DISTRIBUTION SOLUTIONS

NeoGear™ low-voltage switchgear

System Guide

ABB NeoGear™: a revolution in motor control and smart power distribution.

Our world is changing at an everincreasing pace. New technologies are transforming the way we power our societies, produce our goods and services – as well as how we work, live and move.

Switchgear systems are key to this electrified economy. However, over the past 30 years they have seen little innovation. This all changes with the launch of NeoGear, which heralds a revolution in switchgear technology.

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Overview of ABB NeoGear switchgear

An innovation in low-voltage switchgear

Switchgear are essential technology for safe energy distribution and motor control, but the way they are designed and created has not changed for years. With NeoGear, ABB has taken switchgear to the next level, bringing about a new evolution in power distribution in the process.

The first real innovation introduced in lowvoltage switchgear technologies since the 1980s, NeoGear is ready to help customers across process industries to manage changing external dynamics and realize new opportunities in their working environments.

Central to NeoGear is its laminated bus plate technology, which replaces traditional horizontal and vertical busbar systems. This innovative bus plate technology, combined with the connectivity and intelligence of the ABB Ability™ platform, make it an unrivalled solution for industry applications.

Safe

Revolutionary design eliminates hazardous exposure to live busbar parts

Arc ignition protected zones keep maintenance personnel safe

Reduced risk of arcs caused by mechanical failures slashes maintenance and down time

Smart

92%
fewer busbar parts than traditional switchgear

30%
reduction in operational costs through predictive maintenance, increasing uptime and performance

90%
fewer electrical joints for highest switchgear availability

Sustainable

20%
less heat dissipated saves energy and lowers cost thanks to excellent cooling efficiency

Efficient use of reduced CAPEX budgets for quicker return on investment

Up to 25%
less space needed - reduced switchgear footprint brings space savings

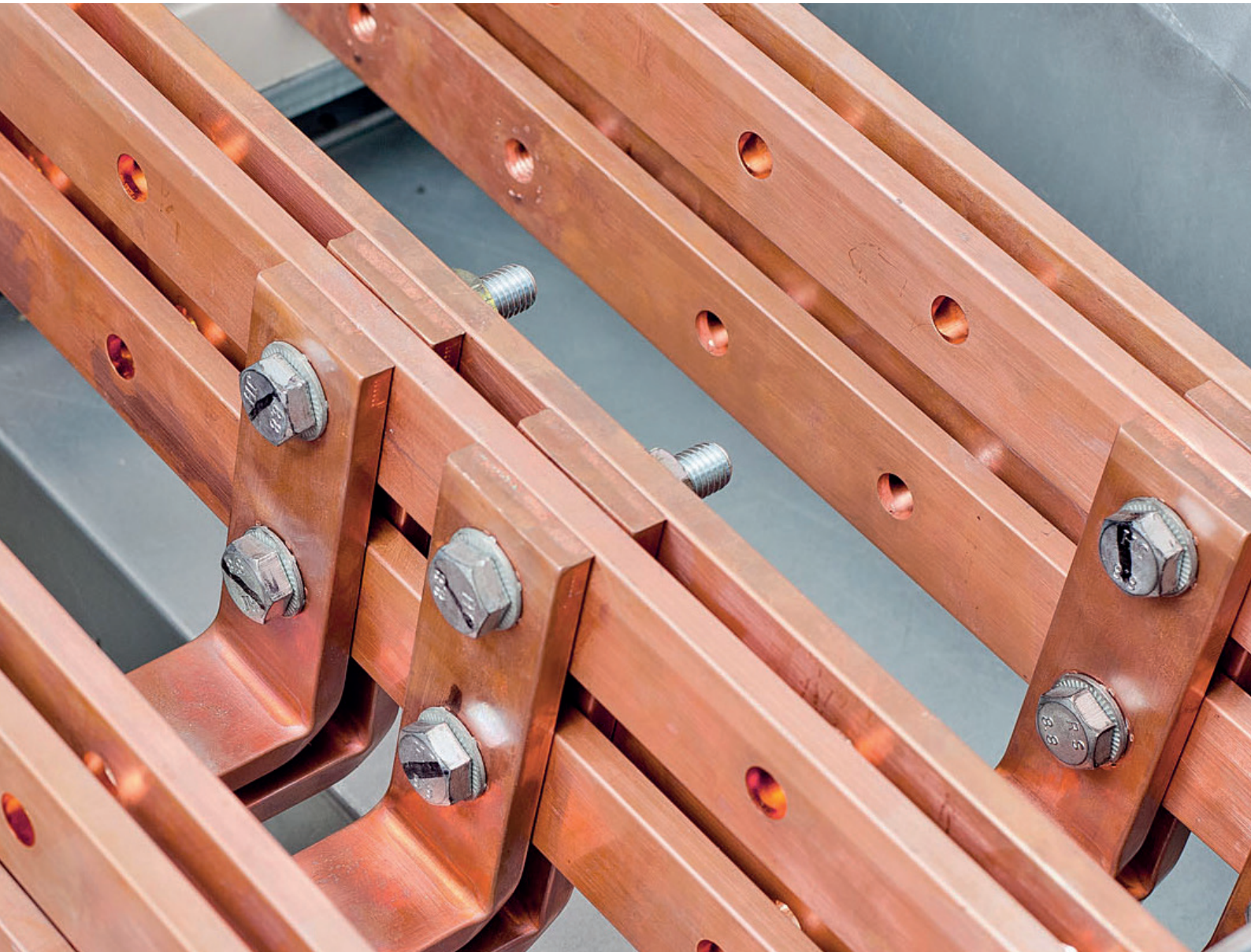
Benefits

Safest by design eliminating the occurrence of arcs

Increase safety for maintenance personnel handling live switchgear compartments with arc ignition protected zones

Higher process availability by reducing switchgear downtime due to need of maintenance or internal arc

Eliminate hazardous exposure to live busbar parts with a revolutionary design that further reduces the chance of serious injuries



Benefits

Smart switchgear design with a robust contact system

Predictive maintenance for increased uptime enabled by asset management based on digital monitoring and diagnostics

Highest process availability through a simplified and robust module contact system

Radical reduction in number of parts, which allows faster delivery and a simplified engineering processs

Benefits

More sustainable with reduced footprint and higher efficiency

Reduced switchgear footprint for more efficient design of the electrical room

Reduced heat dissipation for saving cooling energy and lower cost for switchgear room conditioning

Segments and solutions

The values and benefits of NeoGear fits any segment that is driven by highest level of safety in electrical equipment, smart designs which are ready for the vast array of opportunities Industry 4.0 has to offer and who pursue more sustainable operations.

Applications

NeoGear is a low-voltage switchgear assembly and its design has been verified in accordance with IEC 61439-1/-2. The application of the state-of-the-art laminated bus plate technology and the high-quality contact system design delivers a safer, reliable and more compact design.

Notable system advantages and design aspects

- Highest class of personnel and plant protection by inherent design
- High operational reliability and availability with the fully insulated bus plate design
- Design verified by testing (type-tested) including arc fault containment
- Maintenance-free bus plate, shipping split connectors and frame construction
- Simple and more safe retrofitting procedures with arc Ignition protected zones
- Compact, space-saving design with increased module depth
- Service life time for 30 years

The switchgear's flexible and compact design is ensured thanks to modularity both in electrical and mechanical design, as well as the use of highly standardized components. Depending on the operating and environmental conditions in which NeoGear will be installed there are different design levels available.

Switchgear

Thanks to its modular and space saving design, NeoGear applications can be used for:

- Motor Control Centers
- Power Centers
- Main Distribution Boards

Installation

Suitable for indoor installation in:

- Switchgear rooms
- Mobile substations (eHouse)
- Converted containers

Technical specifications

Standards	Enclosed lowvoltage switchgear and controlgear assemblies	General rules power switchgear and controlgear assemblies Testing under conditions of arcing due to internal fault (internal arc)	IEC 61439 - 1 IEC 61439 - 2 IEC TR 61641
	Vibration	Environmental testing Test Fc: Vibration (sinusoidal) Environmental testing Test Fh: Vibration (broad band random)	IEC 60068 – 2 - 6 IEC 60068 – 2 - 64
	Shock	Environmental testing Test EB: Bump (broad band random) Environmental testing Test: ≥100kg 0,2m (Free fall)	IEC 60068 – 2 - 27 DIN EN ISO 4180 - 12
	Solid insulation	Verification of solid insulation Dry heat Dry heat cycle (2K2) Thermal shock Damp heat	IEC 60664 - 1 IEC 60068 2-- 2 IEC 60068 – 2 – 14 IEC 60068 – 2 - 78
	Flowing mix Gas Protection against electric shock	Environmental testing Test Ke: Method 3 General rules	IEC 60068 – 2 - 60 IEC 61439-1
Test certificates		DEKRA / Netherlands	IEC 61439-1 / 2 IEC TR 61641
Electrical data	Rated voltages	Rated insulation voltage U_i Rated impulse withstand voltage U_{imp} Overvoltage category Degree of pollution Rated frequency	1000 V 3~ 6 -12 kV, depending on equipment II / III / IV, depending on equipment 3 50 Hz
	Rated current Main bus plate	Rated current Ie Rated peak withstands current I_{pk} Rated short-time withstand current I_{cw}	up to 3200 A up to 176 kA up to 80 kA / 1s
	Arc fault containment	Rated operational voltage Prospective short-circuit current Duration IEC TR 61641 criteria	400/415 V 3~ up to 80 kA 500 ms Class I Class C (1 to 7)
Mechanical characteristics	Dimensions	Sections and frames tolerance class Height Width Depth (excl. circuit breaker pagoda door) Basic grid size enclosure Modular system	ISO 2768 2300mm 300 mm, 500 mm, 600 mm, 700 mm, 850mm, 1000mm 600mm E = 25 mm acc. to DIN 43660 E = 150 mm

Mechanical characteristics	Surface protection	Frame incl. internal subdivisions	Magnelis or alu-zinc/zinc coated
		Cladding, internal	Magnelis or alu-zinc/zinc coated
		Cladding, external	Magnelis or alu-zinc/zinc coated and powder coated RAL 7035 (light grey)
	Degree of protection	According to IEC 60529	External IP 43
		ACB compartment	Internal. IPx xB
		Module compartment	Internal. IP2xC
		Contact pins on laminated busplate	Internal. IP4x
		Cable compartment	Internal. IP2xC
		Laminated busplate (LBP) + shipping split connector (SSC)	Internal. IP4x
	External mechanical impact	Metal cladding, external acc. IEC 62262	IK 10
	Plastic components	Life parts	UL94-V0, IEC 60707
		Enclosure, cover	UL94-V2, IEC 60707
		Halogen-free, self-extinguishing, flame retardant, CFC-free	
	Steel components	Frame incl. intern. subdivisions	2,0 / 2,5 / 3,0 mm
		Cladding, internal	0,7 / 1,0 / 1,5 / 2,0 mm
		Cladding external	1,5 / 2 mm
	Forms of separation	MCC section standard	Form 3b
		Direct Connection to Busplate (DC2BP) section standard	Form 4a/4b
	Internal subdivision	Equipment compartment	
		Module compartment	
		Cable compartment	
		Laminated bus plate – covered by solid insulation forms own busbar compartment	
	Laminated bus plate	Standard solid insulated	
		arc ignition protected zone	
		MCC contact system silver plated	
		3P unswitched – ext. 50% Neutral	

Safety for personnel and equipment

The most evident benefit of the laminated bus plate design is in its fully insulated characteristic. Together with the innovative Contact Guard protection device, it creates an arc ignition protected zone from the laminated bus plate up into the module device. According to the IEC TR 61641 an arc ignition protected zone (AIPZ) is defined as part of a circuit within an assembly where specific measures are provided to ensure the initiation of an arcing fault is a remote possibility.

When a withdrawable module is removed the Contact Guard device creates a segregation to the live bus plate of IP4x, which basically means a 1 mm wire is not able to access any of the live parts.

NeoGear low-voltage switchgear system has been subjected to verification by testing in compliance with the IEC 61439 & IEC TR-61641 standards. To ensure the highest possible degree of safety, ABB continues to conduct tests as per a continuous development program. These tests are based on the most critical representative applications of the entire product or performance range of the switchgear with respect to the test standard.

With NeoGear, ABB exceeds the normal levels as a standard by eliminating the remote possibility of an arc occurring in the busbar compartment of a switchgear.

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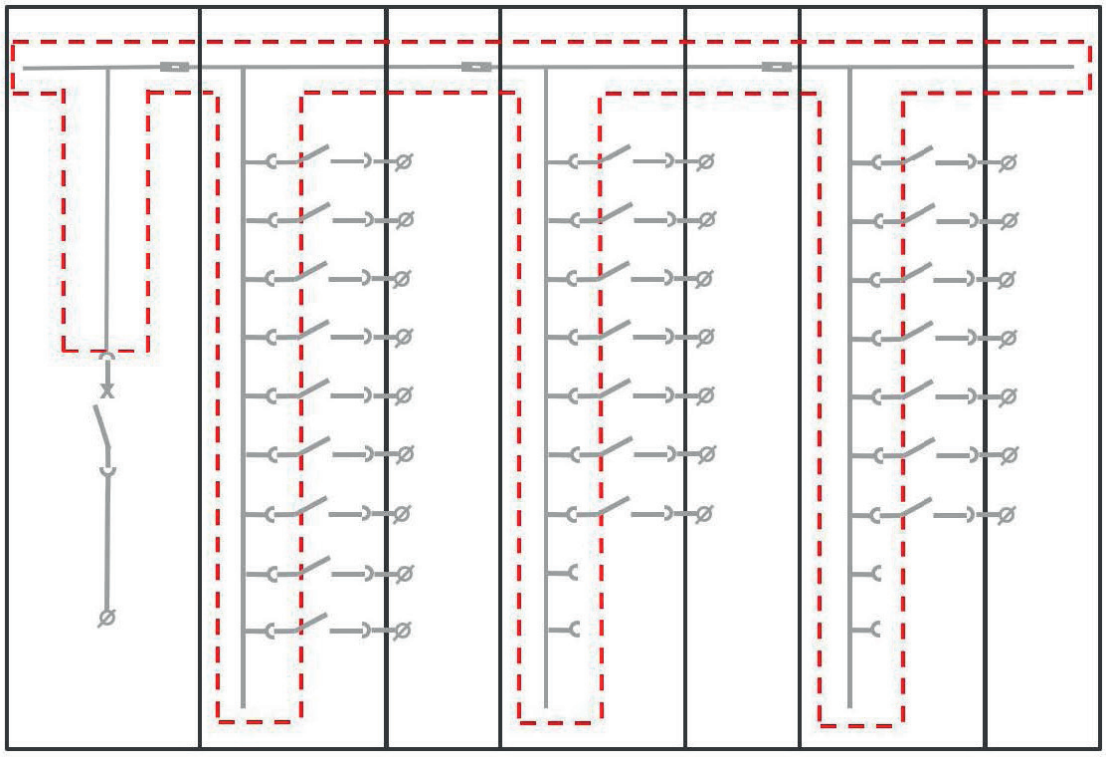
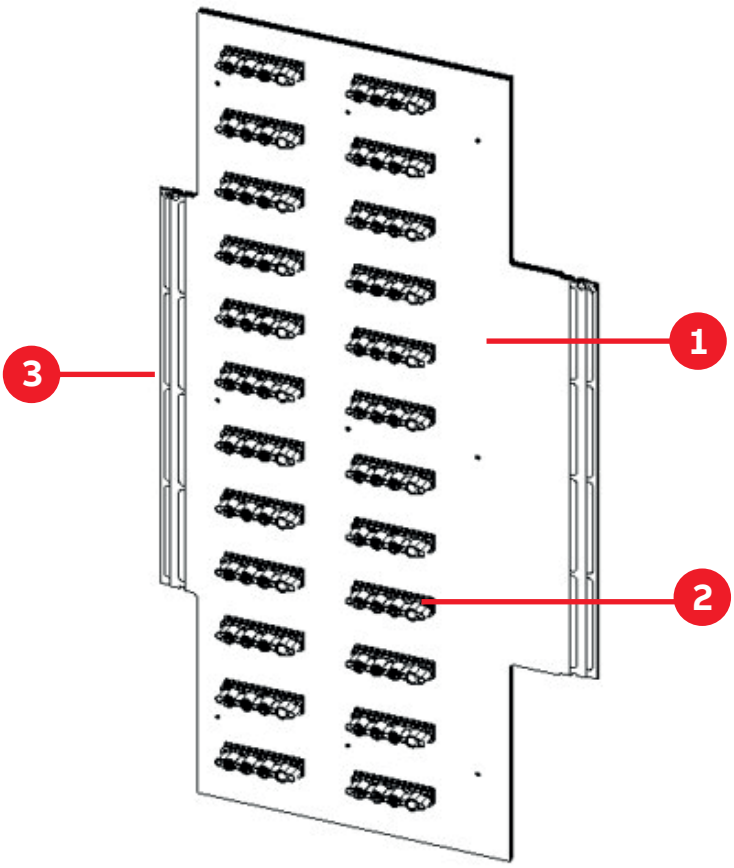
AIPZ in NeoGear switchgear



Laminated bus plate

The function of the laminated bus plate is to distribute the current inside a low-voltage switchgear in a safe and efficient way

It performs the function of the traditional horizontal and vertical distribution bars



1. The copper phase plates are fully segregated by a solid insulation material. The insulation material is a Sheet Molding Composite (SMC) consisting of glass-fiber reinforced polymer material, halogen-free, flameretardant and self-extinguishing. This design makes it impossible for an arc to pass between phase plates or between equipment compartment and cable compartment.

2. The phase plates are fitted with solid copper, silver coated contact pins allowing the direct connection of functional modules to the bus plate. The pins are maintenance-free and a single set of pins is rated up to 400 amps.

3. Inside a switchgear the laminated bus plates are joined by means of a simple and robust bus plate joint. Like the bus plate the joint is a fully insulated and maintenance-free. The joint can be fitted or removed from the front side of the switchgear and requires tightening only by means of four bolts.

Tests

- Design verification acc. IEC 61439-1/-2
- IAC IEC TR 61641
- Vibration and shock test acc. IEC 60068-2-6 and IEC 60068-2-27
- Verification of Solid insulation acc. IEC 60664 - 1

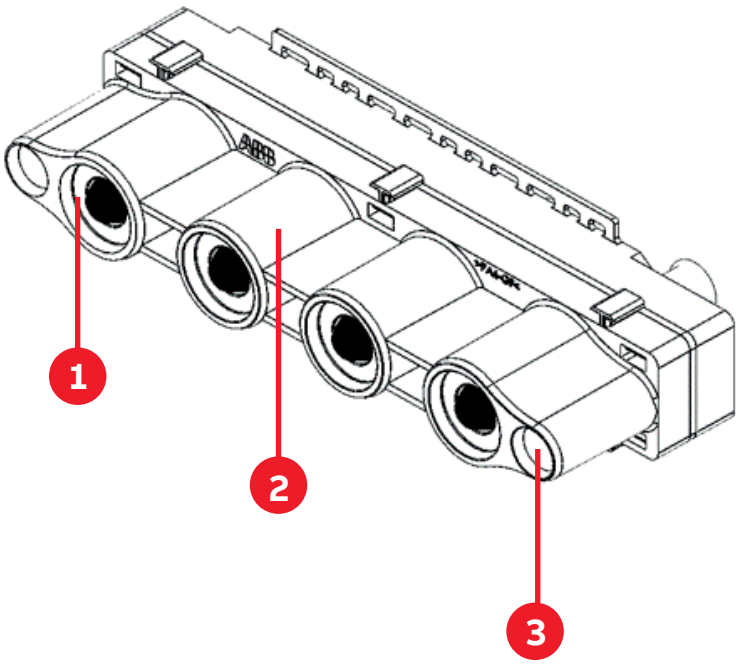
Highlights of the bus plate

- Fully insulated copper conductors
- Strong insulation material (glass-fiber reinforced polymer)
- IP2xC protection when modules are removed
- Maintenance-free bus plate and bus plate joints
- Easy switchgear extension with simple to install joint
- Vibration and shock test acc. IEC 60068-2-6 and IEC 60068-2-27

Power contact

The NeoGear smart contact system allows the direct connection of functional modules onto the laminated bus plate and is based on a proven lamella contact system. This technology has been used since many years in mediumvoltage breaker technology.

The lamella electrical contact points ensure a robust high-quality connection for at least one thousand insertion cycles. Standard both sides of the contact system are silver plated



1. NeoGears' contact system has been subjected to several tests to prove the sophisticated design and the high quality. The IEC 61439 standard specifies that a contact system has to be suitable for a minimum of 200 insertion cycles. NeoGear has successfully passed a minimum of 1000 insertion cycles, increasing its durability and reducing the need for maintenance during the switchgear's 30 years of operational lifetime.

2. **Contact Guard**
   There is a full single-phase segregation achieved prior to making the electrical connection to the laminated bus plate.

3. **Contact alignment**
   Guidance pins on the module ensure a 100% perfect alignment of the contact system when a module is inserted. The bearing tolerance in the module contact side allows a stress-free perfect connection to the contact pin.

Tests

- Design verification acc. IEC 61439-1/-2
- IAC IEC TR 61641
- Corrosion test acc. IEC 60068-2-60
- Vibration and shock test acc. IEC 60068-2-6 and IEC 60068-2-27

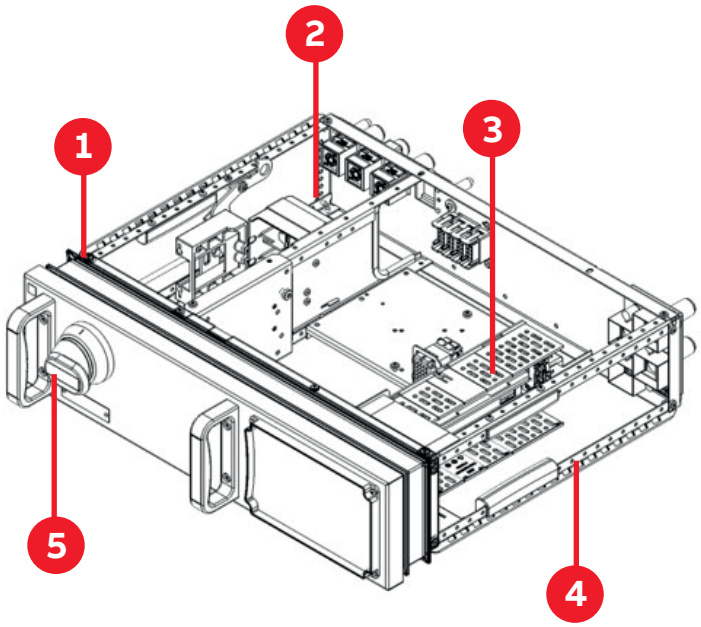
Highlights of the bus plate

- Operational life cycle up to 1000 insertions
- Bearing construction eliminates cable stress
- Full single-phase segregation assured prior to the connection of the power contacts to the bus plate.

Functional modules
Withdrawable

NeoGears' withdrawable technique is distinguished by its extended depth design where 25% more depth space is available inside the module. The modularity enables the assembly to maximize the usage of the available space, which in turn reduces the overall footprint of the switchgear up to 25%.

Whether the module is small, medium-size or large they all connect directly to the laminated bus plate. There is no need for special condaptors simplifying the conversions of compartments when needed.



1. When modules are positioned in the extracted isolated position for e.g. lock-out safety procedures the sealing around the module power contact system maintains the ingress protection up to IP2x.

2. The Arc ignition protected zone concept is continued in the module up to the MCCB upstream side.

3. To allow quick in simple modifications to the modules are divided in a power box and a control box. The power box contains the devices such as the MCCBs and Contactors. The control box is a configurable part in the right side of the module containing the auxiliary and control circuit.

4. The form segregation is done inside the switchgear panel construction. In between the functional modules the degree of protection is IP2xC. The open construction of the modules allows optimum access for maintenance activities (when module is removed) but most importantly allows improved natural air flow inside the switchgear panel improving the maximum permissible watt loss.

5. Withdrawable modules are operated with the multifunction operating handle. This handle also activates the electrical and mechanical interlocking of the module. No further tools or unlocking devices are necessary to withdraw a module, thus replacing a module may take less than a minute. Replacement as well as retrofitting of modules can be performed under live conditions, should plant operating procedures allow

Withdrawable module positions

ON: Module is inserted, main switch closed, main and control circuit connected
OFF: Module is inserted, main switch open, main and control circuit disconnected, padlocking possible.
TEST: Module is inserted, main switch open, main circuit disconnected, control circuit connected, padlocking possible
ISOLATED: Module is withdrawn 30 mm from the inserted position, main switch open, main and control circuit disconnected, padlocking possible
MOVE: Module can be completely withdrawn from the switchgear

All positions/situations are clearly marked on the fixed section of the operation handle in accordance with IEC 61439-1/-2.
All main and auxiliary connections are selflocating, without the need of additional tools.

Highlights

- Arc ignition protected zone on the upstream side in the module
- High stacking density due to increased depth, resulting in a reduced footprint
- Complete phase isolation of main power contact prior to connection to the laminated bus plate
- No special condaptors needed to connect to laminated bus plate
- Open construction for improved natural convectionbus plate.

Power Module and Control Box

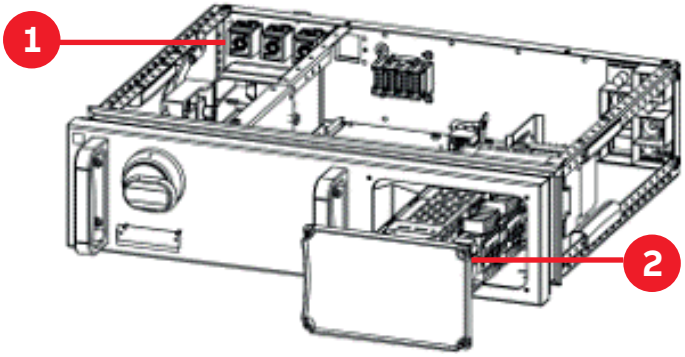
Each withdrawable NeoGear module consists of 2 part:

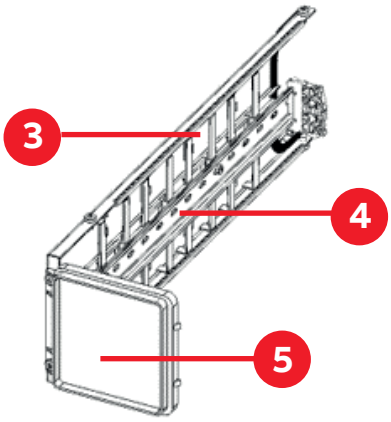
1. Power module
2. Control Box

The power module consists of the main switching device and the contactors in case of (H)DOL or REV applications. This combination is selected in accordance to the ABB motor coordination tables for type 2 motor starters. The Control cuircuit area is situated inside the Control Box on a removable console. The removable part consists of:

3. Base plate
4. DIN rail
5. Instrument panel

This separation of power and control allows easier configuration, upgrade or maintenance of the customized control circuits at any time. The instrument panel is available in 2 sizes for the larger size modules.





Plug-in modules

To meet restriction in maximum weight of withdrawable motor starters or offer flexibility in layout, NeoGear provides the option for plug-in modules. The connection system to the laminated bus plate makes use of the same high-quality contact pin concept as for fully withdrawable units. The configuration of the equipment is done on plug-in base plate and is available in different sizes.

The plug-in module variants in NeoGear platform are widely configurable. The plug-in modules use the same contact system as withdrawable modules.

There are also configurations without a contact system connected to the Laminated busplate (LBP). Plug-in modules are available in S, M, L and XL sizes, as well as in combinations of these.

The basic design consists of a base plate (used for contact system), mounting plate (for device mounting only, without contact system), sidewalls, compartment bottom plate (for the separation of compartments), wire harness (for connecting switches to the contact system) and door assembly.

Air circuit breaker cubicles

All the air circuit breaker (ACB) cubicles are verified in accordance with IEC 61439-1/-2, in addition to IEC 60947-1 required for the individual apparatus and engineered to meet the requirements of IEC 61641 class C (criteria 1 to 7). This ensures ABB's offering of 'Proven Safety Plus' for operators and plant.

Minimum features
All ACBs have the following minimum features:
- Manual charging lever and 'Charged' indication
- Manual Open/Close push buttons
- Mechanical 'Open'/'Closed' indication
- Mechanical signaling of 'Overcurrent' release
- 4 auxiliary contacts

Project specific options
- Separated from the main busbars (separation wall)
- Withdrawable configuration
- Top or bottom cable entry/Top bus duct entry
- Shunt opening/closing release
- Undervoltage release
- Electrical signalization of ACB status
- Key locking facilities
- Shutter locking facilities
- Mechanical indication 'Racked In'/'Racked Out'/'Test Isolated' position
- Locking in 'Racked In'/'Racked Out'/'Test Isolated' position
- Switch disconnector option
- ACB handling truck
- Configuration and test unit

Further options available (but not limited to)
- Zone selectivity
- Dual protection settings
- Directional short circuit protection
- Reverse power
- Under-/overvoltage protection
- Annunciation of measured values, alarms
- Maintenance data
- Integration into on premise condition monitoring and asset health solution CMES

Moulded case circuit breakers

The SACE Tmax XT series of Moulded Case Circuit Breakers (MCCBs) are designed to maximize ease of use, integration and connectivity, while reliably delivering safety and quality. Rather than just offering standalone protection, they are a key element of the system that give you complete flexibility, extreme breaking capabilities and reliable performance under pressure.

Electrical and condition data are collected by the breaker and are possible to be connected to on-premise condition monitoring and asset health solution CMES

Motor protection devices

Electronic overload relays (EF)
The EF-range is a self-supplied electronic overload relay, which means no extra external supply is needed. It offers reliable and fast protection for motors in the event of overload or phase failure. Easy to use like a thermal overload relay.

Motor protection device (M10x)
M10x is a microprocessor-based device which provides comprehensive protection and control features in one device supporting predictive maintenance and asset health for motors and motor starter. Standard features simplify maintenance and plant expansion. Each motor starter is equipped with one standard M10x device. With dedicated parameters in each device, M10x provides specific control, monitoring and protection functions, and is tailored for various motor applications

Universal motor controller (UMC)
The Universal Motor Controller UMC100.3 delivers reliability and protection for motor starter, supporting intelligent data hub for predictive applications, maintenance and asset management. Superior user experience for smooth running of operations, paired with unrivalled communication options and simple configuration.

ABB Ability™ implementation with NeoGear™

Integration into plant-wide control systems

The integration of NeoGear into the LVS Digital system platform provides a clear segregation between process / substation control and asset monitoring. We call it the non-intrusive way of monitoring.

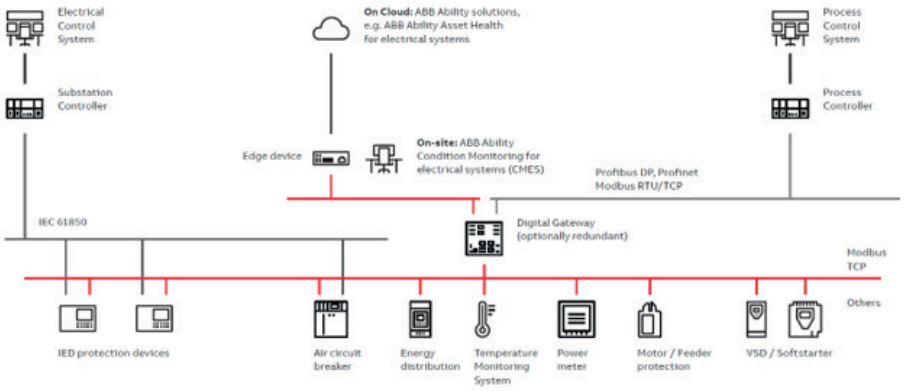
This approach allows fast update time for process relevant data and control of field devices utilizing different fieldbus protocols, nowadays typically Ethernet based.

On the other hand, a vast amount of data from various field devices is sent to the Edge device where the ABB Ability™ CMES – the on-premise Condition Monitoring for electrical systems- is storing and analyzing the data to provide detailed insights into the actual condition of the switchgear and connected consumers.

CMES - supporting quick fault resolution to minimize production stop and creating information for condition-based maintenance to cut down OPEX costs with a clear focus towards predictive maintenance.

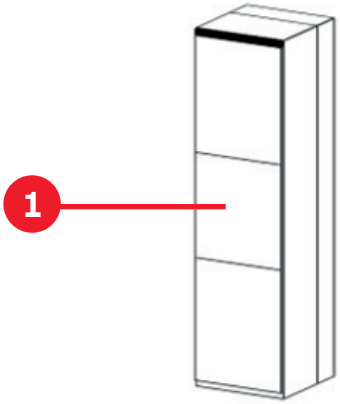
On top of that NeoGear is ready to connect to cloud services like ABB Ability MyRemoteCare for extended asset health monitoring and analytics – a common platform for ABB LV and MV switchgear with remote fleet monitoring capabilities.

NeoGear – The switchgear that sees everything, so you see everything.


Electrical Control System
Substation Controller
On Cloud: ABB Ability solutions, e.g. ABB Ability Asset Health for electrical systems
Edge device
On-site: ABB Ability Condition Monitoring for electrical systems (CMES)
Process Control System
Process Controller
Profibus DP, Profinet
Modbus RTU/TCP
IEC 61850
Digital Gateway (optionally redundant)
Modbus TCP
Others
IED protection devices
Air circuit breaker
Energy distribution
Temperature Monitoring System
Power meter
Motor / Feeder protection
VSD / Softstarter

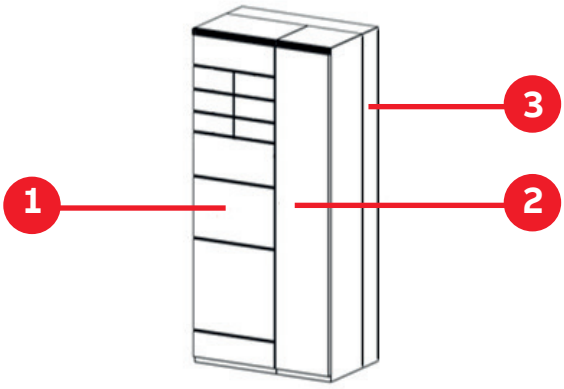
Switchgear design
Functional compartments and segregation

The assembly is divided into compartments thus separating different functional areas.



1. Equipment compartment
The equipment compartment is divided into 3 sub sections, each sub section has its own door. The center sub section accommodates the circuit breaker and associated equipment in fixed or withdrawable design.
Depending upon the option for cable entry, for example with top entry solution access to incoming connections is via the door in the upper sub section, the auxiliary compartment is then located behind the door in the lower sub section. For bottom entry the configuration is vice versa.

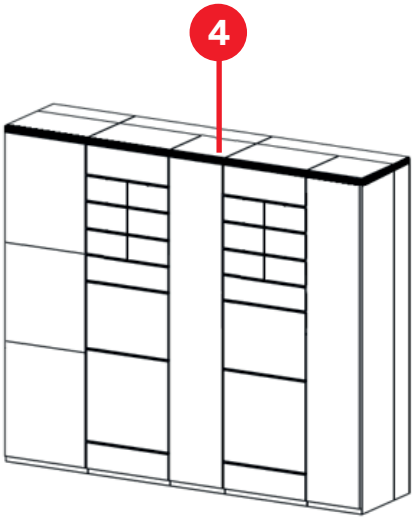
3. Laminated bus plate area
Located at the rear and contains the NeoGear fully insulated laminated bus plate.



1. Equipment compartment
All equipment, including the motor starter modules in withdrawable design, is situated therein. The compartment can be divided into horizontal and vertical sub compartments.

2. Cable compartment
Contains control cables and terminals, as well as power cables and connection units. Cable entry may be top or bottom.

3. Laminated bus plate area
Located at the rear and contains the NeoGear fully insulated laminated bus plate.

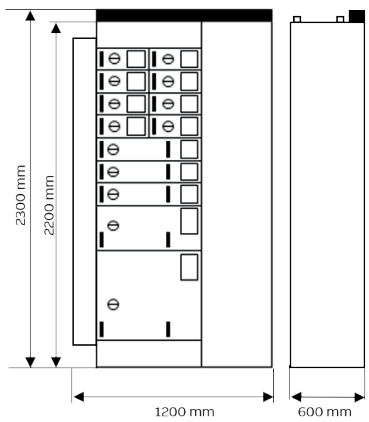


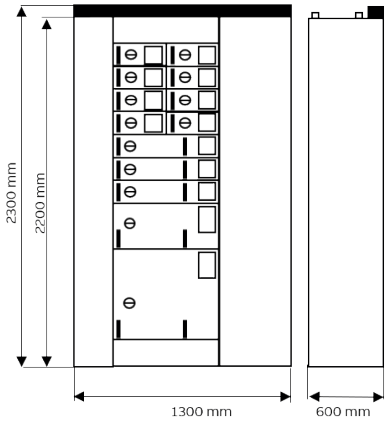
4. Arrangements
Standard arrangement as free standing or back to wall.

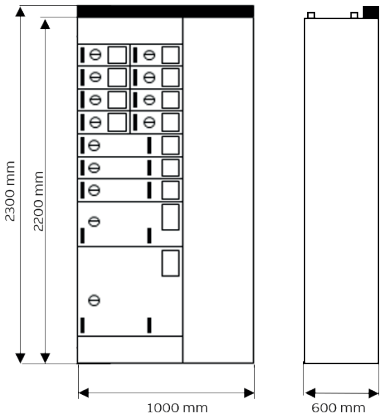
Section dimensions

The following representative dimensions are applicable to the NeoGear sections.
MCC Section: Depth: 600 mm, Width: 1000 mm – 1300 mm*, Height: 2300mm
*depends if the MCC Section has a Sidewall / additional Beginning Section or not

Module section(s) in line up	First module section in lineup with beginning section	First module section in lineup with plain side wall LBP cover

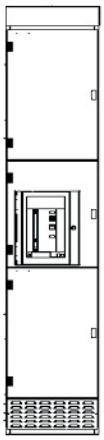




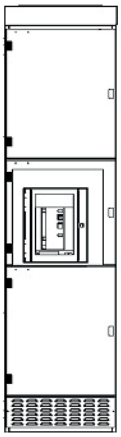


The following representative dimensions are applicable to the NeoGear sections.
DC2BP Section: Depth: 600 mm**, Width: 500 mm– 1050 mm, Height: 2300 mm
** excl pagoda cover

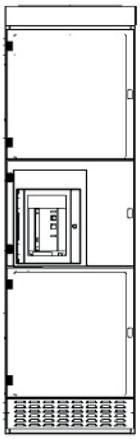
Circuit breaker type	Application	Poles	Cable connection
Emax E1.2	Incomer / Feeder / Bustie	3 / 4	Top / Bottom
Emax E2.2	Incomer / Feeder / Bustie	3 / 4	Top / Bottom
Emax E4.2	Incomer / Feeder / Bustie	3 / 4	Top / Bottom



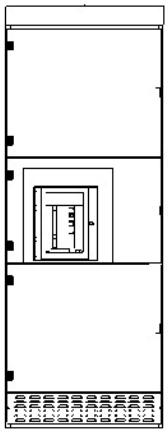
Width: 500 mm



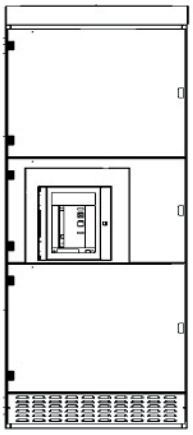
Width: 600 mm



Width: 700 mm

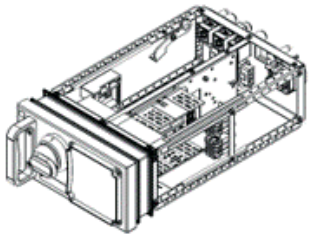
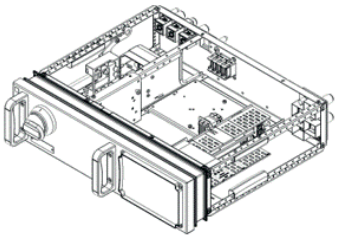
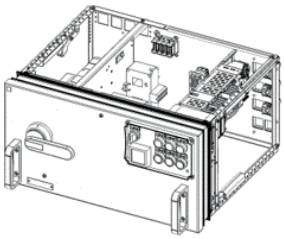
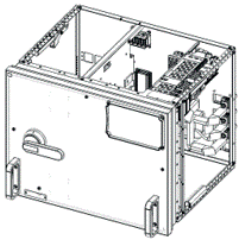
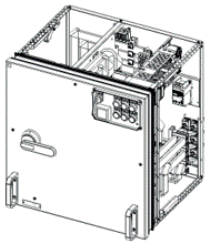


Width: 850 mm



Width: 1050 mm

Withdrawable modules

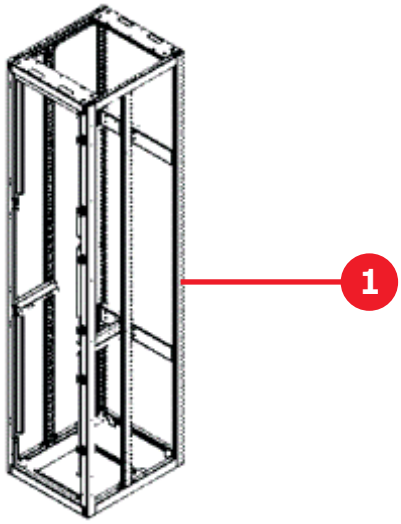
Module	Name size	Dimensions (mm)
	XS size	300x150x500 (L x H x D)
		
	S size	600x150x500 (L x H x D)
		
	M size	600x300x500 (L x H x D)
		
	L size	600x450x500 (L x H x D)
		
	XL size	600x600x500 (L x H x D)
		

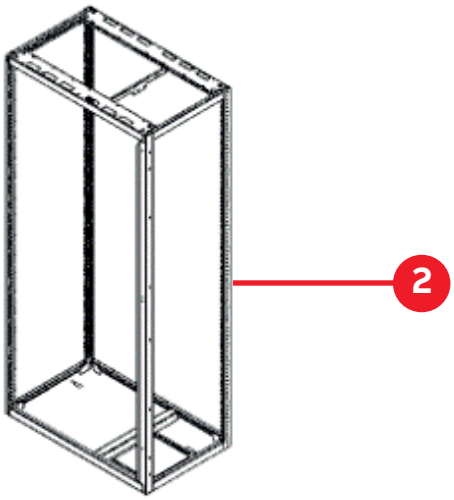
Maximum frame size rating* by module size (fuseless)

400/415V, 65kA, IE3	XS size	S size	M size	L size	XL size
Feeder 3 pole	63 A	250 A	400 A	630 A	-
Feeder 4 pole	63 A	160 A	380 A	400 A	630 A
DOL (EOL)	22 kW	55 kW	160 kW	-	250 kW
HDOL (EOL)	22 kW	55 kW	160 kW	-	-
REV (EOL)	7.5 kW	30 kW	75 kW	160 kW	-
DOL (M10x)	22 kW	55 kW	160 kW	-	250 kW
HDOL (M10x)	22 kW	55 kW	160 kW	-	-
REV (M10x)	7.5 kW	30 kW	75 kW	160 kW	-
DOL (UMC)	22 kW	55 kW	160 kW	-	250 kW
HDOL (UMC)	22 kW	55 kW	160 kW	-	-
REV (UMC)	7.5 kW	30 kW	75 kW	160 kW	-

* For RDF=1 Ing, different ambient and IP conditions can provide different maximum ratings

Mechanical construction





The basic mechanical design comprises:

- The frame
- The enclosure / external cladding
- Internal construction / internal cladding

The frame
Each section is precisely constructed by bolting horizontal and vertical profiles together, to form a rigid modular structure. The assembly is maintenance- free as a result of the construction method utilizing a combination of thread locking ESLOK screws with bolted pressure plates and thread forming screws.

The parts are galvanically protected (Magnelis, Zn or Al/Zn) against corrosion.

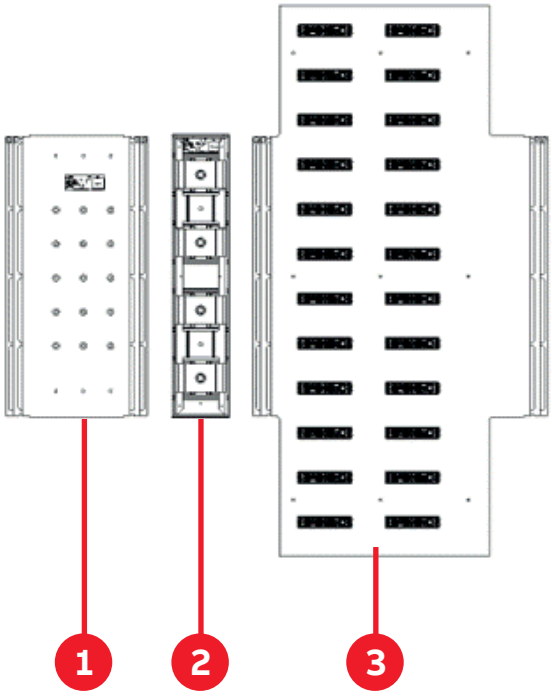
1. DC2BP frame
2. MCC frame

The enclosure / external cladding
NeoGear switchboard enclosure parts are made of a sheet steel which is protected by galvanic coating and powder coating for maximum durability. The fixation of the enclosure is achieved with screws. This applies to roof plates, rear and side walls. Final construction varies depending upon the required degree of protection.

Internal construction / internal cladding
Thanks to the modular construction, the actual assembly in a project is engineered to meet the design requested by the customer. Electrical and mechanical properties will define the arrangement of the sections in conjunction with the “form of separation” requirements.

The bus plate system

The bus plate system performs the main energy distribution for the switchgear. The design comprises:
1. The DC2BP bus plate
2. The shipping split connector (SSC)
3. The MCC bus plate
The rated current is 3200 A. The short-time withstand current (Icw) is 80 kA (2s) or 100 kA (1s). Rated peak withstands current (Ipk) is 176 kA.



LBP area
Located at the rear sits the NeoGear fully insulated laminated bus plate. Connection of ACBs to the LBP is via distribution- and angle bars. Modules are connected via pins on the LBP
The SSC area for LBP interconnection between sections is located on the right-hand side of the section LBP.

1. The DC2BP bus plate
The design of the bus plate for ACB sections strictly reflects needs of current section. Two major types can be recognized:

1. Incomer/feeder bus plate
    a. Emax E1.2
    b. Emax E2.2
    c. Emax E4.2

2. Bus Tie bus plate
    a. Emax E1.2
    b. Emax E2.2
    c. Emax E4.2

2. The shipping split connector (SSC)
Purpose of shipping split connector is to join side by side sections and connect bus plates of a switchgear lineup.

3. The MCC bus plate
MCC bus plate performs energy distribution inside the switchgear and contains the connection points for withdrawable modules.

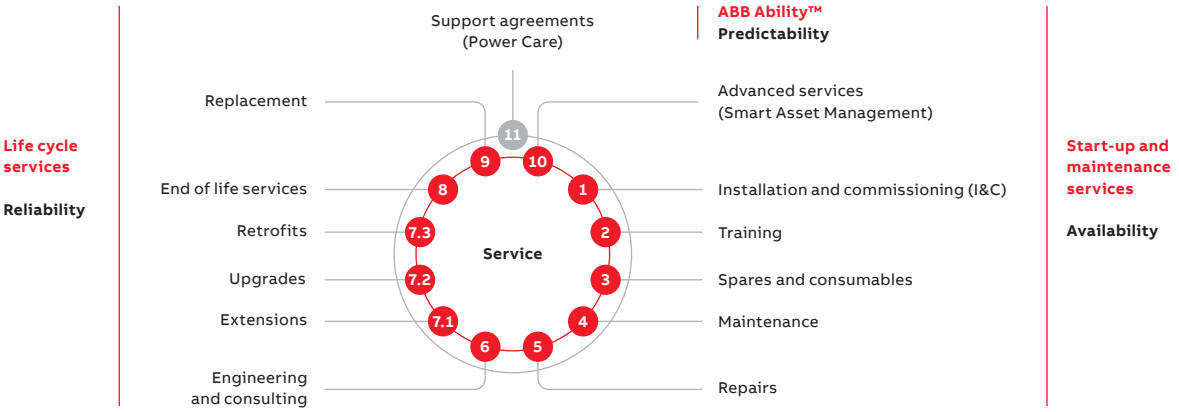
After sales and service

ABB's goal is to ensure the assets' maximum performance and availability. ABB has supplied over 1.5 million low voltage switchgear cubicles from its worldwide manufacturing locations. Each of these locations operates with an after sales and service department, offering unparalleled global support.

ABB Service technician's start offering their support from Installation and Commissioning by ensuring the equipment installed as per the guidelines. On completion of commissioning, the switchgear is at the peak of its performance. To maintain this condition, it is essential to adopt a service and maintenance plan for the NeoGear.

By establishing an effective maintenance plan, the risk of unwanted shutdowns are dramatically reduced. In production the availability of the switchgear ensures productivity, and any downtime is a lost opportunity for profit.

This is where ABB can offer its services. Building a Service Agreement customized to your operating conditions, incorporating services that range from Emergency Call-Out to Predictive Maintenance, we have all the necessary options that will ensure your Neogear and related production is at optimum condition.



Downtime can be attributed to the following maintenance practices:

- Reactive maintenance is costly for both production and unplanned downtime;
- Preventive or continuous maintenance is usually performed on an annual basis, during a scheduled shutdown;
- By evaluating information from the intelligent switchgear, it is possible to adopt a condition based or predictive maintenance schedule.

ABB Ability™ Condition Monitoring for electrical systems (CMES) enables maintenance to be taken into an even predictive maintenance practice, where the information available from the switchgear can further assist with maintenance workflow. Running on an Edge device, no Cloud connection is necessary for the system to operate.

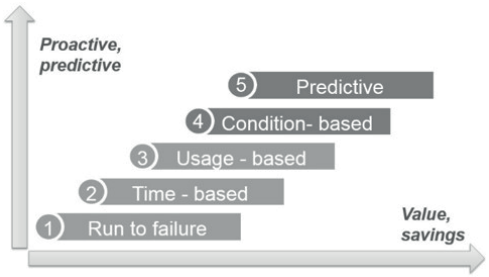
Routine Maintenance regimes can prevent and allow the operator to understand the condition of the equipment.

In practical terms

- Overheating equipment within a switchgear or field can be identified and the condition of the equipment is reported by the tool.
- Trends of equipment performance can be analyzed, any anomalies detected are reported with Asset Condition Monitoring.
- Reports are provided as configured by the user that shows the faults and the energy usage in a specified period.
- Reduced exposure of personnel to operating equipment is made possible with remote monitoring.
- Support from ABB service experts from all over the world can be enefitted. Important for sites in remote locations.
- Avoidance of cost by early identification of possible failures

The operator should consider the costs associated with inspection of the equipment and the loss of production due to an unexpected failure.

Utilizing the latest sensor technology, the Digital platform allows increased visibility on the switchgear. Incorporating this information with advanced algorithms that have been developed specifically by ABB as the OEM of switchgear.



If the system has been utilized from the commissioning phase, the complete performance history is available for analysis. With ABB Ability Market PlaceTM, the users can benefit the future developments and add it to their system.

Developments such as Intelligent Trend Analysis, Diagnostic Flows and Artificial Intelligence are expected in near future. Real OPEX savings are made by utilizing Digital switchgear, which we estimate up to 30 percent.

Utilizing ABB expertise can help to increase the operational lifetime of the switchgear.

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