8220

Multi-Phase Hermetic Analyzer

Owner's Manual

WARNING: Because of the nature of this instrument it is very important that you read and fully undertand this manual before using the unit!

Congratulations!

You have just purchased a high quality handcrafted test instrument Your new Analyzer has been re-designed for convenience of operation, and is now covered by a full one year warranty.
We strongly suggest you take the time to familiarize yourself with the instrument while completely reading these operating instructions. **Please pay particular attention to the cautions and warnings.**

Cautions in Using:

Electricity can be hazardous when not understood or respected. This instrument is intended for use by qualified service personnel who fully understand the electrical operation of the equipment they are servicing. **Make sure that all power is disconnected from the equipment you are testing and that power to this instrument is not energized until all connections are made in accordance with these instructions.**
Never make a guess as whether or not a wire is "live." **Any** wire should be checked for voltage between itself and ground before working on it. Never work on wires that are "live." A tool such as a Connectionless Voltage Detector is ideal for quickly identifying energized circuits. Whenever possible, remove the unit's fuses or turn off the main safety switches or circuit breaker before working on the unit's wiring. If power shut off is not in the area you are in, lock it off or tag it with a note to prevent unauthorized restoration of power.
For the chassis of this instrument to be grounded it **must** be plugged into a line voltage receptacle wired according to NEC standards. When using the cord adaptor, its black clip should be connected to the hot (for 120 VAC) or first hot leg (for 230 VAC). The green clip should be connected to the proper ground. Failure to connect the ground clip of the cord adaptor, use of the power cord with an ungrounded receptacle, or defeating the ground plug may lead to hazardous voltage on the chassis and will automatically void the warranty.
This instrument is protected with a master switch that has an ON/OFF switching capability. After final testing at the factory, this switch is placed in the "OFF" position. Connect the test leads, position the switches and hook up power according to instructions before placing this switch to the "ON" position. It is recomended, for safety, that this switch be kept in the "OFF" position whenever the instrument is not in use.

Ratings:

The 8220 Analyzer is designed for temporary testing purposes only. This unit may be used on 110-250 VAC compressors, up to 50 Amps. Maximum test period is 2 minutes. Exceeding or ignoring these ratings could be dangerous and will automatically void the warranty. Meter tolerance is ± 2 increments.

Care & Handling of your Instrument:

Unlike any of the mechanical tools you may own or work with, an electical testing instrument must be treated with care and respect in order for it to provide accurate and reliable service.
Dirt, grease and moisture can easily contaminate the switches, controls and meters - making them perform erratically. Common sense will tell you to keep your instrument clean and dry so as to avoid these problems. Prevent solvents and chemicals from coming into contact with the case, chassis or meter lens. Clean only with a damp cloth and

mild detergent. Your instrument should be transported and handled with care, as bouncing, vibration and shock can damage meter movements or other more sensitive. parts. Keep your unit in a protected place where it will be out of harms way. Periodically check the external condition of the wiring.

General Description:

The 8220 Multi-phase Analyzer is a starting device for single and three phase compressors. It is designed for hermetically sealed domes as well as semi-hermetics. With a simple three wire and ground hookup, the 8220 can start and rock free any compressor up to 7-1/2 horsepower on single phase, and 15 horse power on three phase current.
The single phase compressors referred to in this manual include split phase compressors, capacitor start compressors, capacitor run compressors, and capacitor start and run compressors. Three phase compressors refer to all units designed to operate on three phase current. The 8220 is limited to a maximum of 250 volts AC on all test procedures.
The 8220 also has an independent battery powered ohmmeter. The large meter and low range of its scale are designed principally for identifying windings and other low resistance checks. Please read ohmmeter instructions, Section I of OPERATION, and Care and Handling information on the ohmmeter.
Power is supplied to the 8220 through a four conductor, six foot long power cord. The green conductor is always used as a ground. The black wire is the primary hot wire on all hookups. The white wire is the neutral for all 115 volt single phase hook-ups, and is used as the second hot leg for 230.

volt single and three phase hookups. The red lead is for the third leg of the circuit on three phase **only.** First, second, and third leg terminology is for purposes of identification only on three phase, as any leg is interchangeable with the next.

The 8220 has three pilot lights to indicate correct hookup for testing a compressor. The "Line 1" light will glow on 115 volt single phase hookup when the power cord leads are connected as follows: Green lead to ground, black lead to one leg of the power source, and the white lead to the other leg. The "line 1, 2, and 3" lights will glow on a 230 volt three phase hookup when the supply cord leads are connected as follows: Green lead to ground, and red, white and black leads to the three hot legs of the power source. If all lights do not glow as outlined above, double check all connections and check hot legs for voltage.

There are six wire leads in the cord pocket for all test hookups. The following is an explanation of the usage and color code of these wires. The **black** wire functions as compressor common on single phase, and any terminal on three phase. The **white** wire is the start lead in the forward direction on single phase hookups and any terminal on three phase hookups. The **red** wire is the run lead in the forward direction for single phase hookups and any lead for three phase. The **green** wire is the safety ground on all applications. The **yellow** wires are used for auxillary functions. They operate the ohmmeter and are used for run capacitor motor starting as explained in the following sections on single phase motor starting.

There are six switches on the 8220. The **main breaker** operates as an overload protection for the instrument and is used to shut off

power to the master switch. The **master switch** is used to turn power on to the compressor and run it in a forward or reverse direction on single and three phase current. The **start switch** is used on single phase units **only**; it is used to put capacitance into the start windings on split phase compressors that do not use capacitors. The **phase switch** is for selecting the proper method of starting various types of units. The three phase position is for all three phase units, single phase position is for all single phase units with capacitor starting, and split phase position is for single phase units that require no capacitors for starting. The **capacitor switch** selects the amount of capacitance desired, see section IV of OPERATION for capacitor values. The **auxiliary switch** is used to engage the ohmmeter circuit when placed in the ohms position. When in the run capacitor position, running capacitors can be added to the circuit for operating a compressor that requires run capacitance. Ohmmeter operation is explained in section I and run capacitor use is covered in section II. At all other times, when the above functions are not being used, the switch should be in the **OFF** position.

Applications

- To check units for continuity, opens, shorts, and/or grounds of the windings.
- To identify compressor terminals for start, run, and common posts.
- To start compressors independently of all controlling circuits.
- To start and rock free any stuck or frozen compressor.
- To measure resistance and check continuity of any electrical apparatus.

***NOTE:** Any discussion of 115 volts AC single phase, will be referring to units from 110 to 125 VAC; 230 volts AC single phase will be referring to units from 208 to 250 VAC; 230 volts AC **three** phase will be referring to units from 208 to 250 VAC.*

Operation

I. OHMMETER OPERATION

A. OPERATION OF METER
Note: The ohmmeter is powered by a "D" cell 1.5v battery. To install or replace battery, remove the two screws holding down the battery cover and lift up. The battery is mounted on the underside of cover.
1. Place auxiliary switch in **OHMS** position.
2. All other switches should be **OFF** or in the center position.
3. Clip yellow leads together.
4. Adjust ohmmeter to zero with control knob.
5. Replace battery if meter will not zero.
6. Unclip leads from each other, the instrument is now ready to measure unknown resistances.

B. OHMMETER PRECAUTIONS
1. Do not connect meter to "live" wires.
2. Do not use on charged capacitors.
3. Do not connect the leads to the terminals of a spinning compressor or motor.

C. OHMMETER TESTS
WARNING: All external wiring should be removed before performing any of these tests.
1. To test for grounds, measure resistance from each terminal post to the housing or frame. No movement of meter is normal and is an indication of infinite resistance. If the meter moves windings are shorted to ground and the unit should be replaced.
2. To test for shorts, measure resistance from terminal to terminal for proper readings. The resistance

between the start and run terminals should be equal to the sum of the resistance of the start and run windings. If the resistance does not add up correctly the windings are shorted together and the unit should be replaced.

3. To identify start, run, and common terminals on single phase units (on three phase all terminals are the same), find the highest resistance between any 2 of the 3 terminals. These are the start and run terminals. The remaining terminal is common. Reading from the common, the highest resistance is to the start terminal. The remaining terminal is the run.

II. SINGLE PHASE COMPRESSOR TESTING

A. Remove all external wiring wiring from the compressor's terminals.

B. Refer to ohmmeter operation section I, C for proper terminal identification.

C. Set switches to proper position for starting:

- Main breaker should be turned **OFF.**
- Master switch should be turned **OFF.**
- Phase switch should be in **SINGLE** position for capacitor start units, and in **SPLIT** position for units that do not require capacitors for starting.
- Auxiliary switch should be **OFF** unless run capacitor is to be used. Further instruction for run capacitor use is listed in step D.
- Capacitor switch should be set to desired range as per chart in section IV. If no capacitor is to be used any position is acceptable, as it will have no effect.

D. Connect test leads to compressor terminals:

- Connect red wire to the run terminal.
- Connect black wire to the common terminal.
- Connect white wire to the start terminal.
- Connect green wire solidly to the housing.
- Yellow wires are **only** used for testing units that use run capacitors. On capacitor run compressors the auxiliary switch should be in the **run capacitor** position. The yellow leads are then connected to the original run capacitor if it is good, or an equivalent replacement.

E. Connect power cord to the correct voltage for compressor being tested:

1. Connect black wire to hot leg on 115 or 230 VAC units.
2. Connect white wire to neutral leg on 115 VAC units or second hot leg on 230 VAC units.
3. Connect green wire solidly to a good ground.
4. The red wire is not used on single phase testing, isolate it from the frame, ground and all other wires.

F. Starting the compressor

1. Check for correct pilot lighting as explained in the General Description; this will insure correct hookup of power supply cord.
2. Turn main breaker to **ON** position.
3. Holding start button **IN**, put master switch in **FORWARD** position, release button when the unit starts. If unit fails to start within three seconds, turn master switch **OFF.** If unit operates satisfactorily, the problem is with the capacitor, relay, control, overload, or other external wiring. If unit fails to start, it is stuck, see step G.

G. Reversing and rocking a stuck or frozen unit.

1. Proceed as outlined in step F parts 1 & 2.
2. Holding the start button **IN,** quickly move master switch between **FORWARD** and **REVERSE** position several times. If unit starts, let it run for approximately a minute, then turn it off.
3. Now try to start the unit as outlined in step F part 3. If the unit fails to start, it is beyond repair and must be replaced.

III. THREE PHASE TESTING

A. Remove all external and control wiring from the compressor's terminals.

B. Set switches to proper positions for starting.

1. Main breaker should be turned **OFF.**
2. Master switch should be turned **OFF.**
3. Phase switch should be in **3 PHASE** position.
4. Auxiliary switch should be turned **OFF.**
5. Capacitor switch can be in any position as it is not used for testing 3 phase units.

WARNING: Start switch is **NOT** to be pressed for starting three phase units.

C. Connect test leads to compressor terminals:

1. Clip red, white, and black instrument leads to compressor terminals in any order.
2. Connect green lead solidly to compressor frame.
3. Yellow leads should be left in the cord pocket, and isolated from each other, as they are not used for this test.

D. Connect power cord to the correct three phase voltage for compressor being tested.

1. Clip red, white, and black power cord leads to all three hot legs in no special order.
2. Connect green lead solidly to a good ground.

E. Starting the compressor.

1. All pilot lights should be glowing as explained in the general description. If any pilot lights to not glow check for the line for power.
2. Turn main breaker to **ON** position.
3. Put master switch in **FORWARD** position. If unit fails to start in approximately 3 seconds, turn master switch **OFF.** If unit operates satisfactorily, the trouble is with the control, overload, or other external wiring. If unit has failed to start it is frozen, see step F.

F. Reversing and rocking a stuck or frozen unit.

1. Proceed as outlined in step E parts 1 & 2.
2. Quickly move master switch between **FORWARD** and **REVERSE** position several times. If unit starts, let it run for approximately a minute in either direction, then turn it off.
3. Now try to start the unit as outlined in step E part 3. If the unit now fails to start, it is beyond repair and must be replaced.

IV. CAPACITOR INFORMATION

1.

A. 110 volt units up to 1/4 HP, use 75-155 MFD range.
B. 110 volt units of 1/3 - 1/2 HP, use 160-240 MFD range.
C. 110 volt units over 1/2 HP, use 250-380 MFD range.
D. 220 volt units, use label rating.

2.

A. 220 volt units up to 1/3 HP, use 25-80 MFD range.
B. 220 volt units between 1/3 and 1 HP, use85-145 MFD range.
C. 220 volt units over 1 HP, use 150-200 MFD range.

Limited Warranty and Repair Policy

This instrument is designed and produced to provide unlimited service. Should it become inoperative after the user has performed the recommended maintenance, a no-charge repair or replacement will be made to the original owner within one year of the date of purchase. This applies to all repairable instruments which have not been tampered with or damaged. This warranty does not cover consumable items such as batteries, tips and fuses, nor physical damage and wear to components such as probes, sensors and adaptors. For repair or customer service return the tool to the place of purchase.

Repaired tools will carry a 90-day warranty.

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