



Operating and Maintenance Manual

AC200 load bank

200kW at 400V AC 3-Phase

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Operating and maintenance manual

200kW load bank rated at 400V AC 3-phase with 5kW steps



Figure 1 - Product photo.

1) Warnings

Prior to use

Operators of this equipment should be of suitable competency to perform electrical testing and must have read and understood this document.

First use

ELECTRIC SHOCK HAZARD! Electric shock can lead to severe injury or death. If the load bank has been damaged in transit, do not operate until a competent technician inspects the unit and determines that it can be operated safely.

Check the equipment for obvious damage. Document and report any exterior damage immediately.

During use

Review the safety requirements stated in this document (Section 3) before using the equipment.

FIRE AND BURNS HAZARD! When using the load bank, the exit grill and adjacent covers will become dangerously hot to touch and remain hot for approximately after testing is completed, whilst the load bank performs its cooling down period. The exiting air will also be hot ~100°C above ambient at 1m from the exit grill.

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2) Product specification

Ratings

Voltage, V 400, 3-phase
 Frequency, Hz 50
 Load steps, kW 5, 10, 15, 20, 50, 100
 Total capacity, kW 200

Operating environment

Service condition Outdoor use
 Ambient temperature -10°C to 50°C
 Humidity 95% RH
 Ingress protection IP23 Load enclosure
 IP54 Control compartment

Control and ventilation

Manual controls System on/off pushbuttons, supply rotary selector switch, emergency stop
 Control interface 7" touch screen display
 Cooling Forced convection, horizontal orientation
 Fan(s) 1 x 2.7kW fan, axial type
 Control supply 400V 3-phase, 3-wire AC
 Source Internal (supply under test) or external supply (recommended)

Construction

Resistor elements Stamped grid and wire coils
 Element material Stainless steel
 Enclosure Dual layer; galvanized sheet steel, painted RAL9002 grey
 Manoeuvrability 4 x heavy duty castors, forklift pockets.

Connection interfaces

Load connections 5 x Powersafe sockets (3P+ N + PE)
 Control supply 1 x EN 60309 3P+PE 16A
 Data downloads USB Type-A
 Networking/remote 2 x RJ45

Weight and dimensions

Drawing reference 164043
 Length, mm 1175
 Width, mm 806
 Height, mm 1370
 Weight, kg 240

Safety

Electrical protection Over current and short circuit fuse protection
 Over voltage protection (via control system)
 Thermal protection PT100 monitoring (load and control compartments)
 PT100 healthy status
 Airflow status



3) Safety

General

When using this equipment basic precautions should always be followed to reduce the risk of fire, electrical shock, and injury to persons, including the following:

- 1) Do not operate the load bank with a damaged cables or plugs or after the malfunction of the equipment itself or if it has been dropped or damaged in any manner. Discard the load bank or return to authorized service facility for examination and/or repair.
- 2) Always unplug the load bank when not in use.
- 3) Do not use the load bank in areas where flammable liquids are used or stored.
- 4) Before use perform a visual inspection of the resistor duct by shining a torch into each end of the duct (fan side and resistor bank side) and ensure there has been no ingress of materials, vermin etc. that could impede the airflow or cold ignite once the resistor elements are hot.
- 5) Perform a walk around of the equipment and ensure all fixings are tight. If there are any obvious signs of damage, please contact Power Prove for support before connecting a power source.

Protective earth bonding

ELECTRIC SHOCK HAZARD! The protective earth socket must be connected to an external earth point. Operating without a grounding connection could lead to injury or death.

When the load bank is in operation, the protective earth socket must be securely, electrically connected to an external earth point. The bonding connection provides a low resistance path to earth. This protects the operator from the possibility of electrical shock.

Power Connections

ELECTRIC SHOCK HAZARD! All power connections must be connected or guarded. Failure to do so will expose operators to electric shock, leading to severe injury or death.

BURNS & SHOCK HAZARD! Connecting or disconnecting plugs and receptacles while current is flowing, or voltage is present may cause arcing. Arcing can generate a great deal of light, heat, and possibility of electrocution.

FIRE HAZARD! Do not run cables under carpeting. Do not cover cord with throw rugs, runners, or similar coverings.

TRIP HAZARD! Arrange cables away from high foot traffic areas, where they will not present a trip hazard.

Ventilation

Aside from the connections the most critical aspect of safe load bank operation is the ventilation. Load banks become very hot during operation and failure to provide sufficient ventilation and adherence to the following instructions could cause fire, burns and/or other injuries.

In principle, high volumes of cooling air are needed to prevent load elements from overheating. By their very nature, resistors under load convert electrical energy to heat. This heat must be removed from the unit. The air inlet and outlets are sized to provide the proper amount of cooling air. Preventing or limiting airflow will cause the load bank to overheat.

Typical temperatures of the load bank:

- Resistor elements ~500degC above ambient (light/red glow)
- Air outlet surfaces ~250degC above ambient
- Exhaust air ~100degC above ambient at 1m from the outlet

FIRE AND BURNS HAZARD! Failure to maintain proper housekeeping and properly securing flammable material could lead to fire, burns, and/or injury. Instructions for safe ventilation of the load bank:

- 1) Position the load bank on a flat surface that is free from surface finishes or contamination that are flammable.
- 2) Provide 2m clearance around the load bank inlet and sides, and 4m from the air outlet.
- 3) Never block or obstruct the air inlets or outlets in any way.
- 4) Clear any combustible material out of the test vicinity including light materials that could be drawn into the inlet by the force of the fan suction.
- 5) Material can be moved by the force of the fan airflow and both the air intake and exhaust. Failure to secure material could cause injury to bystanders, damage to the load bank or other nearby equipment.
- 6) Do not let bare skin touch hot surfaces to avoid burns.
- 7) Do not insert or allow foreign objects to enter any ventilation or exhaust opening as this may cause an electric shock, fire, or damage the heater/load bank.
- 8) Always permit the load bank to run its cooling cycle at the end of a load run, this allows the resistor elements and supporting insulation materials to cool properly. Failure to do so may shorten the resistor element service life.
- 9) Ductwork must not be attached to either the air intake or exhaust of this load bank. This will cause a backpressure that may be harmful to the resistors.

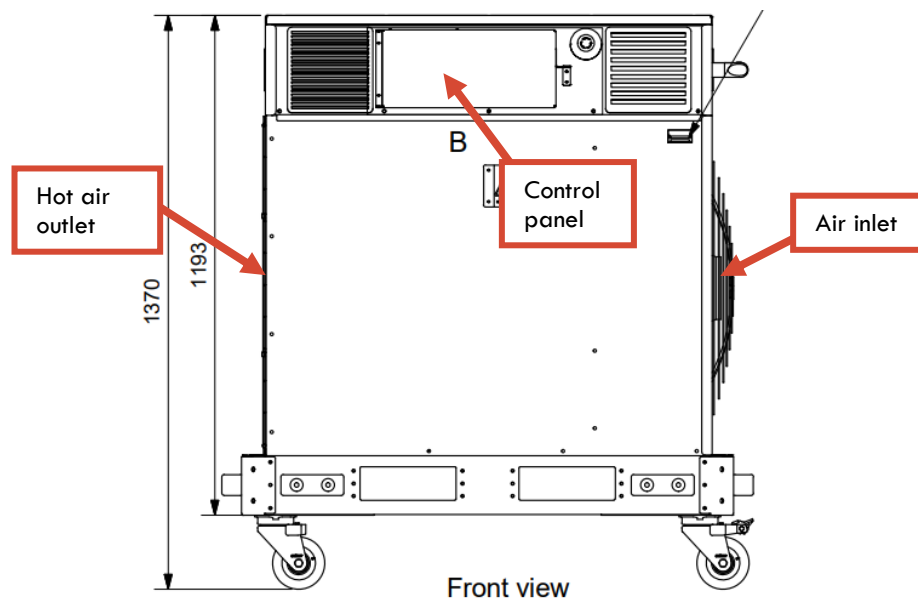


Figure 2 - Unit front view showing ventilation areas

4) Operating Instructions

IMPORTANT! Read section 3, safety instructions before continuing.

Connections

Ensure the protective earth connection is made first, then connect the external control supply if (as recommended) you are using this, and finally the load power connections (See Figure 3). Otherwise ensure the unit's Control Source switch is properly set and the voltage input to the Powersafe sockets is appropriate to supply the units control circuits as well as the full load.

Connection sockets to be used for 1-phase operation are shown in Figure 4 **Error! Reference source not found..**

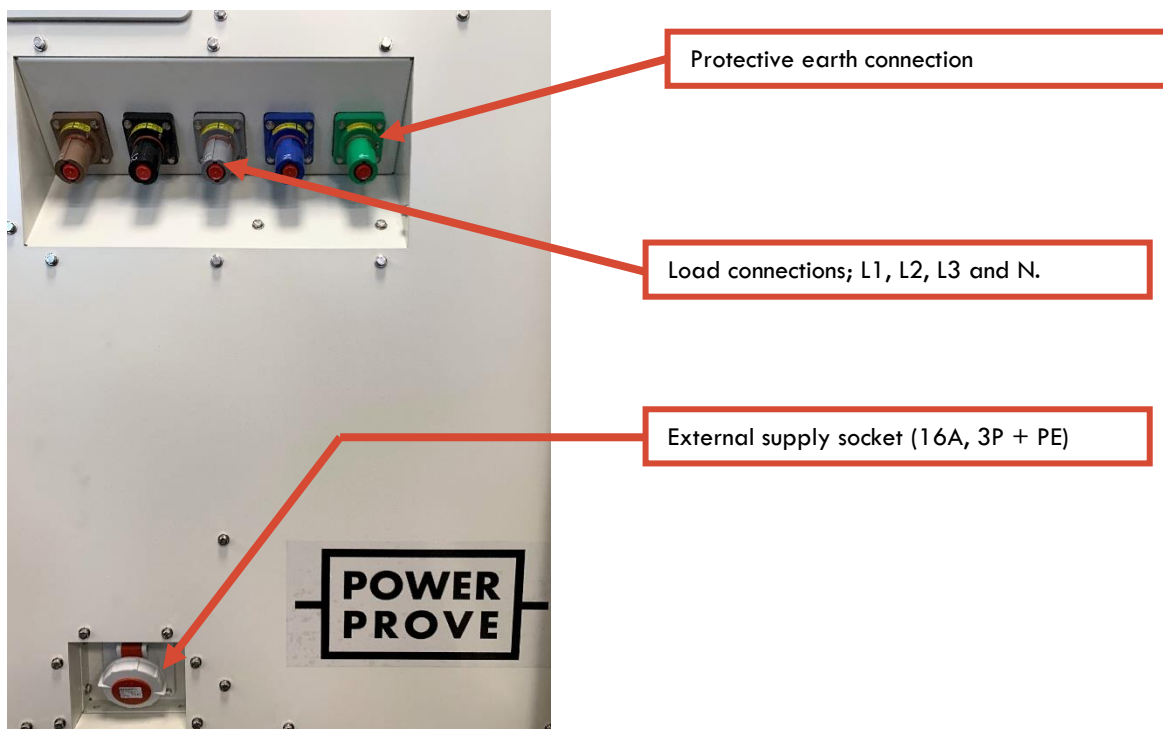


Figure 3 - Powersafe load connections, control power (C14 socket) and Protective Earth stud

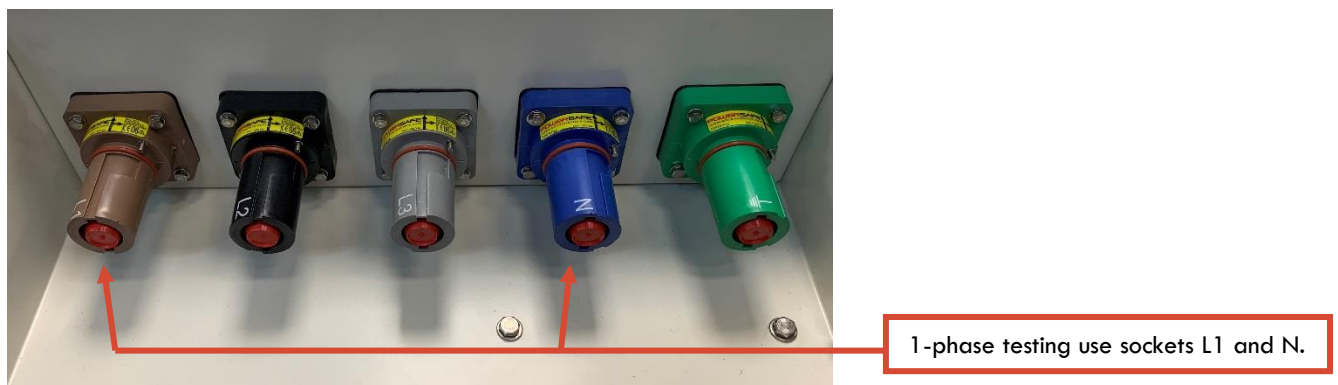


Figure 4 - Load power connections showing 1-phase configuration.

Controls

The load bank is controlled from the panel fitted to the load bank behind the padlock-able access door – see Figure 5.

IMPORTANT!

The unit is also fitted with an emergency stop button, located outside of the area covered by the control access door to always be accessible. The emergency stop cuts power to the load contactors and the load cooling fans. Using the emergency stop will mean the latent heat of each resistor element is retained and the load bank will take a significant period to cool down. Therefore, use of the emergency stop should be reserved for its intended purpose and the controlled shut-down process described later should be used for all other occasions.

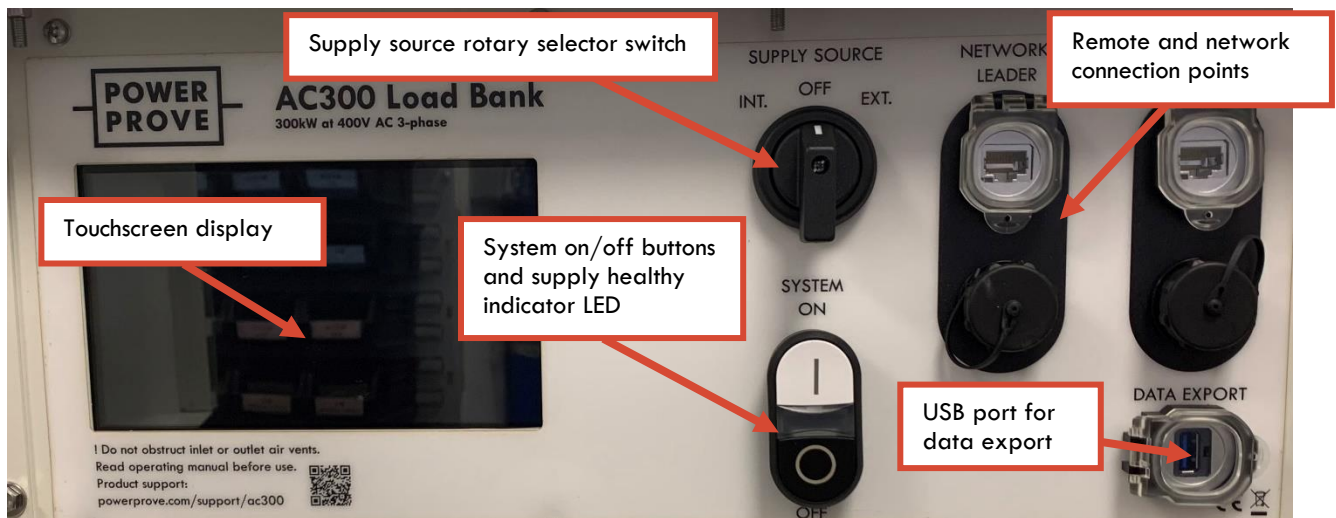


Figure 5 – User control panel.

Pre-start-up

1. Check housekeeping in the area in which the load bank is operating and rectify anything that is unsafe or does not comply with the safety instructions in section 3. Failure to do this presents a significant fire hazard.
2. Connect the load bank's protective earth connection to a known external earth point.
3. Ensure all power supply and load connections are well made, no conductors are exposed, cable sizes used are appropriate and suitably positioned for the conditions.

Start-up

1. The control circuitry including the load and cabinet cooling fans can either be supplied directly from the main load connections or from a separate supply using the provided 16A 3-phase socket. The latter is preferred because should the supply under test cut off the cooling fans will be supplied ensuring the load bank is not left without cooling. Select the supply source using the selector switch.
 - i. "INT." or internal uses the main supply connected to the load Powersafe sockets.
 - ii. "EXT." or external uses supply from the 16A commando socket.

The white LED in the system on/off cluster should now be illuminated indicating the control circuitry has power.

The cabinet conditioning circuit (ventilation fans and anti-condensation heater) now has power and will begin to operate.

2. Switch on the system using the white ON button marked "I". The internal control system computer will now begin its start-up boot sequence, this will take around 2 minutes. When the boot sequence is complete you will see the Human Machine Interface (HMI) displayed on the touchscreen monitor.
3. The system status will be displayed as "IDLE" – see Figure 6.

DIGILOAD HMI

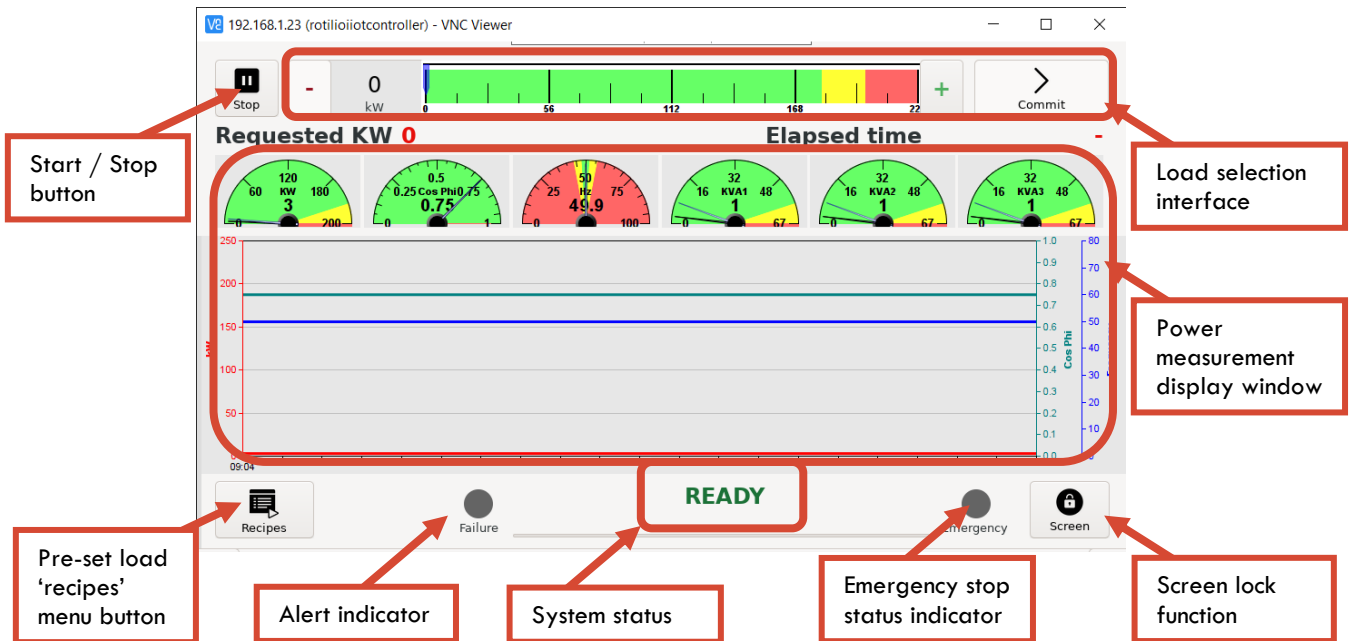


Figure 6 - DIGILOAD HMI interface

Applying & disconnecting load

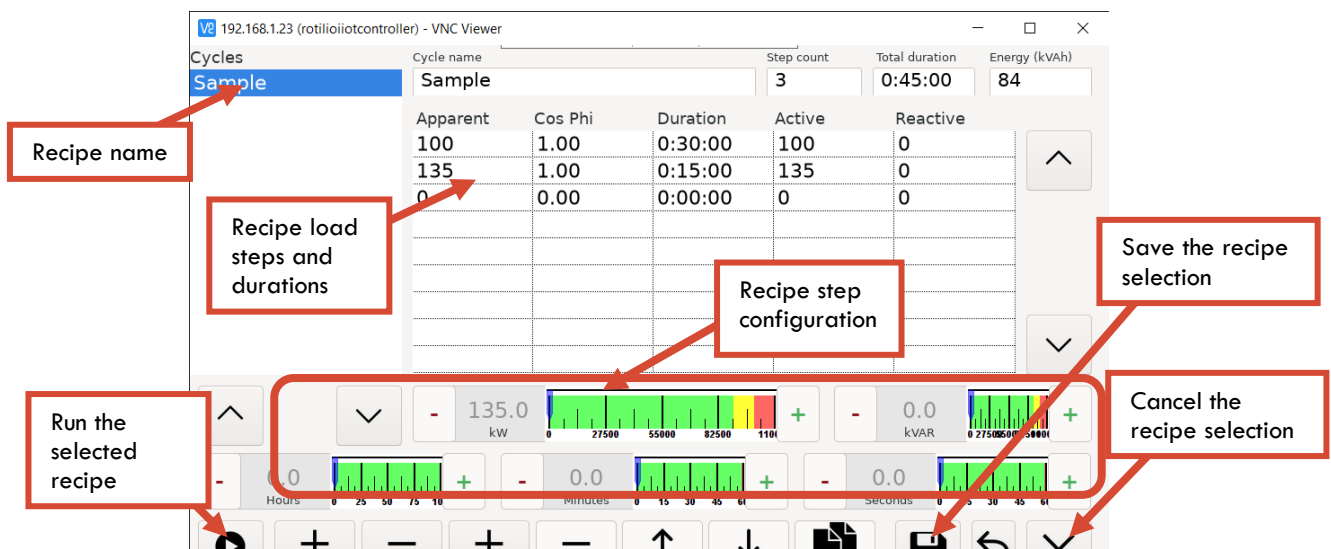
1. Before any load can be applied the fan must be running. With the control system status displayed as IDLE, start the fan using the Start/Stop button in the top left corner for the HMI.
2. When the fan has started the system status will change from "IDLE" to "READY". Check that the airflow is in the right direction, into the fan and out of the resistor bank grill.
3. To apply load press and hold the "+" or "-" buttons until the desired load is shown in the load selection window and then press "Commit" to confirm the selection. The appropriate contactors will immediately operate, and the load is applied.
4. The power measurement window will display the measured values confirming the load applied to the device under test.
5. Further adjustments to the load can be made by repeating the process described in point 3.
6. When the testing is complete simply press the "Start/Stop" button which will change state to show "Confirm". Press again to confirm and the load bank status will change to "COOLING DOWN". This sequence ramps down the load and then continues to run the fan for the required cooling time. The cool down progress bar is displayed below the system status.
7. Once complete the system status will return to IDLE and the load bank can be switched off by pressing and holding the black off button marked "O" for 5 seconds. The internal PSU contactor will de-energise and the HMI screen will switch off.

Switching off and disconnection

- Once the HMI display is off, the control system powered down. The internal control supply still has power - as indicated by the white LED. This can be switched off using the rotary selector switch.
- The power connections can now be disconnected in reverse order (protective earth last) and the unit is ready for storage. Note – there may still be some remnant heat in the load bank and so caution is still advised in terms of proximity to flammable materials and still permit free movement of air for at least 1 hour after use.

Load cycles ‘recipes’

The load bank can run a series of different load levels that can be pre-programmed and recalled at any time. In addition, the load bank records each load test completed and can be recalled from the same menu.



HMI Menus

The DIGILOAD HMI has some slide out menus to give access to additional parts of the system. These are accessed from the arrow icons along the bottom edge of the screen. There are 3 arrows positioned in the bottom left, bottom centre and bottom right respectively.

Alerts menu

The central arrow brings up the system status menu which included the status of the feedback from each load contactor, the PT100 temperatures measurements and alerts when they occur.

For each contactor the letters “O” or “C” are displayed for open or closed respectively.

When an alert occurs the load bank will immediately perform a controlled shutdown. This is where the load steps a switch off one at a time and the cool down timer is run on the fan.

When an alert is cleared i.e., a temperature falls back into range, press the “Alerts rest” button to clear it and enable the load bank to be run again.

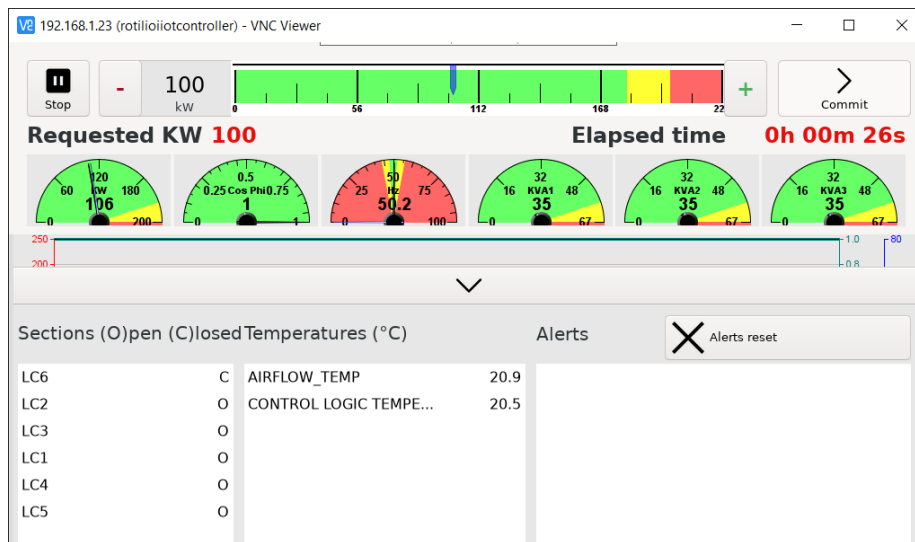


Figure 8 - Alerts menu

Operating mode menu

The bottom right arrow brings up the operating mode menu. This permits the user to select the voltage being applied (if different to the nominal design value of the load bank) so that the system can scale the load steps accordingly. It also allows the user to limit the power of the load bank when being used to test a supply with a lower power rating than that of the load bank itself. This is done by adjusting the load bank power using the plus and minus buttons.

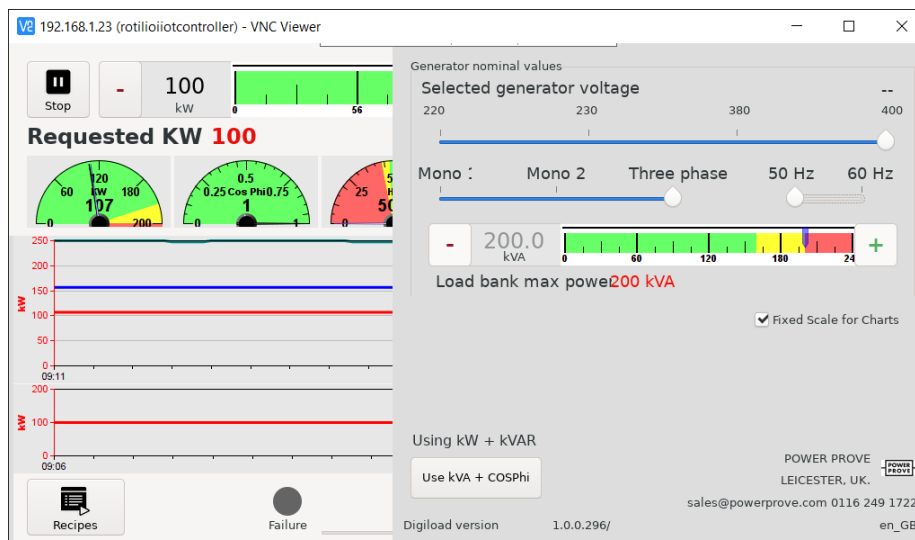


Figure 9 - Operating mode menu

Power measurements menu

Use the arrow icon in the bottom left corner of the HMI to display the power measurements menu. Here all the measured voltages, currents and power values are displayed as numeric values. The user can select which set of values to display on the main screen from the buttons labelled with the corresponding units of measure.

As with all the menus the parameter display menu can be opened at any time whether load is being applied or not. This screen can be particularly useful if the user wishes to read a precise value.

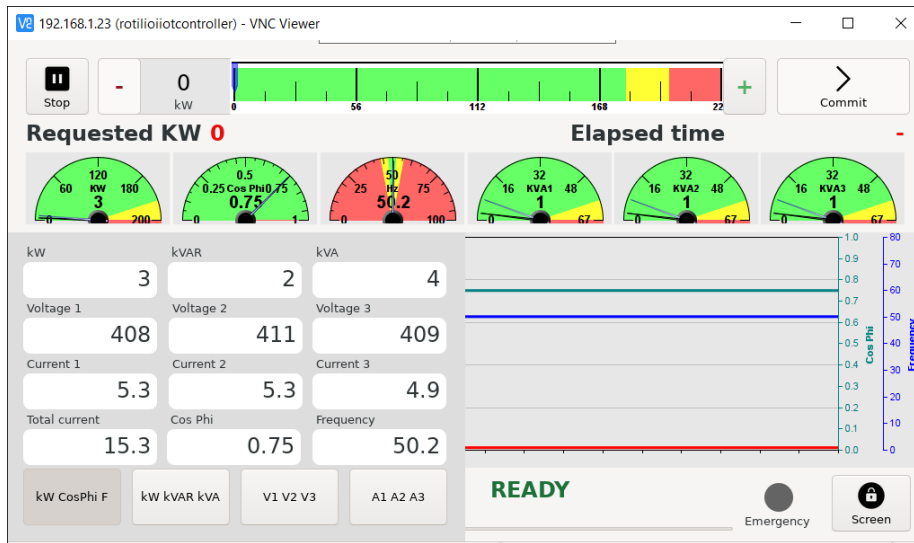


Figure 10 – Power measurements menu

Lock screen

To prevent accidental button presses during testing the HMI can be locked using the icon on the home screen. To unlock the screen simply press each of the 4 buttons.

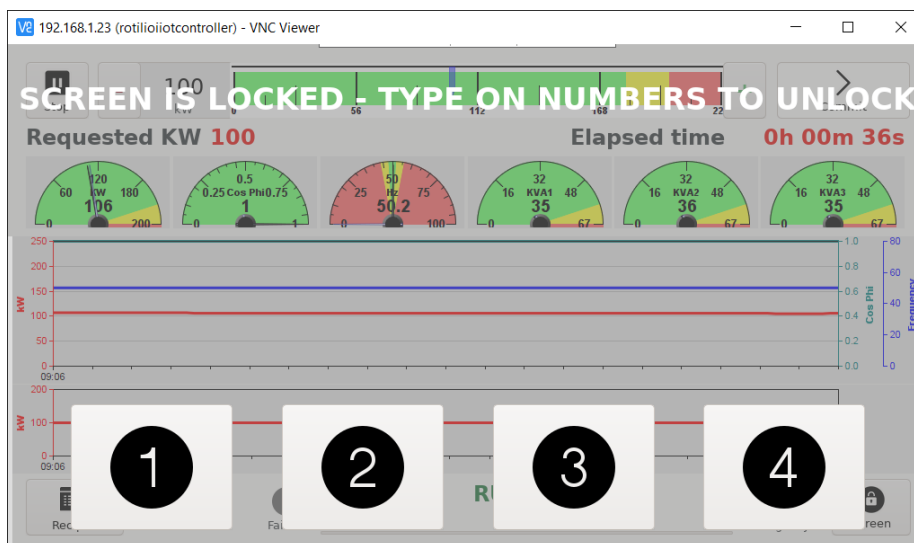


Figure 11 - Lock screen

Exporting test data over USB

The load bank is equipped with a panel mounted USB port and the DIGILOAD system prepares all recorded power data for export after each test completed.

To download the test data simply insert a FAT32 formatted USB drive into the port. The data download will immediately begin, and the HMI will display a message to that effect. Do not remove the USB drive until instructed to do so.

It may take a few minutes for the data export process to complete; depending on the amount of data stored and the speed of the USB drive used.



The data exported will be in a .CSV file which can be opened with all common spreadsheet software. The recorded data is formatted into columns by parameter.

5) Maintenance

The load bank is designed to require minimal maintenance, a list of required maintenance checks is listed below in table 4.

The separate (external) 3-phase supply can be used to check the fan is operating correctly and to perform an insulation resistance and load resistance test every 6 months. With control circuit powered from the external supply, run the fan, and use the HMI to close all contactors (see load to 200kW and all contactors will close). Connect a suitable test device (insulation tester and digital ohmmeter) to lug connections of the protective earth and power connection cables to make the contact with the internal connectors. When checking the resistance ensure the resistance of the cables being used is taken into consideration.

Action	Frequency
Walk around the unit and inspect for: a) Obvious damage b) Loose hardware	Every use
Inspect resistor duct – visual inspection	Every use
Insulation Resistance Test	Every 6 months
Cold Resistance Check (0.8Ω Line to Neutral per phase)	Every 6 months

Table 1 - Routine maintenance checks table

Further maintenance should be completed by the manufacturer. Please contact us to arrange for the load bank to be booked in for inspection, repair, and re-test.

6) Spares


Enquire with reference to resistor product code and serial number, as shown on rating plate.

We offer a full equipment inspection, repair (when necessary) and re-test service for any of our load banks at our headquarters in Leicester, UK.

7) Waste Electrical & Electronic (WEEE) Disposal Instructions

European directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE) GB this appliance is marked according to the European directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE). By ensuring that this product is disposed of correctly. You will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate disposal of this product.



The symbol  on the product, or on the documents accompanying the product, indicates that this appliance must not be treated as municipal waste. Instead, it must be handed over to a licensed waste carrier and waste broker approved by the Environment agency under the Waste (England and Wales) Regulations 2011.