SINGLE PHASE VSD FOR SMALL FANS & PUMPS

Model AVA3.0 240 VAC 2.5A 600VA

FANTECH



AVA3.0

APPLICATIONS

- **Low Cost VSD for Small Fans & Pumps.** Remote electronic speed control of PSC, universal & shaded pole motors.
- **Power Control.** Electronic power control of most resistive and inductive loads eg - lamps, transformers & heaters.
- **BMS compatible.** Control input 0-10 VDC. (option 0-20ma)



Easy Custom Calibration

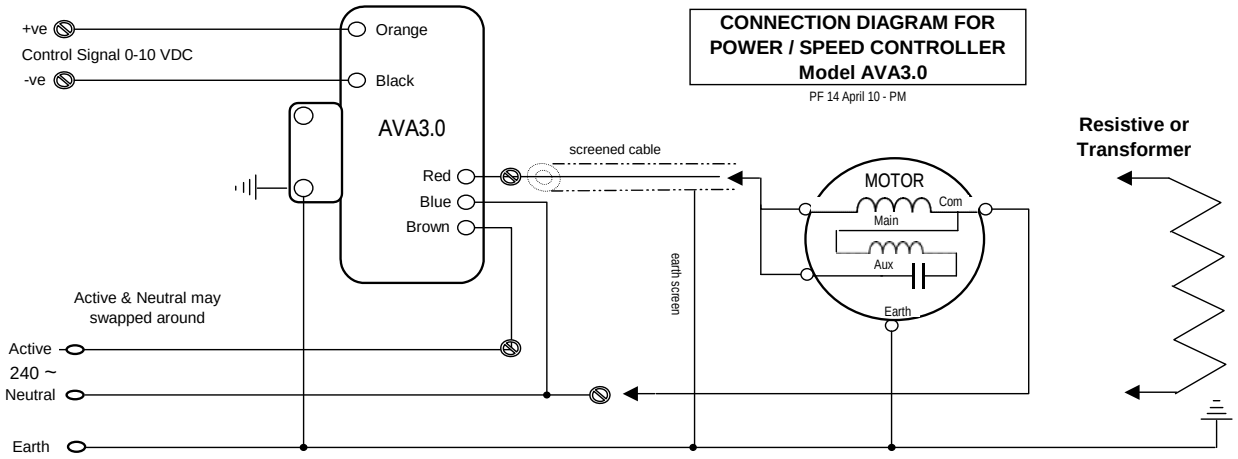
FEATURES

- **Small footprint** ~110x50x40 mm with simple mounting bracket.
- **Continuous RMS power rating** 2.5 amps 600 VA - no derating
- **Integral EMI Filters** no external filters or devices required.
- **Simple 2-wire PSC** motor connection for small fans.
- **Multiple & dissimilar loads** accommodated.
- **Factory calibrated** for most fan / pump motors.
- **Easy Custom On-site Calibration** using 2 preset min / max adjusters for quick and simple range (span & offset) adjustments.
- **Auto OFF at low signal levels** <0.8V
- **Double isolation** of control signal and mains circuitry via transformer and opto-isolation.
- **RoHS** compliant and Ctick approved.
- **IP55 option** using thermoplastic enclosure that is easy to drill & mount and has adequate room for glands, looping & connectors.



IP55 option

FANTECH Model AVA3.0 Universal Power / VSD Controller SPECIFICATIONS	
APPLICATIONS	Speed control of most single phase PSC motors with mechanical loads such as fans, centrifugal pumps or those applications where the torque of the load varies with speed. Can also control shaded pole and universal motors with any type of mechanical load. Remote stepless power control of all general resistive and inductive loads such as lamp, heating elements or transformers. Multiple & dissimilar loads can be accommodated simply by connecting in parallel.
TECHNICAL BASIS	Proportional phase angle control of AC mains via fully isolated 0–10 V DC control signal. Single AC output for small PSC motors connected in a 2-wire configuration, universal and shaded pole motors, lamps, heaters and transformers.
RATINGS RMS continuous	Single phase 240 V AC (+10/- 20%) 50 Hz 2.5 amps 600 VA continuous RMS. 3 amps 700 VA intermittent. 5 amps peak. Output rated to full RMS rated power and can be varied between ~20 and 100%. Environmental: up to 55°C in free air no de-rating required. Max case temp not to exceed 70°C.
PROTECTION	Surge protection network incorporated on board for over voltage / noise spikes. Control circuit for remote control signal operates at 12 volts DC and is totally isolated from the supply mains / load power circuit by a double insulated fully encapsulated BS415 rated transformer and a 5000V opto coupler between control input & power output. Generous power design parameters – controller designed for PSC motor starting and reasonable short term overload conditions. External 3 amp DB MCB overload / isolation protection recommended for motor load is adequate to protect controller. Control input protected for voltages >12 VDC and reverse polarity.
CONTROL INPUTS	0-10 volts between black and orange wires with input resistance 1 Mohm. Optional 0-20ma control can be specified with sink resistance 500 ohm – MOQ applies.
AUTO OFF	At low control levels< 0.8 VDC, the controller is designed to shut down. Normal operation resumes > 0.8V signal level.
COMPLIANCE	Fitted with internal Electromagnetic Interference suppression network, and complies with AS/NZS CISPR 14.1:2003 when correctly installed. ACA C-Tick lev 2 **N29529.** ROHS compliant.
MOUNTING & ENCLOSURE	* Extruded aluminium IP51. Size 111L x 52W x 39D. Weight 300 grams. Fixing bracket 40x18mm 2 mounting holes 4.5D centres 22.5mm. Overall size 111x72x39. Removable aluminium end plate to access setting potentiometers. * Optional IP55 UL94V0 thermoplastic enclosure with removable sealing lid 165x142x84mm. Weight 675g. Generous space for 20/25mm gland holes plus connectors and looping.
SETTING & ADJUSTMENT	Span and Offset are accessible on one end via a removable aluminium end plate secured via 4x self tap cs screws. Two preset potentiometers permit the user to custom calibrate maximum and minimum motor speeds / power output over a range of 1 – 10 VDC control. Factory calibration suitable for most fans and is 1VDC for output ~120 VAC ~ 38% speed and 9.7 VDC for output ~238 VAC ~ 98% of maximum speed.
CONNECTION	5x 24/020 250 volt V105 PVC terminated leads with 10mm bootlace terminals on the ends. Accessory 3-way and 2-way loose terminal block connectors provided with special wire protected securing mechanisms. **INPUT/OUTPUT:** 150mm leads **Brown** = AC Input. **Red** = Motor output. **Blue** = AC common. Active/neutral reversible. **CONTROL SIGNAL:** 200mm leads **Orange** = +ve signal **Black** = -ve or ground **Earth:** via mounting bracket
RELIABILITY	Fantech controllers are built for long service life and are proudly designed & manufactured in Australia for Fantech. Appropriate quality control is ensured throughout their manufacture and all units are hand soldered and assembled using high grade commercial duty rated components. Fantech have a commitment to on-going research and development of their products.
ORDERING & MODEL Nos.	**AVA3.0** – small footprint extruded aluminium enclosure for mounting near motor or in switchboard. **AVA3.0IP** – IP55 sealed thermoplastic enclosure for mounting in dusty/damp environments & cable gland lead in/out **/ ma** – 0 – 20ma DC control input option. MOQ applies. Add suffix /ma



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GUIDELINES FOR INSTALLING the AVA3.0 controllers

How does the controller work? Fantech single phase controllers vary available power to a resistive or inductive load using phase angle conduction control. As the conduction angle is reduced, the power to the load is reduced. This reduction is accompanied by a reduction in the AC voltage across the load and can be used as an indicator of the power change or a calibration reference.

How effective and efficient? There is much to be said for keeping things simple! It is in this spirit that Fantech single phase controllers have been designed. There are no micro controllers or sensitive electronic components – just simple rugged commercially designed circuitry and industrially rated power components that can be protected using standard MCB's and fuses. There are many ways to vary power to AC loads. For resistive and transformer type inductive loads, Fantech Controllers are highly effective and very efficient (~95%) . For universal brush type motors they are also efficient but for some motors minor "cogging" can occur at very low speed settings due to AC waveform and brush / commutator being out of sync. In these cases the minimum speed can easily be set to avoid any cogging. For induction type capacitor run PSC motors using a permanent aux/ run capacitor, phase angle control is highly effective for loads where the torque requirements changes with speed – eg fans and pumps.

Motor considerations Phase angle conduction control is suitable for all types loads connected to universal (brush) or shaded pole motors. For PSC capacitor run motors there are some criteria essential for successful speed control. If a reasonably linear change in speed is required, the motor must be suitable for speed control, it must be optimally sized for the load and the load torque characteristics must change (increase) with speed. Fans and centrifugal pumps are ideal but high starting torque loads such as compressors or loads whose torque does not change with speed, are not. Split phase and capacitor start capacitor run motors cannot be used with a speed control due to the start circuit which is usually motor speed dependant. Inefficient & poorly matched motor / load combinations are more difficult to speed control particularly where the motor is sized much larger than the load requires. Fantech provides an OEM consultancy service to advise and optimise controllers to run on specific motors and loads.

CAUTION: Always isolate the controller / motor OFF via the feed MCB or isolator before working on any wiring. Be careful connecting cables to terminals. Make sure the opposite end plate (adjusting potentiometers end), is in place and secure as it provides a mechanical end stop for the PCB. Divide individual cable cores evenly across each terminal spade. Tighten terminals securely. Support back of connector with finger whilst tightening & pushing with a screwdriver. A slot screwdriver may provide better grip than a star or Phillips type.

Electromagnetic Compliance. No additional snubbers or external suppressors are required. When properly installed, the RC10xD series of Fantech controllers meet the Electromagnetic Compliance (EMC) requirements of Australia & New Zealand. Correct installation requires the *red* conductor between the controller and the load, be screened (shielded), and that the screen be earthed at one point. Screening may be accomplished by enclosing all the cables between the controller and motor in an earthed screen or metal conduit. If the motor and controller are installed within a common earthed metal chassis or are close together, then cable screening may not be necessary.

Mounting and Earthing. Mount the controller in a vibration free location consistent with its IP rating and convenient to the motor and/or local DB. The controller must be installed in accordance with AS3000:2000. The case of the controller is earthed through the mounting foot. Caution - the cross-sectional area of screening on a single screened cable may not be sufficient for it to act as an earth conductor in accordance with AS3000.

Overload Protection. The RC10x / AVA range is adequately rated for motor starting and a generous short term overload margin is provided for in its design. It is recommended that both the load and controller are protected by a thermo-magnetic circuit breaker rated according to the motor or appliance manufacturer recommendations and/or local wiring regulations. As a guide fit a 3 amp circuit breaker for the AVA3.0.

Output Configuration: The AVA3.0 is a 2-wire controller only and only suitable for small PSC motors or general resistive and inductive loads. For motors whose manufactures specify or require a 3-wire configuration where the main and auxiliary windings are split and connected to different signals for the controller, you must use a 3 wire controller such as the AVA5.0. The AVA3.0 can individually control more than one motor (similar or dissimilar) connected in parallel provided the maximum current of the controller is not exceeded.

Wiring. Five leads exit the controller from two grommets. For connection, 3-way and 2-way connector terminal strips are provided that incorporate internal wire protection clamps. Refer to the wiring diagram on page 2.

Totally Isolated Control Input 0-10 VDC: *ORANGE* = +ve 0–10VDC control *BLACK* = -ve 0-10 VDC control (use 2-way connector terminal block)

Mains Input 240 VAC: *BROWN* = Active *BLUE* = Neutral common *MOUNTING FOOT* = Earth

Mains Speed Controlled Output: 240 VAC: *RED* = active output to load *BLUE* = Neutral common *MOUNTING FOOT* = Earth

Operation. When the *orange* lead is at +10 VDC with respect to the *black* lead, the load / motor speed will be at maximum. Reducing the control voltage on the *orange* lead will reduce the power / motor speed until the minimum level is reached when the voltage is 1 volt. Dependant on motor type and mechanical load and efficiency of the motor, the maximum output of the controller will be achieved from 8.5-9.5 VDC input. Ensure that at the minimum speed of the control signal, there is sufficient air flow across the motor to prevent it from overheating. When the voltage is reduced below ~0.8 volts, the controller will shut down 240 VAC power electronically to the *red* lead.
CAUTION – this is an electronic switched STANDBY STATE and should not be used for permanent off or relied upon to switch off / isolate the load for servicing. A separate mechanical safety isolator switch should be included in the wiring for safe isolation.

How does one know if the controller is wired up correctly and the motor is suitable for speed control? Generally, the current draw should decrease linearly with decreasing output. The lower the current at any speed, the higher the efficiency and the less stressed the motor will be. The current draw at any speed setting should never exceed the nameplate maximum current for the motor. If it does, the motor is usually of inferior quality and is not suitable for speed control and will likely overheat.

Calibration adjustment. The standard factory settings are optimal for most loads and usually adequate for most fans and pumps. Most BMS controllers can easily take into account any variations between different loads. If custom calibration is necessary, set-up potentiometers (pots) are provided at the front of the printed circuit board (PCB) located behind the aluminium end plate secured with 4x cs screws. The adjusting end of the PCB is free of mains potential voltages. If the installation requires fine tuning for the particular motor or if the controller is required to operate over a narrow region of speeds, then two simple adjusting pots are provided – MAX and MIN. These adjust the span and offset. Please note that the factory calibration is marked on the pots with a black line so its easy to get back to this calibration.



Calibration Procedure (if required).
Controller to be connected to motor with normal load. Remove end faceplate. What are your control voltages for desired maximum and minimum motor speeds? You will need to know these!
1. Apply the maximum control voltage. eg say 9V
2. Adjust MAX speed pot for desired maximum motor speed.
4. Apply the minimum control voltage. Eg say 1V. Adjust MIN speed pot for desired minimum motor speed
5. Replace end plate. The controller is ready for operation.

Can I measure the output? Yes, very easily. An AC voltmeter between neutral and the red wire will give a "reading" proportional to motor speed and can be used as a calibration reference provided the same voltmeter is always used. NB: as the waveform is not pure AC sine, readings will vary between different model meters by up to +/- 15%.

SAFETY. Always isolate the controller / motor OFF via the feed MCB or isolator before working on any wiring. NEVER rely on the auto OFF standby for isolation.

Need Help? Please contact Fantech or your agent for advice & assistance if you are unsure of any aspect of installation or operation.

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GOODS AND WARRANTY

1. When supplying goods to a consumer, the following mandated statement applies:
   "Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure."

2. The benefits of this warranty are in addition to any rights and remedies imposed by Australian State and Federal legislation that cannot be excluded. Nothing in this warranty is to be interpreted as excluding, restricting or modifying any State or Federal legislation applicable to the supply of goods and services which cannot be excluded, restricted or modified.

3. Subject to the conditions and limitation below, the Company warrants products of its manufacture to be free of defects in workmanship and/or materials at the time of delivery to the Buyer.

4. Any part, assembly or portion thereof found to be defective within one year from the date of commissioning or eighteen (18) months from date of shipment from our factory, whichever is the sooner, unless expressly stated otherwise in the Company's Publications or Literature, will be repaired or exchanged F.O.B factory.

5. The Company reserves the right to replace defective parts of the goods with parts and components of similar quality, grade and composition where an identical component is not available.

6. Goods presented for repair may be replaced by refurbished goods of the same type rather than being repaired. Refurbished parts may be used to repair the goods.

7. Goods or parts that have been returned for repair (except where the repair is as a result of the Company's failure to comply with the statutory guarantees in the ACL) or warranty assessment are deemed to have been abandoned by the Buyer if not collected within 30 days after the Company has notified the Buyer in writing of the warranty assessment outcome or the completed repair.

8. The Company reserves the right to dispose or otherwise deal with an abandoned product or part at its discretion.

9. This warranty does not apply if:
   (i) the goods have not been paid for by the Buyer as per the credit terms provided; or
   (ii) the goods have not been installed in accordance with AS NZS 3000/2000 Australian/New Zealand Wiring rules; or
   (iii) the goods have been misused or neglected.

10. The Company assumes no responsibility under this warranty for the labour costs involved in the removal of defective parts, installation of new parts or service charges related thereto.

11. If a fault covered by this warranty occurs, the Buyer must first contact the Company at the contact address listed below.

12. Any warranty claim must be accompanied by:
    (i) proof of purchase;
    (ii) written details of the alleged defect; and
    (iii) appropriate documentation (such as installation and maintenance records etc).

13. The Company shall have the option of requiring the return of the defective part (transportation prepaid by the Buyer) to establish the claim.

14. The Company makes no warranties or representations other than set out in this clause 7.

15. The repair or exchange of the goods or part of the goods, is the absolute limit of the Company's liability under this express warranty.

FANTECH
Intelligent Ventilation

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