MITSUBISHI ELECTRIC
Changes for the Better

DOUBLE TIER MEDIUM VOLTAGE SWITCHGEAR AND CONTROLGEAR

TYPE
MS-E

MODEL
MS-E-2

7.2 / 12kV
25, 31.5, 40kA

GLOBAL IMPACT OF MITSUBISHI ELECTRIC

Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

"Changes for the Better" represents the Mitsubishi Electric Group's attitude to "always strive to achieve something better", as we continue to change and grow. Each one of us shares a strong will and passion to continuously aim for change, reinforcing our commitment to creating "an even better tomorrow".

Mitsubishi Electric is involved in many areas including the following:

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

Our advances in AI and IoT are adding new value to society in diverse areas from automation to information systems. The creation of game-changing solutions is helping to transform the world, which is why we are honored to be recognized in the 2019 "Forbes Digital 100" as one of world's most influential digital corporations.

OVERVIEW

1 Overview

Model MS-E-2 Double Tier Medium Voltage Switchgear

Mitsubishi Electric has manufactured hundreds of thousands of medium voltage panels over the last almost 70 years. With this experience, Mitsubishi Electric has gained a reputation of manufacturing up-to-date and reliable medium voltage panels, and possesses a supply record that comprises satisfied customers from all across the globe.

Space-saving

MS-E-2 differs from the conventional IEC compliant structure with 1 circuit/1 enclosure, and has a compact, high-density double tier structure with 2 circuits/1 enclosure, to downsize the whole installation.

Safety

MS-E-2 ensures the appropriate safety in the operation, and maintenance based on the IEC 62271-200.

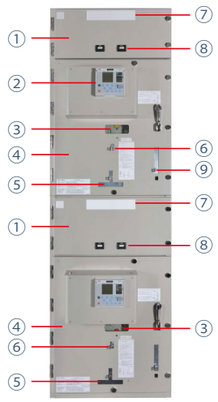
- Withdrawable units (VCB/VMC units) and earthing switch that can be operated from outside the enclosure
- Internal arc classification (IAC): AFLR , 40kA, 1s
- Safety construction: LSC2B-PM
- Degree of protection
  - Standard: External (IP3X), Internal (IP2X)
  - Special: External (IP42) (optional)

Construction

Basic double tier busbar panel design

① LV compartment
② Protection relay (with VCB, VMC operation button)
③ Viewing window
④ Withdrawable equipment compartment (VCB, VMC unit)
⑤ Insertion/draw-out handle port
⑥ Manual Emergency trip port
⑦ Name plate
⑧ VT・CT secondary circuit test terminals
⑨ Earthing switch operating handle port
⑩ Roof ventilation
⑪ Busbar compartment
⑫ Cable compartment

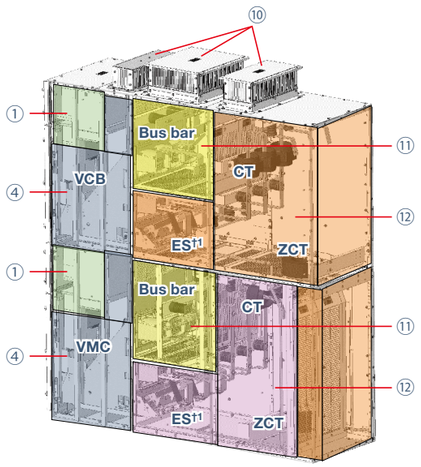
†1: ES is the earthing switch



Front View

Specifications

- Main circuit ratings
  - Incomer & bus tie: 12kV, 3150A, 40kA/3s
  - Feeder: 12kV, 1250A, 40kA/3s
- Vacuum circuit breaker (VCB)
  - Mechanical endurance: M2
  - Electrical endurance: E1, E2
- Vacuum electromagnetic combination unit (VMC)
  - Mechanical endurance
    Mechanical latch type: 0.25 million times
    Electrical hold type: 2.5 million times
- Earthing switch
  - Incomer: 12kV, 40kA/3s (switchgear)
  - Outgoing feeder: 12kV, 40kA/3s (switchgear)
  - Outgoing feeder: 12kV, 31.5kA/3s (controlgear)
- Connection of withdrawable VCB/VMC units
  - Main circuit: Automatic connection
  - Control circuit: Manual connection
- Safety shutter for VCB/VMC withdrawable units
  - Automatic metallic shutters
- Withdrawable VCB/VMC units interlocked with the compartment door
- The panel and main devices comply with the following standards:
  - IEC 62271-1 for general purposes
  - IEC 62271-200 for the switchgear
  - IEC 62271-102 for the earthing switch
  - IEC 62271-100 for the circuit-breakers
  - IEC 60470 for the contactor-based motor-starters
  - IEC 60529 for degree of protections



Section View

Space-saving construction

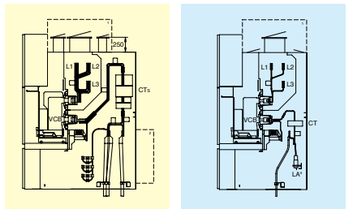
- General construction of MS-E-2
  - Incomer panel: VCB and VT
  - Bus tie: VCB and VT
  - Feeder panel: VCB and/or VMC

- The conventional type single tier switchgear and MS-E-2 were compared based on a 11-panel construction. The width of the panel arrangement has become 2.8m shorter, installation space has been reduced by roughly 10% as a whole. This reduces the number of enclosures to be transported and shortens installation time.

- Single line diagram and panel layout (example)

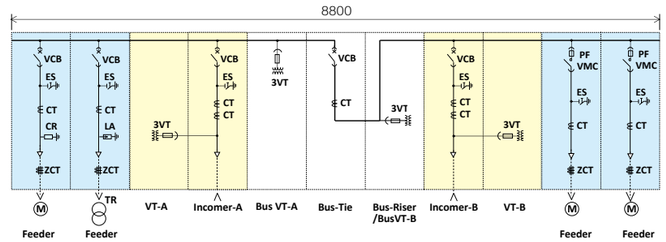
Panel specifications: Rated voltage (12kV), rated normal current (3150A), rated duration of short-circuit (40kA/3s).

1) Conventional type single tier switchgear

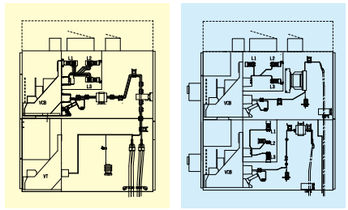


Incomer

Outgoing feeder

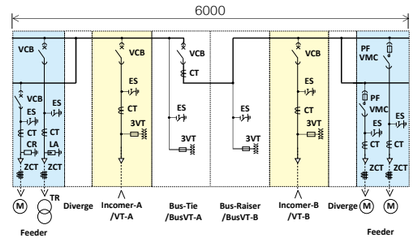


2) MS-E-2



Incomer

Outgoing feeder



VCB: Vacuum circuit breaker
VMC: Vacuum magnetic contactor
ES: Earthing switch
VT: Voltage transformer
CT: Current transformer
ZCT: Zero-phase sequence CT
PF: Power fuse
LA: Lightning arrester
CR: CR suppressor
TR: Transformer
M: Motor

Internal arc specifications

MS-E-2 has an arc-proof structure which ensures the safety of people near the panel when a short circuit fault occurs inside the panel, by exhausting hot gas from the top of the panel.

Type test certificate of internal arc performance

- IEC 62271-200
- Classification IAC†2: AFLR, 40kA/1s

†2: IAC is Internal arc classification

2 Standard Rating and Specifications

Switchgear and controlgear's specifications				
Type			MS-E (model MS-E-2)	
			Switchgear	Controlgear
Applied standard			IEC 62271-200	
Rated voltage		kV, rms	7.2, 12	7.2
Rated frequency		Hz	50, 60	
Rated short-duration power-frequency withstand voltage [1 min]	Main circuits	kV, rms	20, 28	20
	Auxiliary and control circuits		2	
Rated lightning impulse withstand voltage		kV, peak	60, 75	60
Busbar system			Single busbar (Incomer, Bus tie, Bus riser)	
			Double tier busbar (Bus divider, Feeder)	
Rated current	Main busbar current	A, rms	630, 1250, 2000, 3150	
	Feeder current (Double tier feeder)		630, 1250	200, 400
Rated short-time withstand current (Ik), symmetrical	Main circuits	kA, rms	25, 31.5, 40	
	Rated duration of short circuit	sec	1, 3	
Rated peak withstand current (main and earthing circuits)		kA, peak	50Hz : 2.5×Ik, 60Hz : 2.6×Ik	
Earthing switch	Mechanical endurance	class	M0	
	Electrical endurance	class	E2 (Ik: 40kA, rms)	E0 (Ik: 31.5kA, rms) E2 (Ik: 40kA, rms) (Optional)
Degree of protection	Enclosure		IP3X, IP42 (optional)	
	Internal partitions		IP2X	
Internal arc classification (IAC)	Internal arc class		AFLR	
	Internal arc withstand current	kA	25, 31.5, 40	
		sec	0.1, 1.0	
Loss of service continuity category			LSC2B	
Partition class			PM	
Rated auxiliary and control circuits voltage		V DC	100/110	

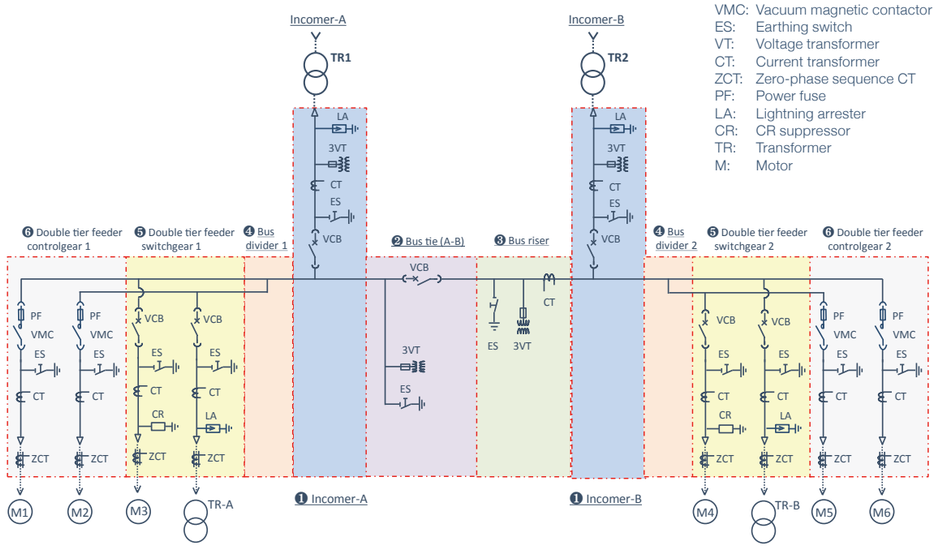
Switchgear and controlgear's specifications			
Service Conditions			
Location			Indoor
Ambient temperature		°C	-5~40
Altitude a.s.l.		m	1000 max
Humidity	R.H.		Average relative humidity over a 24-hour period ≤ 95%
			Average relative humidity over a 1-month period ≤ 90%
	Water vapor pressure		Average vapor pressure over a 24-hour period ≤ 2.2kPa
			Average vapor pressure over a 1-month period ≤ 1.8kPa
Normal service conditions			The ambient air is not significantly polluted by dust, smoke, corrosive and/or flammable gases, vapours or salt.
Features			
Withdrawable equipment position			Upper and/or lower mount
Withdrawal / insertion method			External operation (with front door closed)
Withdrawable equipment	VCB • VMC		Main circuit terminal (automatic connection) Control circuit plug-in terminal (manual connection)
Maintenance access			Front and rear
Power cable entry arrangement	Bottom		Incomer panel, double tier feeder panel
Bus duct interface	Top		Incomer panel
Control cable entry arrangement	Top or bottom		Incomer panel, double tier feeder panel

3 Switchgear and Controlgear Arrangement

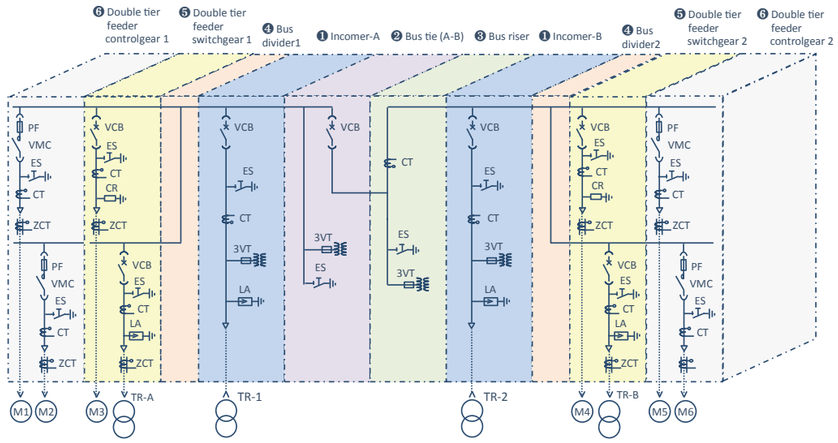
3.1 Arrangement (example)

7.2kV double tier medium voltage switchgear and controlgear

(1) Single-line Diagram

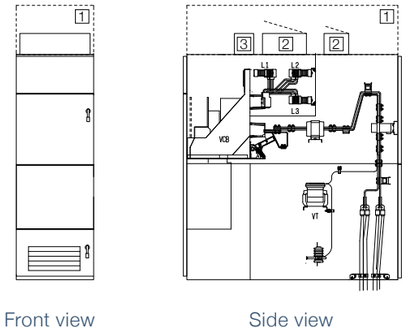


(2) Panel Layout

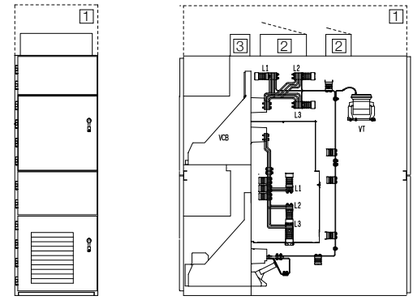


(3) Panel Appearance

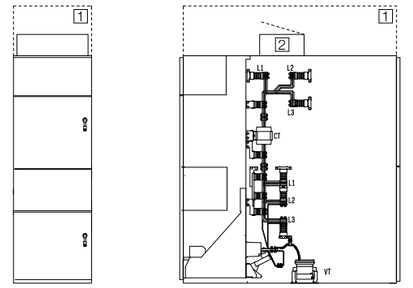
1 Incomer (with fixed VT)



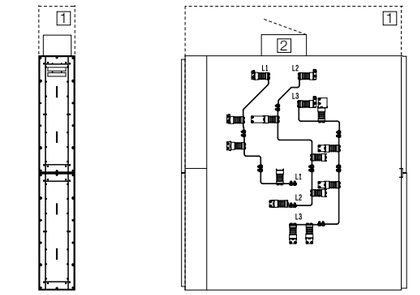
2 Bus tie (with fixed VT)



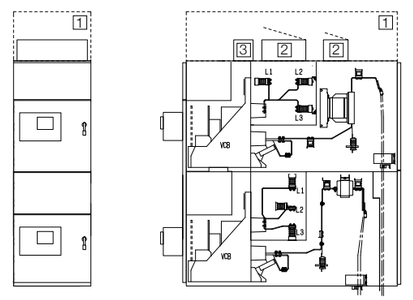
3 Bus riser (with fixed VT)



4 Bus divider

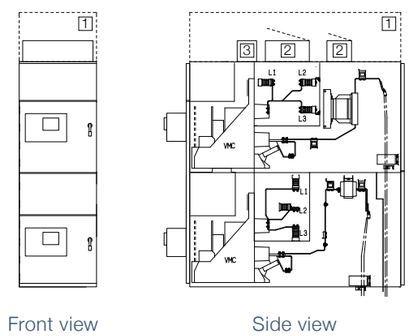


5 Double tier feeder



(4) Controlgear

6 Double tier feeder

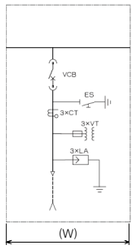
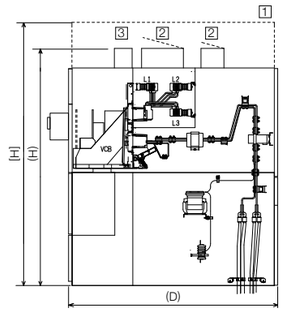


1 Gas screen
2 Roof ventilation with pressure relief flap
3 Roof ventilation

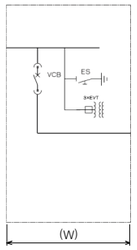
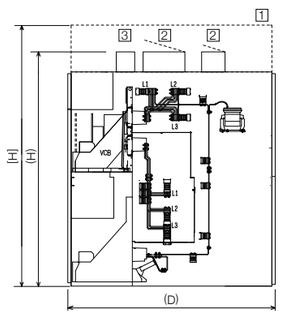
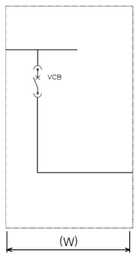
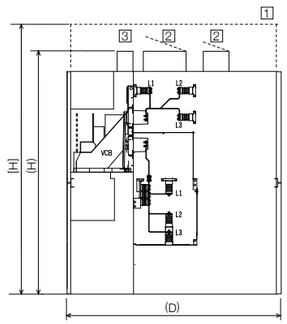
3 Switchgear and Controlgear Arrangement

3.2 Section View and Dimensions

(1) Incomer

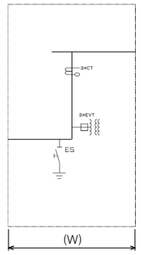
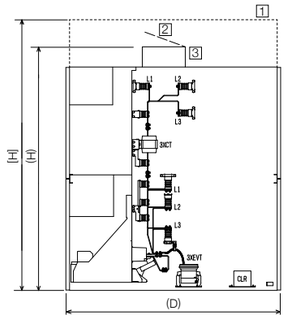
Function (Components)	Section view	Rated current (A)		Dimensions (mm)			Weight (t)
		Main busbar	VCB	Width (W)	Depth (D)	Height (H) • [H]	
• Withdrawable VCB • Earthing switch • Fixed VT		630	630	(900)	(2500)	(2850) [3150]	1.6
		1250	1250				1.7
		2000	2000				1.8
		3150	3150				1.9

(2) Bus Tie

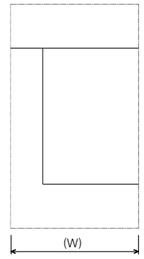
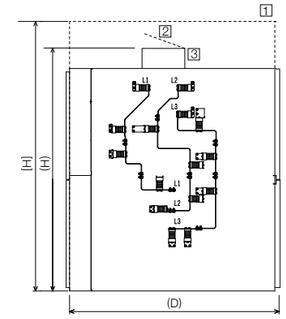
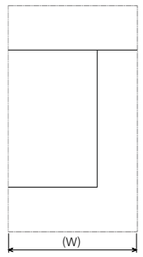
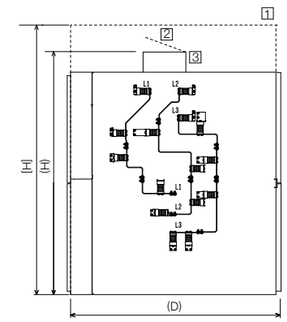
Function (Components)	Section view	Rated current (A)		Dimensions (mm)			Weight (t)
		Main busbar	VCB	Width (W)	Depth (D)	Height (H) • [H]	
• Withdrawable VCB • Earthing switch • Fixed VT		630	630	(900)	(2500)	(2850) [3150]	1.6
		1250	1250				1.7
		2000	2000				1.8
		3150	3150				1.9
• Withdrawable VCB		630	630	(900)	(2500)	(2850) [3150]	1.4
		1250	1250				1.5
		2000	2000				1.6
		3150	3150				1.7

1 Gas screen
2 Roof ventilation with pressure relief flap
3 Roof ventilation

(3) Bus Riser

Function (Components)	Section view	Rated current (A)		Dimensions (mm)			Weight (t)
		Main busbar	VCB	Width (W)	Depth (D)	Height (H) • [H]	
• Earthing switch • Fixed VT		630	630	(900)	(2500)	(2850) [3150]	1.4
		1250	1250				1.5
		2000	2000				1.6
		3150	3150				1.7

(4) Bus Divider

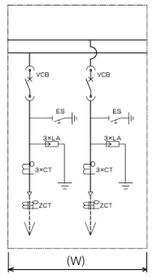
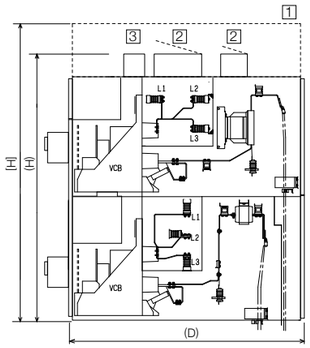
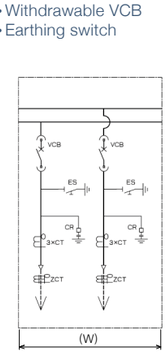
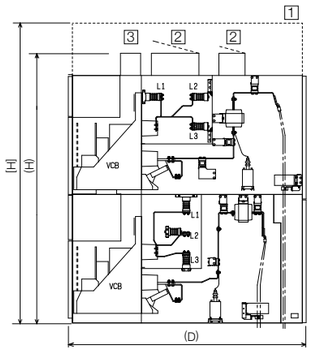
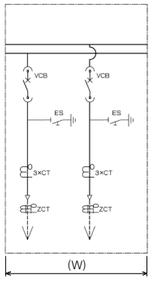
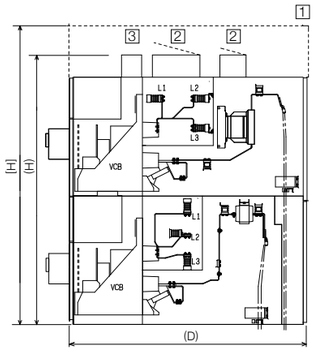
Function (Components)	Section view	Rated current (A)	Dimensions (mm)			Weight (t)
		Main busbar	Width (W)	Depth (D)	Height (H) • [H]	
Device: ---		630	(400)	(2497)	(2850) [3150]	0.6
		1250				0.7
		2000				0.7
		3150				0.7
Device: ---		630	(400)	(2497)	(2850) [3150]	0.6
		1250				0.7
		2000				0.7
		3150				0.7

1 Gas screen
2 Roof ventilation with pressure relief flap
3 Roof ventilation

3 Switchgear and Controlgear Arrangement

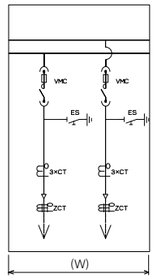
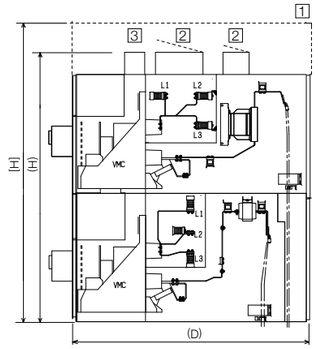
3.2 Section View and Dimensions

(5) Outgoing Feeder

Function (Components)	Section view	Rated current (A) Main busbar	Feeder busbar	VCB	Dimensions (mm) Width (W)	Depth (D)	Height (H) • [H]	Weight (t)
Transformer panel • Withdrawable VCB • Earthing switch		630	630	630	(800)	(2500)	(2850) [3150]	1.5
		1250	1250	1250				1.6
Motor panel • Withdrawable VCB • Earthing switch		630	630	630	(800)	(2500)	(2850) [3150]	1.6
		1250	1250	1250				1.7
Power panel • Withdrawable VCB • Earthing switch		630	630	630	(800)	(2500)	(2850) [3150]	1.5
		1250	1250	1250				1.6

1 Gas screen
2 Roof ventilation with pressure relief flap
3 Roof ventilation

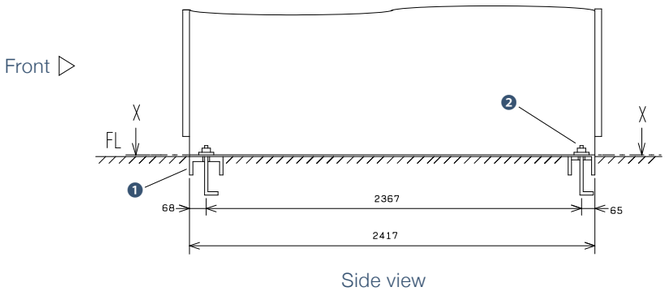
(6) Outgoing Feeder (7.2kV, Controlgear)

Function (Components)	Section view	Rated current (A) Main busbar	Feeder busbar	VMC	Dimensions (mm) Width (W)	Depth (D)	Height (H) • [H]	Weight (t)
Motor panel Power panel Transformer panel • Withdrawable VMC • Earthing switch		630	400	200 400	(800)	(2500)	(2850) [3150]	1.5
		1250	400	200 400				1.6

1 Gas screen
2 Roof ventilation with pressure relief flap
3 Roof ventilation

4 Foundation

■Panel side view

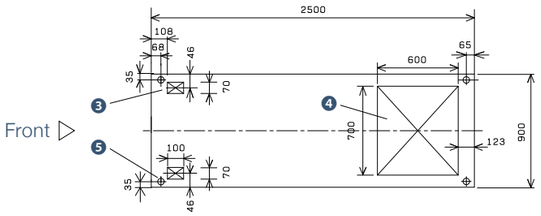


Side view

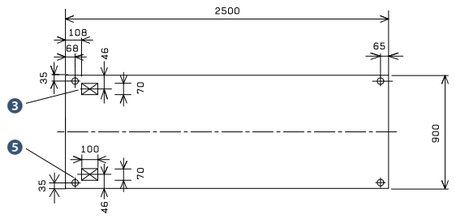
Parts name
1. Channel base
2. Anchor bolt
3. Control cable entrance
4. Power and earth cable entrance
5. Panel mounting hole

■Panel cross-sectional view (X-X)

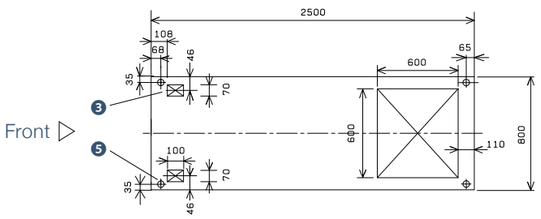
① Incomer panel



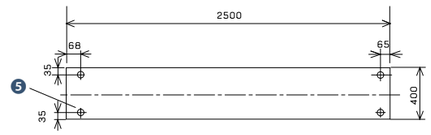
② Bus tie, ③ Bus riser panel



④ Double tier feeder panel



⑤ Bus divider panel



(Notes)
The floor tolerance of electrical room should not exceed 3mm/1000mm.
If it exceeds 3mm/1000mm, install a channel base on the floor.

MEMO

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Safety Precautions

Please read the instruction manual before using the device.

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