

ZENER VARIDRIVE SOLUTIONS

ZENER 8000

High Performance Output Filter

IP00 Series

Instruction Manual



Document: IM00168

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All documentation for this product can be found on our product support link:

<http://www.zener.com.au/support-zener.php>



ZENER TECHNOLOGY AND QUALITY ASSURANCE

Since 1976 Zener Electric has supplied many thousands of drives to industry. These drives have been installed into numerous applications resulting in a wealth of in house experience. The ZENER 8000 AC variable speed controller is the culmination of this experience, modern technology and industrial application requirements. The Zener Quality Assurance program ensures that every ZENER 8000 manufactured has proven to operate correctly in the production test bay before dispatch.

SAFETY

Your ZENER 8000 must be applied, installed and operated in a safe manner. It is the responsibility of the user to ensure compliance with all regulations and practices covering the installation and wiring of your ZENER 8000. The instruction manual should be completely read and understood before attempting to connect or operate the ZENER 8000. Only skilled personnel should install this equipment. This equipment contains a number of components that are designated by their various manufacturers as “not for use in life support appliances, devices or systems where malfunction of the components can reasonably be expected to result in personal injury or death”. Customers using or selling Zener products for use in such applications do so at their own risk and agree to indemnify Zener for any damage resulting from improper use or sale.

THE CONTENTS OF THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE

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Contents

Explanation of Symbols	1
Receiving.....	1
Warnings.....	2
Performance	3
Mechanical Installation Information	4
Dimensions	4
Installation Considerations.....	5
Operating Considerations.....	5
Wiring Diagram.....	6
+B Terminal.....	7
Fuse Data:	7
Specification	8
Standards Compliance.....	8
Current Ratings.....	8

Explanation of Symbols

**WARNING**

Indicates a condition or practice that, if the warning is not strictly observed, could result in personal injury or death.

**CAUTION**

Indicates a condition or practice, if the caution is not strictly observed, could lead to damage or destruction of equipment or a significant impairment of proper operation.

**WARNING**

This symbol is used to highlight an electrical hazard. Failure to strictly observe the warning could result in electrocution.



This symbol is used to highlight additional information on the product's capabilities or a common error in installation, commissioning or operation.

Receiving

Inspect the High Performance Output Filter for any shipping damage. If any damage is found, report it to the carrier immediately. Access the inside of the filter and visually check for any damage.

Do not attempt to operate the High Performance Output Filter if any obvious damage exists.

After the initial inspection, the High Performance Output Filter can be repacked and stored in a clean, dry location until it is required for use.

DO NOT store this equipment in an area where the ambient temperature will fall below -20°C or rise above 70°C. DO NOT store this equipment in areas that are subject to condensation or corrosive atmosphere. Proper storage is necessary to ensure satisfactory High Performance Output Filter start up and performance.

Warnings

This manual should be read in conjunction with the ZENER 8000 Installation Manual (IM00124).



Read all operating instructions before installing, wiring, operating, servicing or inspecting the High Performance Output Filter. Ensure that the instruction manual is made available to the final user of the product as well as all personnel involved in any aspect of installation, adjustment or maintenance. Your High Performance Output Filter must be applied and installed by a suitably qualified and experienced electrical tradesperson in accordance with this manual, good engineering practice and all local rules and regulations



There are hazardous voltages inside the High Performance Output Filter whenever it is connected to an electrical supply and for some time after it is disconnected. Before touching anything inside the High Performance Output Filter enclosure or other equipment connected to the High Performance Output Filter terminals, disconnect all sources of electrical power, wait at least 11 minutes for capacitors within the High Performance Output Filter to discharge to less than 50VDC and then ensure, by measurement, that there is no hazardous AC or DC voltage present at any terminal.

The High Performance Output Filter contains high energy circuits that may be hazardous. Do not operate the High Performance Output Filter with the door open or any part of the enclosure removed.

Do not touch the terminals of the High Performance Output Filter or any associated motor and wiring when it is energised, even if the High Performance Output Filter and motor are stopped. Electric shock may result.

Do not modify this equipment electrically, mechanically or otherwise. Modification may create safety hazards.

The High Performance Output Filter is designed to operate in series with an appropriately rated and otherwise suitable 3 phase induction motor. It is not suitable for single phase motors or other types of motor or non-motor load. Use with inappropriate load types may create a safety hazard.

Where the High Performance Output Filter is used as a component part of another product, it is the purchaser's responsibility to ensure that the final product meets all of the necessary safety, EMC, regulatory, operational and other requirements for that product. Requirements for the purchaser's final product may be substantially different to the requirements for stand-alone filters.

The High Performance Output Filter is intended for use only in fixed wiring applications. It is not intended for use on a flexible supply cable.

Mount the High Performance Output Filter on a vertical, incombustible surface such as metal or masonry.

Do not place combustible or flammable material near the High Performance Output Filter. Failure to observe these precautions may create a fire hazard.

The High Performance Output Filter is manufactured under strict quality control arrangements, however additional and independent safety equipment must be installed if the application is such that failure of the product may result in personal injury or property damage.

Ensure that electrical noise generated by the product and any associated equipment does not adversely affect the proper operation of other equipment or systems, particularly those that have a safety function.

Do not install this equipment in locations where mechanical damage to the enclosure is possible. In particular, consider vehicles, vandalism and attack by insects or animals. Severe equipment damage and safety hazards may result.

Performance

The following benefits can be realised with the **High Performance Output Filter** when connected between the ZENER 8000 inverter and a motor:

- Significant reduction of RF voltages and currents achieving 40dB to 45dB attenuation.
- Complies with AS61800.3 (Adjustable speed electrical power drive systems, Part 3: EMC requirements and specific test methods) category C3 limits, category C2 limits and category
- C1 limits (0.2 to 30MHz) (see below for definitions) in a typical installation with 100m of either unscreened or screened motor cable.
- Ideal solution for eliminating AM radio frequency interference
- Maximum reduction of potential RF voltages and currents achieving 45dB to 50dB attenuation with screened motor cable.
- High efficiency, greater than 99%
- Eliminate the need for installing screened motor cables.

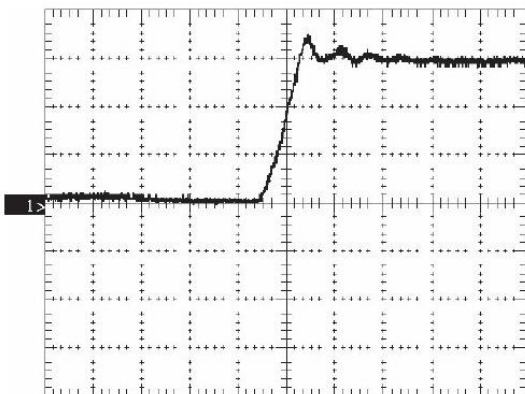
The permissible cable length¹ between filter and motor is 500m.

Categories as defined in AS61800.3 are:

- C1 limits apply to equipment in a domestic environment that does not require installation and commissioning by a professional.
- C2 limits apply to equipment in a domestic environment that does require installation and commissioning by a professional.
- C3 limits apply to equipment in a non-domestic environment.
- C4 limits apply to equipment with currents above 400A and special cases.

Maximum rate of change of voltage (dv/dt) = 150V/ μ s

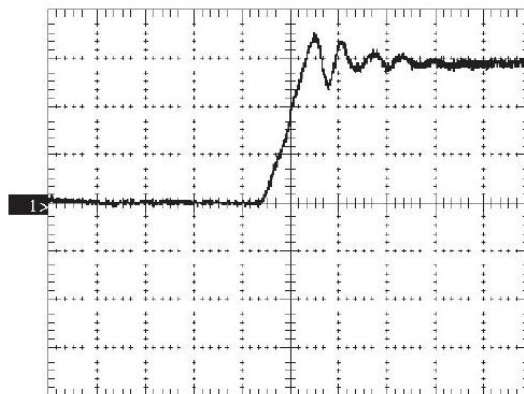
Maximum peak motor voltage with 100m of cable typically 120% of bus voltage



Vertical: 200V / div, Horizontal: 5 μ s / div.

Figure 1

High Performance Output Filter voltage.



Vertical: 200V / div, Horizontal: 5 μ s / div.

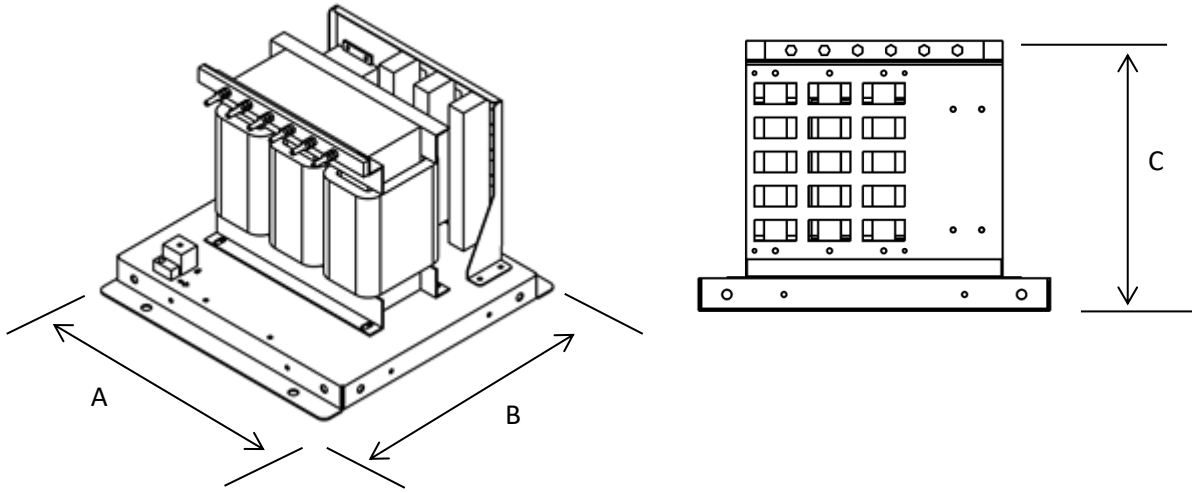
Figure 2

Motor terminal voltage with 100m of unscreened cable.

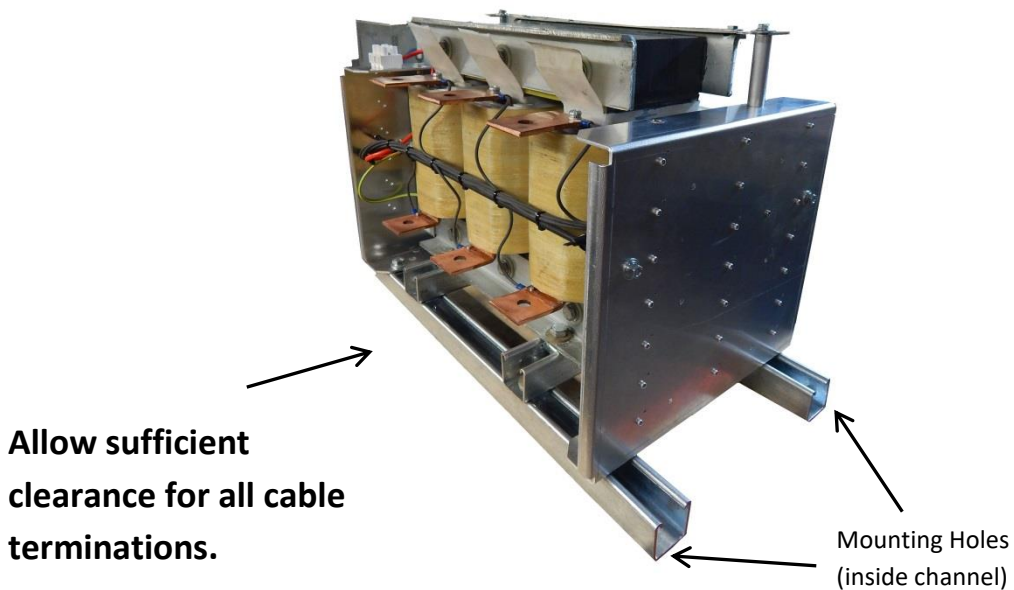
¹ Cable resistive voltage drop should be taken into consideration when long cable runs are used.

Mechanical Installation Information

Dimensions



Model	Dimensions (A x B X C)	Weight	Mounting holes
AHP0070	200 x 280 x 150	10 kg	
AHP2200	650 x 335 x 410		14mm Diameter 600mm x 250mm centres
AHP3150			
AHP3900			
AHP4900		130 kg	



Models AHP2200 - AHP490A (AHP4900 model shown)

Installation Considerations



CAUTION

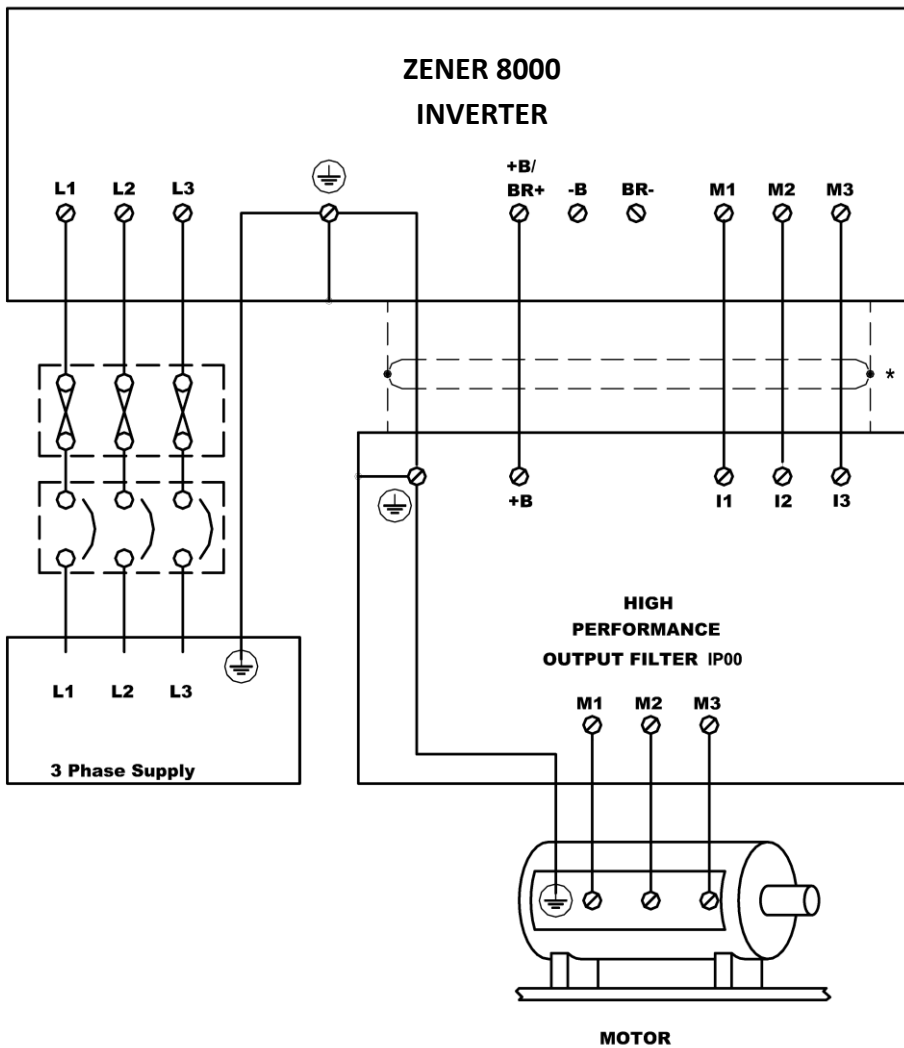
- The High Performance Output Filter must be mounted on a vibration free surface, away from heat radiating sources. Do not mount the High Performance Output Filter in direct sunlight or on a hot surface.
- In selecting an enclosure for the High Performance Output Filter and any associated equipment, the total heat dissipation and resulting temperature rise in the enclosure must be considered.
- Attention is drawn to the potential for condensation in vulnerable environments. Additional precautions may be required for all enclosure types.
- The installation location and environment should provide for safe access and working conditions for service personnel. Do not mount the High Performance Output Filter in “confined spaces”²
- Do not drill holes in the High Performance Output Filter.
- Do not allow metal shavings or any other conductive material to enter the enclosure or damage may result.

Operating Considerations

- Zener recommends that the associated ZENER 8000 inverter be set for an audible switching frequency of 2kHz.

² Confined spaces are generally defined in Workplace Health and Safety (WH&S) regulations to mean spaces where special precautions are necessary to ensure a safe breathing atmosphere, or there is limited access for escape/rescue in case of emergency.

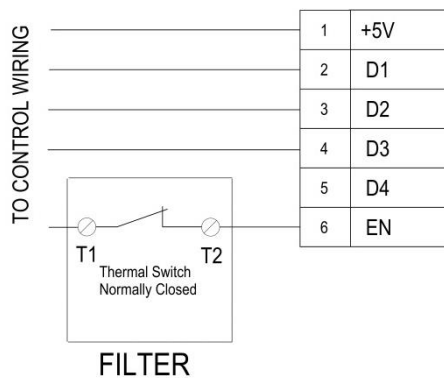
Wiring Diagram



Over temperature Protection:

N/C thermal switches are included. This **must be** connected into the enable circuit or external trip input of the ZENER 8000.

VSD CONTROL TERMINALS



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* If the High Performance Output Filter is not mounted adjacent to the inverter on the same mounting panel, inside a metal enclosure, screened power cable may be required between the inverter and filter. If using screened cable, refer to ZENER 8000 Installation Manual for EMC Installation practices.

+B Terminal

The ZENER 8000 +B/BR+ terminals are supplied as a factory fitted option. The following table lists the part numbers corresponding to ZENER 8000 inverters from 15A to 490A.

Description	Part Number	Internal Fuse
ZENER 8000 DC Bus Terminal Kit for Chassis A - fitted	n/a	n/a
ZENER 8000 DC Bus Terminal Kit for Chassis B - fitted	AF03101	n/a
ZENER 8000 DC Bus (+ only) Terminal Kit for ChC with Fuse - fitted	AF08107	30A
ZENER 8000 DC Bus (+ only) Terminal Kit for ChD with Fuse - fitted	AF08108	30A

Fuse Data:

The fuse is a fast acting type, rated 30A 600VDC with a cartridge size 38.1 x 10.31mm. Do not substitute other types.

Description	Zener Part Number
Replacement Fuse, 30A 600VDC	AP18080

NOTE: THE IP00 HIGH PERFORMANCE OUTPUT FILTER requires connection to the ZENER 8000 (+) DC bus. The factory fitted option provides a fused terminal in the ZENER 8000 for this purpose.

Cable Size:

The minimum cable size used for the filter +B should be no less than the size required for the protective earth conductor in the inverter installation (Chassis A & B models) or 30A for models (Chassis C & D) fitted with a fused terminal. For supply protection, cable size and electrical isolation information, refer to the ZENER 8000 Installation Manual.

Chassis C and D:

Chassis C & D include a 30Amp fuse on the +B terminal. This allows a smaller cable size to be used. The recommended minimum cable size is 6mm² (for UL508C compliance) or according to applicable wiring codes.


The fuse is intended provide thermal protection for the B+ wire in the event of a cable or filter fault condition.

Specification

Voltage Rating	380 to 480Vac, -15% +10%, 3 phase, 0-200Hz
Maximum rate of change of voltage dv/dt	150V/ μ s
Peak motor terminal voltage with 100m of motor cable	Typically 120% of peak mains voltage
Enclosure	Open chassis – IP00
Storage temperature	-20°C to 70°C
Operating environment temperature	0°C to 50°C as per drive rating / temperature (Consult Zener for higher ratings)
Relative Humidity	5 to 95% non-condensing
Altitude	0 to 1000m

Standards Compliance

When used with ZENER 8000 inverter

Complies with the Australian EMC framework requirements	
Adjustable speed electrical power drive systems Part 3: EMC requirements and specific test methods	IEC 61800.3 AS 61800.3

Current Ratings

Model	Current Rating		Heat Dissipation @2KHz Audible frequency
	Continuous @ 40°C	Intermittent 60s	
AHO0070	7.0A	9.0A	
AHP2200	220A	242A	
AHP3150	315A	347A	
AHP3900	390A	429A	
AHP4900	490A	539A	630W

Operation at higher Audible Frequency or at speeds >50Hz may require derating. The filter is matched to the ZENER 8000 to allow for operation at temperatures above 40°C.



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