

# P216

## Condenser Fan Speed Controller

### Product Bulletin

These controllers are designed for speed variation of single phase motors, especially for fan speed control on air cooled condensers. Head pressure control of a refrigeration system, through speed variation of the fan on an air-cooled condenser, results in optimum performance throughout the year.

Using a pressure transducer as the input device to the fan speed controller, gives the most direct and fastest response to pressure variations in the refrigerant system. The controller varies the supply voltage to the motor from 45% to at least 95% over the proportional band using the phase cutting principle. If the pressure drops below the adjusted setpoint minus the proportional band, the output to the motor is zero volt or the adjusted min. speed setting. This provides speed variation of permanent split capacitor or shaded pole motors which do not draw more than 12 A (rms) full load current.

The controller used for dual pressure input varies the fan speed by directly sensing the pressure changes of two separate refrigerant circuits. The setpoint of each pressure transducer can be separately adjusted. The controller selects the input with the greatest cooling demand to control the fan speed. The transducers can be used in non-corrosive refrigerant systems.

The motor manufacturer should have approved his product for this speed control principle. It is recommended to confirm with the electric motor manufacturer, that the motor can be used with a controller, using the phase cutting principle for speed variation.

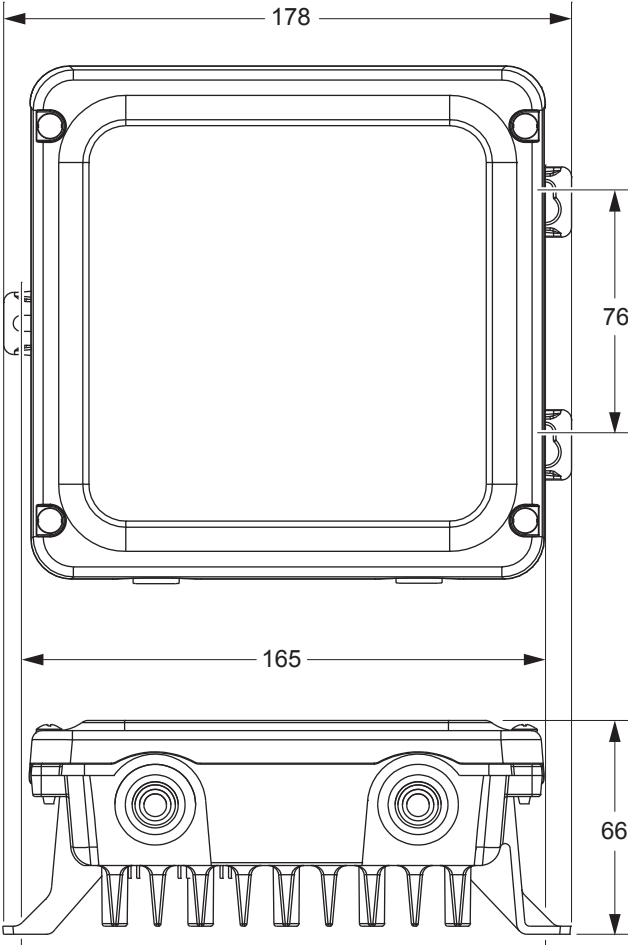
You can also provide a copy of this P216 product data sheet to the motor manufacturer/supplier for review.



### Features

- **The new benchmark in standard FSC**
- **Easy to Install and Easy to operate**
- **Output Range: 0,5 to 12 Amp (1 phase)**
- **Input 0-10 Vdc**
- **Including 0-50 bar pressure transducer P499VCS-405C**
- **Heatpump mode**
- **Reverse operation mode**
- **Master / Slave mode**
- **Fixed pressure ranges for direct replacement (P215)**
- **Setpoint and Min speed potmeters**

Dimensions (mm)



## Installation

The P216 can be used for single or dual pressure input. In the case of dual input the controller selects the input with the greater cooling demand to control the fan speed.

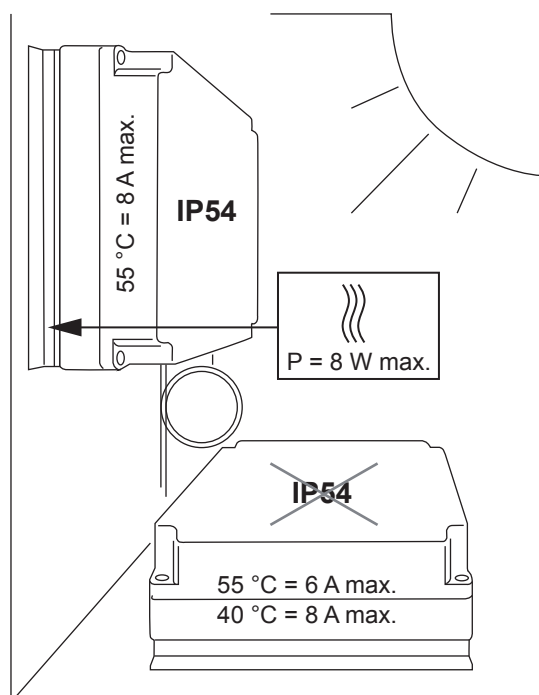
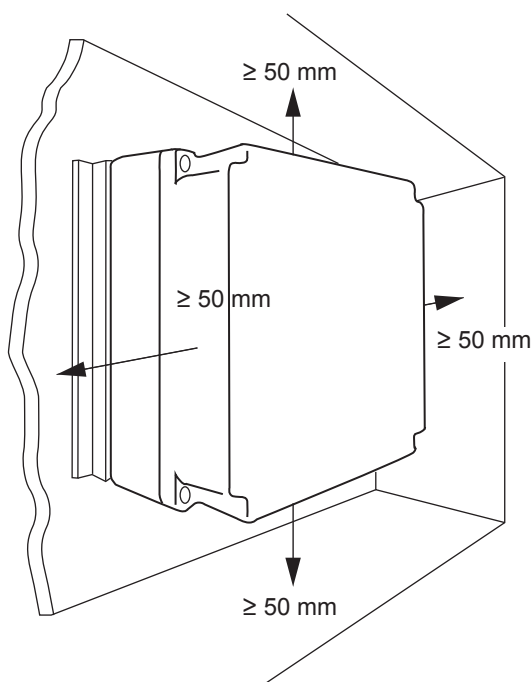
There are four pressure ranges:

- 4 to 10 bar
- 8 to 14 bar
- 14 to 24 bar
- 22 to 42 bar

For proper aircirculation there should be a clearance around the controller of at least 10 mm. When mounted inside a cabinet, holes for air circulation should be provided. If the P216 cannot be mounted vertically, additional limitations apply.

Avoid mounting in direct sunlight the maximum allowable current will be 8A instead of 12A or the maximum allowable ambient temperature is reduced to 40 °C instead of 55 °C.

If a pumpdown system is used the pressure connection must be made at the high-pressure side of the system, (before the solenoid valve).



## Wiring



### WARNING: Risk of Electric Shock.

Disconnect or isolate all power supplies before making electrical connections. More than one disconnect or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

**IMPORTANT:** Do not connect supply power to the P216 Series controller before finishing wiring and checking all wiring connections. Short circuits or improperly connected wires can result in damage to the P216 Series controller and void any warranty.

**IMPORTANT:** Do not exceed the P216 Series Fan Speed Controller electrical ratings. Exceeding P216 Series controller electrical ratings can result in permanent damage to the P216 Series controller and void any warranty.

**IMPORTANT:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations.

**IMPORTANT:** Electrostatic discharge can damage P216 controller components. Use proper Electrostatic Discharge (ESD) precautions during installation and servicing to avoid damaging P216 components.

- Ensure that the wires between the P216 Series controller and the fan motor do not exceed 15 m (50 ft).
- Wires connected to the line-voltage terminal block must be 3.31 mm<sup>2</sup> (12 AWG) or smaller.
- Low-voltage wires must be less than 30 m (100 ft).

## Description

A DIP switch will be used to select one of 4 different pressure ranges. There is one potentiometer to manually adjust the setpoint.

- There is one potentiometer to manually adjust the minimum speed.
- A green LED will indicate that power is applied.
- Two 3 position screw terminal blocks will be used to connect the 50 bar transducers.
- A 3 position screw terminal block will be used to select HP or Reverse modes.

Contacts between HP and C will run the fan at full speed.

Contacts between REV and C will increase the fan speed as pressure decreases.

- Adjustable 4 to 10 bar setpoint, prop band fixed at 2.0 bar
- Adjustable 8 to 14 bar setpoint, prop band fixed at 2.5 bar
- Adjustable 14 to 24 bar setpoint, prop band fixed at 4.0 bar

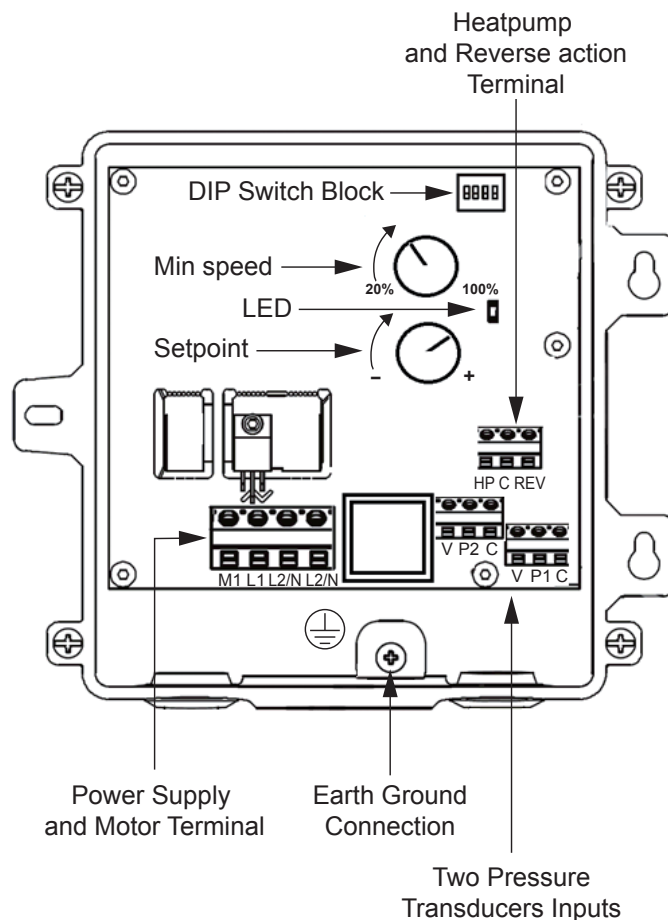


Figure 1



### CAUTION

The P216 is intended to control equipment under normal operating conditions. Where failure or malfunction of the P216 could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory systems) intended to warn of or protect against failure or malfunction of the P216 must be incorporated into and maintained as part of the control system.

## EMC

The controller does have a built-in suppression filter and meets all required EC directives. Please note that when two or more EMC compliant components are built together the total system may not be compliant. To make the total system compliant is the responsibility of the producer.

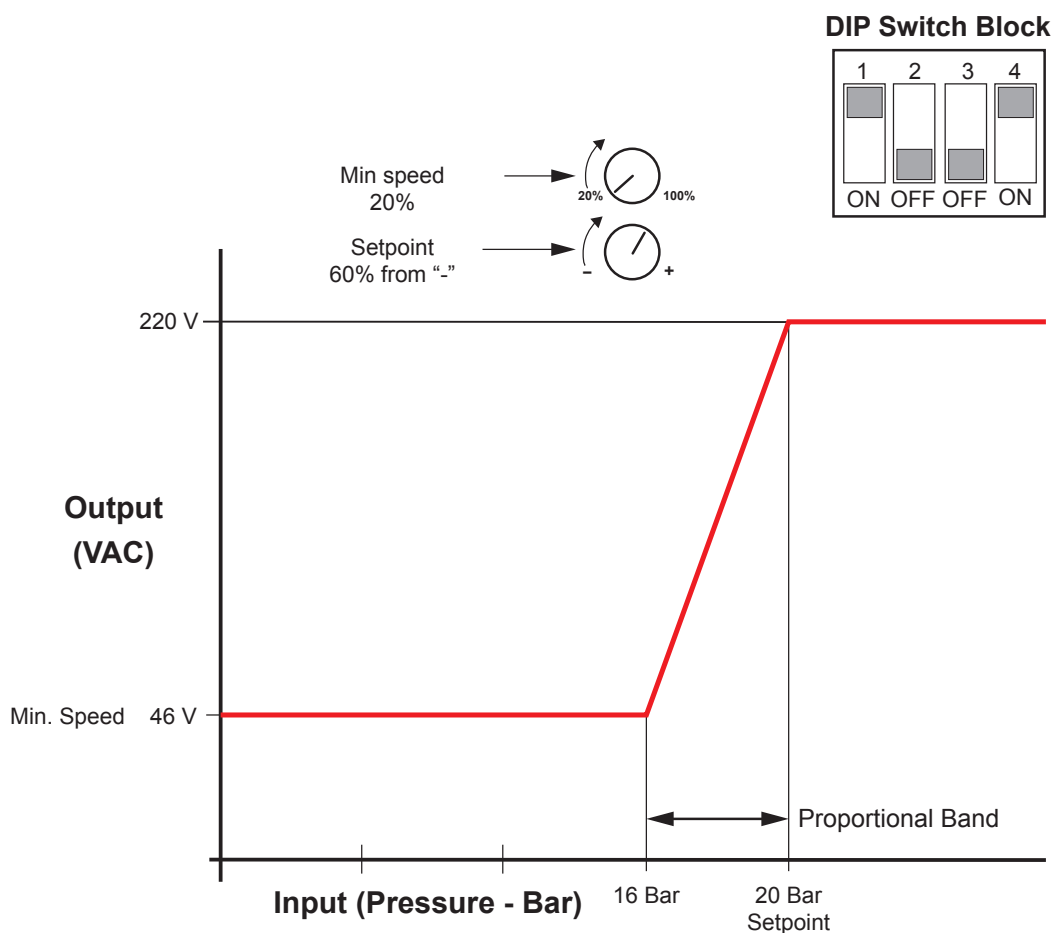
**Note:** More motors can be wired in parallel, provided that the total current will not exceed 12 A rms.

## Input Connections

The input can be connected as indicated in Figure 1. If the distance between the transducer and the controller exceeds 30 metres, shielded cable has to be used.

## P216 Output Voltage vs Input

In reverse operation, the minimum speed occurs when the pressure is equal to the setpoint and the maximum speed occurs when the pressure is less than or equal to the setpoint minus the prop. band.



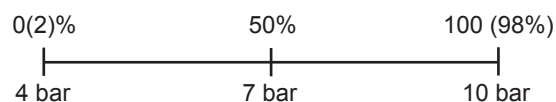
Output vs Input curve

**Example:**

Minimum Speed potmeter on 20% (= 46 Vac)

Setpoint Range = 4 - 10 bar (Switch 1 and 2 OFF)

Proportional Band = 2 bar

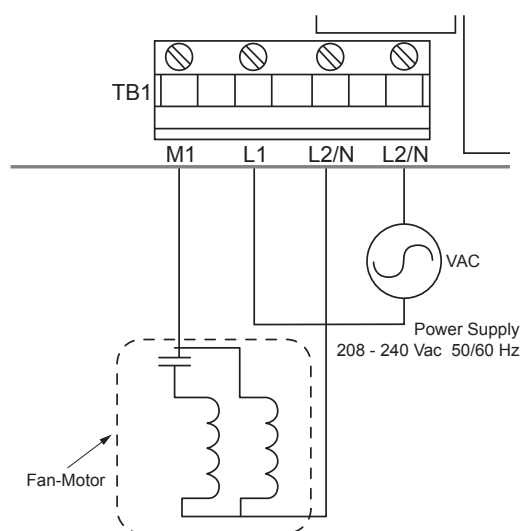
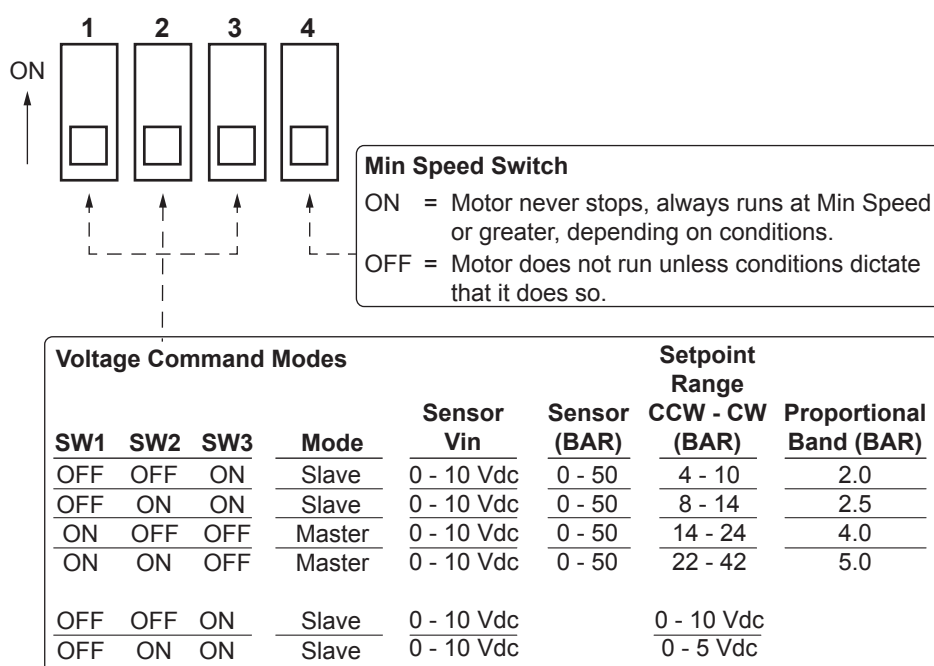


$$40\% = [(10 - 4) 40\%] + 4 = 2,4 + 4 = 6,2 \text{ bar}$$

The P216 modulate the output voltage to the Fan motor between 46 Vac and 230 Vac over condenser pressure range 4,2 to 6,2 bar.

## Switches Positions

### Dip Switch Block



There is a 4 position DIP switch to choose the range.

Switch positions 1, 2, and 3 of the DIP switch determine the range of the setpoint potentiometer. In normal operation, the maximum speed occurs when the higher of the 2 pressure inputs is greater than or equal to the setpoint and the minimum speed occurs when the pressure is equal to the setpoint minus the prop. band.

- In the **master mode** the P216 operate in combination with the P499VCS-405C pressure transmitter as a stand alone unit.
- In the **slave mode** the P216 is controlled by an external 0-10 V or 0-5 V signal.  
0-10 V or 0-5 V = 0 - xxx % Fan output depending on the setpoint potmeter.

## P499 Electronic Pressure Transducers

P216 Series controllers are designed to reference either one or two Johnson Controls P499 Electronic Pressure Transducers to monitor condenser pressure.

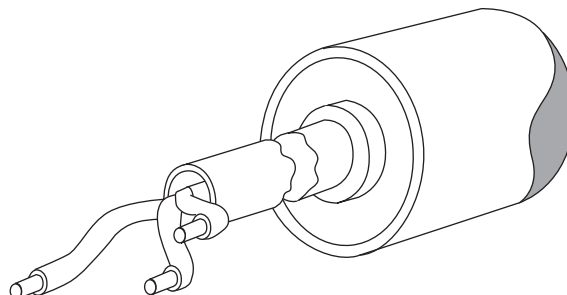
On P216 Series controller applications that use two P499 transducers, the P216 Series controller always references the transducer that is sensing the highest pressure.



### IMPORTANT

Operate the P216 only in combination with one or two P499-VCS-405C Pressure Transmitters.

Only P499 models that have a 0-10 Vdc output signal can be used with the P216 control.



Wire Connection	Terminal
Red	V
Black	C
White	P

## Technical Specification

<b>Product Type</b>	P216EEA-1K / P216EEA-100C
<b>Power Supply</b>	208 - 240 VAC, 50/60 Hz
<b>Pressure Range</b>	Adjustable 4 to 10 bar setpoint, prop band fixed at 2.0 bar Adjustable 8 to 14 bar setpoint, prop band fixed at 2.5 bar Adjustable 14 to 24 bar setpoint, prop band fixed at 4.0 bar Adjustable 22 to 42 bar setpoint, prop band fixed at 5.0 bar
<b>Pressure Transducer</b>	P499VCS-405C Pressure Transducer included with 0- 50 bar range
<b>Input Signal</b>	0 – 10 Vdc
<b>Control Action</b>	Direct or Reverse mode
<b>Maximum Current</b>	12 Amp
<b>Minimum Current</b>	0,5 Amp
<b>Protection Class</b>	IP54
<b>Ambient Operating Conditions</b>	-40°C to 60°C
<b>Storage Temperature</b>	-40°C to 85°C
<b>Dimensions (H x W x D)</b>	159 x 177 x 70 mm
<b>Weight</b>	1 kg
<b>MTTR</b>	20 years
<b>Conformity</b>	



Johnson Controls, Inc., declares that these products are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC, Low Voltage Directive 2006/95/EC.

*The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.*



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