

Vertiv™ PowerBar Track

GUIDE SPECIFICATIONS Open Channel Busbar/Busway System UL

1.0 GENERAL

1.1 Related Documents

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division [XX] Specification Sections, apply to this Section.

1.2 Summary

- This guide specification describes the electrical characteristics and general requirements for a continuous open channel, low voltage busbar/busway system.
- The system should be designed primarily for overhead power distribution of electrical power.
- System shall be designed to be installed at critical distribution points to power specific loads, servers, and workstations.
- Loads fed from plug-in/tap off boxes, shall be added or removed without shutting down the busbar.
- The busbar should be compulsorily hot swappable and compulsorily should be an open channel busbar system which is continuous access and allows plug-in units/tap off boxes to be inserted and removed anywhere along its length.
- Once installed, the completed system will provide a manageable, economical means for power distribution and communications.

1.3 Standards

Underwriters Laboratory Standard, UL 857 – The common UL, CSA, and ANCE Standard for Busbars that is derived from the fifth edition of CSA Standard C22.2 No. 27, the twelfth edition of UL 857, and the second edition of NMX-J-148-1998-ANCE.

- CUL Listing
- National Electric Code (NEC) – Article 364 – Busbar
- NFPA 70 – National Fire Protection Agency

1.4 System Description

1.4.1 Environmental Conditions

The busbar/busway shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage, degradation, or derating of operating capability:

- Ambient temperature for electronic components: 32 °F (0 °C) to 104 °F (40 °C).
- Relative humidity of 95% or below (non-condensing).
- The altitude ranges between sea level to 4000 ft. (1220 m).

1.4.2 Electrical Specification/Performance Requirements

The busbar/busway system shall perform as specified in this specification while supplying rated full-load current as shown on the project drawings.

- The busbar/busway system shall be available in the following current ratings:
 - **UL:** 250 A/400 A/600 A/800 A/1000 A.
- **System voltage:** Busbar/busway shall be rated to 600 V.
- **Insulation voltage:** 1000 V.
- **Frequency:** Available in 60 Hz.
- **Short circuit rating:** Minimum of 50 KAIC.

1.5 Seismic Qualification Certification

Submit certification that busbar, accessories, and components will withstand seismic forces to include the following:

- **Basis of certification:** Indicate whether withstanding certification is based on actual test of assembled components or on calculation.
- The term withstand means the units will remain in place without separation of any parts from the device when subjected to the specified seismic forces.
- **Dimensioned outline drawings of equipment unit:** Identify center of gravity and locate and describe mounting and anchorage provisions.
- Detailed description of equipment anchorage devices on which the certification is based and the installation requirements.

1.6 Documentation/Action Submittals

1.6.1 Submittals/Drawings

Submittals/shop drawings shall be supplied for busway and tap off units.

- **Product data:** For each type of product indicated, include data features, components, ratings, and performance.

1.6.2 Installation and Operations

An installation manual shall be provided.

- **Operation and maintenance data:** For busbar/busway system, operation and maintenance manuals shall be provided.

1.7 Warranty

Vertiv provides a one-year warranty from the date of shipment on the entire system against defective material, manufacturing and workmanship.

Additional years or warranty shall be an option if required.

1.8 Quality Assurance

- **Testing agency qualifications:** An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a national recognized testing laboratory as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- **Testing agency's field supervisor:** Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- **Source limitations:** Obtain busbar and tap off box components and accessories using qualified manufacturers.
- **Product options:** Drawings indicate size, profiles, and dimensional requirements of busbar and are based on the specific systems indicated.
- **Electrical components, devices, and accessories:** Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- **UL compliance:** Listed and labelled under UL 857. ETL is not recognized.
- **NFPA compliance:** Mark components as suitable for installation in computer rooms according to NFPA 75.

2.0 PRODUCT

2.1 Manufacturers

This Specification is based on Vertiv™ PowerBar Busway manufactured by Vertiv.

Acceptable alternates are the following: once they are approved by the Consulting Engineer for use on the project. A specification compliance by paragraph showing Comply, Deviate, or Exception is to be submitted one week prior to bid date.

Approved vendor by the Design Engineer.

2.2 Components

2.2.1 Busbar Assembly

The lengths provided on the project shall be as recommended and selected by the manufacturer to meet the project requirements.

The busbar shall be available in lengths up to four meters with option to extend.

The top of the busbar shall have a slot running the length of the busbar to provide attachment points for installation of the busbar.

The hangers provided with the system should not in any way interfere with the tap off installation.

Various hangers need to be available for different types of installations to meet individual site needs.

The bottom of the busbar shall have a continuous opening to accept the tap off boxes. This opening shall pass the UL and IEC hypothetical finger probe test. The entire opening with the exception of the small area for the joint coupling, shall be available for plug-in/tap off unit insertion.

Housing: The busbar housing sections shall be constructed of extruded aluminium and provide 100% rated system earth path that meets UL 857 standard and must comply with applicable paragraphs of Section 250 of the NEC. Steel housings shall not be permitted.

The housing shall have a means of containing the smart cabling along its length when required.

Conductors: All conductors for amperage ratings up to 600 A shall be made of 100% copper. Manufacturer of busbar to have Aluminium conductor option for amperage ratings up to 1000 A. All conductors sized to handle 100% of the busbar rating under continuous operation up to the maximum ambient temperature. The conductors shall be electrically isolated from the housing.

Bus: Busbars shall be fabricated from high strength electrical grade copper (C101 BS 1432/1433) 99.99% purity to ETP 99.9. Option for aluminium alloy 6101.

The busbar shall be capable of carrying rated current continuously up to an ambient temperature of 104 °F (40 °C).

Isolated earth: An isolated earth is to be supplied if shown on the drawings. This is required for the system where earth isolation is required, such as systems with heavy microprocessor-based loads or large computer-based installations.

Insulators: Internal conductors shall be electrically isolated from the housing using full length individual insulators of IEC and UL certified halogen free, non-flammable thermoplastic. The insulation must have excellent dielectric strength and is impact resistant.

2.2.2 Tap Off Boxes

Tap off boxes shall be polarized to prevent incorrect installation.

Tap off boxes are capable of being inserted safely when the busbar is energized.

All tap offs have mechanical/ electrical interlocks with an 'earth first, break last' safety feature.

All tap off boxes shall utilize a mechanical/electrical interlock that will prevent an energized plug-in unit from insertion or removal from the busbar and will reduce the risk of arch flash to the operator.

The tap off box shall have the option of being hook operated at the client's request.

Tap off boxes shall use either a circuit breaker or a fuse for branch circuit protection as shown in the schedule on the project drawings and shall have the option of interlocking the MCB at the client's request.

Tap off boxes that include drop cords shall be manufactured with cord grips and receptacles as specified on the schedule on the project drawings.

Tap off boxes shall be configured by the manufacturer to balance the load based on quantity of tap off box types provided.

Tap off boxes shall have at least 125 A of distribution capacity for all amperage systems.

Tap off boxes can be easily added or removed without shutting power down to the busbar. Tap off boxes shall have integral shutters. Verification of compliance shall be provided in writing from manufacturer.

Tap off boxes that make a simultaneous mechanical and electrical connection when attached to busbar shall not be permitted.

The tap off units shall be compatible for vertical and horizontal mounting of the busway.

The tap off units shall be compatible with all current ratings of the busbar/busway system.

The required protection device shall be indicated on the manufacturer's submittal drawings.

The required outlet device shall be indicated on the manufacturer's submittal drawings.

For tap off boxes requiring drop cords, the cord length shall be specified by the customer at the time of purchase order. The length shall be the length of the cord and not the pre-assembled outlet.

2.2.3 End Feed

The end feed shall provide the connections from the incoming cables to the busbar system.

The end feed shall be an IP2X enclosure with various access panels for incoming cabling.

The end feed shall have an internal connection to a section of busbar conductors.

End feed or center feed boxes are available to accommodate existing or future site conditions.

2.2.4 Final Circuit Monitoring (Optional)

The final circuit monitoring should be integrated into the busway delivering the measurement of total load for individual tap off loads to the DCIM/BMS system.

Protocol: Modbus RTU or Modbus TCP or any other industry standard open protocol.

The final circuit monitoring system shall be capable of monitoring and providing all power calculations for the total input power for each busway run at end feed level. Tap off box monitoring (optional).

The final circuit monitoring system shall be capable of complete integration with the DCIM and BMS system.

2.2.5 Tap off Box Monitoring

The tap off boxes as indicated on the schedule on the project drawings shall have the following power measurements and remote monitoring interface.

2.2.6 End Feed Monitoring (Optional)

The end feed is to be provided with the following power measurements and remote monitoring interface:

- Input voltage (L/L and L/N).
- Current per phase (Min/Max).
- Voltage per phase (Min/Max).
- Neutral current.
- Power factor.
- Frequency.
- Power (active, reactive, apparent).
- Demand (kWH).
- Voltage and current THD%.
- Current peak demand.
- Accuracy is better than 0.5%.
- Communication is Modbus RTU or Modbus TCP and SNMP simultaneously.
- LED display.

2.2.7 End Feed Thermal Monitoring System (Optional)

- Provide a continuous thermal monitoring system (TMS) for feeder termination points as well as other power conduction points that have the potential to develop hot spots over time.
- TMS shall provide real-time heat rise data for each cable landing. Heat rise data shall be provided to the EPMS system via Modbus TCP protocol.
- TMS shall be factory-installed and tested to the extent possible by the equipment manufacturer. Any fieldwork required shall be performed by factory-certified personnel.

Option 1: IR/Contact Continuous Temperature Monitoring

- Thermal sensors for bus connections shall be non-contact, non-powered, and shall not require periodic calibration.
- Thermal sensors for cables shall be contact type, non-powered, and shall not require periodic calibration.
- Sensors should be positioned appropriately to detect heat rise from potentially overloaded or poorly conducted electrical connections.
- Thermal sensors shall be monitored via a Modbus data concentrator, which in turn will be connected to the EPMS via Ethernet.

Option 2: Infrared Windows for Periodic Manual Scanning

- Provide price delta to substitute infrared arc resistant view windows for IR/contact thermal monitoring. IR windows to be installed in the electrical equipment by manufacturers in locations to allow unobstructed and safe IR scanning of feeder termination points as well as other power conduction points that may develop hot spots over time.

2.2.8 Miscellaneous Hardware

- **End cap:** The end cap is installed at the end of the busbar run.
- **Joint kit:** The joint kit is used to make electrical and mechanical connections between busbar sections and end feeds, via a bolted means and no special tooling is required. The joint packs should be such that tap off boxes can be installed very close to the joints.
- **Busbar hangers:** Busbar hangers are installed in the top slot of the busbar and provide connections to the suspension system provided by the installation contractor. Hanger assemblies must not interfere or obstruct the busbar/busway opening intended for installation of tap off units. The installing contractor shall supply threaded rods or unistrut where required for hanging the busbar/busway.
- **Closure strips:** Is to be provided only if shown on the drawings. This increases the IP rating to IP3X.
- The manufacturer should have available a standard range of accessories including elbows and so on, to all for complete system installation.

3.0 EXECUTION

3.1 Factory Testing

Standard factory tests shall be performed on the equipment provided under this section.

All tests shall be in accordance with the latest version of ANSI and NEMA standards.

The manufacturer shall provide certified copies of factory test reports upon request.

3.2 Examination

With an installer present, examine site conditions to ensure they comply with the requirements that impact busbar performance.

Proceed with installation only after any unsatisfactory conditions have been corrected.

3.3 Installation

The contractor shall install the busbar in accordance with the manufacturer's instructions.

The busbar runs shall consist of lengths as shown on the drawings.

The tap off box orientation shall be as indicated on the drawings.

Hanging of the busbar shall be done using the busbar hangers from a structure above the busbar.

The hangers shall connect to the busbar, and to an all-thread rod provided by the installing contractor.

The spacing of the hangers along the busbar is 4920 ft. (1500 m) or less as recommended by the manufacturer.

The end feed shall have connection provisions for the contractor supplied feeder cabling.

The end feed shall be connected to the busbar section using a joint kit.

Connection of sections of the busbar shall be done using a joint kit. The connection shall be made per the manufacturer's instructions.

An end cap shall be installed at the end of the busbar run.

As shown on the drawings, elbow, or tee connections may also be required.

Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions.

Connections: Contractor shall make connections to supply circuits according to manufacturer's instructions and project drawings.

3.4 Field Quality Control

3.4.1 Installing Contractor Inspections

Prepare inspection reports to include the following:

- Comply with the manufacturer's written instructions.
- Inspect interiors and exteriors of enclosures, including the following:
 - Integrity of mechanical and electrical connections.
 - Component type and labelling verification.
 - Ratings of installed components.

3.4.2 Infrared Scanning

After substantial completion, but not more than 60 days after final acceptance, perform an infrared scanning of each busway.

- **Follow-up infrared scanning:** Perform an additional follow-up infrared scan of each busway six months after the date of substantial completion but prior to final project close out.
- **Instrument:** Use an infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device.
- **Record of infrared scanning:** Prepare a certified report that identifies busways checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.