

We touch your **electricity** everyday!



● C&S + Etacom Installations



## GLOBAL SPECIALIST FOR POWER BUSBARS

### India

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New Delhi-110 020, India  
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#### Regional Office:

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#### Works:

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B1, Site-IV, Surajpur Industrial Area,  
Kasna Road, Greater Noida,  
Distt. Gautam Budh Nagar, (U.P.), India

Haridwar  
Plot No. 1C, Sector 8C,  
Integrated Industrial Estate  
(SIDCUL), Ranipur, Haridwar  
Uttarakhand - 249403, India

Haridwar  
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## GLOBAL SPECIALIST FOR POWER BUSBARS

Cast Resin Insulated Busway System

www.cselectric.co.in  
www.etacomcs.com

www.facebook.com/CSElectricLimited



We touch your electricity everyday!

## Manufacturing Facilities



Haridwar - India



Boom-Belgium

C&S Electric Ltd. is one of the leading manufacturer of electrical equipment in India. It's wide range of electrical and electronic products find application in power generation, distribution, control, protection and final consumption.

C&S employs over 4000 people including 400 engineers, and has 18 state-of-the-art manufacturing plants. It has 24 sales/marketing offices across India and its products are exported to more than 85 countries.

The Power Busbar Division of C&S was founded four decade ago and has been meeting the evolving needs of power generating stations, process and manufacturing industries, infrastructure establishments, technological centers and real estate developments with its complete and fully tested product line of Busduct, Bustrunking and associated equipment.

The Eta-com group was founded in 1979 and ever since markets a full range of cast resin insulated busway systems. The concept which was already in use in the sixties in industrial installations is now in the third generation form. Due to the typical characteristics, the system guarantees the integrity of many projects world-wide, providing safe and maintenance free electrical power supplies in both Low Voltage and Medium Voltage installations.

With the acquisition of Eta-com in December 2011, the co-operation between the two companies gives birth to a **Global Power Busbars Specialist**.



metabar range cover Sandwich Bustrunking, Air Insulated Bustrunking & Lighting Trunking.

Bustrunking has lower impedance in comparison to cable and conventional busducts for the same application. Lower impedance means less energy lost during distribution and this translates into cost savings and makes this as energy saver

Flexible Distribution because of Plug-in type arrangement at regular intervals or as per customer design provides efficient power distribution.

Bustrunking system requires less space for Installation in a building / industry as compared to conventional busduct and cable system, so optimum utilization of space.

Material and manpower used in busway is lower than cable & conventional busduct. It saves money on raw materials and creates less waste by buying pre-engineered lengths of busway.

Bustrunking system comes with provision of expansions, changes, replacement and reusing. Metabar Bustrunking can be supplied in following standard types:

**SB - Sandwich Type**

Up to 1000 V AC Three phase conductors and/or  
50,100% Protective internal & isolated earth  
And 100 & 200% neutral

Al-conductors range up to 5000 A  
Cu-conductors range up to 6300 A  
DC application on request  
Other frequencies on request



**CB-Compact Air Insulated Type**

Up to 1000 V AC  
Three phase conductors and/or  
50,100% Protective internal & isolated Earth  
And 100% Neutral

Al-conductors range up to 800 A  
Cu-conductors range up to 1000 A  
DC application on request  
Other frequencies on request



**LB-Lighting Trunking**

Up to 500 V AC  
Three phase conductors  
Cu-conductors range up to 40 A



betobar is the leading technology in the world for cast resin insulated busbars in low & medium voltage installations.

This concept is unique as it is based on the direct encapsulation of copper or aluminium conductors with an insulation compound, B.I.M. casting mix, consisting of epoxy-resin mixed under vacuum. This B.I.M. casting mix has excellent electrical characteristics and high mechanical withstand with specific physical properties. It is moisture-resistant, fire-resistant and self-extinguishing. A flexible fabrication method, universal moulds and an integrated process controlled mixing technique allow the production of an almost unlimited number of element forms for L.V as for M.V applications. The prefabricated elements are self-supporting and are interconnected electrically by joining the conductors with 2-sided compression contacts, ensuring an excess of contact surfaces and a maximum of adjustment. Junctions and element extremities are overcast with a B.I.M. casting mix resulting in a homogeneous insulation over the full length of the connection.

betobar busbars can be supplied in the following standard types:

**For Low Voltage**

LA - series  
Up to 1000 V AC  
Three phase conductors and/or  
Protective earth / 50,100,150% neutral  
Al-conductors range up to 5000 A  
Cu-conductors range up to 6300 A  
DC application on request  
Other frequencies on request



**For Medium Voltage**

Type	Current Rating	Voltage Rating
SH-Series	Al upto 1500A Cu upto 1850A	3.6 KV to 7.2 KV

Type	Current Rating	Voltage Rating
PH-Series	Al upto 5000A Cu upto 6100A	3.6 KV to 17.5 KV

Other current and voltage ratings on request.



**IP68**  
degree of protection

**IK10**  
mechanical resistance

isobar range covers Isolated Phase Busduct, Segregated Phase Busducts and Non-Segregated Phase Busducts. C&S is a market leader in India and amongst the major global companies for design, manufacture, erection and commissioning of Isolated Phase Bus Ducts upto 1000MW power plants.

Today, we have an enviable track record of having associated with 4 Units of 800 MW, 43 Units of 660 MW, 33 Units of 500 MW, 60 Units of 250 MW, 50 Units of 150 MW Thermal Power Stations, Hydro Power Plants and Nuclear Power Plants, besides many Captive/Private Power Projects of capacity less than 100 MW. The largest proportion of 80,000 MW power generated in India flows through C&S isobar busducts.

isobar Busduct have been successfully type tested for highest peak current during short circuit test and also for temperature rise test at world famous laboratories like KEMA-Holland and EDF-France, CPRI-Bhopal & Bangalore and at IIT-Roorkee (For Seismic tests)

### Isolated Phase Busduct

C&S offers a wide range of natural air cooled Isolated Phase busducts with voltage rating of 11kV to 36kV having current rating of 100A to 30,000A, with the short circuit current withstand capacity of 309 kA/sec & 845 kA peak. These busducts have applications in all generating stations from 50MW & above.



### Segregated Phase Busducts

C&S offer a wide range of Segregated Phase Busducts for Medium Voltage applications from 3.3 kV to 33 kV upto 5000A with a maximum Short Circuit Current withstand capability of 50 kA rms for 3sec. and 128 kA peak. Segregated Phase Busducts find applications in Power Generating Stations and Industrial or Distribution Plants for lower capacity generator connections, inter-connections between switchgear and transformers.

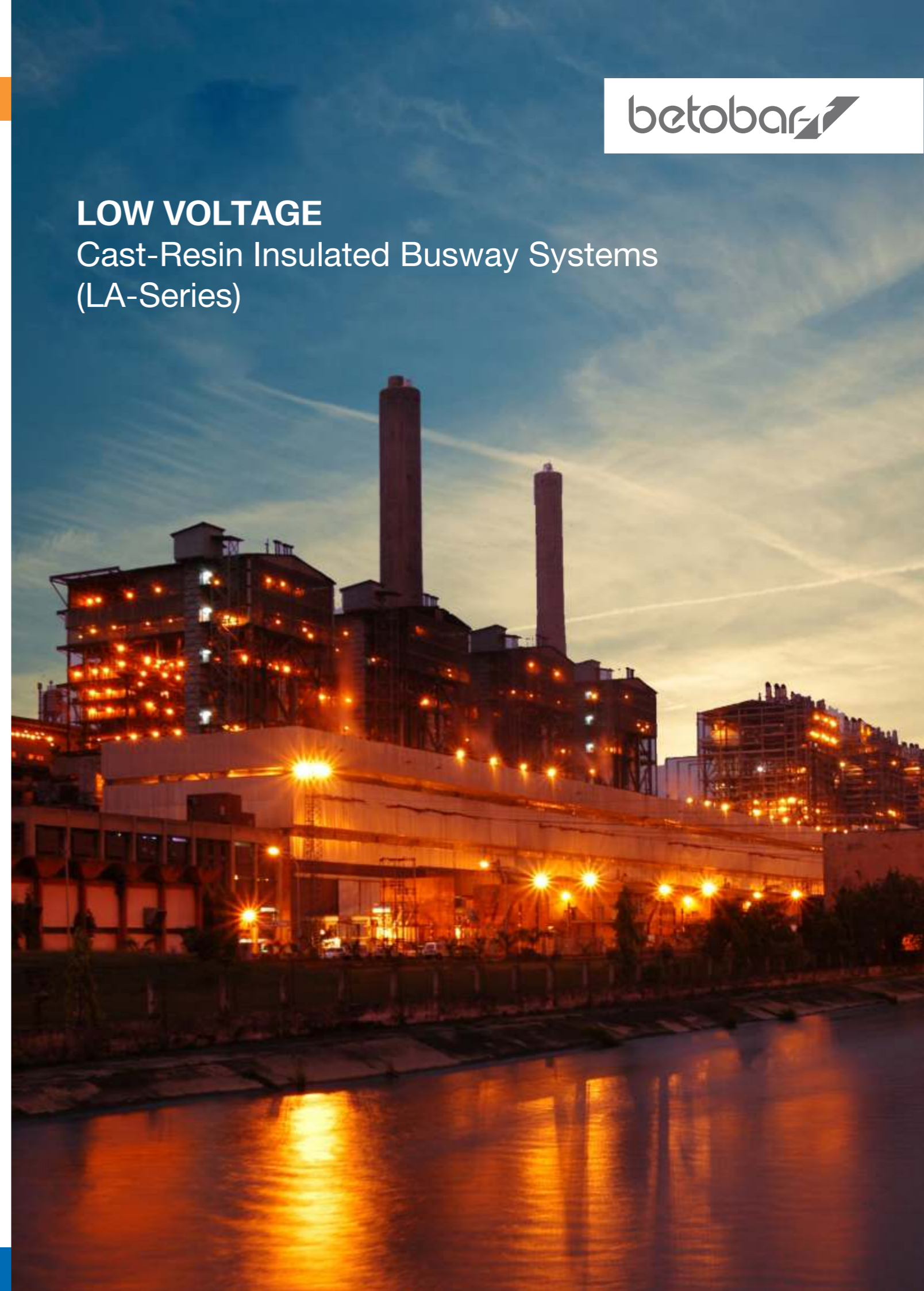


### Non-Segregated Phase Busducts

C&S offer a wide range of Non-Segregated Phase Bus ducts for Low Voltage applications from 415V to 1.1 kV upto 6500A with a maximum Short Circuit Current withstand capability of 80 kA rms for 1sec. and 180 kA peak. Non-Segregated Phase Bus Ducts are commonly used in industrial utilities, power plants for interconnection between switchgear and transformers and also for lower capacity of generator (viz DG sets)



## LOW VOLTAGE Cast-Resin Insulated Busway Systems (LA-Series)



## Extensive application and Element Range

betobar busbars are suitable for application in large buildings, industrial plants, power stations, sub-stations and large switchrooms, such as:

- Factory distribution of low voltage power.
- Rising mains with tap-offs to sub-distribution boards in high rise buildings.
- Transformer switchboard connections.
- Main switchboard feeders to distribution panels.
- Generator and large motor feeders.
- Refineries, offshore and onshore platforms.

betobar busway system is available in a wide range of standard element shapes, forms, and lengths which are fabricated to suit the typical project requirements. Our element range consists of:

- Straight elements.
- Flat and edge elbows.
- Z (double elbow) and T elements.
- Flanged terminal elements.
- Tap-off facilities and phase-transposition elements.
- Thermal expansion compensation elements.



## High-Quality Production

betobar busbars have been developed as a modern, all-purpose means of efficient and safe transmission of electrical energy. They have been in manufacture for more than thirty-five years.

betobar system complies with all the requirements for current distribution.

The busbar consists of copper or aluminium conductors, embedded in an enclosure of a fire retardant, self extinguishing and homogeneous insulation mix based on epoxy cast-resin with mineral fillers, ensuring high mechanical strength and chemical withstand.

Standard types are available for current ratings up to 6300 A and voltage ratings up to 1000V.

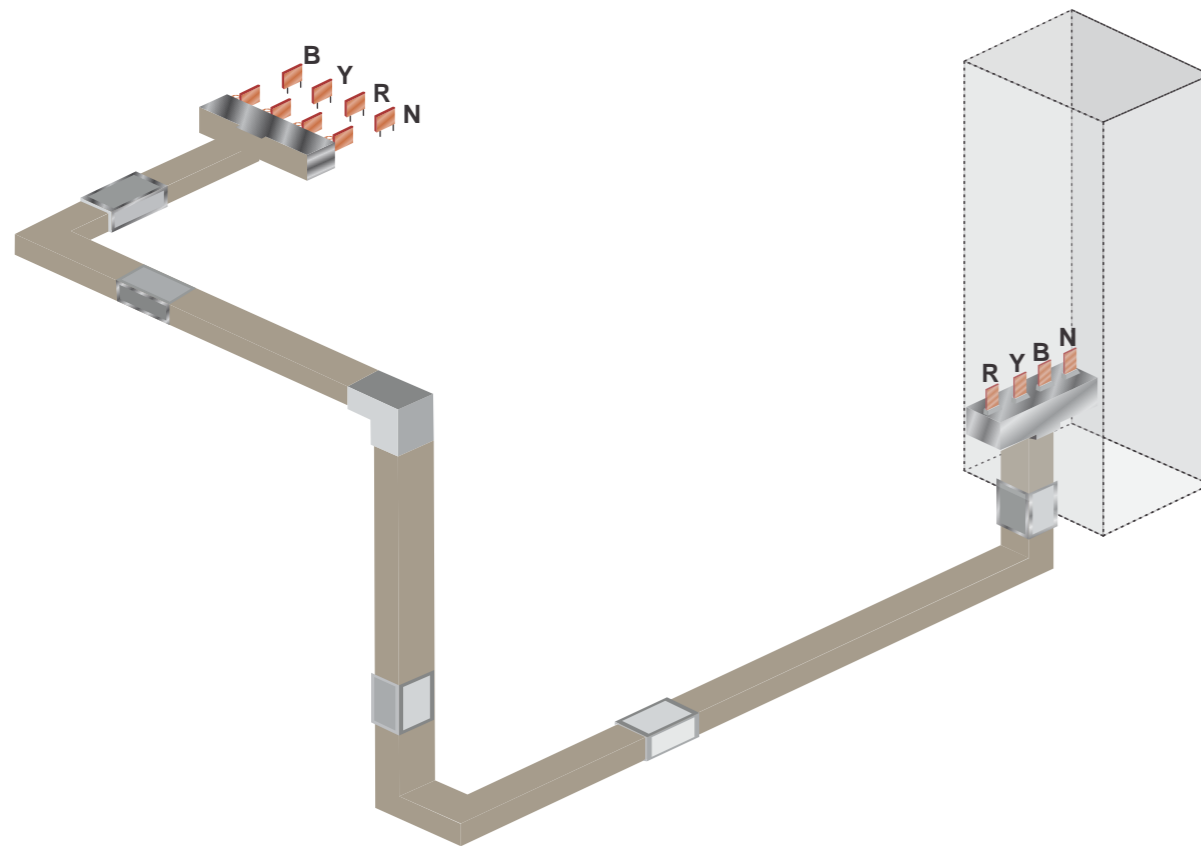
The busbar line consists of a number of prefabricated elements. The electrical joining of the conductors is achieved by Uni-Block Joint with double fish plates and high tensile steel bolts.

The junctions and the element ends are overcast with the same insulation mix as used for the elements. In this way an integral insulating enclosure to IP68.IK10 is guaranteed over the full length of the busbar run.



## Major Advantages

- No possibility of condensation
- No chimney effects
- Protection against corrosion
- Protection against Chemicals
- Protection against fungi, insects & rodents
- UV resistance
- Low voltage drop
- Very compact size
- Virtually maintenance free
- Highest degree of Protection : IP68 as per IEC 60529
- High mechanical strength of IK10 as per IEC 62262
- Fire resistance as per IEC 60331-21
- Fire resistance as per ISO 834-1
- Self-extinguishing Insulation as per IEC 60332

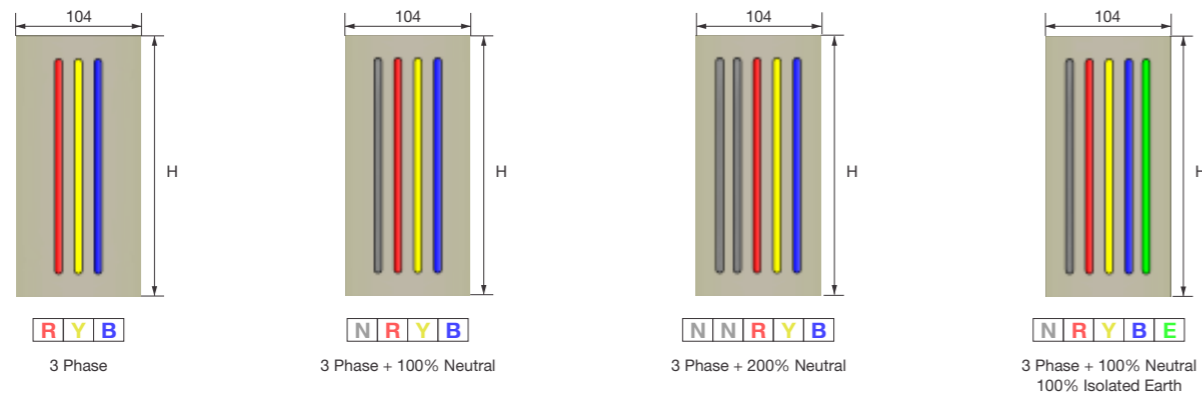


## Technical Specifications

## Cast Resin Bustrunking

Compliance of Standard	IEC 61439 (1&6) / IS 8623 (1&2)
Independent Certification Authority	CPRI, UL
Busbar Arrangement	Cast Resin
Busbar Ratings	Copper 800A ~ 6300A Aluminium 630A ~ 5000A
Busbar Configuration	3 Phase 3 Phase+100% Neutral 3 Phase+200% Neutral 3 Phase+100% Neutral+100% Isolated Earth
Rated Operational Voltage (Ue)	1000 Volt, AC
Rated Insulation Voltage (Ui)	1000 Volt, AC
Rated Impulse Withstand Voltage (Uimp)	12 kV (1.2/50 μs)
Rated Frequency	50 Hz / 60 Hz
Enclosure Material / Busbar insulation	Cast Resin
Busbar Material (Phase/Neutral)	Copper 99.9% pure ETP grade Aluminium 6101 with high conductivity & strength
Degree of Protection	IP 68, Tested for 24 Hours (for feeder Busduct) IP 55 (for Plug in Busduct)
Mechanical Impact strength	IK.10 as per IEC 62262
Joint Type	Uniblock
Plug -in-Box	125-630A
Flame Resistance	As per IEC 60332-2-10

Technical Parameters



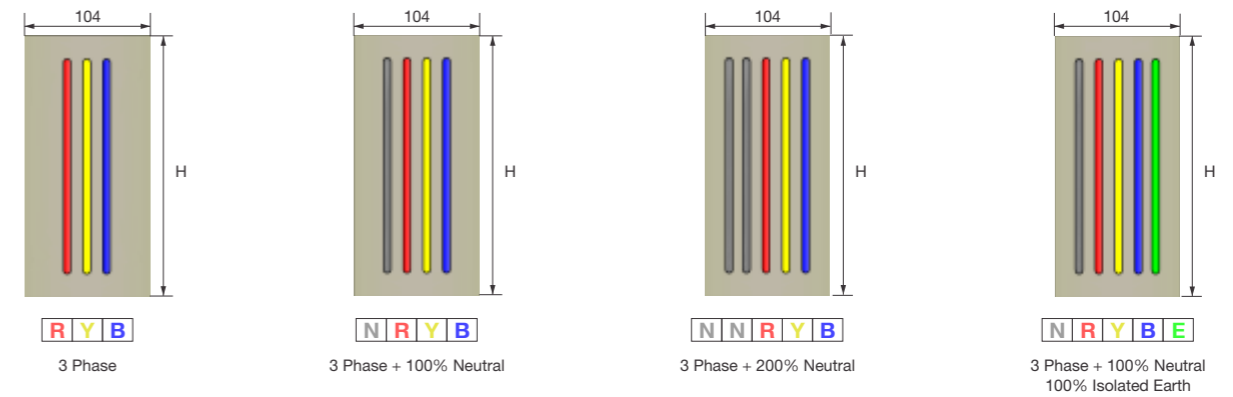
Cast Resin Copper

Rated Current (In)	Amps	800A	1250A	1750A	2200A	2500A	3200A	4000A	5000A	6300A
Product Code	---	LA 04EC	LA 08EC	LA 12EC	LA 16EC	LA 20EC	LA 25EC	LA 16DC	LA 20DC	LA 25DC
Busbar size per phase (No. of busbars)	sqmm.	240	480	720	960	1200	1500	1920	2400	3000
Overall Height (H)	mm	80	120	160	200	240	290	400	480	580
Rated Three Phase RMS Short Time Current for 1 Second (Icw)	kA	30	50	80	80	80	80	120	120	120
Rated Three phase Peak short time current (Ipk)	kA	63	105	176	176	176	176	264	264	264
Rated Single Phase RMS Short Time Current for 1 Second (Icw)	kA	18	30	48	48	48	48	72	72	72
Rated Single phase Peak short time current (Ipk)	kA	36	63	100.8	100.8	100.8	100.8	158.4	158.4	158.4
<b>Approximate Weight of Bustrunking</b>										
3 Phase	kg/mtr.	23	37	51	65	79	97	130	158	191
3 Phase + 100% Neutral	kg/mtr.	25	41	56	72	88	108	144	176	210
3 Phase + 200% Neutral	kg/mtr.	27	45	62	79	97	120	158	194	240
3 Phase + 100% Neutral + 100% Isolated Earth	kg/mtr.	27	45	62	79	97	120	158	194	240
<b>Electrical Characteristics for 50 Hz</b>										
A.C. Resistance at 20°C (R20)	miliohms /mtr.	0.0748	0.0385	0.0264	0.0206	0.0167	0.0128	0.0103	0.0084	0.0064
A.C. Resistance at thermal conditions (Rt)	miliohms /mtr.	0.0969	0.0499	0.0342	0.0266	0.0217	0.0165	0.0133	0.0108	0.0083
Reactance (X)	miliohms /mtr.	0.0602	0.0378	0.0276	0.0222	0.0196	0.0164	0.0122	0.0108	0.0090
Impedance at thermal conditions (Z)	miliohms /mtr.	0.1140	0.0626	0.0440	0.0347	0.0292	0.0233	0.0181	0.0153	0.0122
Composite Voltage drop at full Load concentrated at the end of bustrunking run (ΔV)	mV/mtr./A at 0.7 P.F.	0.1919	0.1072	0.0756	0.0597	0.0505	0.0403	0.0312	0.0265	0.0212
	mV/mtr./A at 0.8 P.F.	0.1968	0.1084	0.0761	0.0599	0.0504	0.0400	0.0311	0.0262	0.0208
	mV/mtr./A at 0.9 P.F.	0.1968	0.1065	0.0743	0.0584	0.0487	0.0383	0.0300	0.0251	0.0197
	mV/mtr./A at 1.0 P.F.	0.1678	0.0864	0.0592	0.0461	0.0375	0.0286	0.0230	0.0188	0.0143

Voltage Drop Calculation Formulae

$$\Delta V = k \times \sqrt{3} \times (R_t \cos \phi + X \sin \phi) \times I_B \times L$$

Technical Parameters



Cast Resin Aluminium

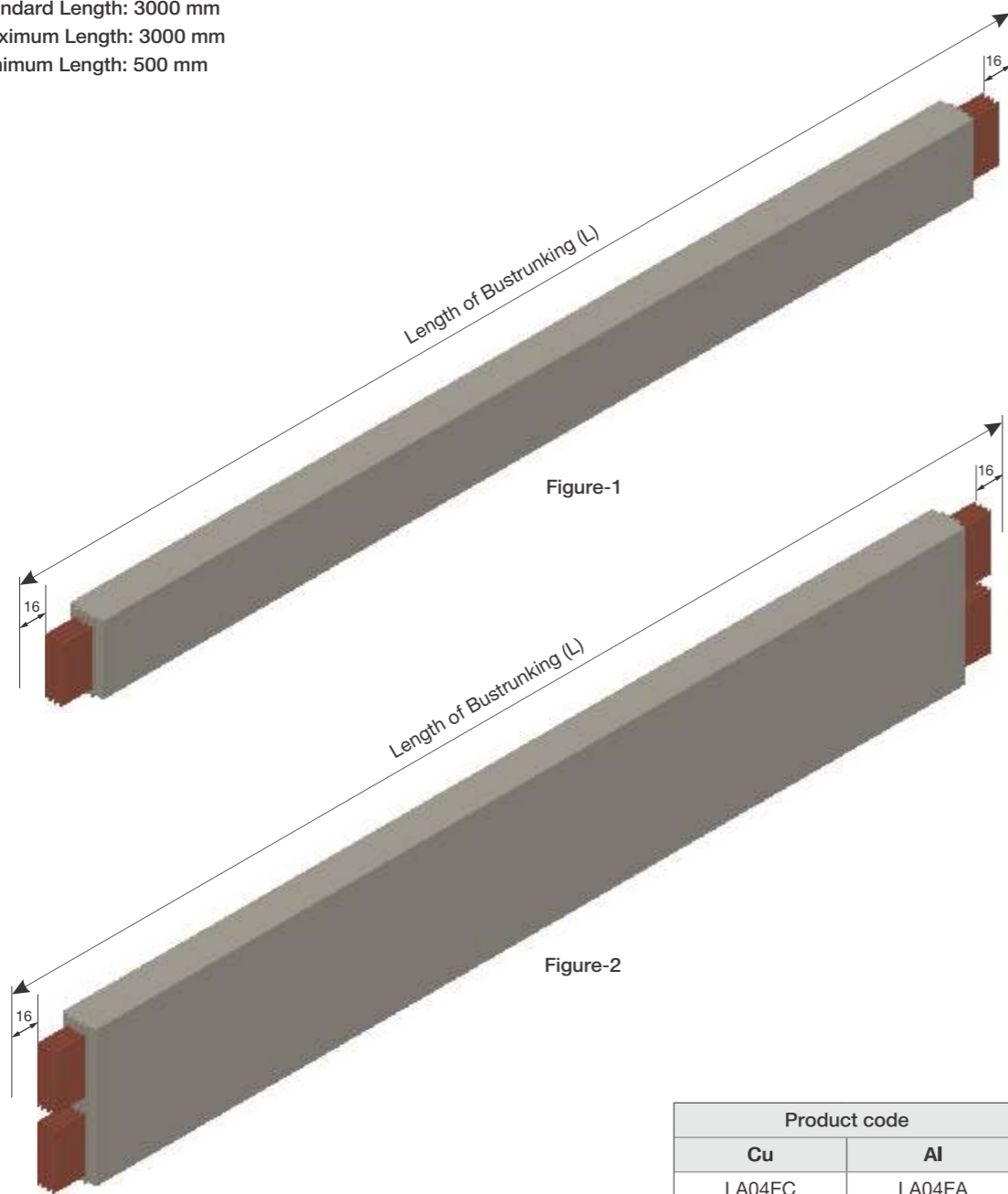
Rated Current (In)	Amps	630	1000	1250	1750	2000	2500	3200	4000	5000
Product Code	---	LA 04EA	LA 08EA	LA 12EA	LA 16EA	LA 20EA	LA 25EA	LA 16DA	LA 20DA	LA 25DA
Busbar size per phase (No. of busbars)	sqmm.	240	480	720	960	1200	1500	1920	2400	3000
Overall Height (H)	mm	80	120	160	200	240	290	400	480	580
Rated Three Phase RMS Short Time Current for 1 Second (Icw)	kA	20	40	50	65	80	80	100	100	100
Rated Three phase Peak short time current (Ipk)	kA	40	84	105	143	176	176	220	220	220
Rated Single Phase RMS Short Time Current for 1 Second (Icw)	kA	12	24	30	39	48	48	60	60	60
Rated Single phase Peak short time current (Ipk)	kA	24	50.4	63	81.9	100.8	100.8	132	132	132
<b>Approximate Weight of Bustrunking</b>										
3 Phase	kg/mtr.	19	28	37	45	55	67	90	110	134
3 Phase + 100% Neutral	kg/mtr.	19	28	37	46	56	68	92	112	136
3 Phase + 200% Neutral	kg/mtr.	19	28	38	47	57	69	94	114	138
3 Phase + 100% Neutral + 100% Isolated Earth	kg/mtr.	19	28	38	47	57	69	94	114	138
<b>Electrical Characteristics for 50 Hz</b>										
AC Resistance at 20°C (R20)	miliohms /mtr.	0.1284	0.0655	0.0443	0.0342	0.0280	0.0214	0.0171	0.0140	0.0107
A.C. Resistance at thermal conditions (Rt)	miliohms /mtr.	0.1635	0.0834	0.0564	0.0435	0.0356	0.0272	0.0218	0.0178	0.0136
Reactance (X)	miliohms /mtr.	0.0602	0.0378	0.0276	0.0222	0.0196	0.0164	0.0122	0.0108	0.0090
Impedance at thermal conditions (Z)	miliohms /mtr.	0.1742	0.0915	0.0628	0.0488	0.0407	0.0318	0.0249	0.0208	0.0163
Composite Voltage drop at full Load concentrated at the end of bustrunking run (ΔV)	mV/mtr./A at 0.7 P.F.	0.2727	0.1478	0.1025	0.0802	0.0674	0.0533	0.0415	0.0349	0.0276
	mV/mtr./A at 0.8 P.F.	0.2891	0.1548	0.1068	0.0834	0.0697	0.0547	0.0428	0.0359	0.0282
	mV/mtr./A at 0.9 P.F.	0.3006	0.1587	0.1089	0.0847	0.0704	0.0549	0.0432	0.0360	0.0280
	mV/mtr./A at 1.0 P.F.	0.2832	0.1444	0.0977	0.0754	0.0617	0.0471	0.0377	0.0308	0.0236

Where  $\Delta V$  is the composite voltage drop of the system (V);  $R_t$  &  $X$  are the mean resistance and reactance value of the system (mΩ/mtr);  $I_B$  is the actual load current of the circuit being considered (A);  $L$  is the length of the system being considered (M);  $\cos \phi$  is the load power factor being considered;  $k$  is the load distribution factor:  $k=1$ , if full load is concentrated at the end of the busbar trunking run;  $k=(n+1)/2n$ , if the load is uniformly spread between n branches.

- Transformer to Panel
- Panel to Panel
- Panel to Rising Main

Standard Length: 3000 mm  
 Maximum Length: 3000 mm  
 Minimum Length: 500 mm

**Straight Length Feeder**

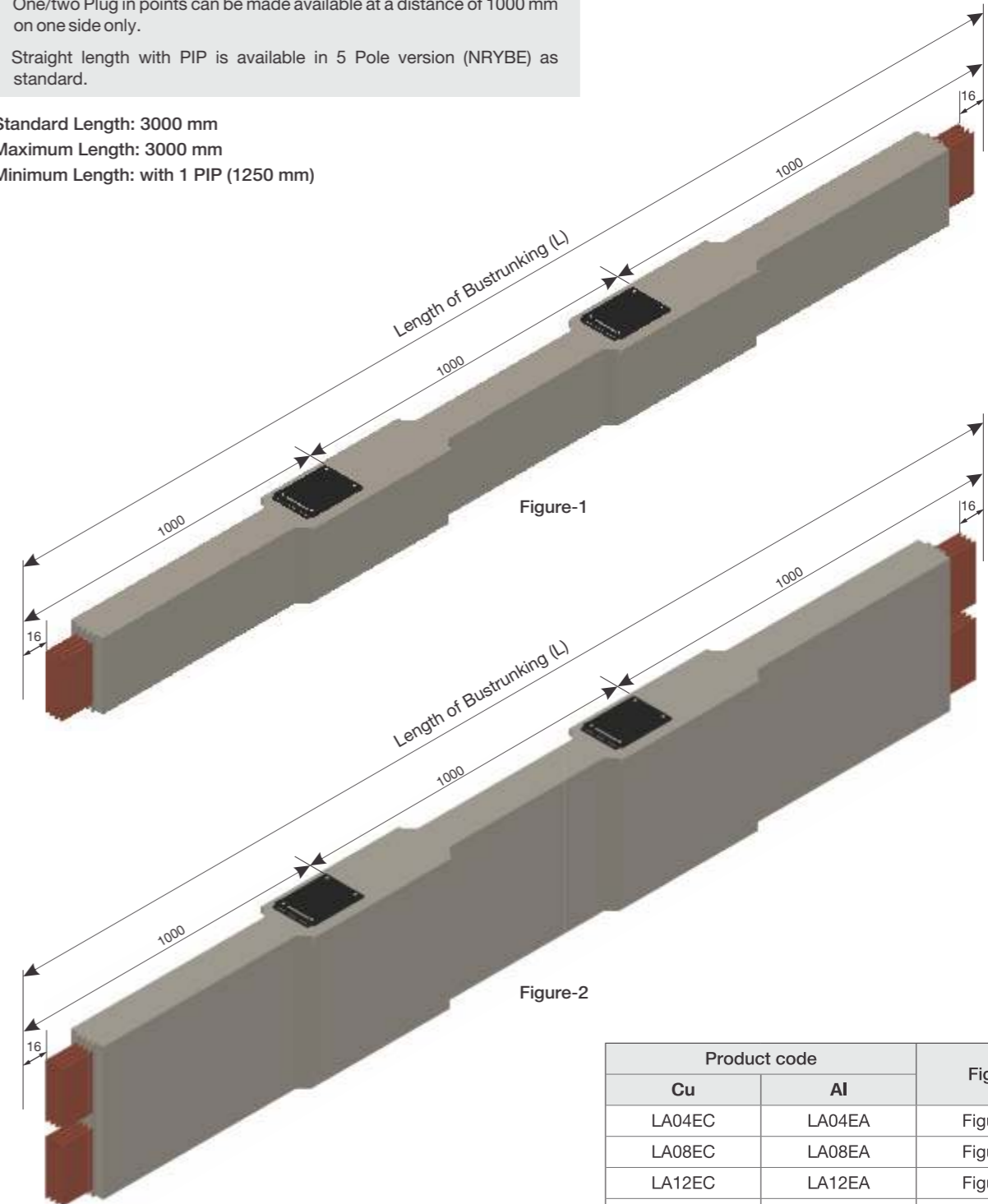


Product code		Figure
Cu	Al	
LA04EC	LA04EA	Figure 1
LA08EC	LA08EA	Figure 1
LA12EC	LA12EA	Figure 1
LA16EC	LA16EA	Figure 1
LA20EC	LA20EA	Figure 1
LA25EC	LA25EA	Figure 1
LA16DC	LA16DA	Figure 2
LA20DC	LA20DA	Figure 2
LA25DC	LA25DA	Figure 2

- For tapping Power from Main Line through Plug -in Boxes
- One/two Plug in points can be made available at a distance of 1000 mm on one side only.
- Straight length with PIP is available in 5 Pole version (NRYBE) as standard.

Standard Length: 3000 mm  
 Maximum Length: 3000 mm  
 Minimum Length: with 1 PIP (1250 mm)

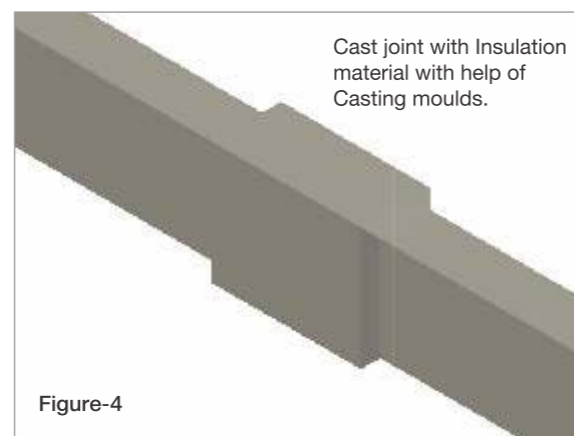
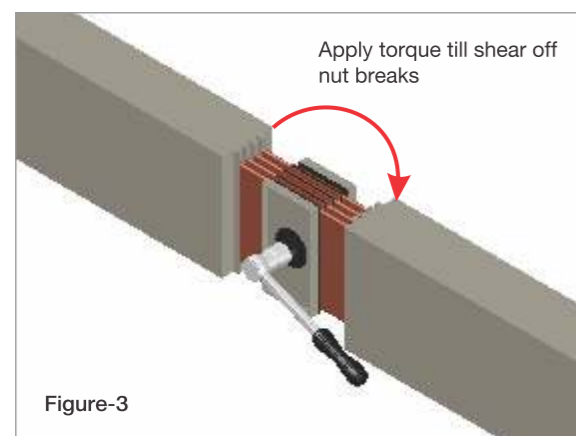
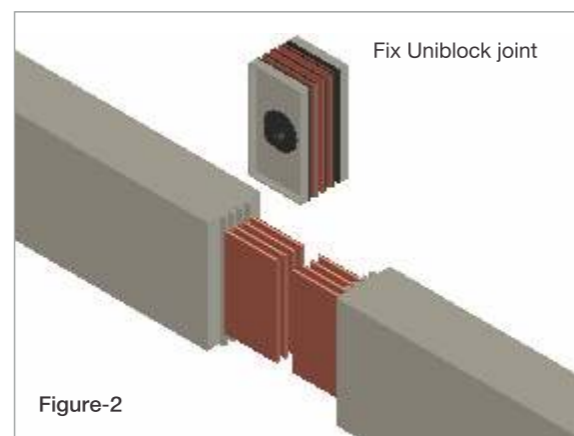
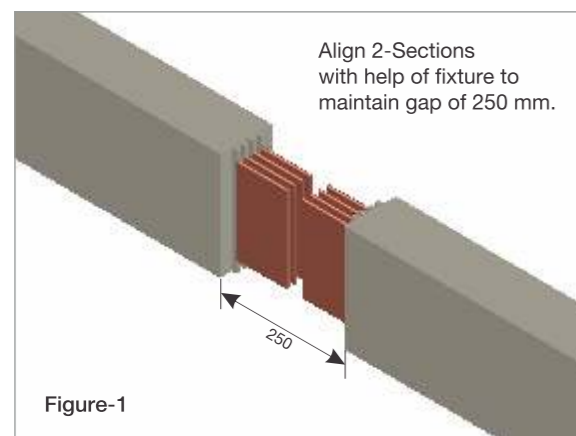
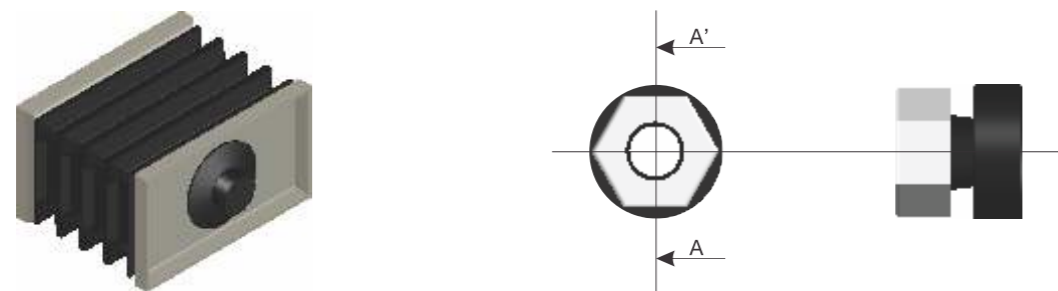
**Straight Length with PIP**



Product code		Figure
Cu	Al	
LA04EC	LA04EA	Figure 1
LA08EC	LA08EA	Figure 1
LA12EC	LA12EA	Figure 1
LA16EC	LA16EA	Figure 1
LA20EC	LA20EA	Figure 1
LA25EC	LA25EA	Figure 1
LA16DC	LA16DA	Figure 2
LA20DC	LA20DA	Figure 2
LA25DC	LA25DA	Figure 2

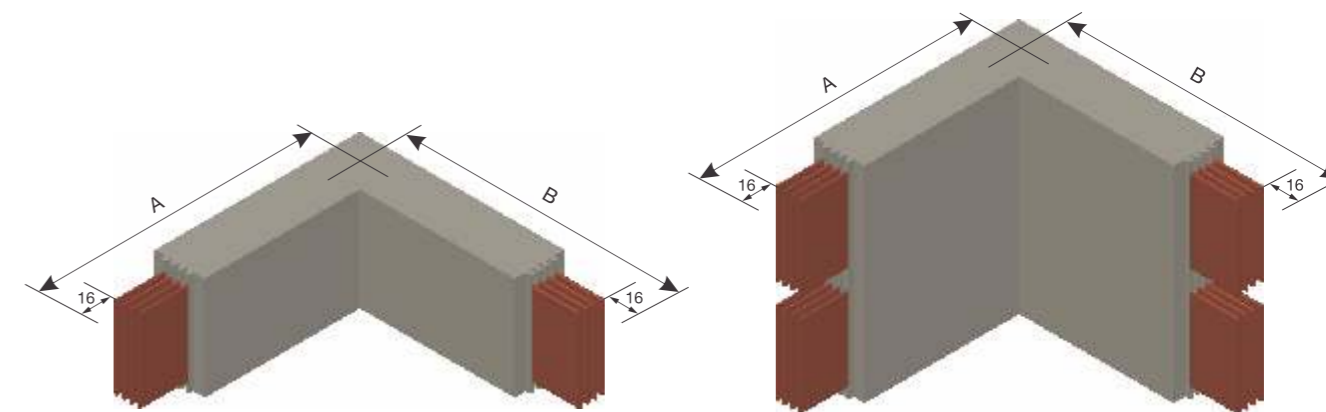
- Joint can be fitted/ removed in installed condition without removal of section.
- Heavy Duty disc spring are used on both side for uniform distribution of pressure.
- Joint can be tightened easily with the help of spanner on the shear of nut side only. (Spanner not required on the Bolt head side)
- Shear off nut ensure tightness of joint at desired torque and eliminates the need of torque wrench during installation.
- Tamper proof cap over the shear off nut prevents opening of the nut after achieving desired torque. Nut can only be opened after the cap is broken.

### Uniblock Joint



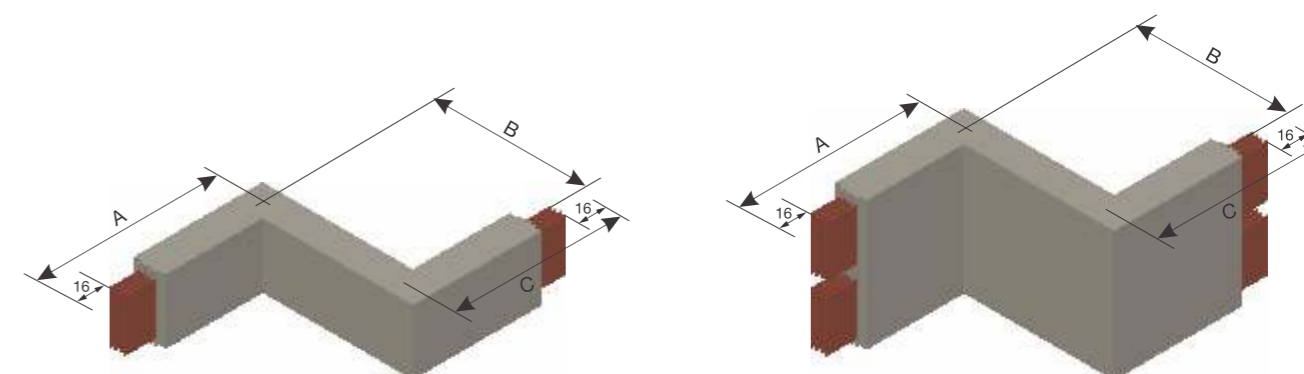
Current Rating	Dimensions mm (A x B)		
	Standard	Minimum	Maximum
Copper 800~6300A	500 x 500	500 x 500	500 x 500
Aluminium 630~5000A			

### Edge Elbow



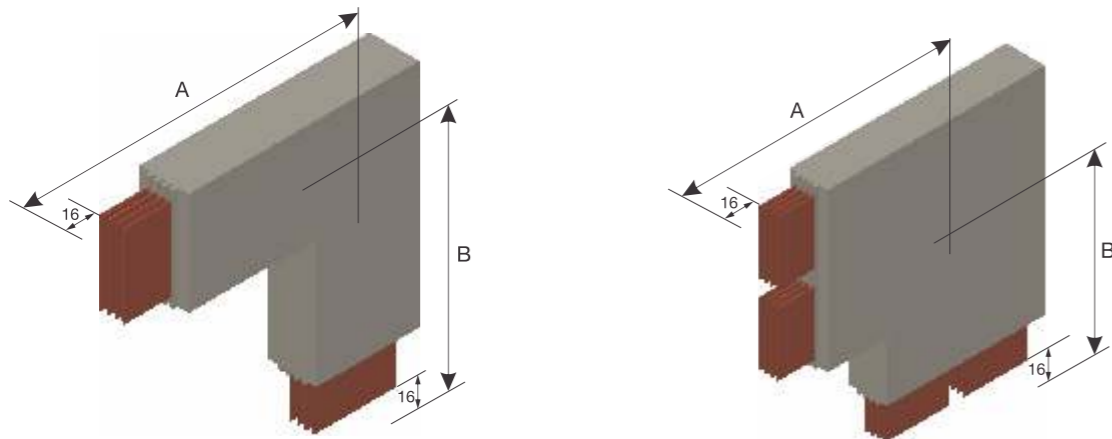
Current Rating	Dimensions mm (A x B x C)		
	Standard	Minimum	Maximum
Copper 800~6300A	500 x 500 x 500	500 x 300 x 500	500 x 1000 x 500
Aluminium 630~5000A			

### Offset Edge Elbow



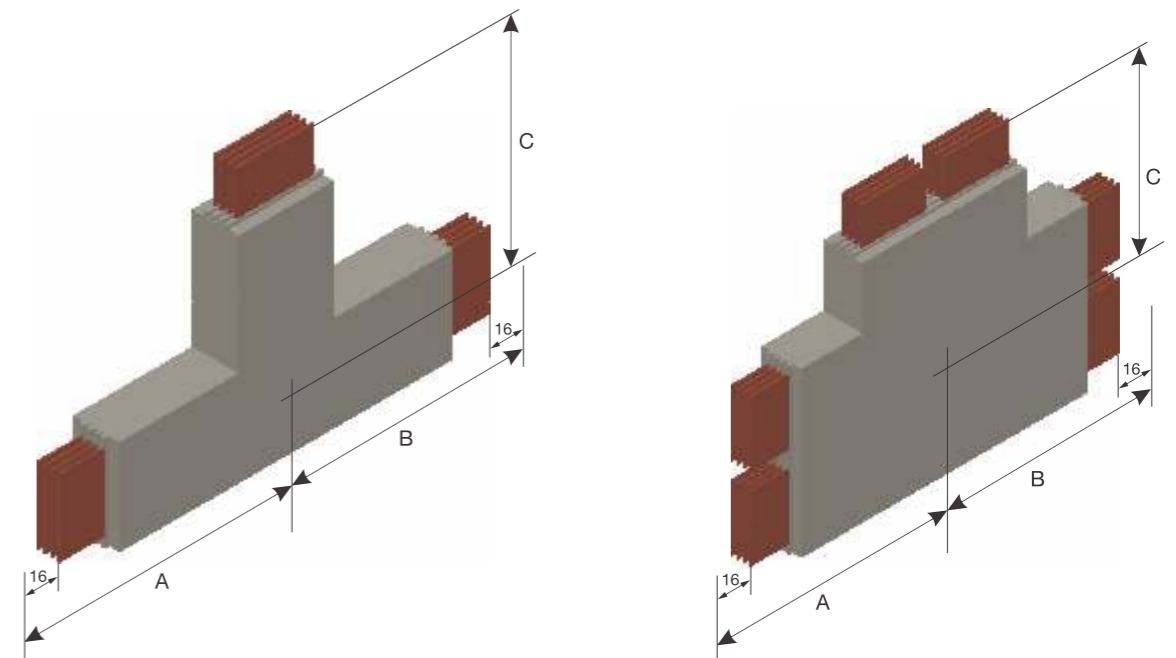
Current Rating	Dimensions mm (A x B)		
	Standard	Minimum	Maximum
Copper 800~3200A	500 x 500	500 x 500	500 x 1000
Aluminium 630~2500A			
Copper 4000~6300A	600 x 600	600 x 600	600 x 1000
Aluminium 3200~5000A			

### Flat Elbow



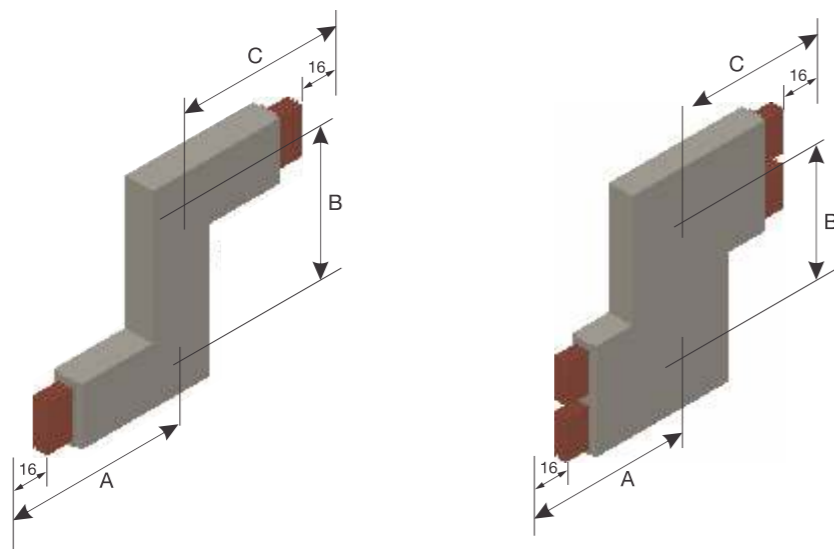
Current Rating	Dimensions mm (A x B)		
	Standard	Minimum	Maximum
Copper 800~3200A	500 x 500 x 500	500 x 500 x 500	500 x 500 x 500
Aluminium 630~2500A			
Copper 4000~6300A	600 x 600 x 600	600 x 600 x 600	600 x 600 x 600
Aluminium 3200~5000A			

### Flat Tee



Current Rating	Dimensions mm (A x B x C)		
	Standard	Minimum	Maximum
Copper 800~3200A	500 x 500 x 500	500 x 300 x 500	500 x 1000 x 500
Aluminium 630~2500A			
Copper 4000~6300A	600 x 600 x 600	600 x 600 x 600	600 x 1200 x 600
Aluminium 3200~5000A			

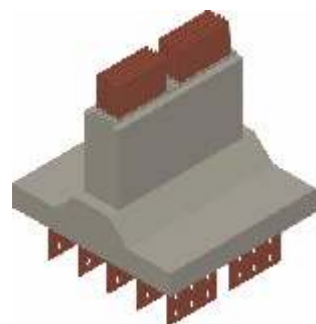
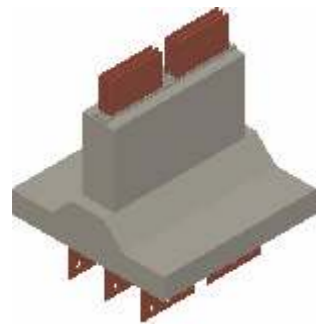
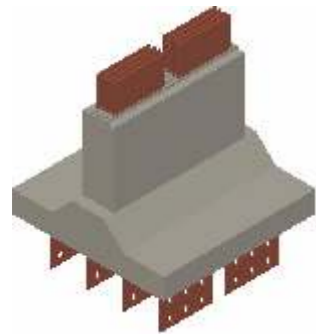
### Offset Flat Elbow



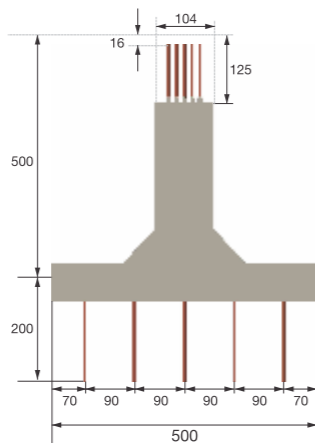
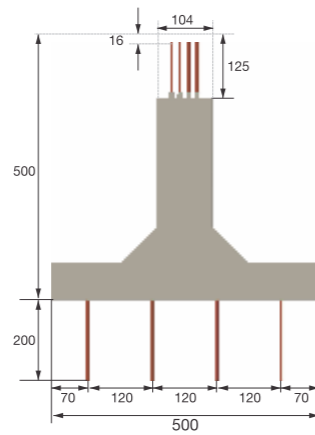
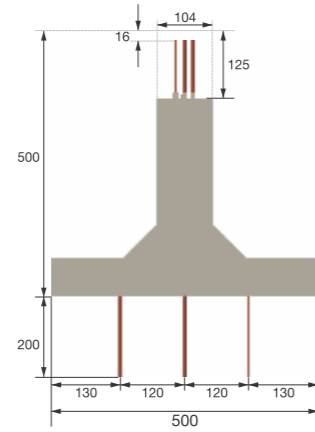
Flanged End are required to connect Bustrunking run with Panel / Transformer directly with combination of Flange End box.

### Flanged End

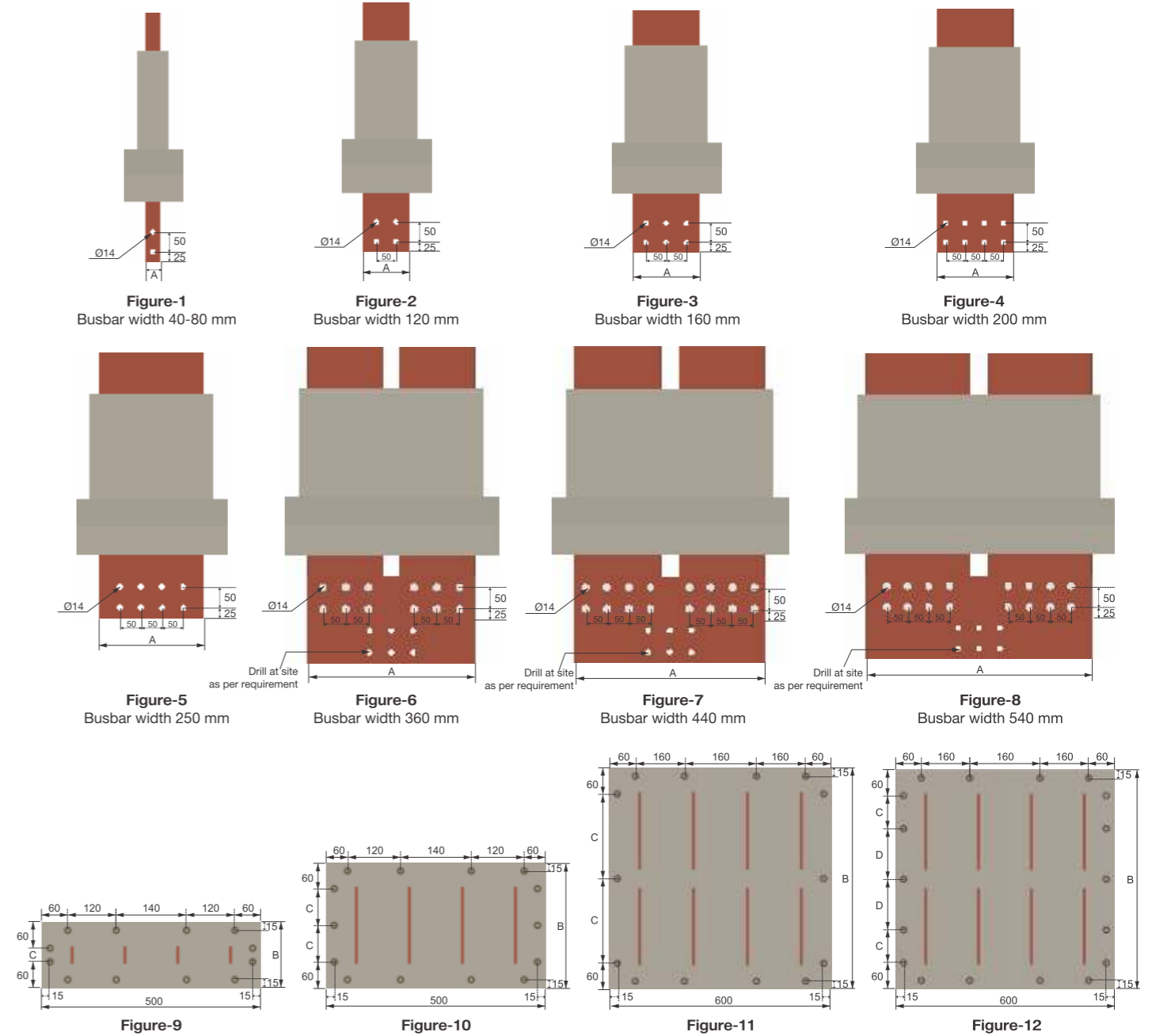
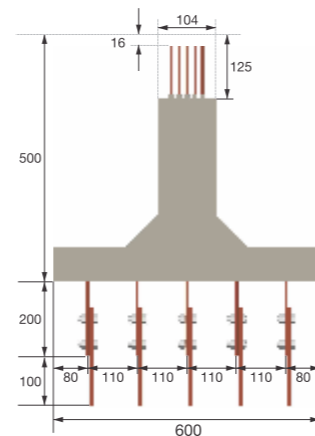
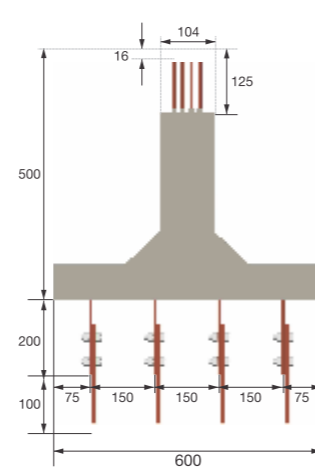
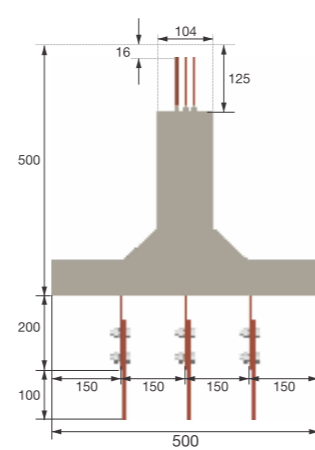
### Flanged End



Copper 800~3200A  
Aluminium 630~2500A



Copper 4000~6300A  
Aluminium 3200~5000A

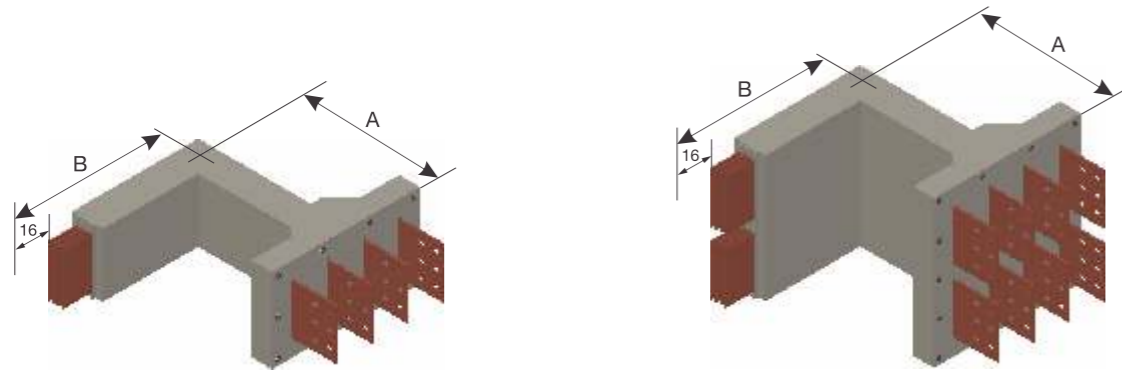


### Flanged End cut out & Drilling

Busbar size (sq. mm)	Copper		Aluminium		Dimensions				Busbar Hole Details	Terminal Details
	Rating (A)	Code	Rating (A)	Code	A	B	C	D		
240(1)	800	LA04EC	630	LA04EA	40	150	30	-	Figure 1	Figure 9
480(1)	1250	LA08EC	1000	LA08EA	80	190	70	-		
720(1)	1750	LA12EC	1250	LA12EA	120	230	110	-		
960(1)	2200	LA16EC	1750	LA16EA	160	270	150	-	Figure 4	Figure 10
1200(1)	2500	LA20EC	2000	LA20EA	200	310	95	-		
1500(1)	3200	LA25EC	2500	LA25EA	250	360	120	-	Figure 5	Figure 11
960(2)	4000	LA16DC	3200	LA16DA	360	470	175	-		
1200(2)	5000	LA20DC	4000	LA20DA	440	550	110	105	Figure 7	Figure 12
1500(2)	6300	LA25DC	5000	LA25DA	540	650	135	130		

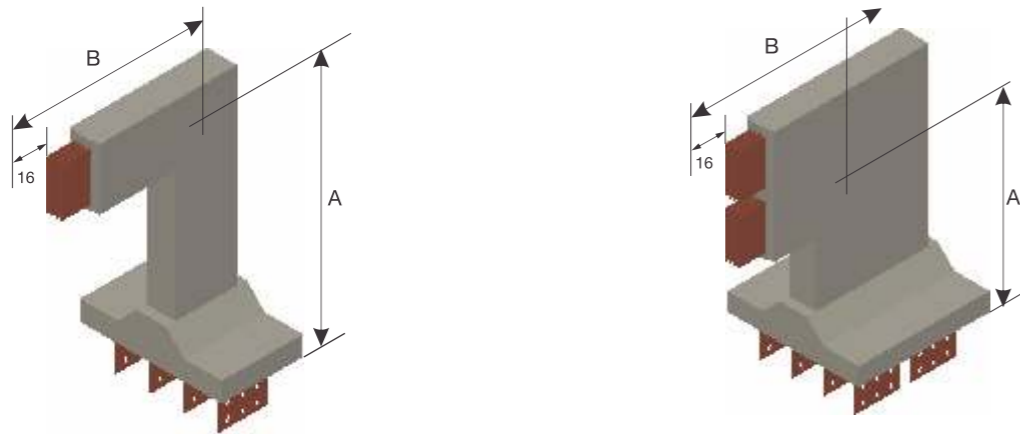
Current Rating	Dimensions mm (A x B)		
	Standard	Minimum	Maximum
Copper 800~6300A	500 x 500	300 x 500	1000 x 500
Aluminium 630~5000A			

### Flange End With Edge Elbow



Current Rating	Dimensions mm (A x B)		
	Standard	Minimum	Maximum
Copper 800~3200A	500 x 500	400 x 400	1000 x 500
Aluminium 630~2500A			
Copper 4000~6300A	600 x 600	600 x 600	1100 x 600
Aluminium 3200~5000A			

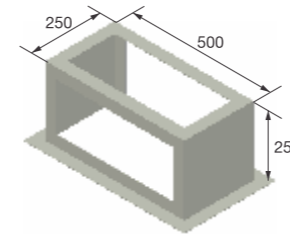
### Flanged End with Flat Elbow



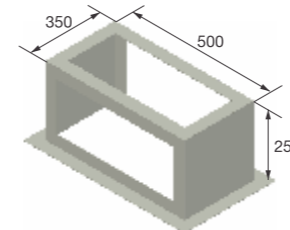
- Flange End Box are used for matching the standard bustrunking flange assembly with the Panel/DG/Trf. flange.
- Flange Bellow need to be fixed between Flanged end box and Genset termination box to avoid impact of vibrations of Genset being transferred to Bustrunking.

### Flanged End Box & Flange Bellow

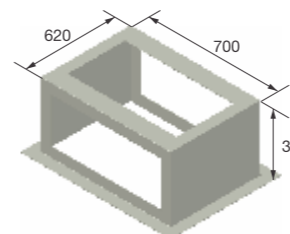
#### Flanged End Box



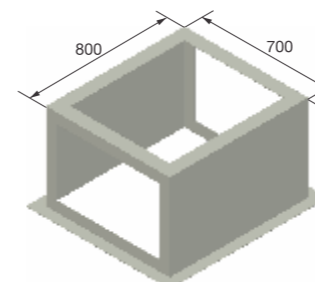
Copper 800~1750A  
Aluminium 630~1250A



Copper 2200~2500A  
Aluminium 1600~2000A

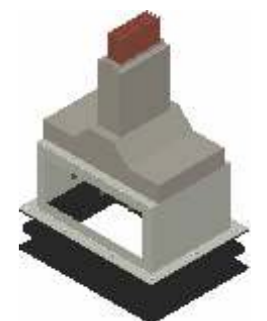
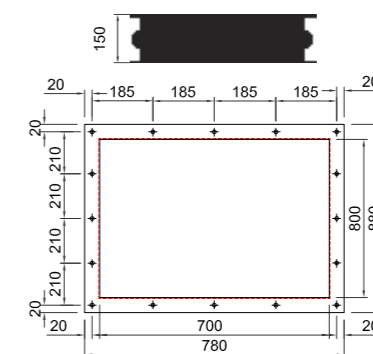
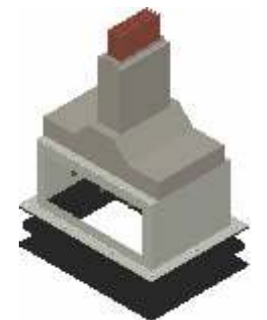
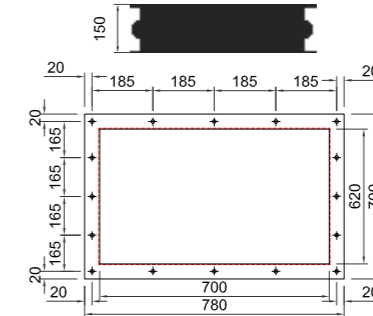
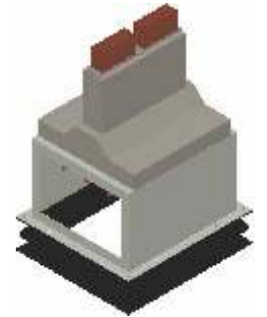
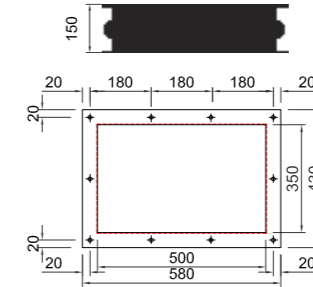
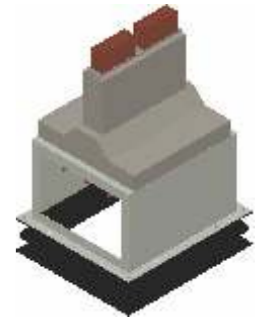
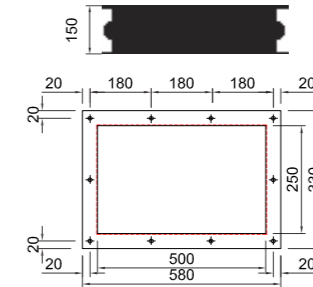


Copper 3200~5000A  
Aluminium 2250~4000A



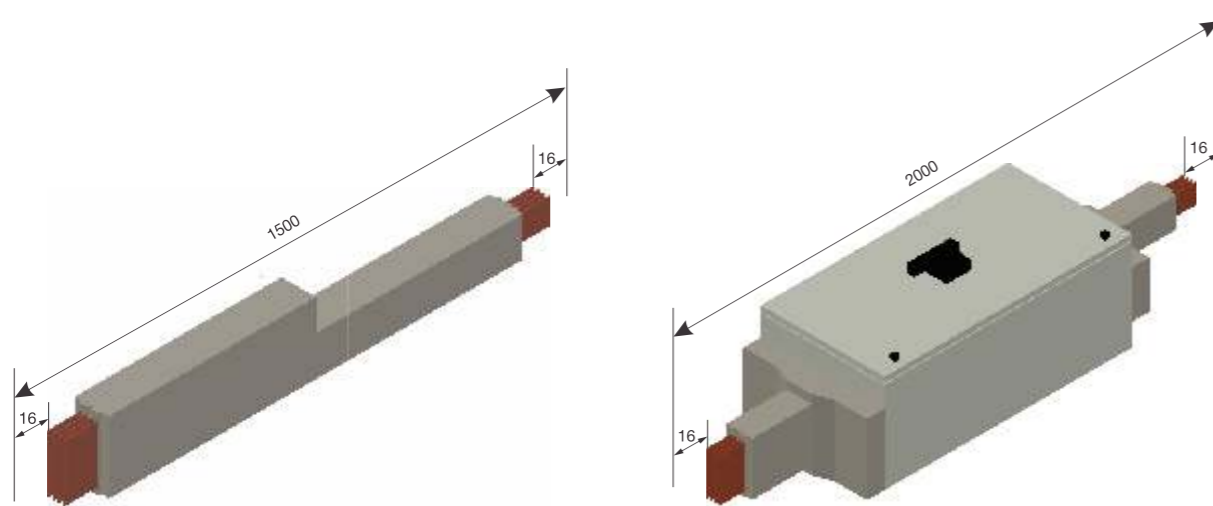
Copper 6300A  
Aluminium 5000A

#### Flange Bellow



- These are required to connect two dissimilar rating of busbar. Reducer may be designed with switching or isolating device.

### Reducer



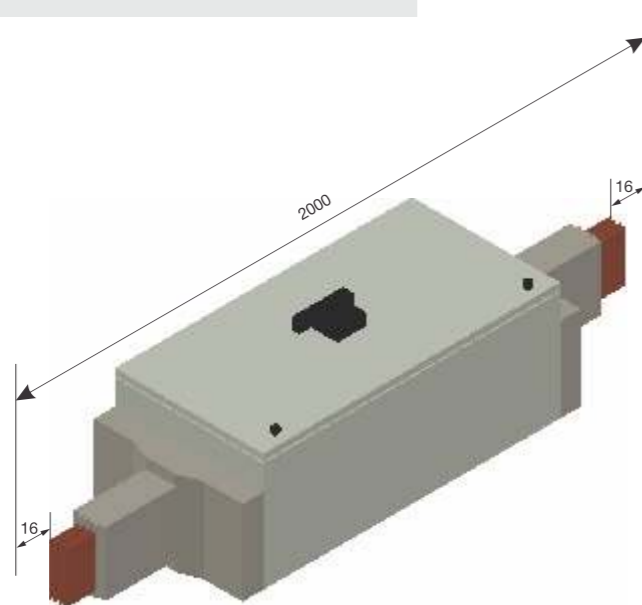
Reducer (Direct)

Reducer (Switchgear)

- These are required to isolate the busbar run in between, for various reasons. Section Isolator Unit can be fitted with load Break Switches / SFU's / MCCB's.

- Standard length 2000 mm

### Sectional Isolator



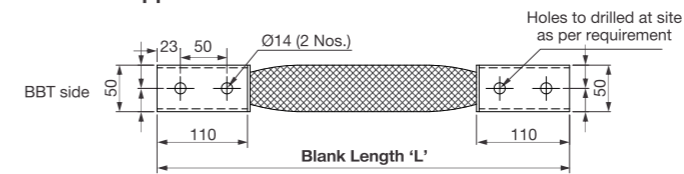
- Braided / Laminated Copper Flexible need to be used to connect flanged end busbar with busbars of Panel / Transformer / Generators.

### Copper Flexible

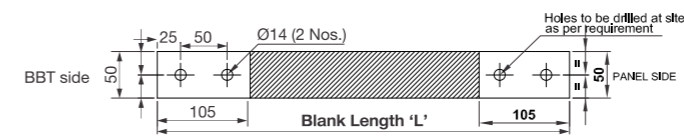
#### Blank Length 'L'

Standard	Minimum	Maximum
320	320	410

#### Braided Copper Flexible



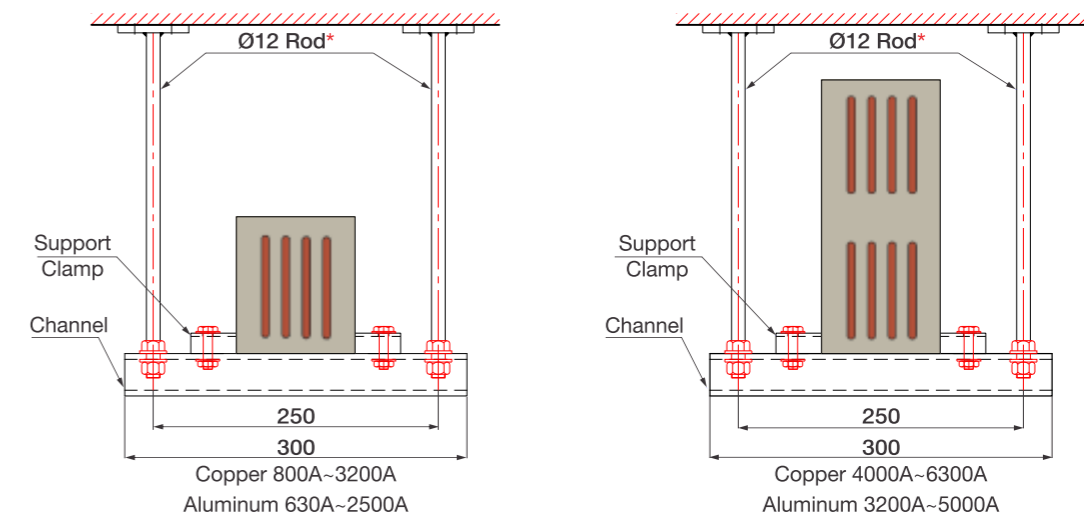
#### Laminated Copper Flexible



\* Thickness (t) & No of flexible as per Rating

- These support need to be provided on horizontal feeder run at an interval of 1.5 Meter (or as per site requirement), common for all ratings.

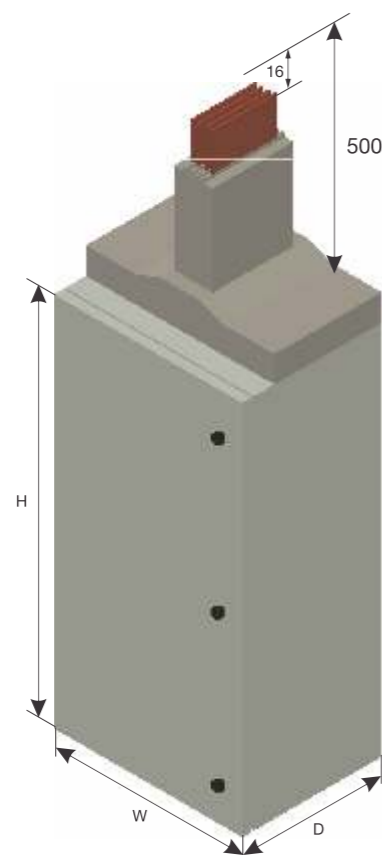
### Edgewise Horizontal Support



\* (Not in Scope of supply)

- To charge bustrunking through cables from one end of bustrunking.
- End feed is available with sufficient space for direct connection through lugs and bolts.
- 500 mm length of bustrunking is integrally fitted (measured with bustrunking) along with End Feed as standard practice so that joint between End Feed and bustrunking is exactly same as joint of two normal bustrunking lengths.
- Undrilled cable gland plate is provided at bottom for multiple cable entry.

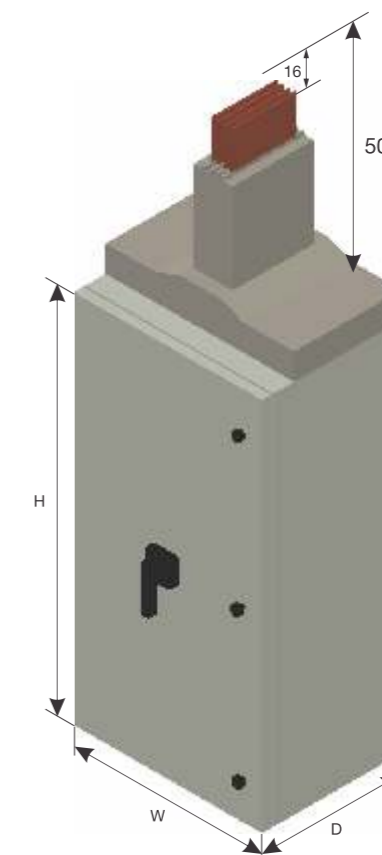
### End Feed Direct



Copper		Dimensions (mm)			Recommend Al. Cable size 3.5 core sqmm (No.)	Aluminium		Dimensions (mm)			Recommend Al. Cable size 3.5 core sqmm (No.)
Rating	Code	Height (H)	Width (W)	Depth (D)		Rating	Code	Height (H)	Width (W)	Depth (D)	
800	LA04EC	800	500	370	400 (2)	630	LA04EA	800	500	370	300 (2)
1250	LA08EC	1000	500	370	300 (4)	1000	LA08EA	1000	500	370	185 (4)
1750	LA12EC	1000	500	370	240 (6)	1250	LA12EA	1000	500	370	300 (4)
2200	LA16EC	1000	500	370	300 (6)	1750	LA16EA	1000	500	370	240 (6)
2500	LA20EC	1000	500	370	300 (8)	2000	LA20EA	1000	500	370	300 (6)
3200	LA25EC	DATA ON REQUEST				2500	LA25EA	DATA ON REQUEST			
4000	LA16DC	DATA ON REQUEST				3200	LA16DA	DATA ON REQUEST			
5000	LA20DC	DATA ON REQUEST				4000	LA20DA	DATA ON REQUEST			
6300	LA25DC	DATA ON REQUEST				5000	LA25DA	DATA ON REQUEST			

- To charge bustrunking through cables from one end of bustrunking.
- End feed is available with MCCB, SFU, Isolators, fuse holders etc. as per requirement.
- 500 mm length of bustrunking is integrally fitted (measured with bustrunking) along with End Feed as standard practice so that joint between End Feed and bustrunking is exactly same as joint of two normal bustrunking lengths.
- Undrilled cable gland plate is provided at bottom for multiple cable entry.

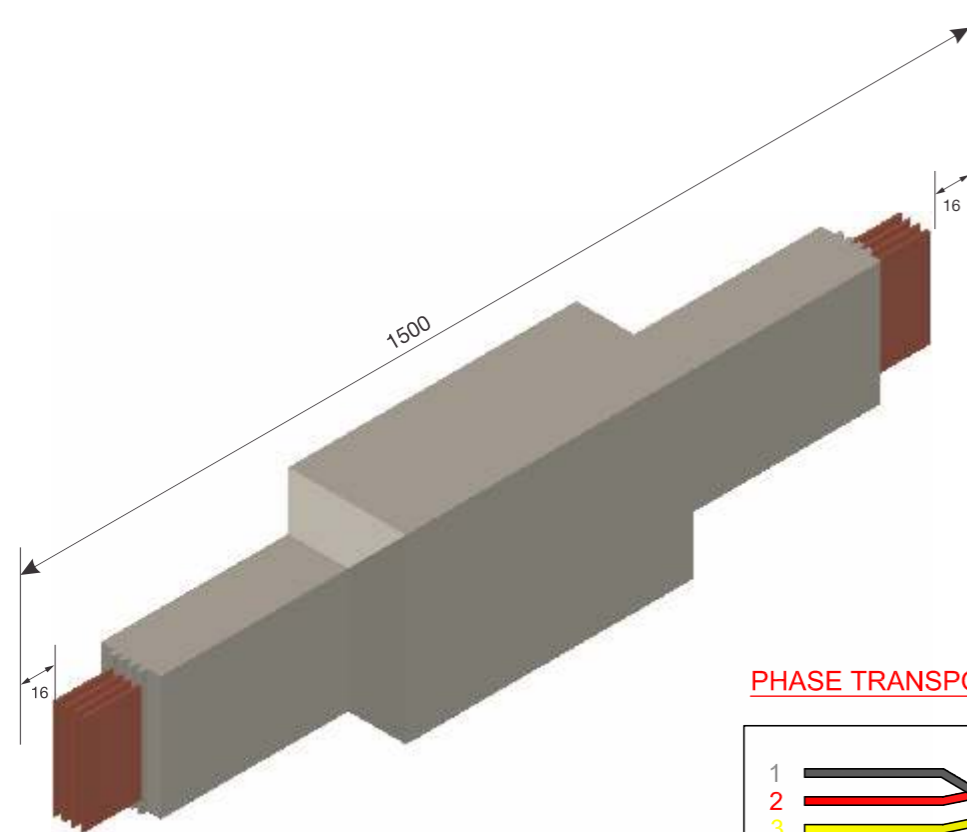
### End Feed with Switchgear



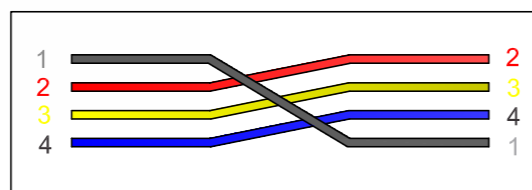
Copper		Dimensions (mm)			Recommend Al. Cable size 3.5 core sqmm (No.)	Aluminium		Dimensions (mm)			Recommend Al. Cable size 3.5 core sqmm (No.)
Rating	Code	Height (H)	Width (W)	Depth (D)		Rating	Code	Height (H)	Width (W)	Depth (D)	
800	LA04EC	800	500	370	400 (2)	630	LA04EA	800	500	370	300 (2)
1250	LA08EC	1000	500	370	300 (4)	1000	LA08EA	1000	500	370	185 (4)
1750	LA12EC	1000	500	370	240 (6)	1250	LA12EA	1000	500	370	300 (4)
2200	LA16EC	1000	500	370	300 (6)	1750	LA16EA	1000	500	370	240 (6)
2500	LA20EC	1000	500	370	300 (8)	2000	LA20EA	1000	500	370	300 (6)
3200	LA25EC	DATA ON REQUEST				2500	LA25EA	DATA ON REQUEST			
4000	LA16DC	DATA ON REQUEST				3200	LA16DA	DATA ON REQUEST			
5000	LA20DC	DATA ON REQUEST				4000	LA20DA	DATA ON REQUEST			
6300	LA25DC	DATA ON REQUEST				5000	LA25DA	DATA ON REQUEST			

- Phase transposition unit are used to change the relative position of the phase conductors in order to balance the inductive reactances or to transpose the phases (such as NRYB to BYRN)
- To be used only in indoor Application.
- Standard Dimension (L) : 1500 mm

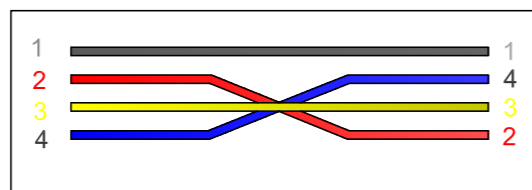
### Phase Transposition Unit



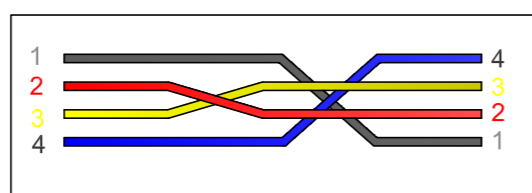
#### PHASE TRANSPOSITION UNIT (TYPE-1)



#### PHASE TRANSPOSITION UNIT (TYPE-2)

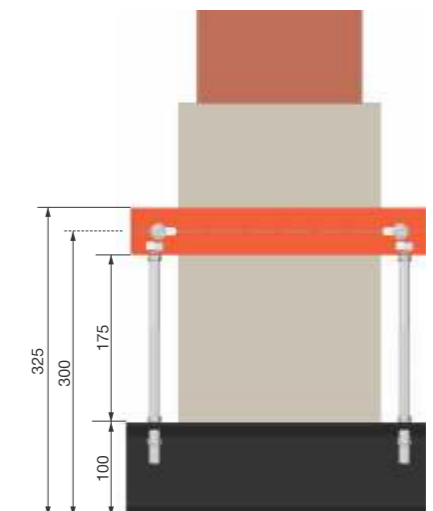
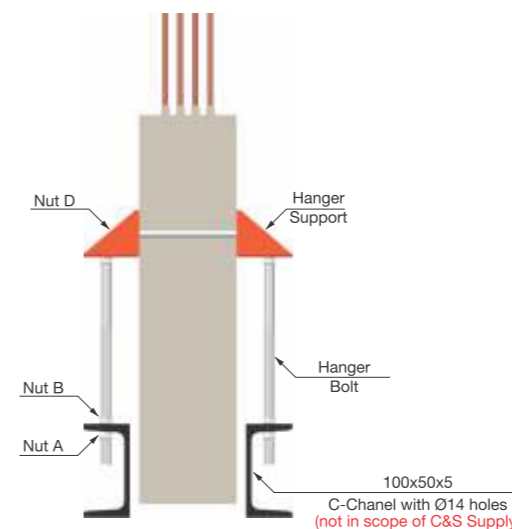


#### PHASE TRANSPOSITION UNIT (TYPE-3)



- One set of Rigid hanger per rising main must be installed at the start of the rising mains (i.e. At the lowest floor) to prevent expansion of bustrunking in downward direction. These can be fitted on 100x50x5 (or equivalent) channels mounted on floor / wall as shown below (not in scope of C&S supply)
- Recommendation for using Rigid hangers floor:
- Up to 4.0 M : 01 Vertical rigid hanger.
  - 4.0 m > 6.0 M : 01 Vertical rigid hanger + 01 Vertical Spring Hanger.

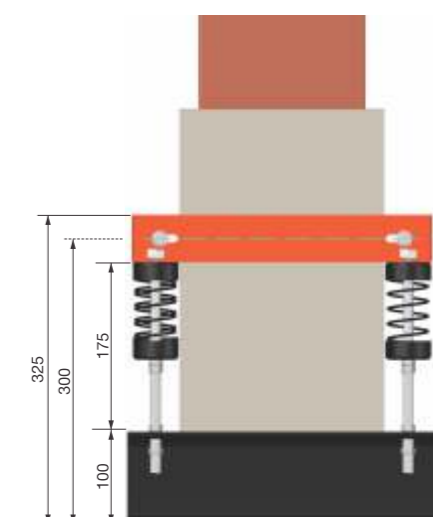
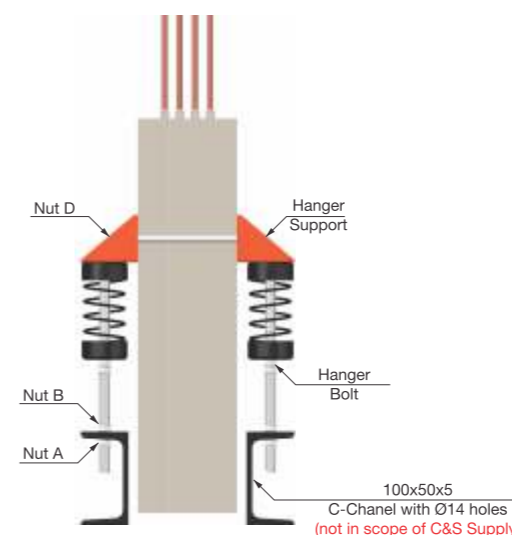
### Vertical Rigid Hanger



**Rigid Hanger**  
Copper 800A ~ 6300A  
Aluminum 630A ~ 5000A

- To One set of Spring hanger per rising main per floor (excluding lowest floor) need to be installed to sustain the bustrunking load and to allow vertical expansion of bustrunking in upward direction only. These can be fitted on 100x50x5 (or equivalent) channels mounted on floors / walls as shown below (not in scope of C&S supply)
- Recommendation for using hangers per floor:
- Up to 4.0 M: 01 Vertical spring hanger.
  - 4.0 M > 6.0 M: 02 Vertical spring hanger.

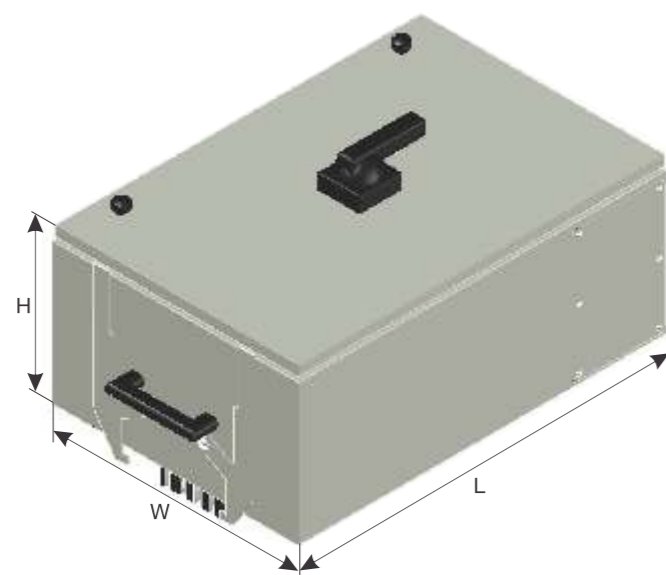
### Vertical Spring Hanger



**Spring Hanger**  
Copper 800A ~ 6300A  
Aluminum 630A ~ 5000A

- Plug in box enclosure is made from 1.6mm G.I with side hinged door.
- Plug in contacts are made out of silver plated copper with spring steel backup pressure clips for ensuring uniform pressure and low contact resistance .
- For cables entry, provision of gland plates are provided on both sides and bottom of Plug in Box.
- Earth contact of Plug-in boxes makes first & breaks last.
- Plug in boxes are suitable for MCCB/SFU's with rotary handle and door interlocking.
- Plug in boxes are available with Interlocking with bustrunking to ensure "Plug-in" and "Plug-Out" possible only in "OFF" Condition.
- Silver Plated contacts are properly shrouded / isolated.
- Plug in boxes can only be fitted on to the Bustrunking with corrected polarity .
- Available in 5 Pole version (NRYBE) as standard.

### Plug-in-Box



### PIB Matrix

Product Code	PIBX- N	PIBX- B	PIBX- C	PIBX- D
With MCCB	32~125A*	160~250A	315~400A	500~630A
With MCCB+Direct R/H	32~125A**	160~250A	315~400A	500~630A
With MCCB+Extended R/H	32~125A	160~250A	315~400A	500~630A
With SFU	32~125A	160~250A	315~400A	500~630A
Final Box Size (L x W x H)	430 x 300 x 200	500 x 300 x 250	600 x 400 x 250	800 x 400 x 250
Recommended Cable Size (Aluminum)	70 Sq. mm	150 Sqmm	2 x 150 Sq. mm	2 x 300 Sq. mm

(\*) For MCCB length upto 165mm use PIBX-N and MCCB above 165mm use PIB-B  
(\*\*) For MCCB +R/H height upto 120mm use PIBX-N & R/H height above use PIB-B

### Chemical Resistance betobar Insulation

The results of the tests carried out at the betobar laboratories are given in the table below. They are based upon the conditions prevailing during these tests : carried out at 20°C and fully immersed for at least one year.

The details given in this list have been prepared with maximum care and to the best of our knowledge. However, we cannot assume liability for usage in very specific cases.

Each individual application has to be considered by the factory.

Chemical agents		Results		
		E	G	F
Boric acid	H <sub>3</sub> BO <sub>3</sub>	X		
Hydrochloric acid 10%	HCl			X
Citric acid 10%	C <sub>3</sub> H <sub>4</sub> OH(CO <sub>2</sub> H) <sub>3</sub>			X
Lactic acid 10%	CH <sub>3</sub> -CHOH-CO <sub>2</sub> H			X
Alcohol (ethyl-)	C <sub>2</sub> H <sub>5</sub> OH		X	
Beer		X		
Ketone (acetone)	H <sub>3</sub> CCOCH <sub>3</sub>			X
Calcium chloride 50%	CaCl <sub>2</sub>	X		
Liquid combustibles (petrol, oil,...)		X		
Water (distilled)	H <sub>2</sub> O	X		
Water (mineral)		X		
Esters			X	
Ether	C <sub>2</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>			X
Formalin 37%	HCOH		X	
Glycerin			X	
Lubricating grease and oil		X		
Greases and oil		X		
Vegetable oil		X		
Aliphatic hydrocarbide (petroleumether)	C <sub>5</sub> H <sub>12</sub>	X		
Aromatic hydrocarbide (toluene)	C <sub>6</sub> H <sub>12</sub>			X
Chloride carbon	CCl <sub>4</sub>			X
Ammonium hydroxide 10%	NH <sub>4</sub> OH		X	
Ammonium hydroxide 30%	NH <sub>4</sub> OH			X
Milk (fresh and sour)				X
Soda-lime 10%	NaOH		X	
Soda-lime 50%	NaOH		X	
Blood		X		
Soap and detergents		X		
Sugar (saturated solution)		X		
Urine		X		
Hydrogen Sulphide	H <sub>2</sub> S	X		

E = Excellent, suitable even for uninterrupted and prolonged exposure

G = Good, suitable for prolonged exposure

F = Fair, suitable for repeated but brief exposures

In the event of consultations or enquiries regarding chemical resistance, please always state the following :

1. The chemical material, if possible with formula, and in case of trade names, the manufacturer.
2. The mixing ration with a solvent, usually water.
3. The temperature, including temperature changes with the corresponding time intervals.
4. Period of exposure.

## Product Certifications

## Product Certifications

**CENTRAL POWER RESEARCH INSTITUTE**  
(Member of STL)

**TEST REPORT**  
CPRI

Test Report No : 2016/STN-1069 Date : 07 JUN 2016

Name and Address of the Customer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Name and Address of the Manufacturer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Particulars of Sample(s) Tested : 1000V, 4000Amps, 120Arms Betobar copper cast resin busbar(LA)

Condition of sample(s) on receipt : New

Type : Cast resin Type

Designation : LA18DC (6x160 Cu-2 Res)

Serial Number(s) : -

Number of Sample(s) Tested : One

Date(s) of Test(s) : 22<sup>nd</sup> & 24<sup>th</sup> February, 2016

CPRI sample code number(s) : STCSST1069001

Particulars of test(s) conducted : (i) Verification of short circuit withstand strength. (ii) Protection against electric shock and integrity of protective circuits.

Tests in accordance with Standards/specification : As per Clause 10.11 & 10.5 of IEC 61439-1, 2011 & IEC 61439-6, 2012

Sampling Plan : NI

Customer's Requirement : NI

Deviations, if any : NI

Name of the witnessing persons : M. Sanjiv Gupta, Sr. Manager, G.A. (Customer's Representative)

Other than Customer's Representative : M. Jaideep S., Project Engineer (M/s.U.L. India Ltd., Bangalore) (Other than Customer's Representative)

Test subcontracted with and address of the laboratory : None

Documents constituting this report (in words) : Seven

No. of Sheets : Two

No. of Photograph(s) : Nil

No. of Graph(s) : Two

No. of Test Circuit Diagram(s) : Two

No. of Drawing(s) : Two

(M. Sanjiv Gupta) TEST ENGINEER

(M.K. Wadhvani) JOINT DIRECTOR

SWITCHGEAR TESTING & DEVELOPMENT STATION  
GOVINDPURA, BHOPAL - 462 023, INDIA  
Phone: +91 (0) 755 2588682 Fax: +91 (0) 755 2587174

**CPRI**

Certificate No.S2140313  
Laboratory Ref: CPRI/STDS-Bhopal

**TYPE TEST CERTIFICATE OF SHORT CIRCUIT PERFORMANCE**

TEST OBJECT : Cast Resin Busbar

DESIGNATION : LA18DA

Rated voltage : 1000V Rated current : 1000A Rated frequency : 50/60 Hz

MANUFACTURER : C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate, SE, Sidcul, Rampur, Haridwar, Uttarakhand

TESTED FOR : C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate, SE, Sidcul, Rampur, Haridwar, Uttarakhand

DATE OF TESTS : 17<sup>th</sup> April 2014

TESTED BY : Central Power Research Institute, Switchgear Testing & Development Station, Govindpura, Bhopal - 462 023

The test object constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with IEC 61439-1, 2011, IEC 61439-6, 2012 clause no. 10.11 & 10.5.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standards and to justify the ratings assigned by the manufacturer as listed on page no.1

The certificate applies only to the test object. The responsibility for conformity of any equipment having the same designations rests with the manufacturer.

The certificate comprises 13 sheets in total including front sheet.

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(M.K. Wadhvani) JOINT DIRECTOR

30-5-2014 Date of Issue

SWITCHGEAR TESTING & DEVELOPMENT STATION  
GOVINDPURA, BHOPAL - 462 023, INDIA  
Phone: +91 (0) 755 2588682 Fax: +91 (0) 755 2587174

**CPRI**

Certificate No.2014/STL/623  
Laboratory Ref: CPRI/STDS-Bhopal

**TYPE TEST CERTIFICATE FOR VERIFICATION OF TEMPERATURE RISE LIMITS**

TEST OBJECT : Cast Resin Busbar

DESIGNATION : LA18DA

Rated voltage: 1000V Rated current: 1000A Rated frequency: 50/60 Hz

MANUFACTURER : C&S Electric Ltd., (Bustrunking Div), Plot No. - 1A, Sector - 4C, Integrated Industrial Estate (IE), SIDCUL, Rampur - Haridwar - Uttarakhand.

TESTED FOR : C&S Electric Ltd., (Bustrunking Div), Plot No. - 1A, Sector - 4C, Integrated Industrial Estate (IE), SIDCUL, Rampur - Haridwar - Uttarakhand.

DATE OF TESTS : 25/04/2014

TESTED BY : Central Power Research Institute, Switchgear Testing & Development Station, Govindpura, Bhopal - 462 023

The test object, constructed in accordance with the description, drawings, incorporated in this certificate has been subjected to the series of proving tests in accordance with IEC 61439-6, 2012 clause no. 10.11

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standards and to justify the ratings assigned by the manufacturer as listed on page no.1

The certificate applies only to the test object. The responsibility for conformity of any equipment having the same designations rests with the manufacturer.

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12 JUL 2014 Date of Issue

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**CENTRAL POWER RESEARCH INSTITUTE**  
(Member of STL)

**TEST REPORT**  
CPRI

Test Report No : 2016/STN-1068 Date : 07 JUN 2016

Name and Address of the Customer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Name and Address of the Manufacturer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Particulars of Sample(s) Tested : 1000V, 3200Amps, 100Arms Betobar Aluminium cast resin busbar(LA)

Condition of sample(s) on receipt : New

Type : Cast resin Type

Designation : LA18DA (3x150 Al-2 Res)

Serial Number(s) : -

Number of Sample(s) Tested : One

Date(s) of Test(s) : 22<sup>nd</sup> & 24<sup>th</sup> February, 2016

CPRI sample code number(s) : STCSST11680001

Particulars of test(s) conducted : (i) Verification of short circuit withstand strength. (ii) Protection against electric shock and integrity of protective circuits.

Tests in accordance with Standards/specification : As per Clause 10.11 & 10.5 of IEC 61439-1, 2011 & IEC 61439-6, 2012

Sampling Plan : NI

Customer's Requirement : NI

Deviations, if any : NI

Name of the witnessing persons : M. Sanjiv Gupta, Sr. Manager, G.A. (Customer's Representative)

Other than Customer's Representative : M. Jaideep S., Project Engineer (M/s.U.L. India Ltd., Bangalore) (Other than Customer's Representative)

Test subcontracted with and address of the laboratory : None

Documents constituting this report (in words) : Seven

No. of Sheets : Two

No. of Photograph(s) : Nil

No. of Graph(s) : Two

No. of Test Circuit Diagram(s) : Two

No. of Drawing(s) : Two

(M. Sanjiv Gupta) TEST ENGINEER

(M.K. Wadhvani) JOINT DIRECTOR

SWITCHGEAR TESTING & DEVELOPMENT STATION  
GOVINDPURA, BHOPAL - 462 023, INDIA  
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**CPRI**

Certificate No.S2140375  
Laboratory Ref: CPRI/STDS-Bhopal

**TYPE TEST CERTIFICATE OF SHORT CIRCUIT PERFORMANCE**

TEST OBJECT : Cast Resin Busbar

DESIGNATION : LA18DA

Rated voltage : 1000V Rated current : 1000A Rated frequency : 50/60 Hz

MANUFACTURER : C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand

TESTED FOR : C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand

DATE OF TESTS : 25<sup>th</sup> & 24<sup>th</sup> April 2014

TESTED BY : Central Power Research Institute, Switchgear Testing & Development Station, Govindpura, Bhopal - 462 023

The test object constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with IEC 61439-1, 2011, IEC 61439-6, 2012 clause no. 10.11 & 10.5.

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standards and to justify the ratings assigned by the manufacturer as listed on page no.1

The certificate applies only to the test object. The responsibility for conformity of any equipment having the same designations rests with the manufacturer.

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30-5-2014 Date of Issue

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**CENTRAL POWER RESEARCH INSTITUTE**  
(Member of STL)

**TEST REPORT**  
CPRI

Test Report No : 2016/STN-1064 Date : 13 JUL 2016

Name and Address of the Customer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Name and Address of the Manufacturer : M/s C&S Electric Ltd., (Bustrunking Division), Sector-4C, Plot No. -1A, Integrated Industrial Estate, SE, SIDCUL, Rampur, Haridwar, Uttarakhand (India)

Particulars of Sample(s) Tested : 1000V, 2200Amps, 80Arms Betobar copper cast resin busbar(LA)

Condition of sample(s) on receipt : New

Type : Cast resin Type

Designation : LA18DC

Serial Number(s) : -

Number of Sample(s) Tested : One

Date(s) of Test(s) : 24<sup>th</sup> & 25<sup>th</sup> February, 2016

CPRI sample code number(s) : STCSST1064001

Particulars of test(s) conducted : (i) Verification of short circuit withstand strength. (ii) Protection against electric shock and integrity of protective circuits.

Tests in accordance with Standards/specification : As per Clause 10.11 & 10.5 of IEC 61439-1, 2011 & IEC 61439-6, 2012

Sampling Plan : NI

Customer's Requirement : NI

Deviations, if any : NI

Name of the witnessing persons : M. Sanjiv Gupta, Sr. Manager, G.A. (Customer's Representative)

Other than Customer's Representative : M. Jaideep S., Project Engineer (M/s.U.L. India Ltd., Bangalore) (Other than Customer's Representative)

Test subcontracted with and address of the laboratory : None

Documents constituting this report (in words) : Seven

No. of Sheets : Two

No. of Photograph(s) : Nil

No. of Graph(s) : Two

No. of Test Circuit Diagram(s) : Two

No. of Drawing(s) : Two

(M. Sanjiv Gupta) TEST ENGINEER

(M.K. Wadhvani) JOINT DIRECTOR

30-5-2016 Date of Issue

SWITCHGEAR TESTING & DEVELOPMENT STATION  
GOVINDPURA, BHOPAL - 462 023, INDIA  
Phone: +91 (0) 755 2588682 Fax: +91 (0) 755 2587174

Report Number: 4767342704-15-NABL-S1

**TEST DISCIPLINE: ELECTRICAL**

**General details**

Customer / Applicant	M/s. CAS ELECTRIC LTD (BUSTRUNKING DIVISION), PLOT NO 1A, SECTOR 4C, INTEGRATED INDUSTRIAL ESTATE, RANPUR, HARIDWAR - 249403, UTTARAKHAND, INDIA
Manufacturer	M/s. CAS ELECTRIC LTD (BUSTRUNKING DIVISION), PLOT NO 1A, SECTOR 4C, INTEGRATED INDUSTRIAL ESTATE, RANPUR, HARIDWAR - 249403, UTTARAKHAND, INDIA
Program	NABL
Test Lab Location	(N) UL, Mansarovar Refer to Cover page for the Location address
Item Under Test	BETOBAR CAST RESIN BUSTRUNKING (LA) 3Ø * 1000A*100% Internal Earth
Model	LA25DA
Number of samples	1 No.
Sample Identification	301202 Refer Summary of Test results for multiple samples
Manufacturer Serial Number (if any)	N.A.
Condition of I/T on receipt	Good
Date of Receipt	23 June 2016
Applicable Standard	IP 68 as per IEC 60529:2001-02
Date of Testing (Start date)	23 June 2016
End Date	25 June 2016
Lab general ambient condition	Temperature in °C : 23±5°C Relative humidity in % : <70%
Date of Reporting	27 July 2016
Test In-charge	Rishabh Kumar

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(M.K. Wadhvani) JOINT DIRECTOR

12 JUL 2016 Date of Issue

**CPRI**

Certificate No.2014/STN-1487  
Laboratory Ref: CPRI/STDS-Bhopal

**TYPE TEST CERTIFICATE OF SHORT CIRCUIT PERFORMANCE**

TEST OBJECT : 1000V, 3000A, Cast Resin Aluminium Busbar

DESIGNATION : LA 20 EA 4 X 123mm<sup>2</sup>

Rated voltage: 1000V Rated current: 3000A Rated frequency: 50/60 Hz

MANUFACTURER : M/s C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate (IE), SIDCUL, Rampur, Haridwar, Uttarakhand (India)

TESTED FOR : M/s C & S Electric Ltd. (Bustrunking Division), Plot No. 1A, Sector-4C, Integrated Industrial Estate (IE), SIDCUL, Rampur, Haridwar, Uttarakhand (India)

DATE OF TESTS : 16<sup>th</sup> December, 2014

TESTED BY : Central Power Research Institute, Switchgear Testing & Development Station, Govindpura, Bhopal - 462 023

The test object, constructed in accordance with the description, drawings and photographs incorporated in this certificate has been subjected to the series of proving tests in accordance with IEC 61439-1, 2011 and IEC 61439-6, 2012, Clause 10.11

The results are shown in the record of Proving Tests and the oscillograms attached hereto. The values obtained and the general performance are considered to comply with the above Standards and to justify the ratings assigned by the manufacturer as listed on page no.1

The certificate applies only to the test object. The responsibility for conformity of any equipment having the same designations rests with the manufacturer.

This certificate comprises 11 sheets in total including front sheet.

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20.10.2014 Date of Issue

### Reference List

Country	City	Project	Industry
Algeria	In Salah	Insalah Gas	Oil & Gas
Algeria	Sidi Ben Adda	Terga	Power Plant
Australia	Onslow	Wheatstone Project Lng Plant	Oil & Gas
Australia	Onslow	Gorgon Onplots Project	Oil & Gas
Australia	Barrow Island	Gorgon Offplots - Switchroom B8388	Oil & Gas
Austria	Klagenfurt	University Klagenfurt	Utility
Austria	Vienna	Telekom Austria	Telecommunication
Austria	Os	Telekom Vienna	Telecommunication
Austria		Telekom Austria	Telecommunication
Austria	Vienna	Kaiser Franz Jozef Spital	Hospital
Azerbaijan	Caspian Sea	Ca-Cwp Platform Azeri	Oil & Gas
Azerbaijan	Baku	South Caucasus Pipeline Expansion	Oil & Gas
Bangladesh	Ashuganj	Ashuganj 450 Mw Ccpp North	Power Plant
Belgium	Olen	Umicore	Metals & Chemicals
Belgium	Zelzate	Sidmar	Engineering
Belgium	Leuven	Uz Leuven - Cabine 403	Hospital
Belgium	Antwerp	Itc Rubis Terminal	Petrochemical
Belgium	Mechelen	Kbc Data Centre	Data Centre
Belgium	Antwerp	Ahpht - Esso	Oil & Gas
Belgium	La Hulpe	Swift	Banking
Belgium	Leuven	Uz Leuven - Nieuwbouw Kopstation	Hospital
Belgium	Zwijndrecht	Borealis	Chemicals
Belgium	Feluy	Afton Chemicals	Chemicals
Belgium	Oevel	Kaneka	Chemicals
Belgium	Mechelen	Dupont	Chemicals
Belgium	Mechelen	Dow Belgium	Chemicals
Belgium	Mechelen	P&G Mechelen	Manufacturing
Belgium	Tessenderlo	Chevron Philips	Chemicals
Belgium	Leuven	Uz Leuven Cabine 408	Hospital
Belgium	Antwerp	Total Olefins	Petrochemical
Colombia	Cartagena	Ecopetrol Cartagena Refinery	Petrochemical
Colombia		Petrominerales	Oil & Gas
Congo	Offshore	Libondo Platform Congo	Oil & Gas
Egypt	Damietta	Lng Plant	Oil & Gas
Egypt		Sumed Steel Mill	Steel Mill
Egypt	Damietta	Lng Train 2	Oil & Gas
Egypt	Cairo	Nile Tower 2	Real Estate
Egypt	Alexandria	Sidi Kerir Petrochemicals	Petrochemical
France	Dunquerke	Asp	Pharmaceutical
France	Feyzin	Total Feyzin Poste 2	Petrochemical
France	Offshore	Traverses Etanches - Projet Bpc3	Manufacturing
France	Drusenheim	Dow France Drusenheim	Chemicals
France	Pierrelatte	Usine Rec II Pierrelatte	Power Plant
France	Lyon	Hpital Neuro-Cardio Lyon	Hospital
France	Bouchain	Gas Power Plant Bouchain - Lec	Power Plant
Germany	Frankfurt	Deutsche Bundesbank	Banking
Germany	Frankfurt	Basell Polyoktins	Chemicals
Germany	Frankfurt	Papermill Wepa	Paper Mill
Germany	Trier	Steel Mill	Steel Mill
Germany	Trier	Kraftwerk Boxberg	Power Plant
Germany	Karlsruhe	Kadu Ks	
Germany	Frankfurt	Ticono Tiger	Chemicals
Germany	Datteln	Kraftwerk Datteln	Power Plant
Germany	Frankfurt	Wepa	Paper Mill

### Reference List

Country	City	Project	Industry
Germany	Offshore	Amrumbank	Wind Farm
Greece	Thinon	Wind Hellas Thinon	Telecommunication
Greece	Metamorfoosi	Wind Hellas Metamorfoosi	Telecommunication
Hungary	Budapest	Procter & Gamble Substation	Manufacturing
India	Greater Noida	JP Sport City Greater Noida	Utility
India	Bangalore	Oracle Bangalore	IT
India	Bihar	Nabinagar Unit 1-2-3	Power Plant
India	Hyderabad	Satwa	IT
India	Chandigarh	Loreal Industries	Manufacturing
India	Gwalior	IIT	Institute
India	Noida	Uflex	Manufacturing
India	Bangalore	Oracle Bangalore -II	IT
India	Hyderabad	Mezzequity software	IT
India	bhubaneswar	ICFMD	Hospital
India	Chennai	Chennai port trust	Port
India	Devangere	EDP factory	Factory
India	Delhi	DMRC	Transport
Iran	West Qurna	West Qurna	Petrochemical
Ireland	Coolkeeragh	Power Station Coolkeeragh	Power Plant
Ireland	Belfast	Bbc Belfast	Media
Ireland	Dublin	Ibm Sor 37 Ireland	Data Centre
Italy	Ponte all Ania	Kappa Ania	Paper Mill
Kazakhstan	Tengiz field	Tengiz Expansion	Oil & Gas
Kazakhstan	Offshore	Kashagan Field Replacement	Oil & Gas
Luxembourg	Hesperange	Dupont Luxembourg	Chemicals
Luxembourg	Bettembourg	Luxconnect	Data Centre
Malaysia	Kerteh	Petlin Ldpe	Oil & Gas
Malaysia	Offshore	Fpso-Mse Offshore	Oil & Gas
Malaysia	Kerteh	Petronas	Oil & Gas
Malaysia	Peninsular Tapis Field	Exxon Mobil Tapis-R Ccp Platform	Oil & Gas
Malaysia	Manjung	Manjung 4	Power Plant
Malaysia	Sipitang	Samur Project	Chemicals
Malaysia	Offshore	Shell Malikai	Oil & Gas
Malaysia	Labuan	Dalak Pipeline	Oil & Gas
Myanmar	Offshore	Yetagun Platform	Oil & Gas
Myanmar	Offshore	Zawtika	Oil & Gas
Nigeria	Offshore	Bonny Island Refinery	Oil & Gas
Nigeria		Nipp	Oil & Gas
Nigeria	Offshore	Total Ofon Phase 2	Petrochemical
Norway	Oslo	Stortinget	Utility
Norway	Offshore	Hammerfest Lng Plant	Oil & Gas
Norway	Glomfjord	Sitech Glomfjord	Manufacturing
Norway	Klemetsrud	Klemetsrud	
Norway		Opera Contact Block 6Kv/1600A	
Norway	Offshore	Valhall Aker	Oil & Gas
Norway	Ulsteinvik	Kleven	Transportation
Norway	Bod	Kulturkvartalet Bod	Utility
Norway	Offshore	Ivar Aasen	Oil & Gas
Oman	Khazzan	Central Processing Facility (Cpf) Khazzan	Oil & Gas
Peru	Talara	Talara	Petrochemical
Qatar	Mesaieed	Q-Chem	Chemicals
Qatar	Mesaieed	Nodco Refinery Expansion	Oil & Gas
Qatar	Ras Laffan	Qatar Gas Common Sulphur	Oil & Gas
Qatar	Ras Laffan	Shell Pearl C4 - C5 - C6	Oil & Gas
Qatar	Ras Laffan	Ras Laffan	Oil & Gas
Qatar	Offshore	Al Shaheen Maersk Oil	Oil & Gas

### Reference List

Country	City	Project	Industry
Qatar	Ras Laffan	Ras Gas Train 6&7	Oil & Gas
Qatar	Ras Laffan	Ras Laffan	Oil & Gas
Russia	Offshore	Sakhalin	Oil & Gas
Russia	Offshore	Sakhalin li Offshore	Oil & Gas
Russia	Offshore	Piltun Field Sakhalin	Oil & Gas
Russia	Moscow	Substation Beskudnikovo	Power Plant
Russia		Ugo-Zapadnaya Heat & Power Plant	Power Plant
Russia	Sakhalin	Odupto 2	Oil & Gas
Singapore	Singapore	The Esplanade - Theatres On The Bay	Utility
Singapore	Singapore	Index	Commercial
South Africa	Lephalale	Medupi	Power Plant
South Africa	Johannesburg	Universal Papers	Industry
South Africa	Mpumalanga	Kusile	Power Plant
Sweden	Kaarstoe	Ibm Kaarstoe	Oil & Gas
Sweden	Kista	Ibm Kista	IT
Switzerland	Gllsgen	Kkw Gllsgen	Power Plant
Syria	Aleppo	Nahas Tower	Real Estate
Syria	Ebla	Gtp Syria Project	Power Plant
Thailand	Rayong	Aerosil Thailand	Chemicals
Thailand	Songkhla	Songkhla Gsp	Oil & Gas
Thailand		Ocs3 Thailand	Power Plant
Thailand	Offshore	Bongkot - Central Facilities	Oil & Gas
Thailand		Tgttu-1 & Aru-2 Project	
Thailand	Map Ta Phut	Posco Ptt Lng Thailand	Oil & Gas
The Netherlands	Amsterdam	Cisco Headoffice	IT
The Netherlands	Delfzijl	Akzo Delesto Saltplant	Power Plant
The Netherlands	Dordrecht	Delrin Plant	Manufacturing
The Netherlands	Almelo	Uranium Plant	Power Plant
The Netherlands	Amstelveen	Abn Amro Computer Centre	Data centre
The Netherlands	Amsterdam	Amc Amsterdam	Hospital
The Netherlands	Amsterdam	Kpn Drenthestraat	Data Centre
The Netherlands	Amsterdam	Ing Treasury	Banking
The Netherlands	Arnhem	Ing Postbank Arnhem	Banking
The Netherlands	Amsterdam	Ing Amsterdamse Poort	Banking
The Netherlands	Sluiskil	Yara	Power Plant
The Netherlands	Rotterdam	Kraftwerke Maasvlakte	Power Plant
The Netherlands	Sluiskil	Vsh Warm Co2 Project	
The Netherlands	Amsterdam	Schiphol Backbone	Airport
The Netherlands	Almelo	Urenco Hal 7	Petrochemical
The Netherlands	Rotterdam	Nieuwbouw Erasmus Med.centrum	Hospital
The Netherlands	Maastricht	Azm	Hospital
The Netherlands	Rotterdam	Cfpp Rotterdam	
The Netherlands	Amsterdam	Nuon Hemweg	Power Plant
The Netherlands	Almere	Nuon Wos Almere Poort	Power Plant
The Netherlands	Amsterdam	Global Switch Fase 1	Data centre
The Netherlands	Amsterdam	Global Switch Fase 2 Deel 1	Data centre
The Netherlands	Bergen op Zoom	Sabic Mcc 501 En 502	Petrochemical
The Netherlands	Amsterdam	Global Switch Fase 2 Deel 2	Data centre
The Netherlands	Diemen	Nuon Ombouw Diemen 33	Power Plant
The Netherlands	Apeldoorn	Rda Walter Bos	Data centre
The Netherlands	Apeldoorn	Rda Quintax	Data centre
The Netherlands	Amsterdam	Global Switch V2	Data centre
The Netherlands	Amsterdam	Schiphol Kws 2	Airport
The Netherlands	Arnhem	Duiventil	Data centre
The Netherlands	Eindhoven	St. Anna Ziekenhuis	Hospital
The Netherlands	Lieshout	Wpb Lieshout	Water Treatment

### Reference List

Country	City	Project	Industry
The Netherlands	Groningen	University Medical Center Groningen (Umcg)	Hospital
The Netherlands	Diemen	Nuon Bufferstation Diemen	Power Plant
The Netherlands	Tilburg	Wpb Tilburg	Water Treatment
The Netherlands	Sluiskil	Yara Sluiskil	Chemicals
The Netherlands	Capelle a/d IJssel	Ijsselland Ziekenhuis	Hospital
The Netherlands	Geleen	Dsm Next Generation Sulfa	Chemicals
The Netherlands	Rotterdam	Erasmus Mc	Hospital
The Netherlands	De Meern	Basf Transformer T9	Chemicals
The Netherlands	Botlek	Air Liquide	Chemicals
The Netherlands	China	Vpc China	Power Plant
The Netherlands	Geleen	Borealis Geleen	Chemicals
U.A.E	Abu Dhabi	Ruwais Sulphur Handling	
U.A.E	Abu Dhabi	Ruwais Bourouge Petrochem.	Petrochemical
U.A.E	Sharjah	Millennium Hotel	Real Estate
U.A.E	Sharjah	Bin Sabath Tower	Real Estate
U.A.E	Abu Dhabi	Difc Gate Village	Utility
U.A.E	Abu Dhabi	Habshan Gasco	Power Plant
U.A.E	Abu Dhabi	Al Nasser Tower	Real Estate
U.A.E	Sharjah	Saleh Bin Lahej	Real Estate
U.A.E	Dubai	Scan Tower 1 - 2 - 3	Real Estate
U.A.E	Dubai	Between The Bridges	Real Estate
U.A.E	Dubai	B2b Extension	
U.A.E	Abu Dhabi	Gasco Agdii	Oil & Gas
U.A.E	Abu Dhabi	District Cooling	District Cooling Plant
U.A.E	Ras Al Khaimah	Ras Al Khaimah	
U.A.E	Sharjah	Sharjah Gate Tower	Real Estate
U.A.E	Sharjah	N-Tower Sharjah	Real Estate
U.A.E	Abu Dhabi	Ruwais 2	Oil & Gas
U.A.E	Abu Dhabi	Yas Island Dcp8,9	District Cooling Plant
U.A.E	Abu Dhabi	Bourouge 2	Oil & Gas
U.A.E	Dubai	Central Park Dubai	Utility
U.A.E	Abu Dhabi	Gasco Ruwais	Oil & Gas
U.A.E	Abu Dhabi	Saadiyat Island	Real Estate
U.A.E	Abu Dhabi	Qasr Al Muwaiji - Al Ain	Real Estate
U.A.E	Ruwais	Green Diesel	Oil & Gas
U.A.E	Habshan	Habshan - 5 Process Plant	Oil & Gas
U.A.E	Habshan	Habshan Project - Lv & Mv	Oil & Gas
U.A.E	Dalma Island	Dalma Island	Real Estate
U.A.E	Abu Dhabi	Shah Gas Project 4	Oil & Gas
U.A.E	Ruwais	Ruwais Refinery Expansion Project No.1	Oil & Gas
U.A.E	Abu Dhabi	Bourouge 3 U&O	Oil & Gas
U.A.E	Abu Dhabi	Bourouge 3 Pp/Pe	Oil & Gas
U.A.E	Abu Al Abyadh	Shah Sulphur Station & Pipelines Project	Oil & Gas
U.A.E	Ruwais	Ruwais Sulphur Handling Terminal 2	Oil & Gas
U.A.E	Abu Dhabi	Satah Full Field Development Project	Oil & Gas
U.A.E	Abu Al Abyadh	Habshan Sulphur Granulation Plant (Hsgp)	Oil & Gas
U.A.E	Habshan	Ngj (Pure Case) Project	Oil & Gas
U.A.E	Abu Dhabi	Liwa Pumping Station	Water Treatment
U.A.E	Offshore	Umm Lulu Ffd Package II Project	Oil & Gas
United Kingdom	Glasgow	Bt Glasgow	Telecommunication
United Kingdom	London	Redbus - Meridian Gate	Data Centre
United Kingdom	London	Sovereign House	Data Centre
United Kingdom	London	Canary Wharf	Real Estate
United Kingdom	London	Empress State Building	Utility

Reference List

Country	City	Project	Industry
United Kingdom	Cardiff	Idc Cardiff	Data Centre
United Kingdom	Hayes Middlesex	Hayes Data Centre	Data Centre
United Kingdom	Swindon	Compaq Data Centre	Data Centre
United Kingdom	Immingham	Immingham Chp	Power Plant
United Kingdom	Warwick	Ibm Warwick	Data Centre
United Kingdom	Cardiff	Idc Cardiff Ph2	Data Centre
United Kingdom	Bletchley	Bt Bletchley	
United Kingdom	Wynyard	Wynyard (Eds)	Commercial
United Kingdom	Walsall	Walsall Hospital	Hospital
United Kingdom	London	Nomura Bank Project Shinkyō	Commercial
United Kingdom	Isleworth	Bskyb Harlequin 1	Data Centre
United Kingdom	Fawley	Esso Fawley	Oil & Gas
United Kingdom	Sunderland	Eds Doxford	Data Centre
United Kingdom	London	Blackfriars Station	Rail
United Kingdom	London	79-97 Wigmore Street	Commercial
United Kingdom	Beckton	Beckton Stw	Water Treatment
United Kingdom	Gartcosh	Scottish Crime Campus	Utility
United Kingdom	Shetland Islands	Laggan Tormore	Oil & Gas
United Kingdom		Quintax Twin Data	Data Centre
United Kingdom	West Bromwich	Sandwell Hospital Lv Infrastructure P4	Hospital
United Kingdom	London	Beckton Sewage Treatment Works	Water Treatment
United Kingdom	London	St Thomas Hospital	Hospital
United Kingdom	Offshore	Mariner Topside Epc	Oil & Gas
Vietnam	Offshore	Nong Yao Field	Oil & Gas
Yemen	Kharir	Kharir Project Phase 1 & 2	Oil & Gas
Yemen		Lng Yemen - Alif Cpu li	Power Plant
Yemen	Kharir	Total E&P Yemen Kharir Power Plant	Oil & Gas

isobar



Isolated Phase Busducts  
(11~36kV up to 30000A)

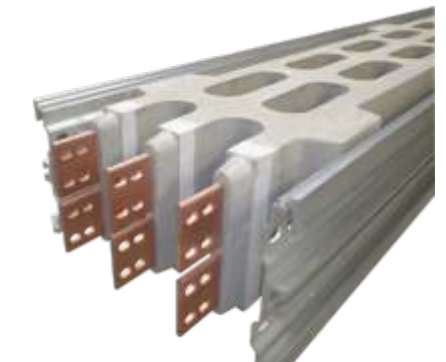


Segregated / Non-Segregated  
Phase Busducts  
(415~33kV up to 6500A)

betobar



Low Voltage Cast Resin  
Insulated Busways  
(1kV upto 6300A)



Medium Voltage Cast Resin  
Insulated Busways  
(3.6kV~17.5kV upto 6100A)

metabar



Sandwich Busbar  
Trunking System (Low-Impedance)  
(400~6300A)



Air Insulated  
Busbar Trunking System  
(125~1000A)