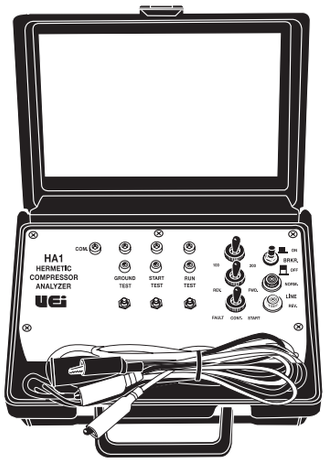
INSTRUCTION MANUAL

HA1

Hermetic Compressor Analyzer



Introduction

The HA1 hermetic analyzer is designed to provide the service technician with an easy to use, reliable test instrument. To obtain the maximum benefit from the HA1, please take time to read these instructions.

Note: *Under some test conditions 120 V AC may be present on a test cable. Refer to section on operation.*

Features include

- Free locked rotors by reversing motor action
- Indicates continuity and ground faults by front panel indicator lights
- Front panel input jacks to facilitate VOM measurement of voltage and resistance
- Dual 120/240 V AC operation
- Color coded for easy use

Safety Notes

Before using this instrument, read all safety information carefully. In this manual the word **"WARNING"** is used to indicate conditions or actions that may pose physical hazards to the user. The word **"CAUTION"** is used to indicate conditions or actions that may damage this instrument.

International Symbols

Dangerous Voltage	Ground
AC Alternating Current	Warning or Caution
DC Direct Current	Double Insulation (Protection Class II)
Either AC or DC	Fuse
Not Applicable to Identified Model	Battery

Controls and Indicators

1. **PWR Breaker:** This is a combination 25A circuit breaker and a **POWER ON** switch.

2. **CAP100/200/300:** Selects one of the three starting capacitor ranges.

Position	Range
100MFD	88-180MFD
200MFD	161-193MFD
300MFD	249-301MFD

3. **REV/OFF/FWD:** Switch determines the mode of operation of the compressor. In the **FWD** position, power is applied to the compressor motor run winding, and the start capacitor is connected to the **START** cable. In the **REV** position, power is applied to the compressor motor start winding and the start capacitor is connected to the **RUN** cable. In the **OFF** position, the power circuit to the motor is broken.

   The REV position is momentary. The **OFF** and **FWD** positions are sustained.

4. **FAULT/CONT./START:** Is a multi-function switch. The FAULT (momentary action) position is used to check for shorts between the COM and the RUN/START windings. The CONT. (sustained action) position is used to check for GROUND, RUN and START continuity. In the START (momentary action) position, the start capacitor is connected to the compressor motor through the REV/OFF/FWD switch.

5. **Ground Test (Yellow):** This push button switch tests for ground continuity between system ground and the frame of the appliance being tested.

   The HA1 introduces an "artificial ground" to make possible the testing for short circuits between the motor winding and the frame of appliances which may not be directly grounded. For example, units with two wire power cords would not be connected to system ground (unless a separate ground connection were present).

6. **Start Test (Red):** This push button switch test two conditions, depending on the position of the FAULT/CONT./START switch.

Switch Position	Condition Tested
FAULT	Short between START winding and frame
CONT.	Continuity of START winding

7. **Run Test (Black):** This push button switch tests two conditions, depending on the position of the FAULT/CON./START switch.

Switch Position	Condition Tested
FAULT	Short between RUN winding and frame
CONT.	Continuity of RUN winding

8. **Indicator Light:** LINE NORM (white)/REV (red). These lights are used to indicate the "condition" of the power source to which the HA1 is connected.

Line Voltage	Indicator Light	Status
110 V AC	NORM on/REV off	Normal
	REV on/NORM off	Neutral and line wires reversed at power receptacle. Refer to CAUTION under section on 110 V AC operation
	NORM and REV	System ground open or not
		OFF (full intensity)

9. **Test Jacks:** The four test jacks are connected directly to the test cable of the corresponding color:

   COMMON = white
   GROUND* = yellow
   START = red
   RUN = black

   The purpose of the test jacks is to facilitate resistance and voltage readings by enabling voltmeter/ohm meter test leads to be connected to the compressor motor circuit by inserting them into the appropriate jack at the HA1 front panel.

   **Since this cable is an "artificial" ground line it is colored yellow instead of green.*

Operating Instructions

NOTE: *Every effort has been made to make the HA1 a safe and versatile tester. However, under some circumstances line voltage may be present on the HA1 test cables when the control switches are in the OFF position. For this reason it is very important to read and become familiar with the section on Operating Instructions.*

The following procedures have been detailed so a thorough understanding of the operation sequence may be gained. In practice, the following tests may be performed very quickly.

110 V AC Operation

CAUTION!

The HA1 is wired so that the white COMMON test cable is connected to the neutral side of the line. The red START and black RUN cables are connected to the hot side of the line by the POWER BREAKER switch and the REV/OFF/FWD switch. If the 110 V AC receptacle has been accidentally reverse wired, the white COMMON cable will be "hot" as soon as the HA1 is plugged into the power receptacle. To warn against such a condition, the red REV LINE indicator will light as soon as the HA1 is plugged into a grounded receptacle. In this case follow procedure B for reversed line condition.

A. Normal Test Procedure

1. The REV/OFF/FWD switch must be in the OFF position.

2. Plug the HA1 into a grounded 110 V AC receptacle and turn on the POWER switch. This is a push on - push off switch. The white NORM LINE indicator should light.

NOTE: *If the receptacle is ungrounded, both the NORM and the REV LINE indicator will light, but at half intensity. The absence of a grounded line will not prevent any of the following tests from being made.* ***IMPORTANT:*** *verify that the receptacle is not also reverse wired by measuring the voltage between the white COM cable and a ground connection. A reversed line will measure 110 V AC. A normal line will measure zero volts. If the receptacle is reverse wired, follow procedure B.*

3. Remove power to the unit which is to be tested.

4. Remove and identify the connectors going to the common, start, and run terminals of the compressor motor.

5. Connect the test cables of the HA1 to the motor frame
   - Red START cable to the start terminal
   - Black RUN cable to the run terminal
   - Leave the white COMMON cable disconnected until step 7

6. Push the **FAULT/CONT./START** switch to the **FAULT** position and hold it there while pressing the red **START TEST** and black **RUN TEST** switches in turn. If either the **START** indicator or **RUN** indicator lights, there is a short between that winding and the frame. STOP the test and replace the unit.

7. Connect the white COMMON cable to the common terminal of the compressor motor.

8. Press, in turn, the **GROUND TEST**, **START TEST**, and **RUN TEST** switches. The appropriate indicator will light indicating continuity in the circuit being tested.

   NOTE: *To test for ground continuity the appliance must be plugged into a grounded 110 V AC receptacle or be grounded through an external connection.*

   If either the run or start winding indicate open, stop the test and replace the unit.

9. Select the appropriate motor start capacitor.

10. Press the **FAULT/CONT./START** switch to the **START** position and, holding it there, throw the **REV/OFF/FWD** switch to the **FWD** position. If the compressor starts, release the **START** switch. The compressor will continue to run. The compressor may be stopped by returning the **REV/OFF/FWD** switch to the **OFF** position.

    If the compressor does not start immediately, the rotor may be locked. Release the **START** switch and return the **REV/OFF/FWD** switch to the **OFF** position.

11. To "bump" the compressor, press the **FAULT/CONT./START** switch to the **START** position and, holding it there, throw the **REV/OFF/FWD** switch to the **REV** position. If the compressor starts immediately, then release both switches. Repeat step 10 to assure that the compressor will run in the forwards direction.

    If the compressor does not start immediately in reverse, then release both switches. A locked rotor will result in excessive current being drawn by the compressor.

12. Steps 10 & 11 may be repeated a few times in an attempt to free a locked rotor, but care should be taken not to overheat the motor windings. If the compressor still does not start, then it should be replaced.

13. Push the **POWER BREAKER** switch **OFF**. Disconnect the HA1 test cables from the motor.

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B. Reversed Line Operation

If the 110 V AC receptacle is reverse wired the main thing to remember is that the white COMMON cable will be "hot" regardless of any HA1 switch setting. Therefore, exercise extreme care.

Follow the same procedure as for Normal Operation (A) steps 1 through 6, but keep the white COMMON cable isolated to prevent accidental contact with it.

Before doing step 7, unplug the HA1 from the power receptacle, connect the white COMMON cable to the common terminal of the motor, and then plug the HA1 into the power receptacle.

Proceed with the tests outlines in steps 8 through 12, section A.

220 V AC Operation

CAUTION!

The white COM cable will be hot as soon as the HA1 line cord is connected to 220 V AC. Always make sure that power to the HA1 is shut off before connecting the HA1 cables to the compressor motor on 220 V AC operation.

1. The **REV/OFF/FWD** switch and the **PWR BREAKER** switch must be in the off position.

2. Remove power to the unit which is to be tested.

3. Some compressor units have fans mounted in the same housing as the compressor. If possible turn down the thermostat, or disconnect the fan, so that the fan will not operate during the compressor tests. The fan noise could make it difficult to listen to the action of the compressor.

4. Remove and identify the connectors going to the **COMMON**, **START**, and **RUN** terminals of the compressor motor.

5. Connect the test cables of the HA1 to the compressor motor.
   - Yellow GROUND cable to compressor motor frame
   - Red START cable to the start terminal
   - Black RUN cable to the run terminal
   - Leave the white COMMON cable disconnected until step 10

6. Use an adapter cord of at least #14 AWG wire size to connect the HA1 to the 220 V AC input terminals.

7. Turn on the power to the HA1.

   NOTE: *Remember to keep the white COM cable out of the way. It will have 110 V AC on the clip.*

8. Push the **POWER BREAKER** to the ON position. Both **LINE NORM/REV** indicators will light.

9. Push the **FAULT/CONT./START** switch to the **FAULT** position and hold it there while pressing the red **START TEST** and black **RUN TEST** switches in sequence. If either the **START** indicator or **RUN** indicator lights, there is a short between that winding and the frame. **STOP** the test and replace the unit.

10. Turn off the 220 V AC power source to the HA1. Connect the white COM cable to the common terminal of the compressor motor.

11. Press, in turn, the **GROUND**, **TEST**, **START TEST**, and **RUN TEST** switches. The appropriate indicator will light indicating continuity in the circuit being tested. If either the run or start winding indicate open, stop the test and replace the unit.

12. Select the appropriate motor start capacitor.

13. Press the **FAULT/CONT./START** switch to the [illegible] position and, holding it there, throw the **REV/OFF/FWD** switch to the **FWD** position. If the compressor starts, release the **START** switch. The compressor will continue to run. The compressor may be stopped by returning the **REV/OFF/FWD** switch to the **OFF** position.

    If the compressor does not start immediately, the rotor may be locked. Release the **START** switch and return the **REV/OFF/FWD** switch to the **OFF** position.

14. To "bump" the compressor, press the FAULT/CONT./START switch t the START position and, holding it there, throw the REV/OFF/FWD switch to the REV position. If the compressor starts immediately then release both switches. Repeat step 13 to assure that the compressor will run in the forwards direction.

    If the compressor does not start immediately in reverse, then release both switches. A locked rotor will result in excessive current being drawn by the compressor.

15. Steps 13 and 14 may be repeated a few times in an attempt to free a locked rotor, but care should be taken not to overheat the motor windings. If the compressor still does not start, then it should be replaced.

15. Turn off the 220 V AC power source to the HA1. Disconnect the HA1 test cables from the motor.

Specifications

Running Current
25

Capacitor Range	
Position	**Range**
100MFD	88-180MFD
200MFD	161-193MFD
300MFD	249-301MFD

Input Voltage
110 to 250 V AC