

## Series P215ST

### Single 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 6 A (rms) full load current.*

*The controller 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.*



**P215ST  
 Condenser Fan Speed Controller**

*You can also provide a copy of this P215ST 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>IP54 enclosure.</b>	Can be mounted outdoor.

**Note**

The P215SH is intended to control equipment under normal operating conditions. Where failure or malfunction of the P215SH 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 P215SH must be incorporated into and maintained as part of the control system.

**Caution**

Because the P215ST is a single phase control, it may be used only with single-phase motors approved by the manufacturer for speed control applications.

**Description**

The transducer and electronics are built into an IP54 enclosure.

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

**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 P215ST cannot be mounted vertically, additional limitations apply. The maximum allowable current will be 4A instead of 6A or the maximum allowable ambient temperature is reduced to 40 °C instead of 55 °C.

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 motor cable shield have to be connected to earth. To prevent stray current, the earth connections of 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.

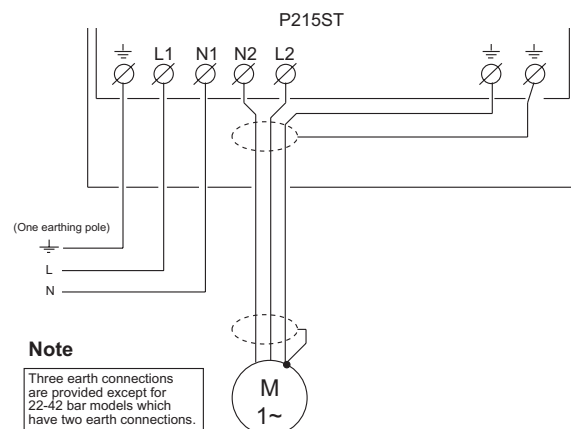
More motors can be wired in parallel, provided that the total current will not exceed 6 A rms.

**Measuring**

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

**Caution**

The P215ST 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 P215ST. Also the P215ST should be externally fused against miswiring or short circuits. Use a thermal/current overload relay with a current rating according to the motor (max. 10 A/slow).

**Fig. 1**

## Adjustments

The P215ST gives a control characteristic according to fig. 2.

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

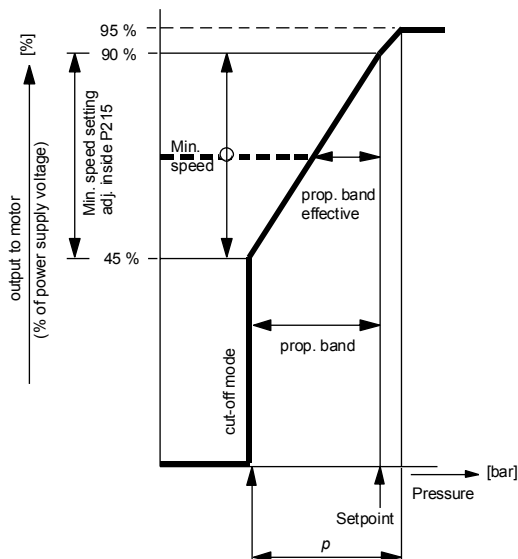


Fig. 2

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
<b>Prop. band</b>	2.5 ± 0.5	4 ± 1	5 ± 2
<b>Δ p (max.)</b>	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.

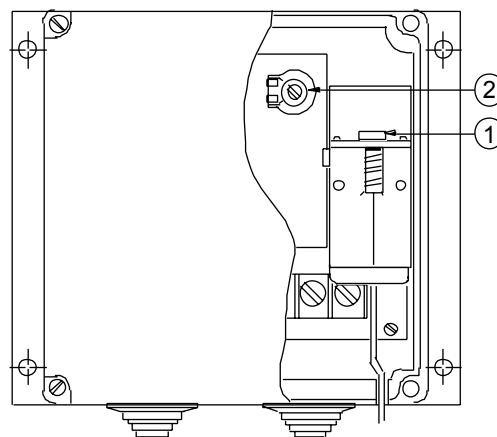


Fig. 3

- 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

## 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.

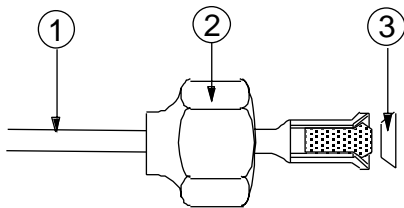
## Type number selection table

Order nr. (bar)	Range (bar)	Element style	Setting (bar)	Prop. band
<b>P215ST-9100</b>	14 to 24	50	16	4
<b>P215ST-9101</b>	8 to 14	50	10	2.5
<b>P215ST-9102</b>	22 to 42	50	30	5
<b>P215ST-9600</b>	14 to 24	51	16	4

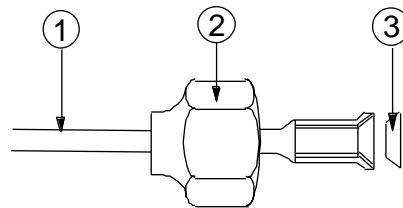
Note: 1 bar = 100 kPa  $\approx$  14.5 psi

## Pressure connections

There are two types of pressure connections available.



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



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

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

## Dimensions (mm)

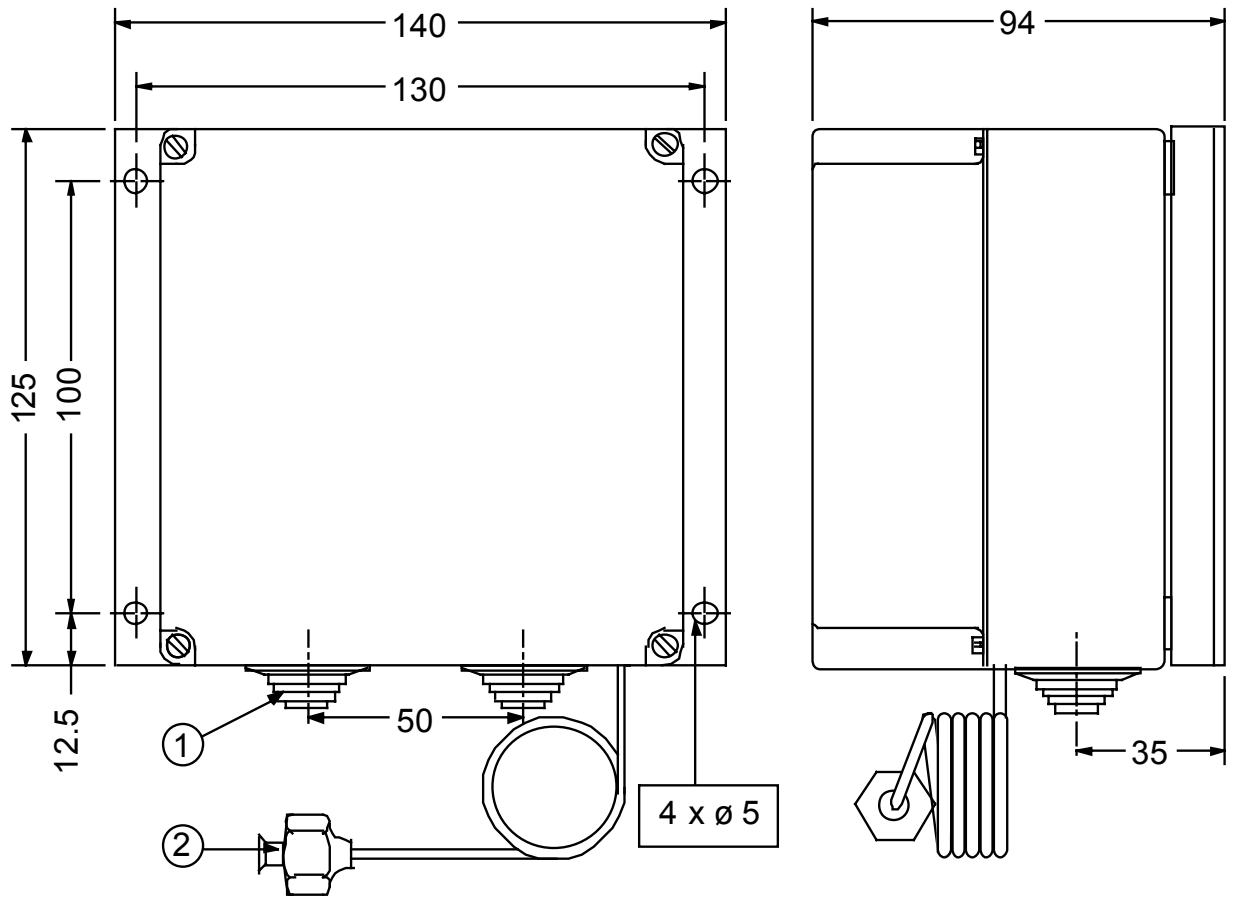


Fig. 6

- 1 cable inlet grommets
- 2 7/16 - 20 UNF flare nut

## Specifications

<b>Product type</b>	<b>P215ST</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	
<b>Control action</b>	direct	
<b>Maximum output voltage</b>	≥ 95 % of supply voltage	
<b>Maximum current</b>	6 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 ± 2 bar
	<b>range</b>	14 to 24 bar = 4 ± 1 bar
	<b>range</b>	8 to 14 bar = 2.5 ± 0.5 bar
<b>Enclosure</b>	<b>electronic module</b>	IP54
	<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>

*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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