MIRUS **International Inc.**

INSTALLATION, OPERATION AND MAINTENANCE GUIDE

SINE-WAVE FILTER

ADVANCED UNIVERSAL SINEWAVE FILTER (AUSF)

AUSF-M001-A

IMPORTANT SAFETY INSTRUCTION

SAVE THESE INSTRUCTIONS - This manual contains important instructions for the SINE-WAVE FILTER that must be followed during installation, operation, and maintenance of the SINE-WAVE FILTER and its auxiliary equipment.

	**WARNING** OPENING ENCLOSURES EXPOSES HAZARDOUS VOLTAGES. ALWAYS REFER SERVICE TO QUALIFIED PERSONNEL ONLY.

	**WARNING** As standards, specifications, and designs are subject to change, please ask for confirmation of the information given in this publication. This manual is a controlled document; pages should not individually be removed from this document.

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AUSF-M001-A
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MIRUS International Inc.
31 Sun Pac Blvd.
Brampton, Ontario
Canada L6S 5P6

1 - 888 - TO – MIRUS (1 - 888 - 866 – 4787)
Tel: (905) 494-1120
Fax: (905) 494-1140
E-Mail: mirus@mirusinternational.com
Website: www.mirusinternational.com

Warranty

Seller warrants to the Ultimate Purchaser (the purchaser who buys for use, and not for resale) that all products furnished under this order and which are manufactured by Seller will conform to final specifications, drawings, samples and other written descriptions approved in writing by Seller, and will be free from defects in materials and workmanship. These warranties shall remain in effect for a period of twelve (12) months from the date of installation or eighteen (18) months from the date of shipment, whichever occurs first. In addition, the warranties are extended a further nine (9) years on a pro-rated basis. Parts replaced or repaired in the warrant period shall carry the unexpired portion of the original warranty.

The liability of Seller hereunder is limited to replacing or repairing at Seller's factory or on the job site at Seller's option, any part or parts which have been returned to the Seller and which are defective or do not conform to such specifications, drawings or other written descriptions; provided that such part or parts are returned by the Ultimate Purchaser within ninety (90) days after such defect is discovered. The Seller shall have the sole right to determine if the parts are to be repaired at the job site or whether they are to be returned to the factory for repair or replacement. If during the pro-rated portion of the warranty a replacement unit is warranted, the purchaser shall bear the cost of a replacement unit on a pro-rated basis. The replacement cost shall be 10% of the original purchase price in the second year, increasing yearly to a maximum of 90% of the original purchase price in the 10^{th} year. All items returned to Seller for repair or replacement must be sent freight prepaid to its factory. Purchaser must obtain Seller's Return Materials Authorization (RMA) prior to returning items. The above conditions must be met if warranty is to be valid. Seller will not be liable for any damage done by unauthorized repair work, unauthorized replacement parts, from any misapplication of the item, or for damage due to accident, abuse, or Act of God.

In no event shall the Seller be liable for loss, damage, or expense directly or indirectly arising from the use of the units, or from any other cause, except as expressly stated in this warranty. Seller makes no warranties, express or implied, including any warranty as to merchantability or fitness for a particular purpose or use. Seller is not liable for and Purchaser waives any right of action it has or may have against Seller for any consequential or special damages arising out of any breach of warranty, and for any damages Purchaser may claim for damage to any property or injury or death to any person arising out of its purchase of the use, operation or maintenance of the product. Seller will not be liable for any labor subcontracted or performed by Purchaser for preparation of warranted item for return to Seller's factory or for preparation work for field repair or replacement. Invoicing of Seller for labor either performed or subcontracted by Purchaser will not be considered as a liability by the Seller.

This warranty shall be exclusive of any and all other warranties express or implied and may be modified only by a writing signed by an officer of the Seller. This warranty shall extend to the Ultimate Purchaser but to no one else. Accessories supplied by Seller, but manufactured by others, carry any warranty the manufacturers have made to Seller and which can be passed on to Ultimate Purchaser.

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There are no warranties which extend beyond the description on the face hereof. In no event shall MIRUS International Inc. be responsible for consequential damages or for any damages except as expressly stated herein.

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Direct questions about the operation, repair, or servicing of this equipment to MIRUS International Inc. Customer Support Services. Include the part number, assembly number, and serial number of the unit in any correspondence. Should you require factory service for your equipment, contact MIRUS International Inc. Customer Support Services and obtain a Return Materials Authorization (RMA) prior to shipping your unit. Never ship equipment to MIRUS International Inc. without first obtaining an RMA.

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Revision History

Revision: A New Release 2009/12/30

Contents

1.0 Installation

WARNING

Danger! There is the potential of electric* shock *whenever working in or around electrical equipment* such as sine-wave *filters. Power must be shut* off before *any work is conducted on a sine-wave filter.

1.1 Location

Location of the SINE-WAVE FILTER should be made with consideration given to accessibility, ventilation and atmospheric conditions. Sufficient clearances from walls and other obstructions should be provided to permit unrestricted opening of hinged and removable doors, covers and panels for the purpose of wiring terminations, inspection, maintenance and testing. Also, **proper ventilation requires at least 6 in. (155mm) clearance** at all ventilation openings.

Installation locations should be free of contaminants including dust, fertilizer, excessive moisture, corrosive gases, flammable materials or chemical fumes. Filtered air may be considered to reduce maintenance where air born contaminants are a problem.

Enclosures are designed in accordance with NEMA and UL standards and can allow for installation in various environments. Standard enclosures for the SINE-WAVE FILTER are NEMA3R and NEMA3R Enhanced.

Where SINE-WAVE FILTER are connected to lines subject to lightning exposure or other voltage surges, careful coordination of BIL levels and protective surge arresters must be made. For derating factors which apply to installation at high altitudes, refer to ANSI C57.12.01-1989.

1.2 Inspection

Upon receipt of shipment the SINE-WAVE FILTER should be inspected for any damage incurred during shipment. Before energization an internal inspection should be conducted with emphasis on loose or broken connections, damaged or displaced parts, cracked insulators, dirt or foreign material, or evidence of moisture.

1.3 Handling

The SINE-WAVE FILTER should be thoroughly protected against the entrance of dust, rain or snow when handled outdoors.

When lifting the SINE-WAVE FILTER, the lifting cables should be held apart by a spreader to avoid bending the lifting lugs or other parts of the structure. The SINE-WAVE FILTER may be skidded or moved on rollers but care must be taken not to damage the base or tip it over. When rollers are used under larger units, skids must be used to distribute the stress over the base.

After the SINE-WAVE FILTER is placed in permanent position, shipping braces should be removed and shipping bolts, if present, should be loosened. **Where isolation pads have been included, the bolt should be loosened until the spring washer has been relaxed before putting into service**. This will reduce noise resulting from the SINE-WAVE FILTER natural vibration.

1.4 Grounding

Consideration must be given to equipment grounding (case and core) and must be made in accordance with all applicable electrical codes.

2.0 Storage

Condensation and moisture absorption must be prevented during storage. The SINE-WAVE FILTER must be stored in a warm, dry location. Ventilation openings should be covered to keep out dust. If outdoor storage cannot be avoided, the SINE-WAVE FILTER must be protected to prevent entrance of water, moisture and foreign material.

3.0 Maintenance

WARNING

Internal maintenance must be performed with a sine-wave filter de-energized, isolated and with the terminals grounded.

3.1 Periodic Inspection and Maintenance

The SINE-WAVE FILTER has no moving or active parts and therefore requires only minimal periodic maintenance when installed in a clean and well ventilated environment. This should include:

3.1.1 Visual inspection for evidence of loose connections, dirt, moisture, rusting, corrosion, and deterioration of the insulation, varnish or paint.
Observations should be made for signs of overheating and overvoltage creeping. Corrective measures should be taken as necessary.

3.1.2 For early detection of any developing hotspots, an infrared scan can be performed while the SINE-WAVE FILTER is operating under its heaviest load condition.

3.1.3 Measuring the current in each of the 3 phases of the capacitor circuit can be a quick and easy method of determining the condition of the capacitors. The capacitors can be assumed to be in good operating condition when all 3 phases carry approximately the same amount of load current. Measurements should be taken at the input to the capacitor fuse block and can be done at any loading condition. If the phase currents are found to be substantially different, the unit should be taken offline and serviced by a qualified technician. This test should be conducted annually or whenever the unit seems to be operating in an abnormal manner.

3.2 Cleaning

Excessive accumulations of dirt on the sine-wave filter windings or insulators and capacitor terminals should be removed to permit free circulation of air and to guard against the possibility of insulation breakdown. Particular attention should be given to cleaning the top and bottom ends of the winding assemblies and to cleaning out ventilating ducts. Windings should be lightly cleaned by the use of a vacuum cleaner. If necessary a blower or compressed air may be used but pressure should not exceed 25 psi. Lead supports, tap changers and terminal boards, bushings, and other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is not recommended due to deteriorating effects on most insulating materials.

3.3 Drying of Core and Coil Assembly

CAUTION

Constant attention during the drying process is recommended.

When it is necessary to dry a SINE-WAVE FILTER sine-wave filter before installation or after an extended shutdown under relatively high humidity conditions, internal and/or external heating methods can be used. (See ANSI/IEEE C57.94-1982 for a description of these methods).

It is important that most of the heated air pass through the winding ducts and not around the sides. Good ventilation is essential in order that condensation not take place in the reactor itself or inside the case. A sufficient quantity of air should be used to assure approximately equal inlet and outlet temperatures.

Air temperature should not exceed 70°C.

4.0 Operation

WARNING

Internal maintenance must be performed with a sine-wave filter de-energized, isolated and with the terminals grounded.

Caution: Do not remove covers, panels, or any enclosure parts while the SINE-WAVE FILTER is energized.

4.1 Effect of Humidity

While the SINE-WAVE FILTER is energized, humidity conditions are generally not important since the heat from the reactor will prevent condensation. If a shutdown exceeding 24 hours occurs during a period of high humidity that could cause condensation within the sine-wave filter, precautions should be taken. Small strip heaters may be energized in the bottom of the unit to maintain the temperature of the unit a few degrees above that of the outside air. If such precautions are not taken the unit should be inspected for evidence of moisture and insulation resistance checked. If necessary, dry as described in Maintenance section above.

4.2 Loading

A SINE-WAVE FILTER should only be loaded in accordance with its nameplate rating.

NOTES

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