

# Phasefale Presscon 4L4H

## Installation and commissioning

### PRESSCON INTRODUCTION

The Presscon 4L4H combines control of suction pressure and condenser pressure of a parallel compressor system with temperature optimising and pressure fault control.

Suction pressure is maintained by switching up to 4 parallel compressors or a single compressor with 3 unloaders to alter capacity according to demand. The intelligent control function decides on the optimum combination of compressors to maintain very accurate suction pressure under any load condition.

A temperature sensor allows optimising of the setpoint once the system has reached the desired temperature.

The condenser pressure is maintained by controlling the fans. Up to four fan groups are cycled on and off allowing accurate control at the programmed pressure. The lead fan is rotated to ensure even wear and extend the life of the fans and condenser.

A Fault output operates if either suction or condenser pressure exceeds its Fault setpoint. The compressors will be switched off for an appropriate time.

The suction and condenser pressures and temperature are displayed on the bright 4 digit LED display. Indicator LED's show which compressors and fans are running and any fault conditions.

Each compressor and each fan also has an override switch with (ON, OFF, and AUTO) positions.

### PRESSCON INSTALLATION

The Presscon should be located to keep the pressure sensor wires as short as possible. Avoid running these wires near high current carrying wires.

The color code of the pressure sensor wires is:

Red: Positive (S1+)  
Black: Negative (S1-)  
White: Signal (S1)

The temperature sensor has no polarity and connects to (S3) and (S3-).

The condensor sensor connects to S1. The suction sensor connects to S2.

The suction pressure sensor should be located to sense the Inlet pipe pressure.

The condensor pressure sensor should be located to sense the discharge pipe pressure. It should be located away from the service valve to avoid pressure pulsation causing fluctuating readings.

The temperature sensor should be located in the refrigerated air entering the cabinet. It may be extended up to 100 meters but make sure any joins are clean, well insulated and kept dry. The fan and compressor outputs should not switch more than 5 Amps. The fan outputs are fused.

### PRESSCON OPERATION

The Presscon 4L4H has one suction pressure sensor, one condensor pressure sensor and one temperature sensor. It will control up to 4 parallel compressors and 4 fan groups.

The display alternates between showing the suction pressure in KPa, the temperature of the cabinet in celcius and the condensor pressure in Kpa. Pressing the > button toggles the display.

The top 4 LED's show which of the 4 fans are on. The outputs may be controlled with the over-ride switch as follows;

ON fan always ON.  
OFF fan always OFF.  
AUTO fan under control of Presscon.

### Programmable Settings - Presscon 4L4H

| Displayed Symbol | Setting                         | Adjustment Range       |
|------------------|---------------------------------|------------------------|
| Prog             | entering program mode           |                        |
| L SP             | suction pressure setpoint       | 30 to 500 KPa          |
| L di             | suction pressure differential   | 5 to 150 KPa           |
| H SP             | condensor pressure setpoint     | Off: 100 to 2000 KPa   |
| H di             | condensor pressure differential | 10 to 200 KPa          |
| OP t             | optimising temperature          | -30 to +20°C           |
| OP P             | optimising pressure             | Off: 5 to 100 Kpa      |
| L C1             | compressor one capacity         | 0 to 10(L, H, U, L, r) |
| L C2             | compressor two capacity         | 0 to 10                |
| L C3             | compressor three capacity       | 0 to 10                |
| L C4             | compressor four capacity        | 0 to 10                |
| L FL             | suction pressure fault          | 0 to 200 KPa           |
| H FL             | condensor pressure fault        | 100 to 2500 KPa        |
| L St             | compressor switching time       | 5 to 250 seconds       |
| H St             | fan switching time              | 5 to 100 seconds       |
| FAN              | number of fan groups            | 1 to 4 fans            |

Press **M** and **>** together to enter programming

Press **↑** to increase setting

Press **↓** to decrease setting

Press **M** to accept and move to next setting

Press **>** to quit programming

The bottom LED's indicate which compressors are running. An override switch with the following positions is available for each compressor;

|      |                                       |
|------|---------------------------------------|
| ON   | compressor always ON.                 |
| OFF  | compressor always OFF.                |
| AUTO | compressor under control of Presscon. |

The fault LED indicates either the condenser pressure is higher than the condenser fault (H FL) setting or the suction pressure is lower than the suction fault (L FL) setting.

If the condenser pressure exceeds the fault setting a fault condition occurs. The compressors will be switched off for 15 minutes and all fans will remain on until the pressure drops below the condenser pressure setpoint.

If the suction pressure falls below the suction fault setting all compressors will be turned off immediately. The compressors will come on again when the pressure rises above the suction pressure setpoint.

The fault relay is normally closed and will open circuit during a fault condition.

To view the settings for each system press and hold the M key until the first setting descriptor, (L SP) is displayed. Release the key and all settings will be displayed in turn. Hold the M key to skip through settings or press the » key to return to normal sensor display.

## PRESSCON PROGRAMMING

Programming mode is entered by pressing the M and » keys together and holding until (Prog) is displayed. Once in programming mode the M key accepts the displayed setting and moves to the next one. If the M key is not pressed the setting will be not be stored. The ↑ and ↓ keys alter the setting and the » key quits programming and returns the presscon to normal sensor display.

Programming settings are shown in order in the table. These settings are stored in memory and will remain unchanged even after power failures.

The compressor 1 capacity setting (L C1) has 2 additional options to allow a single compressor with up to 3 unloaders to be used instead of multiple compressors.

The setting (UL n) refers to a compressor with unloaders which require mains supply to unload. (the unloader outputs are normally open and close when unloading is required).

The setting (UL r) reverses the operation of the unloader outputs so they will open when unloading is required.

If unloading is used the compressor must be connected as compressor 1 and the unloaders as compressors 2, 3 or 4. The settings (L C2), (L C3) and (L C4) are used to program whether these outputs have unloading connected. If 2 or more unloaders are used they are assumed to have equal effect on the compressor. The LED indicators for compressors 2, 3 and 4 refer to unloading active on the respective output.

The presscon operates as outlined below if programmed with unloading except; unloading decreases compressor capacity, and unloading on but compressor off states are not allowed.

## PRESSCON CONTROL STRATEGY

The Presscon 4L4H can be thought of as two controllers in the one unit. The suction pressure and cabinet temperature is used to control the compressors and the condenser pressure is used to control the fans. In the absence of fault conditions these two actions occur independently.

### - Compressors

The suction pressure is continuously monitored and if it moves above the suction pressure setpoint (L SP) the presscon will increase the capacity of the compressors by switching the appropriate units.

If the suction pressure is lower than the suction pressure setpoint (L SP) but by less than the suction pressure differential (L di) the system is running at its desired point and the compressors are not altered.

If the suction pressure falls below the suction pressure setpoint (L SP) by more than the suction pressure differential (L di) the presscon will decrease the capacity of the compressors by switching appropriate units.

The presscon uses the relative capacity of each compressor and a time delay to effect changes in compressor capacity.

The 4 settings (L C1), (L C2), (L C3) and (L C4) are programmed with a relative capacity for each compressor (if unloading is used see programming section). This gives the presscon the ability to calculate the smallest increase or decrease of capacity from any given state allowing a smooth and accurate control of suction pressure.

The Compressor switching time (L St) is the time in seconds that any further changes in capacity are forbidden after a change.

Note that the switching time acts as a minimum cycle time and should be set to avoid possible excessive switching of the compressors.

The logic the presscon uses to control the compressors is as follows;

(a) No change is allowed until the appropriate time (L St) has passed since the previous change.

(b) The compressor capacity is calculated by adding the capacity settings (L C1), (L C2), (L C3) and (L C4) of those compressors which are running.

(c) Changes in compressor capacity are always made to the next highest or lowest possible compressor capacity available from the possible combinations of compressors on and off.

(d) If more than 1 combination of compressors gives the required compressor capacity, the combination which requires the least changes from the current state will be selected.

(e) If 2 or more combinations equally pass tests (c) and (d) above then the appropriate compressor which has not been switched for the longest period of time will be switched.

(f) If 2 or more combinations equally pass tests (c), (d) and (e) above the combination will be selected randomly.

NB: If compressor capacities are equal, this has the effect of rotating compressors.

The temperature optimising function is used to raise the suction pressure setpoint if the temperature of the cabinet is down to its required temperature. This allows more economical operation of the refrigeration system.

The temperature optimising comes into effect when the temperature sensor has

been below the optimising temperature (OP t) for more than three minutes. The optimising indicator will flash and the effective suction pressure setpoint is raised by the amount of the optimising pressure (OP P). If the temperature increases above the optimising temperature (OP t) then temperature optimising ceases immediately and the suction pressure setpoint (L SP) is used as the control point.

### - Condenser fans

The condensor pressure control action is achieved by cycling the condensor fans on and off.

If the sensor pressure is higher than the setpoint pressure, the fans will be turned on one at a time. The programmable Fan Switching time determines the time between each fan coming on.

If the sensor pressure falls below the setpoint pressure by more than the differential, fans which are on will be turned off one at a time. The Fan Switching time also determines the time between each fan going off. If the sensor pressure is below the setpoint pressure, but by less than the differential the fans will stay as they are.

Ideally a condensor with 4 fans could operate normally with say 2 fans on and 2 off. Therefore if the load increases the Presscon can bring on the extra fans or if the load decreases the Presscon can turn the fans off. If the Fan Switching time (H St) is selected to match the typical time response of the system then an accurate multistage control will result.

For example: If the system is running on 2 fans when the load increases and the pressure rises above the setpoint. The first response of the Presscon is to bring on the third fan. If this brings the pressure back below the setpoint then accurate pressure is maintained.

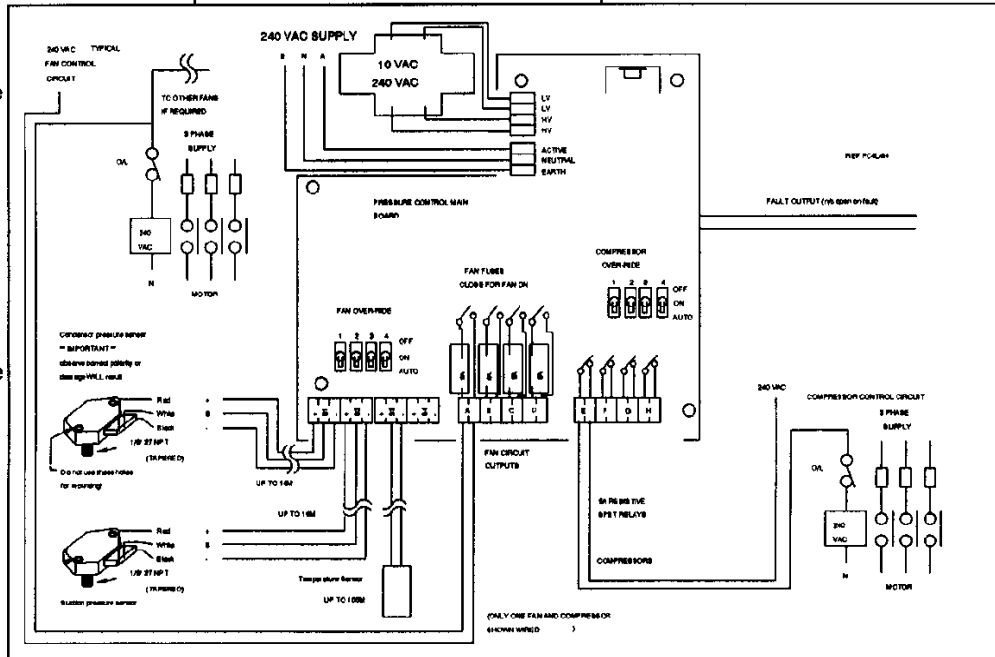
If after the Fan Switching Time the pressure is still above the setpoint then the fourth fan will be turned on providing maximum airflow through the condensor. The same procedure in reverse applies to turning the fans off using the Fan Switching Time.

A rule of thumb to use in setting the delay is: i) If they are too quick the control will overreact and the pressures will overshoot and undershoot for minor changes in load or oscillate around the setpoint. ii) If they take too long the con-

### - Condenser Faults

The Fault setting should be set to the pressure considered a high pressure fault. The compressor cutout time is 15 minutes.

In addition, whenever the pressure reaches the condensor pressure fault level, all fans come on without the normal Fan Switching Times.



rol will be slow to respond to major changes in load and the pressure will move a long way from the setpoint before the control reacts sufficiently.

The best delays to use will depend on the time characteristics of the system being controlled.

An initial setting for a typical system may be in the range:

Fan Switching Time 5 to 30 seconds

Because of the accuracy of control offered by the Presscon the differentials may usually be kept very small, for a typical system:

Differential 20 to 50 KPa

The Setpoint should be set to the optimum pressure required for the particular compressor.