Sollatek™

Voltright™

SOLLATEK AUTOMATIC VOLTAGE REGULATOR (AVR)

Solid state stabilisation for all industrial, professional and domestic applications.

CONTENTS

COMPANY PROFILE

A LEADING FORCE

Established for over 40 years, Sollatek is a manufacturer of innovative products in power control, energy saving, temperature control, and solar energy. With its head office in the United Kingdom – where engineering, production, sales, marketing and logistics are located – Sollatek has a network of partners across the globe.

The Sollatek network comprises local Sollatek companies (with service centres) in over ten countries and distributors and resellers in over sixty countries.

We work closely with our partners around the world to deliver our promise of a two year worldwide warranty, and in some local countries this is further extended to a five year warranty.

AVR INTRODUCTION

AVR3PE600

STABLE POWER YOU CAN DEPEND ON

Using microprocessor and solid-state technology, Sollatek AVRs deliver rapid voltage correction, ensuring a stable power supply to your equipment.

With a correction speed of 1250V per second, the AVR effectively stabilises voltage fluctuations, providing fast and reliable protection for sensitive electronics.

Sollatek AVRs boast a very wide input range of up to ±35%, making them ideal for areas with unstable power supply. They maintain an exceptional accuracy of better than ±5%, far exceeding regulations. SCADA and remote interface options are available.

Sollatek is a world leader in the field of voltage regulation and protection.

Sollatek has the ideal solution to protect all your domestic, commercial and industrial installations, enabling your appliances to operate efficiently, wherever mains supply is erratic and unreliable.

From small domestic appliances (250 VA) to large applications (3 MVA), Sollatek can provide you with a solution. With single and three phase applications available, the Sollatek range of voltage regulators is your answer in the most unstable of power conditions.

The AVR is specified and used by a number of large organisations including:

- Satellite operators
- Infrastructure telecom companies
- Embassies worldwide for reliable electrification of their posts
- Medical systems for digital imaging, scanning and X-ray equipment.
- Mobile phone operators
- Grid utility companies for voltage regulation to their sub-stations
- Various United Nations divisions including WHO, UNICEF and WFP.

Standard and useful features:

- Microprocessor controlled – high speed response
- Wide input frequency tolerance between 45 to 75 Hz allowing unit to function properly in areas of severe voltage disturbances.
- High overload capability with up to 150% for 4 minutes
- Very low losses and minimal heat dissipation due to an efficiency of over 96% at full load
- Internal automatic bypass (larger units)
- All cables made into LSZH compliant materials (low smoke zero halogen)
- Galvanised steel construction with high anti-corrosion paint finish
- Warranty of two years. Sollatek provides full back up support on all its products, with local support in over 20 countries worldwide.

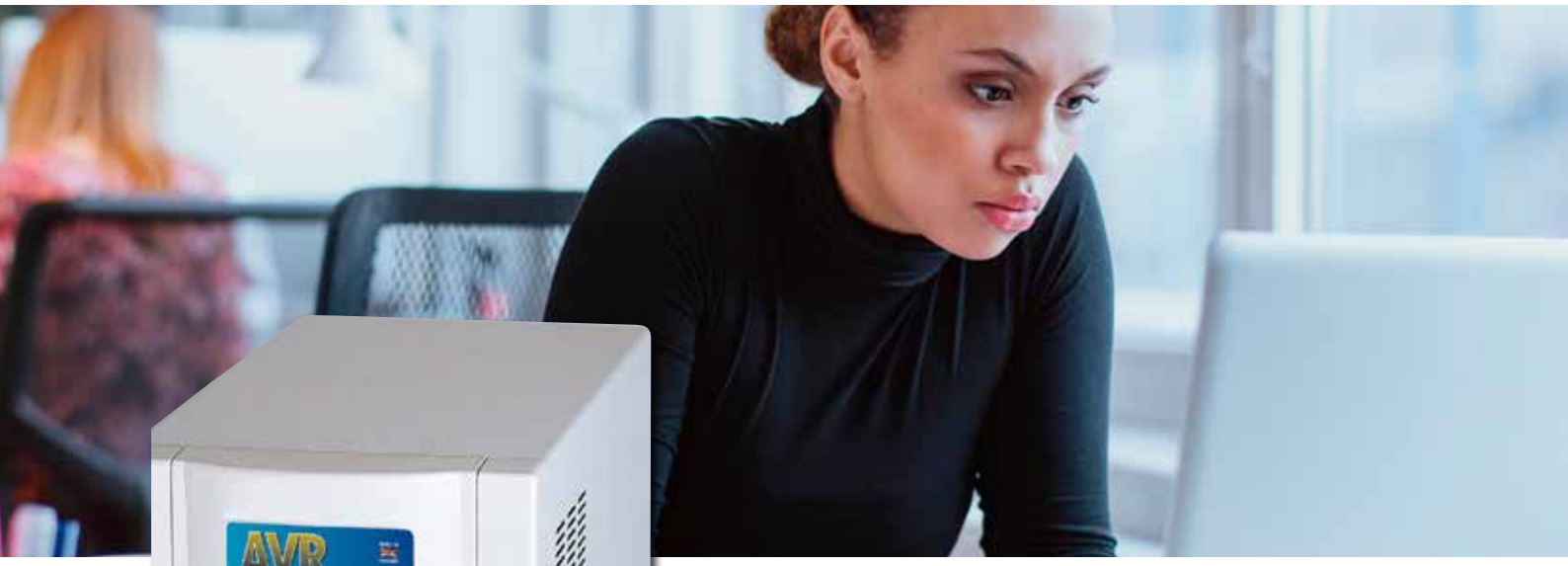
Optional feature includes:

- AVS
- Outdoor enclosure
- Change-over switch
- Isolated transformer
- Digital display: input and output voltage, output current.
- Manual bypass switch transferring the load to the utility grid
- Input circuit breaker
- Output circuit breaker
- DSP class I and II

Fully electronic with no moving parts for:

- High reliability
- Speed of operation
- Immunity to dust and other environmental conditions

AUTOMATIC VOLTAGE REGULATOR
450 VA TO 2500 VA



AVR05-22
AVR10-22

AVR02-22

Suitable for all domestic and small office applications, this range of AVRs is built into an attractive and modern enclosure to suit and blend with modern equipment.

The Sollatek AVR range from 450 VA up to 2500 VA is built into a strong, plastic enclosure (see table opposite for dimensions). The larger units are built into a metal enclosure with a plastic facia, providing a smart unit that will blend well with other equipment.

FEATURES

LED display – A 17 Light Emitting Diodes (LED) display is built on the front panel. This display provides the following indications:

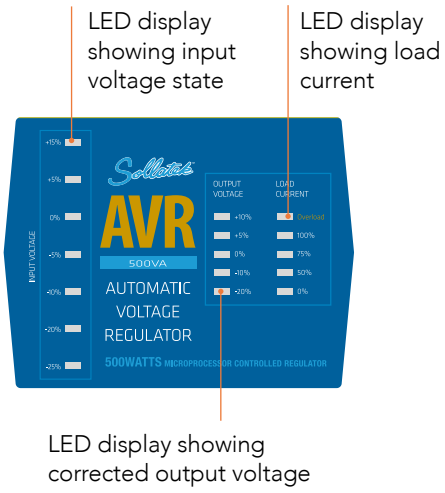
Input voltage – 7 LEDs indicate the state of the incoming voltage. At a glance it is possible to see the level of under-voltage or over-voltage.

Output voltage – 5 LEDs indicate the state of the output voltage. A 0% indication shows the output voltage reaching your equipment is at the correct nominal voltage.

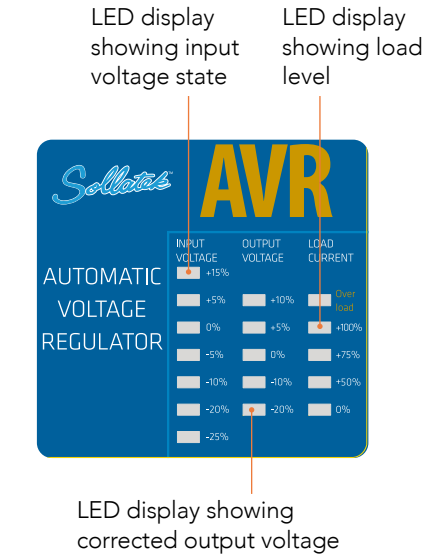
Load current – 5 LEDs display the percentage of rated current the load is drawing through the AVR. Although the Sollatek AVR will withstand 110% overload for long durations, it is never recommended to overload any equipment. The overload indication makes it possible to reduce the load, allowing the AVR to work safely. If the overload persists then the Sollatek AVR will disconnect the load for protection.

FRONT DISPLAYS

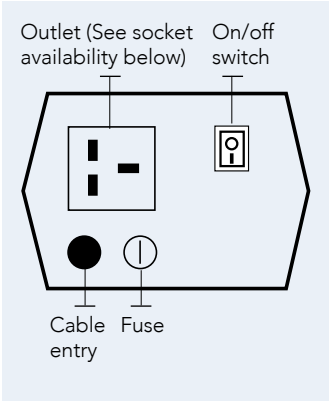
Front panel for Case type A



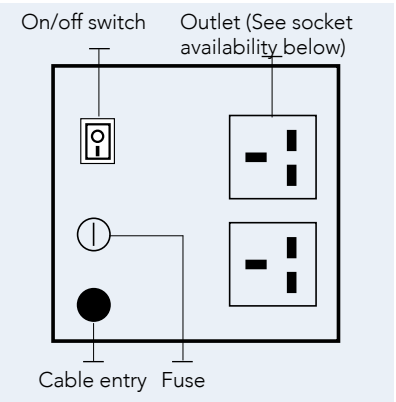
Front panel Case type B, C and D



REAR PANELS

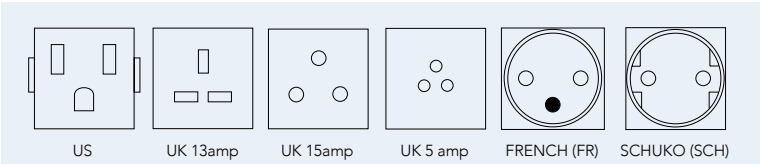


Rear panel Case type A



Rear panel Case type C and D

SOCKET AVAILABILITY



Any of the above sockets types can be ordered on the rear panels (MOQ may apply*)

SPECIFICATIONS

Model	Amps	Voltage	VA	Socket	Weight kg	Dims (LxWxH) mm	Case Material Type	Case
AVR02-22	2	230	460	UK, FR, SCH, UK5	5	124 x 193 x 100	Plastic (ABS)	A
AVR05-22	5	230	1150	UK, FR, SCH, UK15	12	145 x 285 x 212	Metal	C
AVR10-22	10	230	2300	UK, FR, SCH, UK15	15	179 x 335 x 212	Metal	D

AUTOMATIC VOLTAGE REGULATOR
4.5 kVA TO 90 kVA

AVR300-22

Using state of the art technology the Sollatek AVR displays load current in real time, input voltage and output voltage (the display toggles between input and output voltage, using a switch).

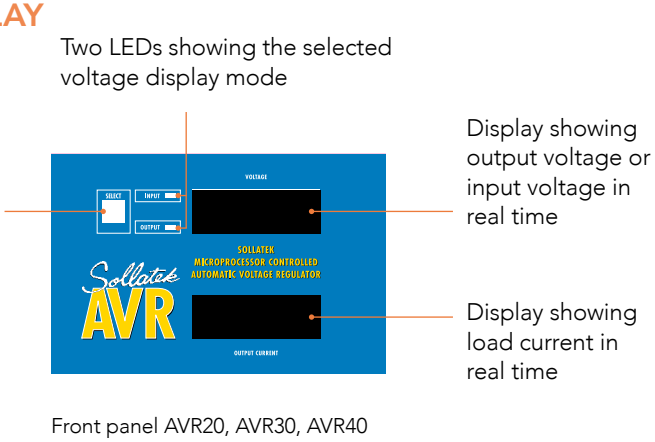
Suitable for large applications covering a small office to an entire apartment, a house or even a small workshop.

Available from 4.5 kVA (at 230 V supply) up to 90 kVA (400 A at 230 V) and built into a tower metal enclosure with a small footprint of 215x347 mm (for models up to AVR40-22).

This range of AVRs come standard with an LCD which provides input voltage, output voltage and output current monitoring.

AVR100-22
with digital display

FRONT DISPLAY

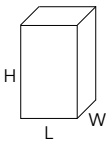


Front panel AVR20, AVR30, AVR40

For AVR models up to 10 kVA @ 230 V (AVR40-22)

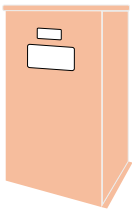
SPECIFICATIONS

Model	Amps	Voltage	kVA	Weight kg	Dims (LxWxH) mm
AVR20-22	20	230	4.6	40	215 x 347 x 520
AVR30-22	30	230	6.9	55	215 x 347 x 520
AVR40-22	40	230	9.2	60	215 x 347 x 520
AVR50-22	50	230	11.5	82	460 x 785 x 445
AVR75-22	75	230	17.2	100	460 x 785 x 445
AVR100-22	100	230	23.0	114	460 x 785 x 445
AVR250-22	250	230	57.5	350	680 x 1200 x 1130
AVR300-22	300	230	69.0	382	680 x 1200 x 1130
AVR350-22	350	230	80.5	397	680 x 1200 x 1130
AVR400-22	400	230	92.0	423	680 x 1200 x 1130
AVR30-11	30	110	3.3	36	215 x 347 x 520
AVR40-11	40	110	4.4	40	215 x 347 x 520
AVR50-11	50	110	5.5	50	460 x 785 x 445
AVR75-11	75	110	8.2	56	460 x 785 x 445
AVR100-11	100	110	11.0	65	460 x 785 x 445
AVR250-11	250	110	27.5	127	680 x 1200 x 1130
AVR300-11	300	110	33.0	186	680 x 1200 x 1130
AVR350-11	350	110	38.5	204	680 x 1200 x 1130
AVR400-11	400	110	44.0	287	680 x 1200 x 1130



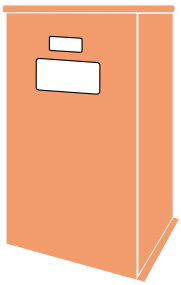
AUTOMATIC VOLTAGE REGULATOR
THREE PHASE RANGE

	L-SERIES	3x SERIES	PRO SERIES
			
	Affordable Voltage Regulation	**Commercial Voltage Regulation**	**High-Capacity Voltage Regulation**
Key Advantage	Budget-friendly solution for cost-sensitive installations	Ideal for light commercial and residential applications	High-performance reliability for critical industrial applications
Voltage Control	Consistent voltage regulation for basic needs	Rapid correction for moderate voltage fluctuations	Ultra-fast response to severe and frequent voltage changes
Durability & Maintenance	Affordable with simple, durable design	Minimal maintenance with robust, long-lasting components.	Heavy-duty construction for long-term, high-demand use.



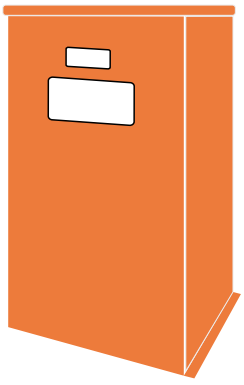
75 to 200
AMPS

INPUT ±20%
OUTPUT ±3%



20 to 200
AMPS

INPUT -30% to +22%
OUTPUT ±4%



250 to 3000
AMPS

NARROW RANGE
INPUT ±12.5%
OUTPUT ±3% or ±4%

STANDARD RANGE
INPUT ±20%
OUTPUT ±3% or ±4%

EXTENDED RANGE
INPUT ±30%
OUTPUT ±3% or ±4%

AVR L-SERIES
FROM 70 kVA TO 180 kVA

Actual unit may differ from shown

The L-Series Sollatek AVR is a solid state stabiliser, micro-processor technology controlled range. At the heart of the unit is an advanced microcomputer that not only ensures very accurate control of output voltage to the load, but also provides a host of advanced features.

The AVR L-Series output voltage accuracy is 3% or better exceeding the most demanding advanced utilities minimum standards around the world.

This range can cope with the harshest environments yet designed to ensure it is affordable for demanding application but where cost is also an important consideration.

The AVR L-Series is suitable for:

- Satellite operators
- Infrastructure telecom companies
- Embassies worldwide for reliable electrification of their posts
- Medical systems for digital imaging, scanning and x-ray equipment.
- Mobile phone operators
- Offices and factories

THE AVR L-SERIES
AVAILABLE WITH TWO DIFFERENT DISPLAYS

AVR - ADM (Advanced Display Module):

- 7" full-colour touchscreen module
- Displays live and historic operational data including:
  - Input/output voltages
  - Output current
  - Transformer and thyristor temperatures.
- Network connectivity through Ethernet and Wi-Fi
- Allows access to event logs via LAN, USB or directly on screen.
- Features a web-based portal for monitoring through trusted local network
- Allows for fast on-site configuration and maintenance without additional tools

MODEL TABLE

Part Number	Description	Output Power @ 230 V	Max Output Current/ Phase	Continuous Output Current*	AVR Dimension WxHxD mm	AVR Weight kg
973LS075	AVR3LS-70kVA 230/400V 3x100/75APi	70 kVA	100 A	75 A	511 x 1026 x 714	250
973LS101	AVR3LS-90kVA 230/400V 3x133/100APi	90 kVA	133 A	100 A	511 x 1026 x 714	300
973LS151	AVR3LS-140kVA 230/400V 3x200/150APi	140 kVA	200 A	150 A	511 x 1226 x 764	400

AVR-DM (Digital Meters):

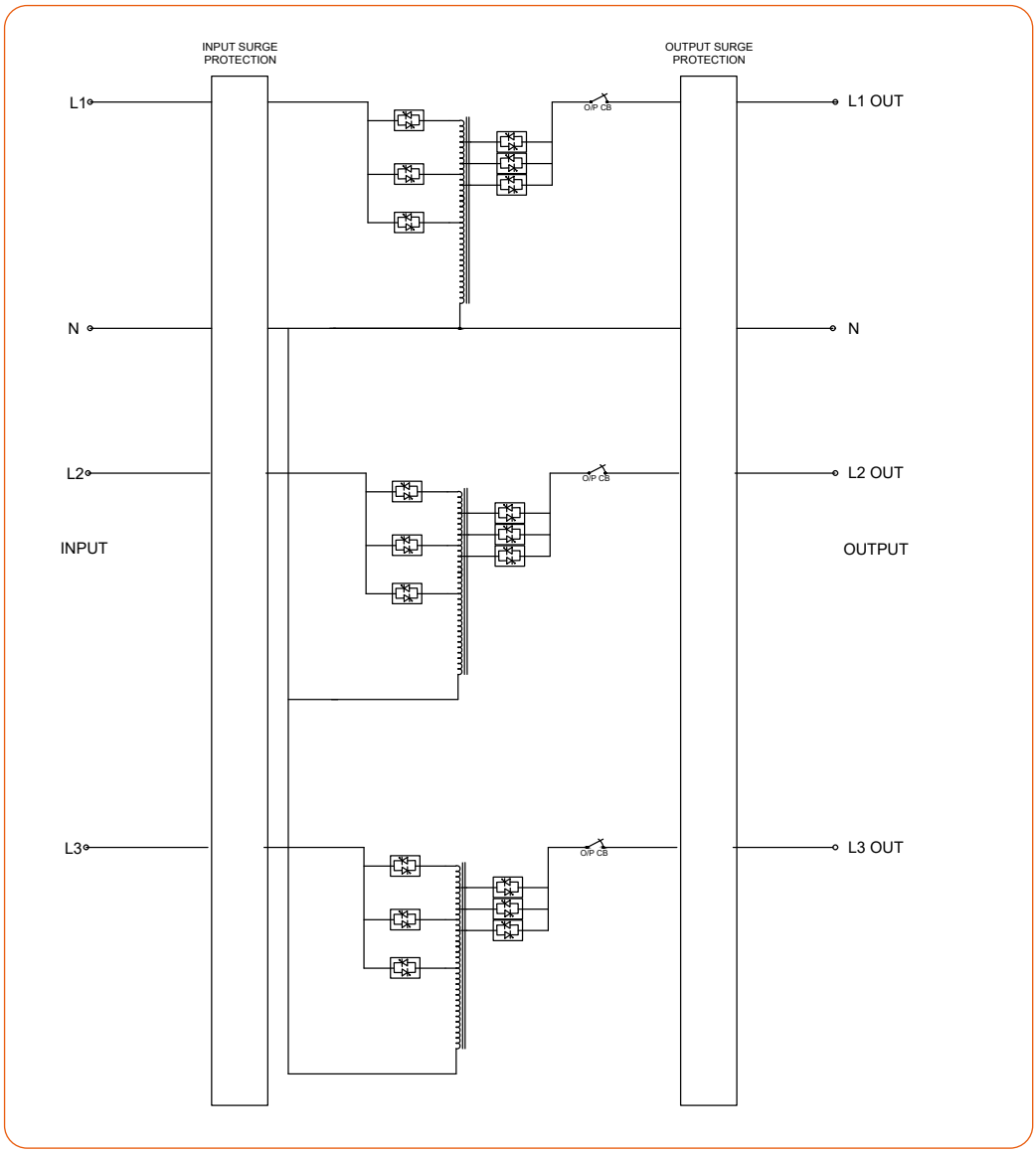
Displays input/output voltage and current

MODEL TABLE

Part Number	Description	Output Power @ 230 V	Max Output Current/ Phase	Continuous Output Current*	AVR Dimension WxHxD mm	AVR Weight kg
973LS075-K	AVR3LS-70kVA 230/400V 3x100/75A M	70 kVA	100 A	75 A	511 x 1026 x 714	250
973LS101-K	AVR3LS-90kVA 230/400V 3x133/100A M	90 kVA	133 A	100 A	511 x 1026 x 714	300
973LS151-K	AVR3LS-140kVA 230/400V 3x200/150A M	140 kVA	200 A	150 A	511 x 1226 x 764	400

HIGHER CAPACITY UNITS AVAILABLE, PLEASE CONTACT SOLLATEK

AVR L-SERIES DIAGRAM



Features:

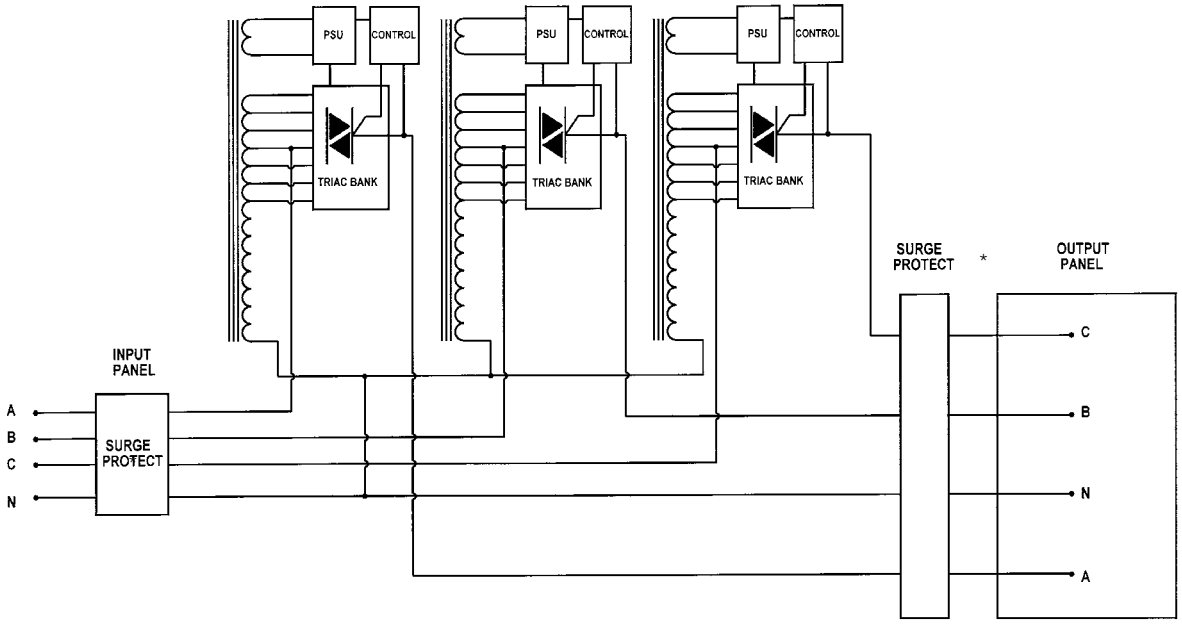
- Digital display: input and output voltage, output current and frequency.
- DSP Class II surge protection
- Wide input frequency tolerance allowing unit to function properly in areas of severe voltage disturbances
- Includes Automatic Voltage Switcher that will protect against very low and very high voltage
- Output circuit breaker protecting the unit in the event of a short circuit or overload
- High overload capability with up to 150% for 4 minutes
- Very low losses and minimal heat dissipation due to an efficiency of over 96% at full load.
- Extremely fast speed of correction
- Solid state, no moving parts and maintenance free.
- USB-B interface for efficient downloading of historical data

AVR 3x SERIES
FROM 18 kVA TO 190 kVA

The Sollatek three phase AVR is made of three identical single phase regulator units providing independent control. Each of these monitors its own output voltage and adjusts for variations in mains supply voltage.

The AVR3x uses triac-based technology, ensuring reliable and efficient performance. It provides a wide input range of 30% to +22% and a 4% output accuracy. A range of options are available for increased safety of the AVR and load, making the three-phase range a very comprehensive source of secure, stable power.

BLOCK DIAGRAM



Block diagram of Sollatek 3x Series *optional

SPECIFICATIONS

These are standard models

Input range for the standard models is -30% to +22%. Other models can be made to order.

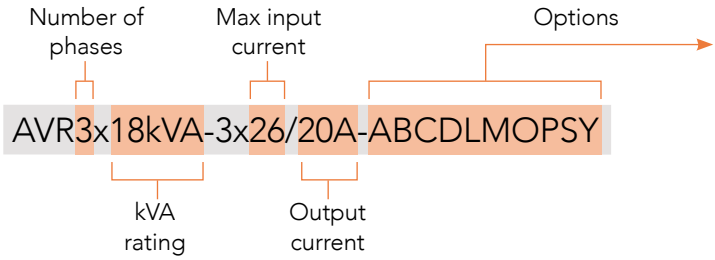
To reduce cost and in areas of more stable input voltage, Sollatek can provide the M (AVRM) series with an input of ±15%. The model number will be as above but with an M suffix. e.g. AVRM3x20-22.

Model	Amps Per	Voltage	Peak	Weight	Dims (WxDxH)
mm		Phase		kVA	kg
AVR3-18kVA 3x26/20A	20	230/400	18	119	450 x 635 x 850
AVR3-25kVA 3x40/30A	30	230/400	25	145	450 x 635 x 850
AVR3-45kVA 3x66/50A	50	230/400	45	224	500 x 685 x 1060
AVR3-70kVA 3x100/75A	75	230/400	70	280	600 x 735 x 1110
AVR3-90kVA 3x133/100A	100	230/400	90	350	500 x 835 x 1280
AVR3-140kVA 3x200/150A	150	230/400	140	405	500 x 835 x 1280
AVR3-190kVA 3x266/200A	200	230/400	190	767	680 x 1200 x 2070

ORDERING

The Sollatek three phase AVR range is easy to order. All units are rated by kVA and the input/output voltage. For example:

Three Phase AVR 3x series naming convention



Some options might not be compatible with others.
Please contact Sollatek sales for full details.

OPTIONS:

A	AVS
B	Input circuit breaker
C	Output circuit breaker
D	Surge & lightning protection up to 20 kA
L	Phase Balancer
M	Digital meters
O	Outdoor enclosure (IP44)*
P	Changeover switch
S	High-level lightning protection >90 kA
Y	Manual bypass

**Model dependent*

Refer to Page 22 for detailed description of the options.

PRO SERIES AVR
FROM 230 kVA TO 2 MVA

The high current Sollatek AVR range (>250 Amps/Phase) uses Silicon Controlled Rectifiers (SCR or Thyristor) technology.

At higher currents, SCR technology provides ultimate robustness and efficiency of operation. They are more rugged and provide versatility during switching.

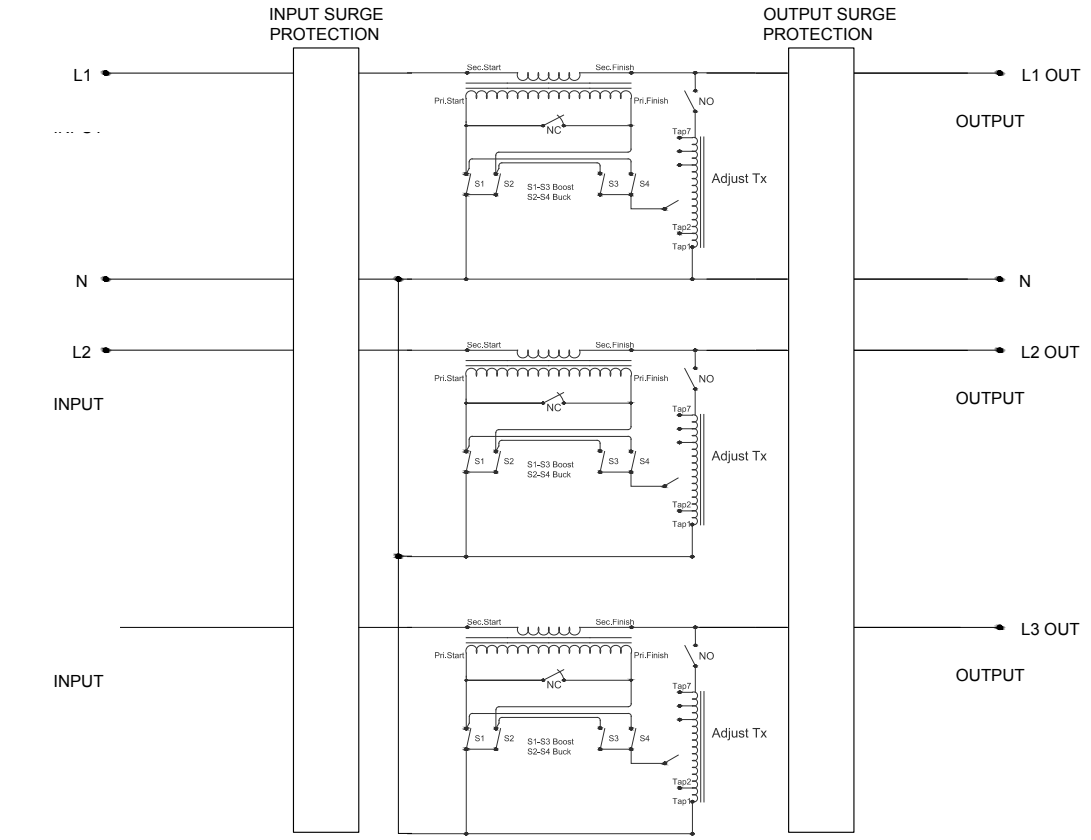
Furthermore, the Thyristor range of the Sollatek AVR has been enhanced with many features including auto-internal by-pass, remote monitoring options, and more efficient electronic designs, making the unit simpler to install and more robust.

The Sollatek Pro range is available as standard with an input range of ±20% and output accuracy of 3%. This is referred to as the S (Standard) range.

Further input tolerance models are available. In areas where fluctuations are not expected to be very wide, the N (Narrow) range provides ±12.5% input and a 3% output accuracy. Where the mains is expected to vary in extreme, the E (Extended) range provides ±30% input with a 3% output accuracy.

Please see page 20 & 21 for more information on the Standard, Narrow and Extended models.

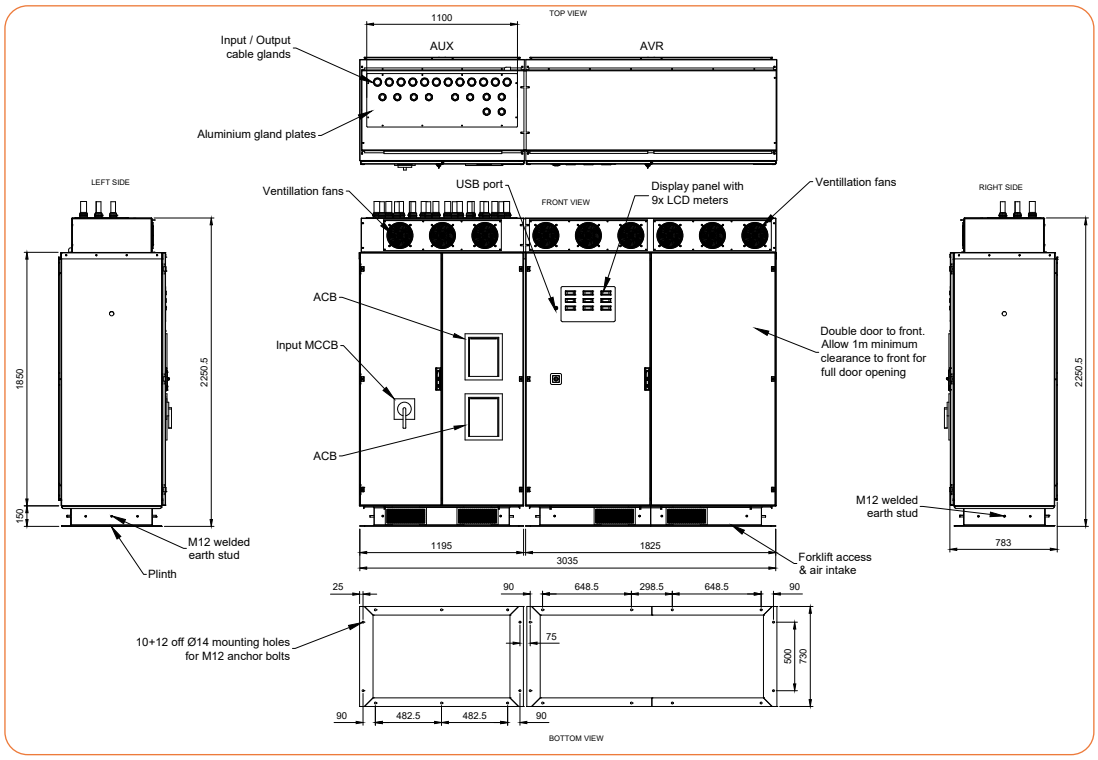
BLOCK DIAGRAM OF PRO SERIES AVR



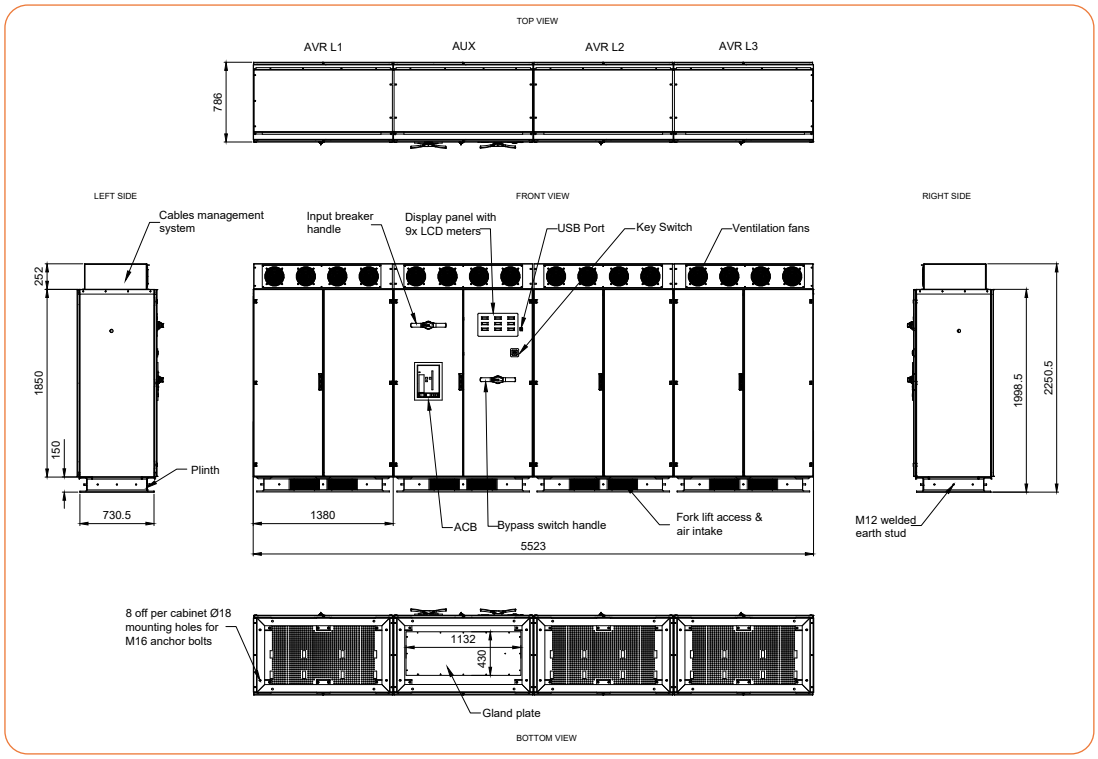
* System shown in optimising mode.
** Three phase balanced independently

GENERAL ARRANGEMENT DIAGRAM

(OTHER VARIATIONS AVAILABLE)



AVR3S-700kVA 3x1066/800A-ABCDMY



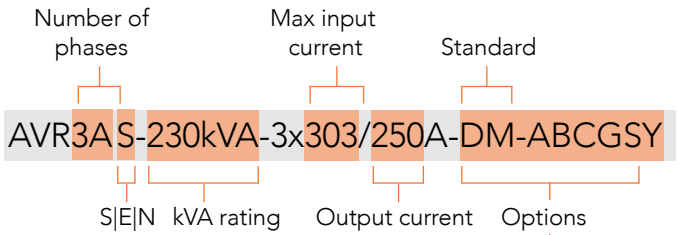
AVR3E-1100 kVA 3x1600/1200A-ABCDMY

MODELS AVAILABLE FOR PRO SERIES

ORDERING

The Sollatek three phase AVR range is easy to order. All units are rated by kVA and the input/output voltage. For example:

Three Phase Professional Power Series – Naming Convention



A	AVS
B	Input circuit breaker
C	Output circuit breaker
D	Surge & lightning protection up to 20 kA
G	GMT modem*
M	Digital meters
S	High-level lightning protection >90 kA
Y	Manual bypass

**Model dependent*

MODELS AVAILABLE FOR PRO SERIES

Model	kVA	Model	No of Cabinets		AVR (each, if >1)		Input Range
			AVR	AUX*	kg	(WxDxH) cm	
AVR3AN-230kVA 3x277/250A	230	N	1	1	520	100 x 56 x 157	±12.5%
AVR3AS-230kVA 3x303/250A		S	1	1	910	143 x 74 x 157	±20%
AVR3AE-230kVA 3x346/250A		E	1	1	1150	160 x 74 x 177	±30%
AVR3AN-275kVA 3x331/300A	275	N	1	1	580	100 x 56 x 157	±12.5%
AVR3AS-275kVA 3x362/300A		S	1	1	940	143 x 74 x 180	±20%
AVR3AE-275kVA 3x414/300A		E	1	1	1250	160 x 74 x 200	±30%
AVR3AN-370kVA 3x446/400A	370	N	1	1	770	143 x 74 x 180	±12.5%
AVR3AS-370kVA 3x487/400A		S	1	1	1250	155 x 74 x 195	±20%
AVR3AE-370kVA 3x557/400A		E	1	1	1500	160 x 74 x 200	±30%
AVR3AN-460kVA 3x554/500A	460	N	1	1	850	143 x 74 x 180	±12.5%
AVR3AS-460kVA 3x606/500A		S	1	1	1650	160 x 74 x 200	±20%
AVR3AE-460kVA 3x693/500A		E	1	1	2000	183 x 79 x 225	±30%
AVR3AN-550kVA 3x662/600A	550	N	1	1	920	143 x 74 x 180	±12.5%
AVR3AS-550kVA 3x725/600A		S	1	1	1877	160 x 74 x 200	±20%
AVR3AE-550kVA 3x828/600A		E	1	1	2150	183 x 79 x 225	±30%
AVR3AN-700kVA 3x843/800A	700	N	1	1	1250	155 x 74 x 195	±12.5%
AVR3AS-700kVA 3x922/800A		S	1	1	2240	183 x 79 x 225	±20%
AVR3AE-700kVA 3x1054/800A		E	3	1	1350	138 x 79 x 225	±30%
AVR3AN-900kVA 3x1084/1000A	900	N	1	1	1393	155 x 74 x 195	±12.5%
AVR3AS-900kVA 3x1186/1000A		S	3	1	1040	110 x 74 x 200	±20%
AVR3AE-900kVA 3x1355/1000A		E	3	1	1500	138 x 79 x 225	±30%
AVR3AN-1100kVA 3x1325/1200A	1100	N	1	1	1877	183 x 79 x 225	±12.5%
AVR3AS-1100kVA 3x1449/1200A		S	3	1	1120	110 x 74 x 225	±20%
AVR3AE-1100kVA 3x1656/1200A		E	3	1	1740	138 x 79 x 225	±30%
AVR3AN-1650kVA 3x1987/1800A	1650	N	3	1	1120	110 x 74 x 200	±12.5%
AVR3AS-1650kVA 3x2174/1800A		S	3	1	1680	138 x 79 x 225	±20%
AVR3AE-1650kVA 3x2484/1800A		E	3	1	2100	183 x 79 x 225	±30%
AVR3AN-2000kVA 3x2409/2173A	2000	N	3	1	1200	110 x 74 x 200	±12.5%
AVR3AS-2000kVA 3x2635/2173A		S	3	1	1740	138 x 79 x 225	±20%
AVR3AE-2000kVA 3x3011/2173A		E	3	1	2150	183 x 79 x 225	±30%

Please note dims and weights are approximate, sizes can vary depending on size of the AVR and options fitted.
Please contact Sollatek sales for full details.

Output Regulation	Max Input A	Output A	Max kVA at 230 V	Max VA at 24hr/45°C/Max Boost	Heat Dissipation in kW	Impedence in mΩ	Short Circuit Capability kA
4%	277	250	230 kVA	172	2.3	4.8	5.6
	303				3.5	7.2	
	346				4.6	9.6	
4%	331	299	275 kVA	206	2.75	4	6.7
	362				4.1	6	
	414				5.5	8	
3%	446	402	370 kVA	277	3.7	3	9
	487				5.6	4.5	
	557				7.4	6	
3%	554	500	460kVA	345	4.6	2.4	12
	606				6.9	3.6	
	693				9.2	4.8	
3%	662	598	550 kVA	412	5.5	1.8	15
	725				8.3	2.7	
	828				11	3.6	
3%	843	761	700 kVA	525	7	1.4	19
	922				10.5	2.1	
	1,054				14	2.8	
3%	1,084	978	900 kVA	675	9	1	24
	1,186				13.5	1.5	
	1,355				18	2	
3%	1,325	1196	1100 kVA	825	11	0.8	29
	1,449				16.5	1.2	
	1,656				22	1.6	
3%	1,987	1793	1650 kVA	1237	16.5	0.7	40
	2,174				24.8	1.1	
	2,484				33	1.4	
3%	2,409	2174	2000 kVA	1500	20	0.6	48
	2,635				30	0.9	
	3,011				40	1.2	

AVR OPTIONS

A number of options are available on the Sollatek 3 Phase AVR range:

Option A – Automatic Voltage Switcher option (AVS™): The AVS (a Sollatek UK Patent 2139436) option completes the protection that can be offered by the Sollatek AVR.

The AVS simply disconnects the mains when the voltage is 'BAD' and re-connects it automatically when the voltage returns to 'GOOD'. Using this principle, the AVS monitors the output of the AVR. If the AVR cannot correct the voltage sufficiently (in cases where the fluctuation is extremely high or extremely low), then the AVS will disconnect the output and thus provide this added protection to the appliance. When the AVR's output is acceptable, the AVS will monitor the supply for 1 minute to ensure stability and will then reconnect the mains.

The Sollatek AVS has an additional useful feature of Timesave™. Using its own microprocessor, the AVS will monitor the time. If the unit has been disconnected for more than 1 minute then the AVS will reconnect within 10 seconds.

Option B&C – Input/output circuit breakers: Circuit breakers protect the load and the AVR from the harmful effects of overcurrent. It is recommended that all Sollatek AVRs are installed with at least input circuit breakers and, wherever possible, output circuit breakers. These can be provided by the customer or alternatively, for ease of installation and for compactness, they can be ordered as an option to be built in to the AVR.

Option D&S – Additional surge/spike suppression: Extra surge/spike suppression is available on the Sollatek 3 Phase AVR range with the DSP. This will provide a high level of protection from lightning induced voltage and other voltage surges on the mains supply.

- Designed to handle surges up to 20 kA (D Option) and 100 kA (S Option)
- Auto resetting
- Remote status indication via volt -free contacts
- Can be built-in or ordered separately in a plastic wall mounting enclosure
- Suitable for all current rating as the unit is shunt connected

Option I – Isolation transformer: The Sollatek AVR can be supplied with a built in Isolating Transformer. For more details, please contact Sollatek.

Option L: The AVR regulates all three phases independently. The L option is an important addition for three phase motors, which, as long as the incoming phases are balanced, ensures that the phases remain balanced at the output.

Option M – Digital input/output voltage and current meters: The Sollatek 3 Phase AVR can be ordered with meters to indicate the state of the input voltage to compare it with the output voltage. Current meters are useful to ensure that the load does not exceed the rating of the AVR.

Option O – Protecting the AVR against outside elements:

Rate at IP44.

Option P – Changeover switch: Manual switch that will by pass the incoming mains from the AVR directly to the load. The AVR will remain powered on. To take the AVR off-line for maintenance, the system will need to be powered down first.

Option Y – Manual by-pass switch: The function of the bypass switch option is to allow the user to remove a regulator from service whilst the load remains connected to mains power. This has the benefit of allowing safe access to the AVR for servicing without having to disconnect power from the load, thereby reducing system downtime.

PRINCIPLES OF OPERATION

AVR function: This is based on an auto transformer with tap changing on the output. There are seven taps to each transformer giving an accurate output voltage for a wide range of input voltage. The taps are switched by generously rated Triac banks to cope with motor start loads.

This technique results in a voltage stabiliser which has no moving parts, responds quickly to voltage fluctuations and is not as large or heavy as other AVRs utilising different regulation techniques.

A micro-controller forms the heart of the control system. It measures the AVR output voltage and turns on the appropriate Triac bank to select the correct tap.

A potentiometer is provided for fine adjustment of the output voltage. The micro-controller also measures the frequency of the mains supply and compensates accordingly. This also means that the AVR will work automatically over a frequency range of 45 - 75 Hz and down to as low as 30 Hz for short periods to help cope with diesel generator loading problems.

Frequency and voltage measurements are filtered by the circuit and software to remove noise and so prevent spurious tap changes. In an industrial environment there can be a large amount of electrical noise and interference present on the mains and load cabling. This may be caused by other equipment in the building such as electric motors and speed controllers, contactors and relays, electric welding, etc. This will distort the waveform of the electricity. To avoid this, spike suppressors are fitted to the AVR input and output to clip any high voltage transients on the line. Additionally, a capacitor type filter is fitted to the measurement input to the AVR to further attenuate spikes and to filter out high frequency noise and interference. As a further precaution, the software programme in the micro performs mathematical filtering using various averaging techniques. The software does a number of checks to ensure that the measurements it is getting are reasonable and consistent. All of these aspects of the design result in an AVR which is rugged and will perform well in an industrial environment.

Zero-voltage switching: The AVR uses an auto transformer with tap changing to regulate the supply. The taps are selected using triacs which are controlled by a microcontroller. The micro measures the voltage of the mains waveform many times in every cycle to determine the voltage and decide which tap to select. The micro also uses these measurements to synchronise the running of its software program to the mains wave-form. When a tap change is necessary, the micro watches for the mains voltage to reach zero volts and then it turns off the present Triac and turns on the new Triac. The micro and the triacs are semiconductor devices and switch very fast so that there is no interruption in the supply. This means that the new Triac is now in operation, selecting the new tap, at the very start of the next half cycle of the mains wave-form. The AVR will continue with this tap selected until the measurements by the micro determine that another tap change is necessary.

Zero-Voltage Solid State Switching is also superior to Relay/Mechanical based switching as it avoids interruption to the supply and also superior to servo based switching which apart from slow response and requiring maintenance, produces noise as the motor brushes move during correction.

Spike protection: The Sollatek AVR is protected against spike and surges primarily by large Metal Oxide Varistors fitted at the input to the unit (260 Joules - 350 VAC). These are fitted between the three lines and neutral and between the three lines and earth. These have the combined function of protecting the AVR and the load.

There is also a further Metal Oxide Varistor (1.5 Joule - 31 VDC) on each circuit board to protect the AVR's low-voltage circuitry. Polyester capacitors are fitted to all power supplies within the unit to filter out interference.

TECHNICAL NOTES

In most applications, purchasing a regulator is simply a process of deciding the power requirement and the voltage and choosing a suitably rated unit.

However, ambient temperature, altitude, load duty cycle, type of load are also all important factors in deciding which AVR to buy. Furthermore, in certain situations it can be necessary to consider in greater detail the characteristics of the electricity supply and connected load when selecting an AVR. Please see the notes below for further details:

Ambient temperature: Ambient temperatures in excess of 40°C should be mentioned at the time of ordering as AVR size or rating may be affected. As a rule of thumb, output power should be de-rated by 10% – 15% per 10°C above 40°C ambient.

Supply frequency: The Sollatek standard ranges of AVRs are suitable for both 50 Hz and 60 Hz supplies. However, frequencies below 50 Hz result in larger transformer and therefore AVR size, while frequencies above 50 Hz may enable AVR size to be reduced. Any frequency other than 50 Hz should be notified at the order/ enquiry stage.

Duty cycle: If the AVR is to be used continually for considerably less than 100% of the time, allowance can be made for this, leading to a reduction in transformer size.

The effective power in VA may be estimated from the following formula:

$$\text{Effective VA} = \sqrt{\frac{\text{Time on (mins)}\ (I^2)}{\text{Total Time (mins)}}} \times \text{Volts} \times 3$$

Time on = time in minutes that AVR supplies current (say 15 minutes)
Total time = total length in minutes of period in question (say 60 minutes)

I = Output current (say 20 A): In the above example, the AVR supplies 20 Amps for 15 minutes out of every 60 minutes. Duty cycle information may result in cost reduction and should be notified at the time of enquiry/order. Operation at Altitude. The operation of electrical equipment at high altitude causes cooling by the circulation of air to be reduced. The greater the altitude the greater this effect. It is therefore important to indicate that the AVR is destined for a high altitude environment at the time of ordering. In this case, a high altitude is regarded as above 1500 m.

Motor starting: Motor loads draw a very high initial starting current from the AVR. Whilst the AVR is designed to be able to supply this initial high current without damage, repeated motor starts within a short period may cause excessive heating in the AVR. If motor based, air conditioner or refrigeration equipment are likely to constitute a large proportion of the AVR load, this should be indicated at the point of enquiry. Since this could result in an increase in AVR size, it may be beneficial in some instances to fit a soft start device to the motor to reduce starting surges. Please contact customer support at Sollatek UK or your nearest Sollatek agent for further advice.

Neutral: The Sollatek 3 phase AVRs MUST have a fully rated neutral connection to the supply.

Harmonics: It is important to state whether harmonics will be present on the supply, or will be generated by the load. Harmonics can be created by devices such as thyristors, silicon controlled rectifiers, switch mode power supplies, computer, UPS, television loads, fluorescent lamps with electronic ballasts, variable speed drives and welding equipment. Alternatively harmonics can be generated from the supply side by neighboring installations. If you think harmonics are present on the supply please contact customer support at Sollatek UK or your nearest Sollatek agent for further advice.

Circuit breakers: As a minimum, the mains input to the AVR should be protected by a circuit breaker. For full protection an output circuit breaker should also be fitted. The input circuit breaker should be rated at 1.4 x output current or to max input current (VA rating / minimum input voltage). The output breaker should be rated at output current. The Sollatek AVR – single phase models – are all protected by either a fuse or circuit breaker. Circuit Breaker is an option on the three phase models.

Spike protection: The AVR is protected against high voltage surges and spikes on input and output by metal oxide varistor based surge suppressors. Spikes can be caused by lightning, switching heavy reactive equipment such as industrial motors and transformers, arc welding and electrical grid switching. In areas of extremely high spike activity, additional protection may be necessary. Please contact customer support at Sollatek UK or your nearest Sollatek agent for further advice.

Cable selection. When selecting cable for the AVR input / out connections, one should bear in mind the input current may be up to 40% higher than the output current of the unit. The input neutral (4-Wire system) must be fitted and be fully rated. Voltage-drop should be kept as low as practicable.

Marine shore power. Sollatek isolating AVR (voltage stabilisation and corrosion prevention): Non isolated shore power supplies will quickly corrode marine vessels sacrificial anodes. Without these anodes severe damage will be caused to the vessels immersed metallic parts.

An isolating transformer type shore supply must be used to prevent this galvanic corrosion.

The shore supply is connected to the AVR transformer's primary winding, the AVR's secondary will be connected to the ship side mains input connector.

To prevent galvanic corrosion, the AVR's primary and secondary earth connections are intentionally seperated and for personnel safety the secondary neutral and earth must be connected together with an earth fault detector (GCFI or RCD sold seperately).

The AVR electrical equipment is contained in an IP44 lockable enclosure (rain proof) but depending on proximity to the water, additional housing may be required.

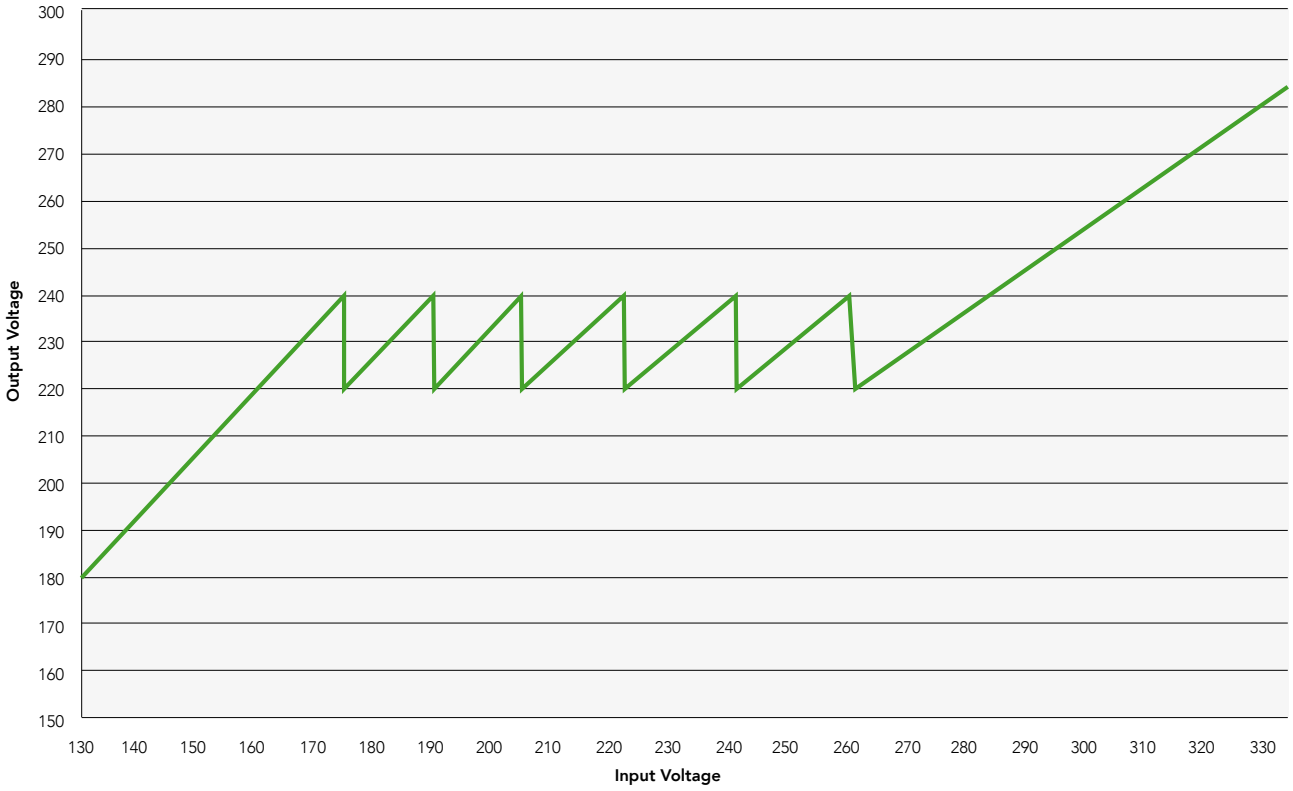
Please contact Sollatek technical support for further details.

INPUT AND OUTPUT VOLTAGE RESPONSE FOR STANDARD MODELS

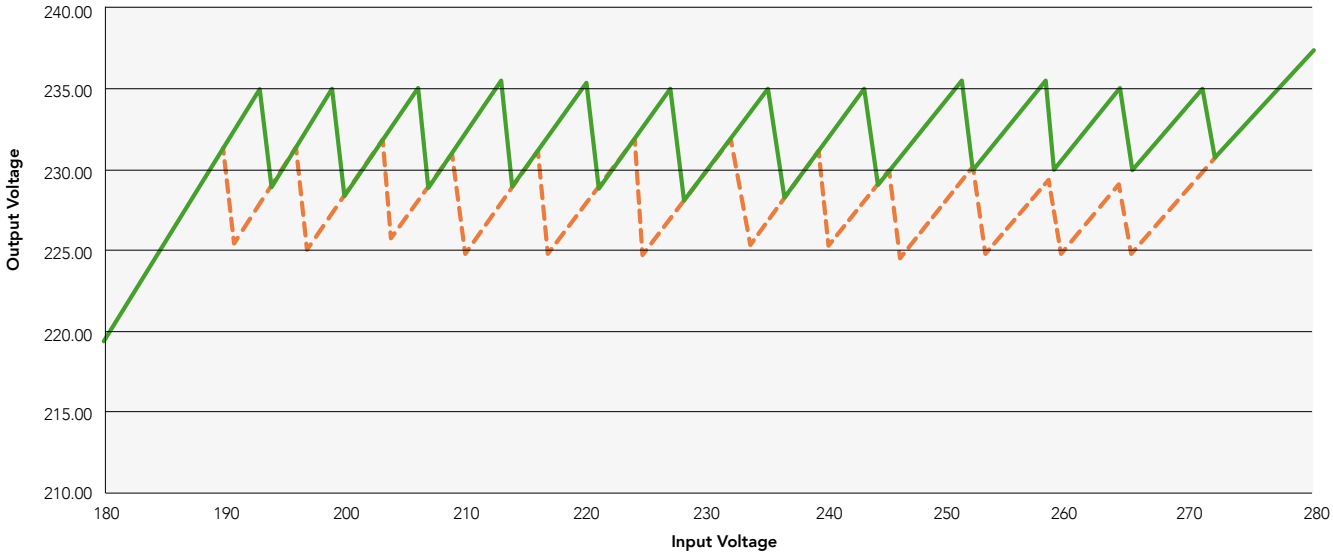
						wake up voltage	NOMINAL SET AT **230 V**																	
INPUT	0-118	125	135	145	155	160	165	175	185	195	205	210	215	220	225	235	240	245	255	265	275	285	295	305	315
OUTPUT	Off	173	185	200	213	220	226	221	234	228	222	228	233	239	225	235	221	226	235	225	235	242	251	260	268

						wake up voltage	NOMINAL SET AT **220 V**																	
INPUT		132	135	145	155	160	165	175	185	195	205	210	215	220	225	235	240	245	255	265	275	285	295	305	315
OUTPUT		OFF	186	200	214	220	228	223	219	212	222	229	214	220	225	219	223	228	217	226	234	242	251	260	315

AVR Input and Output Voltage Ratios



Voltage Diagram for the Thyristor AVR (Standard Model, ±20%)



SPECIFICATIONS			
	3x Series	**L Series**	**Pro Series**
Input			
Input Voltage	230/400 V, -30,+22%. (wider input range optional)	230/400 V ±20%	230/400 V, ±20%. (other input ranges available)
Frequency Range	45 Hz to 75 Hz (i.e 50 Hz -10%, +50%. or 60 Hz -25%, +25%)		
Additional Voltage THD	<0.2% at input (tested at 100% linear load), (No PWM methods used)		
Maximum Input THD	Can withstand 10% THD from the supply		
Output Voltage	230/400 V ±4%	230/400 V ±3%	230/400 ±3 or ±4%, depending on model
Maximum Output Current	20-200 A	75-150 A	250-3000 A
Maximum Output Power	Subject to AVR		
Correction Time	60 ms (0 to 100% load)		
Additional Voltage THD	<0.25% at output (tested at 100% linear load), (No PWM methods used)		
Crest Factor	> 1: 3 permissible on load current (tested at 100% load)		
Synchronization	Output synchronized to input		
Permissible Overload	1000% for 100 milliseconds, 150% for 4 minutes, 110% for 10 minutes.		
Load Types	Designed to run lighting, motors, battery chargers, communication, equipment and office equipment. Suitable for all domestic, commercial and industrial sites.		
General			
Technology	All solid state (static) switching		
Efficiency	>96% (at 100% linear load)	>98% (at 100% linear load)	>98% (at 100% linear load)
Heat Dissipation	Dependent on load		
Control	Microcontroller based control provides system integrity monitoring and diagnostic indicators.		
Control Protection	Filtering algorithms and fault tolerant software protect against disturbances and false measurements.		
Power Connections	Supply phases, neutral and earth. Load phases, neutral and earth.		
Surge Protection	Class II (20 kA) input/output surge arrestors to protect against mains borne transients. Optional Class I-II (100 kA) surge protection available for increased protection against indirect lightning surges.		
Displays*	Digital display, per phase for input voltage, output voltage, output current and frequency.		
Ambient Temperature Range	0 to +55°C		
Relative Humidity	95%, non-condensing		
Environmental Protection	IP21		
Acoustic Noise	< 45 dB (A)		
Expected Service Life	> 25 years		
Standards	Manufactured to comply with :- ISO9001:2000, CE, EN 50081-1:1992, EN 50082-1:1998, EN 55022:1998, EN 61000-4-2:1995/1998, EN 61000-4-3:1996, EN 61000-4-4:1995, EN 61000-4-5:1995, EN 61000-4-6:1996, EN 61000-4-11:1994, DD ENV 50204		
Weight	See tables		

COMPARISON CHART

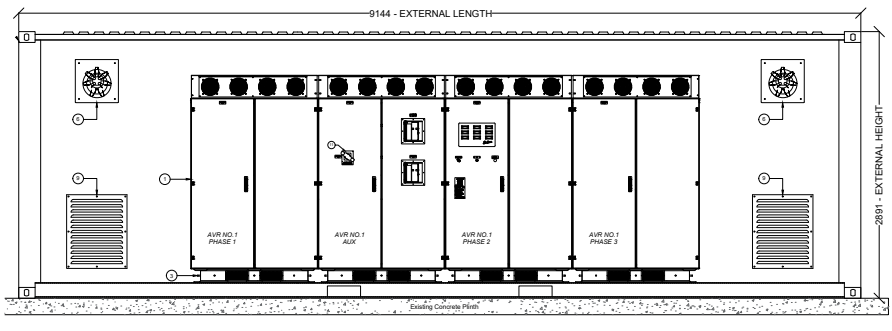
	Sollatek 3x Series	AVR L Series	Sollatek Pro Series	Other Relay Based Stabilisers	Servo/Mechanical Stabilisers	Benefits of Sollatek AVR
Microprocessor Relays	Yes	Yes	Yes	Some	No	Reliable accurate operation allows advanced functions
Relays	No	No	No	Yes	No	Faster connection than mechanical types quiet. Low cost.
Mechanical Elements	No	No	No	No	Yes – uses motorised transfer to adjust output	No mechanical elements means no servicing or maintenance required. Extremely fast correction speed.
Requires Servicing	No	No	No	No	Yes – especially in dusty environment	Low operational expenditure
Typical Voltage Input Range	-30 to +22%	±20%	±20% (Standard) ±30% (Extended) ±12.5% (Narrow)	Varies	±12.5% as a standard	The wide range is ideal, and in some cases essential in countries with chronic mains supply demands.
Typical Voltage Output Range	±4%	±3%	±3%	±6%	±1%	±3% /±4% exceeds most international standards
Total Cost of Ownership (rated 1 to 4)	3	2	2	4	4 (most expensive if same input range compared i.e.+25%)	Value for money. Low total cost of ownership (TOC).

Total cost of ownership (TCO) includes the purchase price of a particular asset, plus operating costs, over the asset's life span.

CONTAINERISED SOLUTIONS

Sollatek now offer a containerised solution where the AVR is installed within a suitably sized shipping container. Prior to installation of the AVR, our specialist supplier modifies the shipping container to suit the end users' requirements and to allow installation of the AVR, the works include:

- Walls (including cargo doors) and ceiling to be lined with metal C-studwork framing lined with white mica steel faced multi pro XS boards and matching trim and insulation- dritherm earth-wool insulation.
- 5 mm thick mild steel plate floor fitted along with mild steel flat bar welded to the steel floor plate to form a platform for the AVR cabinets.
- 2 No defender safeguard steel personnel doors c/w emergency exit hardware, hydraulic door closures and external access device.
- 2 No extractor fans c/w external weatherproof louvre with insect mesh and gravity shutter.
- External air inlet weatherproof louvre with insect mesh, motorised damper and filters.
- External cable boxes for termination of main incoming and outgoing AVR cabling c/w aluminium gland plates and steel access panels. The AVR is provided with busbars to pass through the wall of the container to allow connection of client cabling.
- External lidded IP66 junction boxes c/w cable gland for bottom entry, one for 110 V and alarm cabling and one for the 230 V container auxiliary supply.
- Keyline fall protection safety line fitted to the container roof.
- Lighting, emergency lighting and small power.
- Externally the container shall be painted to a C5 marine specification to client's specified colour.
- Internal floor painted with single pack compliant paint specification c/w anti-slip final coat.



Front View: 30ft Container Solution

SOLLATEK'S EXPERTISE EXTENDS WORLDWIDE THROUGH LOCAL NETWORKS

HEAD OFFICE: SOLLATEK UK
MANUFACTURING FACILITIES: UK, EGYPT, THAILAND, CHINA.
LOCAL SOLLATEK COMPANIES: USA, EGYPT, NIGERIA, GHANA, KENYA, SOUTH AFRICA, INDIA.
STOCKISTS & DISTRIBUTORS IN OVER 60 COUNTRIES INCLUDING: GREECE, CYPRUS, POLAND, JORDAN, SAUDI ARABIA, ZAMBIA, MALAWI, UGANDA, TANZANIA, IVORY COAST, AUSTRALIA.

GLOBAL AND LOCAL

Established for over 40 years in the United Kingdom, Sollatek is a manufacturer of innovative products in power control, energy saving, temperature control and solar energy.

Operating from 12 countries and a global distribution network in 60 more. Sollatek has grown to become a household name, particularly in harsh and demanding environments where reliability and affordability are essential to everyday life.

The Sollatek voltage protection product range now includes full lines of voltage switchers, stabilisers, conditioners and uninterruptible power supplies (UPS). So whether the need is to control the quality or continuity of electrical supply, Sollatek is sure to have a solution.

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ISO9001: 2015 accredited company

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