



E+I ENGINEERING GROUP

HIGH POWERBAR

UL857 ALUMINUM



PowerBar



HIGH POWERBAR

UL857 ALUMINIUM

E+I Engineering's High Powerbar (HPB) UL857 range is a 600 Volt totally encased, non-ventilated, low impedance busduct. The range is available from 800A - 4000A with multiple bar configurations to suit project requirements.

The busduct is housed in an aluminum casing which acts as a ground. Ingress protection ratings are available from IP55 - IP67.

Features:

- Epoxy resin coated copper conductors with tin or silver coated finish
- Joint pack construction with double headed shear bolts for quick installation
- Up to six busplug points per 12ft length
- All busplugs have mechanical/ electrical interlocks with a 'ground first, break last' safety feature
- Pressed out tags for busplug connections

STANDARDS

Standards

The HPB UL range is UL857 listed and manufactured in a certified management system environment where Quality ISO 9001, Safety OHSAS 18001 and Environmental ISO 14001 standards are applied to all aspects of the manufacturing and installation processes. We meet the requirements of NEMA, CSA, IEEE, ANSI, IEC & CE.

UL Listed

Powerbar completed extensive testing at UL accredited laboratories to ensure the product we supply meets UL requirements.

UL 857

Sub-clauses	Description
8.2.1	Verification of Temperature Rise Limits
8.2.2	Verification of Dielectric Voltage Withstand Test
8.2.2.2	Clamped Joint Test
8.2.2.3	Reduced Insulation Thickness Test
8.2.3	Verification of Short Circuit Withstand
8.2.3.1.1.2	Dielectric Test Withstand Tests
8.2.6	Verification of Insulation Resistance and Dielectric Withstand After Exposure to Rain
8.2.7.1	Verification of Bending Resistance
8.2.7.2	Verification of Impact Strength
8.2.7.3	Verification of Crushing Resistance
8.2.7.4	Verification of Resistance to Bus Bar Pull Out
8.2.8	Verification of Overload and Endurance of Non-Switching Plug-in Devices
8.2.9	Verification of Resistance to Aging
8.2.10	Verification of Metallic Coating Thickness
8.2.11	Verification of Insulation Base and Support Strength
8.2.12	Gasket Tests
Ref to ANSI/UL 50	Type Rating Tests (Ingress Protection Tests) for the 2 series

Seismic Compliance

The product range is certified for Seismic withstand capability and has a qualification level - high (Zone-5) in accordance to IEEE standard 693-2005.

All certificates available on request



OHSAS 18001:2007
OHS 533652

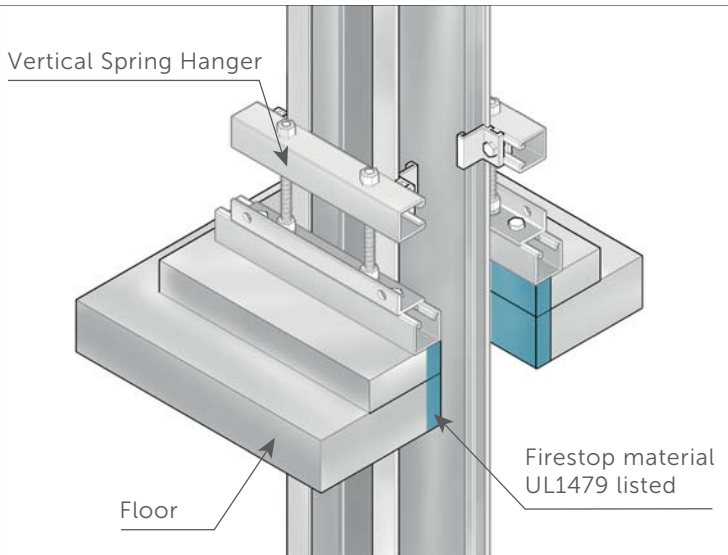


ISO 9001:2008
FM 12680



ISO 14001:2004
No: EMS 566536

TECHNICAL FEATURES



UL Fire Stop System

- High Powerbar is constructed from high density 55% conductivity aluminum
- The low impedance sandwich design:
 - Improves heat dissipation
 - Improves short circuit rating
 - Reduces voltage drop/ impedance
 - Removes potential pathways for flame, smoke and gas
- E+I Engineering's patented process of pressed out tabs to connect busplugs protects the integrity of the conductor
- HPB is constructed with an all-aluminium housing. Aluminium is an extremely light metal and is cheaper and easier to install than steel. Aluminium is much less reactive than steel so it is more durable and easier to maintain.
- E+I Engineering offer a 50% or 100% fully isolated ground for systems where ground isolation is required.
- A fully rated 200% neutral option is available for busduct systems with non-linear loads. The additional neutral capacity prevents overloading caused by zero sequence harmonic currents
- HPB UL857 can be used in 'Through-Penetration Fire Stop Systems' as listed in the UL Fire Resistance Directory

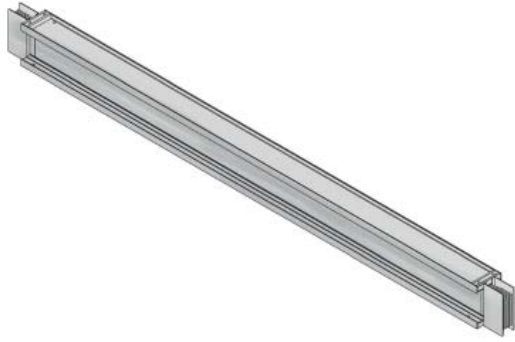
TECHNICAL FEATURES

Phase Configurations

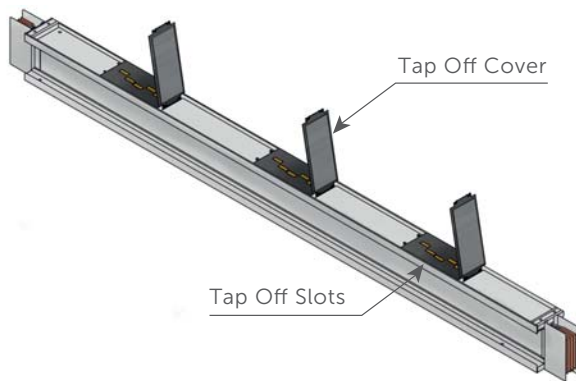
Configuration	Phases	Neutral	Ground
TP	100%	0%	Case
TP/N	100%	100%	Case
TP/E	100%	0%	100% or 50%
TP/NE	100%	100%	100% or 50%
TP/DN	100%	200%	Case

Note: Case refers to the Aluminum casing being used as a ground.

STRAIGHT LENGTHS



Feeder lengths account for the bulk of a busduct run



Distribution lengths allow Busplugs to be plugged into the busduct run

Straight Lengths

Straight lengths can be supplied at any length from 2ft - 12ft.

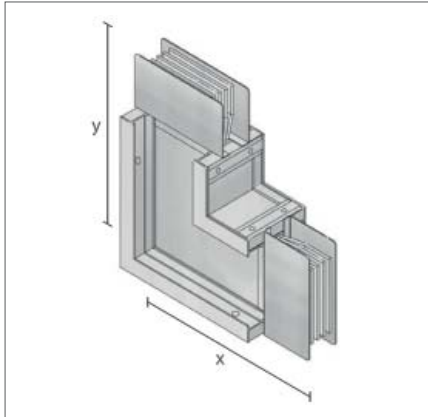
The busplug slot outlet and cover are made from a durable, high strength, Class B, 130°C insulation material.

The busplug slot cover prevents access to the contacts behind the cover and protects it from the entry of dirt, dust or moisture. Busplugs are IP55 as standard but higher levels up to IP67 can be provided upon request.

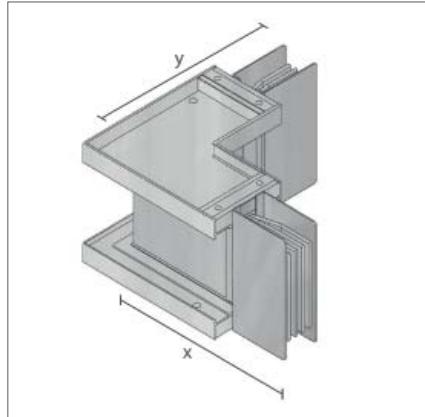
Busduct Rating (Amps)	Construction Type	Busduct Size			
		Width		Height	
		in	mm	in	mm
800A	Single	4.72"	120mm	5.83"	148mm
1000A	Single	5.51"	140mm	5.83"	148mm
1200A	Single	6.30"	160mm	5.83"	148mm
1350A	Single	6.89"	175mm	5.83"	148mm
1600A	Single	8.07"	205mm	5.83"	148mm
2000A	Single	10.24"	260mm	5.83"	148mm
2500A	Double	14.76"	375mm	5.83"	148mm
3000A	Double	17.13"	435mm	5.83"	148mm
4000A	Triple	23.82"	605mm	5.83"	148mm

Note: The maximum and minimum sizes recommended are not the limits of what can be produced, but a guideline to help you choose the correct product. Dimensions are taken from the centre of the joint.

ELBOWS



Flatwise Elbows



Edgewise Elbows

Flatwise and Edgewise Elbows

Flatwise and edgewise elbows are used to make 90° changes in the direction of the busduct system. E-I Engineering can also manufacture specially angled elbows for both flatwise and edgewise products.

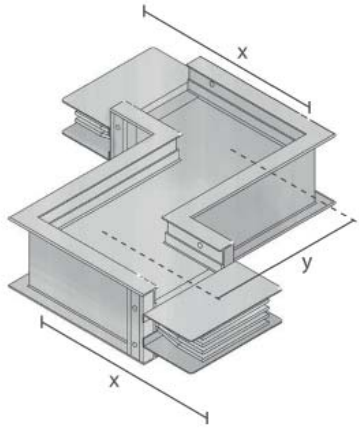
Flatwise Elbow (Up or Down)

Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Maximum Leg Size	
	X and Y		X and Y		X and Y	
	in	mm	in	mm	in	mm
800A	9.763"	248mm	14"	356mm	30"	762mm
1000A	9.960"	253mm	14"	356mm	30"	762mm
1200A	10.551"	268mm	14"	356mm	30"	762mm
1350A	10.826"	275mm	14"	356mm	30"	762mm
1600A	11.220"	285mm	14"	356mm	30"	762mm
2000A	12.322"	313mm	14"	356mm	30"	762mm
2500A	14.330"	364mm	14"	356mm	30"	762mm
3000A	15.708"	399mm	20"	508mm	30"	762mm
4000A	17.874"	454mm	20"	508mm	30"	762mm

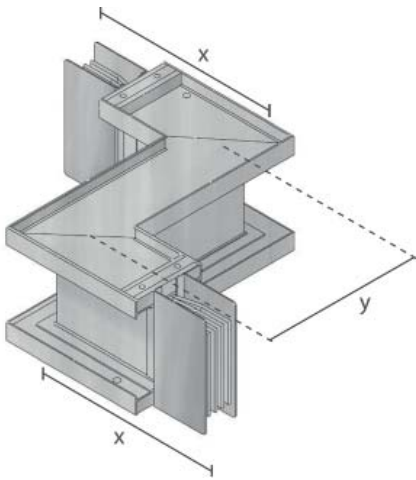
Edgewise Elbow (Left or Right)

Ratings (Amps)	Minimum Leg Size		Standard Leg Size		Standard Leg Size	
	X and Y		X and Y		X and Y	
	in	mm	in	mm	in	mm
800A, 1000A, 1200A, 1350A, 1600A, 2000A, 2500A, 3000A, 4000A	10"	254mm	14"	356mm	24"	610mm

OFFSETS



Flatwise Offset



Edgewise Offset

Offset Sections

An offset is used to avoid any obstacles eg. pipes or to steel columns and to conform to the structure of the building.

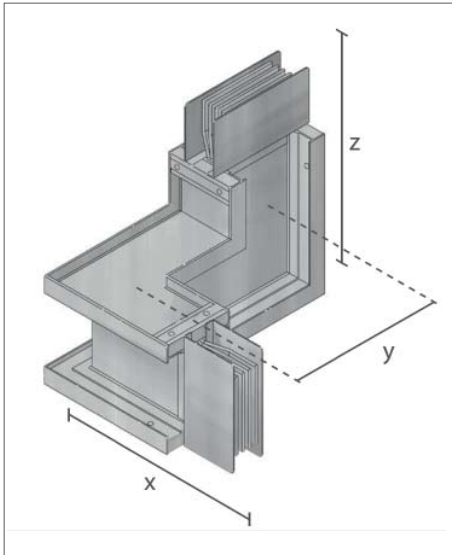
Flatwise Elbow (Up or Down)

Ratings (Amps)	Minimum Leg Size				Standard Leg Size			
	X		Y		X		Y	
	in	mm	in	mm	in	mm	in	mm
800A	9.763"	248mm	2"	51mm	26"	660mm	19.527"	496mm
1000A	9.960"	253mm	2"	51mm	26"	660mm	19.921"	506mm
1200A	10.551"	268mm	2"	51mm	26"	660mm	21.102"	536mm
1350A	10.826"	275mm	2"	51mm	26"	660mm	20.866"	550mm
1600A	11.220"	285mm	2"	51mm	26"	660mm	22.440"	570mm
2000A	12.322"	313mm	2"	51mm	26"	660mm	24.645"	626mm
2500A	14.330"	364mm	2"	51mm	26"	660mm	28.661"	728mm
3000A	15.708"	399mm	2"	51mm	26"	660mm	31.417"	798mm
4000A	17.874"	454mm	2"	51mm	26"	660mm	35.748"	908mm

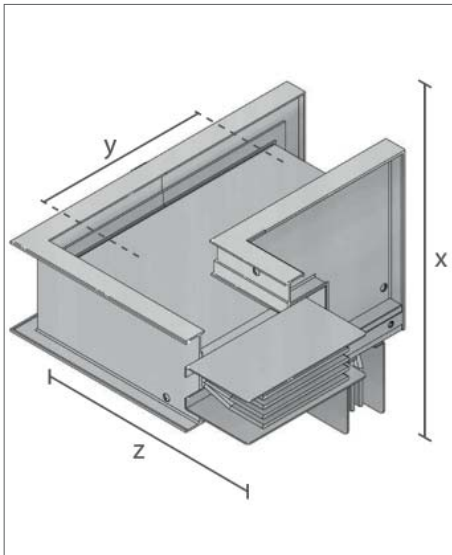
Edgewise Offset (Left or Right)

Ratings (Amps)	Minimum Leg Size				Standard Leg Size			
	X		Y		X		Y	
	in	mm	in	mm	in	mm	in	mm
800A, 1000A, 1200A, 1350A, 1600A, 2000A, 2500A, 3000A, 4000A	10"	254mm	3"	76mm	20"	508mm	24"	610mm

COMBINATIONS



Edge Right Flatwise Up



Flatwise Up Edgewise Right

Combination Elbows

Combination elbows are used to conform to the building's structure and to change the direction of the busduct within a confined space.

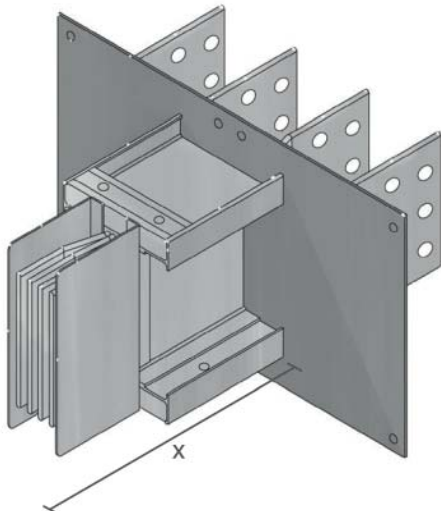
Combination Elbows

Ratings (Amps)	Minimum Leg Size					
	X (Edgewise side)		Y		Z (Flatwise side)	
	in	mm	in	mm	in	mm
800A	10"	254mm	7.181"	182.4mm	9.763"	248mm
1000A	10"	254mm	7.574"	192.4mm	9.960"	253mm
1200A	10"	254mm	7.968"	202.4mm	10.551"	268mm
1350A	10"	254mm	8.263"	209.9mm	10.826"	275mm
1600A	10"	254mm	8.854"	224.9mm	11.220"	285mm
2000A	10"	254mm	9.937"	252.4mm	12.322"	313mm
2500A	10"	254mm	12.200"	309.9mm	14.330"	364mm
3000A	10"	254mm	13.381"	339.9mm	15.708"	399mm
4000A	10"	254mm	16.728"	424.9mm	17.874"	454mm

Combination Elbows

Ratings (Amps)	Maximum Leg Size					
	X (Edgewise side)		Y		Z (Flatwise side)	
	in	mm	in	mm	in	mm
800A	24"	610mm	19.763"	502mm	30"	762mm
1000A	24"	610mm	19.960"	507mm	30"	762mm
1200A	24"	610mm	20.551"	522mm	30"	762mm
1350A	24"	610mm	20.826"	529mm	30"	762mm
1600A	24"	610mm	21.220"	539mm	30"	762mm
2000A	24"	610mm	22.322"	567mm	30"	762mm
2500A	24"	610mm	24.330"	618mm	30"	762mm
3000A	24"	610mm	25.708"	653mm	30"	762mm
4000A	24"	610mm	27.874"	708mm	30"	762mm

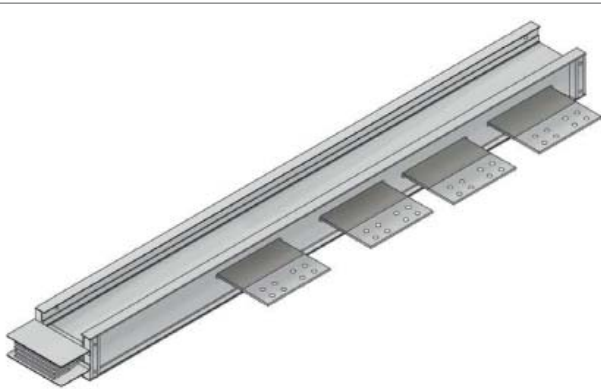
FLANGES



Panel Flange

Flange Connections

Flange connections provide a direct connection to low voltage switchgear, transformer enclosures and other electrical equipment. Standard flanges can be offset to the left or right of the section as required.



Parallel Flange

Panel Flange

The dimension (X) for the flange connection ranges from 9"/229mm up to 33"/838mm for the range 800A - 4000A.

Panel Flange

Ratings (Amps)	Minimum		Maximum	
	X		X	
	in	mm	in	mm
800A	9"	229mm	33"	838mm
1000A	9"	229mm	33"	838mm
1200A	9"	229mm	33"	838mm
1350A	9"	229mm	33"	838mm
1600A	9"	229mm	33"	838mm
2000A	9"	229mm	33"	838mm
2500A	9"	229mm	33"	838mm
3000A	9"	229mm	33"	838mm
4000A	9"	229mm	33"	838mm

FLANGES

Combination Flange

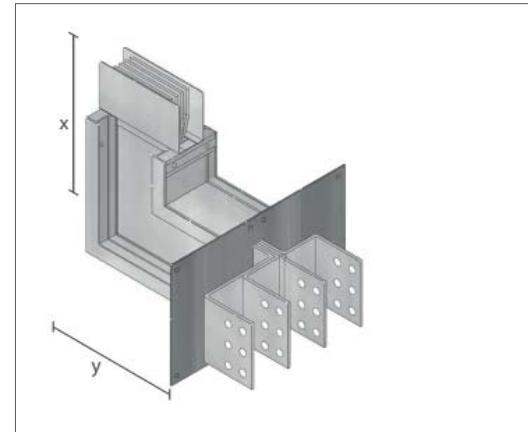
A combination flange is used when the minimum leg lengths for either the standard elbow or the standard flange cannot be met

Flange/Elbows (Flatwise)

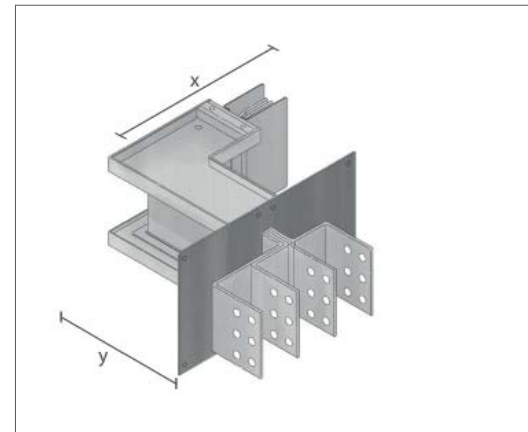
Ratings (Amps)	Minimum Leg Size				Maximum Leg Size			
	X		Y		X		Y	
	in	mm	in	mm	in	mm	in	mm
800A	9.763"	248mm	3.149"	80mm	30"	762mm	19.527"	496mm
1000A	9.960"	253mm	3.543"	90mm	30"	762mm	19.921"	506mm
1200A	10.551"	268mm	3.937"	100mm	30"	762mm	21.102"	536mm
1350A	10.826"	275mm	4.232"	107.5mm	30"	762mm	21.653"	550mm
1600A	11.220"	285mm	4.822"	122.5mm	30"	762mm	22.440"	570mm
2000A	12.322"	313mm	5.905"	150mm	30"	762mm	24.645"	626mm
2500A	14.330"	364mm	6.496"	165mm	30"	762mm	28.661"	728mm
3000A	15.708"	399mm	7.677"	195mm	30"	762mm	31.417"	798mm
4000A	17.874"	454mm	12.677"	322mm	30"	762mm	35.748"	908mm

Flange/Elbows (Edgewise)

Ratings (Amps)	Minimum Leg Size				Maximum Leg Size			
	X		Y		X		Y	
	in	mm	in	mm	in	mm	in	mm
800A, 1000A, 1200A, 1350A, 1600A, 2000A, 2500A, 3000A, 4000A	10"	254mm	5"	127mm	24"	610mm	20"	508mm

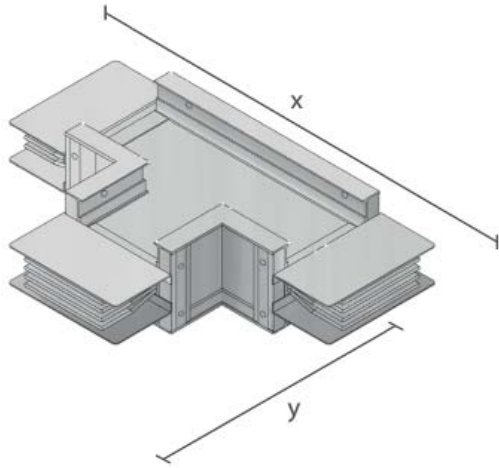


Flatwise Elbow Flange



Edgewise Elbow Flange

FLATWISE TEE'S



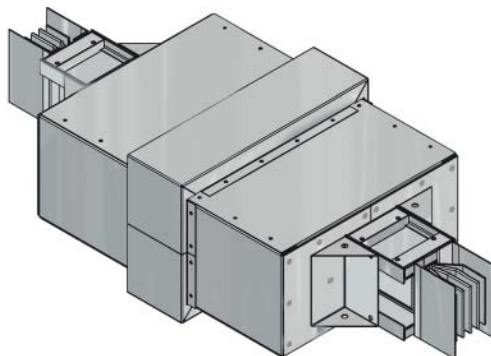
Flatwise Tee

Flatwise Tee's

Flatwise tee's are used to split one busduct run into two runs going in different directions.

Flatwise Tee

Ratings (Amps)	Minimum Leg Size				Standard Leg Size				Maximum Leg Size			
	X		Y		X		Y		X		Y	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
800A	19.527"	496mm	9.763"	248mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
1000A	19.921"	506mm	9.960"	253mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
1200A	21.102"	536mm	10.551"	268mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
1350A	21.653"	550mm	10.826"	275mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
1600A	22.440"	570mm	11.220"	285mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
2000A	24.645"	626mm	12.322"	313mm	28"	711mm	14"	356mm	60"	1524mm	26"	660mm
2500A	28.661"	728mm	14.330"	364mm	40"	1016mm	20"	508mm	60"	1524mm	26"	660mm
3000A	31.417"	798mm	15.708"	399mm	40"	1016mm	20"	508mm	60"	1524mm	26"	660mm
4000A	35.748"	908mm	17.874"	454mm	40"	1016mm	20"	508mm	60"	1524mm	26"	660mm



Expansion Unit

Expansion Units

Expansion units are used to accommodate the expansion and contraction of a busduct system as well as allow for building movement. They allow for a 2" movement along the length of the busduct.

Expansion units are recommended when a straight busduct run exceeds 196ft.

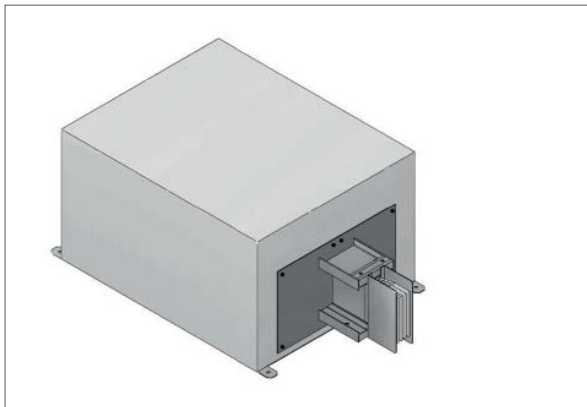
CABLE FEED UNITS

Cable Feed Units

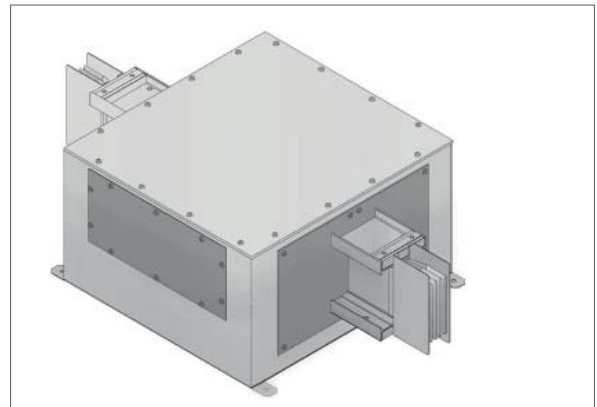
End feed units are used on the ends of busduct risers which are cable fed. Center feed units are used in the middle of busduct risers which are cable fed.

The size of cable feed required depends on a number of factors:

- rating of busduct
- size of cable
- number of cables
- use of a protective device or isolator



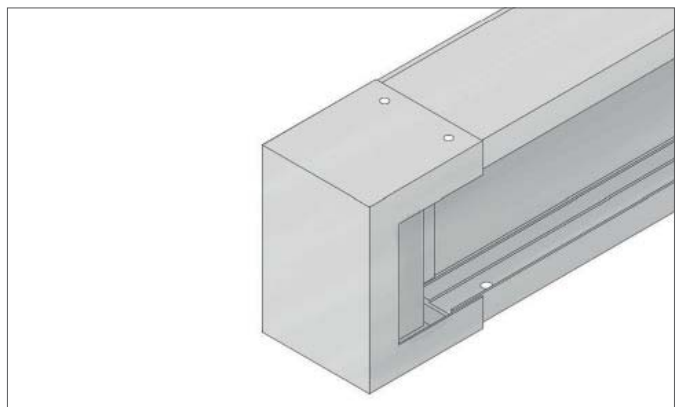
End Feed Units



Center Feed Units

End Caps

End caps are used to safely cap off the end of a busduct run. The end cap units are factory fitted but can be easily removed to allow for the extension of the system.



End Caps

SPLICE



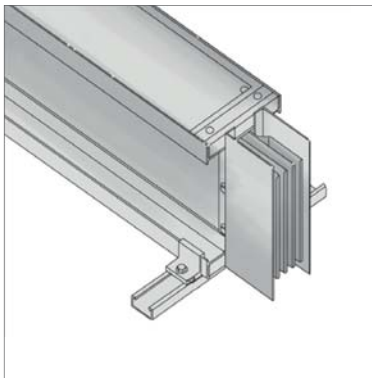
Joint Pack

E+I Engineering's Splice

E+I Engineering's splice is a compression joint design utilising a specially designed Belleville washer to distribute the pressure evenly over the splice. The splice is supplied in specific sizes depending on the rating of busduct required.

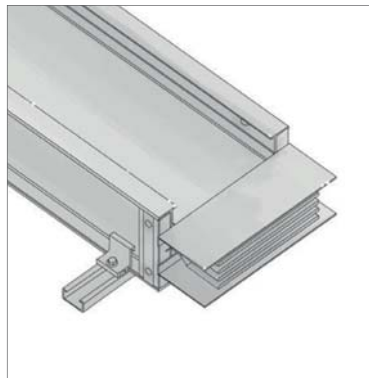
INSTALLATION

The modular design of HPB allows it to be installed flat or on its edge.



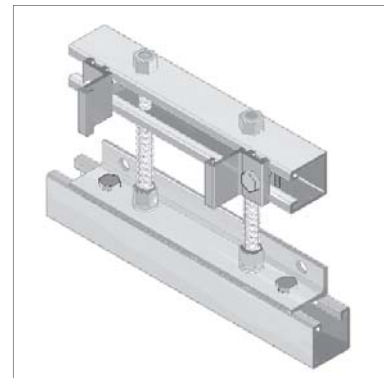
Edge installation

Edge installation is the preferred method of installation for a smaller rated busduct system.



Flat Installation

Flat installation is the preferred method of installation for a higher rated, multistack busduct system. When installed on its flat all busduct rating has a height of 145mm.



Spring Hanger

Spring hangers are used to support vertical busduct runs on the floor. They compensate for building movement and thermal expansion.

Special Pieces

E+I Engineering manufacture a variety of more specialised units and components to meet unique system requirements. These include: edgewise tee's, flatwise cross, step up/ step down reducers, phase rotation units, in-line disconnect cubicles, in-line busplugs, custom built busduct connection units.

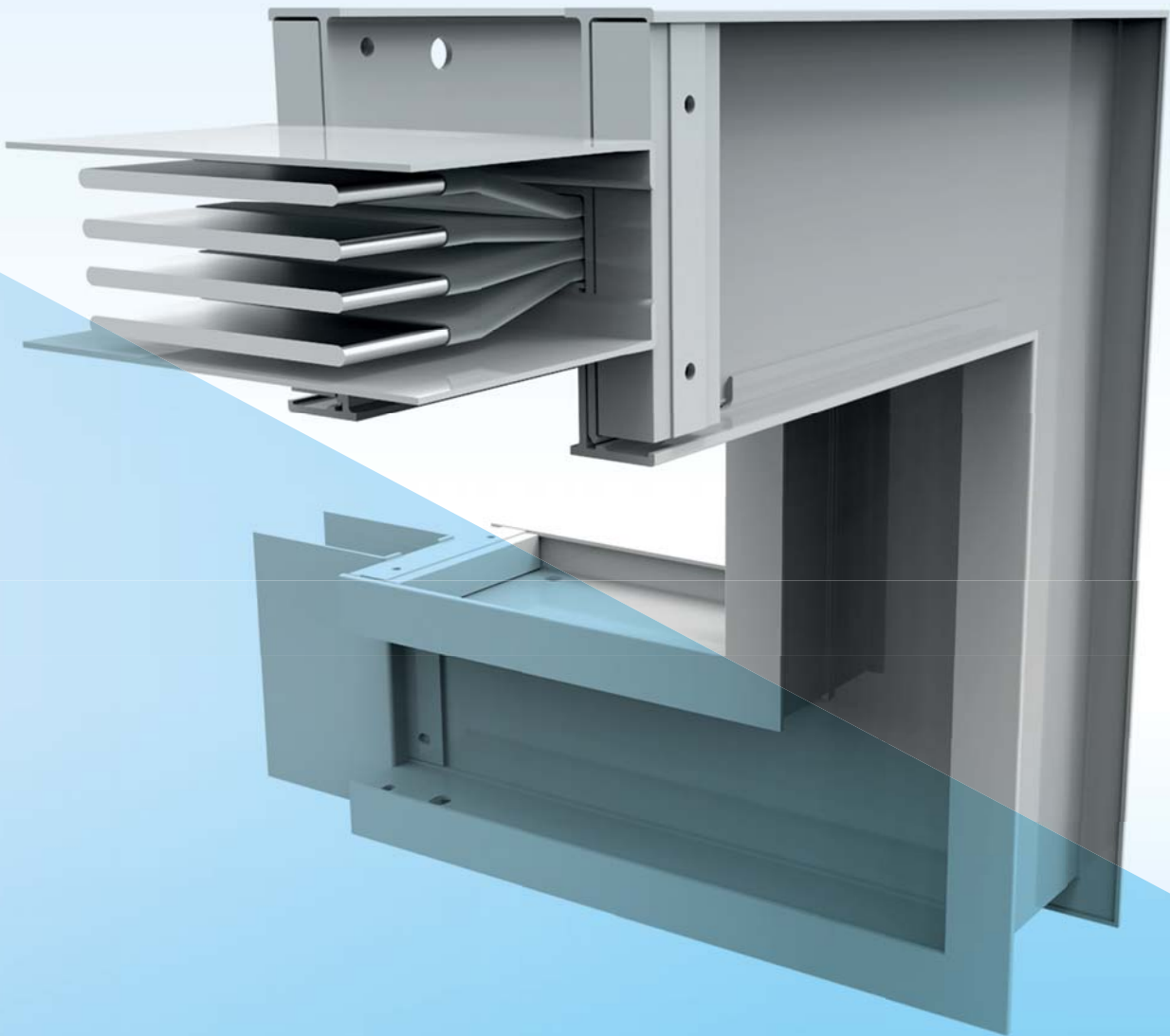
TECHNICAL DATA

Technical Data					
Rated Current (A)	800	1000	1200	1350	1600
Rated Operational Voltage (V)	1000	1000	1000	1000	1000
Rated Insulation Voltage (V)	1000	1000	1000	1000	1000
Short Circuit					
6 Cycle RMS Symmetrical Short circuit rating (KA)	75	100	100	100	150
Phase Conductor Cross Sectional Area					
inches ²	0.59	0.74	0.93	1.07	1.35
Neutral Conductor Cross Sectional Area					
inches ²	0.59	0.74	0.93	1.07	1.35
millimeters ²	360	480	600	690	870
Isolated 100% Ground Conductor					
inches ²	0.59	0.74	0.93	1.07	1.35
millimeters ²	360	480	600	690	870
50% Ground Cross Sectional Area					
inches ²	0.28	0.37	0.47	0.53	0.67
millimeters ²	180	240	300	345	435
Housing Ground Path					
inches ²	2.92	3.10	3.30	3.44	3.74
180millimeters ²	1880	2000	2120	2210	2390
Overall Dimensions					
Height x Width (in)	4.72 x 5.83	5.51 x 5.83	6.30 x 5.83	6.89 x 5.83	8.07 x 5.83
Height x Width (mm)	120 x 148	140 x 148	160 x 148	175 x 148	205 x 148
Weight					
Weight of 4.5 Bar System (lbs/ft)	6.63	7.83	9.03	9.93	11.72
Resistance					
Resistance (mΩ/100ft) at 68°F	2.092	2.009	1.397	1.245	1.165
Resistance (mΩ/100ft) at 176°F	2.628	2.527	1.754	1.562	1.466
Reactance					
Reactance (mΩ/100ft) at 60Hz	0.436	0.430	0.308	0.278	0.265
Impedance					
Impedance (mΩ/m) at 176°F	2.139	2.058	1.427	1.285	1.195
Voltage Drop Full Load 60Hz per 100ft					
Power Factor = 0.7 (V/100ft) at 176°F	2.980	3.596	3.009	3.021	3.369
Power Factor = 0.8 (V/100ft) at 176°F	3.275	3.949	4.085	3.312	3.692
Power Factor = 0.9 (V/100ft) at 176°F	3.540	4.264	3.560	3.571	3.978
Power Factor = 1.0 (V/100ft) at 176°F	3.641	4.377	3.646	3.653	4.064

Technical Data				
Rated Current (A)	2000	2500	3000	4000
Rated Operational Voltage (V)	1000	1000	1000	1000
Rated Insulation Voltage (V)	1000	1000	1000	1000
Short Circuit				
6 Cycle RMS Symmetrical Short circuit rating (KA)	150	200	200	200
Phase Conductor Cross Sectional Area				
inches ²	1.86	2.14	2.70	3.49
millimeters ²	1200	1380	1740	2250
Neutral Conductor Cross Sectional Area				
inches ²	1.86	2.14	2.70	3.49
millimeters ²	1200	1380	1740	2250
Isolated 100% Ground Conductor				
Cross Sectional Area				
inches ²	1.86	2.14	2.70	3.49
millimeters ²	1200	1380	1740	2250
50% Ground Cross Sectional Area				
inches ²	0.93	1.07	1.35	1.74
millimeters ²	600	690	870	1125
Housing Ground Path				
inches ²	4.22	6.88	7.44	10.56
millimeters ²	2720	4419	4779	6809
Overall Dimensions				
Height x Width (in)	10.24 x 5.83	14.76 x 5.83	17.13 x 5.83	23.82 x 5.83
Height x Width (mm)	260 x 148	375 x 148	435 x 148	605 x 148
Weight				
Weight of 4.5 Bar System (lbs/ft)	15.02	19.85	23.44	31.58
Resistance				
Resistance (mΩ/100ft) at 20°F	0.844	0.741	0.582	0.397
Resistance (mΩ/100ft) at 80°F	1.061	0.930	0.732	0.497
Reactance				
Reactance (mΩ/100ft) at 60Hz	0.201	0.160	0.134	0.094
Impedance				
Impedance (mΩ/m) at 176°F	0.866	0.758	0.598	0.406
Voltage Drop Full Load 60Hz per 100ft				
Power Factor = 0.7 (V/100ft) at 176°F	3.070	3.315	3.159	2.878
Power Factor = 0.8 (V/100ft) at 176°F	3.358	3.639	3.460	3.148
Power Factor = 0.9 (V/100ft) at 176°F	3.612	3.928	3.726	3.386
Power Factor = 1.0 (V/100ft) at 176°F	3.675	4.028	3.802	3.445

HIGH POWERBAR

UL857 ALUMINIUM



QUICK REFERENCE GUIDE

Critical Dimensions

- The distance from the centre of a joint to the wall, ceiling or floor must be at least 7 inches.
- All joints must be accessible for maintenance. Joints should not be located inside a wall, ceiling or floor.
- There must be a minimum distance of 2 inches between the busduct and any wall/ ceiling/ other busduct.
- Allow adequate space for busplug units to be installed easily and safely.
- Busduct lengths are available from 2ft - 12ft.
- Distribution busduct lengths are available from 2ft - 12ft.
- Edgewise elbow sections are available with leg lengths from 10in - 2ft.
- Flatwise elbow sections are available with a maximum leg length of 2.5ft. The minimum leg length varies depending on the busduct.

Operating Conditions

- Ambient temperature from -22°F to +131°F

- Relative humidity of 95% or below.
- This product designed for indoor use and can be installed horizontally or vertically.

Critical Details

- Busduct drawings must include all relevant dimensions. Centre-line dimensions are expected. Please highlight any dimensions that are not centre-line.
- Walls and floors must be indicated and the relevant dimensions provided.
- The phasing and location of all switchboards must be provided.
- Full details are required for any transformer connections.
- Horizontal busduct must be installed with the neutral phase to the top. Please indicate the phase orientation for vertically installed busduct.



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