NORELCO
Nordic Electric Company

NorMega

Withdrawable MV switchgear

Customised power distribution
and automation solutions
for every need.

POWERING PEOPLE AND PLANET

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NorMega withdrawable MV switchgear

NorMega is a heavy-duty MV switchgear designed to meet all power distribution needs. This air-insulated withdrawable circuit breaker switchgear is ideally suited for demanding applications in both energy distribution and industrial environments.

Versatile and safe technical solutions

The circuit breaker and protection relay systems are always tailored to meet the specific requirements and preferences of each customer. The scope of delivery is flexible and can include, for example, design services, on-site installation, or comprehensive turnkey solutions.

Norelco has extensive experience in meeting the stringent requirements of energy utilities. Manufactured in Finland, NorMega is a reliable solution designed for decades of operation in substation environments. Commissioning is straightforward, and operation is clear and user-friendly.

Long service life has been a guiding principle throughout the product's lifecycle design. High-quality materials and components are used throughout, and the mechanical strength of the switchgear structure represents top-tier performance in the market.

Norelco designs and tests its switchgear products in-house to the greatest extent possible. The most demanding tests are carried out in independent laboratories. NorMega has been short-circuit and arc-fault tested at an accredited laboratory in Germany.

In addition, all switchgear assemblies undergo final testing at the factory in accordance with the ISO 9001 quality system and IEC standards. These include functional tests as well as all other required tests and measurements. As standard, testing includes a power-frequency withstand voltage test for one minute, performed at either 28 kV or 50 kV depending on the rated voltage.

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Experience is the key to successful projects

Project management is an integral part of Norelco's daily operations. The company has extensive experience in a wide range of switchgear deliveries, all of which are executed carefully and systematically. Changes to project schedules are handled with flexibility, and the scope of delivery can be adapted to meet project-specific requirements.

As a leading switchgear manufacturer, Norelco has the resources and expertise to deliver solutions for power distribution needs of all sizes and types. This experience ranges from individual switchgear deliveries to complete power distribution systems for entire plants or facilities. Reliable switchgear is never the result of chance; it is based on carefully considered and proven technical solutions. The design of NorMega takes into account, among other things, the following:

- Minimisation of eddy currents through the use of aluminium plates
- Electrical field modelling using CAD software
- Optimisation of electric fields through component geometry and arrangement
- Use of advanced insulating materials and the most reliable components available on the market

Well-executed design enhances usability

NorMega is built on domestic product design that takes Finnish requirements and operating conditions into account. Over 60 years of experience in switchgear design, combined with a strong position in the domestic market, ensures long-term product support for decades to come.

The design also takes into account the limited lifecycle of components. Key components can be replaced later with alternative models if needed, supporting the long-term usability and upgradeability of the switchgear.

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Versatile options

Structure

NorMega is one of the most versatile switchgear solutions on the market, ensuring the most suitable configuration for any application. Structurally, there are two main types of switchgear and two withdrawable unit options. In addition, a wide range of component alternatives is available.

NorMega is a metal-enclosed switchgear, available in two structural types based on internal compartmentalisation (Metal-Clad and Cubicle). The compartments are separated by single- and double-layer metal partitions (PM).

NorMega switchgear is manufactured from hot-dip galvanised steel sheet, protected against white rust. Metal parts are epoxy powder-coated, with enclosures finished in RAL 9016. The use of standard components assembled with bolted connections ensures a highly rigid structure, supporting reliable operation long into the future.

Structural options

The Metal-Clad switchgear (LSC-2B-PM) is a metal-enclosed design with four separate compartments:

- circuit breaker compartment
- busbar compartment
- secondary equipment compartment
- cable compartment

The Cubicle switchgear (LSC-2A-PM) is a compartmentalised design with three separate compartments:

- circuit breaker and cable compartment
- busbar compartment
- secondary equipment compartment

Multiple standard cubicle types

The NorMega system consists of the following standard cubicle types, which can be implemented with either half-height or full-height withdrawable units:

- circuit breaker cubicle
- disconnector cubicle
- bus coupler cubicle
- metering cubicle
- fused load break switch / load break switch cubicle
- auxiliary transformer cubicle

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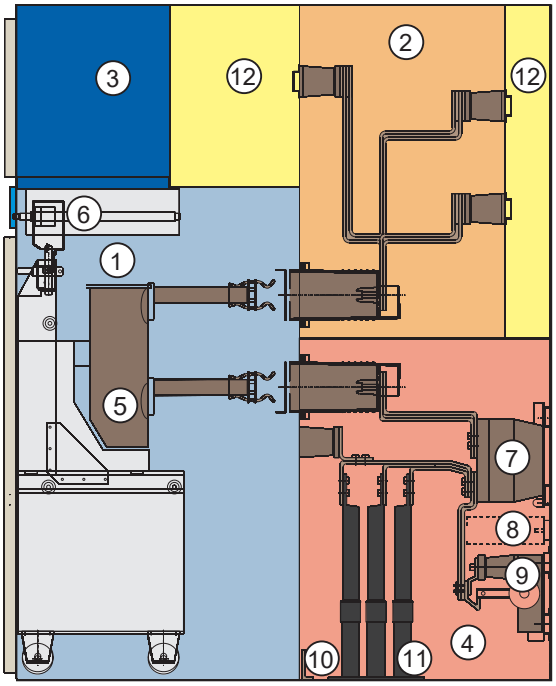
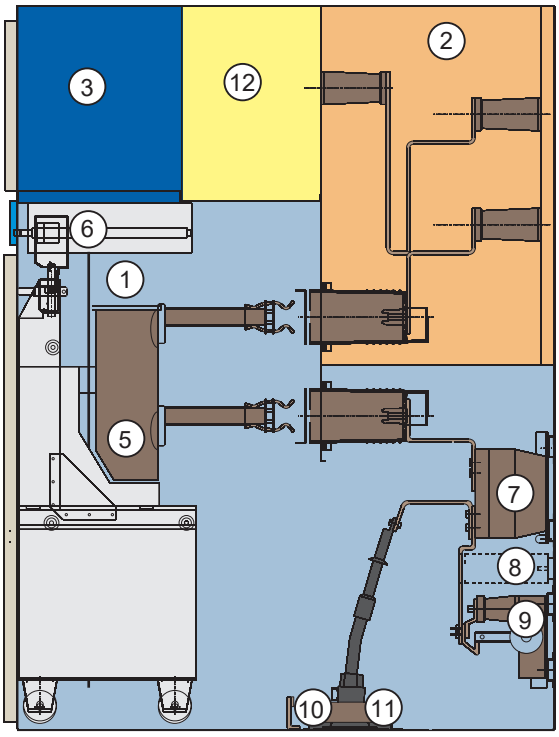
NorMega components

1. Circuit breaker compartment
2. Busbar compartment
3. Secondary equipment compartment
4. Cable compartment
5. Circuit breaker with withdrawable unit
6. Withdrawable unit racking mechanism
7. Current transformer
8. Surge arrester
9. Earthing switch
10. PE busbar
11. Cable current transformer
12. Internal pressure relief duct system



Metal-Clad switchgear with a full-height withdrawable unit.



Cubicle switchgear with a full-height withdrawable unit.

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Circuit breaker compartment and withdrawable solutions

In all feeder types, two different withdrawable solutions can be used:

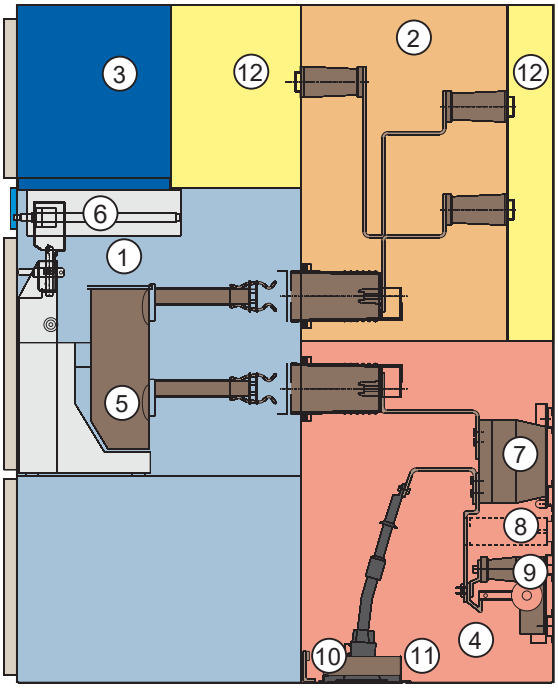
- full-height withdrawable unit
- half-height withdrawable unit

In the full-height withdrawable unit, the device is fixed to a carriage that moves on its own wheels along the floor. Handling the full-height unit during operation and maintenance is straightforward. Each feeder is equipped as standard with a retractable transfer ramp, enabling easy insertion and withdrawal of the unit even on uneven floors.

In the half-height withdrawable unit, the device is fixed to a half-height carriage. The unit is first transferred onto a separate transport trolley and mechanically locked in place. The large wheels allow easy movement and positioning of the units. When moving the unit into the switchgear, it is automatically aligned using positioning wheels, after which it is secured in place with a robust and precise locking mechanism. The innovative design allows the use of circuit breakers from multiple manufacturers, ensuring flexibility for future extensions and modifications.

Circuit breaker feeders include, among others, the following equipment:
- circuit breaker with transfer trolley (full- or half-height unit)
- control panel
- upper and lower metal shutters / PM (metal-clad)
- upper shutters / PM (cubicle)
- lighting
- multi-pole plug connector for the circuit breaker
- optional motorised racking mechanism

Metal-Clad switchgear with a half-height withdrawable unit.



Circuit breakers
Thanks to an innovative mounting solution, the NorMega busbar system is compatible with circuit breakers from different manufacturers. Circuit breakers are equipped with a spring charging motor, the necessary trip coils, and auxiliary contacts. Control signals are connected to the secondary compartment via a multi-pole plug connector. The circuit breakers are fitted with phase-specific busbars and reliable short-circuit-resistant tulip-type main contacts. Insulation of the busbars is ensured through the use of EPDM material. The circuit breaker can be operated via push buttons on the control panel or, alternatively, via programmable push buttons on the protection relay.

Shutters
When the withdrawable unit is in the withdrawn position, metal shutters automatically cover the live parts (internal compartmentalisation IP20).

Cable and busbar compartments

The following equipment is installed in the cable compartment:

- earthing switch
- current transformers and voltage transformers
- cable current transformer
- surge arresters
- cable terminations

Earthing switch
The earthing switch is a three-pole, fault-make earthing switch with snap-action operation, which can be equipped with auxiliary contacts. The earthing switch is operated from the control panel. Maloperation is prevented by means of mechanical interlocking.

Instrument transformers
The compartment is designed for up to three busbar current transformers and one cable current transformer. Either freely dimensioned or DIN-standard current transformers can be used, all sharing the same frame size regardless of current rating or manufacturer. This makes replacement of current transformers straightforward.

Surge arresters
It is possible to install three surge arresters in the cable compartment.

Cable terminations
The installation space required for cables has been maximised, as there are no mechanical obstructions at the front of the cable compartment. Incoming cables are secured to an adjustable cable support equipped with a C-rail. Cable entries are implemented using prefabricated metal entry blocks, which seal the entries to withstand internal pressure. These entry blocks allow optimisation of cable routing positions.

Fire sealing is implemented below the entry blocks to ensure pressure resistance. An A60 fire barrier is installed internally between the entry blocks and the base plate of the switchgear, while an A120 fire barrier is installed externally beneath the base plate.

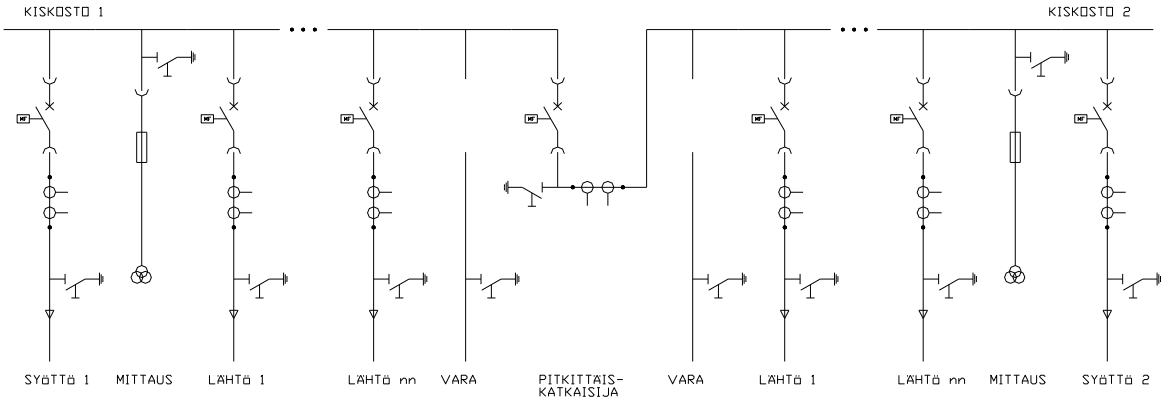
Busbar compartment
NorMega switchgear features a fully enclosed busbar compartment running the entire length of the assembly, housing air-insulated main busbars and upper branch busbars. Copper or aluminium is used as the busbar material.

Excellent impulse voltage withstand performance is ensured, for example, by the rounded shape of the busbars. The passage between the circuit breaker compartment and the busbar compartment is implemented using a pressure-resistant bushing insulator.

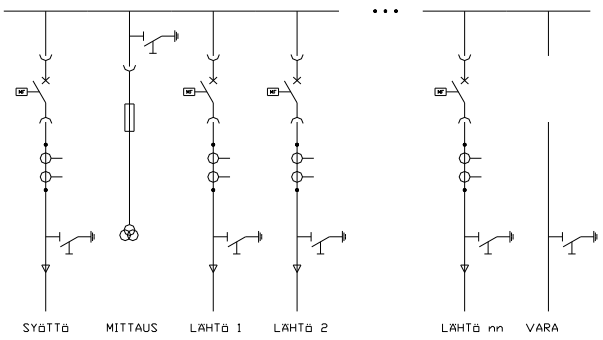
Busbar systems

The following busbar configurations can be implemented in NorMega switchgear:

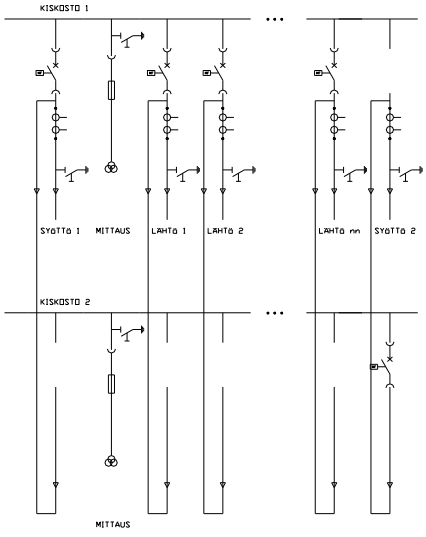
- single busbar system
- single busbar system with bus coupler
- duplex busbar system with cable connection
- semi-duplex busbar system, where part of the feeders are duplex feeders



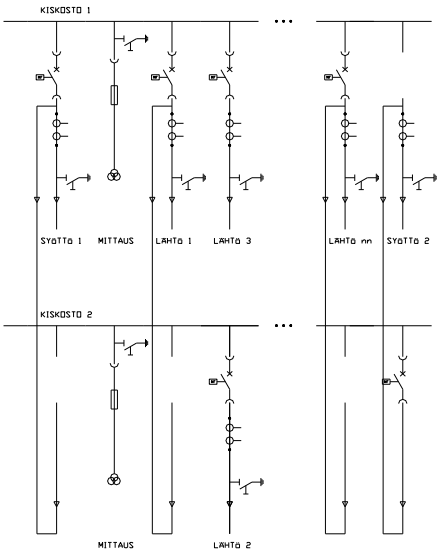
Single busbar system with bus coupler



Extended single busbar system



Duplex busbar system



Semi-duplex busbar system

Secondary equipment compartment

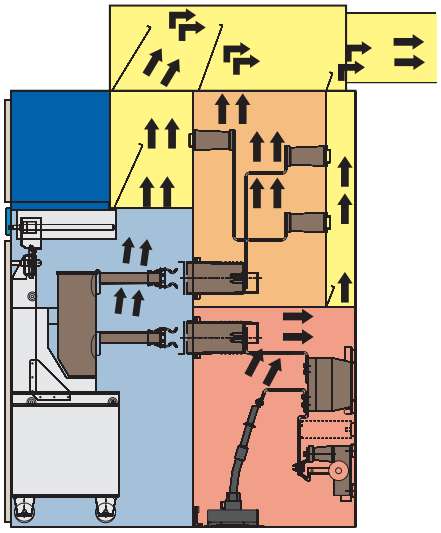
Protection relays and other control devices are installed in the secondary equipment compartment. The robust, hinged door of the compartment can be equipped as required with meters, control switches, and other control components. NorMega is compatible with protection relays from most major manufacturers.

The secondary equipment compartment is fitted with DIN rails and cable ducts. Control signal looping from one feeder to another is implemented via a multi-pole control plug, enabling fast installation of the switchgear. Control cabling can be routed from each feeder either through the top or, alternatively, from the end of the switchgear using an internal wiring duct for control cables.

Arc protection can be implemented using most arc protection relays available on the market. We recommend fibre-optic or loop-based arc protection relays due to their superior level of protection.

Pressure relief ducts
The switchgear is equipped with internal pressure relief ducts, whose performance has been verified through arc-fault testing. These ducts are integrated into the structure and extend along the full length of the switchgear. Internal pressure released within the switchgear is directed through the ducts either above the switchgear or, via an external duct system, out of the switchgear room.

When an external duct system is used, a collection hood is installed on top of the switchgear, to which the external ducting is connected. In this case, the roof plates of the other cubicles are fixed, and the cubicle fitted with the collection hood is equipped with pressure relief flaps. If no external ducting is used, each cubicle is fitted with its own pressure relief flaps.
If required, the switchgear can also be equipped with an arc protection relay to ensure personnel safety.



Arc-fault pressure is directed out of the switchgear ia an arc-tested pressure relief duct system (Metal-Clad design shown).

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Control panel and accessories

One of the key design principles of NorMega is safe and user-friendly operation. All switching operations are performed from the control panel, which is located on the front panel at an ergonomically optimal height. Functions are operated via a three-position selector switch that guides the user's actions and prevents incorrect operations.

The control panel integrates the circuit breaker racking mechanism, operation of the earthing switch, and a reliable mechanical emergency stop switch. The operating positions and the positions of different devices and mechanisms are presented in a dedicated table.

The user is guided to always close the earthing switch before racking the withdrawable unit and, correspondingly, to open the earthing switch before closing the circuit breaker. Before removing the withdrawable unit from the switchgear, the auxiliary voltage plug must be disconnected.

The control panel also includes mechanical position indicators for both the withdrawable unit and the earthing switch. Operation is only possible when the door is closed and locked. Live contacts are always protected by metal shutters when the circuit breaker is in the disconnected or open position. In the disconnected position, control functions of the circuit breaker can be tested with the auxiliary voltage plug connected.

The control panel is equipped with a mechanical emergency stop switch for opening the circuit breaker in emergency situations. More detailed information is provided in the separate NorMega operating manual.

Comprehensive range of accessories

Optional accessories include, among others:
- arc protection
- capacitive voltage indication
- surge arresters
- space heaters for compartments
- external pressure relief duct system
- busbar links
- motorised operation of the withdrawable unit

Position	Main switch-gear	Earthing switch	Shutters	Control plug	Door
closed	closed	open	open	closed	closed
disconnected position	open	closed	closed	closed	open
open position	open	closed	closed	open	open

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NorMega technical specifications

	NorMega 12	NorMega24
Standards	IEC 62271-1, IEC 62271-200	IEC 62271-1, IEC 62271-200
Rated voltage	Ur 12 kV	Ur 24 kV
Rated current	Ir max. 2500A	Ir max. 2000A
Short-time withstand current, main circuit	Ik (1s) max. 40kA	Ik (1s) max. 25kA
Short-time withstand current, earthing circuit	Ik (1s) max. 40kA	Ik (1s) max. 25kA
Peak withstand current	Ip max. 100kA	Ip max. 63kA
Internal arc classification	40 kA, 0.3 s, A FLR	25 kA, 0.3 s, A FLR
Power-frequency withstand voltage, 1 min (50 Hz)	Ud 28 kV	Ud 50 kV
Lightning impulse withstand voltage (1.2/50 µs)	Up 75 kV	Up 125 kV
Frequency	fr 50Hz	fr 50Hz
Degree of protection (enclosure)	IP 30	IP 30
Internal segregation	IP 20	IP 20
Metal-Clad dimensions:		
-Cubicle width	800 mm	1000 mm
-Cubicle depth	1770 mm	1770 mm
-Height	2200 mm	2200 mm
Cubicle dimensions:		
-Cubicle width	800 mm	1000 mm
-Cubicle depth	1620 mm	1620 mm
-Height	2200 mm	2200 mm

Permissible operating conditions for the switchgear

- maximum ambient temperature up to 40°C; average temperature over a 24-hour period not exceeding 35°C
- minimum ambient temperature not below 0°C
- average relative humidity up to 95% over a 24-hour period, non-condensing
- average vapour pressure up to 1.8 kPa over a one-month period, non-condensing
- direct sunlight must be avoided
- installation altitude not exceeding 1000 m above sea level
- the environment must be free from excessive dust or smoke
- the ambient air must not contain corrosive or flammable gases, vapours, or salt

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Switchgear testing

The following type tests, among others, have been performed for NorMega:

- short-circuit test of the main circuit: 25 kA (1 s), 63 kA
- short-circuit test of the earthing circuit: 25 kA (1 s), 63 kA
- testing carried out on both the switchgear structure and the earthing of the withdrawable unit
- internal arc test: 25 kA, 0.3 s, AFLR
- lightning impulse test: 125 kV, 1.2/50 µs
- temperature rise test

All switchgear assemblies undergo quality inspection in accordance with Norelco's ISO 9001 system. In addition to standard routine tests, the following tests are always performed:

- power-frequency withstand voltage test on the main circuit: 28/50 kV, 50 Hz, 1 min
- voltage test of secondary circuits
- mechanical operation tests
- electrical operation tests
- wiring inspection

Protection relay testing is usually carried out at the factory prior to delivery to site, but can also be performed on-site if required.

Switchgear delivery also includes services

Norelco brings its full experience to support customers throughout the design and manufacturing phases of the switchgear. Needs assessment and any customer-specific modifications are carried out in close cooperation with project managers and designers.

The delivery scope can include circuit design, installation, and commissioning of the switchgear as required. Norelco has decades of experience in delivering both domestic and international projects.

Easy installation

NorMega features a highly spacious cable compartment. Thanks to modern component layout, both half-height and full-height withdrawable switchgear provide ample space for connections. The rigidity of the structure enables fast and straightforward installation.

Generous connection space for medium-voltage cables

Medium-voltage cable entries are implemented using metal entry blocks that seal the entries to withstand internal pressure. Alternatively, insulating entry flanges can be used. The PE busbar in the cable compartment runs along the full length of the switchgear, allowing easy installation of cable screens.

Cable current transformers are typically installed inside the switchgear, which further simplifies installation. Standard bolted straight indoor terminations are suitable for medium-voltage cable terminations. Terminations can be completed inside the switchgear, increasing installation reliability. Cables are secured to an adjustable cable support equipped with a C-rail.

Ease of installation

Control signal looping from one feeder to another is implemented via a multi-pole control plug. The horizontal busbar system consists of modular sections for each panel, allowing easy extension of the switchgear at a later stage.

Control cabling can be routed from each panel either through the top or, alternatively, from the end of the switchgear using an internal cable routing channel. More detailed installation instructions are provided in the separate installation and operating manuals.

Norelco has extensive experience in on-site installation of switchgear and turnkey replacement of existing systems. We also deliver complete NorSwitch substation buildings fully assembled and equipped at the factory.

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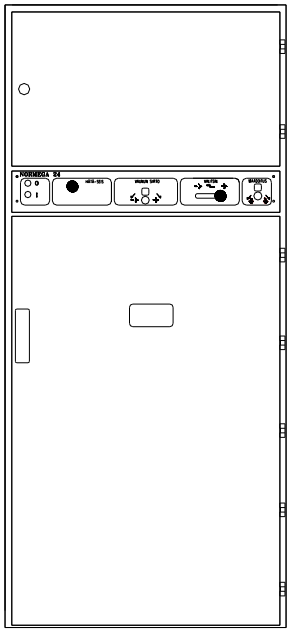
Standard cubicle configurations

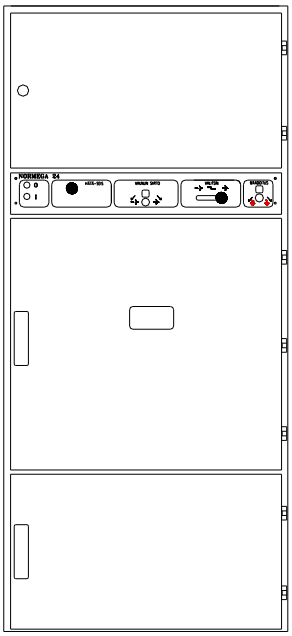
Circuit breaker cubicle, CBRE24_F/H

Standard equipment:
- main busbar system
- circuit breaker in a withdrawable unit
- full-height unit, CBRE24_F
- half-height unit, CBRE24_H
- auxiliary circuits of the unit with plug connector
- fault-make earthing switch
- mechanical interlocking between door, unit, circuit breaker, and earthing switch
- current transformers
- inter-cubicle auxiliary circuit plug connector
- cubicle lighting / maintenance light

Options:
- protection relay
- surge arresters
- cable current transformer
- auxiliary contacts
- motorised racking of the withdrawable unit

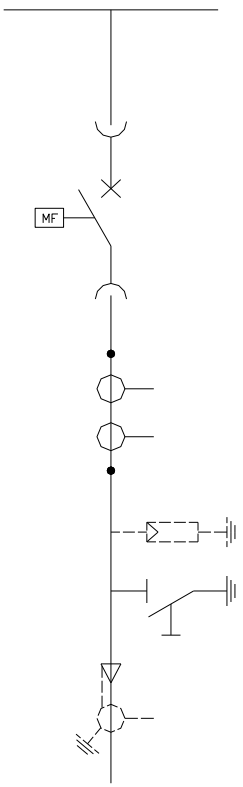


Full-height withdrawable unit



Half-height withdrawable unit

Technical specifications of the circuit breaker cubicle		
Withdrawable unit type	Full-height with-drawable unit CBRE12_F	Full-height withdrawable unit CBRE24_F
	Half-height with-drawable unit CBRE12_H	Half-height withdrawable unit CBRE24_H
Rated voltage	12 kV	24 kV
Rated current	max. 2500A	max. 2000A
Short-circuit withstand current	max. 40kA(1s), 100kA	max. 25kA(1s), 63kA
Dielectric withstand strength	28kV/75kV	50kV/125kV
Internal arc withstand capability	40kA	25kA
Cubicle width	800mm	1000mm
Cubicle height	2200mm	2200mm
Cubicle depth	1770mm metal-clad 1620mm cubicle	1770mm metal-clad 1620mm cubicle
Cubicle weight	n.1050 kg, Ir› =2000A n.910 kg, Ir‹2000A	n.1050 kg, Ir=2000A n.910 kg, Ir‹2000A



Circuit breaker cubicle

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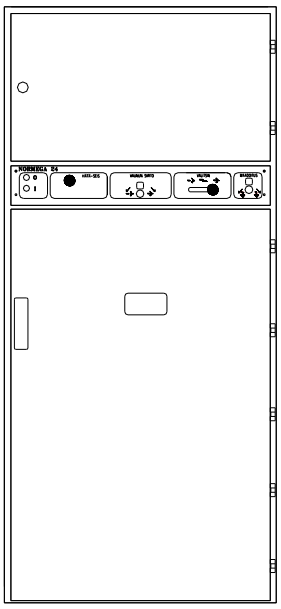
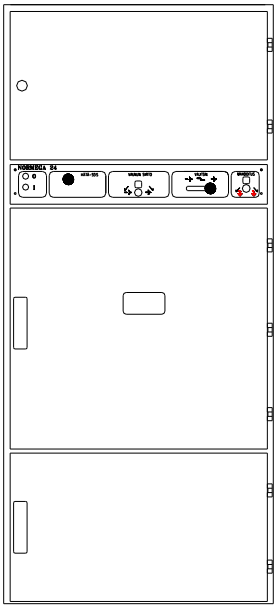
Reserve cubicle, RESE24_F/H

Standard equipment:
- main busbar
- cubicle with half-height or full-height withdrawable unit
- full-height unit, RESE24_F
- half-height unit, RESE24_H
- fault-make earthing switch
- mechanical interlocking between door, unit, circuit breaker, and earthing switch
- inter-cubicle auxiliary circuit plug connector
- cubicle lighting

Options:
- auxiliary contacts

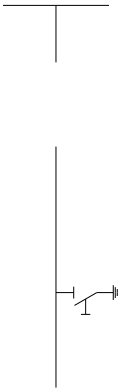


Full-height withdrawable unit



Half-height withdrawable unit

Technical specifications of the reserve cubicle		
Withdrawable unit type	RESE12_F	RESE24_F
	RESE12_H	RESE24_H
Rated voltage	12 kV	24 kV
Rated current	max. 2500A	max. 2000A
Short-circuit withstand current	max. 40kA(1s), 100kA	max. 25kA(1s), 63kA
Dielectric withstand strength	28kV/75kV	50kV/125kV
Internal arc withstand capability	40kA	25kA
Cubicle width	800mm	1000mm
Cubicle height	2200mm	2200mm
Cubicle depth	1770mm metal-clad 1620mm cubicle	1770mm metal-clad 1620mm cubicle
Cubicle weight	690kg	690kg



Reserve cubicle

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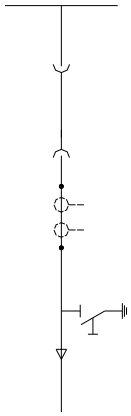
Disconnector cubicle, DISC24_F/H

Standard equipment:
- main busbar system
- withdrawable disconnector unit
- full-height unit, DISC24_F
- half-height unit, DISC24_H
- fault-make earthing switch
- mechanical interlocking between door, disconnector unit, and earthing switch
- inter-cubicle auxiliary circuit plug connector
- cubicle lighting

Options:
- current transformers
- surge arresters

Dimensions and technical specifications are the same as for the reserve cubicle.

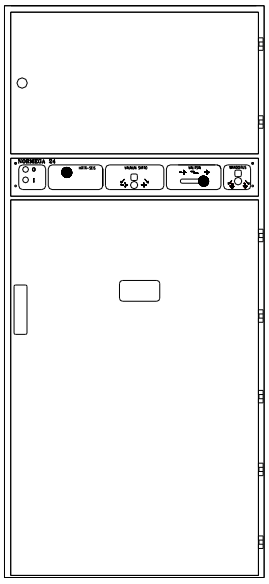


Disconnector cubicle

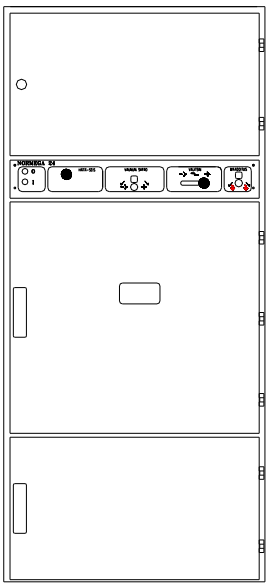
Metering cubicle, MEAS24_F/H

Standard equipment:
- main busbar system
- voltage transformers
- withdrawable disconnector unit
- full-height unit, MEAS24_F
- half-height unit, MEAS24_H
- mechanical interlocking between door, unit, and earthing switch
- fault-make earthing switch
- inter-cubicle auxiliary circuit plug connector
- cubicle lighting

Options:
- fuses

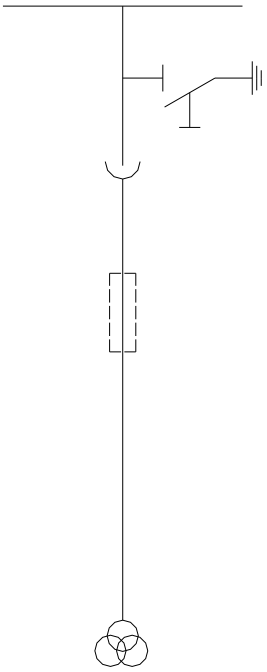


Full-height withdrawable unit



Half-height withdrawable unit

Technical specifications of the metering cubicle		
Withdrawable unit type	MEAS12_F	MEAS24_F
	MEAS12_H	MEAS24_H
Rated voltage	12 kV	24 kV
Rated current	max. 2500A	max. 2000A
Short-circuit withstand current	max. 40kA(1s), 100kA	max. 25kA(1s), 63kA
Dielectric withstand strength	28kV/75kV	50kV/125kV
Internal arc withstand capability	40kA	25kA
Cubicle width	800mm	1000mm
Cubicle height	2200mm	2200mm
Cubicle depth	1770mm metal-clad 1620mm cubicle	1770mm metal-clad 1620mm cubicle
Cubicle weight	690kg	690kg

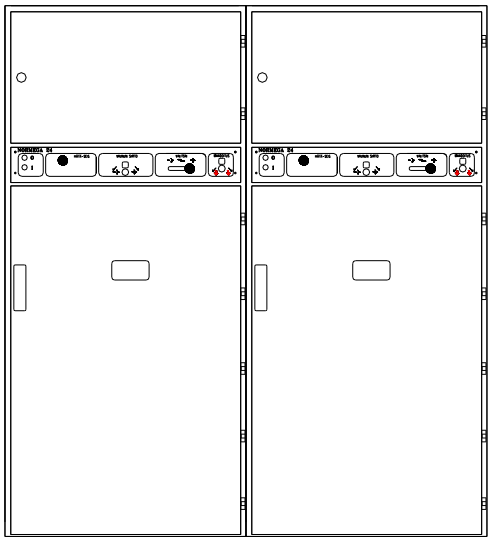


Metering cubicle

Bus coupler cubicle, BCBR24_F/H

Standard equipment:
- main busbar system
- circuit breaker in a withdrawable unit
- full-height unit, BCBR24_F
- half-height unit, BCBR24_H
- auxiliary circuits of the unit with plug connector
- mechanical interlocking between door, unit, circuit breaker, and earthing switch
- inter-cubicle auxiliary circuit plug connector
- cubicle lighting

Options:
- protection relay
- surge arresters
- current transformers
- cable current transformer
- voltage transformers in a withdrawable unit
- fault-make earthing switch
- auxiliary contacts



Two full-height withdrawable units side by side

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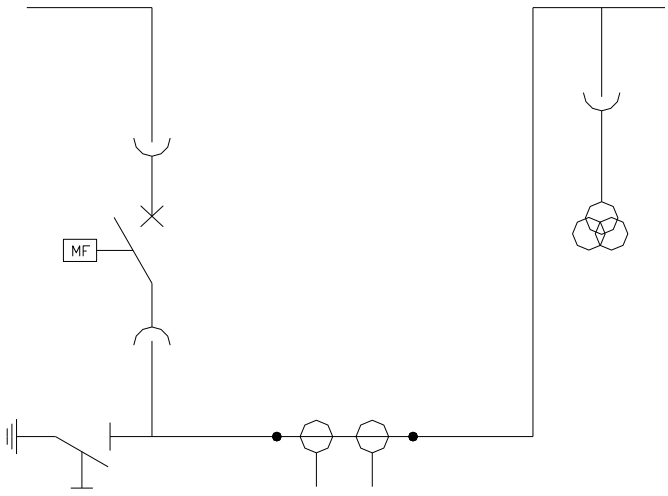
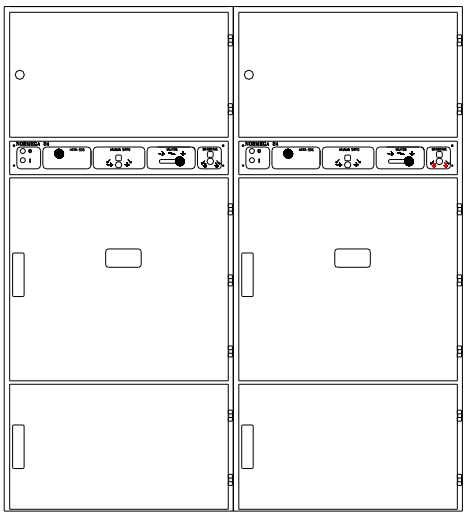
Technical specifications of the bus coupler cubicle		
Withdrawable unit type	BCBR12_F	BCBR24_F
	BCBR12_H	BCBR24_H
Rated voltage	12 kV	24 kV
Rated current	max. 2500A	max. 2000A
Short-circuit withstand current	max. 40kA(1s), 100kA	max. 25kA(1s), 63kA
Dielectric withstand strength	28kV/75kV	50kV/125kV
Internal arc withstand capability	40kA	25kA
Cubicle width	800mm	1000mm
Cubicle height	2200mm	2200mm
Cubicle depth	1770mm metal-clad 1620mm cubicle	1770mm metal-clad 1620mm cubicle
Cubicle weight	1050kg, Ir› =2000A n.910kg, Ir‹ 2000A	n.1050kg, Ir=2000A n.910kg, Ir‹ 2000A



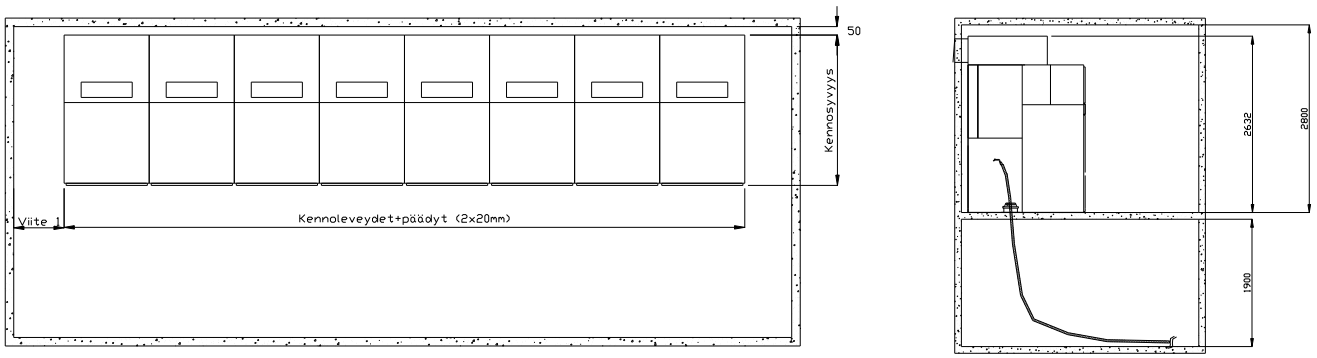
Bus coupler cubicle



Two half-height withdrawable units side by side

Switchgear installation options

The illustration below shows some possible installation layouts. Final positioning is typically designed on a project-specific basis after order confirmation.



NorMega 24 layout drawings

Packaging and delivery

Delivery is carried out in transport units corresponding to a single cubicle. The busbar system is also delivered in sections matching the width of one cubicle, complete with joint kits and accessories.

Detailed instructions for interconnecting the cubicles on site are provided in the separate NorMega installation and operating manual.

Packing dimensions:

Add the following allowances to the cubicle dimensions:
- width +100 mm
- depth +100 mm
- height +250 mm

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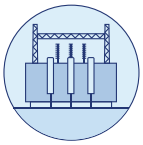

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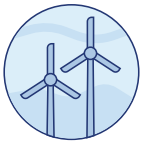

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