Vertiv™ PowerBar HPB IEC

GUIDE SPECIFICATIONS

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 requirements for a 1000 Volt totally encased; non-ventilated, low impedance busbar designed with multiple bar configurations to suit project requirements.
- 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.
- Components shall be marked with a unique QR code for full traceability.
- Loads fed from plug-in/tap off boxes at fixed positions.
- Once installed, the completed system will provide a manageable, economical means for power distribution and communications.

1.3 Standards

The busbar range is fully ASTA Tested Certified and is CE approved.

It is manufactured in a certified management system environment where Quality ISO 9001, ISO 45001 and Environmental IS0 14001 standards are applied to all aspects of the manufacturing health and safety, and installation processes.

It is manufactured in accordance with IEC61439-1 and IEC61439-6.

Systems to be manufactured across multiple ISO-certified facilities to ensure production resilience.

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: -5 °C (23 °F) to 35 °C (95 °F) average over 24 hours or 40 °C (104 °F) maximum peak.
- Relative humidity of 95% or below (non-condensing).
- This product is designed for indoor use.

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:
  - **IEC Aluminum**: 800 A/1000 A/1250 A/1400 A/1600 A/2000 A/2500 A/3200 A/4000 A/ 5000 A.
  - **IEC Copper:** 1000 A/1250 A/1350 A/1600 A/2000 A/2500 A/3200 A/4000 A/5000 A/ 6600 A.
- **System voltage:** Busbar/busway shall be rated to 1000 V.
- **Insulation voltage:** 1000 V.
- **Frequency:** Available in 50 Hz.
- **Short circuit rating:** Minimum of 25 kA (1 second).
- **Conductors:** The busbar is constructed from high density 99.97% conductivity copper or 55% conductivity aluminum.

1.4.3 Performance Features

The conductors are insulated with a Class B or Class F epoxy insulation applied uniformly using an electrostatic coating process. The epoxy coating is non-hygroscopic and chemical resistant with outstanding heat transfer characteristics.

The busbar is housed in an aluminium casing which acts as an earth.

Conductors are tinned using a controlled application process.

The busbar has a fully certified fire wall penetration barrier.

Ingress protection ratings are available from IP55.

The busbar can be used as a feeder or distribution application, or as a combination of both.

Up to 5 tap off points per 3 m length.

The busbar is painted grey (RAL 7035). Other colours can be accommodated on request.

The busbar offers a 50% or 100% fully isolated earth for systems where earth isolation is required.

The busbar offers a fully certified fire wall penetration barrier for either a four hour or two-hour rating.

The low impedance sandwich design:

- Improves heat dissipation.
- Improves short circuit rating.
- Reduces voltage drop/ impedance.
- Do not act as potential pathways for flame, smoke and gas.

1.5 Documentation/Action Submittals

1.5.1 Submittals/Drawings

Provided by Vertiv to client

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

Provided by client to Vertiv

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

Busbar drawings must include all relevant dimensions. Center line dimensions are expected. Highlight any dimensions that are not center line.

Walls and floors must be indicated, and the relevant dimensions provided.

The phasing and location of all switchboards must be provided.

Full details are required for any transformer connections.

1.5.2 Installation and Operations

An installation manual shall be provided.

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

Ensure all site conditions meet the specifications outlined in the manual.

Make sure that all materials are in an area protected against dampness, water ingress, and any extremes of temperature.

If the busbar is not to be installed immediately upon delivery, it should be stored in a heated, clean, and dry area. Busbar should never be stored outdoors.

Prepare the work area in accordance with local safety requirements.

The installation guide provided will provide step-by-step instructions for the entire installation process.

The busbar sections are secured to a framing system, such as Unistrut or by using drop rods fixed to the ceiling. It can also be fixed to a wall. The bar can be secured both on its flat or on its edge.

The busbar hanging brackets must be used.

1.6 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.

1.7 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.

2.0 PRODUCT

2.1 Manufacturers

This Specification is based on PowerBar Busway manufactured by Vertiv.

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 from 600 mm (23.6 in.) to 4000 mm (157.5 in.).

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 busbar shall have fixed plug-in positions to accept the tap off boxes. This opening shall pass the UL and IEC hypothetical finger probe test.

Housing: The busbar housing sections shall be constructed of aluminium sandwich design.

Bus: Busbars shall be constructed from either copper conductor or tinned aluminium conductor. Aluminium case also serving as protective case earth.

The busbar shall be capable of carrying rated current continuously up to an ambient temperature of 35 °C (95 °F) average over 24 hours or 40 °C (104 °F) maximum peak.

The conductors shall be insulated with a Class B or F electrostatically sprayed epoxy coating (non-mylar, non-hygroscopic, and chemical-resistant).

2.2.2 Tap Off Boxes

Tap off boxes shall be polarized to prevent incorrect installation.

The tap off units has an interlock which prevents the tap off door from being opened while the tap off unit is in the ON position.

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

The tap off unit is secured to the busbar housing using high tensile strength, lockable hardware, with an extended shutter actuator and mechanical clamping mechanism. This ensures the units are properly sealed during the installation and cannot be fitted incorrectly.

Vertiv's patented process of pressed out tabs to connect tap off units protects the integrity of the conductor.

The busbar taps off units are designed with the safety of the installer and user as the key criteria. The tap off unit has an extended earth contact bracket which ensures the earth ground is always the first point to connect with the busbar system during installation.

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

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.

Vertiv can also manufacture tap off units based on your specific needs and requirements. These features include:

- Metering options
- BMS monitoring of breaker status.
- BMS monitoring of metering systems.
- Automatic remote open/close features.
- Load shedding features.
    - Integral sockets.
    - Integral distribution boards.

2.3 End Feed

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

The end feed shall provide 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.

End feed units are used on the ends of busbar risers which are cable fed. Center feed units are used in the middle of busbar risers which are cable fed.

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.

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:

- Input voltage per phase (L/L and L/N).
- Current per phase (min/max).
- Voltage per Phase (min/max).
- Power factor.
- Frequency.
- Power (active, reactive, apparent).

- Demand/energy consumption (kWH).
- Current peak demand.
- THD – total harmonic distortion (optional).
- Status monitoring (optional)

  In system should be capable of monitoring closed and trip status for each MCB. The status signals are to be fed back to the end feed using the integrated Ethernet cabling
- Accuracy of 0.5%
- Communication is Modbus RTU or Modbus TCP and SNMP simultaneously
- Tap off box monitoring must support 1-, 2-, and 3-pole circuits with varying phase configurations.

2.4.1 End Feed Monitoring (Optional)

End feed monitoring (option – select as required): 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.

2.4.2 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.

2.4.3 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. Joint pack construction with double headed shear nuts for quick installation
- **Busbar hangers:** Busbar hangers are installed on 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.

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 ISO 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 1.5m 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.

Joint pack construction with double headed shear nuts for quick installation

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.

Horizontal busbar must be installed with the neutral phase to the top.

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.

3.5 Testing and Certification

Type-tested for:

- Strength of materials and parts.
- Degree of protection of enclosures.
- Clearance and creepage distances.
- Protection against electric shock and integrity of protective circuits.
- Dielectric properties.
- Temperature rise limits.
- Short circuit withstand strength.
- Fire resistance in building penetration.
- Corrosion resistance.
- The busbar has a qualification level - high (Zone - 4 and 5) in accordance with IEEE standard 693-2005.60068-2-3 (Damp Heat Cyclic).
- The busbar has completed extensive testing at ASTA and KEMA accredited laboratories to ensure the products supplied meet the international requirements.