Busway: Safety and Reliability

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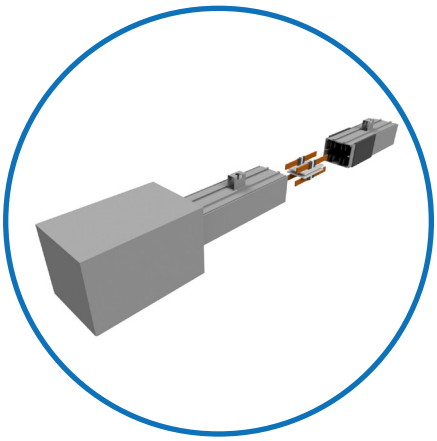
ANORD MARDIX

A Brief History of Busway Systems

Since its introduction within the automotive industry in the 1930's through to its current widespread use in data centers, busway offers a high density, flexible power distribution solution for many applications.

In recent years, the use of "open channel" busway has become commonplace. The open channel construction allows the plug-in (or tap off) sub-distribution units to be placed, theoretically, at any location along the busway. This enables the sub-feed to be positioned directly above or adjacent to its respective load, which in a data center environment would generally be the server cabinet.



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Traditional Coupling

Busway distribution systems in general have some common features. One of those is the requirement to couple together multiple sections of busway of up to 10-12ft in length to form the overall required length of busway.

Traditionally, this coupling has been achieved by the addition of a separate set of components, commonly referred to as the "joint pack". The joint pack will typically comprise:

- 2 - bus connectors
- 2 - housing couplers
- 24 - screws

In addition, a specialist tool will be required to install these components onto the busway.

Installation time of **each** joint pack is typically up to 5 minutes dependent on the busway manufacturer. In a 40 x 40ft busway run data hall, that can equate to 2 days of additional installation time. Mislay or mis-order any of those joint pack components and much larger installation delays will result.

Furthermore, given the critical nature of this busway coupler, annual thermography should be performed on each joint pack area to check for loose connections.

Overall, this constitutes a very labor intensive and time-consuming method of installation which poses an ongoing risk through loose busbar connections.

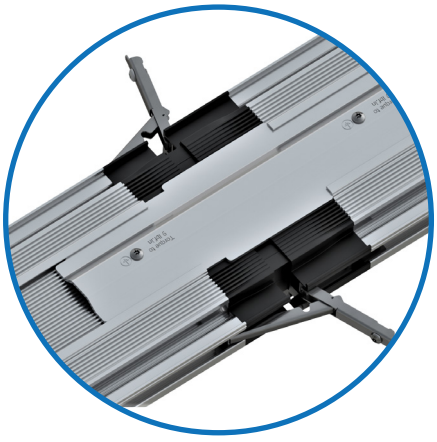
Keep Out

Open channel busway systems, now widely available from several manufacturers, offer the ability for the user to install the plug-in unit at any location along the busway... in theory. The theory being that the power feed to the server rack or item of equipment can be located directly above or adjacent for ease of identification. However, the couplers present an issue to this theoretical management of the plug-in units.

By their very nature the couplers form a physical barrier preventing plug-in units from being inserted along their whole length and in several cases, also some distance away from the coupler. We refer to this distance along the open channel busway where plug-in units cannot be installed as the “keep out area”.

One widely installed busway manufacturer’s keep out area is over 21 inches.... **making over 17% of their busway run unusable** for plug-in units.

But there is another, better way...



Integral Coupling

The Anord Mardix Databar busway utilizes a unique male and female coupling system that is integral to the individual busway sections. The key component of this system is the beryllium copper spring couplers attached to the female end of each busway section.

This **Patent Applied For** component exhibits extreme shape-memory properties and great conductivity, ensuring a highly reliable joint connection at high load currents. Due to the nature of this coupler, no maintenance is required.

The net result is **up to 80% saving in installation time** and 100% saving on maintenance costs.

“...up to 80% saving in installation time...”

Safety First

On open channel busway, a key requirement is the ability to connect the plug-in units to the bus-rail when it's energized. While the technicians responsible for this task should always follow NFPA and safety regulations and the specific site requirements, the design of the plug-in unit can significantly reduce the risks posed to both personnel and the continued operation of the busway system.

Busway manufacturers have varying ideas on how this is best achieved. One manufacturer utilizes a system of twisting the plug-in unit into the busway to both mechanically attach the unit to the busway and to simultaneously make the electrical connections into the conductors.

"Designing safety directly into the components being installed on live busway can't be overemphasized."

The risks of arc flash or electrical shock during this single step method are heightened due to the physical force required and the ability to both misalign plug-in unit phase connections and/or connect the plug-in unit while on load.

For that reason, busway manufacturers will state:-

"DO NOT install Plug-in units under load. Make sure breakers are in the off position."

Anord Mardix believe that making this statement alone is insufficient to ensure safety. By designing interlocks into our Databar tap off boxes, we ensure that they:

1. CANNOT be installed in the incorrect rotation
2. CANNOT be installed or removed with the breakers switched on i.e. on load
3. The breakers can ONLY be switched on when
   a. the tap off box is correctly installed and grounded on the bus-rail and
   b. the connections have been successfully engaged through separate key operation

Designing safety directly into the components being installed on live busway can't be overemphasized.

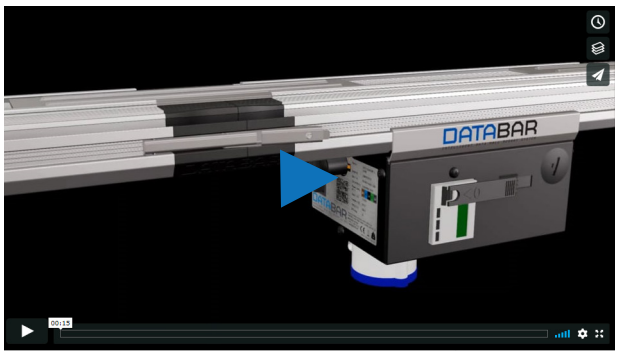
Flash Warning

Furthermore, to mitigate the effects of the potential arc flash, successful arc flash testing of the busway system and plug-in units is essential.

For this reason, the Anord Mardix Databar system and plug-in units have been successfully independently arc flash tested to technical report IEC/TR 61641. This testing involved creating arc ignitions in the end feed, on the busway and on both the supply and load side of the plug-in unit breaker.

In all cases the criteria for personal and assembly protection were met, with the plug-in unit breaker detecting and clearing the faults in under 24.7ms.

Anord Mardix Databar product videos can be viewed below:



https://vimeo.com/314466114

https://vimeo.com/314466127

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