

**ПРЕДЛОЖЕНИЕ
ЗА ИЗПЪЛНЕНИЕ НА ПОРЪЧКАТА
ЗА ОБОСОБЕНА ПОЗИЦИЯ 7**

ДО: „ЧЕЗ разпределение БЪЛГАРИЯ“ АД,

ОТ: «Електролюкс Табаков и синове» ООД –гр. Пловдив

Адрес: гр. Пловдив ул. «Седянка», №9

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Единен идентификационен код: 115812097,

Представявано от Георги Николов Табаков – Управител

Лице за контакти: Георги Николов Табаков, тел.: 032/969-280 факс: 032/969-281; e-mail: info@electrolux-tabakov.com; ntelectrolux@abv.bg

УВАЖАЕМИ ГОСПОЖИ И ГОСПОДА,

След като се запознахме с изискванията на възложителя за изпълнение на обществена поръчка с реф. № РРД 17 – 052 и предмет: „Модернизация (ретрофит) на електрически уредби 110/20 (10) kV и въвеждането им в режим на телемеханика, аз долуподписаният Георги Николов Табаков, в качеството си на представител на «Електролюкс Табаков и синове» ООД, декларирам, че:

В случай че бъдем определени за изпълнител на обществената поръчка, декларираме, че:

1. Ще изпълняваме договора съгласно техническите изисквания на възложителя, представени в т. 4 “Обем от дейности и основни изисквания при изпълнението на ретрофита (модернизацията) на енергийните обекти по предмета на поръчката” от раздел I. на документацията за участие, включени като Приложение № 2 към договора за изпълнение на обществената поръчка.
2. Всички материали, апаратура, оборудване, съоръжения и резервни части, които ще доставим и ще влягаме при изпълнение на предмета на поръчката ще са нови, неупотребявани, придружени от декларации и/или сертификати/декларации за съответствие, съгласно изискванията на българското законодателство.
3. Задължаваме се при всяка доставка на материал и/или апаратура и/или оборудване и/или съоръжение и/или резервни части, същите да бъдат придружени от изискуемите документи съгласно договора.
4. Представяме изисканата информация в Техническо предложение за оборудване – Приложение 2 към настоящото Предложение за изпълнение на поръчката, като:
 - 4.1. Представям попълнено „Гарантирано предложение“ в таблиците с технически данни. Предлаганото от нас оборудване отговаря на минималните технически изисквания на Възложителя, които не съдържат графа „Гарантирано предложение“ в таблиците на техническите спецификации на стоката от раздел II. „Технически спецификации и изисквания на възложителя за изпълнение на поръчката“ от документацията за участие.
 - 4.2. Представям всички изисквани данни и документи от таблиците с Изисквания към документацията и изпитанията. Запознат съм с изискването, че представените документи трябва да бъдат на български език или с превод на български език, придружени с оригиналните документи, с изключение на каталозите и протоколи от изпитания /в случай, че се изискват/ за материалите, които могат да се представят и само на английски език.
5. Запознат съм, че представените от нас технически документи са доказателство за декларираните технически данни и параметри на предлаганото оборудване.
6. Заявяваме, че предлаганите от нас материали, апаратура, оборудване, съоръжения и резервни части са с технически характеристики покриващи посочените от възложителя в раздел II. „Технически спецификации и изисквания на възложителя за изпълнение на поръчката“ от документацията за участие.
7. Ще изпълняваме договора съгласно техническите изисквания на възложителя, представени в раздел II. «Технически спецификации и изисквания на възложителя за изпълнение на поръчката» от документацията за участие, които са включени като Приложение № 3 към договора за изпълнение на обществената поръчка.
8. Потвърждаваме, че доставяните от нас материали, апаратура, оборудване и съоръжения ще отговарят на посочените от възложителя стандарти или на еквивалентни. В случай, че даден материал, апаратура, оборудване и съоръжение отговаря на стандарт, еквивалентен на посочения от Възложителя в раздел II. „Технически спецификации и изисквания на възложителя“.

за изпълнение на поръчката" от документацията за участие, се задължаваме да го отразим в отделен документ и да представим доказателства за еквивалентността на двата стандарта заедно с настоящото предложение за изпълнение на поръчката.

9. С настоящото гарантираме, че ще изпълним сроковете за изпълнение на поръчката, опеделени в Приложение 1 към настоящото Техническо предложение.

10. Гарантираме, че предложеното оборудване за Комуникация на цифрови защити /ЦЗ/ и контролер с RTU отговаря на посочените в Приложение 3 минимални технически изисквания на Възложителя.

11. Декларирам, че представител на участника, когото представлявам е извършил оглед на обекта, на който ще бъде извършен ретрофит и прилагам декларация за извършен оглед към настоящото предложение – Приложение № 4.

12. Предлагам гаранционни срокове:

12.1. за материалите, апаратурата, оборудването и съоръженията, гаранционните срокове са съгласно гаранционните срокове определени от съответния производител, но не по-малко от 36 месеца от датата на приемо-предавателния протокол за приемане на оборудването;

12.2. за строителните работи гаранционните срокове съответстват на минималните гаранционни срокове, посочени в Наредба № 2 от 31 юли 2003 г. за въвеждане в експлоатация на строежите в Република България и минималните гаранционни срокове за изпълнени строителни и монтажни работи, съоръжения и строителни обекти.

13. Задължаваме се в рамките на гаранционните срокове всички разходи по отстраняване на дефекти или замяна на дефектни материали, апаратура, оборудване, съоръжения и резервни части с нови, да са за наша сметка.

Неразделна част от настоящото предложение са следните приложения:

Приложение № 1 - Срокове за изпълнение на ретрофита

Приложение № 2 - Техническо предложение за оборудване

Приложение № 3 – Комуникация на цифрови устройства с RTU

Приложение № 4 – декларация за извършен оглед

Приложение № ... – други по преценка на участника;

Дата: 24.07.2017 г.

ПОДПИС и ПЕЧАТ:
/Георги Табаков-Управляващ/



ПРИЛОЖЕНИЕ №1

СРОКОВЕ ЗА ИЗПЪЛНЕНИЕ НА РЕТРОФИТА ПО ОБОСОБЕНА ПОЗИЦИЯ № 7:

Проектирането, доставката на цялостното оборудване и изпълнението на всички необходими дейности за цялостната реализация на модернизацията (ретрофита) (като демонтаж на съществуващо оборудване, строителни работи /включително доставка на необходимите строителни материали/ по подготовка на площадките в енергийния обект за извършване на монтажа на новото оборудване, монтажни работи по отношение на доставеното ново енергийно оборудване, единични функционални проби на монтираните машини и съоръжения и въвеждането им в работен режим на телемеханика, както и провеждане на обучение на персонал на възложителя за работа с новото оборудване) и настоящото техническо задание следва да се изпълнят в срок до 18 (осемнадесет) месеца, считано от датата на подписване на договора за изпълнение на поръчката.

1. Срок за изготвяне на програмата с линейния план-график за цялостната реализация на модернизацията (ретрофита) и представянето ѝ на Възложителя:

Срокът за изготвяне на програмата с линейния план-график и представянето ѝ на Възложителя за одобрение е до 14 (четирнадесет) дни, считано от датата на подписване на договора. Срокът за одобрение на предложената програма с линеен план-график от Възложителя е до 3 (три) дни, считано от датата на представяне на изработената програмата с линейния план-график на Възложителя.

2. Изготвяне на работен проект:

Срокът за проектирането на модернизацията (ретрофита) на ЗРУ 20 kV в пълен обем е до 20 дни след датата на подписване на Договор с конкретен Изпълнител.

1. Съгласуване на работния проект с „ЧЕЗ Разпределение България“ АД;

Срокът за съгласуване на работния проект е до 10 дни след датата на предаването му на Възложителя.

2. Доставка на цялостно оборудване, съгласно утвърдения работен проект:

Срокът за доставка на цялостното оборудване за изпълнение на предмета на поръчката съобразно предвижданията на съгласувания работен проект, както и на всички необходими резервни части, включително и за изработката и доставката на необходимите за модернизацията врати и детайли в заводски условия, е до 70 (седемдесет) дни от датата на одобрена от Възложителя заявка до съответен доставчик, по количествено – стойностни сметки към договора. В допълнение, доставките на цялостното оборудване, апарати и помощни съоръжения, съответстващи на утвърдения линеен график следва да се изпълнява планово на работната площадка.

5. Срок за изпълнение на модернизацията (ретрофита):

Срокът за изпълнението на модернизацията (ретрофита) на цялата уредба 20 kV, включително и въвеждане на вериги за телемеханика, е до 50 (петдесет) дни от датата на първия подписан възлагателен протокол за изпълнение на модернизацията (ретрофита) на присъединение 20 kV. Срокът за изпълнение на дейности по изпълнение на модернизацията (ретрофита), като демонтаж на съществуващо оборудване, строителни работи /включително доставка на необходимите строителни материали/ по подготовка на площадките в енергийния обект за извършване на монтажа на новото оборудване и монтажни работи по отношение на доставеното ново енергийно оборудване, единични функционални проби на монтираните машини и съоръжения и въвеждането им в работен режим на телемеханика е до 50 (петдесет) дни, считано от датата на първия възлагателен протокол.

6. Обучение на специалисти на Възложителя:

- Срокът за изготвяне от страна на избрания Изпълнител на програма за обучение на 6-ма служители на Възложителя и предаването ѝ за одобрение на Възложителя е до 10 (десет) дни, считано от датата на съгласуване на работния проект от Възложителя и предаването му на Изпълнителя;

- Срокът за одобрение на програмата за обучение от страна на Възложителя е до 2 (два) дни, след датата на предаването ѝ на Възложителя.

- Срокът за провеждане на обучението и сертифицирането на 6-ма служители на Възложителя, за работа и поддръжка на доставеното и монтирано оборудване, включително цифрови защити и др. е до 10 (десет) дни, след датата на одобрение на програмата за обучение от страна на Възложителя.

7. Изработване и предоставяне на екзекутивна документация:

Срокът за изработване и предоставяне от Изпълнителя на Възложителя на екзекутивни чертежи (документация) с нанесени всички изменения в работния проект, настъпили в процеса на изпълнение на модернизацията (ретрофита), е до 15 (петнадесет) работни дни, считано от



датата на последния подписан възлагателен протокол за изпълнение на модернизацията (ретрофита) на присъединение 20 kV, с който приключва целия обем дейности в обекта, но не по-късно от датата на провеждане на 72 часовите проби под напрежение и товар.

8. Провеждане на 72-часови проби под напрежение и товар:

Срокът за провеждане на 72-часови проби под напрежение и товар и въвеждане на новоизградената ЗРУ 20 kV и свързаните с нормалната ѝ експлоатация апарати и съоръжения в работен режим е до 10 (десет) работни дни, считано от датата на протокола на приемателната комисия за приемане на цялостното изпълнение на модернизацията (ретрофит) на ЗРУ 20 kV в пълен обем за целия обект.

Дата: 24.07.2017 г.

ПОДПИС И ПЕЧАТ: ПЛОВДИВ
/Георги Табаков / Управител /



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**ПРИЛОЖЕНИЕ №2
ТЕХНИЧЕСКО ПРЕДЛОЖЕНИЕ ЗА ОБОРУДВАНЕ**

**ТАБЛИЦА 1 КЪМ ОБОСОБЕНА ПОЗИЦИЯ № 7
СТАНДАРТ НА МАТЕРИАЛА ЗА ТРИПОЛЮСНИ ВАКУУМНИ ПРЕКЪСВАЧИ, 24 kV, ЗА
МОНТИРАНЕ НА ЗАКРИТО, ФИКСИРАНИ**

Изисквания към документацията и изпитванията:

№	Документ при участие	Приложение № (или текст)
1.	Техническо описание на прекъсвача, в т.ч. гарантирани параметри и съоръжаване	Приложение 1.1 документ: Приложение 1.1 - Техническо описание.pdf помощен документ: CA_VD4-50kA(EN)V_1VCP000001_DigiPrint.pdf помощен документ: MA_VD4-36kV-50kA(EN)Y_647654-1403.pdf
2.	Протоколи от типови изпитвания на английски или български език, проведени от независима акредитирана изпитателна лаборатория – заверени копия (и допълнителни изпитвания, ако са проведени), с приложен списък на отделните изпитвания на български език.	Приложение 1.2 Документи пакет: 0045Ra[1].pdf; 0511Ra[1].pdf; 100089_C.pdf; HZ235F01[1].pdf; HZ235L02.pdf; HZ236E06[1].pdf; MZ235A01[1].pdf; pehla0311Ra[1].pdf; Превод на 100089_C_List_of_type_tests_BG.pdf
3.	Сертификат/акредитация на независимата изпитателна лаборатория, провела типовите изпитвания – заверено копие	Приложение 1.3 Документ: Приложение 1.3 - Акредитация.pdf

Технически данни за триполюсен вакуумен прекъсвач 24 kV/1250 A/20 kA, за монтиране на закрито, фиксиран, които се попълват от Участника в графа „Гарантирано предложение“:

Наименование на материала		Триполюсен вакуумен прекъсвач 24 kV/1250 A/20 kA за монтиране на закрито, фиксиран	
Съкратено наименование на материала		Трип. вак. прек. 24 kV/1250 A/20 kA 3М Ф	
№	Технически параметър	Изискване	Гарантирано предложение
1.	Тип/референтен номер съгласно каталога на производителя	Да се посочи	VD4 фиксиран 24 kV, 1250 A, 20 kA, p 275 mm; тип VD4 24.12.20 p275; Производствен номер: 1VCF337114R0333
2.	Производител	Да се посочи	АББ Италия, гр. Далмине – Бергамо, Завод АББ Унита оператива САЧЕ
3.	Обявен нормален ток, I _n	≥ 1250 A	1250A

Технически данни за триполюсен вакуумен прекъсвач 24 kV/630 A/20 kA, за монтиране на закрито, фиксиран, които се попълват от Участника в графа „Гарантирано предложение“:

Наименование на материала		Триполюсен вакуумен прекъсвач 24 kV/630 A/20 kA за монтиране на закрито, фиксиран	
Съкратено наименование на материала		Трип. вак. прек. 24 kV/630 A/20 kA 3М Ф	
№	Технически параметър	Изискване	Гарантирано предложение
1.	Тип/референтен номер съгласно каталога на производителя	Да се посочи	VD4 фиксиран 24 kV, 1250 A, 20 kA, p 275 mm

Наименование на материала		Триполюсен вакуумен прекъсвач 24 kV/630 A/20 kA за монтиране на закрито, фиксиран	
Съкратено наименование на материала		Трип. вак. прек. 24 kV/630 A/20 kA, 3М, ф.	
№	Технически параметър	Изискване	Гарантирано предложение
			тип VD4 24.12.20 p275; Производствен номер: 1VCF337114R0333
2.	Производител	Да се посочи	АББ Италия, гр. Далмине – Бергамо, Завод АББ Унита оператива САЧЕ
3.	Обявен нормален ток, I _n	≥ 630 A	1250A

ТАБЛИЦА 2 КЪМ ОБОСОБЕНА ПОЗИЦИЯ № 7
СТАНДАРТ НА МАТЕРИАЛА ЗА ТОКОВИ ТРАНСФОРМАТОРИ 20 KV ЗА МОНТИРАНЕ НА
ЗАКРИТО, ФИКСИРАН

Изисквания към документацията и изпитванията:

№	Документ за участие	Приложение № (или текст)
1.	Точно обозначение на типа на токовите измервателни трансформатори, производителя и страната на произход и последно издание на каталога на производителя	Токови измервателни трансформатори тип TPU 6x.xx Производител: АБВ s.r.o. Произход: Чехия Последно издание на каталога е дадено в Приложение 2.1
2.	Удостоверение за одобряване на типа на токовите измервателни трансформатори, издадено по реда и при условията на Закона за измерванията	Приложение 2.2
3.	Протоколи от типови изпитвания на токовите измервателни трансформатори на английски или български език, проведени от независима изпитателна лаборатория с приложени резултати от изпитванията, представени при доставка	Приложение 2.3
4.	Сертификат/акредитация на независимата изпитателна лаборатория, провела типовите изпитвания – заверено копие	Приложение 2.4

Технически параметри на токови измервателни трансформатори 20 kV, 1250/5/5 A, подпорен тип, за монтиране на закрито, които се попълват от Участника в графа „Гарантирано предложение“:

Наименование на материала		Токов измервателен трансформатор 10 kV 1250/5/5 A за монтиране на закрито	
Съкратено наименование на материала		ТИТ 10 kV, 1250/5/5 A, 3М	
№	Параметър	Изискване	Гарантирано предложение
1.	Тип/референтен номер съгласно каталога на производителя	Да се посочи	TPU 63.23
2.	Производител	Да се посочи	АБВ S.r.o. Република Чехия

Технически параметри на токови измервателни трансформатори 20 kV, 400/5/5 A, подпорен тип, за монтиране на закрито, които се попълват от Участника в графа „Гарантирано предложение“:



Наименование на материала		Токов измервателен трансформатор 10 kV, 400/5/5 A за монтиране на закрито	
Съкратено наименование на материала		ТИТ 10 kV, 400/5/5 A, 3М	
№	Параметър	Изискване	Гарантирано предложение
1.	Тип/референтен номер съгласно каталога на производителя	Да се посочи	TPU 60.23
2.	Производител	Да се посочи	ABB S.r.o., Република Чехия

ТАБЛИЦА № 3 КЪМ ОБОСОБЕНА ПОЗИЦИЯ № 7
СТАНДАРТ НА МАТЕРИАЛА ЗА НАПРЕЖЕНОВИ ТРАНСФОРМАТОРИ 20 KV, ЕДНОПОЛЮСЕН, С ДВЕ ВТОРИЧНИ НАМОТКИ, ЗА МОНТИРАНЕ НА ЗАКРИТО

Изисквания към документацията и изпитванията:

№	Документ за участие	Приложение № (или текст)
1.	Точно обозначение на типа на напреженовия трансформатор (НИТ), производителя и страна на произход и последно издание на каталога на производителя	Напреженови измервателни трансформатори тип ТЈС 6 Производител: АВВ s.r.o. Произход: Чехия Последно издание на каталога е дадено в Приложение 3.1
2.	Техническо описание на НИТ, гарантирани параметри и характеристики, включително клас на изолацията и гранична изходна мощност	Приложение 3.1
3.	Удостоверение за одобряване на типа на НИТ, издадено по реда и при условията на Закона за измерванията	Приложение 3.2
4.	Протокол от първоначална метрологична проверка, проведена от оправомощена лаборатория, съгласно действащото в Република България законодателство в областта на измерванията (представя се при доставка за всеки НИТ)	Доставката на всеки НИТ ще бъде придружен с протокол от първоначална метрологична проверка, проведена от оправомощена лаборатория, съгласно действащото в Република България законодателство в областта на измерванията
5.	Сертификат/акредитация на независимата изпитателна лаборатория, провела типовите изпитвания - заверено копие	Приложение 3.3

Технически параметри на напреженови измервателни трансформатори 20 kV, еднополюсен, с две вторични намотки, за монтиране на закрито, които се попълват от Участника в графа „Гарантирано предложение“:

Наименование на материала		Напреженов измервателен трансформатор 20 kV, еднополюсен, с две вторични намотки, за монтиране на закрито	
Съкратено наименование на материала		НИТ 20 kV, 1P, с две вторични намотки, 3М	
№	Параметър	Изискване	Гарантирано предложение
1.	Тип/референтен номер съгласно каталога на производителя	Да се посочи	ТЈС 6
2.	Производител	Да се посочи	ABB S.r.o., Република Чехия



**ТАБЛИЦА 4 КЪМ ОБОСОБЕНА ПОЗИЦИЯ № 7
СТАНДАРТ НА МАТЕРИАЛА ЗА ЦИФРОВИ ЗАЩИТИ ЗА ВЪЗДУШНИ И КАБЕЛНИ
ЕЛЕКТРОПРОВОДНИ ЛИНИИ СР.Н.**

Технически данни за непосочна цифрова защита за въздушни и кабелни електропроводни линии СР.Н., които се попълват от Участника в графа „Гарантирано предложение“:

Название на материала		Непосочна цифрова защита за въздушни и кабелни електропроводни линии СРН	
Съкратено название на материала		Непосочна ЦЗ ВКЕЛ СРН	
№	Технически параметър	Изискване	Гарантирано предложение
1.	Тип	Да се посочи	REF615
2.	Производител	Да се посочи	ABB Оу, Финландия

Дата: 24.07.2017 г.

ПОДПИС и ПЕЧАТ:
/Георги Табаков-Управляващ




ПРИЛОЖЕНИЕ № 3
ТАБЛИЦА 5 КЪМ ОБОСОБЕНА ПОЗИЦИЯ № 7
КОМУНИКАЦИЯ НА ЦИФРОВИ УСТРОЙСТВА С RTU

Предложеното оборудване отговаря на посочените по-долу минималните технически изисквания на Възложителя:

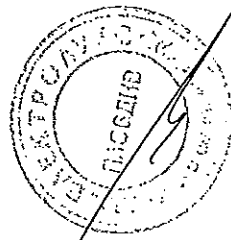
№	Параметър/характеристика	Минимални технически изисквания
1.	Всяка защита и контролер да притежава стандартен интерфейс за комуникация по Ethernet, RS-485 или оптичен интерфейс, стандартен интерфейс за комуникация с персонален компютър и съответно програмно осигуряване.	Да
2.	Комуникацията между RTU и ЦЗ, чрез оптичен интерфейс се осъществява с HFBR-4516Z connector .	Да
3.	Комуникацията между RTU и ЦЗ, чрез четирипроводна или двупроводна мрежа RS-485 се осъществява с RJ-45.	Да
4.	Комуникацията между ЦЗ и персонален компютър се осъществява с USB порт.	Да
5.	Комуникационния интерфейс за връзка с RTU да се счита като неразделна част от ЦЗ. Комуникационния интерфейс да има светодиодна индикация за режима на работа.	Да
6.	ЦЗ трябва да включва система за самоконтрол и самодиагностика, на комуникациите с вътрешни и външни потребители.	Да
7.	Наличие на сменяема парола за достъп до данните за настройките на комуникационните функции.	Да
8.	Наличие на стандартен интерфейс и протокол съгласно MODBUS TCP/IP и IEC 61850 по жична връзка с локална мрежа за предаване на информацията .	Да
9.	Потребителска настройка на комуникацията по комуникационен протокол:	
10.	При осъществяване на комуникацията по комуникационен протокол съгласно БДС EN 61850-5	Потребителска настройка на IP адрес на ЦУ (ЦЗ и контролер)
11.	При осъществяване на комуникацията по комуникационен протокол съгласно MODBUS TCP/IP	Потребителска настройка на MODBUS server адрес на ЦУ (ЦЗ и контролер)
12.	Предаване на данни :	Адресите на всички цифрови входове, цифрови изходи, аналогови входове и изчислени аналогови величини по съответният комуникационен протокол

Дата:24.07.2017 г.

ПОДПИС и ПЕЧАТ:
/Георги Табаков-Управляващ/

Приложение 1.1_Техническое описание LOT7 

КОПИО С ОРИГИНАЛА





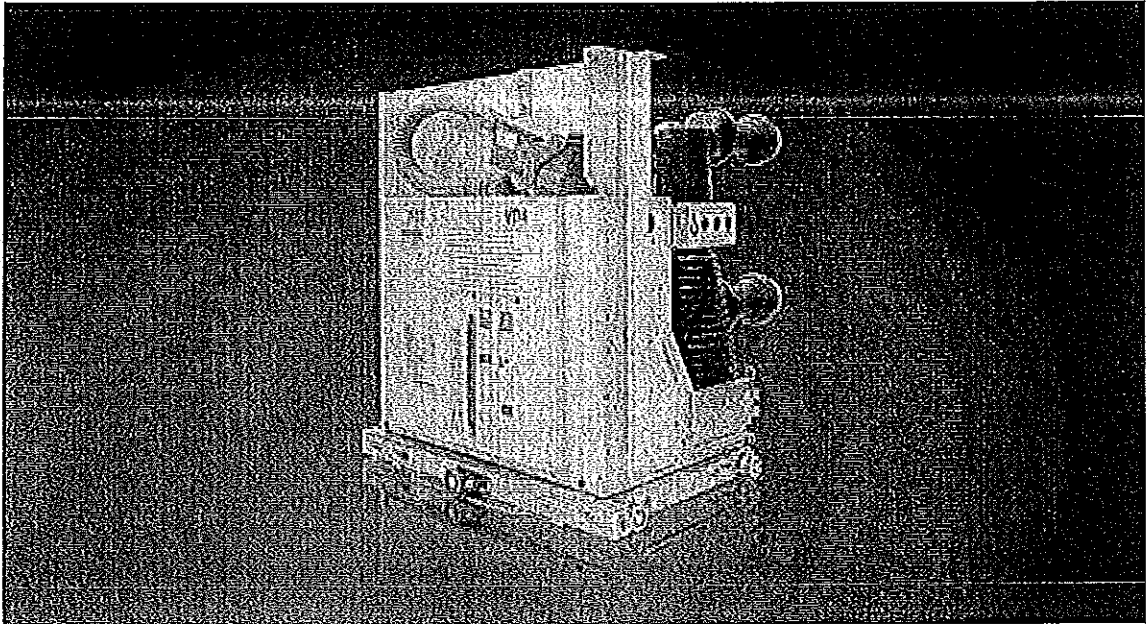


VD4

5

Вакуумни прекъсвачи за средно напрежение

12 ...36kV – 630 ... 4000 A – 16 ... 50 kA



ABB

Handwritten signature or mark.



ВЯРНО С ОРИГИНАЛА

Handwritten mark.

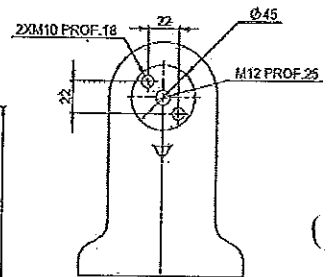
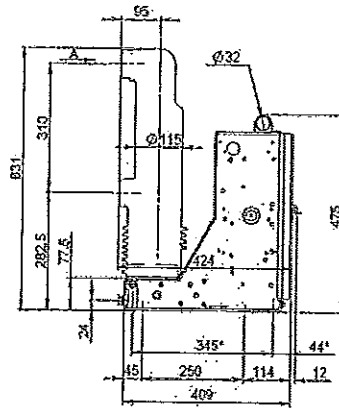
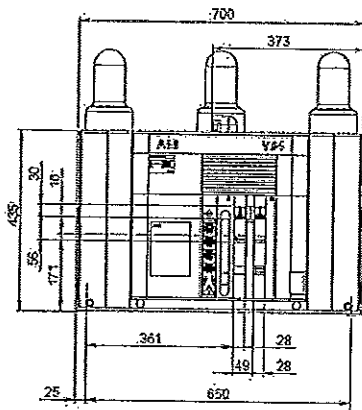
Технически параметри:

1. Вакуумен прекъсвач 24kV, 1250A, 20kA

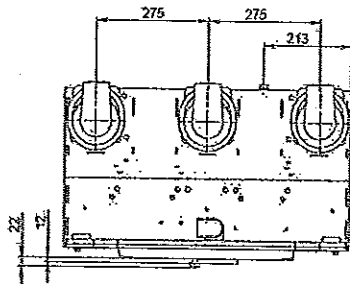
СЕРИЕН НОМЕР: 1VCF337111R1352
 ТИП НА ПРЕКЪСВАЧА: VD4
 НОМИНАЛНО НАПРЕЖЕНИЕ: 24 KV
 НОМИНАЛЕН ТОК: 1250 A
 НОМИНАЛЕН ИЗКЛЮЧВАТЕЛНА СПОСОБНОСТ: 20 KA
 РАЗСТОЯНИЕ МЕЖДУ ЦЕНТРОВЕТЕ НА ПОЛЮСИТЕ: 275 MM
 ТИП НА ПОЛЮСА: РТ ЧЕРЕН
 ТАБЕЛКА: 1VCF339700R0882
 ИЗПИТВАТЕЛЕН СЕРТИФИКАТ: 1VCF339723R0882 ИЗПИТВАТЕЛЕН СЕРТИФИКАТ ЗА VD4 НА АНГЛИЙСКИ ЕЗИК
 ОПАКОВКА: 1VCF339700R5885 ЗА НАЗЕМЕН ТРАНСПОРТ
 МОТОРНО ЗАДВИЖВАНЕ (-MS): 1VCF339701R8918 МОТОРНО ЗАДВИЖВАНЕ С НОМИНАЛНО ЗАХРАНВАЩО НАПРЕЖЕНИЕ 220V DC
 ИЗКЛЮЧВАТЕЛНА БОБИНА -МО1: 1VCF339701R2918 ЗА НОМИНАЛНО ОПЕРТАИВНО НАПРЕЖЕНИЕ 220V DC
 ВКЛЮЧВАТЕЛНА БОБИНА (-MC): 1VCF339800R6922 ЗА НОМИНАЛНО ОПЕРАТИВНО НАПРЕЖЕНИЕ (-MBC) 220...250 V DC/AC
 ПОМОЩНИ КОНТАКТИ: 1VCF339701R0170 16БР. ПОМОЩНИ КОНТАКТИ KNF1G.31-32 FOR FIXED
 БЛОКИРАЩ ЕЛЕКТРОМАГНИТ НА ЗАДВИЖВАЩИЯ МЕХАНИЗЪМ (-RL1): 1VCF329700R0922
 ЕЛЕКТРОМАГНИТ (-RLE1) ЗА НОМИНАЛНО ОПЕРАТИВНО НАПРЕЖЕНИЕ 220...250V DC/AC

Fixed circuit-breakers

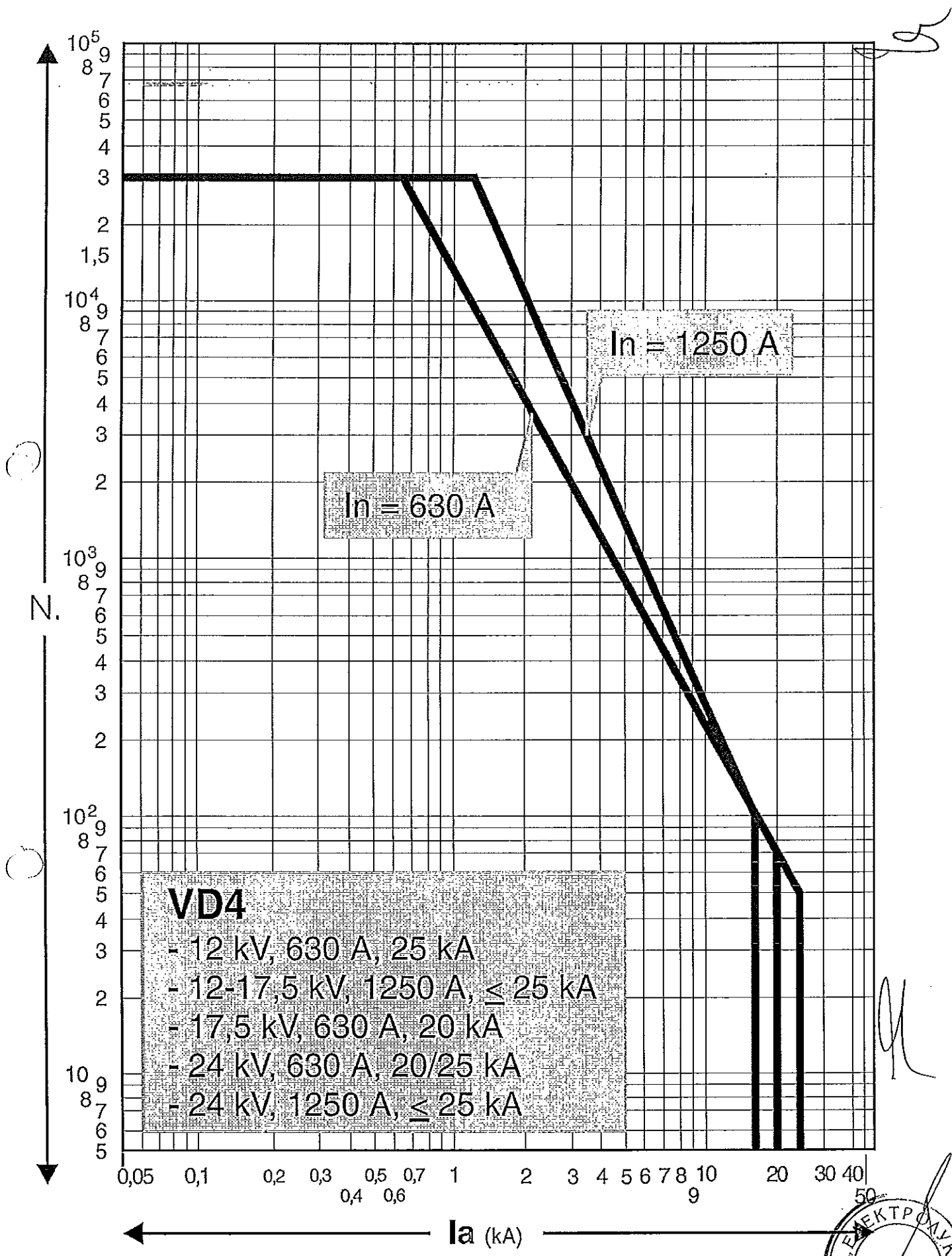
VD4	
TN	7410
Ur	24 KV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA



DÉTAIL A
SCALE 1:2



ВАРНО С ОРИГИНАЛА



VD4

- 12 kV, 630 A, 25 kA
- 12-17,5 kV, 1250 A, ≤ 25 kA
- 17,5 kV, 630 A, 20 kA
- 24 kV, 630 A, 20/25 kA
- 24 kV, 1250 A, ≤ 25 kA

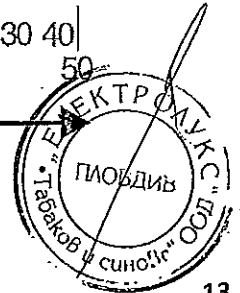
$I_n = 630 \text{ A}$

$I_n = 1250 \text{ A}$

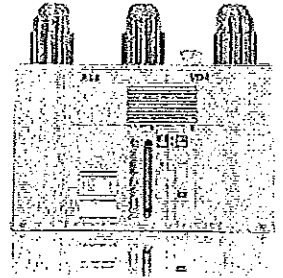
0,05 0,1 0,2 0,3 0,4 0,5 0,6 1 2 3 4 5 6 7 8 9 20 30 40 50

← I_a (kA) →

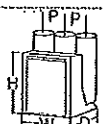
ВЯРНО С ОРГИНАЛА



Fixed VD4 circuit-breaker (24 kV) (2)

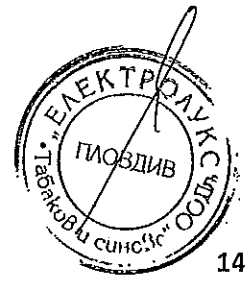


Circuit-breaker		VD4 24						
Standards	IEC 62271-100	•						
Rated voltage	Ur [kV]	24						
Rated insulation voltage	Us [kV]	24						
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50						
Impulse withstand voltage	Up [kV]	125						
Rated frequency	fr [Hz]	50-60						
Rated normal current (40 °C)	Ir [A]	630	630	1250	1250	1600	2000	2500
		16	16	16	16	16	16	-
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	-
		25	25	25	25	25	25	25
		-	-	31.5	-	31.5	31.5	31.5
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	16	16	-
		20	20	20	20	20	20	-
		25	25	25	25	25	25	25
Making capacity	Ip [kA]	-	-	31.5	-	31.5	31.5	31.5
		40	40	40	40	40	40	-
		50	50	50	50	50	50	-
		63	63	63	63	63	63	63
		-	-	80	-	80	80	80
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	• • • • • • •						
Opening time	[ms]	33 ... 60						
Arcing time	[ms]	10 ... 15						
Total breaking time	[ms]	43 ... 75						
Closing time	[ms]	30 ... 60						
Maximum overall dimensions	H [mm]	631	631	631	631	642	642	642
	W [mm]	570	700	570	700	700	700	700
	D [mm]	424	424	424	424	424	424	424
	Pole distance P [mm]	210	275	210	275	275	275	275
Weight	[kg]	100	104	100/106 (1)	104	110	110	110
Standardised table of dimensions	TN	7409	7410	7409	7410	7411	7411	7411
	1VCD	-	-	000172 (1)	-	-	-	-
Operating temperature	[°C]	- 5 ... + 40						
Tropicalization	IEC: 60068-2-30, 60721-2-1	•						
Electromagnetic compatibility	IEC: 62271-1	•						



(1) 31.5 kA version
 (2) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading by a lever built into the front of operating mechanism)

ВЯРНО С ОРИГИНАЛА



VD4 fixed circuit-breaker without bottom and top terminals (24 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]			Circuit-breaker type
		H=631	H=642	H=642	
kV	kA	D=424	D=424		
		u/l=310	u/l=310		
		l/g=282.5	l/g=282.5		
		P=210	P=275	P=275	
		W=570	W=700	W=700	
24	16	630			VD4 24.06.16 p210
	20	630			VD4 24.06.20 p210
	25	630			VD4 24.06.25 p210
	16	1250			VD4 24.12.16 p210
	20	1250			VD4 24.12.20 p210
	25	1250			VD4 24.12.25 p210
	31.5	1250			VD4 24.12.32 p210
	16		630		VD4 24.06.16 p275
	20		630		VD4 24.06.20 p275
	25		630		VD4 24.06.25 p275
	16		1250		VD4 24.12.16 p275
	20		1250		VD4 24.12.20 p275
	25		1250		VD4 24.12.25 p275
	16			1600	VD4 24.16.16 p275
	20			1600	VD4 24.16.20 p275
	25			1600	VD4 24.16.25 p275
	31.5			1600	VD4 24.16.32 p275
	16			2000	VD4 24.20.16 p275
	20			2000	VD4 24.20.20 p275
	25			2000	VD4 24.20.25 p275
	31.5			2000	VD4 24.20.32 p275
	25			2500	VD4 24.25.25 p275
	31.5			2500	VD4 24.25.32 p275

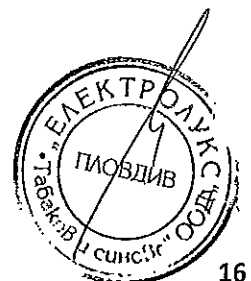
- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.

ВАРНО С ОРИГИНАЛА



Общи положения	4
Принцип на комутиране	6
Предлагани версии	6
Област на приложение	6
Стандарти и признание	6
Безопасност при обслужване	7
Принадлежности	8
Задвижващ механизъм	8
Техническа документация	10
Система за осигуряване на качество	10
Лабораторни изпитания	10
Програма за екологично управление	10

ВЯРНО С ОРИГИНАЛА



Общи положения

Новият VD4 е синтез от най-добрите традиции в проектирането и конструирането на вакуумни камери с полюси от смола и в прецизността на проектирането, инженеринга и производството на прекъсвачи.

Прекъсвачите за средно напрежение VD4 използват вакуумни комутиращи устройства, вградени в полюси от смола. Вграждането на комутиращото устройство в смола прави полюсите на прекъсвачите особено здрави и защитава устройството от сътресения, натрупване на прах и влага.

Комутиационните устройства на прекъсвачите включват в себе си контактите и комутиационната камера.

Прекъсване на ток във вакуум

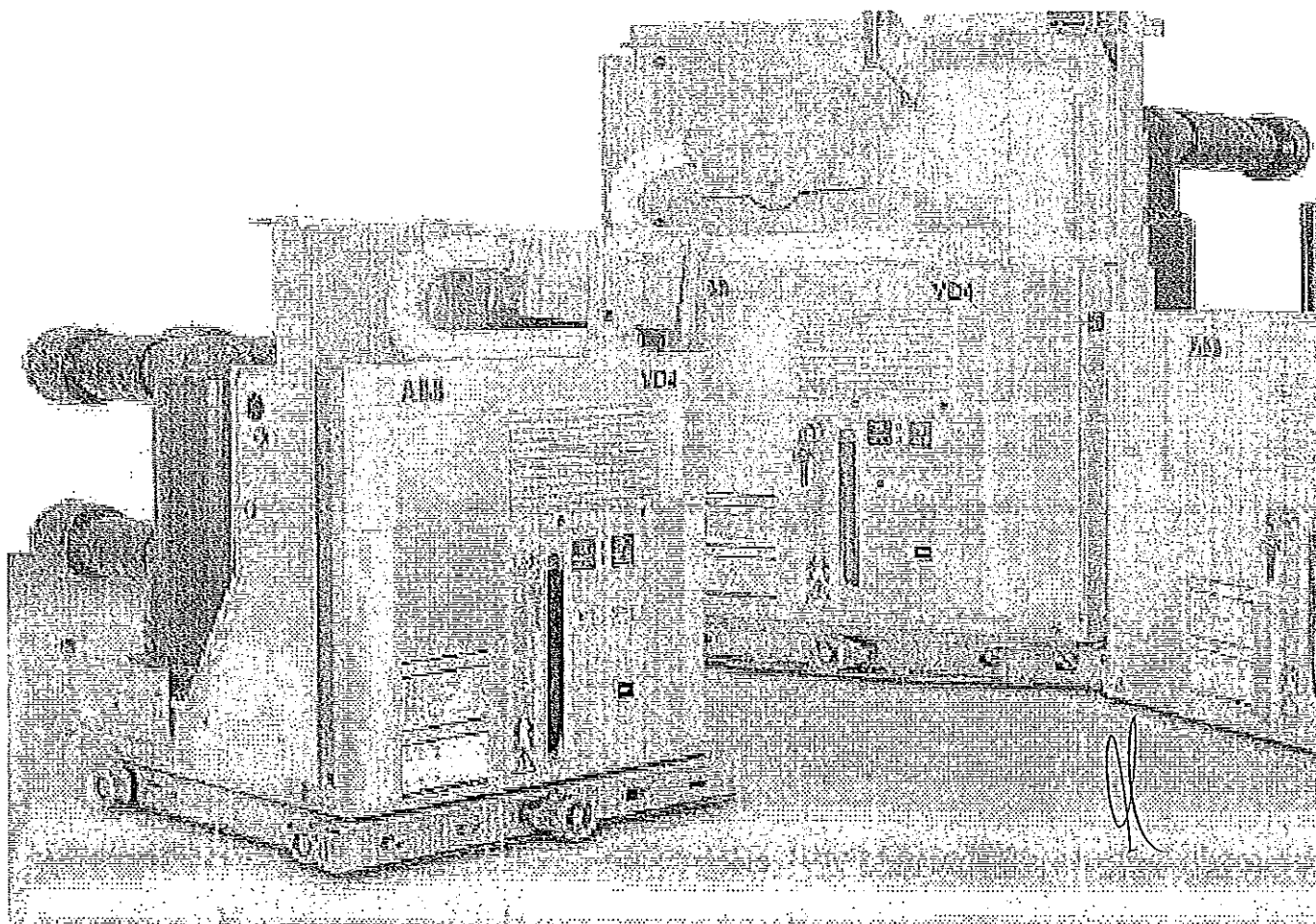
Вакуумните прекъсвачи не изискват специална изолационна среда за да прекъснат аварийния ток. Всъщност, комутиращите устройства не съдържат вещество, което може да се йонизира.

Във всеки случай при разделяне на контактите се генерира дъга от метални пари, която е съставена изключително от разтопеният и изпарен материал на контактите.

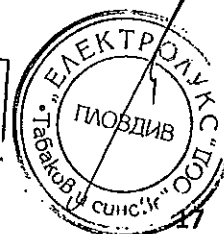
Металните пари се поддържат само от придадената отвън енергия, докато токът не се прекъсне при преминаването през нулата. В момента, в който рязко се намали плътността на тока и след моменталното кондензиране на металните пари, диелектричната якост бързо се възстановява.

По този начин вакуумните прекъсвачи възстановяват изолационната якост и способността си да издържат преходния ток и окончателно гасят дъгата.

Тъй като във вакуумна среда диелектричната якост може да се достигне дори при малки разстояния, прекъсването на контура е гарантирано дори когато



ВЯРНО С ОРИГИНАЛА



отделянето на контактите става няколко милисекунди преди преминаването на тока през нулата.

Специално проектираните контакти и материали, както и ограничената продължителност и ниското напрежение на дъгата гарантират минимално износване на контактите и техния дълъг живот. Освен това вакуумът предотвратява оксидацията и замърсяването.

Тип EL задвижващ механизъм

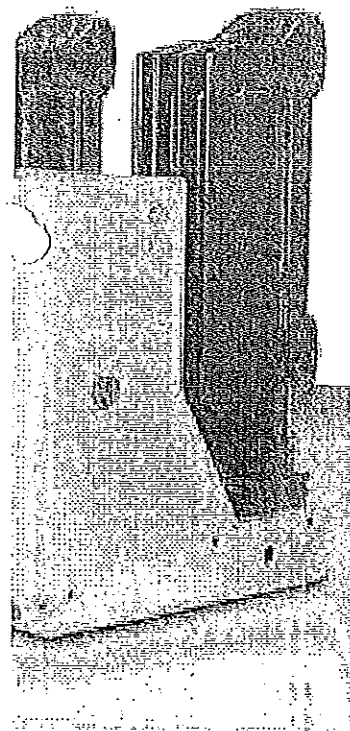
Малката скорост на контактите заедно с намаленото разстояние, което те трябва да преминат и малката маса, ограничават енергията, необходима за задвижването, което гарантира изключително малкото износване на системата. Поради тази причина прекъсвачите VD4 не се нуждаят от особена поддръжка. Прекъсвачите VD4 използват механична енергия за задвижване, с енергия съхраняваща се в освобождаващ механизъм.

Тези характеристики позволяват действията по отварянето и затварянето се извършват независимо от оператор.

Задвижващият механизъм на прекъсвача VD4 е на елементарен принцип и лесен за управление и позволява да бъде оборудван с широка гама от аксесоари с лесно и бързо инсталиране. Простотата на изпълнението води до изключителна надеждност на апарата.

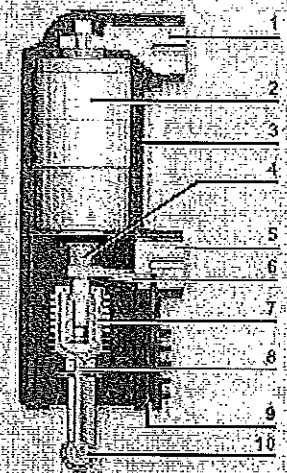
Конструкция

Задвижващият механизъм и полюсите са закрепени на метална рамка, която поддържа и самото комутационно устройство в неподменяемите версии. Компактната конструкция осигурява здравина и механична издръжливост. Отделно от първичните контакти и връзката с накрайник за схемата на вторичните вериги, подменяемите версии притежават и количка за поставяне и изваждане на прекъсвача в комутационното устройство или за включване към контура на веригата при затворена вратичка.



- Вакуумен принцип на комутиране
- Контактите не оксидират във вакуум
- ВДК е вградена в полюси от епоксидна смола
- ВДК е защитена от сътресения, прах и влага
- Работа при различни климатични условия
- Ограничена консумация при комутиране
- Задвижващият механизъм е снабден с неизтощаемо устройство за съхраняване на енергия по изискванията на стандарта
- Улеснена приспособимост посредством пълна гама аксесоари
- Неподменяеми версии и версии на количка
- Компактни размери
- Трайно запечатани полюси
- Здравина и надеждност
- Ограничена поддръжка
- Поставяне и изваждане на прекъсвача при отворена вратичка
- Благодарение на специалните блокировки в работния механизъм и количката, неправилните и рисковани действия са предотвратени
- Екологично безопасни

Вакуумна дьготасителна камера, вградена в епоксиден полюс



- | | |
|---------------------------------|--|
| 1 Горен извод | 7 Контакт на задните стъващите пружини |
| 2 Вакуумна дьготасителна камера | 8 Избулващ прът |
| 3 Кулка от епоксидна смола | 9 Закрепяване |
| 4 Шийка на подвижния контакт | 10 Връзка към задвижващия механизъм |
| 5 Долен извод | |
| 6 Гъвкава връзка | |

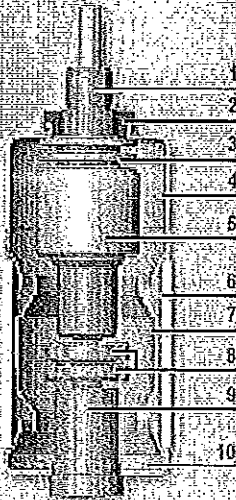
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ВАРНО С ОРИГИНАЛА



Принцип на гасене на дъгата при прекъсвачите на АВВ

Вакуумен прекъсвач



- 1 Шийка/извод
- 2 Защита срещу искривяване
- 3 Резервоари
- 4 Калак на прекъсвача
- 5 Щит
- 6 Керамичен изолатор
- 7 Щит
- 8 Контакти
- 9 Извод
- 10 Калак на прекъсвача

Във вакуумните прекъсвачи, отделянето на контактите поражда вакуумна дъга, която се поддържа до следващото преминаване на тока през нулата или докато не бъде продухана чрез магнитно поле.

Вакуумна дъга- дифузен или концентриран тип

След отделянето на контактите, върху цялата повърхност на катода се образуват отделни точки на разтопяване, които отделят метални пари, поддържащи дъгата. Дифузната вакуумна дъга се характеризира с разширяване над контактната повърхност и с равномерно разпределение на топлинното натоварване върху контактните повърхности.

При номинален ток на вакуумния прекъсвач, електрическата дъга е винаги от дифузен тип.

Ерозиата на контактите е пренебрежимо малка, а броя на комутациите, които могат да се извършат е висок.

При нарастване на стойността на комутирания ток (над номиналния ток), в електрическата дъга се наблюдават тенденция към концентриране на дъгата, което се дължи на ефекта на Хол.

Западена при анода, дъгата се концентрира и колкото повече нараства токът, толкова по- концентрирана става тя. Около областта на горене има повишаване на температурата с последващо термично натоварване на контактите.

За да се предотврати прегряването и ерозиата на контактите, се отдържа въртене на дъгата.

При въртене на дъгата се получава ефект, както при движещ се проводник, по който тече ток.

Спирална геометрия на контактите на вакуумните прекъсвачи АВВ

Специалната геометрия на спиралните контакти генерира радиално магнитно поле, в областта около канала на дъгата, концентрирано около окръжностите на контактите.

Електромагнитната сила се самогенерира и действа тангенциално, предизвиква бързо въртене на дъгата около оста на контактите.

Това означава, че дъгата е принудена да се върти и да огражда все по- голяма повърхност, отколкото неподвижната концентрирана дъга.

Освен минимизирането на термичното натоварване на контактите, това прави ерозиата на контактите пренебрежимо малка и, преди всичко, прави възможно прекъсване на големи к. с.

Вакуумните прекъсвачи на АВВ комутират тока на късо съединение при преминаването му през нулата и не позволяват повторно запалване.

Бързото намаляване на токовото натоварване и бързото кондензиране на металните пари при преминаването на тока през нулата, означава че възстановяването на максималната диелектрична якост между контактите на прекъсвача може да бъде възстановена до няколко микросекунди.

Съществуващи версии

Прекъсвачите VD4 имат неподменяема версия и версия на количка, с преден задвижващ механизъм. Версиите на количка се отнасят до комутирани устройства тип UniGear ZS1 и UniSafe.

Област на приложение

Прекъсвачите VD4 се използват в разпределителните електрически мрежи за управление и защита на кабелни и въздушни линии, двигатели, трансформатори, генератори и кондензаторни батерии.

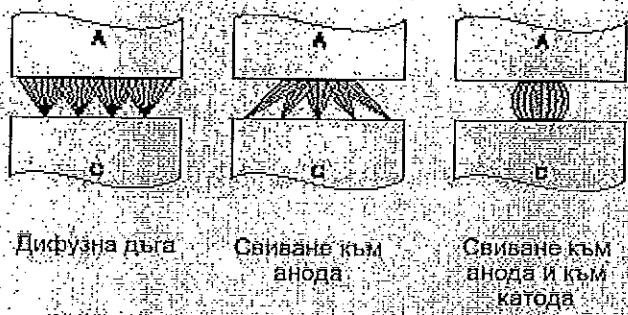
Стандарти и признания

Прекъсвачите VD4 съответстват на Стандартите IEC 62271-100, CEI 17-1, част 1375 и тези на основните индустриални държави. Прекъсвачите VD4 са преминали тестовете, посочени по-долу и гарантират безопасност и надеждност при работа на апарата при всяка инсталация.

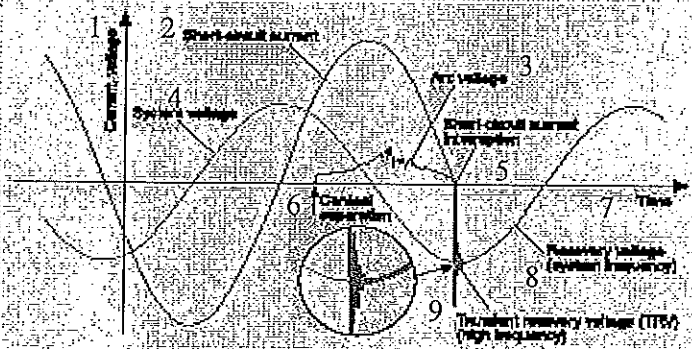
Типове изпитания: прегряване, якост на изолацията при индустриална честота, якост на изолацията при мълниеносна дейност, устойчивост на кратковременен и върхов ток, срок на работа на механичните части, устойчивост при ток на късо съединение и максимален ток и комутирание без товар



2

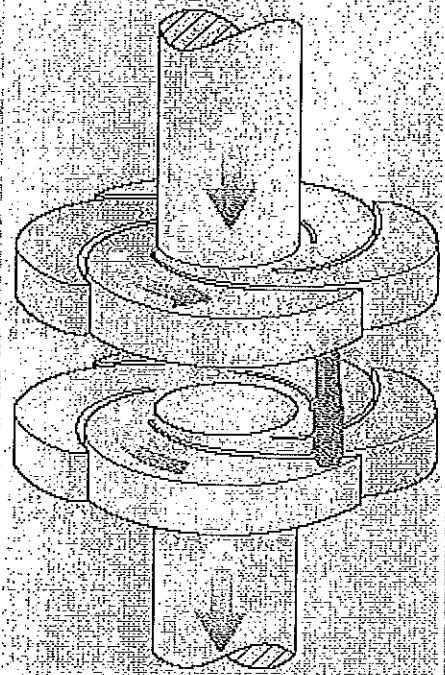


Схематична диаграма на преминаването на дифузната дъга в концентрирана в вакуумните прекъсвачи.



Развитие на тока и напрежението при еднофазно прекъсване

- | | |
|-------------------------------------|---|
| 1. Ток, напрежение; | 6. Отделяне на контакта |
| 2. Ток на късо съединение (т.к.с.); | 7. Време; |
| 3. Напрежение на дъгата; | 8. Възстановяващо се напрежение (честота на системата); |
| 4. Напрежение на системата; | 9. Преходно възстановяващо се напрежение (RTV) с висока честота |
| 5. Прекъсване на т.к.с.; | |



Разположение на контактите един спрямо друг, за формиране на радиално магнитно поле и въртене на дъгата.

• **Индивидуални изпитания:** Изолацията на първичната верига с напрежение на индустриална честота, изолацията на вторичните вериги и задвижващия механизъм, измерване на съпротивлението на първичната верига, механично и електрическо задвижване.

Безопасност при работа

Благодарение на предвиждането на всички необходими механични и електрически блокировки (поръчват се допълнително), е възможно към прекъсвачите VD4 да се конструират напълно безопасни разпределителни табла. Блокиращите устройства са разработени за предотвратяване на неправилни зареждания и за съблюдаване на условията, гарантиращи максимална безопасност за оператора.

Блокирането с ключа на таблото или устройство за заключване разрешава действията за "отваряне / затваряне" и "въвеждане / изваждане".

Устройството за изваждане със затворена вратичка позволява прекъсвачът да бъде поставян и изваждан от количката само със затворена вратичка.

Блокировката против изваждане предпазва прекъсвача със затворена вратичка от изваждане и поставяне при различни номинални токове.

3

ВАРНО С ОРИГИНАЛА



ОПИСАНИЕ

Акcesoари

Прекъсвачите VD4 притежават пълна гама от акcesoари, за да удовлетворят инсталационните изисквания.

Задвижващият механизъм има стандартизирана гама от акcesoари и резервни части, като изборът и тяхното поръчване е напълно улеснено.

Задвижващите механизми са удобни за инсталиране от лицевата част на прекъсвача.

Електрическият контакт се извършва с връзка от вида щепсел-гнездо. Използването, поддръжката и обслужването на апарата са прости и изискват ограничени ресурси.

Задвижващ механизъм

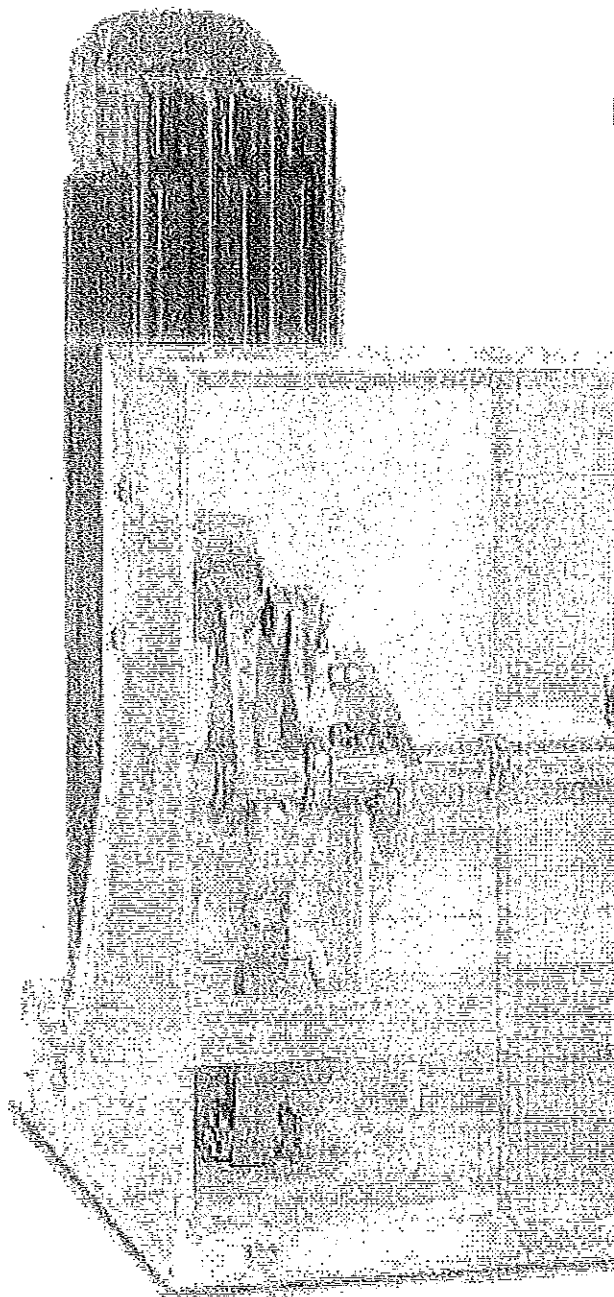
Задвижващият механизъм заработва благодарение на съхранена в него енергия, и е съоръжен с устройство против многократно включване, монтирано стандартно и има подходящи блокировки за предотвратяване на неправилни заработвания.

Всяко едно действие се разрешава само в случай, че всички условия, осигуряващи правилното му протичане са налице.

Акcesoарите са същите, както за прекъсвачите тип VD4s.

За да се улесни монтажът и подмяната на акcesoари, върху монтажните легла са добавени подходящи закрепващи езичета.

- Висока надеждност на задвижващият механизъм, благодарение на малкия брой елементи в състава му и точното им производство в големи количества
- Изключително ограничена и проста поддръжка
- Акcesoарите са общи за цялата гама и са еднакви за апарати за променлива и постоянна тока
- Електрическите акcesoари се заменят лесно и бързо, благодарение на предварително подготвените кабелни връзки със собствени щепсел-гнездо контакти
- Стандартизирано механично устройство, позволяващо утешка
- Вграден пост за зареждане на затварящите пружини
- Ключ за блокиране при отворен лъвкъсвач
- Защитното капаче на пуш-бутоните за отваряне и затваряне се задейства само посредством специален инструмент
- Заклучващо устройство на превключващите пуш-бутони

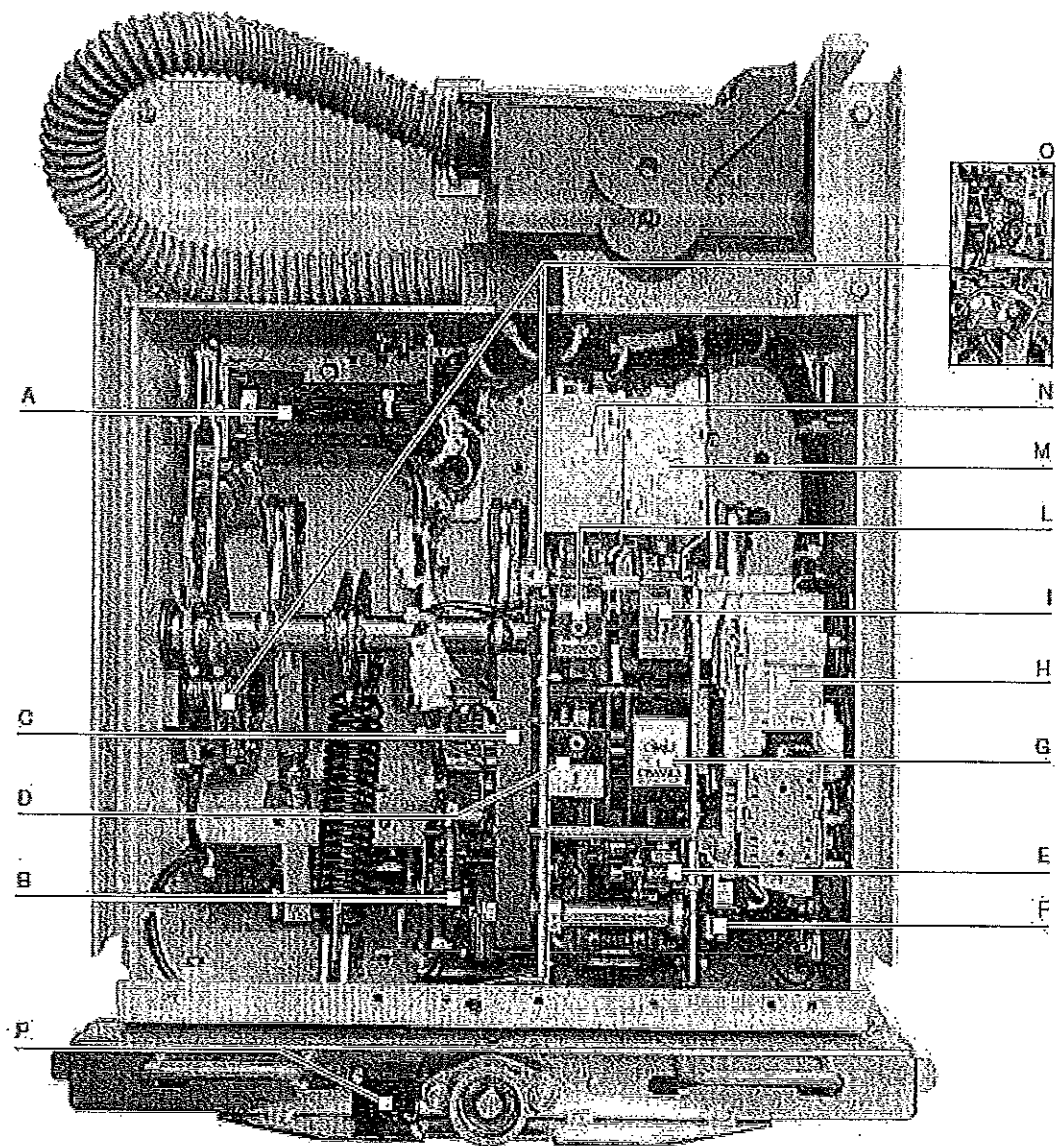


ВЯРНО С ОПРИЖНАДА



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- Задвижващ механизъм на прекъсвача
- A Помощни контакти Вкл./Изкл.
- B Мотор за зареждане на включвателна пружина
- C Вграден лост за зареждане на пружината
- D Механично сигнално устройство за прекъсвача изключен/включен
- E Механичен брояч
- F Контакти за сигнализация на заредена/разредена пружина
- G Сигнално устройство за включвателна пружина заредена/разредена
- H Устройство за освобождаване
- I Бутон за включване
- L Бутон за изключване
- M Блокиращ електромагнит за задвижващия механизъм
- N Допълнителна изключвателна бобина – опция
- O Прелитащ контакт
- P Блокировка при отворена врата

ВЯРНО С ОРИГИНАЛА



Ср.

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ОПИСАНИЕ

Техническа документация

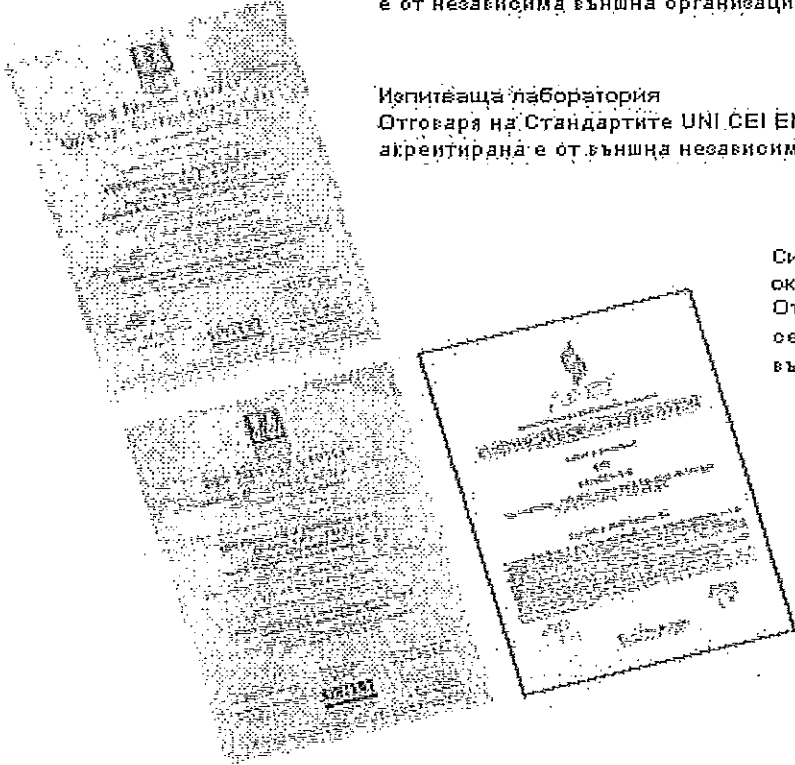
За да добиете задълбочено познаване на техническите аспекти на прекъсвачите VD4 и областта им на приложение, моля осведомете се за следните публикации:

- КРУ тип UniSafe	код 649228
- КРУ тип UniGear ZS1	код 649424
- Релейна защита с блок за управл. REFxxx	код 649423
- Релеен блок PR512	код 649092

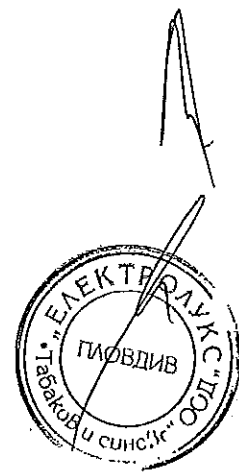
Система за оценяване на качеството
Отговаря на Стандартите ISO 9001, сертифициран
е от независима външна организация.

Изпитваща лаборатория
Отговаря на Стандартите UNI CEI EN ISO/IEC 17025,
акредитирана е от външна независима организация

Система за опазване на
сколцата ореда
Отговаря на Стандартите ISO 14001,
сертифицирана е от независима
външна организация.



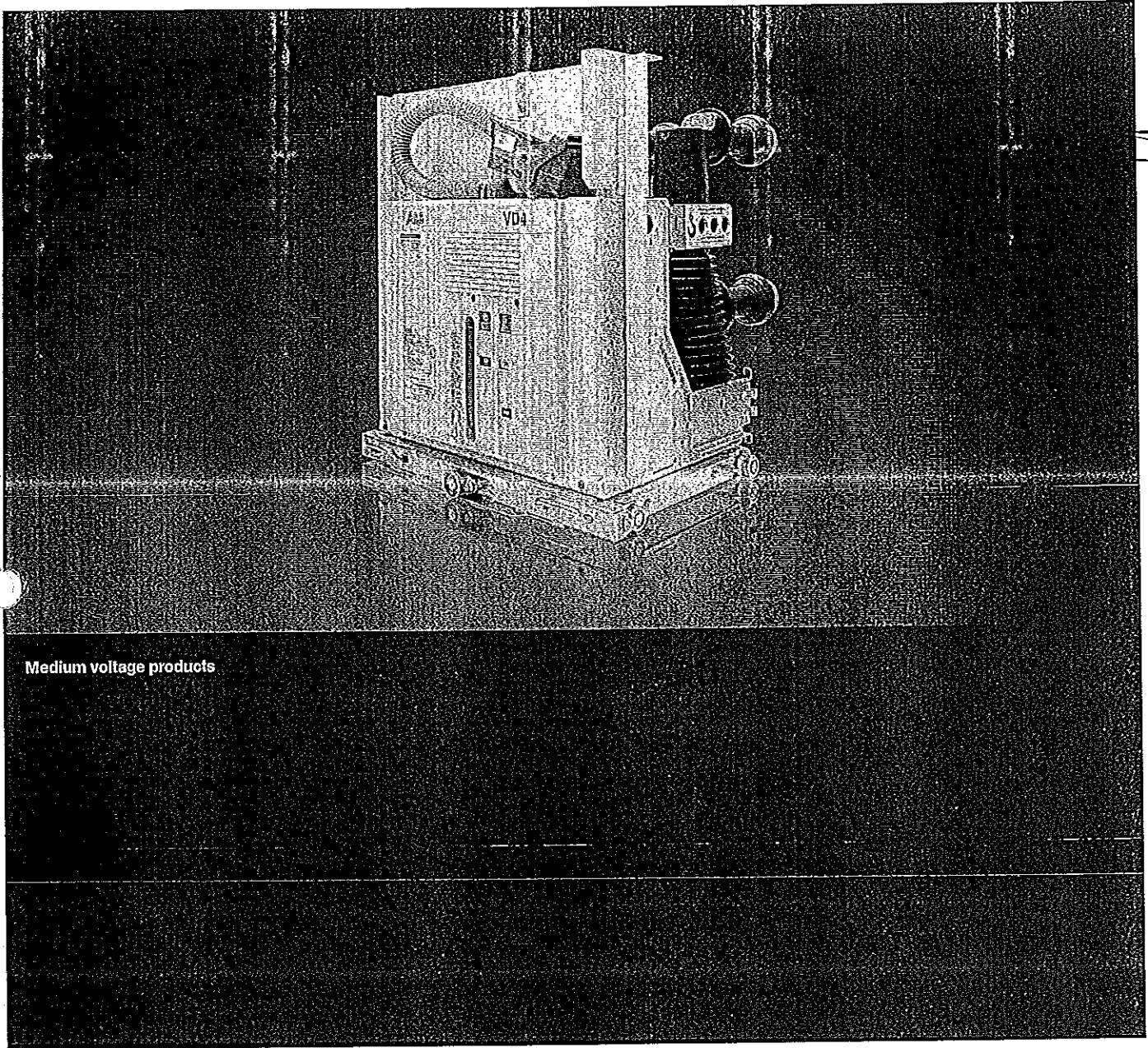
ВЯРНО С ОРИГИНАЛА



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ВЯРНО С ОРИГИНАЛА





Medium voltage products

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96	5. Electric circuit diagram

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ВЯРНО С ОРИГИНАЛА



1. Description

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The new VD4 are a synthesis of renowned technology in designing and constructing vacuum interrupters embedded in poles, and excellency in design, engineering and production of circuit-breakers.

The VD4 medium voltage circuit-breakers use vacuum interrupters embedded in the poles. This construction technique makes the circuit-breaker poles particularly sturdy and protects the interrupter from impacts, dust deposits and humidity. The vacuum interrupter houses the contacts and makes up the interrupting chamber.

Current interruption in vacuum

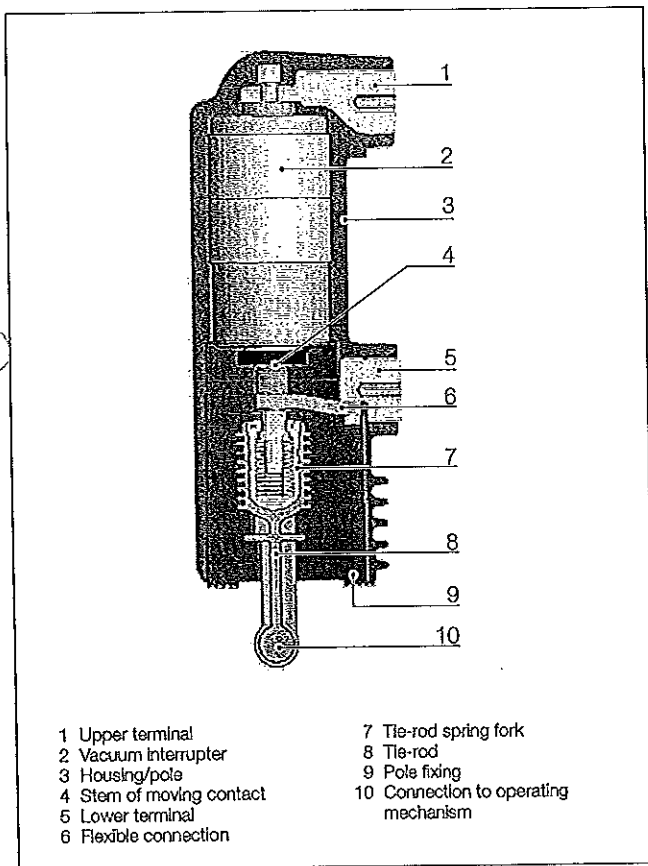
The vacuum circuit-breaker does not require an interrupting and insulating medium. In fact, the interrupters do not contain ionisable material.

In any case, on separation of the contacts an electric arc is generated made up exclusively of melted and vaporised contact material.

The electric arc remains supported by the external energy until the current is cancelled in the vicinity of natural zero. At that instant, the rapid reduction in the load density carried and the rapid condensation of the metallic vapour, leads to extremely rapid recovery of the dielectric characteristics.

The vacuum interrupter therefore recovers the insulating capacity and the capacity to withstand the transient recovery voltage, definitively extinguishing the arc.

Since high dielectric strength can be reached in the vacuum,



Vacuum Interrupter embedded in the pole

- Vacuum interruption technique
- Vacuum contacts protected against oxidation and contamination
- Vacuum interrupter embedded in the pole
- Interrupter protected against shocks, dust and humidity
- Operation under different climatic conditions
- Limited switching energy
- Stored energy operating mechanism with anti-pumping device supplied as standard
- Simple customisation with a complete range of accessories
- Fixed and withdrawable version
- Compact dimensions
- Sealed-for-life poles
- Sturdiness and reliability
- Limited maintenance
- Circuit-breaker racking in and racking out with door closed
- Incorrect and hazardous operations are prevented thanks to special locks in the operating mechanism and in the truck
- High environmental compatibility

M

M

ВЯРНО С ОРИГИНАЛА



g

even with minimum distances, interruption of the circuit is also guaranteed when separation of the contacts takes place a few milliseconds before passage of the current through natural zero.

The special geometry of the contacts and the material used, as well as the limited duration and low voltage of the arc, guarantee minimum contact wear and long life. Furthermore, the vacuum prevents their oxidation and contamination.

Operating mechanism

The low speed of the contacts, together with the reduced run and low mass, limit the energy required for the operation and therefore guarantee extremely limited wear of the system.

The circuit-breaker therefore only requires limited maintenance.

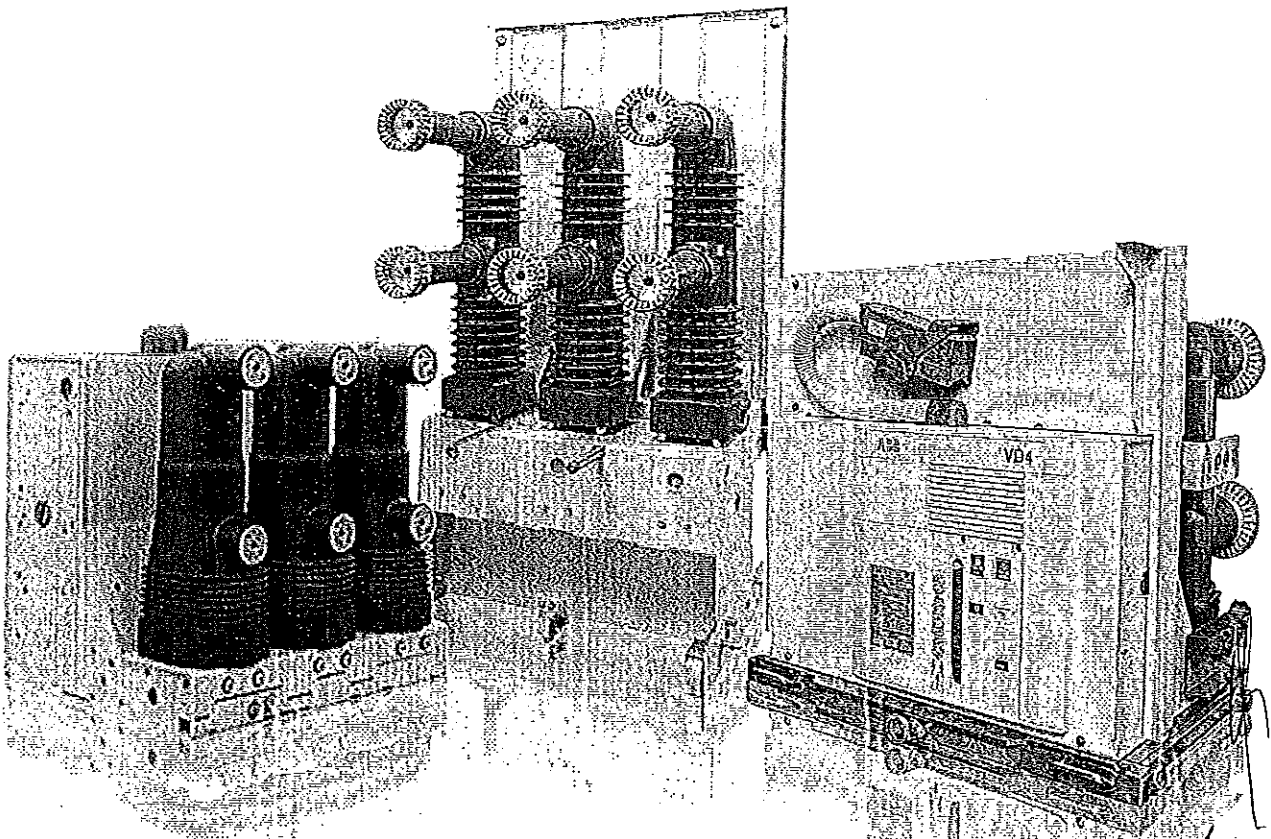
The VD4 circuit-breakers use a mechanical operating mechanism, with stored energy and free trip.

These characteristics allow opening and closing operations independent of the operator. The operating mechanism is of simple conception and use and can be customised with a wide range of accessories which are easy and rapid to install. This simplicity converts into greater reliability of the apparatus.

The structure

The operating mechanism and the poles are fixed to a metal frame which is also the support for the fixed version of the circuit-breaker. The compact structure ensures sturdiness and mechanical reliability.

Apart from the isolating contacts and the cord with plug for connection of the auxiliary circuits, the withdrawable version is completed with the truck for racking it into and out of the switchgear or enclosure with the door closed.



ВЕРНО С ОРИГИНАЛА



W

1. Description

19

Quenching principle of ABB interrupters

In a vacuum interrupter, the electric arc starts at the moment of contact separation and is maintained until zero current and can be influenced by magnetic fields.

Vacuum arc – diffuse or contracted

Following contact separation, single melting points form over the entire surface of the cathode, producing metal vapours which support the arc.

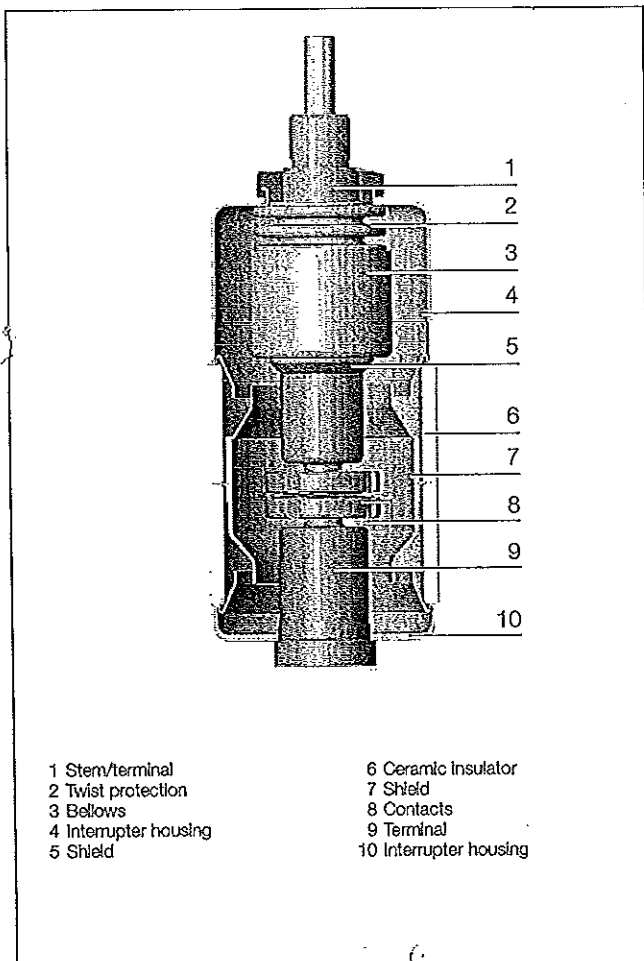
The diffuse vacuum arc is characterised by expansion over the contact surface and by an even distribution of thermal stress on the contact surfaces.

At the rated current of the vacuum interrupter, the electric arc is always of the diffuse type. Contact erosion is very limited and the number of current interruptions very high.

As the interrupted current value increases (above the rated value), the electric arc tends to be transformed from the diffuse into the contracted type, due to the Hall effect.

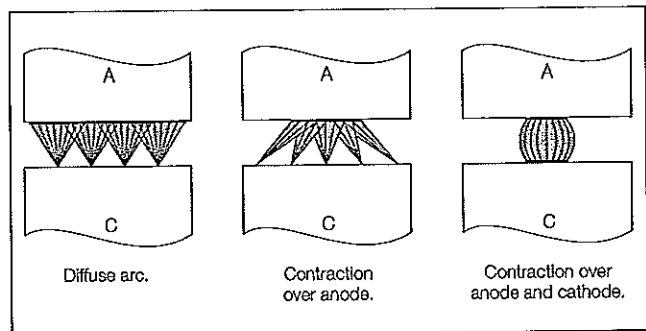
Starting at the anode, the arc contracts and as the current rises further it tends to become sharply defined. Near the area involved there is an increase in temperature with consequent thermal stress on the contact.

To prevent overheating and erosion of the contacts, the arc is kept rotating. With arc rotation it becomes similar to a moving conductor which the current passes through.



- | | |
|-----------------------|------------------------|
| 1 Stem/terminal | 6 Ceramic insulator |
| 2 Twist protection | 7 Shield |
| 3 Bellows | 8 Contacts |
| 4 Interrupter housing | 9 Terminal |
| 5 Shield | 10 Interrupter housing |

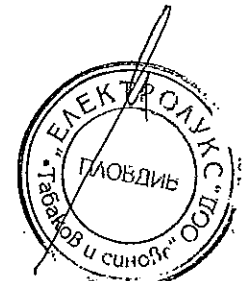
Vacuum interrupter



Schematic diagram of the transition from a diffuse arc to a contracted arc in a vacuum interrupter.

W4

ВЯРНО С ОРИГИНАЛА



5

The spiral geometry of ABB vacuum interrupter contacts

The special geometry of the spiral contacts generates a radial magnetic field in all areas of the arc column, concentrated over the contact circumferences.

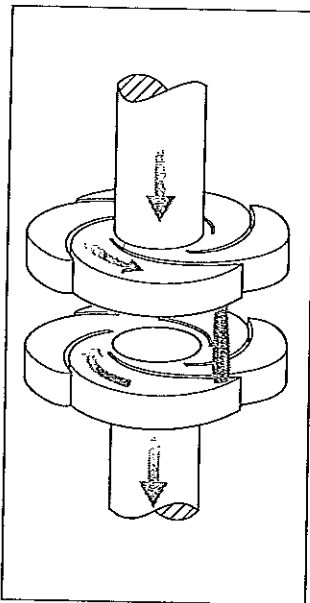
An electromagnetic force is self-generated and this acts tangentially, causing rapid arc rotation around the contact axis.

This means the arc is forced to rotate and to involve a wider surface than that of a fixed contracted arc.

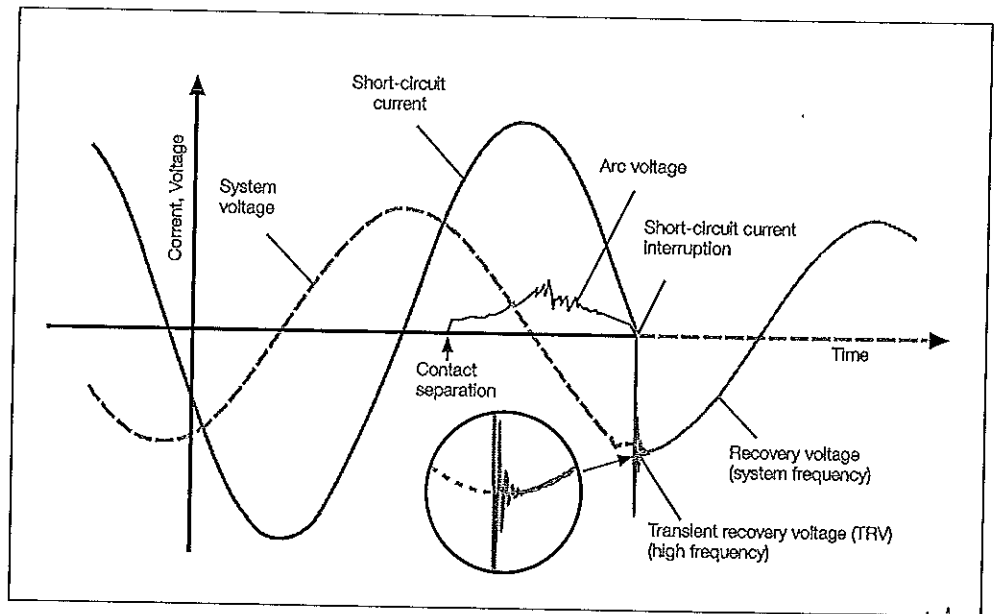
Apart from minimising thermal stress on the contacts, all this makes contact erosion negligible and, above all, allows the interruption process to be controlled even with very high short-circuits.

ABB vacuum interrupters interrupt at the natural passage of the current through zero, thereby preventing the arc from restriking after that event.

Rapid reduction in the current charge and rapid condensation of the metal vapours simultaneously with the zero current, allows maximum dielectric strength to be restored between the interrupter contacts within microseconds.



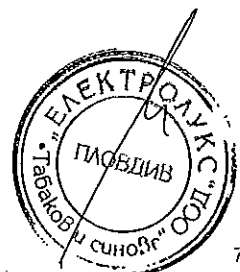
Radial magnetic field contact arrangement with a rotating vacuum arc.



Development of current and voltage trends during a single phase vacuum interruption process.

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ВЯРНО С ОРИГИНАЛА



1. Description

Versions available

The VD4 circuit-breakers are available in the fixed and withdrawable version with front operating mechanism. The withdrawable version is available for UniGear ZS1, ZS2, ZS8.4 and UniSec switchgear and for PowerCube and Powerbloc enclosures.

Fields of application

The VD4 circuit-breakers are used in power distribution for control and protection of cables, overhead lines, transformer and distribution substations, motors, transformers, generators and capacitor banks.

Standards

The VD4 circuit-breakers comply with the IEC 62271-100 Standards and with those of the major industrialised countries.

The VD4 circuit-breakers have undergone the tests indicated below and guarantee the safety and reliability of the apparatus in service in any installation.

- **Type tests:** heating, withstand insulation at power frequency, withstand insulation at lightning impulse, short-time and peak withstand current, mechanical life, short-circuit current making and breaking capacity.
- **Individual tests:** insulation of the main circuits with voltage at power frequency, auxiliary circuit and operating mechanism insulation, measurement of the main circuit resistance, mechanical and electrical operation.

Service safety

Thanks to the complete range of mechanical and electrical locks (available on request), it is possible to construct safe distribution switchgear with the VD4 circuit-breakers.

The locking devices have been studied to prevent incorrect operations and to inspect the installations whilst guaranteeing maximum operator safety.

Key locks or padlock devices enable opening and closing operations and/or racking in and racking out.

The racking-out device with the door closed allows the circuit-breaker to be racked into or out of the switchgear only with the door closed.

Anti-racking-in locks prevent circuit-breakers with different rated currents from being racked in, and the racking-in and racking out operation with the circuit-breaker closed.

- Highly reliable operating mechanisms thanks to a low number of components which are manufactured using production systems for large quantities
- Extremely limited and simple maintenance
- Accessories common to the entire range
- Electrical accessories that can be easily and quickly installed or replaced thanks to wiring pre-engineered with plug-socket connectors
- Mechanical anti-pumping device is supplied as standard
- Built-in closing spring charging lever
- Key lock with circuit-breaker open
- Protective covering over the opening and closing pushbuttons to be operated using a special tool
- Padlock device on the operating pushbuttons

Accessories

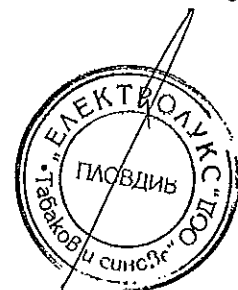
The VD4 circuit-breakers have a complete range of accessories to satisfy all installation requirements. The operating mechanism has a standardised range of accessories and spare parts which are easy to identify and order.

The accessories are installed conveniently from the front of the circuit-breaker. Electrical connection is carried out with plug-socket connectors.

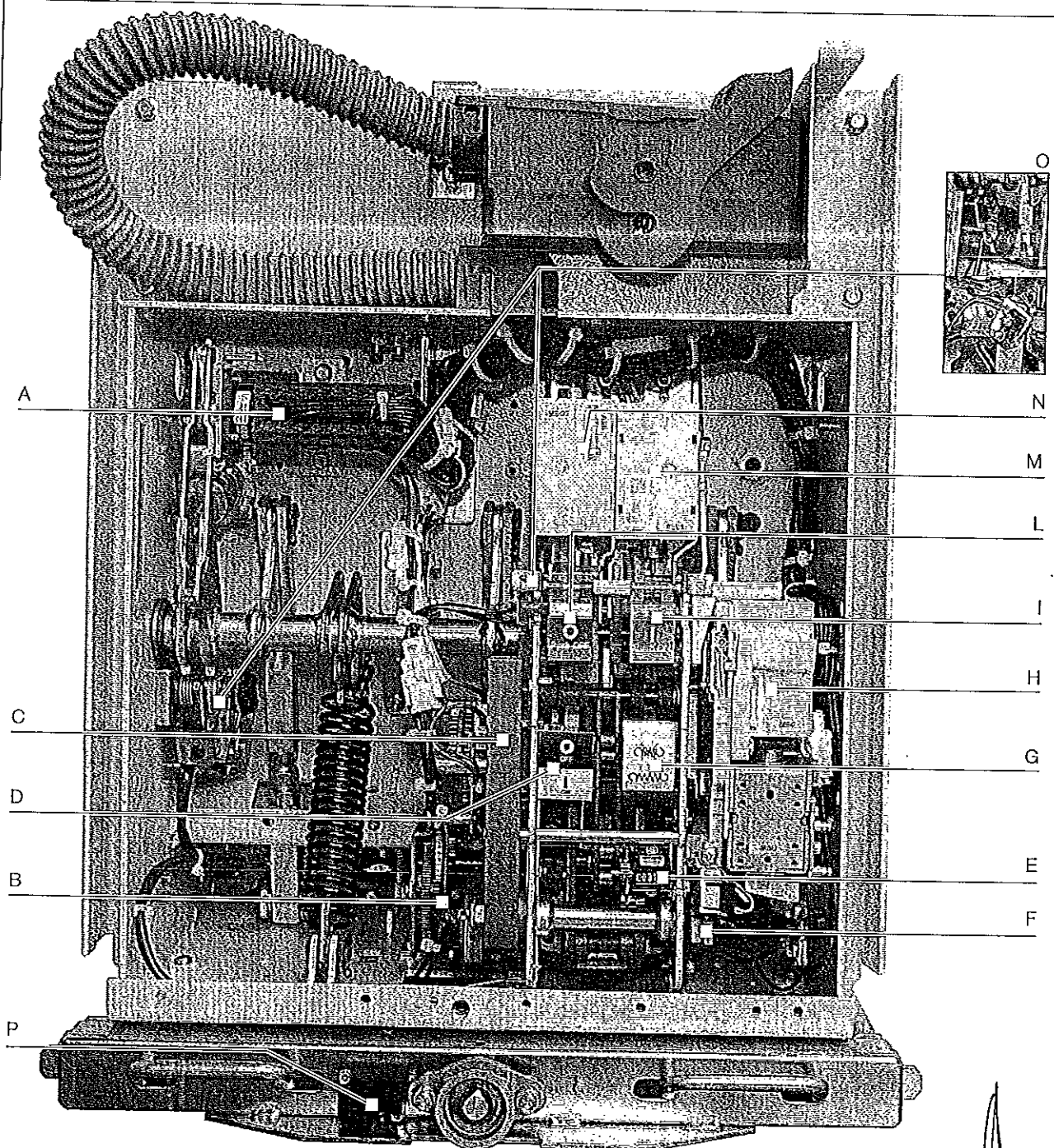
Use, maintenance and service of the apparatus are simple and require limited use of resources.

8

ВЯРНО С ОРИГИНАЛА



g



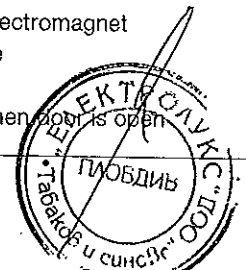
Circuit-breaker operating mechanism

- A Open/closed auxiliary contacts
- B Geared motor for closing spring charging
- C Built-in closing spring charging lever
- D Mechanical signalling device for circuit-breaker open/closed
- E Mechanical operation counter
- F Contacts for signalling spring charged/discharged

- G Signalling device for closing springs charged/discharged
- H Service releases
- I Closing pushbutton
- L Opening pushbutton
- M Operating mechanism locking electromagnet
- N Additional shunt opening release
- O Transient contact
- P Lock that prevents racking-in when door is open

11

ВЯРНО С ОРИГИНАЛА

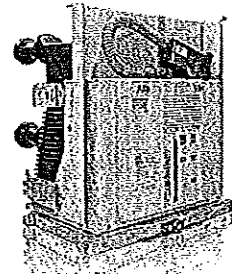
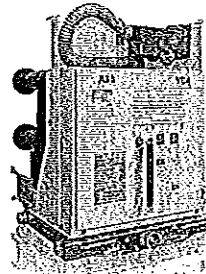


1. Description

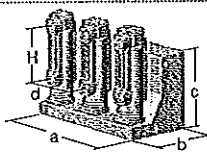
General characteristics of the complete VD4 series (*)
 The VD4 series of vacuum circuit-breakers conform to the specifications of the following standards:

- IEC 62271-1
- IEC 62271-100

(*) For Information about the 12 kV • 1250 ... 4000 A • 50/63 kA and 36/40.5 kV • 630 ... 2500 A • 16 ... 40 kA circuit-breakers, please see technical catalogue GCBA520PO102.



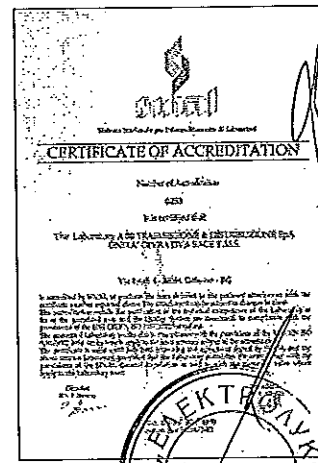
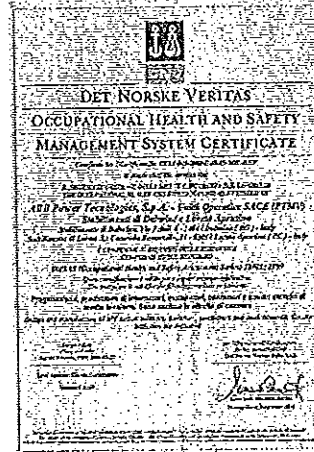
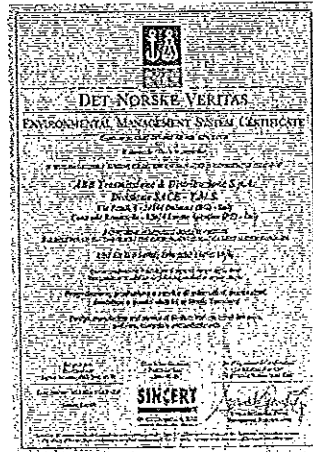
Rated voltage ⁽¹⁾	kV	12			
Rated frequency	Hz	50 - 60			
Rated normal current	A	630 ... 4000 ⁽²⁾			
Short-time withstand current and breaking capacity	kA	16 ... 31.5	40	50	63
Making capacity	kA	40 ... 80	100	125 ⁽³⁾	158
Short-time withstand current	s	3	3	3	3
Fixed / withdrawable version		• / •	• / •	• / •	• / -
Maximum overall dimensions (fixed version)	d (mm)	150 - 275	210 - 275	210 - 275	275
	H (mm)	205 - 310	310	310	310
	a (mm)	450 - 700	570 - 700	600 - 750	750
	b (mm)	424	424	459	459
	c (mm)	461 - 599	599 ⁽⁴⁾	608 ⁽⁵⁾	677
Weight	kg	73 - 105	94 - 180	147 - 260	260
Embedded poles		•	•	•	-
Assembled poles		-	-	-	•



Technical documentation

To go into technical and application aspects of the VD4 circuit-breakers in depth, please ask us for the following publications:

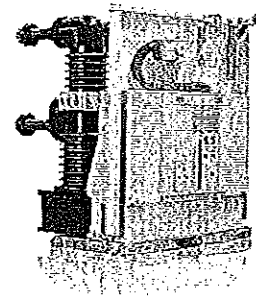
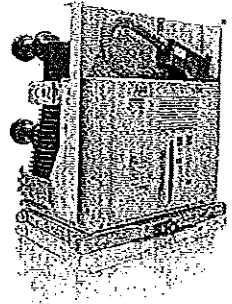
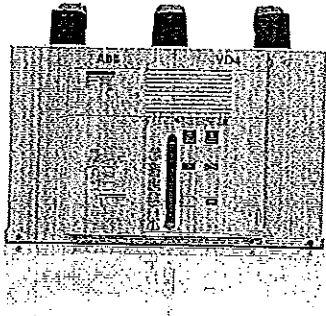
- PowerCube modules code 1VCP000091
- Powerbloc modules code BA441/03E
- UniGear ZS1 switchgear code 1VCP000138
- ZS8.4 switchgear code L2288
- REF542plus unit code 1VTA100001
- UniSec cod. 1VFM200003



ВЕРНО С ОРИГИНАЛОМ



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17.5		24		36		40,5	
50 - 60		50 - 60		50-60		50-60	
630 ... 4000 ⁽²⁾		630 ... 3150 ⁽²⁾		630 ... 3150		630 ... 3150	
16 ... 31.5	40 ... 50	16 ... 31.5	16 ... 31.5	16 ... 31.5	16 ... 31.5	16 ... 40	16 ... 40
40 ... 80	100 ... 125	40 ... 80	40 ... 80	40 ... 80	40 ... 80	40 ... 100	40 ... 100
3	3	3	3	3	3	4	4
*/•	*/•	*/•	*/•	*/•	*/•	*/•	*/•
150 - 275	210 - 275	210 - 275	210 - 275	275	275	280 - 360 ⁽⁴⁾	280 - 360 ⁽⁴⁾
205 - 310	310	310	310	328 / 280 ⁽⁵⁾	328 / 280 ⁽⁵⁾	328	328
450 - 700	570 - 700	570 - 700	570 - 700	786 / 853 ⁽⁵⁾	786 / 853 ⁽⁵⁾	895 ⁽⁵⁾ - 1000	895 ⁽⁵⁾ - 1000
424	424	424	424	492 / 789 ⁽⁵⁾	492 / 789 ⁽⁵⁾	555 - 686 ⁽⁵⁾	555 - 686 ⁽⁵⁾
461 - 599 ⁽⁶⁾	599 ⁽⁶⁾⁽⁷⁾	631 - 661	631 - 661	876 / 973 ⁽⁵⁾	876 / 973 ⁽⁵⁾	1575	1575
73 - 105	94 - 180	100 - 110	100 - 110	170 / 210	170 / 210	290 - 350	290 - 350
•	•	•	•	•	•	•	•
-	-	-	-	•	•	•	•

- ⁽¹⁾ Test voltage according to IEC 62271-1 Standards table 1a, VDE 0670, - part 1000, list 2
- ⁽²⁾ With forced ventilation
- ⁽³⁾ Higher values on request
- ⁽⁴⁾ 360 mm for fixed version, 280 mm for withdrawable version
- ⁽⁵⁾ Circuit-breaker with eat sink 616 mm (2500 A)
- ⁽⁶⁾ Withdrawable version
- ⁽⁷⁾ Circuit-breaker with eat sink 634 mm (3150 A)

Quality System

Complies with ISO 9001 Standards, certified by an independent organisation.

Environmental Management System

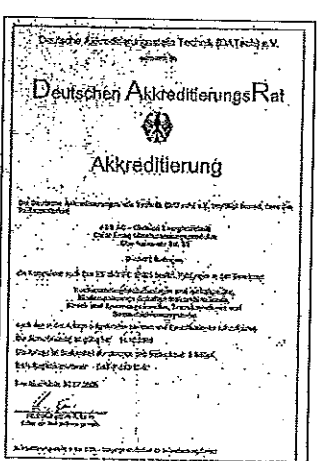
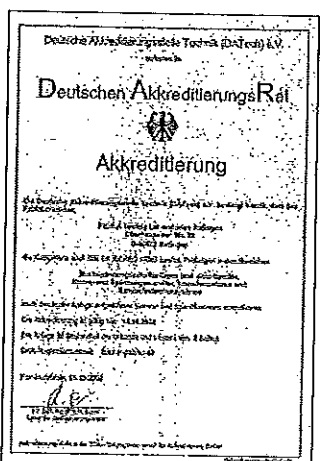
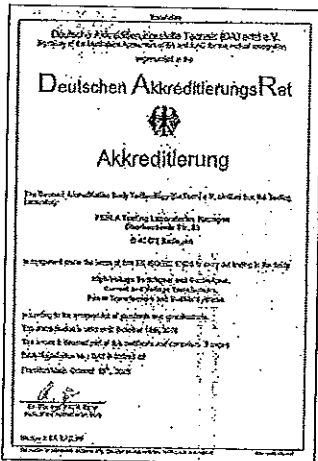
Complies with ISO 14001 Standards, certified by an independent organisation.

Test Laboratory

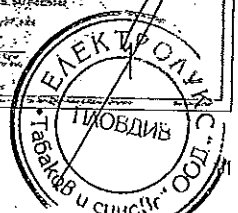
Complies with UNI CEI EN ISO/IEC 17025 Standards, accredited by an independent organisation.

Health and Safety Management System

Complies with OHSAS 18001 Standards, certified by an independent organisation.



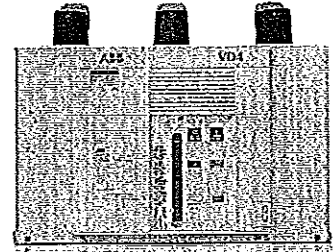
ВЕРНО С ОРИГИНАЛА



2. Selection and ordering Fixed circuit-breakers

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Fixed VD4 circuit-breaker (12 kV) ⁽⁴⁾

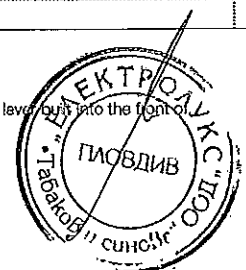


Circuit-breaker		VD4 12											
Standards	IEC 62271-100	•											
Rated voltage	Ur [kV]	12 (2)											
Rated insulation voltage	Us [kV]	12											
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28											
Impulse withstand voltage	Up [kV]	75											
Rated frequency	fr [Hz]	50-60											
Rated normal current (40 °C)	Ir [A]	630	630	630	1250	1250	1250	1250	1250	1250	1250		
		16	16	16	16	16	16	—	—	—	—		
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	—	—	—	—		
		25	25	25	25	25	25	—	—	—	—		
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—	—		
		—	—	—	—	—	—	40	40	—	—		
		—	—	—	—	—	—	—	—	50	50		
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	16	16	—	—	—	—		
		20	20	20	20	20	20	—	—	—	—		
		25	25	25	25	25	25	—	—	—	—		
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—	—		
		—	—	—	—	—	—	40	40	—	—		
Making capacity	Ip [kA]	40	40	40	40	40	40	—	—	—	—		
		50	50	50	50	50	50	—	—	—	—		
		63	63	63	63	63	63	—	—	—	—		
		80	80	80	80	80	80	—	—	—	—		
		—	—	—	—	—	—	100	100	—	—		
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•	•			
Opening time	[ms]	33 ... 60											
Arcing time	[ms]	10 ... 15											
Total breaking time	[ms]	43 ... 75											
Closing time	[ms]	30 ... 60											
Maximum overall dimensions		H [mm]	461	461	461	461	461	461	589	589	610	610	
		W [mm]	450	570	700	450	570	700	570	700	600	750	
		D [mm]	424	424	424	424	424	424	424	424	424	459	459
		Pole distance P [mm]	150	210	275	150	210	275	210	275	210	275	275
Weight	[kg]	73	75	79	73	75	79	84	84	146	158		
Standardised table of dimensions	TN	7405(1)	7406(1)	—	7405(1)	7406(1)	—	—	—	—	—		
	1VCD	—	—	000051(1)	—	—	000051(1)	003282(1)	003285(1)	003440	003441		
Operating temperature	[°C]	- 5 ... + 40											
Tropicalization	IEC: 60068-2-30, 60721-2-1	•											
Electromagnetic compatibility	IEC: 62271-1	•											

(1) Poles in polyamide
 (2) Available in 10 kV voltage version in accordance with GOST standards
 (3) Up to 4000 A with forced ventilation
 (4) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading by a lever built into the front of operating mechanism)

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ВЕРНО С ОРИГИНАЛА



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12 (°)																
12																
28																
75																
50-60																
1600	1600	1600	1600	1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	2500	3150 (°)	3150 (°)
20	20	20	—	—	—	—	—	20	20	—	—	20	20	—	20	—
25	25	25	—	—	—	—	—	25	25	—	—	25	25	—	25	—
31.5	31.5	31.5	—	—	—	—	—	31.5	31.5	—	—	31.5	31.5	—	31.5	—
—	—	—	40	40	—	—	—	40	40	—	—	40	40	—	40	—
—	—	—	—	—	50	50	—	—	—	50	50	—	—	50	—	50
20	20	20	—	—	—	—	—	20	20	—	—	20	20	—	20	—
25	25	25	—	—	—	—	—	25	25	—	—	25	25	—	25	—
31.5	31.5	31.5	—	—	—	—	—	31.5	31.5	—	—	31.5	31.5	—	31.5	—
—	—	—	40	40	—	—	—	40	40	—	—	40	40	—	40	—
—	—	—	—	—	50	50	—	—	—	50	50	—	—	50	—	50
50	50	50	—	—	—	—	—	50	50	—	—	50	50	—	50	—
63	63	63	—	—	—	—	—	63	63	—	—	63	63	—	63	—
80	80	80	—	—	—	—	—	80	80	—	—	80	80	—	80	—
—	—	—	100	100	—	—	—	100	100	—	—	100	100	—	100	—
—	—	—	—	—	125	125	—	—	—	125	125	—	—	125	—	125
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60																
10 ... 15																
43 ... 75																
30 ... 60																
599	599	599	589	589	610	610	599	599	610	610	599	599	610	635	636	
450	570	700	570	700	600	750	570	700	600	750	570	700	750	700	650	
424	424	424	424	424	459	459	424	424	459	459	424	424	459	424	459	
160	210	275	210	275	210	275	210	275	210	275	210	275	275	275	275	
93	98	105	84	84	146	158	98	105	146	158	98	105	163	140	177	
—	7407 (°)	7408 (°)	—	—	—	—	7407 (°)	7408 (°)	—	—	7407 (°)	7408 (°)	—	—	—	
000050	—	—	003282(°)	003285(°)	003440	003441	—	—	003440	003441	—	—	003441	000149 (°)	003443	
- 5 ... + 40																
•																
•																

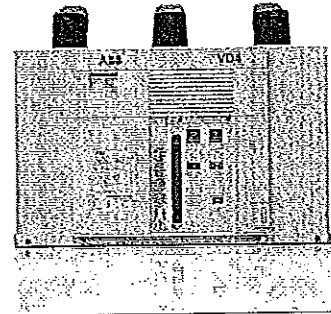
ВАРНО С ОРИГИНАЛА



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2. Selection and ordering Fixed circuit-breakers

Fixed VD4 circuit-breaker (17.5 kV) ⁽³⁾



Circuit-breaker		VD4 17											
Standards	IEC 62271-100	•											
Rated voltage	Ur [kV]	17.5											
Rated Insulation voltage	Us [kV]	17.5											
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38											
Impulse withstand voltage	Up [kV]	95											
Rated frequency	fr [Hz]	50-60											
Rated normal current (40 °C)	Ir [A]	630	630	630	1250	1250	1250	1250	1250	1250	1250		
		16	16	16	16	16	16	—	—	—	—		
		20	20	20	20	20	20	—	—	—	—		
		25	25	25	25	25	25	—	—	—	—		
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—	—		
		—	—	—	—	—	—	40	40	—	—		
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	—	—	—	—	—	—	—	50	50			
		—	—	—	—	—	—	—	—	—			
		16	16	16	16	16	16	—	—	—			
		20	20	20	20	20	20	—	—	—			
		25	25	25	25	25	25	—	—	—			
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—			
Rated short-time withstand current (3s)	Ik [kA]	—	—	—	—	—	—	40	40	—			
		—	—	—	—	—	—	—	—	50			
		16	16	16	16	16	16	—	—	—			
		20	20	20	20	20	20	—	—	—			
		25	25	25	25	25	25	—	—	—			
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—			
Making capacity	Ip [kA]	—	—	—	—	—	—	—	—	—			
		—	—	—	—	—	—	—	—	—			
		40	40	40	40	40	40	—	—	—			
		50	50	50	50	50	50	—	—	—			
		63	63	63	63	63	63	—	—	—			
		80	80	80	80	80	80	—	—	—			
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
Opening time	[ms]	33 ... 60											
		10 ... 15											
		43 ... 75											
		30 ... 60											
		33 ... 60											
		10 ... 15											
Arcing time	[ms]	10 ... 15											
		43 ... 75											
		30 ... 60											
		33 ... 60											
		10 ... 15											
		43 ... 75											
Total breaking time	[ms]	43 ... 75											
		30 ... 60											
		33 ... 60											
		10 ... 15											
		43 ... 75											
		30 ... 60											
Closing time	[ms]	30 ... 60											
		33 ... 60											
		10 ... 15											
		43 ... 75											
		30 ... 60											
		10 ... 15											
Maximum overall dimensions		H [mm]	461	461	461	461	461	461	589	589	610	610	
		W [mm]	450	570	700	450	570	700	570	700	600	750	
		D [mm]	424	424	424	424	424	424	424	424	424	459	459
		Pole distance P [mm]	150	210	275	150	210	275	210	275	210	275	
		[kg]	73	75	79	73	75	79	84	84	146	158	
		Weight	[kg]	73	75	79	73	75	79	84	84	146	158
Standardised table of dimensions	TN	7405 ⁽¹⁾	7406 ⁽¹⁾	—	7405 ⁽¹⁾	7406 ⁽¹⁾	—	—	—	—			
	1VCD	—	—	000051 ⁽¹⁾	—	—	000051 ⁽¹⁾	003282 ⁽¹⁾	003285 ⁽¹⁾	003440	003441		
Operating temperature	[°C]	- 5 ... + 40											
Tropicalization	IEC: 60068-2-30, 60721-2-1	•											
Electromagnetic compatibility	IEC: 62271-1	•											

(1) Poles in polyamide
 (2) Up to 4000 A with forced ventilation
 (3) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading by a lever built into the front of operating mechanism)

ВЯРНО С ОРИГИНАЛА



14

Handwritten mark resembling a stylized 'S' or 'Z' in the top right corner.

•														
17.5														
17.5														
38														
95														
50-60														
1600	1600	1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	3150 (?)	3150 (?)	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	20	—	—	—	—	20	20	—	—	20	—	20	—	—
25	25	—	—	—	—	25	25	—	—	25	—	25	—	—
31.5	31.5	—	—	—	—	31.5	31.5	—	—	31.5	—	31.5	—	—
—	—	40	40	—	—	40	40	—	—	40	—	40	—	—
—	—	—	—	50	50	—	—	50	50	—	50	—	50	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	20	—	—	—	—	20	20	—	—	20	—	20	—	—
25	25	—	—	—	—	25	25	—	—	25	—	25	—	—
31.5	31.5	—	—	—	—	31.5	31.5	—	—	31.5	—	31.5	—	—
—	—	40	40	—	—	40	40	—	—	40	—	40	—	—
—	—	—	—	50	50	—	—	50	50	—	50	—	50	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	50	—	—	—	—	50	50	—	—	50	—	50	—	—
63	63	—	—	—	—	63	63	—	—	63	—	63	—	—
80	80	—	—	—	—	80	80	—	—	80	—	80	—	—
—	—	100	100	—	—	100	100	—	—	100	—	100	—	—
—	—	—	—	125	125	—	—	125	125	—	125	—	125	—
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60														
10 ... 15														
43 ... 75														
30 ... 60														
599	599	589	589	610	610	599	599	610	610	599	610	635	636	
570	700	570	700	600	750	570	700	600	750	700	750	700	750	
424	424	424	424	459	459	424	424	459	459	424	459	424	459	
210	275	210	275	210	275	210	275	210	275	275	275	275	275	
98	105	84	84	146	158	98	105	146	158	105	163	140	177	
7407 (?)	7408 (?)	—	—	—	—	7407 (?)	7408 (?)	—	—	7408 (?)	—	—	—	
—	—	003282 (?)	003285 (?)	003440	003441	—	—	003440	003441	—	003441	000149 (?)	003443	
•														
•														

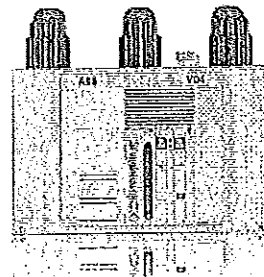
ВЯРНО С ОРИГИНАЛА



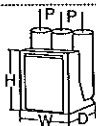
Handwritten mark resembling a stylized 'U' or '4' in the bottom left corner.

2. Selection and ordering Fixed circuit-breakers

Fixed VD4 circuit-breaker (24 kV) (2)



Circuit-breaker		VD4 24						
Standards	IEC 62271-100	•						
Rated voltage	Ur [kV]	24						
Rated insulation voltage	Us [kV]	24						
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50						
Impulse withstand voltage	Up [kV]	125						
Rated frequency	fr [Hz]	50-60						
Rated normal current (40 °C)	Ir [A]	630	630	1250	1250	1600	2000	2500
		16	16	16	16	16	16	--
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	--
		25	25	25	25	25	25	25
		--	--	31.5	--	31.5	31.5	31.5
		16	16	16	16	16	16	--
Rated short-time withstand current (3s)	Ik [kA]	20	20	20	20	20	20	--
		25	25	25	25	25	25	25
		--	--	31.5	--	31.5	31.5	31.5
		40	40	40	40	40	40	--
Making capacity	Ip [kA]	50	50	50	50	50	50	--
		63	63	63	63	63	63	63
		--	--	80	--	80	80	80
		40	40	40	40	40	40	--
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•						
Opening time	[ms]	33 ... 60						
Arcing time	[ms]	10 ... 15						
Total breaking time	[ms]	43 ... 75						
Closing time	[ms]	30 ... 60						
Maximum overall dimensions	H [mm]	631	631	631	631	642	642	642
	W [mm]	570	700	570	700	700	700	700
	D [mm]	424	424	424	424	424	424	424
	Pole distance P [mm]	210	275	210	275	275	275	275
Weight	[kg]	100	104	100/106 (1)	104	110	110	110
	TN	7409	7410	7409	7410	7411	7411	7411
Standardised table of dimensions	1VCD	--	--	000172 (2)	--	--	--	--
Operating temperature	[°C]	- 5 ... + 40						
Tropicalization	IEC: 60068-2-30, 60721-2-1	•						
Electromagnetic compatibility	IEC: 62271-1	•						

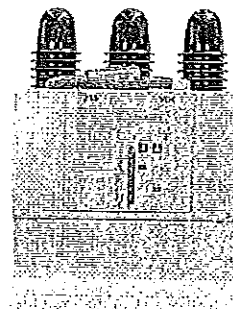


(1) 31.5 kA version

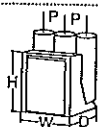
(2) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading by a lever built into the front of operating mechanism)

Handwritten mark

Fixed VD4 circuit-breaker (36 kV)



Circuit-breaker		VD4 36			
Standards	IEC 62271-100	•			
Rated voltage	Ur [kV]	36			
Rated insulation voltage	Us [kV]	36			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	70			
Impulse withstand voltage	Up [kV]	170			
Rated frequency	fr [Hz]	50			
Rated normal current (40 °C)	Ir [A]	1250	1600	2000	2500 ⁽¹⁾
		Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20
Rated short-time withstand current (3s)	Ik [kA]	25	25	25	25
		31.5	31.5	31.5	31.5
Making capacity	Ip [kA]	20	20	20	20
		25	25	25	25
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•
		Opening time	[ms]	35 ... 60	
Arcing time	[ms]	10 ... 15			
Total breaking time	[ms]	45 ... 75			
Closing time	[ms]	30 ... 60			
Maximum overall dimensions	H [mm]	564	564	564	564
	W [mm]	778	778	778	778
	D [mm]	468	468	468	468
	Pole distance P [mm]	275	275	275	275
Weight	[kg]	150	150	170	170
Standardised table of dimensions	TN	1VYN300901-LT	1VYN300901-LT	1VYN300901-LT	1VYN300901-LT
Operating temperature	[°C]	- 5 ... + 40			
Tropicalization	IEC: 60068-2-30, 60721-2-1	•			
Electromagnetic compatibility	IEC: 62271-1	•			



(1) 2500 A with forced ventilation

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ВЯРНО С ОРИГИНАЛА



2. Selection and ordering Fixed circuit-breakers

Types of fixed version circuit-breakers available

Complete the circuit-breaker selected with the optional accessories indicated on the following pages.

VD4 fixed circuit-breaker without bottom and top terminals (12 kV)

Ur	Isc	Rated uninterrupted current (40°C) [A]										Circuit-breaker type	
		H=461		H=589		H=599		H=610		H=636			
kV	kA	D=424		D=424		D=424		D=459		D=459			
		u/l=205		u/l=310		u/l=310		u/l=310		u/l=310			
		l/g=217.5		l/g=238		l/g=237.5		l/g=237		l/g=237			
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275		P=275
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
12	16	630											VD4 12.06.16 p150
	20	630											VD4 12.06.20 p150
	25	630											VD4 12.06.25 p150
	31.5	630											VD4 12.06.32 p150
	16	1250											VD4 12.12.16 p150
	20	1250											VD4 12.12.20 p150
	25	1250											VD4 12.12.25 p150
	31.5	1250											VD4 12.12.32 p150
	20						1600						VD4 12.16.20 p150
	25						1600						VD4 12.16.25 p150
	31.5						1600						VD4 12.16.32 p150
	16		630										VD4 12.06.16 p210
	20		630										VD4 12.06.20 p210
	25		630										VD4 12.06.25 p210
	31.5		630										VD4 12.06.32 p210
	16		1250										VD4 12.12.16 p210
	20		1250										VD4 12.12.20 p210
	25		1250										VD4 12.12.25 p210
	31.5		1250										VD4 12.12.32 p210
	40				1250								VD4 12.12.40 p210
50									1250			VD4 12.12.50 p210	
20							1600					VD4 12.16.20 p210	
25							1600					VD4 12.16.25 p210	
31.5							1600					VD4 12.16.32 p210	
40				1600								VD4 12.16.40 p210	
50									1600			VD4 12.16.50 p210	
20							2000					VD4 12.20.20 p210	
25							2000					VD4 12.20.25 p210	
31.5							2000					VD4 12.20.32 p210	
40							2000					VD4 12.20.40 p210	
50									2000			VD4 12.20.50 p210	
20							2500					VD4 12.25.20 p210	
25							2500					VD4 12.25.25 p210	
31.5							2500					VD4 12.25.32 p210	
40							2500					VD4 12.25.40 p210	

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.

ВЯРНО С ОРИГИНАЛА



Handwritten mark

VD4 fixed circuit-breaker without bottom and top terminals (12 kV)

Ur	Isc	Rated uninterrupted current (40°C) [A]										Circuit-breaker type	
		H=461			H=589		H=599			H=610			H=636
kV	kA	D=424			D=424		D=424			D=459		D=459	
		u/l=205			u/l=310		u/l=310			u/l=310		u/l=310	
		I/g=217.5			I/g=238		I/g=237.5			I/g=237		I/g=237	
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275	P=275	
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
12	16			630									VD4 12.06.16 p275
	20			630									VD4 12.06.20 p275
	25			630									VD4 12.06.25 p275
	31.5			630									VD4 12.06.32 p275
	16			1250									VD4 12.12.16 p275
	20			1250									VD4 12.12.20 p275
	25			1250									VD4 12.12.25 p275
	31.5			1250									VD4 12.12.32 p275
	40					1250							VD4 12.12.40 p275
	50										1250		VD4 12.12.50 p275
	20									1600			VD4 12.16.20 p275
	25									1600			VD4 12.16.25 p275
	31.5									1600			VD4 12.16.32 p275
	40						1600						VD4 12.16.40 p275
	50										1600		VD4 12.16.50 p275
20									2000			VD4 12.20.20 p275	
25									2000			VD4 12.20.25 p275	
31.5									2000			VD4 12.20.32 p275	
40									2000			VD4 12.20.40 p275	
50										2000		VD4 12.20.50 p275	
20									2500			VD4 12.25.20 p275	
25									2500			VD4 12.25.25 p275	
31.5									2500			VD4 12.25.32 p275	
40									2500			VD4 12.25.40 p275	
50										2500		VD4 12.25.50 p275	
20											3150 (1)	VD4 12.32.20 p275	
25											3150 (1)	VD4 12.32.25 p275	
31.5											3150 (1)	VD4 12.32.32 p275	
40											3150 (1)	VD4 12.32.40 p275	
50											3150 (1)	VD4 12.32.50 p275	

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker
- P = Pole horizontal centre distance.
- (1) Up to 4000 A with forced ventilation

Handwritten mark

ВЕРНО С ОРИГИНАЛА



2. Selection and ordering Fixed circuit-breakers

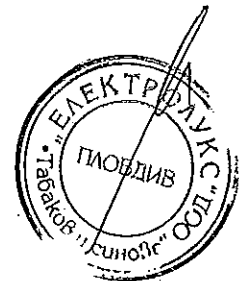
VD4 fixed circuit-breaker without bottom and top terminals (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]										Circuit-breaker type				
		H=461			H=589			H=599			H=610			H=635		
kV	kA	D=424			D=424			D=424			D=459			D=459		
		u/l=205			u/l=310			u/l=310			u/l=310			u/l=310		
		I/g=217.5			I/g=238			I/g=237.5			I/g=237			I/g=237.5		
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275	P=275				
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750				
17.5	16	630														VD4 17.06.16 p150
	20	630														VD4 17.06.20 p150
	25	630														VD4 17.06.25 p150
	31.5	630														VD4 17.06.32 p150
	16	1250														VD4 17.12.16 p150
	20	1250														VD4 17.12.20 p150
	25	1250														VD4 17.12.25 p150
	31.5	1250														VD4 17.12.32 p150
	16		630													VD4 17.06.16 p210
	20		630													VD4 17.06.20 p210
	25		630													VD4 17.06.25 p210
	31.5		630													VD4 17.06.32 p210
	16		1250													VD4 17.12.16 p210
	20		1250													VD4 17.12.20 p210
	25		1250													VD4 17.12.25 p210
	31.5		1250													VD4 17.12.32 p210
	40				1250										VD4 17.12.40 p210	
	50									1250					VD4 17.12.50 p210	
	20								1600						VD4 17.16.20 p210	
	25								1600						VD4 17.16.25 p210	
	31.5								1600						VD4 17.16.32 p210	
	40				1600										VD4 17.16.40 p210	
	50									1600					VD4 17.16.50 p210	
	20								2000						VD4 17.20.20 p210	
	25								2000						VD4 17.20.25 p210	
	31.5								2000						VD4 17.20.32 p210	
	40								2000						VD4 17.20.40 p210	
	50									2000					VD4 17.20.50 p210	

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.

20

ВЯРНО С ОРИГИНАЛА



VD4 fixed circuit-breaker without bottom and top terminals (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]										Circuit-breaker type		
		H=461			H=589		H=599			H=610			H=635	
kV	kA	D=424			D=424		D=424			D=459		D=459		
		u/l=205			u/l=310		u/l=310			u/l=310		u/l=310		
		l/g=217.5			l/g=238		l/g=237.5			l/g=237		l/g=237.5		
		P=150	P=210	P=275	P=210	P=275	P=160	P=210	P=275	P=210	P=275	P=275		
			W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
17.5	16			630										VD4 17.06.16 p275
	20			630										VD4 17.06.20 p275
	25			630										VD4 17.06.25 p275
	31.5			630										VD4 17.06.32 p275
	16			1250										VD4 17.12.16 p275
	20			1250										VD4 17.12.20 p275
	25			1250										VD4 17.12.25 p275
	31.5			1250										VD4 17.12.32 p275
	40						1250							VD4 17.12.40 p275
	50										1250			VD4 17.12.50 p275
	20									1600				VD4 17.16.20 p275
	25									1600				VD4 17.16.25 p275
	31.5									1600				VD4 17.16.32 p275
	40						1600							VD4 17.16.40 p275
	50										1600			VD4 17.16.50 p275
	20									2000				VD4 17.20.20 p275
	25									2000				VD4 17.20.25 p275
	31.5									2000				VD4 17.20.32 p275
	40									2000				VD4 17.20.40 p275
	50										2000			VD4 17.20.50 p275
	20									2500				VD4 17.25.20 p275
	25									2500				VD4 17.25.25 p275
	31.5									2500				VD4 17.25.32 p275
	40									2500				VD4 17.25.40 p275
	50										2500			VD4 17.25.50 p275
	20											3150		VD4 17.32.20 p275
	25											3150		VD4 17.32.25 p275
	31.5											3150		VD4 17.32.32 p275
	40											3150		VD4 17.32.40 p275
	50											3150		VD4 17.32.50 p275

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.
- (1) Up to 4000 A with forced ventilation

КОПИО С ОРИГИНАЛА



2. Selection and ordering Fixed circuit-breakers

VD4 fixed circuit-breaker without bottom and top terminals (24 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]			Circuit-breaker type
		H=631 D=424 u/l=310 l/g=282.5 P=210 W=670	P=275 W=700	H=642 D=424 u/l=310 l/g=282.5 P=275 W=700	
kV	16	630			VD4 24.06.16 p210
		630			VD4 24.06.20 p210
		630			VD4 24.06.25 p210
	20	1250			VD4 24.12.16 p210
		1250			VD4 24.12.20 p210
		1250			VD4 24.12.25 p210
	25	1250			VD4 24.12.32 p210
			630		VD4 24.06.16 p275
			630		VD4 24.06.20 p275
24	16		630		VD4 24.06.25 p275
			1250		VD4 24.12.16 p275
			1250		VD4 24.12.20 p275
	20		1250		VD4 24.12.25 p275
				1600	VD4 24.16.16 p275
				1600	VD4 24.16.20 p275
	25			1600	VD4 24.16.25 p275
				1600	VD4 24.16.32 p275
				2000	VD4 24.20.16 p275
	31.5			2000	VD4 24.20.20 p275
				2000	VD4 24.20.25 p275
				2000	VD4 24.20.32 p275
				2500	VD4 24.25.25 p275
				2500	VD4 24.25.32 p275

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.

ТОЛНО С ОРИГИНАЛ



VD4 fixed circuit-breaker without bottom and top terminals (36 kV)

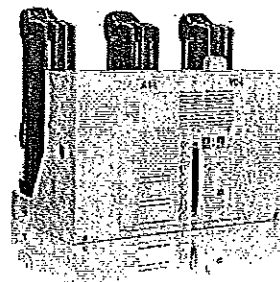
Ur	Isc	Rated uninterrupted current (40 °C) [A]			Circuit-breaker type
kV	kA	H = 876			
		L = 786			
		P = 478.5			
		u/l = 328			
		Vg = 428.5			
		I = 275			
36	20	1250 A			VD4 36.12.20 p275
	25	1250 A			VD4 36.12.25 p275
	31.5	1250 A			VD4 36.12.32 p275
	20		1600 A		VD4 36.16.20 p275
	25		1600 A		VD4 36.16.25 p275
	31.5		1600 A		VD4 36.16.32 p275
	20			2000 A	VD4 36.20.20 p275
	25			2000 A	VD4 36.20.25 p275
	31.5			2000 A	VD4 36.20.32 p275
	20			2500 A ⁽¹⁾	VD4 36.25.20 p275
	25			2500 A ⁽¹⁾	VD4 36.25.25 p275
	31.5			2500 A ⁽¹⁾	VD4 36.25.32 p275

- H = Height of the circuit-breaker.
- W = Width of the circuit-breaker.
- D = Depth of the circuit-breaker.
- u/l = Distance between bottom and top terminal.
- Vg = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- P = Pole horizontal centre distance.
- (1) = 2500 A rated current guaranteed with forced ventilation.

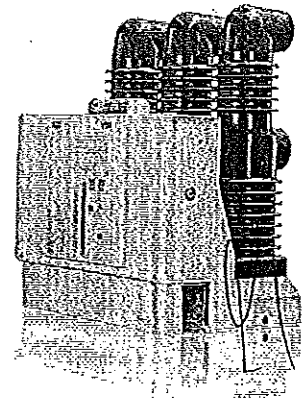
Standard fittings of fixed circuit-breakers

The basic versions of the fixed circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton, opening pushbutton and operation counter
 - set of ten auxiliary circuit-breaker break/make contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and five make contacts (signalling circuit-breaker closed) are available.
- lever built into operating mechanism for linear loading of closing spring.

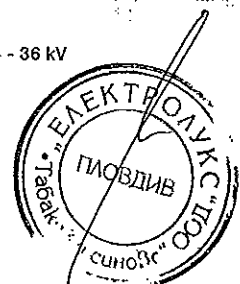


VD4 - up to 24 kV



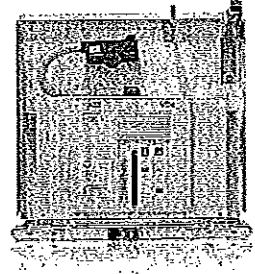
VD4 - 36 kV

ВЯРНО С ОРИГИНАЛА



2. Selection and ordering Withdrawable circuit-breakers

Withdrawable version circuit-breakers
for UniGear ZS1 switchgear (12 kV) ⁽⁵⁾



Circuit-breaker		VD4/P 12							
Standards	IEC 62271-100	•							
Rated voltage	Ur [kV]	12 (*)							
Rated insulation voltage	Us [kV]	12							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28							
Impulse withstand voltage	Up [kV]	75							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	1250	1250	1250	1600	1600	
		16	16	—	—	—	—	—	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	—	—	—	20	20	
		25	25	—	—	—	25	25	
		31.5	31.5	—	—	—	31.5	31.5	
		—	—	40	40	—	—	—	
Rated short-time withstand current (3s)	Ik [kA]	—	—	—	—	50	—	—	
		16	16	—	—	—	—	—	
		20	20	—	—	—	20	20	
		25	25	—	—	—	25	25	
		31.5	31.5	—	—	—	31.5	31.5	
		—	—	40	40	—	—	—	
Making capacity	Ip [kA]	—	—	—	—	—	—	—	
		40	40	—	—	—	—	—	
		50	50	—	—	—	50	50	
		63	63	—	—	—	63	63	
		80	80	—	—	—	80	80	
		—	—	100	100	—	—	—	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	
Opening time	[ms]	33 ... 60							
Arcing time	[ms]	10 ... 15							
Total breaking time	[ms]	43 ... 75							
Closing time	[ms]	30 ... 60							
Maximum overall dimensions	H [mm]	628	628	691	691	691	691	691	
	W [mm]	503	503	653	853	681	653	853	
	D [mm]	662	662	641	642	643	642	642	
	Pole distance P [mm]	150	150	210	275	210	210	275	
Weight	[kg]	116	116	174	176	180	160	166	
	TN	7412 ⁽²⁾	7412 ⁽²⁾	—	—	—	7416 ⁽²⁾	7416 ⁽²⁾	
Standardised table of dimensions	1VCD	—	—	003284 ⁽²⁾	003286 ⁽²⁾	003444	—	—	
Operating temperature	[°C]	- 5 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	•							
Electromagnetic compatibility	IEC: 62271-1	•							

(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.

(2) Up to 4000 A with forced ventilation.

(3) Poles in polyamide

(4) Available in 10 kV voltage version in accordance with GOST standards

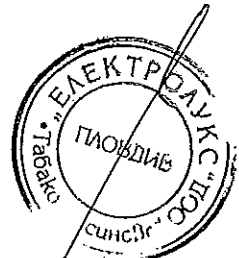
(5) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

Handwritten mark

•												
12 (*)												
12												
28												
75												
50-60												
1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	3150 (2)	3150 (2)	
-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	20	20	-	-	20	-	20	-	
-	-	-	-	25	25	-	-	25	-	25	-	
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	
40	40	-	-	40	40	-	-	40	-	40	-	
-	-	50	50	-	-	50	50	-	50	-	50	
-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	20	20	-	-	20	-	20	-	
-	-	-	-	25	25	-	-	25	-	25	-	
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	
40	40	-	-	40	40	-	-	40	-	40	-	
-	-	50	50	-	-	50	50	-	50	-	50	
-	-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	50	50	-	-	50	-	50	-	
-	-	-	-	63	63	-	-	63	-	63	-	
-	-	-	-	80	80	-	-	80	-	80	-	
100	100	-	-	100	100	-	-	100	-	100	-	
-	-	125	125	-	-	125	125	-	125	-	125	
•	•	•	•	•	•	•	•	•	•	•	•	
33 ... 60												
10 ... 15												
43 ... 75												
30 ... 60												
691	691	691	691	691	691	691	691	691	691	730	742	
653	853	881	853	653	853	681	853	691	853	853	853	
641	642	643	643	642	642	643	643	640	643	640	643	
210	275	210	275	210	275	210	275	275	275	275	275	
174	176	180	193	160	166	190	205	186	225	221	240	
-	-	-	-	7415(*)	7416(*)	-	-	7417(*)	-	-	-	
003284(*)	003286(*)	003444	003445	-	-	003444	003445	-	003446	000153(*)	003447	
- 5 ... + 40												
•												
•												

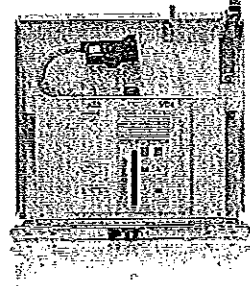
Handwritten mark

ВАЖНО С ОРИГИНАЛОМ

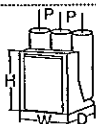


2. Selection and ordering Withdrawable circuit-breakers

Withdrawable version circuit-breakers
for UniGear ZS1 switchgear (17.5 kV) (4)



Circuit-breaker		VD4/P 17							
Standards	IEC 62271-100	•							
Rated voltage	Ur [kV]	17,5							
Rated insulation voltage	Us [kV]	17,5							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38							
Impulse withstand voltage	Up [kV]	95							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C) (1)	Ir [A]	630	1250	1250	1250	1250	1600	1600	
		16	16	—	—	—	—	—	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	—	—	—	20	20	
		25	25	—	—	—	25	25	
		31,5	31,5	—	—	—	31,5	31,5	
		—	—	40	40	—	—	—	
		—	—	—	—	50	—	—	
Rated short-time withstand current (3s)	Ik [kA]	16	16	—	—	—	—	—	
		20	20	—	—	—	20	20	
		25	25	—	—	—	25	25	
		31,5	31,5	—	—	—	31,5	31,5	
		—	—	40	40	—	—	—	
Making capacity	Ip [kA]	40	40	—	—	—	—	—	
		50	50	—	—	—	50	50	
		63	63	—	—	—	63	63	
		80	80	—	—	—	80	80	
		—	—	100	100	—	—	—	
Operation sequence	[O - 0,3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	
Opening time	[ms]	33 ... 60							
Arcing time	[ms]	10 ... 15							
Total breaking time	[ms]	43 ... 75							
Closing time	[ms]	30 ... 60							
		H [mm]	632	632	691	691	691	691	
Maximum overall dimensions	W [mm]	503	503	653	853	881	653	853	
	D [mm]	664	664	641	642	643	642	642	
Weight	[kg]	Pole distance P [mm]	150	150	210	275	210	210	275
		TN	7412(2)	7412(2)	—	—	—	7415(2)	7416(2)
Standardised table of dimensions	1VCD	—	—	003284(2)	003286(2)	003444	—	—	
Operating temperature	[°C]	- 5 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	•							
Electromagnetic compatibility	IEC: 62271-1	•							



(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.

(2) Up to 4000 A with forced ventilation.

(3) Poles in polyamide

(4) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

ВЯРНО С ОРИГИНАЛ



Handwritten mark resembling a stylized 'K' or 'W' in the top right corner.

•												
17,5												
17,5												
38												
95												
50-60												
1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	3150 ^(*)	3150 ^(*)	
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	20	20	—	—	20	—	—	20	—
—	—	—	—	25	25	—	—	25	—	—	25	—
—	—	—	—	31,5	31,5	—	—	31,5	—	—	31,5	—
40	40	—	—	40	40	—	—	40	—	—	40	—
—	—	50	50	—	—	50	50	—	50	—	—	50
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	20	20	—	—	20	—	—	20	—
—	—	—	—	25	25	—	—	25	—	—	25	—
—	—	—	—	31,5	31,5	—	—	31,5	—	—	31,5	—
40	40	—	—	40	40	—	—	40	—	—	40	—
—	—	50	50	—	—	50	50	—	50	—	—	50
—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	50	50	—	—	50	—	—	50	—
—	—	—	—	63	63	—	—	63	—	—	63	—
—	—	—	—	80	80	—	—	80	—	—	80	—
100	100	—	—	100	100	—	—	100	—	—	100	—
—	—	125	125	—	—	125	125	—	125	—	—	125
•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60												
10 ... 15												
43 ... 75												
30 ... 60												
691	691	691	691	691	691	691	691	691	691	730	742	
653	853	681	853	653	853	681	853	853	853	853	853	853
641	642	643	643	642	642	643	643	640	643	640	643	643
210	275	210	275	210	275	210	275	275	275	275	275	275
174	176	180	193	160	166	190	205	186	225	221	240	240
—	—	—	—	7415 ^(*)	7416 ^(*)	—	—	7417 ^(*)	—	—	—	—
003284 ^(*)	003286 ^(*)	003444	003445	—	—	003444	003445	—	003446	000153 ^(*)	003447	003447
- 5 ... + 40												
•												
•												

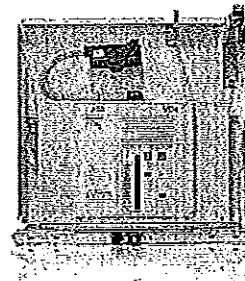
ВЯРНО С ОРИГИНАЛ



Handwritten mark resembling a stylized 'W' or 'M' in the bottom left corner.

2. Selection and ordering Withdrawable circuit-breakers

Withdrawable version circuit-breakers
for UniGear ZS1 switchgear (24 kV) ⁽⁵⁾



Circuit-breaker		VD4/P 24							
Standards	IEC 62271-100 •								
Rated voltage	Ur [kV]	24							
Rated insulation voltage	Us [kV]	24							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50							
Impulse withstand voltage	Up [kV]	125							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	630	1250	1250	1600	2000	2500 ⁽²⁾	3150 ⁽³⁾
		16	16	16	16	16	16	16	–
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	20	–
		25	25	25	25	25	25	25	–
		–	–	31,5	31,5	31,5	31,5	31,5	31,5
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	16	16	16	–
		20	20	20	20	20	20	20	–
		25	25	25	25	25	25	25	–
		–	–	31,5	31,5	31,5	31,5	31,5	
Making capacity	Ip [kA]	40	40	40	40	40	40	40	–
		50	50	50	50	50	50	50	–
		63	63	63	63	63	63	63	–
		–	–	80	80	80	80	80	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•
Opening time	[ms]	33 ... 60							
Arcing time	[ms]	10 ... 15							
Total breaking time	[ms]	43 ... 75							
Closing time	[ms]	30 ... 60							
Maximum overall dimensions	H [mm]	794	794	794	794	838	838	838	838
	W [mm]	653	853	653	853	853	853	853	853
	D [mm]	802	802	802	802	790	790	790	790
	Pole distance P [mm]	210	275	210	275	275	275	275	275
Weight	[kg]	140	148	140/146 ⁽⁴⁾	148	228	228	228	277
Standardised table of dimensions	TN	7413	7414	7413	7414	7418	7418	7418	–
	1VCD	–	–	000173 ⁽⁴⁾	000174 ⁽⁴⁾	–	–	–	000177
Operating temperature	[°C]	– 5 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	•							
Electromagnetic compatibility	IEC: 62271-1	•							

(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.

(2) 2300 A rated current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.

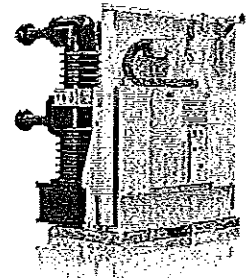
(3) 2700 A rated current guaranteed with natural ventilation; 3150 A rated current guaranteed with forced ventilation.

(4) 31.5 kA version.

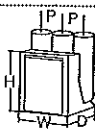
(5) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

Handwritten mark

General characteristics of withdrawable circuit-breakers for UniGear ZS2 and PowerCube modules (36 kV)



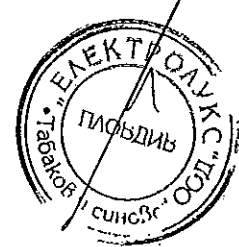
Circuit-breaker	VD4/W 36			
Standards	IEC 62271-100 •			
Rated voltage	Ur [kV]	36		
Rated insulation voltage	Us [kV]	36		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	70		
Impulse withstand voltage	Up [kV]	170		
Rated frequency	fr [Hz]	50		
Rated normal current (40 °C)	Ir [A]	1250	1600	2000
		2500 (1)		
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20
		25	25	25
		31.5	31.5	31.5
Rated short-time withstand current (3s)	Ik [kA]	20	20	20
		25	25	25
		31.5	31.5	31.5
Making capacity	Ip [kA]	50	50	50
		63	63	63
		80	80	80
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•		
Opening time	[ms]	33 ... 60		
Arcing time	[ms]	10 ... 15		
Total breaking time	[ms]	45 ... 75		
Closing time	[ms]	30 ... 60		
Maximum overall dimensions	H [mm]	973	973	973
	W [mm]	842	842	842
	D [mm]	788	788	788
	Pole distance P [mm]	275	275	275
Weight	[kg]	230	230	230
Standardised table of dimensions	TN	1VYN300901-KG	1VYN300901-KG	1VYN300901-KG
Operating temperature	[°C]	- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1 •			
Electromagnetic compatibility	IEC: 62271-1 •			



(1) Up to 2500 A with forced ventilation.

Handwritten mark

ВЕРНО С ОРИГИНАЛА!



Handwritten mark

2. Selection and ordering Withdrawable circuit-breakers

Types of withdrawable version circuit-breakers available for UniGear ZS1 switchgear
Complete the circuit-breaker selected with the optional accessories indicated on the following pages.

VD4 (12 kV) withdrawable circuit-breaker

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650	W=800	W=1000	W=1000	W=1000	
kV	kA	P=150	P=210	P=275	P=275	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=79	ø=79	ø=109	ø=109	
12	16	630					VD4/P 12.06.16 p150
	20	630					VD4/P 12.06.20 p150
	25	630					VD4/P 12.06.25 p150
	31.5	630					VD4/P 12.06.32 p150
	16	1250					VD4/P 12.12.16 p150
	20	1250					VD4/P 12.12.20 p150
	25	1250					VD4/P 12.12.25 p150
	31.5	1250					VD4/P 12.12.32 p150
	40		1250				VD4/P 12.12.40 p210
	50		1250				VD4/P 12.12.50 p210
	20		1600				VD4/P 12.16.20 p210
	25		1600				VD4/P 12.16.25 p210
31.5		1600				VD4/P 12.16.32 p210	
40		1600				VD4/P 12.16.40 p210	
50		1600				VD4/P 12.16.50 p210	
20		2000				VD4/P 12.20.20 p210	
25		2000				VD4/P 12.20.25 p210	
31.5		2000				VD4/P 12.20.32 p210	
40		2000				VD4/P 12.20.40 p210	
50		2000				VD4/P 12.20.50 p210	
40			1250			VD4/P 12.12.40 p275	
20			1600			VD4/P 12.16.20 p275	
25			1600			VD4/P 12.16.25 p275	
31.5			1600			VD4/P 12.16.32 p275	
40			1600			VD4/P 12.16.40 p275	
50			1600			VD4/P 12.16.50 p275	
20			2000			VD4/P 12.20.20 p275	
25			2000			VD4/P 12.20.25 p275	
31.5			2000			VD4/P 12.20.32 p275	
40			2000			VD4/P 12.20.40 p275	
50			2000			VD4/P 12.20.50 p275	

W = Switchboard width.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

ВЕРНО С ОРИГИНАЛОМ



30

Handwritten mark: *h*

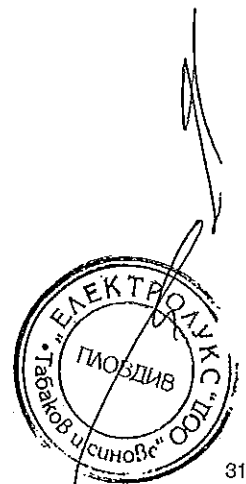
VD4 (12 kV) withdrawable circuit-breaker

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650	W=800	W=1000	W=1000	W=1000	
kV	kA	P=150	P=210	P=275	P=275	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=79	ø=79	ø=109	ø=109	
12	20				2500		VD4/P 12.25.20 p275
	25				2500		VD4/P 12.25.25 p275
	31,5				2500		VD4/P 12.25.32 p275
	40				2500		VD4/P 12.25.40 p275
	50				2500		VD4/P 12.25.50 p275
	20					3150 ⁽¹⁾	VD4/P 12.32.20 p275
	25					3150 ⁽¹⁾	VD4/P 12.32.25 p275
	31,5					3150 ⁽¹⁾	VD4/P 12.32.32 p275
	40					3150 ⁽¹⁾	VD4/P 12.32.40 p275
	50					3150 ⁽¹⁾	VD4/P 12.32.50 p275

W = Switchboard width.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 (1) Up to 4000 A with forced ventilation.

Handwritten mark: *ms*

ВЯРНО С ОРИГИНАЛА



2. Selection and ordering Withdrawable circuit-breakers

VD4 (17.5 kV) withdrawable circuit-breaker for UniGear ZS1 switchboard

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650	W=800	W=1000	W=1000	W=1000	
kV	kA	P=150	P=210	P=275	P=275	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=79	ø=79	ø=109	ø=109	
17.5	16	630					VD4/P 17.06.16 p150
	20	630					VD4/P 17.06.20 p150
	25	630					VD4/P 17.06.25 p150
	31.5	630					VD4/P 17.06.32 p150
	16	1250					VD4/P 17.12.16 p150
	20	1250					VD4/P 17.12.20 p150
	25	1250					VD4/P 17.12.25 p150
	31.5	1250					VD4/P 17.12.32 p150
	40		1250				VD4/P 17.12.40 p210
	50		1250				VD4/P 17.12.50 p210
	20		1600				VD4/P 17.16.20 p210
	25		1600				VD4/P 17.16.25 p210
	31.5		1600				VD4/P 17.16.32 p210
	40		1600				VD4/P 17.16.40 p210
	50		1600				VD4/P 17.16.50 p210
	20		2000				VD4/P 17.20.20 p210
	25		2000				VD4/P 17.20.25 p210
	31.5		2000				VD4/P 17.20.32 p210
	40		2000				VD4/P 17.20.40 p210
	50		2000				VD4/P 17.20.50 p210
	40			1250			VD4/P 17.12.40 p275
	20			1600			VD4/P 17.16.20 p275
	25			1600			VD4/P 17.16.25 p275
	31.5			1600			VD4/P 17.16.32 p275
	40			1600			VD4/P 17.16.40 p275
	50			1600			VD4/P 17.16.50 p275
	20			2000			VD4/P 17.20.20 p275
	25			2000			VD4/P 17.20.25 p275
	31.5			2000			VD4/P 17.20.32 p275
	40			2000			VD4/P 17.20.40 p275
	50			2000			VD4/P 17.20.50 p275

W = Switchboard width.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

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ВЯРНО С ОРИГИНАЛА!



Handwritten mark

VD4 (17.5 kV) withdrawable circuit-breaker for UniGear ZS1 switchboard

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650 P=150 u/l=205 ø=35	W=800 P=210 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=109	W=1000 P=275 u/l=310 ø=109	
17.5	20				2500		VD4/P 17.25.20 p275
	25				2500		VD4/P 17.25.25 p275
	31.5				2500		VD4/P 17.25.32 p275
	40				2500		VD4/P 17.25.40 p275
	50				2500		VD4/P 17.25.50 p275
	20					3150 ⁽¹⁾	VD4/P 17.32.20 p275
	25					3150 ⁽¹⁾	VD4/P 17.32.25 p275
	31.5					3150 ⁽¹⁾	VD4/P 17.32.32 p275
	40					3150 ⁽¹⁾	VD4/P 17.32.40 p275
	50					3150 ⁽¹⁾	VD4/P 17.32.50 p275

W = Switchboard width.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the Isolating contact.
 (1) Up to 4000 A with forced ventilation.

Handwritten mark

Handwritten mark

ВЯРНО С ОРИГИНАЛА



2. Selection and ordering Withdrawable circuit-breakers

VD4 (24 kV) withdrawable circuit-breaker for UniGear ZS1 switchboard

Ur	Isc	Rated uninterrupted current (40 °C) [A]				Circuit-breaker type
		W=800	W=1000	W=1000	W=1000	
kV	kA	P=210	P=275	P=275	P=275	
		u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=35	ø=79	ø=109	
24	16	630				VD4/P 24.06.16 p210
	20	630				VD4/P 24.06.20 p210
	25	630				VD4/P 24.06.25 p210
	16	1250				VD4/P 24.12.16 p210
	20	1250				VD4/P 24.12.20 p210
	25	1250				VD4/P 24.12.25 p210
	31.5	1250				VD4/P 24.12.32 p210
	16		630			VD4/P 24.06.16 p275
	20		630			VD4/P 24.06.20 p275
	25		630			VD4/P 24.06.25 p275
	16		1250			VD4/P 24.12.16 p275
	20		1250			VD4/P 24.12.20 p275
	25		1250			VD4/P 24.12.25 p275
	31.5		1250			VD4/P 24.12.32 p275
	16			1600		VD4/P 24.16.16 p275
	20			1600		VD4/P 24.16.20 p275
	25			1600		VD4/P 24.16.25 p275
	31.5			1600		VD4/P 24.16.32 p275
	16			2000		VD4/P 24.20.16 p275
	20			2000		VD4/P 24.20.20 p275
	25			2000		VD4/P 24.20.25 p275
	31.5			2000		VD4/P 24.20.32 p275
	16			2300 ⁽¹⁾		VD4/P 24.25.16 p275
	20			2300 ⁽¹⁾		VD4/P 24.25.20 p275
25			2300 ⁽¹⁾		VD4/P 24.25.25 p275	
31.5			2300 ⁽¹⁾		VD4/P 24.25.32 p275	
31.5				2700 ⁽²⁾	VD4/P 24.32.32 p275	

W = Switchboard width.

P = Pole horizontal centre distance.

u/l = Distance between bottom and top terminal.

ø = Diameter of the Isolating contact.

(1) 2500 A rated current guaranteed with forced ventilation.

(2) 3150 A rated current guaranteed with forced ventilation.

ВЯРНО С ОРИГИНАЛОМ!



34

VD4 (36 kV) withdrawable circuit-breaker

Ur	Isc	Rated uninterrupted current (40 °C) [A]			Circuit-breaker type
kV	kA	H = 951			
		D = 788			
		W = 778			
		u/l = 380			
		ø = 399			
		P = 275			
36	20	1250 A			VD4/W 36.12.20 p275
	25	1250 A			VD4/W 36.12.25 p275
	31.5	1250 A			VD4/W 36.12.32 p275
	20		1600 A		VD4/W 36.16.20 p275
	25		1600 A		VD4/W 36.16.25 p275
	31.5		1600 A		VD4/W 36.16.32 p275
	20			2000 A	VD4/W 36.20.20 p275
	25			2000 A	VD4/W 36.20.25 p275
	31.5			2000 A	VD4/W 36.20.32 p275
	20			2500 A (1)	VD4/W 36.25.20 p275
	25			2500 A (1)	VD4/W 36.25.25 p275
	31.5			2500 A (1)	VD4/W 36.25.32 p275

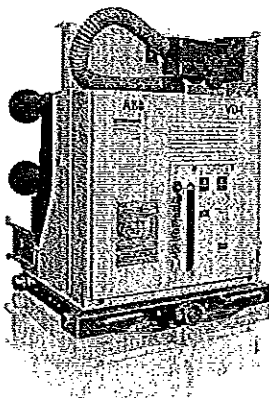
H = Height of the circuit-breaker.
 D = Depth of the circuit-breaker.
 W = Width of the circuit-breaker.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 P = Pole horizontal centre distance.
 (1) 2500 A rated current guaranteed with forced ventilation

Standard fittings of withdrawable circuit-breakers for UniGear ZS1, ZS2 switchgear and similar panels

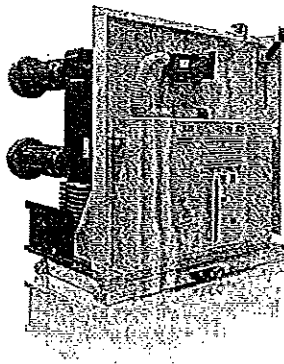
The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten circuit-breaker open/closed auxiliary contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed) are available.

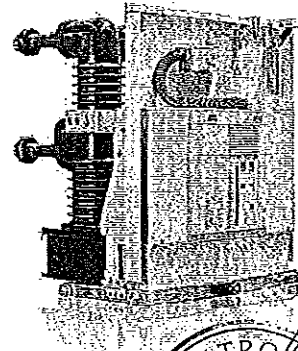
- lever built into operating mechanism for linear loading of closing spring
- isolating contacts
- cord with connector (plug only) for auxiliary circuits, with striker pins which does not allow the plug to be inserted into the socket if the rated current of the circuit-breaker is lower than the rated current of the panel
- racking-out/in lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck (compulsory for ABB switchgear). This device prevents racking the circuit-breaker into the switchgear with the auxiliary circuits disconnected (plug not inserted in the socket)
- door interlock (compulsory for ABB switchgear); this device prevents racking the circuit-breaker into the switchgear when the switchgear door is open.



VD4 with poles in polyamide



VD4 - up to 24 kV



VD4 - 36 kV

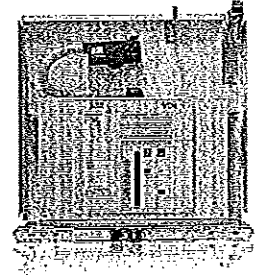
ВЯРНО С ОРИГИНАЛА

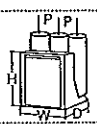


2. Selection and ordering Withdrawable circuit-breakers

M

Withdrawable version circuit-breakers
for PowerCube modules (12 kV) ⁽⁵⁾



Circuit-breaker	VD4/P 12		VD4/W 12 ⁽⁵⁾		
	PowerCube module	PB1	PB2		
Standards	IEC 62271-100	•	•		
Rated voltage	Ur [kV]	12 ⁽⁴⁾	12 ⁽⁴⁾		
Rated insulation voltage	Us [kV]	12	12		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28	28		
Impulse withstand voltage	Up [kV]	75	75		
Rated frequency	fr [Hz]	50-60	50-60		
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	630	1250
		16	16	16	16
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20
		25	25	25	25
		31.5	31.5	31.5	31.5
		—	—	—	—
		—	—	—	—
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16
		20	20	20	20
		25	25	25	25
		31.5	31.5	31.5	31.5
		—	—	—	—
Making capacity	Ip [kA]	40	40	40	40
		50	50	50	50
		63	63	63	63
		80	80	80	80
		—	—	—	—
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•		
Opening time	[ms]	33 ... 60	33 ... 60		
Arcing time	[ms]	10 ... 15	10 ... 15		
Total breaking time	[ms]	43 ... 75	43 ... 75		
Closing time	[ms]	30 ... 60	30 ... 60		
Maximum overall dimensions		H [mm]	628	628	691
		W [mm]	503	503	653
		D [mm]	662	662	642
		Pole distance P [mm]	150	150	210
Weight	[kg]	TN	116	116	135
		TN	7412 ⁽²⁾	7412 ⁽²⁾	7420 ⁽²⁾
Standardised table of dimensions	1VCD	—	—	—	
Operating temperature	[°C]	- 5 ... + 40		- 5 ... + 40	
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•		
Electromagnetic compatibility	IEC: 62271-1	•	•		

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature

(2) Up to 4000 A with forced ventilation.

(3) Poles in polyamide

(4) Available in 10 kV voltage version in accordance with GOST standards

(5) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

(6) VD4/W does not need insulation for the feed-through and tuft contacts in module PB2. On request, the same circuit-breaker with insulated feed-through and tuft contacts is available for installation in enclosures not produced by ABB (version VD4/PW).

ВЯРНО С ОРИГИНАЛО!



Handwritten mark resembling a stylized 'W' or 'V' in the top right corner.

VD4/P 12							VD4/W 12			
PB2							PB3		PB3	
•							•		•	
12 (*)							12 (*)		12 (*)	
12							12		12	
28							28		28	
75							75		75	
50-60							50-60		50-60	
1250	1250	1600	1600	1600	2000	2000	2500	2500	3150 ^м	3150 ^м
-	-	-	-	-	-	-	-	-	-	-
-	-	20	-	-	20	-	20	-	20	-
-	-	25	-	-	25	-	25	-	25	-
-	-	31.5	-	-	31.5	-	31.5	-	31.5	-
40	-	-	40	-	40	-	40	-	40	-
-	50	-	-	50	-	50	-	50	-	50
-	-	-	-	-	-	-	-	-	-	-
-	-	20	-	-	20	-	20	-	20	-
-	-	25	-	-	25	-	25	-	25	-
-	-	31.5	-	-	31.5	-	31.5	-	31.5	-
40	-	-	40	-	40	-	40	-	40	-
-	60	-	-	50	-	50	-	50	-	50
-	-	-	-	-	-	-	-	-	-	-
-	-	50	-	-	50	-	50	-	50	-
-	-	63	-	-	63	-	63	-	63	-
-	-	80	-	-	80	-	80	-	80	-
100	-	-	100	-	100	-	100	-	100	-
-	125	-	-	125	-	125	-	125	-	125
•							•		•	
33 ... 60							33 ... 60		33 ... 60	
10 ... 15							10 ... 15		10 ... 15	
43 ... 75							43 ... 75		43 ... 75	
30 ... 60							30 ... 60		30 ... 60	
691	691	691	691	691	690	691	691	691	730	691
653	681	653	653	681	653	681	853	853	853	853
641	643	642	641	643	642	643	640	643	640	643
210	210	210	210	210	210	210	275	275	275	275
174	180	160	174	180	160	190	185	225	221	245
-	-	7415 (*)	-	-	7415 (*)	-	7417 (*)	-	-	-
003284 (*)	003444	-	003284 (*)	003444	-	003444	-	003445	000162 (*)	003586
- 5 ... + 40							- 5 ... + 40		- 5 ... + 40	
•							•		•	
•							•		•	

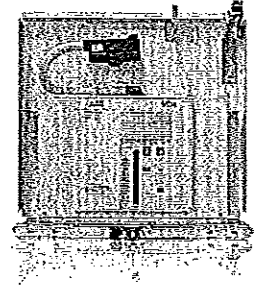
ВЯРНО С ОРИГИНАЛОМ

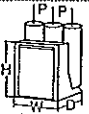


Handwritten mark resembling a stylized 'W' or 'V' in the bottom left corner.

2. Selection and ordering Withdrawable circuit-breakers

Withdrawable version circuit-breakers
for PowerCube modules (17.5 kV) ⁽⁴⁾



Circuit-breaker	VD4/P 17		VD4/W 17 ⁽⁵⁾			
	PowerCube module	PB1	PB2			
Standards	IEC 62271-100	•	•			
Rated voltage	Ur [kV]	17,5	17,5			
Rated insulation voltage	Us [kV]	17,5	17,5			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38	38			
Impulse withstand voltage	Up [kV]	95	95			
Rated frequency	fr [Hz]	50-60	50-60			
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	630	1250	
		16	16	16	16	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	
		25	25	25	25	
		31,5	31,5	31,5	31,5	
		—	—	—	—	
		—	—	—	—	
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	
		20	20	20	20	
		25	25	25	25	
		31,5	31,5	31,5	31,5	
		—	—	—	—	
Making capacity	Ip [kA]	40	40	40	40	
		50	50	50	50	
		63	63	63	63	
		80	80	80	80	
		—	—	—	—	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•			
Opening time	[ms]	33 ... 60	33 ... 60			
Arcing time	[ms]	10 ... 15	10 ... 15			
Total breaking time	[ms]	43 ... 75	43 ... 75			
Closing time	[ms]	30 ... 60	30 ... 60			
Maximum overall dimensions		H [mm]	628	628	691	691
		w [mm]	503	503	653	653
		D [mm]	662	662	642	642
		Pole distance P [mm]	150	150	210	210
Weight	[kg]	116	116	135	135	
Standardised table of dimensions	TN	7412 ⁽²⁾	7412 ⁽²⁾	7420 ⁽²⁾	7420 ⁽²⁾	
	1VCD	—	—	—	—	
Operating temperature	[°C]	- 5 ... + 40	- 5 ... + 40			
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•			
Electromagnetic compatibility	IEC: 62271-1	•	•			

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.

(2) Up to 4000 A with forced ventilation.

(3) Poles in polyamide.

(4) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism

(instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

(5) VD4/W does not need insulation for the feed-through and tulip contacts in module PB2. On request, the same circuit-breaker with insulated feed-through and tulip contacts is available for installation in enclosures not produced by ABB (version VD4/PW).

ВЕРНО С ОРИГИНАЛОМ



Handwritten mark resembling the number '14'.

VD4/P 17							VD4/W 17				
PB2							PB3		PB3		
•							•		•		
17,5							17,5		17,5		
17,5							17,5		17,5		
38							38		38		
95							95		95		
50-60							50-60		50-60		
1250	1250	1600	1600	1600	2000	2000	2500	2500	3150 ⁽²⁾	3150 ⁽²⁾	
--	--	--	--	--	--	--	--	--	--	--	
--	--	20	--	--	20	--	20	--	20	--	
--	--	25	--	--	25	--	25	--	25	--	
--	--	31,5	--	--	31,5	--	31,5	--	31,5	--	
40	--	--	40	--	40	--	40	--	40	--	
--	50	--	--	50	--	50	--	50	--	50	
--	--	--	--	--	--	--	--	--	--	--	
--	--	20	--	--	20	--	20	--	20	--	
--	--	25	--	--	25	--	25	--	25	--	
--	--	31,5	--	--	31,5	--	31,5	--	31,5	--	
40	--	--	40	--	40	--	40	--	40	--	
--	50	--	--	50	--	50	--	50	--	50	
--	--	--	--	--	--	--	--	--	--	--	
--	--	50	--	--	50	--	50	--	50	--	
--	--	63	--	--	63	--	63	--	63	--	
--	--	80	--	--	80	--	80	--	80	--	
100	--	--	100	--	100	--	100	--	100	--	
--	125	--	--	125	--	125	--	125	--	125	
•							•		•		
33 ... 60							33 ... 60		33 ... 60		
10 ... 15							10 ... 15		10 ... 15		
43 ... 75							43 ... 75		43 ... 75		
30 ... 60							30 ... 60		30 ... 60		
691	691	691	691	691	690	691	691	691	730	691	
653	681	653	653	681	653	681	853	853	853	853	
641	643	642	641	643	642	643	640	643	640	643	
210	210	210	210	210	210	210	275	275	275	275	
174	180	160	174	180	160	180	186	225	221	240	
--	--	7415 ⁽²⁾	--	--	7415 ⁽²⁾	--	7417 ⁽²⁾	--	--	--	
003284 ⁽²⁾	003444	--	003284 ⁽²⁾	003444	--	003444	--	003445	000152 ⁽²⁾	003598	
- 5 ... + 40							- 5 ... + 40		- 5 ... + 40		
•							•		•		
•							•		•		

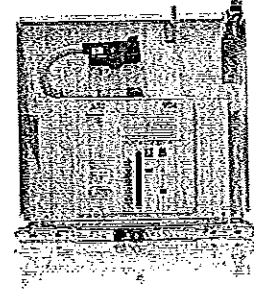
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ВЯРНО С ОРИГИНАЛА



2. Selection and ordering Withdrawable circuit-breakers

Withdrawable version circuit-breakers
for PowerCube modules (24 kV) ⁽⁴⁾



Circuit-breaker	VD4/P 24					
	PowerCube module	PB4		PB5		
Standards	IEC 62271-100	•		•		
Rated voltage	Ur [kV]	24		24		
Rated insulation voltage	Us [kV]	24		24		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50		50		
Impulse withstand voltage	Up [kV]	125		125		
Rated frequency	fr [Hz]	50-60		50-60		
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	1600	2000	2500 ⁽²⁾
		16	16	16	16	16
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20
		25	25	25	25	25
		–	31,5	31,5	31,5	31,5
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	16
		20	20	20	20	20
		25	25	25	25	25
Making capacity	Ip [kA]	–	31,5	31,5	31,5	31,5
		40	40	40	40	40
		50	50	50	50	50
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•
		•	•	•	•	•
Opening time	[ms]	33 ... 60		33 ... 60		
Arcing time	[ms]	10 ... 15		10 ... 15		
Total breaking time	[ms]	43 ... 75		43 ... 75		
Closing time	[ms]	30 ... 60		30 ... 60		
Maximum overall dimensions		H [mm]	794	794	838	838
		W [mm]	653	653	853	853
		D [mm]	802	802	790	790
		Pole distance P [mm]	210	210	275	275
Weight	[kg]	140	140/146 ⁽³⁾	228	228	
Standardised table of dimensions	TN	7413	7413	7418	7418	
	1VCD	–	000173 ⁽³⁾	–	–	
Operating temperature	[°C]	– 5 ... + 40				
Tropicalization	IEC: 60068-2-30, 60721-2-1	•				
Electromagnetic compatibility	IEC: 62271-1	•				

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.
 (2) 2300 A rated uninterrupted current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.
 (3) 31.5 kA version.
 (4) On request, the closing spring can be loaded by means of a removable crank handle outside operating mechanism (instead of linear loading, only possible with the door open, by means of a lever built into the front of the operating mechanism).

ВАРНО С ОРИГИНАЛА!



40

Types of withdrawable version circuit-breakers available for PowerCube modules
 Complete the circuit-breaker selected with the optional accessories indicated on the following pages.

VD4 withdrawable circuit-breaker (12 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]				Circuit-breaker type
		W=650 P=150 u/l=205 ø=35	W=750 P=210 u/l=310 ø=35	W=750 P=210 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=109	
12	16	630				VD4/P 12.06.16 p150
	20	630				VD4/P 12.06.20 p150
	25	630				VD4/P 12.06.25 p150
	31.5	630				VD4/P 12.06.32 p150
	16	1250				VD4/P 12.12.16 p150
	20	1250				VD4/P 12.12.20 p150
	25	1250				VD4/P 12.12.25 p150
	31.5	1250				VD4/P 12.12.32 p150
	16		630			VD4/W 12.06.16 p210
	20		630			VD4/W 12.06.20 p210
	25		630			VD4/W 12.06.25 p210
	31.5		630			VD4/W 12.06.32 p210
	16		1250			VD4/W 12.12.16 p210
	20		1250			VD4/W 12.12.20 p210
	25		1250			VD4/W 12.12.25 p210
	31.5		1250			VD4/W 12.12.32 p210
	40			1250		VD4/P 12.12.40 p210
	50			1250		VD4/P 12.12.50 p210
	20			1600		VD4/P 12.16.20 p210
	25			1600		VD4/P 12.16.25 p210
	31.5			1600		VD4/P 12.16.32 p210
	40			1600		VD4/P 12.16.40 p210
	50			1600		VD4/P 12.16.50 p210
	20			2000		VD4/P 12.20.20 p210
	25			2000		VD4/P 12.20.25 p210
	31.5			2000		VD4/P 12.20.32 p210
	40			2000		VD4/P 12.20.40 p210
	50			2000		VD4/P 12.20.50 p210
	20				2500	VD4/P 12.25.20 p275
	25				2500	VD4/P 12.25.25 p275
31.5				2500	VD4/P 12.25.32 p275	
40				2500	VD4/P 12.25.40 p275	
50				2500	VD4/P 12.25.50 p275	
20				3150 ⁽¹⁾	VD4/W 12.32.20 p275	
25				3150 ⁽¹⁾	VD4/W 12.32.25 p275	
31.5				3150 ⁽¹⁾	VD4/W 12.32.32 p275	
40				3150 ⁽¹⁾	VD4/W 12.32.40 p275	
50				3150 ⁽¹⁾	VD4/W 12.32.50 p275	

W = Enclosure width,
 P = Pole horizontal centre distance,
 u/l = Distance between bottom and top terminal,
 ø = Diameter of the Isolating contact.
 (1) Up to 4000 A with forced ventilation.

ВЯРНО С ОРИГИНАЛА!



2. Selection and ordering Withdrawable circuit-breakers

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VD4 withdrawable circuit-breaker (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]				Circuit-breaker type
		W=650	W=750	W=750	W=1000	
kV	kA	P=150	P=210	P=210	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	
		ø=35	ø=35	ø=79	ø=109	
17.5	16	630				VD4/P 17.06.16 p150
	20	630				VD4/P 17.06.20 p150
	25	630				VD4/P 17.06.25 p150
	31.5	630				VD4/P 17.06.32 p150
	16	1250				VD4/P 17.12.16 p150
	20	1250				VD4/P 17.12.20 p150
	25	1250				VD4/P 17.12.25 p150
	31.5	1250				VD4/P 17.12.32 p150
	16		630			VD4/W 17.06.16 p210
	20		630			VD4/W 17.06.20 p210
	25		630			VD4/W 17.06.25 p210
	31.5		630			VD4/W 17.06.32 p210
	16		1250			VD4/W 17.12.16 p210
	20		1250			VD4/W 17.12.20 p210
	25		1250			VD4/W 17.12.25 p210
	31.5		1250			VD4/W 17.12.32 p210
	40			1250		VD4/P 17.12.40 p210
	50			1250		VD4/P 17.12.50 p210
	20			1600		VD4/P 17.16.20 p210
	25			1600		VD4/P 17.16.25 p210
	31.5			1600		VD4/P 17.16.32 p210
	40			1600		VD4/P 17.16.40 p210
	50			1600		VD4/P 17.16.50 p210
	20			2000		VD4/P 17.20.20 p210
	25			2000		VD4/P 17.20.25 p210
	31.5			2000		VD4/P 17.20.32 p210
	40			2000		VD4/P 17.20.40 p210
	50			2000		VD4/P 17.20.50 p210
	20				2500	VD4/P 17.25.20 p275
	25				2500	VD4/P 17.25.25 p275
	31.5				2500	VD4/P 17.25.32 p275
	40				2500	VD4/P 17.25.40 p275
	50				2500	VD4/P 17.25.50 p275
	20				3150 (1)	VD4/W 17.32.20 p275
	25				3150 (1)	VD4/W 17.32.25 p275
	31.5				3150 (1)	VD4/W 17.32.32 p275
	40				3150 (1)	VD4/W 17.32.40 p275
	50				3150 (1)	VD4/W 17.32.50 p275

W = Enclosure width.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.
(1) Up to 4000 A with forced ventilation.

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ВЯРНО С ОРИГИНАЛА!



42 *Handwritten mark*

VD4 withdrawable circuit-breaker (24 kV)

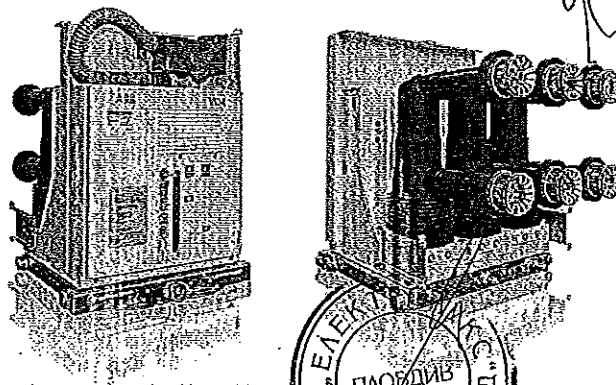
Ur	Isc	Rated uninterrupted current (40 °C) [A]		Circuit-breaker type
		W=800	W=1000	
kV	kA	P=210	P=275	
		u/l=310	u/l=310	
		ø=35	ø=79	
24	16	630		VD4/P 24.06.16 p210
	20	630		VD4/P 24.06.20 p210
	25	630		VD4/P 24.06.25 p210
	16	1250		VD4/P 24.12.16 p210
	20	1250		VD4/P 24.12.20 p210
	25	1250		VD4/P 24.12.25 p210
	31.5	1250		VD4/P 24.12.32 p210
	16		1600	VD4/P 24.16.16 p275
	20		1600	VD4/P 24.16.20 p275
	25		1600	VD4/P 24.16.25 p275
	31.5		1600	VD4/P 24.16.32 p275
	16		2000	VD4/P 24.20.16 p275
	20		2000	VD4/P 24.20.20 p275
	25		2000	VD4/P 24.20.25 p275
	31.5		2000	VD4/P 24.20.32 p275
	16		2300 ⁽¹⁾	VD4/P 24.25.16 p275
	20		2300 ⁽¹⁾	VD4/P 24.25.20 p275
	25		2300 ⁽¹⁾	VD4/P 24.25.25 p275
	31.5		2300 ⁽¹⁾	VD4/P 24.25.32 p275

W = Enclosure width.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 (1) Up to 2500 A rated current guaranteed with forced ventilation.

Standard fittings of withdrawable circuit-breakers for PowerCube modules

- The basic versions of the withdrawable circuit-breakers are always three-pole and fitted with:
- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten circuit-breaker open/closed auxiliary contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed) are available.
- lever built into operating mechanism for linear loading of closing spring
 - Isolating contacts
 - cord with connector (plug only) for auxiliary circuits, with striker pin which does not allow the plug to be inserted into the socket if the rated current of the circuit-breaker is different from the rated current of the panel

- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck. This prevents the circuit-breaker being racked into the panel with the auxiliary circuits disconnected (plug not inserted in the socket).
- door interlock (compulsory for ABB switchgear); this device prevents racking the circuit-breaker into the switchgear when the switchgear door is open.

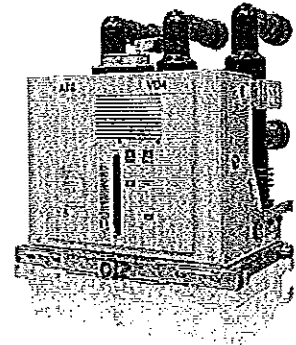


VD4 with poles in polyamide

ВЯРНО С ОПРИГНАЛА

2. Selection and ordering Withdrawable circuit-breakers

Withdrawable circuit-breakers for ZS8:4
type switchgear (12 - 17.5 - 24 kV)



Circuit-breaker		VD4/Z8					
	Panel without partitions	•					
	Panel with partitions	—					
	Preussen Elektra - EON ⁽²⁾	—					
	Width [mm]	650	650	650	650	800	800
	Depth [mm]	1000	1000	1000	1000	1200	1200
Standards		IEC 62271-100 •					
Rated voltage	Ur [kV]	12	12	17.5	17.5	24	24
Rated insulation voltage	Us [kV]	12	12	17.5	17.5	24	24
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28	28	38	38	50	50
Impulse withstand voltage	Up [kV]	75	75	95	95	125	125
Rated frequency	fr [Hz]	50-60					
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	630	1250	630	1250
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	—	—	—	—	16	16
		20	20	20	20	20	20
Rated short-time withstand current(3 s)	Ik [kA]	25	25	25	25	25	25
		—	—	—	—	16	16
Making capacity	Ip [kA]	20	20	20	20	20	20
		25	25	25	25	25	25
Operation sequence	[O-0.3s-CO-15s-CO] •	—	—	—	—	40	40
		50	50	50	50	50	50
Opening time	[ms]	63	63	63	63	63	63
		33...60					
Arcing time	[ms]	10...15					
Total breaking time	[ms]	43...75					
Closing time	[ms]	30...60					
Maximum overall dimensions	H [mm]	579	579	579	579	680	680
	W [mm]	503	503	503	503	653	653
	D [mm]	548	548	548	548	646	646
	Pole distance P [mm]	150	150	150	150	210	210
Weight	[kg]	116	116	116	116	140	140
Standardised table of dimensions	1VCD	000092	000137	000137	000137	000089	000138
Operating temperature	[°C]	- 5 ... + 40					
Tropicalisation	IEC 60068-2-30 •						
	IEC 60721-2-1 •						
Electromagnetic compatibility	IEC 62271-1 •						

(1) Rated current guaranteed with circuit-breaker installed in switchgear with 40 °C ambient temperature.

(2) Special type with device for charging the closing spring by means of a rotary handle outside the operating mechanism.

ВЯРНО С ОРИГИНАЛА



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VD4/ZT8						VD4/ZS8			
—						—			
•						—			
—						•			
650	650	650	650	800	800	650	650	800	800
1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
•						•			
12	12	17.5	17.5	24	24	12	12	24	24
12	12	17.5	17.5	24	24	12	12	24	24
28	28	38	38	50	50	28	28	50	50
75	75	95	95	125	125	75	75	125	125
50-60						50-60			
630	1250	630	1250	630	1250	630	1250	630	1250
—	—	—	—	16	16	—	—	16	16
20	20	20	20	20	20	20	20	20	20
25	25	25	25	25	25	25	25	25	25
—	—	—	—	16	16	—	—	16	16
20	20	20	20	20	20	20	20	20	20
25	25	25	25	25	25	25	25	25	25
—	—	—	—	40	40	—	—	40	40
50	60	50	60	50	50	50	50	50	50
63	63	63	63	63	63	63	63	63	63
•						•			
33...60						33...60			
10...15						10...15			
43...75						43...75			
30...60						30...60			
579	579	579	579	680	680	579	579	680	680
503	503	503	503	653	653	503	503	653	653
638	638	638	638	646	646	638	638	646	646
150	150	150	150	210	210	150	150	210	210
116	116	116	116	140	140	116	116	140	140
000093	000134	000134	000134	000090	000136	000091	000133	000088	000135
- 5 ... + 40						- 5 ... + 40			
•						•			
•						•			
•						•			
•						•			

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ВЯРНО С ПРИМЪНАТА



2. Selection and ordering Withdrawable circuit-breakers

VD4/ZS8 - VD4/ZT8 - VD4/Z8 withdrawable circuit-breaker for ZS8.4 switchgear

Ur	Isc	Rated uninterrupted current (40°C) [A]						Circuit-breaker type		
		Panel without partition		Panel with partition		Special panel EON				
		W = 650	W = 800	W = 650	W = 800	W = 650	W = 800			
		P = 150	P = 210	P = 150	P = 210	P = 150	P = 210			
KV	kA	u/l = 205	u/l = 310	u/l = 205	u/l = 310	u/l = 205	u/l = 310			
		ø = 35	ø = 35	ø = 35	ø = 35	ø = 35	ø = 35			
		12	20	630						VD4/Z8 12.06.20 p150
			25	630						VD4/Z8 12.06.25 p150
			20	1250						VD4/Z8 12.12.20 p150
			25	1250						VD4/Z8 12.12.25 p150
			20			630				VD4/ZT8 12.06.20 p150
			25			630				VD4/ZT8 12.06.25 p150
			20			1250				VD4/ZT8 12.12.20 p150
			25			1250				VD4/ZT8 12.12.25 p150
			20					630		VD4/ZS8 12.06.20 p150
			25					630		VD4/ZS8 12.06.25 p150
20						1250		VD4/ZS8 12.12.20 p150		
25						1250		VD4/ZS8 12.12.25 p150		
17.5	20	630						VD4/Z8 17.06.20 p150		
	25	630						VD4/Z8 17.06.25 p150		
	20	1250						VD4/Z8 17.12.20 p150		
	25	1250						VD4/Z8 17.12.25 p150		
	20			630				VD4/ZT8 17.06.20 p150		
	25			630				VD4/ZT8 17.06.25 p150		
	20			1250				VD4/ZT8 17.12.20 p150		
	25			1250				VD4/ZT8 17.12.25 p150		
	24	16		630					VD4/Z8 24.06.16 p210	
		20		630					VD4/Z8 24.06.20 p210	
		25		630					VD4/Z8 24.06.25 p210	
		16		1250					VD4/Z8 24.12.16 p210	
20			1250					VD4/Z8 24.12.20 p210		
25			1250					VD4/Z8 24.12.25 p210		
16					630			VD4/ZT8 24.06.16 p210		
20					630			VD4/ZT8 24.06.20 p210		
25					630			VD4/ZT8 24.06.25 p210		
16					1250			VD4/ZT8 24.12.16 p210		
20					1250			VD4/ZT8 24.12.20 p210		
25					1250			VD4/ZT8 24.12.25 p210		
16						630	VD4/ZS8 24.06.16 p210			
20						630	VD4/ZS8 24.06.20 p210			
25						630	VD4/ZS8 24.06.25 p210			
16						1250	VD4/ZS8 24.12.16 p210			
20						1250	VD4/ZS8 24.12.20 p210			
25						1250	VD4/ZS8 24.12.25 p210			

W = Switchboard width.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

ВЕРНО С ОРИГИНАЛОМ



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Standard fittings of withdrawable circuit-breakers for ZS8.4 switchgear

The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:

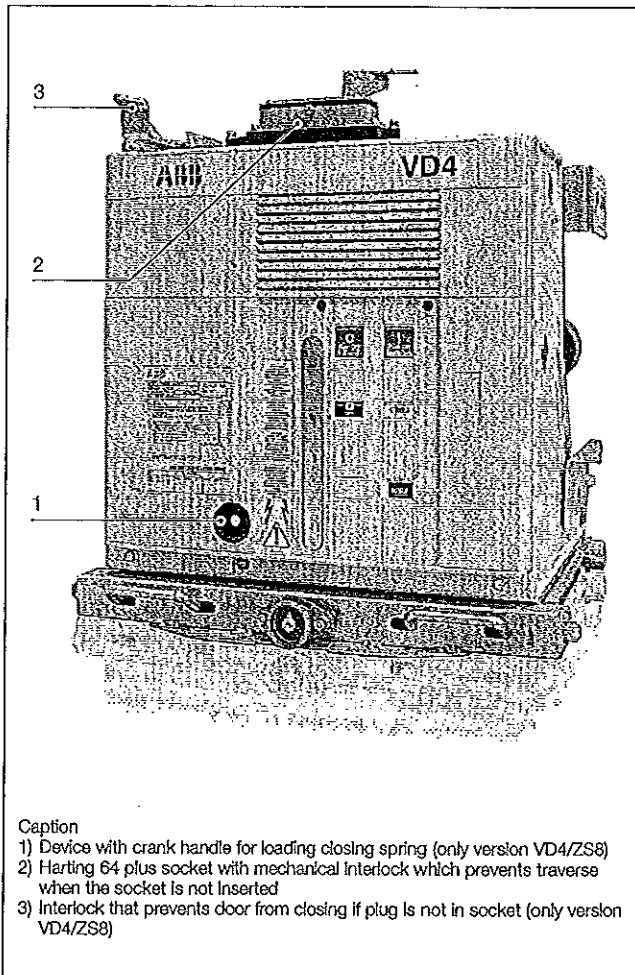
- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/ discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten circuit-breaker open/closed auxiliary contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed) are available.
- lever built into operating mechanism for linear loading of closing spring for VD4/Z8 and VD4/ZT8, external with crank operation for VD4/ZS8
 - racking in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)

VD4/ZS8

- device for closing spring charging, with the door closed, by means of a removable rotary crank handle outside the operating mechanism and the switchgear
- Harting 64-pin socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket
- interlock with the door which prevents the spring charging lever when the circuit-breaker is closed
- interlock with the door and Harting 64 pin socket which prevents door closing when the plug is not inserted in the socket.

VD4/Z8 - VD4/ZT8

- Harting 64-pin socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket.



Caption
 1) Device with crank handle for loading closing spring (only version VD4/ZS8)
 2) Harting 64 pin socket with mechanical interlock which prevents traverse when the socket is not inserted
 3) Interlock that prevents door from closing if plug is not in socket (only version VD4/ZS8)

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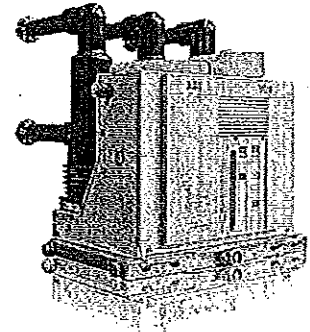
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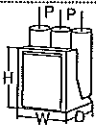


2. Selection and ordering Withdrawable circuit-breakers

Withdrawable circuit-breakers for UniSwitch switchgear (CBW type unit) and UniMix switchgear (P1/E type unit) (24 kV)



Circuit-breaker		VD4/US 24 ⁽¹⁾	VD4/US 24 ⁽¹⁾	VD4/US 24 ⁽¹⁾
	UniSwitch (unit CBW type)	•	•	–
	UniMix (unit P1/E type)	–	–	•
Standards	IEC 62271-100	•	•	•
Rated voltage	Ur [kV]	24	24	24
Rated insulation voltage	Us [kV]	24	24	24
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50	50	50
Impulse withstand voltage	Up [kV]	125	125	125
Rated frequency	fr [Hz]	50-60	50-60	50-60
Rated normal current (40 °C) ⁽²⁾	Ir [A]	630	1250	630
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	16 (20) ⁽³⁾	16 (25) ⁽³⁾	16
		20 (25) ⁽³⁾	20 (25) ⁽³⁾	20
Rated short-time withstand current (3 s) ⁽²⁾	Ik [kA]	16 (20) ⁽³⁾	16 (25) ⁽³⁾	16
		20 (25) ⁽³⁾	20 (25) ⁽³⁾	20
		–	–	25
Making capacity	I _p [kA]	40 (50) ⁽³⁾	40 (50) ⁽³⁾	40
		50 (63) ⁽³⁾	50 (63) ⁽³⁾	50
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•
Opening time	[ms]	33 ... 60	33 ... 60	33 ... 60
Arcing time	[ms]	10 ... 15	10 ... 15	10 ... 15
Total breaking time	[ms]	43 ... 75	43 ... 75	43 ... 75
Closing time	[ms]	30 ... 60	30 ... 60	30 ... 60
Maximum overall dimensions	H [mm]	680	680	680
	W [mm]	653	653	653
	D [mm]	742	742	742
	Pole distance P [mm]	210	210	210
Weight	[kg]	125	125	125
Standardised table of dimensions	1VCD	000047	000047	000047
Operating temperature	[°C]	- 5 ... + 40	- 5 ... + 40	- 5 ... + 40
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•	•
Electromagnetic compatibility	IEC 62271	•	•	•



- (1) Rated current guaranteed with withdrawable circuit-breaker installed in switchgear with 40 °C ambient temperature
 (2) The value and duration of the rated short-time withstand current depends on the switchgear. See the specific catalogues of the UniSwitch and UniMix switchgear
 (3) The top shutter activation wheels of the UniSwitch switchgear (CBW unit) are mounted and adjusted by the manufacturer of the UniSwitch switchgear
 (4) The top shutter activation wheels of the UniMix switchgear (P1/E unit) are available on request
 (5) The values in brackets refer to the 12 kV rated voltage.

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Withdrawable c.-breaker for UniSwitch switchgear (CBW type unit) and UniMix switchgear (P1/E type unit)

Ur	Isc	Rated uninterrupted current (40 °C) [A]		Circuit-breaker type
		UniSwitch CBW	UniMix P1/E	
kV	kA	P=210	P=210	
		u/l=310	u/l=310	
		ø=35	ø=79	
24	16	630 ⁽¹⁾	630	VD4/JS 24.06.16 p210
	20	630 ⁽¹⁾	630	VD4/JS 24.06.20 p210
	25	—	630	VD4/JS 24.06.25 p210
	16	1250 ⁽¹⁾	1250	VD4/JS 24.12.16 p210
	20	1250 ⁽¹⁾	1250	VD4/JS 24.12.20 p210
	25	—	1250	VD4/JS 24.12.25 p210

(1) Isc 25 kA at 12 kV.
 P = Horizontal centre distance between poles.
 u/l = Distance between top and bottom terminal.
 ø = Diameter of the isolating contacts.

Standard fittings of withdrawable circuit-breakers for UniSwitch and UniMix switchgear

The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten circuit-breaker open/closed auxiliary contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed) are available.
- lever built into operating mechanism for linear loading of closing spring
 - isolating contacts
 - cord with connector (plug only) for auxiliary circuits, with striker pin which does not allow the plug to be inserted into the socket if the rated current of the circuit-breaker is different from the rated current of the panel
 - racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
 - locking electromagnet in the truck. This prevents the circuit-breaker being racked into the panel with the auxiliary circuits disconnected (plug not inserted in the socket).

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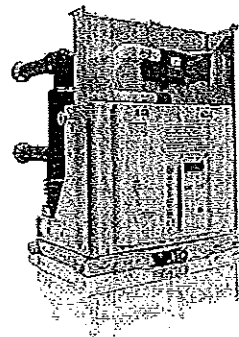
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2. Selection and ordering Withdrawable circuit-breakers

General characteristics of withdrawable circuit-breakers for UniSec switchgear (units WBC and WBS)



Circuit-breaker		VD4/SEC	VD4/P 12		VD4/P 17		
Standards	IEC 62271-100	•	•		•		
Rated voltage	Ur [kV]	24	12		17.5		
Rated insulation voltage	Us [kV]	24	12		17.5		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50	28		38		
Impulse withstand voltage	Up [kV]	125	75		95		
Rated frequency	fr [Hz]	50-60	50-60		50-60		
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630 - 1250	630	1250	630	1250	
		16	16	16	16	16	
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	20	20	20	20	20	
		25	25	25	25	25	
		16	16	16	16	16	
Rated short-time withstand current (3 s)	Ik [kA]	20	20	20	20	20	
		25	25	25	25	25	
		40	40	40	40	40	
Making capacity	Ip [kA]	50	50	50	50	50	
		63	63	63	63	63	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	
Opening time	[ms]	33 ... 60	33 ... 60				
Arcing time	[ms]	10 ... 15	10 ... 15				
Total breaking time	[ms]	43 ... 75	43 ... 75				
Closing time	[ms]	30 ... 60	30 ... 60				
Maximum overall dimensions		H [mm]	743	628	628	632	632
		W [mm]	653	503	503	503	503
		D [mm]	742	662	662	664	664
		Pole distance P [mm]	210	150	150	150	150
Weight	[kg]	133	116	116	116	116	
Standardised table of dimensions	1VCD	000190	7412 ⁽²⁾	7412 ⁽²⁾	7412 ⁽²⁾	7412 ⁽²⁾	
Operating temperature	[°C]	- 5 ... + 40					
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•				
Electromagnetic compatibility	IEC 62271	•	•				

(1) Rated current guaranteed with withdrawable circuit-breaker installed in switchgear with 40 °C ambient temperature.
(2) Poles in polyamide.

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Withdrawable circuit-breaker for UniSec switchgear					
Ur	Isc	Rated uninterrupted current (40 °C) [A]			Circuit-breaker type
kV	kA	P=150	P=150	P=210	
		u/l=205 ø=35	u/l=205 ø=35	u/l=310 ø=79	
12	16	630			VD4/P 12.06.16 p150
	20	630			VD4/P 12.06.20 p150
	25	630			VD4/P 12.06.25 p150
	16	1250			VD4/P 12.12.16 p150
	20	1250			VD4/P 12.12.20 p150
	25	1250			VD4/P 12.12.25 p150
17	16		630		VD4/P 17.06.16 p150
	20		630		VD4/P 17.06.20 p150
	25		630		VD4/P 17.06.25 p150
	16		1250		VD4/P 17.12.16 p150
	20		1250		VD4/P 17.12.20 p150
	25		1250		VD4/P 17.12.25 p150
24	16			630	VD4/SEC 24.06.16 p210
	20			630	VD4/SEC 24.06.20 p210
	25			630	VD4/SEC 24.06.25 p210
	16			1250	VD4/SEC 24.12.16 p210
	20			1250	VD4/SEC 24.12.20 p210
	25			1250	VD4/SEC 24.12.25 p210

P = Horizontal centre distance between poles.
 u/l = Distance between top and bottom terminal.
 ø = Diameter of the Isolating contacts.

Standard fittings of withdrawable circuit-breakers for UniSec

The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
 - mechanical signalling device for closing springs charged/ discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten circuit-breaker open/closed auxiliary contacts
- Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed) are available.
- lever built into operating mechanism for linear loading of closing spring
 - isolating contacts
 - cord with connector (plug only) for auxiliary circuits, with striker pin which does not allow the plug to be inserted into the socket if the rated current of the circuit-breaker is different from the rated current of the panel
 - racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)

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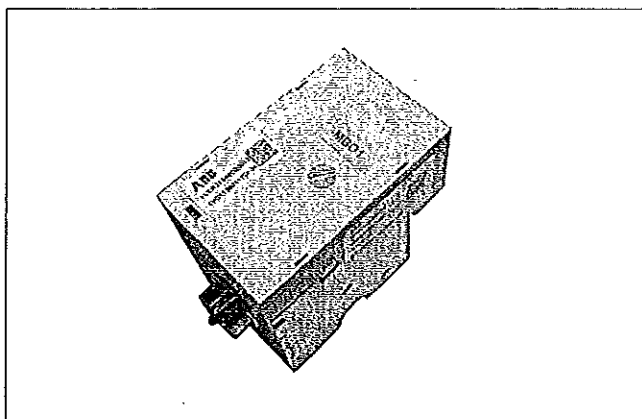
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2. Selection and ordering Optional accessories

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The accessories identified with the same number are alternative to each other.

1 Shunt opening release (-MBO1)



Allows opening command of apparatus to be enabled by remote control.

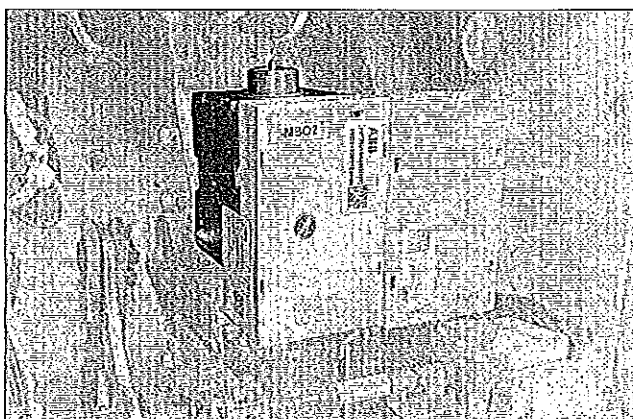
This release is suitable for both instantaneous and permanent duty. However, an auxiliary contact -BGB1 de-energizes it after circuit-breaker has opened. In the case of instantaneous service, the current impulse must last at least 100 ms.

This release can be controlled by the following devices: coil continuity control (CCC), opening circuit supervision (TCS)^(*) or the ABB STU functionality control device (see accessory 21, supplied on request).

Characteristics	
Un	24-30-48-60-110...132-220...250 V DC
Un	48-60-110...127-220...250 V AC 50-60 Hz
Operating limits	65 ... 120% Un
Inrush power (Ps)	60...100 W / VA
Potenza di mantenimento (Pc)	1,5 W
Electronics self-consumption (no coil supplied); value independent of voltage applied	1,5 mA
Opening time	33...60 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

^(*) The minimum current that the relay with TCS function (used for monitoring coil continuity) detects as a condition denoting that the trip circuit is operating correctly (specified for each relay in the relative manual), must be sensibly higher than the current consumption of the actual coil (~1.5 mA).
If this fails to occur, always add, in parallel to the TCS, a circuit able to absorb sufficient current to compensate the gap while preventing the total current in the TCS circuit from rising above the maximum threshold (Itcs < 10 mA for High Voltage coils - from 110V to 250V, and Itcs < 50 mA for Low Voltage coils from 24 V to 60 V).
A simple resistor can be sized for the purpose, depending on the parameters of the TCS and the auxiliary voltage range used.

2 Additional shunt opening release (-MBO2)



Similarly to shunt opening release -MBO1, this allows the opening command of the apparatus to be transmitted by remote control. It can be powered by the same circuit as main shunt opening release -MBO1 or by a circuit that is completely separate from release -MBO1.

This release is suitable for both instantaneous and permanent duty. However, an auxiliary contact -BGB1 de-energizes it after the circuit-breaker has opened.

To guarantee the release action, the current impulse must last at least 100 ms.

Continuity functionality can be checked with a continuity control device (CCC), opening circuit supervision (TCS)^(*) or the STU functionality control device (see accessory 21, supplied on request).

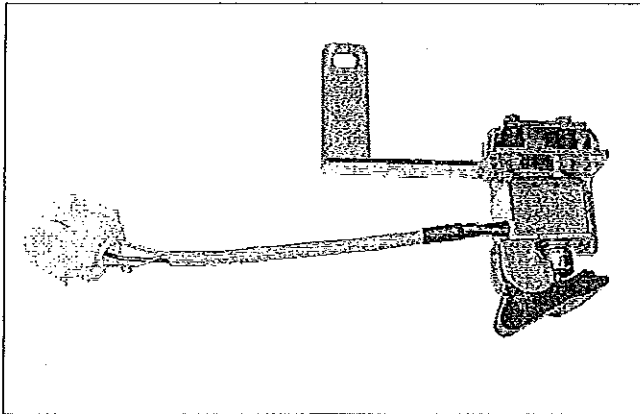
-MBO2 has the same electrical and operating characteristics as release -MBO1.

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3 Opening solenoid (-MO3)



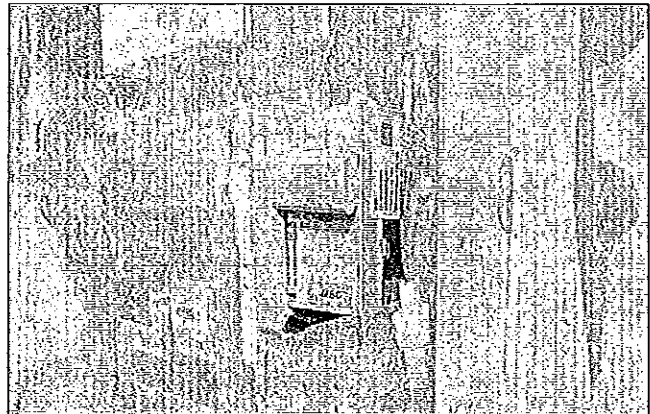
The opening solenoid (-MO3) is a special release with demagnetisation to be combined with an overcurrent protection relay of the self-supplied type. It is located in the operating mechanism (in the left side piece) and is not alternative to the additional shunt opening release (-MO2). It is not available for 40 and 50 kA circuit-breakers. Should the application of this accessory be required, specify the request at the time of order since subsequent application by the customer is not possible.

Note: for combination with the protection relays, please ask for the document: Data sheet 1VCD600854.

- The opening solenoid (-MBO3) is available in two versions:
- For DC (release by discharging energy stored in protection relay against overcurrent of the self-supplied type)
 - For AC (release by means of the energy supplied by an adder transformer on the secondaries of the protection current transformers (the TA is at customer's charge))

(*) The minimum current that the relay with TCS function (used for monitoring coil continuity) detects as a condition denoting that the trip circuit is operating correctly (specified for each relay in the relative manual), must be sensibly higher than the current consumption of the actual coil (~1.5 mA). If this fails to occur, always add, in parallel to the TCS, a circuit able to absorb sufficient current to compensate the gap while preventing the total current in the TCS circuit from rising above the maximum threshold (Itcs < 10 mA for High Voltage coils - from 110V to 250V, and Itcs < 50 mA for Low Voltage coils from 24 V to 60 V). A simple resistor can be sized for the purpose, depending on the parameters of the TCS and the auxiliary voltage range used.

4 Shunt closing release (-MC)



Allows closing command of apparatus to be transmitted by remote control.

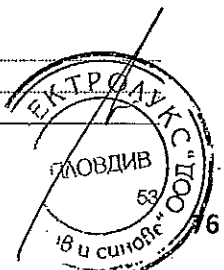
This release is suitable for both instantaneous and permanent duty. An auxiliary contact that de-energizes it after the circuit-breaker has closed is not envisaged.

The permanently supplied release provides the electrical anti-pumping function with both electrical opening and re-closing commands maintained. To guarantee the closing action, the current impulse must last at least 100 ms.

If there is the same supply voltage for shunt closing release -MBC and under-voltage release -MBU and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a delay of at least 50 ms between under-voltage release energizing and energizing of the shunt closing release to allow the closing operation to take place. Continuity functionality can be checked with a continuity control device (CCC), opening circuit supervision (TCS)(*) or the STU functionality control device (see accessory 21, supplied on request).

Characteristics	
Un	24-30-48-60-110...132-220...250 V DC
Un	48-60-110...127-220...250 V AC 50-60 Hz
Operating limits	65 ... 120% Un
Inrush power (Ps)	60...100 W / VA
Continuous power consumption (Pc)	1.5 W
Electronics self-consumption (no coil supplied; value independent of voltage applied)	1.5 mA
Opening time	33...60 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

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2. Selection and ordering Optional accessories

5 Undervoltage release (-MBU)



The undervoltage release opens the circuit-breaker when there is a sensible reduction or lack of the voltage that powers it. The circuit-breaker can only close when the release is energized (the closing lock is obtained mechanically). It can be used for remote release (by means of a pushbutton of the normally closed type), for locking on automatic closing/opening in the absence of voltage in the auxiliary circuits. Supplied by means of the secondary output of a voltage transformer, it provides locking upon automatic closing/opening in the absence of voltage in the Medium Voltage main circuit.

If there is the same supply voltage for shunt closing release -MBC and under-voltage release -MBU and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a delay of at least 50 ms between under-voltage release energizing and energizing of the shunt closing release to allow the closing operation to take place.

The undervoltage release is available in the following versions:

- 5A** Undervoltage release (with supply shunted from a transformer on the supply side of the circuit-breaker or from an auxiliary power supply, regardless of the state in which the circuit-breaker is to be found).
- 5B** Undervoltage release with -KFT electronic time-lag device (0.5 - 1 - 1.5 - 2 - 3 s) (with power supply as indicated for 5A); this device is supplied with a 0.5 s setting (the adjustments are described in the Circuit diagrams chapter)

Characteristics	
Un	24-30-48-60-110...132-220...250 V DC
Un	48-60-110...127-220...250 V AC 50-60 Hz
Operating limits	-- circuit-breaker opening: 35-70% Un
	-- circuit-breaker closing: 85-110% Un
Inrush power (Ps)	150 W / VA
Continuous power consumption (Pc)	1.55 W
Electronics self-consumption (no coil supplied); value independent of voltage applied	1.5 mA
Opening time	60...80 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

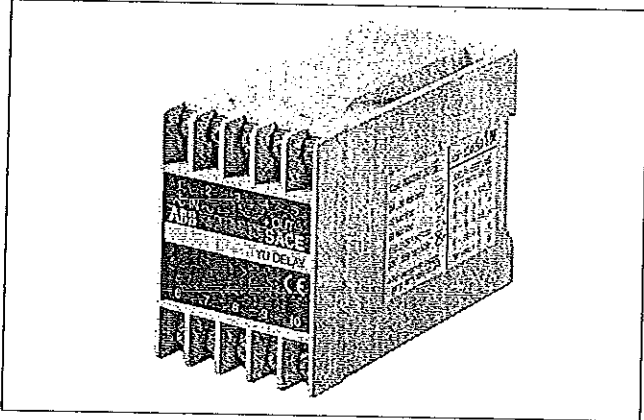
Note

As an alternative to the undervoltage release, an additional shunt opening release (-MBO4) with the same electrical and operating specifications as shunt opening release (-MBO1) can be installed on request (only for circuit-breakers 12..17.5 kV up to 40 kA and 24 kV up to 31.5 kA).

Warning! Since installation of the additional shunt opening release (-MBO4) requires a special mounting plate for releases, ask for application (-MBO4) when ordering and not after delivery.

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5a Electronic time delay device (-KFT)



The electronic time delay device must be mounted externally in relation to the circuit-breaker. It allows release trip delay with established and adjustable times.

The use of the undervoltage release is recommended in order to prevent trips when the power supply network of the release may be subject to cuts or voltage drops of short duration.

If it is not supplied, circuit-breaker closing is disabled.

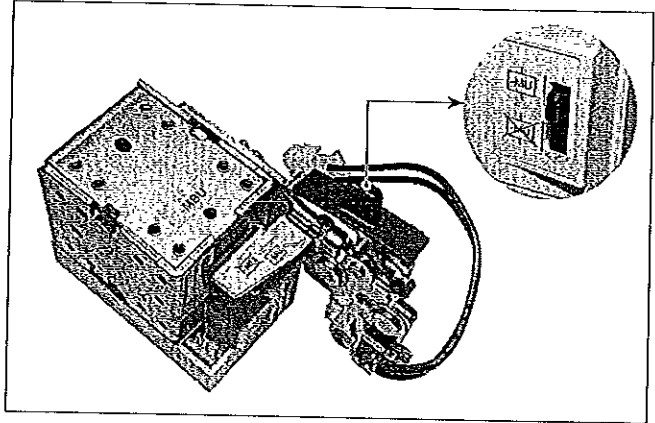
The time delay device must be combined with an undervoltage release for d.c.

Rated voltage of the undervoltage release must be within the selected range of working of the time-delay device.

Characteristics of the time-delay device

Un	24...30 - 48 - 60 - 110...127 - 220...250 V-
Un	48 - 60 - 110...127 - 220...240 - V~ 50/60 Hz
Adjustable opening time (release + time delay device): 0.5-1-1.5-2-3 sec	

6 Undervoltage release mechanical override



This is a mechanical device which allows the undervoltage release trip to be temporarily excluded.

It is always fitted with electrical signalling.

Should the application of this accessory be required, specify the request at the time of order since subsequent application by the customer is not possible.

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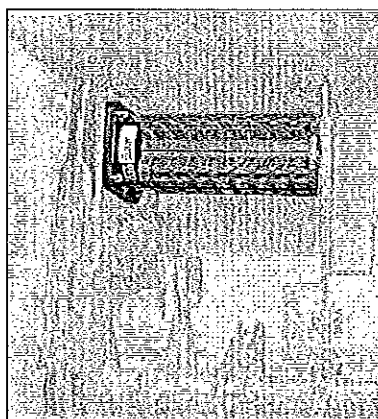
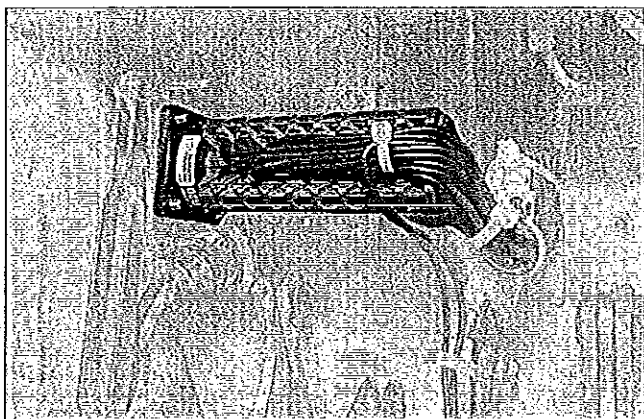


2. Selection and ordering

Optional accessories

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7a Auxiliary contacts of the circuit-breaker (-BGB1) for 12 to 24 kV versions



Electrical signalling of circuit-breaker open/closed can be obtained with a group of 10, 16 or 20 auxiliary contacts for the fixed version and 10 or 16 auxiliary contacts for the withdrawable version. The standard equipment comprises 10 auxiliary contacts.

Note

The following are available using the standard group of ten auxiliary contacts and the maximum number of electrical accessories:

- for fixed circuit-breakers: three closing contacts "a" for signalling circuit-breaker open and five opening contacts "b" for signalling circuit-breaker closed;
- for withdrawable circuit-breakers: three closing contacts "a" for signalling circuit-breaker open and four opening contacts "b" for signalling circuit-breaker closed;

Circuit-breakers in the fixed version are available with two finishing accessories (to be specified when ordering):

- non-wired auxiliary contacts; wiring to the terminals of the contacts is at the customer's charge (photo below left; the terminal box to which the other electrical accessories are wired is at the top); ask for instructions 1VCD601204 (available in the main languages) which describe how to remove, wire auxiliary contacts more easily and fit auxiliary contacts unit back into its housing;
- auxiliary contacts already wired to the terminal box (see photo at top right)

Consult circuit diagrams 1VCD400151 for fixed circuit-breakers and 1VCD400155 for withdrawable circuit-breakers.

Note: The main shunt opening release and/or the additional shunt opening release use 1 and/or 2 closing contacts "a", thereby reducing the number of auxiliary contacts available. Always check the maximum number of contacts available with non-standard equipment.

The new diagrams are interchangeable with the existing ones, with the following exceptions:

- diagram 1VCD400151 (substitutes 1VCD400046 and 1VCD400099)
- fig. 34 on the previous diagrams is represented by fig. 31 + fig. 32 on the new diagram;
- fig. 33 and fig. 35 on the previous diagrams are not available with the new layout
- diagram 1VCD400155 (substitutes 1VCD400047)

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Auxiliary contacts –BGB1 conform to the following standards/ regulations/directives:

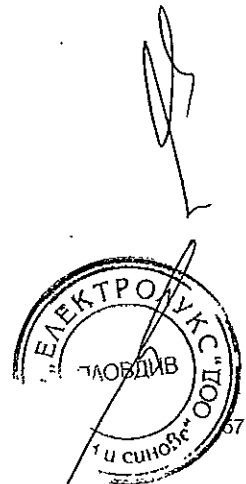
- IEC 62271-100
- IEEE C37.54
- EN 61373 cat.1 class B / impact and vibration test
- Germanish Loyd regulation / vibrations envisaged by the shipping registers
- UL 508
- EN 60947 (DC-21A DC-22A DC-23A AC-21A)
- RoHS Directive

General characteristics	
Insulation voltage to standard VDE 0110, Group C	660 V AC 800 V DC
Rated voltage	24 V ... 660 V
Test voltage	2 kV for 1 min
Maximum rated current	10 A - 50/60 Hz
Breaking capacity	Class 1 (IEC 62271-1)
Number of contacts	5
Groups of contacts	10 / 16 / 20
Contact travel	90°
Actuating force	0.66 Nm
Resistance	<6.5 mΩ
Storage temperature	-30 °C ... +120 °C
Operating temperature	-20 °C ... +70 °C (-30° ref. ANSI 37.09)
Contact overtemperature	10 K
Mechanical life	30,000 mechanical operations
Protection class	IP20
Cable section	1 mm²

Electrical characteristics (according to IEC 60947)		
Rated current Un		Breaking capacity (10000 interruptions)
220 V AC	Cosφ = 0.70	20 A
220 V DC	Cosφ = 0.45	10 A
24 V DC	1 ms	12 A
	15 ms	9 A
	50 ms	6 A
60 V DC	1 ms	10 A
	15 ms	6 A
	50 ms	4,6 A
110 V DC	1 ms	7 A
	15 ms	4.5 A
	50 ms	3.5 A
220 V DC	1 ms	2 A
	15 ms	1.7 A
	50 ms	1.5 A
250 V DC	1 ms	2 A
	15 ms	1,4 A
	50 ms	1.2 A

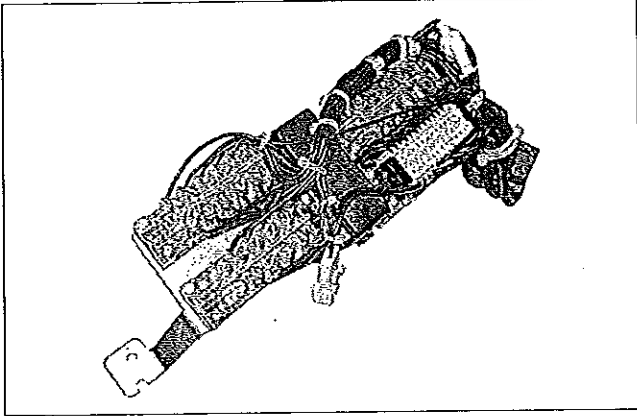
Electrical characteristics (according to IEC 62271-100 class 1)		
Rated current Un		Breaking capacity
24 Vcc	20 ms	18,8 mA
60 Vcc	20 ms	7,4 mA
110 Vcc	20 ms	4,2 mA
250 Vcc	20 ms	1,8 mA

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2. Selection and ordering Optional accessories

7b Circuit-breaker auxiliary contacts (-BGB1, -BGB2, -BGB3) for 36 kV version



Electrical signalling of circuit-breaker open/closed can be provided with a set of 15 auxiliary contacts as an alternative to the 10 provided as standard.

Consult the following circuit diagrams for VD4 36 kV series with "7b" auxiliary contacts:

- for fixed circuit-breakers: 1VCD400236
- for withdrawable circuit-breakers: 1VCD400237

Note

With the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three break contacts (signalling circuit-breaker open) and five make contacts (signalling circuit-breaker closed) are available.

With the group of 15 auxiliary contacts, according to the electrical applications required, the following are available:

- for fixed circuit-breakers: thirteen auxiliary contacts, differently divided between break contacts and make contacts according to the figure selected of the electrical diagram;
- for withdrawable circuit-breakers, since the plug of the auxiliary circuits has a limited number of poles: five break contacts (signalling circuit-breaker open) and five make contacts (signalling circuit-breaker closed).

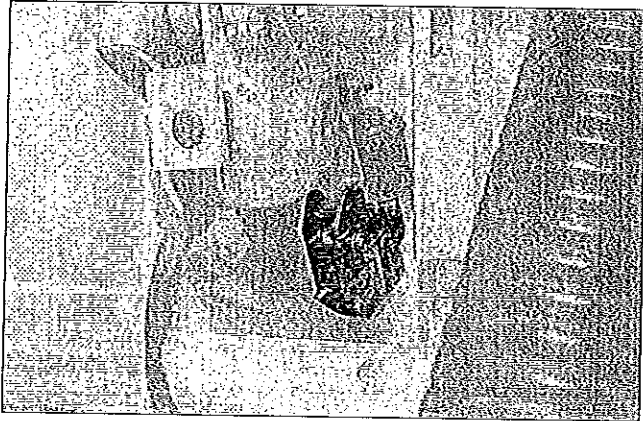
General characteristics	
Insulation voltage to standard VDE 0110, Group C	660 V a.c. 800 V d.c.
Rated voltage	24 V ... 660 V a.c.
Test voltage	2 kV 50 Hz (for 1 min)
Rated overcurrent	10 A
Number of contacts	5
Contact run	6 mm ... 7 mm
Activation force	26 N
Resistance	3 mΩ
Storage temperature	-20 °C ... +120 °C
Operating temperature	-20 °C ... +70 °C
Contact overtemperature	20 K
Number of cycles	30.000
Unlimited breaking capacity if used with 10 A fuse in series	

Electrical characteristics

Un		Rated current	Breaking capacity
220 V a.c.	Cosφ = 0.7	2.5 A	25 A
380 V a.c.	Cosφ = 0.7	1.5 A	15 A
500 V a.c.	Cosφ = 0.7	1.5 A	15 A
660 V a.c.	Cosφ = 0.7	1.2 A	12 A
24 V d.c.	1 ms	10 A	12 A
	15 ms	10 A	12 A
	50 ms	8 A	10 A
	200 ms	6 A	7.7 A
60 V d.c.	1 ms	8 A	10 A
	15 ms	6 A	8 A
	50 ms	5 A	6 A
	200 ms	4 A	5.4 A
110 V d.c.	1 ms	6 A	8 A
	15 ms	4 A	5 A
	50 ms	2 A	4.6 A
	200 ms	1 A	2.2 A
220 V d.c.	1 ms	1.5 A	2 A
	15 ms	1 A	1.4 A
	50 ms	0.75 A	1.2 A
	200 ms	0.5 A	1 A

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8 Transient contact (-BGB4)

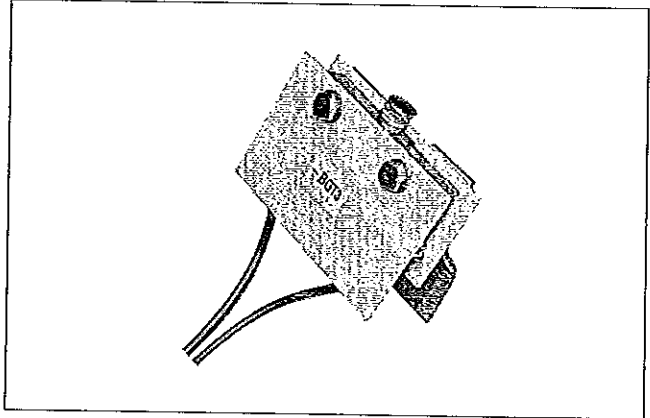


This contact closes momentarily (duration > 30 ms) on circuit-breaker opening controlled remotely with a shunt opening release.

The indication is not provided when opening is manual and local. In fact, a contact (-BGB11) is activated by the manual pushbutton and cuts off the transient contact closure (-BGB4).

The transient contact is activated directly from the main operating shaft when the indication is provided only on actual opening of the main circuit-breaker contacts.

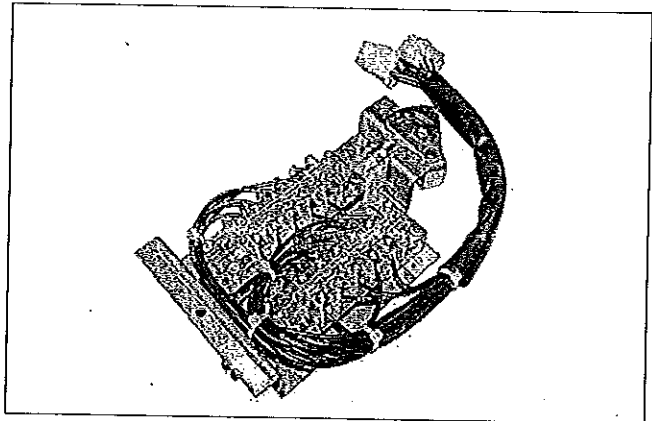
9 Position contact (-BGT3)



This contact is used, together with the locking magnet in the operating mechanism (-RLE1) to prevent remote closing during traverse into the unit.

It is only supplied for the withdrawable version circuit-breakers for UniGear ZS1 switchgear and PowerCube modules. It cannot be supplied when the transmitted contacts are requested in the truck (-BGT1; -BGT2).

10 Transmitted contacts in the truck (-BGT1; -BGT2)

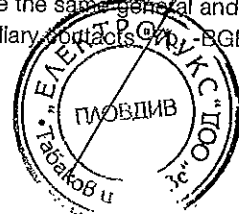


Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck - only for VDA/F withdrawable circuit-breaker).

These contacts are either in addition or as an alternative to the position contacts (for signalling circuit-breaker racked out) located in the unit. They also carry out the function of the position contact (-BGT3).

Contacts -BGT1 and BGT2 have the same general and electrical characteristics as auxiliary contacts (-BGB1, -BGB2, -BGB3*).

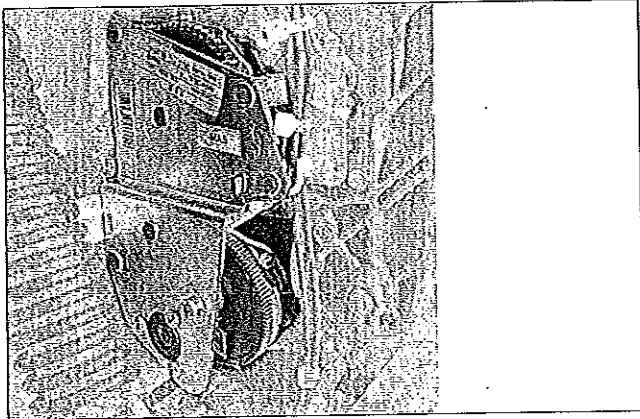
ВЯРНО С ОПРИТНА ДАТА



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2. Selection and ordering Optional accessories

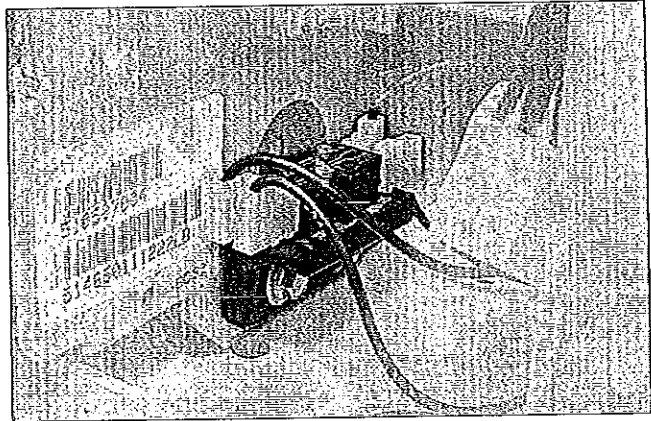
11 Motor operator (-MAS)



This carries out automatic charging of the circuit-breaker operating mechanism closing spring. After circuit-breaker closing, the geared motor immediately recharges the closing springs.

In the case of a power cut or during maintenance work, the closing spring can be charged manually in any case (by means of the special crank handle incorporated in the operating mechanism).

12 Contact for signalling closing spring charged/ discharged (-BGS2)



This consists of a microswitch which allows remote signalling of the state of the circuit-breaker operating mechanism closing spring.

The following signals are possible:

- contact open: signalling spring charged
- contact closed: signalling spring discharged.

The two signals must be used for circuits which have the same power supply voltage.

Characteristics

Un	24...30 - 48...60 - 110...130 - 220...250 V-	
Un	100...130 - 220...250 V- 50/60 Hz	
Operating limits	85 ... 110% Un	
Power on Inrush (Ps)	≤ 40 kA	50 kA
	DC = 600 W; AC = 600 VA	DC = 900 W; AC = 900 VA
Rated power (Pn)	DC = 200 W; AC = 200 VA	DC = 350 W; AC = 350 VA
	Charging time	0,2 s
Charging time	6-7 s	6-7 s
Insulating voltage	2000 V 50 Hz (for 1 min)	2000 V 50 Hz (for 1 min)

ТОЛКО С ОРИГИНАЛА

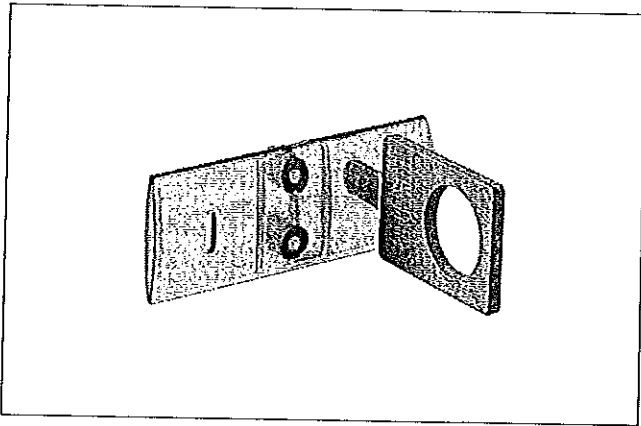


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Protections and locks

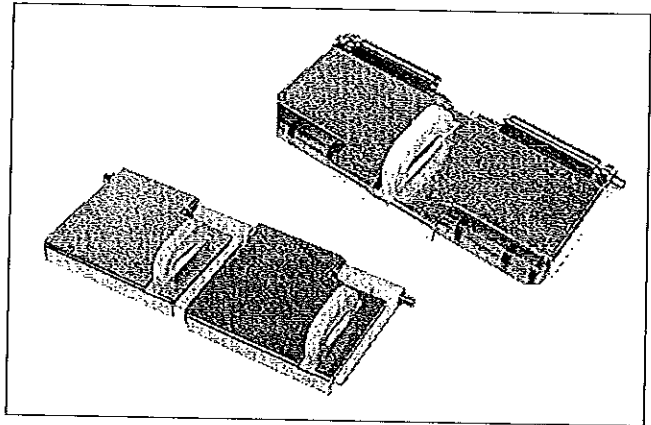
Various mechanical and electromechanical locking and protection devices are available.

13 Opening and closing pushbutton protection



The protection only allows the opening and closing pushbuttons to be operated using a special tool.

14 Opening and closing pushbutton padlock



The device allows the opening and closing pushbuttons to be locked using a maximum of three padlocks (not supplied): \varnothing 4 mm. Also prevents closing using remote control.

This lock is available in two versions:

- 14A Possibility of padlocking both the pushbuttons without distinction
- 14B Separate padlocking of the opening and/or closing pushbutton.

N.B. Lock 14A prevents closure by remote control; lock 14B does not prevent closure by remote control.

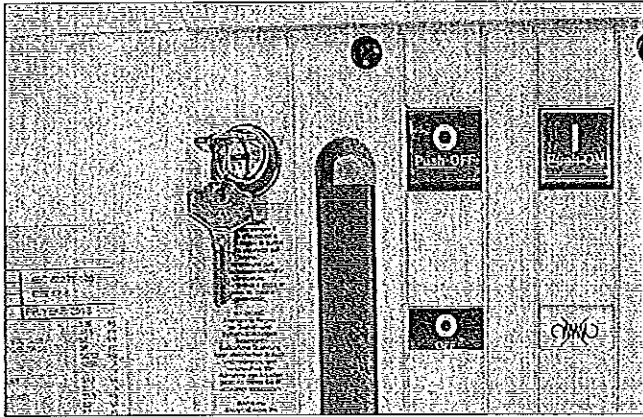
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ВЯРНО С ОРИГИНАЛОМ!



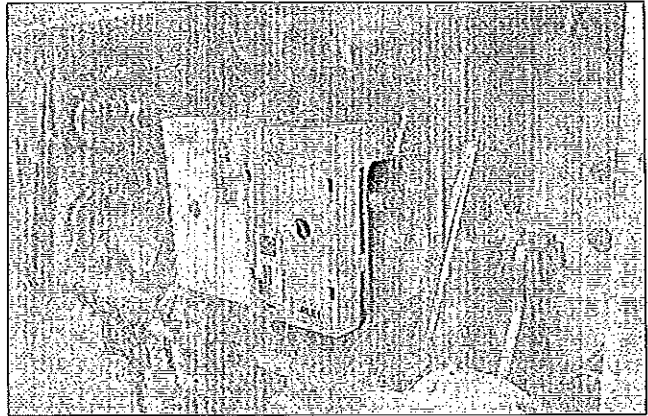
2. Selection and ordering Optional accessories

15 Key lock in open position



The lock is activated by a special circular lock. Different keys (for a single circuit-breaker) are available, or the same keys (for several circuit-breakers). To activate the lock, keep the opening pushbutton pressed down, turn the key and remove it. With the key removed, the opening pushbutton automatically remains in the pressed position preventing local manual closing and remote electrical closing.

16 Locking magnet on the operating mechanism (-RLE1)



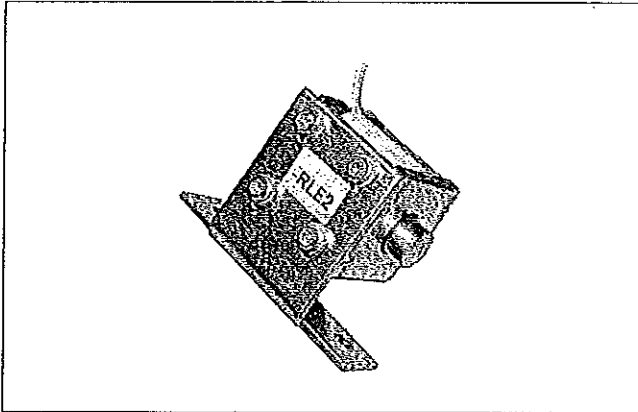
Only allows activation of the command with the electromagnet supplied. The locking electromagnet in the operating mechanism has the same electrical characteristics as shunt closing release -MBC.

ВЯРНО С ОРИГИНАЛА

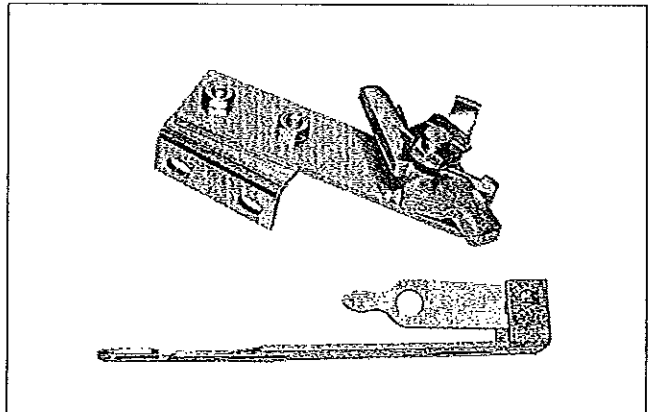


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17 Locking magnet on the truck (-RLE2)



18 Interlock for fixed circuit-breaker



Compulsory accessory for the withdrawable versions for UniGear ZS1 switchgear and PowerCube modules, to prevent circuit-breaker racking into the switchgear with the auxiliary circuit plug disconnected.

The plug also makes the anti-insertion lock for a different rated current. Special striker pins do not allow insertion of the plug in the socket if the rated current of the circuit-breaker is lower than the rated current of the panel.

Note: a specific version for the circuit-breakers of ZS8.4 switchgear is available on request. This accessory is not available when the motor-operated truck is required.

Device for fixed circuit-breakers which are converted into withdrawable ones by the customer. It allows a mechanical lock to be made, by the customer, which prevents racking-out/in with the circuit-breaker closed and prevents circuit-breaker closing during translation.

Note: The device must be requested when ordering since it must be assembled and tested in the factory.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 132 - 220 - 240 V-
Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 220 - 230 ... 240 V- 50/60 Hz
Operating limits	85 ... 110% Un
Nominal power (Pn)	DC 250 W; AC = 250 VA
Continuous power (Pc)	DC = 5 W; AC = 5 VA
Inrush duration	150 ms
Insulating voltage	2000 V 50 Hz (for 1 mln)

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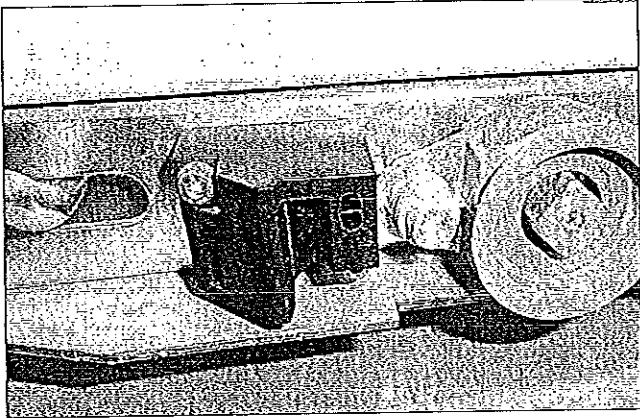
ВЯРНО С ОРИГИНАЛА!



2. Selection and ordering Optional accessories

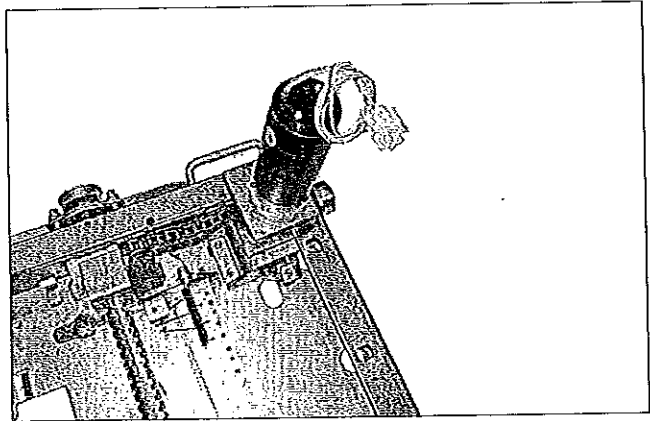
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19 Mechanical interlock with the door



This device prevents circuit-breaker racking-in when the switchgear door is open. It is only provided for circuit-breakers used in switchgear UniGear ZS1 and PowerCube modules, fitted with a special actuator on the door.

20 Motorised truck (-MAT)



It allows racking-in and racking-out of the circuit-breaker in the switchgear to be carried out remotely, (only for circuit-breaker in withdrawable version for UniGear ZS1 and ZS8.4 switchgear and PowerCube modules).
The motor version with clutch can be ordered on request, so that racking-in/ out can be performed in an emergency if the truck motor fails to operate.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 220 V-
Operating limits	85 ... 110% Un
Nominal power (Pn)	40 W

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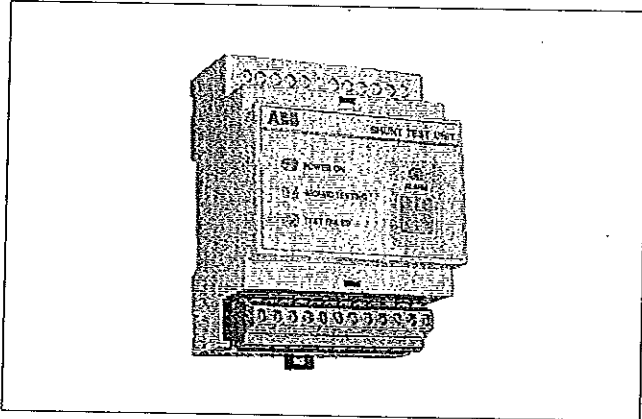
ВЯРНО С ОРИГИНАЛА



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21 STU Shunt Test Unit



Due to the particular construction of these releases, checking the functionality of the shunt closing (-MBC) and opening (-MBO1, -MBO2) releases is not possible with dedicated relays (e.g. TCS Test Control Supervision, CCC Control Coil Continuity) or with the REF control and protection unit. The only device able to carry out a check of the functionality is the STU device. Please contact us if you want to carry out this control with devices other than STU. This device can be combined with the shunt opening release (-MBO1; -MBO2) or with the shunt closing release (-MBC) to check functionality and continuity.

The control/monitoring Shunt Test Unit allows the continuity of releases with a rated operating voltage between 24 V and 250 V (AC and DC) to be checked, as well as the functionality of the electronic circuit of the release.

Checking continuity is carried out cyclically with an interval of 20 seconds between one test and the next.

The unit has optical signals by means of LEDs on the front. In particular the following information is indicated:

- POWER ON: power supply present
- (-MO) TESTING: test being carried out
- TEST FAILED: signal following a failed test or in the absence of auxiliary power supply
- ALARM: signal after three failed tests.

Two relays and a changeover are also available on board the unit, which allow remote signalling of the following two events:

- failure of a test (resetting is carried out automatically when the alarm stops)
- failure of three tests (resetting is only carried out by means of the manual - RESET - from the front of the unit).

There is also a manual - RESET - button on the front of the unit.

Characteristics	
Un	24 ... 250 V AC/DC
Maximum interrupted current	6 A
Maximum interrupted voltage	250 V AC

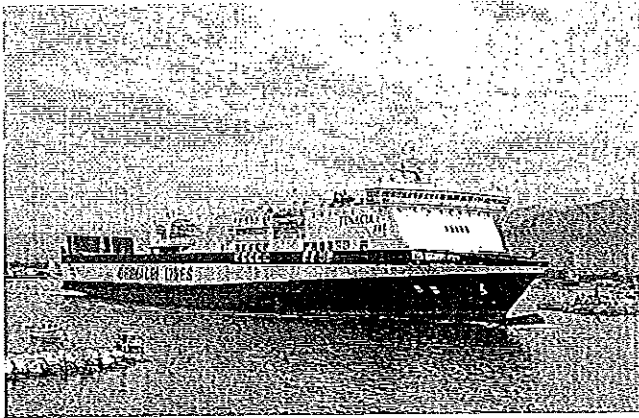
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ВЯРНО С ОРИГИНАЛА



3. Specific product characteristics

Resistance to vibrations



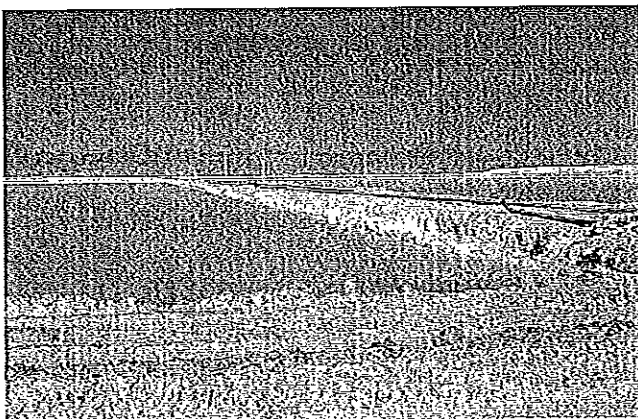
The VD4 circuit-breakers are designed to satisfy high levels of resistance to stresses caused by mechanical vibrations. Many versions are able to satisfy both the approval criteria of the major International Shipping Registers (DNV, Lloyd's Register, RINA) and the qualification criteria of the International Seismic Standards (IEEE 344, IEEE 323 and IEC 60980). For the versions approved by the shipping registers, please contact us.

Galvanisation is carried out in accordance with UNI ISO 2081 Standards, classification code Fe/Zn 12, with a thickness of 12×10^{-6} m, protected by a conversion layer mainly consisting of chromates in compliance with the UNI ISO 4520 Standard.

Altitude



Tropicalization



VD4 circuit-breakers are manufactured in compliance with the strictest regulations regarding use in hot-humid-saline climates. All the more important metal parts are treated against corrosive substances corresponding to standard EN 12500 class C5 atmospheric corrosion.

The insulating property of air decreases as the altitude increases, therefore this must always be taken into account for external insulation of the apparatus (the internal insulation of the interrupters does not undergo any variations as it is guaranteed by the vacuum).

The phenomenon must always be taken into consideration during the design stage of the insulating components of apparatus to be installed over 1000 m above sea level. In this case a correction coefficient must be considered, which can be taken from the graph on the next page, built up on the basis of the indications in the IEC 62271-1 Standards. The following example is a clear interpretation of the indications given above.

ВЯРНО С ОРГИНАЛА



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Graph for determining the Ka correction factor according to the altitude

Example

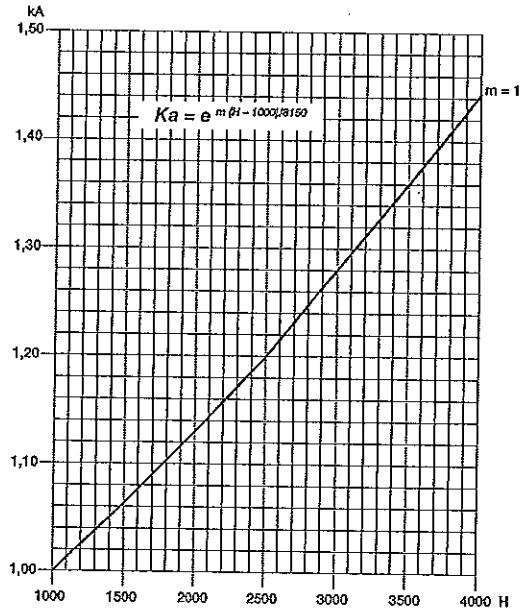
- Installation altitude 2000 m
- Operation at the rated voltage of 12 kV
- Withstand voltage at power frequency 28 kV rms
- Impulse withstand voltage 75 kVp
- Ka factor obtained from graph = 1.13.

Considering the above parameters, the apparatus will have to withstand (under test and at zero altitude, i.e. at sea level):

- withstand voltage at power frequency equal to:
28 x 1.13 = 31.6 kVrms
- impulse withstand voltage equal to:
75 x 1.13 = 84.7 kVp.

From the above, it can be deduced that for installations at an altitude of 2000 m above sea level, with 12 kV service voltage, apparatus must be provided with 17.5 kV rated voltage, characterised by insulation levels at power frequency of 38 kVrms with 95 kVp impulse withstand voltage.

H = altitude in metres;
m = value referred to power frequency and the lightning impulse withstand voltages and those between phases.



Anti-pumping device

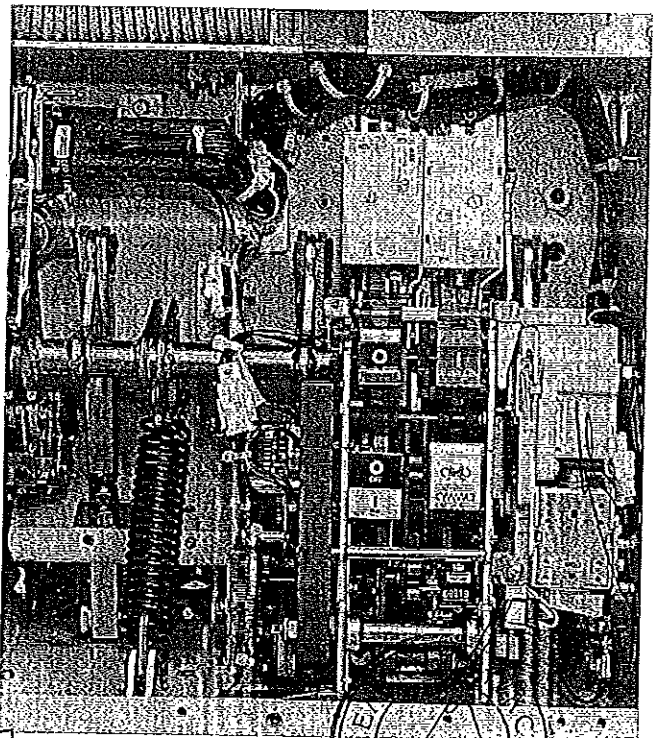
The EL operating mechanism of VD4 circuit-breakers (in all versions) is fitted with a mechanical anti-pumping device which prevents re-closing due to either electrical or mechanical commands.

Should both the closing command and any one of the opening commands (local or remote) be active at the same time, there would be a continuous succession of opening and closing commands.

The anti-pumping device avoids this situation, ensuring that each closing operation is only followed by an opening operation and that there is no other closing operation after this. To obtain a further closing operation, the closing command must be released and then re-launched.

Furthermore, the anti-pumping device only allows circuit-breaker closure if the following conditions are present at the same time:

- operating mechanism spring fully charged
- opening pushbutton and/or shunt opening release (-MBO1/-MBO2) not activated
- circuit-breaker open.



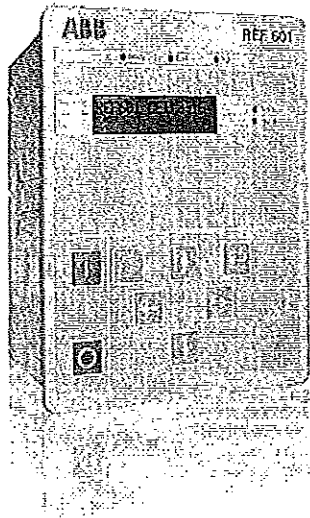
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ВЯРНО С ОРИГИНАЛА



3. Specific product characteristics

REF 601 protection Device



On request, the REF 601 switchgear protection device is available for protection of the installations, which requires an auxiliary power supply for its operation unlike the previous PR512 which was a self-supplied release.

The REF 601 has protections and trip curves in accordance with the IEC 255-3 Standard. It sees to the protection function against overload (51), against instantaneous and delayed short-circuit (50-51) and against instantaneous and delayed homopolar ground fault (50N and 51N). It also detects the second harmonic component to prevent unwarranted tripping on connection of a transformer (68).

The unit has 3 inputs from current sensors of the type with Rogowsky coil, one input from external toroidal CT and from the keyboard 4 rated currents can be set: 40, 80, 250 and 1250 A.

If the unit is connected to 3 current sensors, the 50N and 51N protection functions are carried out with the vectorial sum of the phase currents; if only 2 current sensors are used, then the external toroidal current transformer must be provided for functions 50N and 51N.

The external toroidal current transformer can be with openable core or closed and with any transformation ratio as long with a 1 A secondary current.

The ABB current sensors of the type with Rogowsky coil provided for REF 601, are only suitable for installation on MV insulated cables.

The characteristics of the device are:

- trip precision
- wide adjustment ranges
- single and simultaneous adjustment of the three phases
- no limitation (due to the current sensors) to the rated breaking capacity and at the short-time withstand current of the circuit-breaker
- pushbuttons for local electrical operation of the circuit-breaker (opening and closing pushbutton)
- 5 distinct indicators: "relay in operation", "relay in trip threshold", "relay tripped", "relay tripped due to exceeding phase current", "relay tripped due to exceeding ground fault current"
- interface consisting of an LCD display and of "arrow" keys, "enter" and "esc" for easier navigation inside the "measurement", "data recording", "event recording", "settings", "configuration" and "test" menus
- three user levels: "operator" (only display, with free access, by keeping this key pressed for at least 5 sec.), "configurator" (like the previous one, but also with permission to set the protection parameters, i.e. times and thresholds, and communication, if present - access limited by a password), "administrator" (like the previous ones, but also with permission to set the password and configure the basic settings of the device, such as the rated current - access limited by a password)
- continual display of the current on the most highly loaded phase and of the round current
- recording of the value of the currents which caused the device to trip
- storage of the number of openings carried out by the device
- event log (storage of the parameters described above in the last 5 trips of the device) in a non-volatile memory
- curves "B = 1" or "B = 5" and curve "RI" specific for the Belgian market (only REF 601 IEC)
- circuit-breaker opening by means of an undervoltage release (only REF 601 CEI)
- version, on request, with RS485 4-wire serial communication
- MODBUS RTU full duplex protocol
- multi-voltage feeder 24 ... 240 V a.c.- d.c

ВАРНО С ОРИГИНАЛА



Environmental protection programme

VD4 circuit-breakers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management).

The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

Assessment of the environmental impact of the life cycle of the product, obtained by minimising energy consumption and overall raw materials of the product, became a concrete matter during the design stage by means of targeted selection of the materials, processes and packing.

This is to allow maximum recycling at the end of the useful life cycle of the apparatus.

Spare parts

- Shunt opening release
- Additional shunt opening release
- Undervoltage release
- Time delay device for undervoltage release
- Shunt closing release
- Spring charging geared motor with electrical signalling of spring charged
- Contact signalling geared motor protection circuit-breaker open/closed
- Contact signalling closing spring charged/discharged
- Transient contact with momentary closing during circuit-breaker opening
- Circuit-breaker auxiliary contacts
- Locking electromagnet on the operating mechanism
- Position contact of the withdrawable truck
- Contacts signalling connected/isolated
- Opening solenoid
- Key lock in open position
- Isolation interlock with the door
- Protection for opening pushbutton
- Protection for closing pushbutton
- Locking electromagnet on the withdrawable truck
- Set of six isolating contacts.

Ordering

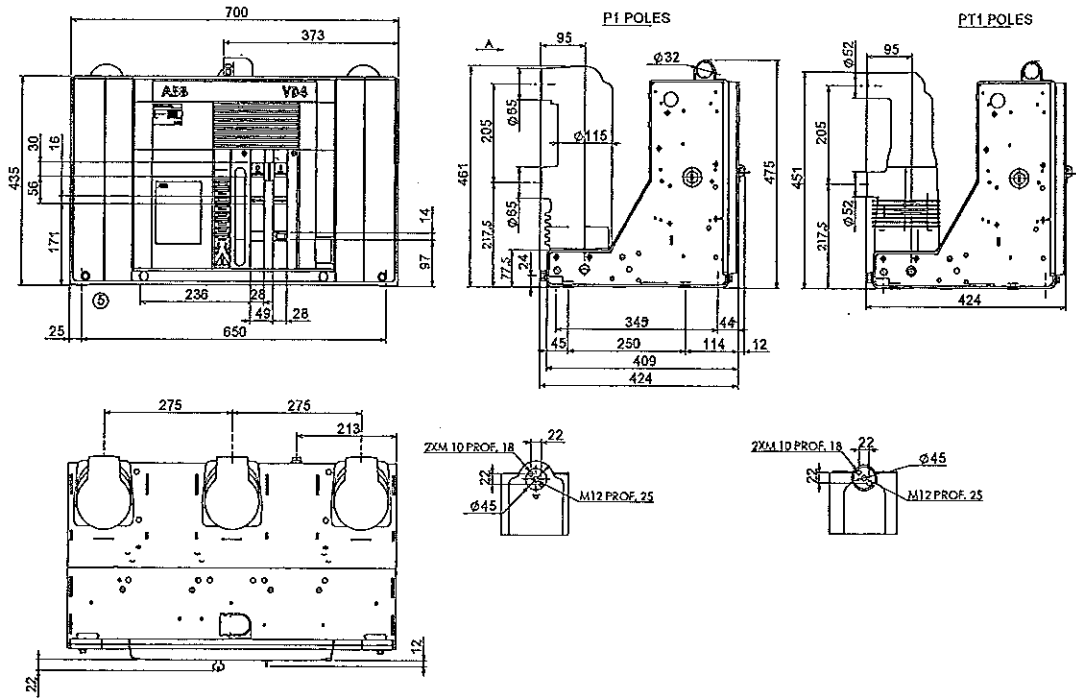
For availability and to order spare parts, please contact our Service department, specifying the circuit-breaker serial number.

ВЕРНО С ОРИГИНАЛОМ



Fixed circuit-breakers

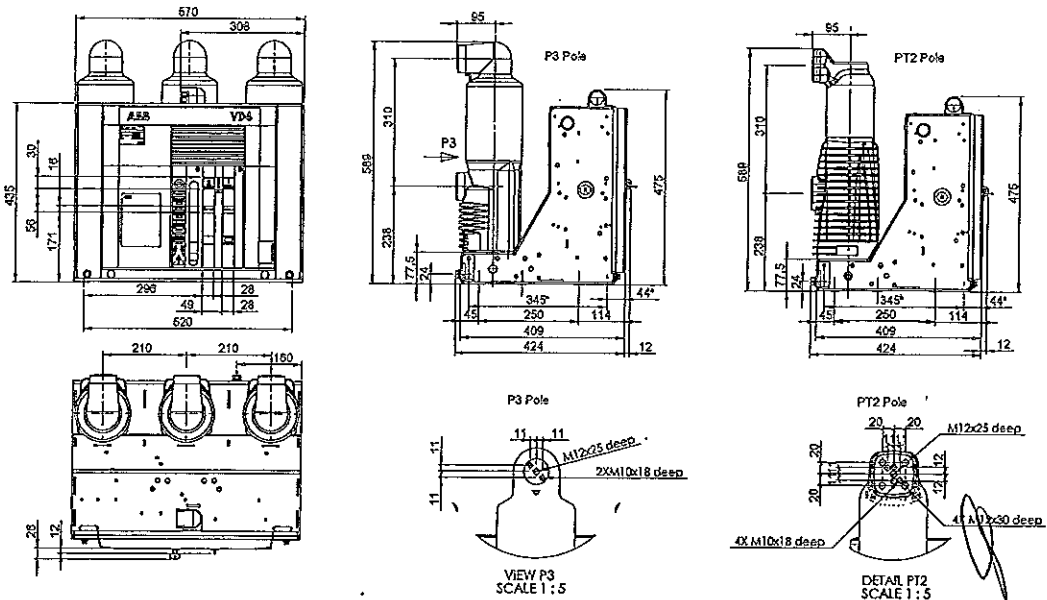
VD4	
TN	1VCD000051
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA
31.5 kA	



(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	1VCD003282
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



(*) Fixing interchangeability with previous series (345 x 650).

ВЯРНО С ОРИГИНАЛА

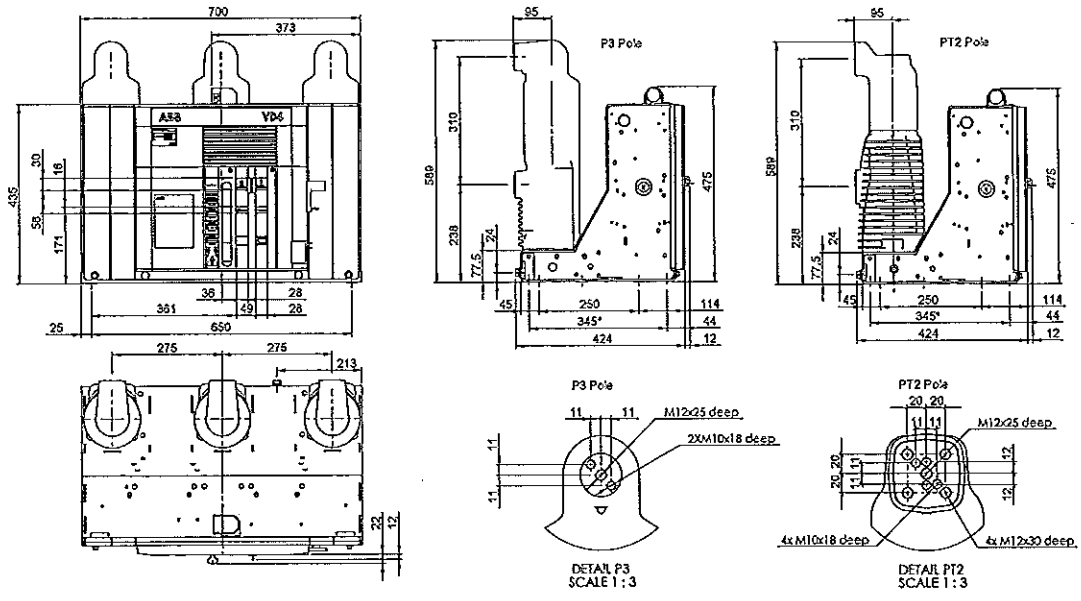


4. Overall dimensions

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Fixed circuit-breakers

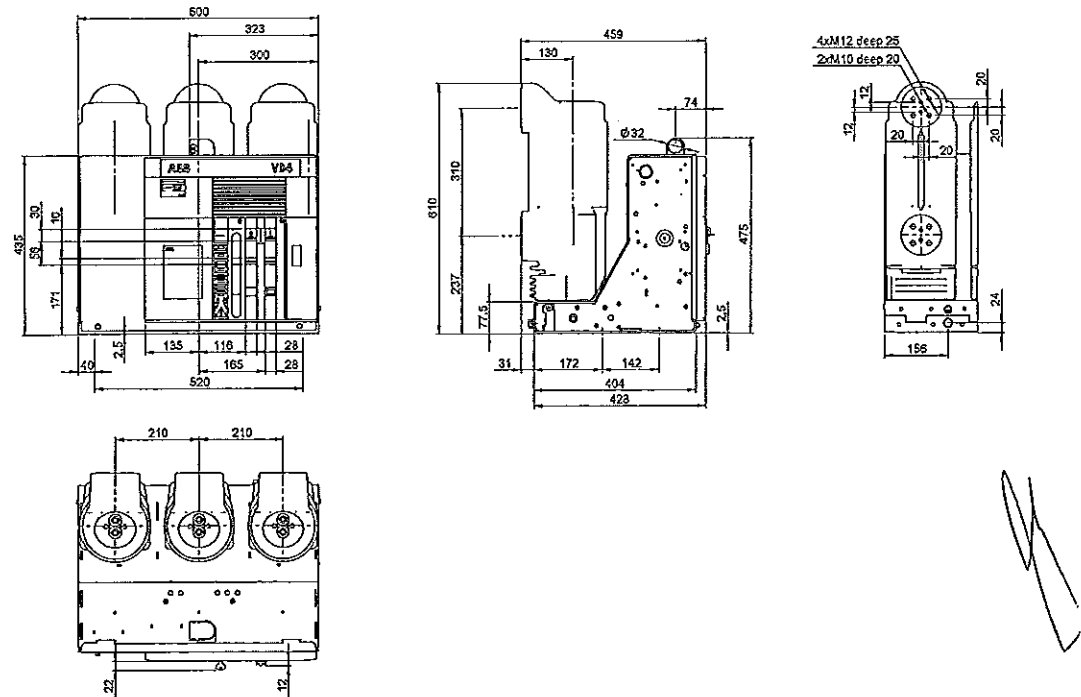
VD4	
TN	1VCD003285
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



(*) Fixing Interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	1VCD003440
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	2000 A
	50 kA



72 *Handwritten signature*

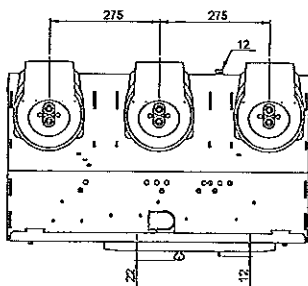
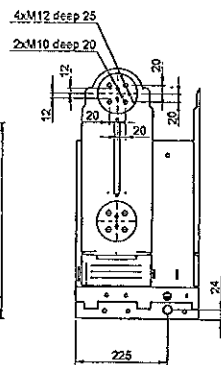
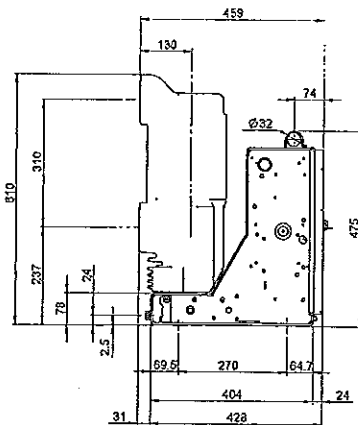
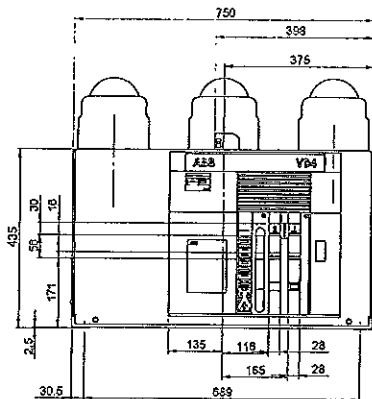
КОПИЯ С ОПРИГНАЛА



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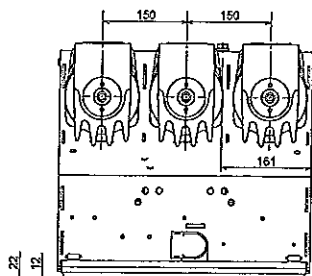
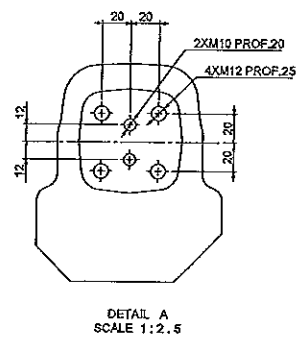
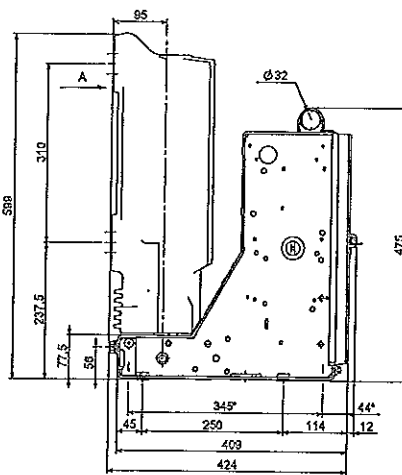
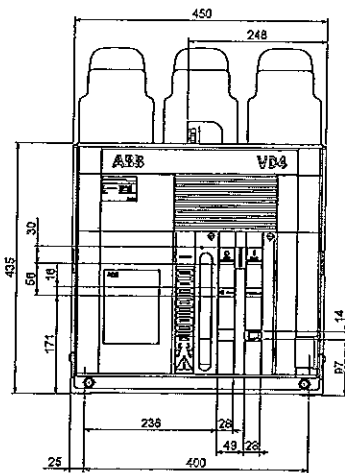
Fixed circuit-breakers

VD4	
TN	1VCD003441
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
	2000 A
	2500 A
Isc	50 kA



Fixed circuit-breakers

VD4	
TN	1VCD000050
Ur	12 kV
	1600 A
Isc	20 kA
	25 kA
	31.5 kA



(*) Fixing Interchangeability with previous series (345 x 400).

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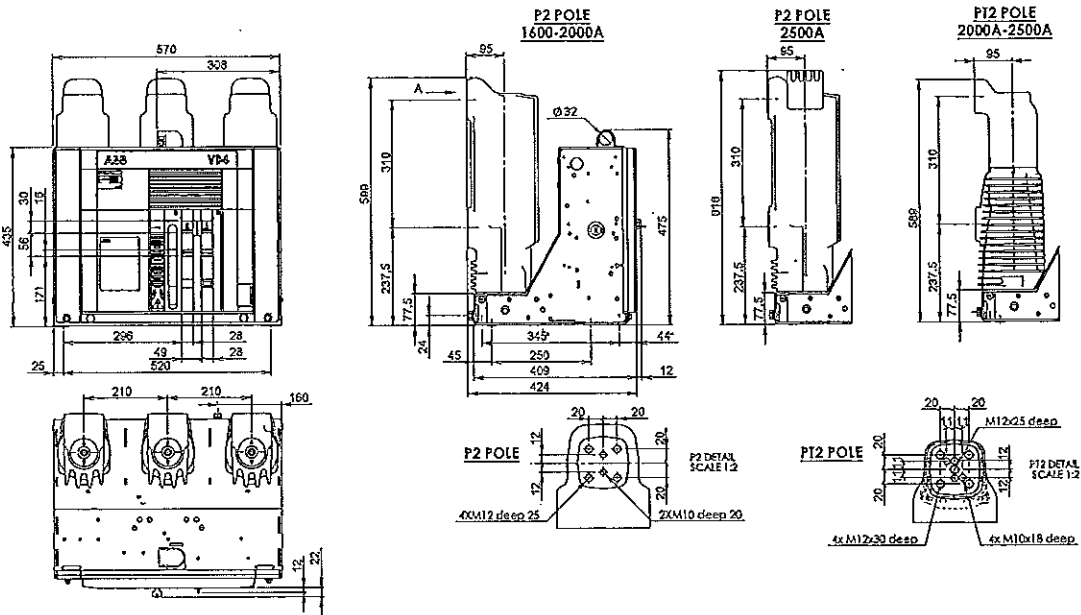
ВЯРНО С ОРИГИНАЛА



4. Overall dimensions

Fixed circuit-breakers

VD4	
TN	7407
Ur	12-17.5 kV
Ir	1600 A
Isc	20 kA
	25 kA
	31.5 kA



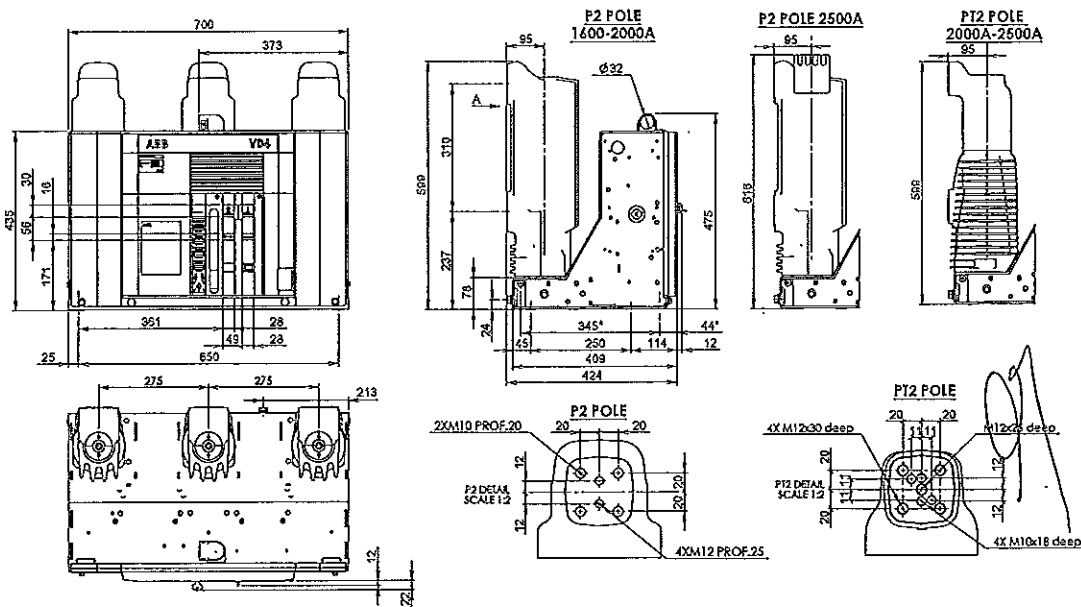
VD4	
TN	7407
Ur	12-17.5 kV
Ir	2000 A
Isc	20 kA
	25 kA
	31.5 kA
40 kA	

VD4	
TN	7407
Ur	12 kV
Ir	2500 A
Isc	20 kA
	25 kA
	31.5 kA
40 kA	

(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	7408
Ur	12 kV
	17.5 kV
Ir	1600 A
Isc	20 kA
	25 kA
	31.5 kA



VD4	
TN	7408
Ur	12 kV
	17.5 kV
Ir	2000 A
	2500 A
Isc	20 kA
	25 kA
	31.5 kA
40 kA	

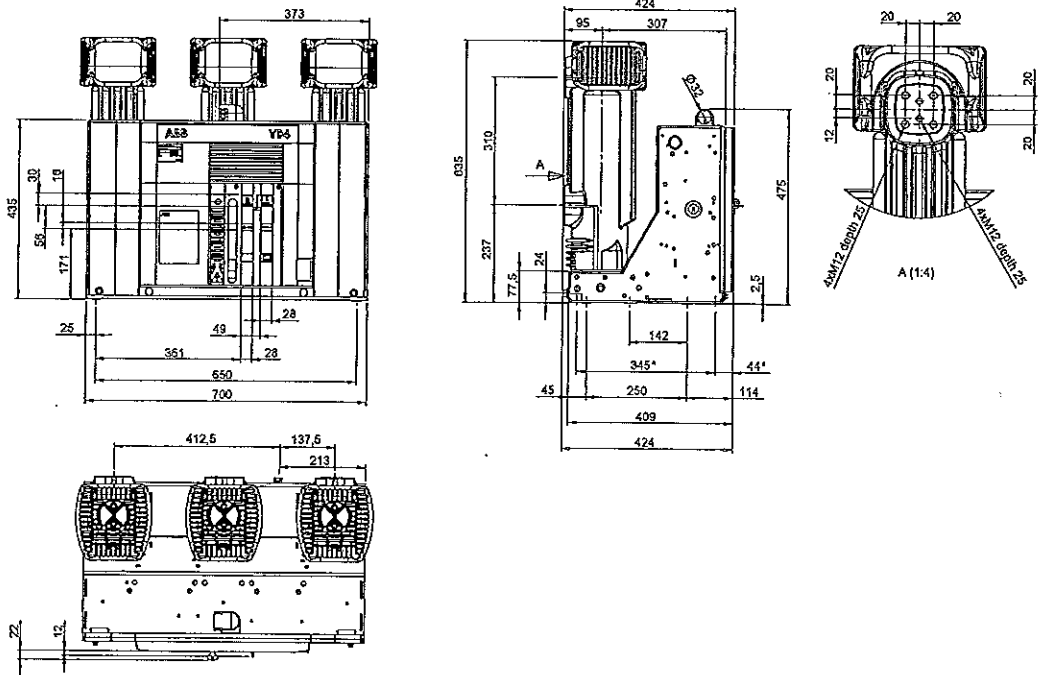
(*) Fixing interchangeability with previous series (345 x 650).

ВЕРНО С ОРИГИНАЛА



Fixed circuit-breakers

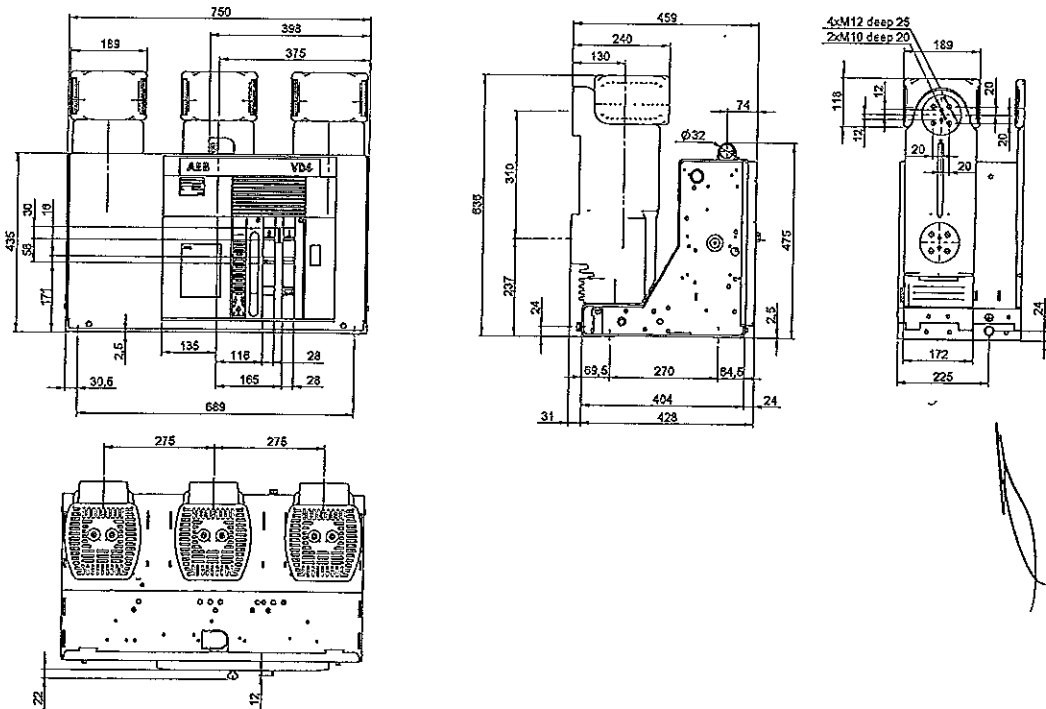
VD4	
TN	1VCD000149
Ur	12 kV
	17.5 kV
Ir	3150 A
Isc	20 kA
	25 kA
	31.5 kA
	40 kA



(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	1VCD003443
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	50 kA



(*) 4000 A with forced ventilation.

СМ

ОРИГИНАЛ

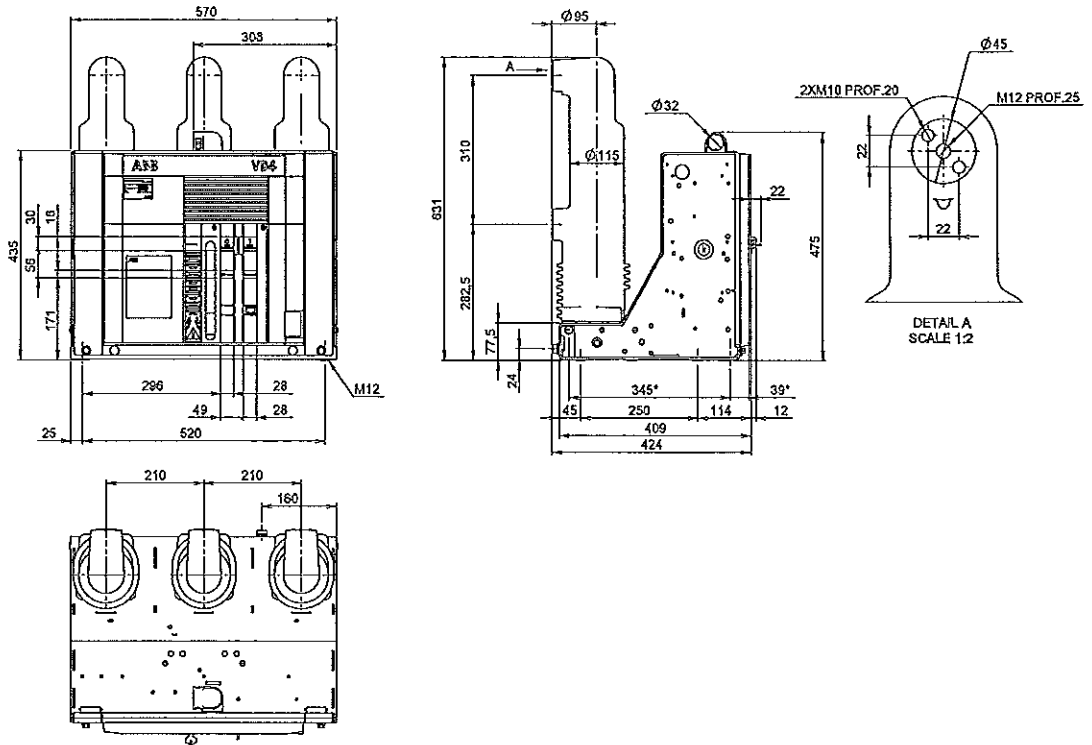


4. Overall dimensions



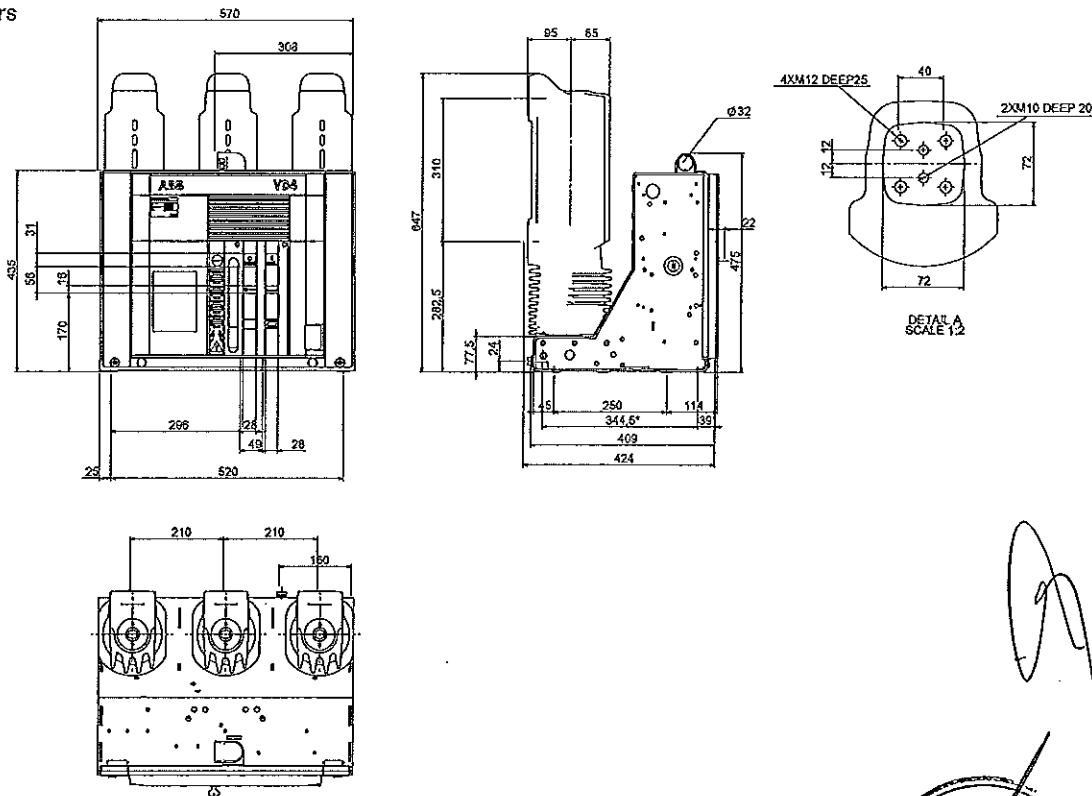
Fixed circuit-breakers

VD4	
TN	7409
Ur	24 kV
I _r	630 A
	1250 A
I _{sc}	16 kA
	20 kA
	25 kA



Fixed circuit-breakers

VD4	
TN	1VCD000172
Ur	24 kV
I _r	630 A
	1250 A
I _{sc}	31,5 kA



76 *My*

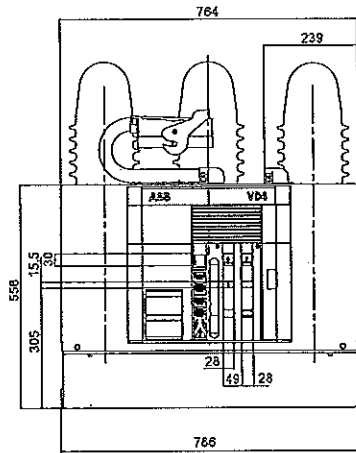
ВЕРНО С ОРИГИНАЛА



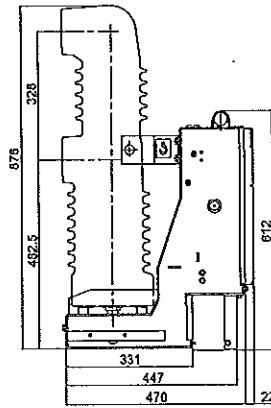
4. Overall dimensions

Fixed circuit-breakers

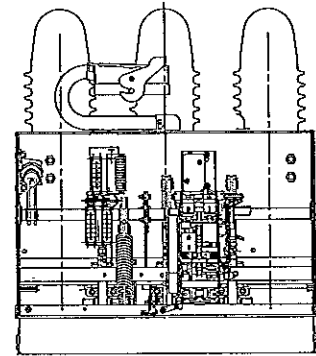
VD4	
TN	1VYN300901-LT
Ur	36 kV
	1250 A
Ir	1600 A
	2000 A
	2500 A
Isc	20 kA
	25 kA
	31.5 kA



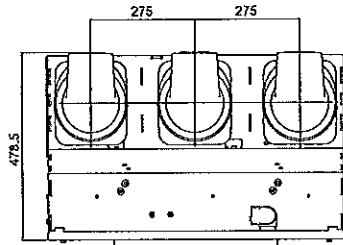
FRONT VIEW



SIDE VIEW



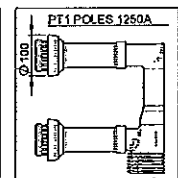
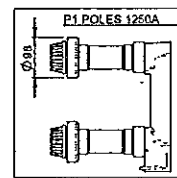
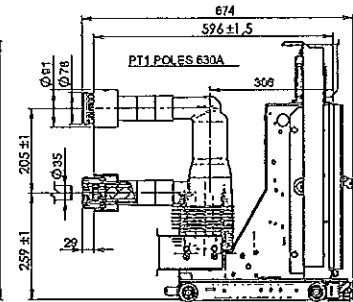
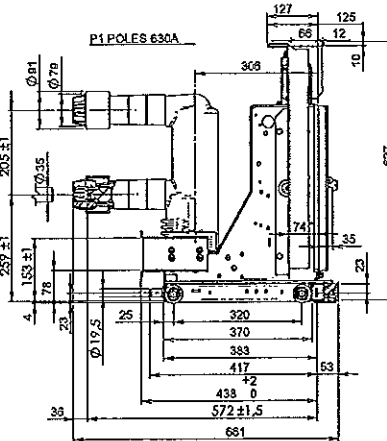
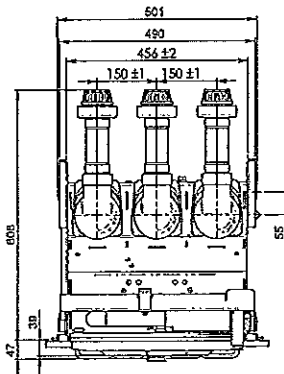
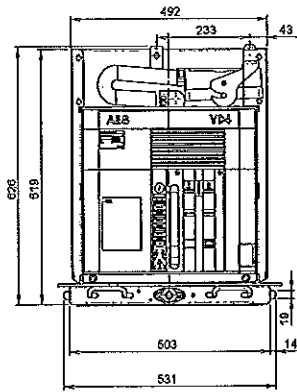
FRONT VIEW WITHOUT FRONT COVER



TOP

Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB1 modules

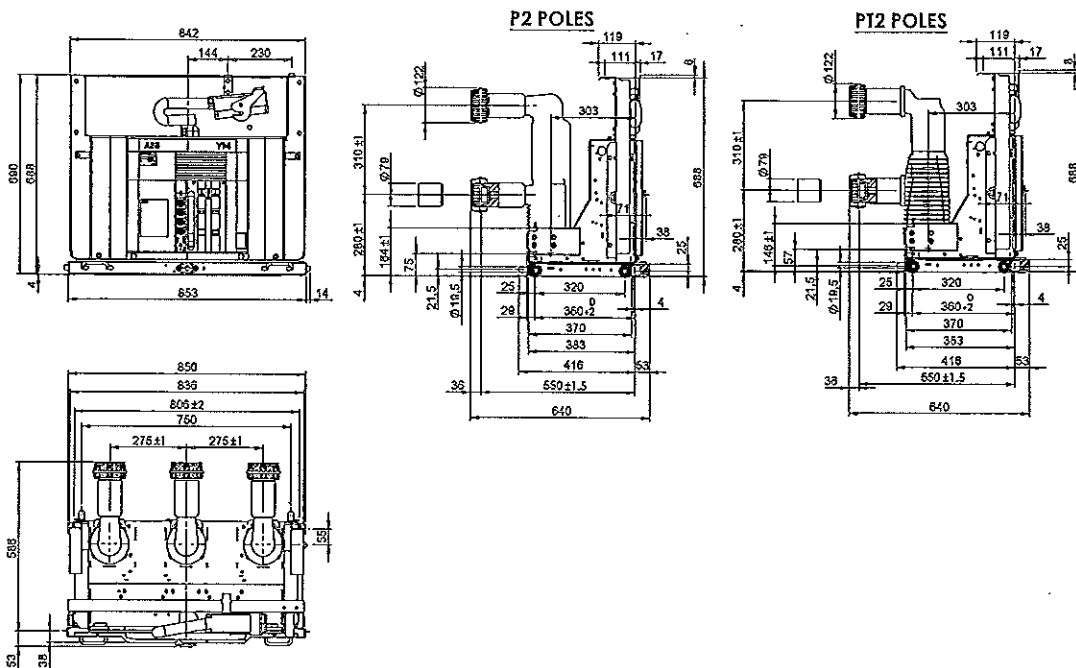
VD4/P	
TN	7412
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
	16 kA
Isc	20 kA
	25 kA
	31.5 kA



4. Overall dimensions

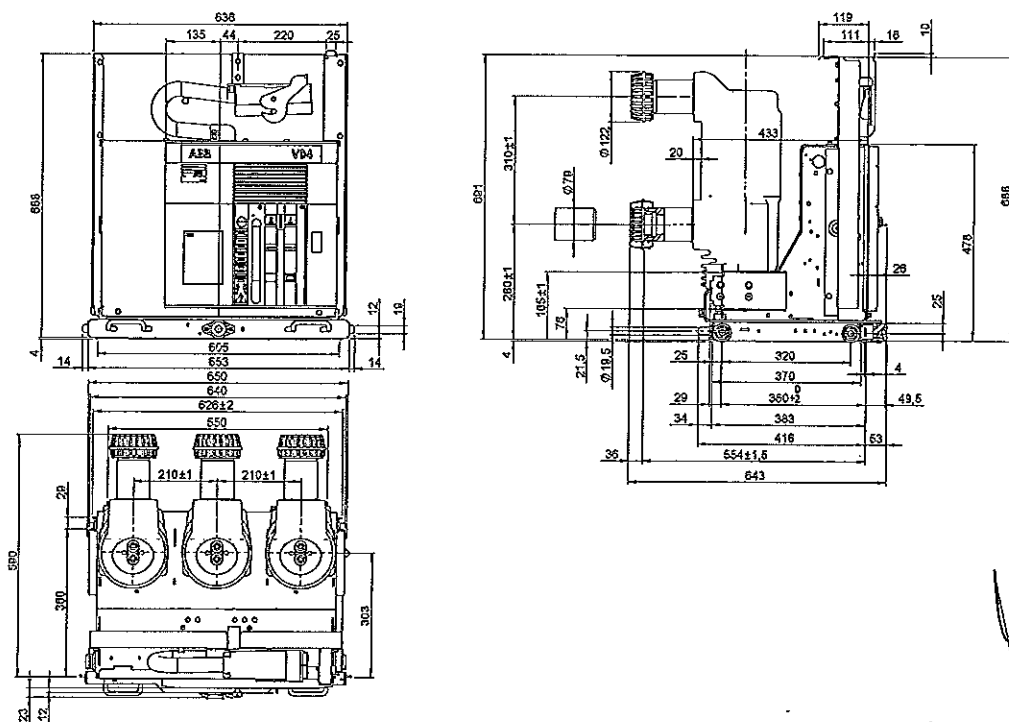
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD003286
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB2 modules

VD4/P	
TN	1VCD 003444
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
	2000 A
Isc	50 kA



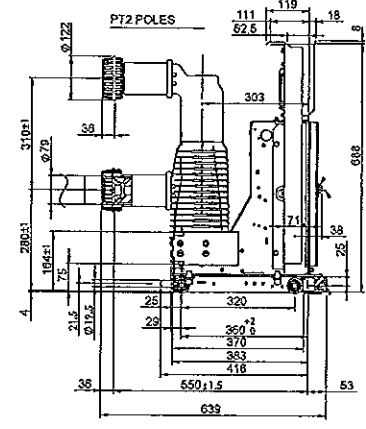
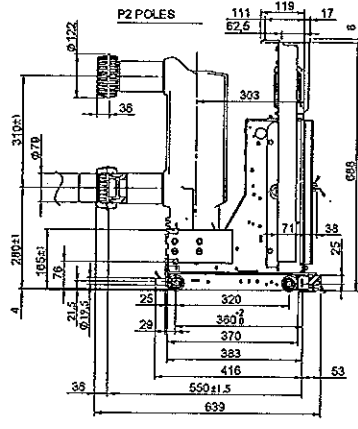
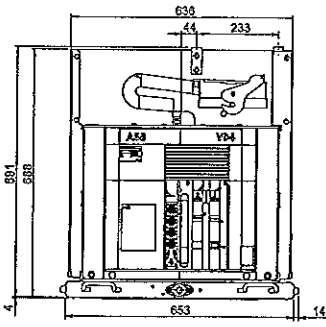
ВЕРНО С ОРИГИНАЛА



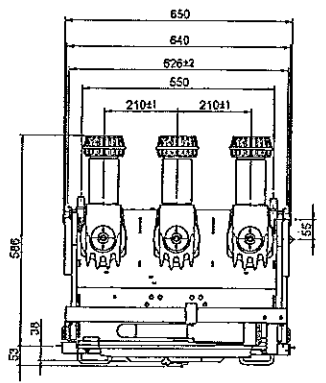
K

Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB2 modules

VD4/P	
TN	7415
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	20 kA
	31.5 kA

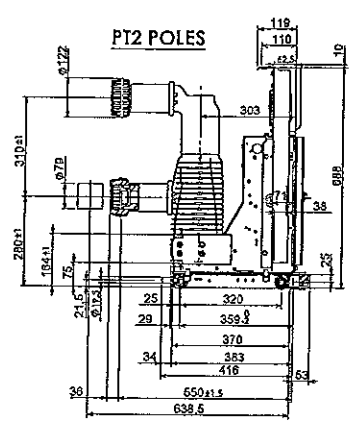
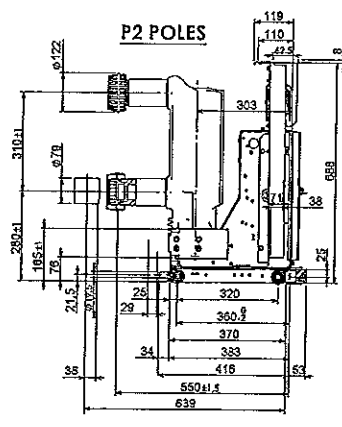
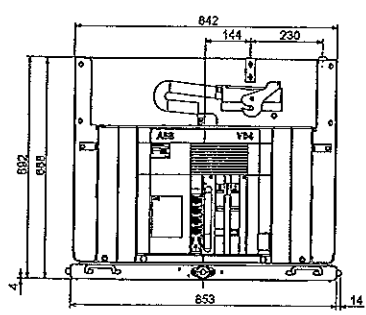


VD4/P	
TN	7415
Ur	12 kV
	17.5 kV
Ir	2000 A
Isc	40 kA

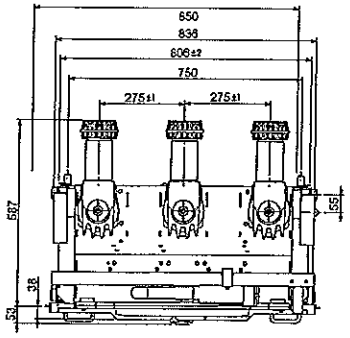


Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	7416
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	20 kA
	31.5 kA



VD4/P	
TN	7416
Ur	12 kV
	17.5 kV
Ir	2000 A
Isc	40 kA



K

K

ВЕРНО С ОРИГИНАЛА

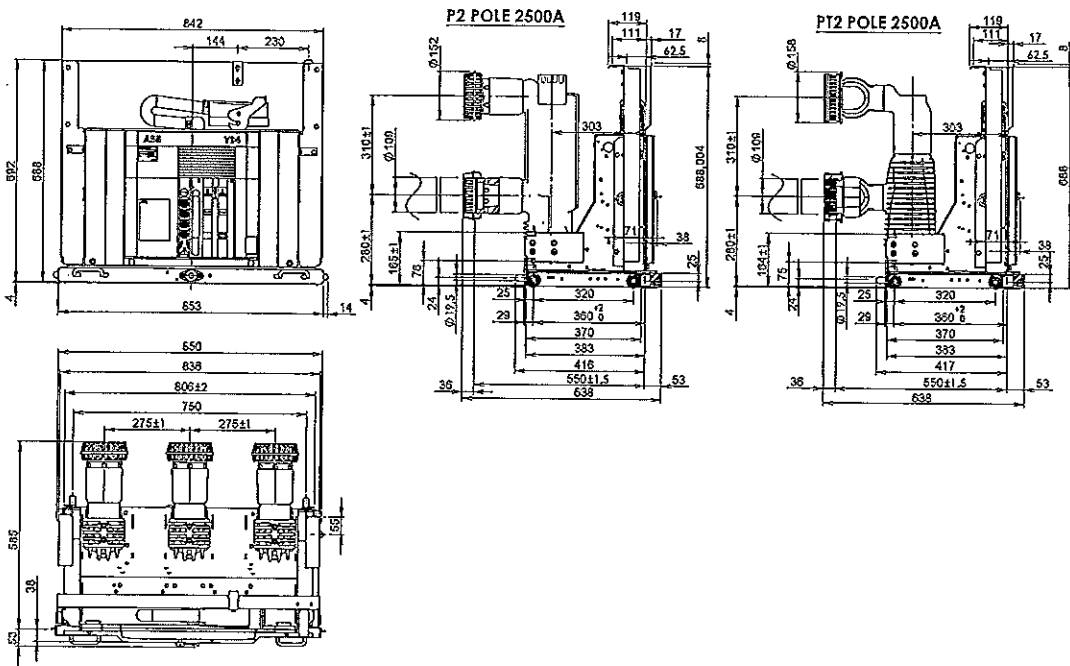


4. Overall dimensions

Handwritten signature

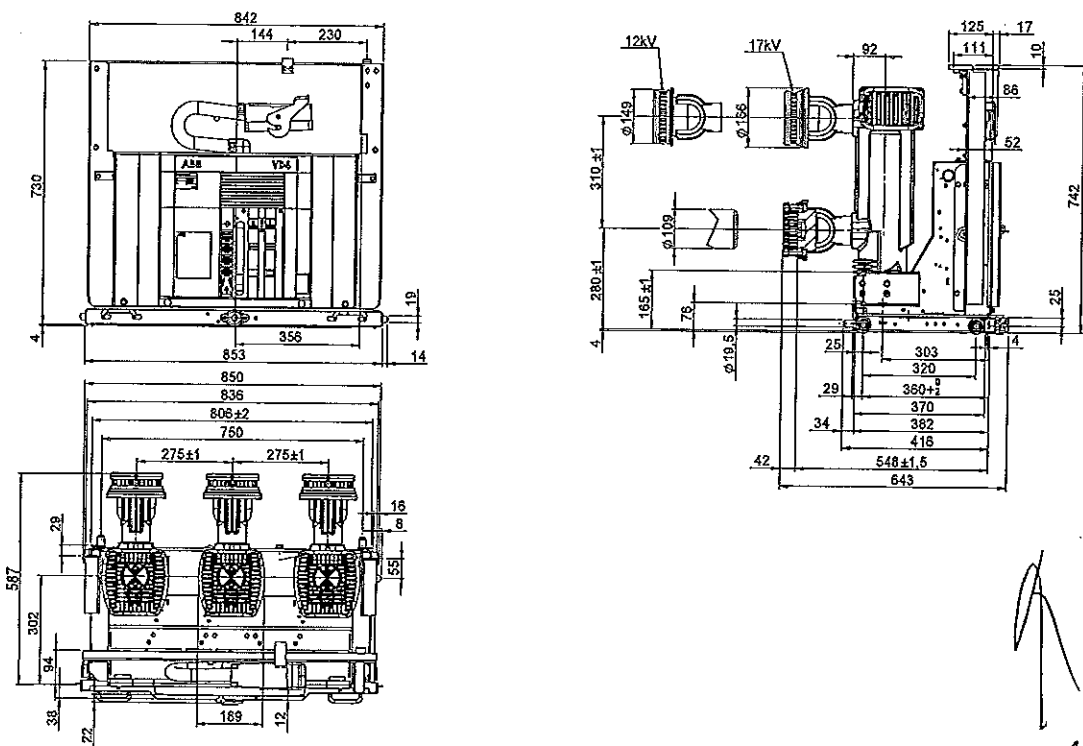
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB3 modules

VD4/P	
TN	7417
Ur	12 kV
	17.5 kV
Ir	2500 A
Isc	20 kA
	25 kA
	31.5 kA
	40 kA



Withdrawable circuit-breakers for PowerCube PB3 modules

VD4/W	
TN	1VCD000152
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	20 kA
	25 kA
	31.5 kA
	40 kA



(*) 4000 A with forced ventilation.

82
Handwritten signature

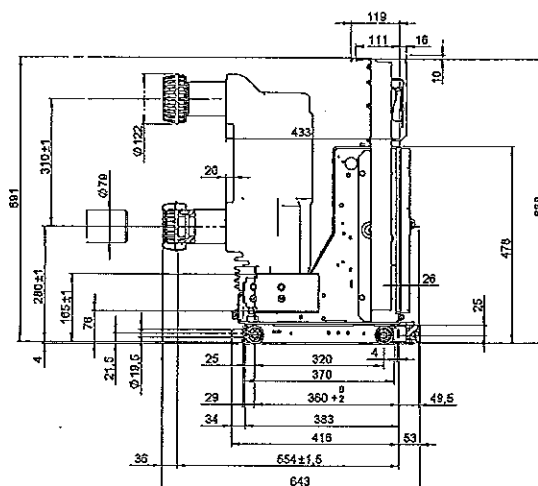
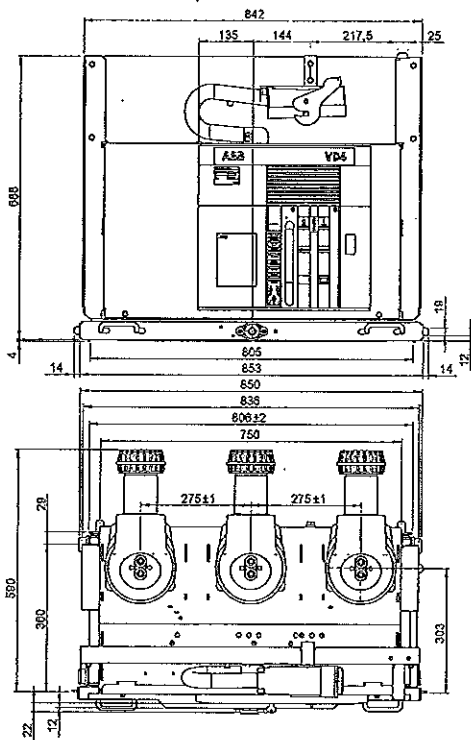
ВЕРНО С ОРИГИНАЛА



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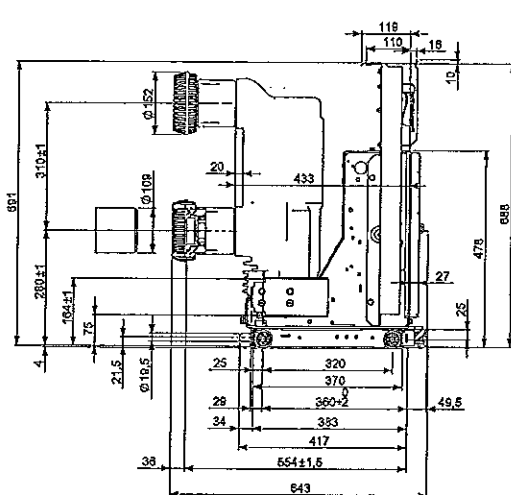
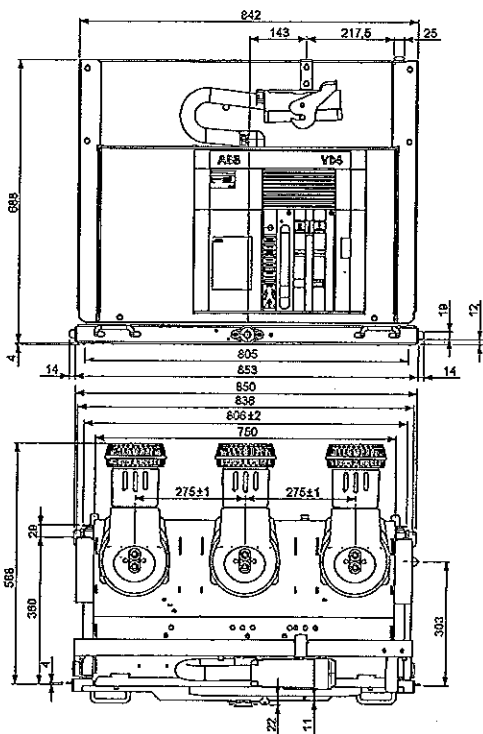
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB3 modules

VD4/P	
TN	1VCD003445
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	50 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD003446
Ur	12 kV
	17.5 kV
Ir	2500 A
Isc	50 kA



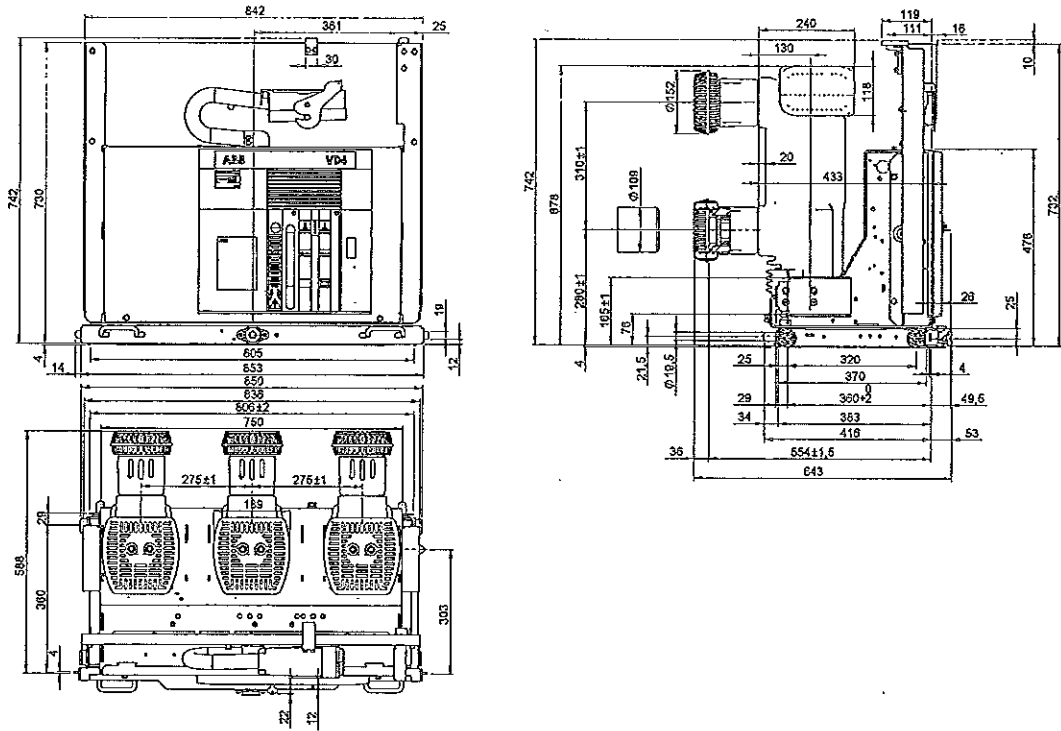
ВЯРНО С ОРИГИНАЛА



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Withdrawable circuit-breakers for PowerCube PB3 modules

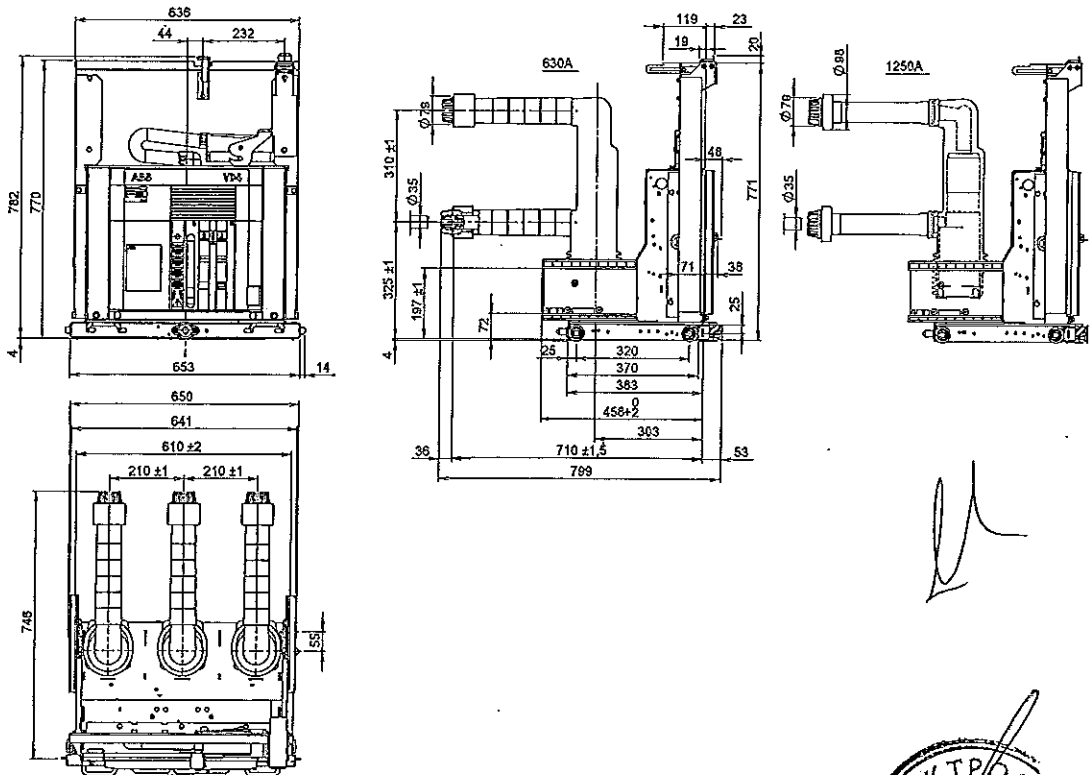
VD4/W	
TN	1VCD003596
Ur	12 kV
	17.5 kV
I _r	3150 A (*)
I _{sc}	50 kA



(*) 4000 A with forced ventilation.

Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB4 modules

VD4/P	
TN	7413
Ur	24 kV
I _r	630 A
	1250 A
I _{sc}	16 kA
	20 kA
	25 kA



ВЯРНО С ОРИГИНАЛА

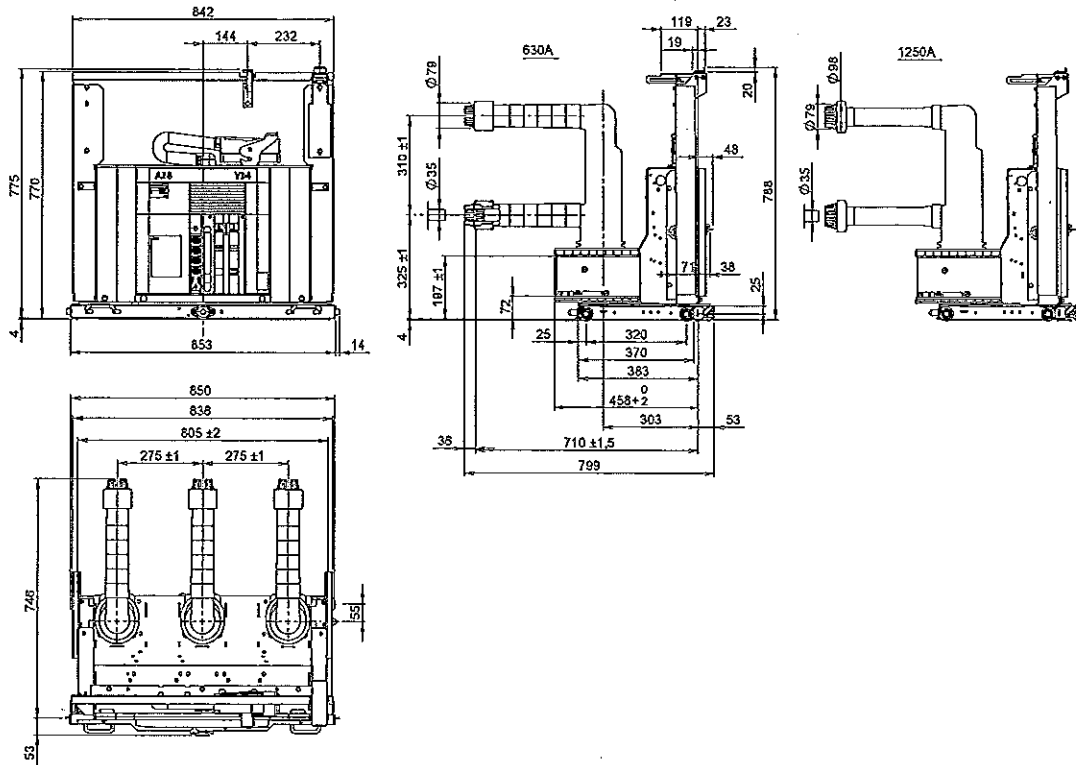


4. Overall dimensions

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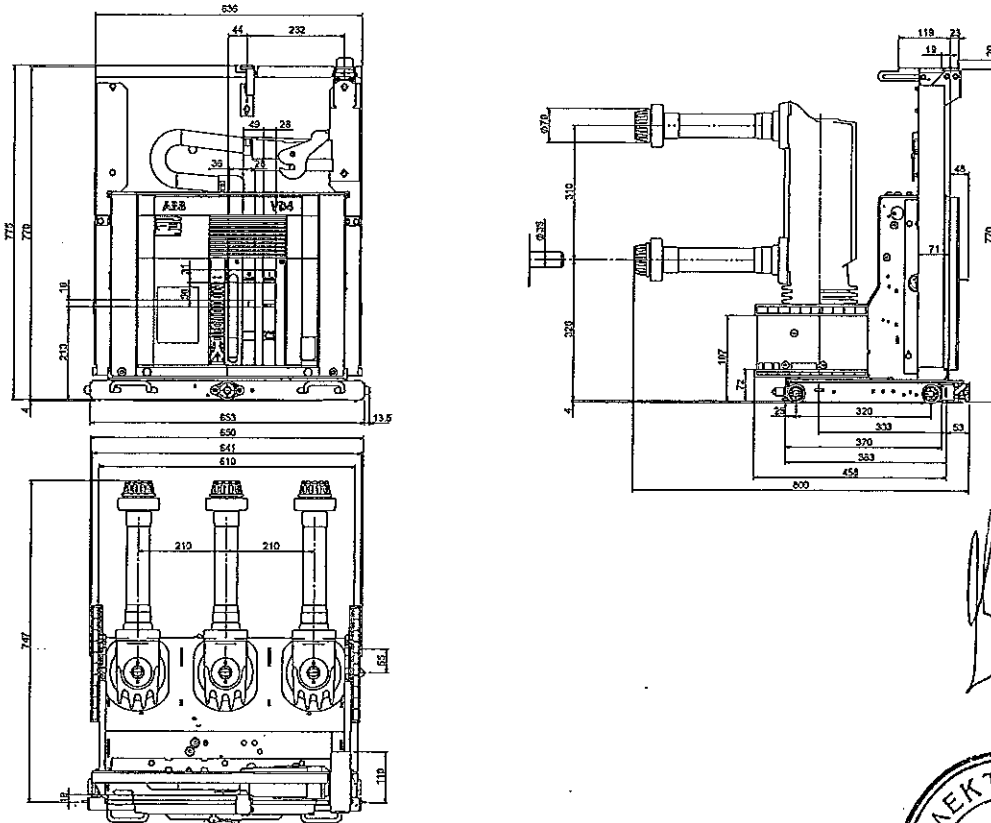
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	7414
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	25 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB4 modules

VD4/P	
TN	1VCD000173
Ur	24 kV
Ir	1250 A
Isc	31.5 kA



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86
[Handwritten signature]

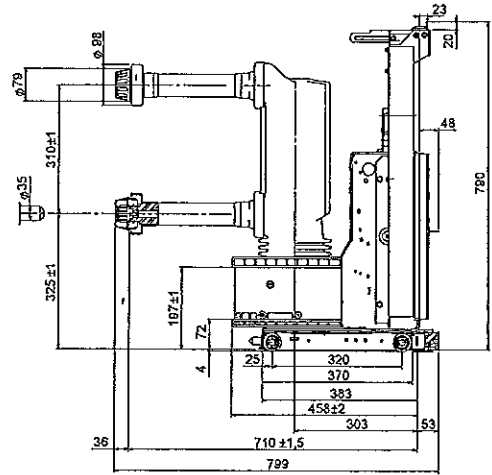
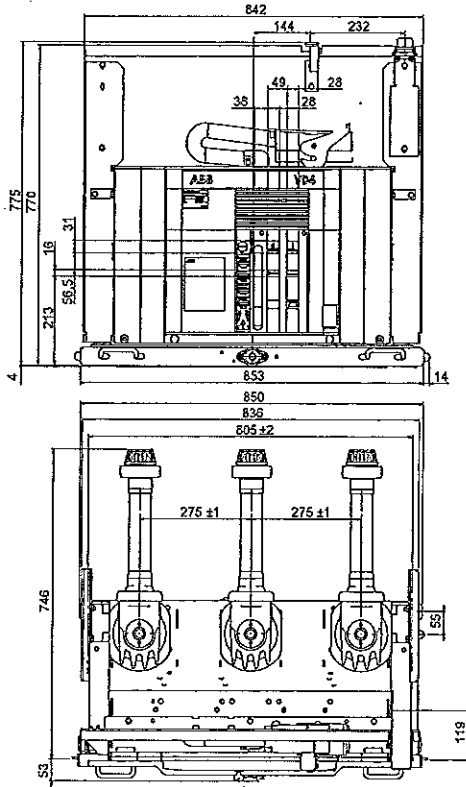
ВЯРНО С ОРИГІНАЛА



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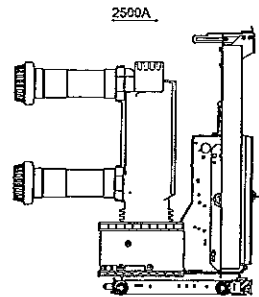
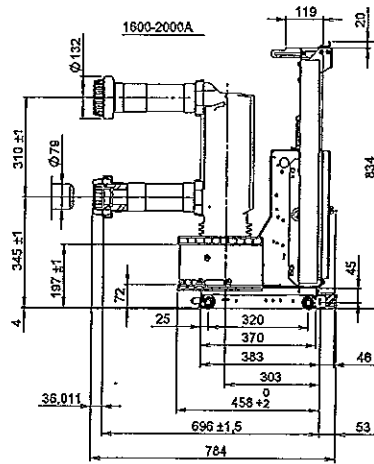
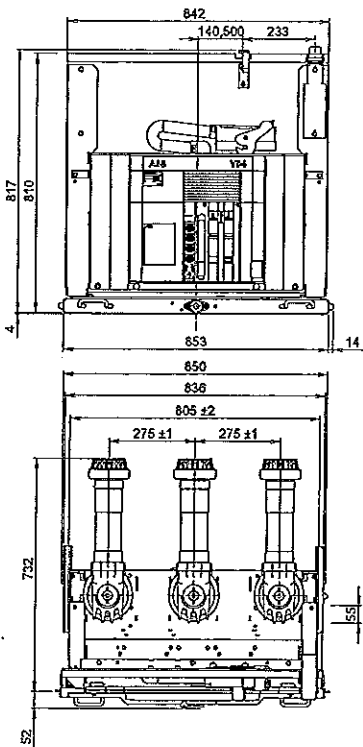
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD000174
Ur	24 kV
Ir	1250 A
Isc	31.5 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube PB5 modules

VD4/P	
TN	7418
Ur	24 kV
Ir	1600 A
	2000 A
Isc	2500 A (1)
	16 kA
	20 kA
	25 kA
	31.5 kA



Handwritten signature or mark.

(1) The rated uninterrupted current of 2300 A is guaranteed with natural ventilation. The rated uninterrupted current of 2500 A is guaranteed with forced ventilation.

Handwritten signature or mark.

ВАРНО С ОРИГИНАЛА

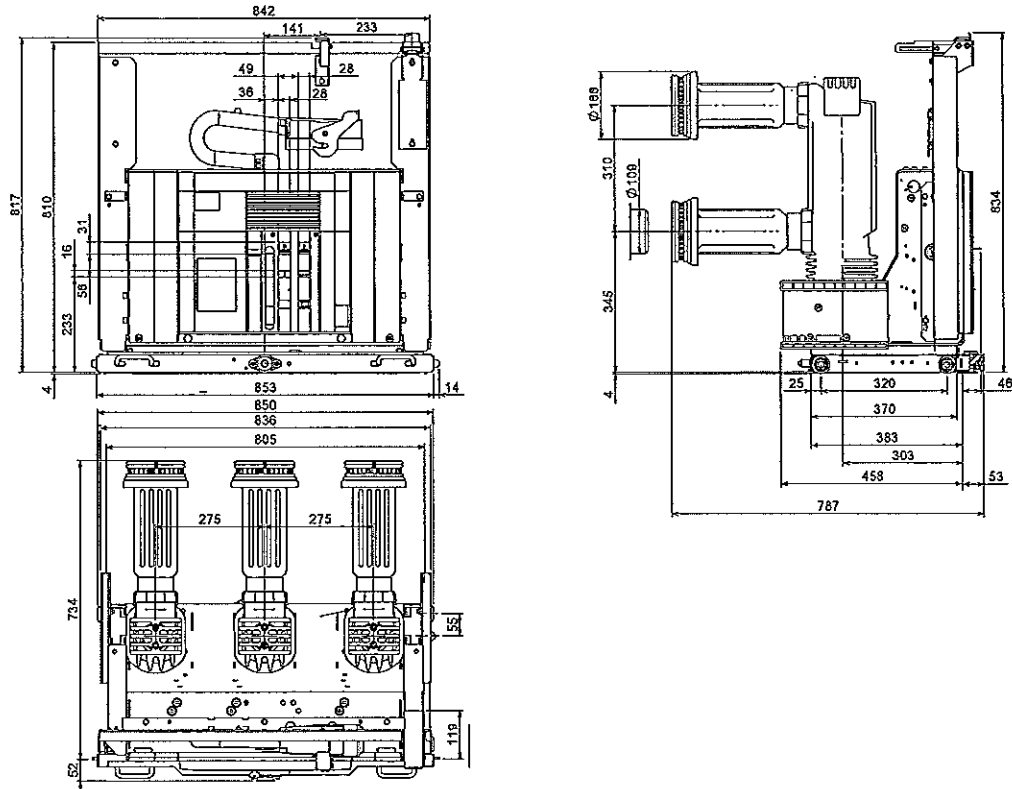


4. Overall dimensions

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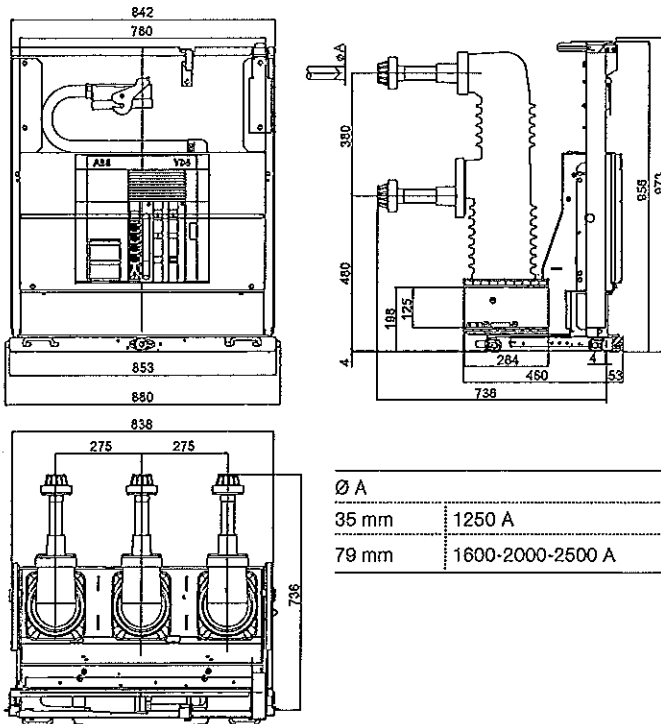
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD000177
Ur	24 kV
	3150 A
Isc	31.5 kA



Withdrawable circuit-breakers for UniGear ZS2 switchgear

VD4/W	
TN	1VYN300901-KG
Ur	36 kV
	1250 A
	1600 A
I _r	2000 A
	2500 A (*)
	20 kA
I _{sc}	25 kA
	31.5 kA



Handwritten signature

(*) The rated uninterrupted current of 2500 A is guaranteed with forced ventilation.

Handwritten signature

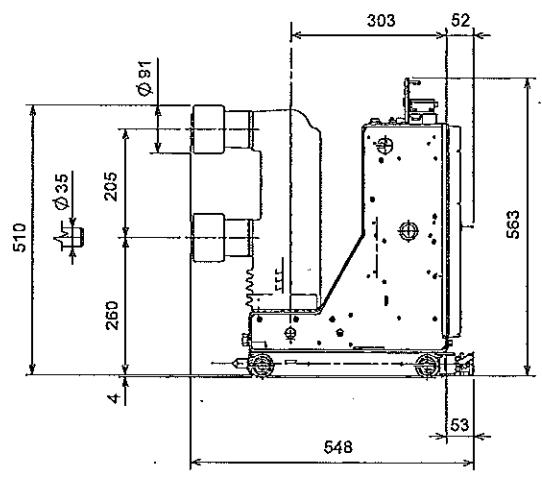
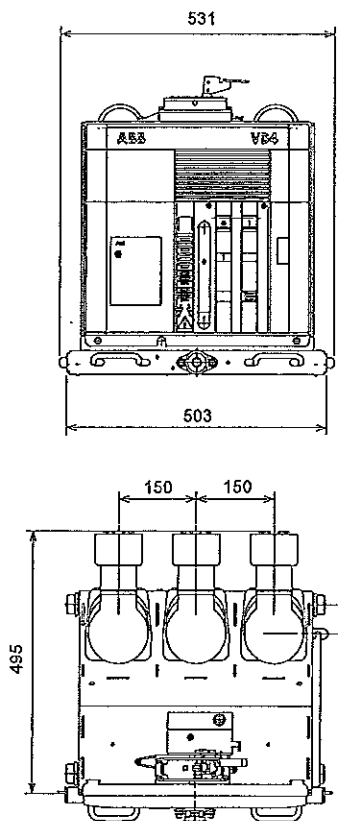
ВЕРНО С ОРИГИНАЛОМ



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Withdrawable circuit-breakers for ZS8.4 switchgear

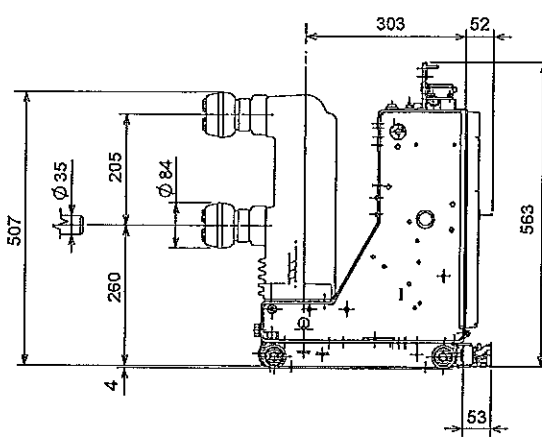
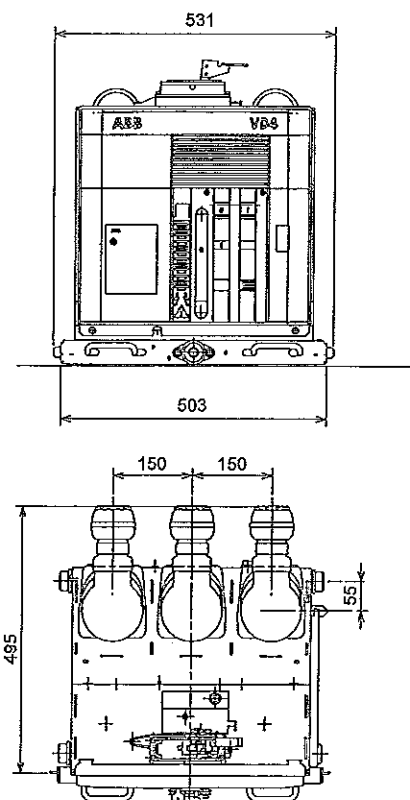
VD4/Z8	
TN	1VCD000092
Ur	12 kV
Ir	630 A
Isc	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8	
TN	1VCD000137
Ur	12 kV
Ir	1250 A
Isc	20 kA
	25 kA

VD4/Z8	
TN	1VCD000137
Ur	17.5 kV
Ir	630 A
Isc	20 kA
	25 kA



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ВЯРНО С ОРИГИНАЛА

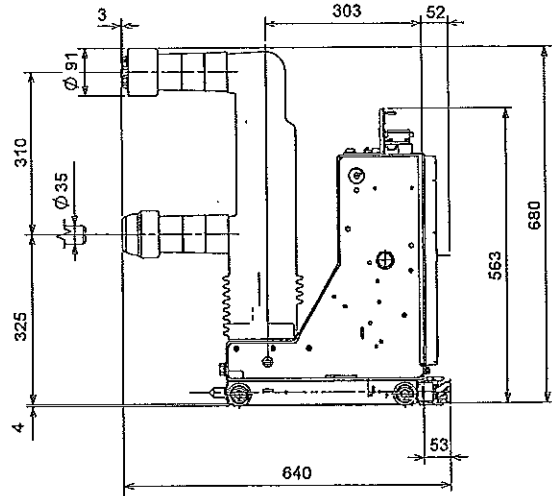
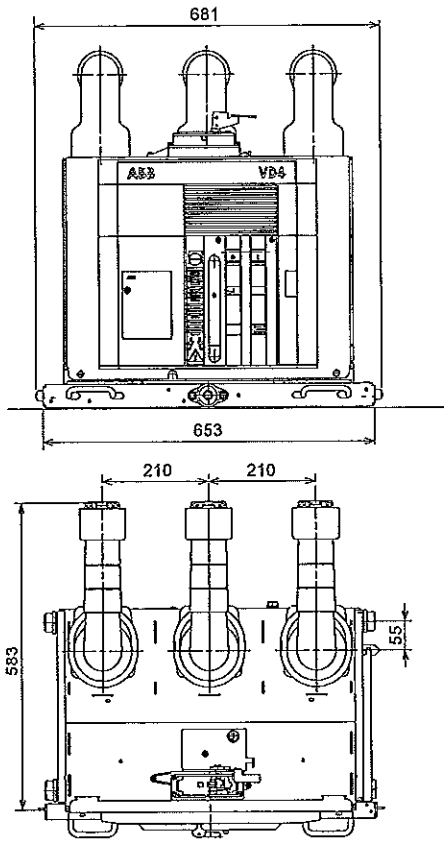


4. Overall dimensions

Handwritten signature

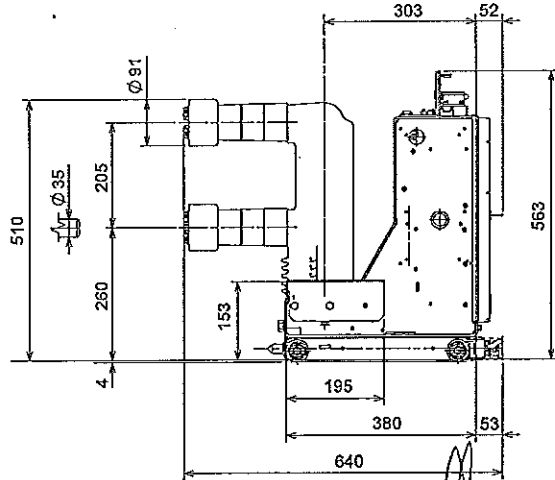
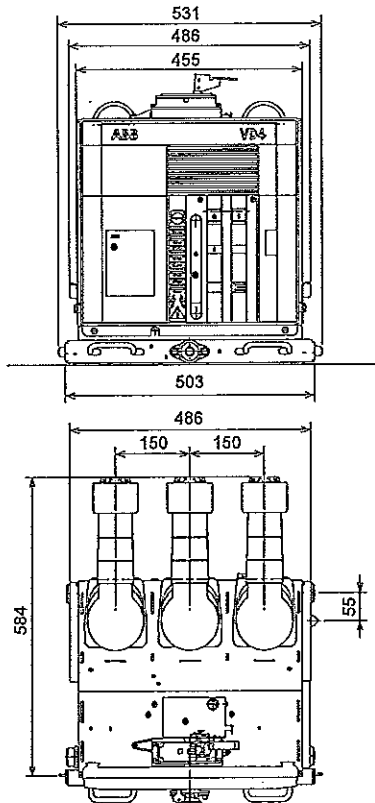
Withdrawable-circuit-breakers for ZS8.4 switchgear

VD4/Z8	
TN	1VCD000089
Ur	24 kV
Ir	630 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000093
Ur	12 kV
Ir	630 A
Isc	20 kA
	25 kA



ВЯРНО С ОРИГИНАЛА

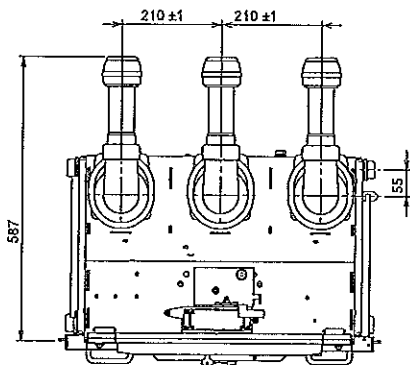
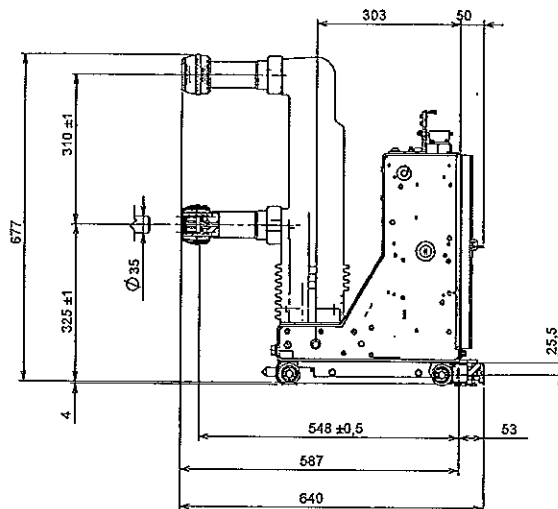
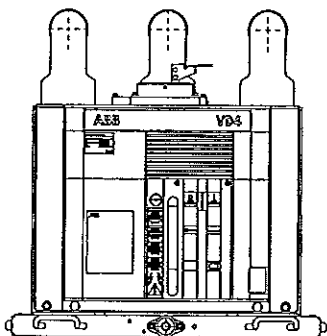
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Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8

TN	1VCD000138
Ur	24 kV
Ir	1250 A
Isc	16 kA
	20 kA
	25 kA



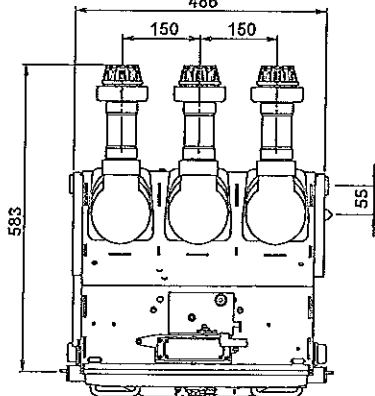
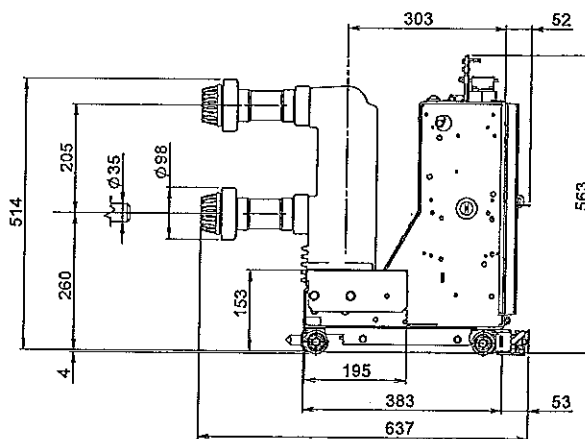
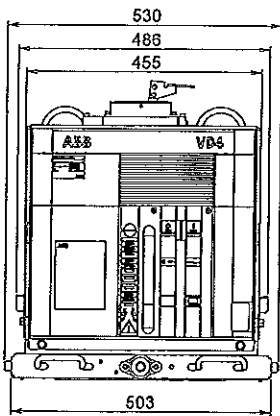
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8

TN	1VCD000134
Ur	12 kV
Ir	1250 A
Isc	20 kA
	25 kA

VD4/ZT8

TN	1VCD000134
Ur	17.5 kV
Ir	630 A
	1250 A
Isc	20 kA
	25 kA



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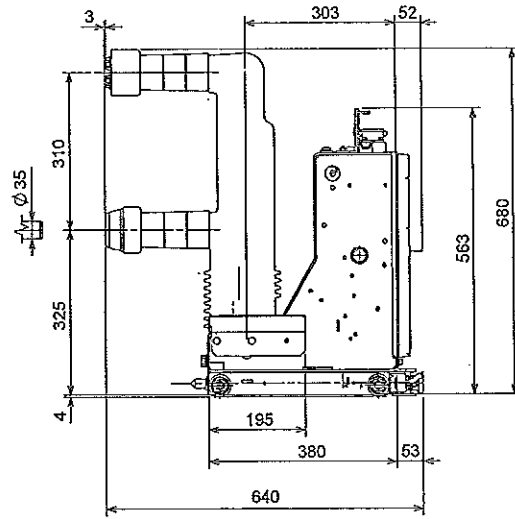
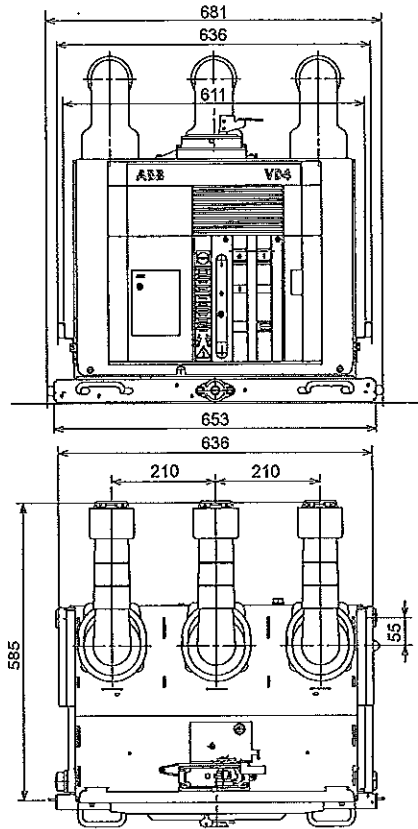
ВЕРНО С ОРИГИНАЛА



4. Overall dimensions

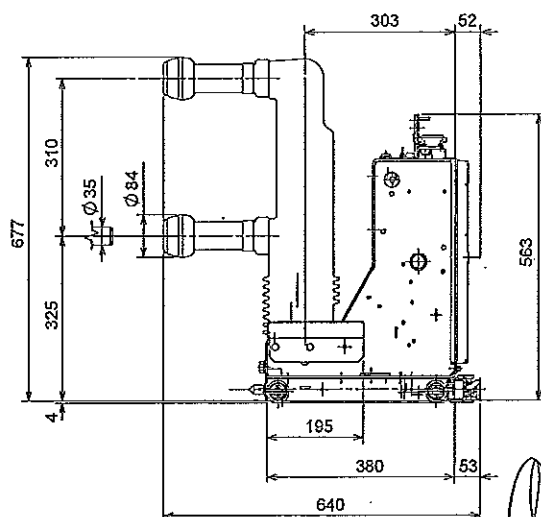
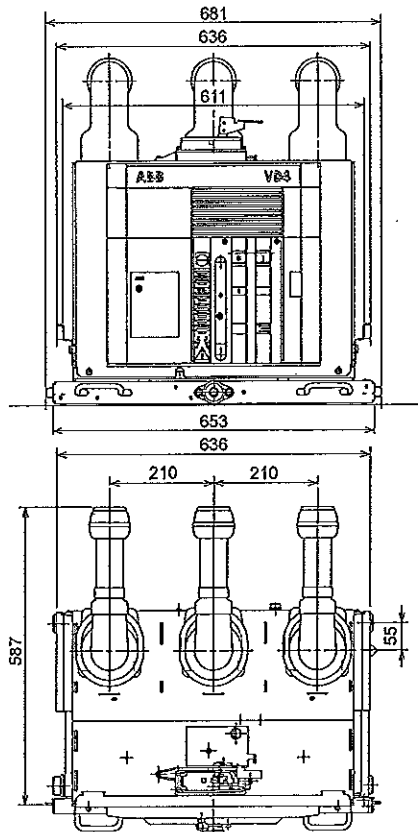
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000090
Ur	24 kV
Ir	630 A
	16 kA
Isc	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000136
Ur	24 kV
Ir	1250 A
	16 kA
Isc	20 kA
	25 kA



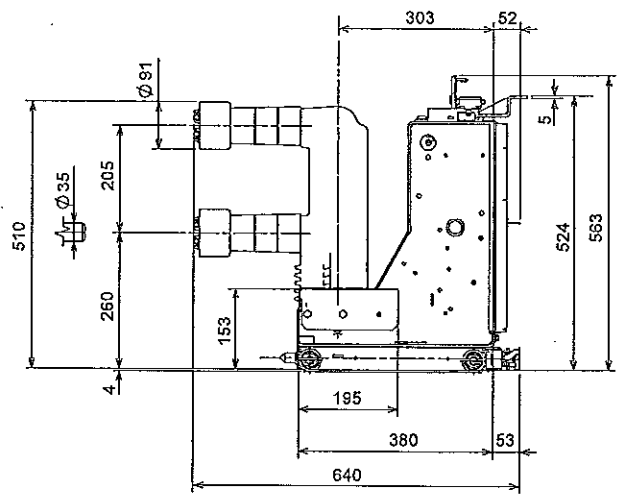
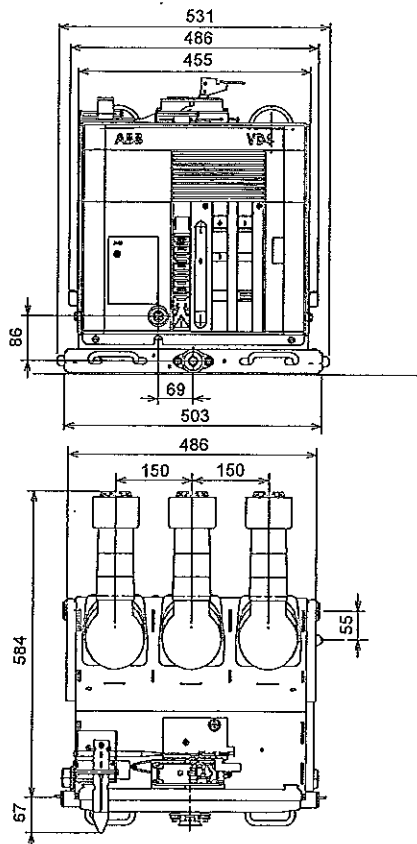
92

ВЯРНО С ОРИГИНАЛА



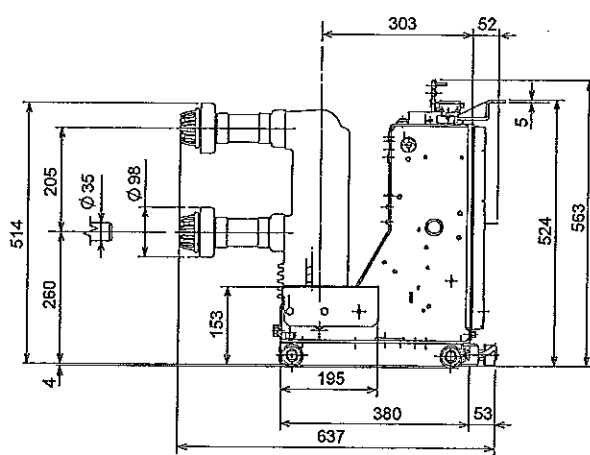
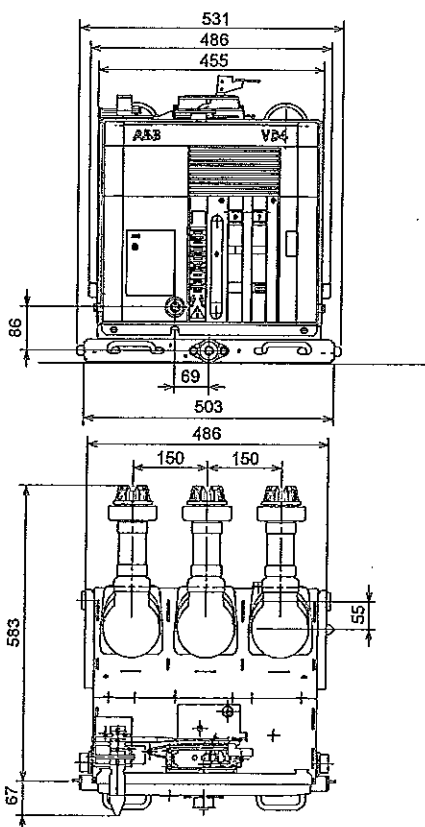
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8		
TN	1VCD000091	
Ur	12	kV
Ir	630	A
Isc	20	kA
	25	kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8		
TN	1VCD000133	
Ur	12	kV
Ir	1250	A
Isc	20	kA
	25	kA



ВЕРНО С ОРИГИНАЛА

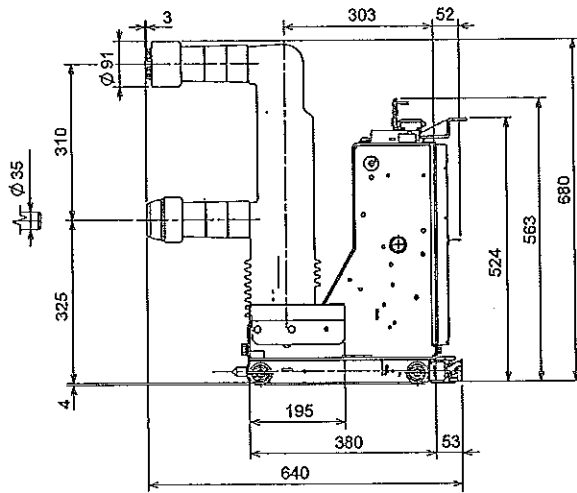
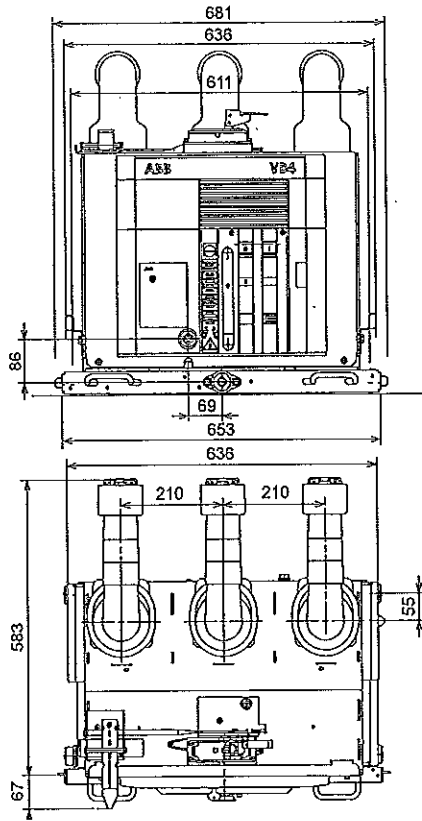


4. Overall dimensions

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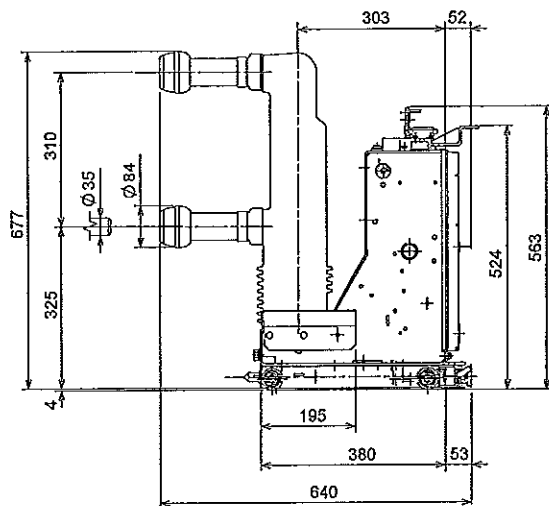
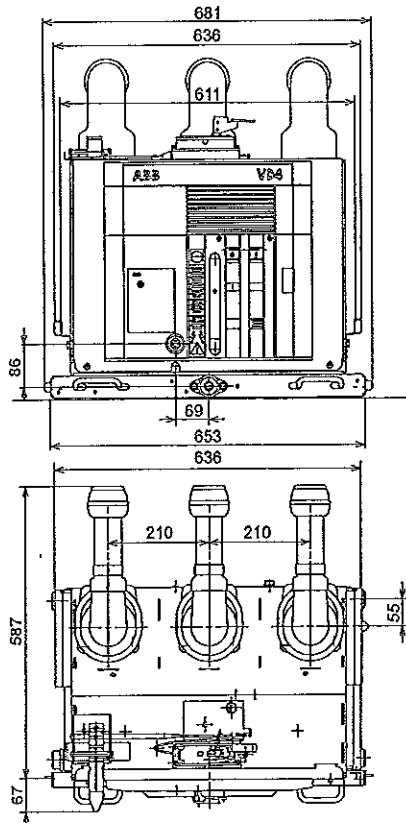
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000088
Ur	24 kV
Ir	630 A
isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000135
Ur	24 kV
Ir	1250 A
isc	16 kA
	20 kA
	25 kA



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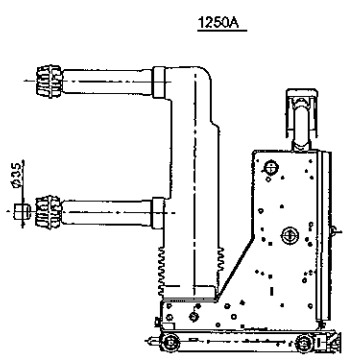
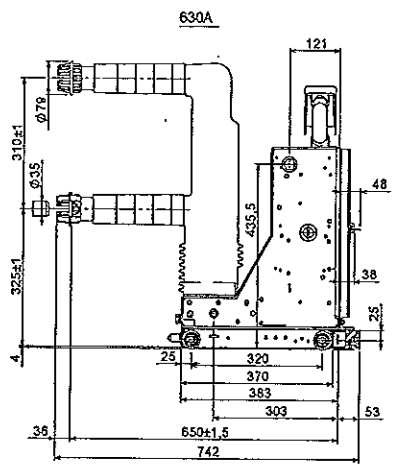
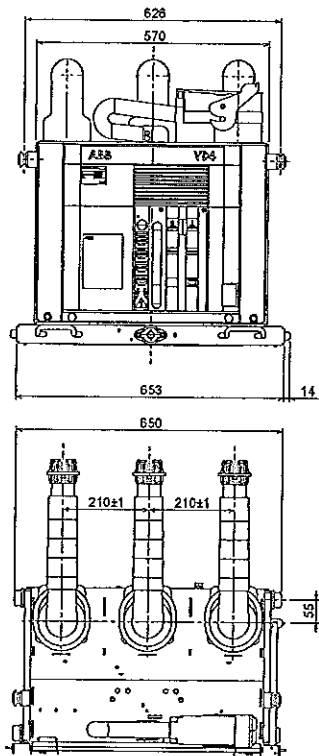
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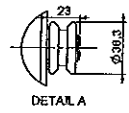
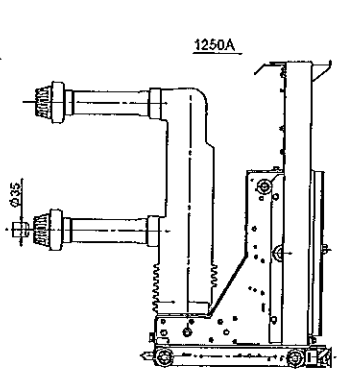
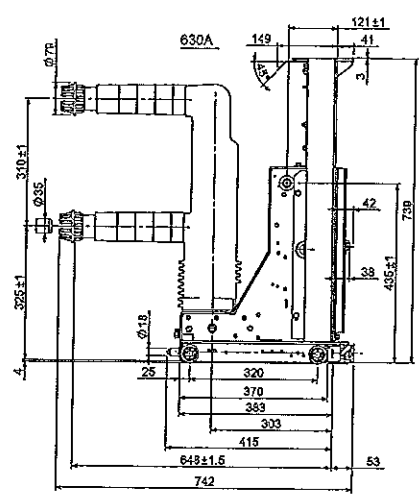
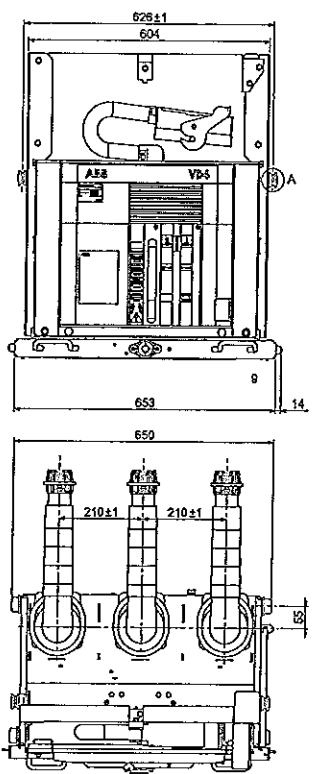
Withdrawable circuit-breakers for UniSwitch (CBW) and UniMix (P1/E) switchgear

VD4/US	
TN	1VCD000047
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for UniSec (WBC e WBS) switchgear

VD4/Sec	
TN	1VCD000190
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA



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5. Electric circuit diagram



State of operation represented

The diagrams shows the following conditions:

- Circuit-breaker open and connected (only withdrawable circuit-breaker)
- Circuits de-energized
- Closing springs discharged

Graphical symbols for electric diagrams

	Thermal effect		Mass, frame		Capacitor (general symbol)		Passing make contact closing momentarily during release
	Electromagnetic effect		Conductors in shielded cable (two conductors shown)		Motor (general symbol)		Closing position contact (limit switch)
	Timing		Connection of conductors		Rectifier with two half-waves (bridge)		Opening position contact (limit switch)
	Pushbutton control		Terminal or clamp		Make contact		Power circuit-breaker with automatic opening
	Key control		Socket and plug (female and male)		Break contact		Control coil (general symbol)
	Earth (general symbol)		Resistor (general symbol)		Change-over break before make contact		Lamp (general symbol)

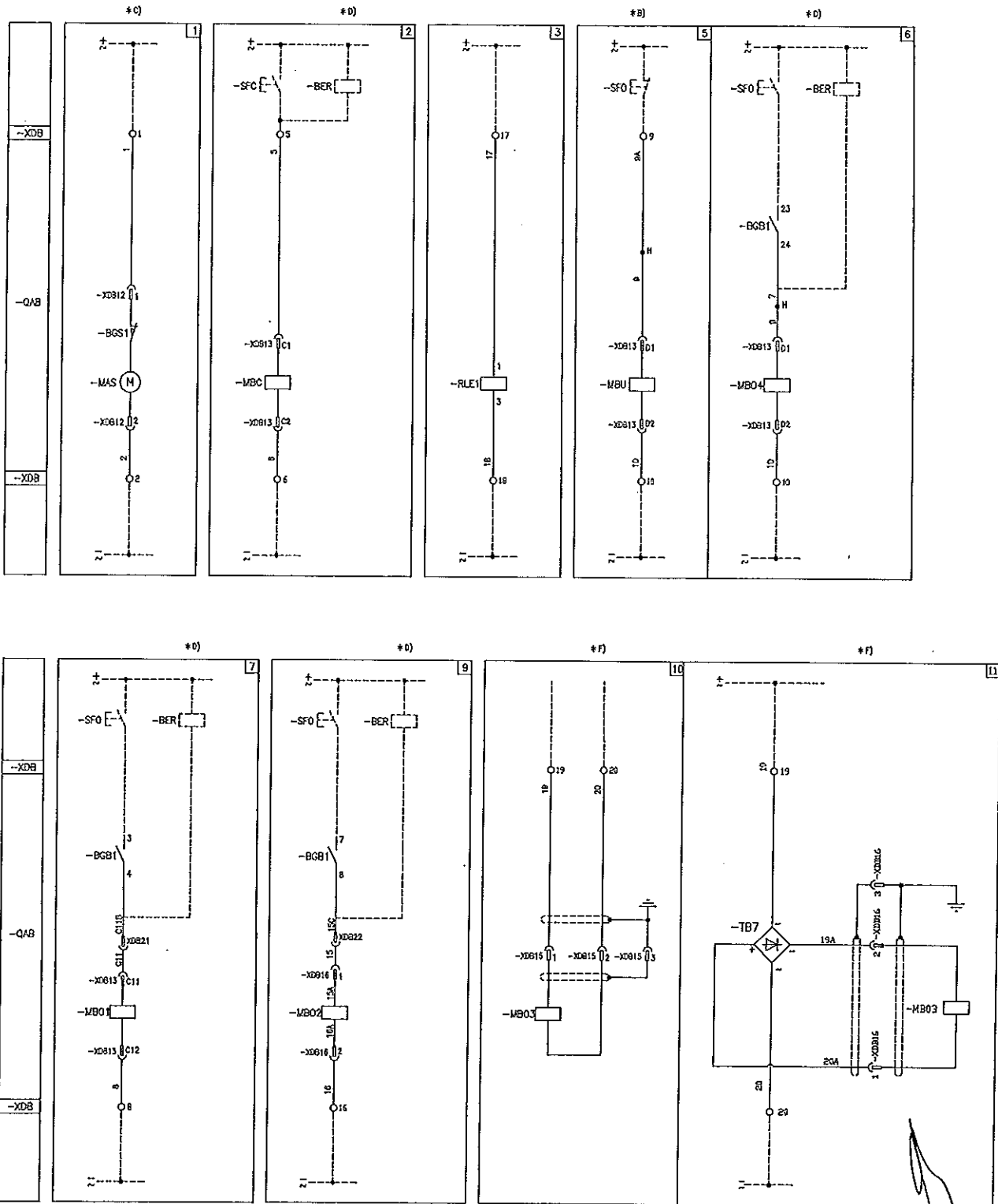
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Electric circuit diagram of fixed circuit-breakers 12 .. 24 kV 1VCD 400046

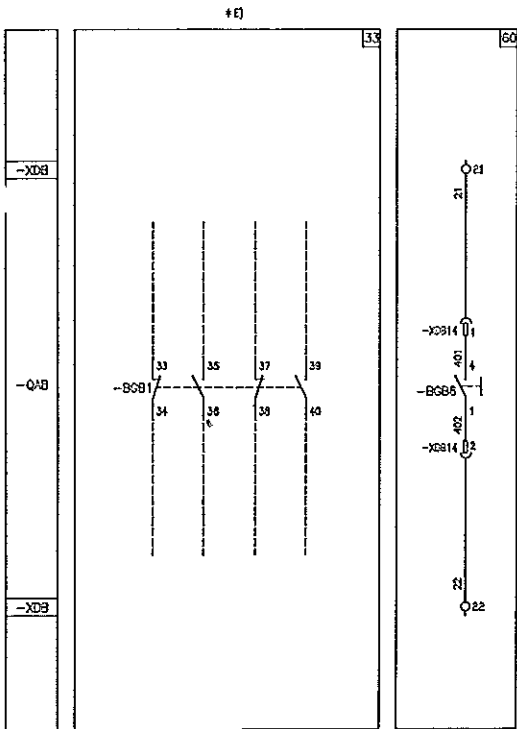
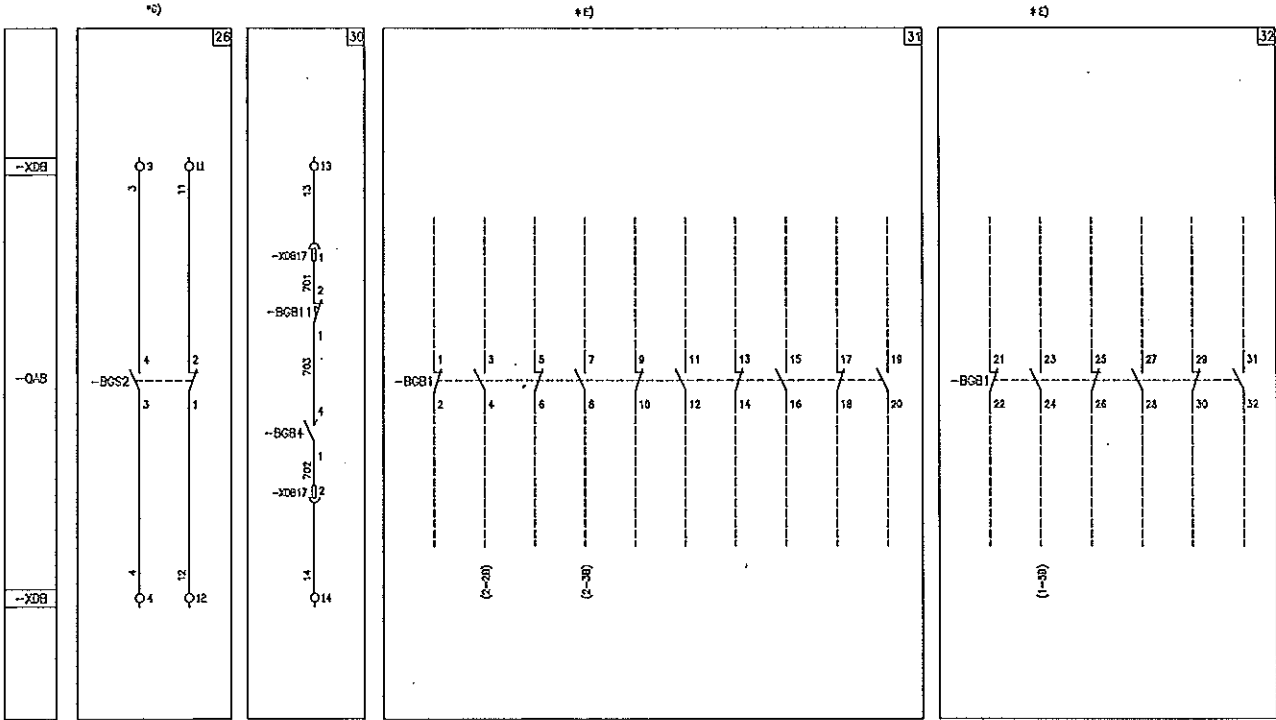
The electric circuit diagram given in this section regards the fixed circuit-breakers 12 .. 24 kV.



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5. Electric circuit diagram

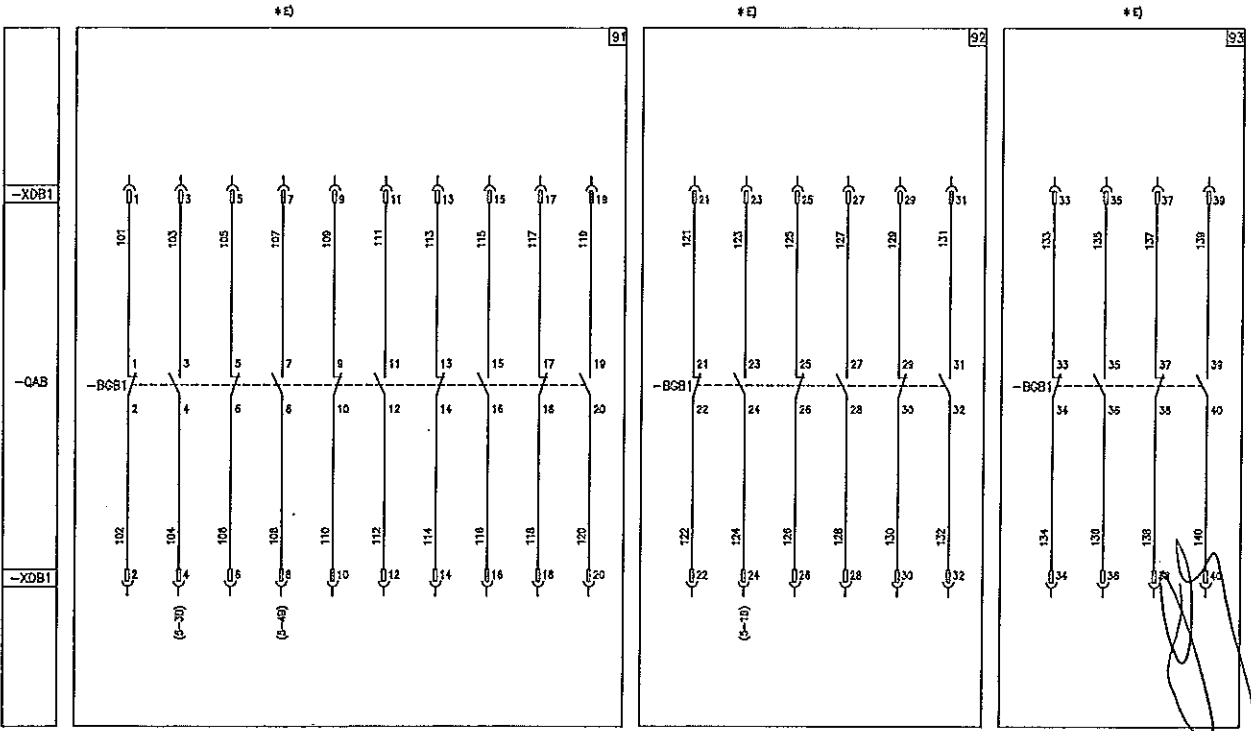
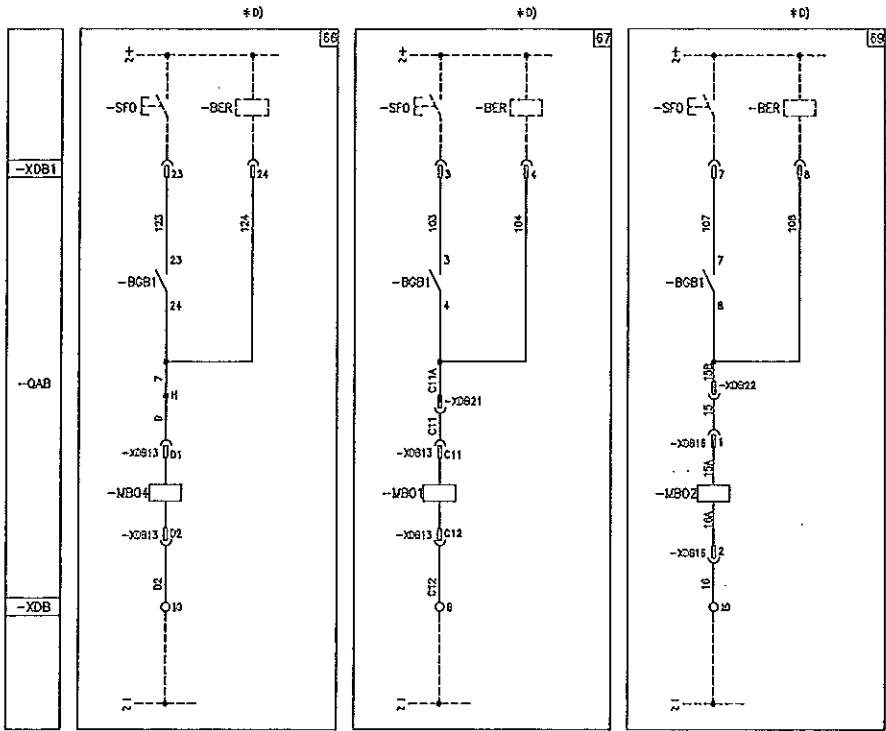


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ВАРНО С ОРИГИНАЛА



5. Electric circuit diagram

Caption

- = Figure number of the diagram.
- * = See note indicated by the letter.
- BER = SOR Test Unit device for monitoring continuity of shunt opening and closing release winding (see note D)
- BGB1 = Auxiliary contacts of circuit-breaker.
- BGB4 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- BGB6 = Contact for electrical signalling of undervoltage release de-energized.
- BGB11 = Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
- BGS1 = Limit contact of spring loading motor.
- BGS2 = Contact for signalling closing springs loaded-discharged.
- MAS = Motor for loading closing springs (see note C).
- MBC = Shunt closing release (see note D).
- MBO1 = First shunt opening release (see note D).
- MBO2 = Second shunt opening release (see note D).
- MBO3 = Opening solenoid for release outside circuit-breaker (see note F).
- MBO4 = Third shunt opening release (see note D).
- MBU = Under-voltage release (see note B).
- QAB = Circuit-breaker applications.
- RLE1 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (Consumption can be limited by connecting a delayed operation enabling pushbutton in series).
- SFC = Pushbutton or contact for closing circuit-breaker.
- SFO = Pushbutton or contact for opening circuit-breaker.
- TB7 = Rectifier for release -MBO3.
- XDB = Terminal box of circuit-breaker circuits.
- XDB1 = Connector of circuit-breaker circuits.
- XDB10, ...,17 = Connectors of applications.

Description of the figures

- Fig. 1 = Circuit of motor for loading closing springs (see note C).
- Fig. 2 = Shunt closing release (anti-pumping is achieved mechanically), (see note D).
- Fig. 3 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. Consumption can be limited by connecting a delayed operation enabling pushbutton in series.
- Fig. 5 = Instantaneous undervoltage release (see note B).
- Fig. 6, 66 = Circuit of third shunt opening release with possibility of continuous control of winding (see note D).
- Fig. 7, 67 = Circuit of first shunt opening release with possibility of continuous control of winding (see note D).
- Fig. 9, 69 = Circuit of second shunt opening release with possibility of continuous control of winding (see note D).
- Fig. 10 = Opening solenoid for release outside circuit-breaker.
- Fig. 11 = Opening solenoid for release outside circuit-breaker with AC supply.
- Fig. 26 = Electrical signalling of closing springs loaded and discharged.
- Fig. 30 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- Fig. 31, 91 = Available auxiliary contacts of circuit-breaker (see note E).
- Fig. 32, 92 = Available auxiliary contacts of circuit-breaker (see note E).
- Fig. 33, 93 = Available auxiliary contacts of circuit-breaker (see note E).
- Fig. 60 = Contact for electrical signalling of undervoltage release de-energized.

ВЯРНО С ОРИГИНАЛА



Incompatibility

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit-breaker:

5-6-66 7-67 9-69 31-91 32-92 33-93 10-11

Notes

- A) The circuit-breaker is equipped solely with the applications specified in the order confirmation. Consult this catalogue for information about how to make out an order.
- B) The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit-breaker or from an independent source. Circuit-breaker closing is only allowed when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release.
Incompatible with -MBO4.
- C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, the springs must be loaded by hand before the auxiliary circuit is powered.
- D) The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases.
-MBO4 incompatible with -MBU.
-MBO4 not available for VD4 50 kA.

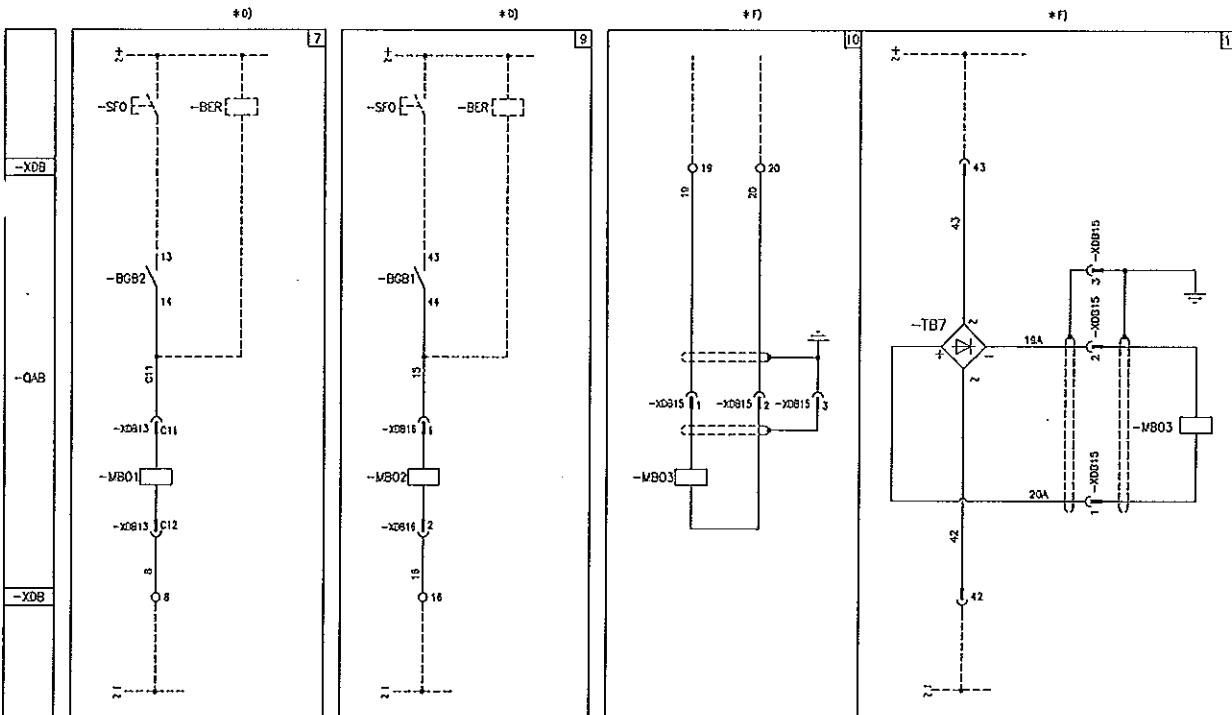
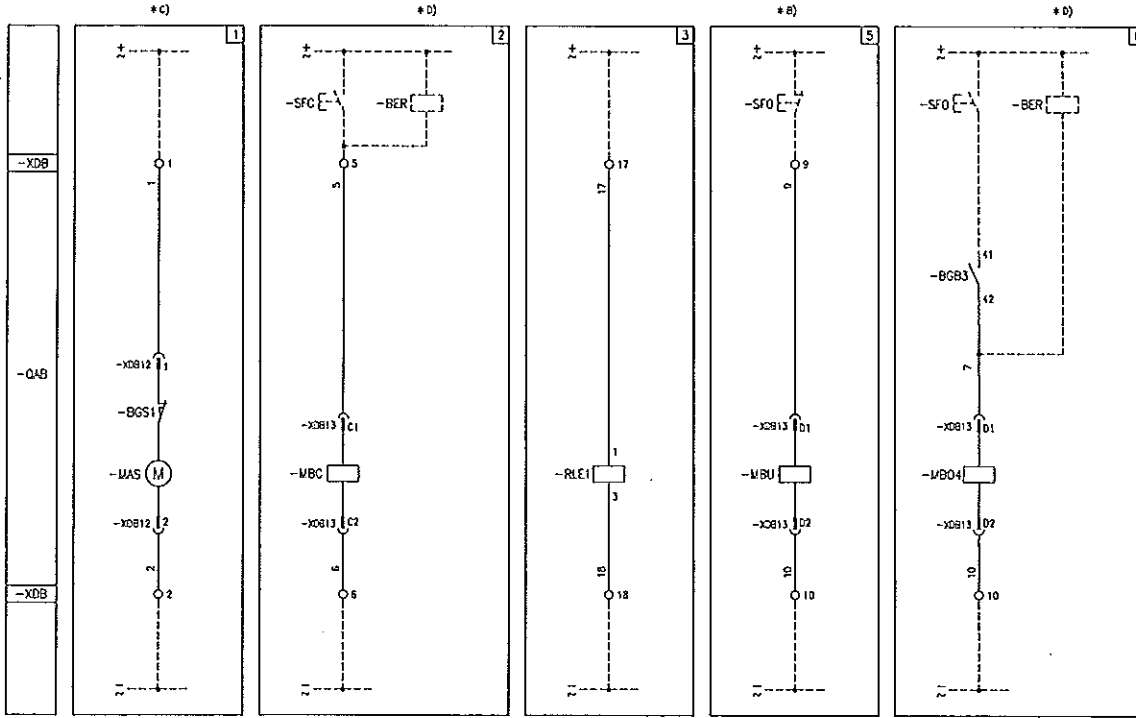
- E) When fig. 6 is required, contact -BGB1 (23-24) of fig.32 is not available.
When fig. 7 is required, contact -BGB1 (3-4) of fig. 31 is not available.
When fig. 9 is required, contact -BGB1 (7-8) of fig. 31 is not available.
When fig. 32 is required, it is obligatory to supply the auxiliary contacts of fig. 31.
When fig. 33 is required, it is obligatory to supply the auxiliary contacts of fig. 32.
When fig. 66 is required, contact -BGB1 (23-24) of fig. 92 is not available.
When fig. 67 is required, contact -BGB1 (3-4) of fig. 91 is not available.
When fig. 69 is required, contact -BGB1 (7-8) of fig. 91 is not available.
When fig. 92 is required, it is obligatory to supply the auxiliary contacts of fig. 91.
When fig. 93 is required, it is obligatory to supply the auxiliary contacts of fig. 92.
Figs. 33 and 93 are not available for VD4 50 kA.
- F) Figs. 10 and 11 are only available for VD4 up to 31.5 kA.
- G) The energizing voltage must be the same for both signals.

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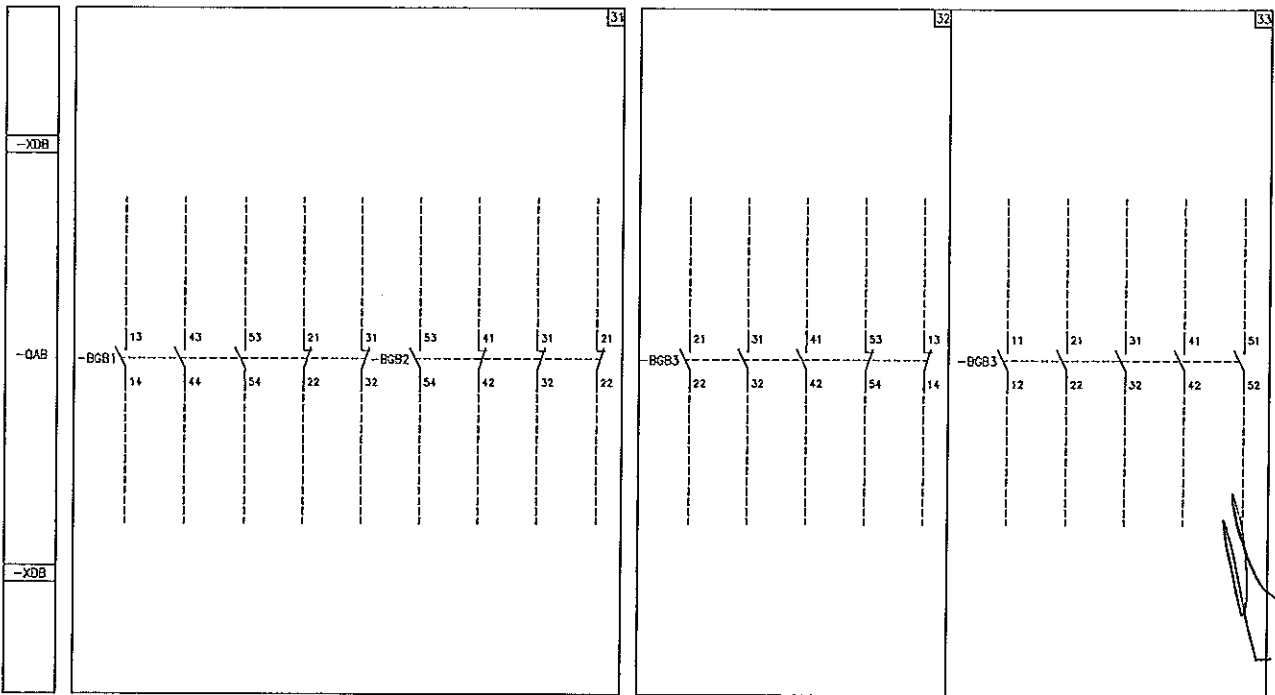
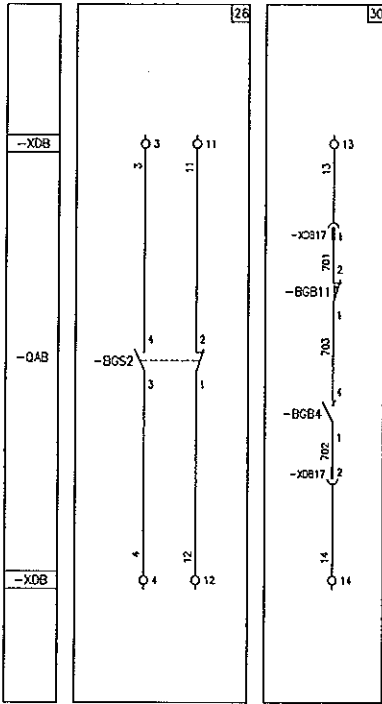


5. Electric circuit diagram

Electric circuit diagram of fixed circuit-breakers 36 kV 1VCD 400236
 The electric circuit diagram given in this section regards the fixed circuit-breakers 36 kA.




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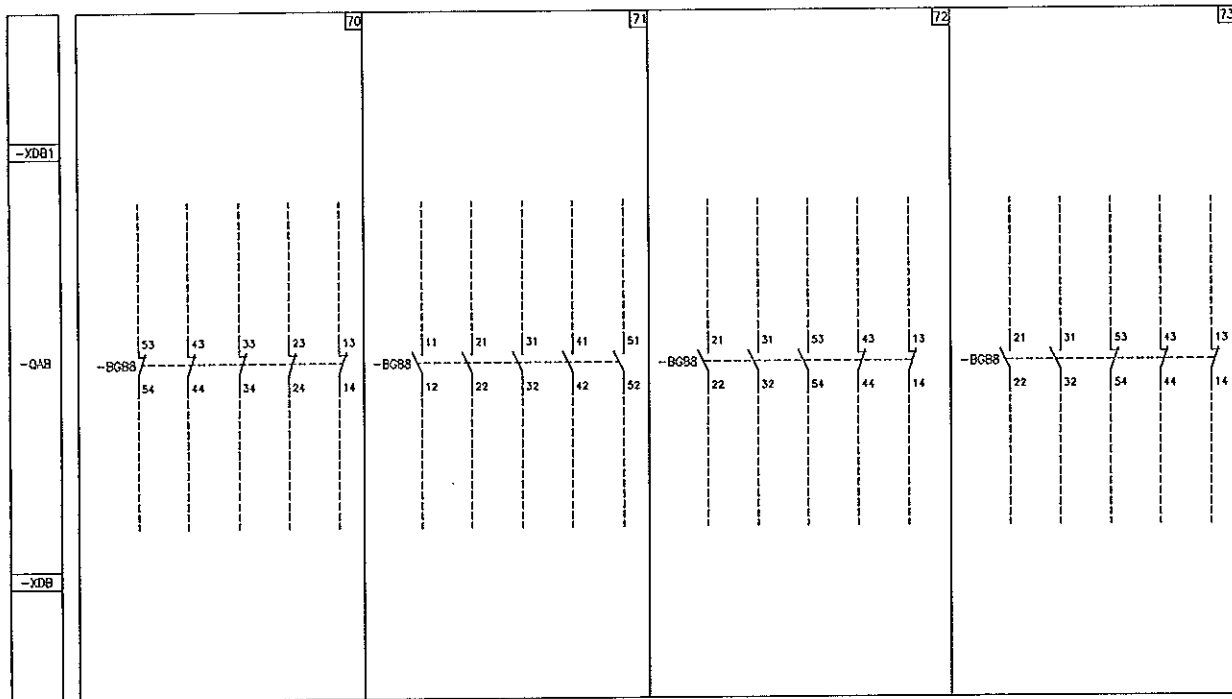
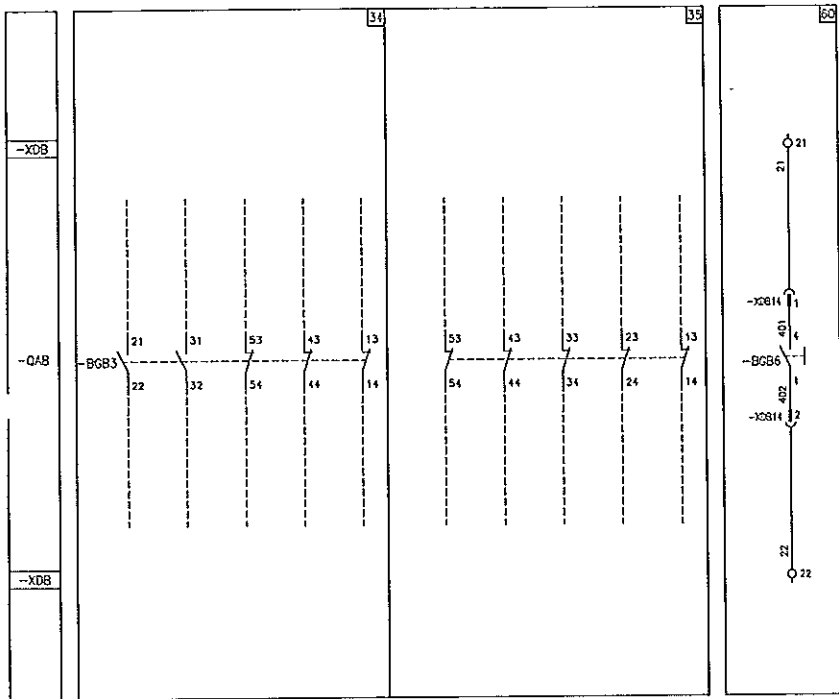


ВЯРНО С ОРИГИНАЛА



5. Electric circuit diagram

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ВЕРНО С ОРИГИНАЛА



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Caption

- = Figure number of the diagram.
- * = See note indicated by the letter.
- BER = SOR Test Unit device for monitoring the continuity of the shunt opening and closing release winding (see note D)
- BGB1, 2, 3, 8 = Auxiliary contacts of circuit-breaker.
- BGB4 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- BGB6 = Contact for electrical signalling of undervoltage release de-energized.
- BGB11 = Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
- BGS1 = Limit contact of spring loading motor.
- BGS2 = Contact for signalling closing springs loaded-discharged.
- MAS = Motor for loading closing springs (see note C).
- MBC = Shunt closing release (see note D).
- MBO1 = First shunt opening release (see note D).
- MBO2 = Second shunt opening release (see note D).
- MBO3 = Opening solenoid for release outside circuit-breaker.
- MBO4 = Third shunt opening release (see note D).
- MBU = Undervoltage release (see note B).
- QAB = Circuit-breaker applications.
- RLE1 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized.
(Consumption can be limited by connecting a delayed operation enabling pushbutton in series).
- SFC = Pushbutton or contact for closing circuit-breaker.
- SFO = Pushbutton or contact for opening circuit-breaker.
- TB7 = Rectifier for release -MBO3.
- XDB = Terminal box of circuit-breaker circuits.
- XDB10, ... ,17 = Connectors of applications

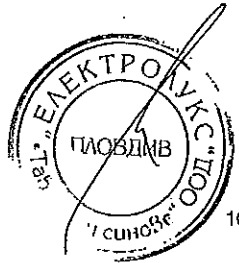
Description of the figures

- Fig. 1 = Circuit of motor for loading closing springs (see note C).
- Fig. 2 = Shunt closing release (anti-pumping is achieved mechanically), (see note D).
- Fig. 3 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation.
- Fig. 5 = Instantaneous undervoltage release (see note B).
- Fig. 6 = Circuit of third opening release with continuous control of winding (see note D).
- Fig. 7 = Circuit of first opening release with continuous control of winding (see note D).
- Fig. 9 = Circuit of second opening release with continuous control of winding (see note D).
- Fig. 10 = Opening solenoid for release outside circuit-breaker.
- Fig. 11 = Opening solenoid for release outside circuit-breaker with AC supply.
- Fig. 26 = Electrical signalling of closing springs loaded and discharged.
- Fig. 30 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- Fig. 31 = Available auxiliary contacts of circuit-breaker.
- Fig. 32, ..., 35 = Available auxiliary contacts of circuit-breaker.
- Fig. 60 = Contact for electrical signalling of undervoltage release de-energized.
- Fig. 70, ..., 73 = Available auxiliary contacts of circuit-breaker.

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5. Electric circuit diagram

Incompatibility

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit-breaker:

5-6 10-11 32-33-34-35 70-71 -72-73

Notes

- A) Circuit-breaker is equipped solely with the applications specified in the order confirmation. Consult this catalogue for information about how to make out an order.
- B) The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit-breaker or from an independent source.
Circuit-breaker closing is only allowed when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release.
Incompatible with -MBO4.
- C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, springs must be loaded by hand before auxiliary circuit is powered.
- D) The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases.
- E) When fig. 6 is required, contact -BGB3 (41-42) of fig. 32-33 is not available and fig. 34-35 cannot be supplied.
When fig. 9 is required, contact -BGB1 (43-44) of fig. 31 is not available.
- F) Only available for 31.5 kA.

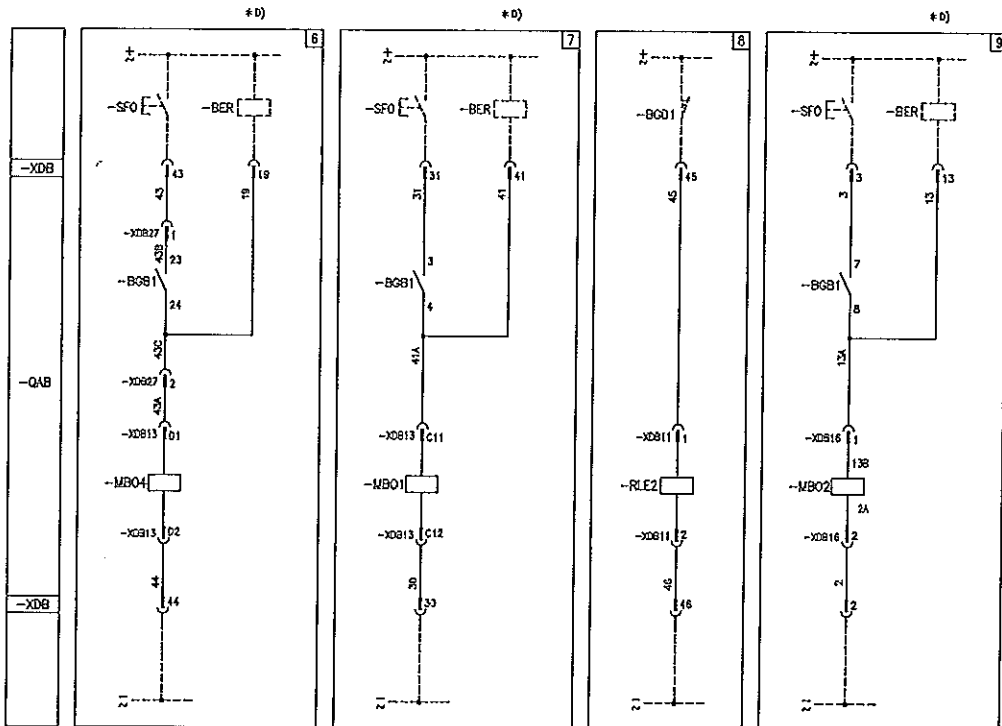
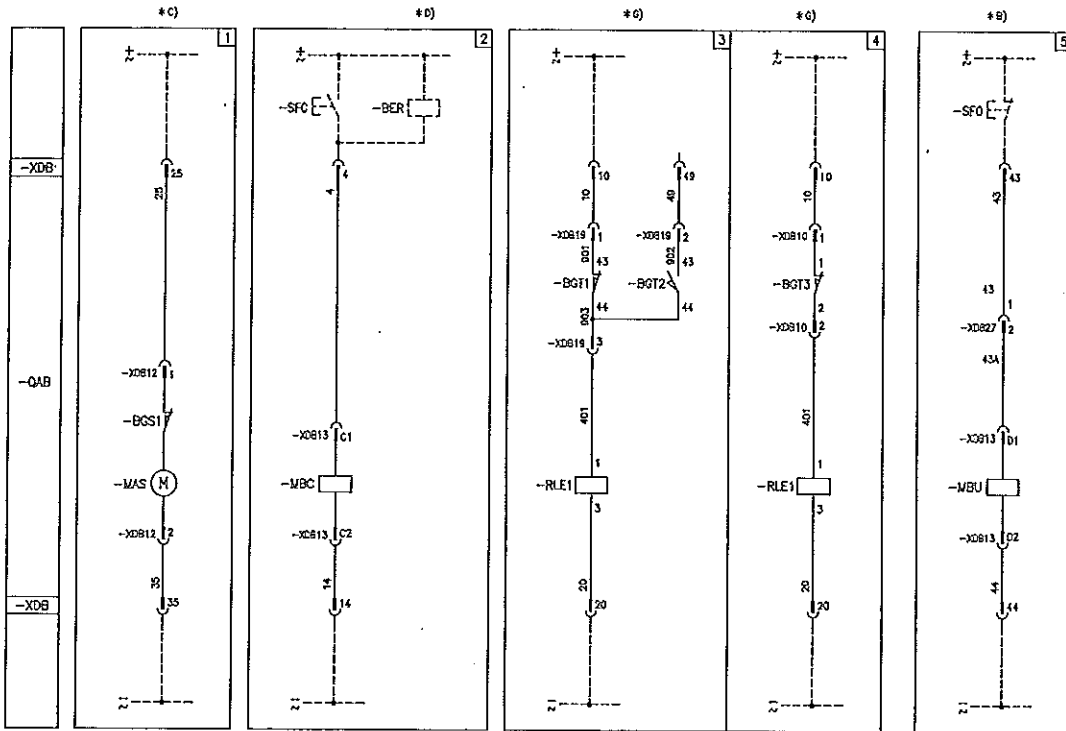
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Electric circuit diagram of withdrawable circuit-breakers for UniGear switchgear and PowerCube enclosure 12 .. 24 kV 1VCD 400155



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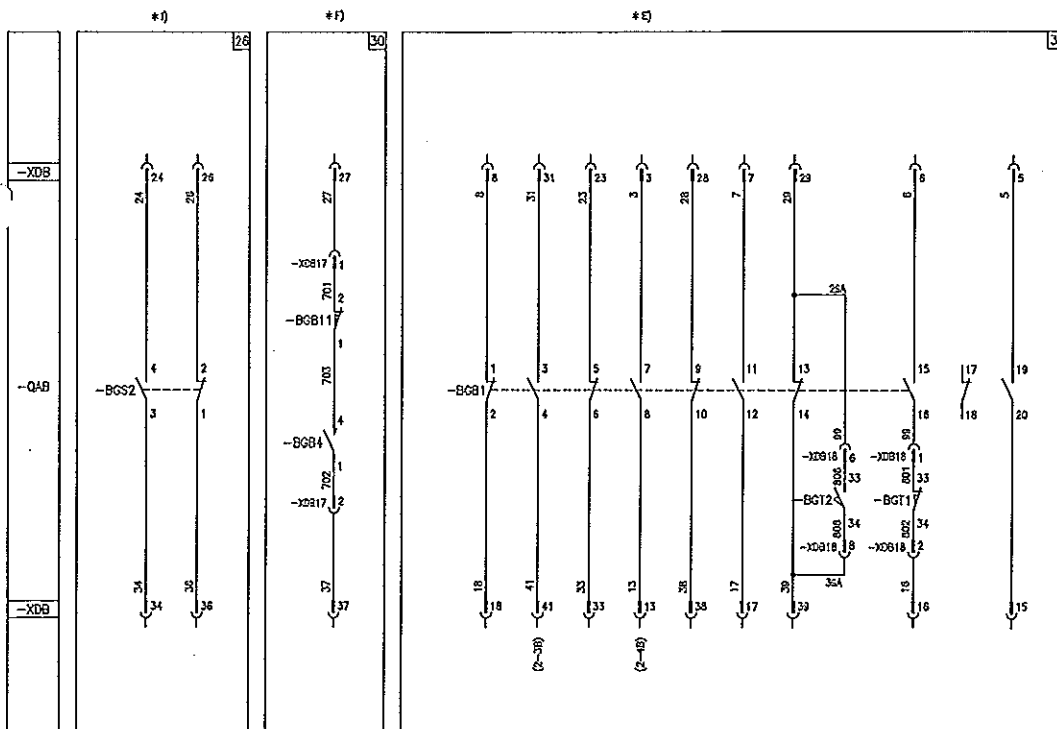
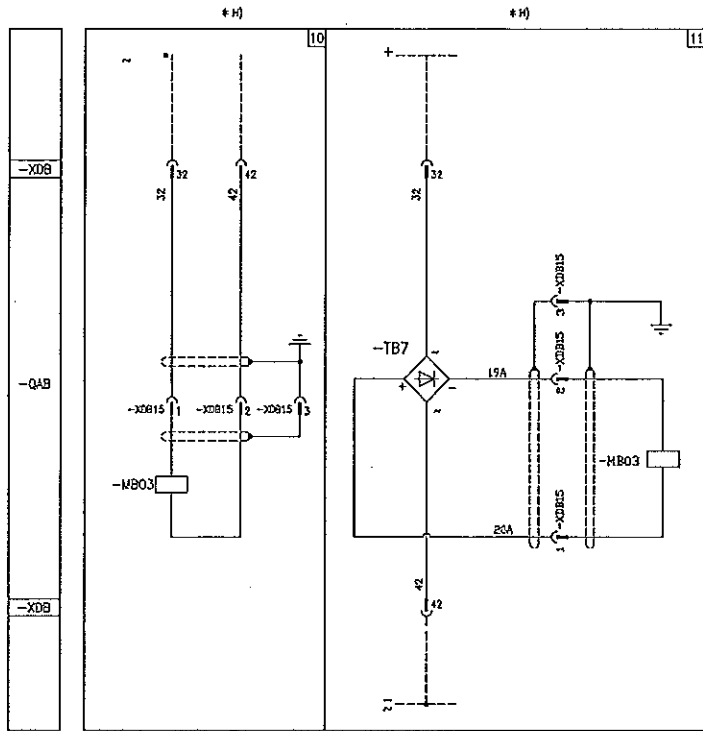


5. Electric circuit diagram

The electric circuit diagram given in this section regards the withdrawable circuit-breakers for UniGear switchgear and PowerCube 12 .. 24 kV enclosures; for withdrawable circuit-breakers with motorized truck, see diagram 1VCD400156.

For circuit-breaker of ZS8.4 switchgears the following diagrams are available:

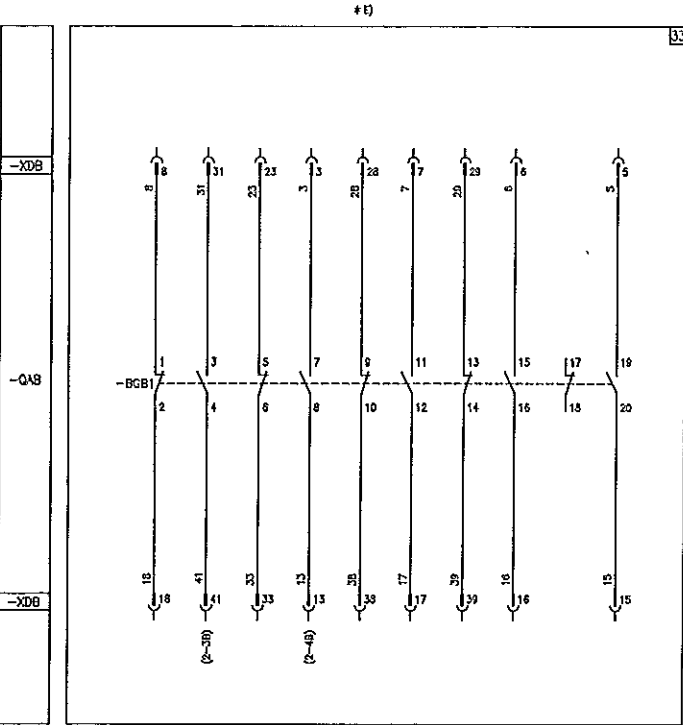
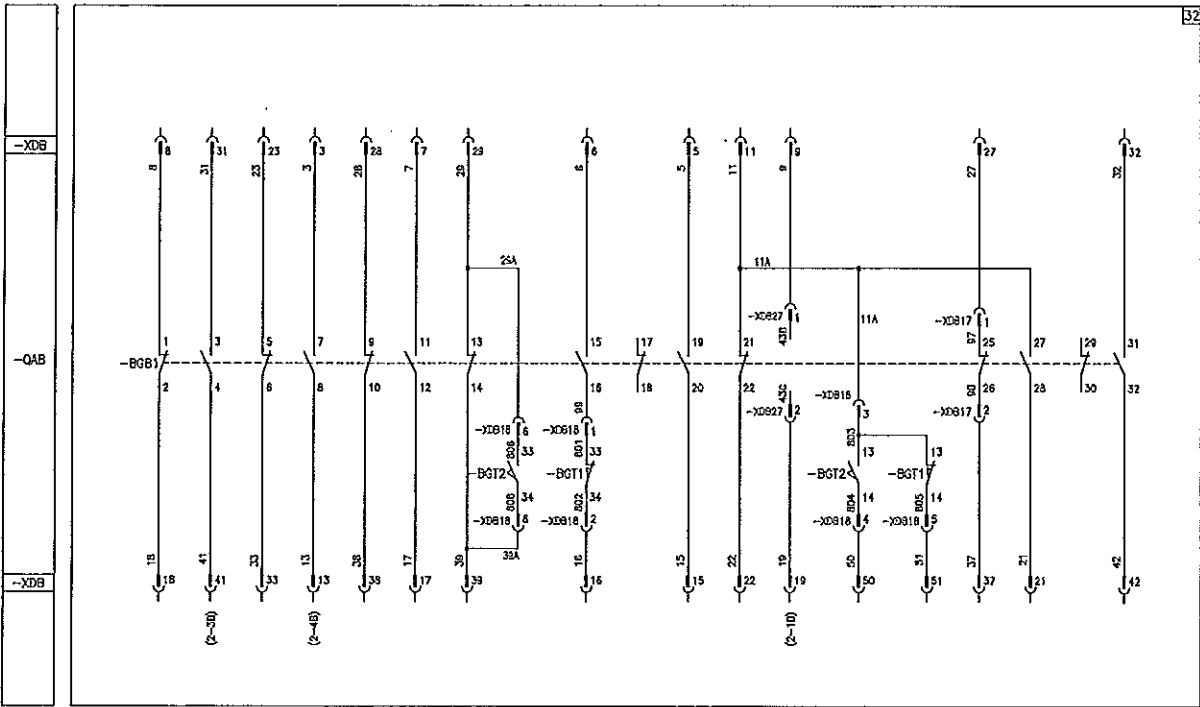
- 1VCD400158 Standard version
- 1VCD400159 Version with motorized truck.



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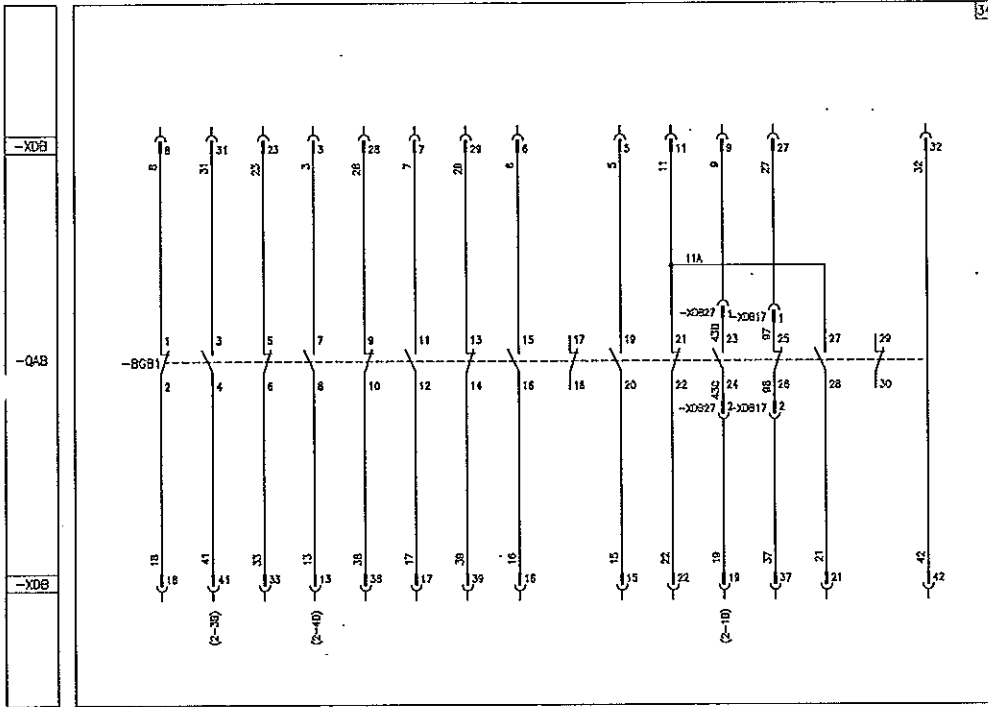
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5. Electric circuit diagram

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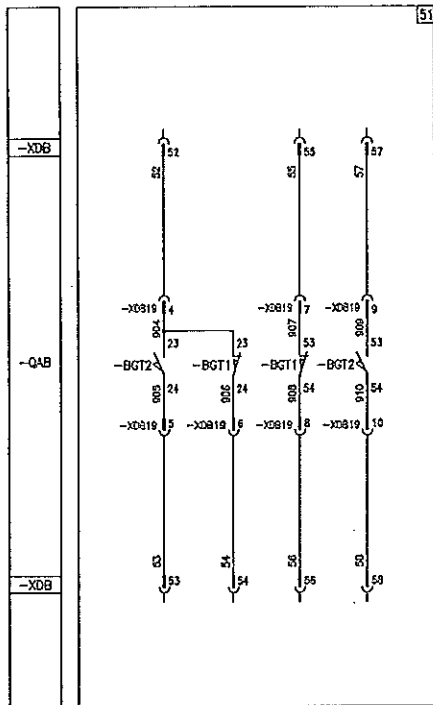
*f)



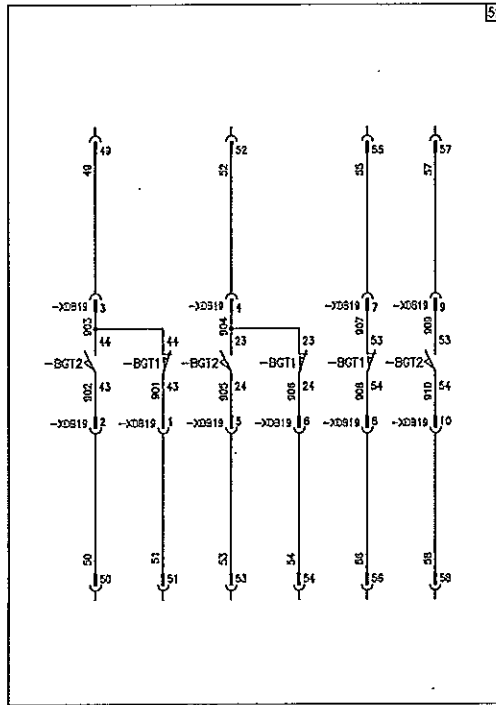
34

*f)

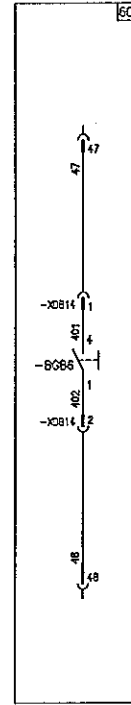
*f)



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Caption

- = Figure number of the diagram.
- * = See note indicated by the letter.
- BER = SOR Test Unit device for monitoring continuity of shunt opening and closing release winding (see note D)
- BGB1 = Auxiliary contacts of circuit-breaker.
- BGB4 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- BGB6 = Contact for electrical signalling of undervoltage release de-energized.
- BGB11 = Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
- BGD1 = Enclosure door position contact.
- BGS1 = Limit contact of spring loading motor.
- BGS2 = Contact for signalling closing springs loaded-discharged.
- BGT1 = Electrical signalling contacts for circuit-breaker in racked-in position (see note F)
- BGT2 = Electrical signalling contacts for circuit-breaker in isolated position (see note F).
- BGT3 = Circuit-breaker position contact, open during isolating travel.
- MAS = Motor for loading closing springs (see note C).
- MBC = Shunt closing release (see note D).
- MBO1 = First shunt opening release (see note D).
- MBO2 = Second shunt opening release (see note D).
- MBO3 = Opening solenoid for release outside circuit-breaker.
- MBO4 = Third shunt opening release (see note D).
- MBU = Under-voltage release (see note B).
- QAB = Circuit-breaker applications.
- RLE1 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation).
- RLE2 = Locking magnet (on truck). Mechanically inhibits circuit-breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation).

- SFC = Pushbutton or contact for closing circuit-breaker.
- SFO = Pushbutton or contact for opening circuit-breaker.
- TB7 = Rectifier for release -MBO3.
- XDB = Terminal box of circuit-breaker circuits.
- XDB10, ... , 27 = Connectors of applications
- XDB28 = Connector of applications.

Description of the figures

- Fig. 1 = Circuit of motor for loading closing springs (see note C).
- Fig. 2 = Shunt closing release (anti-pumping is achieved mechanically), (see note D).
- Fig. 3 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (If -RL1 is required, provide this figure when fig.31 or 32 are selected). Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation.
- Fig. 4 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (If -RL1 is required, provide this figure when fig.33 or 34 are selected). Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation.
- Fig. 5 = Instantaneous undervoltage release (see note B).
- Fig. 6 = Circuit of third opening release with continuous control of winding (see note D).
- Fig. 7 = Circuit of first opening release with continuous control of winding (see note D).
- Fig. 8 = Locking magnet (on truck). Mechanically inhibits circuit-breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation).
- Fig. 9 = Circuit of second opening release with continuous control of winding (see note D).
- Fig. 10 = Opening solenoid for release outside circuit-breaker.
- Fig. 11 = Opening solenoid for release outside circuit-breaker with AC supply.

ВЯРНО С ОРИГИНАЛА



5. Electric circuit diagram

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- Fig. 26 = Electrical signalling of closing springs loaded and discharged.
- Fig. 30 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- Fig. 31, ... , 34 = Available auxiliary contacts of circuit-breaker (see note E).
- Fig. 51 = Contacts for electrical signalling of circuit-breaker in racked-in and isolated positions located on circuit-breaker truck (obligatory when fig. 31 or 32 are required).
- Fig. 52 = Contacts for electrical signalling of circuit-breaker in racked-in and isolated positions located on circuit-breaker truck (supplied on request when fig. 33 to 34 are required).
- Fig. 60 = Contact for electrical signalling of undervoltage release de-energized.

Incompatibility

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit-breaker:

3-4	3-33-34	4-31-32	5-6	10-11
31-32-33-34	31-32-52	33-34-51	51-52	

Notes

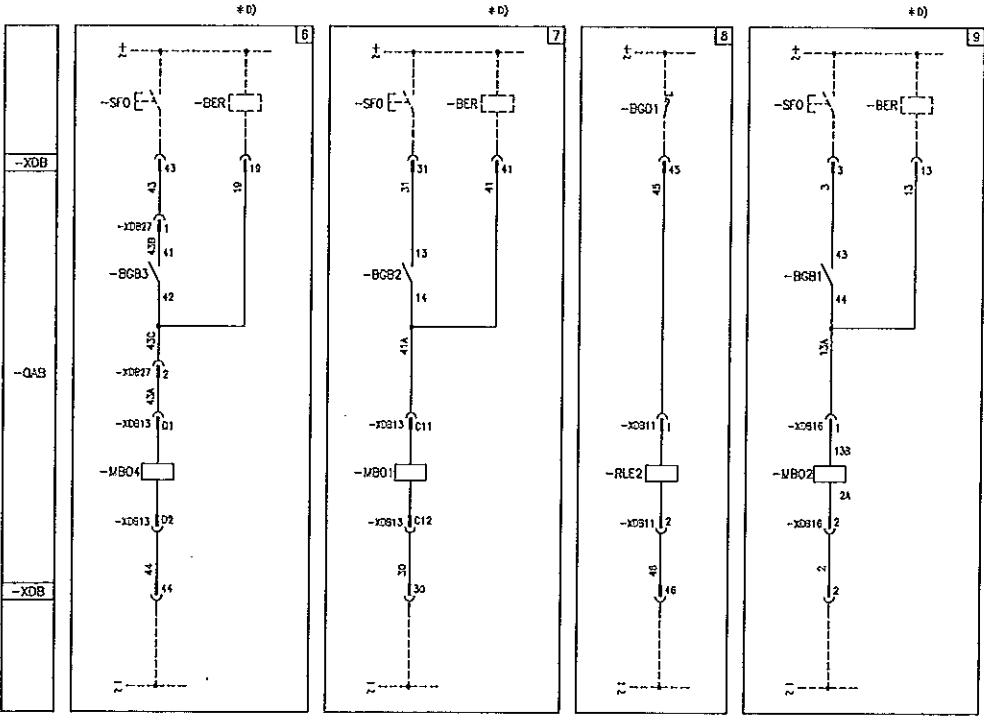
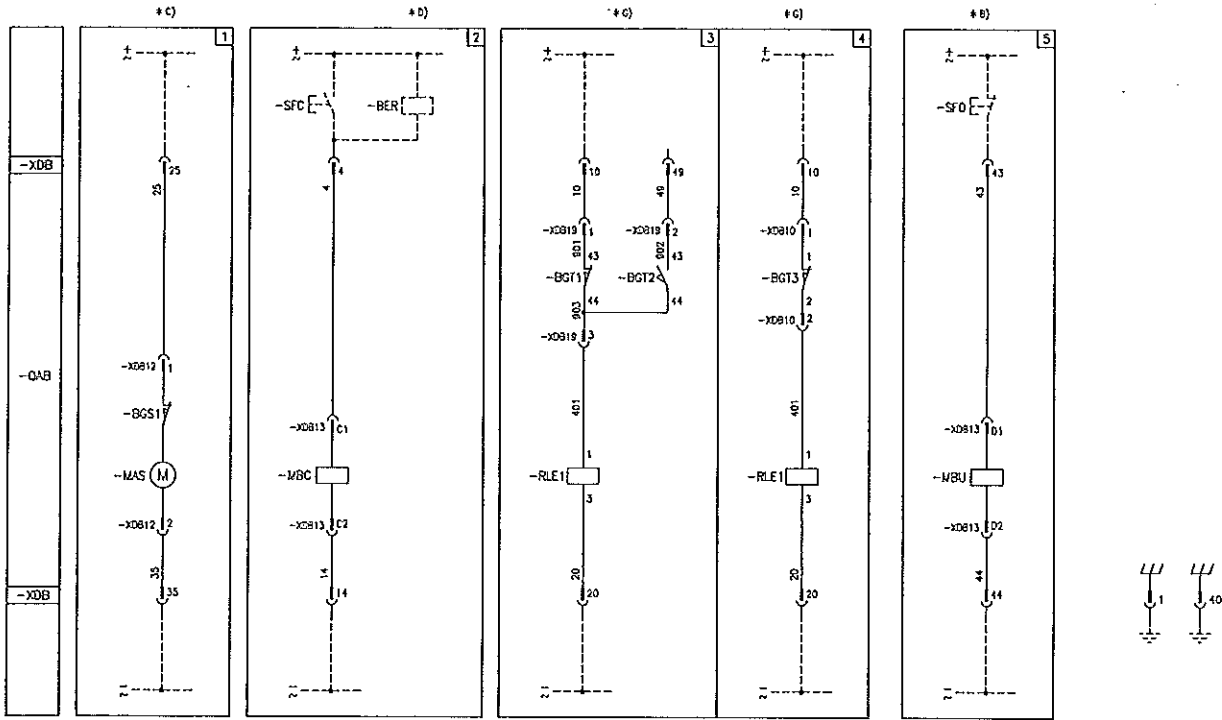
- A) Circuit-breaker is equipped solely with the applications specified in the order confirmation. Consult this catalogue for information about how to make out an order.
- B) The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit-breaker or from an independent source.
Circuit-breaker closing is only allowed when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release.
Incompatible with -MBO4.
- C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, the springs must be loaded by hand before auxiliary circuit is powered.
- D) The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases:
-MBO4 incompatible with -MBU.
-MBO4 not available on Vmax and VD4 50kA.
- E) When fig. 6 is required, contact -BGB1 (23-24) of fig. 32-34 is not available.
When fig. 7 is required, contact -BGB1 (3-4) of fig. 31-32-33-34 is not available.
When fig. 9 is required, contact -BGB1 (7-8) of fig. 31-32-33-34 is not available.
When fig. 10 or 11 are required, contact -BGB1 (31-32) of fig. 32 and 34 is not available.
When fig. 30 is required, contact -BGB1 (25-26) of fig. 32 and 34 is not available.
- F) The contacts for electrical signalling of circuit-breaker in isolated and racked-in position (-BGT1 and BGT2) shown in fig. 51-52 are installed on circuit-breaker truck (movable part).
- G) Fig. 3 is supplied when fig. 31 or 32 are required.
Fig. 4 is supplied when fig. 33 or 34 are required (in this case, it is obligatory to supply -BGT3).
- H) Fig. 10 is only available for VD4 up to 31.5 kA and Vmax.
Fig. 11 is only available for VD4 up to 31.5 kA.
- I) The energizing voltage must be the same for both signals.

ВЕРНО С ОРИГИНАЛОМ





Electric circuit diagram of withdrawable circuit-breakers 36 kV 1VCD 400237



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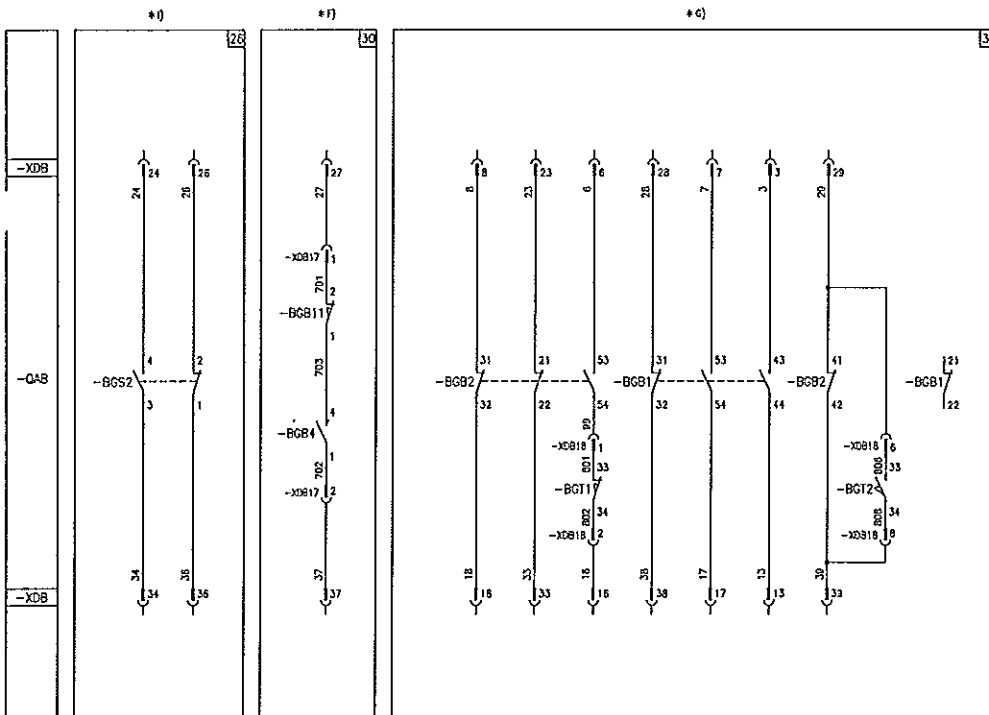
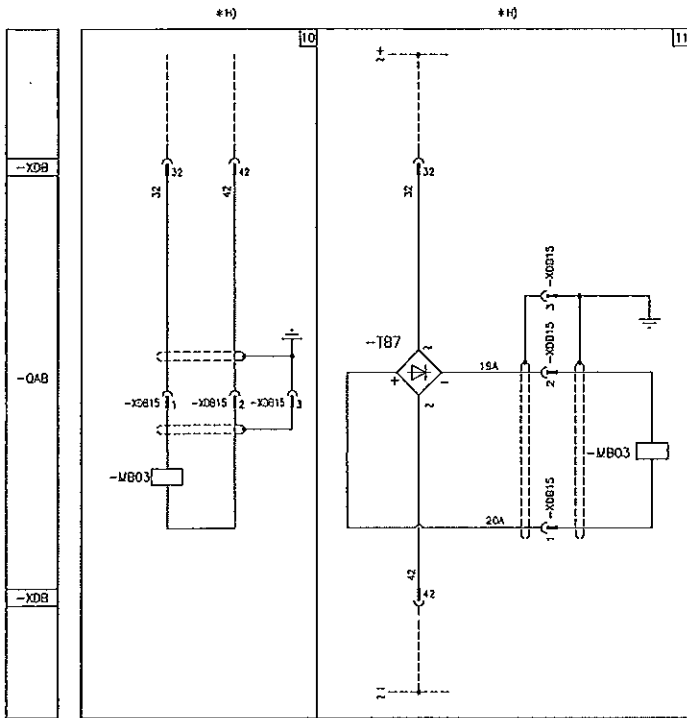


5. Electric circuit diagram

3

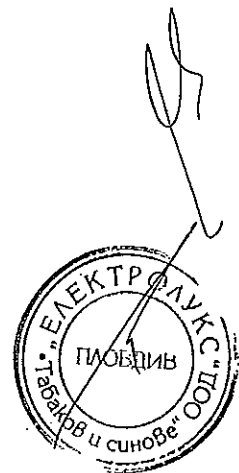
The electric circuit diagram given in this section regards the withdrawable circuit-breakers with breaking capacity up to 36 kV.

Note: the withdrawable version with motor-operated truck is not available for 36 kV.

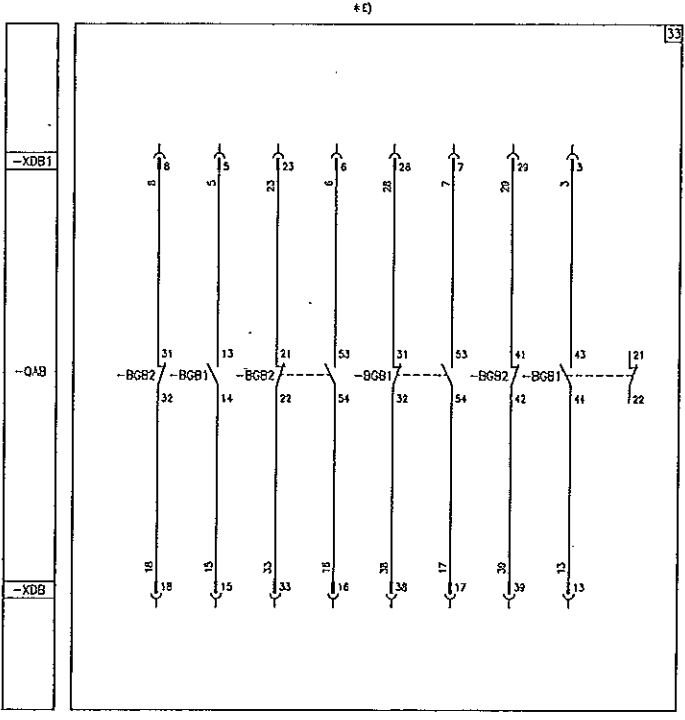
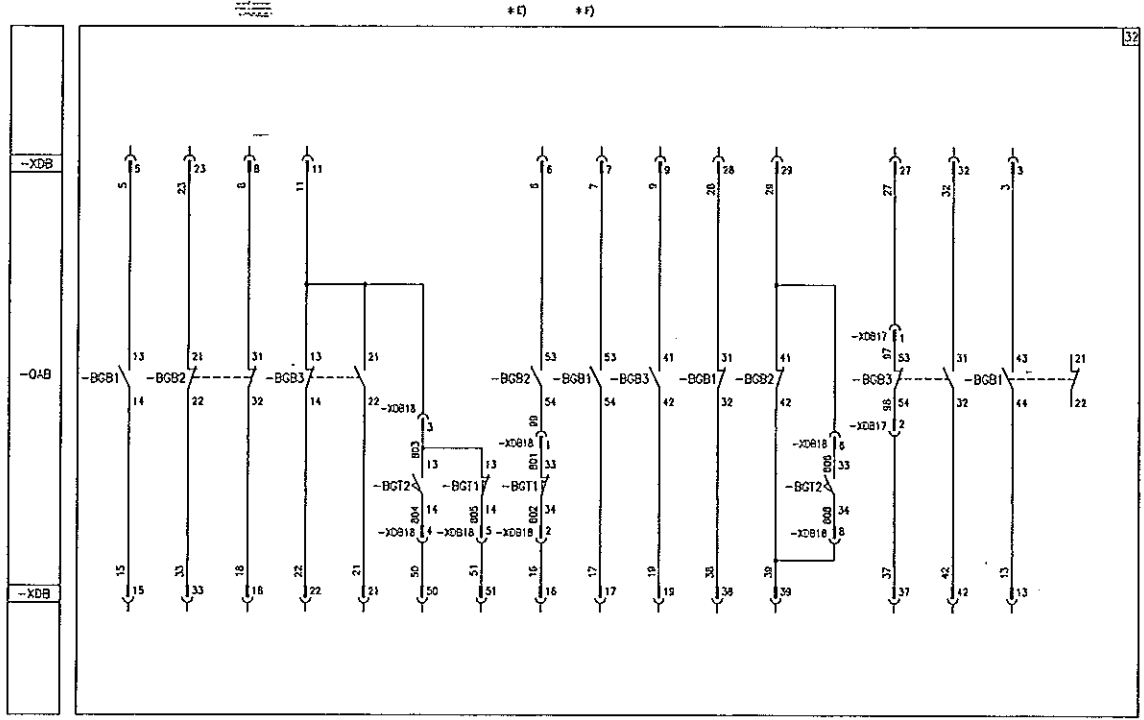


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ВЕРНО С ОРИГИНАЛА



3



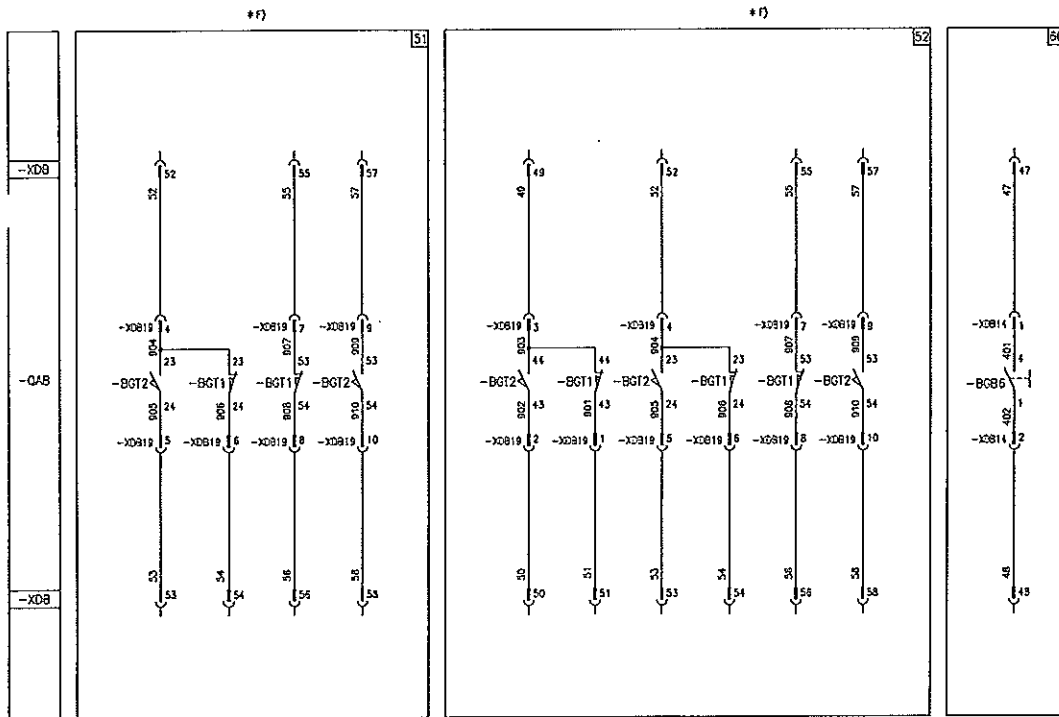
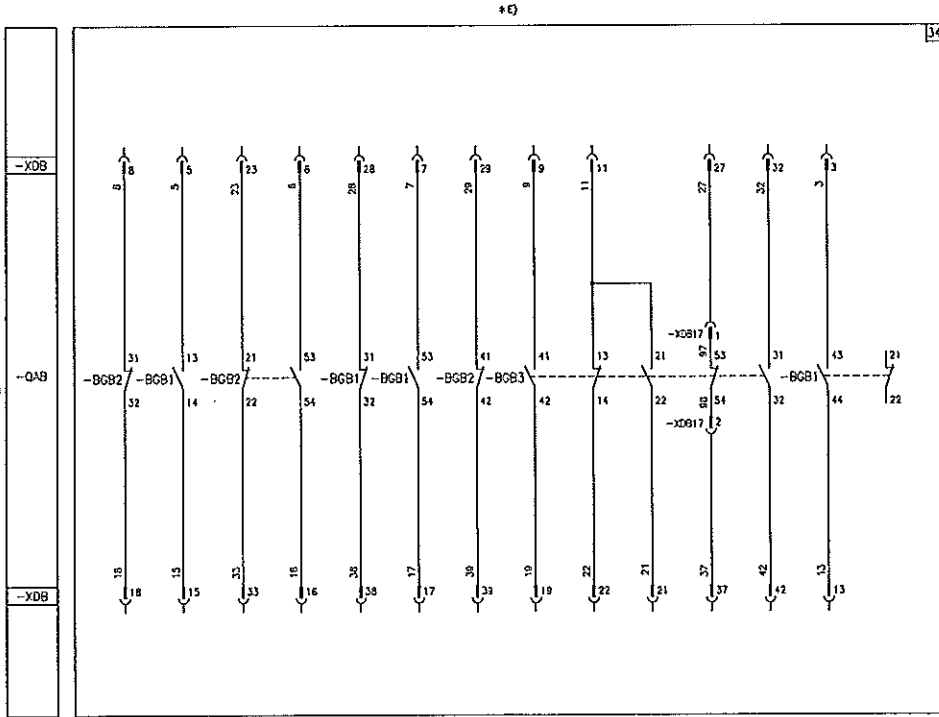
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5. Electric circuit diagram

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ВЕРНО С ОРИГИНАЛА



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Caption

- = Figure number of the diagram.
- * = See note indicated by the letter.
- BER = SOR Test Unit device for monitoring continuity of shunt opening and closing release winding (see note D)
- BGB1, ... ,3 = Auxiliary contacts of circuit-breaker.
- BGB4 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- BGB6 = Contact for electrical signalling of undervoltage release de-energized.
- BGB11 = Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
- BGD1 = Enclosure door position contact.
- BGS1 = Limit contact of spring loading motor.
- BGS2 = Contact for signalling closing springs loaded-discharged.
- BGT1 = Electrical signalling contacts for circuit-breaker in racked-in position (see note F).
- BGT2 = Contacts for electrical signalling of circuit-breaker in isolated position (see note F).
- BGT3 = Circuit-breaker position contact, open during isolating travel.
- MAS = Motor for loading closing springs (see note C).
- MBC = Shunt closing release (see note D).
- MBO1 = First shunt opening release (see note D).
- MBO2 = Second shunt opening release (see note D).
- MBO3 = Opening solenoid for release outside circuit-breaker.
- MBO4 = Third shunt opening release (see note D).
- MBU = Under-voltage release (see note B).
- QAB = Circuit-breaker applications.
- RLE1 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (Consumption can be limited by connecting a delayed operation enabling pushbutton in series).

- RLE2 = Locking magnet (on truck). Mechanically inhibits circuit-breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation).
- SFC = Pushbutton or contact for closing circuit-breaker.
- SFO = Pushbutton or contact for opening circuit-breaker.
- TB7 = Rectifier for release -MBO3.
- XDB = Terminal box of circuit-breaker circuits.
- XDB10, ... , 27 = Connectors of applications.
- XDB28 = Connector of applications.

Description of the figures

- Fig. 1 = Circuit of motor for loading closing springs (see note C).
- Fig. 2 = Shunt closing release (anti-pumping is achieved mechanically), (see note D).
- Fig. 3 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (If -RL1 is required, provide this figure when fig. 31 or 32 are selected). Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation.
- Fig. 4 = Locking magnet. Mechanically inhibits circuit-breaker closing if de-energized. (If -RL1 is required, provide this figure when fig.33 or 34 are selected). Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation.
- Fig. 5 = Instantaneous undervoltage release (see note B).
- Fig. 6 = Circuit of third opening release with continuous control of winding (see note D).
- Fig. 7 = Circuit of first opening release with continuous control of winding (see note D).

ВЯРНО С ОРИГИНАЛА



5. Electric circuit diagram



- Fig. 8 = Locking magnet (on truck). Mechanically inhibits circuit-breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed pushbutton in series so as to enable the operation).
- Fig. 9 = Circuit of second opening release with continuous control of winding (see note D).
- Fig. 10 = Opening solenoid for release outside circuit-breaker.
- Fig. 11 = Opening solenoid for release outside circuit-breaker with AC supply.
- Fig. 26 = Electrical signalling of closing springs loaded and discharged.
- Fig. 30 = Auxiliary let-through contact of circuit-breaker with momentary closing during circuit-breaker opening.
- Fig. 31, ... , 34 = Available auxiliary contacts of circuit-breaker (see note E).
- Fig. 51 = Contacts for electrical signalling of circuit-breaker in racked-in and isolated positions located on circuit-breaker truck (obligatory when fig.31 or 32 are required).
- Fig. 52 = Contacts for electrical signalling of circuit-breaker in racked-in and isolated positions located on circuit-breaker truck (supplied on request when fig.33 to 34 are required).
- Fig. 60 = Contact for electrical signalling of undervoltage release de-energized.

Notes

- A) The circuit-breaker is equipped solely with the applications specified in the order confirmation. Consult this catalogue for information about how to make out an order.
- B) The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit-breaker or from an independent source. Circuit-breaker closing is only allowed when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit-breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release.
Incompatible with -MBO4.
- C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, springs must be loaded by hand before auxiliary circuit is powered.
- D) The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases.
-MBO4 incompatible with -MBU.
- E) When fig. 6 is required, contact -BGB3 (41-42) of fig. 32-34 is not available.
When fig. 9 is required, contact -BGB1 (43-44) of fig. 31-32-33-34 is not available.
When fig. 10 or 11 are required, contact -BGB3 (31-32) of fig. 32 and 34 is not available.
When fig. 30 is required, contact -BGB3 (53-54) of fig. 32 and 34 is not available.
- F) The contacts for electrical signalling of circuit-breaker in racked-in and isolated positions (-BGT1 and -BGT2) shown in fig. 51-52 are located on circuit-breaker truck (moving part).
- G) Fig. 3 is supplied when fig. 31 or 32 are required. Fig. 4 is supplied when fig. 33 or 34 are required (in this case, it is obligatory for -BGT3 to be supplied).
- H) Fig. 10 is only available for VD4 up to 31.5 kA. Fig. 11 is only available for VD4 up to 31.5 kA.
- I) The energizing voltage must be the same for both signals.

Incompatibility

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit-breaker:

3-4	3-33-34	4-31-32	5-6	10-11
31-32-33-34	31-32-52	33-34-51	51-52	

ВЯРНО С ОРГИНАЛА



Contact us

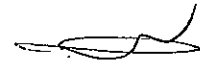


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The data and illustrations are not binding. We reserve the right to make changes without notice in the course of technical development of the product.

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1VCP000001 - Rev. V, en - Technical catalogue - 2016.04 (VD4-50 kA) (gs)



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Приложение 1.1 помощен
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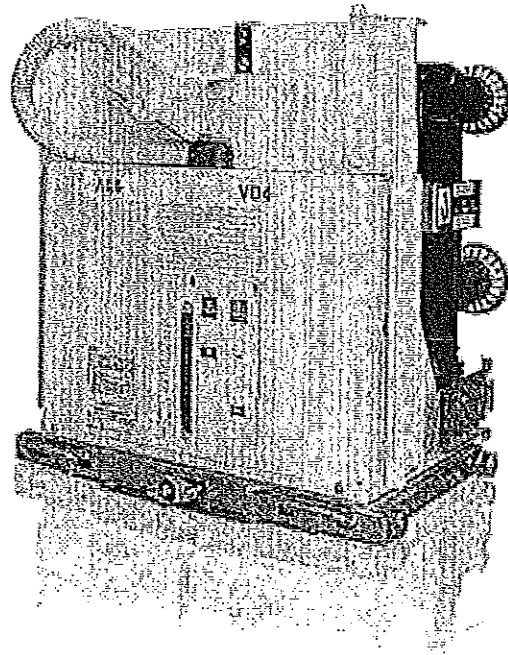
Medium voltage products

Installation and service instructions

12 ... 36 kV - 630 ... 3150 A - 16 ... 50 kA

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ВЯРНО С ОРИГИНАЛА




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For your safety!

5

- Make sure that the installation room (spaces, divisions and ambient) is suitable for the electrical apparatus.
- Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel with suitable knowledge of the apparatus.
- Make sure that the standard and legal prescriptions are complied with during installation, putting into service and maintenance, so that installations according to the rules of good working practice and safety in the work place are constructed.
- Strictly follow the information given in this instruction manual.
- Check that the rated performance of the apparatus is not exceeded during service.
- Check that the personnel operating the apparatus have this instruction manual to hand as well as the necessary information for correct intervention.
- Pay special attention to the danger notes indicated in the manual by the following symbol:

	<p>Responsible behaviour safeguards your own and others' safety!</p> <p>For any requests, please contact the ABB Assistance Service.</p>
---	--

6

6

9

СМ

ВЯРНО С ОРИГИНАЛА



I. Introduction

This publication contains the information needed to install medium voltage VD4 circuit-breakers and put them into service.

For correct use of the product, please read it carefully. Like all the apparatus we manufacture, the VD4 circuit-breakers are designed for different installation configurations. However, this apparatus allows further technical-construction modifications (at the customer's request) to adapt to special installation requirements.

Consequently, the information given below may sometimes not contain instructions concerning special configurations. Apart from this manual, it is therefore always necessary to consult the latest technical documentation (electric circuit and wiring diagrams, assembly and installation drawings, any protection coordination studies, etc.), especially regarding any variants requested in relation to the standardised configurations.

Only use original spare parts for maintenance operations. For further information, please also see the technical catalogue of the circuit-breaker and the spare parts catalogue.



All the installation, putting into service, running and maintenance operations must be carried out by skilled personnel with in-depth knowledge of the apparatus.

II. Environmental protection programme

The VD4 circuit-breakers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management).

The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

ВЕРНО С ОРИГИНАЛА



1. Packing and transport

The circuit-breaker is shipped in special packing, in the open position and with the spring discharged.

Each piece of apparatus is protected by a plastic cover to prevent any infiltration of water during the loading and unloading stages and to keep the dust off during storage.

ВЯРНО С ОРИГИНАЛА



3. Storage

When a period of storage is foreseen, our workshops can (on request) provide suitable packing for the specified storage conditions.

On receipt the apparatus must be carefully unpacked and checked as described in Checking on receipt (chap. 2).

If immediate installation is not possible, the packing must be replaced, using the original material supplied.

Insert packets of special hygroscopic substances inside the packing, with at least one standard packet for piece of apparatus.

Should the original packing not be available and immediate installation is not possible, store in a covered, well-ventilated, dry, dust-free, non-corrosive ambient, away from any easily flammable materials and at a temperature between $-5\text{ }^{\circ}\text{C}$ and $+45\text{ }^{\circ}\text{C}$.

In any case, avoid any accidental impacts or positioning which stresses the structure of the apparatus.

ОРИГИНАЛ



4. Handling

Before carrying out any operations, always make sure that the operating mechanism spring is discharged and that the apparatus is in the open position.

To lift and handle the circuit-breaker, proceed as follows (fig. 2):

- use a special lifting tool (1) (not supplied) fitted with ropes with safety hooks (2);
- insert the hooks (2) in the supports (3) fixed to the frame of the circuit-breaker and lift. Put the hooks (2) into the support holes (3) according to the type of apparatus (see table);
- on completion of the operation (and in any case before putting into service) unhook the lifting tool (1) and dismantle the supports (3) from the frame.

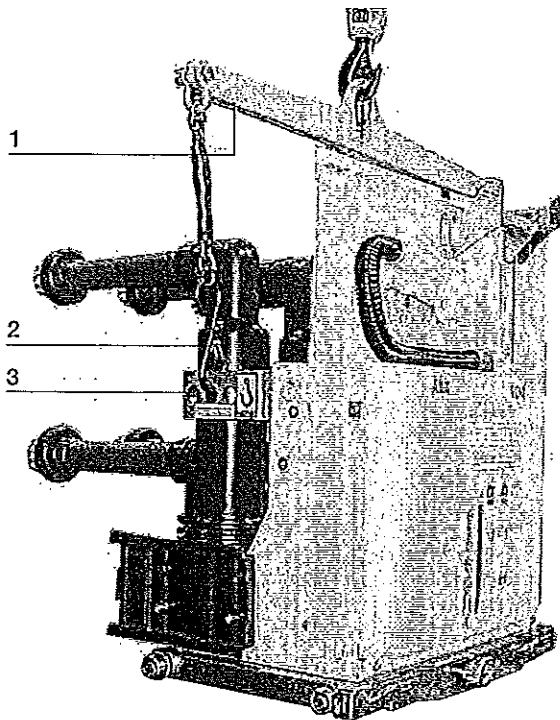
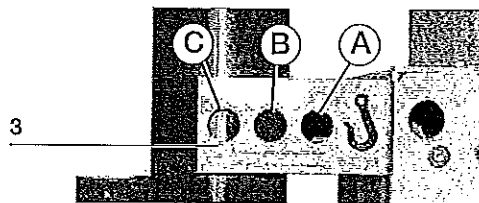


Fig. 2

During handling, take great care not to stress the insulating parts and the terminals of the circuit-breaker.



The apparatus must not be handled by putting lifting devices directly under the apparatus itself. Should it be necessary to use this technique, put the circuit-breaker onto a pallet or a sturdy supporting surface (see fig. 3). In any case, it is always advisable to carry out lifting using the supports (3).



Version	Pole centre distance	Rated current	Hole
Fixed	150-210 mm	up to 1250 A	A
Fixed	275 mm	from 1600 to 3150 A	A
Fixed	210 mm	from 1600 to 2000 A	A
Fixed	210-275 mm	up to 4000 A	C
Withdrawable	150 mm	up to 1250 A	A
Withdrawable	210 mm	from 1600 to 2500 A	B
Withdrawable	275 mm	up to 1250 A	B
Withdrawable	275 mm	from 1600 to 3150 A	C
Withdrawable	210 mm	up to 1250 A	C
Withdrawable	210-275 mm	up to 4000 A	C

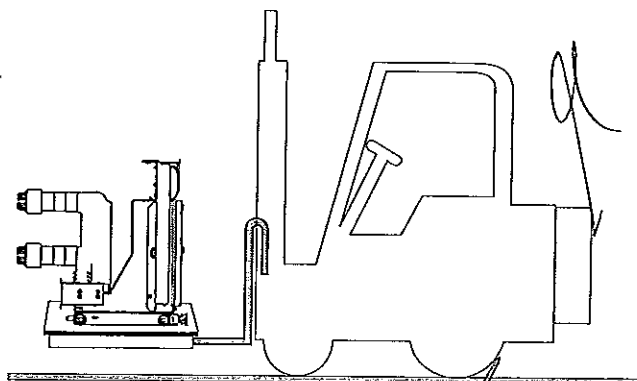


Fig. 3

ВЯРНО С ОРИГИНАЛА



5. Description

5.1. General

The VD4 are vacuum circuit-breaker for indoor installation. For the electrical performances, please refer to the corresponding technical catalogue code 1VCP000001.

For special installation requirements, please contact ABB.

The following versions are available:

- fixed
- withdrawable for UniGear ZS1 switchgear and PowerCube modules.

5.2. Reference Standards

The VD4 circuit-breakers conform to the IEC 62271-100, CEI - VDE - BS Standards are equivalent to IEC Standards due to harmonization with IEC.

5.3. EL operating mechanism

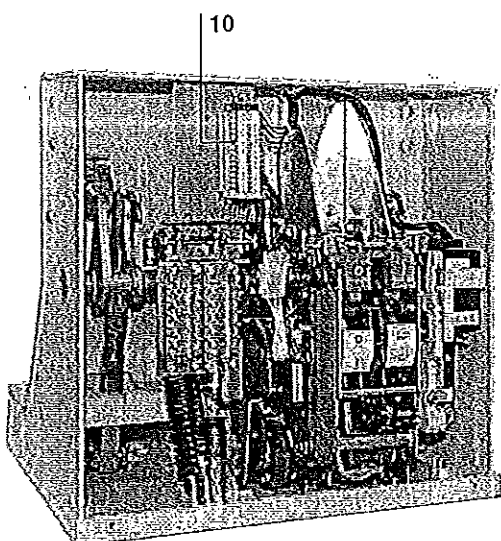
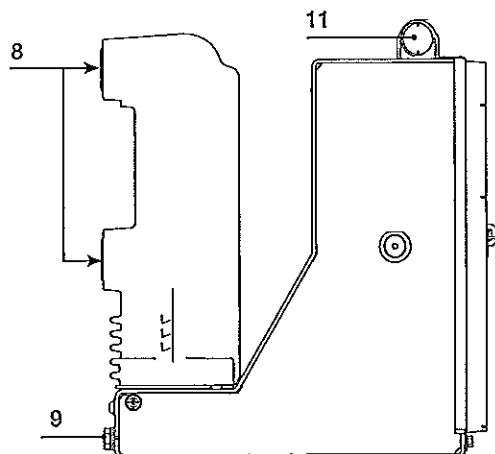
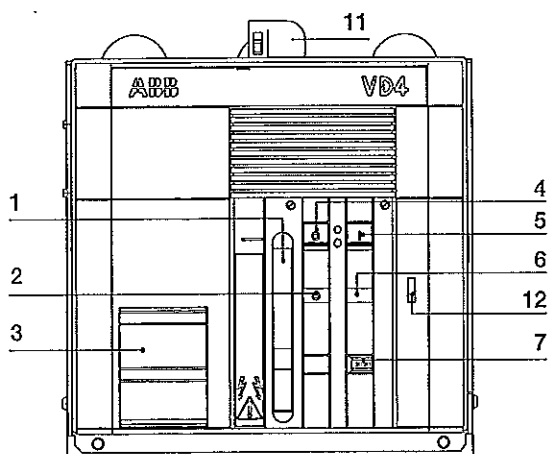
VD4 circuit-breakers are equipped with modular EL spring operating mechanisms. The operating mechanism is designed to cover the whole range of performances as shown in the following table:

Type of operating mechanism	Rated short-circuit current
EL1 - EL2	Up to 31.5 kA
EL3	Up to 40 kA - 24 kV, 31.5 kA
EL1 TWIN	Up to 50 kA (rated current up to 2000 A)
EL2 TWIN	Up to 50 kA (rated current \geq 2500 A)

5.4. Fixed circuit-breakers

The fixed circuit-breaker (fig. 4) is the basic version complete with structure and front protection screen. The fixing holes are made in the lower part of the structure.

For the electrical connections of the circuit-breaker auxiliary circuits, the terminal box (10) is available (also see par. 7.8.1.). The earthing screw is placed in the rear part of the circuit-breaker. For further details please see the caption to figure 4.



Caption

- 1 Lever for manual closing spring charging
- 2 Signalling device for circuit-breaker open/closed
- 3 Rating plate
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for closing spring charged/discharged
- 7 Operation counter
- 8 Terminals
- 9 Earthing screw
- 10 Delivery terminal box
- 11 Cabling connection
- 12 Mechanical override of the undervoltage release (on request)

Fig. 4

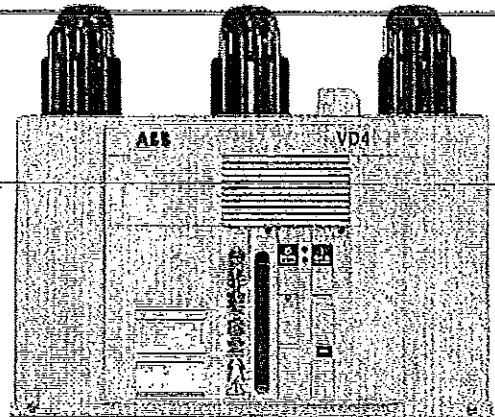
ВЕРНО С ОРИГИНАЛА



5.4.1. General characteristics of fixed circuit-breakers

g

General characteristics of fixed circuit-breakers (12 kV)



Circuit-breaker	VD4 12 (1)												
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •												
Rated voltage	Ur [kV]	12											
Rated insulation voltage	Us [kV]	12											
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28											
Impulse withstand voltage	Up [kV]	75											
Rated frequency	fr [Hz]	50-60											
Rated normal current (40 °C)	Ir [A]	630	630	630	1250	1250	1250	1250	1250	1250			
		16	16	16	16	16	16	—	—	—	—		
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	—	—	—	—		
		25	25	25	25	25	25	—	—	—	—		
		31.5	31.5	31.5	31.5	31.5	31.5	—	—	—	—		
		—	—	—	—	—	—	40	40	—	—		
Rated short-time withstand current (3s)	Ik [kA]	—	—	—	—	—	—	—	—	50	50		
		16	16	16	16	16	16	—	—	—	—		
		20	20	20	20	20	20	—	—	—	—		
		25	25	25	25	25	25	—	—	—	—		
Making capacity	Ip [kA]	31.5	31.5	31.5	31.5	31.5	31.5	—	—	—	—		
		—	—	—	—	—	—	40	40	—	—		
		—	—	—	—	—	—	—	—	50	50		
		—	—	—	—	—	—	—	—	—	—		
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
		•	•	•	•	•	•	•	•	•			
Opening time	[ms]	33 ... 60											
Arcing time	[ms]	10 ... 15											
Total breaking time	[ms]	43 ... 75											
Closing time	[ms]	60 ... 80											
Maximum overall dimensions		H [mm]	461	461	461	461	461	461	589	589	610	610	
		W [mm]	450	570	700	450	570	700	570	700	600	750	
		D [mm]	424	424	424	424	424	424	424	424	424	459	459
		Pole distance P [mm]	150	210	275	150	210	275	210	275	210	275	275
Weight	[kg]	73	75	79	73	75	79	84	84	146	158		
Standardised table of dimensions	TN	7405	7406	—	7405	7406	—	—	—	—	—		
	1VCD	—	—	000051	—	—	000051	003282	003285	003440	003441		
Operating temperature	[°C]	- 5 ... + 40											
Tropicalization	IEC: 60068-2-30, 60721-2-1	•											
Electromagnetic compatibility	IEC: 62271-1	•											

(1) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.

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ВЯРНО С ОРИГИНАЛА

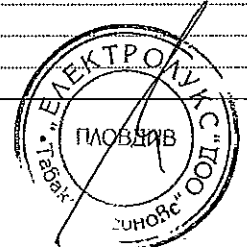


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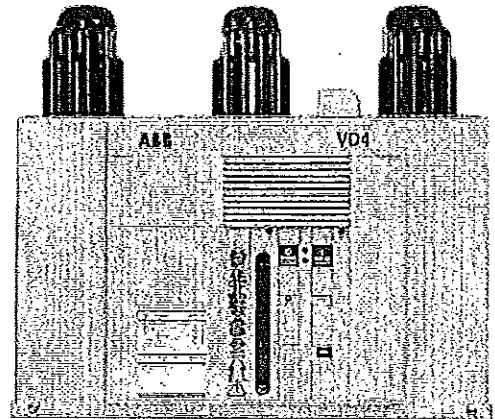
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50-60																
1600	1600	1600	1600	1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	2500	3150	3150
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	20	20	—	—	—	—	—	20	20	—	—	20	20	—	20	—
25	25	25	—	—	—	—	—	25	25	—	—	25	25	—	25	—
31.5	31.5	31.5	—	—	—	—	—	31.5	31.5	—	—	31.5	31.5	—	31.5	—
—	—	—	40	40	—	—	—	40	40	—	—	—	40	—	40	—
—	—	—	—	—	50	50	—	—	—	50	50	—	—	50	—	50
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20	20	20	—	—	—	—	—	20	20	—	—	20	20	—	20	—
25	25	25	—	—	—	—	—	25	25	—	—	25	25	—	25	—
31.5	31.5	31.5	—	—	—	—	—	31.5	31.5	—	—	31.5	31.5	—	31.5	—
—	—	—	40	40	—	—	—	40	40	—	—	—	40	—	40	—
—	—	—	—	—	50	50	—	—	—	50	50	—	—	50	—	50
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	50	50	—	—	—	—	—	50	50	—	—	50	50	—	50	—
63	63	63	—	—	—	—	—	63	63	—	—	63	63	—	63	—
80	80	80	—	—	—	—	—	80	80	—	—	80	80	—	80	—
—	—	—	100	100	—	—	—	100	100	—	—	—	100	—	100	—
—	—	—	—	—	125	125	—	—	—	125	125	—	—	125	—	125
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60																
10 ... 15																
43 ... 75																
60 ... 80																
599	599	599	589	589	610	610	599	599	610	610	599	599	610	636	636	
450	570	700	570	700	600	750	570	700	600	750	570	700	750	700	750	
424	424	424	424	424	459	459	424	424	459	459	424	424	459	424	459	
150	210	275	210	275	210	275	210	275	210	275	210	275	275	275	275	
93	98	105	84	84	146	158	98	105	146	158	98	105	163	140	177	
—	7407	7408	—	—	—	—	7407	7408	—	—	7407	7408	—	—	—	
000050	—	—	003282	003285	003440	003441	—	—	003440	003441	—	—	003441	000149	003443	
- 5 ... + 40																
•																
•																

ММ

ВЕРНО С ОРИГИНАЛА

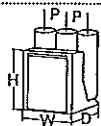


General characteristics of fixed circuit-breakers (17.5 kV)



Circuit-breaker	VD4 17 (1)										
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •										
Rated voltage	Ur [kV]	17.5									
Rated insulation voltage	Us [kV]	17.5									
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38									
Impulse withstand voltage	Up [kV]	95									
Rated frequency	fr [Hz]	50-60									
Rated normal current (40 °C)	Ir [A]	630	630	630	1250	1250	1250	1250	1250	1250	
		16	16	16	16	16	16	-	-	-	-
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	-	-	-	-
		25	25	25	25	25	25	-	-	-	-
		31.5	31.5	31.5	31.5	31.5	31.5	-	-	-	-
		-	-	-	-	-	-	40	40	-	-
Rated short-time withstand current (3s)	Ik [kA]	-	-	-	-	-	-	-	50	50	
		16	16	16	16	16	16	-	-	-	-
		20	20	20	20	20	20	-	-	-	-
		25	25	25	25	25	25	-	-	-	-
Making capacity	Ip [kA]	31.5	31.5	31.5	31.5	31.5	31.5	-	-	-	-
		-	-	-	-	-	-	40	40	-	-
		-	-	-	-	-	-	-	-	50	50
		40	40	40	40	40	40	-	-	-	-
		50	50	50	50	50	50	-	-	-	-
		63	63	63	63	63	63	-	-	-	-
		80	80	80	80	80	80	-	-	-	-
		-	-	-	-	-	-	100	100	-	-
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•	•	
		•	•	•	•	•	•	•	•	•	
		•	•	•	•	•	•	•	•	•	
		•	•	•	•	•	•	•	•	•	
Opening time	[ms]	33 ... 60									
Arcing time	[ms]	10 ... 15									
Total breaking time	[ms]	43 ... 75									
Closing time	[ms]	60 ... 80									
Maximum overall dimensions	H [mm]	461	461	461	461	461	461	589	589	610	610
	W [mm]	450	570	700	450	570	700	570	700	600	750
	D [mm]	424	424	424	424	424	424	424	424	459	459
	Pole distance P [mm]	150	210	275	150	210	275	210	275	210	275
Weight	[kg]	73	75	79	73	75	79	84	84	146	168
Standardised table of dimensions	TN	7405	7406	-	7405	7406	-	-	-	-	-
	1VCD	-	-	000051	-	-	000051	003282	003285	003440	003441
Operating temperature	[°C]	- 5 ... + 40									
Tropicalization	IEC: 60068-2-30, 60721-2-1	•									
Electromagnetic compatibility	IEC: 62271	•									

(1) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.



ИЗРНО С ОРИГИНАЛА

BR

17.5

17.5

38

95

50-60

1600	1600	1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	2500	3150	3150
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	20	-	-	-	-	20	20	-	-	20	20	-	20	-
25	25	-	-	-	-	25	25	-	-	25	25	-	25	-
31.5	31.5	-	-	-	-	31.5	31.5	-	-	31.5	31.5	-	31.5	-
-	-	40	40	-	-	40	40	-	-	-	40	-	40	-
-	-	-	-	50	50	-	-	50	50	-	-	50	-	50
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	20	-	-	-	-	20	20	-	-	20	20	-	20	-
25	25	-	-	-	-	25	25	-	-	25	25	-	25	-
31.5	31.5	-	-	-	-	31.5	31.5	-	-	31.5	31.5	-	31.5	-
-	-	40	40	-	-	40	40	-	-	-	40	-	40	-
-	-	-	-	50	50	-	-	50	50	-	-	50	-	50
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	50	-	-	-	-	50	50	-	-	50	50	-	50	-
63	63	-	-	-	-	63	63	-	-	63	63	-	63	-
80	80	-	-	-	-	80	80	-	-	80	80	-	80	-
-	-	100	100	-	-	100	100	-	-	-	100	-	100	-
-	-	-	-	125	125	-	-	125	125	-	-	125	-	125
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

33 ... 60

10 ... 15

43 ... 75

60 ... 80

599	599	589	589	610	610	599	599	610	610	599	599	610	635	636
570	700	570	700	600	750	570	700	600	750	570	700	750	700	750
424	424	424	424	459	459	424	424	459	459	424	424	459	424	459
210	275	210	275	210	275	210	275	210	275	210	275	275	275	275
98	105	84	84	146	158	98	105	146	158	98	105	163	140	177
7407	7408	-	-	-	-	7407	7408	-	-	7407	7408	-	-	-
-	-	003282	003285	003440	003441	-	-	003440	003441	-	-	003441	000149	003443

- 5 ... + 40

*

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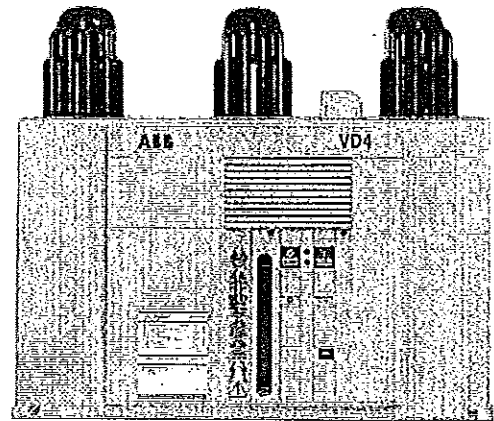
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General characteristics of fixed circuit-breakers (24 kV)

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Circuit-breaker		VD4 24							
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •								
Rated voltage	Ur [kV]	24							
Rated insulation voltage	Us [kV]	24							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50							
Impulse withstand voltage	Up [kV]	125							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C)	Ir [A]	630	630	1250	1250	1600	2000	2500	
		16	16	16	16	16	16	-	
		20	20	20	20	20	20	-	
		25	25	25	25	25	25	25	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	-	-	31.5	-	31.5	31.5	31.5	
		16	16	16	16	16	16	-	
		20	20	20	20	20	20	-	
		25	25	25	25	25	25	25	
Rated short-time withstand current (3s)	Ik [kA]	-	-	31.5	-	31.5	31.5	31.5	
		16	16	16	16	16	16	-	
		20	20	20	20	20	20	-	
		25	25	25	25	25	25	25	
Making capacity	Ip [kA]	40	40	40	40	40	40	-	
		50	50	50	50	50	50	-	
		63	63	63	63	63	63	63	
		-	-	80	-	80	80	80	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	
Opening time	[ms]	33 ... 60							
Arcing time	[ms]	10 ... 15							
Total breaking time	[ms]	43 ... 75							
Closing time	[ms]	60 ... 80							
Maximum overall dimensions		H [mm]	631	631	631	631	642	642	642
		W [mm]	570	700	570	700	700	700	700
		D [mm]	424	424	424	424	424	424	424
		Pole distance P [mm]	210	275	210	275	275	275	275
Weight	[kg]	100	104	100/106 ⁽¹⁾	104	110	110	110	
Standardised table of dimensions	TN	7409	7410	7409	7410	7411	7411	7411	
	1VCD	-	-	000172 ⁽¹⁾	-	-	-	-	
Operating temperature	[°C]	- 5 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1 •								
Electromagnetic compatibility	IEC: 62271-1 •								
(1) 31.5 kA version.									

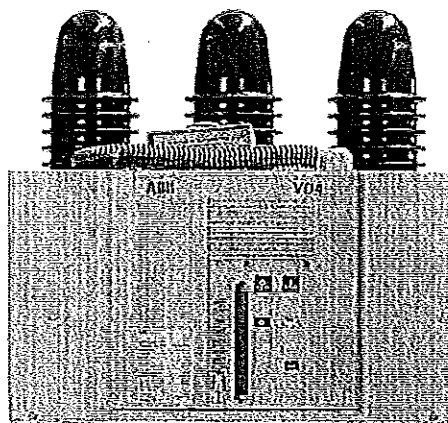
12 *Handwritten mark*

ИЗДАНО С ОРИГИНАЛА

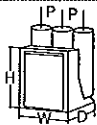


General characteristics of fixed circuit-breakers (36 kV)

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Circuit-breaker	VD4 36				
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •				
Rated voltage	Ur [kV]	36			
Rated insulation voltage	Us [kV]	36			
Withstand voltage at 50 Hz	Ud (1 min) [kV]	70			
Impulse withstand voltage	Up [kV]	170			
Rated frequency	fr [Hz]	50-60			
Rated normal current (40 °C)	Ir [A]	1250	1600	2000	2500 (*)
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	—	—	—	—
		31.5	31.5	31.5	31.5
Rated short-time withstand current (3s)	Ik [kA]	—	—	—	—
		31.5	31.5	31.5	31.5
Making capacity	Ip [kA]	—	—	—	—
		80	80	80	80
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•
Opening time	[ms]	35 ... 60			
Arclng time	[ms]	10 ... 15			
Total breaking time	[ms]	45 ... 75			
Closing time	[ms]	60 ... 80			
Maximum overall dimensions	H [mm]	564	564	564	—
	W [mm]	778	778	778	—
	D [mm]	468	468	468	—
	Pole distance P [mm]	275	275	275	—
Weight	[kg]	150	150	170	—
Standardised table of dimensions	TN	1VYN300901-LT	1VYN300901-LT	1VYN300901-LT	—
Operating temperature	[°C]	- 5 ... + 40			
Tropicalization	IEC: 60068-2-30, 60721-2-1 •				
Electromagnetic compatibility	IEC: 62271-1 •				



BR

ВЯРНО С ОРИГИНАЛА



5.4.2. Types of circuit-breakers available in the fixed version

VD4 fixed circuit-breaker without bottom and top terminals (12 kV)

kV	kA	Rated and interrupted current (40°C) [A]											Circuit-breaker type
		H=461 D=424 u/l=205 l/g=217.5			H=589 D=424 u/l=310 l/g=238		H=599 D=424 u/l=310 l/g=237.5			H=610 D=459 u/l=310 l/g=237		H=636 D=459 u/l=310 l/g=237	
		P=150 W=450	P=210 W=570	P=275 W=700	P=210 W=570	P=275 W=700	P=150 W=450	P=210 W=570	P=275 W=700	P=210 W=600	P=275 W=750	P=275 W=750	
12	16	630											VD4 12.06.16 p150
	20	630											VD4 12.06.20 p150
	25	630											VD4 12.06.25 p150
	31.5	630											VD4 12.06.32 p150
	16	1250											VD4 12.12.16 p150
	20	1250											VD4 12.12.20 p150
	25	1250											VD4 12.12.25 p150
	31.5	1250											VD4 12.12.32 p150
	20							1600					VD4 12.16.20 p150
	25							1600					VD4 12.16.25 p150
	31.5							1600					VD4 12.16.32 p150
	16		630										VD4 12.06.16 p210
	20		630										VD4 12.06.20 p210
	25		630										VD4 12.06.25 p210
	31.5		630										VD4 12.06.32 p210
	16		1250										VD4 12.12.16 p210
	20		1250										VD4 12.12.20 p210
	25		1250										VD4 12.12.25 p210
	31.5		1250										VD4 12.12.32 p210
	40				1250								VD4 12.12.40 p210
	50									1250			VD4 12.12.50 p210
	20							1600					VD4 12.16.20 p210
	25							1600					VD4 12.16.25 p210
	31.5							1600					VD4 12.16.32 p210
	40				1600								VD4 12.16.40 p210
	50									1600			VD4 12.16.50 p210
	20							2000					VD4 12.20.20 p210
	25							2000					VD4 12.20.25 p210
	31.5							2000					VD4 12.20.32 p210
	40							2000					VD4 12.20.40 p210
50									2000			VD4 12.20.50 p210	
20							2500					VD4 12.25.20 p210	
25							2500					VD4 12.25.25 p210	
31.5							2500					VD4 12.25.32 p210	
16			630									VD4 12.06.16 p275	
20			630									VD4 12.06.20 p275	
25			630									VD4 12.06.25 p275	
31.5			630									VD4 12.06.32 p275	
16			1250									VD4 12.12.16 p275	
20			1250									VD4 12.12.20 p275	
25			1250									VD4 12.12.25 p275	
31.5			1250									VD4 12.12.32 p275	
40					1250							VD4 12.12.40 p275	
50									1250			VD4 12.12.50 p275	

H = Height of the circuit-breaker.
W = Width of the circuit-breaker.
D = Depth of the circuit-breaker.
u/l = Distance between bottom and top terminal.
l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
P = Pole horizontal centre distance.

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Ur	Isc	Rated uninterrupted current (40 °C) [A]										Circuit-breaker type	
		H=461			H=589		H=599		H=610		H=636		
kV	kA	D=424			D=424		D=424		D=459		D=459		VD4 12.16.20 p275 VD4 12.16.25 p275 VD4 12.16.32 p275 VD4 12.16.40 p275 VD4 12.16.50 p275 VD4 12.20.20 p275 VD4 12.20.25 p275 VD4 12.20.32 p275 VD4 12.20.40 p275 VD4 12.20.50 p275 VD4 12.25.20 p275 VD4 12.25.25 p275 VD4 12.25.32 p275 VD4 12.25.40 p275 VD4 12.25.50 p275 VD4 12.32.20 p275 VD4 12.32.25 p275 VD4 12.32.32 p275 VD4 12.32.40 p275 VD4 12.32.50 p275
		u/l=205			u/l=310		u/l=310		u/l=310		u/l=310		
		I/g=217.5			I/g=238		I/g=237.5		I/g=237		I/g=237		
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275	P=275	
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
12	20							1600					
	25							1600					
	31.5							1600					
	40				1600								
	50								1600				
	20							2000					
	25							2000					
	31.5							2000					
	40							2000					
	50								2000				
	20							2500					
	25							2500					
	31.5							2500					
	40							2500					
	50								2500				
	20									3150			
	25									3150			
	31.5									3150			
	40									3150			
	50									3150			

H = Height of the circuit-breaker.
W = Width of the circuit-breaker.
D = Depth of the circuit-breaker.
u/l = Distance between bottom and top terminal.
I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
P = Pole horizontal centre distance.

VD4 fixed circuit-breaker without bottom and top terminals (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]										Circuit-breaker type	
		H=461			H=589		H=599		H=610		H=635		
kV	kA	D=424			D=424		D=424		D=459		D=459		VD4 17.06.16 p150 VD4 17.06.20 p150 VD4 17.06.25 p150 VD4 17.06.32 p150 VD4 17.12.16 p150 VD4 17.12.20 p150 VD4 17.12.25 p150 VD4 17.12.32 p150 VD4 17.06.16 p210 VD4 17.06.20 p210 VD4 17.06.25 p210 VD4 17.06.32 p210
		u/l=205			u/l=310		u/l=310		u/l=310		u/l=310		
		I/g=217.5			I/g=238		I/g=237.5		I/g=237		I/g=237.5		
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275	P=275	
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
17.5	16	630											
	20	630											
	25	630											
	31.5	630											
	16	1250											
	20	1250											
	25	1250											
	31.5	1250											
	16		630										
	20		630										
25		630											
31.5		630											

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U _r	I _{sc}	Rated uninterrupted current (40 °C) [A]										Circuit-breaker type	
		H=461			H=589			H=599			H=610		H=635
kV	kA	D=424			D=424			D=424			D=459		D=459
		u/l=205			u/l=310			u/l=310			u/l=310		u/l=310
		I/g=217.5			I/g=238			I/g=237.5			I/g=237		I/g=237.5
		P=150	P=210	P=275	P=210	P=275	P=150	P=210	P=275	P=210	P=275	P=275	
		W=450	W=570	W=700	W=570	W=700	W=450	W=570	W=700	W=600	W=750	W=750	
17.5	16		1250									VD4 17.12.16 p210	
	20		1250									VD4 17.12.20 p210	
	25		1250									VD4 17.12.25 p210	
	31.5		1250									VD4 17.12.32 p210	
	40				1250							VD4 17.12.40 p210	
	50									1250		VD4 17.12.50 p210	
	20								1600			VD4 17.16.20 p210	
	25								1600			VD4 17.16.25 p210	
	31.5								1600			VD4 17.16.32 p210	
	40					1600						VD4 17.16.40 p210	
	50									1600		VD4 17.16.50 p210	
	20								2000			VD4 17.20.20 p210	
	25								2000			VD4 17.20.25 p210	
	31.5								2000			VD4 17.20.32 p210	
	40								2000			VD4 17.20.40 p210	
	50									2000		VD4 17.20.50 p210	
	20								2500			VD4 17.25.20 p210	
	25								2500			VD4 17.25.25 p210	
	31.5								2500			VD4 17.25.32 p210	
	16			630									VD4 17.06.16 p275
20			630									VD4 17.06.20 p275	
25			630									VD4 17.06.25 p275	
31.5			630									VD4 17.06.32 p275	
16			1250									VD4 17.12.16 p275	
20			1250									VD4 17.12.20 p275	
25			1250									VD4 17.12.25 p275	
31.5			1250									VD4 17.12.32 p275	
40					1250							VD4 17.12.40 p275	
50										1250		VD4 17.12.50 p275	
20								1600				VD4 17.16.20 p275	
25								1600				VD4 17.16.25 p275	
31.5								1600				VD4 17.16.32 p275	
40					1600							VD4 17.16.40 p275	
50										1600		VD4 17.16.50 p275	
20								2000				VD4 17.20.20 p275	
25								2000				VD4 17.20.25 p275	
31.5								2000				VD4 17.20.32 p275	
40								2000				VD4 17.20.40 p275	
50										2000		VD4 17.20.50 p275	
20								2500				VD4 17.25.20 p275	
25								2500				VD4 17.25.25 p275	
31.5								2500				VD4 17.25.32 p275	
40								2500				VD4 17.25.40 p275	
50										2500		VD4 17.25.50 p275	
20											3150	VD4 17.32.20 p275	
25											3150	VD4 17.32.25 p275	
31.5											3150	VD4 17.32.32 p275	
40											3150	VD4 17.32.40 p275	
50											3150	VD4 17.32.50 p275	

H = Height of the circuit-breaker.
W = Width of the circuit-breaker.
D = Depth of the circuit-breaker.
u/l = Distance between bottom and top terminal.
I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
P = Pole horizontal centre distance.



ІДІННО С ОРИГІНАЛА

VD4 fixed circuit-breaker without bottom and top terminals (24 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]			
kV	kA	H=631	H=642		
		D=424	D=424		
		u/l=310	u/l=310		
		I/g=282.5	I/g=282.5		
		P=210	P=275	P=275	
		W=570	W=700	W=700	
24	16	630		VD4 24.06.16 p210	
	20	630		VD4 24.06.20 p210	
	25	630		VD4 24.06.25 p210	
	16	1250		VD4 24.12.16 p210	
	20	1250		VD4 24.12.20 p210	
	25	1250		VD4 24.12.25 p210	
	31.5	1250		VD4 24.12.32 p210	
	16		630	VD4 24.06.16 p275	
	20		630	VD4 24.06.20 p275	
	25		630	VD4 24.06.25 p275	
	16		1250	VD4 24.12.16 p275	
	20		1250	VD4 24.12.20 p275	
	25		1250	VD4 24.12.25 p275	
	16			1600	VD4 24.16.16 p275
	20			1600	VD4 24.16.20 p275
	25			1600	VD4 24.16.25 p275
	31.5			1600	VD4 24.16.32 p275
	16			2000	VD4 24.20.16 p275
	20			2000	VD4 24.20.20 p275
	25			2000	VD4 24.20.25 p275
31.5			2000	VD4 24.20.32 p275	
25			2500	VD4 24.25.25 p275	
31.5			2500	VD4 24.25.32 p275	

H = Height of the circuit-breaker.
 W = Width of the circuit-breaker.
 D = Depth of the circuit-breaker.
 u/l = Distance between bottom and top terminal.
 I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
 P = Pole horizontal centre distance.

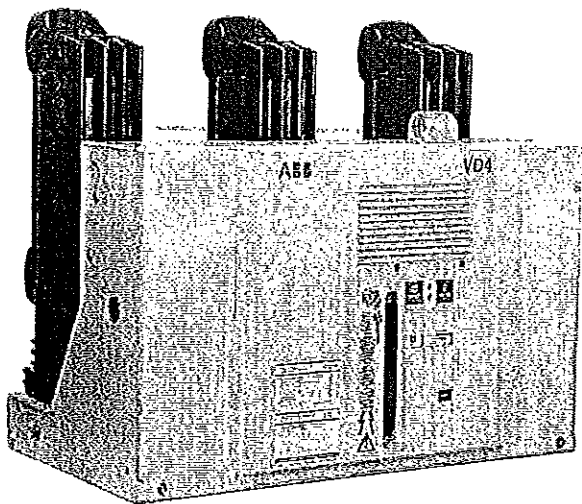
VD4 fixed circuit-breaker without bottom and top terminals (36 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]	
kV	kA	H=876	
		D=478.5	
		u/l=328	
		I/g=428.5	
		P=275	
		W=786	
36	31.5	1250 A	VD4 36.12.32 p275
		1600 A	VD4 36.16.32 p275
		2000 A	VD4 36.20.32 p275
		2500 A (*)	VD4 36.25.32 p275

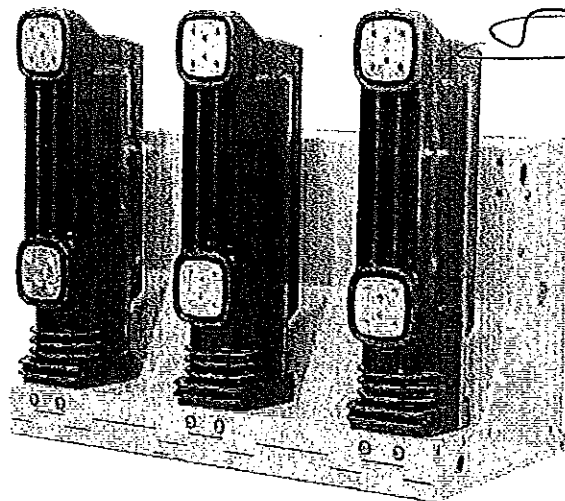
H = Height of the circuit-breaker.
 W = Width of the circuit-breaker.
 D = Depth of the circuit-breaker.
 u/l = Distance between bottom and top terminal.
 I/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
 P = Pole horizontal centre distance.
 (*) = To be released. Contact ABB.

ВЯРНО С ОРИГИНАЛА

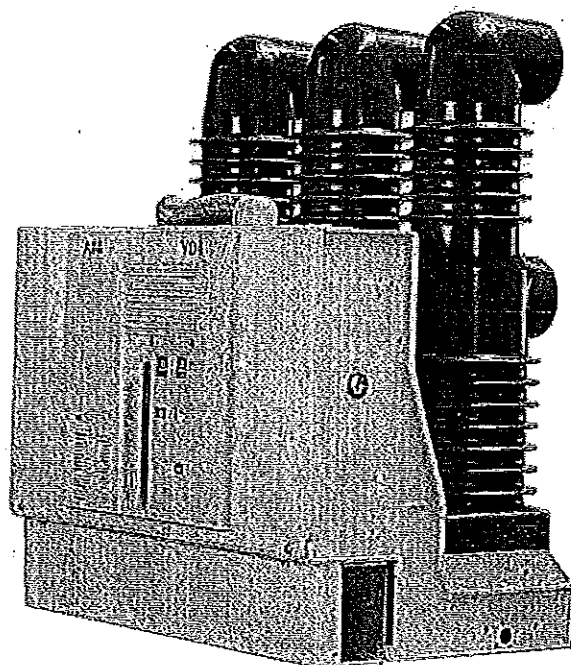




VD4 – up to 24 kV



VD4 – up to 24 kV



VD4 - 36 kV

5.4.3. Standard fittings for fixed circuit-breakers

The basic versions of the fixed circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton, opening pushbutton and operation counter

- set of ten circuit-breaker open/closed auxiliary contacts

Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and five break contacts (signalling circuit-breaker closed) are available.

- lever for manual closing spring charging
- auxiliary circuit support terminal box.

ВЯРНО С ОРИГИНАЛА



5.5. Withdrawable circuit-breakers

The withdrawable circuit-breakers up to 24 kV are available for UniGear ZS1 and UniSec switchgear, PowerCube modules (see fig. 5a) and for ZS8.4 switchgear (see fig. 5b). The 36 kV circuit-breakers are available for ZS2 switchgear. They consist of a truck on which the supporting structure of the circuit-breaker is fixed.

Circuit-breakers for UniGear ZS1 and UniSec switchgear and for PowerCube modules (fig. 5a)

The cord with the connector (14) (plug) for connection of the operating mechanism electrical accessories comes out of the connection (15).

The strikers for operating the contacts (connected/isolated) placed in the switchgear are fixed in the top part of the circuit-breaker.

The shutter actuator (9) (roller (18) for UniSec version) are provided for operating the segregation shutters of the medium voltage contacts of the enclosure or of the switchgear are fixed on the sides of the circuit-breaker.

The crosspiece with the handles (17) for hooking up the circuit-breaker for the racking-in/out operations by means of the special operating lever (16) is mounted on the front part of the circuit-breaker truck.

The circuit-breaker is completed with the isolating contacts (8). The withdrawable circuit-breaker is fitted with special locks on the front crosspiece, which allow hooking up into the corresponding couplings of the switchgear.

The locks can only be activated by the handles with the truck fully resting against the crosspiece.

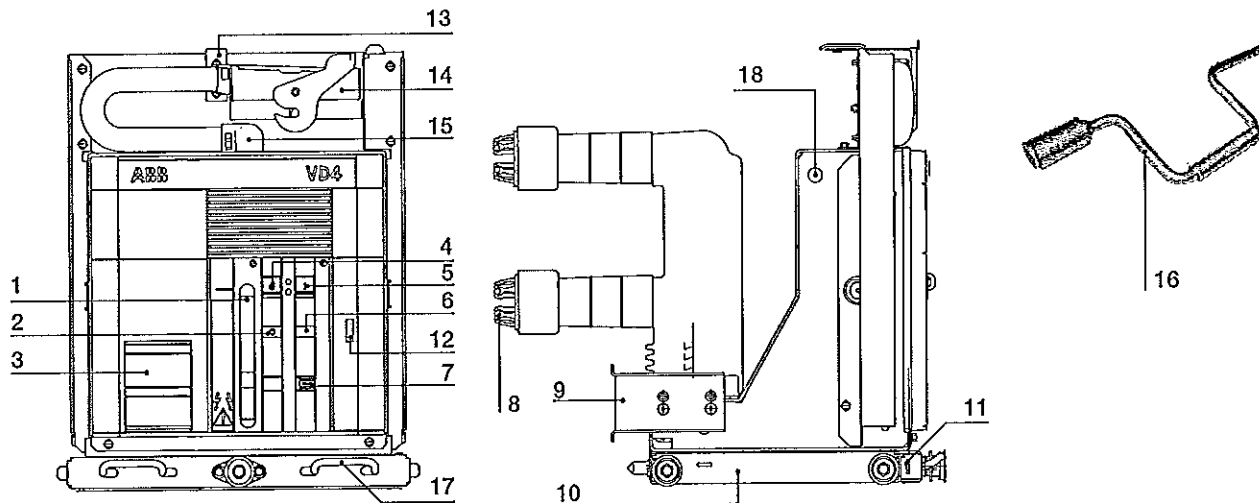
The operating lever (16) must be fully inserted (also see par. 7.5.). A lock prevents the truck from advancing into the enclosure or fixed part when the earthing switch is closed. Another lock prevents racking-in and racking-out with the circuit-breaker closed. With the truck in an intermediate position between isolated and connected, a further lock prevents circuit-breaker closing (either mechanical or electrical).

A locking magnet is also mounted on the truck which, when de-energised, prevents the truck racking-in operation.

On request, an interlock is available which prevents racking-in of the circuit-breaker with the door open, and door opening with the circuit-breaker closed.

The lever for loading the closing spring (1) in the manual mode is built into the operating mechanism. The spring is loaded by repeatedly lowering the lever with linear movements until the yellow indicator (6) appears to show that loading is complete. The spring can only be loaded with the switchgear door open. Comply with the instructions in the UniGear switchgear manual for the operations that can be performed with the door open.

Note: on request, the closing spring loading device for withdrawable circuit-breakers for UniGear switchgear can be supplied with the lever outside the operating mechanism and a rotary loading movement. This device is part of the standard equipment for VD4/ZS8 withdrawable circuit-breakers only (see detail 1 of Fig. 5b on the next page). This rotary loading device allows the closing spring to be loaded with the switchgear door closed.



Caption

- 1 Lever for manually charging the closing spring
- 2 Signalling device for circuit-breaker open/closed
- 3 Rating plate
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for closing spring charged/discharged
- 7 Operation counter
- 8 Isolating contacts

- 9 Slide for operating the switchgear shutters (UniGear ZS1, PowerCube, ZS8.4)
- 10 Truck
- 11 Locks for hooking into the fixed part
- 12 Mechanical override of the undervoltage release (on request)
- 13 Strikers for activating the contacts placed in the enclosure
- 14 Connector (plug)
- 15 Cabling connection
- 16 Operating lever for circuit-breaker racking-in/out
- 17 Handles for activating the locks (11)
- 18 Shutter actuator (for UniSec version only)

Fig. 5a

ВЯРНО С ОПРИГНАЛА



Circuit-breakers for ZS8.4 switchgear (fig. 5b)

The socket (13) takes the connector (plug) placed in the switchgear.

The slides (9) for operating the segregation shutters of the medium voltage contacts of the switchgear are fixed on the sides of the circuit-breaker.

The crosspiece with the handles (17) for hooking up the circuit-breaker for the racking-in/out operations by means of the special operating lever (16) is mounted on the front part of the circuit-breaker truck.

The circuit-breaker is completed with the isolating contacts (8). The withdrawable circuit-breaker is fitted with special locks, described below (see fig. 5c - 5d).

1) Prevention of traverse with circuit-breaker closed

With the circuit-breaker closed, the feeler pin (16 - fig. 5c) prevents the shutter sliding (19 - fig. 5c) and therefore insertion of the lever (20 - fig. 5c) for traverse of the apparatus.

2) Prevention of traverse with socket-plug disconnected

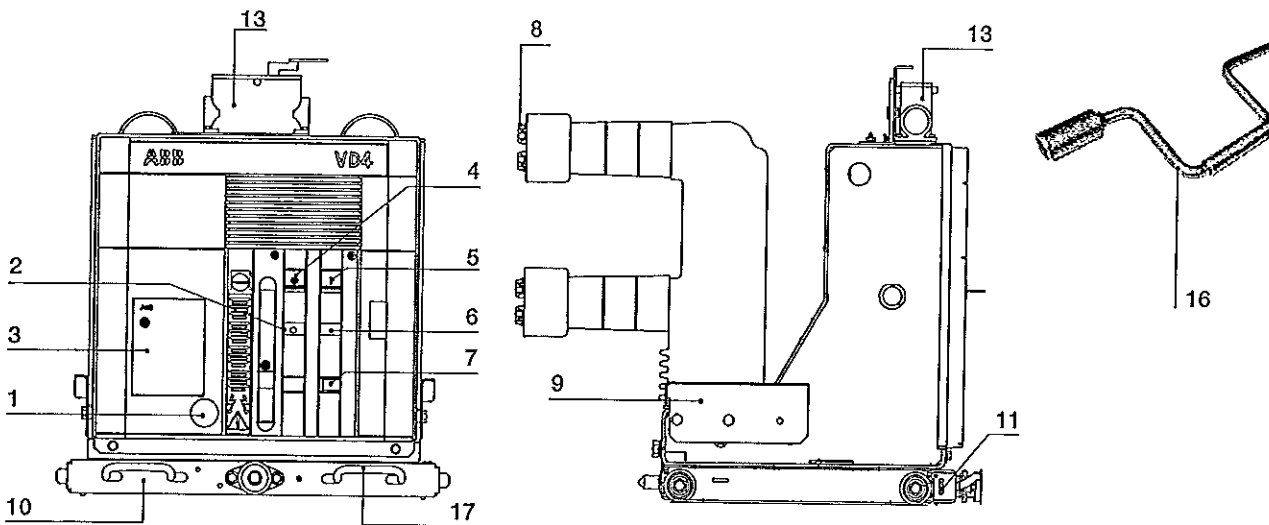
When the plug is not inserted in the socket (13), the stem (21 - fig. 5c) prevents the plate (22 - fig. 5c) lifting and traverse of the apparatus.

3) Prevention of switchgear door closing with socket-plug disconnected (*)

When the plug is not inserted in the socket (13), the feeler pin (23 - fig. 5d) prevents door closing.

4) Prevention of circuit-breaker racking-out with the socket-plug connected (*)

When the plug is inserted in the socket (13), the lock bolt (29 - fig. 5d) hits the pin (30 - fig. 5d) preventing the apparatus from being racked out of the switchgear.



Caption

- 1 Coupling for the manual closing spring charging lever (*)
- 2 Signalling device for circuit-breaker open/closed
- 3 Rating plate
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for closing spring charged/discharged
- 7 Operation counter
- 8 Isolating contacts

9 Slide for operating the switchgear shutters

10 Truck

11 Locks for hooking into the fixed part

13 Connector (plug)

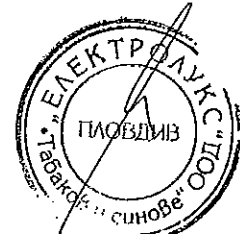
16 Operating lever for circuit-breaker racking-in/out (a special version is provided for VD4/ZS8 Preussen Elektra EON circuit-breakers)

17 Handles for activating the locks (11)

(*) Only VD4/ZS8 Preussen - Elektra EON version.

Fig. 5b

ВЕРНО С ОРИГИНАЛА



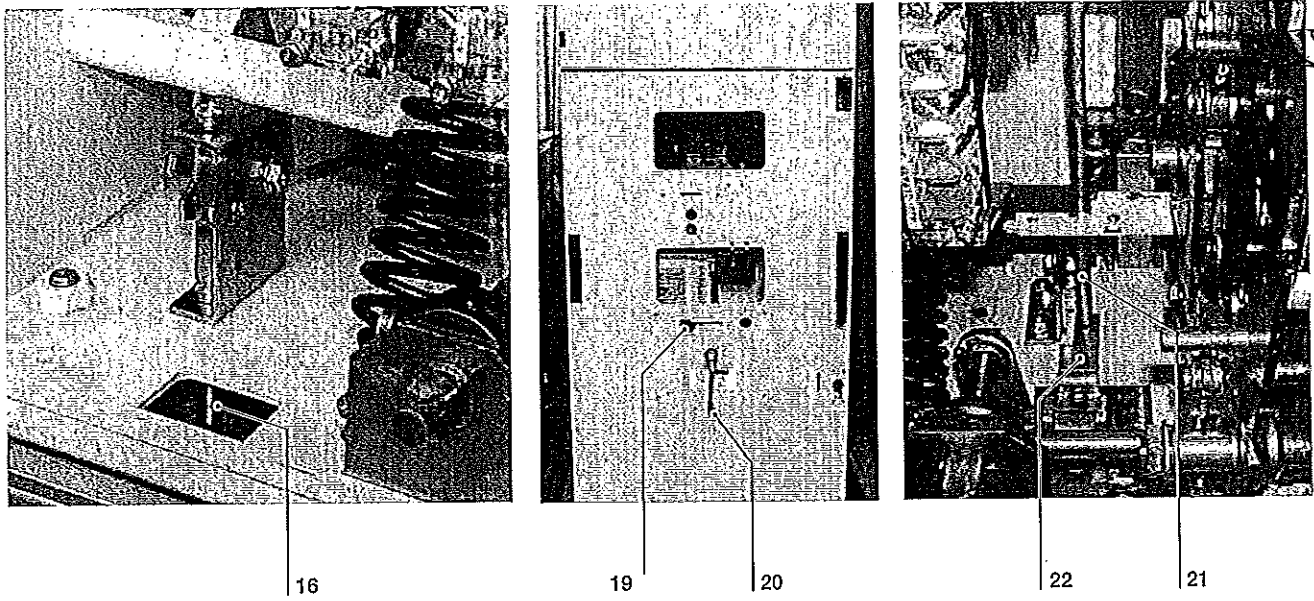


Fig. 5c

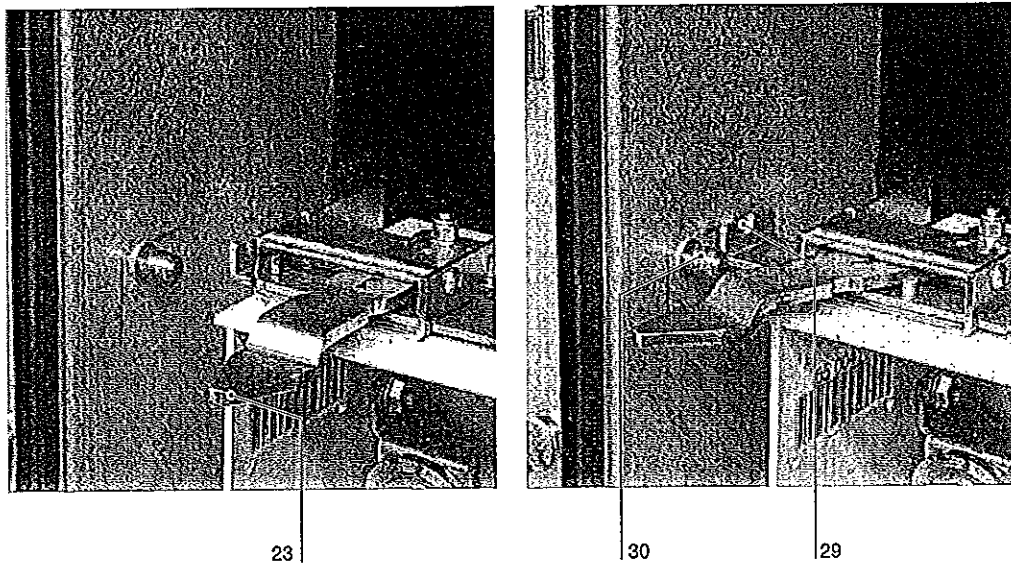
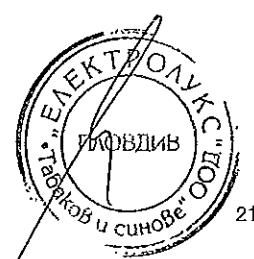


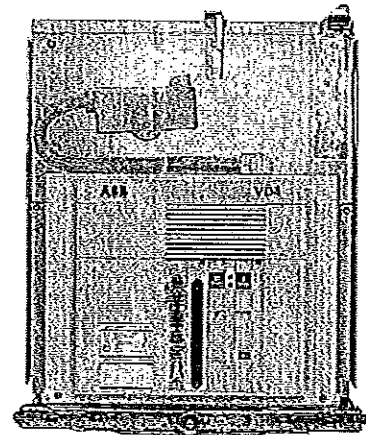
Fig. 5d

ВЯРНО С ОРИГИНАЛА



5.5.1. General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear

General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (12 kV)



Circuit-breaker	VD4/P 12 (*)								
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •								
Rated voltage	Ur [kV]	12							
Rated insulation voltage	Us [kV]	12							
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28							
Impulse withstand voltage	Up [kV]	75							
Rated frequency	fr [Hz]	50-60							
Rated normal current (40 °C) (1)	Ir [A]	630	1250	1250	1250	1250	1600	1600	
		16	16	-	-	-	-	-	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	-	-	-	20	20	
		25	25	-	-	-	25	25	
		31.5	31.5	-	-	-	31.5	31.5	
		-	-	40	40	-	-	-	
Rated short-time withstand current (3s)	Ik [kA]	-	-	-	-	50	-	-	
		16	16	-	-	-	-	-	
		20	20	-	-	-	20	20	
		25	25	-	-	-	25	25	
Making capacity	Ip [kA]	31.5	31.5	-	-	-	31.5	31.5	
		-	-	40	40	-	-	-	
		-	-	-	-	50	-	-	
		40	40	-	-	-	-	-	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	40	40	-	-	-	50	50	
		50	50	-	-	-	50	50	
		63	63	-	-	-	63	63	
		80	80	-	-	-	80	80	
Opening time	[ms]	-	-	100	100	-	-	-	
		-	-	-	-	125	-	-	
		40	40	-	-	-	-	-	
		50	50	-	-	-	-	-	
Arcing time	[ms]	63	63	-	-	-	63	63	
		80	80	-	-	-	80	80	
		-	-	100	100	-	-	-	
		-	-	-	-	125	-	-	
Total breaking time	[ms]	60	60	-	-	-	60	60	
		80	80	-	-	-	80	80	
		-	-	100	100	-	-	-	
		-	-	-	-	125	-	-	
Closing time	[ms]	33 ... 60	33 ... 60	-	-	-	33 ... 60	33 ... 60	
		10 ... 15	10 ... 15	-	-	-	10 ... 15	10 ... 15	
		43 ... 75	43 ... 75	-	-	-	43 ... 75	43 ... 75	
		60 ... 80	60 ... 80	-	-	-	60 ... 80	60 ... 80	
Maximum overall dimensions		H [mm]	628	628	691	691	691	691	691
		W [mm]	503	503	653	853	681	653	853
		D [mm]	662	662	641	642	643	642	642
		Pole distance P [mm]	150	150	210	275	210	210	275
Weight	[kg]	TN	116	116	174	176	180	160	166
		1VCD	-	-	003284	003286	003444	-	-
Standardised table of dimensions		7412	7412	-	-	-	7415	7416	
Operating temperature	[°C]	- 5 ... + 40							
Tropicalization	IEC: 60068-2-30, 60721-2-1	•							
Electromagnetic compatibility	IEC: 62271-1	•							

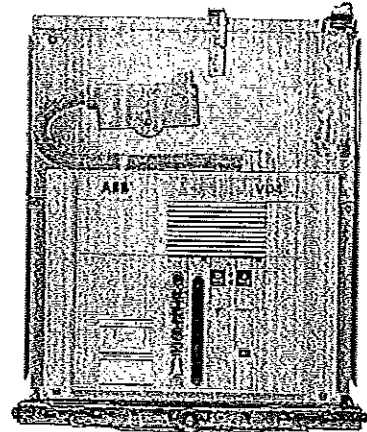
(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
 (2) Up to 4000 A with forced ventilation.
 (3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.

•												
•												
12												
12												
28												
75												
50-60												
1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	3150 ^м	3150 ^м	
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	20	20	-	-	20	-	20	-	-
-	-	-	-	25	25	-	-	25	-	25	-	-
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	-
40	40	-	-	40	40	-	-	40	-	40	-	-
-	-	50	50	-	-	50	50	-	50	-	60	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	20	20	-	-	20	-	20	-	-
-	-	-	-	25	25	-	-	25	-	25	-	-
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	-
40	40	-	-	40	40	-	-	40	-	40	-	-
-	-	50	50	-	-	50	50	-	50	-	50	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	50	50	-	-	50	-	50	-	-
-	-	-	-	63	63	-	-	63	-	63	-	-
-	-	-	-	80	80	-	-	80	-	80	-	-
100	100	-	-	100	100	-	-	100	-	100	-	-
-	-	125	125	-	-	125	125	-	125	-	125	-
•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60												
10 ... 15												
43 ... 75												
60 ... 80												
691	691	691	691	691	691	691	691	691	691	730	742	
653	853	681	853	653	853	681	853	853	853	853	853	853
641	642	643	643	642	642	643	643	640	643	640	643	643
210	275	210	275	210	275	210	275	275	275	275	275	275
174	176	180	193	160	166	190	205	186	225	221	240	240
-	-	-	-	7415	7416	-	-	7417	-	-	-	-
003284	003286	003444	003445	-	-	003444	003445	-	003446	000153	003447	003447
- 5 ... + 40												
•												
•												

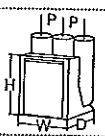
ВАРНО С ОРИГИНАЛА



General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (17.5 kV)



Circuit-breaker		VD4/P 17 (1)						
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •							
Rated voltage	Ur [kV]	17.5						
Rated insulation voltage	Us [kV]	17.5						
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38						
Impulse withstand voltage	Up [kV]	95						
Rated frequency	fr [Hz]	50-60						
Rated normal current (40 °C) (1)	Ir [A]	630	1250	1250	1250	1250	1600	1600
		16	16	-	-	-	-	-
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	-	-	-	20	20
		25	25	-	-	-	25	25
		31.5	31.5	-	-	-	31.5	31.5
		-	-	40	40	-	-	-
		-	-	-	-	50	-	-
Rated short-time withstand current (3s)	Ik [kA]	16	16	-	-	-	-	-
		20	20	-	-	-	20	20
		25	25	-	-	-	25	25
		31.5	31.5	-	-	-	31.5	31.5
		-	-	40	40	-	-	-
Making capacity	Ip [kA]	-	-	-	-	50	-	-
		40	40	-	-	-	-	-
		50	50	-	-	-	50	50
		63	63	-	-	-	63	63
		80	80	-	-	-	80	80
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•
		•	•	•	•	•	•	•
Opening time	[ms]	33 ... 60						
Arcing time	[ms]	10 ... 15						
Total breaking time	[ms]	43 ... 75						
Closing time	[ms]	60 ... 80						
Maximum overall dimensions	H [mm]	632	632	691	691	691	691	691
	W [mm]	503	503	653	653	681	653	853
	D [mm]	664	664	641	642	643	642	642
	Pole distance P [mm]	150	150	210	275	210	210	275
Weight	[kg]	116	116	174	176	180	160	166
Standardised table of dimensions	TN	7412	7412	-	-	-	7415	7416
	1VCD	-	-	003284	003286	003444	-	-
Operating temperature	[°C]	- 5 ... + 40						
Tropicalization	IEC: 60068-2-30, 60721-2-1	•						
Electromagnetic compatibility	IEC: 62271-1	•						



(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
 (2) Up to 4000 A with forced ventilation.
 (3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.



ВЯРНО С ОРИГІНАЛОМ

Handwritten mark

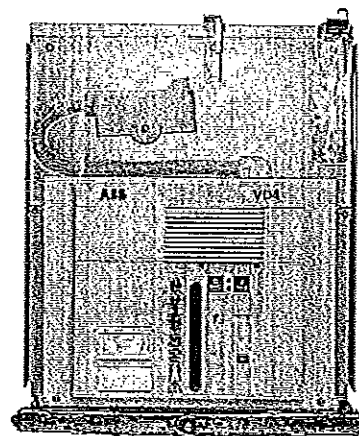
•												
•												
17.5												
17.5												
38												
95												
50-60												
1600	1600	1600	1600	2000	2000	2000	2000	2500	2500	3150 ^{PH}	3150 ^{PH}	
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	20	20	-	-	20	-	20	-	-
-	-	-	-	25	25	-	-	25	-	25	-	-
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	-
40	40	-	-	40	40	-	-	40	-	40	-	-
-	-	50	50	-	-	60	50	-	50	-	-	50
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	20	20	-	-	20	-	20	-	-
-	-	-	-	25	25	-	-	25	-	25	-	-
-	-	-	-	31.5	31.5	-	-	31.5	-	31.5	-	-
40	40	-	-	40	40	-	-	40	-	40	-	-
-	-	50	50	-	-	50	50	-	50	-	-	50
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	50	50	-	-	50	-	50	-	-
-	-	-	-	63	63	-	-	63	-	63	-	-
-	-	-	-	80	80	-	-	80	-	80	-	-
100	100	-	-	100	100	-	-	100	-	100	-	-
-	-	125	125	-	-	125	125	-	125	-	-	125
•	•	•	•	•	•	•	•	•	•	•	•	•
33 ... 60												
10 ... 15												
43 ... 75												
60 ... 80												
691	691	691	691	691	691	691	691	691	691	730	742	
653	853	681	853	653	853	681	853	853	853	853	853	853
641	642	643	643	642	642	643	643	640	643	640	643	643
210	275	210	275	210	275	210	275	275	275	275	275	275
174	176	180	193	160	166	190	205	186	225	221	240	240
-	-	-	-	7415	7416	-	-	7417	-	-	-	-
003284	003286	003444	003445	-	-	003444	003445	-	003446	000153	003447	
- 5 ... + 40												
•												
•												

Handwritten mark

СЪРНО С ОРИГИНАЛА



General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (24 kV)



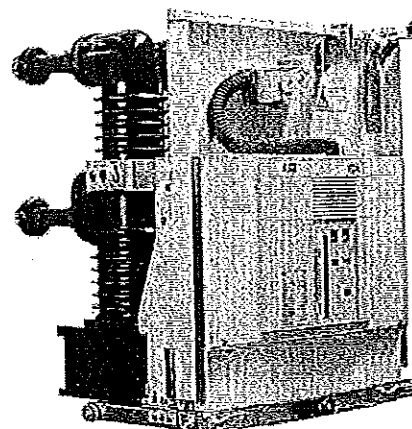
Circuit-breaker		VD4/P 24								
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •									
Rated voltage	Ur [kV]	24								
Rated insulation voltage	Us [kV]	24								
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50								
Impulse withstand voltage	Up [kV]	125								
Rated frequency	fr [Hz]	50-60								
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	630	1250	1250	1800	2000	2500 ⁽²⁾	3150 ⁽³⁾	
		16	16	16	16	16	16	16	-	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	20	20	-	
		25	25	25	25	25	25	25	-	
		-	-	31.5	-	31.5	31.5	31.5	31.5	
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	16	16	16	16	-	
		20	20	20	20	20	20	20	-	
		25	25	25	25	25	25	25	-	
Making capacity	Ip [kA]	-	-	31.5	-	31.5	31.5	31.5	31.5	
		40	40	40	40	40	40	40	-	
		50	50	60	50	50	50	50	-	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	•	•	•	•	
		•	•	•	•	•	•	•	•	
Opening time	[ms]	33 ... 60								
Arcling time	[ms]	10 ... 15								
Total breaking time	[ms]	43 ... 75								
Closing time	[ms]	60 ... 80								
Maximum overall dimensions		H [mm]	794	794	794	794	838	838	838	838
		W [mm]	653	853	653	853	853	853	853	853
		D [mm]	802	802	802	802	790	790	790	790
		Pole distance P [mm]	210	275	210	275	275	275	275	275
Weight	[kg]	140	148	140/146 ⁽⁴⁾	148	228	228	228	277	
Standardised table of dimensions	TN	7413	7414	7413	7414	7418	7418	7418	-	
	1VCD	-	-	000173 ⁽⁴⁾	-	-	-	-	000177	
Operating temperature	[°C]	- 5 ... + 40								
Tropicalization	IEC: 60068-2-30, 60721-2-1 •									
Electromagnetic compatibility	IEC: 62271-1 •									

(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
 (2) 2300 A rated current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.
 (3) 2700 A rated current guaranteed with natural ventilation; 3150 A rated current guaranteed with forced ventilation.
 (4) 31.5 kA version.

ВНЕСЕНО С ОРИГИНАЛА

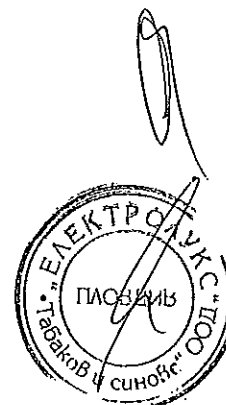


General characteristics of withdrawable circuit-breakers for UniGear ZS2 switchgear and PowerCube modules (36 kV)



Circuit-breaker		VD4/W 36				
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •					
Rated voltage	Ur [kV]	36				
Rated insulation voltage	Us [kV]	36				
Withstand voltage at 50 Hz	Ud (1 min) [kV]	70				
Impulse withstand voltage	Up [kV]	170				
Rated frequency	fr [Hz]	50-60				
Rated normal current (40 °C) ^(*)	Ir [A]	1250	1600	2000	2500 ^(*)	
		-	-	-	-	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	31.5	31.5	31.5	31.5	
		-	-	-	-	
Rated short-time withstand current (3s)	Ik [kA]	31.5	31.5	31.5	31.5	
		-	-	-	-	
Making capacity	Ip [kA]	80	80	80	80	
		-	-	-	-	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•	
Opening time	[ms]	33 ... 60				
Arclng time	[ms]	10 ... 15				
Total breaking time	[ms]	45 ... 75				
Closing time	[ms]	60 ... 80				
Maximum overall dimensions		H [mm]	973	973	973	973
		W [mm]	842	842	842	842
		D [mm]	788	788	788	788
		Pole distance P [mm]	275	275	275	275
Weight	[kg]	230	230	230	-	
Standardised table of dimensions	TN	1VYN300901-KG	1VYN300901-KG	1VYN300901-KG	-	
Operating temperature	[°C]	- 5 ... + 40				
Tropicalization	IEC: 60068-2-30, 60721-2-1	•				
Electromagnetic compatibility	IEC: 62271-1	•				

(*) Ask ABB



КОПИО С ОРИГИНАЛА

5.5.2. Types of withdrawable circuit-breakers available for UniGear ZS1 switchgear

5

VD4 withdrawable circuit-breaker (12 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650 P=150 u/l=205 ø=35	W=800 P=210 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=109	W=1000 P=275 u/l=310 ø=109	
12	16	630					VD4/P 12.06.16 p150
	20	630					VD4/P 12.06.20 p150
	25	630					VD4/P 12.06.25 p150
	31.5	630					VD4/P 12.06.32 p150
	16	1250					VD4/P 12.12.16 p150
	20	1250					VD4/P 12.12.20 p150
	25	1250					VD4/P 12.12.25 p150
	31.5	1250					VD4/P 12.12.32 p150
	40		1250				VD4/P 12.12.40 p210
	50		1250				VD4/P 12.12.50 p210
	20		1600				VD4/P 12.16.20 p210
	25		1600				VD4/P 12.16.25 p210
	31.5		1600				VD4/P 12.16.32 p210
	40		1600				VD4/P 12.16.40 p210
	50		1600				VD4/P 12.16.50 p210
	20		2000				VD4/P 12.20.20 p210
	25		2000				VD4/P 12.20.25 p210
	31.5		2000				VD4/P 12.20.32 p210
	40		2000				VD4/P 12.20.40 p210
	50		2000				VD4/P 12.20.50 p210
	40			1250			VD4/P 12.12.40 p275
	20			1600			VD4/P 12.16.20 p275
	25			1600			VD4/P 12.16.25 p275
	31.5			1600			VD4/P 12.16.32 p275
	40			1600			VD4/P 12.16.40 p275
	50			1600			VD4/P 12.16.50 p275
	20			2000			VD4/P 12.20.20 p275
	25			2000			VD4/P 12.20.25 p275
	31.5			2000			VD4/P 12.20.32 p275
	40			2000			VD4/P 12.20.40 p275
	50			2000			VD4/P 12.20.50 p275
	20				2500		VD4/P 12.25.20 p275
	25				2500		VD4/P 12.25.25 p275
	31.5				2500		VD4/P 12.25.32 p275
	40				2500		VD4/P 12.25.40 p275
50				2500		VD4/P 12.25.50 p275	
20					3150 (1)	VD4/P 12.32.20 p275	
25					3150 (1)	VD4/P 12.32.25 p275	
31.5					3150 (1)	VD4/P 12.32.32 p275	
40					3150 (1)	VD4/P 12.32.40 p275	
50					3150 (1)	VD4/P 12.32.50 p275	

W = Width of the circuit-breaker.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.
(1) Up to 4000 A rated current guaranteed with forced ventilation.

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ВЕРНО С ОРИГИНАЛА



VD4 withdrawable circuit-breaker (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650	W=800	W=1000	W=1000	W=1000	
kV	kA	P=150	P=210	P=275	P=275	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=79	ø=79	ø=109	ø=109	
17.5	16	630					VD4/P 17.06.16 p150
	20	630					VD4/P 17.06.20 p150
	25	630					VD4/P 17.06.25 p150
	31.5	630					VD4/P 17.06.32 p150
	16	1250					VD4/P 17.12.16 p150
	20	1250					VD4/P 17.12.20 p150
	25	1250					VD4/P 17.12.25 p150
	31.5	1250					VD4/P 17.12.32 p150
	40		1250				VD4/P 17.12.40 p210
	50		1250				VD4/P 17.12.50 p210
	20		1600				VD4/P 17.16.20 p210
	25		1600				VD4/P 17.16.25 p210
	31.5		1600				VD4/P 17.16.32 p210
	40		1600				VD4/P 17.16.40 p210
	50		1600				VD4/P 17.16.50 p210
17.5	20		2000				VD4/P 17.20.20 p210
	25		2000				VD4/P 17.20.25 p210
	31.5		2000				VD4/P 17.20.32 p210
	40		2000				VD4/P 17.20.40 p210
	50		2000				VD4/P 17.20.50 p210
	40			1250			VD4/P 17.12.40 p275
	20			1600			VD4/P 17.16.20 p275
	25			1600			VD4/P 17.16.25 p275
	31.5			1600			VD4/P 17.16.32 p275
	40			1600			VD4/P 17.16.40 p275
	50			1600			VD4/P 17.16.50 p275
	20			2000			VD4/P 17.20.20 p275
	25			2000			VD4/P 17.20.25 p275
	31.5			2000			VD4/P 17.20.32 p275
	40			2000			VD4/P 17.20.40 p275
50			2000			VD4/P 17.20.50 p275	
17.5	20				2500		VD4/P 17.25.20 p275
	25				2500		VD4/P 17.25.25 p275
	31.5				2500		VD4/P 17.25.32 p275
	40				2500		VD4/P 17.25.40 p275
	50				2500		VD4/P 17.25.50 p275
	20					3150 (1)	VD4/P 17.32.20 p275
	25					3150 (1)	VD4/P 17.32.25 p275
31.5					3150 (1)	VD4/P 17.32.32 p275	
17.5	40					3150 (1)	VD4/P 17.32.40 p275
	50					3150 (1)	VD4/P 17.32.50 p275

W = Width of the circuit-breaker.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 (1) Up to 4000 A rated current guaranteed with forced ventilation.



ВАЖНО С ОРИГИНАЛА

VD4 withdrawable circuit-breaker (24 kV)

W

Ur	Isc	Rated uninterrupted current (40 °C) [A]				Circuit-breaker type
		W=800	W=1000	W=1000	W=1000	
kV	kA	P=210	P=275	P=275	P=275	
		u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=35	ø=79	ø=109	
24	16	630				VD4/P 24.06.16 p210
	20	630				VD4/P 24.06.20 p210
	25	630				VD4/P 24.06.25 p210
	16	1250				VD4/P 24.12.16 p210
	20	1250				VD4/P 24.12.20 p210
	25	1250				VD4/P 24.12.25 p210
	31.5	1250				VD4/P 24.12.32 p210
	16		630			VD4/P 24.06.16 p275
	20		630			VD4/P 24.06.20 p275
	25		630			VD4/P 24.06.25 p275
	16		1250			VD4/P 24.12.16 p275
	20		1250			VD4/P 24.12.20 p275
	25		1250			VD4/P 24.12.25 p275
	16			1600		VD4/P 24.16.16 p275
	20			1600		VD4/P 24.16.20 p275
	25			1600		VD4/P 24.16.25 p275
	31.5			1600		VD4/P 24.16.32 p275
	16			2000		VD4/P 24.20.16 p275
	20			2000		VD4/P 24.20.20 p275
	25			2000		VD4/P 24.20.25 p275
	31.5			2000		VD4/P 24.20.32 p275
	16			2300 ⁽¹⁾		VD4/P 24.25.16 p275
	20			2300 ⁽¹⁾		VD4/P 24.25.20 p275
	25			2300 ⁽¹⁾		VD4/P 24.25.25 p275
	31.5			2300 ⁽¹⁾		VD4/P 24.25.32 p275
	31.5				2700 ⁽²⁾	VD4/P 24.32.32 p275

W = Width of the switchgear.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 (1) 2500 A rated current guaranteed with forced ventilation.
 (2) 3150 A rated current guaranteed with forced ventilation.

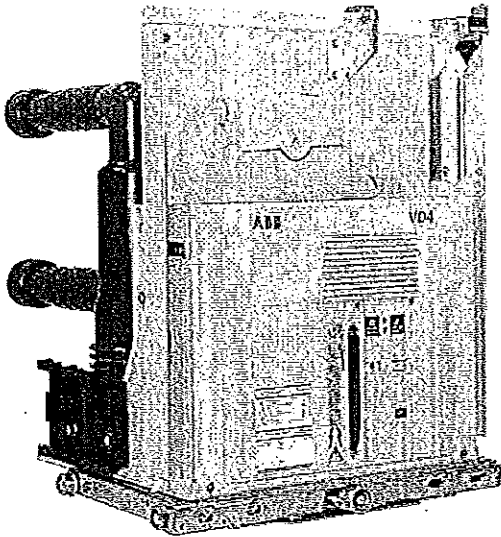
VD4 withdrawable circuit-breaker (36 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]	
kV	kA	H=951	Circuit-breaker type
		D=788	
		u/l=380	
		ø=399	
		P=275	
		W=778	
36	31.5	1250 A	VD4/W 36.12.32 p275
		1600 A	VD4/W 36.16.32 p275
		2000 A	VD4/W 36.20.32 p275
		2500 A ^(*)	VD4/W 36.25.32 p275

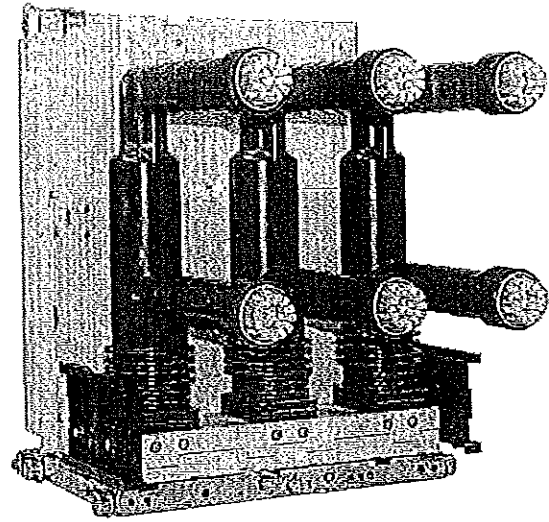
H = Height of the circuit-breaker.
 D = Depth of the circuit-breaker.
 u/l = Distance between bottom and top terminal.
 ø = Diameter of the isolating contact.
 P = Pole horizontal centre distance.
 W = Width of the circuit-breaker.
 (*) = To be released. Contact ABB

ВЯРНО С ОРГИНАЛА

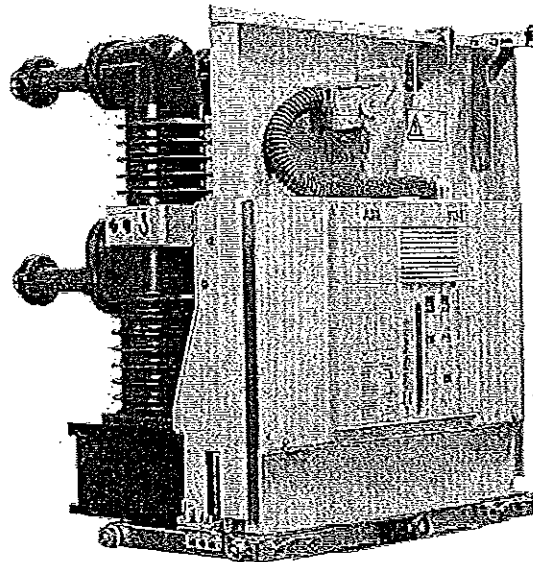




VD4 – up to 24 kV



VD4 – up to 24 kV



VD4 - 36 kV

5.5.3. Standard fittings of withdrawable circuit-breakers for UniGear ZS1 switchgear (up to 24 kV) - UniGear ZS2 and PowerCube modules (VD4 36 kV)

The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton
- opening pushbutton
- operation counter

- set of ten auxiliary circuit-breaker open/closed contacts
 Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.

- lever for manually charging the closing spring
- isolating contacts
- cord with connector (plug only) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck. This prevents the circuit-breaker from being racked into the panel with auxiliary circuits not connected (plug not inserted in the socket).

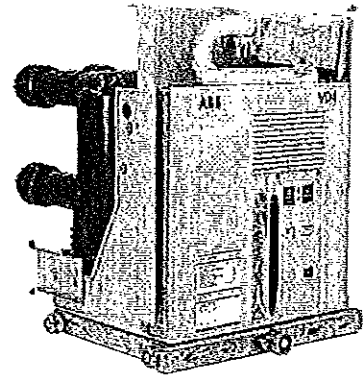
ВЯРНО С ОРИГИНАЛА



5.5.4. General characteristics of withdrawable circuit-breakers for PowerCube modules

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General characteristics of withdrawable circuit-breakers for PowerCube modules (12 kV)



Circuit-breaker	VD4/P 12 (2)				VD4/W 12 (2)			
	PowerCube module	PB1		PB2		PB2		
Standards	IEC 62271-100 VDE 0671; CEI EN 62271-100- File 7642	•		•		•		
Rated voltage	Ur [kV]	12		12		12		
Rated insulation voltage	Us [kV]	12		12		12		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28		28		28		
Impulse withstand voltage	Up [kV]	75		75		75		
Rated frequency	fr [Hz]	50-60		50-60		50-60		
Rated normal current (40 °C) (1)	Ir [A]	630	1250	630	1250	630	1250	
		16	16	16	16	16	16	
		20	20	20	20	20	20	
		25	25	25	25	25	25	
		31.5	31.5	31.5	31.5	31.5	31.5	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	-	-	-	-	-	-	
		16	16	16	16	16	16	
		20	20	20	20	20	20	
		25	25	25	25	25	25	
		31.5	31.5	31.5	31.5	31.5	31.5	
Rated short-time withstand current (3s)	Ik [kA]	-	-	-	-	-	-	
		16	16	16	16	16	16	
		20	20	20	20	20	20	
		25	25	25	25	25	25	
		31.5	31.5	31.5	31.5	31.5	31.5	
Making capacity	Ip [kA]	-	-	-	-	-	-	
		40	40	40	40	40	40	
		50	50	50	50	50	50	
		63	63	63	63	63	63	
		80	80	80	80	80	80	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•		•		•		
Opening time	[ms]	33 ... 60		33 ... 60		33 ... 60		
Arcing time	[ms]	10 ... 15		10 ... 15		10 ... 15		
Total breaking time	[ms]	43 ... 75		43 ... 75		43 ... 75		
Closing time	[ms]	60 ... 80		60 ... 80		60 ... 80		
Maximum overall dimensions		H [mm]	628	628	691	691	691	
		W [mm]	503	503	653	853	853	
		D [mm]	662	662	642	642	642	
		Pole distance P [mm]	150	150	210	210	210	
		TN	7412	7412	7420	7420	7420	
Weight	[kg]	116	116	135	135	135		
Standardised table of dimensions	1VGD	-	-	-	-	-		
Operating temperature	[°C]	- 5 ... + 40		- 5 ... + 40		- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	•		•		•		
Electromagnetic compatibility	IEC: 62271-1	•		•		•		

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature
 (2) Up to 4000 A with forced ventilation.
 (3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.

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ВЕРНО С ОРИГИНАЛА



3

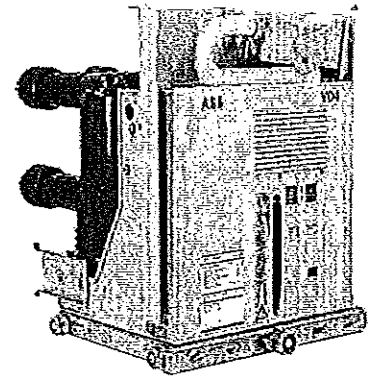
VD4/P 12								VD4/W 12			
PB2								PB3		PB3	
•								•		•	
•								•		•	
12								12		12	
12								12		12	
28								28		28	
75								75		75	
50-60								50-60		60-60	
1250	1250	1600	1600	1600	2000	2000	2500	2500	3150 [Ⓜ]	3150 [Ⓜ]	
-	-	-	-	-	-	-	-	-	-	-	-
-	-	20	-	-	20	-	20	-	20	-	-
-	-	25	-	-	25	-	25	-	25	-	-
-	-	31.5	-	-	31.5	-	31.5	-	31.5	-	-
40	-	-	40	-	40	-	40	-	40	-	-
-	50	-	-	50	-	50	-	50	-	-	50
-	-	-	-	-	-	-	-	-	-	-	-
-	-	20	-	-	20	-	20	-	20	-	-
-	-	25	-	-	25	-	25	-	25	-	-
-	-	31.5	-	-	31.5	-	31.5	-	31.5	-	-
40	-	-	40	-	40	-	40	-	40	-	-
-	50	-	-	50	-	50	-	50	-	-	50
-	-	-	-	-	-	-	-	-	-	-	-
-	-	50	-	-	50	-	50	-	50	-	-
-	-	63	-	-	63	-	63	-	63	-	-
-	-	80	-	-	80	-	80	-	80	-	-
100	-	-	100	-	100	-	100	-	100	-	-
-	125	-	-	125	-	125	-	125	-	-	125
•								•		•	
33 ... 60								33 ... 60		33 ... 60	
10 ... 15								10 ... 15		10 ... 15	
43 ... 75								43 ... 75		43 ... 75	
60 ... 80								60 ... 80		60 ... 80	
691	691	691	691	691	690	691	691	691	730	691	691
653	681	653	653	681	653	681	853	853	853	853	853
641	643	642	641	643	642	643	640	643	640	640	643
210	210	210	210	210	210	210	275	275	275	275	275
174	180	160	174	180	160	180	186	225	221	221	240
-	-	7415	-	-	7415	-	7417	-	-	-	-
003284	003444	-	003284	003444	-	003444	-	003445	000152	000152	003596
- 5 ... + 40								- 5 ... + 40		- 5 ... + 40	
•								•		•	
•								•		•	

60

ВАРНО С ОРИГИНАЛА



General characteristics of withdrawable circuit-breakers for PowerCube modules (17.5 kV)



Circuit-breaker	VD4/P 17 (*)		VD4/W 17 (*)		
	PowerCube module	PB1	PB2		
Standards	IEC 62271-100 •		•		
	VDE 0671; CEI EN 62271-100- File 7642 •		•		
Rated voltage	Ur [kV]	17.5	17.5		
Rated insulation voltage	Us [kV]	17.5	17.5		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	38	38		
Impulse withstand voltage	Up [kV]	95	95		
Rated frequency	fr [Hz]	50-60	50-60		
Rated normal current (40 °C) (1)	Ir [A]	630	630	1250	
		1250	1250	1250	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	16	16	16	
		20	20	20	
		25	25	25	
		31.5	31.5	31.5	
		--	--	--	
		--	--	--	
Rated short-time withstand current (3s)	Ik [kA]	16	16	16	
		20	20	20	
		25	25	25	
		31.5	31.5	31.5	
		--	--	--	
		--	--	--	
Making capacity	Ip [kA]	40	40	40	
		50	50	50	
		63	63	63	
		80	80	80	
		--	--	--	
		--	--	--	
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•		
Opening time	[ms]	33 ... 60	33 ... 60		
Arclng time	[ms]	10 ... 15	10 ... 15		
Total breaking time	[ms]	43 ... 75	43 ... 75		
Closing time	[ms]	60 ... 80	60 ... 80		
Maximum overall dimensions		H [mm]	628	628	691
		W [mm]	503	503	653
		D [mm]	662	662	642
		Pole distance P [mm]	150	150	210
Weight	[kg]	116	116	135	
Standardised table of dimensions	TN	7412	7412	7420	
	1VCD	--	--	--	
Operating temperature	[°C]	- 5 ... + 40	- 5 ... + 40		
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•		
Electromagnetic compatibility	IEC: 62271-1	•	•		

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.
 (2) Up to 4000 A with forced ventilation.
 (3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.



ПРОС ОРИГИНАЛА

[Handwritten mark]

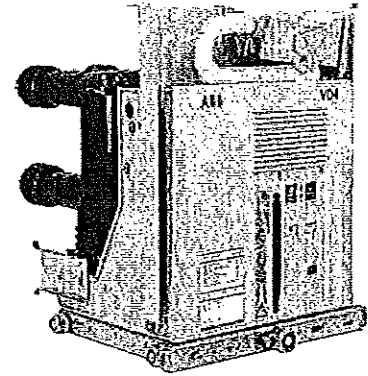
VD4/P 17							VD4/W 17				
PB2							PB3		PB3		
•							•			•	
•							•			•	
17.5							17.5			17.5	
17.5							17.5			17.5	
38							38			38	
95							95			95	
50-60							50-60			50-60	
1250	1250	1600	1600	1600	2000	2000	2500	2500	3150 ²⁾	3160 ²⁾	
-	-	-	-	-	-	-	-	-	-	-	
-	-	20	-	-	20	-	20	-	-	20	
-	-	25	-	-	25	-	25	-	-	25	
-	-	31.5	-	-	31.5	-	31.5	-	-	31.5	
40	-	-	40	-	40	-	40	-	-	40	
-	50	-	-	50	-	50	-	50	50	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	20	-	-	20	-	20	-	-	20	
-	-	25	-	-	25	-	25	-	-	25	
-	-	31.5	-	-	31.5	-	31.5	-	-	31.5	
40	-	-	40	-	40	-	40	-	-	40	
-	50	-	-	50	-	50	-	50	50	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	50	-	-	50	-	50	-	-	50	
-	-	63	-	-	63	-	63	-	-	63	
-	-	80	-	-	80	-	80	-	-	80	
100	-	-	100	-	100	-	100	-	-	100	
-	125	-	-	125	-	125	-	125	125	-	
•							•			•	
33 ... 60							33 ... 60			33 ... 60	
10 ... 15							10 ... 15			10 ... 15	
43 ... 75							43 ... 75			43 ... 75	
60 ... 80							60 ... 80			60 ... 80	
691	691	691	691	691	690	691	691	691	691	730	
653	681	653	653	681	653	681	853	853	853	853	
641	643	642	641	643	642	643	640	643	643	640	
210	210	210	210	210	210	210	275	275	275	275	
174	180	160	174	180	160	190	186	225	240	221	
-	-	7415	-	-	7415	-	7417	-	-	-	
003284	003444	-	003284	003444	-	003444	-	003445	003596	000152	
- 5 ... + 40							- 5 ... + 40			- 5 ... + 40	
•							•			•	
•							•			•	

AM

ВЯРНО С ОРЪИНАЛА



General characteristics of withdrawable circuit-breakers for PowerCube modules (24 kV)



Circuit-breaker	VD4/P 24						
	PowerCube module	PB4		PB5			
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •	•	•	•	•	•	
Rated voltage	Ur [kV]	24		24			
Rated Insulation voltage	Us [kV]	24		24			
Withstand voltage at 50 Hz	Ud (1 mln) [kV]	50		50			
Impulse withstand voltage	Up [kV]	125		125			
Rated frequency	fr [Hz]	50-60		50-60			
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630	1250	1600	2000	2500 ⁽²⁾	
		16	16	16	16	16	
Rated breaking capacity (rated short-circuit breaking current symmetrical)	Isc [kA]	20	20	20	20	20	
		25	25	25	25	25	
		--	31.5	31.5	31.5	31.5	
		16	16	16	16	16	
Rated short-time withstand current (3s)	Ik [kA]	20	20	20	20	20	
		25	25	25	25	25	
		--	31.5	31.5	31.5	31.5	
		40	40	40	40	40	
Making capacity	Ip [kA]	50	50	50	50	50	
		63	63	63	63	63	
		--	80	80	80	80	
		Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•	•
Opening time	[ms]	33 ... 60		33 ... 60			
Arcing time	[ms]	10 ... 15		10 ... 15			
Total breaking time	[ms]	43 ... 75		43 ... 75			
Closing time	[ms]	60 ... 80		60 ... 80			
Maximum overall dimensions		H [mm]	794	794	838	838	838
		W [mm]	653	653	853	853	853
		D [mm]	802	802	790	790	790
		Pole distance P [mm]	210	210	275	275	275
Weight	[kg]	140	140/146 ⁽³⁾	228	228	228	
Standardised table of dimensions	TN	7413	7413	7418	7418	7418	
	1VCD	--	000173 ⁽³⁾	--	--	--	
Operating temperature	[°C]	- 5 ... + 40					
Tropicalization	IEC: 60068-2-30, 60721-2-1	•					
Electromagnetic compatibility	IEC: 62271-1	•					

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.

(2) 2300 A rated uninterrupted current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.

(3) 31.5 kA version.

ВЯРНО С ОРИГИНАЛА



5.5.5. Types of withdrawable circuit-breakers available for PowerCube modules

VD4 withdrawable circuit-breaker (12 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type
		W=650	W=800	W=1000	W=1000	W=1000	
kV	kA	P=150	P=210	P=275	P=275	P=275	
		u/l=205	u/l=310	u/l=310	u/l=310	u/l=310	
		ø=35	ø=79	ø=79	ø=109	ø=109	
12	16	630					VD4/P 12.06.16 p150
	20	630					VD4/P 12.06.20 p150
	25	630					VD4/P 12.06.25 p150
	31.5	630					VD4/P 12.06.32 p150
	16	1250					VD4/P 12.12.16 p150
	20	1250					VD4/P 12.12.20 p150
	25	1250					VD4/P 12.12.25 p150
	31.5	1250					VD4/P 12.12.32 p150
	16		630				VD4/W 12.06.16 p210
	20		630				VD4/W 12.06.20 p210
	25		630				VD4/W 12.06.25 p210
	31.5		630				VD4/W 12.06.32 p210
	16		1250				VD4/W 12.12.16 p210
	20		1250				VD4/W 12.12.20 p210
	25		1250				VD4/W 12.12.25 p210
	31.5		1250				VD4/W 12.12.32 p210
	40		1250				VD4/P 12.12.40 p210
	50		1250				VD4/P 12.12.50 p210
	20			1600			VD4/P 12.16.20 p210
	25			1600			VD4/P 12.16.25 p210
31.5			1600			VD4/P 12.16.32 p210	
40			1600			VD4/P 12.16.40 p210	
50			1600			VD4/P 12.16.50 p210	
20				2000		VD4/P 12.20.20 p210	
25				2000		VD4/P 12.20.25 p210	
31.5				2000		VD4/P 12.20.32 p210	
40				2000		VD4/P 12.20.40 p210	
50				2000		VD4/P 12.20.50 p210	
20					2500	VD4/P 12.25.20 p275	
25					2500	VD4/P 12.25.25 p275	
31.5					2500	VD4/P 12.25.32 p275	
40					2500	VD4/P 12.25.40 p275	
50					2500	VD4/P 12.25.50 p275	
20						3150 ⁽¹⁾ VD4/W 12.32.20 p275	
25						3150 ⁽¹⁾ VD4/W 12.32.25 p275	
31.5						3150 ⁽¹⁾ VD4/W 12.32.32 p275	
40						3150 ⁽¹⁾ VD4/W 12.32.40 p275	
50						3150 ⁽¹⁾ VD4/W 12.32.50 p275	

W = Width of the switchgear.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the Isolating contact.

(1) Up to 4000 A rated current guaranteed with forced ventilation. Available on request.



ВЯРНО С ОПРИГІНАЛА

VD4 withdrawable circuit-breaker (17.5 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]					Circuit-breaker type	
		W=650 P=150 u/l=205 ø=35	W=800 P=210 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=79	W=1000 P=275 u/l=310 ø=109	W=1000 P=275 u/l=310 ø=109		
17.5	kV	16	630					VD4/P 17.06.16 p150
		20	630					VD4/P 17.06.20 p150
		25	630					VD4/P 17.06.25 p150
		31.5	630					VD4/P 17.06.32 p150
		16	1250					VD4/P 17.12.16 p150
		20	1250					VD4/P 17.12.20 p150
		25	1250					VD4/P 17.12.25 p150
		31.5	1250					VD4/P 17.12.32 p150
		16		630				VD4/W 17.06.16 p210
		20		630				VD4/W 17.06.20 p210
		25		630				VD4/W 17.06.25 p210
		31.5		630				VD4/W 17.06.32 p210
		16		1250				VD4/W 17.12.16 p210
		20		1250				VD4/W 17.12.20 p210
		25		1250				VD4/W 17.12.25 p210
31.5		1250				VD4/W 17.12.32 p210		
40		1250				VD4/P 17.12.40 p210		
50		1250				VD4/P 17.12.50 p210		
20			1600			VD4/P 17.16.20 p210		
25			1600			VD4/P 17.16.25 p210		
31.5			1600			VD4/P 17.16.32 p210		
40			1600			VD4/P 17.16.40 p210		
50			1600			VD4/P 17.16.50 p210		
20			2000			VD4/P 17.20.20 p210		
25			2000			VD4/P 17.20.25 p210		
31.5			2000			VD4/P 17.20.32 p210		
40			2000			VD4/P 17.20.40 p210		
50			2000			VD4/P 17.20.50 p210		
20				2500		VD4/P 17.25.20 p275		
25				2500		VD4/P 17.25.25 p275		
31.5				2500		VD4/P 17.25.32 p275		
40				2500		VD4/P 17.25.40 p275		
50				2500		VD4/P 17.25.50 p275		
20					3150 (1)	VD4/W 17.32.20 p275		
25					3150 (1)	VD4/W 17.32.25 p275		
31.5					3150 (1)	VD4/W 17.32.32 p275		
40					3150 (1)	VD4/W 17.32.40 p275		
50					3150 (1)	VD4/W 17.32.50 p275		

W = Width of the switchgear.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.
(1) Up to 4000 A rated current guaranteed with forced ventilation. Available on request.

ВЯРНО С ОРИГИНАЛА



VD4 withdrawable circuit-breaker (24 kV)

Ur	Isc	Rated uninterrupted current (40 °C) [A]		Circuit-breaker type
		W=800	W=1000	
kV	kA	P=210	P=275	
		u/l=310	u/l=310	
		ø=35	ø=79	
24	16	630		VD4/P 24.06.16 p210
	20	630		VD4/P 24.06.20 p210
	25	630		VD4/P 24.06.25 p210
	16	1250		VD4/P 24.12.16 p210
	20	1250		VD4/P 24.12.20 p210
	25	1250		VD4/P 24.12.25 p210
	31.5	1250		VD4/P 24.12.32 p210
	16		1600	VD4/P 24.16.16 p275
	20		1600	VD4/P 24.16.20 p275
	25		1600	VD4/P 24.16.25 p275
	31.5		1600	VD4/P 24.16.32 p275
	16		2000	VD4/P 24.20.16 p275
	20		2000	VD4/P 24.20.20 p275
	25		2000	VD4/P 24.20.25 p275
	31.5		2000	VD4/P 24.20.32 p275
	16		2300 ⁽¹⁾	VD4/P 24.25.16 p275
	20		2300 ⁽¹⁾	VD4/P 24.25.20 p275
	25		2300 ⁽¹⁾	VD4/P 24.25.25 p275
	31.5		2300 ⁽¹⁾	VD4/P 24.25.32 p275

W = Width of the switchgear.

P = Pole horizontal centre distance.

u/l = Distance between bottom and top terminal.

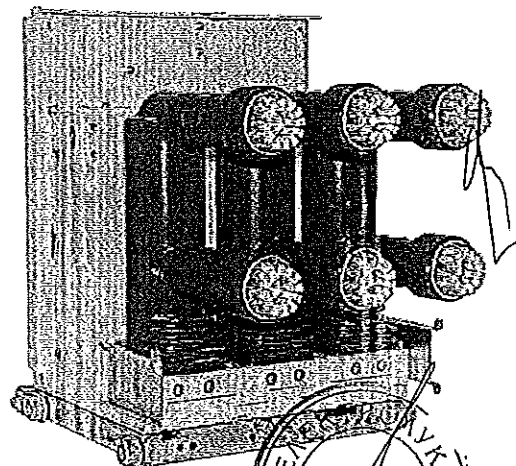
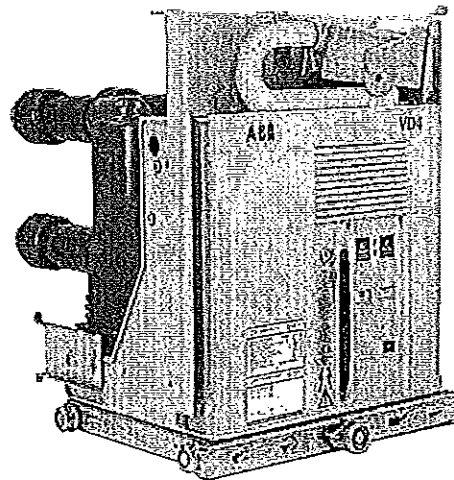
ø = Diameter of the isolating contact.

(1) Up to 2500 A rated current guaranteed with forced ventilation.

5.5.6. Standard fittings for withdrawable circuit-breakers for PowerCube modules

The basic versions of the withdrawable circuit-breakers are always three-pole and fitted with:

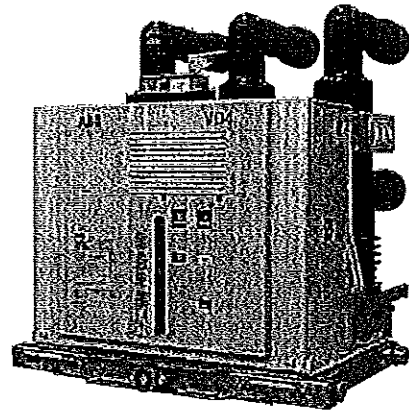
- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton
- opening pushbutton
- operation counter
- set of ten auxiliary circuit-breaker open/closed contacts
Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.
- lever for manually charging the closing spring
- isolating contacts
- cord with connector (only plug) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck. This prevents racking-in of the circuit-breaker in the panel with auxiliary circuits not connected (plug not inserted in the socket).



ВЕРНО С ОРИГИНАЛА



5.5.7. General characteristics of withdrawable circuit-breakers for ZS8.4 switchgear



Circuit-breaker	VD4/Z8						
Panel without partitions	•						
Panel with partitions	-						
Preussen Elektra - EON	-						
Width [kV]	650	650	650	650	800	800	
Depth [kV]	1000	1000	1000	1000	1200	1200	
Standards	IEC 62271-100 •						
	VDE 0671 •						
Rated voltage	Ur [kV]	12	12	17.5	17.5	24	24
Rated insulation voltage	Us [kV]	12	12	17.5	17.5	24	24
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28	28	38	38	50	50
Impulse withstand voltage	Up [kV]	75	75	95	95	125	125
Rated frequency	fr [Hz]	50-60					
Rated normal current (40 °C) (1)	Ir [A]	630	1250	630	1250	630	1250
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	-	-	-	-	16	16
		20	20	20	20	20	20
Rated short-time withstand current (3 s)	Ik [kA]	25	25	25	25	25	25
		-	-	-	-	16	16
Making capacity	Ip [kA]	20	20	20	20	20	20
		25	25	25	25	25	25
		-	-	-	-	40	40
		18,5 mm	50	50	50	50	50
Operation sequence	[O-0.3s-CO-15s-CO]	63	63	63	63	63	63
		•					
Opening time	[ms]	33...60					
Arcing time	[ms]	10...15					
Total breaking time	[ms]	43...75					
Closing time	[ms]	60...80					
Maximum overall dimensions	H [mm]	579	579	579	579	680	680
	W [mm]	503	503	503	503	653	653
	D [mm]	548	548	548	548	646	646
	Pole distance P [mm]	150	150	150	150	210	210
Weight	[kg]	116	116	116	116	140	140
Standardised table of dimensions	1VCD	000092	000137	000137	000137	000089	000137
Operating temperature	[°C]	- 5 ... + 40					
Tropicalisation	IEC 60068-2-30 •						
	IEC 60721-2-1 •						
Electromagnetic compatibility	IEC 62271-1 •						

(1) Rated current guaranteed with circuit-breaker installed in switchgear with 40 °C ambient temperature.

(2) Special type with device for charging the closing spring by means of a rotary handle outside the operating mechanism.

ВЯРНО С ОРМИНАЛА



Handwritten mark resembling a stylized 'W' or 'V' in the top right corner.

VD4/ZT8						VD4/ZS8			
-						-			
•						•			
-						-			
•						•			
•						•			
650	650	650	650	800	800	650	650	800	800
1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
•						•			
•						•			
12	12	17.5	17.5	24	24	12	12	24	24
12	12	17.5	17.5	24	24	12	12	24	24
28	28	38	38	50	50	28	28	50	50
75	75	95	95	125	125	75	75	125	125
50-60						50-60			
630	1250	630	1250	630	1250	630	1250	630	1250
-	-	-	-	16	16	-	-	16	16
20	20	20	20	20	20	20	20	20	20
25	25	25	25	25	25	25	25	25	25
-	-	-	-	16	16	-	-	16	16
20	20	20	20	20	20	20	20	20	20
25	25	25	25	25	25	25	25	25	25
-	-	-	-	40	40	-	-	40	40
50	50	50	50	50	50	50	50	50	50
63	63	63	63	63	63	63	63	63	63
•						•			
33...60						40...60			
10...15						10...15			
43...75						50...75			
60...80						60...80			
579	579	579	579	680	680	579	579	680	680
503	503	503	503	653	653	503	503	653	653
638	638	638	638	646	646	638	638	646	646
150	150	150	150	210	210	150	150	210	210
116	116	116	116	140	140	116	116	140	140
000093	000134	000134	000134	000090	000136	000091	000133	000088	000135
- 5 ... + 40						- 5 ... + 40			
•						•			
•						•			
•						•			

Handwritten mark in the bottom left corner.

ВЯРНО С ОРИГИНАЛА



5.5.8. General characteristics of withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8 - VD4/ZT8 - VD4/Z8 withdrawable circuit-breaker for ZS8.4 switchgear

Ur	Isc	Rated uninterrupted current (40 °C) [A]						Circuit-breaker type	
		Panel without partition		Panel with partition		Special panel EON			
		W = 650	W = 800	W = 650	W = 800	W = 650	W = 800		
		P = 150	P = 210	P = 150	P = 210	P = 150	P = 210		
kV	kA	u/l = 205	u/l = 310	u/l = 205	u/l = 310	u/l = 205	u/l = 310		
		ø = 35	ø = 35	ø = 35	ø = 35	ø = 35	ø = 35		
		20	630					VD4/Z8 12.06.20 p150	
		25	630					VD4/Z8 12.06.25 p150	
12	20	1250						VD4/Z8 12.12.20 p150	
	25	1250						VD4/Z8 12.12.25 p150	
	20			630				VD4/ZT8 12.06.20 p150	
	25			630				VD4/ZT8 12.06.25 p150	
	20			1250				VD4/ZT8 12.12.20 p150	
	25			1250				VD4/ZT8 12.12.25 p150	
	20					630		VD4/ZS8 12.06.20 p150	
	25					630		VD4/ZS8 12.06.25 p150	
	20					1250		VD4/ZS8 12.12.20 p150	
	25					1250		VD4/ZS8 12.12.25 p150	
	17.5	20	630						VD4/Z8 17.06.20 p150
		25	630						VD4/Z8 17.06.25 p150
20		1250						VD4/Z8 17.12.20 p150	
25		1250						VD4/Z8 17.12.25 p150	
20				630				VD4/ZT8 17.06.20 p150	
25				630				VD4/ZT8 17.06.25 p150	
20				1250				VD4/ZT8 17.12.20 p150	
25				1250				VD4/ZT8 17.12.25 p150	
24	16		630					VD4/Z8 24.06.16 p210	
	20		630					VD4/Z8 24.06.20 p210	
	25		630					VD4/Z8 24.06.25 p210	
	16		1250					VD4/Z8 24.12.16 p210	
	20		1250					VD4/Z8 24.12.20 p210	
	25		1250					VD4/Z8 24.12.25 p210	
	16				630			VD4/ZT8 24.06.16 p210	
	20				630			VD4/ZT8 24.06.20 p210	
	25				630			VD4/ZT8 24.06.25 p210	
	16				1250			VD4/ZT8 24.12.16 p210	
	20				1250			VD4/ZT8 24.12.20 p210	
	25				1250			VD4/ZT8 24.12.25 p210	
24	16						630	VD4/ZS8 24.06.16 p210	
	20						630	VD4/ZS8 24.06.20 p210	
	25						630	VD4/ZS8 24.06.25 p210	
	16						1250	VD4/ZS8 24.12.16 p210	
	20						1250	VD4/ZS8 24.12.20 p210	
	25						1250	VD4/ZS8 24.12.25 p210	

W = Width of the switchgear.
 P = Pole horizontal centre distance.
 u/l = Distance between bottom and top terminal.
 Ø = Diameter of the isolating contact.

ВЯРНО С ОРИГИНАЛА



5.5.9. Standard fittings for withdrawable circuit-breakers for ZS8.4 switchgear

The basic versions of the withdrawable circuit-breakers are always three-pole and fitted with:

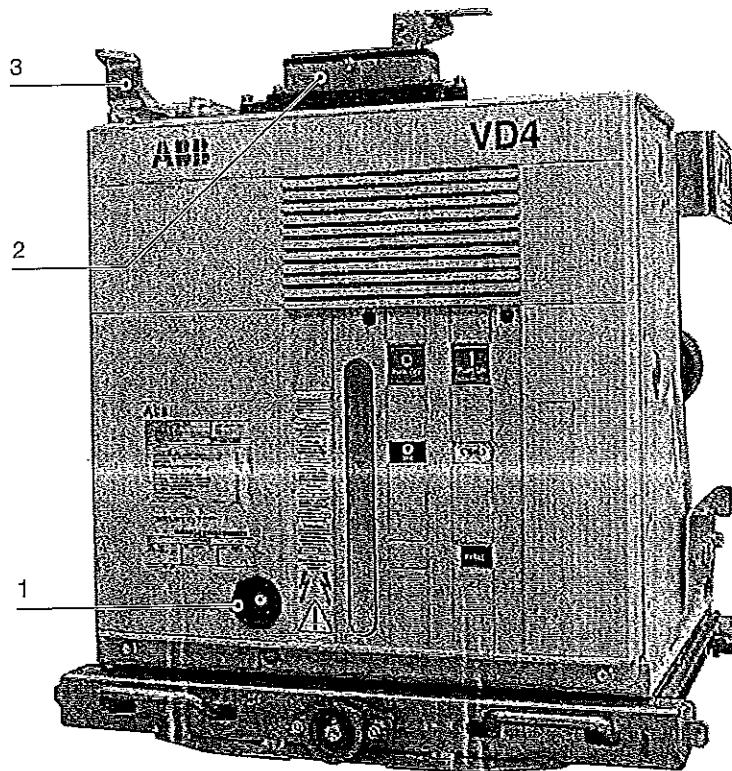
- EL type manual operating mechanism
 - mechanical signalling device for closing spring charged/discharged
 - mechanical signalling device for circuit-breaker open/closed
 - closing pushbutton
 - opening pushbutton
 - operation counter
 - set of ten auxiliary circuit-breaker open/closed contacts
- Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.
- lever for manually charging the closing springs incorporated in the operating mechanism for VD4/Z8 and VD4/ZT8, external with rotary movement for VD4/ZS8
 - isolating contacts
 - cord with connector (only plug) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
 - racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)

5.5.10. VD4/ZS8 (Preussen Elektra-EON version)

- Device for recharging the closing spring, with door closed, by means of removable rotary handle and outside the operating mechanism and the switchgear
- 64-pin Harting socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket
- Interlock with the door which prevents insertion of the spring charging lever when the circuit-breaker is closed
- Interlock with the door and the 64-pin Harting socket which prevents door closure when the plug is not inserted in the socket.

5.5.11. VD4/Z8 - VD4/ZT8

- Harting 64-pin socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket.



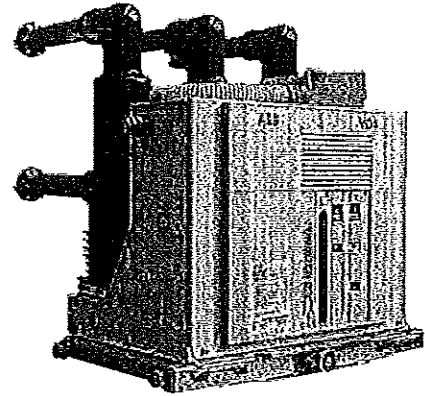
Caption

- 1) Device for spring charging with rotary handle
- 2) Harting 64-pin socket with mechanical interlock which prevents traverse when the socket is not inserted
- 3) Door-socket-spring charging device interlock (only VD4/ZS8 version)

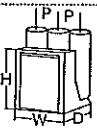
ВЯРНО С ОРИГИНАЛА



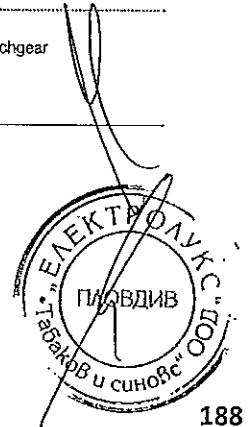
5.5.12. General characteristics of withdrawable circuit-breakers for UniSwitch switchgear and UniMix (24 kV) switchgear



Circuit-breaker		VD4/US 24 ⁽¹⁾	VD4/US 24 ⁽²⁾	VD4/US 24 ⁽³⁾
	UniSwitch (unit CBW type)	•	•	-
	UniMix (unit P1/E type)	-	-	•
Standards	IEC 62271-100	•	•	•
	VDE 0671; CEI EN 62271-100- File 7642	•	•	•
Rated voltage	Ur [kV]	24	24	24
Rated insulation voltage	Us [kV]	24	24	24
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50	50	50
Impulse withstand voltage	Up [kV]	125	125	125
Rated frequency	fr [Hz]	50-60	50-60	50-60
Rated normal current (40 °C) ⁽⁴⁾	Ir [A]	630	1250	630
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	16 (20) ⁽⁵⁾	16 (25) ⁽⁵⁾	16
		20 (25) ⁽⁵⁾	20 (25) ⁽⁵⁾	20
		-	-	25
Rated short-time withstand current (3 s) ⁽⁵⁾	Ik [kA]	16 (20) ⁽⁵⁾	16 (25) ⁽⁵⁾	16
		20 (25) ⁽⁵⁾	20 (25) ⁽⁵⁾	20
		-	-	25
Making capacity	Ip [kA]	40 (50) ⁽⁵⁾	40 (50) ⁽⁵⁾	40
		50 (63) ⁽⁵⁾	50 (63) ⁽⁵⁾	50
Operation sequence	[O - 0.3 s - CO - 15 s - CO]	•	•	•
Opening time	[ms]	33 ... 60	33 ... 60	33 ... 60
Arcing time	[ms]	10 ... 15	10 ... 15	10 ... 15
Total breaking time	[ms]	43 ... 75	43 ... 75	43 ... 75
Closing time	[ms]	60 ... 80	60 ... 80	60 ... 80
Maximum overall dimensions	H [mm]	680	680	680
	W [mm]	653	653	653
	D [mm]	742	742	742
	Pole distance P [mm]	210	210	210
Weight	[kg]	125	125	125
Standardised table of dimensions	1VCD	000047	000047	000047
Operating temperature	[°C]	- 5 ... + 40	- 5 ... + 40	- 5 ... + 40
Tropicalization	IEC: 60068-2-30, 60721-2-1	•	•	•
Electromagnetic compatibility	IEC 62271	•	•	•

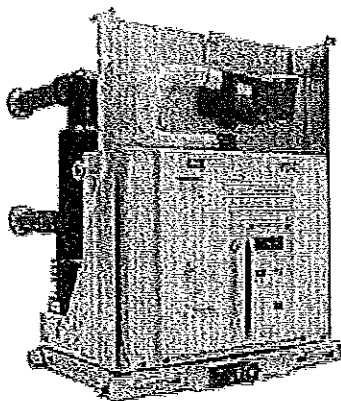


(1) Rated current guaranteed with withdrawable circuit-breaker installed in switchgear with 40 °C ambient temperature
 (2) The value and duration of the rated short-time withstand current depends on the switchgear. See the specific catalogues of the UniSwitch and UniMix switchgear
 (3) The top shutter activation wheels of the UniSwitch switchgear (CBW unit) are mounted and adjusted by the manufacturer of the UniSwitch switchgear
 (4) The top shutter activation wheels of the UniMix switchgear (P1/E unit) are available on request
 (5) The values in brackets refer to the 12 kV rated voltage.

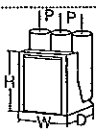


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5.5.13. General characteristics of withdrawable circuit-breakers for UniSec switchgear



Circuit-breaker		VD4/SEC	
Standards	IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •		
Rated voltage	Ur [kV]	24	
Rated insulation voltage	Us [kV]	24	
Withstand voltage at 50 Hz	Ud (1 min) [kV]	50	
Impulse withstand voltage	Up [kV]	125	
Rated frequency	fr [Hz]	50-60	
Rated normal current (40 °C) ⁽¹⁾	Ir [A]	630 - 1250	
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	16 20 25	
	Rated short-time withstand current (3 s)	Ik [kA]	16 20 25
			40
		50	
Making capacity	Ip [kA]	63	
Operation sequence	[O - 0.3 s - CO - 15 s - CO] •		
Opening time	[ms]	33 ... 60	
Arcing time	[ms]	10 ... 16	
Total breaking time	[ms]	43 ... 75	
Closing time	[ms]	60 ... 80	
Maximum overall dimensions	H [mm]	743	
	W [mm]	653	
	D [mm]	742	
	Pole distance P [mm]	210	
Weight	[kg]	133	
Standardised table of dimensions	1VCD	000190	
Operating temperature	[°C]	- 5 ... + 40	
Tropicalization	IEC: 60068-2-30, 60721-2-1 •		
Electromagnetic compatibility	IEC 62271 •		



(1) Rated current guaranteed with withdrawable circuit-breaker installed in switchgear with 40 °C ambient temperature.

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5.5.14. Standard fittings for withdrawable circuit-breakers for UniSwitch, UniMix and UniSec switchgear

The basic versions of the withdrawable circuit-breakers are three-pole and provided with:

- EL type manual operating mechanism
- Mechanical signalling device for closing spring charged/discharged
- Mechanical signalling device for circuit-breaker open/closed
- Closing pushbutton
- Opening pushbutton
- Operation counter
- Set of ten circuit-breaker open/closed auxiliary contacts
Note: with the set of ten auxiliary contacts supplied as standard and the maximum electrical accessories, three break contacts are available (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed).
- Lever for manual charging of the closing spring incorporated in the operating mechanism
- Isolating contacts
- Racking-out/racking-in lever (the quantity must be established according to the number of pieces of apparatus ordered).

VD4 withdrawable circuit-breaker for switchgear UniSwitch (type unit CBW) and UniMix (type unit P1/E)

Ur	Isc	Rated uninterrupted current (40 °C) [A]		Circuit-breaker type
		UniSwitch CBW	UniMix P1/E	
kV	kA	P=210	P=210	
		u/l=310	u/l=310	
24	16	630 ⁽¹⁾	630	VD4/US 24.06.16 p210
		20	630	VD4/US 24.06.20 p210
		25	630	VD4/US 24.06.25 p210
	20	1250 ⁽¹⁾	1250	VD4/US 24.12.16 p210
		20	1250	VD4/US 24.12.20 p210
		25	1250	VD4/US 24.12.25 p210

(1) 25 kA Isc at the 12 kV rated voltage
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
Ø = Diameter of the isolating contact.

5.6. Characteristics of the electrical accessories

- Shunt opening release (-MO1)
- Additional shunt opening release (-MO2)
- Shunt closing release (-MC)
- Locking magnet on the actuator (-RL1)

Un	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V-
Un	48 - 60 - 110 - 120 - 127 - 220 ... 240 V- 50 Hz
Un	110 - 120 - 127 - 220 - 240 V- 60 Hz
Operating limits	70 ... 110% Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	approx. 100 ms
Continuous power (Pc)	DC = 5 W; AC = 5 VA
Opening time	35 ... 60 ms
Closing time	30 ... 80 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

Undervoltage release (-MU)

Un	24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V-
Un	48 - 60 - 110 - 120 - 127 - 220 ... 240 V- 50 Hz
Un	110 - 120 ... 127 - 220 ... 240 V- 60 Hz
Operating limits	
- circuit-breaker opening	35-70% Un
- circuit-breaker closing	85-110% Un
Inrush power (Ps)	DC 200 W; AC = 200 VA
Inrush time	approx. 100 ms
Continuous power	DC = 5 W; AC = 5 VA
Opening time	60 ... 80 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

Electronic time delay device for undervoltage release (mounted outside the circuit-breaker)

Un	24 ... 30 - 48 - 60 - 110 ... 127 - 220 ... 250 V-
Un	48 - 60 - 110 ... 127 - 220 ... 240 V- 50/60 Hz
Adjustable opening time (release + time delay device)	0.5-1-1.5-2-3 s

VD4 withdrawable circuit-breaker for switchgear UniSec

Ur	Isc	Rated uninterrupted current (40 °C) [A]		Circuit-breaker type
		P=210	u/l=310	
kV	kA	u/l=310		
		Ø=35		
24	16	630		VD4/SEC 24.06.16 p210
		20	630	VD4/SEC 24.06.20 p210
		25	630	VD4/SEC 24.06.25 p210
	20	1250		VD4/SEC 24.12.16 p210
		20	1250	VD4/SEC 24.12.20 p210
		25	1250	VD4/SEC 24.12.25 p210

P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
Ø = Diameter of the isolating contact.

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Motor for motorised truck (-MT) (only for withdrawable circuit-breakers for UniGear ZS1, UniSec and ZS8.4 switchgear)

Un	24-30-48-60-110-220 V DC
Operating limits	85 ... 110% Un
Rated power (Pn)	40 W

Motor operator (-MS)

Characteristics

Un	24...30 - 48...60 - 110...130 - 220...250 V-	
Un	100...130 - 220...250 V ~ 50/60 Hz	
Operating limits	85 ... 110% Un	
Inrush power (Ps)	≤ 40 kA	50 kA
	DC=600 W; AC=600 VA	DC=900 W; AC=900 VA
Rated power (Pn)	DC=200 W; AC=200 VA	DC=350 W; AC=350 VA
	Inrush time	0.2 s
Charging time	6-7 s	6-7 s
Insulation voltage	2000 V 50 Hz (for 1 mln)	2000 V 50 Hz (for 1 mln)

Auxiliary contacts of the circuit-breaker

Rated insulation voltage according to VDE 0110, Group C	660 V AC
	800 V DC
Rated voltage	24 V... 660 V
Insulation-test test voltage	2.5 kV
Maximum rated current	10 A
Number of contacts	5
Stroke	6 mm ... 7 mm
Contact force	26 N
On resistance	3 mΩ
Storing temperature range	- 20° C ... + 120 °C
Operating temperature range	- 20° C ... + 70 °C
Contact over temperature	20 K
Operating cycles	30,000
Unlimited short circuit stability by using fuses of max. 10 A time-lag	

Cosφ	Rated current	Breaking capacity	
220 V AC	0.7	2.5 A	25 A
380 V AC	0.7	1.5 A	15 A
500 V AC	0.7	1.5 A	15 A
660 V AC	0.7	1.2 A	12 A
	Time constant		
24 V DC	1 ms	10 A	12 A
	15 ms	10 A	12 A
	50 ms	8 A	10 A
	200 ms	4 A	7.7 A
60 V DC	1 ms	8 A	10 A
	15 ms	6 A	8 A
	50 ms	5 A	6 A
	200 ms	4 A	5.4 A
110 V DC	1 ms	6 A	8 A
	15 ms	4 A	5 A
	50 ms	2 A	4.6 A
	200 ms	1 A	2.2 A
220 V DC	1 ms	1.5 A	2 A
	15 ms	1 A	1.4 A
	50 ms	0.75 A	1.2 A
	200 ms	0.5 A	1 A

Note

With the set of 10 auxiliary contacts supplied as standard, the following are available:
 - 3 NO contacts + 5 NC contacts for fixed circuit-breakers
 - 3 NO contacts + 4 NC contacts for withdrawable circuit-breakers
 With the set of 15 auxiliary contacts (+5 contacts on request compared to the 10 supplied as standard), the following are available:
 - for fixed circuit-breaker, as desired, 6 NO contacts + 7 NC contacts or 5 NO contacts + 8 NC contacts or 3 NO contacts + 10 NC contacts
 - for withdrawable circuit-breakers, depending on the applications required, a maximum of 6 NO contacts + 6 NC contacts and a minimum of 5 NO contacts + 5 NC contacts are available.

Locking magnet on the truck (-RL2) (*)

Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 132 - 220 - 240 V-
Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 220 - 230 ... 240 V~ 50/60 Hz
Operating limits	85 ... 110% Un
Inrush power (Ps)	DC = 250 W; AC = 250 VA
Continuous power (Pc)	DC = 5 W; AC = 5 VA
Inrush time	150 ms


(*) Not available for versions with motorized truck.

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6. Instructions for operating the circuit-breaker

6.1. Safety indications

 The VD4 circuit-breakers guarantee a minimum IP2X degree of protection when installed in the following conditions:

- fixed circuit-breaker, installed behind a protective metal net
- withdrawable circuit-breaker, installed in switchgear.

Under these conditions the operator is totally guaranteed against accidental contact with moving parts.

Should mechanical operations be carried out on the circuit-breaker outside of the switchgear, take great care of the moving parts.

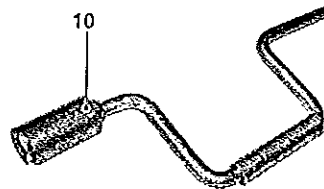
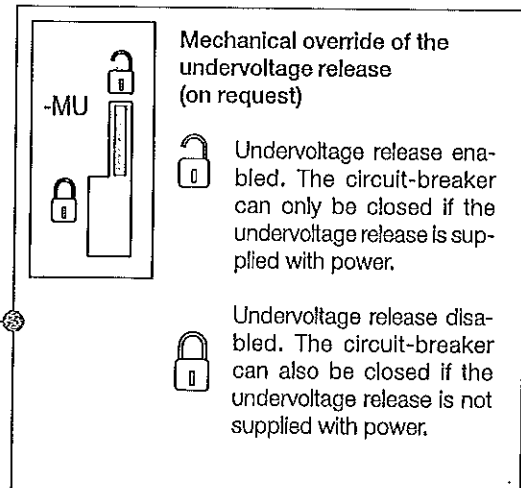
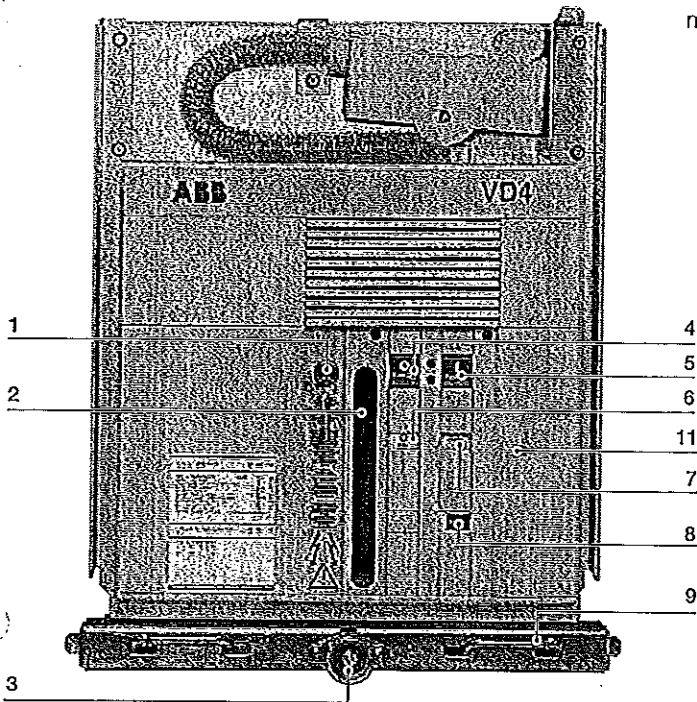
If the operations are prevented, do not force the mechanical interlocks and check that the operating sequence is correct.

Racking the circuit-breaker in and out of the switchgear must be done gradually to avoid shocks which may deform the mechanical interlocks. Due to safety reasons, the circuit-breaker has to be treated as "switched on" if the switching position cannot be clearly determined.

In this case all high voltage connections to the circuit-breaker have to be de-energized and zero potential on the primary side of the circuit-breaker has to be confirmed prior to commissioning, operation, maintenance or repair work.

6.2. Switching and signalling parts

VD4 circuit-breakers for UniGear switchgear and PowerCube modules (fig. 6a)



Caption

- 1 Key lock (if provided) (*)
- 2 Lever for manually charging the closing spring (except version VD4/ZS8 - see figure 6b)
- 3 Coupling lever for racking-out operation (withdrawable circuit-breakers only)
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for circuit-breaker open/closed
- 7 Signalling device for closing springs charged/discharged
- 8 Operation counter.
- 9 Handles for operating the truck locks (only for withdrawable circuit-breakers)
- 10 Operating lever for circuit-breaker racking-in/out (there is a special version for VD4/ZS8)
- 11 Mechanical undervoltage release override (on request).

(*) Warning! To activate the key lock: open the circuit-breaker, keep the opening pushbutton depressed, then turn the key and remove it from the housing.

Fig. 6a

6.3. Circuit-breaker closing and opening operations

Circuit-breaker operation can be either manual or electrical (fig. 6 - fig. 7).

a1) Manual closing spring charging for VD4 circuit-breakers for UniGear switchgear and PowerCube modules (fig. 7a)

Repeatedly activate the charging lever (2) (maximum rotation angle of the lever: about 90°) until the yellow indicator (7) appears.

The maximum forces which can normally be applied to the lever are ≤ 150 N for the EL1 operating mechanism, ≤ 200 N for the EL2 operating mechanism and ≤ 250 N for EL3 operating mechanism.

EL1 Twin and EL2 Twin type operating mechanisms are provided for circuit-breakers with 50 kA breaking capacity. For manual charging, the additional lever (1) should be inserted fully, as indicated in fig. 7c. In this way, the maximum force to be applied is ≤ 200 N. For the type of operating mechanism, please refer to the rating plate in fig. 1.

a2) Closing spring loading in the manual mode for withdrawable VD4 circuit-breakers for UniGear switchgear equipped with a hand-operated rotary loading device for the closing spring (refer to fig. 6b for indicative details)

Rotate the charging lever (2) (rotate about 12 times) until the yellow indicator (7) appears. The maximum force which can normally be applied to the lever is ≤ 150 N for the EL1 operating mechanism and ≤ 230 N for the EL3 operating mechanism.

The operation can be carried out with the door either open or closed and the circuit-breaker either withdrawn or connected.

WARNING (fig. 6b): Fit the hand-operated loading lever of the closing spring (2b) into its housing (2a). Turn the lever clockwise (about 12 times) until the yellow indicator (7) appears to show that loading is complete. Once this happens, the lever will continue for half a turn without loading (without exercising any force), after which it will lock owing to a sudden load increase. Do not exercise force or try to continue loading as this will damage the device.

VD4 circuit-breakers for ZS8.4 switchgear (fig. 6b)

a3) Manual closing spring charging for VD4 circuit-breakers (fig. 7b)

Rotate the charging lever (2) until the yellow indicator (7) appears. The maximum force which can normally be applied to the lever is ≤ 150 N for the EL1 operating mechanism and ≤ 230 N for the EL3 operating mechanism.

The operation can be carried out with the door either open or closed and the circuit-breaker either withdrawn or connected.

WARNING (fig. 6b): Fit the hand-operated loading lever of the closing spring (2b) into its housing (2a). Turn the lever clockwise (about 12 times) until the yellow indicator (7) appears to show that loading is complete. Once this happens, the lever will continue for half a turn without loading (without exercising any force), after which it will lock owing to a sudden load increase. Do not exercise force or try to continue loading as this will damage the device.

b) Electrical spring charging operation

On request, the circuit-breaker can be fitted with the following accessories for electrical operation:

- geared motor for automatic closing spring charging
- shunt closing release
- shunt opening release.

The geared motor automatically recharges the spring after each closing operation until the yellow indicator (7) appears. If the power is cut off during charging, the geared motor stops and automatically starts recharging the springs again when the power returns.

In any case, it is always possible to complete the charging operation manually.

c) Circuit-breaker closing

The operation can only be carried out with the closing spring completely charged.

For manual closing, press the pushbutton (5 - fig. 6b).

When there is a shunt closing release, the operation can also be carried out remotely by means of a special control circuit. Closing having taken place is indicated by the signalling device (6 - fig. 6b).

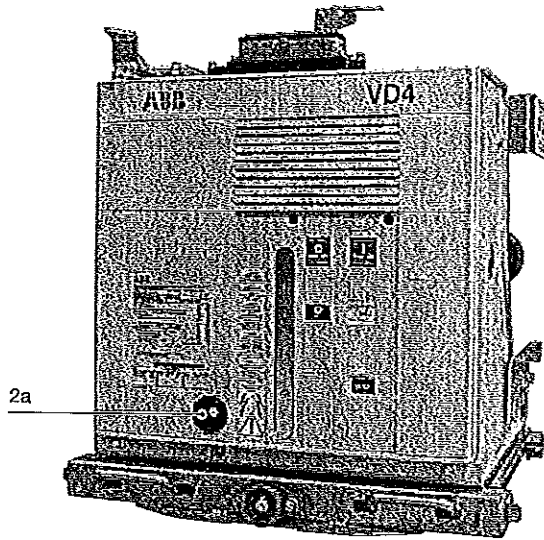
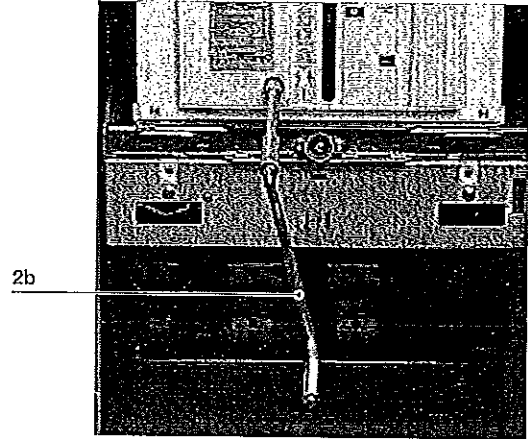
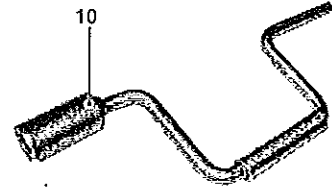
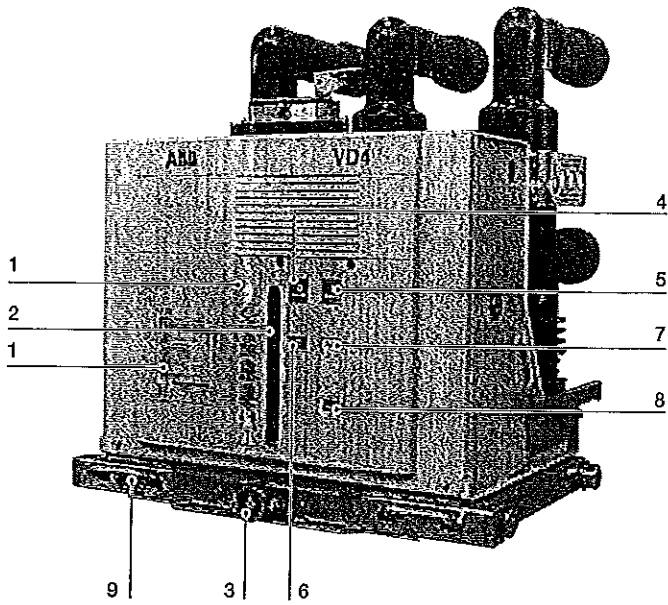
d) Circuit-breaker opening

For manual opening, press the pushbutton (4 - fig. 6b).

When there is a shunt opening release, the operation can also be carried out remotely by means of a special control circuit. Opening having taken place is indicated by the signalling device (6 - fig. 6b).

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Caption

- 1 Key lock (if provided)
- 2 Lever for manually charging the closing spring
 - 2a Coupling for manual closing spring charging (when lever 2 is not provided)
 - 2b Lever for manual closing spring charging for rotary charging device
- 3 Coupling for racking-out operation lever (only for withdrawable circuit-breakers)
- 4 Opening pushbutton
- 5 Closing pushbutton
- 6 Signalling device for circuit-breaker open/closed
- 7 Signalling device for closing spring charged/discharged
- 8 Operation counter.
- 9 Handles for operating the truck locks (only for withdrawable circuit-breakers)
- 10 Operating lever for circuit-breaker racking-in/out.

Fig. 6b



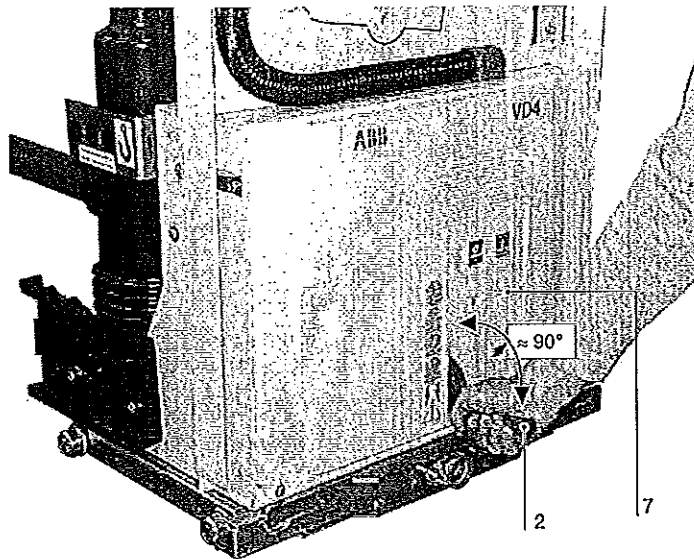


Fig. 7a

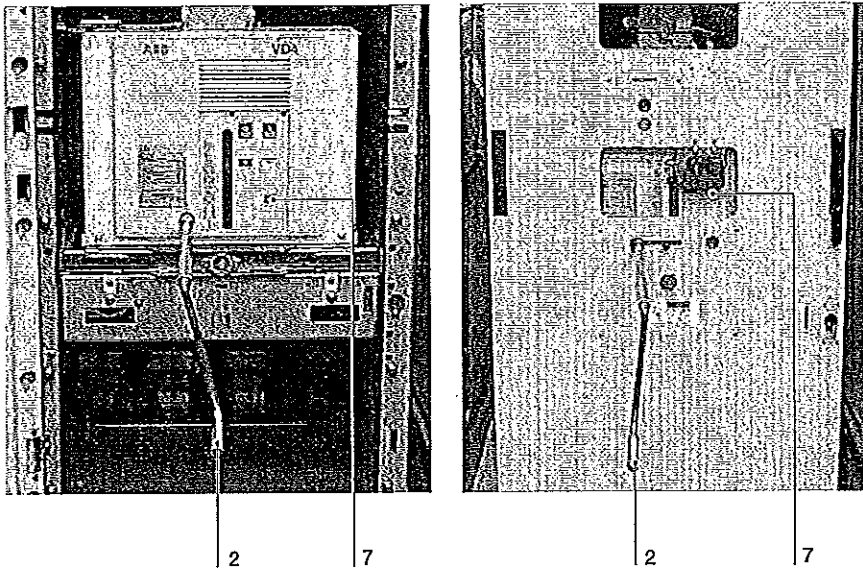


Fig. 7b

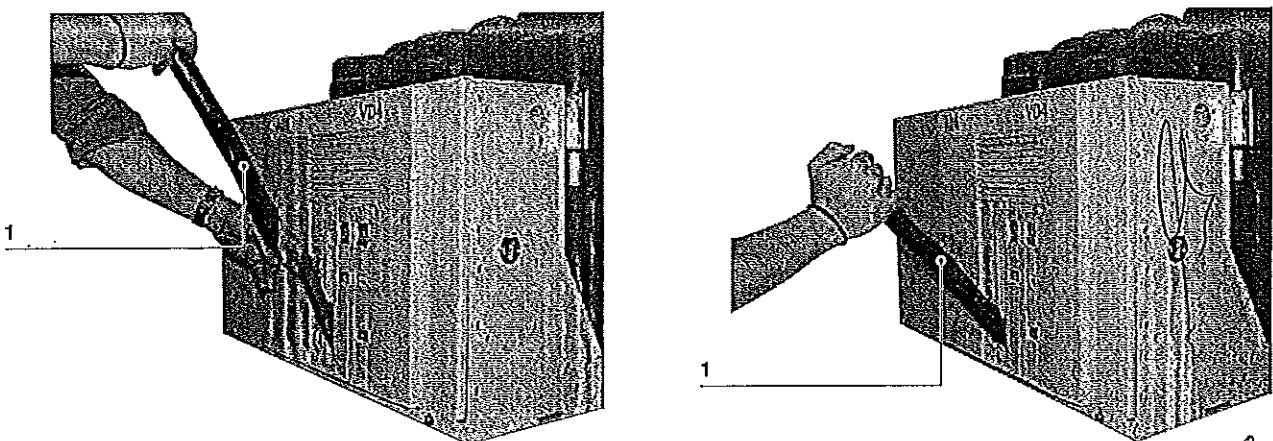


Fig. 7c

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7. Installation

7.1. General

⚠ Correct installation is of primary importance. The manufacturer's instructions must be carefully studied and followed. It is good practice to use gloves for handling the pieces during installation.

7.2: Installation and operating conditions

The following Standards must be taken into particular consideration during installation and service:

- IEC 62271-1/DIN VDE 0101
- VDE 0105: Electrical installation service
- DIN VDE 0141: Earthing systems for installations with rated voltage above 1 kV
- All the accident prevention regulations in force in the relative countries.

7.2.1. Normal conditions

Follow the recommendations in the IEC 62271-1 and 62271-100 Standards. In more detail:

Ambient temperature	
Maximum	+ 40 °C
Average maximum over 24 hours	+ 35 °C
Minimum (according to class - 5), apparatus for indoor installation	- 5°

Humidity	
The average value of the relative humidity, measured for a period longer than 24 hours, must not exceed the 95%.	
The average value of the pressure of the water vapour, measured for a period longer than 24 hours, must not exceed 2.2 kPa.	
The average value of the relative humidity, measured for a period longer than 1 month, must not exceed the 90%.	
The average value of the pressure of the water vapour, measured for a period longer than 1 month, must not exceed 1.8 kPa.	

Altitude	
≤ 1000 m above sea level.	

7.2.2. Special conditions

Installations over 1000 m a.s.l.	
Possible within the limits permitted by reduction of the dielectric resistance of the air.	

Increase in the ambient temperature	
Reduction in the rated current.	
Encourage heat dissipation with appropriate additional ventilation.	

Climate	
To avoid the risk of corrosion or other damage in areas:	
-- with a high level of humidity, and/or	
-- with rapid and big temperature variations, take appropriate steps (for example, by using suitable electric heaters) to prevent condensation phenomena.	

For special installation requirements or other operating conditions, please contact ABB.

⚠ The areas involved by the passage of power conductors or auxiliary circuit conductors must be protected against access of any animals which might cause damage or disservices.

7.2.3. Trip curves

The following graphs show the number of closing-opening cycles (No.) allowed, of the vacuum interrupters, according to the breaking capacity (Ia).

Caption (Figs. 8...)
No. Number of closing-opening cycles allowed for the vacuum interrupters.
Ia: Breaking capacity of the vacuum interrupters.

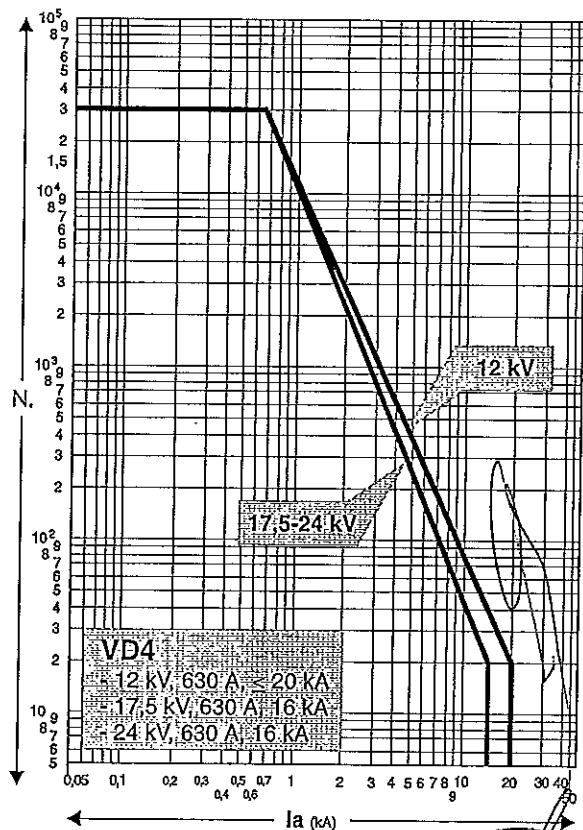


Fig. 8a



КОПИО С ОРИГИНАЛА

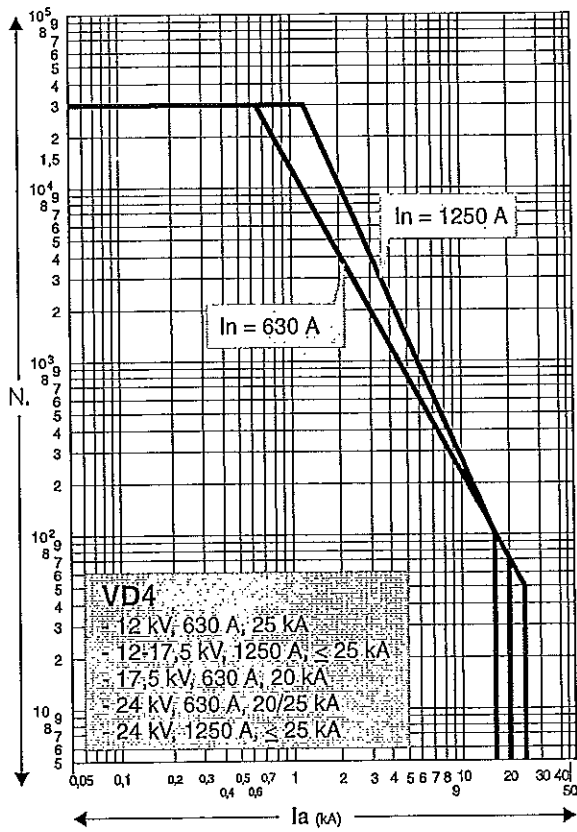


Fig. 8b

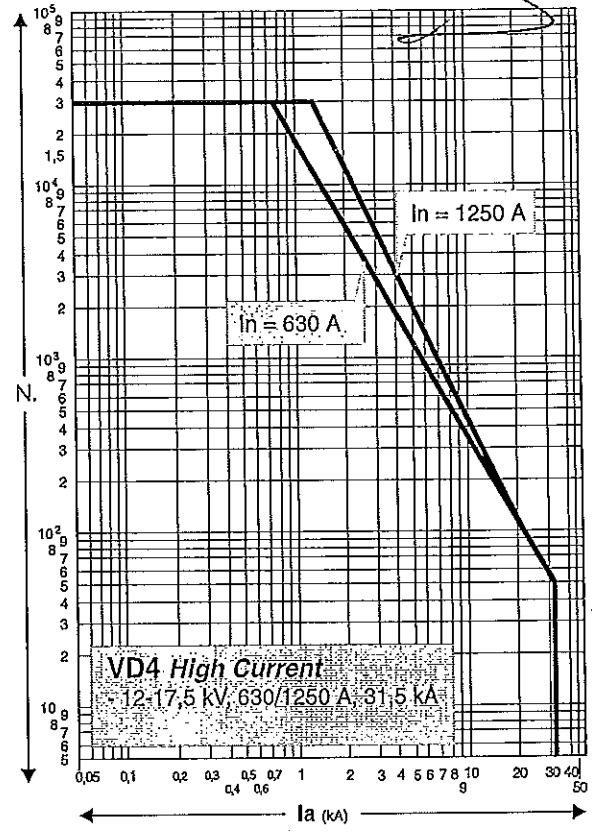


Fig. 8c

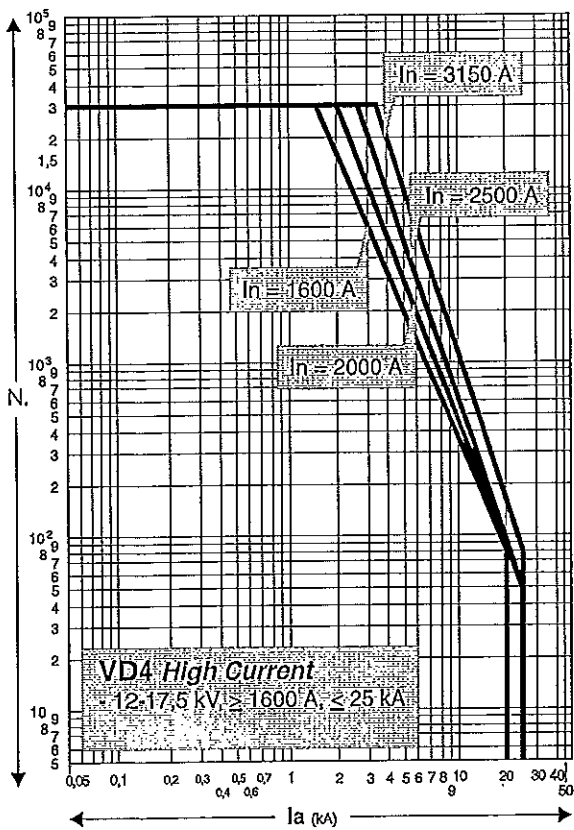


Fig. 8d

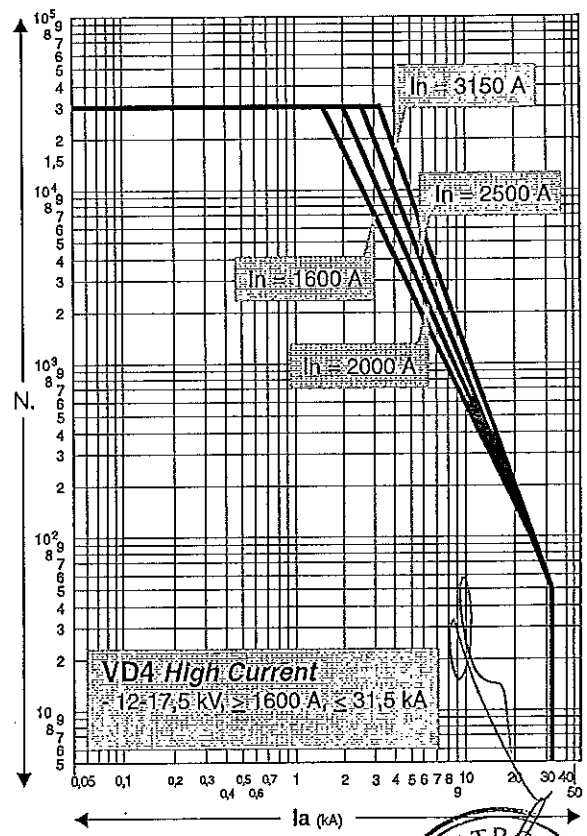


Fig. 8e



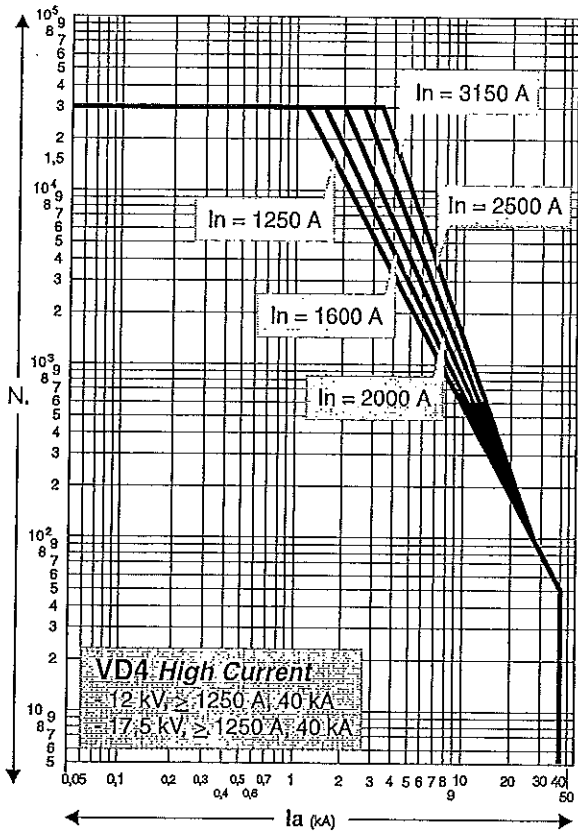


Fig. 8f

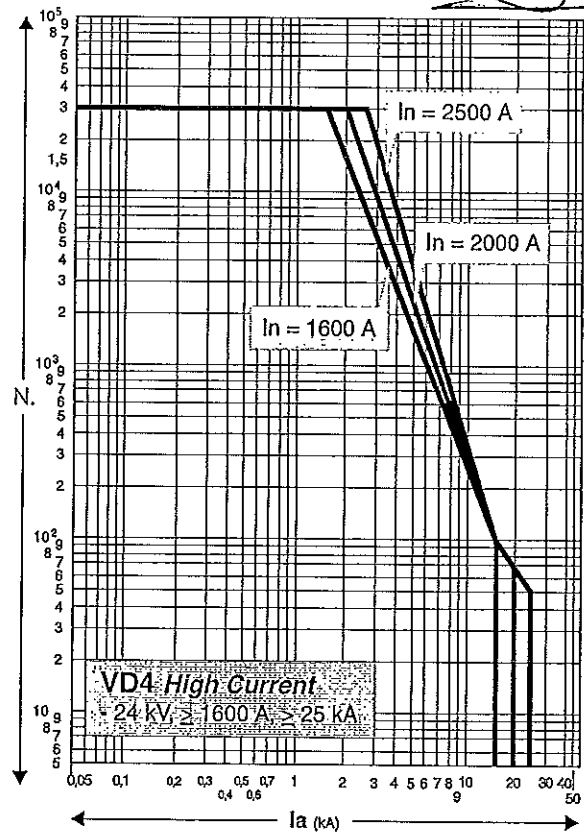


Fig. 8g

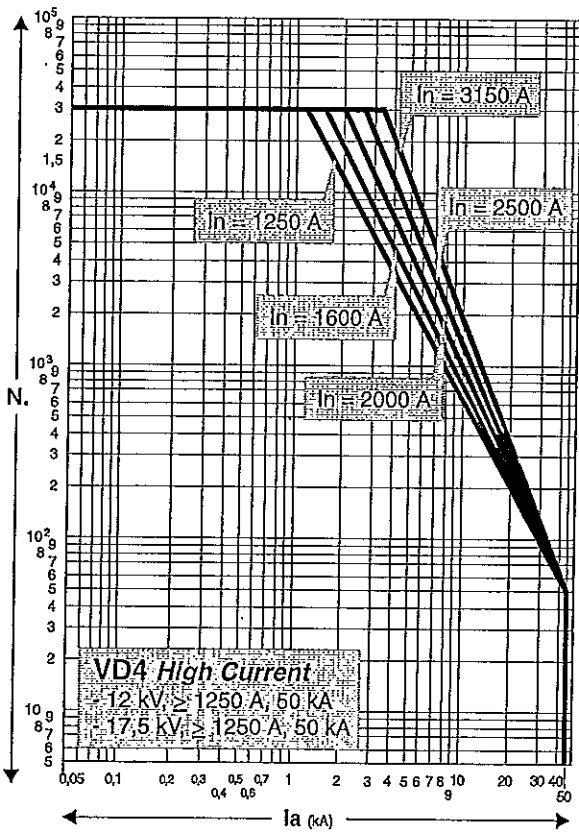


Fig. 8h

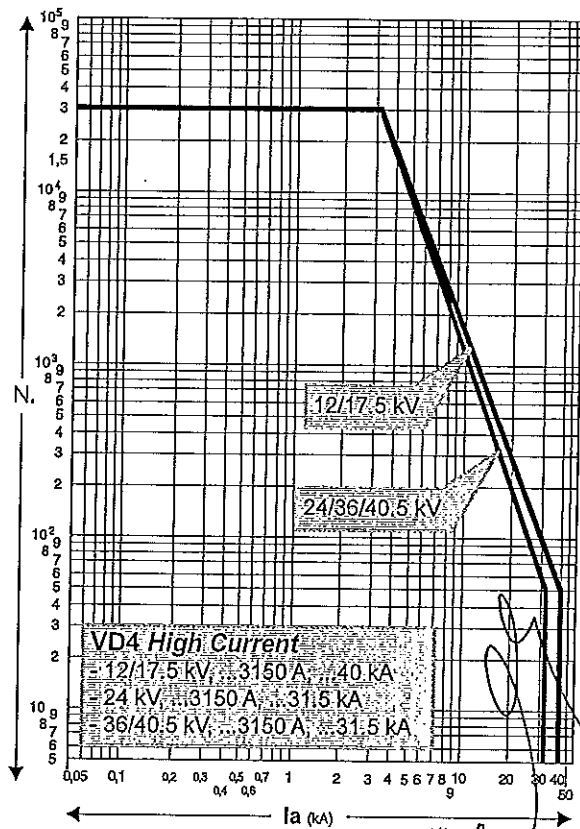


Fig. 8i

КОПИЯ С ОРИГИНАЛА



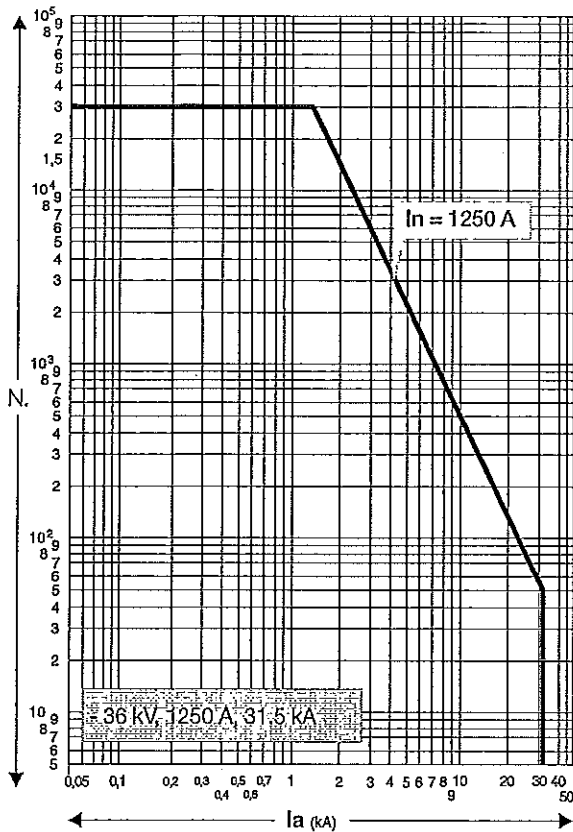


Fig. 8l

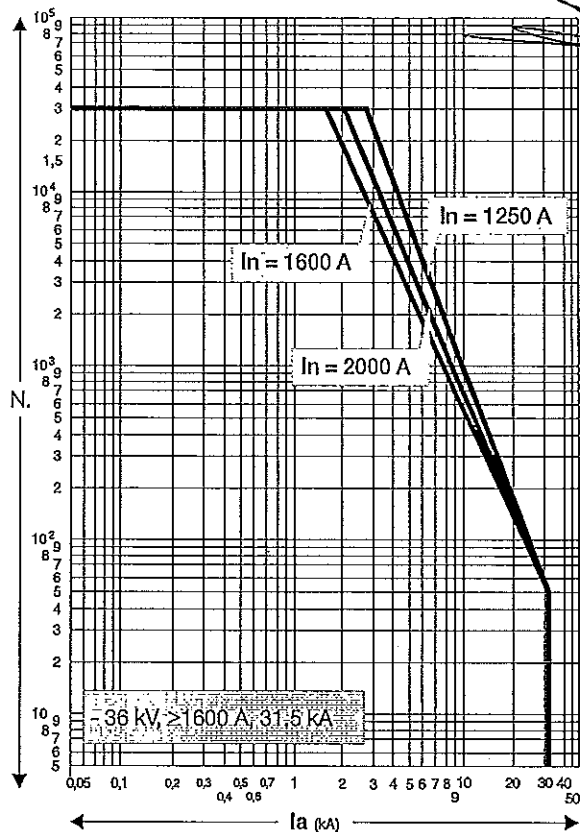


Fig. 8m

7.3. Preliminary operations

- Clean the insulating parts with clean dry cloths.
- Check that the top and bottom terminals are clean and free of any deformation caused by shocks received during transport or storage.

7.4. Installation of fixed circuit-breakers

The circuit-breaker can be mounted directly on supporting frames to be provided by the customer, or on a special supporting truck (available on request).

The circuit-breaker, with supporting truck, must be suitably fixed to the floor of its own compartment by the customer. The floor surface in correspondence with the truck wheels must be carefully levelled.

A minimum degree of protection (IP2X) must be guaranteed from the front towards live parts.

7.4.1. Mounting the circuit-breaker on a truck made by other manufacturers

The VD4 circuit-breakers which are not installed on ABB trucks, but on trucks made by the customer, must be fitted with one or two additional auxiliary contacts (activated by the

mechanical lock and by the circuit-breaker release device) to carry out the function of interrupting the shunt closing release circuit (-MC) during traverse from isolated and vice versa. In ABB trucks, this function is carried out by the -BT1 and -BT2 auxiliary contacts which cut off the release power supply during and before activation of the mechanical lock of the screw truck racking-in device. This means that the shunt closing release power supply can only be applied at the end of activation of the mechanical lock. In this way it is certain that no electrical impulse can activate the shunt closing release with the circuit-breaker in an intermediate position.

7.5. Installation of withdrawable circuit-breaker

The withdrawable circuit-breakers are preset for use in UniGear ZS1, UniGear ZS2, UniSec switchgear and PowerCube modules.

For racking-in/racking-out of the switchgear, fully insert the lever (1) (fig. 9) in the appropriate seat (2) and work it clockwise for racking-in, and anti-clockwise for racking-out, until the limit switch positions are reached.

Circuit-breaker racking-in/-out must be carried out gradually to avoid shocks which may deform the mechanical interlocks and the limit switches.

КОПИО С ОРИГИНАЛА



The torque normally required to carry out racking-in and racking-out is $< 25 \text{ Nm}$.

This value must not be exceeded. If operations are prevented or difficult, do not force them and check that the operating sequence is correct.

Note

To complete the racking-in/out operation, about 20 rotations of the lever are required for circuit-breakers up to 17.5 kV, and about 30 rotations for 24 kV circuit-breakers.

When the circuit-breaker has reached the Isolated for test/ isolated position, it can be considered racked into the switchgear and, at the same time, earthed by means of the truck wheels.

Withdrawable circuit-breakers of the same version, and therefore with the same dimensions, are interchangeable. However, when, for example, different electrical accessory fittings are provided, a different code for the plug of the auxiliary circuits does not allow incorrect combinations between panels and circuit-breakers.

For the circuit-breaker installation operations, also refer to the technical documentation of the above-mentioned switchgear.



- The racking-in/-out operations must always be carried out with the circuit-breaker open.
- When putting into service for the first time, it is advisable to charge the circuit-breaker operating mechanisms manually so as not to overload the auxiliary power supply circuit.

7.5.1. Circuit-breakers with withdrawable motorized truck

Carry out the racking-in/racking-out test of the motorized truck in the same way as for a manual truck, following the instructions below:

- Rack the circuit-breaker into the switchgear in the open and isolated position, with the power supply to the motor circuit cut off and with the enclosure door closed.

- Insert the manual racking-in lever (1) in the special coupling (2) Fig. 9, and take the motorized truck to about half its run between the isolated for test and the connected position. The torque needed to carry out truck handling is $\leq 25 \text{ Nm}$. In the case of accidental inversion of the truck motor power supply polarity, this operation allows a possible error in direction to be dealt with without any damage. Verification checks:

- a) motor rotation clockwise during circuit-breaker racking-in.
- b) motor rotation anticlockwise during circuit-breaker racking-out.

- Remove the manual lever (1) from the coupling (2) Fig. 9
- Supply the truck motor circuit.
- Activate the control for the electrical racking-in operation. When racking-in has taken place, check correct changeover of the relative auxiliary contact.
- On completion, activate the control for the electrical racking-out operation. When racking-out has taken place, check correct changeover of the relative auxiliary contact.
- In the case of a motor fault during a racking-in or racking-out operation, in an emergency the truck can be taken to the end of its run manually, after first cutting off the power supply to the motor power supply circuit and then, using the manual lever, work in the same way as with the manual truck.

Note

By means of the chain transmission, truck handling carried out using the manual lever makes the truck motor armature rotate which, behaving like a generator, can cause inverse voltage at the connection terminals. This may damage the permanent magnet of the motor, therefore all the truck racking-in and racking-out operations carried out using the manual lever must be done without power supply in the motor circuit.

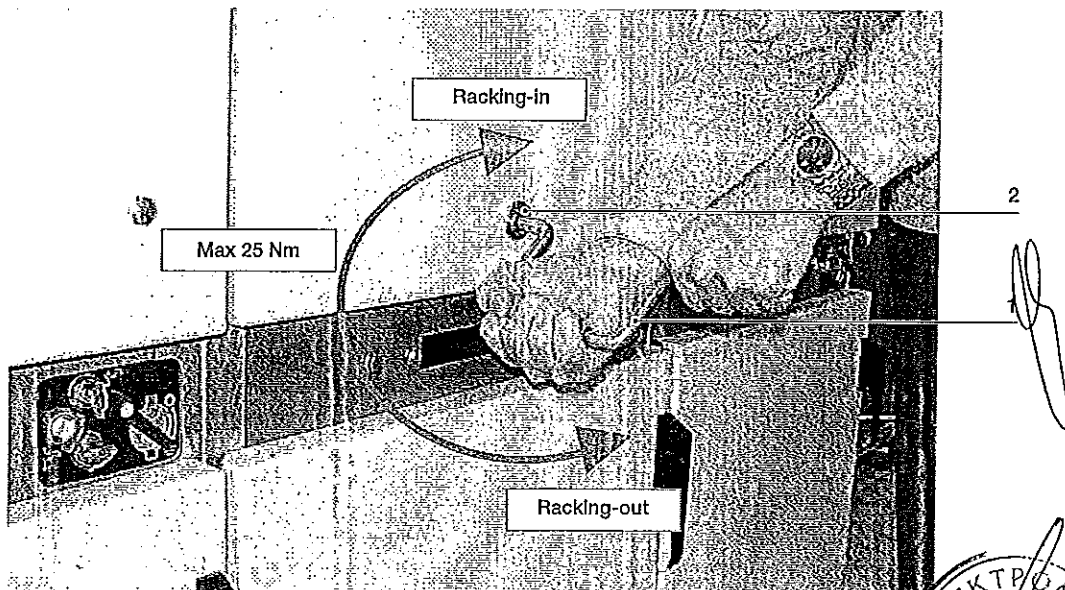


Fig. 9

ВАРНО С ОРГИНАЛА



7.6. Power circuit connections of fixed circuit-breakers

7.6.1. General recommendations

- Select the cross-section of the conductors according to the service current and the short-circuit current of the installation.
- Prepare special pole insulators, near the terminals of the fixed circuit-breaker or of the enclosure, sized according to the electrodynamic forces deriving from the short-circuit current of the installation.

7.6.2. Assembly of the connections

- Check that the contact surfaces of the connections are flat, and are free of any burrs, traces of oxidation or deformation caused by drilling or impacts received.
- According to the conductor material and the surface treatment used, carry out the operations indicated in table T1 on the contact surface of the conductor.

Assembly procedure

- Put the connections in contact with the circuit-breaker terminals, taking care to avoid mechanical stresses (traction / compression) on, for example, the conducting busbars on the terminals.
- Interpose a spring washer and a flat washer between the head of the bolt and the connection.
- It is advisable to use bolts according to DIN class 8.8 Standards, also referring to what is indicated in table T2.
- In the case of cable connections, strictly follow the manufacturer's instructions to make the terminals.

T1

Bare copper

- Clean with a fine file or emery cloth.
- Tighten fully and cover the contact surfaces with 5RX Moly type grease.

Copper or silver-plated aluminium

- Clean with a rough dry cloth.
- Only in the case of obstinate traces of oxidation, clean with a very fine grain emery cloth taking care not to remove the surface layer.
- If necessary, restore the surface treatment.

Bare aluminium

- Clean with a metal brush or emery cloth.
- Cover the contact surfaces again immediately with neutral grease.
- Insert the copper-aluminium bimetal with surfaces shined (copper side in contact with the terminal; aluminium side in contact with the connection) between the aluminium connection and the copper terminal.

T2

Bolt	Recommended tightening torque ⁽¹⁾	
	Without lubricant	With lubricant ⁽²⁾
M6	10,5 Nm	4,5 Nm
M8	26 Nm	10 Nm
M10	50 Nm	20 Nm
M12	86 Nm	40 Nm
M16	200 Nm	80 Nm

(1) The nominal tightening torque is based on a friction coefficient of the thread of 0.14 (distributed value the thread is subjected to which, in some cases, is not negligible). The nominal tightening torque with lubricant is according to the DIN 43673 Standards.

(2) Oil or grease. The thread and surfaces in contact with the lubricated heads. Take into account the deviations from the general Standards table (for example, for systems in contact or terminals) as foreseen in the specific technical documentation. The thread and surfaces in contact with the heads of bolts must be slightly oiled or greased, so as to obtain a correct nominal tightening torque.

7.7. Earthing

For the fixed version circuit-breaker, carry out earthing by means of the special screw marked with the relative symbol. Clean and degrease the area around the screw to a diameter of about 30 mm and, on completion of assembly, cover the joint again with Vaseline grease. Use a conductor (busbar or braid) with a cross-section conforming to the Standards in force.

7.8. Connection of the auxiliary circuits

Note: the minimum cross-section of the wires used for the auxiliary circuits must not be less than the one used for the internal cabling. Furthermore, they must be insulated for 3 kV of test.

7.8.1. Fixed circuit-breaker

Connection of the circuit-breaker auxiliary circuits must be made by means of the terminal box (1) (fig. 10) mounted inside the circuit-breaker and the cables must pass through the connector (2).

Outside the connector, the cables must pass through a suitable metal protective cover (pipe, wiring duct, etc.), which must be earthed.

To prevent the cabling wires outside the circuit-breaker (carried out by the customer) from accidentally coming into contact with moving parts and therefore undergoing damage to the insulation, it is recommended to fix the wires as shown in fig. 10a.



Before removing the operating mechanism cover to access the terminal box, check that the circuit-breaker is open and the closing spring discharged.

7.8.2. Withdrawable circuit-breakers

The auxiliary circuits of withdrawable circuit-breakers are fully cabled in the factory as far as the connector (fig. 11). For the external connections, refer to the electric wiring diagram of the switchgear.



ВАРНО С ОПРИГНАЛА

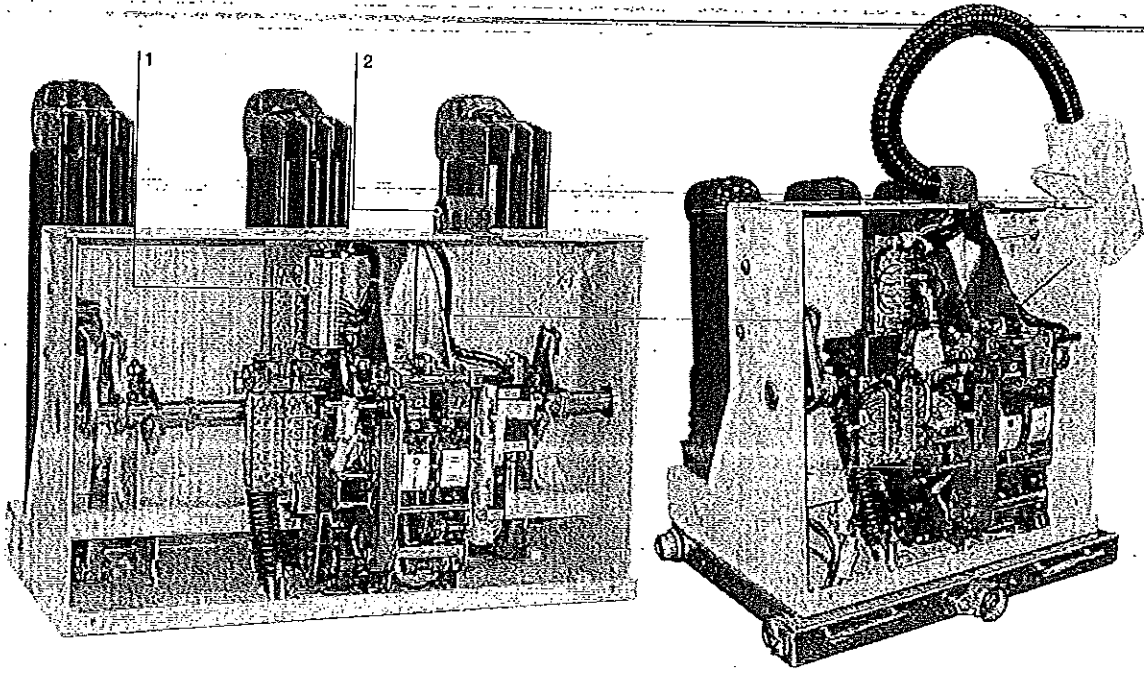


Fig. 10

VD4 circuit-breaker for ZS8.4 switchgear
(VD4/ZS8 version with rotary charging).

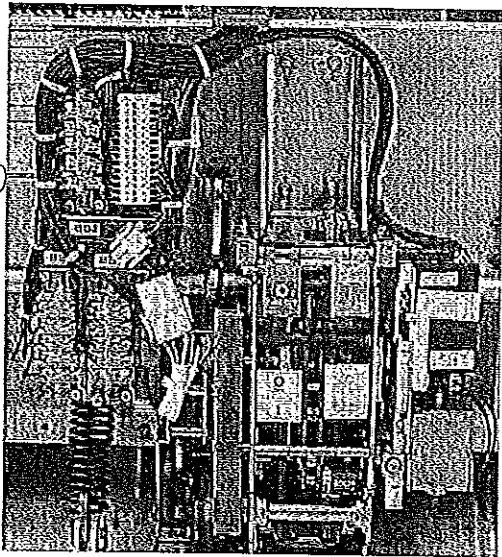


Fig. 10a

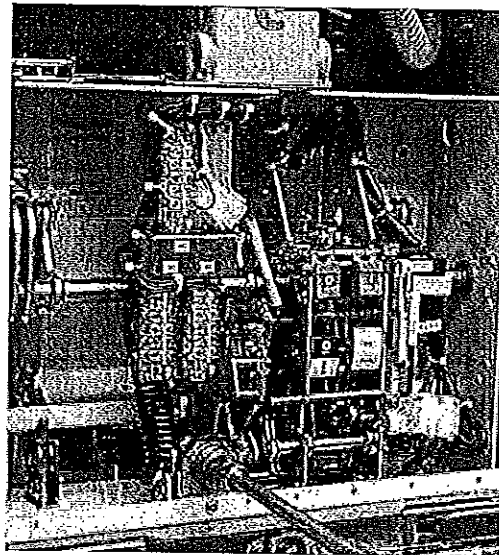



Fig. 11

ВЯРНО С ОРИГИНАЛА



8. Putting into service

8.1. General procedures

 All the operations regarding putting into service must be carried out by ABB personnel or by suitably qualified customer personnel with in-depth knowledge of the apparatus and of the installation. Should the operations be prevented, do not force the mechanical interlocks and check that the operating sequence is correct. The operating forces which can be applied for racking-in withdrawable circuit-breakers are indicated in paragraph 7.5.

Before putting the circuit-breaker into service, carry out the following operations:

- check tightness of the power connections to the circuit-breaker terminals;
- establish the setting of the primary electronic overcurrent release (if provided);
- check that the value of the power supply voltage of the auxiliary circuits is between 85% and 110% of the rated voltage of the electrical accessories;
- check that no foreign bodies, such as bits of packing, have got into the moving parts;
- check that there is a sufficient exchange of air in the installation place to avoid overtemperatures;
- also carry out the checks indicated in table T3.

ВЯРНО С ОРИГИНАЛА



ITEM INSPECTED	PROCEDURE	POSITIVE CHECK
1 Insulation resistance.	Medium voltage circuit With a 2500-V megger, measure the insulation resistance between the phases and the exposed conductive part of the circuit.	The insulation resistance should be at least 50 Mohm and in any case constant over time.
	Auxiliary circuits With a 500 V megger (if the apparatus installed allows this), measure the insulation resistance between the auxiliary circuits and the exposed conductive part.	The insulation resistance should be a few Mohm and in any case constant over time.
2 Auxiliary circuits.	Check that the connections to the control circuit are correct: proceed at the relative power supply.	Operations and signals normal.
3 Manual operating mechanism.	Carry out a few closing and opening operations (see cap. 6), N.B. Supply the undervoltage release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).	The operations and relative signals take place normally.
4 Motor operator (if provided).	Supply the spring charging geared motor at the relative rated voltage.	The spring is charged normally. The signals are normal. With the spring charged, the geared motor stops.
	Carry out a few closing and opening operations. N.B. Supply the undervoltage release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).	The geared motor recharges the spring after each closing operation.
5 Undervoltage release (if provided).	Supply the undervoltage release at the relative rated voltage and carry out the circuit-breaker closing operation.	The circuit-breaker closes normally. The signals are normal.
	Cut off power to the release.	The circuit-breaker opens. The signalling changes over.
6 Shunt opening release and additional shunt opening release (if provided).	Close the circuit-breaker and supply the shunt opening release at the relative rated voltage.	The circuit-breaker opens normally. The signals are normal.
7 Shunt closing release (if provided).	Open the circuit-breaker and supply the shunt closing release at the relative rated voltage.	The circuit-breaker opens normally. The signals are normal.
8 Key lock (if provided).	Open the circuit-breaker, keep the opening pushbutton depressed, then turn the key and remove it from the housing. Attempt the circuit-breaker closing operation.	Neither manual nor electrical closing takes place.
	Put the key back in and turn it 90°. Carry out the closing operation.	Both electrical and manual closing take place normally; in this position the key cannot be removed.
9 Locking electromagnet (-RL1) (if provided).	With the circuit-breaker open, spring charged and locking electromagnet not supplied, attempt circuit-breaker closing both manually and electrically.	Closing is not possible.
10 Auxiliary contacts in the operating mechanism.	Insert the auxiliary contacts in suitable signalling circuits. Carry out a few closing and opening operations.	Signals take place normally.
11 Locking electromagnet on the truck circuit-breaker (-RL2) (if provided).	With the circuit-breaker open, in the Isolated for test position and the locking electromagnet not supplied, attempt racking-in of the circuit-breaker.	Racking-in is not possible.
	Supply the locking electromagnet and carry out the racking-in operation.	Racking-in takes place correctly.
12 Auxiliary transmitted contacts for signalling circuit-breaker racked-in, Isolated (UniGear switchgear or PowerCube modules).	Insert the auxiliary contacts in suitable signalling circuits. With the circuit-breaker racked into the enclosure, carry out a few traverse operations from the Isolated for test position to the connected position. Take the circuit-breaker to the racked-out position.	The signals due to the relative operations take place normally.

ВЯРНО С ОПРИГНИЛАТА



9. Maintenance

The maintenance operations are aimed at keeping the apparatus in good working condition for as long as possible. In accordance with what is specified in the IEC 61208 / DIN 31 051 Standards, the following operations must be carried out.

- Inspection: Finding out the actual conditions
- Overhauling: Measures to be taken to maintain the specific conditions
- Repairs: Measures to be taken to restore the specific conditions.

9.1. General

The vacuum circuit-breakers are characterised by simple, sturdy construction and a long life.

The operating mechanism requires maintenance and functional inspections to reach the expected operating-life (see par. 9.3.2.).

The vacuum interrupters are maintenance-free for their whole operating life.

Vacuum interruption does not produce any harmful effects even when there are frequent interruptions at the rated and short-circuit current.

The interventions during service and their aim are determined by the ambient conditions, by the sequence of operations and by the short-circuit interruptions.

Note

Respect the following Standards for maintenance work:

- the relative specifications given in the chapter on "Standards and Specifications";
- work safety regulations in the chapter on "Putting into service and operations";
- standards and specifications of the country where the apparatus is installed.

The maintenance operations must only be carried out by trained personnel and who follow all the safety regulations. Furthermore, it is advisable to call on ABB personnel, at least in cases for checking the performances in service and for repairs.

Cut the power supply off and put the apparatus under safe conditions during the maintenance operations.



Before carrying out any operations, check that the circuit-breaker is open, with the spring discharged and that it is not supplied (medium voltage circuit and auxiliary circuits).

9.1.1. Operating life expectancy

The operating life expectancy for the VD4 circuit-breakers is as follows:

- vacuum interrupters: up to 30,000 operations, according to their type (see par. 7.2.3. Trip curves);

- switching device, actuator and transmission system: up to 30,000 operations, under normal operating conditions, according to the type of circuit-breaker and with regular maintenance (see par. 9.3.2.);
- with operations correctly executed it is possible to carry out up to 1000 racking-out/in operations (as prescribed in the IEC 60271-200 Standards);
- the data regarding the operating life are basically applicable to all the components which cannot be directly affected by operator activity. The manually operated components (moving parts of isolatable parts, etc.) can vary their behaviour.

9.2. Inspections and functionality tests

9.2.1. Interruption devices in general

- Check the conditions of the interruption devices with regular inspections.
- Inspection at fixed intervals can be avoided when the apparatus is permanently under the control of qualified personnel.
- The checks must, first of all, include visual inspection to check for any contamination, traces of corrosion or electrical discharge phenomena.
- Carry out more frequent inspections when there are unusual operating conditions (including severe climatic conditions) and in the case of environmental pollution (e.g. high level of contamination or an atmosphere with aggressive agents).
- Visual inspection of the isolating contacts.
It is recommended to turn the contact system alternately in order to keep the internal surface of the contact areas clean. The contact areas must be cleaned when there are signs of overheating (discoloured surface) (also see Repairs).
- In the case of abnormal conditions, take suitable overhauling measures (see Overhauling par.).

9.2.2. Stored energy operating mechanism

Carry out the functional test of the operating mechanism after 5,000 operations or during ordinary maintenance operations as specified in par. 9.2.1.

Before doing the test, open the circuit-breaker and carry out the following operations:

- in the case of withdrawable circuit-breakers, take the circuit-breaker to the isolated for test position
- in the case of fixed circuit-breakers: cut off the power supply to the medium voltage circuit.

Note

Insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards.

ВЯРНО С ПРИГЛАНАЛА



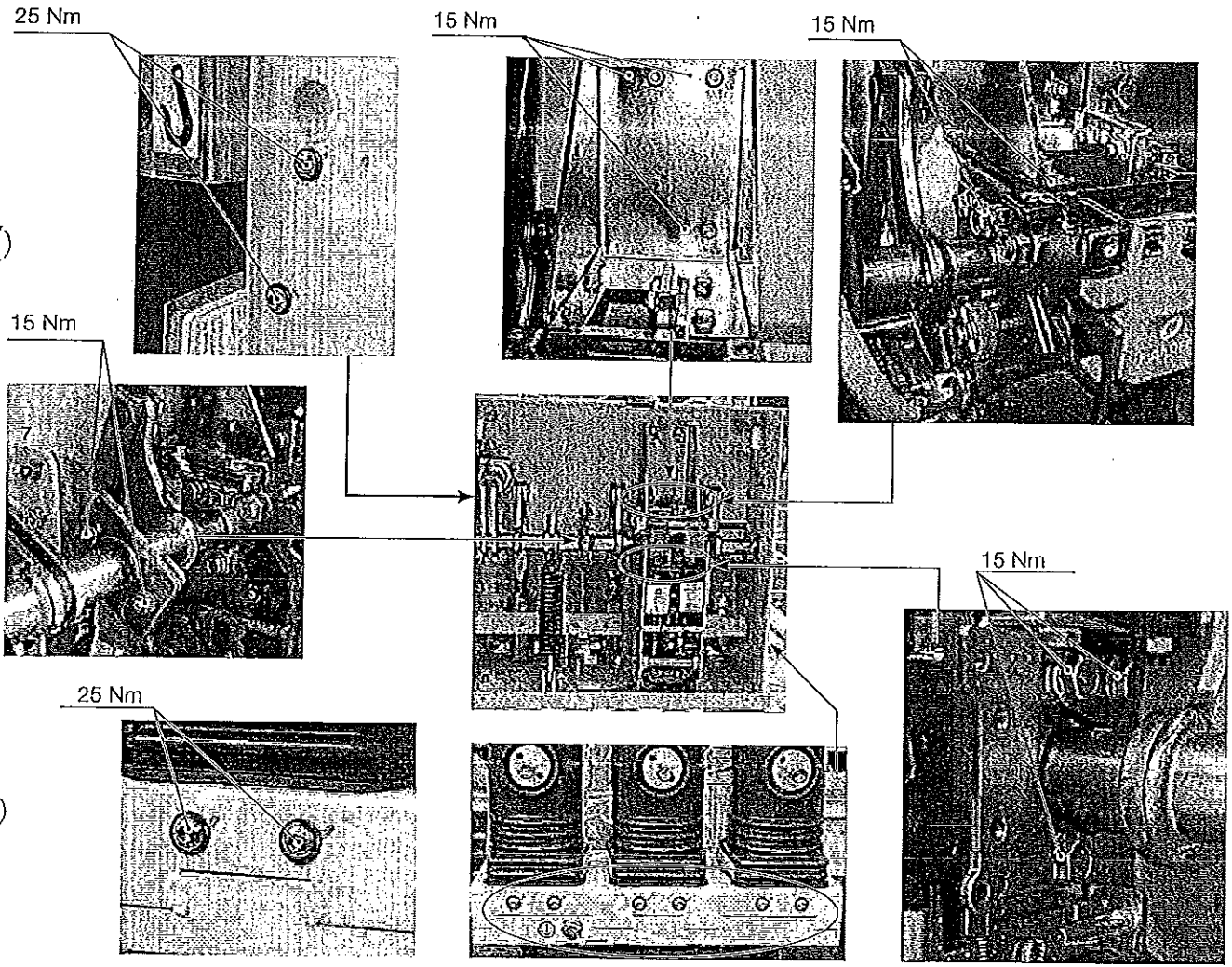
Functional test

- With the circuit-breaker not connected to the load, carry out a few opening and closing operations.
- If foreseen, cut the power supply to the spring charging motor off. Discharge the spring by closing and opening the circuit-breaker by means of the closing and opening pushbuttons.
- Visually inspect the lubrication conditions of the tulip isolating contacts, of the sliding surfaces, etc.

- Check correct electrical and mechanical operation of the various devices, with particular attention to the interlocks.
- The screws and nuts are tightened in the factory and correct tightening is marked with a collared sign. No further tightening operations are foreseen during the operating life of the circuit-breaker. However, following any maintenance interventions, should it be necessary to re-tighten the screws or nuts, it is recommended to always replace the screws and nuts and to keep to the values indicated in fig. 12.

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Checking tightness of the screws



EL Twin actuator - 50 kA

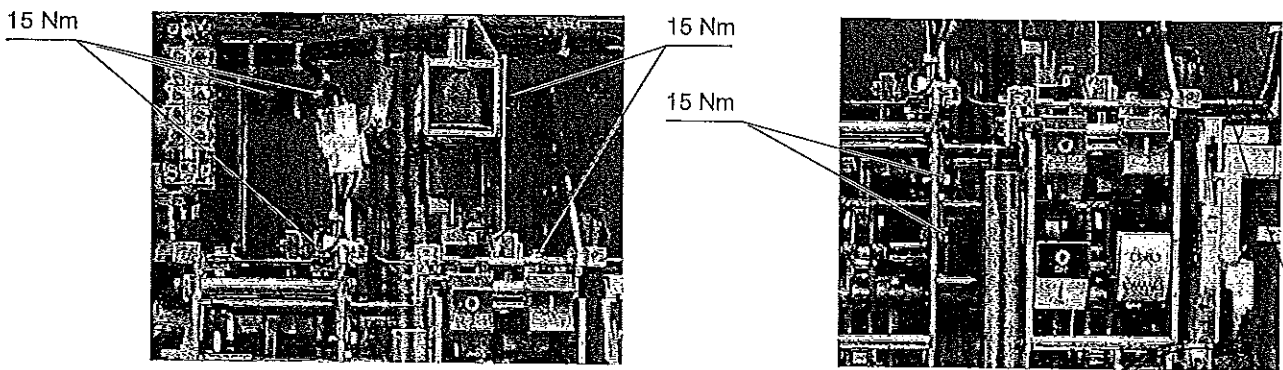


Fig. 12

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ВЯРНО С ОРИГИНАЛА



9.2.3. Circuit-breaker pole

No other check except what has already been specified in par. 9.2.1. is necessary.

9.2.4. Withdrawable assembly (truck and circuit-breaker)

Visually inspect the components, especially those which may be damaged by incorrect operations (also see table in chap. 8). Visually inspect the isolating contacts and that all the contact elements are clean, especially in cases where signs of overheating are found (also see par. 9.4.).

Visually inspect and carry out the functional tests of the locks, checking their correct operation and activation without abnormal force – maximum 25 N (also see table in chap. 8).

9.3. Overhauling

9.3.1. Interruption devices in general

Should it have been necessary to clean the devices during the inspections, according to what is specified in par. 9.2.1., use the following procedure:

- insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards;
- general cleaning of the surfaces:
 - dry and eliminate light deposits of dirt with a soft dry cloth;
 - more resistant deposits of dirt can be removed using slightly alkaline domestic type detergent or Rivolta BWR 210 type detergent;
- cleaning insulating surfaces and conductive parts:
 - light dirt: with Rivolta BWR 210 detergent;
 - resistant dirt: with cold detergent type 716.

After cleaning, rinse thoroughly with clean water and dry carefully.

Note

Only use detergents without halogens and never 1.1.1-trichloroethane, trichloroethylene or carbon tetrachloride!

9.3.2. Tripping device: actuator and transmission system

Circuit-breakers up to 17.5 kV, 2500 A, 31.5 kA and up to 24 kV, 2500 A, 25 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 10,000 operations. For this purpose, please contact the ABB Service office.

Complete replacement of the actuator, shock absorber and of the other transmission system parts (shaft, main levers, safety rings, etc.) must be carried out after 30,000 operations.

Circuit-breakers up to 17.5 kV, 40 kA and 24 kV, 31.5 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 10,000 operations. For this purpose, please contact the ABB Service office.

Complete replacement of the actuator must be carried out every 10,000 operations.

Complete replacement of the shock absorber and of the other transmission system parts (shaft, main levers, safety rings, etc.) must be carried out after 30,000 operations.

Circuit-breakers up to 17.5 kV, 3150 A, 40 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices must be carried out every 5,000 operations. For this purpose, please contact the ABB Service office.

Complete replacement of the shock absorber and of the other part of the transmission system (shaft, main levers, safety rings, etc.) must be carried out after 10,000 operations.

Circuit-breakers up to 17.5 kV, 50 kA and EL twin actuator

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices must be carried out every 10,000 operations. For this purpose, please contact ABB Service.

Complete replacement of the shock-absorber and of the other parts of the transmission system (shaft, main levers, safety rings, etc.) must be carried out every 10,000 operations.

Note

Dismantling and replacement of the operating mechanism (trip box) can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

Details regarding overhauling

- When foreseen, cut of the power supply to the spring charging motor and manually discharge the operating mechanism spring by closing and opening the circuit-breaker.
- Replace the parts subjected to mechanical stress or stress due to particular environmental conditions, (contact and ABB service centre).

Note

These operations can only be carried out by ABB personnel or by skilled and specially trained personnel.

ВЯРНО С ОПРИТНАТА



9.3.3. Circuit-breaker pole

The circuit-breaker pole and relative vacuum interrupter are maintenance-free until the maximum number of electrical operations for the type of interrupter is reached (see par. 7.2.3. Trip curves).

The operating life of the vacuum interrupter is defined by the sum of the ultimate currents corresponding to the specific type of interrupter in accordance with what is indicated in the graphs of par. 7.2.3. Trip curves: when the sum of the ultimate currents is reached, the whole pole must be replaced.

Note

Dismantling and replacement of the pole can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

To carry out the interrupter test without dismantling the circuit-breaker pole, use:

- the VIDAR vacuum tester, made by the company Programma Electric GmbH, Bad Homburg v.d.H.

To check vacuum tightness of the interrupter, the following test values must be set on the VIDAR tester:

Rated voltage of the circuit-breaker	d.c. test voltage
12 kV	40 kV
17.5 kV	40 kV
24 kV - 36 kV	60 kV

The test must always be carried out with the circuit-breaker open with the contacts at the nominal distance.

Procedure for testing the degree of vacuum of the interrupter of the circuit-breaker poles:

- turn the power supply off and make the working area safe by following the safety regulations specified in the IEC/DIN VDE Standards;
- open the circuit-breaker;
- earth a terminal of each circuit-breaker pole;
- connect the earth terminal of the VIDAR tester to the circuit-breaker structure;
- connect the high voltage terminal of the VIDAR tester to the terminal of the circuit-breaker pole not connected to earth (L1 phase) and carry out the test. Repeat the test for phases L2 and L3.

Note

The tester connection cables can produce an indication due to the capacitive effect. In this case the cables must not be removed.

9.4. Repairs

Replacement of spare parts and accessories must only be carried out by ABB personnel or suitably qualified and specially trained personnel.

Always work with the circuit-breaker open and locked so that it cannot be closed again, with the work area insulated and made safe.

The operating mechanism spring must be discharged.

All power supply sources must be disconnected and made safe against any reclosing during removal and installation work.



Should maintenance be carried out by the customer's personnel, responsibility for the interventions remains with the customer.

The replacement of parts not included in the "List of spare parts/accessories" (par. 12.1.) must only be carried out by ABB personnel. In particular:

- complete pole with bushings/connections
- actuator and transmission system
- closing spring set
- opening spring
- shock-absorber.

(3)

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10. Application of the X-ray emission Standards

One of the physical properties of vacuum insulation is the possibility of X-ray emission when the interrupter contacts are open.

The specific tests carried out at the PTB laboratories (Physikalisch-Technische Bundesanstalt, in Brunswick - Germany) show that local emission at a distance of 10 cm from the interrupter or pole surface, does not exceed 1 mSv/h.

It follows that:

- at the rated service voltage the use of vacuum interrupters is absolutely safe;
 - application of the withstand voltage at power frequency, according to the IEC 62271-100 and VDE 0670 Standards, is safe;
 - application of a voltage higher than the withstand voltage at power frequency or of a test voltage in direct current, specified in the IEC and VDE Standards, cannot be used;
 - limitation of the above-mentioned local phenomena, with interrupters with open contacts, depends on keeping the specific distance between the contacts.
- This condition is intrinsically guaranteed by correct operation of the operating mechanism and by the adjustments of the transmission system.

ПРОЦЕС С ОРГАНИЗАЦИЈА



11. Spare parts and accessories



All assembly operations of spare parts/accessories must be carried out following the instructions enclosed with the spare parts, by ABB personnel or by suitably qualified customer personnel with in-depth knowledge of the apparatus (IEC 60694) and of all the Standards aimed at carrying out these interventions in safe conditions. Should the maintenance be carried out by the customer's personnel, responsibility for the interventions remains with the customer. Before carrying out any operation, always make sure that the circuit-breaker is open, the spring discharged and that it is not energised (medium voltage circuit and auxiliary circuits).

To order circuit-breaker spare parts/accessories, refer to the ordering sales codes indicated in the technical catalogue and always state the following:

- type of circuit-breaker
- rated voltage of the circuit-breaker
- rated normal current of the circuit-breaker
- breaking capacity of the circuit-breaker
- serial number of the circuit-breaker
- rated voltage of any electrical spare parts.

For availability and to order spare parts, please contact our Service office.

11.1. List of spare parts

- Shunt opening release
- Additional shunt opening release
- Undervoltage release
- Contact for signalling undervoltage release energised/de-energised
- Time delay device for undervoltage release
- Mechanical override for undervoltage release
- Shunt closing release
- Spring charging geared motor with electrical signalling of spring charged
- Contact signalling protection circuit-breaker of the geared motor open/closed
- Contact signalling closing spring charged/discharged
- Transient contact with momentary closing during circuit-breaker opening
- Circuit-breaker auxiliary contacts
- Locking electromagnet on the operating mechanism
- Position contact of the withdrawable truck
- Contacts signalling connected/isolated
- Opening solenoid
- Key lock in open position
- Isolation interlock with the door
- Protection for opening pushbutton
- Protection for closing pushbutton
- Locking electromagnet on the withdrawable truck
- Set of six tulip contacts.

ВЯРНО С ОРИГИНАЛА



12. Electric circuit diagrams

The standard VD4 circuit-breaker electric circuit diagrams are as follows:

- 1VCD400046: Fixed circuit-breakers
- 1VCD400099: Fixed circuit-breakers 50 kA
- 1VCD400055: Fixed circuit-breakers with 64-pole connector
- 1VCD400064: Fixed circuit-breakers with 58-pole connector
- 1VCD400078: Fixed circuit-breakers with truck
- 1VCD400047: Withdrawable circuit-breakers
- 1VCD400048: Withdrawable circuit-breakers with motorized truck
- 1VCD400100: Withdrawable circuit-breakers 50 kA
- 1VCD400080: Withdrawable circuit-breakers for ZS8.4 switchgear VD4/ZS8, ZT8 and Z8 with circuit-breaker
- 1VCD400080: Withdrawable circuit-breakers for ZS8.4 switchgear with VD4/ZS8, ZT8 and Z8 circuit-breaker with motorized truck
- 1VCD400102: Withdrawable circuit-breakers with motorized truck 50 kA.

Each circuit-breaker is always provided with the standard electric diagram or with a specific diagram in the case of a circuit-breaker with non-standard cabling.

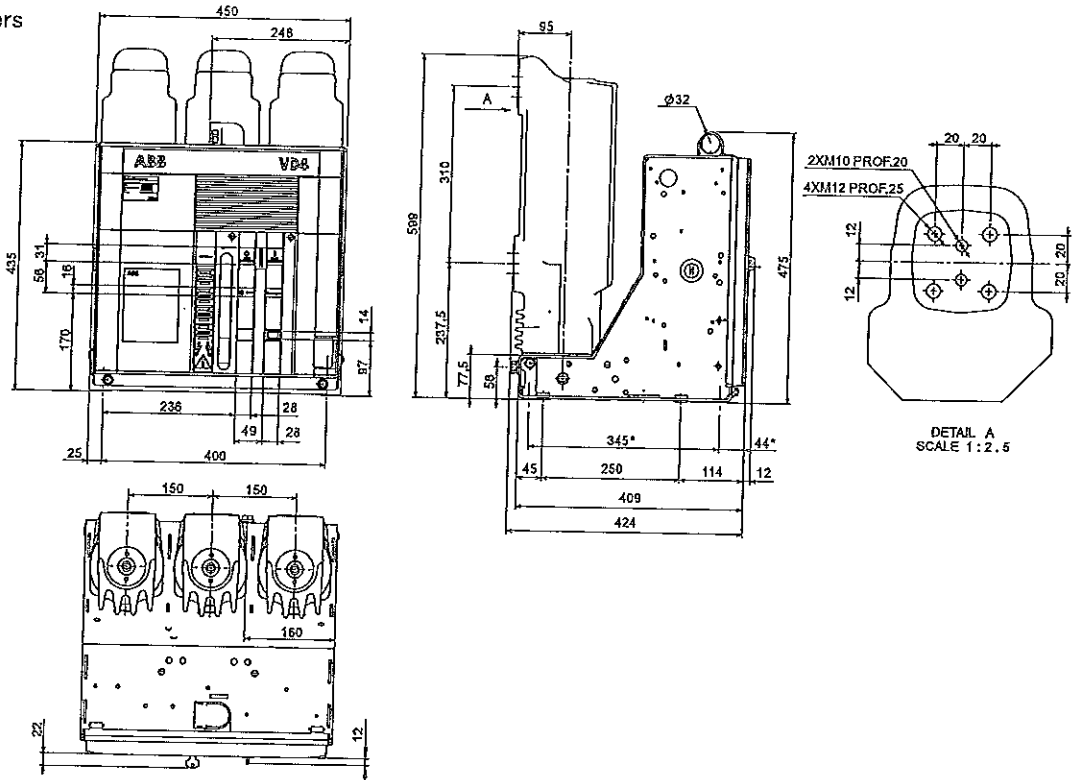
ВЯРНО С ОРИГИНАЛА



13. Overall dimensions

Fixed circuit-breakers

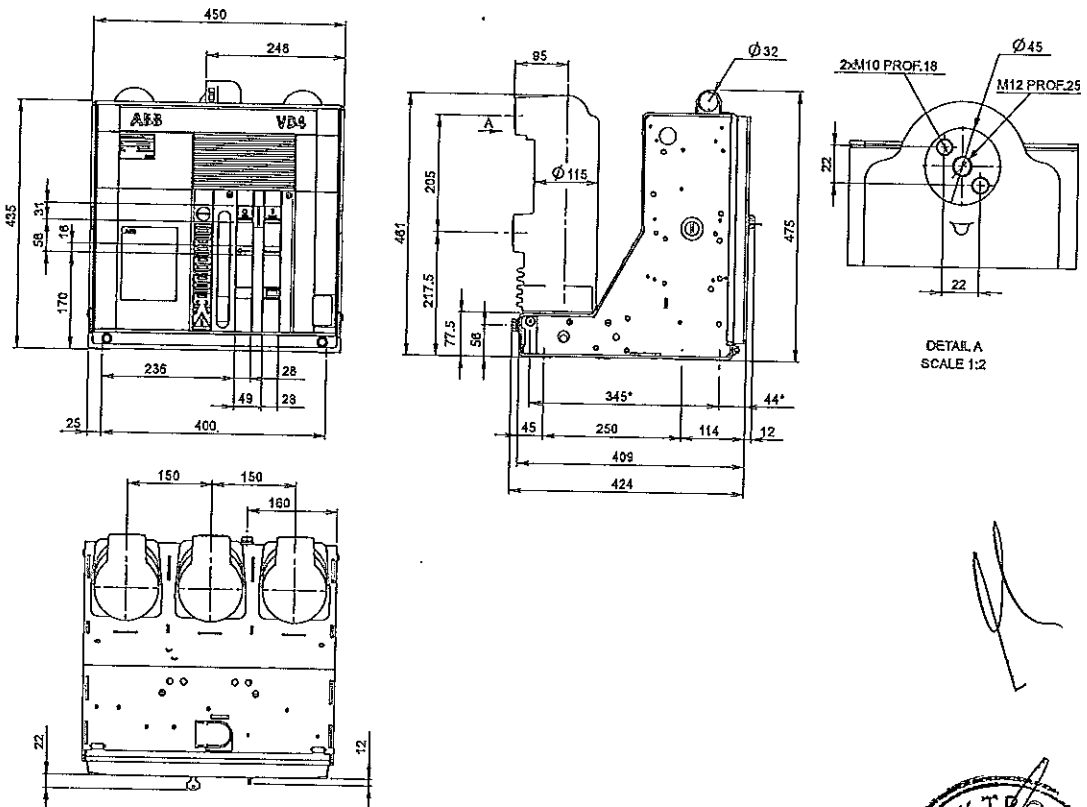
VD4	
TN	1VCD000050
Ur	12 kV
	17.5 kV
Ir	1600 A
	20 kA
Isc	25 kA
	31.5 kA



(*) Fixing Interchangeability with previous series (345 x 400).

Fixed circuit-breakers

VD4	
TN	7405
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	31.5 kA



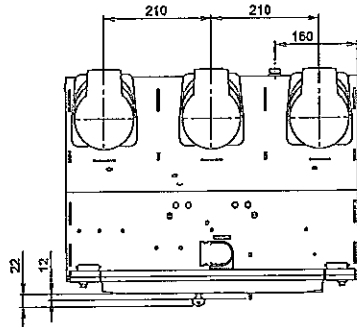
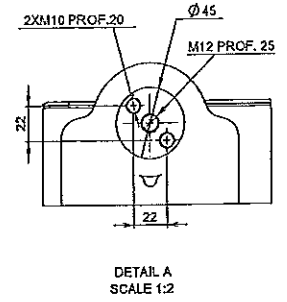
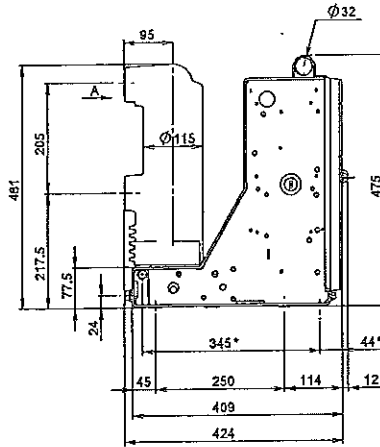
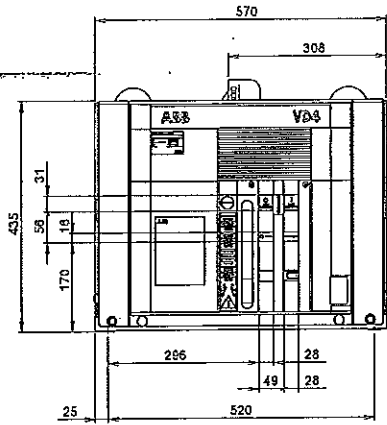
(*) Fixing interchangeability with previous series (345 x 400).

ВЯРНО С ОРИГИНАЛА



Fixed circuit-breakers

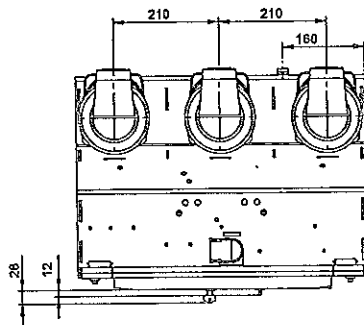
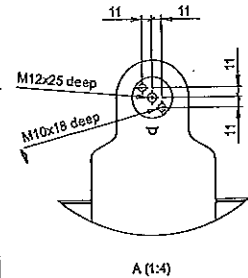
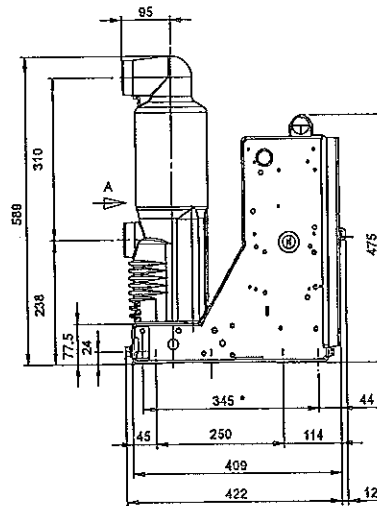
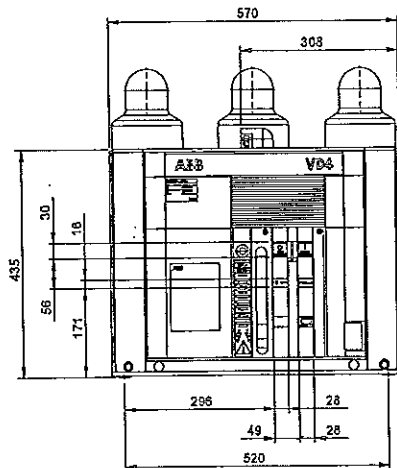
VD4	
TN	7406
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA
	31.5 kA



(*) Fixing interchangeability with previous series (345 x 520).

Fixed circuit-breakers

VD4	
TN	1VCD003282
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



(*) Fixing interchangeability with previous series (345 x 650).

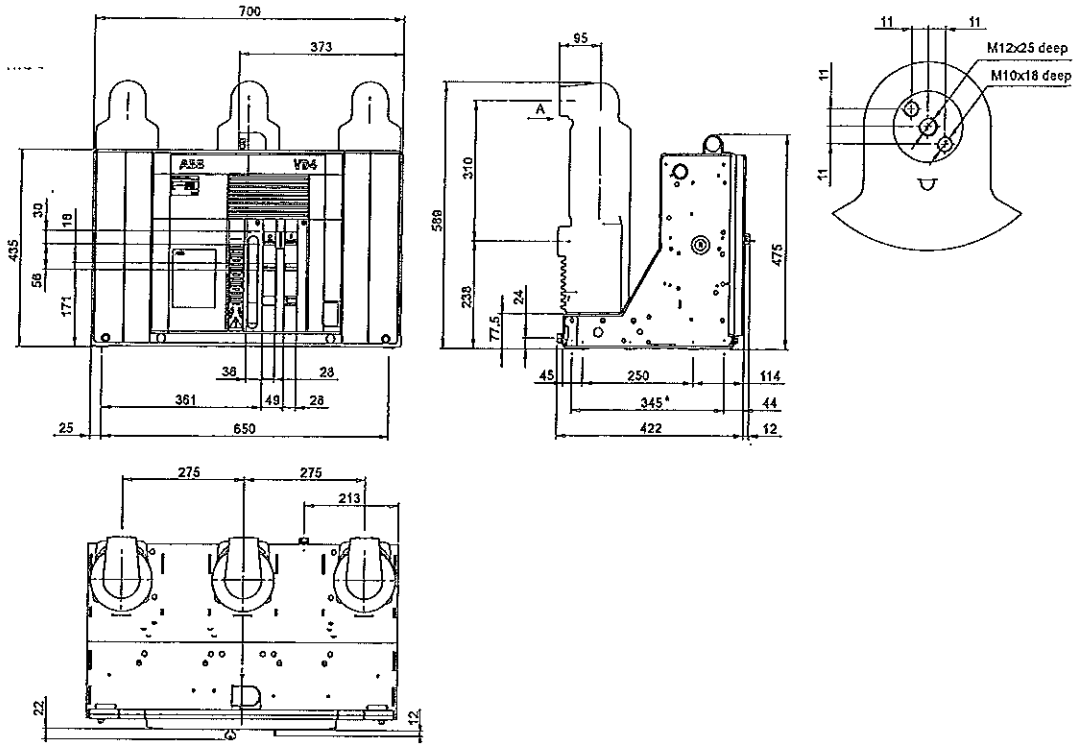
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ВАРНО С ОПРИМНАТА



Fixed circuit-breakers

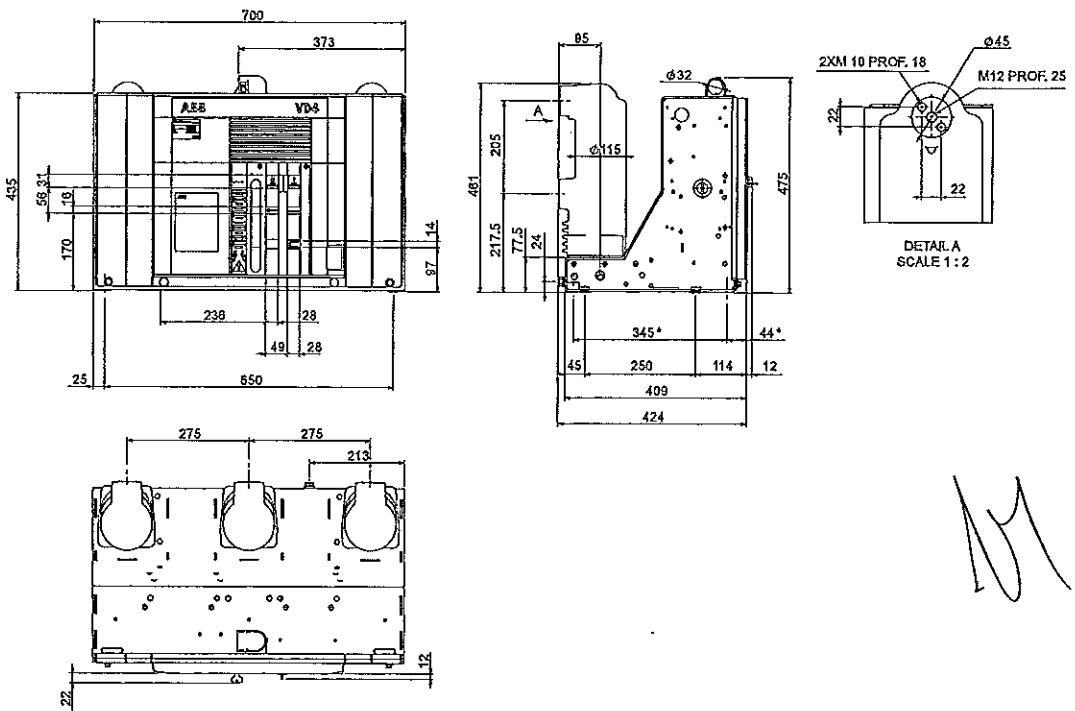
VD4	
TN	1VCD003285
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	1VCD000051
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA
	31.5 kA



(*) Fixing interchangeability with previous series (345 x 650).

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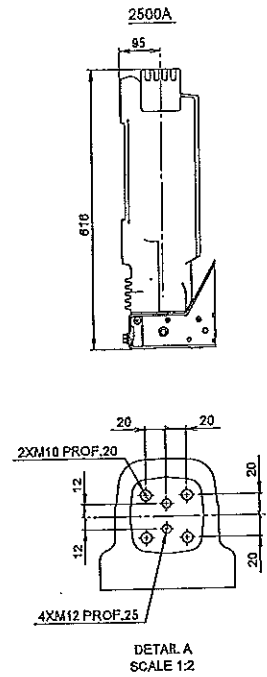
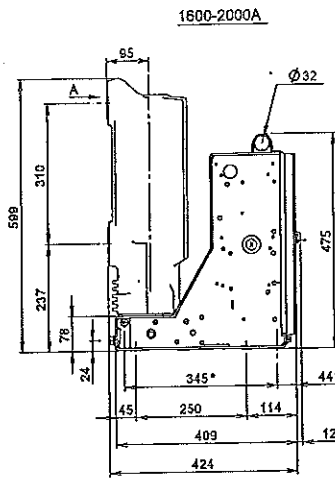
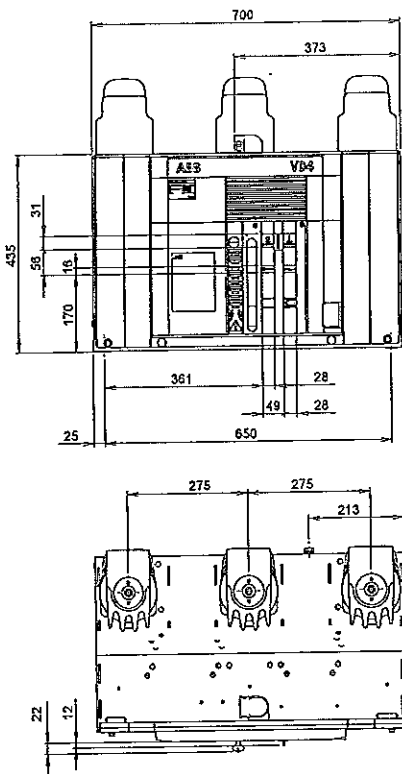
ВЯРНО С ОРИГИНАЛА



Fixed circuit-breakers

VD4	
TN	7408
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
	2500 A
Isc	20 kA
	25 kA
	31.5 kA

VD4	
TN	7408
Ur	12 kV
	17.5 kV
Ir	2000 A
	2500 A
Isc	40 kA

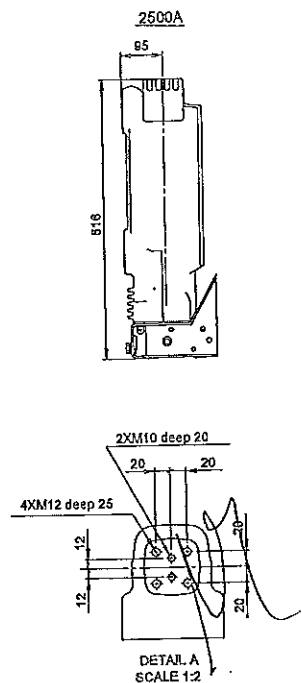
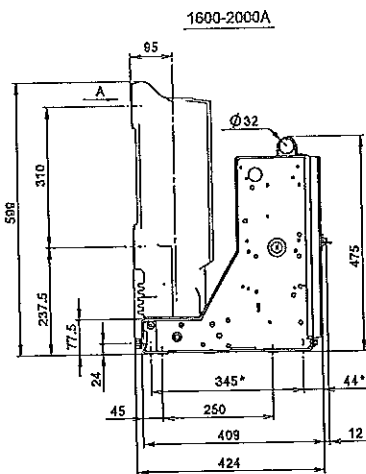
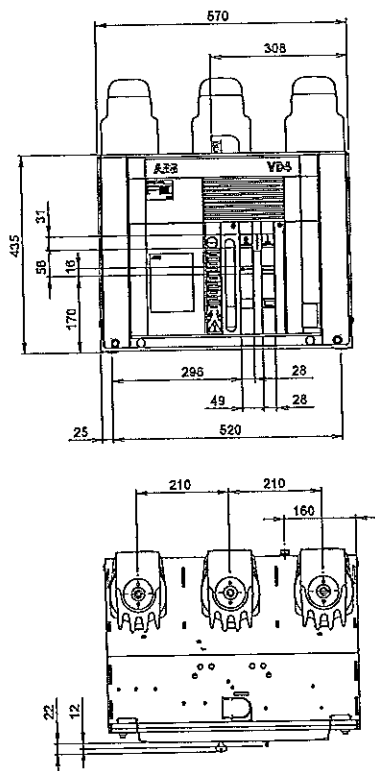


(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	7407
Ur	12 kV
	17.5 kV
Ir	2500 A
	20 kA
	25 kA
Isc	31.5 kA
	40 kA

VD4	
TN	7407
Ur	12-17.5 kV
	1600 A
Ir	2000 A
	20 kA
Isc	25 kA
	31.5 kA
	40 kA



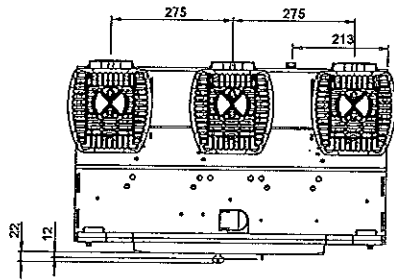
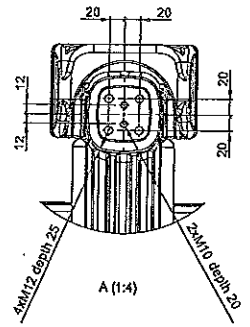
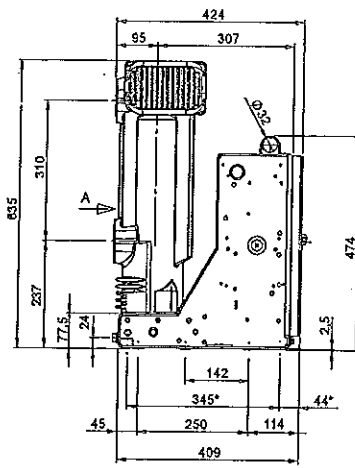
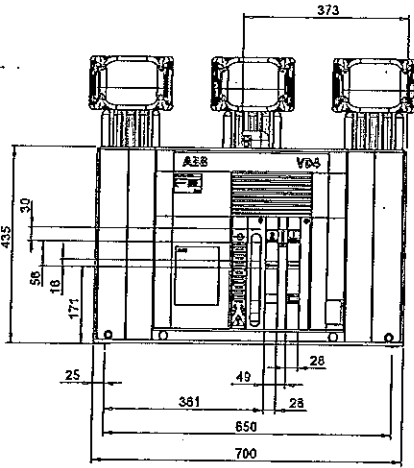
(*) Fixing interchangeability with previous series (345 x 650).



ВАРНО С ОРНИНАЛА

Fixed circuit-breakers

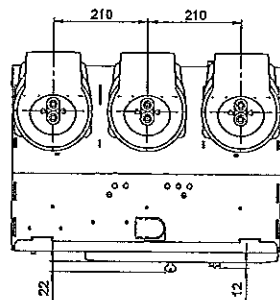
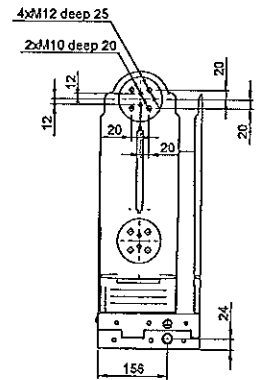
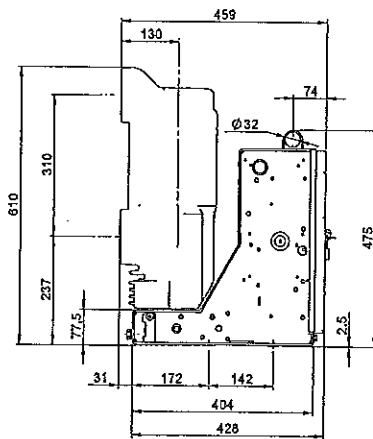
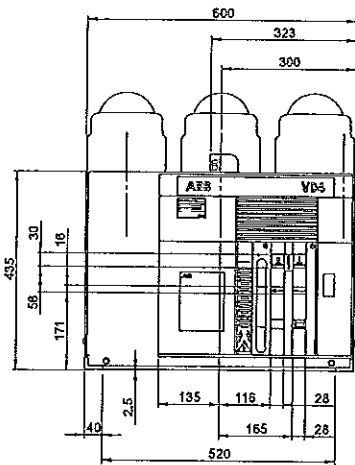
VD4	
TN	1VCD000149
Ur	12 kV
	17.5 kV
Ir	3150 A
	4000 A (**)
Isc	20 kA
	25 kA
	31.5 kA
	40 kA
	50 kA



(*) Fixing Interchangeability with previous series (345 x 650).
 (**) With forced ventilation.

Fixed circuit-breakers

VD4	
TN	1VCD003440
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
	2000 A
Isc	50 kA



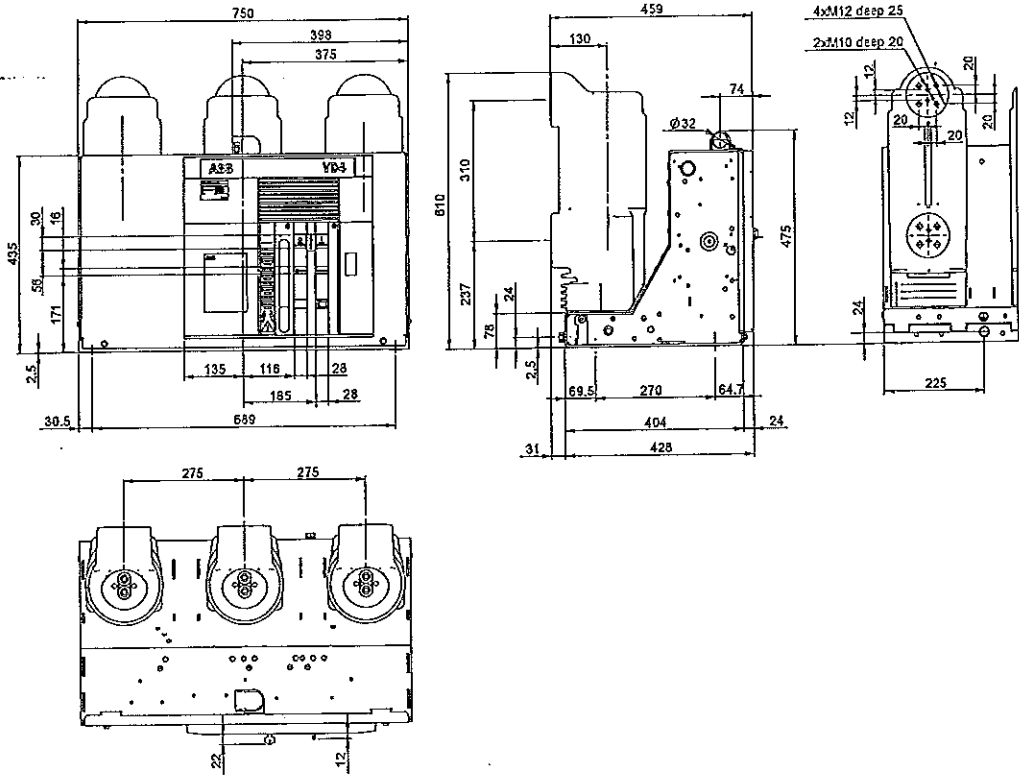
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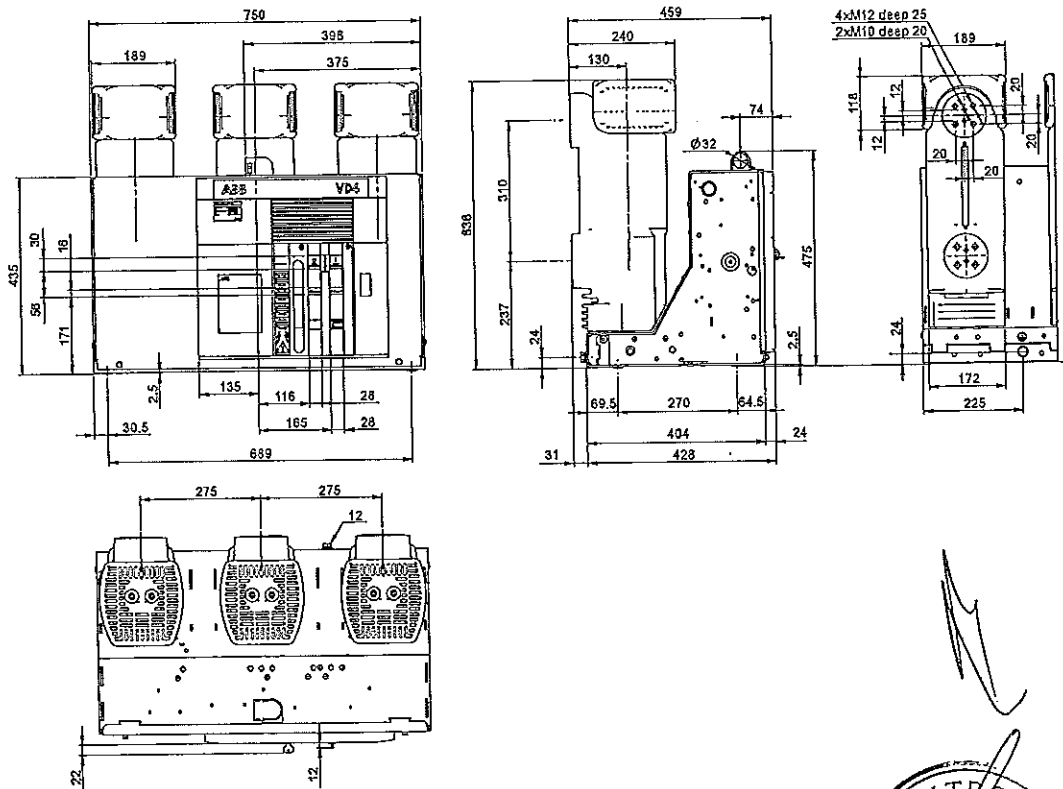
Fixed circuit-breakers

VD4	
TN	1VCD003441
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
	2000 A
isc	50 kA



Fixed circuit-breakers

VD4	
TN	1VCD003443
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
isc	50 kA



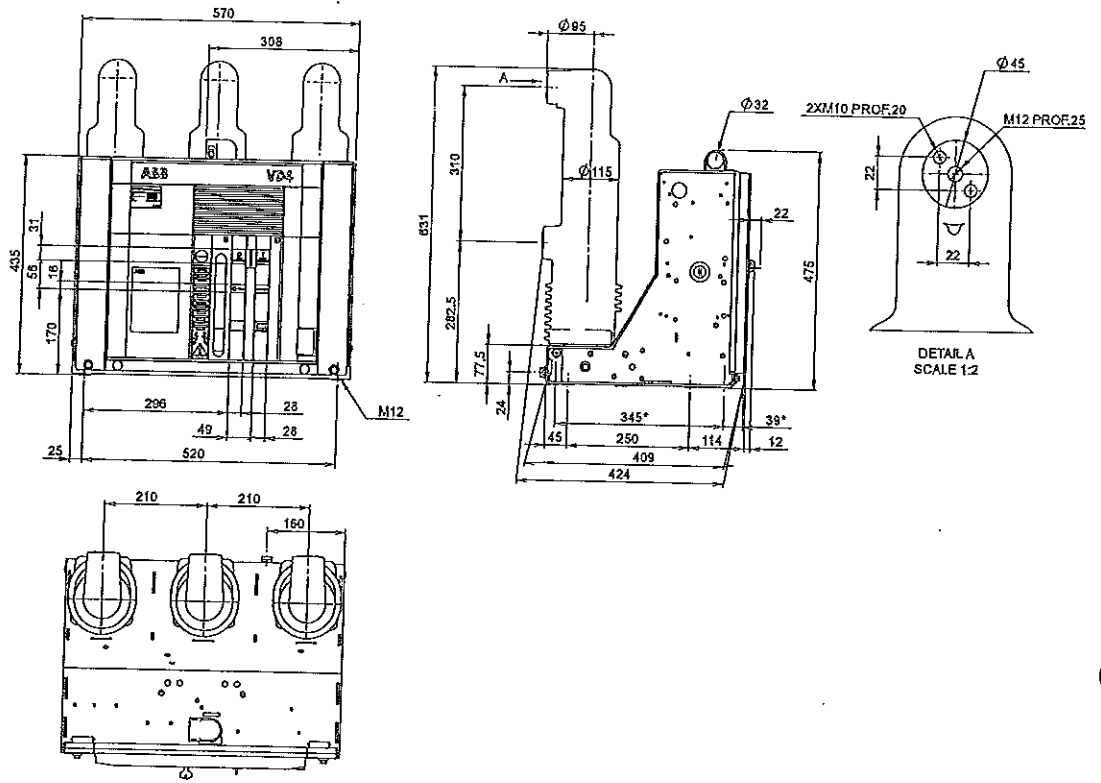
(*) 4000 A with forced ventilation.

ВЯРНО С ОРИГИНАЛА



Fixed circuit-breakers

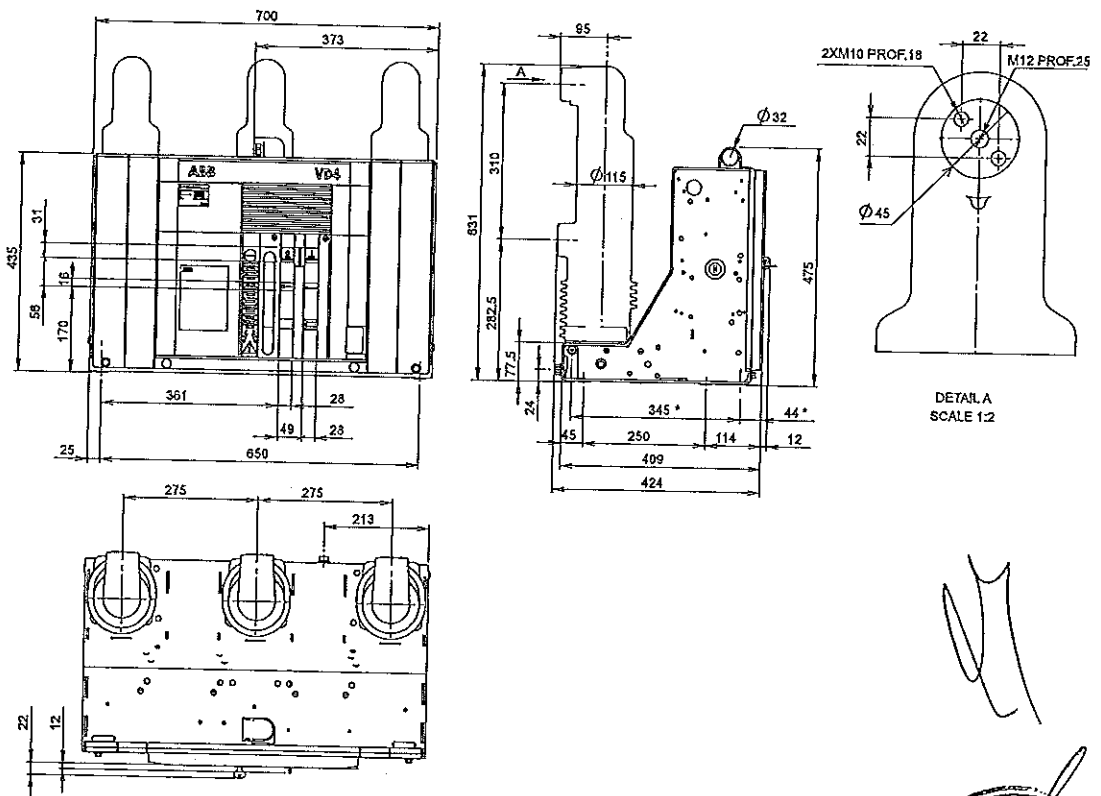
VD4		
TN	7409	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA



(*) Fixing interchangeability with previous series (345 x 520).

Fixed circuit-breakers

VD4		
TN	7410	
Ur	24	kV
Ir	630	A
	1250	A
Isc	16	kA
	20	kA
	25	kA



(*) Fixing Interchangeability with previous series (345 x 650).

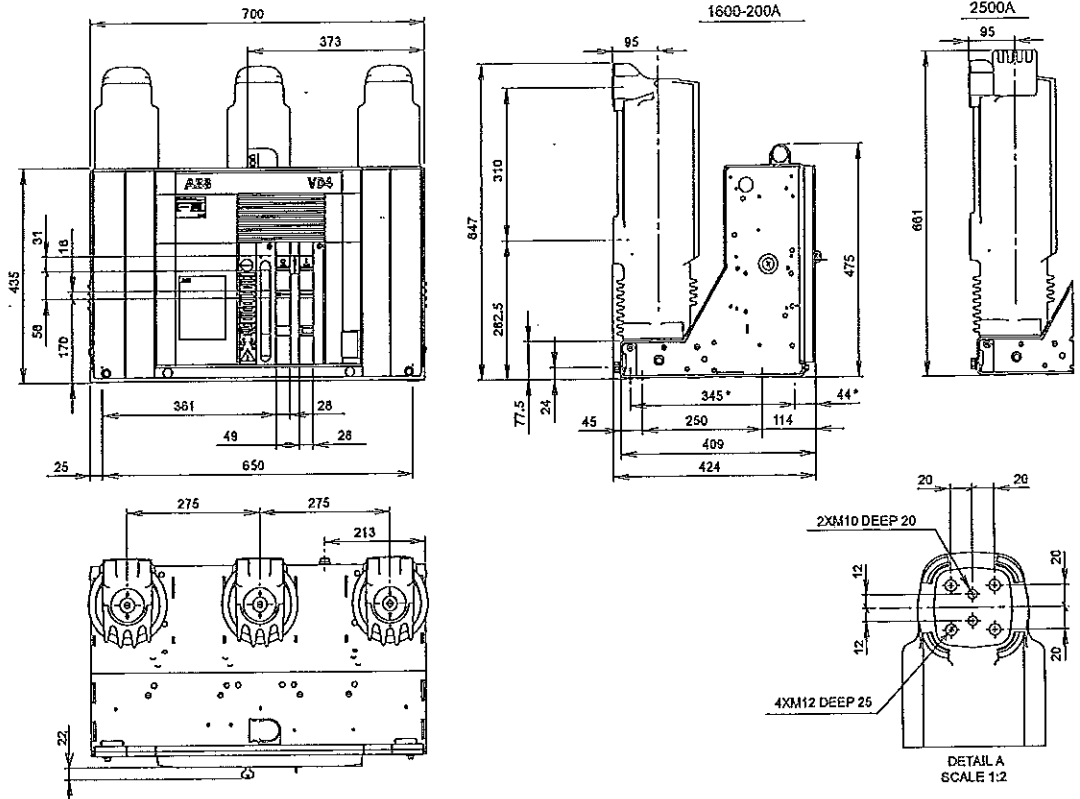
74

ВЯРНО С ОРИГИНАЛА



Fixed circuit-breakers

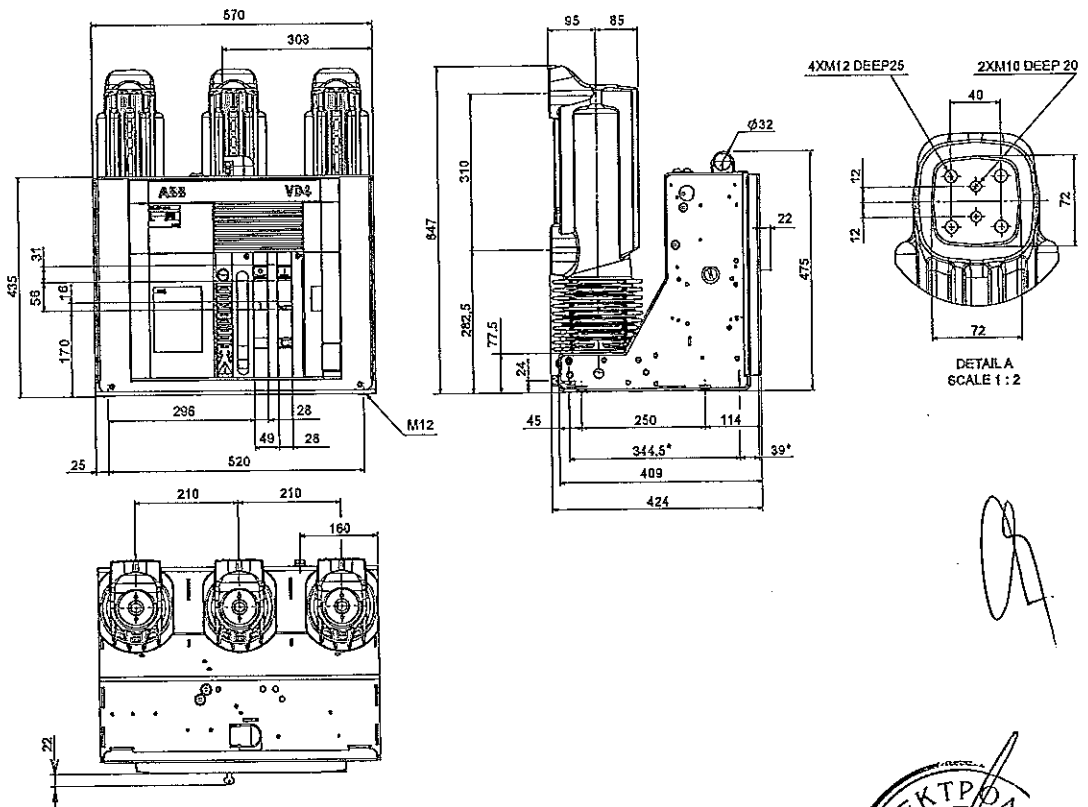
VD4	
TN	7411
Ur	24 kV
Ir	1600 A
	2000 A
	2500 A
Isc	16 kA
	20 kA
	25 kA
	31,5 kA



(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4	
TN	1VCD000172
Ur	24 kV
Ir	1250 A
Isc	31.5 kA



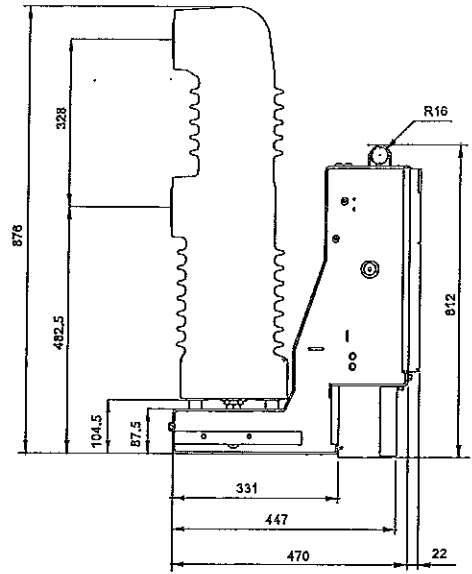
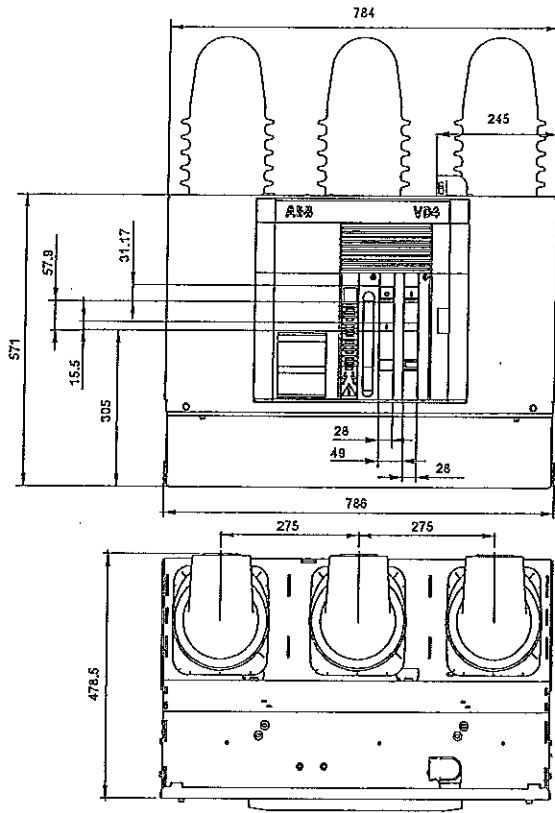
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ВАРНО С ОРИГИНАЛА



Fixed circuit-breakers

VD4	
TN	1VYN300901-LT
Ur	36 kV
	1250 A
Ir	1600 A
	2000 A
Isc	31.5 kA



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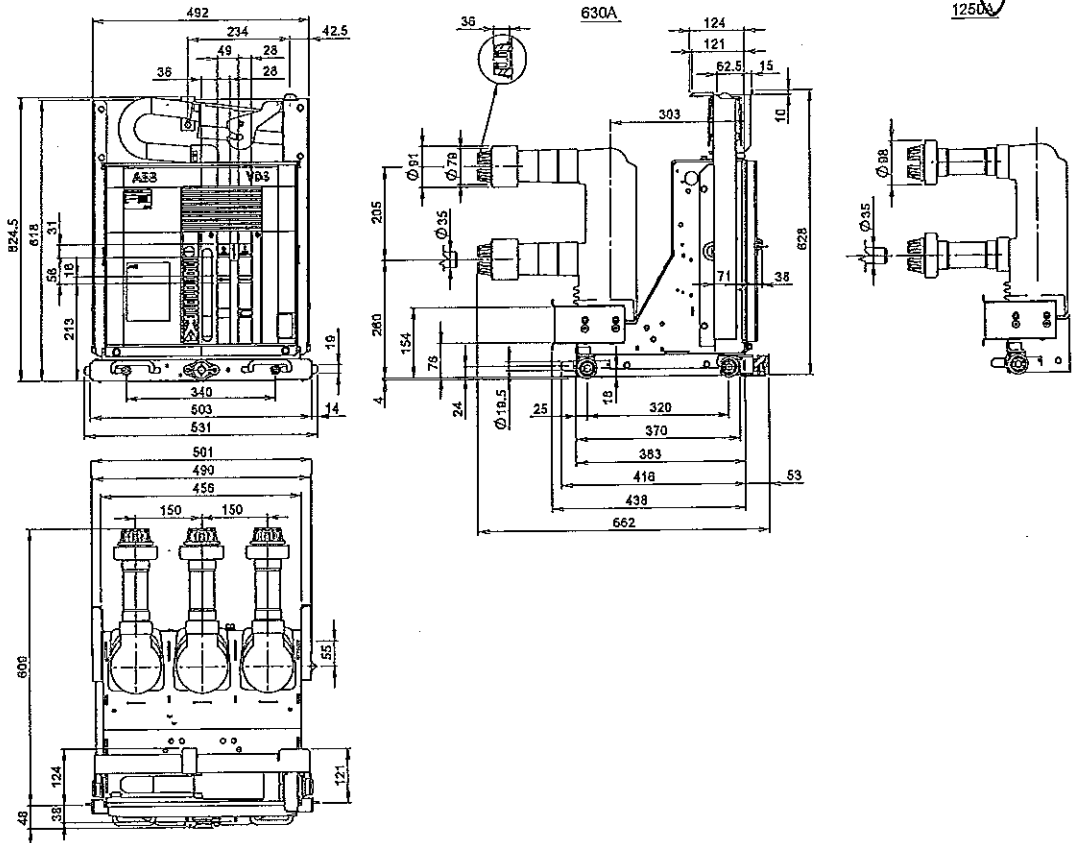
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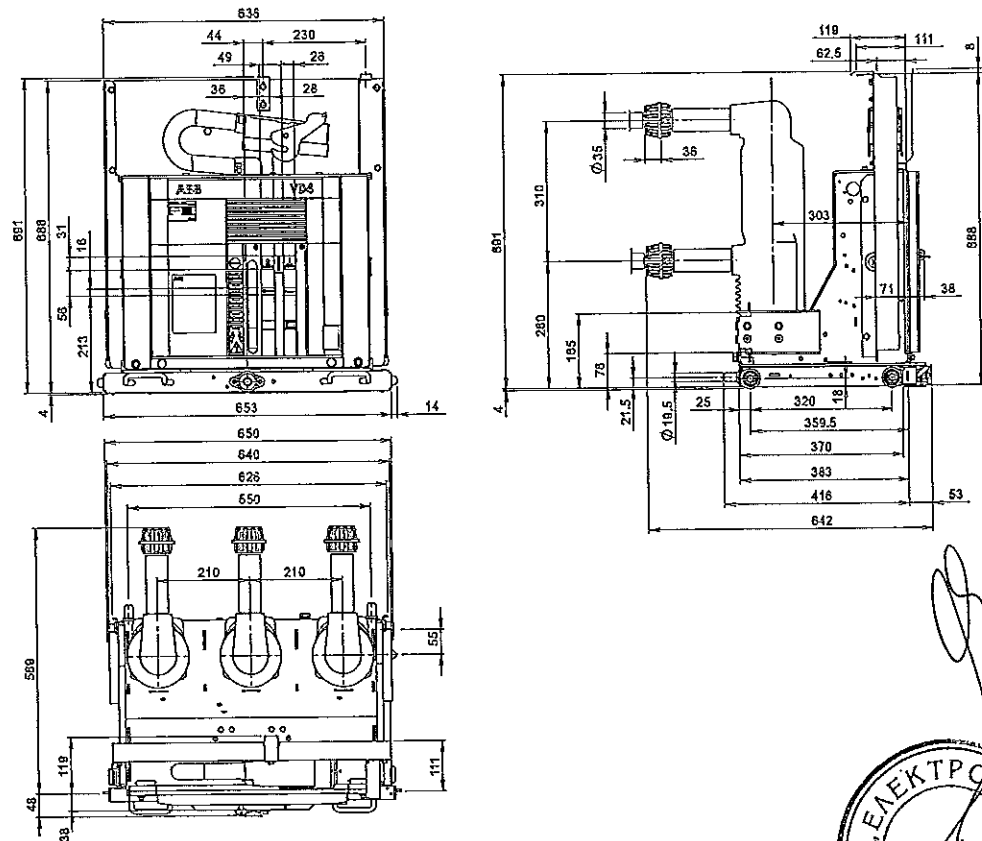
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	7412
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	31.5 kA



Withdrawable circuit-breakers for PowerCube modules

VD4/W	
TN	7420
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	16 kA
	25 kA
	31.5 kA



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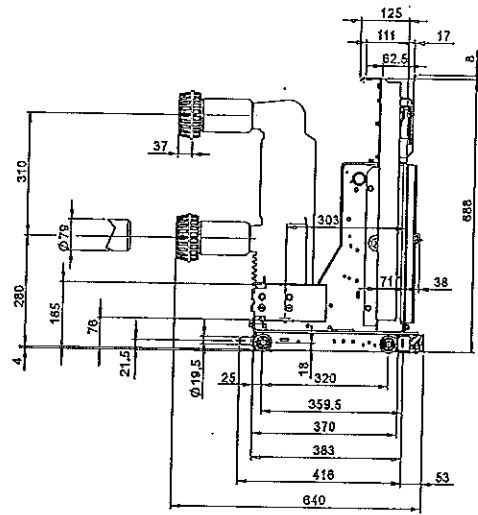
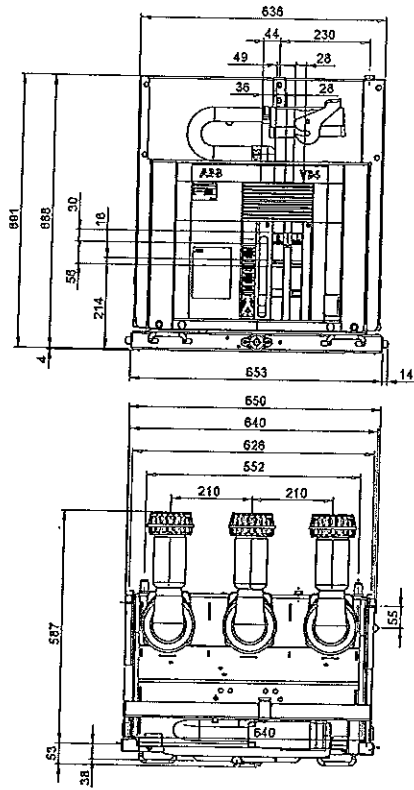
ВАРНО С ОРГИНАЛА



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

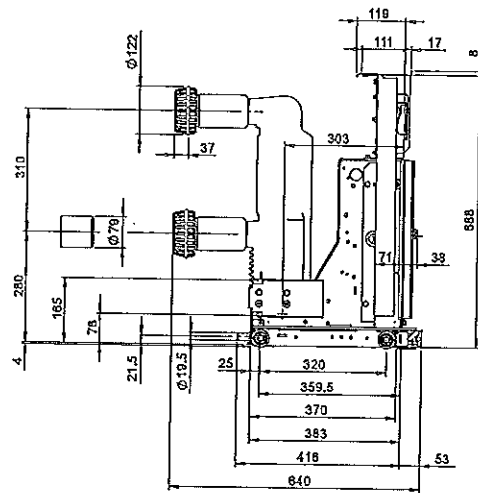
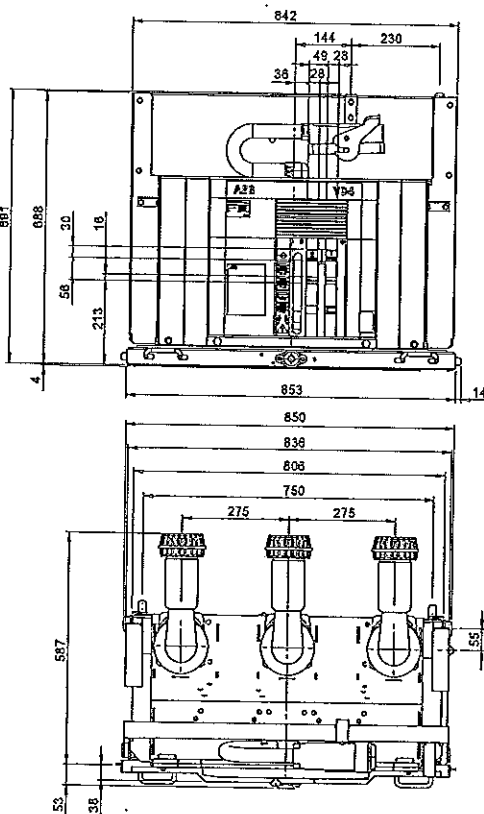
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VD4/P	
TN	1VCD003284
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	1VCD003286
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	40 kA

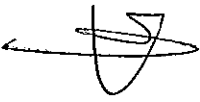


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Stamp: ВЯРНО С ОРИГИНАЛА

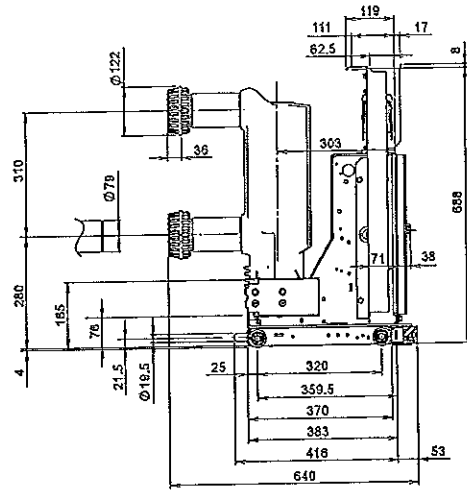
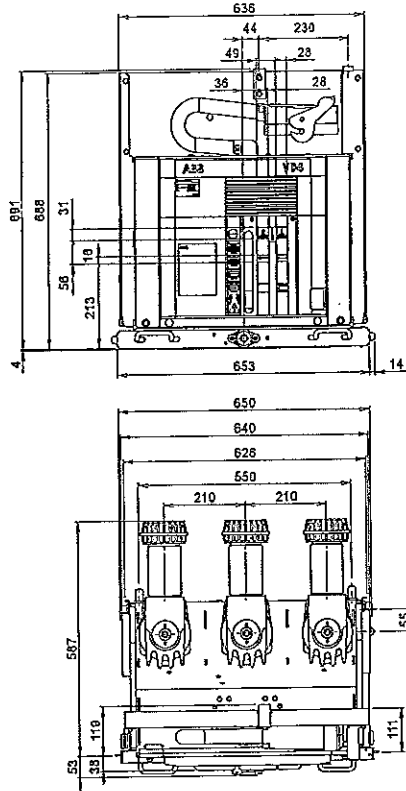
78 *Handwritten signature*



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	7415
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	20 kA
	31.5 kA

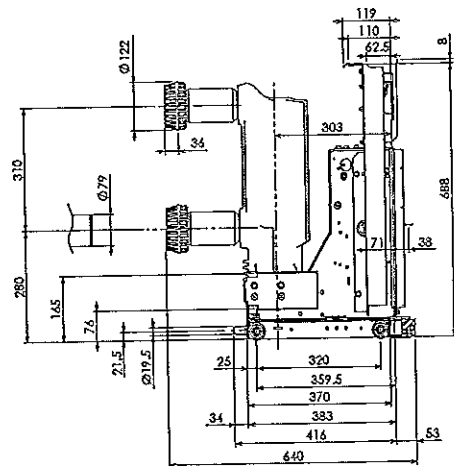
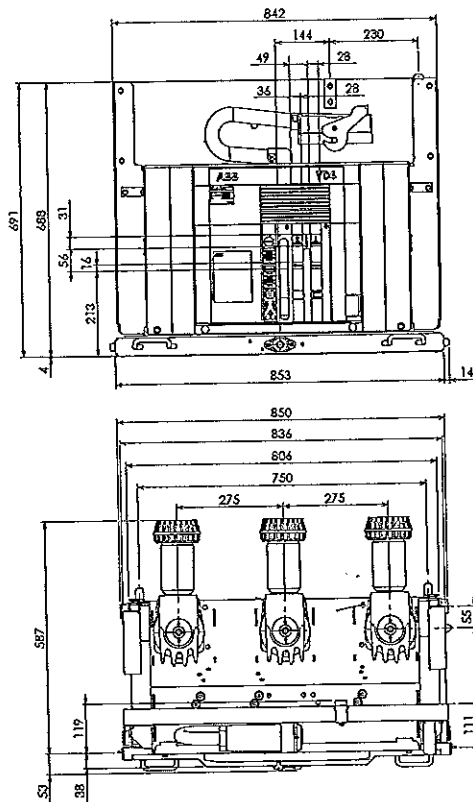
VD4/P	
TN	7415
Ur	12 kV
	17.5 kV
Ir	2000 A
Isc	40 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	7416
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	20 kA
	31.5 kA

VD4/P	
TN	7416
Ur	12 kV
	17.5 kV
Ir	2000 A
Isc	40 kA

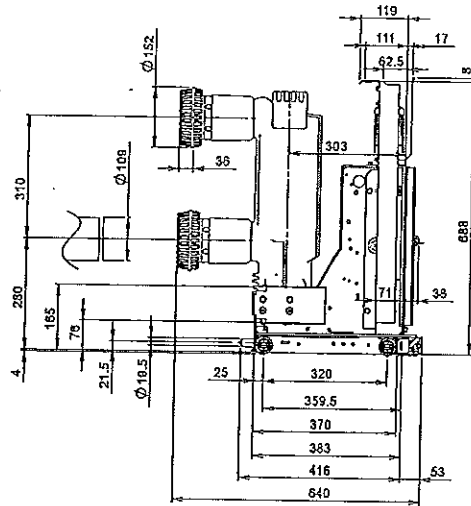
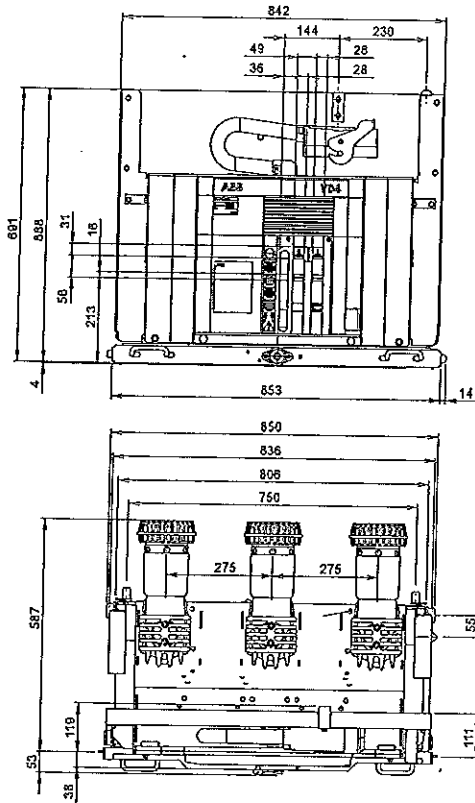


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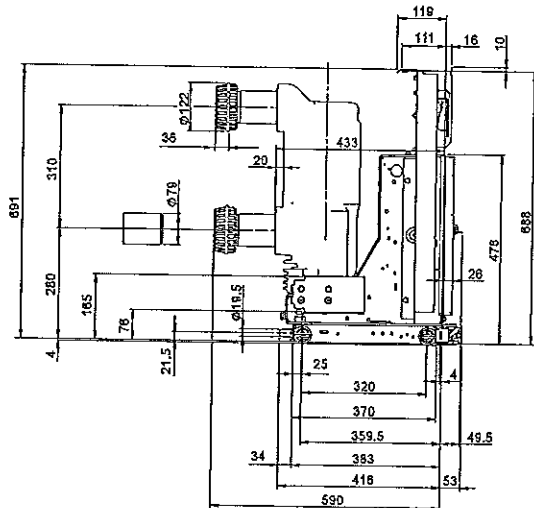
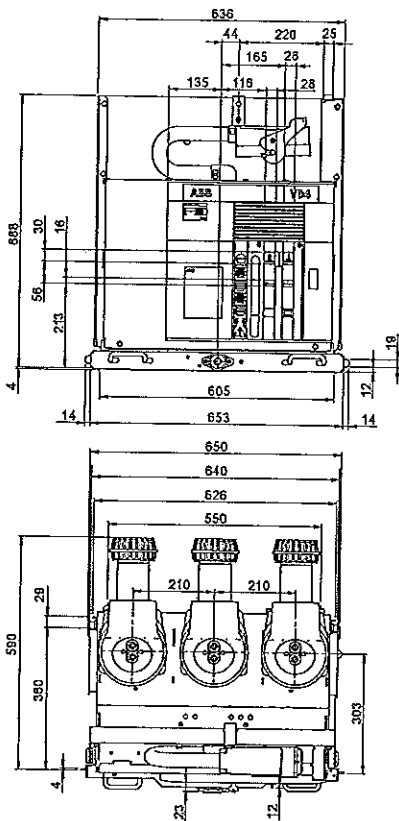
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	7417
Ur	12 kV
	17.5 kV
Ir	2500 A
	20 kA
Isc	25 kA
	31.5 kA
	40 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	1VCD003444
Ur	12 kV
	17.5 kV
Ir	1250 A
	1600 A
Isc	2000 A
	50 kA

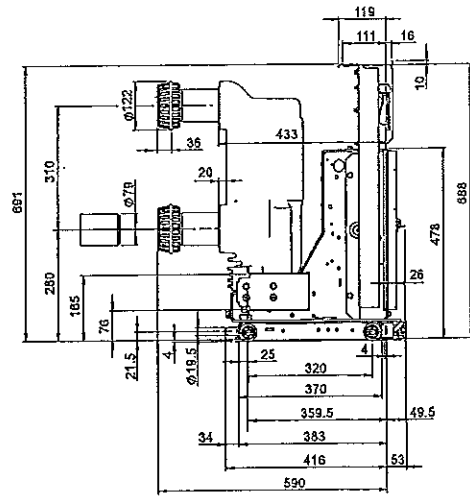
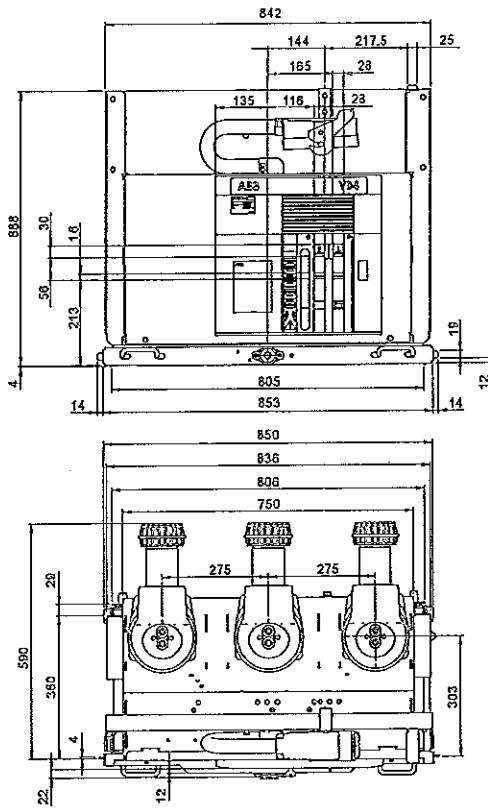


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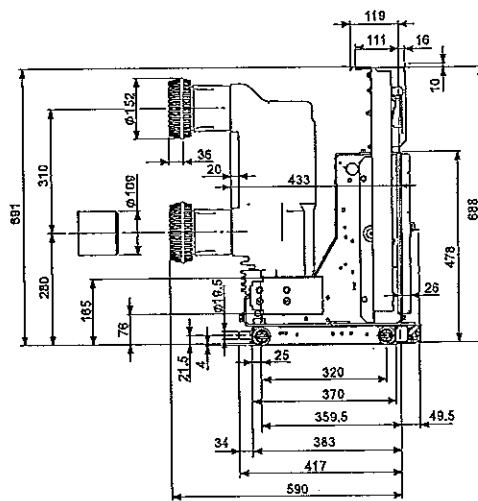
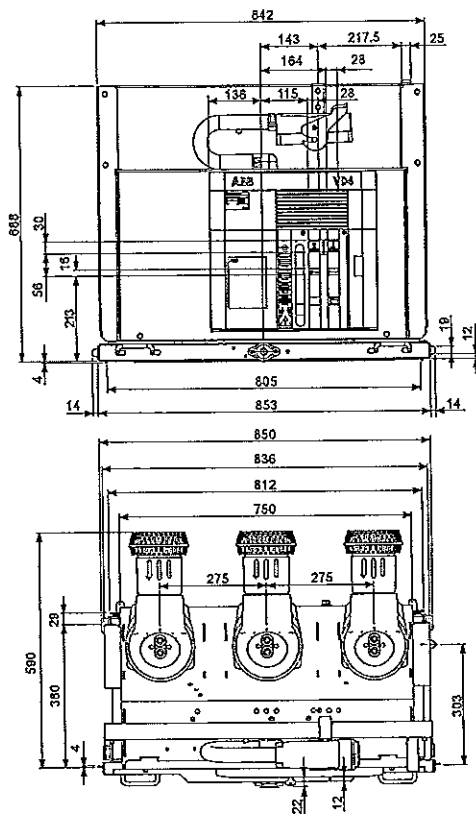
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	1VCD003445
Ur	12 kV
	17.5 kV
Ir	1600 A
	2000 A
Isc	50 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	1VCD003446
Ur	12 kV
	17.5 kV
Ir	2500 A
Isc	50 kA



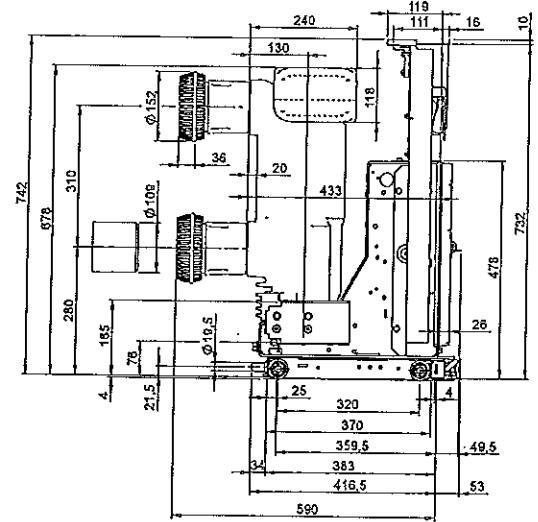
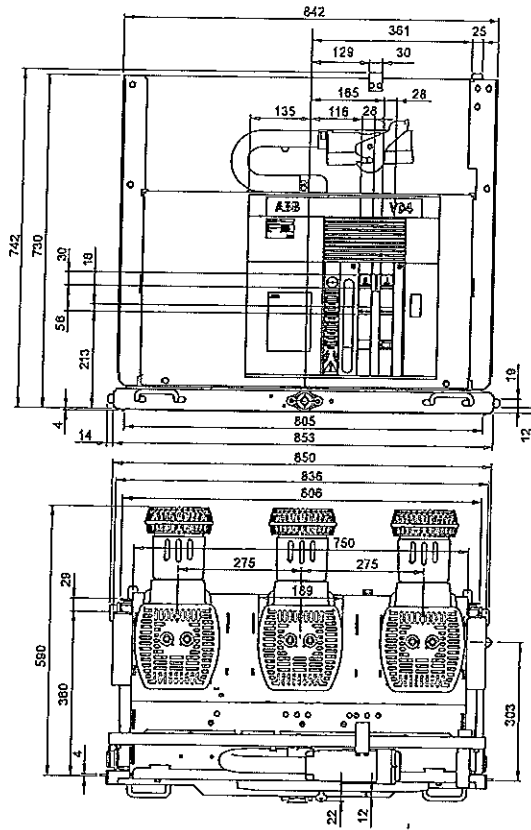
ВЕРНО С ОРИГИНАЛА



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Withdrawable circuit-breakers for PowerCube modules

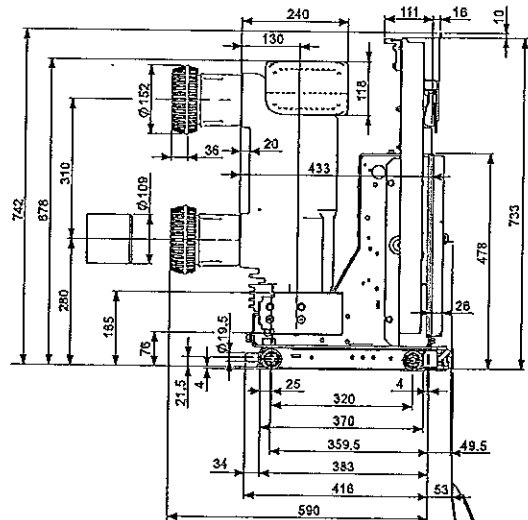
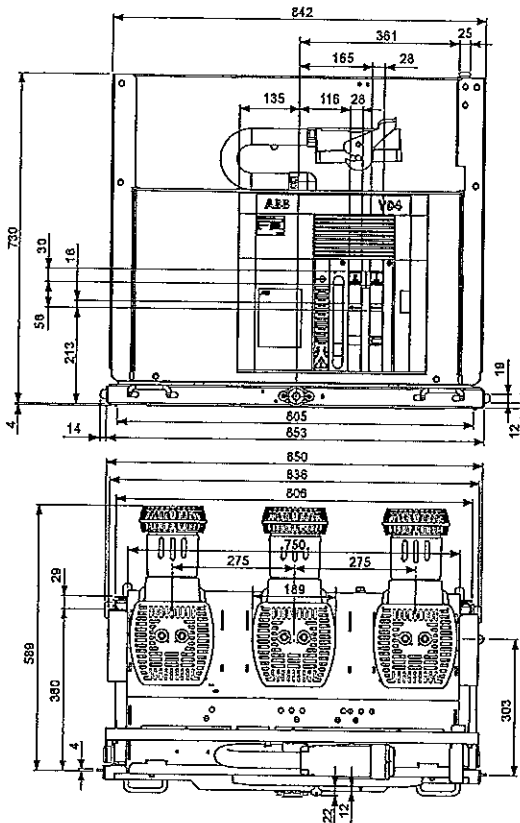
VD4/W	
TN	1VCD003596
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	50 kA



(*) 4000 A with forced ventilation.

Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD003447
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	50 kA



(*) 4000 A with forced ventilation.

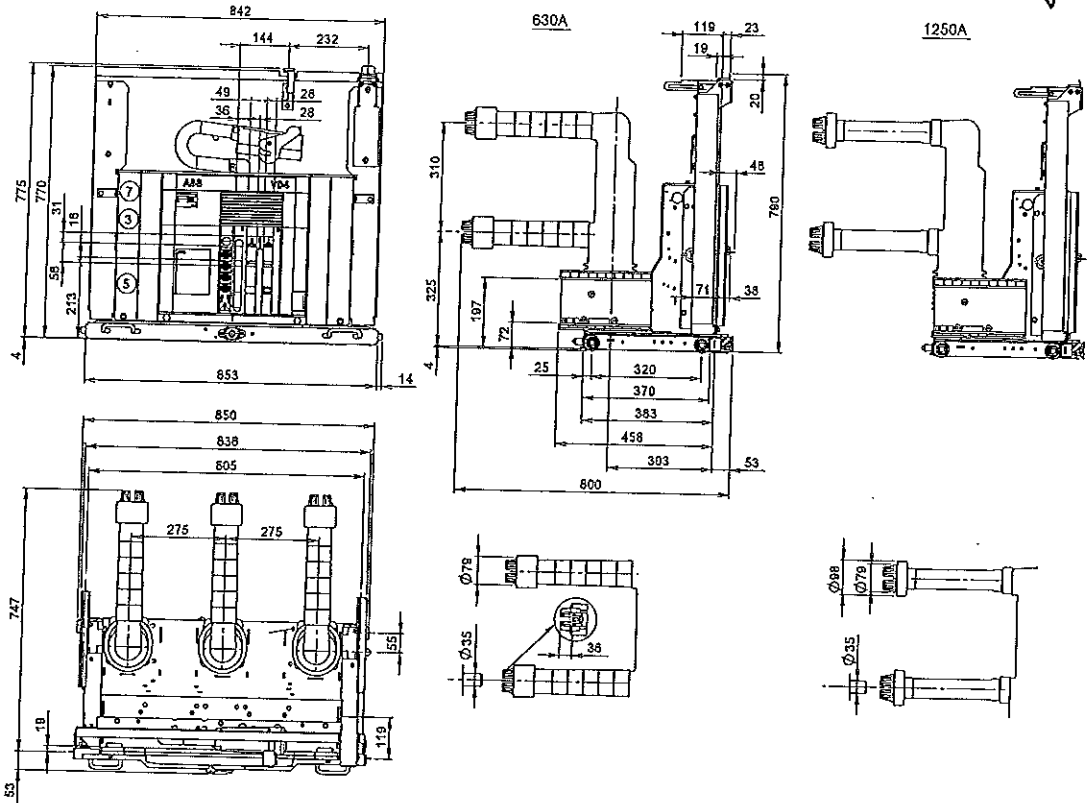
82 *Handwritten signature*

ИДНО С ОПРИНАЛА



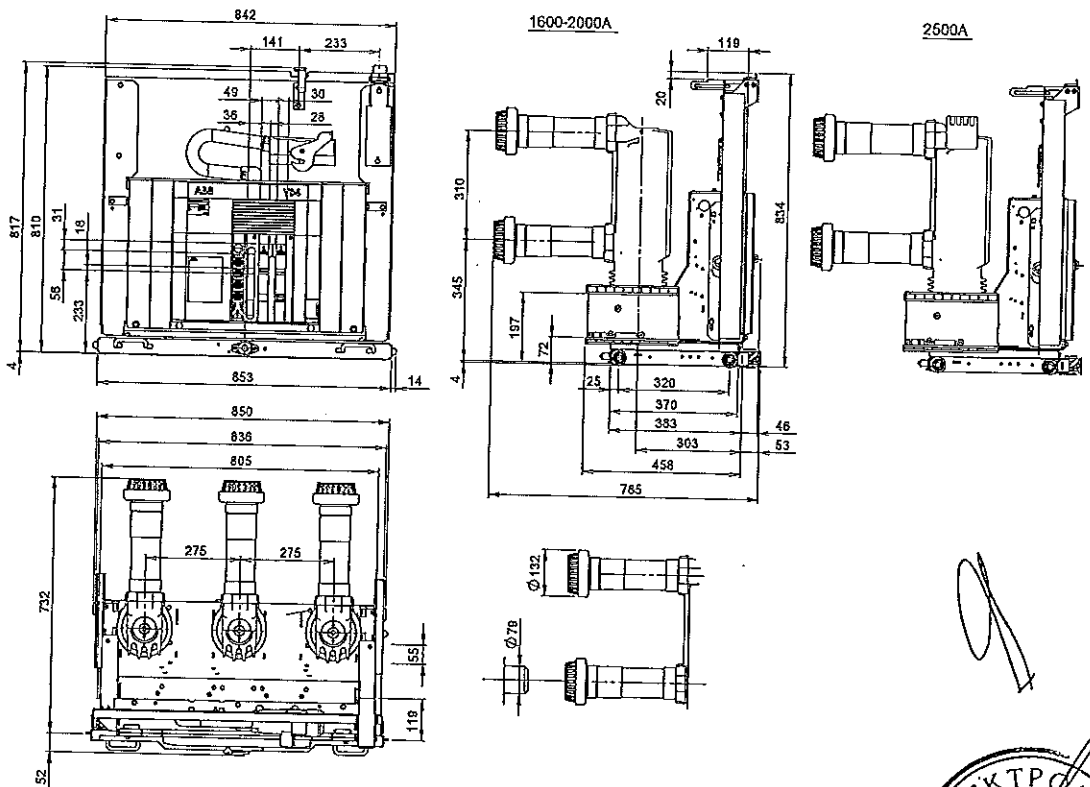
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	7414
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	7418
Ur	24 kV
Ir	1600 A
	2000 A
	2500 A ⁽¹⁾
Isc	16 kA
	20 kA
	31.5 kA

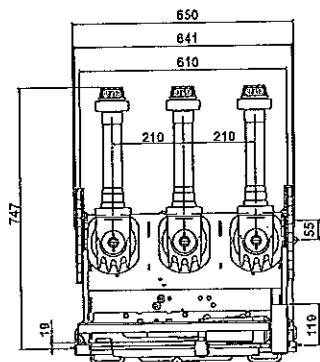
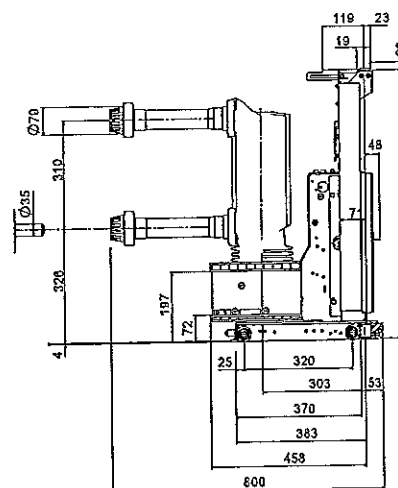
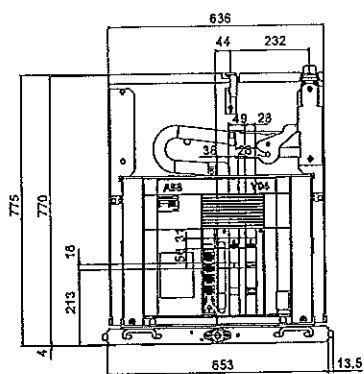


(1) The rated uninterrupted current of 2300 A is guaranteed with natural ventilation. The rated uninterrupted current of 2500 A is guaranteed with forced ventilation.



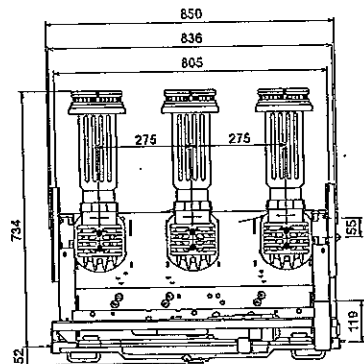
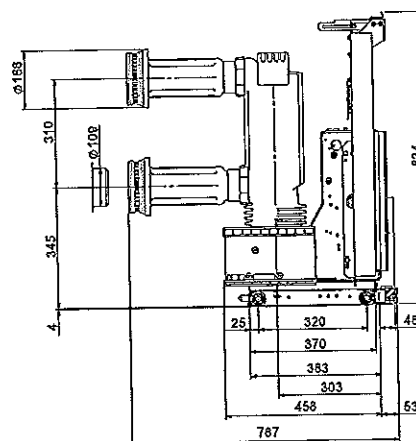
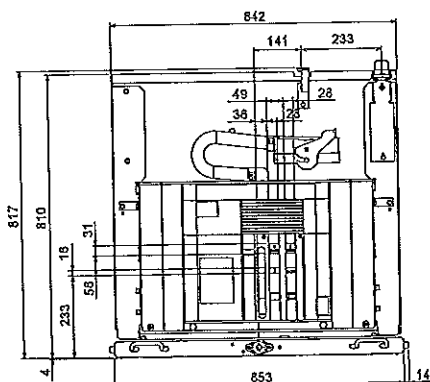
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD000173
Ur	24 kV
Ir	1250 A
Isc	31.5 kA



Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD000177
Ur	24 kV
Ir	2700 A
Isc	31.5 kA

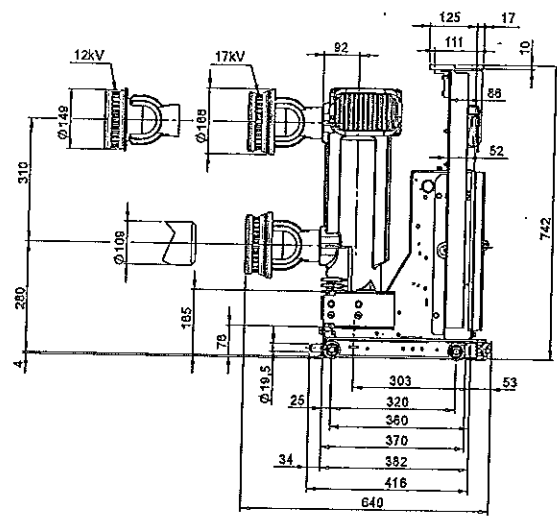
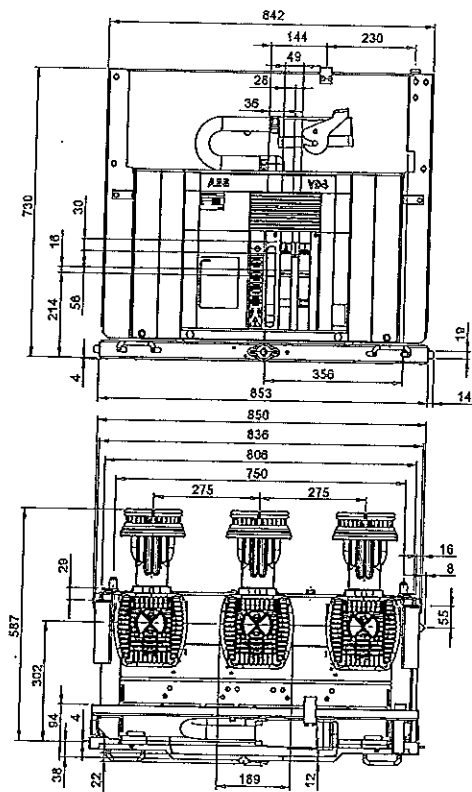


ВАРНО С ОРИГИНАЛОМ



Withdrawable circuit-breakers for PowerCube modules

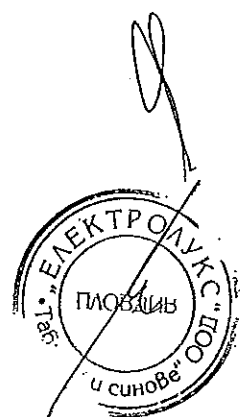
VD4/W	
TN	1VCD000152
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	20 kA
	25 kA
	31.5 kA
	40 kA



(*) 4000 A with forced ventilation.

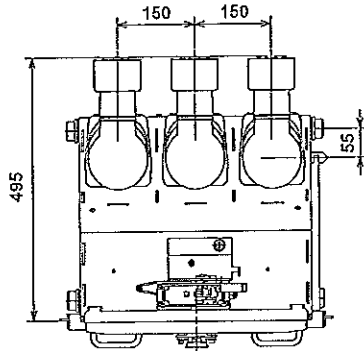
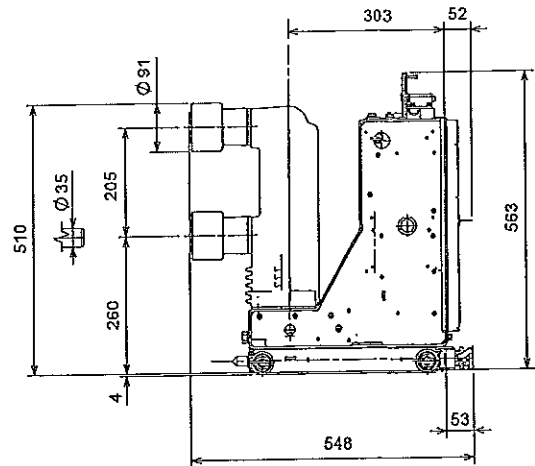
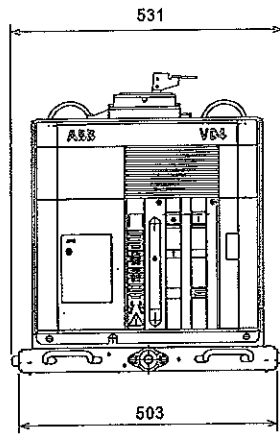
86

ВАЖНО С ОРИГИНАЛА



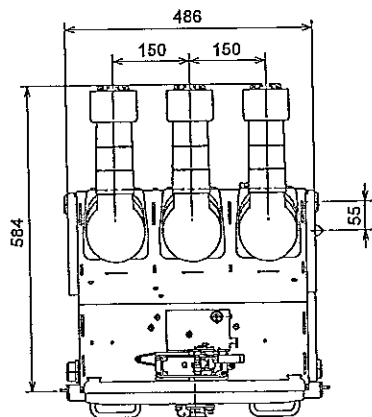
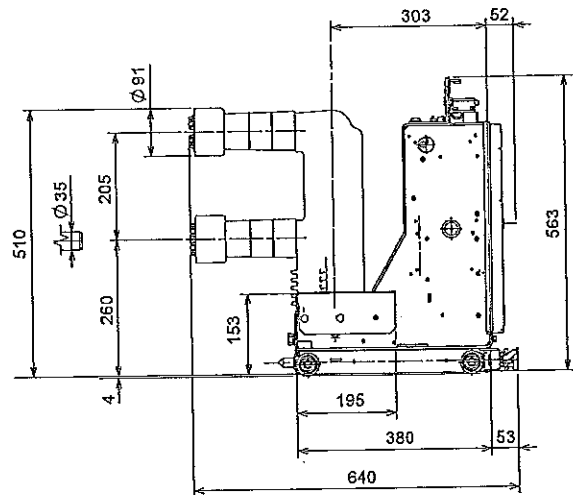
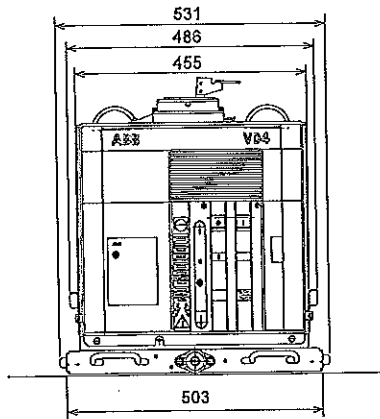
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8		
TN	1VCD000092	
Ur	12	kV
Ir	630	A
Isc	20	kA
	25	kA



Withdrawable circuit-breakers for ZS8.4 switchgear

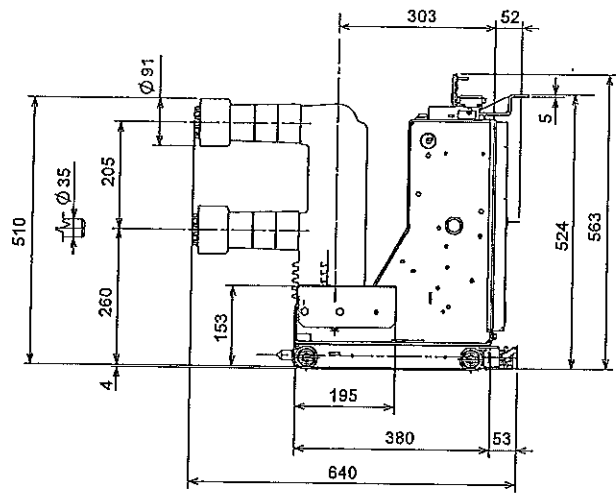
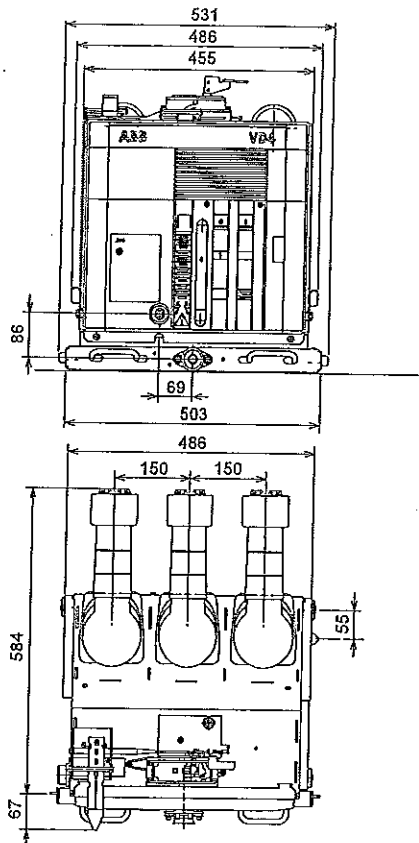
VD4/ZT8		
TN	1VCD000093	
Ur	12	kV
Ir	630	A
Isc	20	kA
	25	kA



ВЭБ Г. ОРНИНА

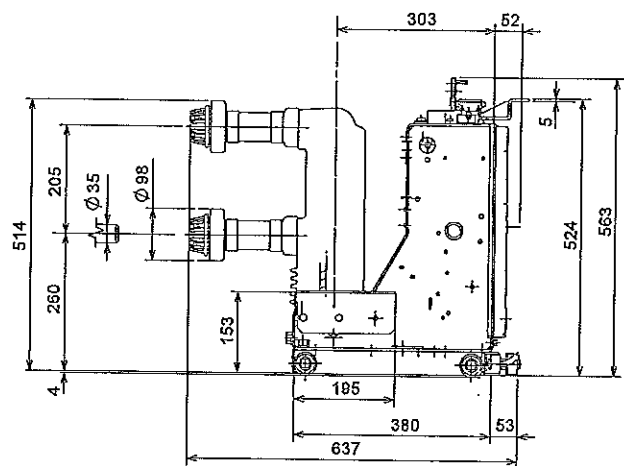
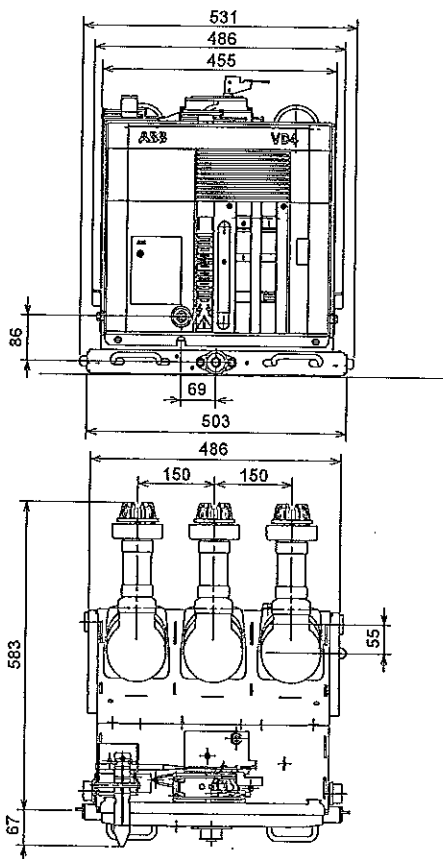
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000091
Ur	12 kV
Ir	630 A
Isc	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000133
Ur	12 kV
Ir	1250 A
Isc	20 kA
	25 kA



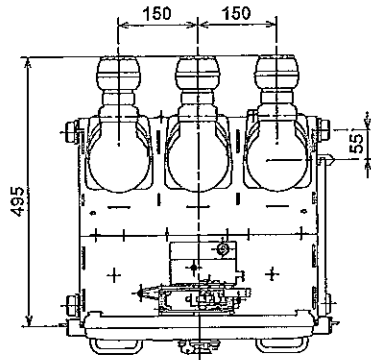
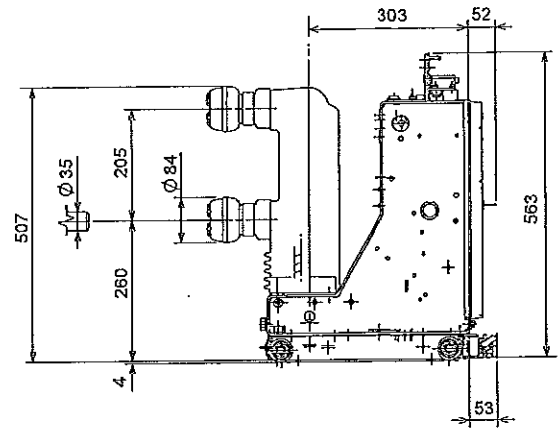
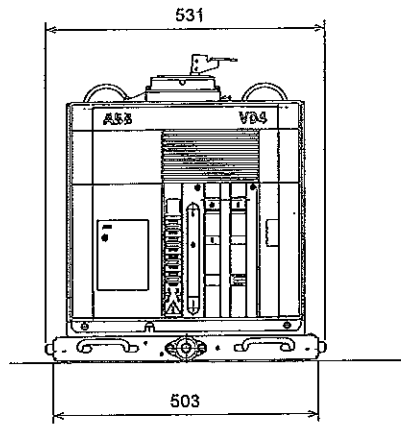
88
Cry

РЕДАКЦИЯ С ОРИГИНАЛА



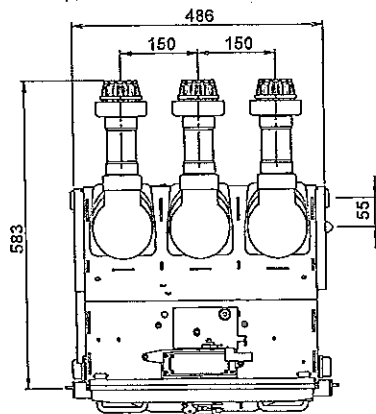
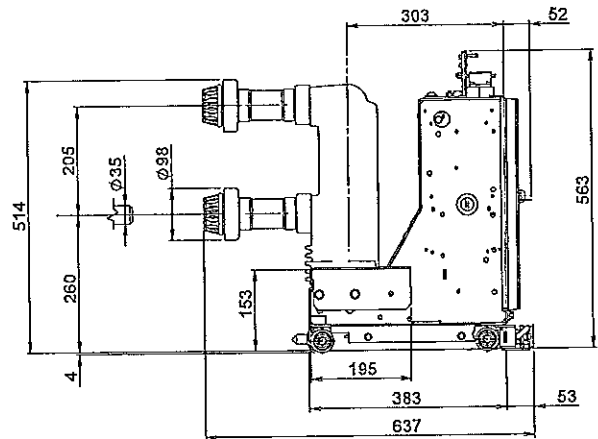
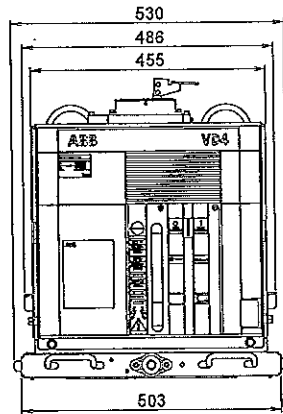
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8		
TN	1VCD000137	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	20	kA
	25	kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8		
TN	1VCD000134	
Ur	12	kV
	17.5	kV
Ir	630	A
	1250	A
Isc	20	kA
	25	kA

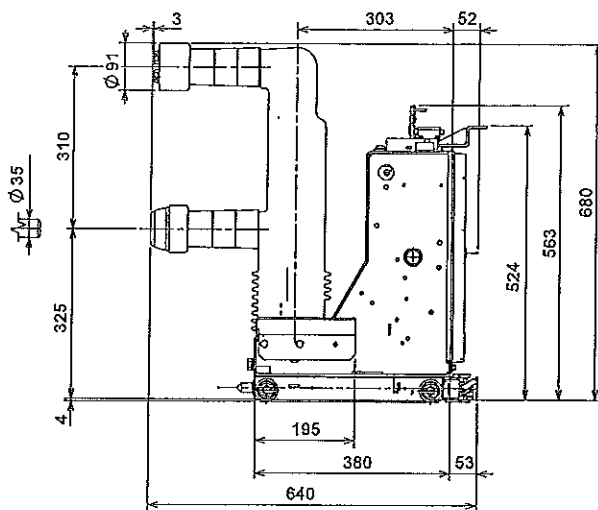
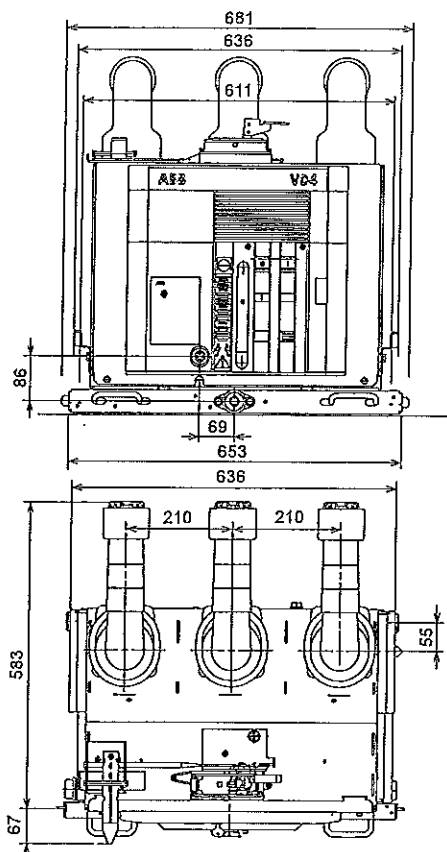


ВАРНО С ОПРИТНАТА



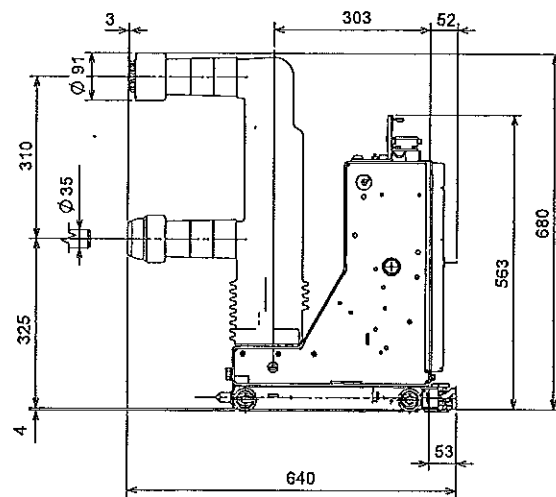
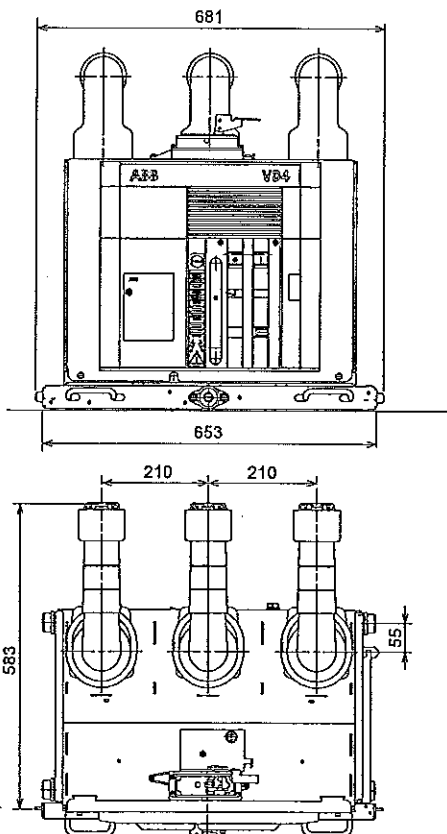
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000088
Ur	24 kV
Ir	630 A
	16 kA
Isc	20 kA
	25 kA



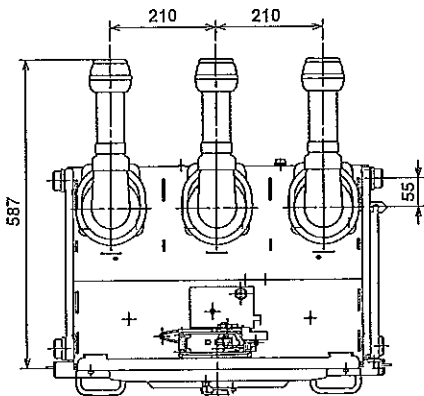
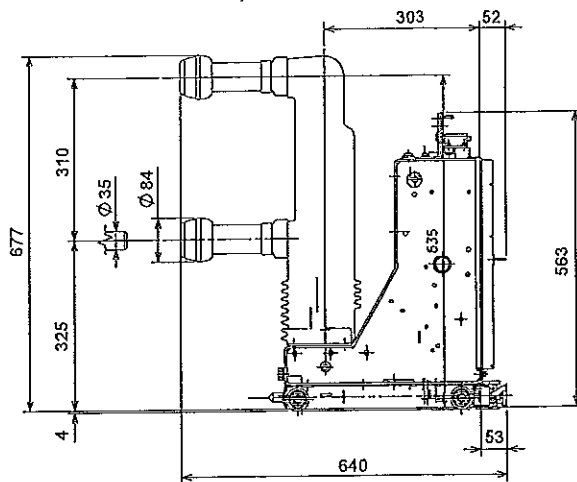
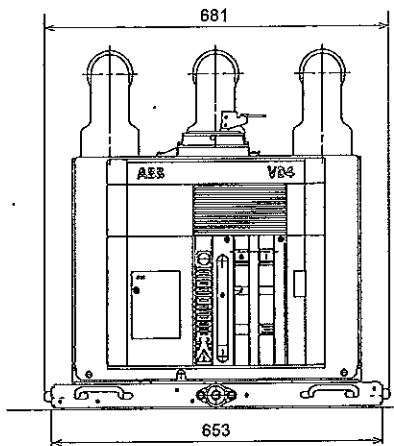
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8	
TN	1VCD000089
Ur	24 kV
Ir	630 A
	16 kA
Isc	20 kA
	25 kA



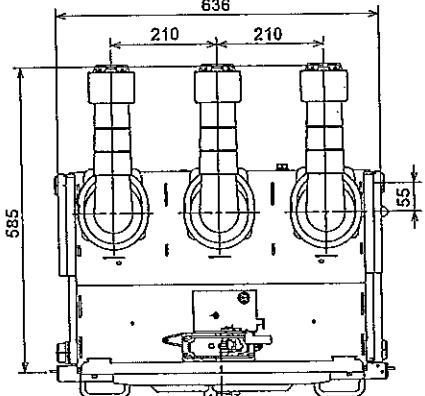
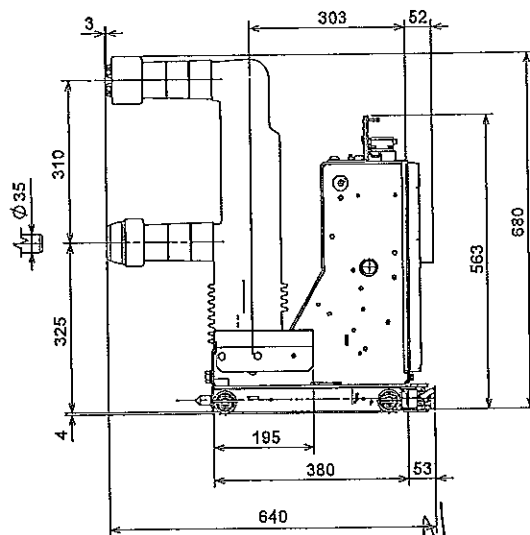
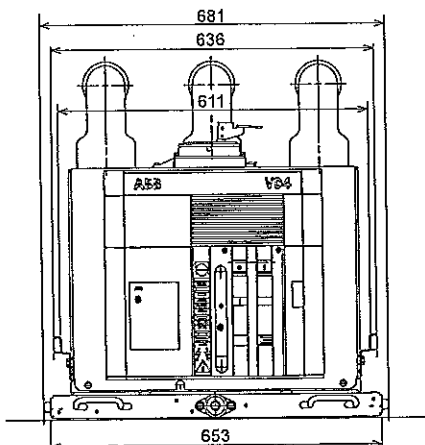
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8	
TN	1VCD000138
Ur	24 kV
Ir	1250 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000090
Ur	24 kV
Ir	630 A
Isc	16 kA
	20 kA
	25 kA

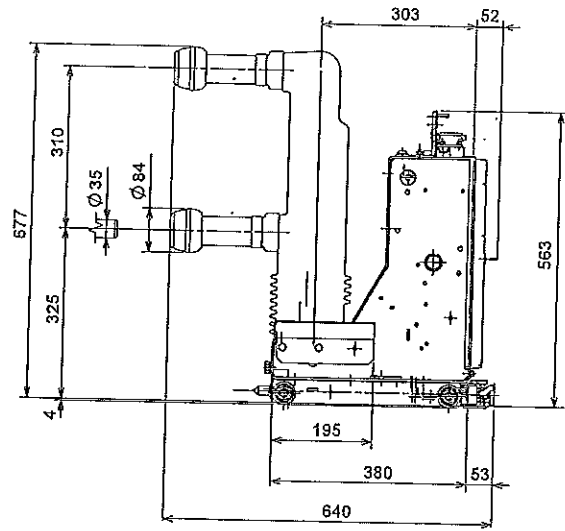
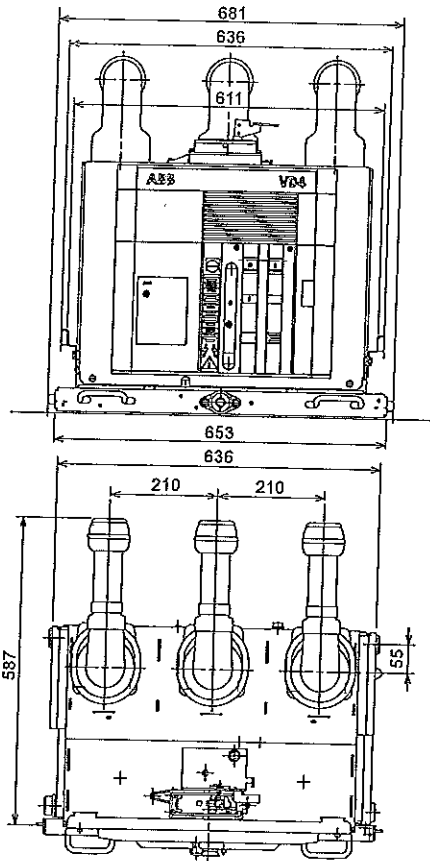


ВІДПОВІДАЄ

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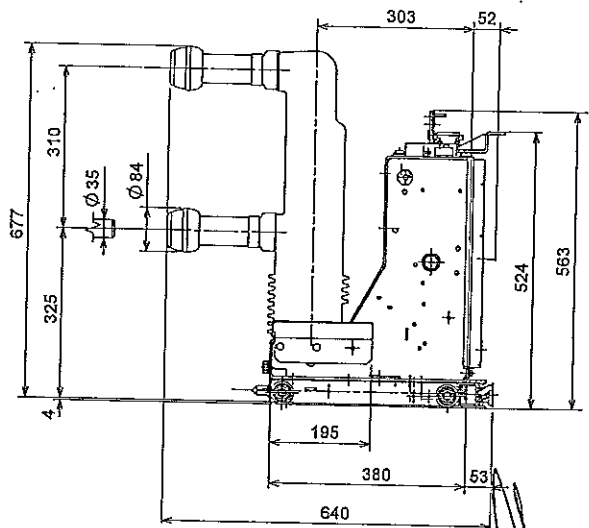
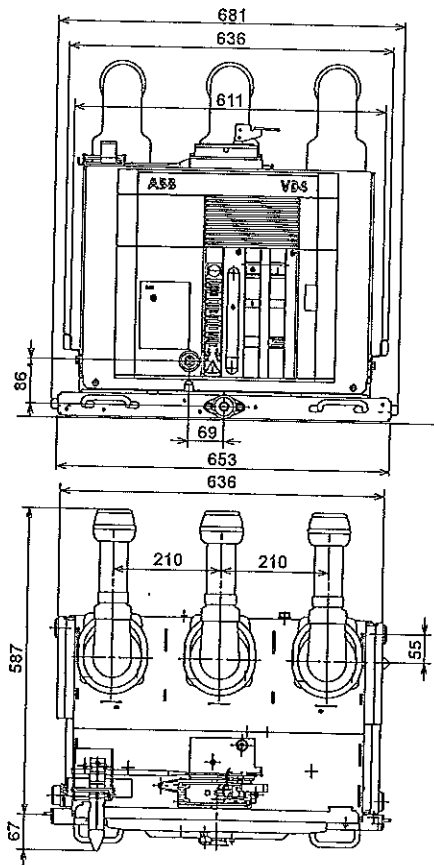
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000136
Ur	24 kV
Ir	1250 A
	16 kA
Isc	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8	
TN	1VCD000135
Ur	24 kV
Ir	1250 A
	16 kA
Isc	20 kA
	25 kA



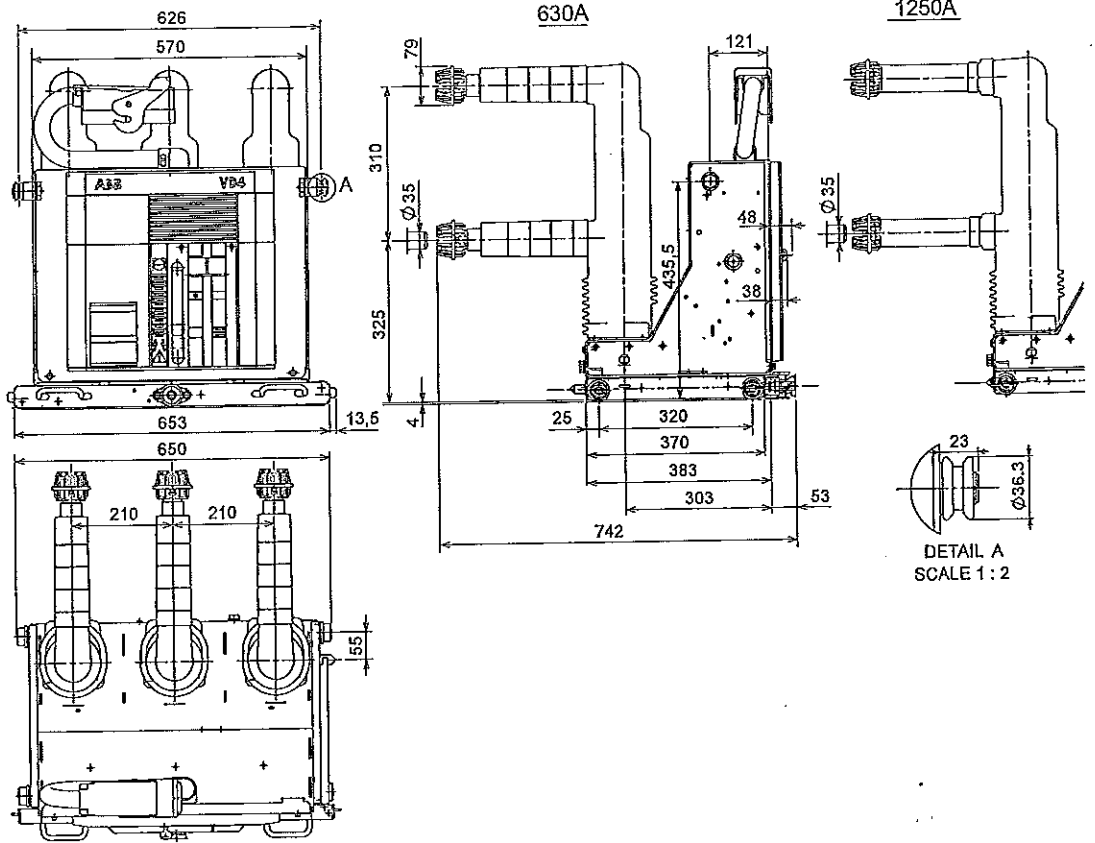
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ВЯРНО С ОРИГИНАЛА



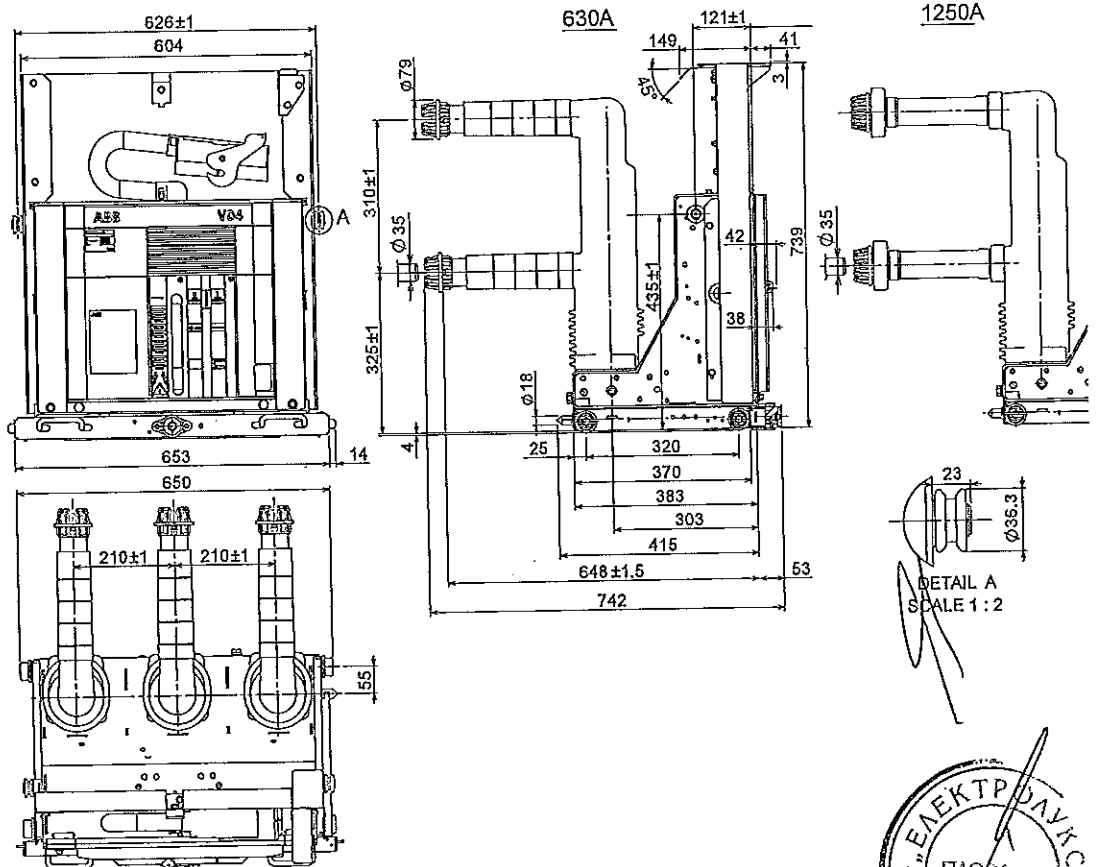
Withdrawable circuit-breakers for UniSwitch / UniMix switchgears

VD4/US	
TN	1VCD000047
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for UniSec switchgears

VD4/SEC	
TN	1VCD000190
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA

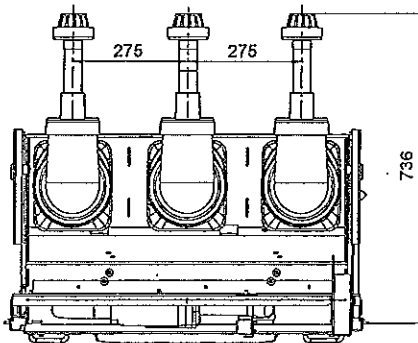
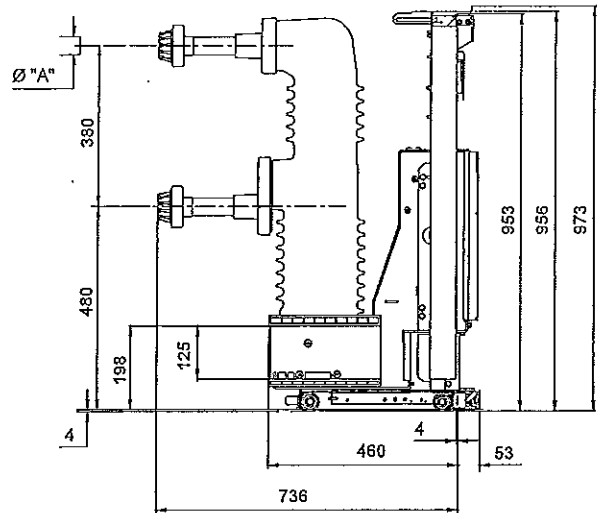
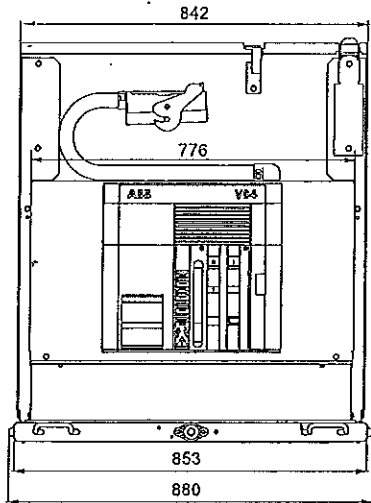


ВЕРНО С ОРИГИНАЛОМ



Withdrawable circuit-breakers for UniGear ZS2 switchgear and PowerCube modules (36 kV)

VD4	
TN	1VYN300901-KG
Ur	36 kV
	1250 A
Ir	1600 A
	2000 A
Isc	31.5 kA



Breaker type	\varnothing A mm
VD4 36.12.32	35
VD4 36.16.32 - VD4 36.20.32	79

ВЯРНО С ОРГИНАЛА



14. Product quality and environmental protection

The apparatus are produced in compliance with the requirements of international standards for the quality management system and environmental management system. In these fields, the excellent level is proved by quality certificates according to ISO 9001 and by the EMS according to ISO 14 001.

End of life of product

The ABB company is committed to complying with the relevant legal and other requirements for environment protection according to the ISO 14 001 standard.

The duty of company is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

Methods of disposal

Disposal can either be carried out thermally in an incineration plant or by storing on a waste site.

RAW MATERIAL	RECOMMENDED METHOD OF DISPOSAL
Metal material (Fe, Cu, Al, Ag, Zn, W, others)	Separation and recycling
Thermoplasts	Recycling or disposal
Epoxy resin	Separation of metal material and the disposal of rest
Rubber	Disposal
Oil as dielectric (transformer oil)	Draining from equipment and further recycling or disposal
Packing material – wood	Recycling or disposal
Packing material – foil	Recycling or disposal



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For more information please contact:

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Power Products Division
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Tel.: +39 035 6952 111
Fax: +39 035 6952 874
E-mail: info.mv@it.abb.com

ABB AG
Calor Emag Medium Voltage Products
Oberhausener Strasse 33
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Phone: +49(0)2102/12-1230, Fax: +49(0)2102/12-1916
E-mail: powertech@de.abb.com
www.abb.com

The data and illustrations are not binding. We reserve the right to make changes without notice in the course of technical development of the product.

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647654/011 - Rev. Y. en - Instruction M1 - 2014.03 (VD4 up to 36 kV; up to 50 kA) (gs)(b)

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ВЪРНО С ОРИГИНАЛА

Power and productivity for better world



Приложение 1.2 - Типови_изпитания

ВЯРНО С ОРИГИНАЛА



ABB Trasmissione & Distribuzione S.p.A.

Unità operativa Sace T.M.S.



Via Friuli 4
124044 - Dalmine (BG)
Italy

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Fax: 0039.035.395874
E-mail: sacetms.tipm@it.abb.com
Internet: www.abb.com

TYPE TEST DOCUMENTATION No. 100089_C Page 1/1

Apparatus: Metal-clad switchgear type ZS1 rel 1.2 with vacuum circuit-breaker type VD4/P 24.12.20 p=275

Identification: 1VCP0000138-Rev.-,en-Technical catalogue-2003-04

Performances:

Rated voltage :	24	kV
Rated lightning impulse withstand voltage :	125	kV
Rated power-frequency withstand voltage :	50	kV
Rated frequency :	50-60	Hz
Rated normal current (busbar) :	1250	A
Rated normal current (tee-off) :	1250	A
Rated peak withstand current :	63	kA
Rated short-time withstand current :	20	kA
Rated duration of short circuit :	3	s

Test reports verifying rating assigned by the manufacturer:

Performances	Test according to	Test reports	
		No.	Issued by
Dielectric test	IEC 60298 Subclause 6.1	0045 Ra	PEHLA High-power Laboratories
Temperature-rise test	IEC 60298 Subclause 6.3/6.4	HZ 236 E06	Calor Emag Laboratories
Short-time and peak withstand current test	IEC 60298 Subclause 6.5	HZ 235 F01	Calor Emag Laboratories
Mechanical operation and interlock test	IEC 60298 Subclause 6.102	MZ 235 A01	Calor Emag Laboratories
Internal arc test	IEC 60298 Annex AA	HZ 235 L02	Calor Emag Laboratories
Mechanical operation test	IEC 62271-100 subclause 6.101.2	0311 Ra	PEHLA High-power Laboratories
Making and breaking capacity test	IEC 62271-100 subclause 6.106	0511 Ra	PEHLA High-power Laboratories

ABB T&D Unit operativa SACE T.M.S. Laboratories Dalmine are accredited according UNI CEI EN ISO/IEC 17025 by SINAL under Reg. No. 0253
 ABB Calor Emag Laboratories Ratingen are accredited according UNI CEI EN ISO/IEC 17025 by DATech under Reg. No. DAT-P-032/93
 PEHLA High-power Laboratories are accredited according UNI CEI EN ISO/IEC 17025 by DATech under Reg. No. DAT-P-032/93 and certificate D-PL-12072-06-01
 CESI Laboratories Milano are accredited according UNI CEI EN ISO/IEC 17025 by SINAL under Reg. No. 030

Date of issue:
04/09/16

Development Dept.
G.M. Cravanzola

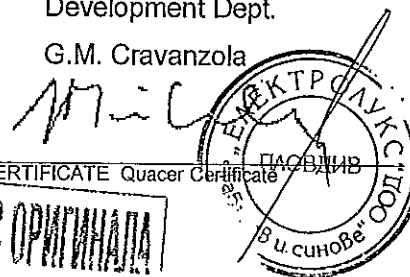


ABB T&D Unit operativa Sace T.M.S. is accredited by DET NORSKE VERITAS QUALITY CERTIFICATE Quacer Certificate No. CERT-07978-2001-AQ-MIL-SINCERT/B according to ISO 9001.

ВЕРНО С ОРИГИНАЛА



АББ Трансмисионе & Дистрибузионе С.п.А. Унита Оператива Саче Т.М.С.

Виа Фриули 4
I 24044 – Далмине (BG)
Италия

тел.: 0039.035.395111
факс: 0039.035.395874
E-mail: sacetms.tipm@it.abb.com
интернет: www.abb.com

ПРОТОКОЛ ЗА ТИПОВИ ИЗПИТАНИЯ No. 100089_С СТРАНЦИ 1/1

Apparatus: КРУ тип ZS1 изд. 1.2 с вакуумнен прекъсвач тип VD4/P
24.12.20 p=275

Идентификация: 1VCP0000138-Rev.-,en-Технически каталог-2003-04

Параметри:	Номинално напрежение:	24	kV
	Ном. Издържано импулсно напрежение:	125	kV
	Ном. Издържано напрежение с 50Hz:	75	kV
	Номинална честота:	50-60	Hz
	Номинален ток на шината:	1250	A
	Номинален ток на ошиновката:	1250	A
	Ном. Издържан ток, пикова стойност:	63	kA
	Ном. Издържан кратковременен ток на к.с.:	20	kA
	Ном. Продължителност на к.с.:	3	s

Test reports verifying rating assigned by the manufacturer:

Изпитания	Тест съгласно стандарт	Тестов протокол	
		No.	Издаден от
Диелектричени изпитания	IEC 60298 Subclause 6.1	0045 Ra	ПЕХЛА Високо-мощностни лаборатории
Тест с повишаване на температурата	IEC 60298 Subclause 6.3/6.4	HZ 236 E06	АББ Калор Емаг Лаборатории
Тест за кратковременен т.к.с. и пиков т.к.с.	IEC 60298 Subclause 6.5	HZ 235 F01	АББ Калор Емаг Лаборатории в лаборатория CESI Лаб.
Механична работа и тест за блокировки	IEC 60298 Subclause 6.102	MZ 235 A01	АББ Калор Емаг Лаборатории
Тест за вътрешна дъга	IEC 60298 Annex AA	HZ 235 L02	АББ Калор Емаг Лаборатории
Тест за механична работа	IEC 62271-100 subclause 6.101.2	0311 Ra	ПЕХЛА Високо-мощностни лаборатории
Тест за способност за изкл. на т.к.с. и вкл. върху т.к.с.	IEC 62271-100 subclause 6.106	0511 Ra	ПЕХЛА Високо-мощностни лаборатории

Лабораторията на АББ Тид Унита Оператива Саче Т.М.С. в гр. Далмине е акредитирана съгласно UNI CEI EN ISO/IEC 17025 от SINAL с регионален номер Reg. No. 0253

Лабораторията на АББ Калор Емаг в гр. Ратинген, Германия е акредитирана съгласно UNI CEI EN ISO/IEC 17025 от DATech под регистрационен номер No. DAT-P-032/93

Високо-мощностните лаборатории ПЕХЛА са акредитирани съгласно UNI CEI EN ISO/IEC 17025 от DATech с регистрационен номер No. DAT-P-032/93 и сертификат Д-ПЛ-12072-06-01

ЧЕЗИ Лаборатории Милано са акредитирани съгласно UNI CEI EN ISO/IEC 17025 от SINAL с регистрационен номер Reg. No. 0030

Дата на издаване:
04/09/16

Отдел за Развойна дейност

Г.М. Граванзола



ABB T&D Unità operativa Sace T.M.S. is accredited by DET NORSKE VERITAS QUALITY CERTIFICATE Quacert Certificate No. CERT-07978-2001-AQ-MIL-SINCERT/B according to ISO 9001.

ВАРНО С ОРИГИНАЛА

PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the Short-Circuit-Testing Liaison (STL)

Test Report

Report No.: 0311 Ra Copy No.: 1 Contents: 24 Sheets

Equipment under test: Vacuum circuit-breaker type VD4 24.12.20

Manufacturer:

Circuit-breaker: ABB SACE T.M.S. S.p.A., 4 - 24044 Dalmine (BG), Italy

Pole parts inclusive

vacuum interrupters: ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen, Germany

Client: ABB T&D SpA, Divisione Sace T.M.S, 4 - 24044 Dalmine (BG), Italy

Testing station: PEHLA - Testing Laboratory Ratingen

Date of test: 03rd February 2003 - 24th February 2003

Applied test specifications:

IEC 62271-100, 1st Ed, 2001-05, clause 6.101.1 and 6.101.2
IEC 60694, Ed.2.2, 2002-01

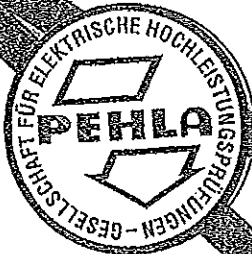
Tests performed:

In accordance with the requirements of class M2, 10 000 mechanical operating cycles without voltage on or current in the main circuit were carried out with the vacuum circuit-breaker of type VD4 24.12.20 to demonstrate the mechanical reliability.

Test results:

No changes impairing the function of the circuit-breaker were noted after the endurance test.
The vacuum circuit-breaker type VD4 24.12.20 passed the mechanical type test successfully.

GESELLSCHAFT FÜR ELEKTRISCHE
HOCHLEISTUNGSPRÜFUNGEN



Technical Committee

Mannheim, 24th February 2003

The test results relate only to the items tested.

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03PE0001

ВЪПРОС С ОПРИТИНАТА

DAT-P-032/99

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Akkreditierungs-
Rat



Accreditation

The PEHLA-Testing Laboratory Ratingen has been approved by the DATech (German accreditation body for technology) according to DIN EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-P-032/93).

Under reference to DIN EN ISO/IEC 17025 PEHLA states the following:

- The accreditation of the PEHLA-Testing Laboratory or any of its test reports by themselves in no way constitute or imply product approval by DATech or any other body.
- If someone refers to a test in an accredited PEHLA-Testing Laboratory this reference shall include the accreditation body, i.e. DATech, the relevant scope of the accreditation and the appropriate registration number.

STL-Member

PEHLA is foundation-member of the Short-Circuit Testing Liaison (STL) which has been founded in March 1969. STL is a forum for the international co-operation of the testing organisations with the further full members ASTA (GB), CESI (I), ESEF (F), KEMA (NL), SATS (N, S, AIR) and STLNA (USA). In the Framework of EC, STL has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents**A Certificate**

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test.

For these tests the equipment under test must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test.

For these tests the equipment under test must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients instructions.

Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the equipment during test, and its condition after the tests.

Addresses:

Office: PEHLA-Geschäftsstelle
Hallenweg 40
68219 Mannheim; Germany

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen; Germany

Manufacturer: ABB SACE T.M.S. S.p.A.
Via Friuli
4 - 24044 Dalmine (BG), Italy

ABB Calor Ermag Mittelspannung GmbH
Oberhausener Str. 33
40472 Ratingen, Germany

Client: ABB SACE T.M.S. S.p.A.
Via Friuli
4 - 24044 Dalmine (BG), Italy

ВАРНО С ОРЖИНАЛА



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ВЯРНО С ОРИГИНАЛА

List of Test Participants

Representatives of the Test Committee:

Mr. G. Heit PEHLA-Testing Laboratory Mannheim
Mr. U. Köster PEHLA-Testing Laboratory Ratingen

Test Operator:

Mr. M. Schöttler PEHLA-Testing Laboratory Ratingen
Mr. J. Mendorf PEHLA-Testing Laboratory Ratingen
Mr. A. Piglas PEHLA-Testing Laboratory Ratingen

Representatives of the Client:

Mr. S. Magoni ABB SACET.M.S. S.p.A., Italy



ВЯРНО С ОРИГИНАЛА

List of Drawings

The manufacturer has guaranteed, that the equipment submitted for test has been manufactured in full accordance with the following drawings. PEHLA has verified that these drawings adequately represent the equipment tested. These drawings have been stamped and signed by PEHLA representatives and are kept

- with the test documents at the test laboratory.
- at the client.

The drawings contained in this document are identical with the checked, stamped and signed drawings.

Drawing-No.	Revision	Title	Additional remarks
TN 7410	M5234 02-10-10	Vacuum Circuit Breaker Type VD4 24kV 630-1250A	Included in test report
510507	50538 02-12-13	Assieme Comando Operating Mechanism Assembly	Included in test report
GCE7004730	09	Pol vst. VD4P 24kV 1250A Pole complete VD4P 24kV 1250A	Included in test report
Parts list			
510564		Ass. molle di ch. com. EL1	—
510507		Assieme comando EL1	—
GCE7004730R0104		Pol vst. 40,7 2400N H310 2412-20 VG4	—



ВЯРНО С ОПРИМАТЕЛЯ

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Details on Performance of the Test

Prior to the endurance test, the following electrical and mechanical data were determined by measurements on the circuit-breaker and its auxiliary systems:

- a) closing time (5 times *)
- b) opening time (5 times *)
- c) time spread between units of one pole - not applicable
- d) time spread between poles (5 times *)
- e) charging time of the motorized operating mechanism (5 times *)
- f) consumption of the motorized operating mechanism (5 times *)
- g) consumption of the tripping devices (5 times *)
- h) duration of opening and closing command impulse
- i) tightness
- j) gas densities or pressures - not applicable
- k) resistance of the main circuit (5 times *)
- l) time-travel chart (5 times *)
- m) other important characteristics
 - contact travel
 - check of vacuum of interrupters
 - verification of the rated operating sequence (refer to clause 6.101.2.5 a))
 - ambient atmospheric conditions

*) 5 times at rated, minimum and maximum supply voltage.

The subsequent endurance test comprising 10 000 mechanical operating cycles was structured as follows and carried out five times:

- 500 operating cycles with operating sequence C - 90 s - O - 90 s at the minimum supply voltage of closing and opening devices and motorized operating mechanism and the minimum pressure for operation
- 500 operating cycles with operating sequence C - 90 s - O - 90 s at the rated supply voltage of closing and opening devices and motorized operating mechanism and the rated pressure for operation
- 500 operating cycles with operating sequence C - 90 s - O - 90 s at the maximum supply voltage of closing and opening devices and motorized operating mechanism and at the maximum pressure for operation
- 250 operating cycles with operating sequence C - 90 s - O - 300 ms - CO - 270 s at the rated supply voltage of closing and opening devices and motorized operating mechanism and at the rated pressure for operation

After each series of 2 000 operating sequences the operating characteristics: a), b), d), e), and l) as listed above have been recorded.

Following the endurance test, the measurements carried out before the mechanical endurance test were measured again for comparison. Check, whether the travel characteristics fell within the envelope curves, taken before the endurance test.



ВЯРНО С ОПРИГИНАЛА

Results of measurements before the mechanical endurance test

Number of operations: counter: 00035

a/b) Opening and closing time:

Rated supply voltage of closing and opening devices: $U_a = 110 \text{ V DC}$
 Operating time [ms]

measured during the 5 x CO operations
 - at the minimum supply voltage
 - at the rated supply voltage
 - at the maximum supply voltage

U [M]	t_o (opening)			t_c (closing)		
	0.7 x U_a	1.0 x U_a	1.1 x U_a	0.85 x U_a	1.0 x U_a	1.1 x U_a
	80.4	53.1	50.4	72.3	66.0	63.3
	79.8	53.4	50.1	72.3	66.3	63.3
t [ms]	79.8	53.4	50.1	72.3	66.0	63.3
	79.8	53.4	50.1	72.3	66.0	63.6
	80.4	53.4	50.1	72.3	66.0	63.3

d) Time spread between the breaker poles:

The time spread between the breaker poles on closing and on opening of the circuit-breaker was measured to $< 2 \text{ ms}$.

e/f) Charging time and power consumption of the motorized operating mechanism:

Rated supply voltage of motor charging: $U_a = 220 \text{ V DC}$

Measured values:

Measured during the 5 x CO operations
 - at the minimum supply voltage
 - at the rated supply voltage
 - at the maximum supply voltage

motor voltage	charging time after O-C operation [s]					current consumption [A]					power consumption [W]				
$U = 0.85 \times U_a = 187 \text{ V DC}$	3.57	3.71	3.71	3.78	3.71	0.95	0.97	0.98	0.98	0.97	178	181	183	183	181
$U = 1.0 \times U_a = 220 \text{ V DC}$	2.94	3.00	2.94	2.96	2.97	0.99	0.98	0.96	0.99	0.98	218	216	211	218	216
$U = 1.1 \times U_a = 242 \text{ V DC}$	2.59	2.54	2.53	2.53	2.50	1.00	0.99	0.99	0.98	0.97	242	240	240	237	234



ВАРНО С ОПРИГИНАЛА!

g) Consumption of the tripping devices:

Measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

Rated operating voltage U_n	Shunt-release ON YC					Shunt-release OFF YO1				
	110 V DC					110 V DC				
Current at minimum supply voltage [A]	1.24	1.24	1.24	1.24	1.24	0.90	0.92	0.92	0.92	0.92
Current at rated supply voltage [A]	1.52	1.56	1.52	1.52	1.52	1.24	1.20	1.20	1.24	1.20
Current at maximum supply voltage [A]	1.68	1.72	1.72	1.72	1.68	1.36	1.36	1.36	1.36	1.36

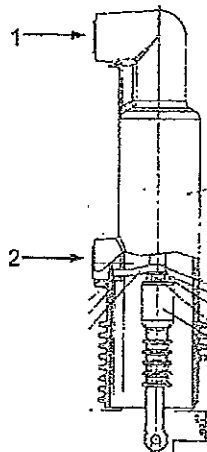
h) Duration of opening and closing command impulse:

Measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

Duration of command impulse at	Shunt-release ON YC					Shunt-release OFF YO1				
	Supply Voltage					Supply Voltage				
at minimum supply voltage [ms]	74.6	75.0	74.7	74.7	74.7	80.7	80.1	80.4	84.9	80.4
at rated supply voltage [ms]	70.5	69.6	69.3	69.3	69.3	54.9	54.9	54.9	54.9	54.9
at maximum supply voltage [ms]	67.2	67.2	67.5	67.5	67.5	52.5	52.2	52.2	51.9	52.2

k) Resistance of the main conductors:

Measuring points:



ВЯРНО С ОРГИНАЛА



Contact resistance measured during the 5 x CO operations at the minimum supply voltage of the coils:

Measuring points	L1					L2					L3				
	$\mu\Omega$					$\mu\Omega$					$\mu\Omega$				
1-2	16.9	16.9	16.9	17.0	17.0	16.6	16.6	16.6	16.6	16.6	17.1	17.2	17.2	17.2	17.2

Contact resistance measured during the 5 x CO operations at the rated supply voltage of the coils:

Measuring points	L1					L2					L3				
	$\mu\Omega$					$\mu\Omega$					$\mu\Omega$				
1-2	16.9	16.9	16.9	16.9	16.9	16.6	16.6	16.6	16.6	16.6	17.2	17.2	17.2	17.2	17.2

Contact resistance measured during the 5 x CO operations at the maximum supply voltage of the coils:

Measuring points	L1					L2					L3				
	$\mu\Omega$					$\mu\Omega$					$\mu\Omega$				
1-2	17.0	16.9	17.0	17.0	17.0	16.6	16.6	16.6	16.6	16.7	17.2	17.2	17.2	17.2	17.2

l) Time-travel chart with opening and closing speed: See diagram 1.1 and 1.2

Speed in [m/s]: $U_a = 110 \text{ V DC}$
at $U = 1.0 \times U_a$

	V_{O1}		V_G
L2	1.18	1.35	0.97

The deviations from the measured mechanical time travel charts are in the allowable limits of the reference mechanical travel characteristics.

m) Other important characteristics:

▪ Contact travel:

	L1	L2	L3
Total Travel [mm]	15.0	15.0	15.1
Cont.-travel [mm]	11.3	11.3	11.2
Contact-spring travel [mm]	3.7	3.7	3.9

▪ Check of vacuum of interrupters:

60 kV DC ok

▪ Verification of the rated operating sequence:

O-0.3s-CO-3min-CO at rated voltage ok

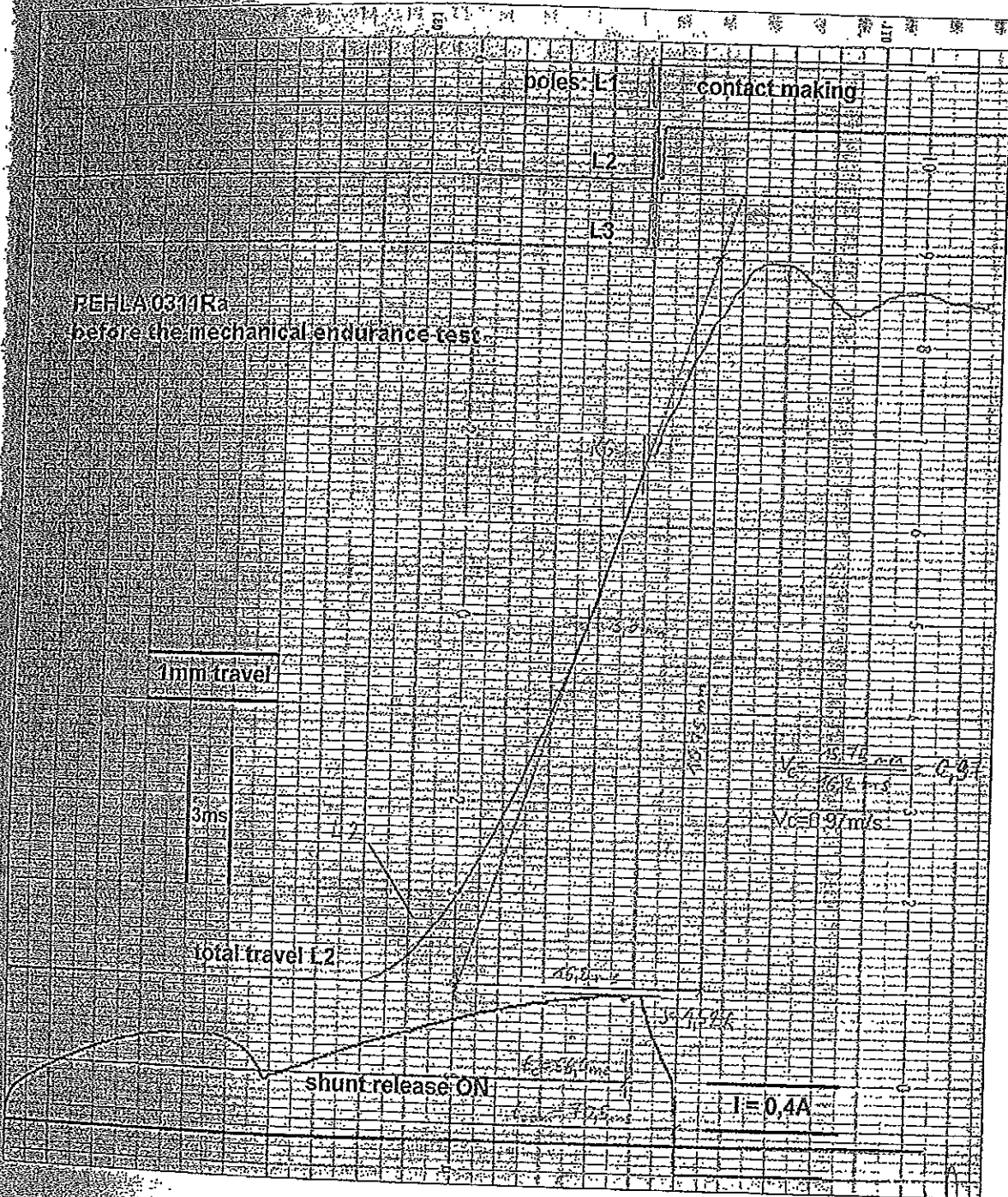
▪ Ambient atmospheric conditions:

Date: 04th February 2003, ambient air temperature: approx. 22°C

ВЕРНО С ОРИГИНАЛА



Diagram 1.1: Measurement of the operating speed before the mechanical endurance test



Measuring point: Insulated coupling rod in phase L2
 Operating speed measured: $V_c = 0.97 \text{ m/s}$ at $U = 1.0 \times U_a$

КОПИО С ОРИГИНАЛА



Results of measurements during the mechanical endurance test

a/b) Opening and closing time:

Operating time [ms] U _a = 110 V DC	U [V]	t _{o1} (opening)			t _c (closing)		
		0.7 x U _a	1.0 x U _a	1.1 x U _a	0.85 x U _a	1.0 x U _a	1.1 x U _a
Number of operations: 2 000	t [ms]	82.2	53.7	50.4	72.0	66.0	63.0
Number of operations: 4 000	t [ms]	79.5	53.7	50.4	72.9	66.3	63.3
Number of operations: 6 000	t [ms]	78.0	53.4	50.4	72.9	66.6	64.2
Number of operations: 8 000	t [ms]	78.6	53.7	50.7	72.9	66.6	64.0

d) Time spread between the breaker poles:

The time spread between the breaker poles on closing and on opening of the circuit-breaker was measured to < 2 ms.

e) Charging time of the motorized operating mechanism:

Motor voltage U _a = 220 V DC	charging time for O1-C [s]		
	U = 0.85 x U _a = 187 V DC	U = 1.0 x U _a = 220 V DC	U = 1.1 x U _a = 242 V DC
Number of operations: 2 000	3.64	2.99	2.47
Number of operations: 4 000	3.87	3.12	2.68
Number of operations: 6 000	3.80	3.06	2.69
Number of operations: 8 000	3.81	3.03	2.65

m) Other important characteristics - contact travel:

Contact travel in L2	Total Travel [mm]
Number of operations: 2 000	14.8
Number of operations: 4 000	14.7
Number of operations: 6 000	14.7
Number of operations: 8 000	14.7

l) Time-travel chart with opening and closing speed:

Speed in [m/s]; at U _a = 110 V DC L2	V _{o1}		V _c
	8.25	6.6 mm	
Number of operations: 2 000	1.12	1.29	0.91
Number of operations: 4 000	1.11	1.29	0.91
Number of operations: 6 000	1.08	1.24	0.91
Number of operations: 8 000	1.13	1.32	0.93

The deviations from the measured mechanical time travel charts are in the allowable limits of the reference mechanical travel characteristics.

ВЯРНО С ОРЖИНАЛА



Results of measurements after the mechanical endurance test

Number of operations counter: 10 199

b) Opening and closing time:

Rated supply voltage of closing and opening devices: $U_a = 110 \text{ V DC}$

Operating time [ms]

measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

U [V]	t _o (opening)			t _c (closing)		
	0.7 x U _a	1.0 x U _a	1.1 x U _a	0.85 x U _a	1.0 x U _a	1.1 x U _a
t [ms]	80.1	55.5	50.7	73.5	67.5	63.3
	79.8	54.0	51.0	73.5	67.5	63.3
	80.1	55.2	51.6	73.5	66.3	63.9
	79.8	54.0	51.0	74.1	66.6	63.9
	79.2	53.4	50.7	72.9	67.5	64.2

d) Time spread between the breaker poles:

The time spread between the breaker poles on closing and on opening of the circuit-breaker was measured to < 2 ms.

e/f) Charging time and power consumption of the motorized operating mechanism:

Rated supply voltage of motor charging: $U_a = 220 \text{ V DC}$

Measured values:

measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

motor voltage	charging time after O-C operation [s]					current consumption [A]					power consumption [W]				
$U = 0.85 \times U_a = 187 \text{ V DC}$	3.60	3.78	3.80	3.86	3.83	0.93	0.92	0.95	0.94	0.93	174	172	178	176	174
$U = 1.0 \times U_a = 220 \text{ V DC}$	3.03	2.86	2.83	2.90	2.93	0.94	0.93	0.92	0.94	0.95	207	205	202	207	209
$U = 1.1 \times U_a = 242 \text{ V DC}$	2.59	2.71	2.69	2.65	2.68	0.90	0.96	0.96	0.95	0.96	218	232	232	230	232

ВАРНО С ОРЖИНАЛА



Report No. 103111Ra

g) Consumption of the tripping devices:

Measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

Rated operating voltage U_n	Shunt-release ON YC					Shunt-release OFF YO1				
	110 V DC									
Current at minimum supply voltage [A]	1.24	1.28	1.28	1.28	1.28	0.92	0.92	0.92	0.92	0.92
Current at rated supply voltage [A]	1.56	1.52	1.52	1.52	1.52	1.20	1.20	1.20	1.20	1.20
Current at maximum supply voltage [A]	1.72	1.72	1.72	1.72	1.72	1.36	1.36	1.36	1.32	1.32

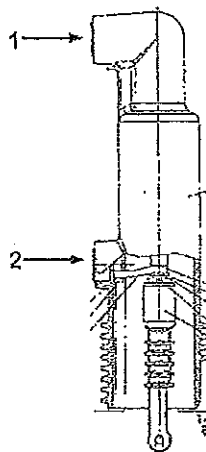
h) Duration of opening and closing command impulse:

Measured during the 5 x CO operations
 at the minimum supply voltage
 at the rated supply voltage
 at the maximum supply voltage

Duration of command impulse at	Shunt-release ON YC					Shunt-release OFF YO1				
	ms									
minimum supply voltage [ms]	75.9	76.2	76.2	76.8	75.3	79.8	79.8	80.1	79.8	79.2
rated supply voltage [ms]	71.4	71.4	69.9	70.5	71.1	56.7	55.5	57.0	55.5	54.6
maximum supply voltage [ms]	67.8	67.8	68.4	68.4	68.7	52.5	52.8	53.4	52.5	52.8

k) Resistance of the main conductors:

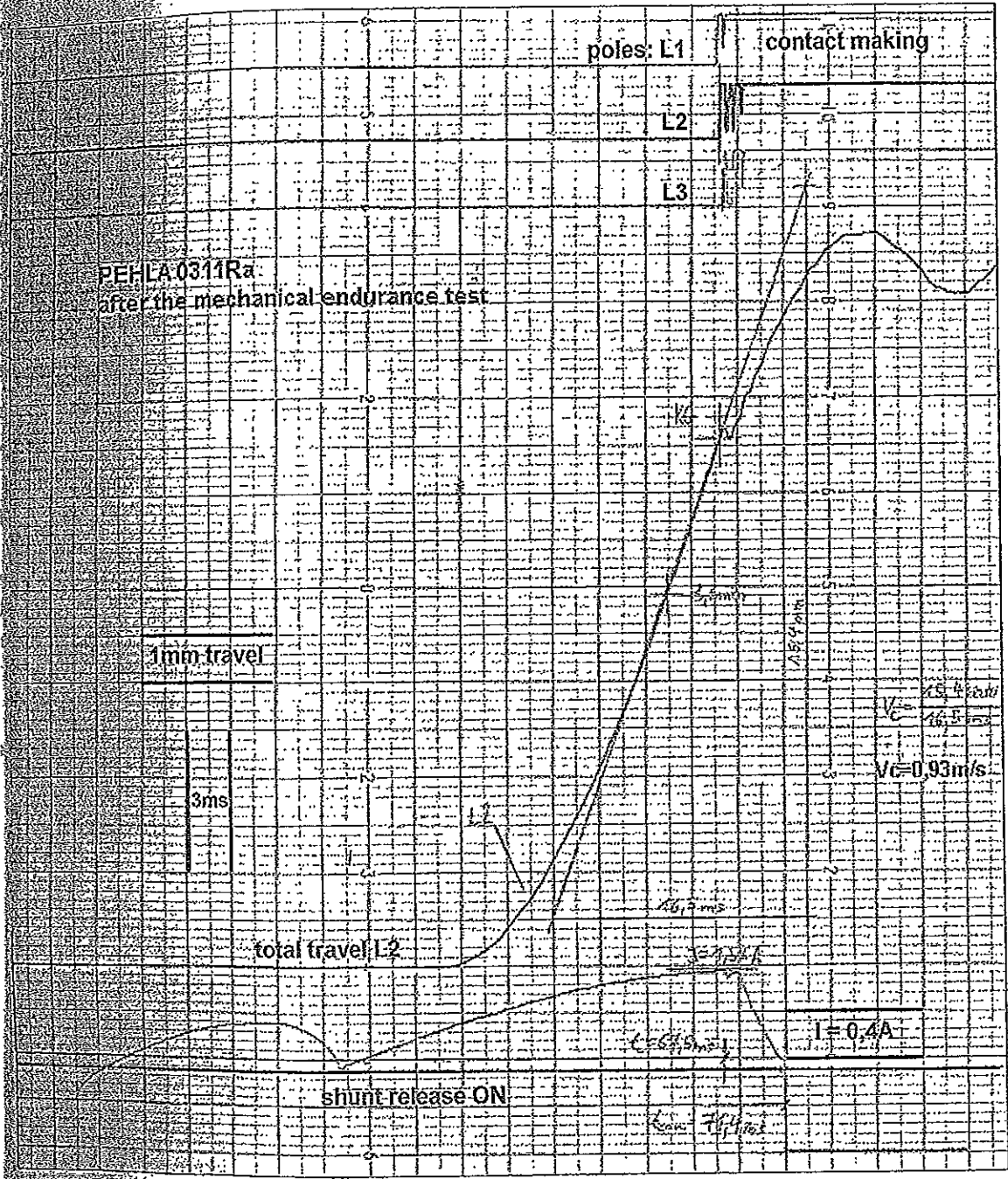
Measuring points:



ВЯРНО С ОРИГИНАЛА



Diagram 2.1: Measurement of the operating speed after the mechanical endurance test



Measuring point: Insulated coupling rod in phase L2
Operating speed measured: $V_c = 0.93 \text{ m/s}$ at $U = 1.0 \times U_a$

ВЕРНО С ОРИГИНАЛОМ



Contact resistance measured during the 5 x CO operations at the minimum supply voltage of the coils

Measuring points	L1 μΩ					L2 μΩ					L3 μΩ				
	1-2	17.1	17.1	17.2	17.1	17.1	16.9	16.9	16.9	16.9	16.8	17.7	17.7	17.7	17.7

Contact resistance measured during the 5 x CO operations at the rated supply voltage of the coils

Measuring points	L1 μΩ					L2 μΩ					L3 μΩ				
	1-2	17.3	17.2	17.2	17.2	17.2	16.9	17.0	16.9	16.9	16.9	17.7	17.7	17.7	17.8

Contact resistance measured during the 5 x CO operations at the maximum supply voltage of the coils

Measuring points	L1 μΩ					L2 μΩ					L3 μΩ				
	1-2	17.1	17.1	17.1	17.1	17.1	16.9	17.0	17.0	17.0	17.0	17.7	17.7	17.7	17.7

l) Time-travel chart with opening and closing speed: See diagram 2.1 and 2.2

Speed in [m/s]; $U_a = 110 \text{ V DC}$
at $U = 1.0 \times U_a$

	V_o	V_c
L2	1.12	0.93

The deviations from the measured mechanical time travel charts are in the allowable limits of the reference mechanical travel characteristics.

m) Other important characteristics:

Contact travel:

	L1	L2	L3
Total Travel [mm]	14.6	14.6	14.7
Cont.-travel [mm]	11.2	11.1	11.2
Contact-spring travel [mm]	3.4	3.5	3.5

Check of vacuum of interrupters:

60 kV DC ok

Verification of the rated operating sequence:

O-0.3s-CO-3min-CO at rated voltage ok

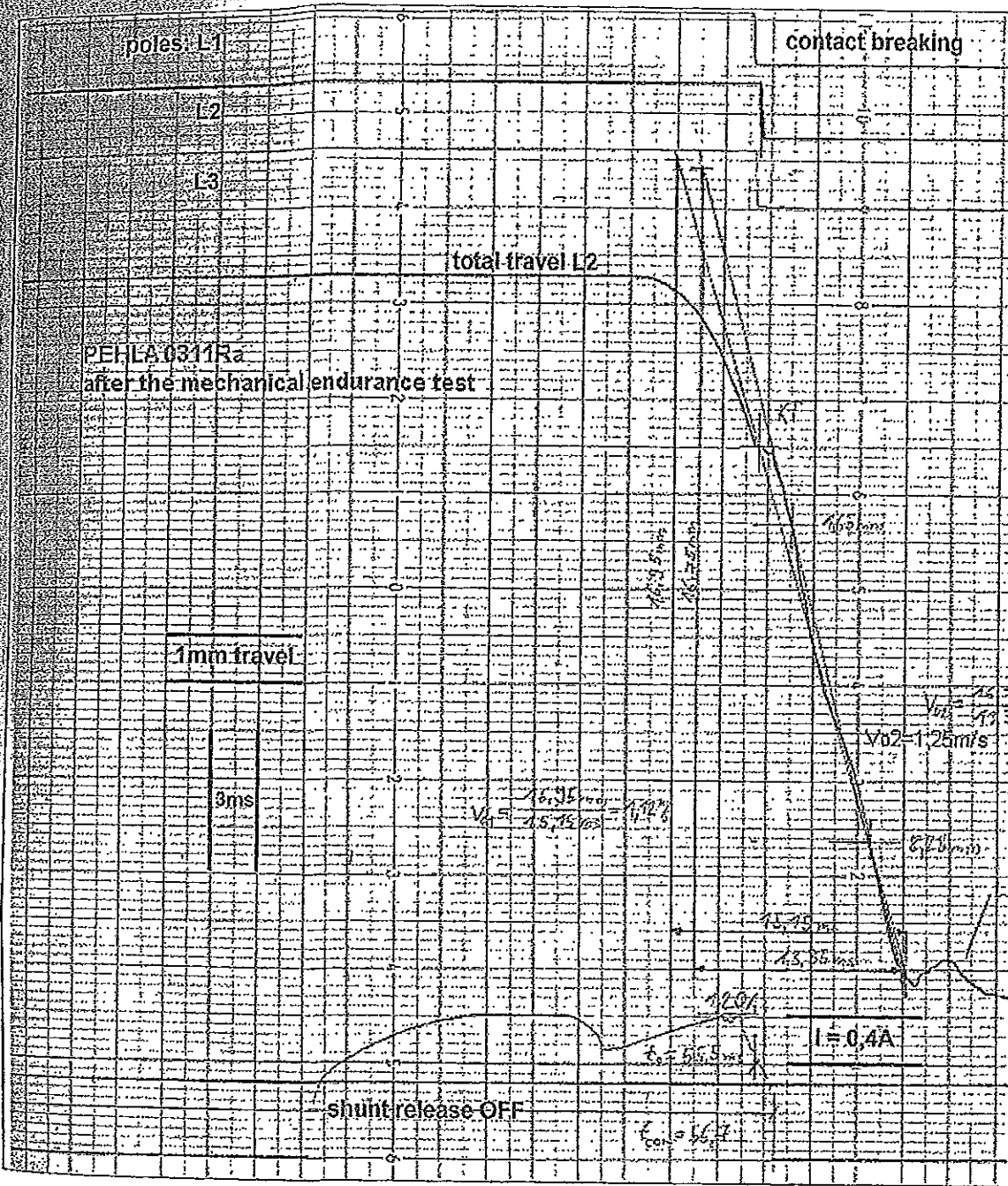
Ambient atmospheric conditions:

Date: 24th February 2003, ambient air temperature: approx. 22°C

ВАРНО С ОПРИГНАЛ

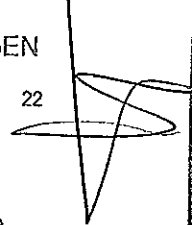


Diagram 2.2: Measurement of the operating speed after the mechanical endurance test



- Measuring point: Insulated coupling rod in phase L2
- Operating speed measured: $V_{01} = 1.12 \text{ m/s}$ $V_{02} = 1.25 \text{ m/s}$ at $U = 1.0 \times U_a$



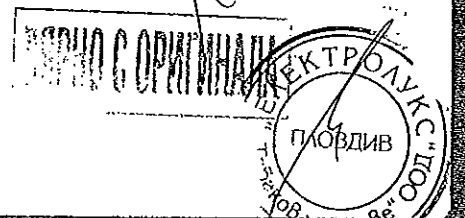


Evaluation of the measurements before and after the test program

The reference mechanical travel characteristic was recorded at the rated supply voltage before the endurance test. All measured travel-curves fall within the limits of the two envelope curves which characterize the allowable deviations from the reference curve.

All characteristics measured before and after the test program do not show unacceptable variations.

The circuit-breaker operated only on command and did not operate without command.



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Measuring Instrument Record

Test job no.: 8002374_M06
 Test object: VD4 24.12.20
 Date of test: 03rd Feb. - 24th Feb. 2003
 Test report No: 0311Ra
 Test operator: Mendorf / Schöttler

Instrument	Ident.-no.	Measuring	Remarks
Microohmmeter MO2A 50	ELK 001111	20μΩ / 200μΩ	Resistance measurement
resistive travel pick-up type lino pot Ts 50 502	ELK 001024	5 kΩ	Travel time measurement
DM 7100 Transient memory	ELK 000466	±2 V / full scale 50μs/word, channel 4 (12 bit)	
YEW-3063 Multi-pen	ELK 000464	0.25 V/cm-vernier 10 cm/min, channel 4	
Slide caliper rule	LAE 002162	0 - 300 mm	
Shunt 1.5A/150mV DM 7100 Transient memory	ELK 001044 ELK 000466	1.5A/150mV ±20/0.2 V/full scale 50 μsec/word/10ms/word channel 1, 2, 3, 8 (8 bit)	Current measurement (y2/y3) Operating time measurement,
YEW-3063 Multi-pen	ELK 000464	Channel 1, 2, 3, 8, 0.25/1 V/cm-cal/vernier 10 cm/min	
Electronic time clock	ELK 001231	0-100s	Charging time measurement
Inigor 6E	ELK 000389	1 A	Motor current measurement
Vidar-Vacuum- Checker-Test device	DRU 000026	40/60kV DC	Vacuum-Checker-Test
BBC M2110	ELK 000359	300 V DC	Voltage measurement
Hygrometer Hygronom	FEU 000022	-30°C - +50°C	temperature measurement

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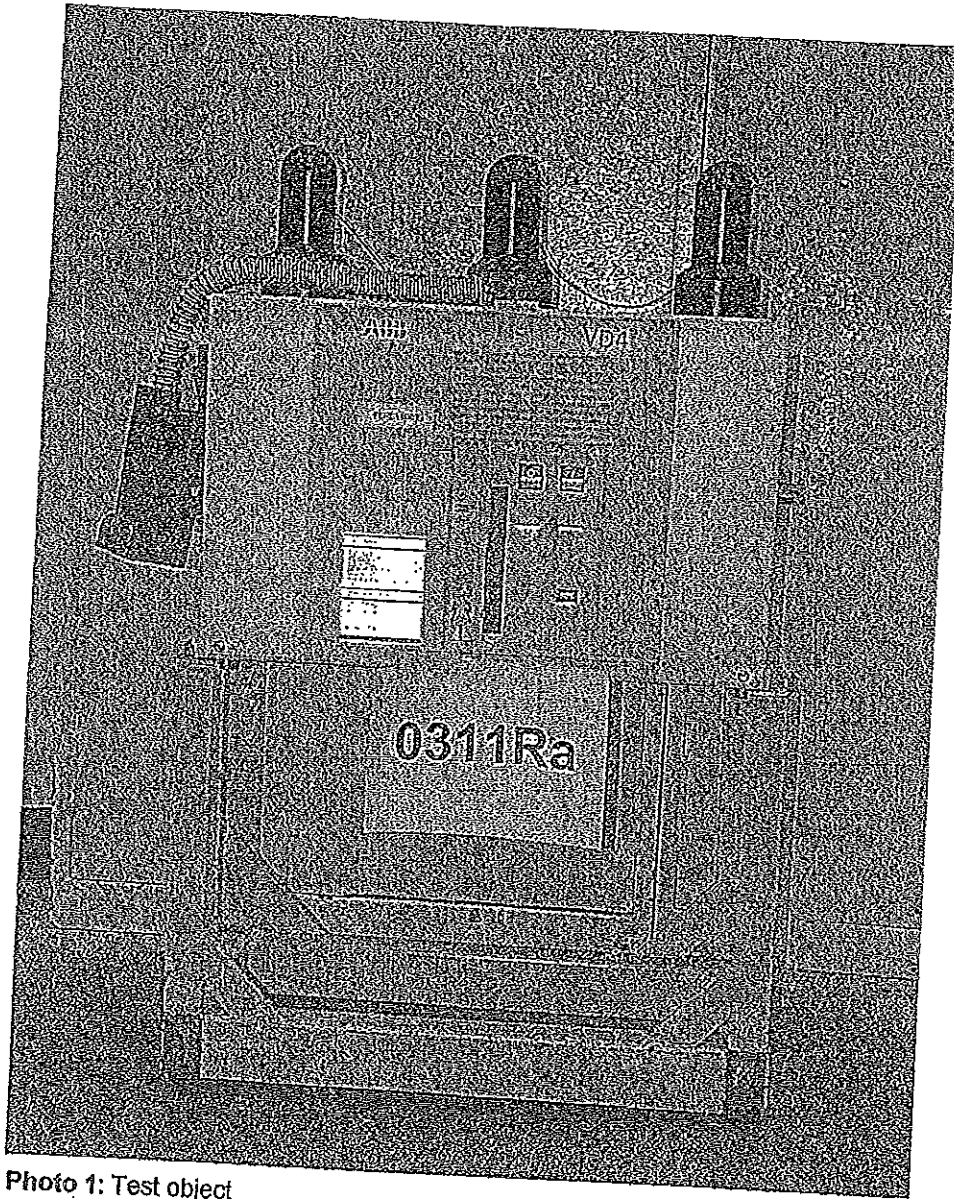


Photo 1: Test object

ВЯРНО С ОРИГИНАЛА



ТОВ и сннове



Deutscher Akkreditierungs Rat

Reg.-Nr.

DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. MZ 235 A 01

Sheet 1

Issued by an Accredited Laboratory corresponding to EN 45001

Copy-No. 02e

Test Object

Metal-clad air-insulated switchgear panel from a 24 kV switchgear type ZS1.2 (T = 1000 mm), drawing-no. GCE 8010459 R0101, with withdrawable vacuum circuit-breaker type VD4 2420-25 and with earthing switch type EK6-2406-275

Ratings of the panel:

Rated voltage	U	24 kV
Rated normal current (tee-off)	I _n	1600 A
Rated frequency	f	50/60 Hz
Rated short-time withstand current	I _{th}	25 kA
Rated peak withstand current	I _p	63 kA
Rated duration of short-circuit current	t _{th}	3 s
Rated short-circuit breaking capacity at 24 kV	I _{sc}	25 kA

Manufacturer

ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen / Germany

Tests performed

Mechanical operation test comprising 50 operations of the vacuum circuit-breaker, 50 operations of the earthing switch, 50 manual operations of the withdrawable part and 25 insertions and 25 removals of the removable part. The interlocks of the circuit-breaker, the earthing switch, the withdrawable part and the removable part were tested in the respective position. Test procedure and test parameters were based on IEC 60298/3rd. Ed./1990/Clause 6.102

Test Specification

IEC 60298/3rd. Ed./1990

Test Results

All switching devices, the withdrawable part, the removable part and the mechanical interlocks passed the mechanical operation test successfully. They were in proper working order and the effort to operate them was practically the same before and after the test.

Test Date

07th September 2000

Client

ABB Calor Emag Mittelspannung GmbH 40472 Ratingen / Germany

18th October 2000
Date of Issue



Kib
Laboratory Manager

Paul
Test Engineer

Total Number of Sheets: 10 Sheets

This test report refers exclusively to the object tested. ABB Calor Emag Mittelspannung GmbH is certified according to DIN ISO 9001 by DQS under Reg. No. 373-03

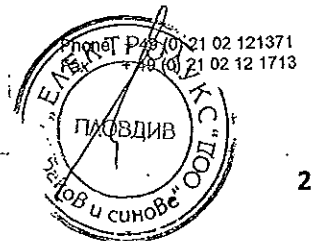
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ABB Calor Emag Mittelspannung GmbH Ratingen
Mechanical Testing Laboratory

Oberhausener Str.33
D - 40472 Ratingen

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Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. MZ 235 A 01
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 2

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Contents	2
1. Technical Data of Test Objects	3
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GCE 7000162 R1104 (Withdrawable vacuum circuit-breaker) ..	7
GCE 7169312 R0118 (Earthing switch)	8
2. Test Location and Set-up	9
3. Mechanical Operation Test	10

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DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. MZ 235 A 01
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Sheet 3

1. Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switchgear

Test Object: Metal-clad air-insulated switchgear panel from a 24 kV switchgear

Type: ZS1.2

Manufacturer: ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen/ Germany

Serial-No.: 7550027/2015/00 **Year of manufacture:** 2000

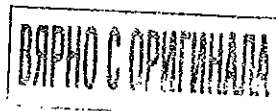
Drawing Nos.: GCE 8010459 R0101

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV
Rated frequency	50/60	Hz
Rated normal current busbar	2500	A
Rated normal current circuit	1600	A
Rated peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated duration of short-circuit	3	s

Prospected values under internal-arc conditions:

Peak withstand current	63	kA
Short-time withstand current	25	kA
Short-circuit duration	3	s

Date of receipt of test object: 24th August 2000





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TEST REPORT No. MZ 235 A 01

Sheet 4

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1. Technical Data of Test Object (Ratings assigned by the manufacturer) Switching Device

Test Object: Withdrawable vacuum circuit-breaker

Type: VD4 2420-25

Vacuum interrupter: VG4S

Manufacturer: ABB Calor Emag Mittelspannung GmbH

Serial-No.: 7008269/4002/00 **Year of manufacture:** 2000

Drawing Nos.:

Withdrawable breaker:	GCE 7000162 R1104
Operating mechanism:	GCE 7179610 R0104
Pole part:	GCE 7005757 R0122
Interrupters:	GCE 7005535 R0102
Pole Centres:	275 mm

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV

Rated frequency	50/60	Hz
Rated normal current	2000	A
Rated short-circuit breaking current	25	KA
Rated short-circuit making current	63	KA
DC-component	30	%
Pole factor	1.5	--

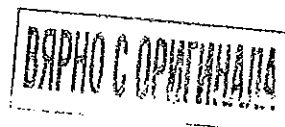
Rated peak withstand current	63	KA
Rated short-time withstand current	25	KA
Rated duration of short-circuit	3	s
Rated operating sequence	O-0,3s-CO-3min-CO	

Rated times of circuit-breaker:

- opening time	≤ 45	ms
- closing time	approx. 60	ms

Number of poles	3
Number of units per pole	1

Date of receipt of test object: 24th August 2000





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ABB Calor Emag Laboratories



TEST REPORT No. MZ 235 A 01

Sheet 5

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1. Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switching Device

Test Object: Earthing switch

Type: EK6-2406-275

Manufacturer: ABB Calor Emag Mittelspannung GmbH

Serial-No.: 06/052/00 **Year of manufacture:** 2000

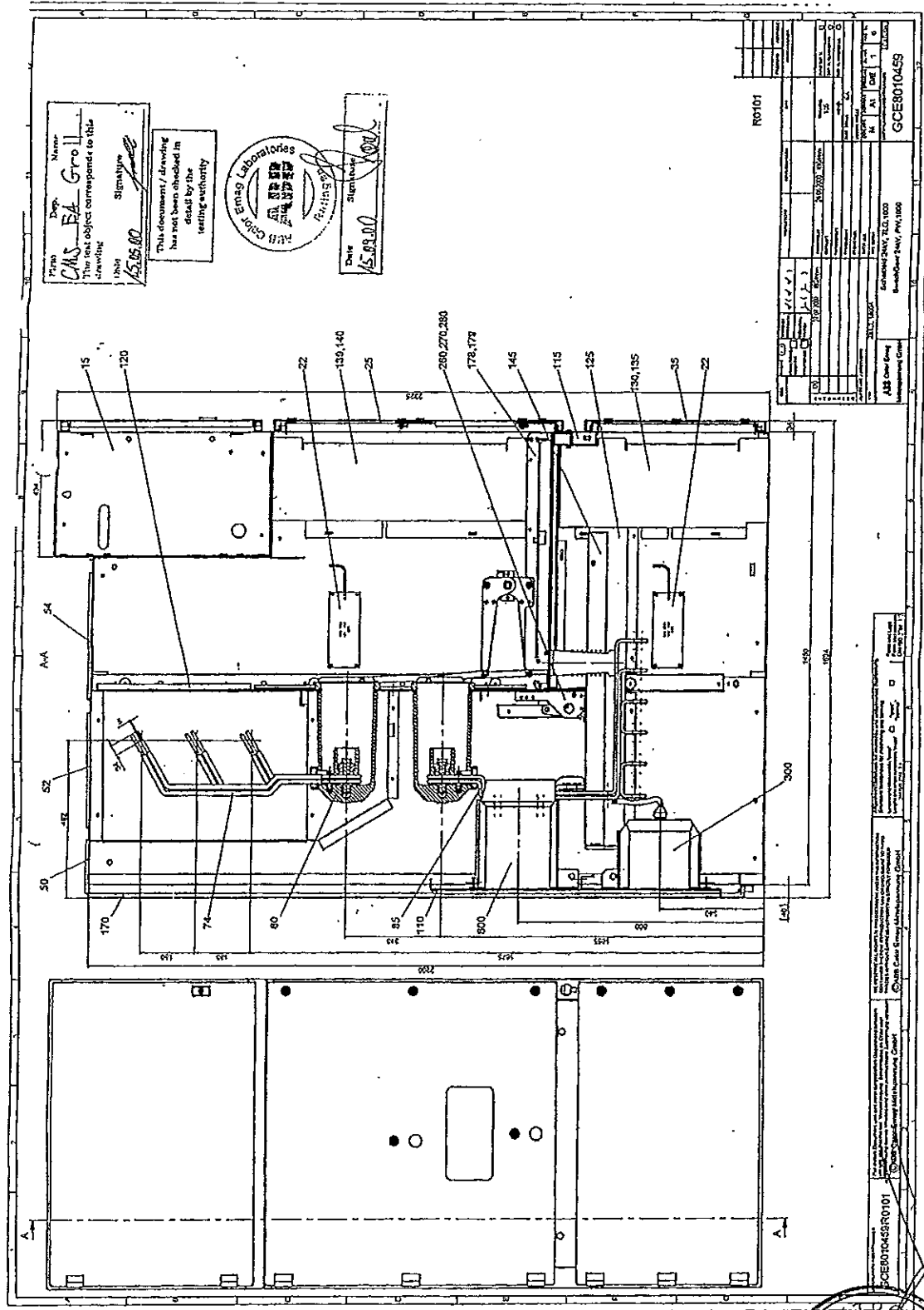
Drawing Nos.: Earthing switch: GCE 7169312 R0118
Pole Centres: 275 mm

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV
Rated short-circuit making current	63	kA
Rated peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated duration of short-circuit	3	s

Date of receipt of test object: 24th August 2000

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Drawn: **BA Groll**
Checked: **BA Groll**
Date: **15.05.00**
Signature: *[Signature]*
This document / drawing has not been checked in detail by the testing authority

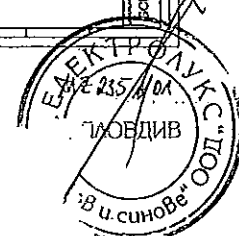
This document / drawing has not been checked in detail by the testing authority



Date: **15.05.00**
Signature: *[Signature]*

R0101		GCE8010459	
Order No.	1300000000000000	Contract No.	1300000000000000
Order Date	13.05.00	Contract Date	13.05.00
Order Ref.	1300000000000000	Contract Ref.	1300000000000000
Order Status	1300000000000000	Contract Status	1300000000000000
Order Type	1300000000000000	Contract Type	1300000000000000
Order Category	1300000000000000	Contract Category	1300000000000000
Order Subcategory	1300000000000000	Contract Subcategory	1300000000000000
Order Description	1300000000000000	Contract Description	1300000000000000
Order Reference	1300000000000000	Contract Reference	1300000000000000
Order Location	1300000000000000	Contract Location	1300000000000000
Order Contact	1300000000000000	Contract Contact	1300000000000000
Order Manager	1300000000000000	Contract Manager	1300000000000000
Order Approval	1300000000000000	Contract Approval	1300000000000000
Order Release	1300000000000000	Contract Release	1300000000000000
Order Delivery	1300000000000000	Contract Delivery	1300000000000000
Order Invoice	1300000000000000	Contract Invoice	1300000000000000
Order Payment	1300000000000000	Contract Payment	1300000000000000
Order Close	1300000000000000	Contract Close	1300000000000000

ВЕРНО С ОРИГИНАЛОМ



Blatt	Typ	P	T	g	s	Index	Blatt	Typ	P	T	g	s	Index
R001	D64-200-A-20	70	195	-	-	20	R001	D64-200-A-20	70	195	-	-	20
R002	D64-200-A-20	10	201	-	-	21	R002	D64-200-A-20	10	201	-	-	21
R003	D64-200-A-20	20	206	-	-	22	R003	D64-200-A-20	20	206	-	-	22
R004	D64-200-A-20	30	211	-	-	23	R004	D64-200-A-20	30	211	-	-	23
R005	D64-200-A-20	40	216	-	-	24	R005	D64-200-A-20	40	216	-	-	24
R006	D64-200-A-20	50	221	-	-	25	R006	D64-200-A-20	50	221	-	-	25
R007	D64-200-A-20	60	226	-	-	26	R007	D64-200-A-20	60	226	-	-	26
R008	D64-200-A-20	70	231	-	-	27	R008	D64-200-A-20	70	231	-	-	27
R009	D64-200-A-20	80	236	-	-	28	R009	D64-200-A-20	80	236	-	-	28
R010	D64-200-A-20	90	241	-	-	29	R010	D64-200-A-20	90	241	-	-	29
R011	D64-200-A-20	100	246	-	-	30	R011	D64-200-A-20	100	246	-	-	30
R012	D64-200-A-20	110	251	-	-	31	R012	D64-200-A-20	110	251	-	-	31
R013	D64-200-A-20	120	256	-	-	32	R013	D64-200-A-20	120	256	-	-	32
R014	D64-200-A-20	130	261	-	-	33	R014	D64-200-A-20	130	261	-	-	33
R015	D64-200-A-20	140	266	-	-	34	R015	D64-200-A-20	140	266	-	-	34
R016	D64-200-A-20	150	271	-	-	35	R016	D64-200-A-20	150	271	-	-	35
R017	D64-200-A-20	160	276	-	-	36	R017	D64-200-A-20	160	276	-	-	36
R018	D64-200-A-20	170	281	-	-	37	R018	D64-200-A-20	170	281	-	-	37
R019	D64-200-A-20	180	286	-	-	38	R019	D64-200-A-20	180	286	-	-	38
R020	D64-200-A-20	190	291	-	-	39	R020	D64-200-A-20	190	291	-	-	39
R021	D64-200-A-20	200	296	-	-	40	R021	D64-200-A-20	200	296	-	-	40
R022	D64-200-A-20	210	301	-	-	41	R022	D64-200-A-20	210	301	-	-	41
R023	D64-200-A-20	220	306	-	-	42	R023	D64-200-A-20	220	306	-	-	42
R024	D64-200-A-20	230	311	-	-	43	R024	D64-200-A-20	230	311	-	-	43
R025	D64-200-A-20	240	316	-	-	44	R025	D64-200-A-20	240	316	-	-	44
R026	D64-200-A-20	250	321	-	-	45	R026	D64-200-A-20	250	321	-	-	45
R027	D64-200-A-20	260	326	-	-	46	R027	D64-200-A-20	260	326	-	-	46
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R029	D64-200-A-20	280	336	-	-	48	R029	D64-200-A-20	280	336	-	-	48
R030	D64-200-A-20	290	341	-	-	49	R030	D64-200-A-20	290	341	-	-	49
R031	D64-200-A-20	300	346	-	-	50	R031	D64-200-A-20	300	346	-	-	50
R032	D64-200-A-20	310	351	-	-	51	R032	D64-200-A-20	310	351	-	-	51
R033	D64-200-A-20	320	356	-	-	52	R033	D64-200-A-20	320	356	-	-	52
R034	D64-200-A-20	330	361	-	-	53	R034	D64-200-A-20	330	361	-	-	53
R035	D64-200-A-20	340	366	-	-	54	R035	D64-200-A-20	340	366	-	-	54
R036	D64-200-A-20	350	371	-	-	55	R036	D64-200-A-20	350	371	-	-	55
R037	D64-200-A-20	360	376	-	-	56	R037	D64-200-A-20	360	376	-	-	56
R038	D64-200-A-20	370	381	-	-	57	R038	D64-200-A-20	370	381	-	-	57
R039	D64-200-A-20	380	386	-	-	58	R039	D64-200-A-20	380	386	-	-	58
R040	D64-200-A-20	390	391	-	-	59	R040	D64-200-A-20	390	391	-	-	59
R041	D64-200-A-20	400	396	-	-	60	R041	D64-200-A-20	400	396	-	-	60
R042	D64-200-A-20	410	401	-	-	61	R042	D64-200-A-20	410	401	-	-	61
R043	D64-200-A-20	420	406	-	-	62	R043	D64-200-A-20	420	406	-	-	62
R044	D64-200-A-20	430	411	-	-	63	R044	D64-200-A-20	430	411	-	-	63
R045	D64-200-A-20	440	416	-	-	64	R045	D64-200-A-20	440	416	-	-	64
R046	D64-200-A-20	450	421	-	-	65	R046	D64-200-A-20	450	421	-	-	65
R047	D64-200-A-20	460	426	-	-	66	R047	D64-200-A-20	460	426	-	-	66
R048	D64-200-A-20	470	431	-	-	67	R048	D64-200-A-20	470	431	-	-	67
R049	D64-200-A-20	480	436	-	-	68	R049	D64-200-A-20	480	436	-	-	68
R050	D64-200-A-20	490	441	-	-	69	R050	D64-200-A-20	490	441	-	-	69
R051	D64-200-A-20	500	446	-	-	70	R051	D64-200-A-20	500	446	-	-	70
R052	D64-200-A-20	510	451	-	-	71	R052	D64-200-A-20	510	451	-	-	71
R053	D64-200-A-20	520	456	-	-	72	R053	D64-200-A-20	520	456	-	-	72
R054	D64-200-A-20	530	461	-	-	73	R054	D64-200-A-20	530	461	-	-	73
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R056	D64-200-A-20	550	471	-	-	75	R056	D64-200-A-20	550	471	-	-	75
R057	D64-200-A-20	560	476	-	-	76	R057	D64-200-A-20	560	476	-	-	76
R058	D64-200-A-20	570	481	-	-	77	R058	D64-200-A-20	570	481	-	-	77
R059	D64-200-A-20	580	486	-	-	78	R059	D64-200-A-20	580	486	-	-	78
R060	D64-200-A-20	590	491	-	-	79	R060	D64-200-A-20	590	491	-	-	79
R061	D64-200-A-20	600	496	-	-	80	R061	D64-200-A-20	600	496	-	-	80
R062	D64-200-A-20	610	501	-	-	81	R062	D64-200-A-20	610	501	-	-	81
R063	D64-200-A-20	620	506	-	-	82	R063	D64-200-A-20	620	506	-	-	82
R064	D64-200-A-20	630	511	-	-	83	R064	D64-200-A-20	630	511	-	-	83
R065	D64-200-A-20	640	516	-	-	84	R065	D64-200-A-20	640	516	-	-	84
R066	D64-200-A-20	650	521	-	-	85	R066	D64-200-A-20	650	521	-	-	85
R067	D64-200-A-20	660	526	-	-	86	R067	D64-200-A-20	660	526	-	-	86
R068	D64-200-A-20	670	531	-	-	87	R068	D64-200-A-20	670	531	-	-	87
R069	D64-200-A-20	680	536	-	-	88	R069	D64-200-A-20	680	536	-	-	88
R070	D64-200-A-20	690	541	-	-	89	R070	D64-200-A-20	690	541	-	-	89
R071	D64-200-A-20	700	546	-	-	90	R071	D64-200-A-20	700	546	-	-	90
R072	D64-200-A-20	710	551	-	-	91	R072	D64-200-A-20	710	551	-	-	91
R073	D64-200-A-20	720	556	-	-	92	R073	D64-200-A-20	720	556	-	-	92
R074	D64-200-A-20	730	561	-	-	93	R074	D64-200-A-20	730	561	-	-	93
R075	D64-200-A-20	740	566	-	-	94	R075	D64-200-A-20	740	566	-	-	94
R076	D64-200-A-20	750	571	-	-	95	R076	D64-200-A-20	750	571	-	-	95
R077	D64-200-A-20	760	576	-	-	96	R077	D64-200-A-20	760	576	-	-	96
R078	D64-200-A-20	770	581	-	-	97	R078	D64-200-A-20	770	581	-	-	97
R079	D64-200-A-20	780	586	-	-	98	R079	D64-200-A-20	780	586	-	-	98
R080	D64-200-A-20	790	591	-	-	99	R080	D64-200-A-20	790	591	-	-	99
R081	D64-200-A-20	800	596	-	-	100	R081	D64-200-A-20	800	596	-	-	100

Funktionsziele
Vorstellung der Wirkung
des Gegenstandes
auftragsgemäß
darstellen

Name
EG Perschke

Abt.
EG

Zeichner
EG

Prüfer
EG

Datum
15.09.00

Signature
[Signature]

Funktionsziele / drawing
Vorstellung der Wirkung
des Gegenstandes
auftragsgemäß
darstellen

Name
EG Perschke

Abt.
EG

Zeichner
EG

Prüfer
EG

Datum
15.09.00

Signature
[Signature]

ABB Calor Emag
Ratung

Datum
15.09.00

Signature
[Signature]

Schnitt B-B

Schnitt A-A

Schnitt C-C

Schnitt A-A

Schnitt B-B

Schnitt C-C

Schnitt A-A

Schnitt B-B

Schnitt C-C

665 9 Strömungskörper mit 1000 mm Durchmesser
Blatt R001/R002/R003/R004/R005/R006/R007/R008/R009/R010/R011/R012/R013/R014/R015/R016/R017/R018/R019/R020/R021/R022/R023/R024/R025/R026/R027/R028/R029/R030/R031/R032/R033/R034/R035/R036/R037/R038/R039/R040/R041/R042/R043/R044/R045/R046/R047/R048/R049/R050/R051/R052/R053/R054/R055/R056/R057/R058/R059/R060/R061/R062/R063/R064/R065/R066/R067/R068/R069/R070/R071/R072/R073/R074/R075/R076/R077/R078/R079/R080/R081

665 8 Strömungskörper mit 1000 mm Durchmesser
Blatt R001/R002/R003/R004/R005/R006/R007/R008/R009/R010/R011/R012/R013/R014/R015/R016/R017/R018/R019/R020/R021/R022/R023/R024/R025/R026/R027/R0

2. Test Locations and Set-up

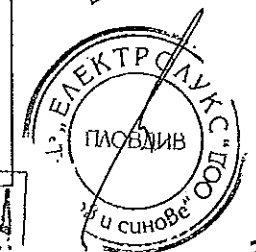
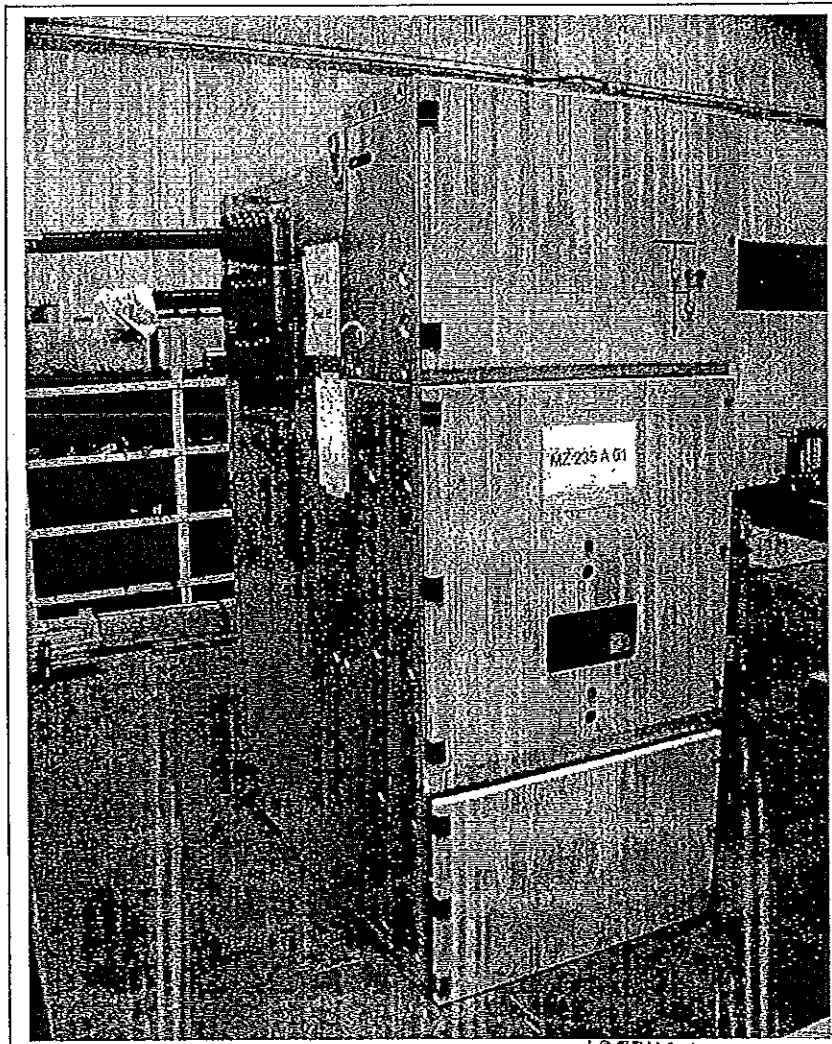
The test was performed in the Mechanical Testing Laboratory

of ABB Calor Emag Mittelspannung GmbH
Dept. LM in Ratingen

at an ambient temperature of approx. 20°C.

Test job no.: 7550027_024A

Test engineer: Koal



ВЯРНО С ОПРИМНАТА

Koal

3. Mechanical Operation Test

List of interlocks:

1. Withdrawable part in test-position
 - Circuit-breaker ON: prevented to move the withdrawable part in service-position
2. Withdrawable part in service-position
 - Circuit-breaker ON: prevented to move the withdrawable part in test-position
3. Withdrawable part between service and test position:
 - prevented to switch ON the circuit-breaker
4. Withdrawable part in test-position
 - Circuit-breaker OFF and earthing switch ON: prevented to move the withdrawable part in service-position
5. Withdrawable part in test-position
 - circuit-breaker ON and earthing switch ON: prevented to move the withdrawable part in service-position
6. Withdrawable part not in test-position
 - prevented to switch ON the earthing switch
7. Withdrawable part not in test-position
 - prevented to remove the removable part

All the above mentioned interlocks were checked. For this the circuit-breaker, the earthing switch and the withdrawable part were operated 50 times and the removable part was removed and inserted 25 times.

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ВЪПРО С ОПРИТНАТА





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Rat

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TEST REPORT No. HZ 236 E 06

Sheet 1

Issued by an Accredited Laboratory
corresponding to EN 45001

Copy-No. 02e

Test Object 2-panel metal-clad air-insulated switchgear type ZS1.2 – 24 kV consisting of
- feeder panel 2000 A with vacuum circuit-breaker type VM1 2420-25,
natural ventilated
- feeder panel 1250 A with vacuum circuit-breaker type VM1 2412-25
max. ambient temperature $\vartheta_{u\max} = 40\text{ }^{\circ}\text{C}$,

Rated voltage	U_n	24	kV
Rated normal current panel	I_n	2000 / 1250	A
Rated frequency	f	50	Hz
Rated short-time withstand current	I_{th}	25	kA
Rated peak withstand current	I_p	63	kA
Rated duration of short-circuit current	t_{th}	3	s
Rated short-circuit breaking capacity at 24 kV	I_{sc}	25	kA
Max. ambient temperature	ϑ_u	40	$^{\circ}\text{C}$

Manufacturer ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany

Tests performed Three-phase temperature-rise test at the rated current of 2000 A / 1250 A at a power frequency of 50 Hz.
Measurement of the resistance of the main circuit before and after the temperature rise test.

Test Specification IEC Standard 60694/2nd Ed./1996-5, clause 6.4 and 6.5
IEC Standard 60298/3rd Ed./1990-12, clause 6.3 and 6.4

Test Results The 2-panel ZS1.2-type switchgear passed the above mentioned tests successfully. The respective requirements are met. The test results are tabulated on sheets 19 to 24.

Test Date November 11th - November 12th, 2000

Client ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany

November 16th, 2000
Date of Issue



Gottlieb
Laboratory Manager

Stroth
Test Engineer

Total Number of Sheets: 29 Sheets (Test Report)

This test report refers exclusively to the object tested.
ABB Calor Emag Mittelspannung GmbH is certified according to DIN ISO 9001 by DQS under Reg. No. 373-02

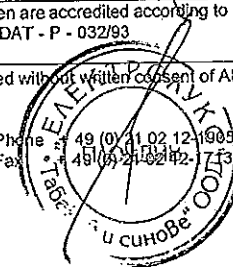
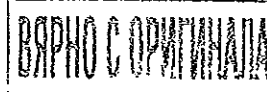
ABB Calor Emag Laboratories Ratingen are accredited according to EN 45001 by DATech under Reg.No. DAT - P - 032/93

With the exception of the cover sheet and any subsequent sheets mentioned thereon, this document may not be partly copied without written consent of ABB Calor Emag Mittelspannung GmbH Ratingen.

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TEST REPORT No. HZ 236 E 06

Sheet 2

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Drawing No. GCE8010457R0102 (Switchgear, 24 kV, PW. 800)	9
Drawing No. GCE7004924R0136 (Draw out VM1 24 kV in ZS1.2)	10
Drawing No. GCE7004924R0121 (Draw out VM1 24 kV in ZS1)	11
Drawing No. GCE7005757R0102 (pole part VD4p 2420-25)	12
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TEST REPORT No. HZ 236 E 06

Sheet 3

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Technical Data of Test Object

Switchgear – Panel 1

Ratings assigned by the manufacturer

Test Object: Metal-clad air insulated switchgear, incoming panel with vacuum circuit-breaker type VM1
Type: ZS1.2
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen; Germany
Serial-No.: 7550027/2016/00 (switchgear) **Year of manufacture:** 2000
Drawing No.: GCE8010459R0102

Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50 Hz
Rated normal current of busbar	2000 A
Rated normal current of tee-offs	2000 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration of short-circuit	3 s
Insulating medium	air / vacuum
Rated functional pressure (abs. / 20°C)	- kPa
Minimum functional pressure (abs. / 20°C)	- kPa
Permissible values for internal arc faults:	
Peak current	63 kA
Short-time current	25 kA
Duration of short-circuit	1 s
Max. ambient air temperature	40 °C

The above mentioned switchgear panel is fully described in the mentioned drawings.

Essential characteristics and installed devices:

The power loss of the controlgear in the low voltage compartment was simulated by a heating resistor of 60 W.

Current Transformers:

Manufacturer	Type	Year of manufacture	Insulation class
Wirges GmbH	TPU66.11	2000	E
Voltages		Frequency	Sort-time withst. current
24/50/125 kV		50 Hz	25 kA / 3 s
Serial Nos.		L1 058249, L2 058250; L3 058251	
Core 1		2000 / 5 A; 15 VA, accuracy class 0.5	
Core 2		2000 / 5 A; 15 VA, accuracy class 5P15	

Date of receipt of test object: 30th October 2000

ВАРНО С ОРИГИНАЛ



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TEST REPORT No. HZ 236 E 06

Sheet 4

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Technical Data of Test Object

Switchgear – Panel 2

Ratings assigned by the manufacturer

Test Object: Metal-clad air insulated switchgear, incoming panel with vacuum circuit-breaker type VM1
Type: ZS1.2
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen; Germany
Serial-No.: 7550027/2014/00 (switchgear) **Year of manufacture:** 2000
Drawing No.: GCE8010457R0102

Rated voltage 24 kV
 Rated lightning impulse withstand voltage 125 kV
 Rated switching impulse withstand voltage - kV
 Rated power frequency withstand voltage 50 kV
 Rated frequency 50 Hz

Rated normal current of busbar 2000 A
 Rated normal current of tee-offs 1250 A

Rated peak withstand current 63 kA
 Rated short-time withstand current 25 kA
 Rated duration of short-circuit 3 s

Insulating medium air / vacuum
 Rated functional pressure (abs. / 20°C) - kPa
 Minimum functional pressure (abs. / 20°C) - kPa

Permissible values for internal arc faults:

Peak current 63 kA
 Short-time current 25 kA
 Duration of short-circuit 1 s

Max. ambient air temperature 40 °C

The above mentioned switchgear panel is fully described in the mentioned drawings.

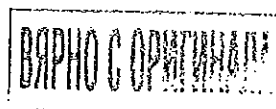
Essential characteristics and installed devices:

The power loss of the controlgear in the low voltage compartment was simulated by a heating resistor of 60 W.

Current Transformers:

Manufacturer	Type	Year of manufacture	Insulation class
Wirges GmbH	TPU63.11	2000	E
Voltages		Frequency	Sort-time withst. current
24/50/125 kV		50 Hz	25 kA / 3 s
Serial Nos.		L1 058240, L2 058241; L3 058242	
Core 1	1250 / 5 A; 10 VA, accuracy class 0.5		
Core 2	1250 / 5 A; 10 VA, accuracy class 5P15		

Date of receipt of test object: 30th October 2000



Technical Data of Test Object

Switching Device – Circuit-Breaker of Panel 1
Ratings assigned by the manufacturer

Test Object: Vacuum circuit-breaker
Type: VM1 2420-25
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen; Germany
Serial-No.: 7550030/4006/00 **Year of manufacture:** 2000
Drawing No.: GCE7004924R0136 (circuit-breaker)
Vacuum interrupter: Type: VG4-S L1: No. 00/061190, L2: No. 00/061193, L3: No. 00/061195
Drawing No.: GCE7005757R0102 (pole part)

Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50 / 60 Hz
Rated normal current	2000 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration of short-circuit	3 s
Rated short-circuit breaking current	25 kA
D.C. component	40 %
Rated short-circuit making current	63 kA
Rated transient recovery voltage:	
Peak value	41 kV
Rate of rise	0.47 kV/μs
First-pole-to-clear-factor	1.5
Rated operating sequence	O-0.3 s –CO-3 min-CO
Arc extinguishing medium	vacuum
Number of poles	3
Number of units per pole	1
Rated opening time	35...45 ms
Rated closing time	50...60 ms
Rated voltage of trip coil	230 V
Rated voltage of closing coil	230 V
Rated supply voltage	230 V
Rated frequency of supply voltage	- Hz
Further specifications:	

Max. ambient air temperature

40 °C

Essential characteristics:

Date of receipt of test object: 30th October 2000

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Sheet 6

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Technical Data of Test Object

Switching Device – Circuit-Breaker of Panel 2

Ratings assigned by the manufacturer

Test Object: Vacuum circuit-breaker
Type: VM1 2412-25
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen; Germany
Serial-No.: 7550027/4004/00 **Year of manufacture:** 2000
Drawing No.: GCE7004924R0121 (circuit-breaker)
Vacuum interrupter: Type: VG4-S L1: No. 01936, L2: No. 00678, L3: No. 02130
Drawing No.: GCE7004730R0102 (pole part)

Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50 / 60 Hz
Rated normal current	1250 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration of short-circuit	3 s
Rated short-circuit breaking current	25 kA
D.C. component	40 %
Rated short-circuit making current	63 kA
Rated transient recovery voltage:	
Peak value	41 kV
Rate of rise	0.47 kV/μs
First-pole-to-clear-factor	1.5
Rated operating sequence	O-0.3 s -CO-3 min-CO
Arc extinguishing medium	vacuum
Number of poles	3
Number of units per pole	1
Rated opening time	35...45 ms
Rated closing time	50...60 ms
Rated voltage of trip coil	230 V
Rated voltage of closing coil	230 V
Rated supply voltage	230 V
Rated frequency of supply voltage	- Hz
Further specifications:	
Max. ambient air temperature	40 °C

Essential characteristics:

Date of receipt of test object: 30th October 2000





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ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 7

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List of Drawings

The manufacturer has guaranteed, that the equipment submitted for test has been manufactured in full accordance with the following drawings. These drawings have been stamped and signed by the manufacturer representative. The drawings has not been checked in detail by the testing authority. The drawings are kept

x with the test documents at the test laboratory.
at the client.

Drawing no.	Title
GCE8010459R0102 index 00	Switchgear, 24 kV, PW. 1000
GCE8010457R0102 index 00	Switchgear, 24 kV, PW. 800
GCE7004924R0136 index 00	Draw out VM1 24 kV in ZS1.2
GCE7004924R0121 index 06	Draw out VM1 24 kV in ZS1
GCE7005757R0102 index 00	Pole part VD4p 2420-25
GCE7004730R0102 index 09	pole part VD4 24 kV 1250 A



ПРОС ОРИГОНАЛ



Reg.-Nr.

DAT-P-032/93

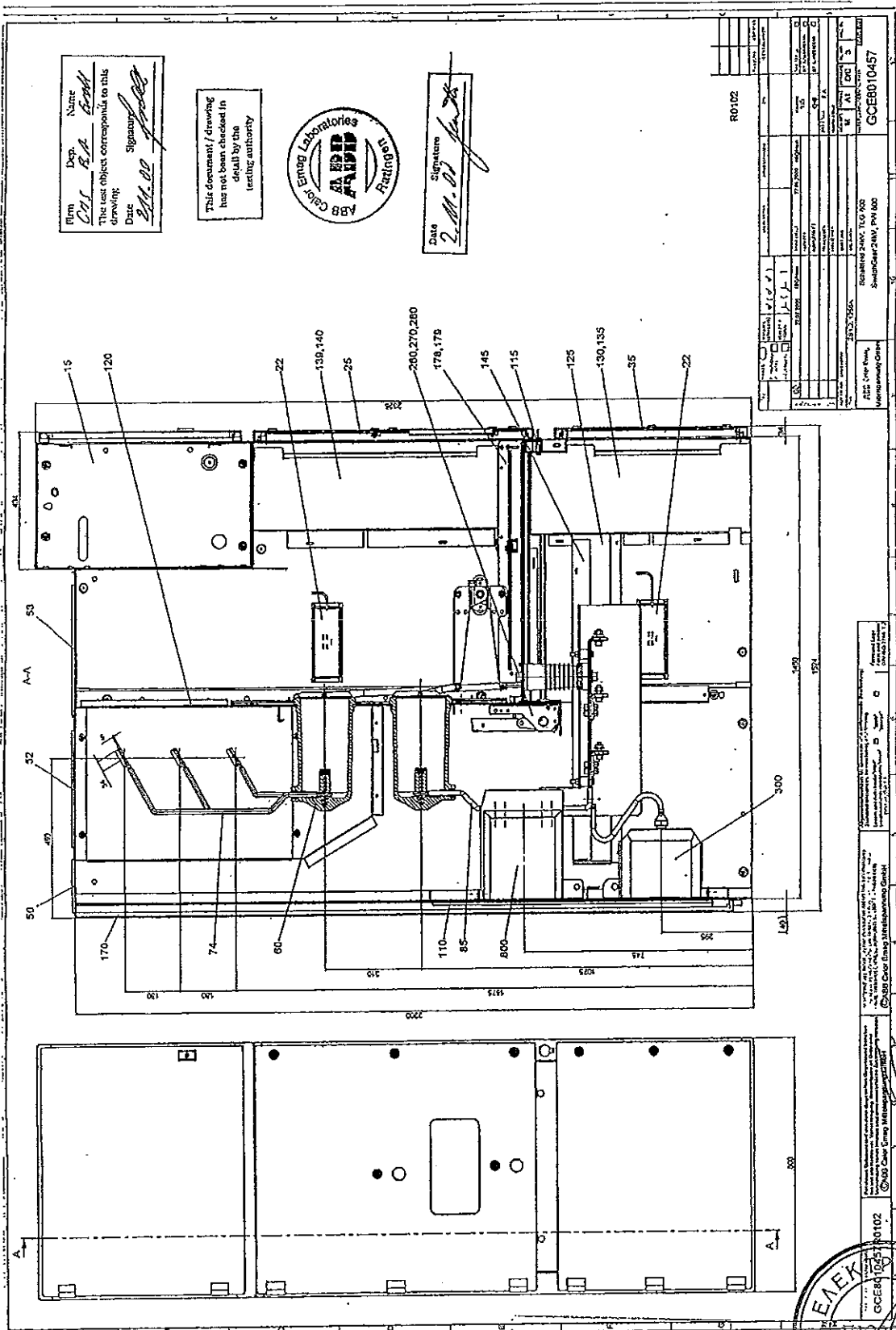
ABB Calor Emag Laboratories



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Sheet 9

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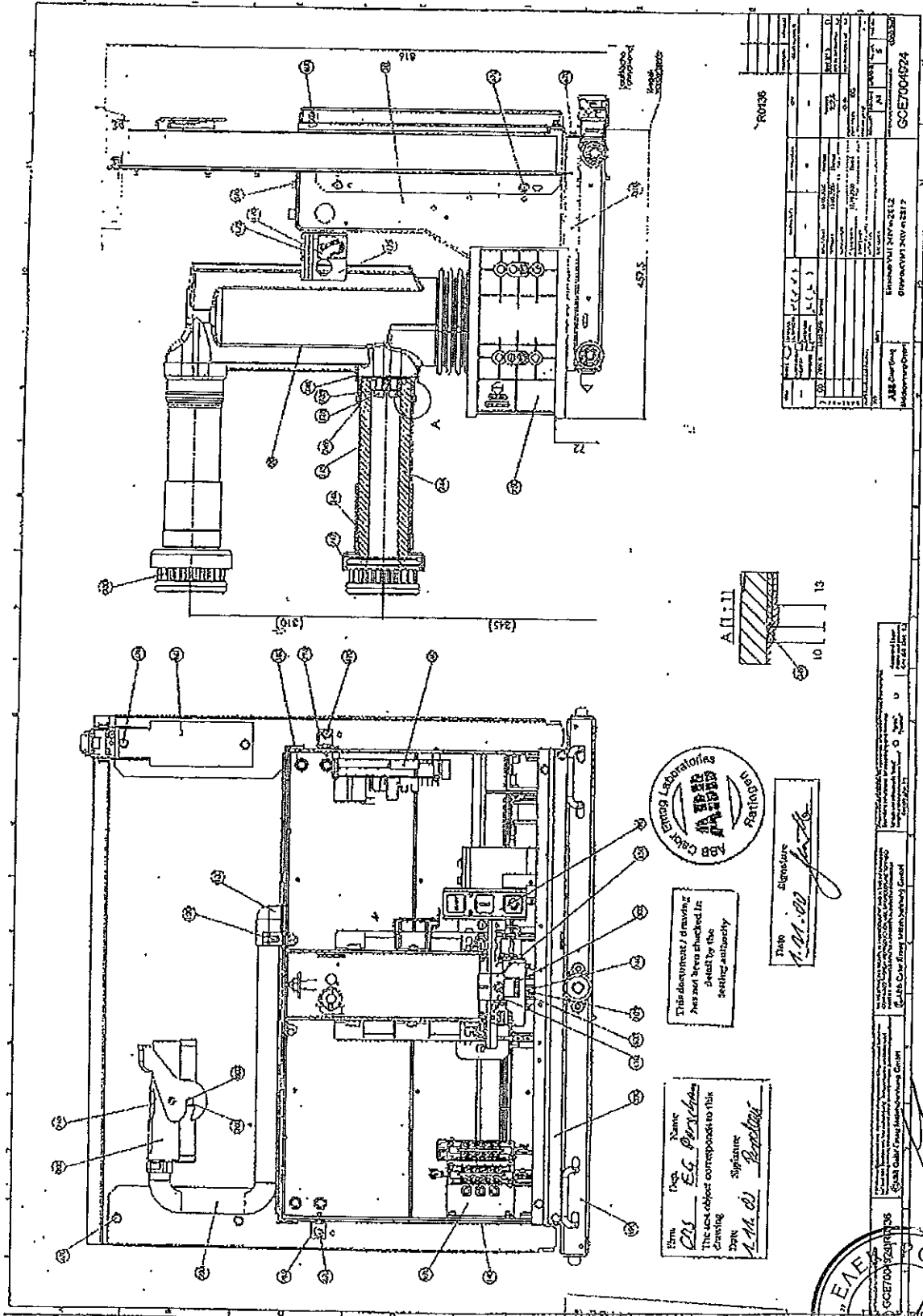
Item: 15 Name: 15
 Date: 21.11.00 Signature: [Signature]
 This test object corresponds to this drawing.

This document / drawing has not been checked in detail by the testing authority



Date: 21.11.00 Signature: [Signature]

R0102	
Material	ABB Calor Emag Switchgear 24kV, ILO 800
Manufacturer	ABB Calor Emag
Order No.	2570, 2350A
Material No.	GCER010457
Material Name	ABB Calor Emag Switchgear 24kV, ILO 800
Material Description	ABB Calor Emag Switchgear 24kV, ILO 800
Material Code	ABB Calor Emag
Material Class	ABB Calor Emag
Material Group	ABB Calor Emag
Material Subgroup	ABB Calor Emag
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Material Mounting	ABB Calor Emag
Material Fastener	ABB Calor Emag
Material Connector	ABB Calor Emag
Material Adapter	ABB Calor Emag
Material Converter	ABB Calor Emag
Material Transformer	ABB Calor Emag
Material Inverter	ABB Calor Emag
Material Rectifier	ABB Calor Emag
Material Amplifier	ABB Calor Emag
Material Controller	ABB Calor Emag
Material Processor	ABB Calor Emag
Material Memory	ABB Calor Emag
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Material Solenoid	ABB Calor Emag
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Material Plug	ABB Calor Emag
Material Jack	ABB Calor Emag
Material Pin	ABB Calor Emag
Material Head	ABB Calor Emag
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Material Cap	ABB Calor Emag
Material Cover	ABB Calor Emag
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Material Tracking	ABB Calor Emag
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Material Control	ABB Calor Emag
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Material Well	ABB Calor Emag
Material Pit	ABB Calor Emag
Material Trench	ABB Calor Emag
Material Ditch	ABB Calor Emag
Material Channel	ABB Calor Emag
Material Drainage	ABB Calor Emag
Material Sewer	ABB Calor Emag
Material Pipe	ABB Calor Emag
Material Conduit	ABB Calor Emag
Material Cableway	ABB Calor Emag
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Material Tray	ABB Calor Emag
Material Ladder	ABB Calor Emag
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Material Mounting	ABB Calor Emag
Material Fastener	ABB Calor Emag
Material Connector	ABB Calor Emag
Material Adapter	ABB Calor Emag
Material Converter	ABB Calor Emag
Material Transformer	ABB Calor Emag
Material Inverter	ABB Calor Emag
Material Rectifier	ABB Calor Emag
Material Amplifier	ABB Calor Emag
Material Controller	ABB Calor Emag
Material Processor	ABB Calor Emag
Material Memory	ABB Calor Emag
Material Storage	ABB Calor Emag
Material Drive	ABB Calor Emag
Material Motor	ABB Calor Emag
Material Actuator	ABB Calor Emag
Material Solenoid	ABB Calor Emag
Material Relay	ABB Calor Emag
Material Switch	ABB Calor Emag
Material Contact	ABB Calor Emag
Material Terminal	ABB Calor Emag
Material Plug	ABB Calor Emag
Material Jack	ABB Calor Emag
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Material Head	ABB Calor Emag
Material Base	ABB Calor Emag
Material Cap	ABB Calor Emag
Material Cover	ABB Calor Emag
Material Lid	ABB Calor Emag
Material Door	ABB Calor Emag
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Material Screw	ABB Calor Emag
Material Nail	ABB Calor Emag
Material Wire	ABB Calor Emag
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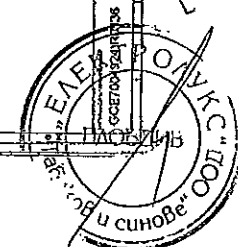
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5	1	St 304	
6	1	St 304	
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24	1	St 304	
25	1	St 304	



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has not been checked in
detail by the
issuing authority

Name: *EG Puschkin*
The object corresponds to this
drawing
Date: *1.11.00* Signature: *A.M. de B...*

Signature
1.11.00



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Deutscher Akkreditierungs Rat

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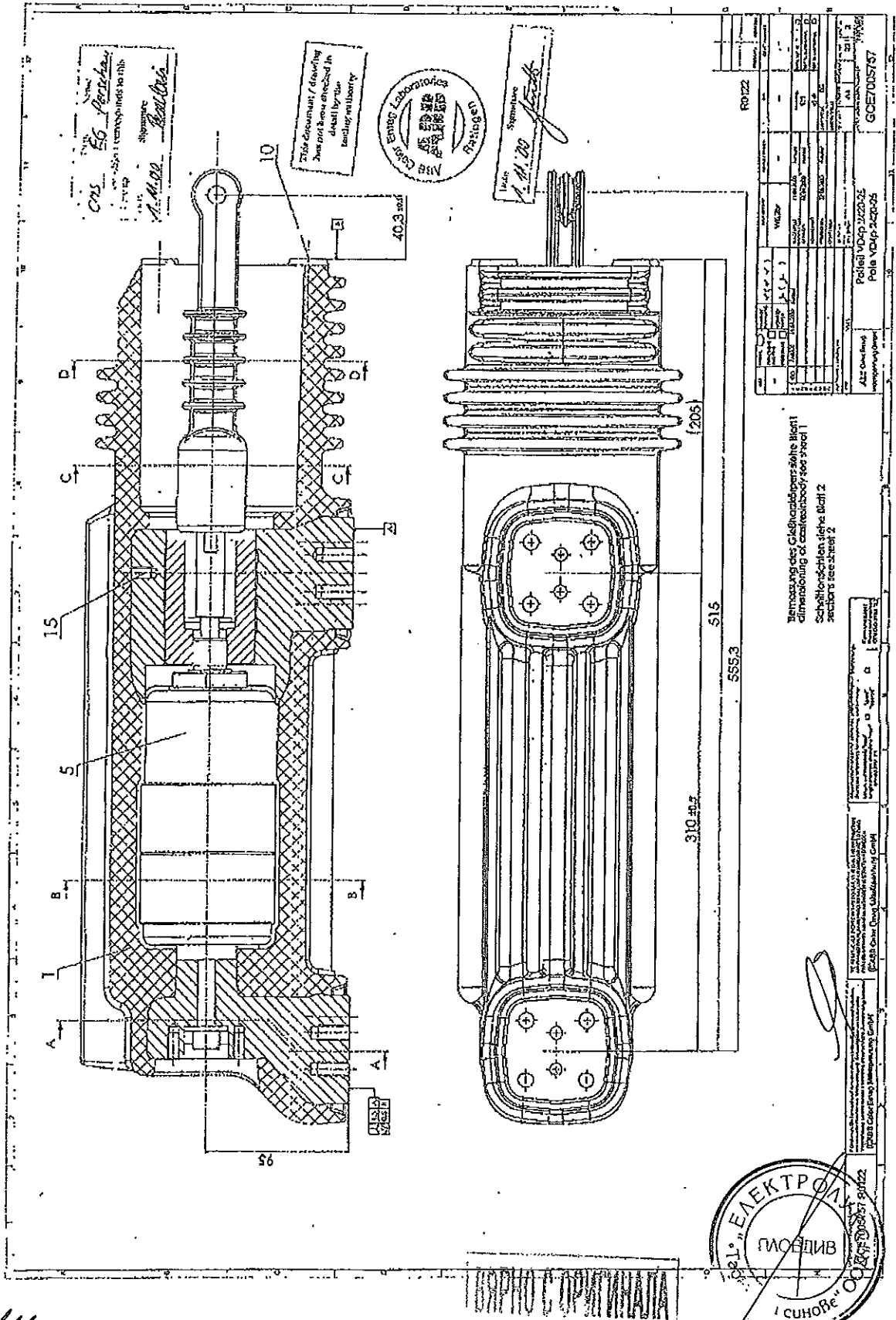
ABB Calor Emag Laboratories

TEST REPORT No. HZ 236 E 06

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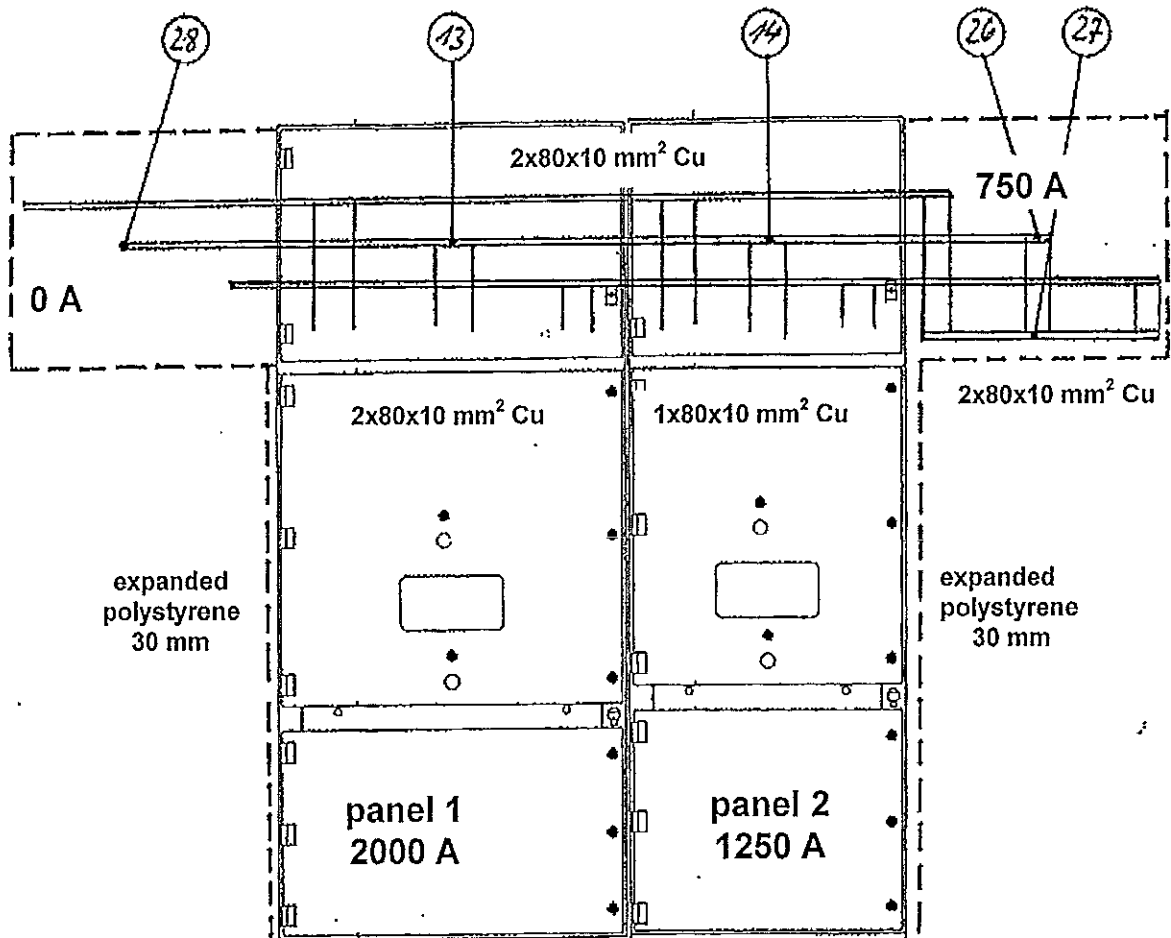


Sheet 12



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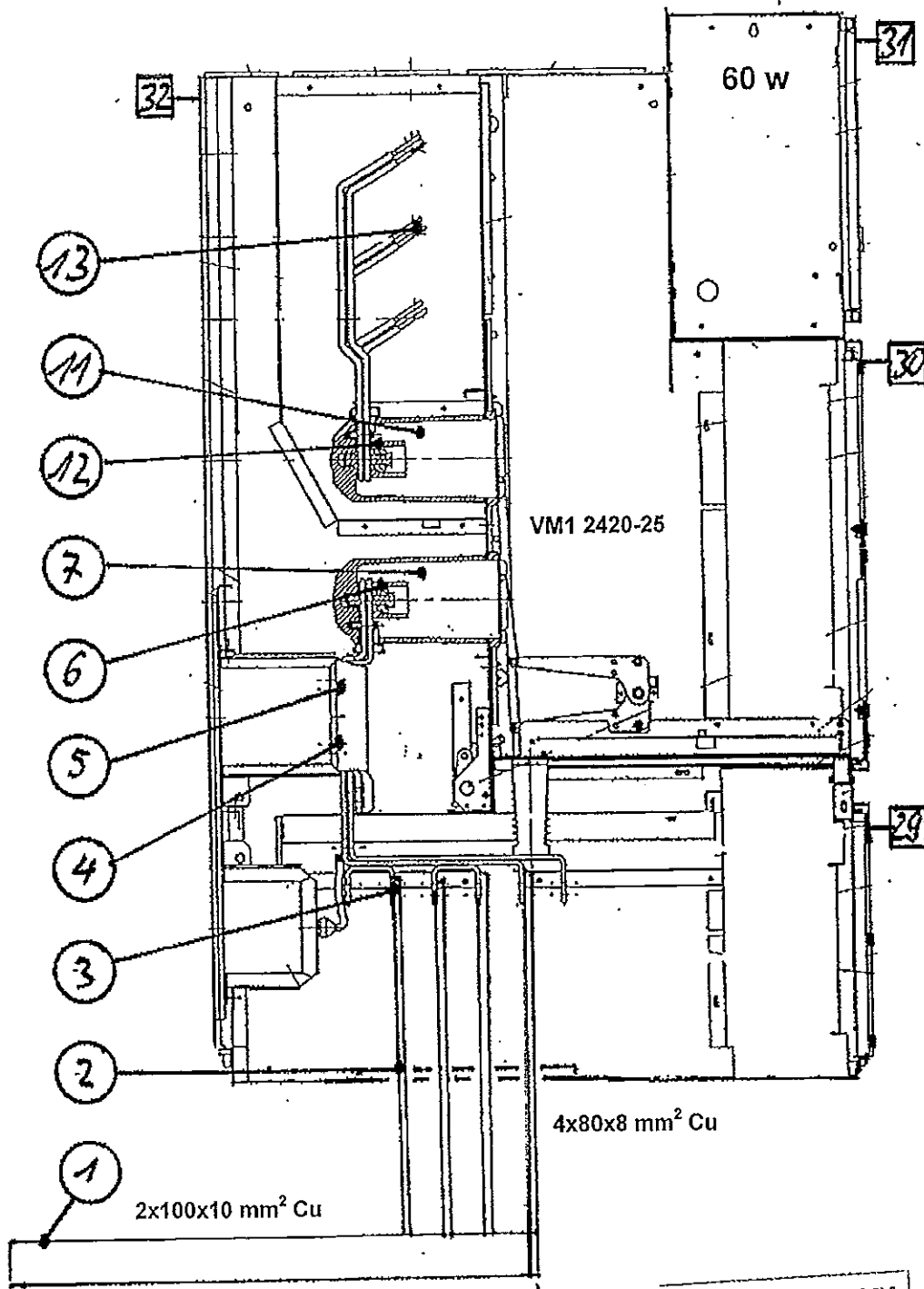
Test Arrangement and Measurement Points for Temperatures and Resistances on the Busbars



ВРЪНО С ОРЪЖИВАТА



Measurement Points for Temperatures and Resistances of Panel 1

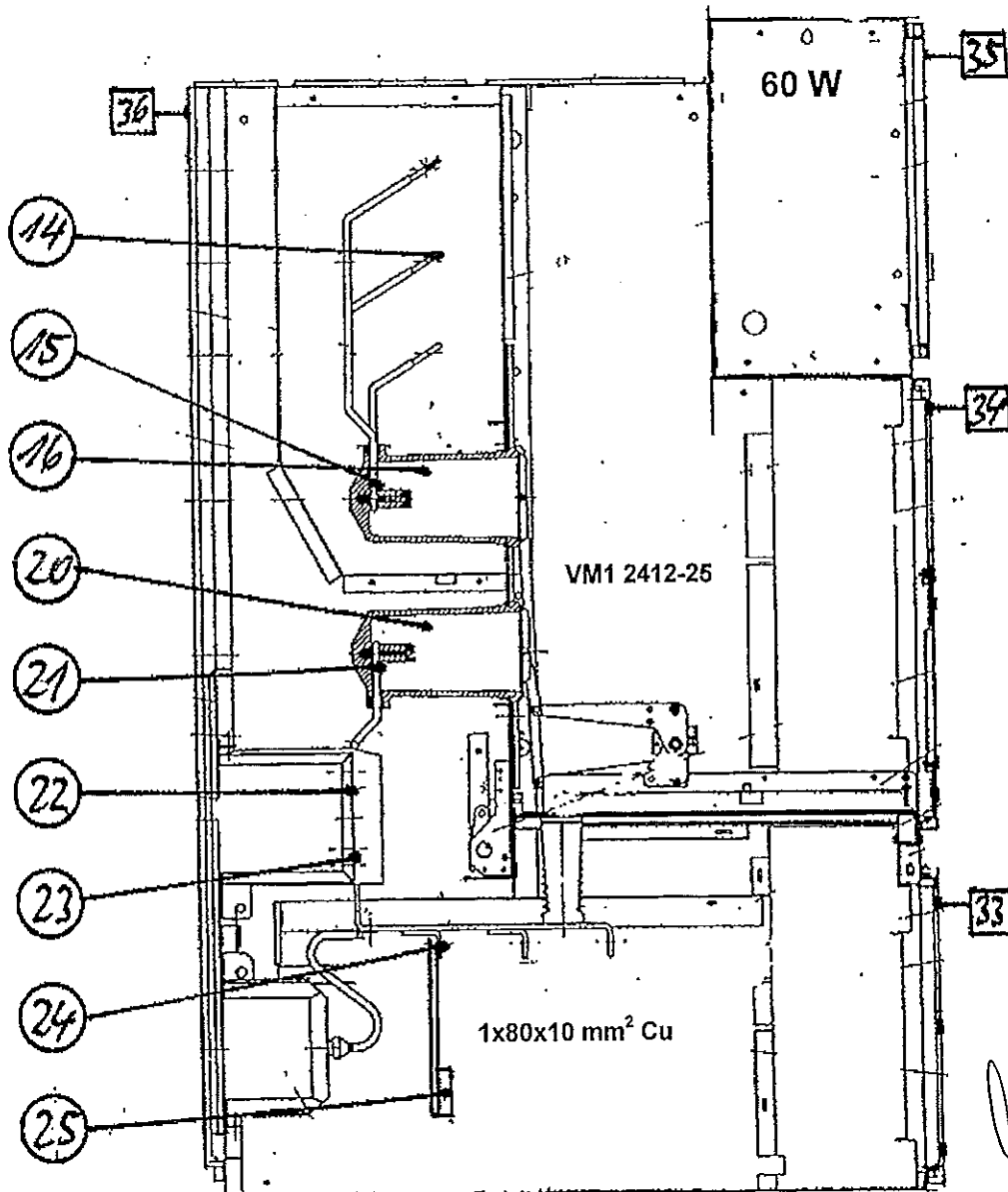


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Measurement Points for Temperatures and Resistances of Panel 2

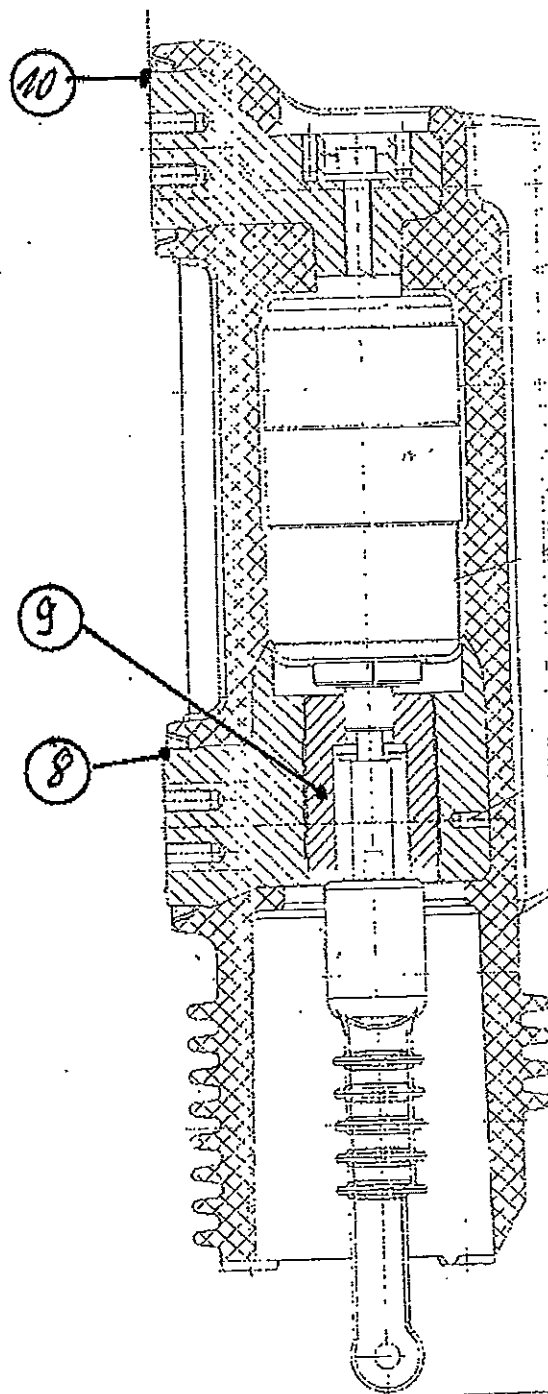


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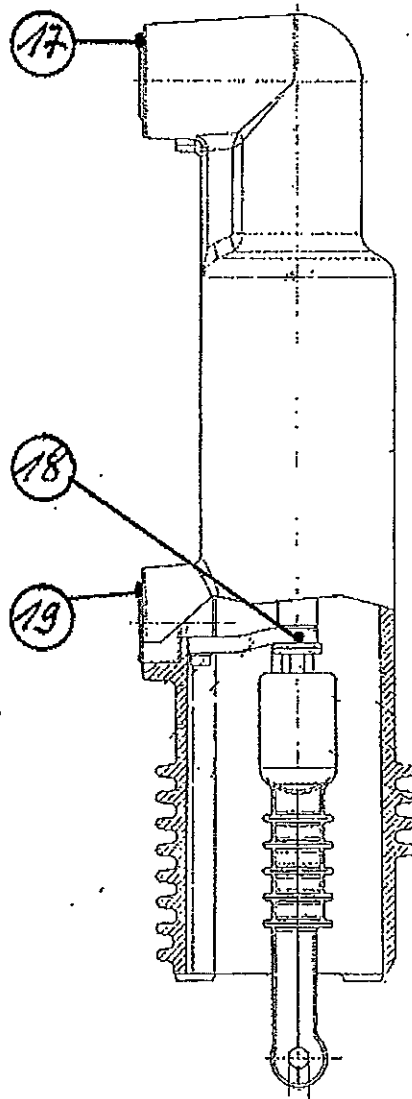
Measurement Points for Temperatures of Circuit-Breaker Poles Panel 1



ПОРНО С ОПРИГНАЛА



Measurement Points for Temperatures of Circuit-Breaker Poles Panel 2



ПОРНО С ОРЖИНАЛА



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TEST REPORT No. HZ 236 E 06

Sheet 19

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Measurement of the Resistance of the Main Circuit

Date of test: 11th November 2000 - before temperature rise test

12th November 2000 - after temperature rise test

Condition of test object before test: factory new panels

Ambient air temperature: before temperature rise test 22 °C

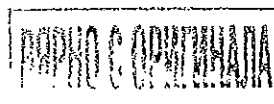
after temperature rise test 24 °C

Measurement between points (see sheet 14 - 16)	Resistance of the main circuit $\mu\Omega$		
	L1 before/after ¹⁾	L2 before/after ¹⁾	L3 before/after ¹⁾
2 - 14 (panel 1)	56.3 / 56.4	53.5 / 53.6	51.6 / 51.5
13 - 25 (panel 2)	95.0 / 94.4	90.4 / 89.1	83.3 / 81.9

Remarks: ¹⁾ Before: before temperature rise test
After: after temperature rise test

Resistance measurement at direct current of: 50 A

The measurement of the resistances are carried out by using the thermocouples at the named measurement points.



Temperature Rise Test

Date of test: 11th and 12th November 2000
Condition of test object before test: factory new panels
Connections to test object: feeder:
 two bars 100x10 mm² Cu, length about 2 m outside the panel and
 four bars 80x8 mm² Cu, length about 0.8 m outside and inside the
 panel
 neutral points:
 1. busbar outside feeder panel 2 with two bars 80x10 mm² Cu
 2. extended cable connection bars of panel 2 with one bar 80x10
 mm² Cu
Duration of test: 9 h
Ambient air temperature: 26.1 °C
Test current: see sheet 14
Test frequency: 50 Hz

Distribution of the currents of the panels:

panel or busbar	current in A			
	phase L1	phase L2	phase L3	average value
panel 1, incoming 2000 A	2002	2004	2013	2006
busbar panel 1 - 2	2002	2004	2013	2006
panel 2, outgoing 1250 A	1251	1250	1252	1251

Remarks:

- The distribution of the currents at the busbar connections of the feeder panel 2 was done by using of iron cores over the extended busbars.
- The side walls of the panels and the extended busbars were covered by expanded polystyrene sheets of 30 mm thickness.
- The temperatures were measured by thermocouples type T. For the measurement points of the main circuit the thermocouples were inserted into holes and fixed. The measurement system determines the average value of the ambient temperatures, calculates the differences to the temperatures of all measuring points and records the temperature rises directly.





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TEST REPORT No. HZ 236 E 06

Sheet 21

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Permitted Temperature Rise of the Main Circuit according IEC 60694 table 3

Kind of measuring point	Maximum value temperature rise at ambient air temperature not exceeding 40 °C	Measuring point (see sheet 14 to 18)
cable terminal	50	3, 24
Connection, bolted, Cu silver coated in air	75	13, 14, 18, 26, 27, 28
Connection, bolted, Cu silver coated in air in contact with insulation material class A	65	8, 10, 17, 19
Connection, bolted, Cu silver coated in air in contact with insulation material class E	75	4, 5, 22, 23
Contact, Cu silver-coated in air	65	6, 7, 9, 11, 12, 15, 16, 20, 21

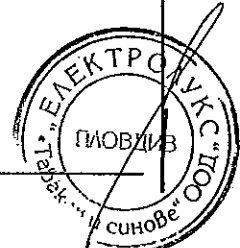
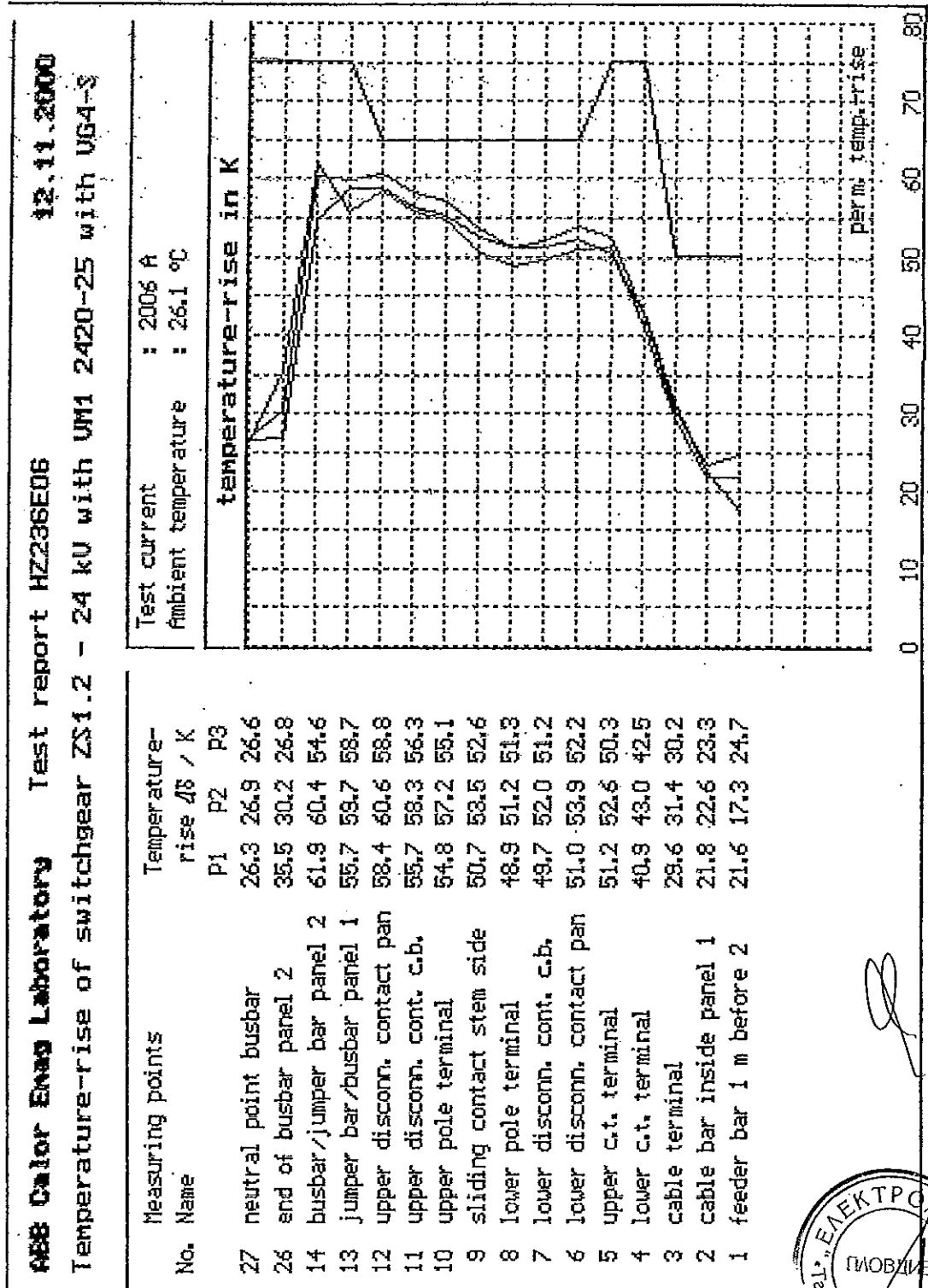
Continuation from sheet 20

Measuring point (see sheets 15 and 16)	Panel	Description of measuring point	Kind of measuring point	Final temperature rise K	Permitted temperature rise K
29	1	Front door top cable compartment	Access. part expected to be touched in normal operation	4.7	30
30	1	Front door top c.b. compartment	Access. part expected to be touched in normal operation	5.0	30
31	1	Front door top low voltage compartment	Access. part expected to be touched in normal operation	7.6	30
32	1	Rear wall top	Accessible part which need not to be touched in normal op.	14.4	40
33	2	Front door top cable compartment	Access. part expected to be touched in normal operation	3.8	30
34	2	Front door top c.b. compartment	Access. part expected to be touched in normal operation	6.3	30
35	2	Front door top low voltage compartment	Access. part expected to be touched in normal operation	8.1	30
36	2	Rear wall top	Accessible part which need not to be touched in normal op.	11.0	40



ВАРНО С ОПРИНАЛА

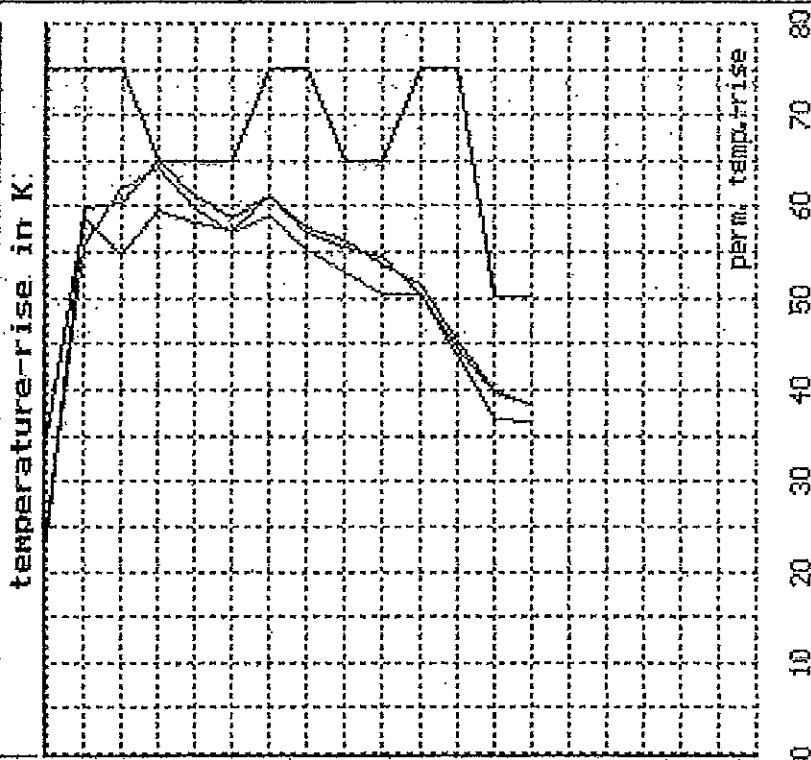
**Temperature rises and Permitted Temperature rises of the Incoming Panel 1
and the Busbar - right side**



**Temperature rises and Permitted Temperature rises of the Feeder Panel 2
and the Busbar – left side**

ABB Calor Emag Laboratory Test report HZ236E06 **12.11.2000**
Temperature-rise of switchgear ZS1.2 - 24 KU with UM1 2406-25 with UG4-S

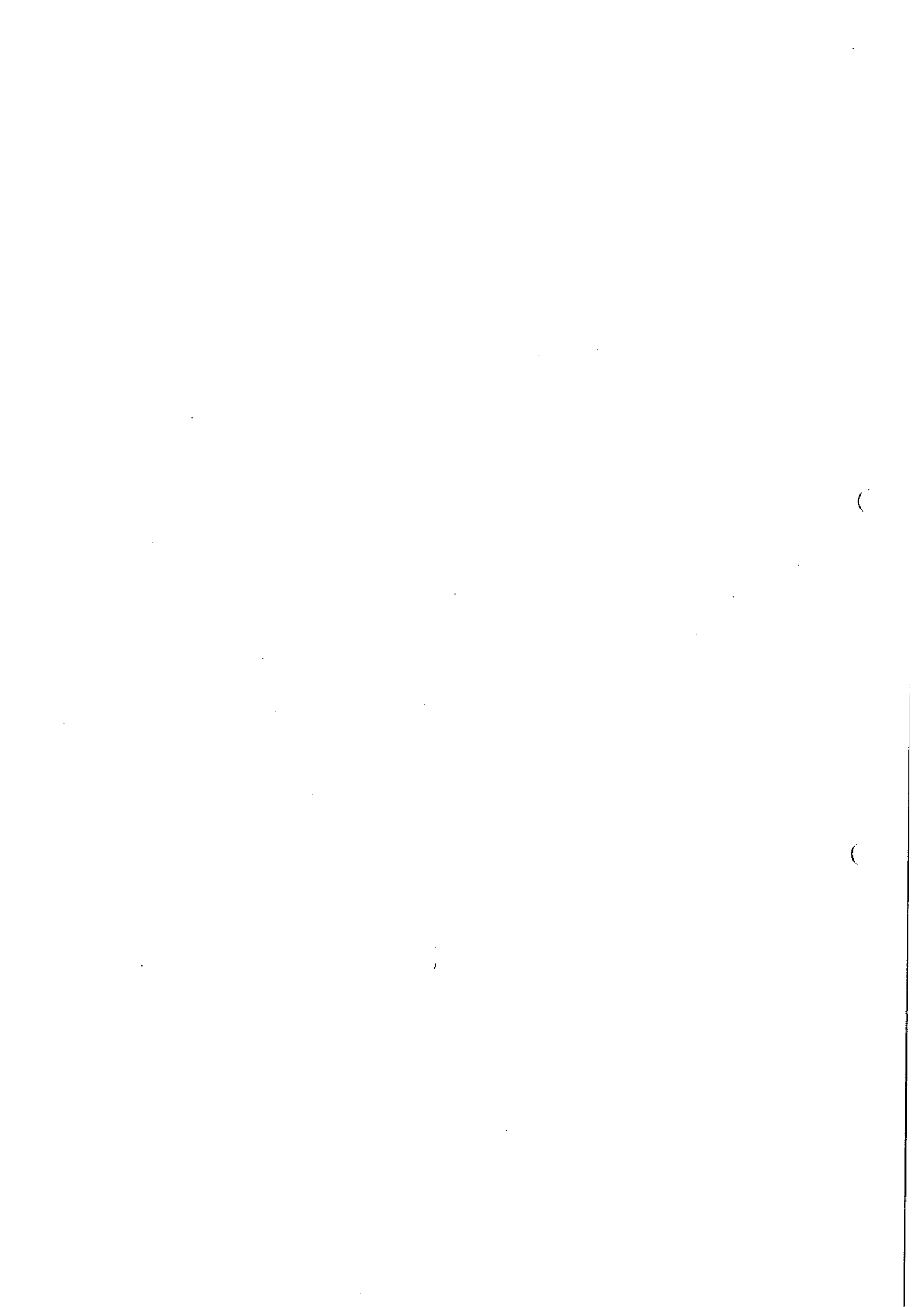
Test current : 1251 A
Ambient temperature : 26.1 °C



No.	Measuring points	Temperature rise 48 / K		
		P1	P2	P3
28	end of busbar panel 1	24.9	23.3	34.9
13	busbar/jumper bar panel 1	55.7	59.7	58.7
14	busbar/jumper bar panel 2	61.9	60.4	54.6
15	upper disconn. contact pan	64.1	64.9	59.6
16	upper disconn. cont. c.b.	59.8	61.2	58.1
17	upper pole terminal	57.0	58.7	57.3
18	current lead interr. stem	59.0	61.1	61.2
19	lower pole terminal	55.2	57.7	57.1
20	lower disconn. cont. c.b.	52.9	56.3	55.5
21	lower disconn. contact pan	50.4	53.5	54.4
22	upper c.t. terminal	50.3	51.6	50.4
23	lower c.t. terminal	43.7	45.4	44.5
24	cable terminal	36.7	40.0	39.7
25	neutral point cable term.	36.5	38.3	38.3



ВАРНО С ОРИГИНАЛ



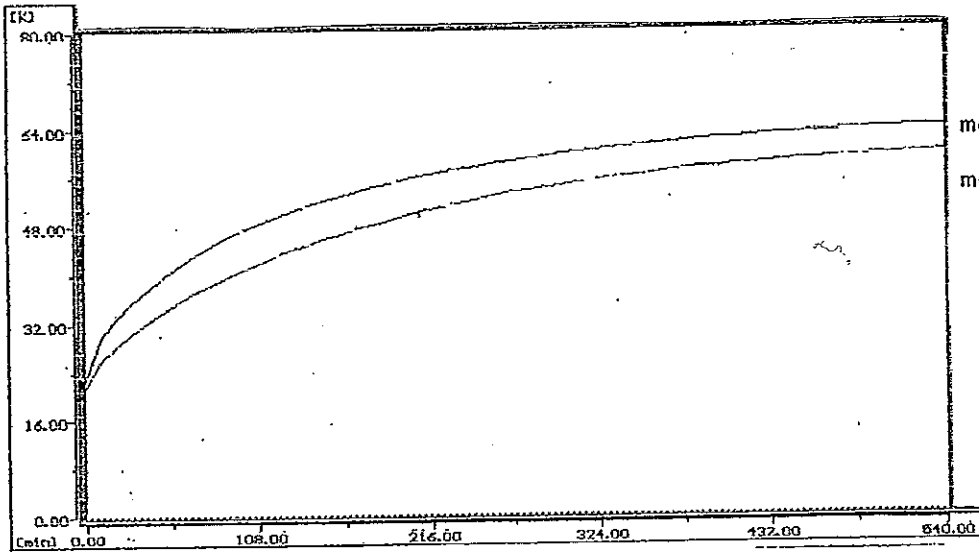


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TEST REPORT No. HZ 236 E 06
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Sheet 24

Temperature rise of upper Disconnecting Contacts Panel Side - Phase L2



panel 2
measurement point 15
panel 1
measurement point 12



ВЕРНО С ОРИГИНАЛА

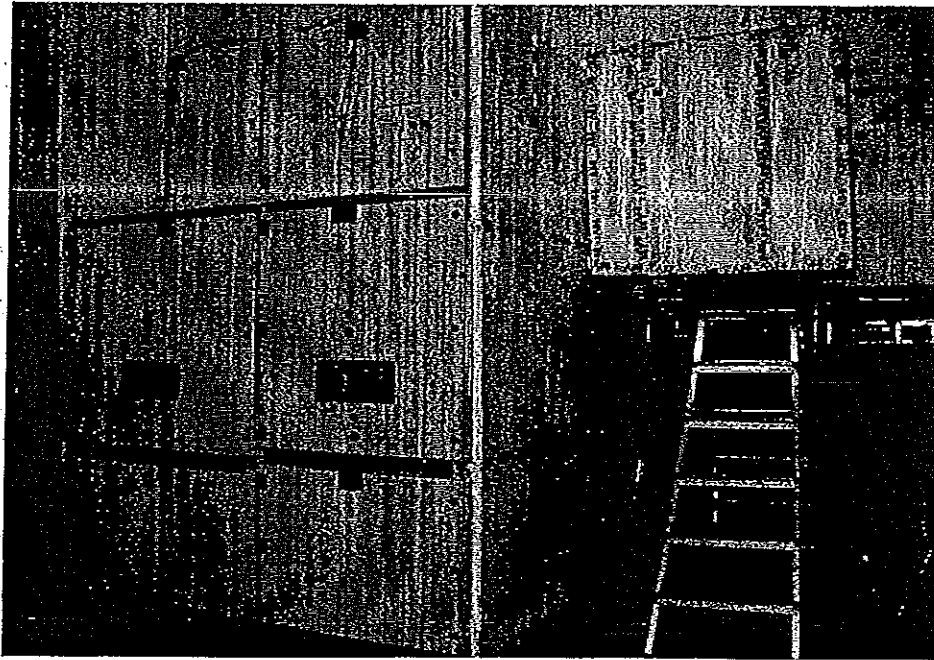


Photo 1: front view left

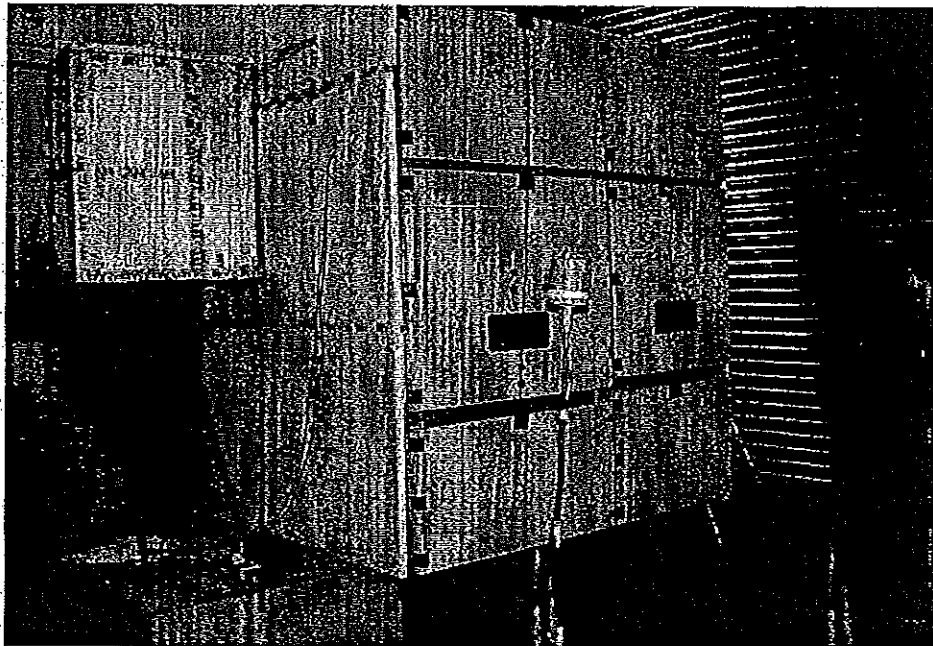


Photo 2: front view right



ВЯРНО С ОРИГИНАЛА

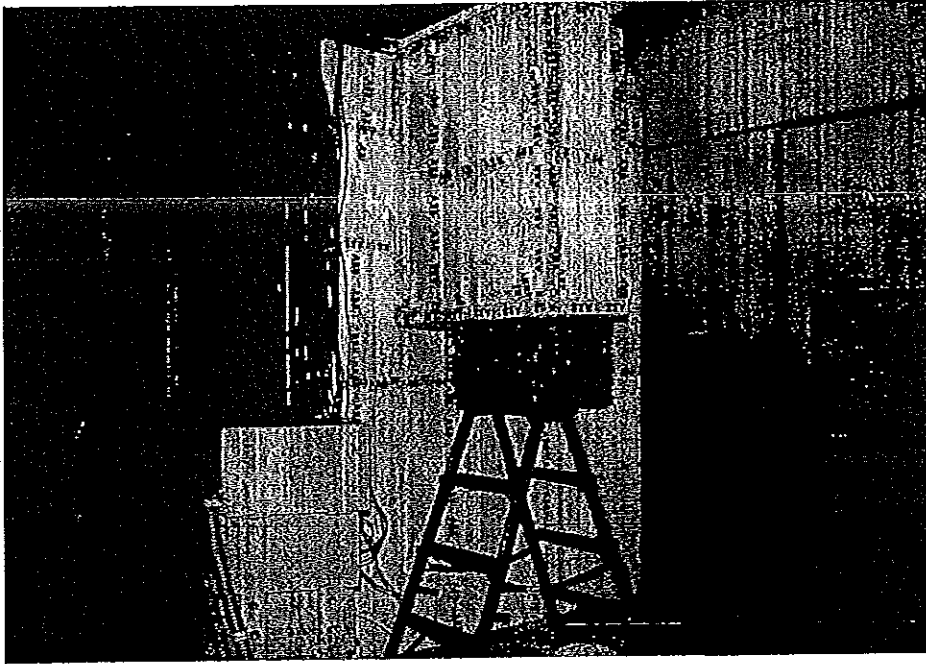


Photo 3: side view left

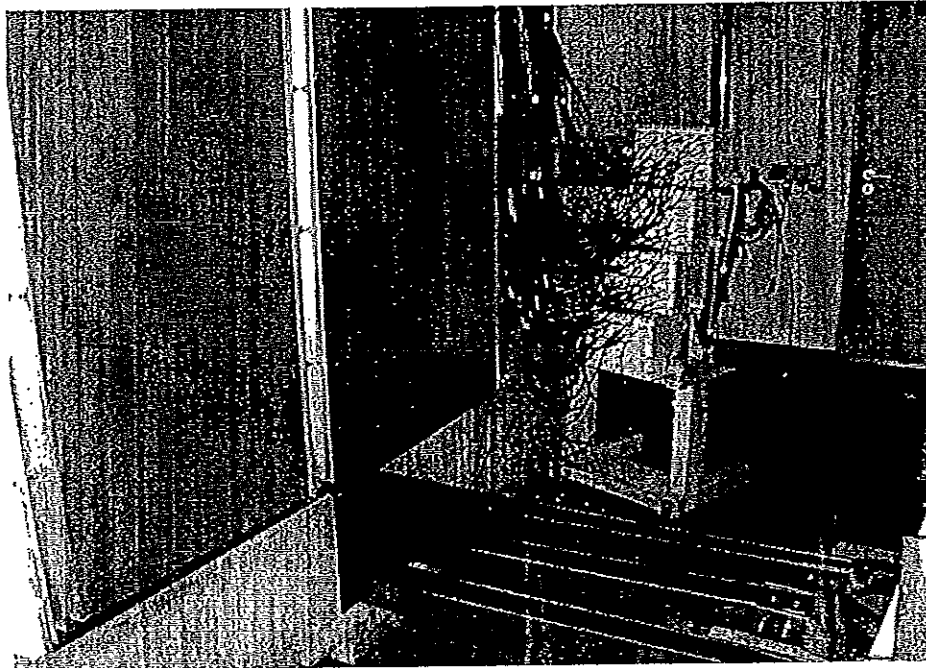


Photo 4: rear view



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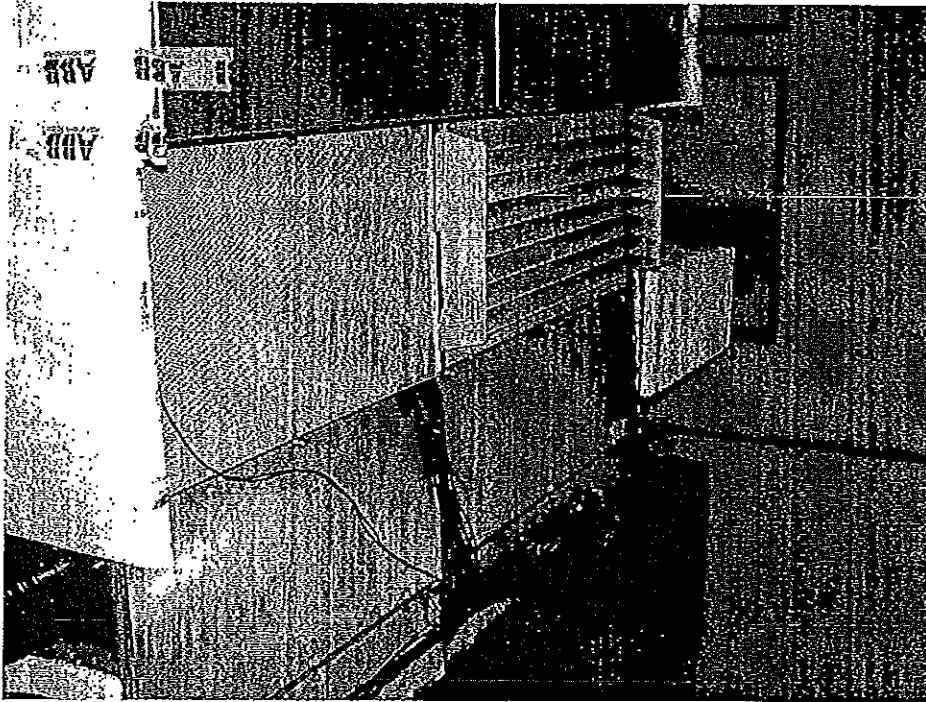


Photo 5: top view



ВЯРНО С ОРИГИНАЛА

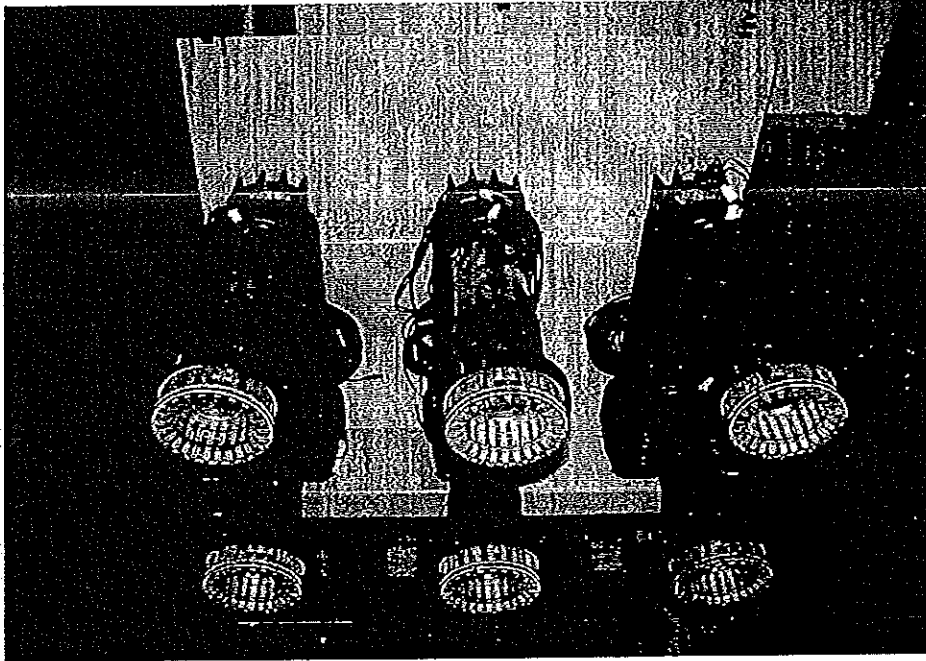


Photo 6: VM1 2420-25

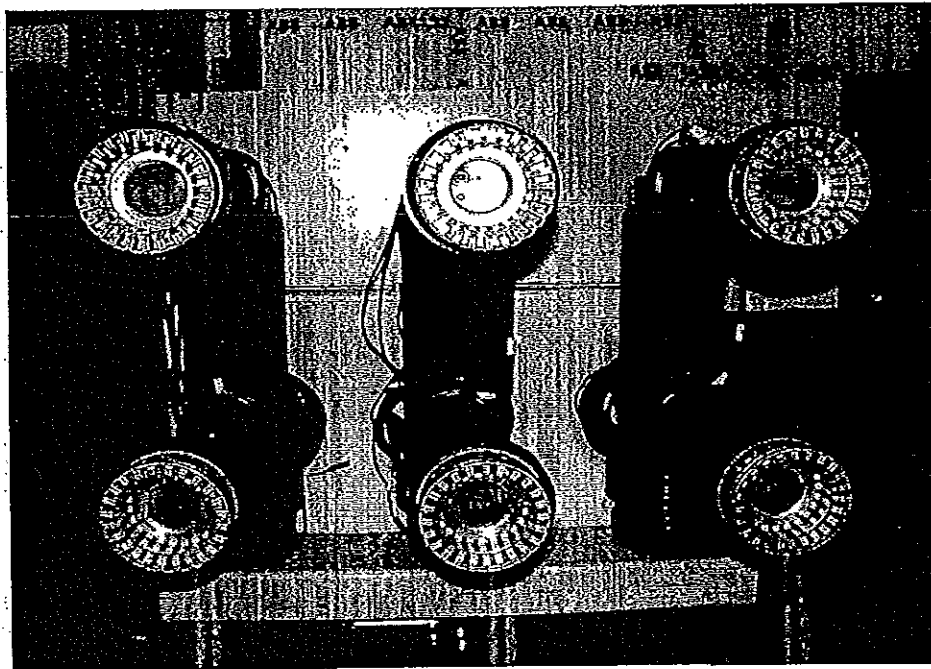


Photo 7: VM1 2420-25



ВЯРНО С ОРИГИНАЛА



Photo 8: VM1 2412-25

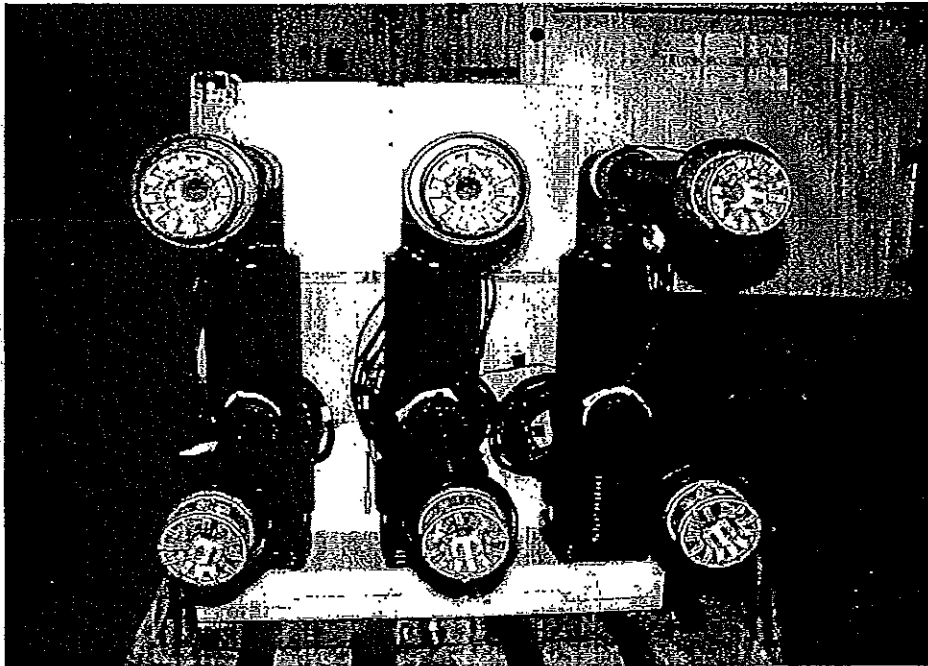


Photo 9: VM1 2412-25



ВЯРНО С ОРГИНАЛА



Reg. No.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 L 02

Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 1

Copy-No. 1

Test Object Three-panel arrangement of metal-clad, air insulated switchgear type ZS1.2 (1000 mm, 1000 mm, 800 mm width) equipped with bushing plates

Rated voltage	U_r	24 kV
Rated normal current	I_r	1600/1600/1000 A
Rated frequency	f_r	50/60 Hz
Rated short-time withstand current	I_k	25 kA
Rated peak withstand current	I_p	63 kA
Rated duration of short-circuit current	t_k	3 s

Manufacturer ABB Calor Emag Mittelspannung GmbH, Oberhausener Str. 33, 40472 Ratingen, Deutschland

Tests performed Testing of the behaviour of the metal-clad switchgear under conditions of arcing due to internal faults with 25 kA - 1.0 s in different compartments of the three panels. For further details see sheet-no. 2 to 5.

Test Specification The test has been carried out in accordance with the client's instructions. Test procedure and test parameters were based on IEC 60298/3rd Ed/1990-12, Clause 6.108, Annex AA in conjunction with PEHLA-Recommendation No. 4 / 3.1995.
(Accessibility Type A: Metal-enclosed switchgear and controlgear with accessibility restricted to authorized personnel only).

Test Results The assessment of the test was carried out in accordance with criteria 1 to 6 of the above mentioned test specifications.
For further details see sheet-no. 2 to 5 and 16 to 20.

Test Date 12th and 14th December 2000

Client ABB Calor Emag Mittelspannung GmbH, Oberhausener Str. 33, 40472 Ratingen, Deutschland



19th February 2002
Date of Issue

G. Göttlich
Dr. G. Göttlich
Laboratory Manager

A. Brandt
Andreas Brandt
Test Engineer

Total Number of Sheets: 30 Sheets

11 Oszillograms

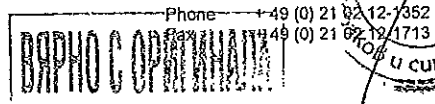
This test report refers exclusively to the object tested.
ABB Calor Emag Mittelspannung GmbH is certified according to DIN ISO 9001 by DQS under Reg. No. 373-02

ABB Calor Emag Laboratories Ratingen are accredited according to EN 45001 by DATech under Reg.No. DAT-P-032/93

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ABB Calor Emag Mittelspannung GmbH Ratingen
High-Power Testing Laboratory

Oberhausener Straße 33
40472 Ratingen, Deutschland





Reg. No.

DAT-P-032/93

TEST REPORT No. HZ 235 L 02

Sheet 2

Issued by an Accredited Laboratory
corresponding to EN 45001

Comments on Test Arrangement and on the Test

The test object was a three-panel arrangement of a metal-clad, air insulated switchgear type ZS1.2 for 24 kV, consisting of a 1000 mm width outgoing panel left-handed, of a 1000 mm width incoming panel in centre and a 800 mm width outgoing panel right-handed. The switchgear was installed in a room mock up with a ceiling height of approximately 3 m. The distance between the rear wall of the switchgear and the room mock up was approximately 0.2 m. The pressure relief took place by a top mounted pressure relief duct overcoming 1800 mm at the side wall of the left-handed panel.

Each panel was equipped with a VD4 vacuum circuit-breaker dummy and a common earthing bar of copper 30 x 8 mm².

Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

For all tests black cretonne indicators (cotton fabric approximately 150 g/m²) were placed in front of and on one side of the switchgear as stated in the relevant test regulations.

During the tests the pressure gauge in the compartment under test was measured and recorded. The tests were filmed with a high-speed video camera with a frequency of 500 frames/s.

The evaluation of the RMS-value of the short-circuit current was made according to the Simpson-Formula.



ВЕРНО С ОРИГИНАЛОМ

Test Results

Test-no.: HZ 235 L 02 / 03 Internal arcing test in the cable compartment of the right-handed panel (800 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm at the cable terminals.

Peak short-circuit current: 59.7 kA
Short-circuit current: 24.7 kA - 1.03 s equivalent to 25.0 kA - 1.02 s

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).

Test-no.: HZ 235 L 02 / 04 Internal arcing test in the cable compartment of the left-handed panel (1000 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm at the cable terminals.

Peak short-circuit current: 59.7 kA
Short-circuit current: 24.9 kA - 1.04 s equivalent to 25.0 kA - 1.03 s

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



ВЕРНО С ОРИГИНАЛОМ

Test Results

Test-no.: HZ 235 L 02 / 05 Internal arcing test in the circuit-breaker compartment of the right-handed panel (800 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm across the lower contact arms of the circuit-breaker.

Peak short-circuit current: 58.8 kA
Short-circuit current: 24.7 kA - 1.04 s equivalent to 25.0 kA - 1.02 s

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).

Test-no.: HZ 235 L 02 / 06 Internal arcing test in the busbar compartment of the left-handed panel (1000 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm across the busbars.

Peak short-circuit current: 56.8 kA
Short-circuit current: 24.7 kA - 1.04 s equivalent to 25.0 kA - 1.03 s

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



ВЯРНО С ОПРИМНАТА

Test Results

Test-no.: HZ 235 L 02 / 07 Internal arcing test in the circuit-breaker compartment of the centre panel (1000 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm across the upper contact arms of the circuit-breaker.

Peak short-circuit current: 59.6 kA
Short-circuit current: 24.7 kA - 1.04 s equivalent to 25.0 kA - 1.03 s

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



ВЕРНО С ОРИГИНАЛОМ



Reg. No.
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corresponding to EN 45001

Sheet 6

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ВАРНО С ОПРИТНАТА

Assessment of the Test

Extraction of IEC 60298/3rd Ed/1990-12, Annex AA

The following criteria allow for the arcing effects.
It is to be observed:

Criterion No. 1

Whether correctly secured doors, covers, etc., do not open.

Criterion No. 2

Whether parts (of the metal-enclosed switchgear and controlgear), which may cause a hazard, do not fly off. This includes large parts or those with sharp edges, for example, inspection windows, pressure relief flaps, cover plates, etc.

Criterion No. 3

Whether arcing does not cause holes to develop in the freely accessible parts of the enclosure as a result of burning or other effects.

Criterion No. 4

Whether the indicators arranged vertically do not ignite. Indicators ignited as a result of paint or stickers burning are excluded from this assessment.

Criterion No. 5

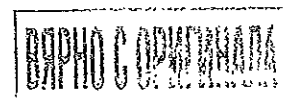
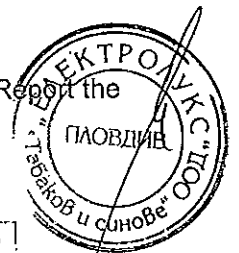
Whether the indicators arranged horizontally do not ignite. Should they start to burn during the test, the assessment criterion may be regarded as having been met, if proof is established of the fact that the ignition was caused by glowing particles rather than hot gases. Pictures taken by high-speed cameras should be produced in evidence.

Criterion No. 6

Whether all earthing connections are still effective.

Remark:

When the PEHLA-Recommendation No. 4 is stated under *Test Specification* in the Test Report the results of each test were assessed by all six criteria.





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Sheet 8

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Participants of the Tests

Client: ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen,
Deutschland

Representatives of the client:

Mr. Aufermann ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen,
Deutschland
Dept. EA

Mr. Groll ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen,
Deutschland
Dept. EA

Representatives of the laboratory:

Mr. Dr. Göttlich ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen,
Deutschland
Dept. LL

Test Engineer:

Mr. Brandt ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen,
Deutschland
Dept. LL





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TEST REPORT No. HZ 235 L 02

Sheet 9

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Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switchgear (left-handed and centre)

Test Object: Metal-clad, air insulated switchgear

Type: ZS1.2, 1000 mm width

Manufacturer: ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen, Deutschland

Serial-No.: 7550027/2027/00
7550027/2025/00

Year of manufacture: 2000

Drawing Nos.: See sheet-no. 10

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV
Rated frequency	50/60	Hz
Rated current (busbar)	2000	A
Rated current (tee-off)	1600	A
Rated short-circuit peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated short-circuit duration	3	s
Insulating medium	air	
Rated filling pressure (abs., 20 ° C)	-	kPa

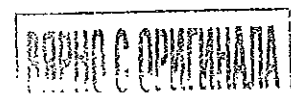
Prospective values under internal-arc conditions:

Peak withstand current	63	kA
Short-time withstand current	25	kA
Short-circuit duration	1	s

Additional specifications and data:

- busbars 2 x 80 mm x 10 mm / R 5 mm, Cu, insulated
- tee-off bars 2 x 80 mm x 10 mm / R 5 mm, Cu, insulated

Date of receipt of test object: 11th December 2000





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TEST REPORT No. HZ 235 L 02

Sheet 10

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Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switchgear (right-handed)

Test Object: Metal-clad, air insulated switchgear

Type: ZS1.2, 800 mm width

Manufacturer: ABB Calor Emag Mittelspannung GmbH, 40472 Ratingen, Deutschland

Serial-No.: 7550027/2022/00

Year of manufacture: 2000

Drawing Nos.: See sheet-no. 10

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV

Rated frequency	50/60	Hz
Rated current (busbar)	2000	A
Rated current (tee-off)	1000	A

Rated short-circuit peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated short-circuit duration	3	s

Insulating medium	air
Rated filling pressure (abs., 20 ° C)	- kPa

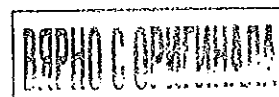
Prospective values under internal-arc conditions:

Peak withstand current	63	kA
Short-time withstand current	25	kA
Short-circuit duration	1	s

Additional specifications and data:

- busbars 2 x 80 mm x 10 mm / R 5 mm, Cu, insulated
- tee-off bars 1 x 60 mm x 10 mm / R 5 mm, Cu, insulated

Date of receipt of test object: 11th December 2000





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Sheet 11

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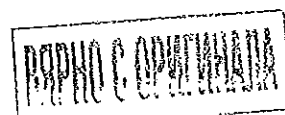
Table of Drawings of Test Objects

The drawings submitted for identification of the test object were stamped and signed by the test engineer.

The manufacturer/client has guaranteed by signature on the drawings that the equipment submitted for tests has been manufactured in accordance with the given drawings.

A copy of the following drawing is part of this Test Report:

ZS 1.2, feeder panel 24 kV, PW.1000	GCE8010459R0101, sheet 1, index 01,
ZS 1.2, feeder panel 24 kV, PW.800	GCE8010457R0101, sheet 1, index 01,
Type Test Arrangement (internal fault) ZS1.2 – Panel 24kV	GCEP800240 sheet 1, index 00





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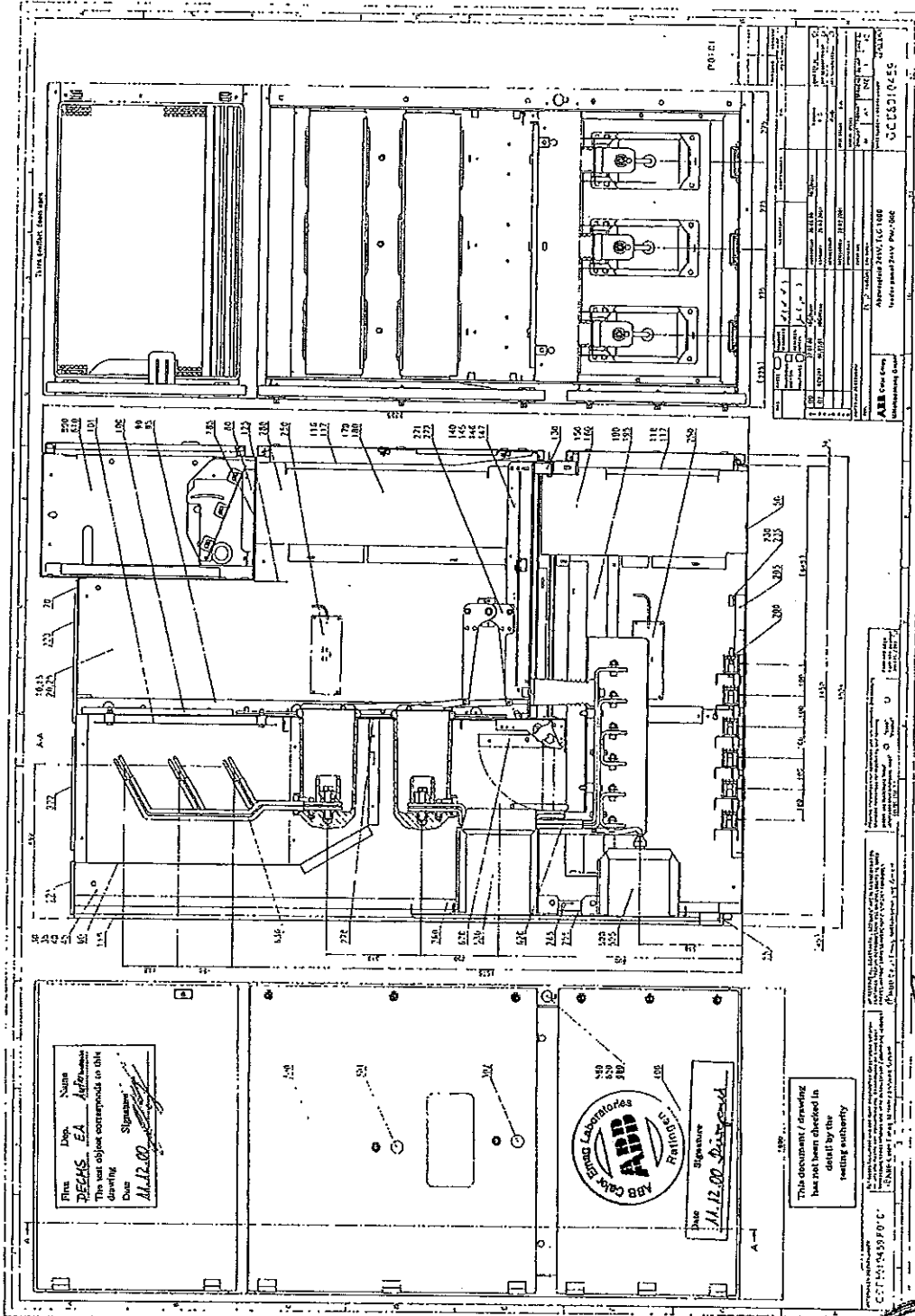
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corresponding to EN 45001

Sheet 12



Drawn: **BEKAS**
Checked: **EA**
Date: **11.12.00**

Signature: **M.12.00**

This document / drawing has not been checked in detail by the testing authority





Deutscher
Akcreditierungs
Rat

Reg. No.
DAT-P-032/93

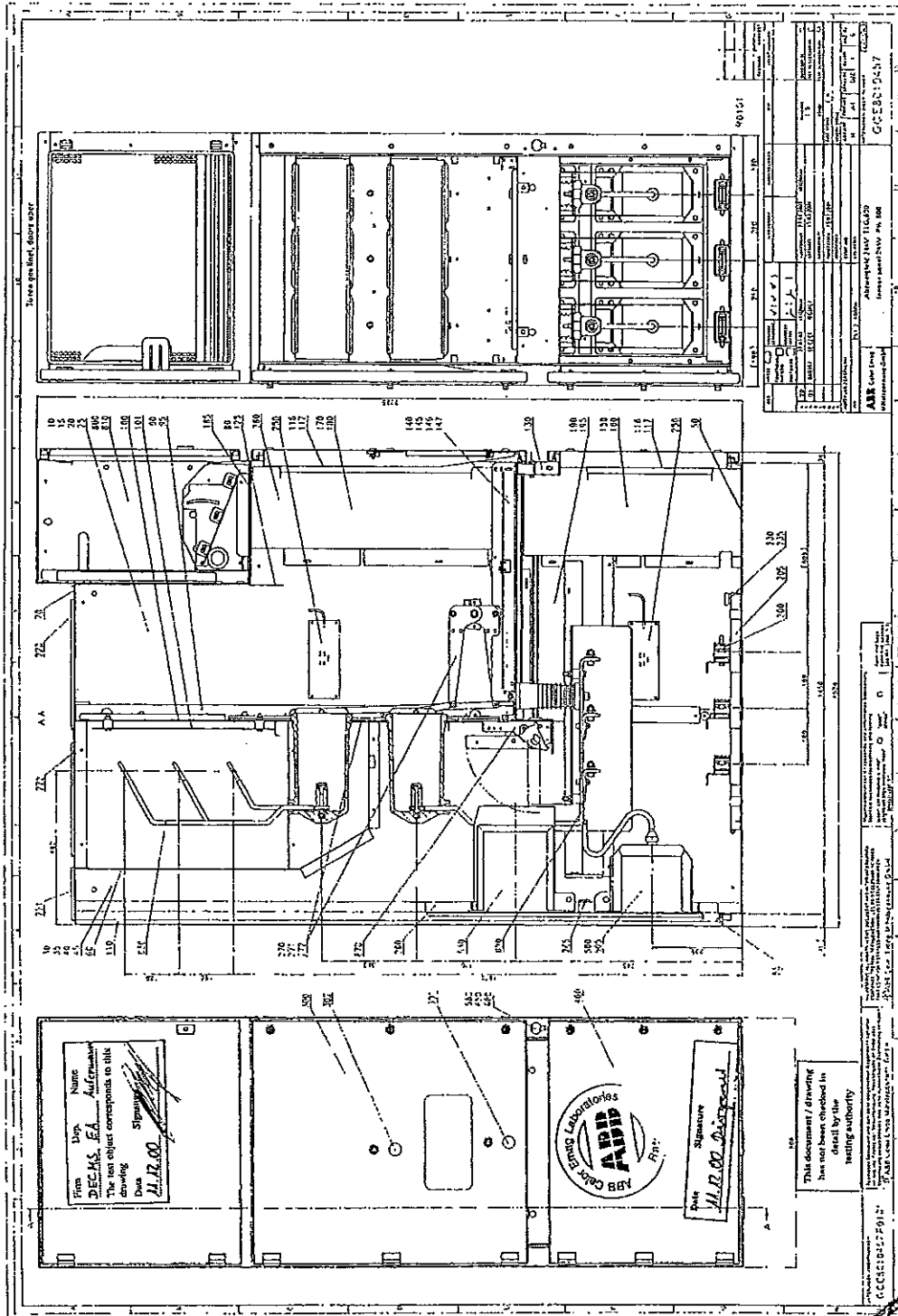
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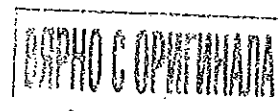
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Sheet 15

Technical Data of Test Circuit

Test	Internal fault	-	-	-
Oscillogram-No. HZ 235 L 02	02 - 07	-	-	-
Number of phases (circuit)	3	-	-	-
Number of poles/phases (test object)	3	-	-	-
Power frequency Hz	50	-	-	-
Power factor $\cos \varphi$	≤ 0.15	-	-	-
Earthing	Generator	earthed via 5 k Ω	-	-
	Transformer	not earthed	-	-
	Short-circuit point	not earthed	-	-
Circuit diagram	Sheet no.:	16	-	-
Circuit impedance m Ω		≈ 170	-	-
			-	-
TRV control elements		-	-	-
Capacitance in parallel μF		-	-	-
Resistance in series Ω		-	-	-
		-	-	-
Prospective TRV		-	-	-
TRV peak value u_c kV		-	-	-
Time co-ordinate t_3 μs		-	-	-
Time delay t_d μs		-	-	-
Based on kV		-	-	-
Rate-of-rise kV/ μs		-	-	-
		-	-	-
Voltage measurements	Divider 375 k Ω / 2 k Ω	-	-	-
Current measurements	Transformer 50 kA / 5 A	-	-	-

Remarks:
HZ 235 L 02 / 01: Current calibration



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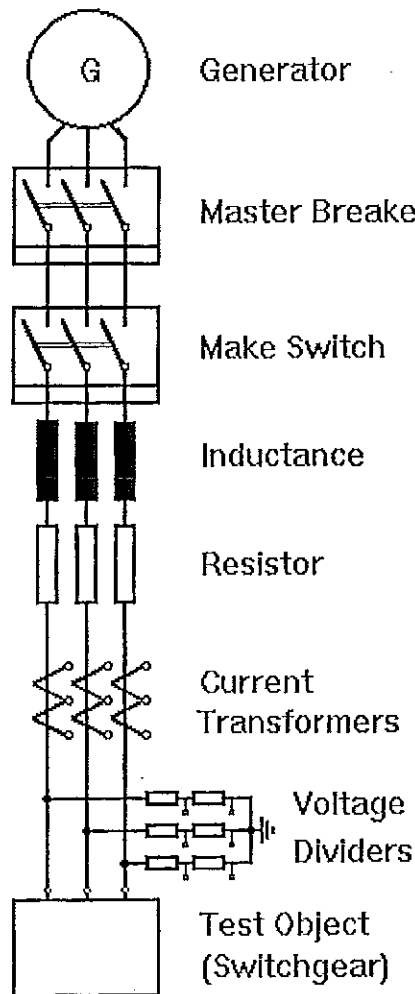
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Sheet 16

Principle Diagram of Test Circuit



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ИЗДАНО С ОРЪГИНАЛА





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TEST REPORT No. HZ 235 L 02

Sheet 17

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Determination of the Prospective Short-Circuit Current

Condition of test object before test: -

Arrangement: See sheet-no. 2

Connection: Infeed of current was made three-phase by means of a three core cable
1 x 3 x 185 mm² through the closed bottom of the centre panel.

For the determination of the prospective short-circuit current the infeeding busbars of the test plant were short-circuited and earthed outside the switchgear under test.

Test-No.: HZ 235 L 02 / 02		Applied voltage (phase-to-phase) 7.30 kV		Duration of short-circuit current 1.03 s
	Peak short-circuit current kA	Short-circuit current: first cycle last cycle kA kA		Arithmetic mean value kA
L1	65.8	27.2	25.8	25.0
L2	19.6	26.9	25.9	25.1
L3	51.3	26.9	25.5	24.8
Average value		27.0	25.7	25.0
Equivalent duration of short-circuit current 1.03 s			corresponding to a short-circuit current of 25.0 kA	

Remarks: -



Internal Arcing Test

Condition of test object before test: Switchgear factory-new.

Arrangement: See sheet-no.: 2

Connection: Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

Ignition: Internal arcing test in the cable compartment of the right-handed panel (800 mm width), ignition of arc three-phase by means of a copper wire \varnothing 0.5 mm at the cable terminals.

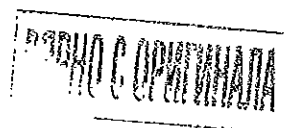
Test-No.: HZ 235 L 02 / 03		Applied voltage (phase-to-phase) 7.45 kV		Duration of short-circuit current 1.03 s
	Peak short-circuit current kA	Short-circuit current:		Arithmetic mean value kA
		first cycle kA	last cycle kA	
L1	59.7	26.9	25.6	24.8
L2	18.3	26.3	25.7	24.9
L3	45.4	26.4	25.2	24.4
Average value		26.5	25.5	24.7
Equivalent duration of short-circuit current 1.02 s			corresponding to a short-circuit current of 25.0 kA	

Remarks and condition of test object after test:

The condition of the switchgear before and after test is shown on the photos on sheet-no. 23 to 29. The measured pressure gauge was about 42 kPa.

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



Internal Arcing Test

Condition of test object before test: as after test HZ 235 L 02 / 03.

Arrangement: See sheet-no.: 2

Connection: Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

Ignition: Internal arcing test in the cable compartment of the left-handed panel (1000 mm width), ignition of arc three-phase by means of a copper wire Ø 0.5 across the cable terminals.

Test-No.: HZ 235 L 02 / 04		Applied voltage (phase-to-phase) 7.45 kV		Duration of short-circuit current 1.04 s
	Peak short-circuit current kA	Short-circuit current:		Arithmetic mean value kA
		first cycle kA	last cycle kA	
L1	59.7	27.1	25.8	25.1
L2	20.5	26.0	25.7	25.0
L3	47.5	26.6	25.4	24.6
Average value		26.6	25.7	24.9
Equivalent duration of short-circuit current 1.03 s			corresponding to a short-circuit current of 25.0 kA	

Remarks and condition of test object after test:
The condition of the switchgear before and after test is shown on the photos on sheet-no. 23 to 29. The measured pressure gauge was about 45 kPa.

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).

ВАРНО С ОПИТИВАНАТА





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Internal Arcing Test

Condition of test object before test: as after test HZ 235 L 02 / 04.

Arrangement: See sheet-no.: 2

Connection: Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

Ignition: Internal arcing test in the circuit-breaker compartment of the right-handed panel (800 mm width), ignition of arc three-phase by means of a copper wire Ø 0.5 mm across the lower contact arms of the circuit-breaker.

Test-No.: HZ 235 L 02 / 05		Applied voltage (phase-to-phase) 7.45 kV		Duration of short-circuit current 1.04 s
	Peak short-circuit current kA	Short-circuit current:		Arithmetic mean value kA
		first cycle kA	last cycle kA	
L1	58.8	26.8	25.3	24.5
L2	19.4	26.3	25.7	24.8
L3	46.4	27.0	25.6	24.7
Average value		26.7	25.5	24.7
Equivalent duration of short-circuit current 1.02 s			corresponding to a short-circuit current of 25.0 kA	

Remarks and condition of test object after test:

The condition of the switchgear before and after test is shown on the photos on sheet-no. 23 to 29. The measured pressure gauge was about 31 kPa.

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



ВЯРНО С ОРИГИНАЛА

Internal Arcing Test

Condition of test object before test: as after test HZ 235 L 02 / 05.

Arrangement: See sheet-no.: 2

Connection: Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

Ignition: Internal arcing test in the busbar compartment of the left-handed panel (1000 mm width), ignition of arc three-phase by means of a copper wire Ø 0.5 mm across the busbars.

Test-No.: HZ 235 L 02 / 06		Applied voltage (phase-to-phase) 7.45 kV		Duration of short-circuit current 1.04 s
	Peak short-circuit current kA	Short-circuit current:		Arithmetic mean value kA
		first cycle kA	last cycle kA	
L1	56.8	26.6	25.5	24.7
L2	19.3	25.3	26.5	25.0
L3	44.1	26.9	24.7	24.2
Average value		26.3	25.6	24.7
Equivalent duration of short-circuit current 1.03 s			corresponding to a short-circuit current of 25.0 kA	

Remarks and condition of test object after test:

The condition of the switchgear before and after test is shown on the photos on sheet-no. 23 to 29. The measured pressure gauge was about 60 kPa.

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).

ВЯРНО С ОРГИНАЛА





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Sheet 22

Internal Arcing Test

Condition of test object before test: as after test HZ 235 L 02 / 06.

Arrangement: See sheet-no.: 2

Connection: Infeed of current was made three-phase by means of a three core cable 1 x 3 x 185 mm² through the closed bottom of the centre panel.

Ignition: Internal arcing test in the circuit-breaker compartment of the centre panel (1000 mm width), ignition of arc three-phase by means of a copper wire Ø 0.5 mm across the upper contact arms of the circuit-breaker.

Test-No.: HZ 235 L 02 / 07		Applied voltage (phase-to-phase) 7.45 kV		Duration of short-circuit current 1.04 s
	Peak short-circuit current kA	Short-circuit current: first cycle last cycle kA kA		Arithmetic mean value kA
L1	59.6	26.7	25.2	24.6
L2	18.7	26.7	25.8	25.0
L3	45.9	27.0	25.3	24.7
Average value		26.8	25.5	24.7
Equivalent duration of short-circuit current 1.03 s			corresponding to a short-circuit current of 25.0 kA	

Remarks and condition of test object after test:

The condition of the switchgear before and after test is shown on the photos on sheet-no. 23 to 29. The measured pressure gauge was about 28 kPa.

Assessment of the test:

- Correctly secured doors, covers, etc. did not open (Criterion No. 1).
- Parts of the switchgear, which may cause injury to persons, did not fly off (Criterion No. 2).
- Arc did not cause holes to develop in the outer, freely accessible parts of the enclosure as a result of burning or other effects (Criterion No. 3).
- The indicators arranged vertically did not ignite (Criterion No. 4).
- The indicators arranged horizontally did not ignite (Criterion No. 5).
- All earthing connections were still effective (Criterion No. 6).



ВЯРНО С ОРИГИНАЛА

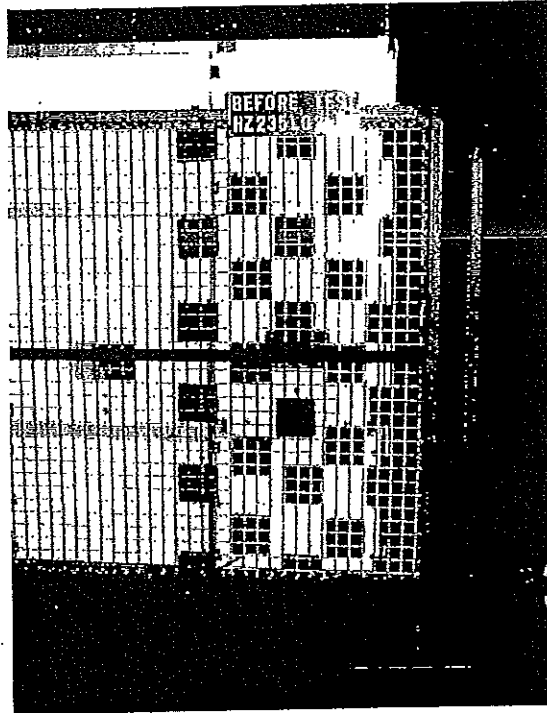


Photo No. 01
Before Test HZ 235 L 02 / 03

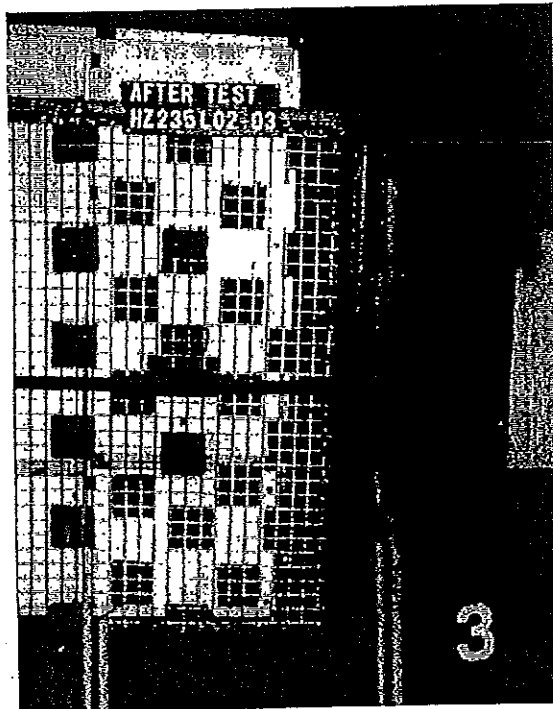


Photo No. 02
After Test HZ 235 L 02 / 03



ВЯРНО С ОРИГИНАЛА



Photo No. 03
After Test HZ 235 L 02 / 03

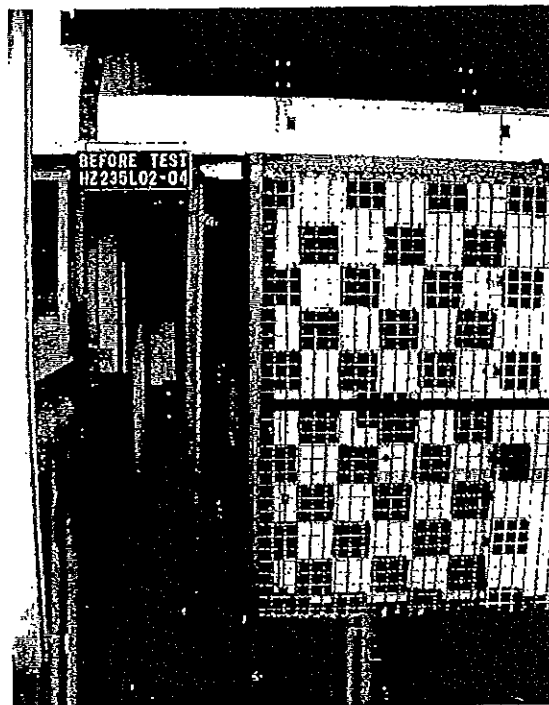


Photo No. 04
Before Test HZ 235 L 02 / 04



ВЯРНО С ОРИГИНАЛА

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Sheet 25

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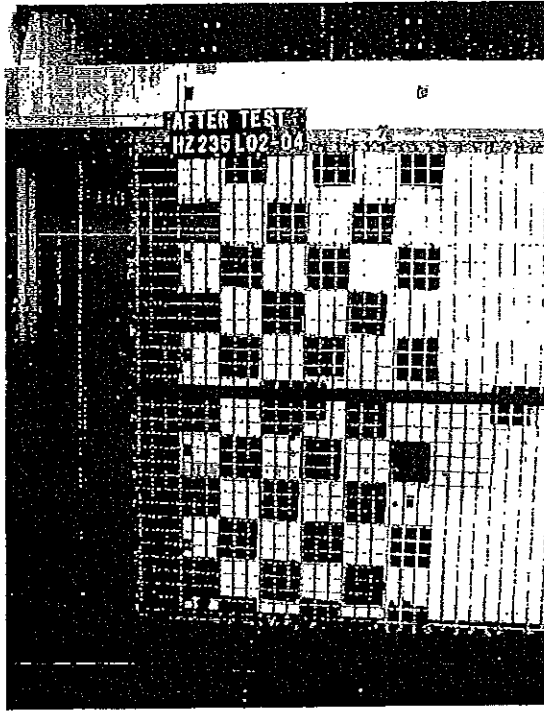


Photo No. 05
After Test HZ 235 L 02 / 04

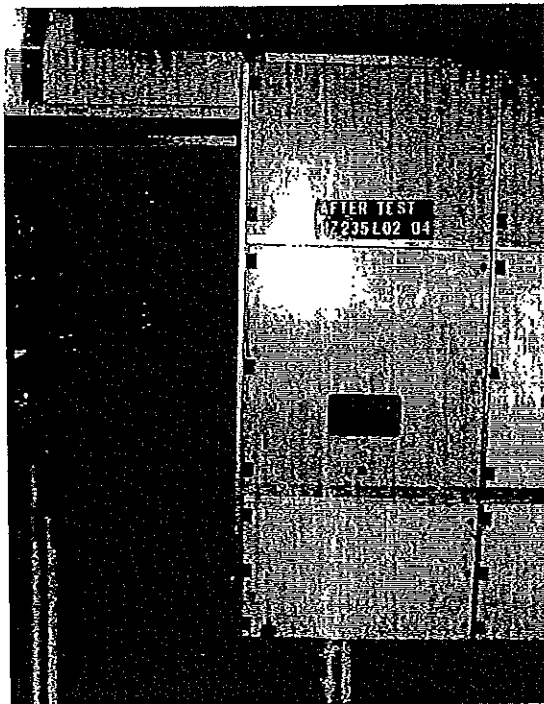


Photo No. 06
After Test HZ 235 L 02 / 04



ВЪРНО С ОРИГИНАЛА

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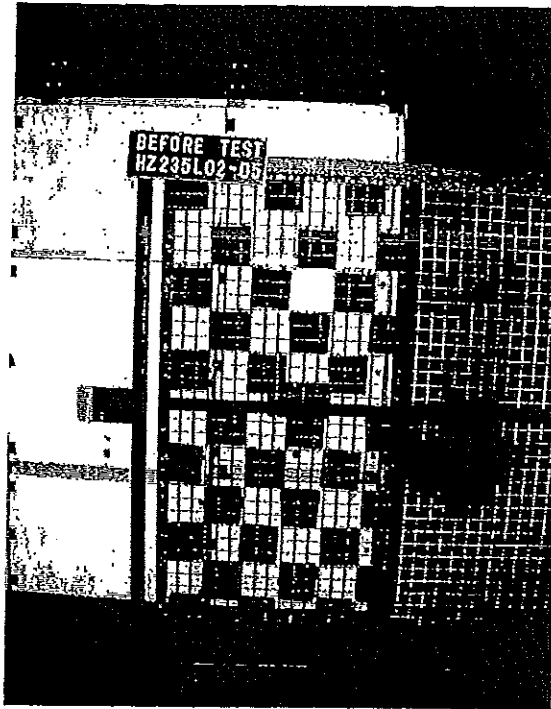


Photo No. 07
Before Test HZ 235 L 02 / 05

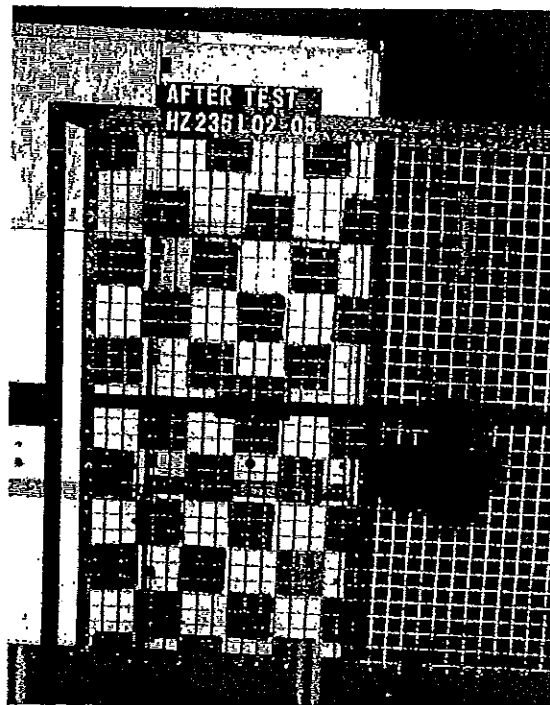


Photo No. 08
After Test HZ 235 L 02 / 05

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Reg. No.
DAT-P-032/93

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TEST REPORT No. HZ 235 L 02
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 27



Photo No. 09
After Test HZ 235 L 02 / 05

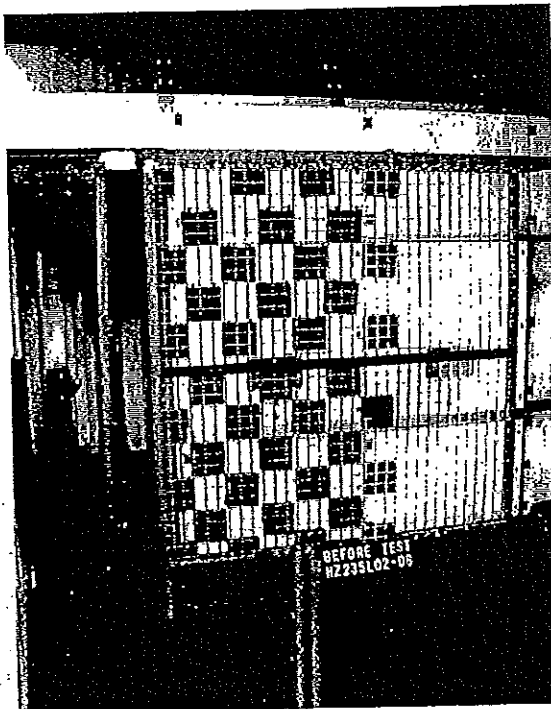


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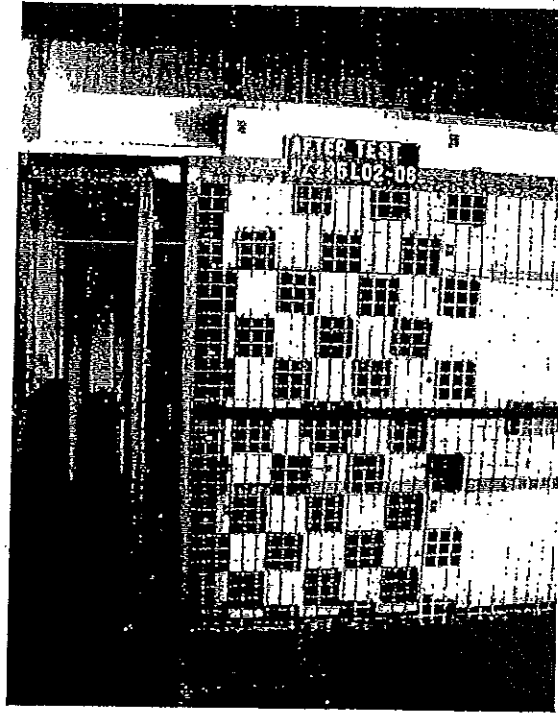


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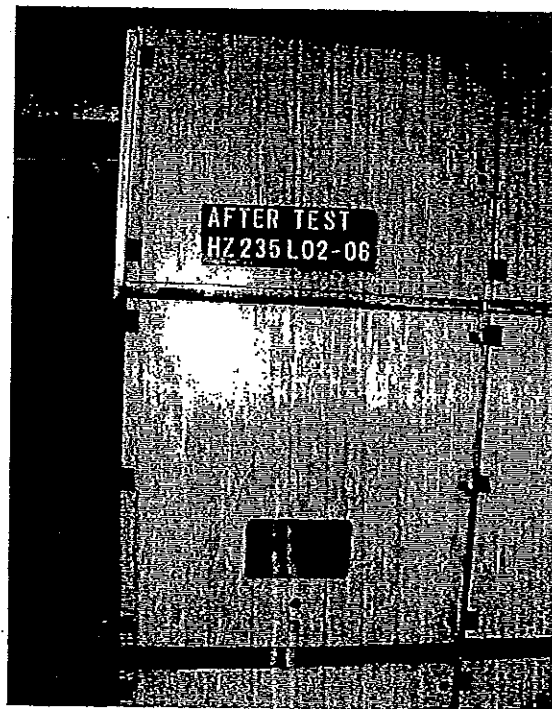


Photo No. 12
After Test HZ 235 L 02 / 06

ВЯРНО С ОРИГИНАЛА



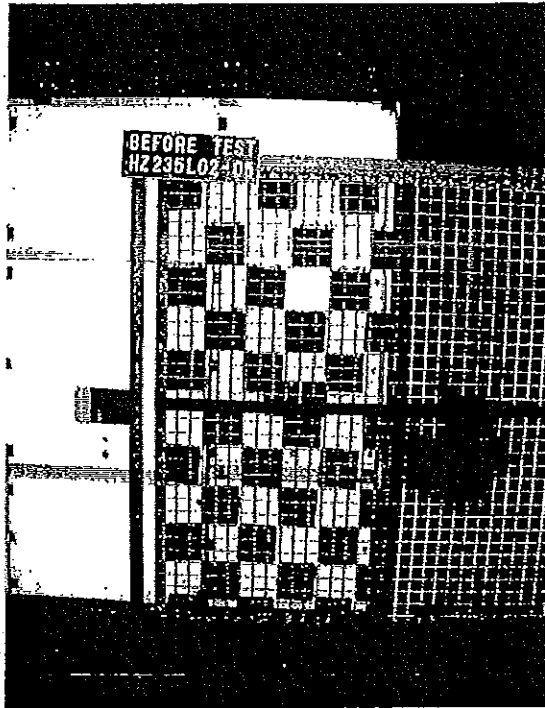


Photo No. 13
Before Test HZ 235 L 02 / 07

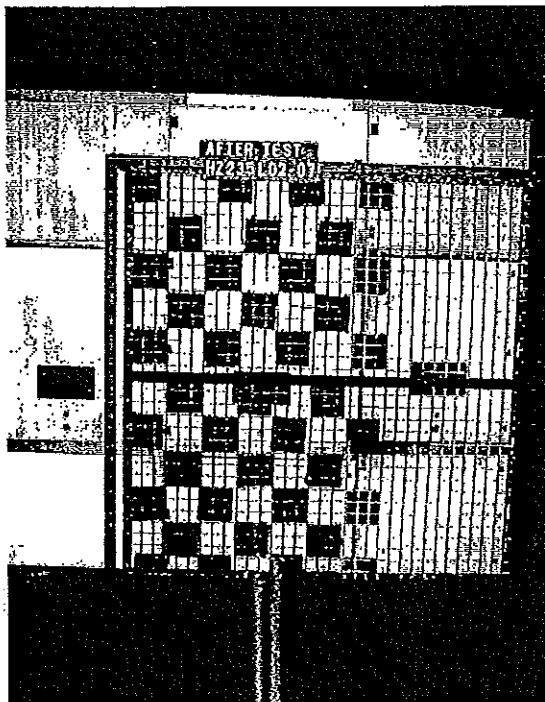
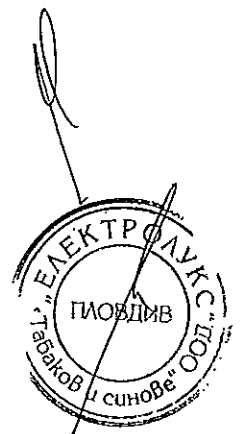


Photo No. 14
After Test HZ 235 L 02 / 07



ВЪРНО С ОПРИГНАДА



Reg. No.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 L 02

Sheet 30

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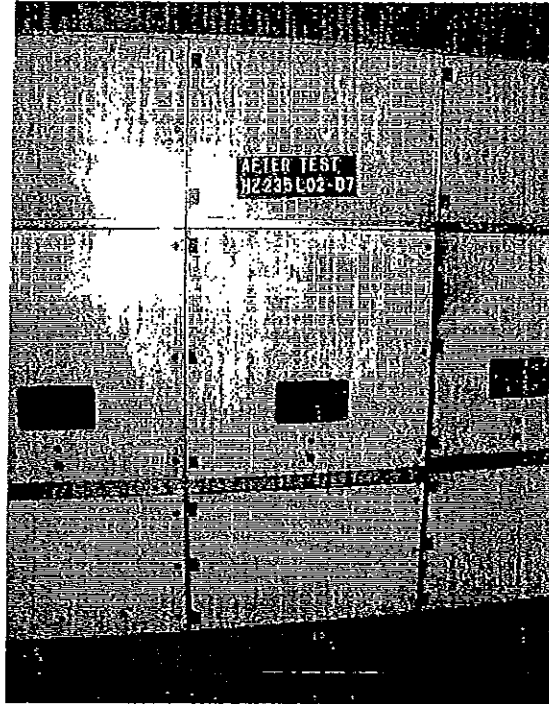


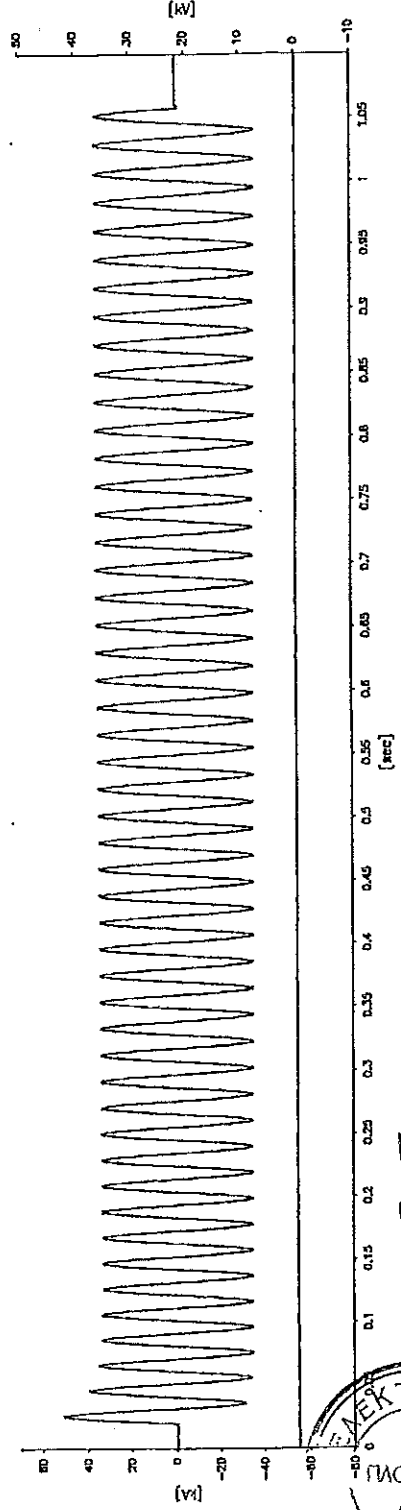
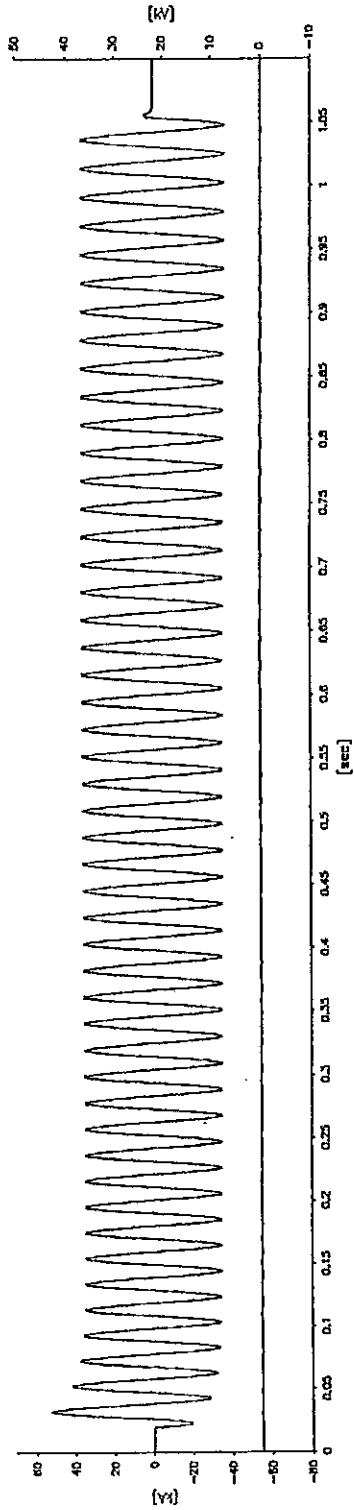
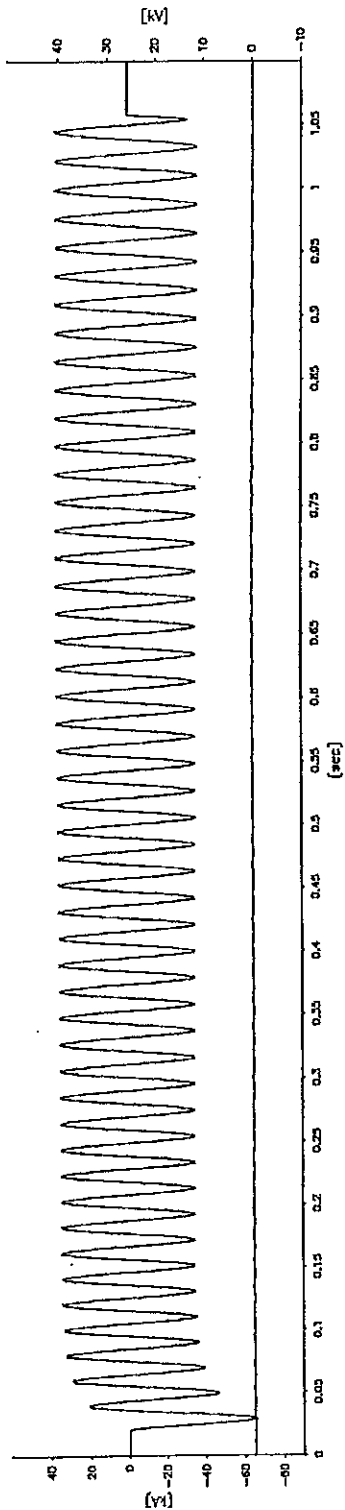
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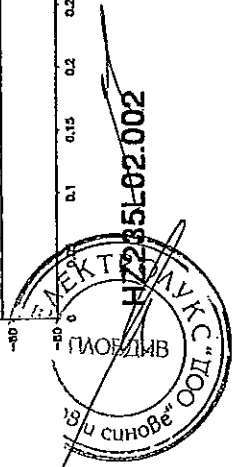
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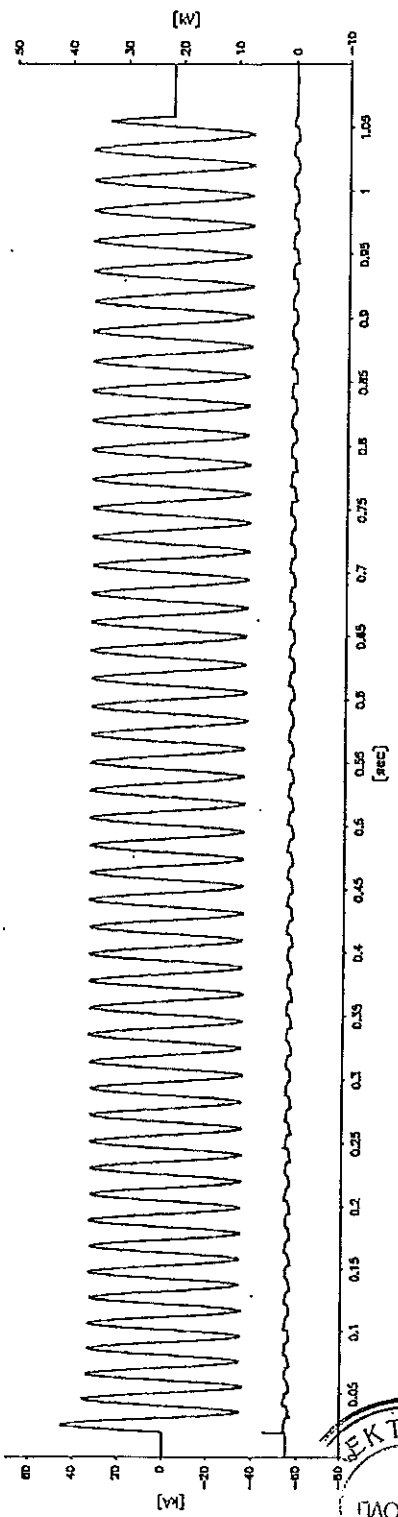
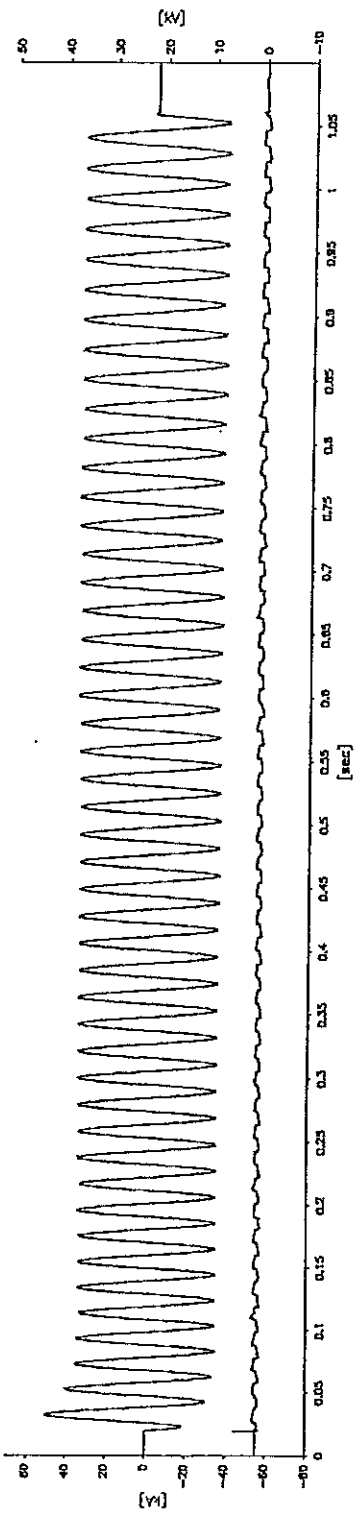
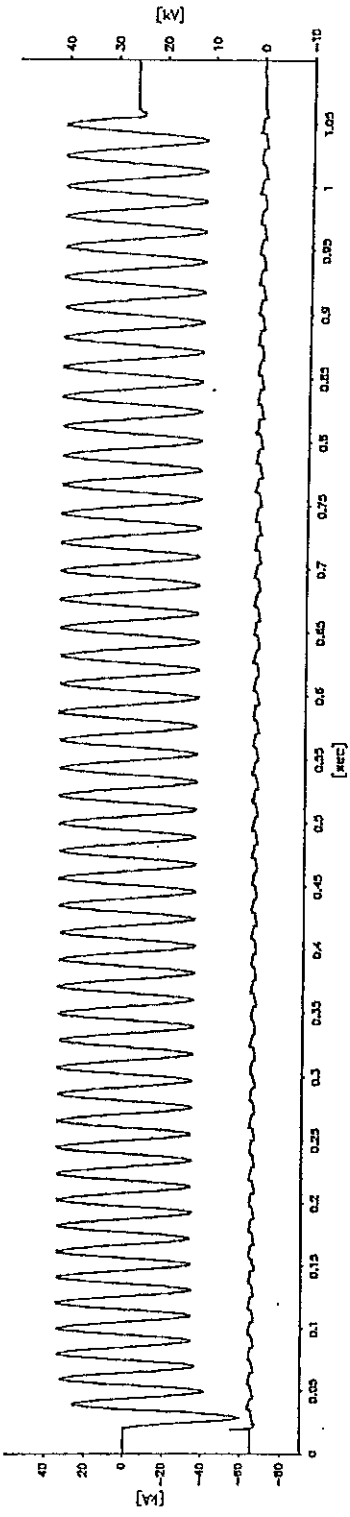
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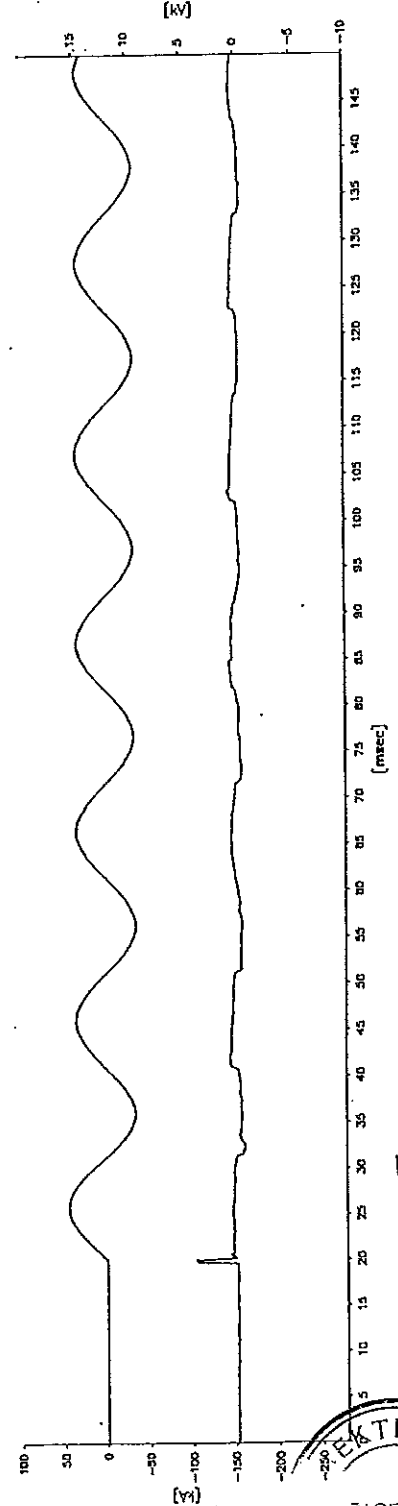
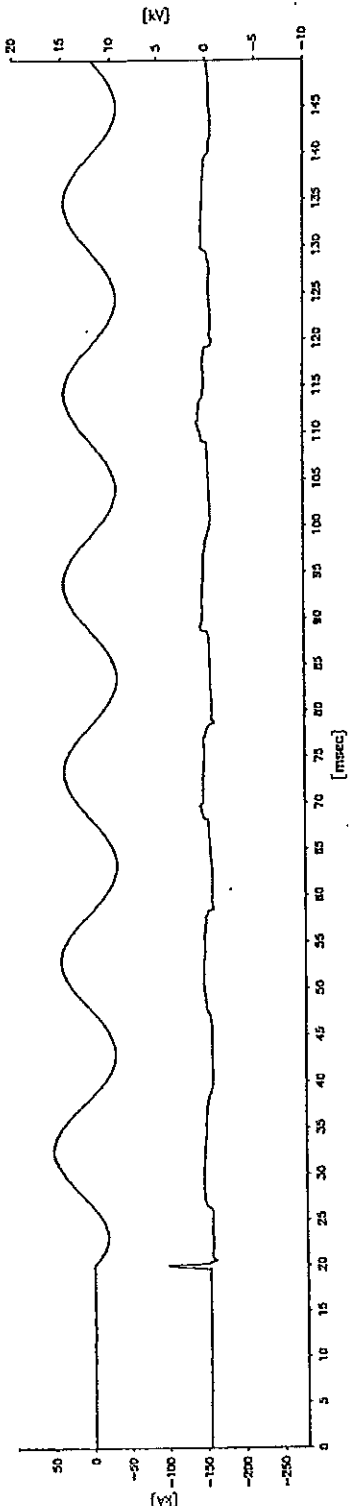
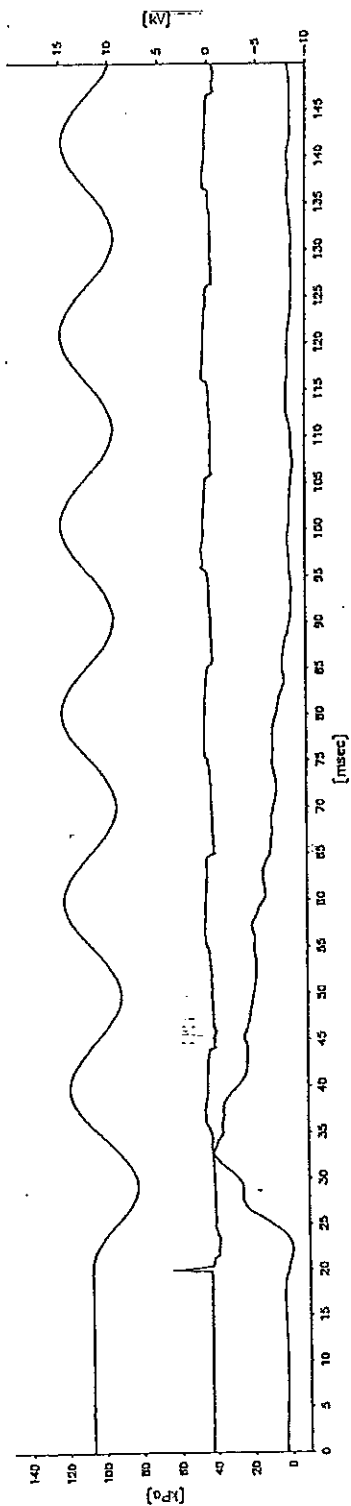
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РЕКТОР
ПЛОВДИВ
И СИНОВЕ" ООД.
#235L02.003

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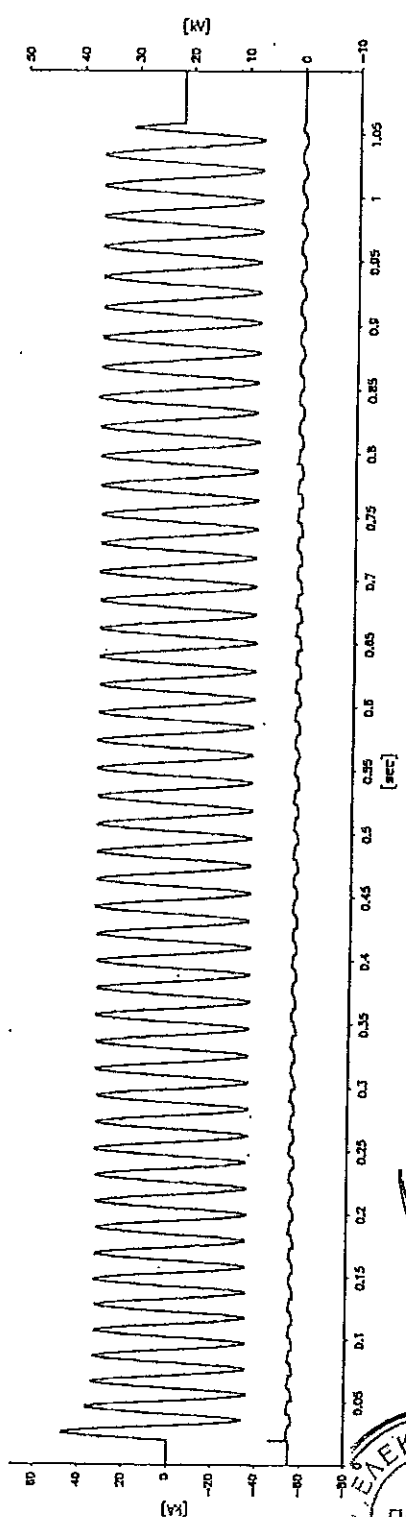
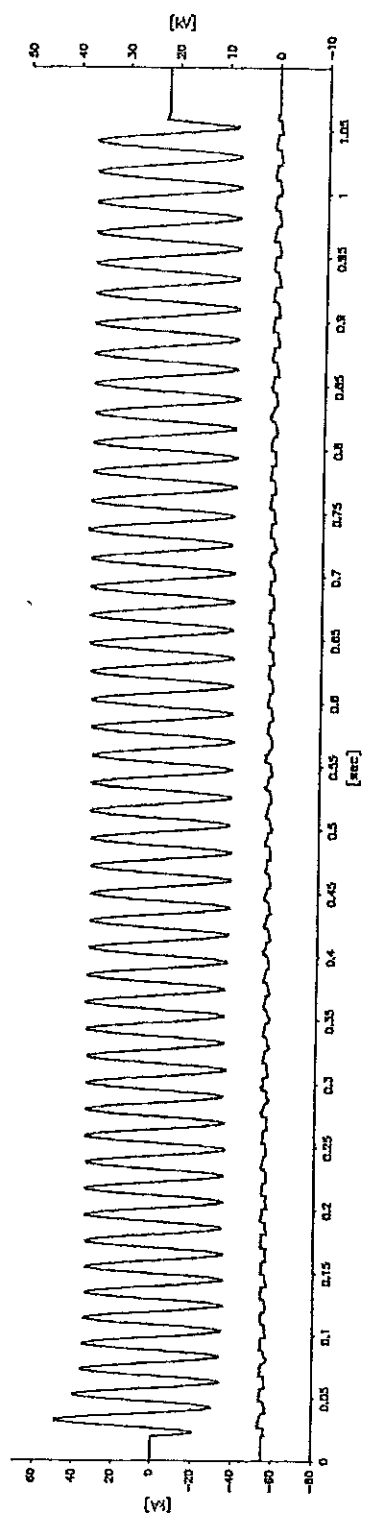
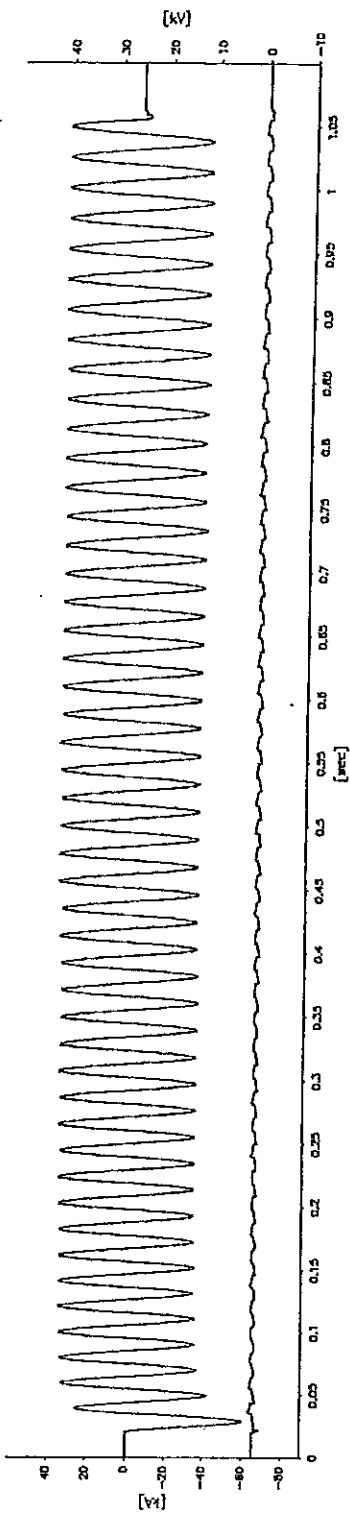
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ЕКТП "ОУК" АД
МОБИЛ
СИЛОВЕ
2235L02.003

62



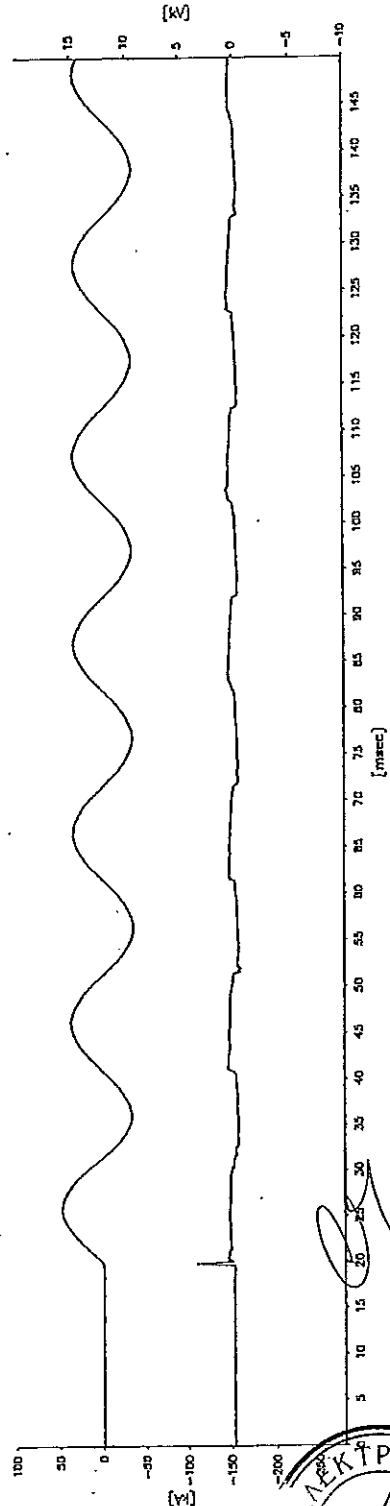
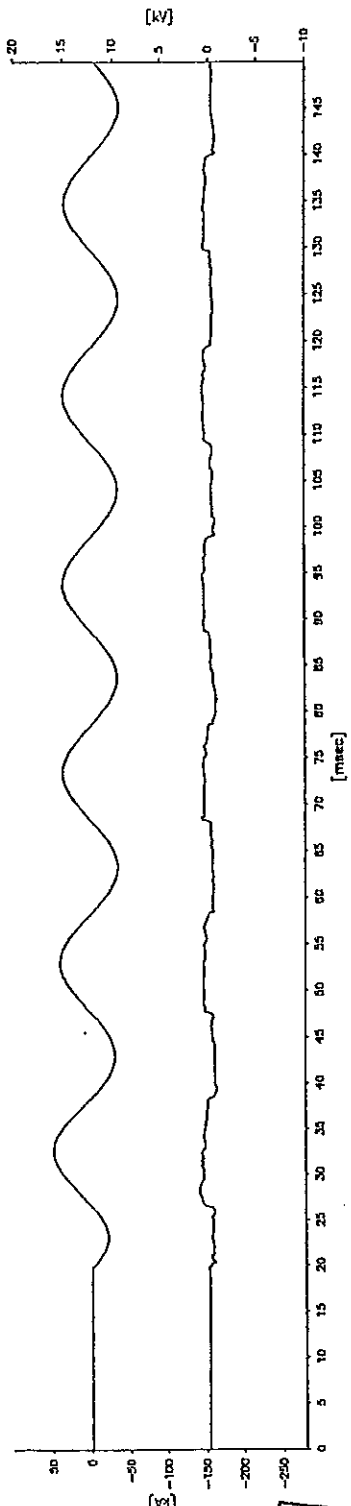
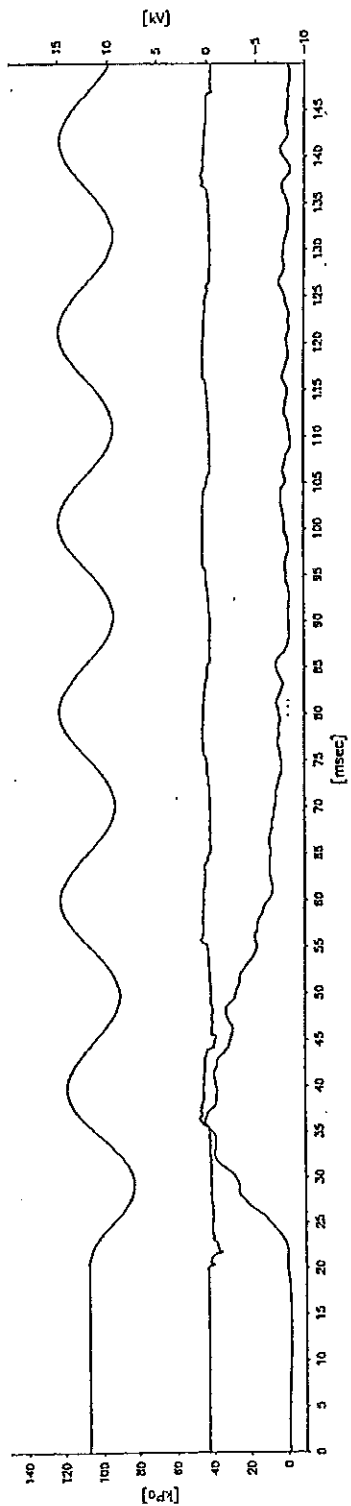
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ИЗПИСИ
 "ТАСКОВ И СИНОВЕ" ООД
 ПЛОВДИВ
 № 235L02.004

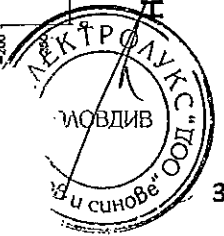
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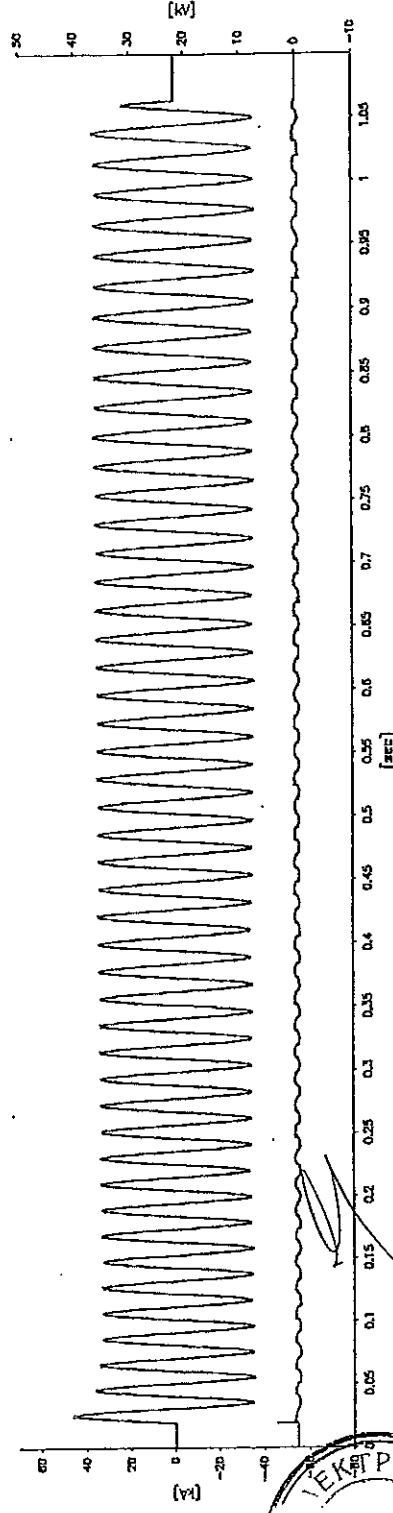
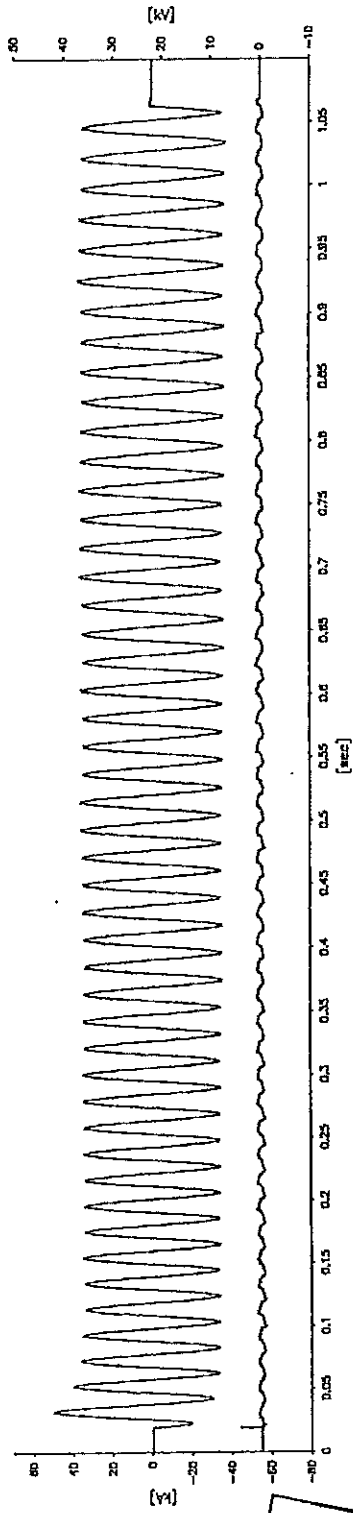
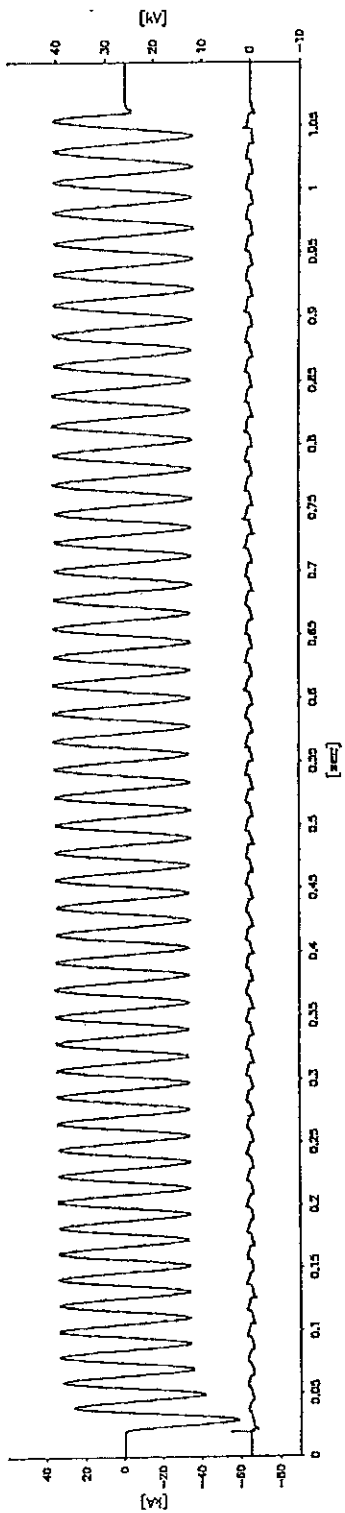
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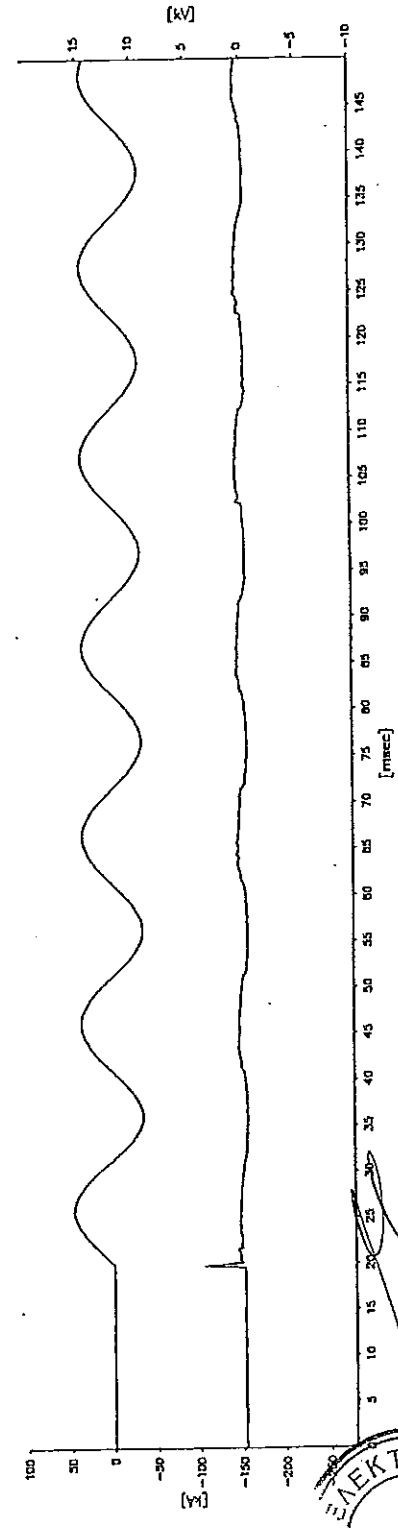
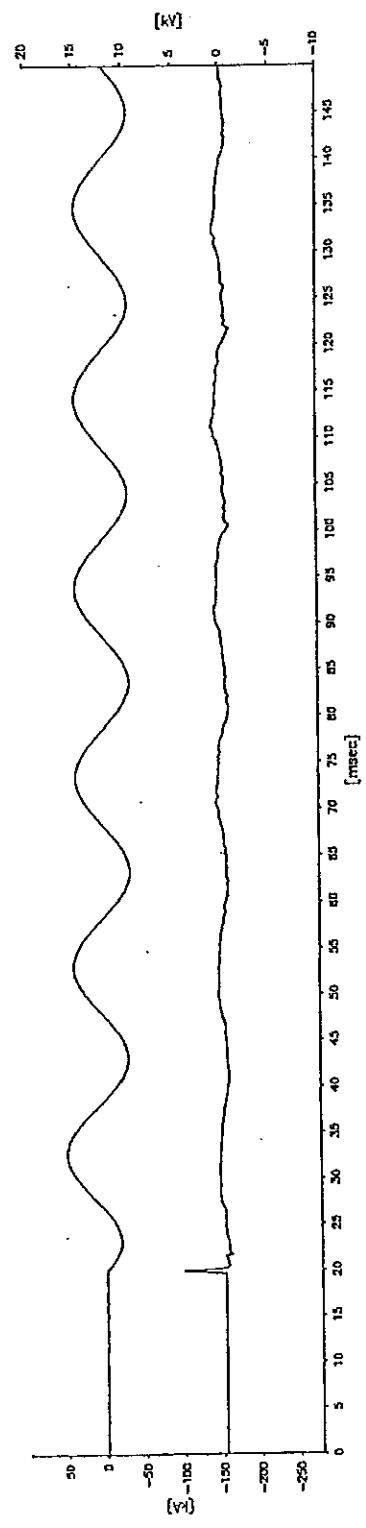
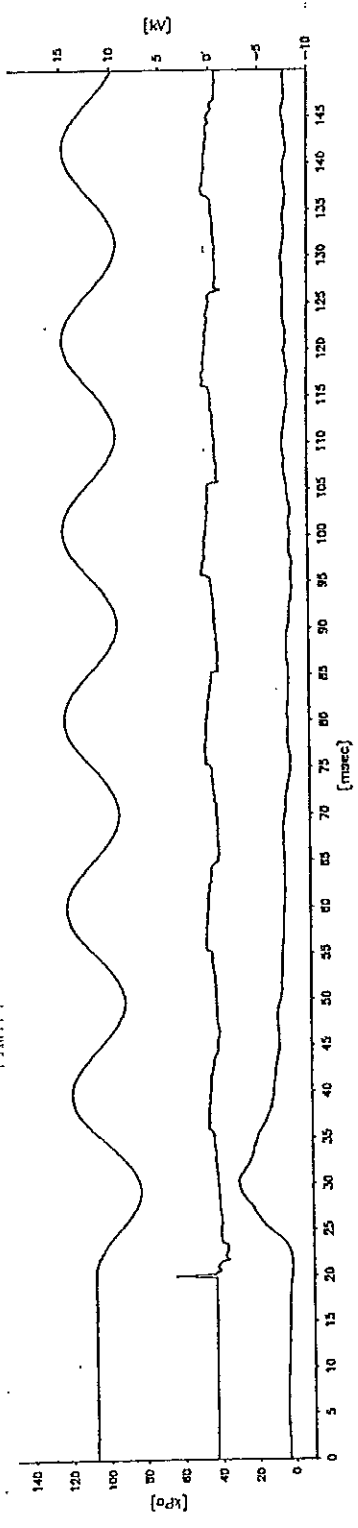
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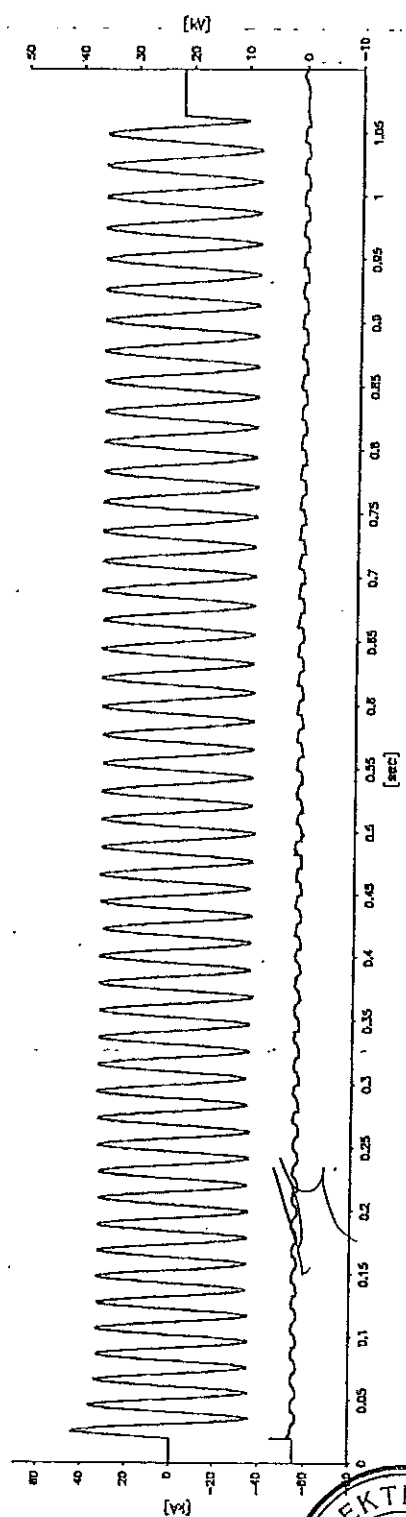
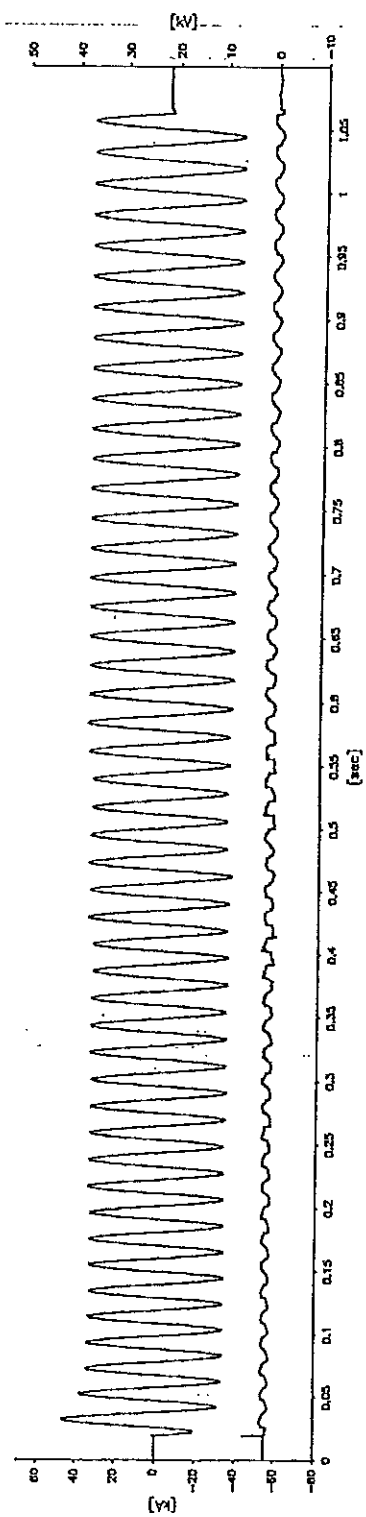
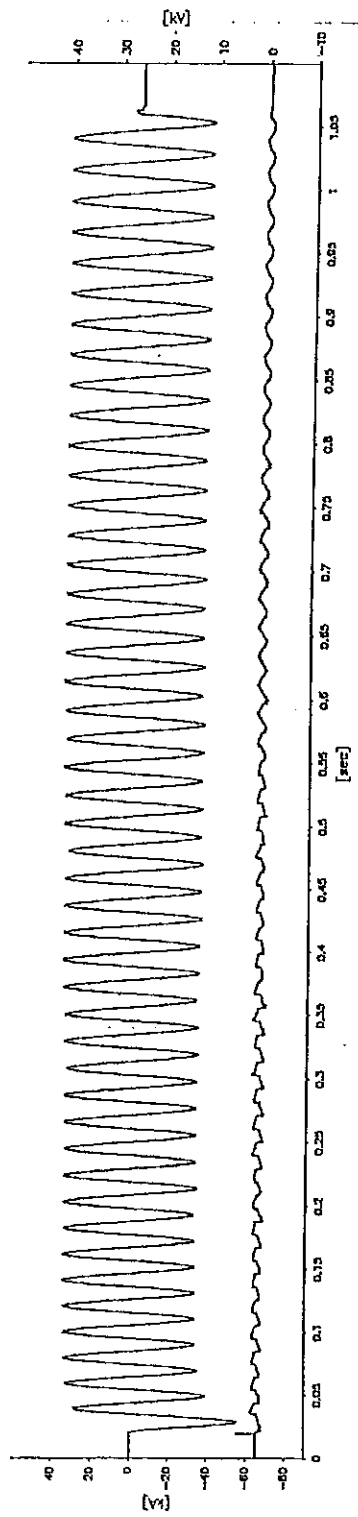
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ЭЛЕКТРОННА СЛУЖБА
 ПЛОВДИВ
 "СИНОВЕ" ООД "С.Ю."

ИЗ235\02.005

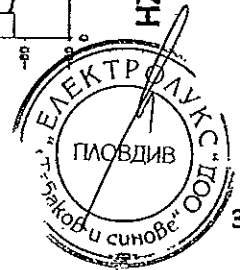
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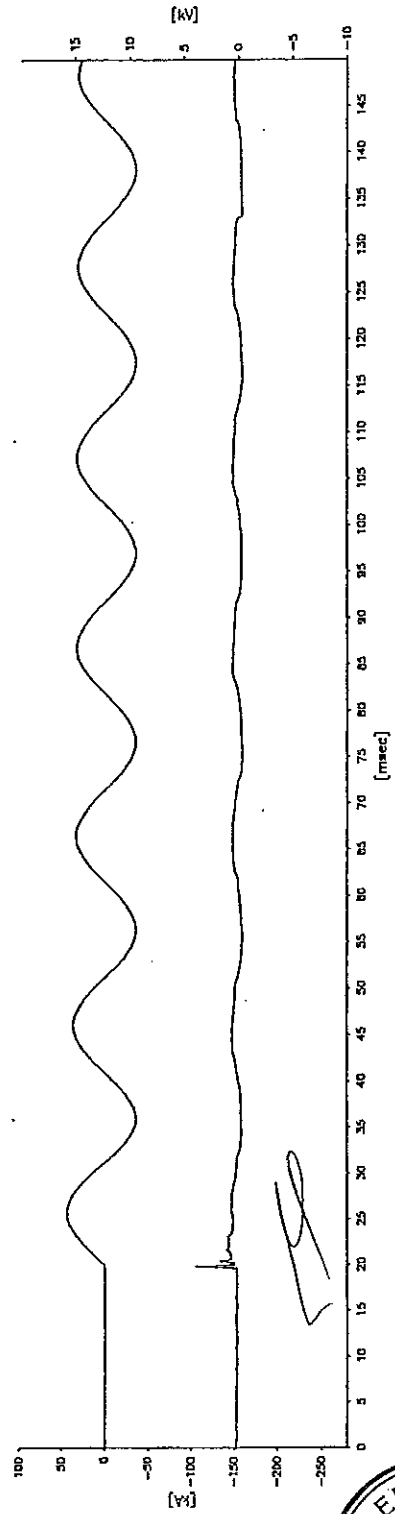
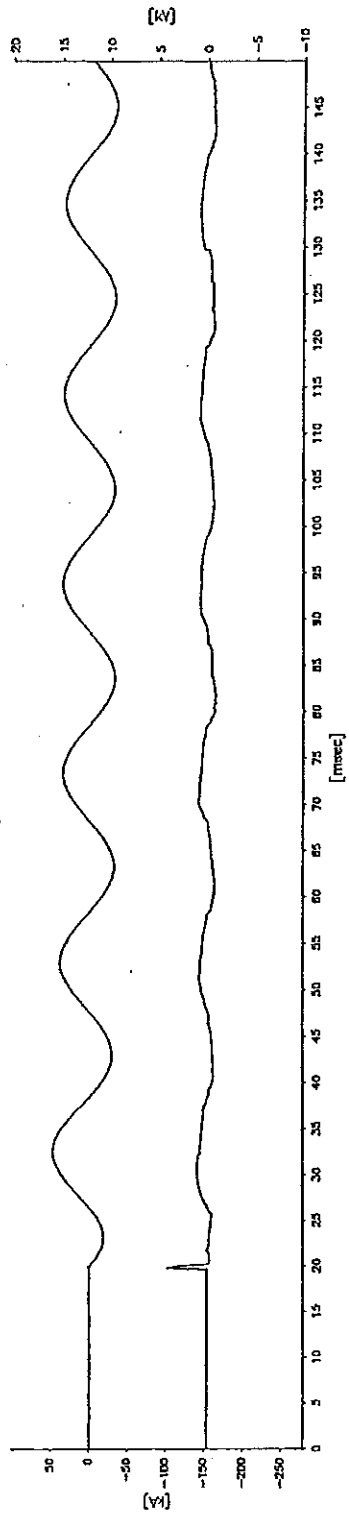
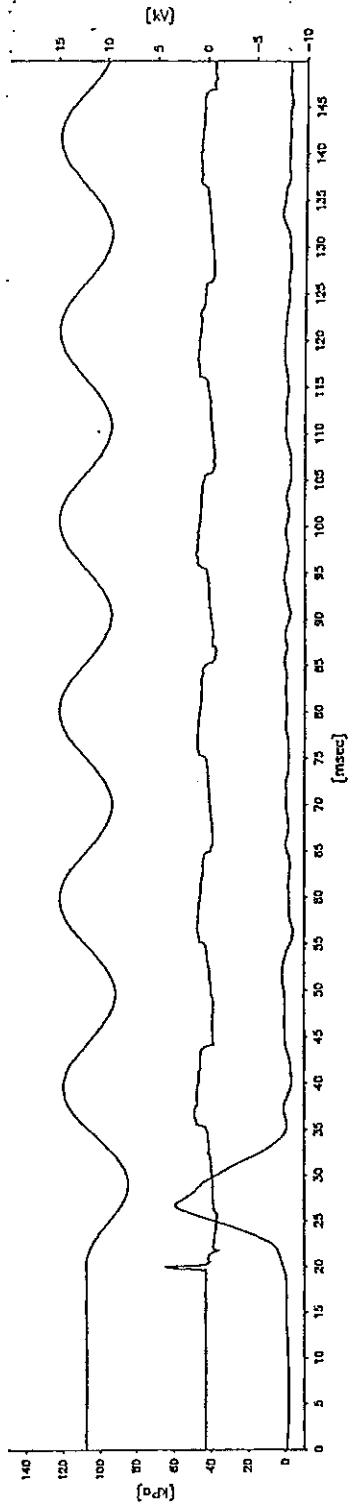
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HZ235L02.006

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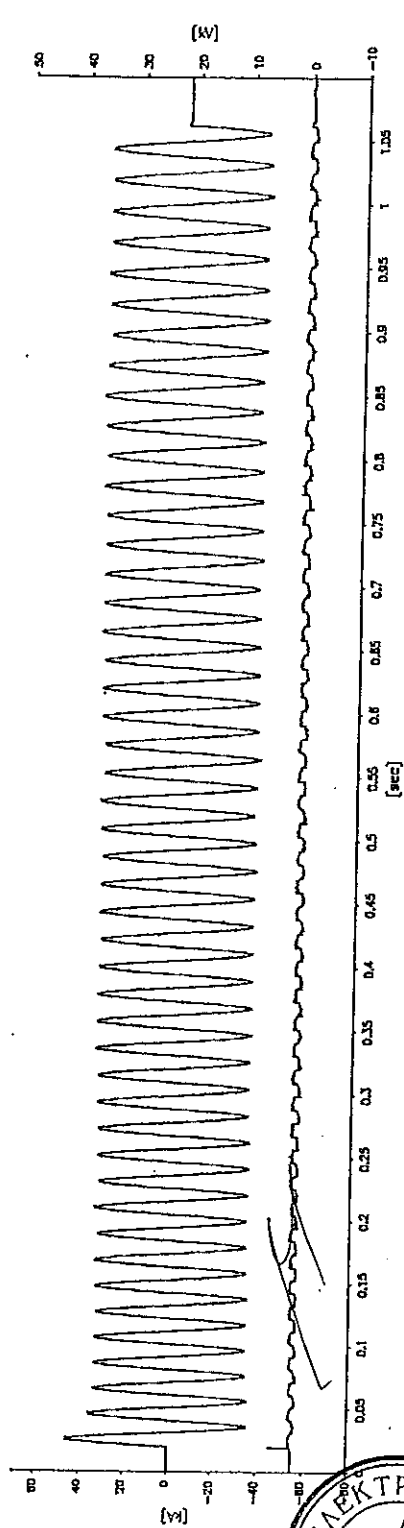
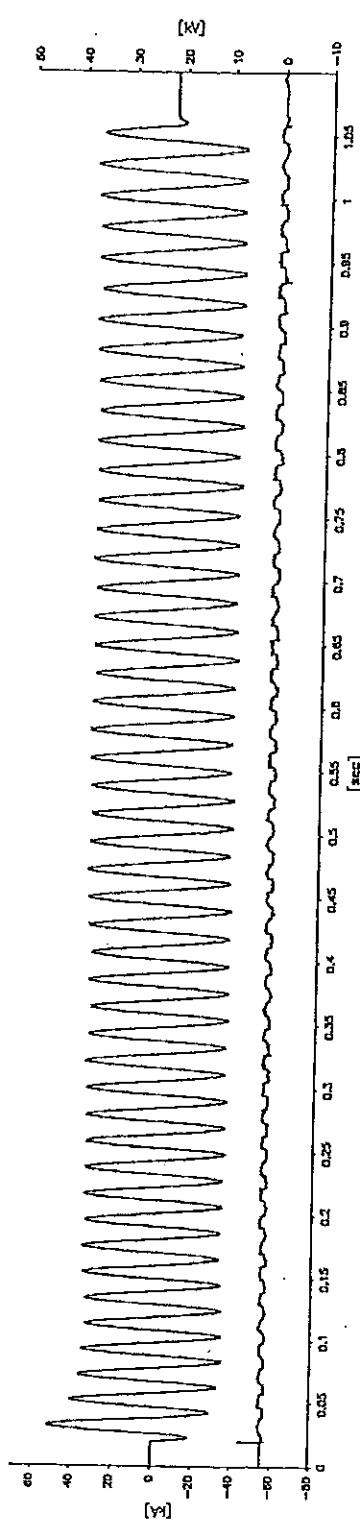
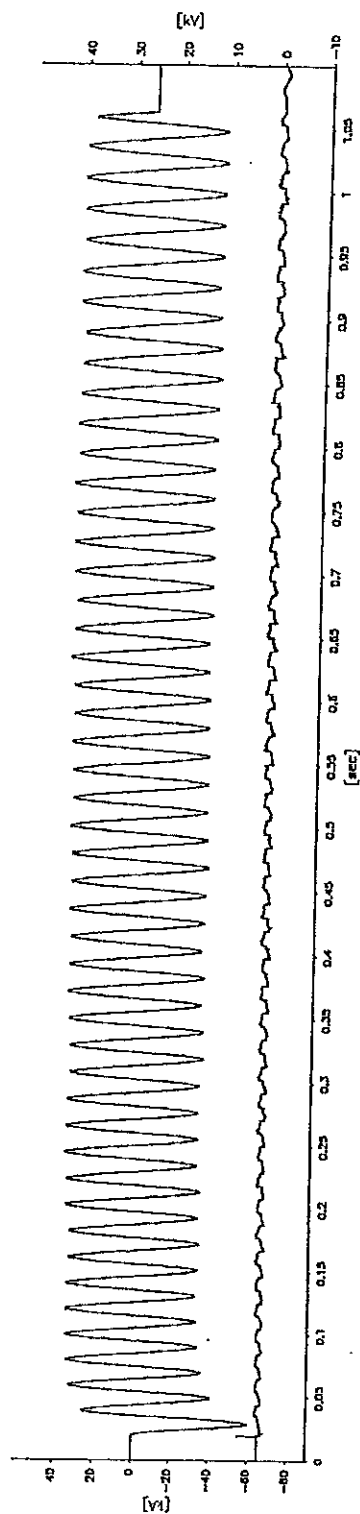
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HZ235L02.006

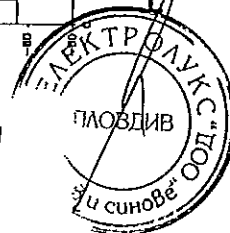
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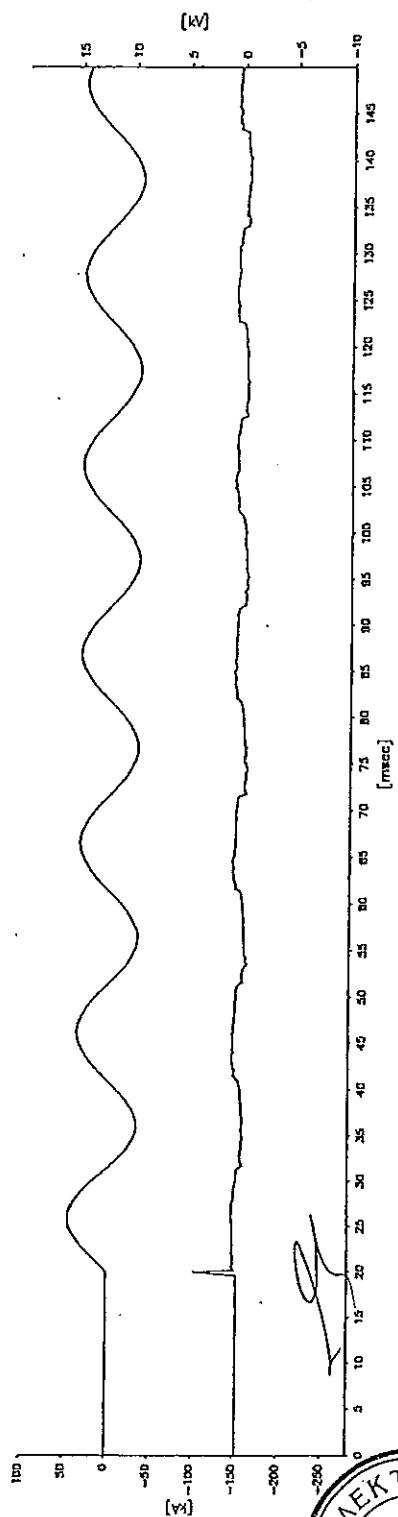
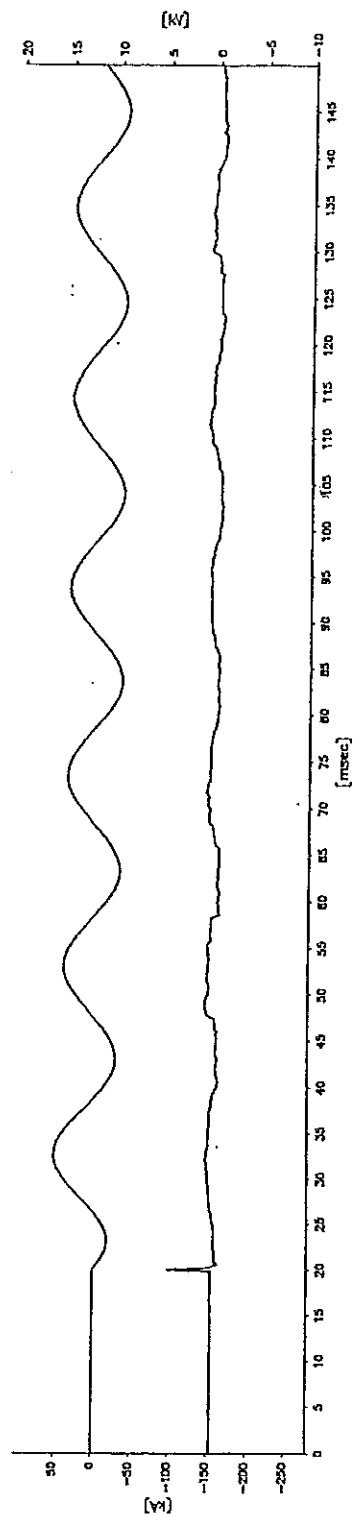
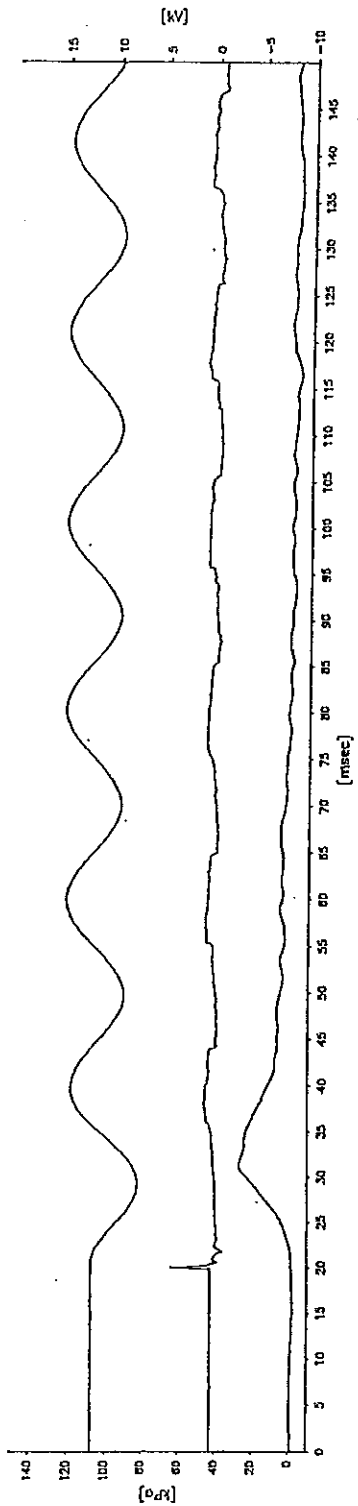
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ВЯРНО С ОРИГИНАЛА



HZ235L02.007

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ВЯРНО С ОРИГИНАЛА

ИЗ235L02.007
"ЕЛЕКТРОЛУКС" ТОО
ПЛОВДИВ
и синагове



Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 1

Issued by an Accredited Laboratory
corresponding to EN 45001

Copy-No. 1e

Test Object One feeder panel (1000 mm width) of metal-clad, air-insulated switchgear type ZS1.2 equipped with a circuit-breaker type VD4P 2420-25 and an earthing switch type EK6-ZS1-2406-275

Rated voltage	U_r	24 kV
Rated normal current busbar / tee-off	I_r	2500/1600 A
Rated frequency	f_r	50/60 Hz
Rated peak withstand current	I_p	63 kA
Rated short-time withstand current	I_k	25 kA
Rated duration of short-circuit current	t_k	3 s
Rated short-circuit breaking capacity at 24 kV	I_{sc}	25 kA

Manufacturer ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen

Tests performed Three-phase peak withstand and short-time withstand current tests of the main circuit and the earthing switch.
For further details see sheet-no. 2.

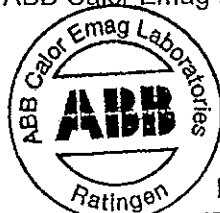
Test Specification The tests have been carried out in accordance with the client's instructions. Test procedure and test parameters were based on:
IEC 60694/2nd Ed./1996-05/Clause 6.6,
IEC 60298/3rd Ed./1990-12/Clause 6.5,
IEC 60129/3rd Ed./1984/Clause 6.5,
IEC 60056/4th Ed./1987/Clause 6.5.

Test Results The switchgear, the vacuum circuit-breaker and the earthing switch passed the above mentioned peak withstand and short-time withstand current tests successfully.

Test Date 14th September 2000

Client ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen

07th February 2002
Date of Issue



Göttlich
Dr. Stefan Göttlich
Laboratory Manager

Diergardt
Karl-Hermann Diergardt
Test Engineer

Total Number of Sheets: 20 Sheets (Test Report) + 6 Sheets (Oscillograms)

This test report refers exclusively to the object tested.
ABB Calor Emag Mittelspannung GmbH is certified according to DIN ISO 9001 by DQS under Reg. No. 373 - 03

ABB Calor Emag Laboratories Ratingen are accredited according to EN 45001 by DATech under Reg.No. DAT-P-032/93

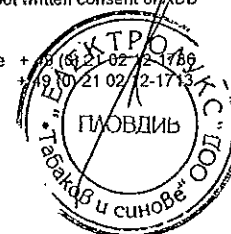
With the exception of the cover sheet and any subsequent sheets mentioned thereon, this document may not be partly copied without written consent of ABB Calor Emag Mittelspannung GmbH Ratingen.

ABB Calor Emag Mittelspannung GmbH Ratingen
High-Power Testing Laboratory

Oberhausener Str. 33
D - 40472 Ratingen

Phone + 49 (0) 21 02 12 17 69
Fax + 49 (0) 21 02 12 17 13

КОПИЯ С ОРИГИНАЛА



Tests performed:

Main circuit with vacuum circuit-breaker type VD4P 2420-25

Infeed by means of copper conductors to the cable terminals of the panel.
Short-circuit bridge mounted on the bushings of busbar system outside the panel.

Three-phase peak withstand current tests up to 65.8 kA and short-time withstand current tests up to 25.5 kA - 3.03 s equivalent to 25.6 kA - 3 s.

(Oscillograms HZ 235 F 01 / 04 and 05)

Earthing switch type EK6-ZS1-2406-275

Infeed by means of copper conductors to the cable terminals of the panel.
Short-circuit made by the earthing switch.

Three-phase peak withstand current tests up to 66.5 kA and short-time withstand current tests up to 25.1 kA - 3.03 s equivalent to 25.2 kA - 3 s.

(Oscillograms HZ 235 F 01 / 08 and 09)

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ВЕРНО С ОРИГИНАЛА





Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 3

Issued by an Accredited Laboratory
corresponding to EN 45001

Contents

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Test Report - Cover Sheet	1
Tests performed	2
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Technical Data of Test Objects	4 - 6
Table of drawings of the Test Objects	7
Drawings	8 - 12
Technical Data of Test Circuit	13
Principle Diagram of Test Circuit	14
Peak and Short-Time Withstand Current Tests	15 - 16
Actual Values of No-Load Operations and Measurement of the Resistance	17
Photos	18 - 20
Oscillograms	





Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 4

Technical Data of Test Object (Ratings assigned by the manufacturer) Switchgear

Test Object: Metal-clad, air-insulated switchgear

Type: ZS1.2 (1000 mm width)

Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen

Serial-No.: 07550027/2015/00

Year of manufacture: 2000

Drawing No's.: See sheet-no. 7

Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV
Rated frequency	50/60	Hz
Rated current busbar	2500	A
Rated current tee-off	1600	A
Rated short-circuit peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated short-circuit duration	3	s
Insulating medium	air	
Rated filling pressure (abs., 20° C)	-	kPa

Prospective values under internal-arc conditions:

Peak withstand current	63	kA
Short-time withstand current	25	kA
Short-circuit duration	1	s

Additional specifications and data:

- Current transformers 1600 / 5 / 5 A in cable compartment

Type	Serial-no. of the transformers		
	L1	L2	L3
ABB / TPU 65.11	058243	058244	058245

Date of receipt of test object: 12th September 2000



ВЯРНО С ОРИГИНАЛА



Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 5

Issued by an Accredited Laboratory
corresponding to EN 45001

Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switching device

Test Object: Vacuum circuit-breaker
Type: VD4P 2420-25
Vacuum interrupter: VG4S series no.: L1: G4 01196, L2: G4 01192, L3: G4 01194
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen
Serial-No.: 7008269/4002/00 **Year of manufacture:** 2000
Drawing No's.: See sheet-no. 7

Rated voltage 24 kV
 Rated lightning impulse withstand voltage 125 kV
 Rated power frequency withstand voltage 50 kV

Rated frequency 50/60 Hz
 Rated normal current 2000 A
 Rated short-circuit breaking current 25 kA
 Rated short-circuit making current 63 kA
 DC-component 35 %
 Pole factor 1.5

Rated peak withstand current 63 kA
 Rated short-time withstand current 25 kA
 Rated duration of short-circuit 3 s
 Rated operating sequence O-0.3 s-CO-3 min-CO
 Rated times of circuit-breaker:

- opening time ≤ 40 ms
 - closing time ≈ 60 ms

Number of poles 3
 Number of units per pole 1

Rated auxiliary voltages:
 - voltage of trip coil 220 V-DC
 - voltage of closing coil 220 V-DC
 - voltage of motor 220 V-DC

Additional specifications and data: -

Date of receipt of test object: 12th September 2000



ВЯРНО С ОРИГИНАЛА



Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 6

Technical Data of Test Object

(Ratings assigned by the manufacturer)

Switching device

Test Object: Earthing switch
Type: EK6-ZS1-2406-275
Manufacturer: ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen
Serial-No.: 06/052/00 **Year of manufacture:** 2000
Drawing No's.: See sheet-no. 7

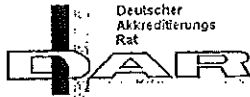
Rated voltage	24	kV
Rated lightning impulse withstand voltage	125	kV
Rated power frequency withstand voltage	50	kV
Rated frequency	50/60	Hz
Rated normal current	-	A
Rated short-circuit breaking current	-	kA
Rated short-circuit making current	63	kA
DC-component	-	%
Pole factor	-	
Rated peak withstand current	63	kA
Rated short-time withstand current	25	kA
Rated duration of short-circuit	3	s
Rated operating sequence	-	
Rated times of earthing switch:		
- opening time	-	ms
- closing time	-	ms
Number of poles	3	
Number of units per pole	1	
Rated auxiliary voltages:		
- voltage of trip coil	-	V-DC
- voltage of closing coil	-	V-DC
- voltage of motor	-	V-DC

Additional specifications and data: -

Date of receipt of test object: 12th September 2000



ВЯРНО С ОРИГИНАЛА



Reg.-Nr.
DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 7

Table of Drawings of Test Objects

The drawings submitted for identification of the test object were stamped and signed by the test engineer.

The manufacturer/client has guaranteed by signature on all drawings that the equipment submitted for tests has been manufactured in accordance with the given drawings.

A copy of the following drawings is part of this Test Report:

- | | |
|---|--|
| 1. Panel ZS1.2,
24 kV, PW 1000 | manufacturing type GCE8010459R0101 according to drawing-no. GCE8010459R0101, sheet-no. 1, index 00 |
| 2. Withdrawable circuit-breaker
VD4P 2420-25 | manufacturing type GCE7000162R1104 according to drawing-no. GCE7000162R1104, sheet-no. 5, index 02 |
| 3. Pole part | manufacturing type GCE7005757R0122 according to drawing-no. GCE7005757R0122, sheet-no. 221, index 00 |
| 4. Mechanism | manufacturing type GCE7179610R0104 according to drawing-no. GCE7179610R0104, sheet-no. 4, index 36 |
| 5. Earthing switch
EK6-ZS1-2406-275 | manufacturing type GCE7169312R0118 according to drawing-no. GCE7169312R0121, sheet-no. 1, index 24 |

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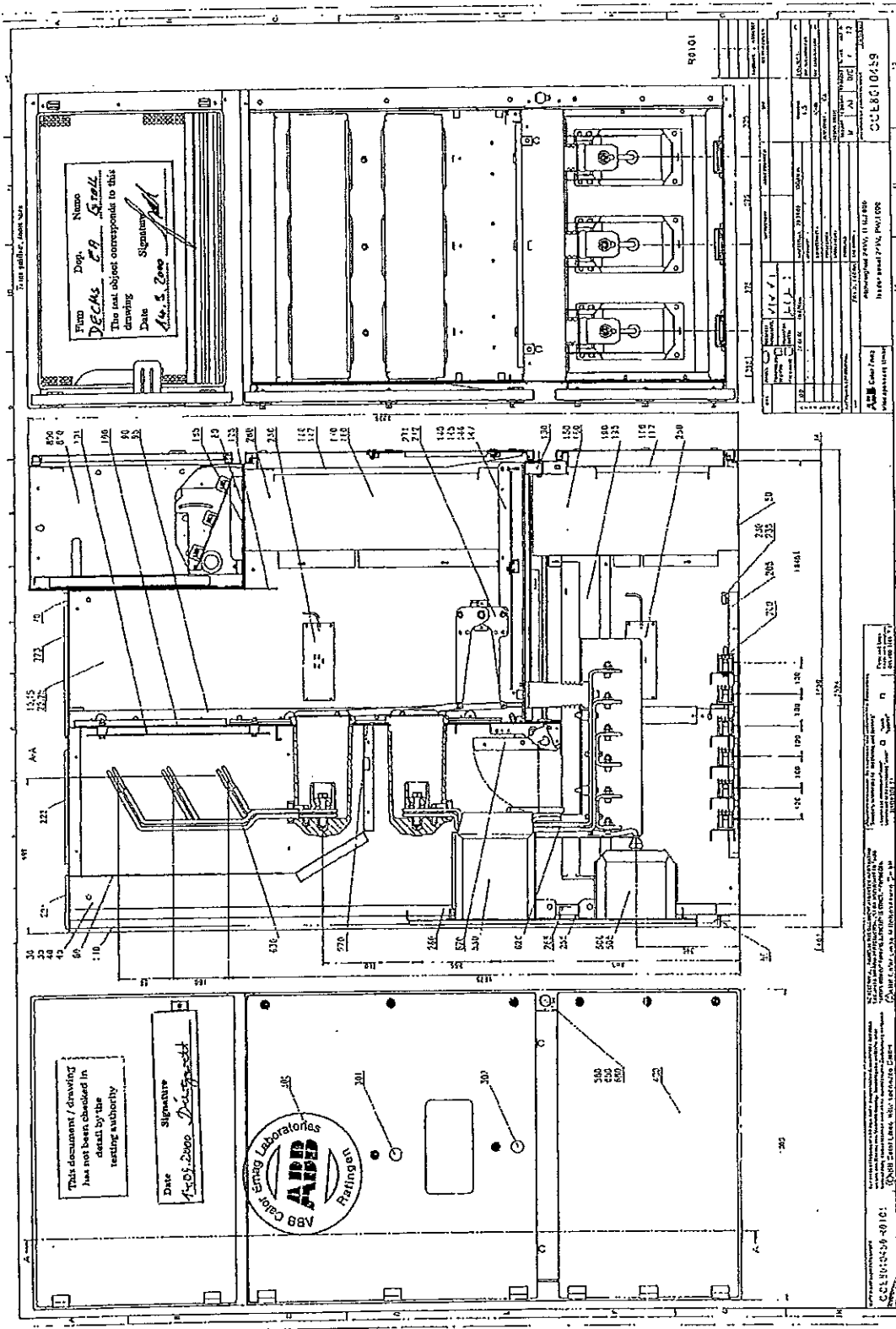
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DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01
Issued by an Accredited Laboratory
corresponding to EN 45001

Sheet 8

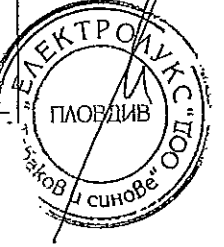


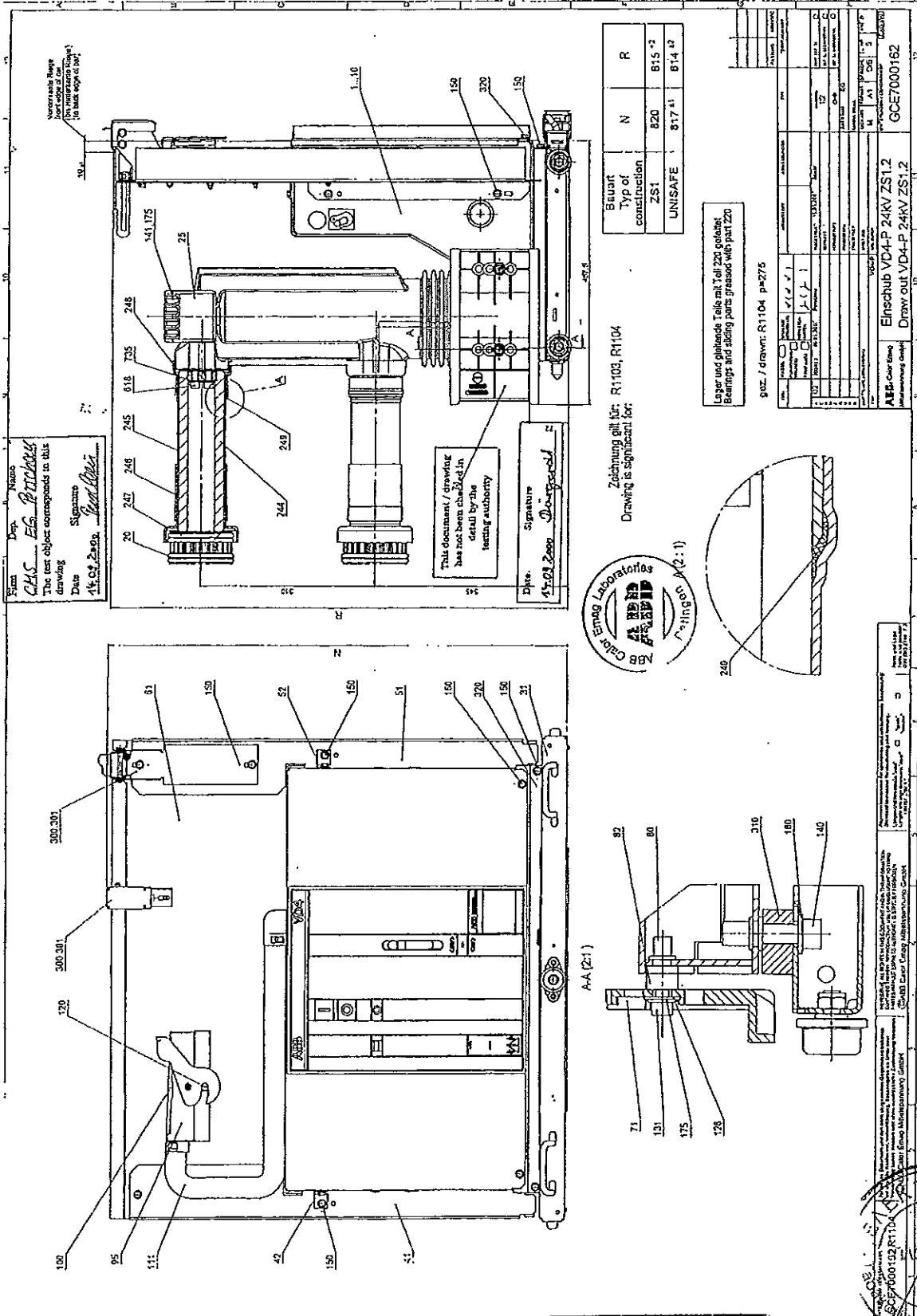
Form Name
DECM
This test object corresponds to this drawing
Date
Signature

This document / drawing has not been checked in detail by the testing authority
Date
Signature



ВАРНО С ОРИГИНАЛА





Name: *Edg. P. P. P.*
Date: *15.03.2000*
Signature: *[Signature]*
The test object corresponds to this drawing.

This document / drawing has not been checked in detail by the testing authority.

Name: *[Signature]*
Date: *15.03.2000*

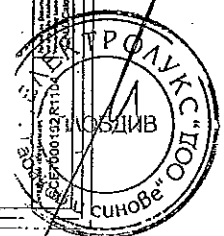
Stuart	N	R
Typ of construction	820	815 '2
ZS1	817 '1	814 '2
UNISAFE		

Zeichnung gilt für: R1103, R1104
Drawing is significant for:



Lager und gleitende Teile mit Teil 220 geölt.
Bearings and sliding parts greased with part 220.

Part No.	100	120	150	240	300	310
Part Name	Stator	Rotor	Shaft	Impeller	Motor Housing	Terminal Box
Material	Aluminum	Steel	Steel	Steel	Aluminum	Aluminum
Quantity	1	1	1	1	1	1
Remarks						



ВЕРНО С ОРИГИНАЛОМ



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DAT-P-032/93

ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01
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corresponding to EN 45001

Sheet 13

Technical Data of Test Circuit

Test		STC	--	--	--
Oscillogram-No.	HZ 235 F 01	02 - 09	--	--	--
Number of phases	(circuit)	3	--	--	--
Number of poles/phases	(test object)	3	--	--	--
Power frequency	Hz	50	--	--	--
Power factor	cos φ	≤ 0.15	--	--	--
Generator		earthed via 5 kΩ	--	--	--
Earthing Transformer		not earthed	--	--	--
Short-circuit point		earthed	--	--	--
Circuit diagram	Sheet no.:	14	--	--	--
Circuit impedance	mΩ	≈ 5	--	--	--
			--	--	--
TRV control elements			--	--	--
Capacitance in parallel	μF		--	--	--
Resistance in series	Ω		--	--	--
			--	--	--
			--	--	--
Prospective TRV			--	--	--
TRV peak value u_c	kV		--	--	--
Time co-ordinate t_3	μs		--	--	--
Time delay t_d	μs		--	--	--
Based on	kV		--	--	--
Rate-of-rise	kV/μs		--	--	--
			--	--	--
			--	--	--
Voltage measurements		Divider 75 kΩ / 1.1 kΩ	--	--	--
Current measurements		Transformer 50 kA / 5 A	--	--	--

Remarks: -



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DAT-P-032/93

ABB Calor Emag Laboratories

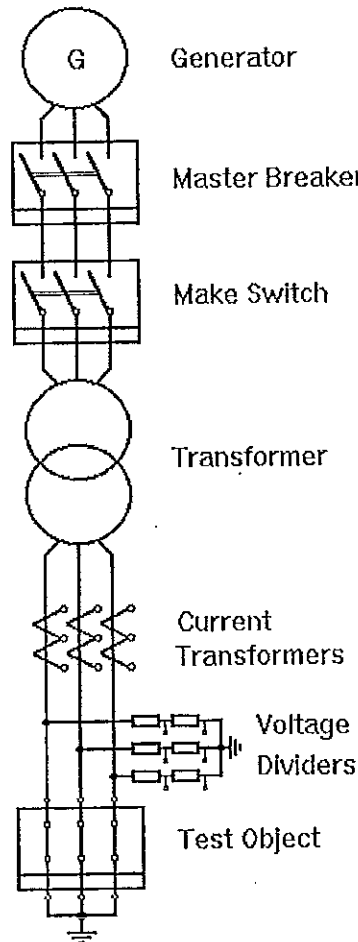


TEST REPORT No. HZ 235 F 01

Sheet 14

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corresponding to EN 45001

Principle Diagram of Test Circuit



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TEST REPORT No. HZ 235 F 01

Sheet 15

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Peak and Short-Time Withstand Current Tests

Actual values
(Main circuit)

Condition of test object before test: Switchgear and equipment new.

Connection to test object: By means of copper conductors to the cable terminals of the panel. Short-circuit bridge mounted on the bushings of busbar outside the panel. The circuit breaker closed.

Oscillogram-No. HZ 235 F 01				04	05	--	--
Peak short-circuit current	L1	kA	65.8	29.8	--	--	--
	L2	kA	53.6	28.1	--	--	--
	L3	kA	19.0	32.5	--	--	--
Short-circuit current	first cycle	L1	kA	27.8	26.2	--	--
		L2	kA	28.6	25.9	--	--
		L3	kA	26.3	25.2	--	--
	last cycle	L1	kA	26.2	25.9	--	--
		L2	kA	27.1	26.9	--	--
		L3	kA	25.3	25.0	--	--
Equivalent r.m.s. value	L1	kA	26.3	25.5	--	--	
	L2	kA	27.3	26.4	--	--	
	L3	kA	25.4	24.6	--	--	
Average value		kA	26.3	25.5	--	--	
Duration of short-circuit current		s	0.304	3.03	--	--	
Short-time current	1 s	L1	kA	--	--	--	--
		L2	kA	--	--	--	--
		L3	kA	--	--	--	--
Average value		kA	--	--	--	--	
Short-time current	3 s	L1	kA	--	25.6	--	--
		L2	kA	--	26.5	--	--
		L3	kA	--	24.7	--	--
Average value		kA	--	25.6	--	--	

Remarks:

- HZ 235 F 01 / 01: Current calibration
- HZ 235 F 01 / 02: No-load operation
- HZ 235 F 01 / 03: Test with reduced values
- HZ 235 F 01 / 06: No-load operation

Condition of test object after test:

HZ 235 F 01 / 05: No visible change or damage. Circuit-breaker opened by its own mechanism at the first attempt.



ВЯРНО С ОПРИГИНАЛА

Peak and Short-Time Withstand Current Tests
Actual values
(Earthing switch)

Condition of test object before test: Switchgear and equipment as after test 06.

Connection to test object: By means of copper conductors to the cable terminals. Short-circuit made by means of the closed earthing switch inside the panel. Circuit-breaker open in test position.

Oscillogram-No. HZ 235 F 01		08	09	--	--	
Peak short-circuit current	L1 kA	66.5	34.1	--	--	
	L2 kA	52.9	30.2	--	--	
	L3 kA	19.1	36.2	--	--	
Short-circuit current	first cycle	L1 kA	27.9	26.9	--	--
		L2 kA	27.9	26.3	--	--
		L3 kA	26.2	25.8	--	--
	last cycle	L1 kA	25.8	25.3	--	--
		L2 kA	26.0	25.6	--	--
		L3 kA	24.8	24.4	--	--
Equivalent r.m.s. value	L1 kA	26.1	25.4	--	--	
	L2 kA	26.4	25.6	--	--	
	L3 kA	25.1	24.4	--	--	
Average value	kA	25.8	25.1	--	--	
Duration of short-circuit current	s	0.302	3.03	--	--	
Short-time current	1 s	L1 kA	--	--	--	--
		L2 kA	--	--	--	--
		L3 kA	--	--	--	--
Average value	kA	--	--	--	--	
Short-time current	3 s	L1 kA	--	25.5	--	--
		L2 kA	--	25.7	--	--
		L3 kA	--	24.5	--	--
Average value	kA	--	25.2	--	--	

Remarks:

HZ 235 F 01 / 07: Test with reduced values

Condition of test object after test:

HZ 235 F 01 / 09: No visible change or damage. Earthing switch could be opened easily by its own mechanism.



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TEST REPORT No. HZ 235 F 01
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Sheet 17

Actual Values of No-Load Operations

Rated supply voltage of closing coil 220 V dc
Rated supply voltage of opening coil 220 V dc

	Voltage of closing coil V	Closing time ms	Voltage of opening coil V	Opening time ms
Test HZ 235 F 01 / 02	--	--	220	36,4
Test HZ 235 F 01 / 06	--	--	220	37,4

Measurement of the Resistance of the Main-Circuit

Cable terminal against busbar outside the panel.

	Phase L 1	Phase L 2	Phase L 3
Before Test HZ 235 F 01 / 02	67.8 $\mu\Omega$	60.4 $\mu\Omega$	54.5 $\mu\Omega$
After Test HZ 235 F 01 / 06	61.1 $\mu\Omega$	60.0 $\mu\Omega$	56.4 $\mu\Omega$



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TEST REPORT No. HZ 235 F 01
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corresponding to EN 45001

Sheet 18

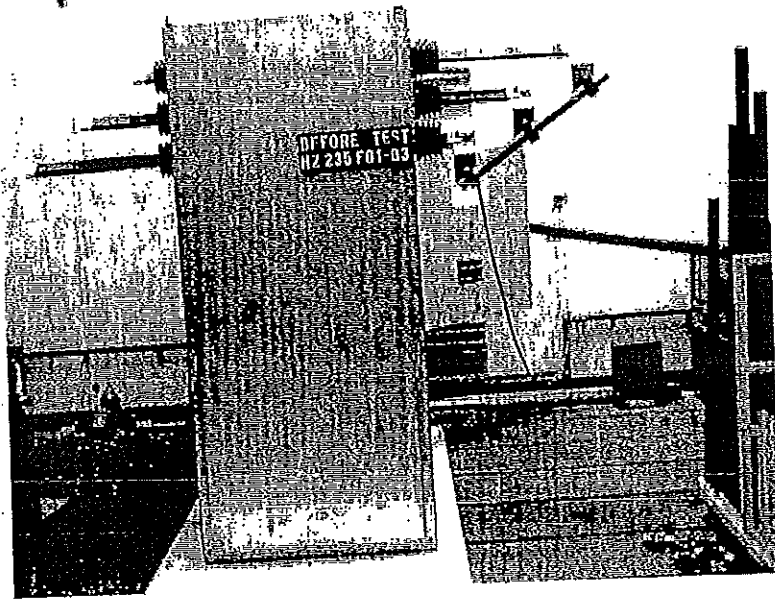


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Before Test HZ 235 F 01 / 03

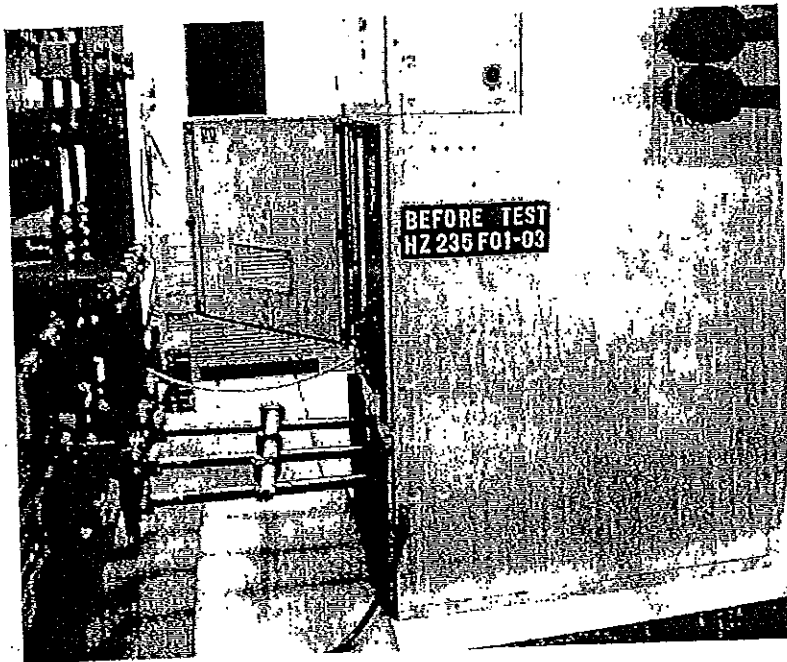


Photo no. 2
Before Test HZ 235 F 01 / 03



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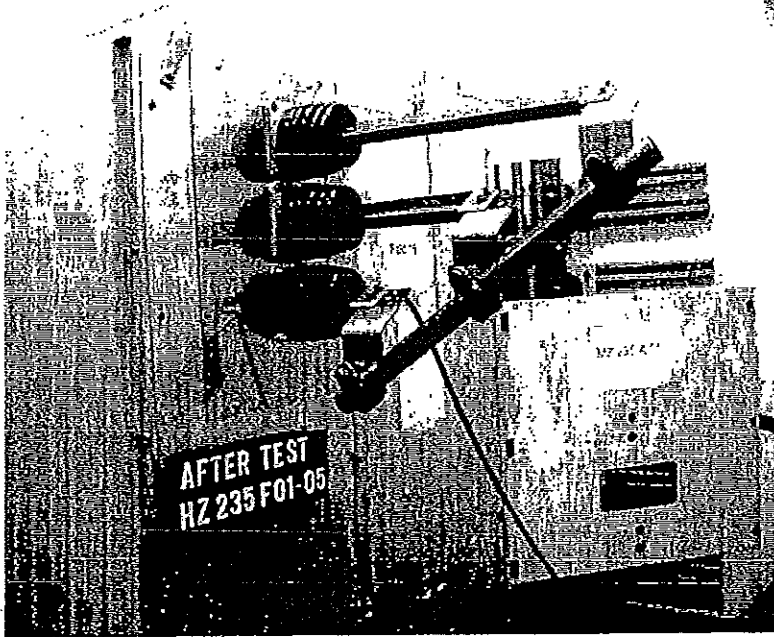


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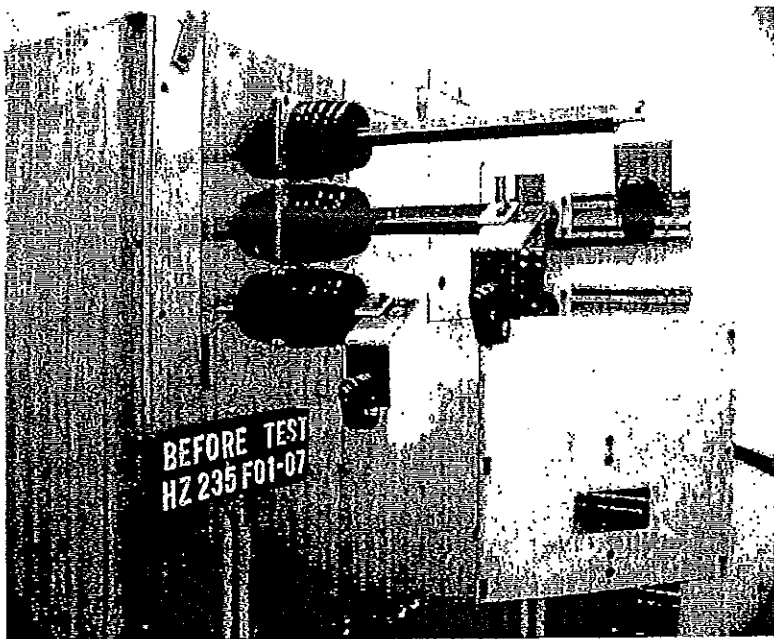


Photo no. 4
Before Test HZ 235 F 01 / 07

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DAT-P-032/93

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TEST REPORT No. HZ 235 F 01
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Sheet 20

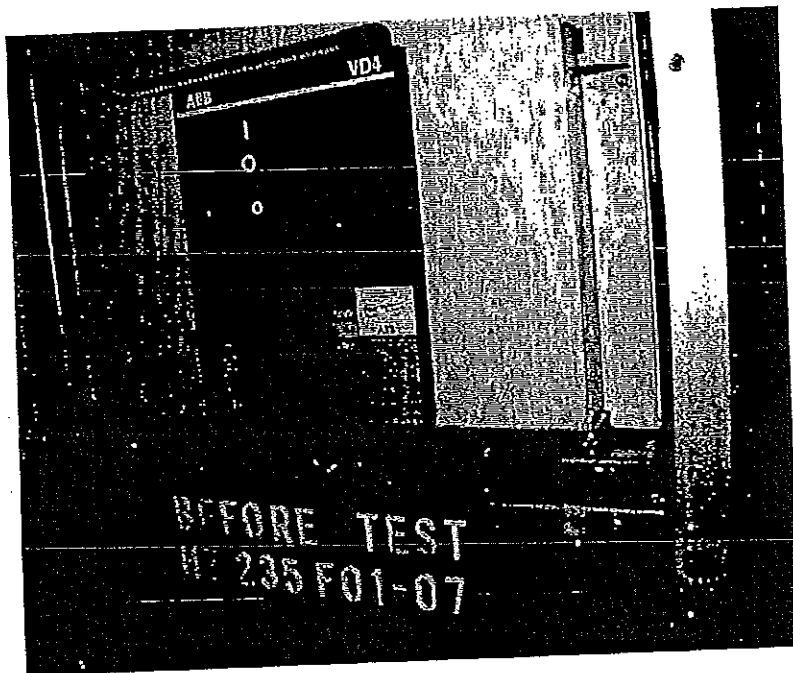


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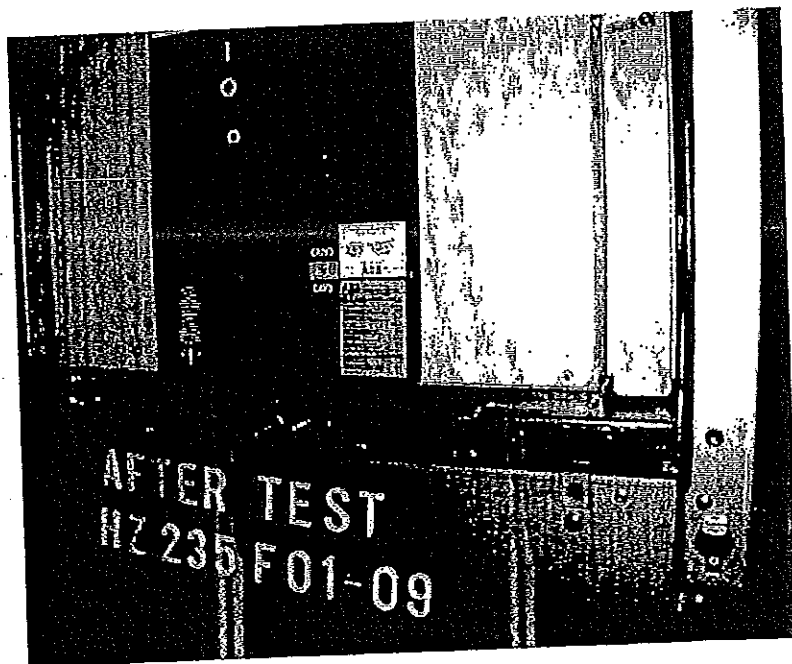


Photo no. 6
After Test HZ 235 F 01 / 09

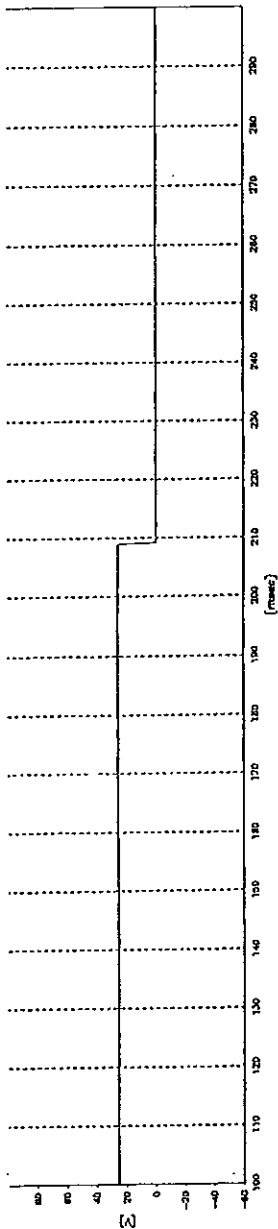
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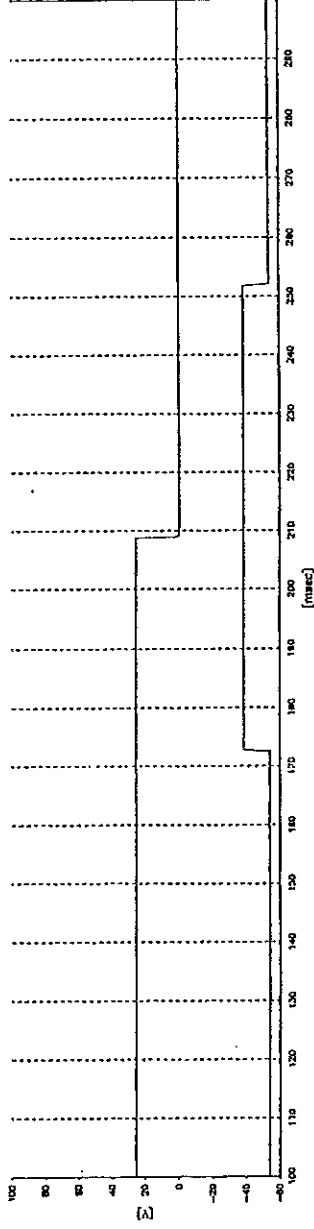
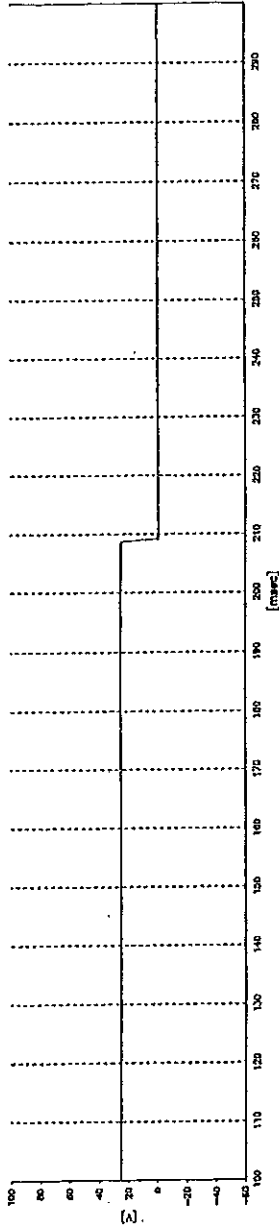
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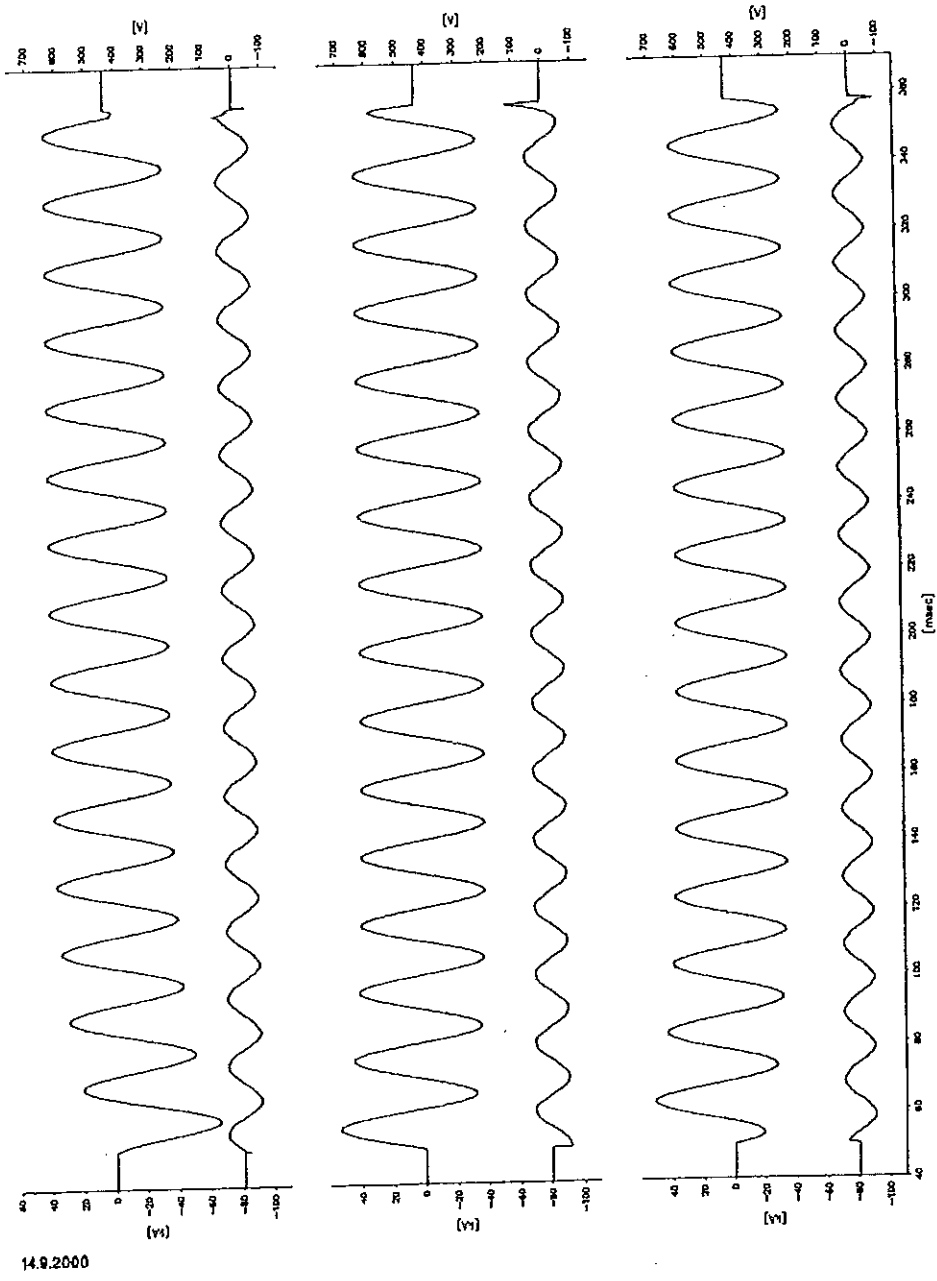
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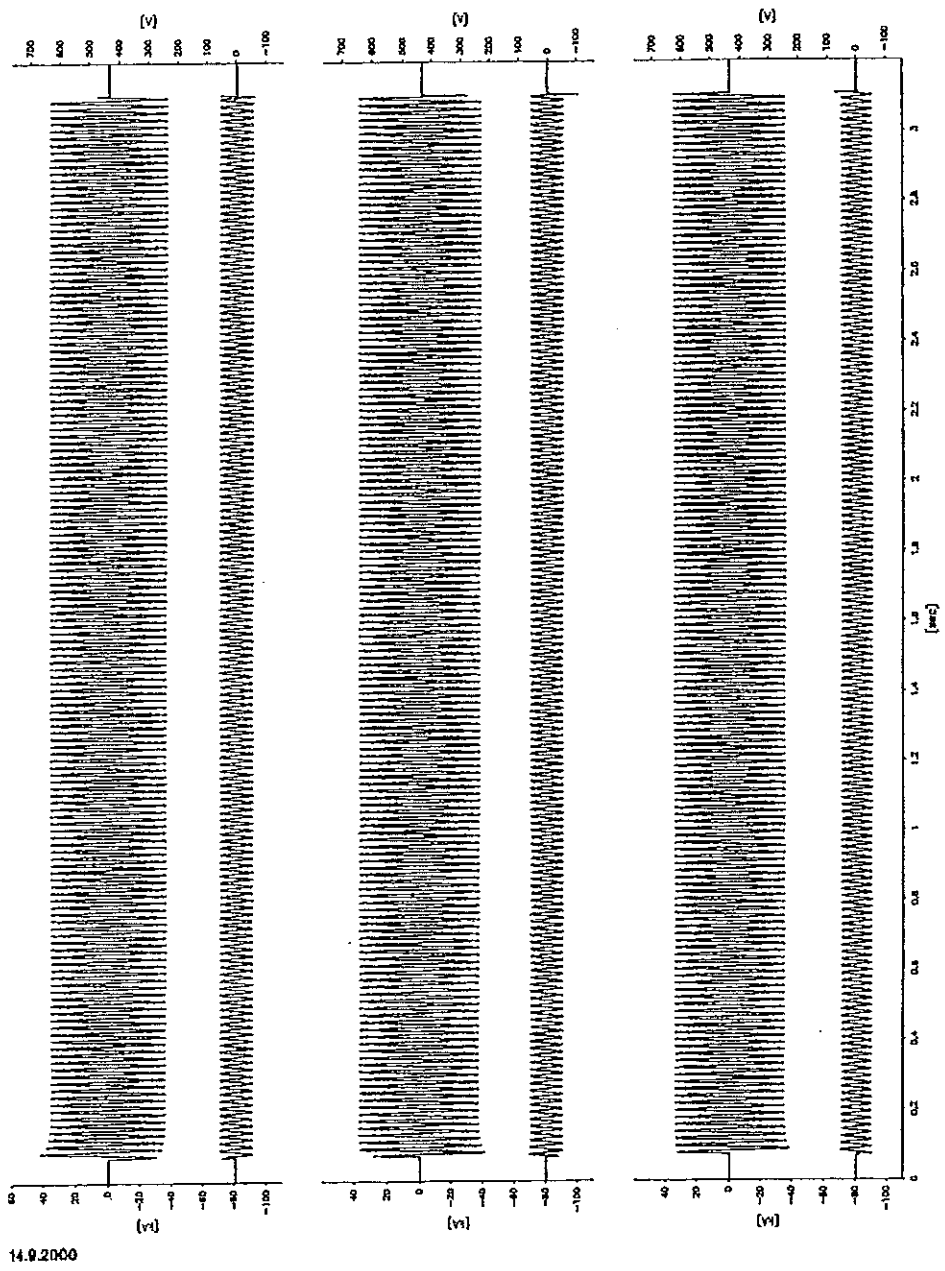
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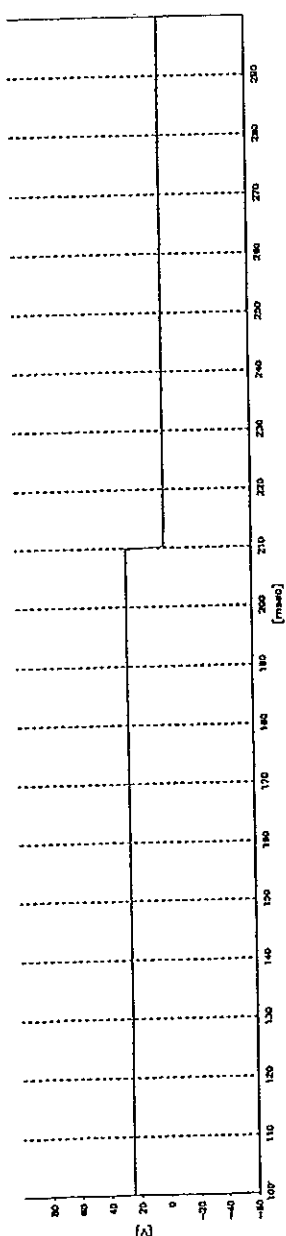
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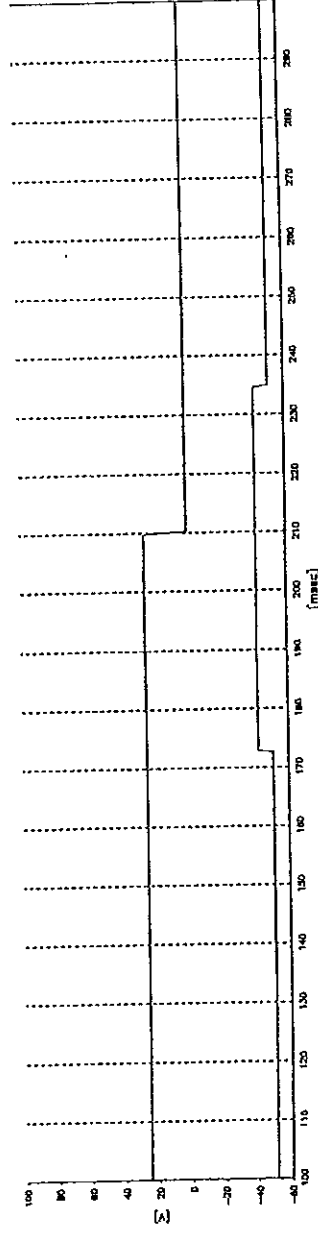
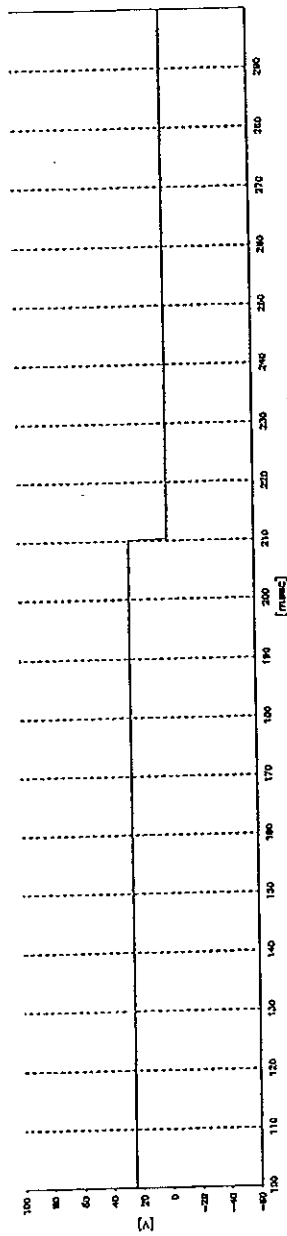
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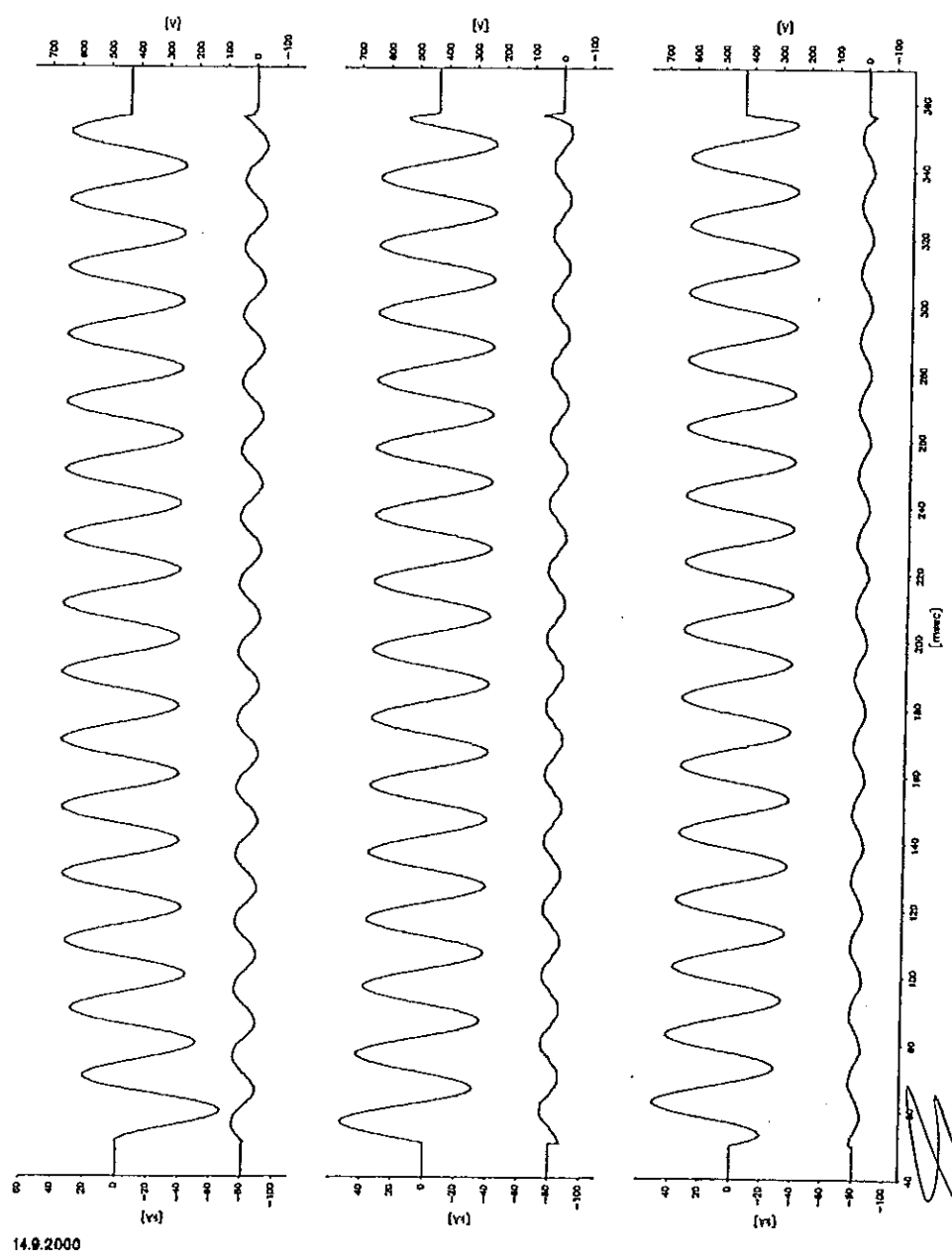
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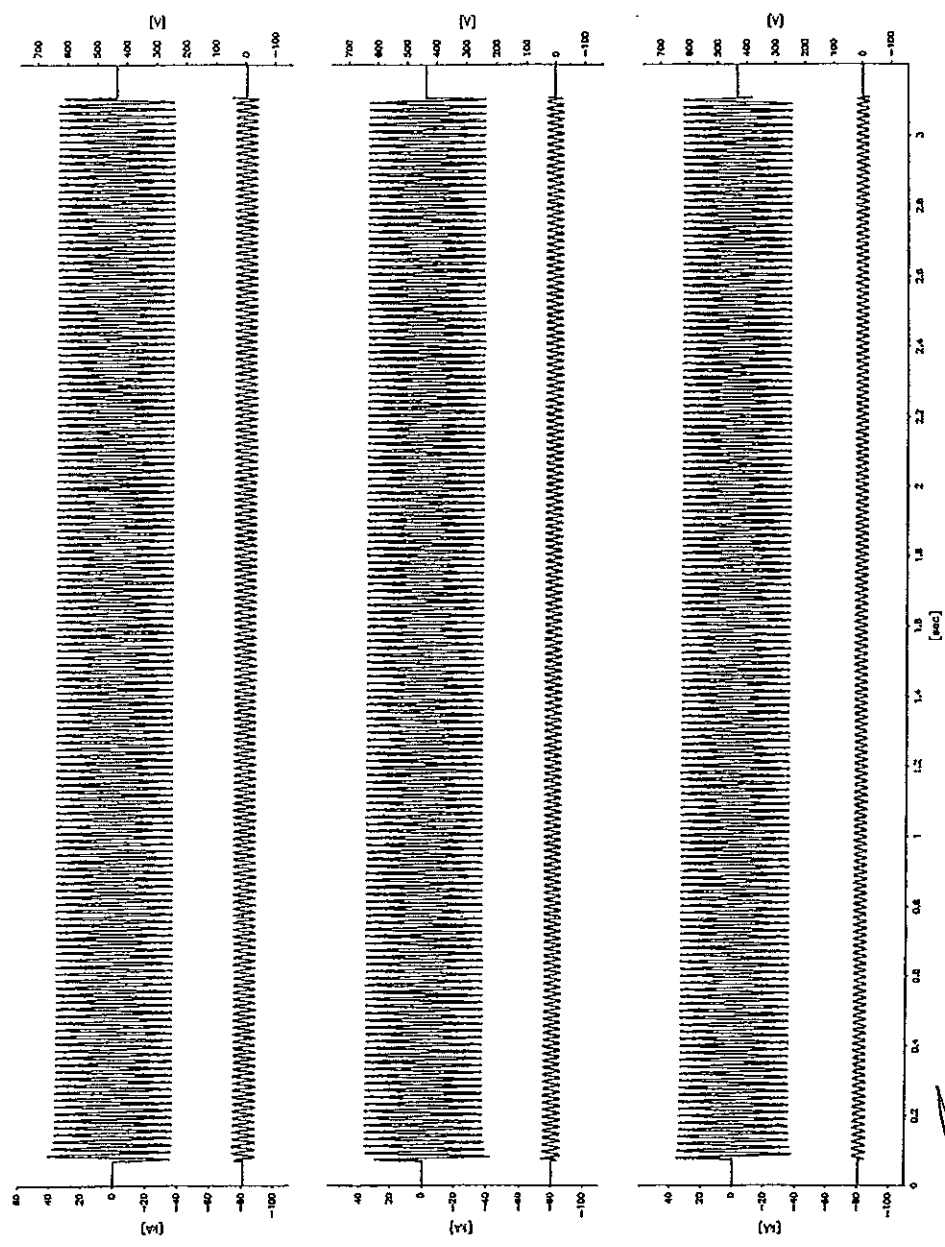
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HZ235F01.009

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PEHLA

GESELLSCHAFT FÜR ELEKTRISCHE HOCHLEISTUNGSPRÜFUNGEN
Member of the SHORT-CIRCUIT TESTING LIAISON (STL)

Test Document

Report No.: 0511Ra

Copy No.: 1

Contents: 72 Sheets

Test object: Vacuum circuit-breaker type VD4/P 24.06.20 p275 in metal-enclosed air-insulated switchgear type UniGear ZS1, 1000 mm width

Designation: VD4/P 24.06.20 p275 in UniGear ZS1 (1000 mm width)
Rated voltage: 24 kV Rated normal current: 630 A Rated frequency: 50 / 60 Hz
Rated short-circuit breaking current: 20 kA

Manufacturer: ABB P.T. S.p.A.

Client: ABB P.T. S.p.A.

Testing station: PEHLA-Testing Laboratory Ratingen

Date of test: 10th February, 09th and 10th March 2005

Applied test specifications:

The tests have been carried out in full compliance with the below mentioned standards.

Test procedure and test parameters were strictly according to:

IEC 62271-200 / 1st Ed. / 2003-11, Clauses 6.6 and 6.101

IEC 60694 / Ed. 2.2 / 2002-01, Clause 6.6

IEC 62271-100 / Ed. 1.1 / 2003-05, Clause 6.106

According to STL Objectives and Operating Principles PEHLA issues a Test Document following exclusively the above mentioned test specifications and the STL Guides wherever applicable.

Tests performed:

Three-phase short-time withstand current and peak withstand current test of the main circuit.

Three-phase making and breaking capacity test based on 20.0 kA at 24 kV comprising the basic test duties T10, T30, T60, T100s and T100a (dc-component of 35 %).

No-load operations and measurement of the resistance of the main circuit before and after the tests.

Power frequency withstand voltage test at 50.0 kV – 1 min before and after the tests as a condition check.

Test results:

The above mentioned vacuum circuit-breaker in metal-enclosed air-insulated switchgear passed the short-time withstand current and peak withstand current test and the three-phase making and breaking capacity test successfully.



GESELLSCHAFT FÜR ELEKTRISCHE
HOCHLEISTUNGSPRÜFUNGEN

[Signature]
Management Committee

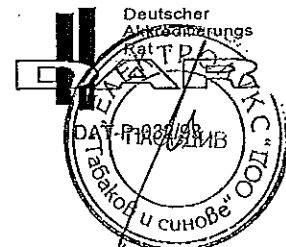
[Signature]
Technical Committee

Mannheim, 20th July 2005

The test results relate only to the items tested.

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03PE0402



ВЕРНО С ОРИГИНАЛА

Notes

Accreditation

The PEHLA-Testing Laboratory Ratingen has been approved by the DATech (German accreditation body for technology) according to EN ISO/IEC 17025 for tests in the field of high-voltage switchgear and controlgear and power engineering equipment (Registration-No. DAT-P032/93).

STL-Member

PEHLA is founder member of the SHORT-CIRCUIT TESTING LIAISON (STL) which has been established in March 1969. STL is a forum for the international cooperation of the testing organisations with the further full members ASTA (UK), CESI (IT), ESEF (FR), KEMA (NL), SATS (NO; SE, FI), STLNA (US, CA) and JSTC (JP). In the framework of EC, STL (EU) has been recognised in 1992 by EOTC as agreement group.

PEHLA-Documents

A Type Test Certificate

is issued for type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of the test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Document

is issued for parts of type tests which have successfully been carried out in full compliance with the relevant specifications or standards and STL Guides valid at the time of test. For these tests the test object must be clearly identified by technical description, drawings and additional specifications.

A Test Report

is issued for all other tests which have been carried out according to specifications, standards or "PEHLA-Richtlinien" (PEHLA Guides) and/or clients' instructions. Similarly, this test report contains all test results, details of the conditions under which the tests were carried out, also details relating to the behaviour of the test object, and its condition after the tests.

A Test Confirmation

is issued immediately after the tests. It confirms that the tests have been conducted and is valid only until publishing the detailed results in an entire document.

Uncertainty of the measurement systems

The PEHLA - Testing Laboratories apply the PEHLA Guide No. 12 for determining the uncertainties of measurement, based on ENV 13005 (Guide to the expression of uncertainty in measurement). As long as no explicit statements are made, the uncertainties required by the relevant standards have been complied with.

Addresses

Office: PEHLA-Geschäftsstelle
Hallenweg 40
68219 Mannheim
Germany
Internet: www.pehla.com

Testing Station: PEHLA-Testing Laboratory Ratingen
Oberhausener Str. 33
40472 Ratingen
Germany

Manufacturer: ABB P.T. S.p.A.
Via Friuli, 4
24044 Dalmine (BG)
Italy

Client: ABB P.T. S.p.A.
Via Friuli, 4
24044 Dalmine (BG)
Italy

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List of Test Participants

Representatives of Technical Committee:

Mr. Klaus Niemeyer	PEHLA-Testing Laboratory Berlin-Siemensstadt, Germany
Mr. Joachim Oemisch	PEHLA-Testing Laboratory Berlin-Siemensstadt, Germany
Dr. Thomas Ebke	PEHLA-Testing Laboratory Ratingen, Germany

Test Engineer / Test Operator:

Mr. Joachim Köhler	PEHLA-Testing Laboratory Ratingen, Germany
Dr. Thomas Ebke	PEHLA-Testing Laboratory Ratingen, Germany

Representatives of Client:

Mr. Stefano Magoni	ABB P.T. S.p.A., Dalmine, Italy
--------------------	---------------------------------

Further Participants:

Mr. Frank Idaszek	PEHLA-Testing Laboratory Ratingen, Germany
-------------------	--

Technical Data of Test Object
Switchgear

Test object: Metal-enclosed air-insulated switchgear.
Designation: UniGear ZS1
Manufacturer: ABB P.T. S.p.A., Via Friuli, 4, 24044 Dalmine (BG), Italy
Serial No.: -
Year of manufacture: 2004
Drawing No.: See sheet 7

Ratings assigned by the manufacturer:

Rated voltage	24 kV
Rated normal current	630 A
Rated frequency	50/60 Hz
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power-frequency withstand voltage	50 kV
Rated peak withstand current	63/65 kA
Rated short-time withstand current	25 kA
Rated duration of short-circuit	3 s
Insulating medium	-
Rated filling pressure for insulation	- MPa abs. at 20 °C
Minimum functional pressure for insulation	- MPa abs. at 20 °C

Permissible values for internal arc faults:

Peak current	63/65 kA
Short-circuit current	25 kA
Duration of short-circuit	1 s

Further data: -**Essential characteristics and installed devices: -**

Technical Data of Test Object
Circuit-Breaker

Test object: Vacuum circuit-breaker
Designation: VD4/P 24.06.20
Manufacturer: ABB P.T. S.p.A., Via Friuli, 4, 24044 Dalmine (BG), Italy
Serial No.: 1VC1AE00038562
Year of manufacture: 2004
Serial No. of drive: -
Drawing No.: See sheet 7

Ratings assigned by the manufacturer:

Rated voltage	24 kV	
Rated normal current	630 A	
Rated frequency	50/60 Hz	
Rated lightning impulse withstand voltage	125 kV	
Rated switching impulse withstand voltage	- kV	
Rated power-frequency withstand voltage	50 kV	
Rated peak withstand current	50/52 kA	
Rated short-time withstand current	20 kA	
Rated duration of short-circuit	3 s	
Rated short-circuit breaking current	20 kA	
DC component of the rated short-circuit breaking current	35 %	
Rated short-circuit making current	50/52 kA	
Rated transient recovery voltage	41 kV	
Rate of rise of transient recovery voltage	0.47 kV/μs	
First-pole-to-clear factor	1.5	
Rated operating sequence	O - 0.3 s - CO - 15 s - CO	
Arc extinguishing medium	vacuum	
Rated filling pressure for operation	- MPa	abs. at 20 °C
Minimum functional pressure for operation	- MPa	abs. at 20 °C
Insulating medium	-	
Rated filling pressure for insulation	- MPa	abs. at 20 °C
Minimum functional pressure for insulation	- MPa	abs. at 20 °C
Driving mechanism (type)	spring charged by motor	
Number of poles	3	
Number of units per pole	1	
Rated opening time	30 - 60 ms	
Rated closing time	50 - 80 ms	
Rated supply voltage of opening device	110 V	d.c.
Rated supply voltage of closing device	110 V	d.c.
Rated supply voltage of auxiliary circuits	110 V	d.c.
Rated frequency of supply voltage	- Hz	

Further data:

Type and Serial No. of Poles: P4 with VG4, L1: EP00013111, L2: EP00013094, L3: EP00013173

Essential characteristics: -



List of Identified Drawings

The manufacturer has submitted to the testing laboratory drawings and other data containing sufficient information to unambiguously identify by type the essential details and parts of the test object presented for test.

The drawings have been stamped and signed by the manufacturer in order to guarantee that the drawings or data schedules truly represent the test object to be tested.

Further these drawings have been stamped and signed by PEHLA representatives and are kept

at the client.

with the test documents at the test laboratory.

The testing laboratory has checked that drawings and data schedules adequately represent the essential details and parts of the test object to be tested, but is not responsible for the accuracy of the detailed information.

The drawing(s) contained in this document are identical with the checked, stamped and signed drawings.

Drawing No.	Rev.	P/D ¹⁾	Title	Additional remarks
GCE8010459 R0103	01	D	Abzweigfeld 24kV, TLG.1000 Feeder panel 24kV, PW.1000	Included in the Test Report
TN 7414	--	D	Interruttore in Vuoto Tipo Vacuum Circuit Breaker Type VD4/P 24kV 630-1250A	Included in the Test Report
GCE8012502 R0103	01	D	MONTAGEPLATTE H=310, KONTAKT 35 Mounting plate H=310, contact 35	-
GCE8685778 P0121	03	D	Kontaktstift	-
N 510509 Gr. 810	--	P	Tabella Materiali N 510509	-
510509 Gr. 810	--	D	Completamento Interruttore C.B. Completion	-
N 1VCR003288 G0015	--	P	Tabella Materiali N 1VCR003288G	-
1VCR003288 G0015	--	D	Struttura con poli Frame with Poles	-
N 1VCR003324 G0015	--	P	Tabella Materiali N 1VCR003324G	-
1VCR003324 G0015	--	D	Interruttore Base Base Breaker	-
N 1VCR003321 G0003	--	P	Tabella Materiali N 1VCR003321G	-
1VCR003321 G0003	--	D	Commando con Albero Operating Mechanism with Shaft	-
N 510508 Gr. 802	--	P	Tabella Materiali N 510508	-
510508 Gr. 802	--	D	Montaggio Passanti e Tulipani Bushing and Tulip Mounting	-
GCE7004730 R0104	11	D	Pol, vst. 24kV 1250A Pole complet 24kV 1250A	-

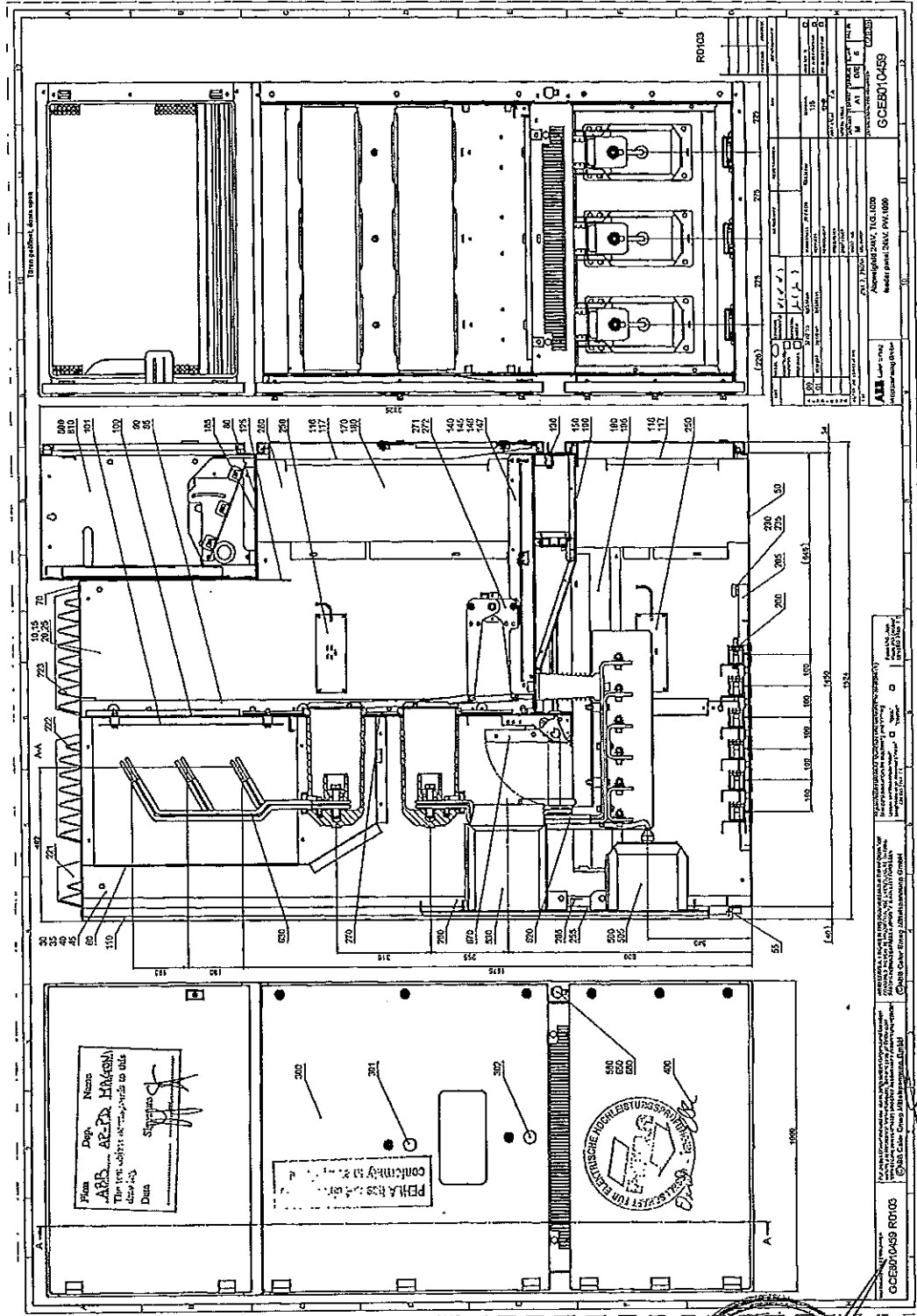
¹⁾ P: Parts list, D: Drawing

Remarks: -

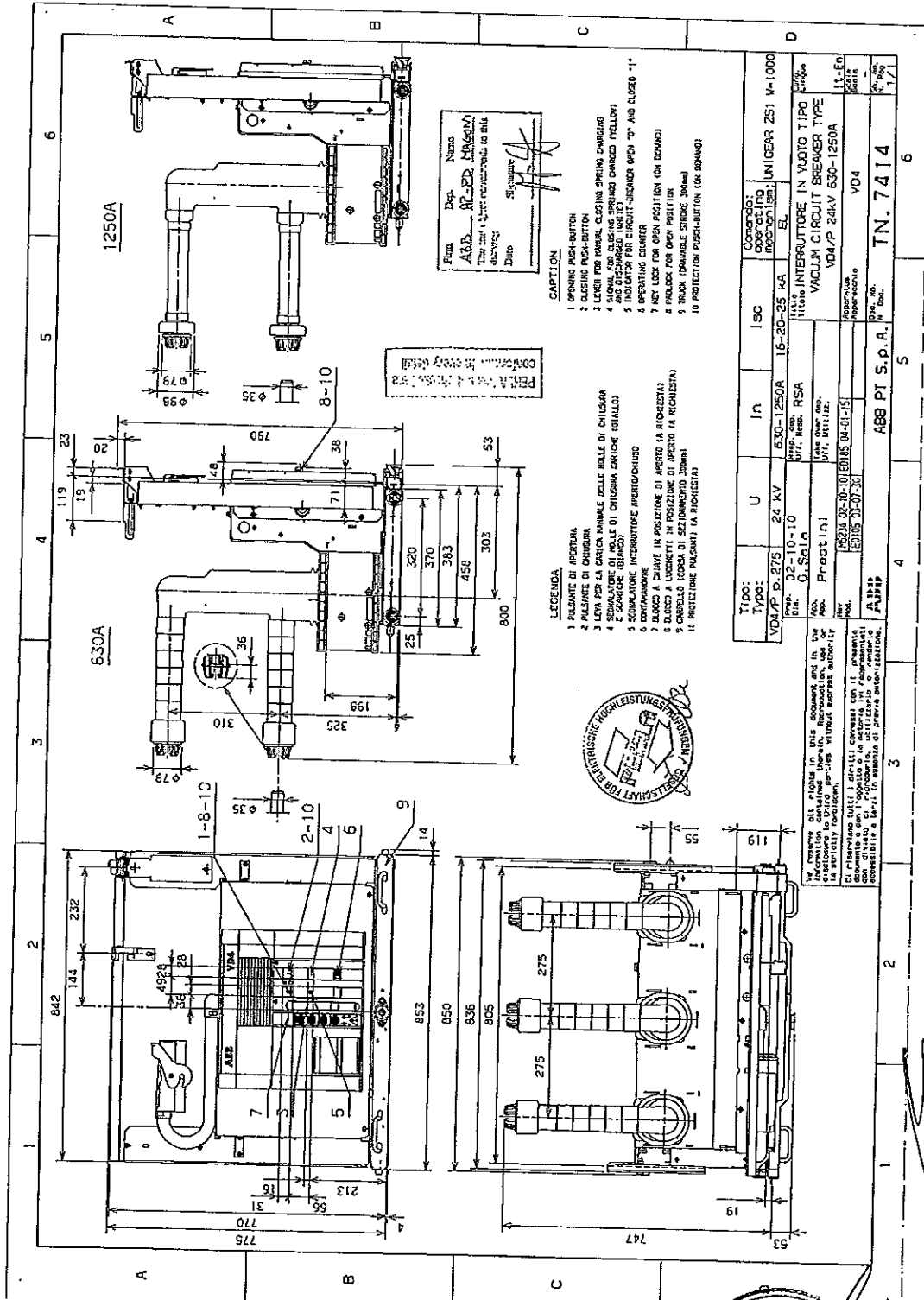
ВАРНО С ОРЖИНАЛА



Drawing
GCE8010459R0103



**Drawing
TN.7414**



File: Des. Name: **ABB - REPER. MANSONI**
 Date: _____
 Signature: _____

- CAPTION**
- 1 OPENING PUSH-BUTTON
 - 2 CLOSING PUSH-BUTTON
 - 3 LEVER FOR MANUAL CLOSING SPRING CHARGING
 - 4 SIGNAL FOR CLOSING SPRING CHARGED (YELLOW)
 - 5 AIR DISCHARGE UNIT
 - 6 OPERATING COUPLER
 - 7 KEY LOCK FOR OPEN POSITION (ON BOARD)
 - 8 KEY LOCK FOR OPEN POSITION (ON BOARD)
 - 9 TRUCK (MOVABLE STRIKE TRUCK)
 - 10 PROTECTION PUSH-BUTTON (ON BOARD)

- LEGENDA**
- 1 PIAZZONE DI APERTURA
 - 2 PIAZZONE DI CHIUSURA
 - 3 LEVA PER LA CARICA MANUALE DELLE MOLLE DI CHIUSURA
 - 4 SEGNALE PER LA CARICA MANUALE DELLE MOLLE DI CHIUSURA (GIALLO)
 - 5 SCARICATORE D'ARIA
 - 6 SCOPPIO
 - 7 CHIAVETTA PER LA POSIZIONE DI APERTO IN AZIONE
 - 8 CHIAVETTA PER LA POSIZIONE DI APERTO IN AZIONE
 - 9 CARROZZA A LANCETTA (SU RICHIESTA)
 - 10 PULSANTE PROTEZIONE (SU RICHIESTA)



Tipo:	U	In	Isc	Comando:	UNI-COMAR 251 M-1000
Type:	24 kV	630-1250A	15-20-25 kA	operating mechanism:	EL
VDA/P D.275	24 kV	630-1250A	15-20-25 kA		
Imp.:	02-10-10	Imp.:	02-10-10	Titolo:	INTERRUTTORE IN VUOTO TIPO
Dir.:	G. Scilla	Dir.:	G. Scilla	Modello:	VACUUM CIRCUIT BREAKER TYPE
Aut.:	Prototipi	Aut.:	Prototipi	Apparato:	VDA/P 24KV 630-1250A
Mod.:	630M 02-10-10 (ENES 04-01-15)	Mod.:	630M 02-10-10 (ENES 04-01-15)	Versione:	V04
Int.:	0205 02-07-30	Int.:	0205 02-07-30	Dis. No.:	TN. 7414
Aut.:	ABB	Aut.:	ABB	Dis. No.:	ABB PT S.p.A.
Mod.:	ABB	Mod.:	ABB	Dis. No.:	5
Int.:	ABB	Int.:	ABB	Dis. No.:	4
Aut.:	ABB	Aut.:	ABB	Dis. No.:	3
Mod.:	ABB	Mod.:	ABB	Dis. No.:	2
Int.:	ABB	Int.:	ABB	Dis. No.:	1

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ВЯРНО С ОРИГИНАЛА



Technical Data of Test Circuits

Short-Time Withstand Current and Peak Withstand Current Tests

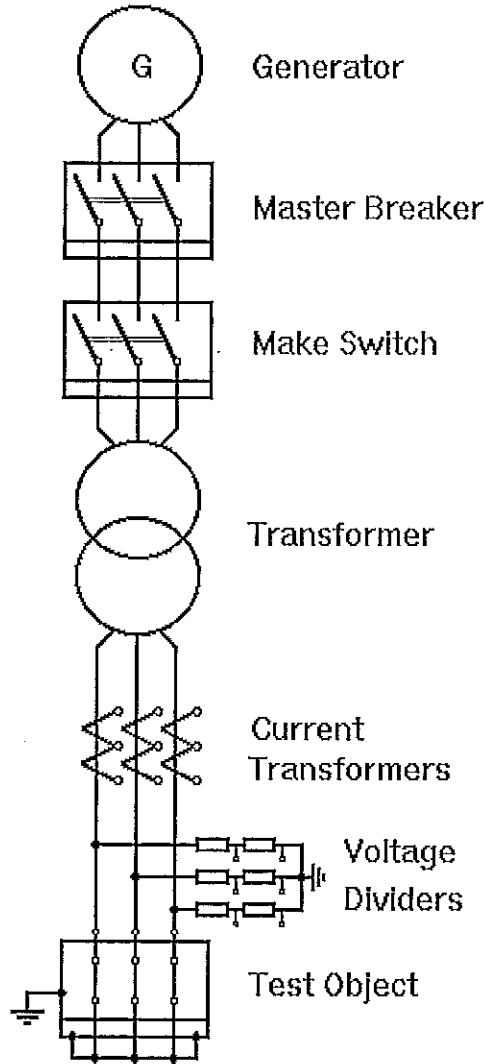
Test performed	STC	-	-	-
Test No. PEHLA 0511Ra	03 - 04	-	-	-
Circuit diagram	Sheet No. 11	-	-	-
Current circuit	-	-	-	-
Number of phases	3	-	-	-
Power frequency	Hz 50	-	-	-
Power factor	< 0.15	-	-	-
Earthing conditions	-	-	-	-
Generator / System	earthed via 5 kΩ	-	-	-
Transformer	not earthed	-	-	-
Short-circuit point	earthed	-	-	-
Test object	earthed	-	-	-
Test object (test values)	-	-	-	-
Number of phases	3	-	-	-
Measurement	-	-	-	-
Voltage measurement	Dividers 80 kΩ / 1.1 kΩ	-	-	-
Current measurement	Transf. 50 kA / 5 A	-	-	-

Remarks: -

ВЯРНО С ОРИГИНАЛА



Circuit Diagram
Test Circuit for Three-Phase Tests
Peak Withstand Current and Short-Time Withstand Current Tests



**Technical Data of Test Circuit
Short-Circuit Direct Test**

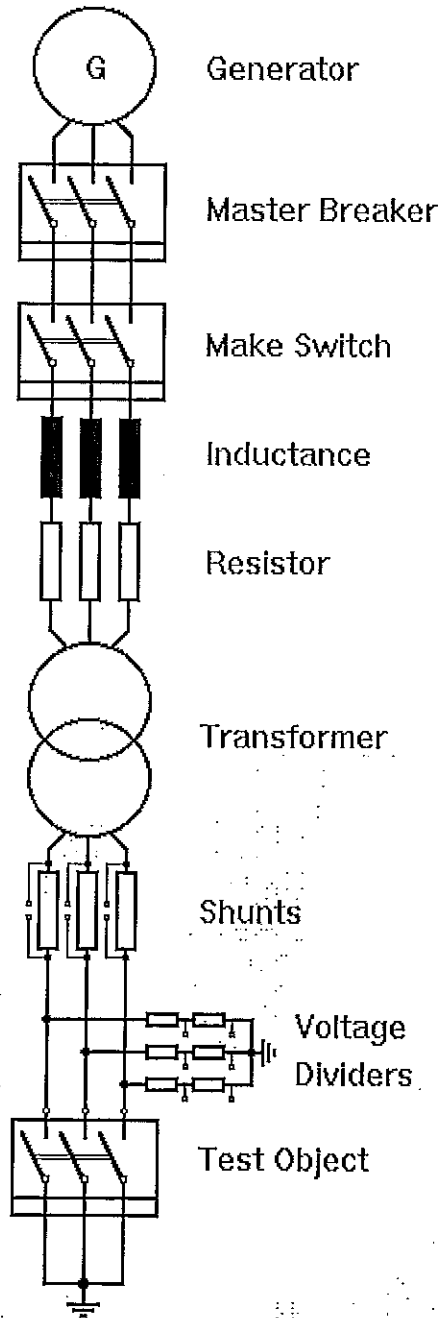
Test performed		T30	T60	T100	T10				
Test No. PEHLA 0511Ra		07-08	09-12	13-28	29-30				
Circuit diagram (test circuit) see sheet		13	13	13	13				
Test object									
Rated voltage	kV	24	24	24	24				
Rated frequency	Hz	50	50	50	50				
Short-circuit breaking current	kA	6.00	12.0	20.0	2.00				
Units under test		-	-	-	-				
Voltage distribution	%	-	-	-	-				
Number of phases (test circuit)		3	3	3	3				
Power factor (test circuit)		≤ 0.15	≤ 0.15	≤ 0.15	≤ 0.15				
Frequency (test circuit)	Hz	50	50	50	50				
Earthing conditions Generator		earthed via 5 kΩ	earthed via 5 kΩ	earthed via 5 kΩ	earthed via 5 kΩ				
Transformer		not earthed	not earthed	not earthed	not earthed				
Short-circuit point		earthed	earthed	earthed	earthed				
Prospective transient recovery voltage		Required values	Tested values	Required values	Tested values	Required values	Tested values	Required values	Tested values
Evaluation of oscillogram	No.	-	prosp.	-	prosp.	-	prosp.	-	prosp.
Crest value u_c	kV	44.0	44.5	44.0	44.0	41.0	41.0	44.0	47.0
Time t_3	μs	19	38 ¹⁾	38	38	87	80	19	66 ¹⁾
Time delay t_d	μs	-	-	-	-	-	-	-	-
Rate of rise u_1/t_1 or u_d/t_3	kV/μs	2.32	1.17	1.16	1.16	0.47	0.51	2.32	0.71
u_1	kV	-	-	-	-	-	-	-	-
t_1	μs	-	-	-	-	-	-	-	-

Remarks: ¹⁾ Due to limitations of the test plant the time coordinate t_3 is higher than the required values.

ВАРНО С ОРИГИНАЛА



Circuit Diagram
Test Circuit for Three-Phase Tests
Basic Short-Circuit Making and Breaking Tests



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18PE0402

ВЕРНО С ОРИГИНАЛА



Test Results

Three-phase short-time withstand current and peak withstand current tests

Test performed: Three-Phase Peak and Short-Time Withstand Current Tests, 52 kA / 20 kA – 3s
 Date of test: 10th February 2005
 Condition of test object before test: Factory new.
 Test arrangement: Direct test circuit, circuit-breaker in air-insulated switchgear
 Connections to test object: Infeed via copper bars to the busbar connection of the switchgear, short-circuited via copper bar at the cable terminals, short-circuit point earthed via cable.

Test No. PEHLA 0511Ra				03	04	-	-	-	-
Short-circuit current - peak	L1	kA	52.3	36.6	-	-	-	-	-
	L2	kA	40.6	29.8	-	-	-	-	-
	L3	kA	46.1	37.1	-	-	-	-	-
Short-circuit current - rms	First cycle	L1	kA	22.0	20.4	-	-	-	-
		L2	kA	22.7	19.9	-	-	-	-
		L3	kA	22.5	21.4	-	-	-	-
	Last cycle	L1	kA	21.0	21.1	-	-	-	-
		L2	kA	22.0	22.2	-	-	-	-
		L3	kA	21.4	21.5	-	-	-	-
Equivalent current	L1	kA	21.0	20.6	-	-	-	-	
	L2	kA	22.1	21.6	-	-	-	-	
	L3	kA	21.4	21.0	-	-	-	-	
Average value	kA	21.5	21.0	-	-	-	-	-	
Duration of short circuit	s	0.317	3.02	-	-	-	-	-	
Short-time current	L1	kA	-	20.6	-	-	-	-	
	L2	kA	-	21.7	-	-	-	-	
	L3	kA	-	21.0	-	-	-	-	
	Average value	kA	-	21.1	-	-	-	-	
Duration	s	-	3.00	-	-	-	-	-	
Emission of flame/gas/oil			no	no	-	-	-	-	
Test result (P/N)			P	P	-	-	-	-	

Resistance of the main circuit

Before test	L1	μΩ	26.5	-	-	-	-	-
	L2	μΩ	28.4	-	-	-	-	-
	L3	μΩ	26.9	-	-	-	-	-
After test	L1	μΩ	-	26.2	-	-	-	-
	L2	μΩ	-	27.1	-	-	-	-
	L3	μΩ	-	26.2	-	-	-	-

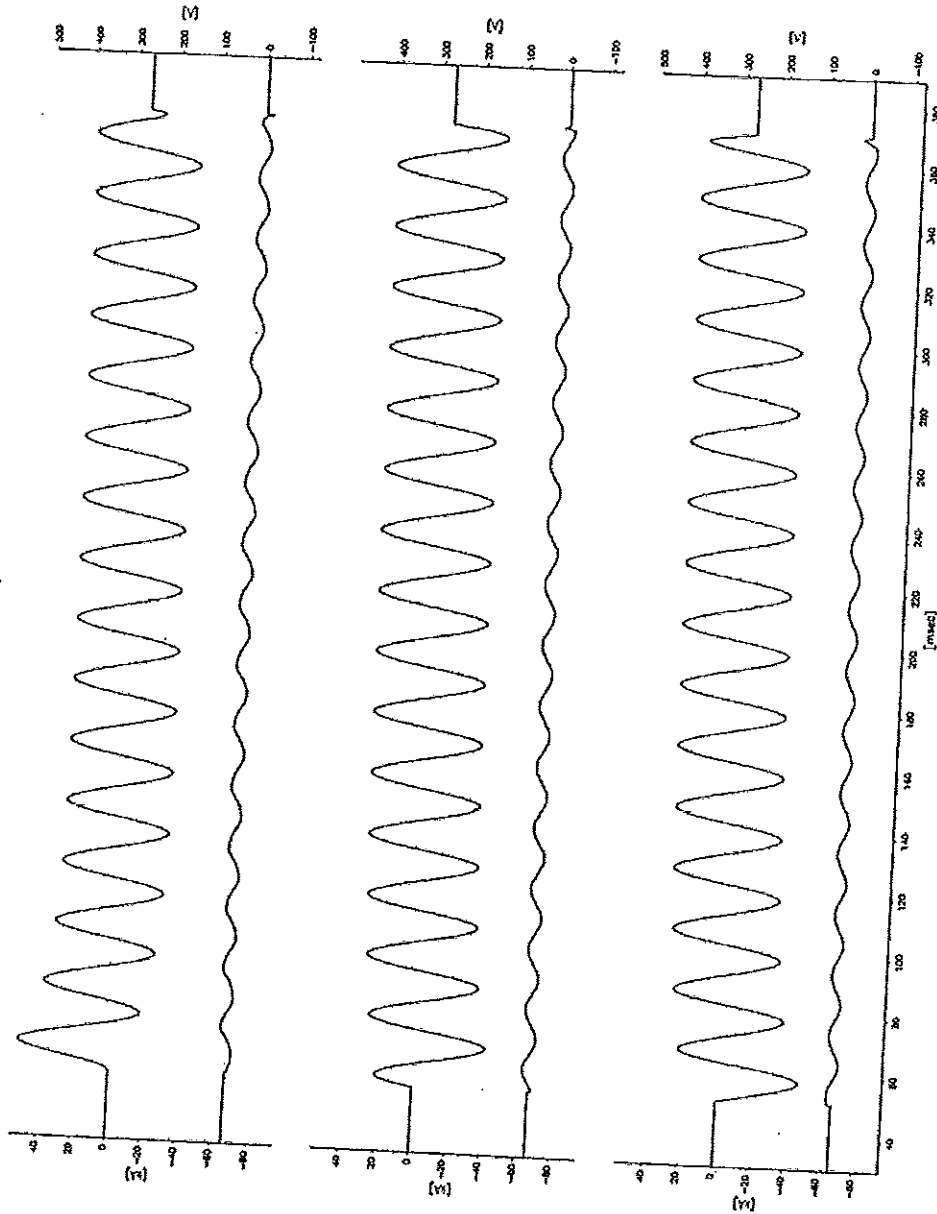
Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard
 Remarks: PEHLA 0511Ra / 01: Current calibration
 PEHLA 0511Ra / 02: No-load operation

Condition of test object after test: Vacuum circuit-breaker type VD4/P 24.06.20 p275 in metal-enclosed air-insulated switchgear type UniGear ZS1, 1000 mm width without visible or functional change or damage. It opened by its own mechanism energized at rated auxiliary voltage at the first attempt.

ВЕРНО С ОРИГИНАЛОМ



Oscillogram
PEHLA 0511Ra / 03



ВЕРНО С ОРИГИНАЛА

