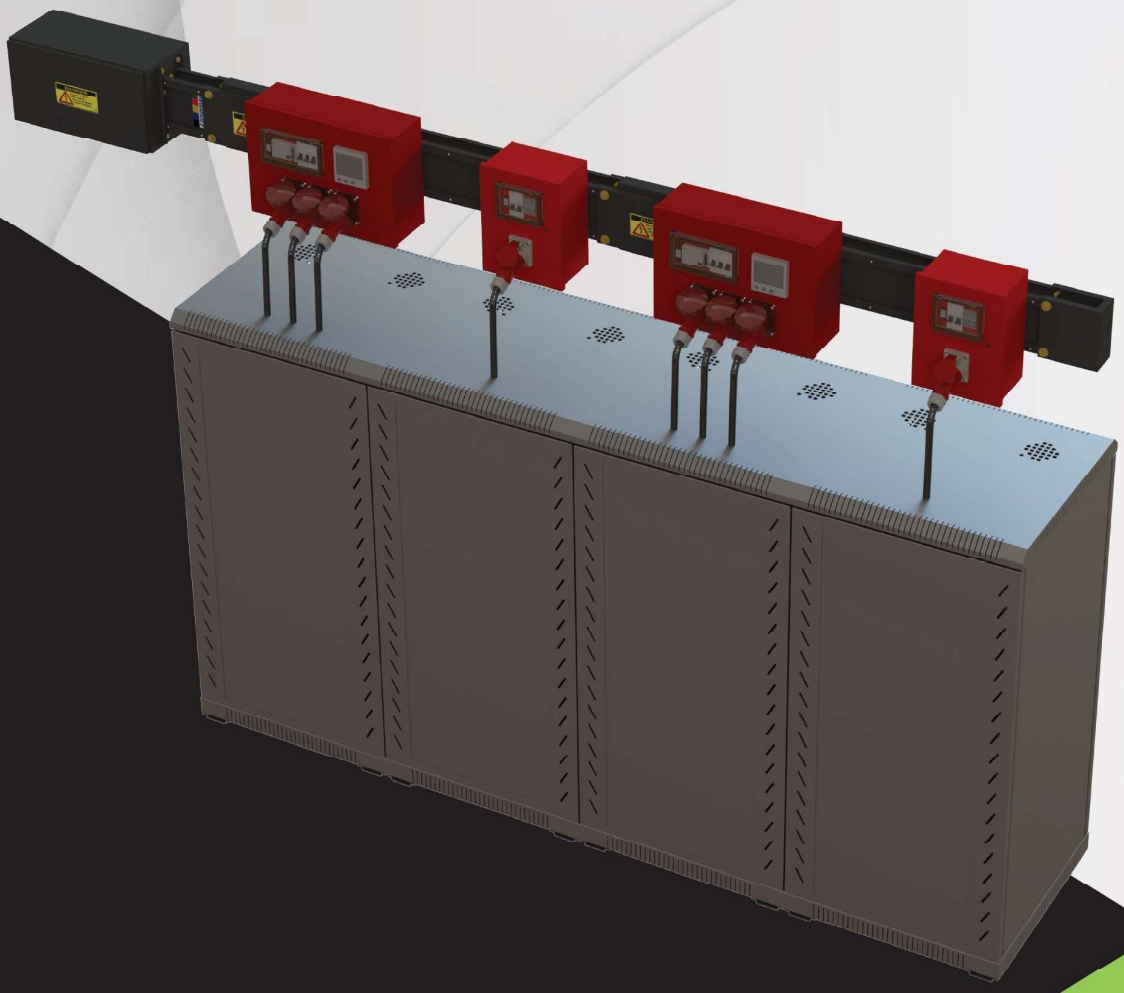
ENERGY MANAGEMENT EXPERTS

sentinel

for Data Center



LINKK
BUSWAY SYSTEMS

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COMPANY PROFILE

Linkk Busway Systems (M) Sdn Bhd have been established since 2010 and have successfully supplied many projects to overseas and local market. We are leading designer and manufacturer of busduct trunking systems in Asia Pacific.

We aim to become the leading busduct manufacturer of the world with providing best supports to our customers, and also committed to produce uniform product quality to achieve total customer satisfaction.

our business structure

group of management committed to provide a complete solution to support the customer in meeting their business objectives. Support is Omnipresent, from the design and supplying stages through to testing and commissioning at site. We treat our customer as business partner.

group of companies has been formed to cater for more specialized field of development. Linkk Busway Systems (M) Sdn Bhd holds the major designs, production system and formulations of the epoxy systems. Linkk Busway Technology (M) Sdn Bhd hold the testing certifications and new product inventions.

PRODUCT CERTIFICATION

Our product has undergone rigorous testing and certification by a DEKRA in compliance in IEC 61439-6 standard. We committed to to delivering product that prioritize safety and reliablity.

KEMA KUER cetification mark is not only associated with electrical and electronic product design and quality, it involve also manufacturing site inspection as part of the certification process. The purpose of this inspection is to evaluate our manufacturing processes, quality control systems, and overall compliance with the relevant standard and requirements.

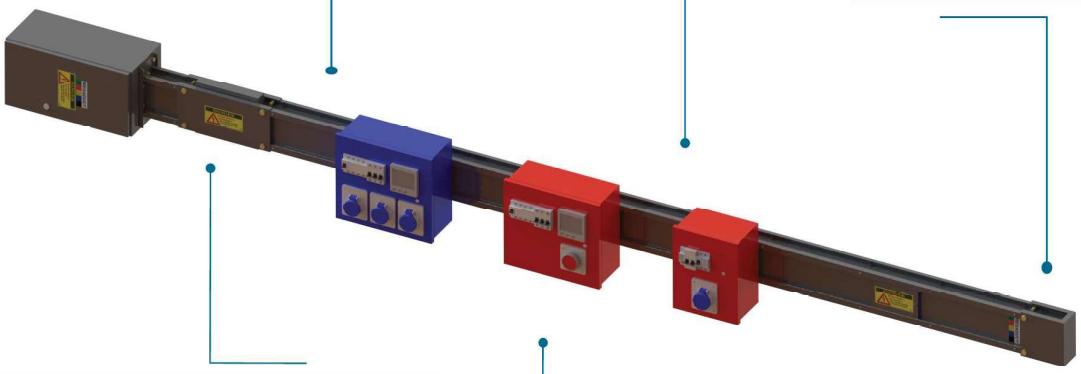
SENTINEL INTELLIGENCE BUSWAY SYSTEMS

comparison between sentinel busway and array cabinets

Flexibility and Scalability:
Busway systems provide greater flexibility and scalability compared to cable systems. With busway, it is easier to add or relocate power distribution as the data center's needs evolve. Busway systems often have tap-off points at regular intervals, allowing for easy connection and disconnection of racks, while cables require more effort and time to reroute.

Higher Power Density:
Data centers are becoming increasingly power-hungry due to the growing demand for high-performance computing. Busway systems can handle higher power densities compared to traditional array systems. Busway offer higher ampacity ratings and better cooling capabilities, enabling the distribution of more power to densely populated racks without the risk of overheating.

Enhanced Efficiency:
Busway systems are designed to minimize power losses and improve efficiency. They have lower impedance compared to long cable runs, reducing voltage drops and power wastage. By providing a shorter and more direct path for power transmission, busway systems contribute to better overall energy efficiency within the data center.



Improved Maintenance and Reliability:
Busway systems simplify maintenance and troubleshooting tasks. They provide clear visibility of power connections and can incorporate monitoring features such as current sensing and power metering. Additionally, busway systems typically have better fault tolerance and reliability, as they have fewer connection points compared to cable systems, which reduces the potential for failures.

Space Optimization:
Busway systems help optimize space within the data center. They are typically mounted overhead or under a raised floor, eliminating the need for cable trays or trenches that take up valuable floor space. This allows for better utilization of the available area and more efficient airflow management.

CONDUCTOR

All Sentinel conductor are high density and conductivity. Copper conductor purity is over 99.95%, and conductivity if >100% IACS, while Aluminium has minimum purity of 99.7% with conductivity >61% IACS. which is fully compliant with IEC electrical standards.
It is fabricated through a sophisticated thermal compression process developed which involves application of tremendous heat under high temperature. It high mechanical strength and outstanding corrosion resistant.

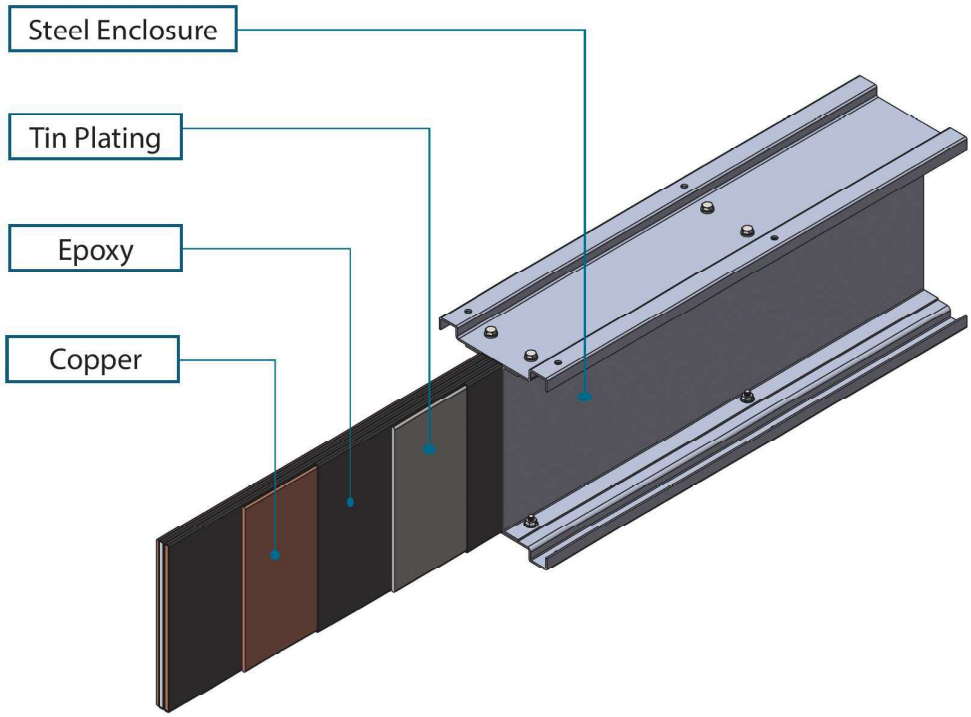
The open design has uniform and fixed connection sockets to ensure reliable connection.
Design for equipment room, the neutral section is equal to 100% phase section.
Busways models: 250A, 400A, 600A, 800A and 1000A.

Specially designed power plug, can plug-in from both side of busduct.

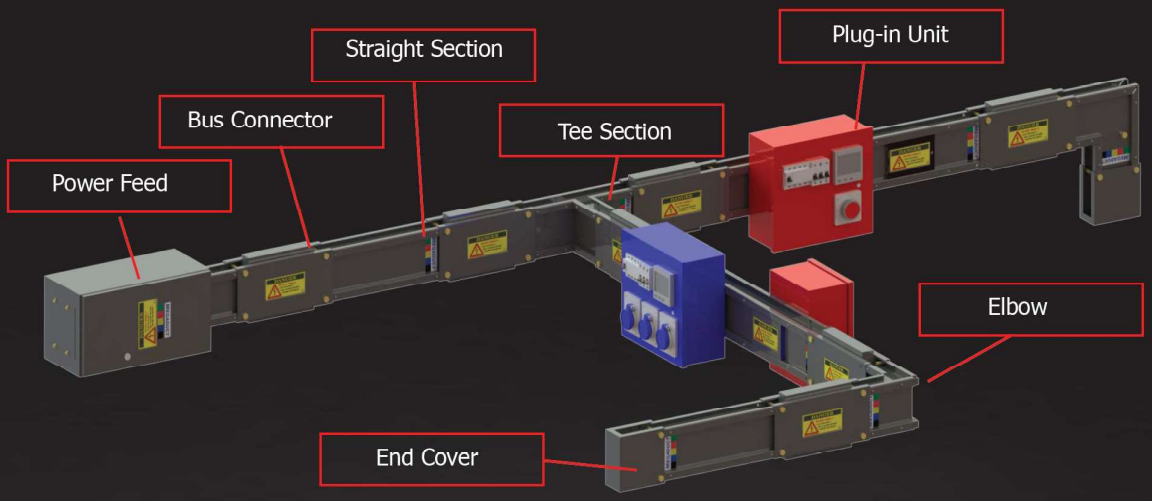
INSULATION

Sentinel Epoxy System is the 3rd generation with its own formulation. The Class H protection level (180-degree Celsius) standard epoxy coating provided 100% waterproofing and high mechanical strength. It has been tested in accordance with IEC 61439-6 and BS 5486.

Advantages of using epoxy coating as insulation are:
1- Design to withstand glitches and spikes in electrical system.
2- Design to cater for expansion and contraction during peak and off-peak hours.
3- Capable of withstanding heat shock.
4- High reliability under static conditions.
5- High mechanical strength against impact.
6- High Thermal conductivity.

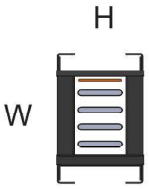


COMPONENTS

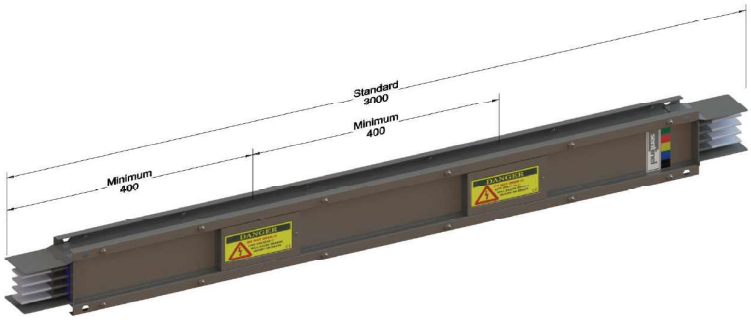


Enables rapid maintenance and capacity changes to adapt to changes in demand without changing the power distribution architecture

STRAIGHT SECTION



[cross section view]



Copper Conductor

Ampere (A)	W x H (mm)			Weight (kg/m)	
				3P4W	3P4W+50%E
250	150	x	59	10.1	10.5
400	150	x	69	13.8	14.6
630	150	x	84	19.1	20.4
800	150	x	99	21.6	23.2
1000	150	x	114	39.4	42.1

Aluminium Conductor

Ampere (A)	W x H (mm)			Weight (kg/m)	
				3P4W	3P4W+50%E
250	150	x	74	9.4	9.6
400	150	x	59	9.7	10.0
630	150	x	74	10.6	11.0
800	150	x	84	11.5	12.0
1000	150	x	114	14.3	15.0

ELECTRICAL CHARACTERISTICS FOR COPPER & ALUMINIUM IN 50Hz

copper

Rated Current (A)	Impedance (10^{-3} Ω/m)			Line to line voltage drop in (V/m) at rated current and various power factors									
	R	X	Z	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10
250	0.234	0.068	0.243	0.101	0.104	0.099	0.092	0.084	0.076	0.067	0.058	0.049	0.039
400	0.170	0.051	0.178	0.118	0.121	0.115	0.108	0.099	0.090	0.080	0.069	0.058	0.047
630	0.117	0.049	0.127	0.128	0.138	0.134	0.128	0.120	0.110	0.100	0.090	0.078	0.066
800	0.068	0.041	0.080	0.094	0.110	0.110	0.107	0.102	0.097	0.090	0.083	0.075	0.066
1000	0.057	0.028	0.064	0.099	0.111	0.109	0.105	0.099	0.092	0.085	0.077	0.068	0.059

aluminium

Rated Current (A)	Impedance (10^{-3} Ω/m)			Line to line voltage drop in (V/m) at rated current and various power factors									
	R	X	Z	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10
250	0.150	0.051	0.159	0.065	0.068	0.065	0.061	0.057	0.052	0.046	0.041	0.035	0.029
400	0.134	0.082	0.157	0.093	0.108	0.109	0.106	0.101	0.096	0.089	0.082	0.074	0.066
630	0.101	0.062	0.119	0.110	0.129	0.129	0.126	0.121	0.114	0.107	0.098	0.089	0.079
800	0.074	0.020	0.077	0.102	0.104	0.099	0.092	0.084	0.075	0.067	0.057	0.048	0.038
1000	0.053	0.016	0.055	0.091	0.094	0.089	0.083	0.076	0.069	0.061	0.053	0.045	0.036

Note: For 60Hz calculation, divide the reactance (X) by 0.83. And the resistance (R) remains unchanged due to the negligible difference in frequency.

**the technical data are subjected to change without prior notice*

voltage drop calculation

As per IEC 61439-6:2012

$$DV = k\ x\ \left(\sqrt{3}\right)\ x\ I\ (R\ Cos\emptyset + X\ Sin\ \emptyset)$$

where,

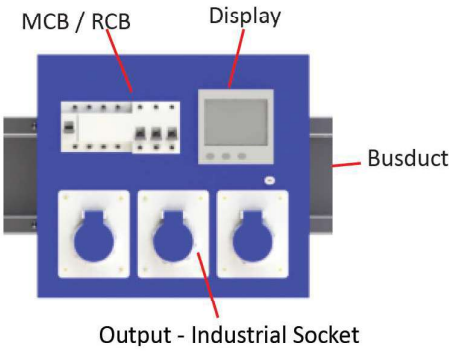
DV	=	Line to line voltage drop per meter (to be calculated)
I	=	Load current
$Cos\emptyset$	=	Load Power Factor
$Sin\ \emptyset$	=	$Sin\ \emptyset$ = Sq. Root $(1 - Cos^2\emptyset)$
R	=	Resistance
X	=	Reactance
k	=	The load distribution factor
	*	1 if the load is concentrated at the end of the BT run;
	*	$(n + 1)/(2\ x\ n)$ if the load is uniformly spread between n branches (where n = no. of TOU)

PLUG-IN UNIT

Enables rapid maintenance and capacity changes to adapt to changes in demand without changing the power distribution architecture

Types:

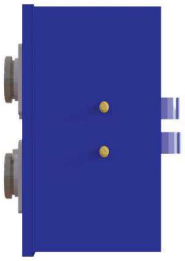
- Single loop one phase in vertical line
- Single loop one phase in adjustable vertical line
- Single loop three phases in vertical line
- Three loops one phase in vertical line
- Six loops one phase in vertical line
- One loop one phase with outlet
- One loop one phase with adjustable outlet
- Three loops one phase with outlet
- Three loops three phases with outlet



Box Size Option	Box Size (mm) D x W x H				
1	150	x	220	x	300
2	160	x	330	x	300
3	200	x	440	x	300

** box size may varies with MCCB models and BMS combination, please refer to manufacturer for details

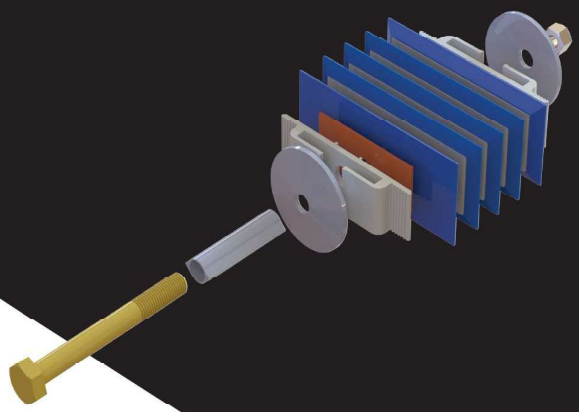

[front view]


[side view]

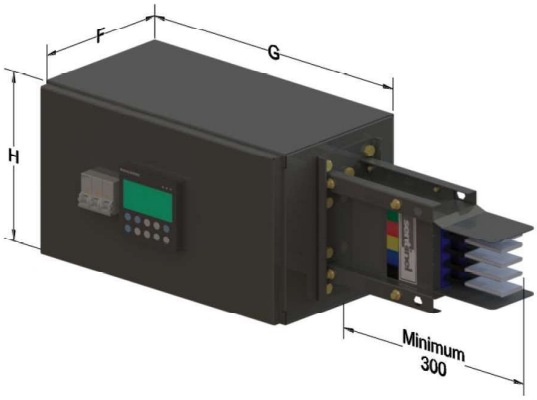
BUS CONNECTOR

In order to overcome extreme rugged conditions at site, the new design precisely and manufactured using the highest quality of materials to minimize all possible problems and enhance system performance. This special design provides outstanding features as follows:

- Incorporates a 5mm thermal expansion and movement at every joint.
- Allow ±15mm of lateral adjustment(total 30mm) to correct site measurement inaccuracy.
- Able to tilt an angle of ±5°(total 10° along single axis).
- Bolt and nuts can be stainless steel, galvanized or chromed black high tensile steel.
- Degree of protection of IP54/IP66.
- Easy installation and removal of any joint in a run without disturbing the two adjacent busduct sections.
- Water/chemical resistance BMC insulation plates.



POWER FEED BOX



POWER FEED BOX WIHTOUT ACCESSORIES

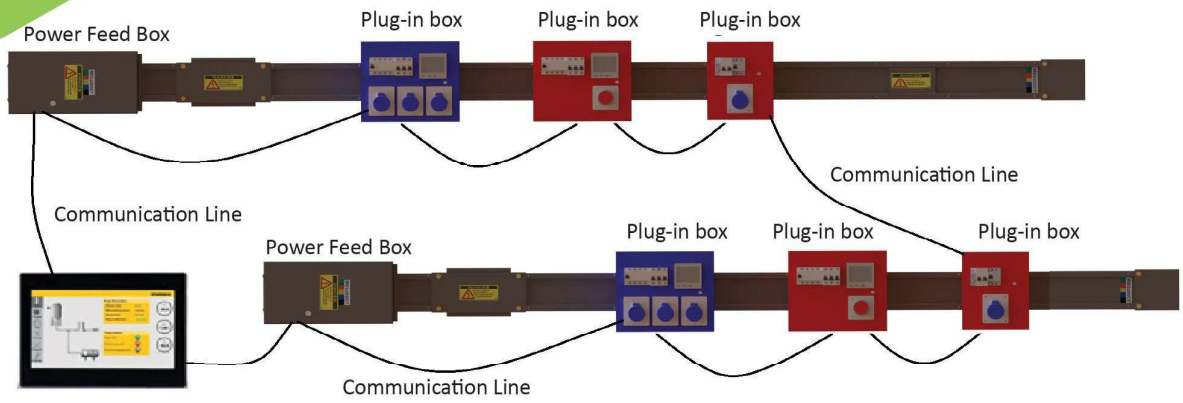
Ampere (A)	Power Feed Box Size (mm)		
	F	G	H
250	200	400	350
400	200	400	350
630	200	400	350
800	250	450	400
1000	250	450	400

POWER FEED BOX C/W ACCESSORIES

Ampere (A)	Power Feed Box Size (mm)		
	F	G	H
250	270	600	350
400	300	700	350
630	300	1000	350
800	300	1000	400
1000	350	1000	400

** box size may varies with MCCB models and BMS combination, please refer to manufacturer for details

MONITORING MODULE

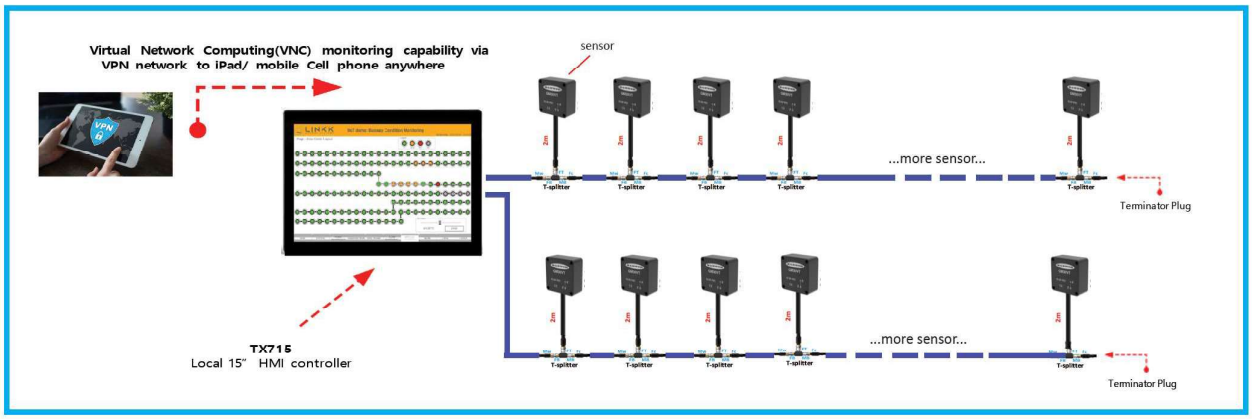


Adopt a decentralized control structure. Each plug-in box has an independent display and processing unit to independently detect the electrical parameters of the loop and upload signals through communication

Adopts a ring-shaped BUS communication bus, and each plug-in box is connected in series to the main control box to avoid communication failure caused by interruption of the line.

A main control box can be connected to 2 busways, no more than 128 plug-in boxes in total

Installation Ways:



monitoring datas:

Busway:

Voltage, current, active, reactive, frequency, power, voltage and current harmonics, switching status, lightning arrester status, etc.

Plug-in units:

Voltage, current, active, reactive, frequency, power, current harmonics, switching status, etc.

DATA CENTER PROJECT REFERENCE

Project experiences

We have spectrum type of market partners, from small M&E contractors to public listed companies. With worldwide partners, we involves in many projects in different sectors.

Hospitals and airports are 2 critical facilities that required higher requirements due to they play a vital role in our society. While fulfilling these requirements may be challenging, we ensure that our product can fulfill the need.

Data Centre Sector is 1 of our key current focus, this is the strongest target sector. Data center projects are involving varies type of busducts included cast resin, sandwich busduct, direct current busduct and data rack busduct.

Microsoft, Bangalore India

Sedenak DC, Malaysia

Mumbai DC, India

Telekom Tower, Malaysia

Bukit Jalil DC, Malaysia

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