User Manual
ENGLISH

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

Leakage Current Probe
Model 2620

GROUND FAULT/LEAKAGE DETECTOR

Measure Up
WITH AEMC® INSTRUMENTS

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
Phone: (603) 749-6434 or (800) 343-1391 • Fax: (603) 742-2346

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met the instrument's published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at www.aemc.com/calibration.

Serial #: _____

Catalog #: **2125.52**

Model #: **2620**

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

Chauvin Arnoux®, Inc.
d.b.a AEMC® Instruments
www.aemc.com

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NOTES:

1. INTRODUCTION

Thank you for purchasing an AEMC® Instruments **Leakage Current Probe Model 2620**.

For the best results from your instrument and for your safety, you must read the enclosed operating instructions carefully and comply with the precautions for use. Only qualified and trained operators should use this product.

1.1 INTERNATIONAL ELECTRICAL SYMBOLS

	Signifies that the instrument is protected by double or reinforced insulation
	**CAUTION - Risk of Danger!** Indicates a **WARNING**. Whenever this symbol is present, the operator must refer to the user manual before operation
	Indicates a risk of electric shock. The voltage at the parts marked with this symbol may be dangerous
	Indicates Important information to acknowledge
	This product complies with the Low Voltage & Electromagnetic Compatibility European directives
	In the European Union, this product is subject to a separate collection system for recycling electrical and electronic components in accordance with directive WEEE 2012/19/EU

1.2 DEFINITION OF MEASUREMENT CATEGORIES

CAT IV: Corresponds to measurements performed at the primary electrical supply (< 1000 V).

Example: primary overcurrent protection devices, ripple control units, and meters.

CAT III: Corresponds to measurements performed in the building installation at the distribution level.

Example: hardwired equipment in fixed installation and circuit breakers.

CAT II: Corresponds to measurements performed on circuits directly connected to the electrical distribution system.

Example: measurements on household appliances and portable tools.

1.3 PRECAUTIONS FOR USE ⚠

These safety warnings are provided to ensure the safety of personnel and proper operation of the instrument.

- Never use this clamp on conductors with a voltage potential above 600 VRMS.
- Never clamp around a conductor unless the clamp is terminated to a measuring instrument with proper input impedance.
- Keep the jaw mating surfaces clean. If necessary, use a slightly oiled cloth to remove oxidation.
- Ensure that the cables or bus bar are properly centered within the clamp jaws.
- Stay away from other conductors which may create interference.
- Avoid leaving the clamp in damp places or exposing it to running water.
- Due to shock or fire hazards, electrical connections of the instrument should be performed only by qualified personnel and in accordance with local, state, and federal electrical requirements.

1.4 RECEIVING YOUR SHIPMENT

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

1.5 ORDERING INFORMATION

Ground Fault/Leakage Detector Model 2620..... Cat. #2125.52
Includes user manual and warranty card.

1.5.1 Accessories & Replacement Parts

Adapter – 4 mm Non-insulated for Safety Leads ..... **Cat. #1017.45**
(Converts male safety plugs to non-shielded male plugs)

Bag – Large Classic Tool Bag..... **Cat. #2133.71**

Bag – Small Classic Tool Bag ..... **Cat. #2133.72**

2. PRODUCT FEATURES

2.1 DESCRIPTION

The Model 2620 measures leakage current shunted to ground caused by insulation breakdown or leaks. It enables the operator to locate failures when or before they occur, without shutting down equipment or spending hours trouble-shooting.

It is designed specifically for locating low current faults on high current loads. The detector is a sensitive AC current transformer capable of measuring differential or leakage current from 500 µA, and may be used to measure current up to 400 A continuous duty.

The Model 2620 provides, on two ranges, 1 mV/mAAC or 1 mV/AAC. The output leads are terminated with standard 4mm banana plugs capable of interfacing with any standard multimeter.

Use of a digital multimeter with analog bar graph is recommended: Digital to provide the proper voltage input impedance, and an analog bar graph to track trends.

When the Model 2620 is used as a current leakage detector, it makes no difference if the system is single-phase or poly-phase, or if the currents are in-phase or out of phase, balanced or unbalanced.

The net magnetic field at any instant in time will be zero if all the conductors surrounded by the current leakage detector are supplying all the current delivered to and received from the load.

If any current is diverted through any alternate path to ground, such as an insulation breakdown, the net loss will be detected producing a output proportional to the amplitude of the fault current.

The Model 2620 may also be used simply as a highly accurate clamp-on current probe. With its 4 in jaw opening and range of 500 µA to 400 A, the Model 2620 provides a versatile way to analyze unbalanced current measurements, leakage values on grounding conductors and ground loop currents.

2.2 CONNECTIONS

The Model 2620 is compatible with most DMMs, voltmeters, or other voltage measuring instruments with the following features:

- Range and resolution capable of displaying 1 mVAC of input.
- Voltmeter accuracy of 0.75 % or better to take full advantage of the accuracy of the probe.
- Minimum input impedance of 1 MΩ.

Connect the probe to the multimeter or other instrument.

Select the appropriate AC voltage range on your multimeter.

The Model 2620 has two selectable output ranges. The 4 A range will produce an mV/mA with an output of 4 VAC at 4 A. The 400 A range produces 1 mV/A with 400 mVAC at 400 A.

WARNING: Always use a DMM, voltmeter or other displaying device, appropriately rated for the working voltage and for safety.

3. SPECIFICATIONS

3.1 REFERENCE CONDITIONS

Ambient temperature:	23 °C ± 3 K
Relative humidity:	(20 to 75) % RH
Position of the conductor:	Centered in the jaws
Current frequency and form:	Sinusoidal 50/60 Hz ± 0.2 Hz, distortion <1 %
Superimposed DC current:	No DC current
Continuous magnetic field:	Earth field < 40 A/m
Alternating magnetic field:	No external alternating magnetic field
Proximity of external conductors:	None
Measuring device's impedance:	≥ 10 MΩ / 100 pF

3.2 ELECTRICAL

4 A Range

Nominal Current: 4 AAC

Measurement Range: 0.5 mA to 4 AAC

Output Signal: 1 mVAC/mAAC

4 A Range	(0.5 to 10) mA	(10 to 100) mA	100 mA to 4 A
Accuracy	3 % of R ± 1 mV	0.5 % of R ± 0.5 mV	0.5 % of R ± 0.5 mV
Phase Shift	–	< 15 °	< 10 °

400 A Range

Nominal Current: 400 AAC

Measurement Range: 0.5 A to 400 AAC

Output Signal: 1 mVAC/AAC

400 A Range	0.5 to 10 A	10 to 100 A	100 to 400 A
Accuracy	0.5 % of R ± 0.5mV	0.35 % of R ± 0.5mV	0.35 % of R ± 1mV
Phase Shift	–	< 1 °	< 0.6 °

Overloads

- Ip limit current: permanent 400 AC RMS
- Peak current: < 1000 A
- Permissible transient di/dt: ≤30 A/µs
- Conductor temperature: ≤ 70 °C with a maximum peak of 90 °C

Load Impedance (DMM): 1 MΩ min

Frequency: (48 to 1000) Hz

Errors caused by external influences:

Ambient temperature	< 0. 1 % per 10 K
Position of the gripped conductor (max with not centred conductor)	0.1 % typic of VOUT (non-differential current); 0.2 % max
Residual differential (max with not centred conductor)	0.1 % typic of IP (differential current); 0.2 % max
External fields, 1 V/A (1)	< 60 mV of Vs
External fields, 1 mV/mA (1)	< 100 µV of Vs
Coupled DC current, 1 V/A (2)	< 1 mV for continuous 1 A
Coupled DC current, 1 mVm/A (2)	< 0.1 mV for continuous 1 A
Frequency, 1 V/A (3)	< 1.5 % from 30 Hz to 1 KHz
Frequency, 1 mV/mA (3)	< 0.5 % from 30 Hz to 1 KHz

(1): 400 A/m 50 Hz field perpendicular to the clamp opening
(2): DC current coupled onto an AC current
(3): Limited to 1 KHz for 100 A

3.3 MECHANICAL

Dimensions: 11.2 x 6.9 x 1.8 in (285 x 175 x 45 mm)

Weight: 2.9 lbs (1300 g) approx.

Jaw opening: 4.4 in (112 mm)

Maximum Jaw Gap: 9.8 in (250 mm)

Maximum Clamping Capacity: Max 4.5 in (115 mm) Ø cable

3.4 ENVIRONMENTAL

Operating Temperature:
(-14 to 131) °F (-10 to 55) °C; (0 to 85) % RH (non-condensing)

Storage Temperature:
(-40 to 158) °F (-40 to 70) °C; (0 to 85) % RH (non-condensing)

Operating Altitude: ≤2000 m on uninsulated conductors

Transport Altitude: ≤12000 m

3.5 SAFETY

Electrical Safety

EN 61010, 600 V CAT III

Pollution Degree: 2

Electromagnetc Compatibility

Industrial Environment: Criterion B

Emissivity (EN 61326-1)

Susceptibility (EN 61326-1)

Self-extinguishing Capability

Jaws and Casing: VO (UL 94)

4. OPERATION

4.1 PRINCIPLE OF OPERATION

4.1.1 Measuring Current Leakage

When a generator supplies an AC load through a pair of wires in an insulated cable, the current going out on one wire is equal to the current returning; their vector sum equals zero. A ground fault changes this equality, and the leakage current detector picks it up, measures it, and provides an AC voltage output proportional to the severity of fault causing the unbalance.

The ground conductor must not pass through the detector.

4.1.2 Interpreting the Measurement

Figure 1 is a schematic of a single-phase installation of a motor and an oven, both grounded. The numbers indicate the amplitudes of the currents in different conductors. This installation has no faults. If you clamp the detector around the cables at points A,B,C or D, it will output zero.

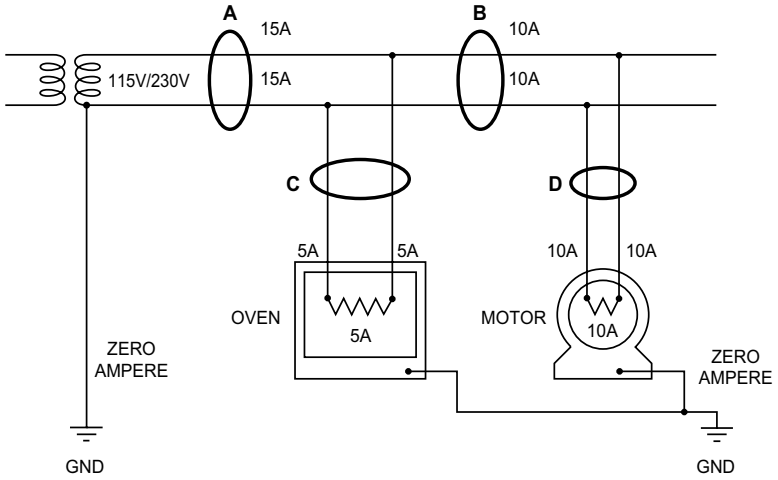

Figure 1

In Figure 2, there is a fault in the installation. At point A, the Model 2620 detects 1 A (the difference between 16 A and 15 A), indicating a fault downstream. At point C, it detects zero; therefore, the fault is not in the oven. At points B and D, the detector picks up 1 A, showing that the fault is in the motor. If it gets worse, the leakage current will increase and the circuit breaker will trip. This motor should be disconnected immediately and repaired.

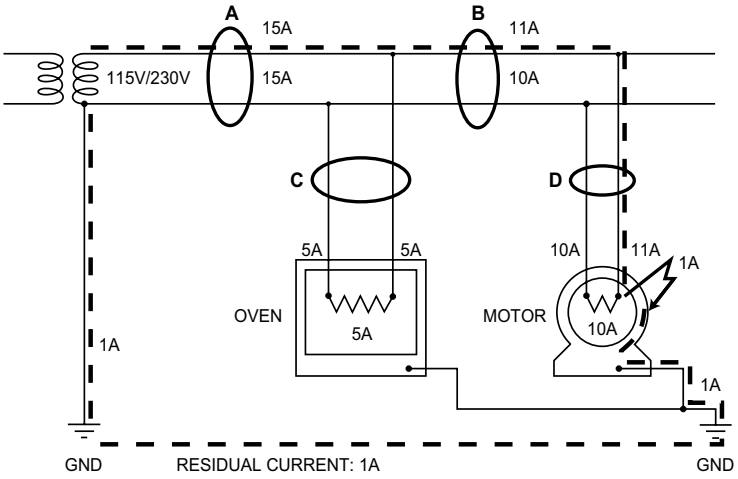

Figure 2

In a three-phase installation the principle is the same. But here it is necessary to pass all active conductors through the detector, including the neutral if one is used. If this is done properly, the detector output will be zero if there is no current leaking to ground. If it detects something other than zero, there is a ground fault that should be repaired.

4.2 EQUIPMENT TROUBLESHOOTING

To locate a fault quickly, begin your troubleshooting at the incoming low-voltage distribution header. Successively check each feeder. If the Model 2620 detects a ground fault, follow the feeder downstream, branch by branch, to the equipment with the problem.

It is useful to take measurements periodically to create a history of the quality of the insulation. This is good preventive maintenance which could prove valuable later. If you detect a fault current that is very low initially but increases from day to day, this means that electrical failure is imminent and should be taken care of during the next planned maintenance shutdown.

For best results, center the conductors within the clamp jaws. Check that the edges of the jaws are perfectly clean and that they close tightly. Try to avoid placing the conductors near the gaps, and group them as much as possible.

If you are careless, you can affect the magnitude of the reading, depending on the current being carried in the conductors. In certain cases this requires an interpretation. Normally, however, the absolute value of the ground current is not important. All you need to know is whether the reading is zero.

4.3 TESTING VARIOUS CABLE CONFIGURATIONS

Older installations have a wide variety of electrical distribution systems. Cables are clamped to walls and pass through metal conduits, and there are many cases where a shielded cable was installed during revamping of an area or addition to a building. If a cable is clamped to walls, detach it and pull it away from the surface at several points, so the clamp can surround all the conductors.

4.3.1 Metal Conduits

Cables enclosed in metal conduits which are grounded are not a problem. Simply apply the clamp around the conduit; the metal tube will not block the measurement. Cables with a metal shield can be handled in the same way as cable in metal conduit.

A grounded shield may present a problem. If it is a simple metal shield, like a thin metal wrapping, it can be considered in the same way as the metal conduit. If the armor is grounded by a conductor, it may be an inconvenience, depending on the terminal connections, as well as on the number and type of ground connections along the cable.

In Figure 3 the detector senses the fault because the shield is not connected to the motor frame and the leakage current cannot flow back through the detector.

In Figure 4, however, the instrument cannot see the fault because the shield is connected to the motor frame, letting the fault current return through the detector and causing it to read zero. If possible, take your measurement where you can avoid closing the shield in the clamp, such as the nearest control panel or inside the connecting box of the motor.

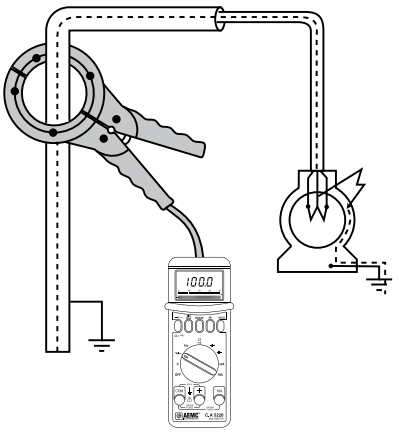

Figure 3

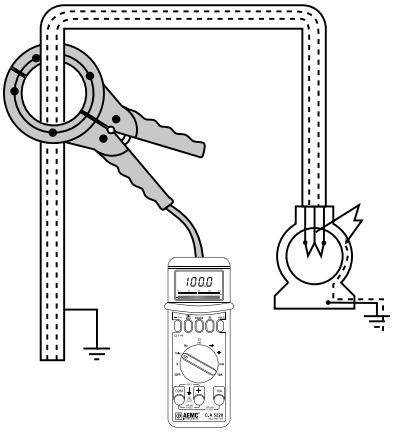

Figure 4

One way to circumvent this shielded cable problem is shown in Figures 5 and 6. Here the shield is looped through the detector twice, so that the reading will be that of the fault current.

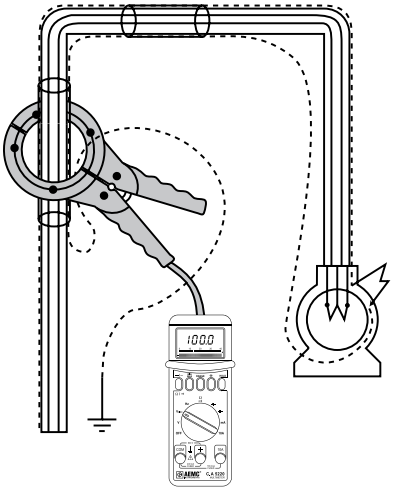

Figure 5

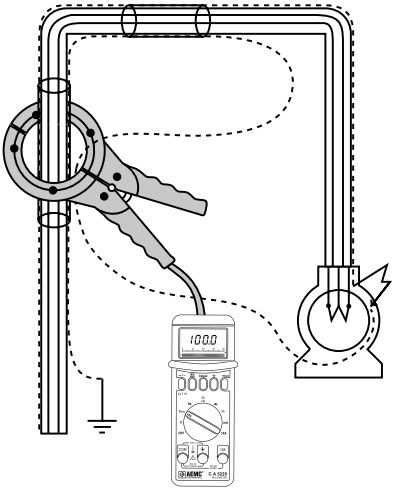

Figure 6

4.3.2 Grounded Neutral

It is easy to take measurements on this type of network, where major faults trip the circuit breaker. Here, the detector can sense minor faults, so repairs can be made before the problem gets worse. The inspection method is the same as for a single-phase installation. Remember that on a three-phase network, the currents add according to the vector sum law.

The Model 2620 measures the vector sum of the enclosed currents. If you have, for example, a 400 mA fault and a 250 mA fault on the same phase, the Model 2620 will detect 650 mA. But if the two faults are on different phases, they add vectorially and may even sum up to zero.

Figure 7 shows an example in which there are two separate faults: 400 mA on a machine in one shop, 250 mA on a machine in another shop. The vector sum is not 650 mA, but 350 mA. If you switch off the machine with the 250 mA fault, the reading increases, indicating faults on different phases.

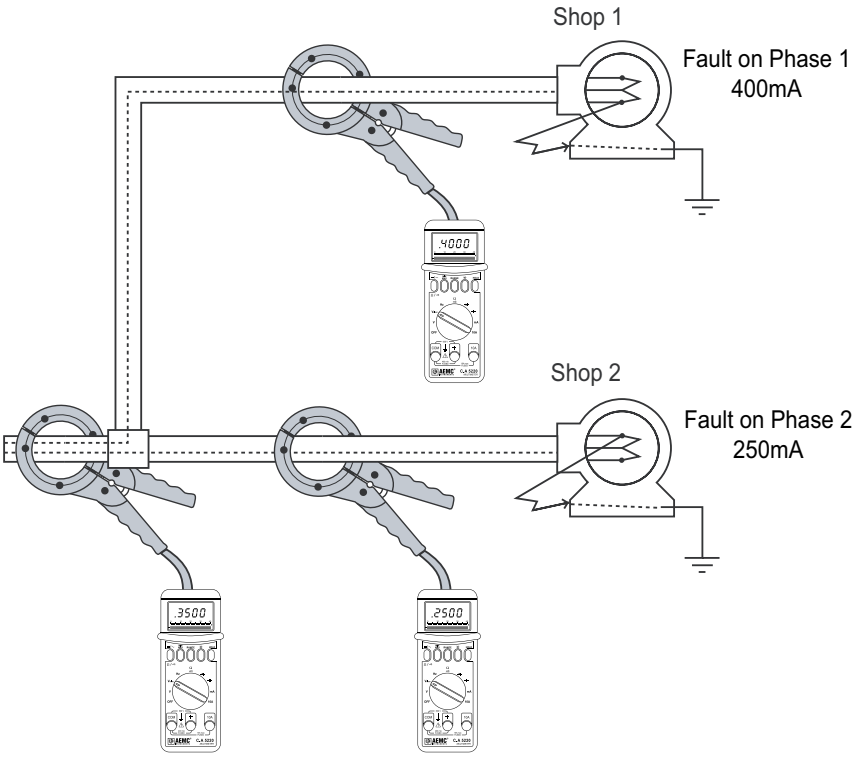

Figure 7

4.3.3 Neutral Grounded Through an Impedance

Follow the procedure the same way as for a grounded neutral installation, but with care. When the neutral is grounded through an impedance, a fault (even a serious one) may not trip the circuit breaker, and the circuit will stay live.

4.4 COMMONLY ASKED QUESTIONS

Q. I have found an indication of (40 to 50) mA on one of the main feeders with 300 A on the line. Is this value a fault?

A. With 300 A on the line, it is possible to find an undesired current of that magnitude. Different cables in the installation may not have equivalent capacitance and resistance. These cables provide for high current and, of course, we apply a high current. Therefore, we may have a capacitive influence which corresponds to 45 mA.

Q. Must the conductors be centered within the jaws?

A. You should avoid placing the conductors close against the magnetic circuit near the gaps, and should group the conductors as much as possible. Best results are obtained while centering the conductor. You must also ensure that the jaw mating surface are perfectly clean and that nothing prevents them from closing tightly.

Q. Is it possible when checking cables which run parallel, yet supply the same load, to clamp the detector over each cable separately?

A. When there are parallel cables, the measurement is valid only if the detector includes the cables together. In fact, if you take each one separately, it is highly probable that the distribution of current in the parallel cables is not even. These differences can be caused by the fact that the cables may not have exactly the same impedance.

Q. I have detected faults of 400 mA and 250 mA on branch circuits being supplied by the feeder. But clamping onto the incoming feeder resulted in an indication of 350 mA. Can you explain why 400 mA + 250 mA = 350 mA?

A. The detector measures residual current; in other words, the vectorial sum of the currents. If you have a 400 mA fault and a 250 mA fault on the same phase, you have every chance of finding 650 mA. But, if you have two faults on different phases, they add as vectors actually, in a very theoretical case we could even find zero.

Q. The Model 2620 detects faults caused by insulation failures. How does detecting faults with the detector differ from information resulting from megohmmeter insulation tests?

A. The Model 2620 will detect electrical faults while the equipment is still in operation. This offers two distinct advantages. First, it is not necessary to shut the equipment down, eliminating costly down time; and second, you may detect faults that would not be evident under non-energized conditions.

Q. Would it be possible to clamp the Model 2620 directly around the grounding detector?

A. Yes, in some instances it may be possible to detect fault current on a specific motor if there is a dedicated grounding path. However, if several devices are sharing a common ground, it should be noted that the fault may be occurring on any one (or multiple) of the devices.

5. MAINTENANCE

WARNING:

- For maintenance use only specified factory replacement parts.
- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the case. Turn the instrument OFF and disconnect the unit from all the circuits before opening the case.

5.1 CLEANING

- Wipe the case and jaw covers with a lightly moistened cloth and mild detergent.
- Do not use any abrasives or solvents.
- If rusted, the jaw mating surfaces of the Model 2620 may be lightly sanded with very fine sandpaper and then very lightly oiled. Wipe off excess oil and do not let it drip into the case.Repair and Calibration

5.2 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that the instrument be sent back to our factory Service Center at one-year intervals for recalibration or as required by other standards or internal procedures.

For instrument repair and calibration:

You must contact our Service Center for a Customer Service Authorization Number (CSA#). Send an email to repair@aemc.com requesting a CSA#, you will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration or a calibration traceable to N.I.S.T. (includes calibration certificate plus recorded calibration data).

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360) / (603) 749-6434 (Ext. 360)
Fax: (603) 742-2346
E-mail: repair@aemc.com

(Or contact your authorized distributor.)

Contact us for the costs for repair, standard calibration, and calibration traceable to N.I.S.T.

NOTE: You must obtain a CSA# before returning any instrument.

5.3 TECHNICAL ASSISTANCE

If you are experiencing any technical problems or require any assistance with the proper operation or application of your instrument, please call, e-mail or fax our technical support team:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
Phone: (800) 343-1391 (Ext. 351)
Fax: (603) 742-2346
E-mail: techsupport@aemc.com
www.aemc.com

5.4 LIMITED WARRANTY

The instrument is warrantied to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused, or if the defect is related to service not performed by AEMC® Instruments.

Full warranty coverage and product registration is available on our website at www.aemc.com/warranty.html.

Please print the online Warranty Coverage Information for your records.

What AEMC® Instruments will do:

If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will repair or replace the faulty material at our discretion.

REGISTER ONLINE AT: www.aemc.com/warranty.html

5.4.1 Warranty Repairs

What you must do to return an Instrument for Warranty Repair:

First, send an email to repair@aemc.com requesting a Customer Service Authorization Number (CSA#) from our Service Department. You will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive, Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360)
(603) 749-6434 (Ext. 360)
Fax: (603) 742-2346
E-mail: repair@aemc.com

Caution: To protect yourself against in-transit loss, we recommend that you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

NOTES:

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