

## Series P215DP

### Single/Dual Pressure Input Condenser Fan Speed Controllers For Single Phase Motors (incl. built-in RFI suppression filter)

#### Introduction

*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 8 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.*



**P215DP  
 Condenser Fan Speed Controller**

*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 P215DP product data sheet to the motor manufacturer/supplier for review.*

Feature and Benefits	
<input type="checkbox"/> <b>Condenser pressure control by fan speed variation.</b>	Optimum condenser pressure control all the year round. Less noise during colder (night) period.
<input type="checkbox"/> <b>Pressure input.</b>	Direct and fast response to pressure variations. Easy to install
<input type="checkbox"/> <b>Transducers with proven reliability.</b>	More than half a million in use today.
<input type="checkbox"/> <b>Easy accessible setpoint screw.</b>	Setpoint easy adjustable. For use on various non-corrosive refrigerants.
<input type="checkbox"/> <b>Built-in suppression filter.</b>	The control meets the electro magnetic compatibility requirements of the 89/336/EEC directive.
<input type="checkbox"/> <b>Adjustable minimum speed or cut-off selection.</b>	Selection to keep the fan running on (adjusted) minimum rpm or to switch it off.
<input type="checkbox"/> <b>Dual input possibility.</b>	Can be used on condensers with two separate refrigerant circuits.
<input type="checkbox"/> <b>IP54 enclosure.</b>	Can be mounted outdoor.



## Caution

The P215DP is intended to control equipment under normal operating conditions. Where failure or malfunction of the P215DP 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 P215DP must be incorporated into and maintained as part of the control system.

## Description

The P215DP can be used for single or dual pressure input. For single input the transducer and the electronics are built in an IP54 enclosure.

For dual input a separate P35AC pressure transducer (IP20) must be ordered (see type number selection table).

In the case of dual input the controller selects the input with the greatest cooling demand to control the fan speed.

There are three pressure ranges:

8 to 14 bar
14 to 24 bar
22 to 42 bar

Pressure connections are:

style 50 - 90 cm capillary/machined flare with valve depressor

style 51 - 90 cm capillary/machined flare without valve depressor

style 28 - 15 cm brazing tube 6 mm ODM

## Installation

The device is provided with a drain hole at the cable inlet side. To maintain the IP54 protection-class the controller must be mounted in a vertical position to assure a permanent drain function. For proper air-circulation 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 P215DP cannot be mounted vertically, additional limitations apply. The maximum allowable current will be 6A instead of 8A or the maximum allowable ambient temperature is reduced to 40 °C instead of 55 °C. For dual input the second transducer can be installed in any convenient location, provided that the ambient conditions are suitable for IP20 enclosure. Enclosed mounting bracket can be used. If a pump-down system is used the pressure connection must be made at the high-pressure side of the system, (before the solenoid valve).

## Note

For style 50 and 51 pressure connections two copper sealrings (one spare) are delivered with the control. Each time the pressure connection is removed this sealring has to be replaced.

## Wiring (see Fig. 1)

To meet the EMC directive shielded cable has to be used for motor wiring in case the distance between controller and motor is more than 2 meters. If the distance is less than 2 meters it is allowed to use non-shielded cable.

Non shielded cable may be used if the control and motor are mounted in one frame.

Both sides of the shield (motor and second pressure transducer wiring) have to be connected to earth. To prevent stray current, the earth connections of the transducer, the controller, the motor earth connection as well as the cable shield, all have to be connected to one earthing pole.

## 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

Three earth connections are provided except for the 22-42 bar models which have two earth connections.

More motors can be wired in parallel, provided that the total current will not exceed 8 A rms.

## Dual input connection

The second input can be connected as indicated in fig. 1.

If the distance between the transducer and the controller exceeds two metres shielded cable has to be used (The shield can be connected under the screw used to connect the transducer to the mounting bracket).

Enclosed quick connector plug can be used to connect wires to the transducer.



## Caution

The enclosed quick connector plug is especially designed (special terminal numbering) for this control and should not be used for other purposes. Take care to connect the correct wires when the original connector is replaced by a non Johnson Control type.



## Caution

There will be line voltage on the wiring between the second input pressure transducer and the P215DP.

## Measuring

For measuring amps or volts values a true rms meter should be used.



## Caution

The P215DP is not equipped with a power switch. Therefore an additional switch to isolate the device should be used in the power supply wiring to the P215DP. Also the P215DP should be externally fused against miswiring or short circuits. Use a thermal/current overload relay with a current rating according to the motor (max. 16 A/slow).

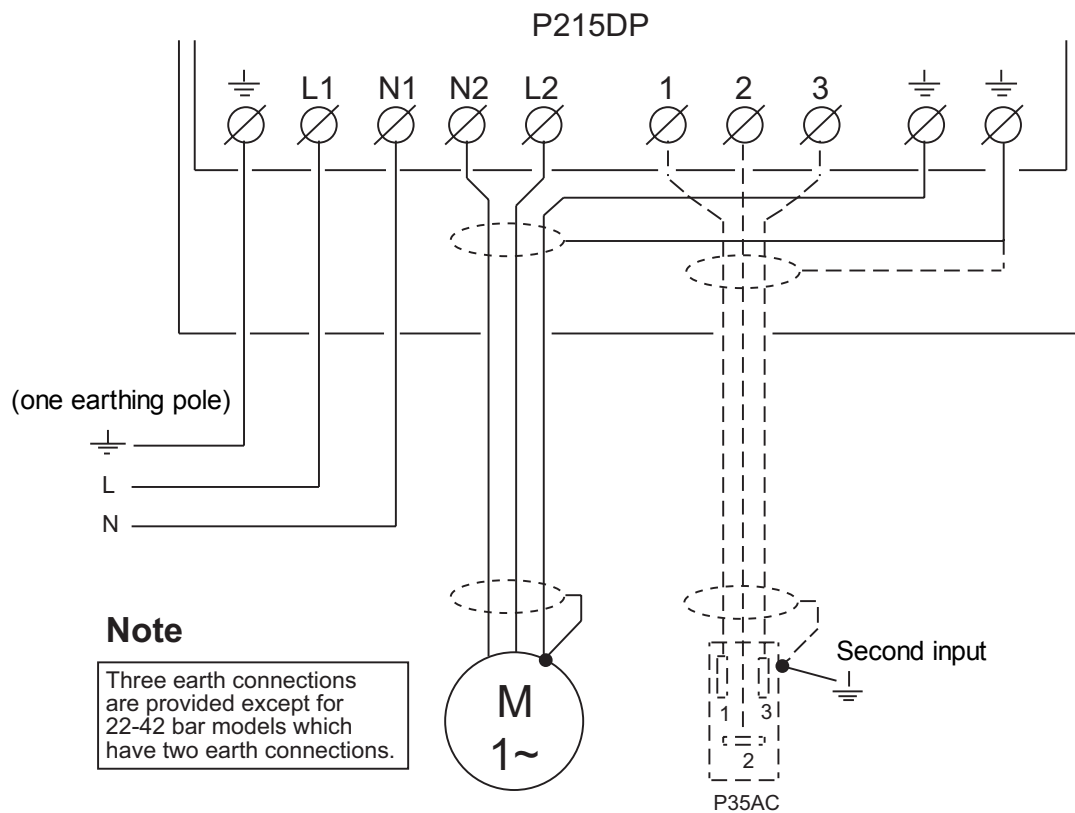


Fig. 1

## Adjustments

The P215DP gives a control characteristic according to fig. 2.

The control characteristic can be affected by the load and the supply voltage.

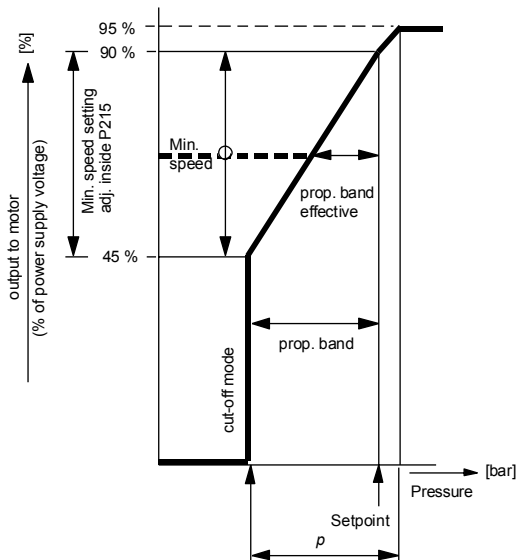


Fig. 2

The proportional band is fixed and defined as the pressure difference between the points where the output values are 45% and 90% of the supply voltage.

	Range in bar		
	8 to 14	14 to 24	22 to 42
Prop. band	2.5 ± 0.5	4 ± 1	5 ± 2
Δ p (max.)	4	6	8

There is a built-in (fixed) hysteresis. This is not indicated in the control characteristic. The hysteresis is included in the prop. band.

## Minimum speed setting

The minimum speed voltage setting, to prevent fan speed reduction below desirable levels, can be adjusted between 45 % and 90 % of the line voltage by means of the potentiometer inside the controller (see fig. 3). By turning this potentiometer clockwise into the minimum speed section, the output to the motor stays at a higher level. The minimum speed setting influences the proportional band. A higher setting of the minimum speed results in a smaller proportional band.

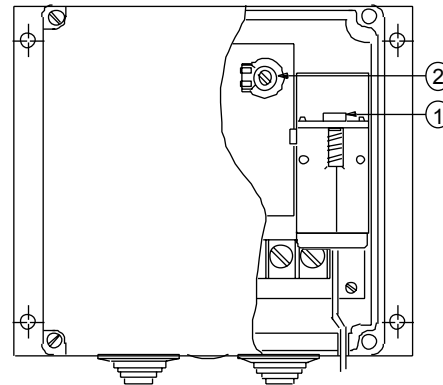


Fig. 3

- 1 Setpoint adjusting screw
- 2 Minimum speed / cut-off potentiometer

## Cut-off mode

If minimum speed is not required, turn the potentiometer completely counter-clockwise. The output to the motor drops to 0 V when the pressure decreases below setpoint pressure minus proportional band. (fan stops.)

## Setpoint

The pressure setpoint at which your equipment has to work can be adjusted by the setpoint adjusting screw (see fig. 2 and 3) between 8 to 14, 14 to 24 or 22 to 42 bar.

The setpoint is factory set at:

range 8 to 14 bar	10 bar
range 14 to 24 bar	16 bar
range 22 to 42 bar	30 bar

## Note

If a second input is used and it is necessary to make setpoint adjustments on the P215DP care should be taken that the additional transducer does not affect the output voltage of the controller while adjustment is being made on the other transducer. The easiest way to do this is to set the built-in transducer to high pressure (+). Then adjust the second transducer to the required value. After adjusting disconnect the blue connector. Then set the built-in transducer to the required value. Reconnect the blue connector of the second transducer.

## Repair and replacement

Repair is not possible. In case of an improperly functioning control, please check with your nearest supplier. When contacting the supplier for a replacement you should state the type-model number of the control. This number can be found on the data plate.

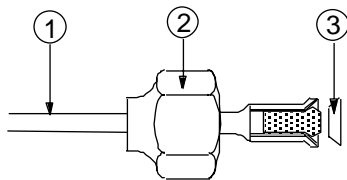
## *T*ype number selection table

Order nr.	Range (bar)	Element style	Setting (bar)	Prop. band (bar)
<b>P215DP-9100</b>	14 to 24	50	16	4
<b>P215DP-9101</b>	8 to 14	50	10	2.5
<b>P215DP-9102</b>	22 to 42	50	30	5
<b>P215DP-9600</b>	14 to 24	51	16	4
<b>P215DP-9601</b>	8 to 14	51	10	2.5
<b>P215DP-9800</b>	14 to 24	28	16	4

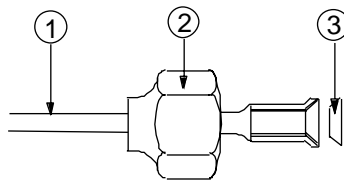
All models are delivered with a single pressure transducer. A second pressure transducer can be ordered.  
Note: 1 bar = 100 kPa  $\approx$  14.5 psi

## *P*ressure connections

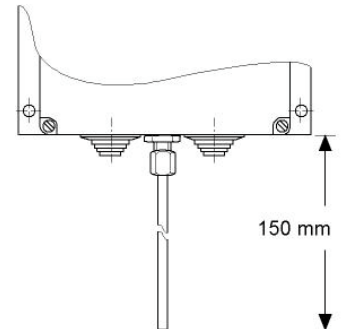
There are three types of pressure connections available.



**Fig. 4**  
Style 50 (incl. valve depressor mounted into machined flare)



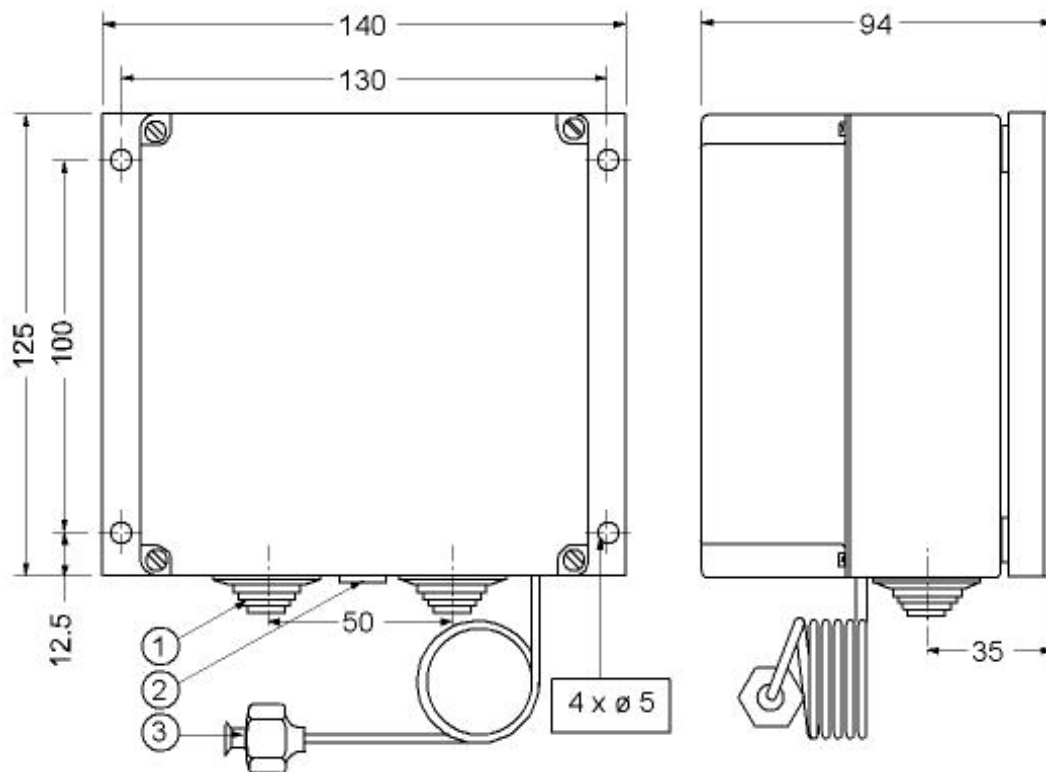
**Fig. 5**  
Style 51 (excl. valve depressor)



**Fig. 6**  
Style 28 Braze connection  
6 mm ODM

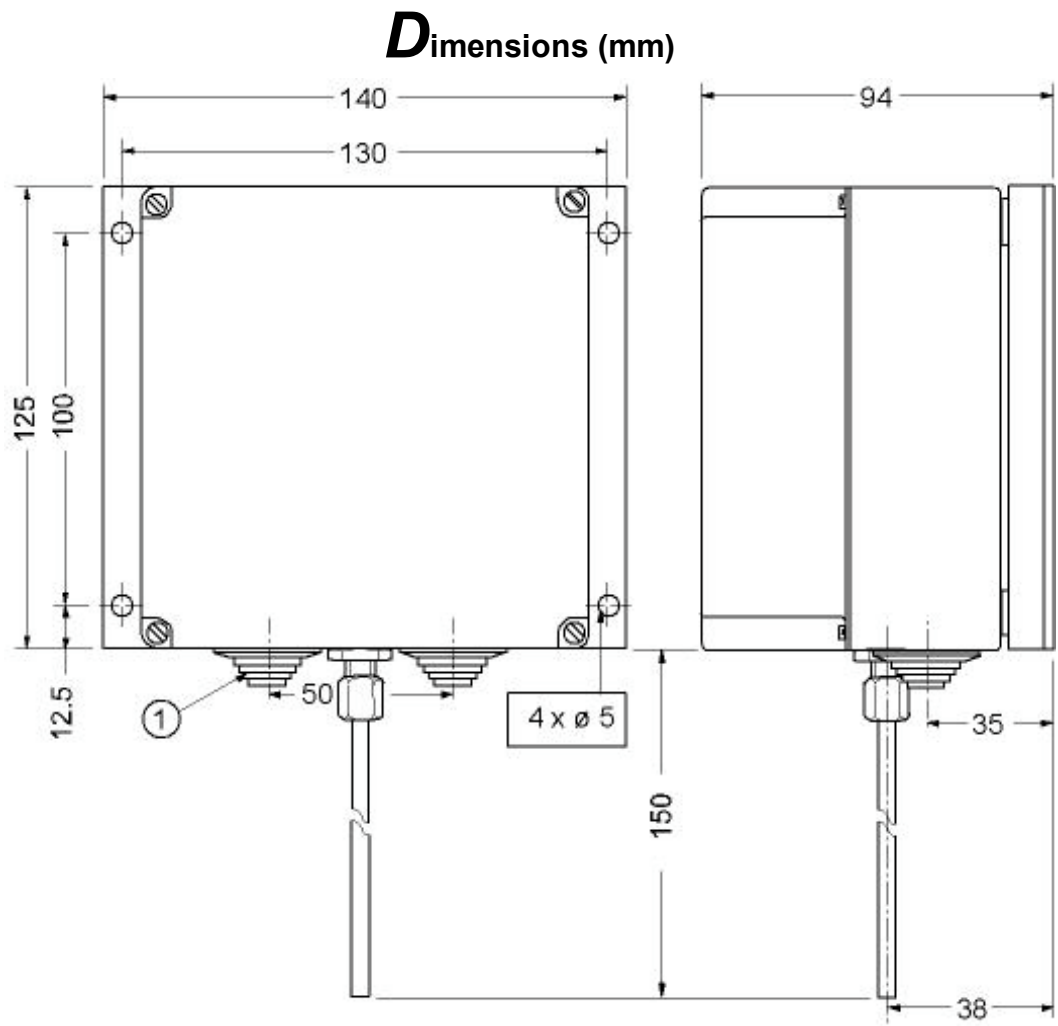
1. 90 cm capillary. 2. 7/16 - 20 UNF flare nut. 3. copper sealring

## *D*imensions (mm)



**Fig. 7**

- 1 cable inlet grommets
- 2 cable inlet second input transducer
- 3 7/16 - 20 UNF flare nut



**Fig. 8**

1 cable inlet grommets

## Specifications

<b>Product type</b>	<b>P215DP</b>	
<b>Pressure range</b>	22 to 42 bar 14 to 24 bar 8 to 14 bar	
<b>Maximum overrun pressure</b>	22 to 42 bar = 48 bar 14 to 24 bar = 40 bar 8 to 14 bar = 34 bar	
<b>Pressure connection</b>	style 50 with 90 cm of capillary style 51 with 90 cm of capillary style 28 with 150 mm tube 6mm ODM	
<b>Control action</b>	direct	
<b>Maximum output voltage</b>	≥ 95 % of supply voltage	
<b>Maximum current</b>	8 A rms (at maximum voltage output)	
<b>Minimum current</b>	≥ 100 mA	
<b>Power factor (cosφ) motor</b>	≥ 0.6	
<b>Mains supply voltage</b>	230 Vac +10 % / -15 %	
<b>Mains supply frequency</b>	50/60 Hz	
<b>Operating ambient temperature</b>	-20 to +55° C	
<b>Operating /storage ambient humidity.</b>	10 to 98 % R.H. (non-condensing)	
<b>Storage ambient Temp.</b>	-40 to 85 °C	
<b>Min. speed</b>	adjustable from 45 to ≥90 % of supply voltage	
<b>Cut-off point</b>	45 % of supply voltage	
<b>Prop. band</b>	<b>range</b>	22 to 42 bar = $5 \pm 2$ bar
	<b>range</b>	14 to 24 bar = $4 \pm 1$ bar
	<b>range</b>	8 to 14 bar = $2.5 \pm 0.5$ bar
		at minimum speed adjustment of 45% of line voltage.
<b>Enclosure</b>	IP54	
<b>additional pressure transducer</b>	IP20	
<b>Material case/cover</b>	polycarbonate	
<b>heatsink</b>	aluminium	
<b>press. connection</b>	90 cm copper capillary with brass flare nut	
<b>Shipping weight</b>	individual pack	1.0 kg
<b>Residual current motor</b>	in cut-off mode ≤ 15 mA	
<b>Wiring connections</b>	screw terminals 1 mm <sup>2</sup> up to 2½ mm <sup>2</sup>	
<b>additional P35AC</b>	screw terminals 1 mm <sup>2</sup> up to 1½ mm <sup>2</sup>	

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



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