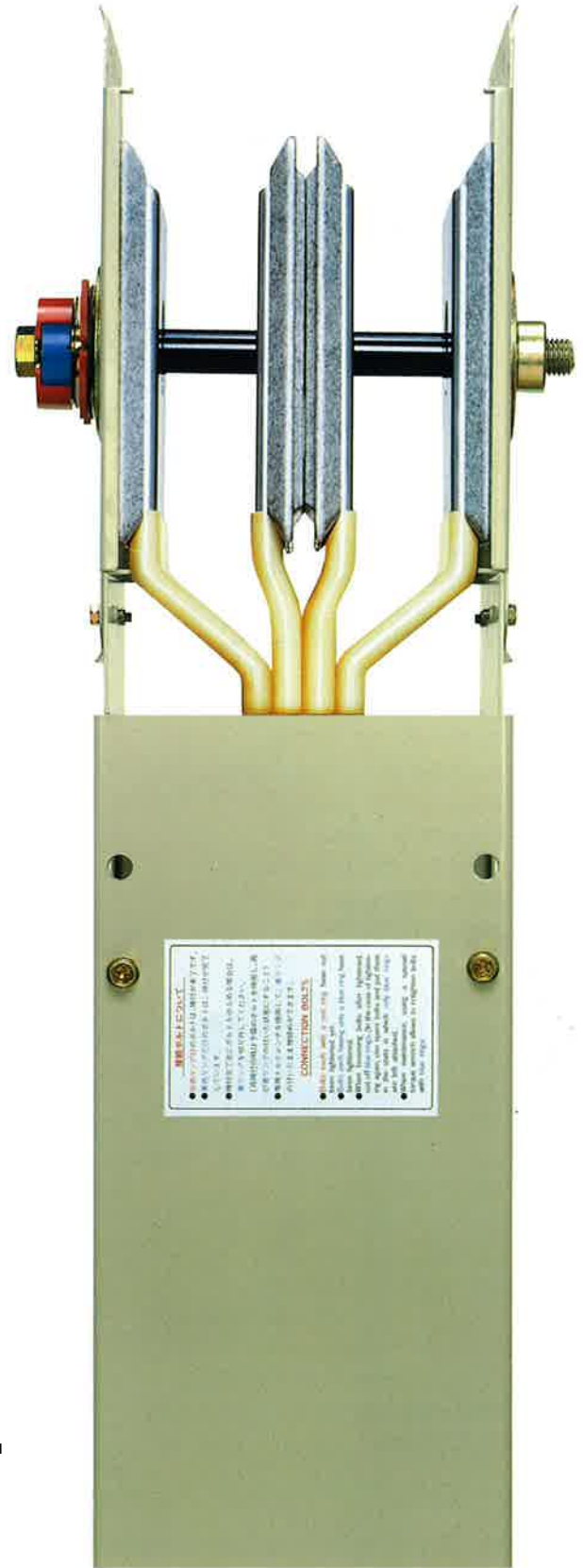




# BUSDUCT

KYODO L-S TYPE  
500A~5000A

Totally Enclosed Low Impedance Type  
Feeder or Plug-in (*Tap-off*) Bus Duct  
with Totally Tin Plated and Insulated  
Aluminum or Copper Bus Bars  
and with Perfect Joint Construction



**KYODO KY-TEC CORP.**

# KYODO BUS DUCT

*KYODO, a manufacturer specializing in bus ducts, has produced safe and easy-to-handle bus ducts for a quarter of a century.*

*The basic conception maintained by us throughout this period is "To keep products in safety is prior to all".*

*KYODO Bus Ducts are highly reliable, finding extensive application not only in Japan but also in foreign countries.*

## CONTENTS

<b>KYODO BUS DUCT</b> .....	1
<b>BUS DUCT SYSTEM</b> .....	2
<b>FEATURES OF L-S BUS DUCT</b> .....	3
<b>PLUG-IN (TAP-OFF) BUS DUCT</b> .....	5
<b>PLUG-IN (BOLT-ON) UNIT</b> .....	6
<b>EARTH SYSTEM</b> .....	7
<b>PRECAUTIONS IN ARRANGEMENT</b> .....	8
<b>CONNECTION METHOD</b> .....	9
<b>SHORT CIRCUIT CAPACITY</b> .....	9
<b>VOLTAGE DROP DATA</b> .....	10
<b>APPLICATION DATA</b> .....	11
(DIMENSIONAL DATA)	
<b>CROSS SECTIONS</b> .....	11
<b>STRAIGHT LENGTHS</b> .....	12
<b>ELBOWS AND OFFSETS</b> .....	13
<b>TEES AND CROSSES</b> .....	14
<b>FLANGED ENDS (CABLE FEED-IN BOXES)</b> ..	15
<b>ADJUSTABLE SECTIONS</b> .....	17
<b>REDUCERS AND EXPANSIONS</b> .....	18
<b>END CLOSERS, HANGERS</b> AND WALL FLANGES.....	19
<b>FLOOR SUPPORTS</b> .....	20
<b>MCCB PLUG-IN UNITS</b> .....	21
<b>MCCB BOLT-ON UNITS</b> .....	22
<b>SWITCH FUSE PLUG-IN</b> (BOLT-ON) UNITS .....	23
<b>SUGGESTED SPECIFICATIONS</b> .....	24
<b>INQUIRY GUIDES</b> .....	25
<b>SHOP DRAWING</b> .....	26

In recent years, with an increase in installed capacity of electric equipment, bus duct systems have rapidly come into wide use in the wiring of buildings and factories.

The bus duct system has a lot of outstanding features as compared with conventional cable wiring. For example, the system can feed heavy current utilizing a small space because of its compactness; it permits to branch loads easily through plug-in hole (*tap-off*); it is excellent in resistance to fire and has good appearance, etc.

In view of its important application in main power lines, bus ducts must be ensured for prolonged safety. KYODO L-S Insulated Bus Ducts are high in safety, made of high-grade material and designed to have sufficient strength both electrically and mechanically.

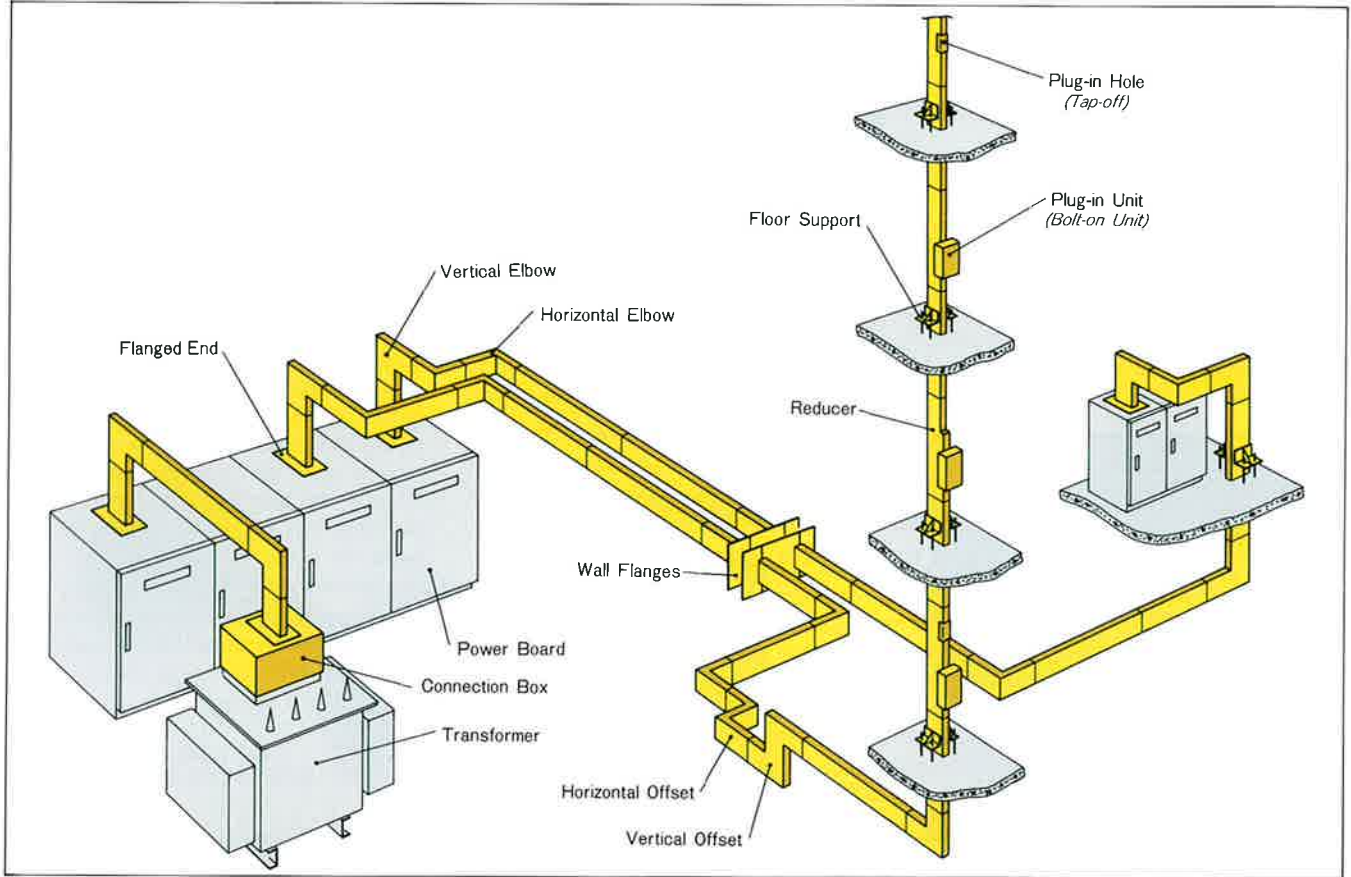
KYODO L-S Bus Ducts are highly reliable bus ducts produced in through process, under strict quality control, at a factory specializing in the production of bus ducts. Further, KYODO L-S Bus Ducts having passed strict standards (NK, ABS, etc.) have been used in in-board wiring and are presently in operation on the sea all over the world.

This is a material which allows to recognize the quality of KYODO bus ducts. Bus ducts requiring long life should be backed up by a long record of past achievements - as KYODO bus ducts has a 33-year record.

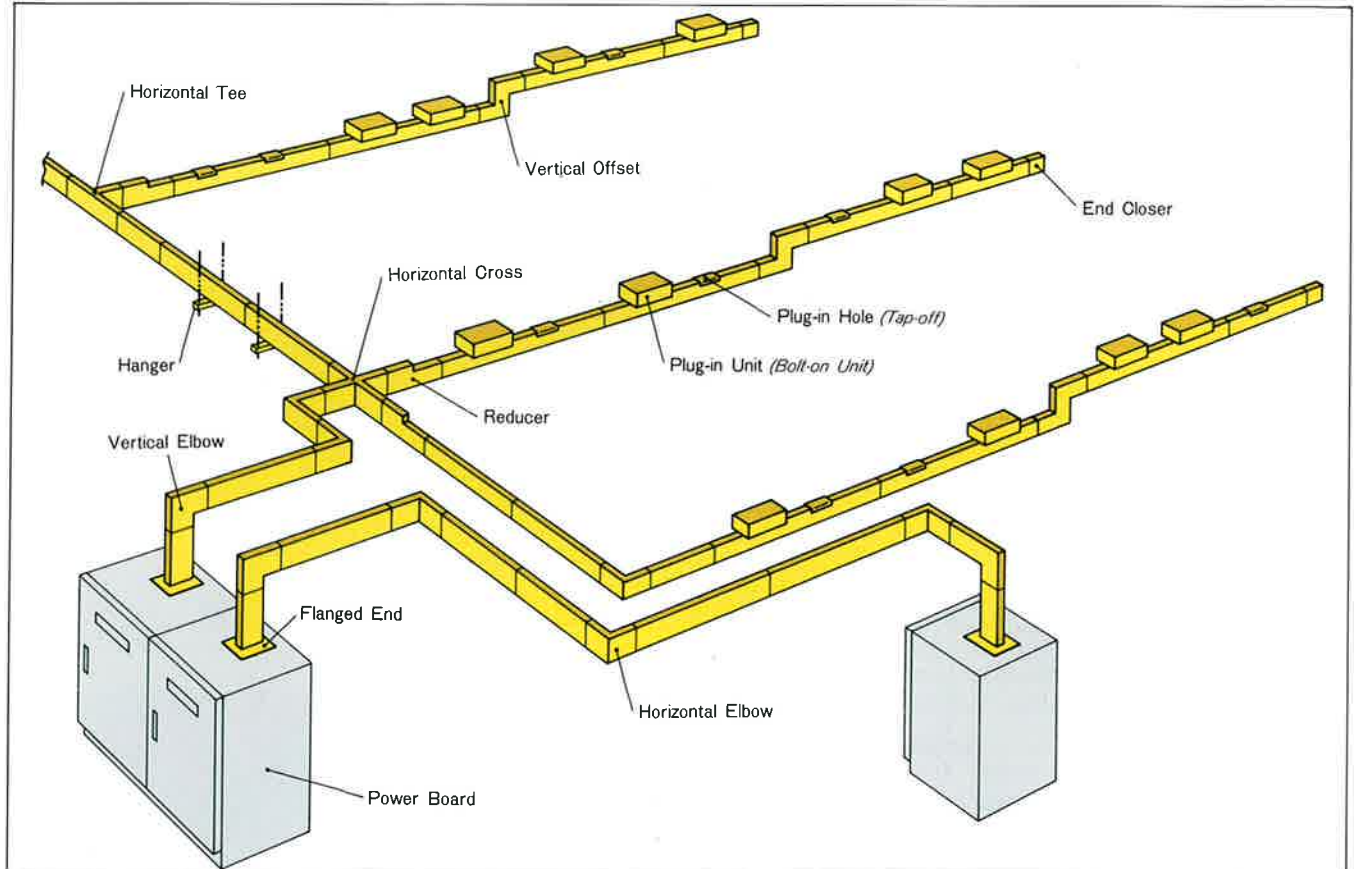
When you need bus ducts, do not hesitate to specify KYODO bus ducts.



## FOR BUILDING



## FOR FACTORY



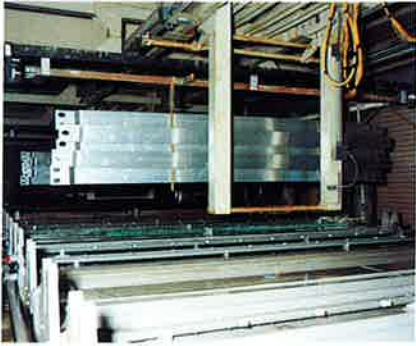
# FEATURES OF L-S BUS DUCT

## EXCLUSIVE PLATING

Bus bars (both aluminum and copper) for L-S Bus Ducts are electro-plated with a heavy coat of tin not only on their contact surface but also over their entire length.

The plating is of the highest quality attained through a 21-stage process with computerized control. The plating is performed after the bus bar has completed all machining, so the plated surface will always be kept from damage.

Further, joint compound is applied over the contact surface so that connection and engagement can be made smooth.



## RELIABLE INSULATION

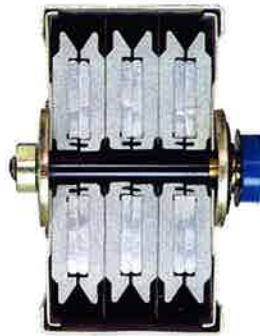
The most important in the design of bus ducts is to use a high-grade insulation because deterioration of insulations means the end of service life of bus ducts. KYODO L-S Bus Ducts maintains elec-

trically and mechanically excellent performance for a long period of time since their bus bars are covered with insulations consisting of polyester film (PETP), Class B (130°C), heat formed in multiple layers.

## ONE BOLT JOINT

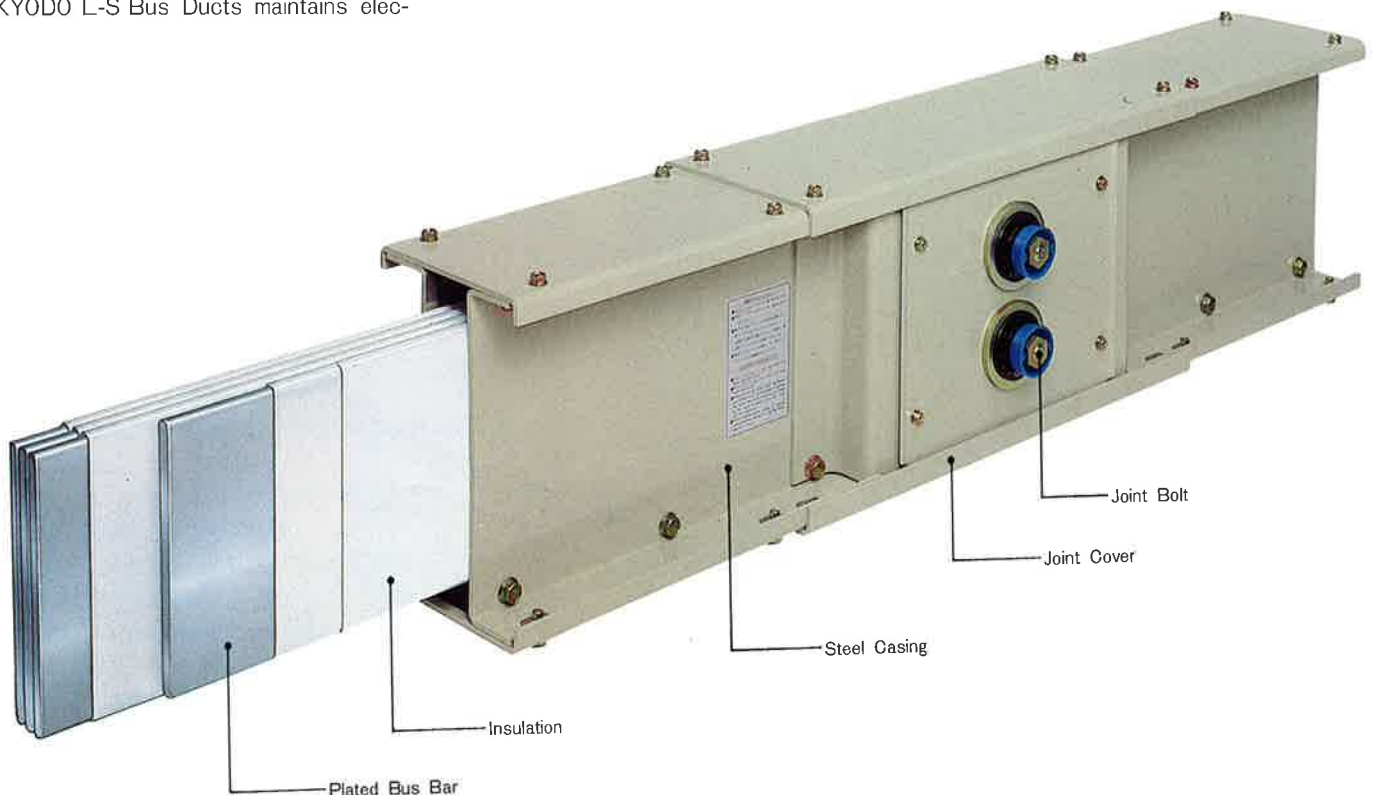
All L-S Bus Ducts incorporate the "one bolt" joint principle, so installation is easy and, at the time of maintenance, bolt can be inspected while the system is being energized.

A high-strength bolt (SCM-3) insulated by an insulation resistant to heat and impact (polycarbonate) clamps the joint with a force of 2000 kg (M12) to 4000 kg (M16), and this clamping force is uniformly distributed over the joint by Belleville washers.



## FIRE BARRIERS

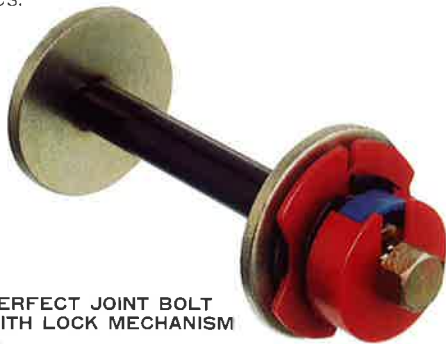
L-S Bus Ducts, both feeder type and plug-in type, contain integral fire barrier blocks as standard, which are located inside the joints of each unit for closing up any open air space between the edge of the bus bars and the casing. So these bus ducts may extend through walls or floors without the fear of a fire spreading by "chimney effect". Moreover, an additional fire resistance material can be provided, by option, at an intermediate portion of the bus duct for extending through walls or floors.



### EXPANSION SECTION IS UNNECESSARY

L-S Bus Duct incorporates the "one bolt" joint principle which clamps the bus bars together with the casing. This joint bolt is inserted into the oval holes of the bus bars and the casing, and clamps the bus duct joint through Belleville washers. So all joint portions can absorb thermal expansion of the bus duct, making it unnecessary to use the expansion section.

On the other side, G-Type expansion section is used at where the bus duct is passed through a building expansion joint, and F-Type is used for adjusting the bus duct level when the ground subsides.



PERFECT JOINT BOLT WITH LOCK MECHANISM



BEFORE TIGHTENING



AFTER TIGHTENING



AFTER CONNECTION

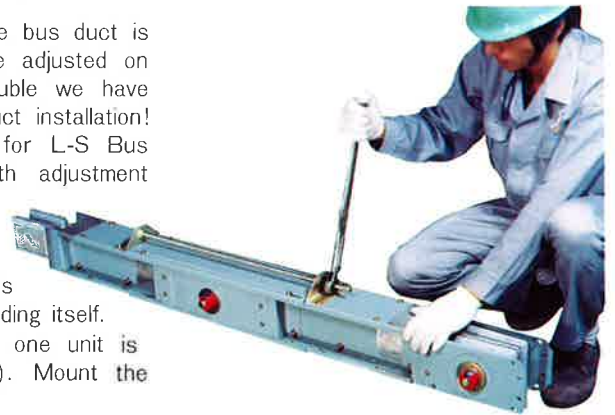


LOOSENING BOLT

### ADJUSTABLE SECTION

The weakest point of the bus duct is that its length cannot be adjusted on the site. How much trouble we have experienced with bus duct installation! This adjustable section for L-S Bus Duct ensures easy length adjustment on the site to absorb the dimensional errors in the location of equipment connected to the bus duct or those of the building itself.

The adjustable range of one unit is  $\pm 30$  mm (See Page 17). Mount the adjustable section finally.



### PERFECT JOINT BOLT

The most important in the use of bus duct is proper tightening of connection bolts. Improper tightening of connection bolts will result, without fail, in overheating after several years of operation. Use of perfect joint bolts permits to visually check for proper tightening of all connection bolts. In addition, the perfect joint bolt can be permanently prevented from loosening under severe conditions because of the adoption of a special lock mechanism. (The bolt has passed a vibration test based on NAS and MIL specifications.)

#### ●Function of Perfect Joint Bolt

##### 1) Before Tightening

As every bolt before tightening has a red ring, failure in tightening any bolts can be discovered visually from a distant place.

##### 2) Tightening

Tighten the bolt to the specified torque by the special wrench, included in the standard equipment, and its outer head is twisted off and the red ring comes off. In that state, the lock mechanism does not function. Break and remove the red plate to set the lock mechanism.

After removal of the red plate, the bolt can not be loosened.

##### 3) After Connection

The perfect joint bolt, when properly connected, leaves only the blue ring on its surface.

##### 4) Loosening Bolt After Connection

To loosen the tightened bolt because of erroneous connection or for dimensional adjustment, break the blue ring and bend the stopper of the lock mechanism upward. Then the bolt can be loosened by wrench.

When tightening again, use a spare, new perfect joint bolt and put it in the state in which only the blue ring is left on its surface.

##### 5) Bolt Inspection

It is only required to visually confirm that all connection bolts have blue rings only.

##### 6) Maintenance

When required to check for torque, the connection bolt can be checked using the special torque wrench without removing the blue ring. Since this wrench is designed to act in the tightening direction only, the bolt will never be loosened by it.

#### ●Precaution in Tightening

When connecting bus ducts, mount them with connection bolts temporarily tightened (without twisting off outer heads) and, upon completing mounting over the entire route length, tighten the bolts (twist off outer heads).

# PLUG-IN (TAP-OFF) BUS DUCT

The plug-in (*tap-off*) bus duct has plug-in holes (*tap-offs*) used for distributing electric power to loads.

L-S Bus Duct comprises feeder bus ducts and plug-in (*tap-off*) bus ducts which have the same basic construction. Therefore, their piercing dimensions through floor and wall and their supporting constructions are quite the same, and no special parts are needed to connect bus ducts with each other.

Thus, there is no inconvenience in installing a plug-in (*tap-off*) bus duct between feeder bus ducts.

## The Number of Plug-in Holes (*Tap-offs*)

The number of plug-in holes (*tap-offs*) of L-S Bus Duct will be as specified by Customer. (See Page 12)

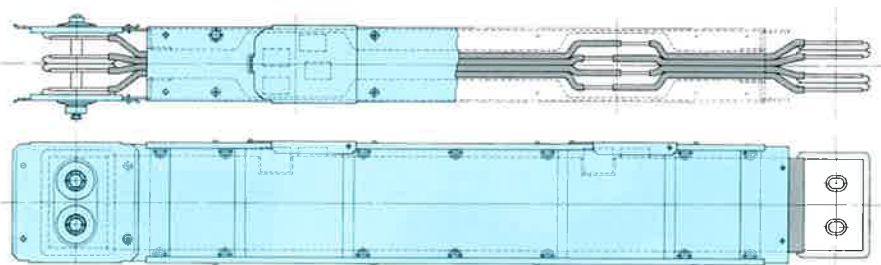
The price of the plug-in bus duct (*tap-off bus duct*) is feeder bus duct price plus the price of the required number of plug-in holes (*tap-offs*).

The location of plug-in holes (*tap-offs*) can be arranged in correct positions as required by Customer. (Ex. In the case of vertical installation, we can arrange them at the same height from each floor level.)

## ■ PLUG-IN BUS DUCT

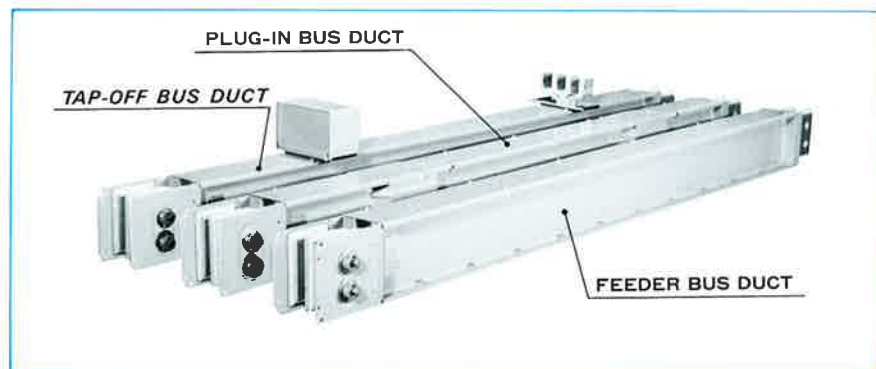
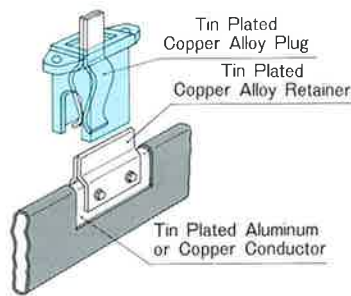
The plug-in bus duct is intended for use at such places where load shift is frequent, and is also used with a plug-in unit to branch a load.

The maximum current capacity of each plug-in hole is 600A.



## Safety of Plug-in Connection

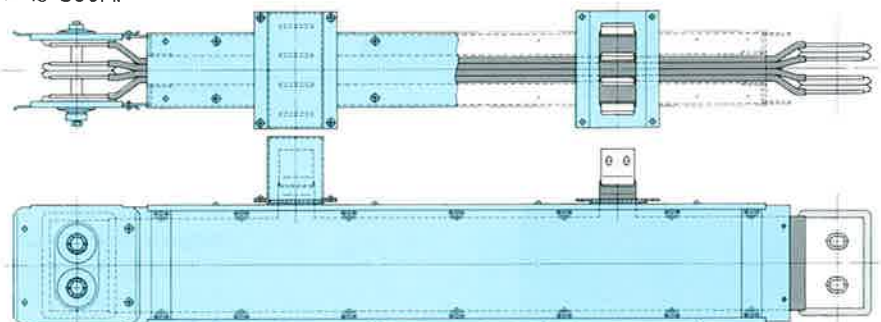
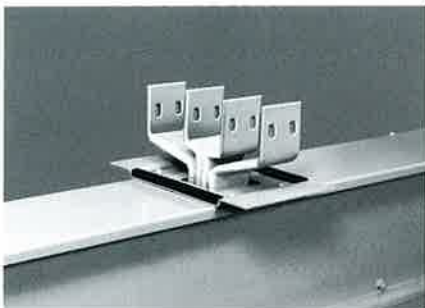
Copper alloy made plug retainers (tin plated) are attached to bus bars (both aluminum and copper) inside the plug-in holes of L-S Bus Ducts to prevent bus bars being damaged by copper alloy plugs (tin plated). Therefore, there will occur no trouble when the plug is fitted and removed more than 200 times, which is an important point, especially for aluminum bus ducts.



## ■ TAP-OFF BUS DUCT

The *tap-off bus duct* is intended for use at such places where load shift is little, and is also used with a *bolt-on unit* to branch a load.

The maximum current capacity of each *tap-off* is 800A.



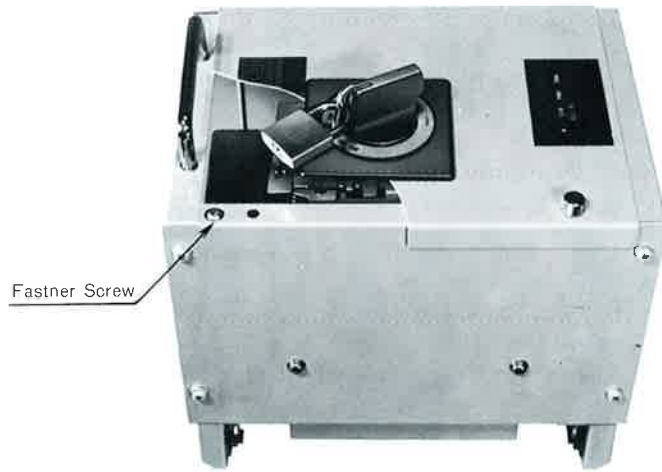
## ■ PLUG-IN UNIT

Plug-in units rated for less than 600A are compatible with plug-in holes of all L-S Bus Ducts.

Mounting of plug-in units requires no special parts.

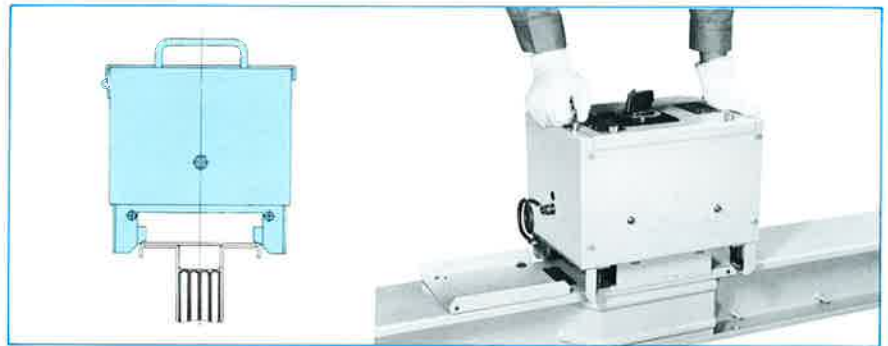
Plugs, the most important in performance, are made of copper alloy heat treated to increase spring force and tin plated, so that they keep stable contact even when fitted and removed more than 200 times. The plug-in unit is provided with an earth wire to ensure reliable earthing to the Bus Duct.

Operating handles for hook stick (or string) for horizontal mounting are optional.



## Interlock Mechanism

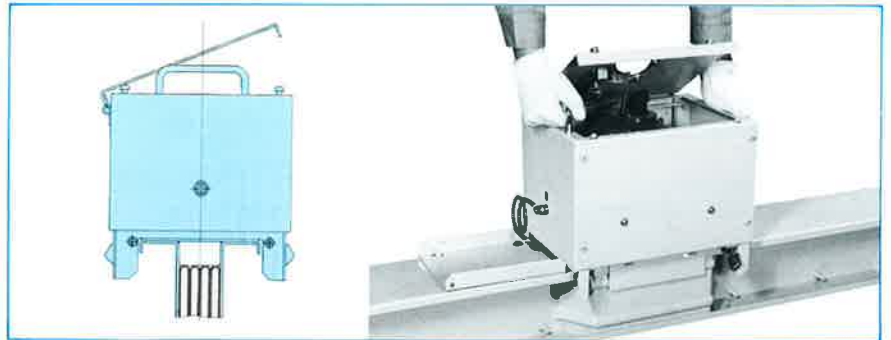
All plug-in units for L-S Bus Ducts can be provided with an interlock mechanism to keep workers (operators) in safety. Interlock with the bus duct casing prevents installation or removal of the unit while the switch is ON. Cover interlock prevents the cover from being opened while the switch is ON and also prevents accidental closing of the switch while the cover is open.



While the plug-in unit is ON, the cover cannot be opened and the fastener screws cannot be loosened, so that the unit cannot be installed to or removed from the bus duct.

## Front Operation

All plug-in units are provided with fastener screws at the front (inside the cover), so their installation to or removal from bus ducts can be done on the front. This is very advantageous for work in a small riser room.

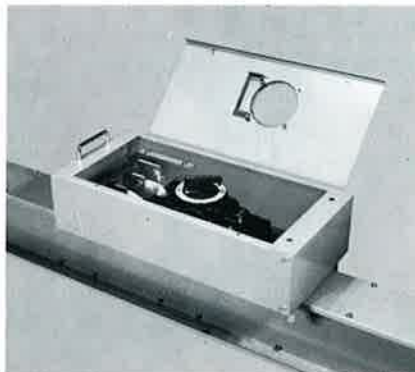


While the plug-in unit is OFF, the cover can be opened and the fastener screws can be loosened, so that the unit can be installed to or removed from the bus duct.

## ■ BOLT-ON UNIT

*Bolt-on units* rated for less than 800A as standard are compatible with the *tap-off* of all L-S Bus Ducts.

*Tap-offs* and terminals of MCCB (fusible switch) are connected by bolts through flexible bus bars. The *bolt-on unit* and bus duct are directly connected by bolts through their galvanized faces, so no earth wire is needed.



The PS (Pressure Sensible) washer, which enables visual control of bolts, is adopted for *tap-off* tightening. (See page 16)

# EARTH SYSTEM

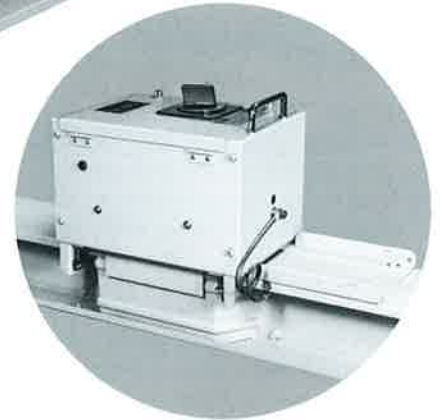
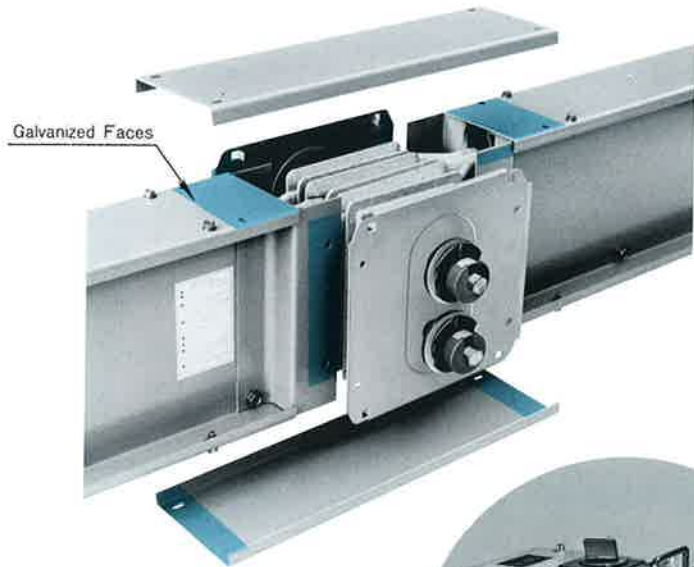
## STANDARD EARTH SYSTEM (Case Earth)

L-S Bus Ducts are of case earth system as standard, namely the bus duct casing themselves serve as the earth conductor.

Both side plates and the top and bottom plates of bus duct are constructed to have positive electric continuity through their galvanized faces, and the joint between bus ducts is also constructed, as shown right, to have positive earth continuity through four galvanized faces. Therefore, the resistance value of the continuous casing, case earth type, is 50% or less compared with that of the earth tape (3mm×25mm).

The plug-in unit and bus duct casing are continuously earthed by an earth wire attached to the plug-in unit.

And the flanged end for connecting equipment and the cable feed-in box are each provided with an earth terminal.

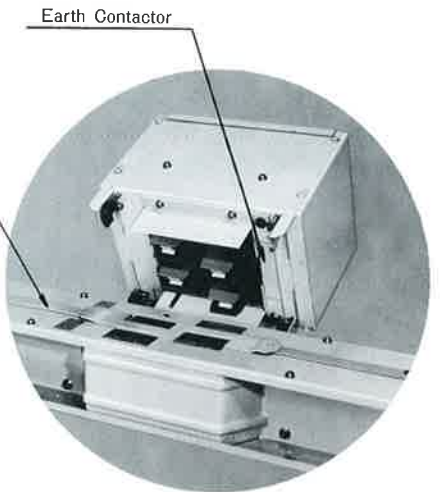
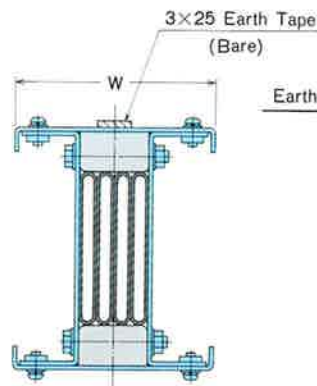


## ADDITIONAL EARTH SYSTEM

### 3×25 External Earth Tape

This is of the earth system with an external earth tape, 3 mm × 25 mm (75 mm<sup>2</sup>), added to the standard case earth system.

The plug-in unit makes positive contact, automatically, with the earth tape through the earth contactor attached to the bottom of the unit. The connections between earth tapes attached to each bus ducts are continuously bonded by a connecting earth tape.

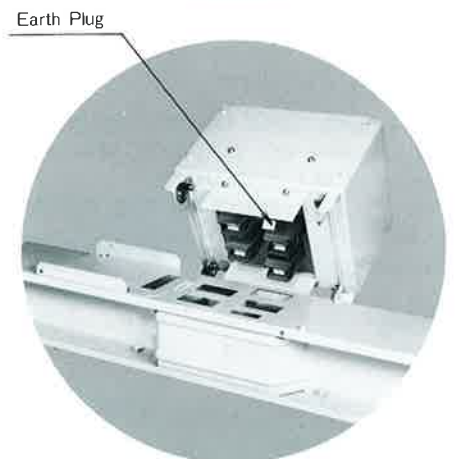
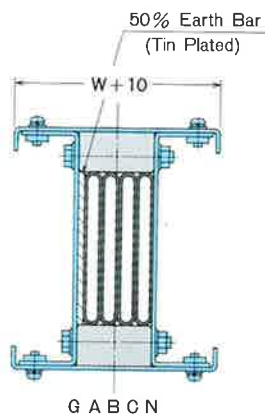


### Integral 50% Earth Bar

This is of the earth system with an integral 50% copper earth bar arranged in the casing in addition to the standard case earth system. The plug-in unit makes positive contact with the earth bar before the phase plugs make contact with the bus bar.

The earth bars of adjacent bus ducts make positive contact, automatically, by connecting the bus ducts.

The bus duct width is larger by 10 mm than the standard 3φ4 Wire system bus duct.





# PRECAUTIONS IN ARRANGEMENT

## MINIMUM INSTALLATION SPACE BETWEEN BUS DUCTS

### FEEDER BUS DUCT

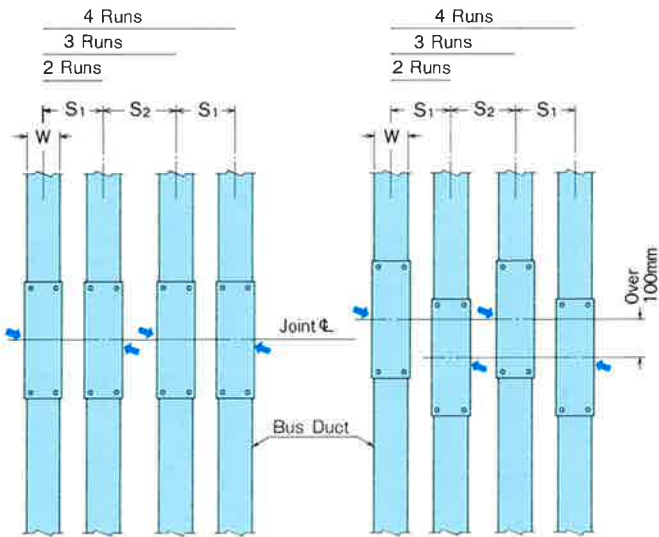


Fig. a

Fig. b

### PLUG-IN (TAP-OFF) BUS DUCT

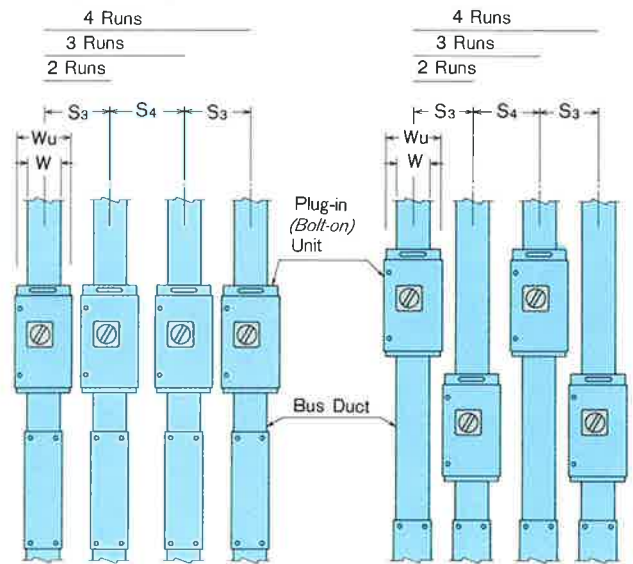


Fig. c

Fig. d

\* Mark  $\rightarrow$  indicates the installing direction for connecting bolts.  
 Dimensions W : refer to dimensions Table on Page 11.  
 Dimensions Wu: refer to dimensions Tables on Page 21~23.

### FEEDER BUS DUCT

(mm)

	Horizontal Mounting		Vertical Mounting (Flatwise Support)	
	S <sub>1</sub>	S <sub>2</sub>	S <sub>1</sub>	S <sub>2</sub>
Fig.a	W + 100	W + 200	W + 150	W + 200
Fig.b		W + 150		W + 150

### PLUG-IN (TAP-OFF) BUS DUCT

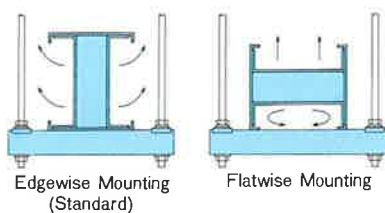
(mm)

	Horizontal Mounting		Vertical Mounting (Flatwise Support)	
	S <sub>3</sub>	S <sub>4</sub>	S <sub>3</sub>	S <sub>4</sub>
Fig.c	Wu + 50	Wu + 50 W + 200	Wu + 50 W + 150	Wu + 50 W + 200
Fig.d	W + 100	W + 150	W + 150	W + 200

\* Whichever is larger value out of two formulas.  
 \* The fusible switch plug-in (bolt-on) units are not applied.  
 \* Space dimensions for vertical mounting are applicable in the case of floor support fittings of flatwise support type. With the edgewise support type, space dimensions are the same as in the case of horizontal mounting.

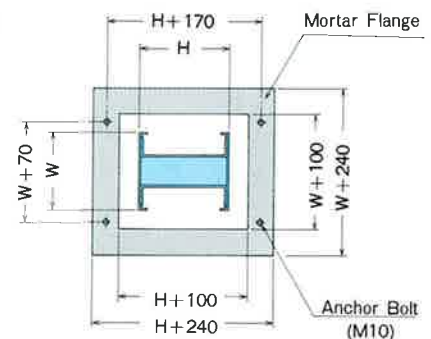
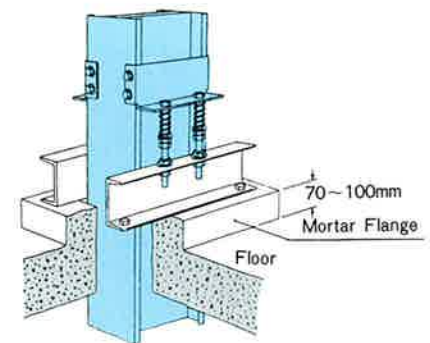
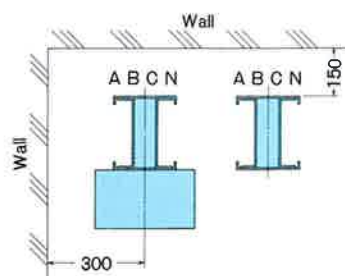
## HORIZONTAL RUN

In the case of horizontal mounting, as a standard mounting method for L-S Bus Ducts, edgewise mounting is applied to improve heat dissipation from bus ducts. Supporting intervals for horizontal mounting is specified to be within 3 meters. However, for easy installation, it is recommended to support bus ducts at intervals of around 2 meters. In the case of flatwise mounting, the actual current capacity decreases by 5 % compared with the nameplate value.



## VERTICAL RUN

In the case of vertical mounting, the phase sequence (A, B, C, N) of bus ducts and the minimum space of the riser room are as shown in the following figures. For vertical mounting, support bus ducts on the floor of each story. Around bus duct holes through floors, it is recommended to provide mortar made water seal flanges to protect bus ducts from water. Even in the case of vertical run, the actual current capacity does not decrease compared with the nameplate value because there is no continuous space inside L-S Bus Duct.



MORTAR FLANGE

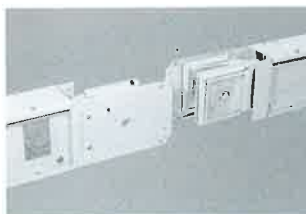
# CONNECTION METHOD

As L-S Bus Ducts incorporate one bolt joint principle, anybody can connect them easily. Further, the possibility of visually confirming completion of clamping improves installation reliability remarkably.

Packing of L-S Bus Ducts consists of covering the contact surface of the bus bar with a polyethylene cover, covering the mechanism of the joint portion with a protective cover of steel plate to prevent damage during transportation, and covering the entire bus duct with a polyethylene tube to keep it from moisture and dust.

Immediately before installation, remove the protective cover of the joint portion and polyethylene cover of the bus bar. It is recommended to remove the polyethylene tube covering the entire bus duct after completion of installation in order to protect the bus duct from water and paint during installation work.

## Description of Connection



1 Engage the bus ducts with each other until the stoppers collide.



2 Set the perfect joint bolt equipped with a lock mechanism.



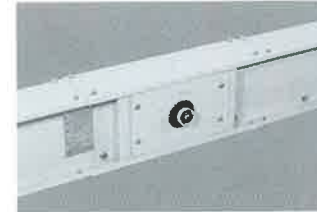
3 Fasten the side, upper and lower plates with screws.



4 After completing mounting over the entire route length, tighten the perfect joint bolts by the special wrench. When the specified torque is reached, the outer head of the bolt is twisted off and the red ring comes off.



5 After tightening the perfect joint bolt, break and remove the red plate to set the lock mechanism.



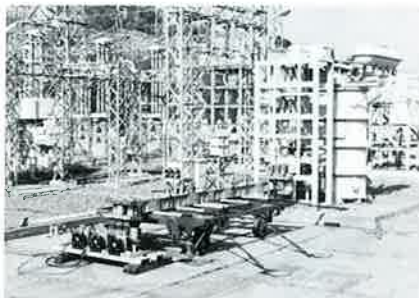
6 Completion of connection  
The perfect joint bolt, when properly connected, leaves only the blue ring on its surface.

# SHORT CIRCUIT CAPACITY

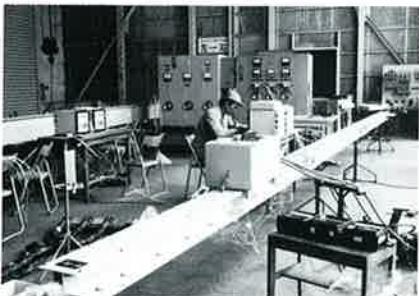
For the values of short circuit current capacity of L-S Bus Ducts, refer to the right table.

Tests have been carried out at an authorized facilities.

The values are the same for the feeder bus duct and plug-in (*tap-off*) bus duct.



SHORT CIRCUIT TEST



TEMPERATURE RISE TEST

## SHORT CIRCUIT CAPACITY (KA) RMS sym.

Ampere Rating	Aluminum Bus Bar			Copper Bus Bar		
	0.1 Sec.	1 Sec.	3 Sec.	0.1 Sec.	1 Sec.	3 Sec.
500	50	30	22	—	—	—
600	50	40	25	—	—	—
700	—	—	—	50	45	26
800	50	40	30	50	45	30
1000	60	50	40	60	60	40
1200	75	60	50	75	75	50
1500	75	75	60	75	75	60
1700	75	75	60	75	75	60
2000	100	100	90	100	100	90
2500	100	100	100	100	100	100
3000	100	100	100	100	100	100
3500	175	175	175	175	175	175
4000	175	175	175	175	175	175
4500	200	200	200	200	200	200
5000	200	200	200	200	200	200

When the duration of short circuit current is 0.1 second, a reinforced type bus duct having larger (short circuit current) capacity is available.

# VOLTAGE DROP DATA



For the values of line to line voltage drop of three-phase L-S Bus Ducts when energized with rated current, refer to the table below.

The values are the same for the feeder bus duct and plug-in (*tap-off*) bus duct.

The values of voltage drop shown are those at terminal concentrated loads. In the case of uniformly distributed loads, the values of voltage drop are equal to 1/2 (50%) of those shown in the table.

**AVERAGE 3-PHASE VOLTAGE DROP AT RATED CURRENT (CONDUCTOR TEMPERATURE 95°C)**

	Ampere Rating	Bus Bars Per Phase (mm)	Impedance ( $10^{-6} \Omega / m$ )			Voltage Drop at Power Factors (V/m)				
			R	X	$Z = \sqrt{R^2 + X^2}$	1.0	0.9	0.8	0.7	
Aluminum Bus Bars	50 Hz	500	One — 6 × 50	127.1	25.0	129.4	0.1101	0.1085	0.1010	0.0925
		600	One — 6 × 55	113.5	23.1	115.8	0.1179	0.1166	0.1088	0.0997
		800	One — 6 × 75	83.9	17.9	85.8	0.1163	0.1154	0.1079	0.0991
		1000	One — 6 × 100	63.7	13.9	65.2	0.1103	0.1098	0.1027	0.0944
		1200	One — 10 × 100	39.7	19.1	44.1	0.0825	0.0916	0.0898	0.0861
		1500	One — 10 × 125	32.8	15.8	36.4	0.0852	0.0946	0.0928	0.0890
		1700	One — 10 × 150	27.9	13.5	31.0	0.0821	0.0913	0.0896	0.0859
		2000	One — 10 × 175	24.4	11.8	27.1	0.0845	0.0939	0.0921	0.0884
		2500	One — 10 × 230	19.2	9.1	21.3	0.0831	0.0922	0.0904	0.0866
		3000	One — 10 × 280	16.2	7.6	17.9	0.0842	0.0932	0.0913	0.0875
	3500	Two — 10 × 175	13.4	5.6	14.5	0.0812	0.0879	0.0854	0.0811	
	4000	Two — 10 × 200	11.9	5.0	12.9	0.0824	0.0893	0.0867	0.0824	
	4500	Two — 10 × 230	10.6	4.4	11.5	0.0827	0.0894	0.0868	0.0825	
	5000	Two — 10 × 280	8.9	3.7	9.6	0.0771	0.0833	0.0809	0.0768	
	60 Hz	500	One — 6 × 50	128.8	30.0	132.2	0.1115	0.1117	0.1048	0.0966
	600	One — 6 × 55	114.0	27.8	117.3	0.1185	0.1192	0.1121	0.1036	
	800	One — 6 × 75	84.6	21.5	87.3	0.1172	0.1185	0.1117	0.1033	
	1000	One — 6 × 100	64.3	16.7	66.4	0.1114	0.1128	0.1064	0.0986	
	1200	One — 10 × 100	40.6	23.0	46.7	0.0844	0.0968	0.0962	0.0932	
	1500	One — 10 × 125	33.5	19.0	38.5	0.0870	0.0999	0.0992	0.0962	
1700	One — 10 × 150	28.7	16.2	33.0	0.0845	0.0969	0.0962	0.0932		
2000	One — 10 × 175	25.1	14.1	28.8	0.0869	0.0995	0.0989	0.0957		
2500	One — 10 × 230	19.8	11.0	22.7	0.0857	0.0979	0.0972	0.0940		
3000	One — 10 × 280	16.6	9.1	19.0	0.0863	0.0985	0.0977	0.0945		
3500	Two — 10 × 175	13.8	6.7	15.4	0.0818	0.0931	0.0914	0.0877		
4000	Two — 10 × 200	12.3	6.0	13.7	0.0852	0.0948	0.0931	0.0893		
4500	Two — 10 × 230	10.9	5.3	12.1	0.0851	0.0946	0.0929	0.0891		
5000	Two — 10 × 280	9.3	4.5	10.3	0.0805	0.0895	0.0873	0.0842		
Copper Bus Bars	50 Hz	700	One — 6 × 50	76.8	25.0	80.8	0.0931	0.0970	0.0927	0.0868
		800	One — 6 × 55	70.0	23.1	73.7	0.0970	0.1012	0.0968	0.0907
		1000	One — 6 × 75	52.0	17.9	55.0	0.0901	0.0946	0.0907	0.0852
		1200	One — 6 × 100	40.0	13.9	42.3	0.0831	0.0874	0.0838	0.0788
		1500	One — 6 × 125	32.9	11.4	34.8	0.0855	0.0898	0.0861	0.0810
		1700	One — 6 × 150	28.0	9.6	29.6	0.0824	0.0866	0.0830	0.0780
		2000	One — 6 × 175	24.6	8.3	26.0	0.0852	0.0893	0.0856	0.0804
		2500	One — 6 × 230	19.3	6.4	20.4	0.0836	0.0875	0.0837	0.0786
		3000	One — 6 × 280	16.3	5.5	17.2	0.0847	0.0887	0.0849	0.0797
		3500	Two — 6 × 175	13.4	3.9	14.0	0.0812	0.0834	0.0792	0.0738
	4000	Two — 6 × 200	11.9	3.4	12.4	0.0824	0.0847	0.0804	0.0749	
	4500	Two — 6 × 230	10.6	3.0	11.0	0.0825	0.0846	0.0803	0.0748	
	5000	Two — 6 × 280	9.0	2.6	9.4	0.0777	0.0799	0.0759	0.0706	
	60 Hz	700	One — 6 × 50	77.2	30.0	82.8	0.0936	0.1001	0.0967	0.0915
	800	One — 6 × 55	70.6	27.8	75.9	0.0978	0.1048	0.1014	0.0960	
	1000	One — 6 × 75	53.0	21.5	57.2	0.0918	0.0989	0.0958	0.0908	
	1200	One — 6 × 100	41.1	16.7	44.4	0.0854	0.0920	0.0892	0.0846	
	1500	One — 6 × 125	33.6	13.7	36.3	0.0873	0.0941	0.0912	0.0865	
	1700	One — 6 × 150	28.8	11.6	31.0	0.0848	0.0912	0.0883	0.0837	
	2000	One — 6 × 175	25.1	10.1	27.1	0.0869	0.0935	0.0905	0.0858	
2500	One — 6 × 230	19.8	7.7	21.3	0.0857	0.0919	0.0889	0.0841		
3000	One — 6 × 280	16.7	6.4	17.9	0.0868	0.0928	0.0897	0.0849		
3500	Two — 6 × 175	13.7	4.6	14.5	0.0830	0.0871	0.0835	0.0784		
4000	Two — 6 × 200	12.3	4.1	13.0	0.0852	0.0893	0.0855	0.0803		
4500	Two — 6 × 230	10.9	3.6	11.5	0.0851	0.0891	0.0853	0.0801		
5000	Two — 6 × 280	9.2	3.1	9.7	0.0710	0.0834	0.0798	0.0749		

# APPLICATION DATA

**Standards** ..... IEC 439-1, IEC 439-2, BS 5486:Part 2, JIS C 8364

**Degree of Protection** ..... IP 41 (IEC 529)

**Type** ..... Totally enclosed low impedance feeder and plug-in (*tap-off*) bus duct

**Systems** ..... 3  $\phi$  3 Wire, 3  $\phi$  4 Wire full neutral, 1  $\phi$  2 Wire, 1  $\phi$  3 Wire full neutral

**Ratings** Feeder and plug-in (*tap-off*) bus ducts are the same.

Rated voltage 600 Volts AC maximum

Rated current: with aluminum bus bars ..... 500A~5000A

with copper bus bars ..... 700A~5000A

**Insulation** ..... All bus bars are fully insulated with Class B (130°C) material excepting joints.

**Platings** ..... Both aluminum and copper bus bars are electro-plated with tin over their entire length.

**Earth Systems** ..... Case earth system (standard)

External earth tape (3 mm $\times$ 25 mm) by option

Integral 50% earth bar by option

## CROSS SECTIONS

### CONTENT AND WEIGHT

#### Feeder Bus Duct, Plug-in (*Tap-off*) Bus Duct

L-S Bus Ducts, both the feeder bus duct and the plug-in (*tap-off*) bus duct, have the same cross section dimensions and approximate weight.

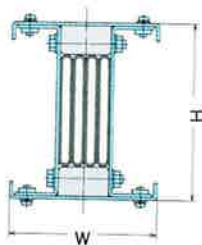


Fig. a

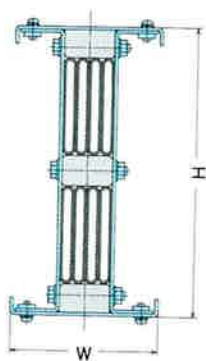


Fig. b

#### ALUMINUM BUS DUCT - L-S (A)

Ampere Rating	Fig.	Bus Bars Per Phase (mm)	3 Wire System			4 Wire System		
			W (mm)	H (mm)	Weight (kg/m)	W (mm)	H (mm)	Weight (kg/m)
500	a	One - 6 $\times$ 50	*125	135	12	*165	135	15
600	a	One - 6 $\times$ 55	*125	135	13	*165	135	16
800	a	One - 6 $\times$ 75	*125	135	14	*165	135	17
1000	a	One - 6 $\times$ 100	*125	185	17	*165	185	20
1200	a	One - 10 $\times$ 100	125	185	21	165	185	27
1500	a	One - 10 $\times$ 125	125	185	24	165	185	30
1700	a	One - 10 $\times$ 150	125	235	28	165	235	34
2000	a	One - 10 $\times$ 175	125	235	30	165	235	38
2500	a	One - 10 $\times$ 230	125	290	35	165	290	44
3000	a	One - 10 $\times$ 280	125	340	44	165	340	55
3500	b	Two - 10 $\times$ 175	125	450	57	165	450	71
4000	b	Two - 10 $\times$ 200	125	500	63	165	500	78
4500	b	Two - 10 $\times$ 230	125	560	69	165	560	86
5000	b	Two - 10 $\times$ 280	125	660	90	165	660	115

#### COPPER BUS DUCT - L-S (C)

Ampere Rating	Fig.	Bus Bars Per Phase (mm)	3 Wire System			4 Wire System		
			W (mm)	H (mm)	Weight (kg/m)	W (mm)	H (mm)	Weight (kg/m)
700	a	One - 6 $\times$ 50	*125	135	18	*165	135	22
800	a	One - 6 $\times$ 55	*125	135	19	*165	135	24
1000	a	One - 6 $\times$ 75	*125	135	22	*165	135	28
1200	a	One - 6 $\times$ 100	*125	185	28	*165	185	36
1500	a	One - 6 $\times$ 125	*125	185	33	*165	185	41
1700	a	One - 6 $\times$ 150	*125	235	39	*165	235	49
2000	a	One - 6 $\times$ 175	*125	235	43	*165	235	55
2500	a	One - 6 $\times$ 230	*125	290	56	*165	290	71
3000	a	One - 6 $\times$ 280	*125	340	67	*165	340	85
3500	b	Two - 6 $\times$ 175	*125	450	84	*165	450	106
4000	b	Two - 6 $\times$ 200	*125	500	94	*165	500	119
4500	b	Two - 6 $\times$ 230	*125	560	112	*165	560	141
5000	b	Two - 6 $\times$ 280	*125	660	134	*165	660	169

Dimensions marked \* in the table can be decreased by 25mm (3Wire) 35mm (4Wire) at no additional cost for the feeder bus duct only.

# STRAIGHT LENGTHS

## FEEDER STRAIGHT LENGTHS

Aluminum, Copper

Any length of bus duct ranging from standard to minimum lengths can be fabricated under the same price per meter.



Standard and Maximum Straight Length L(mm)	Minimum Straight Length L (mm)
3000	600

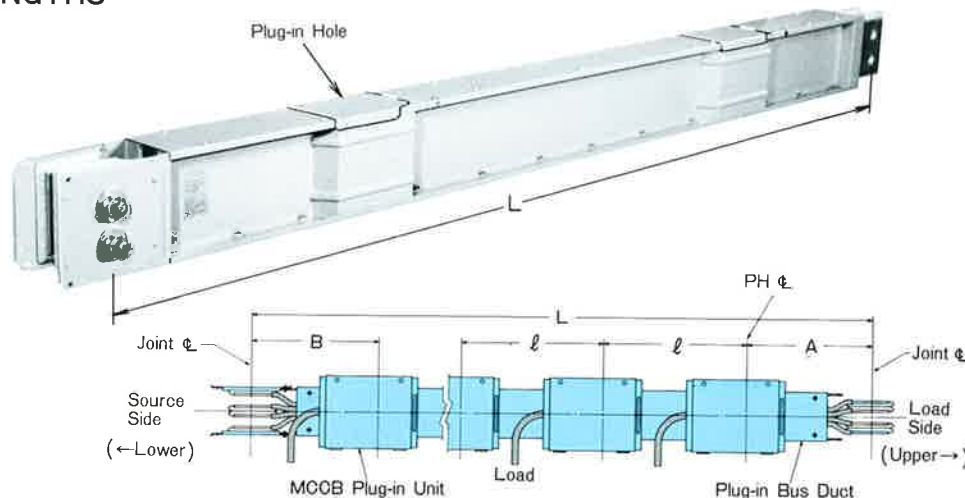
## PLUG-IN STRAIGHT LENGTHS

Aluminum, Copper

### The Number of Plug-in Holes

The number of plug-in holes of L-S Bus Duct will be as specified by Customer. The price of the plug-in bus duct is feeder bus duct price plus the price of the required number of plug-in holes.

The location of plug-in holes can be arranged in correct positions as required by Customer. (Ex. In the case of vertical installation, we can arrange them at the same height from each floor level.)



Ratings of Using MCCB Plug-in Units (Amperes)	Standard Length		Min. Length with One Plug-in Hole L (mm)	Min. Spacing of Plug-in Hole $l$ (mm)	Min. Dimension	
	L (mm)	Max. Nos. of Plug-in Hole			A (mm)	B (mm)
50·100	3000	4 Nos.	1080	540	630	450
225		3 Nos.	1155	660		525
400·600		2 Nos.	1585	1200		955

\* Table shown is applicable to MCCB plug-in unit only; not applicable to fusible plug-in unit.

## TAP-OFF STRAIGHT LENGTHS

Aluminum, Copper

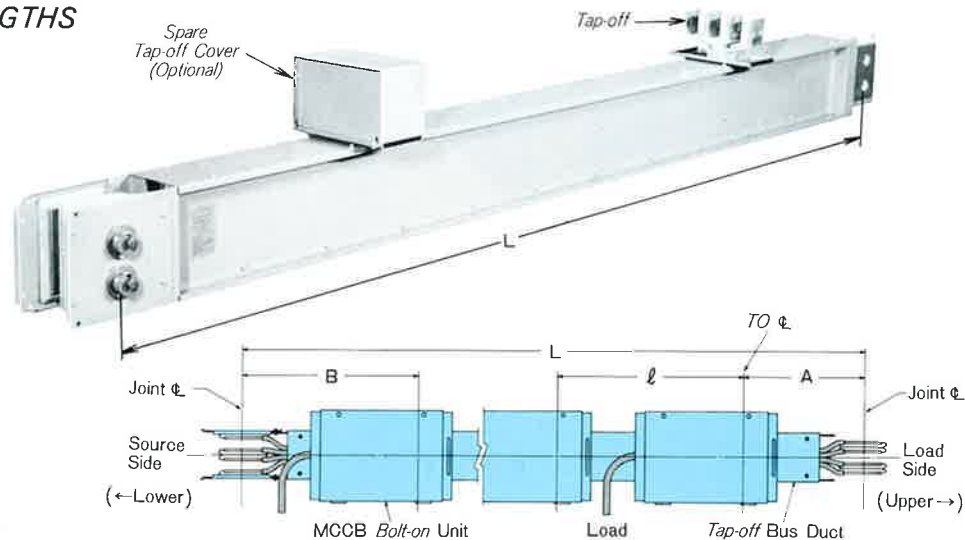
### The Number of Tap-offs

The number of *tap-offs* of L-S Bus Duct will be as specified by Customer.

The price of the *tap-off bus duct* is feeder bus duct price plus the price of the required number of *tap-offs*.

The location of *tap-offs* can be arranged in correct positions as required by Customer. (Ex. In the case of vertical installation, we can arrange them at the same height from each floor level.)

The PS (Pressure Sensible) washer, which enables visual control of bolts, is adopted for *tap-off* tightening. (See page 16)



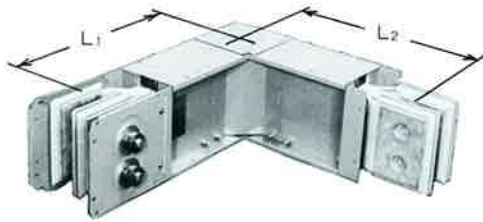
Ratings of Using MCCB Bolt-on Units (Amperes)	Standard Length		Min. Length with One Tap-off L (mm)	Min. Spacing of Tap-off $l$ (mm)	Min. Dimension	
	L (mm)	Max. Nos. of Tap-off			A (mm)	B (mm)
50·100	3000	3 Nos.	1070	700	400	670
225		3 Nos.	1120	830		720
400·600		2 Nos.	1460	1350		1060
800		1 Nos.	1620	1600		1220

\* Table shown is applicable to MCCB bolt-on unit only; not applicable to fusible bolt-on unit.

# ELBOWS AND OFFSETS

## ■ HORIZONTAL ELBOWS (HL)

Aluminum, Copper

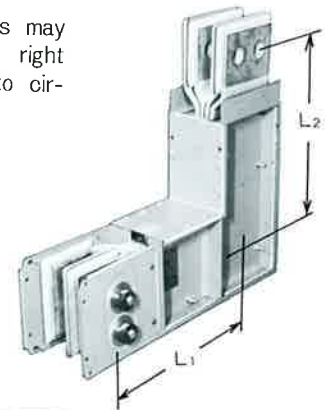


Ampere Rating	Standard Length L <sub>1</sub> × L <sub>2</sub> (mm)	Minimum Length L <sub>1</sub> × L <sub>2</sub> (mm)
500	500 × 500	380 × 380
600		
700		
800		
1000		
1200		
1500		
1700		
2000		
2500		
3000		
3500		
4000		
4500		
5000		

## ■ VERTICAL ELBOWS (VL)

Aluminum, Copper

Straight bus ducts may be connected at right angles according to circumstances.



Ampere Rating	Standard Length L <sub>1</sub> × L <sub>2</sub> (mm)	Minimum Length L <sub>1</sub> × L <sub>2</sub> (mm)
500	500 × 500	350 × 350
600		
700		
800		
1000		
1200		
1500		
1700		
2000		
2500		
3000		
3500		
4000		
4500		
5000		

## ■ HORIZONTAL OFFSETS (HZ)

Aluminum, Copper

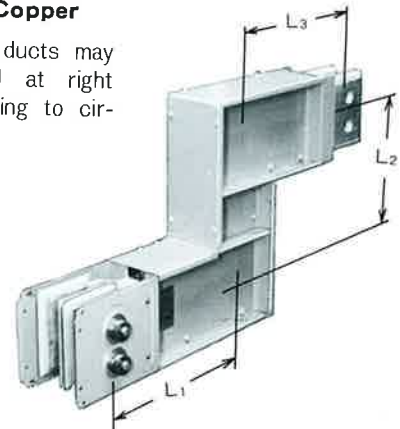


Ampere Rating	Standard Length L <sub>1</sub> × L <sub>2</sub> × L <sub>3</sub> (mm)	Minimum Length L <sub>1</sub> × L <sub>2</sub> × L <sub>3</sub> (mm)
500	500 × 500 × 500	380 × Free × 380
600		
700		
800		
1000		
1200		
1500		
1700		
2000		
2500		
3000		
3500		
4000		
4500		
5000		

## ■ VERTICAL OFFSETS (VZ)

Aluminum, Copper

Straight bus ducts may be connected at right angles according to circumstances.

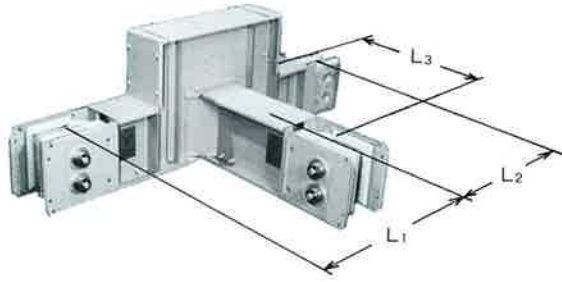


Ampere Rating	Standard Length L <sub>1</sub> × L <sub>2</sub> × L <sub>3</sub> (mm)	Minimum Length L <sub>1</sub> × L <sub>2</sub> × L <sub>3</sub> (mm)
500	500 × 500 × 500	350 × Free × 350
600		
700		
800		
1000		
1200		
1500		
1700		
2000		
2500		
3000		
3500		
4000		
4500		
5000		

# TEES AND CROSSES

## ■ HORIZONTAL TEES (HT)

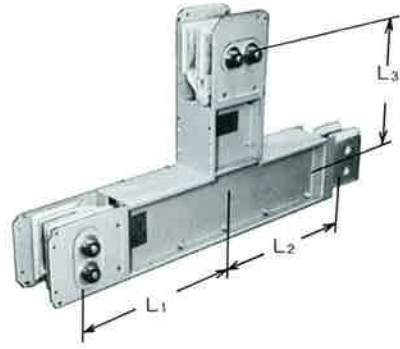
Aluminum, Copper



Ampere Rating	Standard Length $L_1 \times L_2 \times L_3$ (m)	Minimum Length $L_1 \times L_2 \times L_3$ (mm)
500	650 × 650 × 500	495 × 495 × 380
600		
700		
800		545 × 545 × 380
1000		
1200		
1500	750 × 750 × 500	595 × 595 × 380
1700		650 × 650 × 380
2000		
2500	700 × 700 × 380	700 × 700 × 380
3000		
3500	—	—
4000	—	—
4500	—	—
5000	—	—

## ■ VERTICAL TEES (VT)

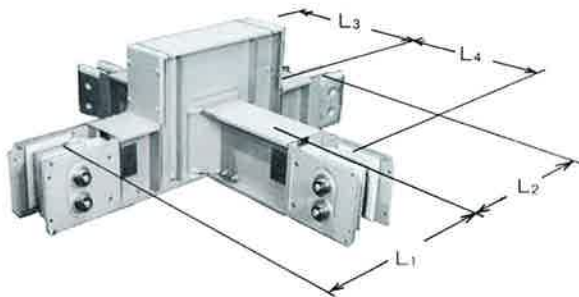
Aluminum, Copper



Ampere Rating	Standard Length $L_1 \times L_2 \times L_3$ (mm)	Minimum Length $L_1 \times L_2 \times L_3$ (mm)
500	500 × 500 × 500	350 × 350 × 350
600		
700		
800		375 × 375 × 375
1000		
1200		
1500	400 × 400 × 400	
1700		425 × 425 × 425
2000		
2500	650 × 650 × 650	450 × 450 × 450
3000		505 × 505 × 505
3500	530 × 530 × 530	560 × 560 × 560
4000		610 × 610 × 610
4500	750 × 750 × 750	610 × 610 × 610
5000		610 × 610 × 610

## ■ HORIZONTAL CROSSES (HX)

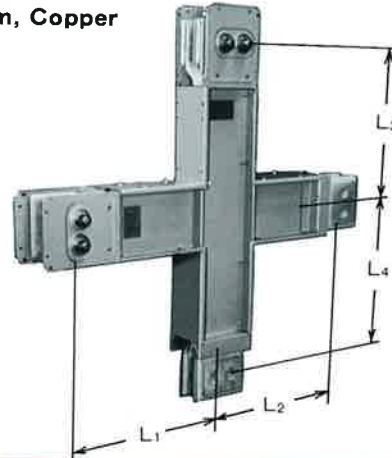
Aluminum, Copper



Ampere Rating	Standard Length $L_1 \times L_2 \times L_3 \times L_4$ (mm)	Minimum Length $L_1 \times L_2 \times L_3 \times L_4$ (mm)
500	650 × 650 × 500 × 500	495 × 495 × 380 × 380
600		
700		
800		545 × 545 × 380 × 380
1000		
1200		
1500	750 × 750 × 500 × 500	595 × 595 × 380 × 380
1700		650 × 650 × 380 × 380
2000		
2500	700 × 700 × 380 × 380	700 × 700 × 380 × 380
3000		
3500	—	—
4000	—	—
4500	—	—
5000	—	—

## ■ VERTICAL CROSSES (VX)

Aluminum, Copper



Ampere Rating	Standard Length $L_1 \times L_2 \times L_3 \times L_4$ (mm)	Minimum Length $L_1 \times L_2 \times L_3 \times L_4$ (mm)
500	500 × 500 × 500 × 500	350 × 350 × 350 × 350
600		
700		
800		375 × 375 × 375 × 375
1000		
1200		
1500	400 × 400 × 400 × 400	
1700		424 × 425 × 425 × 425
2000		
2500	650 × 650 × 650 × 650	450 × 450 × 450 × 450
3000		505 × 505 × 505 × 505
3500	530 × 530 × 530 × 530	560 × 560 × 560 × 560
4000		610 × 610 × 610 × 610
4500	750 × 750 × 750 × 750	610 × 610 × 610 × 610
5000		610 × 610 × 610 × 610

# FLANGED ENDS (CABLE FEED-IN BOXES)

## FLANGED END (Fge.End)—CABLE FEED-IN BOXES

Aluminum: 500A~3000A, Copper: 700A~3000A

Dimension of switchboard plate openings: ※ × F

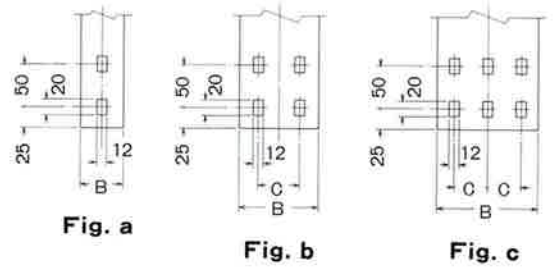
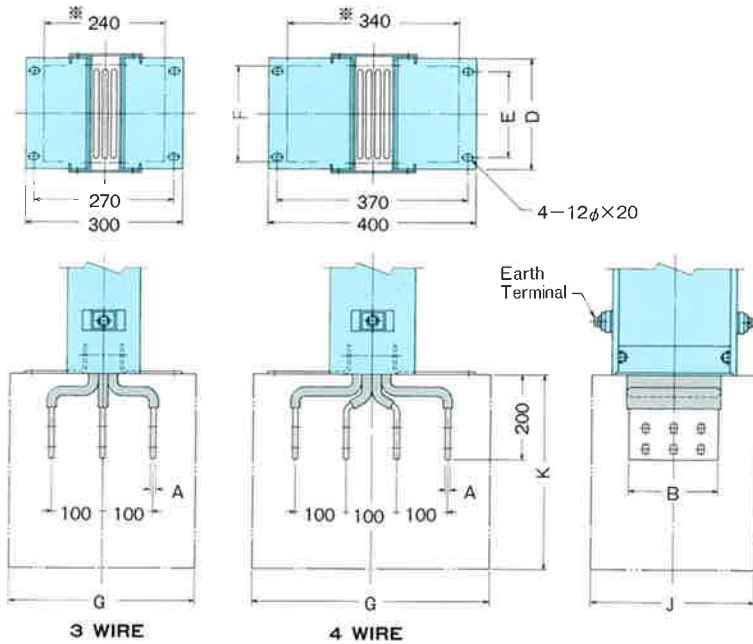


Fig. a

Fig. b

Fig. c

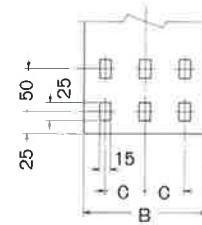


Fig. d

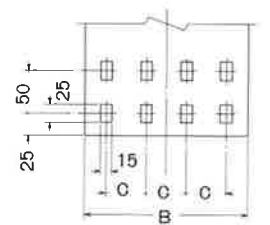


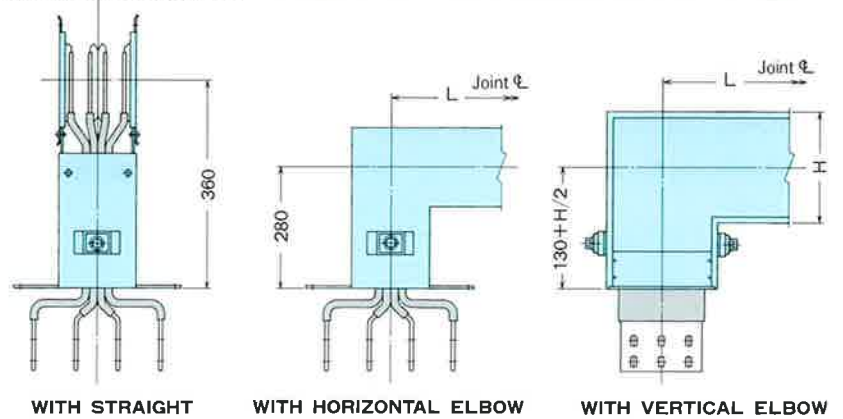
Fig. e

The PS washer is adopted, which enables visual control of bolts, is adopted for tightening of terminal conductors. (See page 16)



STANDARD LENGTH

### Minimum Length of Flanged End (commonness for all ratings)



WITH STRAIGHT

WITH HORIZONTAL ELBOW

WITH VERTICAL ELBOW

Dimensions L: refer to each dimension L of HORIZONTAL or VERTICAL ELBOWS on Page 13.

Dimensions H: refer to each dimension H of CROSS SECTIONS on Page 11.

Ampere Rating		Fig.	Flanged Ends							Cable Feed-in Boxes			
Aluminum	Copper		A (mm)		B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)		J (mm)	K (mm)
			Aluminum	Copper						3 Wire	4 Wire		
500	700	a	6	6	50	—	125	75	95	360	460	250	500
600	800	a	6	6	55	—	125	75	95	360	460	250	500
800	1000	b	6	6	75	40	125	75	95	360	460	250	500
1000	—	b	6	—	100	50	175	125	145	480	600	250	500
1200	1200	b	10	6	100	50	175	125	145	480	600	250	500
1500	1500	b	10	6	125	70	175	125	145	480	600	250	500
1700	1700	c	10	6	150	50	225	175	195	480	600	300	500
2000	2000	d	10	6	175	67	225	175	195	480	600	300	500
2500	2500	e	10	6	230	60	280	230	250	480	600	400	500
3000	3000	e	10	6	280	60	330	280	300	480	600	400	500

\* The bus bar terminal of the flanged end and the cable feed-in box can be manufactured in special dimensions.

\* The connecting box for transformer or switchboard will be manufactured in specified dimensions.

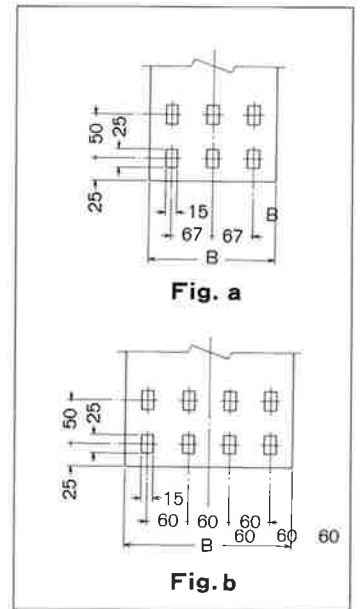
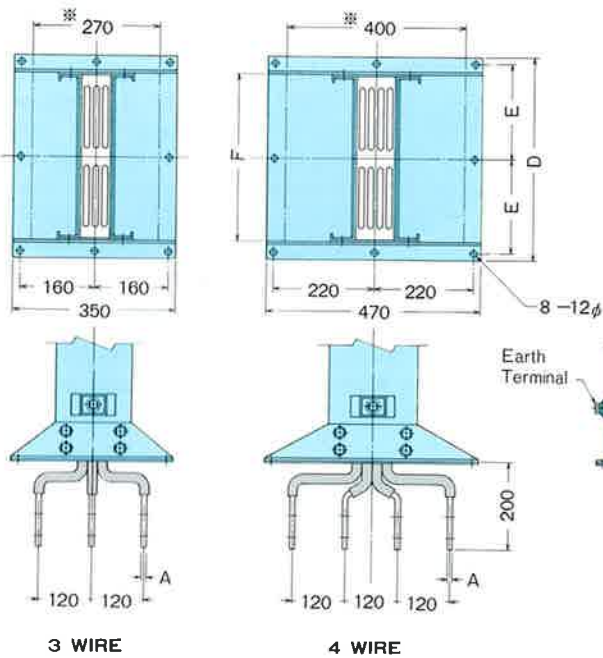
\* It is recommended to use a flexible bus bar for connecting the transformer terminal and bus duct flanged end. (Optional)



■ FLANGED ENDS (Fge.End)

Aluminum, Copper : 3500A~5000A

Dimension of switchboard plate openings : ※ × F



The PS washer is adopted, which enables visual control of bolts, is adopted for tightening of terminal conductors.  
(See the following section “PS Washer”)

Ampere Rating		Fig.	A (mm)		B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
Aluminum	Copper		Aluminum	Copper					
3500	3500	a	10	6	175	215	530	250	430
4000	4000	a	10	6	200	240	580	275	480
4500	4500	b	10	6	230	270	640	305	540
5000	5000	b	10	6	280	320	740	355	640

■ PS Washer

The PS (Pressure Sensible) washer, intended for use in clamping each phase of bus duct joints with equipment, etc., is sensible to the tightening pressure. When a required tightening force is reached, the red washer comes off and the blue washer appears, indicating completion of tightening. This PS washer is the world's first pressure sensible washer that exerts a bolt sealing effect (gas-and water-tightness).

- ☑ Specified tightening pressure
- M10.....500kgf ± 8%  
(same as 300kg-cm)
- M12.....900kgf ± 6%  
(same as 525kg-cm)



When the tightening force reaches the specified level, the red washer comes off, making a popping sound and producing the touch of rubber rupture on your hand.



<Before Tightening>

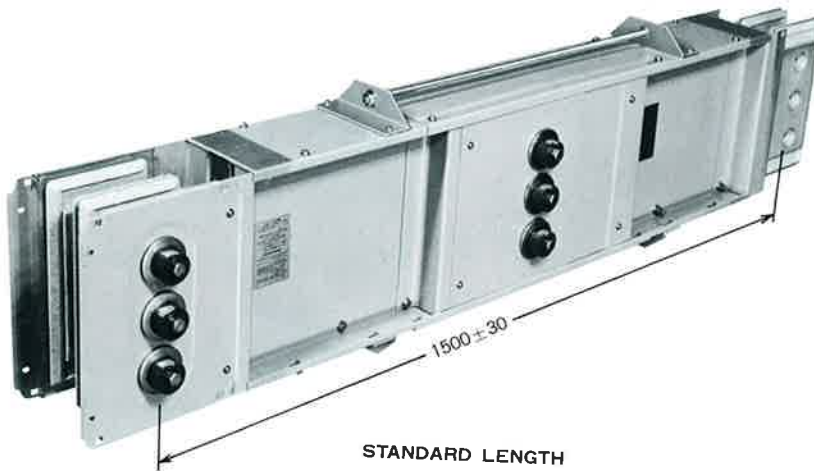
<After Tightening>

Note: To set the PS washer, use the setting method described in the operating instructions affixed to the product.

# ADJUSTABLE SECTIONS

## ■ ADJUSTABLE SECTIONS (Adj)

Aluminum : 500A ~ 3000A, Copper : 700A ~ 3000A

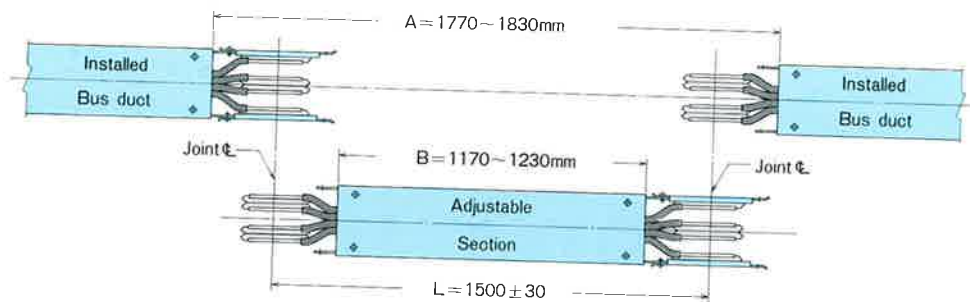


## ADJUSTABLE SECTION

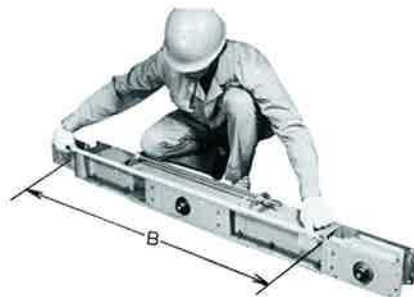
The weakest point of the bus duct is that its length cannot be adjusted on the site. How much trouble we have experienced with bus duct installation! This adjustable section for L-S Bus Duct ensures easy length adjustment on the site to absorb the dimensional errors in the location of equipment connected to the bus duct or those of the building itself.

The adjustable range of one unit is  $\pm 30$  mm. Mount the adjustable section finally.

## Method of Adjustment



\* A : Measuring Dimension  
\* B : Adjusting Dimension  
( $B = A - 600$ mm)



1 Loosen the connecting bolt temporarily tightened and screws of the top and bottom joint covers for the adjustable portion. (They need not be removed.)

2 The adjustable section is preset in the state of the maximum length (+30mm). With reference to the above illust., measure dimension A between installed bus ducts, and calculate dimension B = A - 600mm to be adjusted. Next, adjust the dimension B of the adjustable section by tightening the stud bolt of the adjuster.



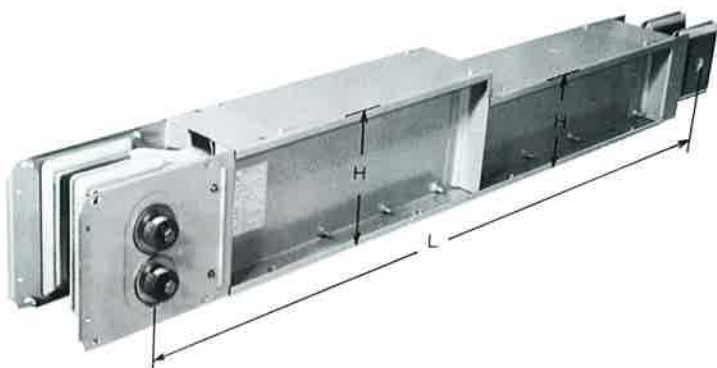
3 After adjusting the length, temporarily retighten the tightening bolt of the adjustable portion. (Do not twist off the outer head.)

4 Tighten the screws of the top and bottom joint covers of the adjustable portion, and remove the adjuster.

5 Finish of adjustment. After mounting the adjustable section, twist off the outer head of the tightening bolt of the adjustable portion together with those of the connecting bolts of the bus ducts.

## REDUCER SECTIONS (Re)

Aluminum, Copper

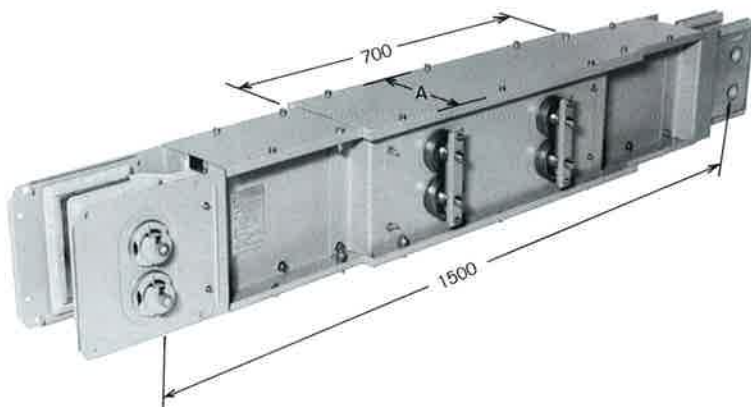


Standard Length L (mm)	Minimum Length L (mm)
1500	800

- \* For the reducer section, express as for example, Re(2000A→1200A).
- \* Reducer section can be provided with floor support or plug-in hole (*tap-off*) by option.
- \* The section having different dimensions H at both sides is fabricated to meet the level at the bottom face for horizontal run and at the rear face for vertical run.

## G-TYPE EXPANSION SECTIONS (G-Exp)

Aluminum, Copper



G-Type expansion section is used at where the bus duct passes through a building expansion joint.

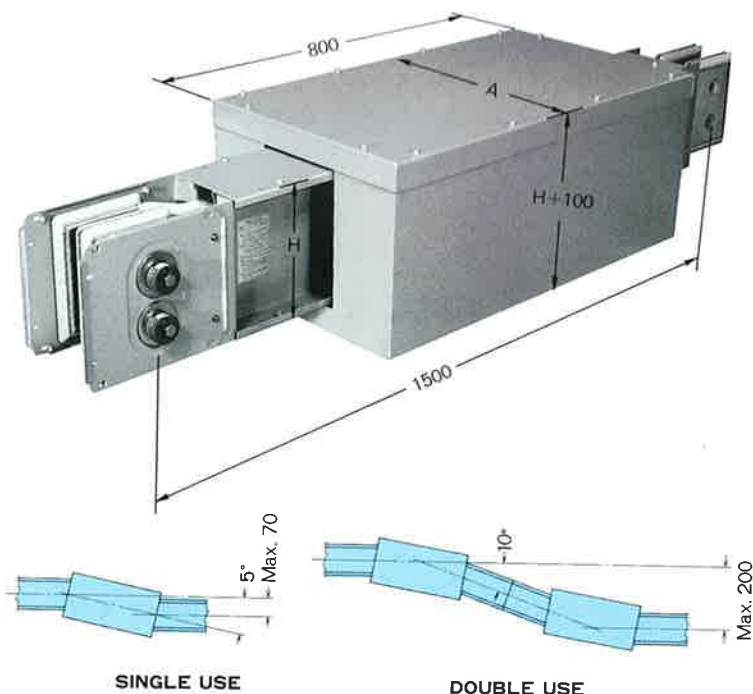
The thermal expansion section is needless for L-S Bus Duct. (See Page 4)

A (mm)	
3 Wire	4 Wire
170	210

- \* The removable range are  $\pm 10/30$  mm for bus duct length directions.
- \* Flexible bus bars incorporated within it are made of copper leaf laminates.
- \* After installation, remove the red butterfly bolts.

## F-TYPE EXPANSION SECTIONS (F-Exp)

Aluminum, Copper



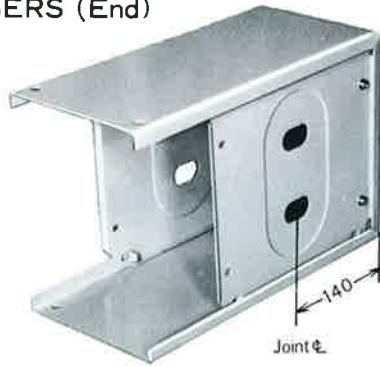
F-Type expansion section is used between buildings made different bases or is used through outdoor and indoor so as to meet the ground sinking.

A (mm)	
3 Wire	4 Wire
360	460

- \* The removable range are  $\pm 5$  degrees in angle for every directions and are  $\pm 30$  mm for length directions.
- \* After installation, remove the fixing covers (no mention in photo).

# END CLOSERS, HANGERS AND WALL FLANGES

## END CLOSERS (End)

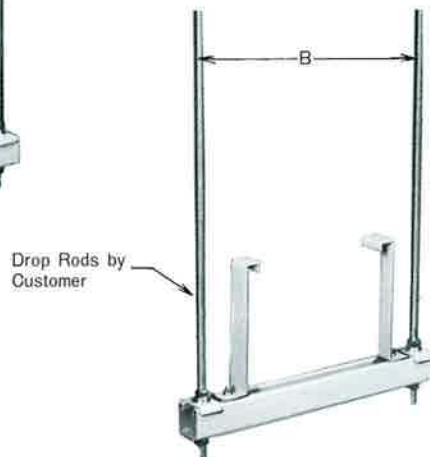


## HANGERS

### Edgewise Hangers (E. Hg) (Standard)



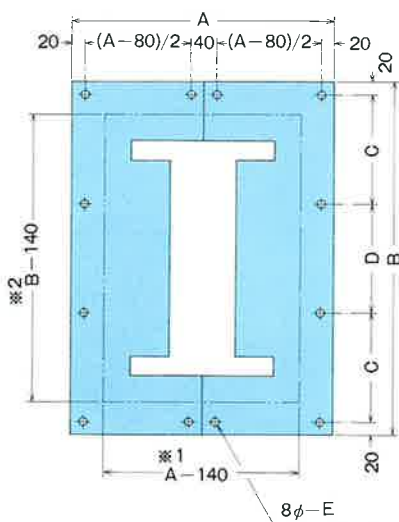
### Flatwise Hangers (F. Hg)



Ampere Rating		A (mm)		B
Aluminum	Copper	3 Wire	4 Wire	(mm)
500	700	260	300	255
600	800	260	300	255
800	1000	260	300	255
1000	—	260	300	305
1200	1200	260	300	305
1500	1500	260	300	305
1700	1700	260	300	355
2000	2000	260	300	355
2500	2500	260	300	410
3000	3000	260	300	460
3500	3500	260	300	570
4000	4000	260	300	620
4500	4500	260	300	680
5000	5000	260	300	780

\* It is recommended to support bus ducts at intervals of around 2 meters.

## WALL FLANGES (FLOOR FLANGE)



Ampere Rating		A (mm)		B	C	D	E
Aluminum	Copper	3 Wire	4 Wire	(mm)	(mm)	(mm)	(mm)
500	700	365	405	375	335	—	8
600	800	365	405	375	335	—	8
800	1000	365	405	375	335	—	8
1000	—	365	405	425	385	—	8
1200	1200	365	405	425	385	—	8
1500	1500	365	405	425	385	—	8
1700	1700	365	405	475	217.5	—	10
2000	2000	365	405	475	217.5	—	10
2500	2500	365	405	530	245	—	10
3000	3000	365	405	580	270	—	10
3500	3500	365	405	690	325	—	10
4000	4000	365	405	740	350	—	10
4500	4500	365	405	800	380	—	10
5000	5000	365	405	900	290	280	12

\* Flanges are paired. (Fit them to the both sides of the wall or floor.)

\* When using the flange together with the floor support, place them between the floor and base channel.

Required Wall Openings: (\*1) × (\*2)

# FLOOR SUPPORTS

## ■ FLOOR SUPPORTS (FS)

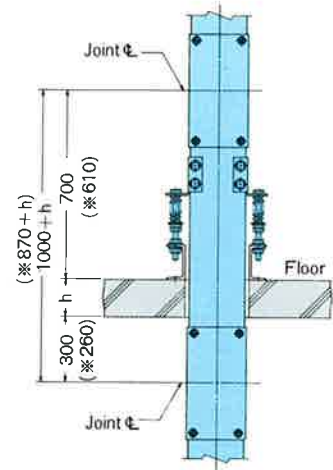
\* L-S Bus Ducts do not require drilling holes on the site because holes for floor support fittings are made in advance in bus duct casings. Further, adjustment can be made within  $\pm 25$  mm.

\* When floor flanges are needed, these can be provided between base channel and floor. (See Page 19)

\* To protect bus ducts from unexpected flooding, it is requested to provide mortar flanges around holes through floors. (See Page 8)



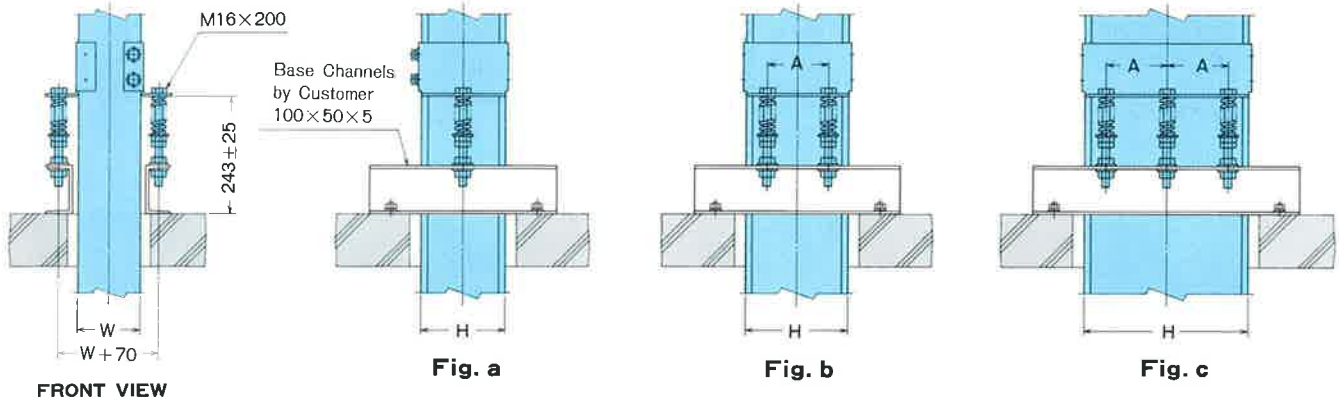
FLATWISE SUPPORT



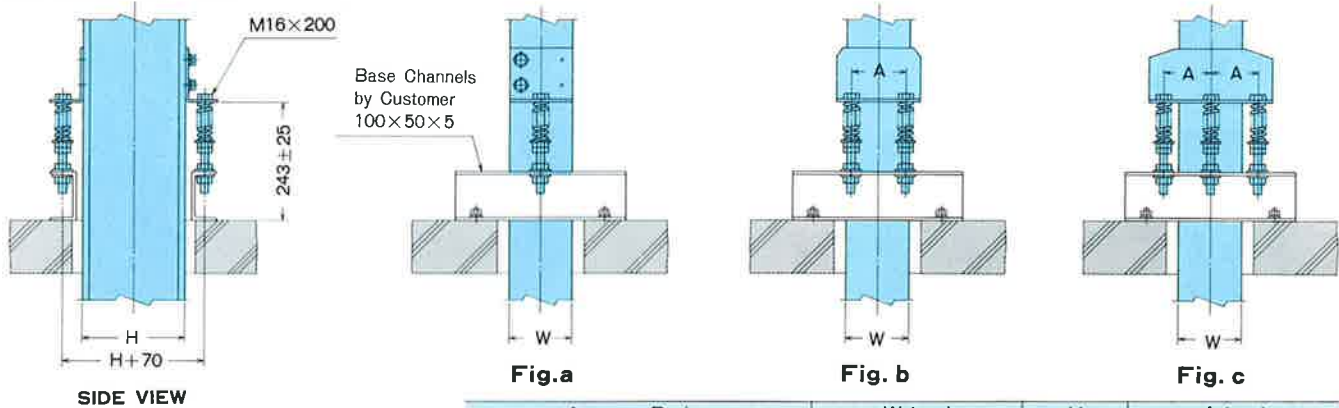
STANDARD LENGTH OF BUS DUCT WITH FLOOR SUPPORT

(Marked \* dimensions are minimum ones.)

### Flatwise Support



### Edgewise Support

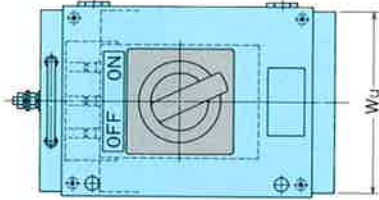


Ampere Rating		W (mm)		H (mm)	A (mm)			
Aluminum	Fig.	Copper	Fig.		3 Wire	4 Wire	Flatwise	Edgewise
500	a	700	a	125	165	135	—	—
600	a	800	a	125	165	135	—	—
800	a	1000	a	125	165	135	—	—
1000	a	—	—	125	165	185	—	—
1200	a	1200	b	125	165	185	130	140
1500	b	1500	b	125	165	185	130	140
1700	b	1700	b	125	165	235	170	140
2000	b	2000	b	125	165	235	170	140
2500	b	—	—	125	165	290	200	140
3000	b	—	—	125	165	340	250	140
—	—	2500	c	125	165	290	115	100
—	—	3000	c	125	165	340	135	100
3500	c	3500	c	125	165	450	190	100
4000	c	4000	c	125	165	500	190	100
4500	c	4500	c	125	165	560	230	100
5000	c	5000	c	125	165	660	250	100

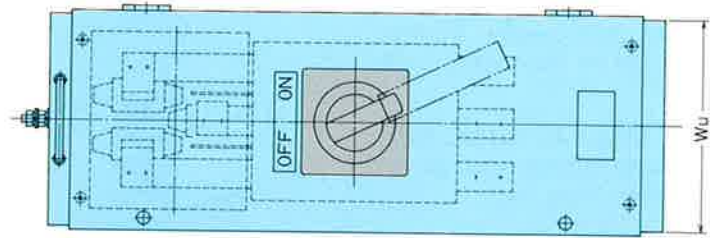
# MCCB PLUG-IN UNITS

## ■ CIRCUIT BREAKER PLUG-IN UNITS (PIL 2 TYPE): For Plug-in Bus Duct

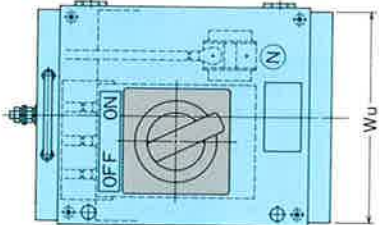
3 WIRE SYSTEM (TP)



3 WIRE SYSTEM (TP)



4 WIRE SYSTEM (TPN)



4 WIRE SYSTEM (TPN)

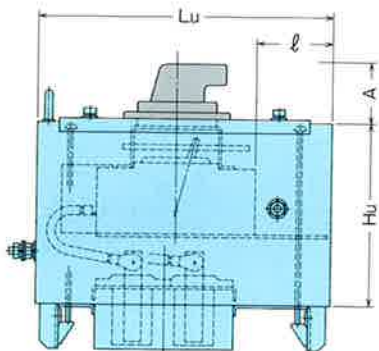
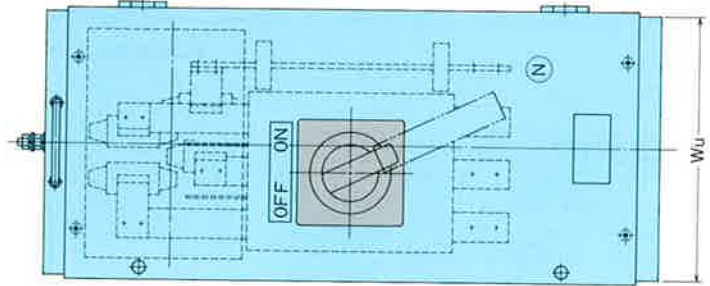


Fig. a

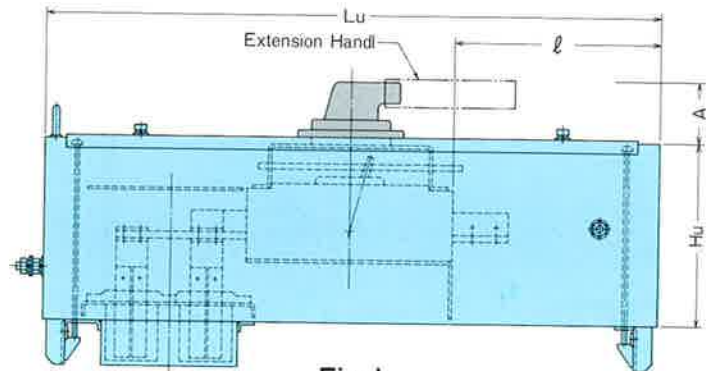


Fig. b



### DIMENSIONAL DATA AND WEIGHT (PIL2 TYPE)

MCCB Frame (Amperes)	Fig.	Wu (mm)		Hu (mm)	A (mm)	Lu (mm)	l (mm)	Weight (kg)	
		TP	TPN					TP	TPN
50	a	195	235	210	37	330	110	13.1	14.2
100	a	195	235	210	37	330	110	14.3	15.5
225	a	215	275	245	35	450	146	21.4	26.3
400	b	285	350	245	52	880	329	40.1	46.6
600	b	285	350	245	52	880	321	42.8	49.1

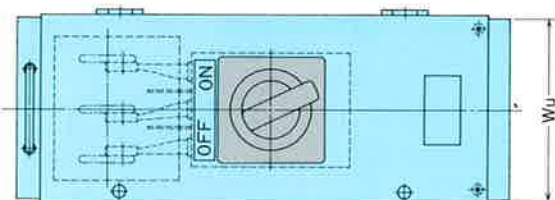
\* All rated units are provided with a duct interlock mechanism and cover interlock mechanism as standard.

\* Special handles for hook stick (or string) operation are optional.

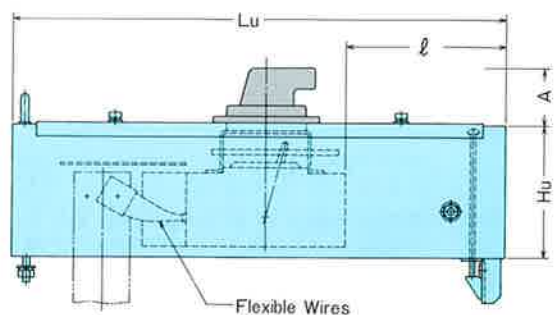
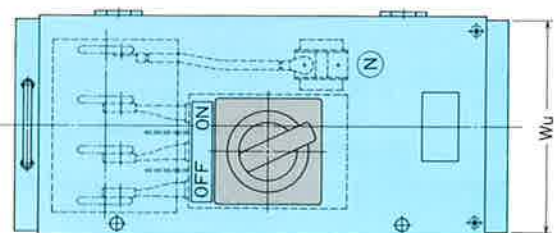
\* The fastener is of front operating type.

## ■ CIRCUIT BREAKER BOLT-ON UNITS (BOL 2 TYPE) : For Tap-off Bus Duct

3 WIRE SYSTEM (TP)



4 WIRE SYSTEM (TPN)



DIMENSIONAL DATA AND WEIGHT (BOL2 TYPE)

MCCB Frame (Amperes)	Wu (mm)		Hu (mm)	A (mm)	Lu (mm)	l (mm)	Weight (kg)	
	TP	TPN					TP	TPN
50	245	320	175	37	500	110	11.8	13.4
100	245	320	175	37	550	135	13.2	15.4
225	245	320	175	37	600	175	20.5	22.7
400	285	350	175	52	800	254	32.5	36.3
600	285	350	195	52	940	342	35.9	39.4
800	285	350	232	52	1100	400	51.2	56.1

- \* All rated units are provided with a cover interlock mechanism as standard.
- \* Special handles for hook stick (or string) operation are optional.
- \* The current rating can be raised up to 3200A by special order.

## ■ INTERRUPTING CAPACITY OF MCCB PLUG-IN (BOLT-ON) UNITS

MCCB Frame (Amperes)	MCCB Trip Range (Amperes)	Interrupting Capacity (KA) RMS sym.		
		220V	380V	550V
50	15 ~ 50	25	15	7.5
50-H	15 ~ 50	85	50	35
100	15 ~ 100	50	30	15
100-H	15 ~ 100	85	50	35
225	125 ~ 225	50	35	22
225-H	125 ~ 225	85	50	35
400	250 ~ 400	50	35	22
400-H	250 ~ 400	85	50	35
600	450 ~ 600	50	45	25
600-H	450 ~ 600	85	65	35
800	700 ~ 800	50	45	25
800-H	700 ~ 800	85	65	35

# SWITCH FUSE PLUG-IN (BOLT-ON) UNITS

## SWITCH FUSE PLUG-IN UNITS (PILF-2 TYPE) : For Plug-in Bus Duct

4 WIRE SYSTEM (TPN)

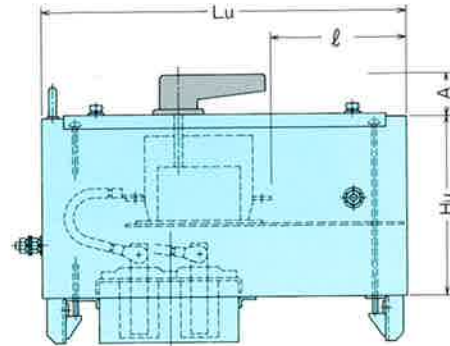
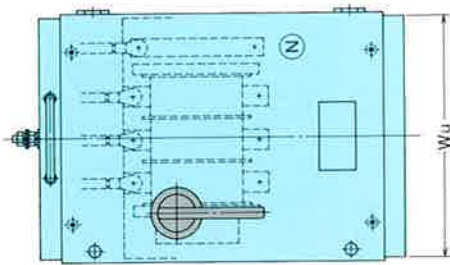


Fig. a

4 WIRE SYSTEM (TPN)

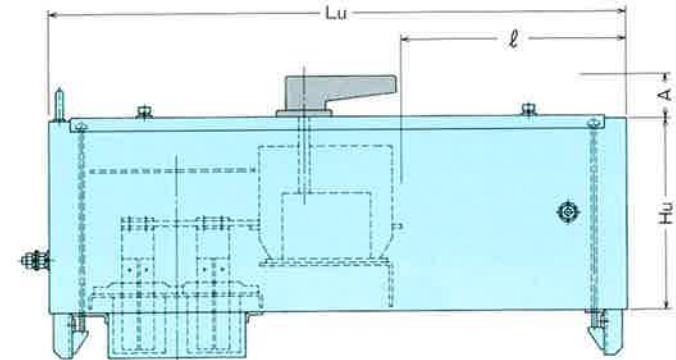
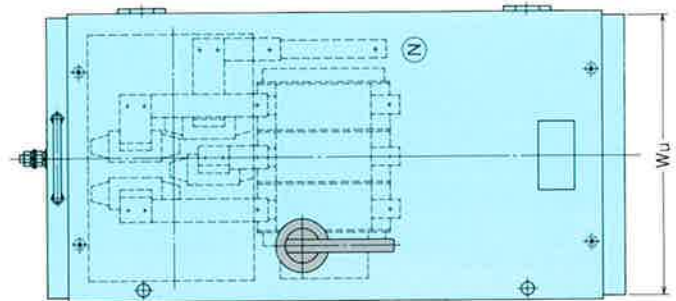


Fig. b

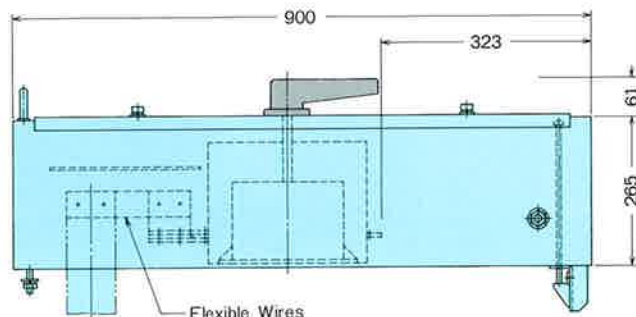
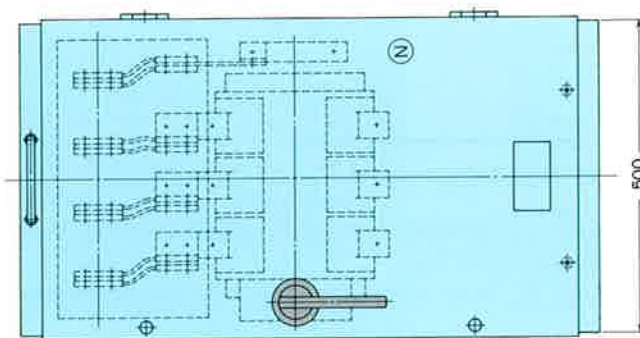
### SHORT CIRCUIT CAPACITY, DIMENSIONAL DATA AND WEIGHT (PILF-2 TYPE)

Switch Size (Amperes)	Short Circuit Capacity (KA) RMS sym. 500V	Fig.	Wu (mm)	Hu (mm)	A (mm)	Lu (mm)	l (mm)	Weight (kg)
100	100	a	290	290	50	330	123	16
160	50	a	310	290	61	400	143	20
200	100	a	360	325	61	450	135	30
315	100	b	400	310	61	780	320	32
400	100	b	400	310	61	780	320	33
630	80	b	450	340	61	800	260	46

- \* The switch is of quick-make and break type.
- \* All rated units are provided with a duct interlock mechanism and cover interlock mechanism as standard.
- \* The switch complies with standard of IEC 408 and BS 5419.

## SWITCH FUSE BOLT-ON UNITS (BOLF-2 TYPE) : For Tap-off Bus Duct

4 WIRE SYSTEM (TPN)



- Switch Size : 800 Ampere
- Short Circuit Capacity (RMS sym. 500V) : 50KA
- Weight : 37kg

- \* The switch is of quick-make and break type.
- \* All rated units are provided with a cover interlock mechanism as standard.
- \* The switch complies with standard of IEC 408 and BS 5419.



## Scope

The present specifications cover the minimum requirements for the material, construction, performance and delivery tests for a totally enclosed bus duct system.

## Standards

The bus duct shall be constructed in accordance with the minimum applicable requirements of the latest edition of the following standards:

- International Electrotechnical Commission . . . . . IEC 439, IEC 439-2
- British Standards . . . . . BS 5486:Part 2
- Japanese Industrial Standard . . . . . JIS C 8364

## Service Conditions

- Duty : Continuous
- Ambient Temperature : 40°C
- Relative Humidity : 95%

## General Requirements

- (1) The bus duct shall be of the low impedance type and totally enclosed for protection against mechanical damage and dust accumulation.
- (2) The bus duct shall be composed of aluminum or copper made bus bars and steel made casings.
- (3) Firestops or barriers shall be included as an integral part of each feeder and plug-in bus duct length and fittings.
- (4) Feeder bus ducts and plug-in bus ducts shall have the same cross sectional dimensions for easy routing and measurement, and no special parts shall be needed to connect bus ducts with each other.
- (5) The bus duct standard lengths shall be of 3-meter length. The bus duct special lengths and fittings shall be provided where necessary to suit the installation.
- (6) Adequate supports, hangers and necessary mounting hardware for bus ducts installation shall be provided and finished with galvanized.
- (7) The maximum temperature rise at any point in the bus duct at continuous rated load shall not exceed 55°C at a maximum ambient temperature of 40°C.
- (8) The neutral bus bar shall be designed with the same size (full-neutral) as that of the other phase bus bars.

## Casing

- (1) The duct casing shall be made of galvanized steel plates.
- (2) The duct casing shall be finished by baking with melamine resin paint in the color specified by purchaser.

## Bus Bars

- (1) The bus bars shall be made of either 61% conductivity aluminum or 98% conductivity copper of the rectangular type with full rounded edges.
- (2) The bus bars shall be electro-plated with tin on their entire length and surfaces. (Soldering are not acceptable.)
- (3) The bus bars shall be insulated with layers of Class B material (130°C, polyester film or equivalent) over their entire length, excepting joints and contact surfaces. (Heat-resistant PVC are not acceptable.)

## Joint

- (1) The bus duct shall be of the "one-bolt" type which can be checked for tightness without de-energizing the bus duct run.
- (2) The bolt shall be fully insulated and be a double headed torque bolt whose outer head is twisted off when a proper torque has been reached. And the bolt shall be provided with two kinds of indicators as follows, which permit to visually confirm the following conditions from distance and cannot be removed by hand.  
Indicators are of:
  - i) failure in tightening or insufficient tightening torque.
  - ii) tightening to proper torque.And the joint bolt, with an indicator of proper tightening attached, shall enable checking for tightening torque using an exclusive torque wrench for maintenance.

- (3) Access shall be required to only one side of the bus duct for tightening joint bolts.
- (4) It shall be possible to remove any one unit in a run without disturbing adjacent units.

## Plug-in Holes

- (1) The location and number of plug-in holes including spare plug-in holes shall be as shown in the drawings.
- (2) The plug-in holes for a vertical run shall be provided at the same height from each floor level to keep each riser room in the same design.
- (3) The copper alloy made plug retainers shall be attached to the contact portions of aluminum bus bars inside the plug-in holes (to prevent aluminum bus bars being damaged by copper alloy plugs).

## Adjustable Sections

The adjustable section which allows to adjust  $\pm 30$ mm Min. in length shall be provided near the connecting portion of the switchboard or transformer to absorb the error in the installation of each horizontal run.

## Short Circuit Capacity

The bus duct short circuit capacity, both of feeder and plug-in, shall be \_\_\_KA RMS sym. (Consulting Engineer's calculated required value.)

## Voltage Drop

The three phase, line-to-line bus duct voltage drop, both of feeder and plug-in type, shall not exceed 1% of rated voltage per 30 meters at concentrated load and at the load power factor which produces maximum voltage drop in the bus duct.

## Plug-in Units

- (1) Plug-in units shall be of molded case circuit breaker (MCCB) type. The interrupting capacity of the plug-in units shall be \_\_\_KA RMS sym.
- (2) The enclosures of the plug-in units shall be made of galvanized steel plates.
- (3) The plugs shall be made of copper alloy heat treated and shall have adequate spring effect and current capacity.
- (4) Plug-in units shall be mechanically interlocked with the bus duct casing to prevent installation or removal of plug-in units while the switch is in the ON position.  
The cover of the plug-in units shall be also interlocked to prevent the cover from opening while the switch is in the ON position and also to prevent accidental closing of the switch while the cover is open.
- (5) Plug-in units shall be provided with a means for padlocking the switch in the ON and OFF positions.
- (6) The fastener of the plug-in unit to the bus duct is of front operating type.

## Responsibility for Routing and Measurement

The electrical contractor shall be responsible for routing the bus duct in coordination with the other trades. Final field measurements shall be made by the contractor prior to release of the bus duct for fabrication.

## Delivery Tests

- (1) Structural Inspection—In this test, conditions regarding material, construction, finish and contact shall be inspected. All data shall conform to the specifications.
- (2) Insulation Resistance Test—The insulation resistance between poles and that between charging portion and non-charging metal portion shall be measured by means of a 500 VDC insulation resistance tester. At that time, each insulation resistance should be read in a value of 100M $\Omega$  or more.
- (3) Withstand Voltage Test—Testing portions in (2) shall be energized with AC voltage of 50Hz or 60Hz. After having attained 3,000V, the testing portions should withstand said voltage for a period of 1 (One) minute.

# INQUIRY GUIDES

## INQUIRY SPECIFICATIONS

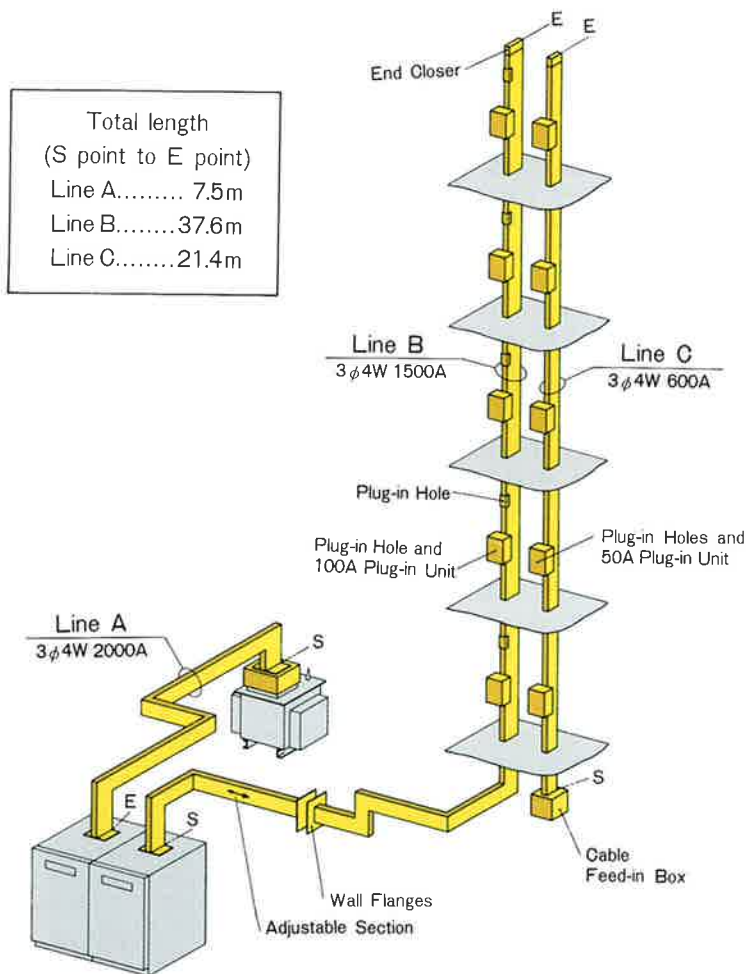
### BUS DUCT

- (1) Bus Bar Material.....Aluminum [L-S(A)]  
or Copper [L-S(C)]
- (2) Indoor or Outdoor Use
- (3) Additional Earth System; if necessary (See Page 7)  
*(The standard is of case earth system.)*
- (4) Systems .....3 $\phi$ 3W, 3 $\phi$ 4W full neutral  
1 $\phi$ 2W, 1 $\phi$ 3W full neutral
- (5) Circuit Voltage.....Volts (Hz)
- (6) Rating Current.....Amperes
- (7) Short Circuit Capacity.....KA RMS sym.
- (8) Additional Fire Barrier; if necessary (See page 3)

### PLUG-IN (BOLT-ON) UNIT

- (1) Type .....Plug-in Unit or Bolt-on Unit
- (2) Switch incorporated within Unit .....  
.....MCCB or Fuse Switch  
*(It is recommended to use MCCB in term of cost and easy maintenance.)*
- (3) Poles.....TP, TPN, SPN, DP
- (4) Rating Current.....Amperes
- (5) Circuit Voltage.....Volts (Hz)
- (6) Interrupting Capacity .....KA RMS sym. (if specified)
- (7) Optional.....(a) With shunt trip  
(b) Special handle for hook stick (or string) operation  
(c) Others

## CALCULATION GUIDE OF BUS DUCT QUANTITIES



### L-S TYPE ALUMINUM BUS DUCT [L-S(A)]

1. Line A		3 $\phi$ 4W 415V 2000A	
Feeder	7.5	M.	1
Elbow	4	NOS.	☆2
Flanged End	(Fge. End)	1	NO.
Tr. Connection Box	(Con. Box)	1	NO. ☆6
Flexible Bus Bar	-if necessary-	4	NOS. ☆5
Hanger	(Hg)	5	NOS. ☆3
2. Line B		3 $\phi$ 4W 415V 1500A	
Feeder	37.6	M.	☆1
Elbow	(Ebw)	6	NOS. ☆2
Flanged End	(Fge. End)	1	NO.
Adjustable Section	(Adj)	1	NO.
Plug-in Hole	(PH)	10	NOS.
End Closer	(End)	1	NO.
Floor Support	(FS)	5	NOS. ☆4
Wall Flanges		1	SET
Hanger	(Hg)	10	NOS. ☆3
3. Line C		3 $\phi$ 4W 415V 600A	
Feeder	21.4	M.	☆1
Plug-in Hole	(PH)	5	NOS.
Cable Feed-in Box		1	NO.
End Closer	(End)	1	NO.
Floor Support	(FS)	5	NOS. ☆4
4. MCCB Plug-in Unit (PIL2)			
100A (I.C. 22KA) TPN		5	NOS.
50A (I.C. 7.5KA) TPN		5	NOS.



SWITCHBOARD CONNECTIONS  
(FLANGED ENDS)

- ☆1 Calculate the total length without distinction of feeder and plug-in bus ducts. (from S up to E points)
  - ☆2 No need to distinguish between horizontal and vertical elbows. And for offset (horizontal and vertical), calculate as elbow-2 Nos. per one.
  - ☆3 Calculate the hanger Nos. by dividing the total horizontal bus duct length by 1.5m.
  - ☆4 Calculate the floor support Nos. as one per floor.
  - ☆5 To absorb the vibration of transformer, if necessary, calculate as four Nos. for 4 wire system.
  - ☆6 Special made to fit the transformer flange.
- Others . . . No expansion section is needed for L-S Bus Duct.