Fault-Pressure Relay

TYPE J

INTRODUCTION

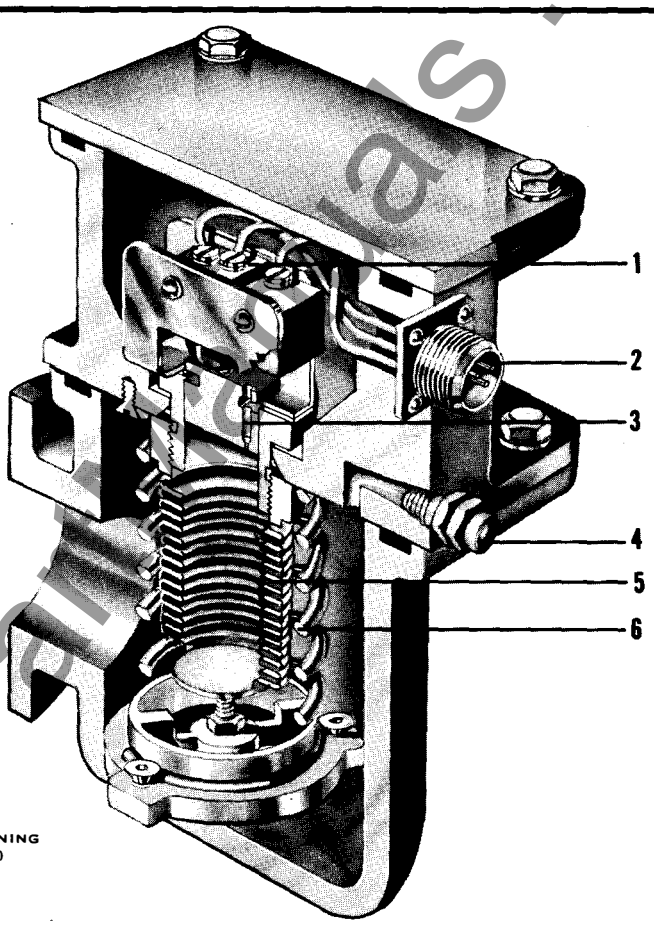
The Type J fault-pressure relay is a protective device used on transformers to detect sudden pressure increases resulting from an internal fault. The relay will not be actuated by normal pressure variations due to transformer temperature changes; nor will it be operated by vibration, mechanical shock, or pump surges when properly mounted.

DESCRIPTION

The fault-pressure relay is mounted on a valve on the transformer tank wall near the base of the unit. It consists of a sealed housing divided into an upper and lower chamber. See Fig. 1. The upper chamber contains a piston, cylinder block and self-resetting snap-action switch assembly with its contacts wired to a three-pin receptacle. The snap-action switch is mounted above the piston so that a gap remains between the top of the piston and the actuating pin of the switch.

The lower chamber contains a spring-loaded phosphor-bronze bellows which forms the seal between the upper and lower chambers and serves as the pressure sensing device of the relay. The bellows and the upper chamber are filled with a special silicone oil to a level approximately 5/16-inch above the cylinder block. This oil has a relatively constant viscosity to minimize the effect of temperature variations on relay operation. The space in the lower chamber surrounding the bellows is filled with oil from the transformer and a valve is provided on the side of the housing for venting and testing.

As the transformer oil pressure increases, the bellows and spring are compressed, forcing a portion of the silicone oil in the bellows up through the equalizer hole in the piston and into the upper chamber. As long as the rate of rise in pressure is gradual, such as the change which accompanies variations in load or ambient temperature, the oil forced out of the bellows can pass through the equalizer hole without raising the piston and operating the switch. With a decreasing pressure the silicone oil will flow back into the bellows.



1. SWITCH
2. RECEPTACLE
3. PISTON (CONTAINING EQUALIZER HOLE)
4. VENT VALVE
5. BELLOWS
6. SPRING

Fig. 1. Sectional view of fault-pressure relay, Type J

If an internal fault should develop, the rate of rise in transformer oil pressure would be too rapid for the required amount of silicone oil to pass through the equalizer hole and therefore pressure would be exerted against the piston, causing it to rise up and operate the switch. Minor oil shocks resulting from external faults, magnetizing inrush current, etc., are compensated for by the gap between the piston and the switch. These pulses may operate the piston slightly but not enough to close the gap and cause false tripping.

SWITCH

The self-resetting, snap-action switch is a single-pole, double-throw switch with normally-open and normally-closed contacts. The common lead is connected to pin A of the socket, the normally-closed lead to pin B, and the normally-open lead to pin C. See Fig. 3. The switch will carry and interrupt the following loads:

Circuit	Type of Load	Circuit Volts	Amperes	
AC	Inductive and	115	10	
	Non-Inductive	230	5	
DC	Inductive	125	0.05	
		250	0.03	
	Non-Inductive	125	0.25	
		250	0.20	
AC or DC	Inductive	125 And 250	Restrict starting inrush currents to values below	
			Already Closed Contacts	Closing Contacts
			30	15

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

GENERAL ELECTRIC

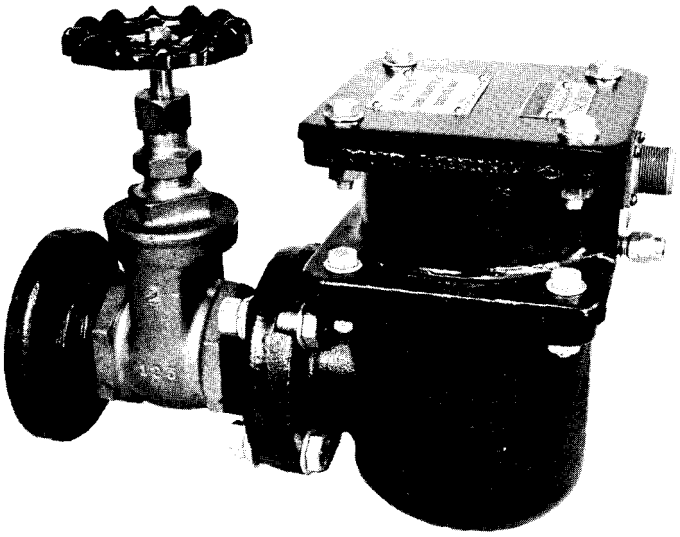


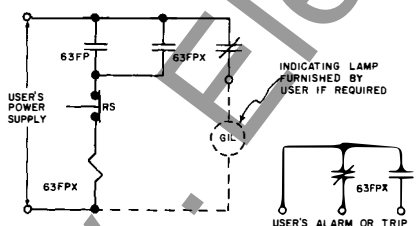
Fig. 2. Fault-pressure relay mounted on shut-off valve

INSTALLATION

The fault-pressure relay is normally shipped in place on the transformer. If the relay is removed for shipment, install it on the relay shut-off valve (identified on the transformer Outline drawing) as shown in Fig. 2. If the relay is to be mounted on a transformer without this standard shut-off valve, a flanged adapter is provided for converting the main drain valve for this purpose. (Brace the relay and valve assembly in locations where the relay might be actuated by accidental mechanical shock.)

NOTE: Before mounting on a transformer, hold the relay in a vertical position and compress the bellows with short strokes (by hand through the elbow opening) to expel all trapped air. Allow one-half minute between compressions, releasing slowly, to give the fluid time to flow into the bellows.

If the transformer contains oil, be sure the shut-off valve is closed before removing the shipping plate. CAUTION —After installing the relay, open the shut-off valve and *release any air trapped in the lower chamber by opening the vent valve (Item 4, Fig. 1.) until the transformer oil begins to flow.* If the transformer does not contain oil at the time the relay is installed, vent the lower chamber as soon as the unit is filled. It is recommended that the shut-off valve be wired in the OPEN position (and sealed if desired) to prevent accidental closing.



RS RESET SWITCH
63FP FAULT-PRESSURE RELAY, TYPE J
63FPX SEAL-IN RELAY
GIL GREEN INDICATING LIGHT

Fig. 3. Typical elementary diagram

WIRING

In order to protect the transformer from the effects of a sudden pressure rise, the Type J relay must be connected to trip the primary circuit breaker. Since transformer pressure changes cause only a momentary closing of the J relay switch contacts, a seal-in relay is provided for the purpose of maintaining the tripping and alarm circuits once initiated. A typical elementary diagram is shown in Fig. 3.

CAUTION

Opening or closing the shut-off valve while the relay switch is connected to an energized breaker tripping circuit may cause unintentional tripping.

TESTING

To test the operation of the relay, a means must be provided to apply an increasing pressure to the elbow side of the relay. With the relay mounted on the transformer, this may be done through the vent valve as shown in Fig. 4. A suggested test method is outlined in the following paragraphs:

1. *Before testing the relay operation, de-energize the control circuit* and remove the cable plug from the relay receptacle.

2. Connect a continuity tester to pins A and C (normally open contacts) in the relay socket.

3. Close the shut-off valve between the relay and transformer tank.

4. Remove the vent cap and connect an air supply as shown in Fig. 4.

5. Open the needle valve slightly.

6. Place a finger over the opening of the "X" connector and note the pressure after a few seconds. (Do not apply pressures in excess of 15 psi to the relay.) Adjust the needle valve to obtain an initial rate of rise of approximately 0.5 psi per second. For example, a pressure of four psi after eight seconds.

7. With the opening of the "X" connector closed, note the time and pressure required for the relay switch contacts to close (indicated by the continuity tester). Allow one-half minute for the relay bellows to return to its neutral condition and repeat the test at slower and faster rates of pressure rise. Normal operation of the relay is indicated if the minimum rate of rise required to actuate the relay switch is between 0.35 and 0.65 psi per second.

In cases where an air supply is not readily available, the relay can be tested using a tire pump. Connect the pump to the relay at the vent valve and apply a pressure surge by quickly pushing the plunger of the tire pump. Proper operation is indicated if the normally open contacts close, and reopen within a few seconds.

8. Remove the test connections and close the vent valve.

9. Open the shut-off valve and wire in this position.

10. Open the vent valve and close when oil runs out.

11. Replace the three-pin connector and re-energize the control circuit.

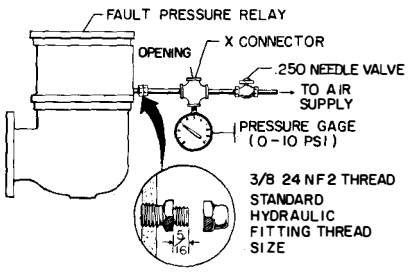


Fig. 4. Field test of fault-pressure relay

Fault-Pressure Relay

TYPE J

INTRODUCTION

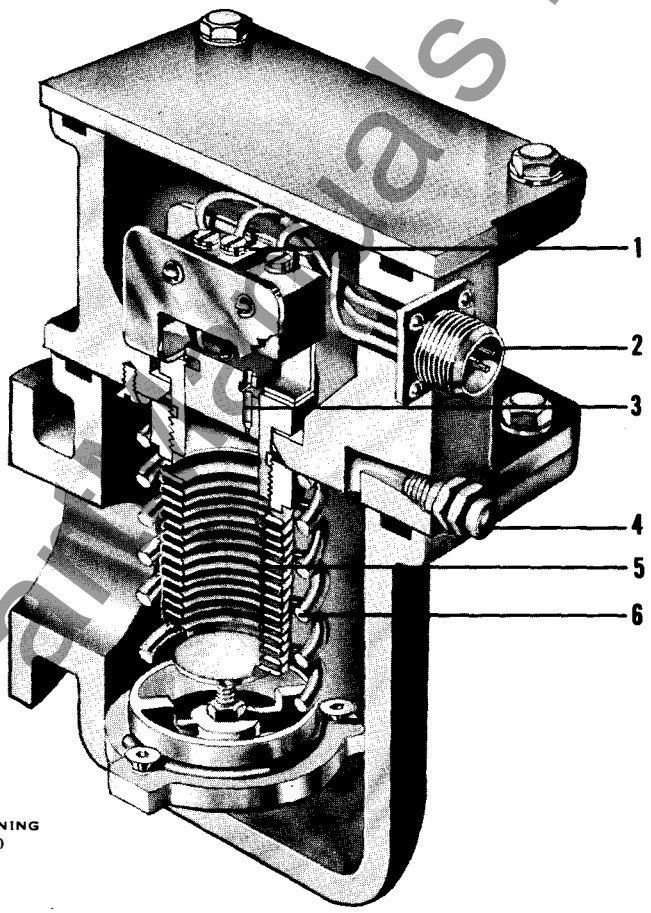
The Type J fault-pressure relay is a protective device used on transformers to detect sudden pressure increases resulting from an internal fault. The relay will not be actuated by normal pressure variations due to transformer temperature changes; nor will it be operated by vibration, mechanical shock, or pump surges when properly mounted.

DESCRIPTION

The fault-pressure relay is mounted on a valve on the transformer tank wall near the base of the unit. It consists of a sealed housing divided into an upper and lower chamber. See Fig. 1. The upper chamber contains a piston, cylinder block and self-resetting snap-action switch assembly with its contacts wired to a three-pin receptacle. The snap-action switch is mounted above the piston so that a gap remains between the top of the piston and the actuating pin of the switch.

The lower chamber contains a spring-loaded phosphor-bronze bellows which forms the seal between the upper and lower chambers and serves as the pressure sensing device of the relay. The bellows and the upper chamber are filled with a special silicone oil to a level approximately 5/16-inch above the cylinder block. This oil has a relatively constant viscosity to minimize the effect of temperature variations on relay operation. The space in the lower chamber surrounding the bellows is filled with oil from the transformer and a valve is provided on the side of the housing for venting and testing.

As the transformer oil pressure increases, the bellows and spring are compressed, forcing a portion of the silicone oil in the bellows up through the equalizer hole in the piston and into the upper chamber. As long as the rate of rise in pressure is gradual, such as the change which accompanies variations in load or ambient temperature, the oil forced out of the bellows can pass through the equalizer hole without raising the piston and operating the switch. With a decreasing pressure the silicone oil will flow back into the bellows.



1. SWITCH
2. RECEPTACLE
3. PISTON (CONTAINING EQUALIZER HOLE)
4. VENT VALVE
5. BELLOWS
6. SPRING

Fig. 1. Sectional view of fault-pressure relay, Type J

If an internal fault should develop, the rate of rise in transformer oil pressure would be too rapid for the required amount of silicone oil to pass through the equalizer hole and therefore pressure would be exerted against the piston, causing it to rise up and operate the switch. Minor oil shocks resulting from external faults, magnetizing inrush current, etc., are compensated for by the gap between the piston and the switch. These pulses may operate the piston slightly but not enough to close the gap and cause false tripping.

SWITCH

The self-resetting, snap-action switch is a single-pole, double-throw switch with normally-open and normally-closed contacts. The common lead is connected to pin A of the socket, the normally-closed lead to pin B, and the normally-open lead to pin C. See Fig. 3. The switch will carry and interrupt the following loads:

Circuit	Type of Load	Circuit Volts	Amperes	
AC	Inductive and Non-Inductive	115	10	
		230	5	
DC	Inductive	125	0.05	
		250	0.03	
	Non-Inductive	125	0.25	
		250	0.20	
AC or DC	Inductive	125 And 250	Restrict starting inrush currents to values below	
			Already Closed Contacts	Closing Contacts
			30	15

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

GENERAL ELECTRIC

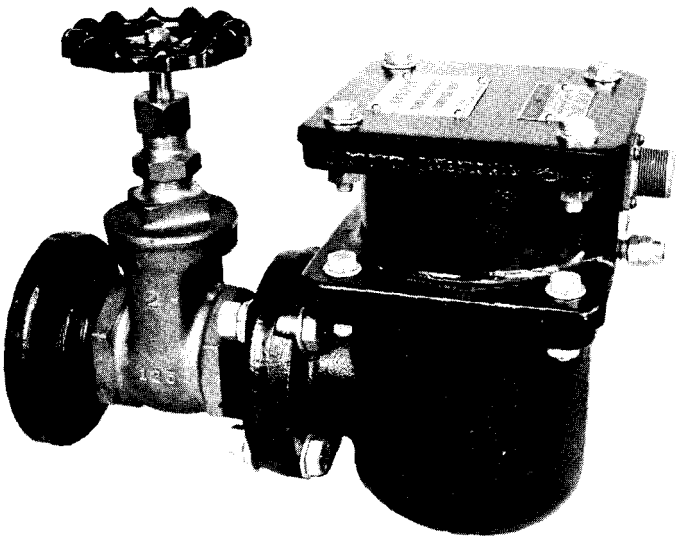


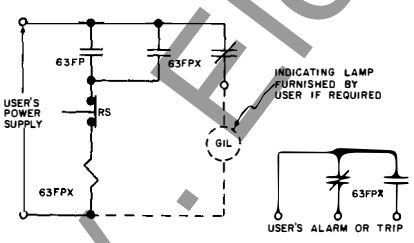
Fig. 2. Fault-pressure relay mounted on shut-off valve

INSTALLATION

The fault-pressure relay is normally shipped in place on the transformer. If the relay is removed for shipment, install it on the relay shut-off valve (identified on the transformer Outline drawing) as shown in Fig. 2. If the relay is to be mounted on a transformer without this standard shut-off valve, a flanged adapter is provided for converting the main drain valve for this purpose. (Brace the relay and valve assembly in locations where the relay might be actuated by accidental mechanical shock.)

NOTE: Before mounting on a transformer, hold the relay in a vertical position and compress the bellows with short strokes (by hand through the elbow opening) to expel all trapped air. Allow one-half minute between compressions, releasing slowly, to give the fluid time to flow into the bellows.

If the transformer contains oil, be sure the shut-off valve is closed before removing the shipping plate. CAUTION —After installing the relay, open the shut-off valve and *release any air trapped in the lower chamber by opening the vent valve (Item 4, Fig. 1.) until the transformer oil begins to flow.* If the transformer does not contain oil at the time the relay is installed, vent the lower chamber as soon as the unit is filled. It is recommended that the shut-off valve be wired in the OPEN position (and sealed if desired) to prevent accidental closing.



RS Reset switch
63FP Fault-pressure relay, Type J
63FPX Seal-in relay
GIL Green indicating light

Fig. 3. Typical elementary diagram

WIRING

In order to protect the transformer from the effects of a sudden pressure rise, the Type J relay must be connected to trip the primary circuit breaker. Since transformer pressure changes cause only a momentary closing of the J relay switch contacts, a seal-in relay is provided for the purpose of maintaining the tripping and alarm circuits once initiated. A typical elementary diagram is shown in Fig. 3.

CAUTION

Opening or closing the shut-off valve while the relay switch is connected to an energized breaker tripping circuit may cause unintentional tripping.

TESTING

To test the operation of the relay, a means must be provided to apply an increasing pressure to the elbow side of the relay. With the relay mounted on the transformer, this may be done through the vent valve as shown in Fig. 4. A suggested test method is outlined in the following paragraphs:

1. *Before testing the relay operation, de-energize the control circuit* and remove the cable plug from the relay receptacle.

2. Connect a continuity tester to pins A and C (normally open contacts) in the relay socket.

3. Close the shut-off valve between the relay and transformer tank.

4. Remove the vent cap and connect an air supply as shown in Fig. 4.

5. Open the needle valve slightly.

6. Place a finger over the opening of the "X" connector and note the pressure after a few seconds. (Do not apply pressures in excess of 15 psi to the relay.) Adjust the needle valve to obtain an initial rate of rise of approximately 0.5 psi per second. For example, a pressure of four psi after eight seconds.

7. With the opening of the "X" connector closed, note the time and pressure required for the relay switch contacts to close (indicated by the continuity tester). Allow one-half minute for the relay bellows to return to its neutral condition and repeat the test at slower and faster rates of pressure rise. Normal operation of the relay is indicated if the minimum rate of rise required to actuate the relay switch is between 0.35 and 0.65 psi per second.

In cases where an air supply is not readily available, the relay can be tested using a tire pump. Connect the pump to the relay at the vent valve and apply a pressure surge by quickly pushing the plunger of the tire pump. Proper operation is indicated if the normally open contacts close, and reopen within a few seconds.

8. Remove the test connections and close the vent valve.

9. Open the shut-off valve and wire in this position.

10. Open the vent valve and close when oil runs out.

11. Replace the three-pin connector and re-energize the control circuit.

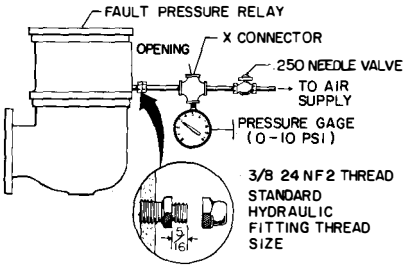


Fig. 4. Field test of fault-pressure relay