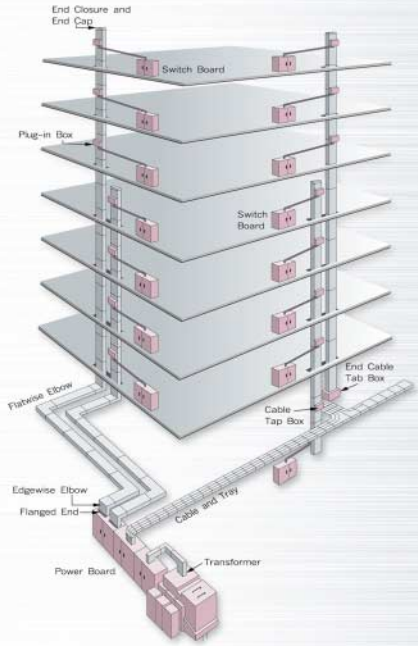
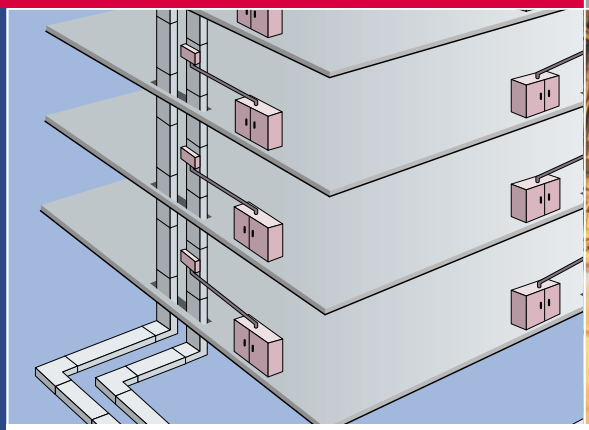
Leader in Electrics & Automation

LS Bus Duct System



Power Transmission & Distribution



LS Industrial Systems
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Contents

Description of GH-P type

1.Features and advantages of GH-P type Busduct

1-1. Features

(1) Insulation

Seamless coating with thickness at least 1.5 mm to prevent infiltration of water and moisture provides high quality insulation electrically and mechanically.

(2) Compact and light weight

Totally isolated and compact size of ducts enable the saving of the facility space, which can lead efficient design bearing compact and light.

(3) Low voltage drop

The voltage drop is very low because the short distance between isolated conductors causes low reactance.

(4) High short time current capacity

The mechanical strength to overcome the magnetic force between conductors allows the higher short time current capacity than that of standards, JIS and KS.

(5) Ease of installation and maintenance

Small, light and one-touch joint system enables easy installation. No bolt connection required other than the standard connection. It's also safe because all conductors are insulated.

(6) temperature rise

The temperature rise shall be made uniformly regardless of the bus duct arrangement - horizontal, vertical, flat and edgy- due to no convection inside.

(7) Safe from fire

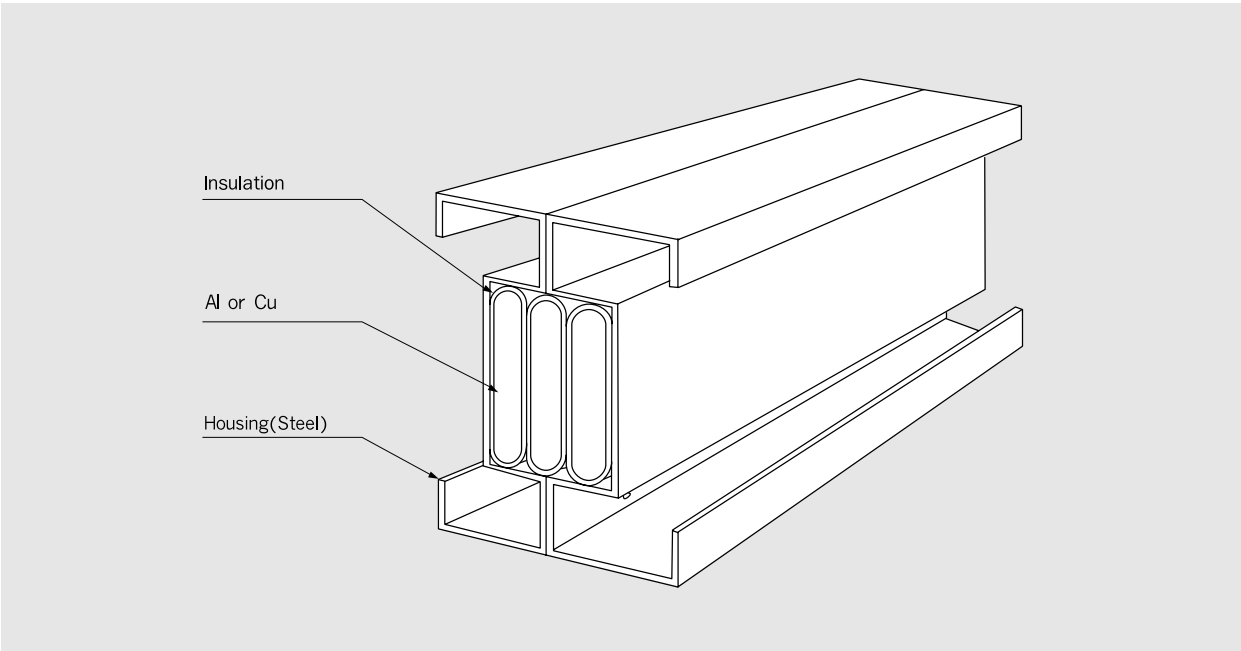
It do not cause the fire and ensure safety in case of fire because of the structure and the insulation material that is flame-retardant.

(8) No noise

Solid structure does not make any noise that may happen by the vibration due to current flow

(9) No influence of induction

Conductors are contacted together closely with proper insulation. Thus the leakage of the magnetic flux is too small to have influnece on communication system



<Fig. 1 Structure of cross section>

1-2. Advantages

(1) No holes in conductors

Joints are made without piercing holes of conductors. Clamping bolts do not run through the conductors in order to secure mechanical strength and electrical reliability.

(2) Contact area

As joints are made without piercing of conductors more contact area can be secured to recuce the resistance.

(3) Joint by leaf springs

A spring material wider than the bus bar is used in jointing so as to ensure a constant contact pressure,
which does not cause any unbalance of temperature rise and current flow.

(4) No stress concentration

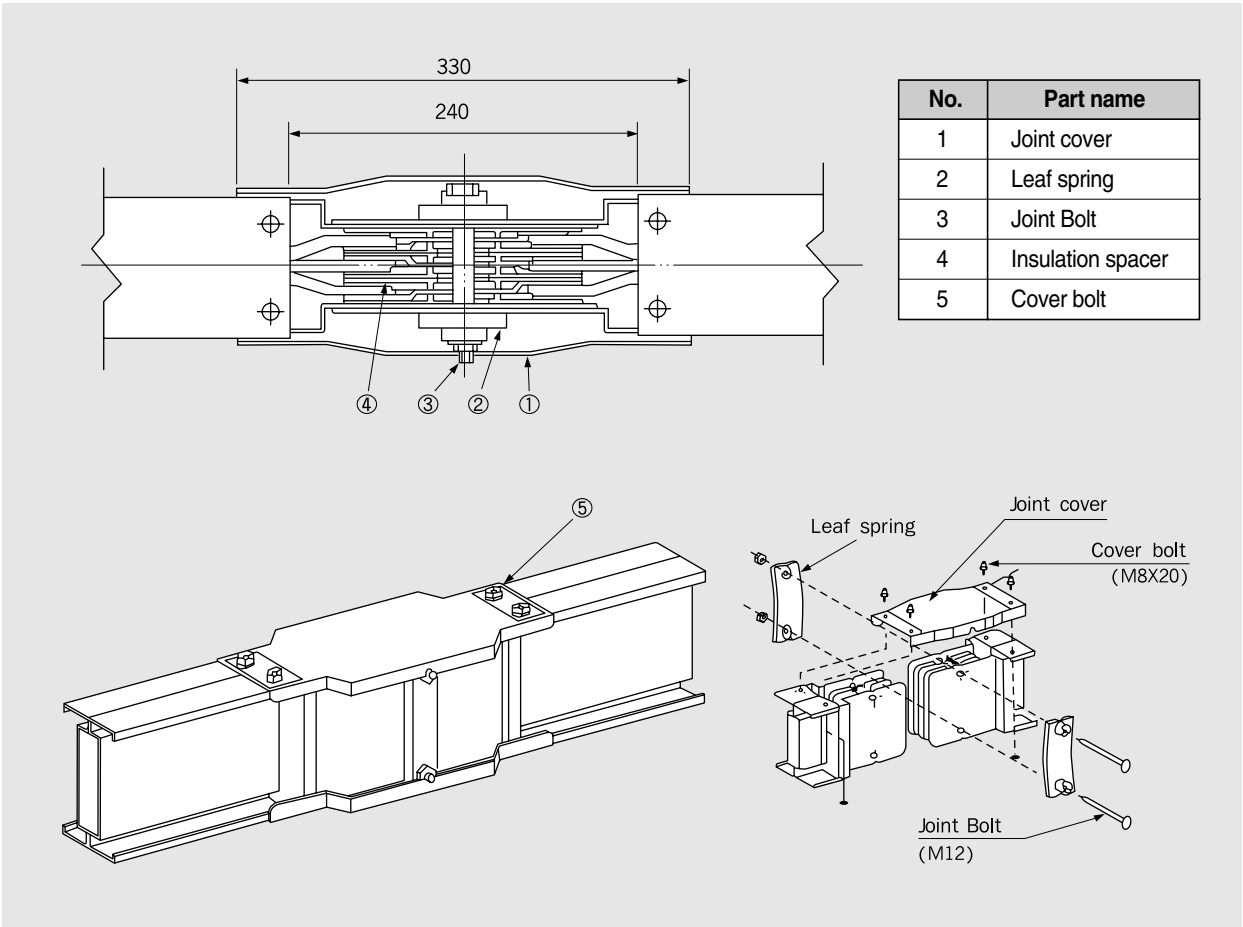
Providing very high reliability electrically and mechanically because of using high strength insulation spacers and removing piercing holes in the conductors which may cause stress concentration at the jointing area.

(5) Ideal connection

To pursue the ideal connection jointing between conducts is made at the same time with that of between ducts.

(6) Ease of installation and maintenance

One-touch joint system enables easy installation.
Checking the jointing area is possible without any interruption of the power.



No.	Part name
1	Joint cover
2	Leaf spring
3	Joint Bolt
4	Insulation spacer
5	Cover bolt

<Fig. 2 Detial of joint part>

2. Structure of GH-P type Busduct

2-1. Conductor

(1) Copper conductor
Cu busbar defined in KSD5530
- With purity of 99.90% and more.
- With conductivity of 98% and more.

(2) Aluminium conductor
Al busbar defined in KSD6762
-With purity of 99.60% and more.
-With conductivity of 61% and more.

2-2. Insulation coating

The conductor is coated with Polyvinyl-Chloride material that is flame-retardant and have insulation class B(135℃).

2-3. Housing

The housing shall be made of galvanized sheet steel SEHC with thickness of 1.6mm defined in KSD3528 which is not apt to corrode.

3. Ratings of GH-P type Busduct

Rated voltage	AC660V, DC750V less
Rated current	Al - Fe Type : 600A~5000A
	Cu - Fe Type : 600A~6500A
Rated frequency	50 / 60Hz
System configuration	1P2W, 3P3W, 3P4W, 3P5W
	3P5W (External Type)
Degree of protection	Indoor Type : IP41 - IP42
	Outdoor Type : IP55 - IP65
	Weather - Proof : IP54
Service condition	Altitude : Max. 1000m Ambient temperature : -20℃ to 40℃ Humidity : Max. 97%
Applied standards	KS C8450, JIS C8364, IEC 60439-2, BS 5486
Type	General type, Fire resistance type

4. Finish color

Powder coating shall be used in color MUNSELL No.5Y 7/1 or 7.5 BG 6/1.5

5. Test

5-1. Routine test

(1) General inspection : Checking materials, structure, dimensions and assembly status

(2) Dielectric test : Should be min. 5㏁ when tested with DC500V Megger between phases, and live part and non-live part.

(3)Withstand voltage : Should withstand when AC 7000V is applied for 1 min. between phases, and live part and non-live metal part.

5-2. Type test

Temperature-rise, Short-circuit, Vertical loading, Holizontal loading and Impact tests, Fire resistance test.

5-3. Certification (concerning short-circuit test)

(1) ASTA in U.K. : 800A/50kA, 1200A/60kA, 1600A/80kA
(2) KERI in Korea : 1600A/80kA, 2500A/120kA
(3) FILK in Korea : 1500A, 2000A (750℃ at fire resistance test)
(4) KIMM in Korea : IP65

Technical data of GH-P type Busduct

1. Voltage drop

● Voltage Drop : Line to Line with Aluminium Conductors

(Unit : Volt/100m)

Rated current(A)	Conductor(mm)	3 ø 50Hz Power factor(%)					3 ø 60Hz Power factor(%)				
		1.0	0.9	0.8	0.7	0.6	1.0	0.9	0.8	0.7	0.6
600	6×50	11.15	11.02	10.30	9.41	8.55	10.62	10.78	10.19	10.33	9.56
800	6×75	10.56	10.51	9.79	8.91	8.04	10.43	10.62	10.14	9.34	8.72
1,000	6×100	10.08	10.06	9.41	8.71	7.82	10.00	9.95	9.75	9.14	8.52
1,200	6×125	7.77	8.68	8.50	8.14	7.33	8.00	9.15	9.10	9.05	9.01
1,500	6×175	7.96	8.92	8.74	8.52	8.33	8.21	9.48	9.40	9.18	9.07
1,600	6×185	7.24	8.13	8.04	7.81	7.68	7.44	8.64	8.59	8.46	8.34
2,000	6×240	7.79	8.81	8.69	8.30	8.12	8.56	8.94	8.87	8.80	8.67
2,500	6×150×2	7.28	8.22	8.09	7.86	7.63	7.12	8.36	8.29	8.13	8.08
3,000	6×185×2	6.73	6.69	7.60	7.48	7.34	7.01	8.21	8.23	8.10	7.97
3,500	6×240×2	6.89	7.86	7.77	7.64	7.48	7.10	8.32	8.39	8.24	8.09
4,000	6×175×3	7.04	7.99	7.91	7.09	7.12	7.21	8.51	8.53	8.48	8.26
4,500	6×185×3	6.76	7.78	7.73	6.83	6.88	6.88	8.26	8.24	8.21	8.10
5,000	6×240×3	6.52	7.52	7.46	6.62	6.53	6.66	8.05	8.02	8.01	7.89

● Voltage Drop : Line to Line with Copper Conductors

(Unit : Volt/100m)

Rated current(A)	Conductor(mm)	3 ø 50Hz Power factor(%)					3 ø 60Hz Power factor(%)				
		1.0	0.9	0.8	0.7	0.6	1.0	0.9	0.8	0.7	0.6
600	6×40	6.83	7.31	7.06	6.84	6.77	6.91	7.60	7.44	7.27	7.21
800	6×50	9.14	9.54	9.16	8.52	8.22	9.26	9.96	9.62	9.07	8.66
1,000	6×75	8.44	8.82	8.46	7.87	7.76	8.66	9.34	9.06	8.51	8.42
1,200	6×100	7.78	8.19	7.81	7.28	7.02	8.01	8.66	8.37	7.91	7.73
1,500	6×125	7.99	8.37	8.09	7.59	7.37	8.22	8.89	8.62	8.15	7.93
1,600	6×150	7.52	7.91	7.54	7.01	6.85	7.68	8.34	8.16	7.66	7.41
2,000	6×185	7.99	8.40	8.10	7.48	7.36	8.12	8.81	8.52	8.06	7.82
2,500	6×125×2	7.03	7.52	7.21	6.94	6.72	7.24	7.97	7.74	7.52	7.37
3,000	6×150×2	6.51	7.02	6.77	6.56	6.43	6.62	7.33	7.18	7.07	7.01
3,500	6×175×2	6.54	7.07	6.81	6.59	6.38	6.71	7.43	7.31	7.21	7.05
4,000	6×125×3	6.77	7.00	6.92	6.67	6.49	6.96	7.74	7.55	7.36	7.22
4,500	6×150×3	6.46	7.01	6.84	6.59	6.36	6.74	7.49	7.36	7.22	7.08
5,000	6×175×3	6.27	6.74	6.56	6.36	6.17	6.52	7.21	7.03	6.88	6.77
5,500	6×185×3	6.20	6.68	6.50	6.30	6.11	6.50	7.19	7.01	6.86	6.75
6,500	6×240×3	5.20	6.59	6.41	5.32	5.26	5.30	6.84	6.79	6.66	5.55

Note) Temperature of conductor is at 95℃

2. Short time current capacity

Ampere rating(A)	Short time current(kA)	
	KS (For 0.1sec)	LSIS (For 1sec)
600	22	40
800	22	50
1000	22	50
1200	42	60
1350	42	60
1500	42	60
1600	60	80
2000	60	80
2500	60	120
3000	60	160
3500	60	160
4000	90	180
4500	90	200
5000	90	200
5500	-	200
6500	-	200

3. Impedance

Below tables show the impedance values for Aluminium and Copper conductors at 50/60Hz

● Aluminium Conductor

[$\times 10^{-4}\,\Omega$/m]

Ampere rating(A)	50Hz			60Hz		
	R	X	Z	R	X	Z
600	1.257	0.323	1.297	1.385	0.387	1.438
800	0.848	0.235	0.879	0.851	0.282	0.896
1000	0.641	0.185	0.667	0.645	0.222	0.682
1200	0.518	0.152	0.540	0.523	0.183	0.554
1350	0.436	0.129	0.454	0.443	0.155	0.469
1500	0.378	0.113	0.394	0.386	0.135	0.409
1600	0.360	0.107	0.375	0.367	0.128	0.389
2000	0.286	0.084	0.298	0.293	0.101	0.310
2500	0.218	0.065	0.228	0.221	0.078	0.235
3000	0.180	0.054	0.188	0.184	0.064	0.195
3500	0.143	0.042	0.149	0.146	0.051	0.155
4000	0.126	0.038	0.131	0.129	0.045	0.136
4500	0.120	0.036	0.125	0.122	0.043	0.130
5000	0.095	0.028	0.099	0.098	0.034	0.103

● Copper Conductor

[×10 -4Ω/m]

Ampere rating(A)	50Hz			60Hz		
	R	X	Z	R	X	Z
600	0.974	0.380	1.045	0.977	0.456	1.078
800	0.784	0.323	0.848	0.789	0.387	0.879
1000	0.530	0.235	0.580	0.536	0.282	0.606
1200	0.405	0.185	0.445	0.412	0.222	0.468
1350	0.331	0.152	0.364	0.338	0.183	0.384
1500	0.331	0.152	0.364	0.338	0.183	0.384
1600	0.282	0.129	0.311	0.289	0.155	0.328
2000	0.235	0.107	0.259	0.241	0.128	0.273
2500	0.166	0.076	0.182	0.169	0.091	0.192
3000	0.141	0.065	0.155	0.144	0.078	0.164
3500	0.122	0.056	0.135	0.127	0.068	0.143
4000	0.110	0.051	0.121	0.113	0.061	0.126
4500	0.094	0.043	0.104	0.096	0.052	0.109
5000	0.082	0.038	0.091	0.084	0.045	0.096
5500	0.078	0.035	0.086	0.080	0.043	0.091
6500	0.068	0.028	0.074	0.071	0.031	0.077

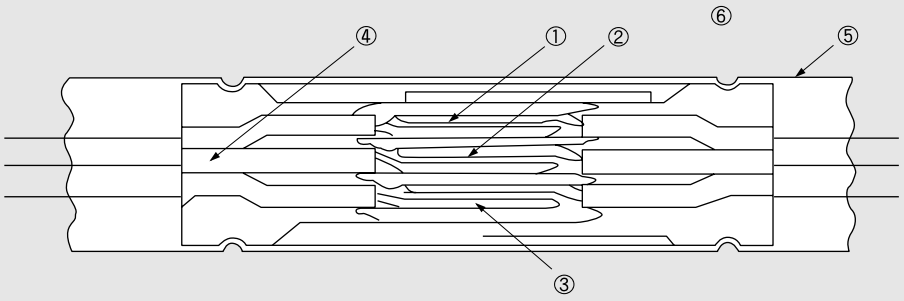
Note) R is the resistance at 95℃

4. Temperature characteristics

4-1. Temperature curve at rated current

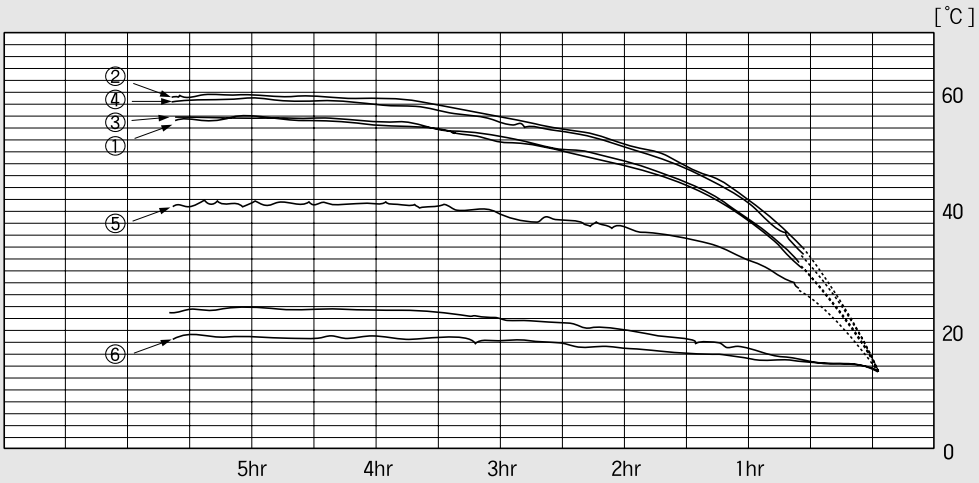
(1) The allowable degree is 95℃ under the current.

(2) Temperature rise is 55℃ at ambient temperature 40℃

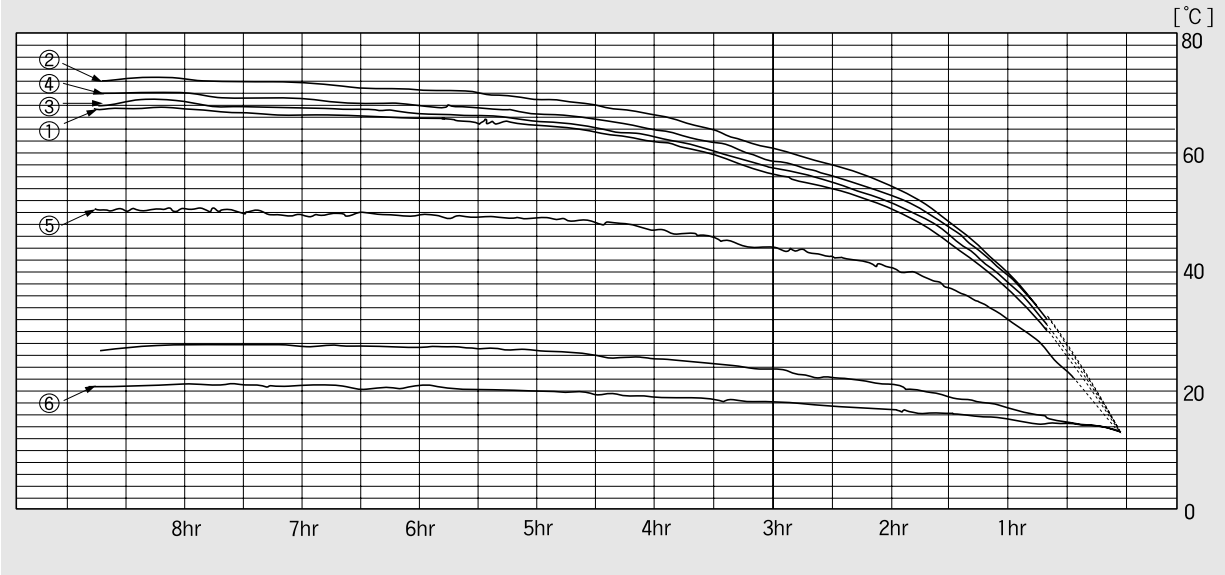


<Fig.1 Temperature checking points of the joint part>

● **3 ø 3W 1200A (Example)**



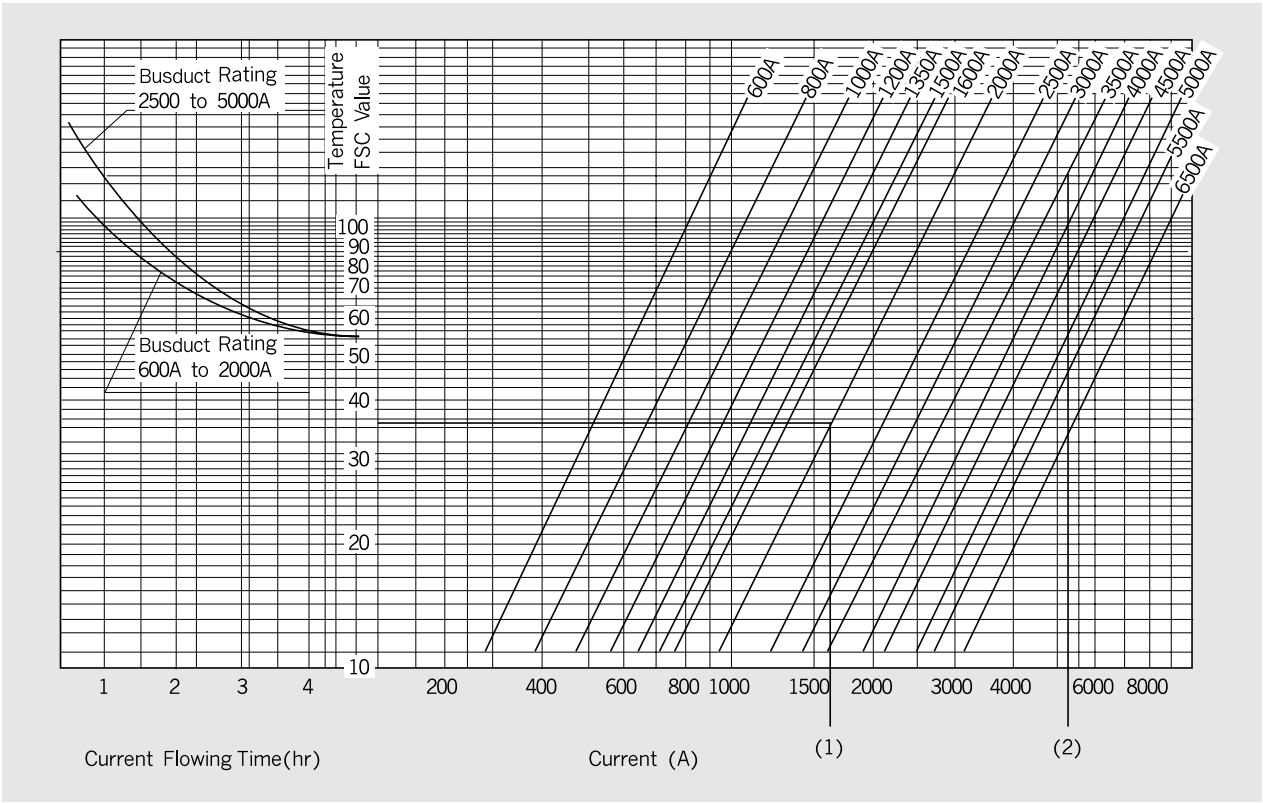
● **3 ø 3W 2000A (Example)**



4-2. Temperature rise at thermal current

Saturated temperature rise is 55℃ at any rated currents.

(1) Temperature rise at different load currents
(2) Allowable load current to short time current before saturation
(3) You can get the above values from below curves.



<Fig.2 Temperature rise curves at thermal current>

Example

1. Allowable temperature rise is 32℃ when 1650A flows in 2000 rating busduct.
2. Allowable overload current is 5300A/hr at no load status in 3500 rating busduct.

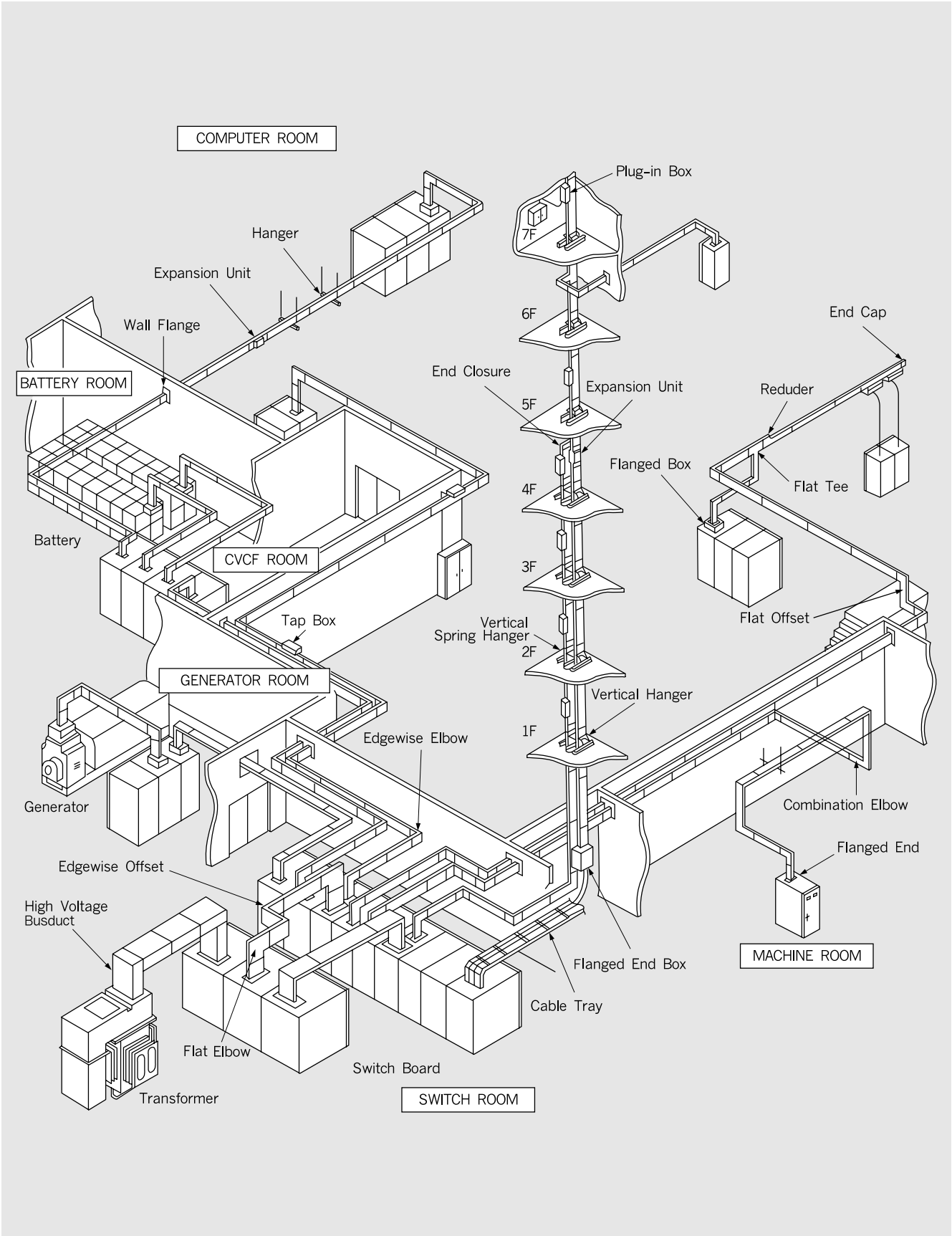
Factor for allowable current by ambient temperature

Ambient temperature		Factor	Ambient temperature		Factor
℃	°F		℃	°F	
15	59	1.21	40	104	1.00
20	68	1.17	45	113	0.95
25	77	1.13	50	122	0.90
30	86	1.09	55	131	0.85
35	95	1.04	60	140	0.80

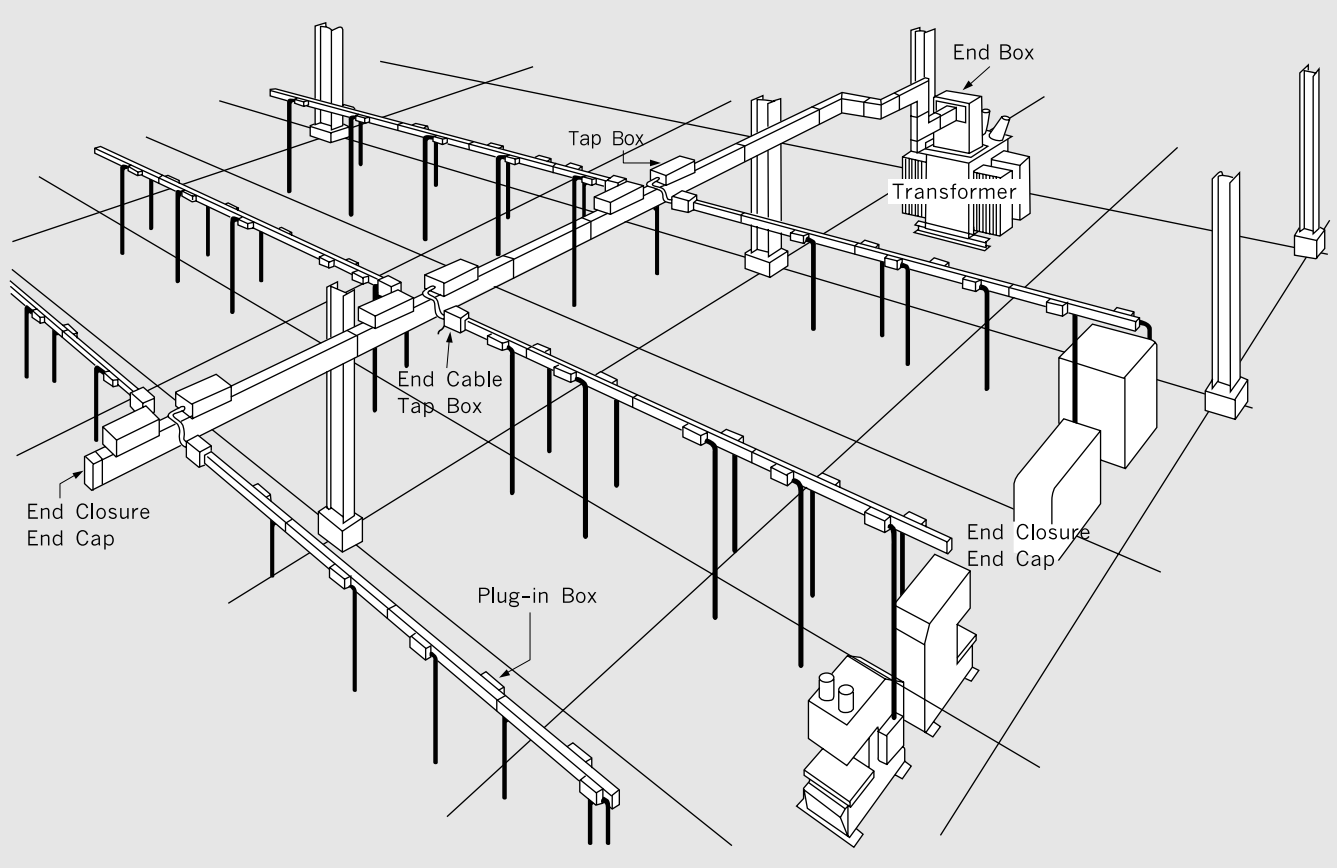
Compositions and dimensions of GH-P type busduct

1. Distribution system

- **Busduct distribution system for a building**

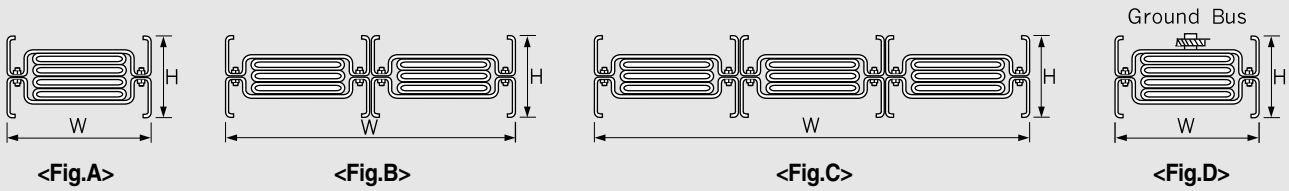


● **Busduct distribution system for a factory**



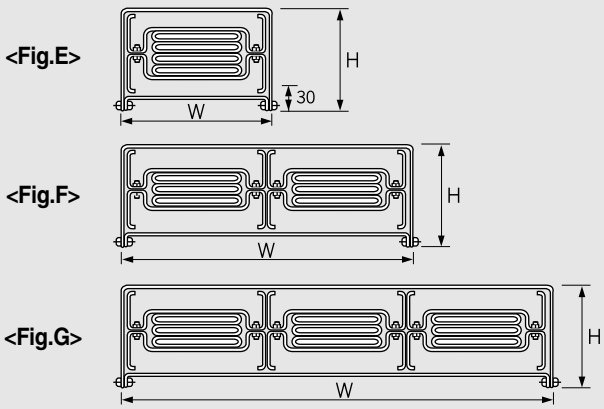
2. Cross section and busbar size

● **For indoor**



<Fig.A> <Fig.B> <Fig.C> <Fig.D>

● **For outdoor**



<Fig.E>

<Fig.F>

<Fig.G>

Note) 1. Ground Busbar (Cu : 3T × 25mm) is external type and optional. Fig.D
2. 5500A and 6500A are only for Cu conductor.

● For indoor

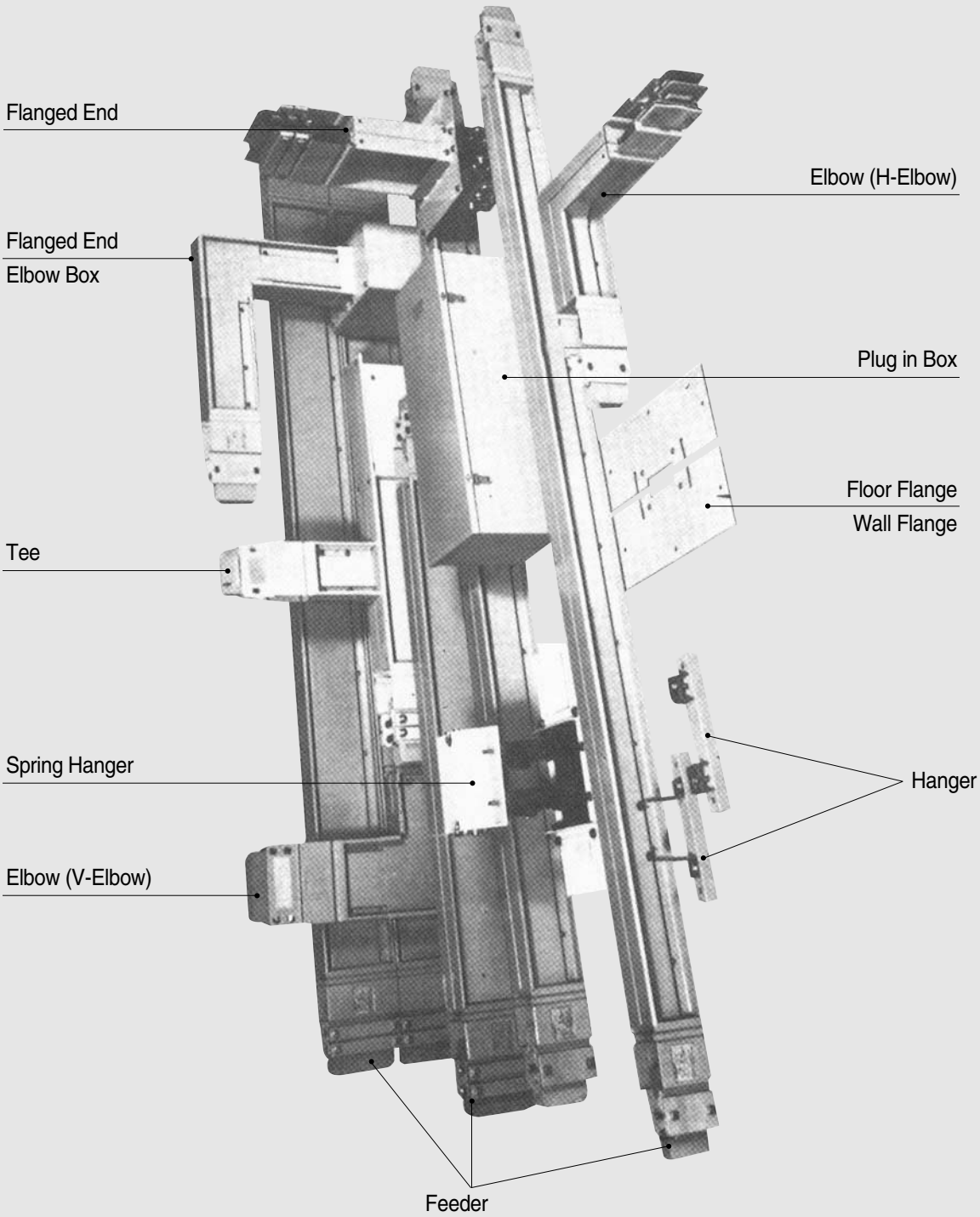
Rated current(A)	Fig.	Busbar(mm)		3W			4W(Full neutral)		
				W(mm)	H(mm)	Weight(kg/m)	W(mm)	H(mm)	Weight(kg/m)
600	Fig. A	Al	One 6×50	125	100	11.0	125	120	13.0
800			One 6×75	150		13.0	150		15.5
1000			One 6×100	175		15.5	175		18.5
1200			One 6×125	200		18.0	200		21.5
1350			One 6×150	225		20.0	225		24.0
1500			One 6×175	250		22.5	250		27.0
1600			One 6×185	260		23.5	260		28.5
2000			One 6×240	315		29.0	315		35.0
2500	Fig. B		Two 6×150	450	100	40.0	450	120	48.0
3000			Two 6×185	520		46.0	520		56.0
3500			Two 6×240	630		57.5	630		69.5
4000	Fig. C		Three 6×175	750	100	67.0	750	120	80.5
4500			Three 6×185	780		70.0	780		84.0
5000			Three 6×240	945		86.5	945		104.0
600	Fig. A	Cu	One 6×40	115	100	14.5	115	120	17.5
800			One 6×50	125		16.5	125		20.5
1000			One 6×75	150		21.5	150		27.0
1200			One 6×100	175		27.0	175		33.5
1350			One 6×125	200		32.0	200		40.5
1500			One 6×125	200		32.0	200		40.5
1600			One 6×150	225		37.5	225		47.0
2000			One 6×185	260		44.5	260		56.5
2500	Fig. B		Two 6×125	400	100	64.0	400	120	80.5
3000			Two 6×150	450		74.0	450		93.5
3500			Two 6×175	500		84.0	500		107.0
4000	Fig. C		Three 6×125	600	100	95.5	600	120	120.0
4500			Three 6×150	675		110.0	675		140.0
5000			Three 6×175	750		127.0	750		160.5
5500			Three 6×185	780		133.0	780		169.0
6500			Three 6×240	945		160.0	945		200.0

● For outdoor

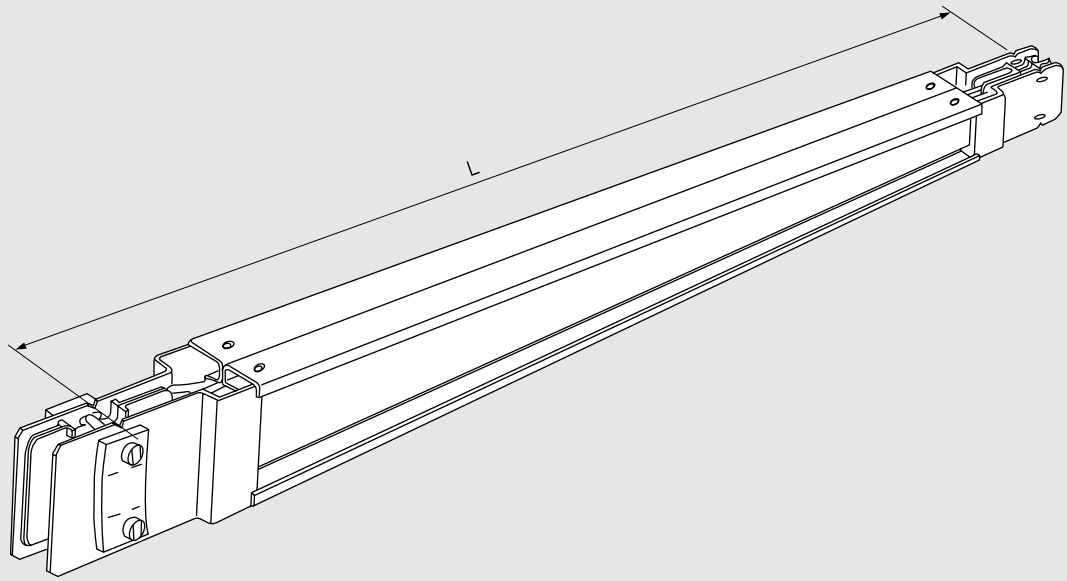
Rated current(A)	Busbar*	Flat type					Weight(kg/m)	
		3W		4W		Fig	3W	4W
		W(mm)	H(mm)	W(mm)	H(mm)			
600	Al	145	150	145	170	Fig. E	20	22
800		170		170			23	26
1000		195		195			26	30
1200		220		220			29	33
1350		245		245			32	37
1500		270		270			35	40
1600		280		280			37	42
2000		335		335			44	50
2500		470	150	470	170	Fig. F	59	68
3000		540		540			67	77
3500		650		650			82	95
4000		770	150	770	170	Fig. G	95	109
4500		800		800			99	113
5000		965		965			120	139
600	Cu	135	150	135	170	Fig. E	23	27
800		145		145			25	30
1000		170		170			31	37
1200		195		195			37	44
1350		220		220			43	52
1500		220		220			43	52
1600		245		245			49	59
2000		280		280			57	70
2500		420	150	420	170	Fig. F	82	98
3000		470		470			93	113
3500		520		520			105	128
4000		620	150	620	170	Fig. G	120	144
4500		695		695			136	166
5000		770		770			155	189
5500		800		800			170	205
6500		965		965			196	236

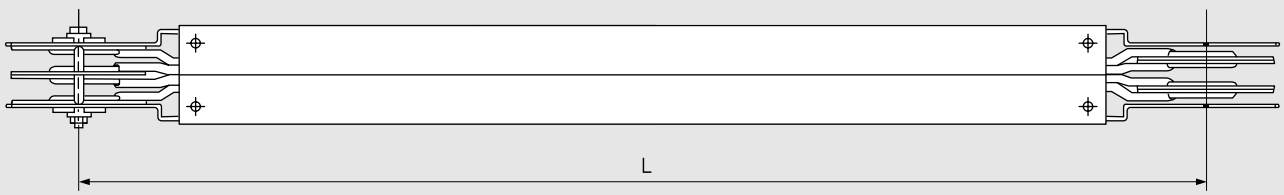
* Refer to above table

3.Compositions



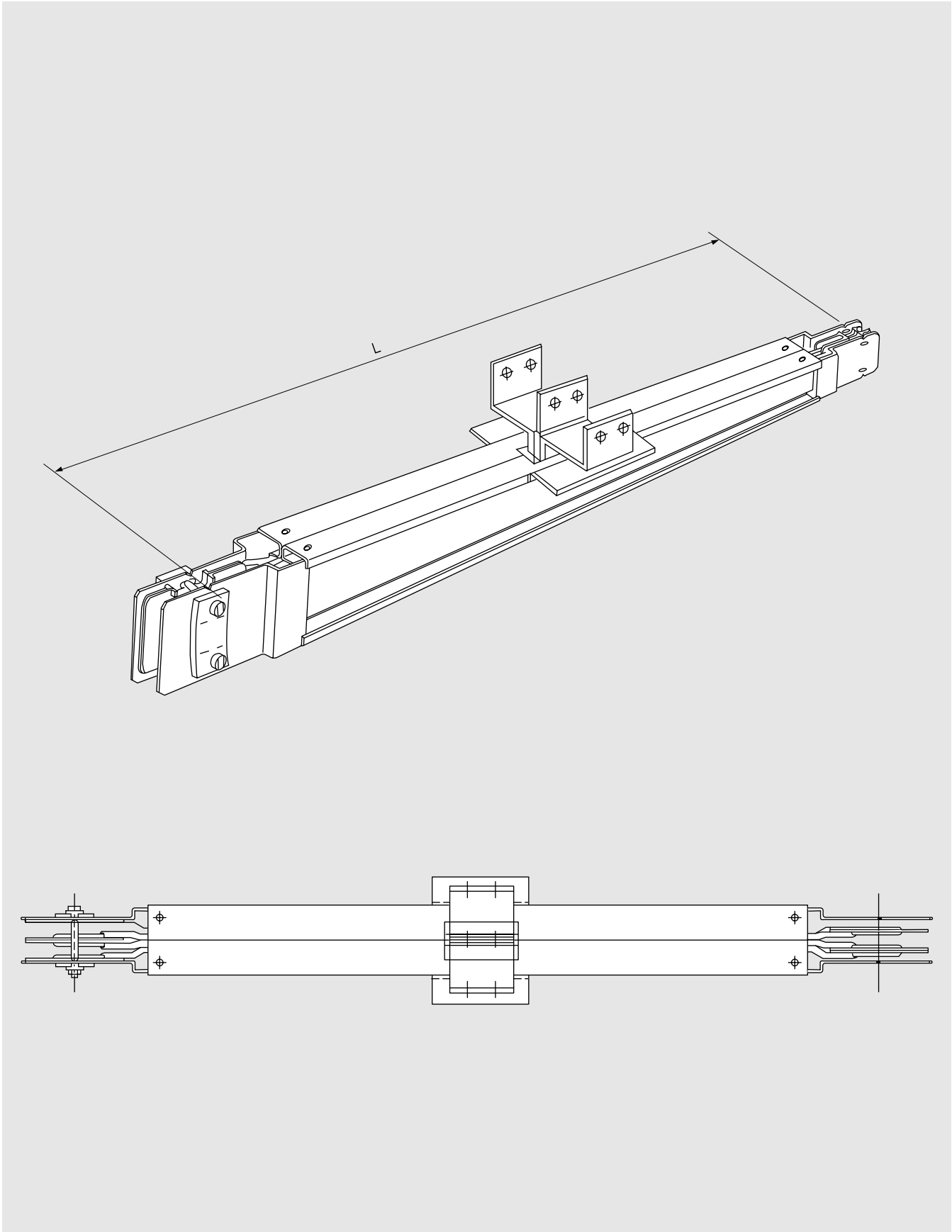
4. Feeder Busduct





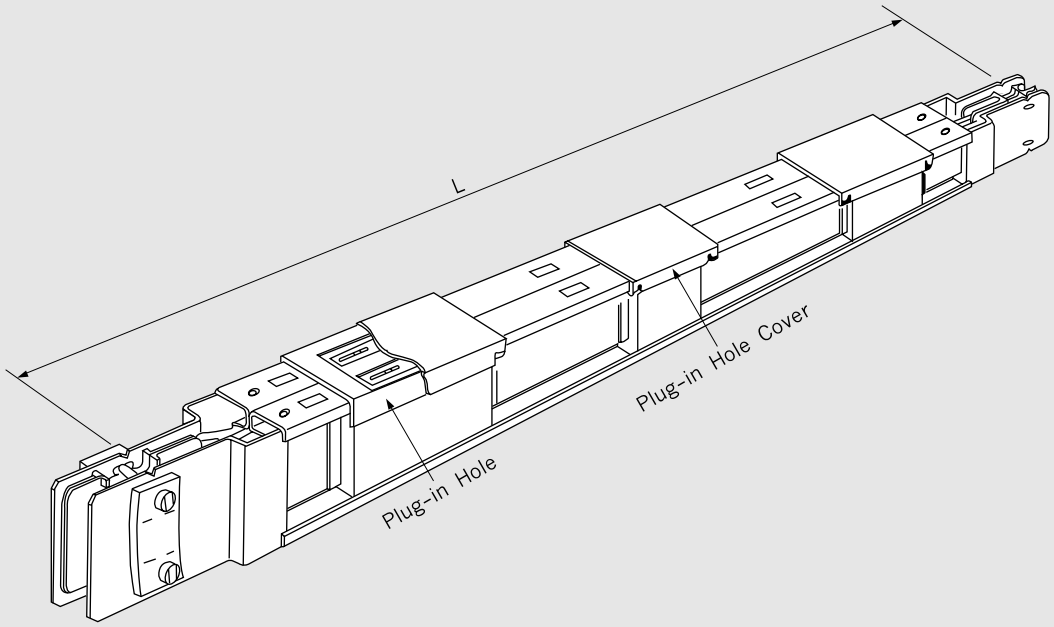
Note) 1. Standard length, L = 500, 1000, 1500, 2000, 3000mm
Minimum length is 500mm, maximum is 3100mm
2. In case of ordering non-standard length user's approval is required before production.

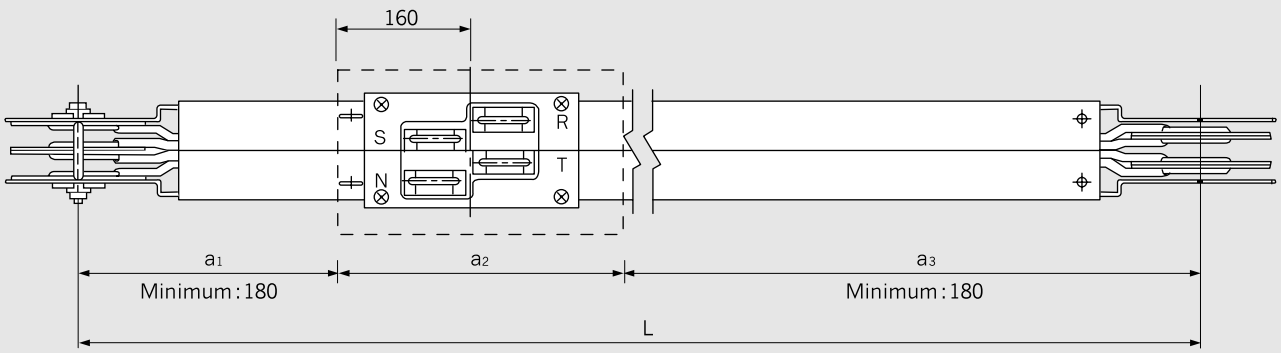
5. Tap off Busduct



Note) 1. Standard length, L is 3000mm
Minimum length is 1300mm
2. In case of ordering non-standard length user's approval is required before production.
3. It is applied to branch circuit rating of 500A and more (Bolt-on type)

6. Plug-in Busduct





Note) 1. Length L= Length of Plug-in Busduct
a1, a3 : Length between Busduct joint and Plug-in Box
a2 : Size of Plug-in Box

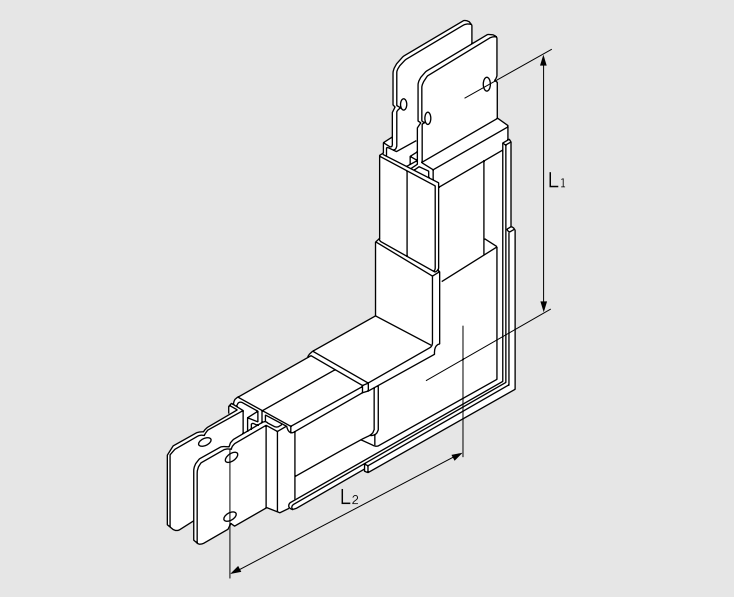
2. It is applied to branch circuit rating of 400A and below.
3. Please contact if Plug-in type is required for branch circuit rating of 500A and more

7. Elbow, Tee and Offset

● Flatwise Elbow(Vertical)

Rated current (A)	Standard length $L_1 \times L_2$(mm)	Minimum length $L_1 \times L_2$(mm)
600	400 × 400	310 × 310
800		320 × 320
1000		335 × 335
1200		345 × 345
1350		360 × 360
1500	500 × 500	370 × 370
1600		375 × 375
2000		405 × 405
2500	600 × 600	470 × 470
3000		505 × 505
3500		560 × 560
4000	700 × 700	620 × 620
4500, 5500		635 × 635
5000, 6500	750 × 750	720 × 720

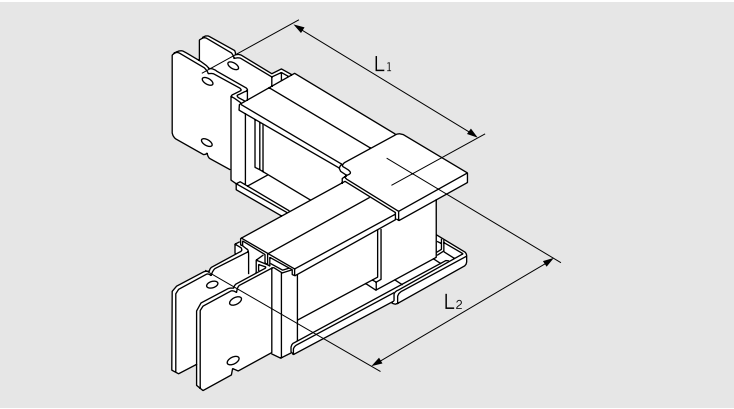
Note) The summation the ELBOW Length of (L_1+L_2) is 2500mm at maximum.



● Edgewise Elbow(Horizontal)

Rated current (A)	Standard length $L_1 \times L_2$(mm)	Minimum length $L_1 \times L_2$(mm)
600-6500	400 × 400	270 × 270

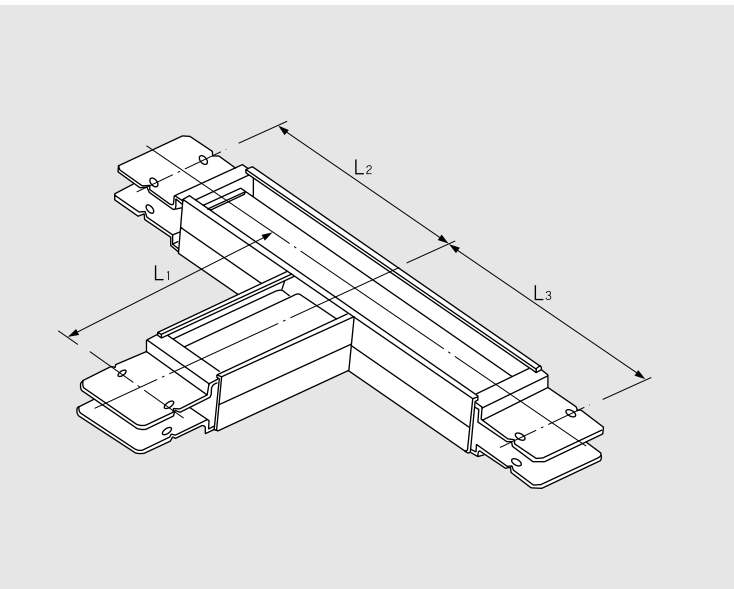
Note) The summation the ELBOW Length of (L_1+L_2) is 2500mm at maximum.



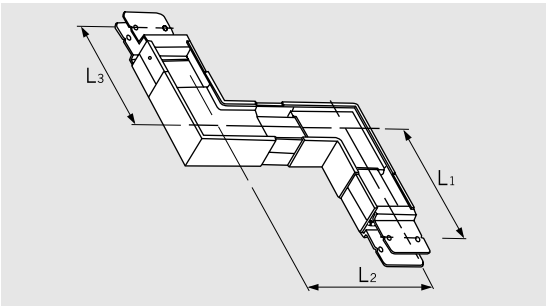
● Flatwise Tee Elbow

Rated current (A)	Standard length $L_1 \times L_2 \times L_3$(mm)	Minimum length $L_1 \times L_2 \times L_3$(mm)
600	500 × 500 × 500	350 × 350 × 350
800		360 × 360 × 360
1000		375 × 375 × 375
1200		385 × 385 × 385
1350		400 × 400 × 400
1500		410 × 410 × 410
1600		420 × 420 × 420
2000		450 × 450 × 450
2500	650 × 650 × 650	510 × 510 × 510
3000		550 × 550 × 550
3500		600 × 600 × 600
4000	700 × 700 × 700	660 × 660 × 660
4500, 5500		680 × 680 × 680
5000, 6500	800 × 800 × 800	760 × 760 × 760

Note) The summation the Tee Length of (L_1+L_2+L_3) is 2500mm at maximum.

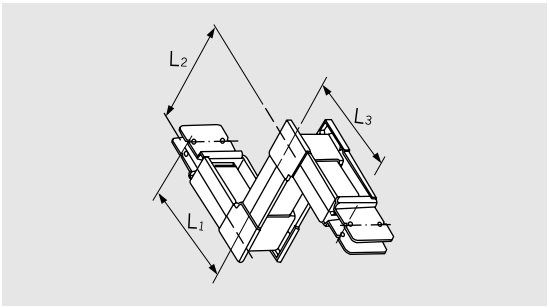


● Flatwise Offset



<Fig.A>

● Edgewise Offset

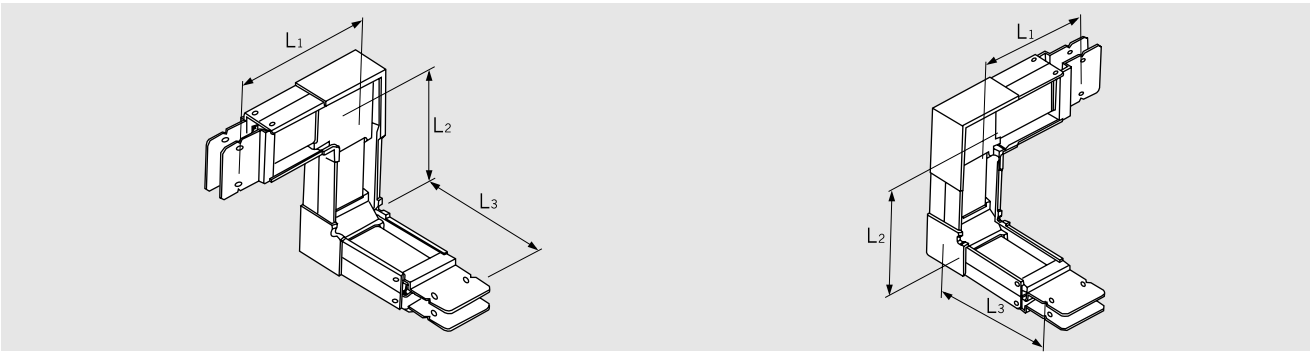


<Fig.B>

Rated current(A)	Flatwise offset : Fig.A		Edgewise offset : Fig.B	
	Standard length $L_1 \times L_2 \times L_3$(mm)	Minimum length $L_1 \times L_2 \times L_3$(mm)	Standard length $L_1 \times L_2 \times L_3$(mm)	Minimum length $L_1 \times L_2 \times L_3$(mm)
600	400×500×400	310×275×310	400×400×400	270×205×270
800		320×300×320		
1000		335×325×335		
1200		345×350×345		
1350		360×375×360		
1500	500×500×500	370×400×370		
1600		375×410×375		
2000		405×465×405		
2500	600×600×600	470×375×470		
3000		505×410×505		
3500		560×465×560		
4000	700×700×700	620×400×620		
4500, 5500		635×410×635		
5000, 6500	750×750×750	720×465×720		

Note) The summation the Offset Length of (L_1+L_2+L_3) is 2500mm at maximum.

● Combination Elbow

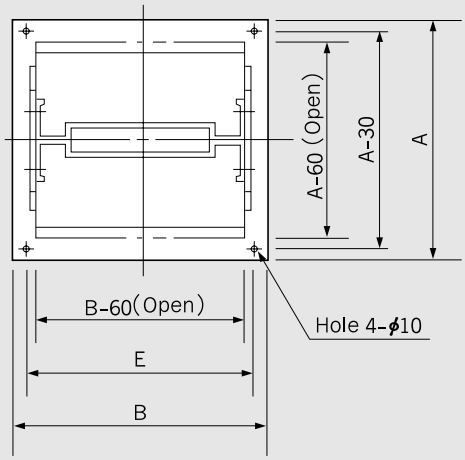


Rated current(A)	Standard length $L_1 \times L_2 \times L_3$(mm)	Minimum length $L_1 \times L_2 \times L_3$(mm)
600	400×400×400	310×245×270
800		320×255×270
1000		335×270×270
1200		345×280×270
1350		360×295×270
1500	500×500×400	370×305×270
1600		375×310×270
2000		405×340×270
2500	600×600×400	470×405×270
3000		505×440×270
3500		560×495×270
4000	700×700×400	620×555×270
4500, 5500		635×570×270
5000, 6500	750×750×400	720×655×270

Note) The summation the Combination Elbow Length of (L_1+L_2+L_3) is 2500mm at maximum.

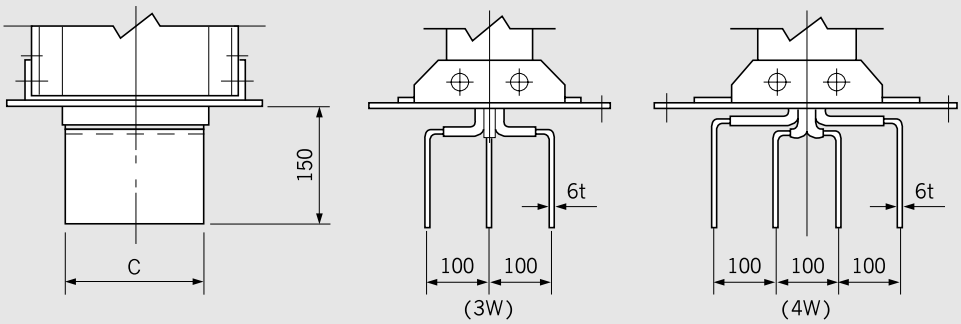
8. Flanged End

● 3W/4W(600A-2000A)

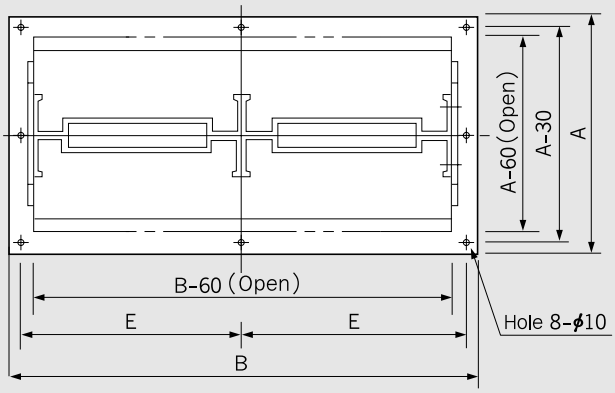


Rated current(A)		Fig*	Dimension(mm)					
Al	Cu		A(3W)	A(4W)	B	C	D	E
-	600	1	350	450	175	40	-	145
600	800	1	350	450	185	50	-	155
800	1000	2	350	450	210	75	40	180
1000	1200	2	350	450	235	100	50	205
1200	1350, 1500	3	350	450	260	125	40	230
1350	1600	3	350	450	285	150	50	255
1500	-	4	350	450	310	175	40	280
1600	2000	4	350	450	320	185	45	290
2000	-	5	350	450	375	240	45	345

* Refer to Detail of the bus terminal on the next page

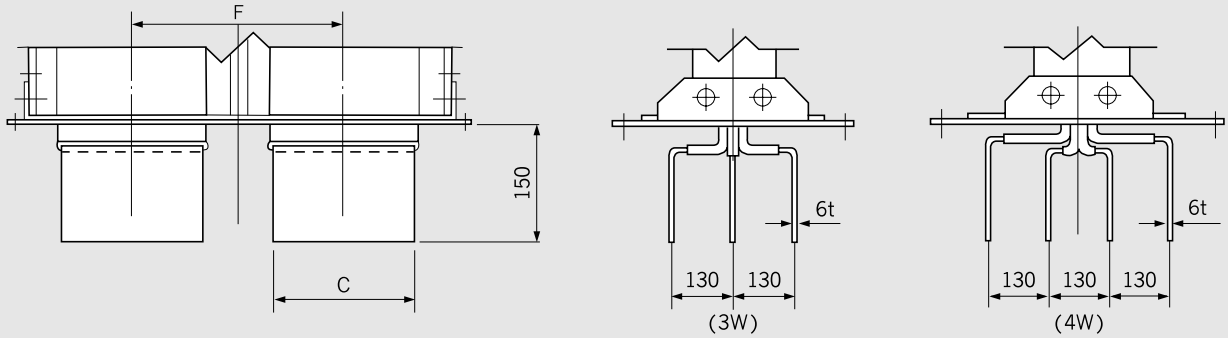


● 3W/4W(2500A-3500A)



Rated current(A)		Fig*	Dimension(mm)						
Al	Cu		A(3W)	A(4W)	B	C	D	E	F
-	2500	3	410	540	460	125	40	215	200
2500	3000	3	410	540	510	150	50	240	225
-	3500	4	410	540	560	175	40	265	250
3000	-	4	410	540	580	185	45	275	260
3500	-	5	410	540	690	240	45	330	315

* Refer to Detail of the bus terminal on the next page

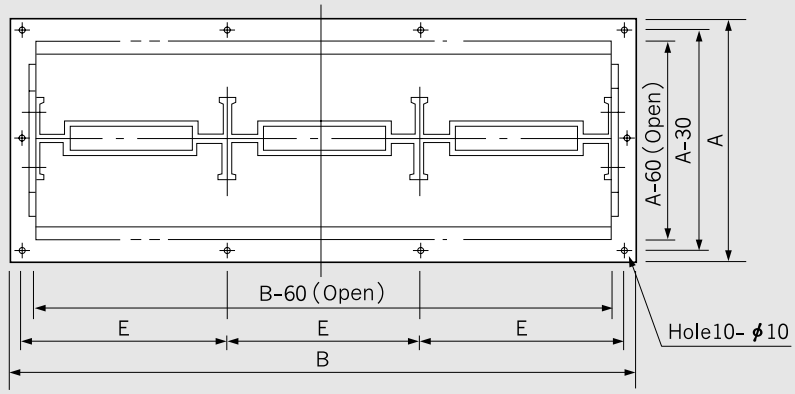


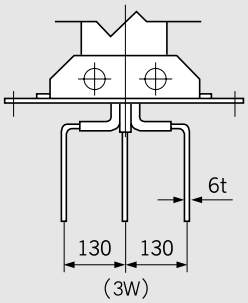
Note) A-60 and B-60 are the dimensions of the opened panel

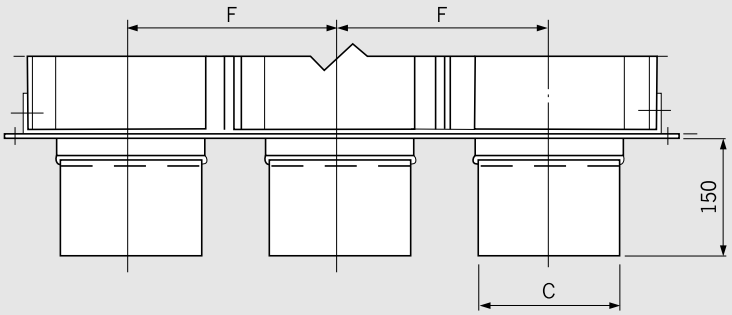
● 3W/4W(4000A-6500A)

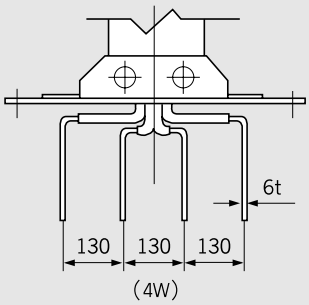
Rated current(A)		Fig*	Dimension(mm)						
Al	Cu		A(3W)	A(4W)	B	C	D	E	F
-	4000	3	410	540	660	125	40	210	200
-	4500	3	410	540	735	150	50	235	225
4000	5000	4	410	540	810	175	40	260	250
4500	5500	4	410	540	840	185	45	270	260
5000	6500	5	410	540	1005	240	45	325	315

* Refer to Detail of the bus terminal

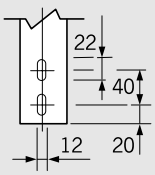




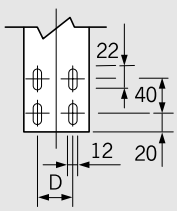




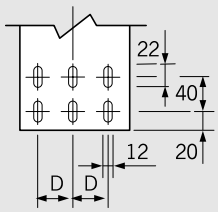
Detail of the bus terminal



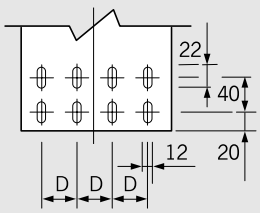
<Fig.1>



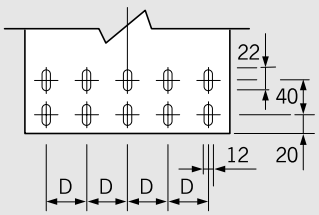
<Fig.2>



<Fig.3>



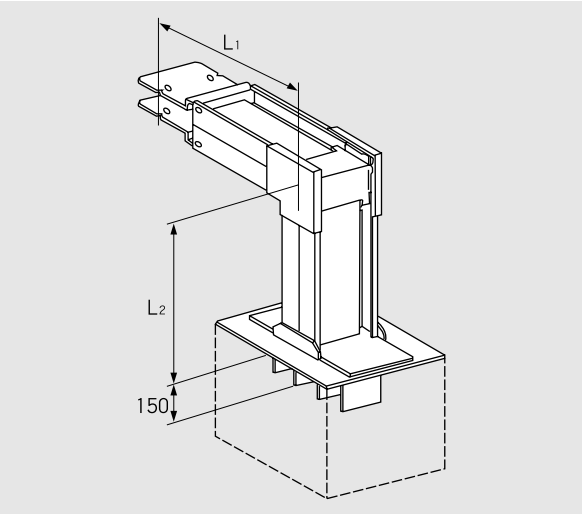
<Fig.4>



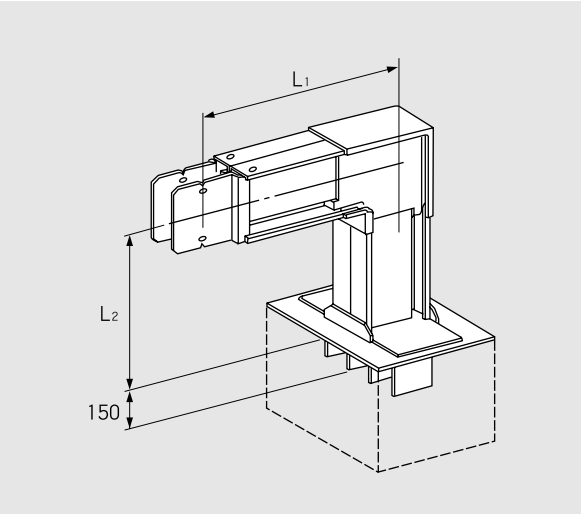
<Fig.5>

Note) A-60 and B-60 are the dimensions of the opened panel

● Elbow with Flanged End(Box)



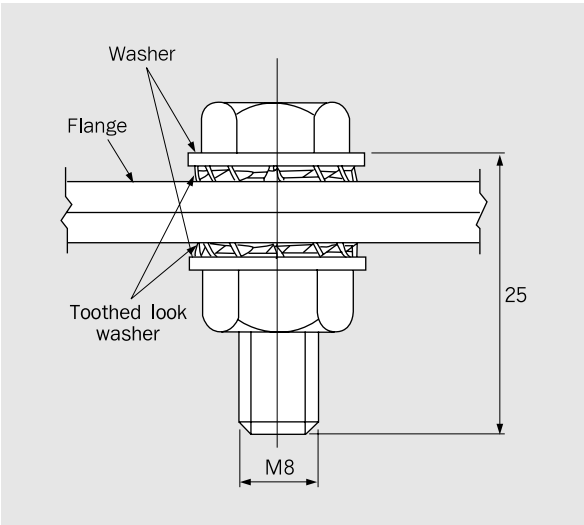
<Edgewise Elbow with Flanged End(Box)>



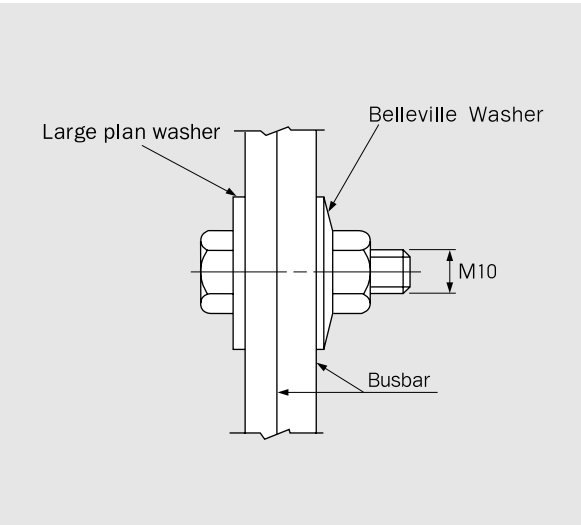
<Flatwise Elbow with Flanged End(Box)>

Rated current (A)	Standard length(mm)				Minimum length(mm)			
	Edgewise Elbow		Flatwise Elbow		Edgewise Elbow		Flatwise Elbow	
	L_1	L_2	L_1	L_2	L_1	L_2	L_1	L_2
600	400	400	400	400	270	200	310	200
800							320	210
1000							335	225
1200							345	235
1350							360	250
1500			500				370	260
1600							375	265
2000							405	295
2500			600	600			470	360
3000							505	395
3500							560	450
4000			700	700			620	510
4500, 5500							635	525
5000, 6500			750	750			720	610

● Flange connection bolt



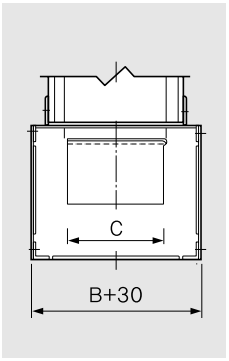
● Conductor connection bolt



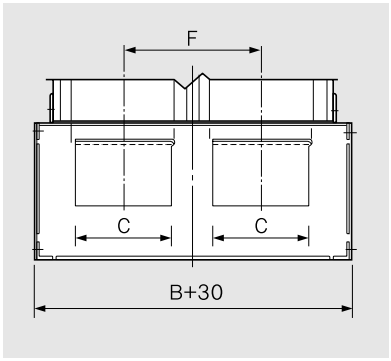
Note) The black painted part of the belleville washer used on the terminals should be contacted on the conductor.

9. Flanged End Box

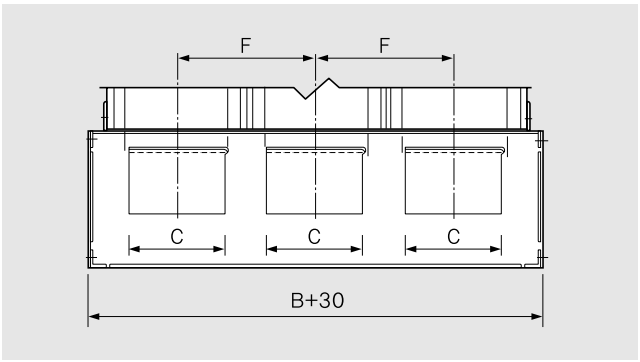
● 3W/4W(600A-6500A)



<Fig.X>



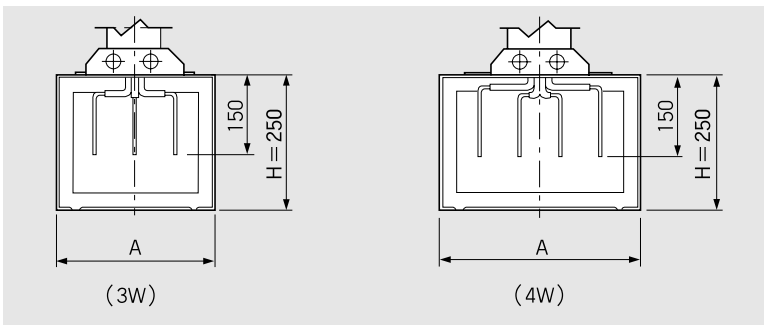
<Fig.Y>



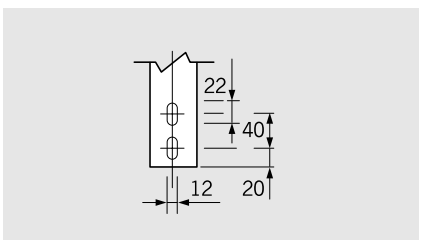
<Fig.Z>

Rated current(A)		Fig*		Dimension(mm)			
				A		B	D
Al	Cu			3W	4W		
-	600		1			175	-
600	800		1			185	-
800	1000		2			210	40
1000	1200		2			235	50
1200	1350,1500	X	3	400	500	260	40
1350	1600		3			285	50
1500	-		4			310	40
1600	2000		4			320	45
2000	-		5			375	45
-	2500		3			460	40
2500	3000		3			510	50
-	3500	Y	4			560	40
3000	-		4			580	45
3500	-		5	500	630	690	45
-	4000		3			660	40
-	4500		3			735	50
4000	5000	Z	4			810	40
4500	5500		4			840	45
5000	6500		5			1005	45

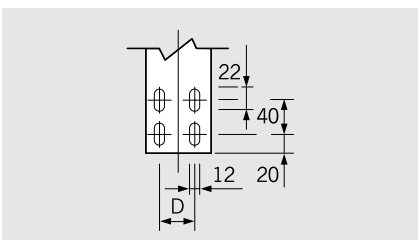
Note) 1. H=450mm is subjected to be changed on condition.
2. C and F dimensions are shown on the detail of Flanged End.
3. External dimensions can be changed if applied to generators



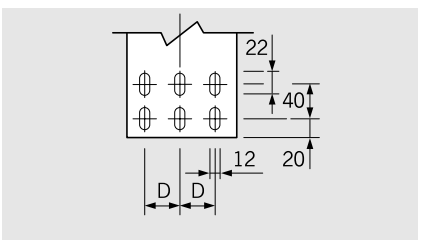
Detail of the bus terminal



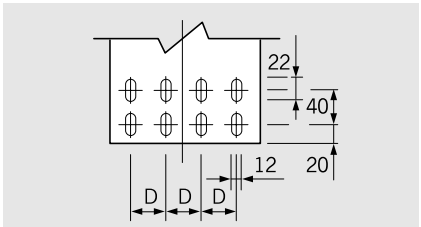
<Fig.1>



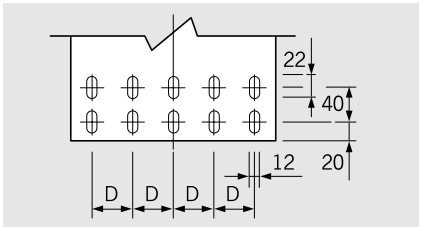
<Fig.2>



<Fig.3>

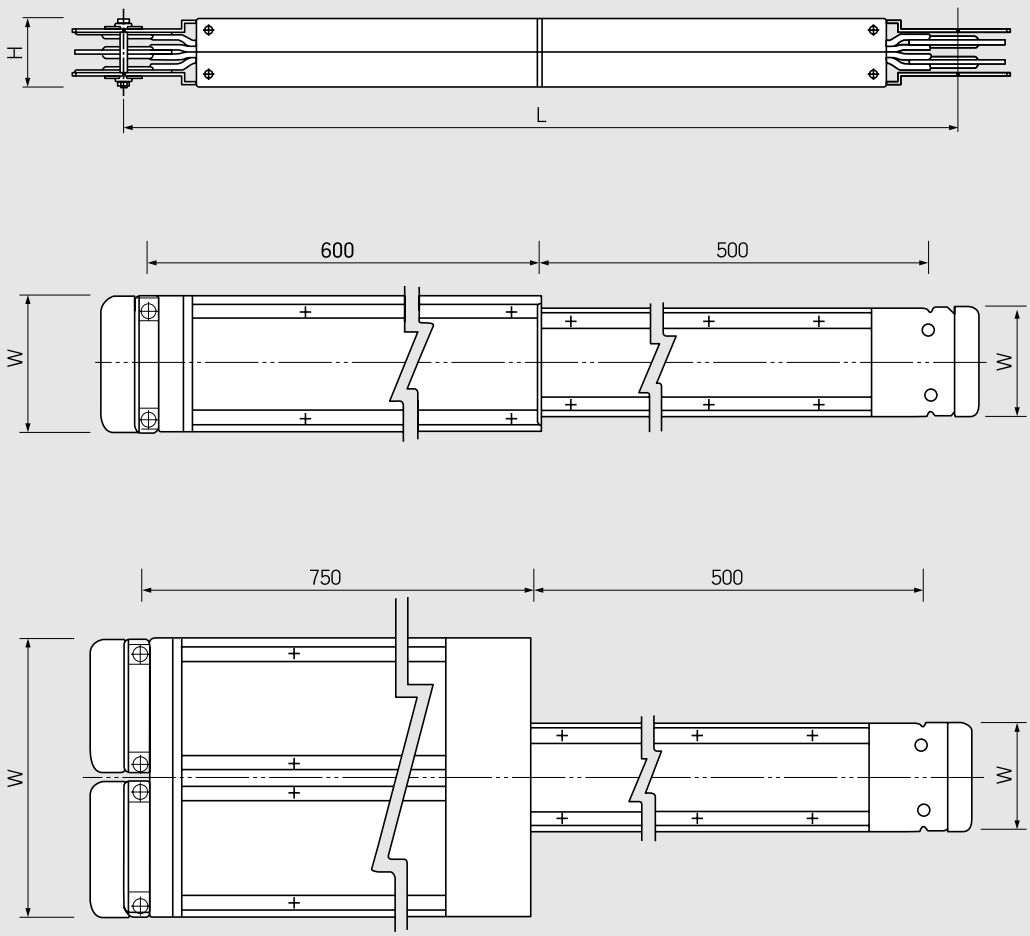


<Fig.4>



<Fig.5>

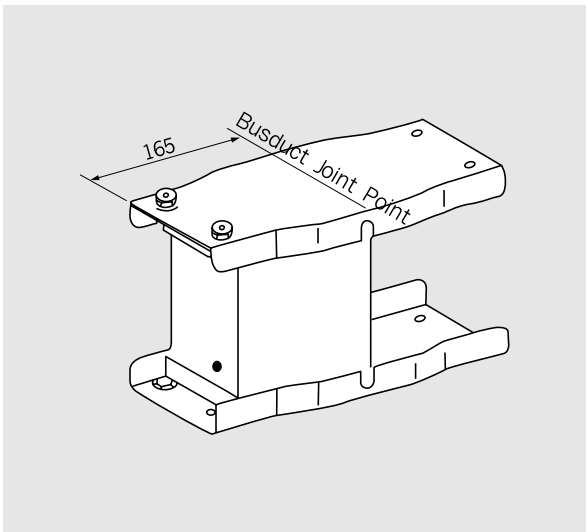
10. Reducer



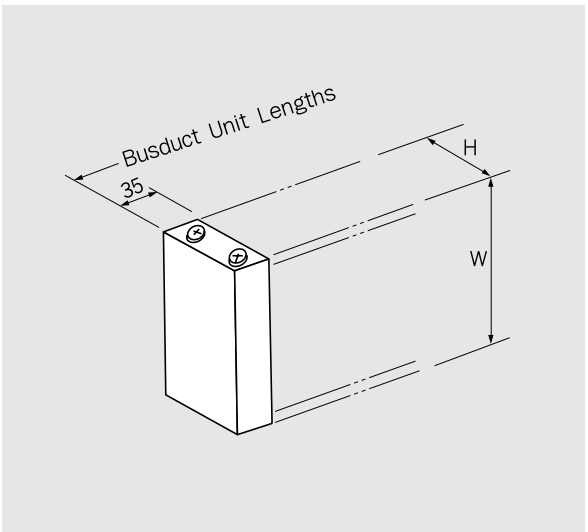
Note) 1. L is Busduct length to be changed on condition.
2. H and W dimensions are shown on the cross section dimensions.
3. Other shapes of reducers are available

11. End Closure, End Cap

● End Closure

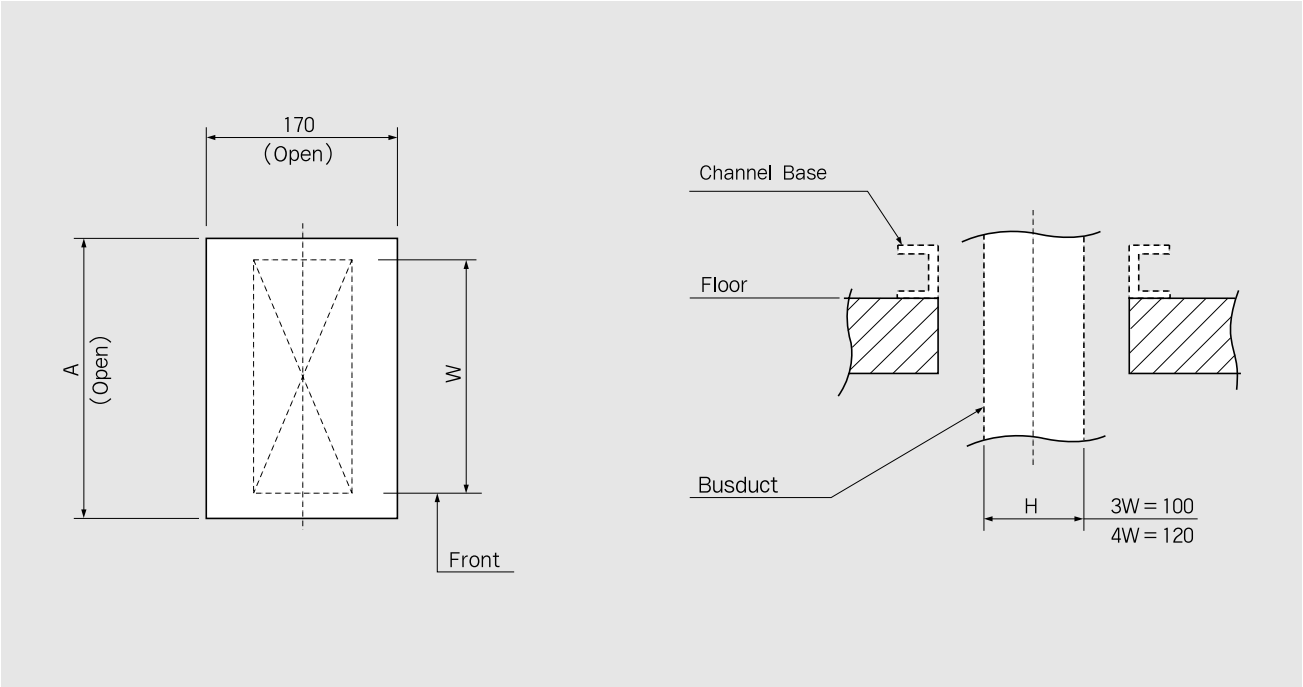


● End Cap



12. Floor Flange

● Floor Flange and open dimensions



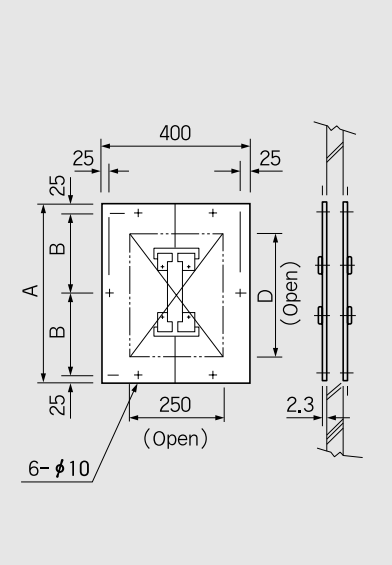
Note) 1. Floor flange is combined with Channel base
2. The dimensions are for Floor open
3. Contact us if modification is required on the site condition
4. Refer to the above dimensions in doing opening for easy installation of Busduct
5. Refer to the cross section of Busduct for the dimensions, W and H

Rated current(A)		A
Al	Cu	
	600	135
600	800	145
800	1000	170
1000	1200	195
1200	1350 1500	220
1350	1600	245
1500		270
1600	2000	280
2000		335
	2500	420
2500	3000	470
3000		540
	3500	520
3500		650
	4000	620
4000	5000	770
	4500	695
4500	5500	800
5000	6500	965

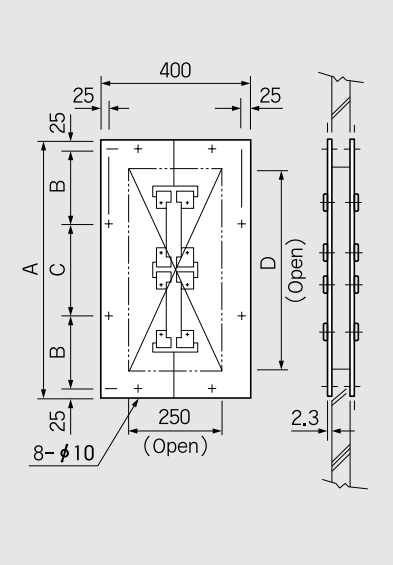
Note) 'A' values are according to standard dimensions

13. Wall Flange

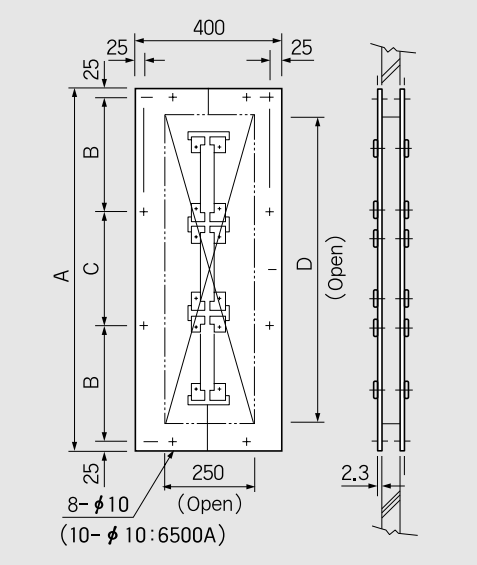
● Indoor Wall Flange and open dimensions



<Fig.A>

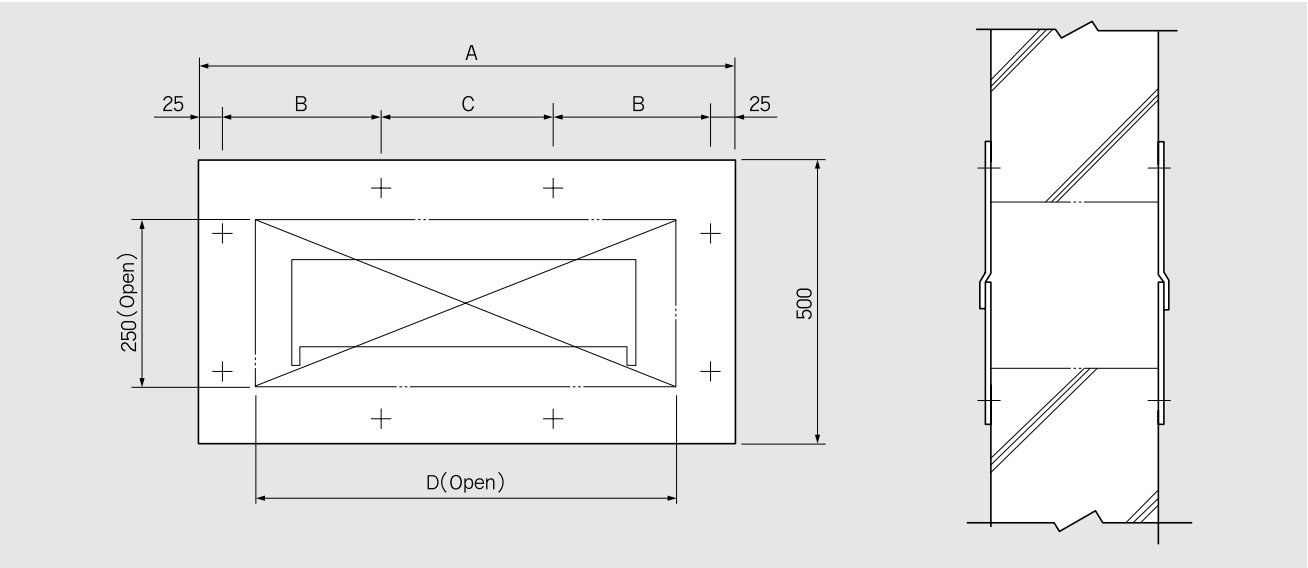


<Fig.B>



<Fig.C>

● Outdoor Wall Flange and open dimensions



<Fig.D>

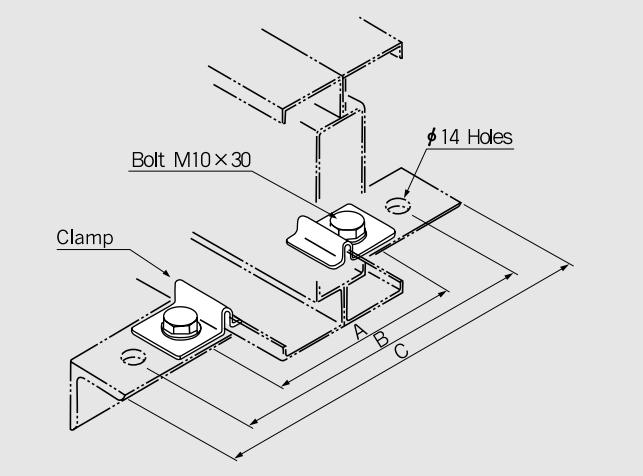
Rated current(A)		Fig.		Dimension(mm)			
Al	Cu	Indoor	Outdoor	A	B	C	D
	600			390	170	0	240
600	800			400	175	0	250
800	1000			420	185	0	270
1000	1200			450	200	0	300
1200	1350,1500	A	D	470	210	0	320
1350	1600			500	225	0	350
1500	-			520	235	0	370
1600	2000			530	240	0	380
2000	-			590	270	0	440

Rated current(A)		Fig.		Dimension(mm)			
Al	Cu	Indoor	Outdoor	A	B	C	D
-	2500			670	185		520
2500	3000			720	210		570
-	3500	B		770	235	250	620
3000	-			790	245		640
3500	-		D	900	300		750
-	4000			870	285	250	720
-	4500			950	300	300	800
4000	5000	C		1020	325	320	870
4500	5500			1050	335	330	900
5000	6500			1230	295	0	1080

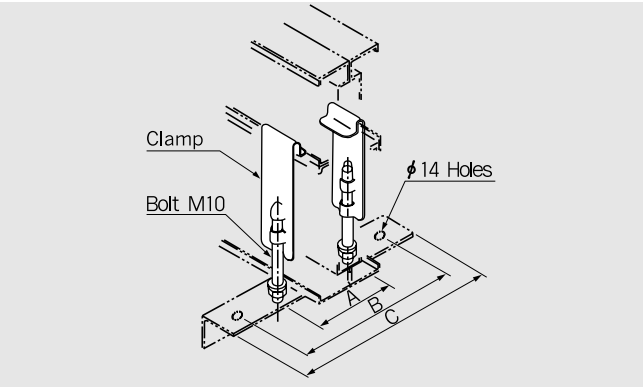
Note) In case of rating 5000A and 6000A B dimension is applied 4 times at Fig. C and D

14. Hanger

● Edgewise Hanger : HEH Type



<Fig.1>

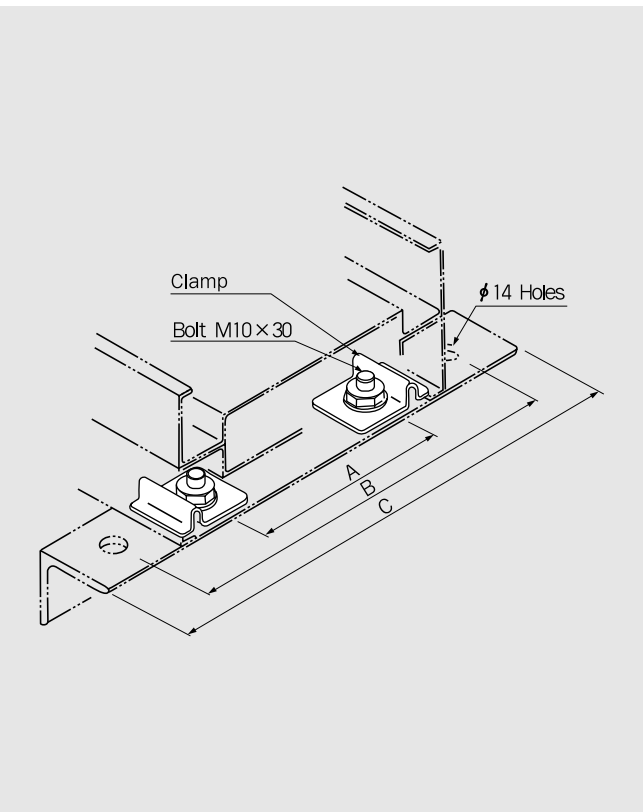


<Fig.2>

Rated current (A)	Fig.	Dimension(mm)					
		A		B		C	
		3W	4W	3W	4W	3W	4W
600 800 1000 1200 1300 1500 1600 2000	1	140	160	220	240	280	300
2500 3000 3500 4000 4500 5000 5500, 6500	2	112	132	200	220	260	280

Note) 1. Clamp, Clamping bolt are supplied together with Busduct, however the items such as Hanger support, Angle, Stud bolt and Anchor bolt are out of standard supply. Please specify if non-standrad items are required.
2. Dimensions for B and C are reference data for Hanger support and Angle, respectively.
3. Stud bolt is M12 and 2m long as standard.

● Flatwise Hanger : HFH Type

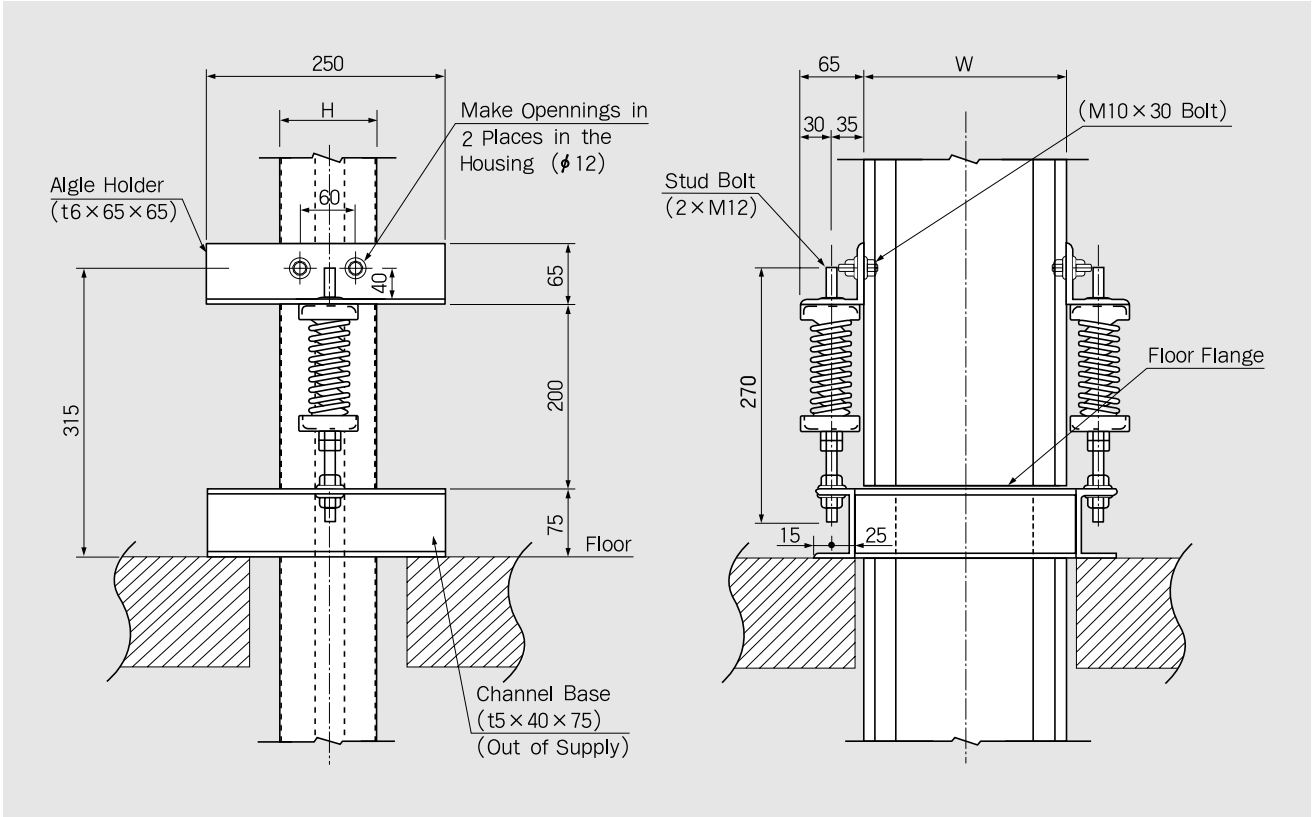


Rated current(A)		Dimension(mm)		
Al	Cu	A	B	C
-	600	38	165	225
600	800	48	175	235
800	1000	73	200	260
1000	1200	98	225	285
1200	1350, 1500	123	250	310
1350	1600	148	275	335
1500	-	173	300	360
1600	2000	183	310	370
2000	-	238	365	425
-	2500	323	450	510
2500	3000	373	500	560
-	3500	423	550	610
3000	-	443	570	630
-	4000	523	650	710
3500	-	553	680	740
-	4500	598	725	785
4000	5000	673	800	860
4500	5500	703	830	890
5000	6500	868	995	1055

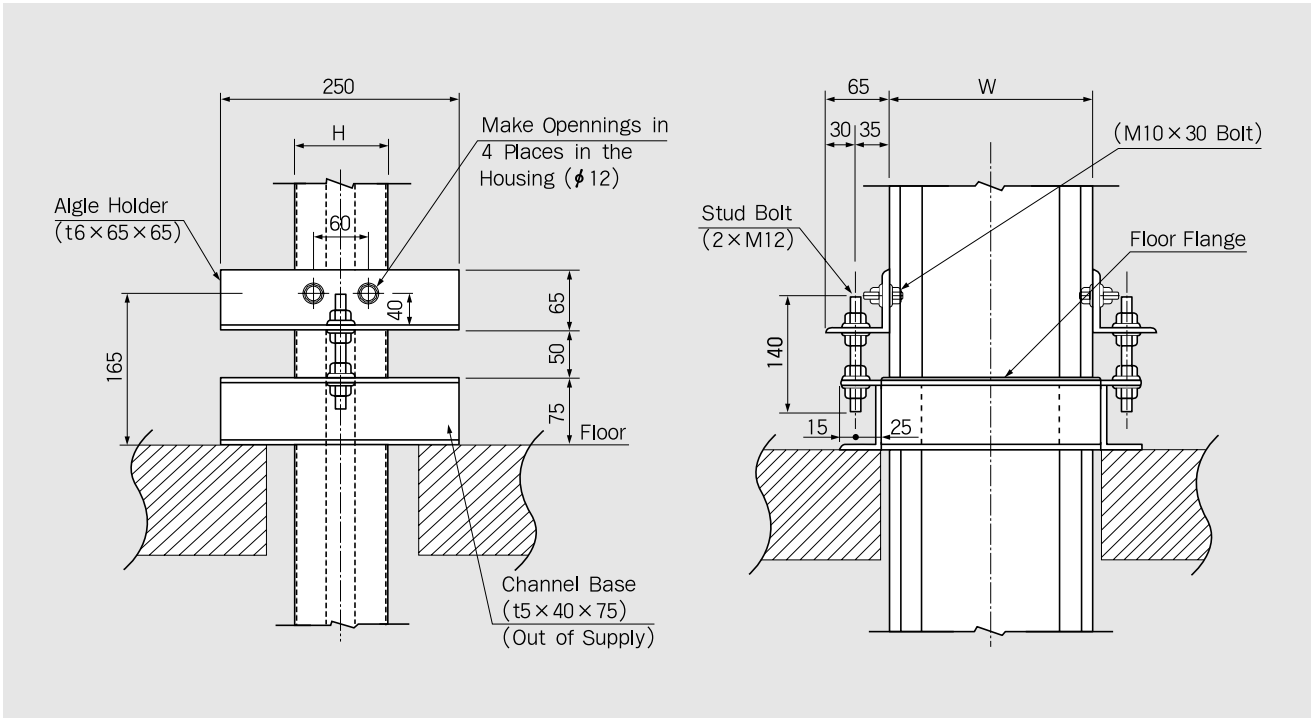
Note) 1. Clamp, Clamping bolt are supplied together with Busduct, however the items such as Hanger support, Angle, Stud bolt and Anchor bolt are out of standard supply. Please specify if non-standrad items are required.
2. Dimensions for B and C are reference data for Hanger support and Angle, respectively.
3. Stud bolt is M12 and 2m long as standard.

15. Vertical fixed(Spring) Hanger

● Vertical Spring Hanger(600A~1000A)

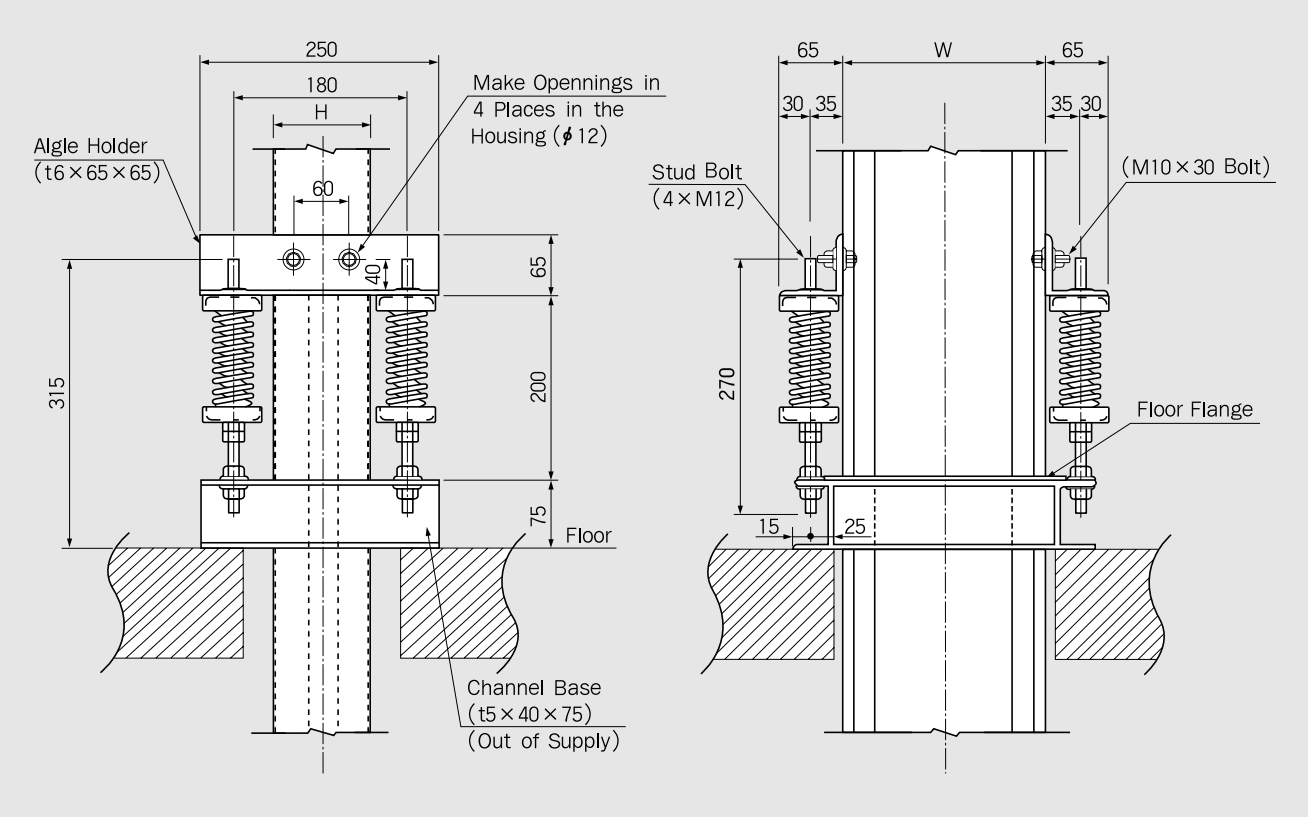


● Vertical Fixed Hanger(600A~1000A)

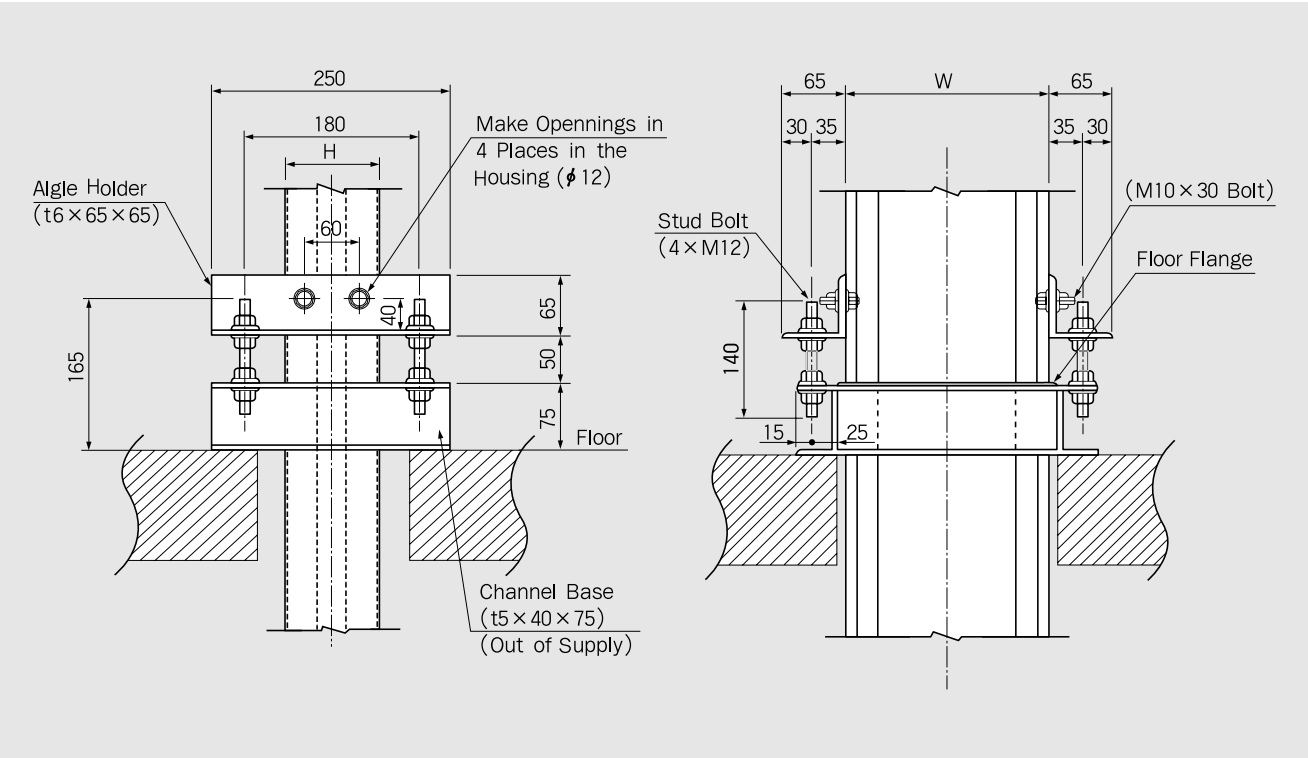


Note) 1. Install after drilling of ø 12 with fitting Holder to Busduct
2. Base channel dimensions are only for reference
3. Coil spring to be black coated
4. Refer to the cross section for W and H dimensions
5. Specify if the channel base is required additionally

● Vertical Spring Hanger(1200A~3500A)

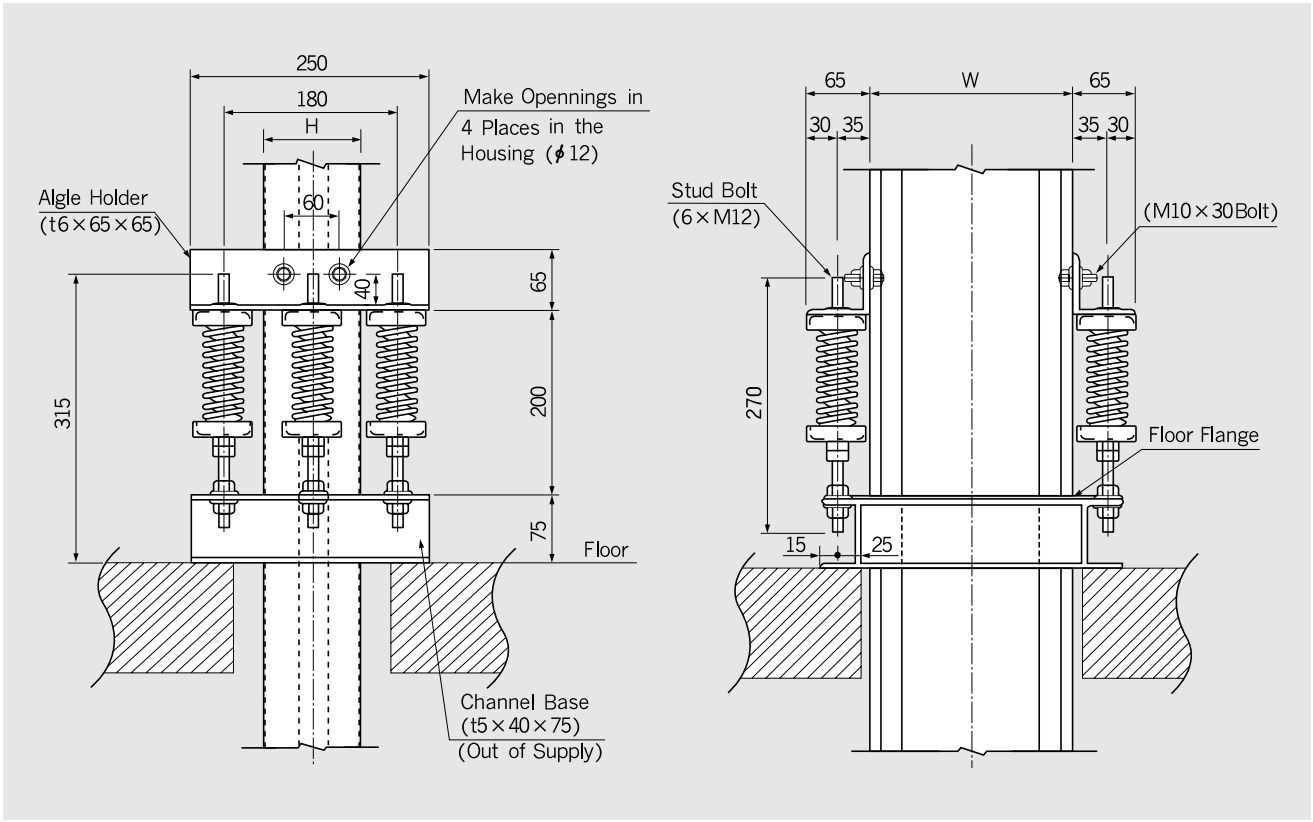


● Vertical Fixed Hanger(1200A~3500A)

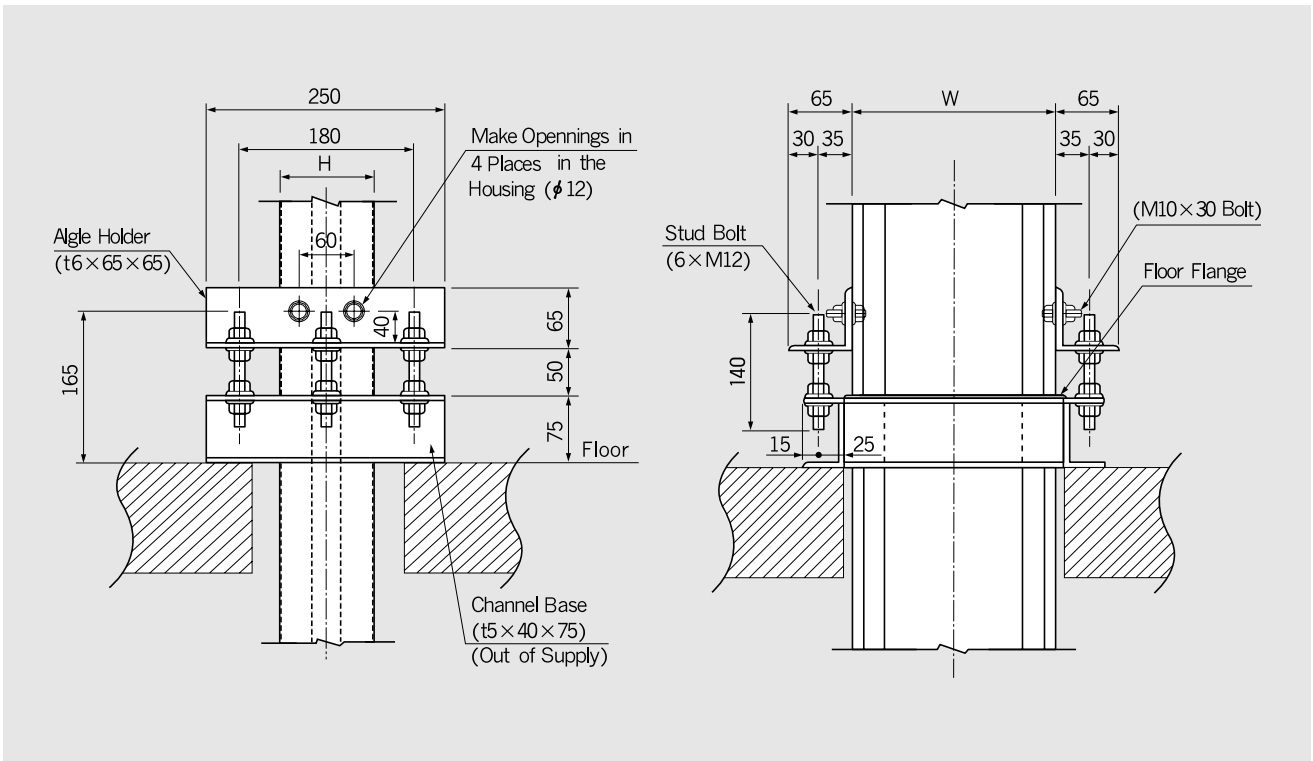


Note) 1. Install after drilling of ø 12 with fitting Holder to Busduct
2. Base channel dimensions are only for reference
3. Coil spring to be black coated
4. Refer to the cross section for W and H dimensions
5. Specify if the channel base is required additionally

● Vertical Spring Hanger(4000A~6500A)



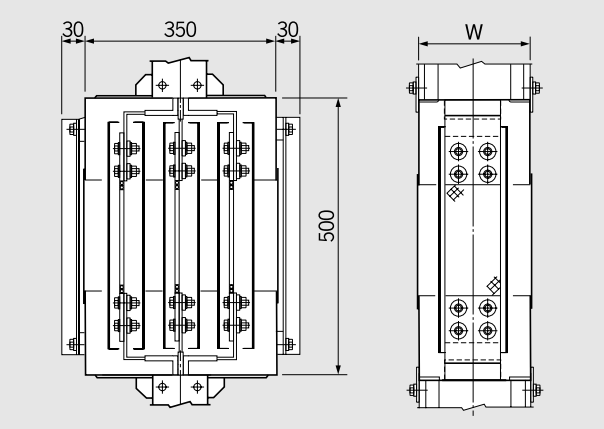
● Vertical Fixed Hanger(4000A~6500A)



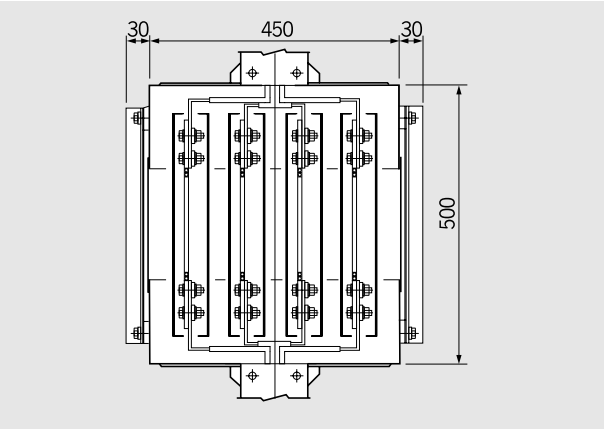
Note) 1. Install after drilling of ø 12 with fitting Holder to Busduct
2. Base channel dimensions are only for reference
3. Coil spring to be black coated
4. Refer to the cross section for W and H dimensions
5. Specify if the channel base is required additionally

16. Expansion Unit

● **3W**



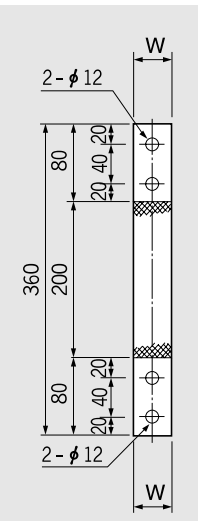
● **4W**



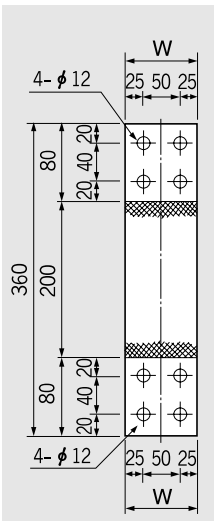
Rated current(A)		Dimensions(mm)
Al	Cu	W
-	600	115
600	800	125
800	1000	150
1000	1200	175
1200	1350, 1500	200
1350	1600	225
1500	-	250
1600	2000	260
2000	-	315
-	2500	400
2500	3000	450
-	3500	500
3000	-	520
3500	-	630
-	4000	600
-	4500	675
4000	5000	755
4500	5500	780
5000	6500	945

Note) Refer to the cross section for W

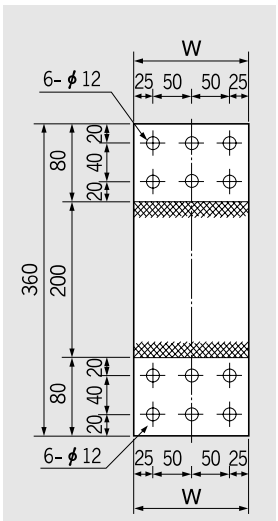
17. Flexible Conductor



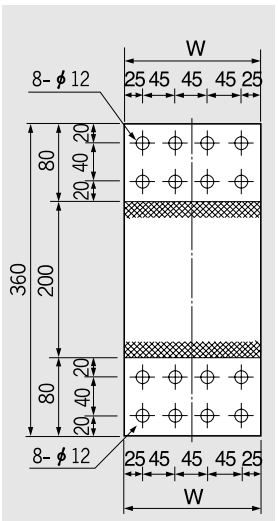
<Fig. A>



<Fig. B>



<Fig. C>



<Fig. D>

Rated current(A)	Fig.	W
600	A	40
800		50
1200	B	100
1600	C	150
2000	D	185
3000	1600A × 2	
4500	1600A × 3	

Note) 1. The above is reference data for Cu type Busduct. Please contact for Al type
2. They are Braided Type
3. Please contact for more information not mentioned here

18. Plug-in Box(3 ø 4W)

(1) Safety lock

Safety lock is used in the Plug-in Box except Fuse type.
Door interlock : Door is locked when the breaker is closed(ON).
Interlock with Busduct : Plug-in Box can not removed from Busduct when the breaker is closed(ON).

(2) Knock-out hole

Company standard knock-outs are provided.

(3) Neutral pole

The neutral pole is located on the right.

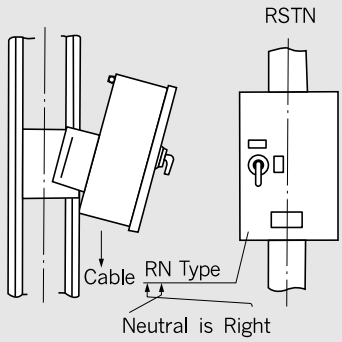
(4) Door opening direction

Right hinge type is used for the door. Left hinge type is optional.

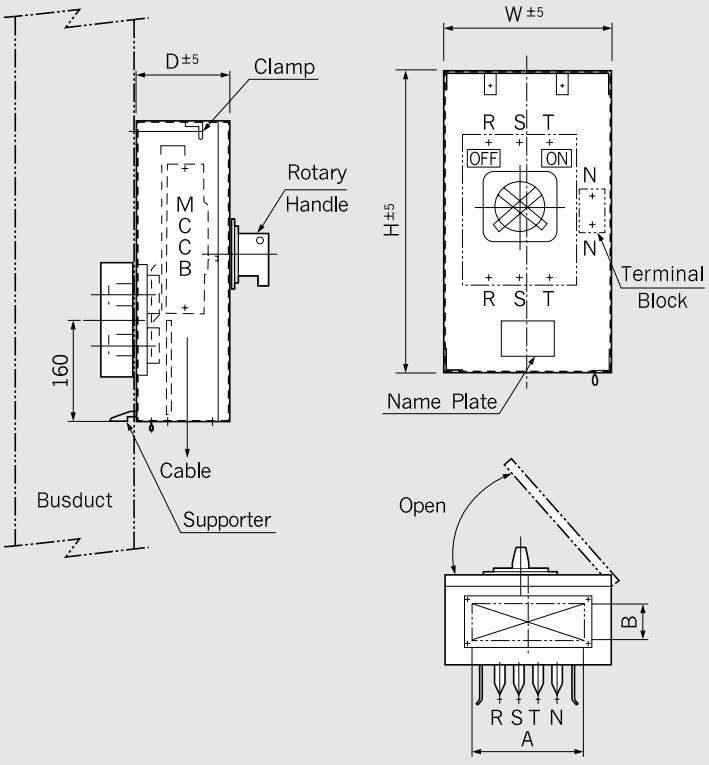
(5) Earthing

Connect the earting support of the plug-in box with the Busduct before installing of the plug-in box.

Vertical Mounting (Example)



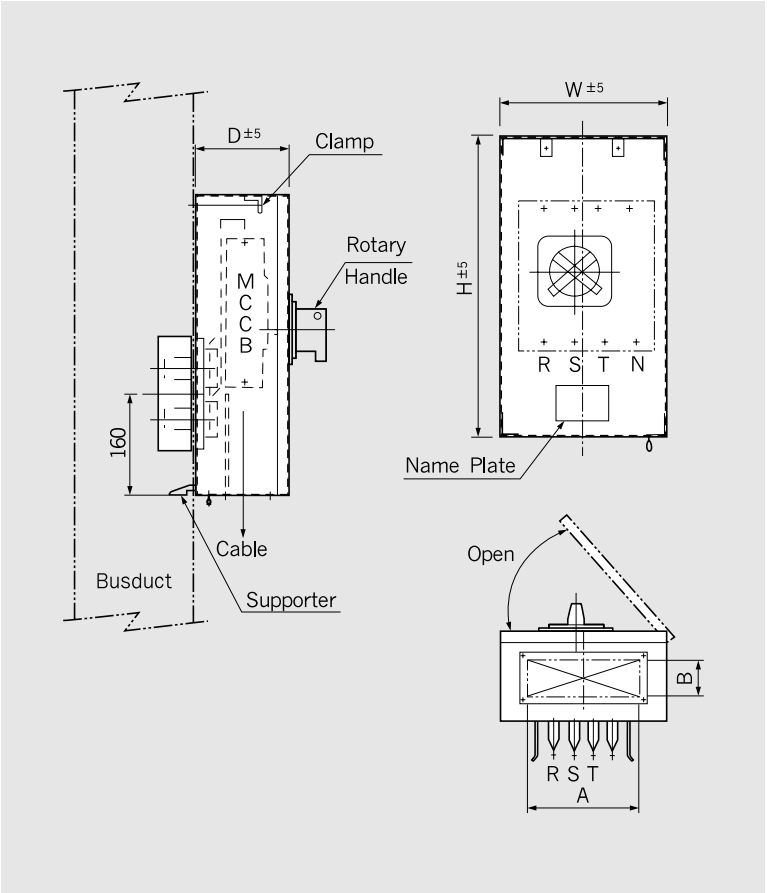
● With Molded Case Circuit Breaker Type(MCCB-Type, 3P+T/B) : External Operation



Frame (AF)	MCCB	Dimension			Cable hole	
		W	H	D	A	B
50AF	ABH53b	230	400	175	120	60
	ABL53a	230	400	195	120	60
100AF	ABS103b	230	400	175	120	60
	ABH103b					
	ABL103a	230	400	195	120	60
225AF	ABS203b	250	440	195	140	60
	ABH203a	250	440	235	140	60
	ABL203a					
400AF	ABS403b	320	600	250	240	100
	ABH403b					
	ABL403b					

Note) 1. Tap box is used for over 400A
2. MCCB models are from LSIS

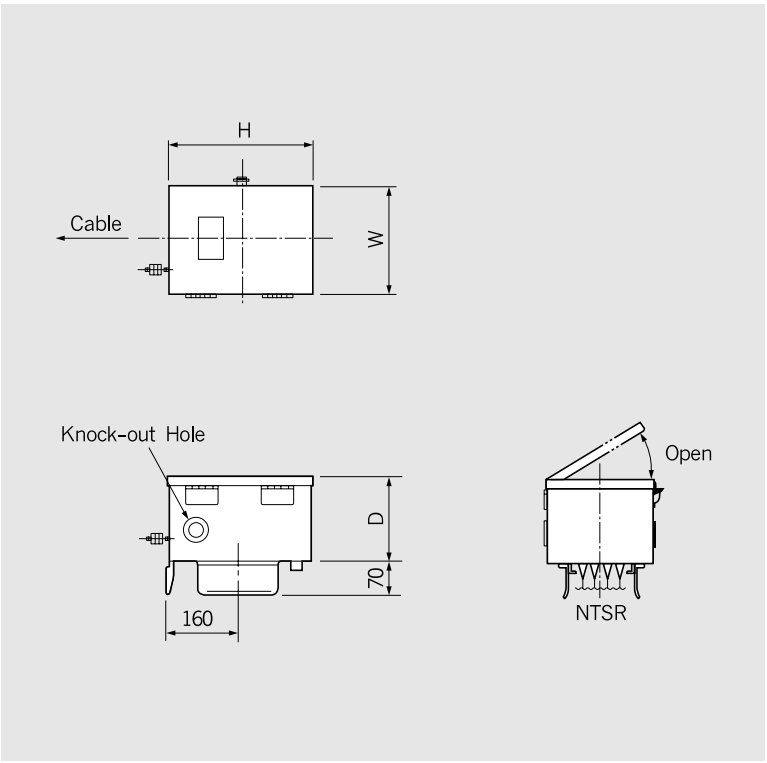
● MCCB-Type(4P) : External Operation



Frame (AF)	MCCB	Dimension			Cable hole	
		W	H	D	A	B
50AF	ABH54b	230	400	175	120	60
	ABL54a	230	400	195	120	60
100AF	ABS104b	230	400	175	120	60
	ABH104b					
	ABL104a	230	400	195	120	60
225AF	ABS204b	250	440	195	140	60
	ABH204a	250	440	235	140	60
	ABL204a					
400AF	ABS404b	320	600	250	240	100
	ABH404b					
	ABL404b					

Note) 1. Tap box is used for over 400A
2. MCCB models are from LSIS

● With Fuse Type(F-Type)

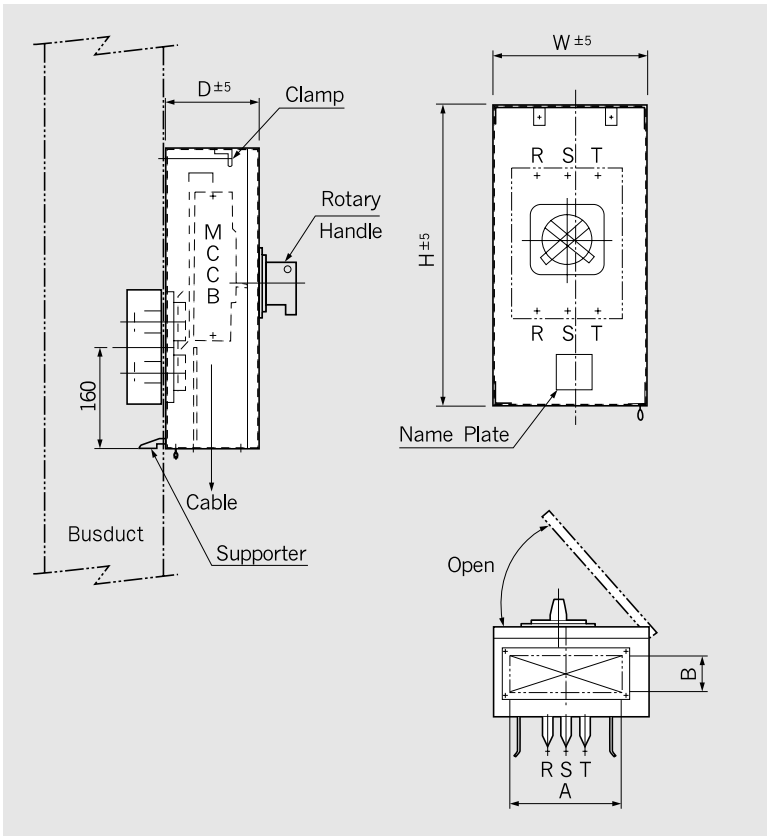


Ampere Rating	W	H	D	Fuse Type
100A	280	500	200	Size 00
200A	420	600	250	Size 1
400A	420	600	250	Size 2

Note) 1. Tap box is used for over 400A
2. Please consult us for Fuse type

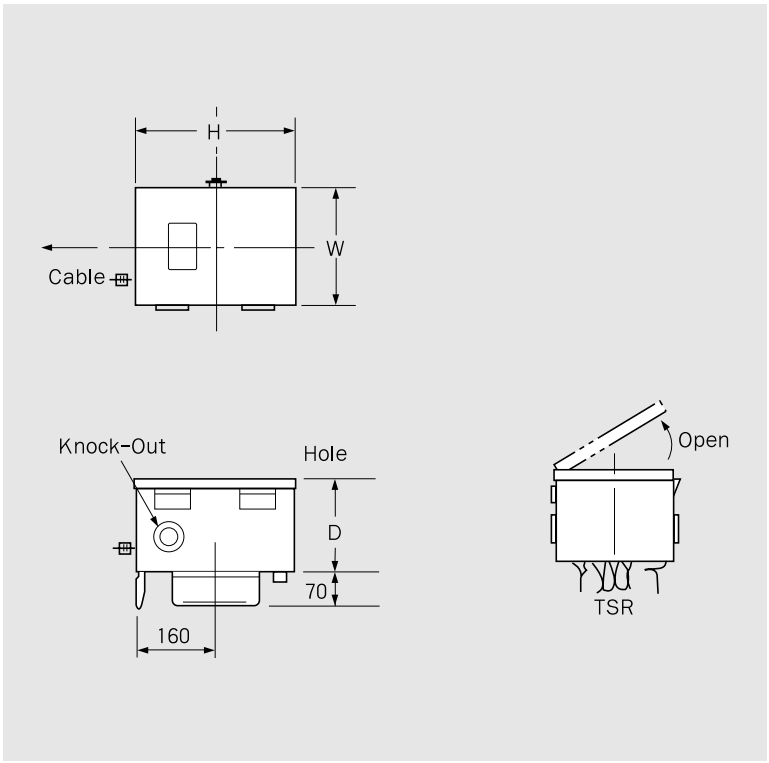
19. Plug-in Box(3 ø 3W)

● With Molded Case Circuit Breaker Type(MCCB-Type) : External Operation



Frame (AF)	MCCB	Dimension			Cable hole	
		W	H	D	A	B
50AF	ABH53b	200	400	175	90	60
	ABL53a	200	400	195	90	60
100AF	ABS103b	200	400	175	90	60
	ABH103b					
	ABL103a	200	400	195	90	60
225AF	ABS203b	200	440	195	90	60
	ABH203a	200	440	235	90	60
	ABL203a					
400AF	ABS403b	240	600	250	150	100
	ABH403b					
	ABL403b					

● With Fuse Type(F-Type)

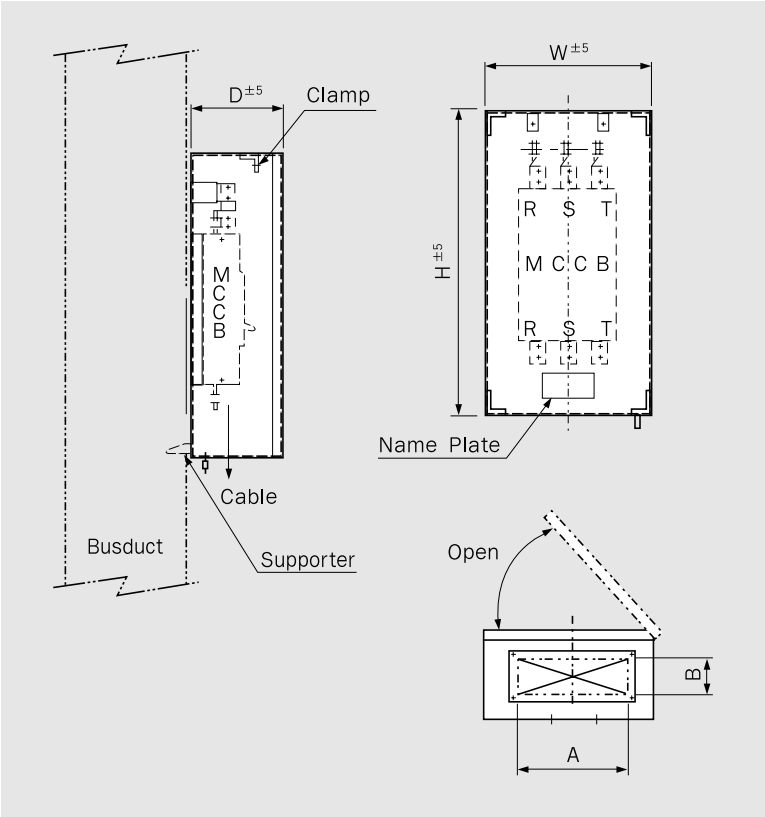


Ampere rating	W	H	D	Fuse type
100A	250	500	200	Size 00
200A	400	600	250	Size 1
400A	400	600	250	Size 2

Note) 1. Tap box is used for over 400A
2. Please consult us for Fuse type

20. Tap Box(3 ø 3W) : Bolt-on type

● With Molded Case Circuit Breaker Type(MCCB-Type) : Internal Operation

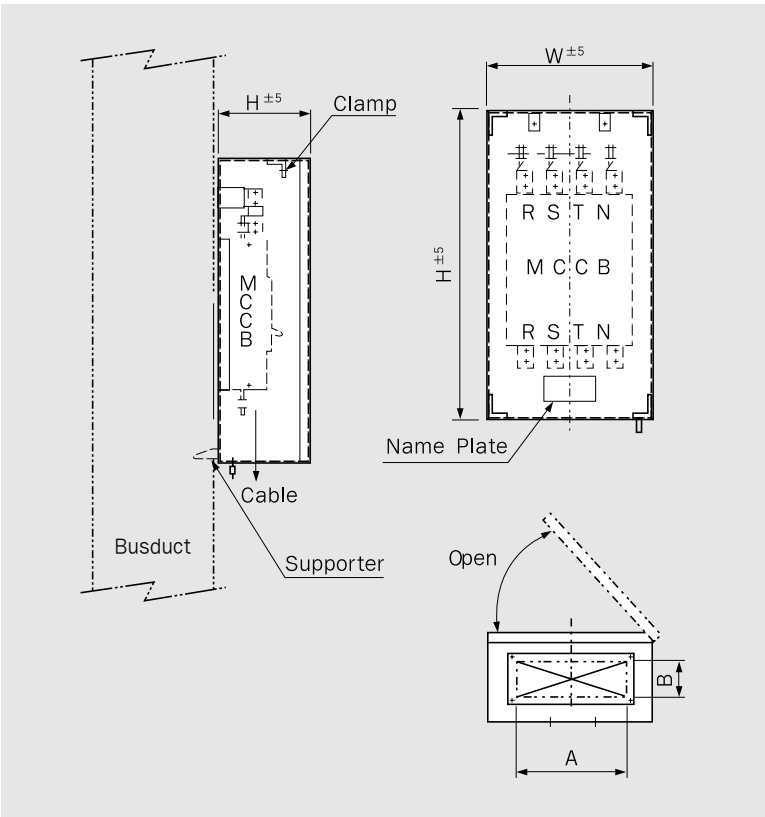


Frame (AF)	MCCB	Dimension			Cable hole	
		W	H	D	A	B
600AF	ABS603b	300	850	200	240	100
	ABL603b					
800AF	ABS803b	300	850	200	240	100
	ABL803b					
1000AF	ABS1003	350	1100	220	240	150
	ABL1003	350	1100	260	240	150
1200AF	ABS1203	350	1100	250	240	150
	ABL1203	350	1100	265	280	150

Note) 1. MCCB models are from LSIS

21. Tap Box(3 ø 4W) : Bolt-on type

● Tap Box(MCCB-Type, 4P) : Internal Operation



Frame (AF)	MCCB	Dimension			Cable hole	
		W	H	D	A	B
600AF	ABS604b	365	850	200	270	120
	ABL604b					
800AF	ABS804b	365	850	200	270	120
	ABL804b					
1000AF	ABS1004	400	1100	220	280	150
	ABL1004	400	1100	260	280	150
1200AF	ABS1204	420	1100	250	280	150
	ABL1204	420	1100	265	280	150

Note) 1. MCCB models are from LSIS

Busduct system design manual

1. Considerations in layout design

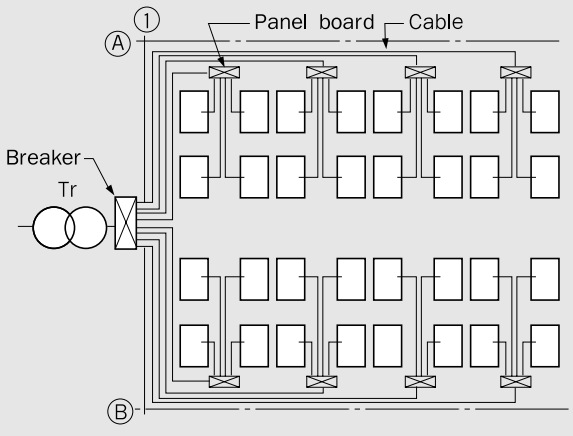
- The current and future loads should be condered in rated current of the busduct
- If the ambient temperature exceeds 40℃, the rated current needs to be compensated. (See the reference table)
- Voltage drop should be considered if the long busducts are used.
- Consider the mechanically thermal strength of the busduct concerning short-circuit current.
- Lower rating Busduct can be used if Reducer is properly used in the Busduct Route.
- Plug-in box is recommended for the connection of the load side and spare plug-in hole for future load should be considered.
- Straight arrangement is recommendable. Try not to use Elbow if possible.
- Install it in the place that is dry and easy for maintenance.
- Consulting with maker is recommendable for install route.
- Remember it is tough to modify and change the spec during Busduct produing and installation.

2. Reasonable distribution system design

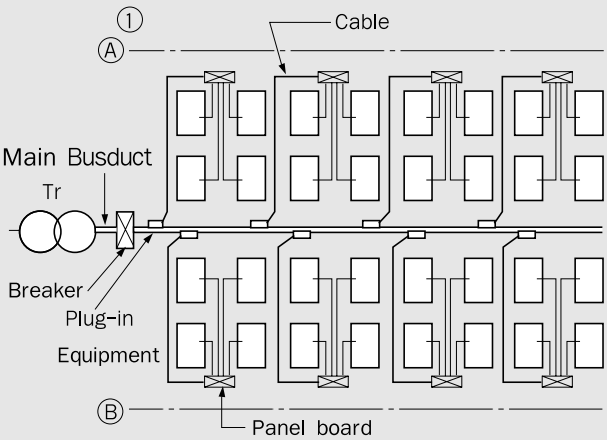
(1) Drawing A : Conventional design that needs complicate distribution works and is not easy to maintenance.

(2) Drawing B : More reasonable and economical than Drawing A in distribution system and works.

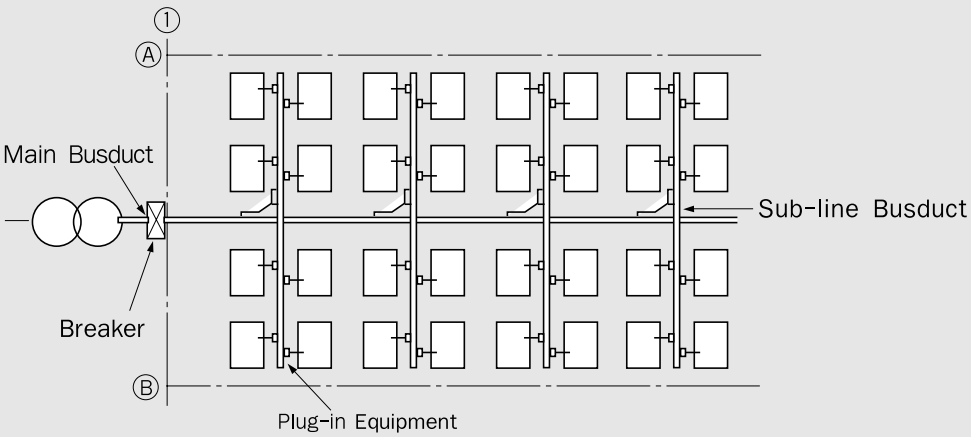
(3) Drawing C : More reasonable and economical than Drawing A and B in distribution system and works.
It also provides more advantages in maintenance, increasing of branch, modifying of layout and less expenses in installation works.



<Drawing A>



<Drawing B>

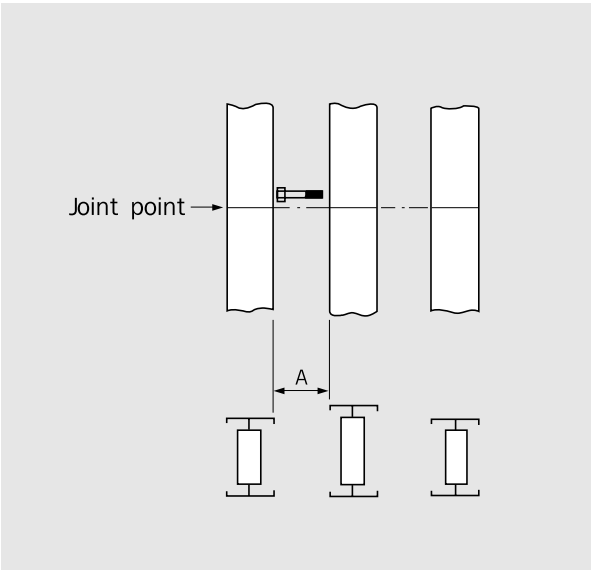


<Drawing C>

3. Minimum distance between parallel-installed Busduct

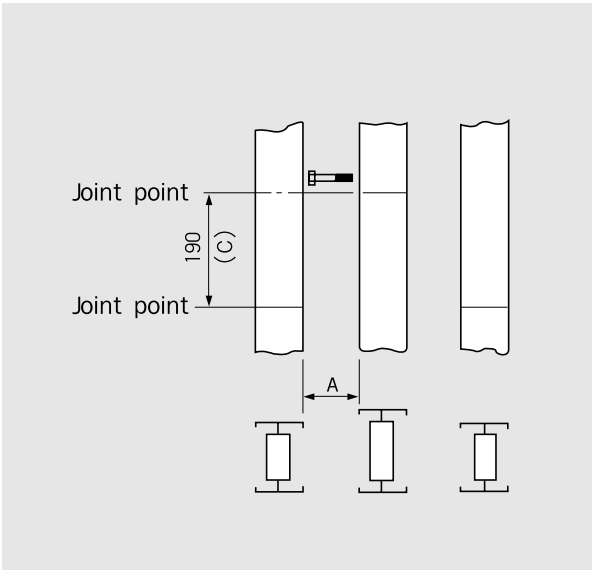
● Indoor type

In case bus duct joints come side by side



Rated current (A)	'A' Dimensions (mm)	
	3W	4W
600-6500	150	160

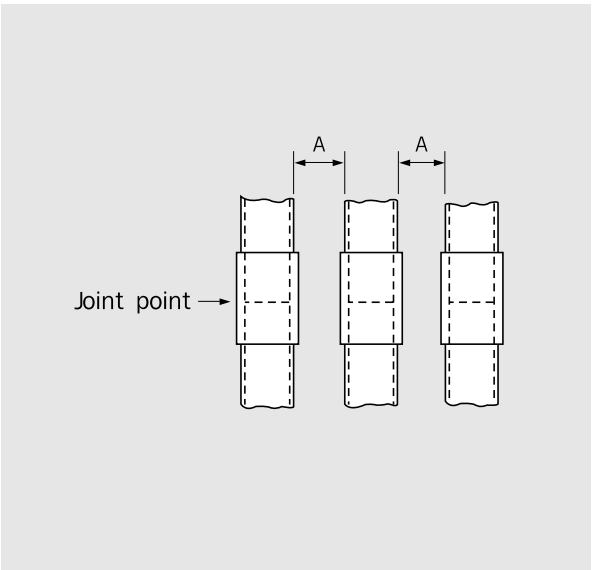
In case bus ducts joints deviate from each other.
(In case 'C' in the following figure is above 190 mm)



Rated current (A)	'A' Dimensions (mm)	
	3W	4W
600-6500	85	95

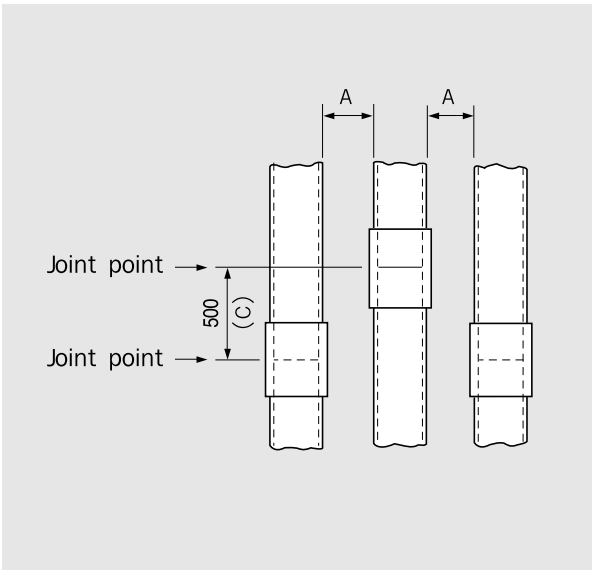
● Outdoor type

In case bus duct joints come side by side



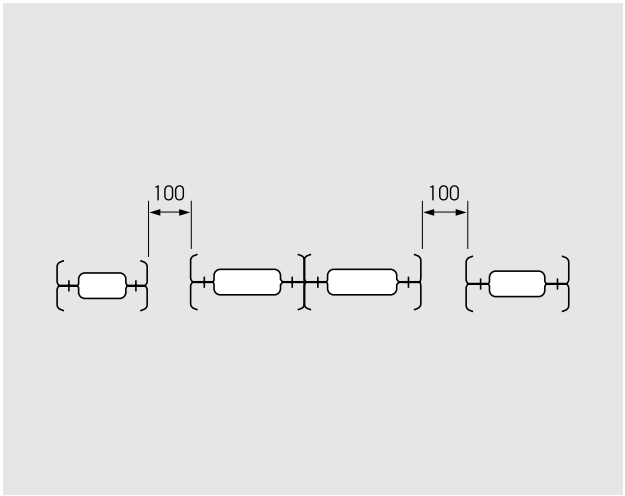
Rated current (A)	'A' Dimensions (mm)	
	3W	4W
600-6500	200	250

In case bus ducts joints deviate from each other.
(In case 'C' in the following figure is above 500 mm)

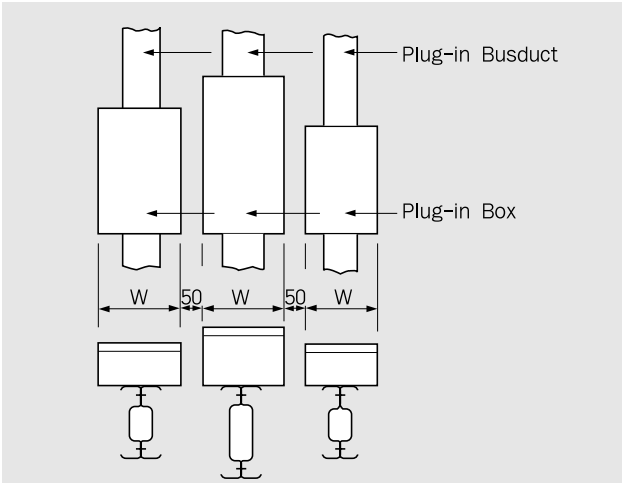


Rated current (A)	'A' Dimensions (mm)	
	3W	4W
600-6500	150	180

Minimum clearance of bus ducts installed flat in parallel.

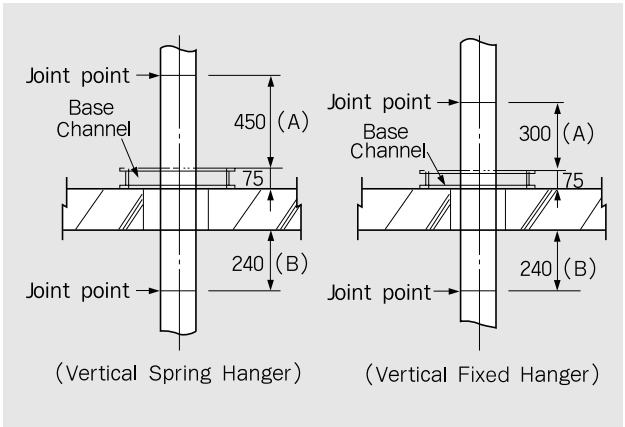


Minimum clearance of plug-in bus ducts installed in parallel.

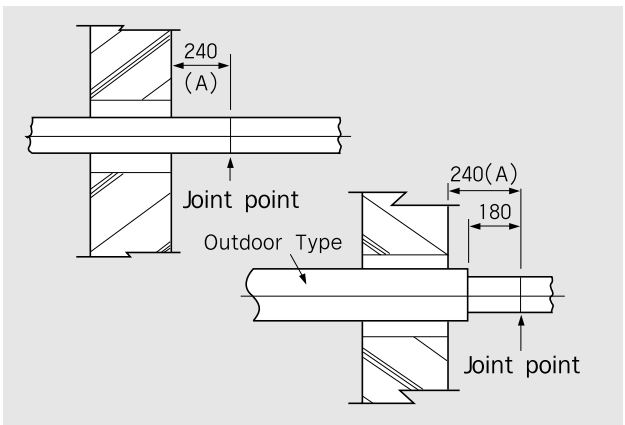


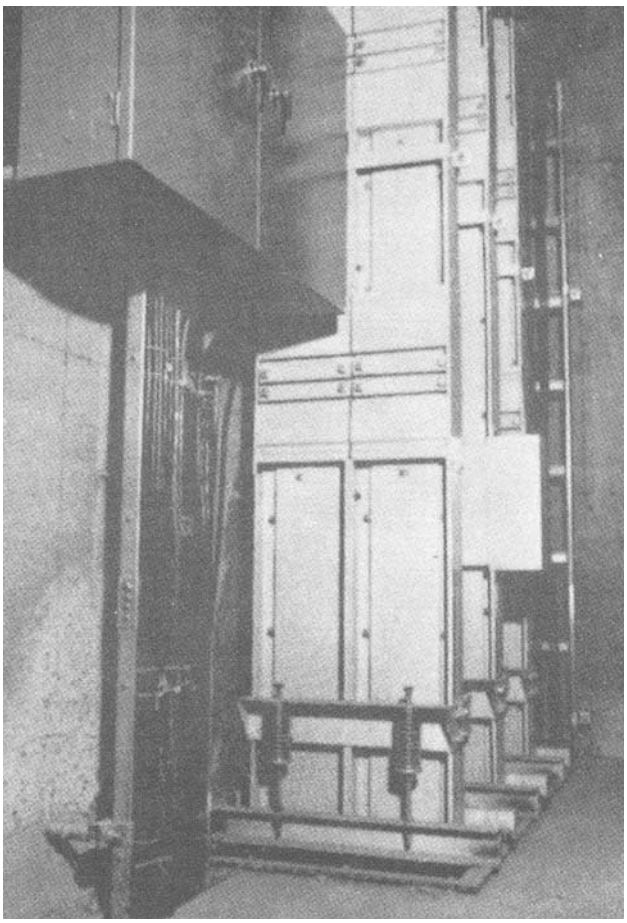
4. Position of the Busduct joint point

Minimum clearance between joint point and the floor (A) and (B)



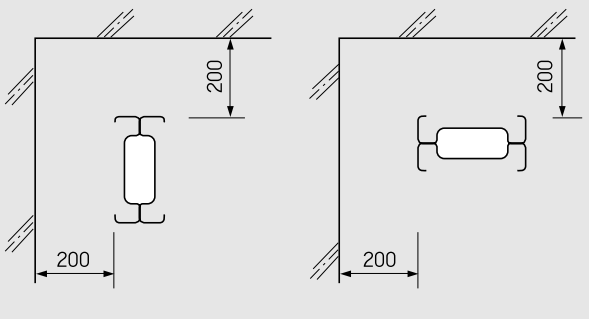
Minimum clearance between joint point and wall (A)



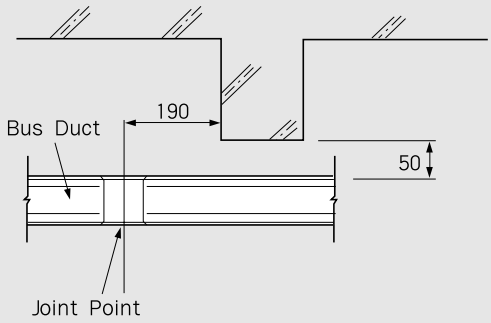


- Joints may not be inside walls or floors.
- Joint point must be more than 240 mm from the surface of a wall.
- If a vertical spring hanger is to be used on a floor, the distance shall be more than 450 mm, while it shall be more than 300mm if a vertical hanger is to be used.
- Floor flange and Wall flange are useful to fill the empty after installation of Busduct
- When each unit is divided from vertical Busduct, the installation of vertical Spring hanger and Fixed hanger should be condsidered.

5. Minimum clearance between bus duct and wall, floor and etc.



A. In the case of ceiling and wall

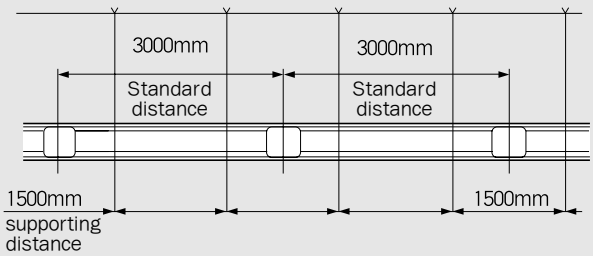


B. In the case of a beam

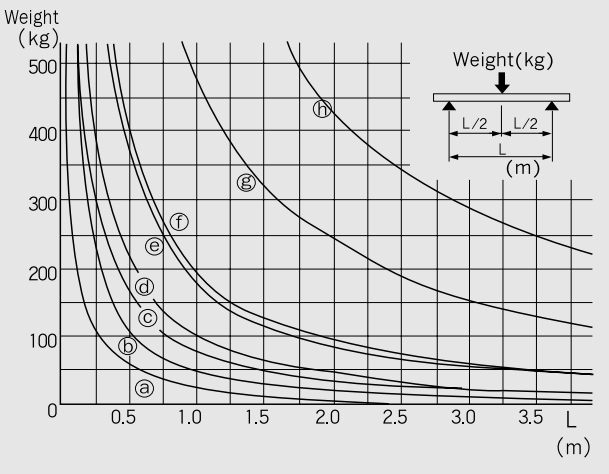
6. Hanger supporting

- Prepare 12mm(1/2") lifting bolts
- Make horizontal level of Busduct with the bolts
- Do not overlap the joint with the lifting bolt
- Busduct shall be fixed with Hanger
- The standard distance between supporters of Busduct shall be 1.5m. It should not be longer than 2m
- In case of more than one Busduct do not separate each Busduct and use one Hanger structure
- The supporters such as Angle and Channel should be selected according to load, supporting distance and its condition.

Standard distance between supporters



Size for supporters



(1) Graph for W and L in case of safety factor Sf=5

(2) Angle and Channel are made of steel

(3) Followings are related formulas

$$\text{Bending stress} = \frac{M}{Z}$$

M : Bending moment

Z : Section modules

Supporting method	Maximum bending moment M	
Both ends supporting	$M = \frac{WL}{4}$	$V = \frac{WL^3}{48EI}$

Note) E=Young' s Modules
I=Second Moment of area

Shapes of steel

	Steel material size	Z (cm^3)	I (cm^3)	Weight (kg/m)
a	40×40×3	1.21	3.53	1.83
b	40×40×5	2.49	9.06	3.06
c	50×50×6	3.55	12.60	4.43
d	65×65×6	8.47	46.10	6.85
e	75×40×5	4.54	12.40	6.92
f	100×50×5	7.82	26.90	9.36
g	75×40×5	20.20	75.90	6.92
h	100×50×5	37.80	189.00	9.36

Note) Z=Section Modules
I=Second Moment of area

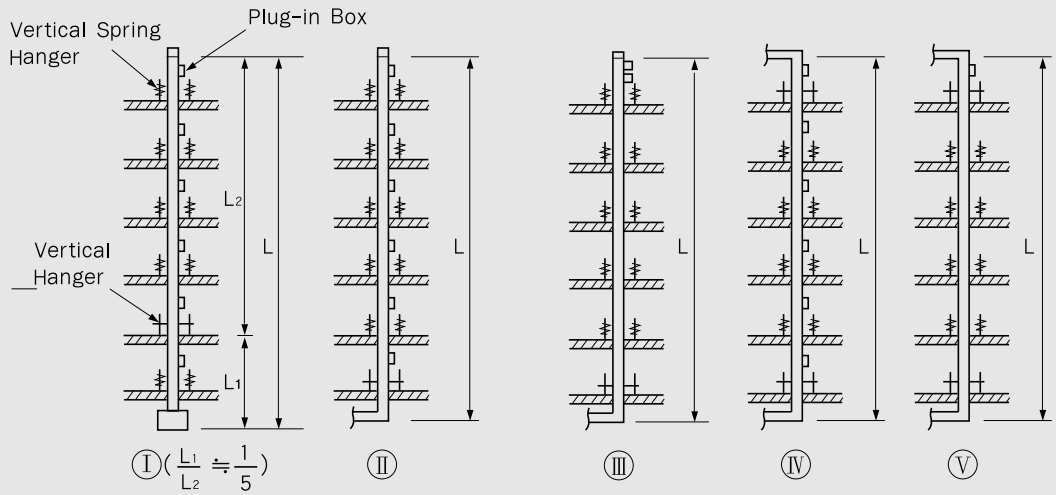
7. How to apply the expansion

Whether or not the expansion unit is determined according to how the bus duct is supported at the two ends of the installation route, whether the bus duct line is branched, and what length the bus duct is installed

Supporting bondition	Branching	Fig.	Length(L)
Both ends free	Branched at each story	I	≦120(m)
One end free One end fixed	Branched at each story	II	≦90(m)
	Not branched	III	≦30(m)
Both ends fixed	Branched at each story	IV	≦30(m)
	Not branched	V	≦15(m)

Note) Following fig. shows How to use the expansion and vertical hanger and vertical spring hanger.

Installation conditions



Basic specification :

1. Use the expansion in case of vertical installation deviating from the above condition.

2. In case of horizontal installation, if necessary, install the expansion unit with the gap between 40 and 50m, where the factors such as ambient temperature, rate of load, installation condition and whether or not elbow is used are considered.

3. Generally the position of expansion unit is made with the approval drawings according to the shape of the Route

8. Actual measurement of busduct

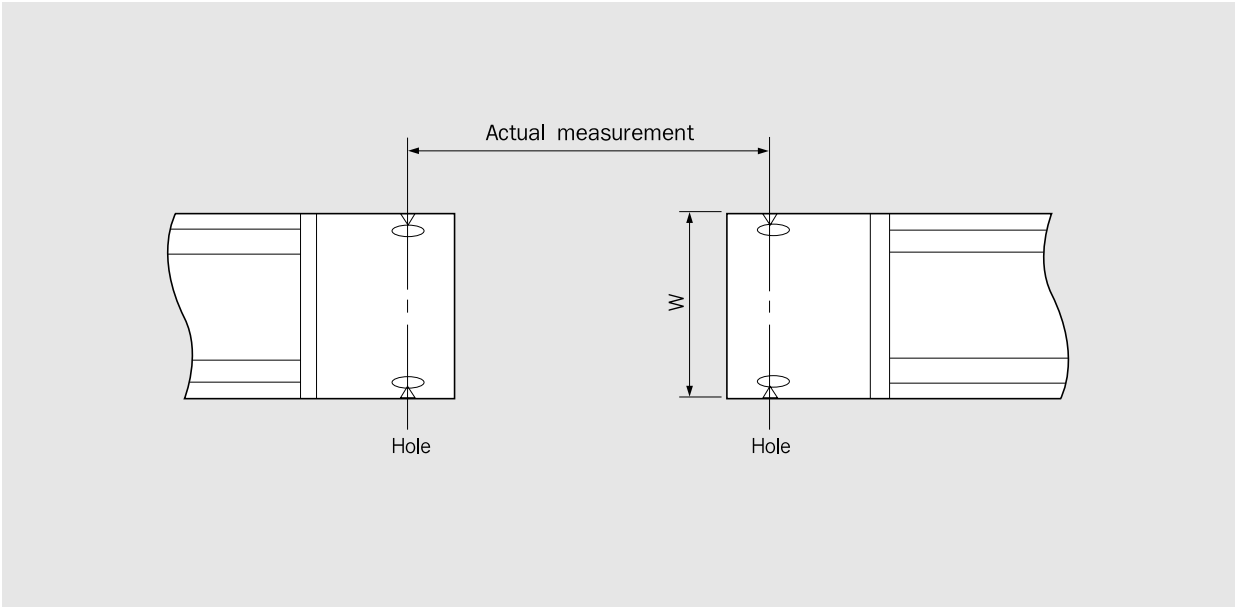
(1) In case there is a remaining porting of actual measurement, contact us with the dimension shown in the drawing below measured.

(2) Take into consideration the work schedule in advance since it takes a minimum of 2 weeks for the actual delivery of the busduct.

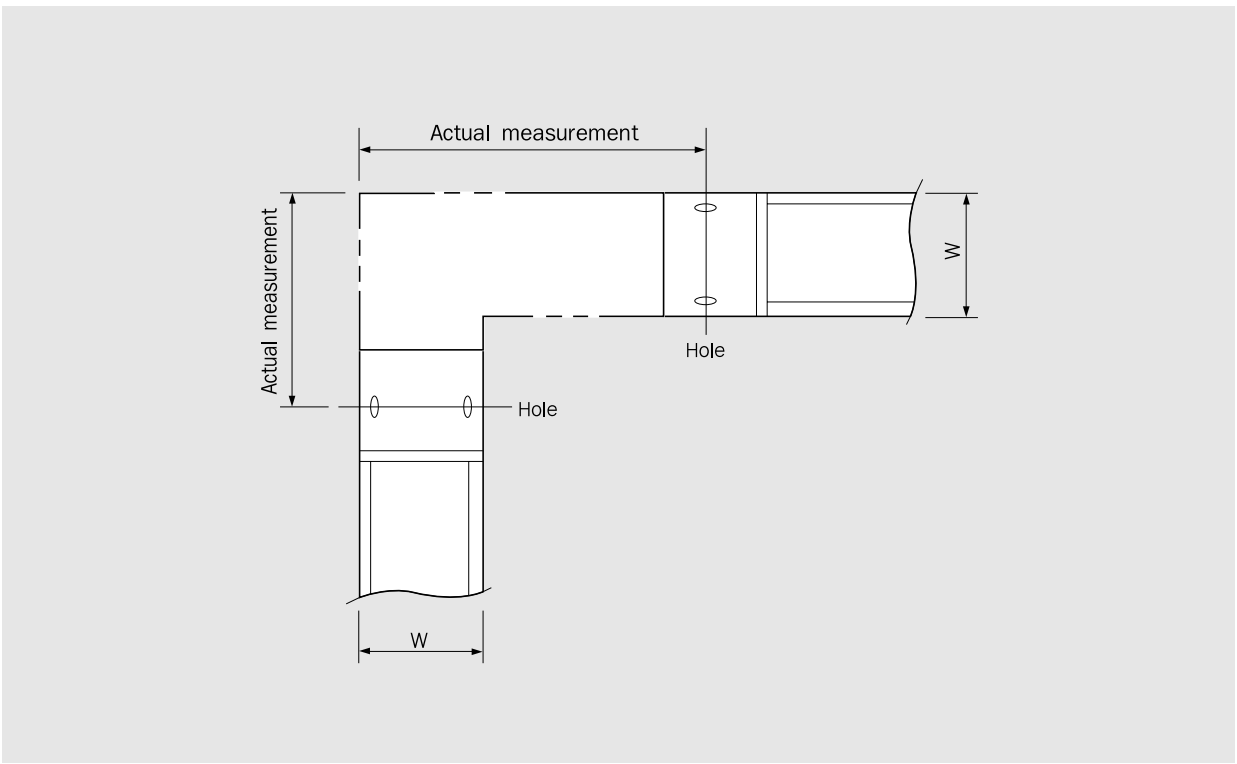
(3) Refer to the cross section for dimension, W

(4) The available minimum length should be considered in case of actual measurement.

● In case of straight



● In case of elbow



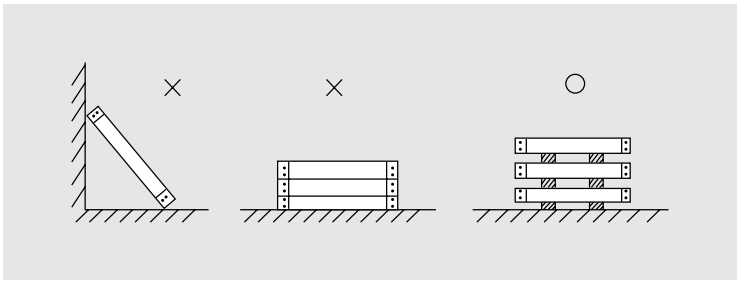
Installation manual

This manual describes the precaution that must be followed in the handing GH-P Type Bus Duct.
Be sure to read it though before the work.

1. General Common Precautions

1-1. Storage

1) When the bus duct arrives at the site, check the type and quantity of the main unit parts against the shipment list. See if any of them were damaged during the transpotation
2) Keep the bus duct at a place, dry and free from moisture and water where there is no fear of being soiled or damaged. If necessary, cover the duct with water proof sheets.
3) Do not lay the bus duct directly on the ground. Always place pieces of wood under the bus duct and stack up firmly as shown. Never put it upright in storage or during installation.



1-2. Preparation

1) Thoroughly check the bus duct laying route to see if there are any obstacles, eat source, water leakage, etc. Check also the dimensions of arrangement and buildings and equipment beforehand.
2) Check both the straight and curved routes of transportation from the place of storage to the laying site.
3) Install the hanging bolts or trestles for hangers beforehand. set the hanger pitch to support two places with one unit as a standard.
4) Investigate the site conditions in advance and determine the most advantageous laying order. The work usually start from connecting the bus duct to the transformer or the switchboard, but in case this impossible to determine precisely the positions of elbows T-branch, and then start construction, and other items which serve as the points of bus duct installation.

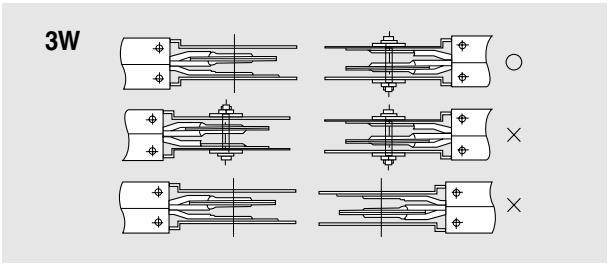
1-3. Laying

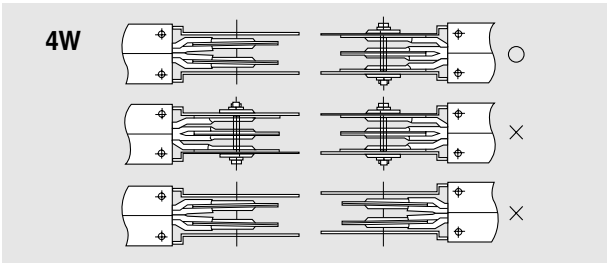
1) Use sufficiently strong materials and equipment for transportation and lifting. The weight per 1m of GH-P type bus duct is given in the catalogues. However, the special bus duct with box sometimes weight 2-3 times more than those shown in this table.
2) When hanging the bus duct with a rope, insert thick pieces of rag or corrugated card between them to prevent the bus duct from being damaged. When handing a copper conductor bus duct of over 2500A, use a piece of strong wood where the rope is applied so as to prevent the housing from being deformed.
3) Before jointing bus duct, examine whether the conductor contact surface or insulating materials are damaged. Also check that they are not soiled with dust, dirt and other foreign matter: otherwise, clean them thoroughly.
4) First, make loose joints of bus ducts over the whole run. After measuring the dimension, proceed the normal jointing. GH-P type bus duct allows dimensional adjustment of approx. ±3mm, at a join.
5) In case a megger value is found abnormal after jointing of the whole route, much time is spend to detect faulty parts. It is therefore recommended that the megger checking be partially conducted even during the jointing work.
6) When the work suspended during the construction, the ends of the connecting section shall be protected against water and dust.
7) Take care not to use the installed bus duct as scaffold or material yard.

2. Jointing procedur

● joint GH-P type bus ducts, as follows:

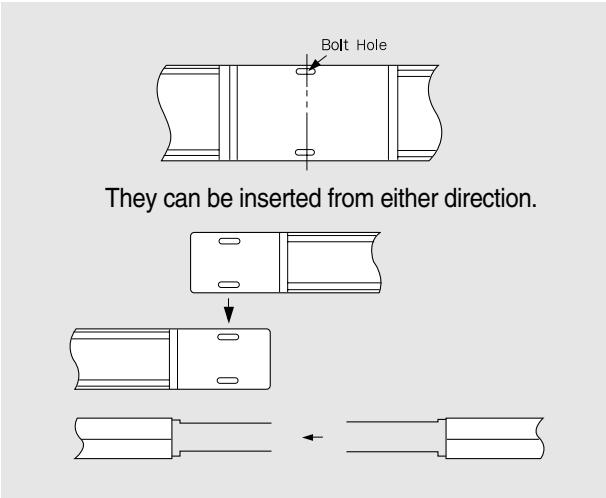
1) Confirm the male-female condition of two bus ducts to connected by arranging them face to face.



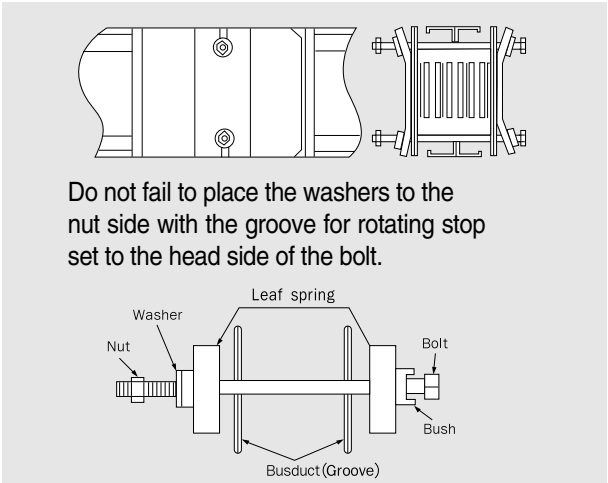


Be sure to check the directions of the male and female ends of the bus duct jointing section, as shown in route drawing it is described.

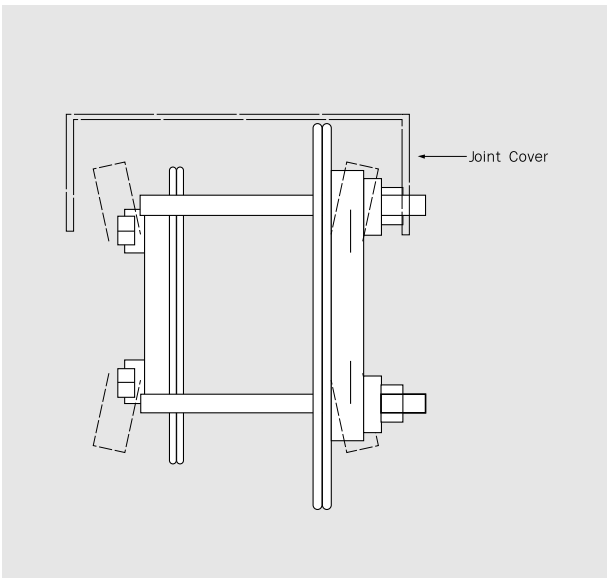
2) Remove the leaf springs temporarily fixed with bolts, and insert them until the bolt holes of both bus ducts almost conform with each other.



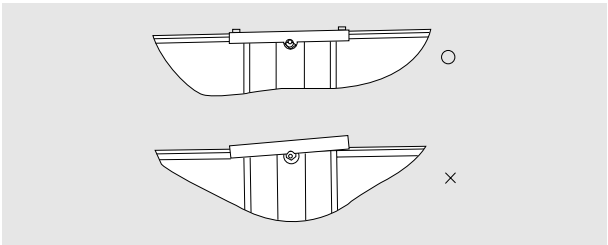
3) Fasten the bus duct with bolts, nuts and washers by soldering both sides of the jointing section between leaf springs.



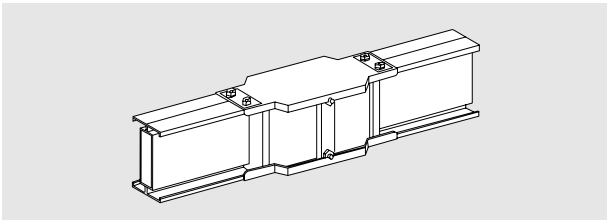
4) Tightly fasten until the leaf springs become almost flat. Do not tighten only one of the bolt first and then the other. tighten the two bolts alternately. Any type of spanner may be used.



5) Set the joint cover after ascertaining that there is no foreign matter or abormality inside the joint section. when the jointing bolts are not tightened sufficiently, the nuts (bolts) touches the joint cover and fitting will be impossible. in this case, tighten the nuts again.



6) A completed joint is illustrated below.



3. connection with equipment

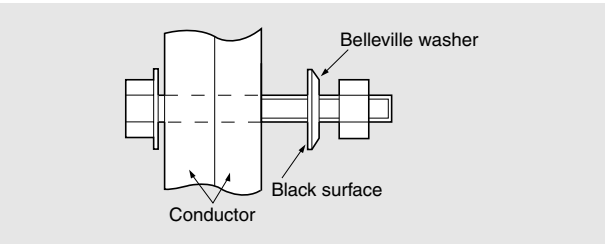
Take care of the following points when jointing the bus duct with the transformer and switchboarde

1) Apply the undermentioned value as yardsticks for the clamping torque of the conductor clamping bolt.

(kg • cm)

Bolt size	Clamping torque
M8	120-150
M10	240-500
M12	420-1020
M16	1050-1300

2) Do not fail to face the blue surface of the Belleville washer (cup washer) towards the inner side (conductor side).



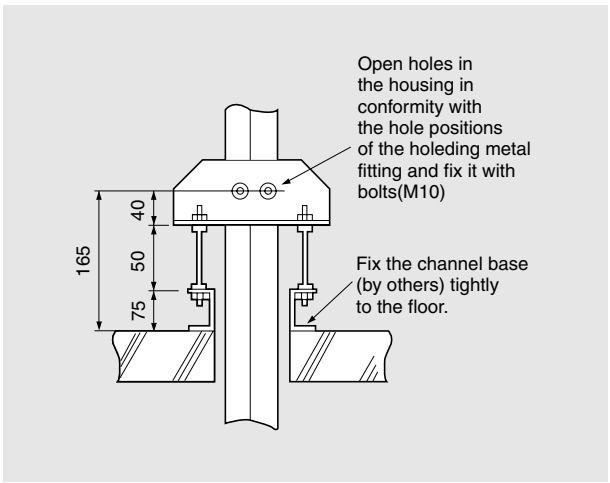
4. Vertical fixed(spring) hanger

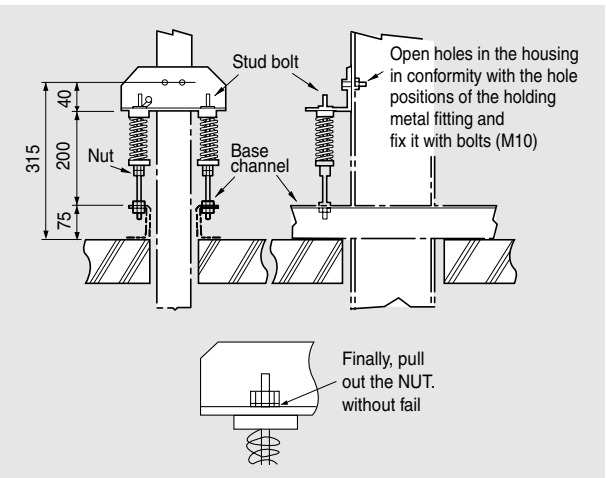
Take care of the following points when fixing the hanger at the time of laying of the bus duct vertically

1) First install the fixed hanger (the position is described in the route drawing) as illustrated in the drawing below and fix the bus duct tightly.

2) After determining the position with fixed hanger installed, connect the bus ducts in sequence and install the spring hangers to each floor.

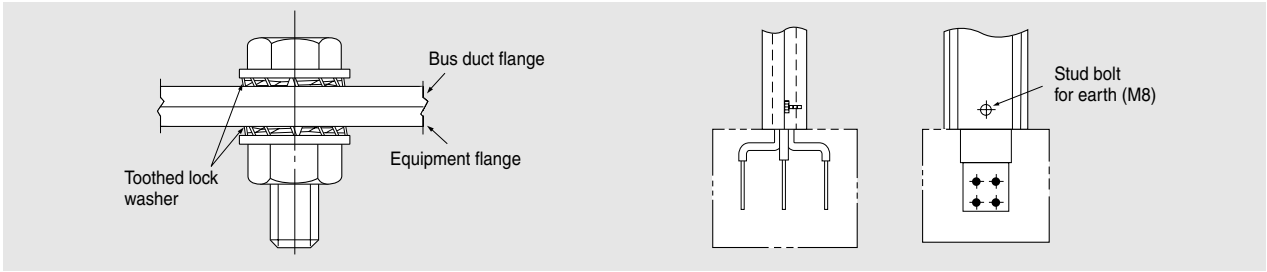
3) Install the spring hanger in accordance with the description below.





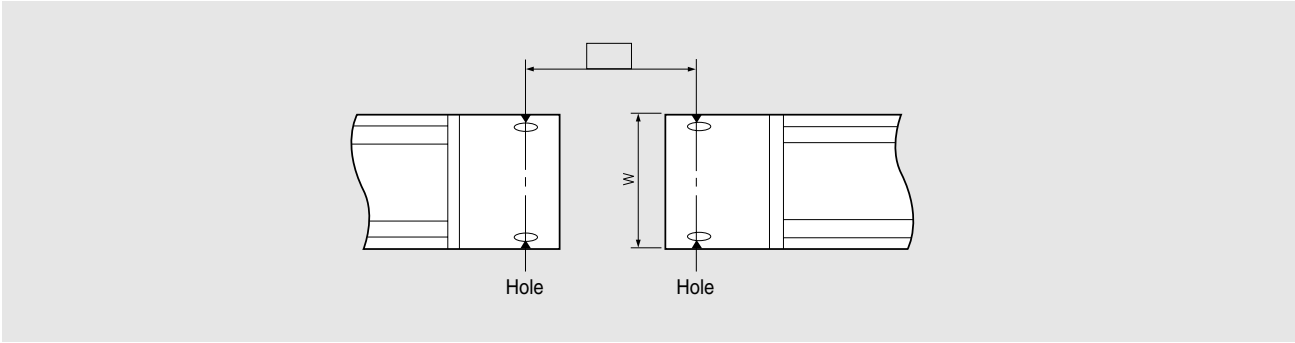
5. Earthing of housing

At the connection section of mutual bus ducts, the continuity of the earth is secured automatically by fixing the joint cover. Further, with the equipment is performed by flange connection, it will be electrically connected with the toothed lock washer attached to the bolt for the flange biting into the flange of the equipment and the bus duct when the bolt is clamped. in case the terminal is not flange connection, set the earth by connection the IV line to the stud fitted to the terminal section.



6. Actual measurement bus duct

In case there is a remaining porting of actual measurement, contact us with the dimension shown in the drawing below measured.



take into consideration the work schedule in advance since it takes a minimum of 2 weeks for the actual delivery of the bus duct.

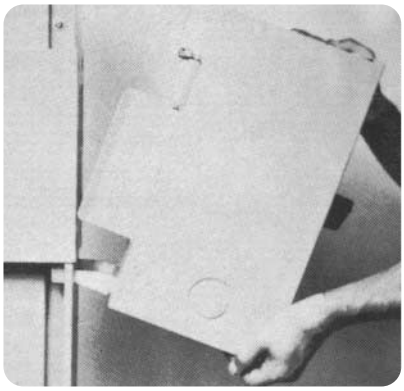
7. Test and checking after the laying

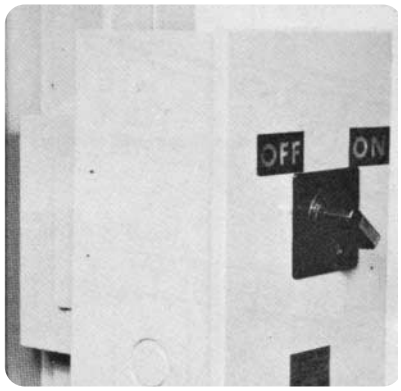
When the laying of the bus duct is completed, check the whole route, mainly the points described below at the same time with the measurement of insulation resistance of the whole structure being carried out. When carrying out the measurement of the insula-tions resistance, disconnect the equipment connected and, further when plug-in breaker is installed conduct the measurement after setting the breaker OFF. The insulation resistance value cannot be specified due to the difference of the length of the route and the environmental conditions, but if it is a dried atmosphere normally it would be a value of some 100㏁ (500V megger). In case it is below 5㏁,it has to be checked as it is most likely that there, may exist some factors which may reduce the insulation. (The confirmation is easy if intermediate checking of Paragraph 1-3 (5) could be conducted).

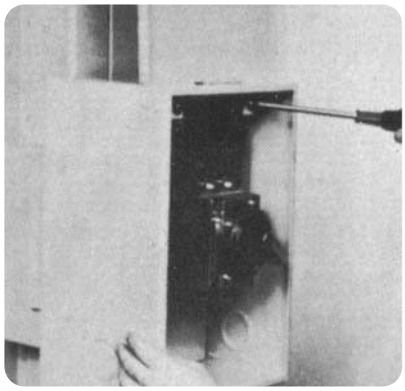
1) Whether the bus duct is not damaged,
2) Whether the connecting parts are fixed precisely,
3) whether the bolts for connecting the equipment are securely fastened,
4) whether the hangers are supporting the bus duct securely.

8. Plug-in box installation sequence

1) Check the drawing to locate where to install boxes.
2) Remove the cover of each plug-in hole.
3) Using the earth jaw of he box as a guide, insert a clip.
4) Open the top cover of the box. Use a screw driver to turn the duct fixing screws in the box to firmly fix the box to the duct.
5) Completion







9. Maintenance and checking

The following maintenance and checking are both recommended for guaranteeing safe usage of the bus duct for a long time.

(1) Check the external appearance

Checking to see whether there is deformation, damage, dirt, etc. throughout the whole length of the bus duct and whether there is dislocation, bending and other abnormality of the connecting covers, hanger and plug-in appliances.

(2) environmental check

The environment where the bus duct is used sometimes changes after its installation. Check whether the environment has become hazardous even partially due to water, moisture, high temperature, corrosive gas, immoderate vibration, duct etc. (There will be no problem with the bus duct where countermeasures are taken from the initial stage.)

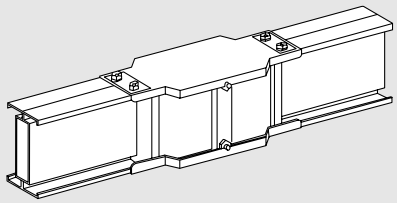
(3) check the connection section

There will be no problem of loosening of the connection section of GH-P type bus-duct by "concordance" as leaf springs of high deflection are employed for the connection section. Therefore, periodical increased clamping is unnecessary. However, when the contact surface is soiled or deteriorated during the construction or during the storage, a simple check by touching the external portion during the current sending is recommended as the above effects would gradually arise. (If the temperature of the connection section and the main body is about the same, there will be no problem.)

(4) Check the load condition

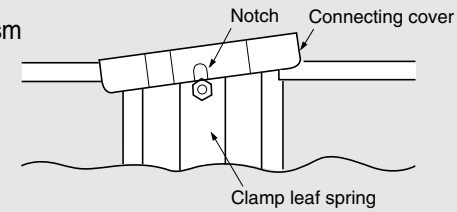
After the construction of the plug in bus duct. increase of load is expected at the early stage. carry out checking whether the total of load is not exceeding the capacity of the bus duct at the time the load is increased. Especially, pay attention when the main line is branched by T-branch or cross.

Conduct the above mentioned check about a year excluding Paragraph (4).

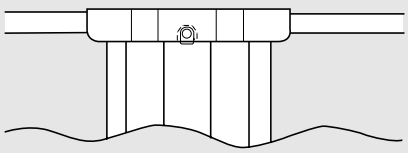


Connection completed bird-eye view

Fool-Proof Mechanism



When clamping is insufficient, the nut will become a stopper and the connecting cover will not be able to be fitted.
When clamping is adequate, the connecting cover will fit



Merits

1. Operation is simple.
   Clamping is only required until the spring becomes flat and special tools such as torque-wrench are wholly unnecessary.
2. Operation id safe
   There is absolutely no shock at the time of cutting such as torque bolts, and operation at elevated spot is also safe.
3. Reliability is great
   As regards the conventional torque management, it is difficult to obtain constant clamping force due to dispersion of the coefficient of fiction.

Korean Standards Association

CERTIFICATE OF APPROVAL

LS INDUSTRIAL SYSTEMS Co., Ltd.

· HEAD OFFICE : 84-11(YONSEIJAEDAN SEVERANCE BLDG.), NAMDAEMUNNO 5-GA, JUNG-GU, SEOUL, KOREA

· PLANT : Refer to the Appendix

Korean Standards Association hereby certifies that the Quality Management System of the above organization has been assessed and found to be in accordance with the requirements of the quality standard and scope of certification detailed below:

CERTIFICATION NO.

QMS-0260

QUALITY STANDARD

KS A 9001:2001/ISO 9001:2000

SCOPE OF CERTIFICATION

Refer to the Appendix

VALID FROM	VALID UNTIL
28 October, 2006	27 October, 2009

Original Certification Date : 16 December, 1997

PRESIDENT OF KSA

KOREAN STANDARDS ASSOCIATION

701-7, Yeoksam-Dong, Gangnam-Gu, Seoul, Korea

Accredited by Member of the IAF MLA for QMS. The Accreditation Mark(KAB) indicates accreditation in respect of those activities covered by the Accreditation Certification Number KAB-QC-30.

KSA KAB IAF

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2000 requirements may be obtained by consulting the organization.

Korean Standards Association

CERTIFICATE OF APPROVAL

LS INDUSTRIAL SYSTEMS Co., Ltd.

CHEONGJU PLANT

· HEAD OFFICE : 84-11, YONSEI JAEDAN SEVERANCE BLDG., 5GA, NAMDAEMUN-RO, JUNG-GU, SEOUL, KOREA

· CHEONGJU 1 PLANT : 1, SONGJEONG-DONG, HEUNGDEOK-GU, CHUNGJU-SI, CHUNGCHONGBUK-DO, KOREA

· CHEONGJU 2 PLANT : 450, BONGMYEONG-DONG, HEUNGDEOK-GU, CHUNGJU-SI, CHUNGCHONGBUK-DO, KOREA

Korean Standards Association hereby certifies that the Environmental Management System of the above organization has been assessed and found to be in accordance with the requirements of the environmental standard and scope of certification detailed below:

CERTIFICATION NO.

EMS-0005

ENVIRONMENTAL STANDARD

KS A ISO 14001:2004/ISO 14001:2004

SCOPE OF CERTIFICATION

DESIGN, DEVELOPMENT AND PRODUCTION OF
1 PLANT : LOW VOLTAGE CIRCUIT BREAKERS, MAGNETIC CONTACTORS, THERMAL OVERLOAD RELAY, MOTOR STARTER(MAGNETIC-SWITCH), ELECTRICITY METERS, HIGH VOLTAGE CIRCUIT BREAKERS, SWITCH GEARS, POWER FUSE, PROTECTION RELAYS, VACUUM INTERRUPTER
2 PLANT : TRANSFORMER, ELECTRICAL POWER DISTRIBUTION & CONTROL SYSTEMS, ULTRA-HIGH VOLTAGE SWITCH GEAR(22KV~55KV GCB, DS, GIS, IPB), POWER CONTROL & ENERGY MANAGEMENT SYSTEMS, SOLAR POWER SYSTEM

VALID FROM

09 November, 2005

VALID UNTIL

08 November, 2008

Original Certification Date : 09 November, 1996

Lee Gyehyung

PRESIDENT OF KSA

KOREAN STANDARDS ASSOCIATION

701-7, Yeoksam-Dong, Gangnam-Gu, Seoul, Korea

Accredited by Member of the IAF MLA for EMS. The Accreditation Mark( ) indicates accreditation in respect of those activities covered by the Accreditation Certification Number KAB-EC-11.

KSA