

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 20% to 100% 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.

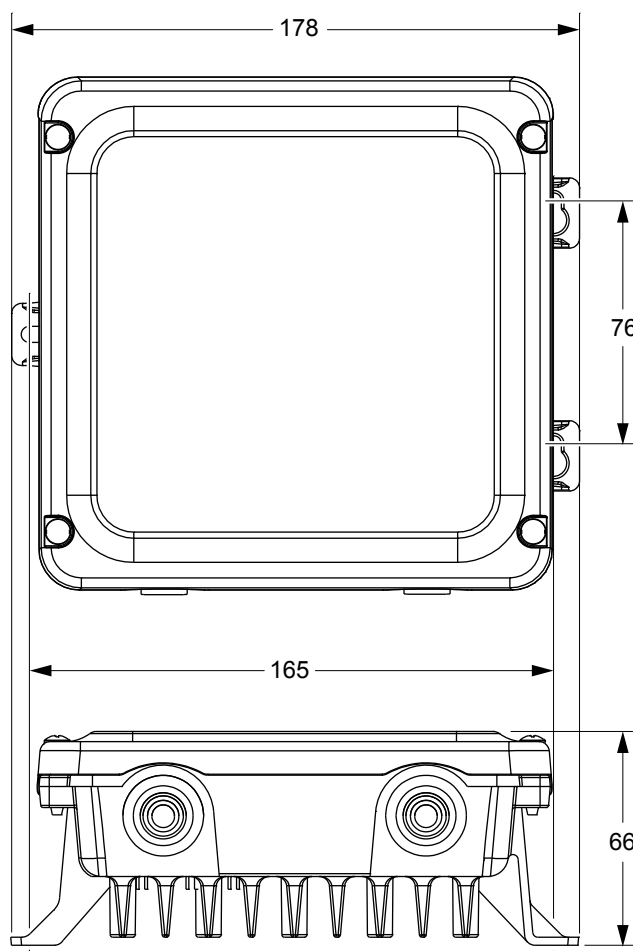
You can also provide a copy of this P216 product data sheet to the motor manufacturer/supplier for review.



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

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.
- Wires connected to the line-voltage terminal block must be 3.31 mm² (12 AWG) or smaller.
- Low-voltage wires must be less than 30 m.

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

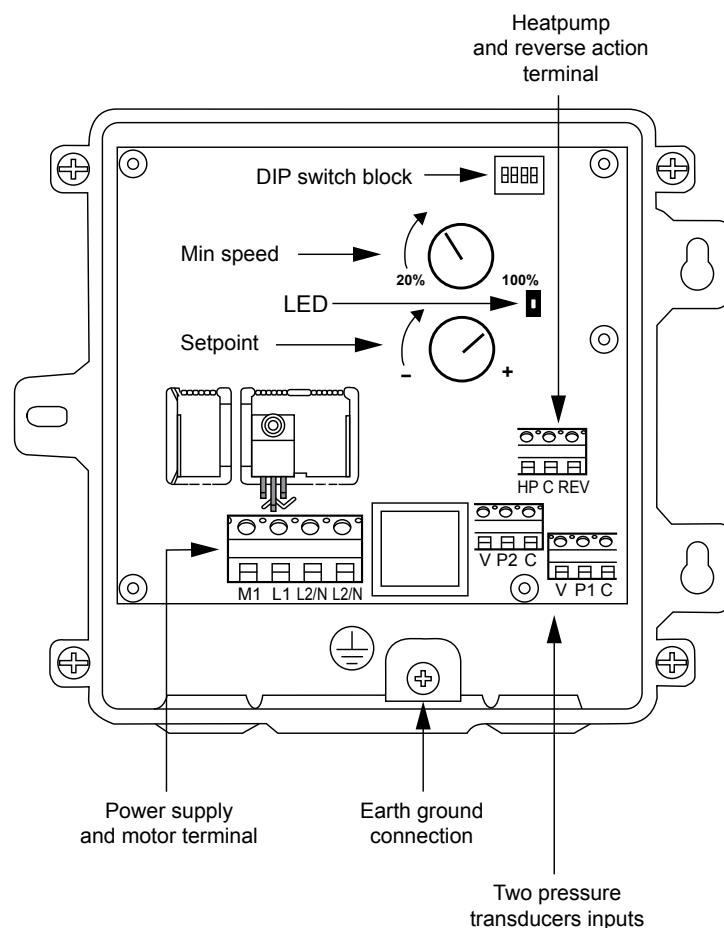


Figure 1



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

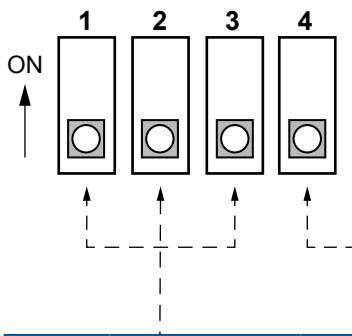
The controller does have a built-in suppression filter and meets all required EC directives. Please note that when two or more EMC compliant components are built together the total system may not be compliant. To make the total system compliant is the responsibility of the producer.

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.

DIP switch settings and wiring diagram



Min speed switch

ON = Motor never stops, always runs at min speed or greater, depending on conditions.

OFF = Minimum speed feature is disabled.
Motor shuts completely off at low pressure

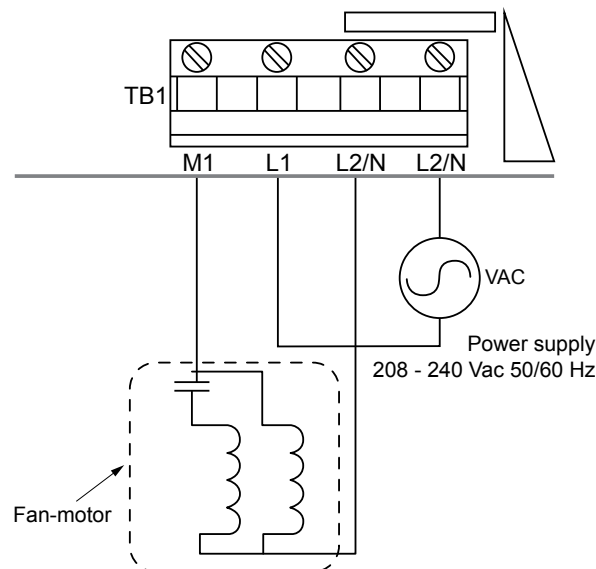
P216 operation using P499VCS-405C transducers

SW1	SW2	SW3	Mode	Setpoint range CCW - CW (BAR)	Proportional band (BAR)
OFF	OFF	OFF	Master	4 - 10	2,0
OFF	ON	OFF	Master	8 - 14	2,5
ON	OFF	OFF	Master	14 - 24	4,0
ON	ON	OFF	Master	22 - 42	5,0

P216 operation in slave mode

SW1	SW2	SW3	Mode	Setpoint range CCW - CW (Vdc)	Proportional band (BAR)
OFF	OFF	ON	Slave	2 - 10 Vdc	(See Note 1)
OFF	ON	ON	Slave	1 - 5 Vdc	

Note 1: The proportional band in slave mode extends from 0 Vdc to the setpoint voltage



When switch 3 is set to ON, the slave mode is selected and the setpoint potentiometer defines the input voltage level that causes the motor to run at full speed.

For example:

- If the 2–10 Vdc setpoint range is selected and the setpoint potentiometer is adjusted completely to "+", then the motor will run at full speed when $V_{in} = 10$ Vdc.
- If the setpoint potentiometer is adjusted midway between "-" and "+", then the motor will run at full speed when $V_{in} = 6,0$ Vdc (see Figure 3).

Normal operation example using a 230 V supply

Output voltage vs input pressure

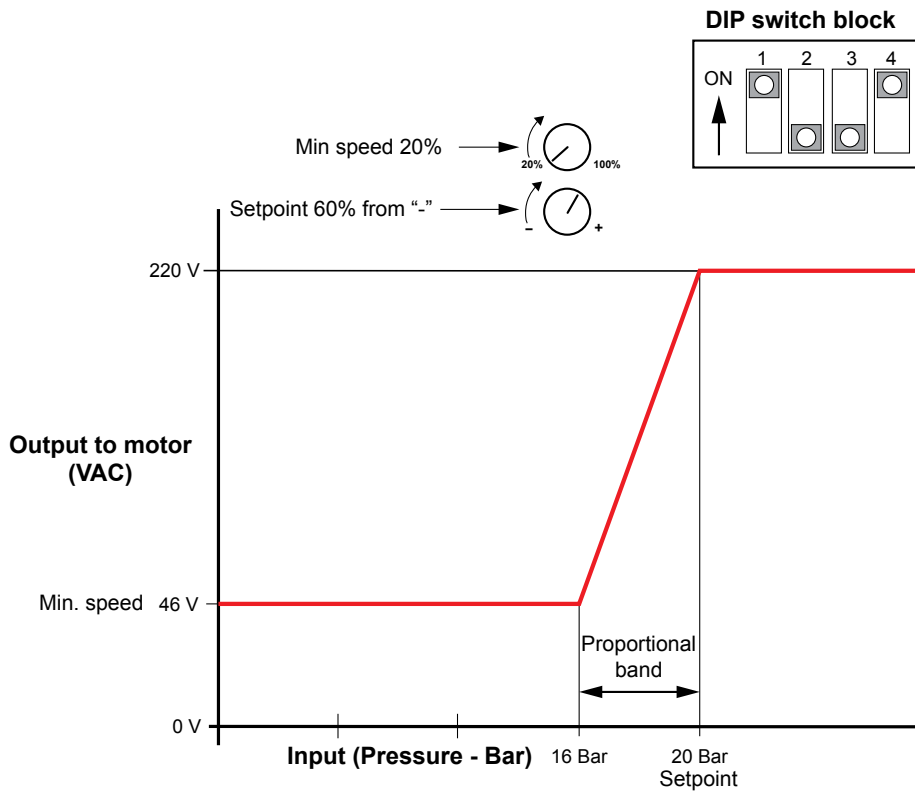


Figure 2

Note

Set switches 1–3 as shown to select a 14-24 Bar setpoint range with a 4 Bar proportional band. Adjust the setpoint potentiometer to 20 Bar (which is 60% rotation from the "-" or CCW end of the setpoint potentiometer). Adjust the minimum speed potentiometer completely CCW (to set the minimum speed to 20% of 230 V or 46 V). Setting switch 4 to ON causes the motor to always run at minimum speed or greater.

0 – 10 Vdc slave operation example using 230 V supply

Output vs input voltage

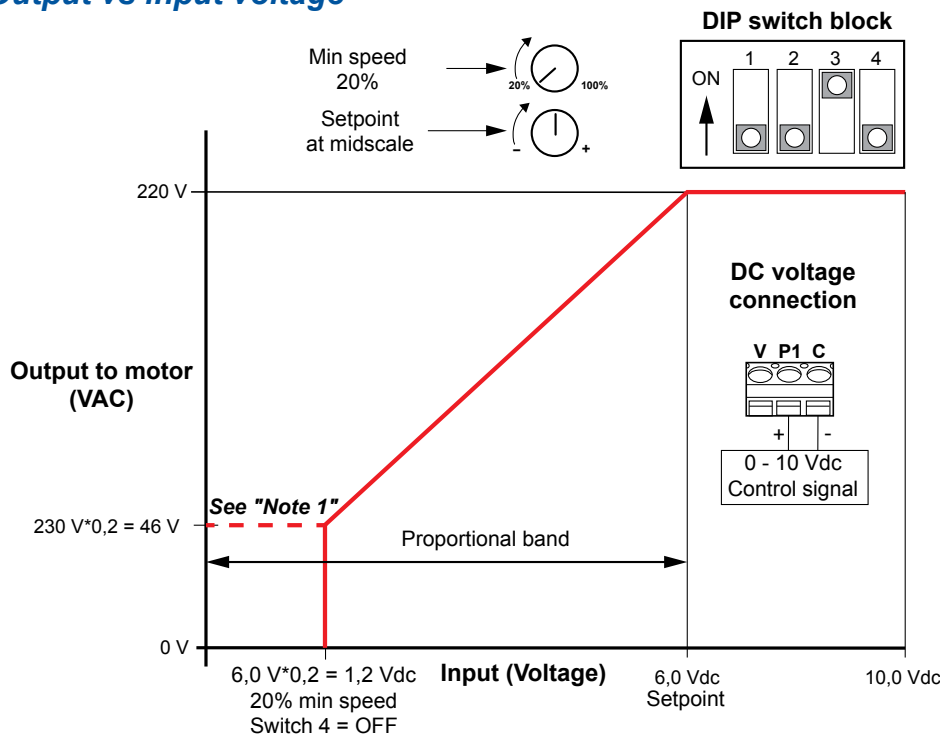


Figure 3

Note 1

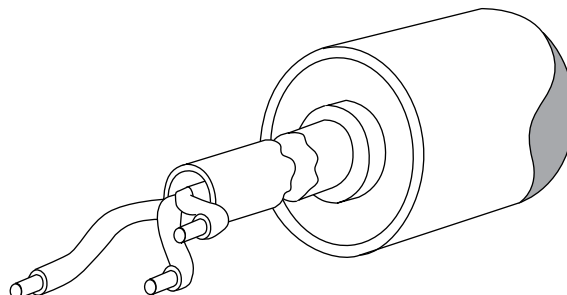
If min speed is set to 40%, then output turns off at $230\text{ V} \cdot 0,4 = 92\text{ VAC}$ when input voltage drops to $6,0\text{ V} \cdot 0,4 = 2,4\text{ Vdc}$

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.

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



IMPORTANT

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

Wire connection	Terminal
Red	V
Black	C
White	P

P216 performance using high efficiency motors

Current rating based on DI percent

Maximum Amps	%DI
12.00	0
11.43	5
10.91	10
10.43	15
10.00	20
9.60	25
9.23	30
8.89	35
8.57	40
8.28	45
8.00	50
7.74	55

Note: High efficiency motors must comply with ERP 2015.

%Di is stated in the fan motor specifications and indicates the value of extra current that the motor is consuming at medium speed.

For example:

%DI = 55 means that a 5A motor consumes a 2,75 A more current so 7,75 A at inrush and up to medium speed. This means that the P216 is limited to 7,75 A, so it is not possible to connect 2 motors in parallel. For a fan motor with %DI = 0, the P216 can deliver 12 A maximum.

Technical specification

Product type	P216EEA-2K / P216EEA-101C
Power supply	208 - 240 VAC, 50/60 Hz
Pressure range	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
Pressure transducer	P499VCS-405C pressure transducer included with 0- 50 bar range
Input signal	0 – 10 Vdc
Control action	Direct or reverse mode
Maximum current	12 Amp
Minimum current	0,5 Amp
Protection class	IP54
Ambient operating conditions	-40 °C to 60 °C
Storage temperature	-40 °C to 85 °C
Dimensions (H x W x D)	159 x 177 x 70 mm
Weight	1 kg
MTTR	20 years
CE Conformity	Johnson Controls International plc declares that these products are in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.

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 International plc shall not be liable for damages resulting from misapplication or misuse of its products.



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