



865-3AA
Three Phase Head Pressure Controller

Description

The 865-3AA Series Electronic Motor Speed Controller (EMSC) is a three-phase, modulating, condenser fan motor speed controller. This Controller regulates head pressure in low ambient conditions by varying the air volume through the condenser.

The Controller adjusts the condenser fan motor speed by monitoring the sub-cooling efficiency of the condenser, regardless of the refrigerant type. Controlling the sub-cooled liquid indirectly controls the condensing temperature and pressure.

All commercially used refrigerants condense and sub-cool at the same temperature. Sensing the sub-cooled refrigerant of various refrigerant types produces the same temperature once the refrigerant is condensed to a liquid.

Speed regulation begins at 80°F liquid line temperature; (60°F ≈ ambient) for commercial/industrial type condensing equipment. As the liquid line temperature falls with ambient temperature, the Controller reduces condenser fan motor speed to maintain head pressure. At 50°F liquid line temper-

ature (30°F ≈ ambient) minimum motor speed is obtained. The Controller removes power from the motor when operation of the condenser produces liquid line temperatures below 50°F.

When the liquid line temperature increases to 53°F, the Controller will “soft start” the motor. As temperature increases to 80°F, the motor speed proportionally increases. For all liquid line temperatures above 80°F (ambients above ≈ 60°F) the control allows the motor to operate at full synchronous speed.

The Controller always “soft starts” the motor when connected to the line and then reverts to either full speed, modulated speed, or off.

The control function maintains a minimum pressure differential for proper expansion of the refrigerant that maintains proper system operating conditions, while assuring proper suction pressure (evaporator temperature) over the anticipated ambient operating range.

The minimum allowable controlled ambient temperature is determined by the lowest controllable condenser flow rate (Minimum RPM).

Application

For each application, the motor and Controller should be selected and installed as a package. The motors are/must be capable of operating at reduced voltage and speed without overheating.

The controller is designed to be installed:

- Inside an approved weather protected control panel, or
- In a factory furnished weatherproof NEMA 3R enclosure.

System refrigerant high/low cutout pressure limit controls must be incorporated in the interlock control system for compressor protection. Evaporator freeze protection is recommended on A/C applications.

The Controller includes a special purpose heat sink, encapsulated Sensor and mounting hardware. The Sensor is designed for fast responses of liquid line temperature changes. In addition, VDC and mA signal inputs are available.

CAUTION

Optional analog sensor inputs may not provide adequate response to sudden temperature changes. Consult factory for “response time” requirements.

Features and Benefits

865-3AA Motor Speed Controller

- “On board” diagnostic features to verify proper field installation.
- Diagnostics for monitoring operating information.

Calibration (Speed Adjustment) — Controller is factory tested and calibrated for condenser fan motor applications. Field calibration may not be required; except to obtain optimum performance for the specific line voltage encountered. An “on-board” Sensor Simulator is available to manually speed regulate the motor without the liquid line sensor or analog input signal being installed.

Min./Max. speed adjustments are available for field calibration of condenser air flow for the specific ambient, A/C or Refrigeration application. Reducing the Min. Speed allows lower ambient operation, while increasing the Max. Speed assures the optimum operating efficiency for the application.

Diagnostics — Four (4) LEDs indicate operating conditions that verify proper Controller operation. This three-phase Controller provides phase rotation.

IMPORTANT

Controller must be wired with phases in sequence, to assure proper phase rotation of the line at the controller.

Status Indicators

1. **“FAULT” LED** indicator reports — Motor Lock-out
 - Phases out of sequence (installation error), and/or,
 - Single-Phasing (operating abnormality)

Note: The Controller will reset and restart the motor once proper phase sequencing has been verified and corrected and/or phase loss has been restored.
2. **“OFF” LED** indicator reports —
 - Liquid line temperature (°F), or the input signal is below the minimum speed setting and the motor is OFF and/or,
 - A “FAULT” has occurred and the motor is not connected to the line.
3. **“MODULATE” LED** indicator reports —
 - Operation in the modulating range (motor is under variable speed control).
4. **“FULL” LED** indicator reports —
 - Full synchronous speed.
 - Motor is across the line at full voltage/speed.

Motors

Motor design criteria is critical for proper speed regulation/operation of three phase motors. Motors must be designed, selected and applied to meet variable speed control specific operating requirements.

Motors are special purpose type, selected and designed for variable speed operation utilizing direct connected, propeller type fan blades. Motors can be furnished by HCC or selected and approved by the original equipment or motor manufacturer.

IMPORTANT

865 Series Controller is only warranted for use with motors approved by manufacturer for variable speed drive applications and/or furnished by HCC.

High Slip/Ventilated (HS/V) Motor Specifications

- 1/2 H.P. through 2 H.P.
- 1150 RPM (Nominal)
- 208-230 / 460 / 600 multiple voltage
- 60 Hz
- 56 Frame, 6 pole, vertical shaft, semi-enclosed, ball bearing motors. (Totally Enclosed is unacceptable)

Specifications

Three-Phase Condenser Motor Speed Controller

Volts (Controlled)	208-230/460/600V AC
Current	8 Amps
Power	4 VA
Input Volts (Nominal)	24V AC
Frequency	50/60 Hz
Operating Ambient	Non-Condensing
Minimum	-30°F (-34°C)
Maximum	160°F (71°C)
Fault Protection	Phase Sequence/Single Phasing
Enclosure types	Open or Weatherproof NEMA 3R
Dimensions (L x W x H)	3.25" x 5.50" x 11.75"

Three-Phase Special Purpose Condenser Fan Motors

H.P.	1/2, 3/4, 1, 1-1/2, and 2
Volts, AC	208-230/460/600
Frequency	50/60 Hz
RPM	1150
Mounting	5/8" Vertical Shaft, Keyed
Frame/Type	56Y/SC
Ambient/Time	60°C/Continuous
Protection	Internal, Auto-Reset
Electronic Components	Totally Encapsulated

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