

Industrial UPS Systems and Inverters



This is an introduction to our industrial, heavy duty, rugged Uninterruptible Power Supply Systems, Inverters and Frequency Converters for the petrochemical engineering, power station, process industries, defence, avionics and other public utilities applications where custom engineered secure power is demanded for critical loads.

Power Systems International rugged transistor 'RT Series' and the compact 'RTC Series' of industrial UPS Systems are built in the conventional active-on-line configuration with 6 pulse or 12 pulse rectifiers, Pulse Width Modulation (PWM) transistor inverters with static and manual bypass, metering and remote signalling interface.

The RT product has separated rectifier module, inverter and bypass modules built in sizes 7.5 kVA to 150 kVA with single phase outputs and from 7.5 kVA to 300 kVA with three phase outputs.

The RTC product has a separated rectifier, inverter and bypass sections but an integrated construction is used to produce a compact format UPS System with single phase and three phase outputs up to 65 kVA.

A mimic status indication and alarm panel with full instrumentation is fitted to the RT Series but only limited instrumentation is provided on the compact RTC Series.

Parallel operation is available where redundancy and optimum power security is required. Other options include: digital metering, remote alarm signalling panels, data interface, AC and DC power distribution.



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RT and RTC description

The RT and RTC Series of Industrial UPS Systems are designed for active-on-line installation between the power source and the critical load where the inverter delivers regulated voltage and frequency to the load at all times.

The power conversion process isolates the critical load from the normal mains borne disturbances and similarly isolates the mains from load induced reflected harmonics affecting other loads connected to the input mains feeder.

The rectifier converts AC power into DC for charging a storage battery such as maintenance free lead acid, vented lead acid or Nickel Cadmium, it also provides the necessary DC for the continuously rated capacity of the inverter. Transistors or IGBT semiconductor devices are used in our PWM inverters and the control logic creates the precise sinusoidal output waveform with a very low harmonic content.

Modes of Operation

Normal

The rectifier converts normal input AC power into DC for the inverter and for charging the battery. The inverter is synchronised with the mains providing it is within the tolerances permitted by the logic, the inverter delivers its closely regulated frequency and voltage through the static switch to the load.

Where the reference frequency and voltage are outside the permitted limits, the inverter will 'uncouple' from the mains and will 'free run' using its internal oscillator to assure the high stability power for the load.

Loss of input power

In the event of input power failure, the inverter will operate from the battery until the low DC threshold is reached or the input power to the rectifier is restored.

When the input AC power to the rectifier is restored, the rectifier resumes the provision of DC for the inverter and it will simultaneously recharge the battery.

The critical load connected to the inverter will not be disturbed during the loss and restoration of the input AC power feeding the rectifier.

Bypass operation

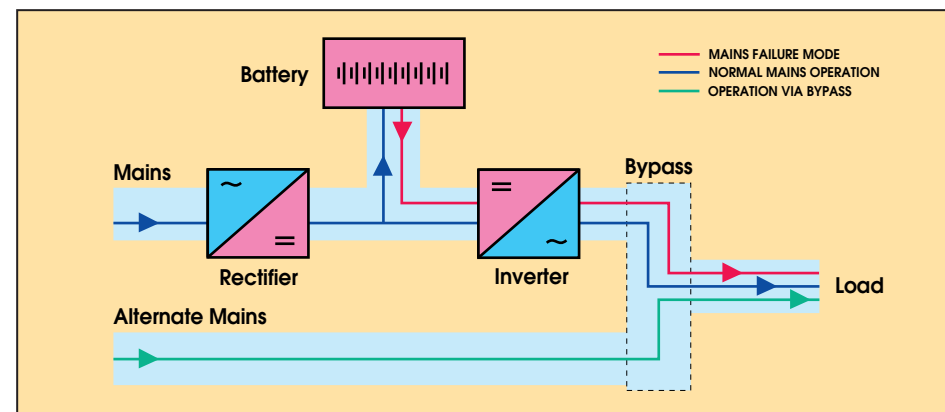
The inverter is provided with a sensing circuit which can detect transient overload, sustained overloads and short circuits. The sensing circuit initiates 'current limit' which causes the static switch to transfer the critical load to the bypass alternate line without interruption.

The bypass logic will automatically initiate a retransfer of the load from the bypass alternate line, synchronised, without a break back to the inverter once the inverter and reference power source are within the predetermined limits.

The bypass circuit may be manually initiated to transfer the load to the bypass power source during the maintenance process. Our inverter designs do not have the high commutation circuit losses nor the high audible noise, large physical mass, or the weight associated with the thyristor generation of inverter designs. The proven logic and transistor switching technology has been used in our industrial inverter designs since 1982, our experienced position is the best assurance of dependability we can offer the user.

RT and RTC Series UPS Systems deliver high stability power with low audible noise they respond instantaneously to non linear loads and transient load changes in high ambient temperatures in arduous, harsh environmental conditions.

UPS System operation modes

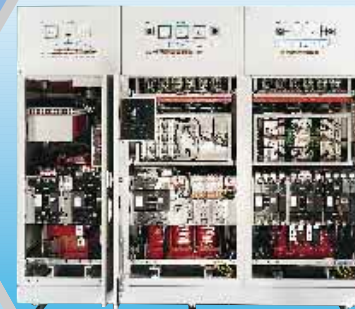


RTC 'S' Class Industrial 2 x 80 kVA 3 phase UPS systems in parallel redundant configuration



RT industrial class inverters with multi module configured system with three 70 kVA single phase output inverters operating in parallel redundant mode

RT/ET 'power station class 150 kVA' industrial UPS systems built in a modular style with the rectifier, inverter and bypass in three separate sections



RT industrial CEG class 2 x 7.5 kVA single phase UPS systems in redundant configuration with distribution



RTC communications class 30 kVA 3 phase UPS system for use with 48 V telecoms station battery

ET/RT industrial UPS system 50 kVA single phase with bypass regulating transformer in special enclosure for use in a hazardous environment



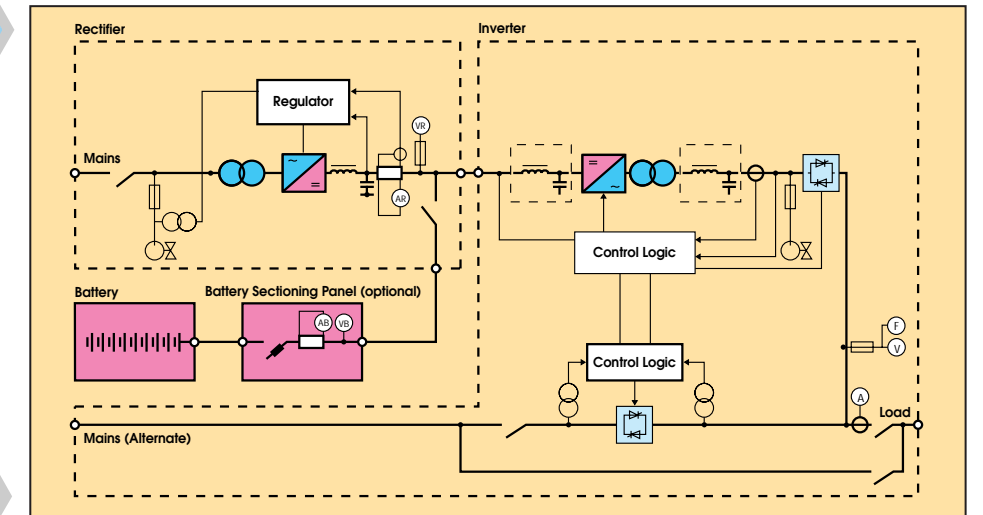
Description

The system consists of rectifier/charger, inverter, static bypass, maintenance bypass, controls, instrumentation, status monitor and battery.

The AC output of the inverter is connected to the critical load, the storage battery is connected between the inverter input and rectifier/charger output through a battery isolation device.

The normal AC limit power is connected to the rectifier, the bypass circuit also takes power from the same power source to provide power for the critical load during bypass operation or when the system is in maintenance mode.

RT System typical schematic



Specification - typical RT

Rectifier	Input Voltage	380 V, 400 V, 415 V +/- 15% 3 Phase (also for 1 Phase Output Modules)
	Frequency	50 Hz +/- 5% (or 60 Hz)
	Start up time	> 15 seconds soft start
Bypass	Input	380 V, 400 V, 415 V Three Phase (220 V, 230 V or 240 V for One Phase models)
	Frequency	50 Hz (same as inverter output)
Inverter	Transfer time	Bypass to inverter t=0, inverter to bypass < 2 milliseconds
	Output Voltage	380 V, 400 V, 415 V Three Phase Y (220 V, 230 V or 240 V for One Phase models)
	Frequency	50 Hz +/- 0.5% (or 60 Hz)
	Power	Rated kVA at 0.8 PF (see table)
	Rating	Continuous capacity at 40°C ambient temperature
	Type	Pulse Width Modulation PWM using transistors / IGBTs
	Voltage regulation	+/- 1% nominal, no load to full load with load power factor 0.7 inductive to unity within the rated kW capacity, or with minimum to maximum DC input to the inverter.
	Voltage transients	The response to application or removal of 100% load changes voltage regulation will be +10%-8% over 0.5 Hz with recovery to within 3% in 4 Hz.
	Voltage adjustment	Manual adjustment range is +/-5%
	Voltage balance	Within 2% between phases with 30% unbalanced loads (3 Phase models)
Phase angle accuracy	With balanced load, 120° +/- 1° and with 30% unbalanced load, 120° +/- 2° (Three Phase models)	
Harmonic distortion	Less than 3.5% THD with linear load	
Overload capacity	150% for 30 seconds, 125% for 10 minutes but not repetitive within short periods	
General	Construction	Folded and welded steel frame with plinth, removable side panels, hinged front door in enclosure class IP 20 as standard. Analogue metering, status and alarm mimic and optional digital metering is fitted to the front door. Remote status alarm signalling and computer data link interface facilities are provided as optional features.
	EMC & RFI Audible Noise Environment	Compliant with EC Directive, RFI Suppression VDE 0875 G < 60 dBA at 1 metre Dust free, damp free with relative humidity < 95%

Heavy duty RT military class UPS system in IP54 enclosure, single phase output



Power Systems international Limited is respected for its commitment to product research and development, care in manufacture and comprehensive testing. Our attention to quality is reflected in the dependability of our products chosen for many installations around the world supported by Power Systems International Limited - the ultimate name in power security.

Selection Guide

Type	Capacity kVA / kW	Battery ¹			Dimensions (mm)			Weight ⁵ kg
		cells	volts ²	space ³	W	D	H	
RTC Series	Single Phase Output, 230 V 50 Hz ⁶ . Three Phase output 400 V 3 Phase 50 Hz ⁶ Three Phase Input 400V 3 Phase 50 Hz ⁶							
RTC 5	5 / 4.0	60	100 - 150	15 mins	600	600	1600	250
RTC 8	8 / 6.4	60	100 - 150	15 mins	650	700	1600	400
RTC 12	12 / 9.6	60	100 - 150	15 mins	800	600	1852	480
RTC 18	18 / 14.4	120	200 - 300	option ⁴	800	600	1852	550
RTC 25	25 / 20.0	120	200 - 300	option ⁴	800	600	1852	650
RTC 35	35 / 28	120	200 - 300	option ⁴	800	600	2000	800
RTC 50	50 / 40	120	200 - 300	option ⁴	1400	800	1852	1050
RTC 65	65 / 52	130	220 - 320	option ^{4,8,9}	1400	800	1852	1150
RT Series	Single Phase Output 230 V 50 Hz ⁶ Three Phase Input 400 V 3 Phase 50 Hz ⁶							
RT 81	8 / 6.4	60 ⁹	100 - 150	option ^{8,9}	650	700	1080	300
RT 121	12 / 9.6	60 ⁹	100 - 150	option ^{8,9}	700	750	1400	390
RT 181	18 / 14.4	60 ⁹	100 - 150	option ^{8,9}	1200	600	1852	500
RT 251	25 / 20	60 ⁹	100 - 150	option ^{8,9}	1400	800	1852	800
RT 351	35 / 28	60 ⁹	100 - 150	option ^{8,9}	1400	800	1852	1010
RT 401	40 / 32	130 ⁹	220 - 320	option ^{8,9}	1400	800	1852	1205
RT 501	50 / 40	130 ⁹	220 - 320	option ^{8,9}	1800	800	1852	1300
RT 601	60 / 48	130 ⁹	220 - 320	option ^{8,9}	1800	800	1852	1470
RT 801	80 / 64	130 ⁹	220 - 320	option ^{8,9}	2100	800	1852	1700
RT 1001	100 / 80	130 ⁹	220 - 320	option ^{8,9}	2100	800	1852	1850
RT 1251	125 / 100	140 ⁹	240 - 340	option ^{8,9}	2100	800	1852	2100
RT 1501	150 / 120	140 ⁹	240 - 340	option ^{8,9}	2400	1000	1852	2480
RT Series	Three Phase Output 400 V 50 Hz ⁶ Three Phase Input 400 V 50 Hz ⁶							
RT 83	8 / 6.4	60 ⁹	100 - 150	option ^{8,9}	650	700	1080	295
RT 123	12 / 9.6	60 ⁹	100 - 150	option ^{8,9}	700	750	1400	385
RT 153	15 / 12	60 ⁹	100 - 150	option ^{8,9}	700	750	1852	480
RT 203	20 / 16	60 ⁹	100 - 150	option ^{8,9}	1200	600	1852	600
RT 223	25 / 20	60 ⁹	100 - 150	option ^{8,9}	1400	800	1852	785
RT 353	35 / 28	60 ⁹	100 - 150	option ^{8,9}	1400	800	1852	990
RT 403	40 / 32	130 ⁹	220 - 320	option ^{8,9}	1400	800	1852	1190
RT 503	50 / 40	130 ⁹	220 - 320	option ^{8,9}	1400	800	1852	1285
RT 603	60 / 48	130 ⁹	220 - 320	option ^{8,9}	1400	800	1852	1465
RT 753	75 / 60	130 ⁹	220 - 320	option ^{8,9}	1800	800	1852	1680
RT 1003	100 / 80	130 ⁹	220 - 320	option ^{8,9}	1800	800	1852	1840
RT 1203	120 / 96	140 ⁹	240 - 340	option ^{8,9}	2100	800	1852	2000
RT 1503	150 / 120	140 ⁹	240 - 340	option ^{8,9}	2400	800	1852	2450
RT 2003	200 / 160	160 ⁹	270 - 400	option ^{8,9}	2400	800	2050	3180
RT 2503	250 / 200	160 ⁹	270 - 400	option ^{8,9}	3200	800	2050	3900
RT 3003	300 / 240	160 ⁹	270 - 400	option ^{8,9}	3600	1000	2050	4250
Notes								
1. VR LA maintenance free				6. Other voltages and frequencies available				
2. Inverter Input range				7. Other voltages available				
3. Available in UPS System enclosure				8. Custom designed enclosures and racks available				
4. In separate matching enclosure size				9. NiCad and other batteries may be used				
5. Excluding batteries				10. Battery charger / rectifier is 6 pulse, 12 pulse option available				



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