

SMART POWER

# SEN Plus

Reliable low-voltage  
switchgear solutions



• New!

Fixed design

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## **SEN Plus, a complete solution**

From power distribution to sophisticated intelligent motor control applications, SEN Plus is the ideal solution. Robust design, technical excellence and state-of-the-art safety features make SEN Plus the obvious choice for electrical installations in all different environments, or whenever reliable power distribution, process continuity and optimal equipment availability are critical.

As part of the ABB portfolio, safe, reliable and efficient SEN Plus system helps distribute, protect, and control electricity worldwide.

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# Why SEN Plus?



## Boundaryless

Fully 3rd party laboratories certified assemblies up to 6300A for power distribution and motor control as per IEC 61439-2 / EN 61439-2. Enables a boundaryless environment.



## Production environment

Certified to IEC 60529 for IP30 - IP54 arrangements. Enables the installation of the equipment in a range of environmental conditions.



## Safe modifications

Up to Form 4B as per IEC 61439- Enables safe modification under energized conditions.



## Functional floor space

Increases functional floor space in building services.



## SEN Plus Pro - online configurator

In a few steps, user can design individual SEN Plus switchgear based on project requirements and needs.



## Fast delivery

Fast and efficient assembly techniques secures fast deliveries and customer satisfaction.



## Resistant

Product design and epoxy powder coating provides a shock and scratch resistant design. Minimizes damage during installation.



## Lower investment

Central design and ongoing testing to the latest standards. Lowers investment costs.



## Environmental benefits

Control of waste and packaging reduces manufacturing processes, additional power monitoring features provide energy saving opportunities.



## Licensing Program

If you are looking to go further with your panel building business, the partner program is for you. We have developed it with panel builders like you in mind, so it's tailored to your specific needs.

# Markets

The SEN Plus system has been designed from the outset based on customer requirements. The result is a product that offers unrivalled flexibility and user safety, backed up by comprehensive testing and support for many specific applications.

## Buildings, machinery and processes

### Commercial

- Small and large offices
- Warehouses
- Shopping malls
- Schools
- Hospitals
- Airports

### Industrial

- Printing
- Machinery
- Pharmaceutical
- Automotive, paper and pulp
- Chemical industry
- Marine
- Oil and gas Airports

### Utilities

- Water treatment plants
- Waste management
- Energy distribution (Electricity and gas)
- Telecommunications
- Cable providers
- Public transport

## Flexible system to suit your requirements

SEN Plus system can meet the most demanding requirements from high current applications up to 6700A down to motor control applications for a few kW. Furthermore the system is available in different configurations, which include:

- **Fixed, plug-in, withdrawable**
- **Front or rear access**
- **Distribution**
- **Motor control**

The system offers varying forms of separation up to Form 4B to IEC 61439-2 and ingress protection from IP30 to IP54.



# Safety

## Safety

The combination of SEN Plus and ABB Emax 2 air circuit breaker excel in terms of safety – both for personnel as well as system protection.

The switchgear has been independently tested to IEC 61439. With a short-circuit fault withstand rating up to 100kA the system is equipped to deal with large faults. Compartmentalization of the functional areas will help to reduce the risk of accidental contact to live parts during maintenance and operations. To ensure the highest operator protection additional tests have been performed, verifying the resistance against arc flash events.

## Complete system control

As a manufacturer of various types of protective equipment ABB offers a complete choice, which includes:

- Miniature, moulded case and air circuit breakers
- Fuses and switch disconnectors
- Variable speed drives and contactors
- Intelligent motor management solutions

Communication and control increasingly forms part of a system – data exchange via Ethernet, Profibus or Modbus is available for most components, to ensure a homogeneous setup.

## Environmental considerations

Caring for the environment in which we live and work is playing an increasingly important role the considerations for the purchase of electrical equipment. SEN Plus has taken this into account in every aspect of its design.

## Manufacturing process

The manufacturing plants are certified to ISO 14001 eliminating waste and packaging. Six Sigma and ISO 9001 ensure that waste is eliminated through highest efficiency in processing and design.

## Components

The steelwork used is mild steel and does not contain harmful cadmium. The frames are zinc plated to prevent corrosion and ensure the product has a long life.

## Operation

You can manage your impact upon the environment while operating SEN Plus by using the various accessories that can improve energy efficiency, like usage of variable speed drives, kWh meters or intelligent motor management modules. A range of software is available to get the highest grade of efficiency while using such products.



# Certification

SEN Plus has been designed in close consultation with our customers to ensure the product really does what you need it to do. The result is a system that really meets all the key requirements and a wide range of technical specifications as proven by comprehensive testing and full certification in 3rd party Laboratories.

## Design verification

Design verification in accordance with IEC EN 61439-2 will include:

- Verification of the characteristics relevant to construction:
  - Strength of materials and parts
  - Degrees of protection IP
  - Clearances and creepage distances
  - Protection against electric shock and integrity of protective circuits
  - Incorporation of switching devices and of components
  - Internal electrical circuits and connections
  - Terminals for external conductors

- Verifications of the characteristic relevant to the performance:

- Dielectric properties
- Verification of temperature-rise limits
- Short-circuit withstand strength
- Electromagnetic compatibility (EMC)
- Mechanical operation.



# Benefits of SEN Plus



Easy commissioning on site

- Main busbars links are accessible from the front



Rigid frame construction

- Non-welded self-supporting construction
- Doors and covers in 2mm sheet steel



Simplified cabling

- Optimized terminal bar arrangement for large cable cross sections



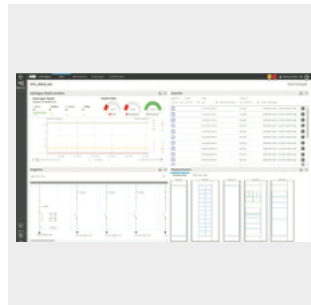
Optimum accessibility

- 115° door opening angle



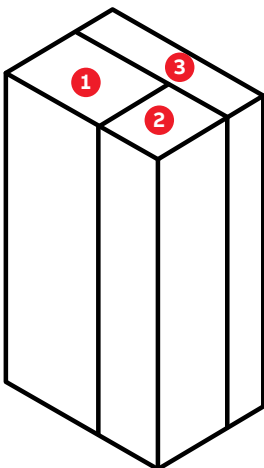
Communication

- Ethernet, Modbus and Profibus are available to integrate industrial automation and communication requirements



Ready to support ABB Ability™

- SEN Plus is ready to realize sophisticated industrial automation and communication solutions supporting protection, control and monitoring requirements



Internal form of separation

- Panel clearly structured into the 3 different zones: equipment, cable and busbar zone
- Up to form 4 separation possible

- ① Equipment zone
- ② Cable zone
- ③ Busbar zone



Complete system integration

- Equipped with the complete range of IEC 60947 tested components

# All for your safety



**Operator protection**

- A special mechanism allows full operation of the module while the door is closed. This ensures the maximum safety level for the operator.



**Prepared to work in rough environments**

- DEKRA certified dust and water protection up to a degree of protection of IP54
- Real tests at 50°C ambient temperature



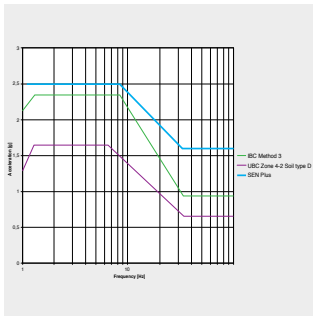
**Ready to withstand internal arc faults**

- Proven passive protection as per EC 61641 & optical active protection using the ABB Arc Guard System TVOC-2



**Highly technical features**

- Ready to support highest technical requirements for both power distribution and motor control applications



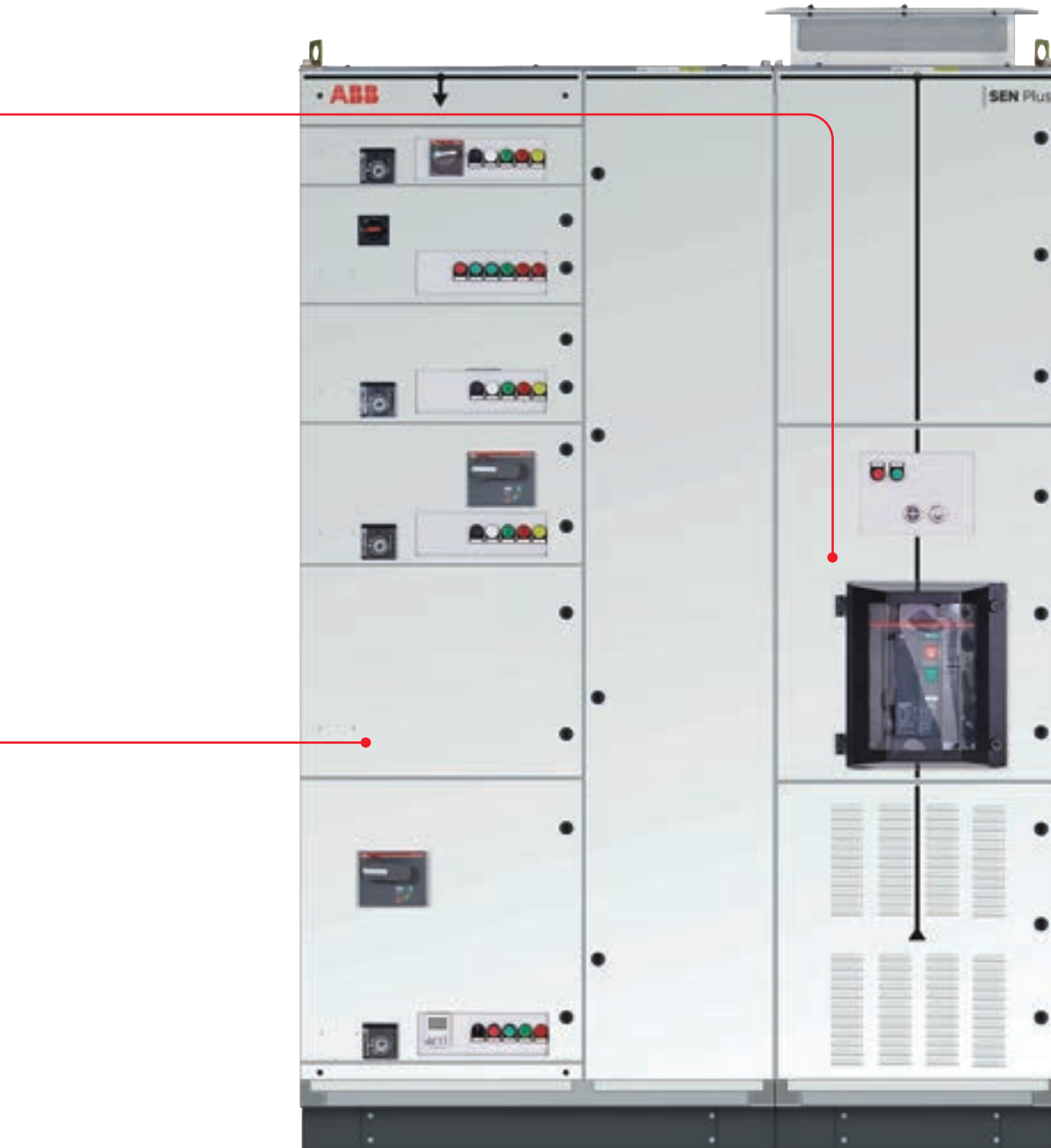
**Seismic proven design**

- Compliant with the most important seismic standards
- Process continuity during & after the seismic event



**Easy and safe operation and maintenance**

- Finger proof shrouds and barriers prevent accidental contact with busbars
- Door locks according to your safety requirements



# Comprehensive distribution solutions



## ABB Ability™ Energy

- Ready for the future
  - reliable remote control, monitoring and analysis of your energy consumption via bus communication



## Continuous operation

- Various features for optimized ventilation and electronic monitoring to ensure continuous performance in all conditions



## Addressing increased industry demands for safe energy distribution

- Compact, space-saving design
- Easy installation
- Increased cabling space



## A cutting-edge molded case circuit-breaker range

- Modular, upgradable design using one-fits-all accessories. Upgradable from basic functions to a sophisticated device with Ekip Touch trip unit



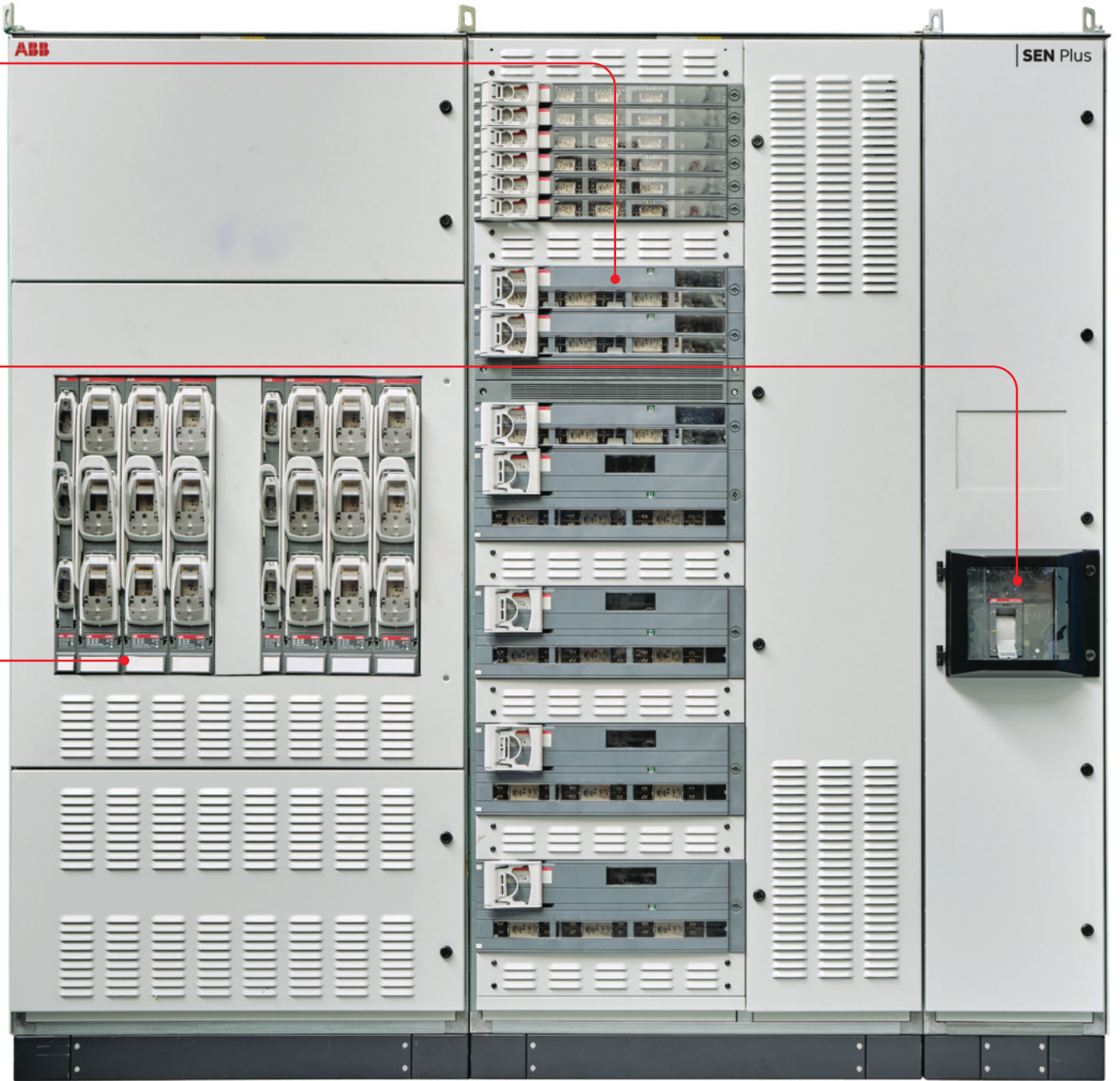
## CombiLine N module

- Sub-distribution solutions up to 400A
- For modular components on DIN-rails
- Mounting plates



## Complete fusegear product portfolio

- Motor operated switch fuses
- Electronic fuse monitoring
- Smart metering & monitoring solutions



# Standard applications

## Feeder with Manual Motor Starter or Moulded Case Circuit Breaker

## Withdrawable

400V 50kA/80kA

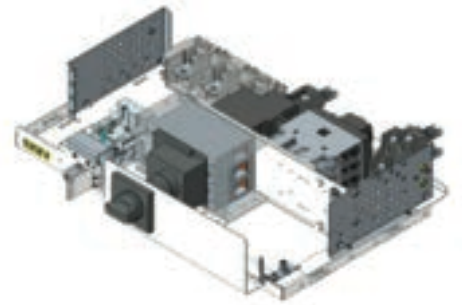
Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 20	MS132	125	5E	-	-	-
Up to 32	MS132/MS165	125	5E	-	-	-
Up to 63	MS165/-	125	5E	-	-	-
Up to 125	XT2 S/L 160	125	5E	250	10E	250
Up to 250	XT4 S/L 250	250	10E	250	10E	250
Up to 630	XT5 S/L 630	250	10E	300	12E	300

500V 50kA/65kA

Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 125	XT2 H/V 160	150	6E	250	10E	250
Up to 250	XT4 H/V 250	250	10E	250	10E	250
Up to 630	XT5 H/L 630	250	10E	300	12E	300

690V 35kA/50kA

Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 250	XT4X 250	250	10E	250	10E	250
Up to 630	XT5 H/L 630	250	10E	300	12E	300



## Feeder with Manual Motor Starter or Moulded Case Circuit Breaker

## Plug-in

400V 50kA/80kA

Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 20	MS132	125	5E	-	-	-
Up to 32	MS132/MS165	125	5E	-	-	-
Up to 63	MS165/-	125	5E	-	-	-
Up to 125	XT2 S/L 160	125	5E	200	8E	200
Up to 250	XT4 S/L 250	200	8E	200	8E	200
Up to 630	XT5 S/L 630	250	10E	300	12E	300

500V 50kA/65kA

Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 125	XT2 H/V 160	125	5E	200	8E	200
Up to 160	XT2 H/ - 160	125	5E	200	8E	200
Up to 250	XT4 H/V 250	200	8E	200	8E	200
Up to 630	XT5 H/L 630	250	10E	300	12E	300

690V 35kA/50kA

Current [A]	Circuit breaker Type	Unit height [mm]	3 pole		4 pole	
			Module size	Unit height [mm]	Module size	Unit height [mm]
Up to 250	XT4X 250	200	8E	200	8E	200
Up to 630	XT5 H/L 630	250	10E	300	12E	300



**Feeder with Manual Motor Starter or Moulded Case Circuit Breaker**

**Fixed**

400V 50kA/80kA

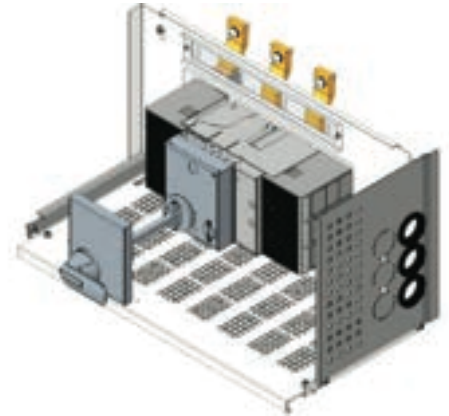
		3 pole		4 pole	
Current [A]	Circuit breaker Type	Unit height [mm]	Module size	Unit height [mm]	Module size
Up to 20	MS132	125	5E	-	-
Up to 32	MS132/MS165	125	5E	-	-
Up to 125	S800/XT2L 160	-	-	-	-
Up to 160	XT1S / XT2L 160	125	5E	150	6E
Up to 250	XT4 S/L 250	200	8E	250	10E
Up to 630	XT5 S/L 630	300	12E	300	12E

500V 50kA/65kA

		3 pole		4 pole	
Current [A]	Circuit breaker Type	Unit height [mm]	Module size	Unit height [mm]	Module size
Up to 160	XT1 H/XT2V 160	125	5E	150	6E
Up to 250	XT4 H/V 250	200	8E	250	10E
Up to 630	XT5 H/L 630	300	12E	300	12E

690V 35kA/50kA

		3 pole		4 pole	
Current [A]	Circuit breaker Type	Unit height [mm]	Module size	Unit height [mm]	Module size
Up to 250	XT4X 250	200	8E	250	10E
Up to 630	XT5 H/L 630	300	12E	300	12E



**Feeder with switch-disconnector-fuses**

**SlimLine XR**

400V, 500V, 690V

		3 pole		4 pole	
Current [A]	Switch disconnector Type	Unit height [mm]	Module size	Unit height [mm]	Module size
Up to 160	XR00	50	2E	100	4E
Up to 250	XR1	100	4E	150	6E
Up to 400	XR2	200	8E	250	10E
Up to 630	XR3	200	8E	250	10E



**Feeder with switch-disconnector**

**InLine II**

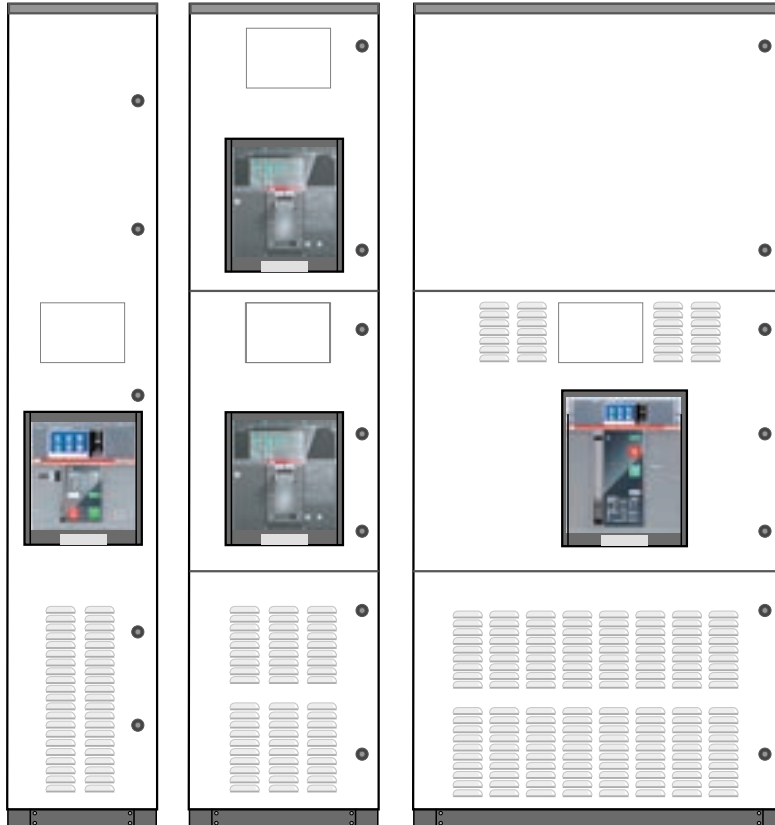
400V, 500V, 690V

		3 pole	
Current [A]	Switch disconnector Type	Unit height [mm]	Module size
Up to 160	ZHBM00	50	2E
Up to 250	ZHBM1	100	4E
Up to 400	ZHBM2	100	4E
Up to 630	ZHBM3	100	4E

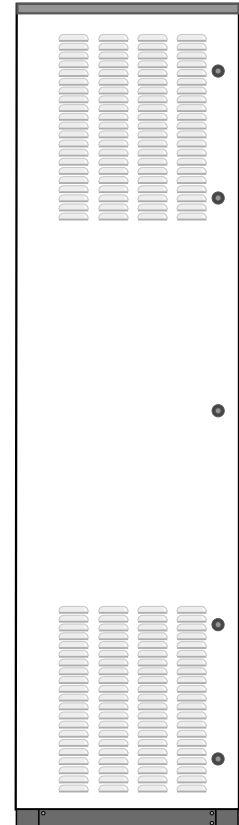


# Dimensions

—  
Power Center



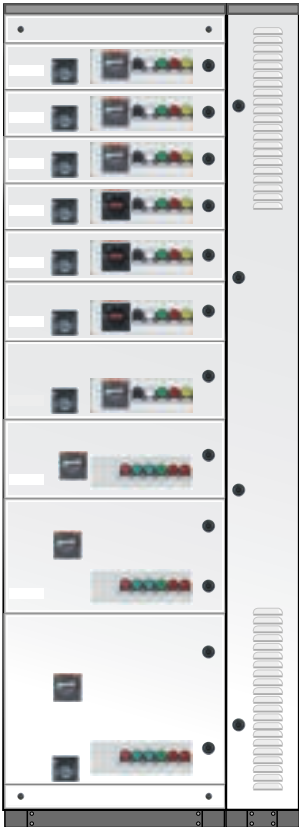
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Empty/Transition Panel



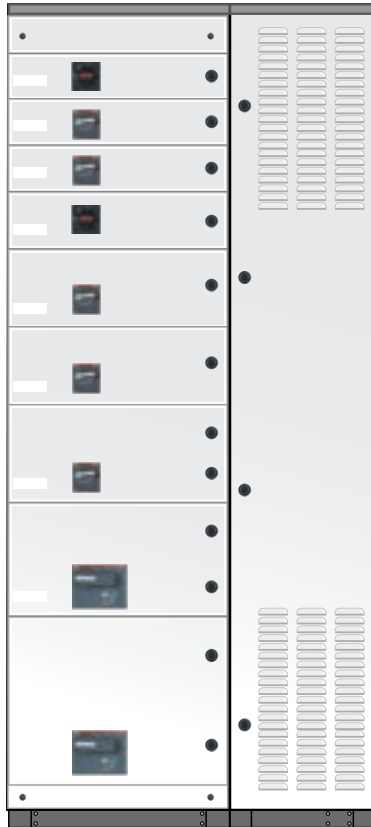
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Dimensions in mm

Panel Type	Height	Width	Depth	Devices
PC up to 1600A	2200	400/500/600/800	600/800/1000	1 or 2x MCCBs / 1 or 2x ACBs
PC up to 2500A	2200	500/600/800	600/800/1000	1 or 2x ACBs
PC 2500-4000A	2200	600/800	600/800/1000	1 ACB
PC 5000-6300A	2200	1000/1200	600/800/1000	1 ACB
Empty Panel	2200	600/800	600/800/1000	
Transition Panel	2200	400/500/600/800	600/800/1000	

**Motor Control Center & Distribution Board**



Type C



Type F



Type B185



Type D

**Dimensions in mm**

Panel Type	Module Type	Heigh	Width	Depth	Application Type	Devices
Type C	Withdrawable & Plug-in	2200	800/1000/1200	600/800/1000	Motor Starters and Feeders	MMS/MCCB
Type B185	Plug-in	2200	800/1000/1200	600/800/1000	Switch disconnectors	SlimLine
Type D	Fixed	2200	600/800/1000	600/800/1000	Fuse switch disconnectors	InLine
Type F	Fixed	2200	1000/1200	600/800/1000	Motor Starters and Feeders	MMS/MCCB

# Technical data

## Electrical data

Rated operational voltage	Ue	up to 690 V AC
Rated frequency	f	50/60 Hz
Rated insulation voltage	Ui	up to 1000V
Rated impulse withstand voltage	Uimp	8/12KV
Overvoltage category		III/IV
Ambient air teemperature		-5°C to + 40°C (see note 1)
Rated current horizontal busbars		1000A up to 6700A
Rated current vertical busbars PC		1250A up to 6300A
Rated current vertical busbars MCC		1000A up to 1900A
Rated short time withstand current	Icw	up to 100kA , 1s
Rated peak withstand current	Ipk	up to 220kA
Rated conditinal short-circuit current	Icc	up to 100kA

Note 1: also tested & certified for ambient air temperature of 50°C

## Mechanical data

Dimensions of columns	height	2200mm
	depth	600/800/1000mm
	width	400–1200mm
Modularity		1E = 25mm
Maximum stacking density		80E
Standard module size		5E up to 36E
Degree of protection		IP30 / IP40 / IP42 / IP54
Internal separation PC		up to from 4b
Internal separation MCC		form 3b / 4b
Painting		Epoxy - Polyester RAL 7035

## Standards

Design verification	IEC 61439-1/-2, Edition 3.0
Internal arc testing	IEC TR 61641
Arc fault mitigation systems	IEC TS 63107
Seismic testing	IEEE 693 / ICC ES AC156





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