

P28 and P128 Series Oil Pressure Cutout Differential Pressure Control with Built-in Time Delay Relay

Application



The P28 and P128 Series controls provide dependable and economical oil pressure cutout for pressure lubricated refrigeration compressors. The factory set pressure adjustment provides operation to the compressor manufacturer's specifications.

The P28 and P128 measure 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.

A built-in time delay relay, accurately compensated for ambient temperature, provides time for pressure to rise on startup and avoids nuisance shutdowns on short duration pressure losses during the running cycle. When supplied with Terminal 3, you can wire the control to operate a runlight to indicate when sufficient net oil pressure is present. Purchase a model with Terminal A if you need a shutdown alarm or signal.

Use the P28 control at normal room temperatures of 32°F to 104°F (0°C to 40°C) and in areas protected from the weather.

Use P28 and P128 controls only as an operating control. Where failure or malfunction of the controls could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the control.

Operation

When the compressor starts, the time delay heater energizes. If the net oil pressure does not build up to the heater off value in the required time limit, the time delay trips to stop the compressor.

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

If the net oil pressure drops below the heater on value, also known as the scale setting, during the running cycle, the time delay relay energizes. If the net oil pressure does not return to the heater off value in the time delay period, the compressor shuts down.

Time delay relay

The time delay relay is a trip-free, thermal expansion device. Manual 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.

Installation

Mounting

1. Position the control so that the pressure connections on the bellows are above the crankcase liquid level of the equipment on which you use the control.
2. Use the two mounting screw holes located on the back of the control case to mount the control in any position, directly to a wall or panel board.

If required, universal mounting bracket Part No. 271-51 is available.

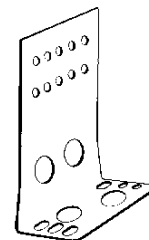


Fig. 2 — Universal mounting bracket.

Note: Use only mounting screws supplied with control to avoid damage to internal components.

CAUTION: If you apply the P28 control for ammonia service, you must mount the control separately from the electrical cabinet.

Pressure connections

- Avoid sharp bends or kinks in the capillary tubing.
- Purge all tubing and lines before you connect the pressure controls. Connect the oil pressure line to the pressure connector labeled OIL and the crankcase line to the pressure connector labeled LOW.

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

CAUTION: With a 1/4 in. male SAE flare fitting and 1/4 in. 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.

Make all wiring connections with copper conductors only, and in accordance with the National Electrical Code and local regulations. For the maximum electrical rating of the control, see the label inside the control cover.

Note: Use the terminal screws supplied in the Pennswitch (8-32 x 1/4 in. binder head). Substitution of other screws may cause problems in making correct connections.

See the label inside the control cover or in the manufacturer's specifications for a typical wiring diagram.

For external wiring diagrams, see Fig. 4 to Fig. 11.

For standard applications that use a 208 V control circuit, use one leg of the 208 V circuit and a neutral or ground wire as a 120 V source to power the time delay heater.

When you install a P28 control on a 440 VAC or 550 VAC system, use an external step-down transformer to provide either 120 V or 240 V to the pilot and time delay relay circuits. The transformer must be of sufficient volt-ampere capacity to operate the motor starter and the P28's time delay relay.

Table 1: Electrical power required for time delay relay

Timing (s)	Voltage	
	24 V or 120 V	240 V
30, 45, 60, 90, or 120	15 VA	30 VA

Note: 240 V includes dropping resistor wattage.

Adjustment

You can change the factory setting in the field. The standard stock setting is:

Cutout 9 psi (62 kPa) pressure difference.
Heater off pressure is approximately 5 psi (34 kPa) higher than the cutout.

Note: When the controls are shipped as an accessory to the compressor unit, time delay and pressure are set to manufacturer's specifications. Ensure that replacement controls duplicate the manufacture's specifications for time delay and pressure settings.

When manufacturer's settings are not known, call the nearest distributor or proceed as follows:

- With the compressor running, read the oil pressure and crankcase pressure.
- Subtract the crankcase pressure from the oil pressure gage reading. This is the net oil pressure to the bearings.
- Set the cutout pointer 6 psi to 8 psi (41 kPa to 55 kPa) below the established running net oil pressure.

CAUTION: Obtain the compressor manufacturer's net oil pressure specifications as soon as possible, and reset the cutout pointer if it is not in accordance with the manufacturer's specifications.

To raise the cutout setting, turn adjusting disk C to the left as viewed from the front of the control. Turn the disk to the right to lower the cutout setting.

Example: Suppose the minimum lube oil pressure required to the bearings is 9 psi (62 kPa) (oil pump pressure minus crankcase pressure). You set the control scale

setting to 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 energizes. If during the time period the lube oil pressure does not build up to the scale setting plus 5 psi (34 kPa) for the switch differential, which is a total of 14 psi (97 kPa), the control breaks the circuit to the compressor. If it reaches the pressure of 14 psi (97 kPa) during the timing period, the time delay heater de-energizes and the compressor can continue normal operation.

Pressure specifications

- The time delay shutdown range, in pressure difference, is 8 psi to 70 psi (55 kPa to 480 kPa)
- The maximum allowable overrun pressure is 325 psig (2,240 kPa)

Note: The time delay heater de-energizes at 5 psi (34 kPa) pressure difference above the scale setting.

Test for shutdown

Immediately after you install the control, and at regular intervals thereafter, test the time delay relay to be sure that all circuits operate correctly. Proceed as follows:

- Pull the disconnect switch and remove the cover from the P28 control.
- Connect a jumper between terminals 1 and 2.
- Close the line switch to start the compressor.

The time delay relay stops the compressor after the time delay interval.

Note: If the control is mounted on a condensing unit where air from auxiliary equipment, such as blowers or fans, can strike the control, replace the cover before the test. After testing the time delay relay, again pull the disconnect switch and remove the jumper between terminals 1 and 2. Place the cover on the control and close the disconnect switch. Manually reset the time delay relay.

Checkout procedure

Before you leave the installation, observe at least three complete operating cycles to be sure that all components function correctly.

Repairs and replacement

In the field, you can replace or interchange the time delay relay assembly, which consists of the timer and terminal board. Do not make field repairs except for replacement of the time delay relay assembly. For a replacement control or time delay relay assembly, contact the nearest Johnson Controls® wholesaler.

Table 2: Replacement time delay relay assemblies

Part number	Voltage	Reset type	Timing in seconds	Alarm circuit
RLY13A-600R	120/240 VAC	Manual	60	No
RLY13A-609R	24 VAC/DC	Manual	120	No
RLY13A-610R	120/240 VAC	Manual	30	No
RLY13A-616R	120/240 VAC	Manual	120	No
RLY13A-617R	120/240 VAC	Manual	45	No

Wiring diagram definitions

PC₁: Pressure actuated contacts. The contacts open on an increase in pressure difference between oil and low pressure connectors. The contacts make and break the time delay heater circuit.

PC₂: The contacts close simultaneously when PC₁ contacts open. Use PC₂ for the runlight circuit.

TD₁: Time delay relay. The contacts open after the factory-set time delay interval if the pressure difference between oil and low pressure connectors is not established or maintained.

TD₂: The contacts close simultaneously when TD₁ contacts open. Use TD₂ for the alarm circuit.

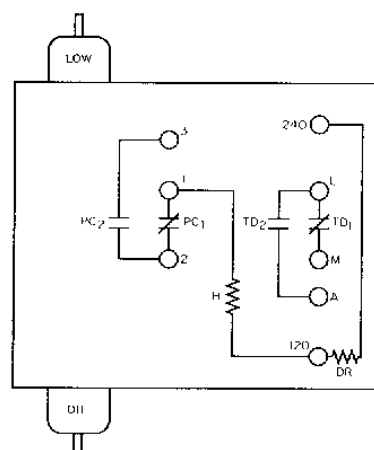
DR: Voltage dropping resistor used in dual voltage models.

H: Heater for time delay relay.

A, 3: In Figure 4, Figure 6 to Figure 9, and Figure 11, the shutdown alarm circuit is A and the runlight is Terminal 3.

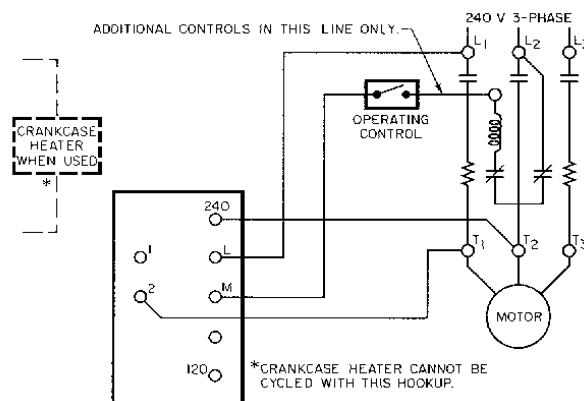
Wiring diagrams

Note: Observe the instructions for the jumper for each diagram.



Connect Terminals L and M as a single-pole switch. Connect Terminals 2 to the 240 V or 120 V terminal to energize the circuit only when the motor starter is closed. See standard wiring diagrams for details.

Fig 4 — Internal circuit for a 120 VAC/240 VAC P28 control



You cannot cycle a crankcase heater with this configuration. For an alternative, see Fig 6.

Fig 5 — Standard wiring for a P28 on a 240 V system with 240 V magnetic coil starter

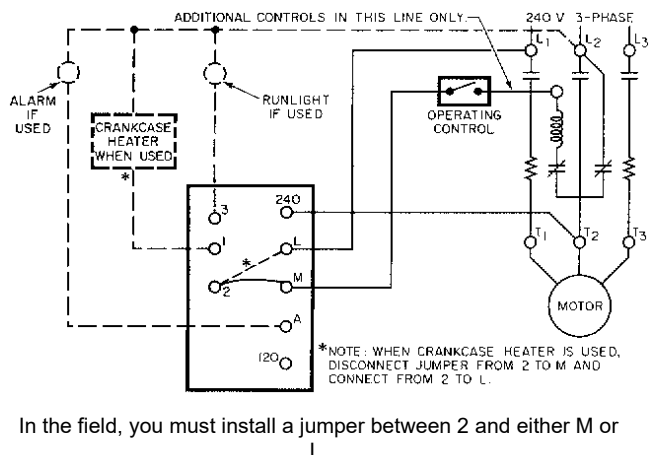
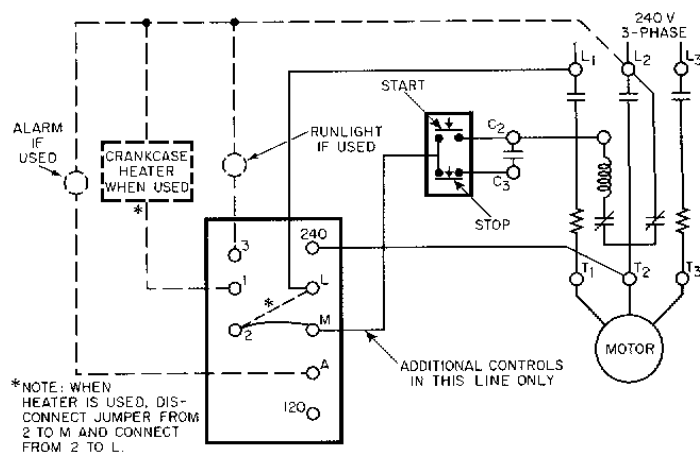
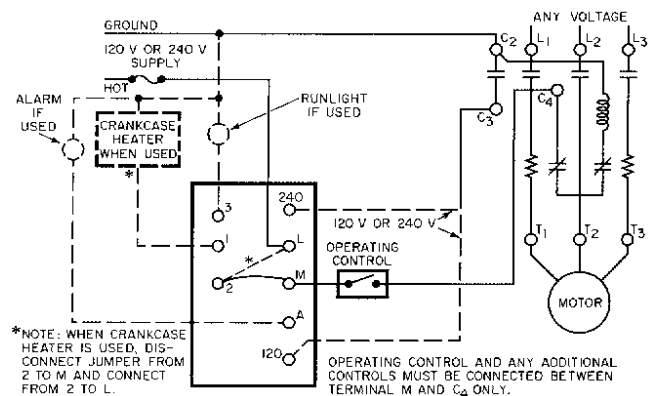


Fig 6 —P28 with 3-wire control, not 4-wire



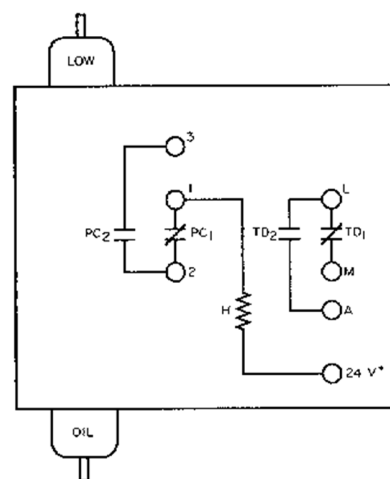
In the field, you must install a jumper between 2 and either M or L. Additional controls could be high pressure cutout, low pressure, or temperature controls.

Fig 9 —Standard wiring for P28 with manual start-stop push button



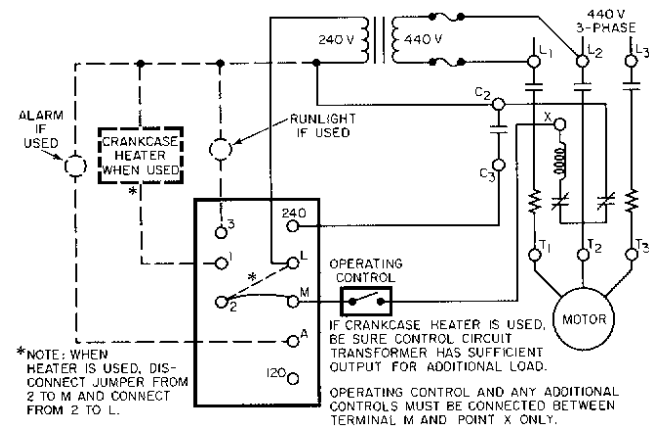
In the field, you must install a jumper between 2 and either M or L. The magnetic coil in the starter must be the same voltage as the control circuit supply. Only install the operating control and addition controls between M and C₄.

Fig 7 —P28 with separate supply to the control circuit



Connect Terminal L so that the circuit only energizes when the operating control and overload terminals are closed.

Fig 10 —Low voltage P28 internal wiring



In the field, you must install a jumper between 2 and either M or L. Use the correct transformer if you use a 550 V supply. Only use a crankcase heater if the control transformer has sufficient output for the additional load. Only install the operating control and addition controls between M and C₄.

Fig 8 —P28 for 440 V or 550 V supply and 240 V magnetic starter coil

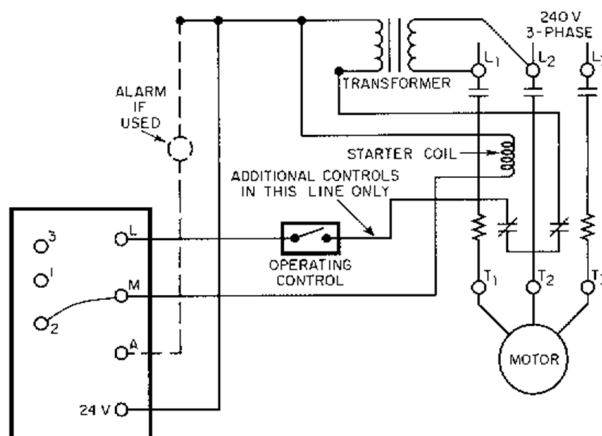


Fig 11 —P28 with 24 V control circuit power from a step-down transformer



Conformity declaration information

Specification	Description
Purpose of control	Pressure operating controls
Method of mounting control	Flat surface or with a universal mounting bracket (Part No. 271-51)
Method of earthing of control	Wiring binding screw terminal
Type 1 or Type 2 action	Type 1.C (micro-interruption)
External pollution situation	Pollution degree 3
Rated impulse voltage	4,000 VAC



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