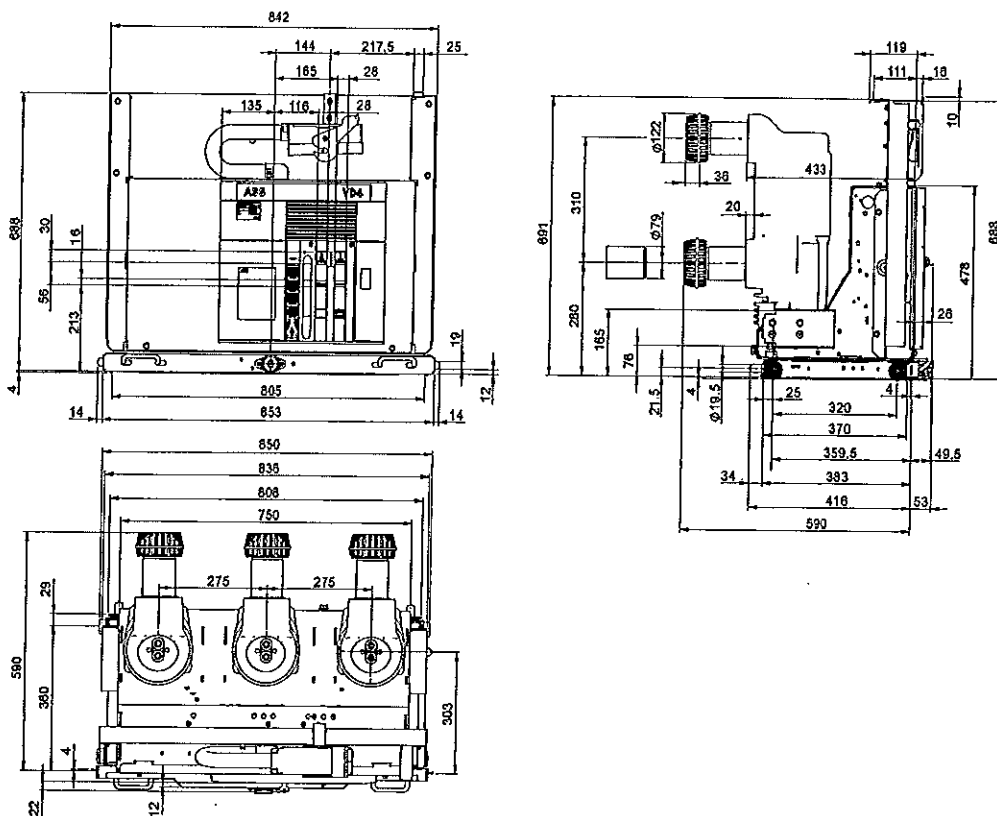


Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

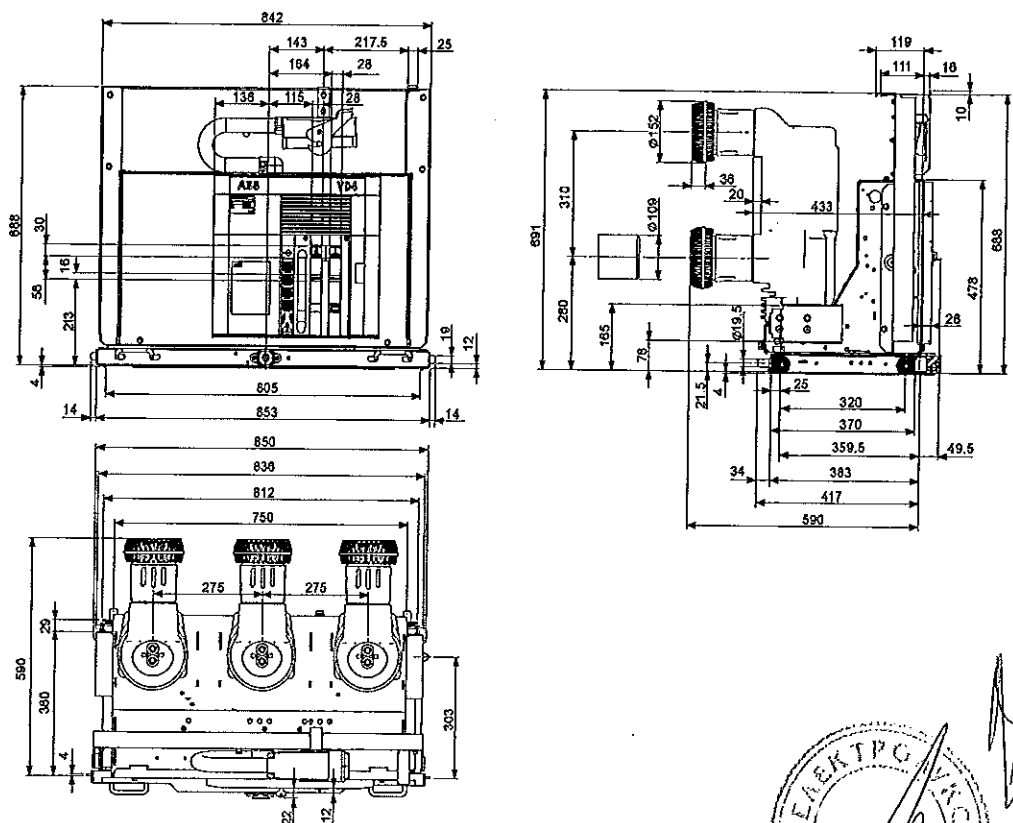
VD4/P	
TN	1VCD003445
Ur	12 kV
Ir	1600 A
Isc	2000 A
Isc	50 kA



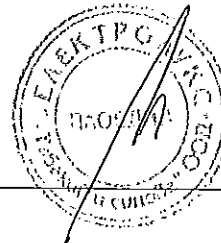
g

Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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



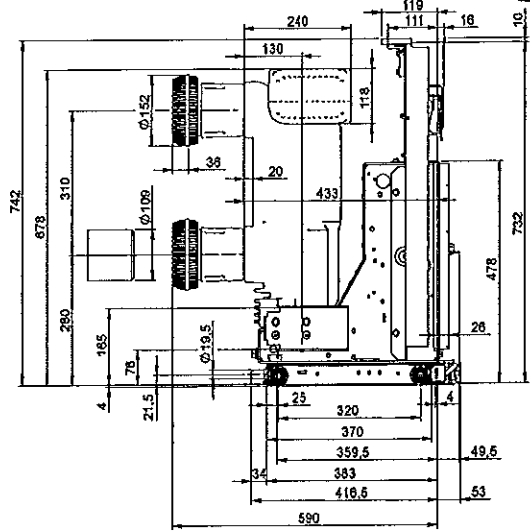
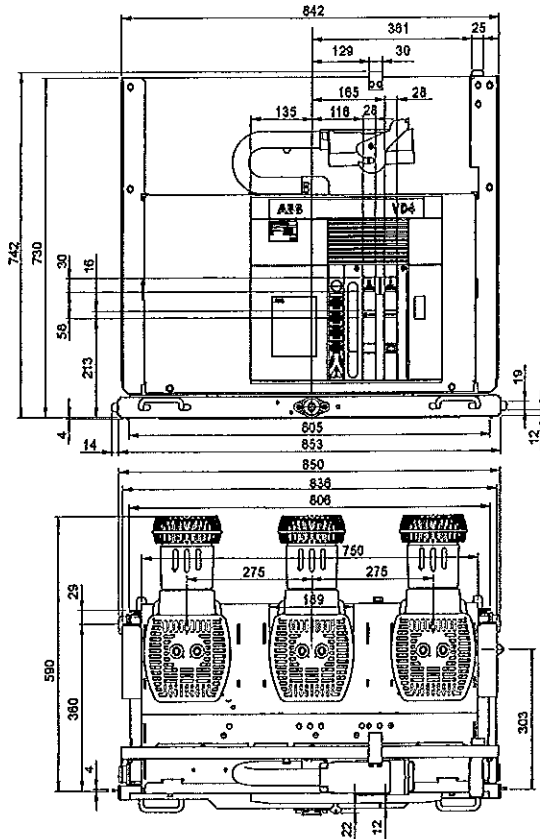
ВЯРНО С ОПРИГНАТА



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Withdrawable circuit-breakers for PowerCube modules

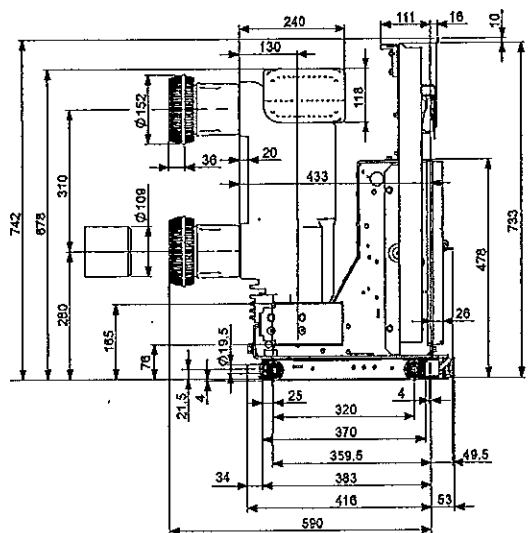
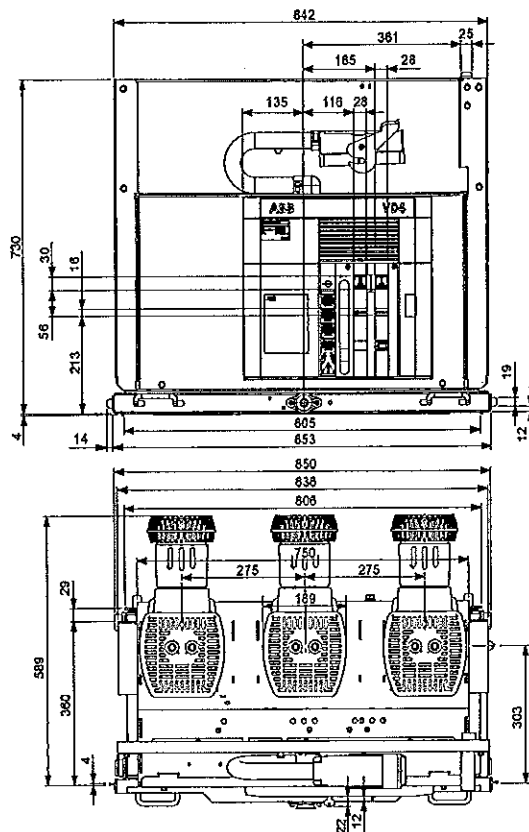
VD4/W	
TN	1VCD003596
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	50 kA



(\*) 4000 A with forced ventilation.

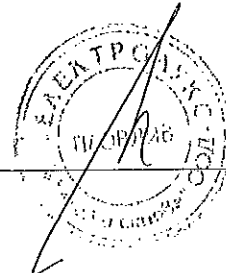
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD003447
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
Isc	50 kA



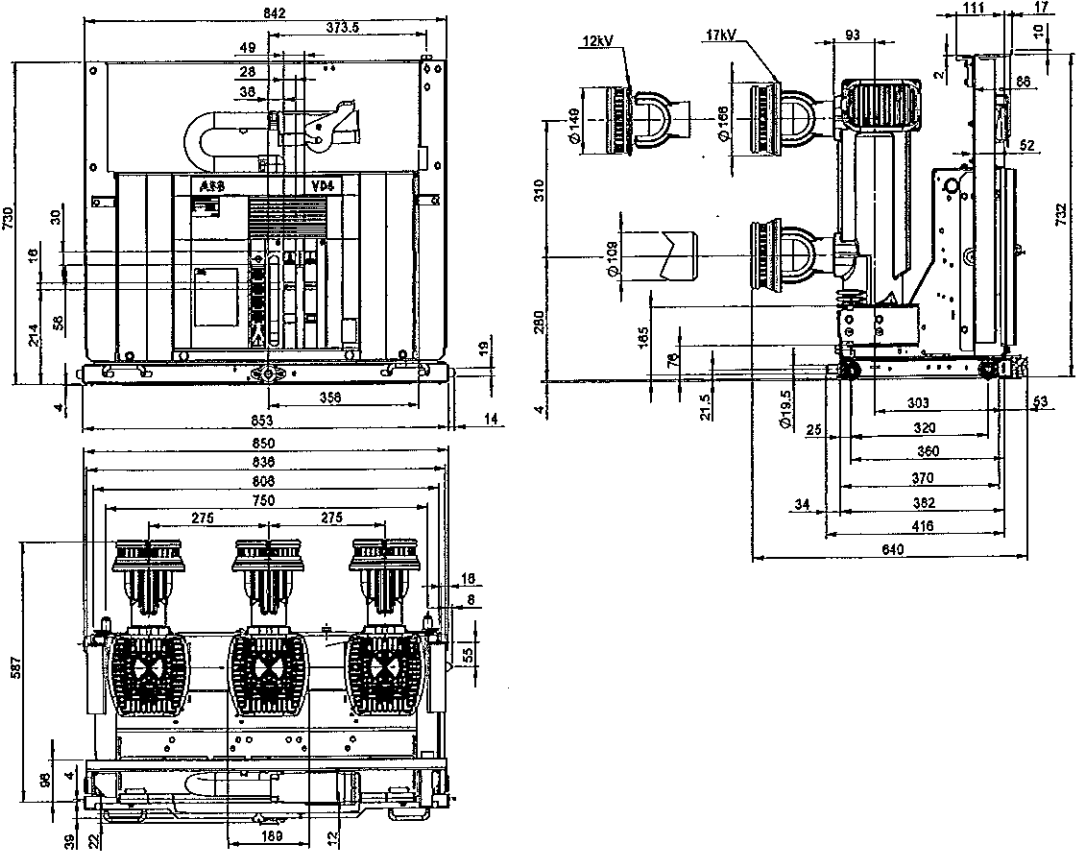
(\*) 4000 A with forced ventilation.

ВЕРНО С ОРИГИНАЛА



Withdrawable circuit-breakers for UniGear ZS1 switchgear

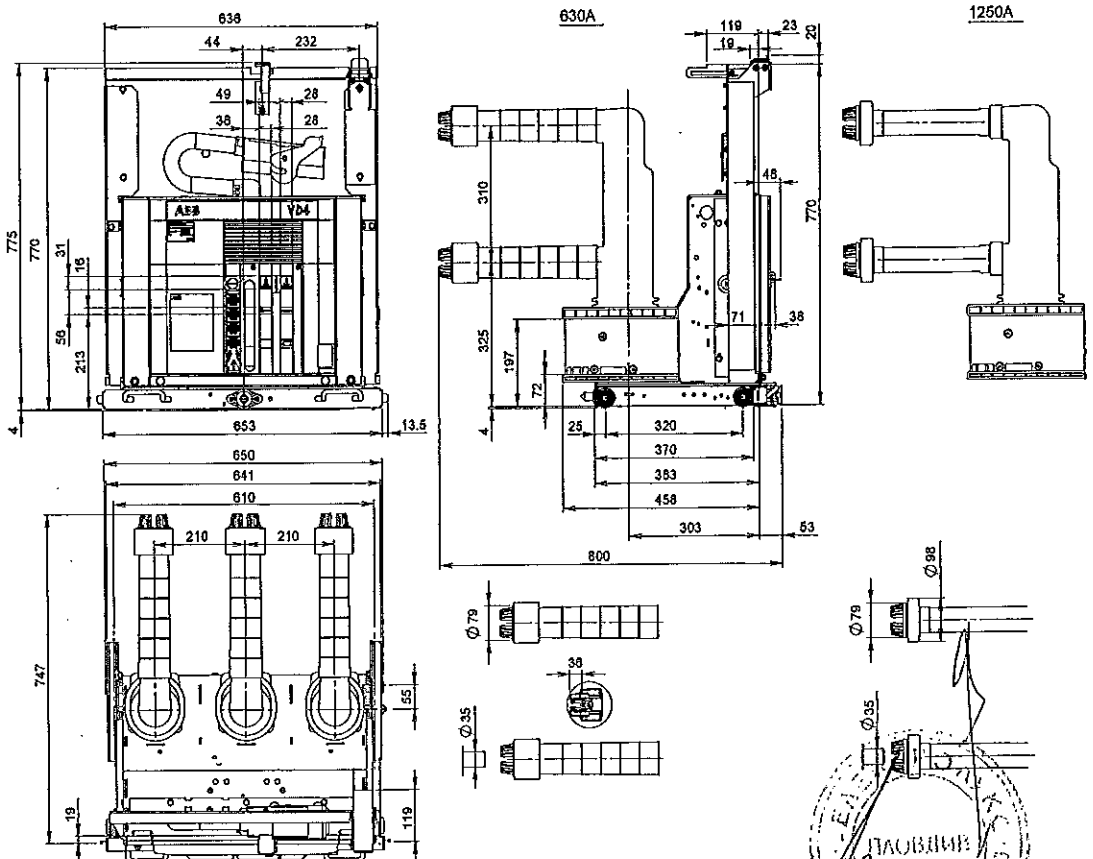
VD4/P	
TN	1VCD000153
Ur	12 kV
	17.5 kV
Ir	3150 A (*)
	20 kA
Isc	25 kA
	31.5 kA
	40 kA



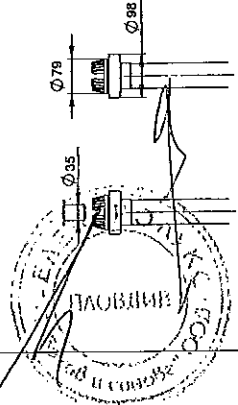
(\*) 4000 A with forced ventilation.

Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P	
TN	7413
Ur	24 kV
	630 A
Ir	1260 A
	16 kA
Isc	20 kA
	25 kA

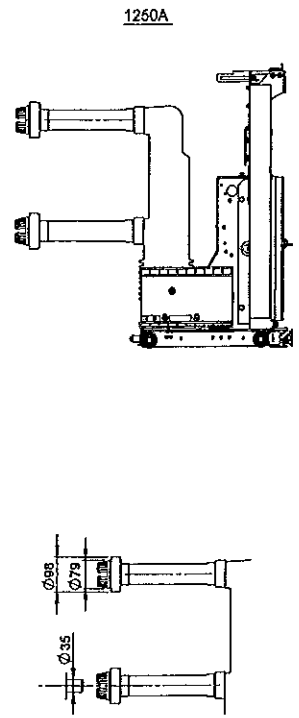
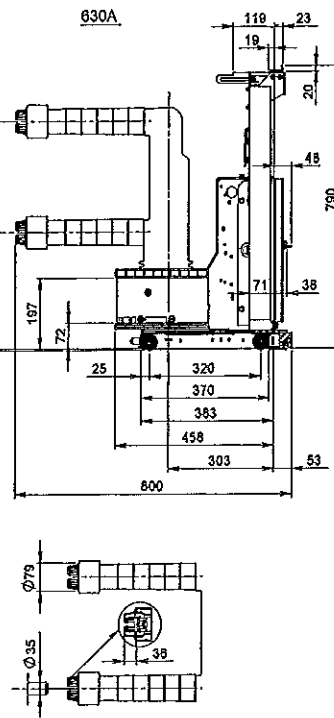
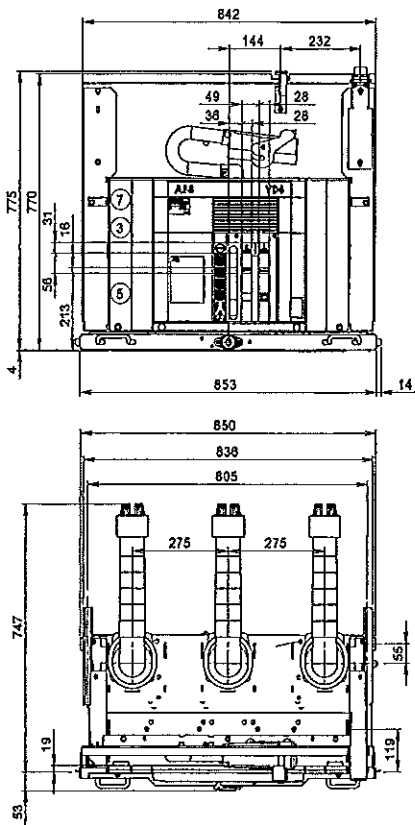


ВЯРНО С ОПРИГНАТА



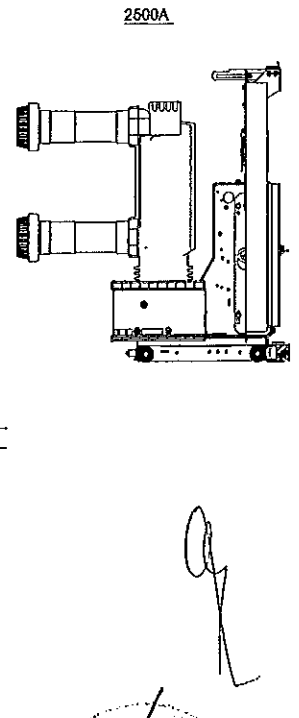
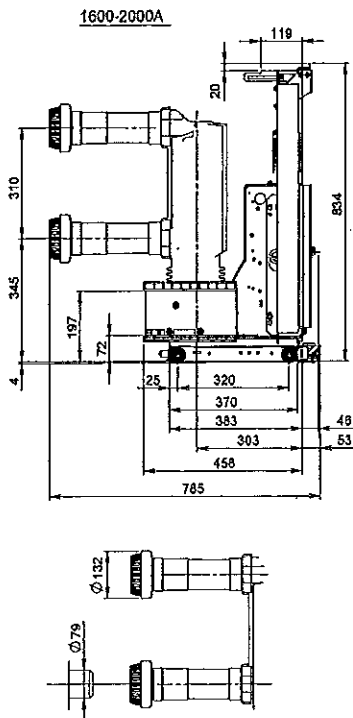
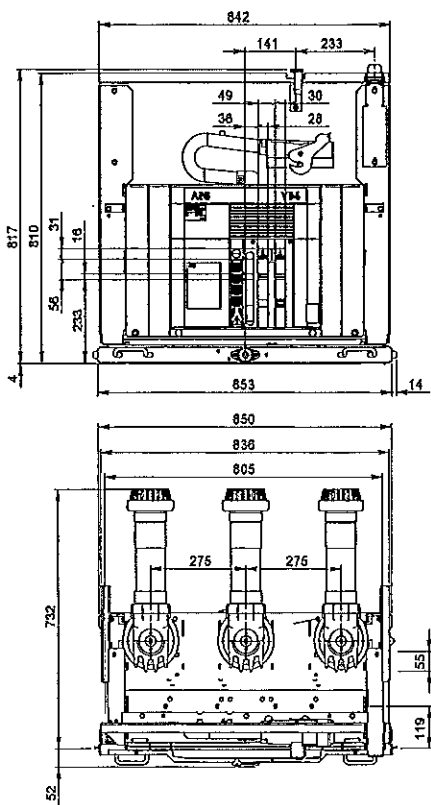
Withdrawable circuit-breakers for UniGear ZS1 switchgear

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 <sup>(1)</sup>
Isc	16 kA
	20 kA
	25 kA
	31.5 kA

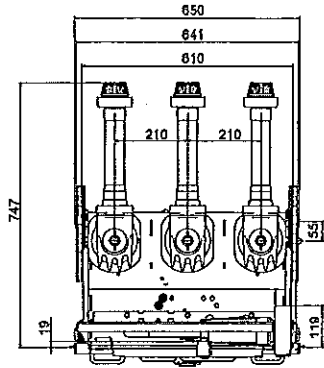
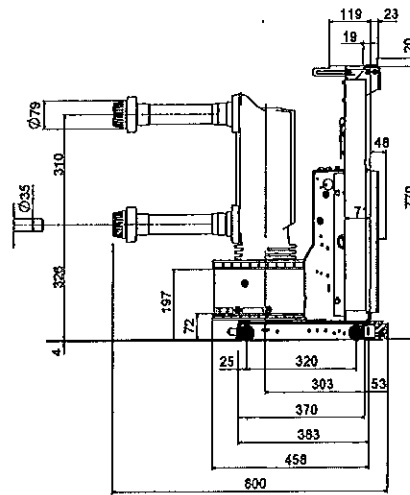
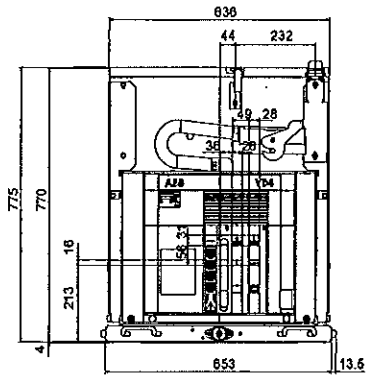


(1) The rated uninterrupted current of 2300 A is guaranteed with natural ventilation. The rated uninterrupted current of 2500 A is guaranteed with forced ventilation.

ВЯРНО С ОПРИГНАЛА

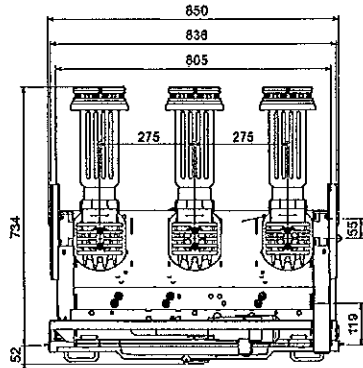
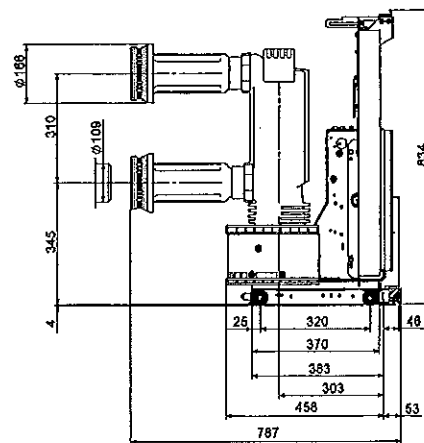
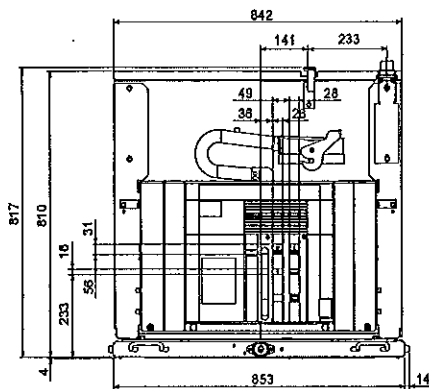
Withdrawable circuit-breakers for UniGear ZS1 switchgear

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

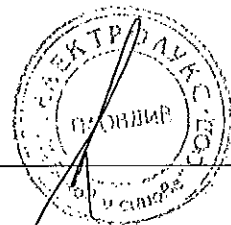


Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P	
TN	1VCD000177
Ur	24 kV
Ir	2700 A
Isc	31.5 kA

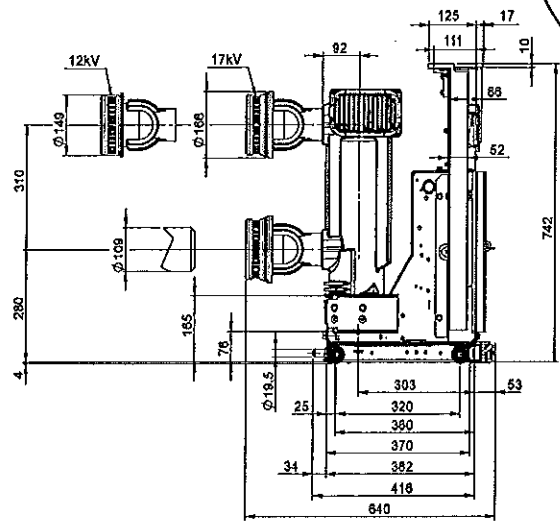
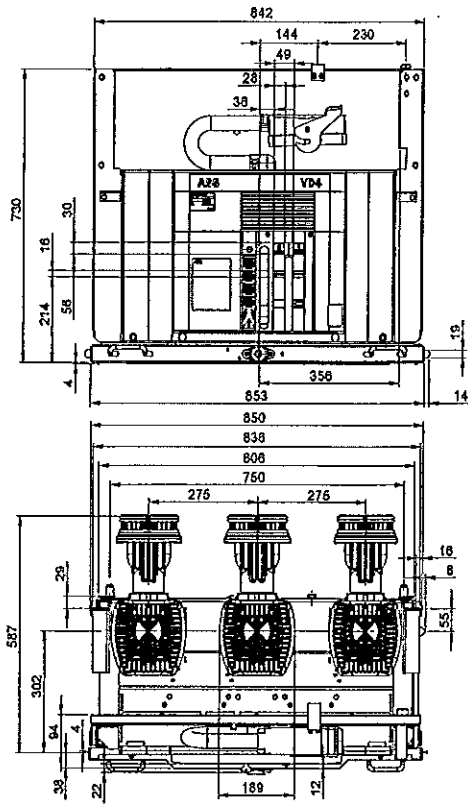


ВЯРНО С ОРИГИНАЛА



### Withdrawable circuit-breakers for PowerCube modules

VD4/W	
TN	1VCD000152
Ur	12 KV
	17.5 KV
Ir	3150 A (*)
	4000 A
Isc	20 KA
	25 KA
	31.5 KA
	40 KA



(\*) 4000 A with forced ventilation.

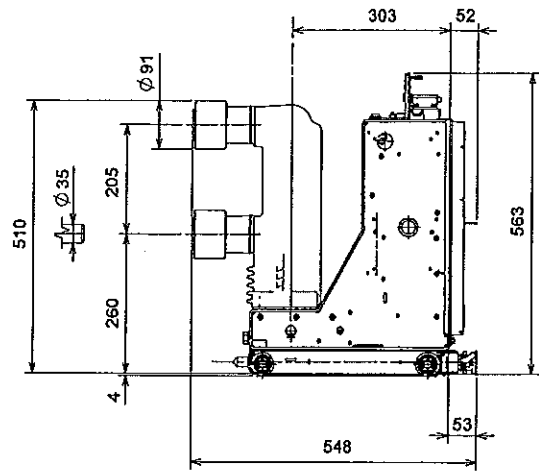
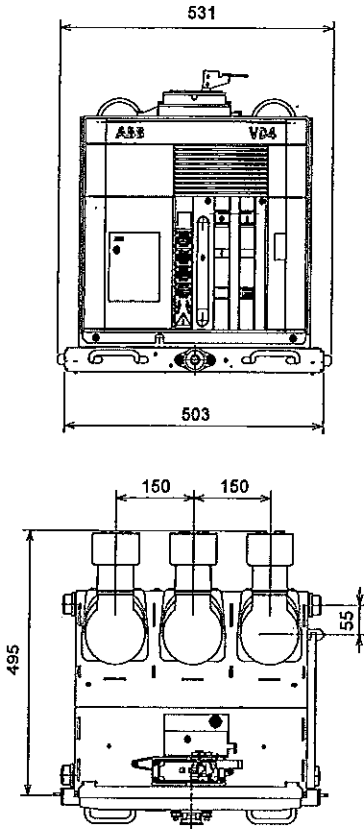
ВЯРНО С ОПРИГНАЛА



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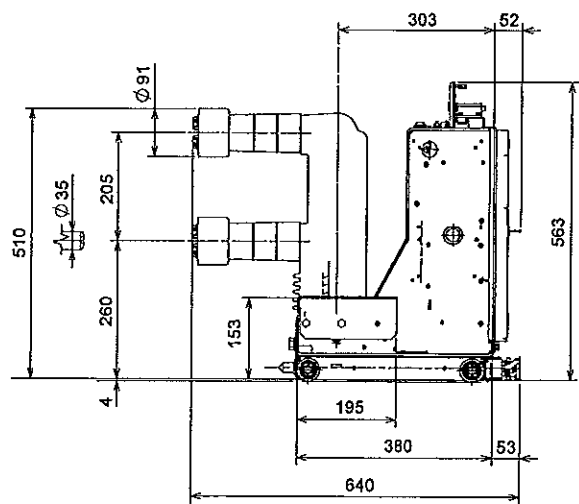
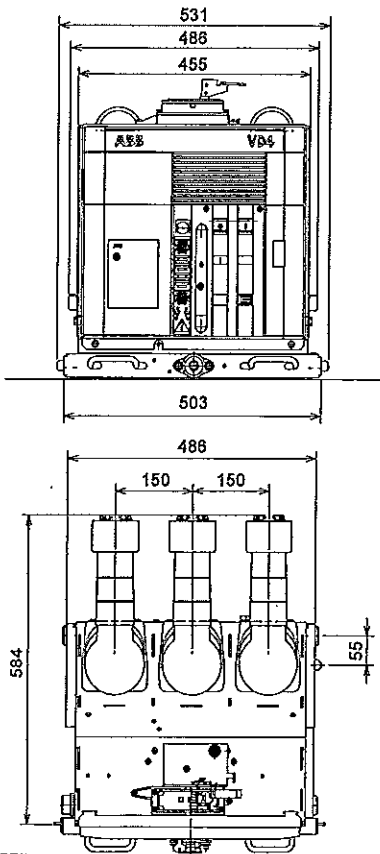
Withdrawable circuit-breakers for ZS8.4 switchgear

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



Withdrawable circuit-breakers for ZS8.4 switchgear

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



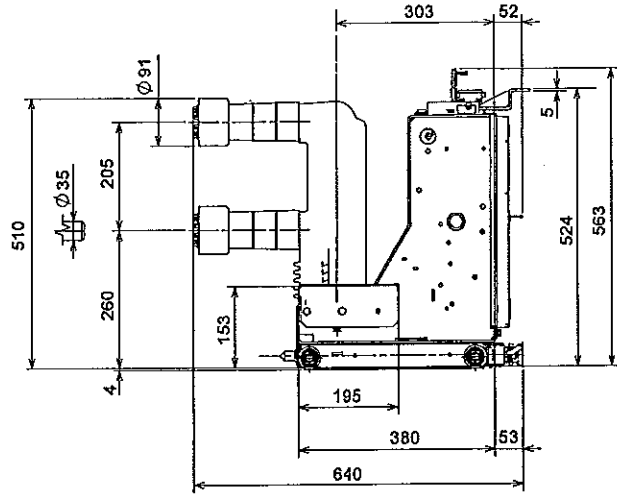
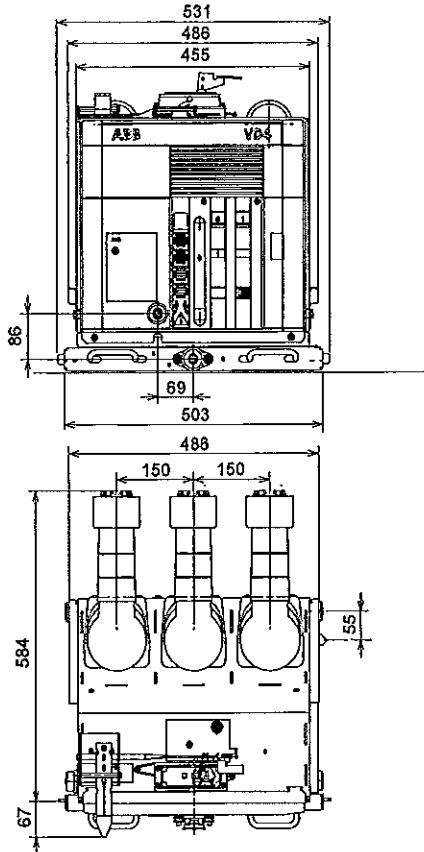
**ВЯРНО С ОПИШВАТА**



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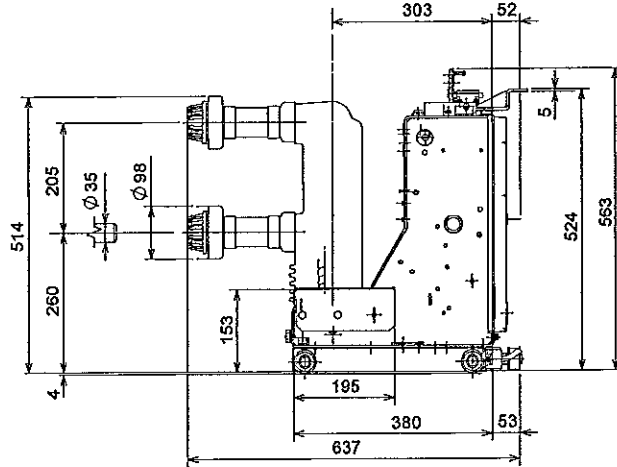
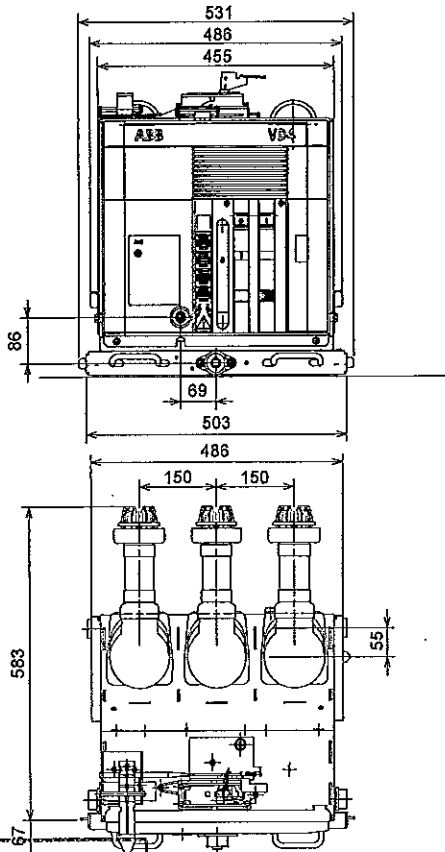
Withdrawable circuit-breakers for ZS8.4 switchgear

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

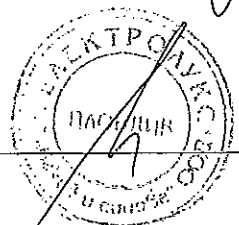


Withdrawable circuit-breakers for ZS8.4 switchgear

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



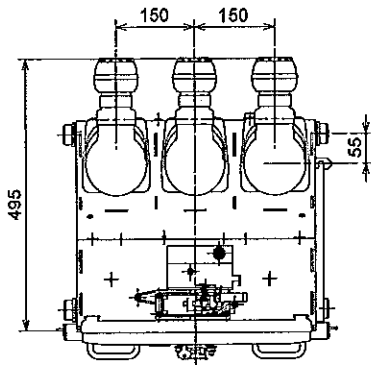
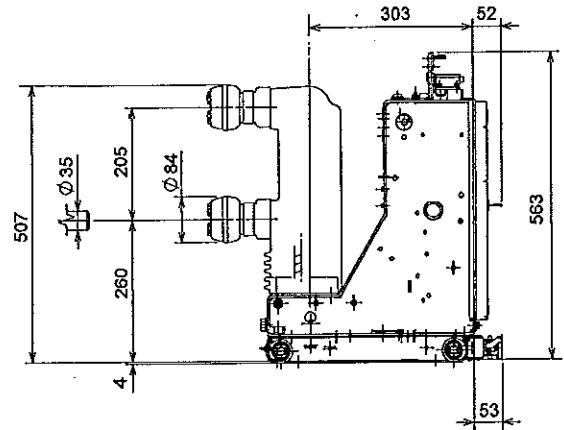
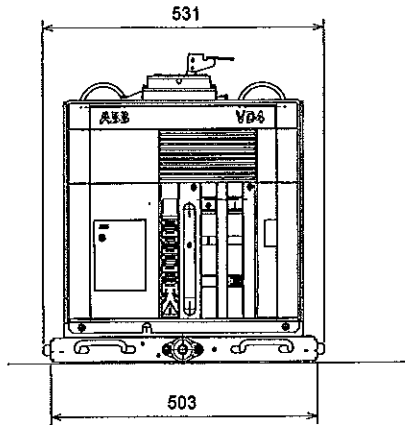
ВЕРНО С ОРИГИНАЛА





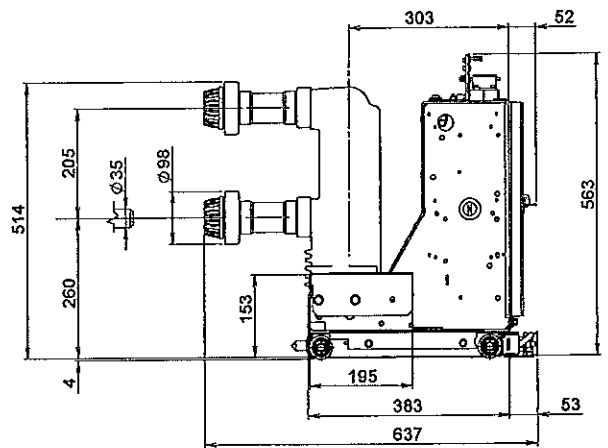
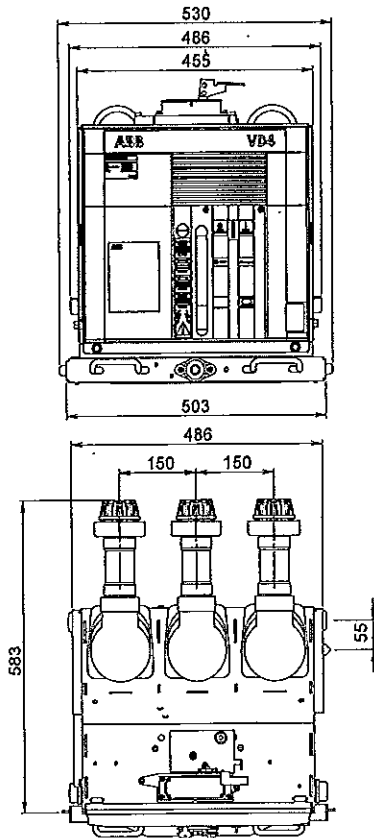
Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8	
TN	1VCD000137
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	20 kA
	25 kA

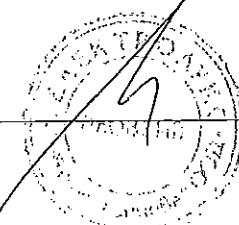


Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8	
TN	1VCD000134
Ur	12 kV
	17.5 kV
Ir	630 A
	1250 A
Isc	20 kA
	25 kA

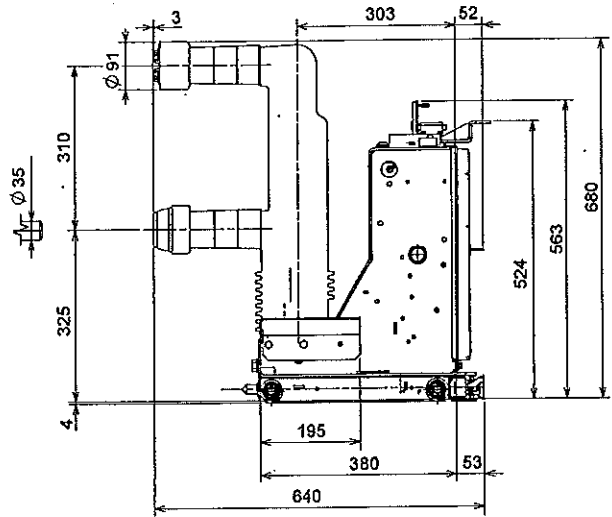
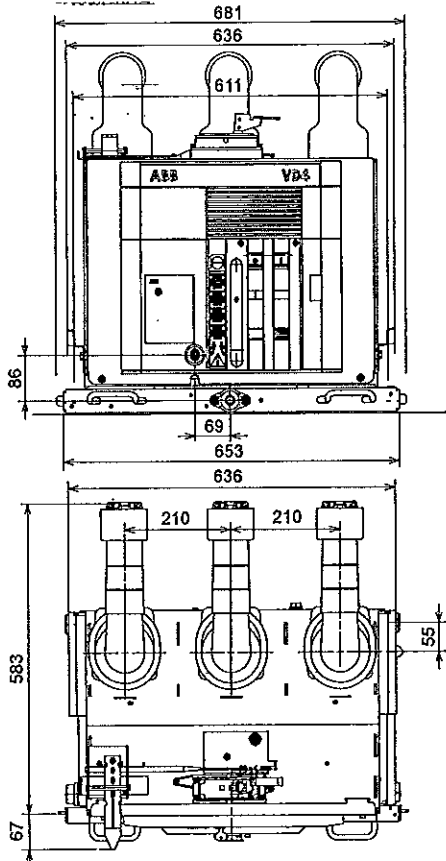


ВЕРНО С ОРИГИНАЛА



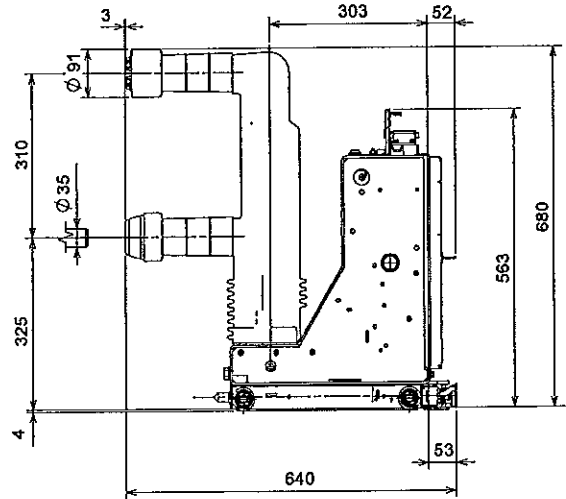
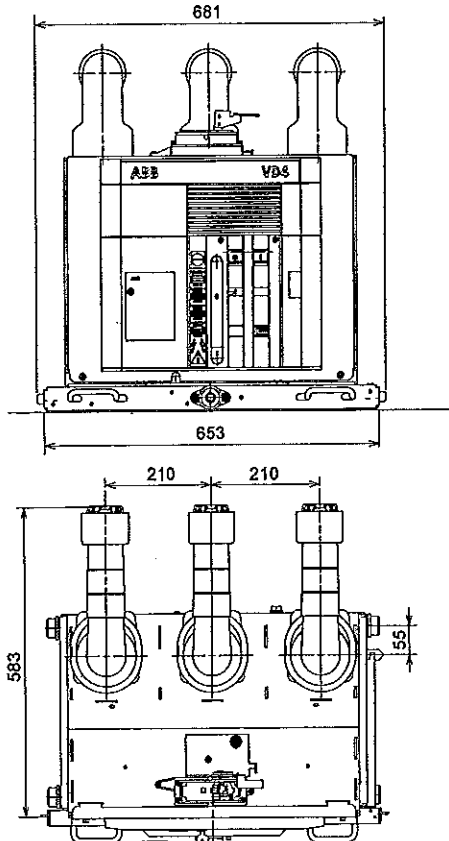
Withdrawable circuit-breakers for ZS8.4 switchgear

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



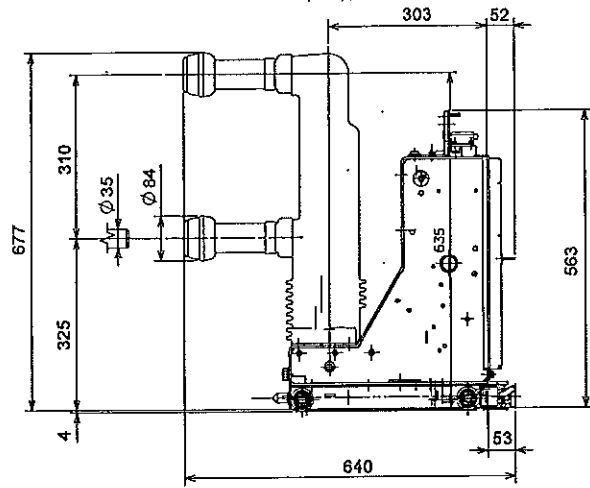
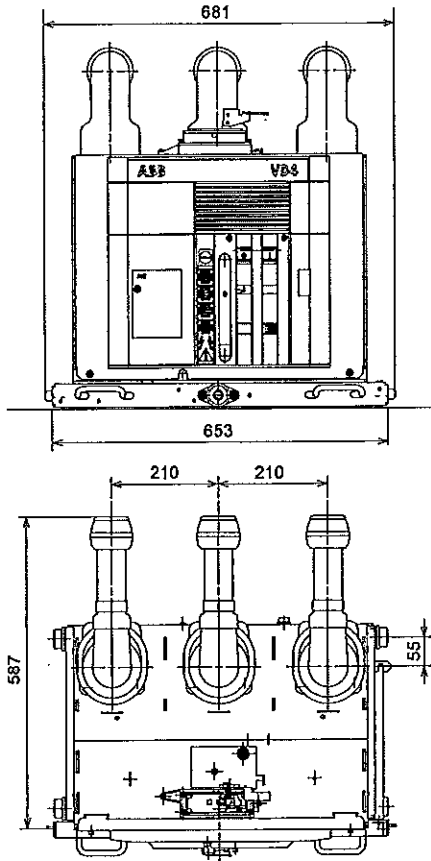
ВРПНО С ОПИТИВАЊА



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/Z8

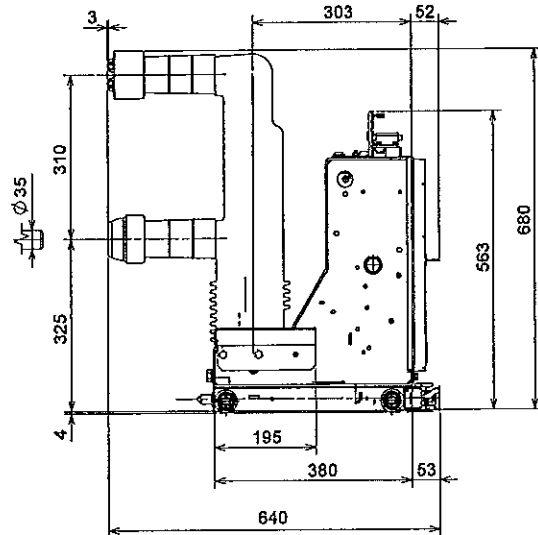
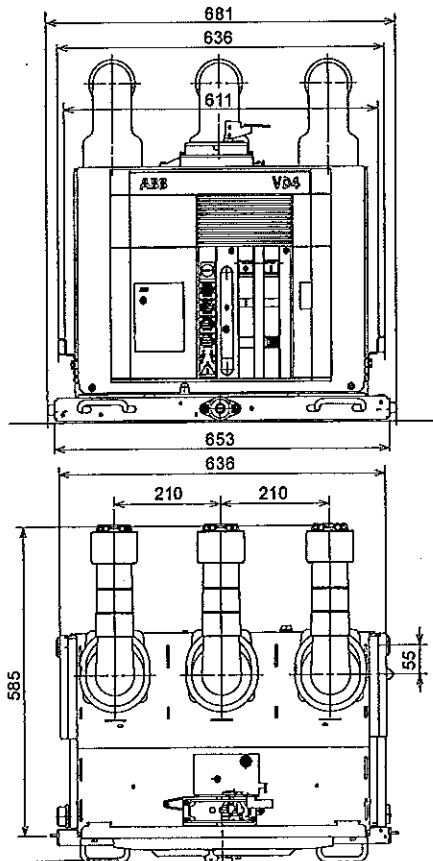
TN	1VCD000138
Ur	24 kV
Ir	1250 A
Isc	16 kA
	20 kA
	25 kA



Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZT8

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

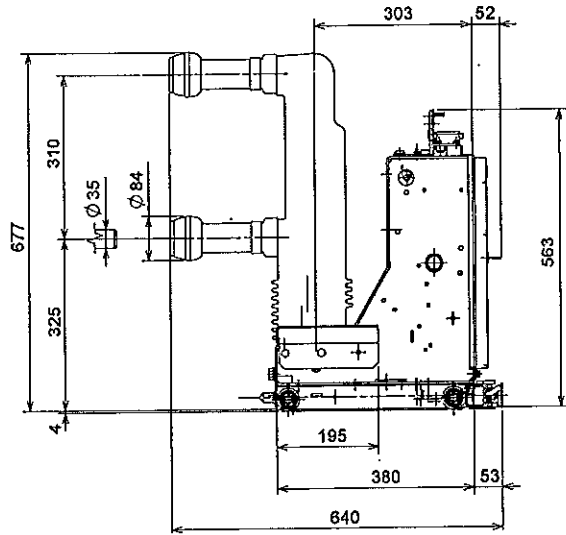
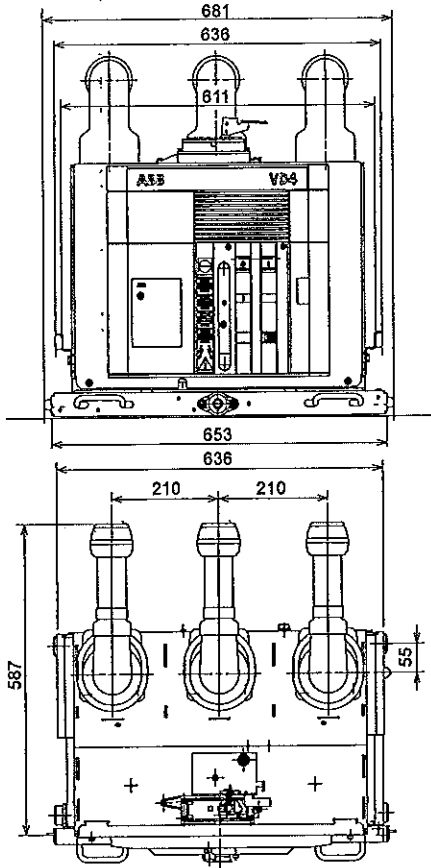


ВЯРНО С ОРИГИНАЛА



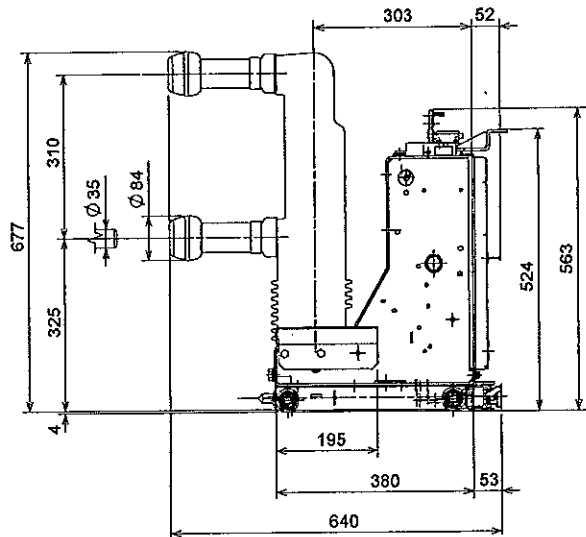
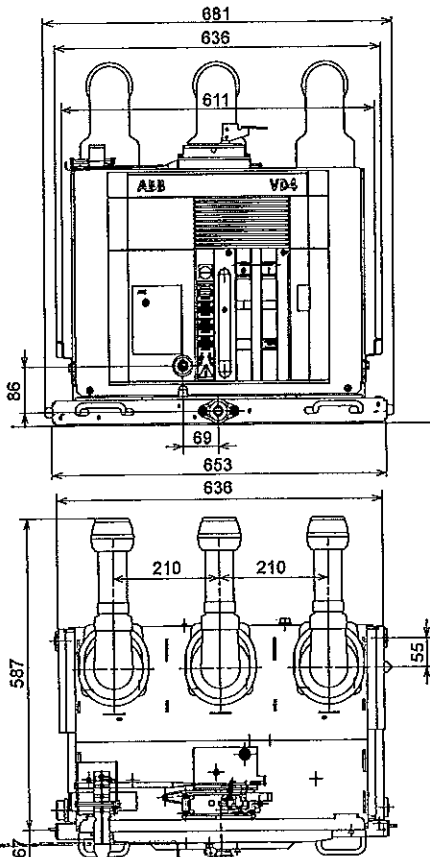
Withdrawable circuit-breakers for ZS8.4 switchgear

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

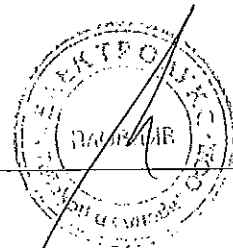


Withdrawable circuit-breakers for ZS8.4 switchgear

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



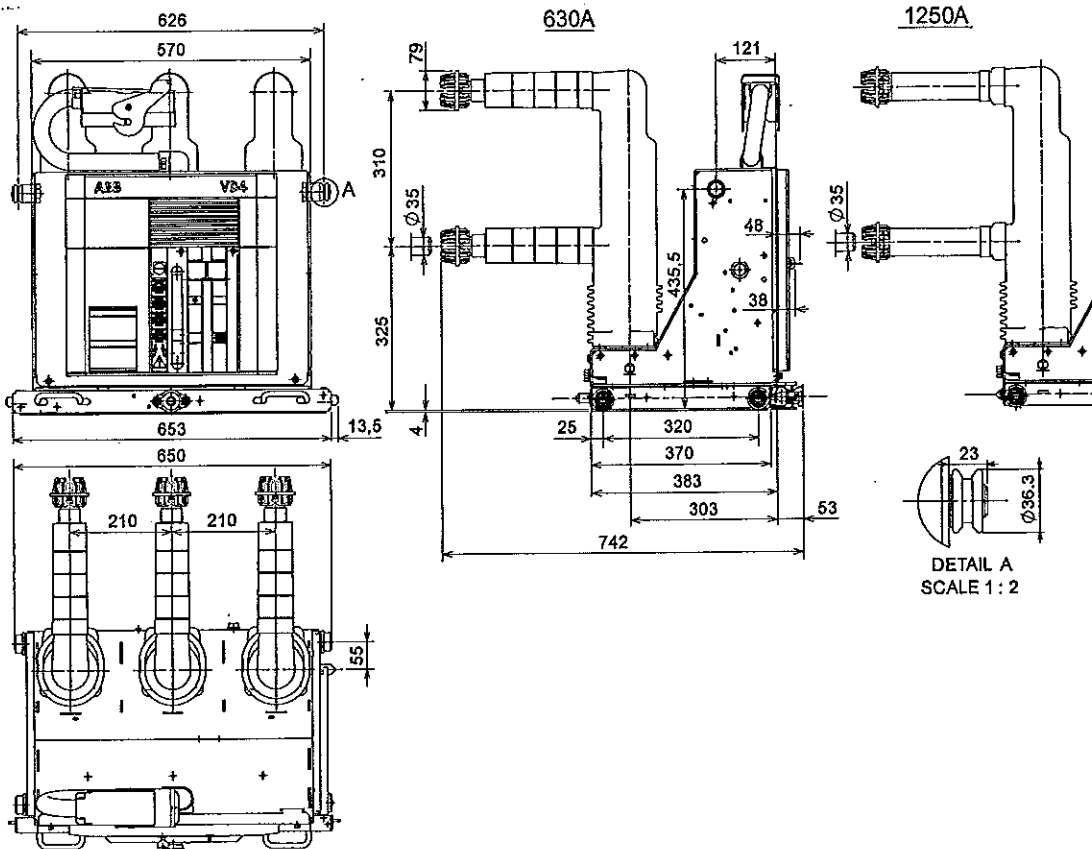
ВАРНО С ОПРИТНАТА



Withdrawable circuit-breakers for UniSwitch / UniMix switchgears

VD4/US

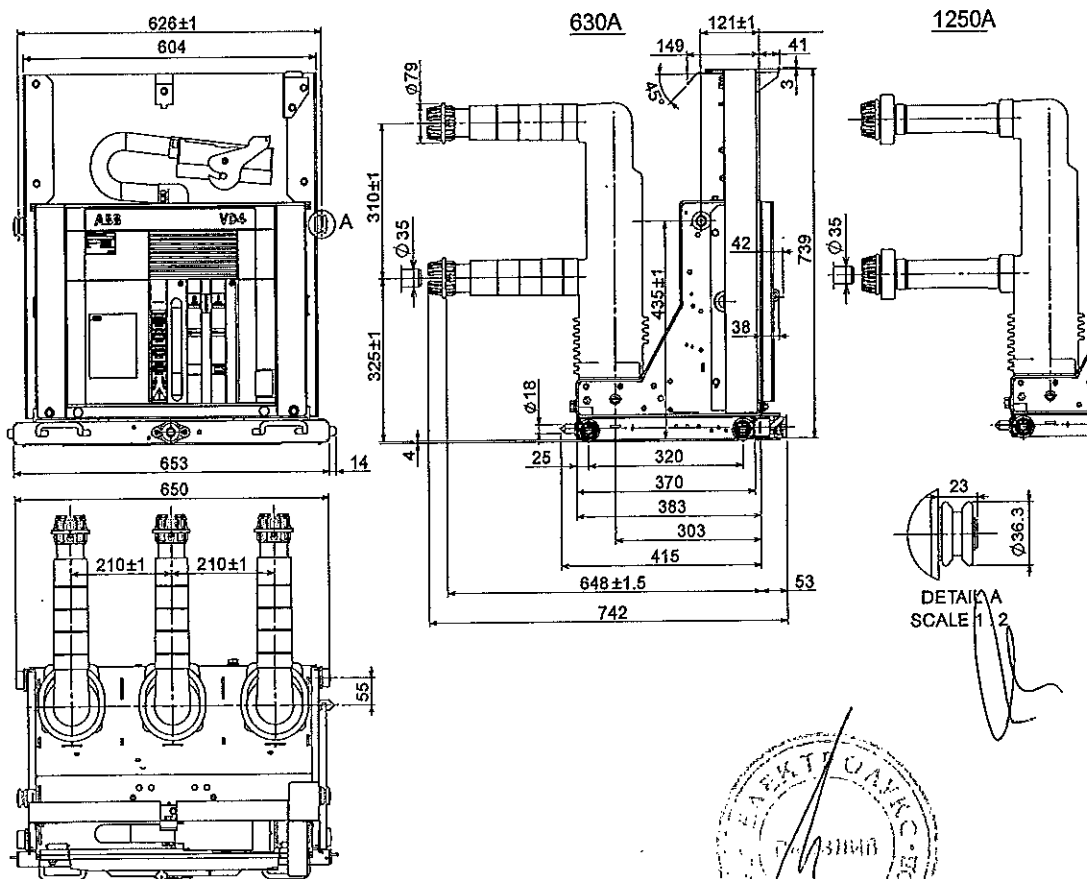
TN	1VCD000047
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA



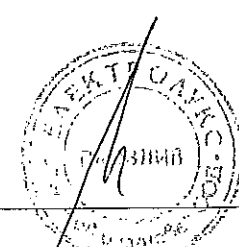
Withdrawable circuit-breakers for UniSec switchgears

VD4/SEC

TN	1VCD000190
Ur	24 kV
Ir	630 A
	1250 A
Isc	16 kA
	20 kA
	25 kA

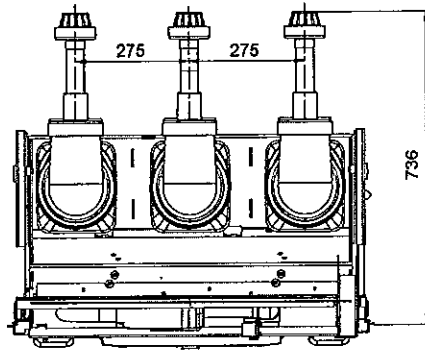
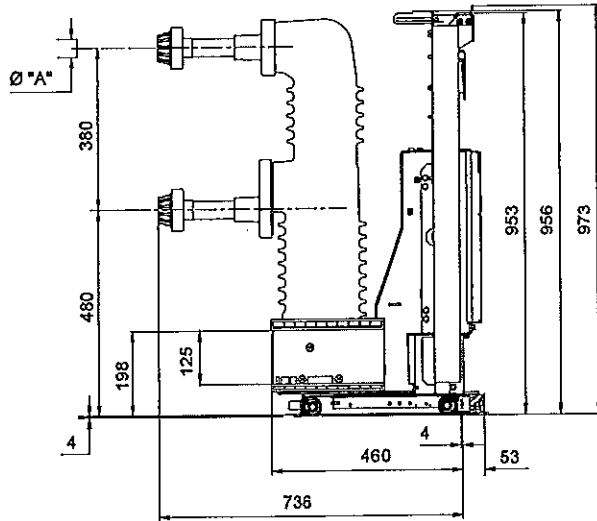
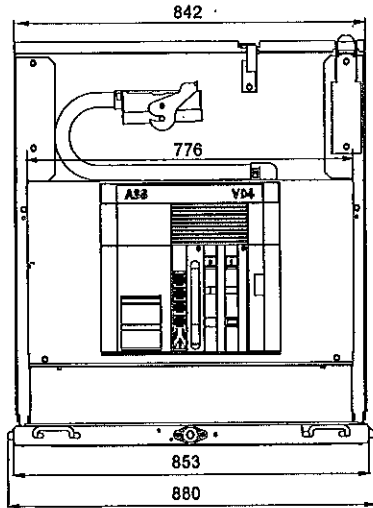


ВЕРНО С ОРИГИНАЛА



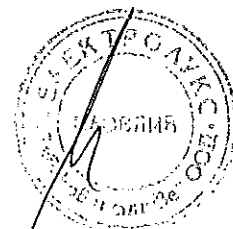
Withdrawable circuit-breakers for UniGear ZS2 switchgear and PowerCube modules (36 kV)

VD4	
TN	1VYN3009D1-KG
Ur	36 kV
Ir	1250 A
	1600 A
	2000 A
Isc	31.5 kA



Breaker type	Ø A mm
VD4 36.12.32	35
VD4 36.16.32 - VD4 36.20.32	79

ВЯРНО С ОРИГИНАЛА



## 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.

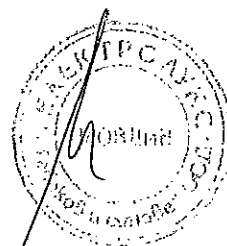
The duty of company is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

### 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

ВЯРНО С ОРИГИНАЛА



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E-mail: [powertech@de.abb.com](mailto:powertech@de.abb.com)  
  
[www.abb.com](http://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 Manual - 2014.03 (VD4 up to 36 kV; up to 50 kA) (gs)(b)

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Power and productivity  
for a better world™





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# Приложение 1.2 - Типови\_изпитания

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ВЯРНО С ОРИГИНАЛА



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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 1

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 60694/2<sup>nd</sup> Ed./1996-05/Clause 6.6,  
IEC 60298/3<sup>rd</sup> Ed./1990-12/Clause 6.5,  
IEC 60129/3<sup>rd</sup> Ed./1984/Clause 6.5,  
IEC 60056/4<sup>th</sup> 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

14<sup>th</sup> September 2000

## Client

ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen

07<sup>th</sup> 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.



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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 2

Issued by an Accredited Laboratory  
corresponding to EN 45001

## 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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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01  
Issued by an Accredited Laboratory  
corresponding to EN 45001

Sheet 3

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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

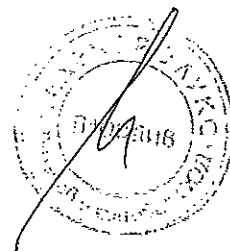
#### Additional specifications and data:

- 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: 12<sup>th</sup> September 2000

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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01  
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Sheet 5

## Technical Data of Test Object

(Ratings assigned by the manufacturer)

### Switching device

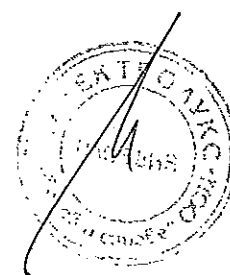
**Test Object:** Vacuum circuit-breaker  
**Type:** VD4P 2420-25  
**Vacuum interrupter:** VG4S series no.: L1: G4 01196, L2: G4 01192, L3: G4 01194  
**Manufacturer:** ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen  
**Serial-No.:** 7008269/4002/00 **Year of manufacture:** 2000  
**Drawing No's.:** 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: 12<sup>th</sup> September 2000

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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 6

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## 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

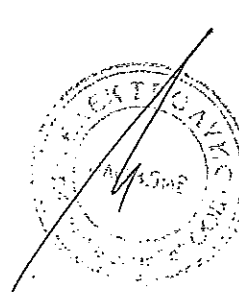
Number of poles 3  
 Number of units per pole 1

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: 12<sup>th</sup> September 2000

ВЯРНО С ОРИГИНАЛА



### Table of Drawings of Test Objects

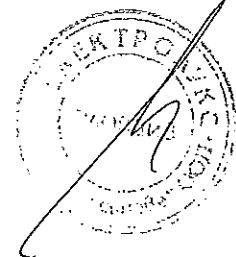
The drawings submitted for identification of the test object were stamped and signed by the test engineer.

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,<br>24 kV, PW 1000               | manufacturing type GCE8010459R0101 according to<br>drawing-no. GCE8010459R0101, sheet-no. 1, index 00   |
| 2. Withdrawable circuit-breaker<br>VD4P 2420-25 | manufacturing type GCE7000162R1104 according to<br>drawing-no. GCE7000162R1104, sheet-no. 5, index 02   |
| 3. Pole part                                    | manufacturing type GCE7005757R0122 according to<br>drawing-no. GCE7005757R0122, sheet-no. 221, index 00 |
| 4. Mechanism                                    | manufacturing type GCE7179610R0104 according to<br>drawing-no. GCE7179610R0104, sheet-no. 4, index 36   |
| 5. Earthing switch<br>EK6-ZS1-2406-275          | manufacturing type GCE7169312R0118 according to<br>drawing-no. GCE7169312R0121, sheet-no. 1, index 24   |

  
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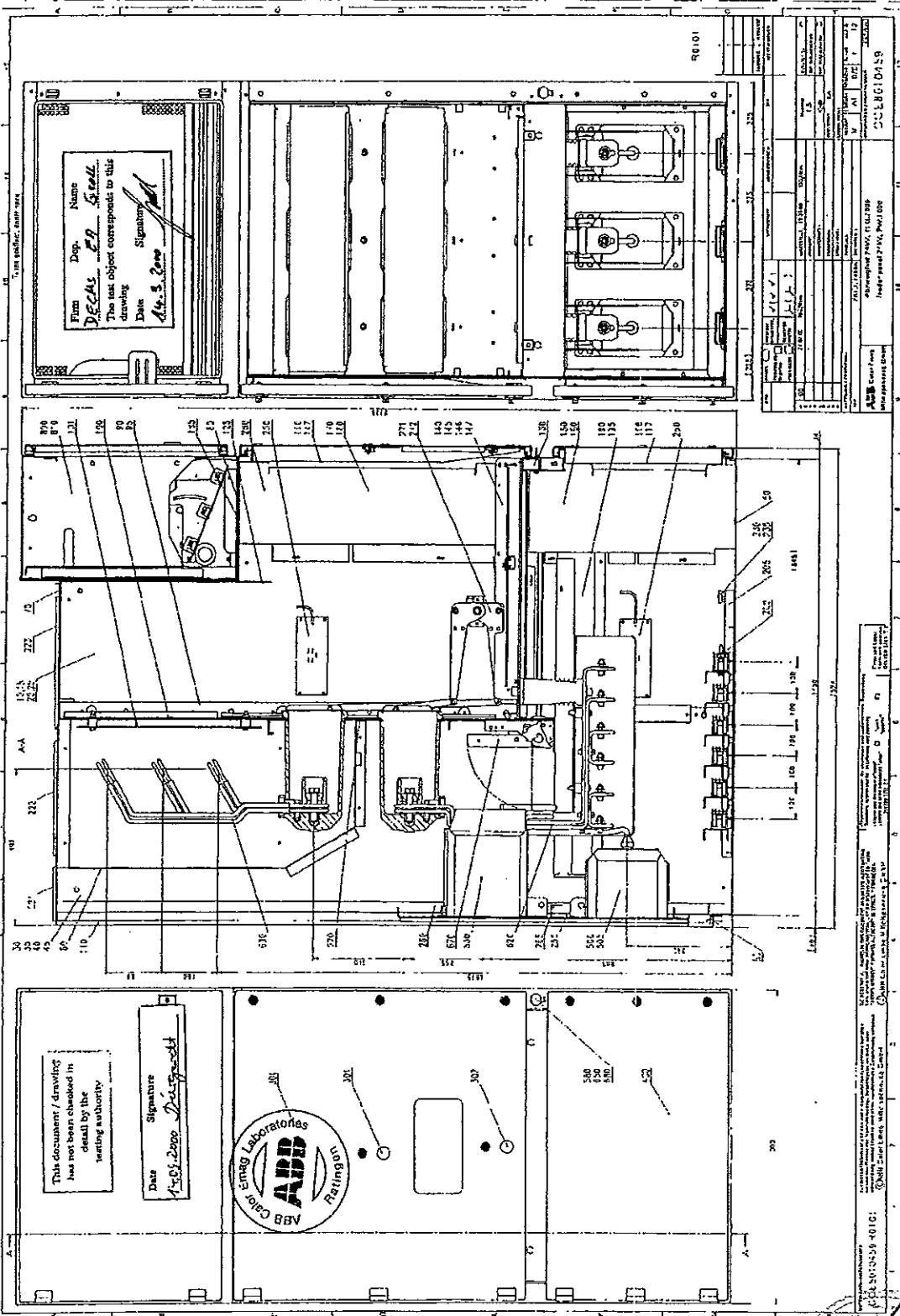
# ABB Calor Emag Laboratories



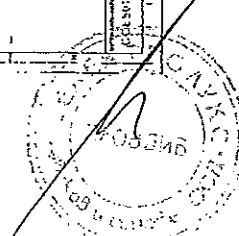
TEST REPORT No. HZ 235 F 01

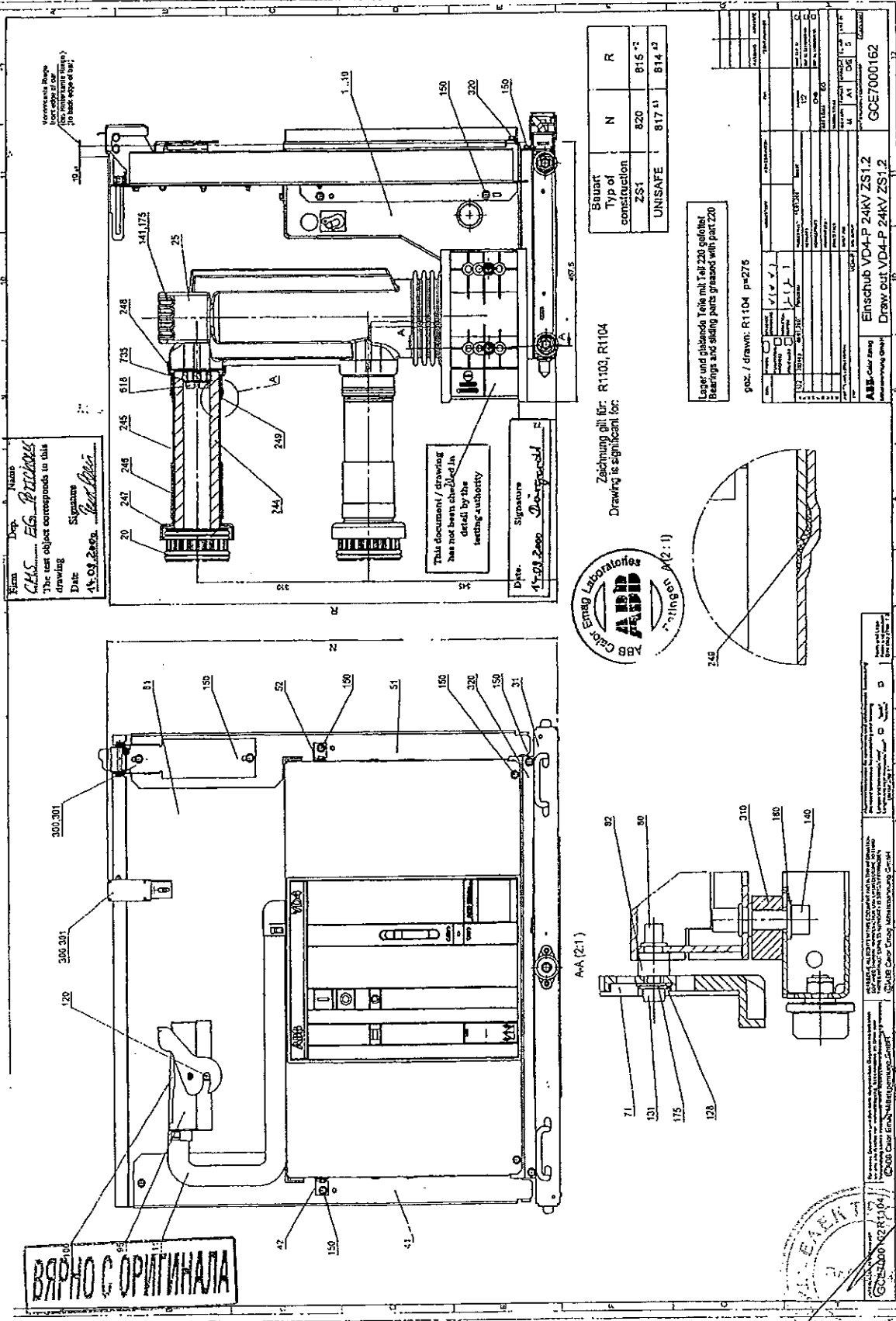
Sheet 8

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Form Name  
Dwg. Name  
The test object corresponds to this drawing  
Date  
Signature  
Date  
*GKS*  
*ES*  
*17.03.2000*

Material	Material	Material	Material	Material	Material	Material	Material
UNISAFE	817 13	814 12	820	815 12	R		
UNISAFE	817 13	814 12	820	815 12	R		

get. / drawn: R1104 pw276

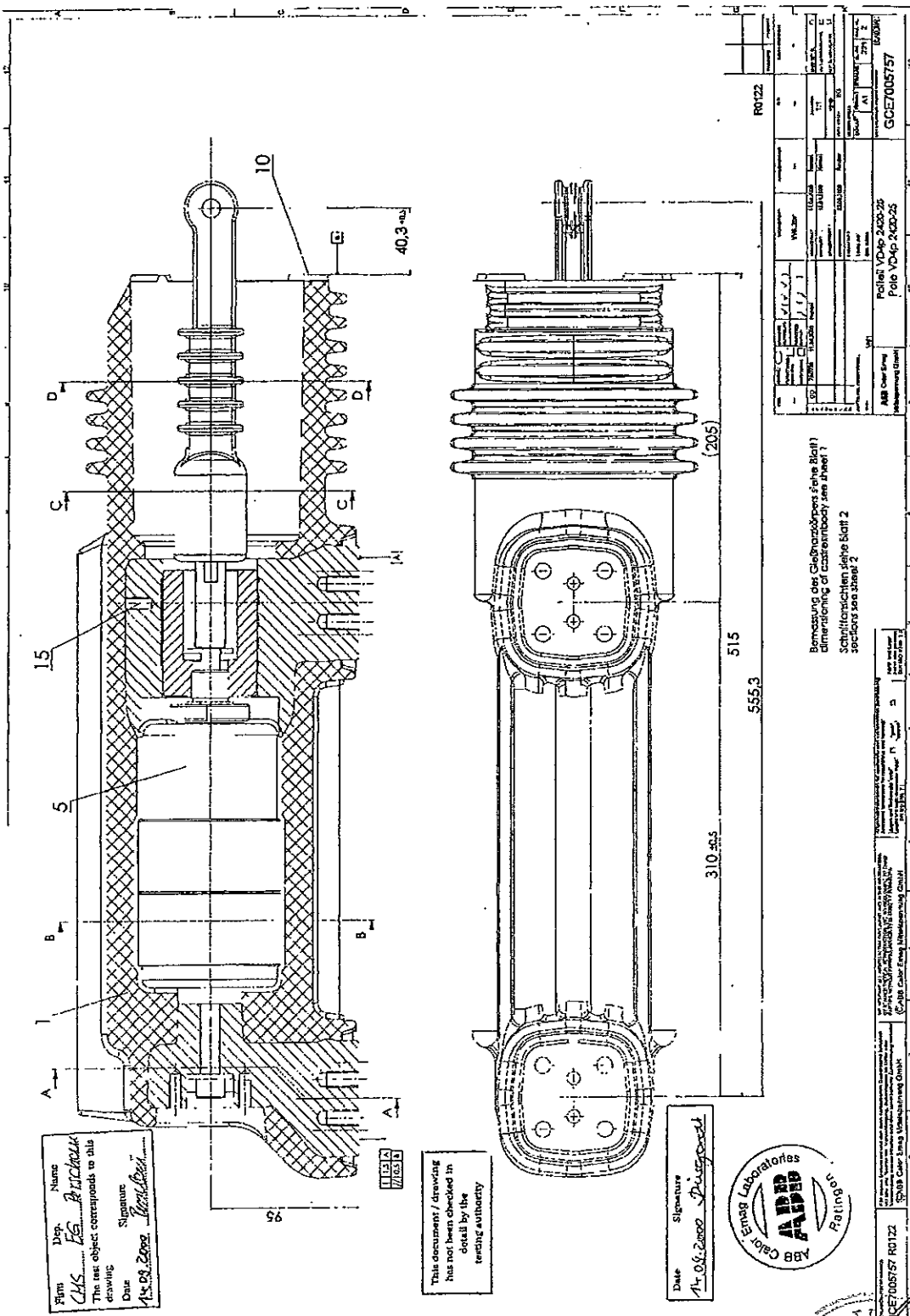
Lager und gleitende Teile mit Teil 220 geölt!  
Bearings and sliding parts greased with part 220

Material	Material	Material	Material	Material	Material	Material	Material
UNISAFE	817 13	814 12	820	815 12	R		

ABB - Color Rating  
Einschub VD4-P 24KV ZS1.2  
Drawout VD4-P 24KV ZS1.2

ВЯРНО С ОРИГИНАЛА

ABB Calor Emag Laboratories  
GCE7000162



Form Name  
Dep. EG  
Client: V. K. K...  
Date: 15.08.2008  
Signature: [Signature]  
The test object corresponds to this drawing

This document / drawing has not been checked in detail by the testing authority

Date: 15.08.2008  
Signature: [Signature]

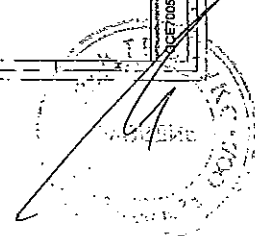


Abbreviations		References	
WZ	Werkzeug	WZ	Werkzeug
VER	Verfahren	VER	Verfahren
GR	Gesamtheit	GR	Gesamtheit
GR	Gruppe	GR	Gruppe
GR	Teil	GR	Teil

Bemessung des Gleitkontaktes (siehe Blatt 1)  
dimensioning of contactbody (see sheet 1)  
Schweißnähten (siehe Blatt 2)  
seams (see sheet 2)

ABB Calor Emag Laboratories  
Polnisch: V. K. K...  
Pole: V. K. K...  
GCE7005757  
R0122

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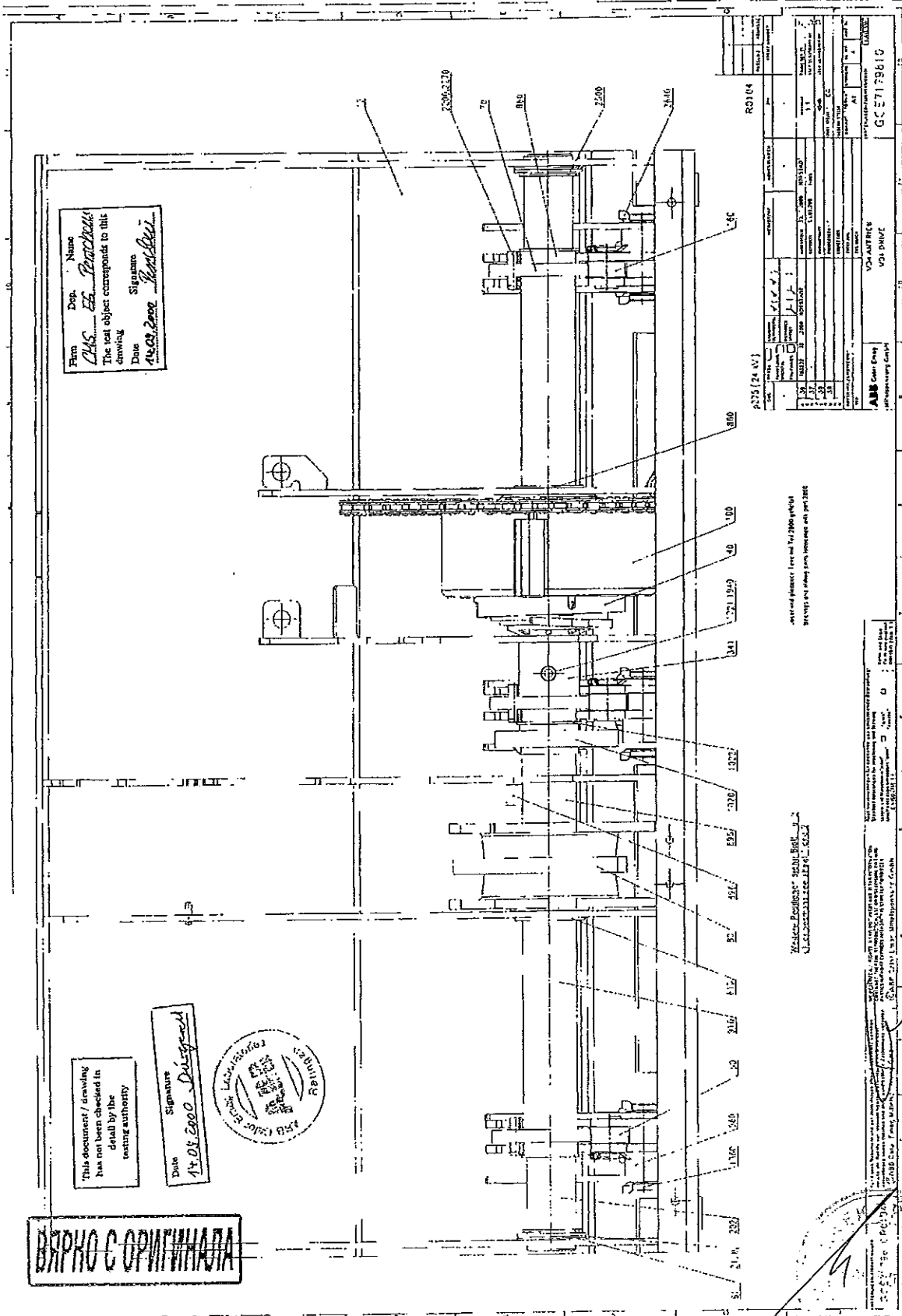
Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01  
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Sheet 11



Firm: *ABB*  
Dep.: *EE*  
Name: *Reinhold*  
The test object corresponds to this drawing  
Date: *14.01.2000*  
Signature: *[Signature]*

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Date: *14.01.2000*  
Signature: *[Signature]*



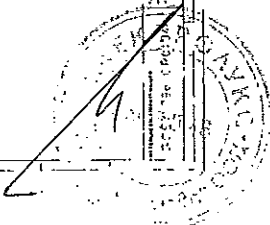
ВЯРНО С ОРИГИНАЛА

TEST REPORT No.	HZ 235 F 01
DATE	14.01.2000
TESTING AUTHORITY	DAR
TESTING LABORATORY	ABB Calor Emag
TESTING ADDRESS	VIA AFFRES
TESTING CITY	VIA DRIVE
TESTING COUNTRY	IT
TESTING REFERENCE	03 E 71 798 10

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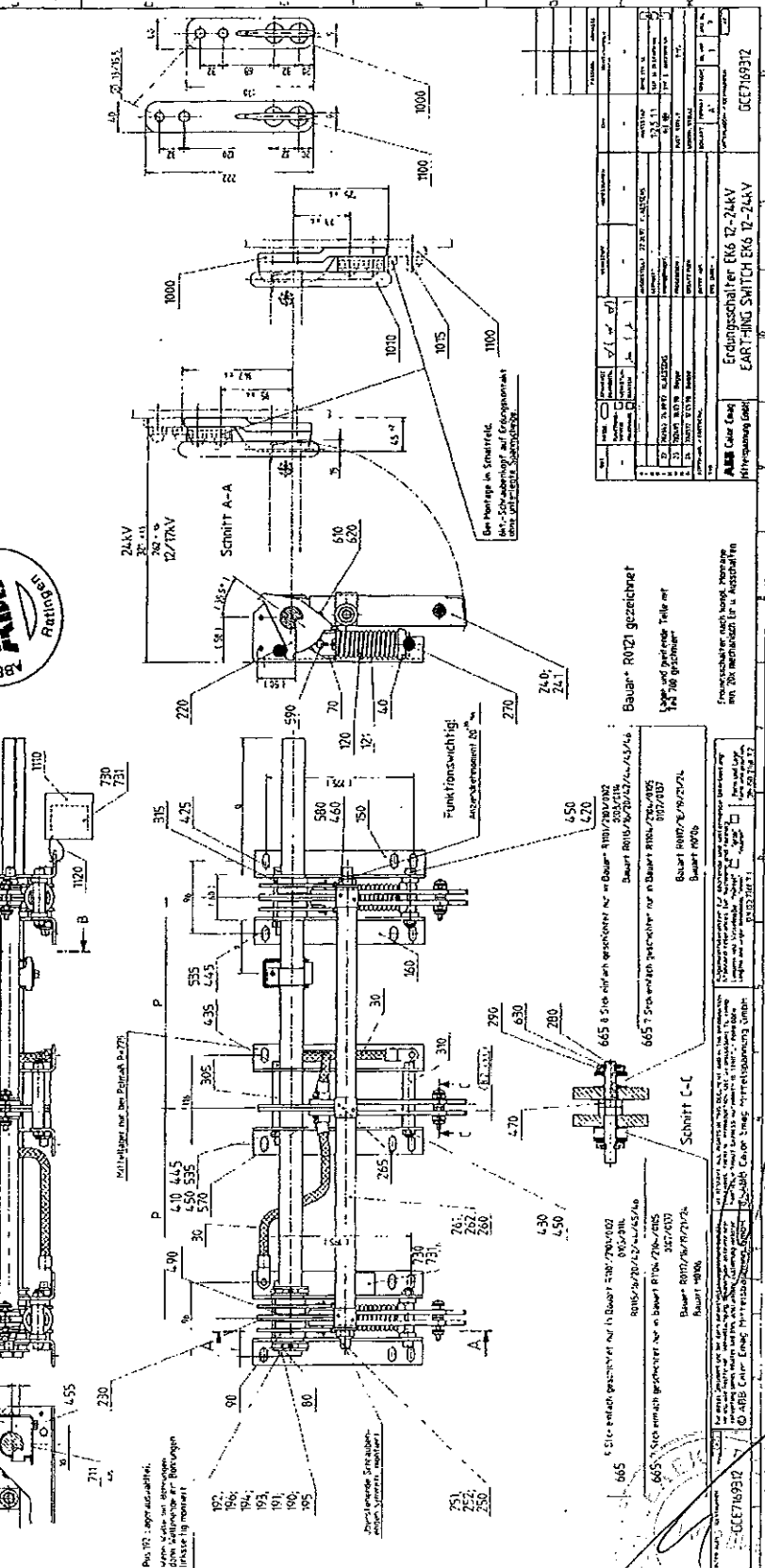
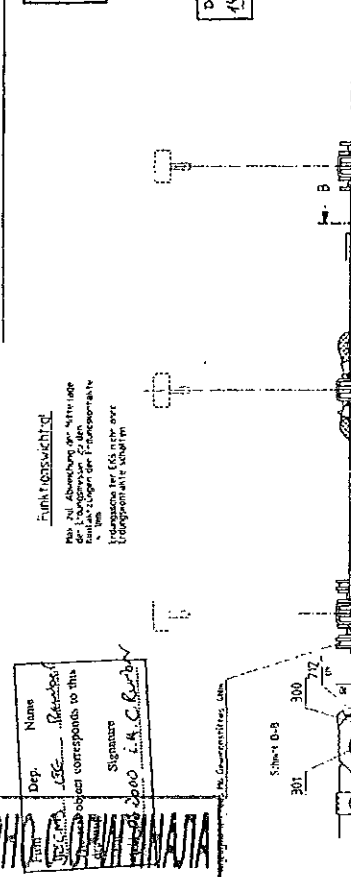
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Bezeichnung	Typ	Code	Typ	Code	Typ	Code	Typ	Code
RE07	ES-8-100A-P-06	70	100A	22				
RE08	ES-8-100A-P-06	80	100A	22				
RE09	ES-8-100A-P-06	90	100A	22				
RE10	ES-8-100A-P-06	100	100A	22				
RE11	ES-8-100A-P-06	110	100A	22				
RE12	ES-8-100A-P-06	120	100A	22				
RE13	ES-8-100A-P-06	130	100A	22				
RE14	ES-8-100A-P-06	140	100A	22				
RE15	ES-8-100A-P-06	150	100A	22				
RE16	ES-8-100A-P-06	160	100A	22				
RE17	ES-8-100A-P-06	170	100A	22				
RE18	ES-8-100A-P-06	180	100A	22				
RE19	ES-8-100A-P-06	190	100A	22				
RE20	ES-8-100A-P-06	200	100A	22				
RE21	ES-8-100A-P-06	210	100A	22				
RE22	ES-8-100A-P-06	220	100A	22				
RE23	ES-8-100A-P-06	230	100A	22				
RE24	ES-8-100A-P-06	240	100A	22				
RE25	ES-8-100A-P-06	250	100A	22				
RE26	ES-8-100A-P-06	260	100A	22				
RE27	ES-8-100A-P-06	270	100A	22				
RE28	ES-8-100A-P-06	280	100A	22				
RE29	ES-8-100A-P-06	290	100A	22				
RE30	ES-8-100A-P-06	300	100A	22				

This document / drawing has not been checked in detail by the testing authority

Signature: *[Handwritten Signature]*  
Date: 14.05.2000

ABB Calor Emag Laboratories  
Ratiburo



Code	Code	Code	Code	Code	Code	Code	Code	Code	Code
RE07	RE08	RE09	RE10	RE11	RE12	RE13	RE14	RE15	RE16
RE17	RE18	RE19	RE20	RE21	RE22	RE23	RE24	RE25	RE26
RE27	RE28	RE29	RE30	RE31	RE32	RE33	RE34	RE35	RE36
RE37	RE38	RE39	RE40	RE41	RE42	RE43	RE44	RE45	RE46
RE47	RE48	RE49	RE50	RE51	RE52	RE53	RE54	RE55	RE56
RE57	RE58	RE59	RE60	RE61	RE62	RE63	RE64	RE65	RE66
RE67	RE68	RE69	RE70	RE71	RE72	RE73	RE74	RE75	RE76
RE77	RE78	RE79	RE80	RE81	RE82	RE83	RE84	RE85	RE86
RE87	RE88	RE89	RE90	RE91	RE92	RE93	RE94	RE95	RE96
RE97	RE98	RE99	RE00	RE01	RE02	RE03	RE04	RE05	RE06

ABB Calor Emag  
Erdungsschalter EK6 12-24kV  
EARTING SWITCH EK6 12-24kV

Code: DECT769312



Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



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TEST REPORT No. HZ 235 F 01

Sheet 13

Issued by an Accredited Laboratory  
corresponding to EN 45001

## 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 $\varphi$	$\leq 0.15$	--	--	--
Generator		earthed via 5 k $\Omega$	--	--	--
Earthing Transformer		not earthed	--	--	--
Short-circuit point		earthed	--	--	--
Circuit diagram	Sheet no.:	14	--	--	--
Circuit impedance	m $\Omega$	$\approx 5$	--	--	--
	--	--	--	--	--
TRV control elements		--	--	--	--
Capacitance in parallel	$\mu F$	--	--	--	--
Resistance in series	$\Omega$	--	--	--	--
	-	--	--	--	--
	-	--	--	--	--
Prospective TRV	-	--	--	--	--
TRV peak value	$u_c$ kV	--	--	--	--
Time co-ordinate	$t_3$ $\mu s$	--	--	--	--
Time delay	$t_d$ $\mu s$	--	--	--	--
Based on	kV	--	--	--	--
Rate-of-rise	kV/ $\mu s$	--	--	--	--
	-	--	--	--	--
	-	--	--	--	--
Voltage measurements		Divider 75 k $\Omega$ / 1.1 k $\Omega$	--	--	--
Current measurements		Transformer 50 kA / 5 A	--	--	--

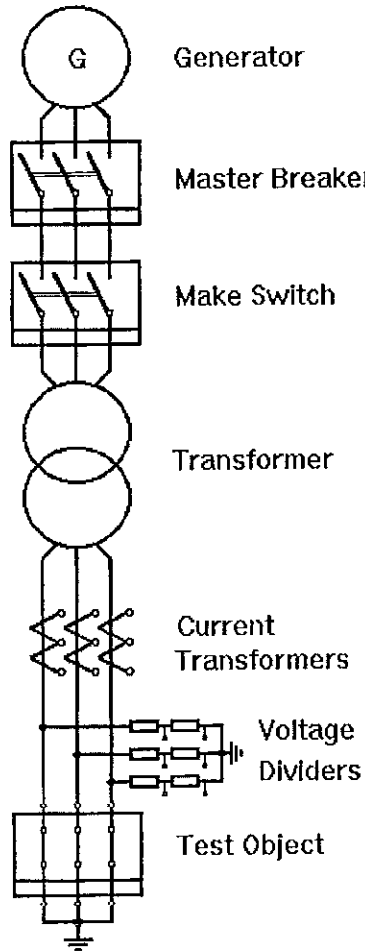
Remarks: -

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**Principle Diagram of Test Circuit**



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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 15

Issued by an Accredited Laboratory  
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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 ОРИГИНАЛА







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# ABB Calor Emag Laboratories



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Sheet 16

## 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.

ВЯРНО С ОРИГИНАЛА





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DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 17

Issued by an Accredited Laboratory  
corresponding to EN 45001

## Actual Values of No-Load Operations

Rated supply voltage of closing coil 220 V dc  
Rated supply voltage of opening coil 220 V dc

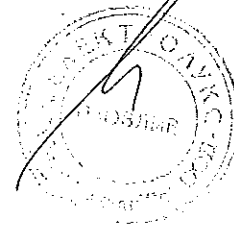
	Voltage of closing coil V	Closing time ms	Voltage of opening coil V	Opening time ms
Test HZ 235 F 01 / 02	--	--	220	36,4
Test HZ 235 F 01 / 06	--	--	220	37,4

## 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 $\mu\Omega$

ВЯРНО С ОРИГИНАЛА





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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 18

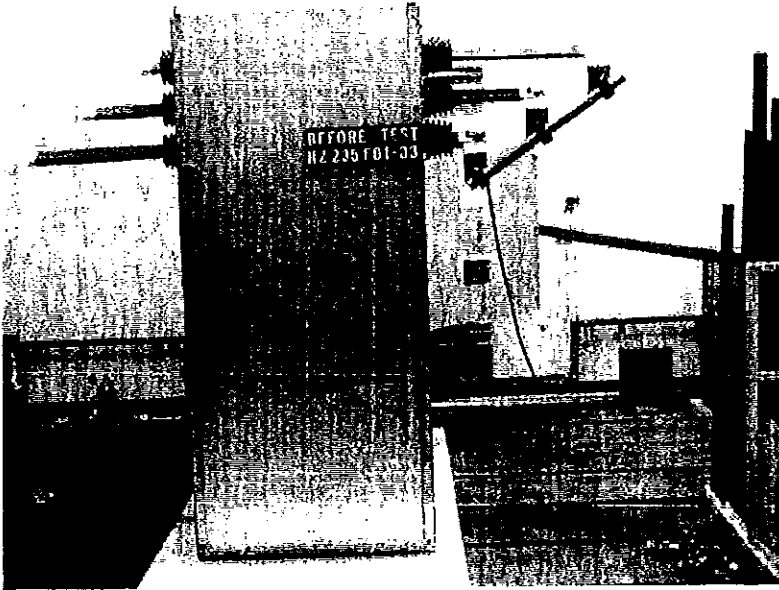


Photo no. 1  
Before Test HZ 235 F 01 / 03



Photo no. 2  
Before Test HZ 235 F 01 / 03

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DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 235 F 01

Sheet 19

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corresponding to EN 45001

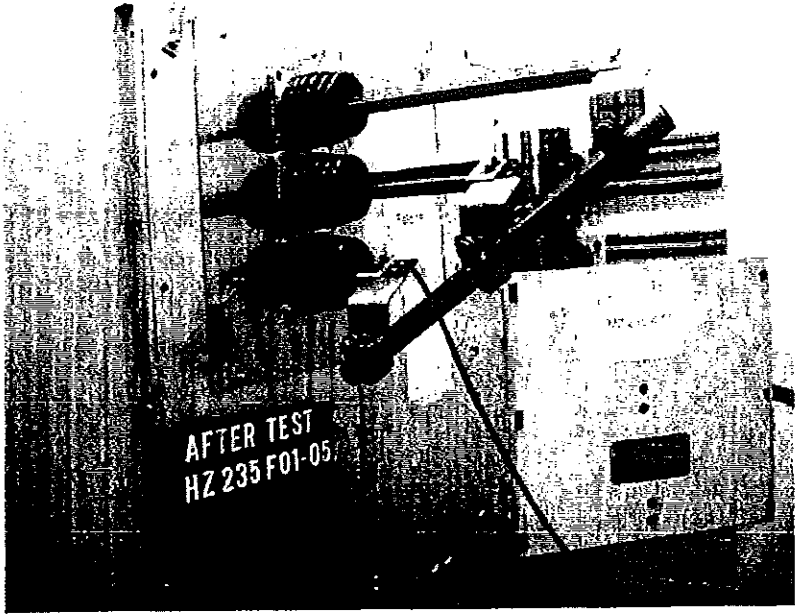


Photo no. 3  
After Test HZ 235 F 01 / 05

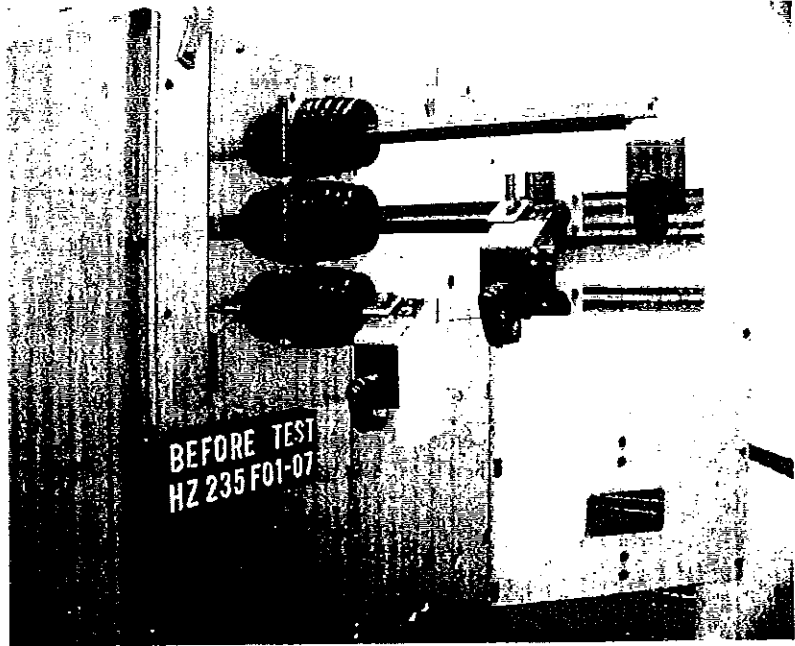
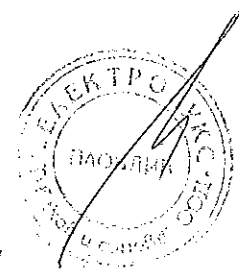


Photo no. 4  
Before Test HZ 235 F 01 / 07

ВЯРНО С ОРИГИНАЛА



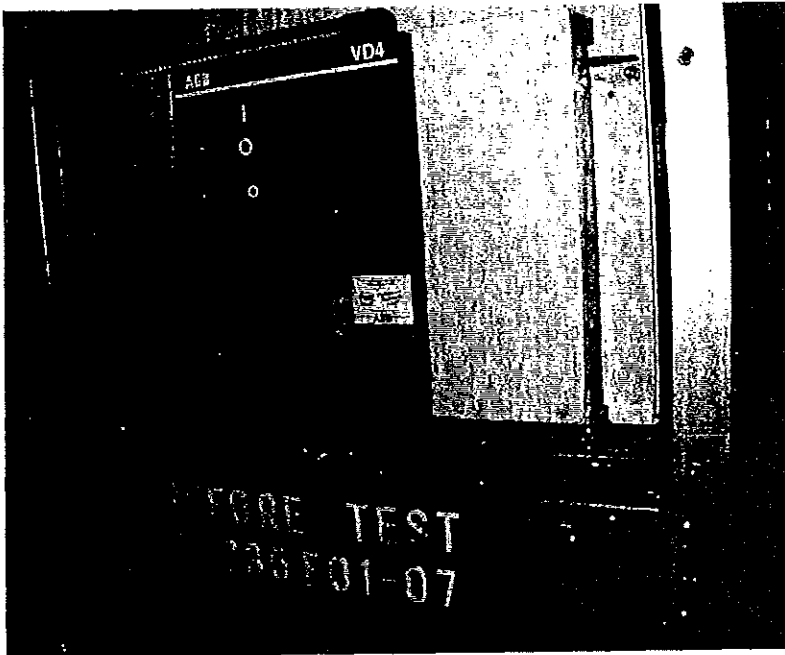


Photo no. 5  
Before Test HZ 235 F 01 / 07

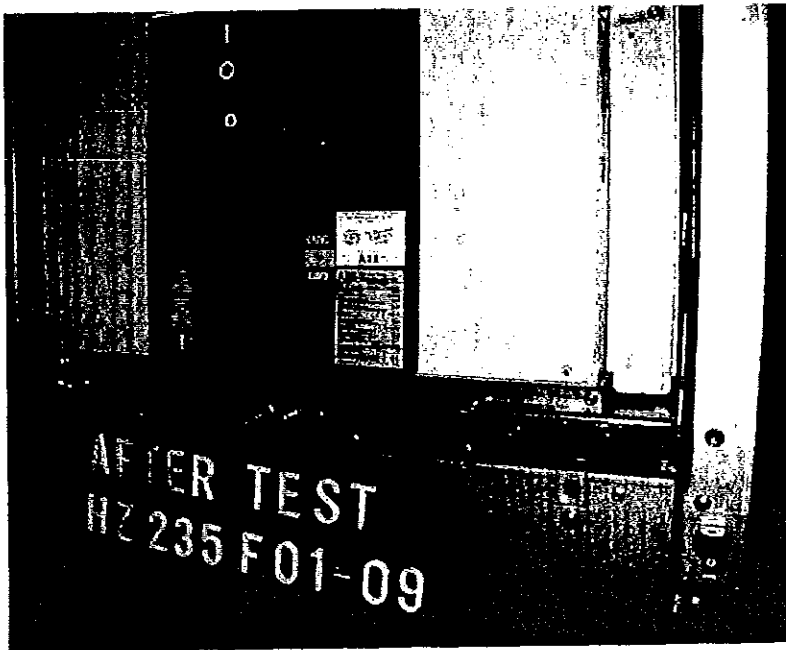
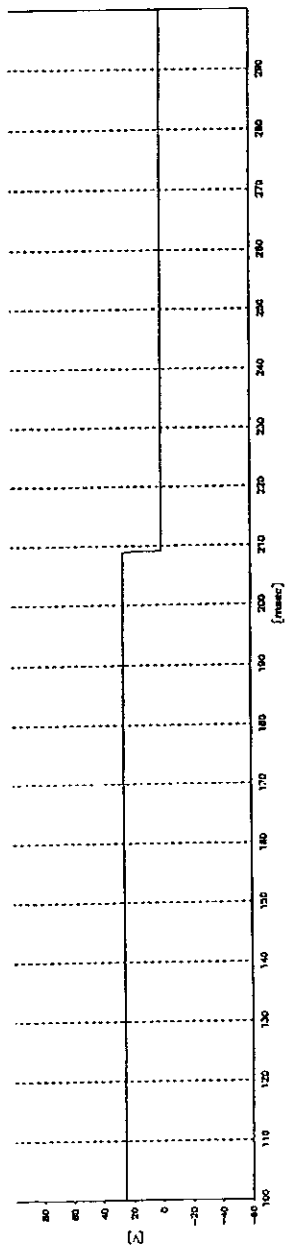


Photo no. 6  
After Test HZ 235 F 01 / 09

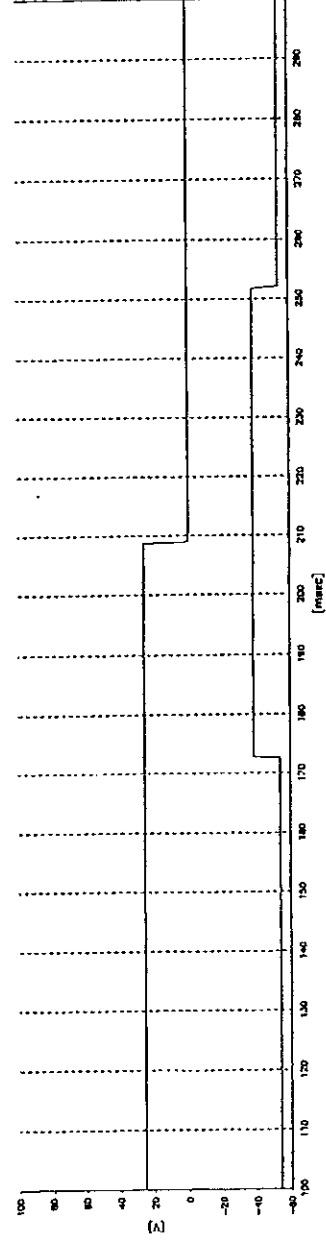
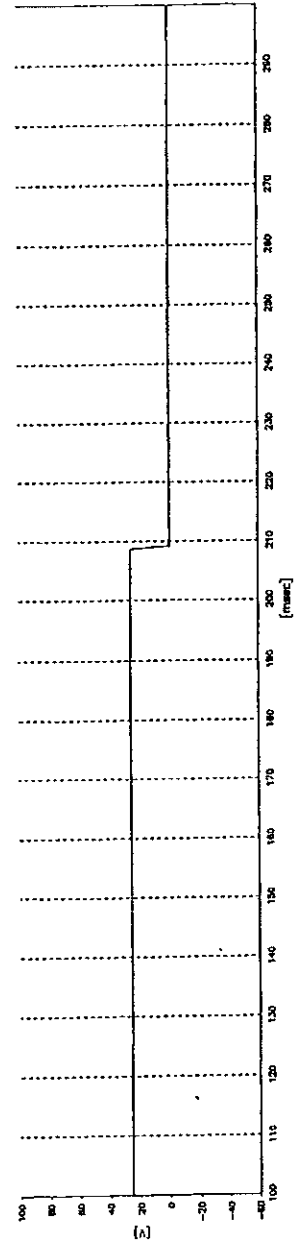
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4.2.2002

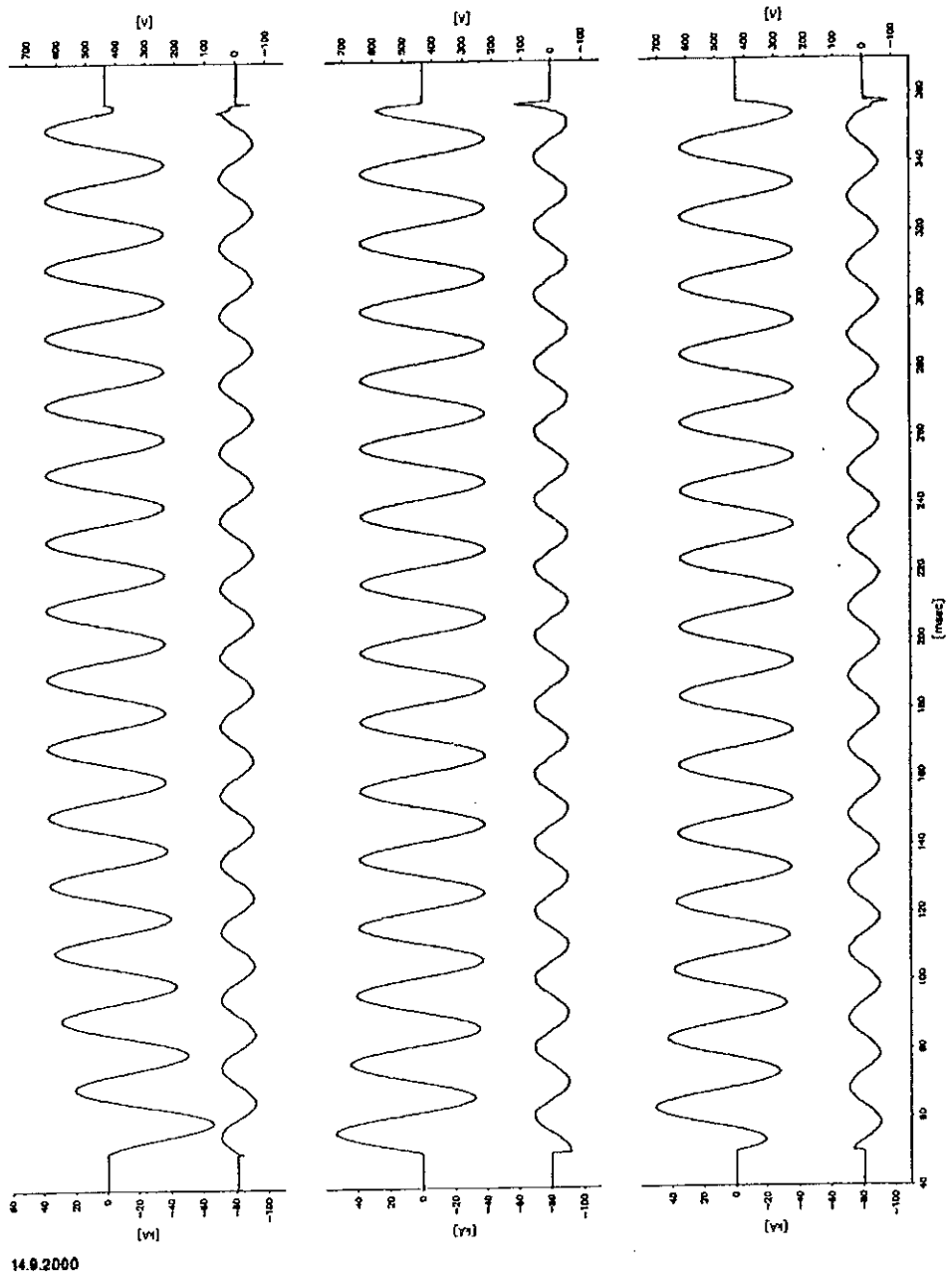


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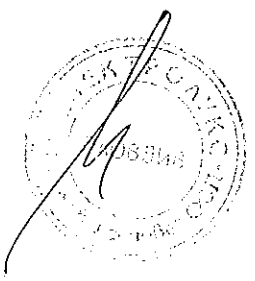


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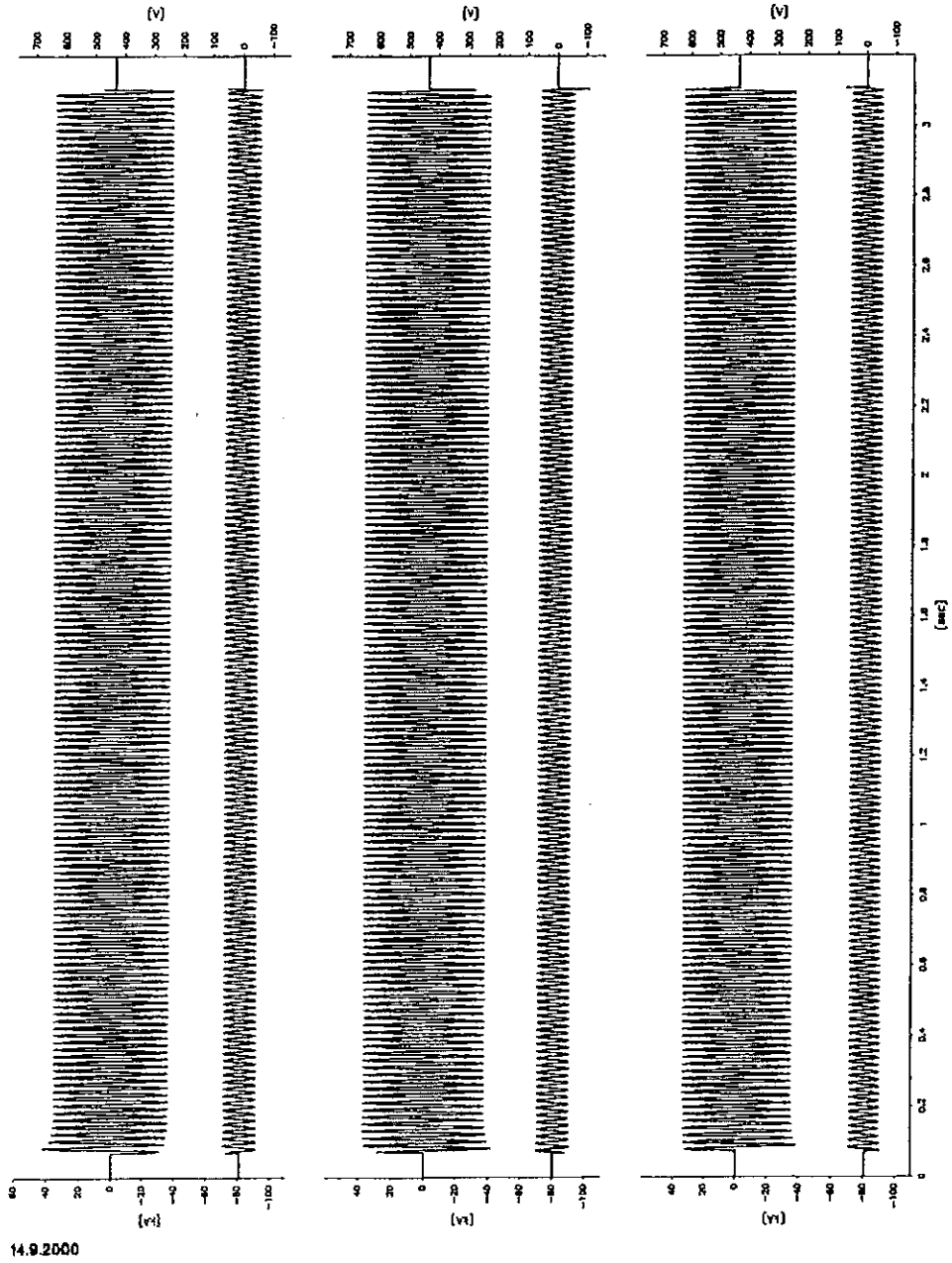
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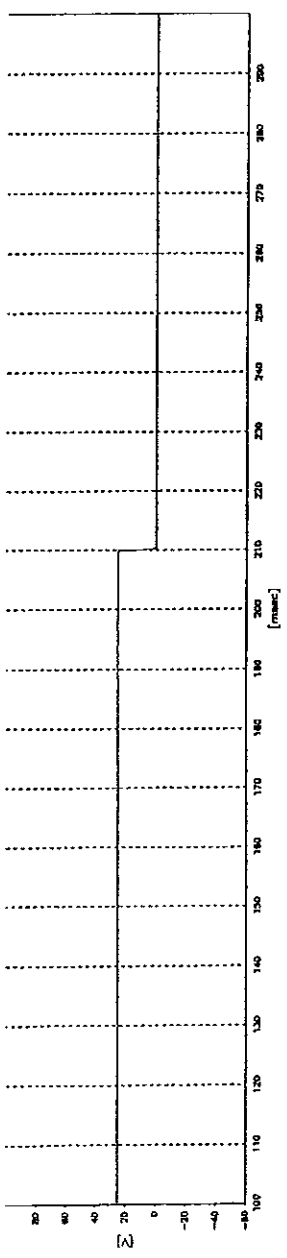
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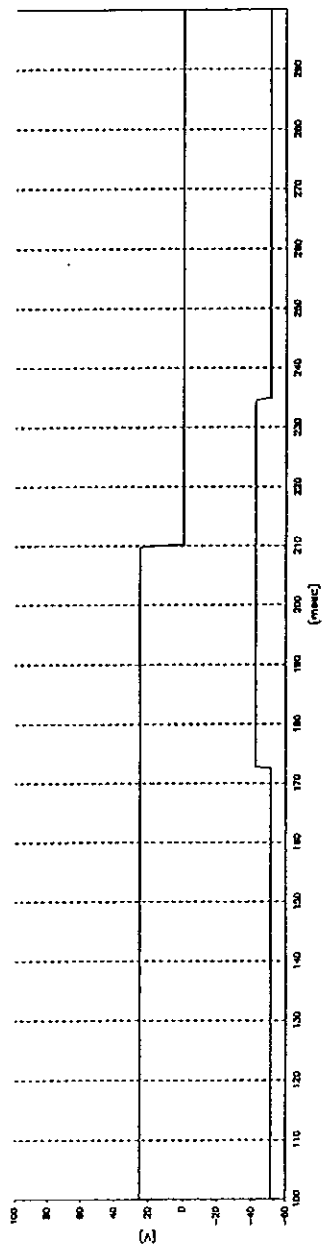
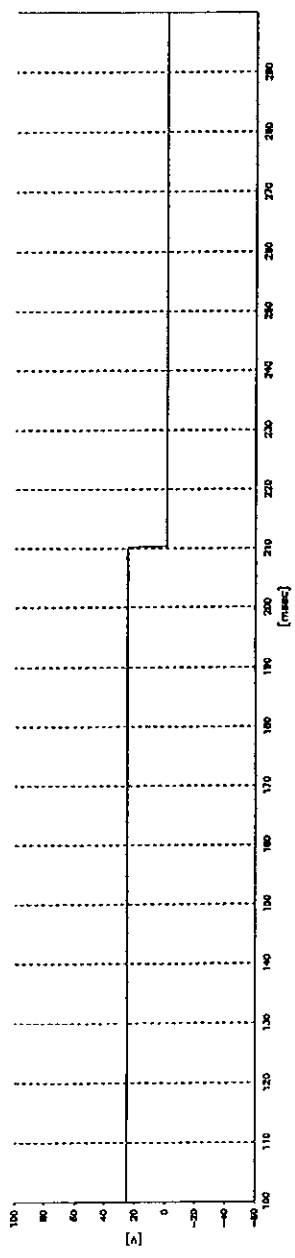




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14.9.2000

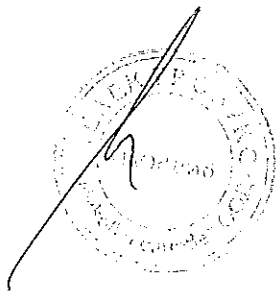


HZZ235F01.006

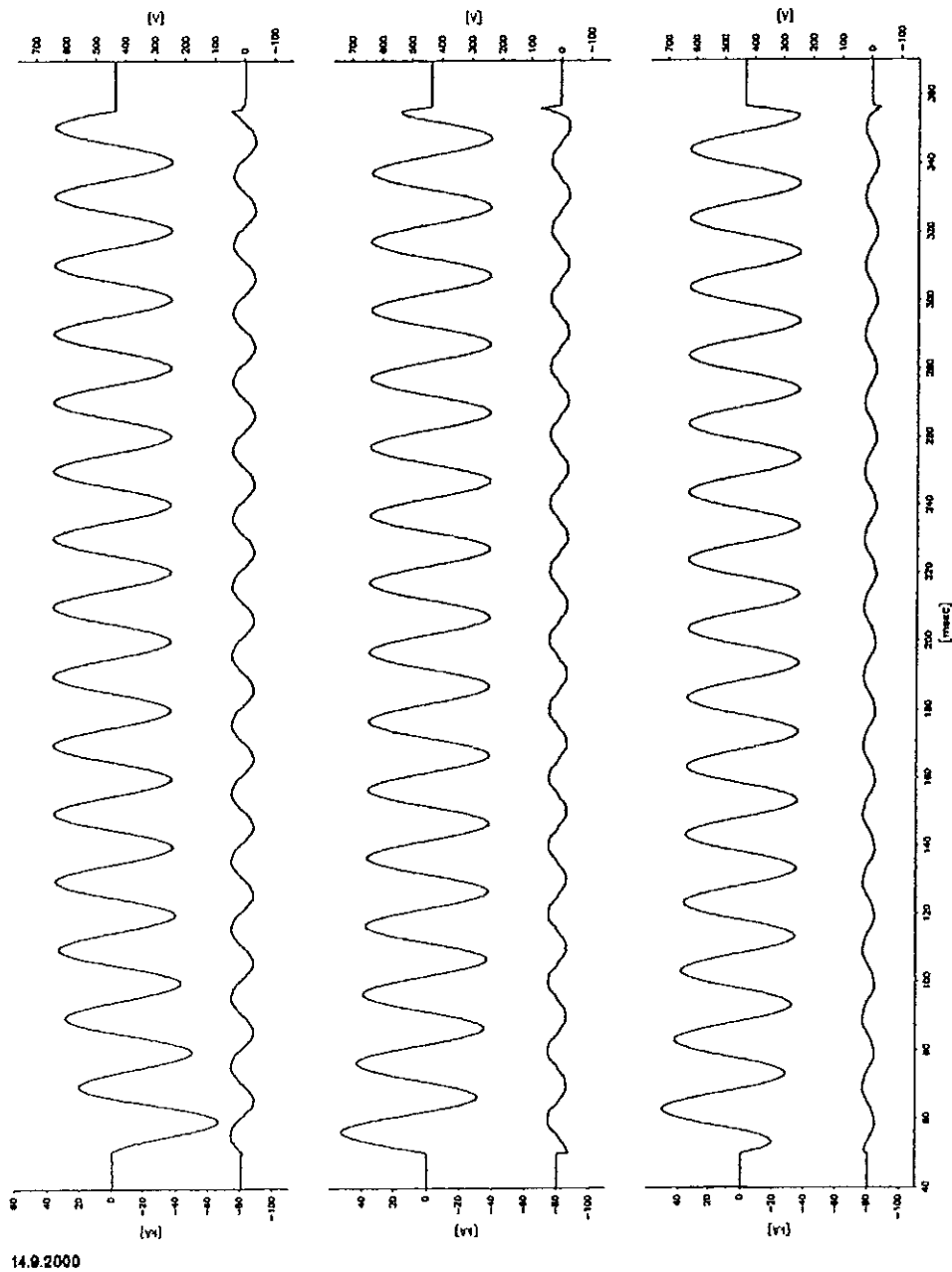
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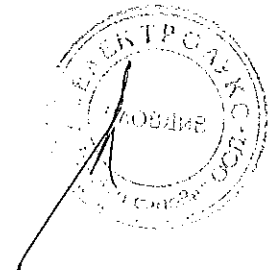


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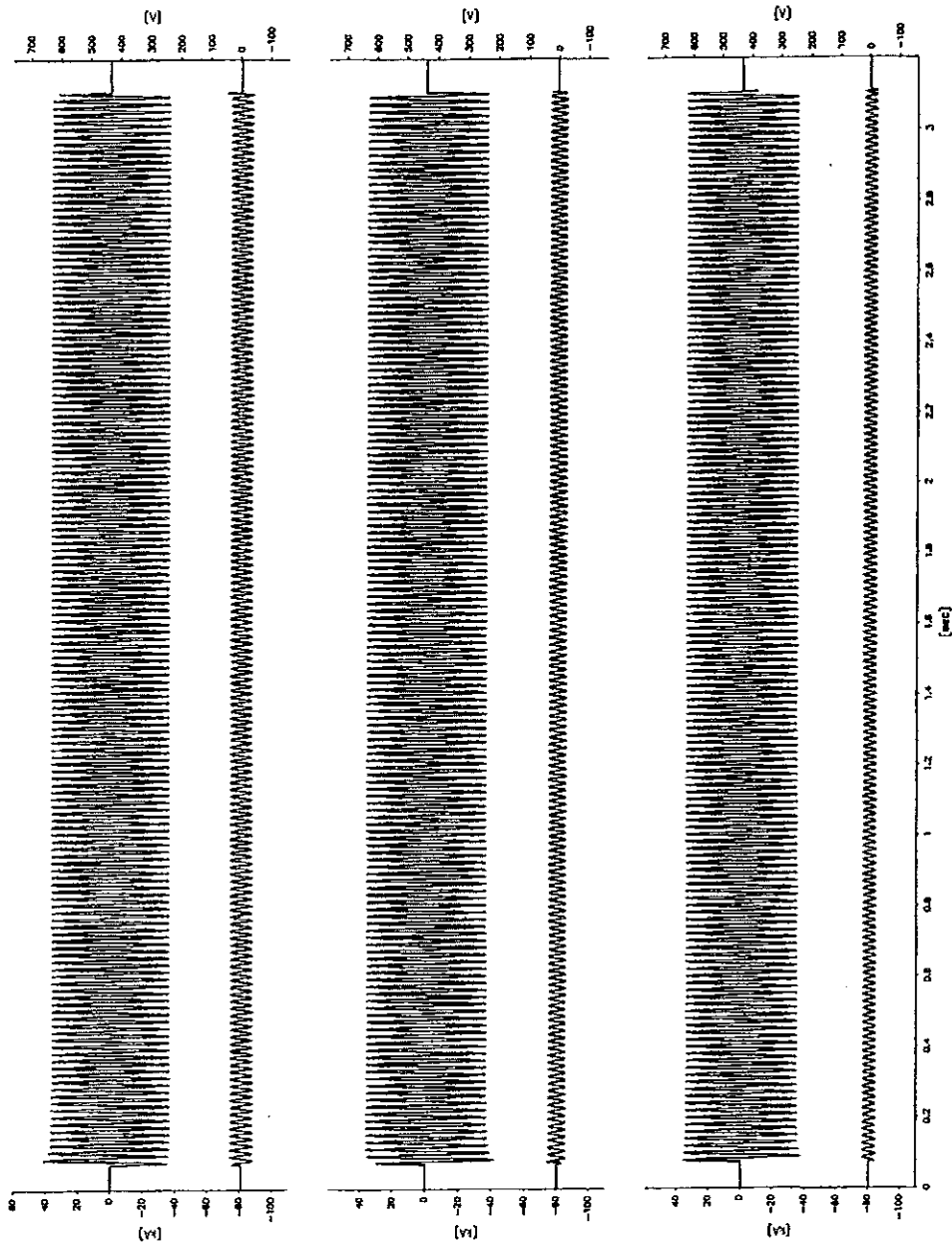
HZ235F01.008

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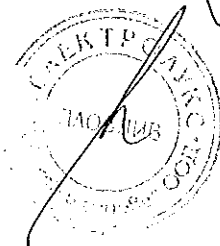
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Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Issued by an Accredited Laboratory  
corresponding to EN 45001

Sheet 1

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  $\vartheta_{\text{umax}} = 40 \text{ }^\circ\text{C}$ ,

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	$\vartheta_u$	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 60694/2<sup>nd</sup> Ed./1996-5, clause 6.4 and 6.5  
 IEC Standard 60298/3<sup>rd</sup> 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 11<sup>th</sup> - November 12<sup>th</sup>, 2000

**Client** ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany

November 16<sup>th</sup>, 2000  
**Date of Issue**



*E. Göttsch*  
**Laboratory Manager**

*[Signature]*  
**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

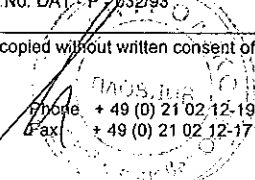
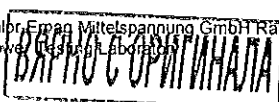
ABB Calor Emag Laboratories Ratingen are accredited according to EN 45001 by DATech under Reg.No. DAT-P-032/93

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ABB Calor Emag Mittelspannung GmbH Ratingen  
 High-Power Testing Laboratory

Oberhausener Straße 33  
 D - 40472 Ratingen

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 Fax + 49 (0) 21 02 12-1713



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Reg.-Nr.

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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 2

Issued by an Accredited Laboratory  
corresponding to EN 45001

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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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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 3

Issued by an Accredited Laboratory corresponding to EN 45001

## 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.

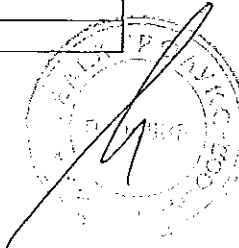
#### Essential characteristics and installed devices:

The power loss of the controlgear in the low voltage compartment was simulated by a heating resistor of 60 W.

Current Transformers:

<b>Manufacturer</b>	<b>Type</b>	<b>Year of manufacture</b>	<b>Insulation class</b>
Wirges GmbH	TPU66.11	2000	E
<b>Voltages</b>	<b>Frequency</b>	<b>Sort-time withst. current</b>	<b>Peak withstand current</b>
24/50/125 kV	50 Hz	25 kA / 3 s	63 kA
<b>Serial Nos.</b>	L1 058249, L2 058250; L3 058251		
<b>Core 1</b>	2000 / 5 A; 15 VA, accuracy class 0.5		
<b>Core 2</b>	2000 / 5 A; 15 VA, accuracy class 5P15		

Date of receipt of test object: 30<sup>th</sup> October 2000





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DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 4

Issued by an Accredited Laboratory  
corresponding to EN 45001

## 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
<b>Permissible values for internal arc faults:</b>	
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.

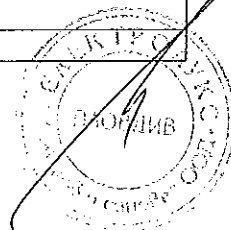
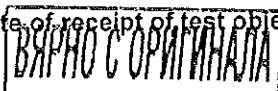
#### Essential characteristics and installed devices:

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.		Peak withstand current	
L1 058240, L2 058241; L3 058242		63 kA	
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: 30<sup>th</sup> October 2000





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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 5

Issued by an Accredited Laboratory  
corresponding to EN 45001

## 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: 30<sup>th</sup> October 2000

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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 6

Issued by an Accredited Laboratory  
corresponding to EN 45001

## 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)

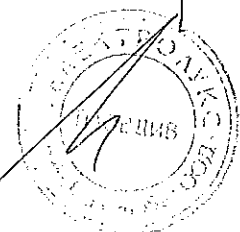
Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50 / 60 Hz
Rated normal current	1250 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration 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: 30<sup>th</sup> October 2000

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Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06  
Issued by an Accredited Laboratory  
corresponding to EN 45001

Sheet 7

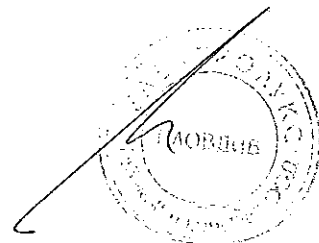
## List of Drawings

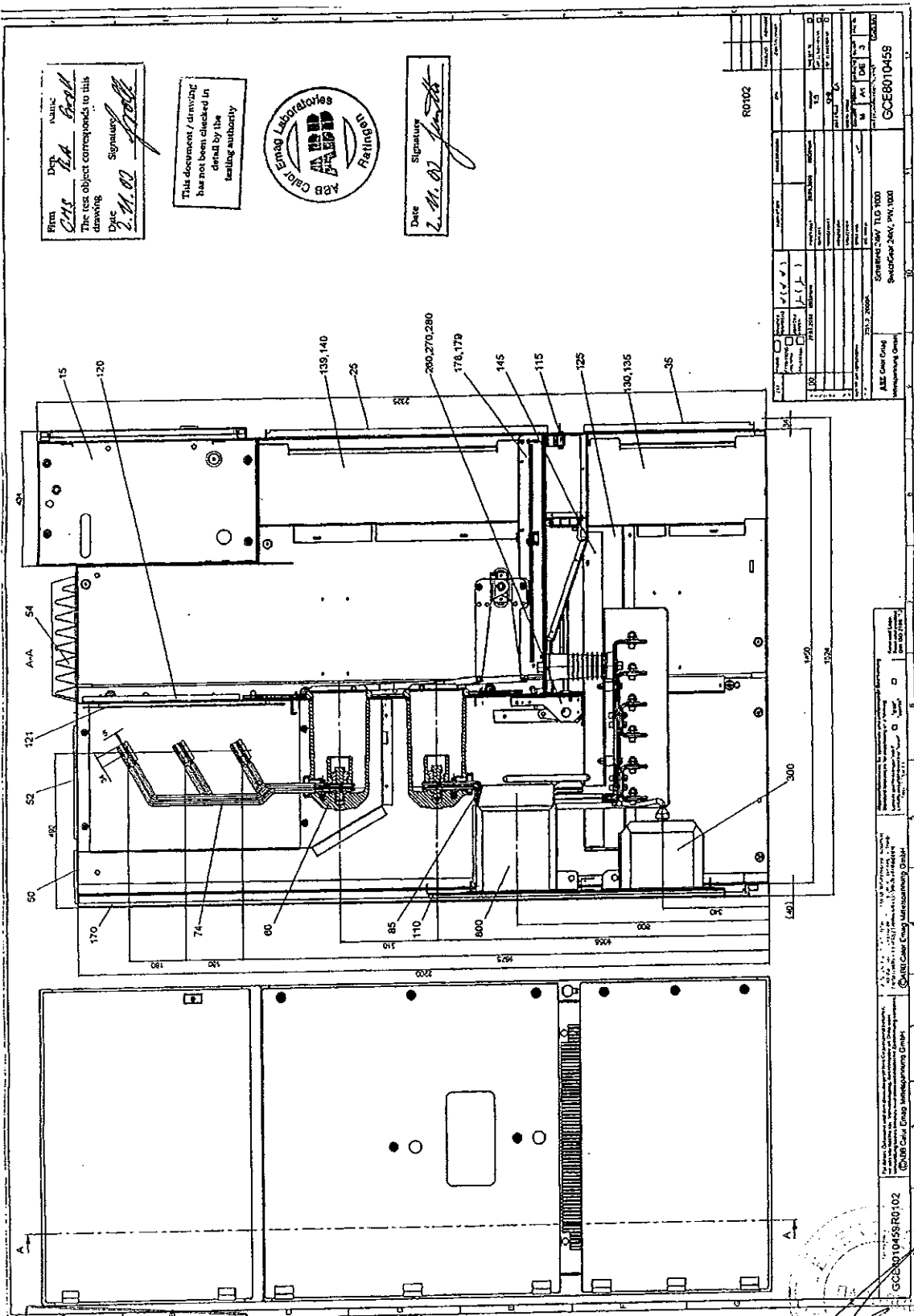
The manufacturer has guaranteed, that the equipment submitted for test has been manufactured in full accordance with the following drawings. These drawings have been stamped and signed by the manufacturer representative. The drawings has not been checked in detail by the testing authority. The drawings 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

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From: *CHS* Drawn: *LA* Name: *Ball*  
 Date: *2.11.02* Disc: *Ball* Signature: *Ball*  
 This document / drawing  
 has not been checked in  
 detail by the  
 issuing authority

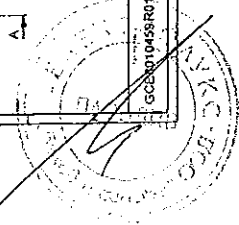


Date: *2.11.02* Signature: *[Signature]*

Title: <i>RO102</i>	
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Part No: <i>300</i>	Part No: <i>300</i>
Rev: <i>1</i>	Rev: <i>1</i>
Issued: <i>02.11.02</i>	Issued: <i>02.11.02</i>
Checked: <i>LA</i>	Checked: <i>LA</i>
Approved: <i>LA</i>	Approved: <i>LA</i>
Project No: <i>GCE6010459</i>	Project No: <i>GCE6010459</i>
Scale: <i>1:1</i>	Scale: <i>1:1</i>
Order No: <i>GCE6010459</i>	Order No: <i>GCE6010459</i>
Contract No: <i>22.2.2000</i>	Contract No: <i>22.2.2000</i>
Manufacturer: <i>ABB Calor Emag</i>	Manufacturer: <i>ABB Calor Emag</i>
Product: <i>SIRIBOND 25kV TLD 1000</i>	Product: <i>SIRIBOND 25kV TLD 1000</i>
Address: <i>Siribond 25kV, POB 1000</i>	Address: <i>Siribond 25kV, POB 1000</i>

**ABB Calor Emag**  
 Siribond 25kV, POB 1000  
 Test Report No. *HZ 236 E 06*  
 Drawing No. *RO102*  
 Part No. *300*  
 Rev. *1*  
 Issued: *02.11.02*  
 Checked: *LA*  
 Approved: *LA*

*ВЪРНО С ОРИГИНАЛА*





Reg.-Nr.

DAT-P-032/93

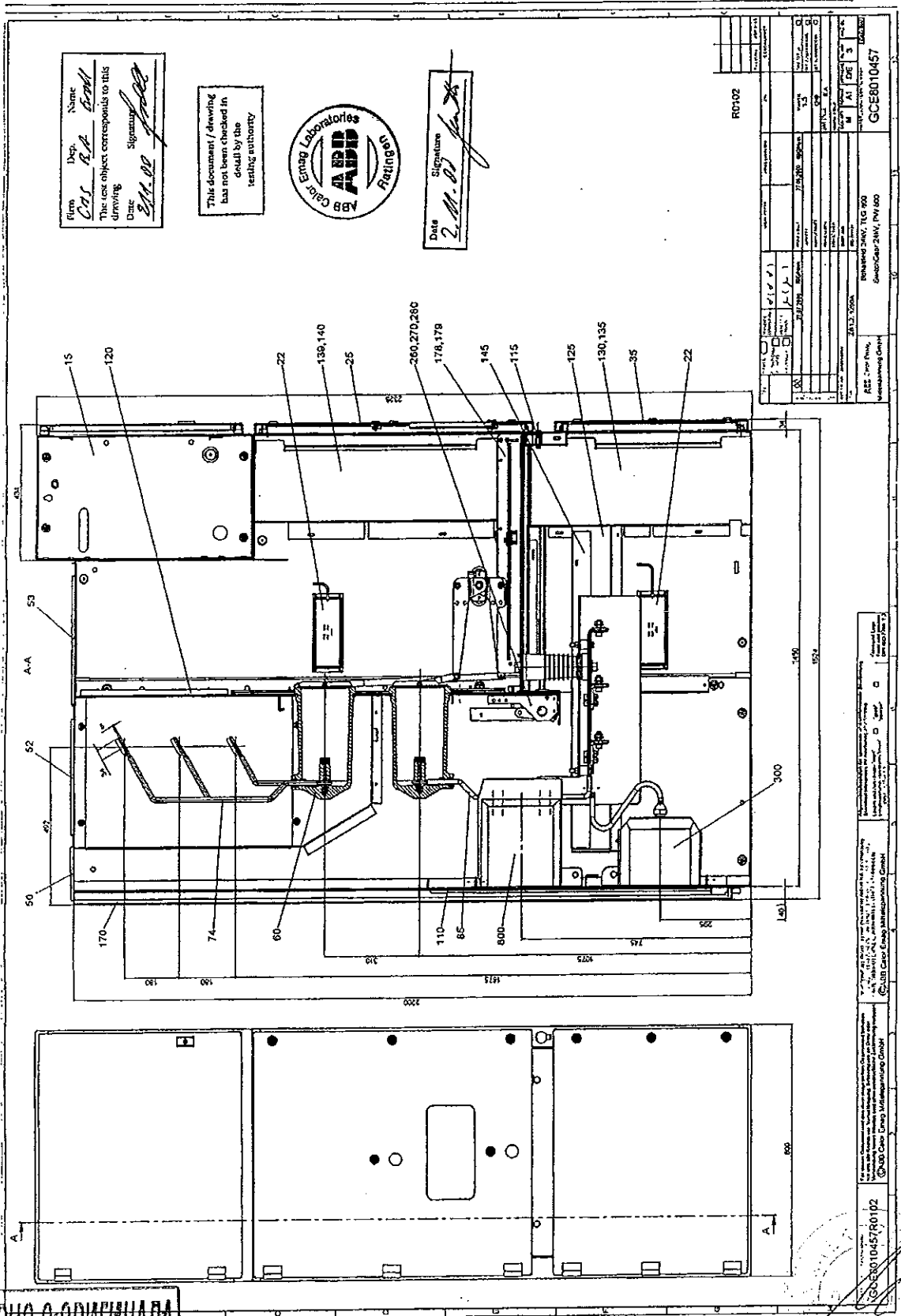
# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 9

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corresponding to EN 45001



Name *Bob*  
Dep. *R.K.*  
This test object corresponds to this drawing.  
Date *2.11.93*  
Signature *[Signature]*

This document / drawing  
has not been checked in  
detail by the  
testing authority



Date *2.11.93*  
Signature *[Signature]*

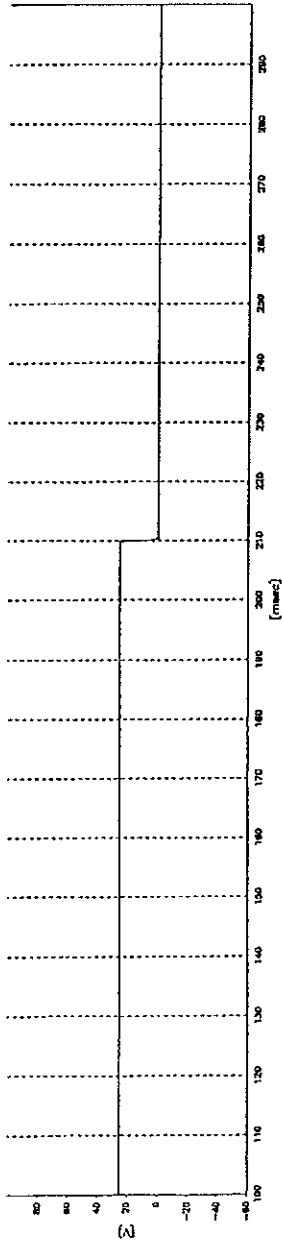
RD102

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Plant No.	311296
Serial No.	311296
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Plant City	
Plant Country	
Plant Telephone	
Plant Fax	
Plant E-mail	
Plant F1	
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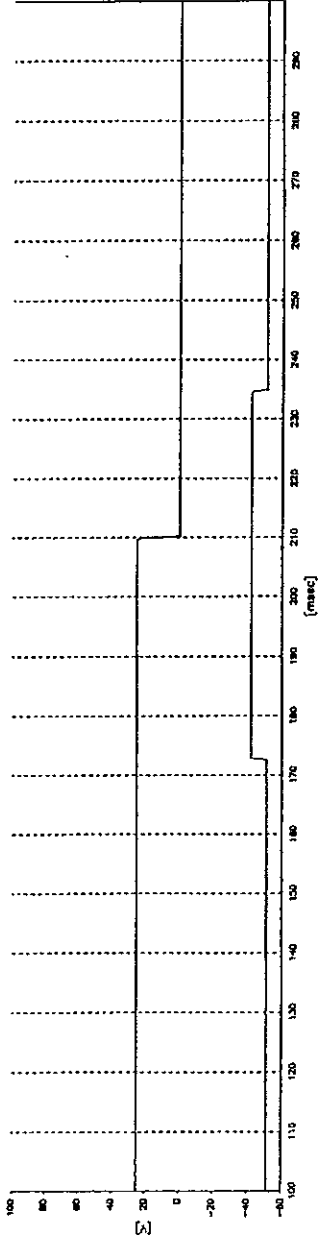
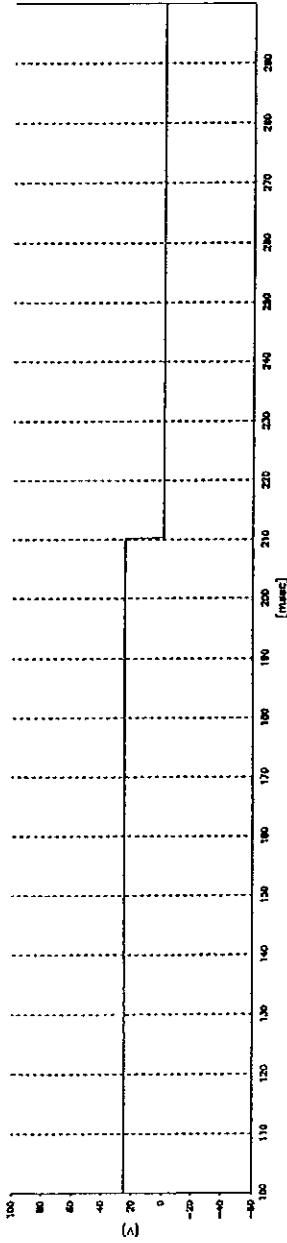
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Rating 60  
GCE8010457

ВЯРНО С ОПРИГИНАЛА

3



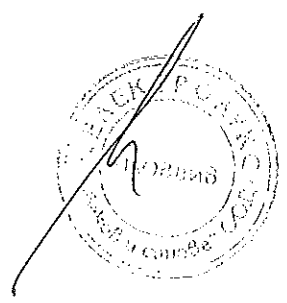
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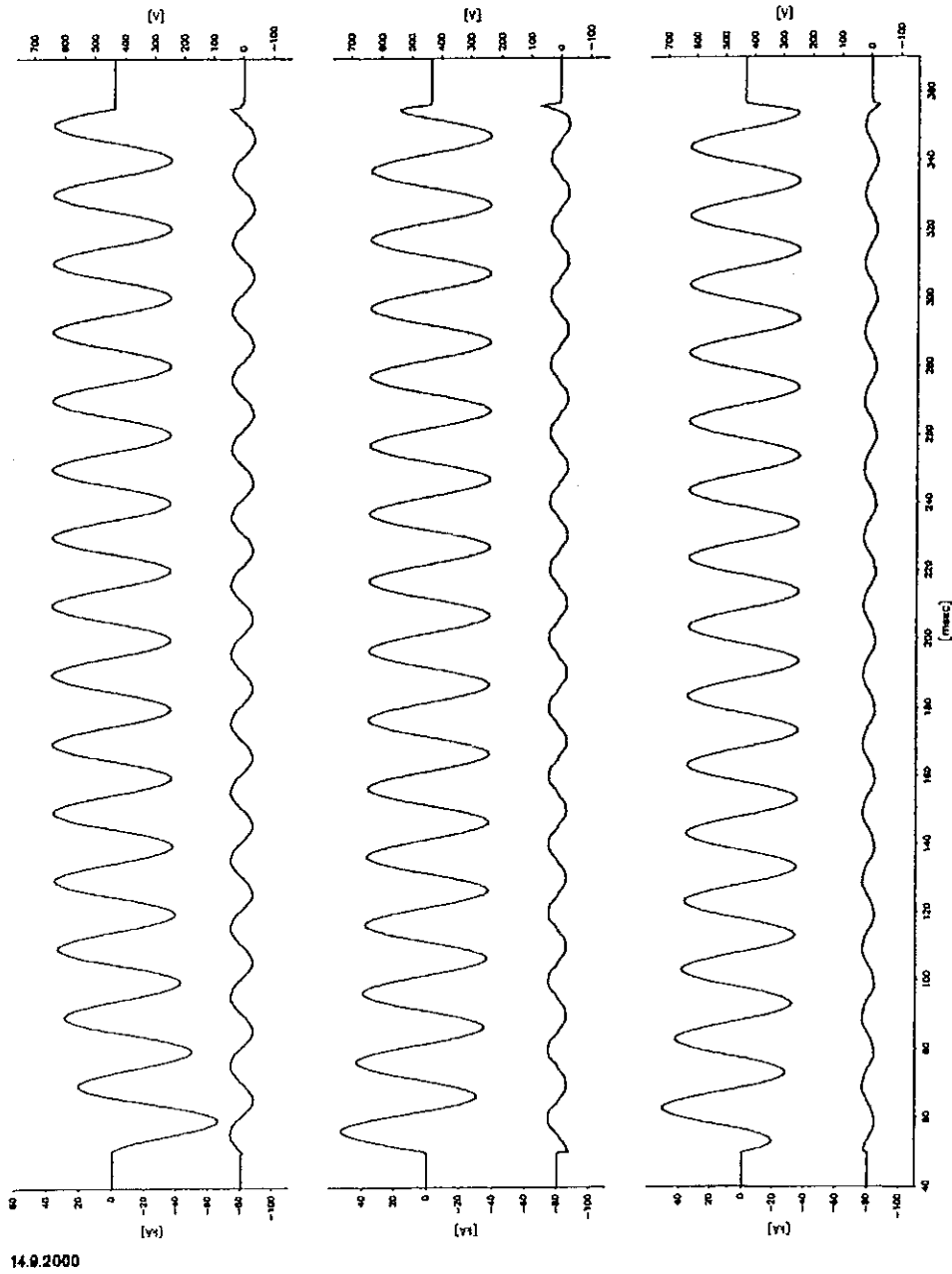
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MSU



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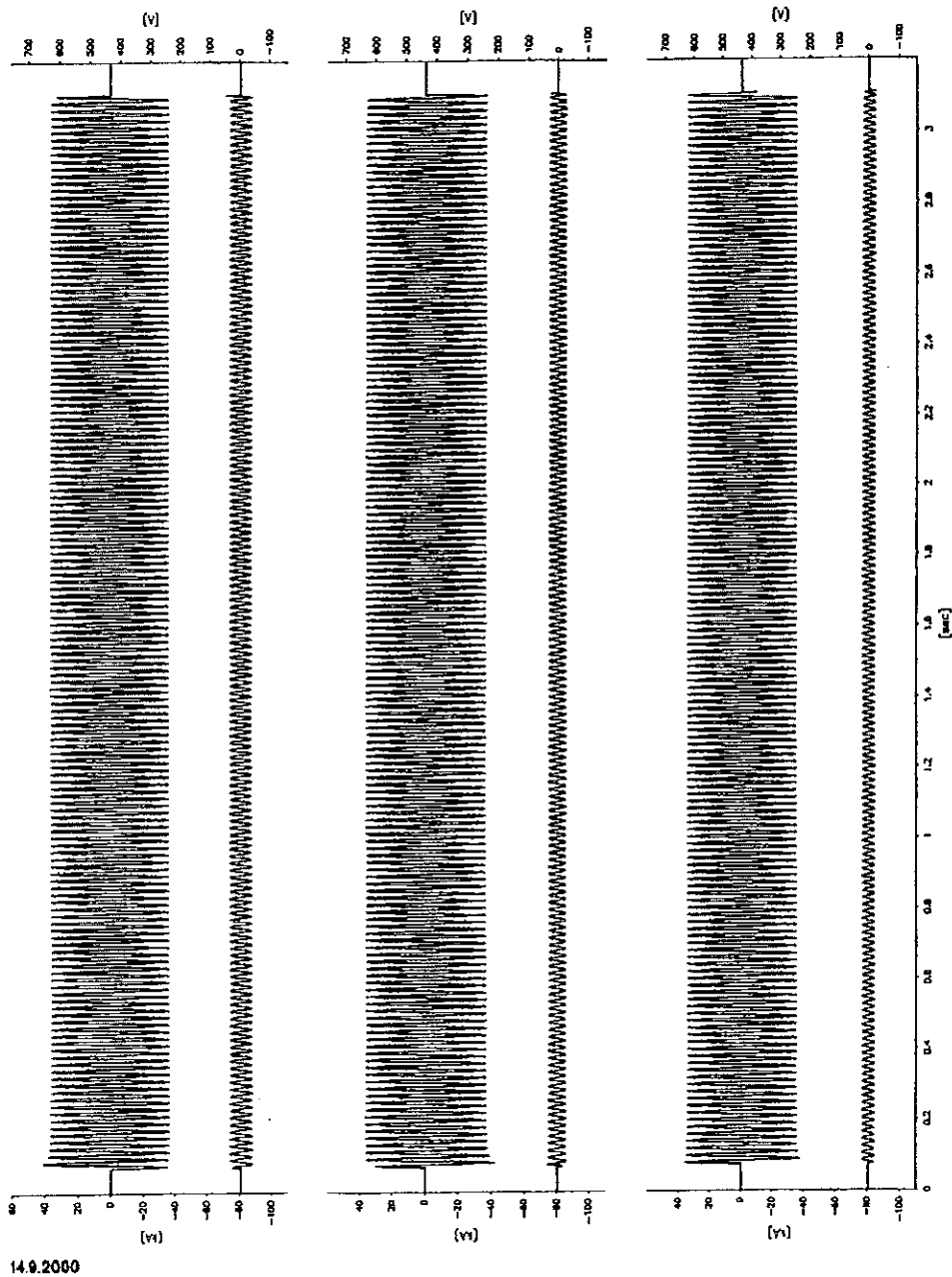
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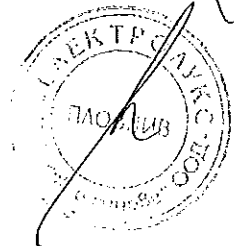
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HZ235F01.009

ВЯРНО С ОРИГИНАЛА





Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



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	$\vartheta_u$	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 60694/2<sup>nd</sup> Ed./1996-5, clause 6.4 and 6.5  
 IEC Standard 60298/3<sup>rd</sup> 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 11<sup>th</sup> - November 12<sup>th</sup>, 2000

**Client** ABB Calor Emag Mittelspannung GmbH, D-40472 Ratingen, Germany

November 16<sup>th</sup>, 2000  
**Date of Issue**



*Gottlieb*  
**Laboratory Manager**

*Smitt*  
**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

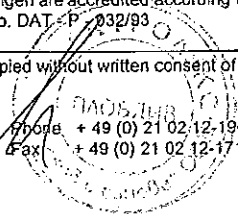
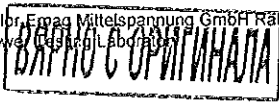
ABB Calor Emag Laboratories Ratingen are accredited according to EN 45001 by DATech under Reg.No. DAT-P-032/93

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.

ABB Calor Emag Mittelspannung GmbH Ratingen  
 High-Power Testing Laboratory

Oberhausener Straße 33  
 D - 40472 Ratingen

Phone + 49 (0) 21 02 12-1905  
 Fax + 49 (0) 21 02 12-1713



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DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

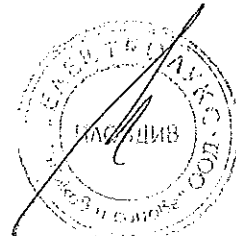
Sheet 2

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corresponding to EN 45001

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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
Drawing No. GCE7004730R0103 (pole complete VM1 24 kV 1250 A)	13
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ВЕРНО С ОРИГИНАЛА



**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
<b>Permissible values for internal arc faults:</b>	
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:**

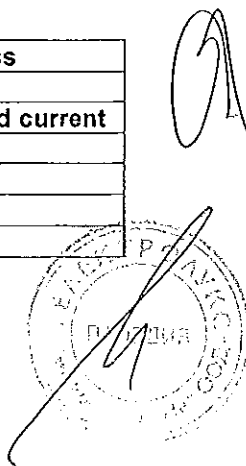
The power loss of the controlgear in the low voltage compartment was simulated by a heating resistor of 60 W.

Current Transformers:

Manufacturer	Type	Year of manufacture	Insulation class
Wirges GmbH	TPU66.11	2000	E
Voltages	Frequency	Sort-time withst. current	Peak withstand current
24/50/125 kV	50 Hz	25 kA / 3 s	63 kA
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: 30<sup>th</sup> October 2000









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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06  
Issued by an Accredited Laboratory  
corresponding to EN 45001

Sheet 4

## 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
<b>Permissible values for internal arc faults:</b>	
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.

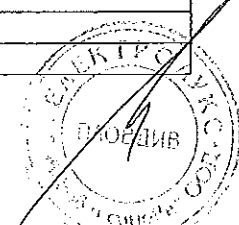
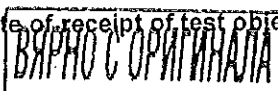
#### Essential characteristics and installed devices:

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: 30<sup>th</sup> October 2000





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DAT-P-032/93

# ABB Calor Emag Laboratories



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Issued by an Accredited Laboratory  
corresponding to EN 45001

Sheet 5

## 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: 30<sup>th</sup> October 2000

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Reg.-Nr.  
DAT-P-032/93

# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

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)

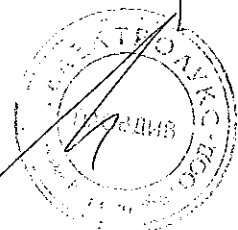
Rated voltage	24 kV
Rated lightning impulse withstand voltage	125 kV
Rated switching impulse withstand voltage	- kV
Rated power frequency withstand voltage	50 kV
Rated frequency	50 / 60 Hz
Rated normal current	1250 A
Rated peak withstand current	63 kA
Rated short-time withstand current	25 kA
Rated duration 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: 30<sup>th</sup> October 2000

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# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06  
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Sheet 7

## List of Drawings

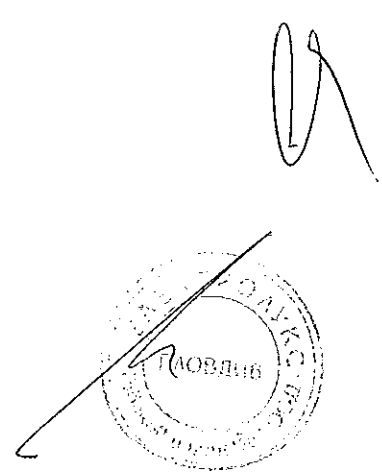
The manufacturer has guaranteed, that the equipment submitted for test has been manufactured in full accordance with the following drawings. These drawings have been stamped and signed by the manufacturer representative. The drawings has not been checked in detail by the testing authority. The drawings 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

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DAT-P-032/93

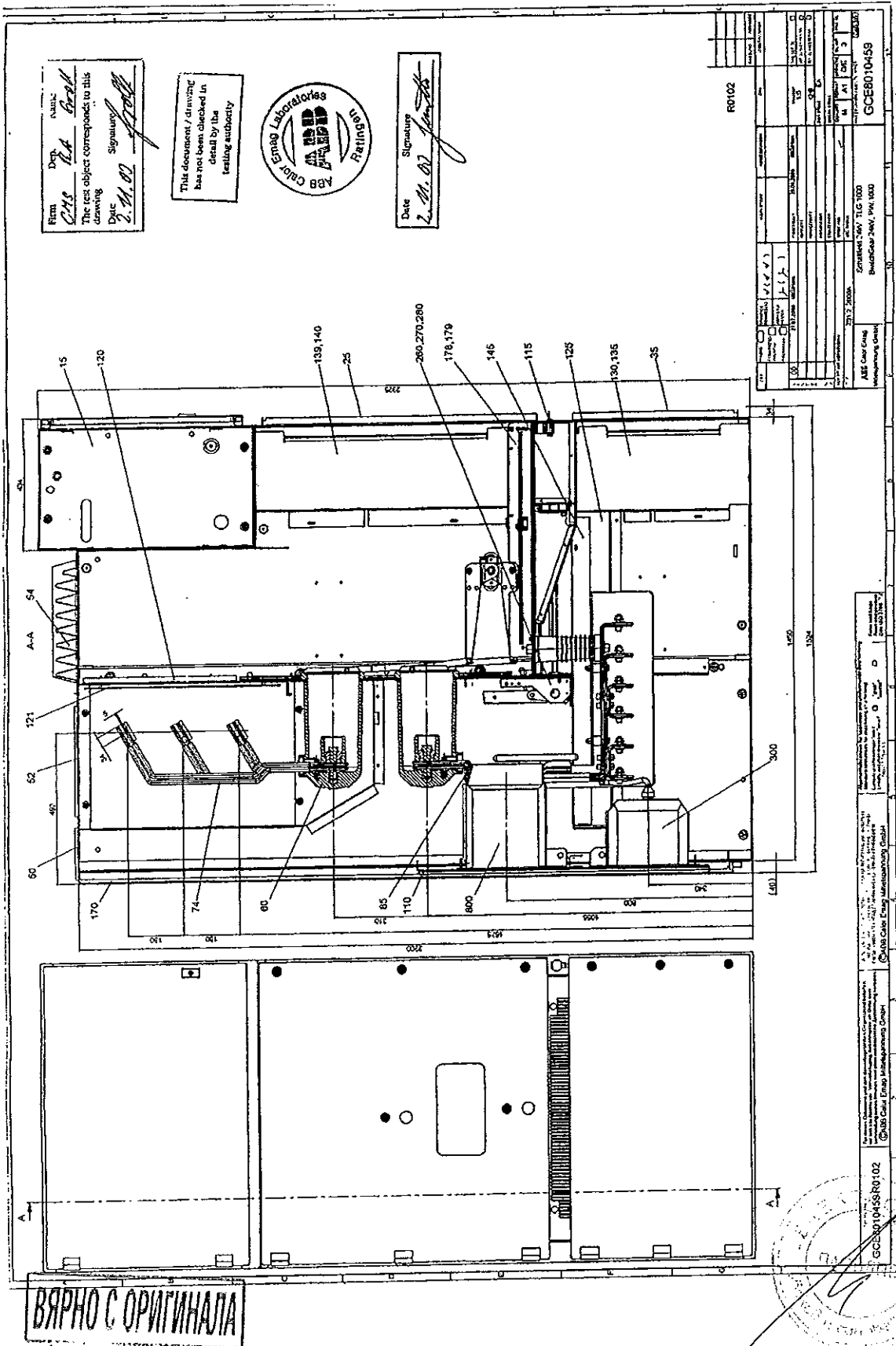
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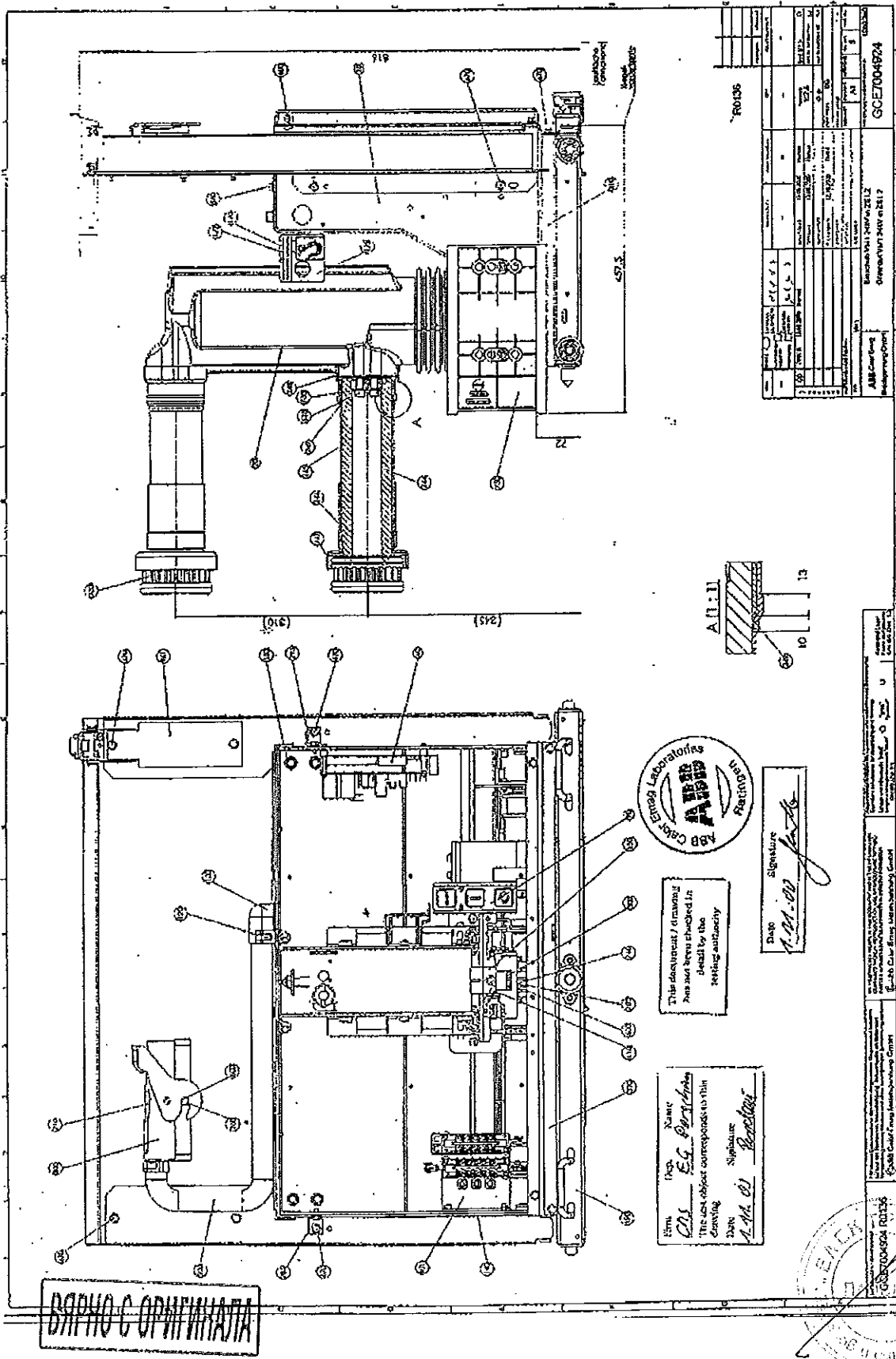
Sheet 8

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General Information	
Order No.	732001
Contract No.	217/21
Material	Steel
Manufacturer	ABB
Product Name	ABB 240V 2E L2
Product Code	00000001 240V 2E L2
Reference	ABB Calor Emag
Order Ref.	00000001 240V 2E L2
Order No.	00000001 240V 2E L2
Contract No.	217/21
Material	Steel
Manufacturer	ABB
Product Name	ABB 240V 2E L2
Product Code	00000001 240V 2E L2
Reference	ABB Calor Emag
Order Ref.	00000001 240V 2E L2
Order No.	00000001 240V 2E L2
Contract No.	217/21
Material	Steel
Manufacturer	ABB
Product Name	ABB 240V 2E L2
Product Code	00000001 240V 2E L2
Reference	ABB Calor Emag
Order Ref.	00000001 240V 2E L2
Order No.	00000001 240V 2E L2
Contract No.	217/21
Material	Steel
Manufacturer	ABB
Product Name	ABB 240V 2E L2
Product Code	00000001 240V 2E L2
Reference	ABB Calor Emag
Order Ref.	00000001 240V 2E L2
Order No.	00000001 240V 2E L2



This document / drawing has not been checked in detail by the testing authority.

Name: *E.G. P. P. P.*  
The test object corresponds to this drawing.  
Date: *21.11.00* Signature: *[Signature]*

Date: *21.11.00* Signature: *[Signature]*

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Reg.-Nr.  
DAT-P-032/93

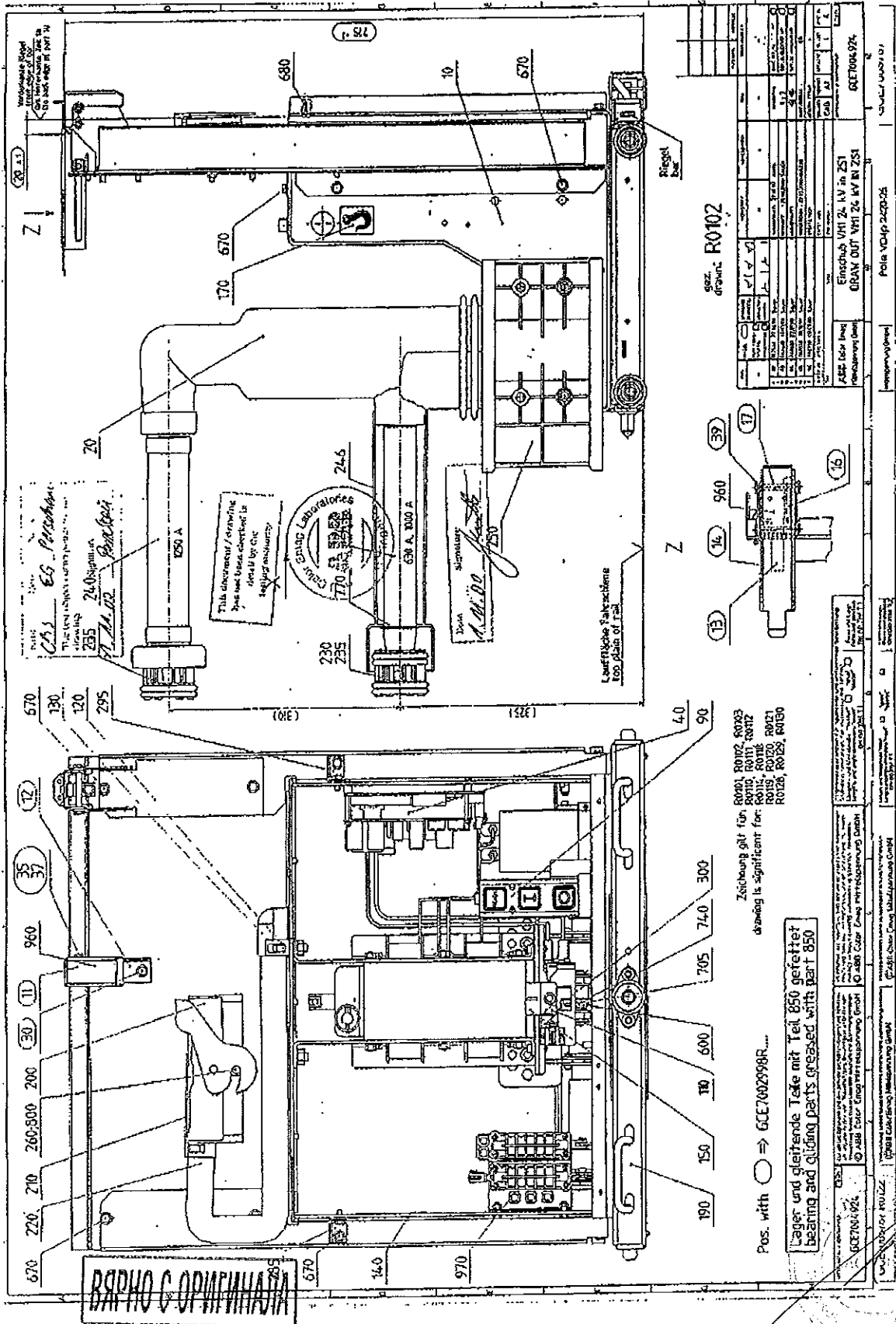
# ABB Calor Emag Laboratories



TEST REPORT No. HZ 236 E 06

Sheet 11

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