



for a greener tomorrow

MS-EBG

Medium Voltage Switchgear and Controlgear



- Conforms to latest IEC 62271-200 standards
- Maximum short circuit current 25–50 kA
- Rated voltage 3.6–24 kV
- Maximum Busbar rating 630–4000 A

Medium Voltage Switchgear for all applications

The MS-EBG switchgear is the latest addition to the long established range of medium voltage products from Mitsubishi Electric. Manufactured in Europe, MSE-EBG conforms fully to the latest IEC 62271-200 standards and is designed and manufactured utilising state-of-the-art technology, comprehensively taking into account present and future power system requirements.



Mitsubishi Electric has manufactured over 250,000 medium voltage panels over the last 60 years – the MS-EBG MV Switchgear panel utilises our highest quality vacuum circuit breaker and vacuum contactor components, including Mitsubishi vacuum interrupters for which Mitsubishi Electric has gained a strong reputation globally.

MS-EBG represents an up-to-date and reliable medium voltage panel design, offering fully withdrawable vacuum circuit breakers and contactors to provide maximum availability, fully in line with Mitsubishi Electric's quality supply and service record resulting in highly satisfied customers all across the globe.

Features

High Reliability

- Type testing of the MS-EBG was performed by an independent external testing and certification authority, IEL, in Europe.
- MS-EBG is designed with the benefit of Mitsubishi's vast experience of medium voltage panel production of hundreds of thousands of panels over the last 60 years.
- All components, such as current transformers, voltage transformers and multi-function relays are made of the highest quality materials.

- Heat stress analysis of the switchgear structure has led to a heat-resistant design in which circuit breakers up to 4000 A are self-cooled (i.e. cooling fans not required).
- Modern design and manufacturing techniques reduces the number of parts which further reduces the chance of failure.

Easy Installation

- Installation and testing duration are considerably reduced as the panel is tested and adjusted in the factory and then delivered as a complete unit.

Safety

Safety and reliability are the prime focus of the MS-EBG design using 60 years of Mitsubishi Electric experience in supplying approximately 250,000 panels of MV switchgear to date.

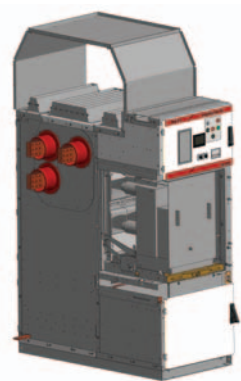
Full type testing to IEC 62271-200 of the MS-EBG has been carried out by the independent external testing and certification authority, Electrotechnical Institute (Instytut Elektrotechniki, IEL) in Warsaw, Poland.



Internal arc safety testing

Flexible Design

- Panels with main circuit and control cable entry from either the top or bottom are available.
- Partitions between compartments and an automatic shutter system (for withdrawable equipment primary junctions) completely isolate live parts.
- Safe operation and maintenance is ensured with the adoption of comprehensive interlocking and padlocking mechanisms.
- In the event of an internal arc fault, the MS-EBG is designed to withstand the huge pressure and scorching effect of the arc (relief flaps located on top of the panel open to limit pressure).
- Withdrawable equipment is mounted behind the front panel door which is screw-closed, so that any arc proof rating is not compromised (compliant with IEC 62271-200 requirements).



Type MEprotect relay

High reliability Mitsubishi Electric Europe MEprotect, Melpro-D, EMC-B Multiple Protection relays are installed as standard - additionally third party protection devices can be supplied according to client requirements.



MEprotect protection relay

SWITCHBOARD RATINGS

Type designation	MS-EBG						
Applied standard	IEC 62271-200 ^①						
Rated voltage ^②	kV rms	U _r	3.6	7.2	12	17.5	24
Rated frequency	Hz	f _r	50, 60				
Rated insulation level ^③	kV rms	U _d	28/32			36/45	50/60
Short-duration power frequency withstand voltage, 1 min	kV peak	U _p	75			95	125
Lightning impulse withstand voltage	A rms	I _r	630,800,1000 1250, 1600, 2000,2500,3150, 4000 ^④			630–3150	630–2500
Rated normal main busbar current	kA rms	I _k	25, 31.5, 40, 50, 63				25
Rated short-time withstand current, symmetrical	kA peak	I _p	50 Hz: 2.5 × I _k , 60 Hz: 2.6 × I _k				
Rated peak withstand current	sec	t _k	3				
Rated duration of short-circuit	LSC2B-PM						
Loss of Service Continuity category	IAC						
Internal Arc Classification ^⑤	AFL, AFLR						
Accessibility type	kA		25, 31.5, 40, 50				25
Arc test current	sec		1				
Arc test current duration							

SERVICE CONDITIONS

Location/IP				Indoor IP 54/5x/4x
Ambient temperature	°C			-5 to +40
Altitude above sea level	m			1000 max.
Humidity R.H.	%			95 max.
Water vapour pressure	kPa			2.2 average
Earthquake protection ^⑥	m/s ²			9.8
Horizontal seismic withstand ^⑦	m/s ²			3.24
Vertical seismic withstand				

FEATURES

Type test ^⑧				IEL (Warsaw)
Withdrawable equipment position ^⑨				Mid-mount
Withdrawal/insertion method				External operation (with door closed)
Maintenance access				Front & rear, Front

① High-voltage switchgear and control-gear-Part 200: AC metal-enclosed switchgear and control-gear for rated voltages above 1 kV and up to and including 52 kV.

② 12 kV and 15 kV apply to switchgear.

③ 28 kV rms (75 kV peak) and 36 kV rms (95 kV peak) apply to switchgear.

④ 3150 A apply to 7.2 kV and 12 kV switchgear.

⑤ Optional

⑥ General use, class B on the upper floor or roof of building according to JEM-TR 144.

⑦ Static acceleration of horizontal is 3.92 m/s² at base of structure.

⑧ TTA fault test.

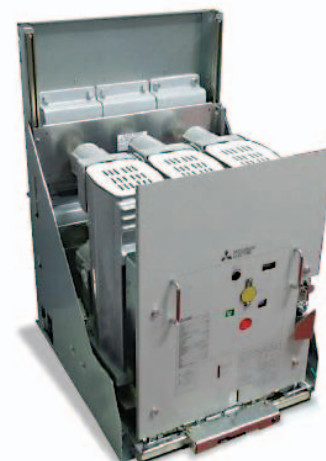
⑨ Circuit breaker/Fused contactor/Voltage transformer.

Applications

- MS-EBG from Mitsubishi Electric Europe provides control and protection of the power supply to motors, transformers, capacitors and other feeder circuits.
- The MS-EBG is available at rated voltages of 3.6 to 24 kV, with rated short-circuit breaking capacities from 25 to 50 kA.
- MS-EBG is designed for indoor use and is particularly suitable for the high demands of electric power plants, substations, industrial plants, commercial buildings, pumping stations, pipeline stations and transportation systems.

VACUUM CIRCUIT BREAKER RATINGS

Type designation	6/10/20-VPR-xx D ^①					
Applied standard	IEC 62271-100					
Rated voltage	kV rms	U _r	7.2	12	17.5 ^②	24
Rated frequency	Hz	f _r	50, 60			
Rated normal current (self-cooling)	A	I _r	630, 800, 1000, 1250, 1600, 2000, 2500			
Rated insulation level						
Short-duration power frequency withstand voltage, 1 min.	kV rms	U _d	20	28	36	50
Lightning impulse withstand voltage	kV peak	U _p	60	75	95	125
Rated short-time withstand current	kA rms	I _k	25, 31.5, 40			
Rated peak withstand current	kA rms	I _p	50 Hz: 2.5 × I _k , 60 Hz: 2.6 × I _k			
Rated duration of short-circuit	sec	T _k	3			
Rated cable-charging breaking current	A rms	I _c	10, 25			
Rated short-circuit breaking current	kA rms	I _{sc}	25, 31.5, 40 ^⑤			
Transient Recovery Voltage (TRV)						
Reference voltage	kV	U _c	12.3	20.6	25.7	xx
Rate of Rise of Recovery Voltage (RRRV)	kV/μs	U _c /t ₃	0.24	0.34	0.34	xx
Rated break time	cycles		3			
Rated short-circuit making current	kA peak		63, 78.8, 100			
Rated control voltage	V DC	U _a	48, 110, 220			
Rated operating sequence			O-3min-CO-3minCO O-0.3sec-CO-3min-CO CO-15sec-CO			
Closing operation						
Motor current (at 110 V DC)	A		1.2 (peak 6 A)			
Spring charging time	sec		Approx. 6 (after closing)			
Closing control current (at 110 V DC)	A		3.4			
Tripping control current (at 110 V DC)	A		3.4			
Auxiliary switch (contacts)			5a, 5b			
Weight	kg	M	630 A, 1250 A: 140 2000 A: 160 3150 A: 210 4000 A: 440			



- ① Rated short-circuit breaking current
25 kA: ② ⑤
31.5 kA: ③ ②
40 kA: ④ ①
- ② North American rating (range I, series II in IEC).
- ③ 3150 A applies only to 7.2 kV and 12 kV switchgear.
- ④ 4000 A applies to 12 kV/50 kA switchgear.
- ⑤ 31.5 kA and 40 kA applies only to 7.2 kV and 12 kV switchgear.

FUSED VACUUM CONTACTOR RATINGS

Type designation	F2VN or F4VN ^①		
Applied standard	IEC 60470		
Rated voltage	kV rms	U _r	6.6
Rated insulating voltage	kV rms		7.2
Rated frequency	Hz	f _r	50, 60
Rated operational current (self-cooling)	A	I _r	200, 400
Rated insulation level			
Short-duration power frequency withstand voltage, 1 min.	kV rms	U _d	20
Lightning impulse withstand voltage	kV peak	U _p	60
Rated short-circuit breaking current	kA rms	I _{sc}	40 (Power fuse)
Rated control voltage	V DC	U _a	100, 110, 200, 220
Closing control current (at 100 V DC)	A		4.8
Tripping control current (at 110 V DC)	A		4.5 (mech. latch type)
Auxiliary switch (contacts)			2a, 2b
Rated short-time withstand current	kA rms	I _k	25, 31.5, 40
Weight	kg	M	00 A: 90 400 A: 90 (for 3.3 kV) 400 A: 100 (for 6.6 kV)



- ① Power fuse rating
25 kA: ① ②
50 kA: ① ⑤
100 kA: ① ①
150 kA: ① ⑤
200 kA: ② ①
300 kA: ③ ①
400 kA: ④ ①

Contacteur rating: 200 A – suffix 2VN,
400 A – suffix 4VN

Construction

Enclosure and partitions

The all-metal enclosure is completely earthed. Each compartment (control, withdrawable switching device, busbar and cable termination) is segregated from other compartments by earthed metal partitions.

The front of the MS-EBG is divided into 3 compartments. The upper or low-voltage compartment is the control/protection compartment; the middle section houses the withdrawable equipment, while the bottom compartment can be used for maintenance access to voltage transformers or cable termination.

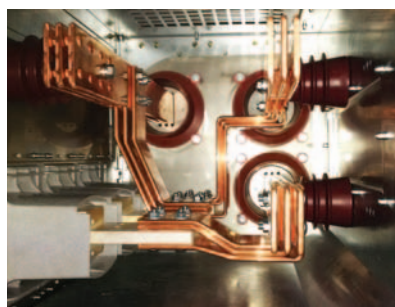
Multi-function relays, meters, protective relays, control switches, etc. are semi-flush mounted on the door of the control compartment.



Busbars

The main busbar is made of copper conductors.

MS-EBG has bare busbars as standard. However, when required, the busbar and joints can be insulated and/or tin plated.



Voltage Transformers

To allow easy maintenance fully withdrawable circuit voltage transformers can be fitted in the bottom section of the panel, accessible from the front of the switchboard via an interlocked panel.



Earthing devices

Optional earthing devices are available for safety during cable and busbar maintenance and/or inspection. The following two types of earthing device can be provided upon request with the MS-EBG.

Earthing Truck

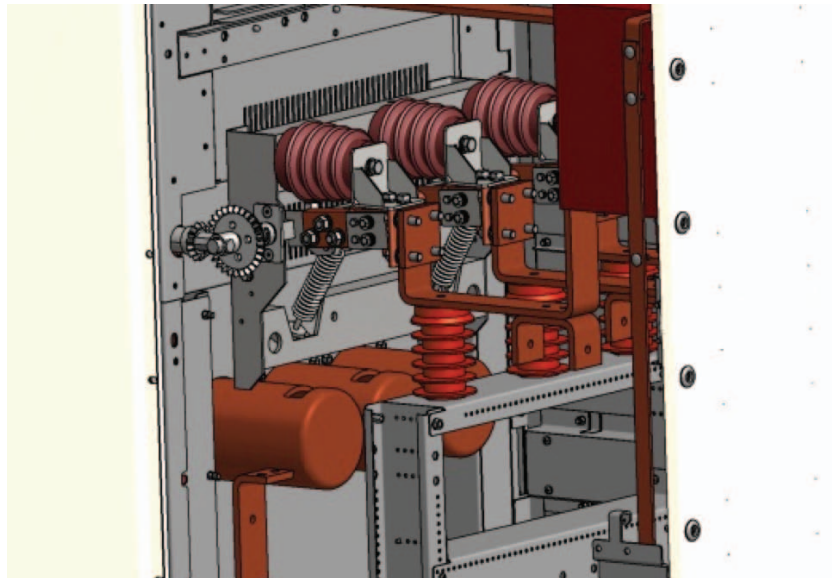
For more demanding applications, an earthing truck with fault-making capability can be supplied which employs the same operating mechanism as the vacuum circuit breaker.

Integral earthing switch

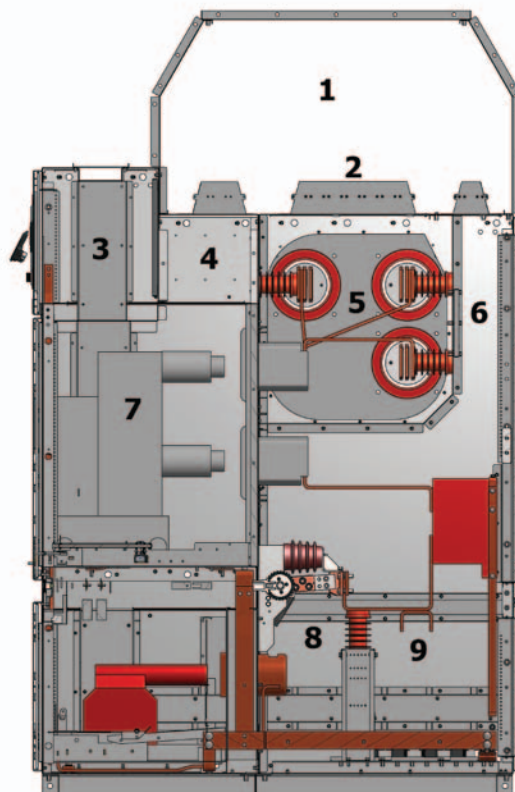
For the purposes of safety during equipment, cable and busbar maintenance and/or inspection, a circuit earth switch can be integrated within the cable compartment. Operated from the front of the panel a mechanical interlock between the switch and circuit breaker (or fused contactor) is provided.

For busbar earthing, switches are usually integrated within a bus riser/VT panel and employ electrical interlocking with the adjacent panel's circuit breaker.

The mechanical indicator and operation for the switch can be viewed from the front of the panel through a small, circular inspection window.



MS-EBG's earthing switch (detail)



1. Gas exhaust duct or gas screen (optional) ^①
2. Ventilator ^②
3. Control compartment
4. Withdrawable equipment compartment
5. Busbar compartment
6. Cable compartment
7. Circuit breaker
8. Earthing switch (optional) ^③
9. Power cable

Notes

- ^① Gas exhaust duct or gas screen required when Internal Arc Classification AFLR is required.
- ^② When the current within a compartment is 2000 A or greater, a ventilator is required for that compartment. However, not required if gas exhaust duct used.
- ^③ Earthing truck is applied for 17.5 & 24 kV switchgear with $I_k > 25$ kA

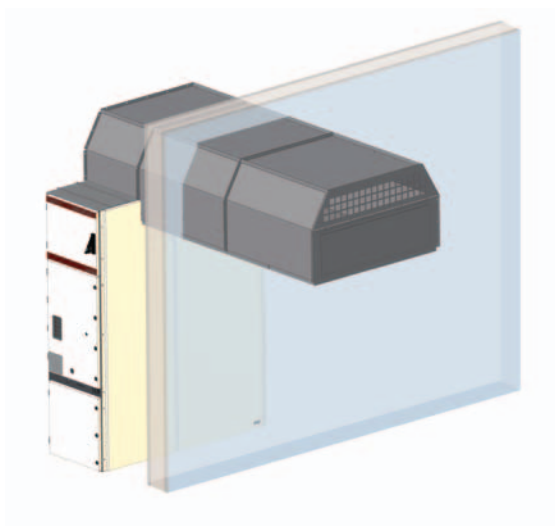
Internal Arc Classification (IAC)

For switchgear and controlgear requiring optional Internal Arc Classification to the AFLR standard, a gas exhaust duct must be fitted onto the top of panel. The gas exhaust duct ensures that in the event of an internal arc fault, any hot gases or vapours are channelled away from personnel in the vicinity of the panel.

The gas exhaust duct may extend to the open air outside the substation or a safe area within the substation. The straight extension two meters width, which is standard, is available. The part of extension duct to reach to the open air will be supplied by others.

The gas exhaust duct is dismantled from the panels prior to shipping and is re-installed after the panels are installed on site.

With the gas exhaust duct, the switchgear and controlgear are designed to protect persons in the event of an internal arc fault of up to 40 kA for 1 second. Thus, in the event of internal arcing, there is no ejection of parts, no expulsion of hot gases (except from the gas exhaust duct) and the enclosure remains earthed. Minimum clearances of within the substation of 600 mm, 100 mm and 800 mm from the panel to the room's ceiling, side walls and back wall, respectively, are required.



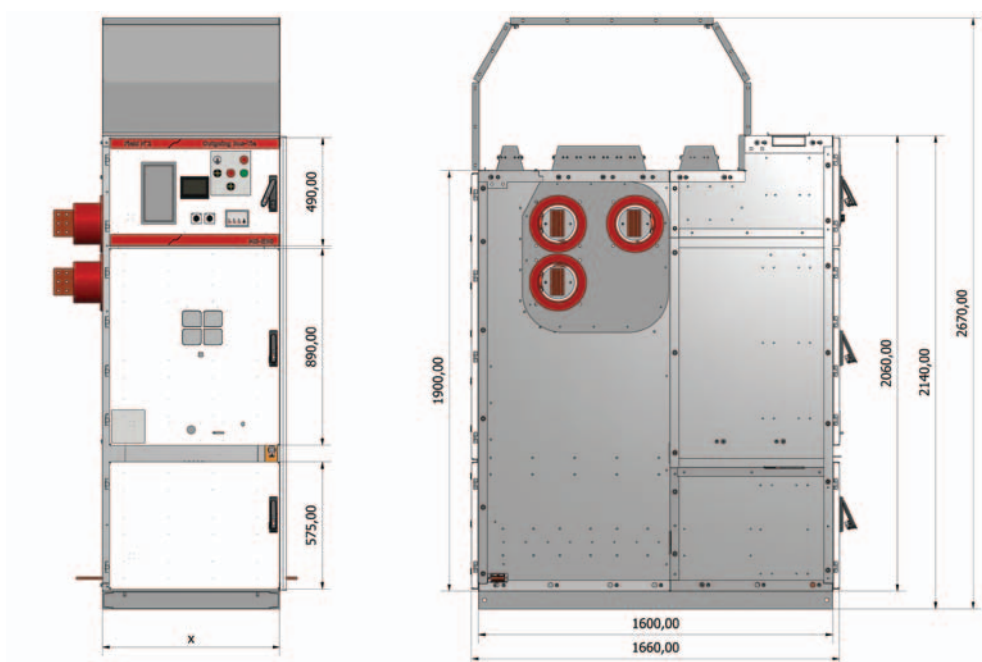
Internal arc containment classification

AFLR – signifies that the switchgear and controlgear are designed for access from the Front, Lateral ends and Rear by Authorised personnel only.

AFL – signifies that the switchgear and controlgear are designed for access from the Front and Lateral ends by Authorised personnel only.

A gas screen can be selected instead of the gas exhaust duct on the condition that ceiling height from floor of electrical room is 4400 mm or over.

Panel Dimensions



Note dimension x = 650/800/1000 mm depending on rating and voltage of switchboard

Dimensions shown are for upto 12 kV versions

Global Partner. Local Friend.

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