

# POWER BAR

MV CAST RESIN BUSBAR SYSTEM



POWERBAR

E+I ENGINEERING GROUP



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# INTRODUCTION

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Powerbar is a patented range of busbar trunking that is utilised within building and industrial applications to deliver power to electrical loads. It is an alternative to traditional cabling and provides numerous advantages to the installer and client including savings on space, time and cost. There are also electrical savings due to reduced losses, reduced voltage drop and flexibility to reposition load centres using tap-off points.



## Powerbar overview

The Powerbar range of products is built with patented design & set processes that make it the most reliable product of its type, providing peace of mind for your installation. This, together with unrivalled product support, means that the Powerbar range of products will provide the optimum solution to your distribution requirements.

Powerbar services the UK and European markets from our manufacturing plant in Donegal, Ireland and the Middle East from our plant in Ras Al Khaimah, U.A.E. We pride ourselves on meeting our client's deadlines and ensuring a quick turnaround on final make-up pieces.

From concept to commissioning we provide complete in-house engineering.

Site surveys

3D - CAD drawings

Project management

Thermal imaging

Our highly skilled teams are experts at providing the client with exactly what they require and are experienced in producing bespoke parts to meet the client's unique demand.

## MVCRB

Powerbar's medium voltage cast resin busbar (MVCRB) systems range is 3.6kV to 24kV, totally encased, non-ventilated, polymer concrete encapsulated copper conductors. The range is available from 1250A to 5000A with multiple bar configurations to suit project requirements, including an external earth bar option.

The conductors are housed in an aluminium casing as standard which also can act as an earth path with an ingress protection of IP66. The copper conductors are protected to IP68. The housing is polyester coated in grey (RAL 7035).

Other colours can be accommodated on request.



# STANDARDS

## MVCRB advantages

- Available according to international standards
- Wide range from 1250A-5000A, 3.6kV-24kV
- Outdoor installation IP68 conductor protection with IP66 aluminium enclosure or optional (stainless steel)
- High short circuit withstand capacity
- Fully insulated with polymer concrete
- Electro erosion resistance
- Electromagnetic compatibility
- Low voltage drop
- Tailor made terminal elements
- High mechanical strength
- Fire, air, moisture, gas and watertight wall bushing
- Compact design
- Chemical resistance
- UV resistance
- Self extinguishing insulation (cast resin)
- Ease of Installation
- Maintenance free

## Standards

The MVCRB range is fully ASTA tested and certified. It is manufactured in a certified management system environment where quality ISO 9001-2008, safety OHSAS 18001-2007 and environmental ISO 14001-2004 standards are applied to all aspects of the manufacturing and installation processes.

It is manufactured in accordance with IEC 62271-200.

## Type test

- Short time current withstand test (6.6)
- Temperature rise test (6.5.6)
- Impulse voltage withstand test (6.2.6.2)
- IP test (5.4.1.3)

## Routine tests

- Verification of dimensions.
- Dimensional check of termination assembly.
- Dry power frequency voltage withstand test
- Insulation resistance test
- Continuity of auxiliary wiring
- Coating thickness measurement
- Polyester coating adhesion test
- Shade matching
- Welding (NDT) test
- Radiography test
- Dye penetration test

## ASTA certificates

Powerbar has completed extensive testing at ASTA accredited laboratories to ensure the product is certified in accordance with international standards.

## Additional test

- Fire resistance
- ATEX (Explosive Atmosphere)
- Fire barrier ISO 830

All certificates available on request



OHSAS 18001:2007  
OHS 533652



ISO 9001:2008  
FM 12680

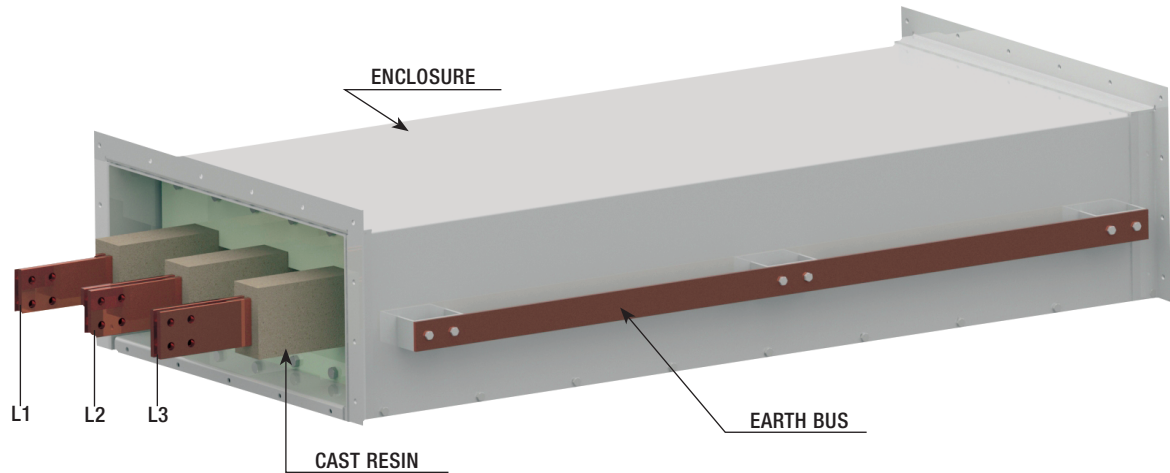


ISO 14001:2004  
No: EMS 566536

# TECHNICAL FEATURES

## Medium voltage cast resin busbar (MVCRB)

Used in power generating stations and Industrial applications for medium capacity generator (up to 60MW) for connections, interconnections between transformer to switchgear and switchgear to switchgear. The MVCRB range is used in hazardous atmospheres, such as oil & gas and mining industries.



### Features of MVCRB

- Fully encapsulated with polymer concrete along the entire conductor with an outer metallic housing.
- Compact design.
- Ease of installation.
- Maintenance free.
- High short circuit withstand.
- Chemical resistance.
- Degree of protection IP66/68.
- Flanged ends from transformers or switchboards are manufactured to suit client requirements.

### Conductor/Insulation system

MVCRB is constructed from high density, high conductivity copper. The conductors are encapsulated with a polymer concrete applied uniformly by our automated casting process. The epoxy cast resin insulation has outstanding heat dissipation characteristics making it ideal for high ambient temperature applications. Epoxy cast resin has excellent dielectric strength, flame retardant and has a high impact resistant level. The copper conductors are electro-plated in either tin or silver at the joints and at the terminations.

#### Compact design:

- Improves heat dissipation.
- Improves short circuit rating.
- Reduces voltage drop/ impedance compared to cable.
- Suitable for hazardous atmospheres.

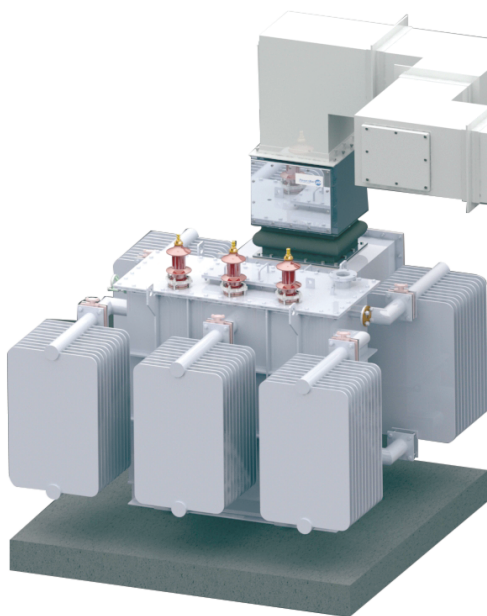


# HOUSING DETAILS

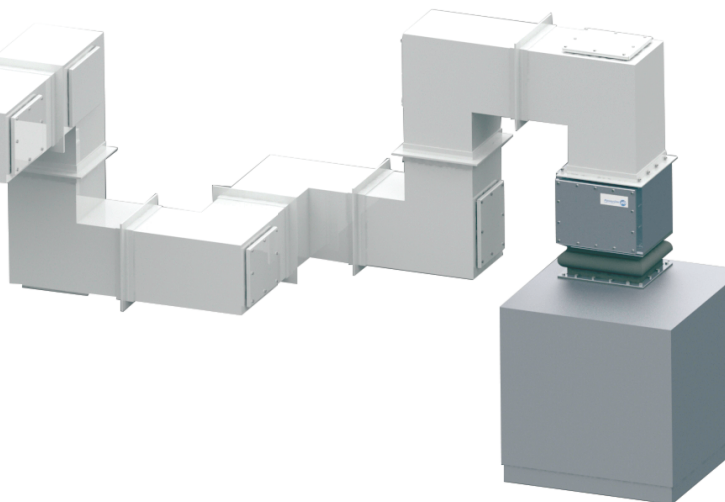
## Housing details

The Powerbar MVCRB range is constructed with an aluminium housing. Aluminium offers numerous advantages.

Aluminium is a very light non-ferrous metal which offers significant reduction in reactance when compared to steel, no hysteresis loss occurs on the distribution system with low temperature rise on housing thus reducing energy losses on the complete distribution system. As aluminium is a good conductor of electricity it also provides an earth path in event of a ground fault on the electrical system. The Aluminium casing also serves as an excellent fully rated ground / earth conductor in the event an earth / ground fault in the system.



**Transformer**



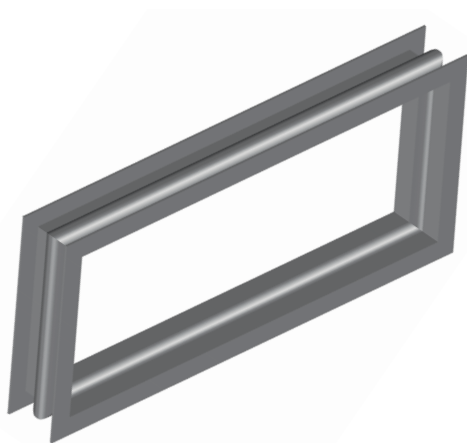
**MV Panel**

- Very light design compared to steel.
- Non-magnetic with low reactance.
- Excellent heat dissipation.
- Non-corrosive.
- Flame retardant.
- High ingress protection IP66.
- Stainless steel housing on request.
- Acts an earth path in the event of a ground fault.

## Rubber bellows for MVCRB

Bellows used to reduce vibration on the terminations and minor adjustment in the length.

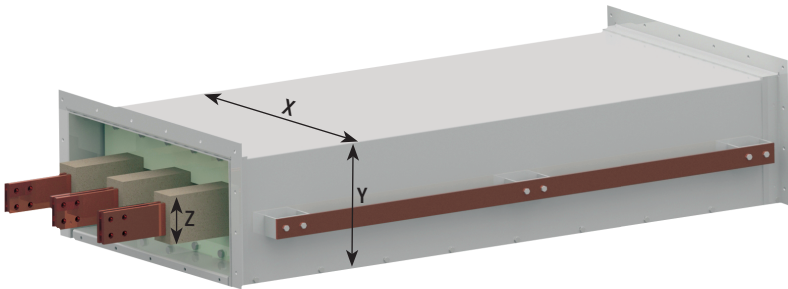
Bellows are manufactured from UV resistant EPDM rubber.



# STRAIGHT LENGTHS

## Straight lengths

Straight lengths account for the bulk of a busbar run. Straight lengths can be supplied at any length between a minimum of 600mm and a maximum of 4000mm. The table below illustrates the size of the enclosure used depending on the rating of busbar required for the application.

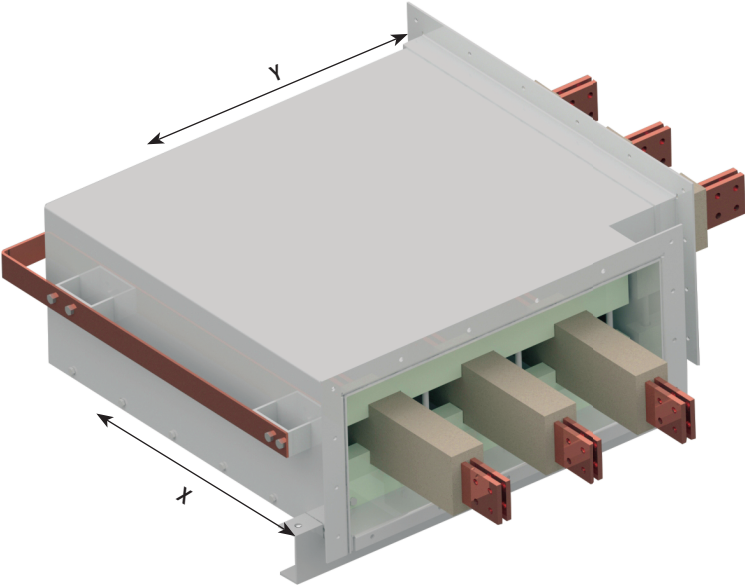


Type	Rating	Voltage	X	Y	Z
MR-C-040-15-01	800A	15kV	600mm	280mm	80mm
MR-C-060-15-01	1250A	15kV	600mm	300mm	100mm
MR-C-080-15-01	1600A	15kV	600mm	320mm	120mm
MR-C-D60-15-02	2000A	15kV	700mm	300mm	100mm
MR-C-D80-15-02	2500A	15kV	700mm	320mm	120mm
MR-C-D120-15-02	3200A	15kV	700mm	360mm	160mm
MR-C-T100-15-03	4000A	15kV	850mm	340mm	140mm
MR-C-T120-15-03	5000A	15kV	850mm	360mm	160mm

Type	Rating	Voltage	X	Y	Z
MR-C-040-24-01	800A	24kV	1200mm	560mm	140mm
MR-C-060-24-01	1250A	24kV	1200mm	560mm	160mm
MR-C-080-24-01	1600A	24kV	1200mm	560mm	180mm
MR-C-D60-24-02	2000A	24 kV	1300mm	560mm	160mm
MR-C-D80-24-02	2500A	24 kV	1300mm	580mm	180mm
MR-C-D120-24-02	3200A	24 kV	1300mm	600mm	220mm
MR-C-T100-24-03	4000A	24 kV	1450mm	600mm	200mm

**Note:** The above maximum and minimum sizes are a guideline to help you to select the correct product. Additional sizes are available on request. Dimensions shown are taken from the center point of the joint.

# EDGEWISE ELBOWS

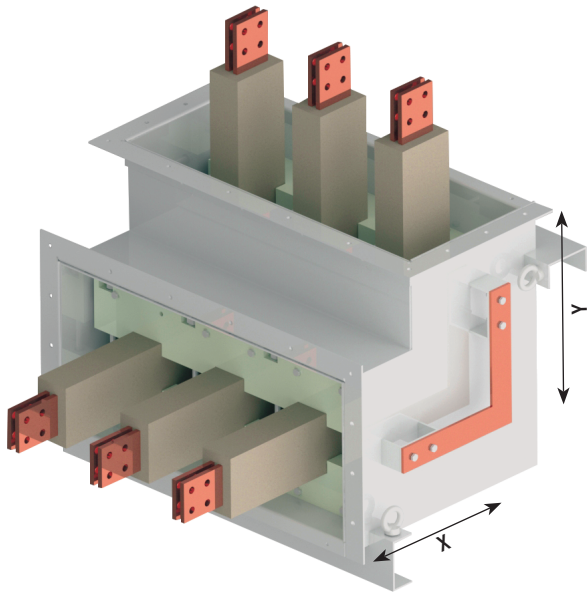


**Edgewise elbows**  
Typically used to make 90° changes in the direction of the busbar system. There are two main kinds, edgewise right and edgewise left. These can be used to turn the busbar route up or down if it is running on its flat, or to turn the busbar left and right if it is running on its edge.

Edgewise Elbow for 15kV	Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
		X	Y	X	Y	X	Y
	800A	450mm	450mm	500mm	500mm	600mm	600mm
	1250A	450mm	450mm	500mm	500mm	600mm	600mm
	1600A	450mm	450mm	500mm	500mm	600mm	600mm
	2000A	500mm	500mm	550mm	550mm	650mm	650mm
	2500A	500mm	500mm	550mm	550mm	650mm	650mm
	3200A	500mm	500mm	550mm	550mm	650mm	650mm
	4000A	650mm	650mm	700mm	700mm	800mm	800mm
	5000A	650mm	650mm	700mm	700mm	800mm	800mm

Edgewise Elbow for 24kV	Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
		X	Y	X	Y	X	Y
	800A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	1250A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	1600A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	2000A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	2500A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	3200A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	4000A	1300mm	1300mm	1350mm	1350mm	1450mm	1450mm

# FLATWISE ELBOWS

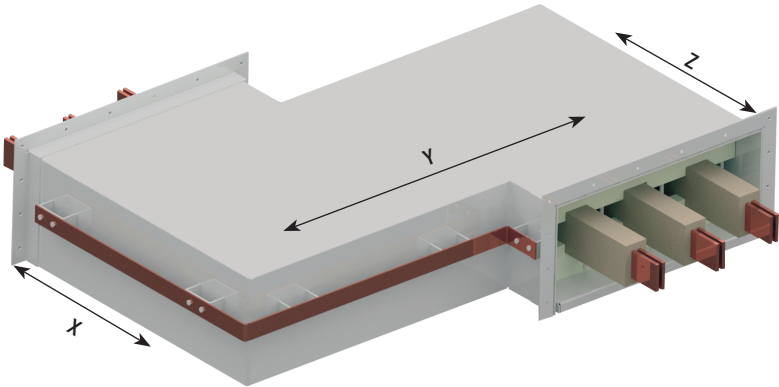


**Flatwise elbows**  
Typically used to make 90° changes in the direction of the busbar system. There are two main kinds, flatwise up and flatwise down. These can be used to turn the busbar route up or down if it is running on its edge, or to turn the busbar left and right if it is running on its flat.

Flatwise Elbow for 15kV	Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
		X	Y	X	Y	X	Y
	800A	450mm	450mm	500mm	500mm	600mm	600mm
	1250A	450mm	450mm	500mm	500mm	600mm	600mm
	1600A	450mm	450mm	500mm	500mm	600mm	600mm
	2000A	500mm	500mm	550mm	550mm	650mm	650mm
	2500A	500mm	500mm	550mm	550mm	650mm	650mm
	3200A	500mm	500mm	550mm	550mm	650mm	650mm
	4000A	650mm	650mm	700mm	700mm	800mm	800mm
	5000A	650mm	650mm	700mm	700mm	800mm	800mm

Flatwise Elbow for 24kV	Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
		X	Y	X	Y	X	Y
	800A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	1250A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	1600A	1050mm	1050mm	1100mm	1100mm	1200mm	1200mm
	2000A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	2500A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	3200A	1150mm	1150mm	1200mm	1200mm	1300mm	1300mm
	4000A	1300mm	1300mm	1350mm	1350mm	1450mm	1450mm

# OFFSET SECTIONS



### Offset sections

An offset is used to avoid obstacles such as pipes or steel columns and to conform to the structure of the building. It consists of a double elbow arrangement fabricated into one single piece.

There are four types of offset section:

- Flatwise offset up.
- Flatwise offset down.
- Edgewise offset left.
- Edgewise offset right.

Offsets for 15kV	Ratings (Amps)	Minimum Leg Size		
		X	Y	Z
	800A	750mm	750mm	750mm
	1250A	750mm	750mm	750mm
	1600A	750mm	750mm	750mm
	2000A	900mm	900mm	900mm
	2500A	900mm	900mm	900mm
	3200A	900mm	900mm	900mm
	4000A	1000mm	1000mm	1000mm
	5000A	1000mm	1000mm	1000mm

Offsets for 24kV	Ratings (Amps)	Minimum Leg Size		
		X	Y	Z
	800A	1400mm	1400mm	1400mm
	1250A	1400mm	1400mm	1400mm
	1600A	1400mm	1400mm	1400mm
	2000A	1500mm	1500mm	1500mm
	2500A	1500mm	1500mm	1500mm
	3200A	1500mm	1500mm	1500mm
	4000A	1700mm	1700mm	1700mm

# COMBINATION

## Combination possibilities

Combination elbows are used to conform to the buildings structure and to utilise a small amount of space to change direction by combining both flatwise and edgewise elbows.

- Elbow + offset up
- Elbow + offset down
- Elbow + offset right
- Elbow + offset left

Offsets for 15kV	Ratings (Amps)	Minimum Leg Size		
		X	Y	Z
	800A	500mm	750mm	500mm
	1250A	500mm	750mm	500mm
	1600A	500mm	750mm	500mm
	2000A	800mm	850mm	800mm
	2500A	800mm	850mm	800mm
	3200A	800mm	850mm	800mm
	4000A	950mm	1000mm	950mm
	5000A	950mm	1000mm	950mm

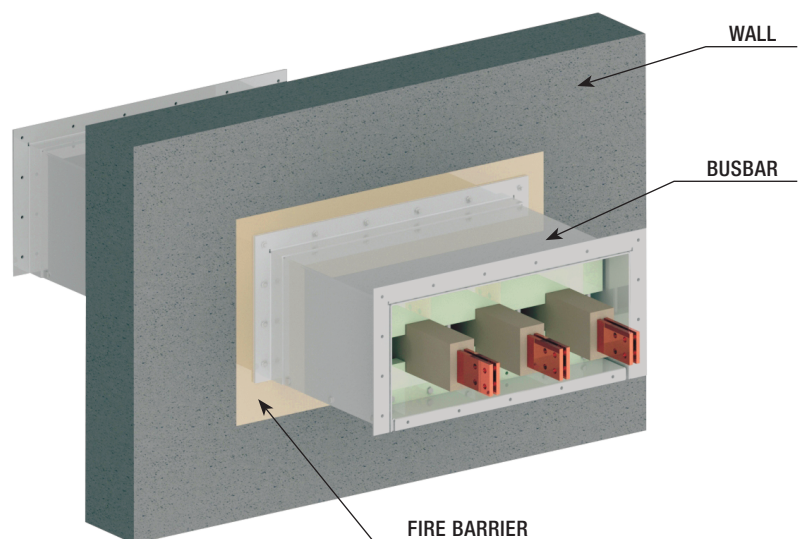
Offsets for 24kV	Ratings (Amps)	Minimum Leg Size		
		X	Y	Z
	800A	1100mm	1400mm	1100mm
	1250A	1100mm	1400mm	1100mm
	1600A	1100mm	1400mm	1100mm
	2000A	1500mm	1800mm	1500mm
	2500A	1500mm	1800mm	1500mm
	3200A	1500mm	1800mm	1500mm
	4000A	1600mm	1800mm	1600mm

## WALL CROSSING

### Wall flange

Wall flange is provided when the busbar passes through a wall or floor. The flange consists of a fire proof barrier to prevent the passage of fire or vapour from passing from one location to another.

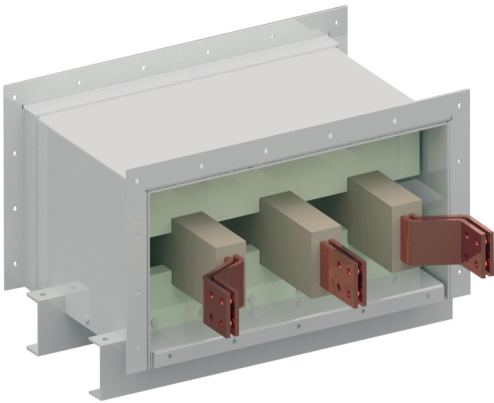
Cast resin is used for encapsulation, due to its flame retardant nature, it fulfils the requirement of ISO 830.



**Wall Crossing**



# FLANGES AND ADAPTER BOX



Flange



Adapter box with copper flexible

### Flange connections with adapter box

Flange connections provide a direct connection to switchgear, transformer enclosures and other electrical equipment by use of custom flanges. The flexible conductor and enclosure between flange busbar and termination end is the adaptor box. The adaptor box has an ingress protection of IP66.

Cut out details, dimensions and drilling plans are provided with the customer drawings and it is the responsibility of the switchgear manufacturer or transformer manufacturer to provide the opening, drill fixing holes, connecting hardware and busbar risers in their equipment to match the adaptor box connections to other termination.

Switchgear/transformer can be provided through our partners E&I Engineering.

For proper coordination between the busbar system and other equipment, detailed drawings, including switchgear phase rotation, should be provided. Standard flanges can be offset to the left or right of the section as required.

Flange 15kV	Rating	Minimum	Maximum
	800A	500mm	1000mm
	1250A	500mm	1000mm
	1600A	500mm	1000mm
	2000A	500mm	1000mm
	2500A	600mm	1100mm
	3200A	600mm	1100mm
	4000A	700mm	1500mm
	5000A	700mm	1500mm

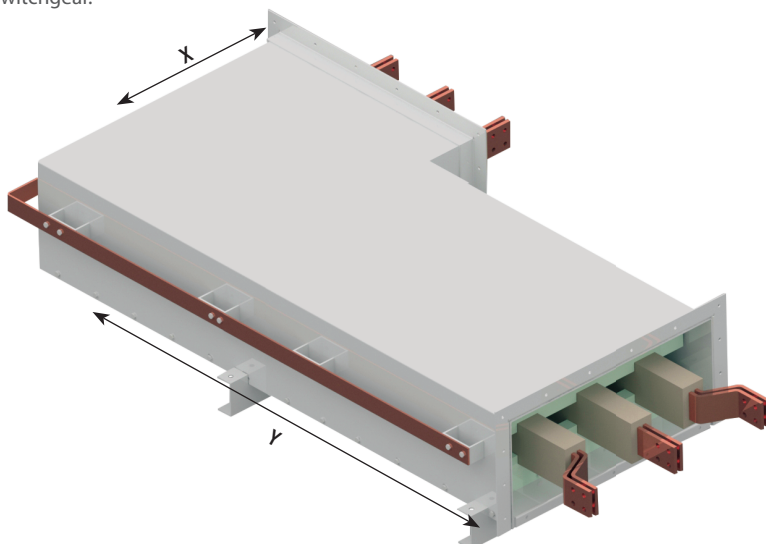
Flange 24kV	Rating	Minimum	Maximum
	800A	1000mm	1500mm
	1250A	1000mm	1500mm
	1600A	1000mm	1500mm
	2000A	1000mm	1500mm
	2500A	1100mm	1600mm
	3200A	1100mm	1600mm
	4000A	1250mm	2000mm

# COMBINATION FLANGES

## Combination flanges

Combination flanges are tailor made items, made as per the project requirement. A flange combination elbow is a combination of a standard elbow and a standard flange. Flange combination elbows are typically used when the minimum leg lengths for either the standard elbow or the standard flange cannot be maintained.

A typical example would be when the busbar is positioned directly above the switchboard, avoiding other services or when there is reduced head room above the switchgear.



Following possibilities are available.

- Flatwise left/flange
- Flatwise right/flange
- Edgewise up/flange
- Edgewise down/flange

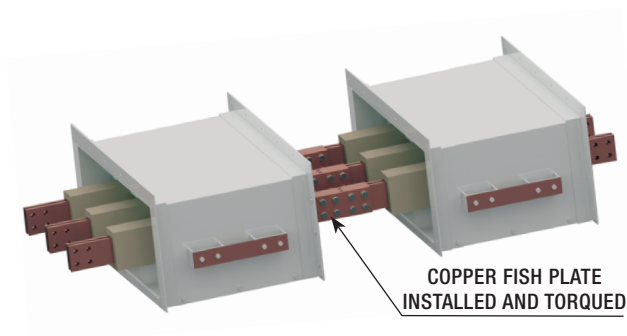
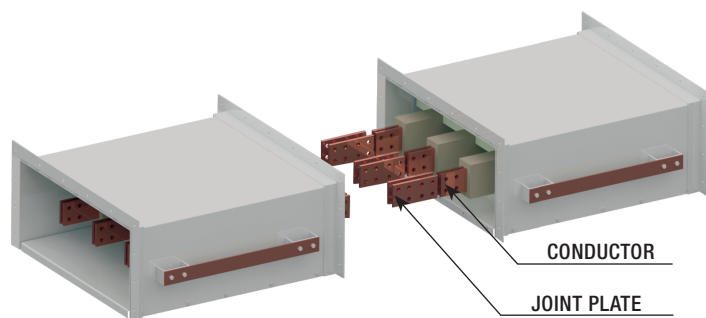
Flange 15kV	Rating	Minimum Leg Size		Maximum Leg Size	
		X	Y	X	Y
	800A	500mm	750mm	1000mm	1500mm
	1250A	500mm	750mm	1000mm	1500mm
	1600A	500mm	750mm	1000mm	1500mm
	2000A	500mm	850mm	1000mm	1700mm
	2500A	500mm	850mm	1000mm	1700mm
	3200A	500mm	850mm	1500mm	1700mm
	4000A	650mm	950mm	1500mm	2000mm
	5000A	650mm	950mm	1500mm	2000mm

Flange 24kV	Rating	Minimum Leg Size		Maximum Leg Size	
		X	Y	X	Y
	800A	1200mm	1500mm	1800mm	2000mm
	1250A	1200mm	1500mm	1800mm	2000mm
	1600A	1200mm	1500mm	1800mm	2000mm
	2000A	1000mm	1700mm	1800mm	2200mm
	2500A	1000mm	1700mm	1800mm	2200mm
	3200A	1000mm	1700mm	2000mm	2200mm
	4000A	1200mm	1800mm	2000mm	2500mm

# STRAIGHT JOINT ASSEMBLY

## Straight joint assembly method

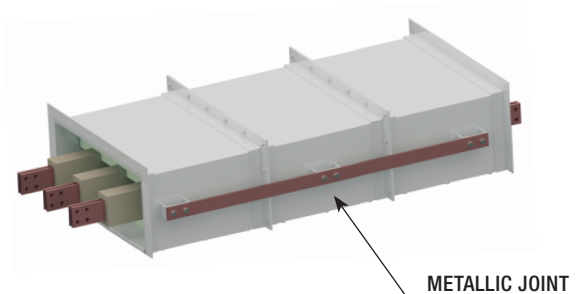
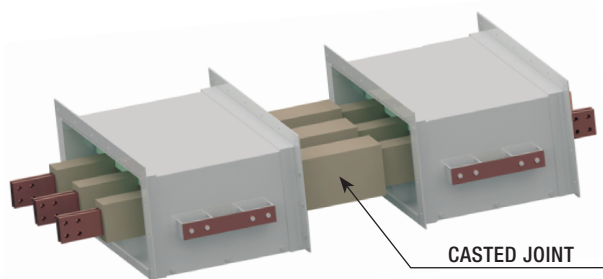
- The onsite installation requires, jointing of two separate sections by the tools and equipment provided. After copper joint plates have been installed and torqued the complete joint assembly is cast in polymer concrete under vacuum to remove any air that may be trapped during casting of the joint assembly.
- After casting the joint it is covered with aluminium enclosure, provided to maintain the IP rating.



## Connecting busbar units

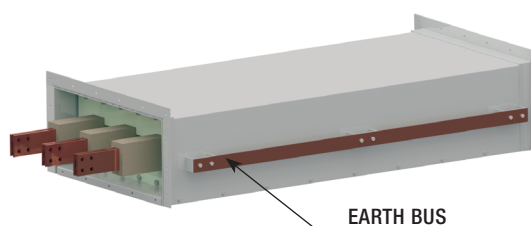
The connection of busbar is made in five parts

- Electrical joining with copper joint plates and torquing.
- After mechanically and electrically checking the joint assembly place the casting mould around the joint.
- Under vacuum cast the joint with polymer concrete.
- Allow it to cure over a 24 hour period and remove the mould.
- Install the outer IP66 cover to maintain the enclosure ingress protection level.

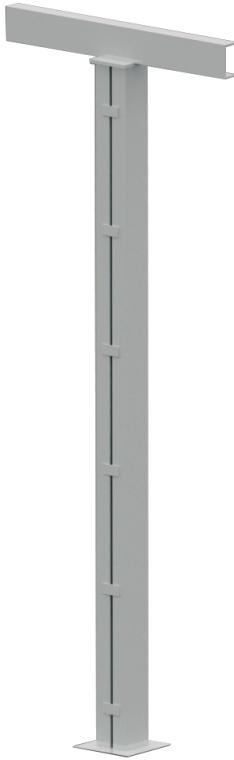


## Earth system

The system is provided with an individual copper external earth busbar, bolted to the enclosure. This provides an earth path for return of fault current. It is provided throughout the length of busbar. Facility to connect the earth bus to the substation earth is provided at both the ends.



## SUPPORT STRUCTURE



### **Type A – Single column support**

Standard single column supports from 1 m up to 3 m high are available. Other non-standard support lengths can be designed to meet the need of a particular application.



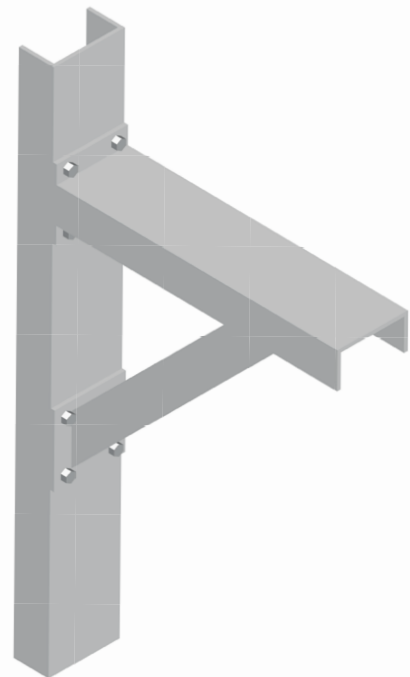
### **Type B – Double column support**

Standard double column supports from 2 m up to 5 m high are available. Other non-standard support lengths can be designed to meet the need of a particular application.



### **Type C – Hanger support**

Hanger supports are available for indoor support applications or to support bus from existing outdoor framed structures.



### **Type D – Knee brace support**

This type of support can be used where the busbar runs along or near a wall and where space below the busbar run is restricted.

# TECHNICAL DATA FOR MVCRB

RATED MAXIMUM VOLTAGE	RATED FREQUENCY IN Hz	1 MINUTE DRY POWER FREQUENCY WITHSTAND VOLTAGE CAPACITY	IMPULSE VOLTAGE WITHSTAND CAPACITY	RATED CONTINUOUS CURRENT IN AMPERE	SHORT CIRCUIT CAPACITY 3 Sec. (RMS SYMMETRICAL)	PEAK VALUE
12kV	50Hz/60Hz	28kV	75kV	1250A	50kA for 3 Sec	130kA peak
12kV	50Hz/60Hz	28kV	75kV	1600A	50kA for 3 Sec.	130kA peak
12kV	50Hz/60Hz	28kV	75kV	2000A	50kA for 3 Sec.	130kA peak
12kV	50Hz/60Hz	28kV	75kV	2500A	50kA for 3 Sec.	130kA peak
12kV	50Hz/60Hz	28kV	75kV	3200A	50kA for 3 Sec.	130kA peak
12kV	50Hz/60Hz	28kV	75kV	4000A	50kA for 3 Sec.	130kA peak
12kV	50Hz/60Hz	28kV	75kV	5000A	50kA for 3 Sec.	130kA peak
15kV	50Hz/60Hz	36kV	95kV	800A	50kA for 3 Sec.	130kA peak
15kV	50Hz/60Hz	36kV	95kV	1250A	50kA for 3 Sec.	130kA peak
15kV	50Hz/60Hz	36kV	95kV	1600A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	1250A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	1600A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	2000A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	2500A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	3200A	50kA for 3 Sec.	130kA peak
24kV	50Hz/60Hz	50kV	125kV	4000A	50kA for 3 Sec.	130kA peak

Rated Current	800A	1250A	1600A	2000A	2500A	3200A	4000A	5000A
Bus bar Size mm	40X10	60X10	80X10	2X60X10	2X80X10	2X120X10	3X100X10	3X120X10
C/S Area Sq. mm.	400	600	800	1200	1600	2400	3000	3600
Rdc 20°C μΩ/M	43.70	29.20	22.00	15.40	10.92	7.39	5.92	4.98
Rac OT μΩ/M	57.75	40.00	30.70	21.70	16.55	11.10	9.05	7.80
X μΩ/M	135.60	125.23	114.40	103.60	93.30	87.60	82.90	81.62
Z μΩ/M	144.60	136.64	118.40	105.85	94.80	88.30	83.16	81.97
<b>Voltage Drop at Full Load 50Hz</b>								
PF = 0.7 (V/m) at 80° C	0.1902	0.2542	0.2859	0.3089	0.3386	0.3897	0.4540	0.5520
<b>PF = 0.8 (V/m) at 80° C</b>	0.1767	0.2320	0.2583	0.2755	0.2997	0.3405	0.3948	0.4781
PF = 0.9 (V/m) at 80° C	0.1539	0.1961	0.2148	0.2241	0.2406	0.2671	0.3068	0.3690
PF = 1.0 (V/m) at 80° C	0.0800	0.0866	0.0851	0.0752	0.0717	0.0615	0.0627	0.0675
<b>Voltage Drop at Full Load 60Hz</b>								
PF = 0.7 (V/m) at 80° C	0.2170	0.2929	0.3312	0.3601	0.3963	0.4591	0.5360	0.6529
PF = 0.8 (V/m) at 80° C	0.1993	0.2645	0.2963	0.3185	0.3482	0.3988	0.4637	0.5630
PF = 0.9 (V/m) at 80° C	0.1703	0.2198	0.2424	0.2554	0.2759	0.3094	0.3569	0.4306
PF = 1.0 (V/m) at 80° C	0.0800	0.0866	0.0851	0.0752	0.0717	0.0615	0.0627	0.0675

## OTHER BROCHURES

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**Product Overview**



**HPB Copper**



**HPB Aluminium**



**HPB IEC Copper**



**HPB ADDC Copper**



**MPB Busbar System**



**Cast Resin Bar**



**Tap Off Units**



**MVSPB/NSPB**



**MVCRB**



**MV Catalogue**

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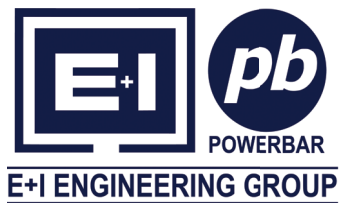
From our partners at **E&I Engineering**



**Switchgear**

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