



## 06 - FRL units

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Once air is compressed it is necessary to process it in order to improve its quality. The air quality is measured in classes according to ISO 8573-1 standard, where the three types of contaminants that could effect pneumatic equipment life:

- quantity of water particles dissolved in the air
- quantity of oil particles dissolved in the air
- quantity of solid particles in the air

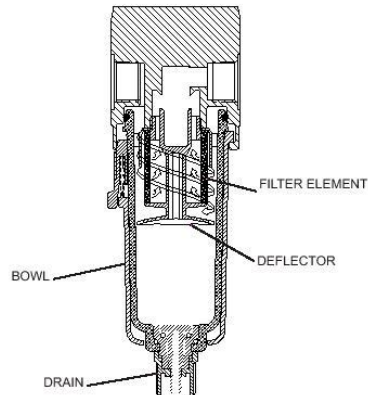
| CLASS | SOLID PARTICLES       |  | TEMPERATURE                           | OIL QUANTITY                                   |
|-------|-----------------------|--|---------------------------------------|--|
|       | Maximum particle size | Maximum concentration (mg/m <sup>3</sup> ) | Maximum dew point under pressure (C°) | Maximum oil concentration (mg/m <sup>3</sup> ) |
| 1     | 0,1                   | 0,1  | -70                                   | 0,01   |
| 2     | 1                     | 1  | -40                                   | 0,1  |
| 3     | 5                     | 5  | -20                                   | 1  |
| 4     | 15                    | 8  | 3                                     | 5  |
| 5     | 40                    | 10   | 7                                     | 25   |
| 6     | /                     | /  | 10                                    | /  |
| 7     | /                     | /  | /                                     | /  |

| USE                  | Class | (mm)       | Class | °C        | Class | mg/m <sup>3</sup> |
|----------------------|-------|------------|-------|-----------|-------|-------------------|
| Mining industry      | 5     | 40         | 7     | /         | 5     | 25                |
| cleaning and washing | 5     | 40         | 6     | +10       | 4     | 5                 |
| Welding              | 5     | 40         | 6     | +10       | 5     | 25                |
| Machine tool         | 5     | 40         | 4     | +3        | 5     | 25                |
| Pneumatic cylinders  | 5     | 40         | 4     | +3        | 2     | 0,1               |
| Pneumatic valve      | 3 ÷ 5 | 5 ÷ 40     | 4     | +3        | 2     | 0,1               |
| packaging            | 5     | 40         | 4     | +3        | 3     | 1                 |
| measuring equipment  | 2     | 1          | 4     | +3        | 3     | 1                 |
| Bearings             | 2     | 1          | 3     | -20       | 3     | 1                 |
| Sensors              | 2     | 1          | 2 ÷ 3 | -40 ÷ -20 | 2     | 0,1               |
| Food                 | 2     | 1          | 4     | +3        | 1     | 0,1               |
| Photografic          | 1     | 0,01 ÷ 0,1 | 2     | -40       | 1     | 0,01              |

The correct functioning of a pneumatic plant is also maintained through the use of FRL units, comprising a filter, a pressure regulator and a lubricator positioned before the pneumatic equipment.

### FILTER

This component is used to eliminate vapour particles, dust, solid particles, corrosive gasses, oil vapours etc from the air.



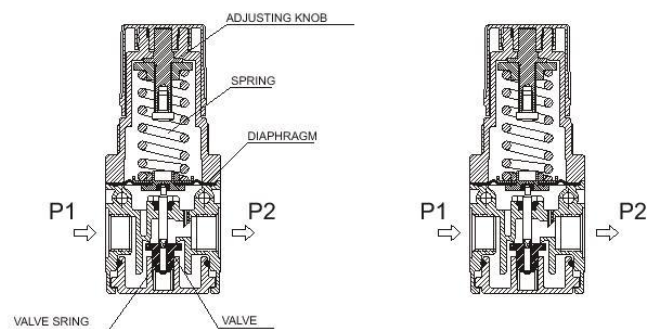
In the bottom of the bowl there is a device which is used to drain the particles which have been extracted from the air. This device can be automatic or manually operated, in case of the manual version it is important to ensure that the condensate level does not reach the deflector as it would be sucked back into the air line.

Subsequently the dried air goes through a filter element which blocks further particles; the element is made of a porous material which, depending on the size of the particles it blocks, can be classified as a 5µm - 20µm - 50µm element.

Another type of filter is based on a double filtering action system (called a **two stage system**) and is capable of removing up to 99.7% of the organic and inorganic solid particles from the air and facilitates the agglomeration of liquid particles into drops that subsequently fall to the bottom of the bowl. Such units are called coalescing filters.

### PRESSURE REGULATOR

Enables the regulation, reduction and stabilization of the air pressure in the pneumatic circuit; adapting it to the requirements of the equipment to be supplied.



Compressed air pressure, both in reservoir and pipe lines, is continuously subjected to variation and fluctuation caused by inconsistencies in consumption and by irregular operation of compressors. Therefore, it is always necessary to regulate the air pressure in order to reduce it to the required values and to level it to a more constant supply.

Screwing and unscrewing the adjusting knob generates an increase or reduction of the regulated pressure.

**RELIEVING:** pressure regulators normally incorporate what is called the RELIEVING function, a system that exhausts any over pressure (pressure above the regulated pressure) that might build up (for example under the force generated by an external actuator) in the down stream part of the circuit.

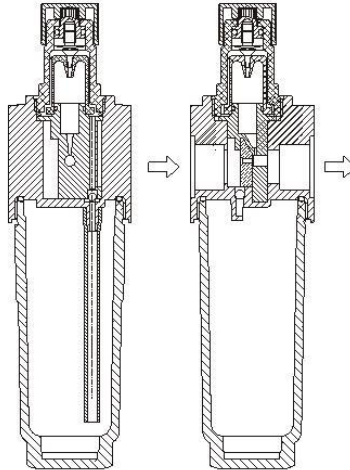
All regulators are fitted with a threaded connection for a pressure gauge to indicate the regulated pressure level.

Pneumax Spa's product range also includes a pressure regulator which integrates the gauge directly in the regulating knob, thus reducing envelope size and assembly costs when compared to a traditional regulator & gauge assembly.

Furthermore Pneumax has designed a dedicated bayonet coupling system which enables the assembly of a series of regulators (both traditional and with integrated gauge) which can thereby be supplied with a single air supply.

**LUBRICATOR**

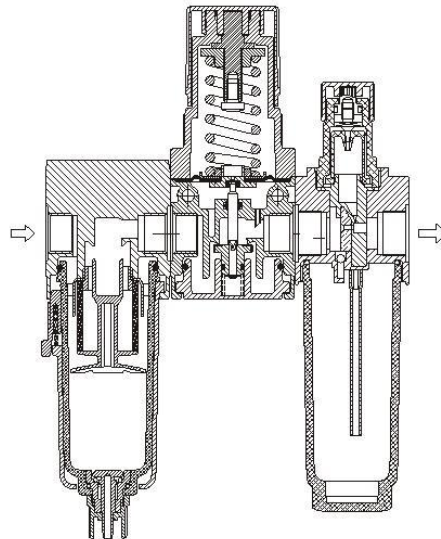
Under normal working conditions Pneumax equipment does not require additional lubrication. Only in specific conditions, and in cases where the prelubrication applied to the sliding components during production is removed, it is necessary to use additional lubrication. The air that passes through the lubricator automatically draws nebulised oil, via a venturi, which subsequently deposit on the pneumatic equipment internals. The lubricator is ideally mounted as close as possible to the components which require lubrication in order to prevent oil deposits in the air lines.



**FRL GROUPS**

The FRL group includes the three items described earlier assembled in sequence; Filter, regulator, lubricator.

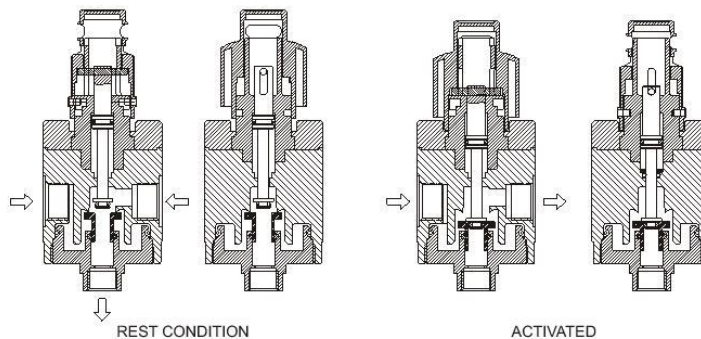
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## SHUT OFF VALVE

A 3/2 way N/C poppet valve, normally manually operated, which is used to allow or block air flow into the FRL group (always fitted before an FRL group).

A lockable version, to be used with a pad lock, is available in order to prevent accidental operation.

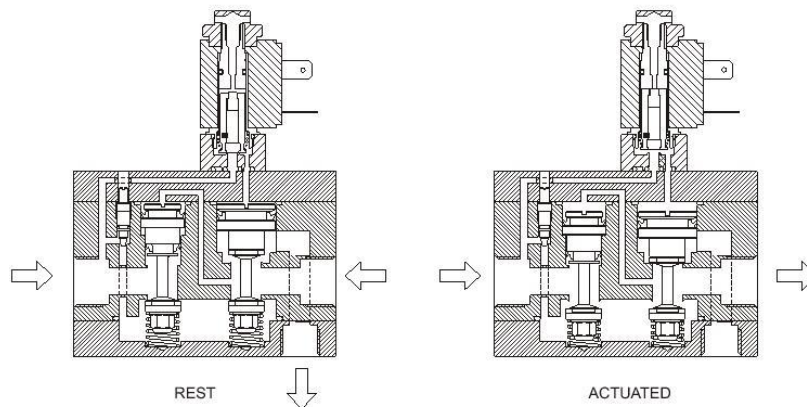


## SOFT START VALVE

When compressed air is supplied to a circuit there is a short period of time during which the pressure level in the different components connected to the circuit is uneven and needs to be stabilised. This difference in pressure can generate sudden and unforeseen cylinder movements which can be dangerous or damage the machine.

In order to prevent this occurring it is necessary to progressively supply the air into the circuit, at least until a pressure of 3bar has been reached. Above this value it is possible to rapidly increase the pressure.

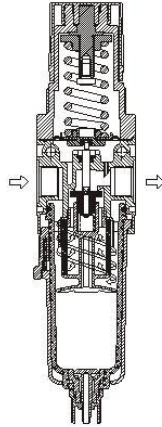
The soft start valve, which can be pneumatically or electrically operated, fitted at the end of the FRL group accomplishes this task.





**FILTER-REGULATOR**

This unit integrates, in one single component the functions of a filter and a pressure regulator. The technical features of this unit combine the features of the two individual components. As shown below the lower part of the unit resembles a conventional filter and offers the same filtration performance as an equivalent stand alone unit. The air then enters the pressure regulator at the top of the unit, where the pressure is regulated and sent downstream. This unit is dimensionally and economically more convenient.



**PRESSURE BOOSTER**

The pressure booster is designed to continuously pump air into the downstream part of the circuit until the pressure reaches a value which doubles the inlet pressure. When this value is reached the unit is balanced and stops pumping. When the downstream pressure drops the booster re-starts, and operates until the balance condition is reached. Pressure boosters can also be fitted with a pressure regulator fitted directly to the inlet connection in order to better regulate the output pressure.

It is important to remember that the pressure booster reaches the 1:2 ratio only when the air consumption is zero, which means that it is possible to put under pressurize a reservoir.

When there is air consumption the boost ratio varies depending on the flow rate and pressures required. Pressure boosters are normally used on application where it is necessary increase the force from a cylinder that can not be replaced with a larger bore. It is therefore necessary to supply the actuator with a higher pressure than the standard line pressure in order to generate a greater force.

This solution allows the use of a single line pressure to the whole machine, increasing it only where necessary.

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The pressure booster compression ratio is 1:2

