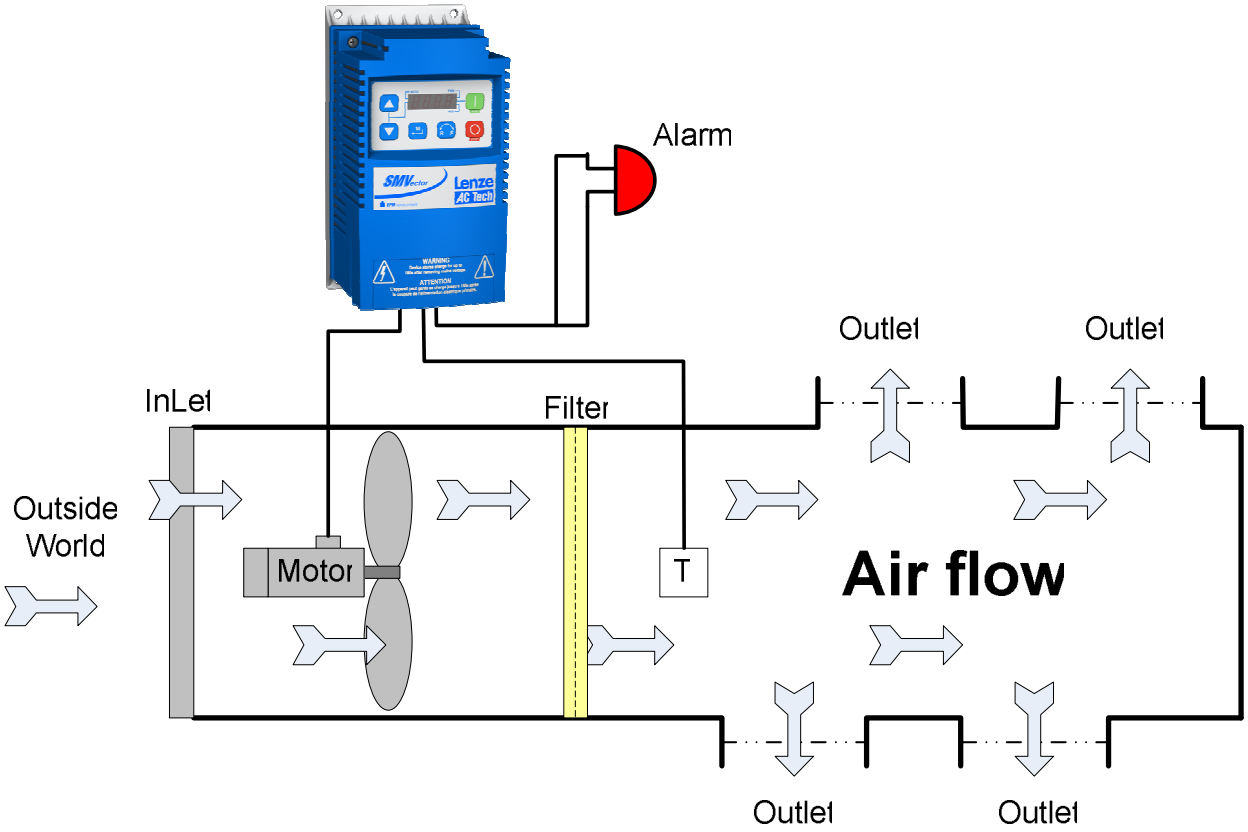
SMV
PI Control Example:
Typical HVAC Fan Application.

This document is relevant to all variants of the SMV drive.

Application Description:

A diagram of a typical HVAC fan application is shown below.



Air is drawn in through the inlet from the outside world and into the central (main) duct by the motor / fan. This air is passed through a filter before the clean air is distributed through several outlets to the different locations around the room / office / building.

The motor / fan is connected to an SMV drive. The SMV controls the speed of the motor / fan in order to keep the volume / pressure of air delivered through the ducting system constant.
The air pressure is detected by the Transducer (T) and is fed back to the SMV drive. The air filter inside the central duct will gradually become blocked and the transducer detects this as the air pressure on this side of the filter gradually drops. The SMV drive then compensates by increasing the motor / fan speed to maintain the constant air pressure in the system.
When the filter becomes overly blocked the SMV will activate an alarm to indicate that the filter must be changed.

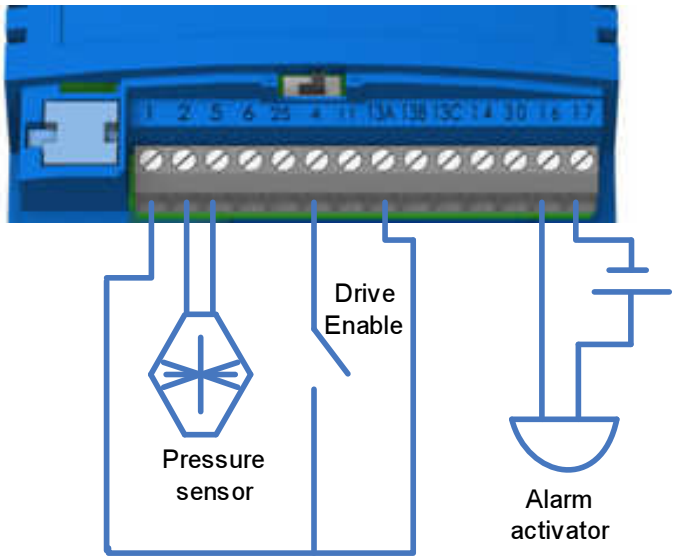
The air Pressure sensor measures the air pressure in millibar (mbar) and has a range from 10 to 160 mbar. The air pressure sensor output is 0-10V and is connected to the SMV analogue reference input. The output signal from the air pressure sensor decrease linearly as air pressure decreases.

Technical Guide

The fan / motor system needs to deliver a constant 80 mbar through the ducting system. If the feedback from the air pressure sensor drops below 60 mbar then the SMV should activate its output relay to sound the alarm and indicate the filter is blocked / saturated.

The minimum frequency for the drive motor should be set to 15Hz to protect the motor against prolonged operation at low speed.

SMV Control Circuit:



Parameter Table:

Parameter	Description	Set Value	Comments
P100	Start control source	1	Start control source from drive terminals
P101	Analogue Input Configuration	1	Set Analogue Input Configuration to 0 – 10V
P102	Minimum Frequency	15	Set SMV minimum output frequency to 15 Hz
P121	TB-13A Input configuration	3	Preset PID Setpoint 1
P140	Relay Output Configuration	23	PID Feedback outside min/max alarm (**P**214, **P**215) range
P200	PID Mode	1	Set PI Mode to Normal acting.
P201	PID Feedback Source	1	0-10VDC (Terminal 5)
P204	Minimum Feedback	10	Minimum PI Feedback Level
P205	Maximum Feedback	160	Maximum PI Feedback Level
P207	Proportional Gain	#	Tune Proportional Gain to Required Value
P208	Integral Gain	#	Tune Integral Gain to Required Value
P210	PID Setpoint ramp	#	Set Ramp Rate for PI Setpoint to Required Value
P214	Feedback Minimum Alarm	60	Min Feedback Trigger Level (Digital / Relay Out)
P215	Feedback Maximum Alarm	150	Min Feedback Trigger Level (Digital / Relay Out)
P231	PID Setpoint	80	PI Reference value (set in mbar)

Parameter Setting Notes:

Tune **P**207 (Proportional Gain) and **P**208 (Integral Gain) to the required value to suit the application. Lenze application guide LenzeDS04 gives guidance on tuning the PI control.

Set **P**231 to the required PI Setpoint. In this application the required air pressure was 80 mbar and we configured the minimum and maximum feedback parameters (**P**204, **P**205) so that units are input in mbar. Therefore this parameter can now be set directly to a value of 80.

P204 and **P**205 (minimum / maximum feedback levels) are set to scale the feedback into mbar units. The sensor output is from 10 mbar up to 160 mbar so **P**204 / **P**205 are set accordingly.

Set parameter **P**200 to a value of 1. This enables the PI control to be normal acting. In Normal Acting Mode speed decreases when the feedback (terminal 5) exceeds the setpoint. For this application, this means that when the filter blocks and the pressure / transducer voltage drops the output speed of the SMV increases.

Set **P**214 (feedback minimum alarm) to 60 mbar. Set **P**215 (feedback maximum alarm) to 150 mbar.The result of this is that when the transducer feedback falls below 60 mbar then the output relay on the SMV will activate (see parameter **P**140, set to 23) indicating that the pressure has dropped to low (most likely due to a blocked filter).

Should pressure increase above 150 mbar then the output relay will also activate to indicate over-pressure (i.e. blocked outlets).

As with the PID Setpoint (**P**231) this value has been scaled by the setting of minimum and maximum feedback parameters (**P**204, **P**205) so that units are input in mbar.