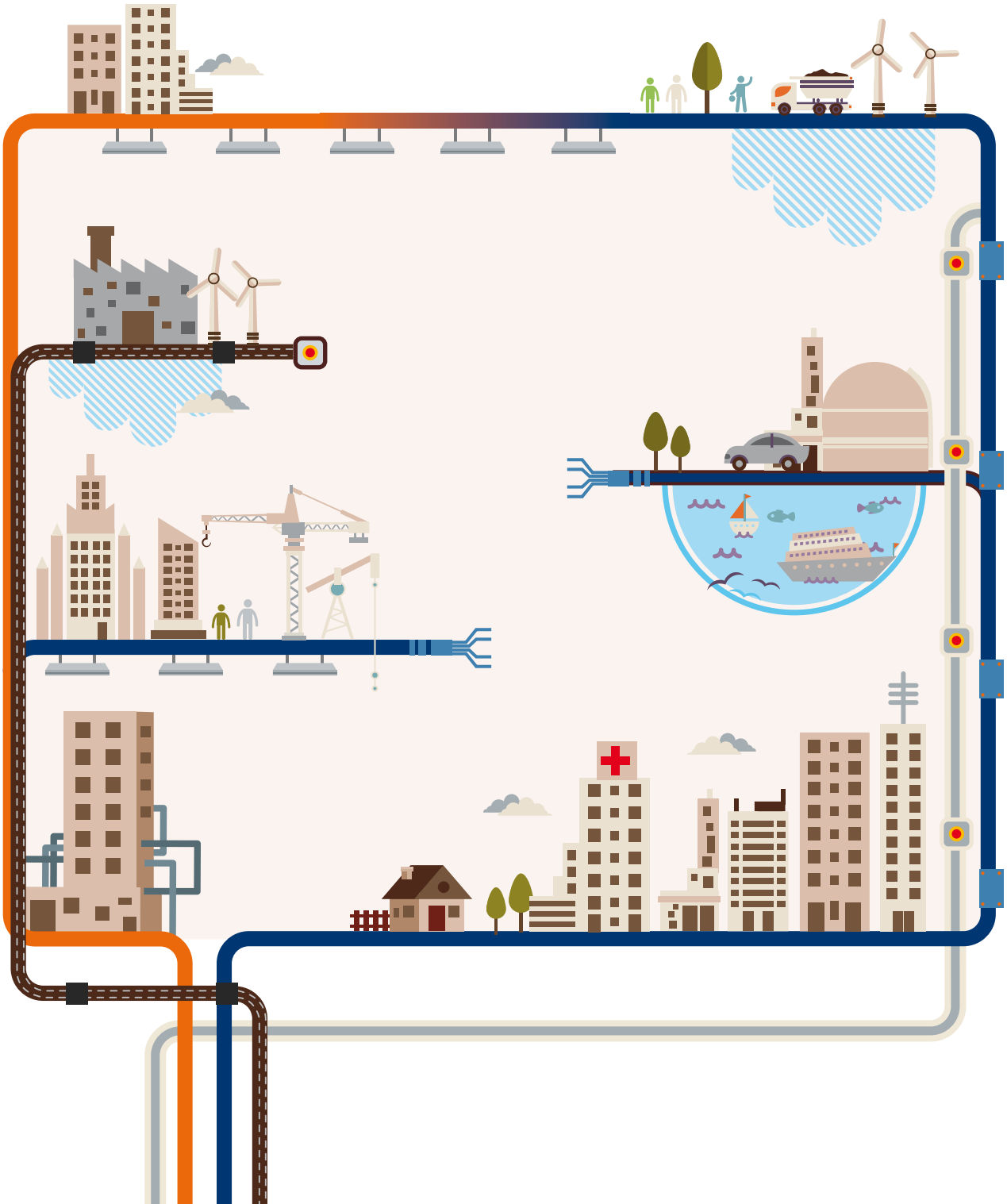
LS전선
Leading Solution

Busduct System

MS/Wind-way, NSPB-LV/MV, SIB



About **LS Cable & System**

Since the separation from LG Electronics in 2003, LS Group has specialized in industrial energy, electronic energy, and industrial materials. Thus, LS Group has achieved specialized global competitiveness in these fields. LS Group is a parent company of 40 subsidiary companies, including LS Cable & System, LSIS, LS Nikko Copper, LS Mtron, Gaon Cable, E1 and Yesco. LS Cable & System holds the unrivaled position of the top cable maker in Korea, and it provides total solutions for electronic power and telecommunication industries.

LS Cable & System has strived to become a global leader in the industry by implementing constant innovation since the establishment of the company. While providing high-quality solutions to help our clients, LS Cable & System is accelerating efforts to be the top player of the global cable industry by securing the top technologies in submarine cables and superconducting cables, as well as focusing on green business. Under the company vision 'Your No.1 Creative Partner,' LS Cable & System dedicates its best effort to deliver only the top technology and service to its clients.

LG

LS

- LS Cable & System
- LSIS
- LS Nikko Copper
- Gaon Cable
- E1
- Yesco
- Superior Essex

LG

- LG Electronics
- LG Chemical
- LG Display
- LG Telecom

GS

- GS Caltex
- GS Engineering & Construction
- GS Retail
- GS Homeshopping

Superior Essex

JS Cable

LS Cable & System

LS Global

Global Cable Incorporated

Pountek

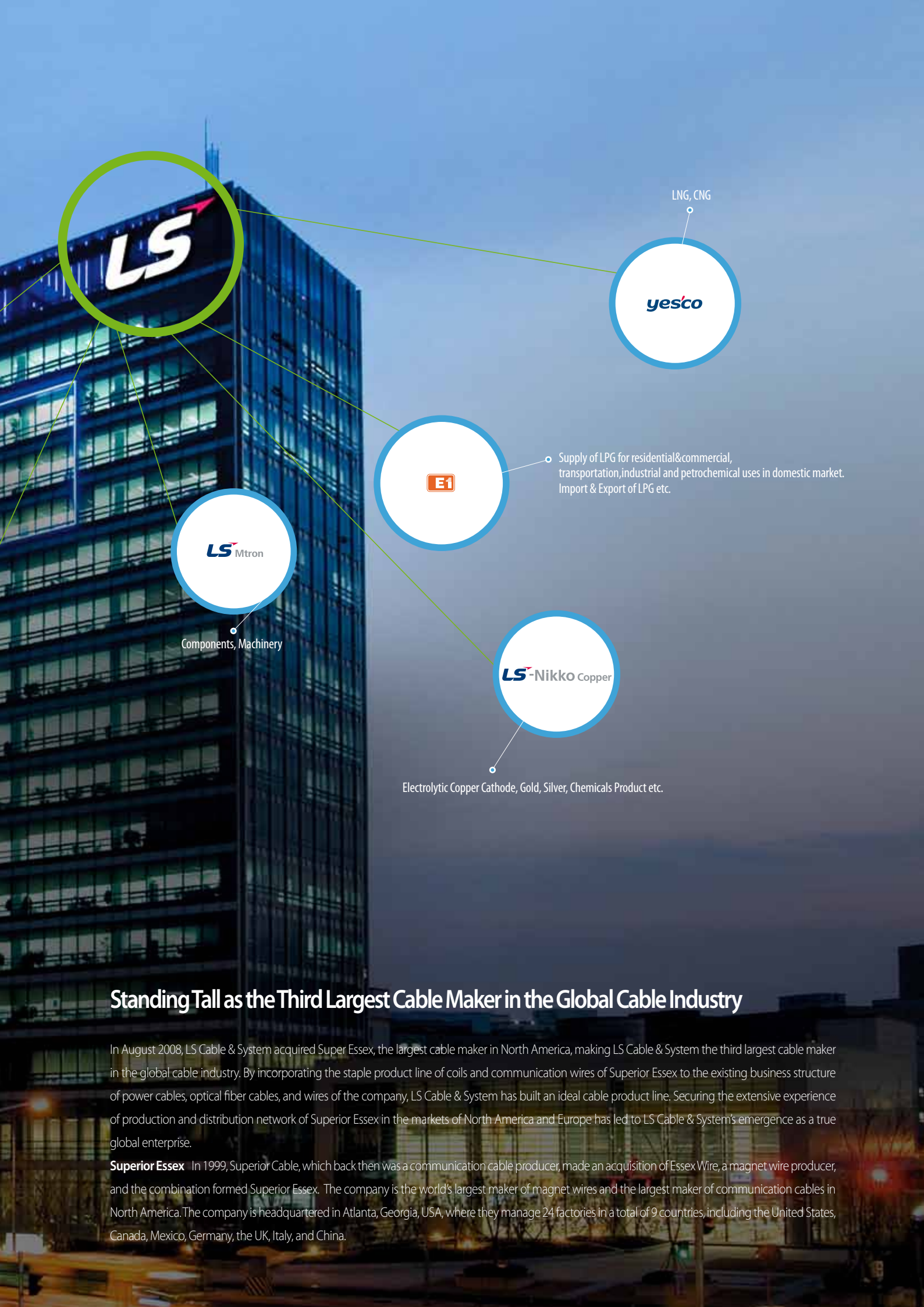
LS IS

Power equipment, Power supply & transmission, Industrial IT, Automation equipment, Electric Power Tools, RFID etc.

A New Beginning as a Total Solution Provider for Electric Power and Telecommunications

History was made when LS Cable & System, the de facto holding company of LS Group, transformed into LS Holding Company in July 2008 and started as a new total-solution provider specialized in electric power and telecommunications. It was the optimized business decision to increase management efficiency of the constantly expending business segments and to strengthen the responsible management system to foster a new growth engine to drive our business.

By separating investment and business segments, LS Holdings was able to discover a new growth engine to propel the group into a new phase of growth. The new change of business provided an opportunity to the subsidiary companies to focus on their own operations and to strengthen their respective business expertise, as well as successfully enhancing the competitiveness in the industry. LS Cable & System, as the holding company, is committed to providing continued support to the subsidiary companies, while practicing responsible management. LS Cable & System endeavor to focus on our core business while strengthening its business expertise and competitiveness as a global company.



Standing Tall as the Third Largest Cable Maker in the Global Cable Industry

In August 2008, LS Cable & System acquired Super Essex, the largest cable maker in North America, making LS Cable & System the third largest cable maker in the global cable industry. By incorporating the staple product line of coils and communication wires of Superior Essex to the existing business structure of power cables, optical fiber cables, and wires of the company, LS Cable & System has built an ideal cable product line. Securing the extensive experience of production and distribution network of Superior Essex in the markets of North America and Europe has led to LS Cable & System's emergence as a true global enterprise.

Superior Essex In 1999, Superior Cable, which back then was a communication cable producer, made an acquisition of Essex Wire, a magnet wire producer, and the combination formed Superior Essex. The company is the world's largest maker of magnet wires and the largest maker of communication cables in North America. The company is headquartered in Atlanta, Georgia, USA, where they manage 24 factories in a total of 9 countries, including the United States, Canada, Mexico, Germany, the UK, Italy, and China.


LS Cable & System
Leading Solution

LS Cable & System
Busduct System Solution

Buildings

The LS C&S Bus Duct system is easy to install, and ensures large capacity of energy transmission while providing space efficiency which makes the bus duct system ideal for high-rise buildings, office buildings, data centers and apartment complexes.

Plants

The full lineup is consisting of NSPB that can cover up to 27kV as well as CAST RESIN and SIB, and the lineup thus enables us to provide our clients customized designs. The system is suitable for electrical rooms and power lines, and it features a real time monitoring system using the temperature and power monitoring system.

Data Center

The flexibility and expandability as well as easy maintenance property of the bus duct system provides the best alternative to improve the existing problems of the conventional power cable system of data centers, which requires constant extension, reinstallation and capacity modification of loads.

Apartment Buildings

Although the demands for more electricity for families are growing, the space for EPS area has reduced. Due to the change, the need for bus ducts and multi boxes have increased.

Hospitals

The stability of the power supply in the hospitals is perhaps the most vital element, because its failure could threaten the safety of patients.
The Bus Duct system distributes larger capacity of electric power, and provides stability of the loads which make it an ideal choice to satisfy the requirements of systematization of hospital complexes and larger hospital equipments.

Airports

In order to secure the stable power supply of the airport, the bus duct system provides the best customized solutions by installing high voltage bus ducts at the transmission, transformation and power distribution lines, and by installing low voltage bus ducts at the cargo, the control tower and general commercial buildings.

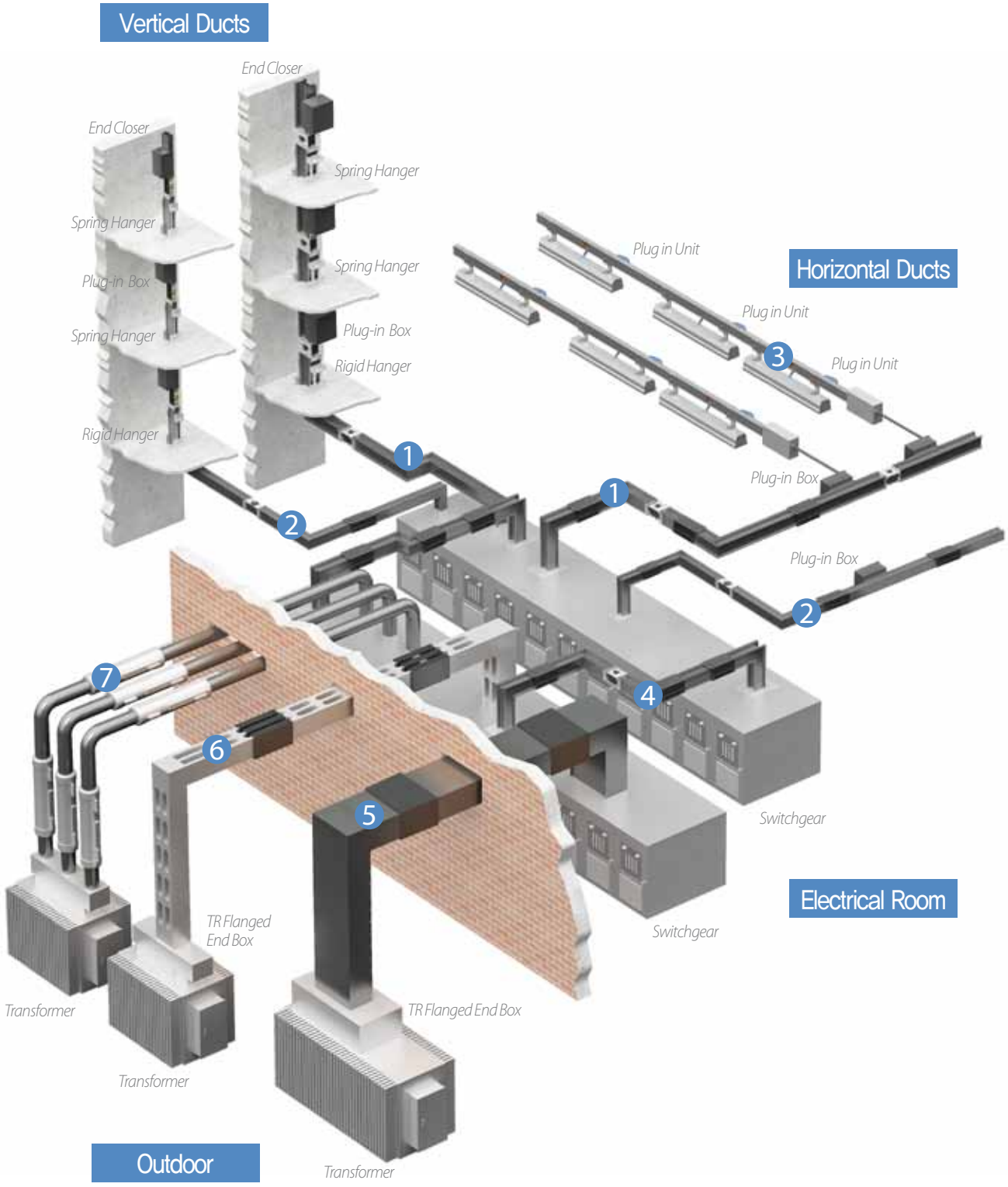
Stadiums

The needs for a bus ducts system has been growing for its benefit such as large capacity of power transmission, providing a stable power supply for various loads and an eco friendly property as well as economical quality.

Marine & Wind

The compact and light weight design of the bus duct satisfies the demands of the clients, and comes with an outstanding quack resistance property. The bus duct provides stability to the operation of the facilities through a real-time monitoring system using a temperature and power monitoring system. As the needs for renewable energy grows, the demand for our bus duct has been increasing teadily.

LS Cable & System Bus Duct Product Line-up



The LS Cable & System Bus Ducts are available in a wide range of products from low voltage LT-Way (25A~63A) to high voltage E-Series (630A~7500A), and the products enable the supply of proper capacity of power for factories and the distribution system. Our products such as the air insulated bus conducts with enhanced safety property and the cast resin bus ducts with resistance for high temperature, humidity and dusty environment will satisfy various application needs and provide a customized engineering service.

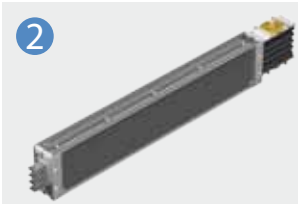
1

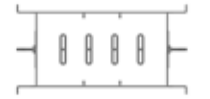
Ez/Ex/EF-way

Sandwich Type (PET Film, Epoxy Coating, MICA)/AL Extrusion Housing/Standard IP54/Joint Kit

- Designed for low voltage products below AC 1000V, and between 630A to 7500A.
- The most widely used conventional model.

2



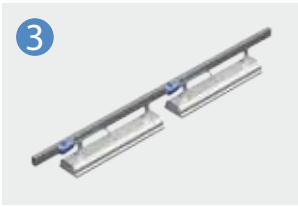


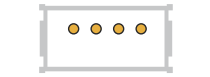
Mini-way

Air Insulated Type/AL Extrusion Housing/Standard IP54/Joint Kit

- Designed for low voltage products below AC 1000V, and between 160A and 800A.
- Ideal for small distribution system with multi distribution loads (Vertical areas of buildings, data centers, assemble factories)

3





LT-way

Flat Wire Type/Copper Conductor with PVC Extruded Insulation/AL Extrusion Housing/Various Plug Types/Joint Brush (Can be installed with a live wire)

- Designed for low voltage products below AC 690V, and between 25A and 63A
- Suitable for Light bulbs, FFU and distribution for small equipments

4

MS/Wind-way

Air Insulated Type/ Compact NSPB Type / One-Bolting Type Designed for low voltage products below AC 1000V, and between 1000A and 5000A

- A Hybrid incorporating NSPB and sandwich type
- Ideal for ships, wind towers and chemical plants where stability is required.

5

NSPB-LV/MV

Air Insulated Type/Insulated conductors separated by phase/AL, STS and Steel Housing/Indoor Type/Outdoor Type

- NSPB-LV : Designed for low voltage products below AC 1000V,and below 4000A
- NSPB-MV: Designed for high voltage products below AC 27kV, and below 4000A
- Suitable for plants where high stability is required.

6

CR-LV/MV

- Cast Resin Type/IP 68/Dielectric Epoxy Molding between Conductors
- CR-LV: Designed for low voltage products below AC 1000V, and between 630A and7500A.
- CR-MV: Designed for high voltage products below AC 27KV, and below 5000A.
- The most safe bus duct suitable for plants where high stability is required.

7

SIB

Epoxy Vacuum Impregnation Dielectric Products/Suitable for phase separation system

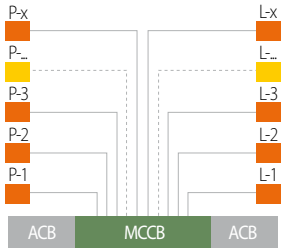
- Designed for high voltage products below AC 27kV and below 7500A
- The benefit of bus ducts and cables are incorporated as SIB.
- Suitable for high voltage products.

Why Busduct?

Easy Distribution of Loads

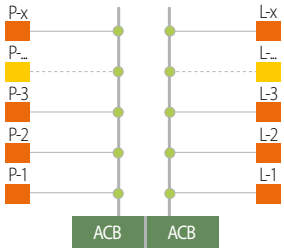
When supplying power using cables, each load has to be connected individually to cables which waste space, and an additional distribution panel is also required.
On the other hand, bus ducts are separated from a single line at a plug box which simplifies the electric power system. A MCCB can be installed at the plug box to effectively shut off fault current.

Cable Wiring System



- One –to-one correspondence of power supply and loads
- Additional lines are needed in case of a load change

Bus Duct Wiring System

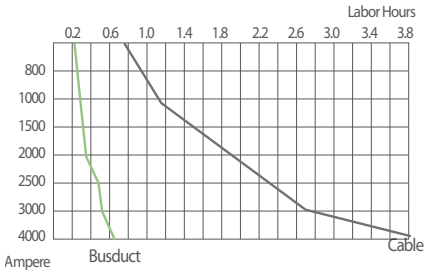


- One –to-many correspondence of power supply for specific power supply
- Additional lines are not necessary in case of a load change

ACB : Air Circuit Breaker, MCCB : Molded Case Circuit Breaker

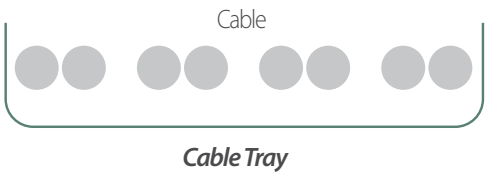
Easy Initial Installation

Pulling and cable tray installation for cables can be difficult, and requires a longer construction period, therefore increases the cost. On the other hand, the bus ducts use a simple installation method to connect specific length of products, which requires a shorter installation period, and is economically friendly.



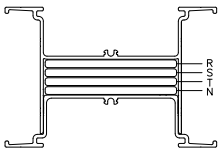
Compact

The compact design of the bus duct system provides high space efficiency at up to 50% compared to the cables. While cables require larger space to install multi lines as well as additional space for coiling areas, the bus ducts use proper fittings to maximize space efficiency.



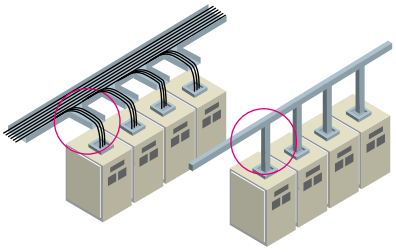
Cable Tray

The space required reduces by 50%



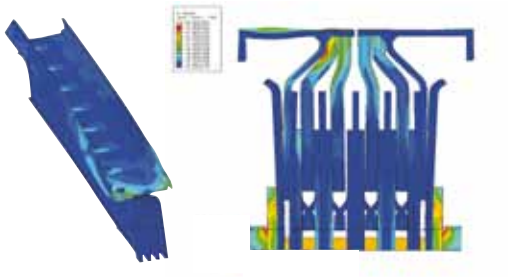
Adaptability to various installation environment and convenience

The bus duct system is a power distribution system and can be applied to various complex routes. The bus duct system comes with various fittings such as elbows, off-set and tee, and can transmit high capacity currents without electrical and mechanical loss.



Excellent short circuit

Cables require low short circuit capacity and additional reinforcement facility. However, the bus duct system has a high tolerance for short circuit. Its stability and reliability make it perfect for a high capacity energy transmission system.

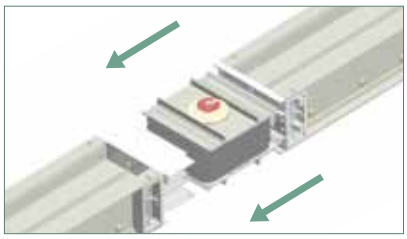


High current density

Cables are connected directly to electric loads using racks. The maximum allowable current ampacity limit is 1000A, and requires additional lines for a higher current. Each line of the bus duct system can transmit up to 7500A, and provides high current density.

Easy maintenance

The design of the bus duct system makes it easy to detect abnormalities during installations, and ensures easy maintenance. When humidity or dust causes a malfunction on the system, the easy-to -maintain design allows replacing only the damaged part.



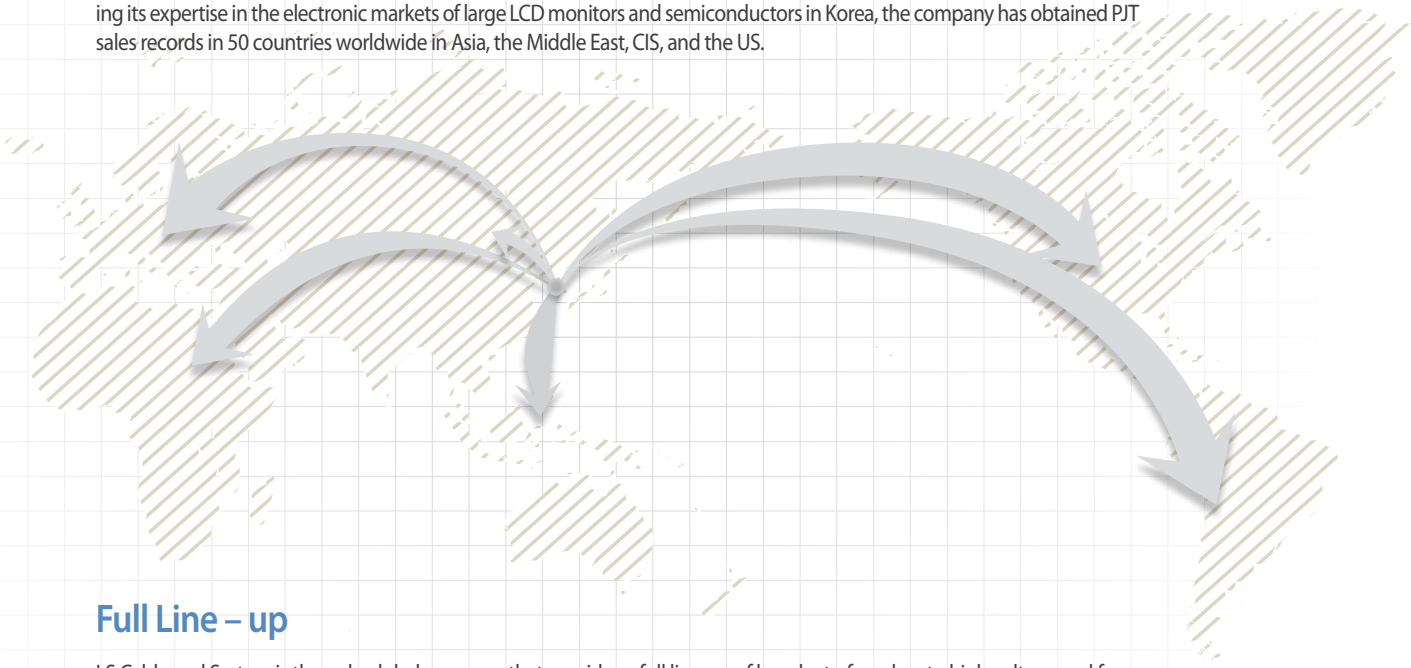
Outstanding features of EMC and EMI

Unlike cables, the bus duct system does not require a shield, instead the housing itself performs as a shield which enhances the features of EMC and EMI.

Why LS Cable &System Bus

Global Top Tier

LS Cable & System has been a long-time leading cable maker of the bus duct market in Korea. With extensive experience and product line competitiveness, the company provides total solutions for each application to satisfy the needs of its clients. Using its expertise in the electronic markets of large LCD monitors and semiconductors in Korea, the company has obtained PJT sales records in 50 countries worldwide in Asia, the Middle East, CIS, and the US.



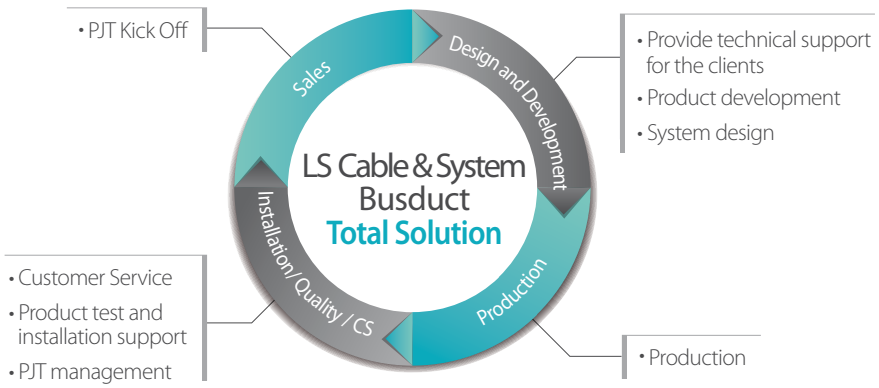
Full Line – up

LS Cable and System is the only global company that provides a full line-up of bus ducts, from low to high voltage and from low to high capacity, to satisfy every need of its clients and provide an optimized solution for each PJT.

Total Solution

- Once PJT launches, our engineer will participate to guide the clients from the initial period in order to produce the best system for our clients, and to respond quickly when the system is changed.
- Our engineers from each department provide full support in design, production, installation and testing at in-bound to satisfy our clients.
- We operate the CS Team, a task force for the bus duct system, to make sure efficient after-sale service and maintenance service are provided.

Process



Technical Excellence

Unparalleled Reliability

- Provides standardized design, and owns numerous certifications such as UL Certification, Quack Proof Certification, and Impact Resistance Certification
- The CS team, a task force for the bus duct system, provides efficient after-sale service
- Safe use in hazardous zones
- Manage the system using an independent temperature monitor sensor
- Semi-permanent service life
- Used qualified insulation such as epoxy and PET film for efficient insulation

Eco friendly

- Fully recyclable
- Halogen free
- Does not contain RoHS 6 hazardous substance
- No toxicity in fire & Fire-Retardant
- Non Explosive

Total Engineering Technology

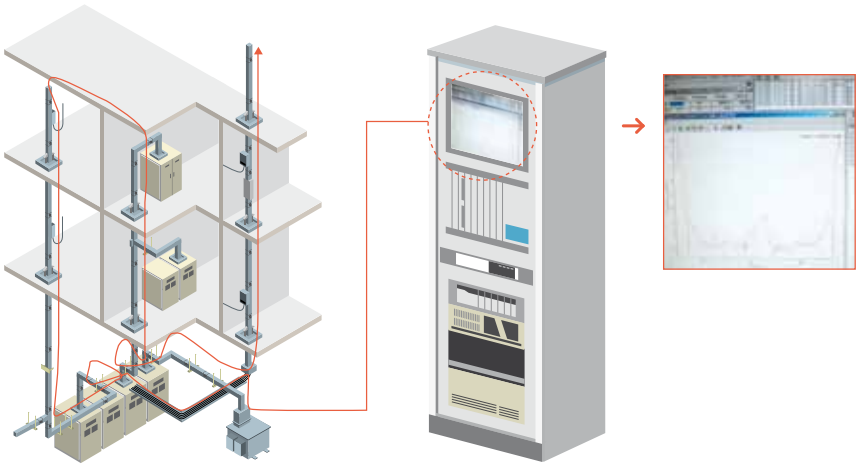
- Provide the optimum design by experienced engineers
- Design following analysis and inspection of CAE
- Unique and exclusive design program for the bus duct system
- Design based on structure stability inspection
- The excellent heat –radiating property of the aluminum housing ensures large capacity of power transmission
- Low Weight & Low cost
- Easy installation
- Deployable where access is difficult
- Automated epoxy insulation facility
- Unique joint kit connections
- Reduce electromagnetic
- BPMS Electric Power Monitoring System
- BTMS Temperature Monitoring System

Why LS C&S Bus Duct?

The Bus Duct Temperature Monitoring System
BTMS : Busduct Temperature Monitoring System

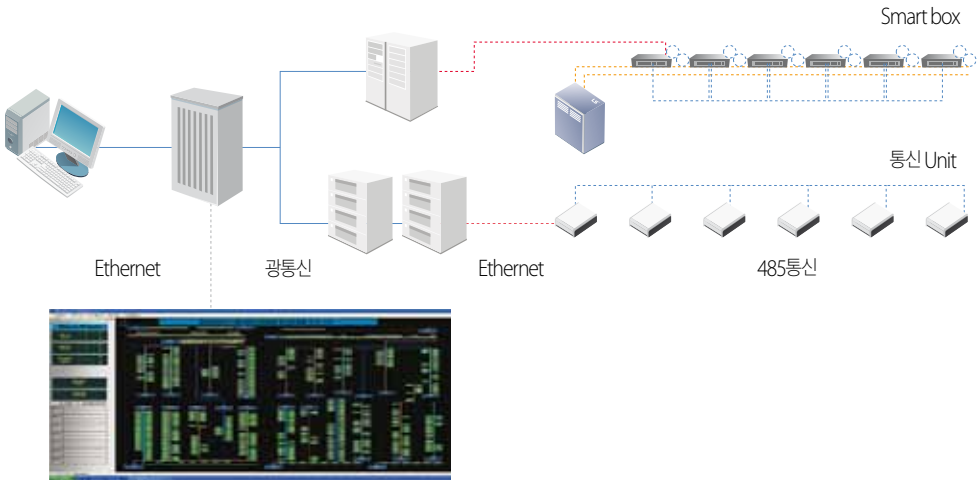
The bus duct is a large capacity power distribution system. The insulation of the duct has to stay stable when the Joule lines occur during a power supply of the conductor. The rated current will be set by the insulation type, and the temperature rises. These properties of the bus duct make it possible to monitor and manage abnormalities of the system by checking the temperature of specific areas of the system.

The temperature monitoring system uses various temperature sensors such as optical fiber cable, IC electric chips and thermo-graphic cameras. Specific areas like the entire system line, joints, plug-in boxes and cable connection can be monitored at the central monitor room using various methods on request.



The Bus Duct Power Monitoring System
BPMS : Busduct Power Monitoring System

The ongoing trends of the bus duct system are more than a simple power supplying system. The growing trend is; 1) the stability of the power system, 2) unmanned system,3)cost cutting, and 4)green and smart grid. While the SCADA system monitors and controls the power of the main system, the BMS monitors low loads of the sub system. The frequency of the resent electrical accidents is higher at the sub system than at the main system. Therefore, the preference for the SCADA system has been increasing.



〈감시 Program〉

MS/Wind - way

LS 전선 Busduct System Catalogue

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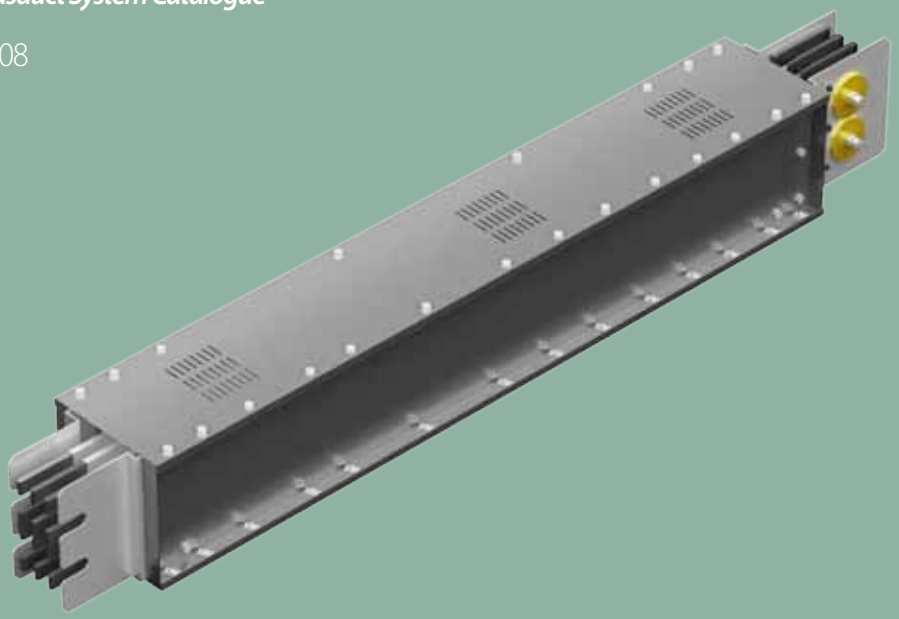


Contents

Overview

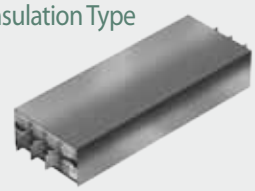
The MS/Wind-Way is a hybrid type bus duct that combined the benefits of the sandwich type and the air insulation type. The MS/Wind-Way is economic, and provides maximum stability. Compared to the existing power supply system (cables), the MS/Wind-Way provides excellent economical efficiency, and provides stable supply of large capacity of energy. It is simple to install, and has excellent space efficiency.

The MS/Wind-Way is suitable for inadequate or special environment such as; chemical or steel plants where the accident rate due to powder coating is high; ships where durability against temperature, humidity and quack (shock vibration) is required; and wind towers. The MS/Wind-Way and its routing system have been fully tested for the functionally.

Sandwich Type

- Compact size
- Economical and easy installation
- Epoxy/PET film insulation type

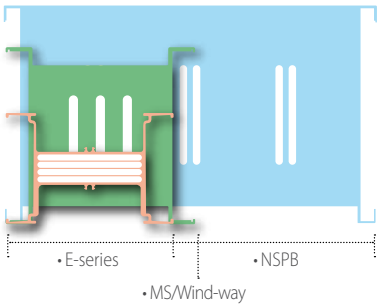
Air Insulation Type



- Highly stable electricity and structure
- Air insulation type

Hybrid Type

[Product Size]
Comparison



- Hybridized insulation system of epoxy and air provides maximum stability.
- The economical optimum size was possible from analyzing and inspecting designs.

- Thanks to the integral joint design, installation is easy.

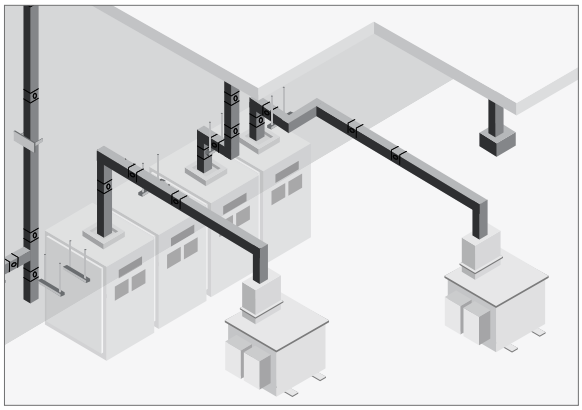
- The hybrid type comes with the optimum explosion proof design against harmful gas in sealed areas.

- The structure design for shock vibration and deformation provides durability.

Application

Chemical Plants

- It is suitable for indoor and outdoor installation as well as a place where high degree of protection is required.
- Petrochemical Plants

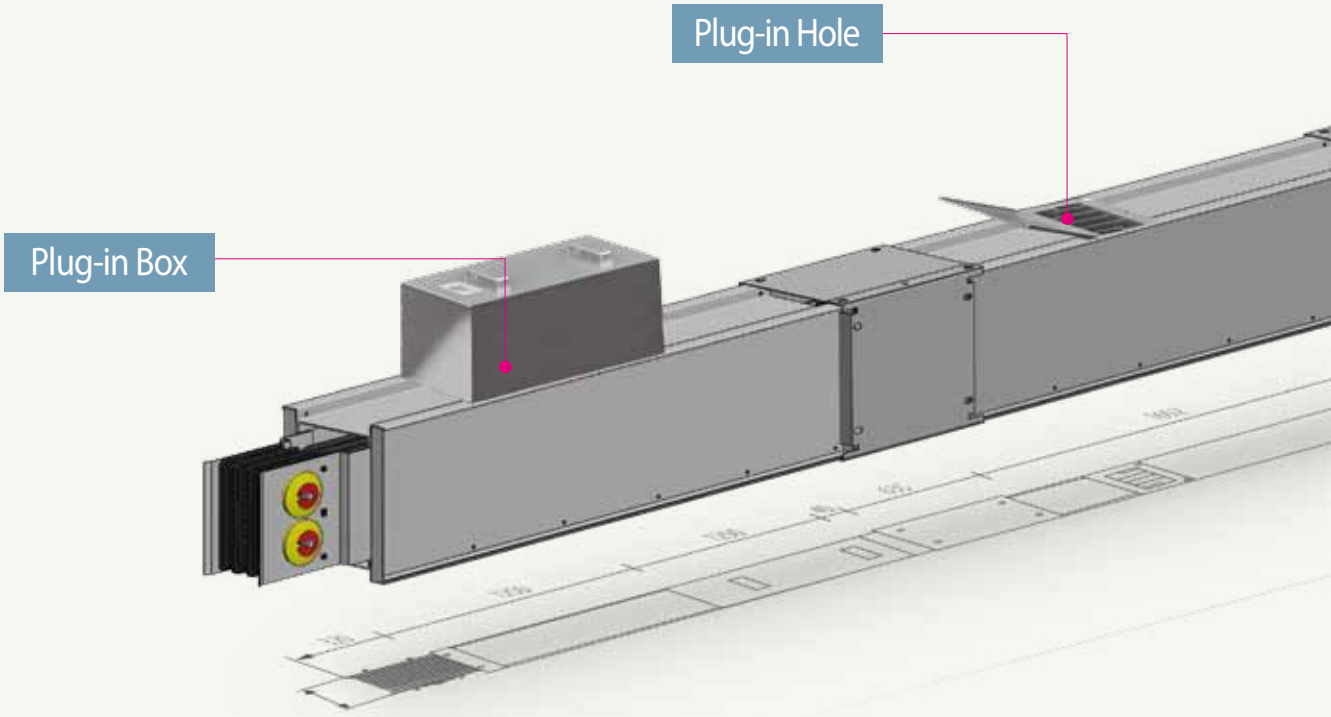


Ships

- It is suitable for areas exposed to high salinity such as seawater.
- Electrical room of a ship

Wind Towers

- Areas where low frequency oscillation occurs by wind
- The generator and the transformer of a wind tower



Structure Stability

The MS/Wind-Way has been designed to withstand shock vibration and deformation caused by inadequate environments. The MS/Wind-Way has been tested for its stability against various shock vibrations and deformation following the analysis of CAE. The MS Wind-Way design provides excellent stability during long period operations. The structure stability has been secured by various classifications of ships.

Environmentally Friendly

The LS C&S Bus Ducts acquired RoHS certification, and only uses components without hazardous substances such as lead, cadmium, mercury, chrome, PBBs and PBDEs.

Electrical Stability

The hybrid type of epoxy and air insulation is designed to withstand the mechanical and heat stress caused by short circuit.

Standard

- IEC 61439-2 [(previous standard)IEC 60439-1] Power Swichgear and Controlgear Asseblies
- IEC 61439-6 [(previous standard)IEC 60439-2] Busbar Trunking Systems
- NSEN 60439 Busways
- NEMA BU 1.1 Busways
- IACS REC No.67 International association of classicfication societies

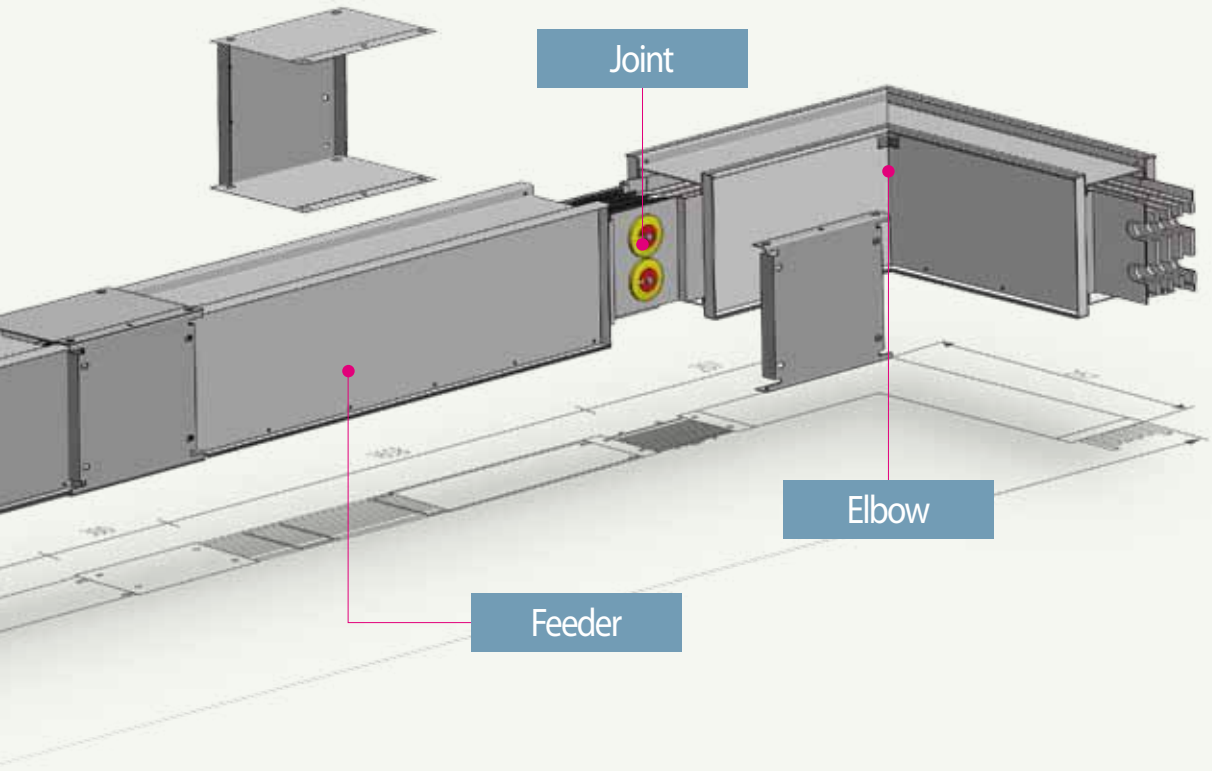
Permissible Operating Temperature

The cross sectional areas of the conductor and housing profile are designed to meet the standard permissible operating temperature of IEC 61439-2 and 6. Therefore the temperature rise limit of the housing is within 55K or less of the ambient temperature.

Service Condition

- Ambient Temperature : -15 Celsius to 55 Celsius
- Relative Humidity : 95% or below

(When the service condition of the environment meets the requirements listed above, please contact our design team.)



Conductors

The MS-Way uses either copper conductors with conductivity at over 99%, or aluminum conductors with conductivity at over 61%. The connection of the conductors is tin-plated in order to reduce contact resistance and to prevent corrosion of the connection.

Housing

The Mini-Way uses an effective heat–radiating aluminum housing profile which produces an excellent mechanical strength and heat radiation. The aluminum housing can be used as a protective conductor (PE) thanks to its high level conductivity and cross sectional areas.

Insulation Properties

The MS-Way uses epoxy and air insulation with a class B (130C) rating. The insulation provides high insulation performance between conductors, and between conductors and housing.

Joint

The MS-Way uses a simple one-bolting design. In order to ensure easy maintenance and reliability, double -headed bolts and visible labels (Red tags) are used to check the application, and a disc spring allows an even connection of the contact surface.(Connecting torque 800~1000kgf. cm)The joint plate of the joint kit is tin plated in order to prevent discoloration and corrosion.(A silver plated option is available.)

Special Feature

Thesafety first designof the MS/Wind-Way makes it an idealoption for ships and wind towers. By separating the poxy coated phase conductors, the Wind-Way obtained the epoxy and air insulation property.
Our design ensures electrical, structural and chemical stability. The MS/Wind-Way as well as the components and the accessories such as feeders,fittings, plug-in boxes and hangers passed the rigorous ship classification, and obtained certification form prestigious risk managing organizations.

*Ship classification: DNV, BV, LR, ABS, GL and KR

Essential Considerations for Ships and Wind Towers

Shock Vibration and Deformation

: Careful consideration should be given to issues of rolling seas during voyage, and consistent shock vibration and vertical load of wind towers

Inadequate Installation Environment

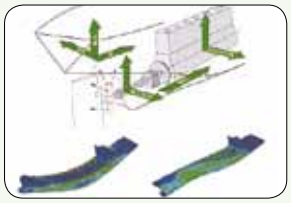
: Properties such as water proof, corrosion proof, flame proof, and explosion proof should be considered against the inadequate environment of ships and wind towers.

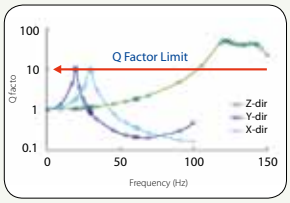
Electrical Stability

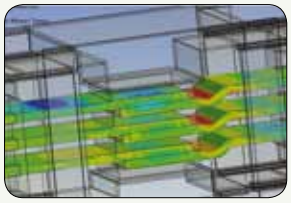
: The mechanical and heat stress caused by short circuit should be taken into consideration when accidents occurs.

Structure Design for Shock Vibration and Deformation

The MS/Wind-Way has been tested for its stability against various shock vibrations and deformation following the analysis of CAE.
The MS Wind-Way design provides excellent stability during a long period operation.

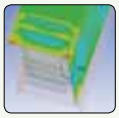






Analysis of the thermal deformation at the maximum load capacity

Accelerated durability test



Shock Vibration Stability Test

- Tested for long term stability.
- Tested for the optimum wire routing method against shock vibration.

Certified Design for Inadequate Installation

The design of The MS/Wind-Way ensures stability against various inadequacy of the installation environment. The design has been certified by the required ship environment test against damp heat, dry heat, slat mist and coldness. The safety first design has been applied to prevent the Wind-Way from igniting in a sealed area filled with harmful gas, and the design has been certified by IEC Explosion Proof Standards.

• Damp Heat

• Dry Heat

• Salt Mist

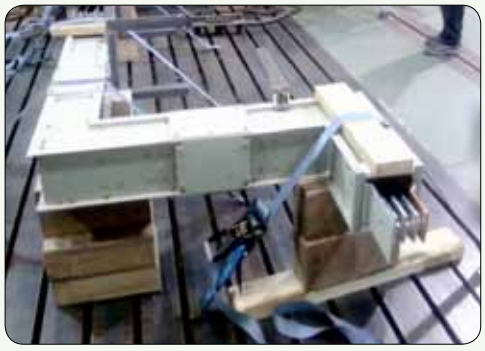
• Cold

Explosion Proof Design ; IEC 60079, Creepage Distance / Spacing / Impact Resistance / IP54

- A 1000V bare conductor with equipment protection by increased safety 'e': The Creepage distance and spacing has been designed as specified in IEC standards.
- Impact Resistance Design: Steal ball weight: 1Kg/Diameter 25mm/Drop Height 1meter
- IP54 : The Wind-Way and its joint connections are designed according to IP54.

Excellent Heat and Electrical Stability

The cross sectional areas of conductors are designed to meet the temperature limits as specified in IEC standards. Thanks to the optimized design of the conductor shape, and the spacing of the supporting insulations, the Wind-Way can easily handle mechanical and heat stress caused by short circuit.



Short Circuit Test

Temperature Rise Test

IP Code (Degree of Protection)

IP Code is an international protection degree code provided by IEC 60529(Degree of Protection Provided by Enclosure-IP Code)

NEMA STANDARD: • IP54=NEMA 12, 12K, 13 • IP55=NEMA 3, 3X, 3S, 3SX • IP66=NEMA 4.4X • IP67=NEMA 6

* As the standard differs, it is a similar substitution, nota 1:1 substitution.

The degree of protection against water of the LS C&S E-Series is a standard IP54; however, it can be adjusted from IP42 to IP65 depending on the environment and on request.

IP □ □

Solid Particle Protection

- 0 No Protection
- 1 Protection against 50mm diameter solid particles. (back of a hand)
- 2 Protection against 12mm solid particles. (fingers)
- 3 Protection against 2.4mm solid particles. (tools or thick wires)
- 4 Protection against 1mm solid particles. (tools or most wires)
- 5 Protection against dust.
- 6 Complete protection against dust.

Liquid Ingress Protection

- 0 No Protection
- 1 Protected against falling drops of water.
- 2 Protected against falling drops of water with an enclosure tilted at a 15degree angle from a vertical line
- 3 Protected against spray sat a 60degree angle from a vertical line
- 4 Protected against water splashed from all directions.
- 5 Protected against low pressure jets of water from all directions.
- 6 Protected against strong jets of water from all directions.
- 7 Protected against the effects of immersion between 15.0 centimeters and 1.0 meter.
- 8 Protected against longer periods of immersion under pressure.

Degree of Protection IP31

With an IP31 rating, it is protected from condensation and rain drops.

Degree of Protection IP54

With an IP54 rating, it is protected against water spray from any direction such as water leakages or sprinklers.

Plating and Coating

Plating

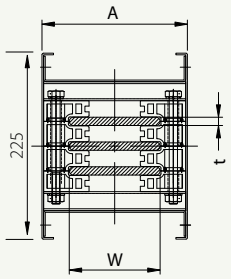
Standard tin plating is applied at taps, plugs and connections of conductors using an electroplating method to keep the electrical characteristics and to prevent corrosion. Silver plating is available on request.

Coating

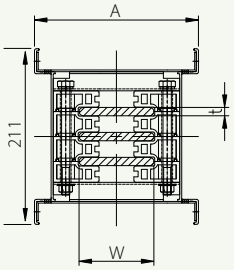
In order to improve the heat radiation and to prevent corrosion, as well as to fit in with the surroundings, we treat the surface before applying polyester-epoxy (Hybrid) power coating. A wide range of color is available to meet the needs of our clients.

Feeder

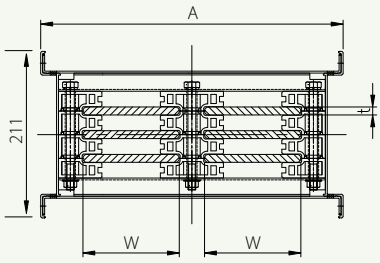
Although the standard length of the mini-way feeder is 3 meters, it can be adjusted to the installation environment on request.



[Fig. W1-1]



[Fig. W1-2]



[Fig. W1-3]

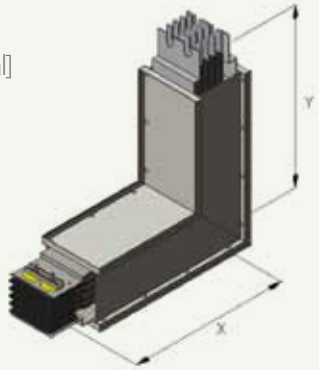
Ampere(A)			Dimension (mm)			Weight(kg/m)	Fig.
			t	W	A		
AL	IP31	1000	10	90	156	16	W1-1
		2200		160	226	22	
		3200		250	316	28	
	IP54	1000		90	197	16.5	W1-2
		1250		98	205	19.5	
		1600		138	245	22.5	
		2000		185	292	31	
		2500		233	340	35	
		3200		160	463	38	W1-3
		3600		187	513	46	
		4000		212	563	49	
		4500		243	652	52	
		5000		260	659	54	

Fittings

MS/Mini-Way has a wide range of fittings to satisfy any layout of buildings. Elbow angles other than ninety degrees are also available. Fitting designs are shown in the following figures, and they consist of the source-side and the load-side. Offset or combination elbows can be used where standard elbows are not feasible. (Dimensions for each fitting are shown in the following figures. Contact our design team for a minimum dimension.)

Elbow

[Horizontal]



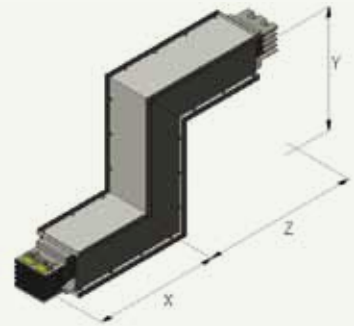
[Vertical]

Ampere(A)		Dimension (mm)	
		X	Y
AL	1000~1600	600	600
	2000~2500	600	600
	3200~3600	800	800
	4000~5000	900	900

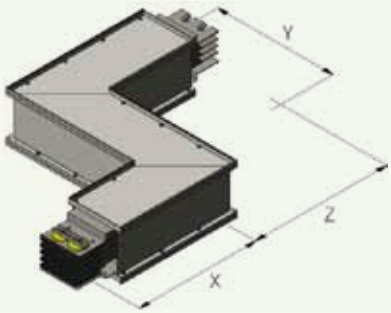
Fittings

Offset

[Horizontal]



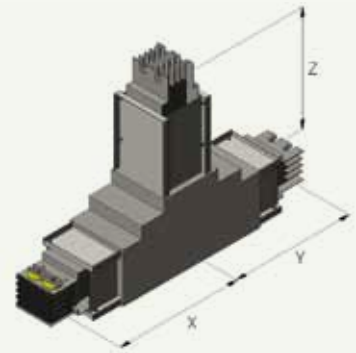
[Vertical]



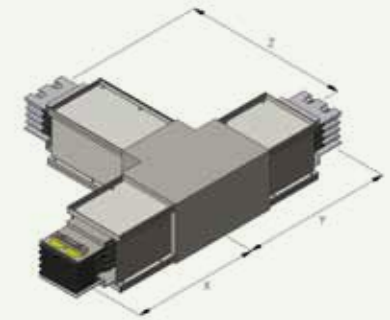
Ampere(A)		Dimension (mm)		
		X	Y	Z
AL	1000~1600	500	500	500
	2000~2500	600	600	600
	3200~3600	800	800	800
	4000~5000	900	900	900

Tee

[Horizontal]

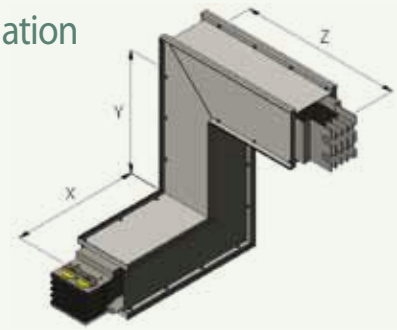


[Vertical]



Ampere(A)		Dimension (mm)		
		X	Y	Z
AL	1000~1600	500	500	500
	2000~2500	600	600	600
	3200~3600	800	800	800
	4000~5000	900	900	900

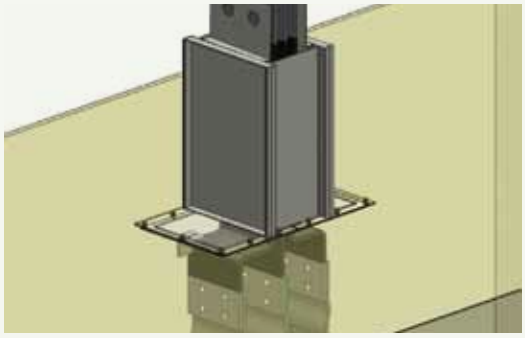
Combination Elbow

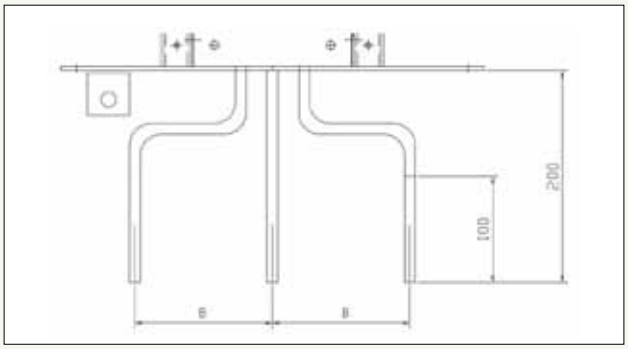


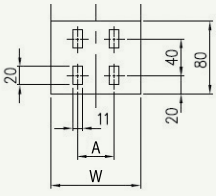
Ampere		Dimension		
		X	Y	Z
AL	1000~1600	500	500	500
	2000~2500	600	600	600
	3200~3600	800	800	800
	4000~5000	900	900	900

Flanged End

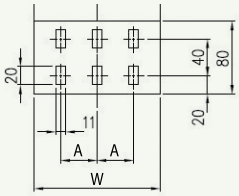
Flanged end is connected to either a transformer or a panel. Dimension details are shown below.



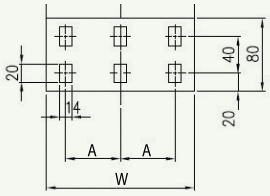




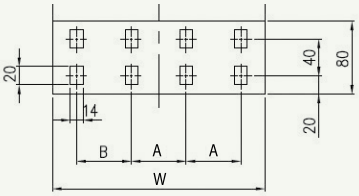
[Fig. W2-1]



[Fig. W2-2]



[Fig. W2-3]

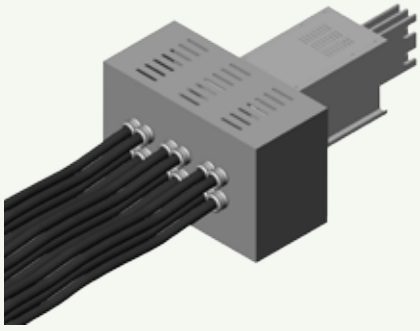


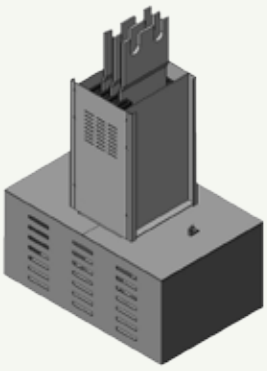
[Fig. W2-4]

Ampere(A)		Dimension (mm)				Fig.
		t	W	A	B	
AL	1000	10	90	40	100	W2-1
	1250		98	40	100	
	1600		138	40	100	W2-2
	2000		185	70	100	W2-3
	2500		233	60	100	W2-4
	3200		(2)160	60	130	W2-3
	3600		(2)187	70	130	
	4000		(2)212	70	130	
	4500		(2)243	60	130	W2-4
	5000		(2)260	70	130	

Cable Junction Box

The cable box is connected to either a transformer or a generator. The size of the box can be adjusted to the installation environment. (The box is usually used for connecting the bus ducts and cables in a wind tower.)



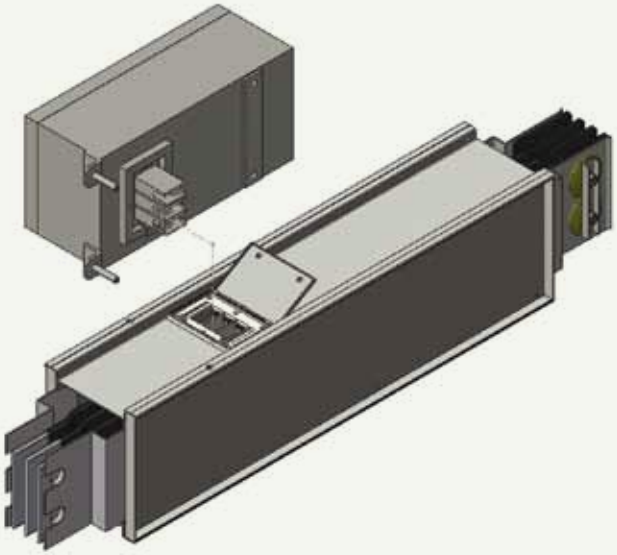


Plug-in Unit

A plug-in unit can be installed at a distribution board to distribute loads between 50 to 800A when a distribution board is required at loads and lines. Thanks to this beneficial factor, the size of the distribution board is reduced, and the distribution board can easily distribute loads at any location of the system. As a result, the unit provides a flexible approach to handle the flow of loads.

The preinstalled MCCB in the plug-in unit can quickly shut off fault currents at a load; therefore, can prevent the fault current from spreading to the other loads.

It is recommended to use MCCB which has been selected as a standard by the company, or other certified products for the plug-in unit.

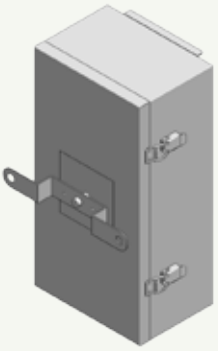


Production Specifications the Doors

Various design of doors for the plug-in box is available to satisfy the demands of our clients.
The available types are shown below.

External Handle

Push Button



External Lever Interlock

Bolt Fastening

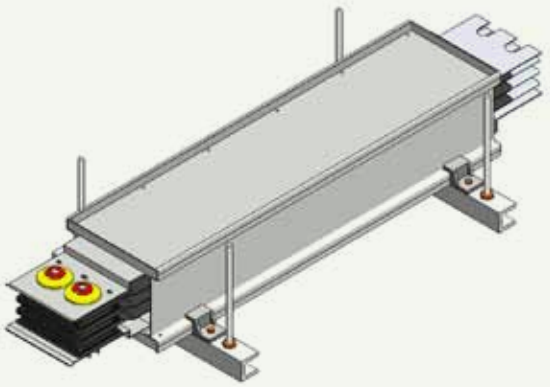
Key Lock

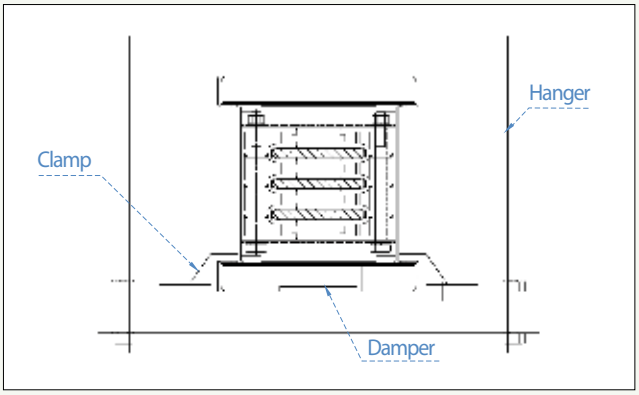
Outlet

Hanger

Horizontal Hangers

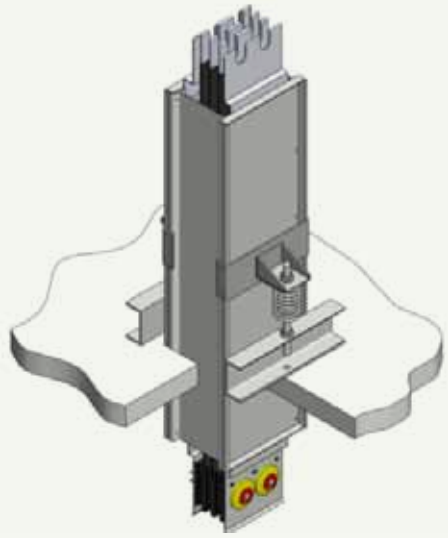
The standard installation method for these hangers is to install them horizontally at 1.5 meters intervals. They generally require 12mm diameter stud bolts.

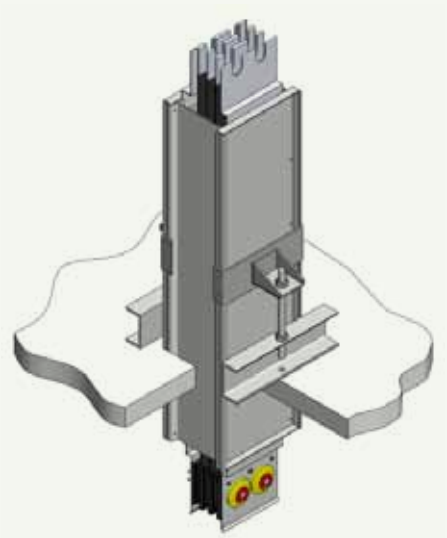




Vertical Mounting Hangers

Spring hangers are used to support the bus ducts between floors. The number of springs depends on the weight of the installed ducts and PH-boxes. A medium hanger should be installed if the height between the floors exceeds 4.5 meters, and the height of the installed spring hangers can be easily adjusted. Rigid hangers (no spring type) are used on the lowest floor, and they can be used instead of spring hangers depending on the set up.

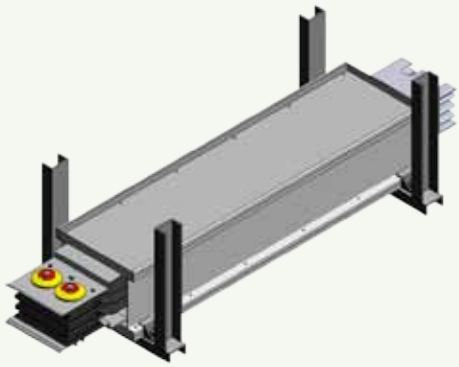




Hanger

Special Type for Ships

This special type is designed for ships, and it comes in U-shaped channel steel. The special type requires two supports per each set.



STEP 1

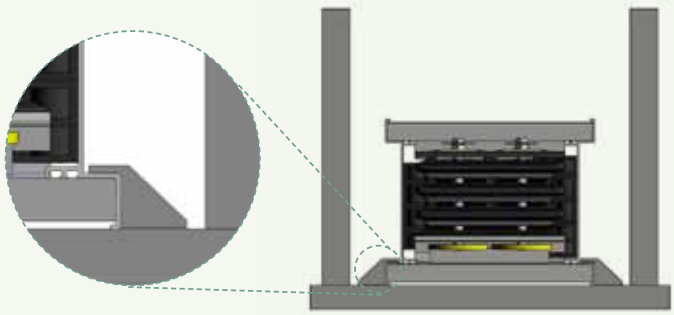
Fix the hanger tightly at a designated location.
(maximum height=700mm, standard installation intervals=1.5m)

STEP 2

Place the product in the center of the hanger.

STEP 3

Use a clamp to apply bolting, and fix both sides as shown in the image.



Special Type for Wind Towers

This special type is designed to be installed vertically at wind towers. Both the vibration endurance type and vertical load type are available.
(Please contact our design team for specific installation locations for each hanger type.)

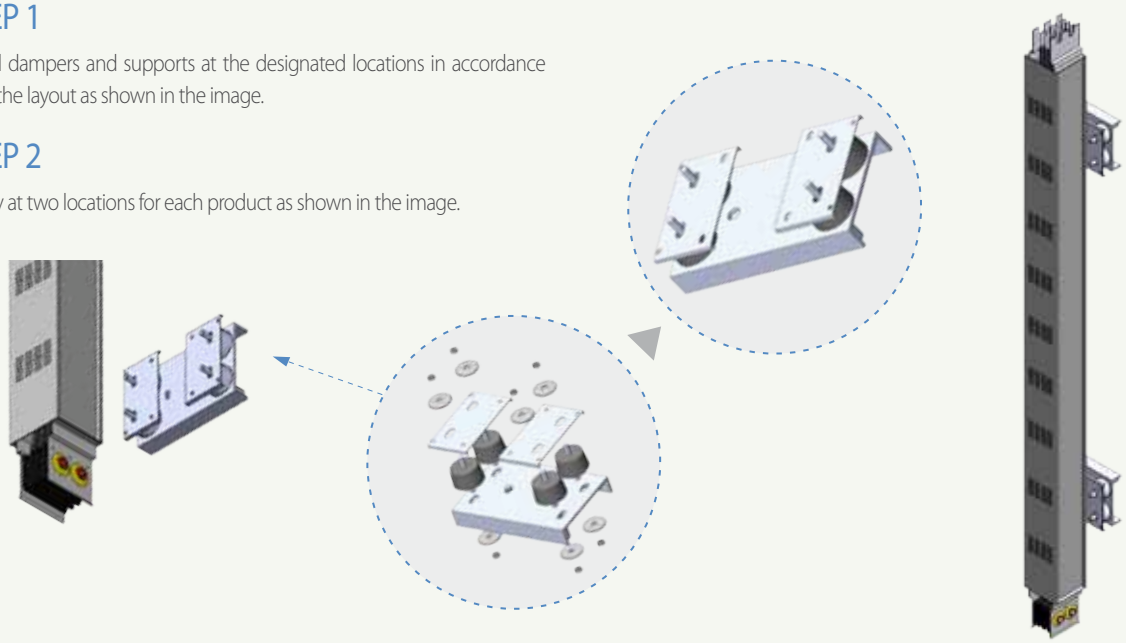
Vibration Endurance Type

STEP 1

Install dampers and supports at the designated locations in accordance with the layout as shown in the image.

STEP 2

Apply at two locations for each product as shown in the image.



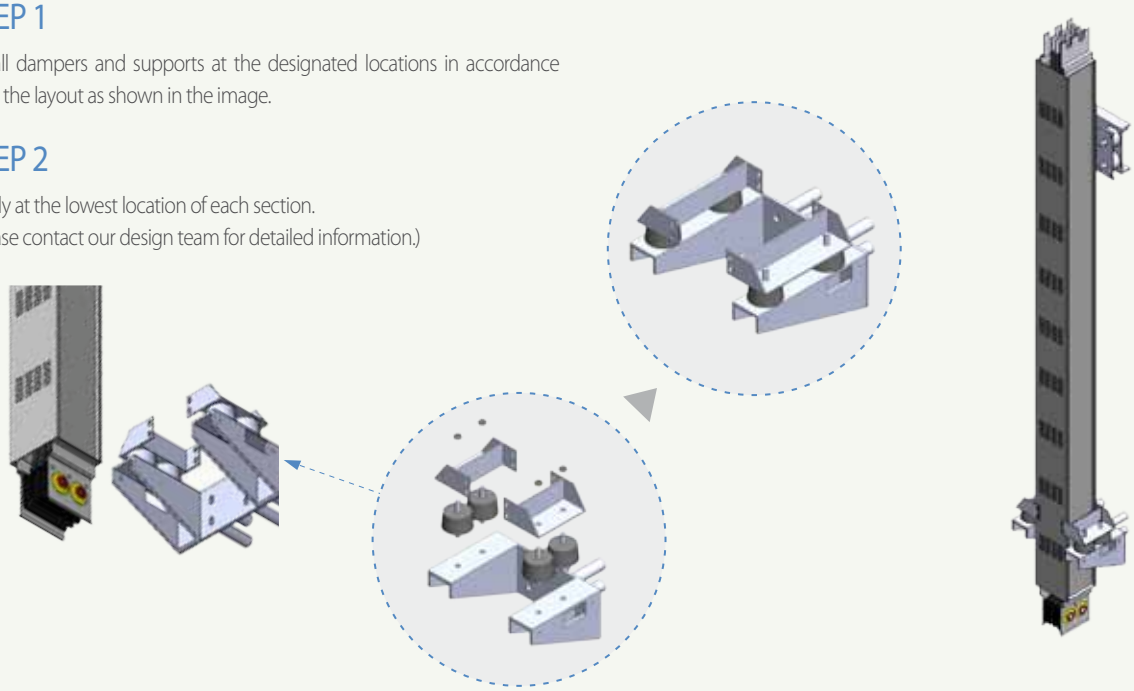
Vertical Load Type

STEP 1

Install dampers and supports at the designated locations in accordance with the layout as shown in the image.

STEP 2

Apply at the lowest location of each section.
(Please contact our design team for detailed information.)

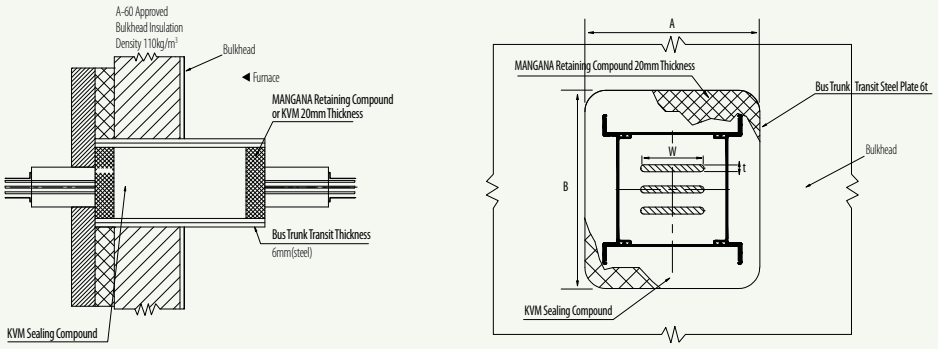


Etc.

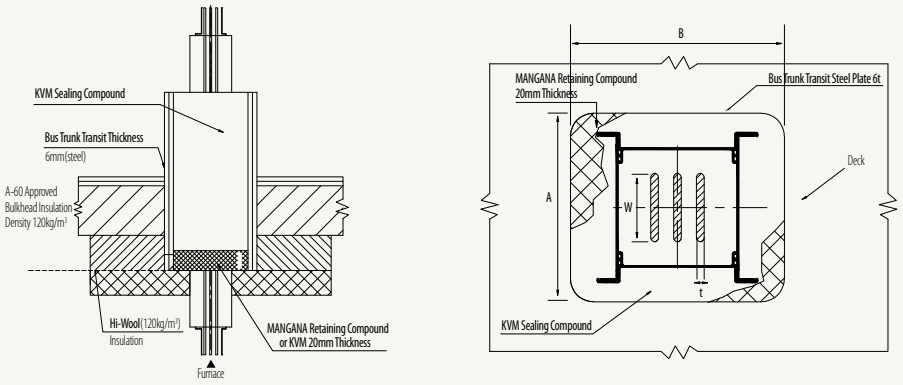
Bulkhead and Deck Opening Size

Either bulkhead or deck can be penetrated while installing the product on a ship. The specifications of the opening size and the installation method are shown below.(Please contact our design team for detailed information for insulation and compound installation.)

Bulkhead



Deck



Ampere(A)		Dimension (mm)			
		t	W	A	B
AL	1000	10	90	320	330
	1250		98	330	
	1600		138	370	
	2000		185	420	
	2500		233	470	
	3200		160	590	
	3600		187	640	
	4000		212	690	
	4500		243	750	
	5000		260	780	

Note

The term for the upper and lower wall of a ship is called 'deck', and the deck needs to satisfy difficult conditions regulated by the classification society in order to prevent flame spreads and flooding.

Technical Data

Impedance and Voltage Drop

The formula to measure the voltage drop of a busduct is shown below. The impedance and voltage drop values for aluminum and copper conductors are shown in the table below.
The values listed are measured between upper and middle lines at 60Hz. For a 50Hz installation, multiply the reactance (X) by 0.83.

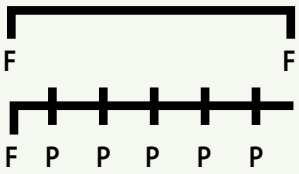
- $V_d = I \times \sqrt{3}(R\cos\theta + X\sin\theta)$

· V_d = voltage drop[V] · I = rated road amperes[A] · R = resistance[Ω] · X = reactance[Ω] / cos = power factor / sim = reactive factor

- Actual voltage Drop $= \alpha \times V_d \times \frac{\text{Actual load current}}{\text{Rated load current}} \times \frac{\text{Actual length of the line (m)}}{100\text{m}}$

- α(Load Constant) $\alpha = 1$, concentrated load
(a place such as an electrical room)

$\alpha = 0.5$, Distributed load
(a place such as a vertical section)



- **F : Flanged End** (panel connections)
- **P : Plug-in Unit**

Ampere (A)	$10^{-3}\Omega$ /100m, 60Hz			Voltage Drop(V/100m)			
	R	X	Z	0.7	0.8	0.9	1
1000	35.71	65.41	74.52	12.42	11.75	10.50	6.19
1250	33.09	61.87	70.16	14.58	13.77	12.29	7.16
1600	24.51	48.78	54.59	14.41	13.54	12.01	6.79
2000	19.06	39.15	43.54	14.31	13.42	11.85	6.60
2500	15.65	32.62	36.18	14.83	13.90	12.26	6.78
3200	12.11	25.49	28.22	14.79	13.85	12.20	6.71
3600	10.38	21.95	24.28	14.30	13.39	11.79	6.47
4000	9.34	19.67	21.77	14.26	13.35	11.76	6.47
4500	8.33	17.44	19.33	14.25	13.35	11.77	6.49
5000	7.85	16.42	18.20	14.91	13.97	12.32	6.80

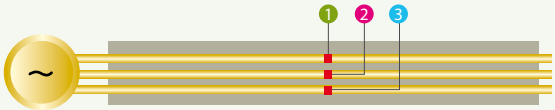
Short Circuit Strength

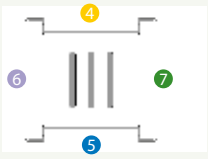
The short circuit strength of the MS/Wind-Way has been tested and certified as specified at IEC 61439-2 and by KOLAS certification authorities including the Korea Electro technology Research Institute (KERI) and PT & T.

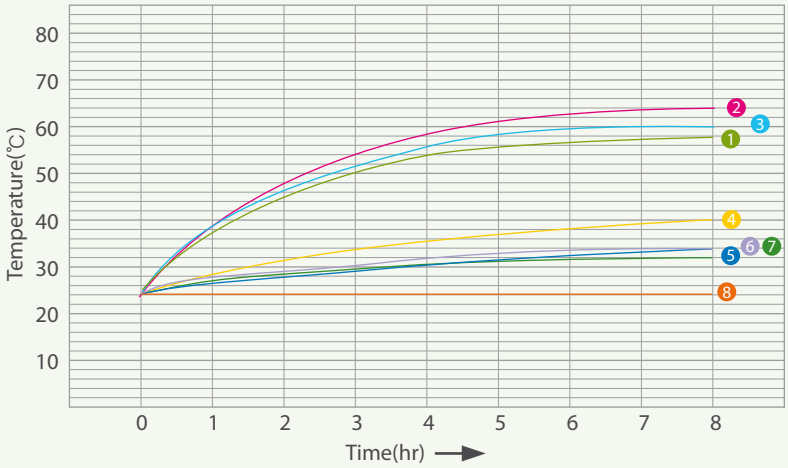
Ampere(A)	1000	1250	1600	2000	2500	3200	3600	4000	4500	5000
Shirt circuit (kA), 1sec.	46	72	90	98	126	135	150	150	150	150
Shirt circuit (kA), 3sec.	26	41	51	56	72	77	86	86	86	86

Temperature Rise

The temperature rise limit is an important property which determines the performance of bus ducts. The temperature rise limit of the bus duct is designed that when a bus duct is operated with a rated current , the temperature limit values of the housing are within 55K as specified in IEC61439-2 and 6 [(previous standard) IEC 60439-1 and 2].

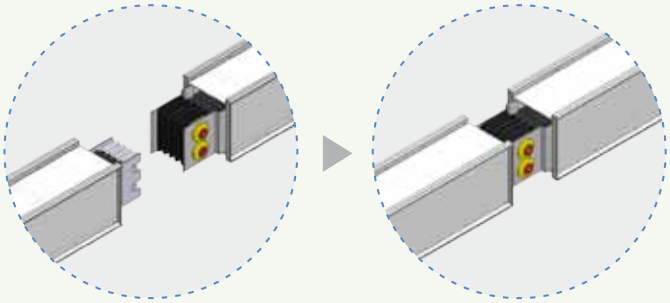






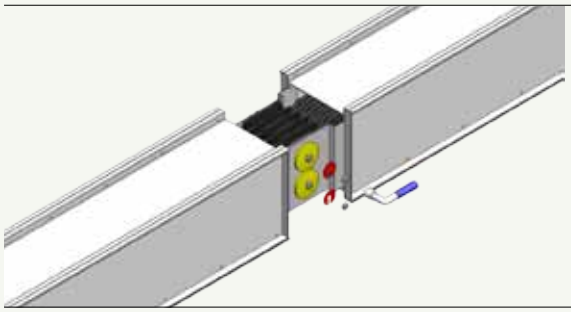
Classification	1	2	3	4	5	6	7	8
Censer Location	Joint Conductor			Housing				Ambient Temperature
Temperature Rise Value	57K	63K	60K	40K	32K	33K	33K	22℃

Joint Connection



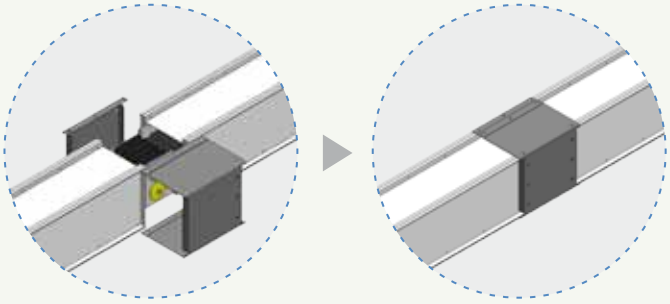
STEP 1

Check for any deformations or stains, and make sure the bus ducts are aligned with the connecting direction. Insert slowly towards the connecting direction.



STEP 2

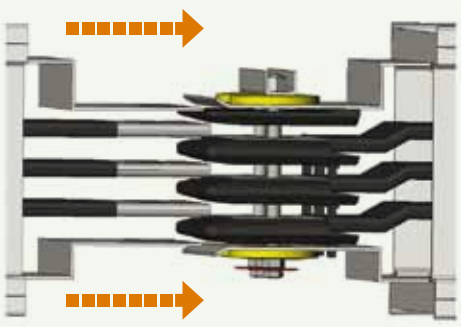
Using a torque wrench, slowly tighten the exposed bolt head of a double head bolt until it breaks off.

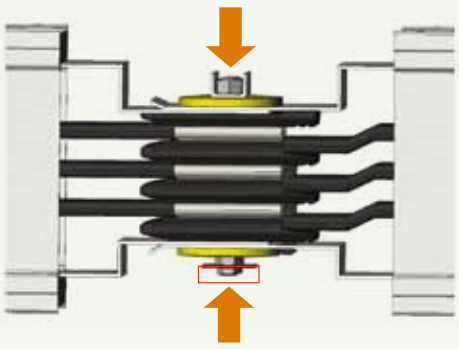


STEP 3

Once all the exposed double head bolts have been cut off, place the top and bottom joint covers, and fix them tightly with bolts.

The double head bolts have been applied to the system for better connection. The double head bolt head and the red tag attached to it are designed to break off at 800~1000Kgf•cm. Once the exposed head and the red tag attached to it have been cut off, the connected torque and the condition of the connection will be visible for inspection. The highly reliable one-bolting connection system will provide electrical and mechanical stability of the entire system to satisfy the needs of the clients.





Certification & Specification

KR Certification

LR Certification

ABS Certification

DNV Certification

GL Certification

Eco Friendly Certification

Major References

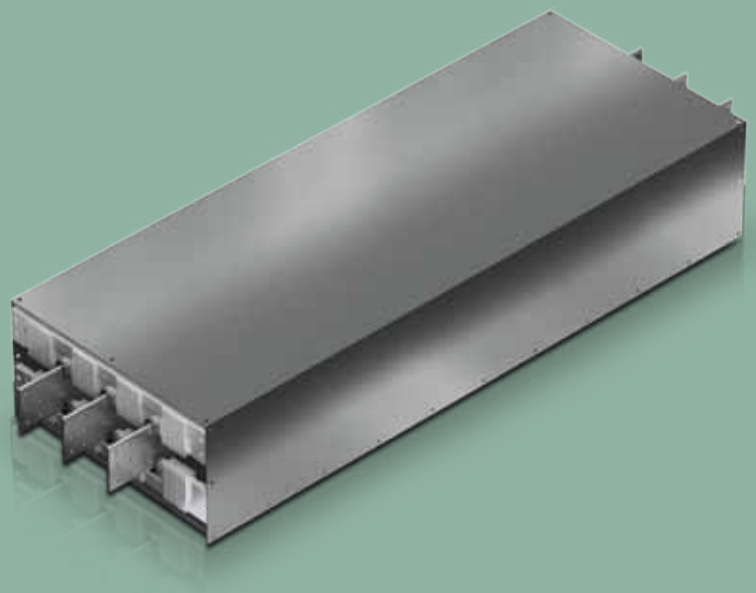
GOLAR LNG LTD. UK.
Contractor : Samsung Heavy Industries
Construction Period : 2012 ~ 2013

HHI 5.5MW OFFSHORE WIND TURBINE
Contractor : Hyundai Heavy Industries
Construction Period : 2013

NSPB-LV/MV

LS 전선 Busduct System Catalogue

05 of 08



Contents

Overview

The NSPB

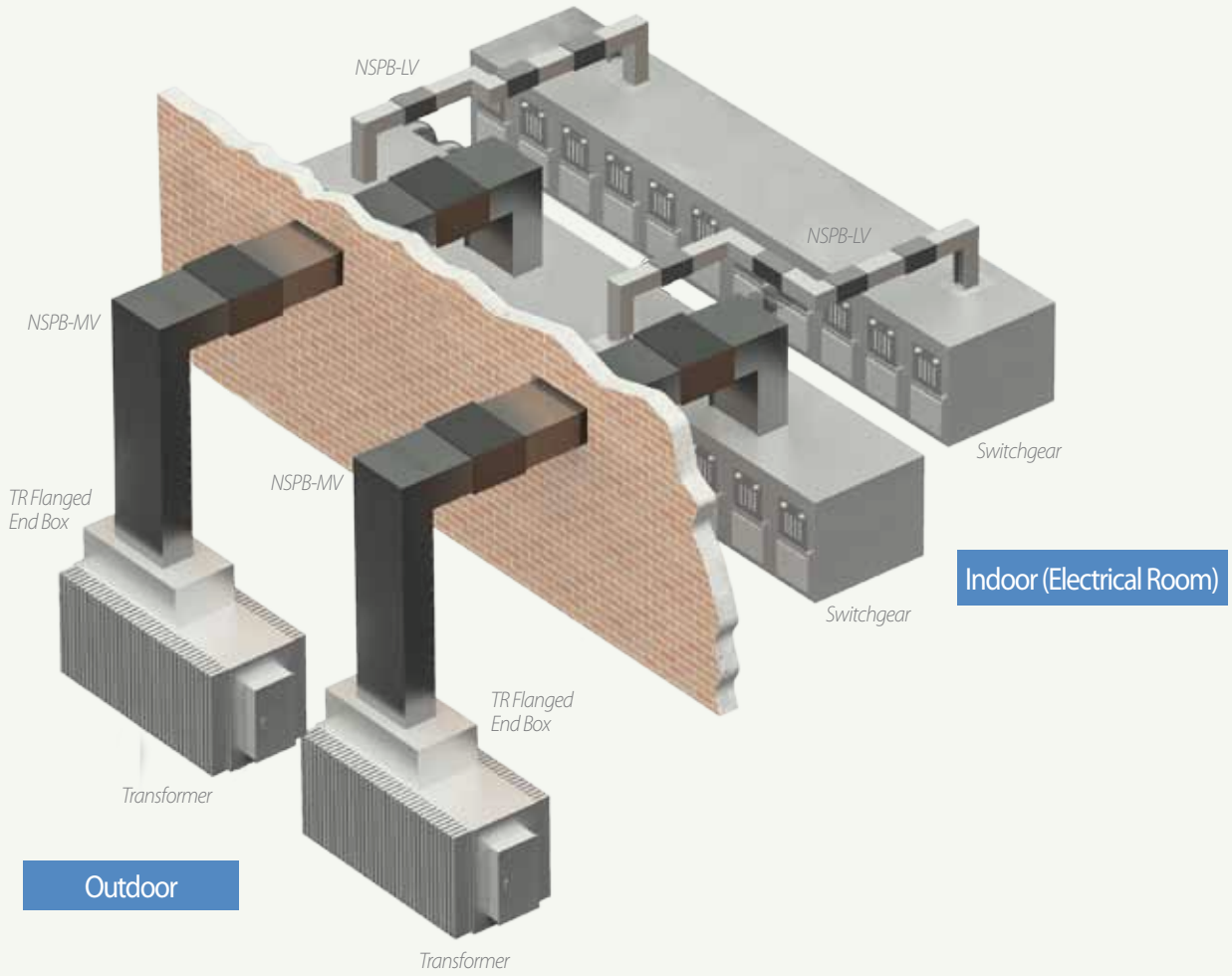
The design of the LS C&S NSPB Bus Duct improved the stability of the system by incorporating the epoxy coating and air insulation. The Bus Duct is available from a low voltage of AC 1000V or less, up to a high voltage of 27kV. It is suitable for current capacities between 800A to 4000A.The bus duct comes with a class B rating (130℃) insulation and its water proof quality is suitable for outdoors.

Safe and Efficient Distribution System

The LS C&S NSPB Bus Duct is designed for large plants as they are becoming larger. The extensive experience and the proficient engineers of LS C&S provide high-performance products. The efficient design ensures the products to harmonize with structures, and the property of the products does not interfere with existing equipments.

Environmentally Friendly and Excellent Performance

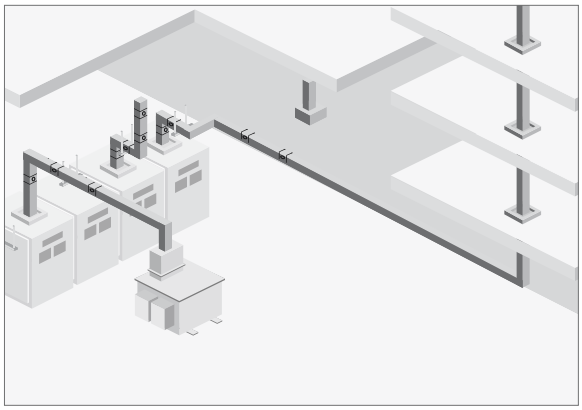
The LS C&S NSPB Bus Duct acquired RoHS certification, and uses components without hazardous substances such as lead, cadmium, mercury, chrome, PBBs and PBDEs. The design of cross sectional areas of the conductors, supporting structures and the housing are in accordance with the standard of IEC and IEEE. It also has high short circuit strength.



Application

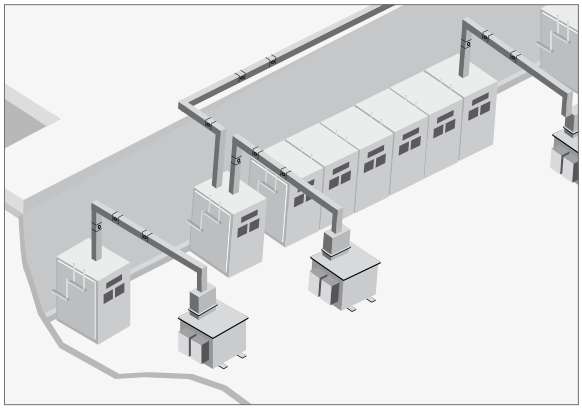
Large Buildings

• Main electric rooms where large capacity of power transmission is required



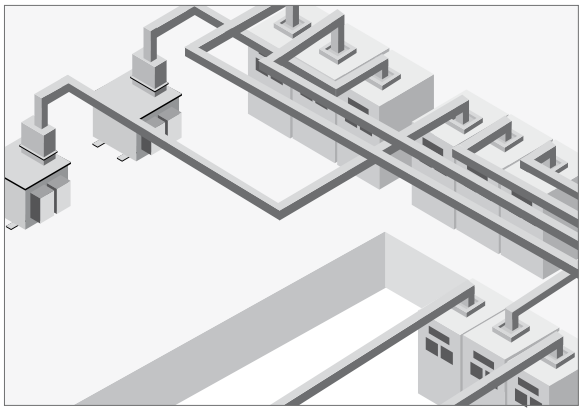
Chemical and Oil

• Due to the use of chemicals, safety is the top priority of plants



Steel and Smelting

• Transmission of high voltage and large capacity of power



Customized Engineering

The company provides a wide range of options including conductors, materials and design of housing as well as products for various range of voltage (27kV or less) and current(between 800A and 4000A) to satisfy the needs of the clients and their specifications.

01 Standard

The specialists of the company will provide the ideal size of the conductors and products through tests and analyses as specified in CAE to satisfy specific needs of clients.

LV

- IEC 61439-6 [(previous standard) IEC 60439-20] Busbar Trunking Systems
- IEEE C37.23 IEEE Standard for Metal-Enclosed Bus

	IEC	IEEE
전압 등급	1000V or less	0.635kVor less
Ambient	35℃	40℃
Tempera–	• Housing : 55K • Conductor : 70K	• Housing : 40K • Conductor : 65K
	The specifics can be adjusted according to the heat resistance values of the insulations.	

MV

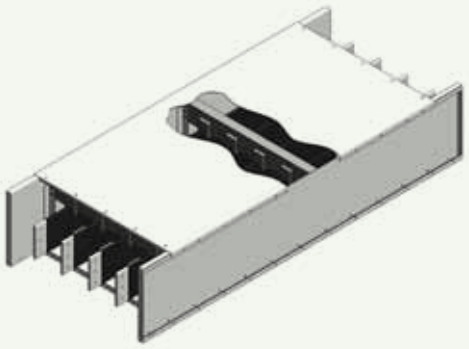
- IEC 62271 High-voltage switchgear and controlgear

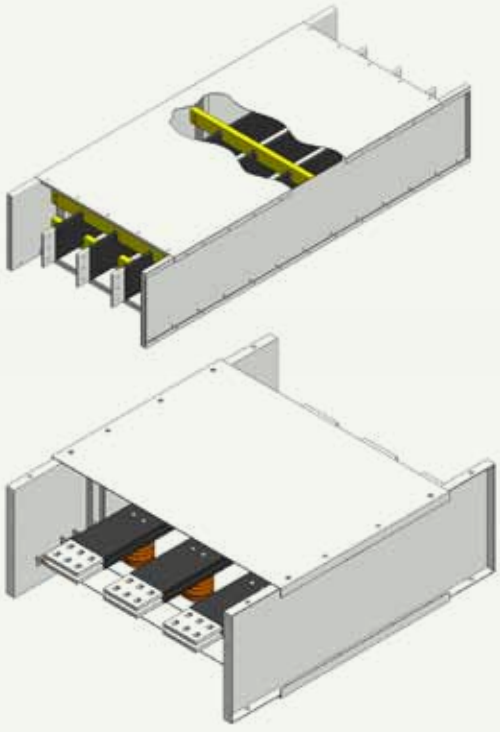
Part 200 : AC metal-enclosed switchgear and controlgear for rated Voltages above 1 kV and up to and including 52 kV

- IEEE C37.23 IEEE Standard for Metal-Enclosed Bus

	IEC	IEEE
전압 등급 (내전압)	7.2(20) 12(28) 17.5(38) 24(50)	4.760(19) - 15(36) 27(60)
Ambient	35℃	40℃
Tempera–	• Housing : 55K • Conductor : 70K	• Housing : 40K • Conductor : 65K
	The specifics can be adjusted according to the heat resistance values of the insulations.	

Configration





02 Conductor Materials

The NSPB Bus Duct uses either copper conductors with conductivity over 99%, or aluminum conductors with conductivity over 54%.
The connection of the conductors is tin-plated in order to reduce contact resistance and to prevent corrosion of the connection.
(A silver plated option is available.)

03 Conductor Insulations

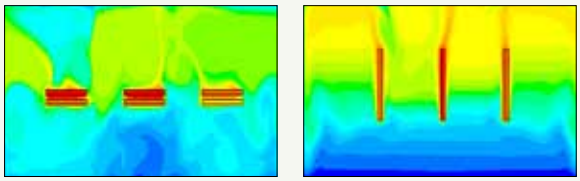
The NSPB Bus Duct comes with standard epoxy coating, however, tube insulations is available on request. Epoxy coating is applied by automated facility. The company performs rigorous testing on the products including exterior of the conductors, coating thickness, pin holes, impacts and flexibilities to provide products that are highly safe.

04 Alignments and Size of Conductors

The alignment of the conductors can be chosen between vertical or horizontal alignments to provide the optimized structures and size to satisfy the installation environment and the specifics of the requests.

Note

The optimized heat-radiating structure and size of the conductors are chosen through simulation and actual measurement tests including heat-radiating mechanism of the conductors, coating effects, housing materials and the location of the grounding bar. (The size of the conductors can be reduced when the conductors are aligned vertically in comparison to horizontally aligned conductors.)



05 Housing Materials

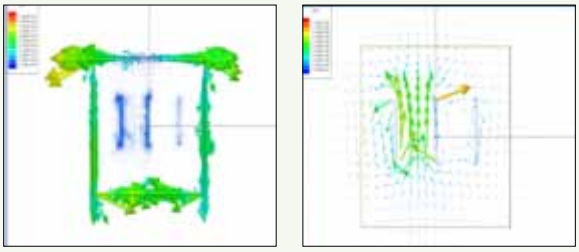
High strength aluminum (50 type), STS, steel or materials with either the same or higher mechanical strength are used for housing of the NSPB Bus Duct. Therefore, the mechanical strength and the heat-radiating property of the housing are excellent. The standard color of the coating is 5Y 7/1, however, the company provides a wide range of color to satisfy the needs.

Note

The 3 types of current supply loss of metal materials are shown below.

1) Hysteresis loss (iron loss)
2) Eddy-current lose (induced current loss)
3) Copper loss.

These losses eventually increase loss resistance. Compared to the characters of steel, a ferromagnetic body and high permeability, using aluminum and STS decreases the loss from magnetic flux caused by time variation of the current.

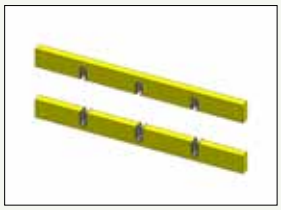


Customized Engineering

The company provides a wide range of options including conductors, materials and design of housing as well as products for various range of voltage (27kV or less) and current(between 800A and 4000A) to satisfy the needs of the clients and their specifications.

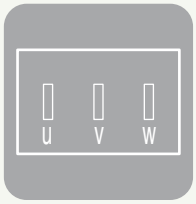
06 Insulation Support

Using insulations (LV: engineering plastic, MV: epoxy type) with dielectric strength in correspondence with voltage ensures the insulation property of the housing. In order to obtain the stable installation and sufficient functionality of the conductors, the insulations are located at ideal intervals based on analysis of CAE (Computer Aided Engineering).



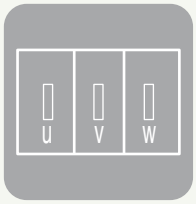
Note

There are 3 types of air insulation bus ducts. (IEEE Std C37.23: IEE Standard for Metal-Enclosed Bus Standard) LS Cable and System provides the NSPB type, however, other types are available to satisfy the needs, or for special environments. (Please contact out design team for further information.)



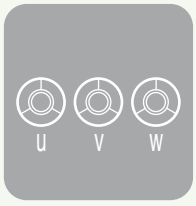
NSPB (NonSegregated Phase Busduct)

Each phase conductor of the bus duct at a single housing is separated by the voltage, and the conductors are supported by either insulators or insulations. The NSPB is suitable for high voltage or extra high voltage lines of substations.



SPB (Segregated Phase Busduct)

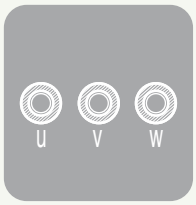
Each phase conductor of the bus duct at a single housing is separated by voltage, and the conductors are supported by either insulators or insulations. However, barriers are installed between the phases to separate them.



IPB (Isolated Phase Busduct)

The air insulated conductors of the bus duct are fixed by insulation supports, and wrapped separately in tubes by phase. The bus duct is a phase separator for power plants that transmits large capacity of power at the centerline of a generator and the main and auxiliary transformer of a power plant.

* LS Cable & System does not produce IPB type products. Instead, the company provides SIB type products that are similar to the IPB type. (Please contact out sales team for further information.)



SIB (Solid Insulated Busduct)

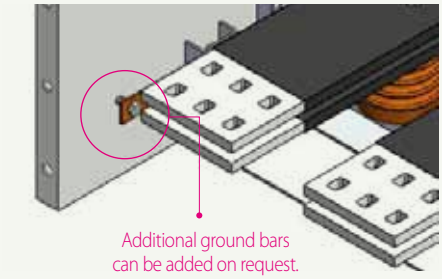
Each phase conductor is completely insulated separately with an epoxy vacuum impregnated method, and they are wrapped with protection tubes. Each phase tube is separated by air bound.

07 Options

Grounding, Space heaters, Vents

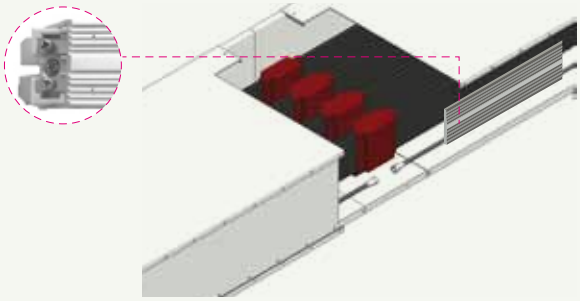
Grounding

The standard aluminum housing of the NSPB is designed to perform as a grounding conductor without additional conductors. (Additional ground bars can be added on request. Please contact our design team for further information.)



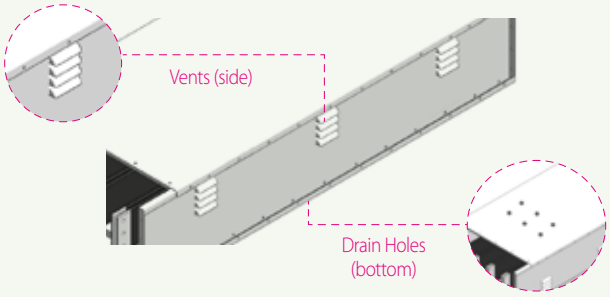
Space Heaters

A space heater can be applied for outdoor products to reduce dew condensation. The heater is installed inside of the product during production. A temperature sensor or a humidistat can be applied along with the heater for better control. A space heater set is installed for each feeder as the standard installation.



Vents and Drain Holes

Vents and drain holes are installed to control the air flow of the interior and exterior of the product in order to minimize water leakage and dew condensation, and to discharge moisture during operation. It is designed to prevent the moisture from penetrating by installing vents on the side and drain holes on the bottom.



Fire Barrier

In order to prevent fire from spreading through the product, refractory materials have been applied at the wall penetration (indoor and outdoor).The barriers also block flames from penetrating into the product.

Vapor Barrier

A vapor barrier is installed to block the air flow at the wall penetration (indoor and outdoor). It also blocks the interior of the product using an epoxy plate.

NSPB-LV

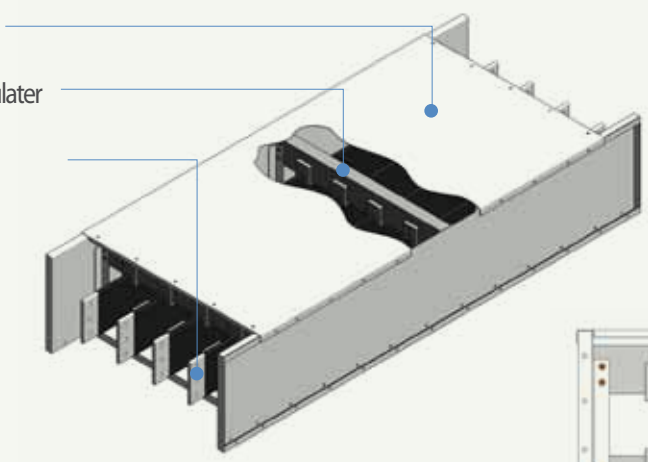
Contents

Basic Structure

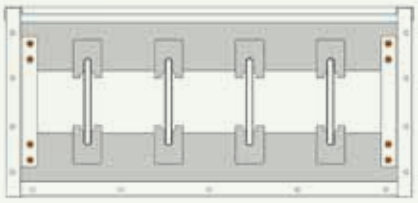
The NSPB-LV uses epoxy insulating material (thermal class 130 C) to separate the phases, and secure them using high strength engineering plastic. It can be applied to 1000V or less, or between 800A and 4000A.

Structure

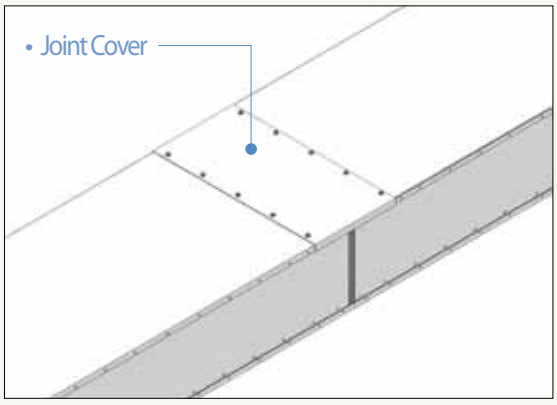
- Al / STS / SPCC
- Supporting Insulater
- CU or AL



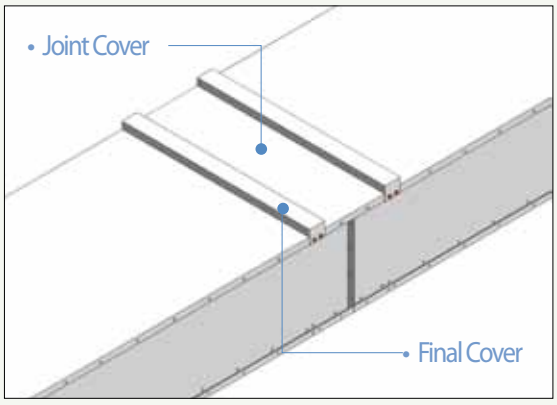
Sectional View



Joint Cover



Indoor



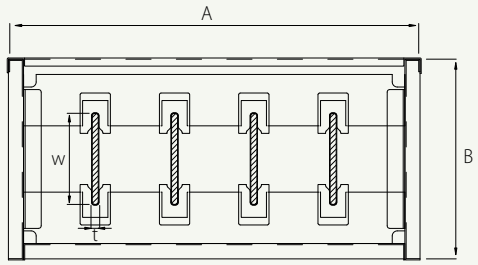
Outdoor

Note

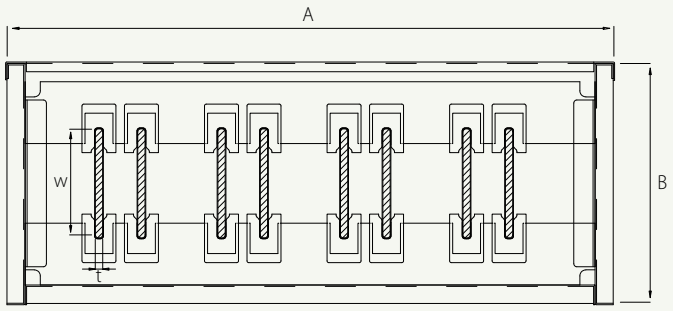
The NSPB is a hybrid type bus duct that combined the benefits of the epoxy insulation type and the air insulation type. Although it provides better insulation stability, it is larger and the cost is higher than the E-Series (sandwich type). Therefore, they are suitable for large plants where the stability is priority.

Feeder

Although the standard length of the LS C&S NSPB-LV Bus Duct is 2 meters, it can be adjusted to the installation environment and on request.



NL-1-1



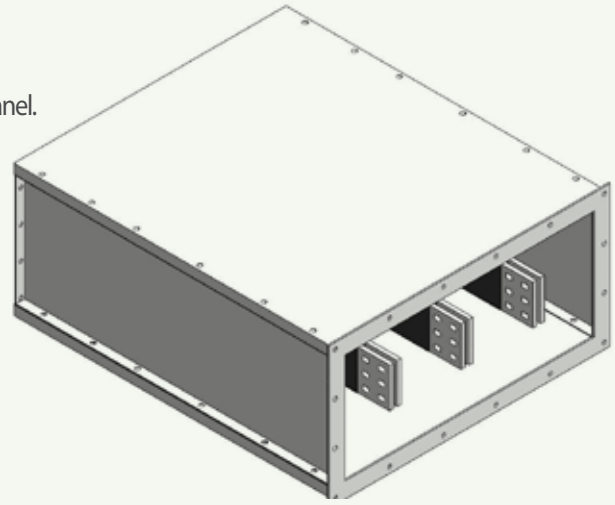
NL-1-2

Ampere(A)		Dimension (mm)				Earth bar (mm)	Fig.
		t	W	A	B		
CU	630	6	70	572	320	6.35*41	NL-1-1
	800	6	70	572	320		
	1,000	6	70	572	320		
	1,250	6	95	572	345		
	1,600	10	95	590	345		
	2,000	10	135	590	385		
	2,500	12	170	590	420		
	3,200	12	240	590	490		
	4,000	12	200	800	500		NL-1-2

* Since the standards of the conductors differ, these are only for reference, and they can be adjusted according to the installation site, or on request.
(For using aluminum conductors, please contact our design team for further information.)

Flanged End

The flanged end is used at a transformer or at a low-tension panel.
(Please, contact our design team for further information.)

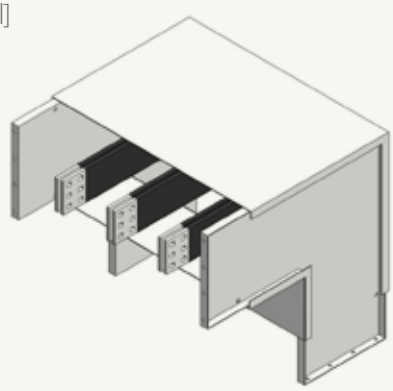


Fittings

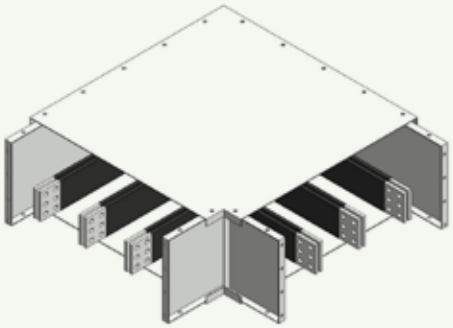
LS C&S NSPB has a wide range of fittings to satisfy any layout of buildings. Elbow angles other than ninety degrees are also available. Offsets or tees can be applied where the standard elbows are not feasible. (Please contact our design team for detailed information about the product length.)

Elbow

[Vertical]

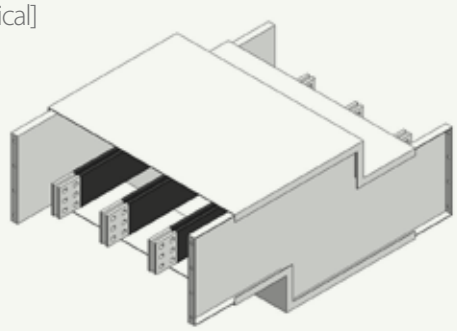


[Horizontal]

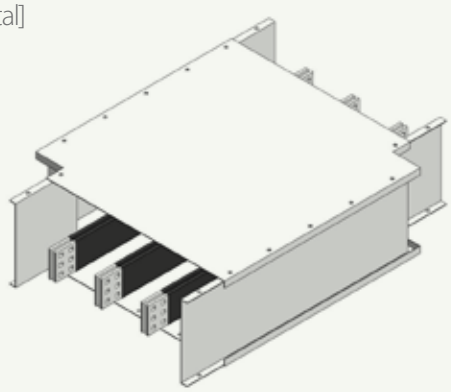


Offset

[Vertical]

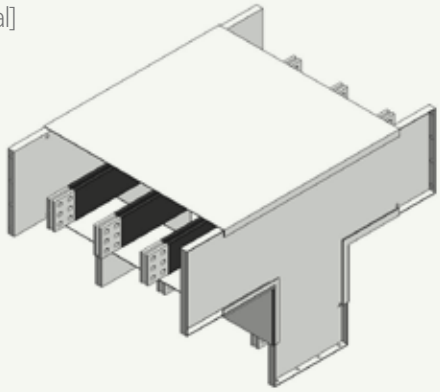


[Horizontal]

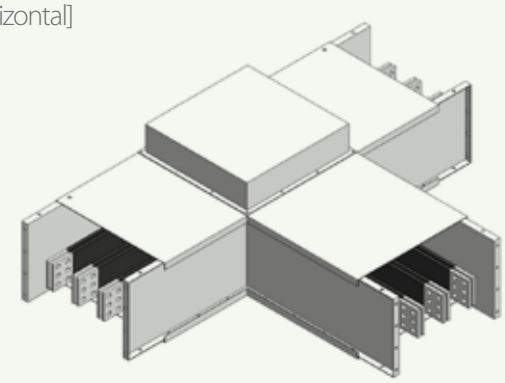


Tee

[Vertical]



[Horizontal]

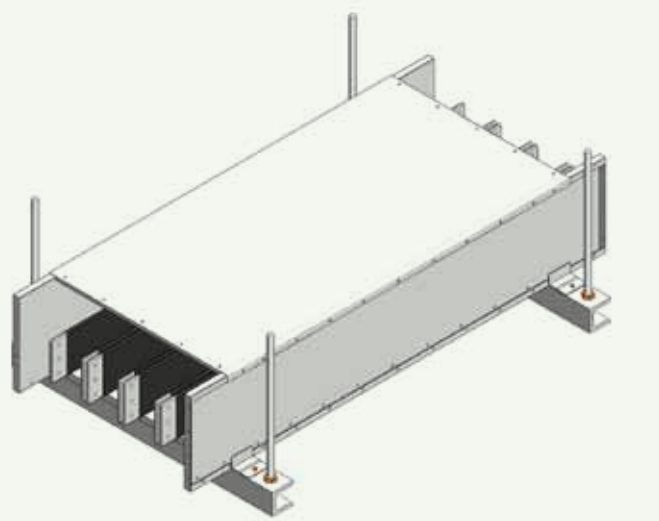


Hanger

LS C&S NSPB can be installed using horizontal hangers, vertical hangers and wall brackets according to the installation environment. (Please contact our design team for detailed information about installation.)

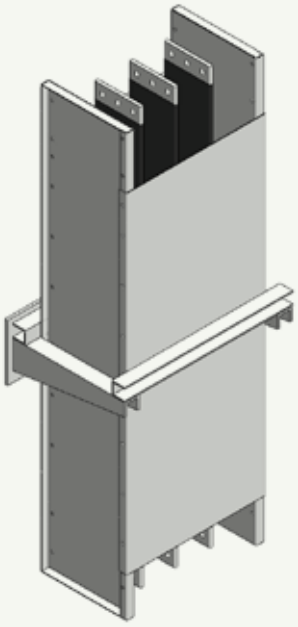
Horizontal

For horizontal installation, the NSPB requires two or more supports for each product.



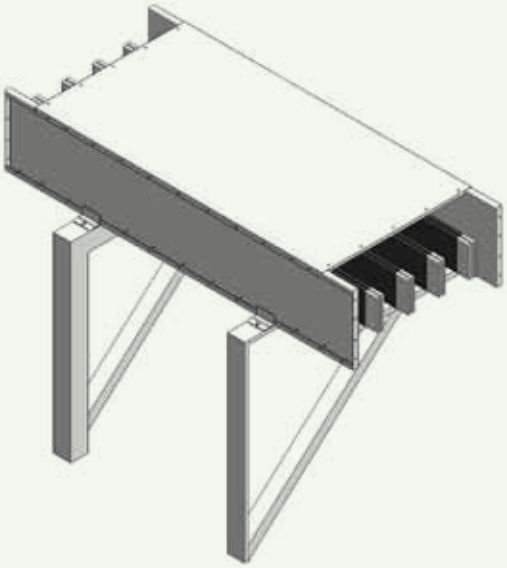
Vertical Hangers

An additional reinforcement design provides stability for the vertical loading of the vertical feeders.



Wall Bracket

Once the angles and the channels are applied on walls, they need to be fixed with bolts.



NSPB-MV

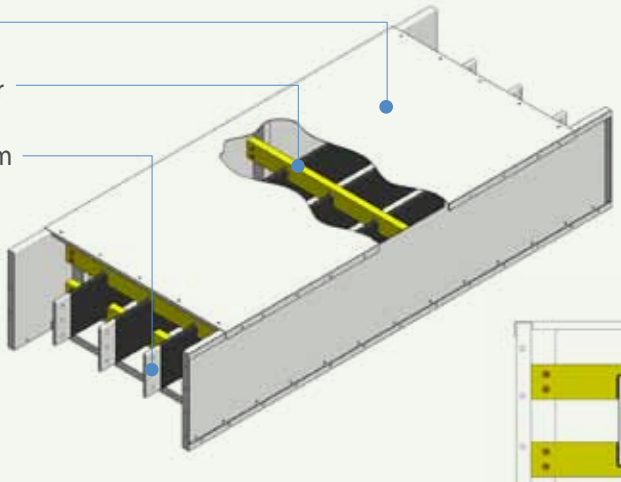
Contents

Basic Structure

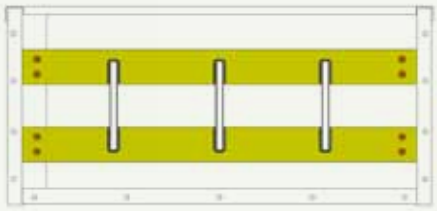
The NSPB-MV uses epoxy insulating material (thermal class 130 C) to separate the phases, and secure them using high strength epoxy. It can be applied to 1000V or less, or between 800A and 4000A.

Structure (Vertical)

- Al / STS / SPCC
- Supporting Insulater
- Copper or Aluminum

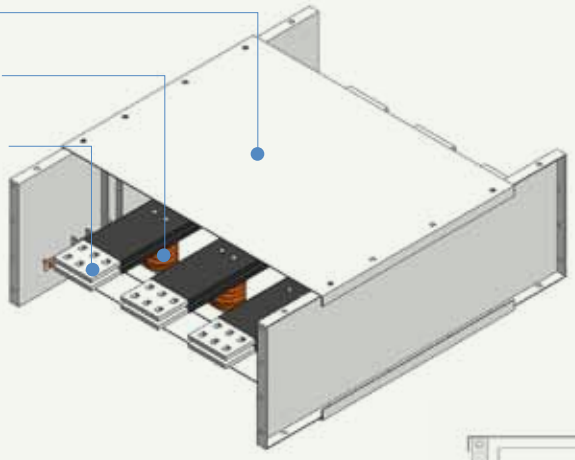


Sectional View

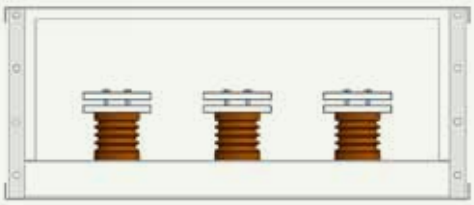


Structure (Horizontal)

- Al / STS / SPCC
- Supporting Insulater
- Copper or Aluminum

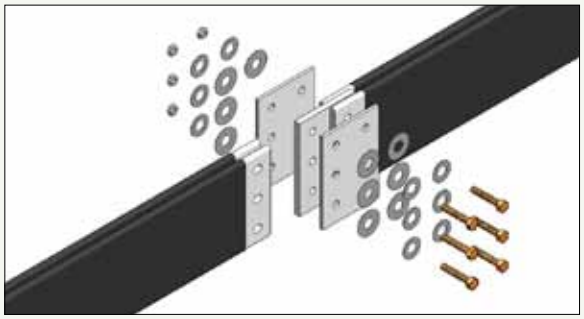


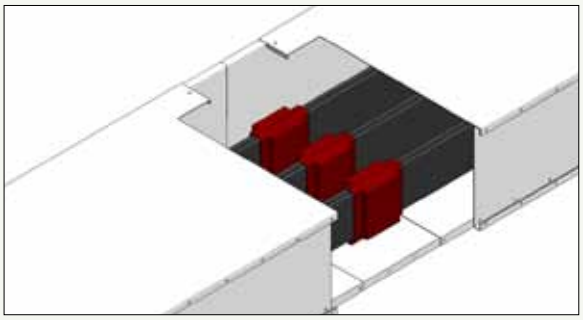
Sectional View



도체 절연 및 접속

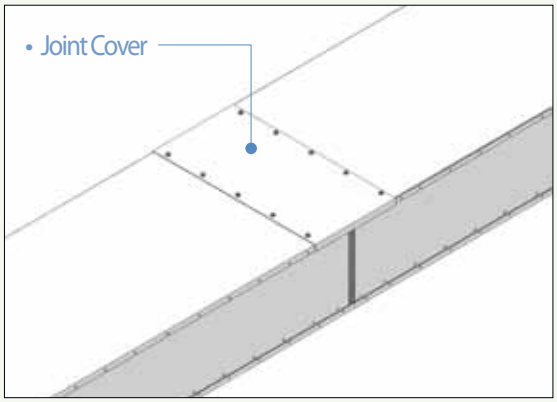
The conductors come with standard epoxy coating insulation. Tube insulation is also available on request. Use joint plates to connect the parts, and cover them with boots as shown in the image below.



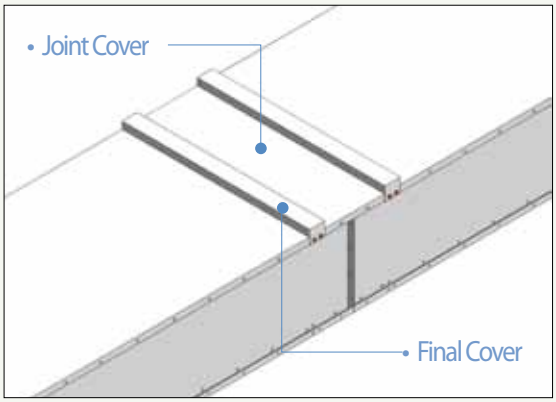


Joint Covers

For indoor installation, applying joint covers are sufficient; however, for outdoor installation, final covers should be applied additionally on top of the joint covers. (Please contact our design team for further information.)

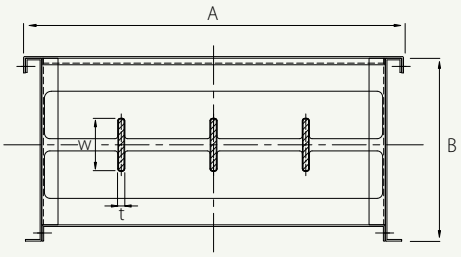


Indoor

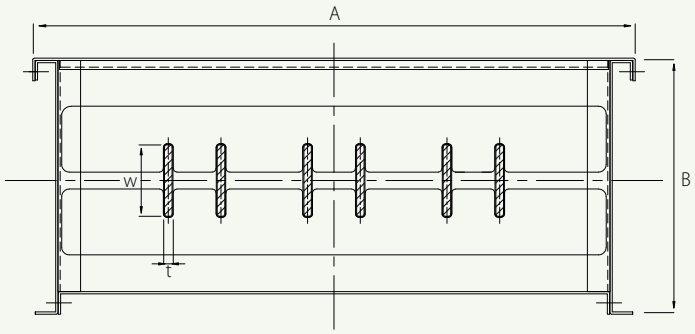


Outdoor

Feeder (Alignment of the Conductors : Vertical)



NM-1-1



NM-1-2

~ 4.76kV (IEC : ~7.2kV)

Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	70	572	320	6.35*41	NM1-1
	1000	6	70	572	320		
	1250	6	95	572	345		
	1600	10	95	590	345		
	2000	10	135	590	385		
	2500	12	170	590	420		
	3200	12	240	590	490		
	4000	12	200	800	500		NM1-2

~ 15kV (IEC : ~12kV)

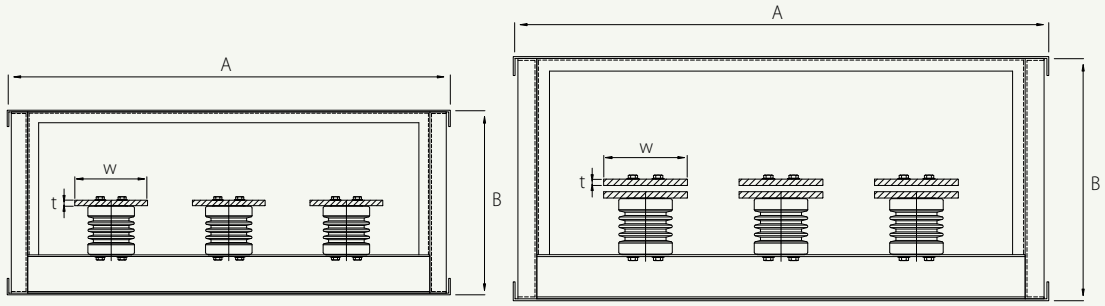
Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	65	632	315	6.35*41	NM1-1
	1000	6	65	632	315		
	1250	6	75	632	325		
	1600	10	80	650	330		
	2000	10	115	650	365		
	2500	12	145	650	395		
	3200	12	200	632	450		
	4000	12	180	860	480		NM1-2

~ 27kV (IEC : ~24kV)

Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	65	692	315	6.35*41	NM1-1
	1000	6	65	692	315		
	1250	6	70	692	320		
	1600	10	75	710	325		
	2000	10	105	710	355		
	2500	12	125	710	375		
	3200	12	180	710	430		
	4000	12	165	920	465		NM1-2

The standards of the conductors are only for reference, and they can be adjusted according to the installation environment, or on request. (For using aluminum conductors, please contact our design team for further information.)

Feeder (Alignment of the Conductors : Horizontal)



NM-2-1 NM-2-2

~ 4.76kV (IEC : ~7.2kV)

Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	50	670	330	6.35*41	NM2-1
	1000	6	65	715	330		
	1250	10	65	715	335		
	1600	10	100	820	335		
	2000	10	125	895	335		
	2500	10	110	850	355		NM2-2
	3200	13	125	895	360		
	4000	15	150	970	370		

~ 15kV (IEC : ~12kV)

Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	50	870	340	6.35*41	NM2-1
	1000	6	60	900	340		
	1250	10	55	885	345		
	1600	10	85	975	345		
	2000	10	110	1050	345		
	2500	10	95	1005	365		NM2-2
	3200	13	115	1065	370		
	4000	15	135	1125	380		

~ 27kV (IEC : ~24kV)

Ampere(A)		Dimension (mm)				Earth bar [mm]	Fig.
		t	W	A	B		
CU	800	6	50	1150	570	6.35*41	NM2-1
	1000	6	60	1180	570		
	1250	10	50	1150	575		
	1600	10	80	1240	575		
	2000	10	100	1300	575		
	2500	10	85	1255	595		NM2-2
	3200	13	100	1300	605		
	4000	15	125	1375	610		

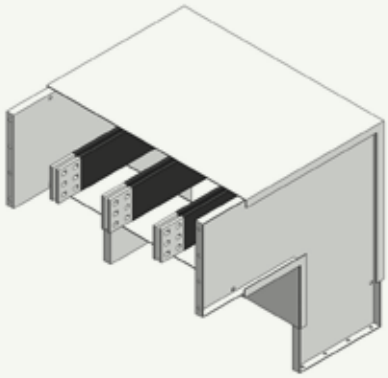
The standards of the conductors are only for reference, and they can be adjusted according to the installation environment, or on request. (For using aluminum conductors, please contact our design team for further information.)

Fittings

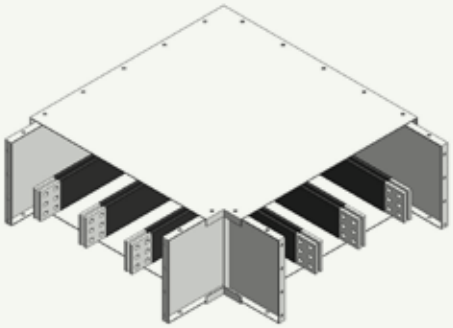
LS C&S NSPB has a wide range of fittings to satisfy any layout of buildings. Elbow angles other than ninety degrees are also available. Offsets or tees can be applied where the standard elbows are not feasible. (Please contact our design team for detailed information about the product size.)

Elbow (Alignment of the Conductors : Vertical)

Vertical

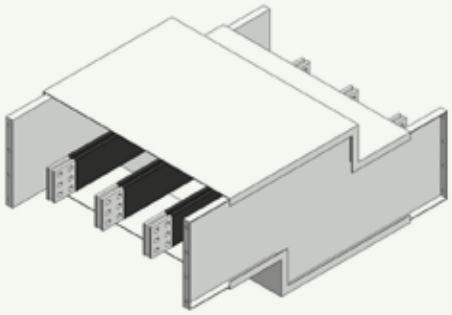


Horizontal

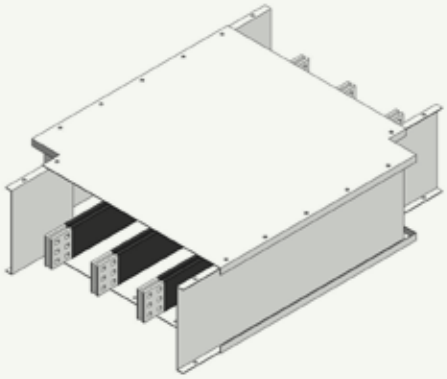


Offset (Alignment of the Conductors : Vertical)

Vertical

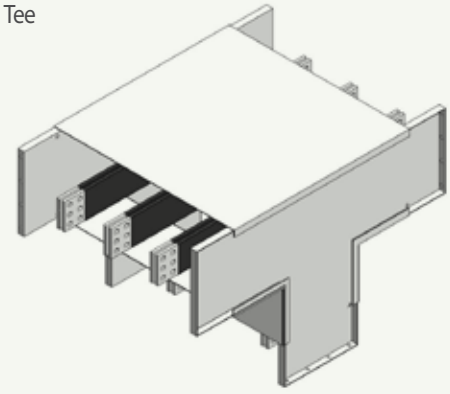


Horizontal

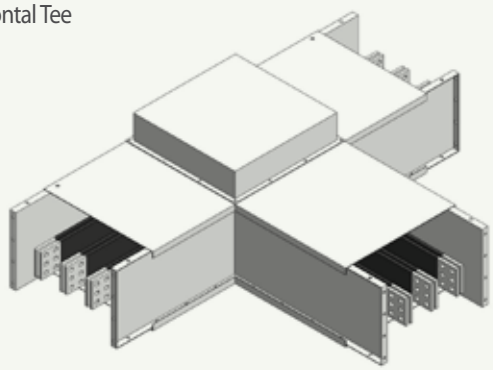


Tee (Alignment of the Conductors : Vertical)

Vertical Tee

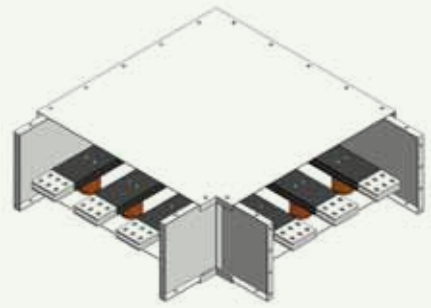


Horizontal Tee

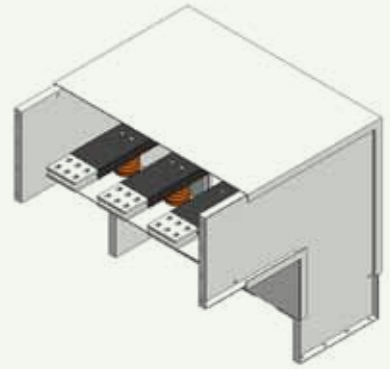


Elbow (Alignment of the Conductors: Vertical)

Vertical

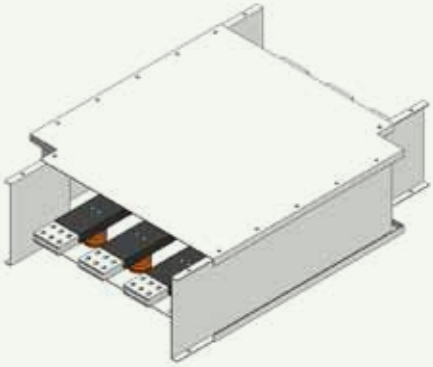


Horizontal

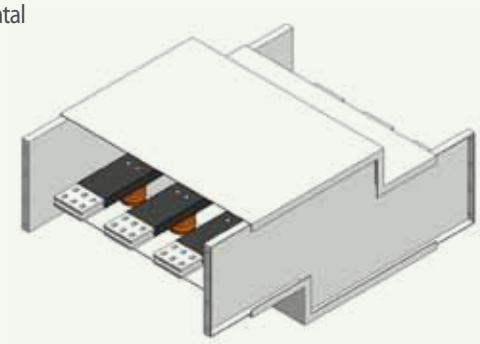


Offset (Alignment of the Conductors : Vertical)

Vertical

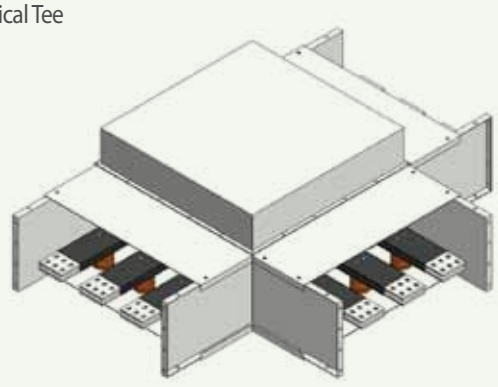


Horizontal

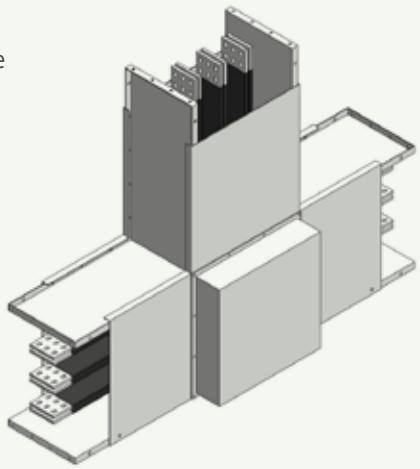


Tee (Alignment of the Conductors : Vertical)

Vertical Tee



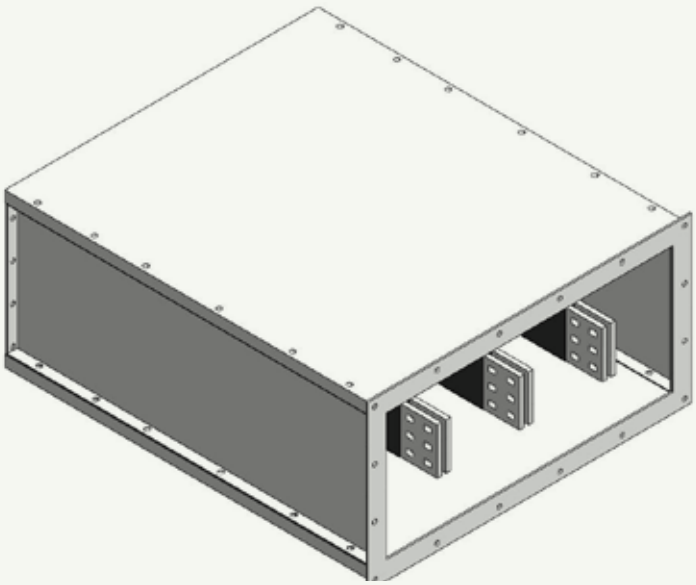
Horizontal Tee



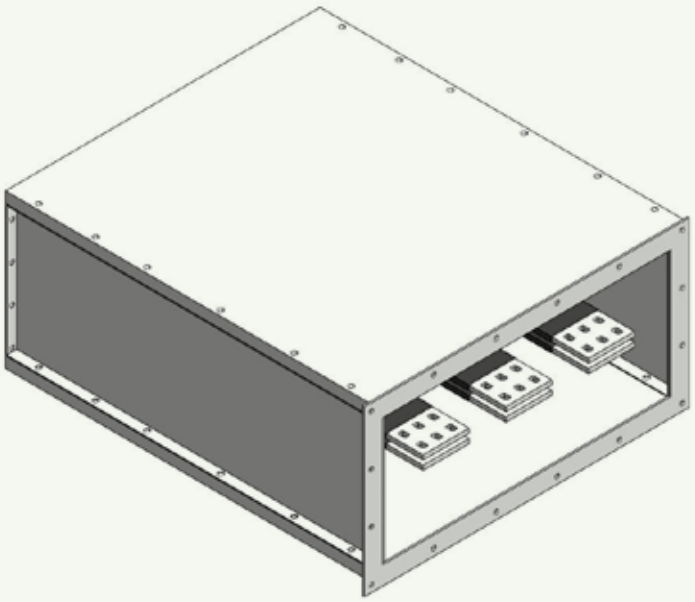
Flanged End

The flanged end is used at a transformer or at a low-tension panel.
(Please, contact our design team for further information including the size and capacity.)

Vertically Aligned



Horizontally Aligned

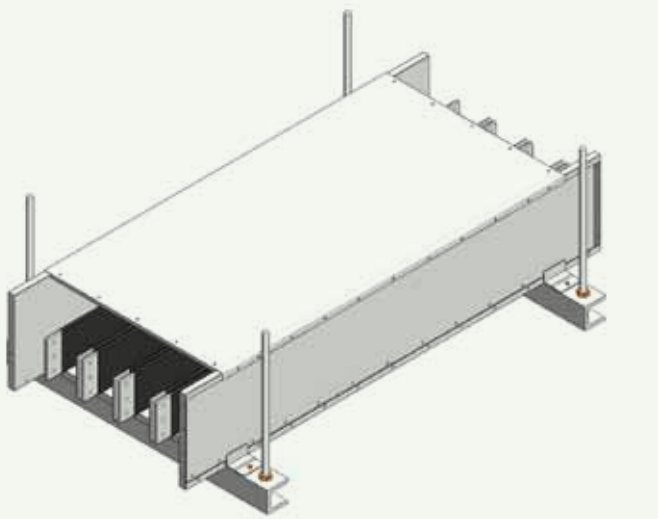


Hangers

LS C&S NSPB can be installed using horizontal hangers, vertical hangers and wall brackets according to the installation environment. (Please contact our design team for detailed information about installation.)

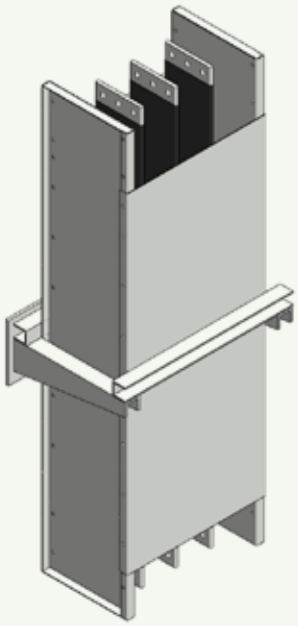
Horizontal Hangers

For horizontal installation, the NSPB requires two or more supports for each product.



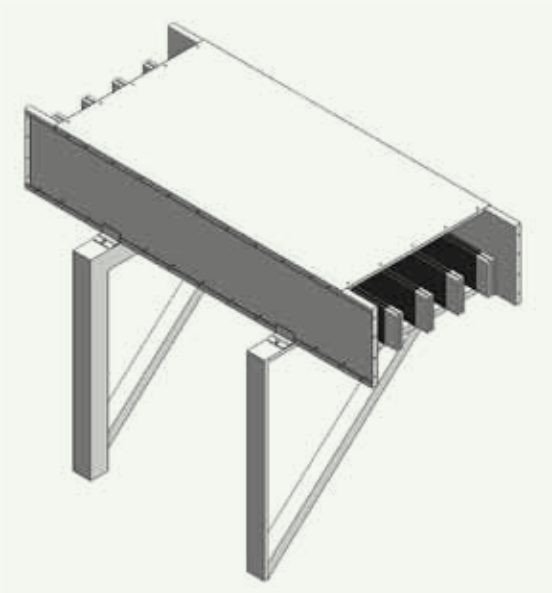
Vertical Hangers

An additional reinforcement design provides stability for the vertical loading of the vertical feeders.



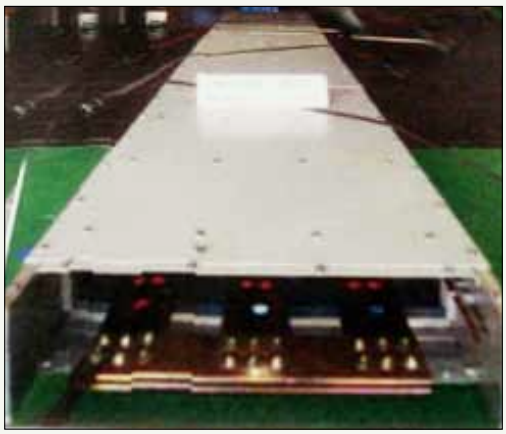
Wall Bracket

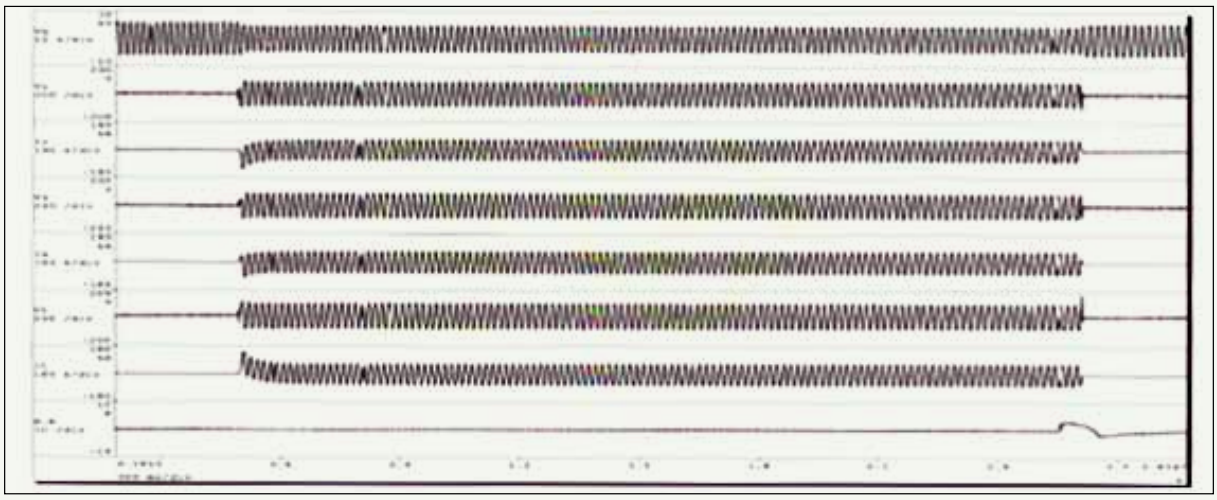
Once the angles and the channels are applied on walls, they need to be fixed with bolts.



Technical Data

The short circuit strength of the LS C&S NSPB can be adjusted and produced in accordance with the request and specifics of the clients.





Rated continuos current (A)	Short-circuit withstand current	
	(kA_{rms}), 2sec.	(kA_{peak})
800~1000	40(50)	104(130)
1250~2000 2500~4000	50(65)	130(170)

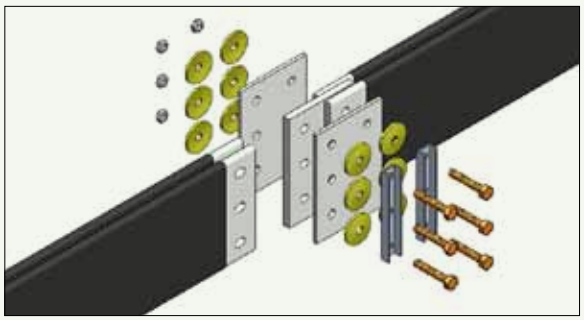
Rated Max. voltage (kV_{rms})	Power frequency withstand voltage (kV_{rms}), 60Hz	Impulse withstand 1.2x50μs (kV_{peak})
0.635 and 4.76	19	60
15	36	95
27	60	125

* The numbers shown in the parenthesis of the short circuit current is the value of reinforcement products (optional).

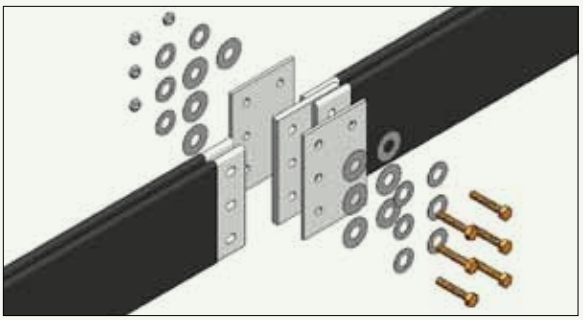
The Joint of NSPB-LV and MV

STEP 1.

- The bus ducts should be aligned at the top and the bottom and the left and the right as well as horizontally and vertically. Make sure that the surface is clear of dust before connecting them.
- Connect the bus ducts by using joint plates and HT bolts as shown in the image. Tighten the bolts until the eye-marking is visible.
- Once they are connected, check for gaps between the bus bars and the joint plates using a feeler gauge.



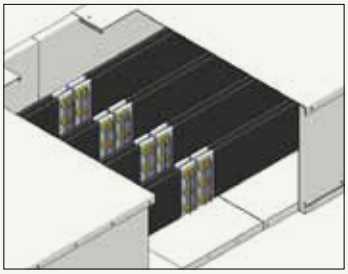
[NSPB-LV]



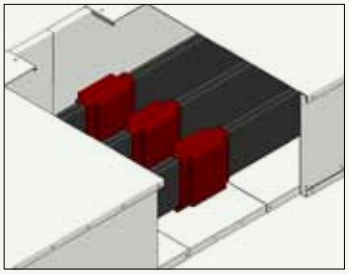
[NSPB-MV]

STEP 2.

- Apply the top and bottom joint covers, and tighten the bolts securely.
- For the NSPB-MV, apply boots additionally after joint plates have been connected as shown in the image.



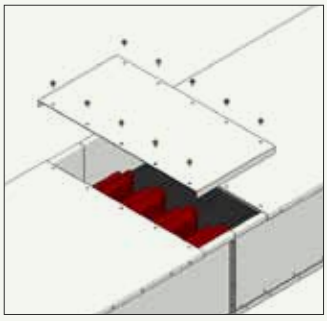
[NSPB - LV]



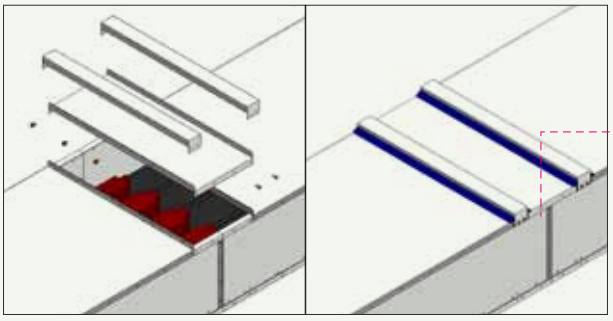
[NSPB - MV]

STEP 3.

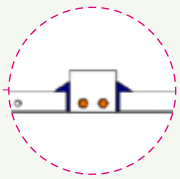
- For outdoor installation, apply the top and bottom joint cover and reinforcement covers. Apply silicone at both sides of the covers as shown in the image. (Torque = 120 kgf·cm)



Indoor Type



Outdoor Type



Silicone Application

Certification & Specification

KERI Certification

KERI Certification

KERI Certification

KERI Certification

KERI Certification

ISO9001

ISO14001

OHSAS18001

Busduct Major References

Steel-making plant and sintering plant of Hyundai Steel Co., Ltd.

Investor : Samsung Engineering
Construction Period : 2008

Korea Gas Corporation Substation 21 in Pyeongtaek

Investor : Korea Gas Corporation
Construction Period : 2010

LG Chem Ltd. Yeosu Plant LDPE

Investor : LGChem Ltd.
Construction Period : 2011

JURONG AROMATIC COMPLEX

Investor : ABB, Singapore
Construction Period : 2012~2013

AKG2 (AL-KHALEEJ GAS) PROJECT PHASE II
Onshore GAS Plant

Investor : Qatar
Construction Period : 2007 ~ 2008

RAS LAFFAN PROJECT PHASE 6 & 7
Onshore LNG Plant

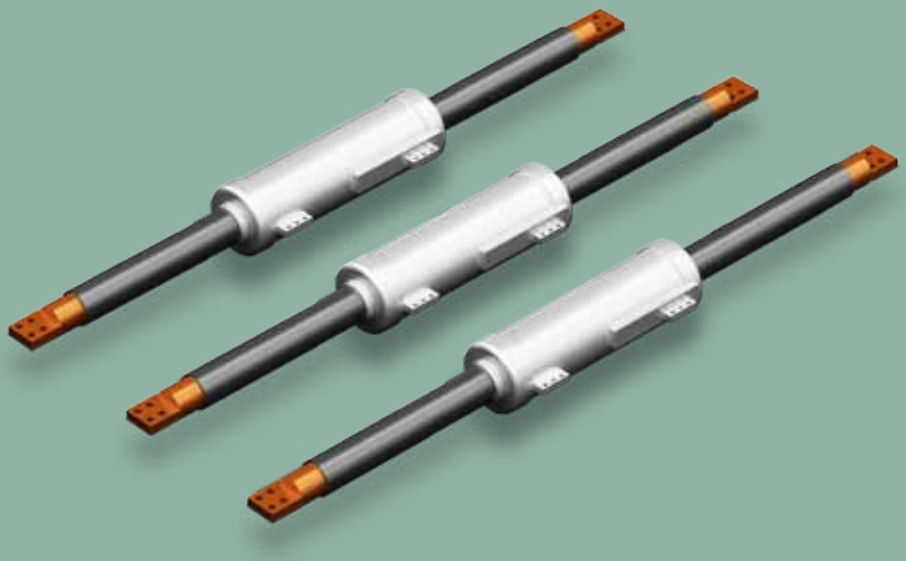
Investor : Qatar
Construction Period : 2006 ~ 2007 Completed

Memo

SIB *(Solid Insulated Bus-system)*

LS 전선 Busduct System Catalogue

07 of 08



Contents

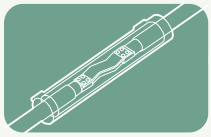
Overview

SIB

The LS C&S SIB (Solid Insulated Bus System) is a power distribution system with epoxy impregnated solid insulation. The SIB is an ideal product with the benefits of bus ducts and cables combined. The SIB is suitable for high voltage (27kV or less) and high current (1000A to 7500A) by completely separating the phases of the bus bars. By replacing the cables, the SIB provides space efficiency, and it also provides excellent short circuit strength and stability.

Large Capacity and Compact Size

The compact SIB can transmit larger capacity of power in comparison with the existing high voltage bus ducts.
The SIB uses only one bus bar for each phase to handle rated current sat up to 7500A, therefore, reducing inconveniency of using several cables.



Economic and Easy Installation

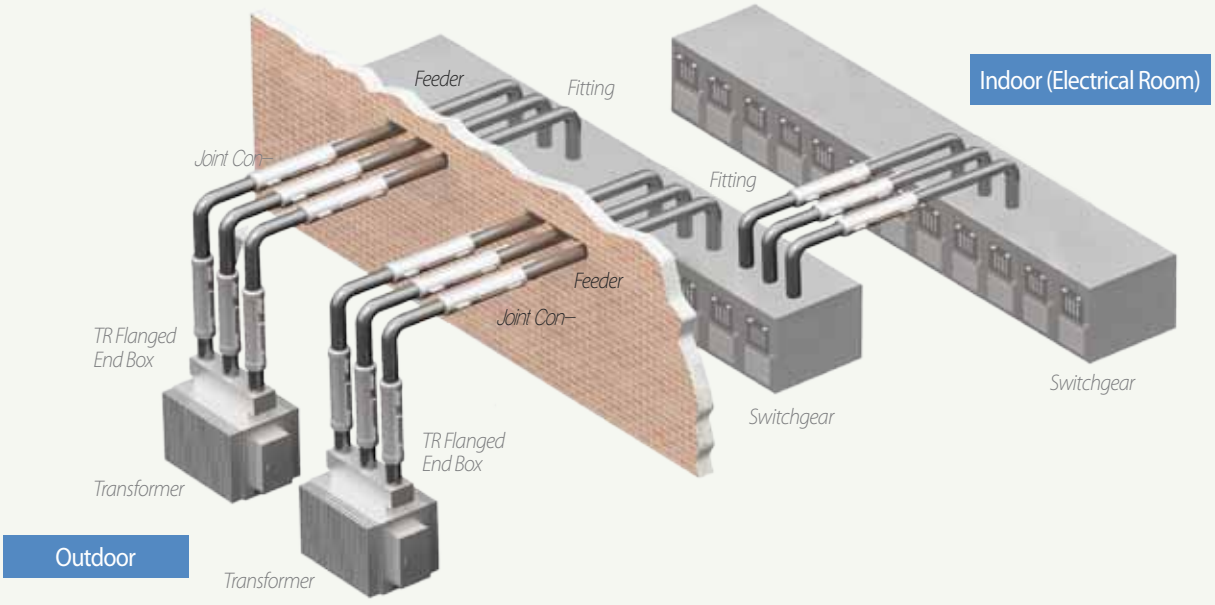
The company provides customized design to maximize the space efficiency for each installation site. Compared to cables, the coiling area of the SIB is noticeably less, and the system does not require additional trays, therefore, the installation is much easier.

Excellent Stability

The epoxy vacuum impregnation of the SIB provides highly stable electrical performance. Thanks to the completely separated phases, it is completely free of short circuit between phases, and the system also comes with excellent short circuit strength.

Superb Weather Resistance

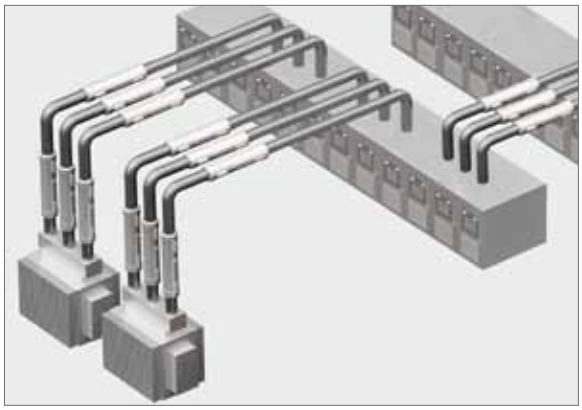
The solid molding design of the SIB protects the system from accidents caused by condensation. Using an exterior flexible tube and STS, the system is reliable against external impact and weather including light, wind, rain, moisture, and gas. It is suitable for both the indoors and outdoors.



Application

Transformer/Generator

- Limited areas where condensation may occur (the exposed section between indoor and outdoor installation)

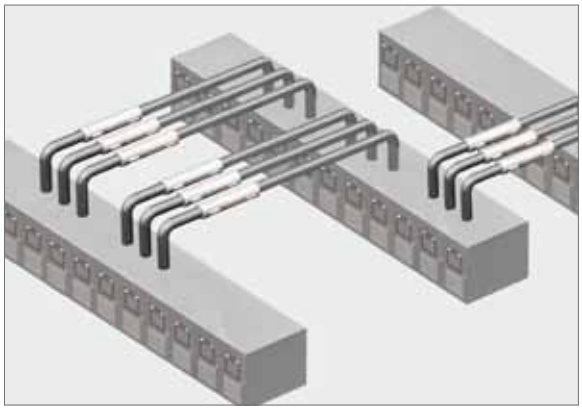


Ships

- Power distribution on ship
- Limited areas where high current needs to be transmitted

Large Plants, Factories and Large Buildings

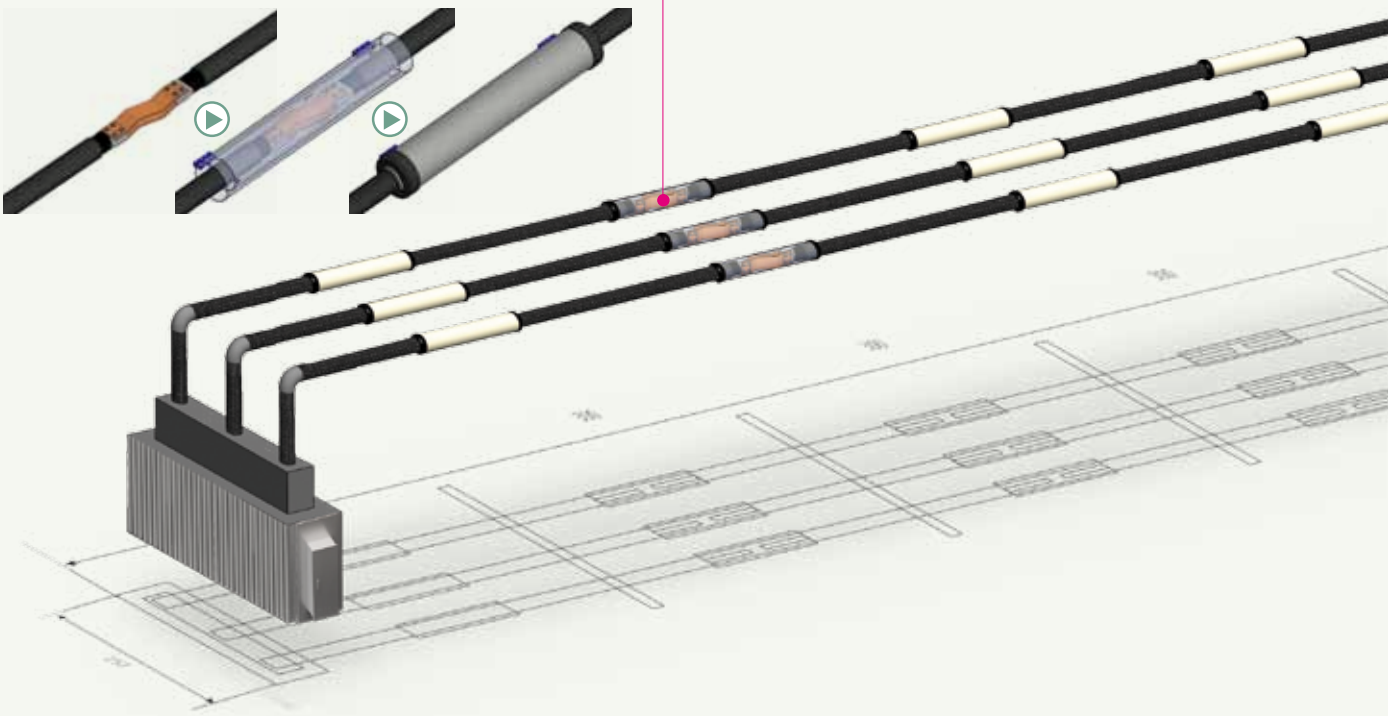
- Limited areas with curved spaces
- Highly safe and easy maintenance



General Data

Joint Connection

The system is very easy to install. By implementing flexible bars, the expansion joint can be applied to the system.



Maintenance Free

The epoxy vacuum impregnation of the SIB provides highly stable electrical performance. The completely separated phases prevent any short circuits. The SIB is perfectly safe from accidents caused by condensation thanks to the completely molded bus duct design. The SIB is partial discharge free, and can be used semi-permanently.

Environmentally Friendly

The LS C&S Bus Ducts acquired RoHS certification, and only uses components without hazardous substances such as lead, cadmium, mercury, chrome, PBBs and PBDEs.

Outstanding Durability

The SIB is designed to be safely used in inadequate environments. The joint connections and the supports of the SIB have been tested in actual wire routings under severe service condition (class E10), and passed the assessment of vibration fatigue.

Standard

- IEC 60137
  Insulated bushings for alternating voltages above 1000 V

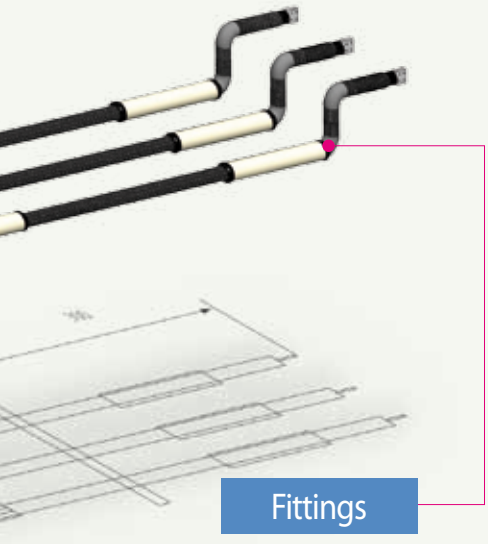
Permissible Operating Temperature

The conductor size of the SIB has been designed to satisfy the test methods and the standard permissible operating temperature of IEC60137.

Service Condition

- Ambient Temperature: -15°~55° C
- Relative Humidity : 95% or below

(When the service condition of the environment does not meet the requirements listed above, please contact our design team.)

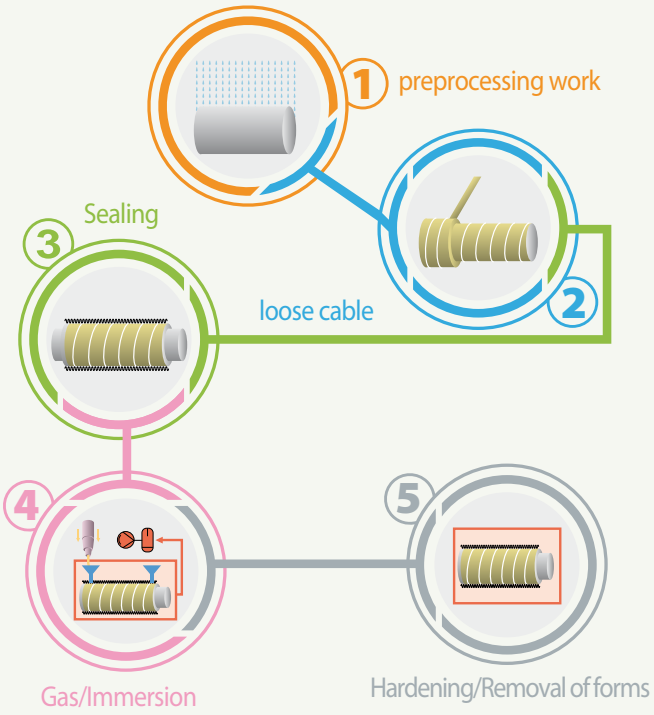


Fittings

The SIB has a wide range of fittings to satisfy any layout of buildings.

Manufacturing Process

The epoxy vacuum impregnation of the SIB provides highly stable electrical performance.



Conductors

The SIB uses either hollow or solid copper conductors with conductivity at over 99%, or aluminum conductors with conductivity at over 54%. The conductor areas are plated in order to provide stable power supply, and to prevent corrosion.

Housing

The housing of the SIB is a flexible plastic tube, and the tube provides protections against environmental elements including ultraviolet rays, humidity and external impacts.

Insulation

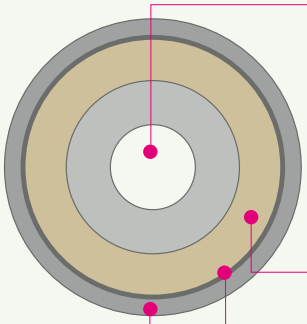
The SIB Bus has been wrapped in crepe-paper, and then dried in a vacuum state before epoxy resin molding. Therefore, it provides excellent electrical performance.

Joint

The SIB uses flexible bars for connections. The design of the flexible bar provides a stable power supply, and the bar itself performs as an expansion joint. The system can be shielded using insulating cylinders, and a standard IP65 rating can be applied.

Basic Structure

Sectional View



Conductor

- Hollow or solid conductors
- Plated to provide a stable power supply and to prevent corrosion

Epoxy Resin and Craft-Paper

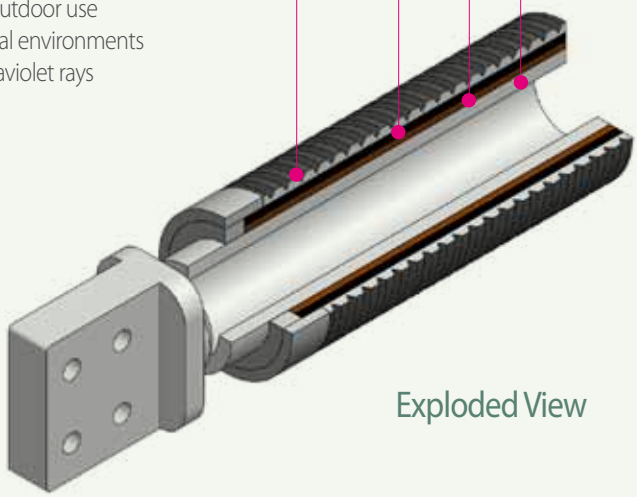
- Epoxy resin applied craft-paper
- Excellent insulation performance

Ground Layers

- Layer for ground has been applied for safe external grounding

Flexible Tube (Outer Cover)

- Suitable for outdoor use
- Suitable for external environments including ultraviolet rays



Exploded View

Component

Feeders

The maximum length of the feeder is 7 meters, and the feeder is designed for 27kV or less, or up to 7000A. Either aluminum or copper conductors are available.

Fittings

The SIB has a wide range of fittings to satisfy any layout of buildings.

Single-Curve Type

Double-Curve Type

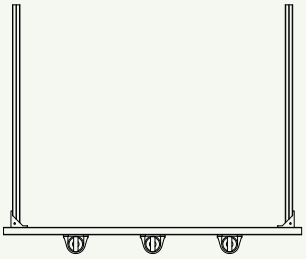
Double-Curve Type

End Connectors (Gas, Oil and Air)

Terminals have been welded at both ends of the SIB. The terminals are designed to be easily connected to various equipments.

Support

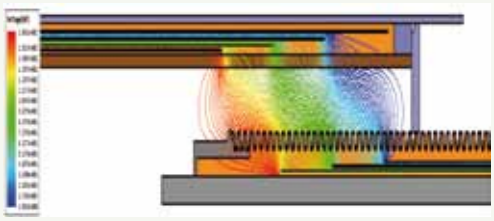
Thanks to aluminum compressive members, the supports are very light, and the self assembly structure design ensures easy installation.



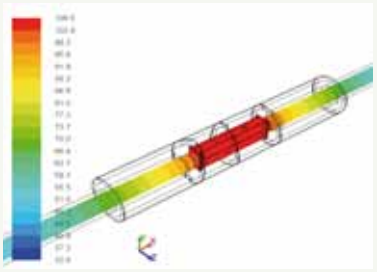
Product Design and Evaluation

The LS C&S SIB has been developed and designed through analysis of CAE, and mechanical, thermal and electrical simulations. The SIB also has been certified by authorized inspection agencies.

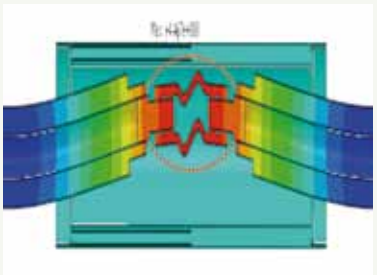
Electric Field Analysis



Thermal Analysis and

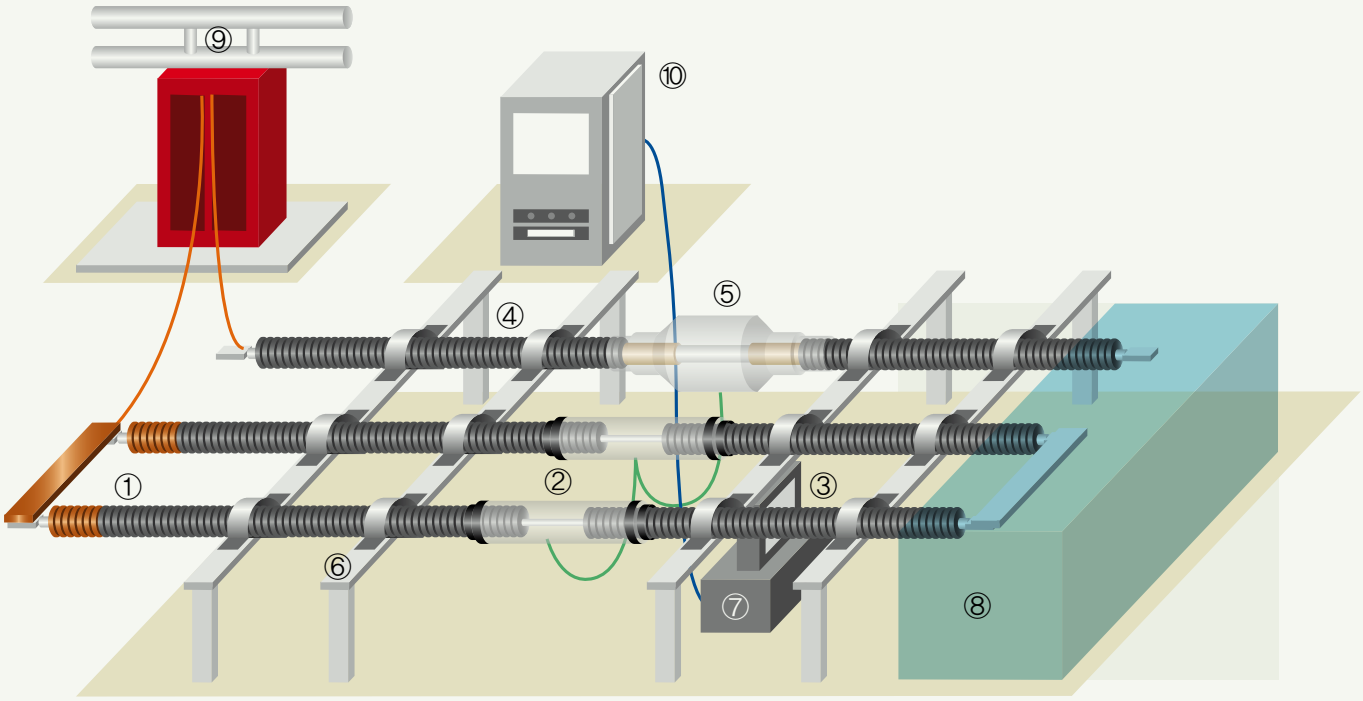


Long-Term Durability Design and Evaluation



Quailty Test

The LS C&S SIB has been tested and certified as specified in the international standards (IEC 60137) by KEMA. The company performed an additional long-term over current test at an actual testing ground by applying current and voltage in accordance with IEC 60502-4 to secure a long term reliability of the system.



Specifics	1	2	3	4	5
Description	Outdoor Termination	Sleeve	Indoor busbar	GIS connector Termination	Gas Tank
Specifics	6	7	8	9	10
Description	Support and Structure	Current Transformer	Cubicle	AC Internal Pressure Testing Device	CT Controller

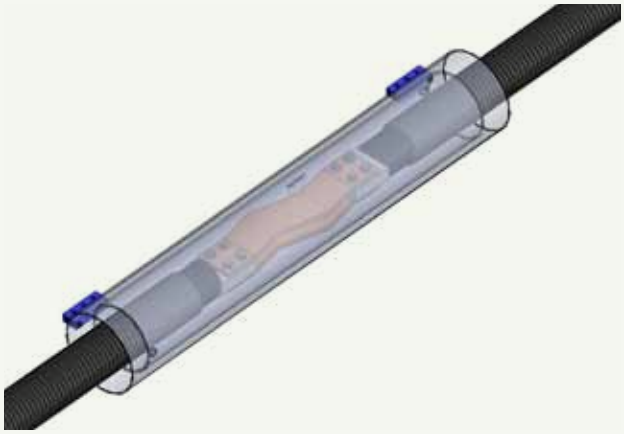
Joint Connection

STEP 1

Check for any deformation or stain on the surface of the connectors. Align them at the top and the bottom and the left and the right as well as horizontally and vertically.

STEP 2

Connect the provided flexible bars as shown in the image. In order to maintain the electric field of the internal equipotential of the joint box, connect the springs of the joint box with the connecting terminal. (Please contact the design team for detailed instructions.)



STEP 3

Push the joint box until it is positioned at the center to support the joint box. Install clamps and connect the grounding.

STEP 4

Install rubber bellows, and fix one of the bellows using STSties. Add moisture absorbent through the other bellow before fastening it with STS ties.

Certification & Specification

KEMA Certification

TUV Eco Friendly Certification

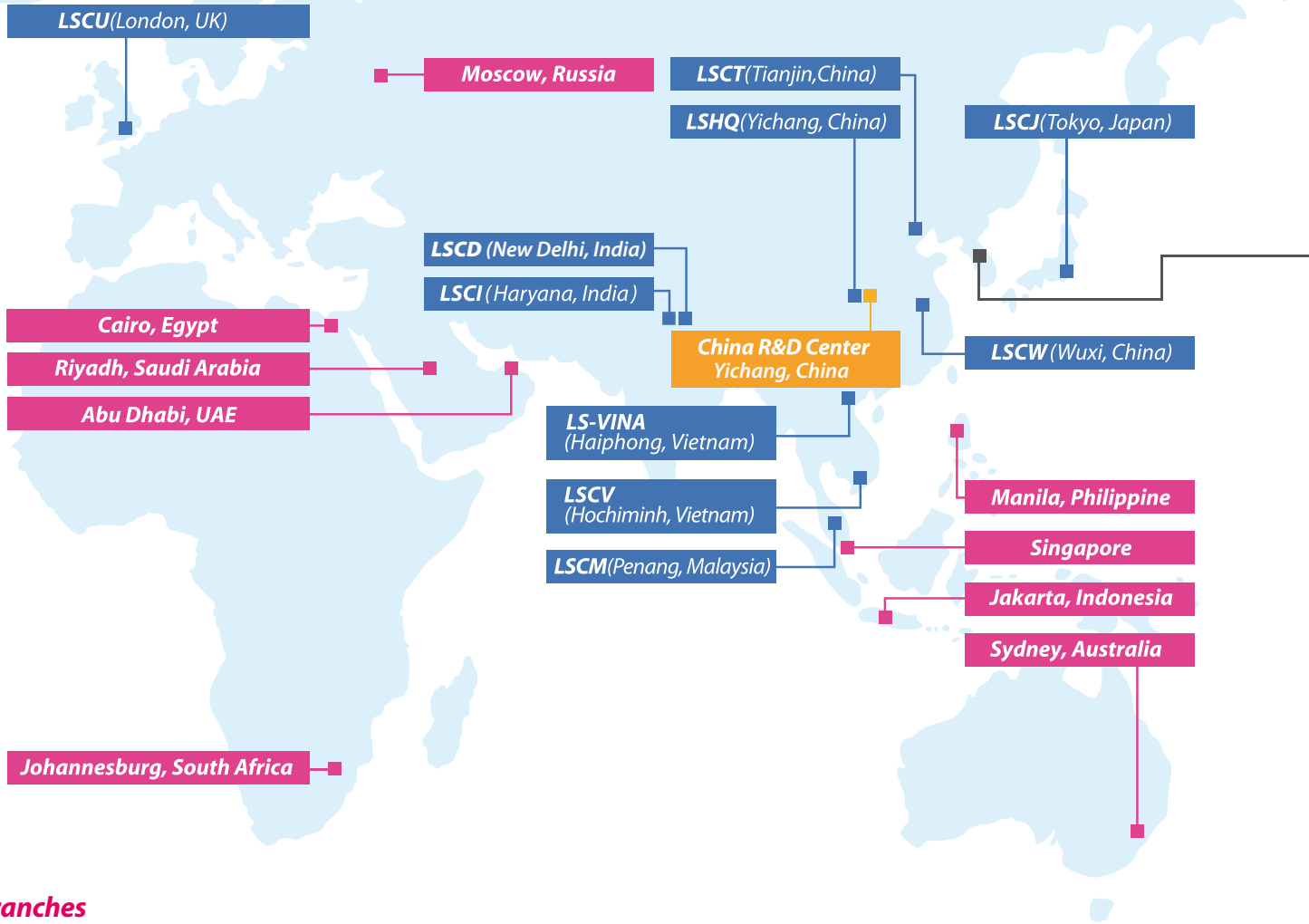
ISO9001

ISO14001

OHSAS18001

Memo

Global Network



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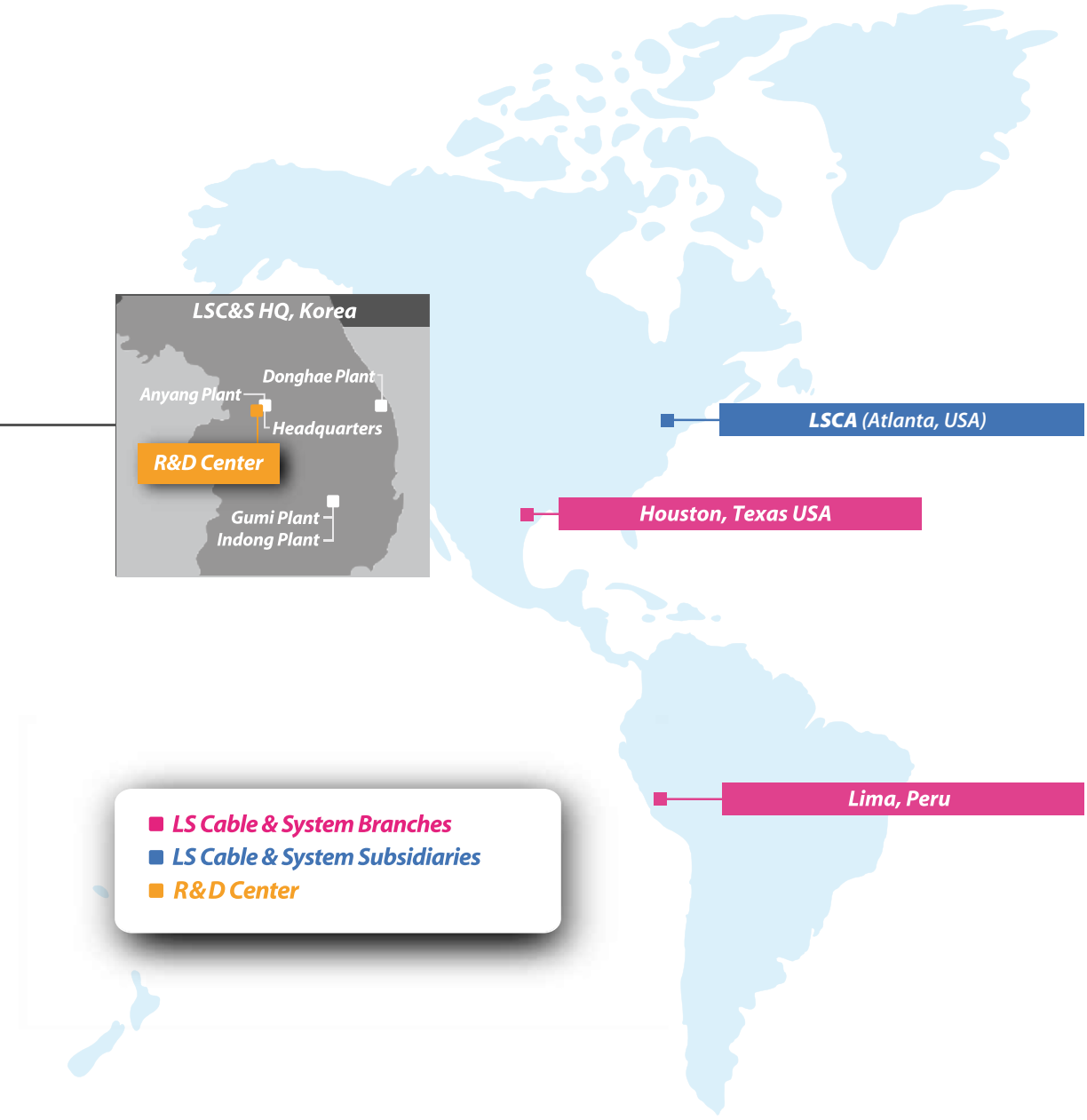

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Oct. 2013

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