

Power Information

KW - kilowatts

KVA - kilo volt-amperes

pf - power factor

KVAR - kilo volt-amperes reactive

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

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

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.



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.

Single-voltage Load bank derating is calculated as follows:

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

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

Multi-voltage load bank derating is calculated as follows:

1. When applied voltage is higher than rated voltage $\div \sqrt{3}$

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

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

2. When applied voltage is lower than rated voltage $\div \sqrt{3}$

$$\frac{\text{Applied Voltage}^2}{(\text{Rated Voltage} \div \sqrt{3})^2} = D$$

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

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LOAD BANK

TEST YOUR GENERATORS WITH
KEYPOWER LOAD BANK



Test your generators with KEYPOWER load bank



1. Resistive or inductive type of load. 304 Stainless steel sheathed elements manufactured from high grade nickel-chromium alloys resistive wire covered by 3-year warranty.
2. Rated testing voltage: AC 3P4W, 110-690 VAC 50/60HZ.
3. Cooling mode: forced air-cooled, vertical or horizontal discharge. External utility power or generator power supply for fans.
4. Working mode: load step control. Total testing capacity ranges from 0kw to the max consisting of 10kw, 20kw, 50kw, 100kw load setting switches plus a 0-10kw fine-tuning knob. From 0kw to the max, any load combination is achievable.
5. Load bank features world-famous components to ensure reliable performance and longer service life including: **Schneider Electric** contactors, **SIEMENS** switches, knobs and indicators, **ABB** circuit breakers, **OMRON** intermediate relays, **PHENIX CONTACT** terminal blocks.
6. Parameter measuring accuracy grade: 0.5.
7. Load control accuracy: $\pm 3\%$.
8. Load bank protections: over heating protection, cooling fans failure protection and over load protection with alarm.
9. Control mode: two control modes available: a) Local manual control; b) Optional: Manual control via a remote control panel (max control distance is 20m)."
10. Parameter display and measurement: Control panel contains a **Lovato electric** Multifunction Electricity Meter displaying voltage, current, load power, reactive power, apparent power, power factor, frequency etc. (Optional: a professional generator tester displays and measures all sorts of steady, dynamic parameters as well as harmonic wave, can be connected to a PC for data recording and test report printing)."
11. Operating environment: Altitude: $\leq 3000\text{m}$ above sea level. Ambient temp: $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$ Relative humidity: $\leq 80\%$ ventilated environment without explosive or corrosive dust. Not allowed to use in rainy outdoor environment."



Routine Maintenance of Generators with Load

- Eliminate wet-stacking
- Find out the aging spare parts
- Troubleshooting for generator

**Generator installed over a Year
 Generator repaired**

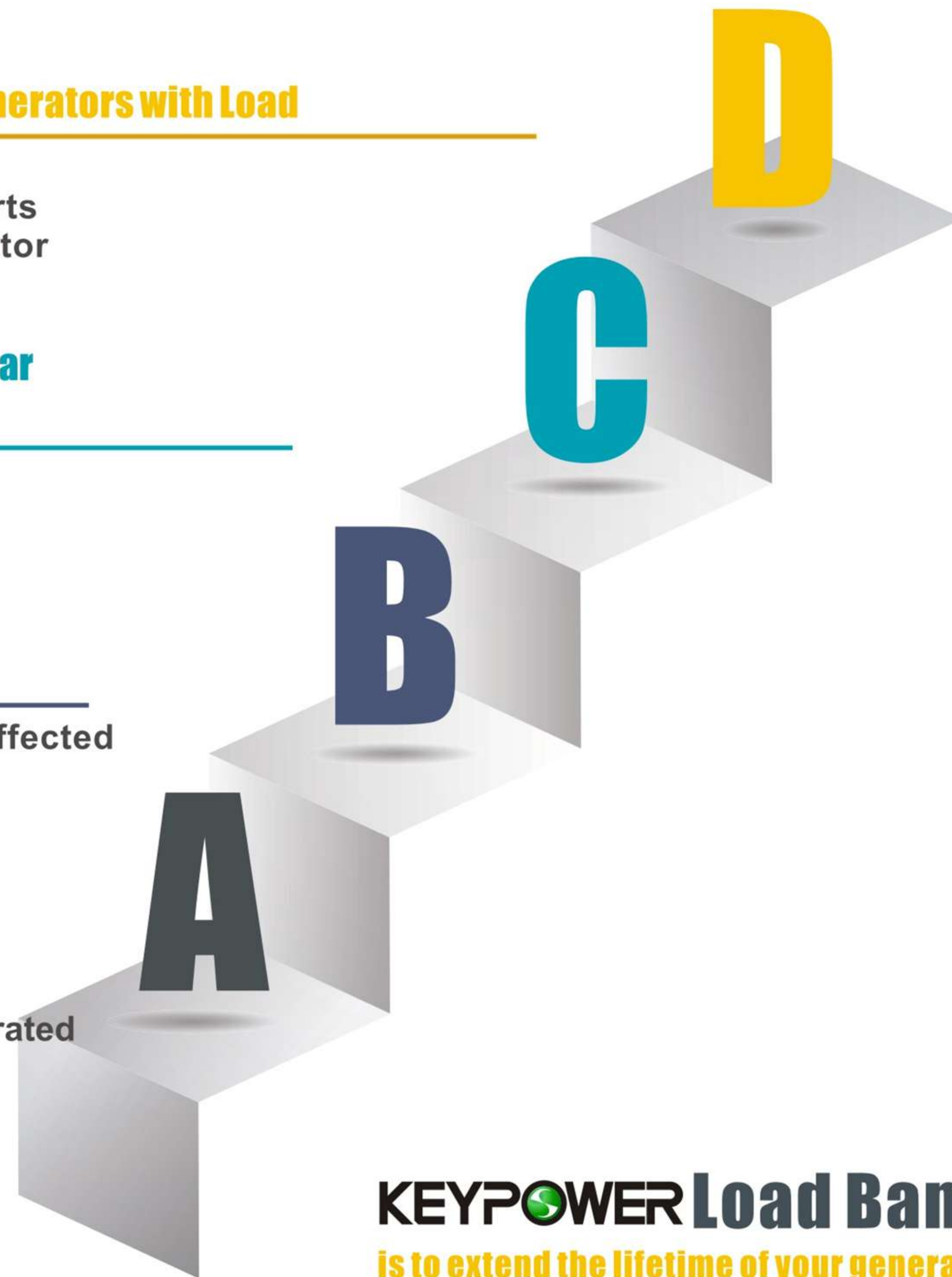
- Test its actual load capacity

Generator after Silencing

- Test if the actual output is affected

Newly Installed Generator

- Projects acceptance
- Test if the power output is as rated



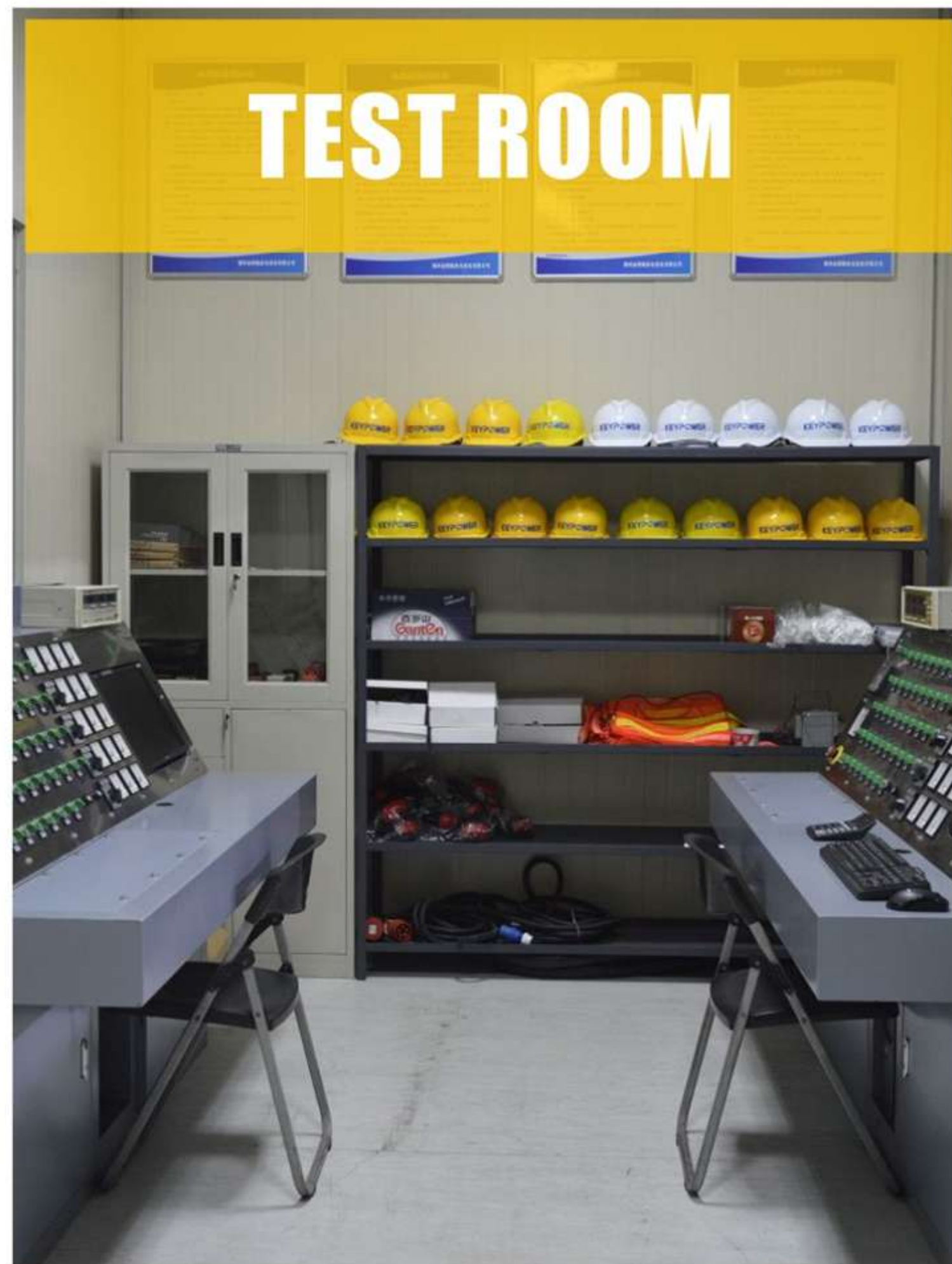
KEYPOWER Load Banks
 is to extend the lifetime of your generators!



- Generator Set
- UPS Systems
- Battery Banks
- Military Power Supply
- Weapon Power Supply System
- Aircraft Power Source
- New Energy Power Source



- Manufacturers & End-users of Generator Set
- Vessel & Offshore Platform
- Oil, Mining, and Metallurgy
- Military & Aerospace
- Data center, Telecom & Communication Operators
- Power Plant, Nuclear Power Plant
- Medical System
- Railway
- Research Institute, University & Schools

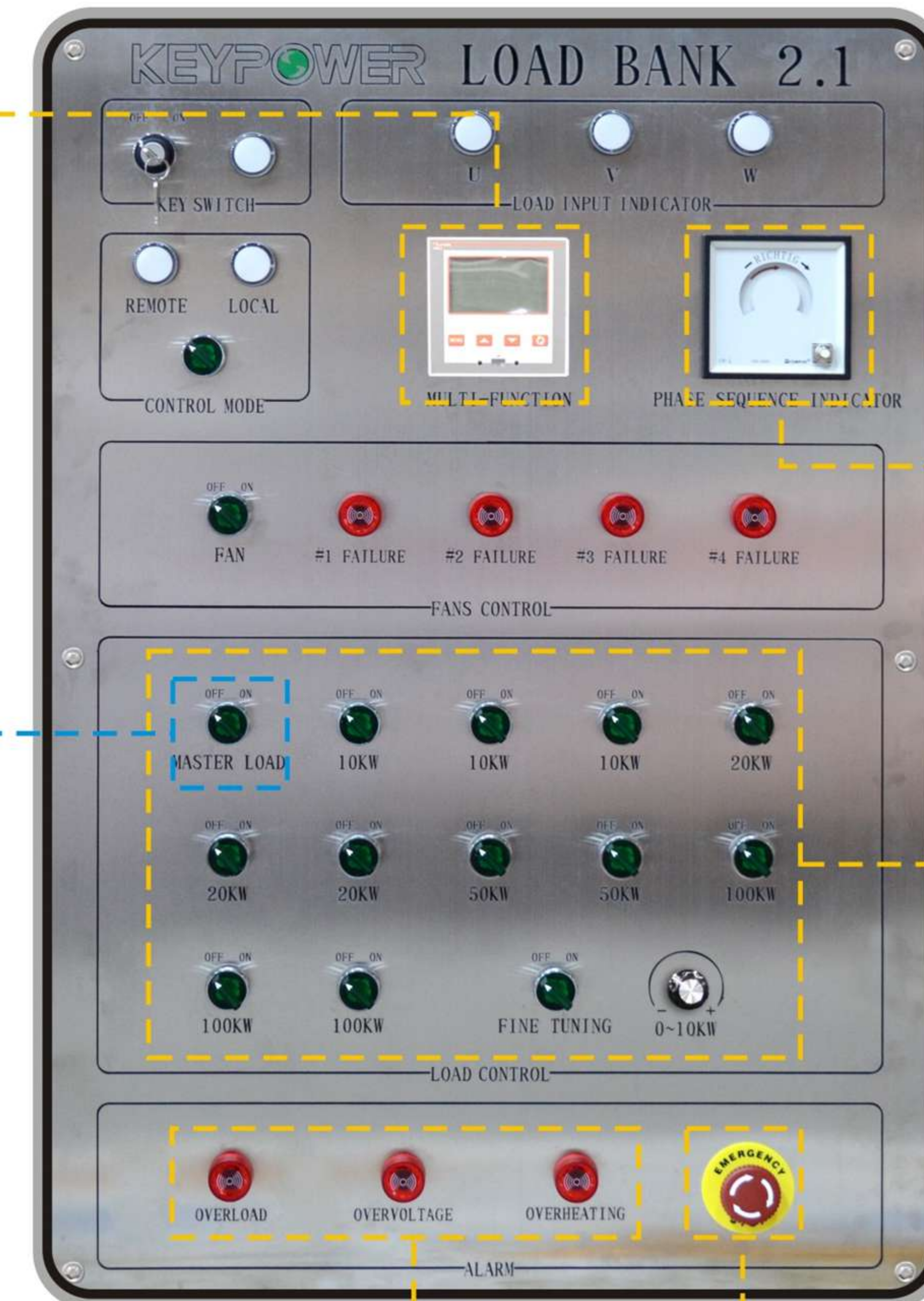


Measurement	Range	Accuracy	Resolution	Overload
Voltage (V)	10.0-500.0V	± (0.4% reading+0.1%range)	0.1V	600V
Current (A)	0.030-5.000A	± (0.4% reading+0.1%range)	0.001A	6A
Power	According to volt range & current range	Power factor=1.0	<200W 0.1W	
		± (0.4% reading+0.1% range)	≥200W 1W	
		Power factor=0.5	≥2kW 10W	
		± (0.8% reading+0.2% range)		
Power factor	0.20-1.00	±0.02	0.001	
Frequency	45-65Hz	±0.2Hz	0.01Hz	
Running time	99h59m	±2min/hour	1 minute	
"Energy (kWh)"	99999kWh	Power factor=1.0	0.001kwh	
		± (0.4% reading+0.1% range)		
		Power factor=0.5		
		± (0.8% reading+0.2% range)		
Harmonic analysis (%)	2-50 times and total harmonic			

LOVATO
MULTI-FUNCTION
METER

SINGLE
STEP LOAD

LOAD BANK
PROTECTIONS



PHASE
SEQUENCE
INDICATOR

SIEMENS
LOAD SWITCHES

EMERGENCY STOP

CONTROL PANEL



Keypower Load Bank, Your Generator Safeguard.



Copper bars and heat-resistant wires



Resistors tested to the core



304 stainless steel sheathed resistors



Schneider contactors

Test report of generator set's steady performance

ISO8528 GB2820-2009 Date of test: 2012-11-15 test time: 17:36:28

(A) technical specification

1:Set type	K1109A	Set NO.	K1109A1007	Item NO.		Set Pr:		power factor	1	power factor	
Rated frequency	60HZ	rate Ur:	127/220V	rate Ir:		Item name					
2:engine type		Engine NO.		certificate of origin:		ex-factory date		governor		governor	
3:generator type	K1109A	Gen NO.	K1109A1007					excitation		excitation	

(B) check item

1: relative humidity:	52%	environmental temperature	22	atmosphere:	kPa	examine the exterior of generator set:						
2: Test of insulation resistance between armature and ground	measure excitation winding grounding insulation resistance					Test of insulation resistance between auxiliary excit winding an ground						
insulation dielectric	phase sequence		check start performance at normal temperature (start 3 times)									
3: check every indication equipment's work condition of control screen	indicating instrument					check overspeed stopp		high water temperature		Test of high cylinders temperature		
low oil pressure protection	check emergency stop		check battery charging									

(C) Load test

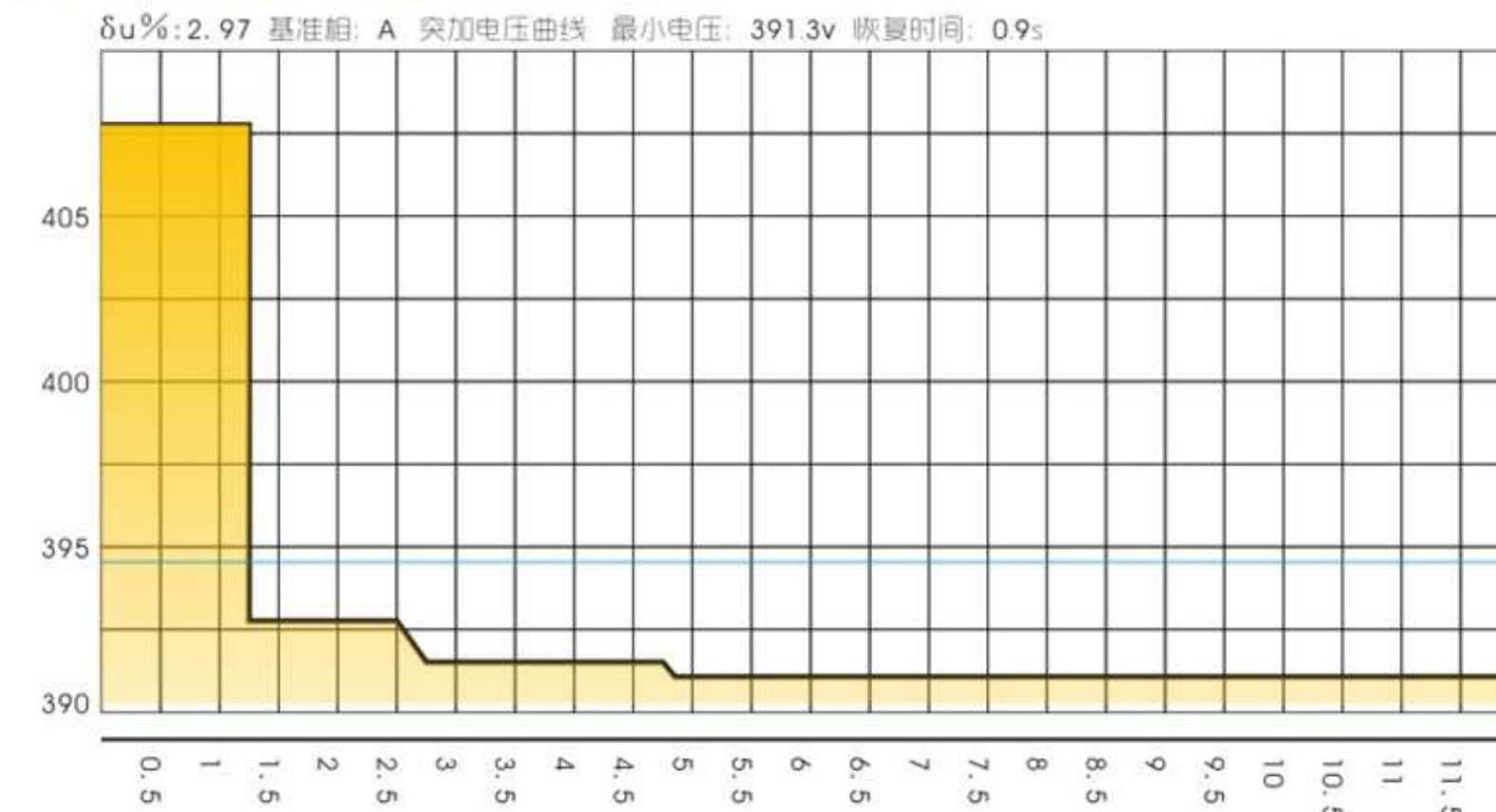
load %	power (KW)	voltage(V)			current(A)			steady power factor	frequency F1 (Hz)	steady voltage deviation	steady frequency deviation	voltage adjustment range		frequency adjustment range		voltage modulation ^Umod,s%
		UA	UB	UC	IA	IB	IC					rise	fall	rise	fall	
0%	0.000	221.1	222.3	221.4	0.000	0.000	0.000	0.000	60.33		0.55	1.03	-0.45	0.85	-0.32	1.55
25%	20.51	221.6	222.1	221.5	53.50	53.29	53.33	1.000	60.34		0.35	1.08	-0.46	0.85	-0.23	0.77
50%	40.64	222.3	221.7	221.7	105.72	106.02	105.56	1.000	60.28		0.78	75.23	-74.03	1.17	0.05	1.39
75%	61.12	221.8	222.2	222.0	159.24	159.34	158.76	1.000	60.23		0.58	75.18	-74.35	0.97	-0.18	1.53
100%	90.90	221.7	221.6	221.6	236.96	237.42	236.39	1.000	60.36		1.23	75.28	-73.77	1.03	-0.12	1.54
110%	87.88	221.8	221.8	221.7	229.06	229.45	228.35	1.000	60.38		0.9	75.1	-73.79	1.08	-0.08	1.23
100%	80.58	221.7	221.5	221.5	210.36	210.70	209.46	1.000	60.44		1.43	75.5	-74.0	1.15	-0.03	1.39
75%	60.75	221.8	222.2	221.6	158.33	158.39	157.86	1.000	60.44		0.78	75.25	-74.13	1.05	-0.12	1.69
50%	40.71	221.7	222.0	222.0	105.89	106.26	105.92	1.000	60.36		0.97	75.44	-74.11	1.05	-0.08	1.23
25%	19.96	221.9	222.1	221.0	52.12	52.70	51.92	1.000	60.13		0.78	74.9	-74.12	1.03	-0.2	0.77
0%	0.000	221.7	221.4	221.8	0.000	0.000	0.000	0.000	60.26		0.65	74.79	-73.97	1.0	-0.2	1.24
test result	steat voltage deviation ΔUst%:		0.2		steady frequency deviation ΔF%:		1.43		voltage wave form distoration rate Ku%:			0.00%				
	voltage modulation ^Umod,s%:		1.69		frequency fall ΔFst%:		0.55									

(D) Load Sudden on(off) test

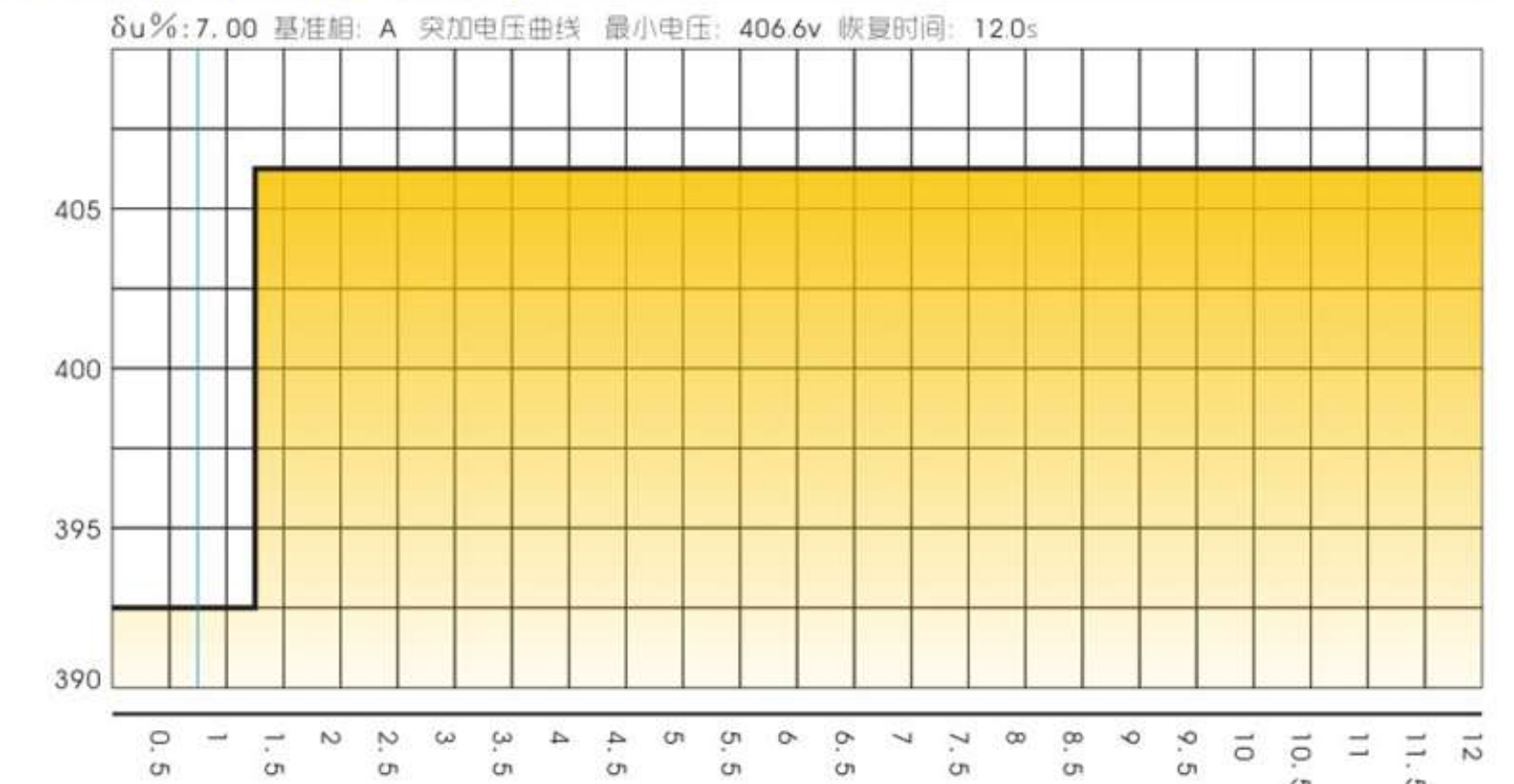
transient	Voltage(Load Sudden on)		Frequency(Load Sudden on)		Voltage(Load Sudden off)		Frequency(Load Sudden off)			
	transient adjustment rate	steady time	transient adjustment rate	steady time	transient adjustment rate ΔU%:	steady time	transient adjustment rate Δf%:	steady time		
	61.89	0.06s	-7.38	0.17s	93.46	0.41s	11.43	0.58s		
conclusion	tester:		checker:		1		examiner:		signature:	

LOAD BANK Series SPECIFICATIONS

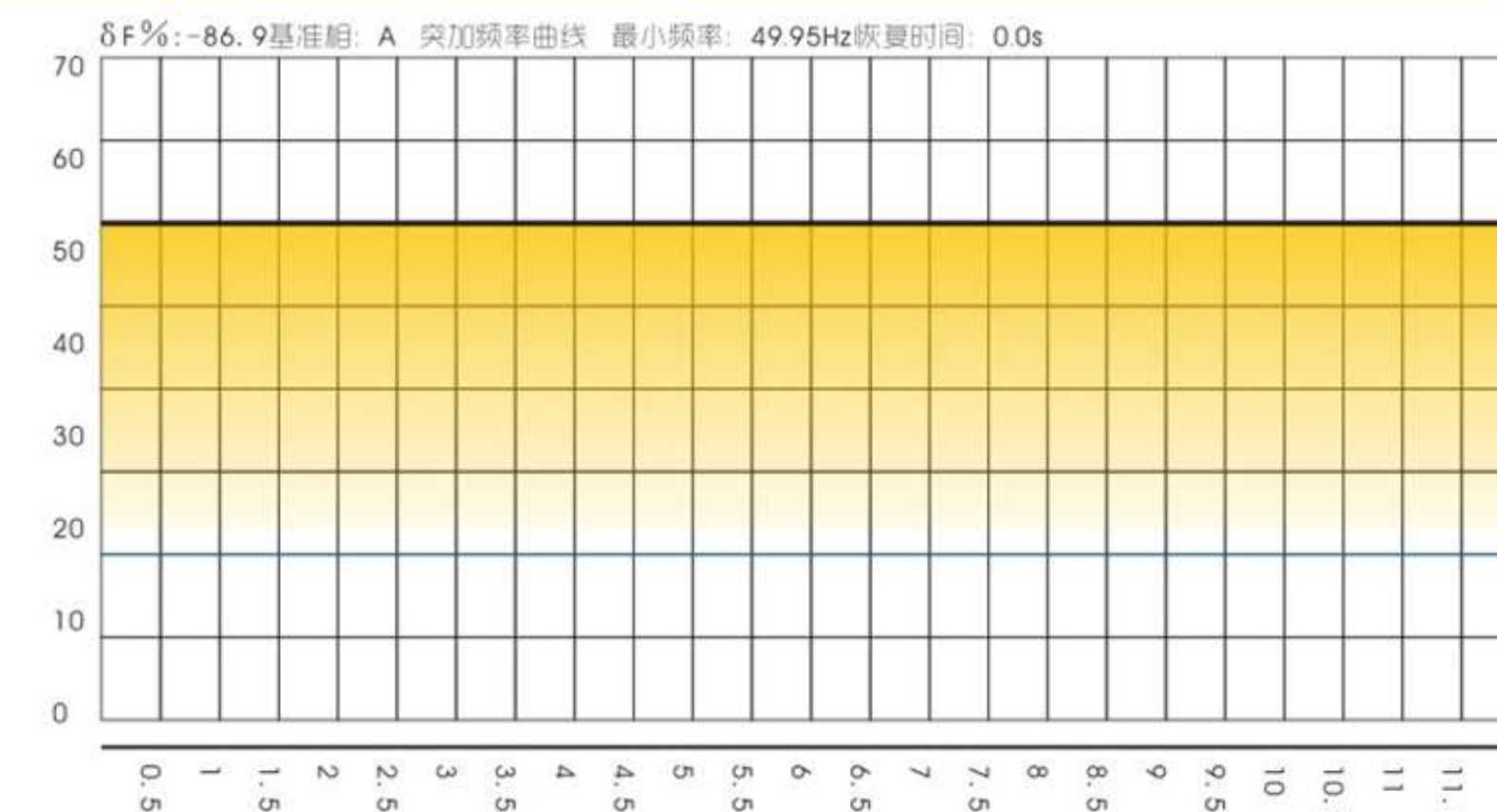
Load volt curve



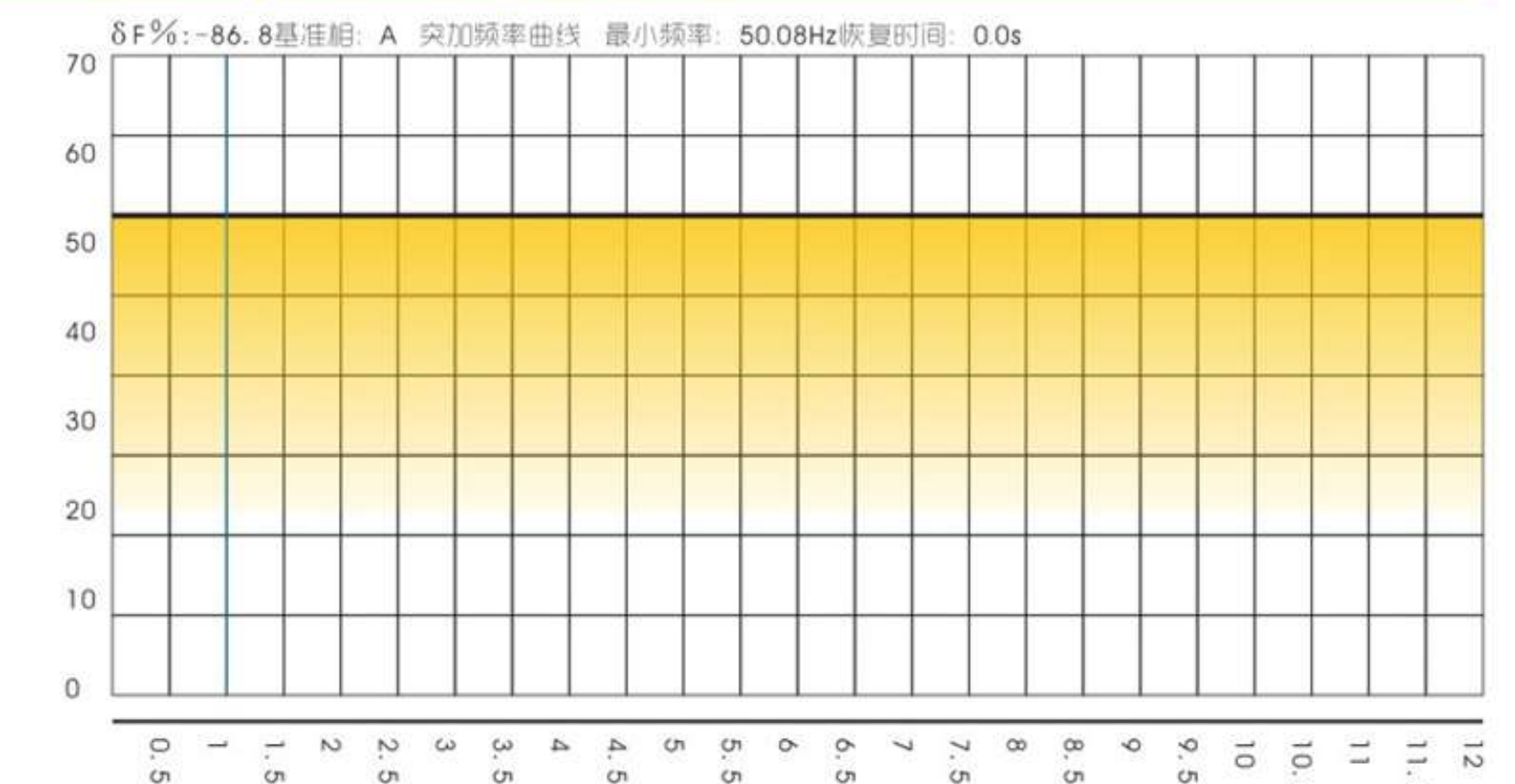
Unload volt curve



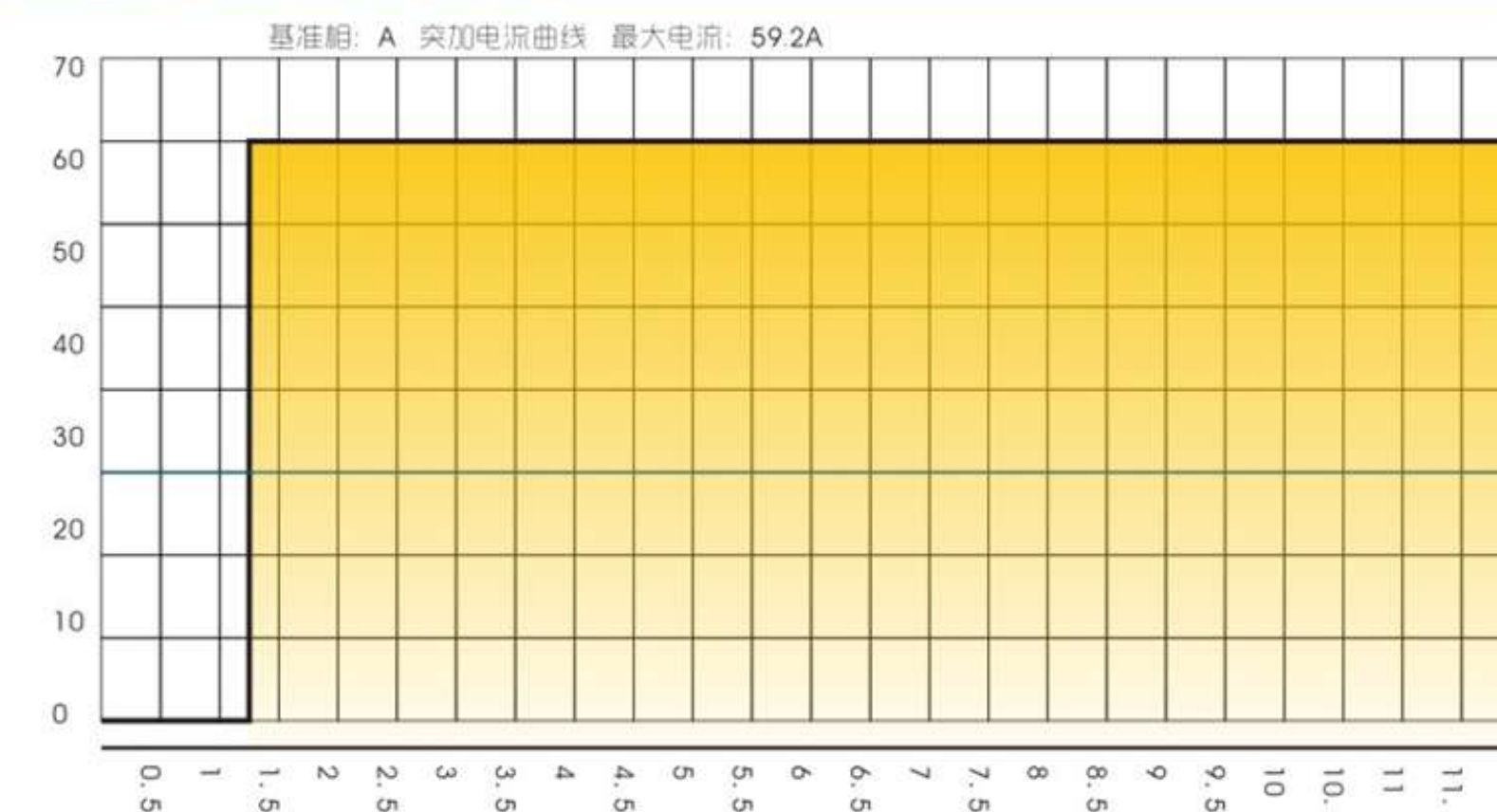
Load frequency curve



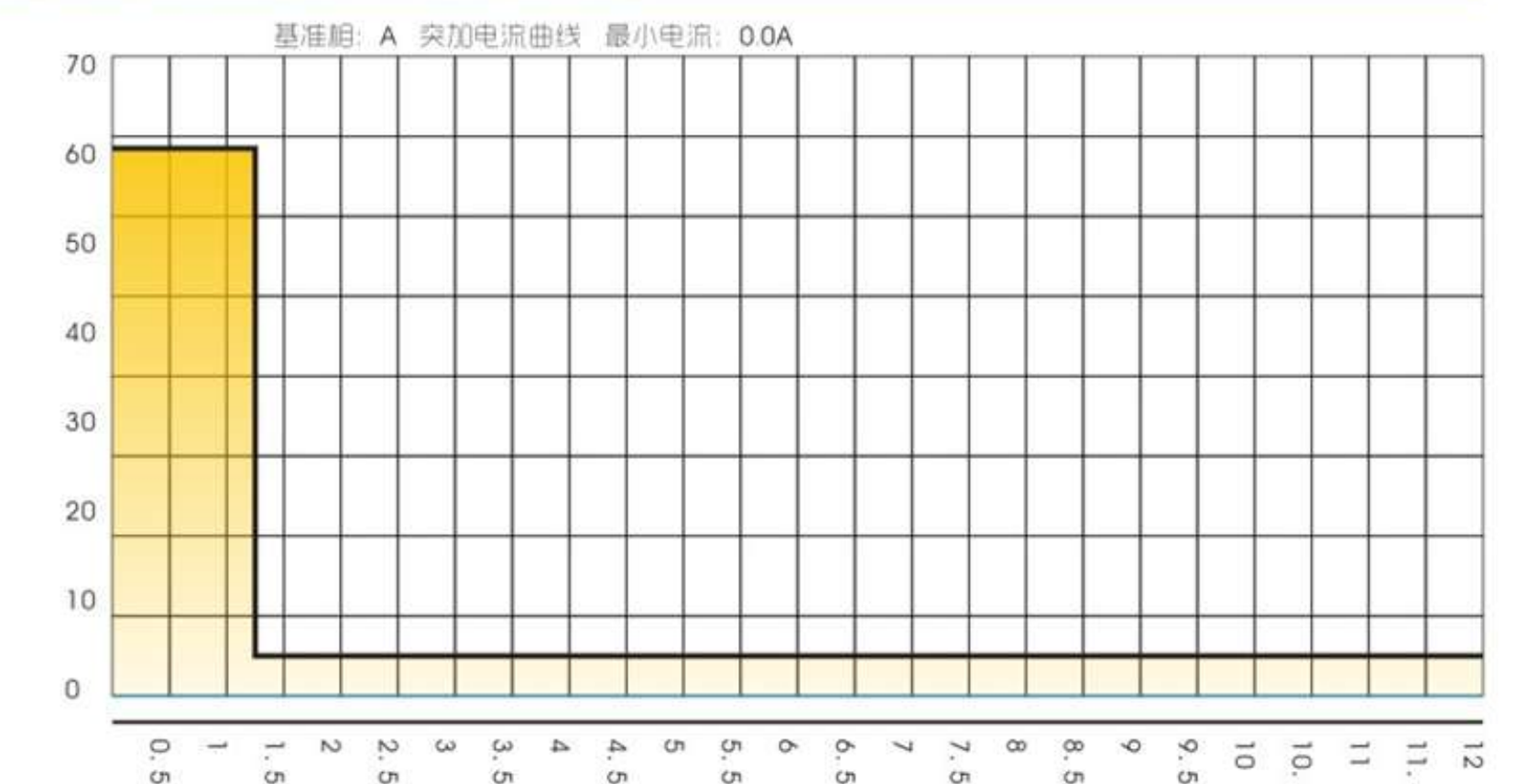
Unload frequency curve



Load current curve



Unload current curve



General:

Load bank is a simulating load test equipment used for generators, UPS, battery banks etc power systems testing.

- (1) Routine load test prolongs the service life of standby generators by minimizing their chances of suffering from wet stacking, cylinder glazing, fouling of exhaust ports and excessive oiling.
- (2) Used for standby generators routine maintenance or functional test to avoid cutting off the mains supply for the whole power system.
- (3) Using load bank for standby generators maintenance or functional test effectively reduces the risk of the powered devices being damaged by the potentially malfunctioning generator.

Applications:

- (1) Generator system R & D and routine test (inspection).
- (2) Standby generator routine maintenance load test.
- (3) Acceptance test for power supply project.
- (4) UPS products R & D, routine test and maintenance.
- (5) Load profile optimization test for electric power supply system.

Operation steps:

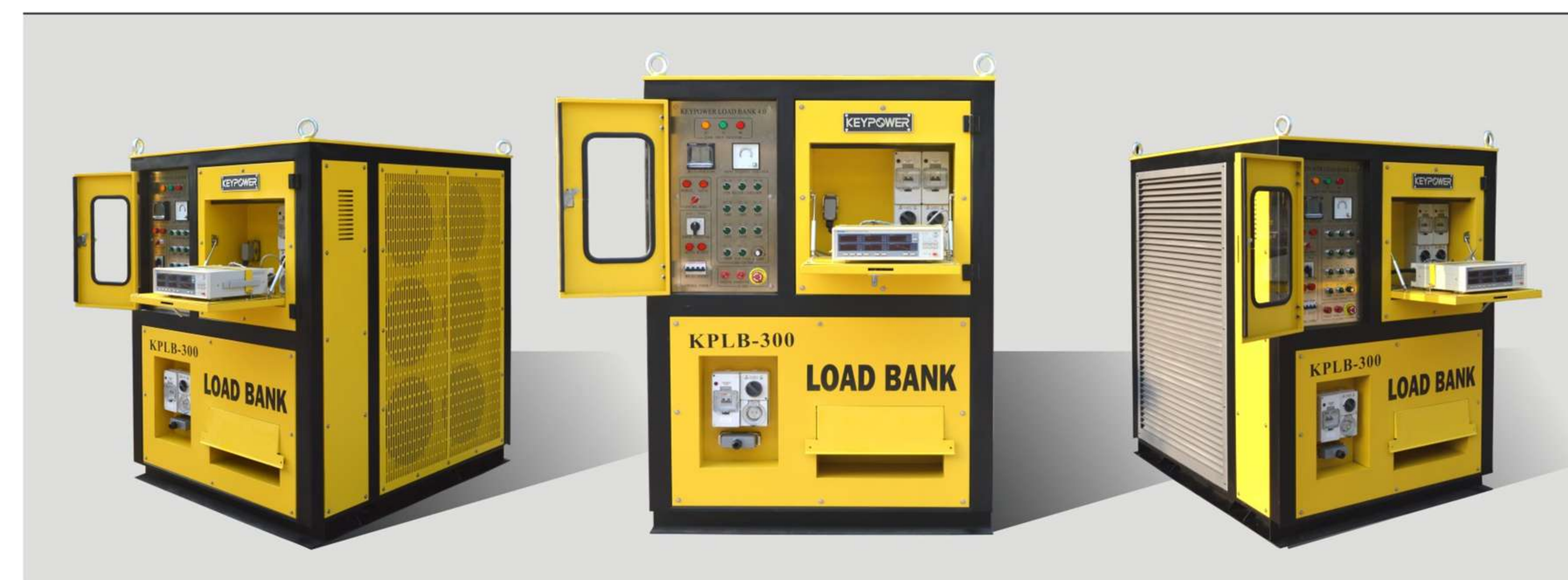
- 1) Make sure the load bank is properly grounded before any operation.
- 2) Connect the load bank and tested generator with suitable size cables according to the power capacity of the tested generator.
- 3) Select the corresponding load testing voltage according to the actual rated voltage of the tested generator.
- 4) Connect mains input socket next to the bus-bars of the load bank with mains power if mains power is chosen as load bank control power.
- 5) Flip either the MAINS or GENSET circuit breakers on load bank control panel to "ON" according to your selection of control power, flip the POWER SELECTOR switch to either MAINS or GENSET position as per your selection.
- 6) Flip the "CONTROL MODE" switch on load bank control panel to "LOCAL".
- 7) Start the generator until the voltage and frequency reach their rated values and stay steady, then flip the circuit breaker on generator to "ON".
- 8) Press the button on PHASE SEQUENCE INDICATOR on control panel, observe the rotating direction of the pointer and make sure it's clock-wise. Otherwise, it means there's mistake in phase sequence amongst the cables connecting load bank to generator; or the internal phase sequence in the generator is wrong. Solve this problem first before proceeding load test.

TEST YOUR GENERATORS WITH KEYPOWER LOAD BANK

- 9) Turn on the FAN switch on control panel to start the cooling fans.
- 10) Turn on the MASTER LOAD switch.
- 11) Turn on the FINE-TUNING switch.
- 12) Increase the load gradually by turning on the load setting switches (interval between every increase should be 10s), also use the knob for 0-10kw fine-tuning until the load reaches the rated power of the generator. Note: load can not be added unless the fans have been started and the MASTER LOAD switch has been turned on.
- 13) When test is over, disconnect the load by turning off load setting switches from bigger ones to smaller ones until all loads are disconnected. (Interval should be 10s as well)
- 14) Keep the fans running for another 10-15 minutes until the discharged air cools down, then switch off the fans. (This step is critical for load bank's service life)
- 15) Flip the circuit breaker on control panel to "OFF" when the fans stop rotating.

IMPORTANT NOTES:

- 1) When the load bank is running, no one is allowed to walk through nor flammable materials such as gasoline, diesel should be placed within 10m extent of the exhaust end.
- 2) When the load bank is running, people with long hair are not allowed to walk through within 1m extent of the air intake end.
- 3) The airflow direction of the load bank is from air intake end to exhaust end. When the fans start running, make sure the airflow direction is correct, otherwise, you'll need to adjust the phase sequence of the input mains power or the testing power.





Picture				
Model	KPLB-100	KPLB-200	KPLB-300	KPLB-400
Testing capacity	0 - 100 kw	0 - 200 kw	0 - 300 kw	0 - 400 kw
Type of load	Resistive, PF = 1.0			
Duty	Continuous			
Cooling system	Industrial grade axial fan			
Phase	Available at both single and three phase			
Rated testing voltage	110-480 VAC			
Rated Frequency	50/60 Hz			
Dimensions (L*W*H) (mm)	960*1060*1400	1560*1310*1650	1690*1440*1750	1900*1600*1900
Weight	350 Kg	500 kg	1083 kg	1200 kg

Picture						
Model	KPLB-500	KPLB-600	KPLB-700	KPLB-800	KPLB-1000	KPLB-2000
Testing capacity	0 - 500 kw	0 - 600 kw	0 - 700 kw	0 - 800 kw	0 - 1000 kw	0 - 2000 kw
Type of load	Resistive, PF = 1.0					
Duty	Continuous					
Cooling system	Industrial grade axial fan					
Phase	Available at both single and three phase					
Rated testing voltage	110-480 VAC					
Rated Frequency	50/60 Hz					
Dimensions (L*W*H) (mm)	1900*1600*1900	2100*1730*2000	2100*1730*2000	2400*2030*2100	2400*2030*2100	20 ft container
Weight	1400 kg	1550 kg	1650 kg	1750 kg	2150 kg	6000 kg

Options:

1. Single-voltage: 220-690V
2. Multi-voltage: 127/220V, 220/380V, 230/400V, 240/415V, 277/480V
3. Intelligent control with PLC

Picture				
Model	KPLB-125	KPLB-250	KPLB-375	KPLB-500
Testing capacity	0 - 125 KVA	0 - 250 KVA	0 - 375 KVA	0 - 500 KVA
Type of load	Inductive and resistive, PF = 0.8-1.0			
Duty	Continuous			
Cooling system	Industrial grade axial fan			
Phase	Available at both single and three phase			
Rated testing voltage	110-480 VAC			
Rated Frequency	50/60 Hz			
Dimensions (L*W*H) (mm)	960*1060*1400	1560*1310*1650	1690*1440*1750	1900*1600*1900
Weight	770 Kg	1100 kg	1700 kg	2060 kg

Picture						
Model	KPLB-625	KPLB-750	KPLB-875	KPLB-1000	KPLB-1250	KPLB-2500
Testing capacity	0 - 625 KVA	0 - 750 KVA	0 - 875 KVA	0 - 1000 KVA	0 - 1250 KVA	0 - 2500 KVA
Type of load	Inductive and resistive, PF = 0.8-1.0					
Duty	Continuous					
Cooling system	Industrial grade axial fan					
Phase	Available at both single and three phase					
Rated testing voltage	110-480 VAC					
Rated Frequency	50/60 Hz					
Dimensions (L*W*H) (mm)	1900*1600*1900	2100*1730*2000	2100*1730*2000	2400*2030*2100	2400*2030*2100	20 ft container
Weight	3200 kg	3600 kg	4000 kg	4730 kg	5000 kg	13200 kg

4. Remote control or monitoring via RS485 or Ethernet
5. Trailer mounted
6. 2000 - 5000kW on request