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**QUICK GUIDE**

Selecting valves for  
proportional control



## QUICK GUIDE TO: Selecting proportional control valves

Proportional valves are suited to a wide variety of applications in machinery, basic processes and simple or complex hydro-pneumatic systems. They provide a cost-effective and compact solution for controlling flow or pressure at relatively low flow rates.

There are many different designs and styles of proportional valves for varying operating pressures and flow rates, with either electric or electro-pneumatic actuation.

To the uninitiated, there can be a confusing amount of choice.

When choosing the right valve for the job, it is important to understand the demands of the application and the relative merits of each valve type. A respected supplier will work with you to determine the ideal valve, but having a working knowledge of proportional technology will speed up the process, allow you to ask the right questions, and give you an advantage when choosing the best supplier.

In the following guide we'll take you through the main considerations governing proportional valve selection in order to help you make an informed choice.

### Selecting proportional control valves

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Before you can select a valve for proportional control you will need some basic information about your application.

- Are you controlling pressure, flow, temperature or level?
- What are the maximum and minimum pressures that the valve is likely to experience?
- What is the flow range?
- Will the set point be static, dynamic or "step by step", and how do you plan to adjust it?

We'll now assess the various types of valves, their characteristics and typical applications.

## Set points

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### Static set point

A static set point is one that will generally be fixed with infrequent changes.

A typical application would be where a valve is used to control pressure to a cylinder that applies the pinching force – such as spot welding. The pressure will be set dependent on the material type and thickness being welded and will remain fixed until the machine is set up for a different material.

Another application is when a fixed pressure is applied to a component to check for soundness – such as leak testing. The pressure will generally be fixed for a specific type of component but has provision for adjustment when the application is changed.

### Dynamic set point

A dynamic set point is one that changes at a high frequency.

A typical application includes pressure control valves connected to cylinders operating a flight simulator. Signals from the simulator control system constantly adjust the pressure in the cylinders to move the simulator cabin.

Material testing is another common application – in which the pressure output of a valve is steadily increased until the material under test fails.

### 'Step by step' set point

A 'step by step' set point is one that changes at a low frequency.

A typical application is a filling system where, as the container being filled approaches the required fill level, the flow rate is adjusted down so that the final filling happens at a slower rate.

'Step by step' set points are also applicable for the control of gas to a burner on a cooker, for instance – requiring different flow rates of gas dependent on the amount of heat required.

### Adjusting the set point

When selecting a proportional valve, it's a good idea to consider how you will adjust the setting, whether it be a set pressure or a set flow rate.

Some valves enable you to adjust the set point by sending an analogue control signal over the power cables or by using fieldbus communications. Others have a local interface, and some, such as the ASCO Numatics Sentronic<sup>D</sup>, enable you to communicate with the device via a PC and an RS 232 interface.

Having a PC interface often enables a far greater degree of tuning and optimisation to take place, enabling you to get the most out of your process.

## Operator

Proportional valves can be operated by different means such as proportional solenoids, pulsed pilot valves or piezoelectric elements. In addition the valves may be pneumatically operated and controlled by a positioner.

### Proportional solenoids

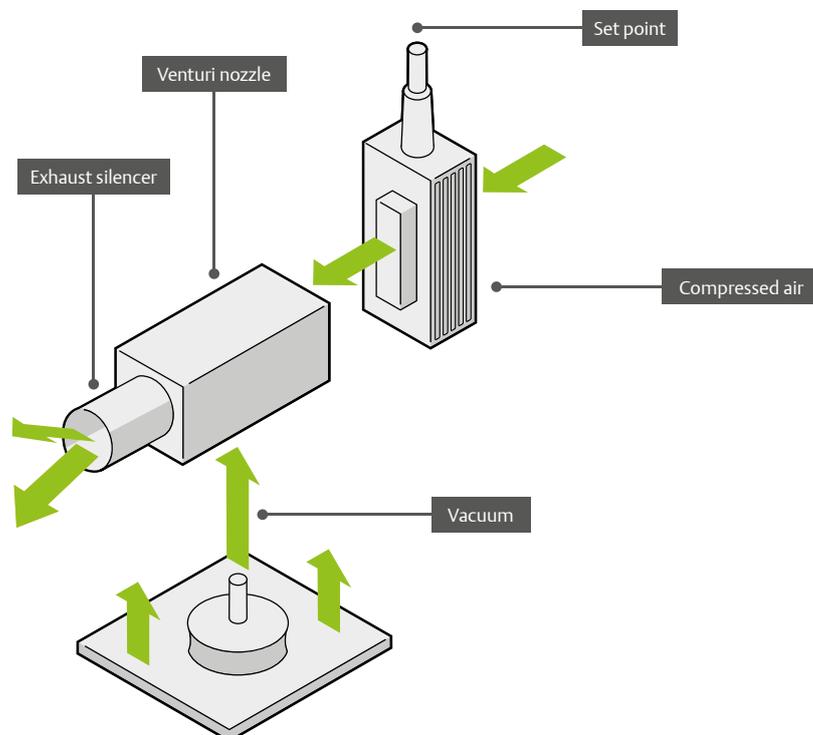
Direct operated proportional solenoids adjust valve position based on a varying voltage across the coil.

The higher the voltage, the greater the magnetic current, and the more the valve spindle moves.

A common operator type, proportional solenoids tend to give short response times and have an extremely low hysteresis.

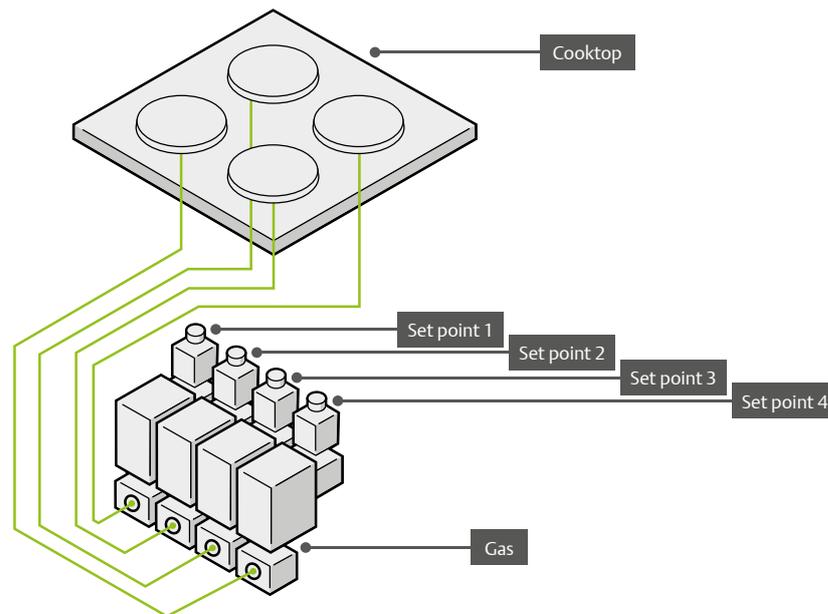
### Vacuum generation

A change of the inlet pressure at the vacuum generator via the proportional valve changes the vacuum generated.



### Gas adjustment

The control unit uses four proportional valves to regulate the gas supply to the four burners.



### Pilot operated proportional valves

Pulsed pilot valves use small solenoid valves that load and unload pressure in a control chamber, allowing the valve to open and close.

With power consumption of less than 2W, pulsed pilot valves are ideal when low power is required.

A typical application of such a compact and low power rating valve is to control the flow of a booster. By using a proportional valve operated by a pulsed pilot valve, a much larger flow can be controlled.

### Piezoelectric elements

Piezoelectrically operated valves are ideal when a very low power consumption is required.

Their highly compact size makes them ideal for use in portable and table top machines such as medical equipment, measuring systems and gas analysers. The valves have very low power consumption and can even be operated by batteries or solar cells.

## Positioner

When looking at larger capacities and larger flow rates it may be necessary to move to a valve fitted with a positioner. The positioner acts as a pilot, enabling air to enter and vent from a diaphragm or a cylinder which enables the much larger valve to operate.

### Proportional valves – quick reference table

Valve type	Specific type	Main characteristics	Typical applications
Set point	Static	Fixed with infrequent changes	Spot welding, leak testing
	Dynamic	Changes at high frequency	Flight simulator, material testing
	'Step by step'	Changes at low frequency	Filling system, control of gas to a burner
Operator	Proportional solenoids	Short response times and extremely low hysteresis	Air/ gas, low vacuum service, precise control of water flow
	Pulsed pilot valves	Low power consumption	Booster control
	Piezoelectric elements	Highly compact	Table top machines, medical equipment, gas analysers
Positioner <sup>D</sup>	Positioner <sup>D</sup>	Highly compact and easily programmable	Dosing (gas, liquid), cooling systems (air, hot and cold water)

## Choosing the right supplier

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We've covered some of the most important aspects of valve selection, but this is by no means an exhaustive list.

In practice there are several additional factors that may need to be taken into account when choosing the right proportional valve for your application.

Many of these decisions will be made in conjunction with a supplier's application experts. So it pays to know what to look for in a supplier. Unfortunately, it's not always immediately obvious. There are hundreds of valves and many companies supplying them, so it can be a challenge to wade through competing solutions.

As a general rule, it's best to seek out a comprehensive and credible manufacturer before a 'quick-fix' merchant selling on price. The process industry in particular should be especially wary of false economy.

Look for a supplier with a broad range of technologies, sizes and operator types. Seek evidence of an established industry position, proven specialist knowledge and long-term customer relationships. But don't go on name alone.

A well-known brand is important, but you should be satisfied your potential partner has the in-house expertise to specify the perfect solution, regardless of application, flowing media or conditions.

'Good enough' rarely is. Don't settle for anything less than exactly what you need.

To find out more, or to request a brochure on proportional valves, please visit [www.asconumatics.eu/proportional-technology](http://www.asconumatics.eu/proportional-technology)

