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L1 & S1 Panel

Low Voltage Switchboard System

HYUNDAI
HEAVY INDUSTRIES CO.,LTD.

We build a better future!

L1 & S1 Panel

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HYUNDAI's low voltage motor control center H8PU series with a withdrawable unit are of multi-tier, factory assembled and for rated voltage of up to 660 V AC.

rd System

L1 & S1 Panel

General

Standard Specifications

The H8PU low voltage switchgear is in line with VDE 0660, Part 5/11.67 (covering FBAs with rated voltages of up to 1000 V a.c. or 3000 V d.c.) and IEC publication 60439-1-2004.

Its creepage distances and clearances in air meet the requirements of:
a) VDE 0110, class C insulation for 1000 V, 40 to 60 Hz
b) NEMA publication ICS2 - 322 for 600 V system voltage
c) CSA C22.2 No.14 - 1966 for 600 V system voltage
d) UL 508 table 18.2 for 600 V system voltage
e) BS 5486 : Part 1 : 1977 for 600 V system voltage
f) IEC 60439-1-2004, clause 8,2,5

General Information

Rated voltage	660 V, 40 to 60 Hz [1]
Rated operational current	
horizontal (main) busbars	up to 4000 A
vertical dropper bars	650 A, 850 A
Withdrawable units with	
contactor	up to 250 A
contactors for reversing	up to 250 A
contactors for star-delta-starting	up to 240 A
contactors for pole-changing	up to 110 A
load-break switch with HRC-fuses	up to 400 A
withdrawable circuit breaker	up to 4000 A
fixed mounted circuit breaker	up to 4000 A
Short circuit strength	
horizontal (main) busbars	up to 83 kA
vertical dropper bars	up to 65 kA
Degree of protection according to	standard : IP40, IP50
IEC publ. 529.	option : IP41, IP51, IP42, IP54 [2]
Tropicalised paint finish, both inside and outside : Munsell no 7.5 BG 6/1.5, Ral 7032 (option)	
Designed for	Indoor installation, against a wall or freestanding

1) active parts in the supporting structure insulated in accordance with VDE 0110, group C for 1000 V a.c., 40 to 60 Hz
2) with outdoor enclosure, it is possible to provide IP54 degree of protection.

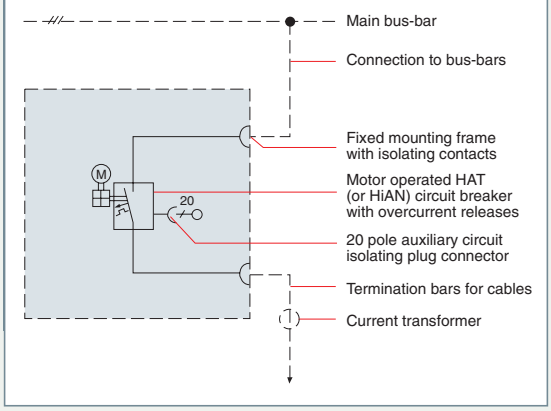
Application

- Incoming supply
- Outgoing feeder
- Bus coupler (bus section switching)
- Bus coupler (double bar system coupling)

Component Range

Withdrawable circuit breakers, HAT 06 to HAT 40 (or HiAN 06 to HiAN 32) hand operated or storage type motor mechanism

Basic circuit diagram of withdrawable circuit breaker

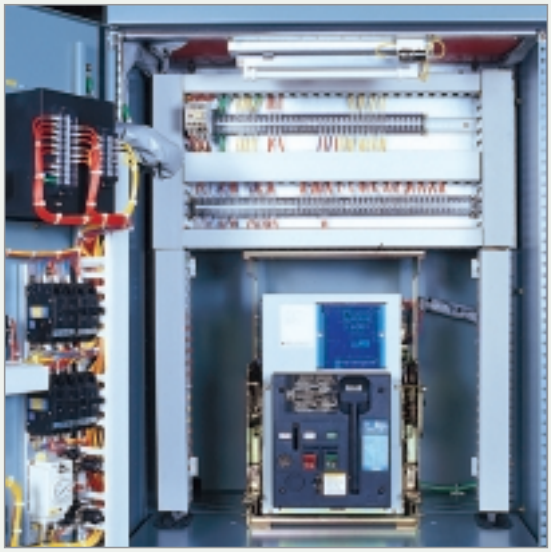


Construction

The 24-module high compartment below the bus-bars can accommodate up to two HAT 06 to 25 (or HiAN 06 to HiAN 25) withdrawable circuit breakers or one withdrawable HAT 32 to 40 (or HiAN 32) breaker.

Each breaker is accommodated in its own compartment with separate door.

The breakers are slid into draw-out cradle fitted with guide rails. An interlocking mechanism prevents breakers from being withdrawn or inserted in the closed state.



HiAN ACB

General

Draw-out Cradle and Withdrawable Circuit Breakers

The draw-out mechanism permits to draw-out and remove the breaker body from the draw-out cradle and to put the breaker body back into the cradle. Breakers with screwed positioning spindle can be moved by turning of the draw-out handle from the connected to the test position.

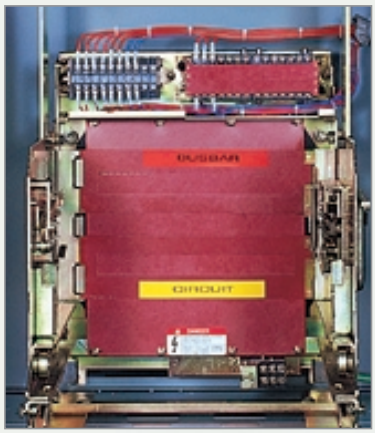
The auxiliary switch assembly mounted on the draw-out cradle works in the CONN. and TEST position.

Automatically actuated shutters in front of upper and lower isolating contacts.

Shutters (Protection against Touch)

The fixed isolating contacts of withdrawable circuit breakers can be blanked off by automatically actuated shutters.
These cover any normally live parts, e.g. connecting bars and fixed contacts, which would be exposed when the breaker has been withdrawn.

The top shutter and bottom shutter are independent. Each shutter can be padlocked in the closed position for safety during inspection and maintenance.
The top shutter and bottom shutter can be opened or closed independently by manual operation.
Maintenance can be done in the open position (The mechanism is released automatically by inserting the breaker).
The control circuit's disconnected contacts have independent shutters for increased safety.



Control circuit safety shutter

Low Voltage
Switchboard System

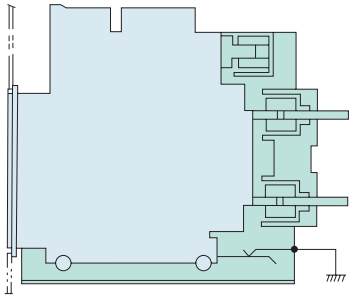
Withdrawable System

Test/Isolated Position

After releasing the interlock, the breaker can be moved from the normal in-service position to the test position, either by hand or by means of a screwed positioning spindle. In this position in which the breaker can be relocked, the power circuits are disconnected but the auxiliary circuits remain made. The breaker can now be tested for correct operation. When the auxiliary circuit isolating plug connector is also withdrawn, the breaker is said to be in the fully isolated position. In both cases, the compartment doors can be closed.

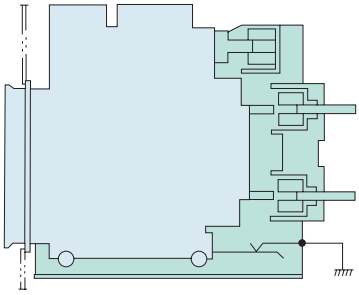
1. CONNECTED Position

Both main and control circuits are connected for normal service.



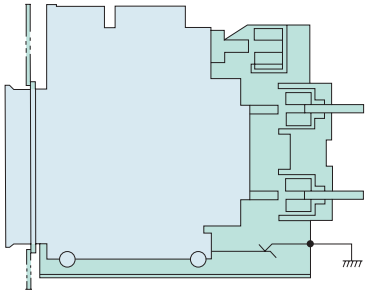
2. TEST Position

The main circuit is isolated and the control circuits are connected. This position permits operation tests with the switchboard panel door closed.



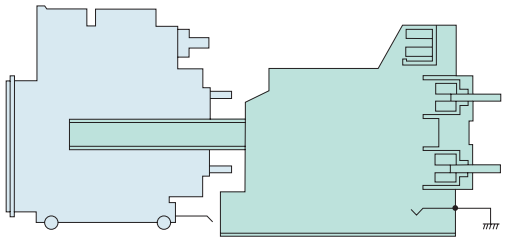
3. ISOLATED Position

Both main and control circuits are isolated. The switchboard panel door can be closed.



4. REMOVED Position

The breaker is completely out of the cradle for removal.



Withdrawable System

Release

Every standard withdrawable circuit breaker is fitted with multi-function protection relay. In addition to three overcurrent protective functions, (long time-delay, short time-delay and instantaneous), a ground fault protective function can be incorporated within one device.

Cable Connections

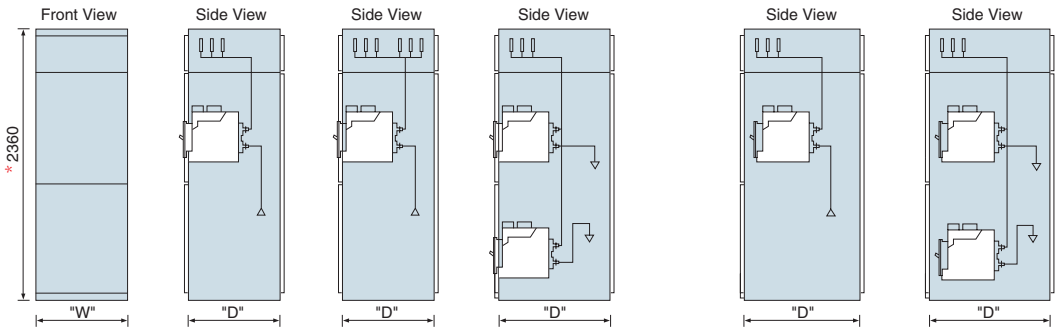
L1-panels are designed for cable entry from bottom. The cables are connected to termination bars at the bottom of the panel, accessible either from the front or the rear, depending upon the panel design. Current transformers can be accommodated on these connecting bars between the breaker and the cable terminations.

Breaker Lifting and Transporting Truck

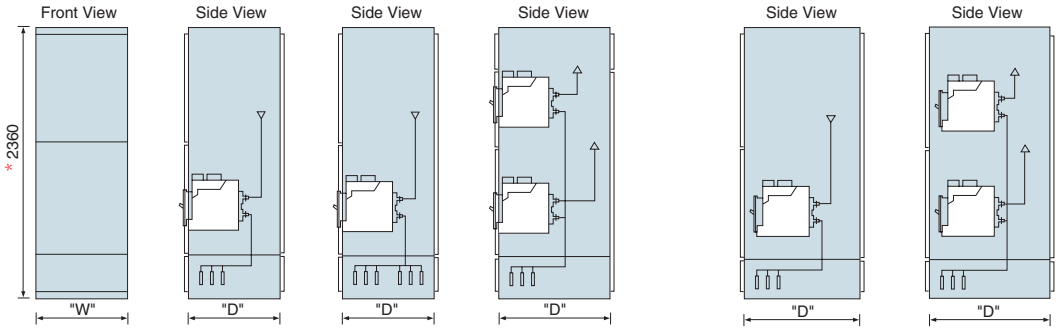
Lifting trucks are available to simplify the handling of breakers when they are withdrawn from their compartment. The platform of the truck can be raised to any breaker mounting level.

Model available - Panel dimensions

Bottom cable entry
Incoming & Feeder ACB Panel (Standard Type)



Top cable entry
Incoming & Feeder ACB Panel (option)



※ * The height with bottom base frame is 2400 mm (Special type).

ACB Frame / Panel depth("D")	HiAN 06~10 HAT 06~10	HiAN 12 HAT 12	HiAN 16 HAT 16	HiAN 20 HAT 20	HiAN 25 HAT 25	HiAN 32 HAT 32	HAT 40	Remark
800	●	●	●	●	-	-	-	1) Cable enterance : bottom 2) ACB (Flush mounted)
1200	●	●	●	●	●	●	●	ACB (Flush mounted)
1600 (1500) * *	●	●	●	●	●	●	●	ACB (Surface mounted)

ACB Frame / Panel wide("W")	HiAN 06~10 HAT 06~10	HiAN 12 HAT 12	HiAN 16 HAT 16	HiAN 20 HAT 20	HiAN 25 HAT 25	HiAN 32 HAT 32	HAT 40	Remark
800	3 ph 3W 3 ph 4W	3 ph 3W 3 ph 4W	3 ph 3W 3 ph 4W	3 ph 3W 3 ph 4W	3 ph 3W	3 ph 3W	-	
1000	-	-	-	-	3 ph 4W	3 ph 4W	3 ph 3W 3 ph 4W	

※ - * * Special type (Order made)
- The 3 tier will be available for HAT 16 and below type.

Busbar data

Main busbars				Control circuit busbars
Rated operating current (A)	Peak withstand current		Cross-section (mm x mm)	Cross-section(mm x mm)
	Normal Standard (kA)	Reinforced (kA)		
800	80	150	2 x (20 x 10)	12 x 4
1000			2 x (25 x 10)	
1200	90	176	2 x (40 x 10)	
1600			2 x (50 x 10)	
1900			2 x (60 x 10)	
2000	120		2 x (80 x 10)	
2500			2 x (100 x 10)	
3100			2 x (120 x 10)	

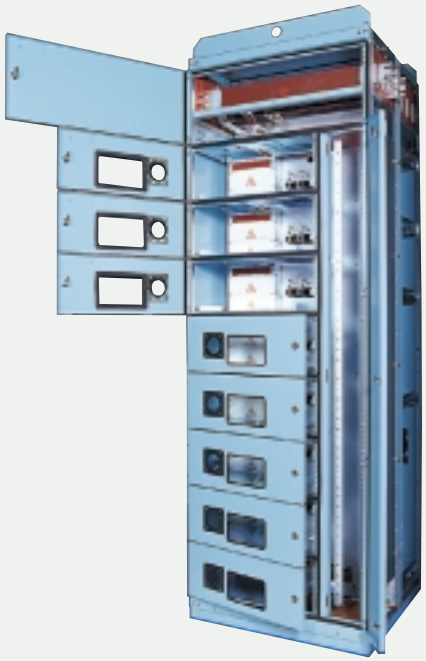
Withdrawable Units

Application

- Motor feeder
- Incoming supply feeder for subdistribution boards

Component Range

- D.O.L. contactor starter (normal start)
- D.O.L. contactor starter (heavy duty start)
- Reversing contactors
- Contactor-type star-delta starter
- Pole-changing starter
- Fused load-break switch / Moulded case circuit breaker

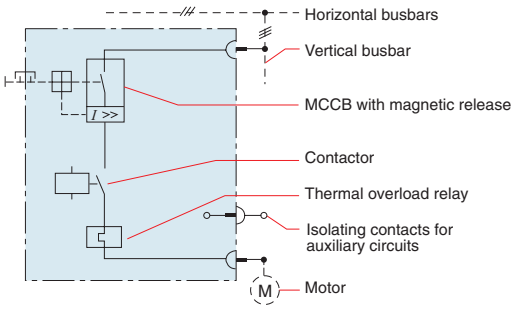


Construction

MCC design concept:

All withdrawable units are designed to satisfy MCC requirements. Main switches (fused load-break switch or moulded case circuit breaker) are used in every starter; they can break 6 to 8 times their rated current and are thus able to disconnect a stalled motor. The switch drive is interlocked with the compartment door so that the latter can only be opened with switch in the OFF position. It is therefore not possible to withdraw a live unit. With the switch in the ON position the compartment door can only be opened by personnel who has been instructed how to defeat the door interlock mechanism. Up to 3 padlocks can be attached to the handle of main switches in the ON and OFF positions: when a padlock is attached it is no longer possible to defeat the door interlock.

Basic circuit of a withdrawable unit with D.O.L. contactor starter



Withdrawable Units

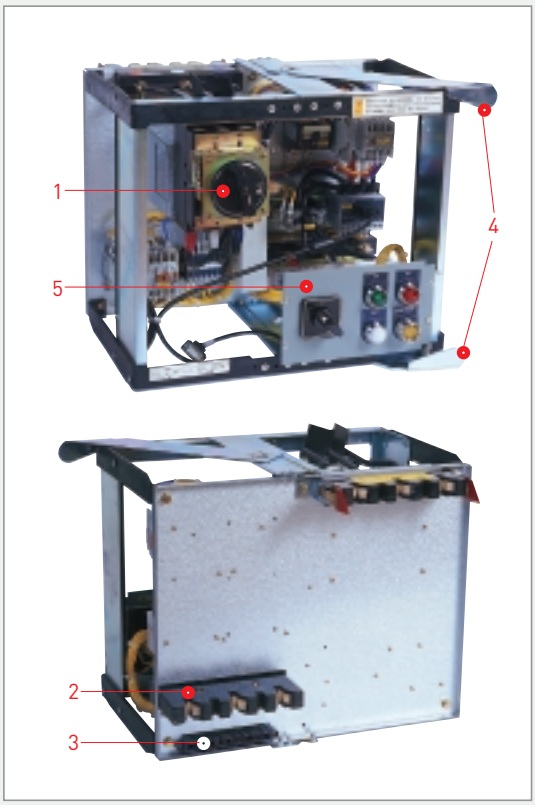
Each withdrawable unit housed in its own self contained compartment. The height of the board within which compartments can be accommodated is 1760 mm/1920 mm. This is divided into 22 height modules or 24 height modules (1 module=80 mm high).

The smallest withdrawable unit is 2 modules high (160 mm) and the largest is 10 modules (800 mm) high. The compartment which comprises the door, the support panel with the unit guides and the isolating contacts for main and control circuits together with the withdrawable unit form a "functional unit."

Chassis sizes

Height in mm	No. of modules	Max. number per panel
160	2	12
240	3	8
320	4	6
400	5	4
480	6	4
560	7	3
640	8	3
720	9	2
800	10	2

1. Each withdrawable unit is provided with its own main switch. This is fitted with three isolating contacts with plug on to the vertical bars of the panel from which the unit's supply is derived.
2. Isolating contacts are also fitted to the withdrawable units for the outgoing load connections.
3. A set of 20 control circuit isolating contacts is provided at the rear of the withdrawable unit; these open automatically when the unit is withdrawn. The terminations for the control leads are of the screwless type.
4. With two swivelling levers, they are easy to operate and are used to push the withdrawable unit fully into the service position.
5. A hinged sub-panel is attached to the withdrawable unit for control devices and instruments. Complete access for maintenance or setting purposes is thus provided to all components with the compartment door open and the subpanel swung out.



Vertical Busbars

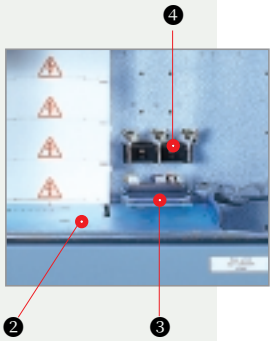
Power is fed to the withdrawable units through the isolating contacts of the main switch which plug on to the vertical bars. "2" sizes of vertical bars are available, rated 650 A, and 850 A respectively. They are housed in an u-shaped duct and are supported every 80 mm thus providing a peak fault current rating of is = 130 kA.
Vertical bar sections : 60 X 6 mm, 60 X 8 mm

Protection against Touching

When the unit is withdrawn a shutter covers the vertical bars. Inadvertent contact with the live bars is thus prevented.

Interchangeability and Modifications

All withdrawable units of the same size are interchangeable irrespective of the equipment which they contain. It is possible to change the size of a compartment of an S1 panel while the board is live; only simple tools are required. Neither cutting nor drilling or welding are required, all necessary holes and openings are already provided. To change the size of a compartment it is only necessary to exchange the compartment door(❶), to move the horizontal support plate with the chassis guides(❷), the fixed part of the 20-pole control circuit isolating contacts(❸) into their new positions, and to screw the fixed part of the load isolating contacts(❹) into already existing holes.



Withdrawable Units

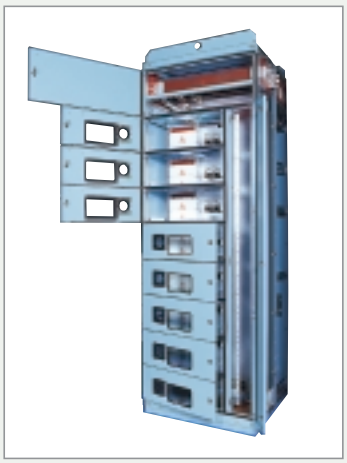
Cable termination

Two types of S1-Panels (400 mm deep) are available for standing against a wall or back-to-back mounting:

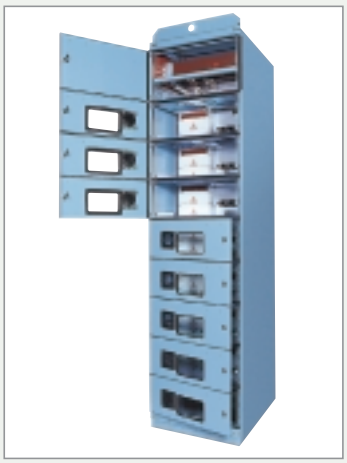
- Narrow panels, 600 mm wide; without separate cable compartment.
- Wide panels, 800 mm wide; with separate cable compartment at the side protected by its own door.

Cables are cleated to support rails on the right side of the compartment.

600 mm deep and 600 mm wide S1 panel is also available for free-standing erection. Their cable compartment is at the rear and is completely isolated from the equipment compartments.



800 mm wide panel with cable compartment at the side

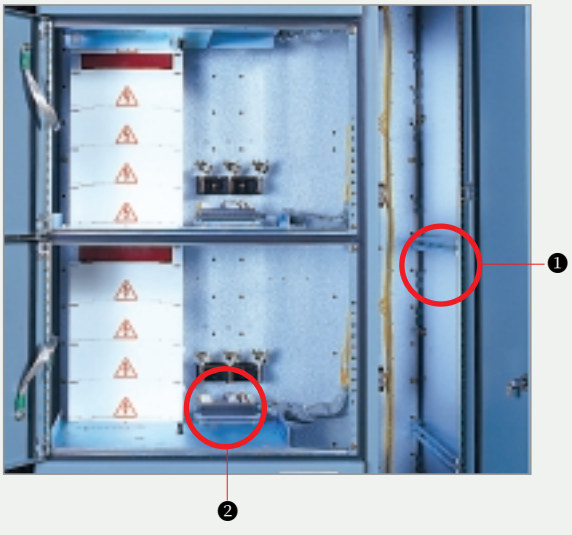


Cable compartment at the rear (Panel 600 mm deep)

Control Supply

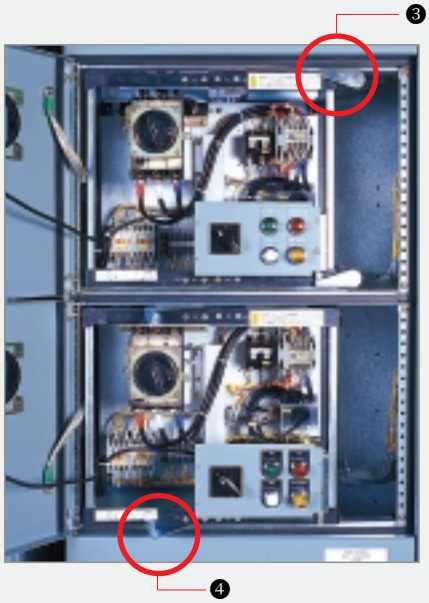
For control supply derived from a common transformer, facilities are provided for the accommodation of up to 5 horizontal and up to 6 vertical control supply busbars. Horizontal control supply bars are housed in a free space below the busbars chamber.

The control supply is fed to the individual withdrawable unit from up to 3 sets of vertical double pole control busbars. They are fitted to the right-hand side of the vertical bar duct(❶) and are connected to contacts in the 20-pole control circuit isolating plug(❷).



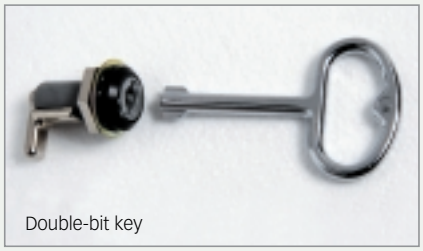
Test Situation and Isolating Position

To test the operation of the equipment of any withdrawable unit it is only necessary to open the main switch. The withdrawable unit remains in its operating position, all control circuit and supply connections remaining made. (Test situation(❸))
By operating the swivel lever of the withdrawable unit into position (❹) the unit will be moved to isolated position. All connections to the withdrawable unit are broken. When the unit is in this position it is not possible to close the compartment door.



Door lock

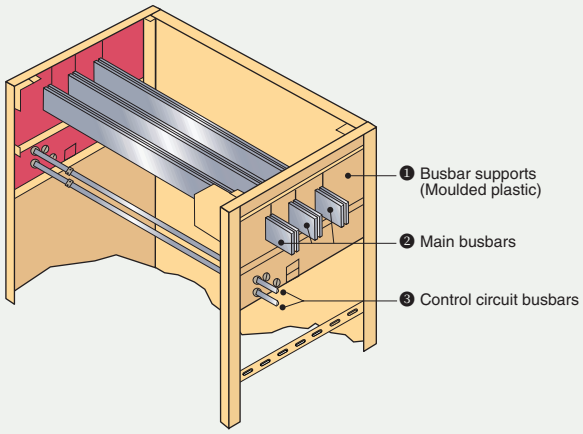
Each door is fitted with one, two or three locks, depending on its height. A standard double-bit key for low voltage cubicles is used.
The special design of lock permits the door to open slightly in the event of a pressure build-up due to arcing but holds it firmly so that the pressure can escape harmlessly.


Double-bit key

Busbars

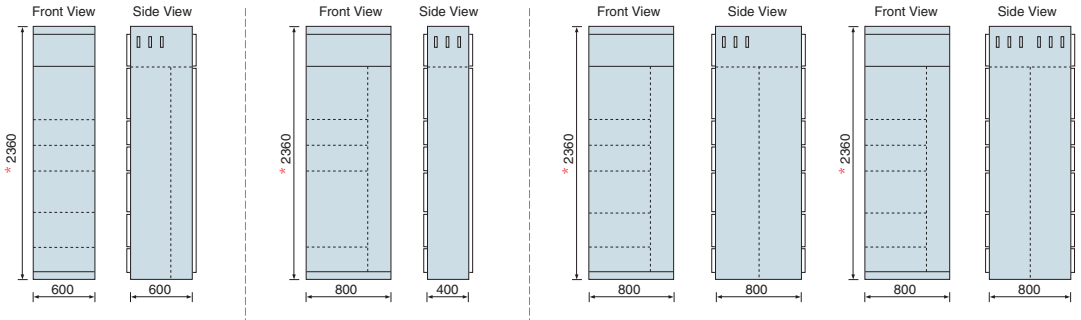
The main busbars, which are made of copper, are installed horizontally in the upper sub-section of the compartment.
Each phase consists of two rectangular-section conductors mounted side by side and on edge. In all the section, the busbars are arranged at the same the section front. This makes it possible to combine sections of level and equidistant from differing depths to form a switchboard with ready aligned busbars and having a continuous front.
The busbars have supports of high quality insulating material, which take the form of arc barriers. This arrangement prevents an arc from travelling from one busbar compartment into the adjacent compartments.

Arrangement of main busbars and control circuit busbars.

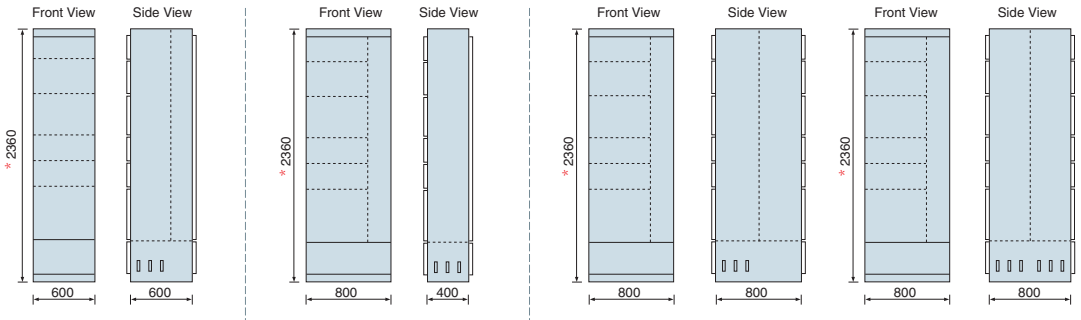


Withdrawable System

Bottom cable entry
MCC Feeder Panel (Standard Type)



Top cable entry
MCC Feeder Panel (option)



* The height with bottom base frame is 2400 mm (special type).

Standing against a narrow panel	Standing against a wide panel	Standing against a wall wide panel
• where space on site is limited	-	-
• front mounting is possible	• front mounting is possible	• back-to-back mounting is possible
• rear cabling access	• front cabling access	• front cabling access
• no separate cable compartment door	• separate cable compartment door at the side	• separate cable compartment door at the side
• re-cabling not possible while board is live	• re-cabling is possible with board live	• re-cabling is possible with board live