

**MESDUOT**  
the busbar specialist

**PowerBar**  
quality busbar systems



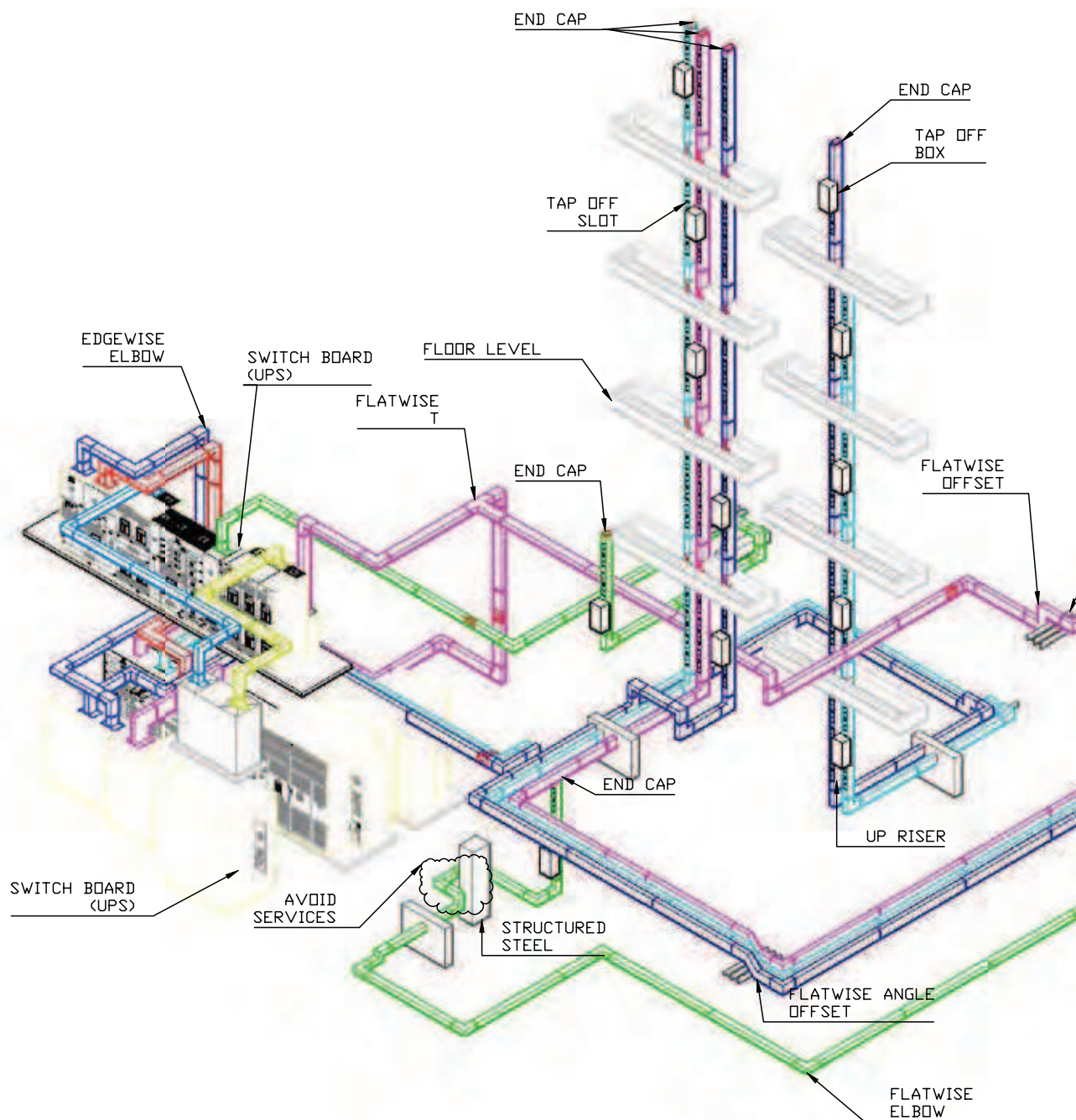
## High Powerbar Busbar Range

1000A - 6300A

*High Power Distribution Made Easy*

**MES**

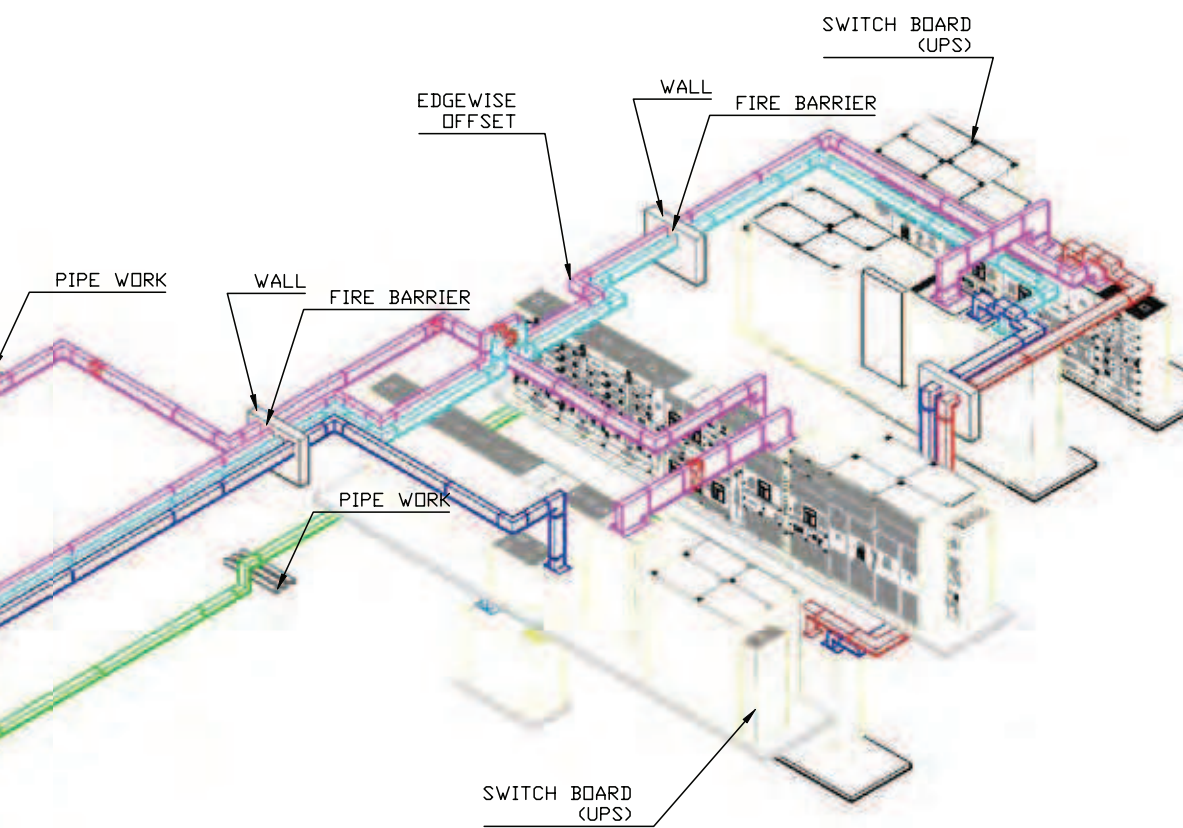
engineered solutions by AKO



## Powerbar Services

- » Complete co-ordination of Busbar project requirements – technical submittal.
- » Site measures & Busbar survey.
- » Autocad Co-ordinated drawings produced.
- » Volt-Drop & Temp raise calculations.
- » Delivery from approval 12-14 weeks.
- » Site training & Busbar installation.
- » Special make up pieces in 2 weeks.
- » Site testing & training.
- » Thermal imaging surveys

# TYPICAL INSTALLATION



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### Busbar Trunking Introduction

Busbar trunking has been around for a long time at least half a century but, in its early days, it was no more than a set of busbars mounted on ordinary supports in what was, in effect, an elongated busbar chamber. Even then, it was a useful alternative to cable, particularly for high current applications where the relatively unsophisticated insulating materials of the era meant that the cables would be bulky, difficult to handle, and susceptible to damage if used in adverse environmental conditions. In truth, however, those early incarnations of busbar trunking offered only a few of the benefits provided by today's products.

The easiest way to understand these benefits is to start by looking at the limitations of cable. It's worth noting that, because cable is so familiar, it's easy to be blind to many of these. First and foremost, cable-based installations are inflexible. Changes can be made, but even a job as simple as relocating a few lighting fittings to accommodate alterations in an office layout is inconvenient and costly.



Typical Riser Installation

Major changes and extensions to existing installations can be very disruptive, particularly as the electrical supply to large parts of the system will almost certainly have to be turned off while the work is being carried out. These considerations are increasingly important, as the dynamic nature of business today leads to the need for frequent premises restructuring.

Another negative aspect of traditional building distribution systems that often passes unnoticed is that they are time consuming to install. First the cable trays, conduit or trunking have to be fixed in place, followed by the cable itself. Every single connection has to be made by hand. The time needed for these processes quickly adds up, and often has a significant impact on the cost of a building project, as well as the time to completion. Once again, these are important concerns for modern businesses where both time and money are scarce resources.

Though many other limitations could be easily identified for cable it is, perhaps, now more profitable to turn to the positive benefits provided by modern busbar trunking.

Essentially, like its earliest predecessors, this usually comprises of insulated solid copper or aluminium busbars encased in steel. The key difference is that modern systems have been designed from the outset for installation applications, rather than being simply adaptations of switchboard busbar assembly.

One of the most important benefits of busbar trunking, however, is the way in which connections are made to it. At regular intervals along its length, the trunking has provision for fitting tap-off units. These are devices that plug into the trunking, and provide terminals for the connection of power outlets, luminaries or other electrical loads.

On the face of it, that doesn't sound too exciting, but the key feature is that tap-offs can be removed, added and repositioned as necessary. That makes the restructuring of electrical services simple and inexpensive, providing the level of flexibility which modern businesses rightly expect.

Indeed, there's a further bonus; with most busbar trunking systems, tap-offs can be removed and fitted without turning off the electrical supply. This means electrical equipment that is not directly affected by modifications can continue to be used while the changes are in progress.

Busbar trunking also facilitates the implementation of decentralised electrical distribution systems. Cabled installations are almost always designed around a central distribution panel, which contains all of the circuit breakers and other protective devices. Typically, several circuits will be fed from a single protective device, which means that, if a fault occurs on one of these circuits, power will be lost to all of them.



6300A Package Sub Station

With a decentralised installation using busbar trunking, the protection is combined within the tap-off units, and is, therefore, close to the equipment it is supplying. This makes it easy for each piece of equipment to have its own protective device, which greatly reduces the impact of faults. A further benefit is that local protective devices simplify fault finding and maintenance.

### Why Busbar Over Cable?

Powerbar Ltd have devoted considerable effort to answering that question, and have found that two reasons are usually given. The first is cost, the second is that it is generally believed to be more difficult to design an installation with trunking than with cable. Let's look at these points. It is certainly true that, as far as the basic materials are concerned, busbar trunking is likely to cost more than cable. But this is far from being a complete analysis of the situation.

As we have seen, trunking is much quicker to install than cable. The resulting savings in labour costs are almost always enough to tip the balance in favour of trunking. For example, a detailed comparison recently carried out which compared busbar trunking and conventional cable in a simple lighting installation showed that overall costs were reduced by almost 30%.

Even this, however, isn't the end of the story. For building owners, earlier completion of electrical work potentially means that they can occupy or rent out the building sooner, which translates into further financial benefits. For contractors, faster installation means that staff are freed up to move on to the next revenue-generating project. Moreover, these are only the initial cost benefits which can be expected when installing a system. When lifetime costs are considered, the financial outlook becomes even more attractive.

Aluminium-cased busbar trunking is far less susceptible to damage than cable in cable trays. So it would be valid to argue that maintenance costs are reduced, along with the risk of damage caused by electrical faults. The really big savings accrue, however, when modifications and extensions are needed to the installation. Again, as we've already seen, with busbar trunking these are quick and straightforward, whereas with cable they're disruptive and costly.

Now let's turn to technical considerations. For every electrical contractor designing cable-based installations is a very familiar process and it is, therefore, seen as quick and easy. In fact, the process of selecting and sizing busbar trunking is even quicker and easier, but for first-time users, it is, of course, less familiar.

The basic design criteria for busbar trunking are exactly the same as those for cable. Namely, the current rating (I<sub>th</sub>) of the trunking must be greater than that of the protective device which, in turn, must be greater than the maximum load current. When it comes to the more detailed aspects of design, however, busbar trunking begins to score over cable. One important benefit is that the current rating of

busbar trunking is far less affected by grouping factors and ambient temperature than that of cable. In fact, since busbar trunking is a modular product with the conductors already installed, grouping factors need not be considered at all. This means that one time-consuming step is completely eliminated from the design process.

When it comes to temperature derating, busbar trunking is clearly superior to cable. Even at modest ambient temperatures trunking typically needs to be derated 10% less than an equivalent cable, and at an ambient temperature of 50°C, this difference can rise to 30%.

For both cable and trunking, voltage drop must, of course, be considered. Again, however, trunking almost always outperforms cable. For currents between 1A and 100A, for example, it's not unusual for the trunking voltage drop to be around 50% lower than that of an equivalent cable. This simplifies the designer's work by allowing longer runs to be used, while remaining within the maximum allowable voltage drops laid down in the wiring regulations.

Not only are phase-to-neutral voltage drops lower than an equivalent cable-based installation, the earth loop impedance is also reduced. Lower loop impedance means that earth fault currents are higher, leading to faster disconnection times, irrespective of whether protection is provided by circuit breakers or fuses.

Reduced earth loop impedance also means that, in the event of a fault, exposed metalwork will rise to a lower voltage above earth which, in turn, reduces the risk of serious electric shock.

Selecting protection devices is also an easy process, especially if the trunking is purchased from an organisation that also supplies the protective devices. In such an instance, detailed co-ordination data is almost certain to be available.

This is often provided in the form of easy-to-use look-up tables, and ensures that the device selected provides a suitable level of both overload and short-circuit protection. The availability of such tables

removes the need to carry out calculations, which compare energy let-through and withstand values for fault conditions, a process which is straightforward but nevertheless time consuming.

The use of tested and co-ordinated components not only reduces the amount of work necessary in designing an electrical installation, but also provides a valuable step toward achieving the best possible levels of safety.

Also worth mentioning, particularly in connection with risers, is the excellent fire performance offered by some types of busbar trunking. Where sandwich construction is used, there is no air space within the trunking, which means that it cannot convey hot combustion products in the way that ordinary wiring ducts invariably do. This makes meeting the fire safety requirements of the Building Regulations much easier with trunking than with cable.

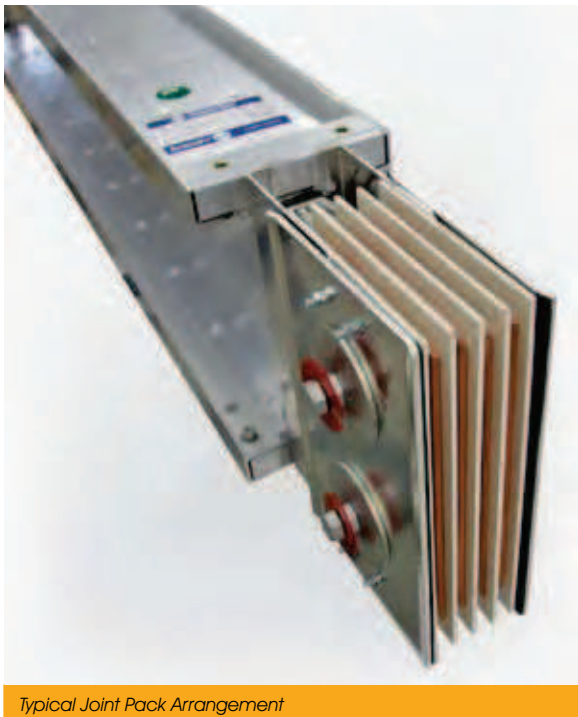
Busbar trunking has a lot to offer, but it has to be accepted that some contractors who are more familiar with cable may still be a little reluctant to make such a radical departure from their usual practice when quoting for an important contract. They need have no fear – Powerbar Ltd back our products with comprehensive support, which embraces every stage of the project, from tendering, through design, to installation and commissioning.

With such a resource to call on, and given the undoubted cost and technical advantages of busbar trunking, what possible reason could there be for choosing the lesser option of cable



## Summary

- » Cables are bulky and difficult to handle, Busbar leaves more space for additional services.
- » Cable is susceptible to damage in adverse environmental conditions.
- » Cable installations are inflexible and changes can be inconvenient and costly.
- » Cable install, time is a lot longer and quickly adds up with significant impact on cost and completion time
- » Busbar replaces multiple cable runs.
- » Busbar reduces installation time.
- » On Busbar, repositioning of distribution points is made easy.
- » Busbar is far less susceptible to damage than cable, thus maintenance costs are reduced.
- » The process of selecting and sizing Busbar trunking is even quicker and easier than that of cable.
- » Powerbar's four hour excellent fire performance, makes meeting the safety requirements of the building regulations, easier with Busbar than cable.
- » Lower volt-drop than equivalent cable arrangements.
- » Aesthetically pleasing in areas of high visibility.
- » Powerbar backs their products with comprehensive support, which embraces every stage of the project, from tendering through design, to installation and commissioning and after sales services such as maintenance, spares, additional Tap-Off units and thermal imaging to mention a few.



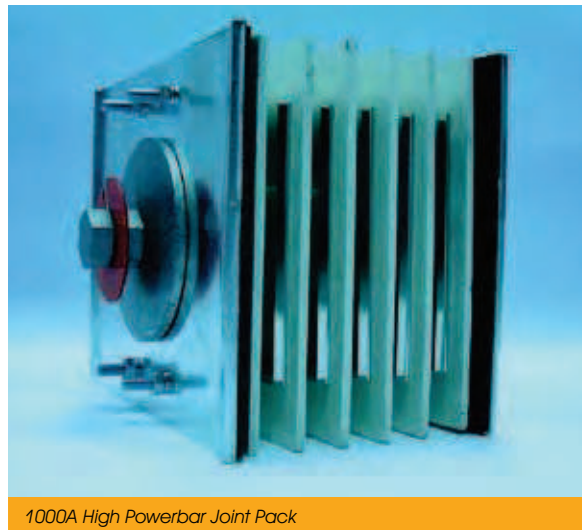
Typical Joint Pack Arrangement

## HPB Features

- » Copper or Aluminium conductor's mill or tin coated finish.
- » Construction with Double headed shear bolt, for quick installation
- » Up to 5 tap-off Points per 3m length.
- » All Tap-off have mechanical/electrical interlocks with a "Earth First, Break Last" safety feature
- » Pressed-out Tags for Tap -off Connections (Not Welded!) - this process is patented.
- » Automatic Case riveting Machine – Saves Time!



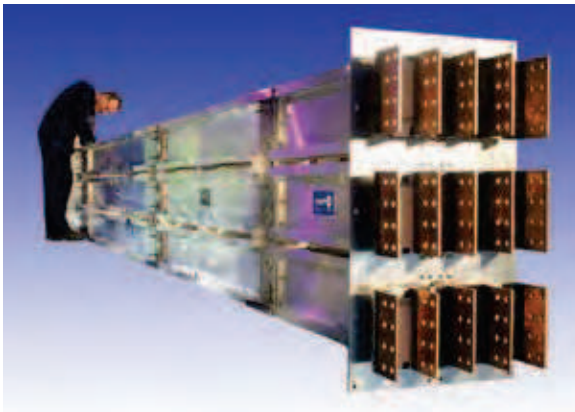
1000A High Powerbar Section



1000A High Powerbar Joint Pack

### Low Voltage Busbar

Powerbar's "High" Powerbar (HPB) range is a 1000 volt, totally encased, non-ventilated, Low Impedance sandwich construction available with either copper or aluminium conductors. The copper option is available from 1000A to 6300A, the aluminium option is available from 800A to 5000A. The HPB range is available with a choice of Ingress Protection rating, either IP54 or IP65. The busbar can be either feeder or distribution or a combination of both. There is no need for any special splice connections and the 2 types are fully interchangeably provided they are the same current, configuration and voltage rating. The short circuit withstand ratings for the distribution busbar is equal to the feeder busbar.



6300A 5 Pole Busbar System

### Standards.

The HPB range is fully ASTA Tested Certified and is CE approved, it is manufactured in a BS EN ISO 9001: 2000 and BS EN ISO18001 & PAS 99 certified facility. It is designed and manufactured in accordance with IEC60439-1 and IEC60439-2.

Configuration	Phases	Neutral	Earth
TP	100%	0%	Case
TP/N	100%	100%	Case
TP/E	100%	0%	100% or 50%
TP/NE	100%	100%	100% or 50%
TP/DN	100%	200%	Case
TP/DN/E	100%	200%	100% or 50%

**Note:** Case, refers to the Aluminium casing been utilised as a 100% housing ground.

### Type Tests

- » Verification of temperature rise limits.
- » Verification of the dielectric properties.
- » Verification of the short circuit withstand strength.
- » Verification of the effectiveness of the protective circuit.
- » Verification of clearance & creepage distances.
- » Verification of mechanical operation.
- » Verification of the degree of protection.
- » Verification of the electrical characteristics.
- » Verification of structural strength.
- » Verification of crushing resistance.
- » Verification of resistance to abnormal heat.
- » Verification of resistance to flame propagation.
- » Verification of the fire barrier in building penetration.

### ASTA Certs

Powerbar Ltd has done extensive testing at ASTA and KEMA accredited laboratories to ensure the product we supply meets the international requirements.





## An Integrated Approach



We value  
our customers

...and our people



## Technical Data

Technical Data Table – Copper

<b>RATING</b>	<b>1000A</b>	<b>1250A</b>	<b>1350A</b>	<b>1600A</b>	<b>2000A</b>
Rating Current (Amps) (Ith)	1000	1250	1350	1600	2000
Rating Insulation Voltage	1000V	1000V	1000V	1000V	1000V
<b>RATING SHORT TIME WITHSTAND CURRENT (I<sub>cw</sub>)</b>					
1 second (kA)	50	65	68	80	80
Peak Value (kA)	110	143	150	176	176
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (PHASE)</b>					
Bar Dimensions	70mm*6mm <sup>2</sup>	90mm*6mm <sup>2</sup>	100mm*6mm <sup>2</sup>	125mm*6mm <sup>2</sup>	160mm*6mm <sup>2</sup>
Cross Sectional Area	420mm <sup>2</sup>	540mm <sup>2</sup>	600mm <sup>2</sup>	750mm <sup>2</sup>	960mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (NEUTRAL)</b>					
Bar Dimensions	70mm*6mm <sup>2</sup>	90mm*6mm <sup>2</sup>	100mm*6mm <sup>2</sup>	125mm*6mm <sup>2</sup>	160mm*6mm <sup>2</sup>
Cross Sectional Area	420mm <sup>2</sup>	540mm <sup>2</sup>	600mm <sup>2</sup>	750mm <sup>2</sup>	960mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (INTEGRAL CLEAN EARTH 100% &amp; 50%)</b>					
Bar Dimensions (100% Earth)	70mm*6mm <sup>2</sup>	90mm*6mm <sup>2</sup>	100mm*6mm <sup>2</sup>	125mm*6mm <sup>2</sup>	160mm*6mm <sup>2</sup>
Cross Sectional Area (100% Earth)	420mm <sup>2</sup>	540mm <sup>2</sup>	600mm <sup>2</sup>	750mm <sup>2</sup>	960mm <sup>2</sup>
Bar Dimensions (50% Earth)	70mm*6mm <sup>2</sup>	90mm*6mm <sup>2</sup>	70mm*6mm <sup>2</sup>	70mm*6mm <sup>2</sup>	90mm*6mm <sup>2</sup>
Cross Sectional Area (50% Earth)	420mm <sup>2</sup>	540mm <sup>2</sup>	420mm <sup>2</sup>	420mm <sup>2</sup>	540mm <sup>2</sup>
<b>PROTECTIVE EARTH C.S.A (mm<sup>2</sup>) ALUMINIUM HOUSING</b>					
Cross Sectional Area	1169mm <sup>2</sup>	1229mm <sup>2</sup>	1289mm <sup>2</sup>	1334mm <sup>2</sup>	1439mm <sup>2</sup>
<b>WEIGHT</b>					
Weight of trunking (4 bar system) kg/mtr	20kg	24kg	26kg	32kg	40kg
<b>RESISTANCE (mΩ/m)</b>					
	0.045	0.036	0.041	0.027	0.022
<b>REACTANCE (mΩ/m)</b>					
	0.013	0.01	0.012	0.0076	0.006
<b>IMPEDANCE (mΩ/m)</b>					
	0.047	0.038	0.043	0.028	0.023
<b>VOLT DROP (V/m)</b>					
Volt drop line to line PF 0.7	0.071	0.071	0.077	0.068	0.068
Volt drop line to line PF 0.8	0.076	0.076	0.082	0.073	0.073
Volt drop line to line PF 0.9	0.08	0.08	0.086	0.077	0.078
Volt drop line to line PF 1.0	0.078	0.078	0.084	0.075	0.078



## Technical Data

Technical Data Table – Copper

<b>RATING</b>	<b>2500A</b>	<b>3200A</b>	<b>4000A</b>	<b>5000A</b>	<b>6300A</b>
Rating Current (Amps) (Ith)	2500	3200	4000	5000	6300
Rating Insulation Voltage	1000V	1000V	1000V	1000V	1000V
<b>RATING SHORT TIME WITHSTAND CURRENT (Icw)</b>					
1 second (kA)	80	100	100	100	100
Peak Value (kA)	176	220	220	220	220
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (PHASE)</b>					
Bar Dimensions	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (NEUTRAL)</b>					
Bar Dimensions	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) COPPER (INTEGRAL CLEAN EARTH 100% &amp; 50%)</b>					
Bar Dimensions (100% Earth)	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area (100% Earth)	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
Bar Dimensions (50% Earth)	100mm*6mm <sup>2</sup>	2*70mm*6mm <sup>2</sup>	2*90mm*6mm <sup>2</sup>	2*100mm*6mm <sup>2</sup>	3*100mm*6mm <sup>2</sup>
Cross Sectional Area (50% Earth)	600mm <sup>2</sup>	840mm <sup>2</sup>	1080mm <sup>2</sup>	1200mm <sup>2</sup>	1800mm <sup>2</sup>
<b>PROTECTIVE EARTH C.S.A (mm<sup>2</sup>) ALUMINIUM HOUSING</b>					
Cross Sectional Area	1559mm <sup>2</sup>	2668mm <sup>2</sup>	2878mm <sup>2</sup>	3118mm <sup>2</sup>	4677mm <sup>2</sup>
<b>WEIGHT</b>					
Weight of trunking (4 bar system) kg/mtr	50kg	64kg	80kg	100kg	150kg
<b>RESISTANCE (mΩ/m)</b>					
	0.018	0.014	0.011	0.0091	0.0061
<b>REACTANCE (mΩ/m)</b>					
	0.005	0.0038	0.003	0.0025	0.0017
<b>IMPEDANCE (mΩ/m)</b>					
	0.019	0.014	0.011	0.0094	0.0063
<b>VOLT DROP (V/m)</b>					
Volt drop line to line PF 0.7	0.07	0.068	0.068	0.07	0.059
Volt drop line to line PF 0.8	0.076	0.073	0.073	0.076	0.064
Volt drop line to line PF 0.9	0.08	0.077	0.078	0.08	0.067
Volt drop line to line PF 1.0	0.079	0.075	0.076	0.079	0.066

## Technical Data

Technical Data Table – Aluminium

<b>RATING</b>	<b>800A</b>	<b>1000A</b>	<b>1250A</b>	<b>1350A</b>	<b>1600A</b>
Rating Current (Amps) (Ith)	800	1000	1250	1350	1600
Rating Insulation Voltage	1000V	1000V	1000V	1000V	1000V
<b>RATING SHORT TIME WITHSTAND CURRENT (Icw)</b>					
1 second (kA)	50	50	60	60	80
Peak Value (kA)	110	110	132	132	176
<b>CONDUCTORS C.S.A (mm2) ALUMINIUM (PHASE)</b>					
Bar Dimensions	70mm*6mm2	90mm*6mm2	125mm*6mm2	125mm*6mm2	160mm*6mm2
Cross Sectional Area	420mm2	540mm2	750mm2	750mm2	960mm2
<b>CONDUCTORS C.S.A (mm2) ALUMINIUM (NEUTRAL)</b>					
Bar Dimensions	70mm*6mm2	90mm*6mm2	125mm*6mm2	125mm*6mm2	160mm*6mm2
Cross Sectional Area	420mm2	540mm2	750mm2	750mm2	960mm2
<b>CONDUCTORS C.S.A (mm2) ALUMINIUM (INTEGRAL CLEAN EARTH 100% &amp; 50%)</b>					
Bar Dimensions (100% Earth)	70mm*6mm2	90mm*6mm2	125mm*6mm2	125mm*6mm2	160mm*6mm2
Cross Sectional Area (100% Earth)	420mm2	540mm2	750mm2	750mm2	960mm2
Bar Dimensions (50% Earth)	70mm*6mm2	90mm*6mm2	70mm*6mm2	70mm*6mm2	90mm*6mm2
Cross Sectional Area (50% Earth)	420mm2	540mm2	420mm2	420mm2	540mm2
<b>PROTECTIVE EARTH C.S.A (mm2) ALUMINIUM HOUSING</b>					
Cross Sectional Area	1169mm2	1229mm2	1334mm2	1334mm2	1439mm2
<b>WEIGHT</b>					
Weight of trunking (4 bar system) kg/mtr	20kg	13.2kg	15.8kg	15.8kg	21kg
<b>RESISTANCE (mΩ/m)</b>					
	0.045	0.057	0.043	0.043	0.034
<b>REACTANCE (mΩ/m)</b>					
	0.013	0.01	0.0076	0.008	0.006
<b>IMPEDANCE (mΩ/m)</b>					
	0.047	0.057	0.043	0.043	0.035
<b>VOLT DROP (V/m)</b>					
Volt drop line to line PF 0.7	0.071	0.081	0.076	0.076	0.079
Volt drop line to line PF 0.8	0.076	0.089	0.084	0.084	0.086
Volt drop line to line PF 0.9	0.08	0.096	0.09	0.09	0.093
Volt drop line to line PF 1.0	0.078	0.089	0.092	0.092	0.095

## Technical Data

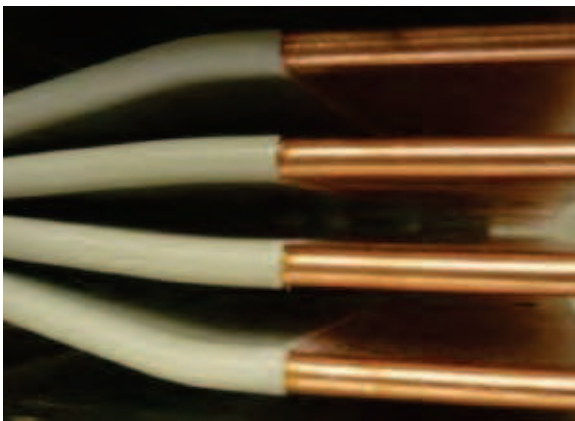
Technical Data Table – Aluminium

<b>RATING</b>	<b>2000A</b>	<b>2500A</b>	<b>3200A</b>	<b>4000A</b>	<b>5000A</b>
Rating Current (Amps) (Ith)	2000	2500	3200	4000	5000
Rating Insulation Voltage	1000V	1000V	1000V	1000V	1000V
<b>RATING SHORT TIME WITHSTAND CURRENT (Icw)</b>					
1 second (kA)	80	100	100	100	100
Peak Value (kA)	176	220	220	220	220
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) ALUMINIUM (PHASE)</b>					
Bar Dimensions	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) ALUMINIUM (NEUTRAL)</b>					
Bar Dimensions	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
<b>CONDUCTORS C.S.A (mm<sup>2</sup>) ALUMINIUM (INTEGRAL CLEAN EARTH 100% &amp; 50%)</b>					
Bar Dimensions (100% Earth)	200mm*6mm <sup>2</sup>	2*125mm*6mm <sup>2</sup>	2*160mm*6mm <sup>2</sup>	2*200mm*6mm <sup>2</sup>	3*200mm*6mm <sup>2</sup>
Cross Sectional Area (100% Earth)	1200mm <sup>2</sup>	1500mm <sup>2</sup>	1920mm <sup>2</sup>	2400mm <sup>2</sup>	3600mm <sup>2</sup>
Bar Dimensions (50% Earth)	100mm*6mm <sup>2</sup>	2*70mm*6mm <sup>2</sup>	2*90mm*6mm <sup>2</sup>	2*100mm*6mm <sup>2</sup>	3*100mm*6mm <sup>2</sup>
Cross Sectional Area (50% Earth)	600mm <sup>2</sup>	840mm <sup>2</sup>	1080mm <sup>2</sup>	1200mm <sup>2</sup>	1800mm <sup>2</sup>
<b>PROTECTIVE EARTH C.S.A (mm<sup>2</sup>) ALUMINIUM HOUSING</b>					
Cross Sectional Area	1559mm <sup>2</sup>	2668mm <sup>2</sup>	2878mm <sup>2</sup>	3118mm <sup>2</sup>	4677mm <sup>2</sup>
<b>WEIGHT</b>					
Weight of trunking (4 bar system) kg/mtr	26kg	33kg	42kg	53kg	66kg
<b>RESISTANCE (mΩ/m)</b>					
	0.028	0.021	0.017	0.014	0.0095
<b>REACTANCE (mΩ/m)</b>					
	0.005	0.0038	0.003	0.0025	0.0017
<b>IMPEDANCE (mΩ/m)</b>					
	0.029	0.022	0.017	0.015	0.0096
<b>VOLT DROP (V/m)</b>					
Volt drop line to line PF 0.7	0.081	0.076	0.079	0.081	0.068
Volt drop line to line PF 0.8	0.089	0.084	0.086	0.089	0.074
Volt drop line to line PF 0.9	0.096	0.09	0.093	0.096	0.08
Volt drop line to line PF 1.0	0.099	0.092	0.095	0.099	0.082

### Construction Details – Conductor/Insulation System

High Powerbar is fabricated from either High Density High Conductivity copper, 99.99% conductivity or 55% conductivity aluminium. The CSA of the conductors varies depending on the rating of the system, the conductor bars have fully rounded edges and this makes for a smooth and easy connection between the busbar and the Joint Pack. The conductors are insulated with a Class B Epoxy Insulation, applied uniformly by our automated electrostatic coating process.

The epoxy coating is non-hygroscopic, chemical resistant, it has outstanding heat transfer characteristics and is ideally suited for sandwich construction applications. The uniform thickness and smooth surface rendered by the automated coating process provides excellent edge coverage to the bars. Epoxy has excellent dielectric strength, it is flame retardant and relatively impact resistant.

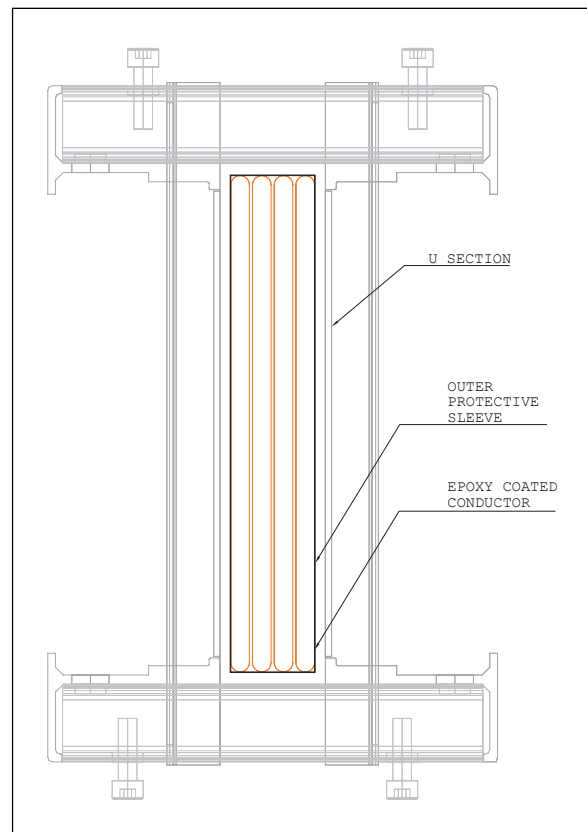


Epoxy Coated Copper Conductors

Distribution busbar applications have a “tab” pressed into the conductor at the contact location points of the Tap Off Box Slot outlet. The Tab is formed by a high impact power press machine, so no welding is required and the integrity of the conductor is not compromised. The low impedance sandwich design is maintained throughout the entire busduct system.

### The Low Impedance Sandwich Design:

- » Improves heat dissipation.
- » Improves short circuit rating.
- » Reduces voltage drop to lower impedance than cable.
- » Removes potential pathways from the propagation of flame, smoke and gas through the busbar system.
- » Reduces busbar size to help with special constraints leaving more space for other services.



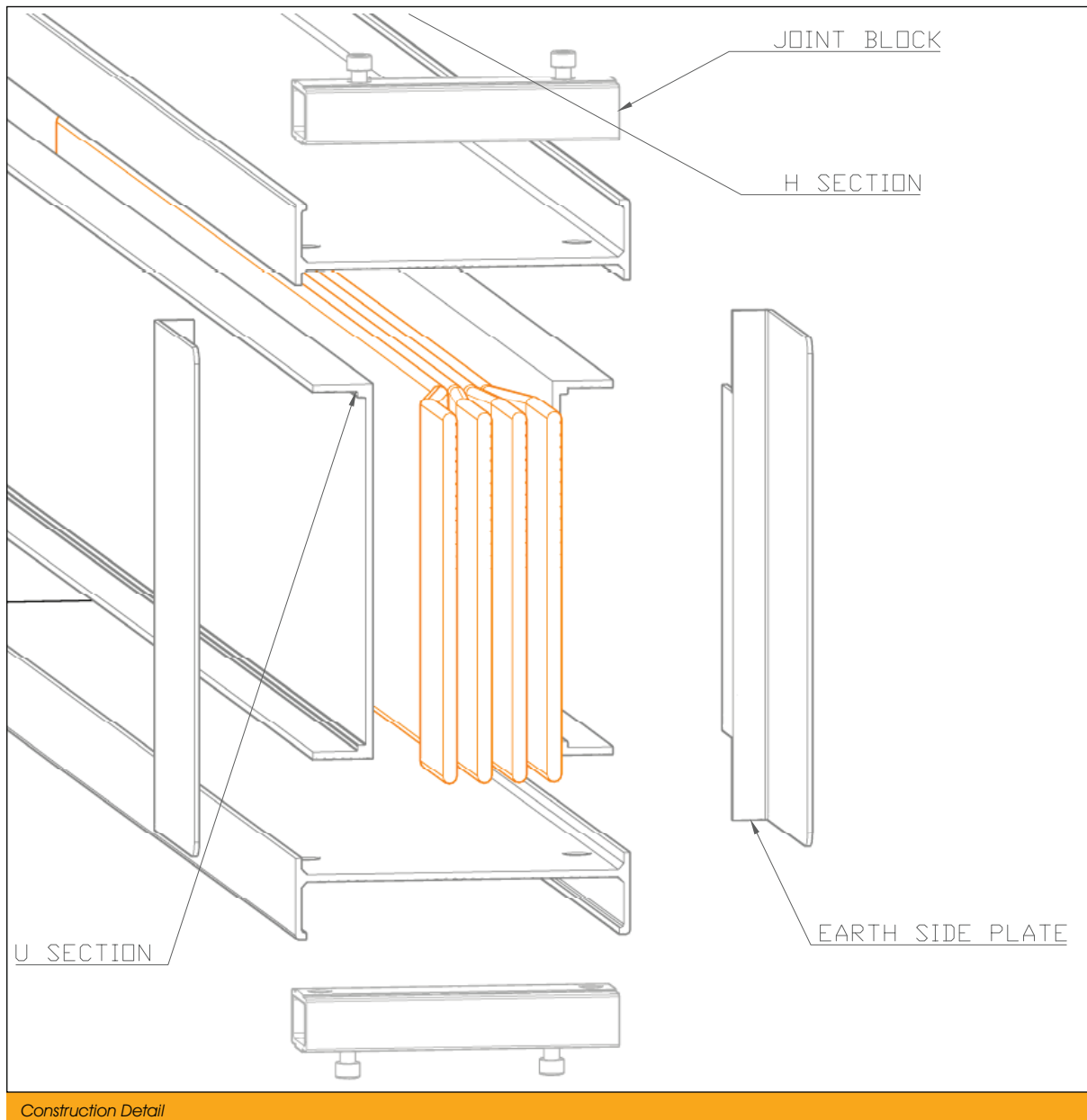
Typical Sandwich Construction



## Housing Details

The Powerbar HPB range is constructed with a lightweight and rugged extruded aluminium assembly. The aluminium extrusions are arranged without the need for welding or seams. The final assembly is riveted together along its seams providing a fully encased tamper proof design.

The aluminium housing provides an excellent ground path through the busbar system. The cross sectional area of the aluminium housing of the busbar assembly is significantly larger than the C.S.A of the individual conductors.



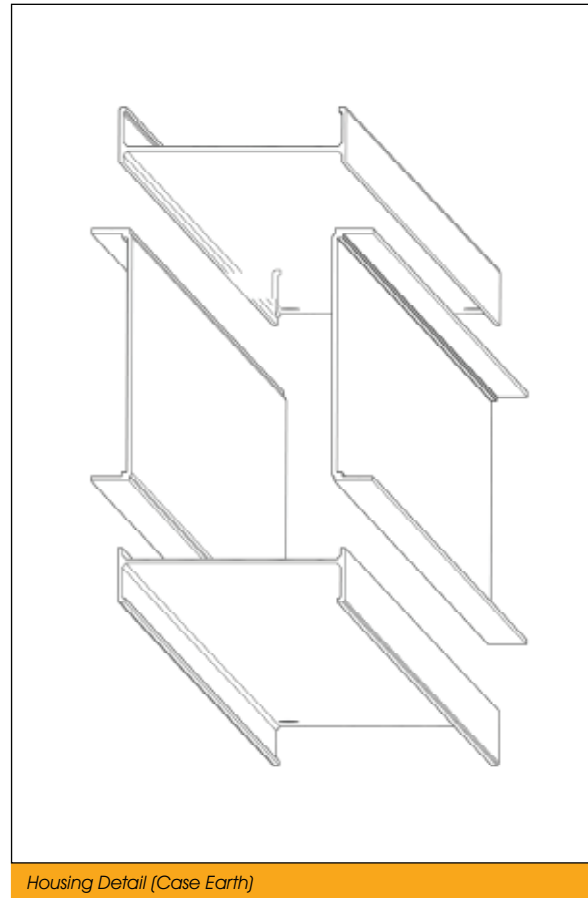
The non-magnetic all-aluminium housing provides excellent heat dissipation. A significant reduction in reactance and magnetic flux leakage, as compared to steel housing. The aluminium housing resists rust and other elements. The integrity and strength of the housing assures specifiers and users with a safe and durable installation over the spectrum of industrial and commercial applications.

### Integral Earth (Case)

The aluminium extrusion assembly is utilised to provide an earth ground along the length of the busbar system. The system ground continuity is maintained along through each joint by the ground path joint block, earth side plates and joint covers. The aluminium joint covers are furnished with ground path contact surfaces on the inside, when installed the contact surfaces are bolted directly to the ground path earth blocks with four M6 x 20 socket head bolts. The result is a 100% earth path that assures ground continuity with very low resistance characteristics.

We have successfully conducted short circuit testing through the case of our busbar system for each current rating proving the earth fault path of our busbar trunking.

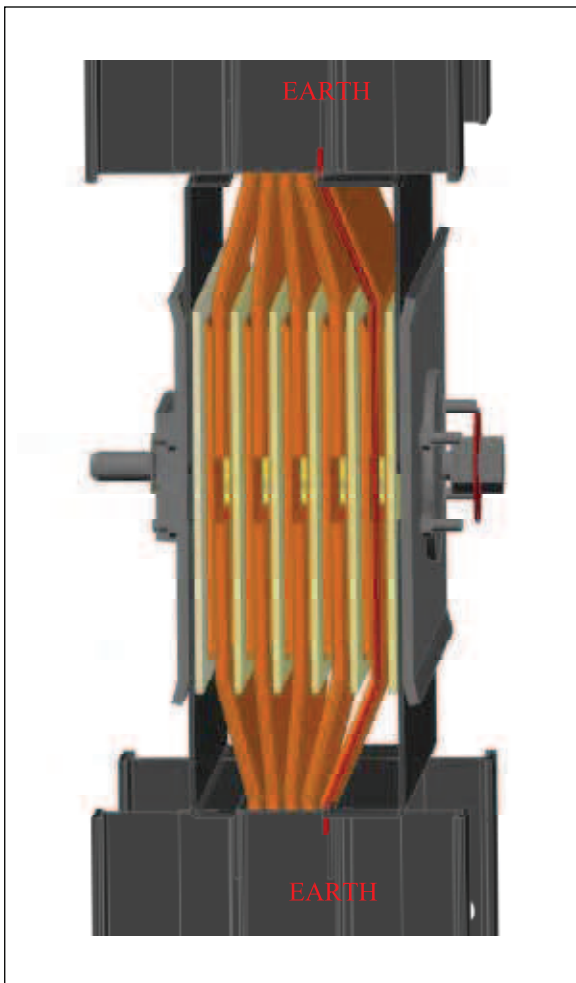
Busbar Rating (Amps)		Protective Earth C.S.A. (mm <sup>2</sup> )
Copper	Aluminium	
1000A	800A	1169
1250A	1000A	1229
1350A	-	1289
1600A	1250A	1334
-	1350A	1334
2000A	1600A	1439
2500A	2000A	1559
3200A	2500A	2668
4000A	3200A	2878
5000A	4000A	3118
6300A	5000A	4677



Housing Detail (Case Earth)

### Isolated Earth Bar (50% OR 100% Copper OR Aluminium)

The earth is internal to the busbar system and it is fully isolated from the Aluminium casing and the other internal conductors. The continuity is maintained through the joint pack. This option is available to meet the ever-growing need for an isolated earth in systems with heavy microprocessor, based loads or large computer based installations where Earth isolation is essential.



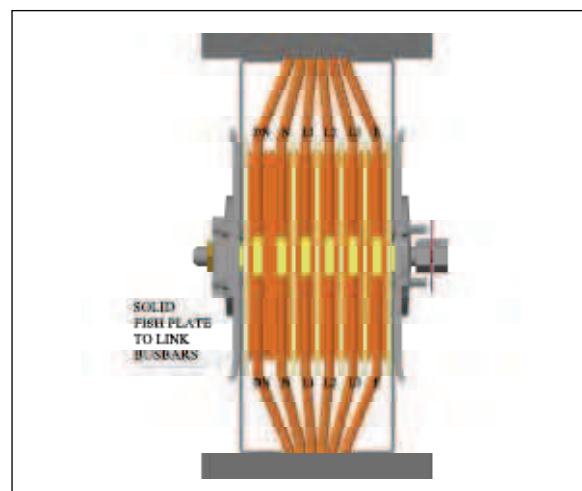
Isolated Earth Arrangement

### Double Neutral (200% Option)

Powerbar offer a fully rated 200% neutral option for busbar systems with non-linear loads. The additional neutral capacity prevents over loading caused by zero sequence harmonic currents. The Powerbar HPB 200% neutral is manufactured using two 100% neutral conductors fully epoxy coated and combined via the joint pack to achieve the 200% capacity. Non-linear load currents typically are extremely high in harmonic content. The harmonics create numerous problems in electrical systems and equipment. Some harmonics are negative sequence with 120 degrees phase displacement (this means the phase rotation is rotated). Positive sequence harmonics have 120 degrees phase displacement but are the same rotation as the distribution system. Certain non-linear loads cause odd triplen harmonics which are zero sequence with no phase displacement.

Balancing the phase load currents in a 3-phase, 4-wire system will normally reduce neutral currents to zero if load currents have an undistorted sinusoidal waveform. However, since zero sequence harmonics are additive and will not cancel each other in the neutral, the neutral current can be as high as 1.73 times the phase current, even with the phase currents perfectly balanced. This can result in over loading neutrals and lead to deterioration of equipment performance and a shortened equipment life cycle.

Powerbar offer a fully rated, 200% neutral conductor option for busbar systems with non-sinusoidal loads.



Double Rated Neutral Arrangement (200%)

## Fire Barrier System

Powerbar busbar systems offer a fully certified fire wall penetration barrier. This fire barrier can have either a 4 hour or a 2 hour rating depending on the amount/depth of the fire resistance material used to surround the busbar.

### Key considerations for utilising fire barriers are:

- » 1. Life safety.
- » 2. Prevention of the passage of smoke or flame from one enclosed space to another.

### Remember:

- » 1. Aluminium melts @ 660°C (933K)
- » 2. Copper melts @ 1084°C (1,357K)
- » 3. Average fire temperature @ 1,200°C (1,473K)

If this protective fire resistance material is not used to encapsulate the busbar, then under fire load the busbar will simply melt and leave a void in the wall allowing the passage of flames and smoke from one area to another.

### Powerbar Fire Barriers are Tested to ISO830 and IEC 439-28.1.15



Two hour fire barrier



Four hour fire barrier



### Fittings

There are fittings to meet every application need, each will be explained in more detail on the following pages: feeder sections, distribution sections, flanges, elbows, offsets, tees, tap off units, power take off sections, transformer connections, reducers, adapter cubicles, expansion joints, end feed units and centre feed units.

### Feeder Busbar

Straight sections of Feeder busbar can be supplied in any length, from a minimum of 600mm to a maximum of 3000mm.

The below table illustrates the different types of build arrangement used depending on the rating of busbar required for the application.



Typical Installation

Busbar Rating (Amps)		Phase Bar Size (mm)		Bar Per Phase	Construction Type	Busbar Size (mm)		Phase Configuration
Copper	Aluminium	Depth	Width			Depth	Width	
1000A	800A	70mm	6mm	1	Single	130mm	145mm	ALL
1250A	1000A	90mm	6mm	1	Single	150mm	145mm	ALL
1350A	-	100mm	6mm	1	Single	160mm	145mm	ALL
1600A	1250A	125mm	6mm	1	Single	185mm	145mm	ALL
-	1350A	125mm	6mm	1	Single	185mm	145mm	ALL
2000A	1600A	160mm	6mm	1	Single	220mm	145mm	ALL
2500A	2000A	200mm	6mm	1	Single	260mm	145mm	ALL
3200A	2500A	125mm	6mm	2	Double	393mm	145mm	ALL
4000A	3200A	160mm	6mm	2	Double	463mm	145mm	ALL
5000A	4000A	200mm	6mm	2	Double	543mm	145mm	ALL
6300A	5000A	200mm	6mm	3	Triple	826mm	145mm	ALL

## Distribution Busbar/Tap Off Units

### Distribution Busbar

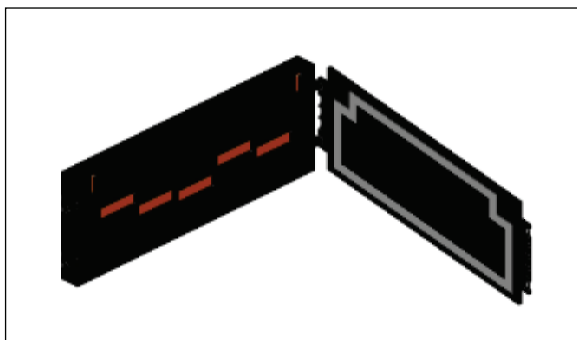
Straight sections of Distribution Busbar can be supplied in any length, from a minimum of 600mm to a maximum of 3000mm.

Busbar Rating (Amps)		Protective Earth C.S.A. (mm <sup>2</sup> )
Copper	Aluminium	
1000A	800A	Single
1250A	1000A	Single
1350A	-	Single
1600A	1250A	Single
-	1350A	Single
2000A	1600A	Single
2500A	2000A	Single
3200A	2500A	Double
4000A	3200A	Double
5000A	4000A	Double
6300A	5000A	Triple

### Tap Off Slot

The tap off slot outlet and cover are made from a durable, high strength, polycarbonate material rated as Class B, 130°C insulation. The tap off slot cover is designed to prevent access to the contacts behind the cover and prevent the entry of dirt, dust or moisture.

The cover is a clip on/clip off design. The tap off slot is IP2X (finger safety) in accordance with standards, with the cover removed. With the tap off module installed or the cover fitted the rating is IP54. A cover is required over unused tap off slots to maintain the ingress protection (IP) level to IP54. When fitting a tap off unit the cover has to be removed. The reversible hinged cover design is used to ensure protection of contact surfaces from dirt, dust or moisture.



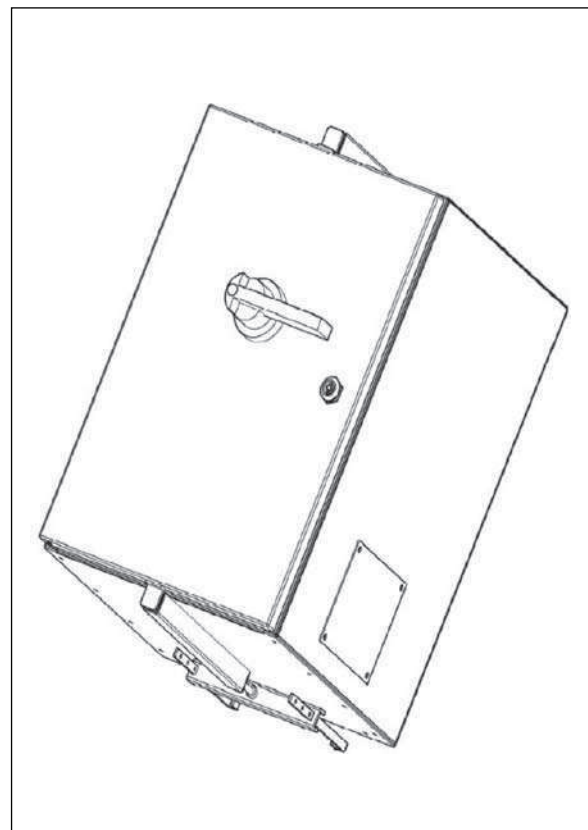
Tap Off Slot

### Tap Off Units (plug in type)

All Powerbar tap off units are designed with the safety of the installer and user as the key criteria. The following features are standard for both fusible and circuit breaker type plug-in units.

The Powerbar tap off unit has an extended Earth Contact Bracket which insures the Earth ground is always the first point to connect with the busbar system during installation and the last point to disconnect during the removal of a tap off unit.

The Earth ground is designed to make positive contact with the busbar earth ground before the phase or neutral contacts engage the busbar. The unit is also fitted with an extended shutter actuator which ensures the tap off unit cannot be inserted upside down (180 degrees out of rotation), as the design of the shutter actuator will prevent this.



Tap Off Box

To ensure the tap off unit is seated correctly on the busbar, the clamping mechanism will draw the unit tight onto the busbar housing as the installer tightens the mounting bracket assembly at the rear. The Powerbar tap off units have an interlock which prevents the tap off door from been opened while the tap off unit is in the ON position and to prevent the accidental closing of the device while the door is open.

As a counter measure to the effect of thermal expansion and vibration, the tap off unit is secured to the busbar housing with high tensile strength, lockable hardware.

### Special Tap-Off Units

Powerbar Ltd began as an electrical switchgear manufacture and can easily engineer custom built Tap-Off units to suit consultant or customer requirements.

#### Special Features Are:

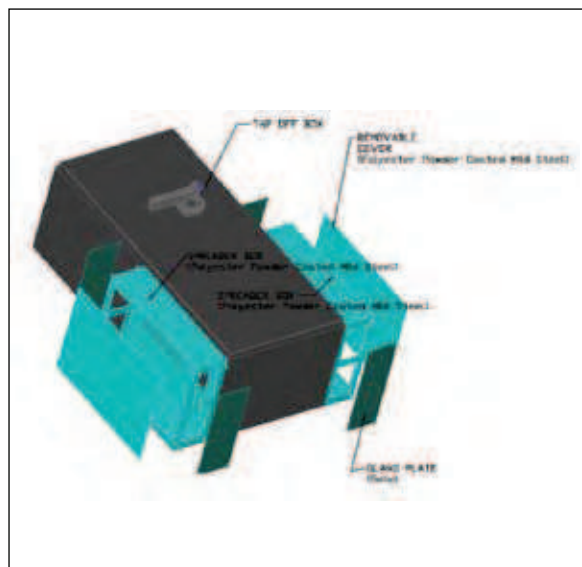
- » Metering option for landlord electrical tariff purpose.
- » BMS monitoring of breaker status.
- » BMS monitoring of metering systems.
- » Automatic remote open/close features.
- » Load shedding features.
- » Integral sockets.
- » Integral distribution boards.
- » Cable spreader boxes.



Special Metering Tap Off Unit



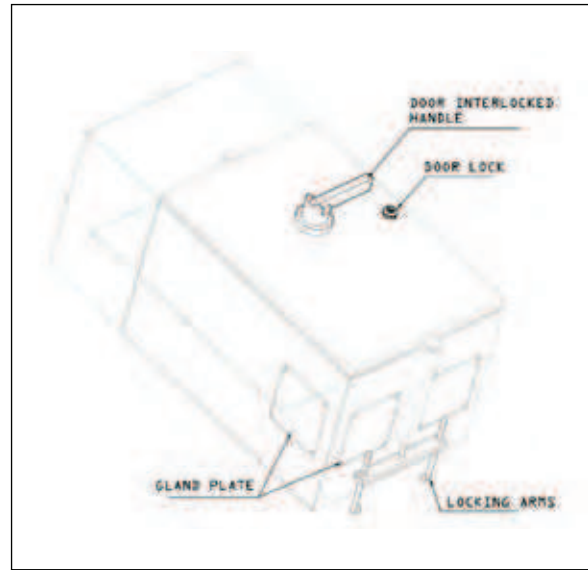
Internal View Of Special Metering Tap Off Unit



3D CAD Design Service Available

## Cable Entry

The standard Tap-Off box usually has bottom and side removable gland plates for cable access, but other variations are available such as top entry, please contact the Powerbar engineering department for further information.



Cable Entry Detail

Circuit Breaker (MCCB) - Tap Off Units	Maximum Amps	Maximum Volts (AC)	Tap Off Slots	Box Type	A	B	C	Approx Weight (Kg)
	100A	690V	1	V2	400mm	256mm	250mm	14
	160A	690V	1	V2	400mm	256mm	250mm	14
	200A	690V	1	V2	400mm	256mm	250mm	14
	250A	690V	1	V2	400mm	256mm	250mm	14
	315A	690V	1	V1	500mm	340mm	250mm	20
	400A	690V	2	V1-D	764mm	340mm	283mm	43
	630A	690V	2	V1-D	764mm	340mm	283mm	43

**NOTE:** The list above is based on typical situation, other factors need to be considered when deciding on what type of box to use, such as, location of box, cable size, additional accessories, etc.

Fuseable & Switched (SW/FS) - Tap Off Units	Maximum Amps	Maximum Volts (AC)	Tap Off Slots	Box Type	A	B	C	Approx Weight (Kg)
	100A	690V	1	V2	400mm	256mm	250mm	14
	160A	690V	1	V2	400mm	256mm	250mm	14
	200A	690V	1	V2	400mm	256mm	250mm	14
	250A	690V	1	V1	500mm	340mm	250mm	14
	315A	690V	1	V1	500mm	340mm	250mm	20
	400A	690V	2	V1-D	764mm	340mm	283mm	43
	630A	690V	2	V1-D	764mm	340mm	283mm	43

**NOTE:** The list above is based on typical situation, other factors need to be considered when deciding on what type of box to use, such as, location of box, cable size, additional accessories, etc.

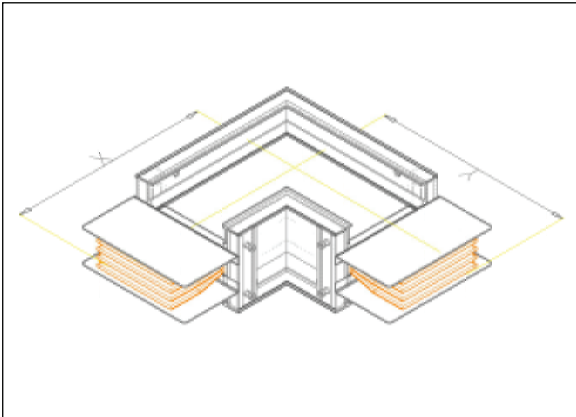
Our Tap Off box range is a "plug-in" type up to 630A. The plug in Tap Off unit is interchangeable between busbars provided the configuration is the same. Above 630A the Tap Off Units range change to "In-line", these units are fixed in position, please contact the Powerbar engineering department for further information.



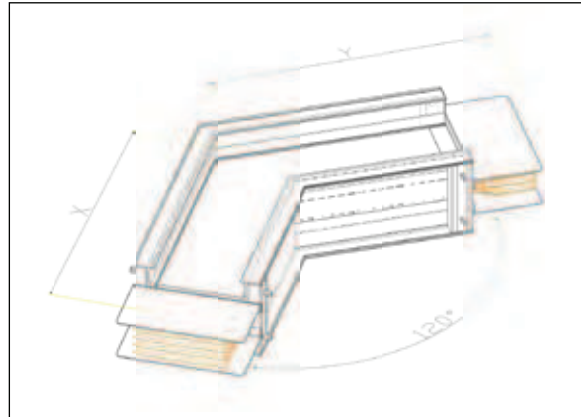
### Flatwise Elbows

Flatwise elbows are used mainly to make 90° changes in the direction of the busbar system, there are two main types, Flatwise Up and Flatwise Down, these can be used to turn the busbar route up or down if the busbar is running on its edge, or to turn the busbar route left or right when the busbar is running on its flat. The tables below can be used as a guide for sizing Elbows.

Elbows are mainly used for 90° changes of direction, Powerbar can however manufacture "special angle" elbows if required, please contact the Powerbar engineering department for further information.



Flatwise Elbow 90°



Flatwise Elbow 0-180°

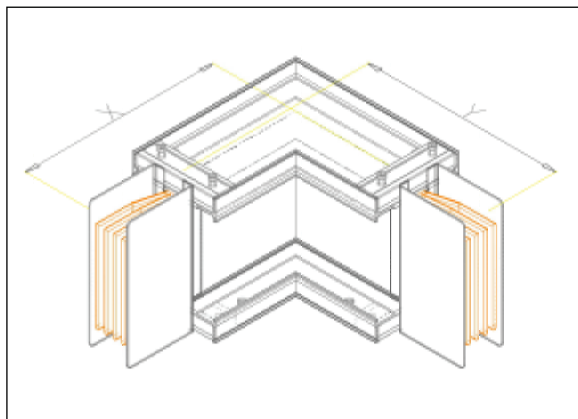
	Rating (Amps)		Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
	Cu	Al	X	Y	X	Y	X	Y
FLATWISE ELBOW (Up OR Down)	1000A	800A	256mm	256mm	350mm	350mm	750mm	750mm
	1250A	1000A	266mm	266mm	350mm	350mm	750mm	750mm
	1350A	-	271mm	271mm	350mm	350mm	750mm	750mm
	1600A	1250A	284mm	284mm	350mm	350mm	750mm	750mm
	-	1350A	284mm	284mm	350mm	350mm	750mm	750mm
	2000A	1600A	301mm	301mm	350mm	350mm	750mm	750mm
	2500A	2000A	321mm	321mm	350mm	350mm	750mm	750mm
	3200A	2500A	388mm	388mm	500mm	500mm	750mm	750mm
	4000A	3200A	423mm	423mm	500mm	500mm	750mm	750mm
	5000A	4000A	463mm	463mm	500mm	500mm	750mm	750mm
	6300A	5000A	604mm	604mm	650mm	650mm	750mm	750mm

# Edgewise Elbows

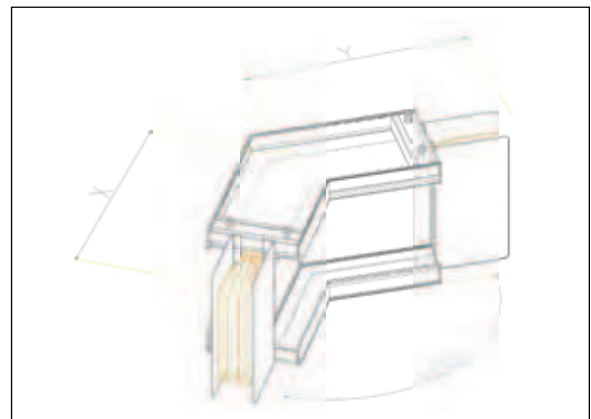
## Edgewise Elbows

Edgewise Elbows are used mainly to make changes in the direction of the busbar system, there are two main types, Edgewise Right and Edgewise Left, these can be used to turn the busbar route up or down if the busbar is running on its Flat, or to turn the busbar route left or right when the busbar is running on its Edge. The tables below can be used as a guide for sizing Elbows.

Elbows are mainly used for 90° changes of direction, Powerbar can however manufacture "special angle" elbows if required, please contact the Powerbar engineering department for further information.



Edgewise Elbow 90°



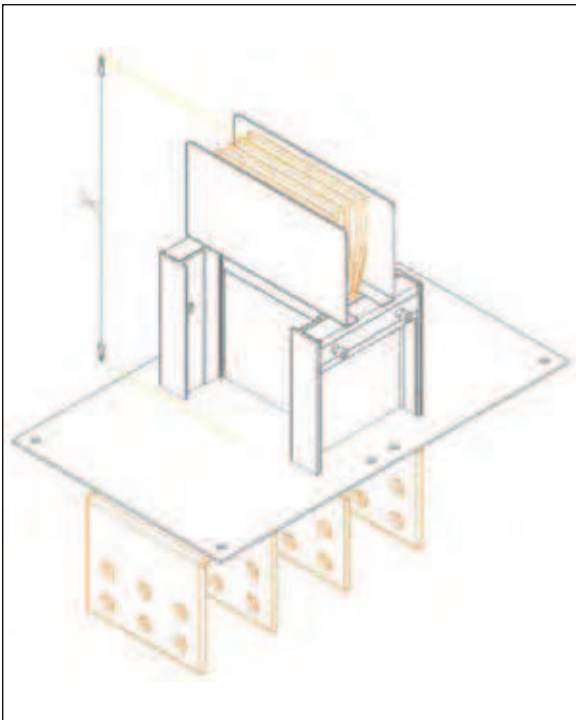
Edgewise Elbow 0-180°

	Rating (Amps)		Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
	Cu	Al	X	Y	X	Y	X	Y
EDGEWISE ELBOW (Left OR Right)	1000A	800A	255mm	255mm	350mm	350mm	600mm	600mm
	1250A	1000A	255mm	255mm	350mm	350mm	600mm	600mm
	1350A	-	255mm	255mm	350mm	350mm	600mm	600mm
	1600A	1250A	255mm	255mm	350mm	350mm	600mm	600mm
	-	1350A	255mm	255mm	350mm	350mm	600mm	600mm
	2000A	1600A	255mm	255mm	350mm	350mm	600mm	600mm
	2500A	2000A	255mm	255mm	350mm	350mm	600mm	600mm
	3200A	2500A	255mm	255mm	350mm	350mm	600mm	600mm
	4000A	3200A	255mm	255mm	350mm	350mm	600mm	600mm
	5000A	4000A	255mm	255mm	350mm	350mm	600mm	600mm
	6300A	5000A	255mm	255mm	350mm	350mm	600mm	600mm

## Flange Connections

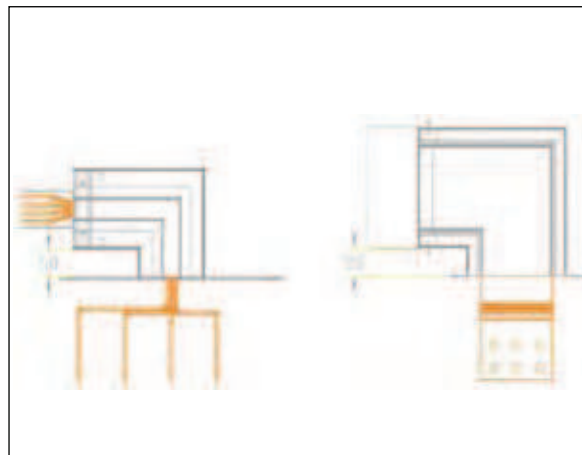
Flanges provide a direct connection to low voltage switchgear, switchboards, transformer enclosures and other apparatus. Cut out details, dimensions and drilling plans are provided with the customer drawings and it is the responsibility of the switchgear manufacturer to provide the opening, drill fixing holes, connecting hardware and busbar risers in their equipment. For proper coordination between the Busbar system and the other equipment, detailed drawings (General Arrangement), including switchgear phase rotation, must accompany the order. Standard flanges can be offset to the left or right of the section, as required.

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 must lay close to the top of the switchboard, when avoiding other services or when there is reduced head-height above the switchgear.



Standard Panel Flange

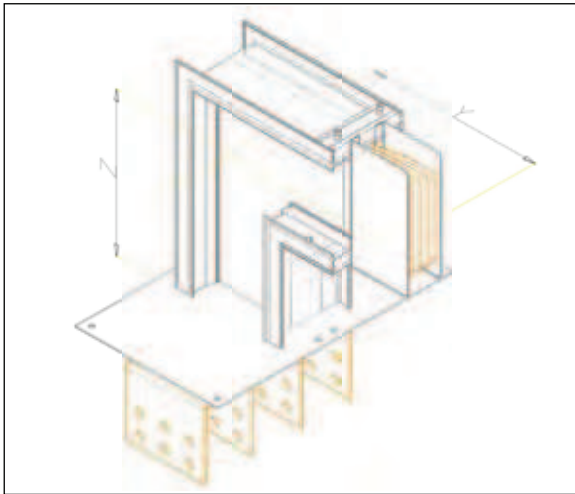
	Rating (Amps)		Minimum	Maximum
	Cu	Al		
FLANGE (External Stump Size)	1000A	800A	240mm	840mm
	1250A	1000A	240mm	840mm
	1350A	-	240mm	840mm
	1600A	1250A	240mm	840mm
	-	1350A	240mm	840mm
	2000A	1600A	240mm	840mm
	2500A	2000A	240mm	840mm
	3200A	2500A	240mm	840mm
	4000A	3200A	240mm	840mm
	5000A	4000A	240mm	840mm
	6300A	5000A	240mm	840mm



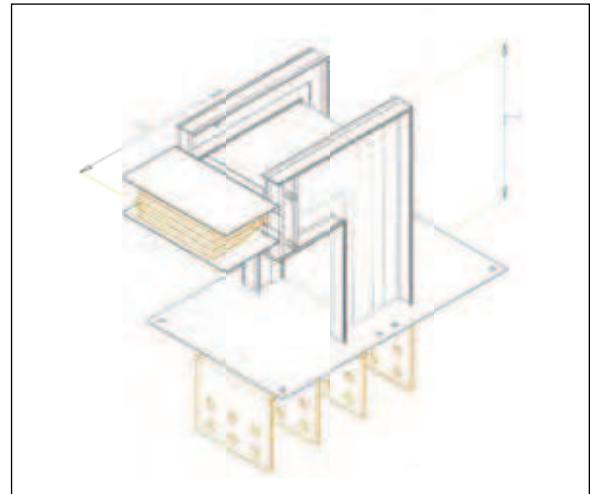
Panel Flange Combination Edgewise Elbow Minimum Clearance Detail

We can bring the gap between the busbar and the top of the panel down to as little as 50mm.

## Combination Flange Connections



Panel Flange Combination Flatwise Elbow



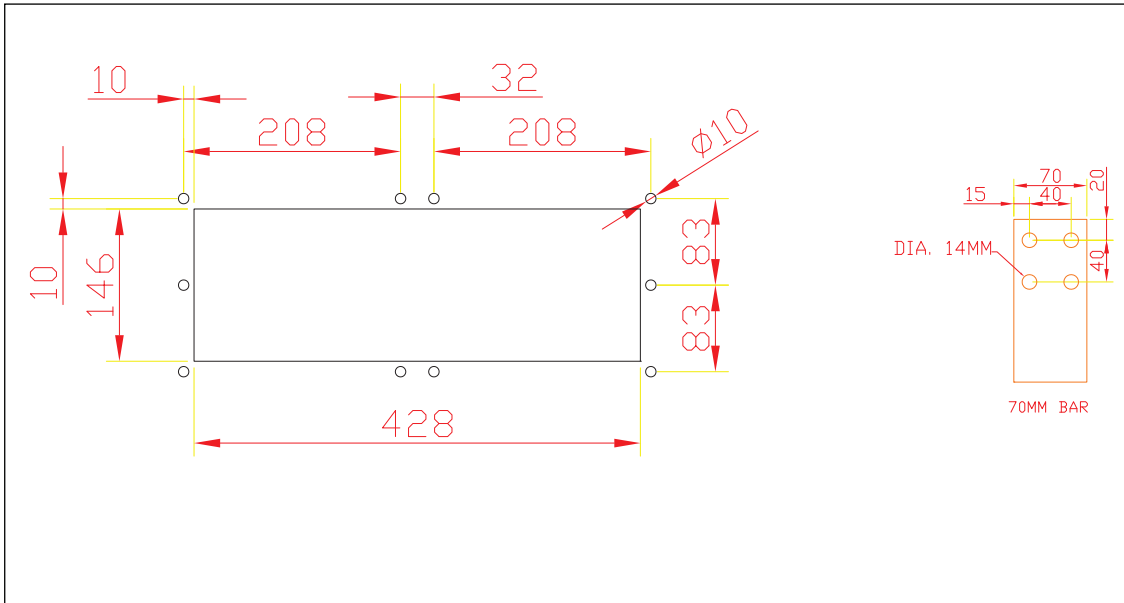
Panel Flange Combination Edgewise Elbow

FLANGE / ELBOWS (Flatwise)	Rating (Amps)		Minimum Leg Size		Maximum Leg Size	
	Cu	Al	Y	Z	Y	Z
	1000A	800A	256mm	115mm	750mm	496mm
	1250A	1000A	266mm	125mm	750mm	506mm
	1350A	-	271mm	130mm	750mm	511mm
	1600A	1250A	284mm	143mm	750mm	524mm
	-	1350A	284mm	143mm	750mm	524mm
	2000A	1600A	301mm	160mm	750mm	541mm
	2500A	2000A	321mm	180mm	750mm	561mm
	3200A	2500A	388mm	247mm	750mm	628mm
4000A	3200A	423mm	282mm	750mm	663mm	
5000A	4000A	463mm	322mm	750mm	703mm	
6300A	5000A	604mm	463mm	750mm	844mm	

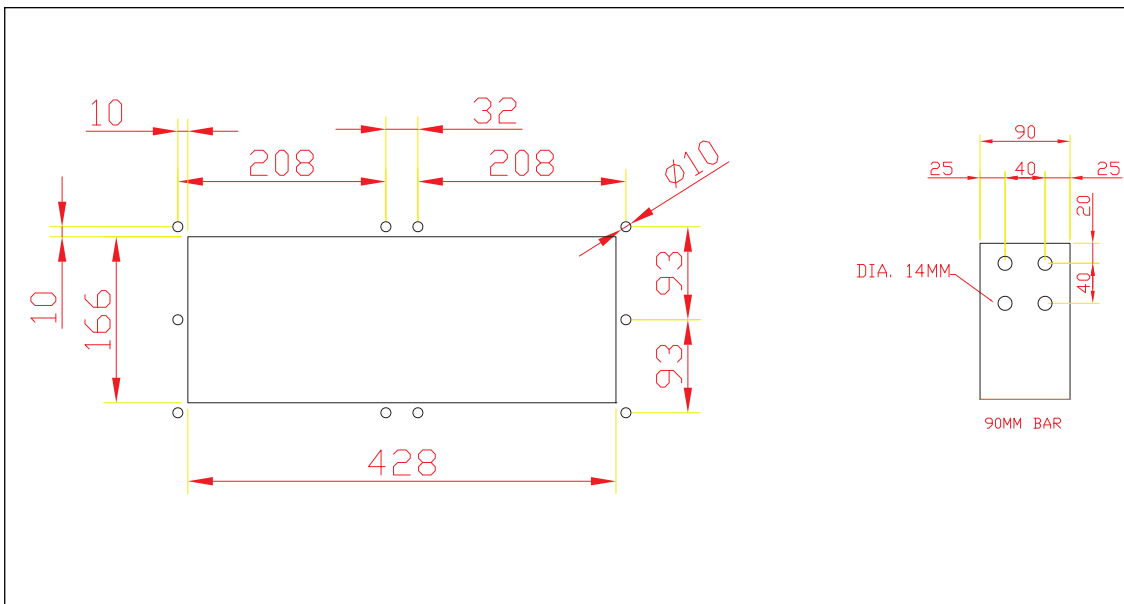
FLANGE / ELBOWS (Edgewise)	Rating (Amps)		Minimum Leg Size		Maximum Leg Size	
	Cu	Al	X	Z	X	Z
	1000A	800A	255mm	122mm	600mm	495mm
	1250A	1000A	255mm	122mm	600mm	495mm
	1350A	-	255mm	122mm	600mm	495mm
	1600A	1250A	255mm	122mm	600mm	495mm
	-	1350A	255mm	122mm	600mm	495mm
	2000A	1600A	255mm	122mm	600mm	495mm
	2500A	2000A	255mm	122mm	600mm	495mm
	3200A	2500A	255mm	122mm	600mm	495mm
4000A	3200A	255mm	122mm	600mm	495mm	
5000A	4000A	255mm	122mm	600mm	495mm	
6300A	5000A	255mm	122mm	600mm	495mm	



Standard Panel Flange Cut Outs and Connection Details

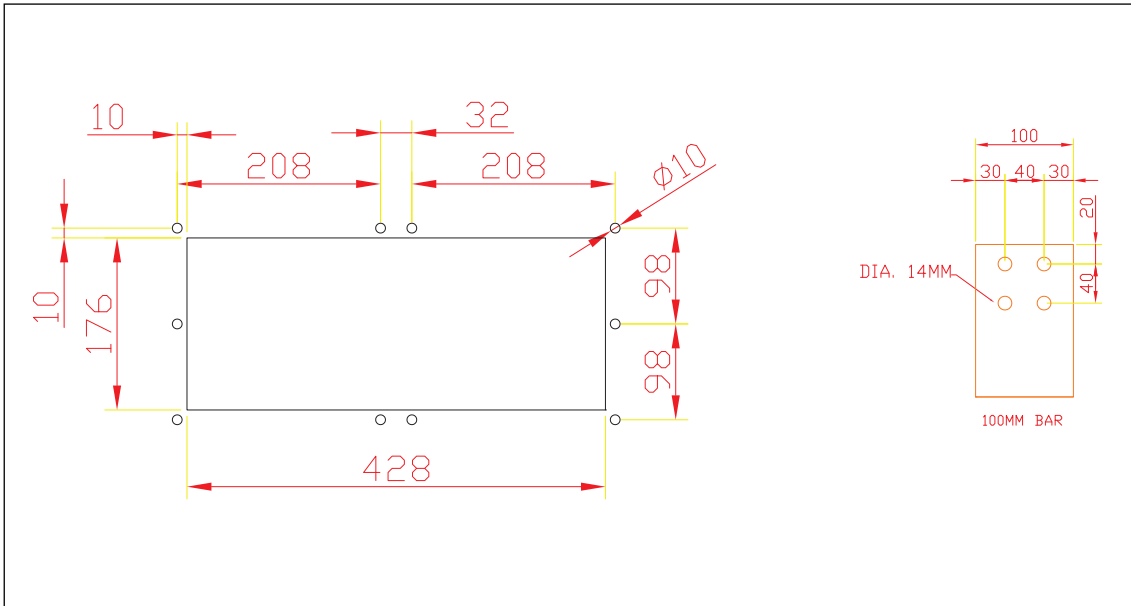


Panel Flangeplate cut-out & bar end connection detail for 1000A copper or 800A aluminium

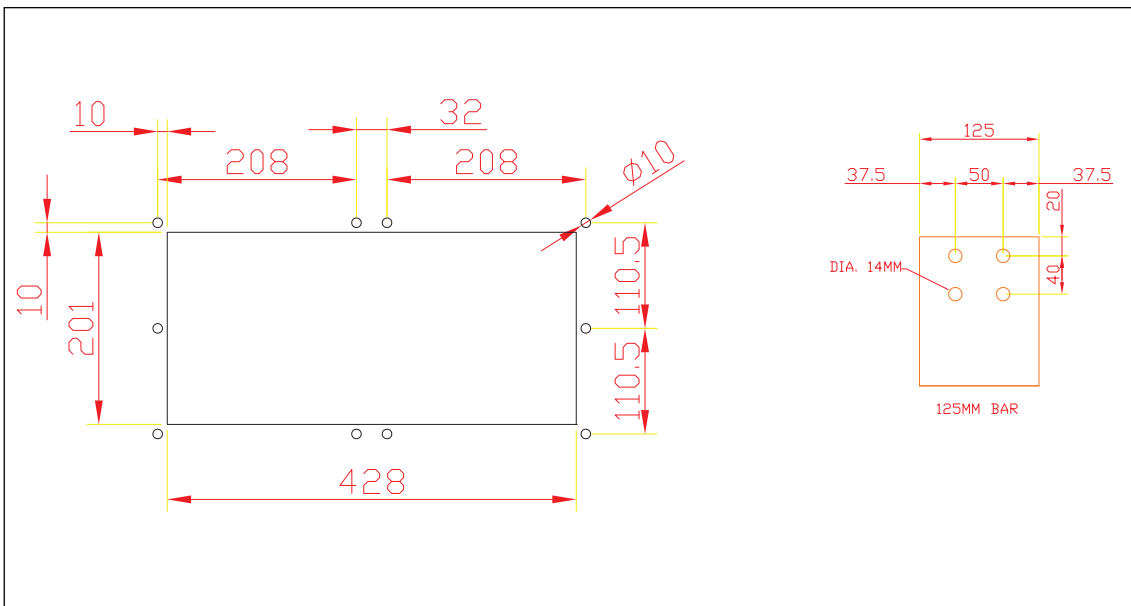


Panel Flangeplate cut-out & bar end connection detail for 1250A copper or 1000A aluminium

## Standard Panel Flange Cut Outs and Connection Details



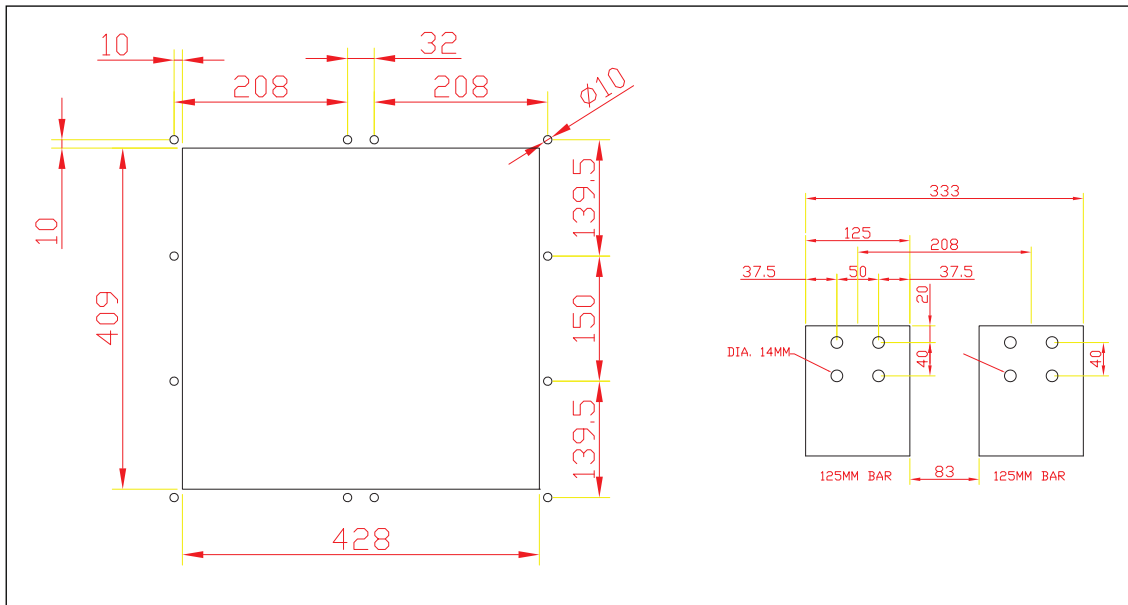
Panel Flangeplate cut-out & bar end connection detail for 1350A copper



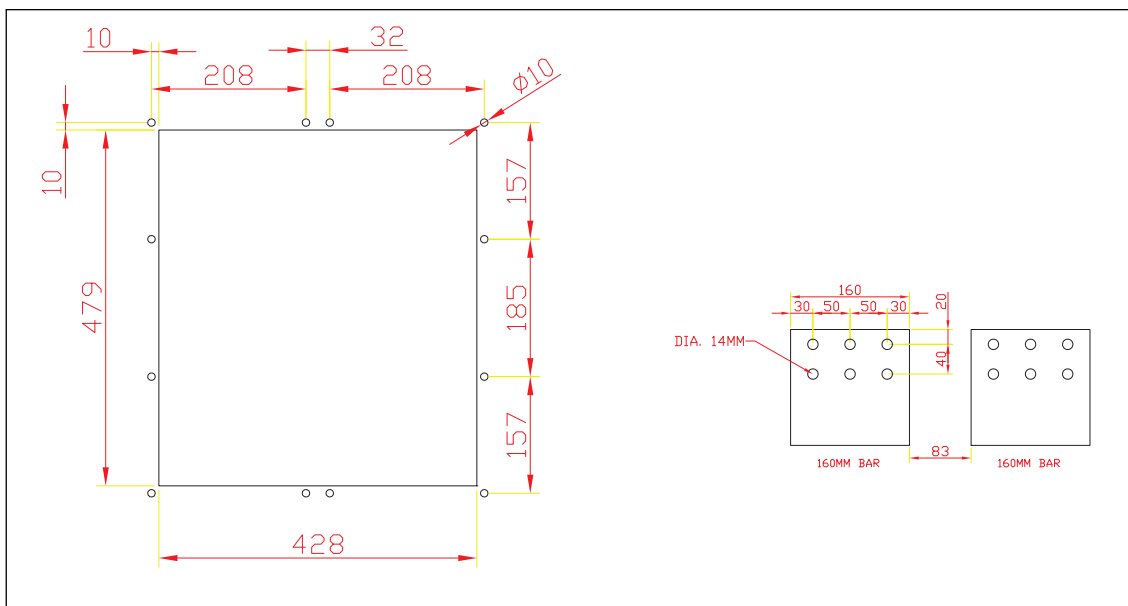
Panel Flangeplate cut-out & bar end connection detail for 1600A copper or 1250A / 1350A aluminium



## Standard Panel Flange Cut Outs and Connection Details



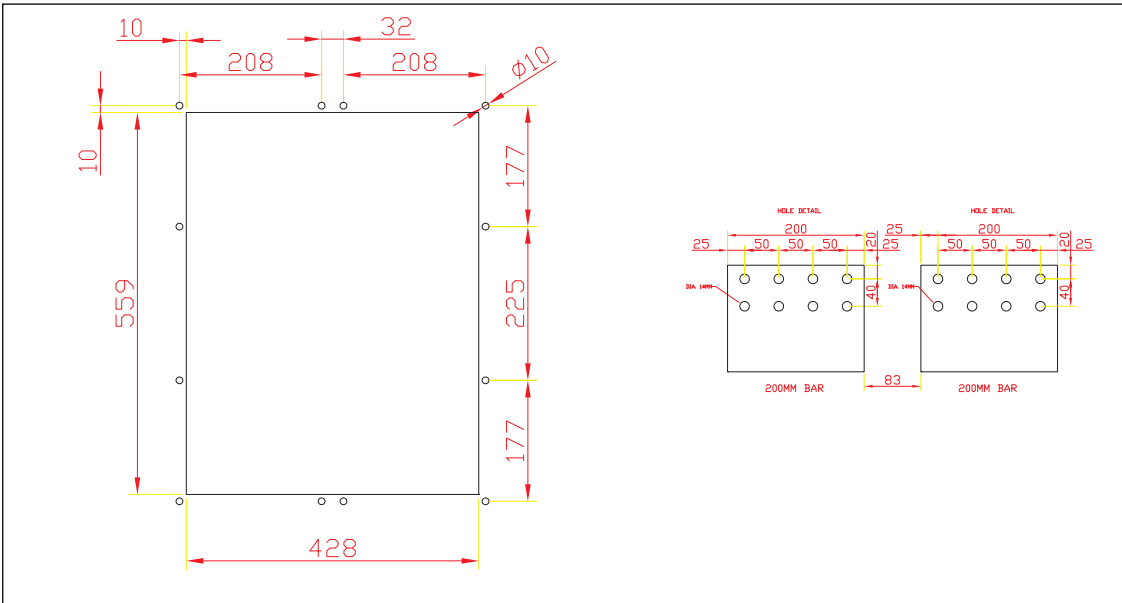
Panel Flangeplate cut-out & bar end connection detail for 3200A copper or 2500A aluminium



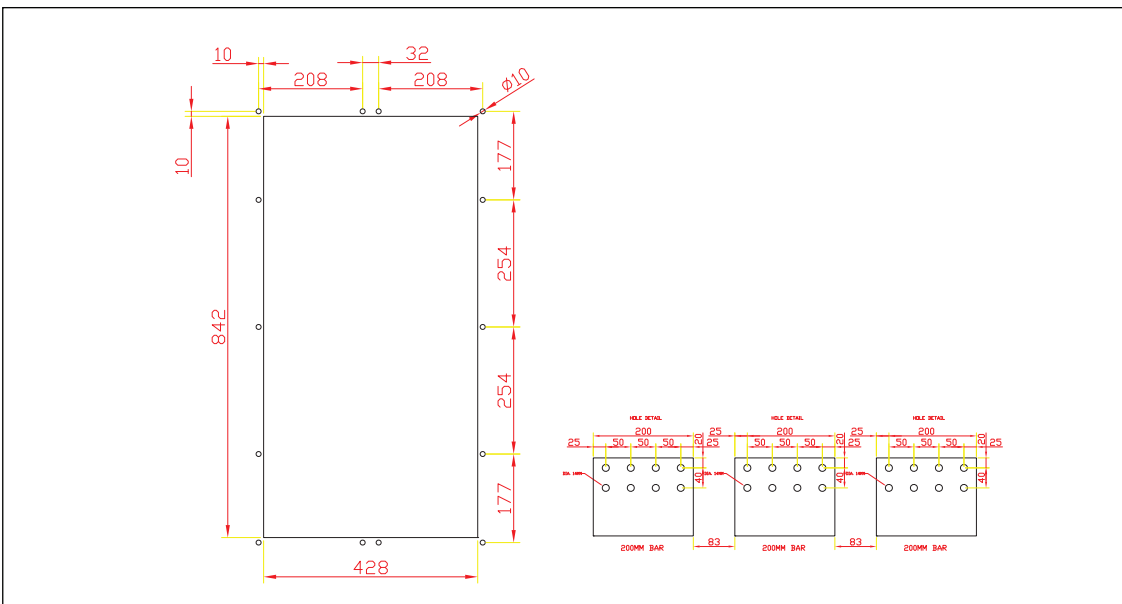
Panel Flangeplate cut-out & bar end connection detail for 4000A copper or 3200A aluminium



Standard Panel Flange Cut Outs and Connection Details



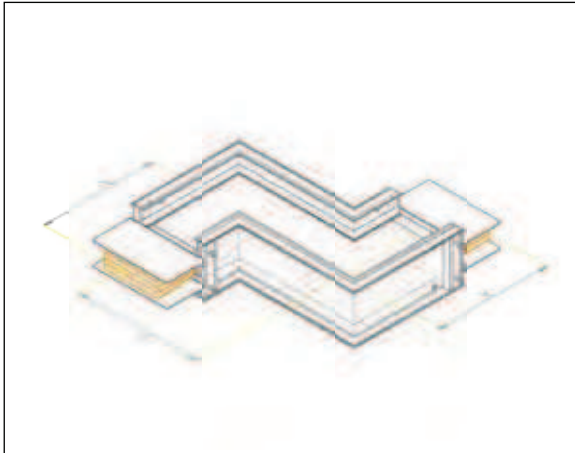
Panel Flangeplate cut-out & bar end connection detail for 5000A copper or 4000A aluminium



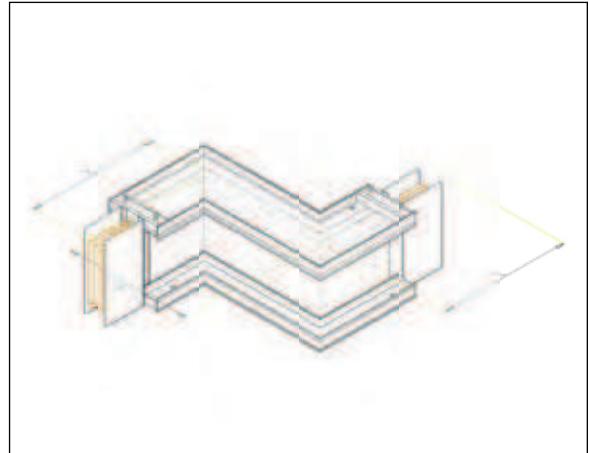
Panel Flangeplate cut-out & bar end connection detail for 6300A copper or 5000A aluminium

## Offset Sections (Flat & Edge)

An Offset is used to avoid obstacles such as pipes steel columns, etc., and to conform to the structure of the building. It is basically two elbows fabricated into a single piece for use where space prohibits the use of two standard elbows. There are again four types, Flatwise Offset Up and Down, Edgewise Offset Left and Right.



Flatwise Offset



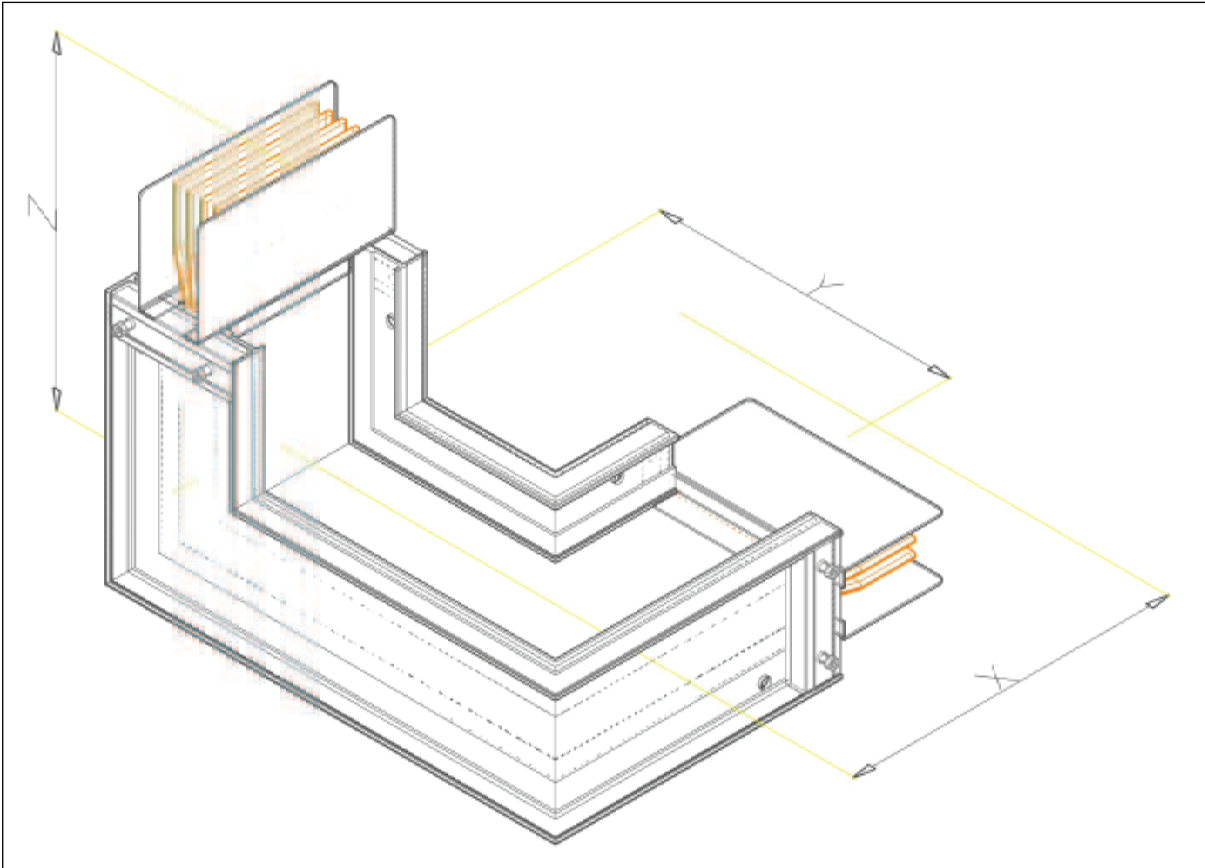
Edgewise Offset

FLATWISE OFFSET (Up & Down)	Rating (Amps)		Minimum Flatwise		Maximum Flatwise	
	Cu	Ai	Y	X	Y	X
	1000A	800A	50mm	256mm	512mm	750mm
	1250A	1000A	50mm	266mm	532mm	750mm
	1350A	-	50mm	271mm	542mm	750mm
	1600A	1250A	50mm	284mm	568mm	750mm
	-	1350A	50mm	284mm	568mm	750mm
	2000A	1600A	50mm	301mm	602mm	750mm
	2500A	2000A	50mm	321mm	642mm	750mm
	3200A	2500A	50mm	388mm	776mm	750mm
4000A	3200A	50mm	423mm	846mm	750mm	
5000A	4000A	50mm	463mm	926mm	750mm	
6300A	5000A	50mm	604mm	1208mm	750mm	

EDGEWISE OFFSET (Left & Right)	Rating (Amps)		Minimum Flatwise		Maximum Flatwise	
	Cu	Ai	Y	X	Y	X
	1000A	800A	80mm	255mm	510mm	600mm
	1250A	1000A	80mm	255mm	510mm	600mm
	1350A	-	80mm	255mm	510mm	600mm
	1600A	1250A	80mm	255mm	510mm	600mm
	-	1350A	80mm	255mm	510mm	600mm
	2000A	1600A	80mm	255mm	510mm	600mm
	2500A	2000A	80mm	255mm	510mm	600mm
	3200A	2500A	80mm	255mm	510mm	600mm
4000A	3200A	80mm	255mm	510mm	600mm	
5000A	4000A	80mm	255mm	510mm	600mm	
6300A	5000A	80mm	255mm	510mm	600mm	

### Combination Elbows

Combination Elbows are used to conform to the building's structure and change direction, utilizing a small amount of space. They have been developed by combining the two different types of elbow, Flatwise and Edgewise, together into one piece.



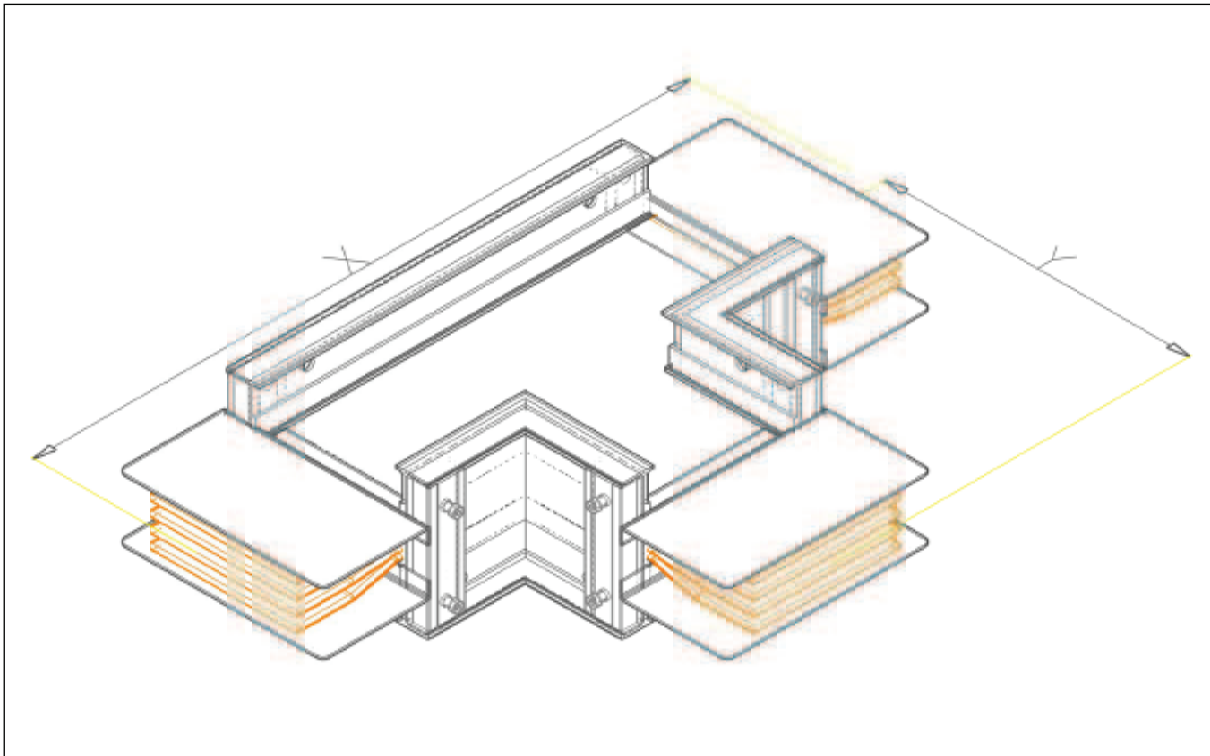
Combination Elbow

COMBINATION ELBOWS (Flatwise/Edgewise & Edgewise/Flatwise)	Rating (Amps)		Min. Combination Elbow		
	Cu	Al	Z	X	Y
	1000A	800A	255mm	256mm	188mm
1250A	1000A	255mm	266mm	198mm	
1350A	-	255mm	271mm	203mm	
1600A	1250A	255mm	284mm	215mm	
-	1350A	255mm	284mm	215mm	
2000A	1600A	255mm	301mm	233mm	
2500A	2000A	255mm	321mm	253mm	
3200A	2500A	255mm	388mm	319mm	
4000A	3200A	255mm	423mm	354mm	
5000A	4000A	255mm	463mm	394mm	
6300A	5000A	255mm	604mm	536mm	

COMBINATION ELBOWS (Flatwise/Edgewise & Edgewise/Flatwise)	Rating (Amps)		Max. Combination Elbow		
	Cu	Al	Z	X	Y
	1000A	800A	600mm	750mm	511mm
1250A	1000A	600mm	750mm	521mm	
1350A	-	600mm	750mm	526mm	
1600A	1250A	600mm	750mm	539mm	
-	1350A	600mm	750mm	539mm	
2000A	1600A	600mm	750mm	556mm	
2500A	2000A	600mm	750mm	576mm	
3200A	2500A	600mm	750mm	643mm	
4000A	3200A	600mm	750mm	678mm	
5000A	4000A	600mm	750mm	718mm	
6300A	5000A	600mm	750mm	859mm	

**Flatwise Tee**

Flatwise Tees are used to split one Busbar run into two runs going in different directions, this can be very helpful in utilizing a small amount of space and supplying two different parts of the building with power. They have been developed by combining a feeder length and a Flatwise elbow together into one piece.



Flatwise Tee Section

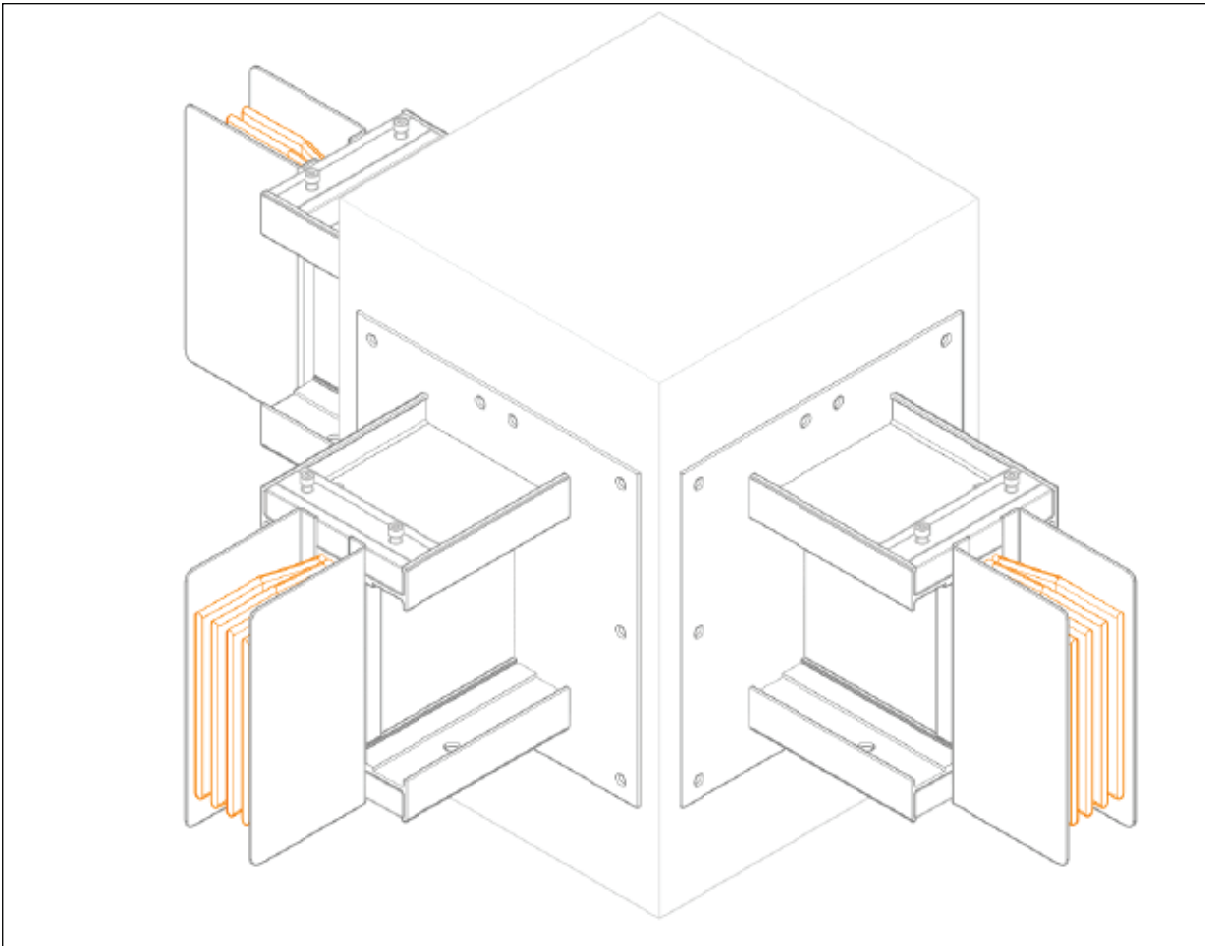
	Rating (Amps)		Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
	Cu	Al	X	Y	X	Y	X	Y
FLATWISE TEE	1000A	800A	512mm	256mm	700mm	350mm	1500mm	750mm
	1250A	1000A	532mm	266mm	700mm	350mm	1500mm	750mm
	1350A	-	542mm	271mm	700mm	350mm	1500mm	750mm
	1600A	1250A	568mm	284mm	700mm	350mm	1500mm	750mm
	-	1350A	568mm	284mm	700mm	350mm	1500mm	750mm
	2000A	1600A	602mm	301mm	700mm	350mm	1500mm	750mm
	2500A	2000A	642mm	321mm	700mm	350mm	1500mm	750mm
	3200A	2500A	776mm	388mm	1000mm	500mm	1500mm	750mm
	4000A	3200A	846mm	423mm	1000mm	500mm	1500mm	750mm
	5000A	4000A	926mm	463mm	1000mm	500mm	1500mm	750mm
	6300A	5000A	1208mm	604mm	1300mm	650mm	1500mm	750mm



### Edgewise Tee

Edgewise Tees are used to split one run into two, this can be very helpful in utilizing a small amount of space and supplying two different parts of the building with power. They have been developed by combining a feeder length and an Edgewise elbow together into one piece.

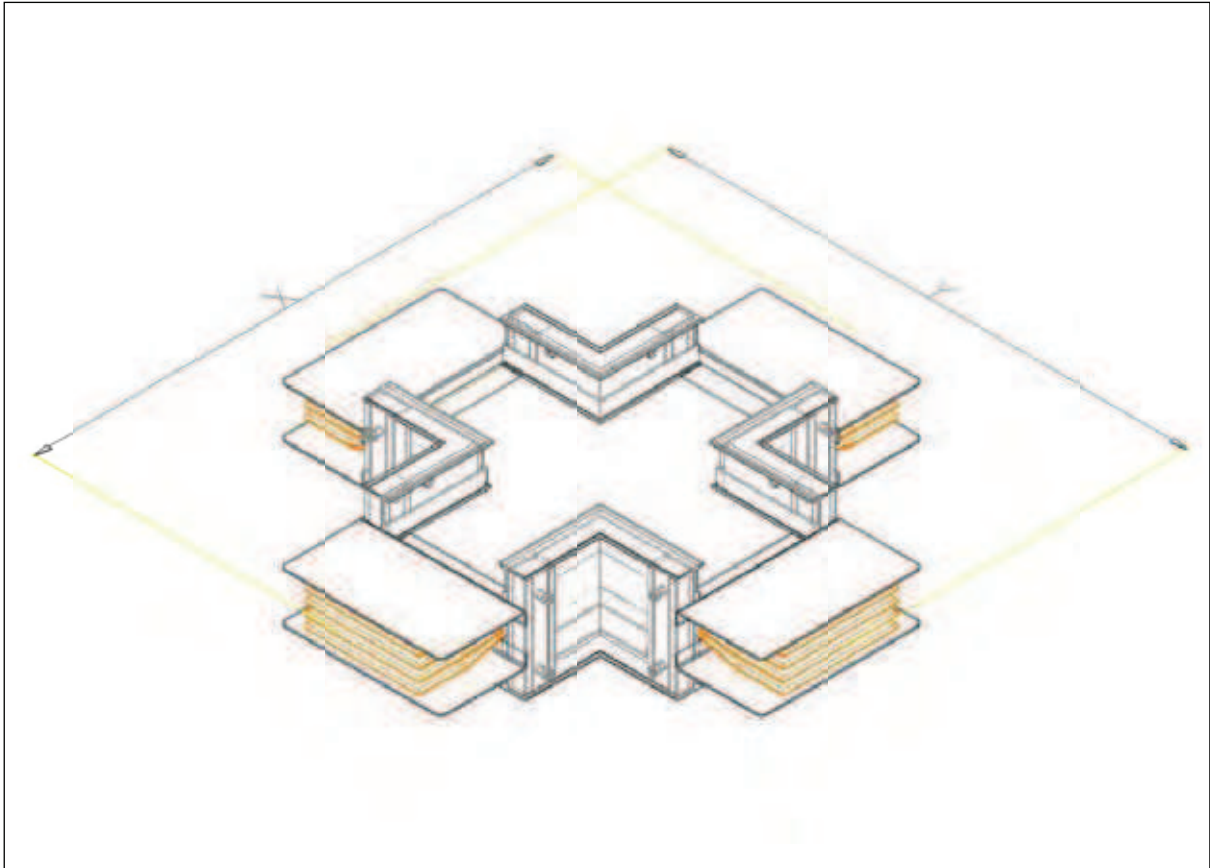
Edgewise Tees sizes are dependant on some factors, the flange stumps will be the size of panel flanges, the box size depends on the rating of the busbar and also on how many phases are needed. Please contact the Powerbar engineering department for further information.



Edgewise Tee Section

**Flatwise Cross**

Flatwise Cross are used to split one run into three, this can be very useful in utilizing a small amount of space and distributes power to multiple parts of the building. They have been developed by combining two Flatwise elbows together into one piece.

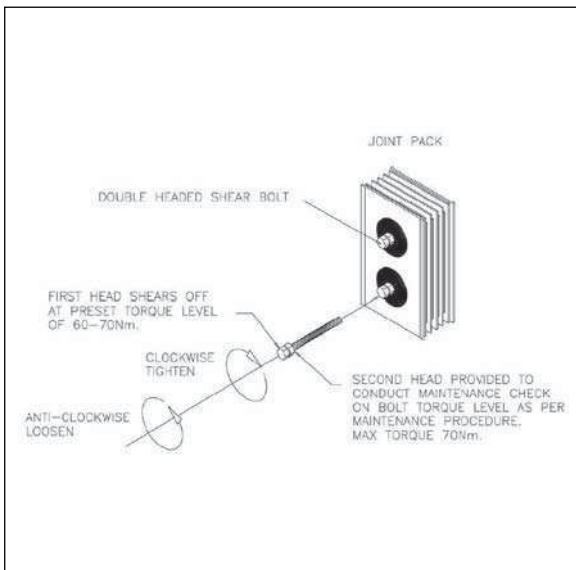


Flatwise Cross Section

FLATWISE CROSS	Rating (Amps)		Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
	Cu	Al	X	Y	X	Y	X	Y
	1000A	800A	512mm	512mm	700mm	700mm	1500mm	1500mm
1250A	1000A	532mm	532mm	700mm	700mm	1500mm	1500mm	
1350A	-	542mm	542mm	700mm	700mm	1500mm	1500mm	
1600A	1250A	568mm	568mm	700mm	700mm	1500mm	1500mm	
-	1350A	568mm	568mm	700mm	700mm	1500mm	1500mm	
2000A	1600A	602mm	602mm	700mm	700mm	1500mm	1500mm	
2500A	2000A	642mm	642mm	700mm	700mm	1500mm	1500mm	
3200A	2500A	776mm	776mm	1000mm	1000mm	1500mm	1500mm	
4000A	3200A	846mm	846mm	1000mm	1000mm	1500mm	1500mm	
5000A	4000A	926mm	926mm	1000mm	1000mm	1500mm	1500mm	
6300A	5000A	1208mm	1208mm	1300mm	1300mm	1500mm	1500mm	

### Joint Packs

The Powerbar joint Pack is a compression joint design, which utilises a specially designed Belleville washer to distribute the pressure evenly over the joint pack. There are two 3mm fish plate conductors for each phase, these have a bevelled edge to allow for easier installation, when fully torqued the fish plates will sandwich the busbar conductor.



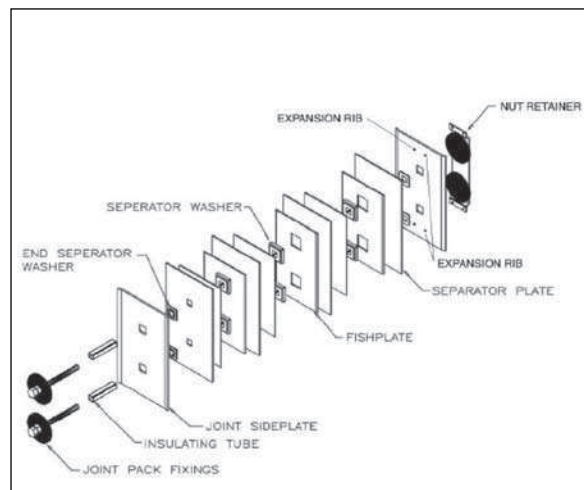
Joint Detail

The earth path is maintained through the joint both by the joint pack cover and by the earth side plate. The joint pack is supplied in specific sizes depending on the rating of busbar required. The RED indicator disk will give a clear indication if any joint is not properly torqued, if the joint is not torqued the indicator disk will still be present, this RED disk is highly visible and can be seen from a distance.



Joint Detail

Our joint pack features a special torque indicating, double headed break-off bolt. This double headed shear bolt eliminates the need for torque wrenches and assures proper torque of 70Nm. When the bolt reaches the preset torque level the first head will shear off, the indicator disk will fall away at this point to indicate the joint is now torqued correctly.



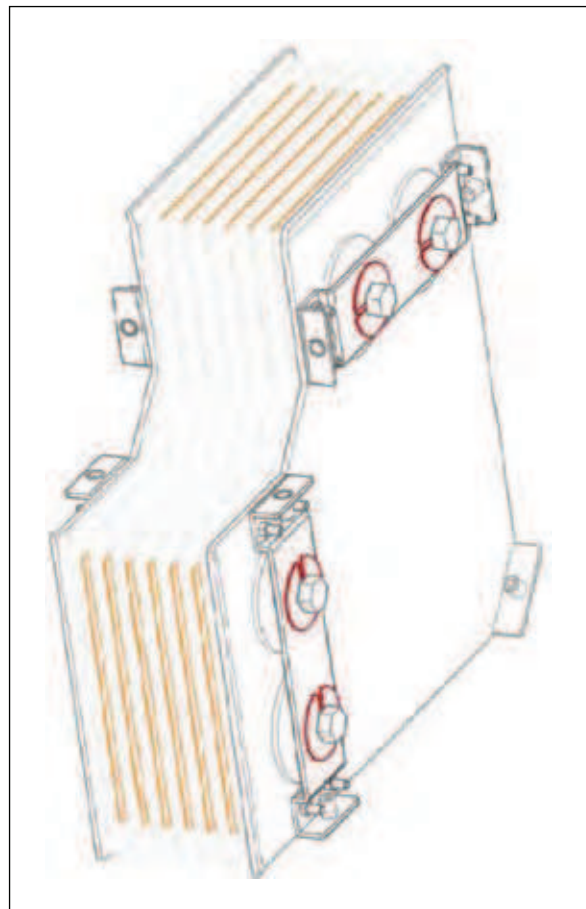
Joint Detail

## Elbow Joint Packs

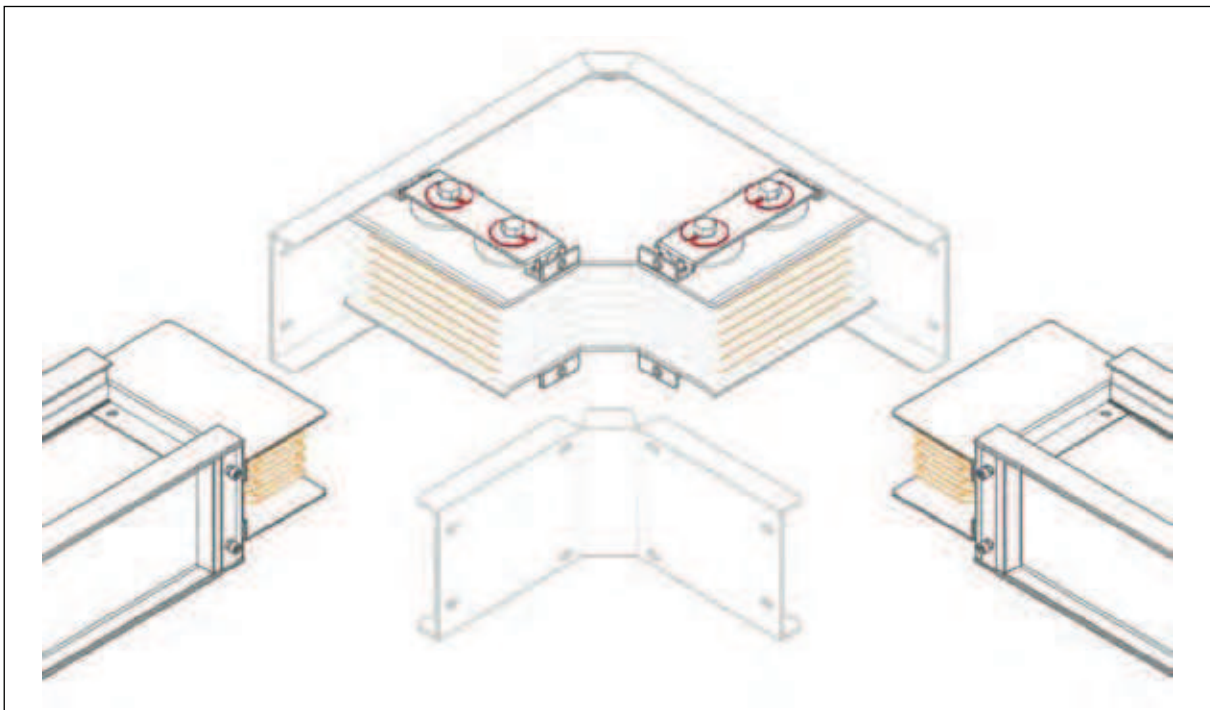
### Flatwise Elbow Joint Packs

Flatwise elbow joint packs are used mainly to make 90° changes in the direction of the busbar system, these can be used to turn the busbar route up or down if the busbar is running on its edge, or to turn the busbar route left or right when the busbar is running on its flat.

Flatwise elbow joint packs are constructed using a similar design as the "straight joint pack" using 3mm fish plates, which are "L-shaped" for this assembly, the standard double headed torque bolt is used to ensure correct torque level on the finished joint. The size of the joint pack elbows will vary depending on the rating of the busbar.



Flatwise Joint Pack



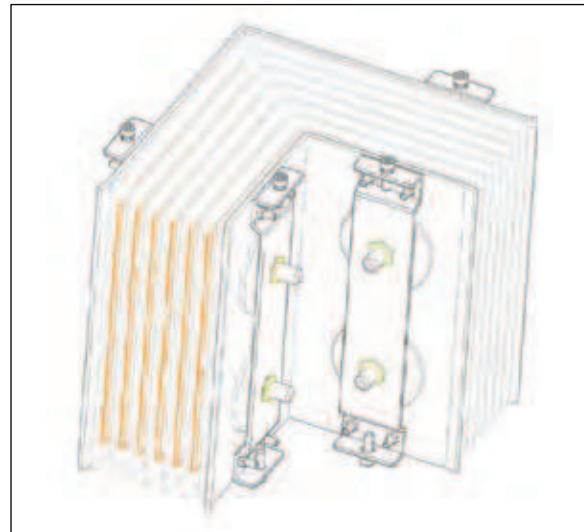
Typical Installation



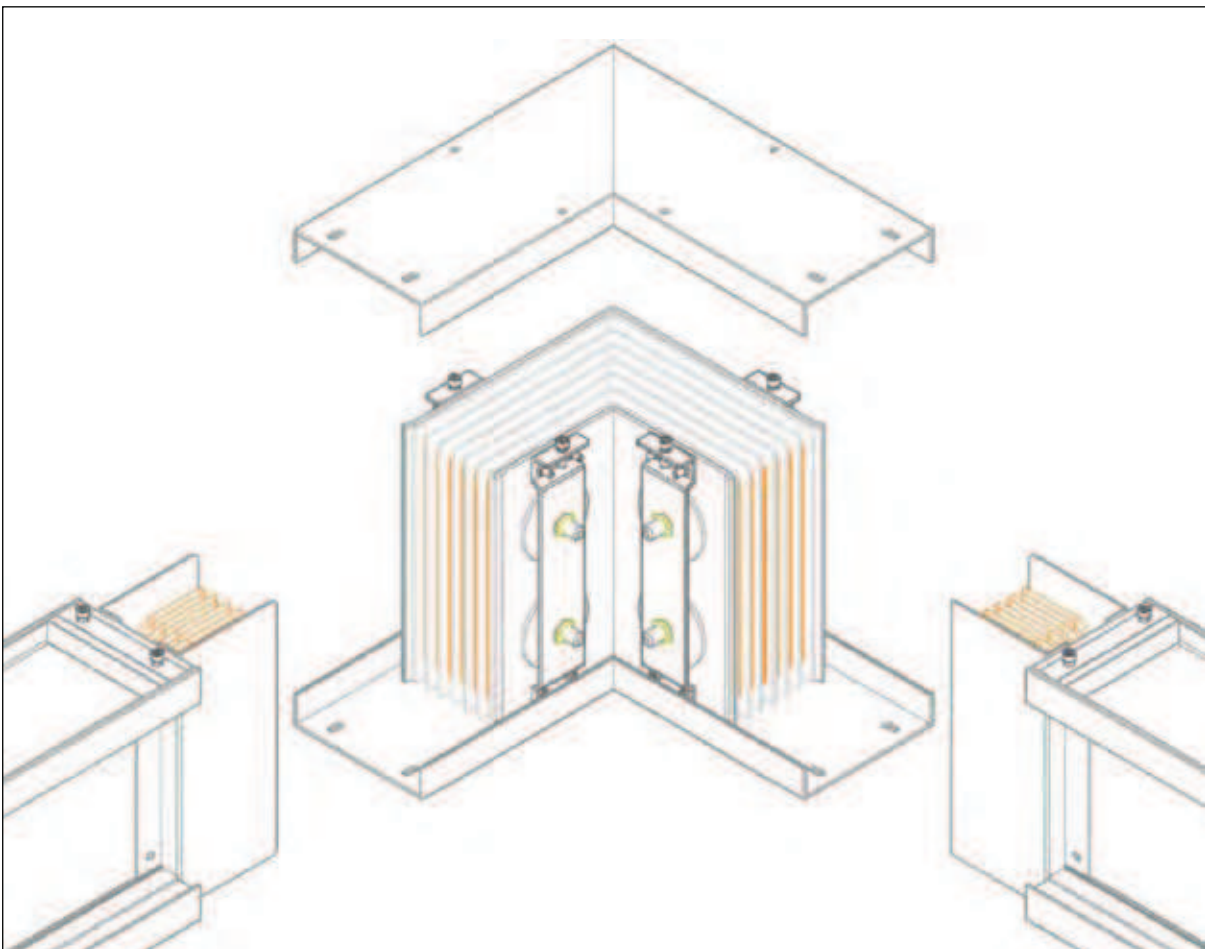
### Edgewise Elbow Joint Packs

Edgewise Elbow Joint Packs are used mainly to make 90° changes in the direction of the busbar system, these can be used to turn the busbar route up or down if the busbar is running on its Flat, or to turn the busbar route left or right when the busbar is running on its Edge.

Edgewise elbow joint packs are constructed using a similar design as the "straight joint pack" using 3mm fish plates, which have a "90° bend" for this assembly, the standard double headed torque bolt is used to ensure correct torque level on the finished joint. The size of the joint pack elbows will vary depending on the rating of the busbar.



Edgewise Joint Pack



Typical Installation



## Fixings

Busbar can either be installed to run on its "Flat" or on its "Edge", the decision of how to run the busbar is governed by a number of factors:

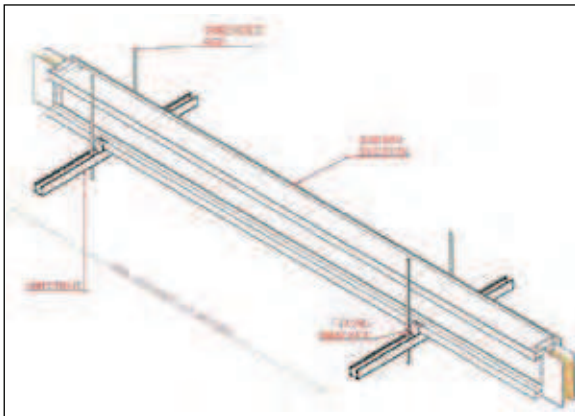
- » Busbar route
- » Type of installation
- » Available space
- » Size of busbar

The modular design of the Powerbar Busbar System is so it lends itself readily to either type of installation.

## Edge Installation

This is the preferred method of installation for the smaller CSA busbar systems, it is also the main method used to install distribution busbar in building risers, as the rising busbar needs to run with the "Neutral" on the left hand side as you look at the front face of the busbar, this is to ensure the tap off face of the busbar is exposed to accept the tap off units.

For edge installation the larger HPB fixing bracket (vertical) is used.

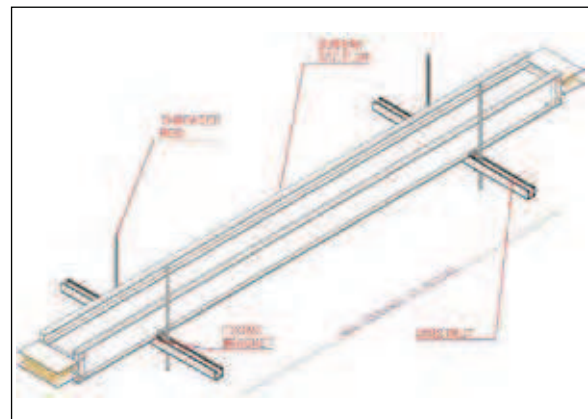


Edge Installation Detail

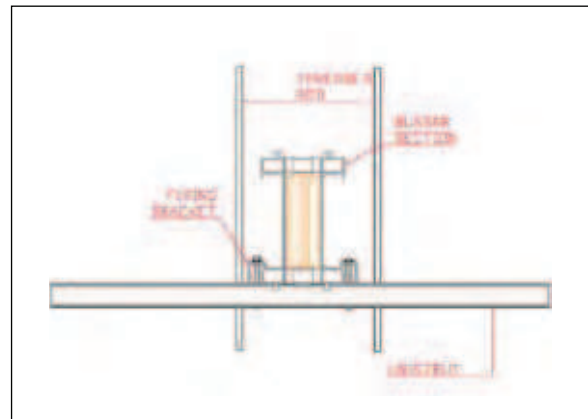
## Flat Installation

This tends to be the preferred method of installation for the higher rating busbar systems, the multi-stack systems which have a larger CSA. When coordinated through the building on its flat any busbar rating only has a "height" of 145mm.

For flat installation the Smaller HPB fixing bracket (horizontal) is used.



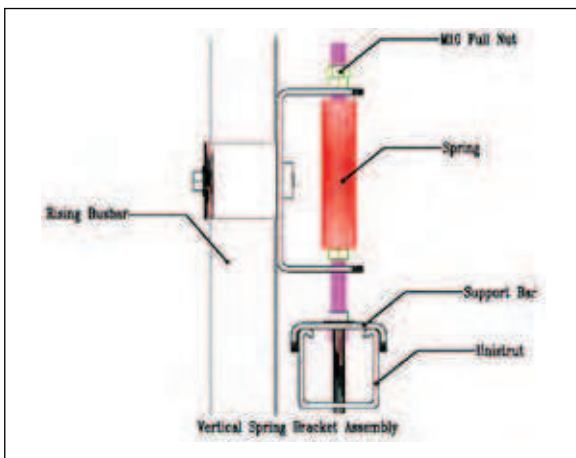
Flat Installation Detail



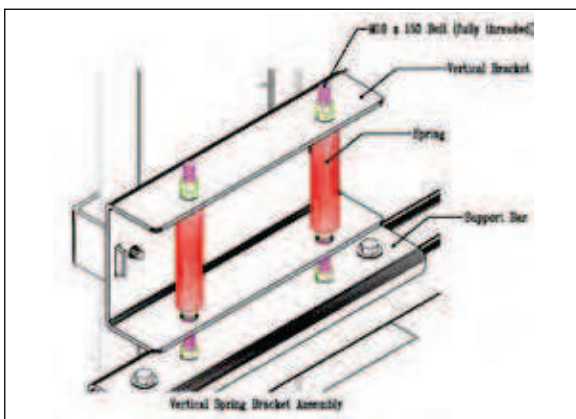
Fixing Clamp Arrangement

## Spring Hanger

Spring Hangers are used to support vertical Busbar runs. There are used to support the weight of the Busbar system on each floor and they also compensate for minimal building movement and thermal expansion. The maximum distance between spring hangers may not exceed 5m. The recommended installation method is pictured. The standard spring bracket is designed to suit our single stack busbar system, for multi-stack arrangements please contact our engineering department for details.



Recommended installation method for Spring Hanger



Spring Hanger Arrangement

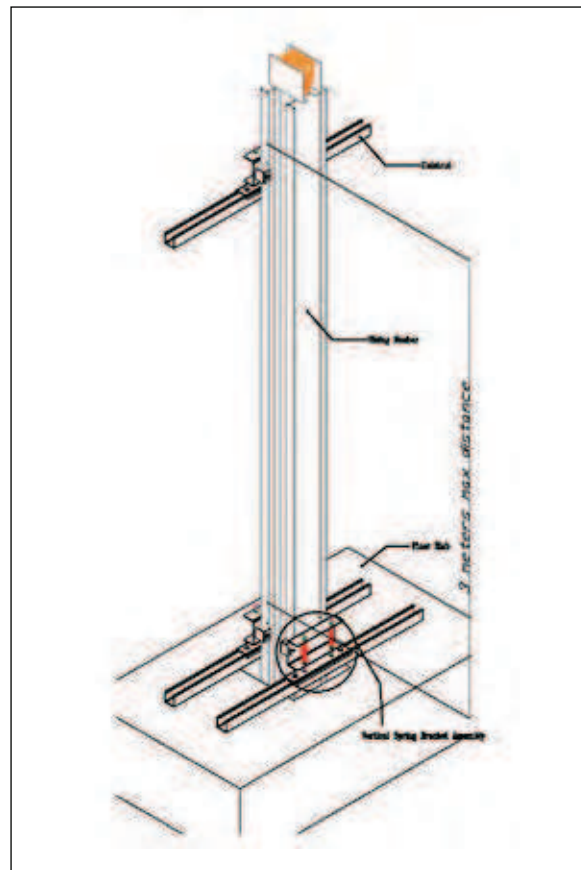
## Specification Detail

### Spring

- » Max load 50kg each (6 x spring = 50 x 6 = 300kg)
- » O/D - 17.5 mm
- » I/D - 11.0mm
- » Wire diameter - 3.66
- » Free length - 77.0
- » Maximum deflection - 11mm (4.55kg/mm)

### Busbar

- » 2500 TP/NE 5-pole Busbar system
- » Maximum weight/metre = 68kg
- » Approximate weight of 3 metre Busbar section = 193kg (max 204kg)
- » Maximum load on each spring = 32kg



Vertical Spring Bracket Assembly

## End Feed Units

Cable End Feed units are used on the ends of busbar risers which are cable fed. They can be on the top of the busbar, feeding down through the building, or they can be located on the bottom of the busbar riser, feeding up through the building.

The size of the cable end feed unit depends on a number of factors;

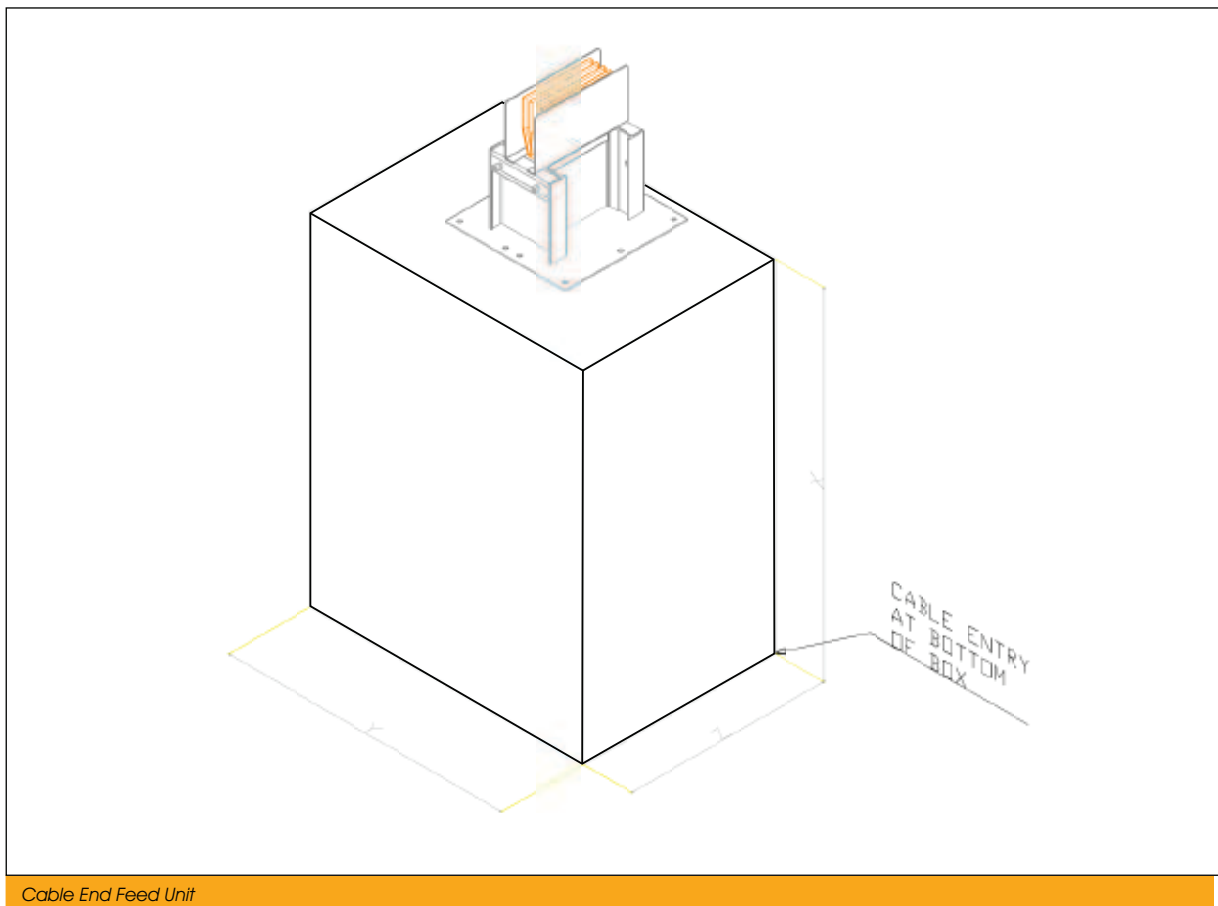
- » Rating of busbar
- » Size of cable
- » Number of cable
- » Is protect device or isolator required?

The table below can be used as a size guide to determine the cable end feed unit to suit your installation.

END FEED UNIT	Rating (Amps)		Typical CEB Sizes		
	Cu	Al	X	Y	Z
	1000A	800A	600mm	600mm	320mm
1250A	1000A	600mm	600mm	320mm	
1350A	-	600mm	600mm	320mm	
1600A	1250A	600mm	600mm	320mm	
-	1350A	600mm	600mm	320mm	
2000A	1600A	600mm	600mm	320mm	
2500A	2000A	600mm	600mm	TBC	
3200A	2500A	800mm	600mm	TBC	
4000A	3200A	800mm	600mm	TBC	
5000A	4000A	800mm	600mm	TBC	
6300A	5000A	800mm	600mm	TBC	

**NOTE:** The list above is based on typical situation; other factors need to be considered when deciding on which type of box to use, such as, location of box, cable size, protection devices (fault rating) additional accessories etc.

The units can be specially manufactured to suit your requirements, a typical requirement would be a gland plate on the side to allow side entry cables. Please contact the Powerbar engineering department for further information.



Cable End Feed Unit

## Centre Feed Units

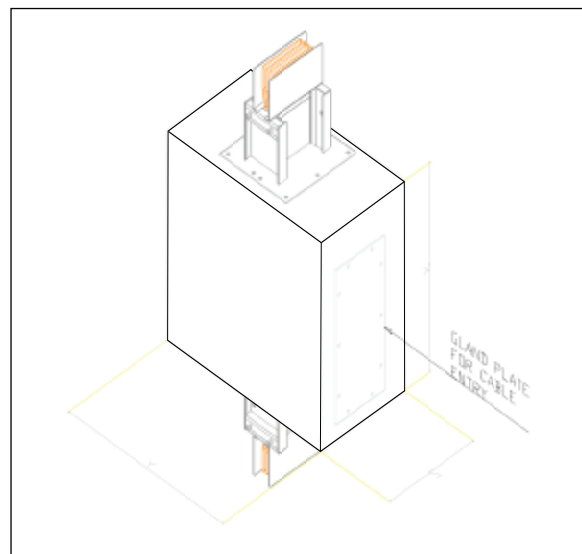
Cable Centre Feed units are used on the centre of busbar risers which are cable fed. They are used to allow the busbar to feed from a central location, feed both up and down through the busbar system. The size of the cable Centre feed unit depends on a number of factors;

- » Rating of Busbar
- » Size of cable
- » Number of cables
- » Is a protection device OR a isolator Required

The table below can be used as a size guide to determine the cable Centre feed unit to suit your installation.

CENTRE FEED UNIT	Rating (Amps)		Typical CEB Sizes		
	Cu	Al	X	Y	Z
	1000A	800A	600mm	600mm	320mm
1250A	1000A	600mm	600mm	320mm	
1350A	-	600mm	600mm	320mm	
1600A	1250A	600mm	600mm	320mm	
-	1350A	600mm	600mm	320mm	
2000A	1600A	600mm	600mm	320mm	
2500A	2000A	600mm	600mm	TBC	
3200A	2500A	800mm	600mm	TBC	
4000A	3200A	800mm	600mm	TBC	
5000A	4000A	800mm	600mm	TBC	
6300A	5000A	800mm	600mm	TBC	

**NOTE:** The list above is based on typical situation; other factors need to be considered when deciding on which type of box to use, such as, location of box, cable size, protection devices (fault rating) additional accessories etc.

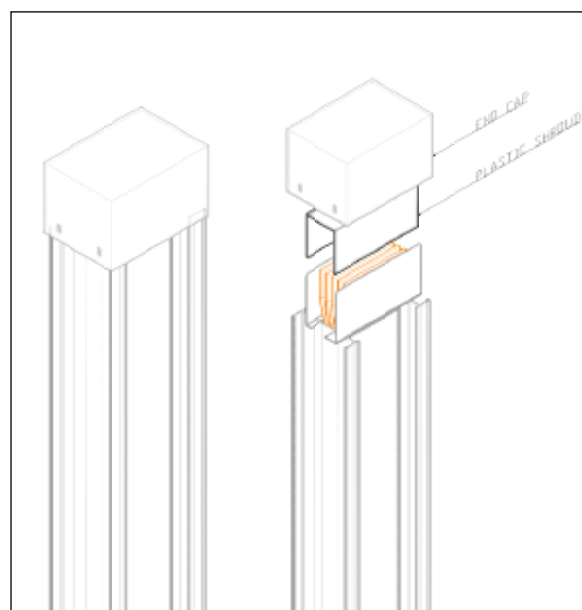


Centre Feed Unit

## End Caps

End caps are used to safely cap off the end of a busbar run, typically a rising busbar might be capped off at the top of the run at the end of the final section of busbar, the End Cap units are factory fitted but they can be easily removed on site to allow for extension of a busbar system, etc.

If the busbar run is bottom fed the End Cap would be located at the top end of the busbar, if the system is top fed then the End Cap would be located at the bottom, In the case of a centre fed system then two End Caps must be used one at the top and one at the bottom.

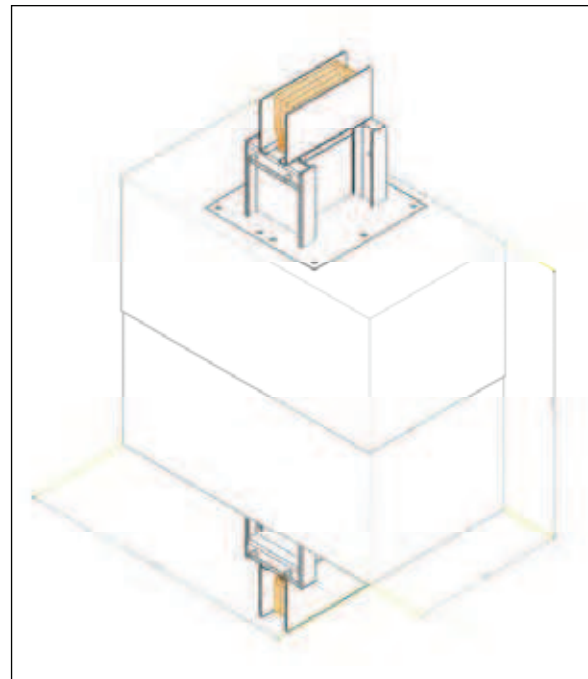


End Cap Unit

## Expansion Units

Expansion Units are fitting which are used to accommodate for expansion and contraction of a busbar system and for building movement. Expansion units are typically installed in the centre of long busbar runs, and might also be used at the beginning of riser runs to minimize the stress on the lower section of the busbar run. Another common use would be where a busbar crosses an expansion joint of a building.

Expansion Units are recommended when a straight busbar run exceeds 60m. Expansion units allow for a 40mm movement along the length of the busbar run.



Expansion Unit

EXPANSION UNITS	Rating (Amps)		Busbar Size (mm)		Length	Expansion Box (mm)	
	Cu	Al	Depth	Width		Depth	Width
	1000A	800A	130mm	145mm	800mm	250mm	265mm
	1250A	1000A	150mm	145mm	800mm	270mm	265mm
	1350A	-	160mm	145mm	800mm	280mm	265mm
	1600A	1250A	185mm	145mm	800mm	305mm	265mm
	-	1350A	185mm	145mm	800mm	305mm	265mm
	2000A	1600A	220mm	145mm	800mm	340mm	265mm
	2500A	2000A	260mm	145mm	800mm	380mm	265mm
	3200A	2500A	393mm	145mm	800mm	513mm	265mm
	4000A	3200A	463mm	145mm	800mm	583mm	265mm
	5000A	4000A	543mm	145mm	800mm	663mm	265mm
	6300A	5000A	826mm	145mm	800mm	946mm	265mm



### Special Sections

We manufacture a variety of more specialist fittings and components depending on the requirements of the system, ranging from Step up/down Reducers, Phase Rotation units, In-line disconnect Cubicles, In-line Tap Off Units, custom built busbar connection Units, etc. Some are detailed below, please contact the Powerbar engineering department for further information.

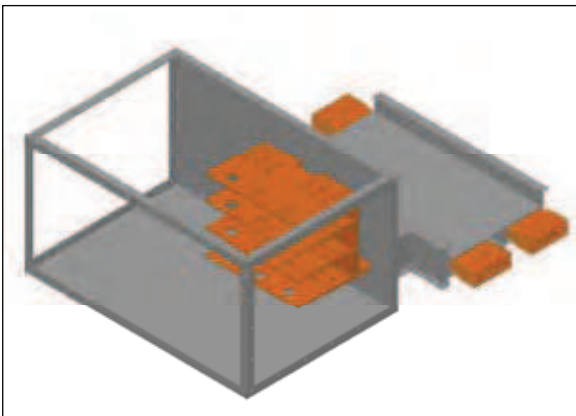
#### Step Up / Down Reducers

Busbar Reducer are used to step up or down between different busbar ratings where a reduction in the busbar size or rating may be required. These devices can also be used to "split" a main header busbar system into two smaller sub-systems; a typical example might be splitting a 4000A busbar run into two runs of 2000A.

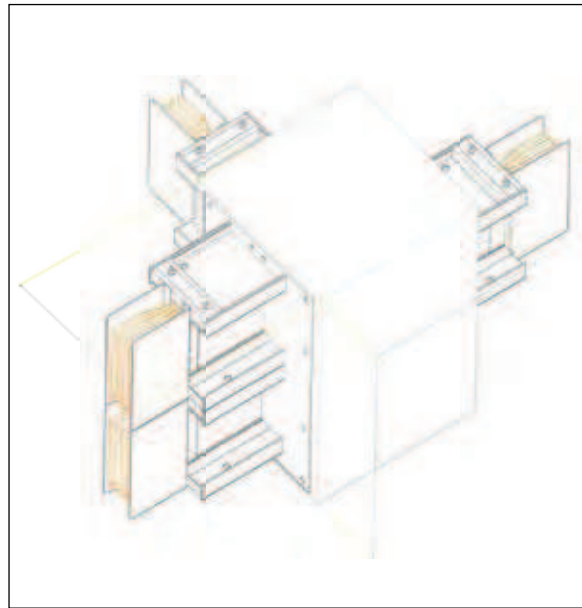
#### Phase Rotation Units

Phase Rotation Units have a number of uses, they can be used to rotate the Phasing of a busbar system through 180° (N L1 L2 L3 to L3 L2 L1 N), these units can also be used to "transpose" the busbar Phases to suit the system it is been connected too, (N L1 L2 L3 to N L3 L2 L1).

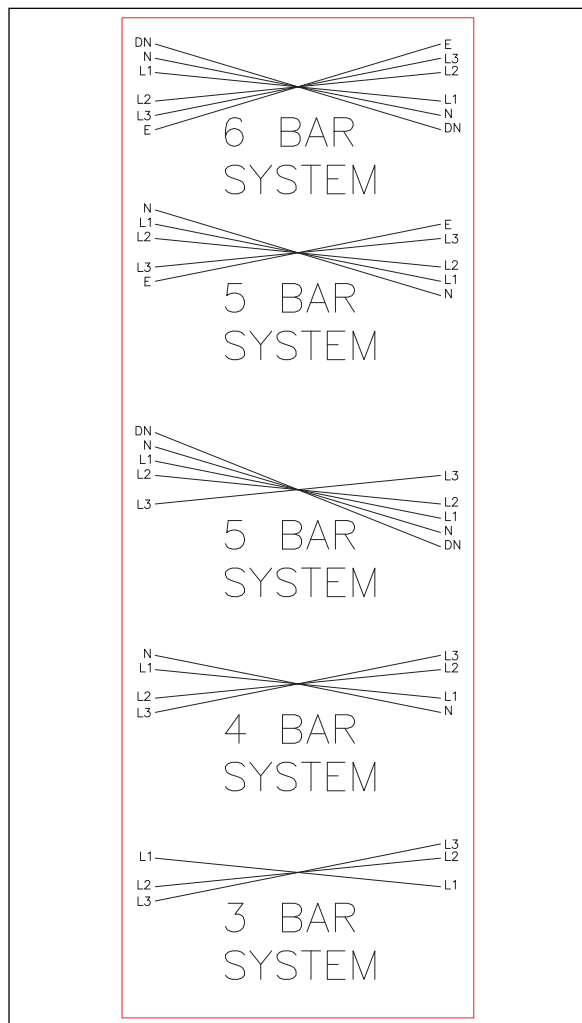
Powerbar Ltd can produce a wide range of "special" sections of busbar to suit a wide variety of applications and unusual issues that may arise. For any special requirements please contact the Powerbar engineering department for further information.



Special Section Detail (3D CAD)



Step Up/Step Down Reducer



Typical Phase Rotation