

DELTABAR[®]

LV BUSBAR TRUNKING SYSTEM



KEMA Quality CE
www.deltaelectric.ws



ISO 9001:2008
Registered Firm Cert No: ME/08/1149

INTRODUCTION

DELTA ELECTRIC FZE The pioneer manufacturer of Busbar Trunking System in GCC

established in 2007 in the SAIF ZONE Sharjah Emirate of the United Arab Emirates, Manu-facture. KEMA / DEKRA Certified Low voltage Busbar Trunking Systems. DELTABAR is available in sandwich and Cast Resin in low voltage and for Medium Voltage DELTABAR – **Cast Resin Type** Phase Segregated OR Non Segregated up to 12 kV are available.

DELTA ELECTRIC FZE is awarded the ISO 90012009 Certification, ensuring that our product Designs, quality systems & processes are of International standards.

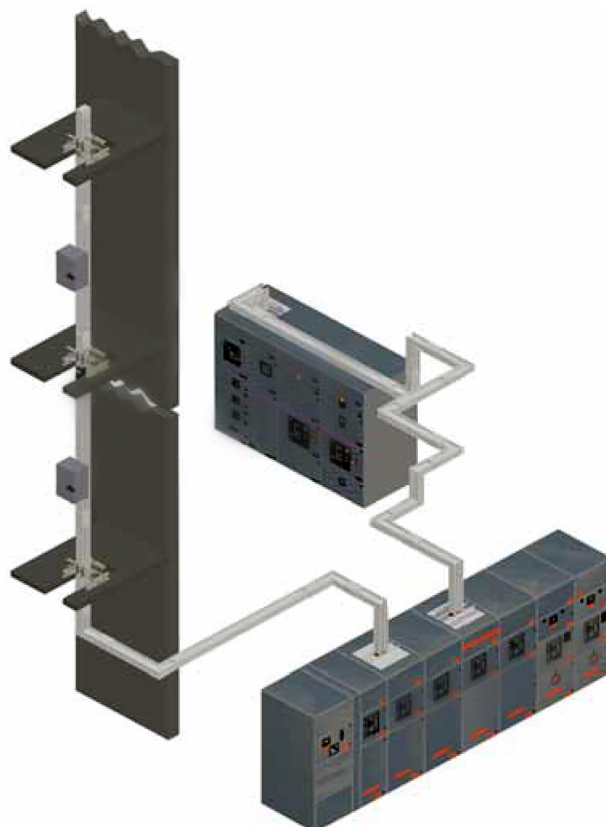
MISSION STATEMENT

“To provide complete busbar based distribution system providing one-stop solution that is cost effective, high quality and cost saving installation to the electrical industry by becoming a leading national manufacturer in producing high quality busbar trunking systems which are in full compliance with IEC standards”.

QUALITY ASSURANCE

All products manufactured at DELTA POWER BUSWAYS PRIVATE LIMITED are subject to strict Quality Assurance Standards under the continuous improvement policies implemented. The products have been tested & certified by Central Power Research Institute Lab in accordance with IEC 61439.

Dedicated to total quality & customer service in all operations

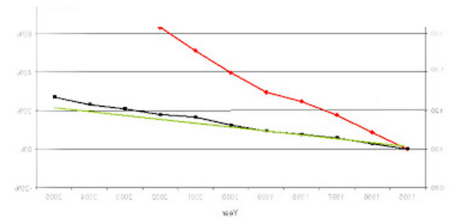


Advantage of DELTABAR Over Cables

When comparing the total estimated cost of the power supply system with cabling and busbar trunking, using the same user, the cost of installation and materials system not only exceeds the cost of cabling, but in some cases much lower, and taking the time factor into account, busbars are simply irreplaceable. Below are some of the benefits.

- DELTABAR has a most compact design compare to all other manufactures in the world. Compactness of the arrangement provides reliably isolated and tightly compressed flat conductors inside the enclosure. Bus systems require less space than the cable systems, especially at loads in the hundreds or thousands of amperes.
- Tightly compressed conductors, enclosed in metal casing with a well-developed surface, can take a well-produces heat to the walls of the enclosure and to the environment. Cooling is better than cable systems.
- The modular design of busbar systems is flexible and mobile, allowing it to be applied to buildings or structures of any type and configuration. With busbar systems, it is possible to easily modify, add or move to another room/building, and reinstall it without any capital expenditure.
- The design stage of the building with bus-systems:
 1. Reduce the number of cable trays;
 2. Decrease the number of switchboards, it becomes possible to connect loads (of the mechanisms on the floors, etc.) directly from the junction boxes;
 3. Decreases the size of the main switchboards;
 4. Reduces the number of circuit breakers;
 5. Excludes many accessories used for cable-systems;
 6. Simplifies design and reduces development time of the project;
- Rigid design elements of the system provides increased resistance to short-circuit compares to cable systems.
- Low resistance values in the busbar system helps to reduce the loss of active energy and limit the growth of reactive power to operate, compared to cable systems.

Comparison of Cost of Installation



Rating in kVA

- Compact design and rigid enclosure provides a significantly lower electromagnetic field around the bus system compared to cable. DELTABAR system of high load (4000A -6300A) can be safely installed near the data cables and does not create electromagnetic interference in an information system.
- With DELTABAR power system, it can be easily, efficiently and safely distributed on the line with the installation of junction boxes in places where needed. Location of the junction boxes can be easily and safely changed if necessary in the future. In addition, there is always the possibility of increasing the number of junction boxes.

DELTABAR systems consist of fully certified standard cells, where everything is made to eliminate human error. For example, junction boxes and plugs are tested and certified parts of the busbar system which meet all safety requirements. The reliability of the adherence of all boxes are standardized and does not depend on the installation. Security of connecting cable systems depends on the experience of the installer.

DELTABAR system cannot be damages by various rodents, because of the presence of an enclosure unlike the unprotected cable systems.

Thus the DELTABAR has significant advantages over the cable, such as: improved electrical performance, simplified, and at the same time, reliable electricity distribution scheme, the minimum spatial volumes, speed installation and reduce time spent on installation, flexibility and transformability of the system, various kinds of high degree of protection, ease of maintenance and energy savings in data center operation.

DELTABAR is a flexible and reliable electrical distribution system with a sandwich construction, unique joint design and superior performance. It is a safe and robust system with high electrical efficiency, low voltage drop, high mechanical strength and easy to install.

The compact sandwich design saves space with minimum voltage drop. They are specially designed to fit into the tight angle and height requirements of today's architectural space, between floors and along walls.

KEY FEATURES

- Available either with Copper or Aluminum conductors,

in the range from 400A to 6300A.

- Housing construction – Extruded Aluminium enclosure; the finned aluminum casing is an enhanced cooling bars to be dissipated with steel enclosures.
- Unique one/two bolt (external bolting) design of joints provides maximum contact area and ensures uniformity of contact pressure at joints.
- The sandwich construction – with conductors insulated by Class F or Class B and Biaxial Oriented Polyethylene Terephthalate film (BOPT) wrapped ensures long-life and high dielectric strength.

PROPERTY	Aluminum Extrusions Housing Busduct	Galvanized Sheet Steel Housing Busduct
Density	Very Light in weight; About 1/2 that of steel	High density; high pounds per cubic foot
Strength to weight ratio	Excellent; it can be further increased along with enhanced appearance, through anodizing or other coating.	Poor, usually highly requires protective coatings for corrosion service
EMC Compatibility	Yes	No
Electrical Conductivity	Excellent	Poor cannot usually be used as an electrical conductor
Thermal Conductivity	Excellent; ideal for heat exchanger applications. Able to dissipate heat very fast and this will enable to reduce the temperature rise from the bus bars and to protect insulation of conductors and long life span of this system	Poor cannot be used for heat exchanger applications. Poor heat dissipation from thermal will enable heat accumulation in the thermal; at the same time will increase heat rise on the busbars and shorter the live span of the busbars insulation.
Magnetic Field	Non-magnetic properties and effect	High magnetic properties and effect which will cost lower electromagnetic immunity and will get rust in certain period of time.
Heat resistnace	Good. Aluminum has inherent electrical and heat dissipation	Poor

The DELTABAR trunking systems are designed complying with the following standards:

- IEC 61439-1 AS NZ 3439-2: 2002
- IEC 61439-6 AS3439-2:1994
- CSA 857 JISC 8364
- BS EN 61439 1&6

HOUSING

DELTABAR Busbar trunking system are constructed with extruded aluminum body (3 to 3.5 mm thickness) with cooling fins and self-piercing body construction.

The use of finned aluminum casing is an enhances cooling concept which allows heat generated by the conductor bars to be dissipated efficiently.

The ultra-compact design enables installation in confined spaces, thus requiring less room to be allocated to electrical riser services.

Epoxy Coated or Anodised as Per Requirement of the Client

PLUG IN UNIT

DELTABAR Plug-In features the following:

Current Collecting areas are Silver coated Interlocking door for safety purpose When the plug-in is in ON position, prevents the door from opening. Mechanical Interlocking: when the busbar is energized, prevents the plug-in unit from taken off. Designed such that the earth mates first and breaks last ensuring safety.

PLUG IN OUTLET

The plug-in outlets are designed to meet the IEC and BS standards for finger safety. Hinged doors at the front of each outlet protect the contact surfaces from rust, dirt and moisture. Padlock designed on the outlet to lock the outlet for safety purpose. All plug in boxes are IP55 on request IP65 available.

IP rating – what they mean

Code letters (Ingress Protection).....	IP
First characteristic numeral (Ingress of foreign objects).....	2
Second characteristic numeral (Ingress of water).....	3

IP rating Protection against ingress of dust and liquid

IP 1st Digit

Degree of protection against contact and ingress of foreign bodies.

- 0. No protection
- 1. Protection against ingress of solid foreign bodies with diameters greater than 50 mm
- 2. Protection against contact with the finger protection against ingress of solid foreign bodies with diameter greater than 12mm
- 3. Protection against contact with wires etc., with diameters greater than 2.5 mm. or ingress of solid foreign bodies with diameters greater than 2.5 mm.
- 4. Protection against contact with wires etc., with diameters greater than 1 mm. or ingress of solid foreign bodies with diameters greater than 1 mm.
- 5. Complete protection against contact with live parts, protection against harmful deposit of dust.
- 6. Complete protection against contact with live parts, protection against ingress of dust.

IP 2nd Digit

Degree of protection against contact and ingress of foreign bodies.

- 0. No protection
- 1. Protection against vertically falling water drops
- 2. Protection against obliquely falling water up to an angle of 15.
- 3. Protection against obliquely sprayed water up to an angle of 60 from the verticle.
- 4. Protection against splash water, from any direction.
- 5. Protection against water - jets from any direction.
- 6. Protection against powerful water - jets from any directions.
- 7. Protection against temporary immersion in water.
- 8. Protection against indefinite immersion in water.

INSULATION

The conductors are provided with high quality – o130C Class B or Class F Insulation upon customer's request.

INGRESS PROTECTION

DELTABAR Busbar Trunking System are totally enclosed by self-piercing contraction method and the conductors are fully insulated by class F or Class B insulation with BOPT film wrapping to protect from dust and water, according to IEC 60529. The minimum protection level is IP 55; IP 65 also available upon customer's request.

CONDUCTORS

DELTABAR busbar trunking systems use Copper or Aluminum as conductors. Joints and Terminal are Silver coated by Default. The busbars are of sandwich construction – no air gap between conductors

CONDUCTORS CONFIGURATIONS

The conductors can be arranged in various configurations according to the specific requirement –

3P + Integral Ground

3P + %50 Earth

3P + %100 Neutral + %50 Earth

3P + %100 Neutral + %100 Earth

3P + %200Neutral

3P + %200Neutral + %50 Earth

3P + %200Neutral + %100 Earth

Neutral conductor cross-section

In order to reduce the susceptibility of the system in networks subject to harmonics, double neutral (%200N) conductor cross-section are selected.

Earth conductor cross-section

Enclosure as earth – Aluminum being a good conductor, the aluminum profile body can be used as earth.

Dedicated Earth – fully insulated separate (dedicated) earth conductors are provided for special applications – as in connections for electronic loads. In the event of short-circuit between the phase and the consumer enclosure, the dedicated earth conductor is not affected by this fault and is therefore potential free during a short-circuit to an exposed conductive part. Even leakage currents in the enclosure due to magnetic fields do not affect the dedicated earth. Thus dedicated earth is ideal for susceptible electronic loads.

MANUFACTURING AND QUALITY ASSURANCE

DELTABAR Busbar Trunking System are manufactured in the modern state-of-the-art facilities.

The quality of the product is ensured through inspection of all incoming materials and at every major stage of processing and through hundred percent routine testing of the final product are

- (i) Insulation resistance measurement
- (ii) High Voltage Withstand test

The standard busbar trunking system are supplied with mill finish Aluminum body. However special aesthetic colouring by powder coating or anodizing can be offered, based on specific requirement.

TECHNICAL DATA SHEET (Aluminium)

Rated Operational Voltage (Ue) = 100V Rated insulation level (Ui)= 1000V, Frequency (f) = 50 Hz													
1	Current rating	(A)	630	800	1000	1250	1600	2000	2500	3200	4000	5000	6300
2	Cross Sectional Area per Phase	(mm ²)	480	480	600	750	1050	1380	1800	2100	2760	3600	4140
3	Conductor Size per Phase	(mm)	80x6	80x6	100x6	125x6	175x6	230x6	150x6x2	175x6x2	230x6x2	200x6x2	200x6x3
4	Current Density	(A/mm ²)	1.31	1.66	1.66	1.66	1.52	1.44	1.38	1.52	1.44	1.38	1.52
5	Short Circuit withstand Current	(kA/1sec)	50	50	50	50	65	80	80	100	100	100	100
6	Weight of Conductor for TPN%50+E	(Kg/m)	5.8	5.8	7.3	9.1	12.8	16.8	21.9	25.5	33.5	43.7	50.3
7	Weight of Busway(Kg/m)	11.62	11.62	13.98	16.50	21.49	26.92	37.98	42.97	53.84	71.94	80.76
8	Busbar Dimensions	(mmxmm)	147x142	147x142	147x162	147x187	147x237	147x292	147x371	147x421	147x531	147x680	147x770
9	Resistance (R)	μΩ/m	70	58	47	39	29	24	18	15	12		
10	Reactance (X)	μΩ/m	24	25	17	20	16	13	11	10	8		
11	Impedance (Z)	μΩ/m	74	63	50	44	33	27	21	18	15		
12	Power Factor	(mV)	VOTAGE DROP VALUES @LOAD DISTRIBUTION FACTOR (k) = 1 (for concentrated load)										
	0.9		0.088	0.095	0.094	0.103	0.100	0.103	0.099	0.107	0.107		
	0.85		0.090	0.098	0.097	0.107	0.103	0.106	0.103	0.112	0.112		
	0.8		0.092	0.101	0.099	0.110	0.107	0.110	0.106	0.116	0.116		
	0.75		0.094	0.103	0.101	0.113	0.110	0.113	0.109	0.120	0.120		
13	Power Factor	(mV)	VOTAGE DROP VALUES @LOAD DISTRIBUTION FACTOR (k) = 0.5 (for distributed load)										
	0.9		0.044	0.048	0.047	0.052	0.050	0.051	0.049	0.054	0.054		
	0.85		0.045	0.049	0.048	0.053	0.052	0.053	0.051	0.056	0.056		
	0.8		0.046	0.051	0.049	0.055	0.053	0.055	0.053	0.058	0.058		
	.075		0.047	0.052	0.050	0.056	0.055	0.056	0.055	0.060	0.060		

TECHNICAL DATASHEET (COPPER)

Rated Operational Voltage (Ue) = 1000 V Rated insulation level (Uj)= 1000 V, Frequency (f) = 50 Hz

1	Current rating (A)	800	1200	1250	1600	2000	2500	2500	3000	3200	4000	5000	6300	7500
2	Cross Sectional Area per Phase (mm ²)	300	480	600	600	900	950	1197	1380	1680	2160	2760	3240	4140
3	Conductor Size per Phase (mm)	50x6	80x6	100x6	100x6	150x6	190X5	190X6.3	230x6	140x6x2	180x6x2	230x6x2	180x6x3	230x6x3
4	Current Density (A/mm ²)	2.66	2.50	2.08	2.60	2.22	2.63	2.09	2.17	1.90	1.85	1.81	1.94	1.81
5	Short Circuit withstand Current (kA/1sec)	50kA			65kA	85kA	85KA	100kA			120kA			
6	Weight of Conductor for TPN+50%E (Kg/m)	12	15	20	24	34	38	44	56	68	87	111	131	167
7	Weight of Busway (Kg/m)	17.5	20.86	27	31	42	49	52	67	84	106	133	159	200
8	Busbar Dimensions (mm)	147x112	147x122	147x162	147x182	147x212	147x252	147x252	147x292	147x351	147x431	147x584	147x620	147x770
9	Resistance (R) µΩ/M	33	31	30	22	20	14.0	12.2	15.4	15	10.1	7.7	6.7	5.1
10	Reactance (x) µΩ/M	29	17	19	20	16.0	13.0	13.4	17	11	8.75	8.5	5.8	5.6
11	Impedance (Z) µΩ/M	65	42	34	34	28.0	23.0	28.8	23	18	14.4	11.5	9.6	7.6
12	Power Factor (mV)	VOLTAGE DROP VALUES @LOAD DISTRIBUTION FACTOR (K) = 1(for concentrated load)												
13	0.9	0.0864	0.0864	0.0864	0.0763	0.0895	0.00912	0.0894	0.0921	0.077	0.0447	0.046	0.0298	0.0307
14	0.85	0.0891	0.0891	0.0891	0.0994	0.0911	0.00923	0.0914	0.0955	0.0797	0.0457	0.0477	0.0304	0.0318
15	Power Factor (mV)	VOLTAGE DROP VALUES @LOAD DISTRIBUTION FACTOR (K) = 0.5 (for distributed load)												
16	0.9	0.0432	0.0432	0.0432	0.0499	0.0496	0.0412	0.0447	0.0461	0.0385	0.0223	0.023	0.0149	0.0153
17	0.85	0.0446	0.0446	0.0446	0.0497	0.05	0.0435	0.0457	0.0477	0.0398	0.0228	0.0238	0.0152	0.0159

DESIGN FUNDAMENTALS - BASIS AND FORMULAE USED FOR CALCULATION

I. Voltage Drop in Volts, $u = k \times \sqrt{3} \times (R \cos \phi + X \sin \phi) \times I_B \times L$, in Volts

Where

K-Load Distribution Factor

Is-Current of the circuit being considered (A)

R-Mean Resistance of the system ($\mu\Omega/m$)

X-Mean Reactance of the system ($\mu\Omega/m$)

L-Length of the system being considered (m)

Cos ϕ - Load Power Factor

The Load Distribution Factor could be suitably selected from any of the 3 values below

$K=1$, if the load is concentrated at the end of the busbar trunking run.

$K = (n + 1) / 2n$, if the load is uniformly spread between n branches

$K = \frac{(2n+1) - (n \times d / L)}{2n}$, when loads are spread uniformly along the length.

Where, n the number of tap offs;

d is the distance between the tap off and origin of the busbar;

L is the length of the busbar trunking run.

II. Voltage Drop in Volts/m = u / L

III. Voltage Drop in Volts/m/A = $u / (L \times I_s)$

IV. Mean Resistance (R)

a) Mean Resistance at 85°C in Ω/m = (DC Resistance at 85°C / Skin effect ratio)

b) DC Resistance at 85°C in Ω/m = (DC Resistance at 20°C) $\times [1 + (0.00393 \times (85 - 20))]$;

Where 0.00393 is the Temperature Coefficient for Copper

Temperature Resistance Equation, $R_{r2} = R_t \times [1 + 6(T_2 - T_1)]$

Where, R_{T2} is D. C. Resistance at 85°C

R_t is D. C. Resistance at 20°C

T_2 & T_1 are temperatures at 85°C and 20°C respectively.

c) DC Resistance at 20°C in Ω/m = Specific Resistance of Cu at 20°C / Cross Section Area
Specific Resistance of Copper at 20°C = 1.68×10^{-6} Ohm - cm

d) Skin Effect Ratio = $\sqrt{\frac{1 + (4 \times f \times A)}{48}}$ / 2 + 1

Where A is Area of Cross Section; and f is the Frequency

V. Reactance (X)

Reactance in Ω/m = $4 \times 3.14 \times f \times \ln \left\{ \frac{3 \times \sqrt{D_a \times D_b}}{D_e} \right\}$

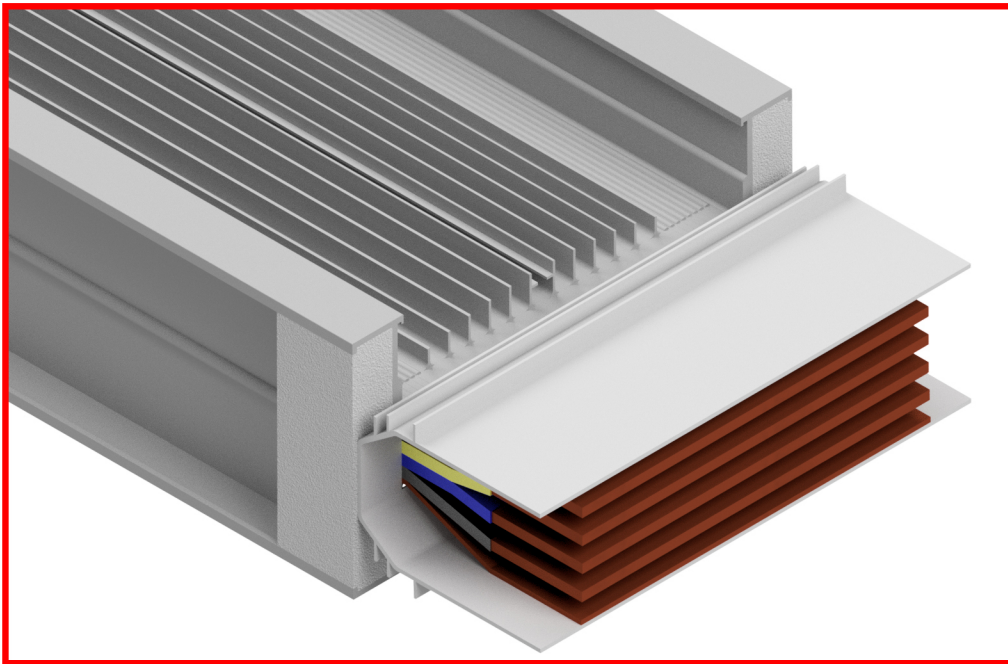
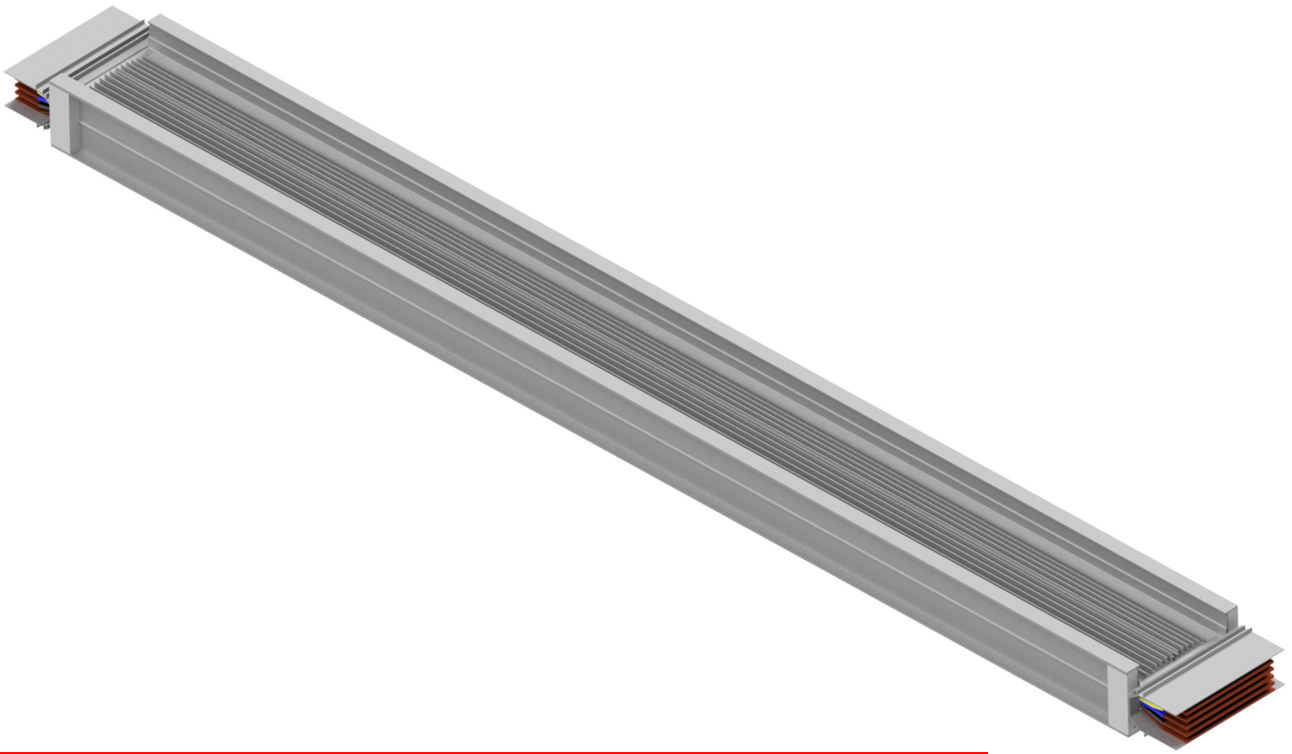
Where D_a = inter phase spacing distance

D_b = spacing distance between 1st phase and 3rd phase D_e = geometric mean distance = $0.2235(a+b)$

Where a is the width and b is the thickness of the busbar

STRAIGHT LENGTH FEEDER

The feeder elements are available in a standard length of 3.0m maximum length (shorter lengths are designed based on requirement). For ratings above 2500A, two or more parallel runs of smaller are used. Each feeder element is provided with one joint stack.

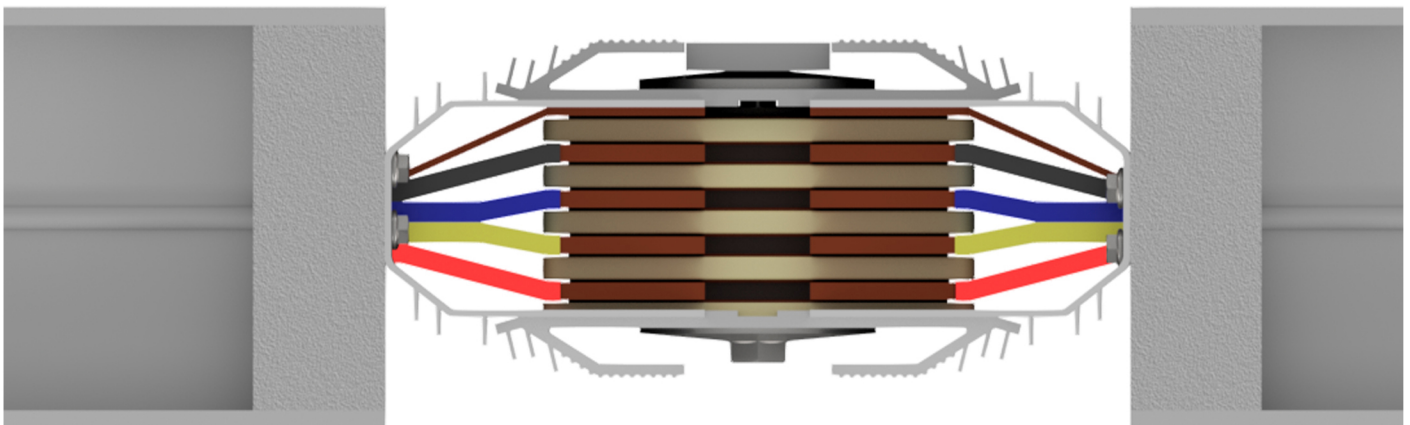
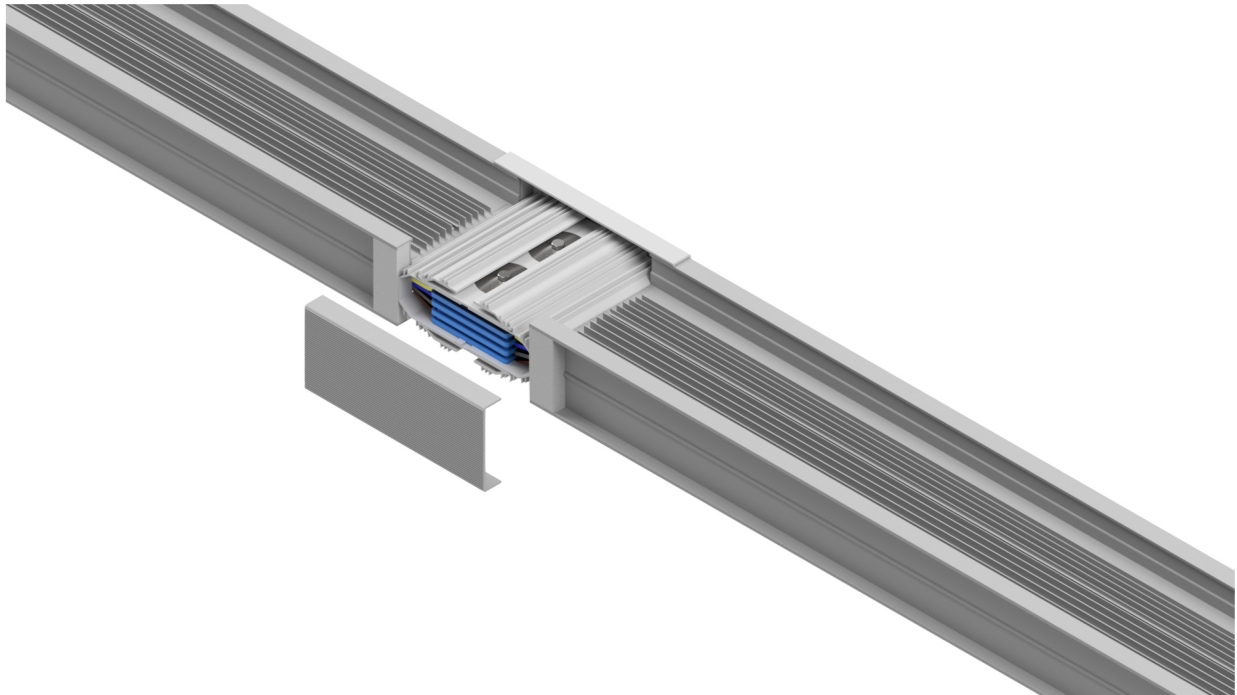


JOINTS

DELATABAR joints are uniquely designed – truly bridge construction,

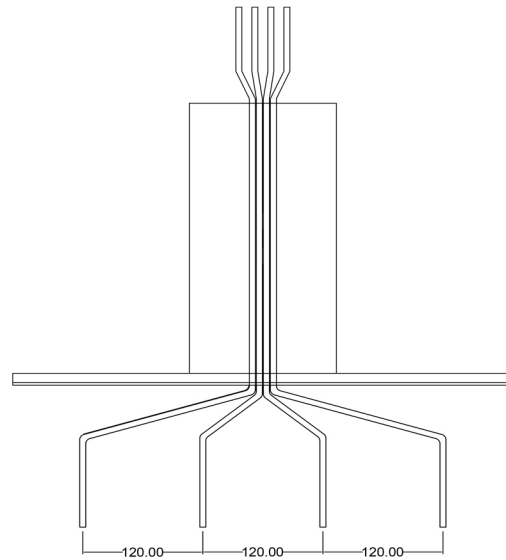
- With two numbers straight fish plates, one on either phase and neutral conductor,
- With two bolt construction, one on either side of the element's and conductors,
- With a pair of Belleville washers of each bolt,
- Phase segregation provided by phase barriers, which ensures a thermally, electrically and mechanically proper and efficient joint design.

10 mm gap between two feeder elements is recommended at the joints. It is possible to remove to allow removal of a busway section/ element.

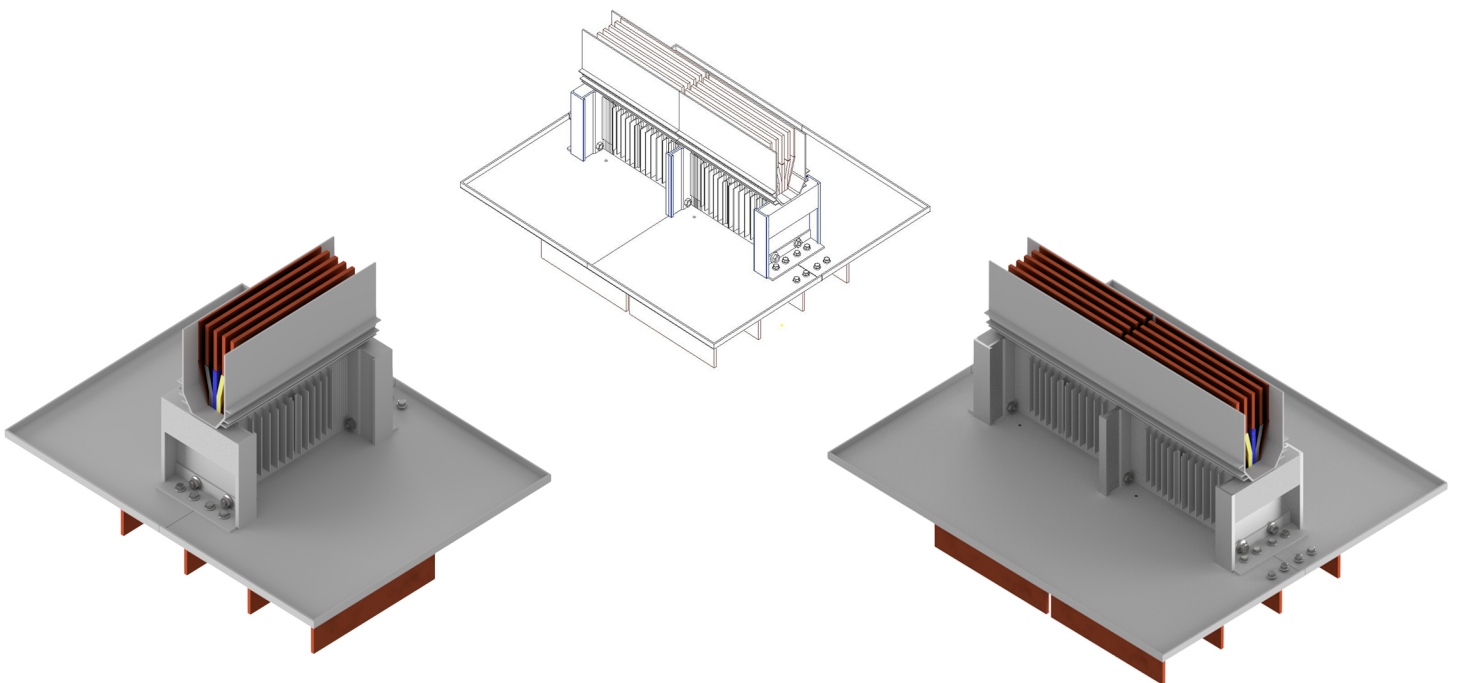


TERMINATION ELEMENTS & ACCESSORIES

Flanges are provided as termination elements for connection between the busbar trunking systems and the low voltage switchboards, control panel or other distribution systems (transformer / generator ends). Specially designed flanges – Elbow flanges are made available depending on project requirement. The termination conductor elements are tin/silver plated (upon customer request) & holed for connection to switchgear termination.



Termination caps are provided to terminate and to protect the ends of the busway run. This also acts as a provision for the extension of the busway run

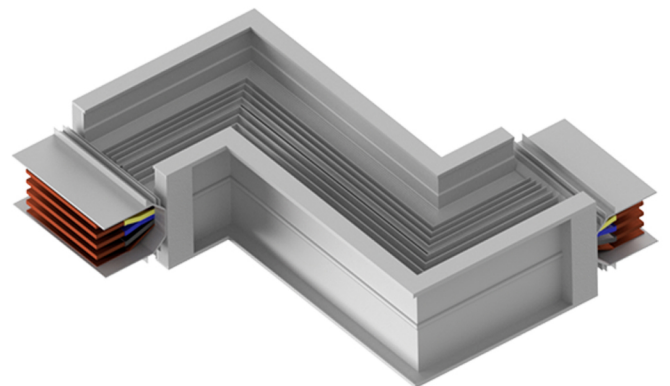
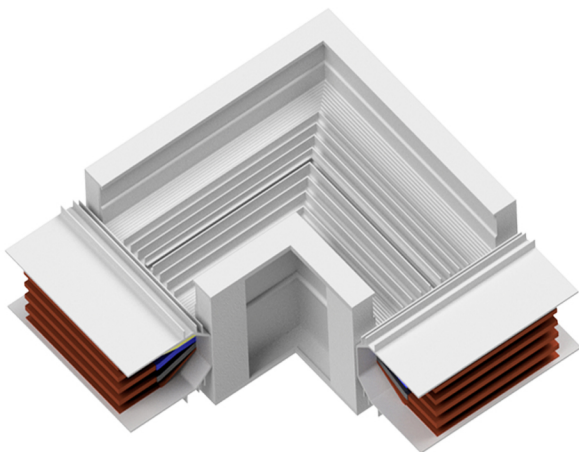
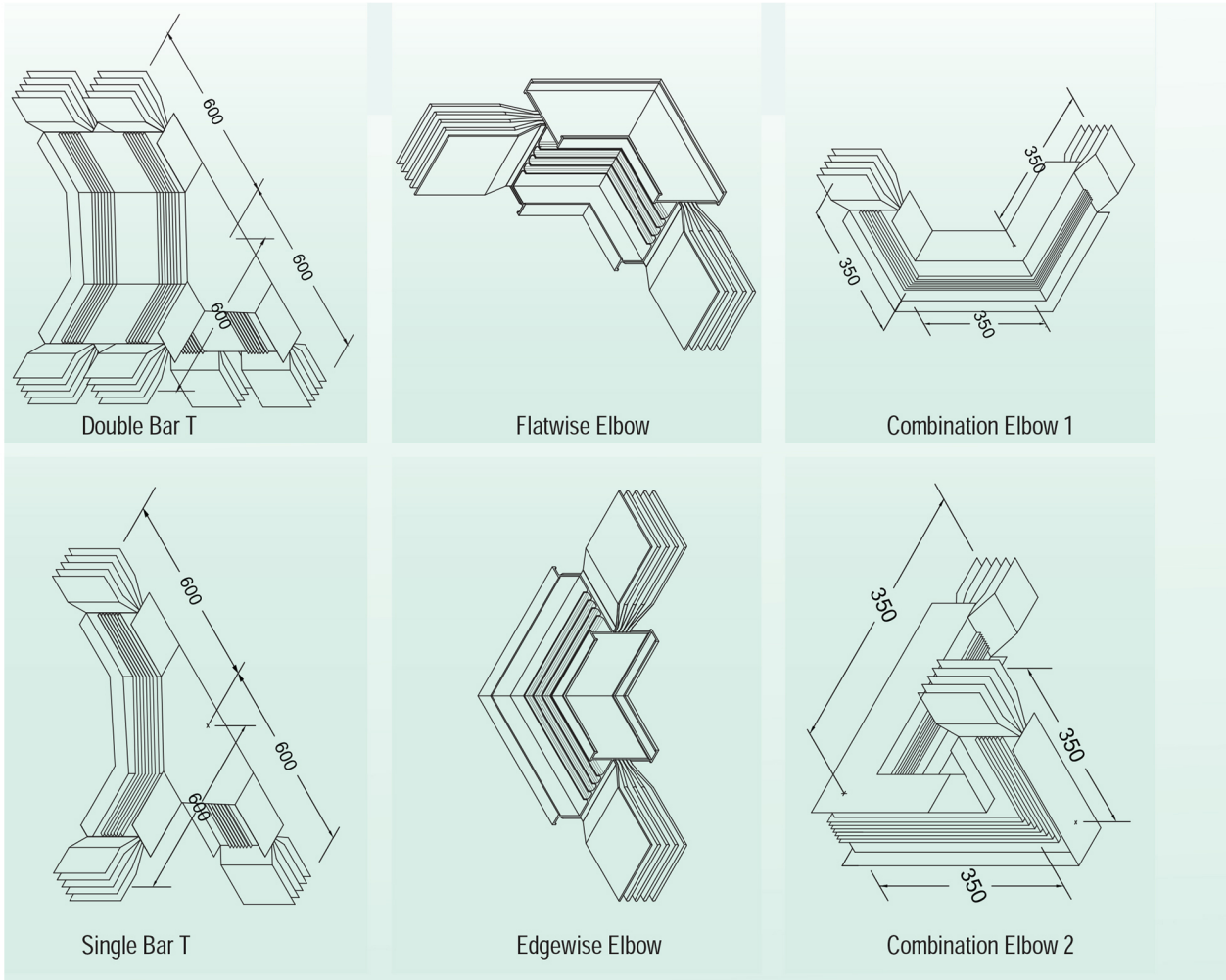


Flanged End Boxes – Adaptor boxes are used in situations when the flanges cannot be directly terminated to the distribution systems.

Bellows, Flexibles & Connecting Links – Bellows & Flexibles are recommended at terminal connection where there are vibrations on the power distribution equipment (transformers).

ELBOWS – Combinations

Typical elbow combinations – offsets, Z elements & T elements are designed where critical site conditions does not allow connection of standard elbows.

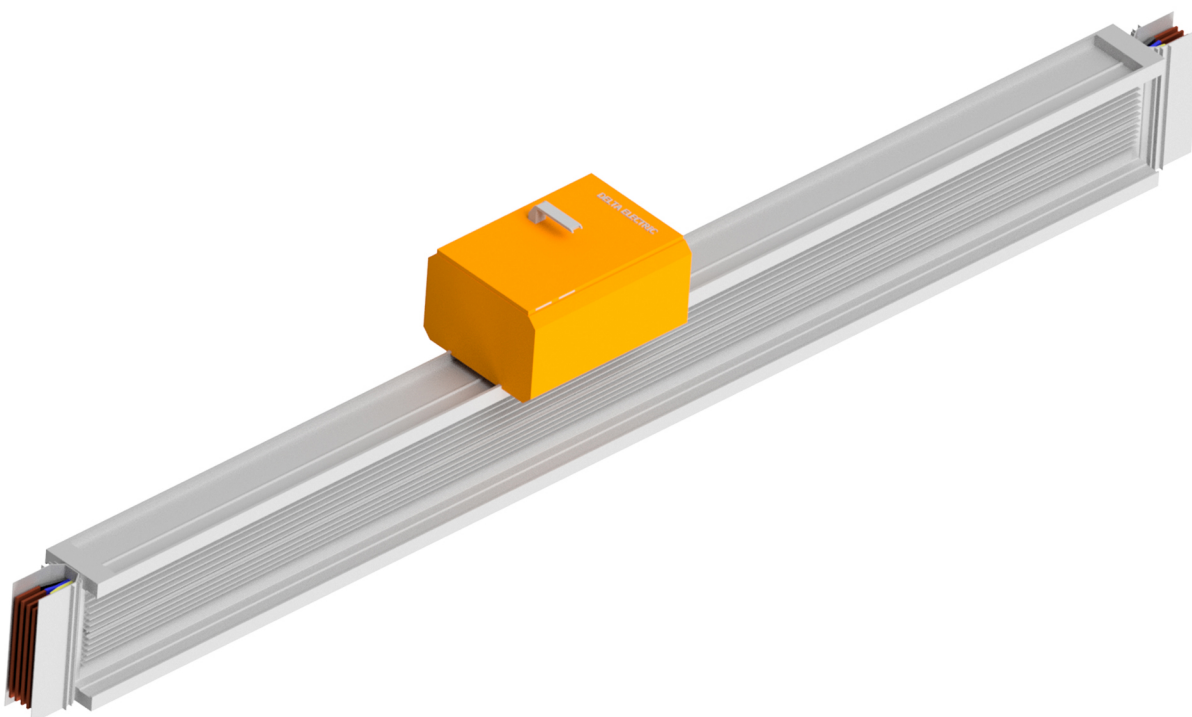


PLUG IN UNIT

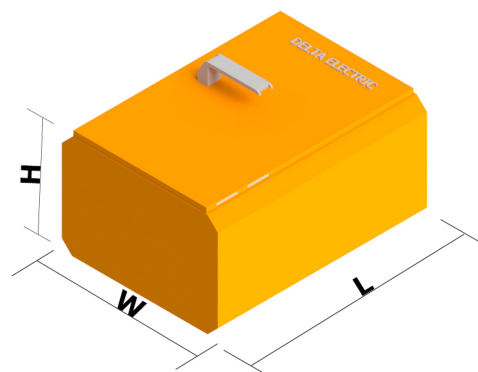
For extensive power distribution, tapoff units – plug-in units of different sizes are available. The rated operational voltage is 400v. The solid enclosure guarantees IPSS protection irrespective of the mounting position.

Key Features

- The plug-in unit features mechanical interlock system. ie. The tap-off units cannot be opened unless the protection device is switched off manually. The front operating switch on the door of plug-in unit allows pad-locking at the OFF position, to prevent switching to ON accidentally during servicing & maintenance.
- The plug-in units are designed such that the earth mates first and breaks last ensuring safety.
- The plug-in points on the busbar feeder elements are “finger-proof”.



Amp Rating	Dimension (in mm)		
	Width (W)	Length (L)	Depth (H)
<100	250	450	220
225	250	450	220
400	300	750	220
630	400	800	220



EXPANSION UNITS

Busbars expand or contract as they are heated by load current Or as the ambient temperature changes. Depending on the type of installation, the elongation along the length of busbar varies. Expansion units are provided at regular intervals to cater to such expansions.

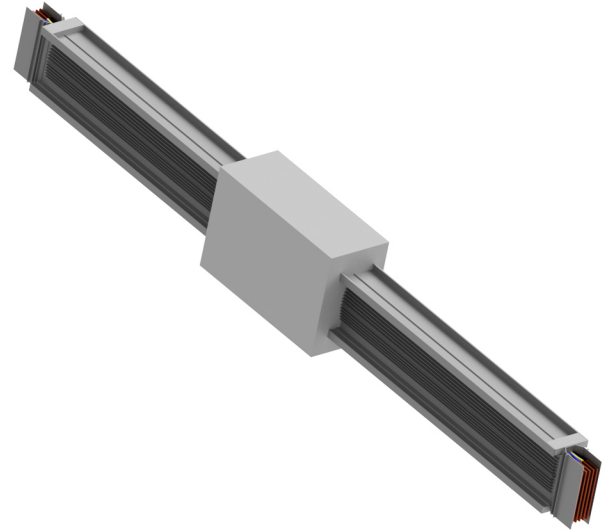
In horizontal installations, expansions is fully absorbed in the busbar joints and bends. In vertical installations, where fixed and spring supports are used, expansion joints are recommended at regular intervals of 406om depending on the ambient temperature at the installation site.

SUPPORTS

Spring supports specially designed to support the weight of busbar trunking system on each floor shall be provided, for vertical supporting. The type of spring support varies for different cross-sections & lengths.

For horizontal applications, the busbar system is to be supported by threaded rods and hanger channels.

In order to fix the run to the structure of the building, directly or with a wall, ceiling beam bracket, it is necessary to use a bracket which serves as a busbar collar.

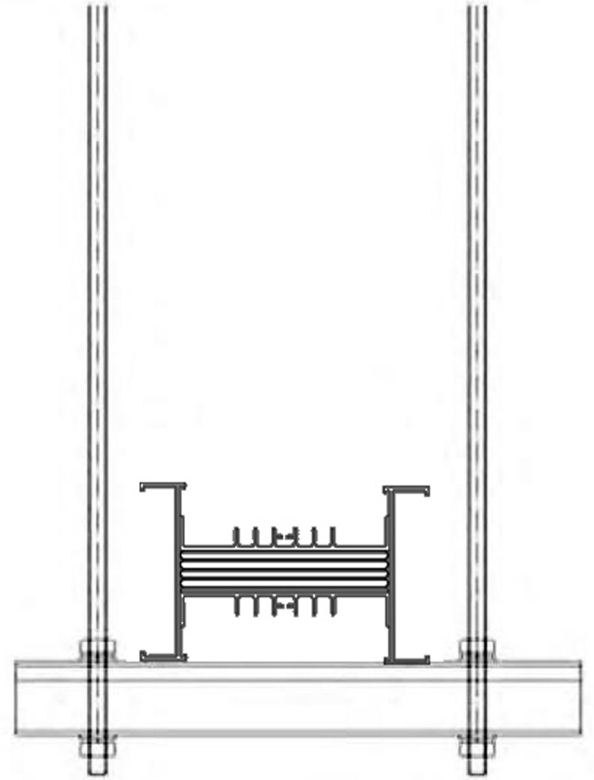
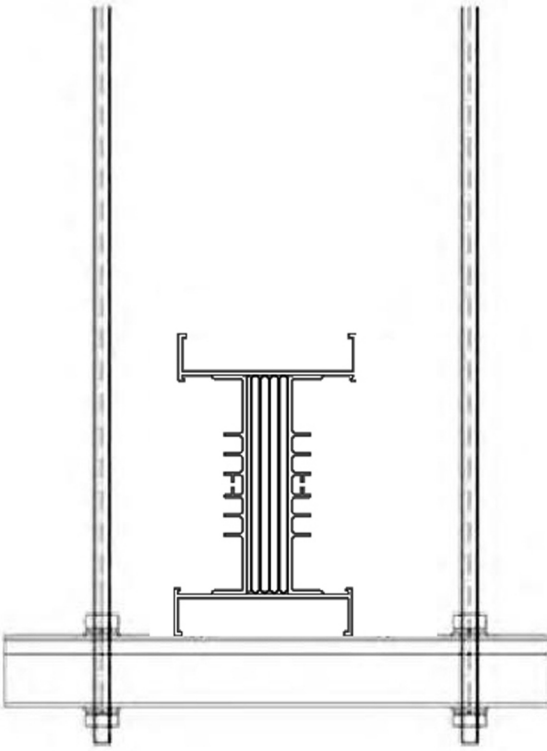


TEST CERTIFICATE form for DELTA ELECTRIC, P.O. Box No. 121 080, SHARJAH, UNITED ARAB EMIRATES (U.A.E.). Includes fields for product name (Deltabar 3000), range (LV 1000 V, LV 1000 V, Group 0 IV, In 2000 A at 50 Hz / 2000 A at 60 Hz), and test requirements (IEC 60439-2, 3rd ed., 2005:02 and Amendment A1:2005:08).

TEST CERTIFICATE form for DELTA ELECTRIC, P.O. Box No. 121 080, SHARJAH, UNITED ARAB EMIRATES (U.A.E.). Includes fields for product name (Deltabar 3000), range (Busbar, LV 1000 V, LV 1000 V, Group 0 IV, In 2000 A at 50 Hz / 2000 A at 60 Hz), and test requirements (IEC 60439-2, 3rd ed., 2005:02 and Amendment A1:2005:08).

TEST CERTIFICATE form for DELTA ELECTRIC, P.O. Box No. 121 080, SHARJAH, UNITED ARAB EMIRATES (U.A.E.). Includes fields for product name (Deltabar 3000), range (LV 1000 V, LV 1000 V, Group 0 IV, In 2000 A at 50 Hz / 2000 A at 60 Hz), and test requirements (IEC 60439-2, 3rd ed., 2005:02 and Amendment A1:2005:08).

TEST CERTIFICATE form for DELTA ELECTRIC, P.O. Box No. 121 080, SHARJAH, UNITED ARAB EMIRATES (U.A.E.). Includes fields for product name (Deltabar 1000), range (LV 1000 V, LV 1000 V, Group 0 IV, In 1000 A at 50 Hz / 1000 A at 60 Hz), and test requirements (IEC 60439-2, 3rd ed., 2005:02 and Amendment A1:2005:08).



Delta Electric Ltd

Unit 21 Bonville Business Centre
BS4 5QR Bonville Road, Bristol
United Kingdom
Tel: +44117 980 1903
deltauk@deltaelectric.ws

Delta Electric FZE

P.O Box: 121080, SAIF Zone Sharjah
United Arab Emirates
Tel: +971 6 5578823
Fax: +971 6 5578824
info@deltaelectric.ws