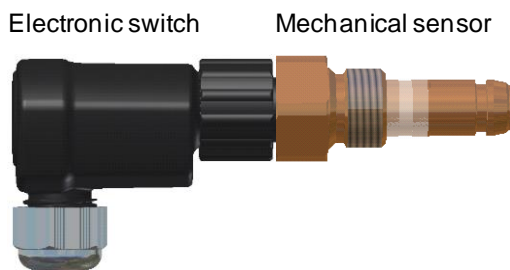


# Copeland semi-hermetic compressors

## Oil pressure differential switch OPS2

### 1 Introduction

The OPS2 monitors the oil pressure differential protecting the compressor against damage if the oil differential becomes too low. Internal channels drilled through the housing link the switch to the inlet and outlet ports of the oil pump.



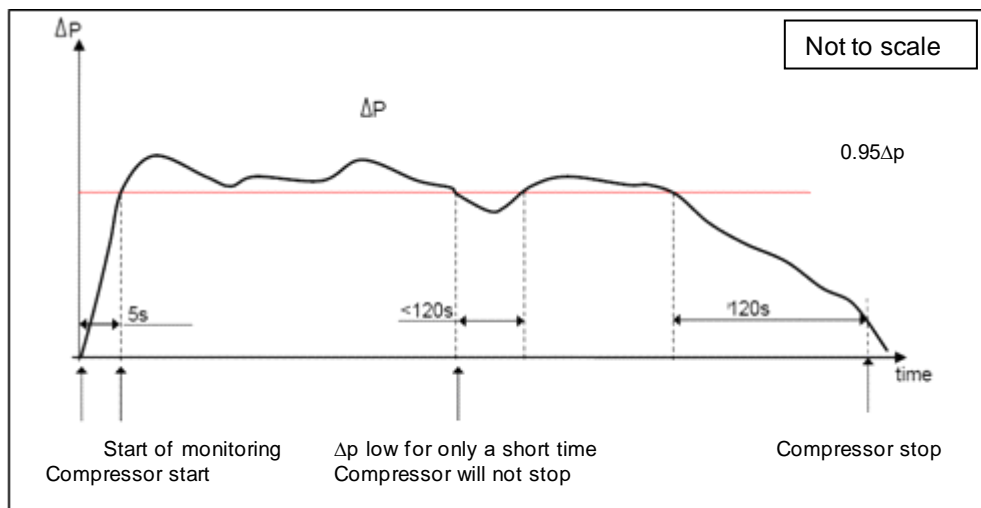
**Figure 1: Oil pressure differential switch OPS2**

The brass mechanical sensor component is fitted as standard on all DWM and Copeland semi-hermetic compressors which have a high pressure oil pump. It is directly screwed into the pump housing. The black electronic switch is screwed onto the brass mechanical sensor. If the electronic switch has to be removed from the brass sensor the refrigeration circuit will not be open to the atmosphere.

The mechanical sensor fitting for the OPS2 is the same as for the OPS1. The electronic switches are interchangeable but require changes to the wiring circuit.

### 2 Function

The OPS2 is activated by the running signal of the compressor contactor. If the oil pressure differential drops below the preset value for longer than the time delay (120 seconds) the output contact of the OPS2 opens and stops the compressor providing protection against internal damage. Repeated shorter periods of insufficient oil pressure are also recognized and will shut off the compressor after an appropriate time delay.



**Figure 2: Functional graph using pressure differential x time axes**

### 3 Operation

There is a 3-second delay after power is supplied to the OPS2 before the relay pulls in and the compressor is ready to start. Once running, the compressor contactor provides the signal to the OPS2 (D1). The differential pressure monitoring will only start when the running recognition D1 signal is present. After a delay of 5 seconds, the OPS2 starts monitoring.

In case of failure or incorrect assembly registered for more than 5 seconds, the relay will trip and lock out.

Methods to reset the switch after shutdown:

- Push the internal reset button (1 sec)
- Disconnect the switch from the power supply – mains interruption (5 sec)
- Remote alarm reset function (1 sec)

After a time delay of 120 seconds the compressor is able to operate again.

### 4 Technical information

#### 4.1 Technical data

Power supply	115 – 230 VAC, –15 %...+10 %, 3 VA 50/60 Hz
Ambient temperature range	–30 °C +70 °C
Restart relay after tripping	120 sec ± 5 sec
Start-up delay	3 sec ± 1 sec
Differential pressure	0.95 ± 0.15 bar
Connection cables	6 x AWG18 (0.75 mm <sup>2</sup> ), L = 1m colour coded
Maximum pressure	30 bar
Refrigerant compatibility	Yes (brass)
Protection class according to EN 60529	IP54
Reset	Manual
Weight	210 g
LED status: 2 x flashes at start-up	Software version
LED status: 1 x flash after 2 x flashes above	Standby version
LED status: Continuous red light	No differential pressure
LED status: 10 Hz flashing – 10 times per sec	Malfunction: - Internal malfunction - Internal power supply is too low - Sensor not correctly mounted into mechanical part - Running signal ON, but relay OUT
LED status: 1 Hz flashing – 1 time per sec	Restart delay
LED status: LED off	Correct operation

#### 4.2 Dimensions

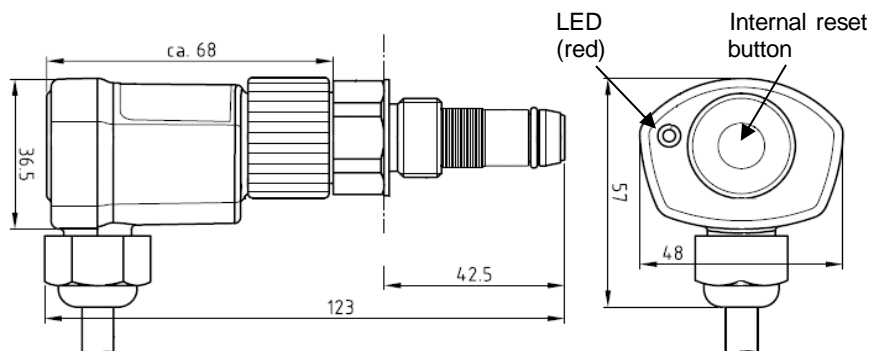


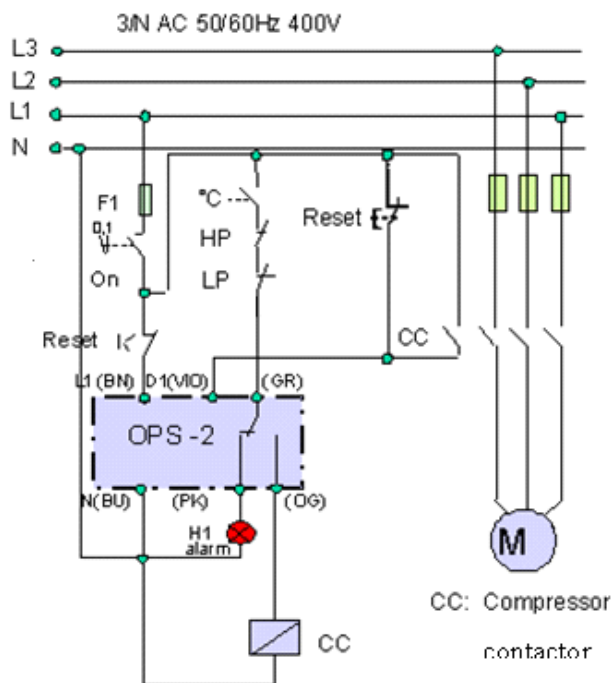
Figure 3: OPS2 dimensions in mm

### 4.3 Wiring diagram OPS2

Where there is a 5-wire cable connection between the electrical control panel and the compressor terminal box to the OPS module, the same wires can be applied to the OPS2 which will give the functions of an OPS1 module.

To obtain use of all of the features of the OPS2, a 7-wire cable between the electrical control cabinet and the compressor terminal box should be used. Wiring diagrams for both the OPS1 and OPS2 are shown on page 5. The wiring diagram in **Figure 3** relates to an option using a 7-wire cable.

**NOTE:** Where a 5- or 7-wire cable is stated, a 4- or 6-wire cable is required. In some countries only a 5- or 7-wire cable is available.



#### **Wiring:**

Brown (BN) = Power supply input

Violet (VIO) = Running signal from compressor

Grey (GR) = Input changeover contact from daisy chain

Orange (OG) = Output changeover contact linked to compressor contactor

Pink (PK) = Output changeover contact linked to alarm

Blue (BU) = Power supply output

**Figure 4:** Wiring diagram for OPS2 with a 7-wire cable

## 5 Installation advice

The brass mechanical sensor component is standard on all DWM and Copeland semi-hermetic compressors with an oil pump (except Stream-D). If it has to be fitted follow the procedure below:

- Wear proper safety clothing and follow the correct codes of practice.
- Isolate the compressor mechanically and electrically.
- Evacuate the compressor.
- Remove the plastic cover placed over the OPS sensor connection.
- Screw the OPS2 electronic switch on to the mechanical sensor and tighten it by hand to 10 Nm. At the same time ensure the electrical leads are running downwards.
- Make the electrical connections for the OPS2 as per the wiring diagram in **Figure 4**.
- Evacuate the compressor to extract any air contamination.
- Set the compressor up for normal operation confirming the tightness of the electronic switch.

## 6 Commissioning

Switch the compressor on and wait until stable operating conditions are achieved.

If insufficient oil differential pressure is built up during start-up or during operation after the time delay expires, the output contact will switch off and mechanically lock out. The power supply to the contactor coil will be interrupted and the compressor will be switched off. Restart is possible after reset and after a time delay of 120 seconds.

## 7 Function testing

The OPS2 has to be set up as normal with fuses removed from power supply to compressor. The control circuit should still be live.

### 7.1 Correct assembly control test

Control power supply ON	Alarm contact switches to compressor contactor (GR-PK to GR-OG)
Remove electronic switch	Signal for incorrect assembly - LED code (fast light 10 Hz) - Shut-off and locked out after 5 sec
Refit electronic switch to the mechanical sensor	
Reset mains (5 sec)	Restart time delay 120 sec - LED code 1 Hz



### 7.2 Brass mechanical sensor - Test differential pressure too low

Control power supply ON	
Cooling required - Thermostat closed circuit	Differential pressure too low – 120-sec time delay LED code = continuous red light
	After time delay, compressor contactor changes to alarm (GR-OG to GR-PK) - Fault signal
Reset mains (5 sec)	Restart time delay 120 sec - LED code 1 Hz

### 7.3 Running signal - Electronic switch not connected to the brass mechanical sensor

Control power supply ON	LED code = fast light 10 Hz Shut-off and locked out after 5 sec
Fit the electronic switch to the mechanical sensor	
Push remote reset	Restart time delay 120 sec - LED code 1 Hz

## 8 OPS1 and OPS2 comparison

FUNCTION	 OPS1	 OPS2
Connecting cable AWG 18	✓	✓
UL / CE conformity	✓	✓
Status LED with fault blink code	✓	✓
Screw in part compatible (P/N 3110784)	✓	✓
Reset function	✓	✓
Anti-tie down		✓
Potential free change over relay – Dry contact		✓
Dual voltage (115...230 V)		✓
Correct assembly (mechanical & electronic)		✓
Remote alarm reset function		✓

#### Advantages:

- Easily mounted – screwed directly into the pump housing – time reduction.
- Hermetically sealed – no external capillaries required – no leakage possibility.
- Anti-tie down – the reset button cannot be forcibly held pressed in position bypassing the function of the switch.
- Retrofit possible – the electrical switch can be replaced without refrigerant loss.
- Potential free change over relay – control with contactor and alarm possible.
- Microprocessor technology – the latest technology.

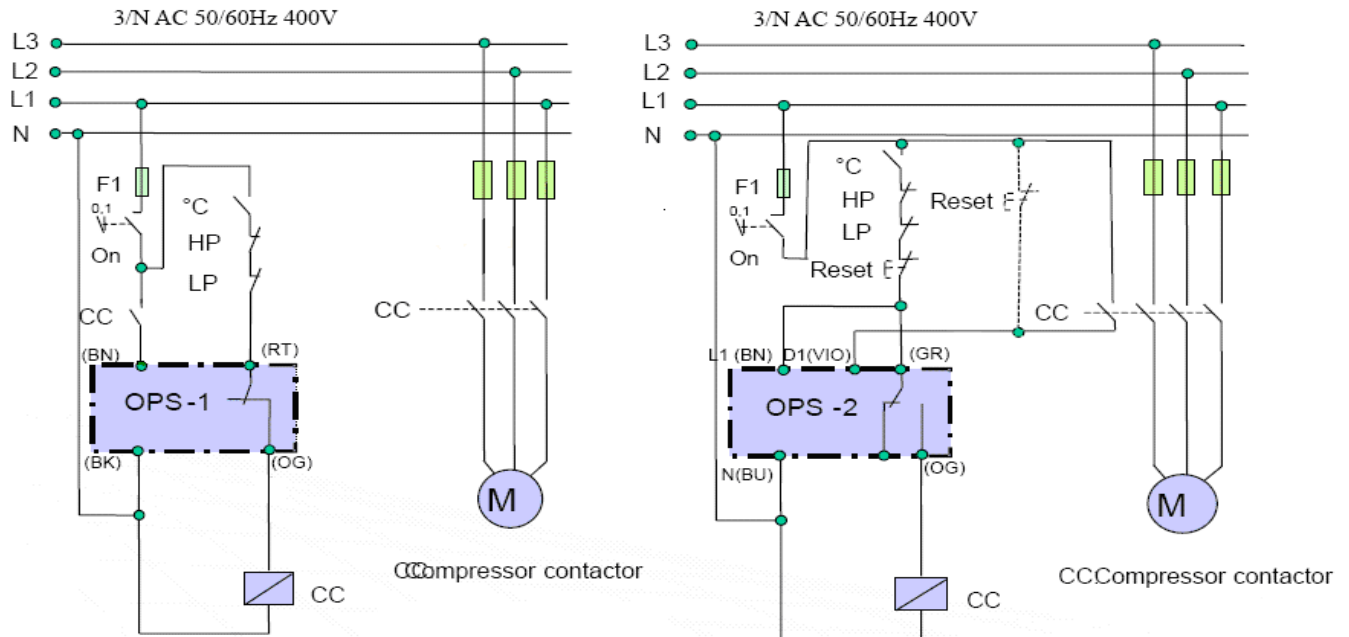
If the electronic switch and the mechanical sensor are assembled incorrectly, the compressor will shut off and be locked out after 5 seconds.

## 9 Wiring diagrams of OPS1 and OPS2

The electrical part of the OPS1 can be replaced by the OPS2 module. Please see connection diagram proposals below.

### 9.1 5-wire connecting cable between electrical control panel and compressor terminal box

With a 5-wire connecting cable to the OPS module, one can duplicate the functions of the OPS1 with the OPS2.



### 9.2 7-wire connecting cable between electrical control panel and compressor terminal box

With a 7-wire connecting cable the full function range of the OPS2 can be used.

