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E-LINE MV General Introduction





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 AI 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
- 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

Short-Circuit Withstand

 Special design for occupying minimum space based on ampere level.

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- Electroerosion resistant
- UV resistant
- Designed to improve heat loss
- Maintenance-free busbar
- Easy Assembly
- ► An ideal high temperature environments

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.

General Introduction

EAE

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.

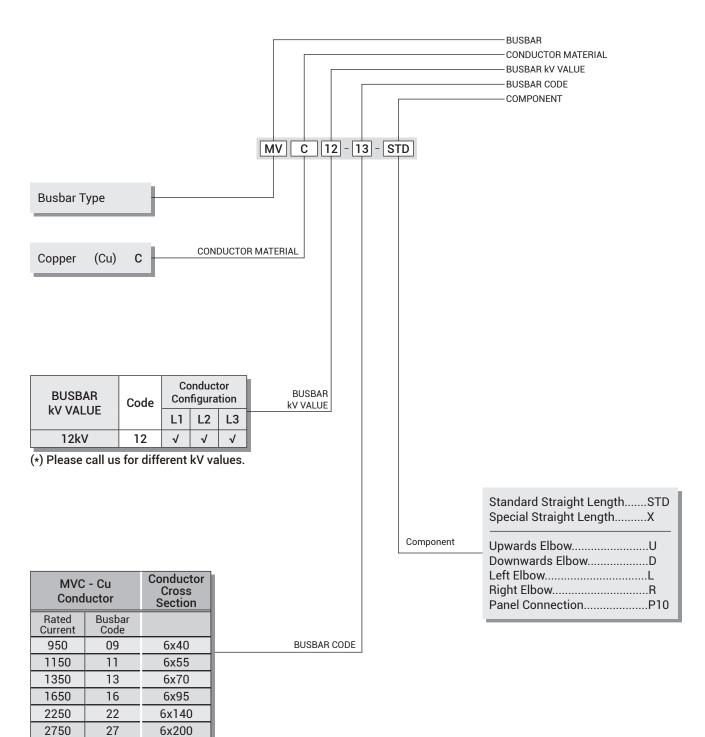
- Light aluminium case

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

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.





Technical Characteristics

► Copper Conductor (Cu)

Rated Current	l,	Α	950	1150	1350	1650	2250	2750
Busbar Code			09	11	13	16	22	27
Standards		1-200 Edition 1-307 Edition				-6 Edition 1 e to IEC 622	.0 2012-05; 71-200	
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 withstand voltage	Up	kV	75	75	75	95	95	95
Rated Frequency	f _r	Hz	50	50	50	50	50	50
Partial Discharge		рС	< 20	< 20	< 20	< 20	< 20	< 20
External Mechanical Impacts (IK Code)*	50J, gre	eater than IK	10					
Rated Short-time Withstand Current (1s)	l _k	kA _{rms}	25	25	43	43	71,3	71,3
Rated Peak Withstand Current	l _{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	n							
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)	Х	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		mm²	240	330	420	570	840	1200
PE (Housing)		mm²	5944	5944	5944	8105	8905	9704
Conductor Cross Section		mm x mm	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°C	Z _{(0)b20phPE}	mΩ/m	0,309	0,292	0,271	0,248	0,203	0,176
Zero-sequence impedance at an ambient temperature of 35°C	Z _{(0)bphPE}	mΩ/m	0,328	0,307	0,285	0,258	0,210	0,182
Mean Resistances and Reactances	(-)5pm E							
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

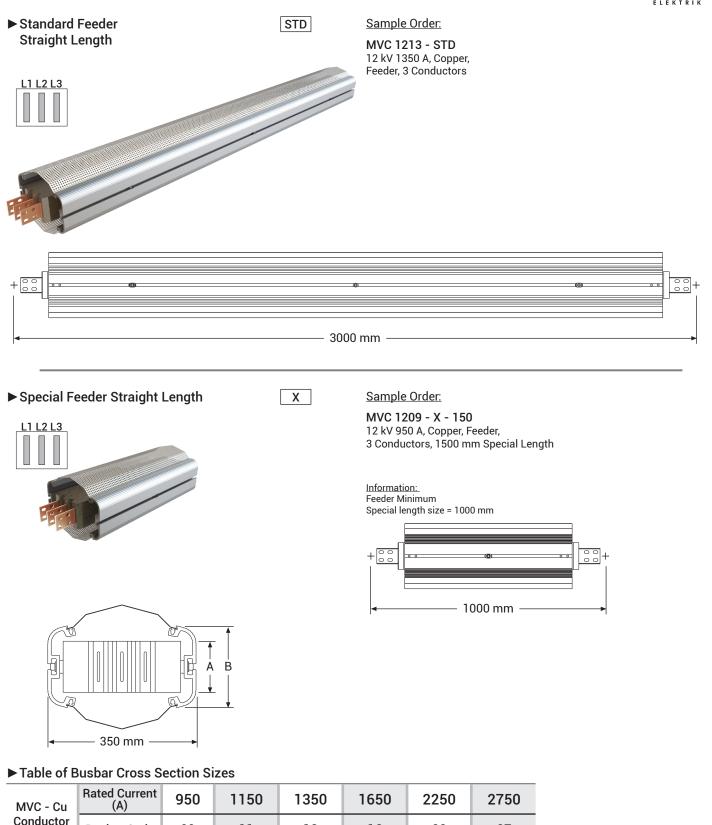
Standards

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



Standard Straight Length





MVC - Cu	Rated Current (A)	950	1150	1350	1650	2250	2750
Conductor	Busbar Code	09	11	13	16	22	27
А	mm	90	105	120	145	190	250
В	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.

Elbows



Sample Order: ► Upwards Downwards Elbow U D MVC 1211 - U 12 kV 1150 A, Copper, Feeder, 3 Conductors 742 mm L1 L2 ■ L3 742 mm ► Left Right Elbow Sample Order: R L MVC 1209 - R 12 kV 950 A, Copper, Feeder, 3 Conductors Х L1 L2 L3 Χ-► Table of Busbar Cross Section Sizes **Rated Current** 950 1150 1350 1650 2250 2750 MVC - Cu (A) Conductor **Busbar Code** 09 22 11 13 16 27 Х 590 580 595 685 740 mm 635 ► Panel Connection P10 Sample Order: T10 MVC 1213 - P10 12 kV 1350 A, Copper, Feeder, 3 Conductors For Panel Feeder 512 mm 89[']0 mm 208 mm 肿 đđ 378 mm 170 mm 120 mm

L3

L2

L1

142 mm 142 mm

480 mm

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Horizontal & Vertical Cast Resin Busbar Applications



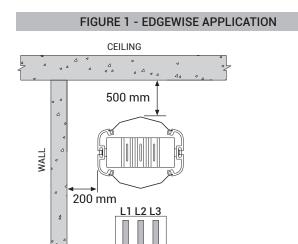


FIGURE 2 - EDGEWISE APPLICATION

CEILING

500 mm

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200 mm

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WALL

FIGURE 4 - SAMPLE WALL CROSSING WITH FIRE BARRIER

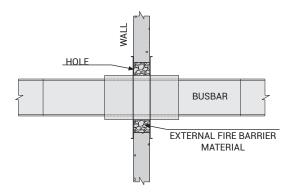
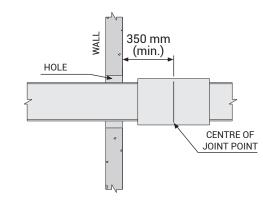


FIGURE 5 - STANDARD WALL CROSSING



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

111213

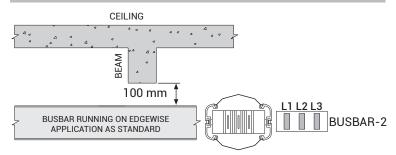
L1 L2 L3

200 mm

BUSBAR-2

BUSBAR-1

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 be not come across to Beams.
- The dimensions given above are minimum values.
- All dimensions are given in mm.

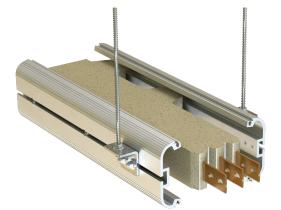
Cast Resin Installation Tools

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



Trunking Support









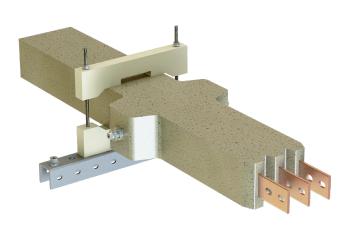


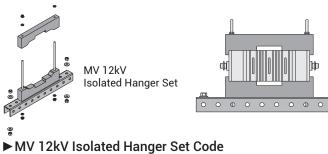


► MV "L" Hanger Set Code

	- Cu luctor	Conductor Dimensions	MV "L" Hanger Set Code					
Rated Current	Busbar Code		Description	Order Code	Description	Order Code		
950	09	6x40						
1150	11	6x55	MV L HANGER SET Ø13-(40)	3191532	MV L HANGER SET Ø17-(40)	3191533		
1350	13	6x70						
1650	16	6x95	MV L HANGER SET Ø13-(90)	3180150	MV L HANGER SET Ø17-(90)	3180153		
2250	22	6x140	MV L HANGER SET Ø13-(110)	3180151	MV L HANGER SET Ø17-(110)	3180154		
2750	27	6x200	MV L HANGER SET Ø13-(160)	3180152	MV L HANGER SET Ø17-(160)	3180155		

Note: Ø17 Panel Connection for Special Suspension. It is not included in the rod hanger set.





MVC - Cu Conductor		Conductor Dimensions	MV 12kV Isolated Hanger Set Code			
Rated Current	Busbar Code		Description	Order Code		
950	09	6x40				
1150	11	6x55	MV 12kV ISOLATED HANGER SET	3195616		
1350	13	6x70	HANGENGET			
1650	16	6x95				
2250	22	6x140	MV 12kV ISOLATED HANGER SET	3195562		
2750	27	6x200	HAROEN DET			

▶ 12kV Additional Zone Weights

MVC - Cu Conductor						
Rated Busbar Current Code						
950	09	6x40	12,0			
1150	11	6x55	13,5			
1350	13	6x70	14,0			
1650	16	6x95	15,5			
2250	22	6x140	18,5			
2750	27	6x200	22,5			



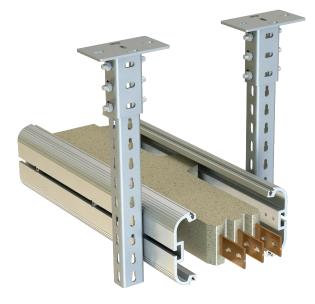
Total mixture weight of 1 Bucket is 15 kg T 15 kg.

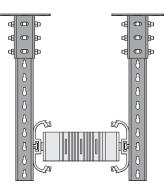
When determining the material to be consumed for joint point, the installation of joint point weighing 15 kg and its multiples should be included in the work plan for the same day. Otherwise, since the remaining material will happen a curing reaction, it cannot be used in another day's work plan and will be scrapped. Material planning should be done taking this detail into consideration.

Trunking Support

E-LINE MV







► Ceiling Fexing Element

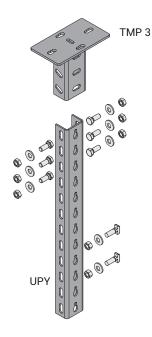
Description	T (mm)	Tensile Load (kg.)	Weight (kg./pcs)	Order Code	Pack (pcs)
TMP 3	4	900	1,689	3086554	10

Note: The bolt set is not included in the product. Please order separately.

► Heavy Duty S	upports	(U)
	_	

Description	T (mm)	L (mm)	Weight (kg./pcs)	Order Code
UPY 150	4	150	0,586	3004486
UPY 300	4	300	1,172	3004487
UPY 400	4	400	1,562	3004489
UPY 500	4	500	1,956	3004491
UPY 600	4	600	2,343	3004493
UPY 700	4	700	2,728	3004495
UPY 800	4	800	3,124	3004496
UPY 900	4	900	3,515	3004497
UPY 1000	4	1000	3,945	3004498
UPY 1100	4	1100	4,296	3004499
UPY 1200	4	1200	4,686	3004500
UPY 1300	4	1300	5,071	3004501
UPY 1400	4	1400	5,467	3004502
UPY 1500	4	1500	5,917	3004503
UPY 1600	4	1600	6,248	3004504
UPY 1700	4	1700	6,633	3004505
UPY 1800	4	1800	7,029	3004506
UPY 1900	4	1900	7,414	3004507
UPY 2000	4	2000	7,811	3004508
UPY 3000	4	3000	11,716	3001954

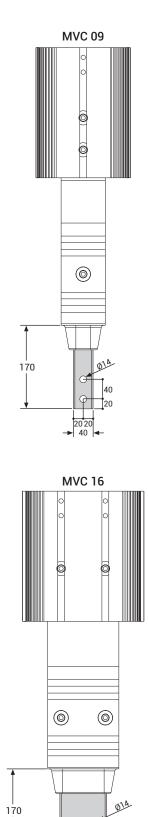
TMP 3 Fixing Element Mounting; 6 pcs M10x30 Bolt, 12 pcs M10 Washers, 6 pcs M10 Spring Washers, 6 pcs M10 Nuts should be used.



Panel Connection

► Two Dimensional Drawings of Panel Modules P10 Panel Mounted Modules





40

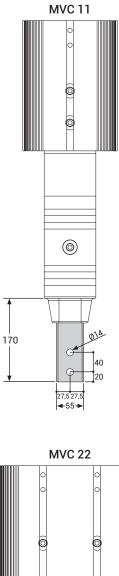
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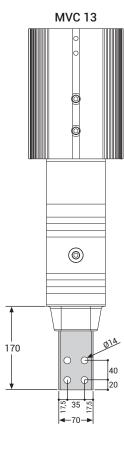
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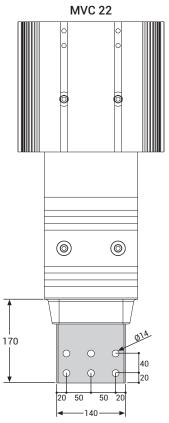
22,5

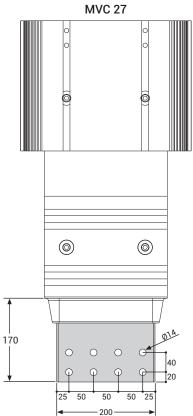
50

22,5 -95



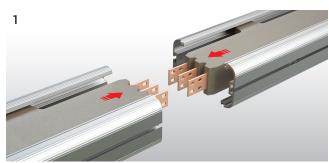






E-LINE MV Horizontal Application





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



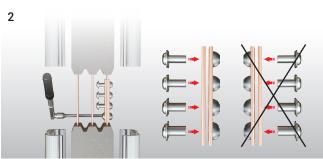
All bolts must be tightened to 72 Nm with torque wrench.



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



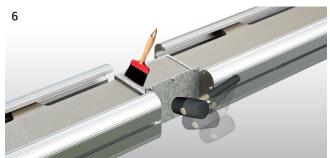
After the curing of the cast material is completed the sheet metal moulds can be removed. (Reaction is completed within 8 - 24 hours based on the air temperature.) The flexibles are fitted to the profiles grooves for earth continuity.



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



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



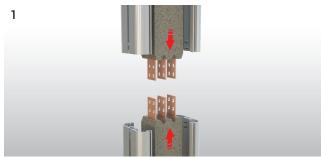
The material should be 'vibrated' with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to brushed.



Joint protection pieces of perforated aluminium should be fitted.

E-LINE MV Vertical Application





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



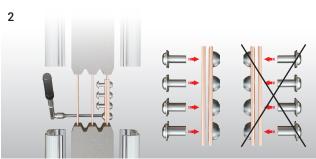
All bolts must be tightened to 72 Nm with torque wrench.



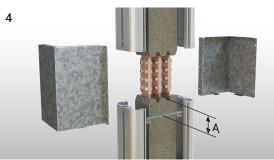
The prepared for casting should be cast from the same spot at all times.

7

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.



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



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 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 brushed.



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. - Busbar trunking 3 sec. encryption must be required.
- 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

- High conductivity bars; It must be insulated with a special composite material formed by a mixture of specially selected sand, calcite and epoxy resin. This material should be suitable for temperature changes and thermal expansion. High protection should be provided against external impacts.

- Insulation structure must be such that it can operate at -70 + 150 $^\circ$ C.

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 materialshould 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)

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.

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- 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.

E-LINE MV Certificate

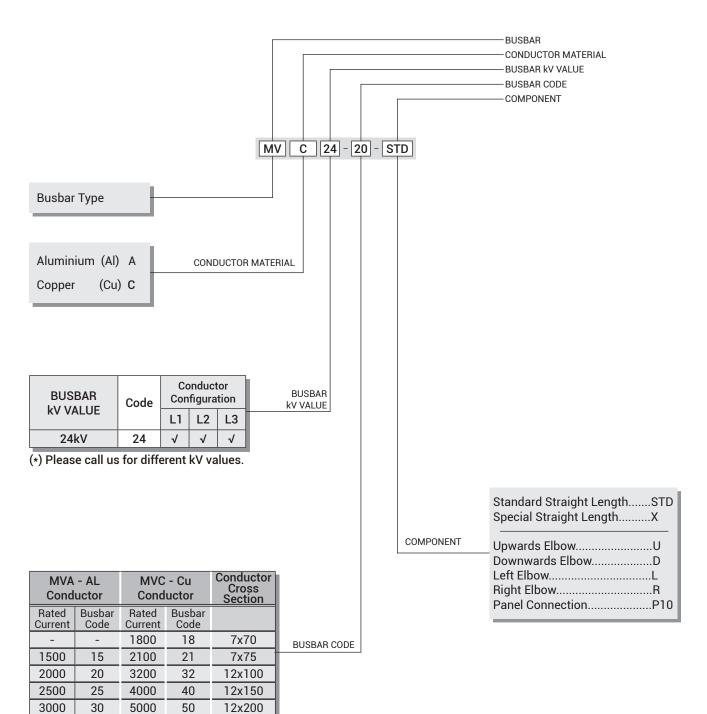


ПромМашТест			
PROMMASHTESTLIMITED COMPANY			
Test Center Principal Place of Business of the Legal Entity: 119530, Moscow city, Ochakovskoy Road, Aprt 34, Office VII/6 (119530, город Москва, дом 34, помещение VII, комната 6)			
Low-Voltage Equipment Test Laboratory Address in where the accreditation activity is executed: 142300 Moscow city, Chehovskiy District, Chehov town,			
Simferopal road, Apt.2 (142300 Московская область, Чеховский район; Симферопольское шоссе, д.2) АРРROVAL			
PROMMASHTEST Test Center Director S.A.Egorov 28.11.2419			
/Sect and Sign.			A
	DEKRA TEST REPORT	2221727.05-MHV	Page 1 of 53
28/3ILNVOK issue number and dated 28.11.2019 TEST REPORT	Applicant	: EAE Elektrik Asansör End. Insaat San. ve Tic, A.S. Akçaburgaz Mahallesi 119, Sokak No: 10	
		34510 Esenyurt / Istanbul Turkey	
	Application Date Order Number	: 23 October 2017 : 222172700	
	Product	: Medium-voltage busbar trunking system (bu	sway)
	Trade name	: EAE	
	Type/Model	: MVC 1211	
	Amhem, 26 February 20		
	Manufacturer	: EAE Elektrik Asansör End. Insaat San. ve Tic. A.S. Akçaburgaz Mahallesi 119, Sokak No: 10 34510 Esenyurt / İstanbul Turkey	
CUME BUS	Subject	: Design verification	
* Brees Suit *	Requirements	EC 62271-200 Edition 2.0 2011-10 EC 61439-6 Edition 1.0 2012-05	
Partial reproduction and distribution of the protocol is strictly prohibited without the written authorization of PROMMASH TEST Limited Company. Test results indicated on this protocol are only valid for the samples tested.		EC 62271-307 Edition 1.0 2015-09 STL Guide to EC 62271-200 Edition 2.0 20	011-10
Cont 190	Conclusion	: The product complies with the specified requ	lirements
	Tested by	: M. Lusing	
	Checked by	: A.D.J. Baas	DEKRA
	MLu	0011-18	DEKKA TEST REPORT 2225821/01-MINV Page 1
DEKRA			Imaad Sarv, va Tic A S. Akpeburgen Mahranikai (10. Sokak No: 10 Sel510 Esenyun/ Jasantou Turkay
PERION TEST REPORT 22258E2USAHW Page t d 44 Aquillare : DAE Glass Aurona Dec	© DEKRA Certification B.V. Al Products may only be provid explicitly created the circle to c	II rights reserved ded with a quality mark or put on the market as approved if D arry a quality mark.	Application Date : 29 June 2018 Onter Number : 222582100 Product : Medium-velage busber hunking system (busway)
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5700

57

15x200

Technical Characteristics



► Aluminium Conductor (Al)

Rated Current	l _r	Α	1500	2000	2500	3000
Busbar Code			15	20	25	30
Standards			2.0 2011-10; 1.0 2015-09;		IEC 61439-6 Edition 1.0 2012-05; STL Guide to IEC 62271-200 Edition 2.0 2011-	
Rated Voltage	U _r	kV	24	24	24	24
Rated power frequency withstand voltage	U _d	kV	50	50	50	50
Rated impulse withstand withstand voltage	Up	kV	125	125	125	125
Rated Frequency	f _r	Hz	50/60	50/60	50/60	50/60
Partial Discharge		рС	<20	<20	<20	<20
External Mechanical Impacts (IK Code)*	50J, > I	K10				
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		kA	78	112	112	112
MEAN PHASE CONDUCTOR CHARACTERISTICS AT RATED CURRENT	In					
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	Z	mΩ/m	0,1537	0,1165	0,0937	0,0779
temperature of 35°C Positive and negative sequence impedances at an ambient air	Z ₂₀	mΩ/m	0,1447	0,1140	0,0915	0,0768
temperature of 20°C 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	FEUC			.,		.,
Phase Conductor		mm²	525	1200	1800	2400
PE (Housing)		mm²	8515	8515	9394	10194
Conductor Cross Section		mm x mm	7x75	12x100	12x150	12x200
Busbar Weight (3 Conductors)		kg/m	95	100	120	143
MEAN FAULT-LOOP CHARACTERISTICS		<u>.</u>				
Zero-sequence Impedance		1				
Zero-sequence impedance at a conductor temperature of 20°C	Z _{(0)b20phPE}	mΩ/m	0,273	0,268	0,219	0,195
Zero-sequence impedance at an ambient temperature of 35°C	Z _{(0)bphPE}	mΩ/m	0,293	0,283	0,231	0,201
Mean Resistances and Reactances	-(0)0pnPE		.,2	-,•	-,	-,20.
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 _{b20phph}	mΩ/m	0,084	0,061	0,046	0,033
Resistance at a conductor temperature of 20 0		mΩ/m	0,173	0,087	0,078	0,033
Resistance at an ambient air temperature of 35 °C	R _{bphph}	 	0,111	0,007	0,060	0,041
Reactance (Independent from temperature)	R _{bphPE}	mΩ/m	0,258	0,215	0,000	0,041
Reactance (Independent from temperature)	X _{bphph} X _{bphPE}	mΩ/m	0,165	0,151	0,125	0,140

Standards

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

Technical Characteristics



► Copper Conductor (Cu)

Rated Current	l _r	Α	1800	2100	3200	4000	5000	5700
Busbar Code			18	21	32	40	50	57
Standards		1-200 Edition 1-307 Edition			61439-6 Ed . Guide to IE		12-05; 0 Edition 2.0	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 withstand voltage	Up	kV	125	125	125	125	125	125
Rated Frequency	f _r	Hz	50	50	50	50	50	50
Partial Discharge		рС	< 20	< 20	< 20	< 20	< 20	< 20
External Mechanical Impacts (IK Code)*	50J, > Ił	(10						
Rated Short-time Withstand Current (1s)	l _k	kA _{rms}	65	65	90,7	90,7	90,7	90,7
Rated Peak Withstand Current	l _{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 IN								
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)	х	mΩ/m	0,1343	0,1303	0,1084	0,0879	0,0806	0,0716
Positive and negative sequence impedances at an ambient air tempe-	Z	mΩ/m	0,1458	0,1413	0,1121	0,0896	0,0818	0,0730
rature of 35°C Positive and negative sequence impedances at an ambient air tempe- rature 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	20	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	FEUC							
Phase Conductor		mm²	490	525	1200	1800	2400	3000
PE (Housing)	-	mm²	8515	8515	8515	9394	10194	10194
Conductor Cross Section		mm x mm	7x70	7x75	12x100	12x150	12x200	15x200
Busbar Weight (3 Conductors)		kg/m	104	106	122	152	187	205
MEAN FAULT-LOOP CHARACTERISTICS				100			101	200
Zero-sequence Impedance								
Zero-sequence impedance at a conductor temperature of 20°C	7	mΩ/m	0,269	0,253	0,220	0,211	0,192	0,161
Zero-sequence impedance at an ambient temperature of 25°C	Z _{(0)b20phPE} Z _{(0)bphPE}	mΩ/m	0,284	0,253	0,220	0,220	0,192	0,167
Mean Resistances and Reactances	←(0)bphPE	11152/111	0,204	0,200	0,230	0,220	0,155	0,101
Resistance at a conductor temperature of 20°C	B	mΩ/m	0,089	0,055	0,047	0,032	0,025	0,023
Resistance at a conductor temperature of 20°C	R _{b20phph}	mΩ/m	0,089	0,055	0,047	0,032	0,025	0,025
Resistance at an ambient air temperature of 35°C	R _{b20phPE}	mΩ/m	0,002	0,030	0,041	0,033	0,020	0,025
· · ·	R _{bphph}					-		
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

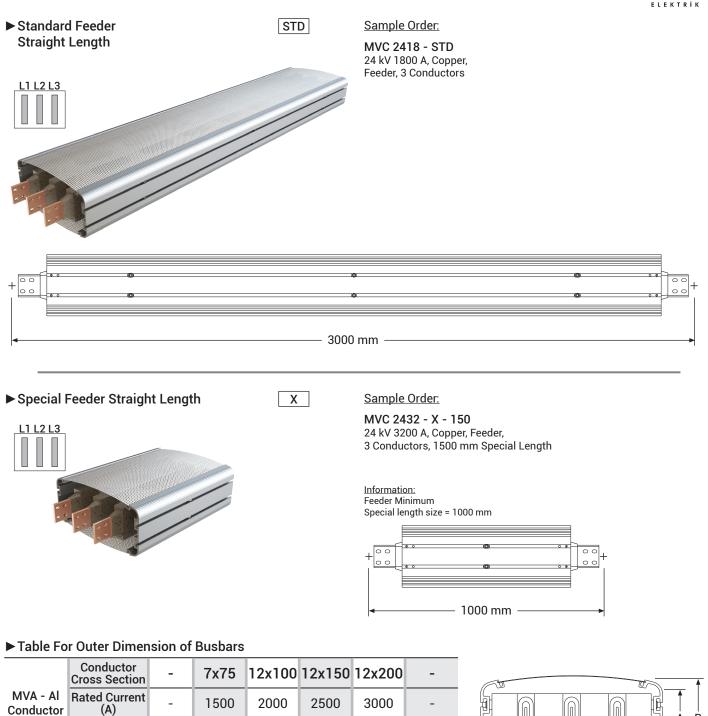
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Standards

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

Standard Straight Length





A B

E

5



MVC - Cu

Conductor

Α

В

Busbar Code

Conductor

Cross Section

Rated Current

(A)

Busbar Code

mm

mm

_

7x70

1800

18

160

247

15

7x75

2100

21

160

247

20

3200

32

160

247

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.

25

12x100 12x150 12x200

4000

40

210

297

30

5000

50

260

347

_

15x200

5700

57

260

347

f

578 mm

Elbows



Sample Order: Upwards Downwards Elbow U D MVC 2421 - U I 1 24 kV 2100 A, Copper, Feeder, 3 Conductors 1040 mm 💷 |L1 ■ L2 ■ L3 1040 mm +► Left Right Elbow Sample Order: R 000 L MVC 2432 - R 24 kV 3200 A, Copper, Feeder, **3** Conductors L1 L2 L3 0 0 Х ► Table of Busbar Cross Section Sizes Conductor 12x100 12x150 12x200 _ 7x75 Cross Section MVA - Al **Rated Current** 1500 2000 2500 3000 -_ Conductor (A) Busbar Code 15 20 25 30 -_ Conductor 7x70 7x75 12x100 12x150 12x200 15x200 **Cross Section** MVC - Cu Rated Current 1800 2100 3200 4000 5000 5700 (A) Conductor **Busbar Code** 18 21 32 40 50 57 690 740 790 Х 690 690 790 mm ► Panel Connection P10 T10 Sample Order: MVC 2450 - P10 24 kV 5000 A, Copper, 625 mm Feeder, 3 Conductors For Panel Feeder 1050 mm 205 mm 425 mm L3 220 mm 120 mm L2 385 mm -- 385 mm ->\|∢ L1 - 970 mm ·

Horizontal & Vertical Cast Resin Busbar Applications



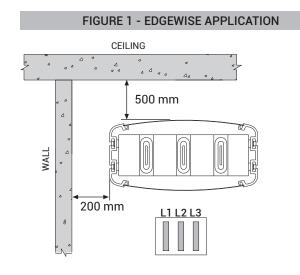
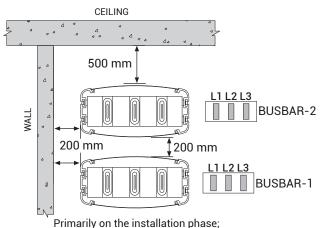
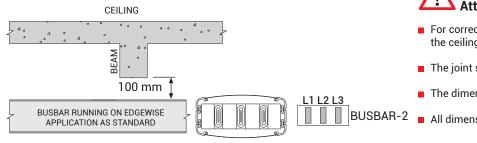


FIGURE 2 - EDGEWISE APPLICATION



BUSBAR-1 line should be installed before BUSBAR-2 line.

FIGURE 3 - CROSSING UNDER A BEAM ON EDGEWISE APPLICATION



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



FIGURE 4 - SAMPLE WALL CROSSING WITH FIRE BARRIER

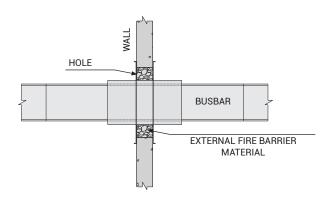
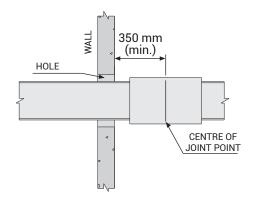


FIGURE 5 - STANDARD WALL CROSSING



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.

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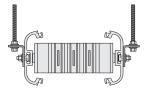
All dimensions are given in mm.

E-LINE MV Trunking Support









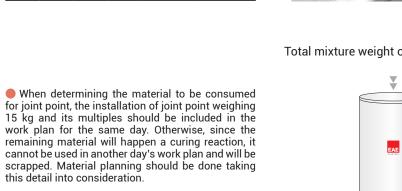
► MV "L" Hanger Set Code

MVA - Al MVC - Cu Conductor Conducto				Conductor Dimensions		MV "L" Hanger Set Code					
Rated Busbar Rated Busba Current Code Current Code				Description	Order Code	Description	Order Code				
-	-	1800	18	7x70							
1500	15	2100	21	7x75	MV L HANGER SET Ø13-(90)	3180150	MV L HANGER SET Ø17-(90)	3180153			
2000	20	3200	32	12x100							
2500	25	4000	40	12x150	MV L HANGER SET Ø13-(110)	3180151	MV L HANGER SET Ø17-(110)	3180154			
3000	30	5000	50	12x200	MV L HANGER SET Ø13-(160)	3180152	MV L HANGER SET Ø17-(160)	3180155			
-	-	5700	57	15x200	IVIV L HAINGEN SET Ø13-(100)	3100152	WIVE HANGEN SET ØTT-(100)	3100100			

Note: Ø17 Panel Connection for Special Suspension. It is not included in the rod hanger set.

► 24kV Additional Zone Weights

	MVA - Al Conductor					Conductor Dimensions	Weight (kg)
Rated Busbar Current Code							
-	-	1800 18		7x70	36,0		
1500	15	5 2100 21		7x75	36,0		
2000	20	3200	32	12x100	34,0		
2500	25	4000	40	12x150	41,5		
3000 30		5000	50	12x200	48,0		
-	-	5700	57	15x200	48,0		

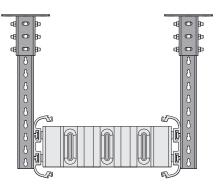


Total mixture weight of 1 Bucket is 15 kg









► Ceiling Fexing Element

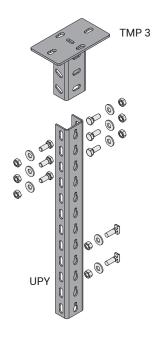
Description	scription T (mm)		Weight (kg./pcs)	Order Code	Pack (pcs)		
TMP 3	4	900	1,689	3086554	10		
Makes with the set of the literation of the							

Note: The bolt set is not included in the product. Please order separately.

► Heavy	Duty	Sup	ports	(U)

Description	T (mm)	L (mm)	Weight (kg./pcs)	Order Code
UPY 150	4	150	0,586	3004486
UPY 300	4	300	1,172	3004487
UPY 400	4	400	1,562	3004489
UPY 500	4	500	1,956	3004491
UPY 600	4	600	2,343	3004493
UPY 700	4	700	2,728	3004495
UPY 800	4	800	3,124	3004496
UPY 900	4	900	3,515	3004497
UPY 1000	4	1000	3,945	3004498
UPY 1100	4	1100	4,296	3004499
UPY 1200	4	1200	4,686	3004500
UPY 1300	4	1300	5,071	3004501
UPY 1400	4	1400	5,467	3004502
UPY 1500	4	1500	5,917	3004503
UPY 1600	4	1600	6,248	3004504
UPY 1700	4	1700	6,633	3004505
UPY 1800	4	1800	7,029	3004506
UPY 1900	4	1900	7,414	3004507
UPY 2000	4	2000	7,811	3004508
UPY 3000	4	3000	11,716	3001954

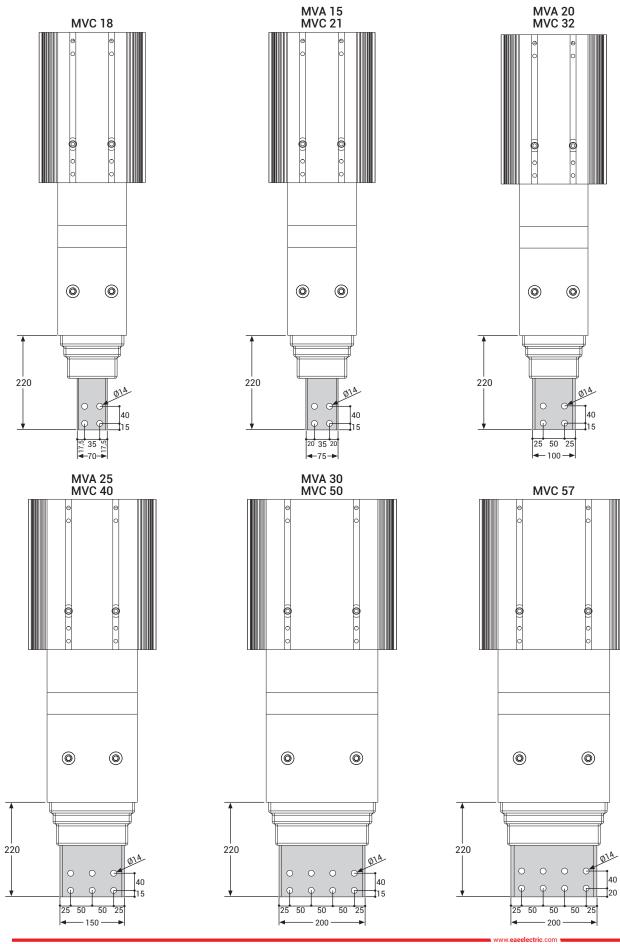
TMP 3 Fixing Element Mounting; 6 pcs M10x30 Bolt, 12 pcs M10 Washers, 6 pcs M10 Spring Washers, 6 pcs M10 Nuts should be used.



Panel Connection

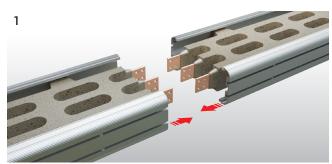


Two Dimensional Drawings of Panel Modules P10 Panel Mounted Modules

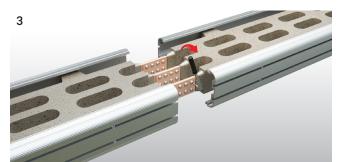


E-LINE MV Horizontal Application





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.



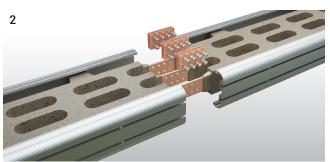
All bolts must be tightened to 72 Nm with torque wrench.



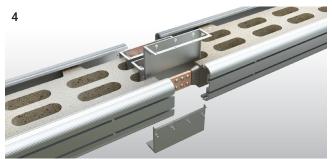
The prepared for casting should be cast from the same spot at all times.



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.



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



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

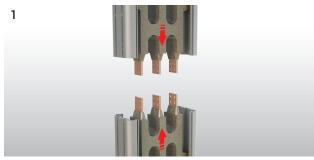


The material should be 'vibrated' with the help of a plastic hammer to remove the air in the material. Then the air bubbles on the surface have to brushed.

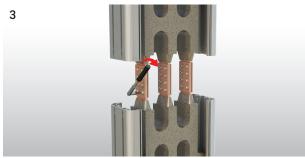


Joint protection pieces of perforated aluminium should be fitted.

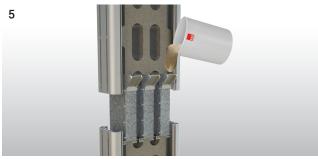




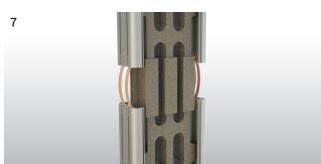
The ends of the conductors of the busbars are cleaned with a clean dry cloth. The busbars have to be fixed in the sameaxis, with a max. distance of 10 mm between the two conductors.



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



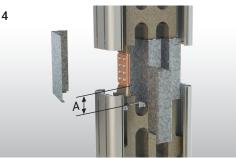
The prepared for casting should be cast from the same spot at all times.



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.



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



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 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 brushed.



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 the tin coated aluminum or copper, the environmental temperature should be maximum 40 °C while the maximum temperature rise should be 90 K.

- Busbar channels 3 sec. encryption must be required.

- Minimum short circuit busbar lengths should be as follows.

For	Al	Conductors;
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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

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

- High conductivity bars; It must be insulated with a special composite material formed by a mixture of specially selected sand, calcite and epoxy resin. This material should be suitable for temperature changes and thermal expansion. High protection should be provided against external impacts.

- Insulation structure must be such that it can operate at -70 + 150 ° C.

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)

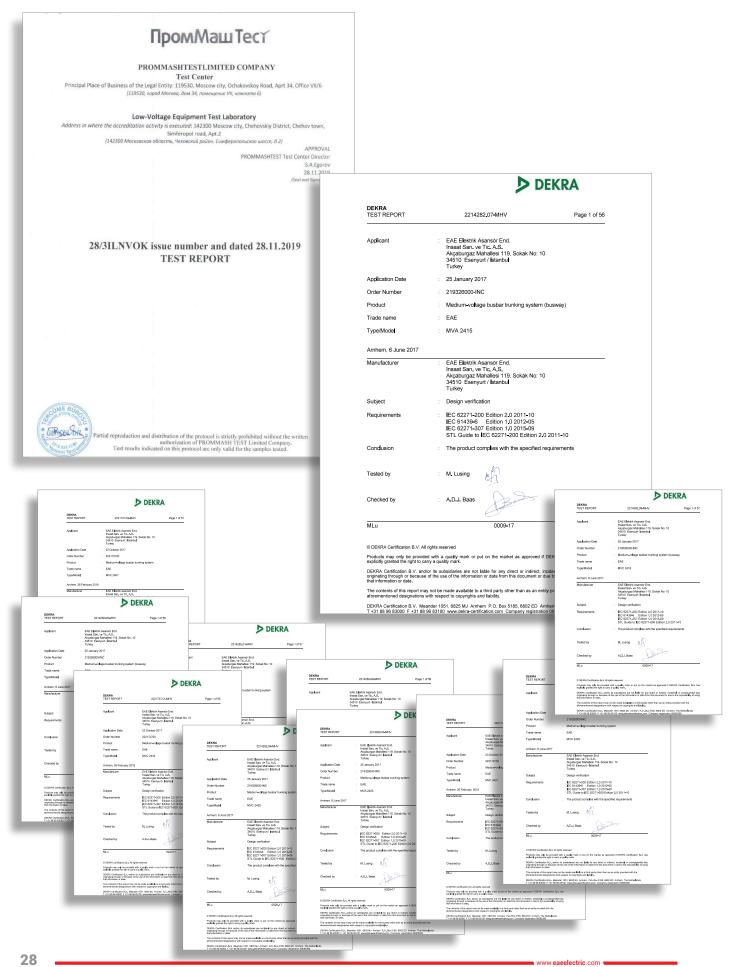
3-Assembly and Commissioning Tests

- 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.

E-LINE MV Certificate





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

EAE DL 3 Factory Busbar Gebze IV Istanbul Makine ve Sanayicileri Organize Bolgesi, 6. Cadde, No: 6 41455 Demirciler Koyu, Dilovası - Kocaeli - TURKEY Tel: +90 (262) 999 05 55 Fax: +90 (262) 502 05 69

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