**ENGINEERING SPECIFICATION**

### FOR VERTICAL AIRFLOW

## OUTDOOR RESISTIVE LOAD BANK

**(25-1000 KW)**

**PART 1.0 GENERAL**

# 1.1 SCOPE

1. This specification contains the minimum requirements for the design, manufacture and testing of a UL listed, air-cooled, outdoor weatherproof resistive load bank.
2. The load bank is required for periodic exercising and testing of the standby or emergency power source. The load bank shall be permanently mounted in a weatherproof enclosure, forced air cooled with locally mounted HMI Color Touchscreen controller.
3. The local HMI Controller shall be housed in a NEMA type wall mount enclosure. To allow for remote operation, the HMI enclosure shall be removable and provided with a minimum of 25’ communication cable.
4. This specification shall apply if the load bank is supplied to the purchaser, or as a part of other equipment.
5. Should the vendor take exception to any part of this specification, it shall be stated in the bid, and referenced to the specification line number.

1.2 SUBMITTALS

1. The manufacturer shall submit for review technical data including features, performance, electrical characteristics, physical characteristics, ratings, accessories, and finishes.
2. Shop drawings shall include dimensional plans, front and side elevations, and mounting details sufficient to properly install the load bank. Load bus configuration and load connections termination area shall be clearly identified.
3. Electrical schematic drawings shall be provided to detail the operation of the load bank and the provided safety circuits. Over-current protection and control devices shall be identified, and their ratings marked. A system interconnection drawing shall be included for control wiring related to the load bank.

1.3 STANDARDS

1. The equipment covered by this specification shall be designed with the latest applicable NEMA,

NEC, and ANSI standards.

1. The load bank shall be listed at UL Standard 508A.

**PART 2.0 PRODUCTS**

2.1 RATINGS

A. The total capacity of the load bank shall be rated (\_\_\_\_\_\_\_\_) KW at (\_\_\_\_\_\_) Volts, 3-Phase, 3-Wire, 60 Hertz, (\_\_\_\_\_\_\_) Amps per Phase at unity Power Factor and 25 KW(nominal) load step resolution.

B. The load bank shall be designed for continuous duty cycle operation with no limitations. The load bank shall operate in an ambient temperature of -20°C to 49°C (-4°F to 120°F).

2.2 MATERIAL AND CONSTRUCTION

A. The load bank shall be outdoor weatherproof construction, suitable for installation on a concrete pad or structural base. All exterior fasteners shall be stainless steel. The load bank shall include forklift channels in the base for lifting.

B. The load bank shall be constructed of heavy gauge CRCA steel per ASTM A1008. CRCA steel with powder coating provides corrosion protection and extended service life, with a better tolerance to high heat exposure.

C. The main input load bus, load step relays, fuses and blower/control relays shall be located within the load bank enclosure. An optional thermostatically controlled heater shall be located within the control section to provide protection to the control devices from the effects of moisture and condensation.

D. Airflow throughout the load bank shall be vertical. Ambient intake cooling air shall be drawn in at the base of the unit and heated air exhausted out the top. Intake openings shall be designed to prevent objects greater than 0.50” diameter from entering the unit.

E. The load bank exhaust shall be integral to the load bank. Load banks that require separate bolt on louvers add back pressure, height, and weight to load bank and to shall not be used.

F. The load bank enclosure shall have a baked polyester powder coated finish with a film

thickness of 1.3-1.8 Mils per coat.

G. Load elements shall be contained in multiple resistor cases or trays. Each can be removed in its entirety as a unit for inspection or service.

2.3 RESISTIVE LOAD ELEMENTS

A. Load elements shall be ULB *Helicon* made from precision nickel chromium alloy rated to operate at approximately ½ of maximum continuous rating of wire. Elements must be fully supported across the entire length within the air stream by segmented high temperature refractory ceramic insulators on stainless steel rods. Element supports shall be designed to prevent a short circuit to adjacent elements or to ground.

B. The change in resistance due to temperature shall be minimized by maintaining conservative watt densities.

C. The overall tolerance of the load bank shall be –0% to +5% KW at rated voltage. A –5%, +5% rating allows the load bank to deliver less than rated KW and shall not be used. The load bank must deliver full rated KW at rated voltage.

2.4 COOLING

A. The load bank shall be cooled by integral TEFC or TEAO motor(s) which is direct coupled to the cooling fan blade. The fan motor must be electrically protected against overload using a motor overload device and short circuit protected using three (3) current limiting fuses with an interrupting rating of 200K A.I.C.

B. A multi-prop fan blade is to be an airfoil design, constructed from aluminum or non-corroding material.

C. Sound Pressure of load bank is not to exceed 85 dBA at 3’ Average over the four (4) corners of load bank.

D. An integral control power transformer shall be provided to supply 120V, 1 phase, 60 Hz to the load banks control and motor starter circuitry. Transformer primary and secondary control circuits shall be fuse protected.

2.5 PROTECTIVE DEVICES

 A. A differential pressure switch(s) shall be provided to detect air loss (one for each stack). The switch(s) shall be electrically interlocked with the load application controls to prevent load from being applied if cooling air is not present.

B. An over-temperature switch shall be provided to sense the load bank exhaust in each vertical heater case assembly. The switch shall be electrically interlocked with the load application controls to remove load from being applied in the event of an over temperature condition.

 C. To provide for major fault protection, branch fuses shall be provided on all three phases of switched load steps above 50KW. Branch fuses shall be the current limiting type with an interrupting rating.

 D. The exterior of the load bank shall have appropriate warning/caution statements on access panels.

E The load bank will contain door switches on access doors that will prevent operation of load bank if door is open.

2.6 HMI Controller

A. The Load Bank shall have a 7” color touchscreen HMI housed in a local NEMA 3R type enclosure. The HMI shall contain the following controls:

1. Power ON/OFF
2. Blower START/STOP
3. Load APPLY/REMOVE
4. Load step control via color touchscreen
5. Hard Wired local E-Stop

 HMI Controller shall display the following safety Information:

1. Overvoltage
2. Undervoltage
3. Phase Loss
4. Phase Reversal
5. Current Sense
6. Overtemperature
7. Air Fail
8. Door Panel Closed
9. Control Power/E-Stop

B Load Bank shall automatically check the status of displayed safeties. If any safety issue is detected, the load bank will automatically drop the load and prevent further application until the safety issue is resolved. The HMI will display real time status of load bank safety parameters.

C. The local HMI controller shall have the ability to provide remote control by means of a 25’ communication cable which shall be provided by load bank manufacturer.

D. A standard remote load dump circuit shall be provided as part of the load bank control circuit. Provisions shall be provided to remove the load bank off-line from the operation of a remote normally closed set of auxiliary contacts from a transfer switch or other device. In the event of the remote contact opening, all loads are removed.

E. The load bank shall have an HMI and PLC monitoring system with real-time data logging, load profiling and power analysis. The monitoring system shall provide a display of Voltage, Current, Frequency and Power Measurements.

F Load Bank shall have the ability to provide up to 10 load steps which will include kW and hours/minutes. Load Bank will automatically provide load profiling when “ACTIVATE” Touchscreen Icon is engaged.

**(OPTIONAL)** An Automatic Load Step Controller shall be provided for maintaining a minimum load on the generator set. The controller shall monitor the connected downstream loads and will automatically add or subtract load steps in response to building load changes to maintain a minimum load level on the generator set. The controller includes an initial time-delay circuit, and automatic time delayed load step application circuit. A remote contact closure is required for activation and transfer of control. A separate (customer supplied) split core current transformer shall be supplied loose for sensing of downstream loads.

G Load bank shall utilize IEC contactors and relays which provide reliable electronic and thermal protection. Definite Purpose (DP) contactors shall not be used as they have exposed coils and require additional environmental protection for reliable operation.

2.7 DOCUMENTATION

A. Installation and operation manuals shall be provided with the equipment and shall include complete details for the installation, commissioning, operation, and maintenance of the load bank.

B. The manuals shall include the electrical schematic and interconnect drawings for the power and control wiring for the load bank and all control devices.

C. A complete parts list with part numbers, device identification, and rating shall be included in the manuals. The original manufacturer’s name and part number shall be included in the parts listing.

D. Two (2) sets of manuals shall be provided with the load bank.

**PART 3.0 QUALITY ASSURANCE**

3.1 QUALITY CONTROL

 A. The load bank shall be fully tested using a test specification written by the supplier. Tests shall include electrical functional testing, verifying conformance to assembly drawings and specifications. Each load step shall be cold resistance checked to verify proper calibration of resistive load steps and proper ohmic value.

 B. Tests using high potential equipment shall be performed to ensure isolation of the load circuits from the control circuits and to determine isolation of the load circuits from the load bank frame. Tests of all safety circuits shall be performed to verify conformance to the specification.

 C. All electrical circuits shall have a high potential insulation resistance test performed at twice rated voltage plus 1000 VAC to assure insulation integrity.

 D. All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.

 E. The Company’s Quality System shall be ISO9001 Certified.

3.2 QUALIFICATIONS OF MANUFACTURER

A. The load bank shall be manufactured by a firm regularly engaged in the manufacture of load banks and who can demonstrate at least twenty-five (25) years’ experience with multiple installations of load banks similar (or equal) to the ones specified herein.

 B. The manufacturer shall have a written Quality Control procedure available for review by the

purchaser, which will document all phases of operations, engineering, and manufacturing.

 C. Manufacturer must have a field service organization with service personnel having a minimum of an Associate Degree in Electrical Engineering.

 D. The load bank shall be as manufactured by:

Universal Load Banks, 28200 Lakeview Ave, Wixom, MI 48393

Email: sales@universalloadbanks.com

Website: www.universalloadbanks.com