

SEN Plus

Reliable LV switchgear solutions



Increased flexibility

- Rear access
- Reduced module size
- Top busbar



GE imagination at work

Why SEN Plus?

SEN+Plus



Boundaryless

Four pole - KEMA type tested assemblies up to 6400A for power distribution and control as per IEC 61439-2 /EN 61439-2 and IEC/TR 61641 for internal arcing.

Enables a boundaryless environment

Test and standards



Production environment

Certified to IEC 60529 for IP30 - IP54 arrangements.

Enables the installation of the equipment in a range of environmental conditions

Dust and waterproof



Safe modifications

Up to Form 4B as per IEC 61439-2

Enables safe modification under energised conditions

Internal form of separation



Functional floor space

Increases functional floor space in building services

Compact



Fast delivery

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

Secures fast deliveries

Smart and simple design



Resistant

Product design and epoxy powder coating provides a shock and scratch resistant design.

Minimises damage during installation

Durable surface protection



Lower investment

Central design and ongoing testing to the latest standards.

Lowers investment costs

Maintenance free busbar system



Environmental benefits

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

Future investment

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

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 7600A 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

The combination of SEN Plus and the new EntelliGuard™ air circuit breaker excel in terms of safety – both for personnel as well as system protection.

The switchboard 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. Compartmentalisation 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 GE 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 Profibus or Modbus is available for most components, to ensure a homogeneous setup.

Environmental considerations

The care of the environment in which we live and work is playing an increasingly important place in the considerations for the purchase of electrical equipment. SEN Plus has taken this into account through 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.



SEN Plus complies with following international standards and is tested at independent test bodies e.g. IPH, KEMA/DEKRA, ABS etc.



Type tests

- IEC 61439-2 Low-voltage switchgear and control assemblies-Part 2: Power switchgear and controlgear assemblies.
*The modified and updated standard released by International Electrical Committee in 2009, based on IEC 60439 standard.
- GB7251.1-2005 Low-voltage switchgear and control assemblies-Part 1: Type-tested and partially type-tested assemblies.
*Type test includes: verification of temperature-rise limits, dielectric properties, short-circuit withstand strength, effectiveness of the protective circuit, clearances and creepage distances, mechanical operation, degree of protection.

Special tests

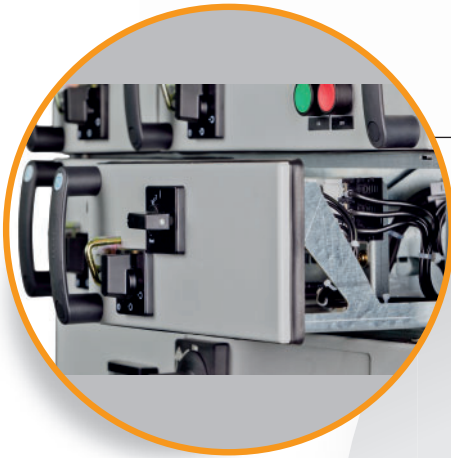
- IEC 60068-2-57 Environment testing-Part 2-57:Test Ff: Vibration-Time history method.
*Seismic vibration environment test in horizontal and vertical direction.
- IEC/TR 61641 : 2008-01 Enclosed low-voltage switchgear and controlgear assemblies - Guide for testing under conditions of arcing due to internal fault.
*International arcing fault protection standard.
- IEC 60529 Degrees of protection provided by enclosures.
*Define IP numbers used to quantify the degree of protection provided by enclosures.
- IEC 60068-2-30 Defining resistance to damp and heat.
*Wet Heat, 6 cycle with 24 h, 40°C, 95 % rel. humidity.
- IEC 60068-2-11 Defining resistance to salt mist.
*Salt fork, 2 cycle with 24 h, 35°C.
- ABS certified for marine vessels or facilities.

NEW FEATURES



Main busbar position in top

- New busbar in top for currents up to 4500A
- Panel front and rear access
- Improved panel derating
- Icw up to 100kA – 1s
- Fully accessible from top for infrared imaging



Small modules

- 3 new module sizes
- Optimized stacking density
- Up to 32 motor starter - 11kW
- Up to 48 feeder - 25A
- Use of standard terminals

EntelliPro

- Motor protection and control
- Interface with process control and SCADA system
- Status information from motors and switchgear
- Maintenance information
- SIL and ATEX certified



Optimized ventilation concept

- New fully ventilated IP42 design
- Same derating from IP30 through IP42
- Fully KEMA/DEKRA certified

Fixed options

- Separate IP40 sheet metal covers for each compartment
- 80E mounting plate with one common door or individual doors.



Rear access Motor Control Center – fixed

- Fixed motor starter and feeder applications
- Simple and fast cabling
- Competitive alternative for power distribution
- Convenient cabling space
- Optimized stacking density by use of MCCB's assembled in vertical orientation.

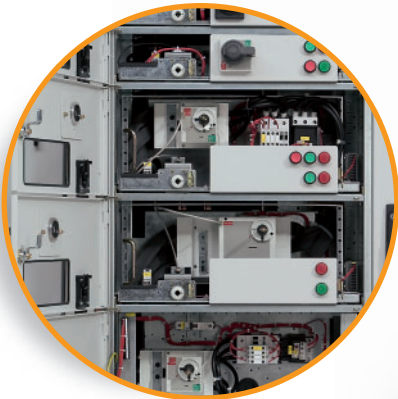
Rear access Power Center

- Rearward cable connection
- Accessable from front and rear
- Busbar position in top

Rear access Motor Control Center

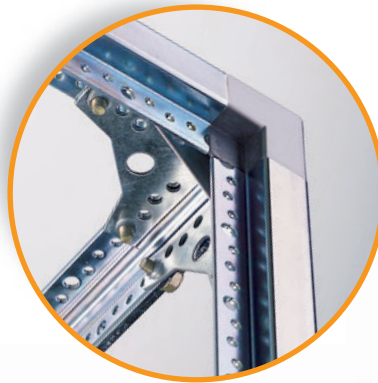
- Rearward cable connection
- Busbar position in top
- New compact Effcor™ motor starter units
- Simple and fast module assembly and wiring

Great benefits



For your safety

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



Rigid frame construction

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

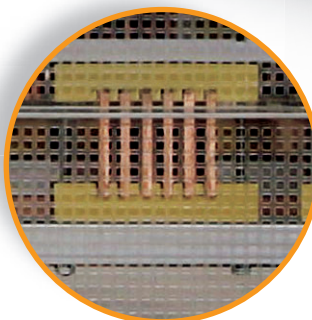
Optimum accessibility

- 135/180° door opening angle



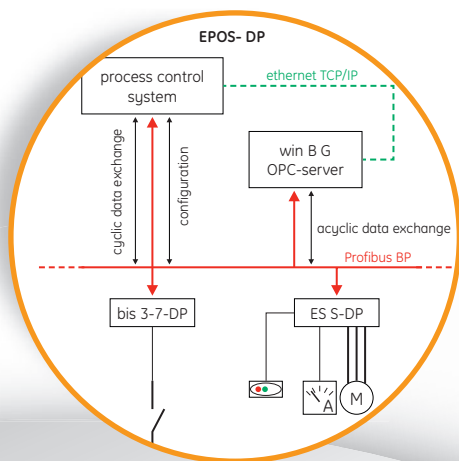
Easy commissioning at site

- Main busbars links are accessible from the front



Simplified cabling

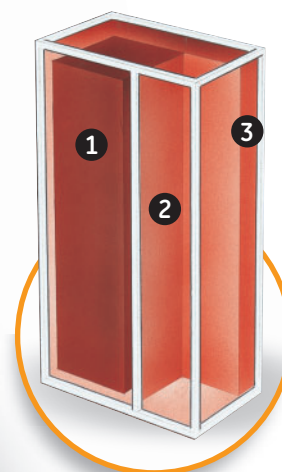
- Optimized terminal bar arrangement for large cable cross sections



Communication

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

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



Internal form of separation

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



Complete system integration

- Equipped with the complete range of IEC 60947 tested components

All for your safety



Easy and safe operation

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

Modularity

- Increased stacking density in the equipment zone due to 25mm module steps in vertical busbar shrouds



VPS modules

- For modular components on DIN-rails
- Mounting plates

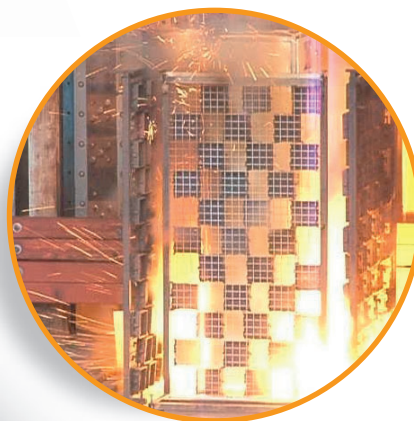
Compact design

- Small footprint with two breakers in one column



Operator protection

- All operations are possible when the doors are closed
- Enclosure is tested under arc fault conditions



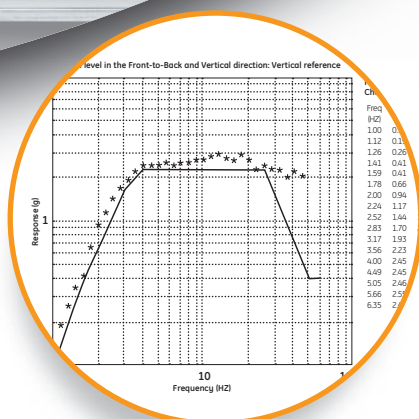
Short-circuit rating up to 100kA

- Circuit breaker and busbars are available for 100kA-1s



State of the art electronic trip unit

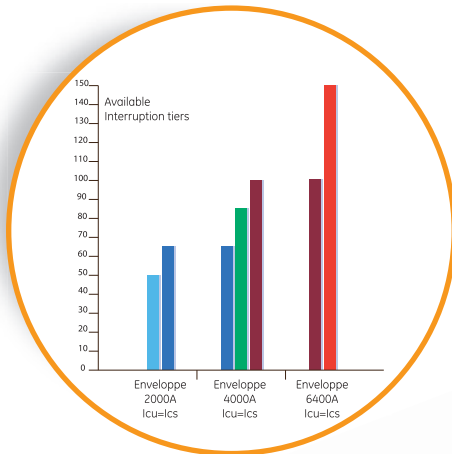
- Integrated current and powermetering
- 4 different versions to cover all applications



Seismic proofed design

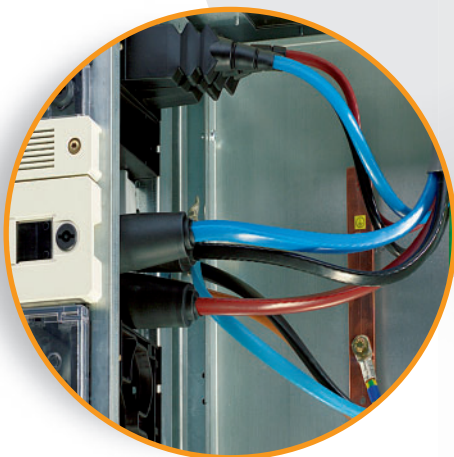
- Suitable for installation across the world under extreme seismic conditions
- UBC zone 4 requirements

It's all about reliability



Ready for 6400A

- Power Center can be equipped with the EntelliGuard™ air circuit breaker up to 6400A
- Full range available in only 3 frame sizes

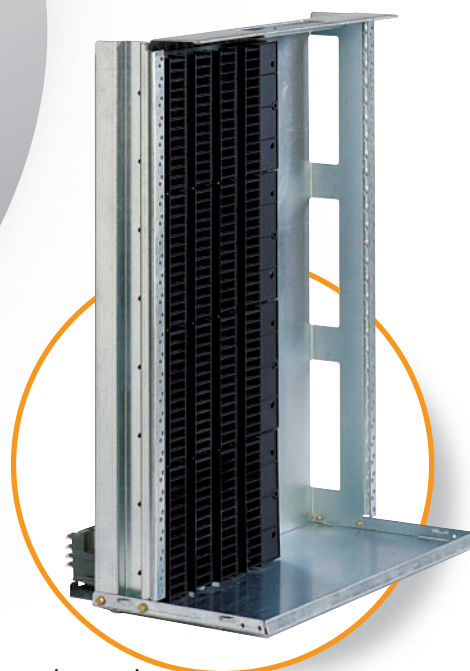
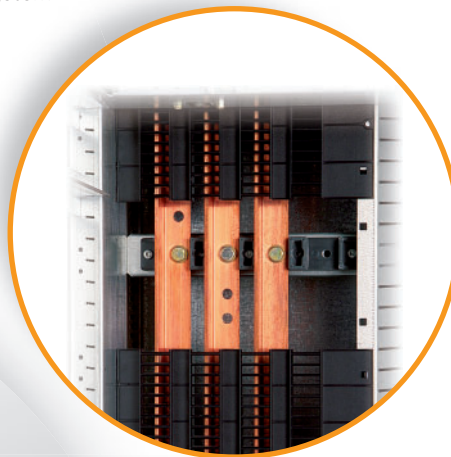


Fast and easy cabling

- Pre-configured copper links, directly to the device or via terminal bars
- Cable compartment can be 200, 400 or 600mm wide

High short-circuit value of the vertical riser system

- Fully rated 3 and 4 pole system



Distribution and control applications in one column

- Standard adapters in 2 different heights ensure combinations of standard 3 and 4 pole fuse loadbreak switch units and motor starters in one column



For your safety

- Short-circuit certified self-aligning stabs provide high safety level during operation

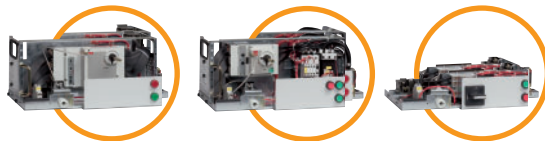
Motor Control Center - Fully withdrawable modules

Functions with circuit breakers - Module size in (E)

Max. load in (kW)	Motor starter DOL		Motor starter Reverse		Motor starter Star/Delta	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
11		12		12		
15						12
30	5	12	8	12	10	
37	5					
55	12		12		12	
75		12		12		12
90			24		24	
110			30		30	
132		18				12
160				24		
200					30	
220	24		30			24
250		24		36		36

Module size in (E)

Current in (A)	Feeder (3 pole)		Feeder (4 pole)	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
63	5	5	6	10
160	5	10	10	10
400	10	10	12	12
630	10	10	12	12



Motor Control Center - Plug-in modules

Functions with circuit breakers - Module size in (E)

Max. load in (kW)	Motor starter DOL		Motor starter Reverse		Motor starter Star/Delta	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
11		10		10		
15						10
30	4	10	4	10	4	
37	5					
55	10		18		24	
75		18		18		24
90			24		30	
110			30		36	
132		18				24
160				24		
220	18		30		30	
250		24		36		36

Module size in (E)

Current in (A)	Feeder (3 pole)		Feeder (4 pole)	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
63	4	8	8	8
160	5	8	8	8
400	10	24	10	24
630	18	24	18	24

Motor Control Center - Fixed modules

Functions with circuit breakers at 400 and 690 Vac

Feeder (3 pole) at 400 Vac		Feeder (4 pole) at 400 Vac		Feeder (3 pole) at 690 Vac		Feeder (4 pole) at 690 Vac	
Current in (A)	Module size in (E)	Current in (A)	Module size in (E)	Current in (A)	Module size in (E)	Current in (A)	Module size in (E)
160	8	160	8	160	8	160	8
250	10	250	10	250	10	250	10
400	10	400	10	400	24	400	24
630	10	630	10	630	24	630	24

Application examples

Feeder (3 pole)		Feeder (3 pole) (4x vertical orientation)		Motor starter DOL, Reverse (3 pole)		Motor starter DOL (3 pole)	
Rating in (A)	Module size in (E)	Rating in (A)	Module size in (E)	Rating in (kW)	Module size in (E)	Current in (kW)	Module size in (E)
63	4	160	10	up to 30	5	220	18
160	5	-	-	37	8	-	-
250	6	-	-	-	-	-	-
400/630	10	-	-	-	-	-	-



Functions with fuses (DIN) - Module size in (E)

Max. load in (kW)	Motor starter DOL		Motor starter Reverse		Motor starter Star/Delta	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
11			5	5		
15					10	
18,5	5					
22		5				
30				5		
37	10		10	10	10	10
45		10	12			
55		12	24		10	
75				30		
90	24		30		24	
132	36	30	36	30		24
200					36	
220	36	36	36	36	36	30



Functions with fuses (DIN) - Module size in (E)

Max. load in (kW)	Motor starter DOL		Motor starter Reverse		Motor starter Star/Delta	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
11			5	5		
15					8	
18,5	5					
22		5				
30				8		
37	8		8	8	8	8
45		8	12			
55		12	18		8	
75				24		
90	18		24		18	
132	24	18	30	24		18
200					30	
220	36	18	36	30	36	30

Module size in (E)

Current in (A)	Feeder (3 pole)		Feeder (4 pole)	
	at 400 Vac	at 690 Vac	at 400 Vac	at 690 Vac
160	2	2	4	4
250	3	3	6	6
400	6	6	12	12
630	6	6	12	12



Empty modules for motor control applications

Height in (E)	4	5	6	8	10	12	16	18	24	30	36
Fixed	x	x	x	x	x	x		x	x	x	

Dimensions - Power Center



Dimensions in mm

	Height	Width	Depth	ACBs
Below 2000A	2000/2200	400/500/600	600/800	1 or 2
2500-4000A	2000/2200	600/800/1000	600/800	1 or 2
5000-6300A	2000/2200	1000/1200	1200	1

(Height ventilated roof + 165mm)



Dimensions - Motor Control Center - Front access

Plug-in/withdrawable design

Fixed design



Dimensions in mm

	Height	Width	Depth
Plug-in/withdrawable	2000/2200	800/1000/1200	600/800/1200
Fixed type	2000/2200	800/1200/1400	600/800

Dimensions - Motor Control Center - Rear access

Plug-in/withdrawable design



Fixed design



Dimensions in mm

	Height	Width	Depth
Plug-in/withdrawable	2200	614	600/800
Fixed type	2200	800	600/800

Technical data

Electrical data

		Back busbar system	Top busbar system
Rated operational voltage	Ue	690V AC / 600V DC	690V AC / 600V DC
Rated frequency	f	50 / 60Hz	50 / 60Hz
Rated impulse voltage / Overvoltage category	Uimp	8kV / III	8kV / III
Rated current horizontal busbars		up to 7600A	up to 4500A
Rated current vertical busbars fixed design		1600 / 2700A	1600 / 2700A
Rated current vertical busbars plug-in / withdrawable design		1000 / 1200 / 1550 / 1900A	1000 / 1450 / 1550 / 1800A
Peak withstand current horizontal busbars	Ipk	up to 220kA	up to 220kA
Short time withstand current - horizontal busbars	Icw	up to 100kA-1s / 50kA-3s	up to 100kA-1s / 50kA-3s
Short time withstand current - vertical busbars			
Fixed design	Icw	up to 50kA-3s / 85kA-1s	up to 50kA-3s / 85kA-1s
Plug-in/withdrawable design	Icw	up to 80kA-1s	up to 85kA-1s

Mechanical data

Modularity / Available height for modules	1E = 25mm	80E	70E
Dimensions (mm)	Height	2000 / 2200	2200
	Depth	600 / 800 / 1200	600 / 800
	Width	400 / 500 / 600 / 800 / 1000 / 1200 / 1400	400 / 500 / 600 / 800 / 1000 / 1200
Degree of protection		IP30 / IP41 / IP42 / IP54	IP30 / IP41 / IP42 / IP54
Form of internal separation		up to Form 4b	up to Form 4b
Colour		RAL 7035	RAL 7035
		Epoxy-polyester	Epoxy-polyester

Standards

Type tested		IEC/EN 61439-2	IEC/EN 61439-2
Internal arc tests		IEC/TR 61641	-
Seismic withstand		UBC	-
Marine certification		ABS	-

SEN+Plus

The policy of GE is one of continuous improvement. The right is reserved to alter the design or any structural details of the products at any time without giving notice.

June 2013
GE Industrial Solutions



GE Industrial Solutions is a first class global supplier of low and medium voltage products including wiring devices, residential and industrial electrical distribution components, automation products, enclosures and switchboards. Demand for the company's products comes from wholesalers, installers, panelboard builders, contractors, OEMs and utilities worldwide.

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GE imagination at work