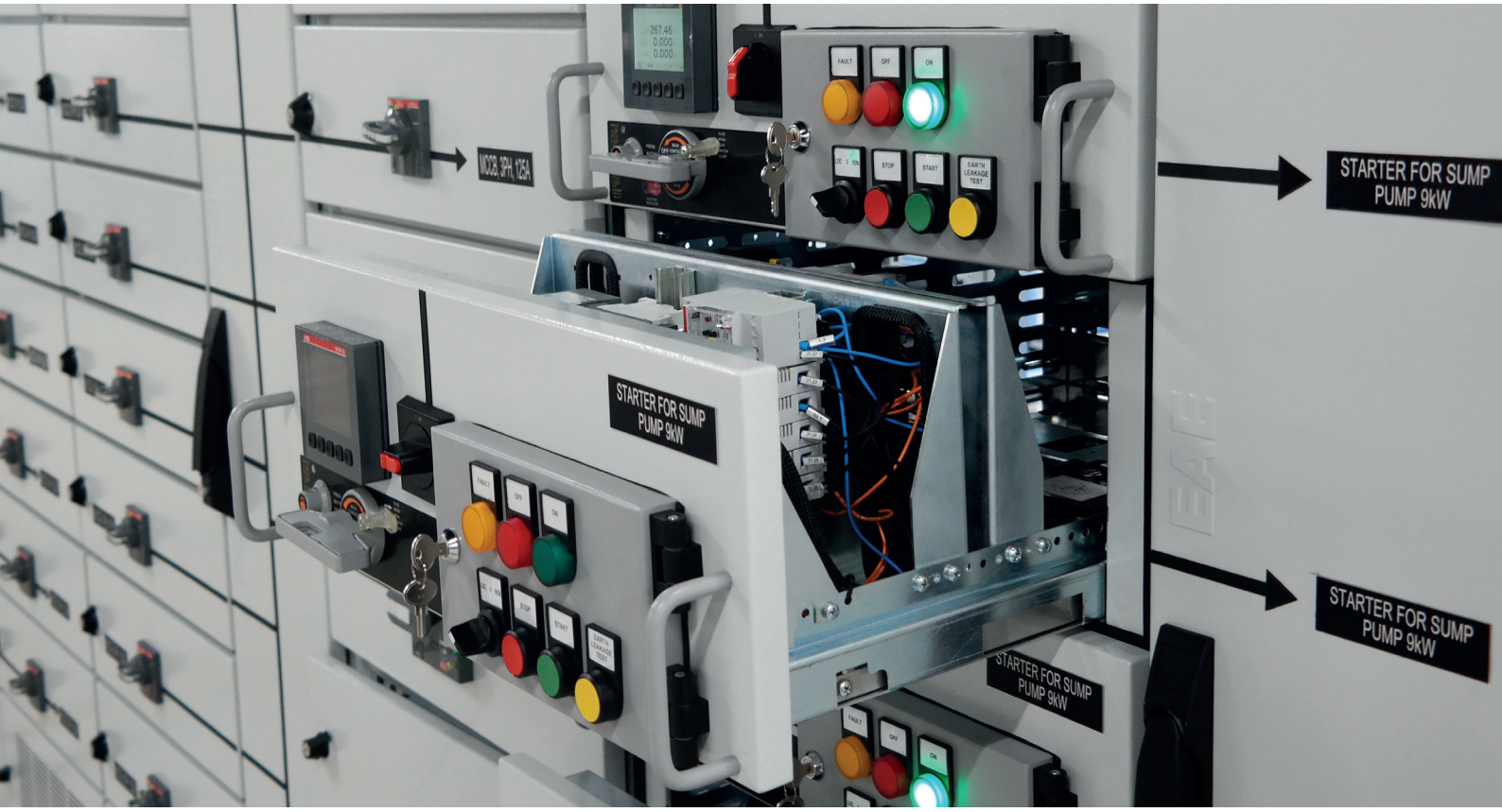
PANELMASTER




# PanelMaster MCC Product Catalogue

11/2023

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# Index

# Introduction

### Compact and modular design for every function

PanelMaster is a simple and modular switchgear solution that is easy to choose, intuitive to use, cost effective, and simple to install or upgrade.

It provides complete range to match various needs for power distribution and motor control including variable speed drives and motor starters.

- Switchgears that comply with standard IEC 61439-1 and 2.

- Guarantee a level of safety that has been 100 % tested.

- Ensure a lasting investment through easy upgrading of the installation in compliance with the standard.

### Different standardized solution for incoming and outgoing feeders

Switchgear requirements differ from project to project. PanelMaster easily allows the assembly to be configured to suit all technical conditions and plant operational procedures and to decrease operational expenses and when possible general investments. Different types of modules can be combined in one common switchgear. PanelMaster switchgear with fixed outgoing modules, in which all electrical connections made with screws and bolts are fixed, has proved to be a reliable solution.

The withdrawable module technique has proved to be the appropriate solution for use in industrial applications where requirements for high availability are a must particularly in Motor Control Centers. All electrical connections are realized using sliding contacts, what makes possible fast and easy exchange of modules under live conditions.

### Scalability and Flexibility

PanelMaster provides complete scalability across the entire portfolio with options for front or rear access designs, this coupled with the portfolio applications that fulfil requirements in all industry segments from final distribution to high end process control and secure power systems ensures PanelMaster is the definitive solution for all applications.

All PanelMaster modules equipped with different device types made by diverse device manufacturers are individually type-tested and certified by DEKRA. Being able to select different device brand enables enormous flexibility for providing application-specific design capability and supply elasticity for improving supply management.

PanelMaster low voltage switchgears are ideal for variety of applications:

- Petrochemical industries
- Oil and gas
- Metal and mining
- Process industry
- Nuclear power
- Pulp and Paper
- Refineries
- Steelworks
- Cement works
- Water treatment plants
- Food industry
- Infrastructure
- Power stations

## Characteristics

PanelMaster MCC is withdrawable low voltage switchgear up to 6800 A.  EAE's proven technologies have been integrated in the design and development of the latest generation PanelMaster MCC switchgear in order to ensure the complete system quality, safety and reliability.

The system has been verified by testing according to IEC 61439-1 and 2 standards.
The standardized, modular PanelMaster MCC system offers practically unlimited possibilities to satisfy customers' demands for high-grade Motor Control Centers whilst providing optimum operational reliability, personal safety, flexibility and economy.

Process changes, e.g. up rating of motor power, may require on-site modification of motor starter circuits and accordingly, enlargement of switchgear compartments. PanelMaster MCC design is able to meet this requirement under live conditions.

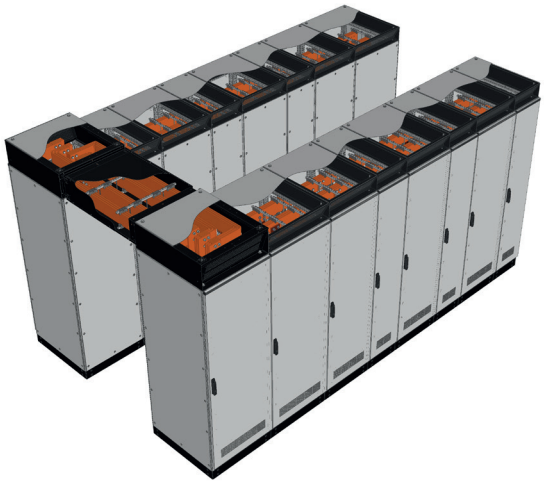
In cubicles with a vertical distribution busbar system, provided with separation shutters for insertion of main double-finger contacts along its entire height, changing of outgoing compartment sizes can be safely carried out under live conditions. For this purpose, the compartment separation barriers being secured by two bolts at the front of the cubicle, can be easily and quickly removed and secured at the desired position.

| | | | |
|---|---|---|---|
| **Electrical Data** | Rated voltages | Rated operating voltage $U_e$ | 690 V AC, 3 Ph. |
| | | Rated insulation voltage $U_i$ | 1000 V AC |
| | | Rated impulse withstand voltage $U_{imp}$ | up to 12 kV |
| | | Rated frequency | up to 60 Hz |
| | Rated currents | **Main Busbars:** | |
| | | Rated current $I_n$ | up to 6800 A |
| | | Rated peak withstand current $I_{pk}$ | up to 264 kA |
| | | Rated short-time withstand current $I_{cw}$ | up to 120 kA / 1 s. |
| | | Internal Arc | Passive, 65 kA / 0,3 s. |
| | | **Distribution bars (MCC Unit):** | |
| | | Rated current $I_n$ | 630 A / 1250 A |
| | | Rated peak withstand current $I_{pk}$ | 105 kA |
| | | Rated short-time withstand current $I_{cw}$ | 50 kA / 1 s. |
| **Mechanical Characteristics** | Dimensions | **Fixed Module Compartment** | 690 V AC, 3 Ph. |
| | | Height | 2000, 2200 mm |
| | | Width | 300, 400, 500, 600, 700, 800, 1000 mm |
| | | Depth | 600, 800, 1000, 1200 mm |
| | | **Withdrawable Module Compartment** | |
| | | Height | 2000, 2200 mm |
| | | Width | 600 mm |
| | | Depth | 600, 800, 1000, 1200 mm |
| | | **Cable Compartment for MCC** | |
| | | Height | 2000, 2200 mm |
| | | Width | 400, 500, 600, 800 mm |
| | | Depth | 600, 800, 1000, 1200 mm |
| | Enclosure | Frame | Pre-galvanized, RAL 7035 painted |
| | | Cover, Door | Pre-galvanized, RAL 7035 painted |
| | Degrees of protection | According to IEC 60529 | IP31, IP54 |
| | Internal separation | According to IEC 61439-2 | up to Form-4b |
| **Environmental Characteristics** | Ambient Conditions | Location Type | Indoor |
| | | Ambient Air Temperature (Operation) | -5 °C to +40 °C |
| | | Maximum Relative Humidity | 5 %-90 % |
| | | Altitude | up to 2000 m |
| | | Degree of pollution | 3 |
| **Standards** | | Low voltage switchgear and controlgear assemblies | IEC 61439-1 and 2 |
| | | Power switchgear and controlgear assemblies Internal Arc | IEC/TR 61641 |
| | | Seismic Verification | IEC 60068-3-3 and IEEE-693/2005 |

## Features

### System flexibility

- Assemblies with combined motor control and high current distribution functions
- Back-to-back or face-to-face mounting features main busbar interconnection modules



- Cable connection terminals positioned at the back of withdrawable unit sections where rear door application is possible eliminate cable connection section and reduce footprint.
- Corner section for angular mounting
- Cable connection section can be positioned on left or right side of withdrawable units section. Common wider cable connection section shared by two withdrawable unit section.
- Wide range of options, such as soft starters, frequency converters, PLC-controlled synchronization and changeover equipment, units for power factor improvement, harmonic filtration, etc.

### Personal safety

- Safe operation of the withdrawable units Withdrawable units of all sizes are equipped with integrated operating error protection via mechanical interlocks and a uniform, clear indication of all withdrawable unit positions.
- Operating the withdrawable unit to connected position takes place when the cover is closed and without eliminating the degree of protection.
- Full internal separation of all functional units
- Enclosure protection IP31 minimum, higher ratings are available when required. (up to IP54)
- Internal separation including for disconnected units are IPXXB (maintained even when units removed).
- Automatic cover interlocking of all outgoing feeder sections prevents access or removal when the main circuit breaker is in the ON position.
- Motor starters and circuit breakers can only be replaced when the withdrawable unit is fully removed.
- Shutters guard the distribution busbars when withdrawable units are removed.
- Safe connection of outgoing cables is feasible under live conditions of the busbar by means of respective protection measures.

### Operational reliability

- Vertical distribution busbars are completely enclosed by double layer insulated busbar chamber.
- Withdrawable unit sections can be modified without process interruption.
- Cable connection to withdrawable units can be accomplished under live conditions.
- Optional additional insulation by thermoplastic coating of main busbars.
- Unique main isolating double-finger contacts between distribution busbars and withdrawable units prevent contact wear or welding to busbars and counteract the risk of contact repulsion under short-circuit conditions.

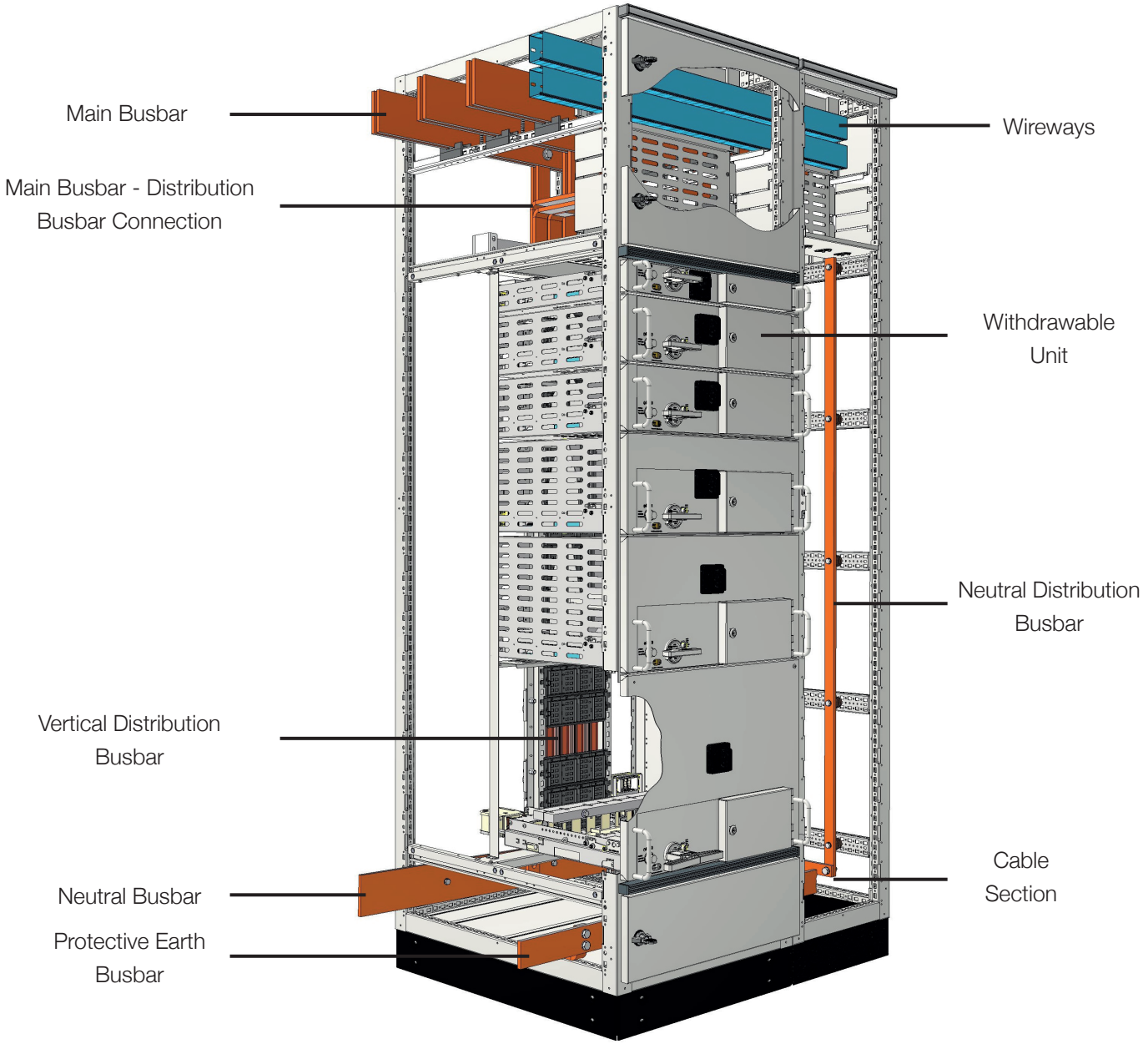
### Maintenance

- Double-finger isolating contacts render maintenance on distribution busbars unnecessary.
- Double-finger contact holders can be quickly and easily changed if necessary.

### Main components

PanelMaster MCC switchgears are of a self-supporting structure, consisting of profiles and sheet-steel sidewalls. The outer sidewalls and front covers are made of zinc coated sheet steel and epoxy polyester coated.

Corrosion-resistant zinc coated sheet-steel plates are used for the rear and inner walls and for compartment separation.




Withdrawable Unit Section

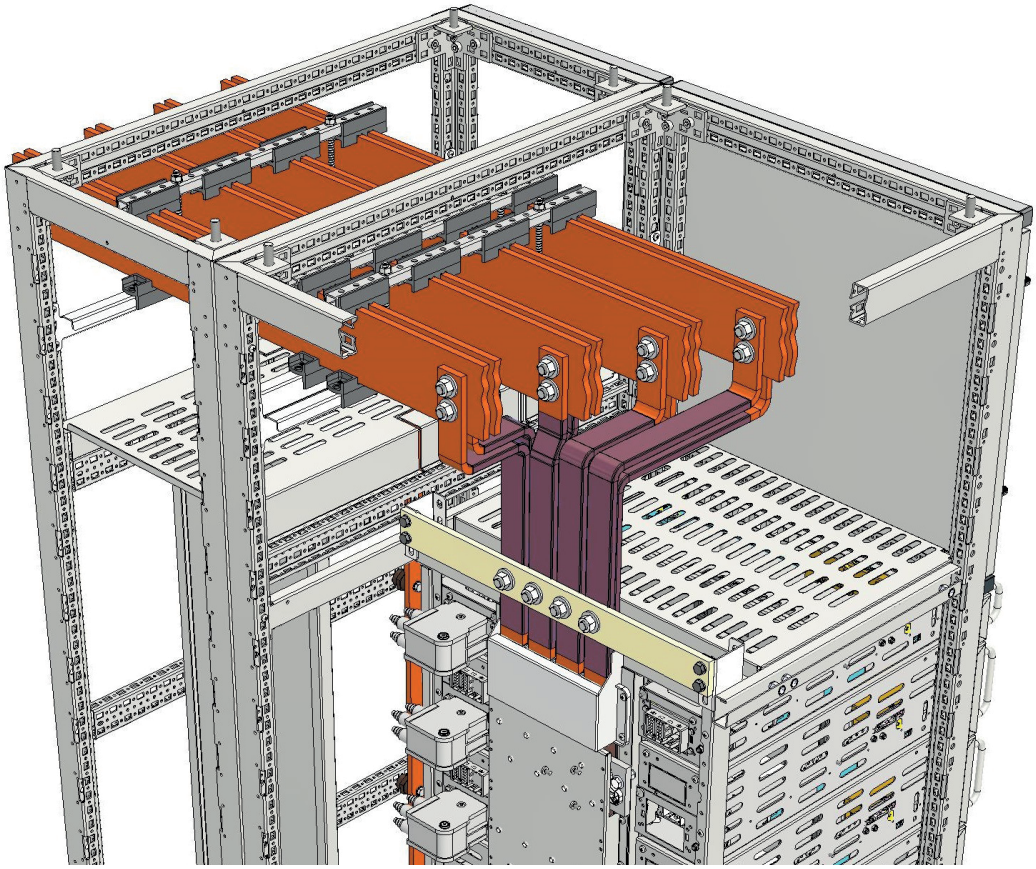
## Main busbar system

Main busbars are located in a separate compartment of the switchgear. The compartment has a degree of protection of IP 2X with respect to the lower situated switchgear and the vertical cable-entry compartment.

Busbars, phase bars and neutral bar, have a standard thickness of 10 mm and are available for current ratings up to 6800 A. They are secured by type-tested busbar supports which allow easy, on-site changing of the busbars if uprating of the system is necessary. This can be done without having to alter the busbar supports.

On-site extension of busbars can be easily and quickly accomplished.

Busbars are arranged in upper, mid or lower height of sections horizontally. Phase conductors are positioned horizontally side by side. The cross section of busbars can be found in the busbar selection table which is inside the “PanelMaster Design and Application Rulebook” documentation

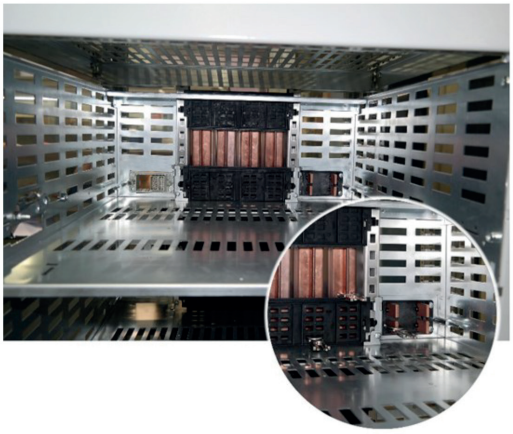


Distribution busbar duct with connection bars to main busbar system. Rear view

## Vertical distribution busbar system for withdrawable units

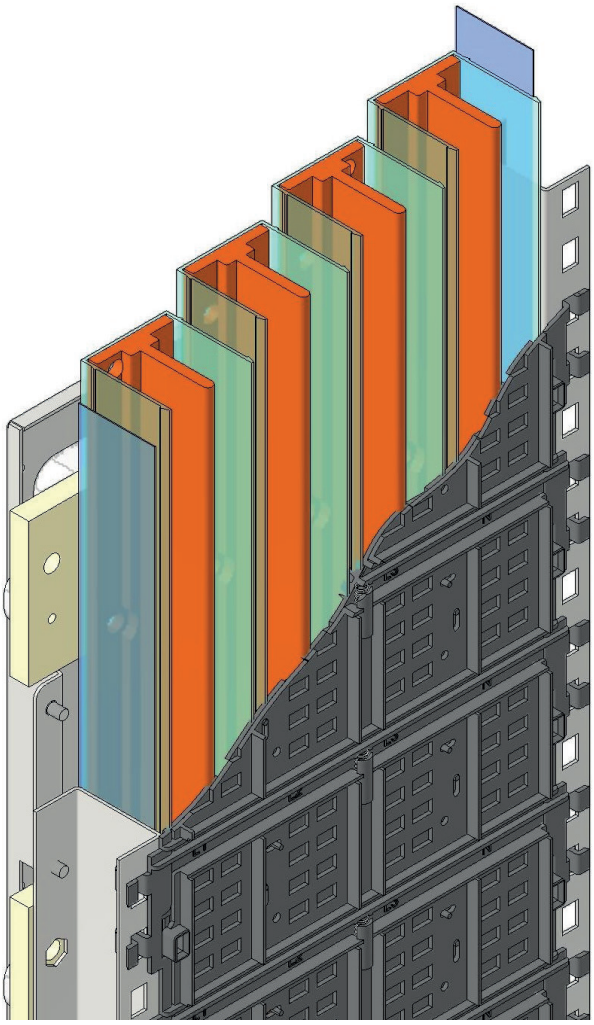
For sections with withdrawable outgoing units vertical busbars are branched from the main busbar system by means of connection bars. The vertical busbars are insulated with double-layer solid insulation material at the back of the section. The busbar duct is partitioned into four sections with double-layer separation wall, each section accommodating a phase or neutral busbar consisting of special shaped conductors. The front of the duct is screened by finger proof (IPXXB) shutters, so that each busbars is fully enclosed, preventing the occurrence of arcs between busbars or between busbars and earth. Busbar shutters have a module height of 75 mm and are each provided with contact openings for busbar branching.

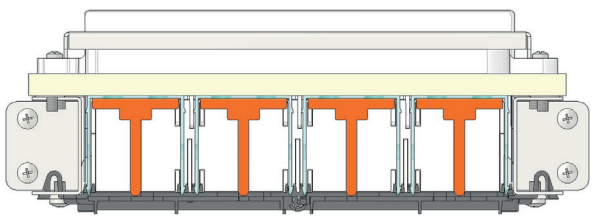
Shutters are blanking all busbar openings automatically when withdrawable units are removed or unused to provide IPXXB protection.



Withdrawable unit compartment, showing from left to right: finger proof sockets of auxiliary contacts, double finger contacts shutter of distribution busbars, outgoing terminal conductors.

| Maximum permissible load current (A) | Busbar cross-section (Cu) Phase and Neutral bar ($mm^2$) | Short-circuit capacity | |
|---|---|---|---|
| | | Icw kA-1 s | Ipk kA |
| 630 | 400 $mm^2$ | 50 | 105 |
| 1250 | 800 $mm^2$ | 50 | 105 |





Top view of distribution busbar system in double layer insulated duct.

## Contacts

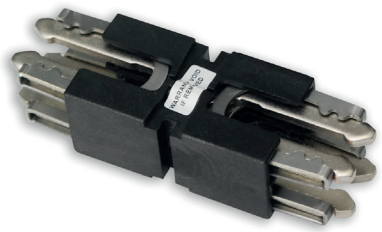
Withdrawable units utilize double-finger main contacts. When a withdrawable unit is being fully inserted and operating handle turned to ON position, both power circuit contact fingers slide on distribution busbar and apply force by means of U-shaped contact spring. As a result an excellent-low resistance, contacting is obtained on both busbar and withdrawable unit.

If required, the finger-contact holder can be removed or replaced easily and quickly. Shutters are blanking all busbar openings automatically when withdrawable units are removed or unused to provide IPXXB protection.

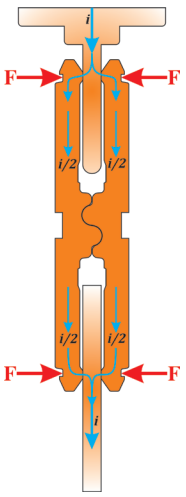
The double-finger contacts (patent granted) have a number of important advantages: They prevent wear on the vertical busbars, normally resulting from the in and outward movement of the withdrawable unit.

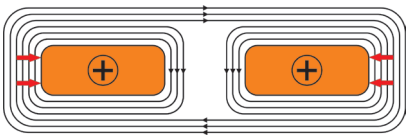
Risk of contact welding to the busbars in the event of high starting or short-circuit currents is eliminated by fine-tuned contact pressure. Through-going currents on parallel double-finger construction cause increased contact pressure on the vertical busbars and on the units contact conductor, consequently preventing contact repulsion under short-circuit conditions.

Double-finger contact



Forces created by current flowing from parallel conductors



Increasing through-going (short-circuit) currents cause increased contact pressure on the vertical busbars and on the unit's contact conductors, consequently preventing contact repulsion under short-circuit conditions.

### Withdrawable outgoing units

Withdrawable outgoing units are provided with contact conductors connecting the unit to distribution busbars and cable terminals via the corresponding double-finger main contacts. Since the full phase segregation of the busbar branching points is also continued at the contact conductors, the possibility of phase-to-phase, phase-to-neutral and phase-to-earth faults are excluded.

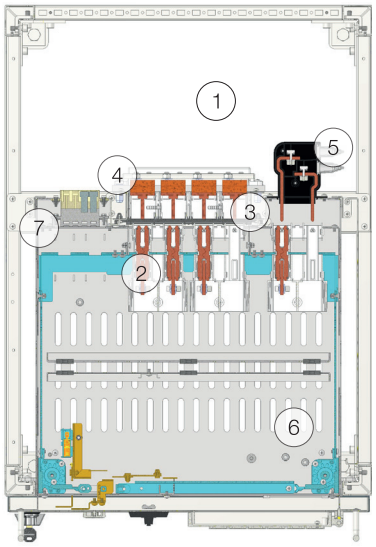
Operating of withdrawable units is made very simple and fault-free. Integrated front face marked with easy-to-perceive instructions require no tools to handle operations. Tests and maintenance operations are safer, simpler and quicker.

Operating the withdrawable unit to “connected” position takes place when the unit is engaged, door is closed and without eliminating the degree of protection. Withdrawable units of all sizes are equipped with integrated operating error protection via mechanical interlocks and a uniform, clear indication of all withdrawable unit positions.

Each withdrawable unit comprises the following locking means:

- Mechanical interlock between main contacts and main circuit breaker. Main contacts can only be switched when main circuit breaker is in OFF position.
- Independent mechanical interlock between withdrawable unit position and mechanism for main contacts.
- Mechanical lock preventing insertion or removal when main contacts or main circuit breaker is in ON position.
- Latch to prevent the unit from being dropped accidentally if removed too quickly.

For local signaling and operation, each withdrawable unit is provided with a front mounted button set cover for testing during service showing up to six operating and signaling functions. An auxiliary contact block (12,24,36,48 poles) has been incorporated to enable remote control and signaling.

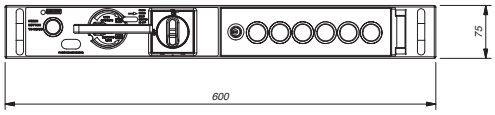



1. Withdrawable unit compartment
2. Double-finger main contacts
3. Distribution busbar
4. Auxiliary contacts
5. Cabling terminal
6. Withdrawable unit
7. Fixed unit

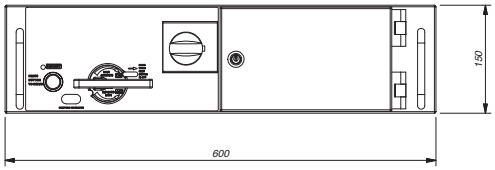
The outgoing units are available in the following heights based on a 75 mm height pitch.

| Withdrawable Unit Height | Max. Motor Feeder | | | Outgoing Feeder |
|---|---|---|---|---|
| | Direct On-Line Motor Starter (DOL) | Forward-Reverse Motor Starter (FR) | Star-Delta Motor Starter (SD) | MCCB |
| 75 mm | 0-15 kW | 0-15 kW | --- | 0-32 A |
| 150 mm | 0-45 kW | 0-45 kW | 0-15 kW | 0-100 A |
| 225 mm | 0-75 kW | 0-75 kW | 0-22 kW | 0-250 A |
| 300 mm | 0-90 kW | --- | 0-55 kW | 0-250 A |
| 450 mm | 0-160 kW | --- | --- | 0-400A |

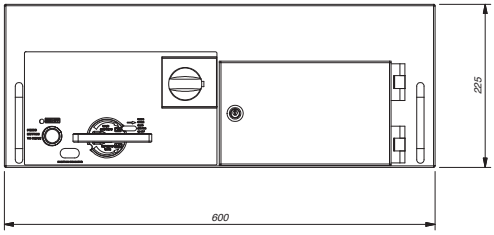
Module height:
75 mm



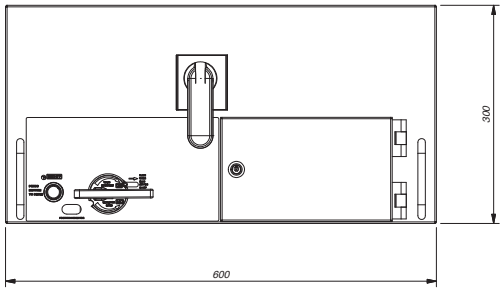

Module height:
150 mm



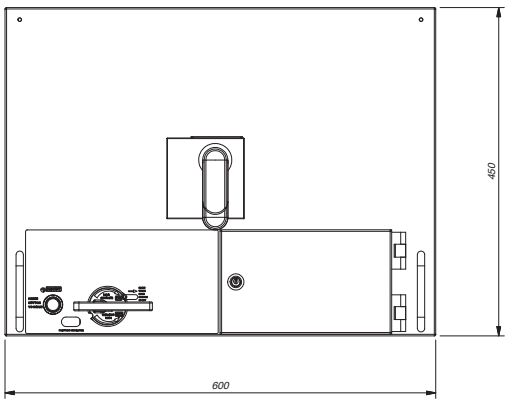

Module height:
225 mm




Module height:
300 mm



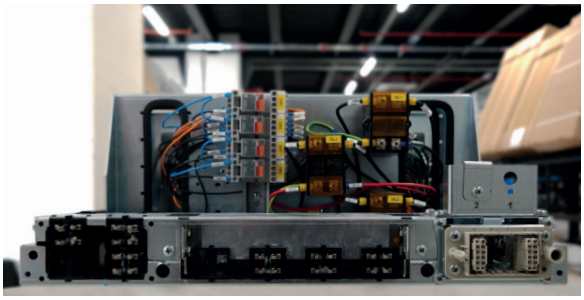

Module height:
450 mm





PanelMaster MCC cubicle showing partly withdrawn motor starter withdrawable unit


Front view of withdrawable unit (module height 225 mm).



Rear view of withdrawable unit

### Hybrid operation method (PATENTED)

Safe and simple operation with two different operating action

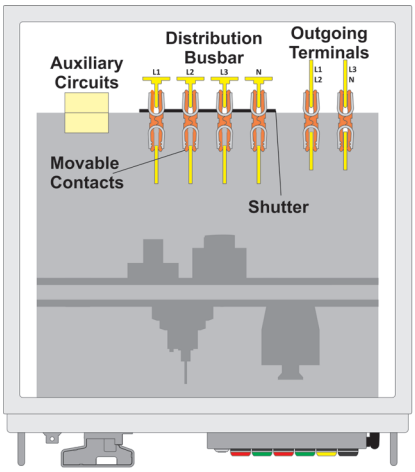
Operating main contacts:

Main contacts can be moved to OFF or ON position with rotatable handle located at front of the unit only, when withdrawable unit is engaged in IN position. Operation can be done without using a removable part or tool that can be lost like key, lever etc.

Operating auxiliary contacts:

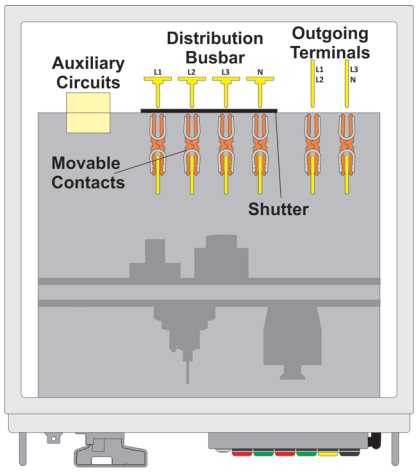
Auxiliary contacts can be switched ON or OFF positions by pulling or pushing the withdrawable unit IN or OUT while pressing unlocking button located besides left handle.

### Withdrawable outgoing unit positions



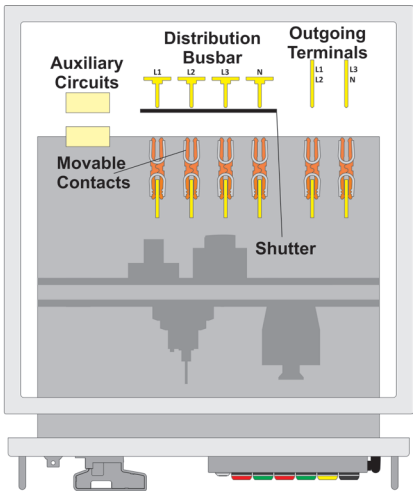

**CONNECTED Position**

Main contacts handle is in ON
Main switching device is in ON or OFF
Auxiliary contacts are in ON
Withdrawable unit is IN



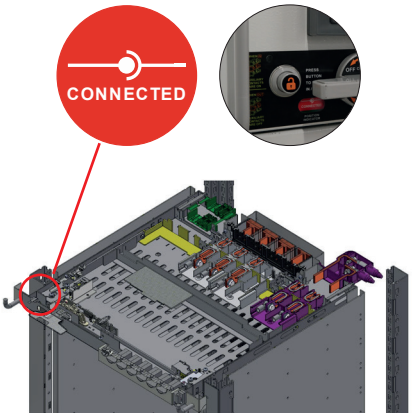

**TEST Position**

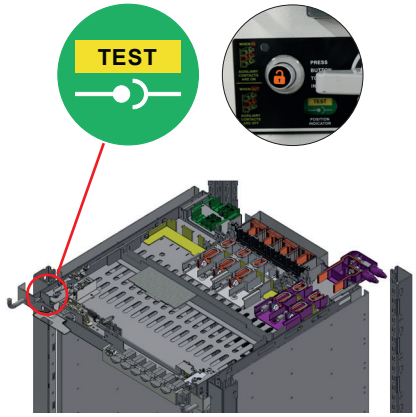
Main contacts handle is in OFF
Main switching device is in OFF
Auxiliary contacts are in ON
Withdrawable unit is IN

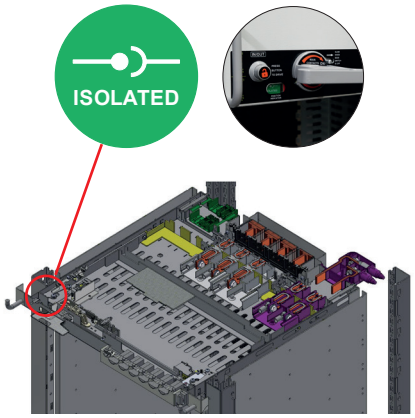



**ISOLATED Position**

Main contacts handle is in OFF
Main switching device is in OFF
Auxiliary contacts are in OFF
Withdrawable unit is OUT

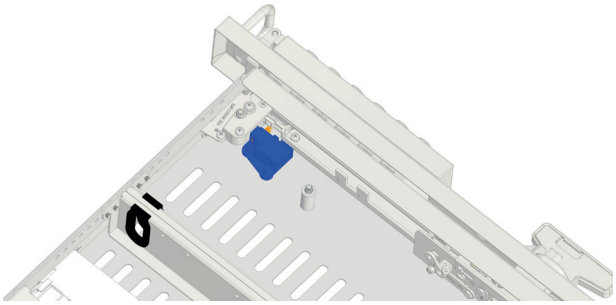


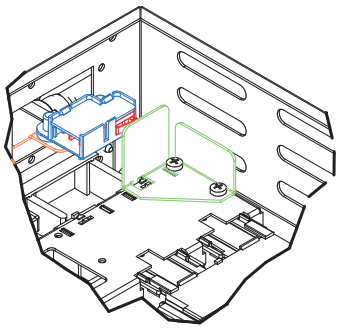
## Options

- Additional insulation by thermoplastic coating of main busbars
- Tin or silver coating of main busbars
- Corner sections for U or L shaped configurations.
- Interconnection of main busbar systems, enabling back-to-back arrangements
- Cubicles with reduced height for application in packaged substations, offshore and on board ships
- Special locking facilities
- Mechanical coding
- Separate foundation frame
- Seismis connection accessories
- Internal arc modules
- Auxiliary switches for withdrawable units
- Mutually insulated busbar sections
- Fully insulated main busbar system

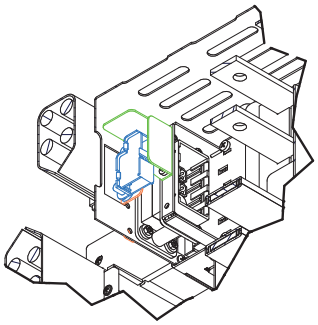


Auxiliary switch - 1
ON-OFF position of main contacts

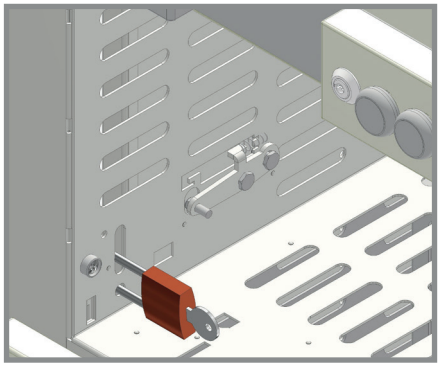
150 / 225 / 300 mm



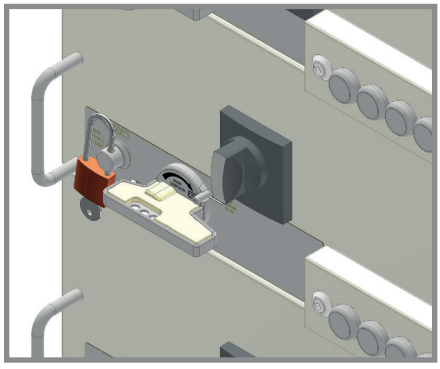
450 mm



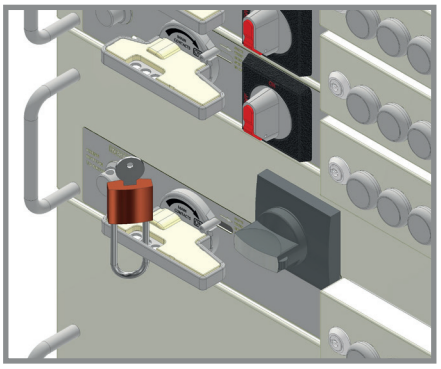
Auxiliary switch - 2
Withdrawable unit IN-OUT position



Padlocking option - 1



Padlocking option - 2

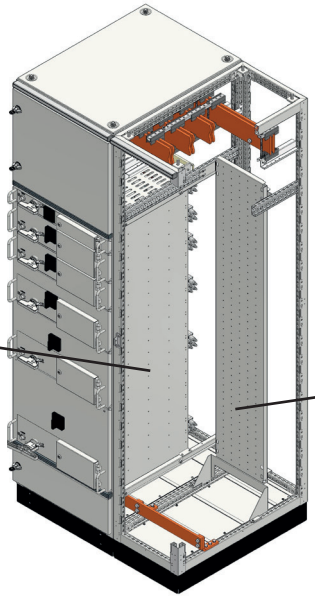


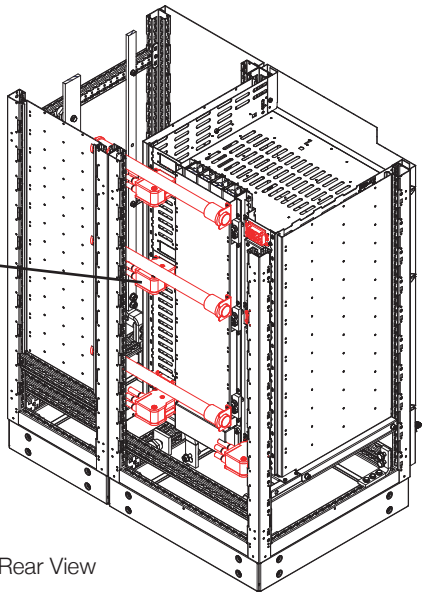
Padlocking option - 3

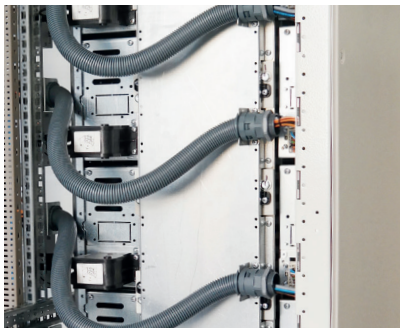
### Cable entry compartment

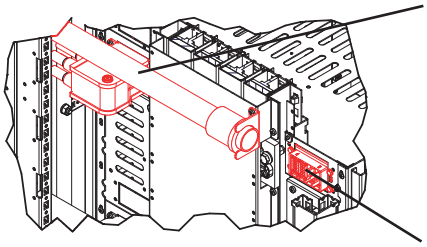
If several incoming and outgoing feeder sections are mounted in one cubicle, and cable connection is made from the front, a separate, lockable cable-entry compartment, along the entire height of the switchgear compartment, is provided at the right or left-hand side.

On the side wall, mounting strips are available for cable clamps or cable glands. Cable connections to withdrawable units are made in the switchgear compartment without the use of cable lugs. The terminals are fully enclosed in a cable connector block, together with the cable sided scissor-shaped isolating double-finger contacts. The cable- entry compartment is isolated from the switchgear compartments by means of screening plates (IP 2X). The standard cable-entry compartment width is 400 mm (500, 600 or 800 mm optional available). The compartment is provided with an undrilled, removable gland plate at the bottom of the cubicle.





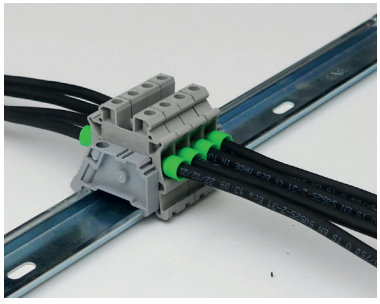
## Cable terminals for main circuit

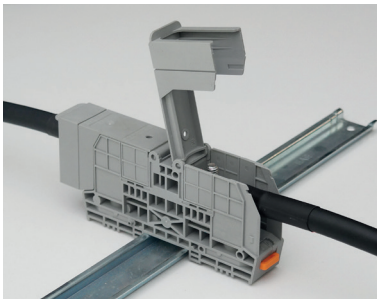
If the application requires form of internal separation Form-4b, other than Type 6 or 7 then outgoing cable terminals must be selected IPXXB or IP2X class.

### Form 4b

Separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and separated by insulated coverings.

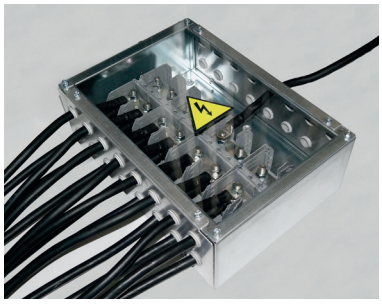
IPXXB or IP2X finger-proof



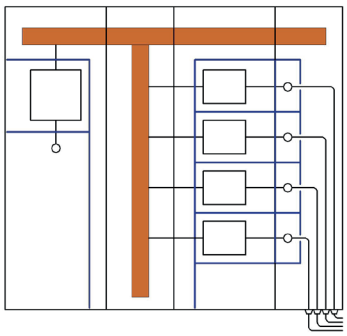


### Form 4b Type 6

Separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and enclosed in their own compartment by means of rigid barriers or partitions.

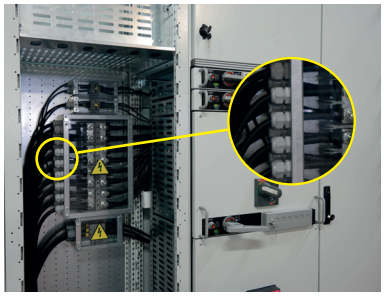


IPXXB finger-proof barriers at cable terminals covering entry.

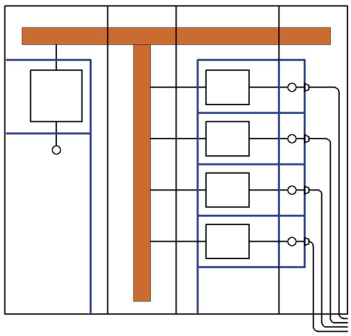


### Form 4b Type 7

Separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and enclosed in their own compartment by means of rigid barriers or partitions complete with integral glanding facility.



Cable glands at cable terminals covering entry.



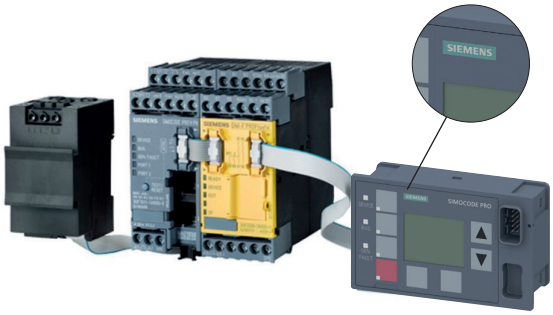
### Variety of Motor Management Systems

PanelMaster low voltage MCC is the intelligent motor control center solution integrating protection, control, monitoring and communication by enabling using different manufacturers microprocessor-based intelligent motor management systems.

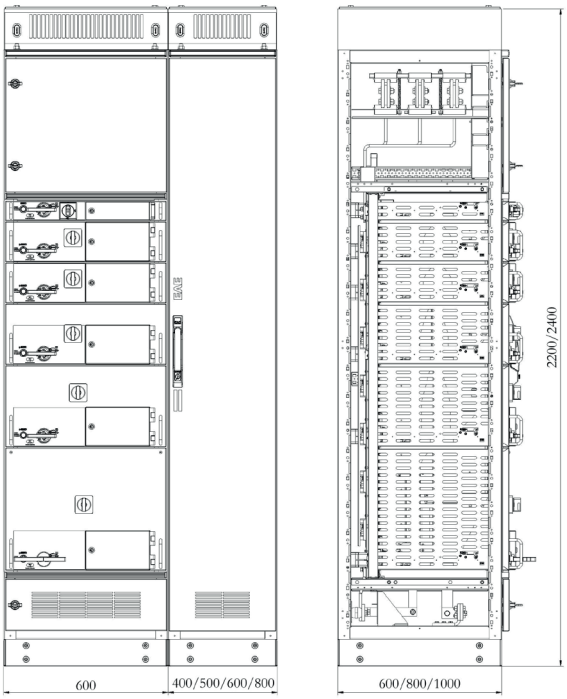
These provide users complete and specialized low voltage motor control, protection and monitoring capabilities. They collect all relevant information from the process involved, including timely alarms, enabling plant operators to make the right decisions based on precise, real-time process conditions.

Main benefits of PanelMaster MCC with motor management systems

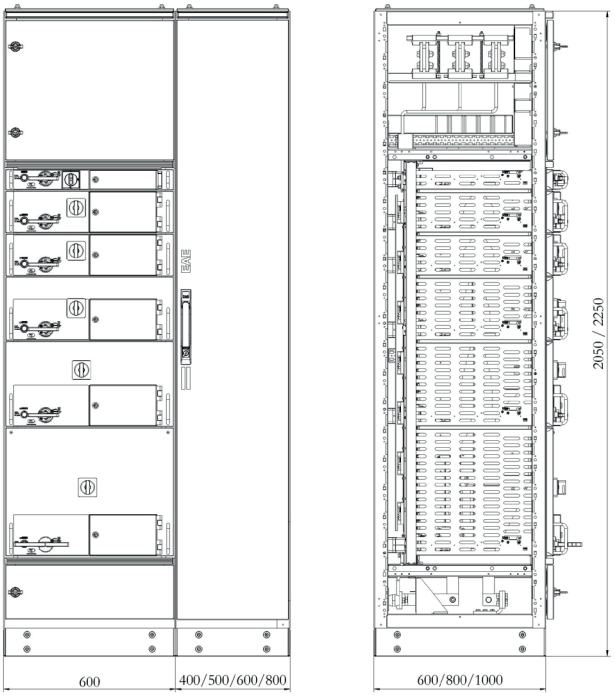
- Increasing plant availability
- Simplicity and high functionality
- Integrated communications
- Reliable solution
- Flexibility in a standardized solution
- Less spare starter module types
- Rapid fault detection and rectification
- Easy integrate and access to digital service






IP31 Version




IP54 Version

## Number of withdrawable units per section

| Switchgear Height | Max. Number of Withdrawable Units | | | | |
|---|---|---|---|---|---|
| | Withdrawable Unit Height | | | | |
| | 75 mm | 150 mm | 225 mm | 300 mm | 450 mm |
| 2000 mm | 16 | 8 | 5 | 4 | 2 |
| 2200 mm | 18 | 9 | 6 | 4 | 3 |

*Note: All dimensions are in mm.*

## Notes: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