

EXTRUDED ALUMINIUM HOUSING WITH COOLING FIN

FULLY TYPE TESTED BUSDUCT TRUNKING SYSTEM



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1. General

Housing

Powerduct busway is constructed with extruded aluminium and is designed with cooling fin on both top and bottom.

Benefits of such design are as follows:

- Super Compact & Light Weight
- Low Impedance
- Greater heat dissipation
- Better housing as Ground medium
- Dust free
- Corrosion free
- Low Installation Cost
- UV resistance

No doubt, this construction has been tested and hasachieved the highest 60-cycle short circuit withstand ratings under the IEC and BSEN publication 61439.6: 2012 approved by third party certification.

The enclosure has also been tested for ingress protection and achieved the highest IP68 for standard feeder and IP55 for plug-in section (ref. Table 5.2).

Hence, this has proved Powerduct housing construction has mechanically strength and it's reliability to protect the busbar conductor.

Standard

All the Powerduct busway product is designed and manufactured in compliance of the following standards:

- IEC 60529
- IEC 61439.6
- UL 857
- CSA 857
- CSA C22.9 NO. 27-94
- NEMA BUI
- JIS 8364

Plug in outlet

Powerduct plug in outlets being designed to meet IEC 60529 and IEC 61439.6 and BS EN 60529 requirement whereby the opening safety rated forfinger safety to IP2X.

Hinged dead designed at the front of each plug in outlet to protect the contact surfaces from rust, dirt and moisture. Pad lock

designed on the outlet to lock the outlet for safety purpose. Gasket is used in IP55.



Plug In unit

Available in both moulded case circuit breaker and fusible type; The following are the features for Powerduct Plug-In Unit:

- Interlocking door during in 'ON' position to prevent the door from opening for safety purpose
- Mechanically interlocking with busway housing during 'ON' position to prevent being take off during energizing.
- The plug-in unit connection on earth designed to engage first before phase connections when installing plug-in unit forthe safety purpose.
- All Plug In units have internationally recognized symbols indicating the "ON/ OFF" position.

Thermal Indicator (optional):

Most of the busway manufacturer will have inspection covers to permit inspection of the joint periodically. However, Powerduct newly designed so call thermal indicator will provide a more convenient for continual visual inspection whereby the thermal indicator will show a sign when the joint is overheating. This benefit from convenience visual inspection without opening the cover and save time from labor inspection.



Insulation

The Powerduct offer includes a 130degC Class B Hybrid insulation that includes Mylar® and epoxy in the standard offer. Class F of 155degC and Class H of 180degC are also available on request.

The innovated coating process provides high quality and uniform epoxy insulation. This epoxy is nonhygroscopic, self-extiguishing and bonded directly to the bus bar thus eliminating any air gap between the insulation and bus bars.

Advantages of using epoxy insulation are as follows:

- Able to withstand glitch and spikes in electrical system
- Halogen free
- Resistant against water and chemical
- · High thermal conductivity
- High mechanical strength against impact and capable with standing heat shock
- Cater for expansion and contraction during peak and off-peak hours
- Long life compare to PVC and Mylar[®]
- · Impervious to acids, alkalis, acetones,
- mechanical oils and lubricants

Joint Stack

Powerduct Joint Stack (bridge type) features a single/ multiple bolt design with the double headed bolt, therefore improving the ease and the cost of the installation.

By using this newly designed joint stack, you will definitely reduce arrangement for installation time. (on-site time as well as cost saving).

The use of the Belleville spring washers on the bolt ensures the original contact pressure is maintained giving a more secure and reliable joint.

Powerduct Bridge type joint Stack features performs;

- Double headed bolts and will shear off when torque exceeds 50lb/ft.
- Single Bolt joint system with the material composition of chrome high tensile steel.
- Ease of removal and installation without removing entire busway section.
- Maintenance Free.

Insulation

All bus bars copper are manufactured from high electrical grade high conductivity electrolytic coppers which comply with international standard-BS1433/1432. Aluminium bus bars also available.

The copper composition of the bus bar are of 99.9% or conductivity in excess of 99% IACS. The aluminium bus bar are of conductivity in excess of 60% IACS. All the copper and aluminium bus bars are electroplated with tin on all contact surfaces. Optional silver plating is also available. This will improve conductivity more effectively.

All Busway are constructed in sandwich type whichmeans no air gap shall exist between bus bars except at the joint. This can obtainlower impedance and better heat dissipation. Lower impedance means lower voltage drop.

The entire conductor also being insulated with epoxy powder (Hybrid Powder) coated which giving 100% water, rust and chemical resistance. Optional specification can be designed and fabricated to customer's request. Bus bars are available in various configurations: Referto next page picture.

- 1. 3P3W + Integral Ground
- 2. 3P3W + 50% Internal Ground
- 3. 3P3W + 100% Neutral + Integral Ground
- 4. 3P3W + 100% Neutral + 50% Internal Ground
- 5. 3P3W + 100% Neutral + 100% Internal Ground
- 6. 3P3W + 200% Neutral + Integral Ground
- 7. 3P3W + 200% Neutral + 50% Internal Ground
- 8. 3P3W + 100% Internal Ground

True 200% Neutral Construction

Harmonics occur generated by nonlinear load devices such as electronic ballast lightning, computers, printers, copier machines & etc. The harmonic currentgenerated in neutral conductor can be 173% of phase current. This abnormal high neutral current results in overheating the neutral conductor and leads to deterioration of equipment performance and its life cycle.

Therefore, we provide two separate 100% neutral bus bars within the same busway housing. This true 200% neutral is doubling the size of phase bus bars to prevent overheating caused by harmonics.

Bus bar Configurations

1. 3P3W + Integral Ground



2. 3P3W + 50% Internal Ground



3. 3P3W + 100% Neutral + Integral Ground



4. 3P3W + 100% Neutral + 50% Internal Ground



5. 3P3W + 100% Neutral + 100% Internal Ground



6. 3P3W + 200% Neutral + Integral Ground







8. 3P3W + 100% Internal Ground





2. Ground Resistance

Powerduct Busway offers you a variety of ground options to meet your specification:

- Integral aluminium housing ground (standard)
- Internal ground bar

The Powerduct aluminium housing provides extremely high ground capacity. The Table 2.1 showing the conductivity and current carrying capacity offered by the housing is at least 2 times greater than the activecopper ground bar (sized 50% of the phase bar)

Ampere Rating	Aluminum housing Cross-Sectional Area Ingegral Ground (mm²)	Copper Section Area 50% Internal Ground Bar (mm²)	Capacity Ratio (Integral/Internal)
Copper			
400	1250	58	12
600	1290	88	8
800	1325	103	7
1000	1401	148	5
1200	1449	178	5
1350	1497	208	4
1600	2745	266	6
2000	2897	356	5
2500	3105	476	4
3200	3393	656	3
4000	3601	776	3
5000	5089	984	3
6300	5690	1344	2
Aluminum			
400	1352	118	10
600	1352	118	10
800	1401	148	9
1000	1496	208	6
1200	1600	268	5
1350	1772	373	4
1600	1876	433	4
2000	2028	523	3
2500	3297	596	5
3200	3753	866	4
4000	4153	1106	3
5000	5690	1344	4
6000	7053	1794	4

Alu Housing Ground Conductivity 55% IACS Copper Ground Bar Conductivity 99% IACS Alu Ground Bar Conductivity 61% IACS



3. Impedance & Voltage Drop

Energy Optimization

Powerduct busway system enable you to optimize theenergy usage and reduce unnecessary energy wastage which is a hidden cost. Better heat dissipation willprovide cooler busway energizing. At the same time, the busway has lower impedance and lower voltage drop if compared to the other competitors' busway

These features also include extremely low reactance due to non-magnetic housing and totally intimate contact of bus bars and housing. Please refer to theTable 3.1 & 3.2 below for your further voltage drop information.

	Ohr	ns*10^-:	3/m	1	Voltage	drop co	oncentro	ited load	ds to line	/m at tl	he rate l	oad, 350	>
Current Load	Li	ine to Lin	ie					Power	Factor				
	R	Х	Z	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Copper													
400	0.208	0.055	0.215	0.144	0.146	0.138	0.128	0.117	0.105	0.093	0.080	0.066	0.052
600	0.140	0.044	0.147	0.146	0.151	0.144	0.134	0.124	0.112	0.100	0.087	0.074	0.060
800	0.119	0.041	0.126	0.164	0.173	0.166	0.156	0.144	0.131	0.118	0.104	0.089	0.073
1000	0.082	0.032	0.088	0.141	0.152	0.147	0.139	0.130	0.119	0.108	0.096	0.083	0.070
1200	0.070	0.032	0.077	0.145	0.160	0.156	0.149	0.140	0.130	0.119	0.107	0.094	0.080
1350	0.060	0.022	0.064	0.141	0.149	0.144	0.136	0.126	0.115	0.104	0.091	0.079	0.065
1600	0.044	0.018	0.047	0.121	0.131	0.127	0.120	0.113	0.104	0.094	0.084	0.073	0.062
2000	0.033	0.015	0.036	0.115	0.126	0.123	0.118	0.111	0.103	0.094	0.084	0.074	0.064
2500	0.025	0.015	0.029	0.107	0.123	0.123	0.120	0.114	0.108	0.101	0.092	0.083	0.074
3200	0.018	0.010	0.021	0.100	0.115	0.114	0.111	0.106	0.100	0.093	0.085	0.076	0.067
4000	0.016	0.007	0.017	0.109	0.119	0.116	0.111	0.104	0.096	0.088	0.079	0.069	0.059
5000	0.012	0.011	0.016	0.106	0.136	0.141	0.140	0.138	0.133	0.127	0.120	0.112	0.103
6300	0.009	0.006	0.010	0.096	0.113	0.113	0.111	0.106	0.101	0.094	0.087	0.079	0.070
Aluminum													
400	0.142	0.034	0.146	0.098	0.099	0.093	0.085	0.078	0.069	0.061	0.052	0.042	0.033
600	0.160	0.034	0.163	0.166	0.164	0.153	0.141	0.127	0.113	0.098	0.083	0.067	0.051
800	0.136	0.038	0.141	0.188	0.192	0.182	0.169	0.155	0.139	0.123	0.106	0.089	0.071
1000	0.094	0.022	0.096	0.163	0.163	0.153	0.141	0.128	0.114	0.099	0.084	0.069	0.053
1200	0.072	0.019	0.075	0.150	0.153	0.144	0.134	0.122	0.110	0.097	0.083	0.069	0.055
1350	0.051	0.015	0.053	0.119	0.122	0.116	0.108	0.099	0.089	0.079	0.068	0.057	0.046
1600	0.045	0.013	0.047	0.124	0.127	0.121	0.113	0.103	0.093	0.083	0.072	0.060	0.048
2000	0.038	0.011	0.039	0.131	0.134	0.128	0.119	0.109	0.098	0.087	0.075	0.063	0.051
2500	0.033	0.021	0.039	0.143	0.168	0.169	0.165	0.159	0.150	0.141	0.130	0.118	0.105
3200	0.023	0.007	0.024	0.128	0.132	0.126	0.118	0.108	0.098	0.088	0.076	0.065	0.052
4000	0.018	0.007	0.019	0.127	0.134	0.129	0.121	0.112	0.103	0.092	0.081	0.070	0.058
5000	0.015	0.006	0.016	0.129	0.138	0.134	0.126	0.118	0.108	0.098	0.087	0.075	0.063
6000	0.011	0.007	0.014	0.117	0.140	0.141	0.138	0.133	0.126	0.118	0.109	0.100	0.089

Table 3.1 Voltage Drop Line to Line, 35°C (50 Hz)

Note: Current density (amps/sq.in) rated busway available. Consult Factory Voltage Drop Formula

Plug-in distributed loads application, divide voltage drop values by 2 To determine voltage drop line to neutral, multiply values from table by 0.577. 1.

Actual voltage drop for different length and at loading less than full rated current can be calculated by using the formula: Vd = Vd (table) X Actual load/Rated load x Actual length (m)/100 m 3.

4. Calculate new voltage drop : Vd = Amp loads $x \sqrt{3} x$ (Rcos ø + Xsi n ø) per 100m, where cos ø = Power Factor

	Ohms*10^-3/m			Ohms*10^-3/m Voltage drop concentrated loads to line /m at the rate load, 35C						>			
Current Load	Li	ine to Lir	ie					Powe	r Factor				
	R	Х	Z	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Copper													
400	0.217	0.055	0.224	0.150	0.152	0.143	0.132	0.117	0.105	0.093	0.080	0.066	0.052
600	0.121	0.108	0.095	0.082	0.067	0.053	0.134	0.124	0.112	0.100	0.087	0.074	0.060
800	0.146	0.044	0.153	0.152	0.157	0.149	0.139	0.128	0.115	0.102	0.089	0.075	0.060
1000	0.124	0.041	0.130	0.172	0.179	0.171	0.161	0.148	0.135	0.121	0.106	0.090	0.074
1200	0.085	0.032	0.091	0.148	0.157	0.152	0.143	0.133	0.122	0.110	0.098	0.084	0.070
1350	0.073	0.032	0.080	0.152	0.165	0.161	0.153	0.144	0.133	0.121	0.108	0.095	0.081
1600	0.063	0.022	0.067	0.147	0.155	0.149	0.140	0.129	0.118	0.106	0.093	0.080	0.066
2000	0.046	0.018	0.049	0.127	0.136	0.131	0.124	0.116	0.107	0.096	0.086	0.074	0.062
2500	0.035	0.015	0.038	0.120	0.131	0.127	0.121	0.114	0.105	0.096	0.086	0.075	0.064
3200	0.026	0.015	0.030	0.111	0.128	0.127	0.123	0.117	0.110	0.102	0.094	0.084	0.074
4000	0.016	0.007	0.018	0.114	0.123	0.120	0.114	0.107	0.099	0.090	0.080	0.070	0.059
5000	0.013	0.011	0.017	0.111	0.140	0.144	0.144	0.141	0.136	0.129	0.122	0.113	0.103
6300	0.009	0.006	0.011	0.100	0.117	0.117	0.114	0.109	0.103	0.096	0.088	0.080	0.071
Aluminum													
400	0.149	0.034	0.153	0.103	0.103	0.097	0.089	0.081	0.072	0.063	0.053	0.043	0.033
600	0.167	0.034	0.170	0.173	0.171	0.160	0.146	0.132	0.117	0.101	0.085	0.069	0.052
800	0.141	0.Q38	0.146	0.196	0.199	0.188	0.175	0.160	0.143	0.126	0.109	0.091	0.072
1000	0.098	0.022	0.100	0.170	0.169	0.158	0.146	0.132	0.117	0.102	0.087	0.071	0.054
1200	0.076	0.019	0.078	0.157	0.159	0.150	0.138	0.126	0.113	0.099	0.085	0.070	0.055
1350	0.053	0.015	0.055	0.124	0.127	0.120	0.111	0.102	0.092	0.081	0.070	0.058	0.046
1600	0.047	0.013	0.049	0.130	0.132	0.125	0.117	0.107	0.096	0.085	0.073	0.061	0.049
2000	0.039	0.011	0.041	0.137	0.140	0.132	0.123	0.112	0.101	0.089	0.077	0.064	0.051
2500	0.034	0.021	0.040	0.149	0.174	0.174	0.170	0.163	0.154	0.143	0.132	0.119	0.106
3200	0.024	0.007	0.025	0.133	0.137	0.130	0.122	0.112	0.101	0.090	0.078	0.066	0.053
4000	0.019	0.007	0.020	0.132	0.139	0.133	0.125	0.116	0.105	0.094	0.083	0.071	0.058
5000	0.016	0.006	0.017	0.135	0.143	0.138	0.130	0.121	0.111	0.100	0.089	0.076	0.064
6000	0.012	0.007	0.014	0.122	0.144	0.145	0.141	0.136	0.129	0.120	0.111	0.101	0.090

Table 3.2 Voltage Drop Line to Line, 50°C (50 Hz)

Note: Current density (amps/sq.in) rated busway available. Consult Factory Voltage Drop Formula
Plug-in distributed loads application, divide voltage drop values by 2
To determine voltage drop line to neutral, multiply values from table by 0.577.
Actual voltage drop for different length and at loading less than full rated current can be calculated by using the formula: Vd = Vd (table) X Actual load/Rated load x Actual length (m)/100 m
Calculate new voltage drop : Vd = Amp loads x √3 x (Rcos Ø + Xsi n Ø) per 100m, where cos Ø = Power Factor



4. Design & Testing

Short Circuit Protection and Capacity

Powerduct structure is designed to provide a very good short circuit protection. The short circuit has been certified by DEKRA (formerly known as KEMA) in accordance with IEC and BSEN Publication 61439-6.









Powerduct tested to ambient 50°C test

Extract from KEMA Newsletter:

KEMA Busduct beats the heat in 50 °C test

er Plug Buictuch Tenter to \$2280439-2 mpatature test opens up new markets for Pol here mony manufactures of electrical gear in the Middle. East are paying the neetope in feeting to mole sure their products can elitistiated the extension impactations in the region, thanks to the KEMA high-temperature test, the Matheman empany News Rug Suduel stir bird, whose products had attends, undergoins KEMA pacticating according to the international standard, can be confident that their power ups with product universimp performance of 50 °C. ght temperature requirements

figh IOMA's Herk Kolmusick saw, "A bus duct tested according to the standard complex to o mean complexit on temperature of test them or equal to 35 °C. (ECC 50389.2) interprising alanded). However, day time temperatures in the Widdle East often access to 1.0 How particularity important for this claim to how here product leaded of the most enterine temperatures, because many of their products complexity individual capes that here placed in uncoded access of buildings. These auction must continue to operande safely of the very highest temperatures and customers barries to access the access of the temperatures and customers barries to access the safely of the very highest temperatures and customers to access the temperature to access the safely of the very highest temperatures and customers to the safely of the very highest temperatures and customers to the data takens."

Thermal cycling test





5. IP Rating

Ingress Protection Level

Water Resistance and Rust Protection : Powerduct busway system has been successfully vvdeveloped into as high as IP68, whereby the busway is protected against dust and the effects of immersion in water. This fine completion system is in 100% compliance IEC standards and is approved through third party authority certification.

Busway			DEG	REE OF PROTEC	TION		
Туре	IP40	IP54	IP55	IP65	IP66	IP67	IP68
Feeder	Х	Х	Х	Х	Х	Х	Х
Plug-In	х	Х	Х				
Plug-In Units	х	Х	х				

Note: All Powerduct plug-in busway is IP 2x rated. (Finger Safe Plug-in outlets)

Degree of	IEC-529 LEVEL OF PROTECTION
Protection	Description
IP2x	Protection against objects greater than 12mm.
IP40	Enclosure protects against objects greater than 1mm. Indoor application. Indoor
IP54	Enclosure is dust protected and splashed water. Indoor
IP55	Enclosure is dust protected and splayed water. Indoor
IP65	Enclosure is dust tight and splayed water. Indoor
IP66	Enclosure is dust tight and protects against heavy jets. Indoor/Outdoor
IP67	Enclosure is dust tight and protects against effects of immersion up to 1 meter. Outdoor
IP68	Enclosure is dust tight and protects against effects of immersion beyond 1 meter. Outdoor



6. Dimension & Weight

Table 6.1 : Cast Resin Busway Dimension & Weight (kg/3 meter)

			Approximate Weight (kg/3Meter)							
Ampere Rating	Figure No.	Dimenson in mm"A"	TP only	TP w/ground bar	TP & 100% N	TP & 100% N w/ ground bar	TP & 200% N	TP & 200% N w/ ground bar		
Copper										
400	6.1	89	24	25	27	29	31	33		
600	6.1	99	30	33	36	39	41	44		
800	6.1	104	33	37	40	43	47	50		
1000	6.1	119	43	48	53	58	63	67		
1200	6.1	129	50	55	61	67	73	79		
1350	6.1	139	56	63	70	77	83	90		
1600	6.2	258	80	88	97	106	115	123		
2000	6.2	288	99	111	123	134	146	158		
2500	6.2	328	125	141	157	172	188	204		
3200	6.2	388	164	186	207	229	251	272		
4000	6.2	428	190	216	241	267	293	318		
5000	6.3	597	246	279	311	344	376	409		
6300	6.3	717	324	368	413	458	502	547		
Aluminum										
400	6.1	109	20	22	23	24	25	26		
600	6.1	109	20	22	23	24	25	26		
800	6.1	119	23	24	26	27	29	30		
1000	6.1	139	27	29	32	34	36	38		
1200	6.1	159	32	35	37	40	43	45		
1350	6.1	194	40	44	48	51	55	59		
1600	6.2	214	45	49	53	58	62	67		
2000	6.2	244	52	57	62	68	73	78		
2500	6.2	368	69	75	81	87	93	99		
3200	6.2	458	90	98	107	116	124	133		
4000	6.2	538	108	119	130	141	153	164		
5000	6.3	717	138	151	165	178	192	205		
6000	6.3	867	184	197	222	240	259	278		



Fig. 6.1

Fig. 6.2





Table 6.2 : Cast Resin Busway Dimension & Weight for IP68 feeders

			Approximate Weight (kg/3Meter)					
Ampere Rating	Ampere Figure No. Dime Rating in mr		TP only	TP w/ ground bar	TP & 100% N	TP & 100% N w/ ground bar	TP & 200% N	TP & 200% N w/ ground bar
Copper								
400	6.4	89	29	31	33	35	37	39
600	6.4	99	37	39	42	45	48	51
800	6.4	104	40	44	47	50	54	57
1000	6.4	119	51	56	61	66	71	76
1200	6.4	129	59	64	70	76	82	88
1350	6.4	139	66	73	80	86	93	100
1600	6.5	258	96	105	114	122	131	140
2000	6.5	288	118	130	142	153	165	177
2500	6.5	328	148	163	179	195	210	226
3200	6.5	388	192	213	235	257	278	300
4000	6.5	428	221	247	272	298	324	349
5000	6.6	597	288	320	353	385	418	451
6300	6.6	717	376	420	465	509	554	599
Aluminum								
400	6.4	114	28	29	30	32	33	34
600	6.4	114	28	29	30	32	33	34
800	6.4	124	31	33	34	36	37	39
1000	6.4	144	38	40	42	44	46	48
1200	6.4	164	44	47	49	52	55	57
1350	6.4	199	55	59	62	66	70	74
1600	6.5	219	61	66	70	74	79	83
2000	6.5	249	71	76	81	87	92	97
2500	6.5	379	95	101	107	113	119	125
3200	6.5	468	123	132	141	150	158	167
4000	6.5	548	153	164	175	186	197	208
5000	6.6	732	191	204	218	231	245	258
6000	6.6	882	244	262	280	298	316	334



7. Physical Data

7.1 Powerduct Busway Feeder

Feeder Section – is available in standard length of 3050mm and with minimum 610mm. This straight length feeder is used to carry power supply directly to the machine and power station without any plug-in opening on the section. (Concentrated Load application) Refer to the Fig. 7.1.1





Feeder Section – is designed to provide convenience and to allow the power to be tapped off from the LIVE busway section for a variety power usage based on the customer's requirement. It is complement with the plug-in unit. The maximum current capacity of each opening is 400A. Refer Fig.7.1.2



Fig. 7.1.2

7.2 Plug-In Section

Plug-In Section is available in minimum 1220mm and standard 3050mm length rating from 400A to 6300A. Custom length also is available on request.

The quantity of plug-in outlet is classified into:

Standard plug-in busway – whereas the openings outlet available in both sides to optimize the amount of plug-in units in horizontal application . Fig.7.2.1 (Optional 5 holes is available upon request. Please consult factory)

Riser – whereas opening outlet available in one side on interval 610mm to fit the vertical runs. Fig.7.2.2



Limited Access – whereas customized design. Plug-in outlet can be placed upon customer request. Fig.7.2.3

Standard Plug-in Outlet





7.3 Elbow Tee

Flatwise Elbow

Edgewise Elbow



Current	Current	Standard Length (mm)			
Rating (Copper)	Rating (Aluminum)	А	В		
400 ~ 1350	400 ~ 1200	305	305		
1600 ~ 4000	1350 ~ 3200	457	457		
5000 ~ 6300	4000 ~ 5000	610	610		
	6000	700	700		



			A	D
	400 ~ 1350	400 ~ 1200	305	305
	1600 ~ 4000	1350 ~ 3200	457	457
	5000 ~ 6300	4000 ~ 5000	610	610
		6000	700	700
Ī				

Flatwise Tees



Edgewise Tees



Current	Standard Length (mm)			
Rating (Aluminum)	А	В	С	
400 ~ 1200	305	305	305	
1350 ~ 3200	457	457	457	
4000 ~ 5000	610	610	610	
6000	700	700	700	
	Current Rating (Aluminum) 400 ~ 1200 1350 ~ 3200 4000 ~ 5000 6000	Current Rating (Aluminum) Standar A 400 ~ 1200 305 1350 ~ 3200 457 4000 ~ 5000 610 6000 700	Current Rating (Aluminum) Standar Length 400 ~ 1200 305 305 1350 ~ 3200 457 457 4000 ~ 5000 610 610 6000 700 700	

7.4 Offset & Combination Elbow

Flatwise Offset



Edgewise Offset



Current	Current	Standard Length (mm)				
Rating (Copper)	Rating (Aluminum)	А	В	С		
400 ~ 1350	400 ~ 1200	254	305	305		
1600 ~ 4000	1350 ~ 3200	254	457	457		
5000 ~ 6300	4000 ~ 5000	254	610	610		
	6000	254	700	700		

Current	Current	Standa	n (mm)	
Rating (Copper)	Rating (Aluminum)	А	В	С
400 ~ 1350	400 ~ 1200	254	254	254
1600 ~ 4000	1350 ~ 3200	254	254	254
5000 ~ 6300	4000 ~ 5000	254	254	254
	6000	254	254	254

Combination Elbow





Current	Current	Standard Length (mm			
Rating (Copper)	Rating (Aluminum)	А	В	С	
400 ~ 1350	400 ~ 1200	254	305	305	
1600 ~ 4000	1350 ~ 3200	254	457	457	
5000 ~ 6300	4000 ~ 5000	254	610	610	
	6000	254	700	700	

7.5 Reducer & Center Tap Box



Table 7.5.1

	Ampere Rating (Copper)	W1 (mm)	W2 (mm)	s (mm)
	600	89	99	10
	800	99	104	5
	1000	104	119	15
	1200	119	129	10
	1350	129	139	10
	1600	139	258	119
	2000	258	288	30
_	2500	288	328	40
	3200	328	388	60
	4000	388	428	40
	5000	428	597	169
	6300	597	717	120

Ampere Rating (Copper)	W1 (mm)	W2 (mm)	s (mm)
800	109	119	10
1000	119	139	20
1200	139	159	20
1350	159	194	35
1600	194	214	20
2000	214	244	30
2500	244	368	124
3200	368	458	90
4000	458	538	80
5000	538	717	179
6000	717	867	150

* Optional Reducer with MCCB / Fusible breaker is available. Please consult factory.



Center Tap Box



Center Tap Box is a device that is non-fusible utilized to take off power from the busway run. It is used inthe condition when loads served by the busway run do not require over-current protection. Refer the Table 7.5.2 for the dimension in (mm).

Table 7.5.2

Current Rating (Copper)	Current Rating (Aluminum)	'A' in (mm)
400 ~ 1350	400 ~ 1200	405
1600 ~ 2000	1350 ~ 2000	555
2500 ~ 4000	2500 ~ 3200	725
5000	4000	930
6300	5000	1030
	6000	1200

* Optional Center Tap Box with MCCB / Fusible breaker is available. Please consult factory



7.6 End Cable Tap Box

End Tap Box are non-fusible devices used to connect cable and conduit to the end of the busway run or where busway runs connect without the need for over current protection.

			•		
Current	Current Rating (Aluminum)	Standard Length (mm)			
Rating (Copper)		А	В	С	
400 ~ 1350	400 ~ 1200	290	525	285	
1600 ~ 2000	1350 ~ 2000	390	625	385	
2500 ~ 4000	2500 ~ 3200	570	675	435	
5000	4000	780	725	485	
6300	5000	880	825	585	
	6000	1030	925	685	

Table 7.6.1 : Vertical End Cable Tap Box Dimension

* Optional End Cable Tap Box with MCCB / Fusible breaker is available. Please consult factory.

Vertical Application



Table 7.6.2 : Horizontal End Cable Tap Box Dimension

Current	Current	Standard Length (mm)			
(Copper)	(Aluminum)	А	В	С	
400 ~ 1350	400 ~ 1200	290	525	285	
1600 ~ 2000	1350 ~ 2000	390	625	385	
2500 ~ 4000	2500 ~ 3200	570	675	435	
5000	4000	780	725	485	
6300	5000	880	825	585	
	6000	1030	925	685	

* Optional End Cable Tap Box with MCCB / Fusible breaker is available. Please consult factory.

Horizontal Application



Fig. 7.6.2

7.7 Expansion Fitting

Powerduct Expansion Fitting is design to accommodate the busway thermal expansion in long straight runs which is over 60.8M without offsets or elbows and spring hanger are included and both ends are held fixed, or in a permanent position. In addition, it is also recommended when the busway crosses the building expansion joint.

Inside the Powerduct Expansion Fitting contains a flexible connector which provides + 50mm linear movement along the straight busway system.

Current Rating (Copper)	Current Rating (Aluminum)	Dimenson 'W' in (mm)
400 ~ 1350	400 ~ 1200	300
1600 ~ 2000	1350 ~ 2000	400
2500 ~ 4000	2500 ~ 3200	600
5000	4000	810
6300	5000	900
	6000	1030



Fig. 7.7.1

7.8 Flanged End

Flanged End provides the connection between busway and the low voltage switch board, control panel or other distribution system.



Right Edge Elbow With Flanged End





JOINT COVER ደ 0 0 0 400 120 φ ϕ φ ϕ 1<u>2</u>0 ÷ . \$ ÷ φ Case and Bars Two Bar Per Phase



7.8 Flanged End

Table 7.8.1 : Flanged End Cut Out and Drilling Pattern

Copper	Dir	nensions in r	nm		Copper		Copper Dimensions in mm			
Ampere	А	В	С	FIG. NO.		Ampere	А	В	С	FIG. NO.
400	260	200	114	7.8.1	_	400	260	200	114	7.8.1
600	260	200	114	7.8.1		600	260	200	114	7.8.1
800	260	200	114	7.8.1	_	800	260	200	114	7.8.1
1000	260	200	114	7.8.1		1000	260	200	114	7.8.1
1200	260	200	114	7.8.1	_	1200	260	200	114	7.8.1
1350	260	200	114	7.8.1		1350	354	294	161	7.8.1
1600	354	294	161	7.8.2	_	1600	354	294	161	7.8.2
2000	476	416	110	7.8.3		2000	354	294	161	7.8.3
2500	476	416	110	7.8.3	_	2500	476	416	110	7.8.3
3200	476	416	110	7.8.3		3200	546	486	128.5	7.8.3
4000	546	486	128.5	7.8.3	-	4000	636	576	151	7.8.3
5000	740	680	118	7.8.4		5000	800	740	128	7.8.4
6300	800	740	128	7.8.4		6300	960	900	115	7.8.5















7.9 Plug-in Unit

Powerduct plug-in unit is available from rating 15A to 800A with different levels of fault protection. A maximum ten pieces of 400A (max) plug-in unit ≤ can be mounted on a standard 3050mm plugin busway.

The maximum amperage carried by each plugin opening is 400A. Therefore, 500A ~ 800A will accommodate two openings.

Safety Features:

Powerduct plug-in unit features mechanical interlocksystem. This is to prevent the insertion or removal when the plug-in unit is in "ON" position (energizing). (Fig. 7.9.2)

The front operating switch allows padlocking at the "OFF" position. This is to prevent switching to "ON accidentally during servicing and maintenance. The plug-in earth contact is being designed so that the earth contact is made prior contact to the LIVE busway during installation. Besides, it also features water resistant capability to suit customers' need. The Plug-in unit is rated to IP40 as standard but customers can order IP55 as optional.

Refer to the table 7.9.1 for the sizes availability of the unit with ampere rating.

Table 7.9.1 Plug-in Dimension

Ampere	Dimension (mm)				
Rating	А	В	С		
15 - 100	380	270	240		
125 - 250	480	270	240		
300 - 400	580	270	270		
500 - 630	1060	470	380		
700 - 800	1060	470	420		

*For above 1000A, please consult factory





Fig. 7.9.2



Safety Lock-

Door Interlock– plug in door locked soon the operating switch is 'ON' position. Mechanical Interlock with Busway Housing-The plug in cannot be attached or detached from the busway when the operating switch is 'ON'

Knock-out Hole

No knock-out hole is provided. Make it at site in conformity with the cable size.

Grounding

Plug in enclosures shall make positive ground connection to the busway housing prior to the bus bar contact.

Plug In unit Dimensions





Plug In unit Dimensions





7.10 Horizontal Riser Application

Horizontal Application



Fig 7.10.1

Riser Application





7.11 Joint Stack

Powerduct joint stack features a single bolt with double headeddesign. The high strength steel bolts together with the Belleville spring washers provide equal pressure across the complete joint contact area to assure proper electrical contact.

Double head bolt will shear off to ensure the proper torque is applied.

It is very important to get the joint installed properly and accurately. Improper tightening of the connection bolts will cause the joint overheating after certain period of time during energizing. Powerduct bolt is maintenance free design.





Before





After

7.12 Joint Detail & Feeder Busway Dimension Spacing

Joint Detail



NOTE: PVC seal provided in IP65/66 busways only.

Feeder Busway Dimension Spacing Between Runs & Minimum Clearance

The minimum clearances for installing between feeder busway with wall, and ceiling are shown as the following picture below.

Additional clearance may required for the plug-in devices installation. Refer to the next page



Minimum Distance between parallel-installed busway

In case the busway been installed side by side **(Flatwise Installation)**



In case the busway been installed side by side. **(Edgewise Installation)**



Feeder Busway Dimension Spacing Between Runs & Minimum Clearance

Minimum clearance of plug-in busway installed in parallel is shown as below. The minimum clearance shall be determined between the plug-in to ensure that 50mm clearance is given. When the busway is to be installed in a tight places, make sure clearance shall be given enough for the plug-in to get opened which is shown as pictured below:





7.13 Busway Connection Procedure:

- 1. Align the sections to be joined by matching up the arrow attached to the ends of each section. Use tools provided by manufacturer to ease the installation. Ref. Fig.7.13.1 and 7.13.2
- 2. Slide the sections together. Ensure that the busbars interweave the insulations.
- 3. If the joint caps are not already in place, reattach them and hand tighten the mounting screws.
- 4. Inspect the busway run for straightness in all planes and make any adjustments necessary for good alignment.
- 5. Tighten the joint bolt to 50 ft-lbs (68N-m) with a 3/4 inch or 19mm socket wretch. When the Belleville washers on both sides are flattened, the bolt is fully tightened. If the double head bolt is used, tighten until the bolt head shear off. (No torque wrench is required) as shown in Fig.7.13.3
- 6. Tighten all joint cover flange bolt (M8x16) to 25lb-ft (34N-m) with a 13-mm socket wrench.
- 7. During the installation, occasionally mega test the assembly to check for any improperly made joints. Resistance should not drop below 1 megaohm per 100 feet of busway. (According to NEMA BU 1)
- 8. Mega test the complete run before energizing.



Fig. 7.13.1



7.14 Hangers & Floor Support

Hangers

Application for horizontal Mounting, cleats shall be mounted for installation at 2 meter intervals. The installer just install all these cleats in the angle irons or U channels to mount the busway at horizontal edgewise or flatwise. In addition, 1/2 inch (12mm) drop rods are recommended with a maximum 10 foot (3840mm) spacing. Drop rods and other hardware must be furnished by the installer.

Please check with manufacturer if cleat quantity provided is insufficient.

Important:

- Maintain good alignment of the drop rods along the busway run.
- Do not support busway at the joint.
- After the busway is secured with the hangers, adjust the hangers on the rods for the correct elevation.
- Busway braces (furnished by the installer) may be required to keep the run straight or to prevent rotation.
- Manufacturer strongly recommends each 2 meter busway adjacent must have busway cleat supported.

Table 7.14.1 dimension for Figure 7.14.1 & 7.14.2

Bars per	Сорр	Dim (mm)	
Phase	Ampere Rating	Busway (W)	Hanger
	400	89	219
	600	99	229
1	800	104	234
I	1000	119	249
	1200	129	259
	1350	139	269
2	1600	258	388
	2000	288	418
	2500	328	458
	3200	388	518
	4000	428	558
2	5000	597	727
3	6300	717	847

Bars per	Alumir	Dim (mm)	
Phase	Ampere Rating	Busway (W)	Hanger
	400	109	239
	600	109	239
1	800	119	249
I	1000	139	269
	1200	159	289
	1350	194	324
	1600	214	344
	2000	244	374
2	2500	368	498
	3200	458	588
	4000	538	668
2	5000	717	847
	6000	867	997



Fig. 7.14.1 Flatwise mounting



Material use for busway support channel:

- Suggest to use 12mm or 1/2 inch of steel rod.
- It is recommended to use 40x40x3(mm) support channel for 2000A or below busway model while 50x50x6(mm) for 2500A or above busway.
- Please refer to below data during busway installation

Refer to the Table 6.1



Floor Support

Spring Hanger is purposely design to support busway at each floor regardless the busway total length. Intermediate support suggests to be use whenever the floor to floor lever is over 4.8M height. The number of spring provided is based on busway weight..



Fig. 7.14.3



8. Catalogue Numbering System

Minimum Distance between parallel-installed busway



Plug-in unit



POWERDUCT

9. Certificates



10. Busduct System Diagram

Busduct System



11. Applications & Job References

The busway includes a comprehensive range of solutions and services tailored to a wide variety of industries and infrastructure sectors such as;

- Oil and Gas Industries •
- Medical Center •
- . **Railway Stations**
- Airport •
- **Financial Centers**
- ٠
- Cooling Towers Heavy Industries •
- High Tech Industries •
- Education Building .
- **Power Stations**
- Shipyards •
- Ships
- High Rise Residential Towers •
- Tunnels •
- **Telecommunication Towers** •
- Commercial Buildings and Complex •
- Data Center
- Hotels

















12. FIRE Rated (FR) System

Fire Rated Powerduct busway system is also available, Fire Rated Powerduct is specially designed upon customer's request where the applications in hazardous environment system. The rating available from 400A to 6300A. The design and construction is completely tested accordance to IEC 60331-1:2009, BS 6387:2013(C,W,Z) / IEC 61034:2005 (measurement of smoke density).

IEC 60331-1:2009

The busbars provide circuit integrity for 120 minutes at 830°C.

BS 6387:2013 / IEC 61034:2005

The busbars provide circuit integrity for :

- Protocol C Resistance to fire alone
- Protocol W Resistance to fire with water
- Protocol Z Resistance to fire with mechanical check.

The busbars provide measurement of smoke density.



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