Switchgear

Delta H2000
Medium voltage switchgear for *primary distribution*

a brand of Schneider Electric

Merlin Gerin


DNV
DET NORSKE VERITAS
ENVIRONMENTAL MANAGEMENT SYSTEM CER
Certifikat Nr. 2001-SKM-AE-556
Härmed intygas att
MILJÖLEDNINGSSYSTEMET
vid
Elektriska Aktiebolaget
ARLÖV i SVERIGE
uppfyller kraven i standarden för milj
SS-EN ISO 14001:19
Detta certifikat gäller för styrning av m
KONSTRUKTION OCH PRODUKT
MELLANSPÄNNING
Plats och datum
Stockholm, 2004-06-10
för det ackrediterade
DNV Certification AB, Sweden
Peter Papinski
Management Representative
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Elek
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Contents

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DET NORSKE VERITAS

…ALITY SYSTEM CERTIFICATE

Certifikat Nr. 2000-SKM-AQ-1135

Härmed intygas att

KVALITETSLEDNINGSSYSTEMET

vid

…triska Aktiebolaget DELTA

ARLÖV i SVERIGE

…ller kraven i standarden för kvalitetsledningssystem

SS-EN ISO 9001:2000

…ertifikat gäller för följande produkter eller tjänster:

…KTION OCH PRODUKTION AV LUFTISOLERADE

MELLANSPÄNNINGSSTÄLLVERK

Certifikatet gäller till

2007-10-31

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1996-02-22

SWEDAC ACKREDITERING

Ansvarig för certifieringsrevisionen

Peter Nydell

Revisionsledare

H2000 is quality certified
according to ISO 9001 and 14001.

Working in cable compartment can be performed without risk for personal injury, even with the busbar under voltage.

Medium voltage switchgear 1-24kV (metal enclosed)

H2000 is primarily intended for primary distribution 1-24kV. The switchgear is air insulated with switching devices installed on floor-moving carriages, using vertical movement for disconnecting.

The cubicles are metal enclosed, Typee tested and fulfil requirements in EN 62271-200 and EN 60298. The H2000 cubicles are divided into separate functional compartments:

- busbar
- combined circuit breaker and cable compartment
- low voltage compartment

Work in cable compartment can be performed without risk for personal injury, even with the busbar under voltage. Each cubicle has a three-pole earthing switch with full making capacity, which is operated with closed door and is mechanically interlocked with the floor-moving carriage. Protection relays and monitoring equipment are normally installed in the separate low voltage compartment. The busbar and its contacts to the cubicles, is automatically screened when the carriage is moved to disconnected position. As an option also screens and insulation for lower contacts (cable connection) can be provided.

Technical characteristics

Rated voltage (kV)	12	24
Rated insulation level	28	50
? - power frequency withstand voltage 50Hz/1 min (rms kV) - lightning impulse withstand voltage 1,2/50_s (kV peak)	75	125
Rated current busbar (A)	3000	2500
Rated current incomming/outgoing (A)	3000	2000
Short-time withstand current (kA, 1s)	40	25
Max. making capacity (kA)	100	63
Protection degree	IP3X	IP3X
Internal arc withstand (kA, 1s)	40	25

Normala driftvillkor enligt SS-EN60694 Inomhus kopplingsutrustning

- Ambient temperature does not exceed 40°C, and its average value, measured over a period of 24 hours, is less than or equal to 35°C. Minimum ambient temperature is -5°C for class “minus 5 indoor”.

- Influence of solar radiation may be neglected.

- The altitude shall be less than or equal to 1000m.

- The ambient air is not significantly polluted by dust, smoke, corrosive and/or flammable gases, vapours or salt.

- Conditions for humidity are: average value of relative humidity 95%, measured over a period of 24 hours max. 2,2 kPa average value of the relative humidity max. 90%, for a period of a month average value of vapour pressure max. 1,8kPa. For these conditions, condensation may occasionally occur.

Notes!

1. Condensation can be expected where sudden temperature changes occur in a period of high humidity.

2. To withstand the effects of high humidity and condensation, which lead to breakdown of insulation or corrosion of metallic parts, switchgear designed for such conditions and accordingly tested should be used.

3. Condensation may be prevented by special design of the building or housing, by suitable ventilation and heating or by use of dehumidifying equipment.

- Inductive electromagnetic disturbances in the secondary system may not exceed a peak value of 1,6kV.

Switching devices

H2000 can be delivered with circuit breakers in SF6 or vacuum technology.

SF6 breakers are especially well suited for switching of motors and transformers as well as capacitor loads. They have a very “soft” breaking behaviour and switching’s are in principal free of transients.

LF-breaker

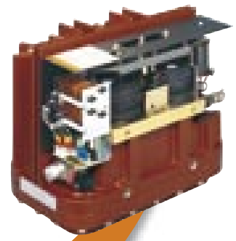
For voltages 1-17,5kV. LF-breakers are present in three variants, LF1, LF2 and LF3, depending of needed rated data. The LF-breaker function is build on so called “self-expansion technique”. SF6 gas is used as breaking- and insulating media at a low relative pressure of 1,5bar.

SF-breaker

For voltages up to 24kV. The SF-breakers are present in two variants, SF1 and SF2, depending of needed rated data. The SF-breaker is using SF6 gas and is designed with conventional “puffer technology”.

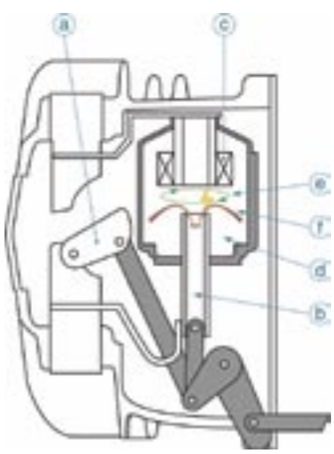
Vacuum-breaker

Merlin Gerin vacuum-breaker Typee Evolis exist in two variants, depending on needed rated data: Evolis 1-17,5kV and Evolis 24kV. Evolis is designed in accordance with requirements in the highest class of IEC 62271-100. As a specialist in breaking technology Merlin Gerin have designed Evolis with own developed vacuum bottles with so called “AMF technology” (Axial Magnetic Field).



SF6 Rollarc

For applications with frequent switching, such as motors, capacitors etc. Rollarc SF6 contactor is especially well suited. Rollarc can be used for voltages up to 12kV and rated current up to 400A.
It has a very high electrical withstand: ≤ 100.000 operations (R400D with mechanical latching).



LF-breaker function

1. Main contact is opening (a) and the current is transmitted to the arcing contact (b).

2. The arcing contact (b) is opening and a rotating arc is created. (Rotate due to the fact that the coil (c) generates a magnetic field (e)).

3. The overpressure, which arises from the arc in the expansion chamber (d), will force the arc into the hollow arcing contact (f).

Protect and monitor H2000 with Sepam protection relays

Sepam series 20 and series 40

Sepam series 20 is a family of digital units used for current or voltage protection functions. Sepam series 40 is used for applications where current and voltage protection functions are required in the same unit, also when power and energy metering is required.

Protection functions in Sepam series 20 and series 40

There are six different variants of protection management in series 20 and seven in series 40, with following protection functions: phase over current, earth fault, breaker supervision, unbalance, directional phase overcorrect, directional earth fault, unbalance/negative sequence, reactive power, thermal overload, phase undercurrent, excessive starting time/locked rotor, number of starts before inhibition, positive sequence under voltage, remanent under voltage, over voltage, residual voltage, negative sequence under voltage, over frequency, under frequency, rate of change of frequency, temperature monitoring (Pt100), transformer monitoring.

Acc. to standard	
IEC 60255-Protection relays	
IEC 60529-Degree of protection	IP52 on front panel
IEC 60068-Operating temperature	-25ºC to +70ºC
Auxiliary power supply	
24-250VDC and 110-240VAC	
Overall size on the base unit	
Total size (wxhxd)	176x222x130

Sepam series 80

Sepam series 80 is a family of digital units with high performances, which is used for current and voltage protection functions.

Protection functions in Sepam series 80

There are 12 different variants of protection management in series 80 with following protection functions: phase over current, earth fault, breaker supervision, unbalance, thermal overload, restricted earth fault, transf. diff., machine diff., directional phase over current, directional earth fault, overpower, reactive overpower, under power, under phase current, excessive starting time/locked rotor, number of starts before inhibition, field loss. out of phase fault, speed, voltage restrained phase over current, under impedance, inadvertent energization, third harmonic undervoltage/100% negative sequence over voltage, positive sequence under voltage, over frequency, under frequency, transformer monitoring, temperature monitoring (Pt100), re-closing.

Modules-Sepam series 20/40

1. Base unit, with several interfaces (UMI)

- standard UMI
- advanced UMI with graphical LCD display

2. Advanced UMI on distance

3. Digital in/output module 10 in-/4 outputs

4. Communication module with connection for 2-wires or 4-wires with RS485 Modbus

5. 5. Temperature transmitter module, inputs from transmitters on motors and transformers

6. 6. Analogue output module

7. 7. Software:
- SFT2841 setting and reading
- SFT2826 graphical disturbance analysis

Merlin Gerin Sepam series 20 / 40

Modules-Sepam series 80

1. Base unit, with interface (UMI) equipped with:

- ß 12 analogue inputs for current/voltage
- ß 5 output relays

2. Parameter and protection relay settings are saved on a withdrawable EE-prom case

3. 42 digital inputs and 23 output relays in three optional modules of which every module contains 14 inputs and 6 outputs

4. Two independent communication modules for Modbus

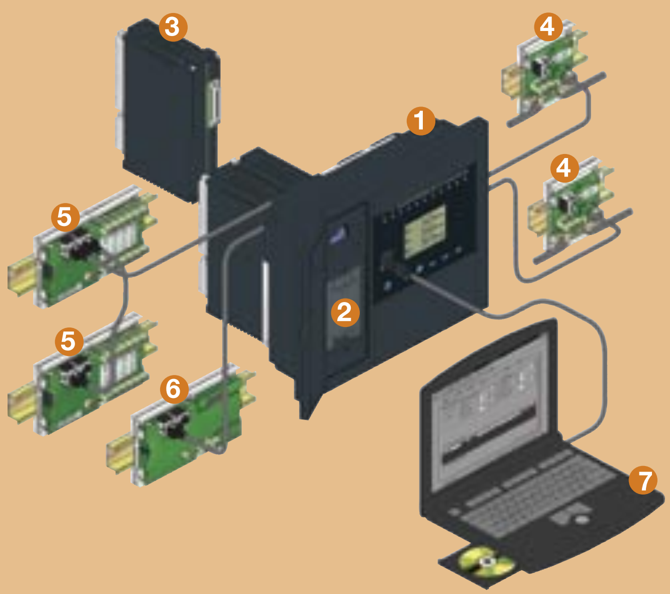
- Direct connection to 2-wires or 4-wires RS485
- Direct connection to optical fibre

5. Temperature transmitter modules for 16 transmitters from motors or transformers, e.g. Pt100

6. Analogue output module, 0-10mA, 4-20mA or 0-20mA

7. Software :
- SFT2841 setting and reading, can also be used over modem
- SFT2826 graphical disturbance analysis

Merlin Gerin Sepam series 80



Personal safe switchgears

Personnel safe switchgear is a matter that has engaged and will engage our business during all foreseeable future. Sweden has been a leading country where praxis has created rules for high safety to internal arc, in our switchgear panels. Personnel working with and operating switchgear are often deeply engaged in safety matters that influence their working conditions.

Laws and directions that prescribe how electrical material and their installations shall be performed to protect personnel and property, have existed in over a hundred years and these regulations are continuously adapted and updated in order to meet today's expectations on personal- and operational safety. New standards have been introduced (EN62271-200 for the switchgear and Cenelec HD637S1 for the installation) which regulate the switchgear design, test and installation.

Safety requirements

The biggest difference between a standard and a direction is that the direction must be applied while a standard is an example on applications that fulfil valid safety requirements, if others can not be shown. This means no big difference for most cases as normally standards are followed. On the other hand will a standard open up for alternative solutions but then it must be shown that the alternatives give the same degree of safety.

Typee tests

When it comes to the question if the equipment fulfil the safety requirements given in the standard, discussions with many angles of incidence can arise. The best and most secure way to prove the withstand ability of the equipment is to perform Typee tests at full current- and voltage levels and under a determined duration. After this it's possible, at reasonable installation conditions, to use computer software programs which based on the measured parameters from the performed Typee tests can simulate the stresses that could arise on the installation and confirm sufficient withstand ability after adaptation.

Pressure relieving

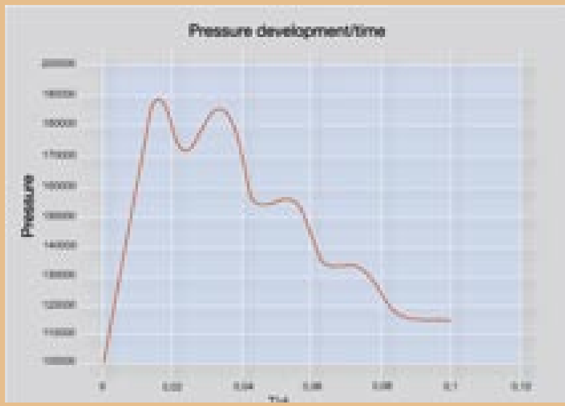
What is stated in the new standard regarding pressure relieve and withstand ability? Following text is stated in Cenelec HD637S1.

- Considering Typee of installation and local conditions, the plant shall be dimensioned and performed so that danger for persons and damage on property shall be avoided.

- When the switchgear is equipped with openings or trenches for pressure relieving, these shall be so mounted that they, at normal functioning, do not expose operating personnel to danger. Collection of dangerous concentrations of gas and/or decomposition products in the switchgear room shall be avoided.

- The building shall be performed with consideration to the mechanical load and eventual inner pressure that can arise due to internal arc at fault.

- If pressure-relieving openings are needed they shall be designed and located so that, when going into function, no persons or property is exposed for damage.



The diagram show how rapid the pressure is built up in a switchgear cubicle, at an internal arc fault.

The diagram above show how rapid the pressure is built up in a switchgear cubicle at an internal arc fault.

The example is taken from Schneider Electric´s software program used on H2000 cubicle for 31,5kA and with a customised installation of the pressure-relieving trench. In this specific case, maximum pressure is reached already after 16 ms. After this it can be seen that the pressure falls when the gas is rushing into the pressure relieving system, and after this is built up again until the flaps in the backside wall opens.

What is important in this context is that the openings in the gas flowing direction are sufficient big and that the design of the pressure relieving trench does not interfere on the pressure rise, so that the switchgear cubicles mechanical withstand is exceeded. It must be emphasised that it never will be possible to close a switchgear cubicle so that the gases will stay in the enclosure and that the cubicle will withstand the pressure rise.

Internal arc

The conclusion of this is that if an internal arc can appear in the switchgear and the design is not strong enough to enclose the arising pressure, it shall be equipped with pressure relieving trenches. The whole system, also including the building if will be integrated in the volume that will be put under pressure at internal arc fault, must be able to show documented withstand ability.
There exist on the market several accessories to limit internal arc fault duration and extension, but in case of non-functioning for these accessories, the switchgear must be able to withstand the stresses it will be exposed for. Accessible accessories is a good complement to limit damages, but dropout of auxiliary voltage, ageing interference on electronics, and EMC disturbances from the short-circuit current, passing through the switchgear at internal arc fault, are examples on matters that can jeopardise the function of these accessories. A gas filled switchgear room or free flying metal parts in the room after a violent explosion and an eventual demolished building due to the overpressure created in the switchgear room, are examples of consequences that the new standard shall protect us from.

Internal arc tests

Elektriska AB Delta has since 1980 performed a lot of internal arc tests where the switchgear cubicle, pressure relieving trench and exhaust flap always has been tested together. This has given us a lot of experience that is used when developing customer adapted solutions. The switchgear panels have always been tested with an internal arc duration of one second and without internal arc limiting devices.

Often the switchgear are supplied with internal arc limiting devices, which give a bonus effect in form of less damages at an eventual internal arc fault. At the same time the passive protection is always there and in case the function of the limiting device should fail, the cubicle will still withstand the pressure rise. For every rising pressure of 0,1bar, the power is rising with 9810N/m_. This also show how important it is that the switchgear cubicle, pressure relieving trench and not least the exhaust flap in the building wall, are tested together in order to secure that, if something is failing, no fire flames or free flying metal parts appear in the switchgear room.

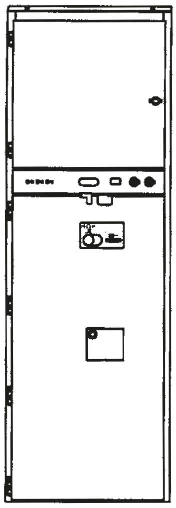
New switchgear standard EN 62271-200

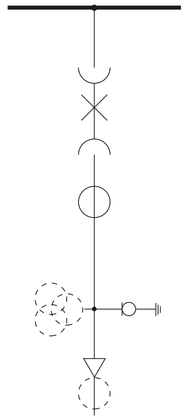
According to appendix A in this standard, the complete system shall be tested together, i.e. switchgear cubicle, pressure relieving trench and exhaust flap, shall be tested together. Dimensions, position and performance with e.g. inspection windows and eventual ventilation openings, shall be documented in the Typee test protocol. Please note that this standard does not cover installation of the switchgear. To achieve high personal safety in a switchgear application, also the switchgear installation and its operating conditions must be taken into consideration by applying the new directions and standards.

Circuit breaker cubicle
Type 03

Basic design:
- ■ busbar
- ■ circuit breaker on withdrawable carriage
- ■ current transformers
- ■ earthing switch
- ■ capacitive voltage detecting system

Options:
- □ voltage transformers
- □ cable current transformers
- □ auxiliary contacts
- □ protection relays
- □ cubicle partition with insulated screens 12 kV ≤ 25 kA
- □ cubicle partition with insulated screens 24 kV ≤ 25 kA
- □ door, mechanically interlocked against earthing switch or switching device
- □ motor operated vertical movement of breaker
- □ multi contact plug for auxiliary wiring between cubicles



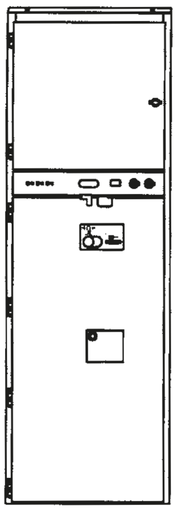


Rated voltage	12 kV	24 kV
Max. rated current cubicle	1250 A	1250 A
Busbar	3000 A	2500 A
Max. short-time withstand current (1s)	40 kA	25k A
Cubicle width (mm)	700-800	1000
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125
Weight (kg) equipped with LF1	630	-
Weight (kg) equipped with SF1	-	700

Spare cubicle
Type 01

Basic equipment:
- ■ busbar
- ■ earthing switch
- ■ door Type 03
- ■ capacitive voltage detecting system

Options:
- □ auxiliary contacts
- □ cubicle partition with insulated screens 12 kV ≤ 25kA
- □ cubicle partition with insulated screens 24 kV ≤ 25 kA
- □ door, mechanically interlocked against earthing switch or switching device
- □ multi contact plug for auxiliary wiring between cubicles



Rated voltage	12 kV	24 kV
Max. rated current cubicle	1250 A	1250 A
Busbar	3000 A	2500 A
Max. short-time withstand current (1s)	40 kA	25 kA
Cubicle width (mm)	700-800	1000
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Circuit breaker cubicle
Type 10

Basic equipment:
- busbar
- circuit breaker on withdrawable carriage
- earthing switch
- capacitive voltage detecting system

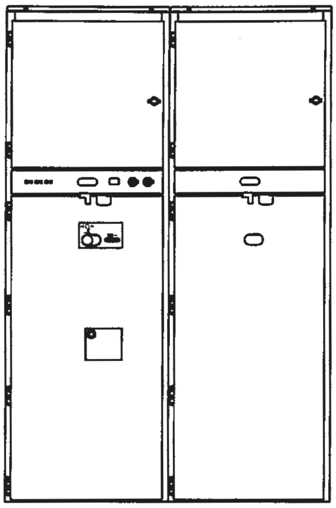
Options:
- ☐ auxiliary contacts
- ☐ protection relays
- ☐ cellindelning m isolerskärmar 12 kV ≤ 25 kA ≤ 1600 A
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ motor operated vertical movement of breaker
- ☐ multi contact plug for auxiliary wiring between cubicles

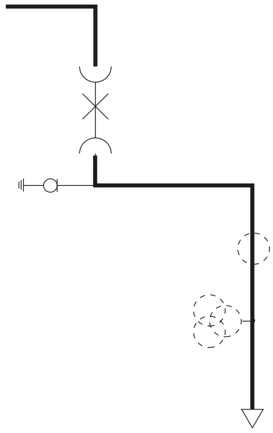
Cable cubicle
Type 12

Basic design:
- busbar

Options:
- ☐ voltage transformers
- ☐ current transformers
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ multi contact plug for auxiliary wiring between cubicles

Incoming- and outgoing feeder Type 10+12



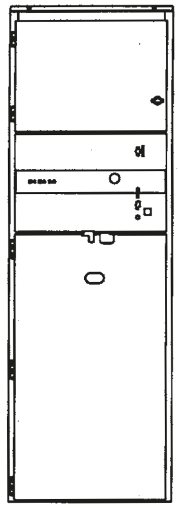


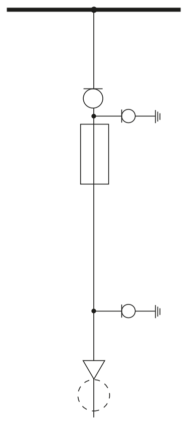
Rated voltage	12 kV	24 kV
Max. rated current cubicle	3000 A	2000 A
Busbar	3000 A	2500 A
Short-time withstand current (1)	40 kA	25 kA
Cubicle width (mm)	700-1000	1000-1100
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125
Weight (kg) equipped with LF3	1700	-

Cubicle with fused load break switch Type 07

Basic design:
- busbar
- fuse load break switch with earthing switch and mechanical trip release
- earthing switch for cable
- capacitive voltage detecting system

Options:
- ☐ cable current transformers
- ☐ auxiliary contacts
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ motor operated device for load break switch



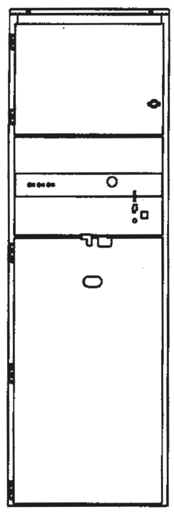


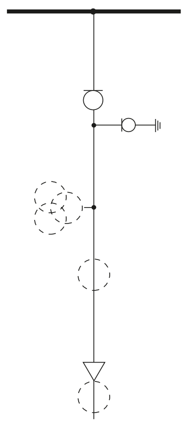
Rated voltage		12 kV	24 kV
Max. rated current cubicle	(max. fuse size 200A)	630 A	630 A
Busbar		3000A	2500 A
Max. short-time withstand current		25kA	20 kA
Cubicle width (mm)		700	700
Cubicle depth (mm)		1435-1525	1670
Cubicle height (mm)		2125	2125

Cubicle with load break switch Type 06

Basic design:
- busbar
- load break switch with earthing switch
- capacitive voltage detecting system

Options:
- ☐ current transformers
- ☐ voltage transformers
- ☐ cable current transformers
- ☐ auxiliary contacts
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ motor operated device for load break switch



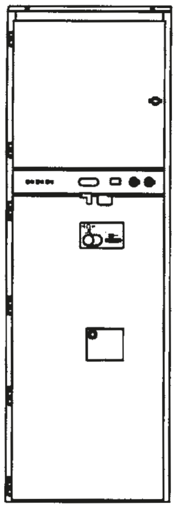


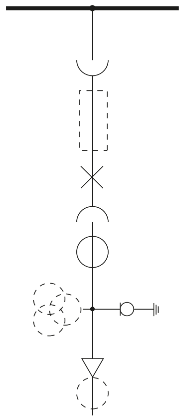
Rated voltage	12 kV	24 kV
Max. rated current cubicle	630 A	630 A
Busbar	3000 A	2500 A
Max. short-time withstand current	25 kA	20 kA
Cubicle width (mm)	700	700
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Cubicle for contactor
Type 04

Basic design:
- ■ busbar
- ■ SF6-contactor (Rollarc) on withdrawable carriage
- ■ current transformers
- ■ earthing switch
- ■ capacitive voltage detecting system

Options:
- ☐ fuse holders
- ☐ voltage transformers
- ☐ cable current transformers
- ☐ auxiliary contacts
- ☐ protection relays
- ☐ cubicle partition with insulated screens ≤ 25 kA
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ motor operated device for vertical movement of contactor
- ☐ multi contact plug for auxiliary wiring between cubicles



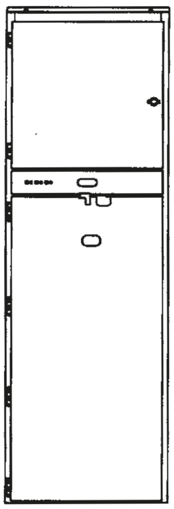


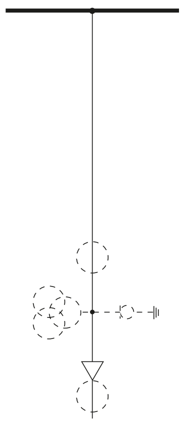
Rated voltage		12 kV
Max. rated current cubicle	(max. fuse size 200A)	400 A
Busbar		3000 A
Max. short-time withstand current		40 kA
Cubicle width (mm)		700-800
Cubicle depth (mm)		1435-1525
Cubicle height (mm)		2125

Cubicle for fixed incoming/outgoing
Type 05

Basic design:
- ■ busbar

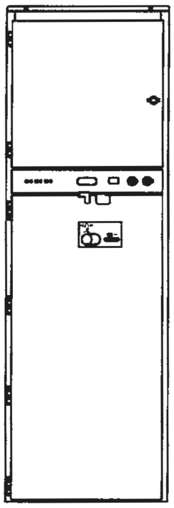
Options:
- ☐ earthing switch
- ☐ capacitive voltage detecting system
- ☐ current transformers ≤ 1600 A
- ☐ voltage transformers
- ☐ auxiliary contacts
- ☐ protection relays
- ☐ door, mechanically interlocked against earthing switch
- ☐ multi contact plug for auxiliary wiring between cubicles

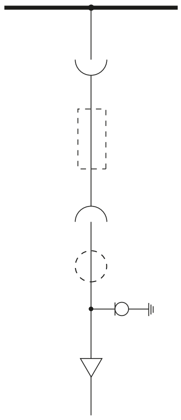




Rated voltage	12 kV	24 kV
Max. rated current cubicle	3000 A	2000 A
Busbar	3000 A	2500 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-1000	1000-1100
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Cubicle for disconnector Type 13



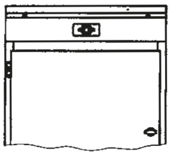


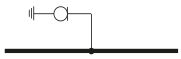
Basic design:
- busbar
- disconnector carriage
- earthing switch
- capacitive voltage detecting system

Options:
- ☐ fuse holders
- ☐ auxiliary contacts
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ motor operated device for movement of disconnector
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ current transformers ≤ 1250 A
- ☐ cubicle partition with insulated screens 12 kV excl. fuses ≤ 25 kA ≤ 1600 A
- ☐ cubicle partition with insulated screens 24 kV excl. fuses ≤ 25 kA ≤ 1250 A

Rated voltage	12 kV	24 kV
Max. rated current cubicle	3000 A	2000 A
Busbar	3000 A	2500 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-1000	1000-1100
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Building-up for earthing of busbar Type 18





Basic design:
- earthing switch

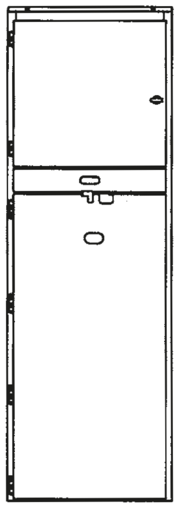
Options:
- ☐ auxiliary contacts
- ☐ capacitive voltage detecting system

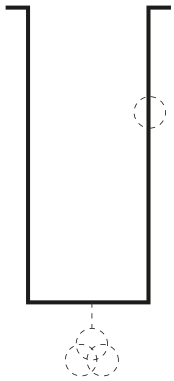
Rated voltage	12 kV	24 kV
Max. short-time withstand current	≤ 31,5 kA	≤ 25 kA
Cubicle height incl. building-up (mm)	2250	2250

Metering cubicle
Type 02

Basic design:
- ■ busbar

Options:
- □ current transformers
- □ voltage transformers
- □ multi contact plug for auxiliary wiring between cubicles



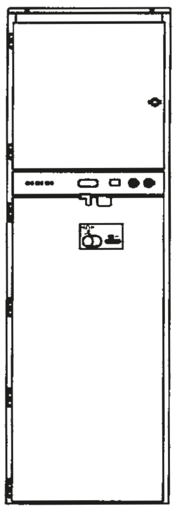


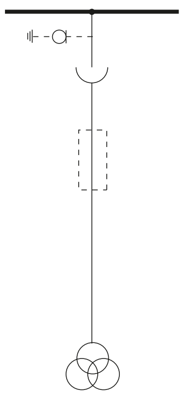
Rated voltage	12 kV	24 kV
Max. rated current cubicle	1250 A	1250 A
Busbar	1250 A	1250 A
Max. short-time withstand current	31,5 kA	25 kA
Cubicle width (mm)	700	1000
Cubicle depth (mm)	1435	1670
Cubicle height (mm)	2125	2125

Metering cubicle
Type 09

Basic design:
- ■ busbar
- ■ voltage transformers on withdrawable carriage

Options:
- □ earthing switch
- □ fuse holders
- □ auxiliary contacts
- □ capacitive voltage detecting system
- □ door, mechanically interlocked against earthing switch or switching device
- □ motor operated device for vertical movement of contactor
- □ multi contact plug for auxiliary wiring between cubicles



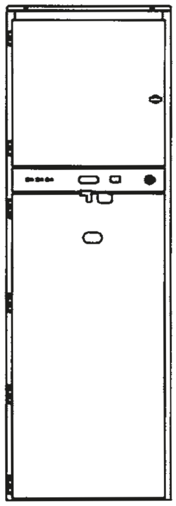


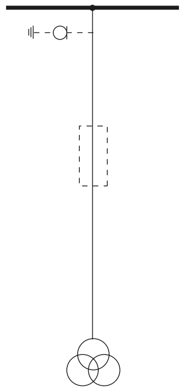
Rated voltage	12 kV	24 kV
Busbar	3000 A	2500 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-800	1000
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Cubicle for voltage metering in busbar Type 19

Basic design:
- ■ busbar
- ■ voltage transformers

Options:
- ☐ earthing switch
- ☐ capacitive voltage detecting system
- ☐ auxiliary contacts
- ☐ door, mechanically interlocked against earthing switch
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ fuse holders

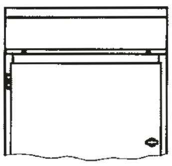


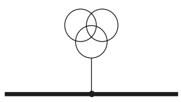


Rated voltage	12 kV	24 kV
Busbar	3000 A	2500 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-1000	1000
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

Voltage metering in busbar Type 17

Basic design:
- ■ voltage transformers





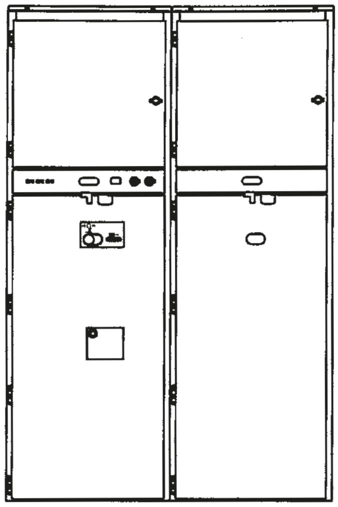
Rated voltage	12 kV	24 kV
Max. short-time withstand current	≤ 31,5 kA	≤ 25 kA
Cubicle height incl. building-up (mm)	2300	2300

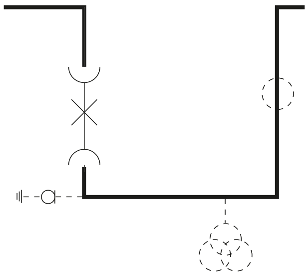
Cubicle for sectionalising of busbar Type 10

Basic design:
- busbar
- circuit breaker on withdrawable carriage

Options:
- ☐ capacitive voltage detecting system
- ☐ auxiliary contacts
- ☐ protection relays
- ☐ cellindelning m isolerskärmar 12 kV ≤ 25 kA ≤ 1600 A
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ motor operated vertical movement of breaker
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ earthing switch

Busbar coupling Type 10+11



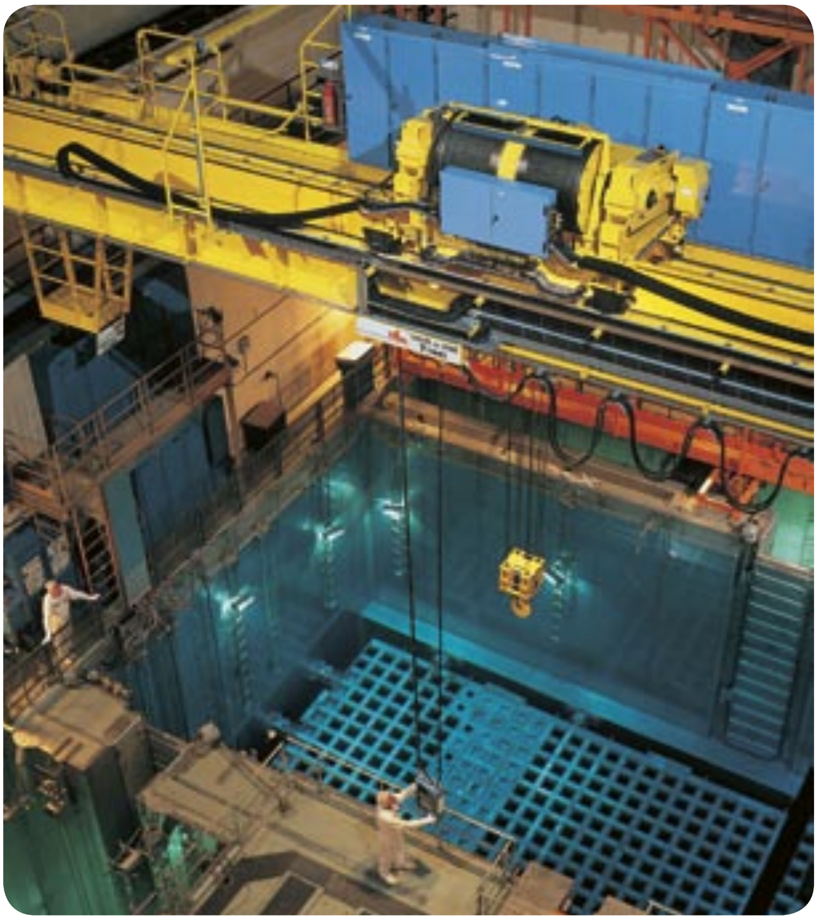


Cubicle for connecting to busbar Type 11

Basic design:
- busbar

Options:
- ☐ current transformers
- ☐ voltage transformers
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ multi contact plug for auxiliary wiring between cubicles

Rated voltage	12 kV	24 kV
Max. rated current cubicle	3000 A	2000 A
Busbar	3000 A	2000 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-1000	1000-1100
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125



Cubicle for break switch Type 16

Basic design:
- busbar
- break switch with earthing switch
- capacitive voltage detecting system

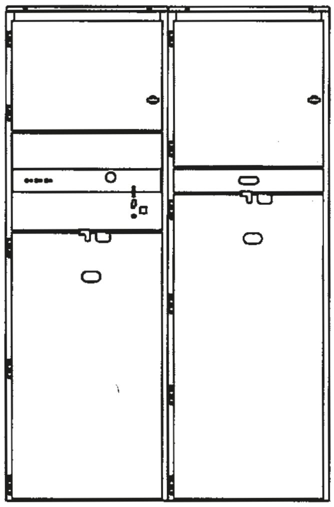
Options:
- ☐ auxiliary contacts
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ motor operated device for load break switch

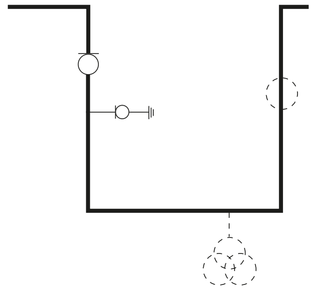
Cubicle for connecting to busbar Type 11

Basic design:
- busbar

Options:
- ☐ current transformers
- ☐ voltage transformers
- ☐ multi contact plug for auxiliary wiring between cubicles

Busbar coupling Type 16+11





Rated voltage	12 kV	24 kV
Max. rated current cubicle	630 A	630 A
Busbar	630 A	630 A
Max. short-time withstand current	25 kA	20 kA
Cubicle width (mm)	700	700-1000
Cubicle depth (mm)	1435	1670
Cubicle height (mm)	2125	2125

Cubicle for sectionalising Type 14

Basic design:
- disconnector carriage
- busbar

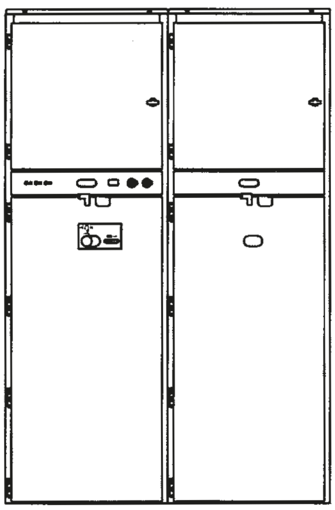
Options:
- ☐ earthing switch
- ☐ cellindelning m isolerskärmar 12 kV excl. fuses ≤ 25 kA ≤ 1600 A
- ☐ auxiliary contacts
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ motor operated device for movement of disconnector
- ☐ multi contact plug for auxiliary wiring between cubicles
- ☐ fuse holders
- ☐ capacitive voltage detecting system

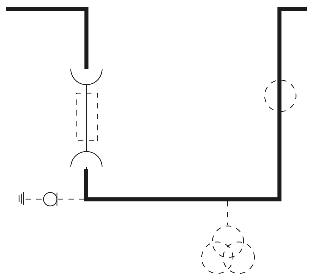
Cubicle for connecting to busbar Type 11

Basic design:
- busbar

Options:
- ☐ strömtransformator
- ☐ spänningstransformator
- ☐ door, mechanically interlocked against earthing switch or switching device
- ☐ multi contact plug for auxiliary wiring between cubicles

Busbar coupling Type 14+11

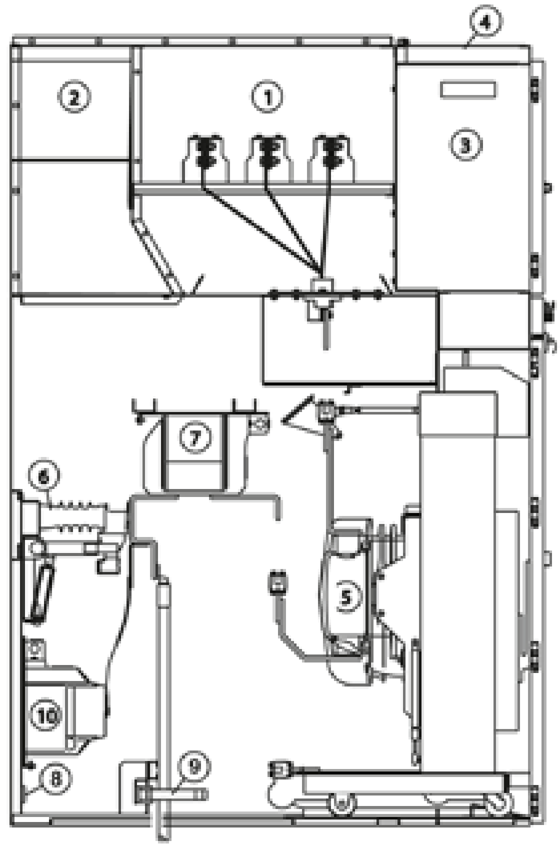




Rated voltage	12 kV	24 kV
Max. rated current cubicle	3000 A	2000 A
Busbar	3000 A	2000 A
Max. short-time withstand current	40 kA	25 kA
Cubicle width (mm)	700-1000	1000-1100
Cubicle depth (mm)	1435-1525	1670
Cubicle height (mm)	2125	2125

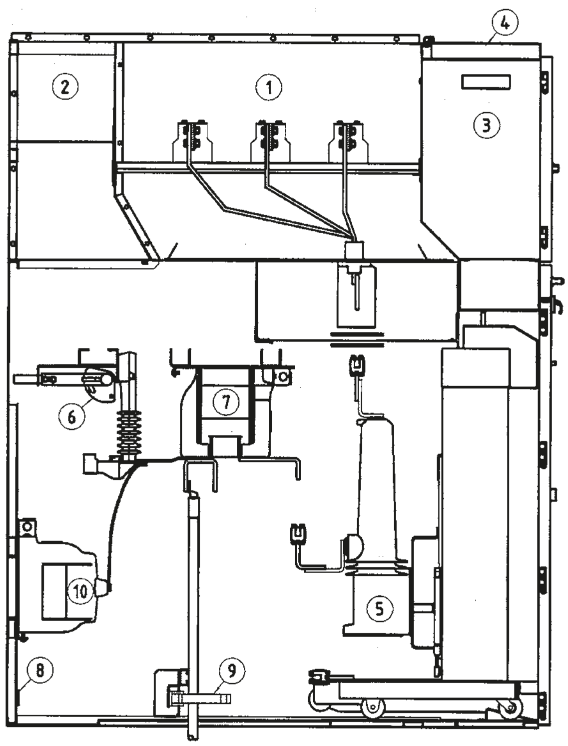
12 kV

1. busbar with fixed contacts
2. pressure release compartment
3. low voltage compartment
4. channel for secondary cables
5. circuit breaker on withdrawable carriage
6. earthing switch
7. current transformers
8. earth busbar
9. cable current transformer
10. voltage transformers



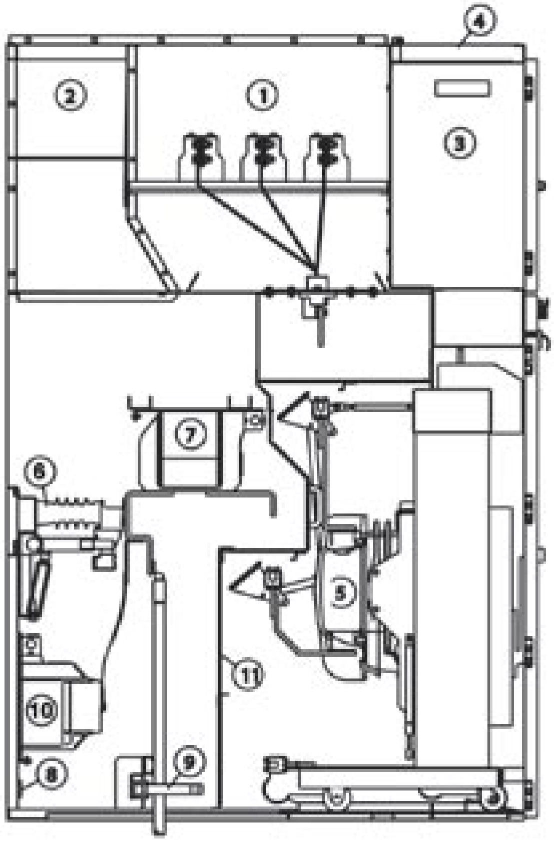
24 kV

1. busbar with fixed contacts
2. pressure release compartment
3. low voltage compartment
4. channel for secondary cables
5. circuit breaker on withdrawable carriage
6. earthing switch
7. current transformers
8. earth busbar
9. cable current transformer
10. voltage transformers



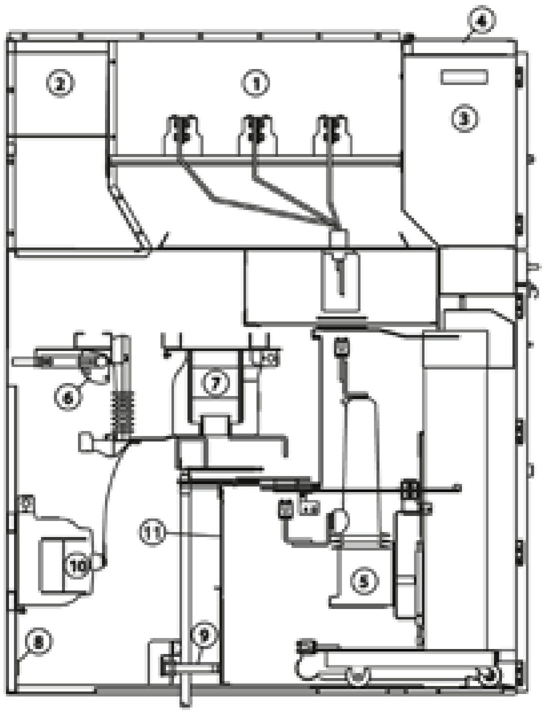
12 kV

1. busbar with fixed contacts
2. pressure release compartment
3. low voltage compartment
4. channel for secondary cables
5. circuit breaker on withdrawable carriag
6. earthing switch
7. current transformers
8. earth busbar
9. cable current transformer
10. voltage transformers
11. insulating screens



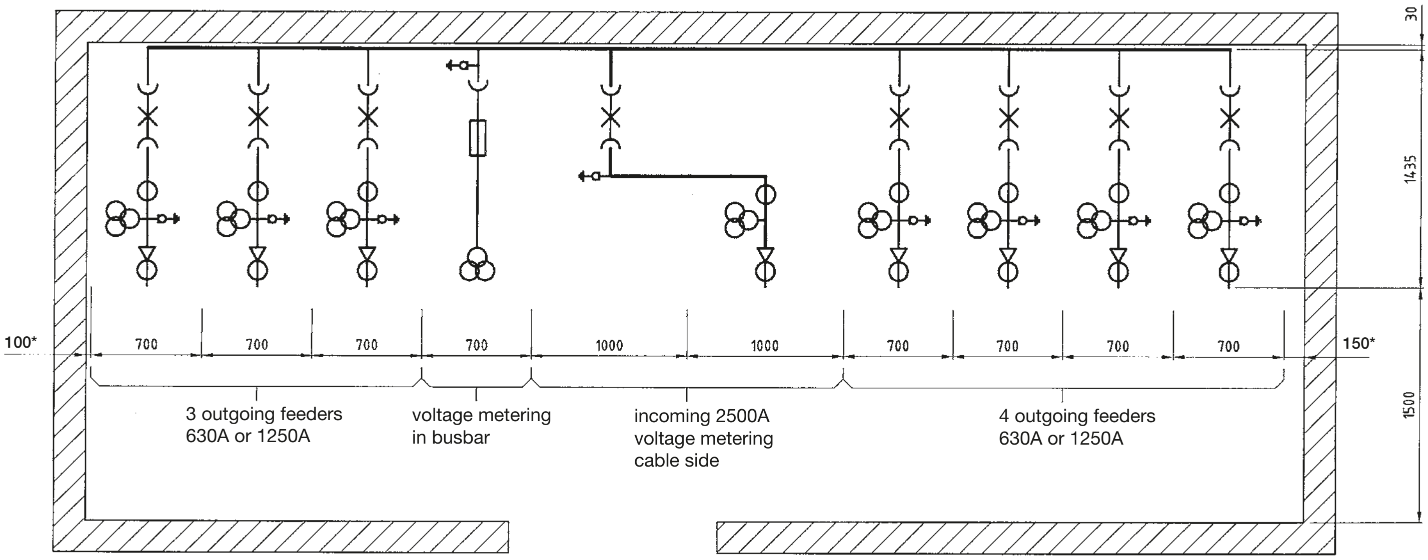
24 kV

1. busbar with fixed contacts
2. pressure release compartment
3. low voltage compartment
4. channel for secondary cables
5. circuit breaker on withdrawable carriage
6. earthing switch
7. current transformers
8. earth busbar
9. cable current transformer
10. voltage transformers
11. insulating screens



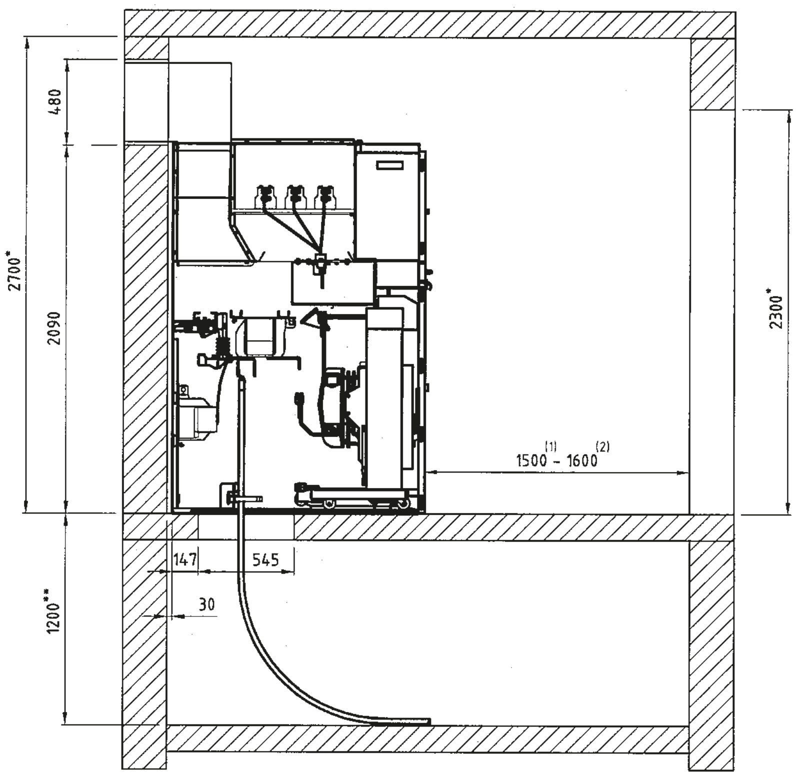
Example of switchgear plant

(12kV, 1 incoming feeder, 1 cubicle for voltage metering, several outgoing feeders)



Switchgear room with switchgear floor

(*) minimum distance
(**) minimum distance depending on the bending radius of the cable
(1) minimum distance for normal service
(2) minimum distance for removing one cubicle (wit-



Schneider Electric Sverige AB

Box 1009
611 29 Nyköping
Tel: 0155-26 54 00
Fax: 0155-21 42 86
info@se.schneider-electric.com
www.schneider-electric.se