ADD-A-PHASE®

TYPE HE-AA/AA-HE

DESCRIPTION OF OPERATING CHARACTERISTICS

The Automatic Adjusting ADD-A-PHASE is designed to handle the unique operating characteristics of hydraulic pump motors. The Type HE-AA is for hydraulic elevator applications, and the Type AA-HE is for hydraulic balers and compactors. The hydraulic pumps used in these applications generally put their motors under variable loads. These converters have an automatic adjusting circuit board which senses load and adjusts the current output (for better current balance to the motor) under these varying load conditions.

CONVERTER OPERATION

STARTING THE MOTOR – A start contactor brings in a set of electrolytic type capacitors that supply the "manufactured" ("A") phase's starting current, which accelerates the motor to its operating speed.

1. A current transformer (C.T.) is used (on the "C" phase) to detect current being drawn by the motor. Recognition of this condition by the Auto Adjust circuit board initiates the converter's motor start sequence. The auxiliary relay closes. Its closing makes the start contactor close. This connects a bank of start (electrolytic) capacitors to the motor, developing the starting current needed to accelerate the motor.
2. The duration of the start sequence is normally very short, two seconds or less. A voltage sensing relay (control relay) will sense a rise in the A-C phase voltage. This rise will occur as the motor comes to speed. The control relay will de-energize the start contactor. This removes the start capacitors from the circuit.

RUNNING THE MOTOR – The autotransformer and run capacitors develop running current for the "A" phase. Changing the capacitance or the taps on the autotransformer will change the currents to the motor. See the Balancing instructions for further information on balancing. Note: Most AA units do not require balancing.

1. Two banks of run capacitors provide running current to the motor for the ("A") phase. The main bank is always connected and supplies the normal operating current. The run assist bank is connected through a contactor controlled by the Auto Adjust circuit board. It is brought into the circuit during motor starts and when high load conditions exist. The number of capacitors connected and the MFD rating of the capacitors determines the manufactured phase's current output to the motor. Capacitors for the 208 and 240 V output units are connected in parallel, while the 480 V output units are series pairs connected in parallel.
2. Some motors, depending on their power factor (P.F.) may require changing to a different tap of the autotransformer to achieve better current balance among the three phases.

RUN ASSIST – The Auto Adjust circuit board, unique to the Automatic Adjust ADD-A-PHASE units, constantly monitors the operating load on the motor (by detecting the amperage on the "C" phase). When the board senses a significant increase in motor load, additional run capacitance is added to

the circuit by the run assist contactor. This increases the manufactured phase's current output to match the motor's higher load condition.

1. When high load conditions are sensed by the board, the run assist contactor is energized, adding the run assist capacitors in parallel with the main bank of run capacitors. This additional capacitance raises the "A" phase current output. The higher "A" phase output helps balance the currents when the motor operates under higher load conditions.
2. When the load conditions are reduced, the circuit board will de-energize the run assist contactor. This removes the run assist capacitors from the circuit, which brings the "A" phase current back down to its normal operating level.

AUTO ADJUST CIRCUIT BOARD

The circuit board performs two different functions. It controls the initiation of the converter's start circuit. It also controls the run assist contactor.

CURRENT TRANSFORMER (C.T.) – The C.T., which senses the amount of current in the "C" phase output wire, provides a signal to the circuit board that is directly proportional to the "C" phase current.

CONTROL CIRCUIT BOARD – The circuit board uses the C.T. signal for its two sensing circuits. The first circuit senses when the motor is operating, and the second circuit senses the load on the motor.

1. The auxiliary relay that powers the start circuit is energized by the control board when the "C" phase current rises above 5-10 amps. The auxiliary relay remains energized while the motor runs. When the motor shuts off, the auxiliary relay is de-energized, which "resets" the start circuit. An indicating LED, located on the right-hand side of the board, illuminates when the current is above the auxiliary relay's "pull in" level.
2. The second function of the circuit board is to control the run assist contactor. The contactor is energized when the board senses an increase in load above the motor's normal operating range. When the board senses that the load has returned to its normal operating range, it will de-energize the run assist contactor. The "pull-in" and "drop-out" points are preset at the factory. An indicating LED in the front center of the board is illuminated when the current is above the "pull-in" level.

ADJUSTMENTS

The potentiometers that set the amperage level where the sensing circuits "pull-in" and "drop-out" are preset for the expected load conditions at the factory. If load conditions are not as expected, the board can be adjusted for those conditions with assistance from RONK. Contact RONK before making any adjustments to the circuit board.

BALANCING

The Auto Adjusting ADD-A-PHASE units generally do not require balancing, but sometimes load conditions are not as expected and current imbalance is greater than wanted. You will need the amperage readings (identified "A" (L3), "B" (L2), and "C" (L1) as labeled in the ADD-A-PHASE), serial number of the ADD-A-PHASE, and motor nameplate information for us to assist you. Use the Data Recording Sheet provided to record this information. Identify whether the run assist contactor is in or out (or both). This information is necessary for us to give you immediate assistance with balancing or

troubleshooting, and it should be kept for future reference. Proper phase identification is crucial for determining what needs to be done to improve current balance. Changes in capacitance or tap adjustments are determined by these phase current relationships. Improper identification of the phases can result in the balance being made worse. Below are the general effects the adjustments have on the phases.

1. Changes in capacitance affect “A” phase current. Reducing capacitance reduces “A” phase current, increasing capacitance raises it. “B” and “C” currents will change as well. Typically, “B” will come down when “A” does, with “C” coming up. Adding capacitance generally lowers “C” phase. “B” phase can either rise or fall when adding capacitance.
2. Tap changes affect “B” phase current. Raising the tap should raise “B”, lowering the tap should lower “B”. However, the tap adjustments also change the voltage applied to the run capacitors. Raising the tap increases the voltage across the run caps and increases “A” phase current output. Lowering the tap decreases the voltage across the capacitors, lowering “A” phase output current. Under most conditions, lowering “B” will raise “C” and raising “B” will lower “C”.

Current imbalance can also indicate problems other than the initial setup of the ADD-A-PHASE. Call RONK with the appropriate information recorded, if imbalance is greater than desired.

NOTE: Before attempting to service or balance the unit <u>always</u> disconnect power and discharge all capacitors.

<u>TROUBLESHOOTING</u>

The following troubleshooting techniques will help you in isolating problems. Record all nameplate information and any readings taken on the Data Recording Sheet. After making these preliminary observations, call RONK if you need assistance. Having this information will make it easier for us to assist you with your problem.

1. Locate and observe the start and run assist indicating LEDs on the circuit board.
2. Observe if the start and run assist contactors, the auxiliary relay, and the start and run assist indicating LEDs energize during motor start. This is normal. If this occurs, it indicates that the circuit board is powered up and the sensing circuits are working. If the LEDs are on, but a contactor or the auxiliary relay does not pick-up, the contactor or relay may have a bad coil. Contact RONK for assistance if the indicating LEDs do not light up.
3. The start contactor should remain energized until the motor accelerates to nearly full speed. Be prepared to turn power off if the start contactor does not “drop-out” within 5-10 seconds.
4. Unusual motor noise, chattering of contactors or relays can indicate: excess start capacitance, magnetic starter coil not on the B-C phase, start contactor failing to energize or drop out, unusually light load conditions, etc. Call RONK for assistance if these conditions exist and the cause cannot be readily isolated.
5. Be prepared to monitor the three-phase currents to the motor and measure the phase-to-phase voltages. This information will usually indicate the source of trouble; overloads, stalled motor, open fuse, fuse fault, etc. Take the readings for A, B, and C phases, as they are labeled in the ADD-A-PHASE.

CONNECTING INSTRUCTIONS & DIAGRAM FOR ADD-A-PHASE®
HE-AA & AA-HE UNITS, MODEL 96A

Before installing the ADD-A-PHASE converter, verify that the supply voltage, motor voltage, and motor horsepower ratings match the ADD-A-PHASE's input voltage, output voltage, and horsepower ratings as shown on its nameplate.

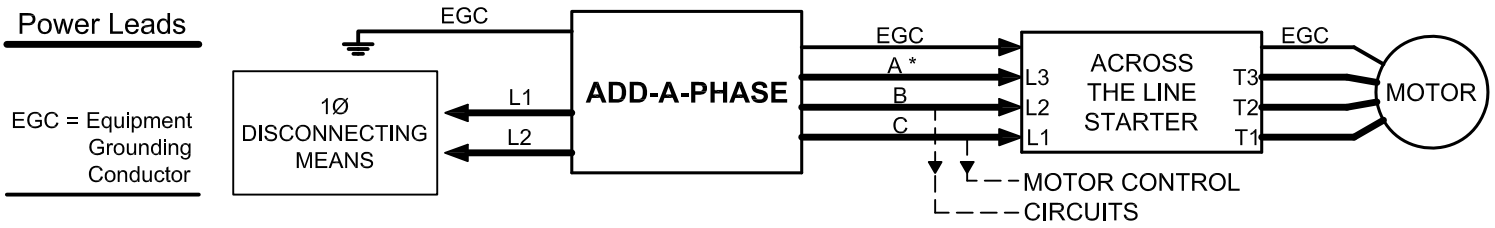
This equipment should be installed by a qualified electrician in compliance with the National Electric Code® (NEC) and all applicable codes. See Article 455 for rules concerning phase converter installations.

The single-phase supply should be connected to the unit through a disconnecting means (a circuit breaker or fused disconnect switch), utilizing a time-delay type breaker or fuses. The ampere rating of the disconnecting means shall not be less than 115% of the single-phase ampere rating of the ADD-A-PHASE. Make sure the single-phase service, utility transformer, and wire size are adequately sized for the expected load.

Connect the single-phase input wires, L1 and L2 to the L1 and L2 input terminals of the ADD-A-PHASE. Connect the three-phase output wires "A", "B", and "C" to their respective terminals on the output terminal block. If applicable, the "C" phase output wire should be ran through the center of the current transformer (C.T.). Connect the output wires to the three-phase motor's across the line starter. "A" will connect to L3, "B" to L2, and "C" to L1, as shown in the diagram below. Be sure that all single-phase loads, such as control circuits, door opener circuits, or single-phase motors are connected to "B" and "C" (L2 and L1) only! The three-phase motor is the only device that should get power from "A" (L3). Phase loss monitors, phase rotation monitors, and soft starters are not compatible with the ADD-A-PHASE and may cause undesired results. Single-phase under/over voltage monitoring devices may be utilized if desired.

The phase labeling can be verified by measuring the phase to phase and phase to ground voltages, and comparing them to the expected voltages on the Data Recording Sheet. If they are correct, then you are ready to start the motor. Measure and record the amperages with the motor operating under its normal load.

If you require assistance with balancing or troubleshooting, be sure to have the nameplate information and your readings recorded. Have this information available if you call RONK for assistance at (217) 563-8333.



* DO NOT USE L3(A) FOR ANY CONTROL OR MONITORING CIRCUIT!

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