

MEDIUM VOLTAGE MV Energy



FEAG

... DIE INTELLIGENTE LÖSUNG ...

ENERGO LINE[®]
SCHALTANLAGEN - SYSTEME BY FEAG



A strong brand for strong products:

The **ENERGOLINE** brand represents our product portfolio of INDUSTRIAL SWITCHGEAR SYSTEMS. Our products are characterized by a high degree of safety, flexibility and cost-efficiency. Type-tested components, compatible products and standardized interfaces are the special features of our **ENERGOLINE** family.

The **ENERGOLINE** brand is emblematic of power, dynamics and strength – properties that our products demonstrate on a daily basis in countless applications.

8PU Premium

Premium quality for all low voltage applications

MV Energy

The energizer of medium voltage up to 17,5kV

ENERGOLINE is more than just quality products “made in Germany”. **ENERGOLINE** is, first and foremost, our employees, and their dedication, creativity and passion.

POWER
DYNAMIC
PASSION
COMMITMENT
CREATIVITY

BUNDESREPUBLIK DEUTSCHLAND



URKUNDE

über die Eintragung der Marke

Nr. 304 07 842

Akz.: 304 07 842 5/09



Introducing our products

Safely reliable

The **INDUSTRIAL SWITCHGEAR SYSTEM**



provides a well-engineered standard product with a type-tested, factory-assembled, air-insulated medium voltage switchgear that can be flexibly used in the networks of public utility companies, public-sector energy companies and industrial companies. It can be used universally as a ring cable switchgear system as well as for complex power distribution.

The MV Energy medium voltage switchgear can be employed wherever medium voltage power has to be distributed safely and economically. It is able to carry out every switching, separation, distribution and control function required of a switchgear system.

Proven design principles, the latest in innovation, flexible modular solutions and continuous type and arc fault testing guarantee appropriate use and the highest degree of reliability and cost-effectiveness.

With its wide spectrum of slide-in and fixed-mounted options, the system can be used for all types of applications in the areas of energy supply, energy distribution, power stations, process industries and infrastructure.

Series:

- » **R12** up to 12 kV 3.150 A 40 kA
- » **R17,5** up to 17,5 kV 3.150 A 40 kA

Our portfolio includes various designs that can easily be combined with one another:

- » Vacuum circuit breakers using fixed-mounted and slide-in technology
- » Vacuum contactor using fixed-mounted and slide-in technology
- » Switch disconnectors using fixed-mounted technology
- » Measuring fields

Today, resistance to arc faults is an important and, in many applications, an imperative requirement of modern **INDUSTRIAL SWITCHGEAR SYSTEM**.

All of our switch cabinets are certified in accordance with IEC 62271-200 and fulfil, without exception, the criteria required by arc fault testing. The medium voltage switchgear **MV Energy** is IAC qualified which serves as proof that it is safe for both personnel and the equipment itself.

The switch cabinets are furnished with all of the equipment, locking mechanisms and accessories necessary to ensure a high level of personal and system safety and reliability.

Your advantages at a glance:

- » Air-insulated medium voltage switchgear, metal-clad, indoor installation
- » More economical and higher flexibility thanks to the modular system
- » Type-tested in accordance with all major international standards
- » Various design options that can be flexibly combined
- » Single or dual busbar system
- » The highest degree in personal and system protection through arc fault testing, IAC AFRL 40 kA, 1s
- » Partition class PM: metal partitioning between all devices, busbar and cable compartments
- » High-quality measuring, control and protection systems ensure reliable operation that can be designed to meet technical and customer requirements
- » Use of communication-specific components
- » Can be optionally equipped with a certified pressure release duct
- » Routine factory testing in accordance with VDE/EN/IEC standards and specific customer requirements



Reliability produces satisfaction

Equipment and switchgear accessories

The medium voltage switchgear **MV Energy** can be fitted with a large range of devices for switching, controlling, measuring and protecting.

Slide-in vacuum circuit breakers

The circuit breakers are mounted on the slide-ins and can be withdrawn. The procedure can be carried out with a closed door. Control and signal leads are connected to a low voltage compartment by a plug.

- » Switching units preferably from ABB, Siemens and TAVRIDA
- Other manufacturers available upon request.

Slide-in vacuum contactors

The vacuum contactor is mounted on the slide-in and can be withdrawn. The procedure can be carried out with a closed door. Control and signal leads are connected to the low voltage compartment by a plug.

- » Switching units preferably from ABB and Siemens

Switch disconnectors

The permanently installed switch disconnector is designed for switching and protecting the ring line or transformers (in connection with HV fuse links for short circuit protection) or for current-free switching. Each unit can be designed with an earthing switch with a making capacity for grounding wires.

- » Switching units preferably from ABB and TAVRIDA

Current transformers

Cast resin contactor transformers are used for feeding the measuring and protection devices. Their thin design enables switch cabinets up to B = 650 mm.

- » Preferably from ABB, ELEQ, Ritz or according to customer requirements

Voltage converters

The single-pole voltage converters are permanently installed or can be mounted on a slide-in trolley. Their thin design enables switch cabinets up to B = 650 mm.

- » Preferably from ABB, ELEQ, Ritz or in accordance to customer requirements

Earthing switches

Every incoming feeder cubicle and outgoing feeder panel can be delivered with a quick earth electrode for grounding wires and busbars that is protected against switch-on. These can be operated using a manually operated or motor driven bevel-gear that is either mechanically or electronically locked

- » to the circuit breaker slide-in unit and/or
- » to the door of the cable terminal compartment.

The position of the earthing switch can be checked via a window in the door.

Surge arresters

There is sufficient room in the cable terminal compartment for surge protection.

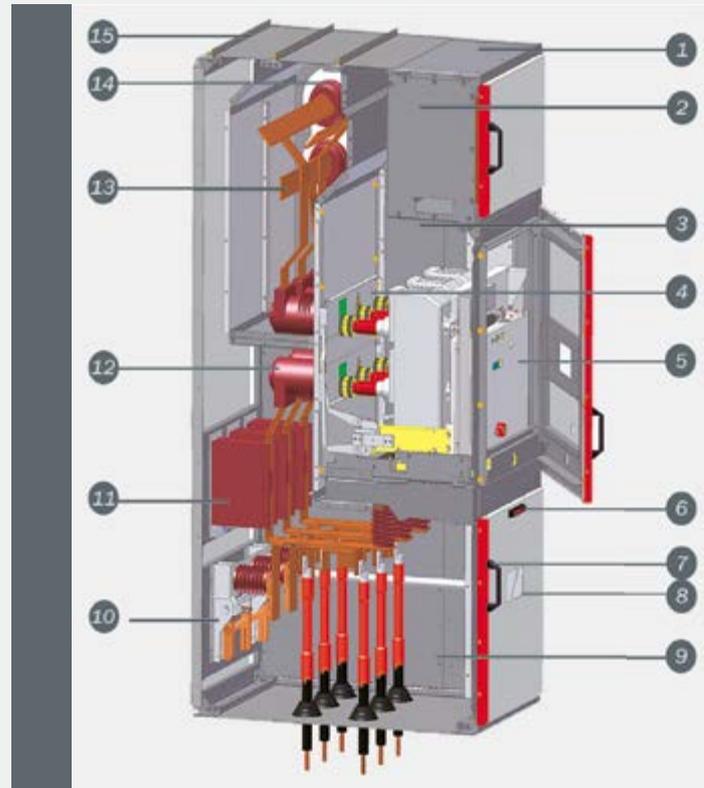
Cable terminal

Depending on the current, up to 8 cables per phase can be connected. The power cable is fed from below, or, upon request, from above as well.

Optional accessories

- » Transport trolley for circuit breakers
- » Lifting equipment for the shutters
- » Crank for circuit breaker slide-in unit
- » Switching lever for earthing switch
- » Double bit keys, or keys for a profile cylinder
- » Installation material/unit screw connection/crank for mech. release

Detail drawing of an incoming or outgoing panel



- 1 Side frame
- 2 Low voltage compartment
- 3 Circuit breaker compartment
- 4 Metal shutter
- 5 Vacuum circuit breaker
- 6 Swing handle lock
- 7 Door handle
- 8 Window
- 9 Cable terminal compartment
- 10 Earthing switch
- 11 Current transformer
- 12 Contact isolator
- 13 Busbars
- 14 Insulating bushing
- 15 Pressure release flap

Optional: voltage converter and surge arrester

Provided by the customer: Foundation-levelling rails/frames

Mechanical layout

Functional compartments

Every unit consists of four functional compartments:

- » Busbar compartment (1),
- » Cable terminal compartment (2),
- » Switchgear compartment (3),
- » and Low voltage compartment (4).

The functional compartments are separated both physically and electrically from one another by partitioning and isolating distances. This allows the functional compartments or units to remain live even though other functional compartments are open.

Busbar compartment

The busbar compartment contains the busbar system which is connected to the upper fixed contacts of the switchgears via branch connections. The busbars are made of electrolyte copper. The busbar compartment of each unit is separated from its neighbouring unit.

Cable terminal compartment

In the cable terminal compartment, the power cable is connected to the lower fixed contacts of the switchgears (e.g. circuit breakers) via a branch connection system. The branch connections are made of electrolyte copper. The cable terminal compartment is designed for the optional installation of a three-pole earthing switch, three surge arresters and three current/voltage transformers. The cable terminal compartment is closed off with a floor panel. Depending on the rated voltage, size of the unit and the cross-section of the cable, up to eight 1 or 3 pole cables can be connected.

Switchgear compartment

The switchgear compartment contains the insulating bushings with the permanent contacts for connecting the switchgears to the busbars and the terminal compartment. The bushings are made of cast resin and are shielded by the metal shutters. The metal shutters function automatically during the movement of the switchgears from the deployed position to the service position and vice versa.

Low voltage compartment

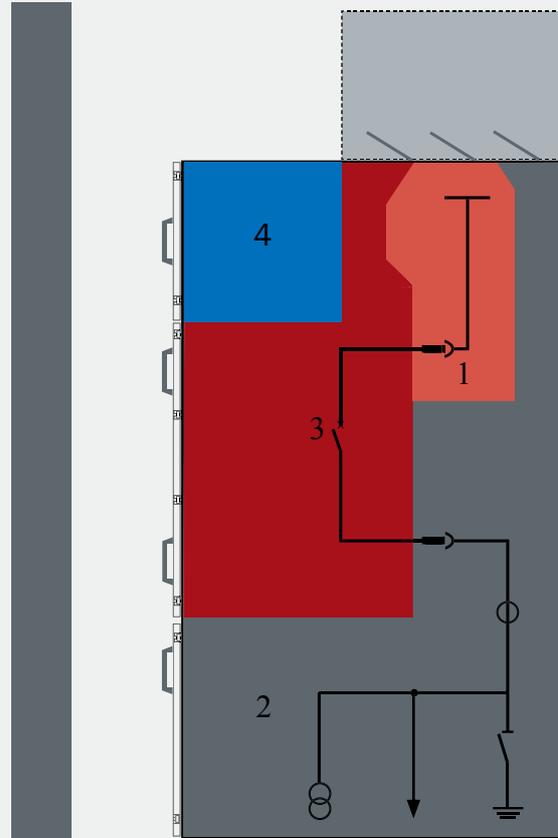
The low voltage compartment contains all of the control and protection devices and the wiring of the components.

Pressure release duct

Our fault arc resistant switchgear systems normally have a pressure release duct to discharge gases in the unlikely event of an arc fault. This is located over the switch cabinets and is installed along the entire system

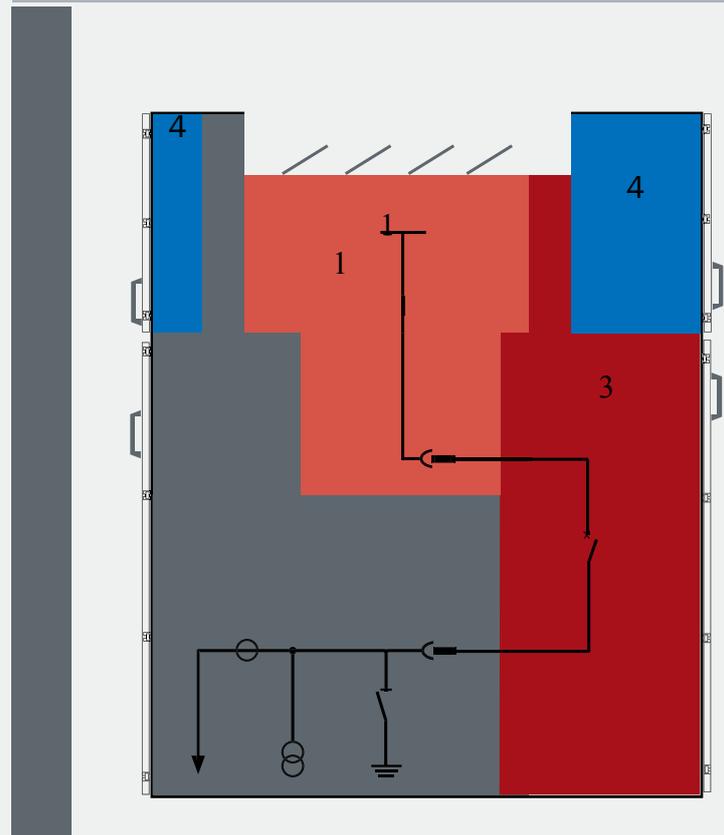
MV Energy

Access from the front



MV Energy

Access from the front



Basic variant

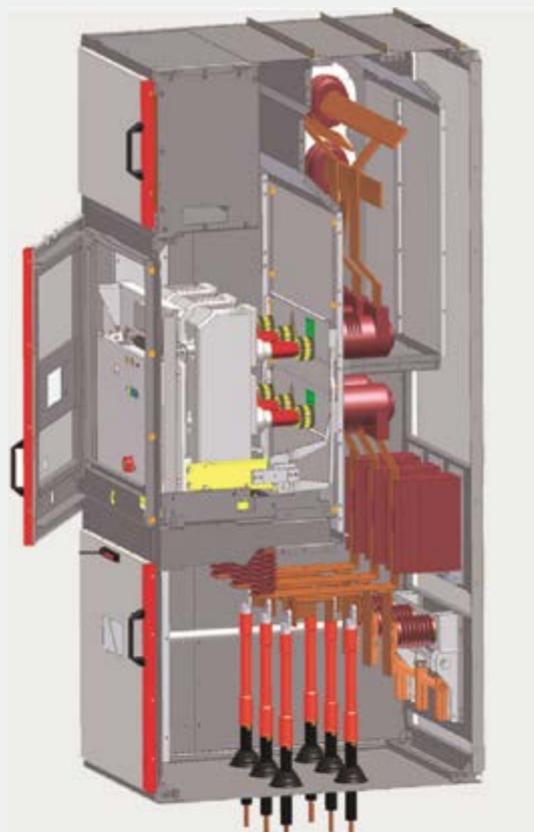
Vacuum circuit breakers

The circuit breakers are mounted on the slide-in and can be withdrawn. The procedure can be carried out with a closed door. Control and signal leads are connected to the low voltage compartment by a plug.

- » Switchgear preferably from Siemens, ABB, TAVRIDA
Other manufacturers available upon request.
- » Slide-in technology
- » Fixed-mounted technology
- » Type tested as per IEC 62271-200 / VDE 0671 part 200
up to 12 kV; 3.150 A; 40 kA
up to 17,5 kV; 3.150 A; 40 kA
- » Arc fault tested PM / LSC 2B / IAC AFRL 40 kA; 1 s

Rated current			
12 kV	31,5 kA	31,5 kA	40 kA*
17,5 kV	630 A...1250A	1600 A...3150 A	1250 A...3150 A
Height	2200 mm	2200 mm	2200 mm
Height with deflector plates	2500 mm	2500 mm	2500 mm
Height with pressure release duct	2600 mm	2600 mm	2800 mm
Width	650/800 mm	800/1000 mm	800/1000 mm
Depth			
12 kV	1260 mm	1260 mm	1450 mm
17,5 kV	1450 mm	1450 mm	1450 mm

* Generator circuit breaker switchgear with ABB VD4G-50 are also possible.



Vacuum contactors with HV fuses

The vacuum contactor is mounted on the slide-in and can be withdrawn. The procedure can be carried out with a closed door. Control and signal leads are connected to the low voltage compartment by a plug.

- » Switchgear preferably from Siemens, ABB
- » Slide-in technology
- » Fixed-mounted technology
- » Type tested as per IEC 62271-200 / VDE 0671 part 200
up to 12 kV; 3.150 A; 31,5 kA
- » Arc fault tested PM / LSC 2B / IAC AFRL 31,5 kA; 1 s

Rated current		
12 kV	630 A...1250 A	1600 A...2500 A
Height	2200 mm	2200 mm
Height with deflector plates	2500 mm	2500 mm
Height with pressure release duct	2600 mm	2600 mm
Width	650/800 mm	800 mm
Depth		
12 kV	1260 mm	1260 mm

Basic variant

Load break switch

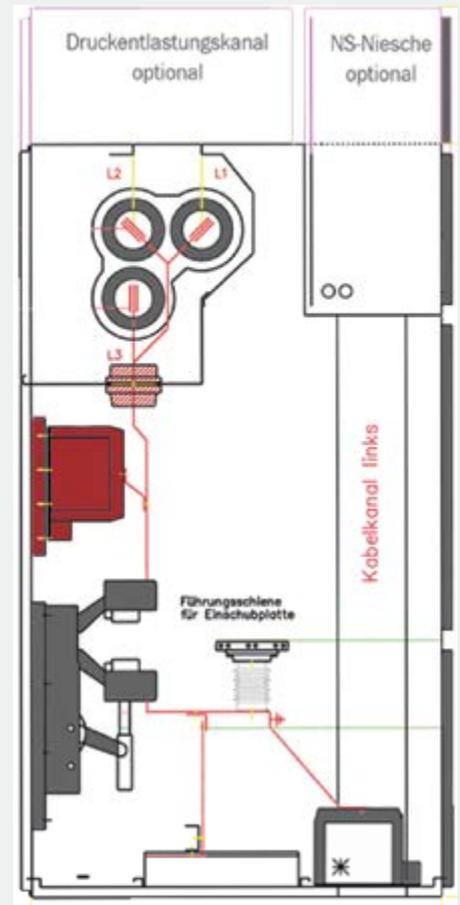
The fixed-mounted switch disconnecter is made for switching and protecting the ring line or transformers (in connection with HV fuse links for short circuit protection) or for current-free switching. Each unit can be designed with an earthing switch with a making capacity for grounding wires.

- » Switchgear preferably from ABB, Areva
- » **Fixed-mounted technology**
- » **Type tested** as per IEC 62271-200 / VDE 0671 part 200
up to 17,5 kV; 2.500 A; 25 kA
- » **Arc fault tested** PM / LSC 2A / IAC AFRL 31,5 kA; 1 s

Options

- » Load break switch as ring line / branch connection
- » Load break switch with HV fuse as transformer or outgoing feeder
- » Separate earthing switch or in combination with load break switch

Rated current		
12 kV	630 A...1250 A	1600 A...3150 A
17,5 kV	630 A...1250 A	1600 A...3150 A
Height	2200 mm	2200 mm
Height with deflector plates	2500 mm	2500 mm
Height with pressure release duct	2600 mm	2600 mm
Width	650/800 mm	800/1000 mm
Depth		
12 kV	1260 mm	1260 mm
17,5 kV	1450 mm	1450 mm



Measuring field

- » **Slide-in technology**
- » **Fixed-mounted technology**
- » **Type tested** as per IEC 62271-200 / VDE 0671 part 200
up to 17,5 kV; 3.150 A; 40 kA; 1 s
- » **Arc fault tested** PM / LSC 2A / IAC AFRL 40 kA; 1 s

Options

- » Fuse-voltage converter combination using slide-in or fixed-mounted technology
- » Current transformer using fixed-mounted technology

Rated current			
12 kV	31,5 kA	31,5 kA	40 kA
17,5 kV	630 A...1250 A	1600 A...3150 A	1250 A...3150 A
Height	2200 mm	2200 mm	2200 mm
Height with deflector plates	2500 mm	2500 mm	2500 mm
Height with pressure release duct	2600 mm	2600 mm	2800 mm
Width	650/800 mm	800 mm	800 mm
Depth			
12 kV	1260 mm	1260 mm	1450 mm
17,5 kV	1450 mm	1450 mm	1450 mm

Basic variant

Combi-cabinet

- » Fixed-mounted technology
- » Type tested as per IEC 62271-200 / VDE 0671 part 200
up to 24 kV; 3.150 A; 31,5 kA
- » Arc fault tested PM / LSC 2A / IAC AFRL 31,5 kA; 1 s

Variants

- » Vacuum circuit breaker
- » Vacuum contactor fuse combinations
- » Voltage converter measurement slide-ins
- » Current transformer
- » Measuring sets



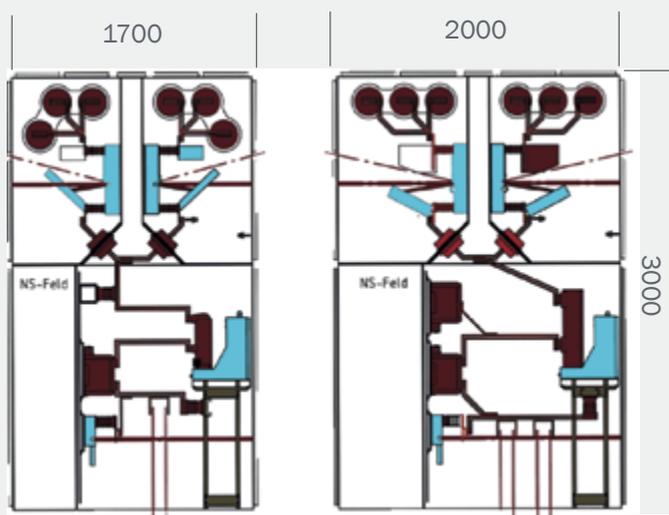
Rated current 12kV	630 A...1250 A	1600 A...3150 A
Height	2200 mm	2200 mm
Height with deflector plates	2500 mm	2500 mm
Height with pressure release duct	2600 mm	2600 mm
Width	650/800 mm	800/1000 mm
Depth 12kV	1260 mm	1260 mm

Dual busbar systems

- » Fixed-mounted technology
- » Type tested as per IEC 62271-200 / VDE 0671 Teil 200
up to 12 kV; 2500 A; 31,5 kA
- » Native current 4000 A; 40,0 kA (as per VDE 0101)

Variants

- » Vacuum circuit breaker
- » Vacuum contactor fuse combinations
- » Voltage converter measurement slide-ins
- » Current transformer
- » Measuring sets



Rated current 12kV	630 A...1250 A	1600 A...3150 A
Height	3000 mm	3000 mm
Height with deflector plates	3400 mm	3400 mm
Height with pressure release duct	3600 mm	3600 mm
Width	750 mm	1000 mm
Depth 12kV	1700 mm	2000 mm

High operational safety

Mechanical locks

The switch cabinets are provided with all of the necessary locking mechanisms to allow for the highest level of reliability and safety for personnel and equipment.

Standard safety features

- » The circuit breakers can only be switched in operating or disconnected position.
- » The slide-in can only be moved between the operating and the disconnected position when the circuit breaker is switched off.

Optional safety features

- » The slide-in can only be switched from the disconnected to the operating position when the control cable is plugged in.
- » The control cable can only be unplugged in the disconnected position.
- » The slide-in can only be switched to operating position if the earthing switch is turned off.
- » The door of the switchgear compartment can only be opened if the slide-in is in the disconnected position. The shutters are located in front of the contact isolators.
- » The door of the cable terminal compartment can only be opened if the earthing switch is turned on. The lock can be unlocked using a reset bolt.
- » The shutter can be locked.
- » The doors of the switchgear and cable terminal compartment can be locked (optionally with a double bit key or profile cylinder).
- » When in closed position, all of the doors can be locked with swing handle locks.

Pressure release and pressure release duct

All functional compartments, with the exception of the low voltage compartment, have their own pressure release on the roof of the switch cabinet. Any excess pressure within the switch cabinets as a result of an internal arc fault will open the corresponding pressure release flap. The following options are available depending on the current and ambient temperature:

- » Smooth pressure release flap up to 1.250 A
- » Vented pressure release flap > 1.250 A,

These will open in the case of a fault and limit the rise in pressure in the switch cabinet.

Ceiling height > 3.000 mm

For stand alone units, gases are discharged through 300 mm diagonal deflector plates (on both sides and on the side). Vertical deflector plates on the side of the switchgear conduct the gases out of the switch cabinet when wall mounted.

Ceiling height < 3.000 mm

The pressure release duct leads outside or to subordinate rooms not accessible by the public (e.g. transformer room) and is closed with a pressure release flap.

The optional pressure release duct runs the entire length of the switchgear.

Lock



Pressure release flaps / pressure release duct in accordance with IEC 62271-200



Diagonal discharge plates for stand alone units



Maximum protection for equipment and personnel

The medium voltage switchgear **MV Energy** a component of the ENERGO LINE product range, is a complete, type-tested, air insulated switchgear system whose physical properties, have been verified in operating and fault situations in accredited testing institutes in accordance with IEC 62271-200 requirements.

Type testing

- » Proof of compliance with high temperature limit
- » Proof of impact resistance and short-circuit strength
- » Proof of the AC voltage testing of the main and auxiliary circuits
- » Proof of short circuit making and breaking capacity of the switchgears
- » Proof of the making capacity of the earthing switch
- » Proof of mechanical functionality
- » Proof of IP protection class
- » Testing under arc fault conditions

Accessibility and operational availability

The set-up of the switchgear systems is in accordance with the LSC2B-PM classification as per IEC 62271-200: All compartments can be opened without tools. Locks allow access only when the corresponding medium voltage parts are turned off and are grounded. Busbar, cable and switchgear compartments are partitioned. Other functional compartments and units can remain live even if the main circuit compartment is open.

arc fault test of a medium voltage switchgear with pressure release duct



Routine factory testing before delivery

As a general rule, every switch cabinet undergoes routing factory testing before it is delivered:

- » Inspection of the switchgears and wiring,
- » Conformity with the approved documentation ,
- » Electrical functional testing,
- » Insulation testing,
- » Mechanical switching run,
- » Resistance measurement of the main circuit.

In addition of the structural arc fault protection, we also offer solutions for active arc fault protection from all conventional system providers.

Principles in accordance with IEC 62271-200 / VDE 0671-200:2008-03

Partition classes	PM	Metal cladding
	PI	Covered with insulating material
Operational availability	LSC1	The busbars and thus the entire switchgear system must be switched off.
	LSC2A	The busbars and adjacent switch cabinets can remain live.
	LSC2B	Other switch cabinets, the busbars and all cable compartments can remain in operation
IAC classification	Accessibility	
	A	Metal encapsulated switchgear that can only be accessed by electrical professionals
	B	Metal encapsulated switchgear with unrestricted accessibility, also for the public.
	C	Systems mounted on a mast.
	FRL	Access from the front (F = front), from the side (L = lateral) and from behind (R = rear)
MV Energy	IAC A FRL 40 kA, 1s	Our switchgear offers the best personal protection thanks to the verifiable arc fault qualification IAC A FRL up to 40 kA and one second arc duration.

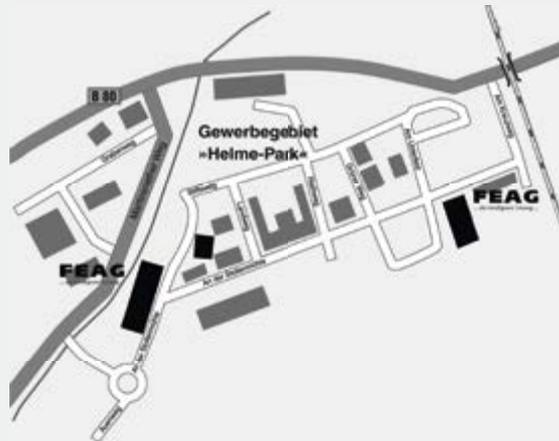
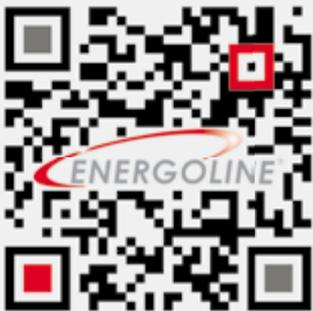
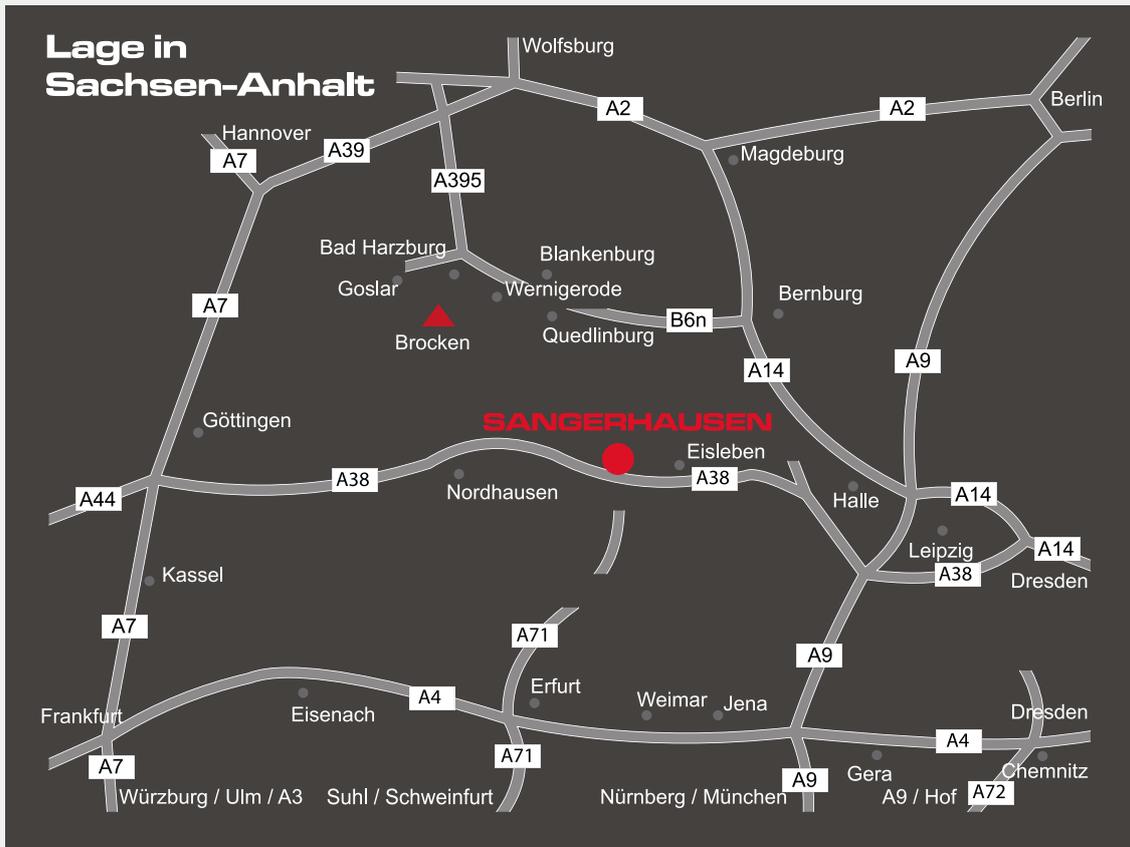
Technical data

Standards and directives	Switchgear	Medium voltage switchgear systems – Part 200: Metal encapsulated AC switchgear systems for rated voltages above 1 kV and up to and including 52 kV (IEC 17C/421/CD:2007)	DIN IEC 62271-200; VDE 0671-200:2008-03
	Devices	Earthing switches Circuit breakers High voltage AC current contactors Switch disconnectors	DIN IEC 62271-102/A1; (VDE 0671-102/A1:2009-02) IEC 62271-100; EN 62271-100 IEC 60470; EN 60470: IEC 60265-1; DIN EN 60265-1
Electrical parameters	Rated voltages	Rated voltage U_r Rated power frequency withstand voltage U_d Rated lightning impulse withstand voltage U_p Rated frequency	12 kV / 17,5 kV 28 kV / 38 kV 75 kV / 95 kV 50/60 Hz
	Rated currents	Rated breaking capacity I_{sc} Rated peak current I_p Rated short-time withstand current I_k Rated duration of short-time withstand current t_k	12 kV bis 40 kA 17,5 kV bis 40 kA up to 80 kA / 63 kA up to 31,5 kA; 40 kA / 25 kA up to 3 s
	Rated currents	Busbars Branch connections	up to 3.150 A / 2.500 A 630 A, 1.250 A, 1.600 A, 2.000 A, 2.500 A
Mechanical parameters	Cabinet measurements	Cabinets and support frames Height Width Depth	2.200 mm ¹⁾ 650, 800, 1.000 mm 1.260, 1.450 mm ²⁾ Customized adjustments possible
	Protection classes	In accordance with IEC 60529, EN 60529	IP 20 to IP 4X
	Surface protection	Coating as per DIN 43656, Standard coating thickness Support frames, sendzimir galvanized Encasement	Epoxy polyester powder 65 µm RAL 7035 (upon request) RAL 7035 (upon request) Special colours and double coating available
Ambient conditions	Rated properties	Ambient temperature Relative humidity Maximum elevation	-5 ... +40 °C 95 % 1.000 m mean sea level

¹⁾ with deflector plates +300 mm
with pressure release duct + 400 mm (31,5 kV) and + 600 mm (40 kA)

²⁾ for doors and rearplate 2x30 mm = 60 mm

Directions



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