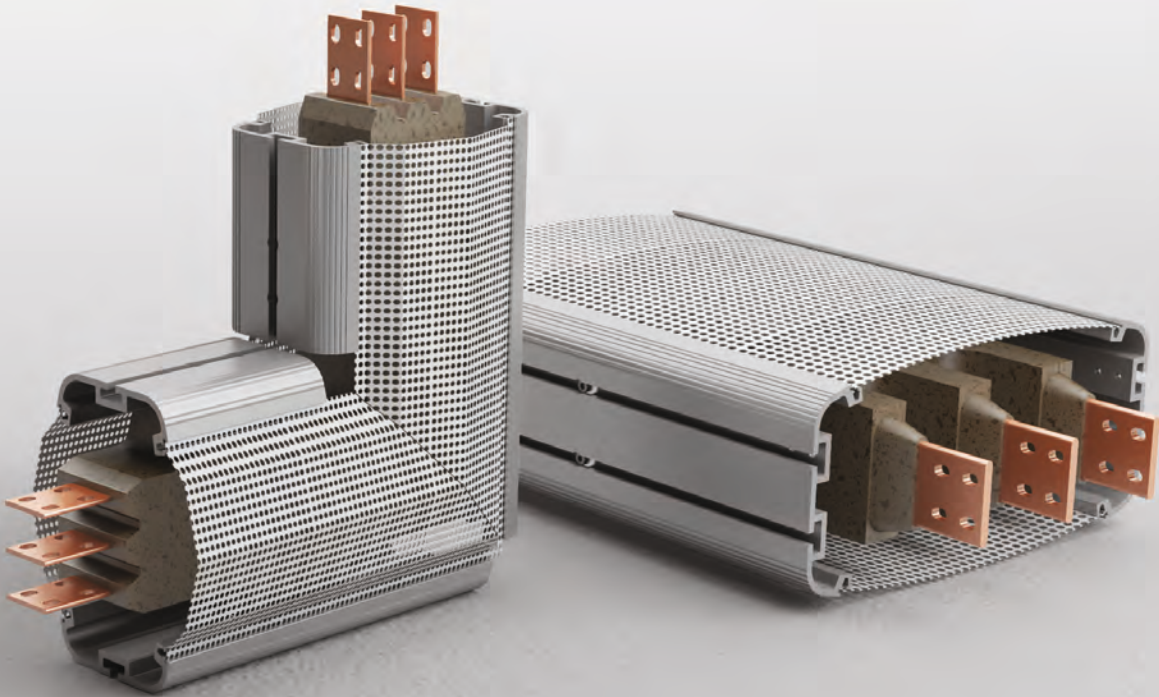




E-LINEMV

Medium Voltage Busbar Systems



E-LINEMV





CONTENTS


►► E-LINE MV

General Introduction.....	2-3
12 kV	
Order Code System.....	4
Technical Characteristics.....	5
Standard Straight Length.....	6
Elbows.....	7
Horizontal & Vertical Cast Resin Busbar Applications	8
12 kV Medium Voltage Busbar Horizontal Application.....	9
12 kV Medium Voltage Busbar Vertical Application.....	10
General Product Specifications.....	11
Project Design Form.....	12
24 kV	
Order Code System	13
Technical Characteristics.....	14-15
Standard Straight Length.....	16
Elbows	17
Horizontal & Vertical Cast Resin Busbar Applications.....	18
24 kV Medium Voltage Busbar Horizontal Application.....	19
24 kV Medium Voltage Busbar Vertical Application.....	20
General Product Specifications.....	21
Project Design Form.....	22

Petrochemical Industry

Oil&Gas Industry

Power Generation Industry



Medium Voltage (MV) is manufactured within a single housing, the conductors of either copper or aluminium are embedded in DURACOMP insulation which is a composite material of epoxy resin and pure silica minerals with Al and Cu conductors specially selected and the epoxy resin. Medium Voltage busbar systems are designed to operate at voltages of 12 kV and 24 kV. Manufactured as standard up to a rating of 5700 A. Please contact us for higher amperage applications.

Areas of Use

Exterior environments, industrial buildings, petrochemical buildings, regions with flood risk, oil and natural gas industry

MV System Benefits

- ▶ Products tested in accordance with international standards
- ▶ Exterior environment IP 68 protection class
- ▶ Corrosion-resistant
- ▶ Chemical-resistant
- ▶ Resistance against insects and rodents
- ▶ Usable in tropical environments
- ▶ High mechanical strength
- ▶ Without stack effect
- ▶ Highly resistant to short circuit
- ▶ Low voltage drop when compared with cable
- ▶ Special design for occupying minimum space based on ampere level.
- ▶ Electroerosion resistant
- ▶ UV resistant
- ▶ Designed to improve heat loss
- ▶ Maintenance-free busbar
- ▶ Easy Assembly
- ▶ An ideal high temperature environments

Short-Circuit Withstand

Short-circuit resistance values tested are presented on the table. High busbar resistance can be seen based on the short-circuit values to be calculated.

Busbar Drawings

You may receive professional assistance is available to our clients by contacting our nearest dealer, distributor or our Project & Design departments for Busbar drawings Blueprints and calculating cost estimates.

* Modules required for special situations can be manufactured in a short time.

High IP Insulation

DURACOMP is a composite material of epoxy resin and pure silicon which gives the E-LINE MV busbar range a high mechanical strength and resistance to high temperatures and external effects as listed on Page 2

EAE Medium voltage busbar systems are manufactured using high density and high conductivity aluminum and copper conductors. Contact areas of copper and aluminum conductors can be coated by tin or optionally silver.

Ease of Heat Transfer

Heat forming on the additives used in the system with high heat transfer is easily dissipated to the environment by means of the housing.

Short-Circuit Withstand

High mechanical and thermal resistance thanks to the DURACOMP material.

Housing:

E-Line MV busbar is produced by combining the Duracomp insulated conductors (Al or CU) within an extruded aluminium housing.

- Light aluminium case
- High Mechanical Strength and Chemical Resistance
- Adjustable support system
- Safety earth continuity
- Very less magnetic field

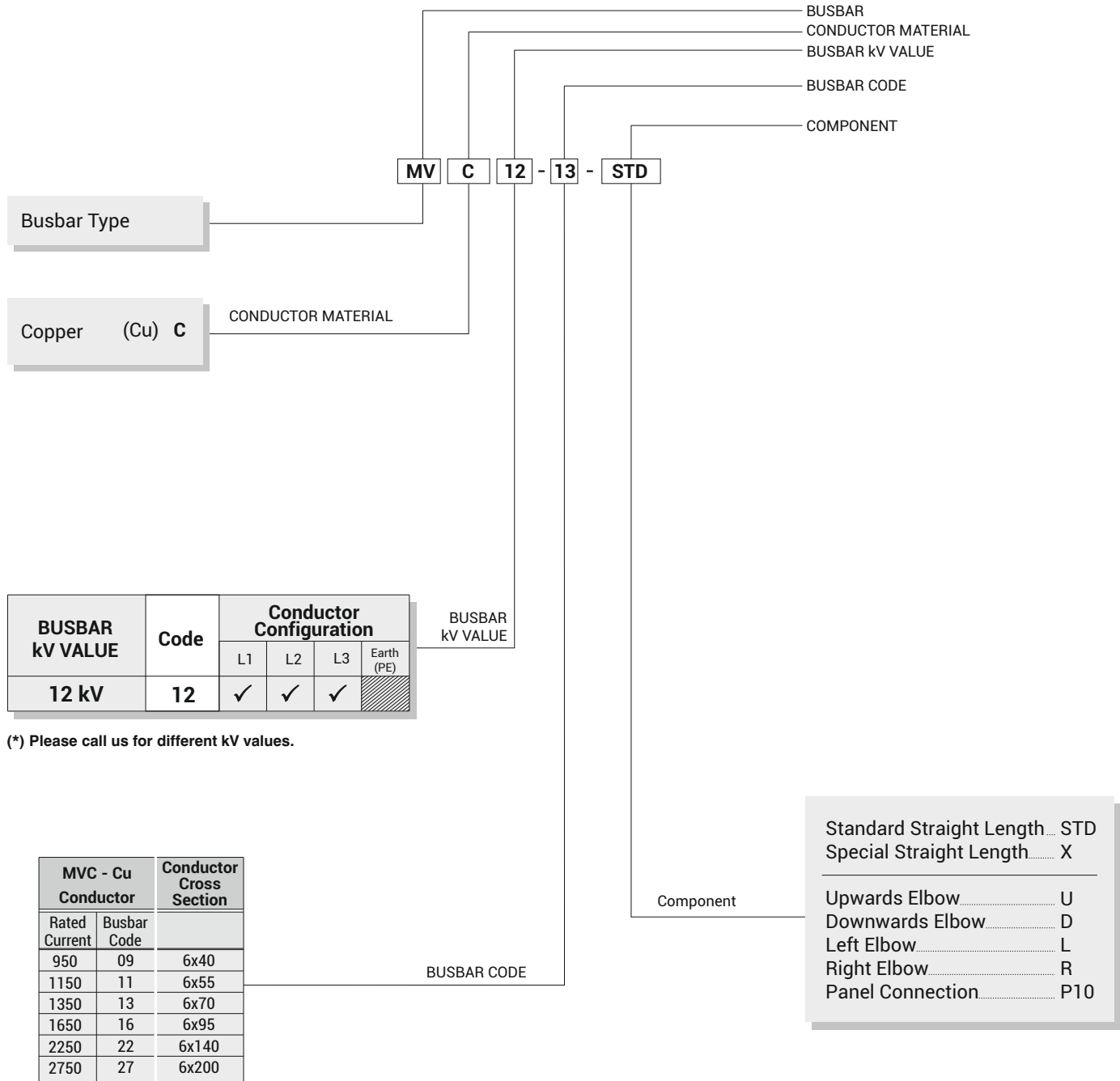
IP68: AFTER CASTING DURACOMP ON THE JOINTS AND THE ENTIRE FINISHING PARTS, IT IS CONSIDERED AS IP 68 – IK 10 CLASS.



IP68

The "DURACOMP" is a composite material of epoxy resin and pure silicon which gives the E-LINE MV busbar range a high mechanical strength and resistance to high temperatures and external effects.

Conductors are of 99.95% purity electrolytic copper or aluminium or electrolytic copper.



Busbar Type

Copper (Cu) **C**

BUSBAR kV VALUE	Code	Conductor Configuration			
		L1	L2	L3	Earth (PE)
12 kV	12	✓	✓	✓	

(*) Please call us for different kV values.

MVC - Cu Conductor		Conductor Cross Section
Rated Current	Busbar Code	
950	09	6x40
1150	11	6x55
1350	13	6x70
1650	16	6x95
2250	22	6x140
2750	27	6x200

- Standard Straight Length... STD
- Special Straight Length... X

- Upwards Elbow..... U
- Downwards Elbow..... D
- Left Elbow..... L
- Right Elbow..... R
- Panel Connection..... P10

Rated Current	I_r	A	950	1150	1350	1650	2250	2750
Busbar Code			09	11	13	16	22	27
Standards	IEC 62271-200 Edition 2.0 2011-10; IEC 62271-307 Edition 1.0 2015-09;		IEC 61439-6 Edition 1.0 2012-05; STL Guide to IEC 62271-200					
Rated Voltage	U_r	kV	12	12	12	12	12	12
Rated power frequency withstand voltage	U_d	kV	28	28	28	38	38	38
Rated impulse withstand voltage	U_p	kV	75	75	75	95	95	95
Rated Frequency	f_r	Hz	50	50	50	50	50	50
Partial Discharge		pC	< 20	< 20	< 20	< 20	< 20	< 20
Protection Degree	IP68							
External Mechanical Impacts (IK Code)*	50J, greater than IK10							
Rated Short-time Withstand Current (1s)	I_k	kA_{ms}	25	25	43	43	71.3	71.3
Rated Peak Withstand Current	I_{ke}	kA	65	65	112	112	185.5	185.5
Rated Short-time Withstand Current for PE Conductor (1s)	I_p	kA	15	15	26.3	26.3	42.4	42.4
Rated Peak Withstand Current for PE Conductor	I_{pe}	kA	39	39	72.4	72.4	110.2	110.2
MEAN PHASE CONDUCTOR CHARACTERISTICS AT RATED CURRENT I_r								
Resistance at a conductor temperature of 20°C	R_{20}	mΩ/m	0,077	0,057	0,045	0,0352	0,0223	0,0162
Resistance at an ambient air temperature of 35°C	R	mΩ/m	0,104	0,078	0,061	0,0474	0,0304	0,0224
Reactance (Independent from Temperature)	X	mΩ/m	0,116	0,097	0,084	0,0788	0,0576	0,0442
Positive and negative sequence impedances at an ambient air temperature of 35°C	Z	mΩ/m	0,156	0,125	0,104	0,0919	0,0651	0,0496
Positive and negative sequence impedances at an ambient air temperature of 20°C	Z_{20}	mΩ/m	0,139	0,113	0,096	0,0863	0,0618	0,0471
Rated Power Loss at 35°C		Watt	278	297,1	324	370,3	443,3	491,7
DC Resistance at a conductor temperature of 20 °C for Phases	R_{phdc}	mΩ/m	0,071	0,050	0,039	0,030	0,019	0,013
DC Resistance at a conductor temperature of 20°C for PE	R_{PEdc}	mΩ/m	0,012	0,012	0,012	0,009	0,006	0,013
SECTIONS								
Phase Conductor		mm ²	240	330	420	570	840	1200
PE (Housing)		mm ²	5944	5944	5944	8105	8905	9704
Conductor Cross Section		mmxmm	6X40	6x55	6x70	6x95	6x140	6x200
Busbar Weight (3 Conductors)		kg/m	48,32	56,85	63,89	76,18	97,13	124,54
MEAN FAULT-LOOP CHARACTERISTICS								
Zero-sequence Impedance								
Zero-sequence impedance at a conductor temperature of 20	$Z_{(0)k20phPE}$	mΩ/m	0,309	0,292	0,271	0,248	0,203	0,176
°CZero-sequence impedance at an ambient temperature of 35°C	$Z_{(0)kphPE}$	mΩ/m	0,328	0,307	0,285	0,258	0,210	0,182
Mean Resistances and Reactances								
Resistance at a conductor temperature of 20°C	$R_{b20phph}$	mΩ/m	0,150	0,112	0,088	0,073	0,049	0,035
Resistance at a conductor temperature of 20°C	$R_{b20phPE}$	mΩ/m	0,089	0,071	0,059	0,049	0,035	0,028
Resistance at an ambient air temperature of 35°C	R_{bphph}	mΩ/m	0,203	0,153	0,121	0,099	0,067	0,048
Resistance at an ambient air temperature of 35°C	R_{bphPE}	mΩ/m	0,120	0,096	0,081	0,065	0,048	0,038
Reactance (Independent from temperature)	X_{bphph}	mΩ/m	0,221	0,184	0,160	0,150	0,115	0,084
Reactance (Independent from temperature)	X_{bphPE}	mΩ/m	0,170	0,153	0,140	0,129	0,106	0,087

Standards

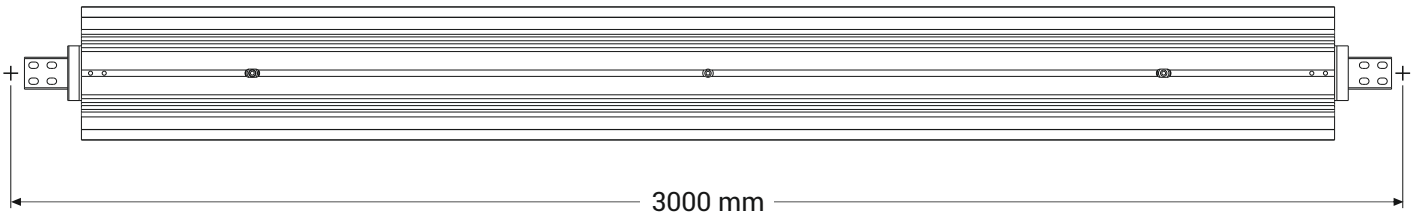
⁽¹⁾ The weight per metre provided in table includes 1/3 of the weight of one block joint.

Standard Feeder Straight Length - STD



Sample Order:

MVC 1213 - STD
12 kV 1350 A, Copper, Feeder, IP 68, 3 Conductors



Special Feeder Straight Length - X



Sample Order:

MVC 1209 - X - 150
12 kV 950 A, Copper, Feeder, IP 68, 3 Conductors, 1500 mm Special Length

Information:
Feeder Minimum
Special length size = 1000 mm

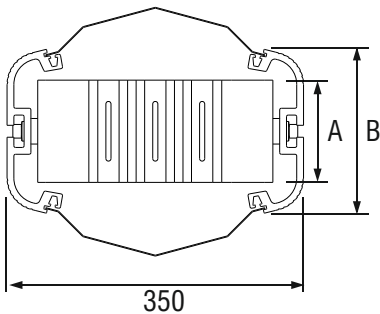
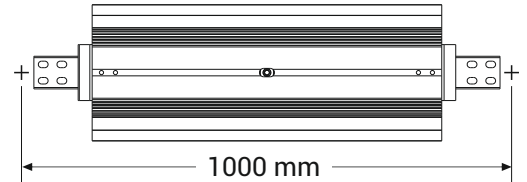


Table of Busbar Cross Section Sizes

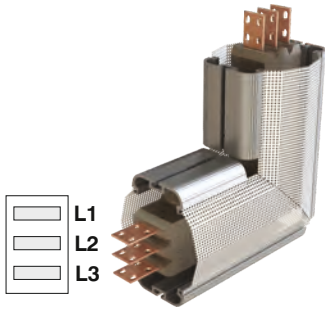
MVC - Cu Conductor	Rated Current (A)	950	1150	1350	1650	2250	2750
	Busbar Code	09	11	13	16	22	27
A	mm	90	105	120	145	190	250
B	mm	192	192	192	247	297	347



Attention ! The standard mounting of the MV busbar is with the conductors on edge. This allows for the easy application of the resin at the joint.

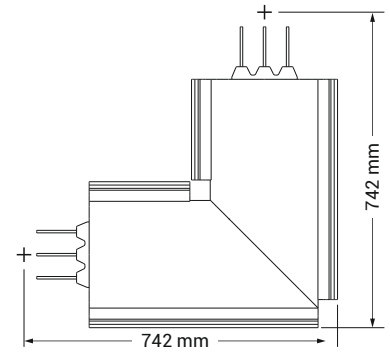
Upwards Downwards Elbow

- U
- D



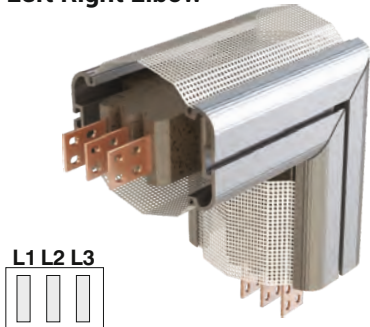
Sample Order:

MVC 1211 - U
12 kV 1150 A, Copper, Feeder, IP 68,
3 Conductors



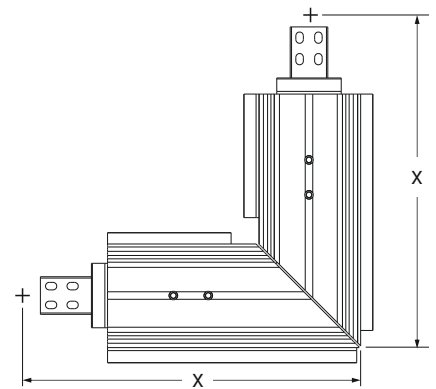
Left Right Elbow

- R
- L



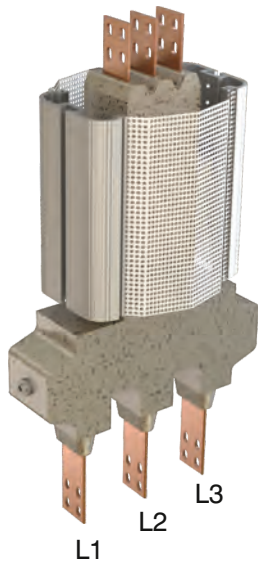
Sample Order:

MVC 1209 - R
12 kV 950 A, Copper, Feeder, IP 68,
3 Conductors



Panel Connection

- P10
- T10



Sample Order:

MVC 1213 - P10
12 kV 1350 A, Copper,
Feeder, IP 68, 3 Conductors
For Panel Feeder

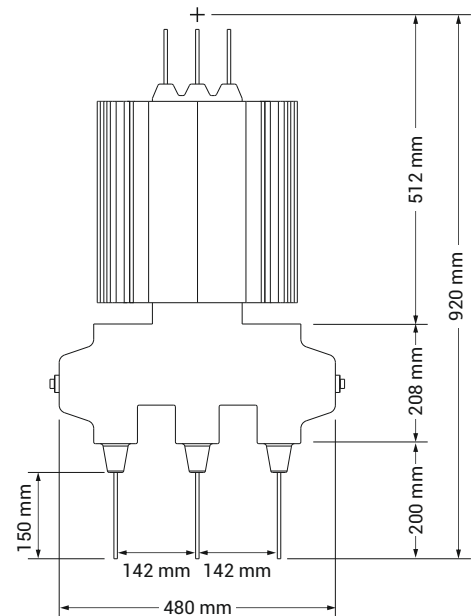


Table of Busbar Cross Section Sizes

MVC - Cu Conductor	Rated Current (A)	950	1150	1350	1650	2250	2750
	Busbar Code	09	11	13	16	22	27
X	mm	580	590	595	635	685	740

FIGURE 1 - EDGEWISE APPLICATION

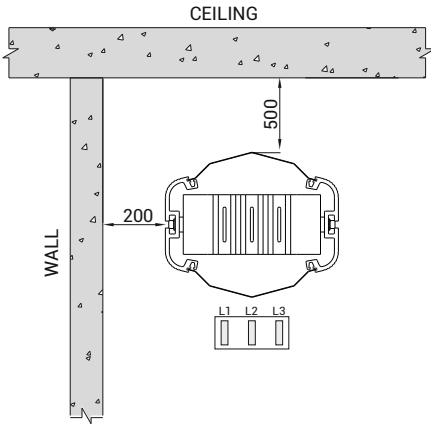
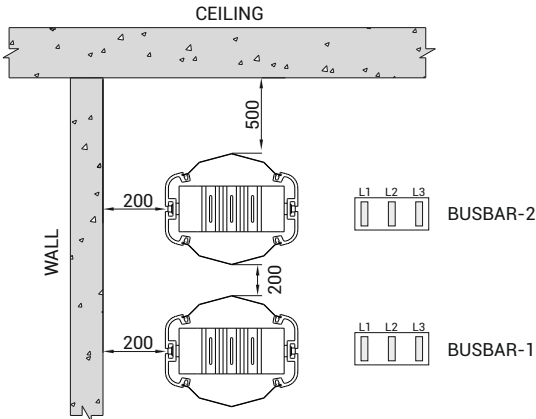


FIGURE 2 - EDGEWISE APPLICATION



Primarily on the installation phase;
BUSBAR-1 line should be installed before **BUSBAR-2** line.

FIGURE 3 - CROSSING UNDER A BEAM ON EDGEWISE APPLICATION

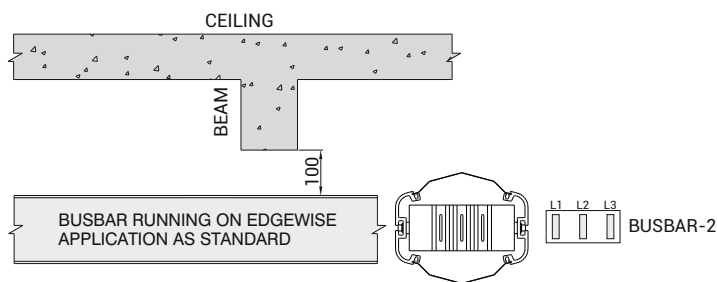


FIGURE 4 - SAMPLE WALL CROSSING WITH FIRE BARRIER

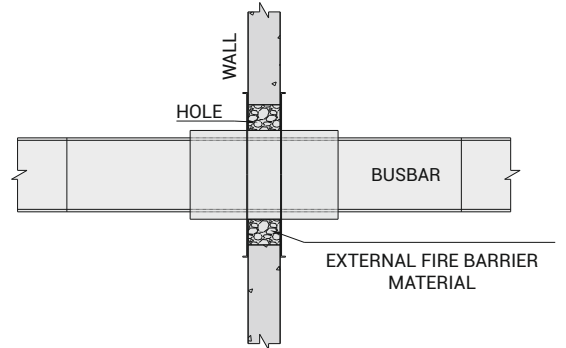
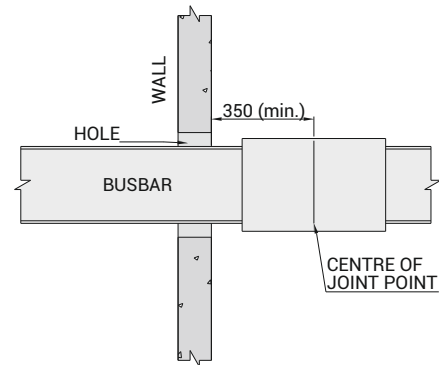


FIGURE 5 - STANDARD WALL CROSSING



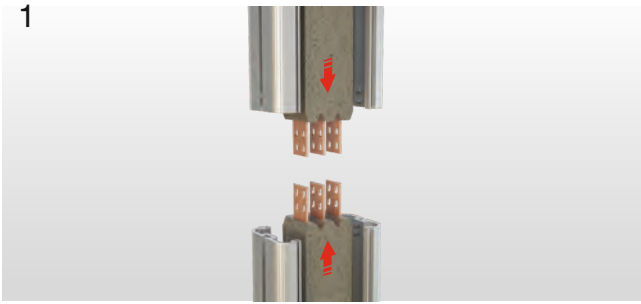
Attention !

- For correct installation, the dimension from the busbar to the ceiling should not be less than 500mm
- The joint should be not come across to Beams.
- The dimensions given above are minimum values.
- All dimensions are given in mm.

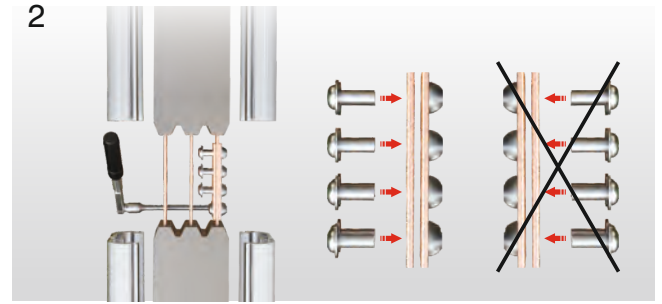
Cast Resin Installation Tools

Description	Order Code
CR Joint Area Mixer	5000132
CR Plastic Hammer	5000310
CR Spoon Brush	5000311
MV Allen Torque Set	5000664

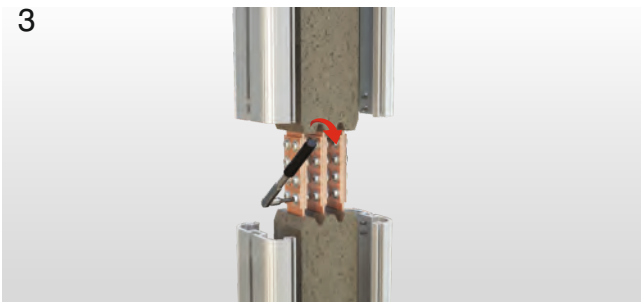




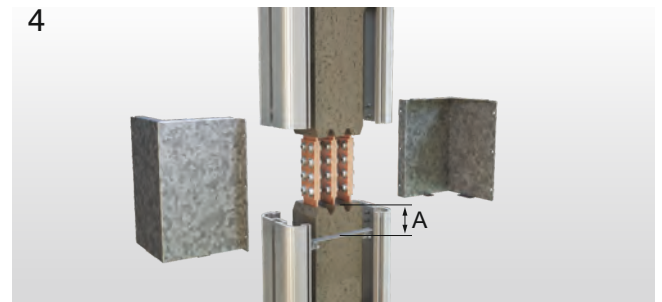
The ends of the conductors of the busbars are cleaned with a clean dry cloth. The busbars have to be fixed in the same axis, with a max. distance of 10 mm between the two conductors.



As shown on the figure, junction plates fixed as the bolts face the same direction at all times.



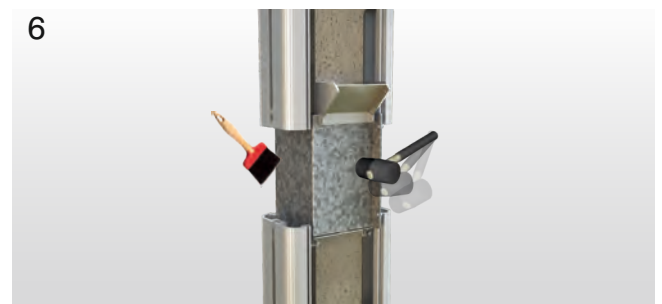
All bolts must be tightened to 72 Nm with torque wrench.



Support sheets are secured on the lower part of juncture area by stem bar. A min. 50-60 mm. The joint moulds are affixed on the support sheet by cleaning with a dry and clean piece of cloth.



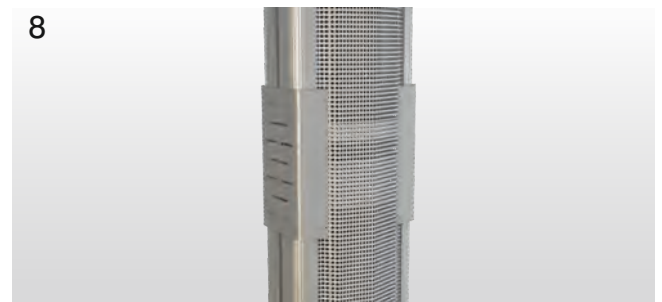
The prepared for casting should be cast from the same spot at all times.



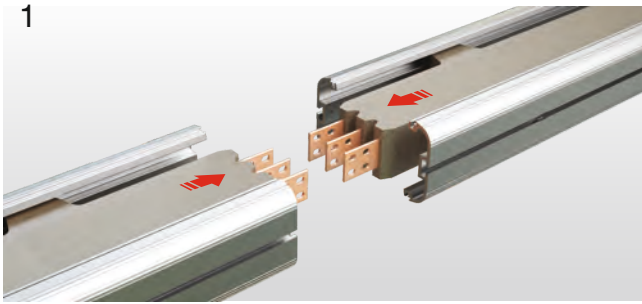
The material should be "vibrated" with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to be brushed.



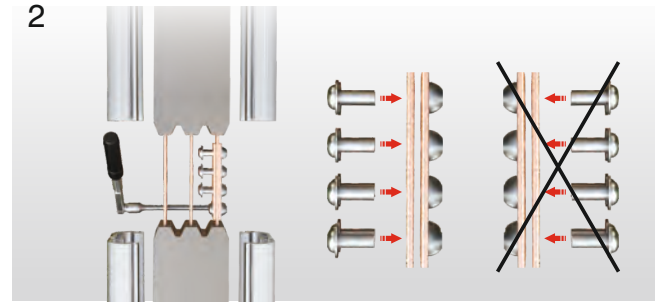
After the curing of the cast material is complete the sheet metal moulds can be removed. (Reaction is completed within 8 - 24 hours based on the air temperature.) The flexibles are fitted to the profiles grooves for earth continuity.



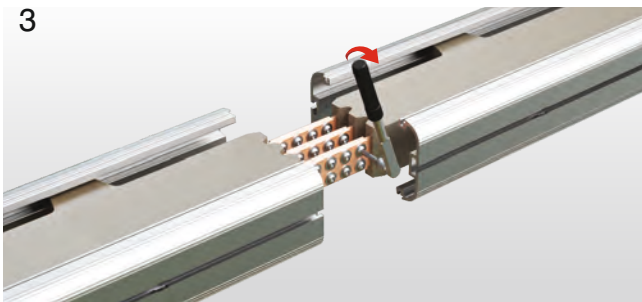
Joint protection pieces of perforated aluminium should be fitted.



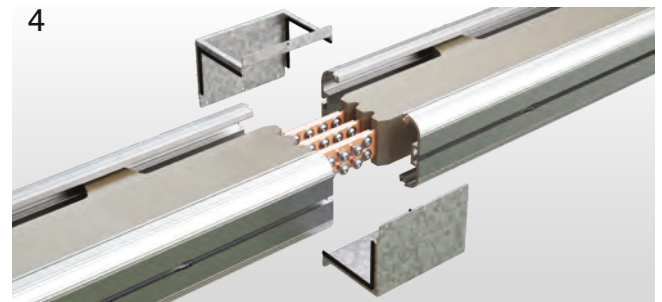
The ends of the conductors of the busbars are cleaned with a clean dry cloth. The busbars have to be fixed in the same axis, with a max. distance of 10 mm between the two conductors.



As shown on the figure, junction plates fixed as the bolts face the same direction at all times.



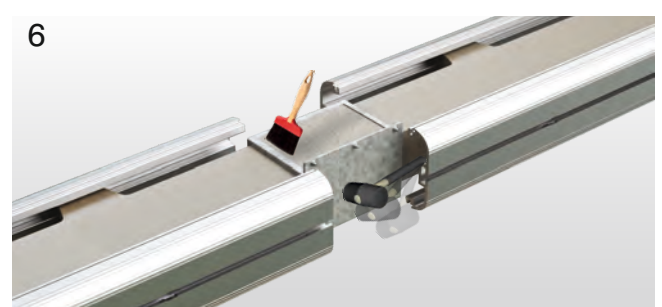
All bolts must be tightened to 72 Nm with torque wrench.



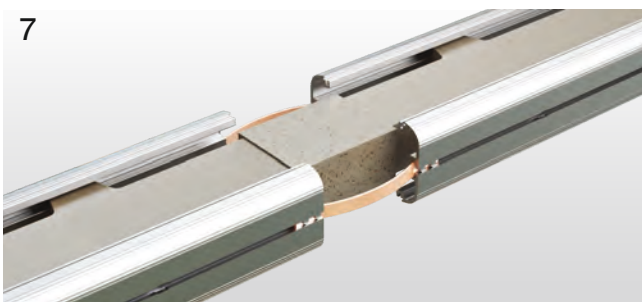
Before assembling the casting moulds, inner surfaces of casting moulds have to be wiped with clean dry cloth.



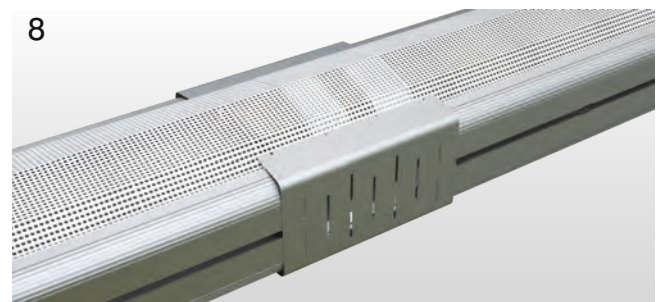
The prepared for casting should be cast from the same spot at all times.



The material should be 'vibrated' with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to be brushed.



After the curing of the cast material is completed the sheet metal moulds can be removed. (Reaction is completed within 8 - 24 hours based on the air temperature.) The flexibles are fitted to the profiles grooves for earth continuity.



Joint protection pieces of perforated aluminium should be fitted.

950 A TO 2750 A MEDIUM VOLTAGE BUSBAR SYSTEMS (E- LINE MV) GENERAL PRODUCT SPECIFICATIONS

1- Standards & Certification:

- Busbar trunking system shall be designed in accordance with the international standards IEC 62271-200 and IEC 61439-6, type tests thereof shall be conducted and manufactured in accordance with the standard. Type tests shall be conducted by independent and accredited testing and certification bodies with international validity and certified accordingly. Short-circuit type tests and the following 3 main type tests shall be conducted for each current rating of busbar system and conformity certificate for the standards shall be obtained.

2- Overall System Structure

Busbar system should be with low impedance complying with the following specifications. This should be accomplished by placement of the tin coated conductors within the material with no entrapped air within.

2.1- Electrical Values

- Nominal insulation voltage of 12kV busbar trunking system should be 28kV.
- For the tin coated aluminum or copper, the environmental temperature should be maximum 40 °C while the maximum temperature rise should be 90 K.
- Minimum short circuit values of busbar should be as follows

For Cu Conductors;

950-2750A : phase-phase 1 sec. value 25kA, peak value 65kA

2.2- Housing and Overall Structure

- Housing of busbar lengths is a special design and should be manufactured from a cast material.
- The structure of the busbar lengths shall have tin plated conductors along their complete length within the housing.
- In the busbar trunking system, there should be down-up and right-left turning elements, panel, transformer and cable connection elements, closure, horizontal and vertical expansion elements as a standard. Special modules and special size busbar lengths that may be required during the implementation of the project should be able to be manufactured within a short time and in accordance with the standard specification and technique.
- If busbar runs pass through the building expansion joint a horizontal expansion element shall be used in the run. Besides, horizontal dilatation element should be used at each 40 m on the horizontal lines.

2.3- Conductors and Phase Configuration

- Busbar trunking systems conductors shall be high conductivity copper with 99.95% / 99.99%? between 950-2750A.
- Busbar trunking system should be in the following conductor number and phase configuration

a) 3 Conductors / PE housing

- Copper conductors should be 99.95% electrolytic copper. Minimum conductivity value should be 56 m/mm². Entire surfaces of the electrolytic copper conductors should be tin-coated.

2.4- Insulation Structure

- Bars with high conductivity value should be insulated with a special composite material composed of allot of specially selected sand, calcite and epoxy resin. This material should be compliant with temperature changes and thermal expansion. It should ensure high protection against external impacts.

2.5- Modular Joint Structure

- The phase conductors shall be joined using two junction plates per phase of suitable cross section to maintain the rating integrity of the conductors. These plates shall be secured using bolts with non-sharp tips torqued to 72 Nm. The joint shall be completed using a mixture of epoxy and silicon to match the material of the busbar lengths. This material should be compliant with temperature changes and thermal expansion. It should ensure high protection against external impacts. Juncture point bolts should be tightened with torque wrench set to 72 Nm (55 lbft)

2.6- Protection Class

- Busbar installations shall have the protection class of IP 68


3- Assembly and Commissioning Tests

- The assembly of the busbar trunking system should be performed in accordance with the electrical project , electrical single line diagram, layout plans and detailed busbar application projects in line with the type and current values indicated on these plans, instructions provided by the manufacturer should be strictly abided with during the assembly process. Joint bolts shall definitely be tightened by the torque wrench set to correct values and insulated accordingly.

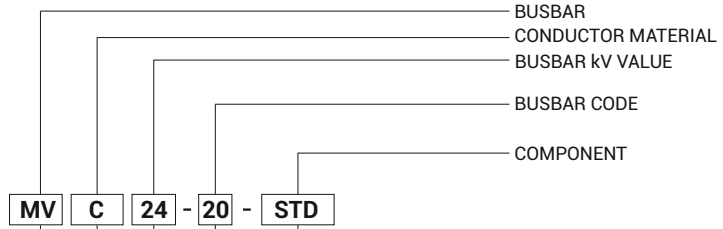
- Upon the completion of the assembly of the busbar system and controlling of the compliance to the project thereof and assembly instructions;

- Di-Electric test with very low frequency should be conducted.
- Joint resistances and Line resistances should be measured.
- Phase sequences should be checked.

Component List	Quantity	Company : Project : Project No :	Name : Date : Signature :
Item		Prepared by	



Please duplicate this page for your own use.



Busbar Type

Aluminium (Al) **A**
 Copper (Cu) **C**

CONDUCTOR MATERIAL

BUSBAR kV VALUE	Code	Conductor Configuration			
		L1	L2	L3	Toprak (PE)
24 kV	24	✓	✓	✓	

BUSBAR kV VALUE

(* Please call us for different kV values.

MVA - Al Conductor		MVC - Cu Conductor		Conductor Cross Section
Rated Current	Busbar Code	Rated Current	Busbar Code	
-	-	1800	18	7x70
1500	15	2100	21	7x75
2000	20	3200	32	12x100
2500	25	4000	40	12x150
3000	30	5000	50	12x200
-	-	5700	57	15x200

BUSBAR CODE

COMPONENT

Standard Straight Length..... STD
 Special Straight Length..... X

Upwards Elbow..... U
 Downwards Elbow..... D
 Left Elbow..... L
 Right Elbow..... R
 Panel Connection..... P10

Rated Current	I_r	A	1500	2000	2500	3000
Busbar Code			15	20	25	30
Standards	IEC 62271-200 Edition 2.0 2011-10; IEC 62271-307 Edition 1.0 2015-09;		IEC 61439-6 Edition 1.0 2012-05; STL Guide to IEC 62271-200 Edition 2.0 2011-10			
Rated Voltage	U_r	kV	24	24	24	24
Rated power frequency withstand voltage	U_d	kV	50	50	50	50
Rated impulse withstand voltage	U_p	kV	125	125	125	125
Rated Frequency	f_r	Hz	50/60	50/60	50/60	50/60
Partial Discharge		pC	<20	<20	<20	<20
Protection Degree	IP68					
External Mechanical Impacts (IK Code)*	50J, > IK10					
Rated Short-time Withstand Current (1s)	I_k	kA _{rms}	50	72	72	72
Rated Peak Withstand Current	I_{ke}	kA	130	187	187	187
Rated Short-time Withstand Current for PE Conductor (1s)	I_p	kA	30	43	43	43
Rated Peak Withstand Current for PE Conductor	I_{pe}	kA	78	112	112	112
MEAN PHASE CONDUCTOR CHARACTERISTICS AT RATED CURRENT I_r						
Resistance at a conductor temperature of 20°C	R_{20}	mΩ/m	0.0608	0,0309	0,0234	0,0170
Resistance at an ambient air temperature of 35°C	R	mΩ/m	0.0799	0,0391	0,0309	0,0213
Reactance (Independent from Temperature)	X	mΩ/m	0.1313	0,1098	0,0884	0,0749
Positive and negative sequence impedances at an ambient air temperature of 35°C	Z	mΩ/m	0.1537	0,1165	0,0937	0,0779
Positive and negative sequence impedances at an ambient air temperature of 20°C	Z_{20}	mΩ/m	0.1447	0,1140	0,0915	0,0768
Rated Power Loss at 35°C		Watt	517.3	457.3	558	554.8
DC Resistance at a conductor temperature of 20 °C for Phases	R_{phdc}	mΩ/m	0,056	0,026	0,021	0,013
DC Resistance at a conductor temperature of 20°C for PE	R_{PEdc}	mΩ/m	0,009	0,009	0,008	0,008
SECTIONS						
Phase Conductor		mm ²	525	1200	1800	2400
PE (Housing)		mm ²	8515	8515	9394	10194
Conductor Cross Section		mmxmm	7x75	12x100	12x150	12x200
Busbar Weight (3 Conductors)		kg/m	95	100	120	143
MEAN FAULT-LOOP CHARACTERISTICS						
Zero-sequence Impedance						
Zero-sequence impedance at a conductor temperature of 20	$Z_{(0)k20phPE}$	mΩ/m	0.273	0,268	0,219	0,195
°CZero-sequence impedance at an ambient temperature of 35°C	$Z_{(0)kphPE}$	mΩ/m	0.293	0,283	0,231	0,201
Mean Resistances and Reactances						
Resistance at a conductor temperature of 20°C	$R_{b20phph}$	mΩ/m	0.132	0,068	0,059	0,037
Resistance at a conductor temperature of 20°C	$R_{b20phPE}$	mΩ/m	0.084	0,061	0,046	0,033
Resistance at an ambient air temperature of 35°C	R_{bphph}	mΩ/m	0.173	0,087	0,078	0,047
Resistance at an ambient air temperature of 35°C	R_{bphPE}	mΩ/m	0.111	0,077	0,060	0,041
Reactance (Independent from temperature)	X_{bphph}	mΩ/m	0.258	0,215	0,174	0,146
Reactance (Independent from temperature)	X_{bphPE}	mΩ/m	0.165	0,151	0,125	0,109

Rated Current	I_r	A	1800	2100	3200	4000	5000	5700
Busbar Code			18	21	32	40	50	57
Standards	IEC 62271-200 Edition 2.0 2011-10; IEC 62271-307 Edition 1.0 2015-09;		IEC 61439-6 Edition 1.0 2012-05; STL Guide to IEC 62271-200 Edition 2.0 2011-10					
Rated Voltage	U_r	kV	24	24	24	24	24	24
Rated power frequency withstand voltage	U_d	kV	50	50	50	50	50	50
Rated impulse withstand voltage	U_p	kV	125	125	125	125	125	125
Rated Frequency	f_r	Hz	50	50	50	50	50	50
Partial Discharge		pC	<20	<20	<20	<20	<20	<20
Protection Degree	IP68							
External Mechanical Impacts (IK Code)*	50J, > IK10							
Rated Short-time Withstand Current (1s)	I_k	kA _{rms}	65	65	90.7	90.7	90.7	90.7
Rated Peak Withstand Current	I_{ke}	kA	169	169	236	236	236	236
Rated Short-time Withstand Current for PE Conductor (1s)	I_p	kA	39	39	55.7	55.7	55.7	55.7
Rated Peak Withstand Current for PE Conductor	I_{pe}	kA	102	102	144	144	144	144
MEAN PHASE CONDUCTOR CHARACTERISTICS AT RATED CURRENT I_r								
Resistance at a conductor temperature of 20°C	R_{20}	mΩ/m	0,0425	0,0401	0,0210	0,0126	0,0100	0,0103
Resistance at an ambient air temperature of 35°C	R	mΩ/m	0,0568	0,0547	0,0289	0,0172	0,0138	0,0142
Reactance (Independent from Temperature)	X	mΩ/m	0,1343	0,1303	0,1084	0,0879	0,0806	0,0716
Positive and negative sequence impedances at an ambient air temperature of 35°C	Z	mΩ/m	0,1458	0,1413	0,1121	0,0896	0,0818	0,0730
Positive and negative sequence impedances at an ambient air temperature of 20°C	Z_{20}	mΩ/m	0,1408	0,1363	0,1104	0,0888	0,0813	0,0723
Rated Power Loss at 35°C		Watt	529	703,3	867,3	797,5	1010,5	1353,3
DC Resistance at a conductor temperature of 20 °C for Phases	R_{phdc}	mΩ/m	0,034	0,034	0,017	0,012	0,009	0,009
DC Resistance at a conductor temperature of 20°C for PE	R_{PEdc}	mΩ/m	0,009	0,009	0,009	0,006	0,013	0,013
SECTIONS								
Phase Conductor		mm ²	490	525	1200	1800	2400	3000
PE (Housing)		mm ²	8515	8515	8515	9394	10194	10194
Conductor Cross Section		mmxmm	7x70	7x75	12x100	12x150	12x200	15x200
Busbar Weight (3 Conductors)		kg/m	104	106	122	152	187	205
MEAN FAULT-LOOP CHARACTERISTICS								
Zero-sequence Impedance								
Zero-sequence impedance at a conductor temperature of 20	$Z_{(0)k20phPE}$	mΩ/m	0,269	0,253	0,220	0,211	0,192	0,161
°CZero-sequence impedance at an ambient temperature of 35°C	$Z_{(0)kphPE}$	mΩ/m	0,284	0,253	0,230	0,220	0,199	0,167
Mean Resistances and Reactances								
Resistance at a conductor temperature of 20°C	$R_{b20phph}$	mΩ/m	0,089	0,055	0,047	0,032	0,025	0,023
Resistance at a conductor temperature of 20°C	$R_{b20phPE}$	mΩ/m	0,062	0,056	0,041	0,033	0,026	0,025
Resistance at an ambient air temperature of 35°C	R_{bphph}	mΩ/m	0,119	0,075	0,046	0,044	0,035	0,032
Resistance at an ambient air temperature of 35°C	R_{bphPE}	mΩ/m	0,083	0,076	0,041	0,045	0,036	0,034
Reactance (Independent from temperature)	X_{bphph}	mΩ/m	0,264	0,246	0,209	0,170	0,143	0,132
Reactance (Independent from temperature)	X_{bphPE}	mΩ/m	0,169	0,156	0,142	0,122	0,108	0,099

Standards

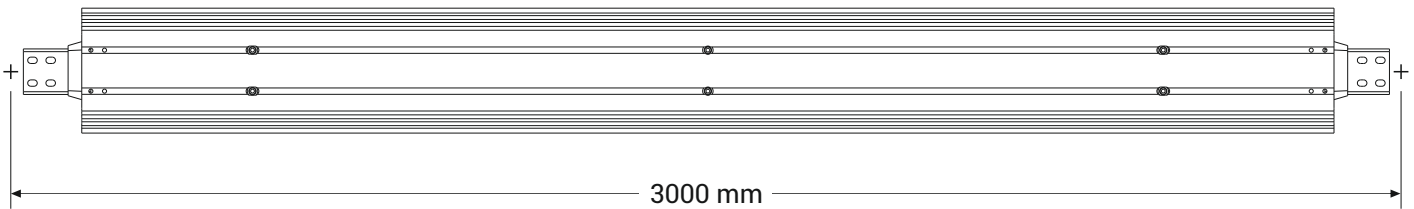
⁽¹⁾ The weight per metre provided in table includes 1/3 of the weight of one block joint.

Standard Feeder Straight Length - STD



Sample Order:

MVC 2418 - STD
24 kV 1800 A, Copper, Feeder, IP 68, 3 Conductors



Special Feeder Straight Length - X



Conductor Cross Section

Sample Order:

MVC 2432 - X - 150
24 kV 3200 A, Copper, Feeder, IP 68, 3 Conductors, 1500 mm Special Length

Information:
Feeder Minimum
Special length size = 1000 mm

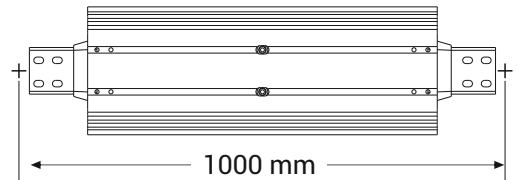
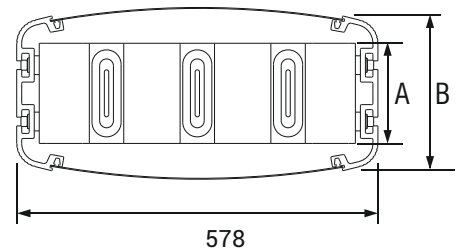


Table For Outer Dimension of Busbars

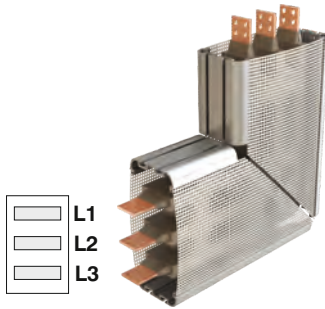
MVA - Al Conductor	Conductor Cross Section		7X75	12X100	12X150	12X200	-
	Rated Current (A)		1500	2000	2500	3000	-
	Busbar Code		15	20	25	30	-
MVC - Cu Conductor	Conductor Cross Section	7X70	7X75	12X100	12X150	12X200	15X200
	Rated Current (A)	1800	2100	3200	4000	5000	5700
	Busbar Code	18	21	32	40	50	57
A	mm	160	160	160	210	260	260
B	mm	247	247	247	297	347	347



24 kV

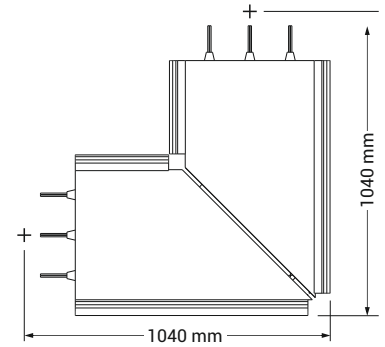
Upwards Downwards Elbow

- U
- D



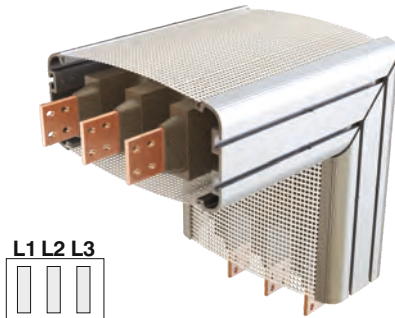
Sample Order:

MVC 2421 - U
24 kV 2100 A, Copper, Feeder, IP 68,
3 Conductors



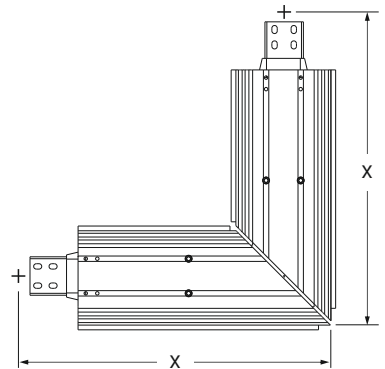
Left Right Elbow

- R
- L



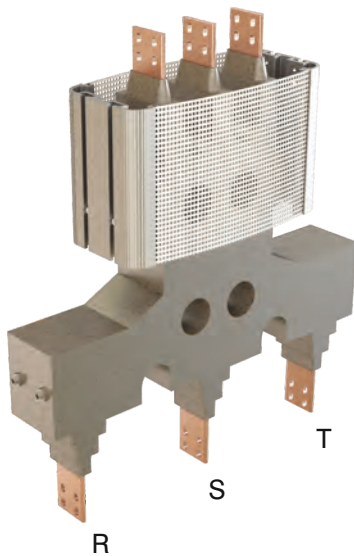
Sample Order:

MVC 2432 - R
24 kV 3200 A, Copper, Feeder, IP 68,
3 Conductors



Panel Connection

- P10
- T10



Sample Order:

MVC 2450 - P10
24 kV 5000 A, Copper,
Feeder, IP 68, 3 Conductors
For Panel Feeder

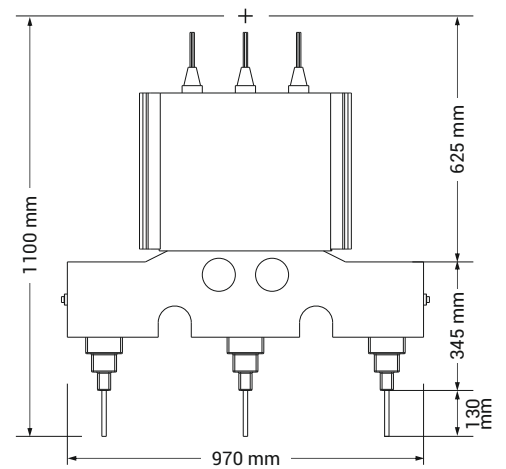


Table of Busbar Cross Section Sizes

MVA - Al Conductor	Conductor Cross Section		7X75	12X100	12X150	12X200	-
	Rated Current (A)		1500	2000	2500	3000	-
	Busbar Code		15	20	25	30	-
MVC - Cu Conductor	Conductor Cross Section	7X70	7X75	12X100	12X150	12X200	15X200
	Rated Current (A)	1800	2100	3200	4000	5000	5700
	Busbar Code	18	21	32	40	50	57
X	mm	690	690	690	740	790	790

FIGURE 1 - EDGEWISE APPLICATION

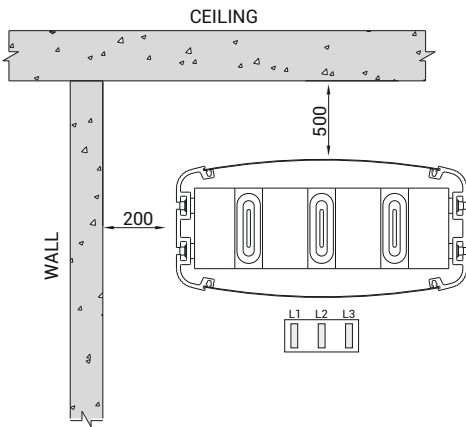


FIGURE 4 - SAMPLE WALL CROSSING WITH FIRE BARRIER

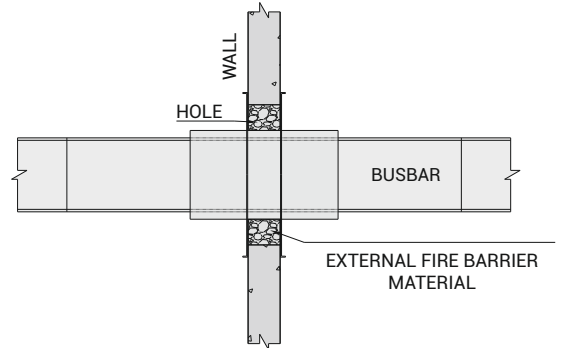
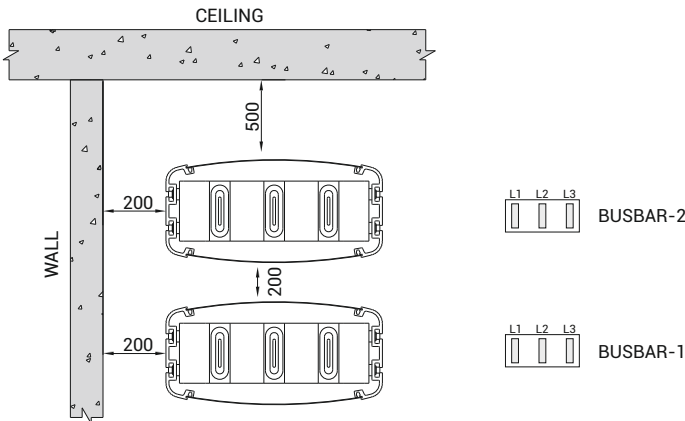


FIGURE 2 - EDGEWISE APPLICATION



Primarily on the installation phase;
BUSBAR-1 line should be installed before **BUSBAR-2** line.

FIGURE 5 - STANDARD WALL CROSSING

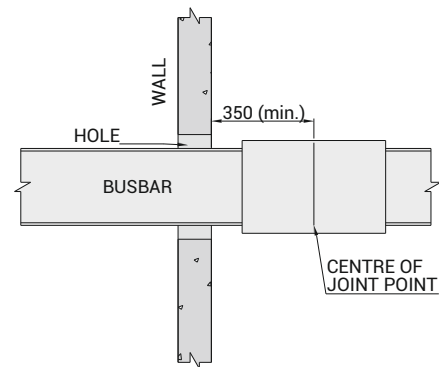
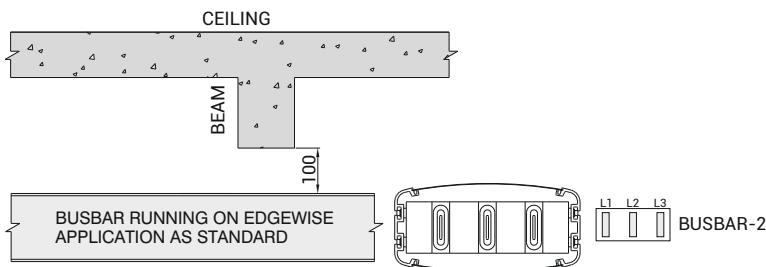


FIGURE 3 - CROSSING UNDER A BEAM ON EDGEWISE APPLICATION



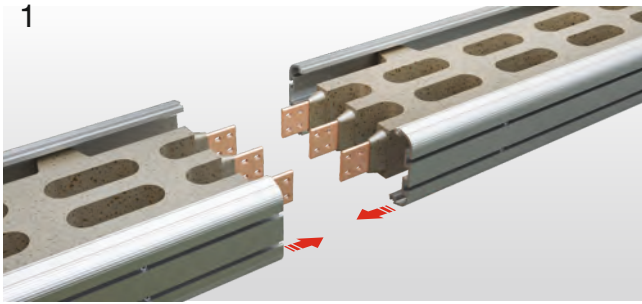
! Attention !

- For correct installation, the dimension from the busbar to the ceiling should not be less than 500mm
- The joint should not come across to Beams.
- The dimensions given above are minimum values.
- All dimensions are given in mm.

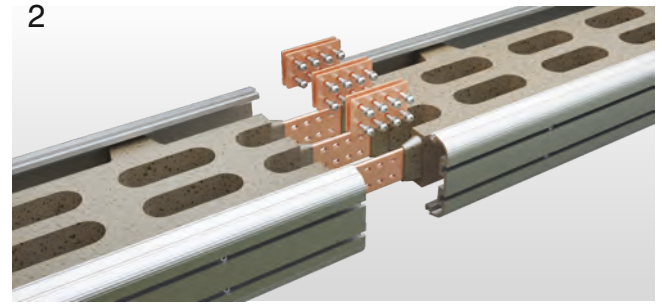
Cast Resin Installation Tools

Description	Order Code
CR Joint Area Mixer	5000132
CR Plastic Hammer	5000310
CR Spoon Brush	5000311
MV Allen Torque Set	5000664

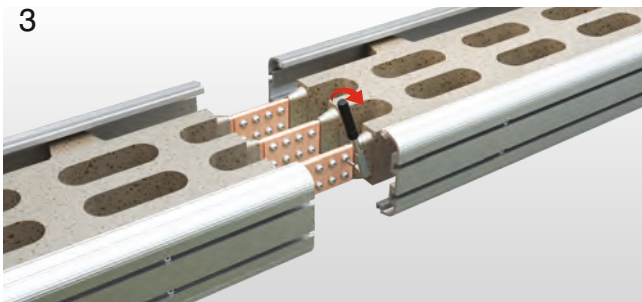




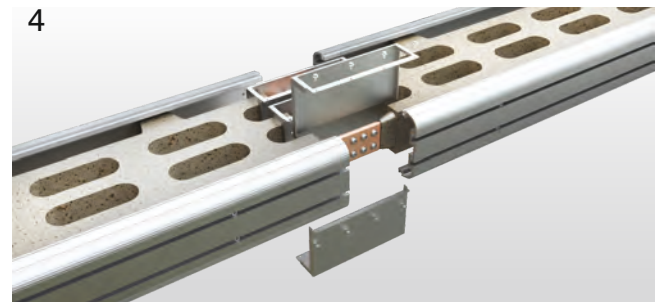
The ends of the conductors of the busbars are cleaned with a clean dry cloth. The busbars have to be fixed in the same axis, with a max. distance of 10 mm between the two conductors.



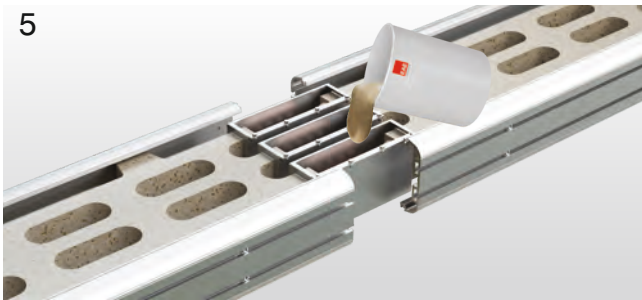
As shown on the figure, junction plates shall be fixed as the bolts face the same direction at all times.



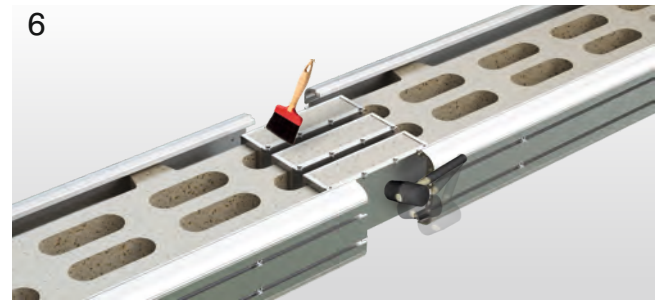
All bolts must be tightened to 72 Nm with torque wrench.



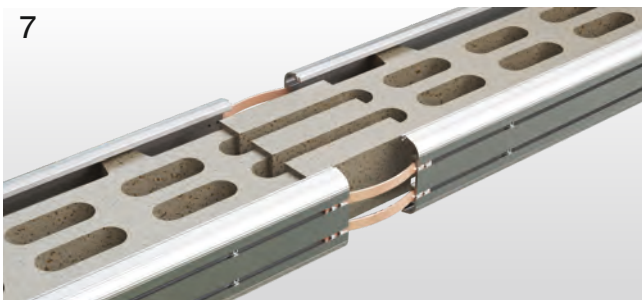
Before the casting moulds assembling, inner surfaces of casting mould shall be wiped with clean dry cloth.



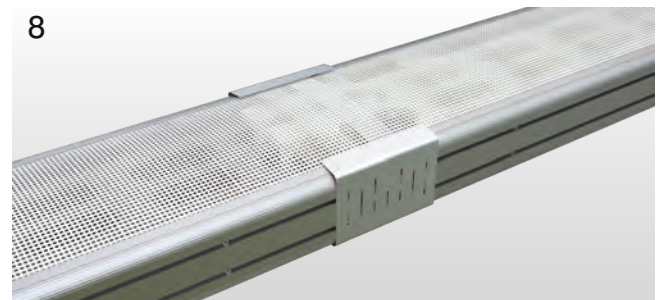
The mixture prepared for casting should be cast from the same spot at all times.



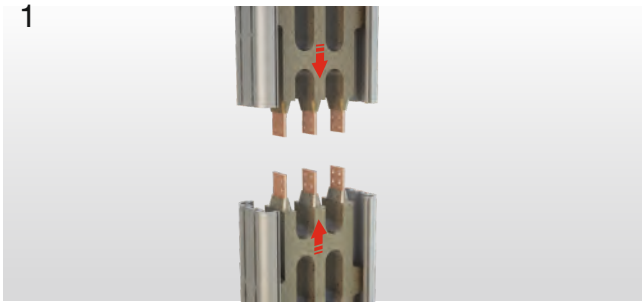
The material should be 'vibrated' with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to be brushed.



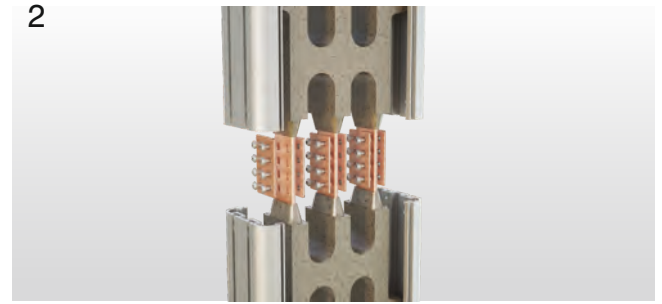
After the curing of the cast material is complete the sheet metal moulds can be removed. (Reaction is completed within 8 - 24 hours based on the air temperature.) The flexibles are fitted to the profiles grooves for earth continuity.



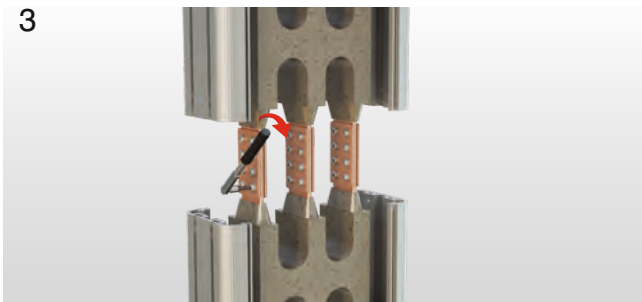
Joint protection pieces of perforated aluminium should be fitted.



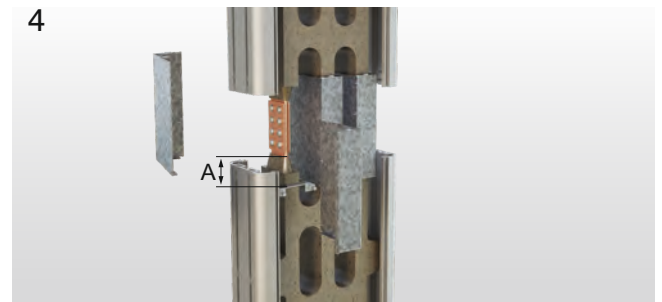
The ends of the conductors of the busbars are cleaned with a clean dry cloth. The busbars have to be fixed in the same axis, with a max. distance of 10 mm between the two conductors.



As shown on the figure, junction plates shall be fixed as the bolts face the same direction at all times.



All bolts must be tightened to 72 Nm with torque wrench.



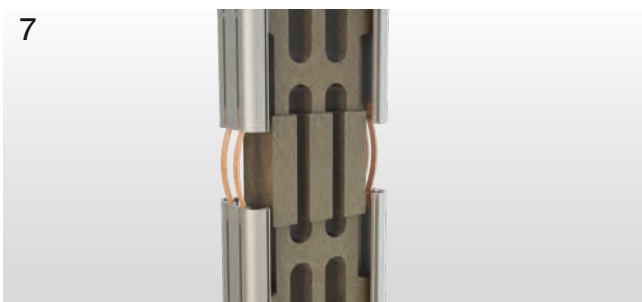
Support sheets are secured on the lower part of the junction area by stem bar. A min. 50-60 mm. The joint moulds are affixed on the support sheet by cleaning with a dry and clean piece of cloth.



The prepared for casting should be cast from the same spot at all times.



The material should be 'vibrated' with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to be brushed.



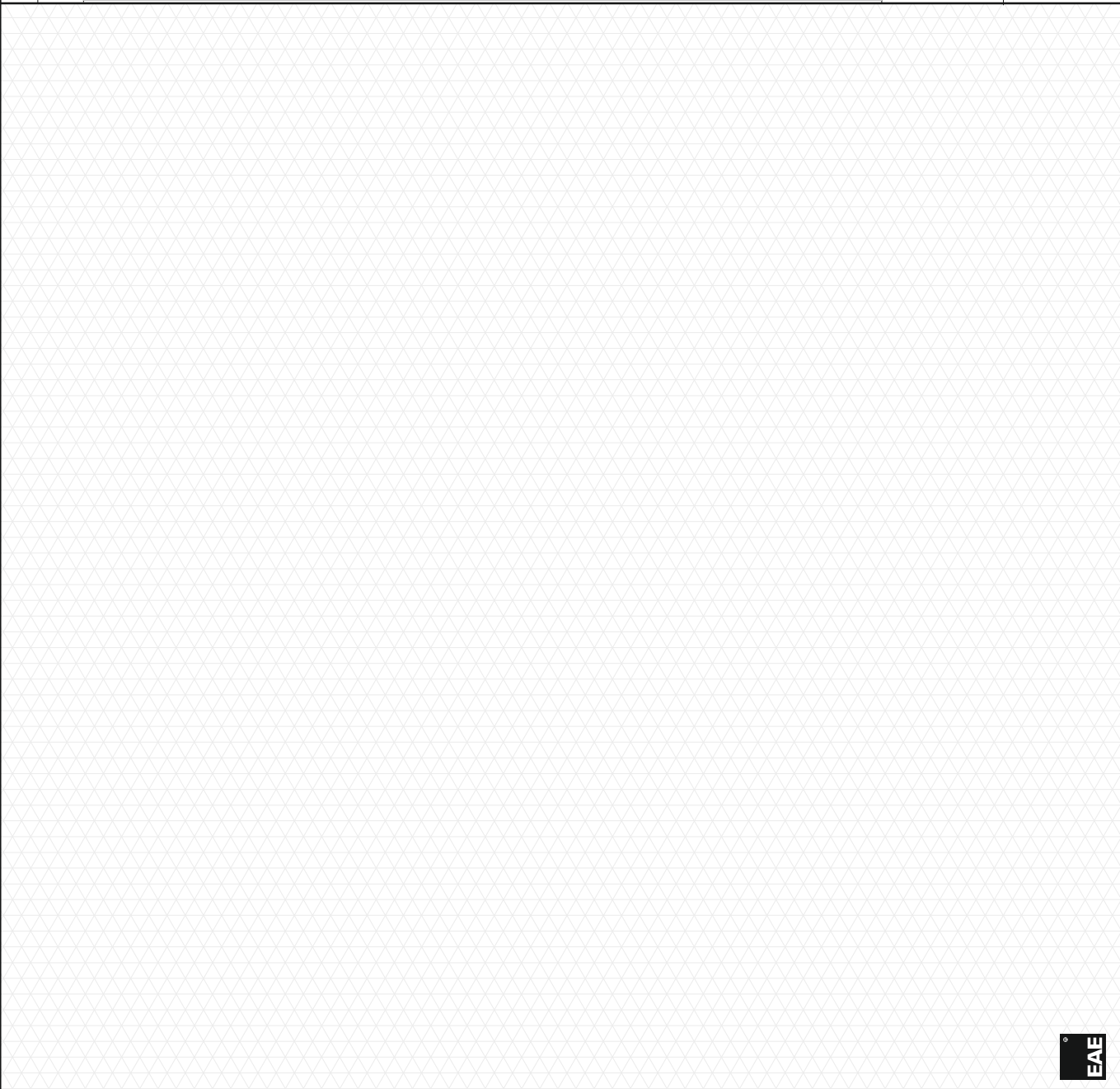
After the curing of the cast material is complete the sheet metal moulds can be removed. (Reaction is completed within 8 - 24 hours based on the air temperature.) The flexibles are fitted to the profiles grooves for earth continuity.



Joint protection pieces of perforated aluminium should be fitted.

1500A TO 5700 A MEDIUM VOLTAGE BUSBAR SYSTEMS (E- LINE MV) GENERAL PRODUCT SPECIFICATIONS

- 1- Standards & Certification:
 - Busbar trunking system shall be designed in accordance with international standards IEC 62271-200 and IEC 61439-6, type tests thereof shall be conducted and manufactured in accordance with the standard. Type tests shall be conducted by independent and accredited testing and certification bodies with international validity and certified accordingly. Short-circuit type tests and the following 3 main type tests shall be conducted for each current rating of busbar system and conformity certificate for the standards shall be obtained.
- 2- Overall System Structure
 - Busbar system should be with low impedance complying with the following specifications. This should be accomplished by placement of the tin coated conductors within the material with no entrapped air within.
- 2.1- Electrical Values
 - Nominal insulation voltage of 24kV busbar trunking system should be 50kV.
 - For Al Conductors;
 - 1500 A : phase-phase 1 sec. value 50 kA, peak value 130 kA
 - 2000-3000 A : phase-phase 1 sec. value 72 kA, peak value 187 kA
 - For Cu Conductors;
 - 1800-2100 A : phase-phase 1 sec. value 65 kA, peak value 169 kA
 - 3200-5700 A : phase-phase 1 sec. value 72 kA, peak value 187 kA
 - For the tin coated aluminum or copper, the environmental temperature should be maximum 40 °C while the maximum temperature rise should be 90 K.
 - Minimum short circuit busbar lengths should be as follows.
- 2.2- Housing and Overall Structure
 - Housing of busbar lengths is a special design and should be manufactured from a cast material.
 - The structure of the busbar lengths shall have tin plated conductors along their complete length within the housing.
 - In the busbar trunking system, there should be down-up and right-left turning elements, panel, transformer and cable connection elements, closure, horizontal and vertical expansion elements as a standard. Special modules and special size busbar lengths that may be required during the implementation of the project should be able to be manufactured within a short time and in accordance with the standard specification and technique.
 - If busbar runs pass through the building expansion joint a horizontal expansion element shall be used in the run. In addition horizontal expansion elements should be used at each 40 m on the horizontal lines.
- 2.3- Conductors and Phase Configuration
 - Busbar trunking system should be aluminum conductive between 1500-3000A.
 - Busbar trunking system should be copper conductive between 1800-5700A.
 - Busbar trunking systems conductors shall be high conductivity copper with .
 - a) 3 Conductors / PE housing
 - Aluminum conductors must be in the EC-Grade class. The minimum conductivity must be 34 m/mm².... . Entire surfaces of the aluminum conductors should be tin-coated.
 - Copper conductors should be 99.99% electrolytic copper. Minimum conductivity value should be 56 m/mm². Entire surfaces of the electrolytic copper conductors should be tin-coated.
- 2.4- Insulation Structure
 - Bars with high conductivity value should be insulated with a special composite material composed of allot of specially selected sand, calcite and epoxy resin. This material should be compliant with temperature changes and thermal expansion. It should ensure high protection against external impacts.
- 2.5- Modular Joint Structure
 - The phase conductors shall be joined using two junction plates per phase of suitable cross section to maintain the rating integrity of the conductors. These plates shall be secured using bolts with non-sharp tips torqued to 72 Nm. The joint shall be completed using a mixture of epoxy and silicon to match the material of the busbar lengths. This material should be compliant with temperature changes and thermal expansion. It should ensure high protection against external impacts. Juncture point bolts should be tightened with torque wrench set to 72 Nm (55 lbf)
- 2.6- Protection Class
 - Busbar installations shall have the protection class of IP 68.
- 3- Assembly and Commissioning Tests
 - The assembly of the busbar trunking system should be performed in accordance with the electrical project , electrical single line diagram, layout plans and detailed busbar application projects in line with the type and current values indicated on these plans, instructions provided by the manufacturer should be strictly abided with during the assembly process. Joint bolts shall definitely be tightened by the torque wrench set to correct values and insulated accordingly.
 - Upon the completion of the assembly of the busbar system and controlling of the compliance to the project thereof and assembly instructions;
 - a) Di-Electric test with very low frequency should be conducted.
 - b) Joint resistances and Line resistances should be measured.
 - c) Phase sequences should be checked.

Component List	Quantity	Component	Item	Company : Project : Project No :	Name : Date : Signature :	Prepared by
						

Please duplicate this page for your own use.

PRODUCT TYPES



BUSBAR ENERGY DISTRIBUTION SYSTEMS



CABLE TRAYS



TROLLEY BUSBAR ENERGY DISTRIBUTION SYSTEMS



INDOOR SOLUTIONS



SUPPORT SYSTEMS

Please visit our website for the updated version of our catalogues.
www.eae.com.tr



EAE Elektrik A.S.
Akcaburgaz Mahallesi,
3114. Sokak, No:10 34522
Esenyurt - Istanbul - TURKEY
Tel: +90 (212) 866 20 00
Fax: +90 (212) 886 24 20

Please visit our website for the updated version of our catalogues.
www.eae.com.tr/EN

IEC 61439-6



Catalogues 35-ENG. / Rev 01 1.000 pcs 23/01/2020
S.S.

EAE has full right to make any revisions or changes on this catalogue without any prior notice.