

# Vertiv™ Liebert® MB GUIDE SPECIFICATIONS

## 1.0 GENERAL

### 1.1 Summary

These specifications describe requirements for a complete indoor busway distribution system supplying computer grade power, 600VAC or less, to sensitive loads. The specified system shall provide isolation, distribution and optional monitoring of AC power. It shall include all equipment, fittings and plug-in units to properly interface the AC power source with the intended load.

### 1.2 Standards

The specified system shall be designed, manufactured, tested and installed in compliance with:

- American National Standards Institute (ANSI)
- Canadian Standards Association (CSA)
- Institute of Electrical and Electronics Engineers (IEEE)
- ISO 9001:2000 (EN ISO 9001:2000; BS EN ISO 9001:2000; ANSI ASQ Q9001:2000)
- ISO 14001:2004
- National Electrical Code (NEC - NFPA 70)
- National Electrical Manufacturers Association (NEMA) - NEMA BU 1.1
- National Fire Protection Association (NFPA 75)
- Underwriters Laboratories (UL)

The system shall be UL listed as a complete system under UL 857 Standard for Information Technology Equipment including all fittings and plug-in units, all ampere ratings (100A, 225A and 400A) and mounting of the busway in any position (i.e., horizontal flat-wise, horizontal edgewise and vertical) without derating.

### 1.3 System Description

#### 1.3.1 Electrical Requirements

- Input/output capacity shall be ((100) (225) (400)) Amps.
- Input/output voltage shall be ((600) (480) (240) (208/120)) volts AC, 60 Hz, three-phase, four-wire-plus-ground.

#### 1.3.2 Environmental Requirements

- Storage temperature range shall be -40 to +158°F (-40 to +70°C).
- Operating temperature range shall be -40 to 104°F (-40 to 40°C).
- Operation shall be reliable in an environment with 0% to 95% non-condensing relative humidity.

### 1.4 Documentation

#### 1.4.1 Equipment Manual

The manufacturer shall furnish an installation manual with installation, startup, operation and maintenance instructions for the specified system.

#### 1.4.2 Drawings

Wiring diagrams and drawings of major components shall be furnished.

### 1.5 Warranty

Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment. (Refer to the Warranty Statement for details.)

### 1.6 Quality Assurance

All busway products shall be manufactured in a facility that has a Quality Management System registered to ISO9001:2000 (EN ISO 9001:2000; BS EN ISO 9001:2000; ANSI ASQ Q9001:2000) and an Environmental Management System registered to ISO 14001:2004.

## 2.0 PRODUCT

### 2.1 Components

#### 2.1.1 Busway

##### Housing

The busway housing shall be fabricated steel and painted with polyester urethane powder paint (color RAL 7021 black) to provide protection against corrosion. The busway housing shall be totally enclosed, non-ventilated and capable of being mounted in any position without derating. Track or continuous plug-in housing shall not be accepted.

##### Busbars

The busbars shall be fabricated from high strength, 98 percent conductivity copper and tin plated over the entire surface to ensure good electrical contact at all joints and plug-in/tap-off points. The busbar shall be a 0.125-in. (3.175mm) solid copper bar. Formed channel shall not be accepted. The temperature rise at any point in the busway shall not exceed a 63°F (55°C) rise above ambient temperature when operating at rated load current.

The voltage drop (input voltage minus output voltage) specified shall be based on the busway operating at full rated current and at stabilized operating temperature in 95°F (35°C) ambient temperature. The three-phase, line-to-line voltage drop shall not exceed 5.0 volts per 100 ft. (30.5m). The minimum short-circuit rating of the busway shall be:

- 10,000 RMS symmetrical amperes for 100 ampere busway
- 22,000 RMS symmetrical amperes for 225 ampere busway
- 35,000 RMS symmetrical amperes for 400 ampere busway

The short circuit rating of the busway shall be determined according to UL Standard No. 857.

##### Bus Joints

The busbars shall be connected by means of a spring clip pressure joint. Joint connections shall be made without special tools, housing couplers or bus connectors. An inspection cover shall be provided at the joint of each section suitable both for visual inspection and to allow thermal scans of busway joints.

##### Bus Ports (Bus Outlets)

Plug-in outlets shall be 2X, IP40 ingress protection with the outlet cover installed. Busway shall be of the plug-in type with standard density port spacing providing busway lengths of 10 ft. (3m), 5 ft. (1.5m) and 2 ft. (0.6m) sections. Bus ports are located every 10" (254mm) on alternating sides, i.e., every 20" (508mm) on one side. A 10 ft. (3m) section has six (6) bus ports per side. A 5 ft. (1.5m) section has three (3) bus ports per side and a 2 ft. (0.6m) section has one (1) bus port per side. All openings shall be usable simultaneously.

##### Bus Mounting

The manufacturer's standard clamp hanger shall support busway sections and fittings. Hangers are adaptable for wall mounting or ceiling suspension arrangements, either edge or flat. Hangers shall be spaced not more than 5 ft. (1.5m) apart along the busway. Each end tap box requires a threaded rod for support.

The manufacturer's standard clamp shall support busway sections and fittings for use in under floor mounting.

## 2.1.2 Bus Plugs

### Plug-In Units

Where required, plug-in units of the types and ratings indicated on the plans and specifications shall be supplied. Plug-in units shall be ((circuit breaker) (fuses)) with quick-make / quick-break mechanism. The plug-in units shall be interchangeable without alteration or modification on all ratings of plug-in busway. Plug-in units shall be equipped with a means for direct positioning or hanging, so that the weight is borne by the busway before the stabs make contact with the busbars. Plug-in enclosures shall make positive ground connection with the ground bus before the contact fingers make contact with the phase bars. No projections shall extend into the busway housing other than the plug-in stabs.

### Circuit Breaker

Circuit-breaker type plugs shall have an interrupting rating of not less than ((10,000) (22,000) (65,000)) symmetrical amperes and shall meet all requirements of UL Standard 489. Circuit breakers shall be rated for ((600) (240)) VAC and ((15) (20) (30) (60)) Amperes. Each plug-in unit shall contain ((1) (2)) circuit breakers.

### Drop Cords

Each plug-in unit shall have ((0) (1) (2)) SO type drop cord(s) sized according to the circuit breaker ampere capacity. The length of the drop cord(s) shall be ((0) (3) (5) (7) (10)) feet (((0) (0.9) (1.5) (2.1) (3)) m). Each drop cord shall feature a strain relief between the plug-in unit and the drop cord. Each drop cord will have one of the specified receptacles attached to one end.

### Receptacles

Each plug-in unit shall have ((0) (1) (2)) receptacles. The specified receptacle type shall be ((5-15R) (5-205) (L5-20R) (L5-30R) (L6-20R) (L6-30R) (L7 - 15R) (L15-20R) (L15-30R) (L21-20R) (L21-30R) (L22 - 30R) (IEC309 - 3PH 20A 480V) (IEC309 - 3PH 60A 120/208V) (CS8364C/CS8369)).

## 2.1.3 Tap Boxes

Tap boxes shall be furnished to provide a connection between the busway and cables. Copper busbars for 2-hole lugs shall be provided on the line side terminals of the tap box. The tap box shall accommodate up to 500kcmil copper cables while meeting NEC wire bending requirements

## 2.1.4 Ground and Neutral

The internal ground bus shall be no less than 100% for 100 amperes, 60% for 225 amperes and 52% for 400 amperes. A 200% neutral shall be provided as standard on all busway and components.

## 3.0 ACCESSORIES (OPTIONAL COMPONENTS)

### 3.1 Monitoring System

The specified system shall be equipped with a microprocessor-based power monitor panel. The monitor panel shall gather and process information from electrical sensors internal to the tap box. The monitored parameters and alarms shall be displayed on the unit monitor panel and shall also be available for communication to a centralized monitoring system using Vertiv™ Liebert® Modbus TCP and an integrated RJ45 port.

#### 3.1.1 Monitored Parameters

The monitoring system shall monitor and display all of the following parameters:

- Output Voltages, Line-to-Line for all three phases
- Output Voltages, Line-to-Neutral for all three phases
- Output Voltage Total Harmonic Distortion (THD) for all three phases
- Output Current for all three phases
- Output Current Total Harmonic Distortion (THD) all three phases
- Output Frequency
- Output kVA
- Output kW
- Output Power Factor
- Output kW-Hours
- Date
- Time

All three phases of the three-phase parameters shall be displayed simultaneously. All voltage and current parameters shall be monitored using true RMS measurements for accurate representation of non-sinusoidal waveforms typical of computers and other sensitive loads.

## 4.0 EXECUTION

### 4.1 Delivery, Storage and Handling

Refer to NEMA Publication BU1.1, a guide for proper installation, operation and maintenance of busway products. Handle busway in accordance with manufacturer's recommendations. Utilize factory provisions for all lifting, rigging and hoisting. Store busway prior to installation in a temperature- and humidity-controlled space.

### 4.2 Installation

Install busway and accessories in accordance with manufacturer's instructions. Additional instructions are detailed in NEMA publication BU1.1, which is provided with the equipment by the electrical manufacturer. Install busway length with expansion fitting at each location where busway run crosses building expansion. Provide curb around interior floor penetrations per NFPA-70.

### 4.3 Adjustments and Cleaning

Set field-adjustable trip devices per coordination study. Clean exposed surfaces using manufacturer-recommended materials and methods. Touch-up damaged coating and finishes using non-abrasive materials and methods recommended by manufacturer.

### 4.4 Startup

Engage a factory-authorized service representative to perform startup service. Train owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules. Verify the circuit breaker is installed and connected according to the Contract Documents. Complete installation and startup checks according to manufacturer's written instructions.

**NOTE:** These Guide Specifications comply with the format outlined by the Construction Specifications Institute per CSI MP-2-1 and CSI MP-2-2. In correspondence, reference Liebert document SL-20905\_REV1\_04-10.