

**Electronic components
for diesel engines & gen-sets**

**Automatic voltage
regulators**



Introduction

IPU Group is a leading supplier of parts and systems to the power generation industry. Specialist products include manual starting solutions, engine control and remote monitoring, engine silencing, heating and filtration. As part of the engine controls range, IPU supplies an extensive range of high quality Automatic Voltage Regulators (AVR's).

The range, featured in this catalogue, includes aftermarket, like for like, 'drop in' replacement AVR's for Leroy Somer, Newage, Mecc Alte, Basler, Marathon and many others, as well as universal aftermarket regulators. Additionally, the Original Equipment regulators are compatible with all brushless type alternators and are suitable for fitment to a wide selection of OE applications.

Whatever your gen-set application IPU are bound to have a voltage regulator to suit your precise requirements. Use the following pages to identify a suitable AVR or **contact our sales team on 0121 511 0400** for advice. Please note that if the regulator that you require that is not listed, we may be able to locate it for you.

Buy online at
<http://online.ipu.co.uk/>

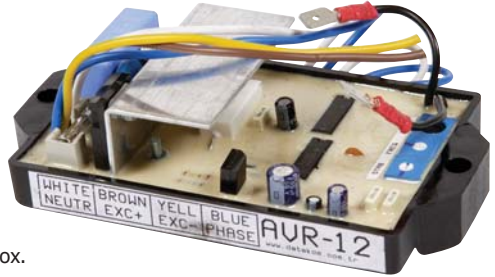


Control function glossary

AMP	Over excitement setting
DIP	U/V rate set
DROOP	Droop adjustment
DWELL	HZ related recovery set time
EXC MAX	Excitation current limit
EXEC TRIP	Over excitement trip level set
I LIMIT	Stator current set limit
OVER V	Over voltage trip level set
RAMP	No lamp voltage ramp set time
RMS	Root mean square of generation
STAB	Stability adjustment
STAT	Droop adjustment
TRIM	Analogue input adjustment
UF	Under frequency protection
UFRO	Under frequency roll off set

IPU Group original equipment AVR's

AVR5, AVR-12 & AVR-20



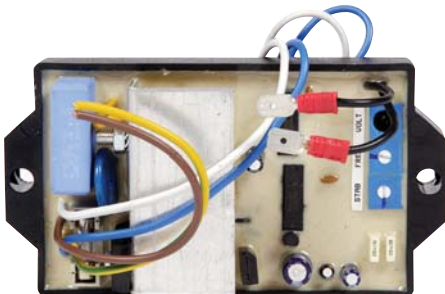
IPU Group voltage regulators are designed for brushless type alternators to produce a fixed output voltage. They feature an open chassis, resin moulded design and are intended to be mounted into the alternator's terminal box.

The AVR's measures the voltage between one of the alternator phases and the neutral point and adjusts the DC voltage applied to the excitation winding until reaching the desired voltage. The output stage of the device is a half-wave thyristor output associated with a free wheeling diode.

The units do not include moving parts; therefore making them suitable for operation in highly vibrating environments. The AVR's include a low frequency protection circuit – a feature which reduces the output voltage during overload or engine stop ensuring the diesel engine is protected from excessive torque generated by high startup currents of large electrical equipments.

Features

- Half-wave thyristor output
- Relay-less circuit design
- Low frequency protection
- Built in voltage adjustment
- Stability adjustment
- Remote voltage adjustment feature
- Easy connection scheme
- Compatible with various types of alternators



Specifications

	AVR-5	AVR-12	AVR-20
Phases	Single phase	Single phase	Single phase
Voltage adjustment range	210-250 volts min	210-250 volts min	210-250 volts min
Frequency	50/60Hz	50/60Hz	50/60Hz
Frequency protection adj. range	40-50Hz	40-50Hz	40-50Hz
Output voltage	0-115 volts-DC at 230 volts	0-115 volts-DC at 230 volts	0-115 volts-DC at 230 volts
Output current	5A continuous, 6A for 5 sec forcing	10A continuous, 20A for 5 sec forcing	20A continuous
Residual voltage for build up	5 volts min	5 volts min	5 volts min
Regulation	+/- 2% typical	+/- 2% typical	+/- 2% typical
Power output stage	Half-wave thyristor	Half-wave thyristor	Half-wave thyristor
Internal fusing	5A (fast acting fuse)	10A (fast acting fuse)	10A (fast acting fuse)
Operating temperature	-10°C (14°F) to 60°C (140°F)	-10°C (14°F) to 60°C (140°F)	-10°C (14°F) to 60°C (140°F)
Storage temperature	-20°C (-4°F) to 80°C (176°F)	-20°C (-4°F) to 80°C (176°F)	-20°C (-4°F) to 80°C (176°F)
Maximum humidity	95% non-condensing	95% non-condensing	95% non-condensing
Dimensions	125x68x35mm (L x W x H)	125x68x35mm	125x68x35mm
Fixing centres	115mm, 2xM6	115mm, 2xM6	115mm, 2xM6
Weight	180g	200g	280g

IPUA460

Self excited automatic voltage regulator compatible with Newage* SX460

Features

- Soft start voltage ramping
- Sensing voltage loss protection
- With under frequency LED indicator
- Control Functions – VOLT, STAB, UFRO

*Use for reference purpose only, not a genuine Newage product.



Specifications

Sensing input

120V (95 ~ 132) or 240V (190 ~ 264) 1 phase 2 wire
50/60Hz – jumper selectable

Output

Max 90 VDC @ 207 VAC input, 4A Continuous,
10A for 10 sec intermittent, min 15

Voltage regulation

< ± 1.0% (with 4% engine governing)

Voltage build-up

Residual volts at AVR terminal > 5 VAC

Thermal drift

0.05% per °C change in AVR ambient

Soft start ramp time

2 sec

Unit power dissipation

Max 10 watt

External volts adjustment

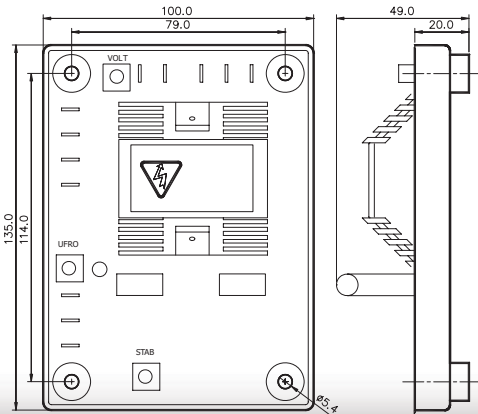
±7% with 1K Ω 1 watt trimmer

Under frequency protection

Set 95% Hz (Factory set)

(UFRO)

Slope 170% down to 30Hz



Mechanical Specifications

UNIT: mm

Environment

Vibration	3.3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight 243 g ± 2%

IPUA440

Self excited automatic voltage regulator compatible with Newage* SX4400

Features

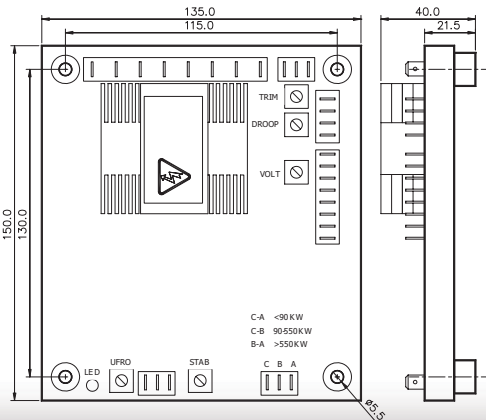
- Can be used in parallel operation
- Sensing voltage loss protection
- Under frequency LED indicator
- Soft start voltage ramping
- Control Functions – VOLT, STAB, UFRO, DROOP, TRIM, DIP

*Use for reference purpose only, not a genuine Newage product.



Specifications

Sensing input	190V ~ 264 VAC, 1 phase 2 wire, 50/60Hz selectable	
Output	Max 90 VDC at 207 VAC, 4A continuous, 10A for 10 sec intermittent, min 15	
Voltage regulation	< ± 1% (with 4% engine governing)	
Voltage build-up	Residual volts at AVR terminal > 5 VAC	
Thermal drift	0.04% per °C change in AVR ambient	
Soft start ramp time	2 sec	
Unit power dissipation	Max 12 watt	
External volts adjustment	±8% with 1K	1 watt trimmer
Under frequency protection (UFRO)	Set	95% Hz
	Slope	170% down to 30Hz
Analogue input	Max input	±5 VDC
	Sensitivity	1V for 5% generator volts
	Input resistance	1K
Drop input	Burden	10
	Max sensitivity	0.07A for 5% droop (PF=0)
	Max input	0.33A



Mechanical Specifications

UNIT: mm

Environment

Vibration	3.3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight 418 g ± 2%

IPUA341

Permanent magnet generator type AVR compatible with Newage* model MX341



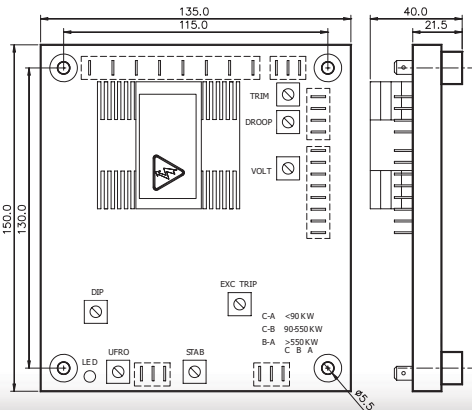
Features

- For use in parallel operation
- Soft start voltage ramping
- UFRO & over excitation LED indicators
- Control Functions – VOLT, STAB, UFRO, DROOP, TRIM, DIP

*Use for reference purpose only, not a genuine Newage product.

Specifications

Sensing input	190 ~ 264 VAC, 1 phase 2 wire, 50/60Hz selectable	
Power input (PMG)	170 ~ 220 VAC, 3 phase 3 wire, 3A per phase, 100 ~ 120Hz nominal	
Output	Max 120 VDC, 2.7A continuous, 6A for 10 sec intermittent, min 15	
Voltage regulation	< ±1% RMS (with 4% engine governing)	
Voltage build-up	Residual volts at AVR terminal > 5 VAC	
Soft start ramp time	2 sec	
External volts adjustment	±10% with 1K 1 watt trimmer	
Thermal drift	0.05% per °C change in AVR ambient	
Unit power dissipation	Max 12 watt	
Under frequency protection (UFRO)	Set point	95% Hz
	Slope	170% down to 30Hz
Over excitation protection	Set point	75 VDC, time delay 10 sec
Analogue input	Max input	±5 VDC
	Sensitivity	1V for 5% generator volts
	Input resistance	1K
Droop input	Burden	10
	Max sensitivity	0.07A for 5% droop (PF=0)
	Max input	0.33A



Mechanical Specifications

UNIT: mm

Environment

Vibration	3.3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight 394g ± 2%

IPUA321

Permanent magnet generator type AVR compatible with Newage* model MX321

Features

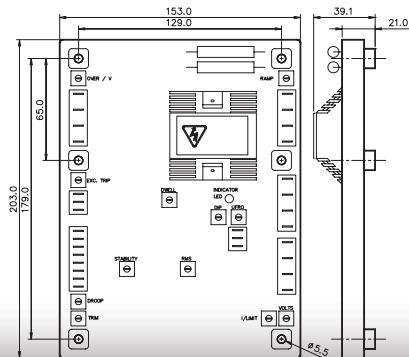
- For use in parallel operation
- Over exc./Over volt. & UFRO LED indicators
- Current limiting function
- Control Functions – VOLT, STAB, UFRO, DROOP, TRIM, DIP, EXC TRIP, DWELL, I LIMIT, OVER V, RAMP, RMS

*Use for reference purpose only, not a genuine Newage product.



Specifications

Sensing input	190 ~ 264 VAC, 1 phase 2 wire, 50/60Hz selectable	
Power input (PMG)	170 ~ 220 VAC, 3 phase 3 wire, 3A per phase, 100 ~ 120Hz nominal	
Output	Max 120 VDC, 3.7A continuous, 6A for 10 sec intermittent, min 15	
Voltage regulation	< ±0.5% RMS (with 4% engine governing)	
Voltage build-up	Residual volts at AVR terminal > 5 VAC	
Soft start ramp time	0.4 ~ 4 sec adjustment	
Thermal drift	0.05% per °C change in AVR ambient	
Current limit input	Burden	10 , Sensitivity range: 0.5 ~ 1A
Unit power dissipation	Max 18 watt	
External volts adjustment	±10% with 1K	1 watt trimmer
Over excitation protection	Set point	75 VDC, time delay 8 ~ 15 sec
Under frequency protection (UFRO)	Set point	95% Hz (factory set)
	Slope	100 ~ 300% down to 30Hz
	Max dwell	20% volts/sec recovery
Analogue input	Max input	±5 VDC
Adjustable parameters	Sensitivity	1V for 5% generator volts
	Input resistance	1K
Droop input	Burden	10
	Max sensitivity	0.22A for 5% droop (PF=0)
	Max input	0.33A
Over voltage detector input	Set point	300V, time delay 1 sec (fixed)
	CB trip coil	10 ~ 30 VDC / 0.5 amp



Mechanical Specifications

UNIT: mm

Environment

Vibration	3.3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight 530g ± 2%

IPUA230

Self excited automatic voltage regulator compatible with Leroy Somer* R230

Features

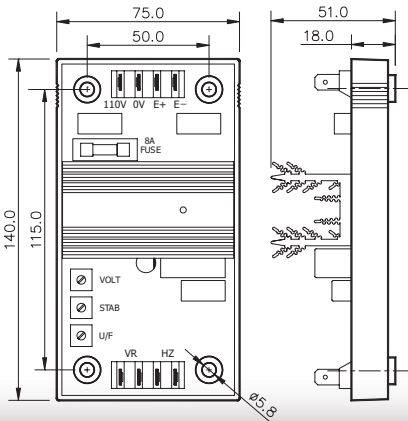
- Economical compact design
- For use in 50/60Hz brushless generators
- EMI suppression
- Overexcitation current shutdown
- 120 VAC optional
- Control Functions – VOLT, STAB, UF

*Use for reference purpose only, not a genuine Leroy Somer product.



Specifications

Input	120 VAC (90 ~ 140 VAC), 1 phase 2 wire 45 ~ 65Hz
Output	Max 100 VDC @ 120 VAC input, 8A continuous, 10A for 10 sec intermittent, min 15
Voltage build-up	Residual volts at AVR terminal > 5 VAC
Voltage regulation	< ±1% RMS (with 4% engine governing)
Thermal drift	0.03% per °C change in AVR ambient
External volts adjustment	±5% with 5K , 1/2 watt trimmer
Under frequency protection	Knee point 47/57Hz (adjustable)
Unit power dissipation	Max 6 watt
EMI suppression	Internal electromagnetic interference filtering



Mechanical Specifications

UNIT: mm

Environment

Vibration	1.5g @ 5 ~ 30Hz 5.0g @ 30 ~ 500
Operating temperature	-40 ~ 60°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight	310g ± 2%
Shock	Withstands up to 20g in each X, Y, Z axes

IPUA448

Permanent magnet generator or A.R.E.P or auxiliary winding type compatible with Leroy Somer* R448, R449 and R438

Features

- Load acceptance module (LAM)
- Under frequency & exc. max protection
- Single phase or three phase voltage sensing optional
- Soft start voltage ramping
- Normal rapid response time (option)
- Control Functions – VOLT, STAB, UFRO, EXC MAX, STAT

*Use for reference purpose only, not a genuine Leroy Somer product.



Specifications

Sensing input

Terminal 0-110V = 95 ~ 140V
 Terminal 0-220V = 170 ~ 260V
 Terminal 0-380V = 340 ~ 520V
 Frequency 50/60Hz selectable

Power input

Voltage 40 ~ 150 VAC three phase

Auxiliary winding

6 ~ 150 VAC (no load rms)

Voltage output

Max 160 VDC @120 VAC

Output current

Max 10A

Response time

0.3 ~ 1 sec @ ±20% voltage vibration

Current droop

Max 4% @ P.F. = 0.8

Voltage regulation

< ±0.5% (with 4% engine governing)

External voltage adjustment

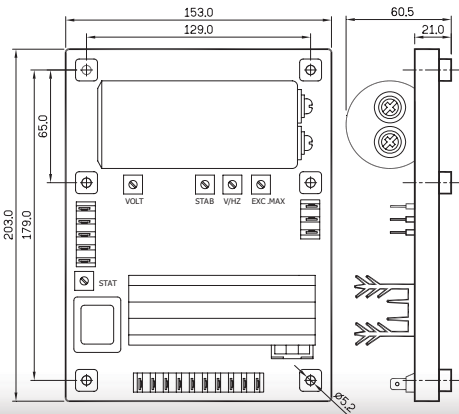
±10% @ 1K

Voltage build

Residual volts at AVR terminal >5 VAC

LAM voltage droop rate

10% & 15% selectable



Mechanical Specifications

UNIT: mm

Environment

Vibration

1.5g @ 5 ~ 30Hz
 5.0g @ 30 ~ 500Hz

Operating temperature

-40 ~ 60°C

Relative humidity

< 95%

Storage temperature

-40 ~ 85°C

Physical specifications

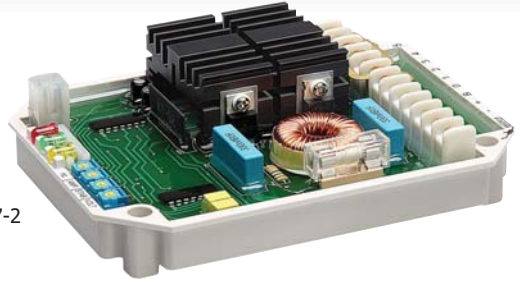
Weight

970g ± 2%

IPUA06

Self excited half wave rectified type automatic voltage regulator suitable for single or three phase self excited brushless generator maximum output 6A

Compatible with Mecc Alte® Model UVR6 & SR7-1 SR7-2



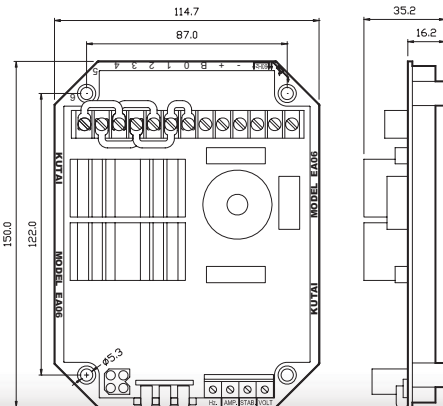
Features

- Low frequency & over excitation protection
- EMI suppression
- Control Functions – VOLT, STAB, UF, AMP

*Use for reference purpose only, not a genuine Mecc Alte product.

Specifications

Sensing input	Terminal 1 2 3 4 5 6 Can be connected to Y or Δ 220 ~ 480 VAC single phase 50/60HZ
Power input	50 ~ 280 VAC (1 2), 50/60HZ
Output voltage	Maximum 90 VDC @ 220 VAC, harmonic wave
Output current	Continuous 6A maximum 8A for 10 sec
Over excitation protection	25 ~ 55 VDC @ 0.1 ~ 20 sec
Under frequency protection	U/F Range 42 ~ 60Hz
Voltage regulation	< ±1% (with 6% engine governing)
External volts adjustment	±5% @ 100K
Voltage build-up	Residual voltage above 5 VAC 25Hz
EMI suppression	Internal electromagnetic interference filtering
Excitation winding resistance	DC resistance 10 ~ 100



Mechanical Specifications

UNIT: mm

Environment

Vibration	1.5g @ 5 ~ 30Hz 5.0g @ 30 ~ 500Hz
Operating temperature	-40 ~ 60°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Physical specifications

Weight 520g ± 5%

IPUA350

**Self excited automatic voltage regulator compatible with*
Marathon SE350 & Basler AVC 63-4D**

Features

- Optional 120 / 240 VAC** sensing input switch
- 50/60Hz selectable
- Under frequency protection
- Built-in high breaking capacity fuse
- EMI suppression
- Control functions – VOLT, STAB, UF

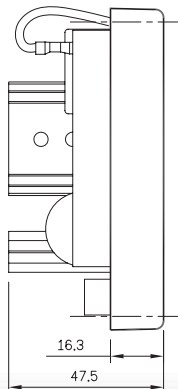
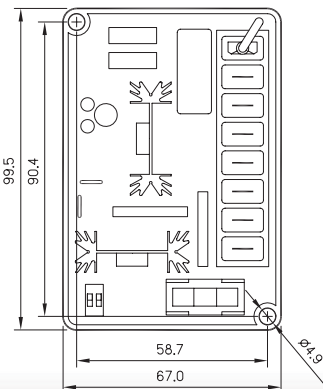
*Use for reference purpose only, not a genuine Basler or Marathon product.

** SE350 and AVC 63-4D only fits 220 VAC Generators, and do not have fuse protection.



Specifications

Sensing & power input	120 (90 ~ 132) / 240 (171 ~ 264) VAC selectable, 50/60Hz selectable
Output	Max 37 VDC @ 120 VAC input, max 74 VDC @ 240 VAC input Continuous 4A, intermittent 7A for 60 sec
Voltage regulator rate	< ±1% (with 4% engine governing)
Voltage build	Residual volts at AVR terminal >3.5 VAC
External voltage adjustment	±5% @ 1 K 1 watt, ±10% @ 2 K 1 watt
Unit power dissipation	Max 8 watt
EMI suppression	Internal electromagnetic interference filtering
Under frequency protection (UFRO)	60Hz system presets knee point at 55Hz* 50Hz system presets knee point at 45Hz* (*Factory setting)



Mechanical Specifications

UNIT: mm

Environment

Vibration	1.3g @ 5 ~ 26Hz 5.0g @ 52 ~ 1000Hz
Operating temperature	-40 ~ 60 °C
Relative humidity	< 95%
Storage temperature	-65 ~ 85 °C

Physical specifications

Weight 185g ± 2%

IPUA03A

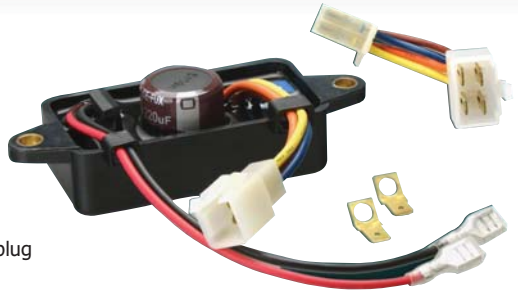
Self excited automatic voltage regulator designed for Denyo* & gasoline generators

Features

- For use in 50/60Hz generators
- Adjustable output voltage**
- Compatible with many different models by adapter plug
- Economical compact design
- Single phase voltage sensing

* For reference purpose only, not a genuine Denyo* product.

** The output voltage of the original AVR is not adjustable.

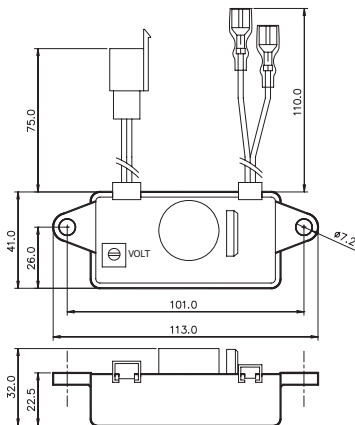


Specifications

Sensing input	Voltage	18 ~ 22 VAC, 1 phase 2 wire
Power input	Voltage	60 ~ 90 VAC, 1 phase 2 wire
Excitation		5 ~ 85 VDC, 3A continuous, 4A for 60 sec intermittent, min 25
Voltage regulation		< ±2% (within 4% engine governing)
Voltage build-up		Residual volts at AVR terminal > 1 VAC
Voltage adjust range		110 VAC ± 15%
Thermal drift		0.05% per °C change in AVR ambient

Mechanical Specifications

UNIT: mm



Environment

Vibration	1.5g @ 5 ~ 30Hz 5.0g @ 30 ~ 500Hz
Operating temperature	-40 ~ 60°C
Relative humidity	< 95%
Storage temperature	-40 ~ 85°C

Applicable modules

Brand	Type
KUBOTA Low Boy	GL6500S
YAMAHA	EDL6500S
HONDA	EP-1800, EP-2500
KAWASAKI	GE-1400, GE-2200, GA-2300, GA-2900
SUZUKI	SV-1400L, SV-1400LD, SV-2200L, SV-2200LD
SAWAFUJI	SH-1800, SH-2600
MARUYAMA	ME-1800, ME-2600
ELEPAQ	PH-1800, PH-2600

Physical specifications

Weight	109g ± 2%
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IPUA05A

Universal 5 amp 1/2 wave self excited dip-switch programmable automatic voltage regulator

Features

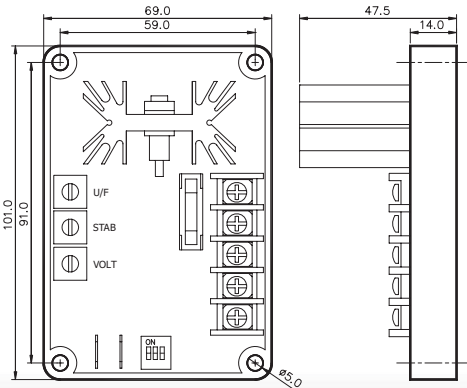
- 220 / 380 / 440 VAC programmable input
- Rugged compact design
- With under frequency protection
- Soft start voltage ramping
- EMI suppression
- Built-in high capacity 5 amp fuse
- Control Functions – VOLT, STAB, U/F

*Use for reference purpose only, not a genuine Mecc Alte product.



Specifications

Sensing input	220/380/440 VAC, 1 phase 2 wire, selectable frequency 50/60Hz, DIP switch selectable
Power input	100 ~ 300 VAC, 1 phase 2 wire
Output	Max 90 VDC @ 240 VAC input, 5A continuous, 7A for 10 sec intermittent, Resistance min 12 Ω , max 100 Ω
Voltage regulation	< $\pm 0.5\%$ (with 4% engine governing)
Voltage build-up	Residual volts at AVR terminal > 5 VAC
External volts adjustment	7% with 1K Ω 1 watt trimmer
Soft start ramp time	2 sec
Unit power dissipation	Max 8 watt
EMI suppression	Internal electromagnetic interference filtering
Thermal drift	0.03% per $^{\circ}\text{C}$ change in AVR ambient
Under frequency protection (Factory settings)	60Hz system presets knee point at 55Hz 50Hz system presets knee point at 45Hz



Mechanical Specifications

UNIT: mm

Environment

Vibration	3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70 $^{\circ}\text{C}$
Relative humidity	< 95%
Storage temperature	-40 ~ 85 $^{\circ}\text{C}$

Physical specifications

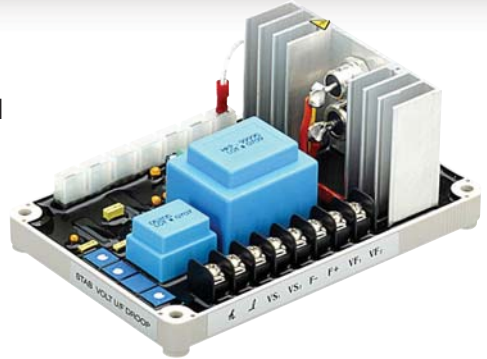
Weight 183g \pm 2%

IPUA15A

Universal 15 amp 1/2 wave self excited automatic voltage regulator can be used in parallel operation

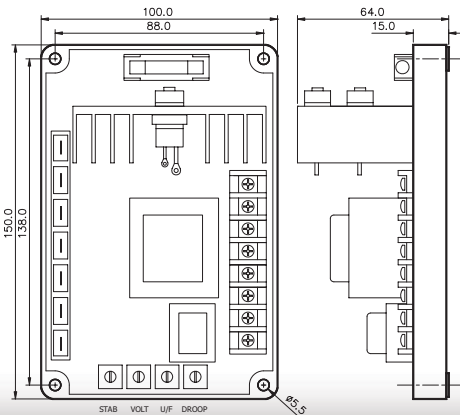
Features

- Senses input voltage 220/380/440/480 VAC
- Can be used in parallel operation
- Simple 50/60Hz U/F programming
- Soft start voltage ramping
- Built-in high breaking capacity fuse
- Control Functions – VOLT, STAB, U/F, DROOP



Specifications

Sensing input	220/380/440/480 VAC, 1 phase 2 wire, selectable. 50/60Hz selectable
Power input	100 ~ 300 VAC 1 phase 2 wire
Output	Max 90 VDC @ 240 VAC input, 15A continuous, 20A for 10 sec intermittent Resistance min 4 @ 35 volts output
Voltage regulation	< $\pm 0.5\%$ (with 4% engine governing)
Voltage build-up	Residual volts at AVR terminal > 5 VAC
External volts adjustment	$\pm 15\%$ with 5K ohm 1 watt trimmer
Soft start ramp time	2 sec
Unit power dissipation	Max 10 watt
Thermal drift	0.03% per °C change in AVR ambient
Under frequency protection	60Hz system presets knee point at 55Hz 50Hz system presets knee point at 45Hz



Mechanical Specifications

UNIT: mm

Environment

Vibration	3g @ 100 ~ 2K Hz
Operating temperature	-40 ~ 70 °C
Relative humidity	< 95%
Storage temperature	-40 ~ 85 °C

Physical specifications

Weight 600g \pm 2%

Cross reference table

Manufacturer	Manufacturer's reference	IPU replacement part number
Basler	AVC63-4D	IPUA350
FG Wilson	922-124	IPUA448
FG Wilson	922-197	IPUA230
Kubota	18961-02800	IPUA03A
Leroy Somer	9AR230	IPUA230
Leroy Somer	9AR448	IPUA448
Leroy Somer	AEM110RE014	IPUA230
Leroy Somer	AEM110RE016	IPUA448
Leroy Somer	R230	IPUA230
Leroy Somer	R438	IPUA448
Leroy Somer	R448	IPUA448
Leroy Somer	R449	IPUA448
Marathon	762594-01	IPUA350
Marathon	SE350	IPUA350
Mecc Alte	GEAVRSR7	IPUA06
Mecc Alte	GEAVRUVR6	IPUA06
Mecc Alte	SR7-1	IPUA06
Mecc Alte	SR7-2G	IPUA06
Mecc Alte	UVR6	IPUA06
Newage	E000-23410	IPUA341
Newage	E000-23412	IPUA341
Newage	E000-24030	IPUA440
Newage	E000-24600	IPUA460
Newage	E000-24602	IPUA460
Newage	MX321	IPUA321
Newage	MX341	IPUA341
Newage	SX440	IPUA440
Newage	SX460	IPUA460
Newage	SX460-2	IPUA460
Onan	305-0823	IPUA321
Onan	305-0824	IPUA440
Onan	305-0846	IPUA341
Onan	305-0949	IPUA460
Onan	305-0982	IPUA460

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