Vertiv™ Liebert® Busway
Medium (MBX) Power Distribution

1.0 GENERAL

1.1 Summary

This specification describes requirements for an IP-2X certified busway system, which will supply power to the customers critical and sensitive loads. The Busway system shall be designed with safety, flexibility, and advanced standard features as the forefront.

1.2 Definitions

1. EMI: Electromagnetic interference
2. LED: Light-emitting diode
3. PC: Personal computer
4. THD: Total harmonic distortion

1.3 Standards

- The Liebert® Busway shall be designed, manufactured, tested and installed in compliance with:
  - Low Voltage Directive (73/23/EEC) including Amendment (93/68/EEC)
  - Low Voltage Switchgear and Control gear assemblies, Part 1: Type Tested and partially type tested Assemblies, IEC 60439-1: 1999
  - Low Voltage Switchgear and Control gear assemblies, Part 2: Particular Requirements for Busbar Trunking systems (Busways), IEC 60439-2: 2000
  - Underwriters Laboratory Standard, UL 857 – The common UL, CSA, and ANCE Standard for Busways 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, ETL Listing.
  - National Electric Code (NEC) – Article 364 – Busway
  - NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches
  - NEMA KS-1, Enclosed and Miscellaneous Distribution Equipment Switches (600VAC)
  - NFPA 70 – National Fire Protection Agency

1.4 Documentation

Drawings

- Wiring diagrams and drawings of major components shall be furnished.

1.5 Quality Assurance

The Vertiv™ Liebert® Busway shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, “Hi-Pot” Test, two times rated voltage plus 1000 volts, per UL requirements (and Metering Calibration Tests). The Vertiv™ Liebert® MBX shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

1.6 Warranty

The manufacturer shall provide a two-year warranty against defects in material and workmanship for 24 months after initial startup or 30 months after shipping date, whichever occurs first. (Refer to the Warranty Statement for details.)

1.7 Environmental Requirements

The Busway shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage, degradation, or derating of operating capability.

- Operating temperature range: +32° to 104°F (0° to 40°C).
- Relative humidity: Operation shall be reliable in an environment with 0% to 95% noncondensing relative humidity.
- Operating altitude: Up to 4,000 ft. (1,220m) above Mean Sea Level; derated for higher altitude applications.
- Storage/transport: Up to 40,000 ft. (12,200m) above Mean Sea Level.

1.8 Spare Parts

A list of recommended spare parts shall be supplied at the customer’s request.

2.0 PRODUCT

2.1 Electrical Requirements

- Voltage Rating: 600V AC and 600V DC
- Frequency: DC to 60Hz
- Short Circuit Rating: Fully rated to interrupt symmetrical short-circuit current available. Min. 3-cycle short-circuit rating of 50ka RMS symmetrical. Rating is dependent on lowest rated branch circuit breaker used in the system (commonly 10kAIC or 22kAIC)

2.2 Components

2.2.1 Power Feed

- The Power Feed will be supplied by a NEMA enclosure which provides connections for incoming power cables to the busway system. The enclosure shall have access panels for ease of cable installation and shall be constructed of galvanized or painted steel to provide a strong substructure. The enclosure shall meet IP2X requirements.
- The Power Feed enclosure shall have an internal connection to the first busway length section.
- The color of the exterior panels shall be the manufacturer's standard color: black gray matte.

2.2.2 Busway Track

1. Housing: Constructed of extruded aluminum for lightweight applications, the busway shall be 100% rated with a ground path that meets the UL857 standard and must comply with applicable paragraphs of Section 250 of the NEC.
2. Conductors: All conductors shall be made of 100% copper and sized to handle 100% of the busway rating under continuous operation up to the maximum ambient temperature. The conductors shall be electrically isolated from the housing.
   - Bus bars shall be fabricated from high strength 98% conductivity copper and shall be capable of carrying rated current continuously without exceeding a temperature rise of 55 degrees C based on a 40-degree C ambient.
   - Neutral: A 100% rated neutral conductor rating is to be supplied.
   - (optional) Oversized Neutral: An oversized neutral conductor rating is to be supplied.
3. Input three-phase power conductors shall connect to the (main circuit breaker) or (input busbars). Input neutral conductor shall be connected to a busbar and the ground conductor to a parity-sized insulated ground busbar shall be provided.

2.2.3 Tap off Boxes (Bus Plugs)

- Tap off Boxes shall be polarized to avoid incorrect installation. Tap off Box are capable of being inserted safely when the busbar is energized. All Tap off Box have Mechanical/Electrical interlocks with "Ground First, Break Last" safety feature. All Tap off Box 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 arc flash to the operator.
- Tap off Boxes shall use be equipped with a main input circuit breaker.
- Tap off Boxes shall have locking clips to secure units to the busway.
- Tap off Boxes shall be configured by the manufacturer to balance the load based on quantity of receptacle types provided.

- Tap off Boxes shall be easily added or removed without shutting power down to the busway. Integrated shutters provide an ease of installation.

2.2.4 Accessories

- End Cap: The End Cap is installed at the end of the busway run.
- Joint pack: The Joint Pack is used to make electrical and mechanical connections between Busway sections and Power Feed Box, via a compression or bolted means.
- Busway Hangers: Busway Hangers are installed in the top slot of the busway and provide for connections to the suspension system provided by the installing contractor.
- Monitoring/Comms cable strip: The open slot on the side of the busway shall be enclosed to protect any RJ45 comms cables which may be used in the system.

2.3 Power Monitoring (optional – you can HAVE one or both of the following options)

1. Power monitoring shall be available as an option either as Power Feed Monitoring only or Power Feed plus Tap off Box Monitoring.
2. Power Feed Box Monitoring (Option):
    - The Power Feed box 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
        - IEC 61557-12 Accuracy Class 0.5 is better than (0.5%)
        - Busway system communications using Modbus RS485
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        - Network connection via RJ45 jack
3. Tap of Boxes (Bus Plugs) Monitoring (Option): The box shall be provided with a monitoring device which accommodates the following monitored points and criteria
    - Input Voltage (L/L and L/N)
    - Current per Phase (Min/Max)
    - Voltage per Phase (Min/Max)
    - Power Factor

- Frequency
- Power
- Demand (kWH)
- Current Peak Demand
- IEC 61557-12 Accuracy Class 0.5 (0.5%)
- Accuracy is better than 1%
- Communications using Modbus RS485
- Interconnect communications between Power Feed and Tap off boxes uses RJ45 jack

4. Tap off Box Monitoring must be serviceable without requiring the unit to be removed or powered down.
5. Tap off box Monitoring must support 1, 2 and 3 pole circuits with varying phase configurations up to 8 circuits per unit.

2.4 Export Crating (optional)

Heavy-duty solid wood crating shall be provided to meet international requirements regarding package strength and special markings for overseas shipments.

3.0 EXECUTION

3.1 Factory Testing

Standard factory tests shall be performed on the equipment proposed. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

3.2 Examination (By Others)

1. Examine areas and conditions, with installer present, for compliance with requirements for conditions affecting performance of the busway.
2. Inspect interiors and exteriors of enclosures, including the following:
    - Integrity of mechanical and electrical connections.
    - Component type and labeling verification.
    - Ratings of installed components.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 Factory Service and Support

Factory startup, installation support, and service support for the specified system shall be available and included upon request. The manufacturer shall directly employ a service organization of factory-trained field service personnel dedicated to the startup, maintenance and repair of the manufacturer's power equipment. The manufacturer shall maintain a dispatch center 24 hours per day, 365 days per year, to minimize service response time and to maximize availability of qualified service personnel.

3.4 Installation (by others)

1. The contractor shall install the busway in accordance with manufacturer's instructions.
    - Hanging of the busway shall be done using busway hangers provided by the manufacturer. There are varying types of hangers depending on orientation and installation requirements. Some hangers are outlined herein:
        - Vertical/Horizontal Hanger VUB (Strut channel mount): This hanger is for vertically or horizontally mounting the busway using a strut channel product, refer to installation submittal MBX-17-S001 for mounting instructions. The spacing of the hangers along the busway is 5 feet or less as recommended by the manufacturer.
        - Horizontal Hanger HDH (Threaded Rod mount): This hanger is for horizontally mounting the busway using all-thread (threaded rod) from above the busway, refer to installation submittal MBX-17-S002 for mounting instructions. The spacing of the hangers along the busway is 5 feet or less as recommended by the manufacturer.
        - Vertical Hanger VDH (Strut channel mount): This hanger is for vertically or horizontally mounting the busway using a strut channel product, refer to installation submittal MBX-17-S003 for mounting instructions. The spacing of the hangers along the busway is 5 feet or less as recommended by the manufacturer.
    - The power feed shall have connection provisions for the contractor supplied feeder cabling. The power feed shall be connected to the busway section using a joint pack.
    - Connection of sections of the busway shall be done using a joint pack. The connection shall be made per the manufacturer's instructions.
    - An End Cap shall be installed at the end of the busway run.

2. Grounding
    - The housing of the busway shall be the system ground.
        - Ground equipment according to NEC requirements for “Grounding and Bonding for Electrical Systems.”
        - Connect wiring according to Division 26 Section “Low-Voltage Electrical Power Conductors and Cables.”
3. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.
4. Connections: Contractor shall make connections to supply circuits according to manufacturer's instructions and project drawings.

3.5 Field Quality Control

1. Infrared Scanning: After Substantial Completion, but not more than 60 days after finial acceptance, perform an infrared scanning of each busway.
    - Follow-up infrared scanning; perform an additional follow-up infrared scan of each busway 6 months after date of substantial completion but prior to final project close out.
    - Instrument; Use an infrared scanning device designed to measure temperature or the 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.