Perfecting the Power, Ranking the Life.

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Power Quality Solution

Dynamic Voltage Restorer (DVR)

www.samwha-cn.com
www.sanhenergy.com

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About SANHE

Leading brand of power quality solutions for the new energy industry

Sanhe Power Tech (shenzhen) Co.,Ltd established in 2002, is committed to the principle of “Care Profoundly, Carry out Persistently”. The company specializes in power quality products and has expanded its focus to encompass the development of photovoltaic renewable energy, electric vehicle charging systems, energy storage solutions, and hydrogen production technologies in recent years. Our dedication to innovation has positioned us at the forefront of the industry in the application of distributed new energy systems. We offer a comprehensive range of services, from product development and manufacturing to sales and after-sales support, providing our clients with tailored, end-to-end system solutions across a variety of sectors.

SANHE BASE

Sanhe's headquarter is located in Shenzhen, which mainly undertakes operational functions, and Sanhe's production base is located in Wuxi.



SANHE's Honors

Power quality expert, solving more than 5,000 scenarios

National High-tech Enterprise Certificate
AAA Credit Certificate
28 Patents
24 Software Copyrights
37 International and China standards
CE, COC, SGS ,GOST,CNAS Certificates
Shenzhen SRDI Enterprise etc.
Sanhe Power Tech is a member of interational committees such as:
The intemational Electrotechnical Commission (IEC),
The Institute of Electrical and Electronics Engineers (IEEE) etc,
The software development system has passed the CMMI evaluation of the American SEI.



New energy development

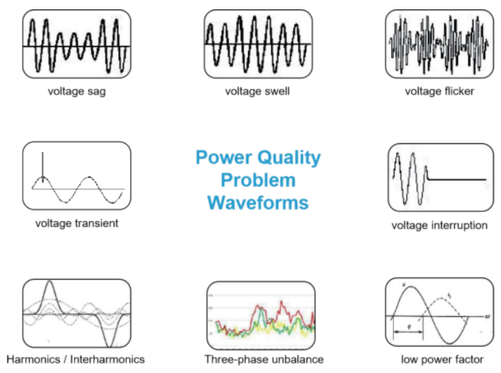
Based on years of accumulation of power quality technology and experience, combined with new power electronics and advanced intelligent software and hardware technology, the company will continue to provide upgrade solutions for the traditional type of power system, and at the same time, it will also be closely involved in the construction and optimization of the new type of power system, so as to contribute to the industrial upgrading and the progress of the industry as well as to the sustained development of the world.

Power Quality and Sanhe Active PQ products

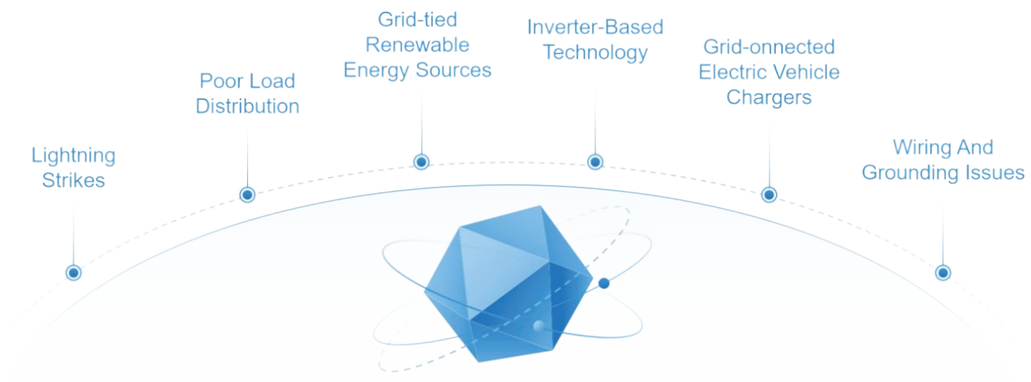
What is the power quality?

Power quality is a general term that describes the level of consistency, reliability, and stability of electrical power. It refers to the effects of AC power on a user's equipment when it exceeds a certain limit.Four major issues in power quality:

·Low power factor
·High harmonics
·Unstable voltage
·Three-phase imbalance

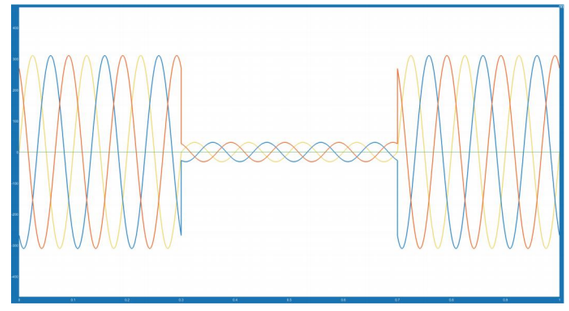


Power quality can be affected by many factors, including:



What is voltage sag?

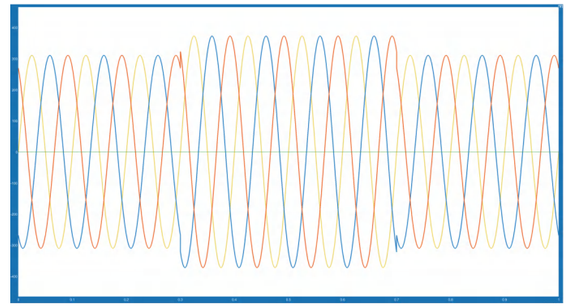
IEEE standard and the national standard "Power Quality Voltage Sag and Short Interruption" (GB/T30137-2024) define: the RMS value of the power frequency voltage at a certain point in the power system is temporarily reduced to 10%-90% of the rated voltage (that is, the amplitude 0.1-0.9p.u), and the phenomenon that it returns to normal after 10ms-1min is called voltage sag.



Voltage sag

Voltage swell

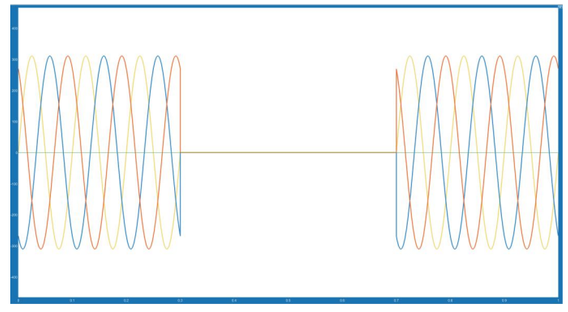
The phenomenon that the RMS value of the power frequency voltage at a certain point in the power system temporarily rises to 1.1-1.8p.u, and returns to normal after a short period of 10ms-1min is called voltage swell.



Voltage swell

Short interruption

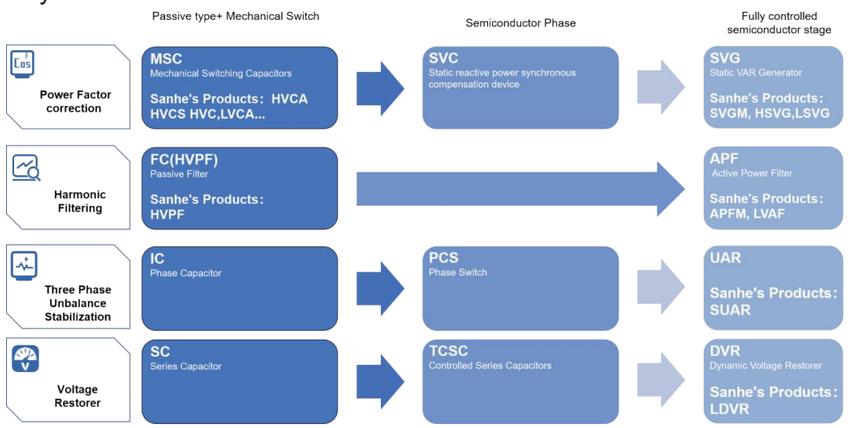
IEEE standard and national standard "Power Quality Voltage Sag and Short Interruption" (GB/T30137-2024) definition: The rms value of the power frequency voltage at a certain point in the power system suddenly drops below 0.1p.u, and after a short duration of 10ms-1min The phenomenon of returning to normal is called short interruption of voltage.



Short interruption

Sanhe active power quality product

Since 2002, Sanhe has devoted in developing and participating PQ projects. It developed from traditional passive PQ to active PQ. Sanhe active power quality product include harmonic filtering, power factor correction, three phase imbalance stabilization and voltage restorer.These are based on IGBT 3-toplogoy theory to resolve power quality problem automatically.



Comparison among DVR,UPS,BESS

Characteristic	DVR w/w.o battery	UPS	BESS
Key Features	Short-time voltage compensation	Seamless power backup	Large-scale energy storage and dispatch
Response time	Millisecond level	Milliseconds to seconds	Seconds to minutes
Energy storage capacity	Very small (seconds)	Medium (minutes to hours)	Large (hours to days)
Typical Topology	Connected in series in the power grid	Connected in parallel to the power grid	Parallel or independent operation
Applicable issues	Voltage sag, voltage swell and power outage	Power outages, voltage/frequency fluctuations	Peak shaving and valley filling, renewable energy smoothing
Typical energy storage media	Super capacitor(or Lead acid/lithium ion battery)	Lead acid/lithium ion battery	Lithium-ion/flow batteries, etc.

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Sanhe Voltage Stabilization Device

Sanhe has three types of DVR. The AC LDVR-A with energy storage, the DC compensation LDVR-D, and the AC AVC without energy storage.

How to choose DVR type?

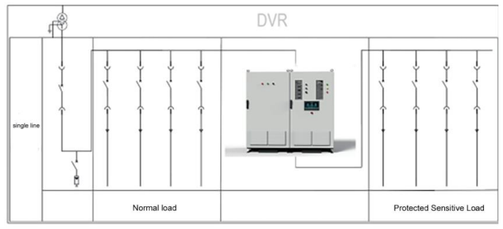
LDVR-A is primarily designed to address short-term voltage disturbances and deep fluctuations. It is suitable for power grid systems experiencing voltage dips, swells, or brief interruptions, operating in a hot-standby mode. When grid voltage exceeds preset limits, it activates immediately.
LDVR-D is primarily applied in scenarios involving load equipment with DC bus ports, typically variable frequency drives (VFDs). When a voltage dip occurs at the AC terminals of a VFD, the DC bus voltage will drop synchronously. The device will then output a reasonable DC voltage to support the bus voltage.
AVC draws energy from the grid itself, making it suitable for compensating prolonged, shallow voltage dips. Coupling transformers are connected in series within the system, operating in real-time to ensure stable output voltage.

Model Guide

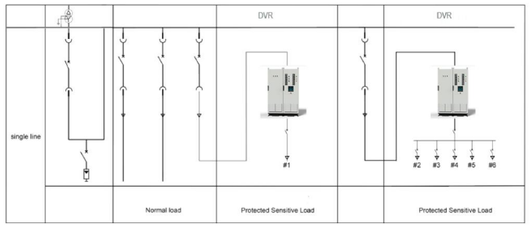
Rated voltage: 110V/230V/400V/12KV/24KV or customized
Rated Frequency:50/60hz
Rated power: according to load rating(KVA), covering transformer, protected machines/devices etc.
Compensation time: typical time is 3s 2s 1s but also customization acceptable.
Take into comprehensive consideration of your sensitive loads amount, location, cabling and the space for installation.

Installation site

DVR centralization compensation

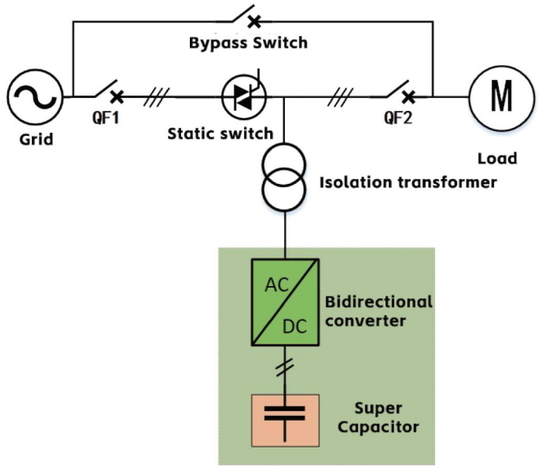


DVR local compensation



LDVR-A AC with Energy Storage

System Compositipn



Advanced compensated DVR is installed in parallel between input power and VSD load. The inverter work in voltage source mode and protects the load device when the main power grid is subject to voltage sag, short interruption.

When detecting a temporary voltage dip, surge, or interruption in the utility grid, the static switch rapidly disconnects the grid from the load. The DVR then establishes a new power supply, with a typical switching time ≤1ms, ensuring the load remains unaffected by input voltage disturbances. Once the input power voltage returns to normal, the equipment automatically switches to hot standby mode, the static switch re-engages, and the utility grid is reconnected to the load.

Work Instructions

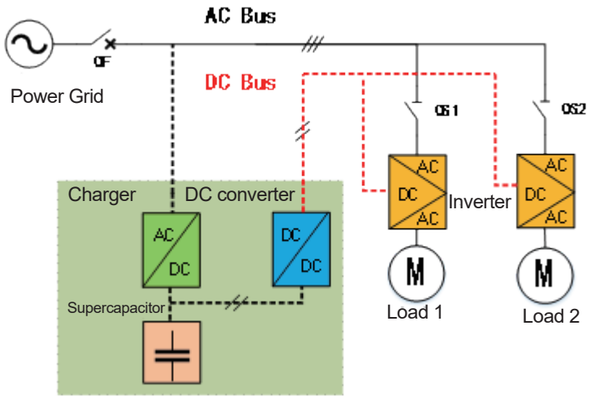
normal state	work status	Bypass state
When the grid voltage is normal, the static switch and maintenance switch are turned on, and the load is directly powered by connecting to the grid through the static switch. The bidirectional converter is in a hot backup state, and a small current is used to float charge the supercapacitor. The voltage fluctuation in the grid is monitored in real-time through the sampling circuit.	When the LDVR detects abnormal voltage fluctuations, the static switch quickly cuts off the connection between the grid and the load, switching the backend equipment to be powered by the LDVR. The supercapacitor provides the energy required by the load, ensuring that the normal operation of the electrical equipment is not affected. When the voltage of the power supply system returns to stability, the LDVR device adjusts its output phase. The device automatically adjusts the inverter output phase until it matches the system voltage phase before turning on the static switch. At the same time, the inverter stops outputting, and the load is powered by the external power supply system. The LDVR device enters a standby state.	When the equipment malfunctions, LDVR automatically switches to bypass operation; when the device needs maintenance, it can be switched to bypass operation with one key, and then the incoming and outgoing switches are disconnected, isolating LDVR from the power supply system. The load is powered by the external grid system, allowing maintenance of the LDVR device without power interruption to the load equipment. After maintenance is completed, the LDVR device can be restarted with one key, achieving seamless switching without affecting the load operation.

System Composition

Technical Parameters		
Basic Parameters	Voltage rating	0.22kV/0.4kV/0.48kV/0.69kV/6kV/10kV/12kV
	Rated capacity	10-2500kVA
	Scope of compensation	0%-130%
	Compensation time	0-10s(The time may be customised)
Grid-side Parameters	Frequency	50Hz/60Hz
	Efficiency	99.2%
	Overload capacity	Overload 150%, sustained for 60 seconds; Overload 500%, sustained for 1 second.
	Wiring method	3P3W/3P4W
Output Parameters	Protection	possess
	Output frequency	50Hz/60Hz
	Compensation full response time	<2ms
	Compensation accuracy	<1%
	Voltage imbalance	<3%
	Frequency deviation	≤0.1Hz

DC Compensation LDVR-D

System Compositipn



This apparatus comprises three principal components: the charger, the supercapacitor, and the DC converter.

Charger: Serves as the supercapacitor charging module, incorporating corresponding current-limiting protection functions.

Supercapacitor: Functions as the energy storage unit for compensating load requirements, configurable flexibly according to load compensation demands.

DC Converter: Establishes a stable DC compensation voltage, outputs the compensatory energy required by the load, and incorporates protective functions including current limiting and voltage limiting.

Working Principle

When a voltage dip or brief interruption occurs in the mains supply, the DC bus voltage consequently drops. Should this fall below the preset threshold, the diodes conduct in the forward direction to rapidly respond with power output. The supercapacitors discharge under load current control to maintain the system's DC output voltage stable at the preset value, thereby ensuring DC bus voltage stability.

Upon restoration of normal mains voltage, the DC bus voltage rises to its standard level. At this point, the diode reverse-blocks, and the unit's charger commences operation. Automatic control ensures the supercapacitor is fully recharged, preparing for the next potential voltage quality crisis.

Advantages

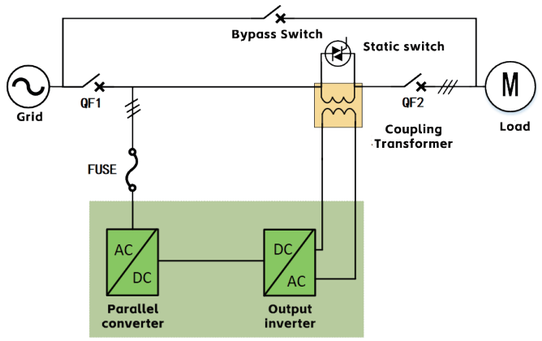
This unit operates as a standalone supply, connected in parallel with the frequency converter to monitor DC bus voltage in real time. It offers advantages including a compact footprint, simple structure, straightforward installation, and rapid response times. The output terminals connect directly to the customer's existing DC bus terminals, with a response time ≤200μs and no disturbance. The output ports offer flexible expansion capabilities and high reliability. It automatically controls charging and discharging, incorporates detection and protection functions, and does not affect the customer's original equipment system. This provides safe and reliable power quality for downstream equipment, preventing production stoppages, equipment damage, or personal safety issues caused by grid voltage quality problems.

System Composition

Electrical parameters	
Input AC voltage (phase to phase)	0.22kV/0.4kV/0.48kV/0.69kV
Frequency	50Hz/60Hz
Output DC voltage	0.3~1kV(customized)
Technical Parameters	
Response time	<1ms，Non-disruptive switching
Voltage compensation deviation	<1%*Un
Operation Loss	<1%

AVC Automatic Voltage Compensator (WITHOUT ENERGY STORAGE)

System Compositipn



Work Instructions

On line working mode	Over-limitation Working Mode	By-Pass/Maintenance Mode
Bypass switch and static switch are switched off, the inverter regulates the system voltage real-time through the injection transformer. The output voltage compensation accuracy is ±2%*Un (some typical application can be +1%*Un).	when the voltage fluctuation is over 10% Un (configu-rable), static switch switches off. The inverter will regulate the system voltage through injection transformer. The output voltage compen-sation is ±2%*Un (Critical application can be ±1%*Un).	Switching on the by-pass switch before maintenance, The breaker is switched off at both incoming and outgoing sides. The grid will supply the loads. DVR is completely electrically isolated.

System Composition

Electrical parameters			
Rated voltage (line)	0.2kV/0.4kV/0.69kV/6kV/12kV/24kV		
Frequency	50Hz/60Hz		
Technical Parameters			
Response time	< 3ms		
Compensation range	Grid voltage	Output voltage	Time of duration
	3P 50%*Un	100%	30s
	2P 40%*Un	100%	30s
	1P 30%*Un	95%	30s
	1P 0%*Un	1P 60%*Un 2P 90%*Un	30s
	3P (80%~120%)*Un	100%	Continuously
Voltage unbalance	<3%		
Frequency tracking deviation	< ±0.2HZ		
Output voltage harmonic	<2.5%		
Operation Loss	<2%		
Voltage compensation error	<1%		
Voltage loss	<2%		

Application & Reference



Semiconductor manufacturing requires ultra-stable power for:
Cooling systems (equipment protection)
Exhaust fans (toxic gas control)
Precision tools (wafer processing)
Voltage sags or outage cause:
• Equipment damage
• Production stoppage
• Million-dollar wafer losses
Sanhe Typical Project:Konka Optoelectronics Project 2500kVA 400v



Petrochemical and coal chemical production involves complex processes with critical equipment operating under harsh conditions.
Voltage sags or outage can trigger:
Emergency shutdowns of sensitive loads (lube oil pumps, oxygen compressors, coal slurry pumps)
Production chain reactions causing material waste
Safety hazards and extended recovery times
Sanhe Typical Project
Sinopec Project 1000kVA 400V



Challenges:
Production Halts - Sensitive grinding mills trip during voltage disturbances, causing full process line stoppages
Equipment Stress - Frequent power fluctuations increase mechanical/electrical wear on crushers and motors
Quality Variability - Intermittent operation leads to inconsistent particle size in crushed materials
Safety Risks - Unexpected shutdowns may compromise critical lubrication and cooling systems
Impact: Voltage fluctuation issues reduce equipment lifespan by 30-40% and cause up to 15% production loss annually in typical mining operations.
Sanhe Typical Project:
Africa miner project 2500kVA 400V



Automotive manufacturing processes (stamping, welding, painting) rely on highly automated production lines with voltage-sensitive equipment (PLCs, variable frequency drives, sensors).
Voltage sags can cause:
Equipment shutdowns & reduced yield
Production line interruptions & delivery delays
Sanhe Typical Project:
Automobile production base, welding and printing processing.



Challenges:
Production Disruptions – Millisecond power dips trigger automated shutdowns, halting the entire production line for hours.
Product Loss – Aborted sterilization ruins batches, wasting semi-finished/finished goods.
Delayed Restart – Cleaning and re-sterilizing equipment (e.g., tanks) extends downtime.
Impact:
Unstable Power Supply – Voltage fluctuations disrupt precision heating/cooling cycles.
Overly Rigid Interlocks – Safety systems force full-line stoppages for minor faults.
Insufficient Backup – Lack of UPS/buffering fails to sustain critical processes.
Sanhe Typical Project:
A food production project 2000kVA 400V



Challenges:
Precision Disruptions - Sub-micron machining tolerances are compromised by millisecond voltage sags
High-Cost Downtime - Single workpieces may require 40-80 continuous machining hours; interruptions cause million-level scrap losses
Equipment Vulnerability - German/Japanese CNC systems (e.g., DMG Mori, Makino) trigger faults at 85% nominal voltage
Strategic Risk - Military/aerospace production delays impact national defense programs
Sanhe Typical Project:
A space programme 2000kVA 400V