JOHNSON CONTROLS

Johnson Controls, Inc.
Systems Products Division
507 East Michigan Street
P.O. Box 423
Milwaukee, WI 53201

Series P45 Oil Pressure Cutout Controls With Built-In Time Delay Relay

Application

The P45 controls provide dependable oil pressure cutout for pressure lubricated refrigeration compressors. The controls are factory set to compressor manufacturer's specifications.

A built-in time delay relay, compensated for ambient temperature, allows for pressure pickup on start and avoids nuisance shutdowns on short duration pressure losses during the running cycle.

All Series P45 controls are designed for use only as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) that protect against, or systems (alarm, supervisory systems) that warn of, control failure.

Operation

The P45 control measures the net oil pressure available to circulate oil through the lubrication system. (Net oil pressure is the difference between the oil gage pressure and the refrigerant pressure in the crankcase.) Total oil pressure is the combination of crankcase pressure and the pressure generated by the oil pump.

When the compressor is started, the time delay heater is energized. If the net oil pressure does not build up to the "heater off" value, within the required time limit, the time delay trips to stop the compressor.

If the net oil pressure rises to the "heater off" value within the required time after the compressor starts, the time delay heater is automatically de-energized and the compressor continues to operate normally.

If the net oil pressure drops below the "heater on" value (control setting) during the running cycle, the time delay is energized. If the net oil pressure does not return to the "heater off" value within the time delay period, the compressor will be shut down.

Installation

Mounting

Mount the control in any position, directly to a wall or panel board, using the two mounting screw holes located on the back of the control case. Mount so the pressure elements inside the control case are above the crankcase liquid level of the equipment on which the control is being used.

If required, Part No. 271-51 universal mounting bracket is available. (NOTE: Use only mounting screws supplied with the control to prevent damage to internal components.)

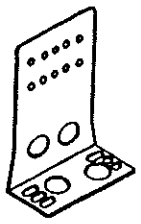


Fig. 2 — Universal mounting bracket.

Pressure Connections

1. Avoid sharp bends or kinks in capillary tubing.
2. Purge all tubing and lines before connecting pressure controls. Connect the oil pressure line to pressure connector labeled "OIL" and the crankcase line to pressure connector labeled "LOW." (See Fig. 1.)

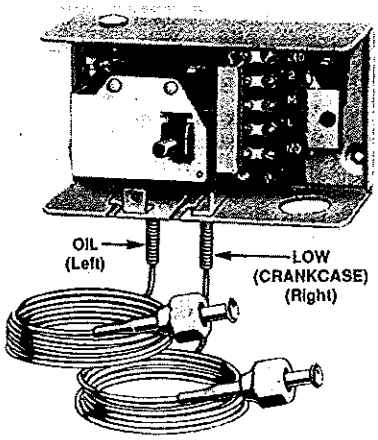


Fig. 1 — A P45 line voltage control with cover removed.

3. Coil and secure excess capillary to avoid vibration. Allow some slack in capillary to avoid "violin string" vibration which can cause tubing to break. Do not allow tubing to rub against metal surfaces where friction can damage capillary.

CAUTION: When a P45 with a ¼" male SAE flare is connected to ¼" tubing, a pulsation dampener must be used where there is a possibility of pulsation.

Wiring

WARNING: Disconnect the power supply before the wiring connections are made to avoid possible electrical shock or damage to the equipment. On multiple circuit units, more than one circuit may have to be disconnected.

All wiring should conform to the National Electrical Code and local regulations. Use copper conductors only. For maximum electrical rating of the control, see the label inside the control cover.

See label inside control cover or in the manufacturer's specifications for a typical wiring diagram. For external wiring diagrams, write for Form 3646.

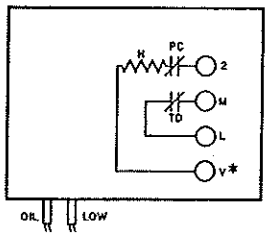
Time Delay Relay

The time delay relay is a "trip-free", thermal expansion device. Manual reset models and automatic reset models are available with factory set and sealed time delays of 30, 45, 60, 90 or 120 seconds.

The time delay relay is compensated to minimize the effect of ambient temperature variations. Timing is affected by voltage variations.

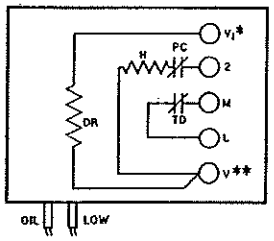
Internal Wiring Diagrams

P45AAA, P45NAA



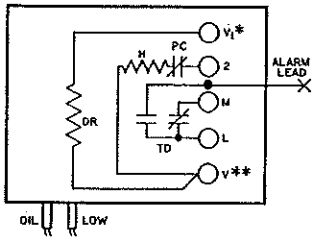
*V: 120, 208, 240 VAC OR 24 VAC OR DC SINGLE VOLTAGE MODELS

P45ACA, P45NCA, P45PCA



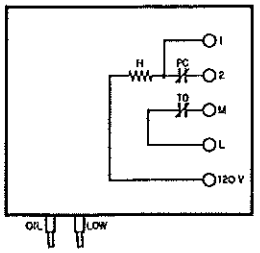
*V1: 240 VOLTS
**V: 120 VOLTS
DUAL VOLTAGE MODELS

P45NCB



*V1: 240 VOLTS
**V: 120 VOLTS
DUAL VOLTAGE MODELS WITH ALARM CIRCUIT

P45NBA



120 VOLT SINGLE VOLTAGE MODEL WITH STATUS CIRCUIT

PC PRESSURE ACTUATED CONTACTS OPEN ON INCREASE IN PRESSURE DIFFERENCE BETWEEN OIL AND LOW PRESSURE CONNECTORS. MAKES AND BREAKS TIME DELAY HEATER CIRCUIT.

TD HEATER ACTUATED TIME DELAY CONTACTS OPEN AFTER FACTORY SET TIME DELAY INTERVAL IF:

1. PRESSURE ACTUATED CONTACTS CLOSE WHEN DIFFERENTIAL PRESSURE DROPS BELOW SET POINT, OR
2. DIFFERENTIAL PRESSURE FAILS TO INCREASE TO 3 PSI (21 kPa) ABOVE SET POINT AFTER MACHINE STARTS.

DR VOLTAGE DROPPING RESISTOR USED IN DUAL VOLTAGE MODELS.

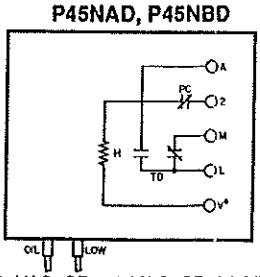
H HEATER FOR TIME DELAY RELAY.

CONNECT L AND M TERMINALS IN CONTROL CIRCUIT AS SINGLE-POLE SWITCH.

CONNECT 2 AND V1 TERMINALS SO THAT CIRCUIT IS ENERGIZED ONLY WHEN MOTOR STARTER IS CLOSED.

IN THE P45 CONTROLS WITH ALARM LEAD THE TD SWITCH IS SPDT. THE CONTACTS BETWEEN TERMINALS L AND M OPERATE AS THE TD OUTLINED ABOVE. WHEN THESE CONTACTS ARE OPEN, THE CONTACTS BETWEEN L AND THE ALARM LEAD WIRE ARE CLOSED.

P45NAD, P45NBD



*V: 120 VAC OR 24 VAC OR 24 VDC SINGLE VOLTAGE MODELS WITH ALARM TERMINAL.

For applications using a 208 volt control circuit, it is suggested that one leg of the 208 volt circuit and a neutral or ground wire be used to power the 120 volt circuit of the time delay heater.

Electrical Power Required for Time Delay Relay

Timing	Voltage	
In Seconds	12, 24 or 120	240*
30, 45, 60, 90 or 120	15 VA	30 VA

*Includes dropping resistor wattage.

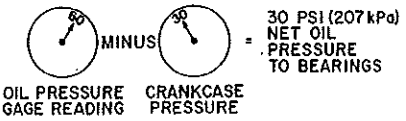
When a P45 control is installed on a 440 or 550 VAC system, use an external step-down transformer to provide either 120 or 240 volts to the pilot and time delay relay circuits. The transformer must be of sufficient volt-ampere capacity to operate the motor starter and the P45's time delay relay.

Pressure Specifications

Time Delay Shutdown Range (Pressure Difference)*	Maximum Allowable Overrun Pressure
7 to 60 PSI (50 to 400 kPa)	425 PSIG (2930 kPa)

*NOTE: The control is set to Original Equipment Manufacturer's Specifications — not field adjustable. The time delay heater de-energizes at approximately 3 PSI (21 kPa) pressure difference above setting. (See example.)

EXAMPLE: Suppose the minimum lube oil pressure required to the bearings is 9 PSI (62 kPa) (oil pump pressure minus crankcase pressure). The P45 control setting should be 9 PSI (62 kPa). Upon an initial start of the compressor, or if the oil pressure drops during the running cycle, the time delay heater is energized. If the lube oil pressure does not build up to the scale setting plus 3 PSI (21 kPa) for control differential or total of 12 PSI (83 kPa) during the timing period, the control breaks the circuit to the compressor. If this pressure of 12 PSI (83 kPa) is reached during the timing period, the time delay heater is de-energized and the compressor is permitted to continue normal operation.



LUBRICATING PRESSURE TO BEARINGS IS *NOT* OIL PRESSURE GAGE READING — it is: ***NET OIL PRESSURE or OIL PRESSURE GAGE READING MINUS CRANKCASE PRESSURE.***

NOTE: When controls are shipped as an accessory to compressor unit, time delay and pressures are set to manufacturer's specifications. Replacement controls should duplicate manufacturer's specifications for time delay and pressure settings.

Checkout Procedure

Before leaving the installation, at least three complete operating cycles should be observed to see that all components are functioning correctly.

The time delay relay should be tested after installation and at regular intervals.

Proceed as follows:

1. Pull line switch.
2. Remove control cover.
3. Insert a screwdriver or test tool (836-61 available on request) into slot and under the trip arm as shown in Fig. 3.

   NOTE: A screwdriver with a thin blade not over 3/16" wide may be used.
4. Tool must fit snugly to prevent trip arm from moving down to open contacts. Keep tool in place and proceed through Step 8.
5. It is important that the control be shielded from moving air during this test. The time delay is a thermal device and air will affect timing.

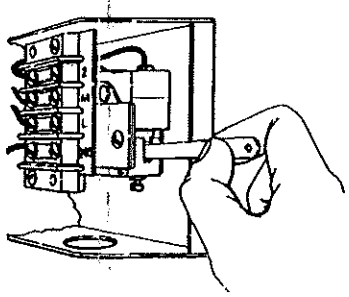


Fig. 3 — Illustration of the 836-61 test tool in checkout position.

⚠ WARNING: Before reconnecting power, be sure nothing is touching live electrical parts. Failure to do so may result in electrical shock and damage to the equipment.

6. Close line switch to start compressor running.
7. The time delay switch will stop the compressor after the time delay interval.
8. Pull line switch.
9. Remove test tool or screwdriver.
10. Replace cover and close line switch.
11. Manually reset control.

Repairs and Replacement

Field repairs must not be made. For replacement control, contact the nearest Johnson Controls distributor.

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