Pressure Guard and Filter Guard FV51X

for pressure monitoring and min./max alarm of

Lean Process Ventilation

The Manual contains:

- General introduction to Lean Process Ventilation
- FV process ventilation controllers
- Installation guide to FV51X

From software edition 2.2

1. Lean Process Ventilation

Process ventilation has 2 main objectives:

- remove dust and fumes at the source
- provide fresh clean air for the operators.

Both objectives must be met at minimum investment costs and operation costs.
Flow rates for extraction air and substitute inlet air and heating and energy consumption are minimized.
No air or energy is wasted.
We call this **Lean Process Ventilation**.

Lean Process Ventilation plants have the following **characteristics:**

- All dust and fume are extracted at source
- Air extractions are only active when necessary
- Air flows are controlled according to demand
- Air pressures are controlled to minimum level
- Balanced Room air and inlet air
- Plant capacity is designed for average necessary extraction flow, after demand
- Air extractions are monitored with alarm limits.

Lean Process ventilation plants are designed according to an approved simultaneity factor that again is based on a calculated demand factor for the plant.
Many plants have a demand factor below 25% because the operator or machine only is polluting (e.g. welding) less than 25% of the time.

Lean Process ventilation also has a number of **secondary advantages**, such as

- minimum size for ventilation components
- minimum air noise
- minimum draught in operation zones

because of much lower air volumes and velocities.

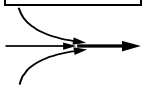
The saving in plant size and component costs normally more than pays for the extra control elements.
Investment in efficient control elements pays for itself!
A Lean Process Ventilation plant is cheaper in both investment and operation than a conventional plant!

2. Applications

The principles of Lean Process Ventilation is applied for various industrial applications, such as:

Automotive exhaust gas extraction from personal cars and commercial vehicle.

Welding Fume and grinding fume extraction in production facilities



Material Transport of powder and dust and chips within metal and wood industries

Fume Hood and spot extraction in pharmaceutical and food industry laboratories

Exhaust gas extraction from modern cars and vehicles becomes increasingly complex and requires still more specialised **extraction nozzles**, with various openings and activation methods, to ensure a good grip. Process extractions in vehicle repair workshops or in car inspections are controlled according to demand, with signal from hose reel or suction rail.

For welding extraction the demand factor is typically 20-25%, and the simultaneity factor often 30-40%.
This implies that a plant for 10 welders only requires 3-4000 m^3/h extraction against standard 10.000 m^3/h!
Fans, frequency inverters, filters, dampers and air ducting only need to be about 35% of standard size.

In **Laboratory Fume Hoods** the extraction flow is regulated to maintain a constant face velocity independent of actual sash height. This implies large variations in flow rates, which must be balanced by room extraction and fresh inlet air.

Most process extraction plants are controlled to constant suction pressure, by means of frequency inverter or regulation damper with fixed setpoint. **Inlet air** and **room air** extractions are balanced with process extractions by means of slave control or feedback regulation**,** with variable setpoint, calculated from 0-10V signals from one or more process extraction flows.

3. Applications for controllers

FV controllers are applied for:

- On/off control of air extraction dampers or fans
- Feedback fan speed regulation of air pressure
- Feedback fan speed regulation of air flow
- Feedback regulators with fan speed Sumbox
- Regulation of electric and pneumatic dampers
- Regulators for zone room-pressure control
- Control of balanced inlet air and extraction air
- Regulators for air extraction hoods
- Pressure and flow transmitters with alarm

and is thereby the following **dampers**:

- Electric dampers for on/off control
- Electric dampers for regulation
- Pneumatic dampers for on/off control
- Pneumatic dampers for regulation
- Powerbox with 24V power supply

Furthermore, the controllers can regulate fans with **frequency inverter**, or DC motors, via 0-10V signal.

FlexValve Control produces and supplies all necessary control elements for Lean Process Ventilation, and can be connected to all standard types of frequency inverters, electric dampers and pneumatic dampers.

4. Airflow Controller Models

The FV-controller program contains 5 models of **controllers** with 12 different software versions:

- FV50X **PowerBox** on/off control and power supply
- FV51X **Pressure Guard** with min/max alarm
- FV52X **Pressure/Flow Transmitter** with:
  - V520 Monitor and transmitter with alarm (5000Pa)
  - V620 Monitor and transmitter with alarm (1000Pa)
- FV56X **Process Airflow Controller** with:
  - V530/V630 Regulator with flow transmitter
  - V540/V640 Regulator with 3 power sensors
  - V550/V650 Regulator with 3 setpoints
  - V520/V620 Pressure and flow transmitter
  - V660 Regulator with Fan speed sumbox (1000
- FV68X **Laboratory Comfort Airflow Controller** with:
  - V680 Laboratory Fume Hood regulator (1000)
  - V630 Regulator with flow transmitter (1000 Pa)
  - V650 Regulator with 3 setpoints (1000 Pa)
  - V660 Regulator with Fan speed Sumbox (1000)
  - V670 Regulator with Flowmeter Sumbox
  - V675 Regulator with Flow rate Sumbox
  - V620 Pressure and flow transmitter (1000 Pa)

as indicated in Table 1 below.
The software versions are described on page 4 –11. FV50X is recommended for on/off control, and FV56X is ideal for standard ventilation with balanced flows.

Table 1: FV-Software programs

Name	Monitor – Control - Regulating	Pressure range (Pa)	Control Principle	Output Signal 0-10V	FV-Controller models			
					FV 51X	FV 52X	FV 56X	FV 68X
V510	Pressure Guard with min/max alarm	5-5000	Alarm	(Alarm)	X			
V520	Pressure/flow Monitor and Transmitter	5-5000	Transmitter	Press.+flow		X	X	
V620	Pressure/flow Monitor and Transmitter	1-1000	Transmitter	Press.+flow		X	X	X
V530	Feedback regulator with flow transmitter	5-5000	PID feedback	Control+transmit			X	
V630	Feedback regulator with flow transmitter	1-1000	PID feedback	Control+transmit			X	X
V540	Feedback regulator with 3 power sensors	5-5000	PID feedback	Control+slave			X	
V640	Feedback regulator with 3 power sensors	1-1000	PID feedback	Control+slave			X	
V550	Feedback regulator with 3 set points	5-5000	PID feedback	Control+slave			X	
V650	Feedback regulator with 3 set points	1-1000	PID feedback	Control+slave			X	X
V660	Feedback regulator w/ fan speed sumbox	1-1000	Variable PID	Sumbox + control			X	X
V670	Feedback regulator w/ flowmeter sumbox	1-1000	Variable PID	Sumbox + control				X
V675	Feedback regulator w/flow rate sumbox	1-1000	Variable PID	Sumbox + control				X
V680	Laboratory Fume Hood regulator	1-1000	Variable PID	Sash height + control				X

X" indicates that a software program is available in the actual FV-controller model. Controller FV50X has no pressure sensor and no microprocessor

5. Installation of FV51X as Pressure Guard or Filter Guard

Controller FV51X is applied for **Pressure Monitor and Pressure Guard** for process ventilation plants. The min. and max. alarm limits are selected according to the desired pressure level in the extraction or air inlet plant.

3.1. Installation and start.

The following start up procedure is recommended for feedback regulation:

- 230 V supply is connected to slot N, L and perhaps PE
- *Alarm* contact T3 starts and stops the alarm function, and is normally connected to an external start/stop contact (e.g. on fan starter). Alternatively T3 is closed permanently with a wire
- Green or red alarm diode will light when T3 is activated
- Connect one pressure sensor tube to the ventilation ducting, or two sensor tubes to each side of a flow meter.
- Enter min. and max. alarm limits into P02 and P03 .
- T7 submits 24V DC alarm when alarm limits are exceeded.
- The alarm voltage-free contacts (C, NO and NC) can be connected to a serene or a alarm lamp (max 2 W) with own power supply (up to 230 V)
- Battery Back up (with build-in alarm) can be connected to 24V DC exit plus terminal 7 for alarm signal.
- Vacuum pressure is monitored from pressure sensor (-) and over pressure (compared to atmospheric pressure) is measured from pressure sensor (+).

Display in FV 51X shows the measured pressure (or pressure difference) together with minimum (P2) or maximum alarm limit (P3).

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3.2. Parameter setup and adjustments

- The display shows minimum alarm limit in upper line, and the maximum alarm limit in lower line, together with the monitored pressure or pressure difference.
- Press Enter to open the menu for change of minimum or maximum alarm limits.
- When "Min" or "Max" texts are blitzes than the value are open for adjustment, via the menu.
- Press "Enter" to store the selected values.
- The pressure monitor operates in interval 5- 5000 Pa.
- The alarm lamp or serine is activated ca 10 sec after the alarm limit has been exceeded.

3.3. Alarms and maintenance

- The alarm function is activated when the monitored pressure or pressure difference is below minimum limit or above manimum limit.
- Actual pressure and set point is read in display
- Adjust low and high alarm limits in P02 and P03.
- Press (indicator up) bottom to stop the alarm sound.
- Press ESC bottom for over 10 sec to test the alarm.
- Battery-backup with alarm is mounted on T7 and 24V exit.