GeneratorJoe

AVTRON

LOAD BANKS

50 HERTZ BUYER'S GUIDE

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ISO 9001 CERTIFIED
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Avtron Manufacturing

Since 1953, Avtron has been a leader in the design and manufacture of high quality and reliable products intended for very demanding industrial applications. Avtron's products include:

- Resistive and Reactive Load Banks
- Industrial Resistors
- Aircraft Electrical Test Systems
- Digital Instrumentation Systems
- Digital Control Systems

Avtron is 100% committed to maintaining the high standards that you have every right to expect – in Design, Manufacturing, and Product Support.

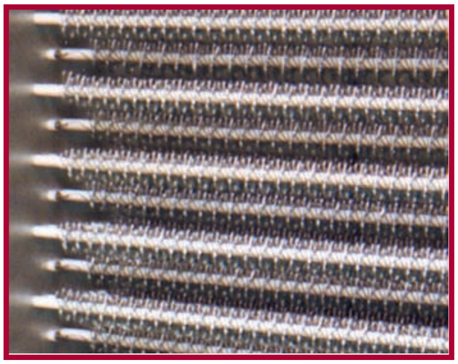
Decades of extensive experience provide Avtron with capabilities for satisfying any load bank design requirement.

Quality System Certified to ISO 9001

Avtron's Quality System is certified to meet ISO 9001 standards. This means that Avtron products consistently meet high quality standards.

Avtron Load Banks

Load Banks are devices designed to provide electrical loads for testing power sources such as generators and Uninterruptible Power Supplies (UPS). Load banks are also used to reduce "wet stacking" problems in diesel engines of backup generating systems.



Avtron's Helidyne™ elements are fully supported and operate at low temperatures for longer life.

Most Avtron resistive load banks feature Helidyne™ resistive elements. These Avtron designed and manufactured elements are made of a corrosion resistant chromium alloy and are fully supported across their entire length on stainless steel support rods with segmented ceramic insulators. Elements are carefully selected to operate at low temperatures to provide extended, reliable performance, eliminating the need for a "cool down" period after load bank operation.

Applications

Load banks can be used in a wide variety of applications, such as:

- Factory testing of engine generator sets
- To reduce "wet stacking" problems
- Periodic exercising of stand-by engine generator sets
- UPS system testing
- Battery system testing
- Ground power testing
- Load optimization in prime power applications
- Factory testing of turbines

Avtron manufactures both the load banks and the auxiliary equipment necessary to handle these and other applications. Contact your Avtron sales representative for complete support in choosing the best load bank system for your requirements.

Improve Reliability of Generator Set

Industry trade organizations and manufacturers both agree that a well planned preventive maintenance program is vital to the reliable operation of a standby generator. Load Banks are an essential part of such a program. Load Banks provide a practical means to test the system without interruption to the critical loads.

The primary cause of diesel engine failure is "wet-stacking" ("wet" unburned fuel accumulating in the engine "stack"). It is caused by under-loading of the generator. Diesel engines that are lightly loaded, or allowed to idle for long periods, never reach their recommended operating temperature. Over time, unburned fuel coats the combustion chamber, reducing engine rating, efficiency, and life span. A preventive maintenance plan that includes load testing of a diesel generator set, will reduce the harmful effects of "wet-stacking" and increase engine life.

Advantages of Aluminized Steel Construction

Load Banks convert electrical energy into heat. The majority of this heat is dissipated away from the device by the cooling fan. However, the enclosure itself absorbs a portion of the generated heat. As such, these products must be constructed out of a material that can withstand this thermal environment. Avtron Load Bank enclosures are constructed from Aluminized Steel, which offers superior heat and corrosion protection over the more commonly used Galvanized Steel.

Standard Models

Note: *Models shown are available in 60 Hertz Voltages and custom DC designs. For details see 60 Hertz Buyer's Guide or Canadian Buyer's Guide.*

TYPE	MODEL	CAPACITY	MIN. LOAD STEP RESOLUTION	LOAD VOLTAGE	BLOWER VOLTAGE	APPROX. DIMENSIONS (mm) (LxWxH)	APPROX. WEIGHT (kg)
Portable, Resistive, Indoor with Integral Control Panel	K490	5 KW	1 KW	220 VAC; 1Ø; 50 HZ	220 VAC; 1Ø off load bus	320 x 490 x 340	14
	LPH-60	60 KW	5 KW	400 VAC; 3Ø; 50 HZ	110 VAC; 1Ø; 50 HZ	584 x 330 x 610	32
	LPH-80	80 KW	5 KW	400 VAC; 3Ø; 50 HZ	220 VAC; 1Ø external supply	635 x 413 x 740	48
	LPH-150	150 KW	5 KW	400 VAC; 3Ø; 50 HZ	220 VAC; 1Ø; 50 HZ	1207 x 858 x 1353	270
	LPH-300	300 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 50 HZ	1423 x 858 x 1353	360
	LPH-500	500 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 50 HZ	1537 x 851 x 1905	522
Portable, DC	K492	150 Amps DC	1 Amp	26/52 VDC	26/52 VDC or 120 VAC; 1Ø by voltage converter	320 x 490 x 340	14
	LPH-24	500 Amps DC	2.5 Amps	48 VDC	220 VAC; 1Ø	635 x 413 x 740	48
	K571	1000 Amps DC	5 Amps	28 VDC	120 VAC; 1Ø by control transformer	575 x 712 x 1588	133
		1000 Amps DC	50 Amps	52 VDC	120 VAC; 1Ø by control transformer	575 x 712 x 1588	133
Trailer-Mntd, Outdoor, Resistive	K580	750 or 1000 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; 50 HZ	5284 x 2363 x 2134	1800
	LTV-1400	1400 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø	4775 x 2363 x 2998	2475
	LTV-2100	2100 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø	5284 x 2363 x 2988	3150
Radiator/ Duct Mount	K711/K711 A	10 to 1000 KW	as required	400 VAC; 3Ø; 50 HZ	N/A	customer defined	–
Permanently Mounted Installed, Outdoor, Resistive with Remote Control Panel	LSH	50, 75, 100, or 150 KW	5 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; 50 HZ; 1HP	1296 x 674 x 889	225
	K675A	200 to 400 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; 50 HZ	1740 x 1182 x 1321	405
	K575A	500, 750, or 1000 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; 50 HZ	1912 x 2134 x 1283	810
	K975A	1500 to 2000 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; 50 HZ	1912 x 2134 x 2566	1620
	K875A	750 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	(1) 10 HP; 400 VAC	1016 x 1499 x 3505	675
		1400 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	(2) 10 HP; 400 VAC	2032 x 1499 x 3505	1350
		2100 KW	5 or 50 KW	400 VAC; 3Ø; 50 HZ	(3) 10 HP; 400 VAC	3048 x 1499 x 3963	2250
	K875A-MV	750 KW	5 or 50 KW	5 kVAC to 15 kVAC; 3Ø	(1) 10 HP; 400 VAC	4191 x 1524 x 3760	4500
		1400 KW	5 or 50 KW	5 kVAC to 15 kVAC; 3Ø	(2) 10 HP; 400 VAC	5842 x 1524 x 3760	6750
		2100 KW	5 or 50 KW	5 kVAC to 15 kVAC; 3Ø	(3) 10 HP; 400 VAC	7011 x 2134 x 3823	9000
	K922A	3000 - 6000 KW per module	500 or 1000 KW	5 kVAC; 3Ø to 15 kVAC; 3Ø	(4) to (8) 10 HP; 400 VAC	4750 x 2591 x 4877	5850 - 7650
Permanently Installed, Reactive	K841	150 to 375 KVAR	3.75 KVAR	400 VAC; 3Ø; 50 HZ	120 VAC; 1Ø; 1/8 HP by integral control transformer	1372 x 1321 x 2337	2250
	K841B	375 to 600 KVAR	3.75 or 30 KVAR	400 VAC; 3Ø; 50 HZ	120 VAC; 3/4 HP by integral control transformer	2947 x 1677 x 2032	2700
		750 to 1500 KVAR	3.75 or 30 KVAR	400 VAC; 3Ø; 50 HZ	120 VAC; 3/4 HP by integral control transformer	3658 x 1677 x 2032	4500
Skid-Mntd, Outdoor, Res./Reac.	LPS	1400 KW; 1050 KVAR or 2100 KW; 1575 KVAR	5 KW; 3.75 KVAR or 20 KW; 15 KVAR	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø	6477 x 1931 x 2769	5850
Containerized Resistive and Reactive	LCV	1400 KW, 1050 KVAR or 2100 KW, 1575 KVAR	5 KW; 3.75 KVAR or 20 KW; 15 KVAR	400 VAC; 3Ø; 50 HZ	400 VAC; 3Ø; (3) 10 HP	6096 x 2439 x 2743	9000 to 13500

Note: *Other models with different KW/KVAR and Voltage ratings are available on request. Specifications are subject to change without notice.*

Permanent Load Banks

Avtron's permanently installed resistive load banks are ruggedly constructed units typically rated between 50 KW and 2100 KW.

Designed for outdoor operation, these units feature highly reliable Avtron Helidyne™ load elements. These elements are mounted in enclosures equipped with screened and louvered intake and exhaust openings to protect against debris, and are cooled by heavy duty blowers.

These units are provided with a gasketed and heated enclosure to protect contactors and other components from condensation related problems.

Remote control panels are provided with each unit, ready for rack mounting, or installed in a NEMA-type wall-mount enclosure.

Horizontal airflow, resistive load bank from 50 KW to 150 KW (model LSH).

Horizontal airflow, resistive load bank from 200 KW to 400 KW (model K675A).

Space saving high capacity vertical airflow load bank from 700 KW to 2100 KW (model K875A).

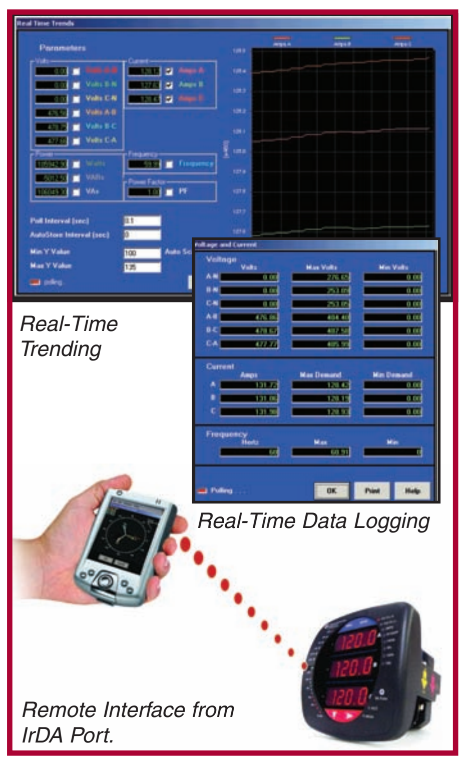
1250 KW to 2000 KW (model K975A).

Advanced Digital Monitoring System

The Avtron Advanced Digital Monitoring System (ADMS™) is a Multi-Function Digital Power Meter that provides 3-line digital display of Voltage, Current, Frequency, and Power Measurements. Unlike conventional meters, the large 0.56" extra-bright LED's allow the user to clearly monitor the meter display under any condition 24/7. The meter faceplate features an optical IrDA port for data transfer and comes complete with an IrDA/USB adapter for "plug and play" convenience. Meter parameters are captured from the IrDA port and can be downloaded to your PC or PDA. The Communicator EXT™ software provides Real-Time Monitoring and Data Acquisition from your laptop PC, allowing the user to display meter parameters in Real-Time Trending or Real-Time Data Logging format. Data can automatically be recorded and saved to your computer which can be easily imported into a Windows™ spreadsheet.

This rugged metering system is designed to save both time and money. It virtually eliminates the need to manually record load bank values during a load test.

The ADMS™ meter is provided as a standard feature on most portable load banks and as an option for many other models.



Portable Load Banks

Avtron's complete line of portable resistive load banks range (in size) from 10 KW to 500 KW. For larger ratings, Avtron can provide trailer mounted models to satisfy most load testing requirements at remote sites.

Built to resist vibration encountered during transportation, Avtron portable load banks are lightweight, compact, reliable, and save money because they last long.

These Avtron units feature durable Helidyne™ resistive elements cooled by high volume blower assemblies and integral operator control panels. Switches on the control panel actuate contactors to safely isolate the operator from high voltage circuits. Control power is usually derived from the power source under test. The ADMS™ Digital Metering system is standard on units rated 25 KW or higher.

Avtron's portable load banks are constructed using heavy gauge aluminized steel for years of reliable service. These units are fitted with casters or rubber shock mount feet for easy movement from one test site to another using common pickup trucks or vans.

The LPH load bank (300 KW) is compact and is easily transported.

The LPV load bank (500 KW) is equipped with lockable casters for easy repositioning.

Hand Carried Portable Load Banks

Avtron produces three small portable load banks. The model K490 is an AC load bank designed for indoor use that provides up to 10 KW load at 220 VAC, 1 phase. Due to its small size, the K490 is easily transported to any job site.

The LPH-60 load bank is capable of enough to meet with your smaller 3 phase load bank needs, lightweight enough to be easily moved into position, and rugged enough to stand up to years of reliable service in all kinds of shop and field environments.

For DC loading in a hand carried package, Avtron offers the model K492. This unit provides up to 150 amps loading capacity for testing UPS and other DC power sources at either 26 or 52 Volts DC. This unit does not require special tools.

These units are "the load banks of choice" as they provide the right mix of transportability, ease of use, and reliable Avtron construction.

The LPH-60 (above, shown with case) and the K490 (left) are popular and easy to use Avtron load banks.

High Capacity, Ultra Compact, Portable Load Bank

The Avtron LPH Load Bank is rated 80 KW at 400 VAC, 3-Phase, 50 Hz. Designed for continuous operation, this load bank gives users a high capacity load in a lightweight and ultra compact package. Weighing only 48 kg, this load bank is less than half the weight and size of traditional load banks of similar capacity. Built for indoor operation, the load bank is ideal for field testing Uninterruptible Power Supplies (UPS) and small AC generators. The ADMS™ Digital Metering system is standard.

The LPH load bank (80 KW) is ultra compact and lightweight.

Reactive Load Banks

Avtron inductive/reactive load banks (KVAR) are typically used in combination with resistive load banks (KW) to test a generator or power source at 0.8 power factor (lagging). The reactive load bank should be sized at 75% of the resistive load bank KW rating to achieve a 0.8 power factor. The resistive and reactive load banks are connected and operated in parallel.

Models such as the K841 and K841B range from 50 - 1500 KVAR. They are designed for indoor or outdoor permanent installations and come complete with remote operator control panels (19" rack mount or NEMA enclosed).

Avtron's inductive/reactive load banks feature non-saturating single phase and three phase iron core load reactors.

Trailer Load Banks

Avtron offers trailer packages for high power mobile testing at multiple sites. Resistive, Reactive, or DC models are available. The load bank can be supplied loose as a "Trailer-Ready" load bank that is ready for installation on your own locally purchased trailer. The "Trailer-Ready" unit will save on shipment costs and ocean packaging costs.

Remote Hand Held Controller

The Avtron Remote Hand Held Controller is standard on most High Capacity Load Banks (LCV and LPS). The controller is also available as an option on the LTV and K580 Load Banks.

This rugged, compact, and lightweight controller is designed for easy operation. All of the load bank controls are activated by pressing the membrane style keypad. The load bank functions are shown on a backlit LCD display. A hard wired E-Stop push button is also provided in the controller. Communication between the controller and the load bank PLC is via a 200' cable with an MS style connector.

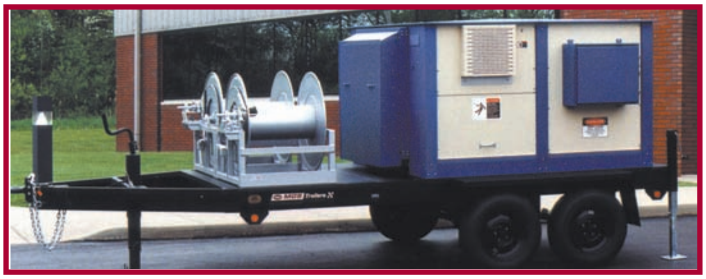
Large capacity reactive load bank (model K841B) available from 375 KVAR to 1500 KVAR.

Installed 375 KVAR units (model K841) can be used individually or in parallel depending on load requirements.

High capacity skid mounted resistive/ reactive load bank (model LPS) available from 875 - 1750 KVA.

High capacity 1400 KW trailer package with optional cable reels (model LTV).

Custom 1000 KW trailer package with all stainless steel construction (model K580).



Standard 1000 KW trailer package with optional cable reels (model K580).

Large trailer package with resistive/reactive load bank (model LCV) and step-down transformer.

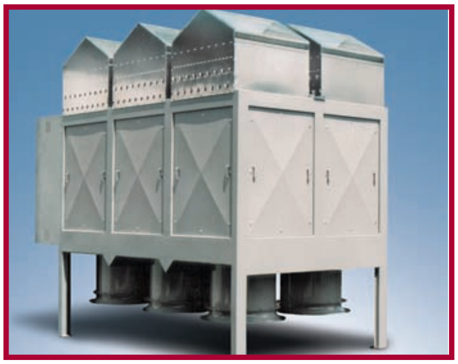
Medium Voltage Load Banks

Avtron is a leading manufacturer of true medium voltage load banks.

These units operate at the actual output voltage of medium voltage generators and therefore do not require large step-down transformers.

A typical module is rated 3 to 5 megawatts and multiple modules are used when tens or hundreds of megawatts are required. Voltages of 3.3, 6.6, and 11 kV are standard. Voltages (up to 15 kV) are available in custom designs.

Also available are conventional load bank and step-down transformer designs (model K875A-MV) mounted on a common structural skid.



Cost effective skid mounted medium voltage load bank system, available from 700 - 1400 KW (model K875A-MV, above).

Model K922A (left) is one of several medium voltage modules used by a large turbine manufacturer.

Radiator & Duct Mounted Load Banks

The Avtron model K711 and K711A load banks are designed for radiator or duct mounting on diesel engine generator sets. The load bank is permanently mounted to the front of the engine generator and sized to match the width and height of the radiator core or exhaust duct opening. The load bank utilizes the engine cooling air rather than an internal cooling fan found on conventional load banks. A top and bottom mounting flange, or removable duct adapter flanges are supplied for mounting and ease of installation.

The load banks are typically sized at 50-60% of the generator KW rating and used to periodically test the generator or to supplement the real generator load to minimize the effects of diesel engine “wet-stacking”.

Capacities range from 10-1000 KW at voltages of 220, 240, 380, 400, 480, or 600 Volts AC, 3-Phase, 50/60 Hz.

Radiator and duct mounted load bank from 10-1000 KW (model K711).

Avtron Neutral Grounding Resistors

Avtron Neutral Grounding Resistors are designed to provide added safety to industrial distribution systems by limiting ground fault current to reasonable levels. In a typical solidly grounded four wire system, the neutral is tied directly to earth ground. This can cause high ground fault current (typically 10,000 to 20,000 amps) and excessive damage to transformers, generators, motors, wiring, and associated equipment. Inserting an Avtron Neutral Grounding Resistor between neutral and ground limits fault current to a safe level (typically 25 to 400 amps) while still allowing sufficient current flow to operate fault clearing relays. Limiting fault current also reduces the problem of transient overvoltages (up to six times normal voltage) which can occur during arcing type ground faults.

Neutral Grounding Resistor rated 3300/1905 volts, 400 amps, 10 seconds.

Power Information

KW - kilowatts
KVA - kilo volt-amperes
pf - power factor
KVAR - kilo volt-amperes reactive

$$KW = KVA \times pf$$

$$KVA = \frac{KW}{pf}$$

$$pf = \frac{KW}{KVA}$$

$$KVAR = \sqrt{KVA^2 - KW^2}$$

The KW rating of the engine-generator set is dependent on the horsepower rating of the prime mover and the electrical rating of the generator.

The KVA rating of the generator is dependent on the current rating of the generator.

Ordering

When ordering or requesting pricing on Avtron load banks, the following information is helpful:

1. Resistive, Reactive, or DC
2. Applied Voltage(s) and Frequency
3. Portable or Permanent Mounting
4. Capacity
5. Load Step Resolution
6. Internal and/or External Control Power
7. Blower Voltage Requirements
8. Indoor or Outdoor Service
9. Core Dimensions and Air Flow (K711 Duct Mount only)

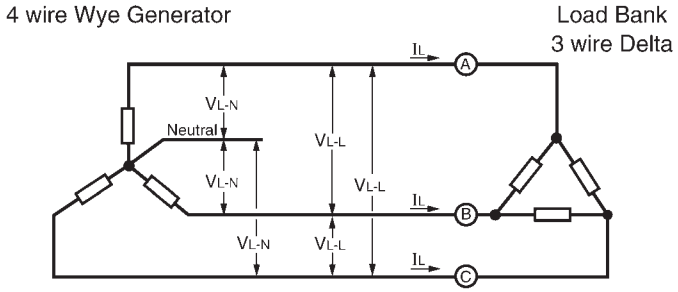
For a prompt quotation, please provide a complete specification via FAX: (1) 216-573-5953, PHONE: (1) 216-573-7600, or E-MAIL: LBsales@avtron.com.

Load Bank Connections

Four wire wye power systems can be easily connected to the standard Avtron load bank by connecting phases A, B, and C to their respective input terminals.

The standard Avtron load bank is a balanced 3 phase load, so the generator's neutral wire is not required.

CONNECTION DIAGRAM



$$V_{L\text{-}L} = V_{L\text{-}N} \times \sqrt{3}$$

$$I_L = \frac{KW \times 577}{V_{L\text{-}L}}$$

$V_{L\text{-}L}$ = Voltage measured Line to Line
$V_{L\text{-}N}$ = Voltage measured Line to Neutral
I_L = Current in Amps

Voltage Derating

Load banks are designed to provide a specific capacity at a rated voltage. They cannot be operated at a voltage higher than their rating without risking damage to the load bank. However, the load bank can be operated at lower voltages.

Load bank derating is calculated as follows:

$$\frac{\text{Applied Voltage}^2}{\text{Rated Voltage}^2} = D$$

$$D \times \text{Rated Capacity} = \text{Reduced Rating}$$

Example:

Question: Can a 500 KW 480 VAC load bank fully load test a generator rated at 300 KW, 380 VAC?

$$\frac{380^2}{480^2} = \frac{144{,}400}{230{,}400} = .6267$$

.6267 x 500 KW = 313 KW
Load Bank Capacity

Answer: Yes, the load bank in this example provides 313KW load at 380V which is higher than the 300KW required

Example of Different Voltages Applied to the LPH-80 Load Bank

TOTAL LOAD KW	VOLTAGE	LOAD STEP RESOLUTION KW
80	400 VAC; 50 HZ	5, 10, 10, 25, 30
86.4	416 VAC; 50 HZ	5.4, 10.8, 10.8, 27, 32.4
72	380 VAC; 50 HZ	4.5, 9, 9, 22.5, 27

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