HEVAC Control Agencies

DPFC

COMBINED TRIPLE LOOP 2 x STAIRWELL & RELIEF PRESSURE CONTROLLER

Features

- 3 INDEPENDANT P + I 0-10vDC Input / Output CONTROL LOOPS
- PRESSURE SENSORS (0-10vDC) INPUT Pa RANGE CONFIGURABLE
- COMMON RUNNING SCREEN WITH ALL I/O, *makes total system monitoring easy*
- CLEAR PLAIN ENGLISH L.C.D MESSAGE'S OF INPUT & OUTPUT STATUS
- SETPOINTS, P+I SETTINGS etc SITE ADJUSTABLE USING KEYPAD & MENUS
- AUTOMATIC (*optional use)* SETPOINT SHIFT ALGORITHM BASED ON LOAD *greatly assists commissioning & tuning system to meet open/closed door demands.*
- PRESET WITH TYPICAL FIRE MODE FAN SPEED CONTROL PARAMATERS.
- SMALL SWITCHBOARD FOOT PRINT, 6 MODULE SIZE DIN RAIL MOUNT

Use

The DPFC has been specifically developed as a purpose built building fire mode pressure controller, for controlling pressure in up to two stairwells and a lobby / corridor pressure relief system. Multiple differential pressure sensors in each stairwell and the lobby relief system, connect to this module (via suitable external signal selectors) to determine system pressures. The measured pressures are compared to their relative operating setpoints, and P+I controlled 0-10vdc output signals are generated to control their respective VSD driven fan speeds. This allows the VSDs to be quickly commissioned & left with basic operating settings, enabling quick system commissioning & parameter editing to be easily made in one convenient location at the switchboard. The controllers running screen can be set to display all I/O on one very handy summary screen to monitor overall system performance or set to an individual loop to display at a higher resolution. The DPFC incorporates the very successful tried & proven Hevac developed **HASS** *algorithm (**Hevac Automatic Setpoint Shift)** which is a powerful feature that automatically shifts the operating pressure setpoints based on load (demand), to greatly assist meeting the often different operating pressure setpoint requirements to satisfy both the door pull & open door velocity tests, a feature not seen in VSD parameters when they are used & setup with fire mode pressure control functions. We at Hevac believe VSD's should be set to perform just speed control & leave control functions to purpose built & engineered controllers, which make service & commissioning a far easier process.*

Power supply	Operating Voltage	16- 24 Volts AC or DC
	Power Consumption	
	At 24vDC Volts	MAX. 100mA
	At 24vAC Volts	3 VA
	Y Output load	1mA Max.(typically upto 3 VSDs per Y Output)

Input / Output

X1 is the loop 1 input with Y1 as its controlled output (STAIRWELL 1)
X2 is the loop 2 input with Y2 as its controlled output (STAIRWELL 2)
X3 is the loop 3 input with Y3 as its controlled output (LOBBY RELIEF)

Analogue Inputs

X1, X2 & X3   0-10vDC in reference to power supply Neutral. G0 or M

Digital Inputs

D1 : Standby / Run mode select (for interlock to 24v neutral / ground)
N/C (to M) **= Standby Mode**, Y O/P's can be set to settle at (start from) 0 or 10v
DEFAULT=10v *Starting at 10v reduces time to kick system into fire mode speed*
N/O (to M) **= Fire Mode** , Active modulating Y outputs to maintain Setpoints

Communication

Terminal's X5, X6 & X7 for **possible future** RS485 MODBUS communication.

Output Indication

LCD Display   2 x 16 character LCD

Parameters

Set point Setting Range   5 ~ 99 pascals in 1pa Increments
DEFAULT X1/Y1 & X2/Y2 Setpoints = 30 pascals. X3/Y3 = (-) 20 pascals

Sensor 0-10vDC input range   10 to 500 pascals
DEFAULT 10v = 100 pascals

Running screen increments   2 digit for for X Input & Setpoint : 0~99 pa
                                 3 digit for Y output level : 0~100%

Y1/Y2/Y3 Proportional Band   5 ~ 200 pascals
DEFAULT = 100 pascals

Y1/Y2/Y3 Integral action   Off - 60 seconds in 1 second intervals, then
DEFAULT = 10 seconds   in 1 minute intervals upto 60 minutes

Y1/Y2/Y3 Output Voltage Range 0-10vDC
Y Outputs Minimum & Maximum range individually adjustable 0-100%
DEFAULTs, MIN = 0% & MAX = 100%

(HASS)
Automatic Setpoint Shift Capability

Automatic Setpoint Shift Function : Individual Yes / No for each Y O/P
DEFAULT = NO

Setpoint Shift Trigger Point   : 1.0 to 9.0 based on Y output volts
DEFAULT = 4 volts (40% Y output)

S/P Shift Up / Back hysteresis   : 0 to 2 volts (based on Y O/P)
DEFAULT = 0.5 volts

Added setpoint shift range   : 0 to 30 pascals
DEFAULT = + 5 pascals

MIN / MAX OUTPUT (Y) VALUES

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Mn 0%  Mn 0%  Mn 0%
Mx100% 100% 100%
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With this menu displayed, Press the [ENTER] button to enter this menu to edit of the Y minimum & maximum voltage output limits for each of the 3 control loops Y1, Y2 & Y3. Press the [▲] or [▼] buttons to edit the existing minimum output voltage for loop 1 (Y1) Press [ENTER] to accept the value & move onto Y2's minimum setting and repeat above procedure to also set Y3's minimum setting. After the 3 minimum output setting has been set the display will move to Y1's maximum output setting. Repeat procedure above to set all 3 maximum output settings. AfterY3 maximum setting is set the display will return to this menu heading. Press [↵] to return to the running screen or use the [▲] or [▼] buttons to move to another menu for editing.

The controller will operate either in a Standby state or Active Fire mode as set with a fire alarm interlock connected to terminals D1 & M. With the digital input D1 connected to M, the controller is put into standby mode, when this interlock is opened, the controller will energise its 3 control loops with P+ I action to control & maintain the systems at design pressures.

STANBY : OPTIONS

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Y O/P in Standby
Mode : 100 %
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With this menu displayed, Press the [ENTER] button to enter this menu to set the controllers Y1, Y2 & Y3 output level whilst in standby mode (fire mode off). The setting option is 0 volts or 10v output. One advantage of starting at 10 volts is the control system will launch the VSD's /fans into full speed mode to quickly establish pressure in the system when the fire mode is instigated, whereas starting from 0v will allow a less aggressive system start up but could take upto ~30 seconds to achieve design pressures. Press the [▲] or the [▼] botton to toggle the choice between the output starting from 0 or 100%. Press the [ENTER] button to accept the set option and return to this menu heading. Press [↵] to exit the menu system & return to the running screen or use the [▲] or [▼] buttons to move to another menu for editing.

Control Output Response

The control loops are set to use P + I action with preset typical settings to give stable but fast control response. These settings govern both the direct response of the outputs in relation to the input values & setpoint plus the speed of correction to achieve setpoint. Ex Hevac, the loops Proportional Bands (P Band) are set to 100 pascals & the Integral action times (I Times) are set to10 seconds. Note keep VSD ramp & down times to a minimum as they fight the controller trying to set the required fan speed ..i'd suggest 10 seconds for VSD ramp & down times. The Proportional Bands sets the direct cause and affect of output change due to input change (when at or below setpoint) and needs to be set wide enough to not cause hunting but low enough to give an instant reasonable output reaction. Proportional control by itself does not eliminate offset of input to the setpoint, it only gives a proportional relative output response. Integral action is used to automatically increase output (based on what the P-band is producing) to cause more correction and thus force the output to produce enough signal level output (over time) to eliminate error (difference) between the input value and the setpoint. If the fan speed constantly hunts (changes) up and down and wont settle, increase the P Band setting, if the system seems to produce too little response to change of pressure - decrease the PB. Ideal settings are gained with experience and trial & error, but in my experience you should never need to set PB lower than 80 pascals or higher than 150 pascals. If the control system is stable but taking too long to eliminate the error (difference between actual pressure value and the setpoint) reduce the integral action time , but do not set less than 5 seconds. If the system seems to be over reacting its error correction, increase the integral time setting but in most cases the ex-hevac settings of PB=100 & I-Time =10 seconds, should give good control and not need altering.

TYPICAL CONNECTION DETAIL WITH ONE COMMON RELIEF DUCT PRESSURE SENSOR AND MULTIPLE SIGNAL SELECTED STAIRWELL DIFFERENTIAL SENSORS.

D1 & M CONNECTED = STANDBY MODE
D1 & M OPEN CIRCUIT = FIRE MODE
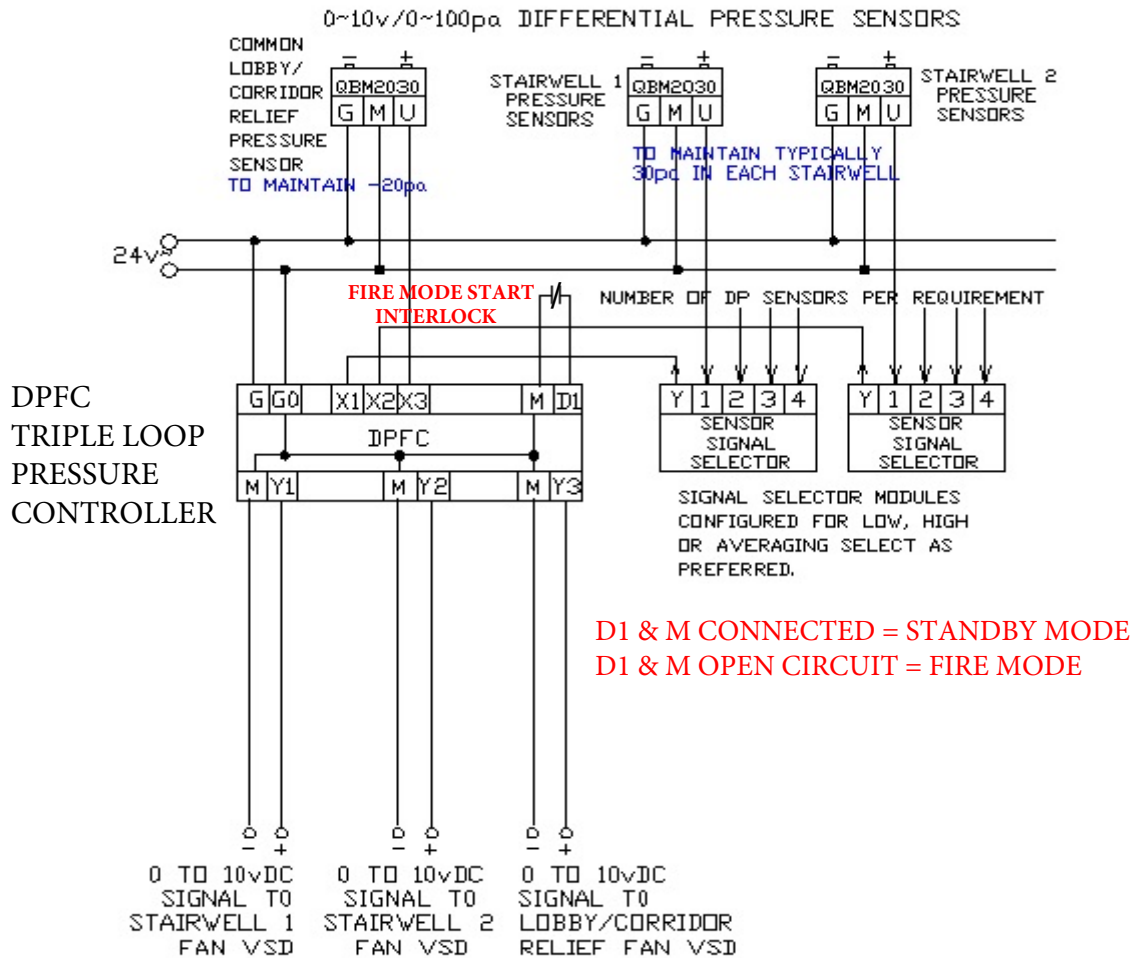
TYPICAL CONNECTION DETAIL WITH MULTIPLE FIRE AFFECTED FLOOR DIFFERENTIAL PRESSURE & STAIRWELL SENSORS.