

LOW VOLTAGE 8PU Premium



FEAG
... DIE INTELLIGENTE LÖSUNG ...

ENERGOLINE[®]
SCHALTANLAGEN - SYSTEME BY FEAG

Family of products



is a patent-protected trademark (registration number 304 078 42, German Patent and Trademark Office) of a family of products for low and medium voltage AC/DC electricity supply. These products contain the latest developments and innovations.

A new generation of **INDUSTRIAL SWITCHGEAR SYSTEMS** has been developed for the low-voltage application area.



is economical, tailored to meet market needs and has a type test certification for the following performance levels:

- » POWER CENTER up to 8500 A
- » MOTOR-CONTROL-CENTER up to 8500 A
- » Building distributor up to 4000 A
- » Automation and drive technology

Fixed-mounted, plug-in and slide-in systems are available for use in power plant technology, the process industry and infrastructure. The product is based on technology from Siemens AG.

Additional arc fault testing as per IEC/TR 61641, VDE 0660 part 500, supplementary sheet 2, guarantees the highest level of personal and equipment safety.

These low-voltage switchgears connect power generation plants (generators), transport systems (cables, transmission lines) and energy conversion systems (transformers) with consumption units, such as motors, gearboxes, motor-integrated drive systems, pumps, lighting etc.

Modular components with a type test certification, compatible products, and standard connections create a consistency in the **ENERGOLINE** family throughout its entire portfolio.



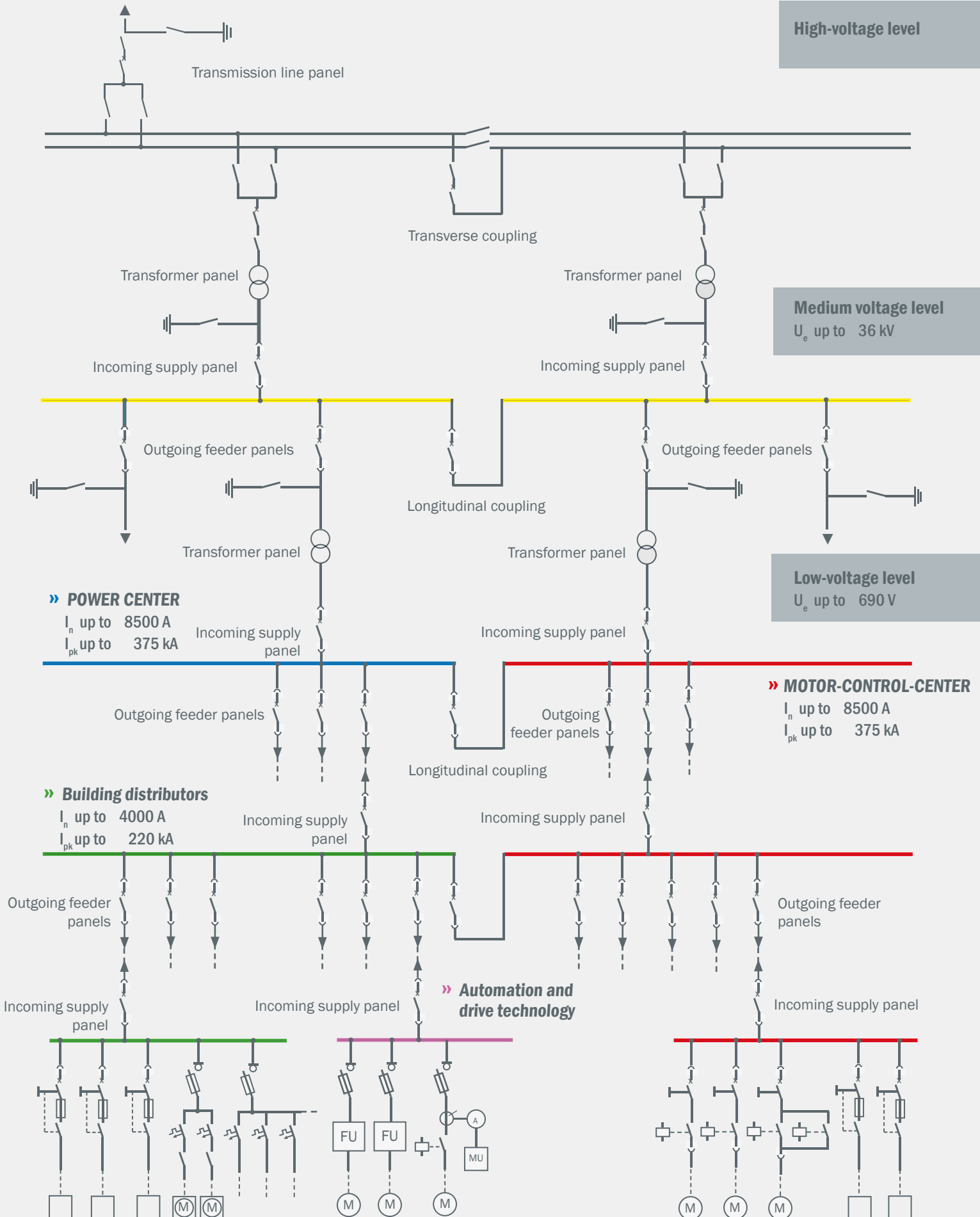
Power plant technology / infrastructure



Process industry



Applications in a high, medium and low voltage network



Safety reliable and multi-functional

Thanks to its POWER CENTER and MOTOR CONTROL CENTER the **INDUSTRIAL SWITCHGEAR SYSTEM**



offers modular products for flexible applications and high performance requirements in power plants and process-oriented production facilities. The system is available in the following designs:

- » Fixed-mounted technology
- » Plug-in technology
- » Slide-in technology

A space-saving design is technically and economically necessary for many industrial applications. The consistent modular design of the electrical and mechanical construction in our switchgears allows you to select the type of model, protection class and interior configuration to meet your individual needs. This means that different installation technologies and functional compartments can be combined in one panel, e.g. applications for power distribution combined with MCC modules.

The POWER CENTER is used wherever low-voltage electrical power needs to be safely distributed. It is suitable for all switching, disconnecting, distribution and control tasks required by a switchgear. The POWER CENTER is an ideal solution for medium and high load applications up to 690 V AC and 1000 V DC. The switching panels for supply, coupling, outgoing feeders and power factor correction are exclusively designed on the basis of type-tested and standardized modules. The exclusive use of high-quality switchgears guarantees a long product life and selective protection of your supply units, as well as seamless integration of all conventional management and control systems.

The MOTOR CONTROL CENTER is designed to use only components that are standardized, tested and tailored to meet requirements. Adjusting to new performance standards is fast and easy by exchanging or expanding the components. The sole use of high-quality switchgears guarantees a long product life, selective protection of your supply units and seamless integration into all management and control systems. Electricity supply must be continuously ensured at every point of the process chain in all industrial application areas, from incoming supply to the last consumption unit and from energy management to emergency power concepts. Because fault-free and disruption-free operation of power plants,

refineries and industrial plants is a major economic factor. The MOTOR CONTROL CENTER ensures personal safety in the area around the plant and proof of safety of the plant itself through testing under arc fault conditions.

The POWER CENTER and MOTOR CONTROL CENTER can be combined with all other low-voltage switchgears of the **ENERGOLINE** family and provide proof of personal and plant safety through testing under arc fault conditions.

Type test certification guarantees a high level of operational and personal safety. On page 6 you will find the certificates which were obtained in close cooperation with accredited testing institutes.

The quality of our products and services is our company's top priority. Constant auditing by an internal quality management system ensures that our customers receive products that have a consistently high quality.

Your benefits at a glance:

- » High level of operational and plant safety thanks to modular standard components (type test certification)
- » Maximum personal protection through built-in arc fault protection (testing under arc fault conditions)
- » Flexible busbar positions above or behind (3 to 5 pole busbar system)
- » More cost-efficient by combining different installation technologies in one panel
- » High degree of accessibility and flexibility of the slide-in technology through quick changeovers that do not disrupt operation
- » Modular design of the equipment compartments
- » Individual design of the slide-in modules and shuttle
- » Compact construction, panel depths 600/800 mm
- » Consistency through tested busbar distributor connection with type test certification
- » Cable/busbar connection from above/below
- » High quality switchgears ensure reliable operation
- » Single front, duplex and back-to-back arrangement

Standards and regulations		<p>Low-voltage switchgear combination (type test certification) Testing behavior for internal faults (arc faults) Touch proof with fingers or back of the hand as per BGV A3 Protection against electrical shock Clearances and creepage distances</p>	<p>DIN EN / IEC 61439-1 u. 2 IEC/TR 61641 DIN EN 60439 supplementary page 2 DIN EN 50274 VDE 0660 Teil 514 DIN VDE 0110 Insulation group C for 1000 V</p>
Electrical specifications	Rated voltages	<p>Rated insulation voltage U_i Rated operational voltage U_e Rated frequency</p>	<p>1000 V 690 V up to 50...60 Hz</p>
	Rated current I_e	<p>Main busbars Panel distribution busbars L 1/L10 - panel L3/L30 - panel T2/T20 - panel T5/T50 - panel F1/F10 - panel F5/F51 - panel C - panel</p>	<p>up to 8500 A up to 6300 A up to 2000 A up to 2000 A up to 1900 A up to 2000 A up to 1900 A up to 500 kvar</p>
	Rated peak withstand current I_{pk}	<p>Main busbars Panel distribution busbars L10/L20 - panel L3/L30 - panel T2/T20 - panel T5/T50 - panel F1/F10 - panel F5/F51 - panel C - panel</p>	<p>375 kA up to 330 kA up to 143 kA up to 143 kA up to 143 kA up to 143 kA up to 143 kA up to 143 kA</p>
	Rated voltages of devices I_n	<p>Open circuit breaker SIEMENS SENTRON 3WL ABB SACE Emax Merlin Gerin Masterpact NT/NW</p>	<p>up to 6300 A up to 6300 A up to 6300 A</p>
		<p>Compact circuit breaker Siemens SENTRON 3VL/3VA ABB Tmax/XT Merlin Gerin Compact NS</p>	<p>up to 1600 A up to 1600 A up to 3200 A</p>
		<p>Fuse switch disconnectors Siemens 3NJ4/EFEN/JM SL/ABB ZH Siemens 3NJ6/ABB XR/JM SASIL+</p>	<p>up to 1250 A up to 630 A</p>
Mechanical specifications	Panel dimensions	<p>Cabinets and framework Height Width Depth Preferred dimensions as per DIN 41488 page 2</p>	<p>1800 to 2600 mm 400 to 1600 mm (variable in 100 mm increments) 400 to 1000 mm individual adjustments possible</p>
	Protection classes	As per IEC 60529, EN 60529	IP 20 to IP 54
	Surface protection	<p>Coating as per DIN 43656, Epoxy polyester powder Standard layer thickness Framework Housing</p>	<p>65 μm RAL color as per customer requirements / Standard RAL 7035 Double coating up to 130 μm possible</p>

Modular panel design

Modular functional compartments in the individual panels and a modular design of the overall system means the equipment can be optimally adjusted to meet your requirements. The individual panels are divided into defined functional compartments (functional units):

- » Equipment compartment
- » Busbar compartment
- » Cable and busbar connection compartment
- » Cross wiring or auxiliary device compartment

Regardless of the busbar position and panel depth, all functional units can be combined as desired and, if required, be exchanged with one another.

The equipment compartment is used for the installation of switching and control devices. The connection compartments provide space to connect cables and external busbar systems from every well-known supplier. This connection, like the POWER CENTER, has been tested and thus increases operational safety. The busbar compartment contains the main 3- to 5-pole busbars and the panel distribution busbars. Cables and busbars can run from above and below. The cable terminal compartment is spacious enough to provide room for external cables, the current and voltage converters, the cable catch rails and the control voltage busbar system.

Busway system connection

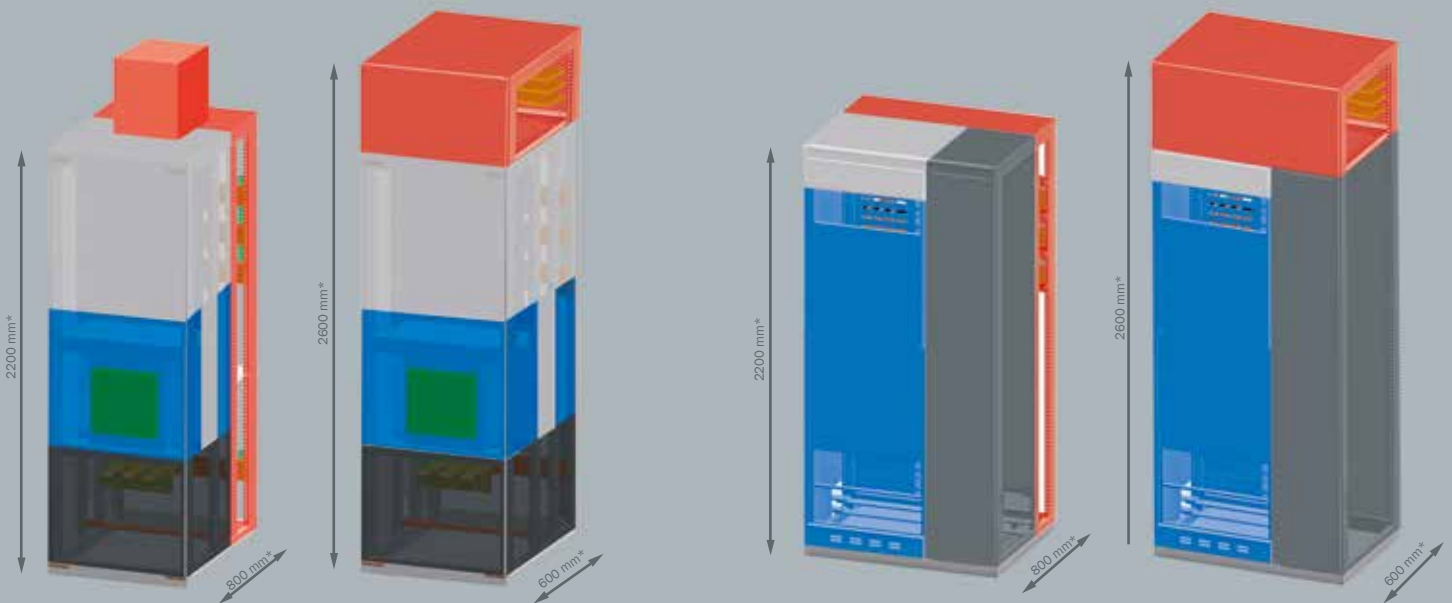


The cross wiring compartment leads the busbar, control and conductor rails from panel to panel.

The auxiliary device compartment is for components that generate control voltage and terminal blocks etc.

The panel width can be varied from 250 to 1200 mm to meet your technical specifications.

The panel depth is a standard 600 or 800 mm. A tested option, measuring 700 mm, is available for transformer load center substations.



* Special dimensions available

- Busbar compartment
- Cable and busbar connection compartment
- Cross wiring or auxiliary device compartment
- Equipment compartment

Purpose of internal divisions

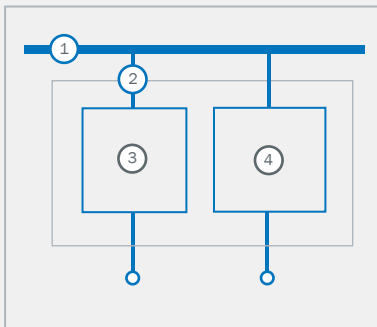
Personal and equipment protection can be enhanced in the individual panels through sensible, specification-oriented internal partitioning as per DIN EN 61439 part 2.

Internal division of the functional compartments is achieved through partitioning walls, covers or device housing. Bulkhead partitions must be used to divide panels so they are resistant to arc interference.

Which protection targets can be achieved?

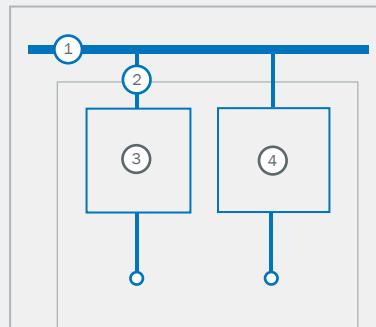
- » Protection against touching dangerous parts with adjacent functional compartment
- » Protection against penetration of foreign objects from one functional compartment to another
- » Protection against accidental touching of dangerous parts within the functional compartment

Form 2 Devision between main busbar and functional units



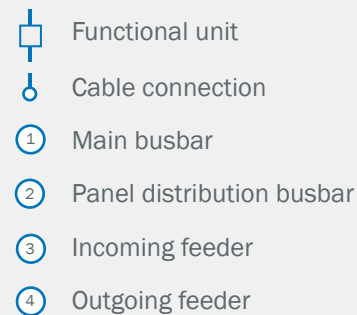
Form 2a

No devision between connections and busbars

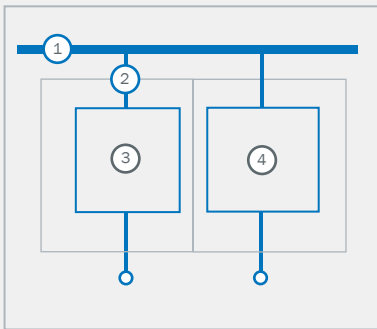


Form 2b

Devision between connections and busbars

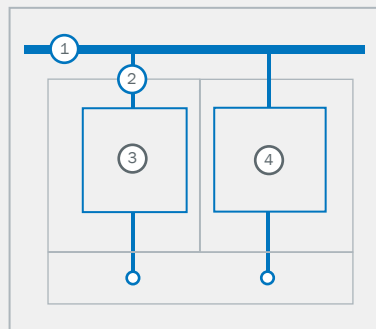


Form 3 Devision between: • Busbars and functional units • Each functional unit • Connections and functional units



Form 3a

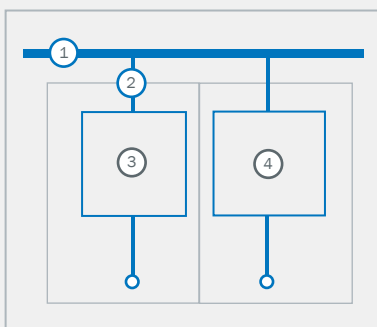
No devision between connections and busbars



Form 3b

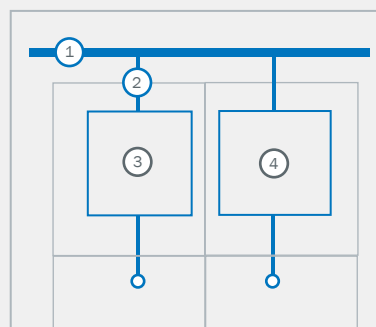
Devision between connections and busbars

Form 4 Devision between: • Busbars and functional units • Each functional unit • Connections and functional units



Form 4a

Connections in the same devision as the connected functional unit



Form 4b

Connections not in the same devision as the connected functional unit

Key technical data of the main busbars and panel distribution busbars

Quantity and dimensions	Material	I_n Current carrying capacity at room and ambient temperature of 35 °C, Protection class IP 41	I_{cw} kA _{eff} , 1 s	I_{pk} Short circuit strength (surge current, peak value)
Main busbars				
2x40x10	Cu	1700 A	80	176 kA
2x60x10	Cu	2250 A	80	176 kA
2x80x10	Cu	2700 A	80	176 kA
2x100x10	Cu	3200 A	80	176 kA
2x120x10	Cu	3750 A	100	220 kA
2x120x10 sw	Cu	4050 A	100	220 kA
4x100x10	Cu	5500 A	120	264 kA
4x120x10 sw	Cu	6300 A	120	264 kA
Panel distribution busbars				
1x40x10	Cu	600 A	55	120 kA
2x30x10	Cu	1200 A	65	143 kA
2x40x10	Cu	1600 A	65	143 kA
1x100x10	Cu	1900 A	65	143 kA

Upon request: tin-plated Cu busbars

Nominal currents of transformers

Rated currents and initial short-circuit alternating currents of three-phase current distribution transformers with 50 to 3150 kVA

Rated voltage U_{rt}	400/230 V, 50 Hz			525 V, 50 Hz			690 V, 50 Hz		
	Rated current I_n	Rated value of the short-circuit voltage $U_{kr} = 4\%^{1)} \quad U_{kr} = 6\%^{2)}$		Rated current I_n	Rated value of the short-circuit voltage $U_{kr} = 4\%^{1)} \quad U_{kr} = 6\%^{2)}$		Rated current I_n	Rated value of the short-circuit voltage	
Transformer rated power S_{rt}		Short-circuit current I_k			Short-circuit current I_k			Short-circuit current I_k	
kVA	A	A (eff.)	A (eff.)	A	A (eff.)	A (eff.)	A	A (eff.)	A (eff.)
50	72	1933	1306	55	1473	995	42	1116	754
100	144	3871	2612	110	2950	1990	84	2235	1508
160	230	6209	4192	176	4731	3194	133	3585	2420
200	288	7749	5239	220	5904	3992	167	4474	3025
250	360	9716	6552	275	7402	4992	209	5609	3783
315	455	12247	8259	346	9331	6292	262	7071	4768
400	578	15506	10492	440	11814	7994	335	8953	6058
500	722	19438	12020	550	14810	9158	418	11223	6939
630	910	24503	16193	693	18669	12338	525	14147	9349
800	1154	-	20992	880	-	15994	670	-	12120
1000	1444	-	26224	1100	-	19980	836	-	15140
1250	1805	-	32791	1375	-	24984	1046	-	18932
1600	2310	-	39818	1760	-	30338	1330	-	22989
2000	2887	-	52511	2200	-	40008	1674	-	30317
2500	3608	-	65547	2749	-	49941	2090	-	37844
3150	4550	-	82656	3470	-	62976	2640	-	47722

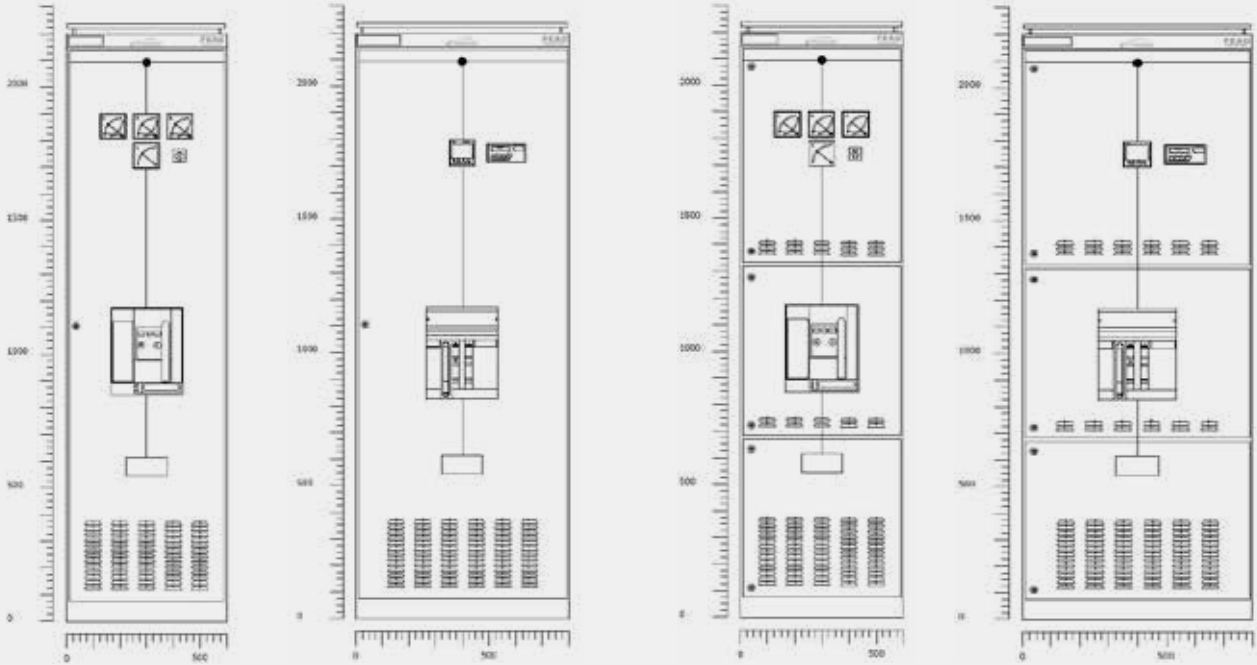
¹⁾ as per DIN 42503 for $S_{rt} = 50 \dots 630$ kVA

²⁾ as per DIN 42511 for $S_{rt} = 100 \dots 1600$ kVA

³⁾ Initial short-circuit alternating current of transformer unaffected when connected to a network with unconditional short-circuit power, taking into account the voltage and correction factor of the transformer impedance in accordance with DIN EN 60909/ DIN VDE 102 (07/2002)

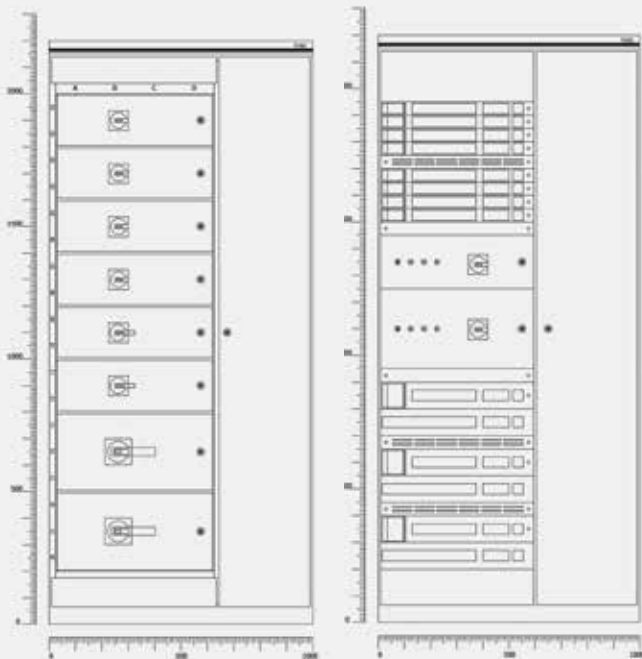
Overview

Circuit breaker panel from 630 A to 6300 A
Slide-in and fixed-mounted technology



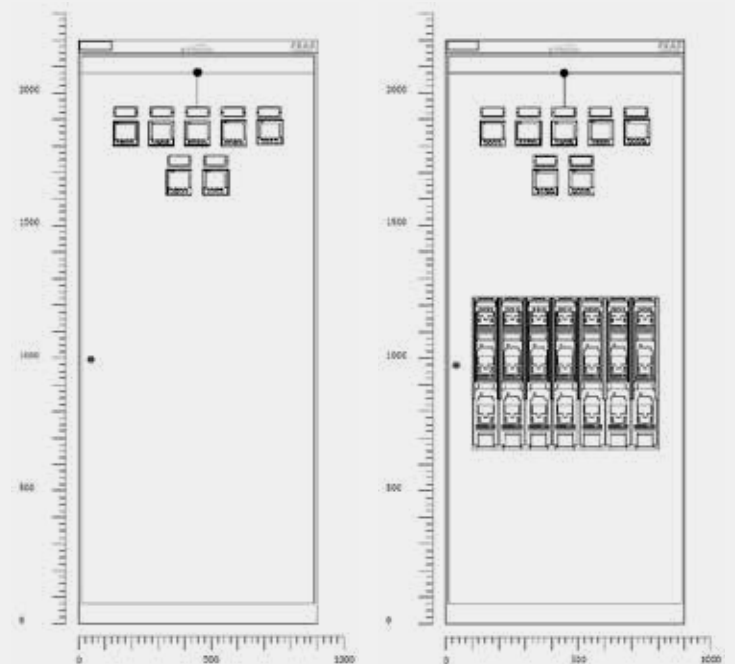
Page 12 et seq.

Modular circuit breaker panel
Fixed-mounted, plug-in and slide-in technology



See page 14

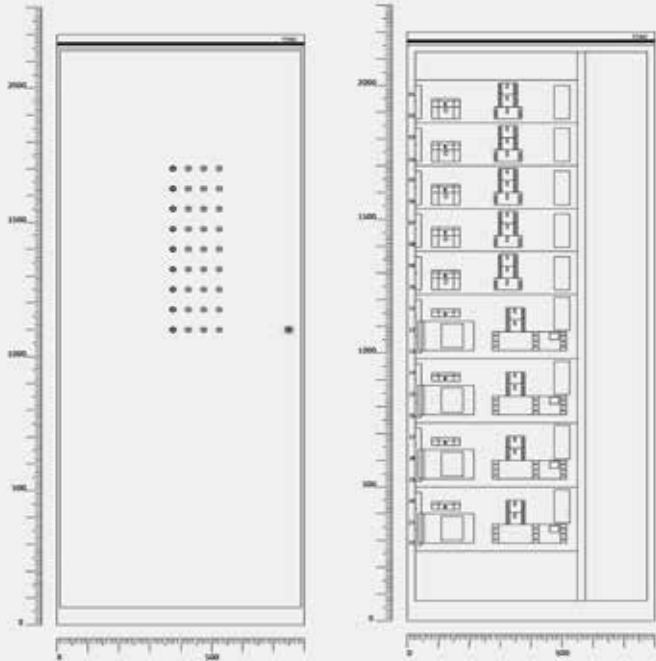
Rail panel
Fixed-mounted technology up to 1600 A



See page 15

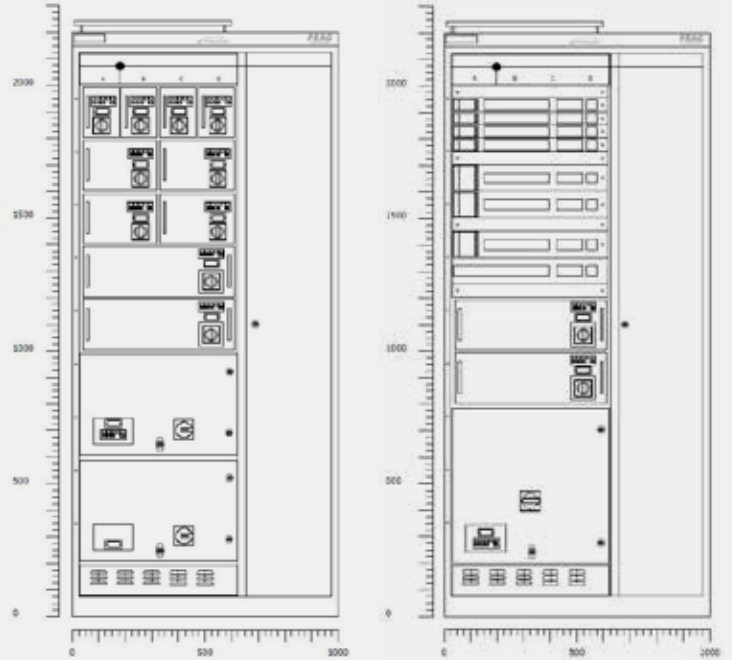
Overview

Outgoing feeder panel in modular design
Fixed-mounted technology up to 1250 A



See page 18

Outgoing feeder panel in modular design
Slide-in technology up to 630 A



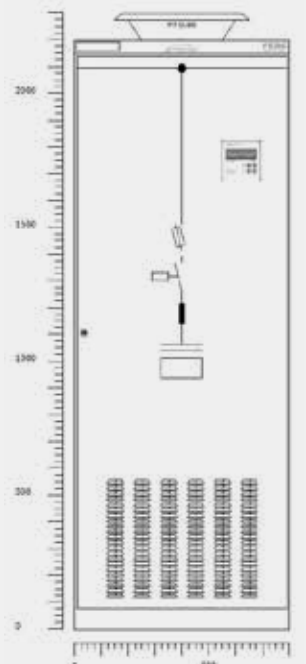
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Outgoing feeder panel in modular design
Plug-in technology up to 630 A



See pages 16-17/19

Power factor correction
C-panel



See page 23

Areas of application
 Incoming and outgoing feeders
 Longitudinal and transverse
 coupling

Modular components with fixed-mounted and slide-in technology

Features

- » Internal partitioning of the functional compartments to meet customer requirements, form 1 to form 4b
- » Feed-in possible from above and below
- » Device support plate above or below the circuit breaker for the configuration of comprehensive control and locking mechanisms, and connection to control technology
- » Installation of the measuring equipment and touch panel at eye level in the panel door
- » Cable connection busbars for:
 - Installation of current converters
 - max. 24 single conductors 300mm²
- » Consistency through tested connection to busbar distributors

Device spectrum

- » Open circuit breaker
 - SIEMENS SENTRON 3WL
 - ABB SACE Emax
 - Merlin Gerin Masterpact NT/NW

Dimensions

- » Panel depth: 600 mm
- » Panel height: 2200/2600 mm
- » Panel width: depending on the dimensions of the circuit breaker

Open circuit breaker (TNC networks)

Switch Size	Model	Nominal current I_n in A	Short-circuit breaking capacity I_{CU} in kA		
			AC 415 V	AC 500 V	AC 690 V
I	3WL11	630	55/66	55/66	42/50
	3WL11	800	55/66	55/66	42/50
	3WL11	1000	55/66	55/66	42/50
	3WL11	1250	55/66	55/66	42/50
	3WL11	1600	55/66	55/66	42/50
II	3WL12	800	66/80/100	66/80/100	50/75/85
	3WL12	1000	66/80/100	66/80/100	50/75/85
	3WL12	1250	66/80/100	66/80/100	50/75/85
	3WL12	1600	66/80/100	66/80/100	50/75/85
	3WL12	2000	66/80/100	66/80/100	50/75/85
	3WL12	2500	66/80/100	66/80/100	50/75/85
	3WL12	3200	66/80/100	66/80/100	50/75/85
	3WL12	4000	66/80/100	66/80/100	50/75/85
III	3WL13	4000	100/150	100/150	85/150
	3WL13	5000	100/150	100/150	85/150
	3WL13	6300	100/150	100/150	85/150
E1	SACE Emax	800	42/50	42/50	42/50
	SACE Emax	1000	42/50	42/50	42/50
	SACE Emax	1250	42/50	42/50	42/50
E2	SACE Emax	1600	42/65/85/130	42/55/65/85	42/55/65/85
	SACE Emax	2000	42/65/85/130	42/55/65/85	42/55/65/85
E3	SACE Emax	2500	75/100/130	75/100	75/85/100
	SACE Emax	3200	75/100/130	75/100	75/85/100
E4	SACE Emax	4000	75/100/150	75/100/150	75/85/100
E5	SACE Emax	5000	100/150	100/130	100
	SACE Emax	6300	100/150	100/130	100

Detailed information about design features, models, electronic trip units etc. of the built-in devices can be found in the manufacturers catalogs.

L1 panel: Incoming feeder panel with slide-in circuit breaker SACE Emax



L1 panel: Incoming feeder panel with slide-in circuit breaker SENTRON 3WL



Areas of application
 Incoming and outgoing feeders
 Longitudinal and transverse coupling

Modular components with fixed-mounted and slide-in technology

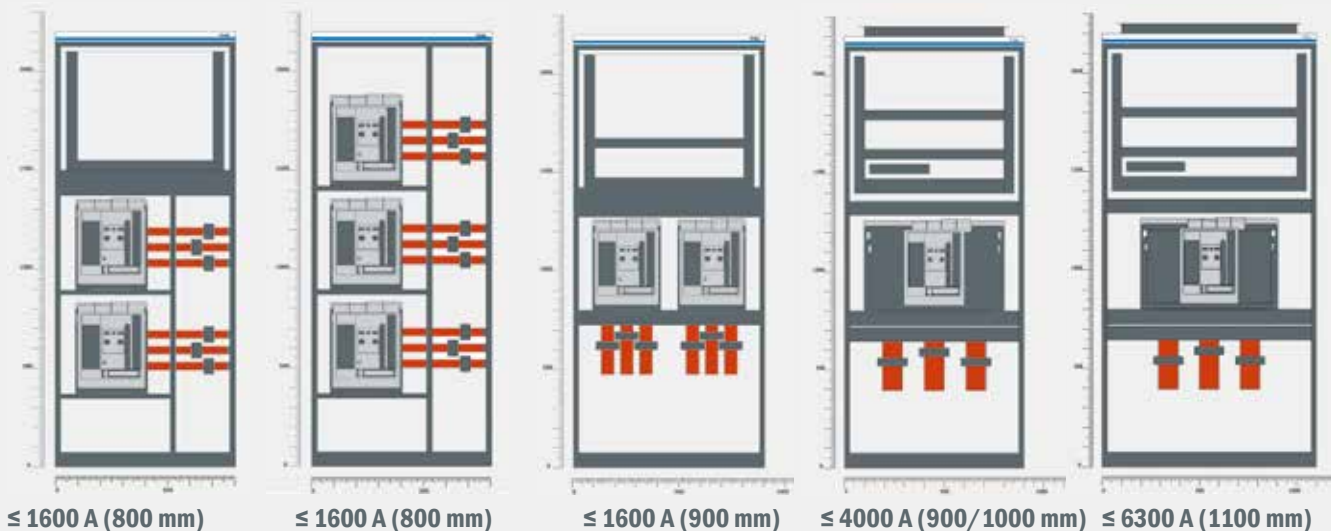
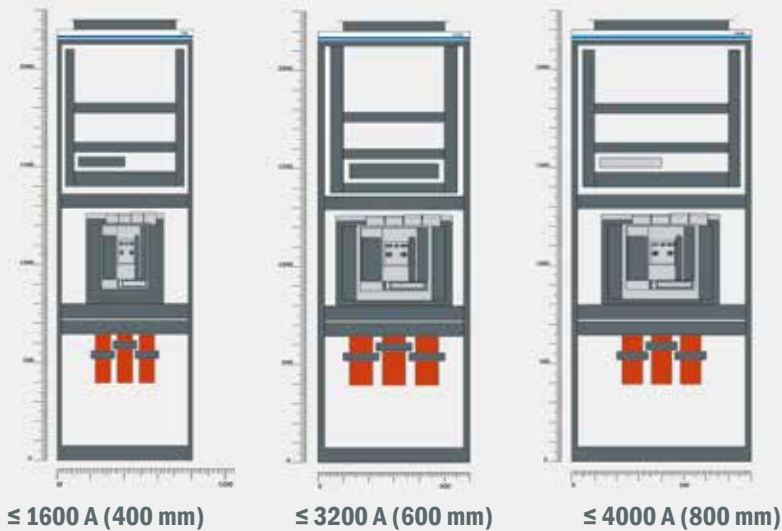
Features

- » Internal partitioning of the functional compartments to meet customer requirements, form 1 to form 4b
- » Feed-in possible from above and below
- » Device support plate above or below the circuit breaker for the configuration of comprehensive control and locking mechanisms, and connection to control technology
- » Installation of the measuring equipment and touch panel at eye level in the panel door or compartment doors
- » Cable connection busbars for:
 - Installation of current converters
 - max. 24 single conductors 300mm²
- » Consistency through tested connection to busbar distributors

Device spectrum

- » Open circuit breaker
 SIEMENS SENTRON 3WL
 ABB SACE Emax
 Merlin Gerin Masterpact NT/NW

Optional panel widths depending on the dimensions of the circuit breaker



L10 panel: In combination with slide-in circuit breaker



Dimensions

- » Panel depth: 800 mm
- » Panel height: 2200/2600 mm
- » Panel width: as per the dimensions of the circuit breaker

Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular components using fixed-mounted, plug-in and slide-in technology with compartment doors

The L3/L30 panel is a safe and variable solution for applications requiring a strict modular partitioning (form 3...4b).

The individual compartments in the switching panel are equipped with compact circuit breakers that use slide-in, plug-in and fixed-mounted technology. They can alternatively be equipped with fixed-mounted circuit breakers and drive modules.

Partitioning the internal functional compartments up to form 4b ensures protection against touching the busbars or distribution busbars and the adjacent functional units when work is being carried out on one of the functional units (device compartment or cable connection compartment).

Specifications of the individual compartments

Manufacturer	Model	Nominal current in A	Height in mm
Siemens AG	3VL1/2	160	200
	3VL,3	250	300
	3VL4	400	300
	3VL5	630	500
	3VL6	800	600
ABB AG	SACE Isomax S1	125	200
	SACE Isomax S2	160	200
	SACE Isomax S3	160-250	300
	SACE Isomax S4	160-250	300
	SACE Isomax S5	400-630	500
	SACE Isomax S6	630-800	600

Features

- » Individual compartments equipped with switchgears and protection devices, as well as combinations, control devices and measuring devices in the respective compartment door
- » Internal partitioning of the functional compartments to meet customer requirements form 1 to form 4b
- » Conversion, retrofitting and exchange of an outgoing feeder possible once the switchgear has been turned off
- » Panel distribution busbars (3- to 5-pole) for supply-side circuit breaker contact
- » Protection against touching the panel busbars with the fingers or back of the hand
- » Cable connection work for power and control lines, as well as lines for PROFIBUS-DP interfaces can be conducted directly on the switchgear and protection devices or in a separate cable connection compartment:
 - Standard widths: 400 and 600 mm
 - Supports with top-hat rails for the installation of terminals
 - Variable adjustments possible

L30 panel: Individual compartments with compact circuit breaker



Device spectrum

- » Compact circuit breaker with rocker lever drive, front rotary drive or door coupling rotary drive:
 SIEMENS SENTRON 3VL
 ABB SACE Isomax
 Merlin Gerin Kompakt

Dimensions

- » Panel depth: 600/800 mm
- » Panel height: 2200/2600 mm
- » Panel width: 1000/1200 mm
 varies depending on design

Switch strip panel

Areas of application
 Outgoing feeders
 Outgoing feeders to subdistributors

Modular components with fixed-mounted technology

The fixed-mounted panels for the cable outlets are equipped with NH fuse switch disconnectors. They unite the functions “load switching” and “disconnector” in one system. Thanks to an integrated NH fuse, they also provide reliable protection against overload and short circuiting.

Device spectrum

- » NH-fuse switch disconnector, in strip form
- SIEMENS 3NJ4, 3NJ5
- Jean Müller SL
- ABB XLB
- EFEN E³

Dimensions

- » Panel depth: 600/800 mm
- » Panel height: 2200/2600 mm
- » Panel width: as per the dimensions of the NH-fuse switch disconnector

Features

- » Requires little space thanks to compact design
- » Outgoing cables up to 630 A with/without 3-pole current measurement
- » High packing density up to 16 outgoing feeders per panel
- » Modern energy management through flexible measurement possibilities: control and measuring devices in the panel door or on the switch rail (1-pole)
- » Optional installation of equipment racks that can be freely arranged
- » Protection against touching the panel busbars with the fingers or back of the hand
- » Single or collective fault signal through electronic fuse monitoring

Equipped with NH-fuse switch disconnectors

Manufacturer	Switch size	A	Conditional short-circuit current* in kA	Width in mm
Siemens AG	00	160	80/50	50
	1	250	110	100
	2	400	110	100
	3	630	110	100
	4	1250	80	248
EFEN	00	160	50	50
	1	250	80	100
	2	400	80	100
	3	630	80	100
	4a	1250 1600	50	122
Jean-Müller	00	160	50	50
	1	250	110	100
	2	400	110	100
	3	630	110	100
Doppelleiste	3*	1250	50	200

* for AC 40 Hz to 60 Hz 690 V (protected by NH-fuses)

T2 panel: NH-fuse switch disconnectors with fixed-mounted technology in switch sizes NH00, NH1, NH2 und NH3



T2 panel: NH2-fuse switch disconnectors with fixed-mounted technology



Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular components with plug-in technology

The plug-in technology of the POWER CENTER offers a cost-effective standard alternative to slide-in technology. The outgoing power and motor units are subdivided into functional components. MCC plug-in modules and plug-in fuse switches in strip form (SASIL, SlimeLine, 3NJ6) can be combined as desired. The plug-in switchgears and modules can be exchanged without disrupting operation.

Features

- » Panel can be fitted with fuse switch disconnectors in strip form as:
 - Fuse switch disconnector with double interruption
 - Integrated amperemeter (1-pole current measurement)
 - 3-pole current measurement possible
 - Optional: fuse monitoring in the strips
- » MCC functional assemblies can be variably combined
- » Plug-in modules are fitted with switchgears, protection devices and combinations, the control and measuring devices are built into the swiveling compartment door
- » Outgoing feeders can be modified, retrofitted and exchanged without turning off the switchgear
- » Guide rails on the sides to ensure secure docking to the panel busbars and plug-in contacts
- » Protection against touching the panel busbars with the fingers or back of the hand
- » Cable connection work for power and control lines, as well as lines for PROFIBUS-DP interfaces in the separate cable connection compartment:
 - Standard widths: 400 and 600 mm
 - Supports with top-hat rails for the installation of terminals
 - Variable adjustments possible

Device spectrum

- » Switch disconnectors with fuses in strip form:

• SIEMENS, 3NJ6	125 to 630 A
• ABB, SlimeLine	125 to 630 A
• Jean Müller, SASIL	125 to 630 A
- » MCC plug-in modules up to 400 kW / 630 A, fitted with high-quality switchgear and protection devices preferably from SIEMENS, ABB and Schneider Electric, guarantee reliable operation:
 - Circuit breakers
 - Switch disconnectors
 - Contactors/contactor combinations for switching motors
 - Overload relays
 - Motor- and soft starters
 - Motor management, monitoring and control devices

Dimensions

- » Panel depth: 600/800 mm
- » Panel height: 2200/2600 mm
- » Panel width: varies according to model

T5 panel: Outgoing feeder panel with plug-in fuse switch disconnectors (3NJ6)



T5 panel: Circuit breaker technology combined with fuse switch disconnectors (SlimeLine)



Modular components with plug-in technology

A device compartment height of 1750 mm is available for the combination of plug-in fuse switch disconnectors and plug-in modules. The panel distribution busbars (plug-in busbar system) is located at the back of the panel and offers tap-off openings in a modular grid of 50 mm. Reserve spaces can be provided for future retrofitting.

Fitted with plug-in switch disconnector with fuses in strip form

Manufacturer	Switch size	A	Conditional short-circuit current in kA	Width in mm
ABB AG	00	160	100	50
	1	250	100	100
	2	400	100	200
	3	630	100	200
Siemens AG	00	160	100	50
	1	250	100	100
	2	400	100	200
	3	630	100	200
Jean-Müller	00	160	$80^1/100^2$	50
	1	250	$80^1/100^2$	75
	2	400	$80^1/100^2$	150
	3	630	$80^1/100^2$	150

¹ for AC 40 Hz to 60 Hz 690 V (protected by NH-fuses)

² for AC 40 Hz to 60 Hz 400 V (protected by NH-fuses)

Fitted with MCC plug-in modules

Unfused technology, 400 V/50 Hz, 50 kA, coordination type 2

Module size	Direct starters in kW	Reversing starters in kW	Star/delta in kW
100	22	11	-
200	45	45	22
300	110	45	45
400	160	75	55
500	250	132	110
600	250	250	160

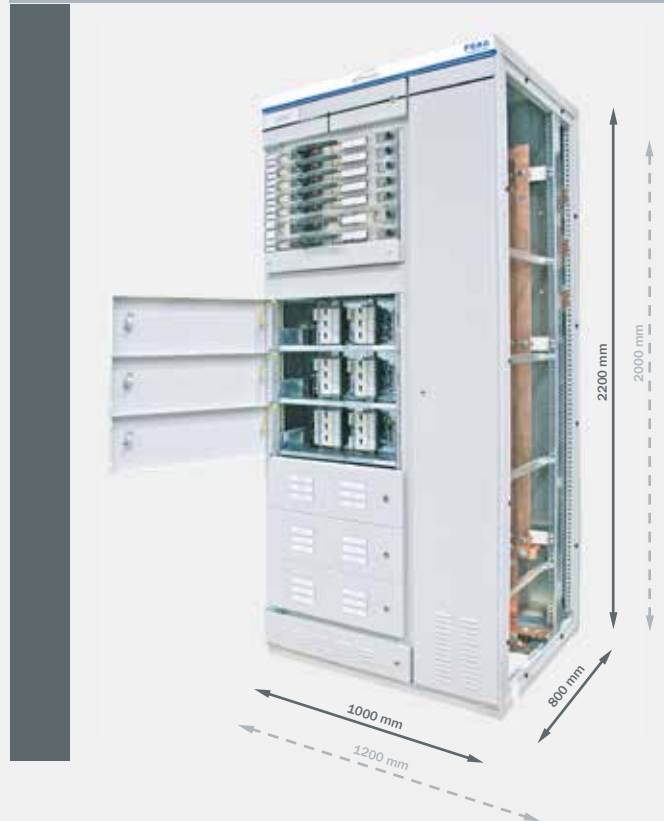
Cable connection

- » Input side: power is pluggable via power contacts on field busbars
- » Output side:
 - Outgoing feeders and control lines are securely connected
 - Outgoing feeders are securely connected – control lines are pluggable via control contacts
 - Outgoing feeders and control lines are pluggable via contacts ($\leq 18, 5$ kW)

Areas of application

- Motor- and outgoing feeders
- Outgoing feeders to subdistributors

T50 panel: Plug-in modules combined with fuse switch disconnectors (SASIL)



- » Plug-in fuse switch disconnector switch size 00 and switch size NH1, 2 or 3



- » Plug-in module: direct starter 55 kW with soft-start and bypass protection, module height 150 mm



Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular fixed-mounted components

For several applications, the MCC functional assemblies do not have to be replaced during operation and/or short downtimes are acceptable. In these cases the fixed-mounted MOTOR CONTROL CENTER is a safe, variable and cost-effective alternative.

Features

- » MCC functional assemblies can be variably combined using modular technology
- » Modular plates for fitting with switchgears, protection devices and combinations
- » Easy replacement of the MCC functional assemblies when equipment is offline
- » Cable connected directly to the switchgears and protection devices or in a separate cable compartment
- » Control and measuring devices are built into the panel-high door
- » Supports with top-hat rails for the installation of terminals
- » Cables connected to the cable bearers which can be adjusted in height

Device spectrum

- » MCC modular plate up to 630 kW / 1000 A, fitted with high-quality switchgears and protection devices, preferably from SIEMENS, ABB and Schneider, guarantee reliable operation:
 - Circuit breaker
 - Switch disconnecter
 - Contactors and contactor combinations for switching motors
 - Overload relays
 - Motor and soft starters
 - Motor management, monitoring and control devices
 - Circuit breaker outgoing feeders up to 1250 A
 - Frequency converter

Example (see interior view)

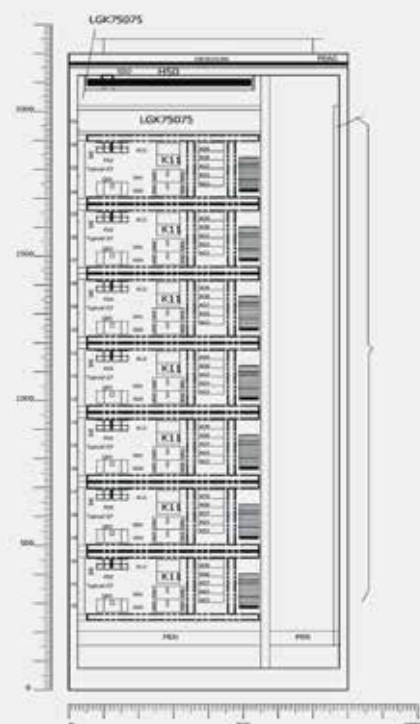
- » SIMATIC ET 200, connected to the control system via PROFIBUS-DP
- » Protected with fuse switch disconnecter 40 A
- » Direct starter, fused technology 11 kW
- » Reversing starter, unfused technology 4 kW
- » Frequency converter 1.8 kW

The panel can be fitted with a maximum of 22 modular plates each measuring 80 mm (1HU)

F1: Outgoing feeder panel with MCC functional assemblies using modular technology



F1: Interior view of outgoing feeder panel – (E plan)



Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular components using plug-in technology

A device compartment height of 1750 mm is available for the combination of plug-in fuse switch disconnectors and plug-in modules. The panel distribution busbars (plug-in busbar system) is located at the back of the panel and offers tap-off openings in a modular grid of 50 mm. Reserve spaces can be provided for future retrofitting.

Fitted with MCC plug-in modules

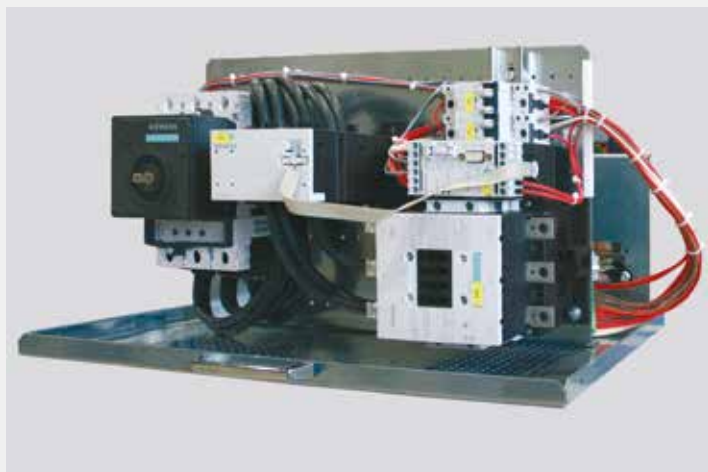
Unfused technology, 400 V/50 Hz, 50 kA, coordination type 2

Module size	Direct starters in kW	Reversing starters in kW	Star/delta in kW
100	22	11	-
200	45	45	22
300	110	45	45
400	160	75	55
500	250	132	110
600	250	250	160

Cable connection

- » Input side: Power is pluggable via power contacts on field busbars
- » Output side:
 - Outgoing feeders and control lines are securely connected
 - Outgoing feeders are securely connected – control lines are pluggable via control contacts
 - Outgoing feeders and control lines pluggable via contacts (≤ 18, 5 kW)

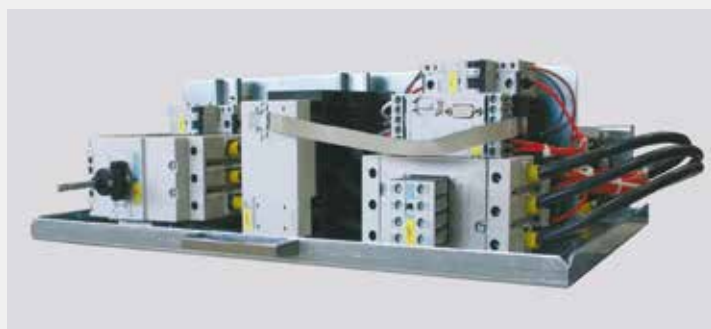
- » Plug-in module: direct starter 90 kW with Simocode PRO C, module height 300 mm



T5 panel: Plug-in module



- » Plug-in module: direct starter 45 kW with Simocode PRO V, module height 150 mm



- » Plug-in module: direct starter 55 kW with soft-start and bypass protection, module height 150 mm



Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular components using slide-in technology

The new generation of MOTOR CONTROL CENTER that uses slide-in technology offers good accessibility, is easy to operate and service, and is highly flexible for all cost-efficient solutions. It is suitable for all MCC variations, particularly in process-oriented production plants thanks to its technical features and high packing density.

Start-up and maintenance procedures can be greatly simplified and optimized as a result of the functions "testing and disconnected positions".

Features

- » Slide-in modules with switchgears and protection devices, as well as combinations, control and measuring devices fitted in the compartment door
- » Outgoing feeder can be modified, retrofitted and exchanged without switching off the switchgear
- » Slide-in module sizes:
 - Small slide-in modules E0,25: 1/4; E0,5: 1/2
 - Full slide-in module E1H: 200 mm
 - Cranked slide-in modules KE200, KE400, KE600, KE800
- » Operation mechanism follows the sequence "disconnected position – testing position – operating position" and back
- » Contact assemblies to lock the main circuit and control circuit to safely disconnect busbar and device compartments
- » Protection against touching the panel busbars with the fingers or back of the hand
- » 12; 24; 36 control contacts are freely adjustable, (E0,25 max. 24 control contacts)
- » Optional slide-in coding for the same slide-in sizes
- » Cable connections for power cables and control lines and for cables for PROFIBUS-DP interfaces in a separate cable connection compartment:
 - Standard widths: 400 and 600 mm
 - Supports with top-hat rails for the installation of terminals
 - Variable adjustments possible

Device spectrum

- » MCC slide-in modules up to 250 kW / 630 A, fitted with high-quality switching and protection devices (preferably SIEMENS, ABB and Schneider Electric), guarantee reliable operation:
 - Circuit breakers
 - Switch disconnectors
 - Contactors and contactor combinations for switching motors
 - Overload relays
 - Motor and soft starters
 - Motor management, monitoring and control devices

Dimensions

- » Panel depth: 600/800 mm
- » Panel height: 2200/2600 mm
- » Panel width: varies according to model

F51 panel: MCC outgoing feeder panel with cranked slide-in units KE200 and KE400



F51 panel: MCC outgoing feeder panel with 6 shuttle levels (10 x 1/4 and 6 x 1/2 slide-in units), 1 x E1H, 1 x KE400



Modular components using slide-in technology

The small slide-in modules E0,25 (1/4) and E0,5 (1/2) are inserted into a shuttle via a second plug level. They can be easily combined in one panel and exchanged without disconnecting the switchgear. The shuttle is fixed-mounted to the switch panel.

The full slide-in module E1H is a slide-in unit measuring (h x w x d) 170 x 540 x 520 mm, grid height 200 mm, with a full width and a full depth. A switch is used to mechanically lock and unlock the slide-in modules and open and close the main circuit and control circuit (conforming with DIN VDE 0600 part 500).

After being inserted into the switch panel, a crank is used to place the cranked slide-in modules into the “operation, testing and disconnected position”. The door must be closed before the slide-in modules can be brought into the desired position by operating the disconnection contact assemblies of the main circuit and control circuit. This means the slide-in modules can remain in the disconnected position in the compartment without dirt or foreign objects penetrating the slide-in units, thereby retaining their protection class. This greatly reduces the danger of corresponding faults.

MCC slide-in module: cranked slide-in unit KE400



Fitted with MCC slide-in modules

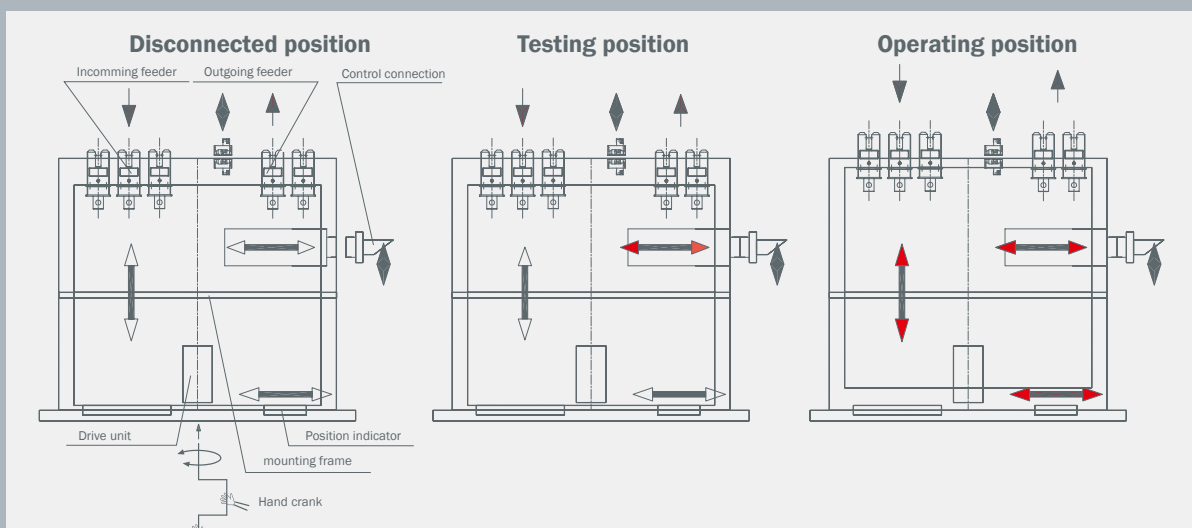
Unfused technology, 400 V/50 Hz, 50 kA, coordination type 2

Slide-in sizes	Power outgoing feeder	Direct outgoing feeder	Reversing starter	Star/delta
	Circuit breaker	Circuit breaker, contactor, automatic control unit, coupling relay or Simocode		
E0,25	16 A	5,5 kW	-	
E0,5	32 A	18,5 kW	11 kW	11 kW
E1H	80 A	45 kW	45 kW	45 kW
KE200	250 A	90 kW	45 kW	-
KE400	400 A	160 kW	90 kW	90 kW
KE600	630 A	250 kW	160 kW	160 kW
KE800	630 A	250 kW	250 kW	250 kW

Fused technology, 400 V/50 Hz, 50 kA, coordination type 2

Slide-in sizes	Power outgoing feeder	Direct outgoing feeder	Reversing starter	Star/delta
	Circuit breaker	Circuit breaker, contactor, automatic control unit, coupling relay or Simocode		
E0,25	16 A	5,5 kW	-	
E0,5	32 A	18,5 kW	11 kW	11 kW
E1H	80 A	45 kW	45 kW	45 kW
KE200	125 A	45 kW	22 kW	-
KE400	250 A	90 kW	45 kW	75 kW
KE600	400 A	160 kW	160 kW	160 kW
KE800	630 A	250 kW	250 kW	250 kW

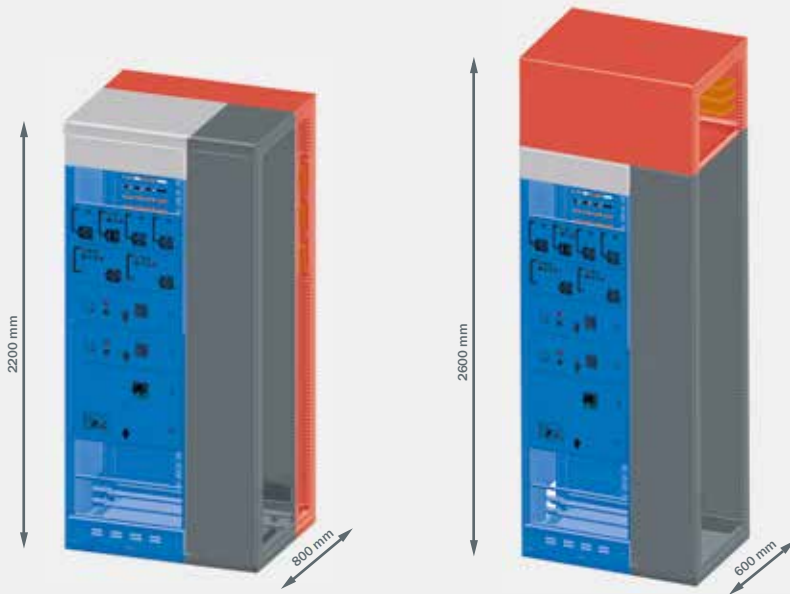
Using the cranked slide-in modules



Modular outgoing feeder panel

Areas of application
 Motor- and outgoing feeders
 Outgoing feeders to subdistributors

Modular components using slide-in technology



- Busbar compartment
- Cable connection compartment
- Cross wiring compartment
- Equipment compartment

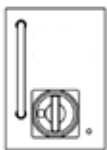
MCC slide-in module:
 small slide-in unit E 0,25 (1/4)

MCC-slide-in module:
 small slide-in unit E 0,5 (1/2)

MCC slide-in module:
 full slide-in unit E1H



Switching positions



"0"-position
 mechanical
 unlocked



"0"-position
 mechanical
 interlocked
 (lockable)



"T"-position
 mechanical
 interlocked



"B"-position
 mechanical
 interlocked



MCC slide-in module: cranked slide-in unit KE200

MCC-slide-in module: cranked slide-in unit KE400



Areas of application
Power factor correction system

Modular compensation modules using fixed-mounted technology

Providing capacitive reactive power at a central location of an energy distribution network reduces transmission losses, relieves transformers and cables, and saves on energy costs. The C panel ensures a high-performance level, with unlimited power of up to 500 kvar in one panel at a degree of choking of up to 14 %.

Features

- » Modular plates are fitted with capacitor and controller components for installation
- » Installation of the electronic reactive power controller in the panel-high door
- » Optional degree of choking of 5.67 %; 7 %; 12.5 % and 14 % (standard)
- » Special choking for extraction 3...11 harmonic
- » Cable connection in separate cable connection area or power factor correction system is powered by the main busbars in the plant network
- » Fuse switch disconnecter: optional for central activation of the installed capacitor assemblies
- » Protection against touching the busbars with the fingers or back of the hand
- » Installation of a filter pad fan for IP54 and higher

Gerätespektrum

- » MKK power capacitors
- » Capacitor contactors
- » Thyro modules
- » Fuse switch disconnecter
- » Filter reactors (choked)
- » Discharge devices
- » Electronic reactive power controller

Device spectrum

- » Panel depth: 600/800 mm
- » Panel height: 2200/2600 mm
- » Panel width: varies according to model

Equipped with capacitor modules

Tuning	Max. capacitor power per panel	Panel width
Choked	350 kvar	800 mm
Unchoked	600 kvar	800 mm

C panel: Functional assemblies using modular technology



C panel: 5 capacitor assemblies equipped with 2 x 50 kvar each, degree of choking of 7 % (Thyro module)



Connection to the management and control level

A high system availability as a result of fast error messaging and troubleshooting, and a high system transparency that permanently reduces operating costs, open up new prospects in the implementation of cost-effective, highly available **INDUSTRIAL SWITCHGEAR SYSTEMS**. This is why intelligent MOTOR CONTROL CENTERS, whose job is to control and protect motors, are ubiquitous today in industrial applications. Modular motor starters, which use slide-in technology fitted with fieldbus-capable intelligent motor protection and control devices, as well as intelligent POWER CENTERS, are the current state of the art in technology.

Device spectrum

- » Switchgear and protection devices with communication module
 - Compact circuit breakers
 - Open circuit breakers
- » Communicative soft starters
- » Motor management and control devices with integrated communication functionality
- » Universal measuring devices with communication interface

Features

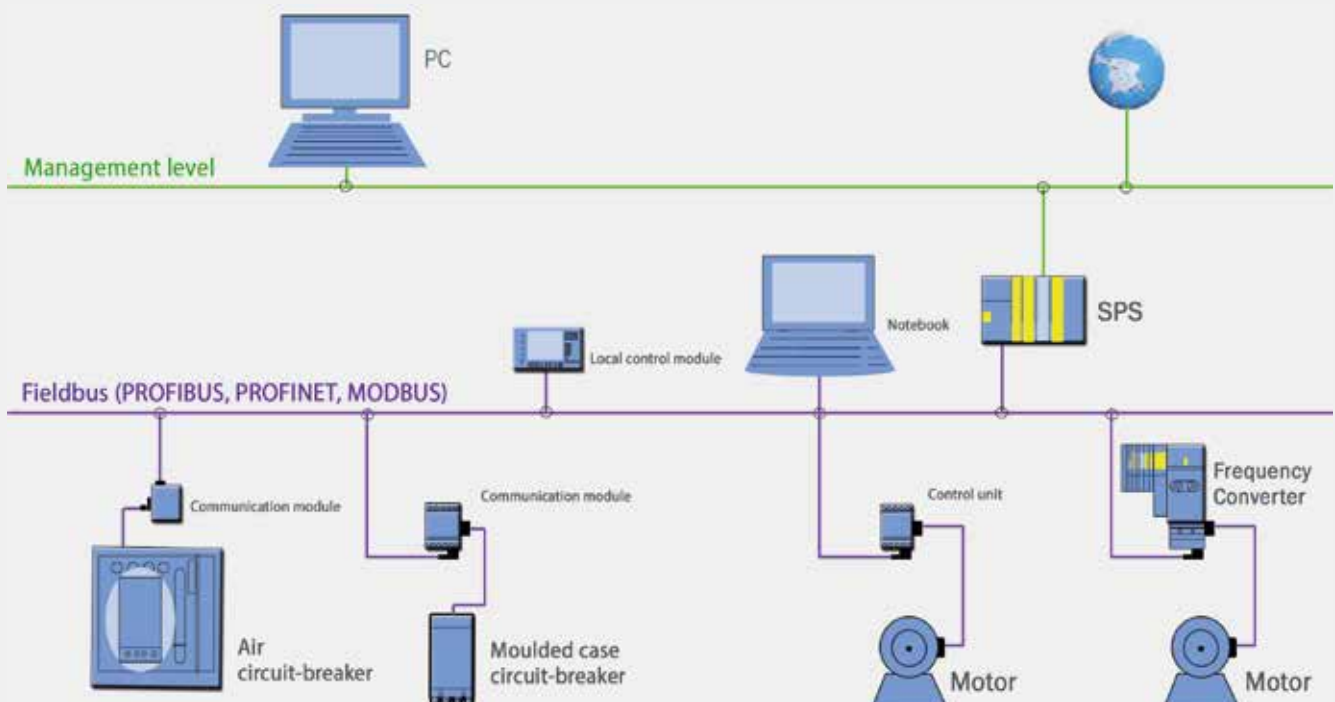
- » Communication module as data interface
 - Connection to PROFIBUS-DP, PROFINET or MODBUS
 - Remote control, parameterization and diagnosis
 - Continuous collection of system and operating data, e.g. switch status, current, power for acyclic data transfer
 - Modification of the switch-on lock and switching sequence without rewiring

Control room



- » Communicative motor starter with control function
 - Connection to PROFIBUS-DP, PROFINET or MODBUS
 - Collection of operating, service and diagnosis data that are also available for visualization
 - Full electronic motor protection, such as
 - current-dependent electronic overload protection
 - Phase failure detection
 - Earth-fault monitoring system
 - Integrated control function, such as
 - Direct and reversing starters
 - Star/delta starter also with change in rotation

Connection to automation level



Maximum system protection and personal protection

The **INDUSTRIAL SWITCHGEAR** of this family of products



is a low-voltage switchgear combination with a type test certification, whose physical properties have been verified by accredited testing institutes for both operating and fault situations.

Type test certification

- » Verification of compliance with temperature-rise limits through testing
- » Verification of isolation capability through testing
- » Verification of a perfect connection between the assembly components and protective conductor through controls or resistance measurement
- » Verification of short-circuit resistance of the protective conductor through testing
- » Verification of the clearances and creepage distances
- » Verification of mechanical function
- » Verification of the IP protection class

Testing under arc conditions

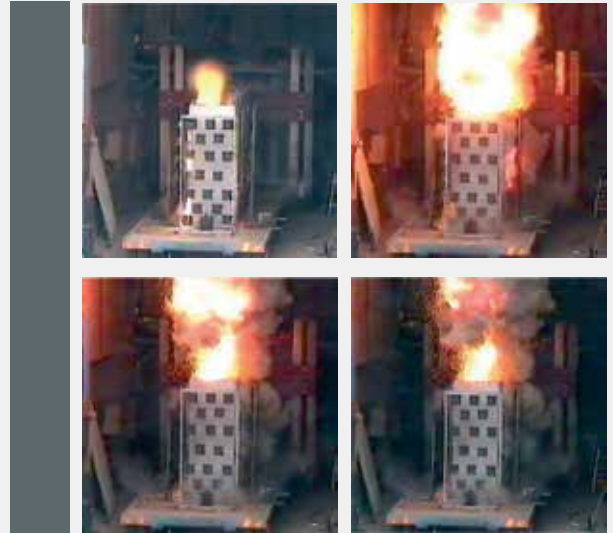
Today resistance to arc interference is an important and, in many applications, crucial requirement of modern INDUSTRIAL SWITCHGEAR SYSTEMS.

Arc faults cause an increase in pressure that results from a rapid rise in temperature in the interior of the switching cabinet. Its effects could injure people working close by. The system can also be damaged, such as partial or complex destruction of the switchgear and secondary damage to buildings. No matter what the extent of the damage, the system operator can expect to face long production stoppages and high downtime costs. Testing under arc conditions is considered a special test in accordance with IEC/TR 61641 and VDE 0660 part 500, supplementary sheet 2. Supplementary sheet 2 refers to constructional arc fault protection. Testing under arc conditions provides evidence that the low-voltage switchgear is safe for people within the vicinity of the system and verifies the safety of the system itself.

L Panels

725 V 100 kA 0,3 s

Outgoing feeder panels, MCC-panels 725 V 100 kA 0,3 s



Routine testing in the factory before delivery

Every switchgear undergoes routine testing in the factory before it is dispatched:

- » Inspection of the switchgear assembly and wiring
- » Conformity with the approved documentation
- » Optional electrical function test
- » Insulation testing
- » Review of the protection measures and inspection of the protective conductor connection running throughout

Other safety regulations

These high safety requirements are supported by further requirements:

- » Avoidance of operator errors for plug-in and slide-in technology as a result of precisely crafted mechanical guides and locks
- » The use of less insulation material and only high-quality material (e.g. for reinforcements, rail supports etc.)
- » The use of high-quality switchgears from renowned manufacturers guarantee a long product life and minimal downtimes
- » Can be switched off safely after 70 to 100 ms even when there are high delay times as a result of circuit breakers with reduced-time selectivity control
- » DP-supported project planning ensures error-free selection and placement of operating materials
- » Effective quality management

Range of products and services

The 8MF cabinet system offers you a complex enclosure platform for **INDUSTRIAL SWITCHGEAR SYSTEMS**. We would be happy to support you in designing and implementing customer-specific, tailor-made solutions for all electrical engineering applications.

Because of their high degree of flexibility, our cabinet systems are suitable for the installation of devices and systems for control technology, drive technology, measurement and process technology, protection and process control technology, communications engineering and electronics (19" mounting technology).

Our range of services consist of the design, manufacturing and delivery of individual cabinets as empty cabinets or completely assembled cabinets, including cabinet groups.

You determine the requirements, we implement them.

Contract-specific designs enable individual solutions

- » Function-related design
- » Customer-specific, modular configuration of the breakthroughs, ventilation slits or gills
- » Individual adjustments based on electrical requirements
- » Software for processing **HIGAD** / **HELIOS** TruTops

Variable cabinet system

Modular configuration:

The 8MF cabinet system, either welded or screwed together, is the ideal solution for implementing your technical requirements. Its high flexibility is the result of its modular configuration which is divided into frame, fittings and customer-specific applications, housing and basic frame/base.

- » A series of holes in the profile (9.2 mm in diameter, distance between holes 20 mm) enable installation levels in all three cabinet dimensions:
- » Optional floor plate
- » Doors (ground clearance is 63 mm) with interior hinges, opening angle of 180° (130° when arranged in a series)
- » Height, width and depth can be varied (size matrix)
- » Can be arranged in any order
- » Our cabinet systems are suitable for heavy fittings up to 1000 kg

Your benefits at a glance:

- » Modular configuration
- » Height, width and depth can be varied (matrix)
- » Surface treatment can be provided
- » RAL colors as requested by customer
- » Protection class up to IP54, higher degree of protection upon request
- » Contract-specific design
- » Customer-specific configuration
- » Earthing concept
- » Manufacturing of punch and bent parts
- » Surface treatment can be provided
- » ISO 9001

8MF cabinet



Safely reliable

The **INDUSTRIAL SWITCH CABINET SYSTEM** provides a reliable product for use in municipal and energy company networks thanks to the safety cabinet. Entire power transmission networks are protected against possible errors.

One of the most important aspects of FEAG Sangerhausen GmbH's portfolio is the safety cabinet. For over 20 years we have been designing and manufacturing various models of safety cabinet. During this time we have developed expertise and gained experience in project implementation and are well-acquainted with the special requirements of safety cabinet designs. Countless customers place their trust in our seal of quality "Made in Sangerhausen", enabling us to produce more than 1,000 safety cabinets every year.

Because we produce our own sheet metal and do our own varnishing, we can quickly and easily implement special requirements.

Basic system specifications

Height (excluding base) standard	2000 or 2200mm
Width	800, 900, 1000, 1200mm
Depth	600, 800mm
Base	100, 200, 300, 400mm

The 8 MF cabinet system allows individual adjustments to the dimensions to be easily and flexibly made in line with project requirements.

Your benefits at a glance:

- » Use of the tried and tested cabinet system 8 MF or Rittal
- » Customization through our own design and sheet metal production
- » High degree of flexibility through various interior systems
- » Integration of safety devices in swivel frames (19") or fixed-mounted, for example, busbar protection, distance protection, overcurrent protection ...
- » A range of doors available (glass doors, solid doors, divided doors)
- » Upon request: electric door locks and protection against dismantling the covering from outside

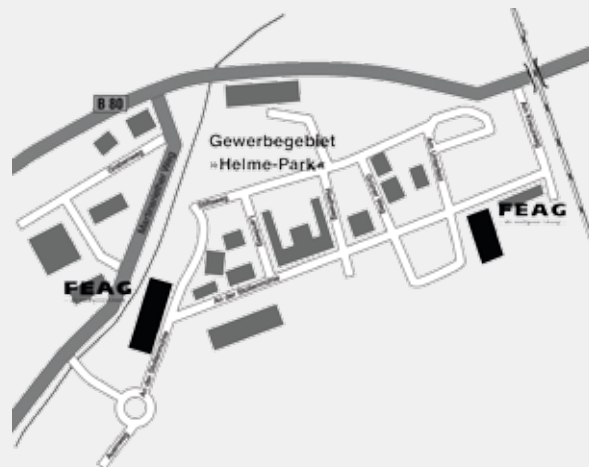
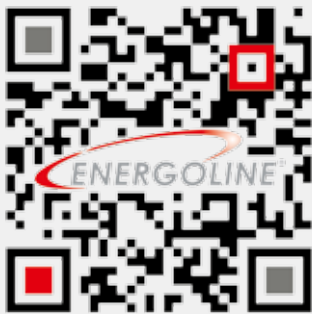
Safety cabinet (8MF)



Communication cabinet (8MF)



LOCATION – DIRECTIONS



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