ном. краткотраен ток / Ном. краткотрайна пикова стойност.

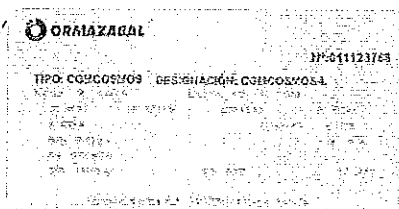
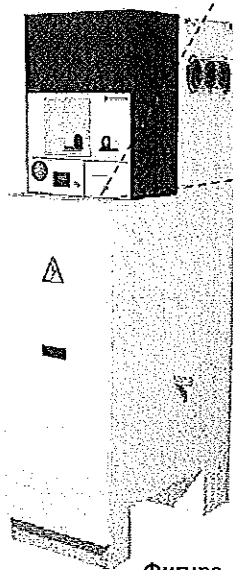
t_k: Време на вътрешната дъга в казана.

Pre: Налягане на газа в казана (MPa).

SF₆: Маса (g) на изолиращия флуид.

Año: Година на производство.

TC: Топлинен клас.



Фигура 1.22: Информационна табелка на шкаф CGMCOSMOS

^[8] В случай на инцидент отбележете този номер и го изпратете на Техническо-търговския отдел на Ormazabal.

1.2. ЕКСПЛОАТАЦИОННИ УСЛОВИЯ

Монтаж	Вътрешен
Максимална околна температура	+ 40 °C ^(a)
Минимална околна температура	- 5 °C ^(b)
Максимална средна околна температура за период от 24 часа	+ 35 °C
Максимална средна относителна влажност за период от 24 часа	< 95%
Максимално средно налягане на парата за период от 24 месеца	22 mbar
Максимално средно налягане на парата за период от 1 месец	18 mbar
Максимална надморска височина	2000 m ^(c)
Слънчева радиация	Пренебрежима
Замърсяване на въздуха (прах, соли и др.)	Незначително
Вибрации (сеизмичност)	Пренебрежима

^(a) За специфични експлоатационни условия (макс. околна температура над 40 °C) се консултирайте с Техническо-търговския отдел на Ormazabal.

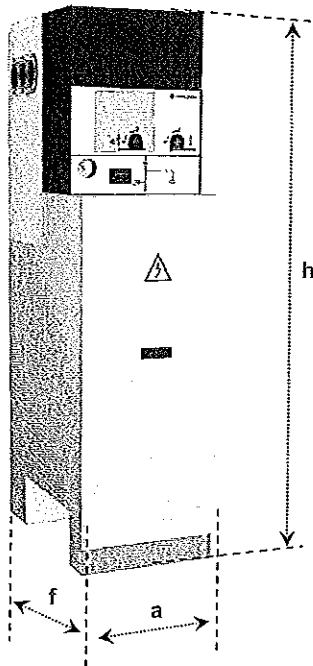
^(b) Има също така шкафове от клас "минус 15 за вътр. монтаж" и "минус 25 за вътр. монтаж".

^(c) За по-висока надморска височина се консултирайте с Техническо-търговския отдел на Ormazabal.

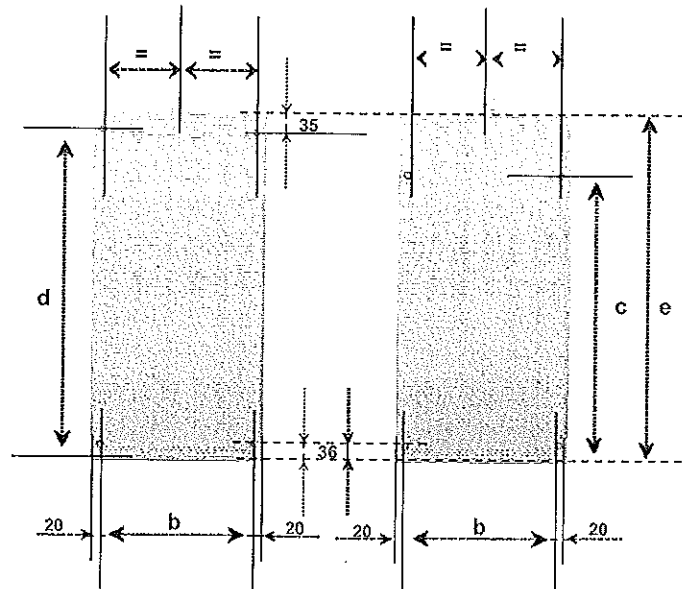
Забележка: Горепосочените спецификации се отнасят за раздел "Нормални условия за експлоатация на шкафове за вътрешен монтаж" от стандарта IEC 60694 "Общи спецификации за КРУ и управляващи механизми за високо напрежение".

1.3. МЕХАНИЧНИ ХАРАКТЕРИСТИКИ: Размери и тегла

1.3.1. CGMCOSMOS-L: Модулен шкаф за захранващи изводи



Фигура 1.23: Размери на шкаф CGMCOSMOS-L.



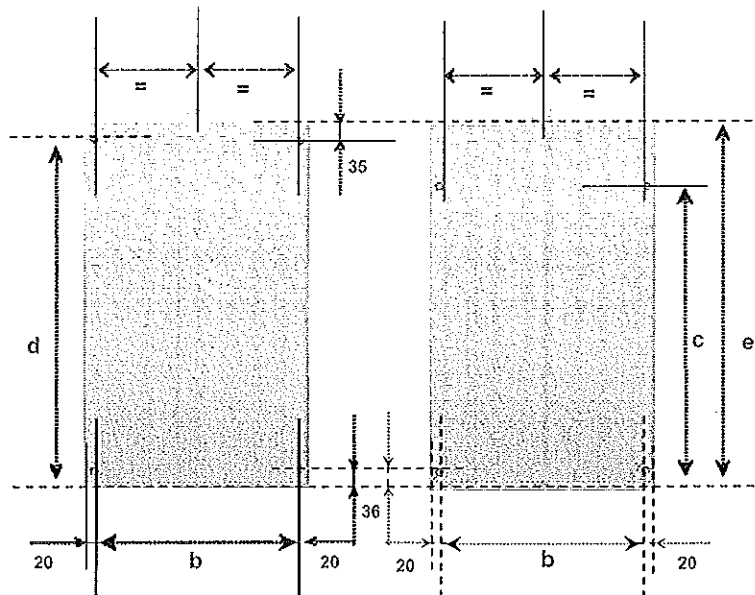
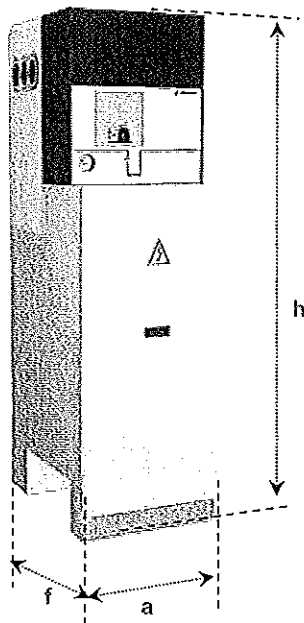
Височина 1300 mm

Височина 1740 mm

Фигура 1.24: Точки за анкериране на шкаф CGMCOSMOS-L.

Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)	365	
дълбочина (f)	735	
височина (h)	1300	1740
Анкерирания		
ниво b	325	
ниво c	576	
ниво d	668	
ниво e	703	
Тегло [kg]		
Общо	86	95

1.3.2. CGMCOSMOS-S: CGMCOSMOS-S: Модулен шкаф за шинен изключвател и CGMCOSMOS-S-Pt: Модулен шкаф за шинен изключвател със заземяване

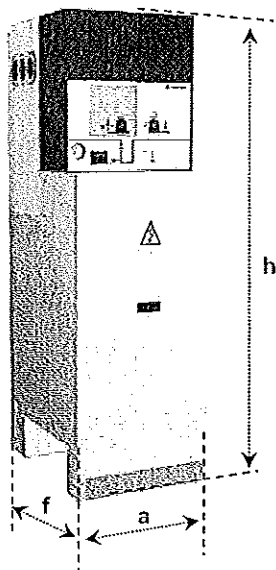


Височина 1300 mm

Височина 1740 mm

Фигура 1.25: Размери на шкаф CGMCOSMOS-S

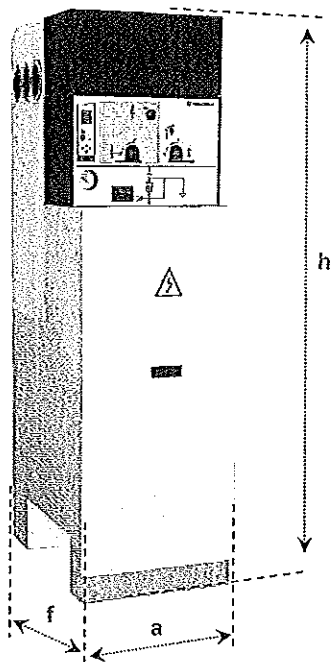
Фигура 1.26: Точки за анкериране на шкафове CGMCOSMOS-S и CGMCOSMOS-S-PT



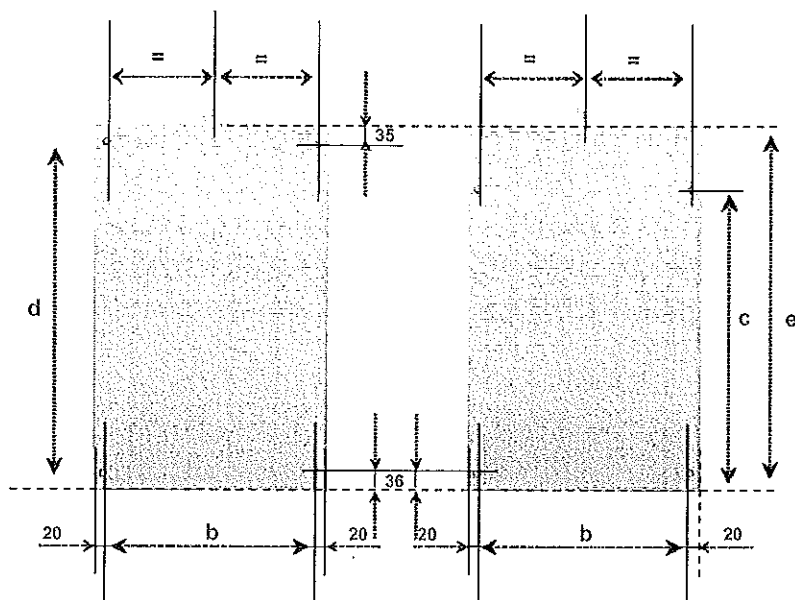
Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)		450
дълбочина (f)		735
височина (h)	1300	1740
Анкерирания		
ниво b		410
ниво c		576
ниво d		668
ниво e		703
Тегло [kg]		
Общо CGMCOSMOS-S	98	105
Общо CGMCOSMOS-S-PT	103	110

Фигура 1.27: Размери на шкаф CGMCOSMOS-S-PT

1.3.3. CGMCOSMOS-P: Модулен шкаф за предпазители



Фигура 1.28: Размери на шкаф CGMCOSMOS-P



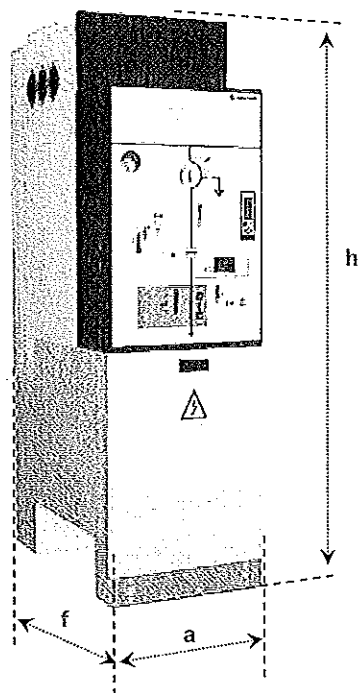
Височина 1300 mm

Височина 1740 mm

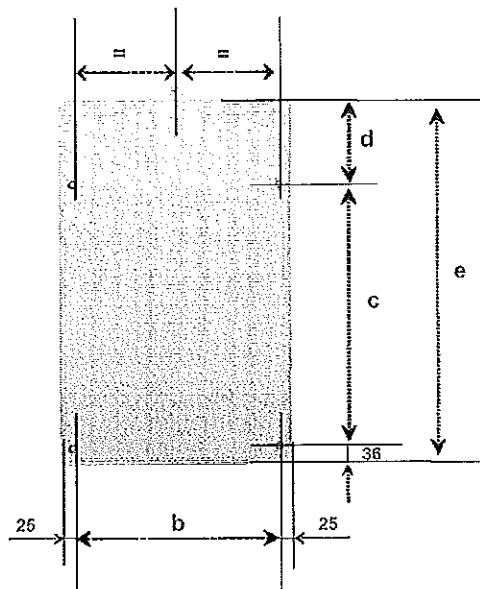
Фигура 1.29: Точки за анкерирание на шкаф CGMCOSMOS-P

Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)	470	
дълбочина (f)	735	
височина (h)	1300	1740
Анкерирания		
ниво b	430	
ниво c	576	
ниво d	668	
ниво e	703	
Тегло [kg]		
Общо	129	140

1.3.4. CGMCOSMOS-V: Модулен шкаф за вакуумен прекъсвач

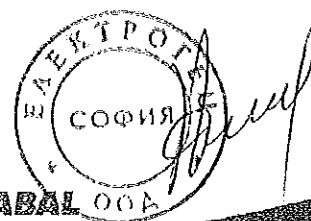


Фигура 1.30: Размери на шкаф CGMCOSMOS-V

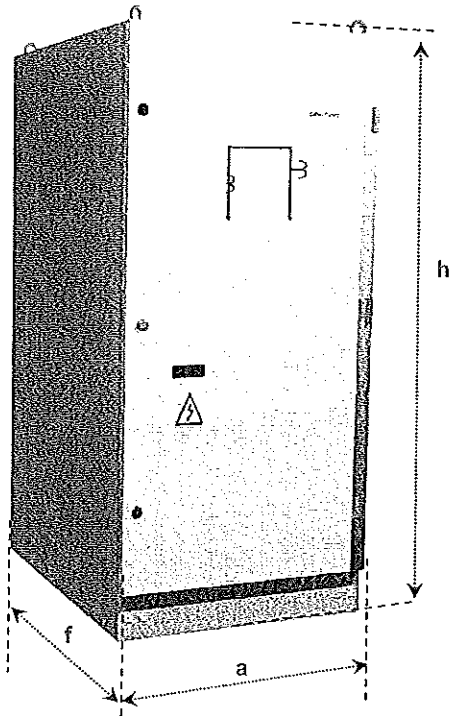


Фигура 1.31: Точки за анкериране на шкаф CGMCOSMOS-V

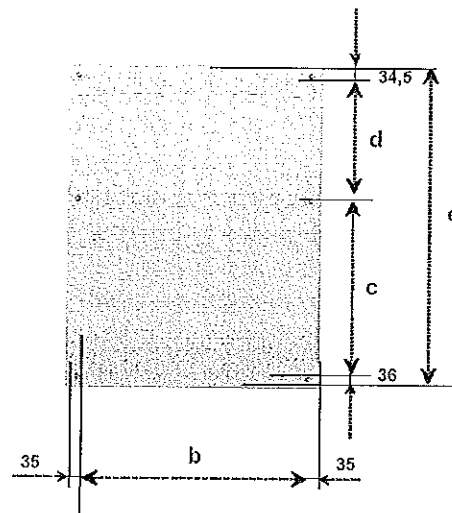
Размери [mm]	
Шкаф	
ширина (a)	480
дълбочина (f)	850
височина (h)	1740
Анкерирания	
ниво b	430
ниво c	540
ниво d	175
ниво e	751
Тегло [kg]	
Общо	218



1.3.5. CGMCOSMOS-M: Модулен шкаф за търговско мерене



Фигура 1.32: Размери на шкаф CGMCOSMOS-M

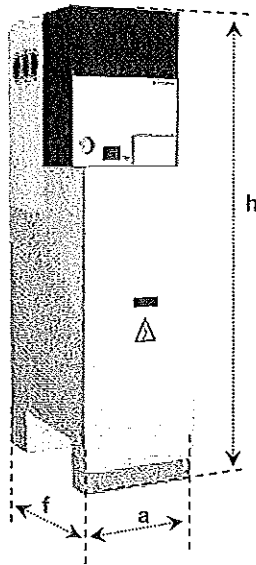


Фигура 1.33: Точки за анкерирание на шкаф CGMCOSMOS-M

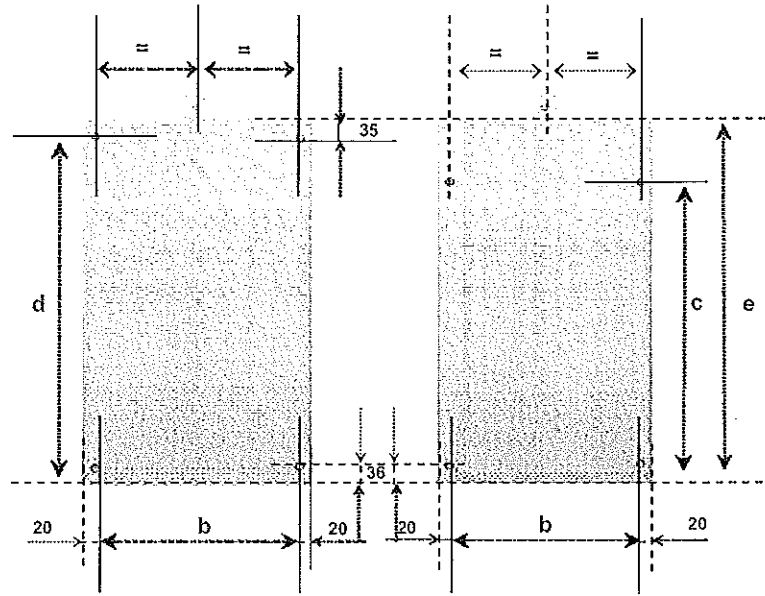
Размери [mm]	
Шкаф	
ширина (a)	800
дълбочина (f)	1025
височина (h)	1740
Анкерирания	
ниво b	730
ниво c	540
ниво d	379,5
ниво e	990
Тегло [kg]	
Общо	165

Забележка: Теглото се отнася за шкафа без измервателен трансформатор вътре в него

1.3.6. CGMCOSMOS-RB: Модулен шкаф за свързване на шини и CGMCOSMOS-RB-Pt: Модулен шкаф за свързване на шини със заземяване



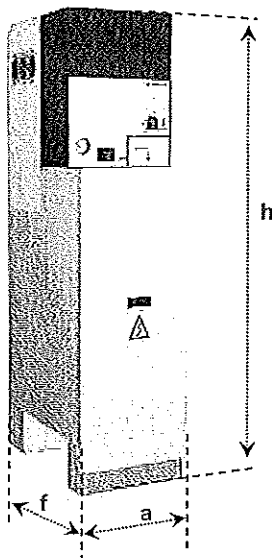
Фигура 1.34: Размери на шкаф CGMCOSMOS-RB



Височина 1300 mm

Височина 1740 mm

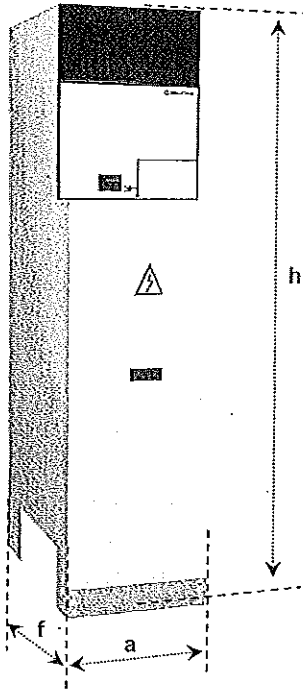
Фигура 1.35: Точки за анкерирание на шкафове CGMCOSMOS-RB и CGMCOSMOS-RB-Pt



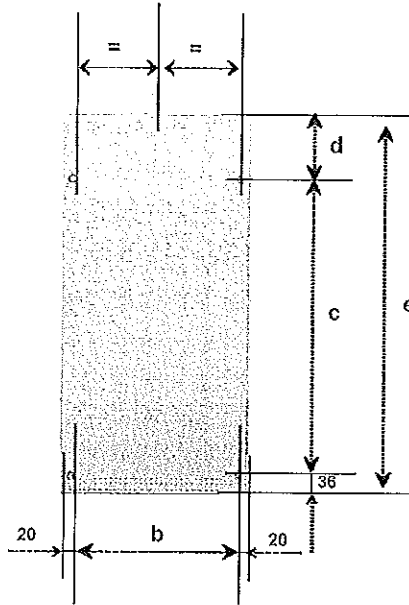
Фигура 1.36: Размери на шкаф CGMCOSMOS-RB-Pt

Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)	365	
дълбочина (f)	735	
височина (h)	1300	1740
Анкерирания		
ниво b	325	
ниво c	576	
ниво d	668	
ниво e	703	
Тегло [kg]		
Общо CGMCOSMOS-RB	80	95
Общо CGMCOSMOS-RB-PT	86	100

1.3.7. CGMCOSMOS-RC: Модулен шкаф за свързване на кабели



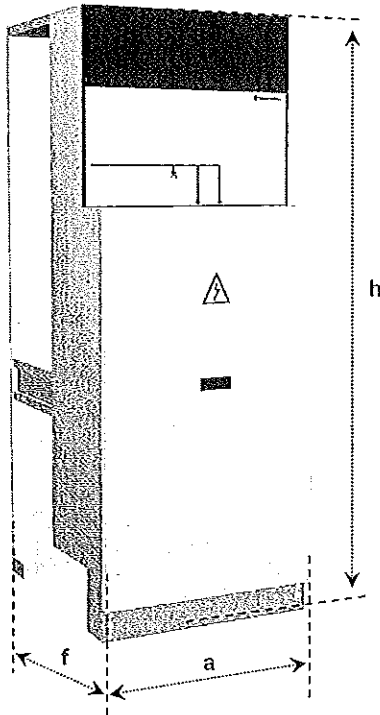
Фигура 1.37: Размери на шкаф CGMCOSMOS-RC



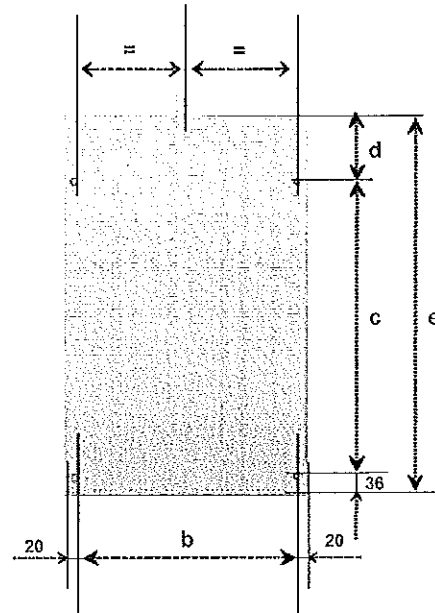
Фигура 1.38: Точки за анкерирание на шкаф CGMCOSMOS-RC

Размери [mm]	
Шкаф	
ширина (a)	365
дълбочина (f)	735
височина (h)	1740
Анкерирания	
ниво b	325
ниво c	576
ниво d	91
ниво e	703
Тегло [kg]	
Общо	40

1.3.8. CGMCOSMOS-R2C: Модулен двоен шкаф за свързване на кабели



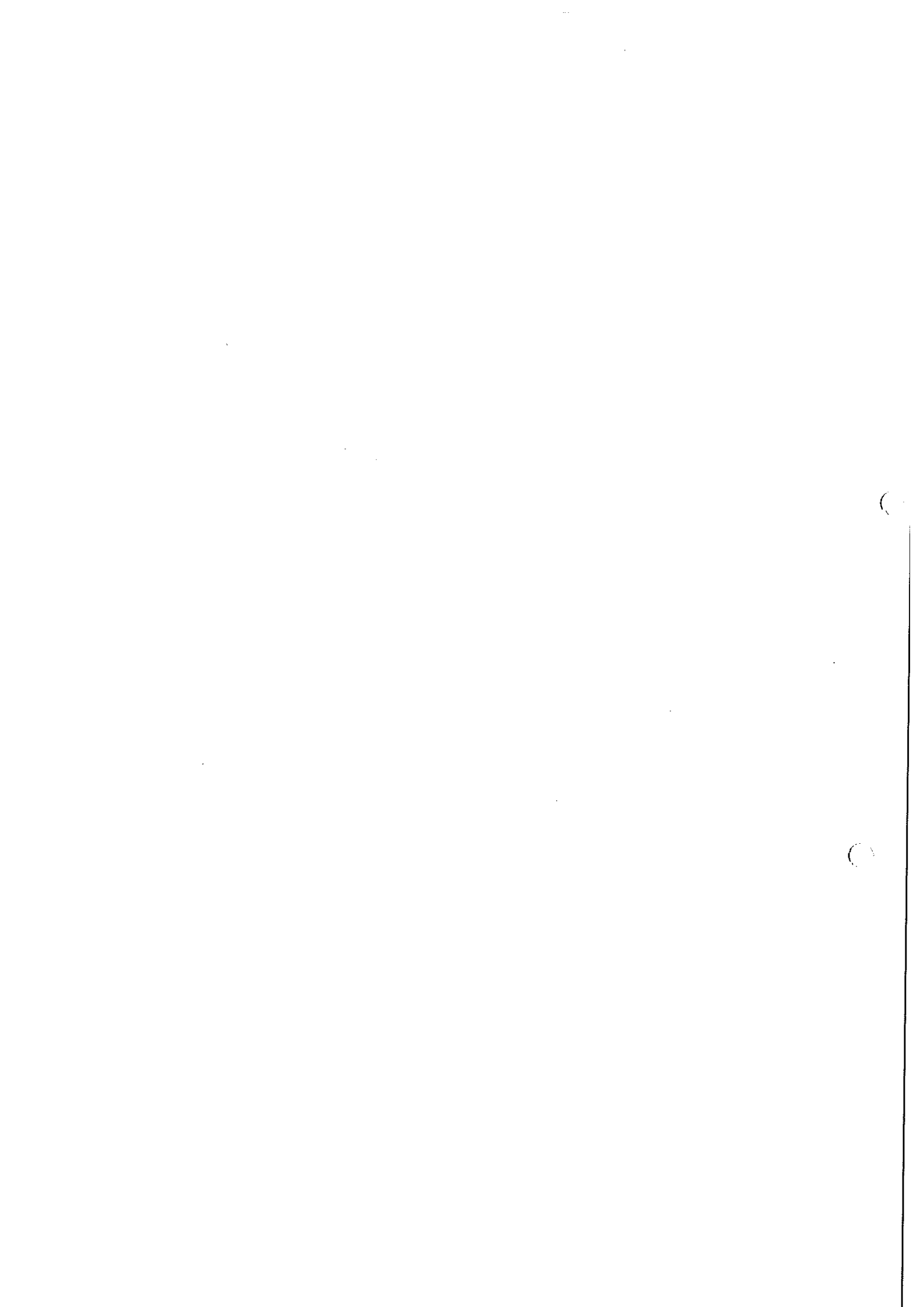
Фигура 1.39: Размери на шкаф CGMCOSMOS-R2C



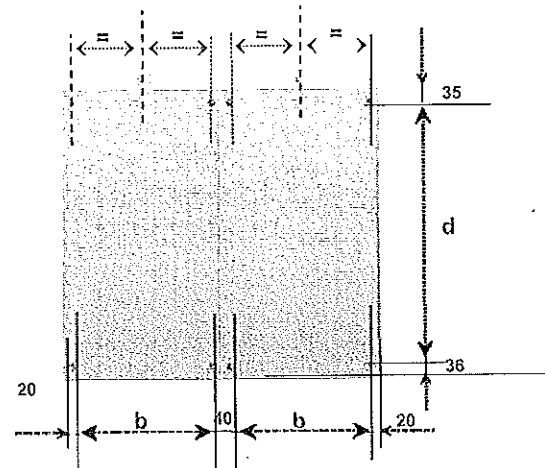
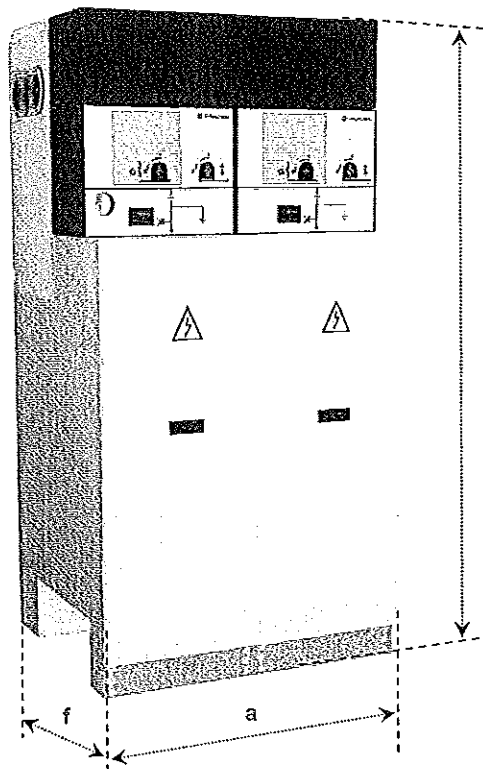
Фигура 1.40: Точки за анкерирание на шкаф CGMCOSMOS-R2C

Размери [mm]	
Шкаф	
ширина (a)	550
дълбочина (f)	735
височина (h)	1740
Анкерирания	
ниво b	510
ниво c	576
ниво d	91
ниво e	703
Тегло [kg]	
Общо	60

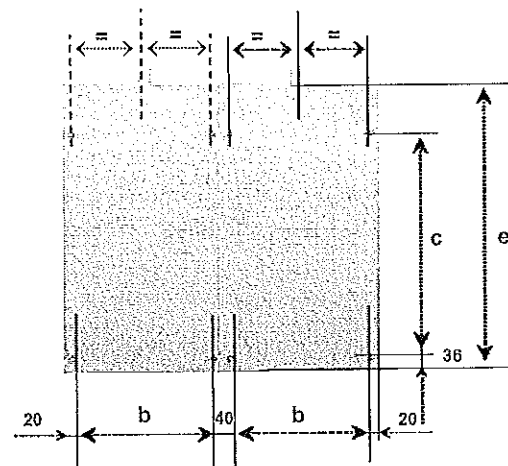




1.3.9. CGMCOSMOS-2L: Компактен двоен шкаф за захранващи изводи



Височина 1300 mm



Височина 1740 mm

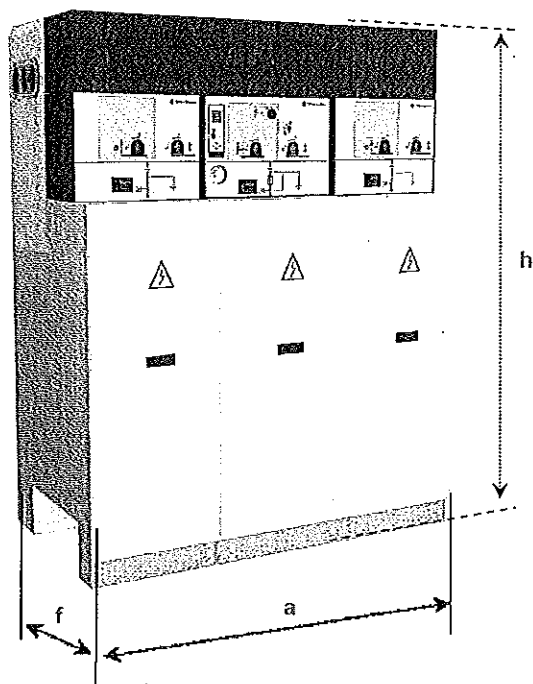
Фигура 1.41: Размери на шкаф CGMCOSMOS-2L

Фигура 1.42: Точки за анкериране на шкаф CGMCOSMOS-2L

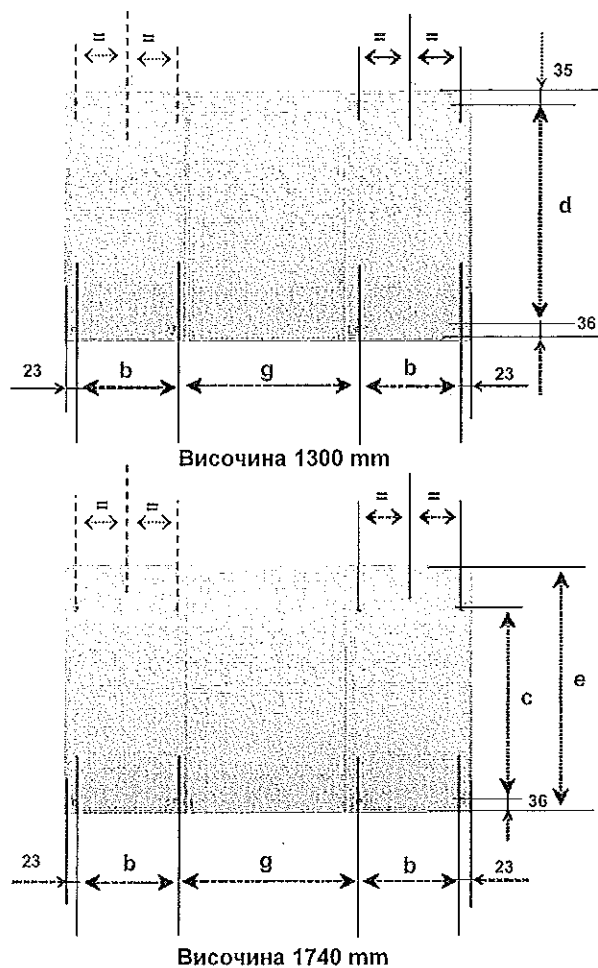
Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)	730	
дълбочина (f)	735	
височина (h)	1300	1740
Анкерирания		
ниво b	325	
ниво c	540	
ниво d	632	
ниво e	703	
Тегло [kg]		
Общо	182	200



1.3.10. CGMCOSMOS-2LP: Компактен шкаф тип "Вход/Изход" (2 блока с изводи и 1 блок с предпазители)

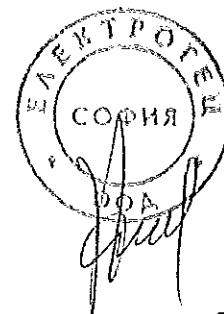


Фигура 1.43: Размери на шкаф CGMCOSMOS-2LP

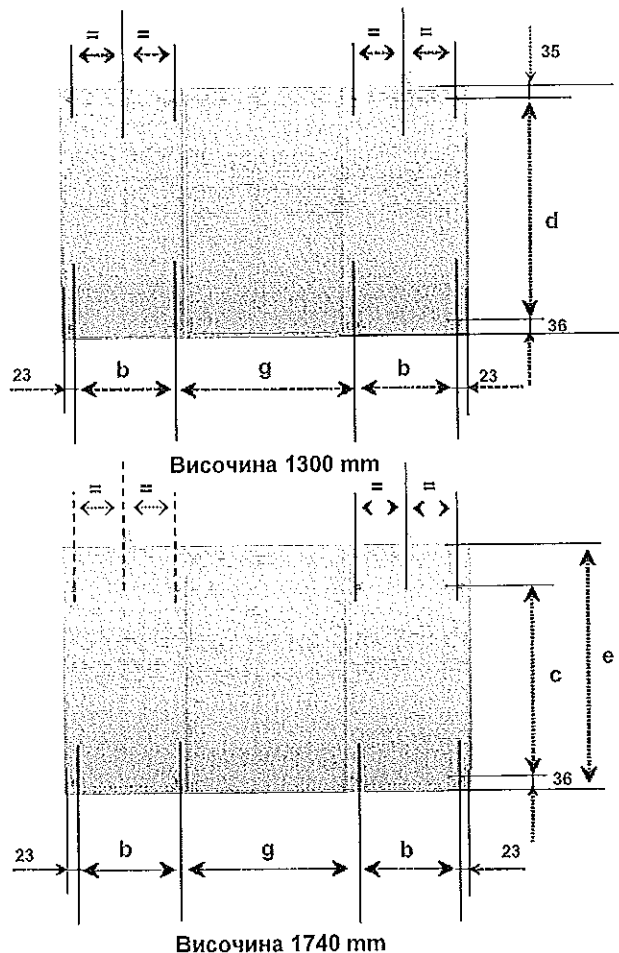
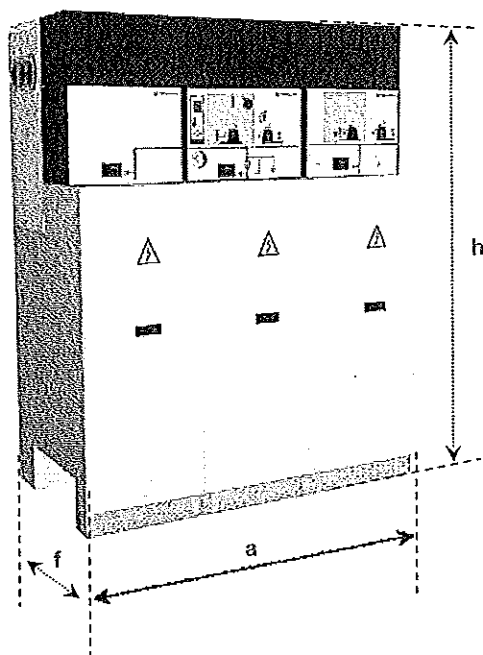


Фигура 1.44: Точки за анкериране на шкаф CGMCOSMOS-2LP

Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)		1190
дълбочина (f)		735
височина (h)	1300	1740
Анкерирания		
ниво b		317
ниво c		540
ниво d		632
ниво e		703
ниво g		510
Тегло [kg]		
Общо	270	290



1.3.11. CGMCOSMOS-RLP: Компактен шкаф с блокове за свързване на шини, изводи и предпазители



Фигура 1.45: Размери на шкаф CGMCOSMOS-RLP

Фигура 1.46: Точки за анкерирание на шкаф CGMCOSMOS-RLP

Размери [mm]		
Шкаф	с ниска основа	с висока основа
ширина (a)	1190	
дълбочина (f)	735	
височина (h)	1300	1740
Анкерирания		
ниво b	317	
ниво c	540	
ниво d	632	
ниво e	703	
ниво g	510	
Тегло [kg]		
Общо	264	284



1.4. ОСНОВНИ ЕЛЕКТРОТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ

1.4.1. Напрежение

Функционален блок		Предпазители	
		Шинни изключватели	
		Шинни изкл. със заземяване	
		Прекъсвачи	
Номинално [kV]		12	24
Промислена честота 1 мин. [kV]			
	Между полюси и клеми на отворения разединител	28	50
	Изоляционно разстояние	32	60
Импулсна вълна [kV]			
	Между полюси и клеми на отворения разединител	75	125
	Изоляционно разстояние	85	145

1.4.2. Ток

	Изводи	Шинен изкл.	Предпазители	Прекъсвач
	Св. на шини	Шинен изкл. със заземяване		
	Св. на шини със заземяв.			
Връзка между шини и шкафове	400/630	400/630	400/630	400/630
	16/20* / 25#	16/20* / 25#	16/20* / 25#	16/20
	16/20*	16/20*	16/20*	16/20

(*) Изпитанията са проведени с ток 21 kA / 52.5 kA.

(#) Само за 12 kV. Консултирайте се с Техническо-търговския отдел на Ormazabal.

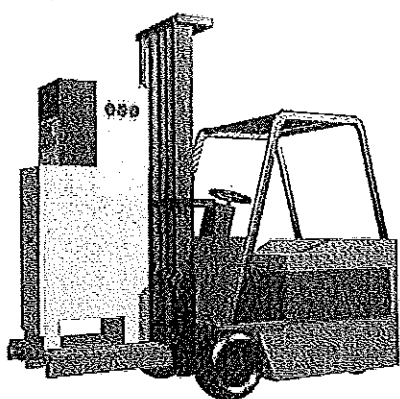


2.1. ПОДЕМНИ СПОСОБИ

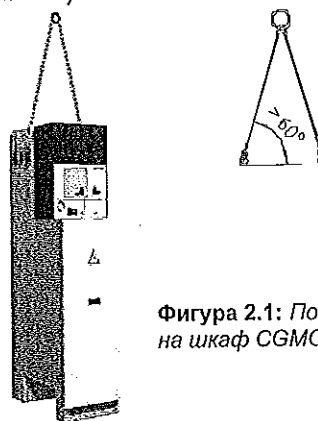
Шкафовете трябва винаги да бъдат вертикално изправени, директно на пода или на палета в зависимост от типа на действието, което ще се извършва.

За модулните конструкции CGMCOSMOS трябва да се използва един от следните подечни способности:

- С ролко под шкафа
- С мотокар или повдигач за палети¹⁹⁾
- Повдигане с фиксирани въжета за страничните подечни скоби отгоре на шкафа. Уверете се, че повдигате във възможно най-изправено положение (при ъгъл на скобата над 60° спрямо равнината).

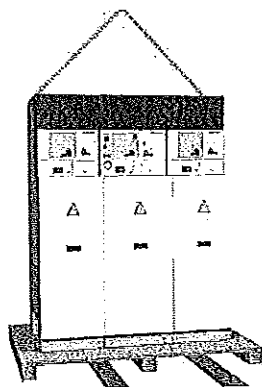


Фигура 2.2: Повдигане с мотокар на шкаф CGMCOSMOS

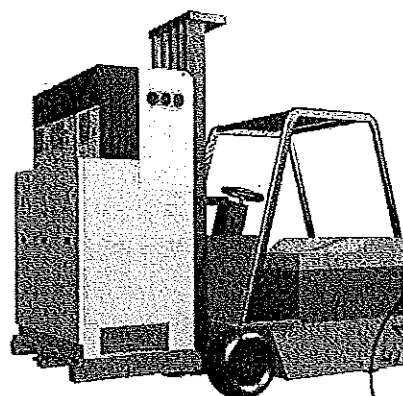


Фигура 2.1: Повдигане с въжета на шкаф CGMCOSMOS

Използването на подечни греди е необходимо при боравенето с компактни конструкции CGMCOSMOS или сборни модули с до четири шкафа, при ъгъл над 65° и под 115° , за да се избегне евентуална повреда на шкафовете при тяхното повдигане.



Фигура 2.3: Повдигане с въжета на шкаф CGMCOSMOS



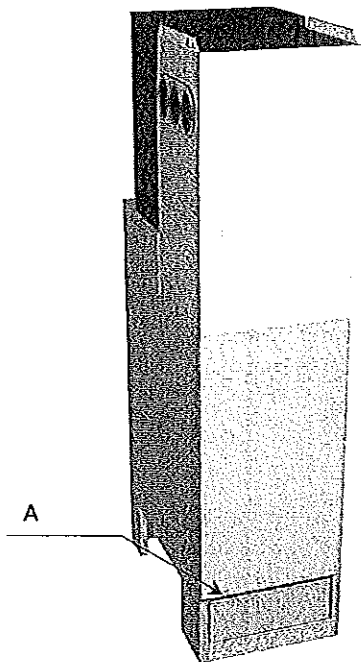
Фигура 2.4: Повдигане с мотокар на шкаф CGMCOSMOS

¹⁹⁾ Задната част на шкафа трябва да бъде с лице към мотокариста, за да се избегнат повреди отпред.

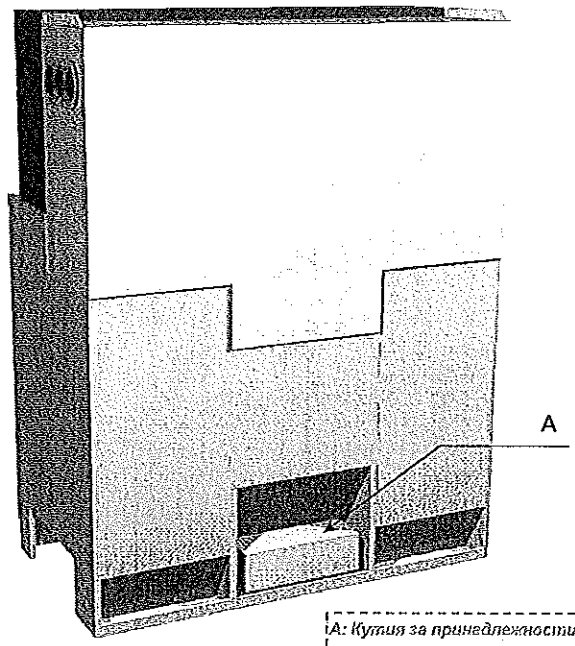
2.2. РАЗПОЛОЖЕНИЕ НА ПРИНАДЛЕЖНОСТИТЕ ПРИ ТРАНСПОРТИРАНЕ

При транспортиране шкафът трябва да бъде стабилен и сигурен, така че да не се измества и да не се повреди.

С шкафовете се доставят няколко принадлежности, разположени както следва:



Фигура 2.5: Положение на принадлежностите в модулни шкафове CGMCOSMOS



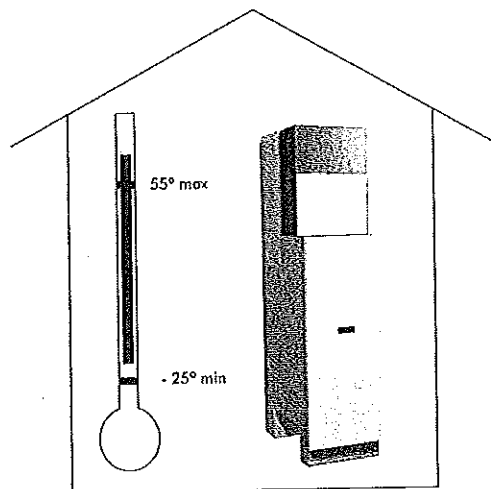
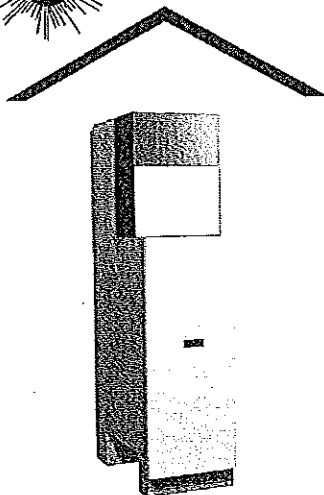
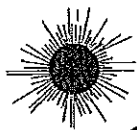
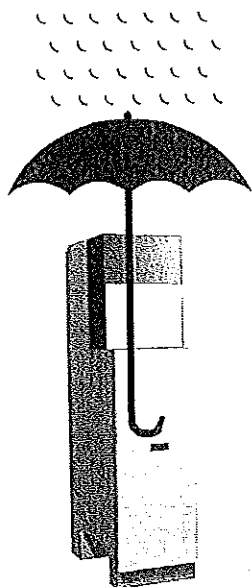
Фигура 2.6: Положение на принадлежностите в компактни шкафове CGMCOSMOS

В зависимост от модела на шкафа, кутията за принадлежности съдържа някои от следните компоненти:

- Документ с общите инструкции IG-078
- Задвижващ лост
- Лост за зареждане на пружината
- За свързване на шкафа
 - ORMALINK
 - Пружини
 - Силиконова смазка
 - Заземителна шина
- Комплект за фиксиране отстрани
 - Краен панел на шкафа
 - Найлонов конец
 - Пластмасови вложки
 - Страничен капак
- Сглобка за анкериране към пода

Ако шкафът ще бъде съхраняван, той трябва да бъде поставен на суха повърхност или върху изолиращ против влажност материал, винаги в неговата оригинална опаковка.

След дълъг период на съхранение внимателно почистете всички изолационни части преди пуска на оборудването. Корпусът трябва да се почисти с чист сух парцал без власинки.



- Максимална надморска височина 2000 m
- Съхранявайте в неагресивна към материалите среда

При монтажа оборудването трябва да се регулира спрямо съществуващото атмосферно налягане, тъй като в противен случай стрелката на манометъра може да показва грешни стойности (червена скала), дори когато вътрешното налягане се нормално.



4.1. РАЗОПАКОВАНЕ НА ОБОРУДВАНЕТО

Шкафовете от системата CGMCOSMOS се доставят защитени в пластмасова опаковка.

При получаване на оборудването проверете дали заявката и съответната документация отговарят на доставката.

Процесът по разопаковане на оборудването е описан по-долу:

- С нож, резец или нещо подобно срежете омотания около шкафа целофан^[10].
- Махнете целофана.
- Извадете белите коркови ъглови вложки.
- Развинтете закрепващите елементи между основата и палетата.
- Извадете палетата, боравейки с шкафа според препоръчаното в раздел 2.1.
- Разопаковайте кутията с принадлежности в задната долна част на шкафа.
- Отлепете защитната самозалепваща лента от капака на кабелното отделение, а ако е необходимо, я отстранете.
- Изхвърлете остатъчните материали по природосъобразен начин.

Препоръчително е да се провери визуално оборудването, за да се види дали не няма щети при транспортирането. Ако е така, незабавно се свържете с Техническо-търговския отдел на Ormazabal.

⚠ ВАЖНО:

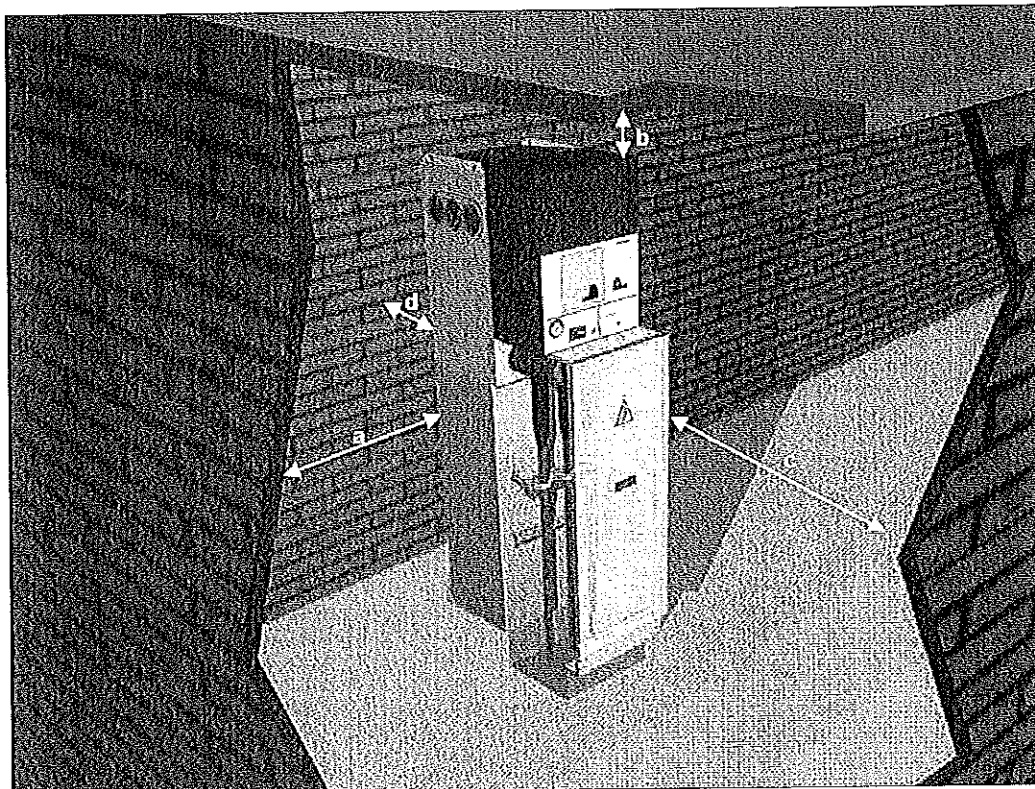
Ако не отстраните самозалепващата лента от кабелното отделение, заземяването на опаковката на оборудването може да няма адекватна непрекъснатост.

^[10] Препоръчително е да разрежете целофана отзад на шкафа или при ъгловите вложки, за да не надраскате повърхността.



4.2. ИНЖЕНЕРНИ РАБОТИ

Минималните отстояния от стените и тавана, както и от канала за кабелите за СН са следните:



Фигура 4.1: Минимални отстояния при монтажа

Минимални отстояния [mm]	
Шкаф	
Странична стена (a)	> 100
Таван (b)	> 600
Коридор отпред (c)	Експлоатация: > 1000 Изваждане на шкафа: > 2000
Задна стена (d)	> 100*

(* Освен за CGMCOSMOS-V, където мярката ще бъде > 50 mm и 0 mm за шкафове CGMCOSMOS-M.

Забележка: Тези измерения трябва да се получат съгласно изпитанията с вътрешна дъга, проведени в зала с височина 2300 mm, за газо-изолирани модули съгласно IEC 62271-200, Приложение А.



Размерите на кабелния канал зависят от максималния радиус на закривяване на използваните кабели ^[11].

РАЗМЕРИ НА КАБЕЛНИЯ КАНАЛ ЗА ШКАФ С ИЗВОДИ [КЛЕМА "L" или "T" 400/630 A]

ДАННИ ЗА КАБЕЛА				ПРИБЛ. РАДИУС НА ЗАКРИВЯВАНЕ [mm]	ДЪЛБОЧИНА НА КАНАЛА ВИСОЧИНА НА ШКАФА			
КАБЕЛНА ИЗОЛАЦИЯ	ТИП КАБЕЛ	НАПР. СЕЧ. НА КАБЕЛА [mm ²]	ДИАМЕТЪР НА КАБЕЛА [mm]		1300 mm		1740 mm	
					D1	D3	D2	D4
Суша изолация	Едно- жилен	150	38	500	350	350	(R) 0*	0*
		185	42	600	400	400	(F) 400	0*
		240	42					
		300	48					
	400	48	750	600	600	(R) 500 (F) 600	250	
	Три- жилен ^[12]	150						85
		185	85					

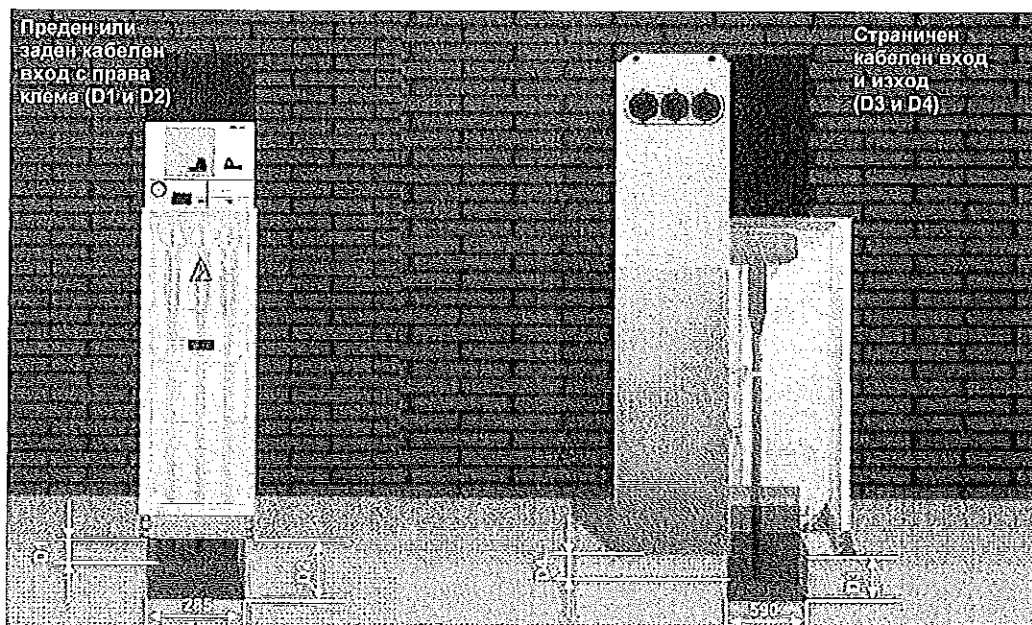
D1 и D2 за вход отпред (F) или отзад (R).

D3 и D4 за вход от страни.

D5 Отстъп от задната стена.

(*) Шкафове, монтирани на 65 mm помощна секция.

Размери в mm



Фигура 4.2: Отстояния за кабелния канал при CGMCOSMOS-L

^[11] Имайте предвид използвания кабел при всеки отделен монтаж.

^[12] За други кабелни секции се консултирайте с Техническо-търговския отдел на Ormazabal.

РАЗМЕРИ НА КАБЕЛНИЯ КАНАЛ ЗА ШКАФ С ПРЕДПАЗИТЕЛИ [ВИСОЧИНА 1300 mm]										
ДАНИИ ЗА КАБЕЛА				ПРИБЛ. РАДИУС НА ЗАКРИВЯВАНЕ [mm]	ИЗХОД ОТДОЛУ		ИЗХОД ОТЗАД			
					КАБЕЛНА ИЗОЛАЦИЯ	ТИП КАБЕЛ	НАПР. СЕЧ. НА КАБЕЛА [mm ²]	ДИАМ. НА КАБЕЛА [mm]	КЛЕМИ	
500	500	Коленчата 250 А		Коленчата 400/630 А						
		750	с.	с	без	с	без			
D1 или D3				D5						
Суша изолация	Едно-жилен	≤50	38	500	500	500	300	500	300	
		70	38							
		95	38							
		150	38							
Суша изолация	Три-жилен	≤95	38	750	с.	750	с.	750	с.	
		150	85							
		185	85							

РАЗМЕРИ НА КАБЕЛНИЯ КАНАЛ ЗА ШКАФ С ПРЕДПАЗИТЕЛИ [ВИСОЧИНА 1740 mm; ШИРИНА 470 mm]										
ДАНИИ ЗА КАБЕЛА				ПРИБЛ. РАДИУС НА ЗАКРИВЯВАНЕ [mm]	ИЗХОД ОТДОЛУ		ИЗХОД ОТЗАД			
					КАБЕЛНА ИЗОЛАЦИЯ	ТИП КАБЕЛ	НАПР. СЕЧ. НА КАБЕЛА [mm ²]	ДИАМ. НА КАБЕЛА [mm]	КЛЕМИ	
500	0* (F) 300	Коленчата 250 А		Коленчата 400/630 А						
		750	с.	с	без	с	без			
D2 or D4				D5						
Суша изолация	Едно-жилен	≤50	38	500	0* (F) 300	500	300	500	300	
		70	38							
		95	38							
		150	38							
Суша изолация	Три-жилен	≤95	38	750	с.	750	с.	750	с.	
		150	85							
		185	85							

(*) Всеки кабел трябва да бъде проверен спрямо данните от производителя.

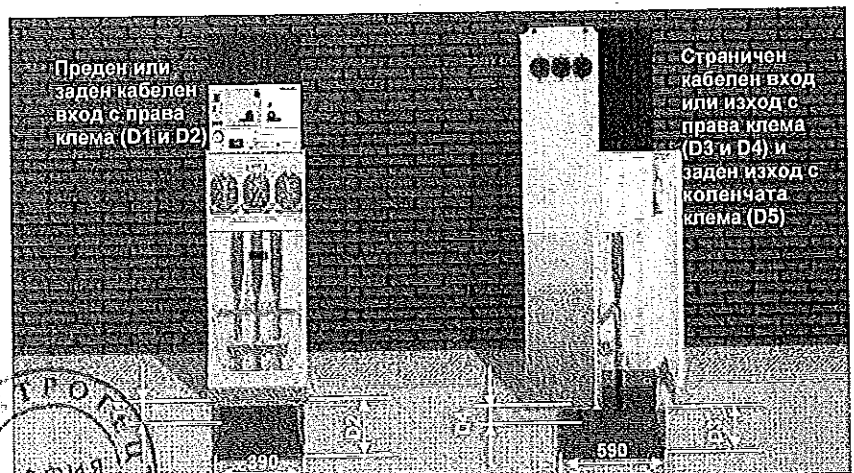
D1 и D2 за вход отпред (F) или отзад (R).

D3 и D4 за вход от страни.

D5 Отстъп от задната стена.

(*) Шкафове, монтирани на 65 mm помощна секция.

(с.) Свържете се с Техническо-търговския отдел на Ormazabal.



Фигура 4.3: Отстояния за кабелния канал при CGMCOSMOS-P

Размери в mm

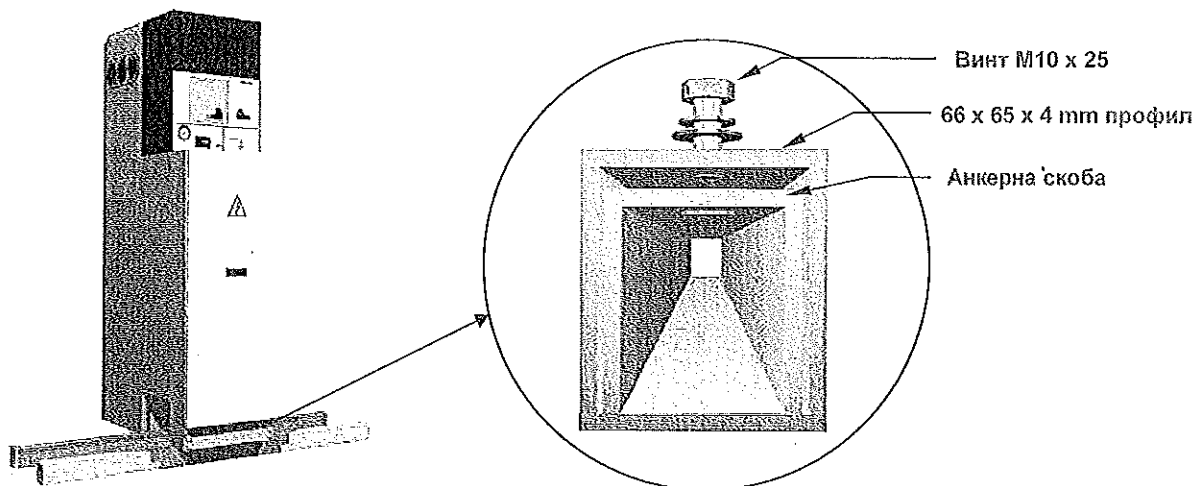
ORMAZABAL

4.3. АНКЕРИРАНЕ ЗА ПОДА

Подът трябва да бъде добре нивелиран за поставянето на шкафове, за да се избегнат смущения, които биха затруднили свързването на даден шкаф към останалите шкафове.

Шкафовете могат да бъдат анкерирани за пода по един от следните два начина:

а) **Върху профилна шина:** Ако подът в трансформаторната подстанция не е достатъчно равен, се препоръчва да монтирате шкафната конструкция върху помощна профилна шина, която улеснява закрепването на шкафа. Тази шина, която може да се поръча, трябва да бъде анкерирана за пода, особено ако има риск от наводняване.



Фигура 4.4: Разположение на шкафа върху профилната шина

б) **Без профилна шина:** Ако подът е достатъчно равен, шкафът може да бъде директно анкериран за него.

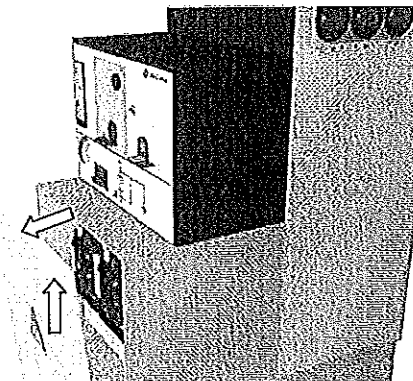
Процесът на анкерирание за пода е както следва:

1. Превключвателят в шкафа трябва да бъде в заземеното положение^[13]

Забележка: Шкафовете се доставят при превключвател по подразбиране в заземено положение, освен при шкафа с прекъсвач.

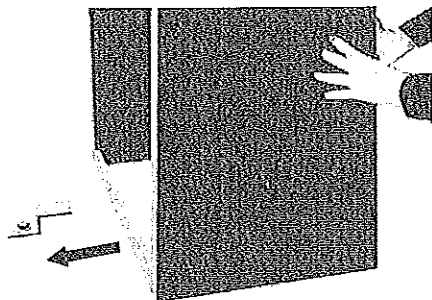
^[13] Вж. раздел 5. Последователност на операциите.

2. След това извадете долния капак, издърпвайки го нагоре, докато излезе.

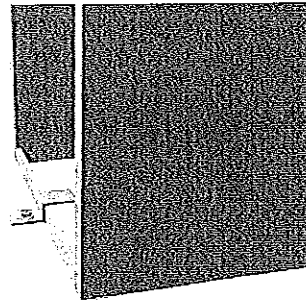


Фигура 4.5: Изваждане на долния капак

3. Поставете и закрепете ъгловите скоби, доставени с оборудването, и закрепете за пода така, че щом процеса по анкериране завърши, те да лежат приблизително в средата на задния газов изпускател. Поставете по една ъглова скоба на функционален модул или по две в случай на шкаф от компактен тип.

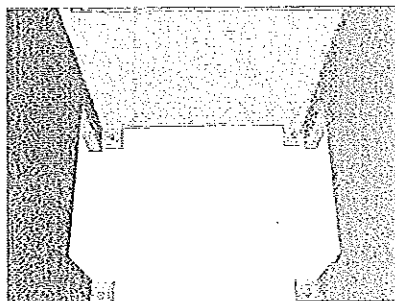


Фигура 4.6: Избутайте шкафа отпред



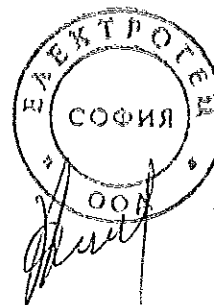
Фигура 4.7: Шкаф с ъгловата скоба в центрирано положение

4. Анкерирате първия шкаф за пода на трансформаторната подстанция с винтовете, подготвени в основата му^[14]. По този начин се избягват измествания или вибрации поради причини, като къси съединения, евентуално наводняване на трансформаторната подстанция и др.



Фигура 4.8: Точково разположение на ъгловите скоби при шкафове CGMCOSMOS

^[14] Вж. раздел 1.3. Механични характеристики.



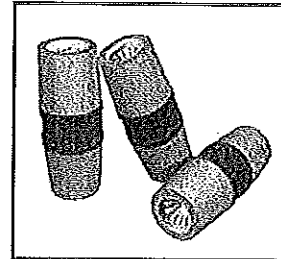
След нивелирането иглобяването на групата шкафове изисква само механичното и електрическото свързване между шкафовете и тяхното последващо анкериране за пода, както е показано в точка 4 от тази последователност.

4.4. СВЪРЗВАНЕ МЕЖДУ ШКАФОВЕТЕ

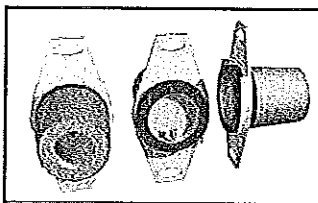
Комплектът за електрическото и механичното свързване на шкафовете се нарича ORMALINK. Този патентован от Ormazabal компонент позволява свързването на шината за шкафовете от системата CGMCOSMOS без да се налага замяната на елегаза.

ORMALINK се състои от три изваждаеми еластомерни адаптери, които могат да се поставят между "женските" проходни изолатори (изходни отвори за шината)

отстрани на свързваните шкафове, за да се осигури непрекъснатост към шината и да се уплътни връзката, като се следи електричното поле.



Фигура 4.9: Комплект за свързване ORMALINK

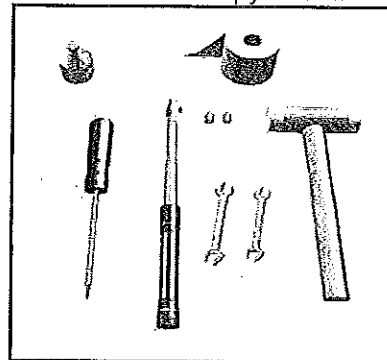


Фигура 4.10: Крайни тапи

Докато трансформаторната подстанция не бъде разширена, разширяемите шкафове в краищата на системата трябва да имат уплътняващи компоненти (крайни тапи) за "женските" проходни изолатори.

За правилното функциониране на шкафната връзка или за поставянето на крайните тапи за системата CGMCOSMOS дръжте под ръка следните основни инструменти:

- 2 гаечни ключа размер 12-13
- 1 френски ключ с накрайници "13" и "10"
- 1 прът или здрав винт
- 1 бутилка спирт
- 1 сух парцал без власинки или здрава хартия
- 1 пластмасово чукче



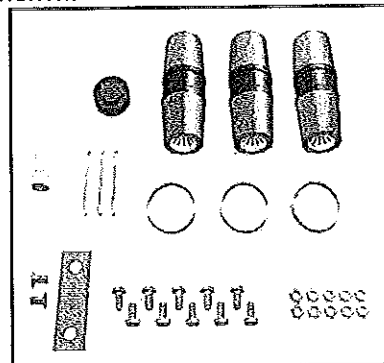
Фигура 4.11: Необходими инструменти



4.4.1. Сглобяване на комплекта за свързване

Комплектът за свързване се състои от следните компоненти:

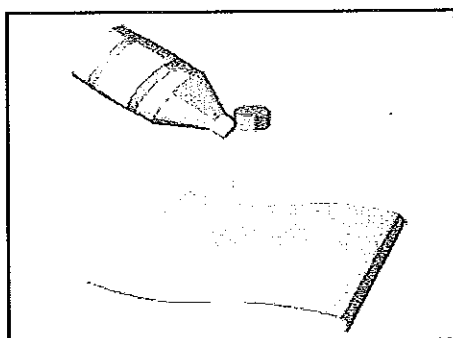
- 3 ORMALINK
- 3 защитни пръстена
- 3 заземителни пружини
- Инструмент за поставяне на ORMALINK
- Съответните гайки и болтове:
 - 8 x M8 x 20
 - 2 x M8 x 30
- Заземителна шина
- Klüber Proba 270 Syntheso - силиконова смазка



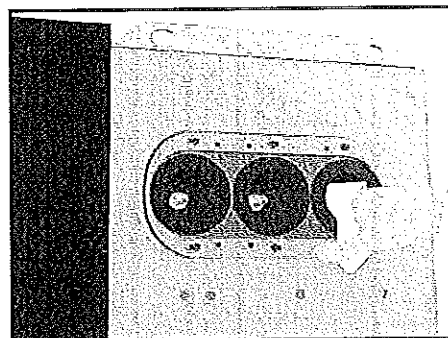
Фигура 4.12: Съдържание на комплекта

За да се сглобят шкафите в системата CGMCOSMOS, шкафът който ще се свързва към наличната конструкция (монтираният в момента шкаф), трябва да бъде докаран и да се спази следната посочена последователност за сглобяването:

- 1) Осигурете видимост във вътрешността на "женските" проходни изолятори и ги почистете от всякакви остатъци от прах или мръсотия, използвайки напоен със спирт парцал.

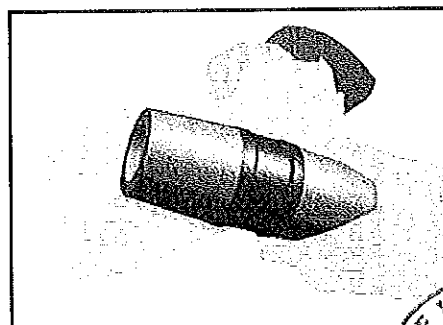


Фигура 4.13: Напоеете парцала със спирт



Фигура 4.14: Почистване на "женския" прох. изолатор отвътре

- 2) Повторете този процес за външните конични части на ORMALINK, които след това се поставят вътре във всеки "женски" проходен изолатор.

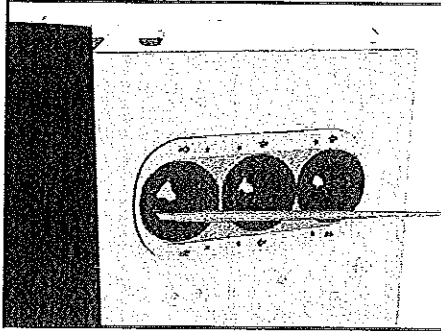


Фигура 4.15: Почистване на ORMALINK

▲ ВАЖНО:

Трябва да се избягва стъргането или надраскването черната полупроводникова част на ORMALINK.

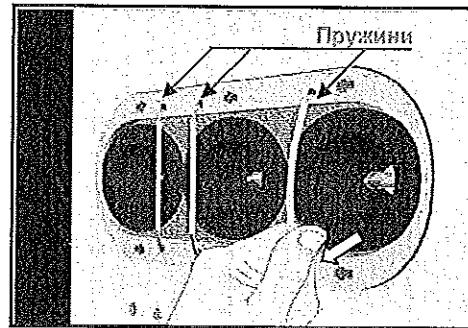




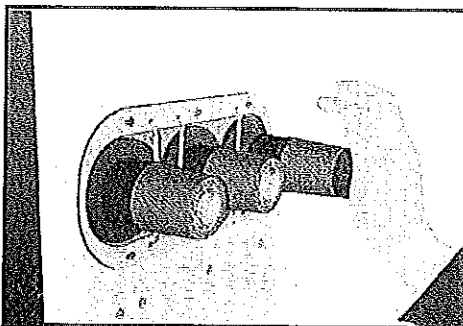
3) Използвайте силиконовата смазка, доставена в комплекта с принадлежности (Syntheso Proba 270), на цялата вътрешна повърхност на "женските" проходни изолатори, специално внимавайки да избягвате точките за свързване на шината.

Фигура 4.16: Използване на силиконовата смазка Syntheso Proba 270

4) За всеки монтиран шкаф трябва да се използва по една пружина за всеки "женски" проходен изолятор.



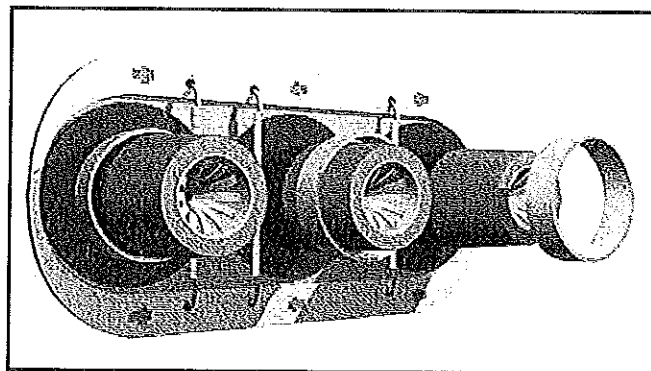
Фигура 4.17: Пружини



5) Поставете по един ORMALINK във всеки "женски" проходен изолятор, натискайки с инструмента за поставяне.

Фигура 4.18: Процес по поставянето на ORMALINK

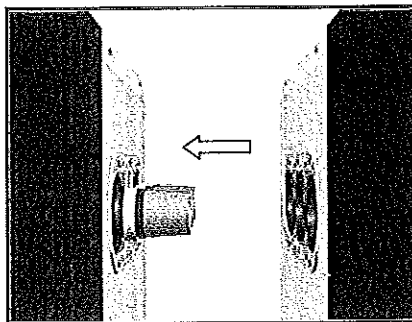
6) Поставете защитен пръстен в централната област на всеки ORMALINK.



Фигура 4.19: Подробен изглед на защитния пръстен

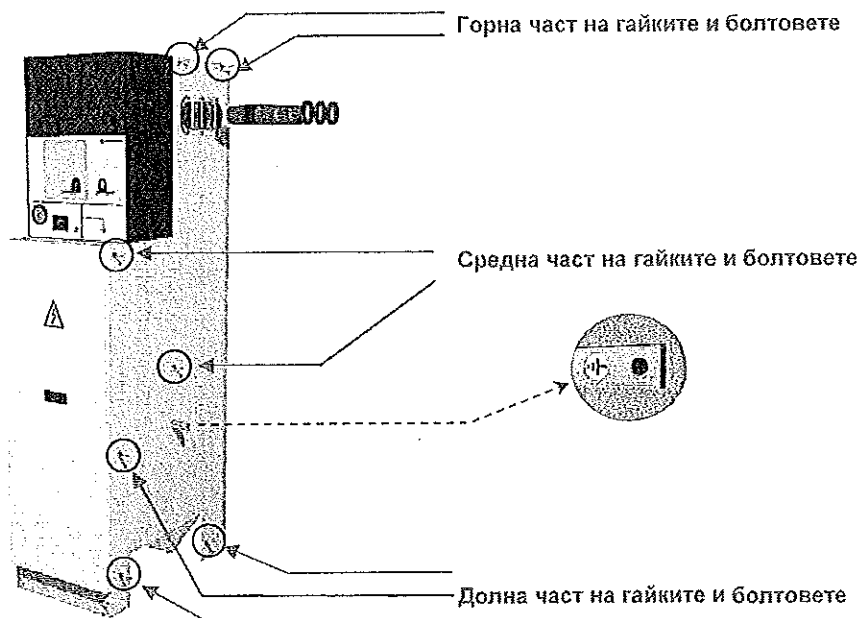


7) Когато шкафовете бъдат подравнени и идеално нивелирани, придвижете без сила присъединявания шкаф към другия такъв в тяхното крайно положение, като се уверите, че ORMALINK влизат в трите проходни изолатора.



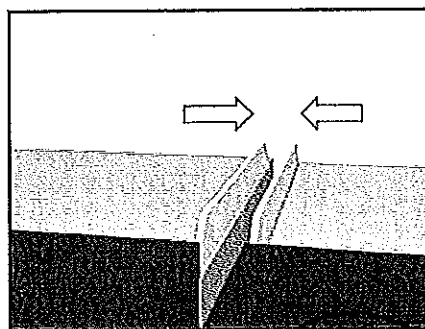
Фигура 4.20: Правилно подравняване на шкафовете

8) Поставете гайките и болтовете M8 x 20 за анкерването на шкафа с обратната страна нагоре с помощта на нит или здрава отвертка.



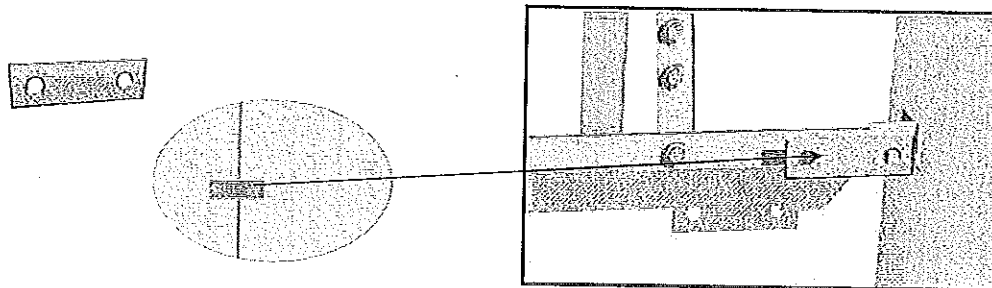
Фигура 4.21: Подробен изглед на точките за сглобяване на гайките и болтовете

Винтовете с размери M8 x 30 се използват в горната част на шкафа.



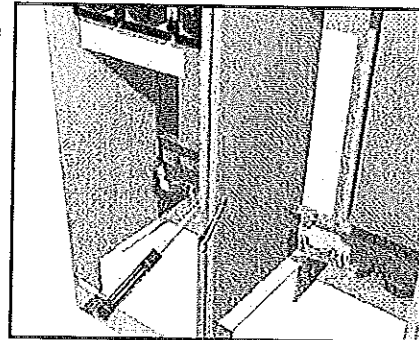
Фигура 4.22: Положение на винтовете в горната част

9) Свържете между основите заземяванията на всеки шкаф, въвеждайки съответните свързващи ленти в техните съответни отвори, разположени отстрани на кабелното отделение на шкафовете, с помощта на нит или здрава отвертка (не поставяйте винтовете).

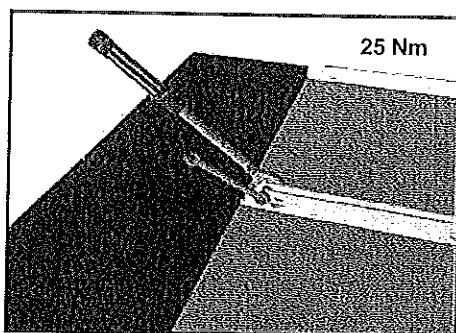


Фигура 4.23: Поставяне на заземителната свързваща шина

10) Затегнете гайките и болтовете надолу с прилагане на 25 Nm във всички точки на свързване.



Фигура 4.24: Точка за свързване на основата на шкафовете



Фигура 4.25: Затягане на горната част

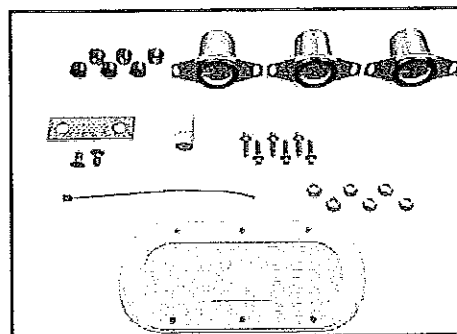
11) Приложете затягане с въртящ момент 25 Nm във всички точки на свързване (включително на заземителната шина).



4.4.2. Край на шкафа

Комплектът с крайни тапи включва следните компоненти:

- 3 изолационни тапи
- 6 пластмасови тапи
- Найлонов конец
- Страничен капак
- Крайна заземителна шина
- Съответните гайки и болтове
- Klüber Proba 270 Syntheso – силиконова смазка

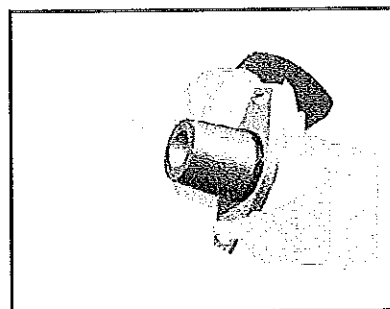


Фигура 4.26: Съдържание на комплекта

Крайните тапи трябва да се поставят в "женските" проходни изолятори на последния разширяем шкаф в системата, ако след него няма да има повече разширения.

Процесът по поставяне на крайните тапи е както следва:

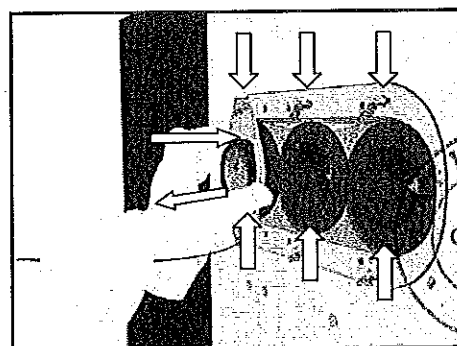
- 1) Осигурете видимост във вътрешността на "женските" проходни изолятори и ги почистете от всякакви остатъци от прах и мръсотия, използвайки напоен със спирт парцал.
- 2) Повторете този процес за външните части на изолационните тапи, които след това се поставят във всеки от "женските" проходни изолятори.



Фигура 4.27: Крайни тапи в шкафове CGMCOSMOS

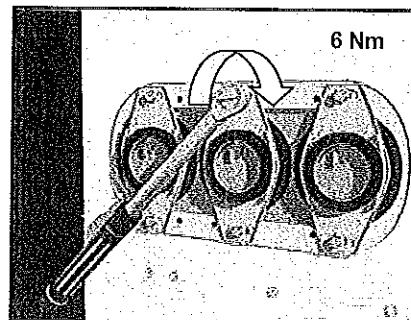
3) Използвайте силиконовата смазка, доставена в комплекта с принадлежности (Syntheso Proba 270), по цялата вътрешна повърхност на "женските" проходни изолятори, като обърнете особено внимание да не засягате точките за свързване на шината. След това поставете 6-те винта (специална глава), за да закрепите тапите в положението, показано на Фигура 4.28. Обърнете особено внимание при поставянето на 2-та дълги винта по централната фаза.

4) Поставете найлоновия конец, последван от крайната тапа, изваждайки конца навън, докато натискате капака, така че да изтеглите въздуха.

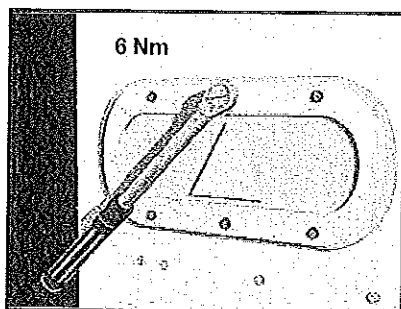


Фигура 4.28: Изтегляне на въздуха

5) Завинтете и затегнете съответните тапи с винтове М6 (специална глава) и гайки М6 с включена шайба, използвайки затягане с въртящ момент 6 Nm.



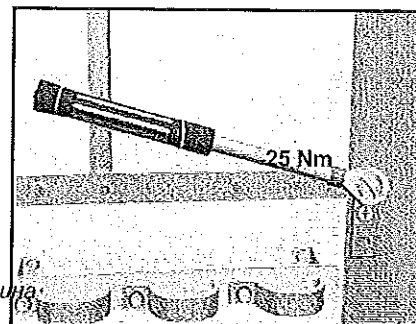
Фигура 4.29: Затягане на тапите



6) Поставете и закрепете крайния капак с двете гайки М6 с включена шайба.

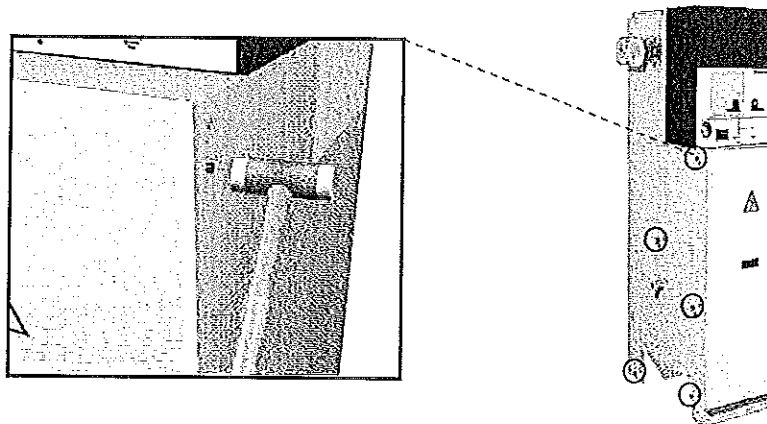
Фигура 4.30: Затягане на уплътнителните крайни капаци

7) Поставете крайната заземителна шина в крайната проводяща шина чрез винт М8х20 с включена шайба и затегнете с въртящ момент 25 Nm.



Фигура 4.31: Поставяне на крайната заземителна шина

8) Накрая покрийте отворите за занитване на шкафовете с пластмасовите тапи с помощта на чукчето.

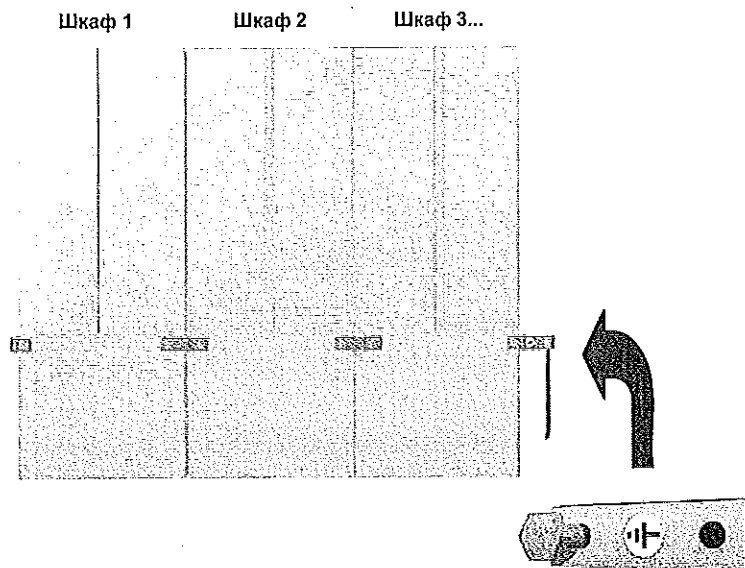


Фигура 4.32: Поставяне на крайните тапи и тяхното положение в шкафа



4.5. ЗАЗЕМЯВАНЕ НА ОБОРУДВАНЕТО

Свържете общата заземителна шина, както е показано на следната фигура.



Фигура 4.33: Заземяване на оборудването

Свържете крайната заземителна лента, маркирана с ⏏ към общата заземителна връзка на трансформаторната подстанция.

⚠ ВНИМАНИЕ!

Заземяването на оборудването е важно условие за безопасността.



4.6. СВЪРЗВАНЕ НА КАБЕЛИТЕ

Входовете и изходите за СН към и от трансформатора или (в някои случаи) към и от други шкафове трябва да бъдат окабелени. Тези кабели могат да бъдат свързани към съответните кабелни проходни изолатори в шкафове от системата CGMCOSMOS или с опростени (изваждаеми), или с усилен (болтови) свързващи клеми, тип IEC или съвместими с IEEE-386^[15].

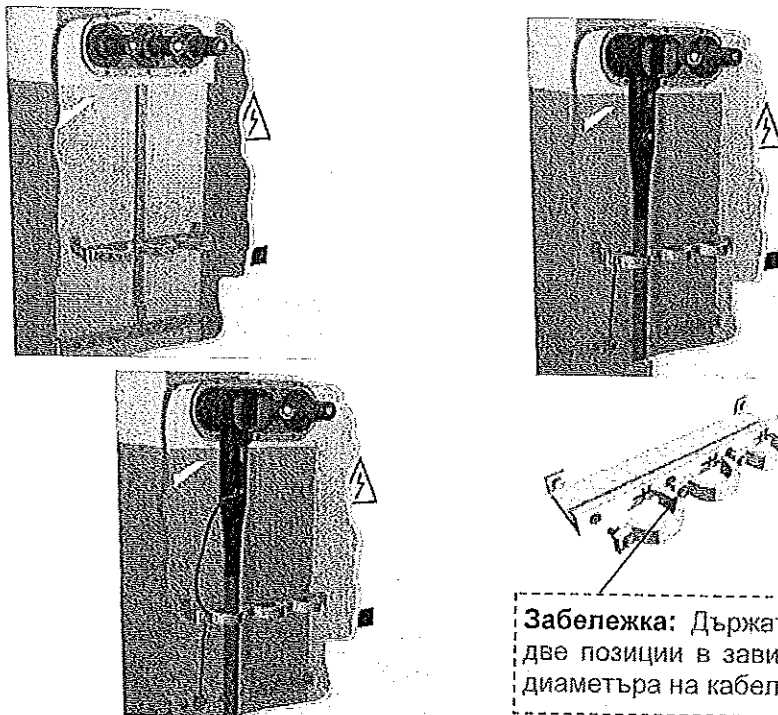
⚠ ВНИМАНИЕ:

Конекторите под напрежение никога не бива да се докосват, дори в случай на екранирани конектори. Екранирането не осигурява защита при пряк допир.

Когато оборудването се обслужва и резервен шкаф е оставен с напрежение по горната шина и без кабелите в долните проходни изолатори, е нужно да се поставят изолационни тапи на проходните изолатори (тип EUROMOLD) или да се приведе разединителят в заземено положение и да се блокира с катинар това положение.

4.6.1. Хоризонтално свързване отпред

1. Свържете заземителния нож.
2. Извадете капака, за да имате достъп до кабелното отделение.
3. Свържете клемите по предните кабелни проходни изолатори и закрепете кабелите с кабелната скоба и съответния държател.
4. Свържете заземителните конектори на клемите, ако е приложимо, както и заземителните конектори на кабелните екранирания.
5. Поставете капака на кабелното отделение обратно на мястото му.



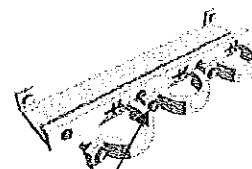
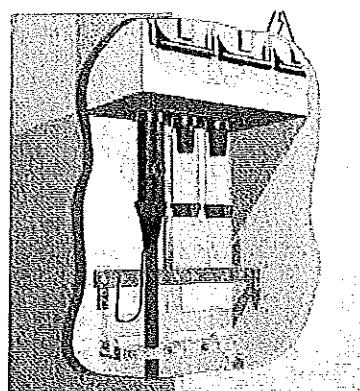
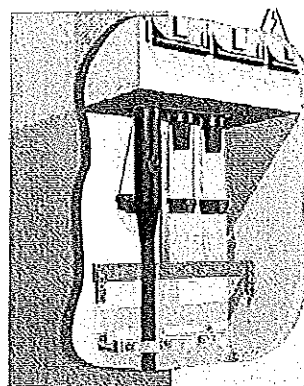
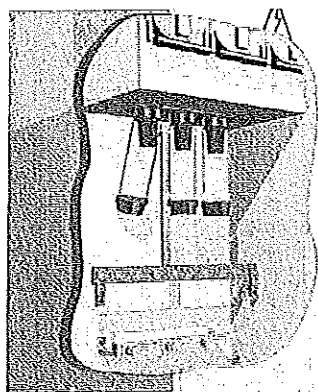
Фигура 4.34: Процес на хоризонтално свързване отпред

^[15] Вж. раздел 4.6.3 Типове проходни изолатори.

4.6.2. Вертикално свързване отпред

▪ Свързване на долния изход: права клемма

1. Свържете заземителния нож.
2. Извадете капака, за да имате достъп до кабелното отделение, и поставете фиксиращите щифтове за закрепване на клемите. Завъртете ги, така че клемите да могат да се поставят.
3. Свържете клемите на проходните изолатори и регулирайте щифтовете с приспособлението за натягане. След това закрепете кабелите с кабелната скоба и държателя.
4. Свържете заземителните конектори на клемите, ако е приложимо, и заземителните конектори на кабелните екранирания.
5. Поставете капака на кабелното отделение обратно на мястото му.



Забележка: Държателят има две позиции в зависимост от диаметъра на кабела.

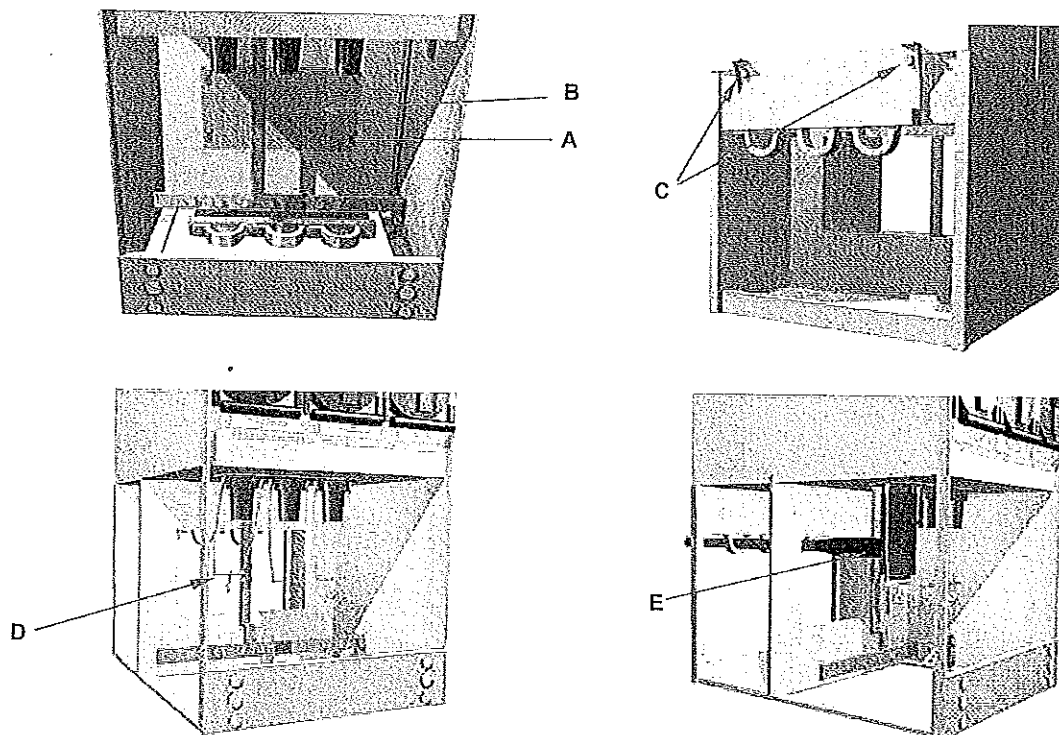
Фигура 4.35: Свързване отпред на функционални блокове за защита на шкаф



• **Свързване отзад при модулните шкафове**

Свързване отзад при модулните шкафове с височина 1300 mm

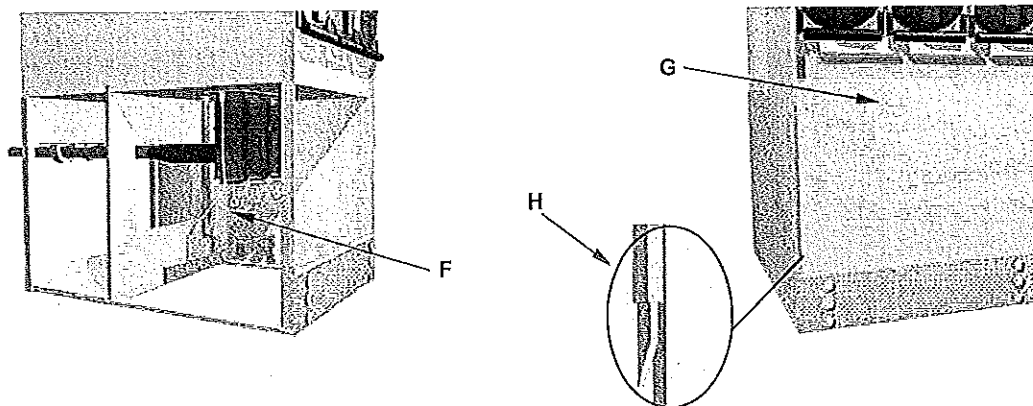
1. Свържете заземителния нож.
2. Извадете предния капак, за да имате достъп до кабелното отделение.
3. Развийте четирите винта на кабелната скоба (А) и задната подпора (В). Запазете ги за следващите стъпки.
4. Извадете задната подпора и кабелната скоба.
5. Анкерирате скобата към задната стена, използвайки осигурените винтове (С).
6. Поставете щифтовете за фиксиране на клемите (D). Завъртете ги така, че клемите да могат да се монтират.
7. Свържете клемите към проходните изолятори (Е).



Фигура 4.36: Свързване отзад при модулни шкафове с височина 1300 mm

8. Регулирайте щифтовете към клемите, използвайки приспособлението за натягане. По подобен начин закрепете кабелите с кабелната скоба (F).
9. Свържете заземителните конектори на клемите, ако е приложимо, и заземителните конектори на кабелните екранирания.
10. Монтирайте задната подпора, извадена на стъпка 4, отпред (G), като я поставите в посока отзад напред. Отворите за плъзване трябва да пасват на релсите на подпората (H). Затегнете винтовете, разхлабени на стъпка 3.
11. Поставете капака на кабелното отделение обратно на мястото му.

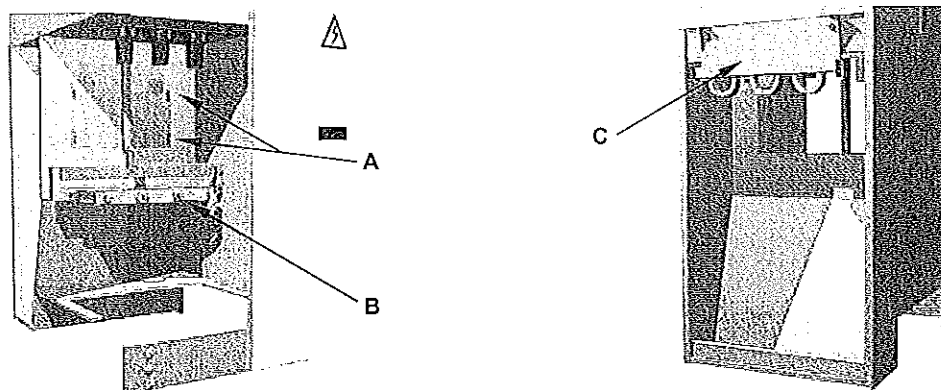




Фигура 4.37: Свързване отзад при модулни шкафове с височина 1300 mm

Свързване отзад при модулни шкафове с височина 1740 mm

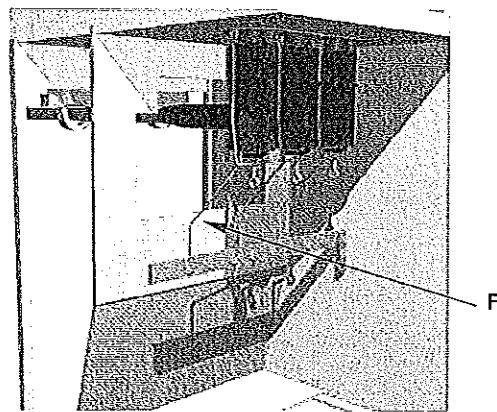
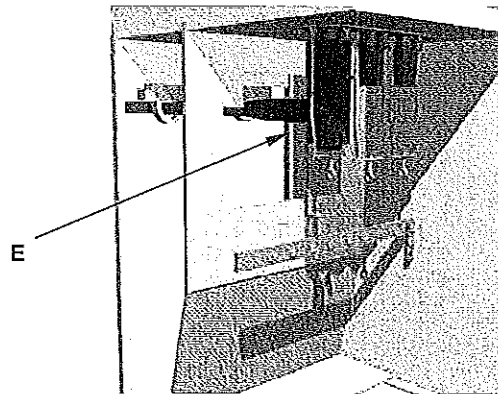
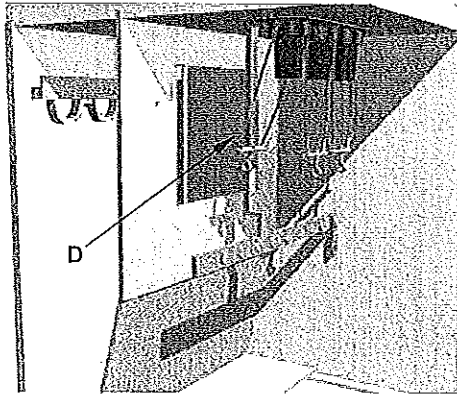
1. Свържете заземителния нож.
2. Извадете предния капак, за да имате достъп до кабелното отделение.
3. Разхлатете винтовете на задната подпора (А).
4. Плъзнете подпората, за да се открият отворите, или за по-лесно я снемете.



Фигура 4.38: Свързване отзад при модулни шкафове с височина 1740 mm

5. Извадете кабелната скоба (В) и я поставете отзад на шкафа (С).
6. Поставете щифтовете за фиксиране на клемите (D). Завъртете ги така, че клемите да могат да се монтират.
7. Свържете клемите към проходните изолятори (Е).
8. Затегнете щифтовете към клемите, използвайки приспособлението за натягане.
9. Регулирайте двете части на подпората спрямо размера на кабела и затегнете винтовете.
10. Свържете заземителните конектори на клемите, ако е приложимо, и заземителните конектори на кабелните екранирания.
11. Поставете капака на кабелното отделение обратно на мястото му.





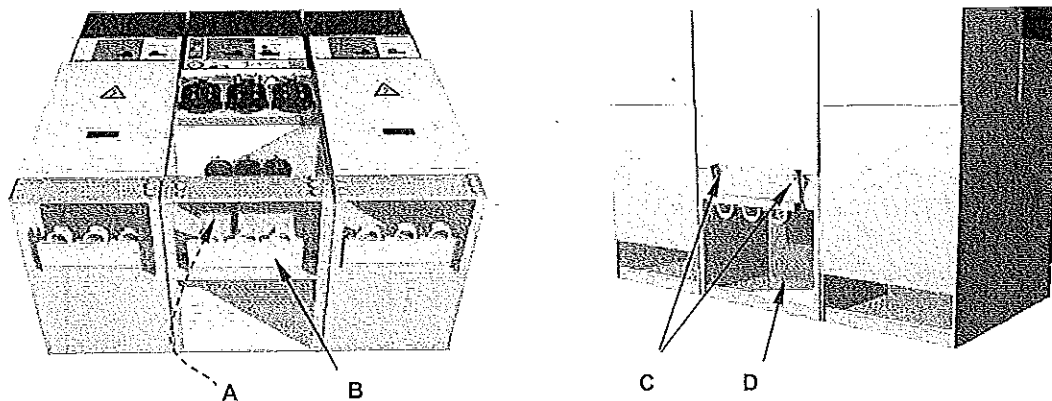
Фигура 4.39: Свързване отзад при модулни шкафове с височина 1740 mm



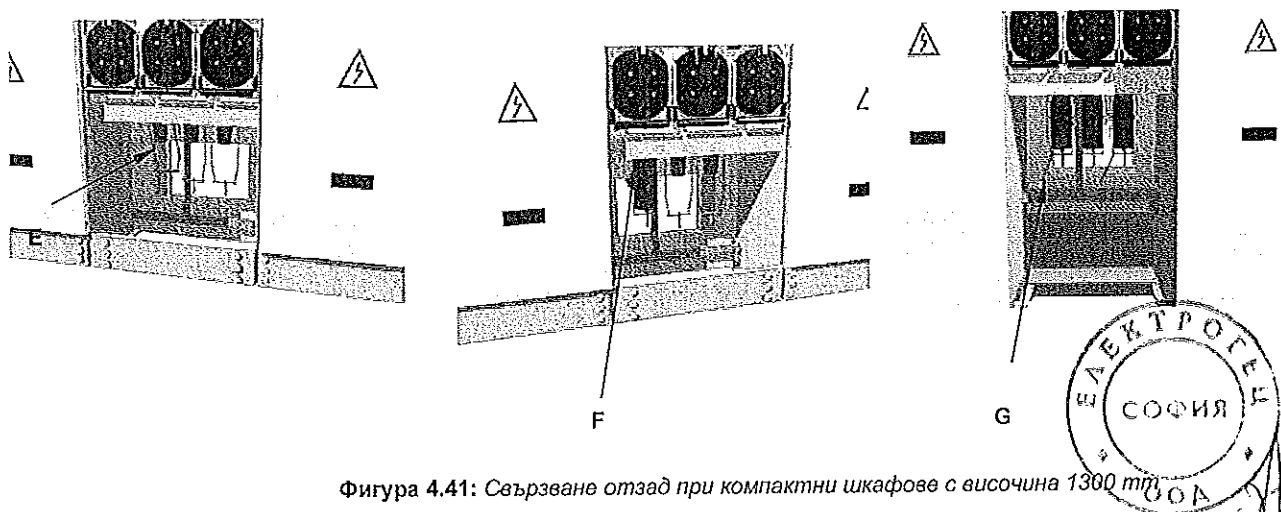
- Свързване отзад при компактните шкафове

Свързване отзад при компактните шкафове с височина 1300 мм

1. Свържете заземителния нож.
2. Извадете предния капак, за да имате достъп до кабелното отделение.
3. Извадете задната подпора (A).
4. Извадете кабелната скоба (B) и я прикрепете отзад (C).
5. Поставете задната подпора в долната част на шкафа (D).
6. Поставете щифтовете за фиксиране на клемите (E). Завъртете ги така, че да могат да се монтират клемите.
7. Свържете клемите към проходните изолятори (F).
8. Затегнете щифтовете към клемите, използвайки приспособлението за натягане (G).
9. Свържете заземителните конектори на клемите, ако е приложимо, и заземителните конектори на кабелните екранирания.
10. Поставете капака на кабелното отделение обратно на мястото му.



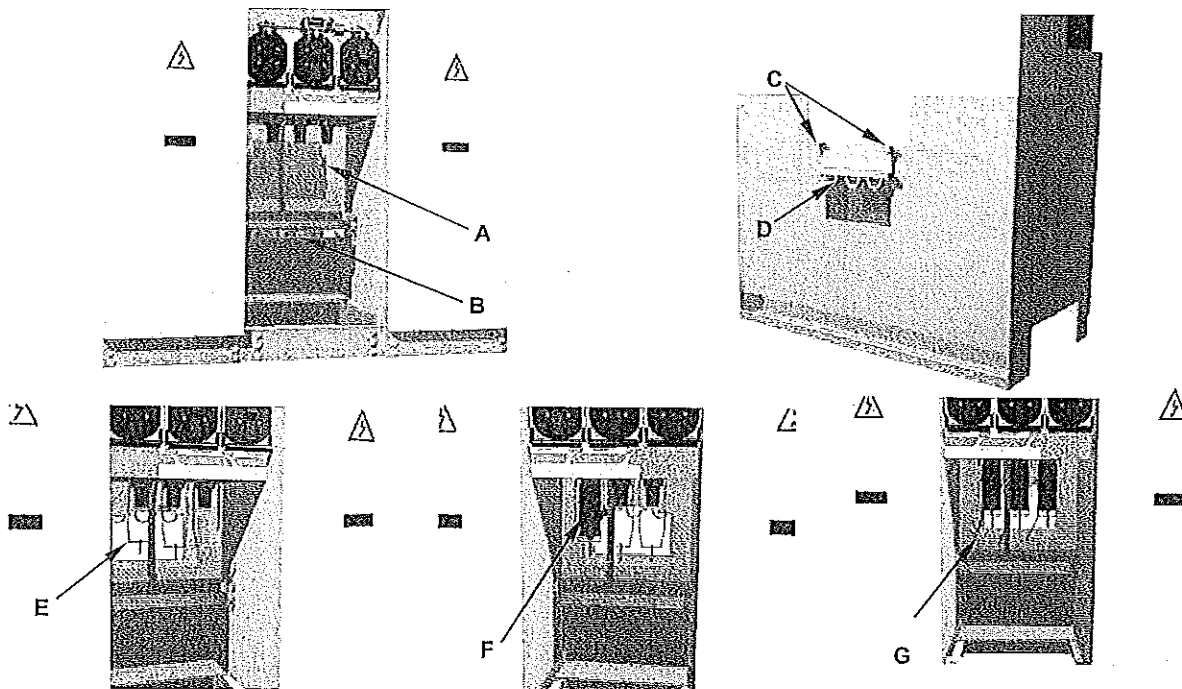
Фигура 4.40: Свързване отзад при компактни шкафове с височина 1300 mm



Фигура 4.41: Свързване отзад при компактни шкафове с височина 1300 mm

Rear Connection in 1740 mm High Compact Cubicles

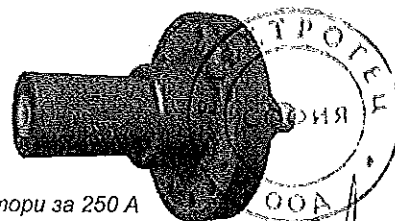
1. Свържете заземителния нож.
2. Извадете предния капак, за да имате достъп до кабелното отделение.
3. Извадете задната подпора (A).
4. Извадете кабелната скоба (B) и я прикрепете отзад (C).
5. Поставете задната подпора в задната част на шкафа (D).
6. Поставете щифтовете за фиксиране на клемите (E). Завъртете ги така, че да могат да се монтират клемите.
7. Свържете клемите към проходните изолятори (F).
8. Затегнете щифтовете към клемите, използвайки приспособлението за натягане (G).
9. Свържете заземителните конектори на клемите, ако е приложимо, и заземителните конектори на кабелните екранирания.
10. Поставете капака на кабелното отделение обратно на мястото му.



Фигура 4.42: Свързване отзад при компактни шкафове с височина 1740 mm

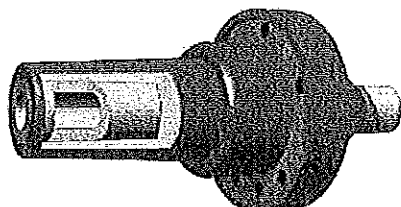
4.6.3. Типове проходни изолятори

- IEC
- Проходни изолятори с номинален ток **250 A**, при 12 и 24 kV, за предлагани в търговската мрежа колелчати или прави конектори на сух кабел. (примери: K158LR, 152SR от Euromold)

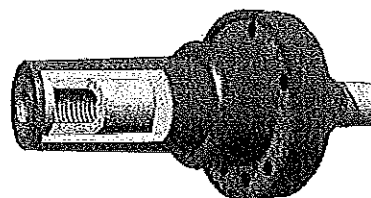


Фигура 4.43: Изваждаеми проходни изолятори за 250 A

- Проходни изолятори с номинален ток 400/630 А, при 12 и 24 kV, за изваждаеми, екранирани и неекранирани предлагани в търговската мрежа конектори, на сух кабел и кабел с изолация от импрегнирана с масло хартия (примери: K400LR, K400TB от Euromold)



Фигура 4.44: Изваждаеми прох. изолятори за 400 А



Фигура 4.45: Винтови прох. изолятори за 630 А

- Съвместими с ANSI (Съответстващи на IEEE-386)
- Проходни изолятори с номинален ток 400/630 А, при 12 и 24 kV, за предлагани в търговската мрежа коленчати или прави конектори на сух кабел.

В случаите, когато конекторите се използват без заземяване между кабела за СН и шкафа, трябва да се поръчат специални адаптери от Ormazabal^[16].

4.7. ИЗМЕРВАТЕЛНИ ТРАНСФОРМАТОРИ

Напреженовите и токовите трансформатори се монтират в съответното положение според заявената схема и типовете трансформатори за сглобяване.

Максималният брой трансформатори, които могат да се монтират, че 6: три напреженови и три токови трансформатора.

Шкафът за мерене може да приеме следните стандартни трансформатори:

	ARTECHE		LABORATORIO ELECTROTÉCNICO	ACTARIS
НАПРЕЖЕНОВИ	UCH-12	UCJ-24	VKPE-12	U24Bha
	VCL-24	UXN-24	VKPE-24	E24Bha
	VCJ-24	UXJ-24	VCF-24	U24Bma
	UCL-24	VXJ-24		E24Bma
ТОКОВИ	ACD-12		AED-12	J24BM
	ACF-12		AEB-24P	J24BR
	ACD-24		AED-24	J24BQ
	ACF-24		AER-24	
	ACJ-24			

⚠ ВАЖНО:

Ormazabal е производителят на този метален корпус. Ormazabal няма да носи отговорност за връзките или за всякакво добавено оборудване от други производители. За всякакъв друг тип измервателни трансформатори, моля, свържете се с Техническо-търговския отдел на Ormazabal.

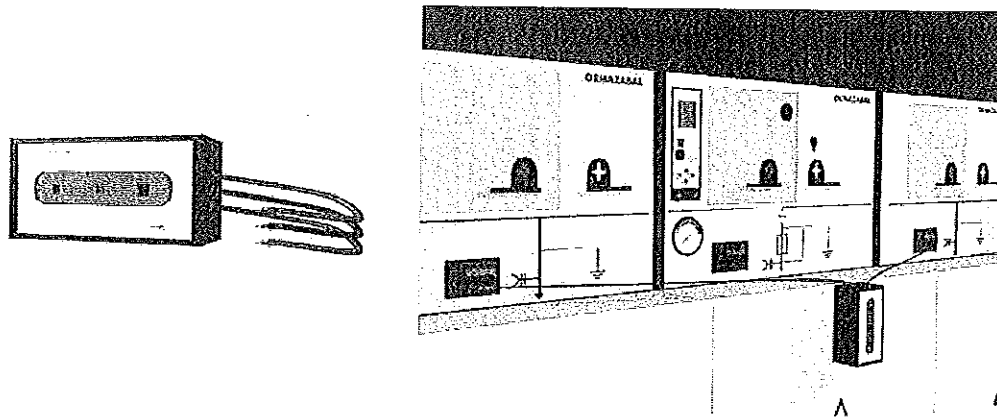


^[16] За потвърждение се свържете с Техническо-търговския отдел на Ormazabal.

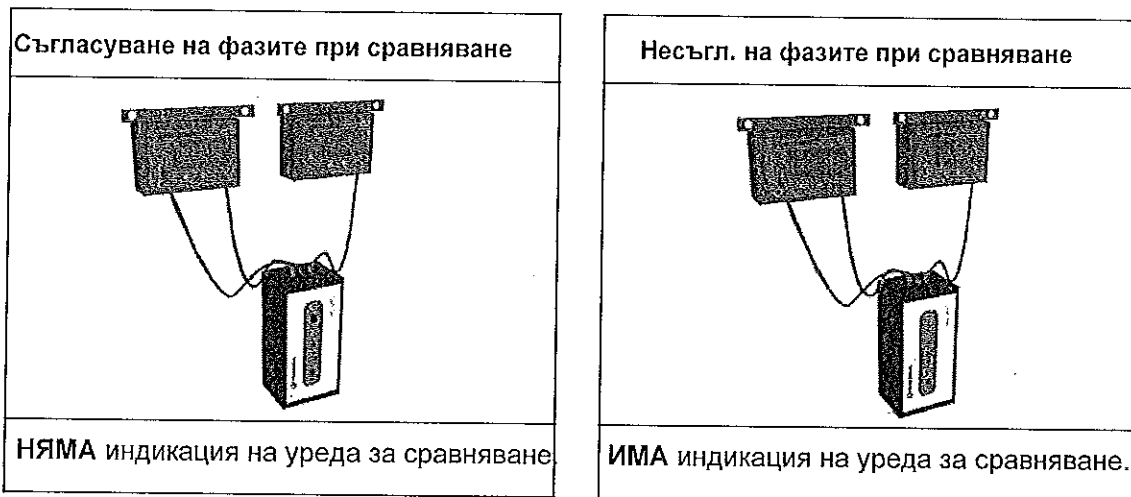
4.8. ПРОВЕРКА ЗА НАЛИЧИЕТО НА НАПРЕЖЕНИЕ И СЪГЛАСУВАНЕТО НА ФАЗИТЕ

За да се потвърди правилното свързване на кабелите за СН към шкафовете с изводи в трансформаторната подстанция, трябва да се използва уредът за сравняване на фазите ekorSPC^[17] от Ormazabal.

Най-напред свържете червените кабели на модула ekorSPC към точките за изпитване на същата фаза на съответните модули ekorVPIS^[18], а черния кабел – към точката за изпитване на заземяването. Това действие трябва да се повтори за всички фази L1, L2 и L3.

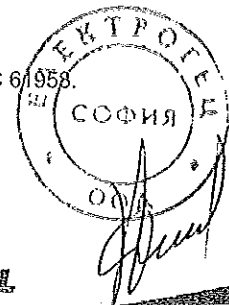


Фигура 4.46: ekorSPC



^[17] Опционално могат да се използват и други уреди за сравняване на фази, съвместими с IEC 61958.

^[18] Вж. раздел 1.1.1. ekorVPIS – Модул за индикация на наличие на напрежение.



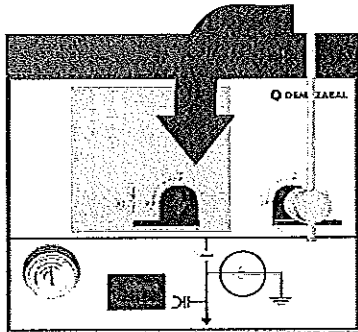
⚠ ВНИМАНИЕ!

Преди извършването на всякакви действия под напрежение проверете елегаза, използвайки манометъра.

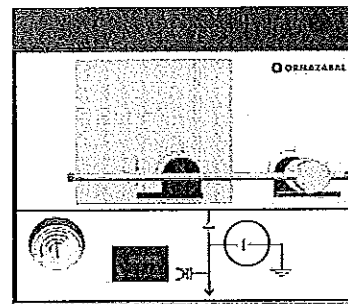
5.1. ШКАФ СЪС ЗАХРАНВАЩИ ИЗВОДИ

5.1.1. Действие по разединяване от заземено положение

1. Придвигнете жълтия плъзгач в дясното му положение (по този начин се освобождава достъпа за разединяване на заземителния нож).
2. Поставете лоста в отвора за лост на заземителния нож и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.1: Процес по завъртане на лоста



Фигура 5.2: Разединен заземителен нож

ПРЕПОРЪКА: Въпреки, че фигурата показва началния момент на действието при верт. положение на рамото на лоста, се препоръчва да стартиране при хориз. положение на рамото, насочено надясно, за да се използва най-добре приложената от оператора сила.

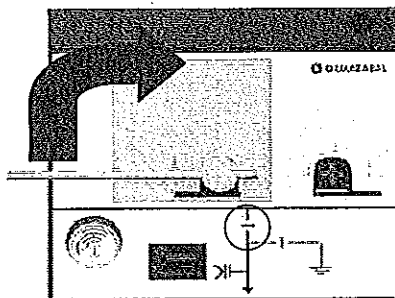
5.1.2. Действие по свързване на превключвател от разединено положение

3. Придвигнете черния плъзгач от сивата зона до лявото му положение (по този начин се освобождава достъпа за лоста за свързване на превключвателя).

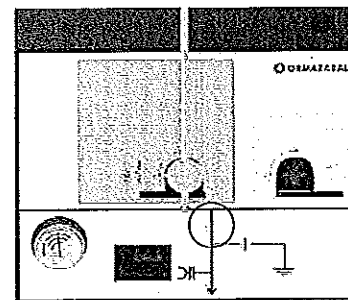
4. Действие по свързването:

4.1. Ръчно задействане (задвижващ механизъм В)

Поставете лоста в отвора на превключвателя (сивата зона) и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.3: Процес по завъртане на лоста



Фигура 5.4: Свързан мощн. разединител



4.2. Задействане чрез двигател (задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.

⚠ ВАЖНО:

Ако по някаква причина по средата на задействането чрез двигател той спре, е важно действието да бъде завършено ръчно преди да го стартирате отново, така че всички датчици, контролери и др. части в механизма да останат в надеждно, ефективно и логично положение в системата за задействане чрез двигател, когато тя бъде включена отново.

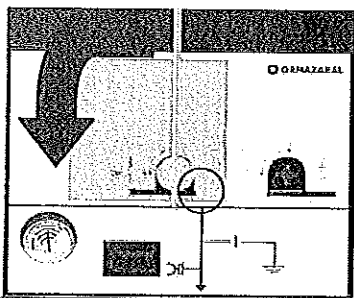
5.1.3. Действие по разединение от свързано положение

5. Придвигнете черния плъзгач от сивата зона до лявото му положение, по аналогия с предходната ситуация (по този начин се освобождава достъпа за свързване на превключвателя).

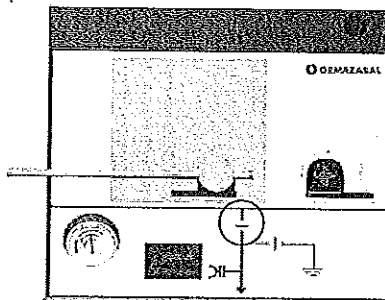
6. Действие по разединението

6.1. Ръчно задействане (задвижващ механизъм В)

Поставете лоста в отвора на превключвателя (сивата зона) и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.5: Процес по завъртане на лоста



Фигура 5.6: Разединен мощн. разединител

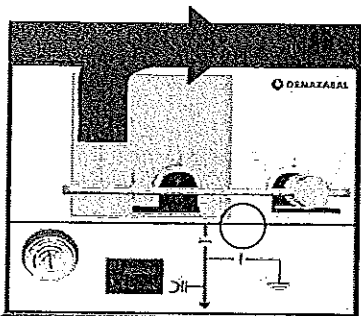
6.2. Задействане чрез двигател (задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.

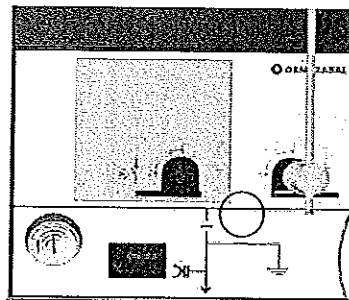
5.1.4. Действие по заземяване от разединено положение

7. Придвигнете жълтия плъзгач в жълтата зона в дясното му положение (по този начин се освобождава отвора за лоста за свързване на заземителния нож).

8. Поставете лоста в отвора за лост в заземителния нож и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.7: Процес по завъртане на лоста



Фигура 5.8: Свързан заземителен нож



5.2. ФУНКЦИОНАЛЕН БЛОК С ШИНЕН ИЗКЛЮЧВАТЕЛ

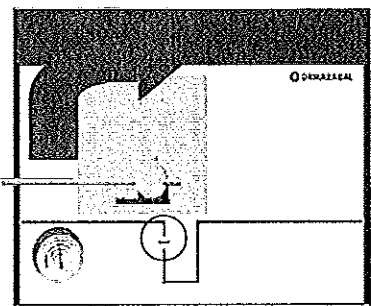
5.2.1. Действие по свързване на изключвателя от разединено положение

1. Придвигнете черния плъзгач от сивата зона в лявото му положение (по този начин се освобождава отвор за лост за свързване на изключвателя).

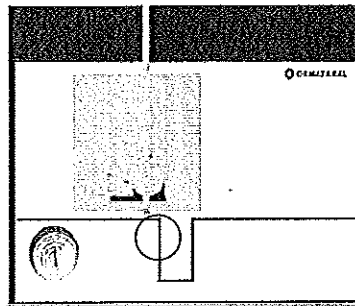
2. Действие по свързването:

2.1. Ръчно задействане (задвижващ механизъм В)

Поставете лоста в отвора на изключвателя и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.9: Процес по завъртане на лоста



Фиг. 5.10: Свързан мощн. разединител

2.2. Задействане чрез двигател (задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.

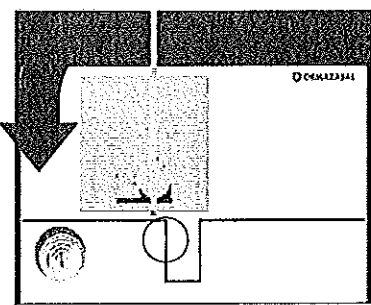
5.2.2. Действие по разединение от свързано положение

3. Придвигнете черния плъзгач от сивата зона в лявото му положение (по този начин се освобождава достъпа за разединяване на изключвателя).

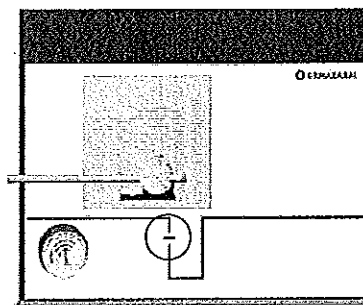
4. Действие по разединяването

4.1. Ръчно задействане (задвижващ механизъм В)

Поставете лоста в отвора на изключвателя и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.11: Процес по завъртане на лоста



Фигура 5.12: Разединен мощн. разединител

ПРЕПОРЪКА: Въпреки, че фигурата показва началния момент на действието при верт. положение на рамото на лоста, се препоръчва да стартиране при хориз. положение на рамото, насочено надясно, за да се използва най-добре приложената от оператора сила.

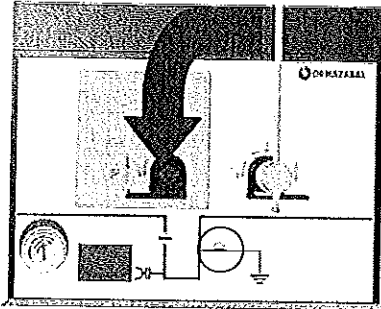
4.2. Задействане чрез двигател (задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.

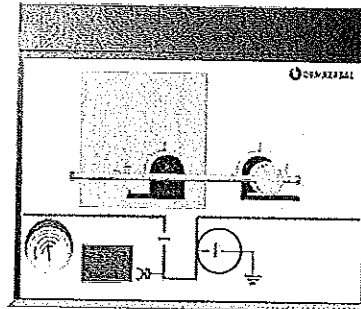
5.3. ШКАФ ЗА ШИНЕН ИЗКЛЮЧВАТЕЛ СЪС ЗАЗЕМЯВАНЕ

5.3.1. Действие по разединение от заземено положение

1. Придвигнете жълтия плъзгач в дясното му положение (по този начин се освобождава достъпа за разединяване на заземителния нож).
2. Поставете лоста в отвора на заземителния нож и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.13: Процес по завъртане на лоста



Фигура 5.14: Разединен заземителен нож

ПРЕПОРЪКА: Въпреки, че фигурата показва началния момент на действието при верт. положение на рамото на лоста, се препоръчва да стартиране при хориз. положение на рамото, насочено надясно, за да се използва най-добре приложената от оператора сила.

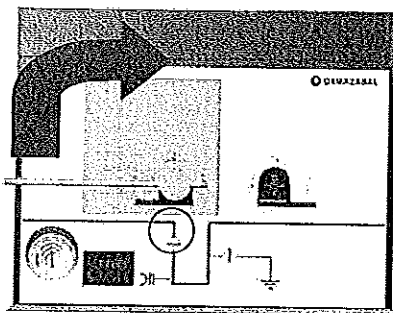
5.3.2. Действие по свързване на изключвателя от разединено положение

3. Придвигнете черния плъзгач от сивата зона в лявото му положение (по този начин се освобождава отвора за лоста за свързване на изключвателя).

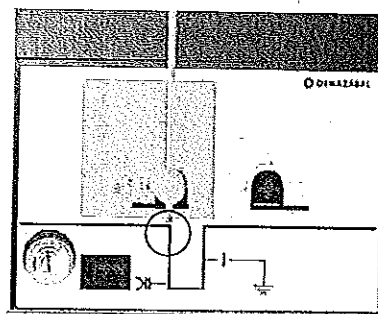
4. Действие по свързването:

4.1. Ръчно задействане (Задвижващ механизъм В)

Поставете лоста в отвора на изключвателя (сива зона) и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.15: Процес по завъртане на лоста



Фигура 5.16: Свързан мощн. разединител

4.2. Задвижване чрез двигател (Задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.



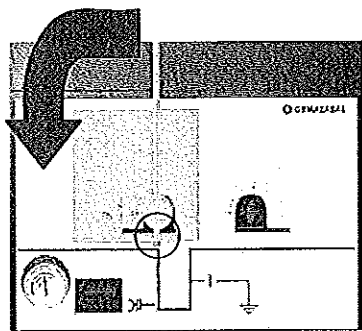
5.3.3. Действие по разединение от свързано положение

5. Придвигнете черния плъзгач от сивата зона в лявото му положение, по аналогия с предходната ситуация (по този начин се освобождава достъп за свързване из изключвателя).

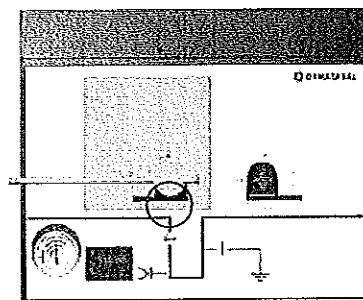
6. Действие по разединението

6.1. Ръчно задействане (Задвижващ механизъм В)

Поставете лоста в отвора на изключвателя (сивата зона) и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.17: Процес по завъртане на лоста



Фигура 5.18: Разединен мощн. разединител

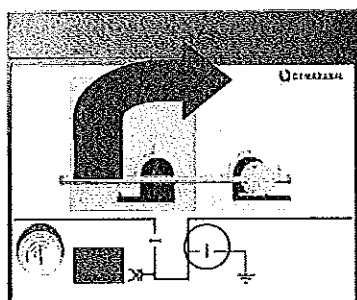
6.2. Задействане чрез двигател (Задвижващ механизъм ВМ)

Активирайте съответната команда за задействането.

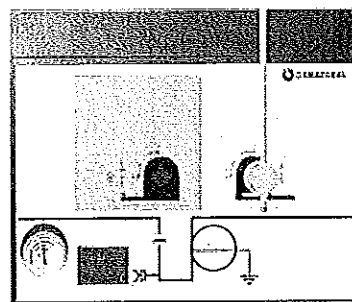
5.3.4. Действие по заземяване от разединено положение

7. Придвигнете жълтия плъзгач в жълтата зона в дясното му положение (по този начин се освобождава отвора за лоста за свързване на заземителния нож).

8. Поставете лоста в отвора на заземителния нож и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.19: Процес по завъртане на лоста



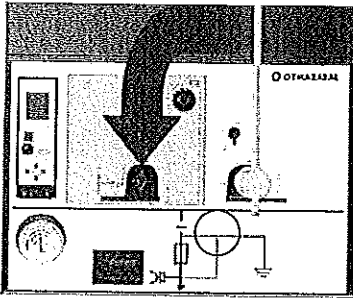
Фигура 5.20: Свързан заземителен нож



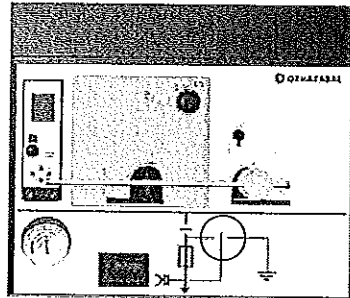
5.4. ШКАФ СЪС ЗАЩИТНИ ПРЕДПАЗИТЕЛИ

5.4.1. Действие по разединение от заземено положение

1. Придвигнете жълтия плъзгач в дясното му положение (по този начин се освобождава отвора за лост за разединение на заземителния нож).
2. Поставете лоста в отвора на заземителния нож и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.21: Процес по завъртане на лоста



Фигура 5.22: Разединен заземителен нож

ПРЕПОРЪКА: Въпреки, че фигурата показва началния момент на действието при верт. положение на рамото на лоста, се препоръчва да стартиране при хориз. положение на рамото, насочено надясно, за да се използва най-добре приложената от оператора сила.

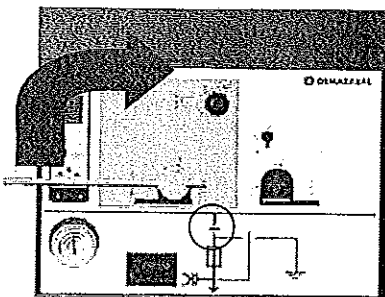
5.4.2. Действие по свързване от разединено положение

3. Придвигнете черния плъзгач от сивата зона в лявото му положение (по този начин се освобождава отвора за лост за свързване на превключвателя)^[19].

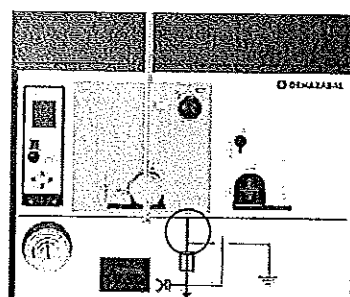
4. Извършете действието за свързване:

4.1. Ръчно задействане (Задвижващ механизъм BR)

Поставете лоста в отвора на превключвателя и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.23: Процес по завъртане на лоста



Фигура 5.24: Свързан мощн. разединител

^[19] Действието на селекторния плъзгач е същото, като при шкафите със захранващи изводи.



5.4.3. Зареждане на пружината от свързано положение

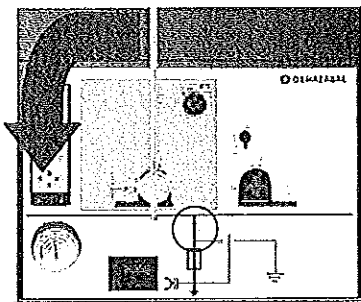
5. Зареждането на пружината се извършва, задържайки задвижващия лост в отвора на превключвателя.

⚠ ВАЖНО:

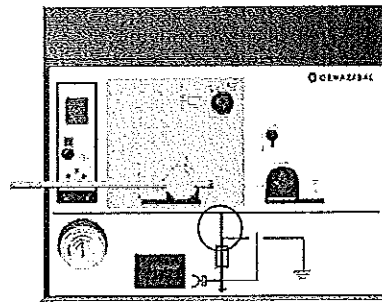
Лостът не може да се изважда от отвора на превключвателя след свързването му, докато не бъде извършено действието по зареждане на пружината.

6. Завъртете лоста ОБРАТНО НА ЧАСОВНИКА.

7. Извадете лоста от отвора на превключвателя.



Фиг. 5.25: Процес по завъртане на лоста



Фиг. 5.26: Превключвателят остава свързан

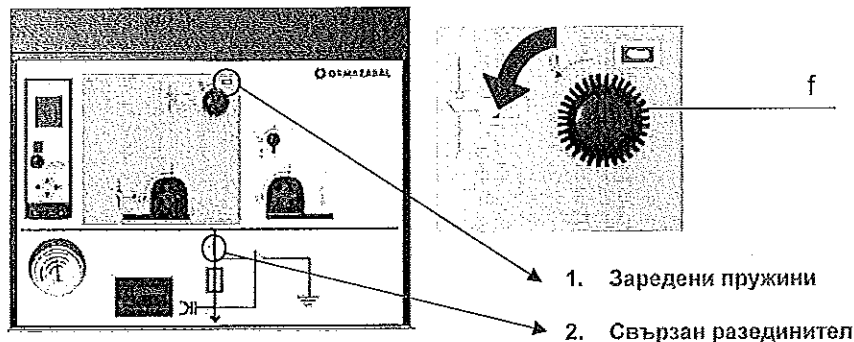
5.4.4. Действие по разединение от свързано положение

8. При затворен превключвател и заредени пружини.

9. Извършете действието по разединение:

9.1. Ръчно задействане (Задвижващ механизъм BR)

Отворете превключвателя, завъртайки задействащата ръчка (f), в положението, показано на Фигура 5.27.



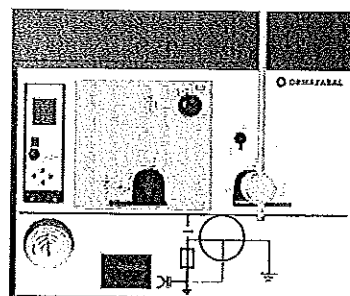
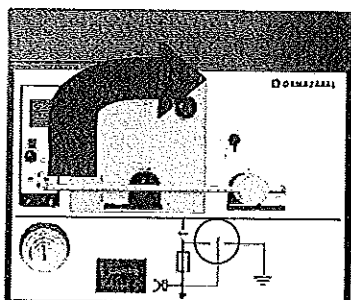
Фигура 5.27: Действие по разединение на разединителя



5.4.5. Действие по заземяване от разединено положение

10. Придвигнете жълтия плъзгач в дясното му положение (по този начин се освобождава отвора за лост за свързване на заземителния нож).

11. Поставете лоста в отвора на заземителния нож и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.28: Процес по завъртане на лоста
Фигура 5.29: Свързан заземителен нож

5.4.6. Избор на препоръчителни предпазители

Предпазителите, препоръчителни за използване в шкафа CGMCOSMOS-P, са дефинирани според пробите и изпитанията, проведени от производителя. Следващата таблица показва препоръчителните характеристики на предпазителите според $U_r/P_{transf.}$:

U_r линия [kV]	U_r шкаф [kV]	U_r предп. [kV]	Ном. мощност на трансформатора БЕЗ СВРЪХТОВАР [kVA]																
			25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
			Ном. ток на предпазителя (A) IEC 60282-1																
10	24	6/12	6,3	10	16	16	20	20	25	31,5	40	50	63	63	80	100	160	200	250
13,5	24	10/24	6,3	6,3	10	16	16	20	20	25	31,5	40	50	63	63	80	100	-	-
15	24	10/24	6,3	6,3	10	16	16	20	20	25	31,5	40	50	63	80	80	160	-	-
20	24	10/24	6,3	6,3	6,3	10	16	16	20	20	25	31,5	40	50	50	63	80	125	-

- Препоръчителни SIBA предпазители със среден тип ударник съгласно IEC 60282-1 (с ниски енергийни загуби).
- Стойностите за комбинирани предпазители по IEC 62271-105 (IEC 60420) са в по-тъмен шрифт.
- Блокът от изключватели с предпазители е изпитан с нагряване при нормални експлоатационни условия съгласно IEC 60694.
- Има контактното колело на държателя, адаптирано за размера на предпазителите за 6/12 kV, който е 292 mm.
- За характеристики, които не са в по-тъмен шрифт, мярката е 442 mm.
- Всичките три предпазителя трябва да бъдат заменени, ако някой от тях изгори.
- При условия на претоварване в трансформатора или при използване на други марки предпазители се свържете с Техническо-търговския отдел на Ormazabal.

Трансферен ток съгласно IEC 60420 (IEC 62271-105):

U_r предп. [kV]	U_r шкаф [kV]	$I_{transfer}$ [A]
12	24	2300
24	24	1600



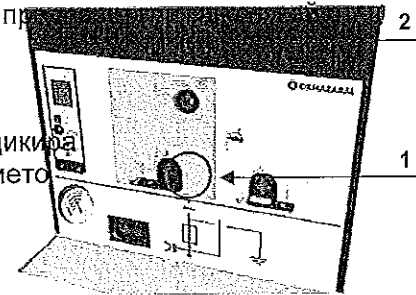
5.4.7. Последователност за замяна на предпазител

За да имате достъп до държателите за предпазители, извадете капака на кабелното отделение; а заземителният нож трябва да е затворен.

Когато има достъп до държателите за предпазители, извършете следните стъпки:

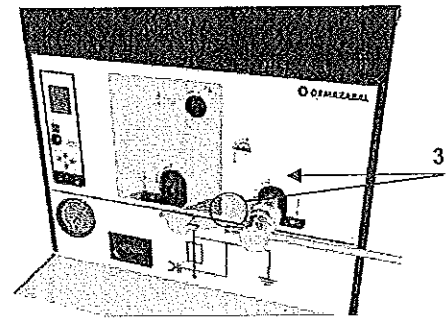
1. Тъй като това е комбиниран шкаф за превключватели с притрите предпазителя изгори, мощностният разединител ще се отвори автоматично.

2. Недвусмисленият сигнал за изгорял предпазител се индикира от червената лента, която се появява отпред на отделението със задвижващия механизъм.



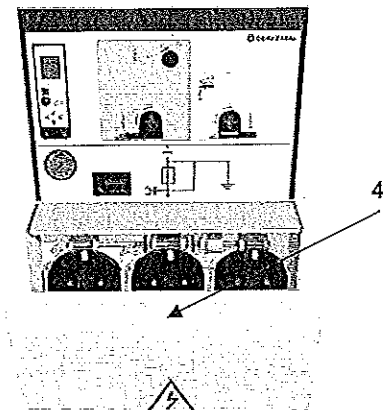
Фигура 5.30: Индикация за задействане

3. Затворете заземителния нож.



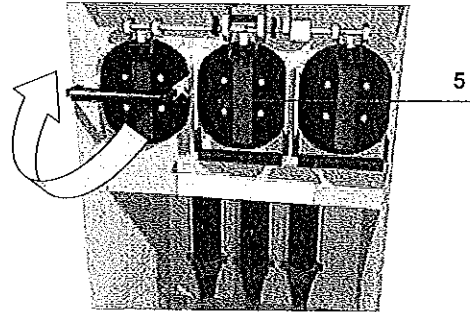
Фигура 5.31: Затворете заземителния нож

4. Отворете капака за достъп до кабелното отделение.



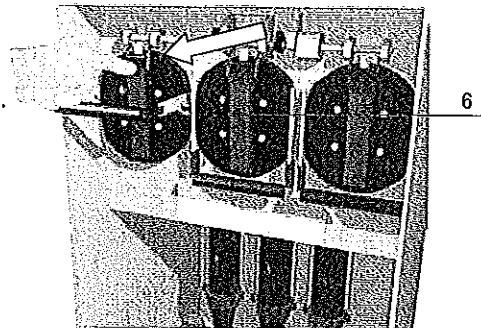
Фигура 5.32: Отваряне на капака на кабелното отделение

5. Завъртете ръчката на капака на държателя на предпазителя нагоре, докато закрепващата скоба се освободи, а след това здраво издърпайте навън.



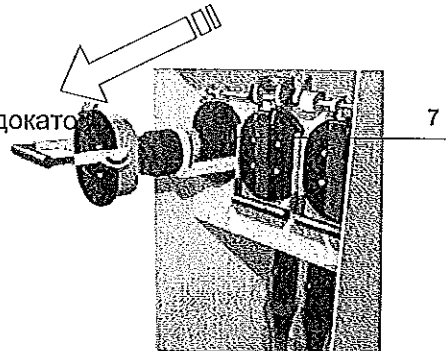
Фигура 5.33: Отваряне на капак на предпазител

6. Натиснете задействащия механизъм за обезопасяване.



Фигура 5.34: Натиснете задействащия механизъм за обезопасяване

7. Издърпайте леко в хоризонтално направление, докато контактното колело на държателя излезе.

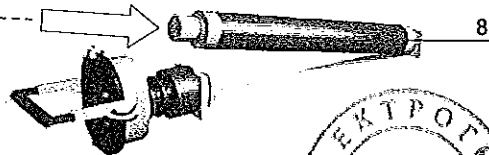


Фигура 5.35: Изваждане на контактното колело на държателя

8. Заменете изгорелия предпазител. Не оставяйте контактното колело на повърхност, която може да замърси гуменото уплътнение или контакта.

ВАЖНО:

Уверете се, че страничната повърхност на ударника на новия предпазител е с лице напред (страна на изолятора на контактното колело). Препоръчително е да замените и трите предпазителя, дори ако те не изглеждат повредени.

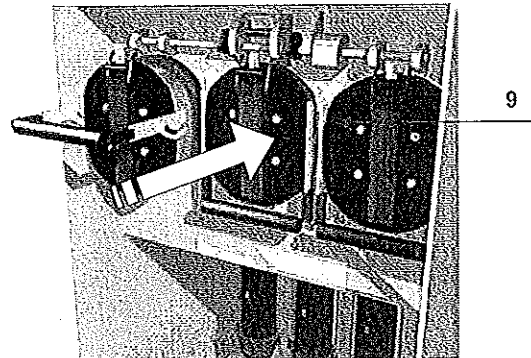


Фигура 5.36: Замяна на предпазител за СН

9. Поставете контактното колело на държателя.

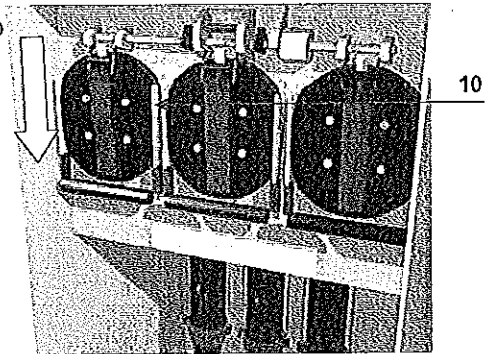
⚠ ВАЖНО:

Преди поставяне на контактното колело е важно да се уверите, че и то, и вътрешността на държателя на предпазителя са чисти.



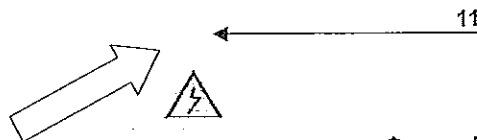
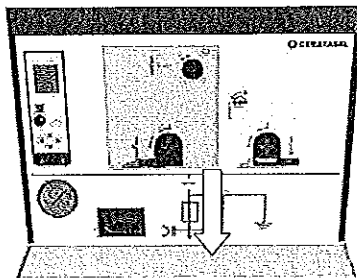
Фигура 5.37: Поставяне на контактното колело на държателя

10. Натиснете надолу ръчката на държателя, докато застане "закрепена" към пусковия механизъм за обезопасяване.



Фигура 5.38: Затворете държателя на предпазителя

11. За да затворите капака, най-напред се уверете, че скобата е правилно закрепена и че държателят е правилно поставен. Поставете вратичката за достъп до предпазителя и кабелното отделение, издърпвайки я нагоре, докато застане на мястото си.

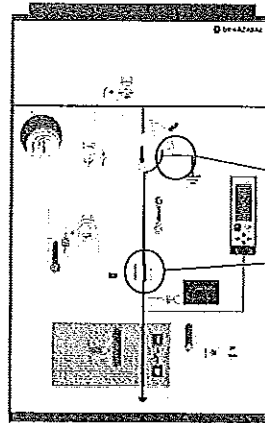


Фигура 5.39: Затваряне на вратичката на кабелното отделение

12. Пуснете в експлоатация шкафа, следвайки инструкциите в раздели 5.4.1 до 5.4.300 А

5.5. ШКАФ ЗА ПРЕКЪСВАЧИ

5.5.1. Действие по разединение от заземено положение



Ефективно заземяване на шкаф за прекъсвачи:

1. Затворен заземителен нож
2. Затворен прекъсвач

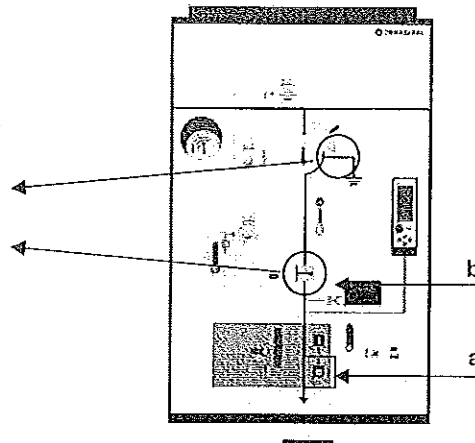
Фигура 5.40: Заземяване на шкаф CGMCOSMOS-V

• Стъпка от заземено положение към положение "готовност за заземяване"

1. Отворете прекъсвача чрез бутона за отваряне (а) и проверете индикатора за състоянието (b). Разединителят се намира в положение "готовност за заземяване".

"Готов за заземяване" шкаф за прекъсвачи:

1. Затворен заземителен нож
2. Отворен прекъсвач



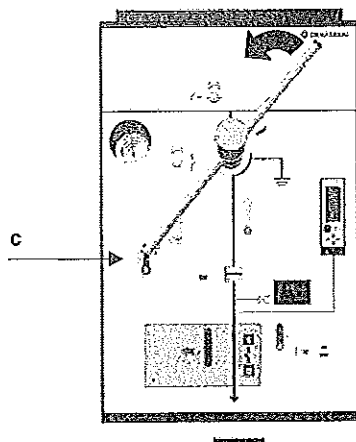
Фигура 5.41: "Готов за заземяване" шкаф CGMCOSMOS-V

⚠ ВНИМАНИЕ!

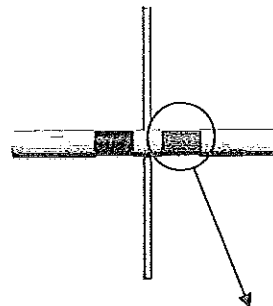
Ако пружините не са заредени, заредете ги ръчно. Ако шкафът има задвижван с двигател механизъм RAMV, този процес се извършва автоматично.



- Стъпка от положение "готовност за заземяване" към разединено положение
2. Започнете при прекъсвач в отворено положение и разединител в положение "готовност за заземяване".
 3. Завъртете заключващата част (с) и плъзнете дръжката надолу, за да извадите блокиращата плоча. Завъртете я отново, за да я заключите на мястото ѝ (вж. Фигура 5.42).
 4. Натиснете навътре лоста от ЧЕРВЕНАТА страна, докато се освободи скобата, и завъртете ОБРАТНО НА ЧАСОВНИКА, докъдето стигне, за да придвижите разединителя до положение "готовност за заземяване".



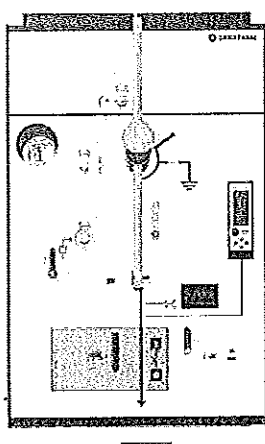
Фигура 5.42: Процес по завъртане на лоста



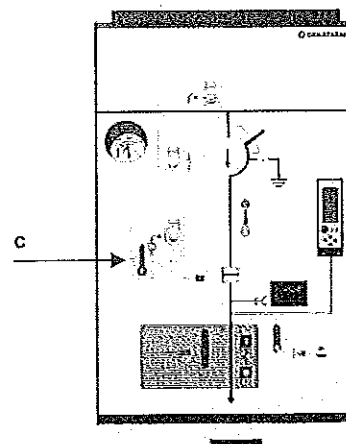
ЧЕРВЕН край на лоста

Фигура 5.43: Лост за мощн. разединител

5. Извадете лоста. Предвид конструкцията му, той може да се изважда само в обезопасено положение.
6. Завъртете отново частта (с), за да премахнете блокировката.



Фигура 5.44: Крайно положение на лоста

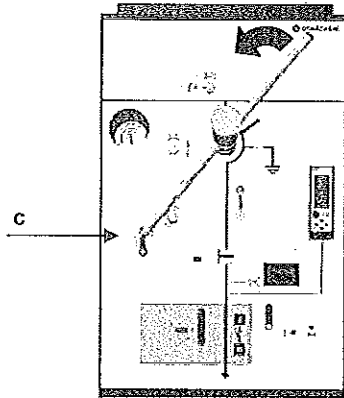


Фигура 5.45: Разединен шкаф за прекъсвачи

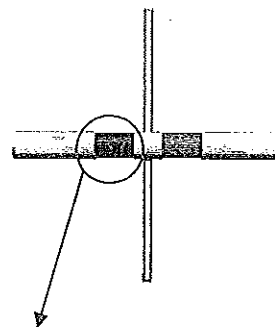


5.5.2. Действие по свързване от разединено положение

7. Уверете се, че прекъсвачът е отворен.
8. Завъртете заключващата част (с) и я плъзнете надолу, за да извадите блокиращата плоча (вж. фигурите).
Завъртете я отново, за да я заключите на мястото ѝ.
9. Поставете лоста от ЧЕРНАТА страна, докато се освободи скобата, и завъртете ОБРАТНО НА ЧАСОВНИКА, докдето стигне, за да придвижите разединителя от разединено в свързано положение.

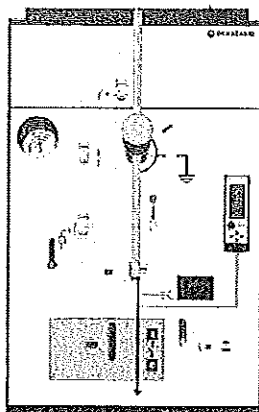


Фигура 5.47: Процес по завъртане на лоста

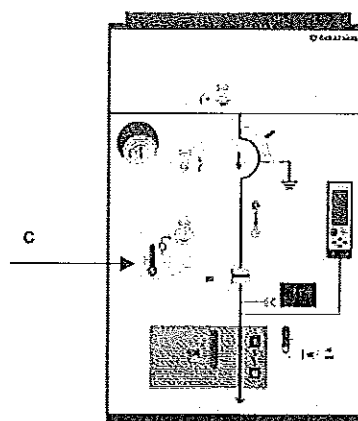


Фигура 5.46: Лост за разединителя

10. Издърпайте лоста изцяло, за да можете да затворите прекъсвача. Поради конструкцията му, лостът може да се извади само в обезопасено положение.
11. Завъртете частта (с) отново, за да премахнете блокировката (блокиращата плоча ще се придвижи нагоре)



Фигура 5.48: Крайно положение на разединителя



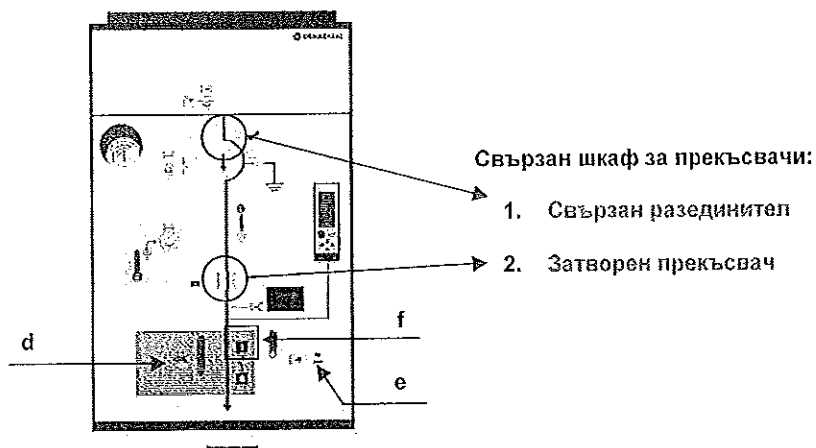
Фигура 5.49: Крайно положение на лоста

12. Затворете прекъсвача.

а) Ръчен задвижващ механизъм (задвижващ механизъм RAV):

Заредете пружините, работейки с лоста за зареждане (d), докато бъде индикирано, че затворящата пружина е натегната -> Зареждане на пружината (e).

За да затворите прекъсвача, натиснете бутона за затваряне (f).



Фигура 5.50: Свързан шкаф CGMCOSMOS-V

б) Задвижващ механизъм с двигател (задвижващ механизъм RAMV): Натиснете бутона за затваряне на прекъсвача (f).

13. Проверете за наличието на напрежение (екoрVPIS)

5.5.3. Действие по разединение от свързано положение

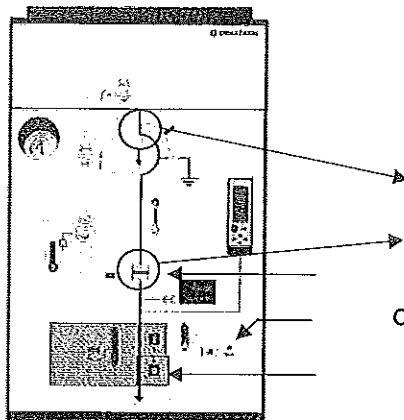
Началните условия са: затворен прекъсвач и затворен заземителен нож (вж. Фигура 5.50).

1. Отворете прекъсвача с бутона за отваряне (a) и проверете индикатора за състоянието (b)

ВНИМАНИЕ:

За да отворите прекъсвача, проверете индикацията за зареждане на пружината (e) и ако пружината е отпусната, я натегнете ръчно^[20]. Ако шкафтът има задвижван с двигател механизъм RAMV, този процес се извършва автоматично.

^[20] Вж. точка 12 от процеса за пуск в експлоатация на шкафа CGMCOSMOS-V



Отворен прекъсвач:

1. Свързан разединител
2. Отворен прекъсвач

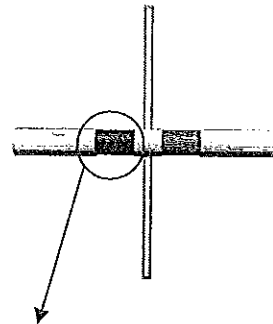
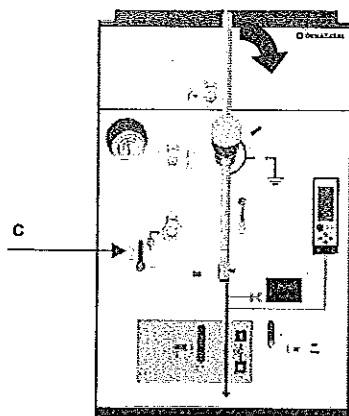
b

e

a

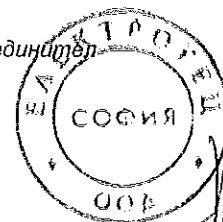
Фигура 5.51: Отваряне на прекъсвач

2. Уверете се, че няма напрежение.
3. Уверете се, че прекъсвачът е отворен.
4. Завъртете заключващата част (с) и я плъзнете надолу, за да извадите блокиращата плоча (вж. фигура 5.52). Завъртете я отново, за да я заключите на мястото ѝ.
5. Поставете лоста от ЧЕРНАТА страна, докато се освободи скобата, и завъртете ПО ЧАСОВНИКА, докато стигне, за да придвижите разединителя от свързано в разединено положение.

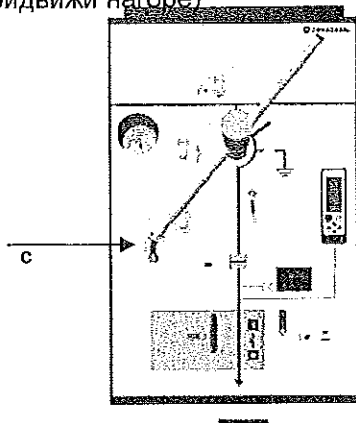


ЧЕРЕН край на лоста

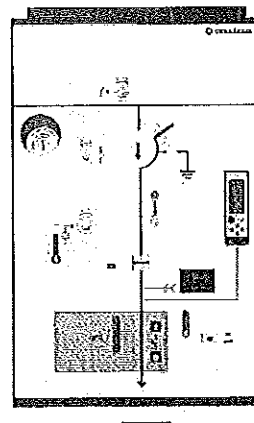
Фигура 5.52: Процес по завъртане на лоста Фигура 5.53: Лост за мощн. разединител



6. Издърпайте лоста изцяло, за да можете да затворите прекъсвача. Поради конструкцията му, лостът може да се извади само в обезопасено положение.
7. Завъртете частта (с) отново, за да премахнете блокировката (блокиращата плоча ще се придвижи нагоре)



Фигура 5.54: Крайно положение на лоста

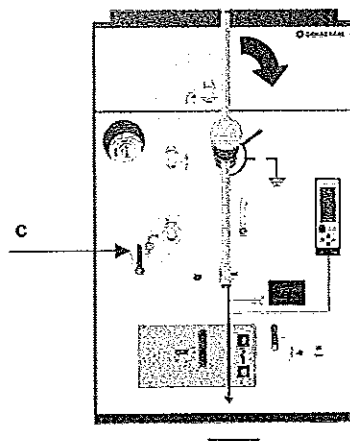


Фигура 5.55: Разединен шкаф за прекъсвачи

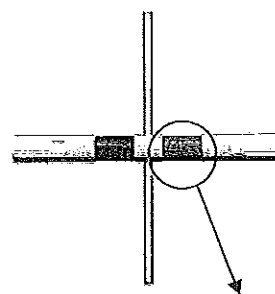
5.5.4. Действие за заземяване от разединено положение

- Стъпка от положение "готовност за заземяване" към разединено положение

8. Започнете при прекъсвач в отворено положение и разединител в положение "готовност за заземяване".
9. Завъртете заключващата част (с) и плъзнете дръжката надолу, за да извадите блокиращата плоча. Завъртете я отново, за да я заключите на мястото ѝ (вж. Фигура 5.56).
10. Натиснете навътре лоста от ЧЕРВЕНАТА страна, докато се освободи скобата, и завъртете ПО ЧАСОВНИКА, докъдето стигне, за да придвижите "готовия за заземяване" разединител в разединено положение.



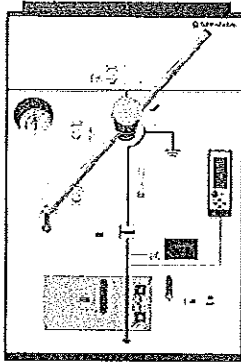
Фигура 5.56: Процес по завъртане на лоста



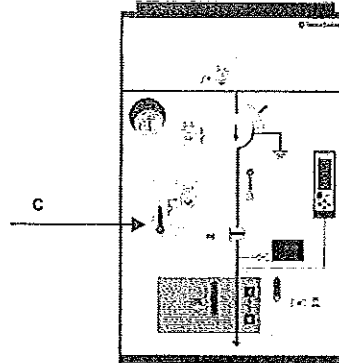
ЧЕРВЕН край на лоста

Фигура 5.57: Лост за мощн. разединител

11. Извадете лоста. Предвид конструкцията му, той се вади само в обезопасено положение.
12. Завъртете отново частта (b), за да премахнете блокировката.



Фигура 5.58: Крайно положение на лоста



Фигура 5.59: "Готов за заземяване" шкаф за прекъсвачи

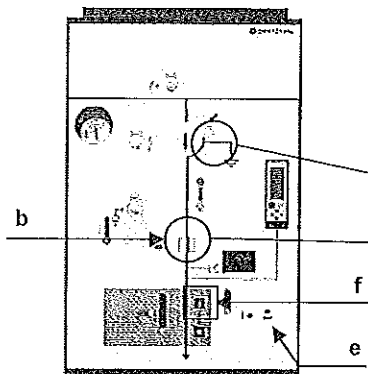


ВНИМАНИЕ:

За правилното заземяване на кабела прекъсвачът трябва да бъде затворен, както е описано по-долу.

- Стъпка от положение "готовност за заземяване" към заземено положение

13. Затворете прекъсвача чрез бутона за отваряне (f) и проверете индикатора за състоянието (b). Разединителят е заземен.



Фигура 5.60: Заземяване на шкаф CGMCOSMOS-V

Ефективно заземяване на шкаф за прекъсвачи:

1. Заземителен нож
2. Затворен прекъсвач

14. Уверете се, че няма напрежение.



ВНИМАНИЕ:

За да можете да затворите прекъсвача, проверете индикатора за зареждане на пружината (f) и ако тя е отпусната, я натегнете ръчно ^[21].

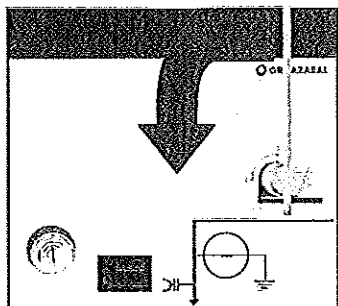
За работа без напрежение затвореното положение на заземителния нож трябва да се блокира или с катинар, или с ключалка.

^[21] Вж. точка 12 от последователността за пуск в експлоатация на шкафа CGMCOSMOS-V.

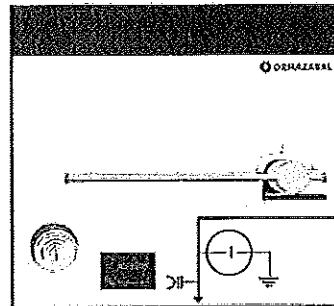
5.6. ФУНКЦИОНАЛЕН БЛОК ЗА СВЪРЗВАНЕ НА ШИНИ СЪС ЗАЗЕМЯВАНЕ

5.6.1. Действие за разединение от заземено положение

1. Придвижете жълтия плъзгач в дясното му положение (по този начин се освобождава достъп за разединение на заземителния нож).
2. Поставете лоста в отвора на заземителния нож и завъртете на 90° ОБР. НА ЧАСОВНИКА.



Фигура 5.61: Процес по завъртане на лоста

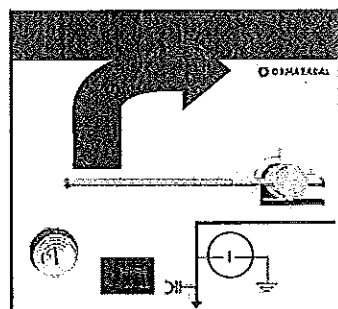


Фигура 5.62: Разединен заземителен нож

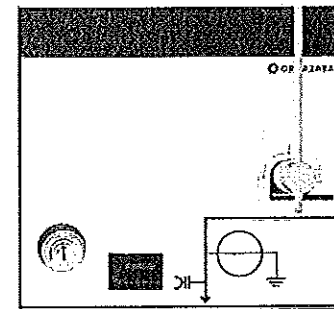
ПРЕПОРЪКА: Въпреки, че фигурата показва началния момент на действието при верт. положение на рамото на лоста, се препоръчва да стартиране при хориз. положение на рамото, насочено надясно, за да се използва най-добре приложената от оператора сила.

5.6.2. Действие за заземяване от разединено положение

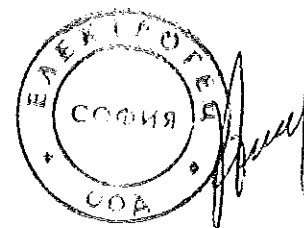
3. Придвижете жълтия плъзгач в лявото му положение (по този начин се освобождава отвора за лост за свързване на заземителния нож).
4. Поставете лоста в отвора на заземителния нож и завъртете на 90° ПО ЧАСОВНИКА.



Фигура 5.63: Процес по завъртане на лоста

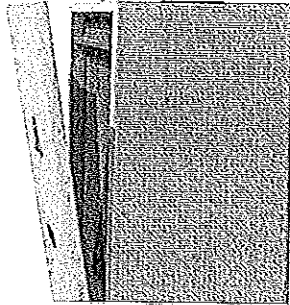


Фигура 5.64: Свързан заземителен нож

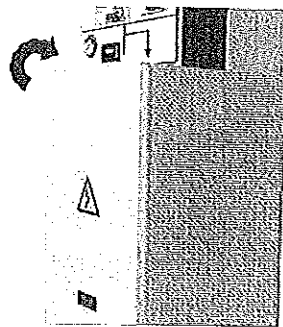


5.7. ПОСТАВЯНЕ НА КАПАКА ЗА ДОСТЪП ДО КАБЕЛНОТО ОТДЕЛЕНИЕ

5.7.1. Стандартни основи



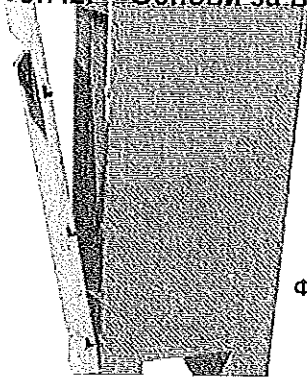
Фигура 5.1



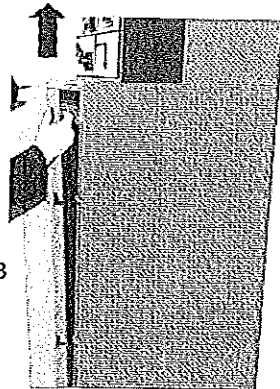
Фигура 5.2

Положете капака в долната част на основата и го натиснете, докато застане в горната ѝ част.

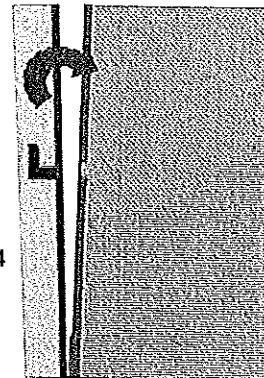
5.7.2. Основи за вътрешна дъга в кабелното отделение



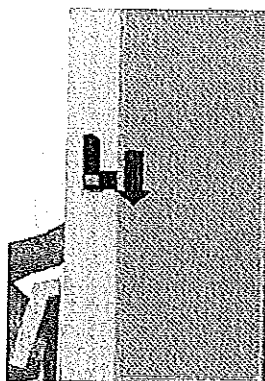
Фигура 5.3



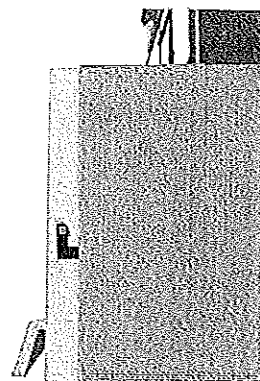
Фигура 5.4



Фигура 5.5



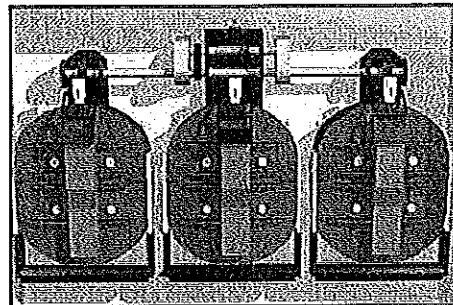
Фигура 5.6



Фигура 5.7

Положете капака в долната част на основата, повдигнете го леко, докато се намести в нейните странични отвори, и го натиснете надолу, докато се намести в нейната горна част. Извършете действията в обратна последователност, за да отворите капака за достъп до кабелното отделение.

В шкафите CGMCOSMOS-P със защита чрез предпазители при блокиране на вратичката за достъп до кабелното отделение настройването на предавателния задействащ механизъм се извършва **директно**, предизвиквайки го да зареди автоматично пружината.

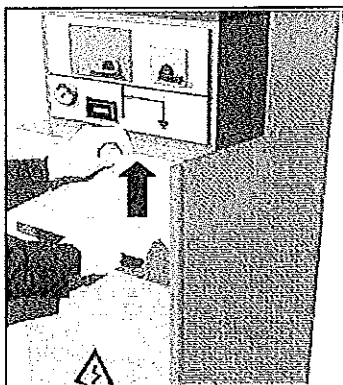


Фигура 5.8: Задействащ предавателен механизъм в шкафове CGMCOSMOS-P

5.8. ПОСЛЕДОВАТЕЛНОСТ ЗА СГЛОБЯВАНЕ НА КЛЕМНАТА КУТИЯ В КАБЕЛНОТО ОТДЕЛЕНИЕ ОТ ТИП 21 КА - 1 s

5.8.1. Изваждане

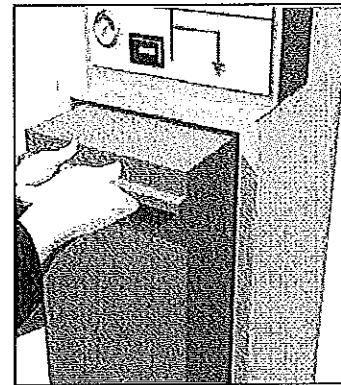
1. Отворете и извадете капака за достъп до кабелното отделение съгласно раздел 5.7.1.
2. Леко повдигнете предпазното приспособление за кутията чрез ръчката в горната част.
3. Бавно извадете кутията, докато достигне края на направляващата релса.



Фигура 5.9

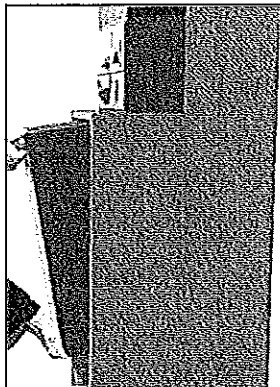


Фигура 5.10

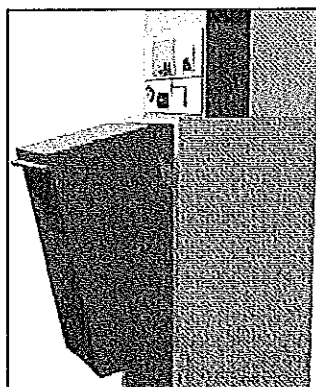


Фигура 5.11

4. Държейки горната част на кутията в едната ръка и долната част в другата, свалете внимателно кутията на пода, като внимавате за нейното тегло.



Фигура 5.12



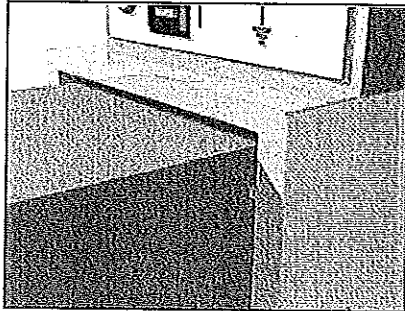
Фигура 5.13



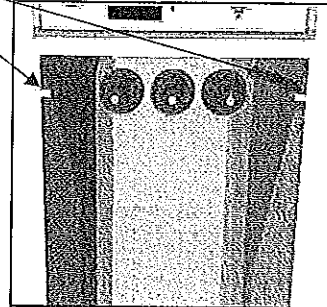
Фигура 5.14: Подробен изглед на клемната кутия

5.8.2. Поставяне

1. Повдигнете кутията и я наместете в направляващата релса на основата.

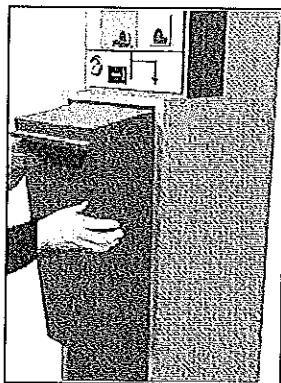


Фигура 5.15: Поставяне на кутията на релсите

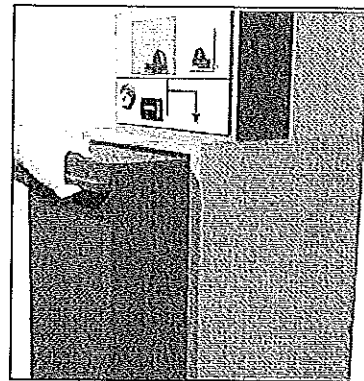


Фигура 5.16: Направляващите релси

2. Натиснете я, докато спре.

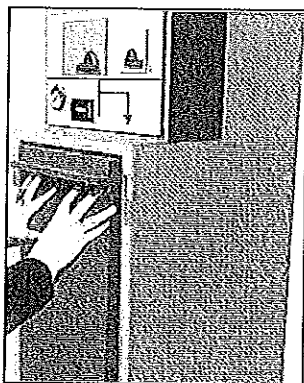


Фигура 5.17: Леко наклонете при поставяне

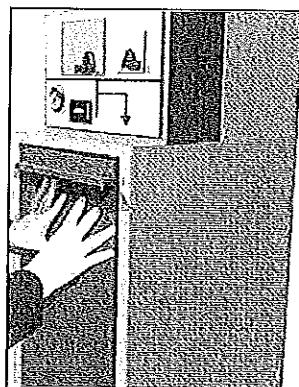


Фигура 5.18: Натискане на кутията навътре

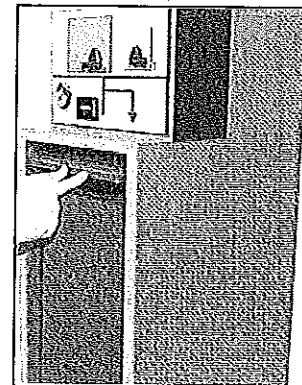
3. Накрая натиснете, докато тя застане на мястото си, и поставете горната дръжка.



Фигура 5.19



Фигура 5.20



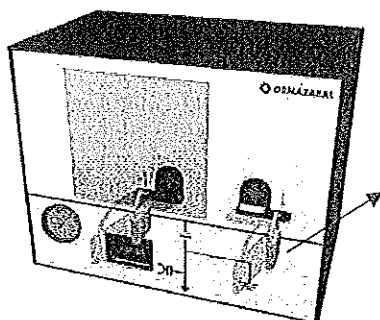
Фигура 5.21

4. Поставете капака за достъп до кабелното отделение.

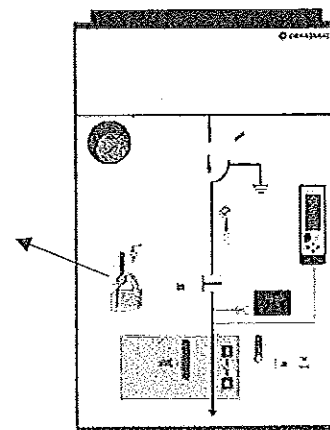
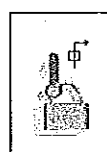
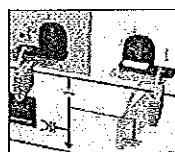
5.9. ВЗАИМНИ БЛОКИРОВКИ

5.9.1. Блокировка с катинар

Всеки задвижващ вал може да се блокира с до три стандартни катинара с максимален диаметър на дръжката 8 mm.



Фигура 5.22: Блокировка с катинар на шкафове за изводи



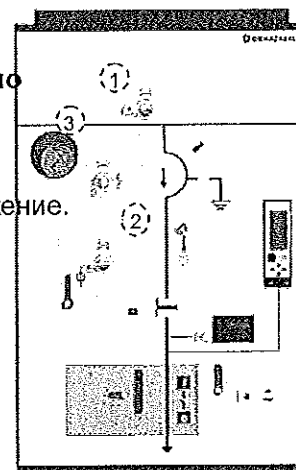
Фигура 5.23: Блокировка с катинар на шкафове за прекъсвачи

5.9.2. Блокировка с ключалка

Шкафовете са подготвени за опционално включване на комплекти отворени и затворени ключалки.

Примери за блокировки с ключалки (опционални):

- **Блокировка 1: Заземителен нож, блокиран в отворено положение.** Това предотвратява привеждането на ножа в "заземено/готово за заземяване" положение, докато ключът за ключалката на превключвателя за ниско напрежение бъде използван, но позволява превключването му в основното положение.
- **Блокировка 2: Заземителен нож, блокиран в затворено положение (ВИНАГИ ТРЯБВА ДА Е БЛОКИРАН при работа в условия на дезактивирано напрежение).** Това предотвратява неволното отваряне на ножа и премахване на заземяването за кабела от някого.
- **Блокировка 3: Заземителен нож, блокиран в отворено положение.** Това предотвратява превключването на заземителния нож в "свързано" положение, но не позволява ножът да се превключва и в "заземено/готово за заземяване" положение.



Фиг. 5.24: Блокировка в шкаф CGMCOSMOS-V

Съвместното използване на Блокировка 1 и Блокировка 3 заедно ще предотврати придвижването на ножа от "разединено" положение.

Активните части на комутационния апарат и на главната верига в шкафовете CGMCOSMOS не се нуждаят от инспекция или поддръжка, тъй като те са напълно изолирани с елегаз и затова не изпитват никакво влияние от външната среда. Изпитанията за електрическа устойчивост от клас E2 гарантират необслужваемостта на изключвателните компоненти.

При експлоатационните условия, посочени в IEC 60694, задвижващият механизъм за шкафовете от системата CGMCOSMOS не се нуждае от никакъв вид смазване, за да функционира правилно през очаквания за него експлоатационен период при условията за експлоатация, посочени в IEC 60694.

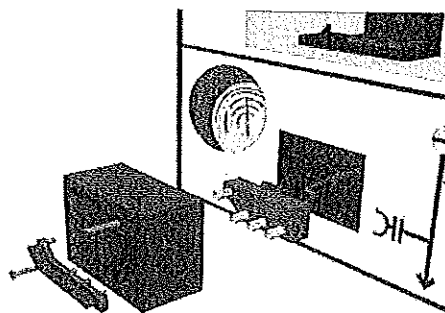
Тези механизми трябва да се наблюдават при екстремални експлоатационни условия (прах, сол, замърсяване). Препоръчително е да се извършва поне едно задвижване при тези наблюдения.

Компонентите в корпуси от галванизирани ламарина са били подложени на специално боядисване, за да се осигури защитата им срещу корозия. Ако те бъдат надраскани, нацърбени или деформирани по друг начин, е нужен ремонт за избягване на корозията.

6.1. ИЗПИТАНИЕ НА ИНДИКАТОРА ЗА НАЛИЧИЕ НА НАПРЕЖЕНИЕ

За да извършите изпитание на индикатора за наличие на напрежение ekorVPIS, го свържете към източник на захранване 230 V_{ac}. За да направите това, шкафът трябва да бъде разединен и при 4 mm клемми в индикатора да приложите напрежение между проверяваната точката за изпитание на фазата и точката за изпитание на заземяването. Няма полярност за контакта 230 V_{ac} и затова може да бъде свързана или фазата, или нулата. Индикаторът работи правилно, ако има светлинен премигващ сигнал. За правилното изпитване на индикатора тази проверка трябва да се извърши за трите фази.

Индикаторът ekorVPIS може да бъде заменен, ако е нужно. За да направите това, трябва да извадите двата винта в горната дясна и долната лява част на индикатора. След това индикаторът може да се извади от основата без да е необходимо дезактивиране на захранването на шкафа.



Фигура 6.1: Свързване на ekorVPIS

6.2. ПРОВЕРКА НА АКУСТИЧНАТА АЛАРМА ЗА ПРЕДОТВРАТЯВАНЕ НА ЗАЗЕМЯВАНЕ

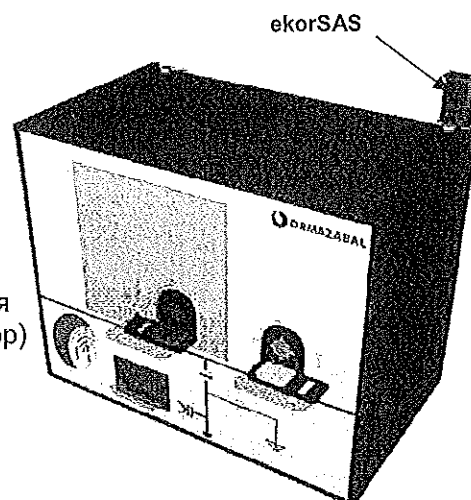
Правилното функциониране на ekorSAS може да се изпита чрез свързване на индикатора за наличие на напрежение ekorVPIS към 230 V_{ac} с 4 mm клемми, разположени в индикатора между точката за изпитване на заземяването и точката за изпитване на фаза L1. Помощното захранване се поддържа за 5 минути, а след това лостът се поставя в заземителната ос за превключване, алармата стартира и остава включена за поне 30 секунди. Тя спира, когато лостът бъде изваден.

Ако е необходимо, **ekorSAS** може да се замени, тъй като той е свързан към съответните компоненти с два PCB конектора за регулиране на триенето:

- Един 3-иглен конектор (поляризиран) за индикатора за наличие на напрежение
- Един 2-иглен конектор за лостовия микропрекъсвач

Процесът е както следва:

- Разхлабете винтовете, държащи горния цокъл и го извадете.
- Извадете капака на задв. механизъм.
- Леко натиснете долните закрепващи ушета на **ekorSAS**, за да го извадите.
- Разхлабете двата конектора и заменете повредения модул, а след това свържете новия към лостовия микропрекъсвач (2-иглен конектор) и към индикатора за наличие на напрежение (поляризиран 3-иглен конектор).

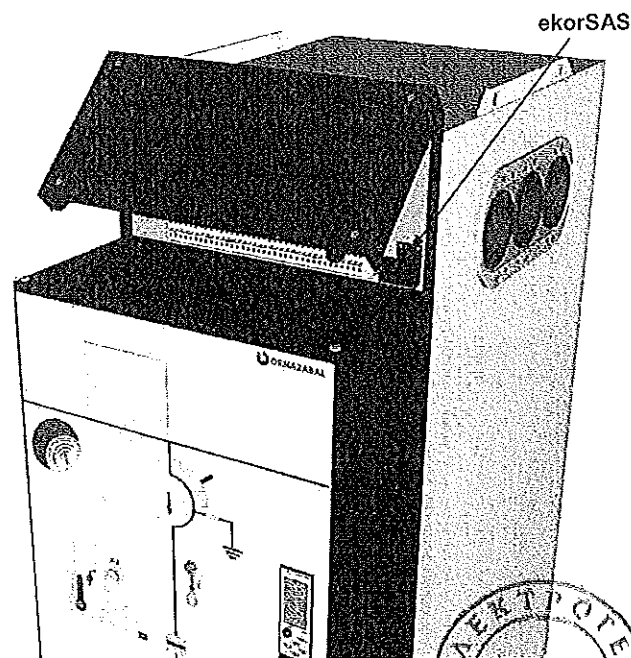


Фигура 6.2: Поставяне на устройство **ekorSAS** в шкафов **CGMCOSMOS**

➤ **Замяна на ekorSAS в шкафов **CGMCOSMOS-V**:**

Процесът е както следва:

- Разхлабете винтовете, държащи горния цокъл и го извадете.
- Извадете капака на задв. механизъм.
- Развинтете винтовете на ключалката на **ekorSAS**, за да го извадите.
- Разхлабете двата конектора и заменете модула, а след това свържете новия към лостовия микропрекъсвач (2-иглен конектор) и към индикатора за наличие на напрежение (поляризиран 3-иглен конектор).

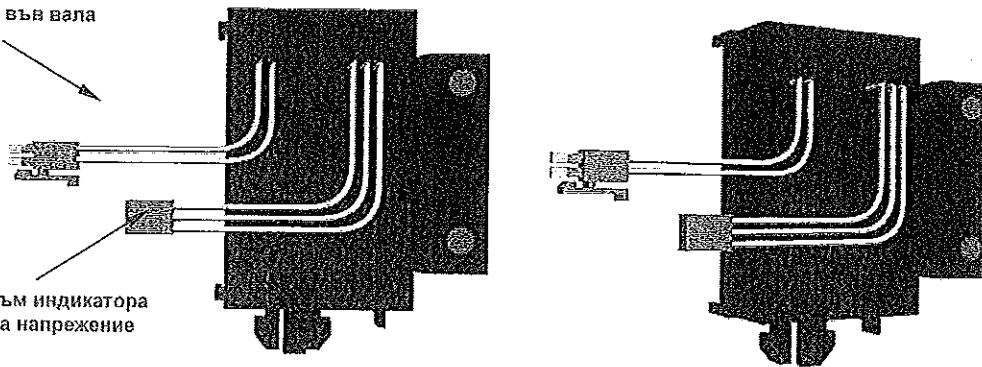


Фигура 6.3: Поставяне на устройство **ekorSAS** в шкафов **CGMCOSMOS-V**

➤ Свързване на ekorSAS:

Свързване към постоянен микропрекъсвач във вала за заземяване

Свързване към индикатора за наличие на напрежение



Фигура 6.4: Свързване на ekorSAS

6.3. ПРЕВАНТИВНА ПОДДРЪЖКА НА ШКАФ CGMCOSMOS-V

Задвижващите механизми и другите компоненти извън казана с елегаз може да се нуждаят от превантивна поддръжка, а интервалите за нея ще зависят от наличните условия на околната среда (агресивна към материалите среда, прах, екстремни температури и др.) и трябва да се установят според опита и надеждността при монтажа.

Трябва да се извършва поддръжка на всеки 5 години или 2000 работни цикъла, освен ако не е решено друго от потребителя съвместно с Техническо-търговския отдел на Ormazabal според експлоатационните условия.

Задвижващата система, при необходимост от ниска степен на поддръжка, има механична трайност от 10 000 операции.

- Разтворители, разпръсквани със сгъстен въздух, не бива да се използват за почистване.
- Регулиращите положението компоненти, като ограничителен вал, амортисьор, тапи, гайки и болтове, които са били уплътнени, не бива да се манипулират.

Предполагаемото време за проверка на състоянието за ремонт е около един час и преди това е необходимо да имате под ръка следните инструменти:

- Loctite A-270
- Френски ключ
- Спрей с лубрикант "Super-Lube"
- Антикорозионен спрей

Превантивната поддръжка трябва да се извършва съгласно следните условия:

- Отворен прекъсвач и свързан заземителен нож.
- Разединено захранване на помощната верига.
- Разединение на оборудването за отдалечено управление.
- Проверка, че отварящите и затварящите пружини са разтоварени.



6.3.1. Визуална проверка

- Проверете дали блокиращите зегерови пръстени, шплинтове и блокиращи пластични щифтове са правилно поставени на местата им и дали не са разхлабени или изпаднали, като обърнете особено внимание на онези елементи, които са по основната верига на ходовата трансмисия.
- Проверете дали уплътнените компоненти за регулиране на положението са незасегнати (по-специално ограничителния вал и закрепващите гайки на фазовата трансмисия и изходния вал).
- Погрижете се свързващите кабели да не са в близост до зони на трансмисионен ход.
- Ако защитата на повърхността е ръждясала или прашна, вземете посочените по-горе продукти, обръщайки особено внимание на частите вътре в шасито, трансмисиите, зъбните механизми и гърбиците, вземайки предвид функционалността и естетиката.
- При нови инспекции имайте предвид броя операции на брояча, датата на монтажа и характеристиките на локацията и (ако това е първо обслужване) дори предходната коригираща поддръжка.

Предполагаема продължителност на визуалната проверка: 10 минути

6.3.2. Контролни проверки

Състоянието на оборудването трябва да се провери, извършвайки 2 ръчни действия:

Първо:

- Ръчно зареждане на пружината.
- Проверка, че тя държи в стабилно положение затварящия зъбен механизъм и че фиксатора при отваряне "връща" до под ограничителния вал бързо и с минимален ход от 2 mm.
- Затворете прекъсвача.
- Проверете дали фиксатора при отваряне е стабилен.
- Отворете прекъсвача чрез таблото с бутони.

Второ:

- Заредете затварящата пружина.
- Затворете
- Заредете затварящата пружина
- Отворете
- Затворете и отворете

Ако шкафът има задвижващ механизъм с двигател, трябва да се извършат две двигателни действия с бобина (или бобини)

Първо:

- Заредете чрез двигателния механизъм



- Проверете микропрекъсвачите M0 и M1



- Проверете дали НЗ контактите са отворени и с активиран управляващ лост.
 - Затворете чрез включващата бобина.
 - Отворете чрез изключвателната бобина.

Второ:

- Заредете затварящата пружина
- Затворете чрез бобината.
- Заредете затварящата пружина.
- Отворете-затворете и отворете чрез бобините.

Ако шкафът има модула за защита ekoRPG, извършете следната проверка:

- Активирайте захранването за релето с 220 V_{ac} (ако вече не е активирано).
- Свържете мостово клеми G4 и G5 от релето според електрическата схема на защитния модул ekoRPG
- Проверете дали прекъсвачът отваря.
- Извършете 2 отварящи действия.

Предполагаемо време: 20 минути

6.3.3. Проверка на затягането на закрепващите гайки и болтове

Уверете се, че гайките и болтовете не са разхлабени. Обърнете особено внимание на болтовите връзки, закрепващи рамата, закрепващи шасито към конструкцията на шкафа, както и онези, които формират конструкцията на задвижващия механизъм.

Необходимо е да се провери (ръчно с обикновен гаечен ключ) дали за дадена връзка е нужно прилагането на затягане с определения въртящ момент.

Ако бъдат открити разхлабени болтове, използвайте Loctite A-270 и приложете номиналния въртящ момент на затягане според съответните им размери.

Предполагаемо време за проверката: 10 минути

6.3.4. Проверка на сглобките

Задвижващият механизъм е сглобен от производителя във вид, годен за целия експлоатационен живот. Затова, сглобките, които не бива да бъдат манипулирани, са запечатани.

Главна сглобка на ограничителния вал:

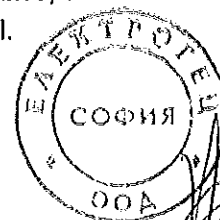
- Проверете дали не е разхлабена или без пломба. Не манипулирайте, освен в присъствието на човек от Техническо-търговския отдел на Ormazabal.

Сглобка на амортизатора:

- Проверете дали е уплътнена.

Трансмисия към фазите:

- Да не се манипулира никога. Проверете дали е уплътнена.



6.3.5. Смазване

Смажете всички въртящи се точки на валове, лагери, проходни изолатори, ролки, както и (по принцип) всички плъзгащи се компоненти.

Използвайте базирания на Тефлон смазочен спрей Super-Lube с тубичка за приложение, за да се гарантира, че смазката се прилага по най-ефективен начин.

Ако по някой компонент бъде забелязана не-функционална ръжда, приложете антикорозионен спрей.

Не използвайте разяждащи течности, като корозивни разтворители и др., нито пък сгъстен въздух за отстраняване на малки частици или натрупана прах.

Предполагаемо време: 10 минути

Ако по задвижващия механизъм са направени някакви корекции, е необходимо да извършите действията за проверка (раздел 6.4.4) на целия цикъл два пъти^[22].

Иначе, няколко операции са достатъчни за равномерно смазване на компонентите.

^[22] Техническо-търговският отдел на Ormazabal трябва да бъде уведомен с доклад за всякакви извършени корекции с цел съответния техен анализ.



7.1. РЕЗЕРВНИ ЧАСТИ И ПРИНАДЛЕЖНОСТИ

Въпреки, че шкафовете са конструирани за експлоатационен живот според стандарта IEC 60298, някои компоненти може да се наложи да бъдат заменени и монтирани отново по различни причини. Следва списък с тези компоненти:

- Индикатори за наличие на напрежение ekorVPIS
- Задвижващ механизъм
- Акустична аларма ekorSAS
- Лостове *

В случай на наложителна замяна на някоя от посочените помощни части, трябва да се подаде съответната поръчка за комплекта с резервни части и да бъдат следвани съответните инструкции в приложимата документация.

Забележка: Някои резервни части и принадлежности е задължително да се монтират от специализиран персонал. Свържете се с Техническо-търговския отдел на Ormazabal.

7.2. ИНФОРМАЦИЯ ЗА ОКОЛНАТА СРЕДА

7.2.1. Серен хексафлуорид (елегаз) – SF₆^[23]

Шкафовете CGMCOSMOS са дефинирани като херметизирани системи под налягане, съдържащи серен хексафлуорид (SF₆).

SF₆ е включен в списъка на парниковите газове към Протокола от Киото. SF₆ има GWP от 22 200 единици.

В края на живота на продукта съдържанието на SF₆ трябва да бъде върнато за обработка и рециклиране, като се избягва неговото освобождаване в атмосферата. Извличането и обработката на SF₆ трябва да се извършат от специализиран персонал^[24].

^[23] Тази информация е посочена на етикет върху оборудването.

^[24] Ако имате съмнение за нещо, се свържете с Техническо-търговския отдел на Ormazabal.



7.3. ЕЛЕКТРОТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ НА ЗАДВИЖВАЩИЯ МЕХАНИЗЪМ BS

7.3.1. Бобини

Номиналните електротехнически характеристики на бобините и помощните контакти за комутационната позиция са както следва:

ЕЛЕКТРОТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ			
ИЗКЛ. БОБИНА	Ном. напрежение	24 V _{cc} , 48 V _{cc} 230 V _{ac}	110 V _{cc}
	Макс. потребление	80 W	
	Вътрешна изолация	2 kV	
СИГНАЛНИ КОНТАКТИ	Сигнални контакти за комутационна позиция	1 NAC 1 NAC + 2 NA	2 NA
	Ном. напрежение	250 V _{ac}	
	Ном. ток	16 A	

Задвижващият механизъм BR позволява да се добавят до 2 НО + 2 НЗ контакта за комутационното състояние и 2 НО контакта за състоянието на заземителния нож.

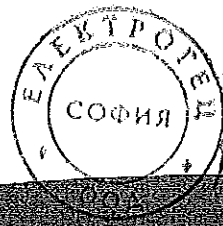
7.3.2. Двигателни механизми

Електротехническите характеристики са както следва:

ЕЛЕКТРОТЕХНИЧЕСКИ ХАРАКТЕРИСТИКИ			
ДВИГАТЕЛНИ МЕХАНИЗМИ	Ном. напрежение	24 V _{cc} , 48 V _{cc} 125 V _{cc}	110 V _{cc} и
	Пиков ток	<5	
	Време за превкл. на двигател	3	
	Сигнални контакти за комутациите	2 НО + 2 НЗ	
СИГНАЛНИ КОНТАКТИ	Сигнални контакти за заземяването	2 НО	
	Ном. напрежение	250	
	Ном. ток	16	

Забележка: Електрическите схеми за всеки тип шкаф се доставят с документацията по поръчката.





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/“

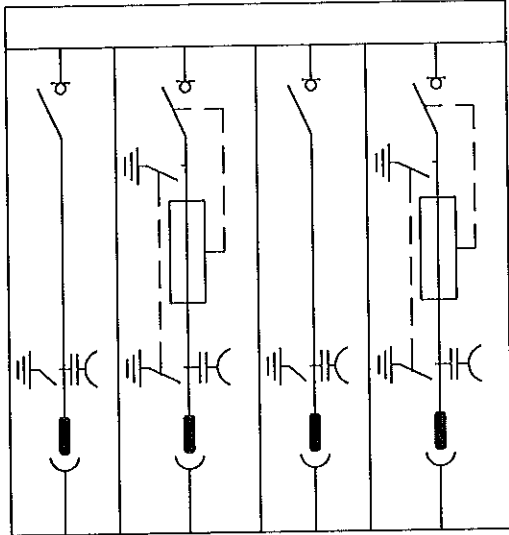
РЕФ. № PPD 15-042

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 кА, с SF₆ изолация, с товарови прекъсвачи”

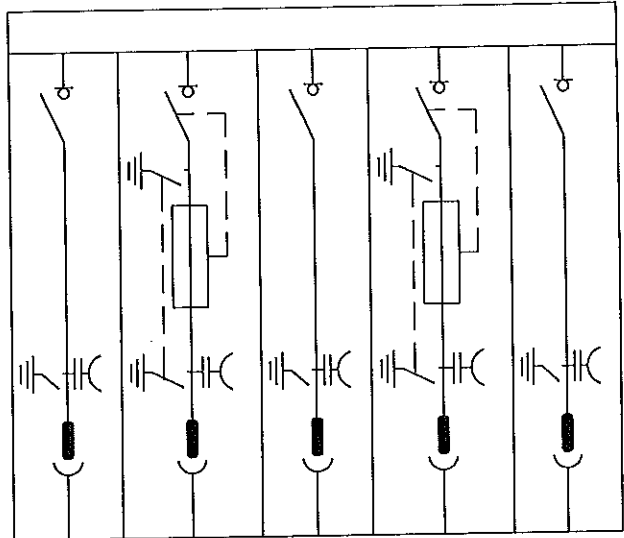
Приложение № 3



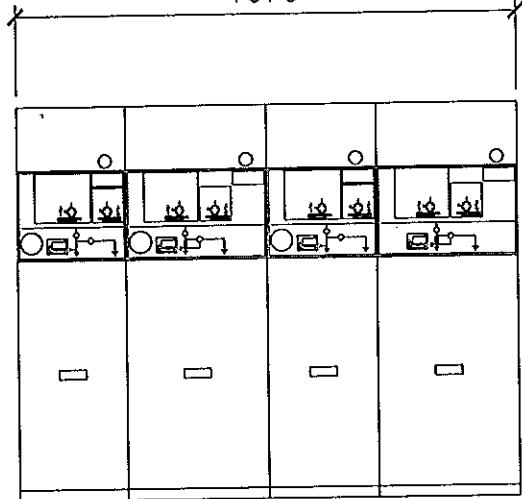
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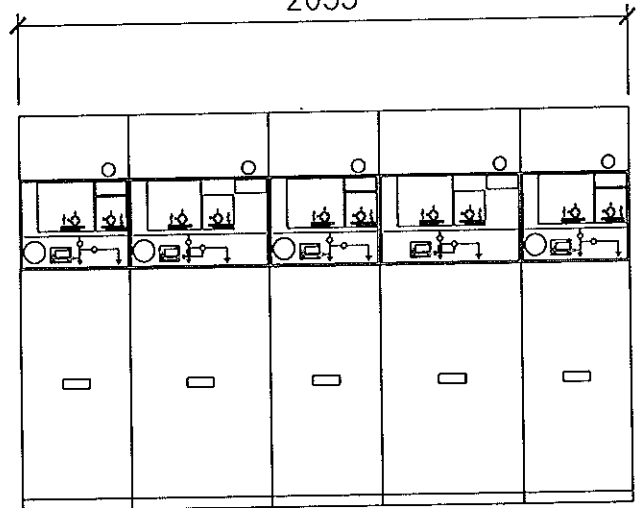
CGMOSMOS-3L2P



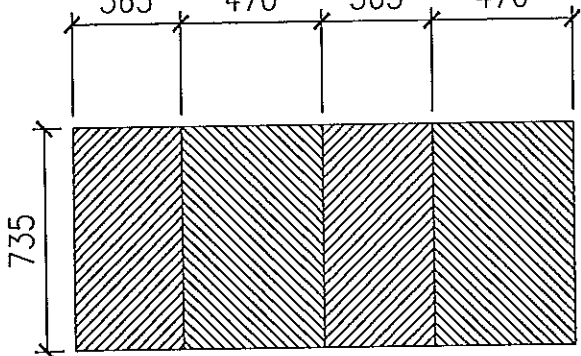
1670



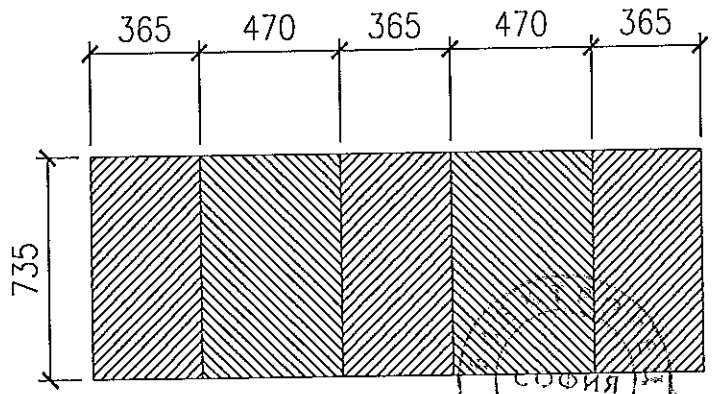
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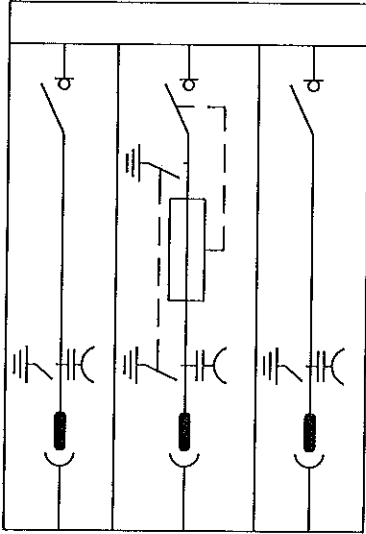


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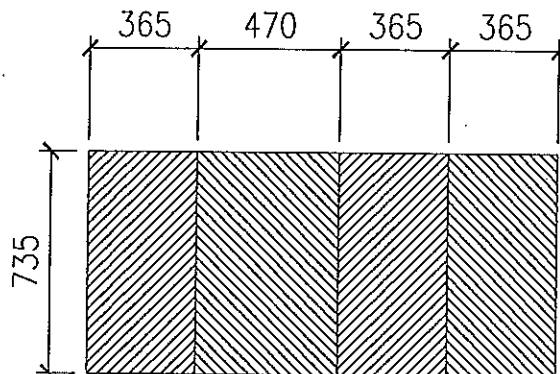
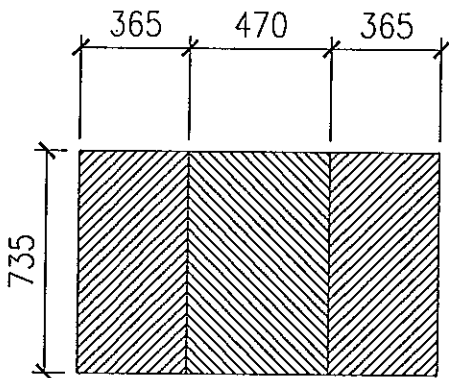
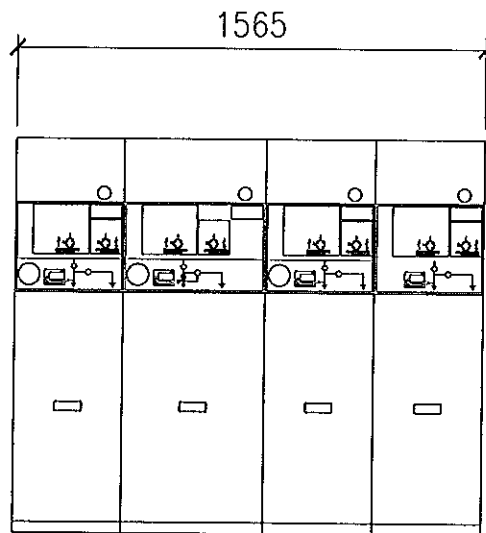
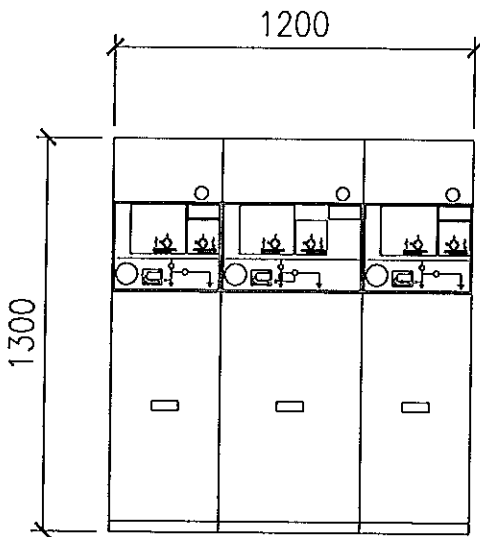
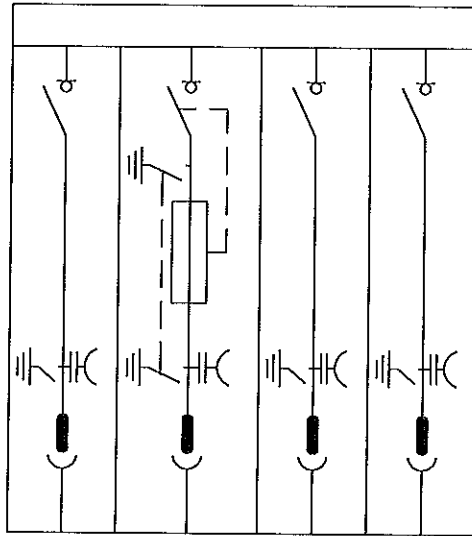


Российская Федерация
 ООО
 [Signature]

CGMCOSMOS-2LP



CGMCOSMOS-3LP



ДОКУМЕНТАЦИЯ

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

с предмет:

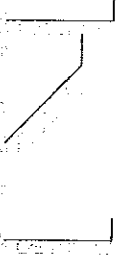
„Доставка и монтаж на бетонови комплектни трансформаторни постове /БКТП/“

РЕФ. № PPD 15-042

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 kA, с SF₆ изолация, с товарови прекъсвачи”

Приложение № 4



B-POWER

Списък на протоколи от типови изпитания на КРУ CGCOSMOS, производство на ORMAZABAL

Сериен No	Описание	Стандарт	Акредитирана лаборатория
24507001	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AFL 16 kA/1 s	IEC 62271-200, Annex A	KEMA
31745101	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AFL 20/21 kA/1 s	IEC 62271-200, Annex A	KEMA
31756402	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AFL 20/21 kA/1 s	IEC 62271-200, Annex A	KEMA
K12520001	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AF 20 kA/1 s	IEC 62271-200, Annex A	KEMA
31009211-M5	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AFL 21 kA/1 s	IEC 62271-200	ORMAZABAL Corporate Technology
31009211-M6	Изпитание на вътрешно к.с. с електрическа дъга, класификация IAC AFL 21 kA/1 s	IEC 62271-200	ORMAZABAL Corporate Technology

ВЯРНО С
ОРИГИНАЛА



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REPORT OF PERFORMANCE

304-07

APPARATUS The busbar and three-phase three-position switch compartment of an SF₆-insulated metal-enclosed ring main unit cubicle

TYPE CGM Cosmos-2LP-F **SERIAL No.** 24507001

24 kV – 630 A – 16 kA – 50/60 Hz

CLIENT Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

MANUFACTURER Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

TESTED BY KEMA HIGH-POWER LABORATORY
Utrechtseweg 310 - 6812 AR Arnhem - The Netherlands

DATE(S) OF TESTS 14 February 2007

TEST SPECIFICATION The tests have been carried out in accordance with the client's instructions.
Test procedure and test parameters were based on IEC 62271-200, Annex A

This report consists of 22 sheets in total.

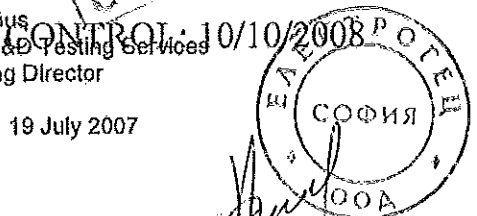
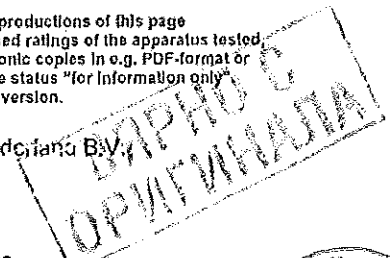
This report falls under the scope of the accreditation certificate L 020 of the Dutch Council for Accreditation.
See information sheet (page 2).

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KEMA Nederland B.V.

P.G.A. Bus
KEMA T&D Testing Services
Managing Director

Arnhem, 19 July 2007





1 Certificate

A Certificate contains a record of a series of type tests carried out strictly in accordance with a recognized standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KEMA. The Certificate is applicable only to the equipment tested. KEMA is responsible for the validity and the contents of the Certificate.

The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The Certificate contains the essential drawings and a description of the equipment tested.

Detailed rules are given in KEMA's Certification procedure.

2 Report of Performance

A Report of Performance contains a record of one or more tests which have been carried out according to the client's instructions. These tests are not necessarily in accordance with a recognized standard. The test results do not verify ratings of the test object.

KEMA issues three types of Reports of Performance:

2.1 The tests have been carried out strictly in accordance with The apparatus has complied with the relevant requirements.

This sentence will appear on the front page of a Report of Performance if the tests have been performed in accordance with a recognized standard, but the series of tests does not completely fulfil the requirements for a Certificate of Compliance (for example, if the number of test duties is not a complete series of type tests). The Report contains verified drawings and a description of the equipment tested. Detailed rules are given in KEMA's Certification procedure. The condition of the test object after the tests is assessed and recorded in the Report.

2.2 The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on

This sentence will appear on the front page of a Report of Performance if the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer. If the apparatus does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on the client's request.

2.3 The tests have been carried out according to the client's instructions.

This sentence will appear on the front page of a Report of Performance if the tests, test procedure and/or test parameters are not in accordance with a recognized standard.

3 Standards

When reference is made to a standard, and the date of issue is not stated, this applies to the latest issue, including amendments which have been officially published prior to the date of the tests.

4 Official and uncontrolled test documents

The official test documents of KEMA High-Power Laboratory are issued in bound form. Uncontrolled copies may be provided as loose sheets or as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

5 Accuracy of measurement

In the table of test results the measured quantities are given in three digits. This method of presentation does not indicate an accuracy. The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

6 Qualified by RvA (Dutch Council for Accreditation)

KEMA High-Power Laboratory and High-Voltage Laboratory have been entered in the RvA-register for laboratories under resp. Nrs. L 020 and L 218 for the testing services as defined in the Field of Accreditation.

The accreditation is carried out in accordance with ISO/IEC 17025.

CONTROL: TEST/01/0/2008
RVA 1 020

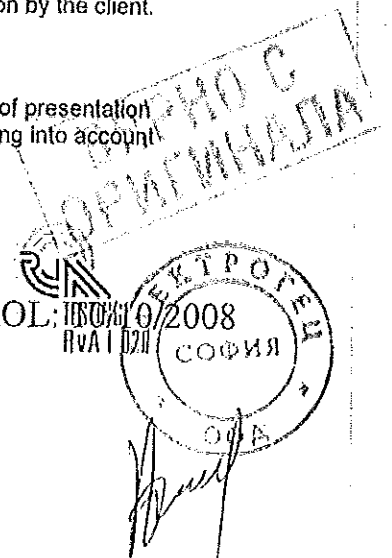




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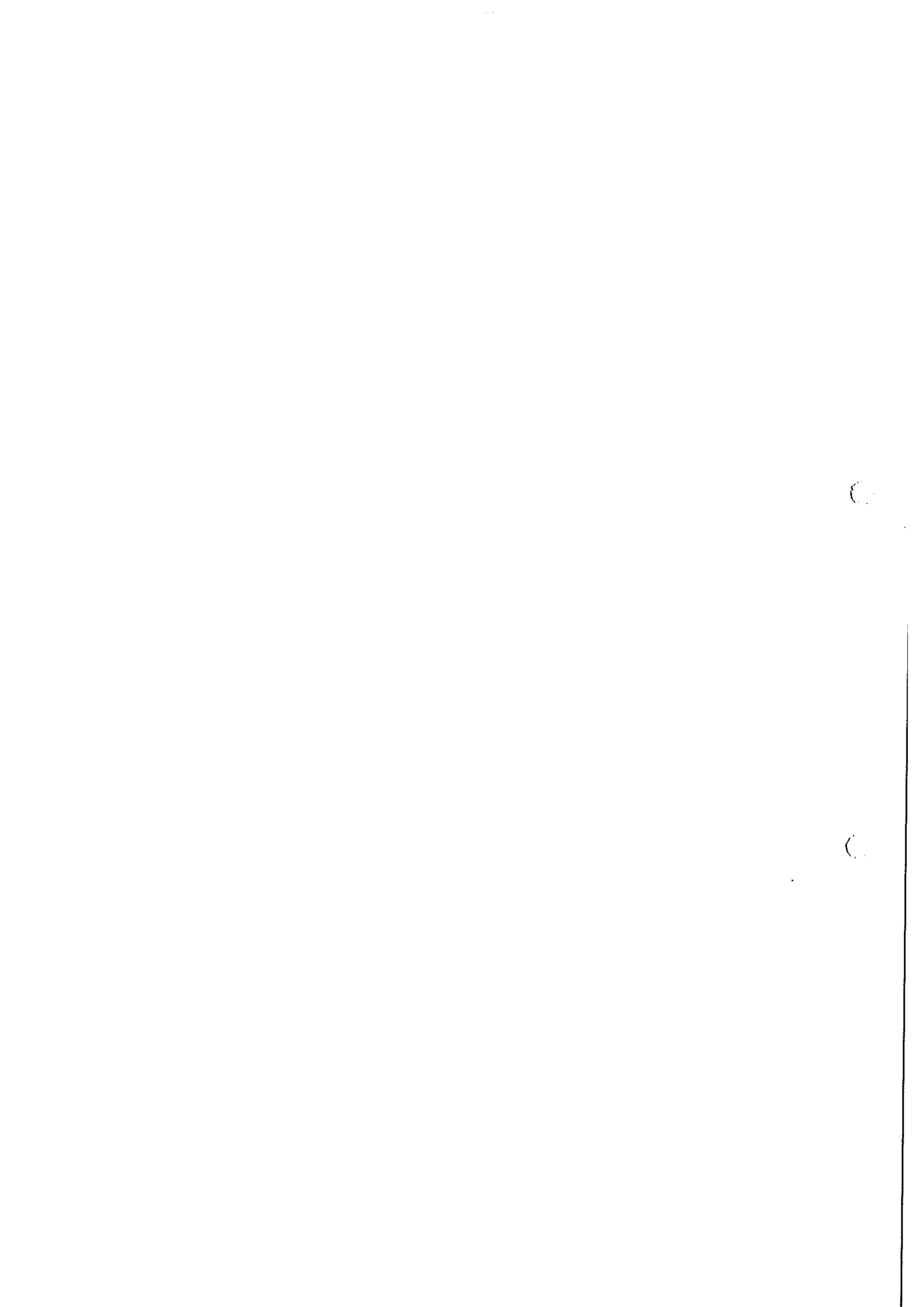
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ВЕРНО С
ОРИГИНАЛА

CONTROL: 10/10/2008



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304-07

IDENTIFICATION OF THE APPARATUS TESTED

Page 4

RATINGS ASSIGNED BY THE MANUFACTURER

Voltage 24 kV
Number of poles 3
Frequency 50/60 Hz

Normal current:
Busbar 630 A
Feeder circuit 630 A

Short-time withstand current: Peak withstand current:
Internal arc current 16 kA for 1 s 41,6 kA

Classification IAC AFL

DESCRIPTION OF APPARATUS TESTED

The busbar and three-phase three-position switch compartment of an SF₆-insulated metal-enclosed ring main unit cubicle

Minimum pressure for insulation at 20 °C 0,115 MPa
Maximum pressure for insulation at 20 °C 0,13 MPa

LIST OF DRAWINGS

The manufacturer has guaranteed that the equipment submitted for tests has been manufactured in accordance with the following drawings.

KEMA has verified that these drawings adequately represent the equipment tested.

The following drawings are included in this report:

- DOC-2561 Rev. 01
- DOC-2562 Rev. 01
- DOC-2563 Rev. 01
- DOC-2567 Rev. 01
- DOC-2572 Rev. 01
- DOC-2200 Rev. 01

ВЯРНО С
ОРИГИНАЛА

CONTROL: 10/10/2008



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304-07

GENERAL INFORMATION

Page 5

THE TESTS WERE WITNESSED BY

Name	Company
Casado, J.M.	Ormazabal Distribución Secundaria, Igorre (Vizcaya), Spain
Osuna, J.A.	
Rodríguez, J.	
Sainz De La Maza, N. Sebastián Martín, S.	

THE TESTS WERE OBSERVED BY

Name	Company
Jorna, R.E.	KEMA, Arnhem, The Netherlands

NOTES

- The tests were recorded on regular-speed video and on high-speed video.
- During tests assembly was filled with air at rated pressure.

ВАРНО С
КОПИРАЛА

CONTROL 10/10/2008
СОФИЯ
ООА



REPORT OF PERFORMANCE

308-09

APPARATUS The cable compartment of a three-phase SF₆-insulated metal-enclosed switchgear assembly

TYPE CGMCosmos L **SERIAL No.** 31745101

24 kV – 630 A – 20 ⁽¹⁾ kA – 50/60 Hz

⁽¹⁾ See note on page 4.

CLIENT Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

MANUFACTURER Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

TESTED BY KEMA HIGH-POWER LABORATORY
Utrechtseweg 310 - 6812 AR Arnhem - The Netherlands

DATE(S) OF TESTS 12 March 2009

TEST SPECIFICATION The tests have been carried out in accordance with the client's instructions.
Test procedure and test parameters were based on IEC 62271-200, Annex A.

This report applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

This report consists of 31 sheets in total.

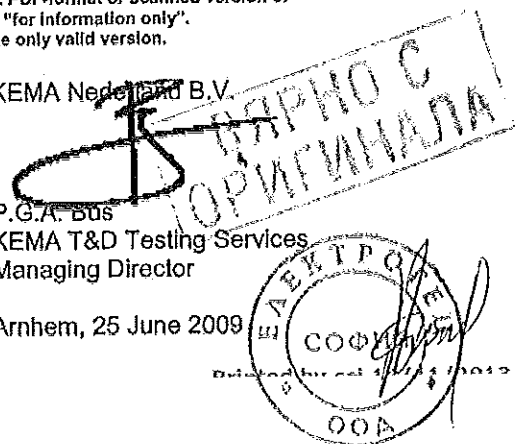
This report falls under the scope of the accreditation certificate I. 020 of the Dutch Council for Accreditation.
See information sheet (page 2).

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The sealed and bound version of the report is the only valid version.

KEMA Nederland B.V.

P.G.A. Bus
KEMA T&D Testing Services
Managing Director

Arnhem, 25 June 2009





1 Certificate

A Certificate contains a record of a series of type tests carried out strictly in accordance with a recognized standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KEMA. The Certificate is applicable only to the equipment tested. KEMA is responsible for the validity and the contents of the Certificate.

The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The Certificate contains the essential drawings and a description of the equipment tested.

Detailed rules are given in KEMA's Certification procedure.

2 Report of Performance

A Report of Performance contains a record of one or more tests which have been carried out according to the client's instructions. These tests are not necessarily in accordance with a recognized standard. The test results do not verify ratings of the test object.

KEMA issues three types of Reports of Performance:

2.1 The tests have been carried out strictly in accordance with The apparatus has complied with the relevant requirements.

This sentence will appear on the front page of a Report of Performance if the tests have been performed in accordance with a recognized standard, but the series of tests does not completely fulfil the requirements for a Certificate of Compliance (for example, if the number of test duties is not a complete series of type tests). The Report contains verified drawings and a description of the equipment tested. Detailed rules are given in KEMA's Certification procedure. The condition of the test object after the tests is assessed and recorded in the Report.

2.2 The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on

This sentence will appear on the front page of a Report of Performance if the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer. If the apparatus does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on the client's request.

2.3 The tests have been carried out according to the client's instructions.

This sentence will appear on the front page of a Report of Performance if the tests, test procedure and/or test parameters are not in accordance with a recognized standard.

3 Standards

When reference is made to a standard, and the date of issue is not stated, this applies to the latest issue, including amendments which have been officially published prior to the date of the tests.

4 Official and uncontrolled test documents

The official test documents of KEMA High-Power Laboratory are issued in bound form. Uncontrolled copies may be provided as loose sheets or as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

5 Accuracy of measurement

In the table of test results the measured quantities are given in three digits. This method of presentation does not indicate an accuracy. The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

6 Qualified by RvA (Dutch Council for Accreditation)

KEMA High-Power Laboratory and High-Voltage Laboratory have been entered in the RvA-register for laboratories under resp. Nrs. L 020 and L 218 for the testing services as defined in the Field of Accreditation.

The accreditation is carried out in accordance with ISO/IEC 17025.

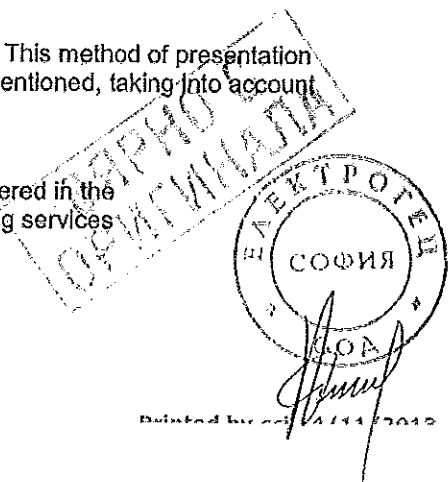




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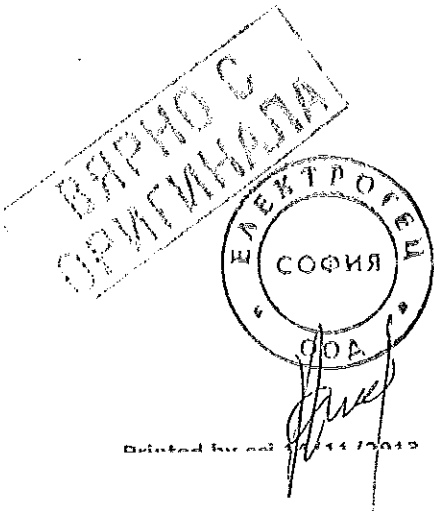
DUTY: Checking of the prospective current.....12
 Test circuit.....13
 Tests 090312-400214

DUTY: Checking of the prospective current.....15
 Test circuit.....16
 Tests 090312-400417

DUTY: Internal fault test.....18
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DRAWINGS.....25



**RATINGS ASSIGNED BY THE MANUFACTURER**

Voltage	24 kV
Number of poles	3
Frequency	50/60 Hz

Normal current:

Busbar	630 A
Feeder circuit	630 A

Short-time withstand current:

Main circuit	20/21 kA for 1 s
Earthing circuit	20/21 kA for 1 s
Internal arc current	20/21 ⁽¹⁾ kA for 1 s

Peak withstand current:

55 kA
55 kA
55 kA

Pressure for insulation SF₆ at 20 °C

0,13 MPa

Classification IAC

AFL

⁽¹⁾ IEC rating / Rating assigned by the manufacturer.

On request of the client the tests in this report have been based on a short-circuit current of 21 kA.

DESCRIPTION OF APPARATUS TESTEDThe cable compartment of a three-phase SF₆-insulated metal-enclosed switchgear assembly.

Minimum pressure for interruption at 20 °C

0,115 MPa

Maximum pressure for interruption at 20 °C

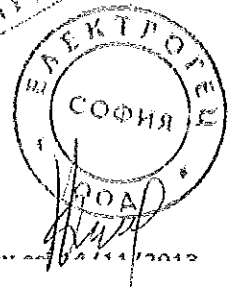
0,13 MPa

LIST OF DRAWINGS

On request of the manufacturer the following drawings are included in this report.
KEMA has not verified these drawings.

DOC-2685 Rev. 02
DOC-2864 Rev. 01
DOC-2930 Rev. 01
DOC-2879 Rev. 01
DOC-2866 Rev. 01
DOC-2867 Rev. 01
DOC-2868 Rev. 01

ВРЕМНО С
ОРИГИНАЛА





308-09

GENERAL INFORMATION

Page 5

THE TESTS WERE WITNESSED BY

Name	Company
Sebastián Martín, S.	Ormazabal Distribución Secundaria, Igorre (Vizcaya), Spain

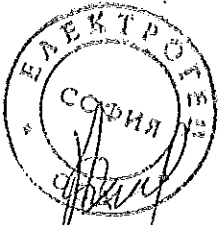
THE TESTS WERE OBSERVED BY

Name	Company
de Vries, G.J.	KEMA, Arnhem, The Netherlands

NOTES

For test purposes equipment filled with air at rated pressure for insulation instead of SF₆ gas.
The tests were recorded on regular-speed video and on high-speed video.

ВАШНОЕ
СОВЕТОВАТЬСЯ



Printed by 02 14 111 7042



REPORT OF PERFORMANCE

249-09

APPARATUS The busbar and switch compartment of a three-phase SF₆-insulated metal-enclosed switchgear assembly, incorporating a switch-fuse combination

TYPE CGMCosmos P **SERIAL No.** 31756402

24 kV – 630 A – 20 ⁽¹⁾ kA – 50/60 Hz

⁽¹⁾ See note on page 4.

CLIENT Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

MANUFACTURER Ormazabal Distribución Secundaria,
Igorre (Vizcaya), Spain

TESTED BY KEMA HIGH-POWER LABORATORY
Utrechtseweg 310 - 6812 AR Arnhem - The Netherlands

DATE(S) OF TESTS 12 March 2009

TEST SPECIFICATION The tests have been carried out in accordance with the client's instructions.
Test procedure and test parameters were based on IEC 62271-200, Annex A.

This report applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designations with that tested rests with the Manufacturer.

This report consists of 25 sheets in total.

This report falls under the scope of the accreditation certificate L 020 of the Dutch Council for Accreditation. See information sheet (page 2).

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KEMA Nederland B.V.

P.G.A. Bus
KEMA T&D Testing Services
Managing Director

Arnhem, 25 June 2009

Printed by i:0#.w\velatia\eds 14/09/2015



**RATINGS ASSIGNED BY THE MANUFACTURER**

Voltage	24 kV
Number of poles	3
Frequency	50/60 Hz
Normal current:	
Busbar	630 A
Feeder circuit	630 A
Short-time withstand current:	
Main circuit	20/21 kA for 1 s
Earthing circuit	20/21 kA for 1 s
Internal arc current	20/21 ⁽¹⁾ kA for 1 s
Peak withstand current:	
	55 kA
	55 kA
	55 kA
Pressure for insulation SF ₆ at 20 °C	0,13 MPa
Classification IAC	AFL

⁽¹⁾ IEC rating / Rating assigned by the manufacturer.

On request of the client the test in this report has been based on a short-circuit current of 21 kA.

DESCRIPTION OF APPARATUS TESTED

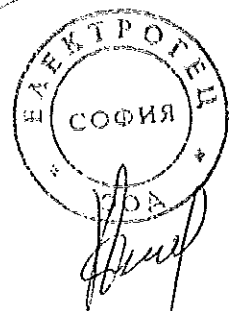
The busbar and switch compartment of a three-phase SF₆-insulated metal-enclosed switchgear assembly, incorporating a switch-fuse combination.

Minimum pressure for interruption at 20 °C	0,115 MPa
Maximum pressure for interruption at 20 °C	0,13 MPa

LIST OF DRAWINGS

On request of the manufacturer the following drawings are included in this report.
KEMA has not verified these drawings.

DOC-2685 Rev. 02
DOC-2869 Rev. 01
DOC-2870 Rev. 01
DOC-2871 Rev. 01
DOC-2872 Rev. 01
DOC-2873 Rev. 01
DOC-2930 Rev. 01





249-09

SUMMARY: Checking of the prospective current

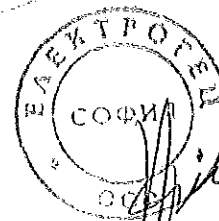
Page 7

Test no.			090312 4002					
Peak value of current	L1	kA	-43,6					
	L2	kA	-42,8					
	L3	kA	56,8					
Symmetrical current, beginning	L1	kA	19,7					
	L2	kA	20,1					
	L3	kA	19,9					
Symmetrical current, middle	L1	kA	19,7					
	L2	kA	20,1					
	L3	kA	19,9					
Symmetrical current, end	L1	kA	19,9					
	L2	kA	20,3					
	L3	kA	20,1					
Symmetrical current, average	L1	kA	19,8					
	L2	kA	20,2					
	L3	kA	20,0					
Average current, three phase		kA	20,0					
Current duration		s	1,11					
Thermal equivalent			21,0 kA during 1,06 s					
Gas pressure at 20 °C		MPa	-					

REMARKS

090312-4002 No visible disturbance.

ВАРНО С
ОРИГИНАЛА



REPORT OF PERFORMANCE

529-03

APPARATUS A three-phase SF₆-insulated ring main unit.

TYPE CGMcosmos-2L **SERIAL No.** K12520001

24 kV – 630 A – 20 kA – 50 Hz

CLIENT Ormazabal y Cia S.A.,
Igorre (Vizcaya), Spain

MANUFACTURER Ormazabal y Cia S.A.,
Igorre (Vizcaya), Spain

TESTED BY KEMA HIGH-POWER LABORATORY
Utrechtseweg 310 - 6812 AR Arnhem - The Netherlands

DATE(S) OF TESTS 17th December 2003

TEST SPECIFICATION The tests have been carried out in accordance with the client's instructions.
Test procedure and test parameters were based on IEC 62271-200, Annex A

This report consists of 23 sheets in total.

This report falls under the scope of the accreditation certificate L 020 of the Dutch Council for Accreditation.
See Information sheet (page 1).

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ВАРНО
ОРИГИНАЛ



KEMA Nederland B.V.

P.G.A. Bus
Manager High-Power Laboratory

Arnhem, 10th March 2004

1 Certificate

A Certificate contains a record of a series of type tests carried out strictly in accordance with a recognized standard. The equipment tested has fulfilled the requirements of this standard and the relevant ratings assigned by the manufacturer are endorsed by KEMA. The Certificate is applicable only to the equipment tested. KEMA is responsible for the validity and the contents of the Certificate.

The responsibility for conformity of any apparatus having the same designation as the one tested rests with the manufacturer. The Certificate contains the essential drawings and a description of the equipment tested.

Detailed rules are given in KEMA's Certification procedure.

2 Report of Performance

A Report of Performance contains a record of one or more tests which have been carried out according to the client's instructions. These tests are not necessarily in accordance with a recognized standard. The test results do not verify ratings of the test object.

KEMA issues three types of Reports of Performance:

2.1 The tests have been carried out strictly in accordance with The apparatus has complied with the relevant requirements.

This sentence will appear on the front page of a Report of Performance if the tests have been performed in accordance with a recognized standard, but the series of tests does not completely fulfil the requirements for a Certificate of Compliance (for example, if the number of test duties is not a complete series of type tests). The Report contains verified drawings and a description of the equipment tested. Detailed rules are given in KEMA's Certification procedure. The condition of the test object after the tests is assessed and recorded in the Report.

2.2 The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on

This sentence will appear on the front page of a Report of Performance if the number of tests, the test procedure and the test parameters are based on a recognized standard and related to the ratings assigned by the manufacturer. If the apparatus does not pass the tests such behaviour will be mentioned on the front sheet. Verification of the drawings (if submitted) and assessment of the condition after the tests is only done on the client's request.

2.3 The tests have been carried out according to the client's instructions.

This sentence will appear on the front page of a Report of Performance if the tests, test procedure and/or test parameters are not in accordance with a recognized standard.

3 Standards

When reference is made to a standard, and the date of issue is not stated, this applies to the latest issue, including amendments which have been officially published prior to the date of the tests.

4 Official and uncontrolled test documents

The official test documents of KEMA High-Power Laboratory are issued in bound form. Uncontrolled copies may be provided as loose sheets or as a digital file for convenience of reproduction by the client. The copyright has to be respected at all times.

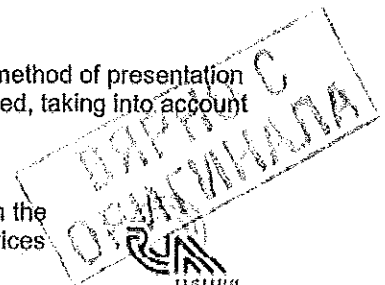
5 Accuracy of measurement

In the table of test results the measured quantities are given in three digits. This method of presentation does not indicate an accuracy. The guaranteed uncertainty in the figures mentioned, taking into account the total measuring system, is less than 5%, unless mentioned otherwise.

6 Qualified by RvA (Dutch Council for Accreditation)

KEMA High-Power Laboratory and High-Voltage Laboratory have been entered in the RvA-register for laboratories under resp. Nrs. L 020 and L 218 for the testing services as defined in the Field of Accreditation.

The accreditation is carried out in accordance with ISO/IEC 17025.



ISSUES
RvA L 020

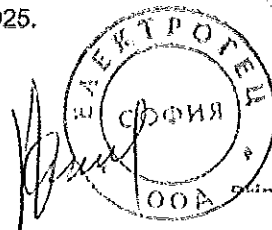


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 Test circuit 7
 Test 031217-4007 8

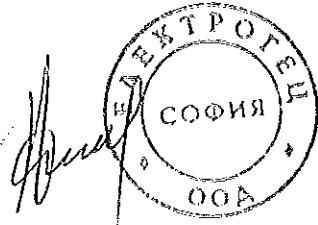
CONDITION / INSPECTION AFTER TEST 9

DUTY: Internal fault test 10
 Test circuit 11
 Test arrangement 12
 Photographs before test 13
 Test 031217-4008 16

CONDITION / INSPECTION AFTER TEST 17
 Photograph after test 18

DRAWINGS 19 to 22

ВАРНО С
ОРИГИНАЛА



RATINGS ASSIGNED BY THE MANUFACTURER

Voltage		24 kV
Number of poles		3
Frequency		50 Hz
Normal current:		
Main busbar		630 A
Feeder circuit		630 A
Short-time withstand current:		Peak withstand current:
Main circuit	20 kA for 1 s	50 kA
Earthing circuit	20 kA for 1 s	50 kA
Classification IAC		AF
Internal arc	20 kA for 1 s (1)	50 kA peak
(1) Tests carried out at 21 kA – 1 s		

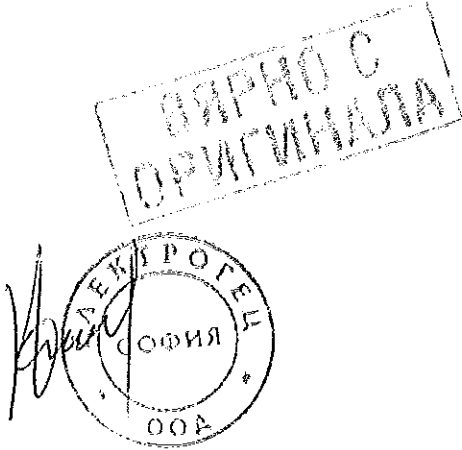
DESCRIPTION OF APPARATUS TESTED

A three-phase SF₆-insulated ring main unit.

DRAWINGS

*According to the client the following drawing number(s) refer.
KEMA has not verified these drawings.*

- DOC-2149 Rev. 1
- DOC-2145 Rev. 1
- DOC-2146 Rev. 1
- DOC-1449 Rev. 1



THE TESTS WERE WITNESSED BY

Name	Company
Mena, M. Rodriguez, J. Sebastian, M.	Ormazabal y Cia S.A., Igorre (Vizcaya), Spain

THE TESTS WERE OBSERVED BY

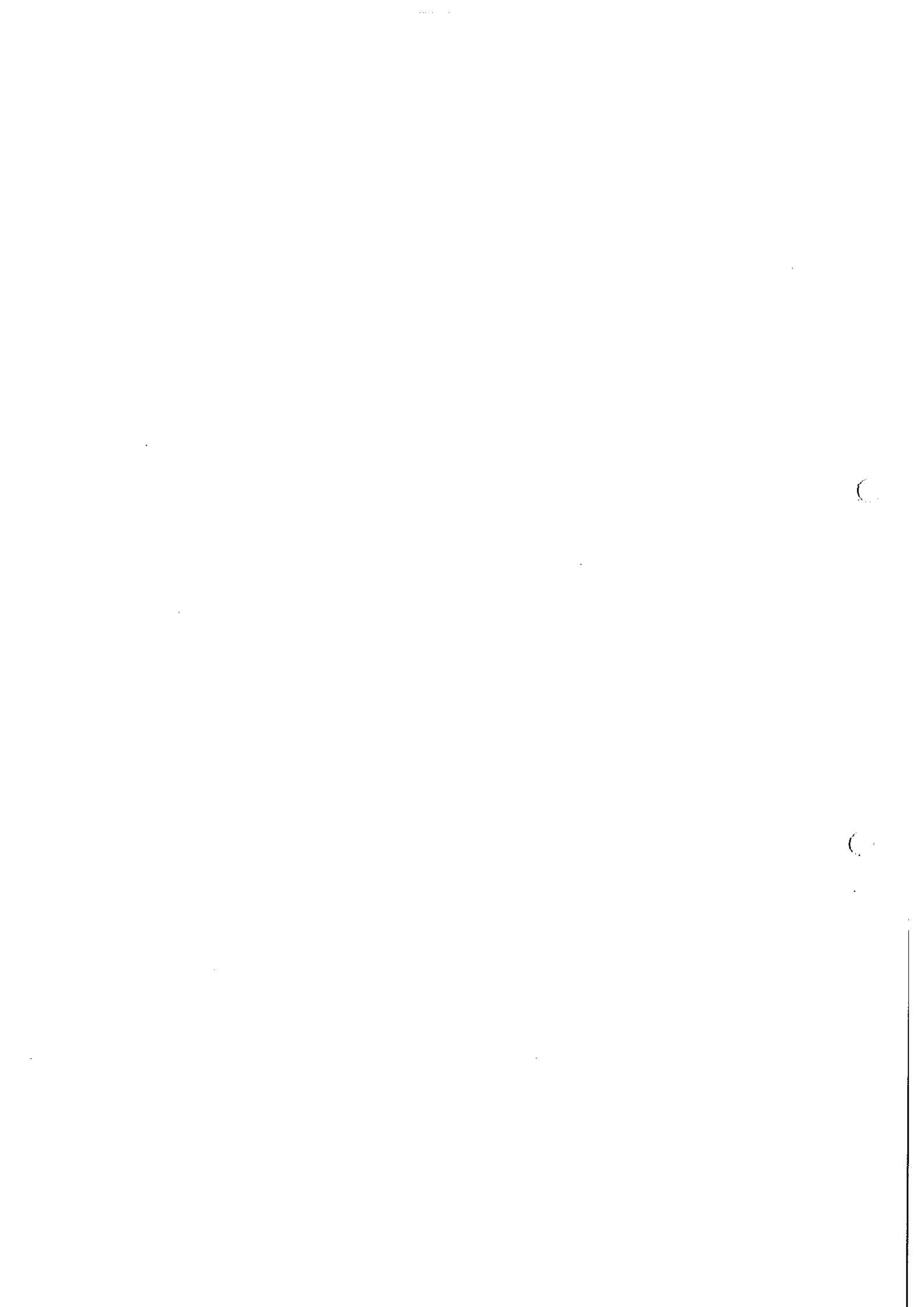
Name	Company
Jorna, R.E.	KEMA, Arnhem, The Netherlands

NOTES

- The tests were recorded on regular-speed video and on high-speed video.

ВЯРНО С
ОРИГИНАЛА

[Handwritten Signature]
ЭЛЕКТРОТЕХНИКА
СОФИЯ
ООА



TEST REPORT

31009211-3GB

PERFORMED TEST Internal arc test. 21 kA-1s AFL

OBJECT TESTED The cable compartment of a three-phase metal-enclosed SF6-Insulated switchgear assembly.

TYPE	SERIAL No.
CGM Cosmos-L	31009211-M5

STANDARD IEC 62271-200:2003

MANUFACTURER ORMAZABAL

DATE OF TEST 1st of October 2010

TEST SPECIFICATION The test object was submitted to the requested tests, according to the procedures specified in the above mentioned Standard and the client's instructions.

The present report refers only and exclusively to the samples tested and at the moment and conditions in which the measures were made. The full or partial reproduction of this document is categorically forbidden without the written approval of ORMAZABAL.

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Annexes 1

VERIFIED BY APPROVED BY



[Signature]
Eduardo Sánchez
Corporate Technology, S.L.E.
Eduardo Sánchez
Inaki Ojeda
Operator / Quality Manager
Amorebieta-Etxano, 17th of January 2011

**ВАРНИ
ОРИГИНАЛ**

[Signature]
СОФР
Printed by I:0#.wivelatia\eds 14/09/2015

Version 1

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IDENTIFICATION OF THE TEST OBJECT

31009211-3GB

RATED CHARACTERISTICS

Manufacturer	ORMAZABAL
Designation	CGMCosmos
Type	CGMCosmos L
Serial number	31009211-M6
Rated voltage	24 kV
Rated current	630 A
Frequency	50/60 Hz
Rated short-time withstand current	21 kA
Rated peak withstand current	54.6 kA
Rated duration of short-circuit	1 s
Rated SF ₆ pressure	1.3 bar
IAC Classification	AFL

DESCRIPTION

The cable compartment of a three-phase metal-enclosed SF₆-insulated switchgear assembly.

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**ВАРНО С
ОРИГИНАЛА**

ORMAZABAL
Corporate Technology S.A.
LABORATORIO

SUMMARY OF TESTS
31009211-3GB

PERFORMED TEST

The test object was submitted to an Internal arc test with an expected current value of 21 kA and an expected peak current value of 54.6 kA during 1 second.

The indicators used in the test were A accessibility class as indicated in clause A3.3 of annex A IEC 62271-200:2003,

RESULTS TABLE

Register number			T31009211_14
Peak value of current, 2 phase		kA	44.37
Symmetrical current, 2 phase, average		kA	18.34
Duration		s	1.003

CONCLUSIONS

The acceptance criterions from IEC 62271-200:2003 Annex A clause. A.6 are applied:

-A accessibility:

Criterion No. 1: Correctly secured doors and covers do not open. PASSED

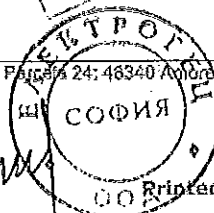
Criterion No. 2: No material fragmentation of the enclosure occurs within the time specified for the test. Projections of small parts, up to an individual mass of 60g, are accepted. PASSED.

Criterion No. 3: Arcing does not cause holes in the accessible sides up to a height of 2m. PASSED

Criterion No. 4: Indicators do not ignite due to the effect of hot gases. PASSED

Criterion No. 5: The enclosure remains connected to its earthing point. PASSED

The test was PASSED.


 ORMAZABAL
 Corporate Technology

IDENTIFICATION OF THE TEST OBJECT

31009211-4GB

RATED CHARACTERISTICS

Manufacturer	ORMAZABAL
Designation	CGMCosmos
Type	CGMCosmos L
Serial number	31009211-M6
Rated voltage	24 kV
Rated current	630 A
Frequency	50/60 Hz
Rated short-time withstand current	21 kA
Rated peak withstand current	54.6 kA
Rated duration of short-circuit	1 s
Rated SF6 pressure	1.3 bar
IAC Classification	APL

DESCRIPTION

The busbar and three-phase three-position switch-fuse combination compartment of an SF6-insulated metal-enclosed switchgear assembly.

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**ВЕРНО С
ОРИГИНАЛА**

ORMAZABAL
Corporate Technology
LABORATORIO

Version: 1

ORMAZABAL Corporate Technology, Parque Empresarial Borda, Parcela 24, 48340 Amorebieta-Etxano (Vizcaya) Spain.

СООФИЯ
ООА

SUMMARY OF TESTS
31009211-4GB
PERFORMED TEST

The test object was submitted to an internal arc test with an expected current value of 21 kA and an expected peak current value of 54.6 kA during 1 second.

The indicators used in the test were A accessibility class as indicated in clause A3.3 of annex A IEC 62271-200:2003.

RESULTS TABLE

Register number			T31009211_15
	R	kA	45.38
Peak value of current	S	kA	42.74
	T	kA	-55.60
	R	kA	21.90
Symmetrical current, phase average	S	kA	21.91
	T	kA	21.04
Duration		s	0.985

CONCLUSIONS

The acceptance criterions from IEC 62271-200:2003 Annex A clause. A.6 are applied:

-A accessibility:

Criterion No. 1: Correctly secured doors and covers do not open. PASSED

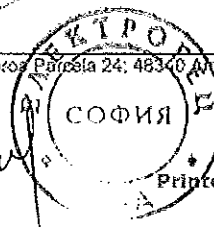
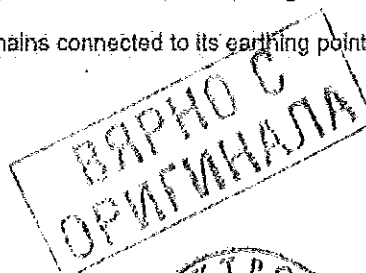
Criterion No. 2: No material fragmentation of the enclosure occurs within the time specified for the test. Projections of small parts, up to an individual mass of 60g, are accepted. PASSED

Criterion No. 3: Arcing does not cause holes in the accessible sides up to a height of 2m. PASSED

Criterion No. 4: Indicators do not ignite due to the effect of hot gases. PASSED

Criterion No. 5: The enclosure remains connected to its earthing point. PASSED.

The test was PASSED.



ORMAZABAL
 Corporate Technology
 LABORATORIO

Documentazione di riferimento: IEC 62271-200:2003 Annex A clause A.6

Version: 1

This Document is an English translation, performed by ORMAZABAL, of the original Technical Annex of Accreditation



Rev.5, dated 08/09/14.

<https://www.enac.es/documents/7020/b5adee99-debf-4f8c-b788-6f21f82a1132>

(UNE-EN Standards, are the official versions of the corresponding edition of EN Standards)

SCOPE OF ACCREDITATION

ORMAZABAL CORPORATE TECHNOLOGY A.I.E.

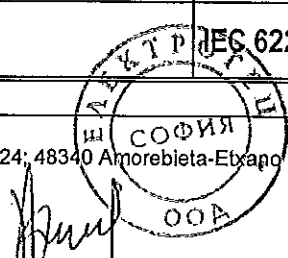
Address: Parque Empresarial Boroa, Parcela 3A; 48340 Amorebieta-Etxano (Bizkaia) SPAIN

Is accredited by the ENTIDAD NACIONAL DE ACREDITACIÓN, according the criteria collected in EN ISO/IEC 17025:2005 (CGA-ENAC-LEC), for performing the following tests on:

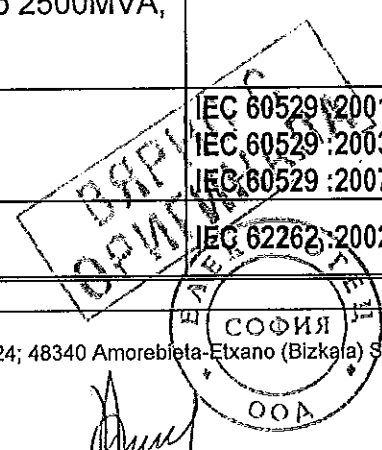
Electrical Distribution Equipment

Category 0 (Tests in the permanent laboratory)

PRODUCT / TEST OBJECT	TEST	STANDARD / PROCEDURE
High-voltage/low voltage prefabricated substation	Dielectric tests: <ul style="list-style-type: none"> Power Frequency: up to 100 kV Lightning Impulse: up to 288 kV 	IEC 62271-202:2006 IEC 62271-202:2014.
	Temperature-rise tests	
	Short-time and peak withstand current tests on main and earthing circuits: up to 80kA/3s	UNE-EN 62271-202:2007.
	Internal arcing test: up to 40kA/1s	
Degrees of Protection IP: from 2X up to 4X from X3 up to X6	Degrees of Protection IK: from 06 up to 10	IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.
		IEC 62262 :2002

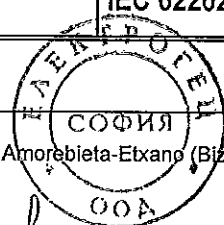


Alternating current disconnectors and earthing switches	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests</p> <p>Measurement of the resistance of circuits</p> <p>Operating and mechanical endurance tests</p> <p>Short-time and peak withstand current tests on main and earthing circuits: up to 80kA</p> <p>Test to prove the short-circuit making performance of earthing switches: up to 40kA</p>	<p>IEC 62271-102:2001 IEC 62271-102: 2002 CORRIGENDUM 1 IEC 62271-102: 2003 CORRIGENDUM 2 IEC 62271-102: 2005 CORRIGENDUM 3 IEC 62271-102/A1: 2011 IEC 62271-102/A1: 2012 CORRIGENDUM 1 IEC 62271-102/A1&A2:2013</p> <p>UNE-EN 62271-102:2005 UNE-EN 62271-102:2005 ERRATUM 2011 UNE-EN 62271-102/A1:2012</p>
	<p>Degrees of Protection IP: from 2X up to 4X from X3 up to X6</p>	<p>IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.</p>
	<p>Degrees of Protection IK: from 06 up to 10</p>	<p>IEC 62262 :2002</p>
High-voltage switches for rated voltages above 1 kV and less than 52 kV	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests</p> <p>Measurement of the resistance of circuits</p> <p>Mechanical operating tests</p> <p>Short-time and peak withstand current tests on main and earthing circuits: up to 80kA</p> <p>Making and breaking tests: up to 2500MVA, 36kV</p>	<p>IEC 60265-1:1998 IEC 60265-1:2000 CORRIGENDUM IEC 62271-103:2011 IEC 62271-103 CORRIGENDUM 1: 2013.</p> <p>UNE 60265-1:1999. UNE 60265-1:2005 CORRIGENDUM UNE-EN 62271-103 :2012</p>
	<p>Degrees of Protection IP: from 2X up to 4X from X3 up to X6</p>	<p>IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.</p>
	<p>Degrees of Protection IK: from 06 up to 10</p>	<p>IEC 62262 :2002</p>



<p>High-voltage Alternating current circuit-breakers</p>	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests</p> <p>Measurement of the resistance of circuits</p> <p>Mechanical operating tests</p> <p>Short-time and peak withstand current tests: up to 80kA</p> <p>Making and breaking tests: up to 2500MVA, 36kV</p>	<p>IEC 62271-100:2008 IEC 62271-100/A1:2012 IEC62271-100/A1 CORRIGENDUM 1 :2012</p> <p>UNE-EN 62271-100:2003. UNE-EN 62271-100/A1:2004 UNE-EN 62271-100:2004 ERRATUM UNE-EN 62271-100/A2:2007 UNE-EN 62271-100:2011 UNE-EN 62271-100:2011/ Versión Corregida Abril 2014</p>
	<p>Degrees of Protection IP: from 2X up to 4X from X3 up to X6</p>	<p>IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.</p>
	<p>Degrees of Protection IK: from 06 up to 10</p>	<p>IEC 62262 :2002</p>
<p>A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV</p>	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests</p> <p>Measurement of the resistance of circuits</p> <p>Mechanical operating tests</p> <p>Short-time and peak withstand current tests: up to 80kA</p> <p>Internal fault test: up to 40kA/1s</p>	<p>IEC 62271-200: 2003 IEC 62271-200: 2011.</p> <p>UNE-EN 62271-200:2005 UNE-EN 62271-200:2012.</p>
	<p>Degrees of Protection IP: from 2X up to 4X from X3 up to X6</p>	<p>IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.</p>
	<p>Degrees of Protection IK: from 06 up to 10</p>	<p>IEC 62262 :2002</p>

ВЪРНО С
ОРИГИНАЛ



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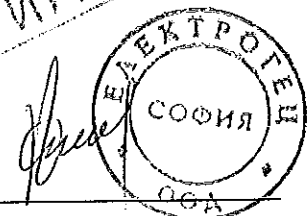
High-voltage switchgear and controlgear	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests</p> <p>Measurement of the resistance of circuits</p> <p>Mechanical operating tests</p> <p>Short-time and peak withstand current tests: up to 80kA</p>	<p>IEC 62271-1:2007 IEC 62271-1/A1:2011</p> <p>UNE-EN 62271-1:2009 UNE-EN 62271-1/A1:2011.</p> <p>UNE-EN 60694:1998. UNE-EN 60694:1999 CORRIGENDUM UNE-EN 60694/A1:2002 UNE-EN 60694/A2:2002</p>
	Degrees of Protection IP: from 2X up to 4X from X3 up to X6	<p>IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.</p>
	Degrees of Protection IK: from 06 up to 10	<p>IEC 62262 :2002</p>
Power transformers	Routine tests	<p>IEC 60076-1:1993. IEC 60076-1/A1:1999 IEC 60076-1:1997 CORRIGENDUM 1 IEC 60076-1:2011 UNE-EN 60076-1:1998. UNE-EN 60076-1/A1:2001 UNE-EN 60076-1/A12:2002 UNE-EN 60076-1:2013</p>
	Temperature-rise tests	<p>IEC 60076-2:1998. IEC 60076-2:1 IEC 60076-3:2013998 ERRATUM 2006 IEC 60076-2:2011 UNE-EN 60076-2:2013.</p>
	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Separate source AC: up to 100kV ▪ Induced AC ▪ Lightning Impulse: up to 288kV 	<p>IEC 60076-3:2000. IEC 60076-3:2000 CORRIGENDUM 1 IEC 60076-3:2013 UNE-EN 60076-3:2002. UNE-EN 60076-3:2006 ERRATUM</p>
	Ability to withstand short circuit	<p>IEC 60076-5:2006 UNE-EN 60076-5:2002 UNE-EN 60076-5:2008</p>



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	Degrees of Protection IP: from 2X up to 4X from X3 up to X6	IEC 60529 :2001 IEC 60529 :2003 CORR. IEC 60529 :2007 CORR.
	Degrees of Protection IK: from 06 up to 10	IEC 62262 :2002
Requirements for Subsurface, vault and Pad-Mounted Load-Interrupter switch-gear and fused load-interrupter switch-gear for alternating current systems up to 38 kV	Dielectric tests: <ul style="list-style-type: none"> Power Frequency: up to 100 kV Lightning Impulse: up to 288 kV Partial discharge measurement: up to 100 kV and up to 2pC Temperature-rise tests Measurement of the resistance of circuits Mechanical operating tests Short-time and peak withstand current tests on main and earthing circuits: up to 80kA Making and breaking tests: up to 2500MVA, 38kV	IEEE C37.74:2003.
Automatic circuit reclosers and fault interrupters for alternating current Systems up to 38 kV	Dielectric tests: <ul style="list-style-type: none"> Power Frequency: up to 100 kV Lightning Impulse: up to 288 kV Partial discharge measurement: up to 100 kV and up to 2pC Temperature-rise tests Measurement of the resistance of circuits Mechanical operating tests Short-time and peak withstand current tests on main and earthing circuits: up to 80kA Making and breaking tests: up to 2500MVA, 38kV: <ul style="list-style-type: none"> Line charging current and cable charging current interruption tests Making current capability Rated symmetrical interrupting current tests Degrees of Protection	IEEE C37.60:2012 IEC 62271-111:2012

ВАРНО С
ОРИГИНАЛА



<p>Metal-Enclosed Interrupter Switchgear (1kV – 38kV)</p>	<p>Dielectric tests:</p> <ul style="list-style-type: none"> ▪ Power Frequency: up to 100 kV ▪ Lightning Impulse: up to 288 kV ▪ Partial discharge measurement: up to 100 kV and up to 2pC <p>Temperature-rise tests Measurement of the resistance of circuits Mechanical operating tests Short-time and peak withstand current tests on main and earthing circuits: up to 80kA Making and breaking tests: up to 2500MVA, 38kV:</p> <ul style="list-style-type: none"> ▪ Line charging current and cable charging current interruption tests ▪ Making current capability ▪ Rated symmetrical interrupting current tests <p>Degrees of Protection</p>	<p>IEEE C37.20.3:2013 IEEE C37.100.1:2007</p>
<p>Electric and Electronic Equipment</p>	<p>Degrees of Protection IP: from 2X up to 4X from X3 up to X6</p> <p>Degrees of Protection IK: from 06 up to 10</p>	<p>IEC 60529:2001 IEC 60529:2001 CORRIGENDUM 1:2003 IEC 60529:2001 CORRIGENDUM 2:2007</p> <p>IEC 62262:2002</p>

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

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 kA, с SF₆ изолация, с товарови прекъсвачи”

Приложение № 5



ДОКУМЕНТАЦИЯ

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

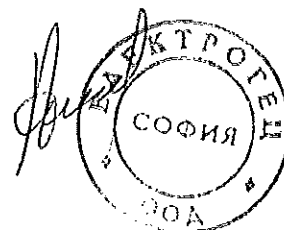
с предмет:

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

РЕФ. № PPD 15-042

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 кА, с SF₆ изолация, с товари прекъсвачи”

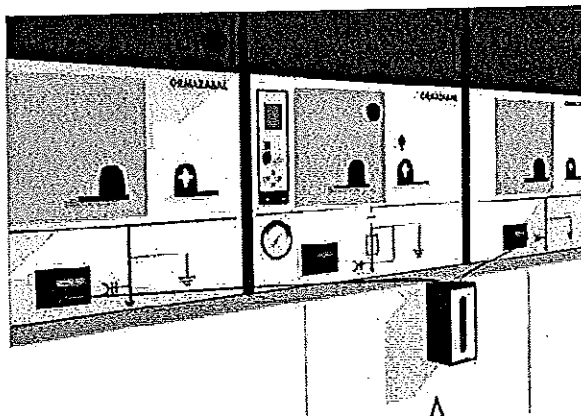
Приложение № 6



4.8. ПРОВЕРКА ЗА НАЛИЧИЕТО НА НАПРЕЖЕНИЕ И СЪГЛАСУВАНЕТО НА ФАЗИТЕ

За да се потвърди правилното свързване на кабелите за СН към шкафовете с изводи в трансформаторната подстанция, трябва да се използва уредът за сравняване на фазите ekorSPC^[17] от Ormazabal.

Най-напред свържете червените кабели на модула ekorSPC към точките за изпитване на същата фаза на съответните модули ekorVPIS^[18], а черния кабел – към точката за изпитване на заземяването. Това действие трябва да се повтори за всички фази L1, L2 и L3.



Фигура 4.46: ekorSPC



^[17] Опционално могат да се използват и други уреди за сравняване на фази, съвместими с IEC 61958.

^[18] Вж. раздел 1.1.1. ekorVPIS – Модул за индикация на наличие на напрежение.

C

C

ДОКУМЕНТАЦИЯ

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

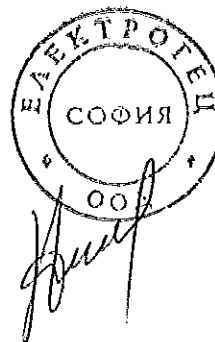
с предмет:

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

РЕФ. № PPD 15-042

“Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 kA, с SF₆ изолация, с товарови прекъсвачи”

Приложение № 7



ДЕКЛАРАЦИЯ

Долуподписаната НАТАША КОСТАДИНОВА НЕШЕВА, притежаваща лична карта № 64450794, издадена на 14.03.2013г. от МВР гр. София, адрес: гр. София 1408, ул. »Забърде« 1, в качеството си на Изпълнителен директор на „БИ-ПАУЪР“ АД,

Декларирам, че:

Предвидените за доставка от нас КРУ Срт3 отговарят на прилежащите български и международни стандарти, включително на посочените по-долу и на техните валидни изменения и поправки:

- БДС EN 60099-4:2005 Вентилни отводи. Част 4: Метало-оксидни вентилни отводи без разрядници за електрически системи за променливо напрежение (IEC 60099-4:2004, с промени)
- БДС EN 60265-1:2003 Превключватели високо напрежение. Част 1: Превключватели за обявени напрежения над 1 kV и по-ниски от 62 kV (IEC 60265-1:1998)
- БДС EN 60282-1:2010 Предпазители за високо напрежение. Част 1: Токоограничаващи предпазители (IEC 60282-1:2009)
- БДС EN 60529:1991/A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989 + A1:1999)
- БДС EN 62271-1:2008 Комутационни апарати за високо напрежение. Част 1: Общи технически изисквания
- БДС EN 62271-102:2007 Комутационни апарати за високо напрежение. Част 102: Разединители и заземителни разединители за променлив ток (IEC 62271-102:2001 + поправка 1, април 2002 + поправка 2, май:2003)
- БДС EN 62271-105:2003 Комутационни апарати високо напрежение. Част 105: Комутационни апарати за променливо напрежение комбинирани с предпазител (IEC 62271-105:2002)*
- БДС EN 62271-200:2005 Комутационни апарати за високо напрежение. Част 200: Промекливотохови комутационни апарати в метална обвивка за обявени напрежения над 1 kV и по-високи, включително 52 kV (IEC 62271-200:2003)*
- БДС IEC 60050 (441) Международен електротехнически речник Глава 441: Комутационни апарати за разпределение, комутационни апарати за управление и стопяеми предпазители

гр. София

06.01.2016г.

ВАРНО С
ОРИГИНАЛА



Наташа Нешева
Изпълнителен директор

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

„Компактни КРУ в метален шкаф 12/24(25) kV, 630 A, 16 кА, с SF₆ изолация, с товарови прекъсвачи“

Приложение № 8



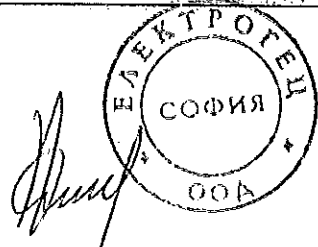
**INFORME DEL ENSAYO DE CUALIFICACIÓN SÍSMICA DEL
"SISTEMA CGM COSMOS L+P+V",
DE ORMAZABAL, S.A.**

NOTA: De acuerdo con lo indicado en el Apartado 5.10.2 de la Norma ISO-IEC 17025:2005, se hace constar:

- Los resultados del presente informe conciernen, única y exclusivamente a las muestras sometidas a ensayo.
- Queda prohibida la reproducción parcial de este documento sin la autorización por escrito del Laboratorio.

**ВАРНО С
ОРИГИНАЛА**

Fecha	Realizado por	Revisado por	VIRLAB, S.A. División de URBAR INGENIEROS, S.A.
27.09.11	<i>Juan Antonio Pérez</i> Juan Antonio PÉREZ	<i>Alberto Corral</i> Alberto CORRAL	Polígono Industrial de Astasu Zona B, Pabellón 44 20159 Astasu (Gulpúzcoa) ESPAÑA
			www.virlab.es E-mail: virlab@urbar.com Tel.: +34 943 69 15 00 Fax: +34 943 69 26 67



12.0.- CONCLUSIONES

Un Cuadro Eléctrico "SISTEMA CGMCOSMOS L+P+V" de ORMAZABAL, S.A., formado por tres (3) *Celdas*, según plano n° DOC-3410, Revisión 01, de fecha 08/04/11, cuyas características se describen en el punto 3,0, destinado a **SUBESTACIONES Y CENTROS DE TRANSFORMACIÓN ELÉCTRICOS**, ha sido sísmicamente ensayado tal y como se indica en el procedimiento descrito en el punto 8,0, conforme a la norma europea UNE EN 60068-3-3 de 1994, la norma NSR-98 (Colombia), las especificaciones ETGI-1020 (Chile), E-SE-010 (Enersis) y NSP-420 (Venezuela), apoyándose igualmente en las normas norteamericanas IEEE-344 de 2004 e IEEE-693 de 2005.

En el punto 11,0 se describen los resultados de los ensayos a los que ha sido sometido el Cuadro. Este equipo ha soportado satisfactoriamente los ensayos sin que se haya detectado anomalía ni deterioro estructural alguno en el mismo.

La única incidencia significativa habida en estos ensayos se ha presentado en el ensayo n° 21, ensayo sísmico multifrecuencial de nivel S2 realizado en dirección YZ, *lado-lado* al Cuadro y *vertical* simultáneamente, en el que se han alcanzado microdeformaciones de valor superior a 1000 (1198), valor considerado como el máximo admisible, en una (G4) de las cuatro bandas colocadas en la base del equipo.

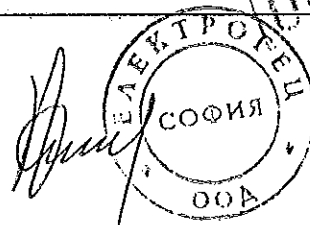
Con objeto de reducir las tensiones en el equipo se ha aumentado el n° de tornillos desde 12 hasta 18 (dos (2) por Celda), reduciéndose el n° máximo de microdeformaciones desde 1198 hasta 719 en el ensayo n° 22, realizado con el mismo nivel que el ensayo n° 21.

En el **APÉNDICE I**, se encuentran dibujados los registros de las galgas extensométricas obtenidos de los ensayos sísmicos realizados, tanto de tipo multifrecuencial como de tipo senoidal, a las frecuencias de resonancia del Cuadro, no superándose, excepción hecha del caso citado, el 80% del límite de fluencia del material, definido por 1000 microdeformaciones.

En el **APÉNDICE II** se encuentran dibujados los espectros de frecuencia, integrados por valores máximos, del grupo 1 de acelerómetros, colocado sobre la plataforma vibrante, en los que se refleja el nivel aplicado en los ensayos exploratorios realizados antes y después de los ensayos sísmicos.

En este mismo **APÉNDICE** se encuentran dibujados los espectros de frecuencia del grupo 1 de acelerómetros, colocado sobre la plataforma vibrante; y del grupo 2, colocado en el Centro de Gravedad del Conjunto, en los que se refleja el nivel aplicado en los ensayos sísmicos senoidales realizados en dirección Y (*lado-lado*) y X (*frente-atrás*) al equipo.

En el **APÉNDICE III**, se encuentran las Funciones de Transferencia (*módulo y fase*) obtenidas en los ensayos exploratorios iniciales y finales, realizados con un nivel de aceleración de 0,1 g, de los que se han deducido las frecuencias de resonancia más significativas de las *Celdas*, en el rango de 0,5 a 35 Hz.



En la tabla que se acompaña a continuación se muestran las resonancias del punto 2 obtenidas en los ensayos exploratorios iniciales y finales.

PUNTO NÚMERO	RESONANCIA (Hz)			
	Dirección Horizontal "X" (frente-atrás)		Dirección Horizontal "Y" (lado-lado)	
	Inicial	Final	Inicial	Final
2 (CDG)	12,87	10,49	6,68	7,63

Del análisis de estos resultados se deduce que las desviaciones entre las resonancias finales y las iniciales son del orden del 14,2% en dirección Y del orden del 18,5% en dirección X, por debajo del 20% de las admitidas por la norma IEEB693/2005.

No obstante, hay que decir a este respecto que estas desviaciones son más pequeñas si se consideran los resultados obtenidos en los ensayos realizados después de colocar los seis tornillos adicionales, resultados que se encuentran en el APÉNDICE IV sintetizan en la tabla siguiente:

PUNTO NÚMERO	RESONANCIA (Hz)			
	Dirección Horizontal "X" (frente-atrás)		Dirección Horizontal "Y" (lado-lado)	
	Inicial	Final	Inicial	Final
2 (CDG)	11,03 (0,15 g)	10,49 (0,1 g)	7,37 (0,15 g)	7,63 (0,1 g)

Estas resonancias suponen unas desviaciones del orden del 4,9% en dirección X del orden del 3,5% en dirección Y.

En el APÉNDICE IV, se encuentran las funciones de transmisibilidad (*módulo*) del punto 2 (CDG) obtenidas mediante el Controlador de Vibraciones de los ensayos exploratorios locales, realizados con un nivel de aceleración de 0,15 g, a partir de las cuales se ha obtenido el amortiguamiento del equipo, asociado a sus correspondientes modos de vibración (*calculados por el Método del Ancho de Banda*), tal y como se resume a continuación:

PUNTO NÚMERO	RESONANCIA (Hz) / Amortiguamiento (%)	
	Dirección Horizontal "X" (frente-atrás)	Dirección Horizontal "Y" (lado-lado)
	2 (CDG)	10,15 / 13,45%

En dirección vertical no se ha encontrado resonancia significativa alguna.



ВАРНО С
ОРИГИНАЛА



Por otro lado, después de colocar los seis tornillos adicionales y antes de realizar los ensayos sísmicos de tipo senoidal, se han vuelto a repetir los ensayos exploratorios locales, debido al aumento de rigidez de la unión del Cuadro a la plataforma de ensayos, habiéndose obtenido los valores de amortiguamiento, asociados a sus correspondientes modos de vibración, que se resumen en la tabla siguiente:

PUNTO NUMERO	RESONANCIA (Hz) / Amortiguamiento (%)	
	Dirección Horizontal "X" (frente-atrás)	Dirección Horizontal "Y" (lado-lado)
2 (CDG)	11,03 / 9,46%	7,37 / 10,04%

Todos estos valores se han calculado con los *Interruptores Conectados*. Por último, se ha realizado un ensayo exploratorio local con los *Interruptores Desconectados* en dirección X, ya que se ha observado una variación significativa en esta dirección, al realizar el ensayo sísmico senoidal. La frecuencia y amortiguamiento obtenidos han sido de 10,54 Hz y 6,82%.

En el APÉNDICE V, se encuentran dibujados los Espectros de Respuesta de Ensayo (TRS), del grupo 1 de acelerómetros, colocado sobre la plataforma de ensayos, obtenidos de los ensayos sísmicos multifrecuenciales realizados sobre las *Celdas*.

Estos espectros, obtenidos con el Controlador de Vibraciones, se han calculado para el 2% amortiguamiento y por 1/24 de octava; y se encuentran superpuestos sobre los Espectros de Respuesta Requeridos (RRS).

En el APÉNDICE VI, se encuentran dibujados los Espectros de Respuesta de Ensayo (TRS), del grupo 1 de acelerómetros, calculados para el 5% amortiguamiento por 1/24 de octava, obtenidos de los ensayos sísmicos realizados sobre las *Celdas*. Estos espectros, obtenidos con el Analizador de Vibraciones, se encuentran igualmente superpuestos sobre los Espectros de Respuesta Requeridos (RRS).

En el APÉNDICE VII, se encuentran dibujados los acelerogramas del grupo 1 de acelerómetros obtenidos de los Ensayos Sísmicos realizados con excitación tipo multifrecuencial.

Asteasu, 27 de Septiembre, 2011

VIRLAB, S.A.

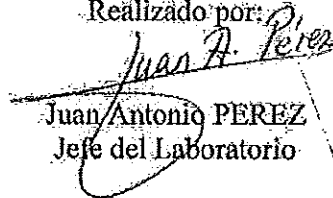
División de URBAR INGENIEROS, S.A.

Revisado por:



Alberto CORRAL
Ingeniero del Laboratorio

Realizado por:



Juan Antonio PEREZ
Jefe del Laboratorio

ВАРНО С
ОРИГИНАЛА



ВИРЛАБ, С.А. Подразделение на УРБАР ИНЖЕНИЕРОС, С.А.	ДОКЛАД НОМЕР 111640	СТРАНИЦА НОМЕР 1/279
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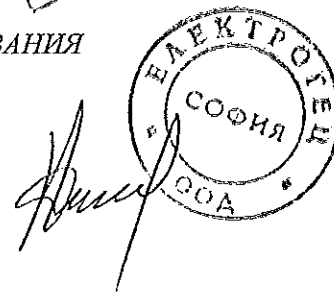
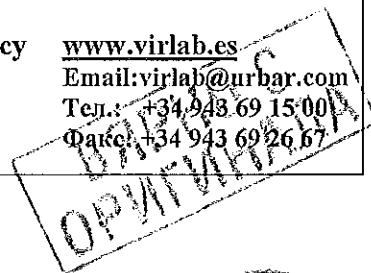
**ДОКЛАД ОТ ИЗПИТВАНЕТО ЗА ОЦЕНКА НА
СЕИЗМИЧНАТА УСТОЙЧИВОСТ НА
„СИСТЕМАТА CGM COSMOS L+P+V“
НА ОРМАСАБАЛ, С.А.**

ЗАБЕЛЕЖКА: Съгласно разпоредбите на точка 5.10.2 от Стандарта ISO-IEC 17025:2005 следва да се направи следното предупреждение:

- Резултатите от настоящия доклад се отнасят единствено и изключително за подложените на изпитване образци.
- Забранява се частичното или цялостно възпроизвеждане на този документ без писменото разрешение от страна на лабораторията.

Дата	Извършил:	Проверил:	ВИРЛАБ, С.А. Подразделение на УРБАР ИНЖЕНИЕРОС, С.А.
	<i>нечетлив подпис</i>	<i>нечетлив подпис</i>	Индустрална зона Астеасу www.virlab.es Зона Б, Сграда 44 Email: virlab@urbar.com 20159 Астеасу (Гипускоа) Тел.: +34 943 69 15 00 ИСПАНИЯ Факс: +34 943 69 26 67
27.09.11	Хуан Антонио ПЕРЕС	Алберто КОРАЛ	

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12.0.- ЗАКЛЮЧЕНИЯ

Разпределителната уредба „СИСТЕМА CGM COSMOS L+P+V“ на ОРМАСАБАЛ, С.А., съставена от три (3) *Килии*, съгласно чертеж номер DOC-3410, Преразглеждане 01 от дата 08.04.11 год., с характеристики, описани в точка 3.0, която е предназначена за **ПОДСТАЦИИ И ТРАФОПОСТОВЕ**, е подложена на сеизмични изпитвания, както е посочено в обяснената в точка 8.0 процедура, в съответствие с европейския стандарт **UNE EN 60068-3-3** от 1994 год., стандарта **NSR-98** (Колумбия), спецификациите **ETGI-1020** (Чили), **E-SE-010** (Energis) и **NSP-420** (Венецуела), както и въз основа на американските стандарти **IEEE-344** от 2004 год. и **IEEE-693** от 2005 год.

В точка 11.0 са описани резултатите от изпитванията, извършени по отношение на разпределителната уредба. Съоръжението е издържало удовлетворително изпитванията, без по него да са открити аномалии или структурни повреди.

Единственото отклонение, отчетено по време на изпитванията, се наблюдава при изпитване № 21, многочестотно сеизмично изпитване от ниво **S2**, извършено по посока **YZ**, *странично* спрямо разпределителната уредба и едновременно с това *вертикално*, в резултат на което са получени микродеформации със стойност по-висока от 1000 (1198), тоест по-висока от максимално допустимата стойност, по една от четирите ленти (**G4**), поставени в основата на съоръжението.

С цел намаляване на напрежението в съоръжението е увеличен броят на болтовете от 12 на 18 (с по два (2) на клетка), с което максималният брой микродеформации при изпитване № 22 спада от 1198 на 719 при прилагане на същото ниво като при изпитване № 21.

В **ПРИЛОЖЕНИЕ I** са представени в графична форма данните от сензорите за измерване на механични деформации, отчетени в резултат на многочестотните и синусоидалните сеизмични изпитвания, по време на които са прилагани резонансните честоти на уредбата. Резултатите от тези изпитвания, с изключение на горесцитирания случай, не надвишават 80% от максималната граница на провлачване на материала, дефинирана посредством 1000 микродеформации.

В **ПРИЛОЖЕНИЕ II** са отразени честотните спектри, интегрирани по максимални стойности, на акселерометрите от Група 1, закрепени върху вибрираща платформа, като е посочено нивото, приложено по време на скрининга преди и след сеизмичните изпитвания.

В същото това **ПРИЛОЖЕНИЕ** е отразен честотният спектър не само на Група 1 акселерометри, закрепени върху вибрираща платформа; но и на Група 2, която е поставена в Центъра на тежест на съоръжението. Посочено е и нивото, приложено при синусоидалните сеизмични изпитвания, осъществени по посока **Y** (*странично*) и **X** (*отпред-назад*) спрямо разпределителната уредба.

В **ПРИЛОЖЕНИЕ III** са представени предавателните функции (*модул и фаза*), получени при първоначалния и крайния скрининг при ниво на ускорение 0,1 g, като въз основа на тези функции се прави извод, че най-значимите резонансни честоти на *Килиите* са в диапазона от 0.5 до 35 Hz.

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В приложената по-долу таблица са показани резонансите на точка 2, получени при началния и крайния скрининг.

ТОЧКА НОМЕР	РЕЗОНАНС (Hz)			
	Хоризонтална посока „X“ <i>(отпред - назад)</i>		Хоризонтална посока „Y“ <i>(странично)</i>	
	Начален скрининг	Краен скрининг	Начален скрининг	Краен скрининг
2 (ЦЕНТЪР НА ТЕЖЕСТТА)	12,87	10,49	6,68	7,63

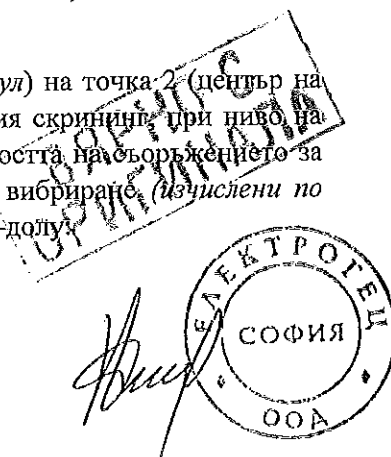
От анализа на тези резултати се стига до извода, че отклоненията между крайните и началните резонанси са в порядъка на 14,2% в посока Y и в порядъка на 18,5% в посока X, при всички случаи под 20-те %, които представляват допустимата стойност на отклонение съгласно стандарт IEEE 693/2005.

Независимо от това следва да се отбележи, че посочените отклонения реално са по-ниски, ако се вземат предвид резултатите от изпитванията, извършени след поставяне на шестте допълнителни болта. Тези резултати са представени в **ПРИЛОЖЕНИЕ IV**, като в обобщен вид са отразени в таблицата по-долу:

ТОЧКА НОМЕР	РЕЗОНАНС (Hz)			
	Хоризонтална посока „X“ <i>(отпред - назад)</i>		Хоризонтална посока „Y“ <i>(странично)</i>	
	Начален скрининг	Краен скрининг	Начален скрининг	Краен скрининг
2 (ЦЕНТЪР НА ТЕЖЕСТТА)	11,03 <i>(0,15 g)</i>	10,49 <i>(0,1 g)</i>	7,37 <i>(0,15 g)</i>	7,63 <i>(0,1 g)</i>

В този случай при резонансите се наблюдава отклонение от порядъка на 4,9% в посока X и от порядъка на 3,5% в посока Y.

В **ПРИЛОЖЕНИЕ IV** са отразени трансмисионните функции (*модул*) на точка 2 (център на тежестта), получени с помощта на виброметър по време на локалния скрининг при ниво на ускорения 0,15 g. Въз основа на тези функции е изчислена способността на съоръжението за поглъщане на вибрации, съответстваща на различните режими на вибриране (*изчислени по метода Широчина на лентата*), както е показано в обобщен вид по-долу:



ТОЧКА НОМЕР	РЕЗОНАНС (Hz) / Способност за вибропоглъщане (%)	
	Хоризонтална посока „X“ (отпред - назад)	Хоризонтална посока „Y“ (странично)
2 (ЦЕНТЪР НА ТЕЖЕСТТА)	<u>10,15</u> / 13,45%	<u>6,12</u> / 16,11 %

Във вертикална посока не е отчетен значителен резонанс.

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ВИРЛАБ, С.А. Подразделение на УРБАР ИНЖЕНИЕРОС, С.А.	ДОКЛАД НОМЕР 111640	СТРАНИЦА НОМЕР 35/279
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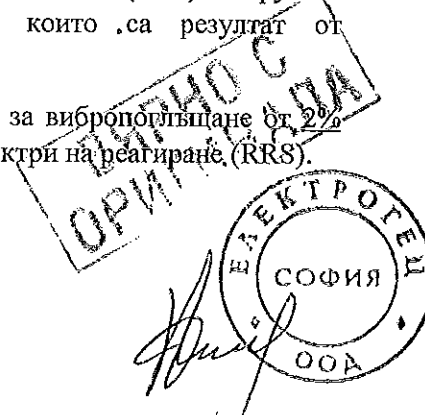
От друга страна, след поставяне на шестте допълнителни болта и преди извършване на синусоидалните сеизмични изпитвания са повторени локалните изпитвания, тъй като е повишена здравината на връзките между разпределителната уредба и изпитвателното оборудване. Способността на уредбата за поглъщане на вибрациите, съответстваща на отделните режими на вибриране и получена в резултат на горното изпитване, е представена в долната таблица:

ТОЧКА НОМЕР	РЕЗОНАНС (Hz) / Способност за вибропоглъщане %	
	Хоризонтална посока „X“ (отпред - назад)	Хоризонтална посока „Y“ (странично)
2 (ЦЕНТЪР НА ТЕЖЕСТТА)	<u>11,03</u> / 9,46%	<u>7,37</u> / 10,04 %

Всички тези стойности са изчислени при *Включени разединители*. Накрая е извършен локален скрининг в посока X с *Изключени разединители*, тъй като е забелязана значителна промяна в тази посока при извършване на синусоидалното сеизмично изпитване. Честотата и способността за вибропоглъщане, получени в резултат на това изпитване, са 10,54 Hz и 6,82%.

В ПРИЛОЖЕНИЕ V са показани спектрите на реагиране на изпитванията (TRS) за Група 1 акселерометри, закрепени върху изпитвателното оборудване, които са резултат от многочестотните сеизмични изпитвания върху *Килиите*.

Тези спектри, получени с помощта на Виброметра, са изчислени за вибропоглъщане от 2% при 1/24 октави; те са нанесени на графиката върху изискуемите спектри на реагиране (RRS).



В **ПРИЛОЖЕНИЕ VI** са отразени спектрите на реагиране на изпитванията (TRS) за Група 1 акселерометри, изчислени за вибропоглъщане от 5% при 1/24 октави и получени в резултат на сеизмичните изпитвания върху *Килиите*. Тези спектри, изчислени с помощта на Виброметъра, също са нанесени на графиката върху изискуемите спектри на реагиране (RRS).

В **ПРИЛОЖЕНИЕ VII** са отразени акселограмите на Група 1 акселерометри, резултат от сеизмичните изпитвания, осъществени с многочестотно възбуждане.

Астеасу, 27 септември 2011 год.
ВИРЛАБ, С.А.
Подразделение на УРБАР ИНЖЕНИЕРОС, С.А.

Проверил:
нечетлив подпис

Алберто КОРАЛ
Лабораторен инженер

Извършил:
нечетлив подпис

Хуан Антонио ПЕРЕС
Ръководител на Лабораторията

Кръгъл печат на ВИРЛАБ, ЛАБОРАТОРИЯ ЗА ВИБРАЦИОННИ ИЗПИТВАНИЯ

ВЯРНО С
ОРИГИНАЛА



Наименование на материала: Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А

Съкратено наименование на материала: Трип. авт. прек. НН, с ел. защита, 160-1250 А, кат. А

Област: Н – Електрически уредби СрН/НН

Категория: 17–Комутационни апарати

НН за защита

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

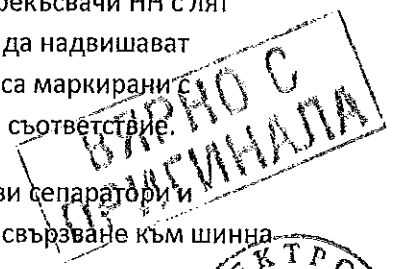
Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система. Автоматичните прекъсвачи са способни да провеждат и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством защита от електронен тип токове във вериги при условията на претоварване и късо съединение.

Тялото (корпусът) на автоматичните прекъсвачи НН е изработено чрез формоване на устойчив на нагряване, на огън и на механични удари изолационен материал. Използваните в конструкцията изолационни материали съответстват на изискванията на т. 7.1. от БДС EN 60947-2:2006.

Управлението се осъществява ръчно посредством лост. Включването/изключването на контактите на трите полюса се осъществява едновременно с висока скорост, която не зависи от действията на оператора. Автоматичният прекъсвач изпълнява разединяваща функция, която е обозначена с предвидения от стандарта символ. На челния панел на прекъсвача е разположен тест-бутон за проверка на изключвателния механизъм. Лостът за управление при вертикално монтиране на автоматичните прекъсвачи се движи в направление „нагоре – надолу“, при което контактите се затварят при движение „нагоре“. Лостът има три ясно индицирани положения, съответстващи на позицията на контактната система: „Включено“, „Изключено“ и „Автоматично изключено от свръхтокове /Тест“. Конструкцията осигурява защита срещу проникване на твърди тела и вода до степен най-малко IP20 за клемните съединения и IP40 за челната повърхност на прекъсвача, съгласно БДС EN 60529+A1:2004.

Стойностите на прегряването на частите на триполюсните автоматични прекъсвачи НН с лят корпус при нормален работен режим при температура до 40°C не трябва да надвишават посочените в таблица 7 от БДС EN 60947-2:2006 стойности. Прекъсвачите са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-2:2006 и CE маркировка за съответствие.

Прекъсвачите се доставят с предпазни клемови капаци, изолиращи фазови сепаратори и разширители и удължители на входа и на изхода, които са подходящи за свързване към шинна система, която е изработена с алуминиеви шини с правоъгълно сечение.



су

Андрей

По искане на възложителя прекъсвачите трябва да бъдат доставени с адапторни планки, които са съобразени с присъединителните и габаритните размери на автоматичните прекъсвачи от сериите: А100, А1, А250, А2, А2-400, А3, А4 и А5 съгласно табл. 1 и фиг. 1 по-долу, произвеждани от бившия ЕАЗ гр. Пловдив.

Триполюсните автоматични прекъсвачи са пакетирани в картонени кутии, на които е залепен етикет с наименование на материала „Автоматичен прекъсвач“, техническите данни, годината на производство, партидните номера и стандарта, в съответствие с който са произведени и изпитани - БДС EN 60947-2:2006.

Използване:

Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в главните разпределителни табла в трансформаторните постове и се използват за защита на силови трансформатори СрН/0,4 kV с мощност до 800 kVA.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:

Триполюсните автоматични прекъсвачи НН с лят корпус трябва да отговарят на посочените по-долу стандарти или еквиваленти, включително на техните валидни изменения и допълнения:

- БДС EN 60947-1:2007 “Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)”; и
- БДС EN 60947-2:2006 „Комутационни апарати за ниско напрежение. Част 2: Автоматични прекъсвачи (IEC 60947-2:2006)“ и техните валидни изменения и допълнения
- БДС EN 60529+A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989+A1:1999) 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	PN1250S, GACIA ELECTRICAL APPLIANCE CO., LTD., Китай Приложение 1
2.	Техническо описание и чертежи с нанесени на тях размери	Приложение 2
3.	ЕО декларация за съответствие	Приложение 3

ВАЖНО С
КОПИРАНЕТО

ООА

№ по ред	Документ	Приложение № или текст
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, провела типовите изпитвания по т. 4 – заверено копие	Приложение 5
6.	Техническо описание и чертежи с нанесени размери на монтажни планки, единичната цена на които не се включва в цената на прекъсвачите	Приложение 6

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.)

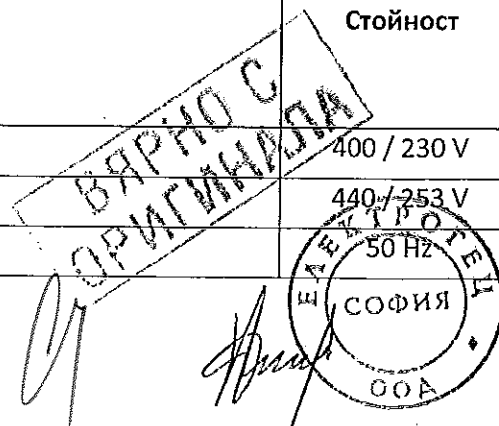
Технически данни:

1. Характеристики на работната среда

№ по ред	Характеристика	Стойност
1.1	Място на монтиране	На закрито
1.2	Максимална околна температура	+ 40°C
1.3	Минимална околна температура	Минус 5°C
1.4	Максимална средна околна температура за период от 24 ч.	+ 35°C
1.5	Относителна влажност (при 20°C)	До 90 %
1.6	Степен на замърсяване	3
1.7	Надморска височина	До 2000 m

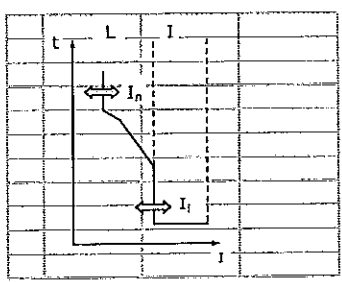
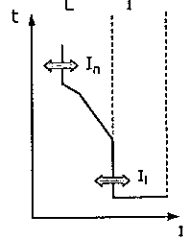
2. Параметри на електроразпределителната мрежа

№ 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	Схема на разпределителната мрежа	TN-C

3. Общи технически параметри и други данни

№ по ред	Технически параметър	Изискване	Гарантирано предложение
3.1	Брой на полюсите	3	3
3.2	Обявено работно напрежение (U _e)	min 690 V AC	690 V AC
3.3	Обявена честота	50 Hz	50 Hz
3.4	Обявено импулсно напрежение (U _{imp})	min 6 kV	8 kV
3.5	Обявено изолационно напрежение (U _i)	min 690 V	750 V
3.6	Категория на приложение	A	A
3.7	Работна изключвателна възможност при късо съединение (I _{cs})	min 50% от I _{cu}	I _{cs} = I _{cu} (т.е. 100% от I _{cu})
3.8	Защита от свръхтокове	-	-
3.8.1	Тип и времетокова характеристика	<p>Защитата от свръхтокове трябва да бъде от електронен тип с времетокова характеристика от показания по-долу вид:</p> 	<p>Защитата от свръхтокове е от електронен тип с времетокова характеристика от показания по-долу вид:</p> 
3.8.2	Защита от претоварване	<p>а) Диапазон на настройване $I_R = (\min 0,5 \div 1) \times I_n$</p> <p>б) Условен ток на неизключване $I_{nd} = 1,05 \times I_R$ във времеви интервал от 120 минути</p>	<p>а) Диапазон на настройване $I_R = (0,4 \div 1) \times I_n$</p> <p>б) Условен ток на неизключване $I_{nd} = 1,05 \times I_R$ във времеви интервал от 125 минути</p>

ОРИГИНАЛ

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№ по ред	Технически параметър	Изискване	Гарантирано предложение
		в) Условен ток на изключване $I_d = 1,30xI_R$ във времеви интервал до 120 минути	в) Условен ток на изключване $I_d = 1,30xI_R$ във времеви интервал до 107 минути
3.8.3	Защита от къси съединения	Токът на изключване I_f трябва да бъде фиксиран на една от стойностите или регулируем в диапазона препоръчително от $\min 4x I_n$ до $10x I_n$	Защита от къси съединения регулируема в диапазона от $2xI_f$ до $10xI_f$ и моментална $I_f=11x I_n$
3.9	Степен на защита от проникване на твърди тела и вода съгласно БДС EN 60529+A1:2004	-	-
3.9.1	Клемни съединения	IP 20	IP 20
3.9.2	Челна повърхност	IP 40	IP 40
3.10	Акcesoари	а) Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение	а) Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение
		б) Два комплекта предпазни клемови капаци и изолиращи фазови сепаратори.	б) Два комплекта предпазни клемови капаци и изолиращи фазови сепаратори.

4. Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А ÷ 1250 А, с електронна защита, категория А

4.1 Триполюсен автоматичен прекъсвач НН с лят корпус, 1250 А, с електронна защита, кат. А

Номер на стандарта	Тип/референтен номер съгласно каталога на производителя
20 17 6004	PN1250S
Наименование на материала	Триполюсен автоматичен прекъсвач НН с лят корпус, 1250 А, с електронна защита, кат. А
Съкратено наименование на материала	Трип. авт. прек. НН, с ел. защита, 1250 А, кат. А

Сел

ВЯРНО
ОРИГИНАЛ

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ООО

№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.1.1	Обявен ток (I_n)	1250 A	1250 A
4.1.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 45 kA / 500 V	60 kA / 500 V.
4.1.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.5.2 Да се посочи	60kA
4.1.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	1250 – 13 750A
4.1.5	Време за изключване при I_{cu}	max 0,030 s	max 0,030 s
4.1.6	Износоустойчивост	-	-
4.1.6a	Електрическа (брой к.ц.)	min 500 бр.	500 бр.
4.1.6b	Механична (брой к.ц.)	min 2500 бр.	2500 бр.
4.1.7	Максимални размери ВхШхД (Дълбочината „Д“ не включва лоста за управление)	375x210x160 mm	330x210x146,5 mm
4.1.8	Тегло, kg	Да се посочи	17.5 kg

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

“Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А”

Приложение № 1

ВЯРНО С
ОРИГИНАЛА

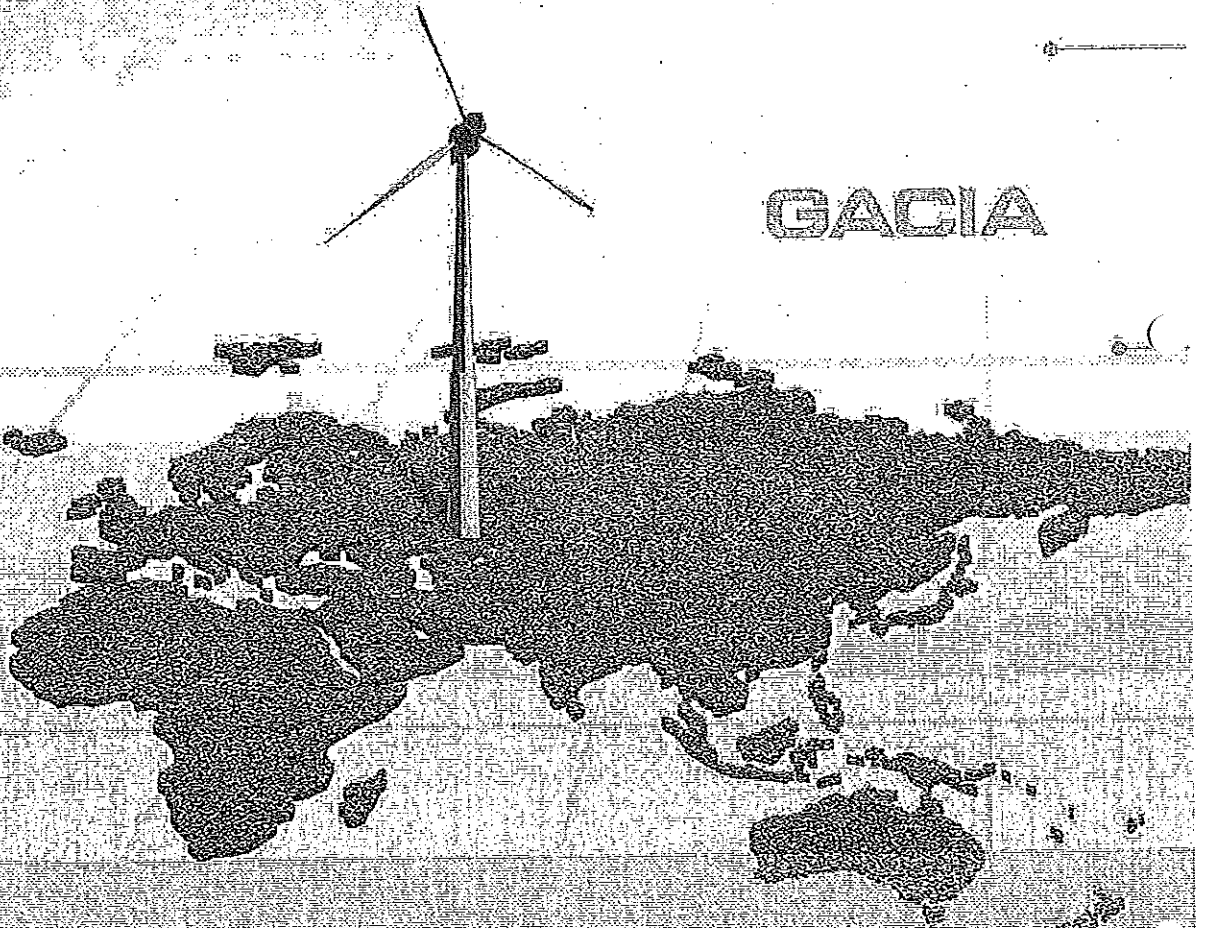


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We produce circuit breaker only

*Build up the most professional circuit breaker brand in China
be devoted to the cooperation with world famous brand*

GACIA



ISO9001 ISO14001 OHSAS18001 SA8000

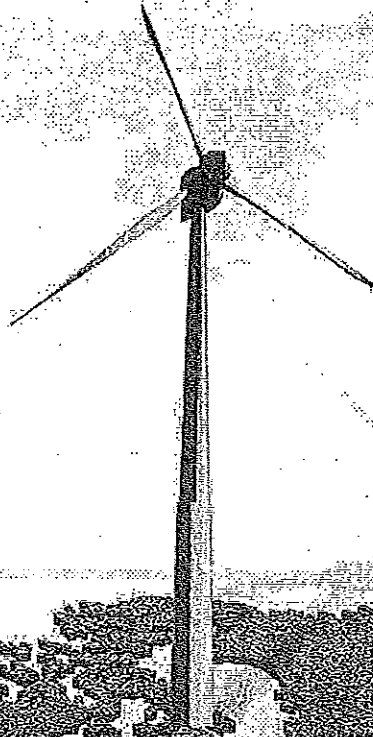
ВЪРНО С
ОРИГИНАЛА



Safety

Intelligent

Sensitive



GACIA

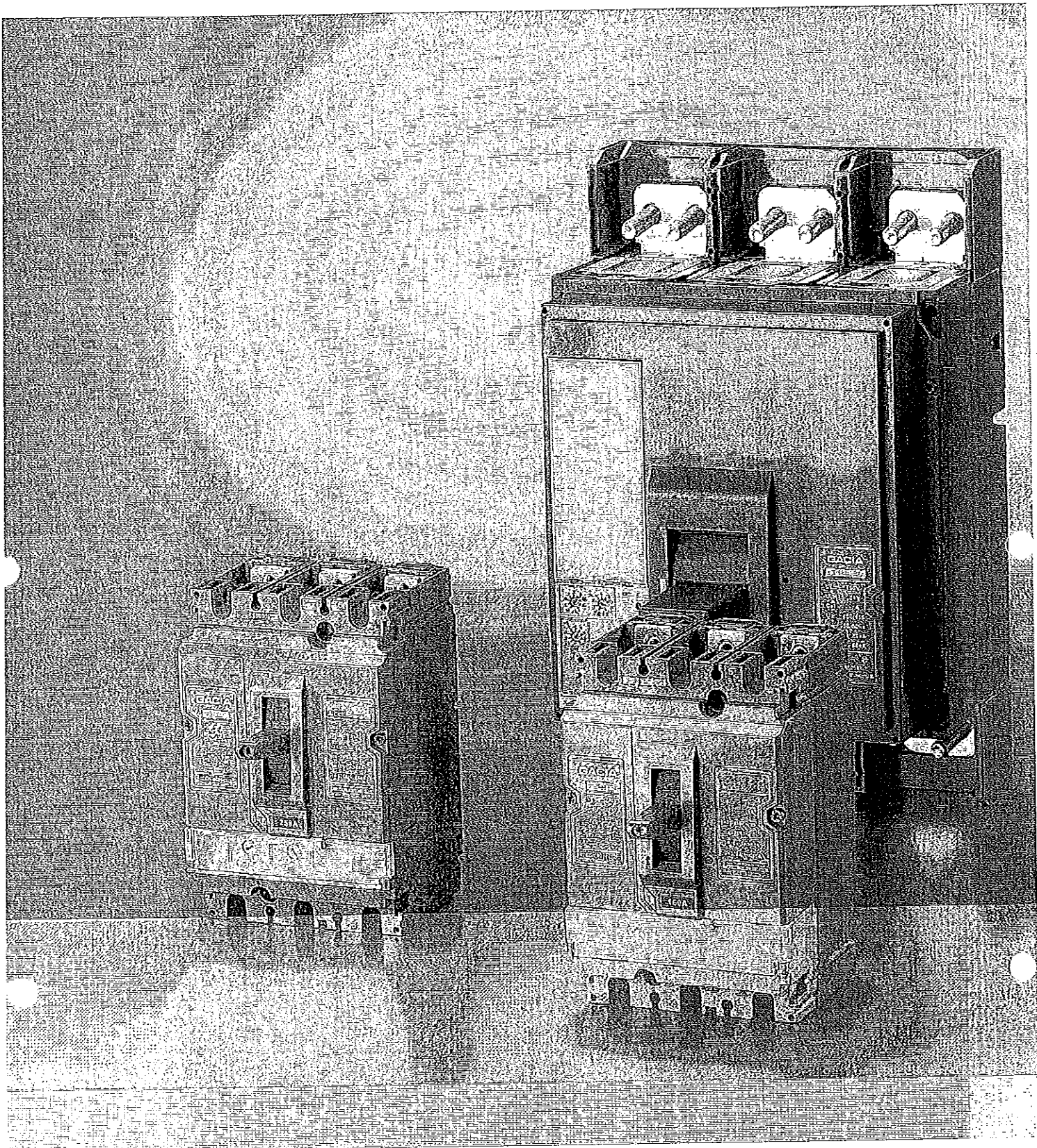


RoHS

ВЪРНО С
ОРИГИНАЛА

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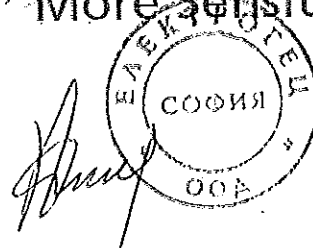
More Professional

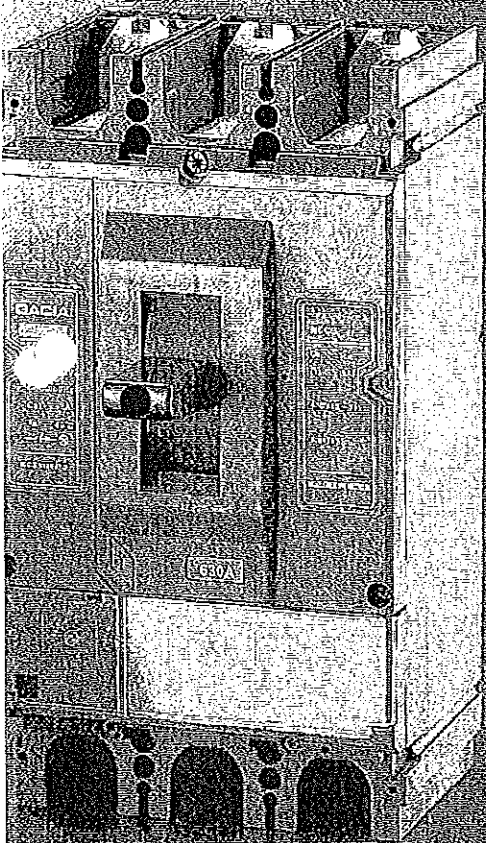


Safer



More Sensitive





We produce circuit breaker only

GACIA



More Intelligent



Higher Cost-Performance



C

O

PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2

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Product Selection Guide

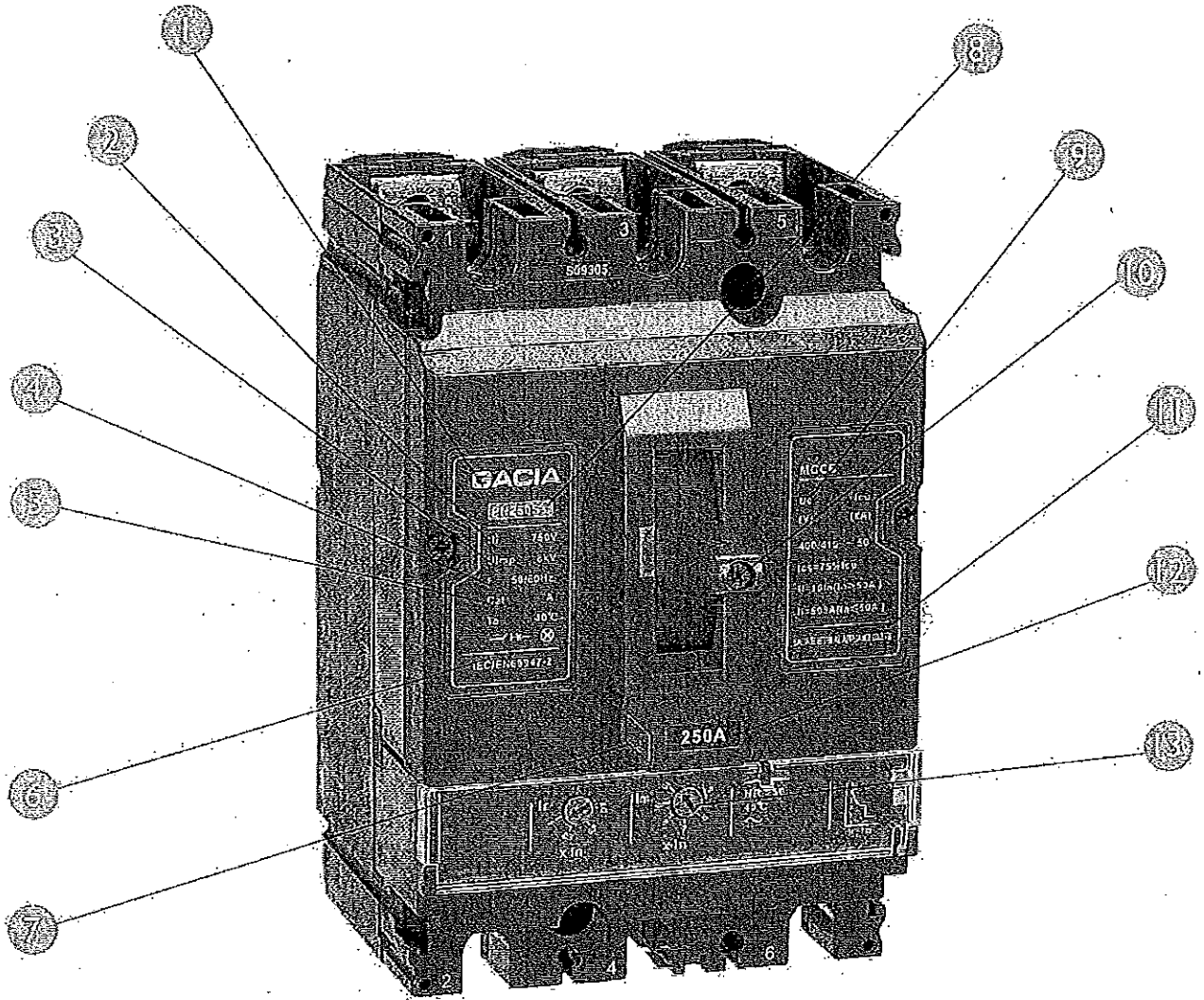
PN Moulded Case Circuit Breaker

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ВЯРНО С
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Panel Diagram



- 1. Gacia company brand
- 2. Insulation voltage
- 3. Rated impulse withstand voltage
- 4. Rated frequency
- 5. Product category
- 6. Insulation sign
- 7. Testing button

- 8. Product code
- 9. Working voltage
- 10. Handle
- 11. Company name
- 12. Rated current
- 13. Adjustable button

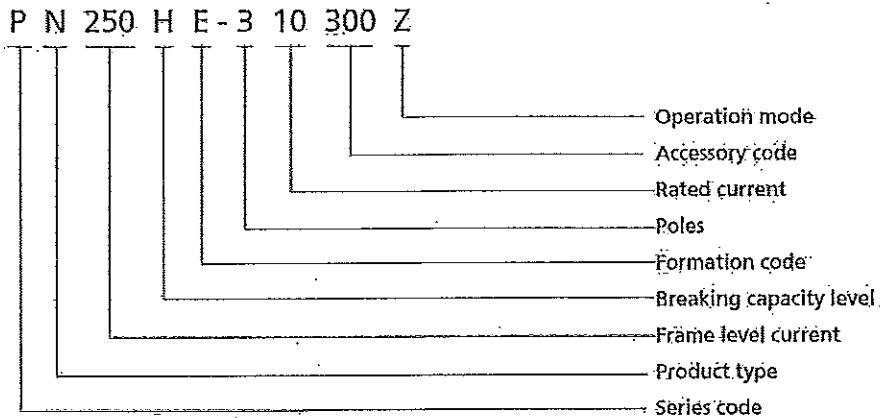
ВАРНО С
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PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2

Model Implication




- According to the application range: Power distribution protection and motor protection
- According to the wiring method: front-wiring, back-wiring, plug-in wiring, draw-out wiring.
- According to the operation type: Direct handle operation, external rotary handle operation, motor operation..
- According to the tripping device type: only instantaneous tripping device(electro-magnetic tripping device), thermo+electro-magnetic tripping device(compound tripping device), intelligence tripping device(electronic tripping device)
- According to pole classification: Three poles and four poles
- According to the frame level rated current: PN100, PN160, PN250, PN400,PN630, PN1250, Attached device, with several wiring methods, including front-wiring, back-wiring, plug-in wiring, draw-out wiring etc., adopts modulization plug-in and protective cover to assure the safety and reliability and has functional adjusting button which can adjust the tripping current and tripping time according to different requirements.

Use and Range of Application

The design of PN series molded case circuit breaker (hereinafter circuit breaker) indicates the newest current-limiting principle and manufacturing technology with the characteristics of compact structure, modulization, high breaking capacity, no flashover. It is used for infrequent exchange and startup of motor in the circuit AC 50HZ of which rated insulation voltage is 750V, rated working voltage 690V or less, rated working current up to 1250A. Circuit Breaker has the overload, short-circuit, and undervoltage protection device, which can protect the circuit and power-supply device from damages.

Circuit Breaker can be divided into N,S,H type.

This circuit breaker can be installed vertically (Erect), and horizontally installed(Level). The line of this circuit breaker can not be connected reversely, that is, 1,3,5 line connected to power line, 2,4,6 connected to the load line.

This circuit breaker has isolation function, using the mark  to refer to.

This circuit breaker conforms to the standard below:

- IEC/EN 60947-2 General Principle
- IEC/EN 60947-2 Low Voltage Circuit Breaker
- IEC/EN 60947-2 Contactor and Motor Starter
- IEC/EN 60947-2 Electromechanical
- Controlling Circuit Appliance



PN Series



Use and Application Range

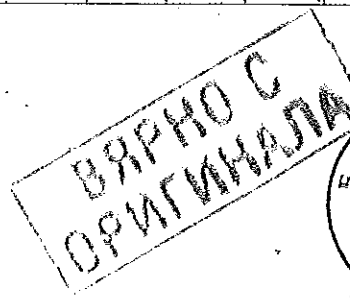

- ☑ Height above Sea Level: ≤ 2000m
- ☑ Ambient Medium Temperature: ≤ +40°C, ≥ -5°C
- ☑ It can endure the effect of humid air and the effect of salt mist, oil mist and fog bacteria.
- ☑ In the place within the medium without danger of explosion and without corrosion of metal box, damage of insulation gases and conductive dust.
- ☑ No damage of rain and snow
- ☑ Pollution degree: 3

Function and Attached Device

			TRN160	TRN160P	TRN250	TRN160T	TRN160S
Control	Manual operation	Push the handle	☑	☑	☑	☑	☑
		Direct rotary handle and outspread rotary handle	☑	☑	☑	☑	☑
	Motor operation		☑	☑	☑	☑	☑
Connection	Fixed	Front wiring	☑	☑	☑	☑	☑
		Back wiring	☑	☑	☑	☑	☑
	Plug-in wiring	Front wiring	☑	☑	☑	☑	☑
		Back wiring	☑	☑	☑	☑	☑
	Draw-out wiring	Front wiring	☑	☑	☑	☑	☑
		Back wiring	☑	☑	☑	☑	☑

Trip Unit Method and Accessories Code

Trip Unit Method	No Attached Device	Alarm Contact	Shunt Release Trip Unit	Auxiliary Contact	Undervoltage Trip Unit	Shunt Release Auxiliary Contact	Two Groups Auxiliary Contact	Undervoltage Release Auxiliary Contact	Shunt Release Alarm Contact	Auxiliary Alarm Contact	Undervoltage Release Alarm Contact	Shunt Release Auxiliary Alarm Contact	Two Groups Auxiliary Alarm Contact	Undervoltage Release Auxiliary Alarm Contact
Instantaneous Trip Unit	200	208	210	220	230	240	260	270	218	228	238	248	268	278
Complex Trip Unit	300	308	310	320	330	340	360	370	318	328	338	348	368	378
Electrical Trip Unit	400	408	410	420	430	440	460	470	418	428	438	448	468	478

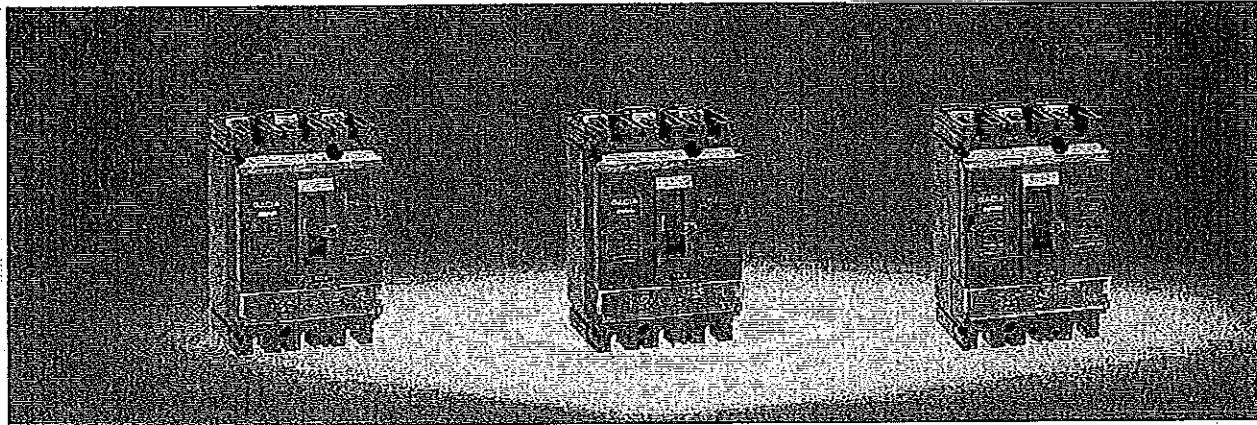
03

PN Series

PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB 14048.2



Technical parameters



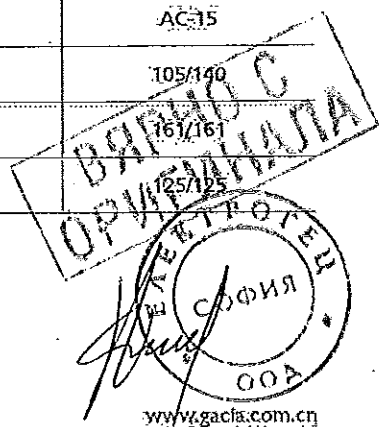
PN100

PN160

PN250

Width (mm)		PN100 (100, 125, 160, 200, 250)	PN160 (160, 200, 250)	PN250 (250, 315, 400)
Rated current of frame size Inm(A)		100	160	250
Rated current In(A)		16, 20, 25, 32, 40, 50, 63, 80, 100	125, 160	200, 225, 250
Rated insulation voltage Ui		750V	750V	750V
Rated operational Voltage Ue		400V/415V	400V/415V	400V/415V
Number of poles		3/4	3/4	3/4
AC400V/50Hz O-CO (Icu) Rated ultimate short-circuit breaking capacity (kA)		35, 50, 65	35, 50, 65	35, 50, 65
AC400V/50Hz O-CO-EO (Ics) Rated service short-circuit breaking capacity (kA)		Ics=75% Icu		
(Uimp) Rated impulse withstand voltage (V)		8000	8000	8000
Dielectric property (V)		3000	3000	3000
Life (times)	Total cycles	10000	8000	8000
	Electrical life	1500	1000	1000
	Mechanical life	8500	7000	7000
Flashover distance (mm)		≤50	≤50	≤50
Utilization category	Main circuit	A	A	A
	Auxiliary circuit	AC-15	AC-15	AC-15
Outline dimensions	W(mm)	105/140	105/140	105/140
	L(mm)	161/161	161/161	161/161
	H(mm)	125/125	125/125	125/125

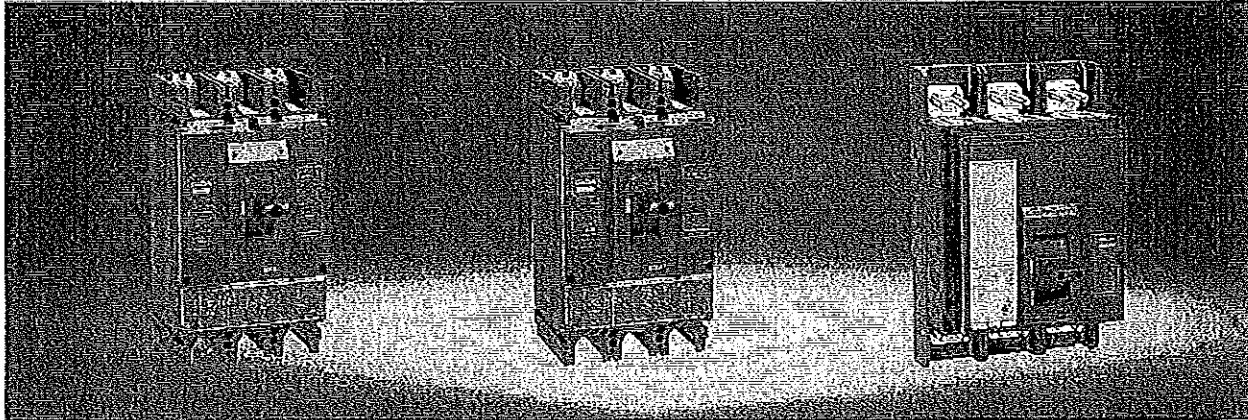
PN Series



PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2



Technical parameters



PN400

PN630

PN1250

Model number		PN400 (3P/4P)			PN630 (3P/4P)			PN1250 (3P/4P)	
Rated current of frame size Inm(A)		400			630			1600	
Rated current In(A)		350,400			500,630			800,1000,1250,1600	
Rated insulation voltage Uj		750V			750V			750V	
Rated operational voltage Ue		400V/415V			400V/415V			400V/415V	
Number of poles		3/4			3/4			3/4	
AC400V/50Hz O-CO(Icu) Rated ultimate short-circuit breaking capacity (kA)		35	50	70	35	50	70	50	80
AC400V/50Hz O-CO-CO(Ics) Rated service short-circuit breaking capacity (kA)		Ics=75% Icu							
(Uimp) Rated impulse withstand voltage (V)		8000			8000			8000	
Dielectric property (V)		3000			3000			3000	
Life (times)	Total cycles	5000			5000			3000	
	Electrical life	1000			1000			500	
	Mechanical life	4000			4000			2500	
Flashover distance (mm)		≤50			≤50			≤100	
Utilization category	Main circuit	A/B			A/B			A/B	
	Auxiliary circuit	AC-15			AC-15			AC-15	
Outline dimensions	W(mm)	3P/4P 140/185			3P/4P 140/185			3P/4P 210/280	
	L(mm)	3P/4P 256/256			3P/4P 256/256			3P/4P 330/330	
	H(mm)	3P/4P 170/170			3P/4P 170/170			3P/4P 206/206	

PN Series

ВАРМО С
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ЭЛЕКТРОТЕХ
ОФИС
05
0А

PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2



Low Voltage Power Distribution Protection PN100-630

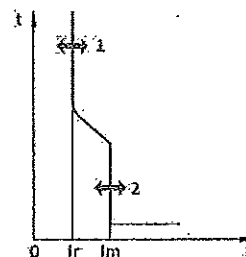
PN100-250 circuit breaker is attached with electro-magnetic or electronic tripping device(PN100, PN160 and PN250N, N,S,H type). With a mechanical structure, it can prevent the mismatching between tripper and circuit breaker from happening.



1. Protection function can be realized through adjusting the knob.
2. Overload protection thermal protection can be adjusted.
3. Short-circuit protection: It can be divided into fixed and adjustable types according to current specification magnetic protection.
4. Neutral line protection:

- ☐ 4P circuit breaker can be divided into;
- ☐ 4P 3d type (neutral line without protection)
- ☐ 4P 3d +N/2 type (neutral line protection 0.5In) or 4P 4d type(neutral line protection In).

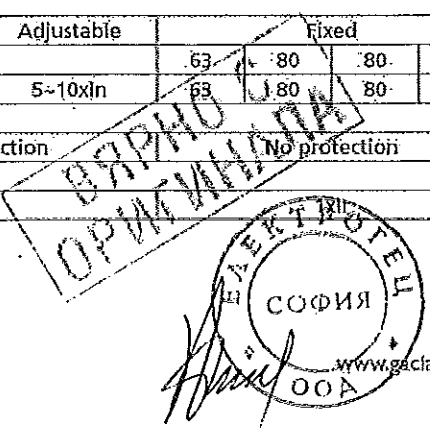
- ☐ Overload Thermal Protection Adjustable Value(1)
- ☐ Protection Setting Value Adjustable or Fixed Short-circuit Fault



PN100-250 (Thermal Protection)		PN100-250							
Rated Voltage(V)	Rated Current(A)	10	25	50	100	250	630	1000	1250
Circuit Breaker	PN100	☐	☐	☐	☐	☐	☐	☐	☐
	PN160	☐	☐	☐	☐	☐	☐	☐	☐
	PN250	☐	☐	☐	☐	☐	☐	☐	☐
Overload Protection(Thermal Protection)		Adjustable range 0.7~1 × In							
Tripping Current Value(A)		Adjustable range 0.7~1 × In							
Short-circuit Current Protection(Electro-magnetic Tripper)		Fixed							
Short-circuit Current Value(A)	In	Fixed							
	PN100	190	300	400	500	500	500	640	800
	PN160/250	190	300	400	500	500	500	1000	1250
Neutral Line Protection		No protection							
Neutral Line Protection	4P 3d	No protection							
Neutral Line Protection 0.5In	4P 3d+N/2							56	56
Neutral Line Protection In	4P 4d	1xIr							

PN100-250 (Thermal Protection)		PN100-250				PN100-250			
Rated Voltage(V)	Rated Current(A)	10	25	50	100	250	630	1000	1250
Circuit Breaker	PN100	-	-	-	-	☐	☐	☐	☐
	PN160	☐	☐	-	-	☐	☐	☐	☐
	PN250	☐	☐	☐	☐	☐	☐	☐	☐
Overload Protection(Thermal Protection)		Adjustable range 0.7~1 × In							
Tripping Current Value(A)		Adjustable range 0.7~1 × In							
Short-circuit Current Protection(Electro-magnetic Tripper)		Fixed				Adjustable		Fixed	
Short-circuit Current Value(A)	In	Fixed				Adjustable		Fixed	
	PN100	190	300	5~10xIn		63	80	80	125
	PN160/250	190	300	5~10xIn		63	80	80	125
Neutral Line Protection		No protection							
Neutral Line Protection	4P 3d	No protection							
Neutral Line Protection 0.5In	4P 3d+N/2	63	0.5xIr	No protection					
Neutral Line Protection In	4P 4d	1xIr							

PN Series



PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2



Technical Parameter

Electrical Trip Unit

Protection

LT (Long Time Delay) Overload protection Adjustable Ir Setting Value

ST (Short Time Delay) short-circuit Current Protection:

1. Im Operating Value Adjustable
2. Have Fixed Time Delay(4)

INST(Instantaneous) Short-circuit Current Protection, operating value(5) fixed 4 pole Circuit Breaker with Neutral line protection adopts a sealed 3 grades setting:

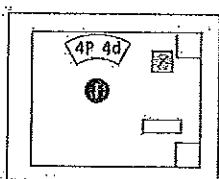
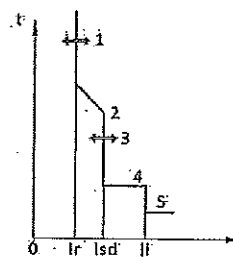
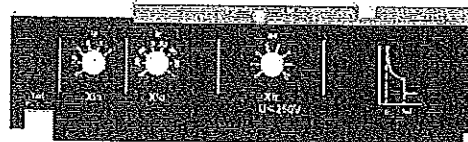
4P 3d (No Neutral Line protection) 4P 3d+N/2(Neutral Line Protection Operating Value; 0.5Ir), 4P 4d (Neutral Line Protection Operating Value Ir) Neutral Line Overload Protection (OSN), used for 4 pole circuit breaker, three times-systematic protection of higher content of harmonic wave. At the 4P 4d position; neutral line protection adjusting knob can be set to 1.6XIr.

Indication

1. Load(LED) Indicator light(6) on the front side
2. The indicator light will be turned on brightly when setting value is bigger than 90%Ir.
3. Indicator Light twinkles when setting value is bigger than 105% Ir.

Test

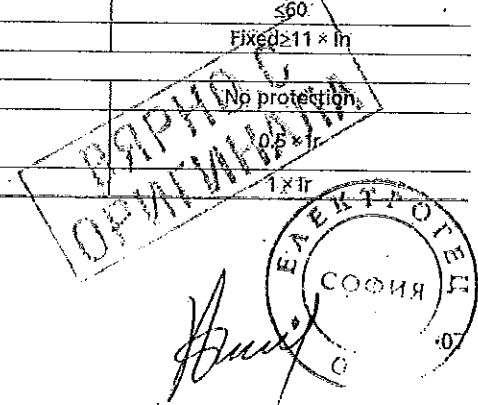
There is a test hole on the front side from which small testing appliance or calibration testing box can be connected, and working state of circuit breaker can be checked.



Neutral Line protection

1. Long Time Delay Protection Setting Value
2. Long Time Delay Protection Delaying Time
3. Short-circuit Protection Setting Value
4. Short-circuit Protection Delaying Time
5. Instantaneous Short-circuit Protection
6. Warning Indicator Light
7. Testing Hole

PN Electrical Trip Unit		IEC				GB	
Model	Rated Current (A)	6kV	10kV	17.5kV	24kV	30kV	36kV
Circuit Breaker	PN100	■	■	-	-	-	-
	PN160	■	■	■	-	-	-
	PN260	■	■	■	■	-	-
	PN400	-	-	-	-	■	-
	PN630	-	-	-	-	-	■
Tripping Current Setting Value(A)(Ir)	Ir=In x...	0.4...1 Adjustable(48 Points)				0.4...1 Adjustable(48 Points)	
Tripping Time (s)(min...max)	at 1.5 × Ir	90...180				90...180	
	at 1.6 × Ir	5...7.5				5...7.5	
	at 7.2 × Ir	3.2...5.0				3.2...5.0	
Tripping current setting value	Isd=Ir x...	2...10				2...10	
Accurate Assurance ± 15%		Adjustable(8 Points)				Adjustable(8 Points)	
Delaying Time (ms)		Fixed					
	The highest overcurrent tripping time	≤40				≤40	
	Total Breaking Time	≤60				≤60	
Tripping Current Value (A) Ii		Fixed ≥11 × In				Fixed ≥11 × In	
Neutral line protection							
No neutral line protection	4P 3d	No protection				No protection	
Neutral line protection 0.5In	4P 3d+N/2	0.5 × Ir				0.5 × Ir	
Neutral line protection 1x	4P 4d	1 × Ir				1 × Ir	





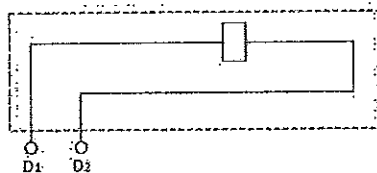
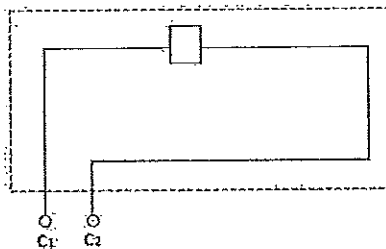
The characteristics and installation of Accessory devices

Shunt release tripping unit wiring diagram (it is the internal attached device of switch in the inner box.)

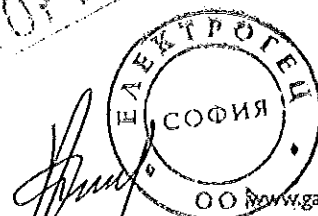
- a: When the controlling voltage reaches 70%-100%, the circuit breaker can break reliably.
- b: long time power is forbidden ($\leq 5s$)
- Response time: impulse mode $\geq 20ms, \leq 60ms$

- a. When the controlling voltage is lowered to 35%-70%, undervoltage tripping unit should trip and circuit breaker should break reliably.
 - b. When the controlling voltage reaches more than or equal to 85%, the switching on of circuit breaker should be assured.
 - c. When the controlling voltage reaches less than 35%, switching on of circuit breaker should be prevented.
- Attention: As for circuit breaker attached with undervoltage trip unit, the circuit breaker can be switched on or off normally when its controlling voltage reaches more than or equal to 85%.

- ☐ Note: The attached undervoltage module is PN(125, 160). Other type without undervoltage module can be connected with lead wire; when it reaches the 70%-35% of the rated working voltage, undervoltage trip unit should let circuit breaker trip reliably.
- ☐ Warning: Undervoltage tripping unit should be electrified on first. Then the circuit breaker can be reset and switched on, or the switch will be damaged.
- ☐ User Warning: After the internal attached device of circuit breaker is installed, it can be adjusted and tested in order to assure the quality when products are transported out of the factory. If user purchases the internal attached device from the outside by his own, user should bear the bad results.



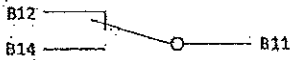
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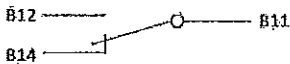


Alarm Contact

Contact Position of circuit breaker at the state of "on" or "off"



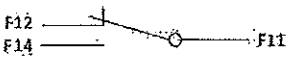
Contact Position of circuit breaker at the state of tripping (Alarm)



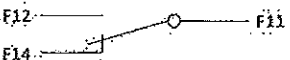
- When circuit breaker normally switches on or off, alarm contact doesn't trip. Only when free tripping (or fault tripping) happens, it will alarm.
- Contact position changes from "on" to "off", or "off" to "on". When circuit breaker has already been reset, alarm contact returns to original state.

Auxiliary Contact

Contact Position of Circuit Breaker at the "off" state



Contact Position of Circuit Breaker at the "on" state



Auxiliary Contact Rated Current

Rated Auxiliary Contact Current (A)	Rated Working Current (A)	Rated Working Current at 25°C (A)
< 250	3	0.3
> 400	6	0.4

PN Series



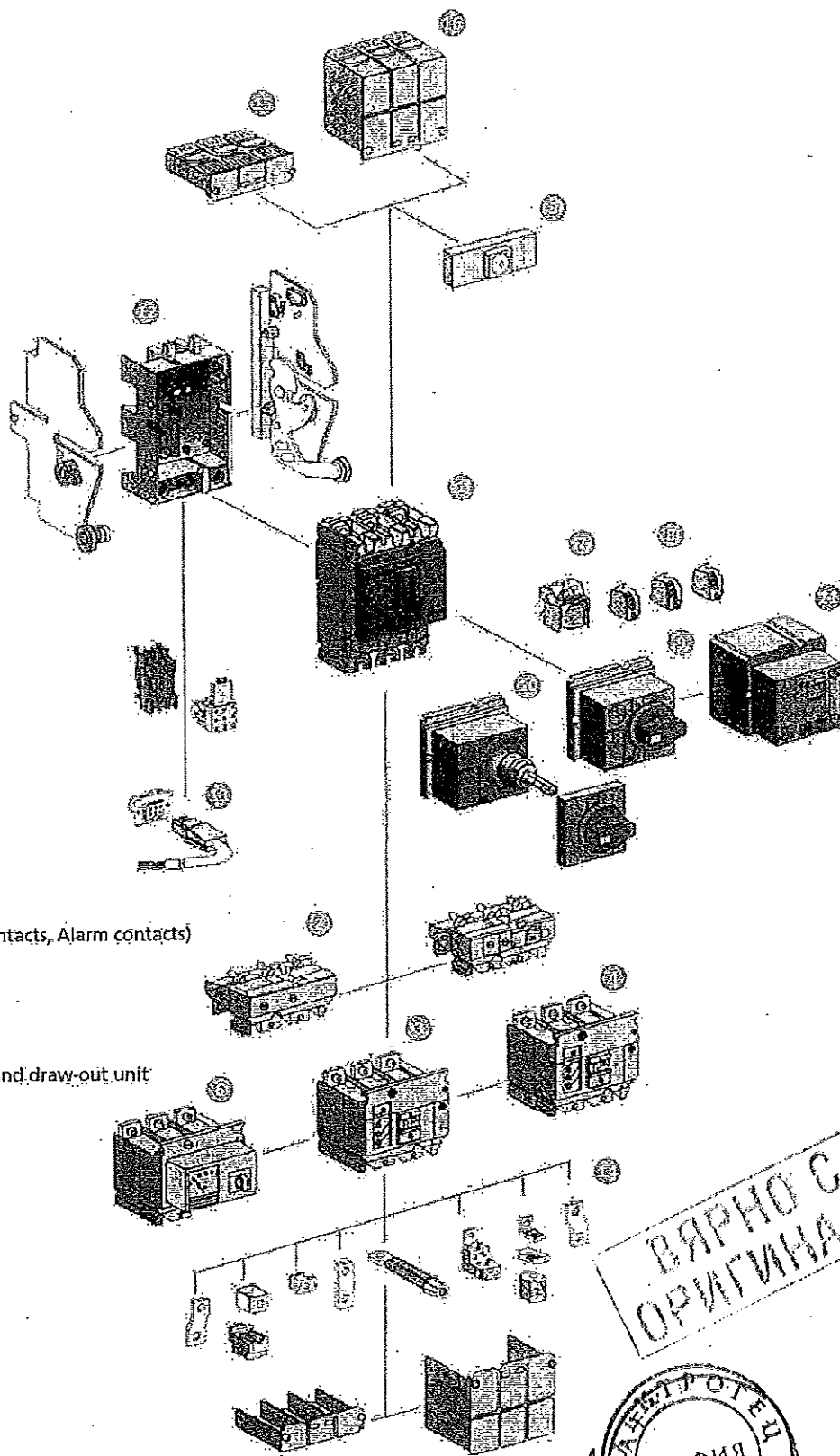
PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2

GACIA

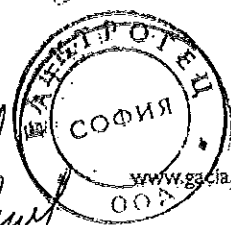
Inside and Outside Accessory

PN series circuit breaker adopts all-module structure, with the characteristics of easy and convenient installation, and wide application range. Several elements can be applied in all similar products. Its structure system picture is below:



1. Breaking unit
2. Tripping unit
3. Earth fault protection unit
4. Insulation monitoring unit
5. Electrified indicator model
6. Current meter model
7. Voltage trip coil MN or MX
8. Auxiliary switch (Auxiliary contacts, Alarm contacts)
9. Direct rotary handle
10. Outspread rotary handle
11. motor operation handle
12. Plug-in baseplate
13. Connector for plug-in unit and draw-out unit
14. Connection accessory
15. Cover for short terminal
16. Cover for long terminal

ВАРНО С
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PN Series

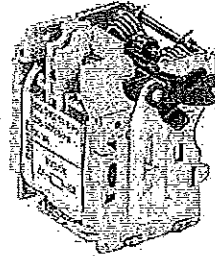
PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2



PN Series MCCB Accessory order Code List

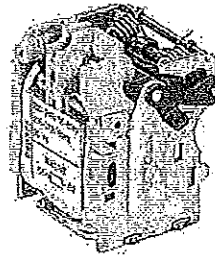
PN Shunt release

Applicable frame	Order code	
	3P/4P	
	AC230V	AV400V
PN160N/S/H	PN160FT.230.001	PN160FT.400.001
PN250N/S/H	PN250FT.230.002	PN250FT.400.002
PN400N/S/H	PN400FT.230.003	PN400FT.400.003
PN630N/S/H	PN630FT.230.004	PN630FT.400.004
PN1600S/H	PN1600FT.230.005	PN1600FT.400.005



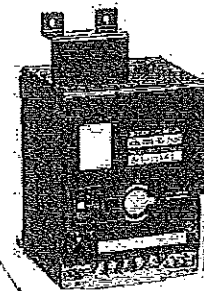
PN Under voltage release

Applicable frame	Order code	
	3P/4P	
	AC230V	AV400V
PN160N/S/H	PN160QT.230.001	PN160QT.400.001
PN250N/S/H	PN250QT.230.002	PN250QT.400.002
PN400N/S/H	PN400QT.230.003	PN400QT.400.003
PN630N/S/H	PN630QT.230.004	PN630QT.400.004
PN1600S/H	PN1600QT.230.005	PN1600QT.400.005



PN Electric operating mechanism

Applicable frame	Order code	
	3P/4P	
	AC230V	AV400V
PN160N/S/H	PN160CD.230.001	PN160CD.400.001
PN250N/S/H	PN250CD.230.002	PN250CD.400.002
PN400N/S/H	PN400CD.230.003	PN400CD.400.003
PN630N/S/H	PN630CD.230.004	PN630CD.400.004
PN1600S/H	PN1600CD.230.005	PN1600CD.400.005



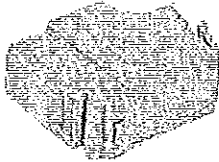
PN Series

ВАРНО С
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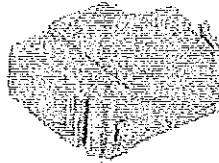
PN Series MCCB Accessory order Code List

PN Auxiliary contacts



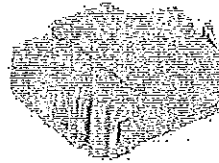
Applicable frame	IEC/EN code	
	3P/4P	
	Single auxiliary	Double auxiliary
PN160N/S/H	PN160FC.230.001	PN160SFC.400.001
PN250N/S/H	PN250FC.230.002	PN250SFC.400.002
PN400N/S/H	PN400FC.230.003	PN400SFC.400.003
PN630N/S/H	PN630FC.230.004	PN630SFC.400.004
PN1600S/H	PN1600FC.230.005	PN1600SFC.400.005

PN Alarm contacts



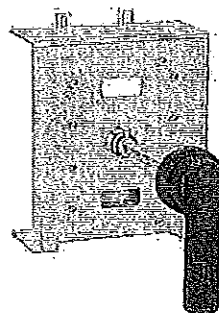
Applicable frame	IEC/EN code
	3P/4P
PN160N/S/H	PN160BC.001
PN250N/S/H	PN250BC.002
PN400N/S/H	PN400BC.003
PN630N/S/H	PN630BC.004
PN1600S/H	PN1600BC.005

PN Auxiliary alarm contacts

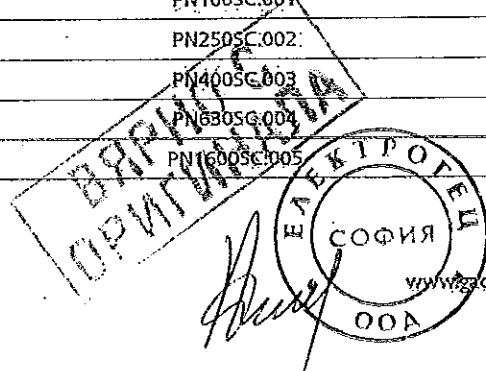


Applicable frame	IEC/EN code
	3P/4P
PN160N/S/H	PN160FB.001
PN250N/S/H	PN250FB.002
PN400N/S/H	PN400FB.003
PN630N/S/H	PN630FB.004
PN1600S/H	PN1600FB.005

PN Handle operation



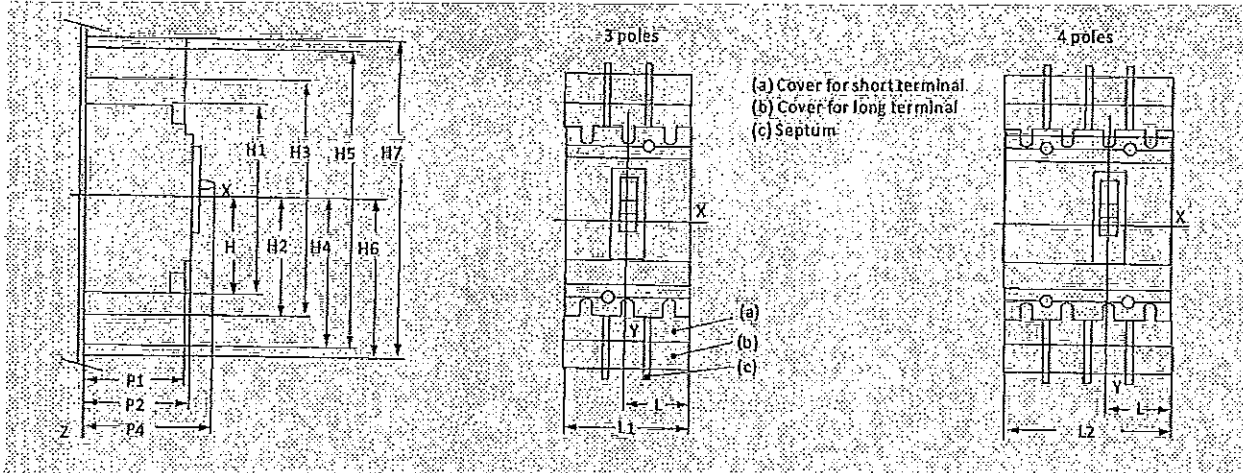
Applicable frame	IEC/EN code
	3P/4P
PN160N/S/H	PN160SC.001
PN250N/S/H	PN250SC.002
PN400N/S/H	PN400SC.003
PN630N/S/H	PN630SC.004
PN1600S/H	PN1600SC.005



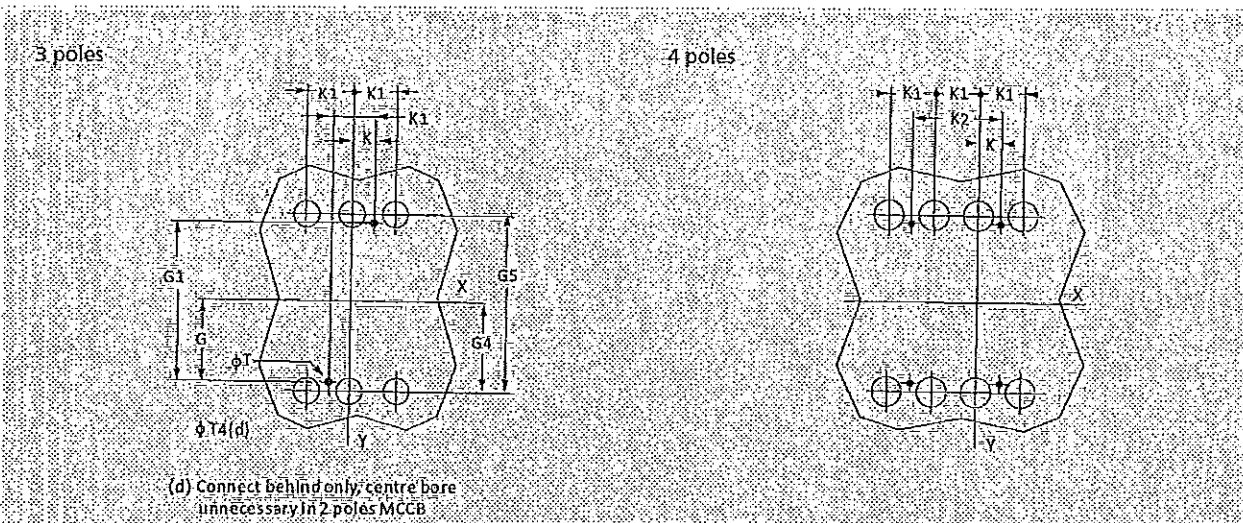


Product and installation dimension

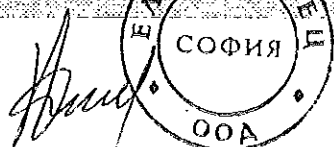
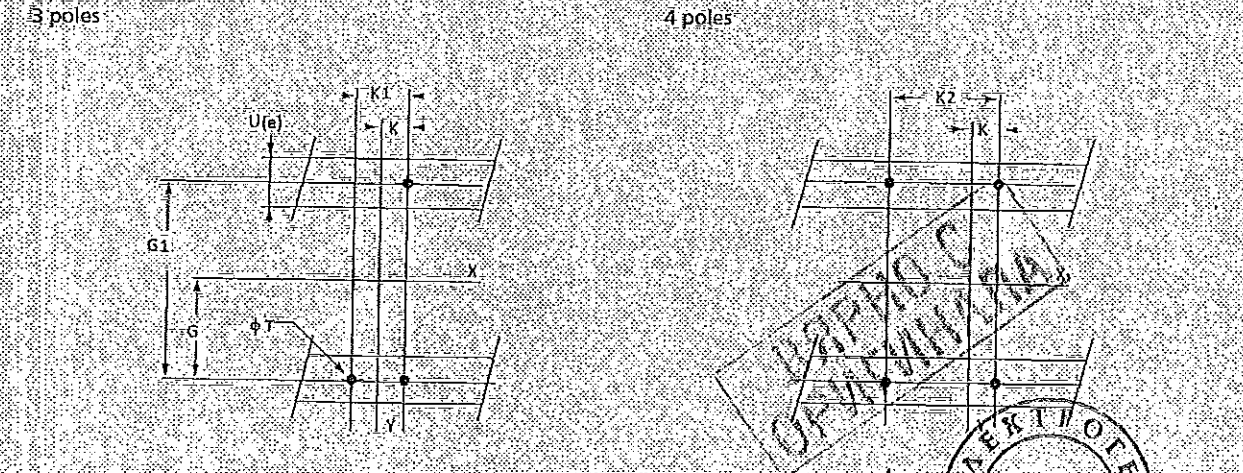
Frame 10-530



Baseboard installation dimension



DIN rail installation dimension

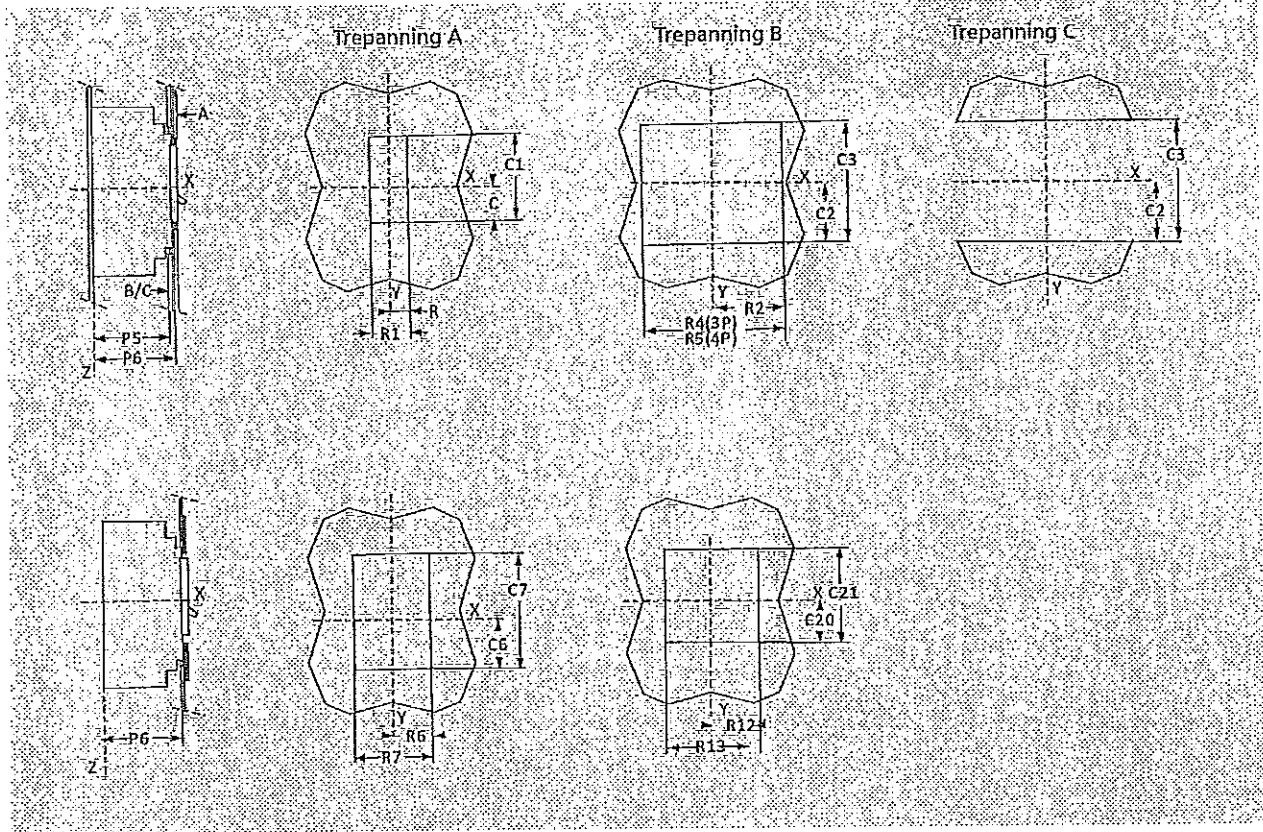


PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB 14048.2



Product cover dimension



Measurement (mm)

Model	\varnothing_1	\varnothing_2	\varnothing_3	\varnothing_4	\varnothing_5	\varnothing_6	\varnothing_7	\varnothing_8	\varnothing_9	\varnothing_{10}	\varnothing_{11}
PN-100/160/250N/H/L	29	76	54	108	43	104	34	86	62.5	125	70
PN-400/630N/H/L	41.5	116	92.5	184	56.5	146	46.5	126	100	200	113.5

Model	\varnothing_{12}	\varnothing_{13}	\varnothing_{14}	\varnothing_{15}	\varnothing_{16}	\varnothing_{17}	\varnothing_{18}	\varnothing_{19}	\varnothing_{20}	\varnothing_{21}	\varnothing_{22}
PN-100/160/250N/H/L	140	95	75	13.5	23	17.5	80.5	161	94	188	160.5
PN-400/630N/H/L	227						127.5	256	142.5	285	240

Model	\varnothing_{23}	\varnothing_{24}	\varnothing_{25}	\varnothing_{26}	\varnothing_{27}	\varnothing_{28}	\varnothing_{29}	\varnothing_{30}	\varnothing_{31}	\varnothing_{32}	\varnothing_{33}
PN-100/160/250N/H/L	321	178.5	357	17.5	35	70	52.5	105	140	81	86
PN-400/630N/H/L	480	237	474	22.5	45	90	70	140	185	95.5	110

Model	\varnothing_{34}	\varnothing_{35}	\varnothing_{36}	\varnothing_{37}	\varnothing_{38}	\varnothing_{39}	\varnothing_{40}	\varnothing_{41}	\varnothing_{42}	\varnothing_{43}	\varnothing_{44}
PN-100/160/250N/H/L	111 ⁽¹⁾	83	88	14.5	29	54	108	143	29	58	43
PN-400/630N/H/L	168	107	112	31.5	63	71.5	143	188	46.5	93	63

(1): P4=126mm, use for Compact NS250N/H/L

Model	\varnothing_{45}	\varnothing_{46}	\varnothing_{47}	\varnothing_{48}	\varnothing_{49}	\varnothing_{50}	\varnothing_{51}	\varnothing_{52}	\varnothing_{53}	\varnothing_{54}	\varnothing_{55}
PN-100/160/250N/H/L	29	76	54	108							
PN-400/630N/H/L	41.5	116	92.5	184							

(e): If use automatic auxiliary connector, $U \leq 20\text{mm}$ (NS100-250)

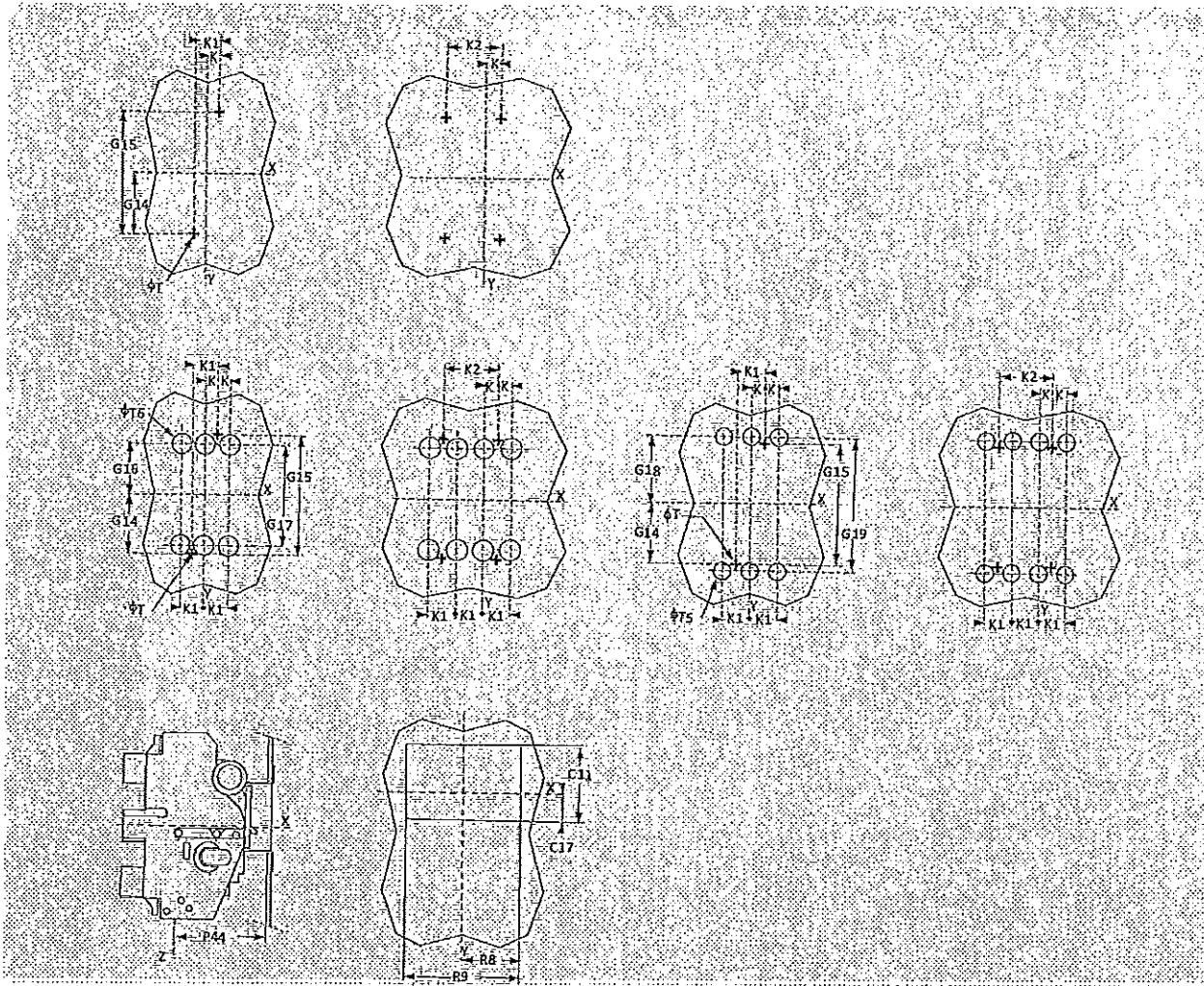
PN Series

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Hole-Making position dimension for pleg-in and draw-out wire connection in the balt panel



Measurement (mm)

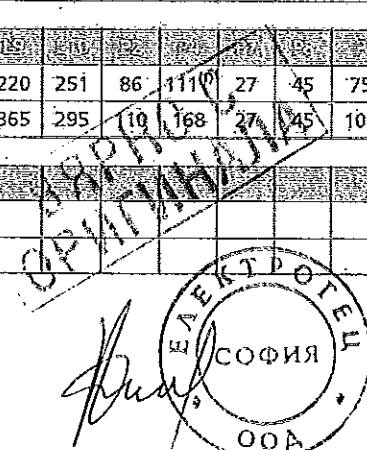
Model	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20	G21	G22	G23	G24	G25	G26	G27	G28
PN-100/160/250N/H/L	103	42.5	95	190	87	174	77.5	155	61	122	79	158	37.5	75	141	222	190	
PN-400/630N/H/L	155	56	150	300	137	274	125	250	101	202	126	252	75	150	170.5	341	283	

Model	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40	G41	G42	G43	G44	G45
PN-100/160/250N/H/L	380	208	416	102.5	205	103.5	210	17.5	35	70	54.5	109	144	74	148	183	35
PN-400/630N/H/L	567	318.5	637	157.5	315	140	280	22.5	45	90	71.5	143	188	91.5	183	228	50

Model	G46	G47	G48	G49	G50	G51	G52	G53	G54	G55	G56	G57	G58	G59	G60	G61	G62
PN-100/160/250N/H/L	70	105	52.5	105	140	92.5	185	216	220	251	86	111	27	45	75	64	32
PN-400/630N/H/L	100	145	70	140	185	110	220	250	365	295	110	168	27	45	100	86	32

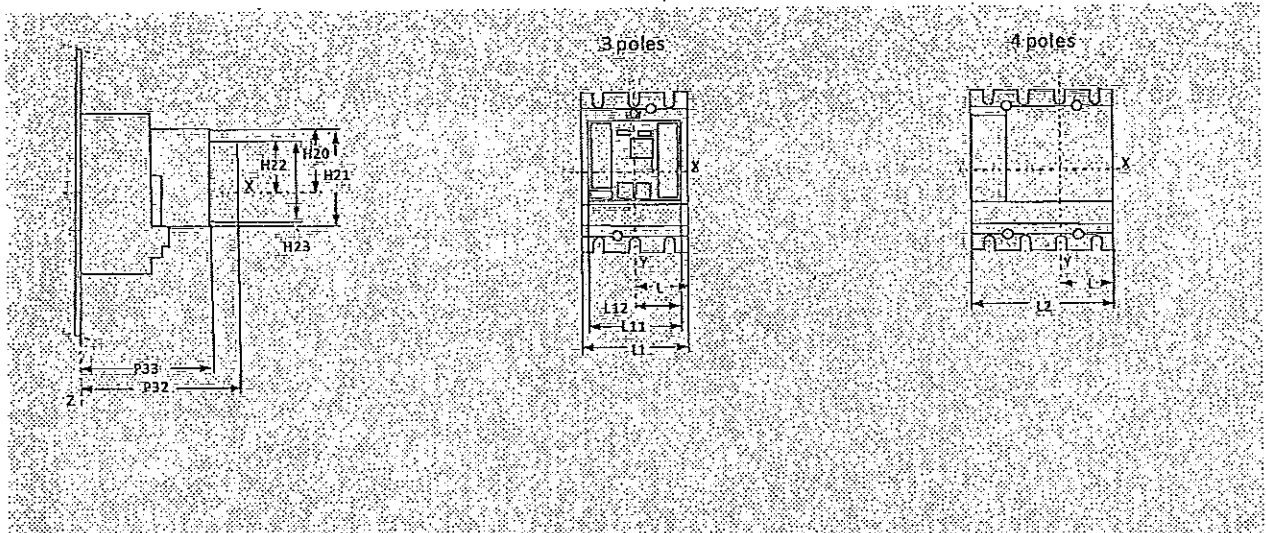
Model	G63	G64	G65	G66	G67	G68	G69	G70	G71	G72	G73	G74	G75	G76	G77	G78	G79
PN-100/160/250N/H/L	123	74	148	≤32	6	24	30										
PN-400/630N/H/L	147	90	180	≤32	6	33	33										

(1): P4=126mm, use for Compact NS250N/H/L
(e): If use automatic auxiliary connector, U≤20mm(NS100-250)

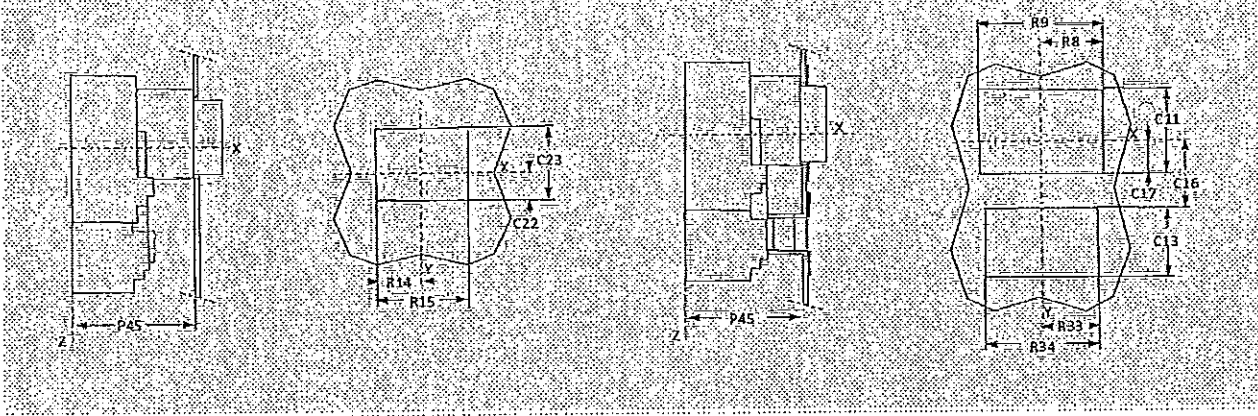




Motor operation handle dimension



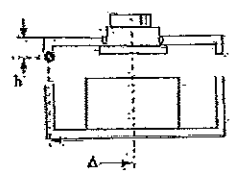
Motor operation handle installation dimension



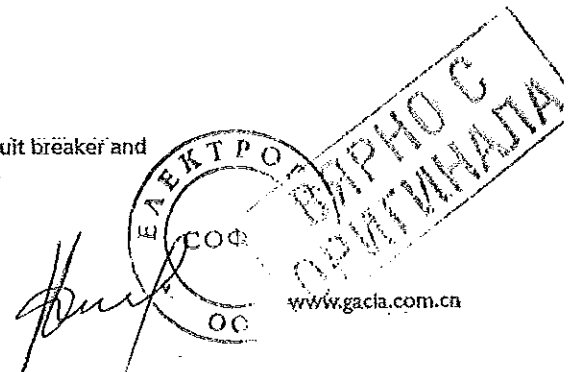
Measurement (mm)

Model	C11	C22	C23	C17	C16	C13	R33	R34	R32	R31	R30	R29	R28
PN-100/160/250N/H/L	103	82.5	56	42.5	29	76	62.5	97	45.5	73	52.5	105	
PN-400/630N/H/L	155	82.5	116.5	56	47.5	126	100	152	83	123	70	140	

Model	R27	R26	R25	R22	R32	R31	R30	R29	R28	R27	R26	R25	R24
PN-100/160/250N/H/L	140	91	45.5	178	143	145	74	148	48.5	97	74	148	
PN-400/630N/H/L	185	123	61.5	250	215	217	90	180	64.5	129	74	148	

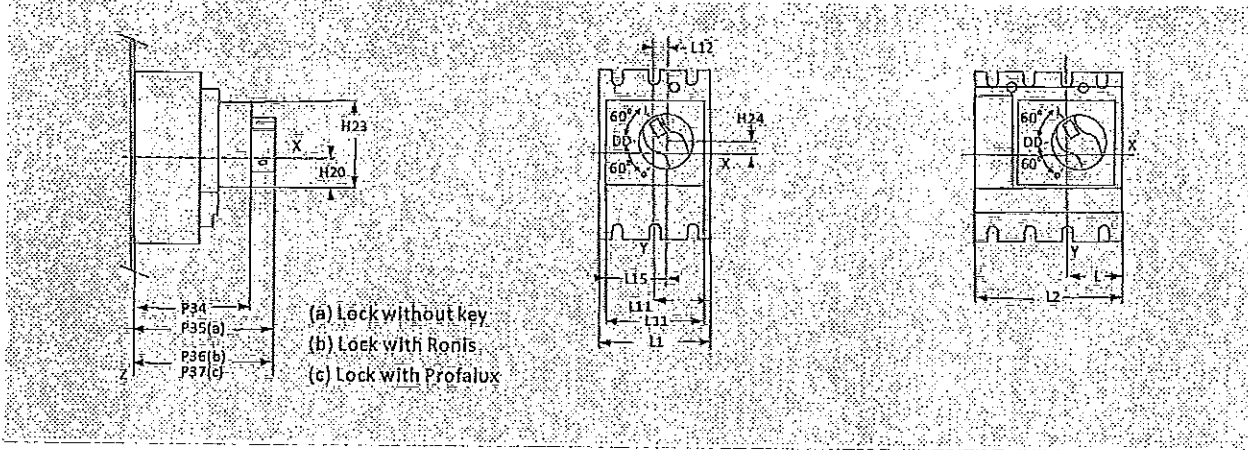


Remark: When we open a hole on the door, the distance between the center of circuit breaker and door spindle is more than $100+(h*5)$.

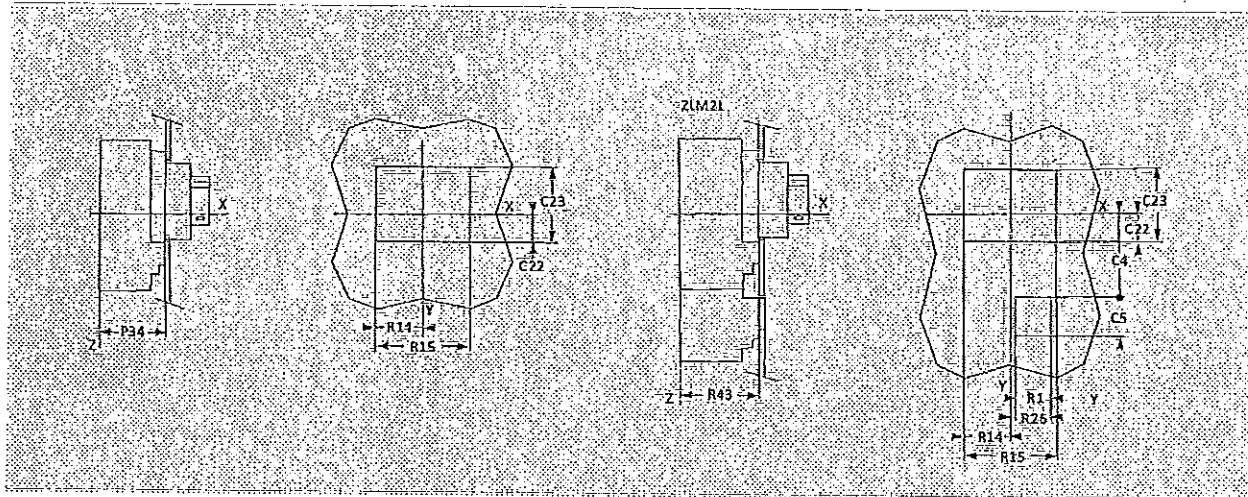




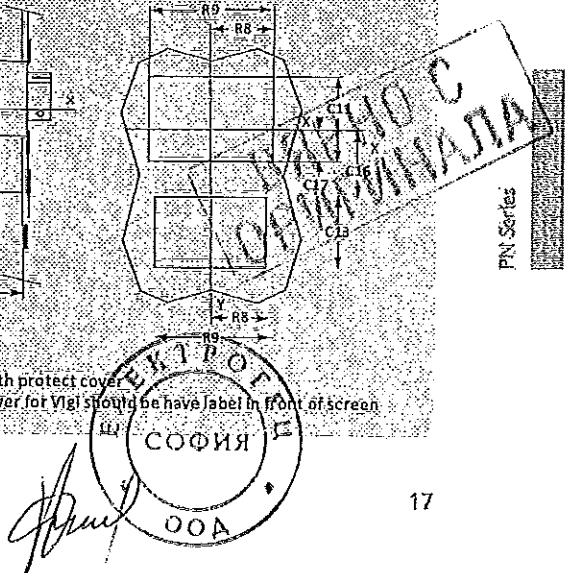
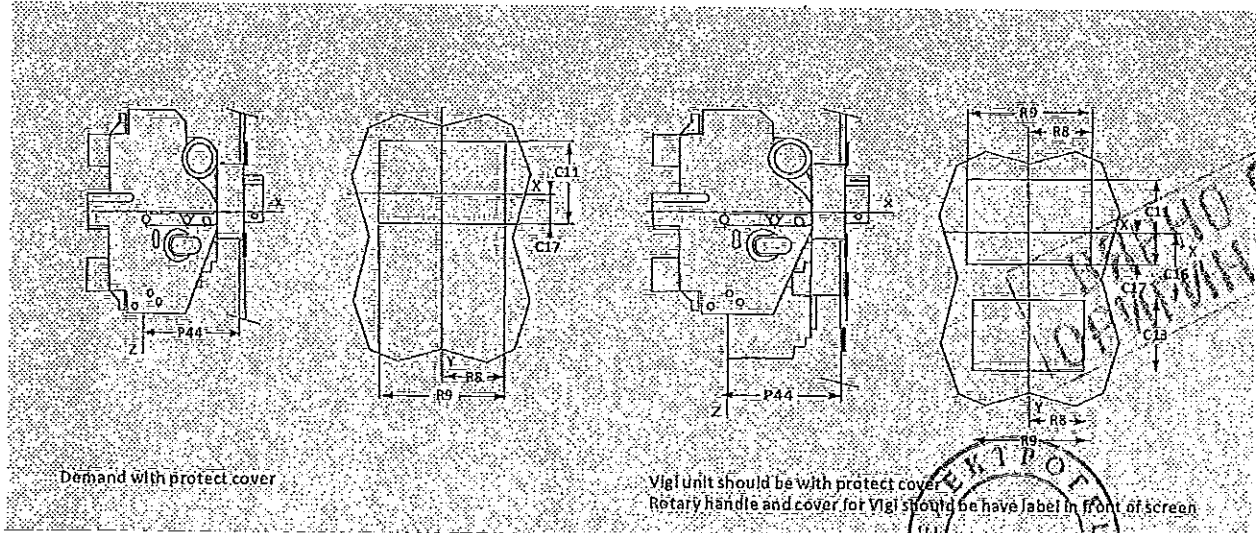
Direct rotary handle dimension



Direct rotary handle cover dimension



Direct rotary handle cover dimension (with plug-in)

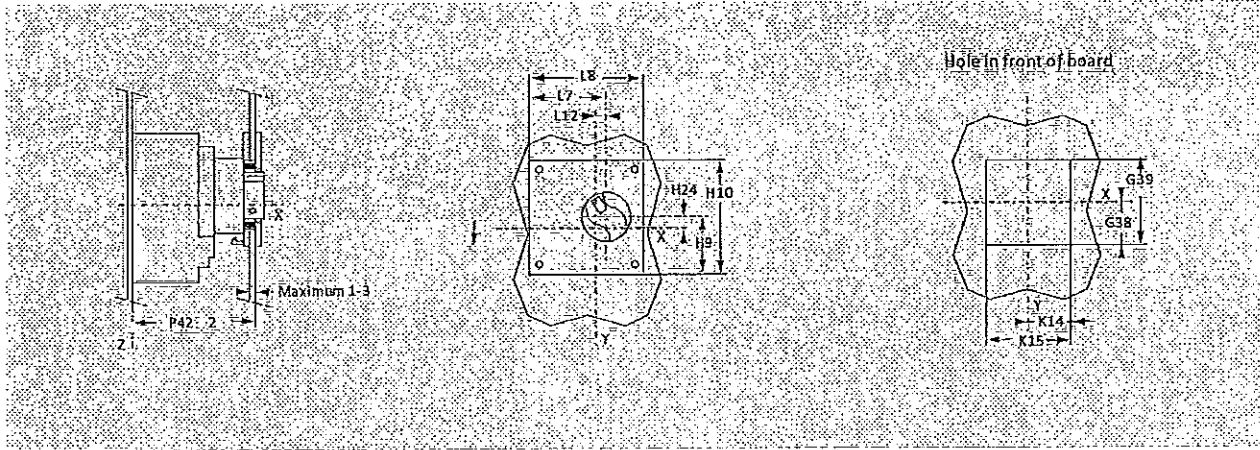


PN Moulded Case Circuit Breaker

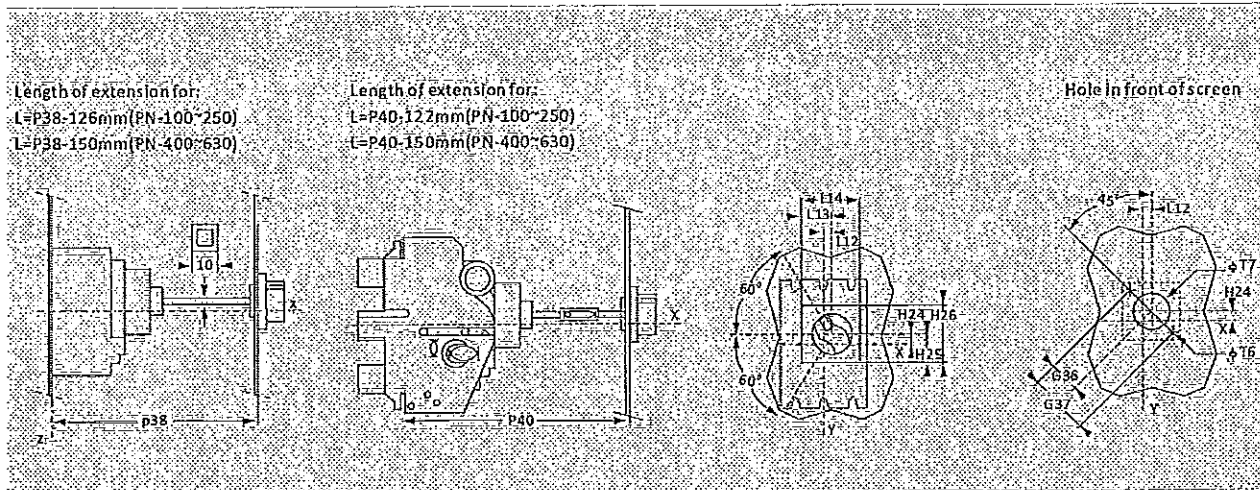
IEC/EN 60947-2, GB14048.2



Outspread rotary handle dimension



Outspread rotary handle cover dimension



Measurement (mm)

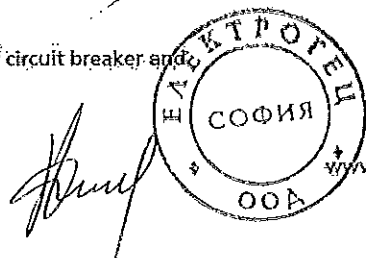
Model	W	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
PN-100/160/250N/H/L	86	37	103	82.5	55	42.5	29	76	36	72	41	100	60	120	28	73	9
PN-400/630N/H/L	147.5	37	155	82.5	166.5	56	41.5	126	36	72	51	146	63	160	40	123	24.5

Model	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	
PN-100/160/250N/H/L	37.5	75	50	100	52.5	105	140	69	120	91	9.25	37.5	75	55	121	155	156
PN-400/630N/H/L	37.5	75	72.5	145	70	140	185	85	160	123	5	37.5	75	66.5	145	179	180

Model	W33	W34	W35	W36	W37	W38	W39	W40	W41	W42	W43	W44	W45	W46	W47		
PN-100/160/250N/H/L	164	≥185	≥248	125	89	123	29	74	148	48.5	97	14.5	29	74	148	4.2	50
PN-400/630N/H/L	188	≥209	≥272	149	112	147	63	90	180	64.5	129	32	29	74	148	4.2	50

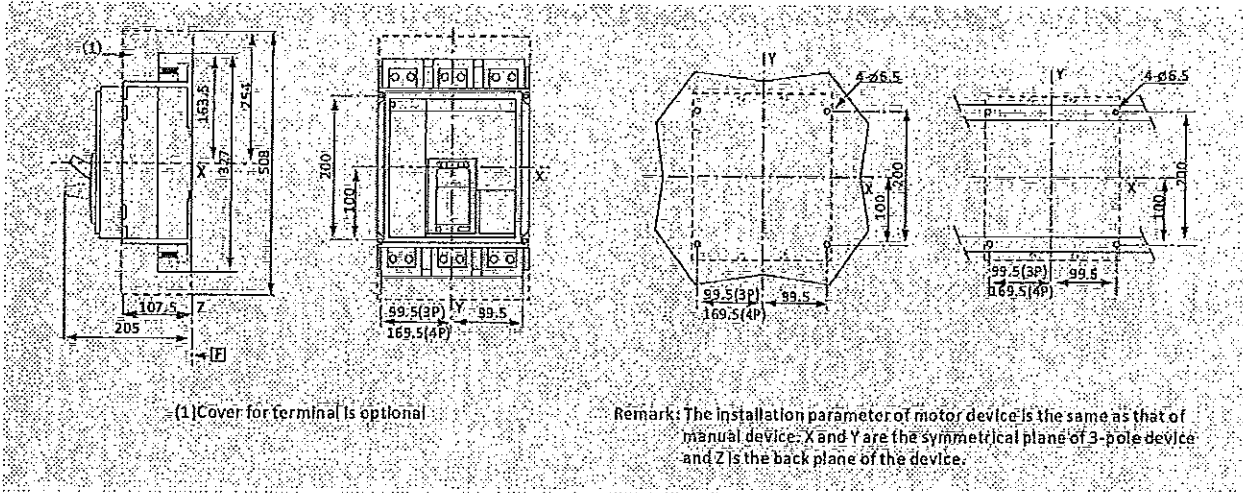
(1) ≤ 600mm

Remark: When we open a hole on the door, the distance between the center of circuit breaker and door spindle is more than $100 + (h \times 5)$.

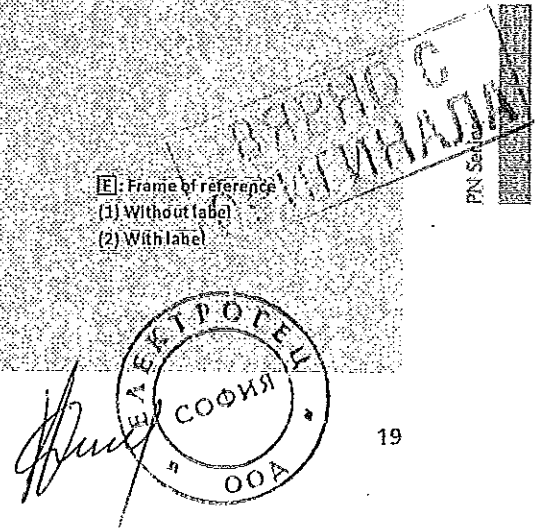
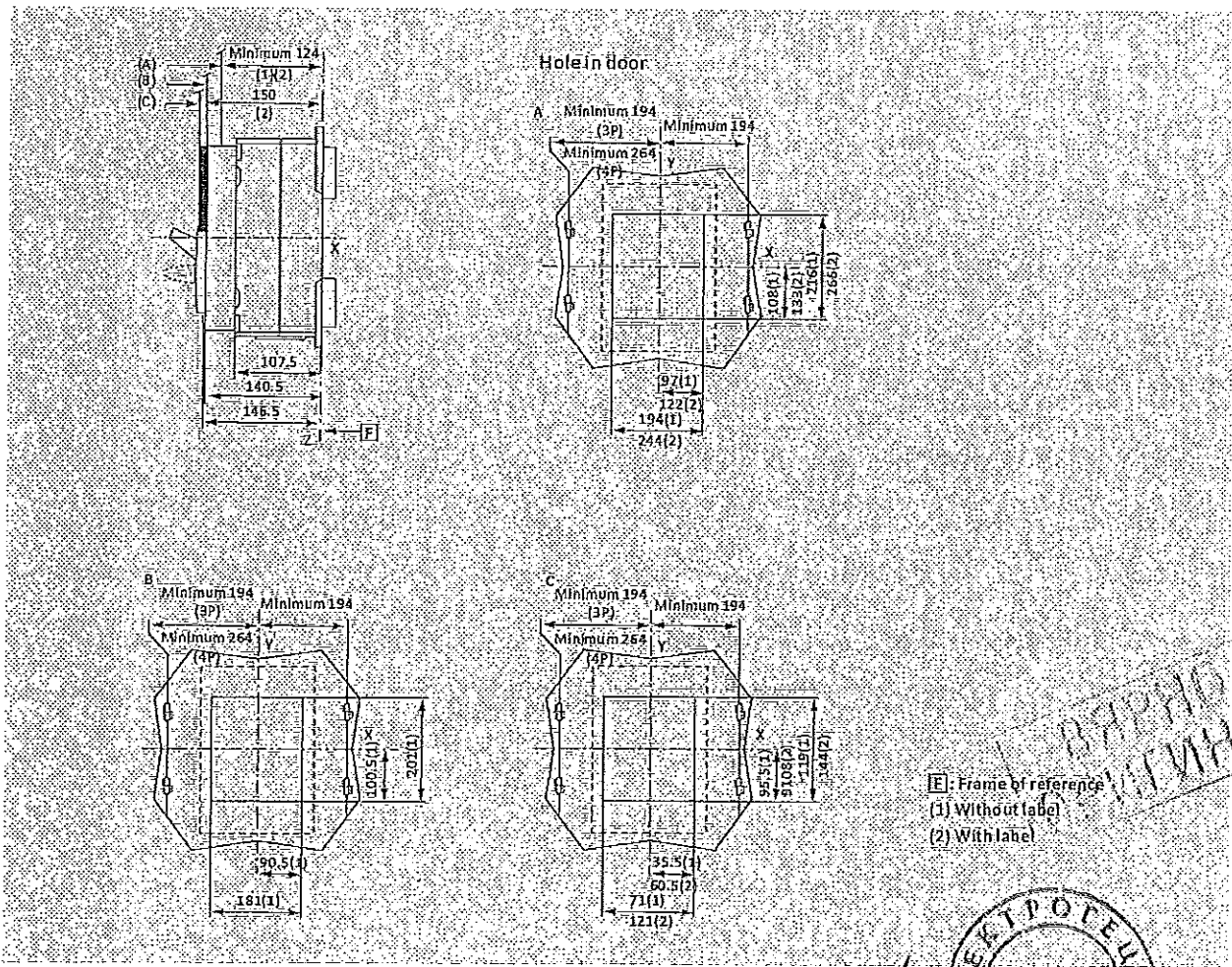




Product dimension(Frame 1600)

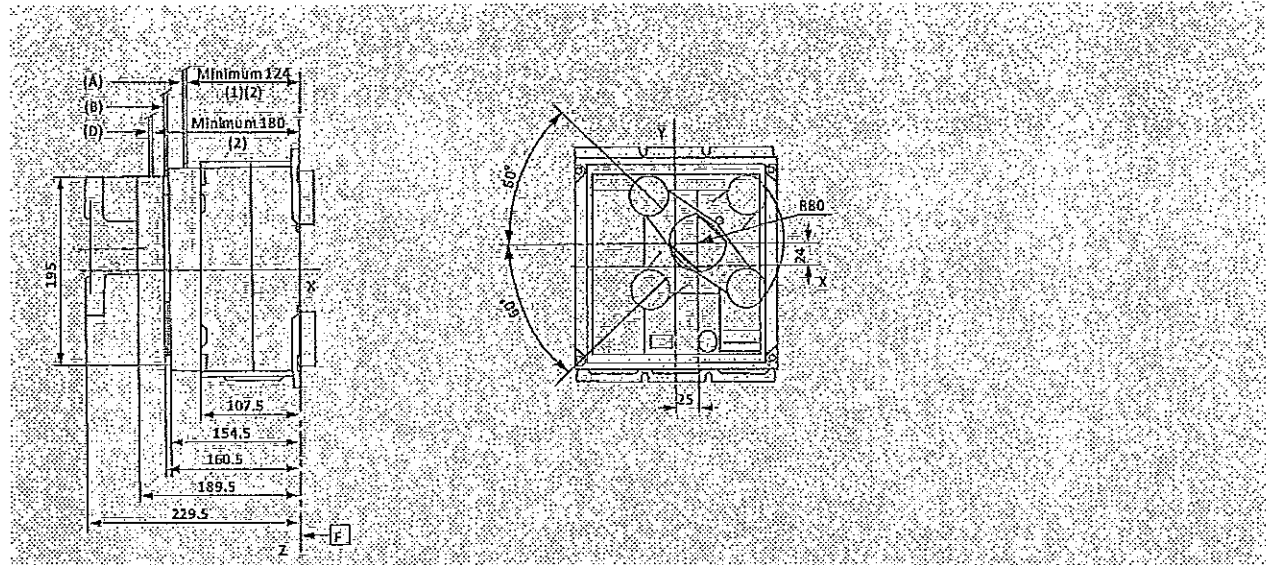


Product cover dimension

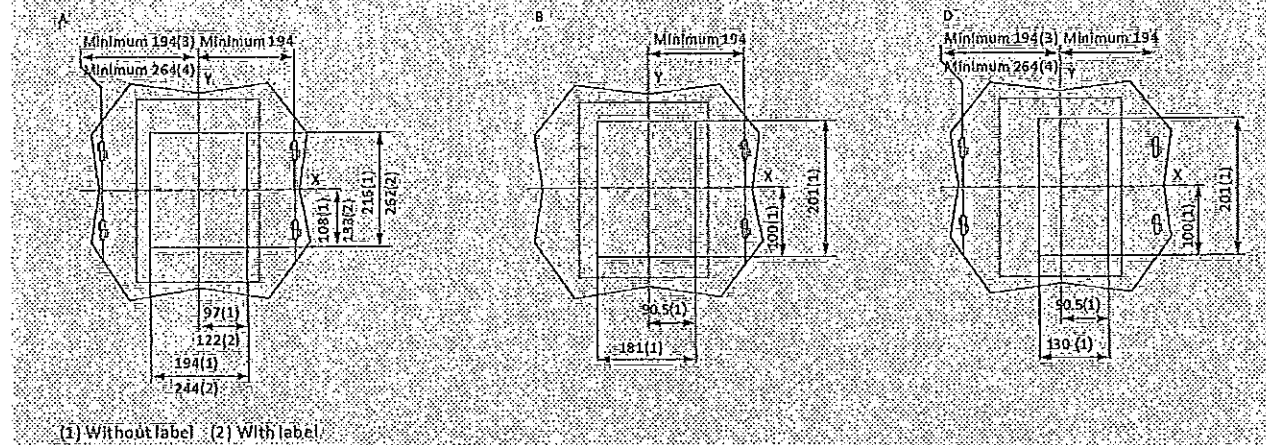




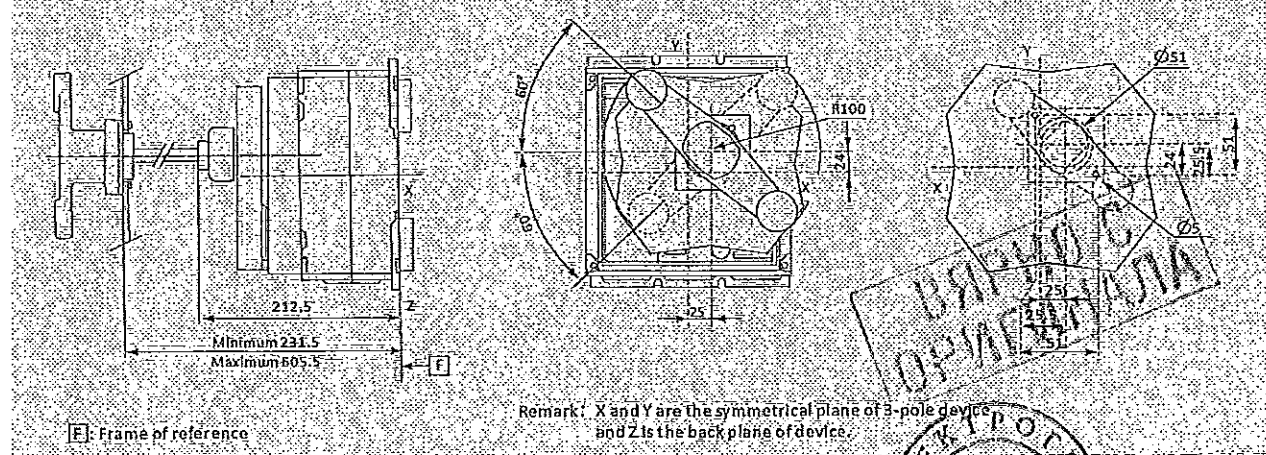
Rotary handle dimension



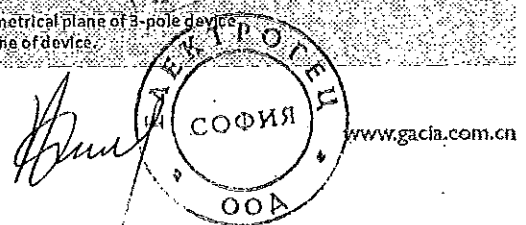
Rotary handle cover dimension



Outspread rotary handle dimension



PN Series

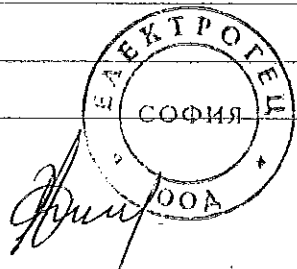


PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2



Lined area for technical drawing or notes.

PN Series



SYSTEM CERTIFICATION

CERTIFICATE TUV NORD

Management system as per
SA-8000 : 2008

ZHEJIANG GACIA ELECTRICAL APPLIANCE CO., LTD.
Comprehensive Building, No.545, Dongdajie, Daxuewang Industry
Zone, North Bailiang, Yueqing City, Wenzhou, Zhejiang Province, P.
R. China


The Management system is in conformity with the SA-8000:2008

Design and Manufacturing of Circuit Breaker

Contract Registration No. SA 14 (1008)
Valid From: 2010-07-29

Issue Date: 2010-07-29
Term of Validity: 2013-07-29

TUV NORD CERT



Kaisin Certification (Beijing) Co., Ltd.
Certificate of Registration

Registration No. 140101040004

This is to certify that

Zhejiang Gacia Electrical Appliance Co., Ltd.
Address: No.545, Dongdajie, Daxuewang Industry Zone, Bailiang, Yueqing
City, Wenzhou, Zhejiang Province, China




The Management system is in conformity with

GB/T24001-2004 / ISO14001:2004 standard

Scope: The Relative Equipment Management Activities about
Manufacture of Mini Circuit Breaker, Earth Leakage
Circuit Breaker

Issue Date: 2010-07-29
Term of Validity: 2013-07-29

CERTIFICATE OF REGISTRATION

MANAGEMENT SYSTEM
CNAS 0001-11

Kaisin Certification (Beijing) Co., Ltd.
Certificate of Registration

Registration No. 140101040004

This is to certify that

Zhejiang Gacia Electrical Appliance Co., Ltd.
Address: No.545, Dongdajie, Daxuewang Industry Zone, Bailiang,
Yueqing City, Wenzhou, Zhejiang Province, China

The Occupational Health & Safety system is in conformity with

GB/T28001-2001

Scope: The Relative Situation and Occupation Health Safety
Management Activities about Design, Develop, Manufacture
and Service of Mini Circuit Breaker, Earth Leakage Circuit
Breaker, Molded Case Circuit Breaker in Zhejiang Gacia
Electrical Appliance Co., Ltd. Which Located in No.545,
Dongdajie, Daxuewang Industry Zone, Bailiang, Yueqing
City, Wenzhou, Zhejiang

Issue Date: 2010-07-29
Term of Validity: 2013-07-29
Transfer Date: 2011-06-28

CERTIFICATE OF REGISTRATION





MANAGEMENT SYSTEM
CNAS 0001-11

Kaisin Certification (Beijing) Co., Ltd.
Certificate of Registration

Registration No. 140101040004

This is to certify that

Zhejiang Gacia Electrical Appliance Co., Ltd.
Address: No.545, Dongdajie, Daxuewang Industry Zone, Bailiang, Yueqing
City, Wenzhou, Zhejiang Province, China




The Quality system is in conformity with

GB/T19001-2008 / ISO9001:2008

Scope: Design, Develop, Manufacture and Service of Mini Circuit
Breaker, Earth Leakage Circuit Breaker, Molded Case
Circuit Breaker

Issue Date: 2010-07-29
Term of Validity: 2013-07-29
Transfer Date: 2011-06-28

CERTIFICATE OF REGISTRATION

MANAGEMENT SYSTEM
CNAS 0001-11

00A

ИЗДАНО С
ДИПЛОМАТА

PRODUCT CERTIFICATION



CERTIFICATE

Issued to:
 Applicant:
 Zhejiang Gacia Electrical Appliances Co., Ltd.
 8448 Dongqiao, Baimawang Industrial Zone,
 Baimawang, Yueqiao, Zhejiang, 315603, China

Manufacturer/Issuer:
 Zhejiang Gacia Electrical Appliances Co., Ltd.
 8448 Dongqiao, Baimawang Industrial Zone,
 Baimawang, Yueqiao, Zhejiang, 315603, China

Product(s): Module/Case smart breaker
Type(s) (name): GACIA
Type(s) (model): PMS30E, PMS30E, PMS30E, LMS30E, LMS30E, LMS30E

The product and any necessary technical details is specified in the Annex to this certificate and the documents referred to.

DEKRA hereby declares that the above mentioned product has been certified in accordance with:
 - a type test according to EN 60897-2:2006 + A1:2009 + A2:2010 + A3:2011
 - an inspection of the production location according to CEI/IEC 60364-4-712:2011
 - a certification agreement with the number 2152291

DEKRA hereby grants the right to use the KEVA/KEUR certification mark.

The KEVA/KEUR Certification mark may be applied to the product as specified in the certificate for the duration of the KEVA/KEUR certification agreement and under the conditions of the KEVA/KEUR certification agreement.

This certificate is issued on 15 January 2013 and expires upon withdrawal of one of the certificates concerned.

Certificate number: 20130311-0

DEKRA Certification B.V.

[Signature]
 F.S. Smeets
 Certification Manager

Original publication of this certificate is allowed.

As issuing, inspection, auditing and certification activities of the former KEVA/KEUR by the former part of the DEKRA Certification Group.

ACCREDITED BY:
 THE DUTCH COUNCIL
 FOR ACCREDITATION

CERTIFICATE

Issued to:
 Applicant:
 Zhejiang Gacia Electrical Appliances
 Co., Ltd.
 8448 Dongqiao, Baimawang Industrial Zone,
 Baimawang, Yueqiao, Zhejiang, 315603, China

Manufacturer/Issuer:
 Zhejiang Gacia Electrical Appliances
 Co., Ltd.
 8448 Dongqiao, Baimawang Industrial Zone,
 Baimawang, Yueqiao, Zhejiang, 315603, China

Product(s): Module/Case smart breaker
Type(s) (name): GACIA
Type(s) (model): PMS30E, PMS30E, PMS30E, LMS30E, LMS30E, LMS30E

The product and any necessary technical details is specified in the Annex to this certificate and the documents referred to.

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 - a type test according to the standard EN 60897-2:2006 + A1:2009 + A2:2010 + A3:2011
 - an inspection of the production location according to CEI/IEC 60364-4-712:2011
 - a certification agreement with the number 2152291

DEKRA hereby grants the right to use the KEVA/KEUR certification mark.

The KEVA/KEUR Certification mark may be applied to the product as specified in the certificate for the duration of the KEVA/KEUR certification agreement and under the conditions of the KEVA/KEUR certification agreement.

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Certificate number: 20130311-0

DEKRA Certification B.V.

[Signature]
 F.S. Smeets
 Certification Manager

Original publication of this certificate is allowed.

As issuing, inspection, auditing and certification activities of the former KEVA/KEUR by the former part of the DEKRA Certification Group.

ACCREDITED BY:
 THE DUTCH COUNCIL
 FOR ACCREDITATION

DEKRA Certification B.V., Vriesdijkweg 118, 6117 AR Amstelveen, P.O. Box 124, 6162 ED Amstelveen, The Netherlands
 T +31 20 350 2120 F +31 20 350 2121 00 www.dekra-certification.com Email: info@amstelveen.dekra.nl

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

OB TEST CERTIFICATE

Issued to: DEKRA Certification B.V.
Product: Module/Case smart breaker

Applicant: ZHEJIANG GACIA ELECTRICAL APPLIANCE CO., LTD.
Manufacturer: ZHEJIANG GACIA ELECTRICAL APPLIANCE CO., LTD.
Country: CHINA

Product and technical description: See Annex for further details

Technical details: PMS30E, PMS30E, PMS30E, LMS30E, LMS30E, LMS30E

As issued information: 00947262-01-01
 330311-00

DEKRA

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

CB TEST CERTIFICATE

Issued to: DEKRA Certification B.V.
Product: Module/Case smart breaker

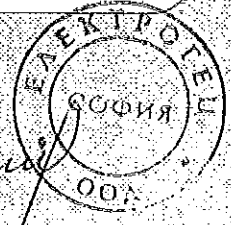
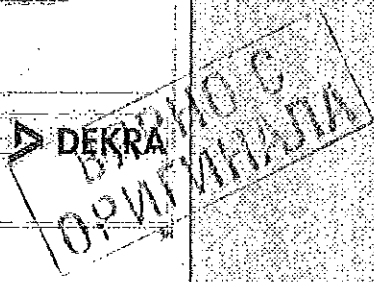
Applicant: ZHEJIANG GACIA ELECTRICAL APPLIANCE CO., LTD.
Manufacturer: ZHEJIANG GACIA ELECTRICAL APPLIANCE CO., LTD.
Country: CHINA

Product and technical description: See Annex for further details

Technical details: PMS30E, PMS30E, PMS30E, LMS30E, LMS30E, LMS30E

As issued information: 00947262-01-01
 330311-00

DEKRA



BRAND MARKETING

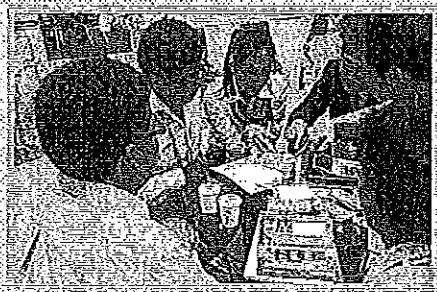
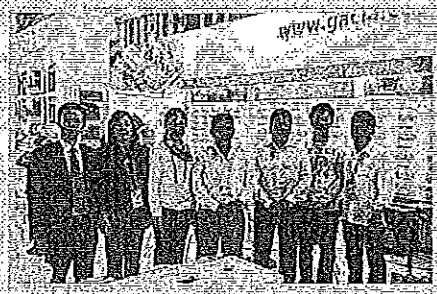
Gacia Company is constantly strengthening its capacity of product technology research and development, and after-sale service. In 2011, our company was awarded Zhejiang High-tech Enterprise, Zhejiang Patent Demonstration Enterprise, and Provincial High-tech Enterprise Research Center. "Customer Is God" is always our principle.



Areas Our Products Are Sold to:

Gacia products are sold to areas including Europe, North and South America, Africa, Southeast Asia, and East Asia etc. In many countries of those areas, some of our customers are granted exclusive sales right, which helps customers expand market for Gacia products. What's more, Gacia Company has established subsidiaries in most of provinces in China.





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СОФИЯ
ООО

LEADER CARE

Gacia has complete independent research & development capacity, investing 1 million dollars in setting up a standardization electrical-appliance laboratory and purchasing 10 million dollars of professional electrical production equipment, and is now one of a few professional electrical production enterprises owning the same design ideas as that of world top electrical companies such as European Schneider, ABB, Legrand, Eton, and invests over 7 million dollars in total in developing 7 series including S, BV, G, L, N, M and new products with 100 kinds of specifications and models. In 2012, the total output reaches 90 million dollars.

Gacia is one of the three biggest export electrical manufacturers including Chint in the first China domestic low voltage electrical manufacture base in Yueqing, Wenzhou.

Gacia, with near 100 customers in over 50 countries in the World, has set up Gacia brand agents in 29 countries and established cooperation with some of the world fortune 500 enterprises and world famous electrical brands such as Korea Hyundai, US GE Electric.

Gacia has spent 1.8 million dollars in total in acquiring market admittance certification qualifications of over 30 countries, such as KEMA, VDE, TUV, SEMKO, PCT, CE, CB, CCC, ROHS, and four systems certification: ISO9001, ISO14001, OHSAS18001, SA8000 which have achieved remarkable market effects.

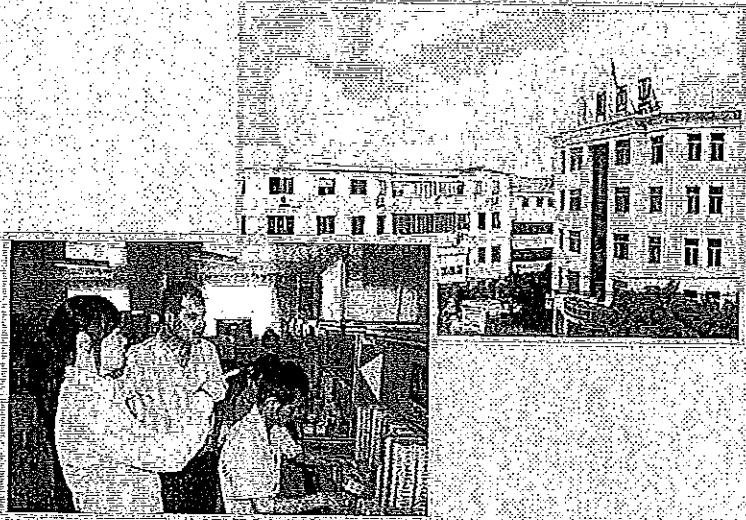
Warmly welcome customers from all over the world to visit Gacia.

President *Manhuai Wu*
Gacia Electrical Appliance Co., Ltd



Enterprise Spirit

- Concentration
- Devotion
- Innovation
- Win-Win



Enterprise Goal

Build up the most professional circuit breaker brand in China, be devoted to the cooperation with world famous brands.

World fortune 500 cooperation customers



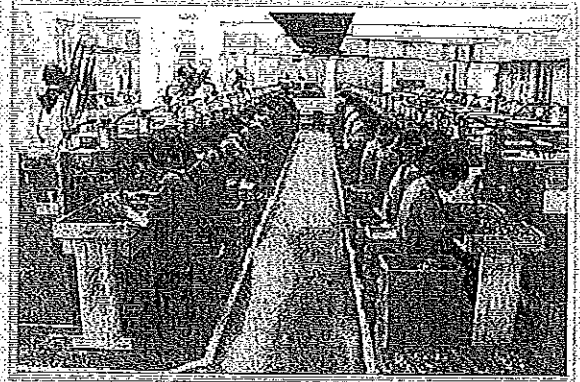
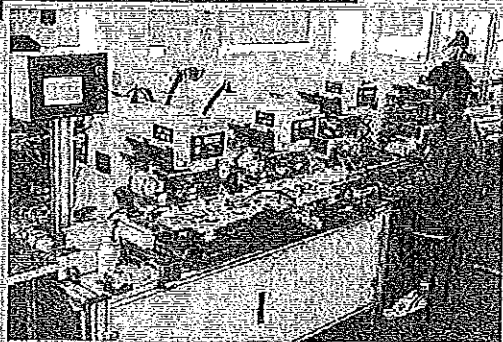
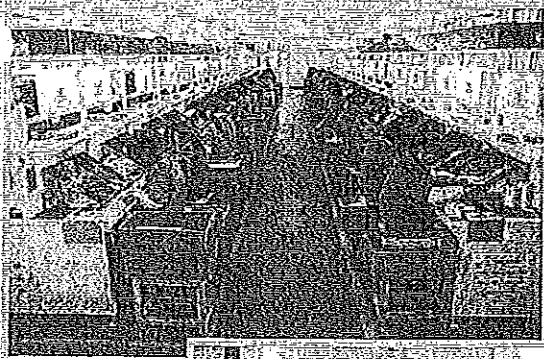
ВАРНО С
ОРИГИНАЛА

ЕЛЕКТРОТЕЦ
СОФИЯ
ООА

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BRAND STORY

100 years ago, a war broke out between America and Spain. A US army Lieutenant Rowen underwent great hardships and sent a secret letter from US President Mckinley to Cuba Revolution Army leader General Gacia. Thus, the whole war situation was finally changed. Rowen's story of loyalty, devotion to responsibility, and pursuit for success became widely known. "A message to Gacia" becomes a symbol of pursuit for success from generation to generation.

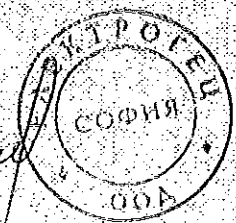


COMPANY INTRODUCTION

Gacia Electrical Appliance Co., Ltd is a national high-tech enterprise and professional circuit breaker manufacturer which is involved in research&development, manufacture, China Chamber of Commerce for Machinery and Electronic Products Import and Export(CCCME), specializes in production and export of MCB, RCCB, RCD/RCBO, MCCB. During the past years, Gacia established three circuit breaker manufacture bases in Shanghai, Zhejiang and Jiangxi, with total plant area 160000 M2, 1750 workers, technical research&development team of over 100 staffs, international marketing team of 35 staffs, and annual output of 65 million circuit breakers.

ВАРНО
ОРИГИНАЛ

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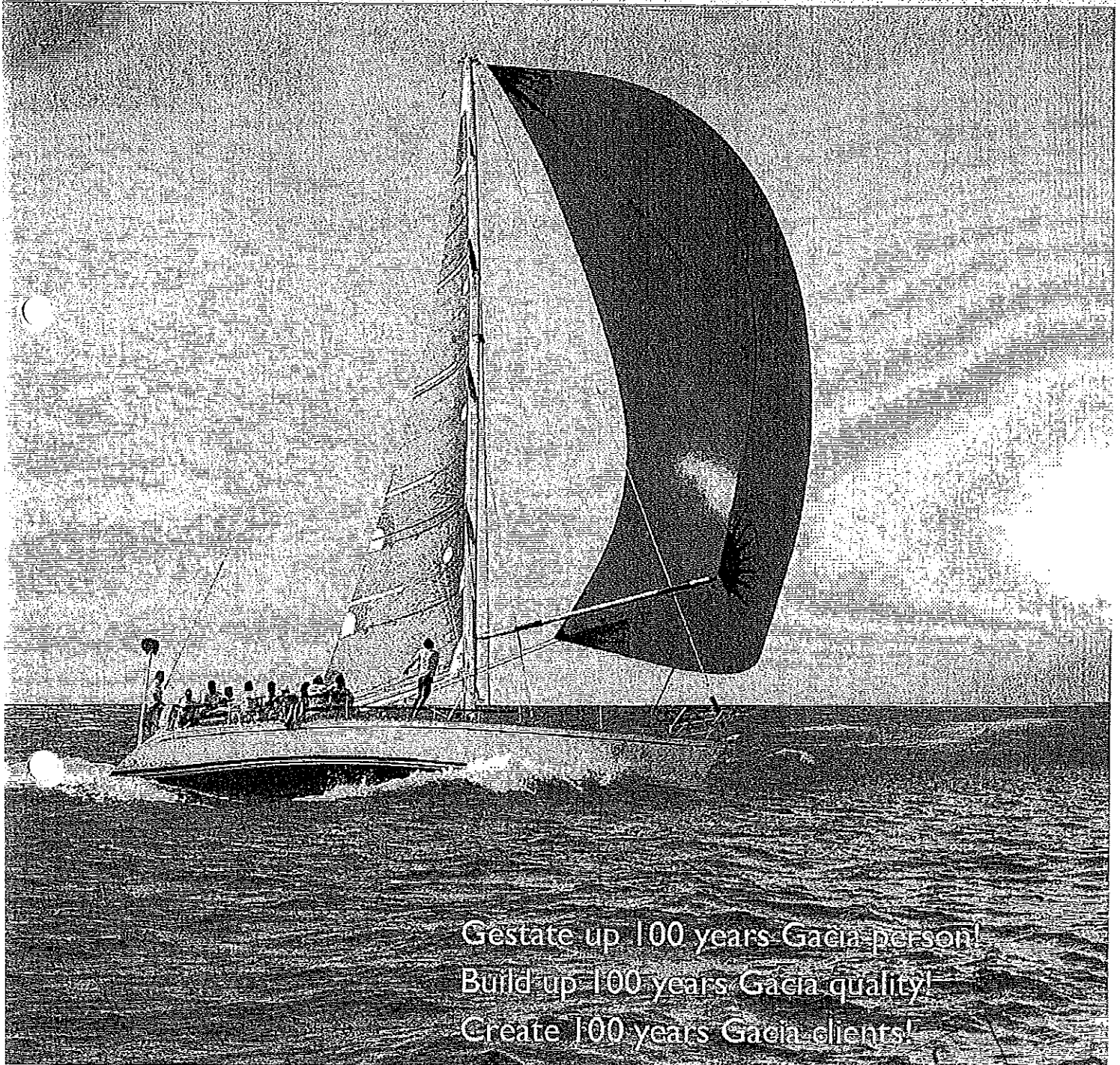


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Operation Idea



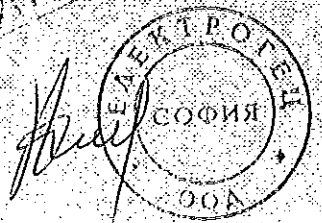
Gestate up 100 years Gacia person!
Build up 100 years Gacia quality!
Create 100 years Gacia clients!

Recent Management Goal (management idea)

Standardization
Normalization

Systematization
Institutionalization

ВАРНОЕ
ОРИГИНАЛ



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 автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А”

Приложение № 2

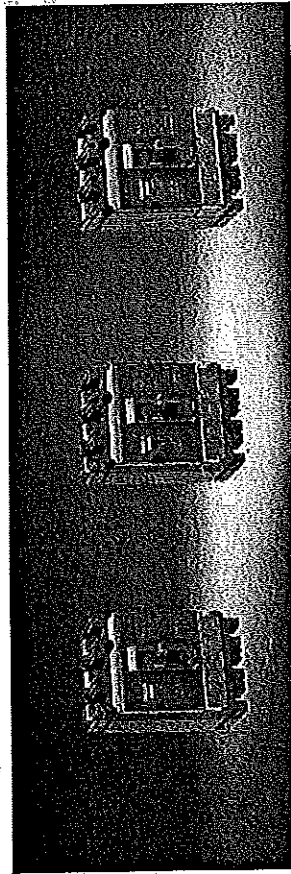
ВЯРНО С
ОРИГИНАЛА



PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2



Technical parameters

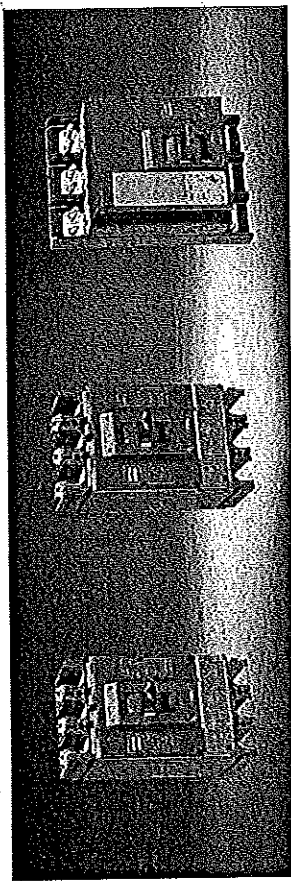


PN100		PN160		PN250	
Rated current of frame size I _{nm} (A)	100	160	250		
Rated current I _n (A)	16,20,25,32,40,50,63,80,100	125,160	200,225,250		
Rated insulation voltage U _i	750V	750V	750V		
Rated operational voltage U _e	400V/415V	400V/415V	400V/415V		
Number of poles	3/4	3/4	3/4		
AC400V/50Hz O-CO(Icu) Rated ultimate short-circuit breaking capacity (kA)	35	50	65	35	65
AC400V/50Hz O-CO(Ics) Rated service short-circuit breaking capacity (kA)	15±75% Icu				
(U _{imp}) Rated impulse withstand voltage (kV)	8000	8000	8000		
Dielectric property (kV)	3000	3000	3000		
Total cycles	10000	8000	8000		
Electrical life	1500	1000	1000		
Mechanical life	8500	7000	7000		
Flashover distance (mm)	550	550	550		
Utilization category	A	A	A		
Main circuit	AC-15	AC-15	AC-15		
Auxiliary circuit	10S/140	10S/140	10S/140		
W(mm)	161/161	161/161	161/161		
L(mm)	125/125	125/125	125/125		
H(mm)	161/161	161/161	161/161		
Outline dimensions	3P/4P	3P/4P	3P/4P		

PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB14048.2



Technical parameters



PN400		PN630		PN1250	
Rated current of frame size I _{nm} (A)	400	630	1600		
Rated current I _n (A)	350,400	500,630	800,1000,1250,1600		
Rated insulation voltage U _i	750V	750V	750V		
Rated operational voltage U _e	400V/415V	400V/415V	400V/415V		
Number of poles	3/4	3/4	3/4		
AC400V/50Hz O-CO(Icu) Rated ultimate short-circuit breaking capacity (kA)	35	50	70	35	50
AC400V/50Hz O-CO(Ics) Rated service short-circuit breaking capacity (kA)	15±75% Icu				
(U _{imp}) Rated impulse withstand voltage (kV)	8000	8000	8000		
Dielectric property (kV)	3000	3000	3000		
Total cycles	5000	5000	5000		
Electrical life	1000	1000	1000		
Mechanical life	4000	4000	4000		
Flashover distance (mm)	550	550	550		
Main circuit	A/B	A/B	A/B		
Auxiliary circuit	AC-15	AC-15	AC-15		
W(mm)	140/185	140/185	140/185		
L(mm)	256/256	256/256	256/256		
H(mm)	170/170	170/170	170/170		
Outline dimensions	3P/4P	3P/4P	3P/4P		



Handwritten signature

PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2

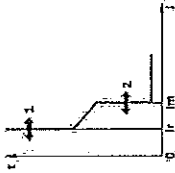


Low Voltage Power Distribution Protection PN100-630

PN100-250 circuit breaker is attached with electro-magnetic or electronic tripping device (PN100, PN160 and PN250, N.S.H type). With a mechanical structure, it can prevent the mismatching between tripper and circuit breaker from happening.



1. Protection function can be realized through adjusting the knob.
2. Overload protection, thermal protection can be adjusted.
3. Short-circuit protection: It can be divided into fixed and adjustable types according to current specification magnetic protection.
4. Neutral line protection.



- 4P 3d type (neutral line without protection);
- 4P 3d +N/2 type (neutral line protection 0.5In) or 4P 4d type (neutral line protection In);
- Overload Thermal Protection Adjustable Value (I_{th});
- Protection Setting Value Adjustable or Fixed Short-circuit Equit.

Circuit Breaker	Adjustable range 0.7-1 × In										
	PN100	PN160	PN250	190	300	400	500	500	500	640	800
Overload Protection (Thermal Protection)	■	■	■	■	■	■	■	■	■	■	■
Short-circuit Current Protection (Electro-magnetic Tripper)	■	■	■	■	■	■	■	■	■	■	■
Short-circuit Current Value (A)	190	300	400	500	500	500	500	500	640	800	1250
Neutral Line Protection	■	■	■	■	■	■	■	■	■	■	■
Neutral Line Protection 0.5In	■	■	■	■	■	■	■	■	■	■	■
Neutral Line Protection In	■	■	■	■	■	■	■	■	■	■	■

Circuit Breaker	Adjustable range 0.7-1 × In										
	PN100	PN160	PN250	190	300	400	500	500	500	640	800
Overload Protection (Thermal Protection)	■	■	■	■	■	■	■	■	■	■	■
Short-circuit Current Protection (Electro-magnetic Tripper)	■	■	■	■	■	■	■	■	■	■	■
Short-circuit Current Value (A)	190	300	400	500	500	500	500	500	640	800	1250
Neutral Line Protection	■	■	■	■	■	■	■	■	■	■	■
Neutral Line Protection 0.5In	■	■	■	■	■	■	■	■	■	■	■
Neutral Line Protection In	■	■	■	■	■	■	■	■	■	■	■



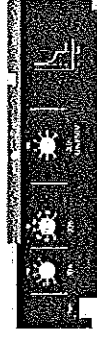
PN Moulded Case Circuit Breaker

IEC/EN 60947-2, GB14048.2

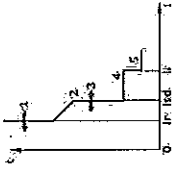


Technical Parameter:

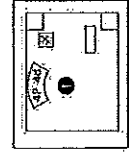
Electrical Trip Unit:
 ■ Protection:
 LT (Long Time Delay) Overload protection, Adjustable Ir Setting Value
 ST (Short Time Delay) Short-circuit Current Protection:
 1. In Operating Value Adjustable
 2. Have Fixed Time Delay (t)



INST (Instantaneous) Short-circuit Current Protection, operating value (I_n) fixed 4 pole Circuit Breaker with Neutral line protection adopts 3 grades setting:
 4P 3d (No Neutral Line Protection) 4P 3d+N/2 (Neutral Line Protection, Operating Value: 0.5In)
 4P 4d (Neutral Line Protection, Operating Value In) Neutral Line Overload Protection (0.5In), used for 4 pole circuit breaker, three times systematic protection of higher content of harmonic wave.
 At the 4P 4d position, neutral line protection adjusting knob can be set to 1, 0.5In.



- Indication:
 1. Load (LED) indicator light (6) on the front side
 2. The indicator light will be turned on brightly when setting value is bigger than 90% In.
 3. Indicator light twinkles when setting value is bigger than 105% In.
- Test:
 There is a test hole on the front side from which small testing appliance or calibration testing box can be connected, and working state of circuit breaker can be checked.



Neutral Line protection

1. Long Time Delay Protection Setting Value
2. Long Time Delay Protection Delaying Time
3. Short-circuit Protection Setting Value
4. Short-circuit Protection Delaying Time
5. Instantaneous Short-circuit Protection
6. Warning Indicator Light
7. Testing Hole

Circuit Breaker	PN100	PN160	PN250	PN630
Tripping Current Setting Value (Δ) (Ir)	at 1.5 × Ir	at 1.6 × Ir	at 1.7 × Ir	at 1.5 × Ir
Tripping Time (t) (min-max)	90-180	5-7.5	3.2-5.0	2-10
Tripping current setting value (kA)	0.4...1 Adjustable (48 Points)	0.4...1 Adjustable (48 Points)	0.4...1 Adjustable (48 Points)	0.4...1 Adjustable (48 Points)
Accurate Assurance ± 15%	Fixed	Fixed	Fixed	Fixed
Delaying Time (ms)	The highest overcurrent tripping time	≤40	≤60	≤60
Tripping Current Value (A) (I _n)	Fixed: 11 × In	Fixed: 11 × In	Fixed: 11 × In	Fixed: 11 × In
Neutral line protection	No protection	No protection	No protection	No protection
Neutral line protection 4P 3d	0.5% Ir	0.5% Ir	0.5% Ir	0.5% Ir
Neutral line protection 4P 3d+N/2	1 × Ir	1 × Ir	1 × Ir	1 × Ir
Neutral line protection 4P 4d	1 × Ir	1 × Ir	1 × Ir	1 × Ir

The characteristics and installation of Accessory devices

Short-circuit tripping unit wiring diagram (for the integral attached device of switch in the front box)

a) When the controlling voltage reaches 70%-100%, the circuit breaker can break reliably.

b) Long time power is forbidden ($\leq 5s$)

Response time: impulse mode $\geq 20ms$, $\leq 60ms$

a) When the controlling voltage is lowered to 35%-70%, under-voltage tripping unit should trip and circuit breaker should break reliably.

b) When the controlling voltage reaches more than or equal to 85%, the switching on of circuit breaker should be assured.

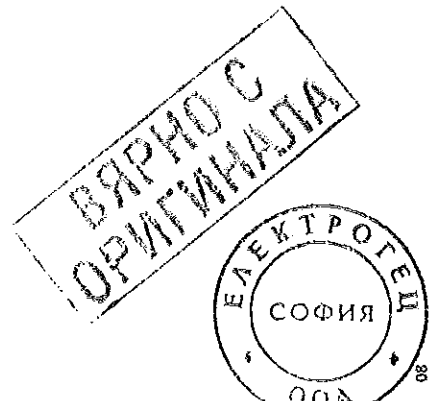
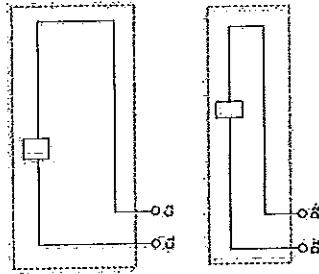
c) When the controlling voltage reaches less than 35%, switching on of circuit breaker should be prevented.

Attention: As for circuit breaker attached with under-voltage trip unit, the circuit breaker can be switched on or off normally when its controlling voltage reaches more than or equal to 85%.

iii) Note: The attached under-voltage module is 2N(125, 160). Other type, without under-voltage module, can be connected with lead wires when it reaches 80%-85% of the rated working voltage, under-voltage trip unit should let circuit breaker trip reliably.

iv) Warning: Under-voltage tripping unit should be electrified on first. Then the circuit breaker can be reset and switched on, or the switch will be damaged.

User Warning: After the internal attached device of circuit breaker is installed, it can be adjusted and tested in order to assure the quality when products are transported out of the factory. If user purchases the internal attached device from the outside by his own, user should bear the load, realize the



Alarm Contact

Contact Position of circuit breaker at the state of "on" or "off"



Contact Position of circuit breaker at the state of tripping (Alarm)



ii) When circuit breaker normally switches on or off, alarm contact doesn't trip. Only when free tripping (or fault tripping) happens, it will alarm.

iii) Contact position changes from "on" to "off", or "off" to "on". When circuit breaker has already been reset, alarm contact returns to original state.

Auxiliary Contact

Contact Position of Circuit Breaker at the "off" state



Contact Position of Circuit Breaker at the "on" state

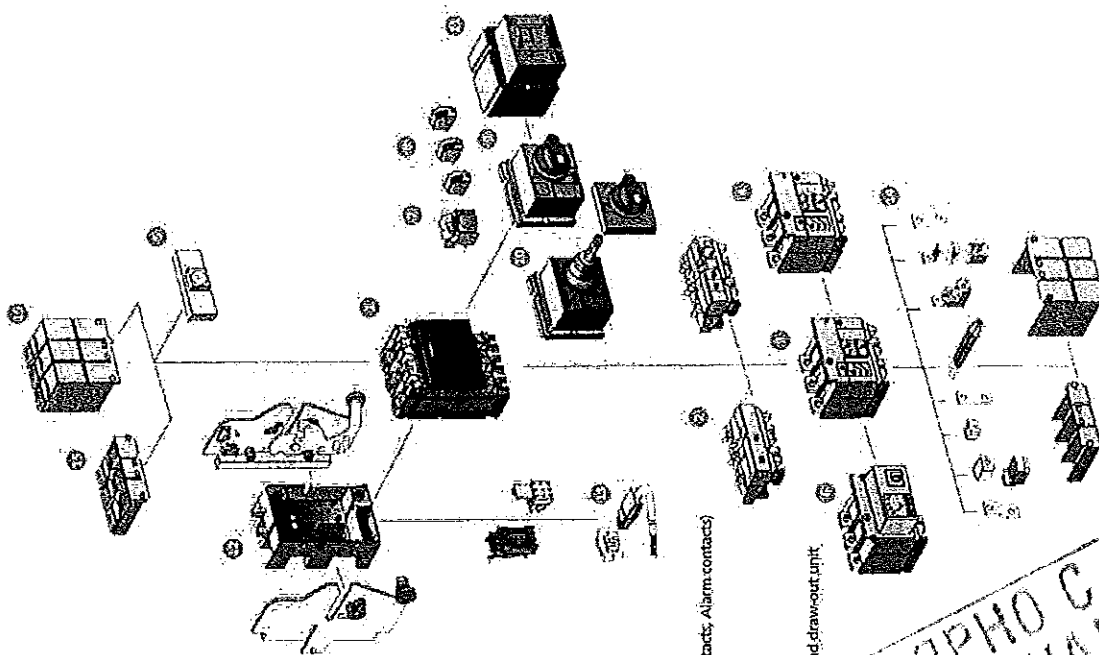


Auxiliary Contact Rated Current

< 250	3	0.3
> 400	6	0.4

Inside and Outside Accessory

PN series circuit breaker adopts all-module structure, with the characteristics of easy and convenient installation, and wide application range. Several elements can be applied in all similar products. Its structure system picture is below:



1. Breaking unit
2. Tripping unit
3. Earth fault protection unit
4. Insulated reciprocating unit
5. Electrified indicator model
6. Current meter model
7. Voltage trip coil MN or MX
8. Auxiliary switch (Auxiliary contacts, Alarm contacts)
9. Direct rotary handle
10. Outspread rotary handle
11. Trip operation handle
12. Plug-in baseplate
13. Connector for plug-in unit and draw-out unit
14. Connection accessory
15. Cover for short terminal
16. Cover for long terminal

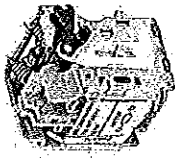
**ВЪРНО С
ОРИГИНАЛА**



PN Series MCCB Accessory order Code List

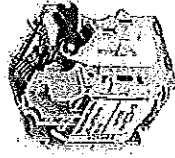
PN Shunt release

3P/4P	
Applicable frame	AV400V
PN160N/SH	PN160FT230.001 AC230V
PN250N/SH	PN250FT230.002
PN400N/SH	PN400FT230.003
PN630N/SH	PN630FT230.004
PN1600SH	PN1600FT230.005



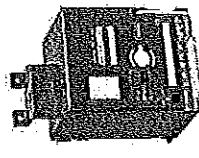
PN Under-voltage release

3P/4P	
Applicable frame	AV400V
PN160N/SH	PN160QT230.001 AC230V
PN250N/SH	PN250QT230.002
PN400N/SH	PN400QT230.003
PN630N/SH	PN630QT230.004
PN1600SH	PN1600QT230.005



PN Electric operating mechanism

3P/4P	
Applicable frame	AV400V
PN160N/SH	PN160CD.230.001 AC230V
PN250N/SH	PN250CD.230.002
PN400N/SH	PN400CD.230.003
PN630N/SH	PN630CD.230.004
PN1600SH	PN1600CD.230.005



PN Molded Case Circuit Breaker
IECEN 60947-2,GB14048.2



PN Series MCCB Accessory order Code List

PN Auxiliary contacts:

Applicable frame	Single auxiliary	Double auxiliary
PN160N5/H	PN160FC230.001	PN160SFC400.001
PN250N5/H	PN250FC230.002	PN250SFC400.002
PN400N5/H	PN400FC230.003	PN400SFC400.003
PN630N5/H	PN630FC230.004	PN630SFC400.004
PN16005/H	PN1600FC230.005	PN1600SFC400.005

PN Alarm contacts:

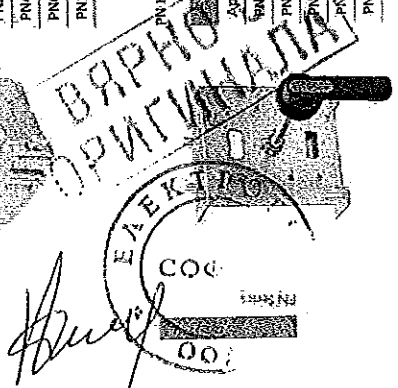
Applicable frame	3P/4P
PN160N5/H	PN160BC.001
PN250N5/H	PN250BC.002
PN400N5/H	PN400BC.003
PN630N5/H	PN630BC.004
PN16005/H	PN1600BC.005

PN Auxiliary alarm contacts:

Applicable frame	3P/4P
PN160N5/H	PN160FB.001
PN250N5/H	PN250FB.002
PN400N5/H	PN400FB.003
PN630N5/H	PN630FB.004
PN16005/H	PN1600FB.005

PN Handle operation

Applicable frame	3P/4P
PN160N5/H	PN160SC.001
PN250N5/H	PN250SC.002
PN400N5/H	PN400SC.003
PN630N5/H	PN630SC.004
PN16005/H	PN1600SC.005

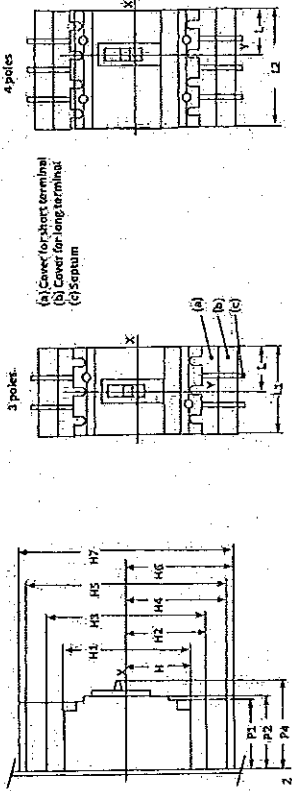


PN Molded Case Circuit Breaker
IECEN 60947-2,GB14048.2



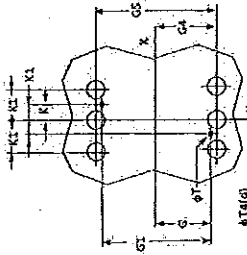
Product and installation dimension

Frame 10-630

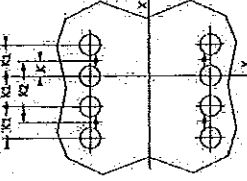


Baseboard installation dimension

3 poles



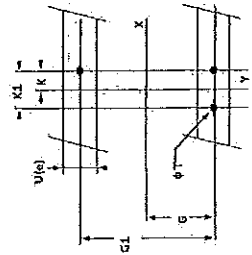
4 poles



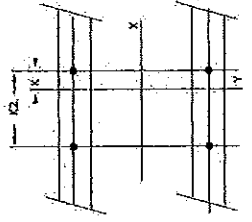
(a) Connect behind only, center bore unnecessary in 2 poles MCCB

DIN rail installation dimension

3 poles



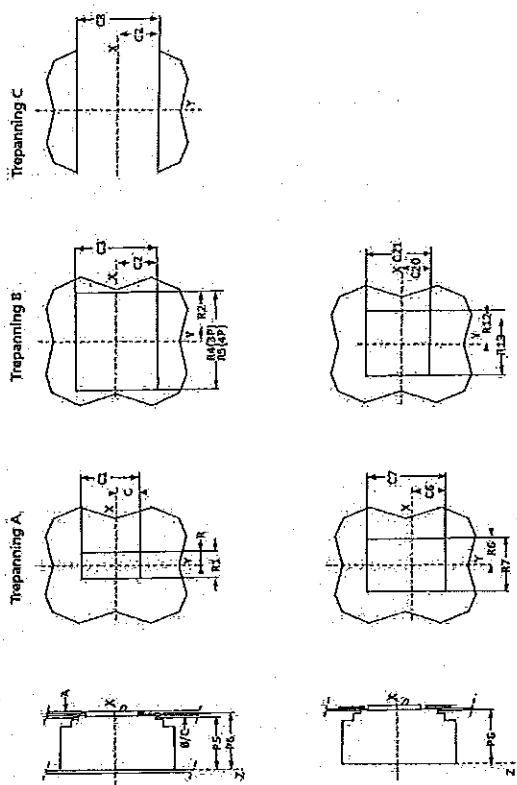
4 poles



PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB 14048.2



Product cover dimension:



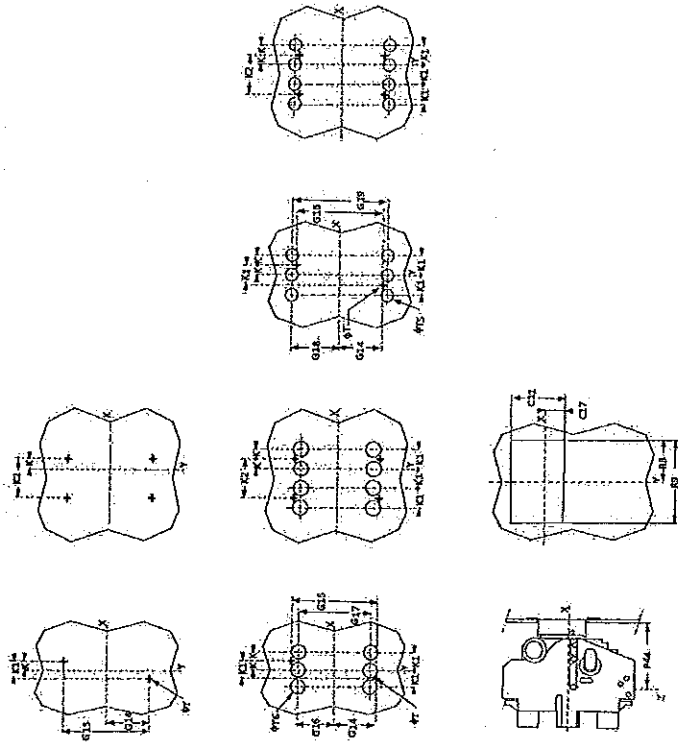
Measurements (mm)

Model	29	76	54	108	43	104	34	46	62.5	125	70
PN-100/160/250N/H/L	29	76	54	108	43	104	34	46	62.5	125	70
PN-400/630N/H/L	41.5	116	92.5	184	56.5	146	46.5	126	100	200	113.5
PN-100/160/250N/H/L	140	95	75	13.5	23	17.5	80.5	161	94	188	160.5
PN-400/630N/H/L	227					127.5	256	142.5	285	240	
PN-100/160/250N/H/L	320	178.5	357	17.5	35	70	52.5	105	140	81	86
PN-400/630N/H/L	489	237	474	22.5	45	90	70	140	185	95.5	110
PN-100/160/250N/H/L	111	88	14.5	29	54	108	143	29	58	43	
PN-400/630N/H/L	168	107	112	31.5	63	71.5	143	188	46.5	93	63
(1): \varnothing 120mm, use for Compact NS250N/H/L											
PN-100/160/250N/H/L	29	54	54	108							
PN-400/630N/H/L	41.5	116	92.5	184							
(2): If use autometal auxiliary connector, U220mm(NS100-250)											

PN Moulded Case Circuit Breaker
IEC/EN 60947-2, GB 14048.2



Hoie-wiaking position dimension for plug-in and draw-out wire connection in the ball panel



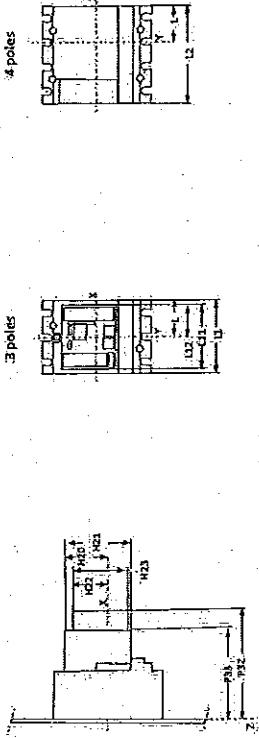
Measurements (mm)

Model	103	42.5	95	190	87	174	77.5	155	61	122	79	158	37.5	75	111	222	190
PN-100/160/250N/H/L	103	42.5	95	190	87	174	77.5	155	61	122	79	158	37.5	75	111	222	190
PN-400/630N/H/L	155	56	150	300	137	274	125	250	101	202	126	252	75	150	170.5	341	283
PN-100/160/250N/H/L	380	208	416	102.5	205	103.5	210	17.5	35	70	54.5	109	144	74	148	183	35
PN-400/630N/H/L	567	318.5	637	157.5	315	140	280	22.5	45	90	71.5	143	188	91.5	183	228	50
PN-100/160/250N/H/L	70	105	52.5	105	140	92.5	165	216	220	251	86	111	27	45	75	64	32
PN-400/630N/H/L	100	145	70	140	185	110	220	250	365	295	110	168	27	45	100	86	32
PN-100/160/250N/H/L	123	74	148	32	6	24	30										
PN-400/630N/H/L	147	90	180	32	6	33	33										
(1): \varnothing 120mm, use for Compact NS250N/H/L																	
(2): If use autometal auxiliary connector, U220mm(NS100-250)																	

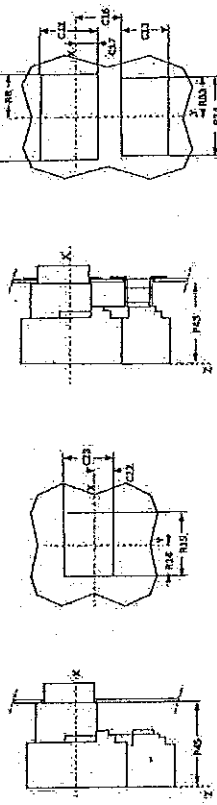
PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2



Motor operation handle dimension



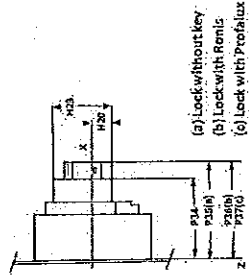
Motor operation handle installation dimension



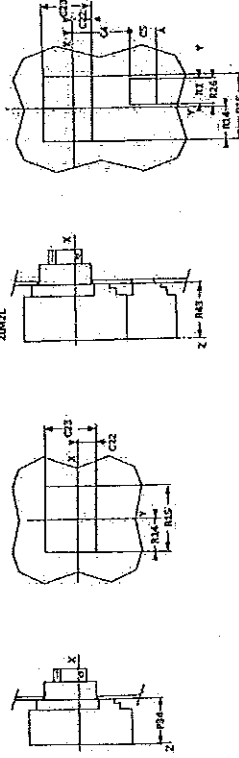
PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2



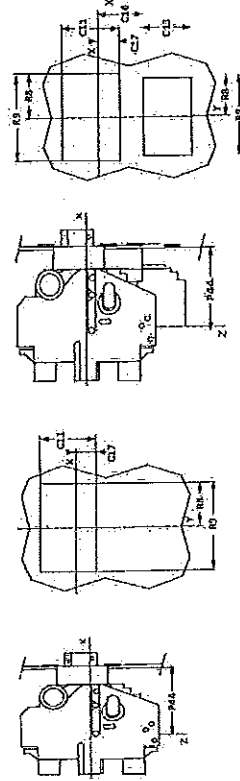
Direct rotary handle dimension



Direct rotary handle cover dimension



Direct rotary handle cover dimension (with plug-in)



Demand with protect cover

Vigi unit should be with protect cover.
Rotary handle and cover for Vigi should be have label in front of screen

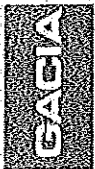
PN Series

Measurement (mm)

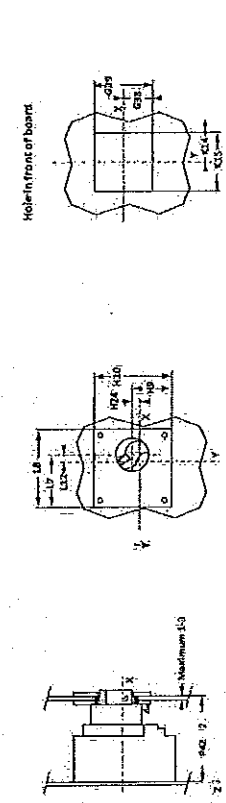
Model	103	82.5	56	42.5	29	76	62.5	97	45.5	73	52.5	105
PN-100160Z50N/AK	103	82.5	56	42.5	29	76	62.5	97	45.5	73	52.5	105
PN-40030N/HL	155	82.5	116.5	56	47.5	128	100	152	83	123	70	140
PN-100160Z50N/HC	140	91	45.5	178	143	145	74	148	48.5	97	74	148
PN-40030N/HS	185	123	61.5	250	215	217	90	180	64.5	129	74	148

Remark: When we open a lock on fire door, the distance between the center of circuit breaker and door spindle is more than 200mm (1'-5").

PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2

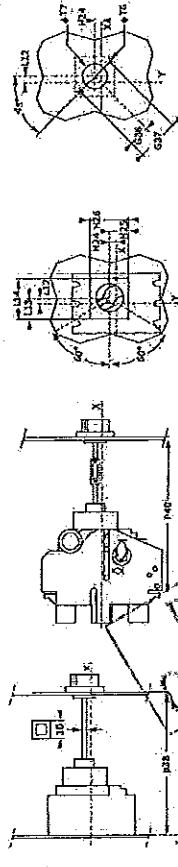


Outspread rotary handle dimension



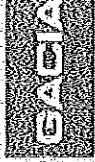
Outspread rotary handle cover dimension

Length of extension for:
L=P10-122mm (PN-100-250)
L=P30-150mm (PN-400-630)

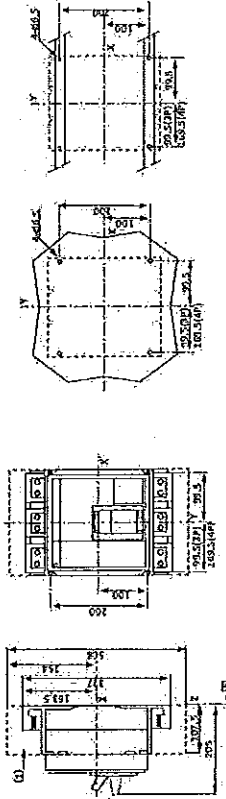


Hole in front of screen

PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2



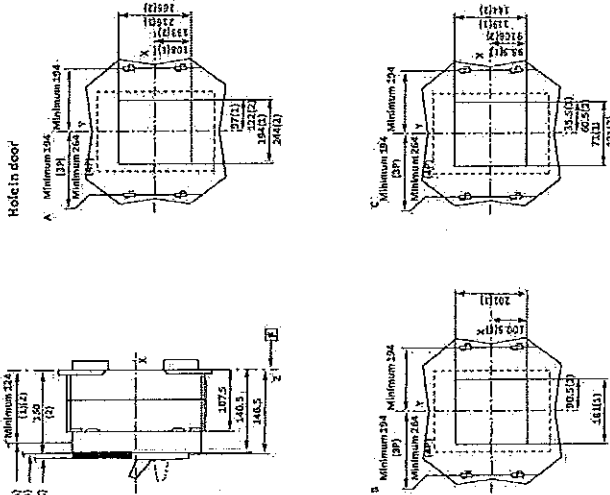
Product dimension (Frame 1600)



(1) Cover for terminals optional

Remark: The installation parameter of motor device is the same as that of manual device. X and Y are the symmetrical plane of 3-pole device and Z is the back plane of the device.

Product cover dimension

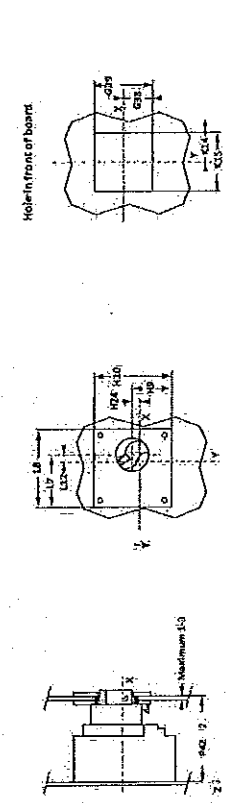


(1) Frame of reference
(2) Without label
(3) With label

PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2

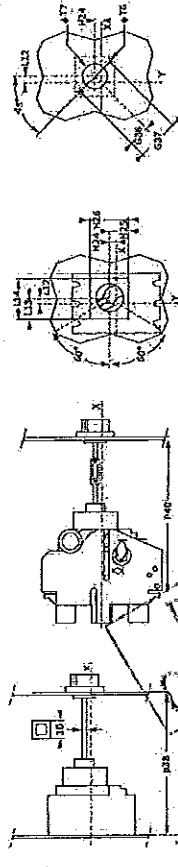


Outspread rotary handle dimension



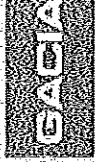
Outspread rotary handle cover dimension

Length of extension for:
L=P10-122mm (PN-100-250)
L=P30-150mm (PN-400-630)

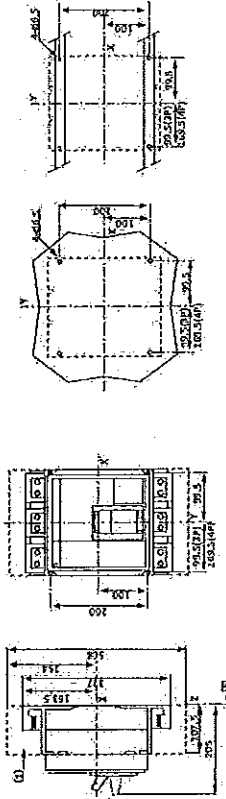


Hole in front of screen

PN Moulded Case Circuit Breaker
IEC/EN 60947-2:GB14048.2



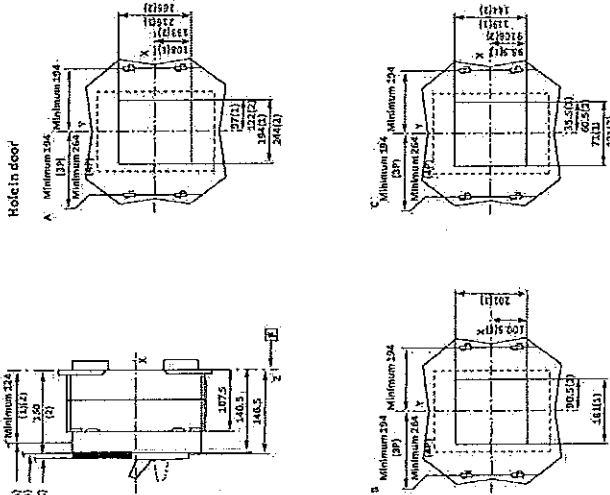
Product dimension (Frame 1600)



(1) Cover for terminals optional

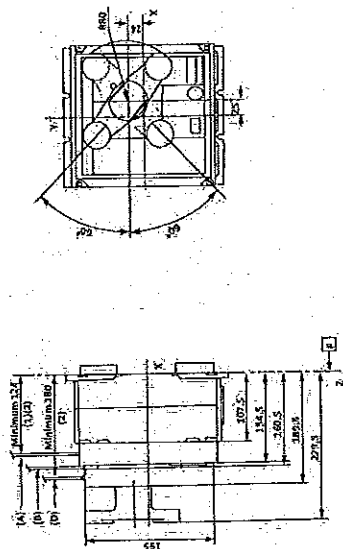
Remark: The installation parameter of motor device is the same as that of manual device. X and Y are the symmetrical plane of 3-pole device and Z is the back plane of the device.

Product cover dimension

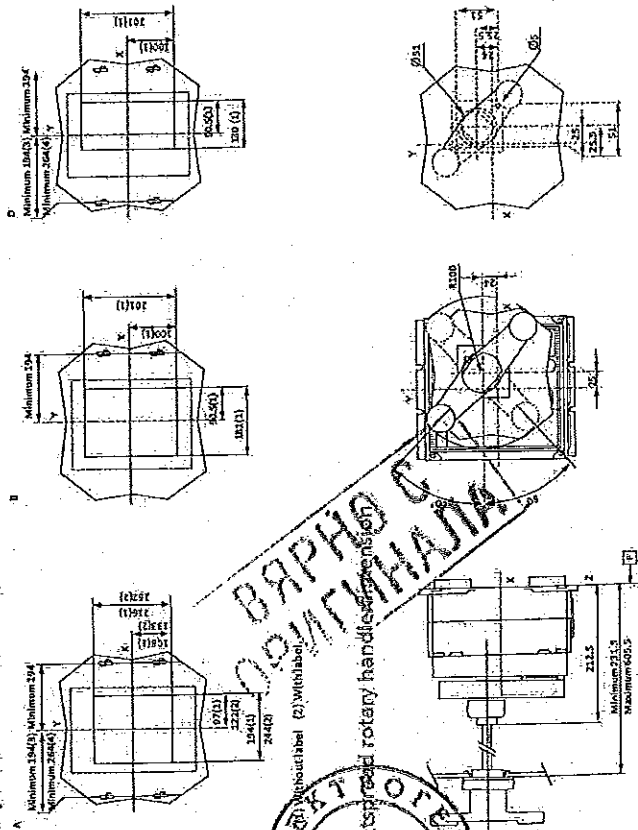


(1) Frame of reference
(2) Without label
(3) With label

Rotary handle dimension



Rotary handle cover dimension



Remark 1 X and Y are the symmetrical plane of 3-pole device and Z is the back plane of device.

[E] Frame of reference

To: Tender procedure of CEZ – Electro Distribution Company of Bulgaria

LETTER-CONFIRMATION

GACIA ELECTRICAL APPLIANCE CO., LTD, with address: No 545, Dongdajie, Baitawang Industry Zone, Beibaixiang, Yueqing City,, Wenzhou City, Zhejiang, 325603 China,

give the following values of parameters I_{cu} and I_{cs} ($I_{cu}=I_{cs}$) at AC 500V/50Hz, as follow:

	Series PN1250S
AC500V/50Hz O-CO (I_{cu}) Rated ultimate short-circuit breaking capacity (kA)	60 kA
AC500V/50Hz O-CO-CO (I_{cs}) Rated service short-circuit breaking capacity (kA)	60 kA

We also explicitly confirm that for tender procedure of CEZ – Electrodistribution company of Bulgaria we will produce and deliver the product PN with rated operational voltage of $U_e=690V$ which is a product of our range of manufacturing.

Date: 27 of November 2015

Name:

Stamp and Signature:



За: Тръжна процедура на ЧЕЗ – Електроразпределително дружество на България

ПИСМО-ПОТВЪРЖДЕНИЕ

ГАЦИЯ ЕЛЕКТРИКАЛ АПЛАЙАНС КО, ООД, с адрес: 545# Дондажие, Бейбаксианг, Байтаунг Индустриал Зоун, Уенджоу Джейджанг, 325603 Китай, даваме следните стойности на параметрите I_{cu} и I_{cs} ($I_{cu}=I_{cs}$) при АС 500V/50Hz, както следва:

	PN1250S
AC500V/50Hz O-CO (I_{cu}) Обявена максимална изключвателна възможност при к.с. (kA)	60
AC500V/50Hz O-CO-CO (I_{cs}) Работна изключвателна възможност при късо съединение (kA)	60


Ние също изрично потвърждаваме, че за тръжната процедура на ЧЕЗ – Електроразпределително дружество на България, ние ще произведем и доставим продукт PN с обявено работно напрежение $U_e=690V$, който продукт е от обхвата ни на производство.

Дата: 17 Ноември 2015

Име, подпис и кръгъл печат на ГАЦИЯ ЕЛЕКТРИКАЛ АПЛАЙАНС КО, ООД

ВЯРНО С
ОРИГИНАЛА

ЕЛЕКТРОТЕЦ
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/“

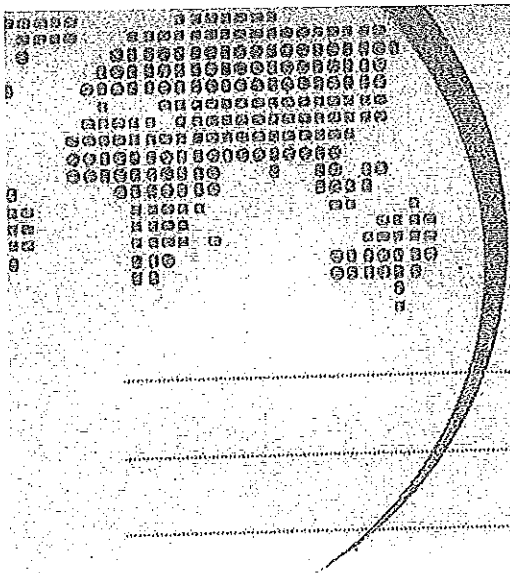
РЕФ. № PPD 15-042

“Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А”

Приложение № 3

ВЯРНО С
ОРИГИНАЛА





GACIA
加西亚

加西亚电子电器有限公司
GACIA ELECTRICAL APPLIANCE CO., LTD.

地址: 浙江省乐清市北白象镇白塔王工业区东街645号
电话: 0577-62882655 网络实名: 加西亚 GACIA
传真: 0577-62883555 E-mail: gacia@gacia.com.cn
邮编: 325603 网址: Http://www.gacia.com.cn
中文网址: Http://www.加西亚.cn Http://www.加西亚.中国

CE

DECLARATION OF CONFORMITY

We, GACIA ELECTRICAL APPLIANCE CO., LTD,
with address: No 545, Dongdajie, Baitawang Industry Zone, Beibaixiang, Yueqing
City, Wenzhou City, Zhejiang, 325603 China

declare that our product

MOULDED CASE CIRCUIT BREAKER

Type: *PN series*

to which this declaration relates is in conformity with the following standard (s) or other
normative document(s)

IEC/EN 60947-1

IEC/EN 60947-2

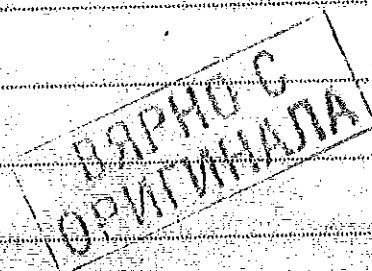
IEC/EN 60529

The products are satisfied the provisions for CE marking according to the Low Voltage
directive 73/23/EEC and 93/68/EEC

Date: 27 of November 2015

Name:

Stamp and Signature:



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ЛОГО на GACIA

ЕС ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСВИЕ

Ние, ГАЦИЯ ЕЛЕКТРИКАЛ АПЛАЙАНС КО, ООД

Адрес: 545# Дондажие, Бейбаксианг, Байтауанг Индустриал Зоун, Уенджоу
Джейджанг, 325603 Китай

Декларираме, че нашият продукт

АВТОМАТИЧЕН ПРЕКЪСВАЧ ЛЯТ КОРПУС

ТИП: PN серия

за които се отнася тази декларация са в съответствие с долните стандарти или други
нормативни документи:

IEC/EN 60947-1

IEC/EN 60947-2

IEC/EN 60529

Продуктите изпълняват изискванията за CE маркировка според Ниско волтовата
директива 73/23/ЕЕС и 93/68/ЕЕС

Дата: 27 Ноември 2015

Име и подпис: А Лонг

кръгъл печат на ГАЦИЯ ЕЛЕКТРИКАЛ АПЛАЙАНС КО, ООД

ВЯРНО С
ОРИГИНАЛА



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„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

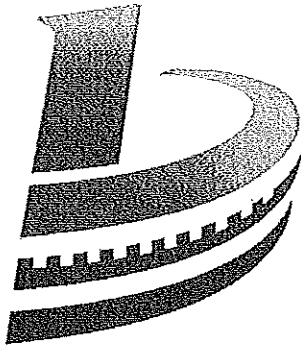
“Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А”

Приложение № 4

ВАРНО С
ОРИГИНАЛА



Report No.: MA-JO-20151117-LVD



MAMBO
Testing & certification centre

TEST REPORT

REPORT NO.: MA-JO-20151117-LVD

Category of Directive: 2006/95/EC Low Voltage Directive

Name of Equipment: MCCB

Test Model: PN1600HE

Test Standard: EN 60947-2:2006/A2:2013

Applicant: GACIA ELECTRICAL APPLIANCE CO.,LTD

Manufacturer: GACIA ELECTRICAL APPLIANCE CO.,LTD

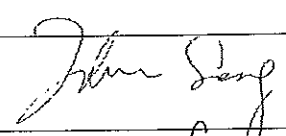
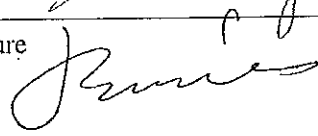
GACIA ELECTRICAL APPLIANCE CO.,LTD



MAMBOCERT

EN 60947-2:2006/A2:2013

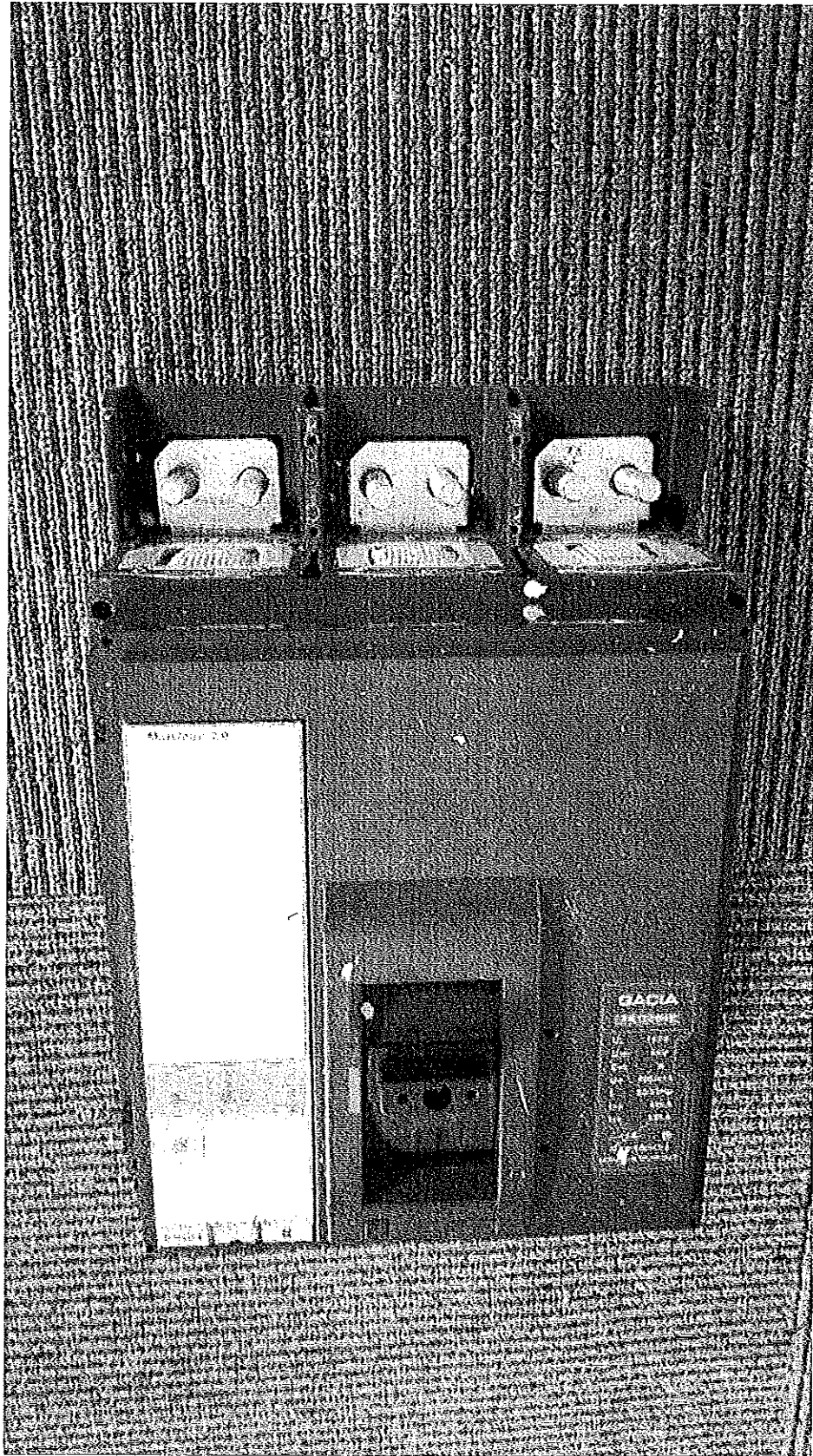
Safety of machinery — Electrical equipment of machines — Part 1: General requirements

Name and address of the testing laboratory	Mambocert (shanghai) Technology Co., Ltd.		Tel:021-51695369 Fax:021-60319657					
Name and address of the applicant	GACIA ELECTRICAL APPLIANCE CO.,LTD No.545 Dongdajie,Baitawang Industrial Zone Beibaixiang,Wenzhou,325603,China							
Name and address of the manufacturer	GACIA ELECTRICAL APPLIANCE CO.,LTD No.545 Dongdajie,Baitawang Industrial Zone Beibaixiang,Wenzhou,325603,China							
Product Name	MCCB							
Model/type reference	PN1600SE , PN1600HE, LN1600SE, LN1600HE							
Application model	PN1600SE , PN1600HE, LN1600SE, LN1600HE							
Tested according to	EN 60947-2:2006/A2:2013							
Test report no.	MA-JO-20151117-LVD							
Work carried out by	John Song			Signature 				
	Director							
Work verified by	Bowien			Signature 				
	Manager							
Date of issue	Nov, 17,2015							
Summary of testing								
Type No	Rated current	Number of poles	Use classes	Rated Voltage (Ue)	Rated insulation voltage(Ui)	Rated impulse voltage(Uimp)	Rated frequency	Limit segmentati on capability
PN1600	800A,100A,1250A., 1600A	3P,4P	A	400/415V 690V	690V 750V	8kV 8kV	50/60Hz 50/60Hz	80kA 40kA

GACIA ELECTRICAL APPLIANCE CO.,LTD

ВЫДАТСЯ
ОРИГИНАЛ





GACIA ELECTRICAL APPLIANCE CO.,LTD

ВЯРНО С
ОРИГИНАЛА



Test Report Content

This test report consists of:

1. EN 60947-2:2006/A2:2013
2. Test Record
3. Test Equipment
4. Product's Electrical Equipment List

General information:

The test results presented in this report relate only to the object tested and information given from applicant or manufacturer.

Test case verdicts:

Pass = Pass, Fail = Fail, N.A. = Not applicable. Placed in the column marked "Verdict".

This is a Computer generated Test Report.

× Information written in "Italic" or "Italic and bold" font style is written by project Engineer during testing. All other information in "Regular" or "Regular and bold" font style is a part of this "Test Report Form".

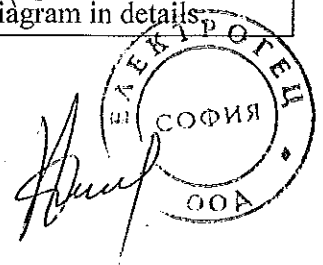
EN 60947-2:2006/A2:2013

1	Scope	-
	This part of EN 60947 applies to the application of electrical and electronic equipment and systems to machines not portable by hand while working. Including a group of machines working higher level system aspects	Pass. This product is within this scope.
	This part is applicable to the electrical equipment or parts of the electrical equipment that operate with nominal supply voltages not exceeding 1000V for alternating current and not exceeding 1500V for direct current, and with nominal frequencies not exceeding 200Hz	Pass. The nominal supply voltage for these machines is AC 220V.
2	Normative references	-
3	Definitions	-
4	General requirements	-
4.1	The risks associated with the hazards relevant to the electrical equipment shall be assess as part of the overall requirements for risk assessment of the machine	Pass. See the risk assessment report in detail.
4.2	Selection of equipment	-
	Electrical components and devices shall be suitable for their intended use and shall conform to relevant IEC	Pass.

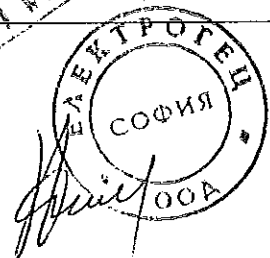
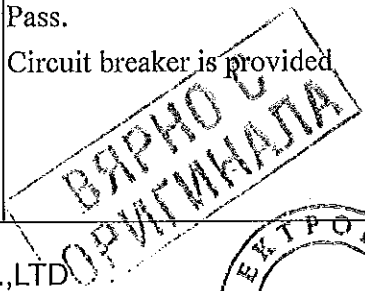
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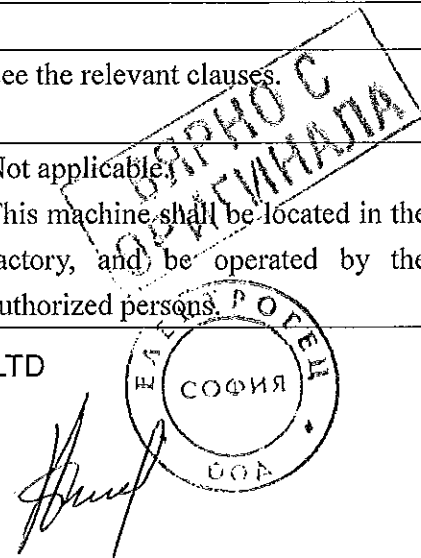
	standards where such exist	
4.3	Electrical supply	-
	The electrical equipment shall be designed to operate correctly with the relevant conditions of supply	Pass. They can be operated correctly with the relevant conditions of supply.
4.4	Physical environment and operating conditions	-
	Shall be suitable for use as specified: - Electromagnetic compatibility - Ambient air temperature - Humidity - Altitude - Contaminants - Ionizing and non-ionizing radiation - Vibration, shock and bump	Pass. This machine is suitable for use as specified in this clause.
4.5	Transportation and storage	-
	-2.5° C to + 55° C And short periods not exceeding 24 h at up to + 70° C	Pass. This requirement is complied with.
4.6	Provisions for handling	-
	Heavy and bulky equipment shall be moved by cranes or similar equipment	Pass. Appropriate equipments are provided.
4.7	Installation and operation	-
	According to supplier's instructions	Pass. All the related information is stated in the instruction manual.
5	Incoming supply conductors terminations and devices for disconnecting and switching off	-
5.1	Incoming supply conductor terminations	-
	Single or multiple power supply	Pass. Single power supply.
	The supply conductors are terminated at the supply disconnection device if not, the separate terminals shall be provided	Pass. Terminated at the supply disconnection device
	If a neutral conductor is used, it shall be indicated clearly in the technical documentation	Pass. See circuit diagram in details




	Labelled N shall be provided for the neutral conductor	Pass. Appropriate label has been provided.
	No connection between the protective bonding circuit and the neutral conductor	Pass. This requirement has been taken into account during the design.
	All terminals for the incoming supply connection shall be identified clearly	Pass. All of them have been identified clearly.
5.2	Terminal for connection to the external protective earthing system	-
	Shall be in the vicinity of the associated phase conductor terminals	Pass.
	Cross-sectional area of the external protective copper conductor according to table 1	Pass. The cross-sectional area of the external protective copper conductor is selected according to table 1.
	Marking of the external protective conductor with the letters "PE"	Pass. 'PE' is marked.
	Other protective terminals shall be marked with the symbol \perp	Pass.
	All protective terminals shall be coloured by use of the bicolor combination Green-And-Yellow	Pass.
5.3	Supply disconnecting (isolating) device	-
5.3.1	General	-
	Shall disconnect (isolate) the electrical equipment of the machine from supply when required	Pass. Disconnect the electrical equipment of the machine from supply.
	If two or more supply disconnecting devices are provided, protective interlocks shall be used	Not applicable.
5.3.2	Type	-
	a) Switch-disconnector according to en60947-3 b) A disconnector with auxiliary contact c) Circuit breaker according to EN 60947-2 d) Plug/ socket combination for a machine with a rated current not exceeding 16 A and a total power rating	Pass. Circuit breaker is provided

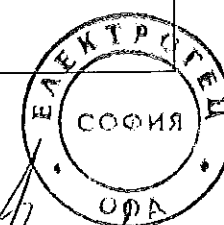


	not exceeding 3 kW	
5.3.3	Requirements	-
	Have one OFF and one ON position only	Pass.
	Marked clearly with "I" and "O"	Pass.
	Have a reset(tripped) position between "O" and "I"	Not applicable
	Have an external operating handle	Not applicable
	The handle should be Black or Grey	Not applicable
	Could be locked in the OFF position	Not applicable
	Disconnect all live conductors of its power supply circuit	Pass.
	Sufficient breaking capacity	Pass.
5.3.4	Operating handle	-
	Shall be easily accessible and located:0.6 m~1.9 m	Not applicable
5.3.5	Excepted circuits	-
	Have their own disconnecting device (Recommended)	Not applicable.
	If no disconnecting device, the relevant safety requirements shall be complied with	Not applicable.
5.4	Devices for switching off for prevention of unexpected start-up	-
	Unexpected start-up shall be prevented (Devices described in 5.3.2 may fulfil this function)	Not applicable.
5.5	Devices shall be provided for disconnecting (isolating) electrical equipment to enable work to be carried out without a risk from electric shock or burn	Pass. Appropriate devices are provided.
5.6	Protection against unauthorized, inadvertent and/or mistaken connection	-
	The devices described in 5.4 and 5.5 shall be equipped with such function	Not applicable.
6	Protection against electric shock	-
6.1	General	See the relevant clauses.
6.2	Protection against direct contact	-
6.2.1	General	-
	Either 6.2.2 or 6.2.3 and, where applicable, 6.2.4 shall be applied	See the relevant clauses.
	When the equipment is located in places open to all persons, measures of either 6.2.3 or 6.2.2 with a min. degree of protection against direct contact corresponding to IP4X or IPXXD shall be applied	Not applicable. This machine shall be located in the factory, and be operated by the authorized persons.



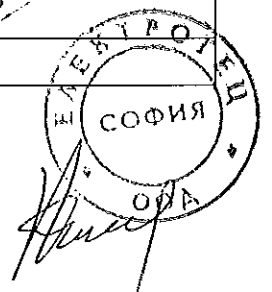
6.2.2	Protection by enclosures	-
	Min protection degree for live parts: IP2X or IPXXB	Pass. IP2X.
	Min. protection degree for top surface:IP4X or IPXXD	Pass. IP4X.
	Opening an enclosure shall only be possible under one of the following conditions:	-
a)	The use of a key or tool is necessary by skilled or instructed persons	Pass.
	Min. protection degree for live parts on the inside of doors:IP1X or IPXXA	Pass. IP2X.
	Min. protection degree for live parts inside the enclosure:IP2X or IPXXB	Pass. IP2X.
b)	The disconnection of live parts inside the enclosure before the enclosure may be opened (Use of the supply disconnecting device)	Pass.
	Min. protection degree for all parts are still have live after switching off the disconnecting device:IP2X or IPXXB	Not applicable.
	Such parts shall be marked with a warning sign: 	Not applicable.
c)	Opening without the use of a key or a tool and without disconnection of live parts shall be possible only when the min. protection degree is IP2X or IPXXB	No this kind of situation.
6.2.3	Protection by insulation of live parts	-
	Live parts shall be covered by insulation which can only be removed by destruction	Pass.
	Such insulation shall withstand the mechanical, chemical, electrical and thermal stresses under normal service conditions	Pass.
6.2.4	Protection against residual voltages.	-
	After disconnecting, any exposed conductive part having a residual voltage that shall be discharged to 60V or less within 5 seconds	Pass. This requirement is complied with.
	If mentioned above is not possible, a warning notice drawing shall be provided	Not applicable.
	If the withdrawal of plugs or similar devices would make the exposure of the conductors (e.g. pins),the discharge.	Not applicable.

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ОРИГИНАЛА



	time shall not exceed 1 second such conductor shall have the protection degree at least IP2X or IPXXB	
6.2.5	Protection by barriers	-
	For protection by barriers, see 412.2 of IEC 60947-4-1	Not applicable.
6.2.6	Protection by placing out of reach or protection by obstacles	-
	For protection by placing out of reach see 412.4 of IEC 60947-4-1	Not applicable.
	For protection by obstacles see 412.3 of IEC 60947-1	Not applicable.
	For collector wire systems or collector bar systems with a degree of protection less than IP2X see 13.8.1	Not applicable.
6.3	Protection against indirect contact	-
6.3.1	General	-
	For each circuit or part, at least one of the measures in accordance with 6.3.2 to 6.3.3 shall be applied	See the following descriptions.
6.3.2	Measure to prevent the occurrence of a hazardous touch voltage	-
6.3.2.1	General	-
6.3.2.2	Protection by use of class II equipment or by equivalent insulation	-
	Application of class II equipment or equivalent insulation	Pass. Appropriate insulations have been provided.
6.3.2.3	Protection by electrical separation	-
	Application of electrical separation	Pass.
6.3.2.4	Supply system design	-
	Application of a supply system designed with its neutral point either insulated from or having a high impedance to earth	Not applicable.
6.3.3	Protection by automatic disconnection of supply	-
	Use of the automatic disconnection of supply	Not applicable.
6.4	Protection by the use of PELV	-
6.4.1	General requirements	-
	PELV (protective extra-low voltage) circuits shall satisfy all of the conditions specified in this clause	Not applicable.
6.4.2	Sources for PELV	-
	The sources for PELV shall be one of the conditions	Not applicable.

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	specified in this clause	
7	Protection of equipment	-
7.1	General	-
7.2	Over current protection	Pass
7.2.1	General	-
7.2.2	Supply conductors	-
	The supplier is not responsible for providing the over current device for the supply conductors	Pass.
	Installation diagram with data necessary for selection of the over current protective device	Pass. Related information is stated in the installation diagram.
7.2.3	Power circuits	-
	All conductors shall be protected against over current (except earthed neutral conductor)	Pass. Appropriate devices against over current are provided.
	Cross-section area of neutral conductor	Pass
	For neutral conductors smaller than phase conductors then IEC 60947-1 shall apply	Pass
	In IT-systems, it is recommended that the neutral conductor is not used	Not applicable.
7.2.4	Control circuits	-
	Conductors of control circuits connected to the supply voltage and of circuits feeding control circuit transformers shall be protected against over current in accordance with 7.2.3	Pass. Appropriate devices against over current are provided.
7.2.5	Socket outlets and their associated conductors	-
	Over current protection devices shall be provided in the unearthed live conductors	Pass. Appropriate devices against over current are provided
7.2.6	Lighting circuits	-
	All unearthed conductors of circuits supplying lighting shall be protected against the effects of short circuits by the provision of over current devices separate from those protecting other circuits	Not applicable
7.2.7	Transformers	-
	Transformers shall be protected against Over current in accordance with IEC 60076-5 and IEC	Not applicable



	60947-1 appropriate	
	The type and setting of the overcurrent protective device should be in accordance with the recommendations of the transformer supplier	Not applicable
7.2.8	Location of over current protective device	-
	Over current protective device shall be located at the point where the conductors to be protected are connected to their supply	Pass. Over current protective device are installed correctly.
7.2.9	Over current protective devices	-
	Sufficient breaking capacity	Pass.
	Where fuses are used, a type readily available in the country of use shall be selected, or arrangement shall be made with the use for the supply of spare parts	Pass. Spare parts are readily available.
7.2.10	Rating and setting of over current protective devices	-
	The rated current of fuses or the setting current of other over current protective devices shall be selected as low as possible but adequate for the anticipated over currents	Pass. The rated current of fuses are correctly selected.
	The rated current or setting of an over current protective device is determined by the current carrying capacity of the conductors to be protected by that device in accordance with 13.4	Pass. Please see the related clause.
7.3	Overload protection of motors	-
	Overload protection of motors shall be provided for each motor rated at more than 0.5kW	Not applicable.
	In applications where an automatic interruption of the motor operation is unacceptable, the overload detection shall give a warning signal to which the operator can respond	Not applicable.
	Detection of overload shall be provided in each live conductor excepted for the neutral conductor	Not applicable.
	For motors having single-phase or d.c. power supplies. Detection in only one unearthed live conductor is permitted	Not applicable.
	Automatic restarting of any motor after the operation of overload protection shall be prevented	Not applicable.
7.4	Abnormal temperature protection	-
	Use of abnormal temperature protection	Not applicable

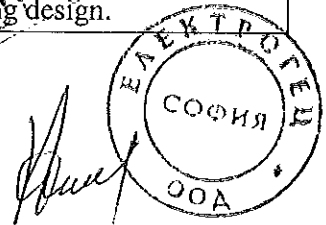


7.5	Protection against supply interruption or voltage reduction and subsequent restoration	-
	Where a voltage drop or a supply interruption can cause a hazardous condition, damage to the machine, or to the work in progress, under voltage protection shall be provided	Not applicable.
	The operation of the under voltage device shall not impair the operation of any stopping control of the machine	Not applicable.
	Upon restoration of the voltage or upon switching on the incoming supply, automatic or unexpected restarting of the machine shall be prevented	Pass. Automatic of unexpected restarting of the machine can be prevented.
	Where only a part of the machine or of the group of machines working together in a coordinated manner is affected by the voltage reduction or supply interruption, the under voltage protection shall initiate appropriate control responses to ensure co-ordination	Not applicable.
7.6	Motor over speed protection	-
	Use of the motor over speed protection	Not applicable.
7.7	Earth fault/residual current protection	-
	Use of earth fault/residual current protection for automatic disconnection	Not applicable.
7.8	Phase sequence protection	-
	Where an incorrect sequence of the supply voltage can cause a hazardous condition or damage to the machine, protection shall be provided	Not applicable.
7.9	Protection against over voltage due to lighting and to switching surges	-
	Protection devices can be provided to protect against the effects of over voltages due to lighting or to switching surges	Not applicable.
8	Equipotential bonding	-
8.1	General	-
8.2	Protective bonding circuit	-
8.2.1	General	-
	On mobile machines with on-board power supplies, it	Not applicable.

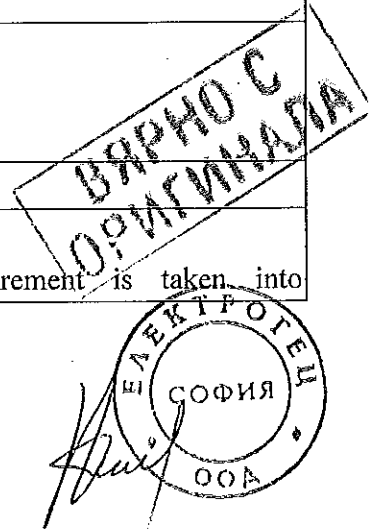
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	shall be connected to a protective bonding terminal to provide protection against electric shock	
	When a mobile machine is also capable of being connected to an external incoming supply, the protective bonding terminal shall be the connection point for the external protective conductor	Not applicable.
	All parts of the protective bonding circuit shall be so designed that they are capable of withstanding the highest thermal and mechanical stresses	This requirement has been complied with.
	Any structural part of the electrical equipment or of the machine may be used as part of protective bonding circuit	Pass. They have been used as part of protective bonding circuit.
	If an IT distribution system is used, the machine structure shall be used as part of the protective bonding circuit in conjunction with an earth fault supervision system	Not applicable.
	The structural bonding is not required where all the equipment provided is in accordance with 6.3.2.2	Pass.
8.2.2	Protective conductors	-
	Protective conductors shall be identified according to 14.2.2	Pass. See clause 14.2.2 in detail.
	Copper conductors should be used	Pass.
	Where a conductors material other than copper is used, its electrical resistance per unit length shall not exceed that of the allowable copper conductor and such conductors shall not be less than 16 mm ² in cross-sectional area	Only copper conductors are used.
	The cross-sectional area of protective conductors shall be determined according to the requirements of: -543 of IEC 60947-2 -7.4.3.1.7 of IEC 60947-2 appropriate	Pass. They have been used according to these requirements.
8.2.3	Continuity of the protective bonding circuit	-
	All exposed conductive parts shall be connected to the protective bonding circuit	Pass. All the parts have been connected.
	Where a part is removed for any reason, the protective bonding circuit for the remaining parts shall not be interrupted	Pass. This requirement is taken into account during design.

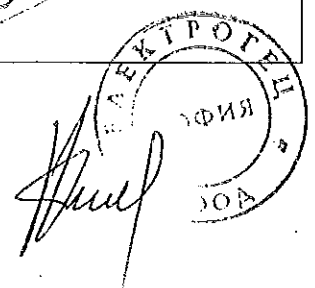


	Connection and bonding points shall be so designed that their current-carrying capacity is not impaired by mechanical, chemical, or electrochemical influence	Pass. This requirement is taken into account during design.
	Metal ducts of flexible or rigid construction and metallic cable sheathes shall not be used as protective bonding conductors	Pass.
	Nevertheless such metal ducts and the metal sheathing of all connecting cables shall be connected to the protective bonding circuit	Not applicable.
	Where the electrical equipment is mounted on lids, doors, or cover plates, continuity of the protective bonding circuit shall be ensured and it is recommended that a protective conductor is used	Pass.
	Otherwise fastenings, hinges or sliding contacts designed to have a low resistance shall be used	Pass.
	The continuity of the protective conductor in cables that are exposed to damage shall be ensured by appropriated measures	Pass.
	For requirements for the continuity of the protective conductor using collector wires, collector bars and slip-ring assemblies (see 13.8.2)	Not applicable,
8.2.4	Exclusion of switching devices from the protective bonding circuit	-
	Shall not incorporate a switching device, an over current protective device nor a means for current detection for such devices	Not applicable,
	The only means permitted for interruption shall be carried out by instructed or skilled persons by using a tool	Not applicable,
8.2.5	Parts that need not to be connected to the protective bonding circuit	-
	Screws, rivets, and nameplates and to parts inside an enclosure, are not necessary to connect to the protective bonding circuit	Pass
8.2.6	Interruption of the protective bonding circuits	-
	The protective bonding circuit shall be interrupted only after the live conductors have been interrupted, and shall	Pass. This requirement is taken into

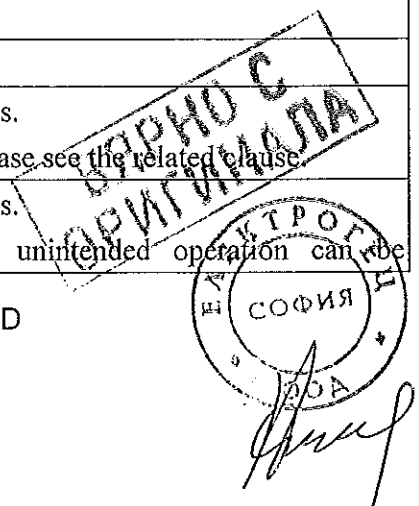


	be re-established before any live conductor is reconnected.	account during design.
	Metallic housings of plug/socket combinations shall be connected to the protective bonding circuit except where used for PELV	Pass. All the related devices are connected to the protective bonding circuit.
8.2.7	Protective conductor connecting points	-
	All protective conductors shall be terminated in accordance with 14.1.1	Pass. Please see the related clause.
	Shall have no other function and shall not be used to attach or connect appliances or parts	Pass.
	Use of earthing symbol \perp	Pass. Earthing symbol is used.
	By the bicolor combination GREEN-AND-YELLOW	Pass. The color is correct.
8.3	Bonding for operational purposes	-
	Use of bonding for operational purpose	See the following descriptions.
8.3.1	General	-
8.3.2	Bonding to the protective circuit	-
	One method for protection against unintended operation as a result of insulation failure is achieved by connection one side of a control circuit fed by a transformer to the protective bonding circuit	Pass. The measure described in this clause has been used.
8.3.3	Bonding to a common reference potential	-
	Use of bonding to a common reference potential	Pass.
9	Control circuits and control functions	-
9.1	Control circuits	-
9.1.1	Control circuit supply	-
	Transformers shall be used for supplying the control circuits	Not applicable.
	Transformers are not mandatory for machines with a single motor starter and a maximum of two control devices	Not applicable.
9.1.2	Control circuit voltages	-
	The nominal voltage shall not exceed 277 V when supplied from a transformer	Pass.

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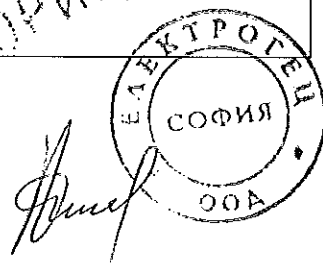


9.1.3	Protection	-
	Over current protection shall be provided according to 7.2.4 and 7.2.10	Pass.
9.1.4	Connection of control devices	-
	Appropriate connection for control devices	Pass. Appropriate connection have been provided.
9.2	Control functions	-
9.2.1	Start functions	-
	Start functions shall operate by energizing the relevant circuit	Pass. This requirement is taken into account during design.
9.2.2	Stop functions	-
	Each machine shall be equipped with appropriate stop functions	Pass. Appropriate stops are provided.
9.2.3	Operating modes	-
	When hazardous conditions can arise from mode selection, such selection shall be prevented by suitable means	Pass.
	Mode selection by itself shall not initiate machine operation (A separate action by the operator shall be required)	Not applicable.
	Safeguarding shall remain effective for all operating modes	Pass.
	Indication of the selected operating mode shall be provided	Pass. Appropriate indication is provided.
9.2.4	Suspensions of safeguarding	-
	Where it is necessary to suspend safeguarding, a secure provision shall be provided to prevent automatic operation	Pass. Provisions for preventing automatic operation are provided.
9.2.5	Operation	-
9.2.5.1	General	-
	The necessary interlocks (see 9.3) shall be provided for safe operation	Pass. Please see the related clause.
	Measures shall be taken to prevent movement of the machine in an unintended manner after any stopping of	Pass. No unintended operation can be

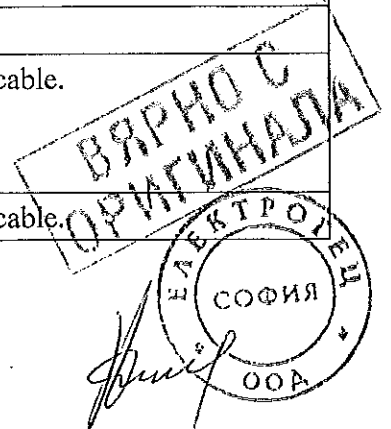


	the machine	occurred after any stopping of the machine.
9.2.5.2	Start	-
	The start of an operation shall be possible only when all the safeguards are in place and functional (except described in 9.2.4)	Pass. Appropriate interlocks are provided.
	Hold-to-run control shall be used for the others machines, as appropriate	Not applicable.
	Suitable interlocks shall be provided to secure correct sequential starting	Not applicable.
	The use of more than one control station to initiate a start	Not applicable.
9.2.5.3	Stop	-
	Category 0, category 1 and/or category 2 stops shall be provided where indicated by the risk assessment and the functional requirements of the machines	Pass. category 1 stops are provided.
	Stop functions shall override related start functions	Pass. Stop functions have priorities over start functions.
9.2.5.4	Emergency operations (emergency stop, emergency switching off)	-
9.2.5.4.1	General	-
9.2.5.4.2	Emergency stop	-
	Shall function either as a category 0 stop or as a category 1 stop	Pass.
	The choice of the emergency stop shall be determined by the risk assessment of the machine	Pass. According to the result of risk assessment of the machine.
	Where a category 0 stop is used for emergency stop function, it shall have only hard-wired electromechanical components	Not applicable.
	The operation of emergency stop shall not depend on electronic logic or on the transmission of commands over a communications network or link	Pass.
	Where a category 1 stop is used for the emergency stop function, final removal of power to the machine actuators shall be ensured and carried out by means of	Pass.

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	electromechanical components	
9.2.5.4.3	Emergency switching off	-
	Use of emergency switching off	Pass. Identical to that of emergency stop.
9.2.5.5	Monitoring of command actions	-
	Movement or action of a machine or part of a machine that can result in a hazardous condition shall be monitored	Not applicable
9.2.5.6	Hold-to-run controls	-
	Hold-to run controls shall require continuous actuation of the control devices to achieve operation	Not applicable..
9.2.5.7	Two-hand control	-
	Three types of two-hand control are available, the selection of which is determined by the assessment	Not applicable.
9.2.5.8	Enabling device	-
	It shall be designed to allow motion when actuated in one position only (In any other position motion shall be stopped)	Pass. These machines have been designed to allow motion when actuated in one position only.
9.2.6	Combined start and stop controls	-
	Push-buttons and similar devices that, when operated, alternately initiate and stop motion shall only be used for functions which cannot result in a hazardous condition	Not applicable.
9.2.7	Cableless control	-
9.2.7.1	General	-
	Means shall be provided to readily remove or disconnect the power supply of the operator control station	Not applicable.
	Means shall be provided, as necessary, to prevent unauthorized use of the operator control station	Not applicable.
	Each operator control station shall carry an unambiguous indication of which machine is intended to be controlled by that operator control station	Not applicable.
9.2.7.2	Control limitation	-
	Measures shall be taken to prevent the machine from responding to signals other than those from the intended operator control station	Not applicable.
	Where necessary, means shall be provided so that the	Not applicable.



	machine can only be controlled from operator control station in one or more predetermined zones or locations	
9.2.7.3	Stop	-
	Operator control stations shall include a separate and clearly identifiable means to initiate the stop function of the machine or of all the motions that can cause a hazardous condition	Not applicable.
	The actuating means to initiate this stop function shall not be marked or labeled as an emergency stop device	Not applicable.
	A machine which is equipped with cableless control shall have a means of automatically initiating the stopping of the machine and of preventing a potentially hazardous operation	Not applicable
9.2.7.4	Series data communication	-
	In a machine where the control of safety-related functions relies on series data transfer, correct communications shall be ensured by using an error detection method that is able to cope with up to three error bits in any command sequence	Not applicable
9.2.7.5	Use of more than one operator control station	-
	Where a machine has more than one operator control station, measures shall be taken to ensure that only one control station can be enabled at a given time	Not applicable
	An indication of which operator control station is in control of the machine shall be provided at suitable locations as determined by the risk assessment of the machine	Not applicable
9.2.7.6	Battery-powered operator control stations	-
	A variation in the battery voltage shall not cause a hazardous condition	Not applicable
	If one or more potentially hazardous motions are controlled using a battery-powered operator control station, a clear warning shall be given to the operator when a variation in battery voltage exceeds specified limits	Not applicable
	Under those circumstances, the operator control station shall remain functional long enough to put the machine	Not applicable

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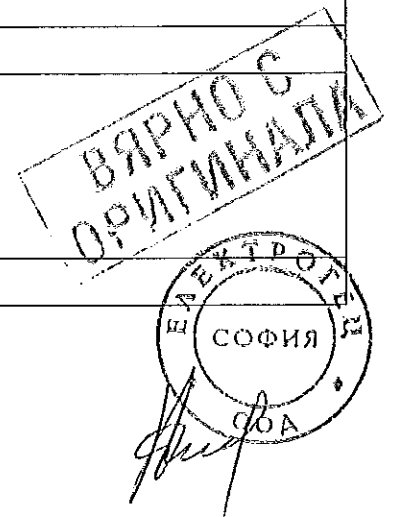


	into a non-hazardous condition	
9.3	Protective interlocks	-
9.3.1	Reclosing or resetting of an interlocking safeguard	-
	The reclosing or resetting of an interlocking safeguard shall not initiate machine motion or operation	Pass
9.3.2	Over travel limits	-
	Use of a position sensor or limit switch	Not applicable
9.3.3	Operation of auxiliary functions	-
	The correct operation of auxiliary functions shall be checked by appropriate devices	Not applicable.
	Use of appropriate interlocking	Not applicable.
3.4	Interlocks between different operations and for contrary motions	-
	Interlocking shall be provided against incorrect operation	Pass.
9.3.5	Reverse current braking	-
	Use of reverse current braking	Not applicable.
9.4	Control functions in the event of failure	-
9.4.1	General requirements	-
	Provision of control functions in case of failure according to the level of risk assessment	Pass. According to the risk assessment.
9.4.2	Measures to minimize risk in the event of failure	-
9.4.2.1	Use of proven circuit techniques and components	-
	Use of proven circuit techniques and components	Pass. Appropriate components have been used.
9.4.2.2	Provisions for redundancy	-
	Provisions for redundancy	Not applicable.
9.4.2.3	Use of diversity	-
	Use of diversity	Not applicable.
9.4.2.4	Functional tests	-
	Carried out automatically by the control system or manually by inspection	Pass.
9.4.3	Protection against maloperation due to earth faults, voltage interruptions and loss of circuit continuity	-
9.4.3.1	Earth faults	-
	Bonding to the protective bonding circuit may be provided according to 8.2 and the devices may be	Pass.

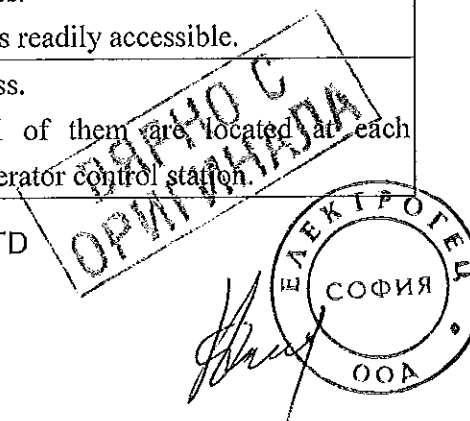
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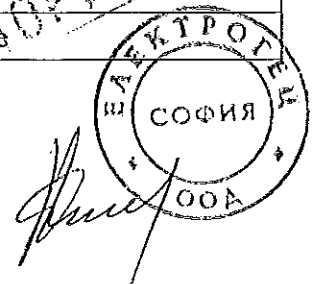
	connected as described in 9.1.4	
9.4.3.2	Voltage interruptions	-
	Where a memory device is used, proper functioning in the event of power failure shall be ensured to prevent any loss of memory that can result in a hazardous condition	Not applicable
9.4.3.3	Loss of circuit continuity	-
	Where the loss of continuity of safety-related control circuits depending upon sliding contacts can result in hazardous condition, appropriate measures shall be taken	Not applicable.
10	Operator interface and machine-mounted control devices	-
10.1	General	-
10.1.1	General device requirements	-
	As far as is practicable, those devices shall be selected, mounted, and identified or coded according to IEC 60073 and IEC 60447	Pass.
10.1.2	Location and mounting	-
	Appropriate location mounting for machine-mounted and hand-operated control devices	Pass
10.1.3	Protection	-
	Operator and machine mounted control devices shall withstand the stress of expected use	Pass. They can withstand the stress of expected use.
	The operator interface control devices shall have a min. degree of protection: IPXXD	Pass.
10.1.4	Position sensors	-
	Position sensors shall not be damaged in the event of over travel	Not applicable
	Position sensors used in circuits with safety-related functions either shall have positive opening operation or shall provide similar reliability	Not applicable
10.1.5	Portable and pendant control stations	-
	Portable and pendant control stations and their control devices shall be so selected and arranged as to minimize the possibility of inadvertent machine operations caused by shocks and vibrations	Pass.
10.2	Push-buttons	-



10.2.1	Colors	-
	Push-button actuators shall be color -coded according to table 2	Pass. Their colors are according to table 2.
10.2.2	Markings	-
1.2.3	Use of adequate markings for push-buttons	Pass. Adequate markings are used.
10.3	Indicator lights and displays	-
10.3.1	Modes of use	-
	Indication and /or confirmation	Pass
10.3.2	Colors	-
	Color-coded according to table 3 (Unless otherwise agree between the supplier and the user)	Pass. Their colors are according to table 3.
10.3.3	Flashing lights	-
	Use of flashing lights	Not applicable
10.4	Illuminated push-buttons	-
	Color-coded according to table 2 and 3	Pass. Their colors are according to table 3.
10.5	Rotary control devices	-
	Devices having a rotational member shall be mounted to prevent rotation of the stationary member (Friction alone shall not be sufficient)	Pass. Appropriate measure has been provided to prevent rotation of the stationary member.
10.6	Start devices	-
	Shall be constructed and mounted to minimise inadvertent operation	Pass. Flat type start push -buttons are used to prevent inadvertent operation.
10.7	Devices for emergency stop	-
10.7.1	Location	-
	Devices for emergency stop shall be readily accessible	Pass. It is readily accessible.
	Emergency stop devices shall be located at each operator control station and at other locations where the initiation of an emergency stop can be required	Pass. All of them are located at each operator control station.

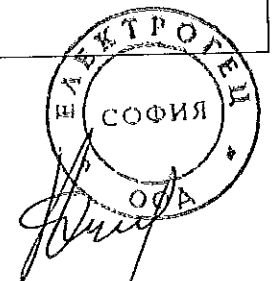


10.7.2	Types	-
	Use of type - a push-button operated switch - a pull-cord operated switch - a pedal-operated switch without a mechanical guard	Pass. a pedal-operated switch without a mechanical guard
	Shall be of the self-latching type and shall have positive opening operation	Pass.
10.7.3	Restoration of normal function after emergency stop	-
	It shall not be possible to restore an emergency stop circuit until all emergency stop devices have been manually reset	Pass. This requirement has been complied with.
10.8.5	Local operation of the supply disconnecting device to effect emergency switching off	-
	Where the supply disconnecting device is to be locally operated for emergency switching off, it shall be readily accessible and should meet the colour requirements of 10.8.4	Not applicable
10.9	Displays	-
11	Electronic equipment	-
11.1	General	-
11.2	Basic requirements	-
11.2.1	Inputs and outputs	-
	Status indication of all digital inputs and outputs should be provided	Pass. This function has been provided.
11.2.2	Equipotential bonding	-
	Electrically bonded together according to the supplier's specifications	Pass.
11.3	Programmable equipment	-
11.3.1	Programmable controllers	Not applicable
	Programmable controllers shall conform to relevant IEC standards	Not applicable
11.3.2	Memory retention and protection	-
	Means shall be provided to prevent memory alteration by unauthorized persons and the requirements detailed in 9.4.3.2 shall apply	Not applicable
11.3.3	Software verification	-
	Shall have means for verifying	Not applicable

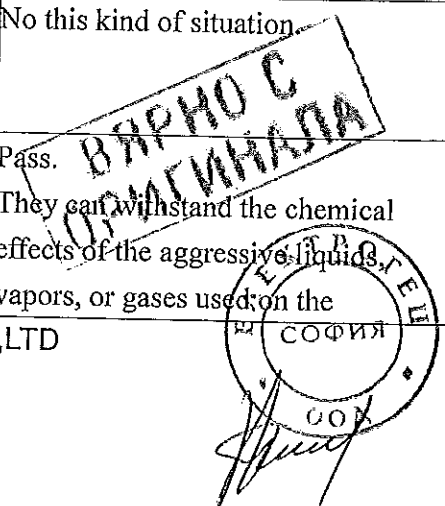


11.3.4	Use in safety-related functions	-
	Programming electronic equipment shall not be used for category 0 emergency stop functions.	Pass. This requirement has been complied with.
12	Control gear: location, mounting, and enclosures	-
12.1	General requirements	-
12.2	Location and mounting	-
12.2.1	Accessibility and maintenance	-
	All control gears can be identified without moving or the wiring	Not applicable
	Replacement without dismantling other equipment or parts of the machine	Not applicable
	Terminals not associated with control gear shall also comply with the requirements mentioned above	Not applicable
	Facilitate operation and maintenance from the front	Not applicable
	Use of special tools (if necessary)	Not applicable
	If access is required for regular maintenance or adjustment, the devices shall be located between 0.4 m and 2.0 m above the severing level	Not applicable
	It is recommended that terminals be at least 0.2m above the servicing level and so placed that connectors and cables can be easily connected to them	Not applicable
	Except those for operating, indicating, measuring and cooling, no devices shall be mounted on doors, and normally removable access covers, of enclosures	Not applicable
	If control devices are connected through plug-in arrangements, their association shall be made clear by type (shape), marking or designation, singly or in combination.	Not applicable.
	Plug in devices shall be provided with non-interchangeable features	Not applicable.
	Use of plug/socket combinations shall be unobstructed access	Not applicable.
12.2.2	Physical separation or grouping	-
	Non-electrical parts and devices not directly associated with the electrical equipment shall not be located within enclosures containing control gear	Pass.

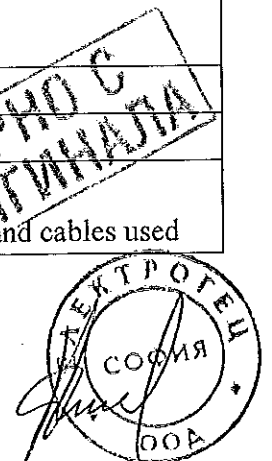
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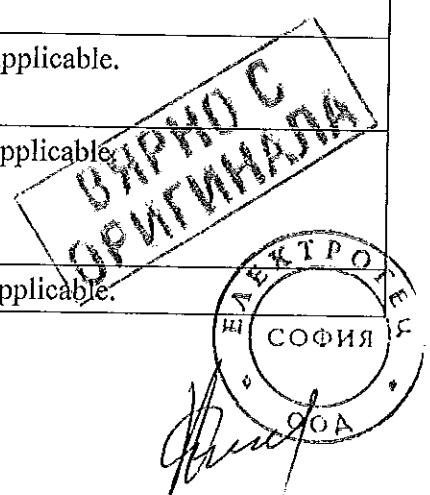
	Devices such as solenoid valves should be separated from the other electrical equipment	Pass.
	Control devices mounted in the same location and connected to the supply voltage, or to both supply and control voltages, shall be grouped separately from those connected only to the control voltages	Pass.
	Terminals shall be separated into groups for : - power circuits; - associated control circuits - other control circuits, fed from external sources	Pass.
	The clearances and creep distances specified for the devices shall be maintained	Pass.
12.2.3	Heating effects	-
	Heat generating components shall be located so that the temperature of each component in the vicinity remains within the permitted limit	Pass
12.3	Degrees of protection	-
	Enclosures of control gear: at least IP 22	Pass.
12.4	Enclosures, doors and openings	-
	Enclosure shall be constructed using materials capable of withstanding the mechanical, electrical and thermal stresses	Pass.
	Fasteners used to secure doors and covers should be of the captive type	Pass.
	Windows provided for viewing internally mounted indicating devices shall be of a material suitable to withstand mechanical stress and chemical attack	Not applicable.
	It is recommended that enclosures doors shall have: - Not wider than 0.9 m - Vertical hinges - Lift-off type - Angle of opening at least 95°	Pass. These requirements have been taken into account during the design.
	If enclosures which readily allow a person fully to enter, the relevant requirements specified in this clause shall be comply	No this kind of situation.
	The joints or gaskets of doors, lids, covers and enclosures shall withstand the chemical effects of the aggressive liquids, vapours, or gases used on the machine	Pass. They can withstand the chemical effects of the aggressive liquids, vapors, or gases used on the



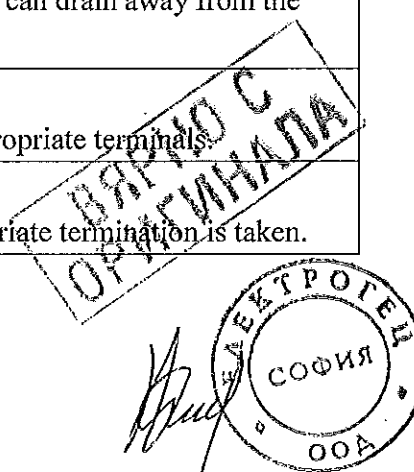
		machine.
	The means used to maintain the degree of protection of an enclosure on doors, lids and covers that require opening or removal for operation or maintenance shall be secured	Pass. They can be secured firmly.
	The degree of protection for all openings in the enclosures shall be secured	Pass.
	Openings for cable shall be easily re-opened on site	Pass. They can be re-opened easily.
	There shall be no opening between enclosures containing electrical equipment and compartments containing coolant, lubricating or hydraulic fluids, or those into which oil, other liquids, or dust can penetrate	No this kind of opening has been found.
	The requirement mentioned above does not apply to electrical devices specially designed to operate in oil nor to electrical equipment in which coolants are used	Not applicable.
	Where there are holes in an enclosure for mounting purpose, the degree of protection for the enclosure shall be secured	Pass. Appropriate protection degree can be secured.
	Equipment that, can attain a surface temperature sufficient to cause a risk of fire or harmful effect to an enclosure material, the relevant requirements shall be complied	Not applicable.
12.5	Access to control gear	-
	The min. dimensions of gangways in front of and between control gear shall be according to 481.2.4 of IEC 60364-4-481	Not applicable.
	Doors in gangways and for access to electrical operating areas shall: -be at least 0.7 m wide and 2.0 m high; -open outward; -have a menace to allow opening from the inside without the use of a key or tool	Not applicable.
13	Conductors and cables	-
13.1	General requirements	-
	Conductors and cables shall be selected so as to be suitable for the operating conditions and external	Pass. All of conductors and cables used



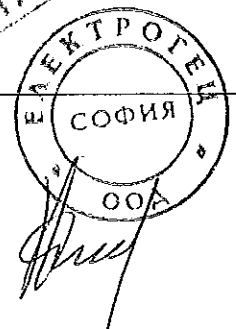
	-prevent damage from a swinging load	
13.8.2	Protective conductor circuit	
	Where collector wires, collector bars and slip-ring assemblies are installed as part of the protective bonding circuit, they shall not carry current in normal operation	Not applicable.
	The continuity of the protective conductor circuit using sliding contacts shall ensured by taking appropriate measures	Not applicable.
13.8.3	Protective conductor current collectors	
	Not interchangeable with the other current collectors	Not applicable.
	Not interchangeable with the other current collectors	Not applicable.
	Such current collectors shall be of the sliding contact type	Not applicable.
13.8.4	Removable current collectors with a disconnect function	
	Shall be so designed that the protective conductor circuit is interrupted only after the live conductors have been disconnected, and the continuity of the protective conductor circuit is re-established before any live conductor is reconnected	Not applicable.
13.8.5	Clearance in air	
	Shall be suitable for operation in pollution degree 3 conditions	Pass
13.8.6	Creepage distances	
	Shall be suitable for operation in pollution degree 3 conditions	Pass
13.8.7	Conductor system sectioning	
	If collector wires or collector bars can be divided into isolated sections, suitable design measures shall be employed to prevent the energization of adjacent sections by the current collectors themselves	Not applicable.
13.8.8	Construction and installation of collector wire, collector bar systems and slip-ring assemblies	Not applicable.
	Used for power circuits shall be grouped separately from those used for control circuit	Not applicable.
	Shall be capable of withstanding, without damage, the mechanical forces and thermal effects of short-circuit currents	Not applicable.
	Removable covers shall not be opened by one person	Not applicable.




	without the aid of a tool	
	If collector bars are installed in a common metal enclosure, the individual sections of the enclosure shall be bonded together and earthed at several points depending upon their length	Not applicable.
	Metal covers of collector bar laid underground or underflow shall also be bonded together and earthed	Not applicable.
	Underground and underflow collector bar ducts shall have drainage facilities	Not applicable.
14	Wiring practices	-
14.1	Connections and routing	-
14.1.1	General requirements	-
	All connections shall be secured against accidental loosening	Pass. All connections can be secured against accidental loosening.
	The means of connection shall be suitable for the cross-sectional areas and neutral of the conductors being terminated	Pass. The means of connection is suitable.
	The connection of two or more conductors to one terminal is permitted (only when the terminal is designed for that purpose)	Pass. No terminal has been connected with three or more conductors.
	One protective bonding circuit conductor shall be connected to one terminal connecting point	Pass. One conductor connected to one terminal.
	Soldered connections shall only be permitted if terminals are suitable for soldering	Not applicable.
	Terminals on terminal blocks shall be plainly identified to correspond with markings on the diagrams	Pass. All of them have been marked corresponding to markings on the diagrams.
	The installation of flexible conduits and cables shall be such that liquids shall drain away from the fittings	Pass. Liquids can drain away from the fittings.
	Means of retaining conductor strands shall be provided (Solder shall not be used for that purpose)	Pass. By appropriate terminals
	Shielded conductors shall be so terminated as to prevent fraying of strands and to permit easy disconnection	Pass. Appropriate termination is taken.



	Identification tags shall be legible, permanent, and appropriate for the physical environment	Pass. They are legible, permanent, and appropriate for the physical environment.
	Terminal blocks shall be so mounted and wired, that the internal and external wiring does not cross over the terminals	Pass. No conductor cross over the terminals.
14.1.2	Conductor and cable runs	-
	Shall be run from terminal to terminal without splices or joints	Pass. All of them are run from terminal to terminal without splices or joints.
	If it is necessary to connect and disconnect cables assemblies, a sufficient extra length shall be provided	Pass.
	The terminations of cables shall be adequately supported to prevent mechanical stresses at the terminations of the conductors	Pass. Adequate support measure has been taken.
14.1.3	Conductors of different circuits	-
	Suitable arrangement for conductors of different circuits	Pass, Suitable arrangement is provided.
14.2	Identification of conductors	-
14.2.1	General requirements	-
	Conductors shall be identifiable at each termination according to the technical documentation (see clause 18)	Pass. Make reference to clause 18.
	Use of color-coding for identification of conductors	Pass. Color-coding for identification is used.
	Color GREEN or YELLOW should not be used	Pass. No GREEN or YELLOW conductor is used.
14.2.2	Identification of the protective conductor	-
	Shall be really distinguishable by shape, location, marking or color	Pass By marking and color.
	When identification is by color alone, the bicolor combination GREEN-AND YELLOW shall be used	Pass. By GREEN-AND YELLOW.
	For the bicolor combination GREEN-AND YELLOW : one of the color covers at least 30% and not more than 70% of the surface of the conductor, the other color	Pass.



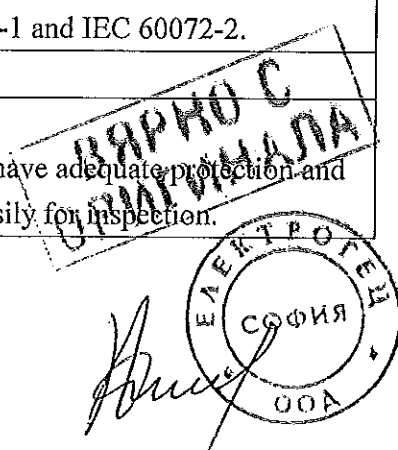
	covering the remainder of the surface	
	Use of graphical symbol 	Pass. The earthing symbol has been used.
14.2.3	Identification of the neutral conductor	-
	The color shall be Light Blue	Pass
	Requirements for bare conductors used as neutral conductors	Pass
14.2.4	Identification of other conductors	-
	Identification of other conductors shall be by color, number, alphanumeric, or a combination of color and numbers or alphanumeric	Pass. By a combination of color and numbers or alphanumeric.
14.3	Wiring inside enclosures	-
	Panel conductors shall be supported where necessary to keep them in place	Pass. Appropriate supports is provided.
	Non-Metallic ducts shall be permitted only when they are made with a flame-retardant insulating material	Pass. Some non-metallic ducts are used with a flame-retardant insulating material.
	Connections to devices mounted on doors or to other movable parts shall be made using flexible conductors according to 13.2	Pass. Connections according to 13.2.
	The conductors shall be anchored to the fixed part and to the movable part independently of the electrical connection	Pass. Adequate anchored measures have been taken.
	Conductors and cables that do not run in ducts shall be adequately supported	Pass. All of them have been supported adequately.
	Terminal blocks or plug-socket combinations shall be used for control wiring that extends beyond the enclosure	Pass. This application has been taken.
14.4	Wiring outside enclosures	-
14.4.1	General requirements	-
	The protection degree shall be ensured when cables or ducts are introduced into the enclosure	Pass. The protection degree can be secured.
14.4.2	External ducts	-
	Shall be enclosed in suitable ducts as described in 14.5	Pass

ВАРНОС
ОРИГИНАЛ

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14.5.7	Machines compartments and cable trunking systems	-
	Are isolated from coolant or oil reservoirs and are entirely enclosed	Not applicable.
	Conductors run in enclosed compartment and cable trunking systems shall be so secured and arranged that they are not subject to damage	Not applicable.
14.5.8	Connection boxes and other boxes	-
	Shall be readily accessible for maintenance	Pass. They are readily accessible for maintenance.
	Shall provide protection against the ingress of solid bodies and liquids	Pass. Adequate protection is provided.
	Shall not have opened but unused knockouts nor any other opening and shall be so constructed as to exclude materials such as dust, flying, oil, and coolant	Pass. These requirements have been complied with.
14.5.9	Motor connection boxes	-
	Shall enclose only connections to the motor and motor-mounted devices	Not applicable.
15	Electric motors and associated equipment	-
15.1	General requirements	-
	Electric motor should conform to the requirements of IEC 60034-1	Pass.
	Motor control equipment shall be located and mounted according to clause 12	Pass.
15.2	Motor enclosures	-
	Protection degree shall be at least IP 23	Pass. At least IP23.
15.3	Motor dimensions	-
	As far as is practicable, the dimensions of the motors shall comply with IEC 60072-1 and IEC 60072-2	Pass. It is in compliance with IEC 60072-1 and IEC 60072-2.
15.4	Motor mounting and compartments	-
	Each motor and its associated couplings, belts and pulleys, or chains, shall be so mounted that they are adequately protected and are easily for inspection	Pass. They have adequate protection and are easily for inspection.




	Shall be such that all motor hold-down means can be removed and all terminal boxes are accessible	Pass. This requirement has been complied with.
	The proper cooling shall be ensured and the temperature rise remains within the limits of the insulation class	Pass. This requirement has been complied with.
	Motor compartment should be clean and dry, and shall be ventilated directly to the exterior of the machine	Not applicable. No motor compartment is found.
	The vents shall be such that ingress of swarf, dust, or water spray is at an acceptable level	Pass. Adequate vents are provided.
	There shall be no opening between the motor compartment and any other compartment that does not meet the motor compartment requirements	Pass. No this kind of opening.
	If a conduit or pipe is run into the motor compartment from another compartment not meet the motor compartment requirements, any clearance around the conduit or pipe shall e sealed	Not applicable.
15.5	Criteria for motor selection	-
	Shall be selected according to the anticipated service and physical environment conditions	Pass. They are selected according to the anticipated service and physical environment conditions.
15.6	Protective devices for mechanical brakes	-
	Operation of the overload and over current protective devices for mechanical brake actuators shall initiate the simultaneous de-energization (release) of the associated machine actuators	Not applicable.
16	Accessories and lightning	-
16.1	Accessories	-
	Socket-outlets for accessory equipment shall comply:	-
	Should conform to IEC 60309-1 (if this is not possible, they should be clearly marked with the voltage and current ratings)	Pass. Marked with the voltage and current ratings.
	The continuity of the protective bonding circuit to the socket-outlet shall be ensured	Pass. It can be ensured
	All unearthed conductors: Over current or overload protection according to 7.2 and 7.3 separately from the	Pass. Over current protection is provided.



	protection of other circuits	
	if the power supply to the socket outlet is not disconnected by the supply disconnecting device, the clause 5.3.5 shall apply	Pass. Please see the related clause.
16.2	Local lighting of the machine and equipment	-
16.2.1	General	-
	Connections to the protective bonding circuit according to 8.2.2	Pass. Please see the related clause.
	The ON-OFF switch shall not be incorporated in the lamp holder or in the flexible connecting cords	Pass. This requirement is complied with.
	Stroboscopic effects from lights shall be avoided	Pass. Stroboscopic effects from lights has been avoided
16.2.2	Supply	-
	The nominal voltage of the local lighting circuit shall not exceed 250 V	Pass. This requirement is complied with.
	Lighting circuits shall be supplied from one of the sources specified in this clause	Pass. Please see the related clause.
16.2.3	Protection	-
	Local lighting shall be protected according to 7.2.6	Pass. Please see the related clause.
16.2.4	Fittings	-
	Adjustable lighting fittings shall be suitable for the physical environment	Pass.
	The lamp holders shall be: - According to the relevant IEC publication; - Constructed with an insulating material protection the lamp cap so as to prevent unintended contact	Pass. This requirement has been taken into account during design.
	Reflectors shall be supported by a bracket and not by the lamp holder	Pass. Reflectors are supported by a bracket.
17	Marking, warning signs and reference designations	-
17.1	General	-
	The electrical equipment shall be marked with the supplier's name, trade mark, or other identifying symbol and, when required, with a certification mark	Pass. These information have been marked.
	Shall be of sufficient durability to withstand the physical	Pass.

ВАРНО С
ОРИГИНАЛА

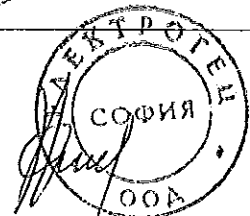


	environment involved	They can withstand the physical environment involved.
17.2	Warning signs	-
	Enclosures shall be marked with the warning sign 	Pass. This warning sign has been used.
	The warning sign shall be plainly visible on the enclosure door or cover	Pass. It is plainly visible on the enclosure door.
17.3	Functional identification	-
	Control devices, visual indicators and displays, used in man-machine interface shall be clearly and durably marked with regard to their functions either on or adjacent to the item	Pass. Appropriate markings have been provided for these devices.
	Preference should be given to the use of standard symbols give in IEC 60417 and ISO 7000	Pass. These relevant requirements appropriate for this machine have been used.
17.4	Marking of control equipment	-
	Control equipment shall be legibly and durably marked in a way that is plainly visible after the equipment is installed	Pass. They have been marked legibly and durably.
	A nameplate giving the relevant information specified in this clause shall be attached to the enclosure	Pass. A nameplate is used.
	The full-load current shown on the nameplate shall be sufficient	Pass.
17.5	Reference designations	-
	All enclosures, assemblies, control devices, and components shall be plainly identified with the same reference designations as shown in the technical documentation	Pass. These information have been provided within the instruction manual.
	Where size or location preclude the use of an individual reference designation, group reference designation shall be used	Pass. Make reference to the instruction manual.
18	Technical documentation	-
18.1	General	-
	The information necessary for installation, operation, and maintenance of the electrical equipment of a	Pass. All the information have been

ВАРНО С
КОПИТАТА

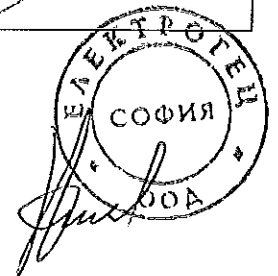


	machine shall be supplied in the form of drawings, diagrams, charts, tales and instructions	provided by many forms.
	The information shall be in an agreed language	Pass. In English.
	The supplier shall be ensure that the technical documentation in this clause is provided with each machine	Pass. The instruction manual is equipped with each machine.
18.2	Information to be provided	-
	The information provided with the electrical equipment shall include the requirements specified in this clause	Pass. Please see the related clause.
18.3	Requirements applicable to all documentation	-
	Relevant requirements according to 18.4 to 18.10 shall be complied	Pass. Please see the related clause.
18.4	Basic information	-
	Min. requirements for he technical documentation shall be contained	Pass.
18.5	Installation diagram	-
	Use and requirements for installation diagram	Pass. Installation diagrams are provided.
18.6	Block (system) diagrams and function diagrams	-
	Use and requirements for system (block) diagram	Pass. System diagrams are provided.
18.7	Circuit diagrams	-
	Use and requirements for circuit diagrams	Pass. Circuit diagrams are provided.
18.8	Operating manual	-
	Use and requirements for operating manual	Pass. Operating manual is provided.
18.9	Maintenance manual	-
	Use and requirements for maintenance manual	Pass. Maintenance manual is provided.
18.10	Parts list	-
	Use and requirements for parts list	Pass. Parts list is provided in manual book
19	Testing and verification	
19.1	General	



	When these tests are performed, it is recommended that they follow the sequence listed	Pass. All tests have been carried out according to the following sequence.
	When the electrical equipment is modified, the requirements stated in 19.7 shall apply	Pass.
19.2	Continuity of the protective bonding circuit	-
	Test conditions: a current of at least 10 A at 50 Hz or 60 Hz	Pass.
	The measured voltage shall not exceed the values given in table 9	Pass. See the test report in detail.
19.3	Insulation resistance tests	-
	Test conditions : 500 V d.c.	Pass.
	The measured values shall not less than 1 MΩ	Pass. See the test report in detail.
19.4	Voltage tests	-
	Test conditions : - at least 1 second - test voltage is twice the rated supply voltage of the equipment or 1000 V, whichever is greater - frequency of 50/60 Hz - supplied from a transformer with a min. rating of 500 VA	Pass.
	Shall not breakdown	Pass. See the test report in detail.
19.5	Protection against residual voltages	-
	Tests shall be performed to ensure compliance with 6.2.4	Not applicable.
19.6	Functional test	-
	The functions of electrical equipment shall be tested (particularly those related to safety and safeguarding)	Pass. All functions equipped with this machine have been tested.
19.7	Retesting	-
	Where a portion of the machine and its associated equipment is changed or modified, that portion shall be verified and retested, as is appropriate	Not applicable.

ВАРНО С
ОРИГИНАЛА



2. Test Record:

• Manufacturer	: Dongguan Hongya Machinery Co., Ltd.
• EUT	: Hardcover book back-gluing machine
• Test model	: HY618
• application model	: HY618
• Ratings	: 220VAC 26KW
• Test Equipment	: Extech Electronics
Withstanding Voltage/Arc/Insulation/Grounding Tester	
Model	: 7740
Date of Calibration :September 30 , 2012	
• Test according to	: Chapter 19 of EN 60204-1
• Test conditions	: 10A / 50Hz
• Date	: 05/08/2013

(1) Grounding continuous test

The test record:

Test Points	Test Result (mΩ)	Test current (A)	Voltage Drop (V)
PE – Enclosure	2	10	0.02

Result: pass

(2) Insulation Resistance test

The test record:

Test Points	Test Result (MΩ)	Required value no less than 1MΩ
PE – L1	>380	pass
PE – L2		

(3) Withstanding Voltage test

The test record:

GACIA ELECTRICAL APPLIANCE CO.,LTD

ВЕРНО С
ОРИГИНАЛА



Certificate of Compliance



No. 0P151117.GEAQU50

Certificate's
Holder:

GACIA ELECTRICAL APPLIANCE
CO.,LTD.
No. 545 Dongdajie, Baitawang Industrial Zone
Beibaixiang, Wenzhou, 325603, China

Certification ECM
Mark:



Product:
Model(s):

MCCB
PN1600SE, PN1600HE, LN1600SE, LN1600HE

Verification to:

Standard:
EN 60947-2:2006/A2:2013

related to CE Directive(s):
2014/35/EU (Low Voltage)

Remark: The product(s) has been verified on a voluntary basis. The product(s) satisfies the requirements of the Certification Mark of ECM, in reference to the above listed Standard(s). The above Certification Mark can be affixed on the product(s) accordingly to the ECM regulation about its release and its use. Regulation can be found at www.entecerma.it.

Whereas the Manufacturer is responsible of the CE certification of the product(s) and not exempted to perform all the necessary activities before placing the product(s) on the market.

The Manufacturer is also responsible to maintain efficient the internal production control to ensure the product(s) are in compliance with the Certification ECM Mark.

This certificate can be checked for validity at www.entecerma.it

Date of issue 17 November 2015

Expiry date 16 November 2020

Chief Manager
Tim Mahan



Deputy Manager
Viola Miller



ВЯРНО С
ОРИГИНАЛА



Ente Certificazione Macchine Srl

Via Ca' Bella, 243 - Loc. Castello di Serravalle - 40053 Valsamoggia (BO) - ITALY
 ☎ +39 051 6705141 ☎ +39 051 6705156 ✉ info@entecerma.it 🌐 www.entecerma.it

лого на IAC-MRA
лого на CNAS

Китайската национална служба за акредитация за оценка на съответствието

СЕРТИФИКАТ ЗА АКРЕДИТАЦИЯ НА ЛАБОРАТОРИЯ

(Регистрационен No. CNAS L3258)

Китайската национална служба за акредитация за оценка на съответствието е акредитирала

Мамбосерт (Шанхай) Технолоджи Ко., Лтд

бул. Йишан № 520, квартал Ксухуи, Шанхай

към ISO/IEC 17025:2005 Основни изисквания към системата за компетентност на лаборатории за тестване и калибрация (CNAS-CL01 критерии за акредитация за компетентност на лаборатории за тестване и калибрация) за компетентност в областта на тестване.

Обхвата на акредитация е описан в приложението, носейки същия номер за акредитация както горния. Формулярите в списъка са неразделна част от този сертификат.

Дата на издаване: 2013-12-15

Дата на изтичане: 2017-12-11

Дата на първоначална акредитация: 2012-12-12

Подпис: (не се чете)

Подписан от страна на Китайската национална служба за акредитация за оценка на съответствието

Китайската национална служба за акредитация за оценка на съответствието (CNAS) е оторизирана от Сертифицираща и Акредитираща Администрация на Народна република Китай (CNCA) да оперира националните системи за акредитация за оценка на съответствието. CNAS е подписваща страна към Международната кооперация за акредитации на лаборатории (ILAC-MRA) и подписваща страна към Азия-Пасифик Международна кооперация за акредитации на лаборатории (APLAC-MRA).

**ИЗПЪЛНЕН
ОРИГИНАЛ**



Test Points	Applicable voltage	Test period in sec	Breakdown?
PE-L	440V	1s	No

Result: pass

3. List of test equipment used

Clause	Measurement / testing	Testing / measuring equipment / material used	Manufacturer	Range used	Model/Specification	S/N	Calibration Date	Calibration Due
4.4.6	IP	accessible conductive parts probe / Ø1mm., Hand sprayer serial number (IP protection test probe)	Shenzhen Chuangxin Precious Measuring Tool Mfr. Co., Ltd	Ø1	GTS-01	30295	01-08-2013	01-07-2014
6.2.2	IP	accessible conductive parts probe / Ø1mm., Hand sprayer serial number (IP protection test probe)	Shenzhen Chuangxin Precious Measuring Tool Mfr. Co., Ltd	Ø1	GTS-01	30295	01-08-2013	01-07-2014
10.1.3	IP	accessible conductive parts probe / Ø1mm., Hand sprayer serial number (IP protection test probe)	Shenzhen Chuangxin Precious Measuring Tool Mfr. Co., Ltd	Ø1	GTS-01	30295	01-08-2013	01-07-2014
11.3	IP	accessible conductive parts probe / Ø1mm., Hand sprayer serial number (IP protection test probe)	Shenzhen Chuangxin Precious Measuring Tool Mfr. Co., Ltd	Ø1	GTS-01	30295	01-08-2013	01-07-2014
11.4	L	Protractor	Zhejiang Lishui Nanguang Measuring Tool Co., Ltd	L°	0-360°	NG1303820	02-08-2013	02-07-2014
11.4	m	Roulette Tape	Yucheng County Mingzhi Measuring Tool Co., Ltd	0-2 m	0832	06	02-08-2013	02-07-2014
12.3	V	multifunctional handheld device serial	Clare Electronic Co., Ltd	10000V	A252	A8.51.5	02-08-2013	02-07-2014
18.3	MΩ	multifunctional handheld device serial	Clare Electronic Co., Ltd	MΩ	A252	A8.51.5	02-08-2013	02-07-2014
18.4	V	multifunctional handheld device serial	Clare Electronic Co., Ltd	10000V	A252	A8.51.5	02-08-2013	02-07-2014

End



Списък на отделните изпитания:

1. Обхват;
2. Нормативни референции;
3. Дефиниции;
4. Общи изисквания;
5. Входящи проводници за захранване и устройства за разединяване и изключване;
6. Защита срещу електрически удар;
7. Защита на оборудването;
8. Изравняване на потенциали;
9. Контролни вериги и контролни функции;
10. Оперативен интерфейс и устройство за контрол на машините;
11. Електрическо оборудване;
12. Контролен механизъм: местоположение, монтаж и приложения;
13. Проводници и кабели;
14. Практики за окабеляване;
15. Електрически мотори и свързано оборудване;
16. Аксесоари и осветление;
17. Маркиране, предупредителни знаци и референтни обозначения;
18. Техническа документация;
19. Тестване и верификация;

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/“

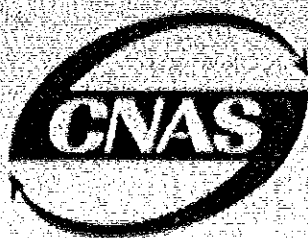
РЕФ. № PPD 15-042

“Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А”

Приложение № 5

ВЯРНО С
ОРИГИНАЛА





China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(No. CNAS L3258)

China National Accreditation Service for Conformity Assessment has accredited

Mambocert (shanghai)

Technology Co., Ltd

No. 520 Yishan Road Xuhui District

Shanghai

to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

The scope of accreditation is detailed in the attached schedule bearing the same accreditation number as above. The schedule forms an integral part of this certificate.

Date of Issue: 2013-12-16

Date of Expiry: 2017-12-11

Date of Initial Accreditation: 2012-12-12

ВЕРНО С
КОПИЯ



Signed on behalf of China National Accreditation Service
for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CACA) to operate the national accreditation system for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA), and the signatory to Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

„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/“

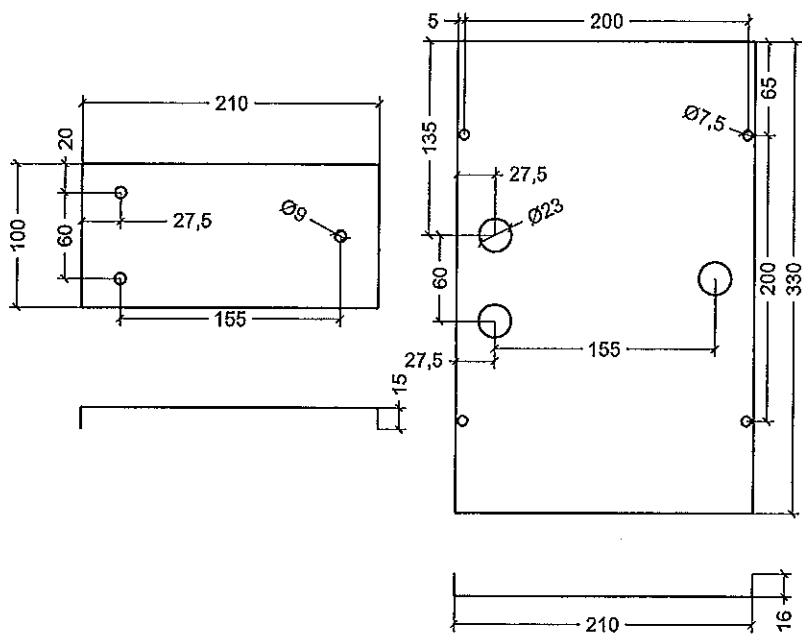
РЕФ. № PPD 15-042

"Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А"


Приложение № 6



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ВЯРНО С
ОРИГИНАЛА

					Стадий	Маса	Мащаб
Монтажна планка за прекъсвач PN 1250A					РП		M1:5
					Лист:1	Вс. Листа:1	
Изм.	Бр.	№ на докум.	Подпис	Дата	Обект: Тръжна процедура с реф. № РРД 15-101, на „ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ“ АД,  "ЕЛЕКТРОГЕЦ" ООД СОФИЯ		
Разработил	инж.Кьосев	<i>[Signature]</i>	12.15				
Начертал	инж.Кьосев	<i>[Signature]</i>	12.15				
Проверил	инж.Кьосев	<i>[Signature]</i>	12.15				
Проверил	инж.Лазаров	<i>[Signature]</i>	12.15				

[Signature]

[Signature]

Наименование на материала: Вертикален предпазител-разединител НН 400 А, с триполюсно управление

Съкратено наименование на материала: ВПР НН, 400 А, 3-полюсно управление

Област: Н – Трансформаторни постове Категория: 16 - Предпазители, основи за предпазители и предпазител- разединители

Мерна единица: Брой Аварийни запаси: Да

Характеристика на материала:

Триполюсен предпазител-разединител с вертикална конструкция, с обявен работен ток 400 А, с общо управление на полюсите, за директен монтаж върху събирателни шини с междуосово разстояние 185 mm, за високомощни предпазители със стопяема вложка НН, система А (NH система), с характеристика gG, размер 2, съответстващи на БДС EN 60269-1:2007 и БДС HD 60269-2:2007.

Използване:

Вертикалният предпазител-разединител е предназначен за включване, изключване, разединяване и защита на кабелни линии НН.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:

Триполюсният вертикален предпазител-разединител за 400 А, с общо управление на полюсите трябва да отговаря на приложимите български и международни стандарти или еквиваленти и на техните валидни изменения и поправки:

БДС EN 60947-1:2007 „Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)“; и

БДС EN 60947-3:2002 „Комутационни апарати за ниско напрежение. Част 3: Товарови прекъсвачи, разединители, товаров прекъсвач-разединители и апарати, комбинирани с предпазители (IEC 60947-3:1999 + поправка юли 1999)“

и

да бъде оценен 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	SL2G-3X3/9/KM2G-F Jean Muller, Германия, Приложение 1

Сектор
ВЪРНО
ОРИГИНАЛ
ЕЛЕКТРО
СОФИЯ

№ по ред	Документ	Приложение № или текст
2.	Техническо описание и чертежи с нанесени на тях размери	Приложение 2
3.	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 3
4.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 3 – заверено копие	Приложение 4
5.	ЕО декларация за съответствие	Приложение 5
6.	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 с нормативно-техническите документи“ по-горе	Приложение 6

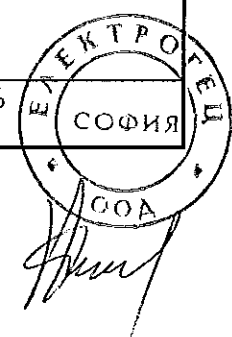
Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. (Каталозите и протоколите от проверките и изпитванията могат да бъдат и само на английски.)

Технически данни:

Характеристики на работната среда

№ по ред	Наименование	Стойност
1.1	Място на монтиране	На закрито
1.2	Максимална t терминът е ачава:духа в околнромени: кост еползван, не е уточнена и продължителността на експозиция на изпитвания спвецимен на 2емпература на въздуха в околната среда	+ 40°C
1.3	Минимална t терминът е ачава:духа в околнромени: кост еползван, не е уточнена и продължителността на експозиция на изпитвания спвецимен на 2емпература на въздуха в околната среда	Минус 5°C
1.4	Максимална средна t терминът е ачава:духа в околнромени: кост еползван, не е уточнена и продължителността на експозиция на изпитвания спвецимен на 2емпература на въздуха в околната среда за период от 24 ч.	+ 35°C
1.5	Относителна влажност (при 20°C)	До 90 %

ВАЖНО С
ОРИГИНАЛА



№ по ред	Наименование	Стойност
1.6	Степен на замърсяване	3
1.7	Надморска височина	До 2000 m

Параметри на електроразпределителната мрежата НН

№ по ред	Наименование	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Електроразпределителна мрежа	4 проводна мрежа (L1, L2, L3, PEN)
2.5	Схема на електроразпределителната мрежа	TN-C

3. Технически параметри и други данни

№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.1	Обявено работно напрежение, U_e	min 690 (500) V AC	690 (500) V AC
3.2	Брой на полюсите	3	3
3.3	Обявена честота	50 Hz	50 Hz
3.4	Категория по пренапрежение съгласно БДС EN 60664-1:2007	IV	IV
3.5	Обявено издържано импулсно напрежение, U_{imp}	8 kV	12 kV
3.6	Обявено напрежение на изолацията, U_i AC	min 800 V	1000 V AC
3.7	Обявен работен ток, I_e	400 A	400 A

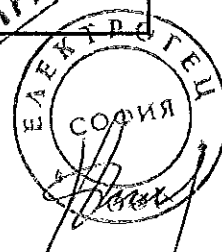
ВЕРНО С
ОРИГИНАЛ

1000 V AC
400 A

ЕЛЕКТРОТЕЦ
СОФИЯ

№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.8	Термичен ток със стопяема вложка, I _{th}	400 A	400 A
3.9	Условен ток на късо съединение (ефективна стойност) при 400 V AC	min 50 kA	80 kA
3.10	Размер на стопяемите вложки (съгласно серията БДС EN 60269)	2	2
3.11	Максимален обявен ток на стопяемите вложки, I _n	400 A	400 A
3.12	Категория на приложение (при 400 V AC)	AC 22 В или по висока	AC 22 В
3.13	Механична износоустойчивост, брой на комутационните цикли	min 800	1400
3.14	Електрическа износоустойчивост, брой на комутационните цикли	min 200	200
3.15	Управление	Триполюсно (едновременно включване и изключване на трите полюса)	Триполюсно (едновременно включване и изключване на трите полюса)
3.16	Основни размери:	-	-
3.16a	широчина	max 100 mm	99 mm
3.16b	височина (измерена от края на клемните съединения)	680 mm - информативно	662 mm
3.17	Разстояние между осите на събирателните шини	185 mm	185 mm
3.18	Присъединяване към събирателните шини	Клеми за свързване без необходимост от пробиване на шините	Клеми за свързване без необходимост от пробиване на шините
3.19	Степен на защита срещу проникване на твърди тела и вода във вътрешността и допир до части под напрежение от лицевата страна съгласно БДС EN 60529+A1:2004 или еквивалентно.	min IP20	IP30

ВЯРНО С
ОРИГИНАЛА



№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.20	Клемови съединения за токопроводимите жила на присъединяваните кабелни линии	Вертикалните предпазител-разединители трябва да бъдат съоръжени с V-съединителна арматура за свързване на токопроводими кабелни жила в диапазона най малко от 35 mm ² re до 185mm ² sm.	V-съединителна арматура за свързване на токопроводими кабелни жила от 25 – 240 mm ²
3.21	Маркировка	Вертикалните предпазител-разединители трябва да бъдат маркирани с информацията съгласно т. 5.2 от БДС EN 60947-3:2002 или еквивалентно и инициалите „CE”.	Вертикалните предпазител-разединители са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-3:2002 или еквивалентно и инициалите „CE”.
3.22	Тегло, kg	Да се посочи	4.9 kg

ВЯРНО С
ОРИГИНАЛА

AC



[Signature]

C

C

3

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 предпазител-разединител НН 400 А, с триполюсно управление”

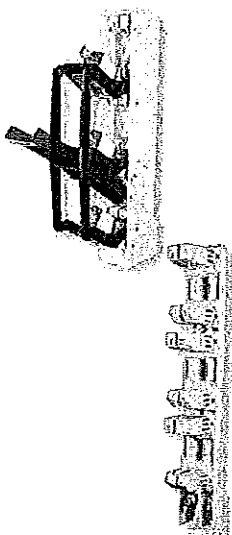
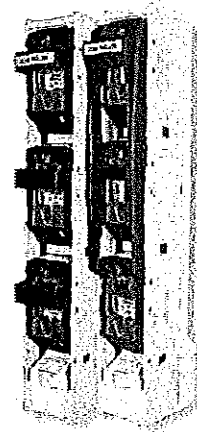
Приложение № 1



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungslastschaltleisten Größe 1-3 für
185mm Sammelschienensysteme
*NH strip-type fuse-switch-disconnectors
size 1 to 3 for 185mm busbar systems*



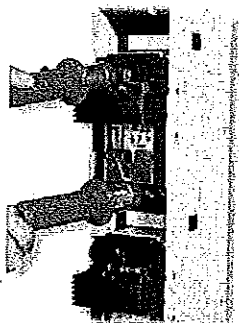
Vorteile, die überzeugen

Schalthebel

- Langer Schalthebel für sicheres und schnelles Schalten
- Abschließbar mit bis zu 3 Vorhängeschlössern in EIN- und AUS-Stellung

Montage

- Sichere Montage unter Spannung durch stets berührungsgeschütztes Kontaktsystem
- Nachrüstbare Montagehaken



Messung und Überwachung

- Sichere Spannungsmessung durch Prüflöcher über den Sicherungsaufnahmekontakten
- Elektronische Sicherungsüberwachung oder Sicherungsüberwachung durch Motorschutzschalter
- Einsatz von Wandlersicherungen für temporäre Strommessungen



Anschlussraumabdeckung

- Anschlussraumabdeckung im Gerät integriert
- Typenschild auch im eingebauten Zustand jederzeit lesbar

Convincing advantages

Operating lever

- Long operating lever for safe and reliable switching
- Lockable with up to 3 padlocks in both ON and OFF position

Installation

- Safe installation on live busbars due to always touch proof contacts
- Retrofittable mounting hooks

Measuring and monitoring

- Safe voltage testing through test holes leading to blade-contacts
- Electronic fuse monitoring or fuse-monitoring by means of motor circuit-breaker
- Current-transformer (c.t.) fuse-links for temporary current measurements

Terminal cover

- Integrated in NH strip-type fuse-switch-disconnector
- Markings always readable before and after installation

ВЕРНО С
ОРИГИНАЛА



Größe 1-2 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > OMEGA Kontaktsystem > 1-pollig schaltbar
Size 1-2 > 185mm busbar system > Terminal at top or bottom side > OMEGA contact system > 1-pole switchable

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm ²]	I _n [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150			SL1H-3X/3A	L193100103
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1H-3X/9/KM2G-F	L199600403
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL1H-3X/9/KM2G	L199602903
2	Flachanschluss M12 Flat terminal M12	25-240		1	SL2H-3X/3A	L293100103
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240			SL2H-3X/4A	L294100203
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2H-3X/4A-60	L294100303
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240			SL2H-3X/9/KM2G-F	L299600403
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2H-3X/9/KM2G	L299600503

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip-
type fuse-switch
disconnectors

Größe 2 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > OMEGA Kontaktsystem
> 1-pollig schaltbar > Versenkbarer Griff
Size 2 > 185mm busbar system > Terminal at top or bottom side > OMEGA contact system
> 1-pole switchable > Retractable handle

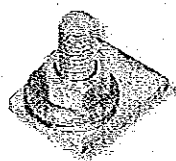
NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

2	Flachanschluss M12 Flat terminal M12	25-240			SL2H-3X/3A/GV	L293100603
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400	1	SL2H-3X/9/KM2G-F/GV	L299600903
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2H-3X/9/KM2G/GV	L299601003

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Anschlussarten/Terminal versions

Flachanschluss Flat terminal M...	Stehbolzenanschluss Stud bolt terminal	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G
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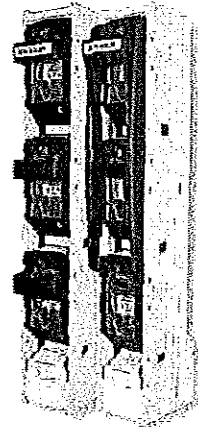
Anhang
Appendix



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungsleisten Größe 1-3 DELTA und OMEGA Kontaktsystem NH strip-fuseways size 1-3 DELTA and OMEGA contact system



Vorteile, die überzeugen

OMEGA Kontaktsystem

- Maximale Sicherheit dank hohem Kurzschluss-einschaltvermögen (120kA/500V)
- Gefahrloser Betrieb durch hohe Schaltleistung bis zu AC-23B (400V/400A)
- Korrosionsfreie Edelstahl-Fremdfederung
- Robustes und alterungsbeständiges Kontaktsystem mit hohen Rückstelleigenschaften



DELTA Kontaktsystem

- Gezielte Lichtbogenführung und geringer Kontaktverschleiß durch Opferelektroden
- Gefahrloser Betrieb durch hohe Schaltleistung bis zu AC-23B (400V/630A)
- Hohe Alterungsbeständigkeit durch zwei voneinander unabhängige Fremdfedermente
- Optimale Kontaktierung und niedrige Verlustleistung durch 2fach-Linienkontaktsystem
- Hohe Kurzschlussfestigkeit bis zu 120kA durch integrierte Kurzschlussblockade



Einsatz

- Das OMEGA Kontaktsystem bietet für die typischen Anwendungen im Bereich der Versorgungsnetzbetreiber für Geräte der Größe 1 und 2 ein ideal angepasstes Leistungsprofil
- Das DELTA Kontaktsystem sorgt mit seiner Stromtragfähigkeit von bis zu 1000A Dauerstrom insbesondere in Industriellen Anwendungen sowie in Geräten mit einem Bemessungsstrom von > 400A für hervorragende Lastschalteigenschaften



Convincing advantages

OMEGA contact system

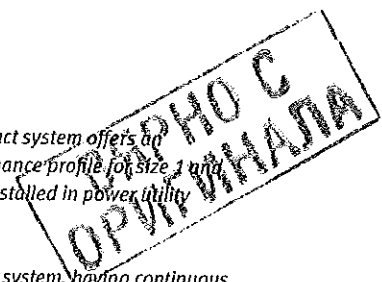
- Maximum safety thanks to high short-circuit making capacity (120kA/500V)
- Riskless operation due to high switching capacity up to AC-23B (400V/400A)
- Corrosion-resistant external spring elements made by stainless steel
- Robust and age-resistant contact system with high restoring properties

DELTA contact system

- Defined arc initiation and low contact wear due to sacrificial electrodes
- Riskless operation due to high switching capacity up to AC-23B (400V/630A)
- High age resistance by two independent spring elements
- Optimal contacting and low power loss by dual line contact system
- High short-circuit strength up to 120kA by integrated short circuit pinch-stop

Application

- The OMEGA contact system offers an optimum performance profile for size 1 and 2 devices to be installed in power utility networks
- The DELTA contact system, having continuous current carrying capability up to 1000A, provides excellent load-break capability in industrial applications and in switching devices having rated currents above 400A





Größe 1-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 1-polig schaltbar
Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 1-pole switchable

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm²]	I _n [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
	Flachanschluss M10 Flat terminal M10	25-150			SL1-3X/3A	L1931001
1	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1-3X/9/KM2G-F	L1996004
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL1-3X/9/KM2G	L1996029
	Flachanschluss M12 Flat terminal M12	25-240			SL2-3X/3A	L2931001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240			SL2-3X/4A	L2941002
2	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2-3X/4A-60	L2941003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240		1	SL2-3X/9/KM2G-F	L2996004
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2-3X/9/KM2G	L2996005
	Flachanschluss M12 Flat terminal M12	25-300			SL3-3X/3A	L3931001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-300			SL3-3X/4A	L3941002
3	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-300	630		SL3-3X/4A-60	L3941003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240			SL3-3X/9/KM2G-F	L3996018
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL3-3X/9/KM2G	L3996004
2 x 3	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1250		SL3-3X2/1250/HA	L3921400

NH-Sicherungs-
lelsten
NH strip-
fuseways

NH-Sicherungs-
lastschaltlelsten
NH strip-
type fuse switch
disconnectors

NH-Sicherungs-
lasttren-
schalter
NH fuse-switch-
disconnectors

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Größe 2-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem
> 1-polig schaltbar > Versenkbarer Griff
Size 2-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system
> 1-pole switchable > Retractable handle

	Flachanschluss M12 Flat terminal M12	25-240			SL2-3X/3A/GV	L2931006
2	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400		SL2-3X/9/KM2G-F/GV	L2996009
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300		1	SL2-3X/9/KM2G/GV	L2996010
	Flachanschluss M12 Flat terminal M12	25-300			SL3-3X/3A/GV	L3931005
3	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	630		SL3-3X/9/KM2G-F/GV	L3996048

Klemmen
Terminals

Anhang
Appendix



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

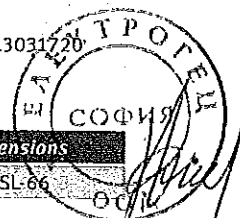
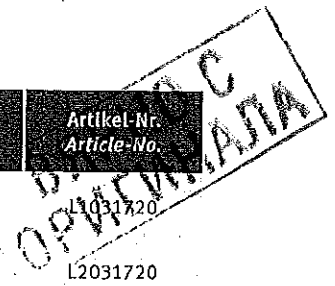
Größe 1-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 3-polig schaltbar
 Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 3-pole switchable



Größe Size	Anschlussart Terminal version	Anschluss Connection [mm ²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150	250		SL1-3X3/3A	L1031001
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1-3X3/9/KM2G-F	L1096004
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	250		SL1-3X3/9/KM2G	L1096026
2	Flachanschluss M12 Flat terminal M12	25-240	400		SL2-3X3/3A	L2031001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240	400		SL2-3X3/4A	L2041002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2-3X3/4A-60	L2041003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400	1	SL2-3X3/9/KM2G-F	L2096015
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	400		SL2-3X3/9/KM2G	L2096005
	Flachanschluss M12 Flat terminal M12	25-300	630		SL3-3X3/3A	L3031001
3	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-300	630		SL3-3X3/4A	L3041002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-300	630		SL3-3X3/4A-60	L3041003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	630		SL3-3X3/9/KM2G-F	L3096012
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	630		SL3-3X3/9/KM2G	L3096004
2 x 3	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1250		SL3-3X6/1250/HA	L3021400

Größe 1-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 3-polig schaltbar >
 Elektronische Sicherungsüberwachung ES00
 Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 3-pole switchable >
 Electronic fuse-monitoring unit ES00

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm ²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150	250		SL1-3X3/3A/ES00	L1031720
2	Flachanschluss M12 Flat terminal M12	25-240	400	1	SL2-3X3/3A/ES00	L2031720
3	Flachanschluss M12 Flat terminal M12	25-300	630		SL3-3X3/3A/ES00	L3031720



Zubehör/Accessories	Technische Daten/Technical data	Maßzeichnungen/Dimensions
Seite/Page: SL-32ff.	Seite/Page: SL-44ff.	Seite/Page: SL-60f., SL-66

NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Typ/Type		SL1	SL2	
Nach Norm/According to standard		DIN EN 60947-3		
Für NH-Sicherungen nach DIN VDE 0636-2 For NH fuse-links acc. to DIN VDE 0636-2		Größe Size	1 2	
Elektrische Kenngrößen Electrical characteristics	Bemessungsbetriebsspannung Rated operational voltage	U_e V	AC690 AC690	
	Bemessungsstrom ¹⁾ Rated operational current ²⁾	I_e A	250 400	
	Konv. therm. Strom frei in Luft mit Sicherungen Conv. free air thermal current with fuse-links	I_{th} A	250 400	
	Konv. therm. Strom frei in Luft mit Trennmessern Conv. free air thermal current with solid-links	I_{th} A	400 630	
	Bemessungsfrequenz Rated frequency	– Hz	40-60 40-60	
	Bemessungsisolationsspannung Rated insulation voltage	U_i V	AC1000 AC1000	
	Gesamtverlustleistung bei I_{th} (ohne Sicherungen) Total power loss at I_{th} (without fuse-links)	P_v W	23 54	
	Verlustleistung bei 80% I_{th} (ohne Sicherungen) ²⁾ Power loss at 80% I_{th} (without fuse-links) ²⁾	P_v W	14,7 34,6	
	Bemessungsstoßspannung Rated impulse withstand voltage	U_{imp} kV	12 12	
	Gebrauchskategorie Utilization category	– –	AC-23B (250A/400V) AC-22B (250A/500V) AC-22B (250A/690V)	AC-23B (400A/400V) AC-22B (400A/500V) AC-21B (400A/690V)
	Bedingter Bemessungskurzschlussstrom ³⁾ Rated conditional short-circuit current ³⁾	I_{cc} kA	120	
	Max. zul. Verlustleistung pro Sicherungseinsatz Max. permis. power loss per fuse-link	P_a W	32 45	
	Kabel- anschluss Cable terminal	Flachanschluss Flat terminal	Bolzendurchmesser Bolt diameter	– –
Kabelschuh Cable lug			– mm ²	1 x 25-150 1 x 25-240
Flachschiene Flat bar			– mm	30 x 10 30 x 10
Klemme Clamp		Anzugsdrehmoment Tightening torque	M_a Nm	30-35 35-40
		Klemmquerschnitt Clamping cross-section	– mm ²	KM2G-F 25-240 25-240
		Anzugsdrehmoment Tightening torque	– Nm	32 32

35-40
25-240
32
ВЯРНО С
ОРИГИНАЛА



Typ/Type		SL1	SL2
Schutzart Degree of protection	Frontseitig, Gerät eingebaut mit Klemmen- und Seitenabdeckung Front side, device fitted with clamp and lateral covers	Betriebszustand Operating condition	IP30
	Schaltdeckel geöffnet Switching element open	IP10	IP10
Betriebsbedingungen Operating conditions	Umgebungstemperatur ⁴⁾ /Ambient temperature ⁴⁾	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, waagrecht Vertical, horizontal
	Höhenlage/Altitude	m	Bis zu 2000/Up to 2000
Verschmutzungsgrad/Pollution degree		3	
Überspannungskategorie/Overvoltage category		IV	

- 1) Bei Einbau von mehreren Geräten in Niederspannungs-Schaltgerätekombinationen sind Bemessungsbelastungsfaktoren nach DIN EN 61439 zu beachten.
In case of mounting of several units in low voltage switchgear-combinations, please consider rated diversity factors acc. to DIN EN 61439.
- 2) Bezugsgröße für Austausch von Geräten nach DIN EN 61439-1 Abs. 10.10.4.2.
Reference value for replacement of devices acc. to DIN EN 61439-1 clause 10.10.4.2.
- 3) Typgeprüft mit NH-Sicherungseinsätzen Betriebsklasse gG./Type tested with NH fuse-links characteristic gG.
- 4) 35°C Normaltemperatur, bei 55°C mit reduziertem Betriebsstrom./35°C Normal temperature, at 55°C with reduced operating current.

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip-
type fuse-switch
disconnectors

NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

CJOISIMJO
CJOISIMIO®

Klemmen
Terminals

Anhang
Appendix

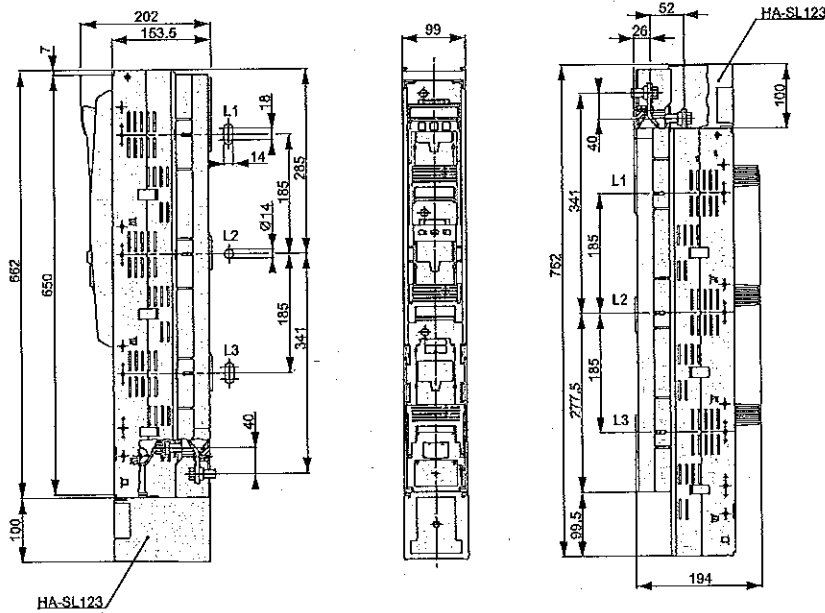
**ВЯРНО С
ОРИГИНАЛА**



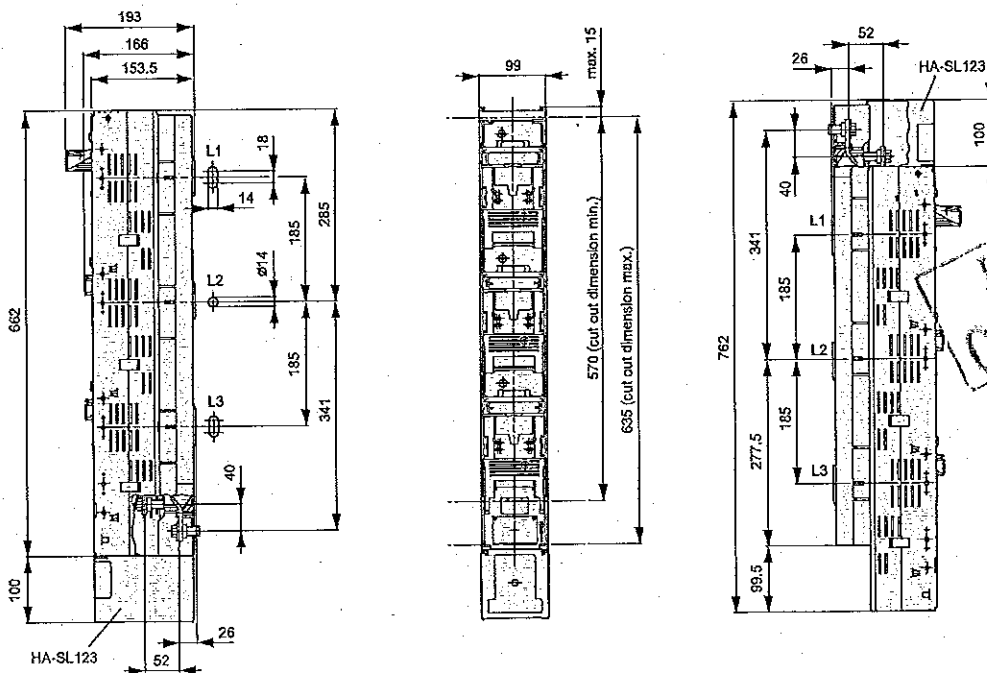
NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Typ/Type	Artikel-Nr./Article-No.	Seite/Page	Typ/Type	Artikel-Nr./Article-No.	Seite/Page
SL1(G)-3X/... (W)	L19...	L12...	SL-17,SL-19	SL2-3X3/... (W)	L20...
SL1-3X3/... (W)	L10...	L13...	SL-20	SL3-3X/... (W)	L39...
SL2(G)-3X/... (W)	L29...	L22...	SL-17,SL-19	SL3-3X3/... (W)	L30...



Typ/Type	Artikel-Nr./Article-No.	Seite/Page	Typ/Type	Artikel-Nr./Article-No.	Seite/Page
SL2(G)-3X/.../GV	L29...	SL-17, SL-19	SL3-3X/.../GV	L3931005	SL-19



ВАРНО С
ОРИГИНАЛА



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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

“Вертикален предпазител-разединител НН 400 А, с триполюсно управление”

Приложение № 2

ВЯРНО С
ОРИГИНАЛА



ТЕХНИЧЕСКО ОПИСАНИЕ

на

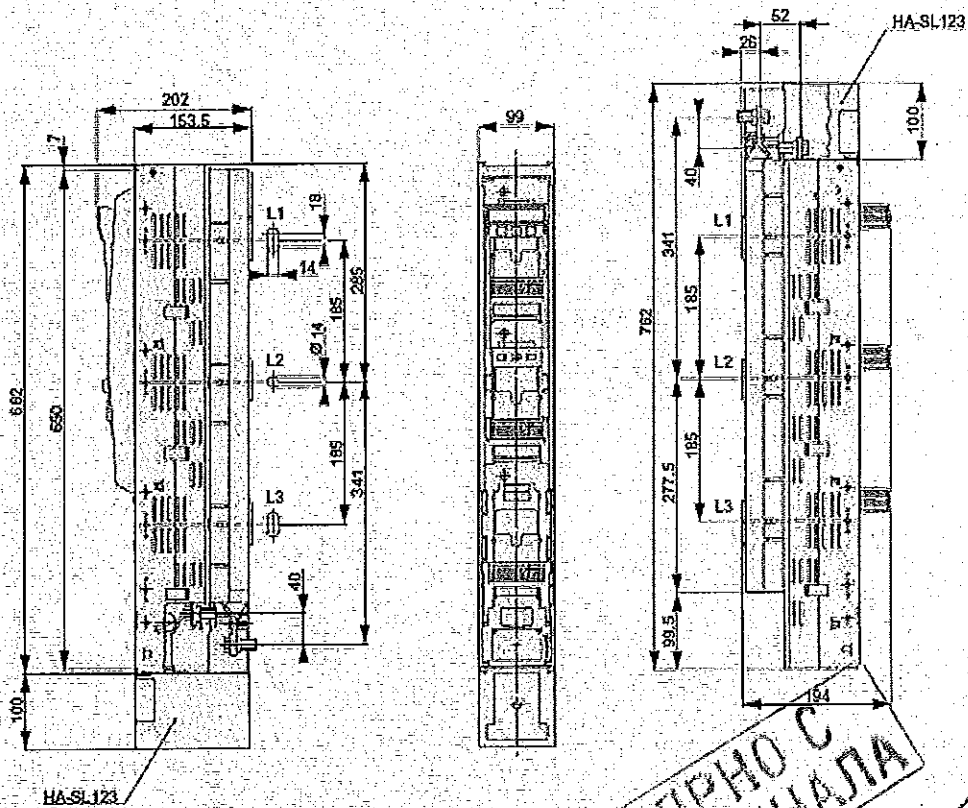
Вертикален предпазител-разединител НН 400А с триполюсно управление

I. Описание

Триполюсните предпазител-разединители серия SL 2 са произведени от фирма Jean Muller и са предназначени за включване, изключване, разединяване и защита на кабелни линии НН. Те комбинират три еднополюсни предпазител-разединителя в един корпус. SL 2 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.

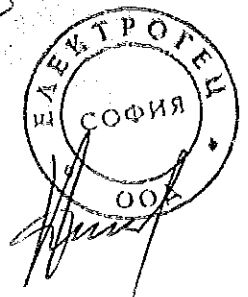
Корпусът на SL2 е изработен от високоякостна стъклонапълнена пластмаса. Контактната система със сребърно покритие осигурява малки загуби, оптимални термични характеристики и висока комутационна способност. Тоководещите части (високомощните предпазител р-р 2 и тоководещите шини) остават недостъпни и след премахване на горната част, благодарение на защитните капаци с вградени дъгогасителни камери оставащи в основата.

II. Размери



SL 2 (3) 400

ВАРНО С
ОРИГИНАЛА



C

C

ДОКУМЕНТАЦИЯ

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

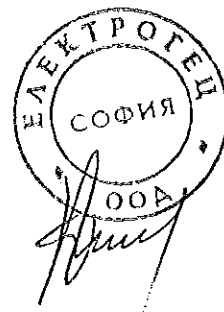
с предмет:

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

РЕФ. № PPD 15-042

“Вертикален предпазител-разединител НН 400 А, с триполюсно управление”

Приложение № 3



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 400 A/630 A

Pre-licence factory inspection carried out by VDE

Trade mark (if any) JEAN MÜLLER

Model/Type Ref. SL 2-3x and SL 2-3x3

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.) 2001980.52 (30 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.

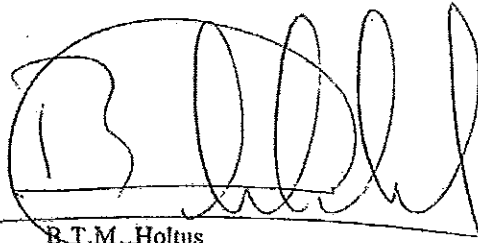
N.V. KEMA

Arnhem

Date: June 23, 2000

Internal ref: HLS/Sco

Signature:



B.T.M. Holtus

**ВЪРНО С
ОРИГИНАЛА**

**ЕЛЕКТРОТЕХ
СОФИЯ**



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

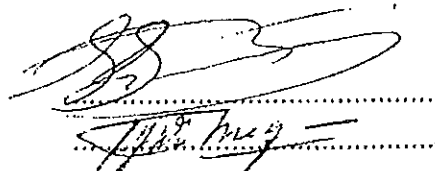
TEST REPORT

EN 60 947-3

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

Report

Reference No. : 2001980.52
 Tested by (+ signature) : *H. L. Schendstok*
 Approved by (+ signature) : *L.J.W. van Megen*
 Date of issue : 2000-06-22
 Contents : 30 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

Copyright reserved to the bodies participating in the Committee of Certification Bodies (CCB) and/or the bodies participating in the CENELEC Certification Agreement (CCA).

Test item

Description : *fuse-switch-disconnector*
 Trademark : *Jean Müller*
 Model and/or type reference : *SL 2-3x and SL 2-3x3*
 Manufacturer : *Jean Müller GmbH, Eltville am Rhein, Germany*

ВЯРНО С
ОРИГИНАЛА



Rating(s)	<i>Ui 1000 V, Ith 400 A / 630 A</i>
Particulars: test item vs. test requirements	
- method of operation	<i>dependent manual operation</i>
- switching positions.....	<i>2 (on and off)</i>
- number of poles.....	<i>3-poles</i>
- kind of current.....	<i>AC</i>
- number of phases.....	<i>3</i>
- rated frequency (Hz).....	<i>50 Hz</i>
- number of positions of the main contacts.....	<i>2 (on and off)</i>
Rated and limiting values, main circuit	
- rated operational voltage U_e (V).....	<i>400 V, 500 V and 690 V</i>
- rated insulation voltage U_i (V).....	<i>1000 V</i>
- rated impulse withstand voltage U_{imp} (kV).....	<i>12 kV</i>
- conventional free air thermal current I_{th} (A).....	<i>fuse: 400 A</i> <i>disconnect knife: 630 A</i>
- conventional enclosed thermal current I_{the} (A).....	
- rated operational current I_e (A)	<i>fuse: 400 A</i> <i>disconnect knife: 630 A</i>
- rated uninterrupted current I_u (A)	<i>fuse: 400 A</i> <i>disconnect knife: 630 A</i>
- utilization category	<i>with disconnect knife:</i> <i>AC-21B 630 A 690 V</i> <i>AC-22B 630 A 400 V</i> <i>AC-22B 630 A 500 V</i>
	<i>with fuse:</i> <i>AC-21B 400 A 690 V</i> <i>AC-22B 400 A 400 V</i> <i>AC-22B 400 A 500 V</i>
Short-circuit characteristic.....	
- rated short-time withstand current I_{cw} (kA).....	-
- rated short-time making capacity I_{cm} (kA).....	-
- rated conditional short-circuit current.....	<i>80 kA</i>
Rated and limiting values, auxiliary circuits	
- rated operational voltage (V).....	<i>N</i>
- rated frequency (Hz)	

**ВАРНО С
ОРИГИНАЛА**



[Handwritten signature]

- number of circuits:
- number and kind of contact elements:
Co-ordination of short-circuit protective devices.....:
- kind of protective device : *fuse-link, NH2 gL/gG 400 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 2000-04*
.....:

ВЯРНО С
ОРИГИНАЛА



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 bottom.

The fuse-switch-disconnector type SL 2-3x 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



Copy of marking plate

JEAN MULLER  **CE**
IEC /EN 60947-3 50Hz
500V - 630A - AC-22B
690V - 630A - AC-21B

max. 400A 45W
SL2-3X L2931001
NH2-400A TM3-630A

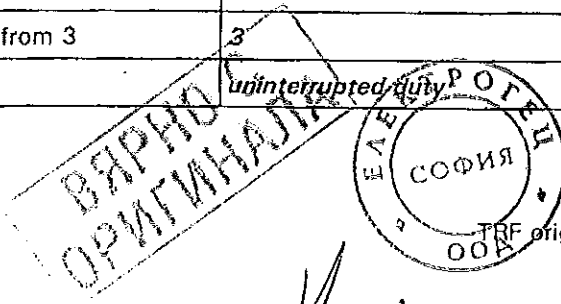
JEAN MULLER  **CE**
IEC /EN 60947-3 50Hz
500V - 630A - AC-22B
690V - 630A - AC-21B

max. 400A 45W
SL2-3X L2031001
NH2-400A TM3-630A

ВЯРНО С
ОРИГИНАЛА



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	<i>main contacts are visible in the open position</i>	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	<i>JEAN MÜLLER</i>	P
	- type designation or serial number	<i>SL 2-3x and SL 2-3x3</i>	P
	- rated operational current	<i>630 A</i>	P
	- rated operational voltage	<i>500 V / 690 V</i>	P
	- utilization category	<i>AC-21B / AC-22B</i>	P
	- rated frequency	<i>50 Hz</i>	P
	- manufacturer's claim for compliance with IEC 60 947-3	<i>IEC/EN 60947-3</i>	P
	- degree of protection	<i>IP</i>	N
	Marking on fuse-combination units:		
	- fuse type	<i>NH2-400 A</i>	P
	- maximum rated current	<i>400 A</i>	P
	- power loss of the fuse-link	<i>45 W</i>	P
	Identification of terminals:		
	- line terminals	<i>immaterial</i>	P
	- load terminals	<i>L1, L2, L3</i>	P
	- neutral pole terminal		N
	- protective earth terminal		N
	Data in the manufacturer's published information:		
	- rated insulation voltage	<i>1000 V</i>	P
	- rated impulse withstand voltage for equipment suitable for isolation or when determined	<i>12 kV</i>	P
	- pollution degree, if different from 3	<i>3</i>	P
	- rated duty	<i>uninterrupted duty</i>	P



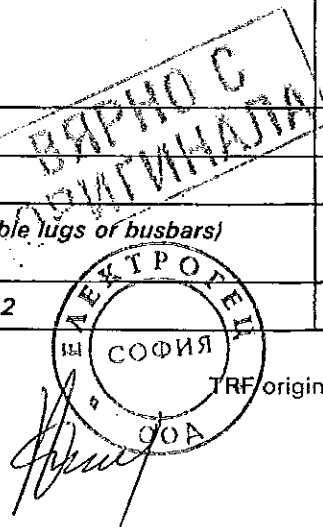
EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	- rated short-time withstand current and duration		N
	- rated short-circuit making capacity		N
	- rated conditional short-circuit current	80 kA	P

7.1	CONSTRUCTION		
7.1.2	Current-carrying parts and their connection	<i>no contact pressure through insulation material</i>	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	<i>by actuator</i>	P
7.1.5.2	Indication by the actuator	<i>all main contacts are visible in the open position</i>	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	<i>all main contacts are visible in the open position</i>	P
	- construction of the actuating mechanism		P
	- minimum clearances across open contacts (see Table XIII, Part 1) (mm)	74 mm	-
	- measured clearances (mm)	74 mm	P

ОРИГИНАЛ

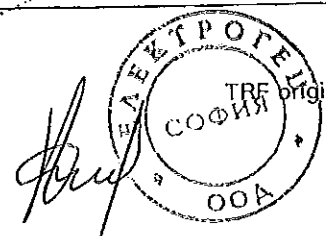


EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- test Uimp across gap (kV)	18,5 kV	P
7.1.6.2	Supplementary requirements for equipment with provision for electrical interlocking with contactors or circuit-breakers:		N
	auxiliary switch shall be rated according to IEC 60 947-5-1		
	minimum 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:		
	the locking means shall be designed in such a way that it cannot be removed with the appropriate padlock(s) installed	only SL 2-3x3	P
	test force F applied to the actuator in an attempt to operate to the closed position (N) ...	178 N	—
	rated impulse withstand voltage (kV)	12 kV	—
	test Uimp on open main contacts at the test force	18,5 kV	P
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	—



EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	torque (Nm)	40 Nm x 110% = 44 Nm	-
	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 (mm ²)		-
	number of conductor of the smallest cross section		-
	diameter of bushing hole (mm)		-
	height between the equipment and the platen ..		-
	mass at the conductor(s) (kg)		-
	135 continuous revolutions: the conductor shall neither slip out of the terminal nor break near the clamping unit		N
	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 (mm ²)		-
	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 (mm ²)		-
	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 ..		-

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EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	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
7.1.7.2	Connection capacity		
	type of conductors	<i>(cable lugs or busbars)</i>	—
	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

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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		N

ВАРНО С
ОРИГИНАЛА

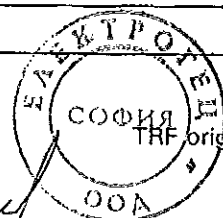


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EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	Degree of protection	IP	N

8.3.3	TEST SEQUENCE I: GENERAL PERFORMANCE CHARACTERISTICS		
8.3.3.1	Temperature-rise		
	ambient temperature 10-40 °C	24 °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)	400 A with fuse-links 630 A with disconnect knives	--
	- conventional enclosed thermal current Ithe (A)		--
	- cable/busbar cross-section (mm ²) / (mm)	fuse-links: 30 x 10 mm busbar and 240 mm ² cable disconnect knives: 40 x 10 mm busbar and 2 x 185 mm ² cable	--
	Fuse-link details (fuse-combination units only):		
	- manufacturer's name, trademark or identification mark	-	--
	- manufacturer's model or type reference	dummy	--
	- rated current (A)	400 A	--
	- power loss (W)	45 W	--
	- rated breaking capacity (kA)	- 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 (mm ²)		--
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
	- test Uimp auxiliary circuits (kV)		N

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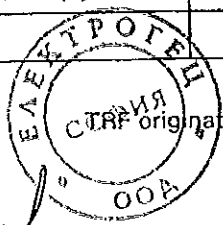
EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	- test Uimp on open main contacts (equipment suitable for isolating) (kV)	18,5 kV	P
	Test of dielectric properties, dielectric withstand voltage (Uimp not indicated):		N
	- rated insulation voltage (V)		-
	- main circuits, test voltage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

8.3.3.3	Making and breaking capacity	<i>fuse-switch-disconnector type SL 2-3x3</i>	
	utilization category	AC-22B	-
	rated operational voltage Ue (V)	500 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: 542 V L2: 542 V L3: 542 V	-
	- test current I/Ie = (A)	L1: 1979 A L2: 1919 A L3: 1931 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: 547 V L2: 557 V L3: 557 V	-
	current duration (ms)	580 ms	-
	time interval between operations	30 s	-

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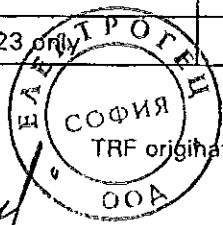
EN 60 947-3			
Clause	Requirement -- Test	Result - Remark	Verdict
	Number of make/break or make and break operations	5 x make/break	P
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz)	62,68 kHz	—
	Measured oscillatory frequency (kHz)	L1: 66,6 kHz L2: 67,5 kHz L3: 66,6 kHz	P
	Factor y	L1: 1,12 L2: 1,13 L3: 1,13	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)	4,4 μA – 8,1 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: 38 K – 49 K disconnect knives: 46 K – 73 K	P
	conductor cross-sectional area (mm ²)	fuse-links: 30 x 10 mm busbar and 240 mm ² cable disconnect knives: 40 x 10 mm busbar and 2 x 185 mm ² cable	—
	test current Ie (A)	fuse-links: 400 A disconnect knives 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)	178 N	—



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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		P
	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	<i>fuse-switch-disconnector type SL 2-3x</i>	
	utilization category	AC-22B	-
	rated operational voltage Ue (V)	500 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: 532 V L3:	-
	- test current I/Ie = (A)	L1: L2: 1956 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: 531 V L3:	
	current duration (ms)	820 ms	
	time interval between operations	30 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		

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EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	oscillatory frequency (kHz)	62,68 kHz	—
	Measured oscillatory frequency (kHz)	L1: L2: 64,1 kHz L3:	P
	Factor y	L1: L2: 1,14 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 – 7,3 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: 39 K – 49 K disconnect knives: 54 K – 70 K	P
	conductor cross-sectional area (mm ²)	fuse-links: 30 x 10 mm busbar and 240 mm ² cable disconnect knives: 40 x 10 mm busbar and 2 x 185 mm ² cable	—
	test current Ie (A)	fuse-links: 400 A disconnect knives 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)	141 N	
	test force with blocked main contacts (N)	400 N	

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EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts'		P
	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	<i>fuse-switch-disconnector type SL 2-3x3</i>	
	utilization category	AC-21B	-
	rated operational voltage U_e (V)	690 V	-
	rated operational current I_e (A) or power (kW) ..	630 A	-
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage $U/U_e = 1,05$ (V)	L1: 747 V L2: 747 V L3: 747 V	-
	- test current $I/I_e =$ (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 $U/U_e = 1,05$ (V)	L1: L2: L3:	-
	- test current $I/I_e =$ (A)	L1: L2: L3:	-
	- power factor	L1: L2: L3:	-
	transient recovery voltage (V)	L1: 740 V L2: 745 V L3: 747 V	-
	current duration (ms)	280 ms	
	time interval between operations	30 s	
	Number of make/break or make and break operations	5 x make/break	
	Characteristic of transient recovery voltage for AC-22 and AC-23 only		
	oscillatory frequency (kHz)	kHz	-

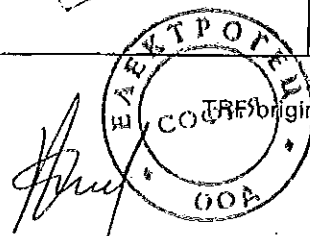


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Clause	Requirement – Test	Result - Remark	Verdict
	Measured oscillatory frequency (kHz)	L1: L2: L3:	N
	Factor y	L1: L2: L3:	N
8.3.3.3.5	Behaviour of the equipment during making and breaking capacity tests		P
8.3.3.3.6	Condition of the equipment after 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) $\leq 0,5$ mA		N
	Leakage current (other utilization categories) ≤ 2 mA)	4,1 μ A – 7,5 μ A	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: 38 K – 52 K disconnect knives: 55 K – 65 K	P
	conductor cross-sectional area (mm ²)	fuse-links: 30 x 10 mm busbar and 240 mm ² cable disconnect knives: 40 x 10 mm busbar and 2 x 185 mm ² cable	—
	test current Ie (A)	fuse-links: 400 A disconnect knives 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)	178 N	—
	test force with blocked main contacts (N)	400 N	—
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts		P

EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

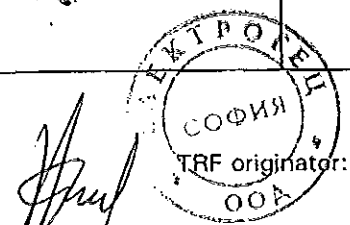
8.3.3.3	Making and breaking capacity	<i>fuse-switch-disconnector type SL 2-3x</i>	
	utilization category	AC-21B	-
	rated operational voltage U_e (V)	690 V	-
	rated operational current I_e (A) or power (kW) ..	630 A	-
	Conditions, make/break operations or make operation AC-23A and AC-23B only:		
	- test voltage $U/U_e = 1,05$ (V)	L1: L2: 747 V L3:	-
	- test current $I/I_e =$ (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 $U/U_e = 1,05$ (V)	L1: L2: L3:	-
	- test current $I/I_e =$ (A)	L1: L2: L3:	-
	- power factor	L1: L2: L3:	-
	transient recovery voltage (V)	L1: L2: 745 V L3:	-
	current duration (ms)	360 ms	-
	time interval between operations	30 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

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Clause	Requirement – Test	Result - Remark	Verdict
	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 U_i) 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) $\leq 0,5$ mA		N
	Leakage current (other utilization categories) ≤ 2 mA)	3,9 μ A – 7,8 μ A	P
	test voltage (1,1 U_e) (V)	759 V, tested with 800 V	—
8.3.3.6	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K	<i>fuse-links: 39 K – 51 K</i> <i>disconnect knives: 59 K – 68 K</i>	P
	conductor cross-sectional area (mm ²)	<i>fuse-links: 30 x 10 mm busbar and 240 mm² cable</i> <i>disconnect knives: 40 x 10 mm busbar and 2 x 185 mm² cable</i>	—
	test current I_e (A)	<i>fuse-links: 400 A</i> <i>disconnect knives 630 A</i>	—
8.3.3.7	Strength of actuator mechanism (switch-disconnectors and $U_e > 50$ V only)		
	actuator type (fig.)	<i>one-hand operated (e)</i>	—
	actuating force for opening (N)	141 N	—
	test force with blocked main contacts (N)	400 N	—
	Lockability of driving mechanism in OFF-position at test force and blocked main contacts		P
	Position indicator does not show OFF-position after capture of test force at blocked main contacts		P

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Clause	Requirement - Test	Result - Remark	Verdict

8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY <i>fuse-switch-disconnector type SL2-3x</i>		
8.3.4.1	Operational performance test		
	utilization category	<i>AC-21B and AC-22B</i>	—
	rated operational voltage (V)	<i>500 V and 690V</i>	—
	rated operational current (A)	<i>630 A</i>	—
	Test conditions electrical operation cycles:		
	test voltage (V)	L1: - L2: <i>689 V</i> L3: -	—
	test current (A)	L1: - L2: <i>634 A</i> L3: -	—
	power factor/time constant	L1: - L2: <i>0,81</i> L3: -	—
	Number of cycles with current	<i>200</i>	<i>P</i>
	Number of cycles without current	<i>1400</i>	<i>P</i>
	First test sequence (with/without current)	<i>with current</i>	—
	Second test sequence (with/without current) ..	<i>without current</i>	—
	time interval between first and second test sequence	<i>1 hour</i>	—
8.3.4.2	Dielectric verification		
	test voltage (2 Ui) for 1 min (V)	<i>2000 V</i>	—
	No breakdown or flashover		<i>P</i>
8.3.4.3	Leakage current		
	Leakage current (utilization categories AC-20A, AC-20B, DC-20A and DC-20B) ≤ 0,5 mA		<i>N</i>
	Leakage current (other utilization categories) ≤ 2 mA	<i>5,8 μA - 8,2 μA</i>	<i>P</i>
	test voltage (1,1 Ue) (V)	<i>759 V, tested with 800 V</i>	—
8.3.4.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K	<i>fuse-links: 39 K - 48 K</i> <i>disconnect knives:</i> <i>42 K - 79 K</i>	<i>P</i>

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Clause	Requirement - Test	Result - Remark	Verdict
	conductor cross-sectional area (mm ²)	<i>fuse-links: 30 x 10 mm busbar and 240 mm² cable</i> <i>disconnect knives: 40 x 10 mm busbar and 2 x 185 mm² cable</i>	-
	test current I _e (A)	<i>fuse-links: 400 A</i> <i>disconnect knives: 630 A</i>	-

8.3.4	TEST SEQUENCE II: OPERATIONAL PERFORMANCE CAPABILITY <i>fuse-switch-disconnector type SL2-3x3 only without current</i>		
8.3.4.1	Operational performance test		
	utilization category	<i>AC-21B and AC-22B</i>	-
	rated operational voltage (V)	<i>500 V and 690V</i>	-
	rated operational current (A)	<i>630 A</i>	-
	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	<i>1400 + 200</i>	P
	First test sequence (with/without current)	<i>without current</i>	-
	Second test sequence (with/without current)		-
	time interval between first and second test sequence		-
8.3.4.2	Dielectric verification		
	test voltage (2 U _i) for 1 min (V)	<i>2000 V</i>	-
	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

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Clause	Requirement - Test	Result - Remark	Verdict
	Leakage current (other utilization categories) ≤ 2 mA	5,3 μA – 7,3 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	<i>fuse-links: 55 K – 75 K</i> <i>disconnect knives:</i> <i>50 K – 65 K</i>	P
	conductor cross-sectional area (mm ²)	<i>fuse-links: 30 x 10 mm</i> <i>busbar and 240 mm² cable</i> <i>disconnect knives:</i> <i>40 x 10 mm busbar and</i> <i>2 x 185 mm² cable</i>	—
	test current Ie (A)	<i>fuse-links: 400 A</i> <i>disconnect knives: 630 A</i>	—

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		
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)		

ВЪРНО С
 ОРИГИНАЛА



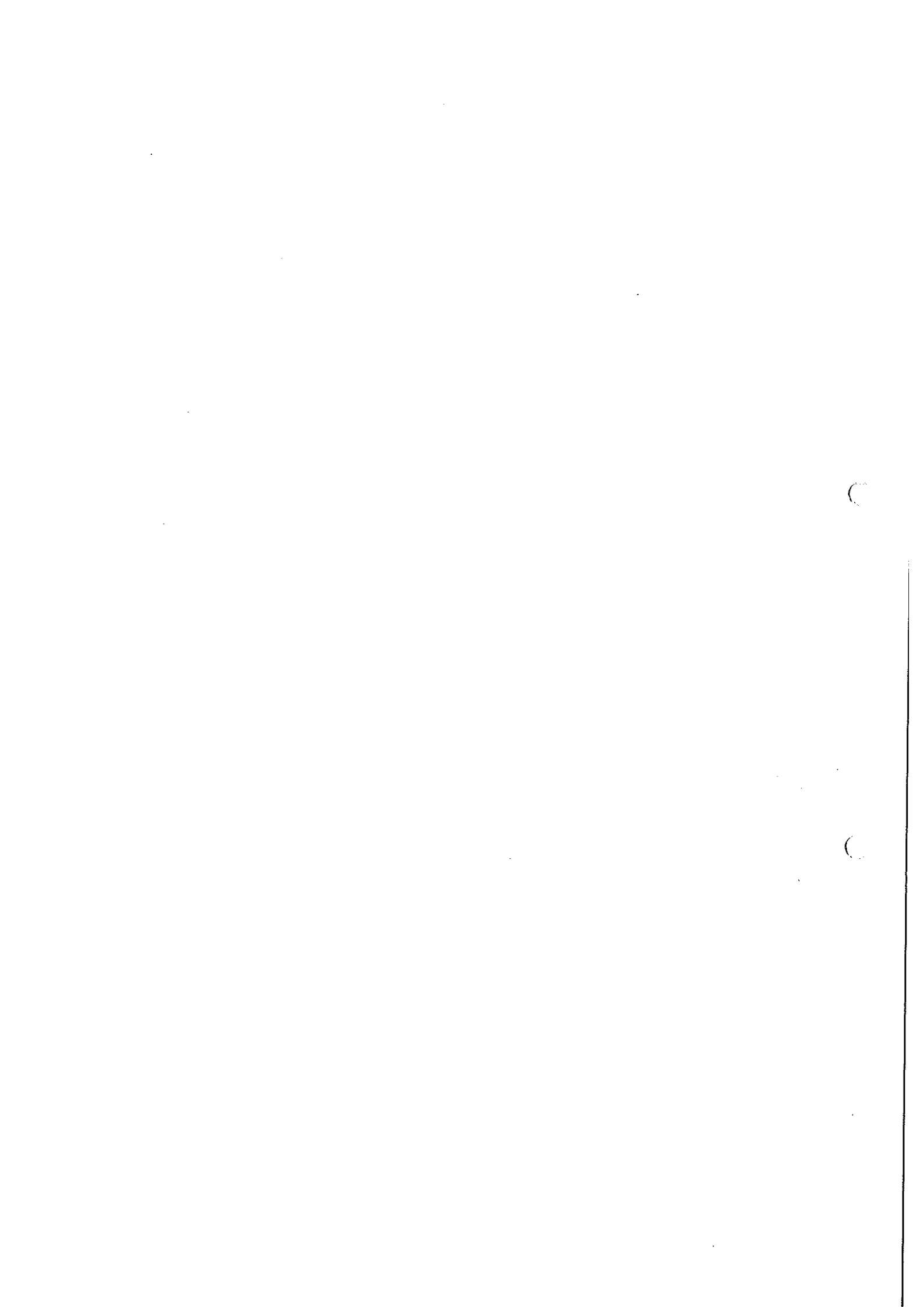
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EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	test voltage (V)	L1: L2: L3:	—
	r.m.s. test current (A)	L1: L2: L3:	—
	peak test current (A)	L1: L2: L3:	—
	power factor/time constant	L1: L2: L3:	—
	current duration (s)		—
	number 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) $\leq 0,5$ mA		
	Leakage current (other utilization categories) $\leq 2,0$ 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 (mm ²)		—
	test current Ie (A)		—

8.3.6	TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT <i>fuse-switch-disconnector type SL 2-3x3</i>		
	Protective device details:		
	- manufacturer's name, trademark or identification mark	Jean Müller	—
	- manufacturer's model or type reference	M2gL400MI/am	—
	- rated voltage (V)	500 V	—

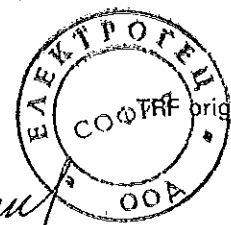
ВІДНО С
ОРГАНІЗАЦІЇ

ЛАБОРАТОРІЯ
СОФІЯ
TRF originator: KEMA



EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	- rated current (A)	400 A	-
	- rated breaking capacity (kA)	120 kA	-
8.3.6.2	Fuse protected short-circuit withstand		
	test voltage (1,05 Ue) (V)	L1: 725 V L2: 725 V L3: 725 V	-
	test current (kA)	L1: 84,4 kA L2: 84,7 kA L3: 82,9 kA	--
	rated frequency (Hz)	50 Hz	--
	power factor	0,17	--
	Fuse protected short-circuit withstand		
	- max. let-through current (kA)	L1: 7,17 kA L2: 37,4 kA L3: 38,5 kA	--
	- Joule integral I ² dt (A ² s)	L1: 160 kA ² s L2: 1370 kA ² s L3: 1290 kA ² s	-
	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: 35,6 kA L2: 35,6 kA L3: 7,55 kA	-
	- Joule integral I ² dt (A ² s)	L1: 1180 kA ² s L2: 1090 kA ² s L3: 94,1 kA ² s	-
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		

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ОРУЖИНАТА



EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	Leakage current (other utilization categories) $\leq 2,0$ mA	4,4 μ A - 7,3 μ A	P
	test voltage (1,1 Ue) (V)	759 V, tested with 800 V	--
8.3.6.5	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K	39 K - 49 K	P
	cross-sectional area (mm ²)	30 x 10 mm busbar and 240 mm ² cable	-
	test current Ie (A)	fuse-links: 400 A	-

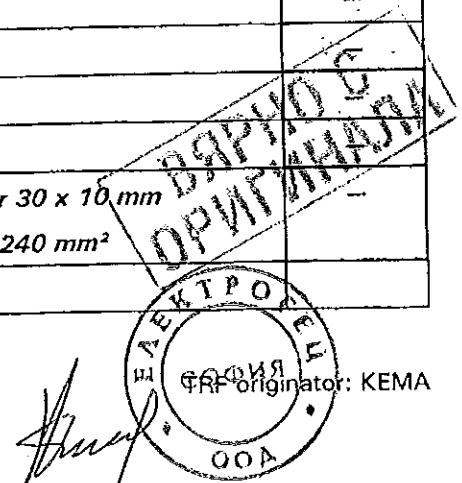
8.3.6	TEST SEQUENCE IV: CONDITIONAL SHORT-CIRCUIT CURRENT <i>fuse-switch-disconnector type SL 2-3x</i>		
	Protective device details:		
	- manufacturer's name, trademark or identification mark	Jean Müller	-
	- manufacturer's model or type reference	M2gL400MI/am	-
	- rated voltage (V)	500 V	-
	- rated current (A)	400 A	-
	- rated breaking capacity (kA)	120 kA	-
8.3.6.2	Fuse protected short-circuit withstand		
	test voltage (1,05 Ue) (V)	L1: 725 V L2: 725 V L3: 725 V	-
	test current (kA)	L1: 84,4 kA L2: 84,7 kA L3: 82,9 kA	-
	rated frequency (Hz)	50 Hz	-
	power factor	0,17	-
	Fuse protected short-circuit withstand		
	- max. let-through current (kA)	L1: 6,85 kA L2: 38,1 kA L3: 39,0 kA	-
	- Joule integral I ² dt (A ² s)	L1: 144 kA ² s L2: 1410 kA ² s L3: 1330 kA ² s	-
	Fuse protected short-circuit making		
	- mean velocity of 15 manually under no-load conditions operations (m/s)	7,15 m/s	-

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КЕМА
 КОМПАНИЈА
 00A

EN 60 947-3			
Clause	Requirement - Test	Result - Remark	Verdict
	- 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: 36,6 kA L2: 36,6 kA L3:	-
	- Joule integral I ² dt (A ² s)	L1: 1200 kA ² s L2: 1200 kA ² s 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	3,7 μA - 7,2 μA	P
	test voltage (1,1 Ue) (V)	759 V, tested with 800 V	-
8.3.6.5	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K	37 K - 48 K	P
	cross-sectional area (mm ²)	30 x 10 mm busbar and 240 mm ² cable	-
	test current I _e (A)	fuse-links: 400 A	-

8.3.7	TEST SEQUENCE V: OVERLOAD PERFORMANCE CAPABILITY		
8.3.7.1	Overload test		
	ambient temperature 10-40 °C	24 °C	
	test enclosure W x H x D (mm x mm x mm)	-	
	material of enclosure		
	test current 1,6 I _{th} e or 1,6 I _{th} (A)	640 A	
	cable/busbar cross-section (mm ²) / (mm)	busbar 30 x 10 mm cable 240 mm ²	
	Fuse-link details:		



EN 60 947-3			
Clause	Requirement – Test	Result - Remark	Verdict
	- manufacturer's name, trademark or identification mark	<i>Jean Müller</i>	—
	- rated current (A)	<i>400 A</i>	—
	- power loss (W)	<i>40 W</i>	—
	- rated breaking capacity (kA)	<i>120 kA</i>	—
	- time duration of the overload test (s)	<i>1500 s</i>	—
	Within 3 min after the fuse(s) has(have) operated (or 1 h), the equipment shall be operated once, i.e. opened and closed		<i>P</i>
	The equipment shall not have undergo any impairment hindering such operation		<i>P</i>
8.3.7.2	Dielectric verification		
	test voltage (2 U _I) for 1 min (V)	<i>2000 V</i>	—
	No flashover or breakdown		<i>P</i>
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)	<i>4,8 μA – 7,6 μA</i>	<i>P</i>
	test voltage (1,1 U _e) (V)	<i>759 V</i>	—
8.3.7.4	Temperature-rise verification		
	Temperature rise of main circuit terminals ≤ 80 K (K)	<i>36 K – 47 K</i>	<i>P</i>
	cross-sectional area (mm ²)	<i>30 x 10 mm busbar and 240 mm² cable</i>	—
	test current I _e (A)	<i>fuse-links: 400 A</i>	—

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

TABLE: temperature rise measurements with dummy			
temperature rise dT of part:	phase	dT (K)	required dT (K)
<i>terminal to horizontal busbar system (line terminal)</i>	L1	52	70
	L2	51	70
	L3	51	70
<i>terminal to cable(s) (load terminal)</i>	L1	45	70
	L2	48	70
	L3	62	70
<i>internal busbar near insulation material</i>	L1	123	145
<i>actuator</i>	-	4	25

TABLE: temperature rise measurements with contact knives			
temperature rise dT of part:	phase	dT (K)	required dT (K)
<i>terminal to horizontal busbar system (line terminal)</i>	L1	60	70
	L2	60	70
	L3	58	70
<i>terminal to cable(s) (load terminal)</i>	L1	64	70
	L2	59	70
	L3	60	70

**ВЯРНО С
ОРИГИНАЛА**



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 2-3x : fuse-switch-disconnector, 3-poles, switching pole after pole*
- Type SL 2-3x3 : fuse-switch-disconnector, 3-poles, switching 3-poles, with locking device in close and open position*

ВЯРНО С
ОРИГИНАЛА!



TRF originator: KEMA

СПИСЪК

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

Марка: Jean Muller
Продукт: вертикален предпазител-разединители
Серия: SL2

- 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 стояем 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

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ОРИГИНАЛА



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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

“Вертикален предпазител-разединител НН 400 А, с триполюсно управление”

Приложение № 4

**ВЯРНО С
ОРИГИНАЛА**



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

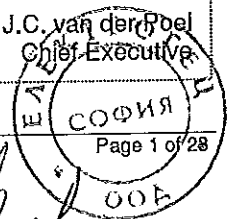
Meander 1051
6825 MJ
Arnhem
The Netherlands

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:

**ВЯРНА С
ОРИГИНАЛ**

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

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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
3	Household and similar equipment (HOUS)	Type test of household equipment according to the tests in the standard, among others: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none"> - 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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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
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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Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

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

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Replaces annex dated: **03-11-2014**

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
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D. Electromagnetic Compatibility (EMC): Emission tests

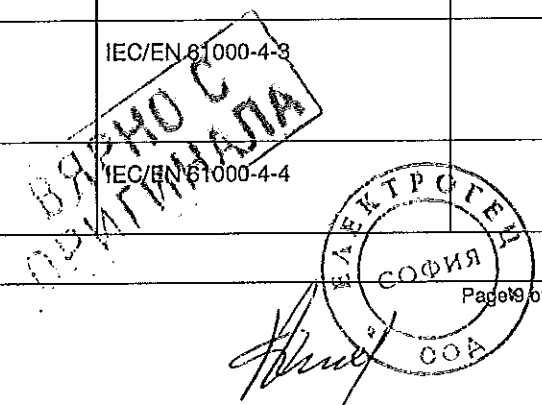
1	Electrical and electronic equipment	Conducted emission 9 kHz to 30 MHz	EN 55011, CISPR 11 EN 55013, CISPR 13 EN 55014-1, CISPR 14-1 EN 55015, CISPR 15 EN 55022, CISPR 22	
2		Radiated Emission Electric (EM) Field 30 MHz to 18 GHz	EN 55011, CISPR 11 EN 55014-1, CISPR 14-1 EN 55022, CISPR 22	
3		Disturbance 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	

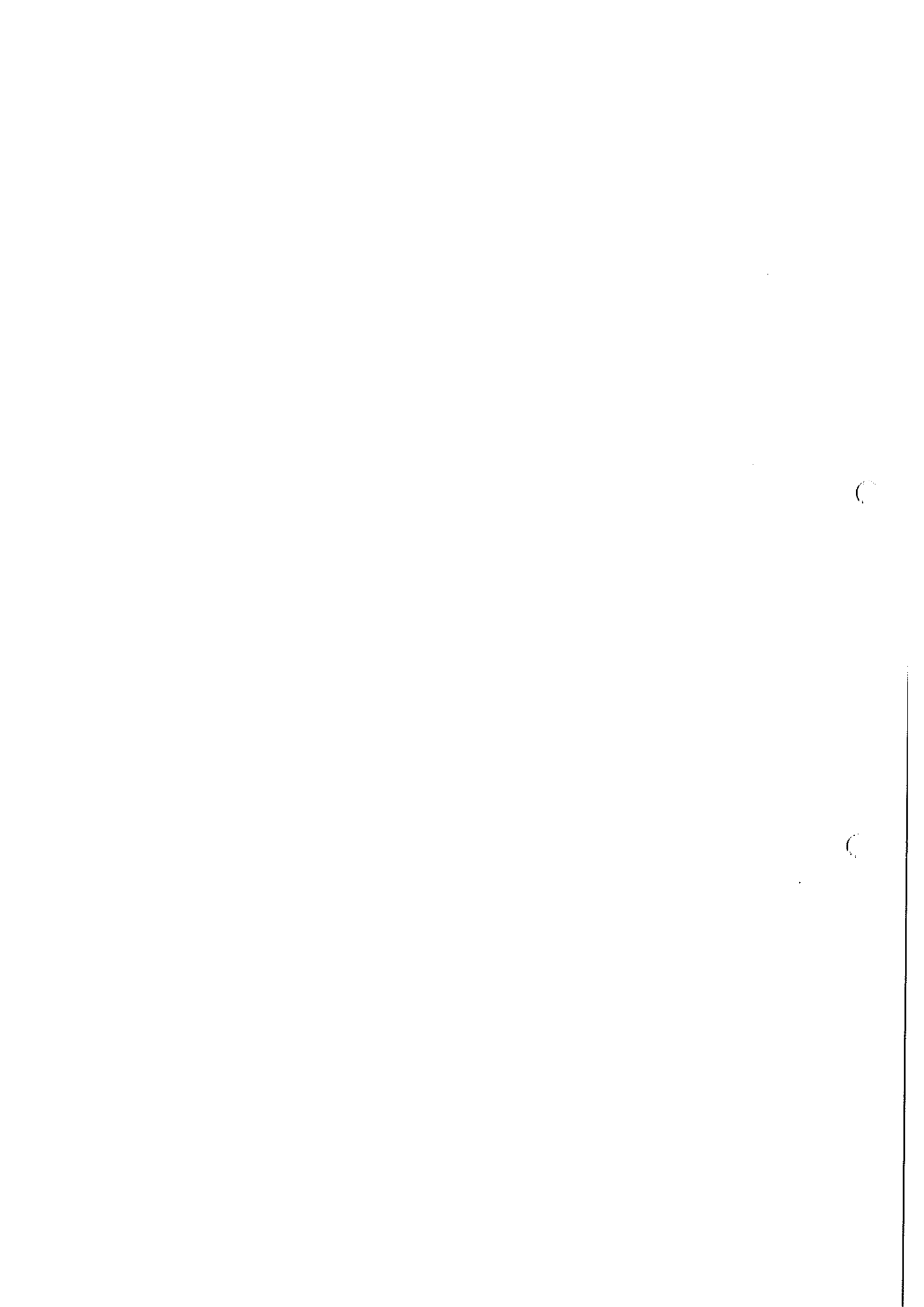
E. Electromagnetic Compatibility (EMC): FCC tests (USA legislation)

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	
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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	





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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 60 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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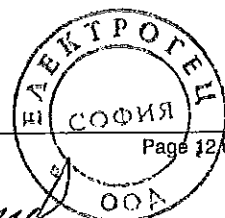
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No.	Material or product	Type of activity	Reference number	Remarks
I. Lighting testing: EPA ENERGY STAR Program				
1	Non-directional Fluorescent Luminaires	Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps, Source Run-up Time (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 Luminaires, 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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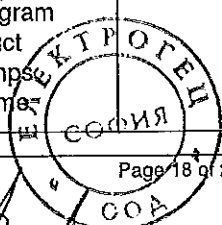
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No.	Material or product	Type of activity	Reference number	Remarks
14	CFL Directional Lamps	Electrical and Photometric Measurements of Single-Ended Compact Fluorescent Lamps, Efficacy, Light Output, Center beam Intensity, Lumen Maintenance, Lifetime, 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 GBCP 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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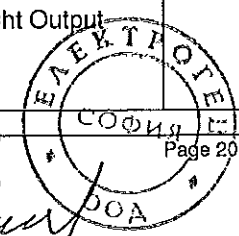
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No.	Material or product	Type of activity	Reference number	Remarks
16	LED Directional Lamps	Electrical and Photometric Measurements of Solid-State Lighting Products, Efficacy, Output, Center Beam Intensity, Luminous Intensity Distribution, Lumen Maintenance, 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	

ДЕКРА
ДИПЛОМ
ОДЪРЖАНА



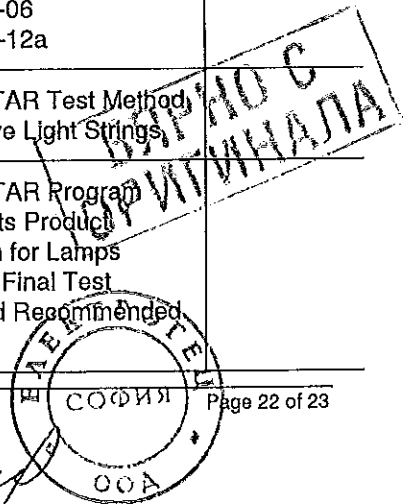
Annex to ISO/IEC 17025:2005 declaration of accreditation for registration number: **L 022**

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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This annex is valid from: **29-04-2015** to **01-03-2018**

Replaces annex dated: **03-11-2014**

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

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

“Вертикален предпазител-разединител НН 400 А, с триполюсно управление”

Приложение № 5



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EG-Konformitätserklärung EC Conformity Declaration

Dok.-Nr. L_98_01
Doc. No.

Hersteller, Anschrift Manufacturer, Address	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 Schalttafelauflaufbau 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 council 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

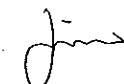
Europäische Normen Harmonized European standards	EN 60947-3
IEC-Standards IEC standards	
Nationale Normen National standards	VDE 0660 Teil 107

Aussteller / Issuer G / QM
Ort, Datum / Place, Date Eltville, den 16. Jan. 2008

Rechtsverb. Unterschriften
Legally binding signature



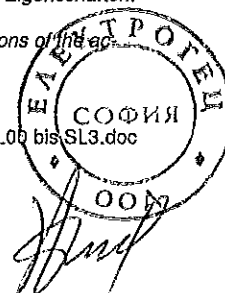
Dr. B. Müller



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.*



ДОКУМЕНТАЦИЯ

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с предмет:

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

РЕФ. № PPD 15-042

“Вертикален предпазител-разединител НН 400 А, с триполюсно управление”

Приложение № 6



A handwritten signature in black ink, appearing to be "Ваня".

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. № РРД 15-042,

ДЕКЛАРИРАМ,

че предлагания материал Вертикален предпазител-разединител НН 400 А, с триполюсно
управление Jean Muller тип SL2G-3X3/9/KM2G-F, съответства с изискванията на техническата
спецификация на стандарт за материал Вертикален предпазител-разединител НН 400 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. № РРД 15-042.

Дата 20.01.2016 г.

Декларатор:

инж. Георги Димитров Георгиев



/име, подпис и печат/

ПРЕДЛОЖЕНИЕ ЗА ИЗПЪЛНЕНИЕ НА ПОРЪЧКАТА

„Доставка и монтаж на бетонови комплектни трансформаторни
постове /БКТП/“, РЕФ. № PPD 15-042, Обособена позиция 2

03

„Електрогец“ ООД, www.electrogetz.com

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Наименование на материала: Вертикален разединител НН 1000 А, с триполюсно управление

Съкратено наименование на материала: ВР НН, 1000 А, 3-полюсно управление

Област: Н – Трансформаторни постове **Категория:** 16 - Предпазители, основи за предпазители и предпазител- разединители

Мерна единица: Брой **Аварийни запаси:** Да

Характеристика на материала:

Триполюсен разединител с вертикална конструкция, с обявен работен ток 1000 А, с общо управление на полюсите, за директен монтаж върху събирателни шини с междуосово разстояние 185 mm, съоръжен с твърди връзки (тоководещи шини), система А (НН система), размер 3, съответстващи на БДС EN 60269-1и БДС HD 60269-2.

Използване:

Вертикалният предпазител-разединител е предназначен за свързване на шинните системи на разпределителните табла посредством едножилни кабели НН.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:

Триполюсният вертикален разединител за 1000 А, с общо управление на полюсите

трябва да отговаря най-малко на посочените по-долу стандарти или еквиваленти и на техните валидни изменения и допълнения:

- 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, товарови прекъсвач-разединители и апарати комбинирани със стопяеми предпазители (IEC 60947-3:2008)“;
- БДС EN 60269-1:2007 „Стопяеми предпазители за ниско напрежение. Част 1: Общи изисквания (IEC 60269-1:2006)“;
- БДС HD 60269-2:2013 „Стопяеми предпазители за ниско напрежение. Част 2: Допълнителни изисквания за стопяеми предпазители, предназначени за използване от квалифицирани лица (стопяеми предпазители предимно за промишлено приложение). Примери за стандартизирани системи за стопяеми предпазители от А до К (IEC 60269-2:2013, с промени)“;
- БДС EN 60664-1:2007 „Координация на изолацията за съоръжения в електроразпределителни мрежи за ниско напрежение. Част 1: Правила, изисквания и изпитвания (IEC 60664-1:2007)“;
- БДС EN 60529+A1:2004 „Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989 + A1:1999)“

и

да бъде оценен положително по реда и при условията на Наредбата за съществените изисквания и оценяване на съответствието на електрически съоръжения, предназначени за



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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	SLT3-3SR/3X3/1000 Jean Muller, Германия, Приложение 1
2.	Техническо описание и чертежи с нанесени на тях размери	Приложение 2
3.	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 3
4.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 3 – заверено копие	Приложение 4
5.	ЕО декларация за съответствие	Приложение 5
6.	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 с нормативно-техническите документи” по-горе	Приложение 6

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.)

Технически данни:

1. Характеристики на работната среда

№ по ред	Наименование	Стойност
1.1	Място на монтиране	На закрито
1.2	Максимална температура на въздуха в околната среда	+ 40°C
1.3	Минимална температура на въздуха в околната среда	Минус 5°C
1.4	Максимална средна температура на въздуха в околната среда за период от 24 ч.	+ 35°C



№ по ред	Наименование	Стойност
1.5	Относителна влажност (при 20°C)	До 90 %
1.6	Степен на замърсяване	3
1.7	Надморска височина	До 2000 m


2. Параметри на електроразпределителната мрежата НН

№ по ред	Наименование	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Електроразпределителна мрежа	4 проводна мрежа (L ₁ , L ₂ , L ₃ , PEN)
2.5	Схема на електроразпределителната мрежа	TN-C

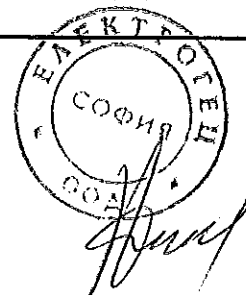
3. Технически параметри и други данни

№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.1	Обявено работно напрежение, U _e	690 (500) V AC	500 V AC
3.2	Брой на полюсите	3	3
3.3	Обявена честота	50 Hz	50 Hz
3.4	Категория по пренапрежение съгласно БДС EN 60664-1	IV	IV
3.5	Обявено издържано импулсно напрежение, U _{imp}	8 kV	12 kV
3.6	Обявено напрежение на изолацията, U _i AC	min 800 V	1000 V AC СОФИЯ

04



№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.7	Обявен работен ток, I_e	1000 A	1000 A
3.8	Термичен ток със стояема вложка, I_{th}	1000 A	1000 A
3.9	Условен ток на късо съединение (ефективна стойност) при 400 V AC	min 50 kA	120 kA
3.10	Размер на твърдите връзки/тоководещи шини (съгласно серията БДС EN 60269)	3	3
3.11	Максимален обявен ток на стояемите вложки, I_n	1000 A	1000 A
3.12	Категория на приложение (при 400 V AC)	AC 20 B или по-висока	AC 22 B
3.13	Механична износоустойчивост, брой на комутационните цикли	min 500	800
3.14	Електрическа износоустойчивост, брой на комутационните цикли	min 100	100
3.15	Управление	Триполюсно (едновременно включване и изключване на трите полюса)	Триполюсно (едновременно включване и изключване на трите полюса)
3.16	Основни размери:	-	-
3.16a	широчина	max 100 mm	99 mm
3.16b	височина (измерена от края на клемните съединения)	680 mm - информативно	662 mm
3.17	Разстояние между осите на събирателните шини	185 mm	185 mm
3.18	Присъединяване към събирателните шини	Клеми за свързване без необходимост от пробиване на шините	Клеми за свързване без необходимост от пробиване на шините



№ по ред	Технически характеристики	Изискване	Гарантирано предложение
3.19	Степен на защита срещу проникване на твърди тела и вода във вътрешността и допир до части под напрежение от лицевата страна съгласно БДС EN 60529+A1 или еквивалентно.	min IP20	IP30
3.20	Клемови съединения за токопроводимите жила на присъединяваните кабелни линии	Вертикалните разединители трябва да бъдат съоръжени с V-съединителна арматура за свързване на токопроводими кабелни жила в диапазона най-малко от 185 mm ² ге до 240 mm ² sm.	Присъединяването не се осъществява чрез V-съединителна арматура. Макс. сечение на присъединяваните кабели до 2x300 (3x120) mm ²
3.21	Маркировка	Вертикалните разединители трябва да бъде маркирани с информацията съгласно т. 5.2 от БДС EN 60947-3 или еквивалентно и инициалите „СЕ“.	Вертикалните разединители са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-3 или еквивалентно и инициалите „СЕ“.
3.22	Тегло, kg	Да се посочи	8,5 kg



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ДОКУМЕНТАЦИЯ

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РЕФ. № PPD 15-042

“Вертикален разединител НН 1000 А, с триполюсно управление”

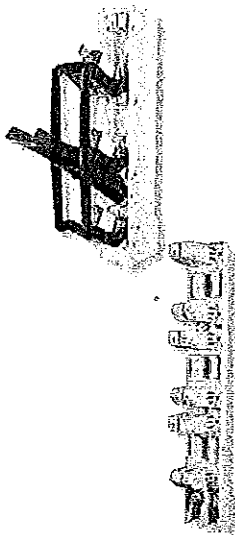
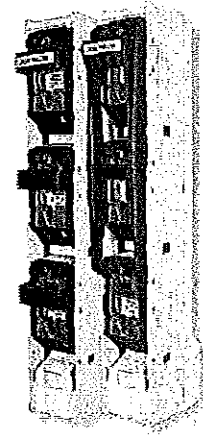
Приложение № 1



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungslastschaltleisten Größe 1-3 für
185mm Sammelschienensysteme
*NH strip-type fuse-switch-disconnectors
size 1 to 3 for 185mm busbar systems*



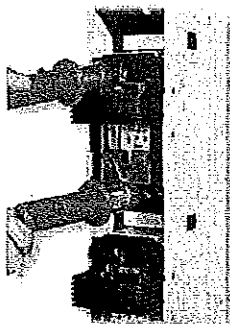
Vorteile, die überzeugen

Schalthebel

- Langer Schalthebel für sicheres und schnelles Schalten
- Abschließbar mit bis zu 3 Vorhängeschlössern in EIN- und AUS-Stellung

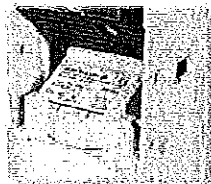
Montage

- Sichere Montage unter Spannung durch stets berührgeschütztes Kontaktsystem
- Nachrüstbare Montagehaken



Messung und Überwachung

- Sichere Spannungsmessung durch Prüflöcher über den Sicherungsaufnahmekontakten
- Elektronische Sicherungsüberwachung oder Sicherungsüberwachung durch Motorschutzschalter
- Einsatz von Wandlersicherungen für temporäre Strommessungen



Anschlussraumabdeckung

- Anschlussraumabdeckung im Gerät integriert
- Typenschild auch im eingebauten Zustand jederzeit lesbar

Convincing advantages

Operating lever

- Long operating lever for safe and reliable switching
- Lockable with up to 3 padlocks in both ON and OFF position

Installation

- Safe installation on live busbars due to always touch proof contacts
- Retrofittable mounting hooks

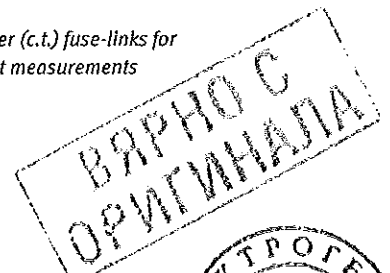
Measuring and monitoring

- Safe voltage testing through test holes leading to blade-contacts
- Electronic fuse monitoring or fuse-monitoring by means of motor circuit-breaker

- Current-transformer (c.t.) fuse-links for temporary current measurements

Terminal cover

- Integrated in NH strip-type fuse-switch-disconnector
- Markings always readable before and after installation



Größe 1-2 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > OMEGA Kontaktsystem > 1-pollig schaltbar
Size 1-2 > 185mm busbar system > Terminal at top or bottom side > OMEGA contact system > 1-pole switchable

Größe Size	Anschlussart Terminal version	Anschluss- Connection [mm ²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150			SL1H-3X/3A	L193100103
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1H-3X/9/KM2G-F	L199600403
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL1H-3X/9/KM2G	L199602903
2	Flachanschluss M12 Flat terminal M12	25-240		1	SL2H-3X/3A	L293100103
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240			SL2H-3X/4A	L294100203
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2H-3X/4A-60	L294100303
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240			SL2H-3X/9/KM2G-F	L299600403
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2H-3X/9/KM2G	L299600503

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip
type fuse-switch-
disconnectors

NH-Sicherungs-
lasttrennschalter
NH fuse-switch-
disconnectors

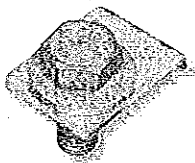
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CIOISIMIO®

Größe 2 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > OMEGA Kontaktsystem
> 1-pollig schaltbar > Versenkbarer Griff
Size 2 > 185mm busbar system > Terminal at top or bottom side > OMEGA contact system
> 1-pole switchable > Retractable handle

2	Flachanschluss M12 Flat terminal M12	25-240			SL2H-3X/3A/GV	L293100603
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400	1	SL2H-3X/9/KM2G-F/GV	L299600903
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2H-3X/9/KM2G/GV	L299601003

Anschlussarten/Terminal versions

Flachanschluss Flat terminal M...	Stehbolzenanschluss Stud bolt terminal	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G
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Анhang
Appendix
ВАРНО С
ОРИГИНАЛА
ЕЛЕКТРОТЕХ
СОФИЯ
2002
SL-17

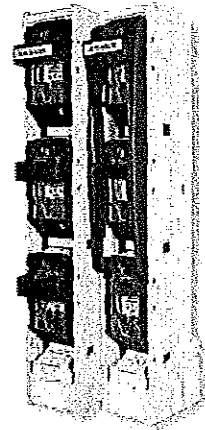
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NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungsleisten Größe 1-3 DELTA und OMEGA Kontaktsystem NH strip-fuseways size 1-3 DELTA and OMEGA contact system



Vorteile, die überzeugen

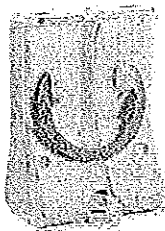
OMEGA Kontaktsystem

- Maximale Sicherheit dank hohem Kurzschluss-einschaltvermögen (120kA/500V)
- Gefahrloser Betrieb durch hohe Schaltleistung bis zu AC-23B (400V/400A)
- Korrosionsfreie Edelstahl-Fremdfederung
- Robustes und alterungsbeständiges Kontaktsystem mit hohen Rückstell-eigenschaften



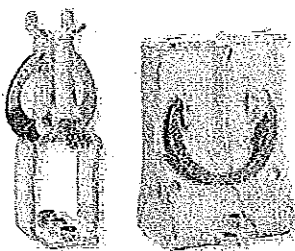
DELTA Kontaktsystem

- Gezielte Lichtbogenführung und geringer Kontaktverschleiß durch Opferelektroden
- Gefahrloser Betrieb durch hohe Schaltleistung bis zu AC-23B (400V/630A)
- Hohe Alterungsbeständigkeit durch zwei voneinander unabhängige Fremdfeder-emente
- Optimale Kontaktierung und niedrige Verlustleistung durch 2fach-Linienkontaktsystem
- Hohe Kurzschlussfestigkeit bis zu 120kA durch integrierte Kurzschlussblockade



Einsatz

- Das OMEGA Kontaktsystem bietet für die typischen Anwendungen im Bereich der Versorgungsnetzbetreiber für Geräte der Größe 1 und 2 ein ideal angepasstes Leistungsprofil
- Das DELTA Kontaktsystem sorgt mit seiner Stromtragfähigkeit von bis zu 1000A Dauerstrom insbesondere in Industriellen Anwendungen sowie in Geräten mit einem Bemessungsstrom von > 400A für hervor-ragende Lastschalteigenschaften



Convincing advantages

OMEGA contact system

- Maximum safety thanks to high short-circuit making capacity (120kA/500V)
- Riskless operation due to high switching capacity up to AC-23B (400V/400A)
- Corrosion-resistant external spring elements made by stainless steel
- Robust and age-resistant contact system with high restoring properties

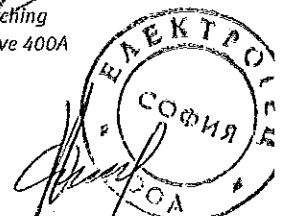
DELTA contact system

- Defined arc initiation and low contact wear due to sacrificial electrodes
- Riskless operation due to high switching capacity up to AC-23B (400V/630A)
- High age resistance by two independent spring elements
- Optimal contacting and low power loss by dual line contact system
- High short-circuit strength up to 120kA by integrated short circuit pinch-stop

Application

- The OMEGA contact system offers an optimum performance profile for size 1 and 2 devices to be installed in power utility networks
- The DELTA contact system, having continuous current carrying capability up to 1000A, provides excellent load-break capability in industrial applications and in switching devices having rated currents above 400A

ВАРНО С
ЭЛЕКТРО
ИНЖЕНЕРИ





Größe 1-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 1-pollig schaltbar
Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 1-pole switchable

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150			SL1-3X/3A	L1931001
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1-3X/9/KM2G-F	L1996004
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL1-3X/9/KM2G	L1996029
2	Flachanschluss M12 Flat terminal M12	25-240			SL2-3X/3A	L2931001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240			SL2-3X/4A	L2941002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2-3X/4A-60	L2941003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240		1	SL2-3X/9/KM2G-F	L2996004
3	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL2-3X/9/KM2G	L2996005
	Flachanschluss M12 Flat terminal M12	25-300			SL3-3X/3A	L3931001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-300			SL3-3X/4A	L3941002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-300	630		SL3-3X/4A-60	L3941003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240			SL3-3X/9/KM2G-F	L3996018
2 x 3	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300			SL3-3X/9/KM2G	L3996004
	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1250		SL3-3X2/1250/HA	L3921400

NH-Sicherungs-
lelsten
NH strip-
fuseways

NH-Sicherungs-
lastschaltelsten
NH strip-
type fuse-switch-
disconnectors

NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

CIOISIMIO®

Größe 2-3 > 185mm Sammelschienenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem
> 1-pollig schaltbar > Versenkbarer Griff
Size 2-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system
> 1-pole switchable > Retractable handle

2	Flachanschluss M12 Flat terminal M12	25-240			SL2-3X/3A/GV	L2931006
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400		SL2-3X/9/KM2G-F/GV	L2996009
3	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300		1	SL2-3X/9/KM2G/GV	L2996010
	Flachanschluss M12 Flat terminal M12	25-300			SL3-3X/3A/GV	L3931007
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	630		SL3-3X/9/KM2G-F/GV	L3996048

Klemmen
Terminals

Anhang
Appendix

ВАРНО С
ОРГНИЗАЦИЯ



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

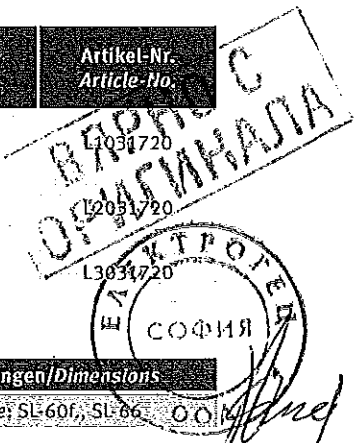
Größe 1-3 > 185mm Sammelschlenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 3-polig schaltbar
 Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 3-pole switchable



Größe Size	Anschlussart Terminal version	Anschluss Connection (mm ²)	I _n [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150	250		SL1-3X3/3A	L1031001
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	250		SL1-3X3/9/KM2G-F	L1096004
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	250		SL1-3X3/9/KM2G	L1096026
2	Flachanschluss M12 Flat terminal M12	25-240	400		SL2-3X3/3A	L2031001
	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-240	400		SL2-3X3/4A	L2041002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-240	400		SL2-3X3/4A-60	L2041003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	400		SL2-3X3/9/KM2G-F	L2096015
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	400	1	SL2-3X3/9/KM2G	L2096005
	Flachanschluss M12 Flat terminal M12	25-300	630		SL3-3X3/3A	L3031001
3	Stehbolzenanschluss M12x35 Stud bolt terminal M12x35	25-300	630		SL3-3X3/4A	L3041002
	Stehbolzenanschluss M12x60 Stud bolt terminal M12x60	25-300	630		SL3-3X3/4A-60	L3041003
	V-Stahl-Rahmenklemme KM2G-F Steel-frame clamp KM2G-F	25-240	630		SL3-3X3/9/KM2G-F	L3096012
	V-Stahl-Rahmenklemme KM2G Steel-frame clamp KM2G	25-300	630		SL3-3X3/9/KM2G	L3096004
2 x 3	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1250		SL3-3X6/1250/HA	L3021400

Größe 1-3 > 185mm Sammelschlenensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 3-polig schaltbar >
 Elektronische Sicherungsüberwachung ES00
 Size 1-3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 3-pole switchable >
 Electronic fuse-monitoring unit ES00

Größe Size	Anschlussart Terminal version	Anschluss Connection (mm ²)	I _n [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1	Flachanschluss M10 Flat terminal M10	25-150	250		SL1-3X3/3A/ES00	L1031720
2	Flachanschluss M12 Flat terminal M12	25-240	400	1	SL2-3X3/3A/ES00	L2031720
3	Flachanschluss M12 Flat terminal M12	25-300	630		SL3-3X3/3A/ES00	L3031720



Größe 3 > 185mm Sammelschienensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 1-polig schaltbar
Size 3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 1-pole switchable

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
3	Flachanschluss 2 x M12 Flat terminal 2 x M12	2 x 300, 3 x 120	1000		SL3-3X/1000/HA/TM3 ¹⁾	L3921300
	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1600	1	SL3-3X2/1600/HA/TM3 ¹⁾	L3921402
	Flachanschluss 4 x M12 Flat terminal 4 x M12	4 x 300	2000		SL3-3X2/2000/HA	L3921507

Größe 3 > 185mm Sammelschienensystem > Kabelabgang oben oder unten > DELTA Kontaktsystem > 3-polig schaltbar
Size 3 > 185mm busbar system > Terminal at top or bottom side > DELTA contact system > 3-pole switchable

3	Flachanschluss 2 x M12 Flat terminal 2 x M12	2 x 300, 3 x 120	1000		SL3-3X3/1000/HA/TM3 ¹⁾	L3021300
	Flachanschluss 3 x M12 Flat terminal 3 x M12	3 x 300, 4 x 185	1600	1	SL3-3X6/1600/HA/TM3 ¹⁾	L3021401
	Flachanschluss 4 x M12 Flat terminal 4 x M12	4 x 300	2000		SL3-3X6/2000/HA	L3021501

1) Einschleiflich Trennmesser 1250A/Including solid link-1250A

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltelstein
NH strip-
type fuse-switch-
disconnectors

Größe 3 > 185mm Sammelschienensystem > Einspeisung rückseitig auf Sammelschienensystem > DELTA Kontaktsystem
Size 3 > 185mm busbar system > Supply at rear side to busbar system > DELTA contact system

Größe Size	Anschlussart Terminal version	Anschluss Connection [mm²]	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
3	1-polig/1-pole	2 x 300	1000	1	SL3-3X/1000/ARO/TM3 ¹⁾	L3920303
	3-polig/3-pole				SL3-3X3/1000/ARO/TM3 ¹⁾	L3020303

1) Einschleiflich Trennmesser 1250A/Including solid link-1250A

NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

CIO/SIMIO®
CIO/SIMIO®

Anschlussarten/Terminal versions

Flachanschluss 2 x M12 Flat terminal 2 x M12	Flachanschluss 3 x M12 Flat terminal 3 x M12	Flachanschluss 4 x M12 Flat terminal 4 x M12
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Klemmen
Terminals

Anhang
Appendix



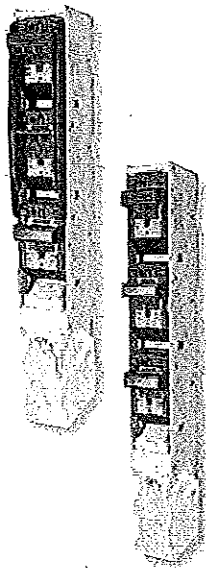
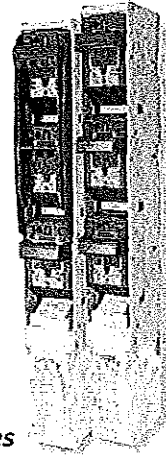
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30-21

NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungslastschaltleiste SL3/910A und SL3/910Aplus NH strip-type fuse-switch-disconnector SL3/910A and SL3/910Aplus



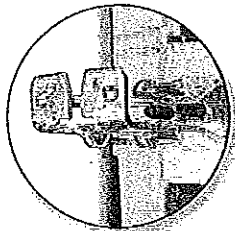
Vorteile, die überzeugen

Großzügige Dimensionierung

- Geringe Verlustleistung dank 480mm² Querschnitt bei Einspelsewinkeln und Abgangsschienen
- Niedrige Kontakttemperaturen durch gute Wärmeabführung

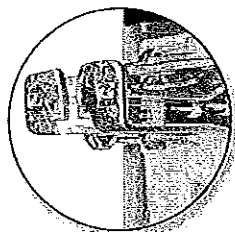
Gute Anschlussbedingungen

- Spezielle Anschlusselemente ermöglichen 2-Leiteranschluss bis 2x300mm² oder 3-Leiteranschluss bis 3x185mm²
- Einfache Montage auf Sammelschienen-system durch 100mm Baubreite



SL3/910A

- Standardgerät für übliche Anwendungen der Versorgungsnetzbetreiber
- DELTA Kontaktsystem für hohe Schaltleistung



SL3/910Aplus

- Kontaktsystem DELTAplus für erschwerte Einsatzbedingungen
- Sechs unabhängig befederte Linienkontakte pro Sicherungsaufnahmekontakt für beste Kontaktierung

Convincing advantages

Generously dimensioned

- Low power loss thanks to 480mm² cross section of feeding contacts and terminal bars
- Low contact temperature-rise due to excellent heat dissipation

Fast and easy connecting

- Special connectors enable the connection of two conductors up to 2x300mm² or three conductors up to 3x185mm² cross section
- Easy installation on busbars due to uniform 100mm width

SL3/910A

- Standard Product for regular power utility applications
- DELTA contacts for superior breaking capacity

SL3/910Aplus

- DELTAplus contacts for severe operating conditions
- Six independent spring loaded linear contacts corresponding to each blade contact provide optimum contact performance

ВЯРНО С
ОРИГИНАЛА





Größe 3/910A > 185mm Sammelschienensystem > Sekundärschutz von 630kVA-Transformatoren > DELTA Kontaktsystem
Size 3/910A > 185mm busbar system > Secondary protection of 630kVA transformers > DELTA contact system

Schaltbarkeit Switching mode	Einspeisung Supply	Anschlussart Terminal version	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1-polig/1-pole	Oben oder unten Top or bottom side	2 x M12	910	1	SL3-3X/910/HA	L3921200
		1 x M16			SL3-3X/910/AO/AU-100	L3920208
		1 x M16			SL3-3X/910/AO/AU-75	L3920210
	Rückseitig From rear side	2 x M12			SL3-3x/910/AO/AU-65	L3920214
		1 x M12			SL3-3X/910/ARO	L3920203
		1 x M16			SL3-3X/910/ARO/110	L3920206
		1 x M16			SL3-3X/910/ARUS	L3920204
3-polig/3-pole	Oben/Top side	1 x M16	SL3-3X/910/AORL	L3920220		
		2 x M12	SL3-3X3/910/HA	L3021200		
		1 x M16	SL3-3X3/910/AO/AU-100	L3020208		
	Rückseitig From rear side	1 x M16	SL3-3X3/910/AO/AU-75	L3020210		
		2 x M12	SL3-3x3/910/AO/AU-65	L3020214		
		1 x M12	SL3-3X3/910/AO-102	L3021229		
		1 x M12	SL3-3X3/910/ARO	L3020203		
Oben/Top side	1 x M16	SL3-3X3/910/ARO/110	L3020218			
	1 x M16	SL3-3X3/910/ARUS	L3020204			
	1 x M16	SL3-3X3/910/AORL	L3020216			
		1 x M16	SL3-3x3/910/AORK	L3020221		

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip-
type fuse-switch-
disconnectors

NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

Größe 3/910Aplus > 185mm Sammelschienensystem > Sekundärschutz von 630kVA-Transformatoren > DELTA Kontaktsystem
Size 3/910Aplus > 185mm busbar system > Secondary protection of 630kVA transformers > DELTA contact system

Schaltbarkeit Switching mode	Einspeisung Supply	Anschlussart Terminal version	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
1-polig/1-pole	Oben oder unten Top or bottom side	2 x M12	910	1	SL3-3X/910+/HA	L392120099
	Rückseitig From rear side	1 x M12			SL3-3X/910+/ARO	L392020399
3-polig/3-pole	Oben oder unten Top or bottom side	2 x M12			SL3-3X3/910+/HA	L302120099
	Rückseitig From rear side	1 x M12			SL3-3X3/910+ARO	L302020899

CJO/SIM/O
CIO/SIM/O®

Klemmen
Terminals

Weitere Ausführungen auf Anfrage/further versions on request

ВЪРНО С
ОРИГИНАЛА
Anhang
Appendix



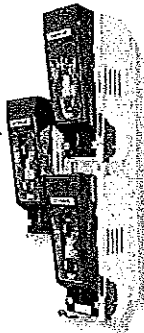
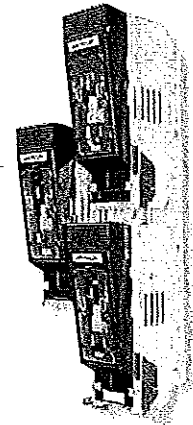
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NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

NH-Sicherungslastschaltleisten Größe 4a

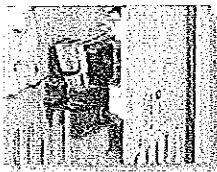
NH strip-type fuse-switch-disconnectors size 4a



Vorteile, die überzeugen

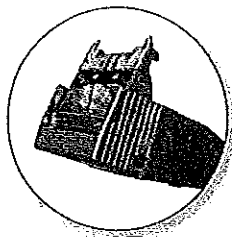
Kompatibilität

- Reduzierte Einbauhöhe bei 248mm Baubreite
- Verschiedene B erührerschutzabdeckungen als Zubehör
- Nachrüstbar mit Mikroschaltern zur Sicherungsüberwachung (Schlagmelderausführung)
- Schaltstellungsanzeige nachrüstbar



LYRA-Kontaktsystem

- LYRA-Kontaktsystem mit Q-Einschalthilfe für hohes Schaltvermögen
- 4 unabhängig befederte Kontaktschenkel für niedrige Verlustleistung



Hohe Sicherheit

- Sichere Deckelverriegelung für hohe Kurzschlussfestigkeit bis 80kA

Convincing advantages

Compatibility

- Reduced installation height at 248mm width
- Various protective covers available
- Retrofit microswitch for fuse monitoring (striker fuse-links)
- Retrofit switch position monitoring

LYRA contact system

- LYRA contact system with Q-making feature
- Four independently spring loaded contact fingers ensure low power loss

High safety level

- Reliable fuse carrier latch for high short-circuit current withstand up to 80kA





Größe 3 > 185mm Sammelschienensystem > Sammelschienenlängsttrennung > DELTA Kontaktsystem
Size 3 > 185mm busbar system > Busbar disconnection > DELTA contact system

Größe Size	Schaltbarkeit Switching mode	Sammelschienenentrennung Busbar disconnection	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
3	3-polig/3-pole	Linksseitig/Left side	630	1	SLT3-3SL/3X3	L3000001
		Rechtsseitig/Right side	630		SLT3-3SR/3X3	L3000002
		Linksseitig/Left side	1000		SLT3-3SL/3X3/1000/TM3 ¹⁾	L3000003
		Rechtsseitig/Right side	1000		SLT3-3SR/3X3/1000/TM3 ¹⁾	L3000004
2 x 3		Rechtsseitig/Right side	910		SLT3-3SR/3X3/910	L3000201
		Rechtsseitig/Right side	2000		SLT3-3SR/3X6/2000/TM3 ¹⁾	L3000501
3	1-polig/1-pole	Linksseitig/Left side	630		SLT3-3SL/3X	L3900001
		Rechtsseitig/Right side	630		SLT3-3SR/3X	L3900002
		Linksseitig/Left side	1000	SLT3-3SL/3X/1000/TM3 ¹⁾	L3900003	
		Rechtsseitig/Right side	1000	SLT3-3SR/3X/1000/TM3 ¹⁾	L3900004	
2 x 3		Rechtsseitig/Right side	910	SLT3-3SR/3X/910	L3900201	
		Rechtsseitig/Right side	2000	SLT3-3SR/3X2/2000/TM3 ¹⁾	L3900501	

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip
type fuse-switch
disconnectors

NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

1) Einschließlich Trennmesser 1250A/including solid link 1250A

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Größe 4a > 185mm Sammelschienensystem > 1-polig schaltbar
Size 4a > 185mm busbar system > 1-pole switchable

Baubreite Width	Anschlussart Terminal version	Kabelabgang Terminal	I [A]	VE PU	Typ Type	Artikel-Nr. Article-No.
248mm	1 x M16	Unten/Bottom side	1250	1	SLTL4A-3AS/3X/4	L4941000
		Oben/Top side	1250	1	SLTL4A-3AS/3X/4/AO	L4941001

Klemmen
Terminals

Anhang
Appendix



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Kompetenz Competence

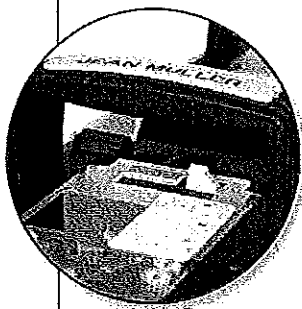
Sonderbauformen/Special versions

Die unterschiedlichen Anwendungsfälle unserer Kunden erfordern besondere Lösungen. Diese zu entwickeln, ist eine Herausforderung, der sich JEAN MÜLLER seit mehr als 115 Jahren erfolgreich stellt. Die Anpassung der Bauformen

oder die Ergänzung mit Spezialteilen generiert Kundennutzen. In enger Abstimmung mit unseren Partnern werden solche individuellen technischen Lösungen für besondere Einbausituationen und Anforderungen geschaffen.

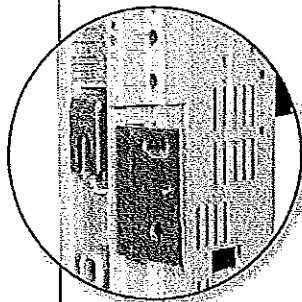
The different applications of our customers require special solutions. JEAN MÜLLER has successfully met the challenge of the development of those extraordinary solutions for more than 115 years. The adaptation of product-versions and the completion with special accessories generates customer's benefit. Individual technical solutions for special built-in applications and requirements are designed in close coordination with our partners.

Sie haben keine Lösung für Ihre Anwendung gefunden?/You haven't found any solution for your application?
Kontaktieren Sie uns!/Please contact us!



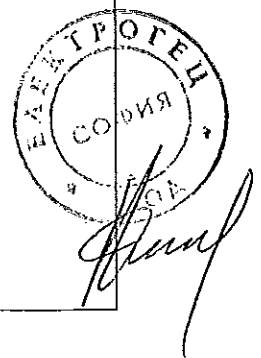
Eine zusätzliche Verriegelung sorgt bei Trennschaltleisten für eine Bemessungskurzzeitstromfestigkeit von 25kA/1s und ermöglicht damit einen Einsatz als Trennschalter auf der Sekundärseite von 630kVA-Transformatoren ($I_k = 22,75\text{kA}$ bei $u_k = 4\%$)

An additional interlock at switch-disconnectors makes sure a rated short-time withstand current of 25kA/1s and enables therewith an usage as switch-disconnector on the secondary side of 630kVA-transformers ($I_k = 22,75\text{kA}$ at $u_k = 4\%$)



Geschlitzte Einspeisewinkel ermöglichen das Einhängen des Schaltgerätes auf die vormontierten Befestigungsbolzen am Sammelschlenensystem

Slotted feeding contacts allow to hook the disconnecter into pre-assembled bolts on busbar system



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Typ/Type		SL3	SL3/910A	SL3/910A+	
Nach Norm/ <i>According to standard</i>		DIN EN 60947-3			
Für NH-Sicherungen nach DIN VDE 0636-2 <i>For NH fuse-links acc. to DIN VDE 0636-2</i>		Größe <i>Size</i>	3	3	
Elektrische Kenngrößen <i>Electrical characteristics</i>	Bemessungsbetriebsspannung <i>Rated operational voltage</i>	U_e V	AC690	AC400	
	Bemessungsbetriebsstrom ¹⁾ <i>Rated operational current ¹⁾</i>	I_e A	630	910	
	Konv. therm. Strom frei in Luft mit Sicherungen <i>Conv. free air thermal current with fuse-links</i>	I_{th} A	630	910	1000
	Konv. therm. Strom frei in Luft mit Trennmessern <i>Conv. free air thermal current with solid-links</i>	I_{th} A	800		1250
	Bemessungsfrequenz <i>Rated frequency</i>	– Hz	40-60		40-60
	Bemessungsisolationsspannung <i>Rated insulation voltage</i>	U_i V	AC1000		AC690
	Gesamtverlustleistung bei I_{th} (ohne Sicherungen) <i>Total power loss at I_{th} (without fuse-links)</i>	P_v W	115	155	140
	Verlustleistung bei 80% I_{th} (ohne Sicherungen) ²⁾ <i>Power loss at 80% I_{th} (without fuse-links) ²⁾</i>	P_v W	73,6	99,2	89,6
	Bemessungsstoßspannung <i>Rated impulse withstand voltage</i>	U_{imp} kV	12		8
	Gebrauchskategorie <i>Utilization category</i>	– –	AC-23B (630A/400V) AC-22B (630A/500V) AC-21B (630A/690V)	AC-22B (1250A/400V) AC-22B (910A/400V)	
	Bedingter Bemessungskurzschlussstrom <i>Rated conditional short-circuit current</i>	I_{cc} kA	120 ^{3a)}		50 ^{3b)}
	Bemessungskurzzeitstromfestigkeit <i>Rated short-time withstand current</i>	I_{cwr} kA	10/15kA ⁴⁾		10/15kA ⁴⁾
	Max. zul. Verlustleistung pro Sicherungseinsatz <i>Max. permis. power loss per fuse-link</i>	P_a W	48		61

- 1) Bei Einbau von mehreren Geräten in Niederspannungs-Schaltgerätekombinationen sind Bemessungsbelastungsfaktoren nach DIN EN 61439 zu beachten.
In case of mounting of several units in low voltage switchgear-combinations, please consider rated diversity factors acc. to DIN EN 61439.
- 2) Bezugsgröße für Austausch von Geräten nach DIN EN 61439-1 Abs. 10.10.4.2.
Reference value for replacement of devices acc. to DIN EN 61439-1 clause 10.10.4.2.
- 3a) Typgeprüft bei AC420V mit NH-Sicherungseinsätzen 630A/500V Betriebsklasse gG, bei AC725V mit NH-Sicherungseinsätzen 500A/690V Betriebsklasse gG.
Type tested at AC420V with NH fuse-links 630A/500V characteristic gG, at AC725V with NH fuse-links 500A/690V characteristic gG.
- 3b) Typgeprüft mit NH-Sicherungseinsätzen 400V/910A Betriebsklasse gTr./Type tested with NH fuse-links 400V/910A characteristic gTr.
- 4) 1-polig/3-polig schaltbar./1-pole/3-pole switchable.



Typ/Type				SL3	SL3/910A	SL3/910A+
Kabel-anschluss Cable terminal	Flachanschluss Flat terminal	Bolzendurchmesser Bolt diameter	- -	M12	2 x M12	
		Kabelschuh Cable lug	- mm ²	1 x 25-300	Breite max 43mm Width max. 43mm	2 x 300, 3 x 185
		Flachschiene Flat bar	- mm	30 x 10	80 x 10	
	Klemme Clamp	Anzugsdrehmoment Tightening torque	M _a Nm	35-40	35-40	
		Klemmquerschnitt Clamping cross-section	- mm ²	KM2G	25-150/ 185-300	-
		Anzugsdrehmoment Tightening torque	- Nm		32	-
		Klemmquerschnitt Clamping cross-section	- mm ²	KM2G-F	25-240 32	-
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	
Betriebs- bedingungen 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, waagrecht Vertical, horizontal		
	Höhenlage/Altitude	- m		Bis zu 2000/Up to 2000		
Verschmutzungsgrad/Pollution degree	- -			3		
Überspannungskategorie/Overvoltage category	- -			IV		

NH-Sicherungs-
leisten
NH strip-
fuseways

NH-Sicherungs-
lastschaltleisten
NH strip-
type fuse-switch-
disconnectors

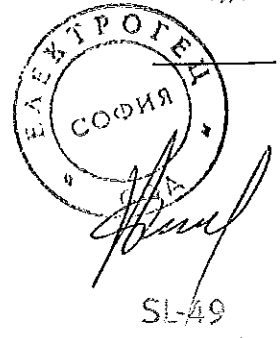
NH-Sicherungs-
lasttrenn-
schalter
NH fuse-switch-
disconnectors

C[0]S[M]O[®]
C[0]S[M]O[®]

Klemmen
Terminals

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

Anhang
Appendix



NH-Sicherungslastschaltleisten

NH strip-type fuse-switch-disconnectors

Typ/type		SL3/1000-TM	SL3/1250
	Nach Norm/According to standard	DIN EN 60947-3	
	Für NH-Sicherungen nach DIN VDE 0636-2 For NH fuse-links acc. to DIN VDE 0636-2	Größe Size	3
	Bemessungsbetriebsspannung Rated operational voltage	U_e V	AC690
	Bemessungsbetriebsstrom ¹⁾ Rated operational current ²⁾	I_e A	1000
	Konv. therm. Strom frei in Luft mit Sicherungen Conv. free air thermal current with fuse-links	I_{th} A	630
	Konv. therm. Strom frei in Luft mit Trennmessern Conv. free air thermal current with solid-links	I_{th} A	1000
	Bemessungsfrequenz Rated frequency	Hz	40-60
Elektrische Kenngrößen Electrical characteristics	Bemessungsisolationsspannung Rated insulation voltage	U_i V	AC1000
	Gesamtverlustleistung bei I_{th} (ohne Sicherungen) Total power loss at I_{th} (without fuse-links)	P_v W	275
	Verlustleistung bei 80% I_{th} (ohne Sicherungen) ²⁾ Power loss at 80% I_{th} (without fuse-links) ²⁾	P_v W	176
	Bemessungsstoßspannung Rated impulse withstand voltage	U_{imp} kV	12
	Gebrauchskategorie Utilization category	—	AC-22B (1000A/400V) AC-22B (800A/500V) AC-21B (630A/690V)
	Bedingter Bemessungskurzschlussstrom Rated conditional short-circuit current	I_{cc} kA	120 ³⁾
	Bemessungskurzzeitstromfestigkeit Rated short-time withstand current	I_{cw} kA	10/15/25 ⁴⁾
	Max. zul. Verlustleistung pro Sicherungseinsatz Max. permis. power loss per fuse-link	P_a W	51
			AC-22B (1250A/400V) AC-22B (1250A/500V) AC-21B (1250A/690V)
			80
		20/25/46 ⁴⁾	
		48	

1) Bei Einbau von mehreren Geräten in Niederspannungs-Schaltgerätekombinationen sind Bemessungsbelastungsfaktoren nach DIN EN 61439 zu beachten.
In case of mounting of several units in low voltage switchgear-combinations, please consider rated diversity factors acc. to DIN EN 61439.

2) Bezugsgröße für Austausch von Geräten nach DIN EN 61439-1 Abs. 10.10.4.2.
Reference value for replacement of devices acc. to DIN EN 61439-1 clause 10.10.4.2.

3) Typgeprüft bei AC420V mit NH-Sicherungseinsätzen 630A/500V Betriebsklasse gG, bei AC725V mit NH-Sicherungseinsätzen 500A/690V Betriebsklasse gG.
Type tested at AC420V with NH fuse-links 630A/500V characteristic gG, at AC725V with NH fuse-links 500A/690V characteristic gG.

4) 1-pollig/3-pollig schaltbar./1-pole/3-pole switchable.

