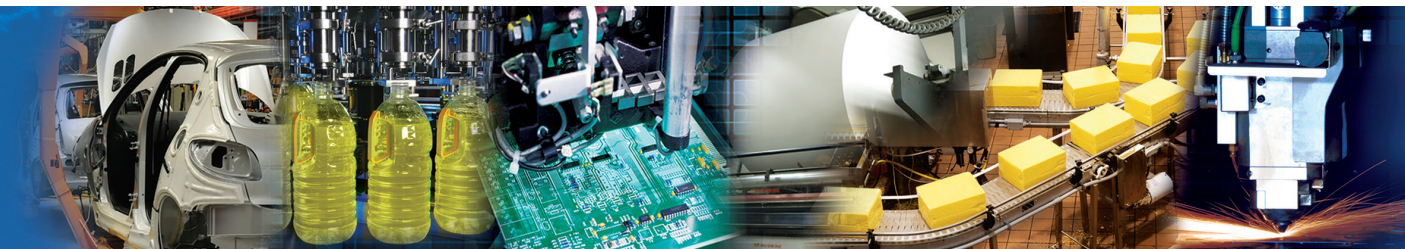
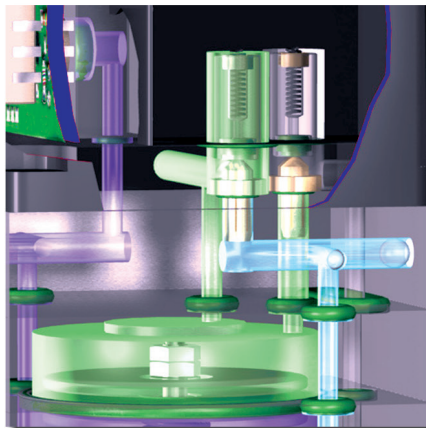
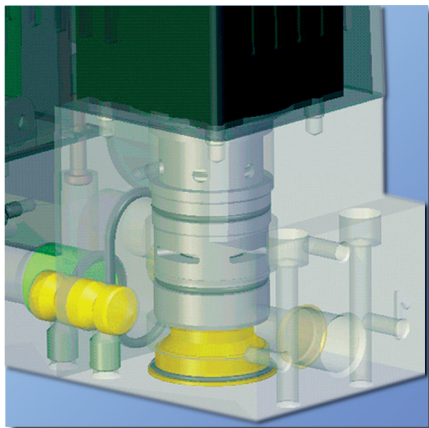
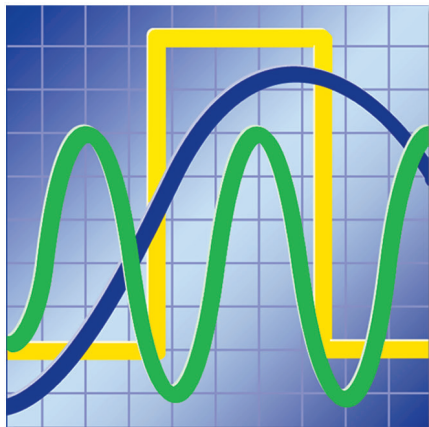


numatics®

Proportional Technology

Precise Control of Pressure and Flow



www.numatics.com

Numatics, Inc. is a leading manufacturer of pneumatic products and motion control products.

Our broad spectrum of standard, custom developed products and application components have made a significant impact on pneumatic innovation as well as pneumatic and motion control technology. Our company has an extensive history of generating innovative concepts and technological breakthroughs. Many of today's standard features in pneumatic technology were industry firsts from Numatics. We continue our innovative approach to product development by developing electric motion control solutions and enhancing our embedded Fieldbus and I/O products to continually meet and solve our customer's application requirements.



Today Numatics is proud to be a part of the Industrial Automation Division of Emerson Electric Co.

Emerson (NYSE:EMR), based in St. Louis, Missouri (USA), is a global leader in bringing technology and engineering together to provide innovative solutions for customers in industrial, commercial, and consumer markets through its network power, process management, industrial automation, climate technologies, and appliance and tools businesses. For more information, visit www.Emerson.com.

Introduction to Control Technology

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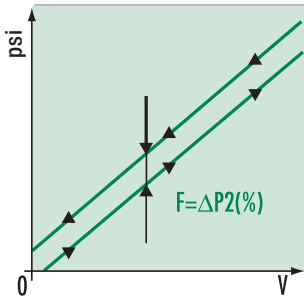
G3 Fieldbus High Current Analog Module Information



Symbols and Terminology

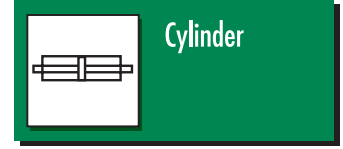
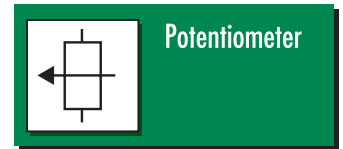
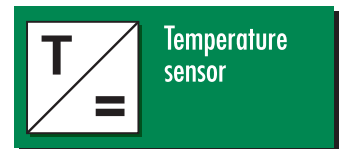
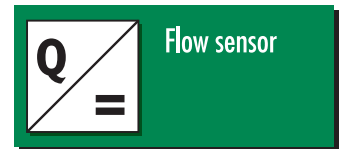
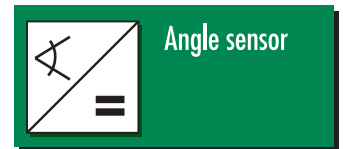
Glossary of Terms

Hysteresis

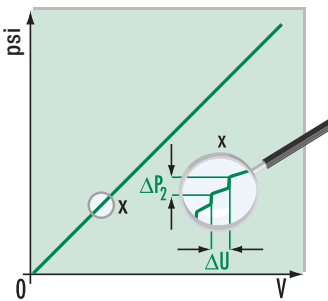


Hysteresis is the tolerance of the outlet pressure for a given command signal depending on whether the previous pressure was higher or lower.

Symbols

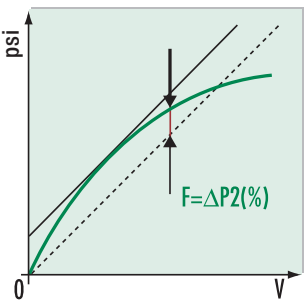


Sensitivity



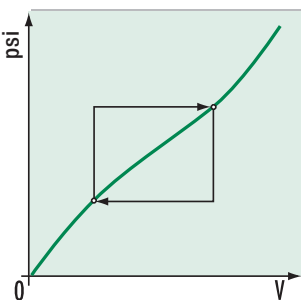
The smallest change in command signal which leads to a change in the outlet pressure is called sensitivity. Expressed as a percentage of the maximum outlet pressure.

Linearity



The ideal relationship between command signal and outlet pressure is linear, and when plotted results in a straight line (dotted line). Linearity is a measure of the maximum deviation between the actual outlet pressure and commanded pressure.


Repeatability



Repeatability is the tolerance of the outlet pressure for the same command signal given multiple times.



Trimming potentiometer



Electrical switch



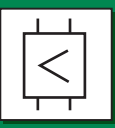
Digital display




Analogue display



Tachometer generator



Proportional valve



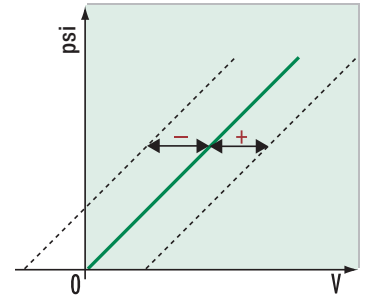
Voltage / current selector



Digital-to-analogue converter

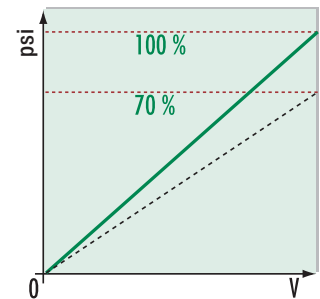
Zero Adjustment

The pressure or flow that corresponds with the lowest command signal.



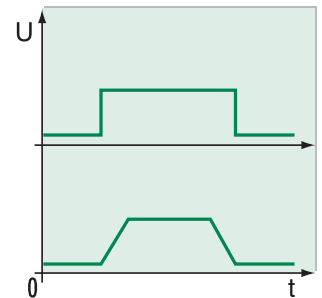
Span Adjustment

The valve's output pressure or flow range can be reduced to match the application's needs, providing the highest possible resolution.



Ramp Function

The ramp function transforms a command signal step into an internal gradual increase. This allows slow opening and closing of proportional valves.



Ripple Frequency

Modulation voltage to minimize friction (slip-stick) in a valve.

Feedback Value

Actual electrical value of a physical variable. (Pressure, force, temperature, flow, etc.)

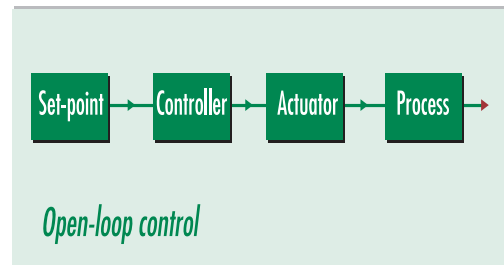
Control Systems

Within industrial automation, the goal of a control system is to move a physical variable such as temperature, pressure, force or displacement to a predetermined value. The complexity of the system, impact of external variables and required accuracy will dictate whether the control system needs some type of feedback measurement in order to ensure that the desired value (or setpoint) is reached. The difference between open-loop and closed-loop control is that the feedback allows the control system, or control loop, to compare the output to the commanded value and adjust as needed.

Open-Loop Control

An example of an open control loop is a timer for a sprinkler system. When the timer is activated, the sprinkler goes on for a set amount of time. This is open-loop control because the system does not monitor, for instance, the moisture content of the soil. The system will turn the sprinklers on in the middle of a rainstorm. The desired outcome of the controlled action is not monitored.

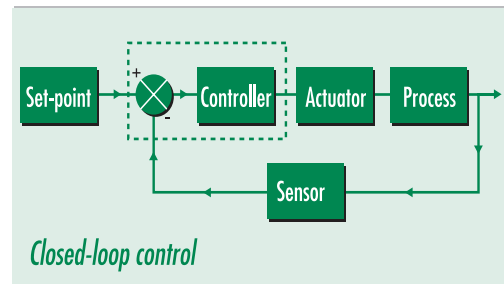
An open sequence of actions where there is no comparison of the end result to the desired result is the primary characteristic of open-loop control.



Closed-Loop Control

In a closed loop, the desired value or setpoint is constantly compared to the actual value. DIN standard 19226 defines the terms “Control and Adjustment” as follows: “Control and adjustment is an operation in which a physical variable (e.g. temperature, pressure etc.) is continuously measured and compared to a previously specified value of the variable with the aim of matching the two. The resulting closed sequence of actions occurs in a closed loop, the closed-control loop.”

In the example of the sprinkler system, the actual moisture content of the soil could be measured with a sensor and compared to the desired moisture level. As soon as there is a difference between the desired value and measured value, a signal can be sent to either open the water valve (if the soil is dryer than specified) or close the valve (if the soil is wetter than specified). The feedback, provided by the sensor in this case, that is used to compare and adjust the actual value to the desired value is the primary characteristic of a closed-loop system.

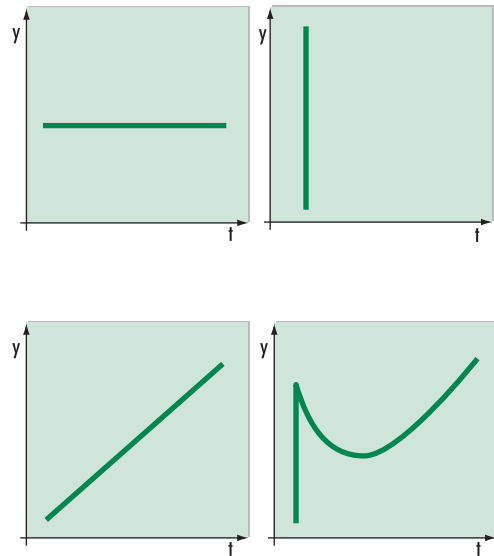


Types of Controllers

A controller is a transfer element which compares the feedback value received from a transducer (sensor) to a predetermined value (i.e. setpoint) and processes it in such a way that a control signal is transmitted to the actuating element (e.g. a proportional valve). The controller should control this transmission in such a way that the dynamic qualities of the controlled process are balanced. The setpoint should be reached quickly while the feedback value should fluctuate as little as possible around the setpoint.

Numatics' proportional valves use a common controller called a proportional-integral-derivative (PID) controller. The P, I and D terms can easily be modified with each product's software to achieve various types of control based upon the needs of a given application. The most basic controller is the P controller. P, PI and PID control are best suited to a wide range of applications.

The charts to the right show graphical representations of the various PID terms and the table below shows the types of controllers that are most often successful by application.

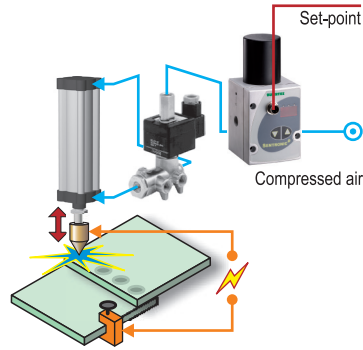


Application	Types of controllers		
	P	PI	PID
Pressure	low profile	suitable	suitable
Flow	unsuitable	suitable	less suitable
Temperature	low profile	suitable	suitable
Level	suitable	unsuitable	unsuitable
Speed	suitable	suitable	suitable

For Economical Quality and Control...

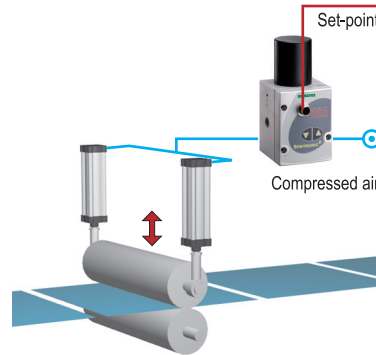
Proportional valves maximize production processes in many industries including food processing, textiles, industrial plant engineering, medical technology, pharmaceutical, semiconductor, and automobile. These valves create many innovative solutions when incorporated into a programmable control system. The combination of electronics and mechanics in proportional valves provides ideal performance for many industrial applications. Numatics' proportional pressure regulators and flow control valves are highly customizable to specific applications. Numatics continually develops customized components and solutions for specific customer requirements. Please do not hesitate to contact Numatics' technical support team.

Spot Welding



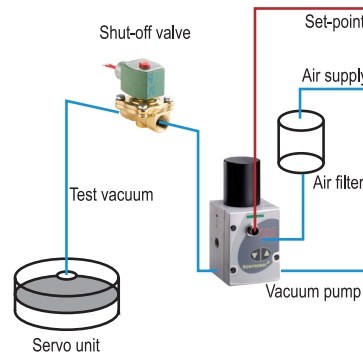
The proportional pressure regulator controls the clamping force of the welding head depending on the material to be welded and its thickness.

Compensation of Thickness



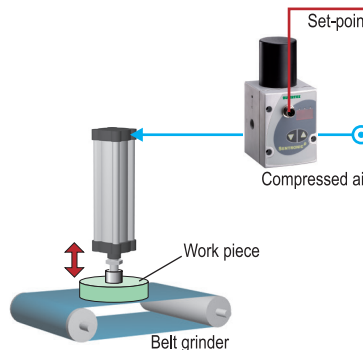
The pressure acting against the roller is controlled with a proportional pressure regulator. Different thickness in the materials is offset.

Servo Unit for Brakes



The proportional pressure regulator is incorporated in the bypass of a vacuum pump. The brake booster is checked against the setpoint.

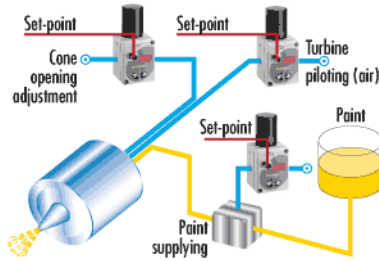
Force



The proportional valve controls the force acting against work pieces on grinding belts, pneumatic presses etc.

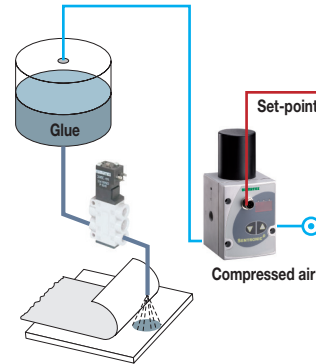
Control of Pressure and Flow

Paint Spray Gun Application



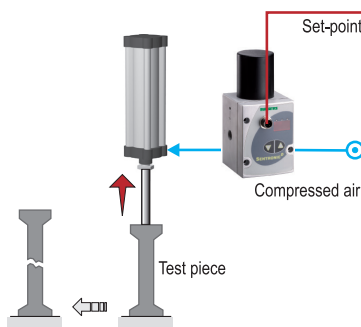
Spray gun control: Control of paint flow and spray density, and of the surface of the part of being painted.

Glue Dosing



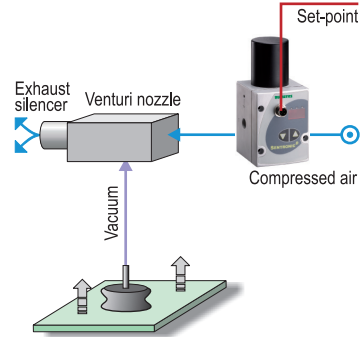
The proportional pressure regulator maintains system pressure as the level of glue in the container decreases. Glue is dosed accordingly.

Material Testing



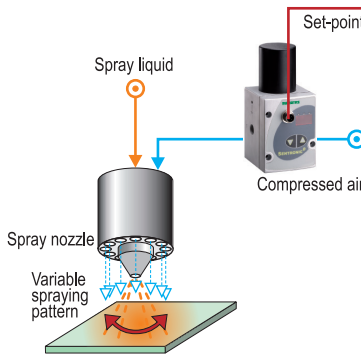
The force acting against the test piece is continuously increased until the test piece is destroyed.

Vacuum Generation



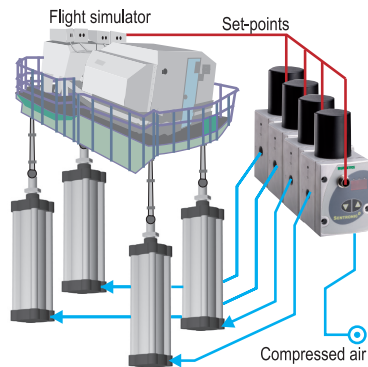
A change of pressure into the venturi nozzle via the proportional valve changes the vacuum generated.

Fluid Coating



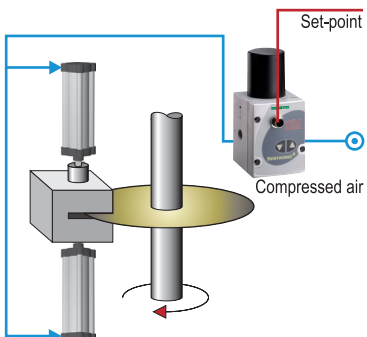
The spray pattern, i.e. the coating width, is adjusted by controlling the air supply through fan adjusting nozzles.

Flight Simulator



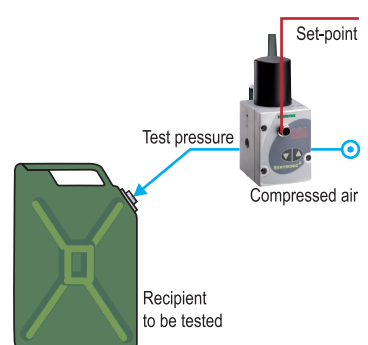
The movements of an aircraft are simulated by applying different pilot pressures to the cylinders.

Brake Pressure



A command signal is used to gradually brake and slow down a rotating mass in accordance with the controller's speed profile.

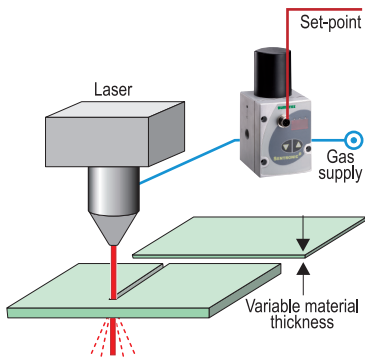
Leak Test



The proportional pressure regulator precisely adjusts the test pressure for different leak tests.

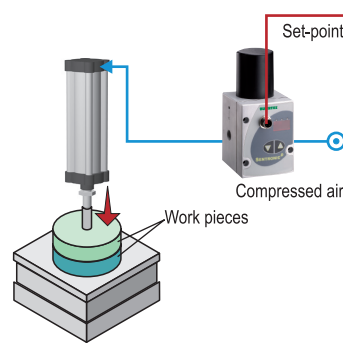
Control of Pressure and Flow

Laser Cutting



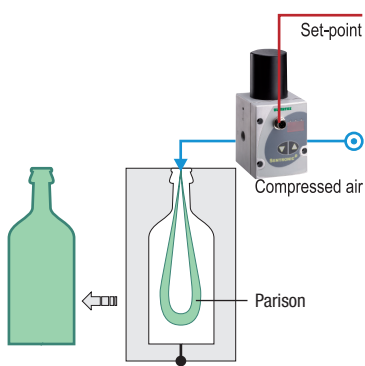
The gas pressure is adjusted in accordance with the material and its thickness.

Ultrasonic Welding



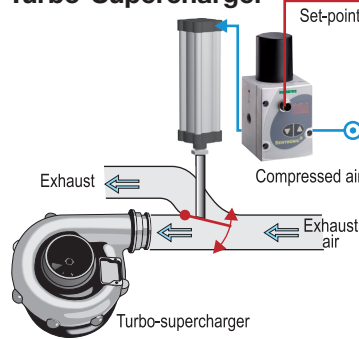
The proportional pressure regulator adjusts the frictional pressure of ultrasonic welding machines.

Bottle Molding



The parison is inflated at a varying rate using a proportional valve.

Turbo-Supercharger

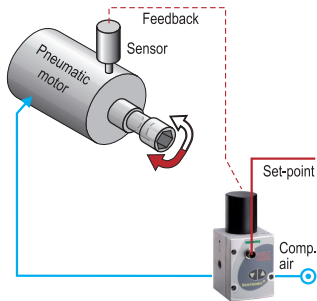


Exhaust gas flow is adjusted to the turbo-supercharger depending on the engine speed to maintain the charging pressure at a constant level.

Dual Loop Control

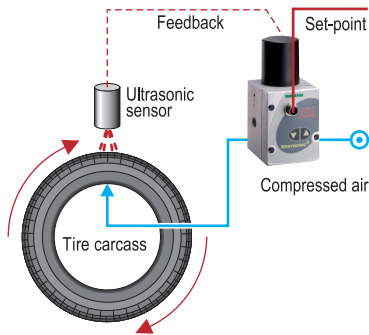
Sentronic^D, Sentronic^{PLUS} and Flowtronic^D can be configured for dual loop control. Process variables such as pressure, flow, force, speed, RPM, and temperature can be controlled. Dual loop control requires no additional components other than a process sensor to provide an analog feedback input.

Control of Speed and Torque



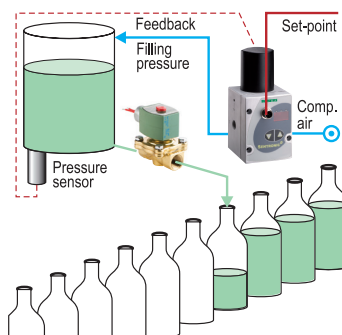
Speed and torque are controlled by changing the pilot pressure.

Tire Making



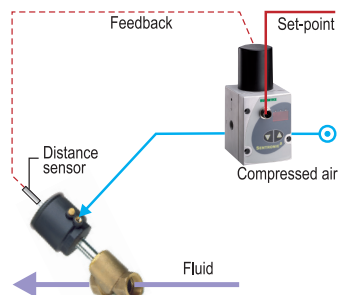
Controlled by the proportional pressure regulator with a dependence on the tire's diameter, the individual plies of the tires are built up and a constant tire quality is ensured.

Filling Pressure



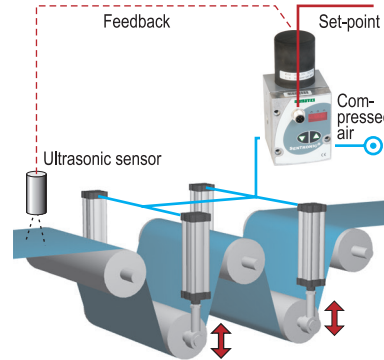
The liquid flows to the valve at a constant pressure irrespective of the fluid level in the storage tank. The filling volume remains constant.

Flow Control



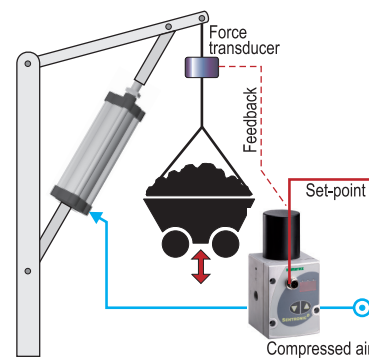
The flow of liquids is varied by continually adjusting the orifice of the fluid valve by measuring the valve's travel (distance sensor).

Compensation of Lengths in Winding



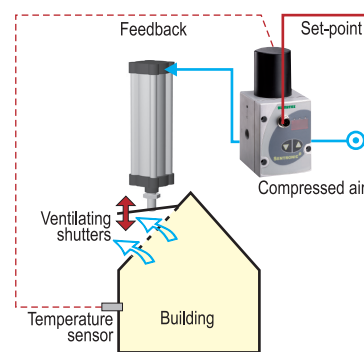
Different lengths of winding material are offset with cylinders controlled by proportional pressure regulators, which controls the tensile stress.

Balancer



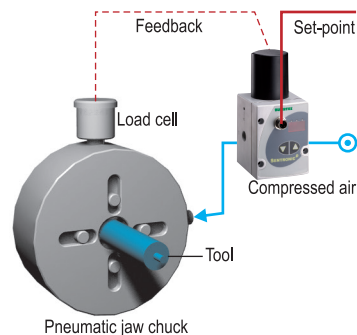
The proportional valve pneumatically balances the weight over the cylinder pressure. Heavy loads can easily be lifted and lowered by hand.

Temperature Control



The room temperature is held at a constant level by opening or closing ventilating shutters.

Clamping Pressure Control



The clamping pressure of machine tools is adjusted in accordance with the tool's material (steel, synthetic material, etc.).

Technical Characteristics



	Port size	Pilot pressure	Pressure range	Flow	Filtration	Hysteresis	Power rating	Type of construction	Loss of power behavior
SENTRONIC^D	1/8, 1/4, 3/8 NPT or GTap	-	0 to 150 psi 0 to 10 bar	up to 45.9 SCFM 1300 NI/min	50 µm	< 1%	21 to 40 W	Poppet valve	Pressure released
SENTRONIC^{PLUS}	1/8, 1/4, 1/2, 1 NPT or GTap	-	0 to 725 psi 0 to 50 bar	up to 197.8 SCFM 5600 NI/min	50 µm	< 1%	33 to 44 W	Poppet valve	Pressure released
PULSTRONIC II	1/4 NPT or GTap	-	0 to 150 psi 0 to 10 bar	17 SCFM 470 NI/min	50 µm	< 1%	3.6 W	Pilot + Poppet valve	Pressure held
E22	1/4, 3/8, 1/2, NPT, GTap or BSPT	-	0 to 150 psi 0 to 10.2 bar	up to 100 SCFM 2800 NI/min	5 µm	< 1%	1 W	Pilot + Poppet valve	Pressure held
SERVTRONIC^{DIGITAL}	G 3/8	-	0 to 580 psi 0 to 40 bar	60 SCFM 1700 NI/min	5 µm	< 0.5%	28 W	Spool-Sleeve Assembly	Pressure released
FLOWTRONIC^D	1/4, 3/8, 1/2 NPT or GTap	-	58 to 116 psi 4 to 8 bar	0.4 to 35.3 SCFM 10 to 1000 NI/min	50 µm	< 3%	33 to 44 W	Poppet valve	Pressure released

Choice of Equipment



	Control		Fluids				Control loop		Actuation		Application		Special features
	Pressure	Flow	Vacuum	Air/neutral gases	Liquids	Steam	open	closed	electrical	air piloted	static	dynamic	
SENTRONIC ^D	●	○		●				●	●		■	▲	Digital control with or without display, controller adaptation
SENTRONIC ^{PLUS}	●	○	●	●				●	●		■	▲	Digital control with or without display, controller adaptation
PULSTRONIC II	●	○		●				●		●	■		Digital control with or without display, controller adaptation
E SERIES	●	○		●				●		●	■		Optional 2 bit binary digital
SERVTRONIC ^{DIGITAL}	●	○		●				●	●		■	▲	Digital control, controller adaptation
FLOWTRONIC ^D		●		●				●	●		■	▲	Digital control with or without display, controller adaptation



Sentronic^D

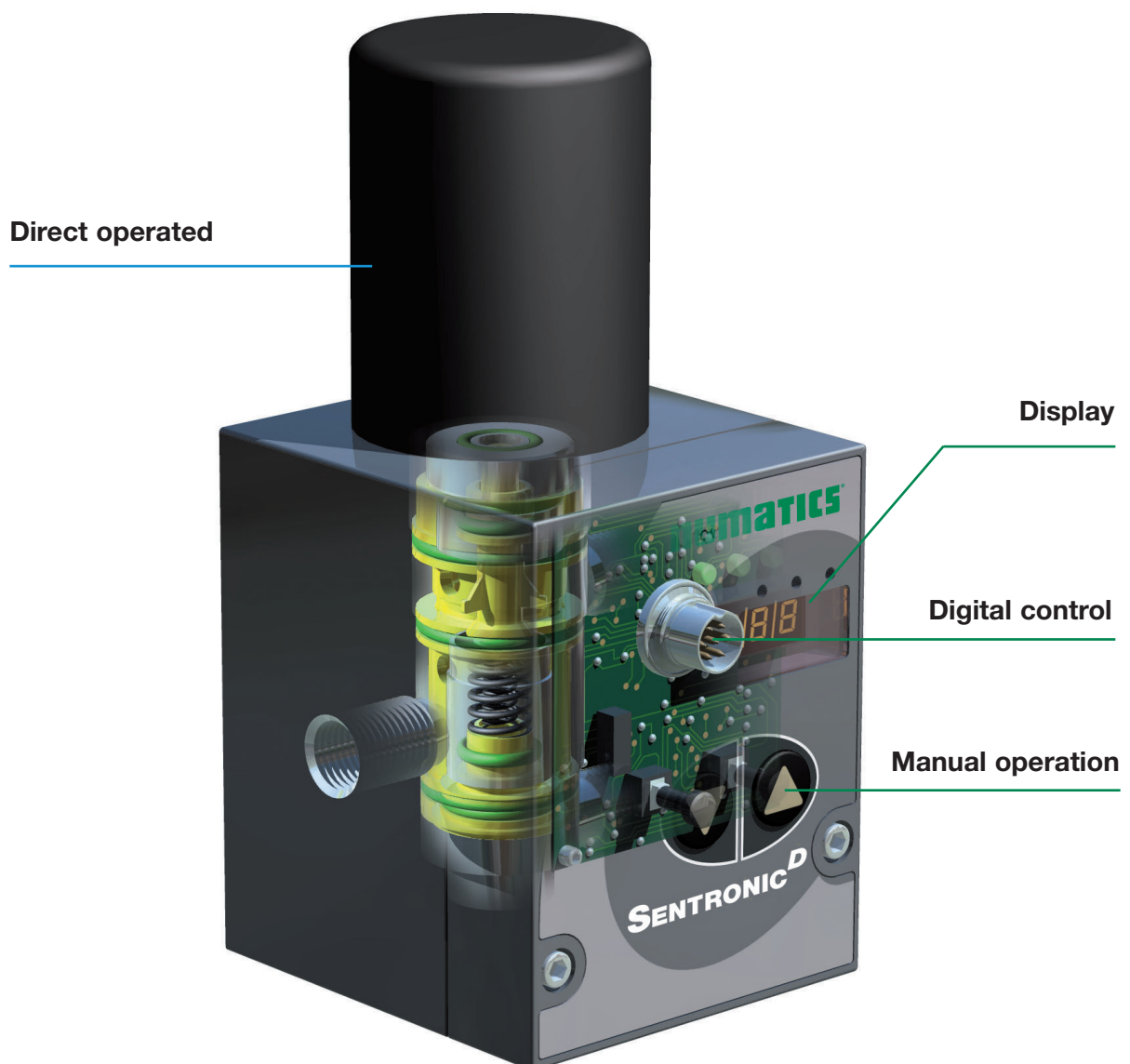
Sentronic^D is a digitally operated pressure regulator valve.

Sentronic^D stands for:

- Digital control
- Display (integrated)
- Direct operated valve

With the Data Acquisition Software (DaS) and the RS232 interface, it's now possible to optimally adjust the valve's control parameters to a specific application. The scope function allows you to log and read the system's response in real time.

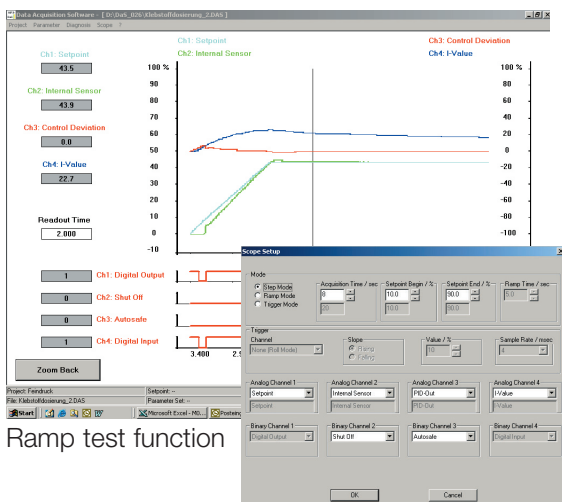
The DaS capabilities streamline the development process and identify application-specific problems at an early stage. Saved parameters can also be used for future production so that valves are factory-set to a specific application.





Step test function

Parameters setup



Ramp test function

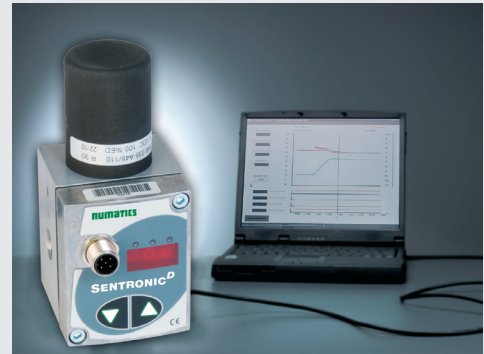
Scope setup

Advantages

- Minimum hysteresis
- Quick response times
- Very high sensitivity
- Standard 50 µm filtration
- No constant air consumption
- Analog feedback output
- Easy change of control parameters
- Digital control
- Integrated display (optionally without)
- PC communication

Specifications

Fluids: Air or neutral gases
 Pressure Range: 0 - 50 psi,
 0 - 100 psi, 0 - 150 psi, 0 - 3
 bar, 0 - 6 bar, 0 - 10 bar
 Ports: 1/8, 1/4, 3/8 (NPT
 or GTap)
 Construction: Poppet Valve
 Actuation: Proportional Solenoid
 Command Signal: 0 - 10 V,
 0 - 20 mA, 4 - 20 mA



By connecting the Sentronic^D to a PC with an RS232 interface, the Data Acquisition Software (DaS) can be used to optimally adjust the valve's control parameters to a specific application. DaS has an oscilloscope function that allows the user to select and visually see various response characteristics as the valve operates in an application. Control loop parameters can be adjusted using the software without removing the valve from service. This functionality streamlines the application development process. Control parameters can be saved and reloaded at any time.

The DaS software offers the following features:

- Real time display of: command signal, outlet pressure, internal control parameters (e.g. P, I or D), pressure switch signal, etc.
- Parameter setting: command signal, zero offset, span, limitation of output current, ramp function, etc.
- Diagnostics menu for error detection and testing
- Custom adjustment to an application
- Control of Sentronic^D

Sentronic^D

1/8 to 3/8 tapped body or 1/8 - 1/4 sub-base mounted body (NPT or GTap)



Features

- Sentronic^D is a highly dynamic 3-way proportional valve with digital control.
- Sentronic^D stands for:
 - Digital communication and control
 - Display (integrated)
 - Direct operated valve
- A special feature of the Sentronic^D is its DaS software supplied for optimum adjustment via PC and viewing of command and feedback signals.
- Other functions are valve diagnostics, parameter setting and maintenance.
- Sentronic^D can be configured for dual loop control of process variables such as flow, force, speed, RPM and temperature.

Construction

Body: Aluminum
 Internal parts: POM (polyacetal)
 Seals: NBR (nitrile) and FPM (fluoroelastomer)

General

Fluids: Air or neutral gas, filtered at 50 µm, condensate-free, lubricated or unlubricated
 Maximum allowable pressure (MAP): 90 to 190 psi (6 to 13 bar)
 Pressure range: 0-50 psi to 0-150 psi (0-3 bar to 0-10 bar)
 Fluid temperature: 32°F - 140°F (0°C - 60°C)
 Ambient temperature: 32°F - 122°F (0°C - 50°C)
 Flow (Qv at 6 bar): 470 to 1300 l/min (ANR)
 Command signal: 0 - 10 V (impedance 100 kΩ)
 0 - 20 mA / 4 - 20 mA (impedance 250 Ω)
 Hysteresis: < 1% of span
 Linearity: < 0.5% of span
 Repeatability: < 0.5% of span
 Minimum setpoint: 100 mV (0.2 mA/4.2mA) with shut-off function
 Minimum outlet pressure: 1% of span

Electrical Characteristics

Nominal Diameter DN (mm)	Voltage *	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
4	24 VDC ±10%	21	850	H	IP 65	5-pin M12 connector (not supplied)
8	24 VDC ±10%	40	1650	H	IP 65	5-pin M12 connector (not supplied)

* Max. ripple: 10 %

Specifications

Ø Ports	Ø Orifice DN (mm)	Flow	
		C _v Flow Factor (K _v Nm ³ /h)	at 6 Bar (l/min - ANR)
1/8, 1/4 NPT or GTap	4	0.29 (0.25)	470
1/4, 3/8 NPT or GTap	8	0.81 (0.7)	1300

How to Order

608 6 C 0 1 1 1

Nominal diameter
 608 = DN 4mm
 609 = DN 8mm

Version (ports), body
 0 = G 1/8 (DN4), G 1/4 (DN 8)
 1 = G 1/4 (DN 4), G 3/8 (DN 8)
 2 = Manifold version¹⁾
 G 1/8 (DN 4), G 1/4 (DN 8)
 6 = NPT 1/4 (DN 4), NPT 3/8 (DN 8)

Pressure range

Maximum pressure		Maximum pressure	
A = 0 - 50 psi	90 psi	1 = 0 - 10 bar	13 bar
B = 0 - 100 psi	140 psi	2 = 0 - 12 bar	15 bar
C = 0 - 150 psi	190 psi	3 = 0 - 3 bar	6 bar
		4 = 0 - 1 bar	4 bar
		5 = 0 - 15 bar	18 bar
		6 = 0 - 6 bar	9 bar

Options
 A00 = Dual loop control
 211 = Oxygen clean

Display
 0 = without display
 1 = with display

Digital output
 1 = Pressure switch output
 PNP ± 5 %

Feedback
 1 = Feedback output 0 - 10 V
 2 = Feedback output 0 - 20 mA
 3 = Feedback output 4 - 20 mA
 4 = Feedback input 0 ... 10 Volt²⁾
 5 = Feedback input 0 ... 20 mA²⁾
 6 = Feedback input 4 ... 20 mA²⁾

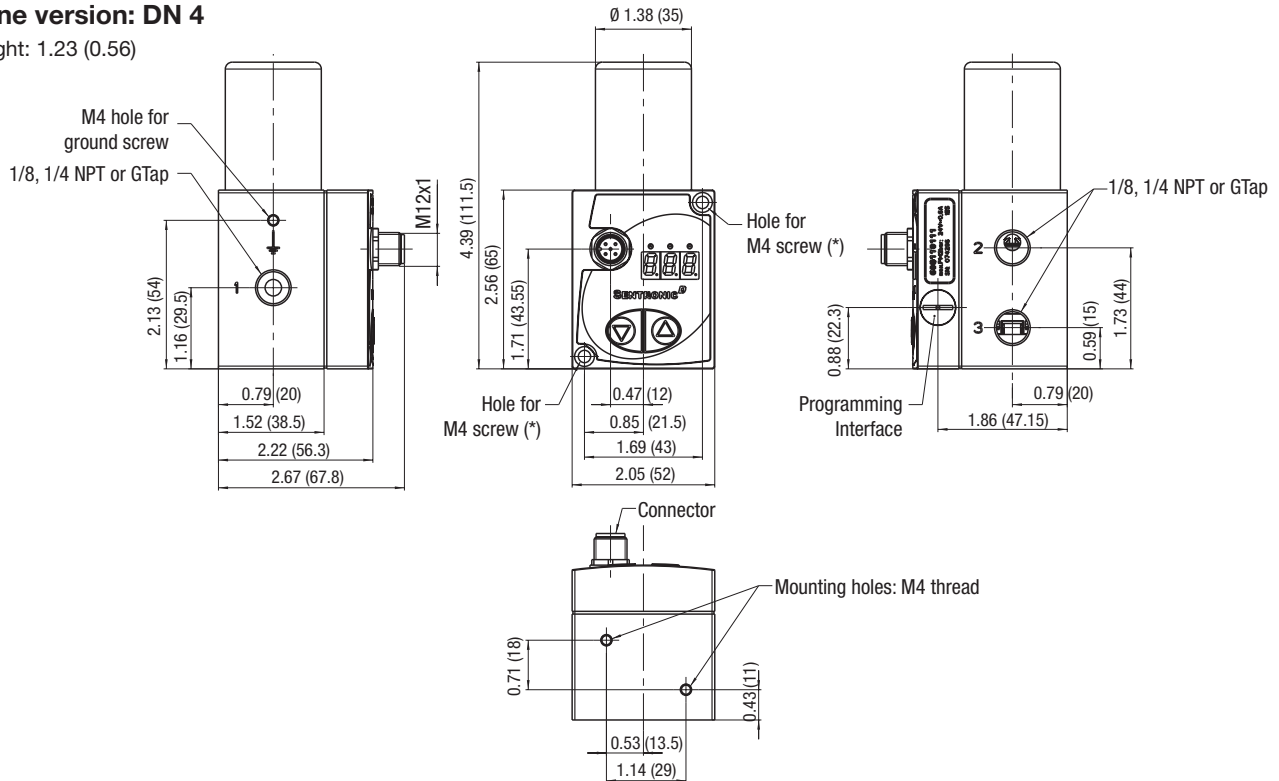
Command signal
 0 = 0 - 10 V
 1 = 0 - 20 mA
 2 = 4 - 20 mA

Notes:
¹⁾ See Accessories section for required manifold sub-base.
²⁾ Feedback input is needed for dual loop units.

Dimensions: Inches (mm), Weight in lbs. (kg)

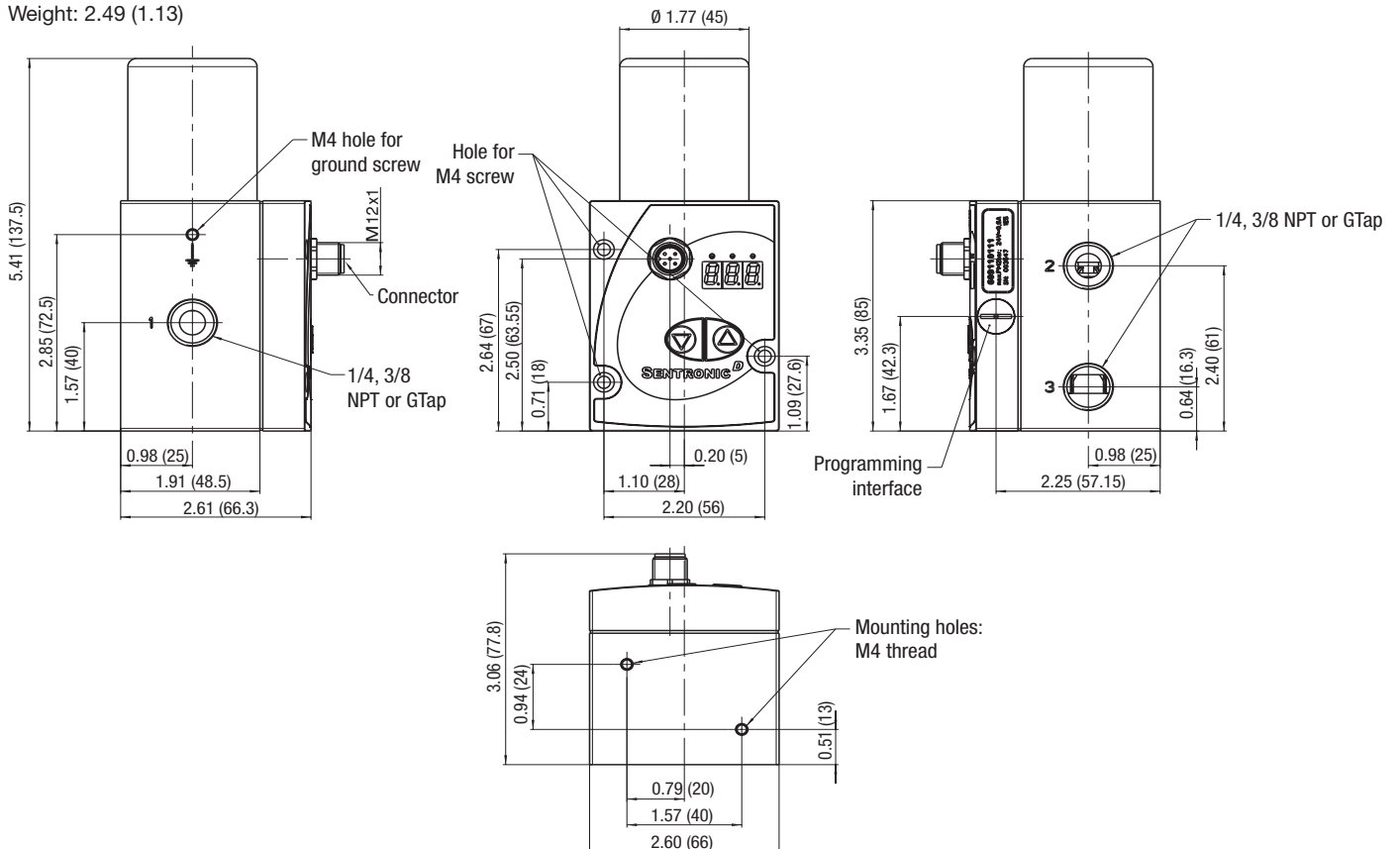
Inline version: DN 4

Weight: 1.23 (0.56)



Inline version: DN 8

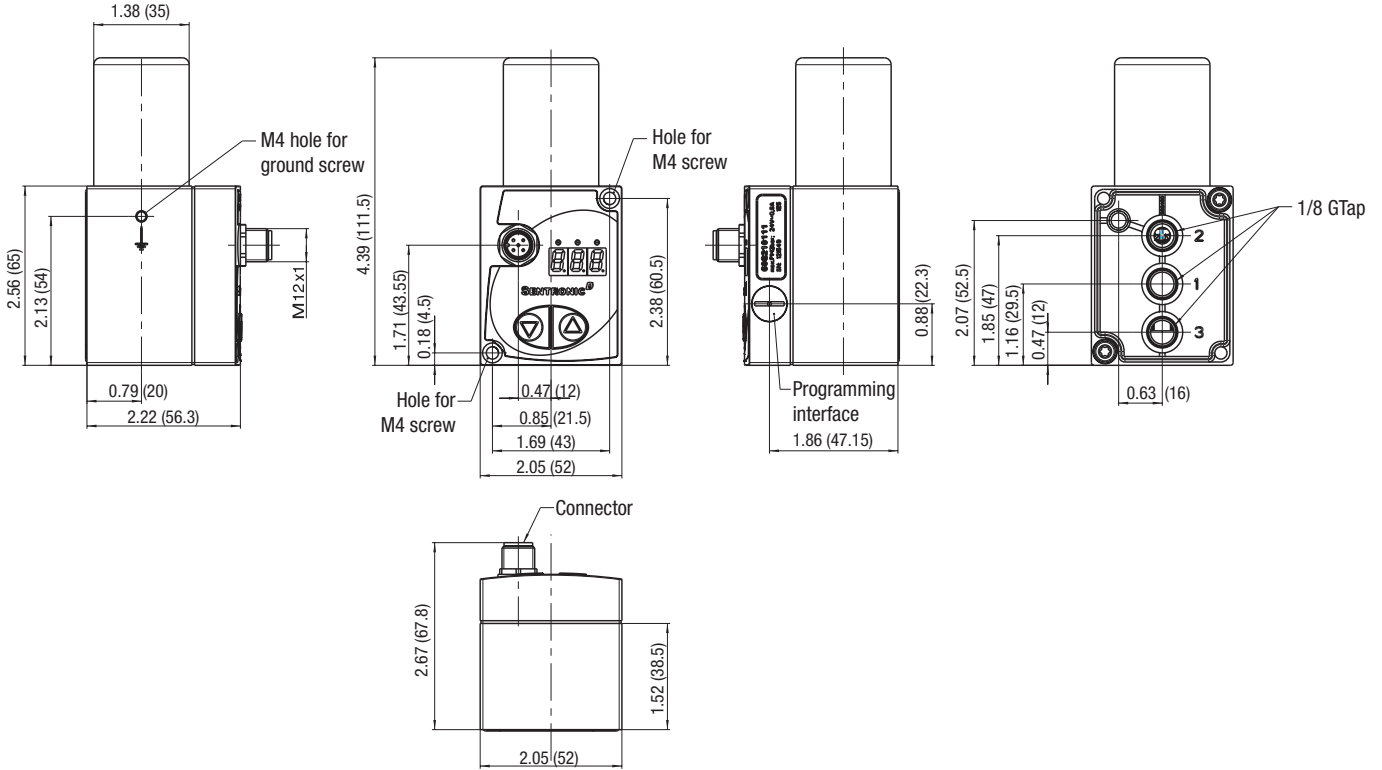
Weight: 2.49 (1.13)



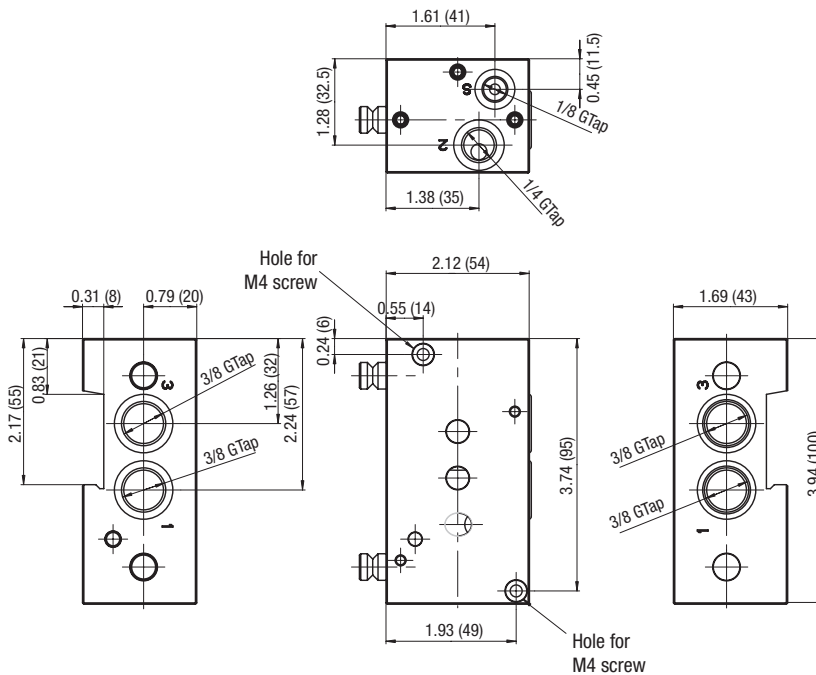
Dimensions: Inches (mm), Weight in lbs. (kg)

Manifold version: DN 4

Weight: 1.23 (0.56)



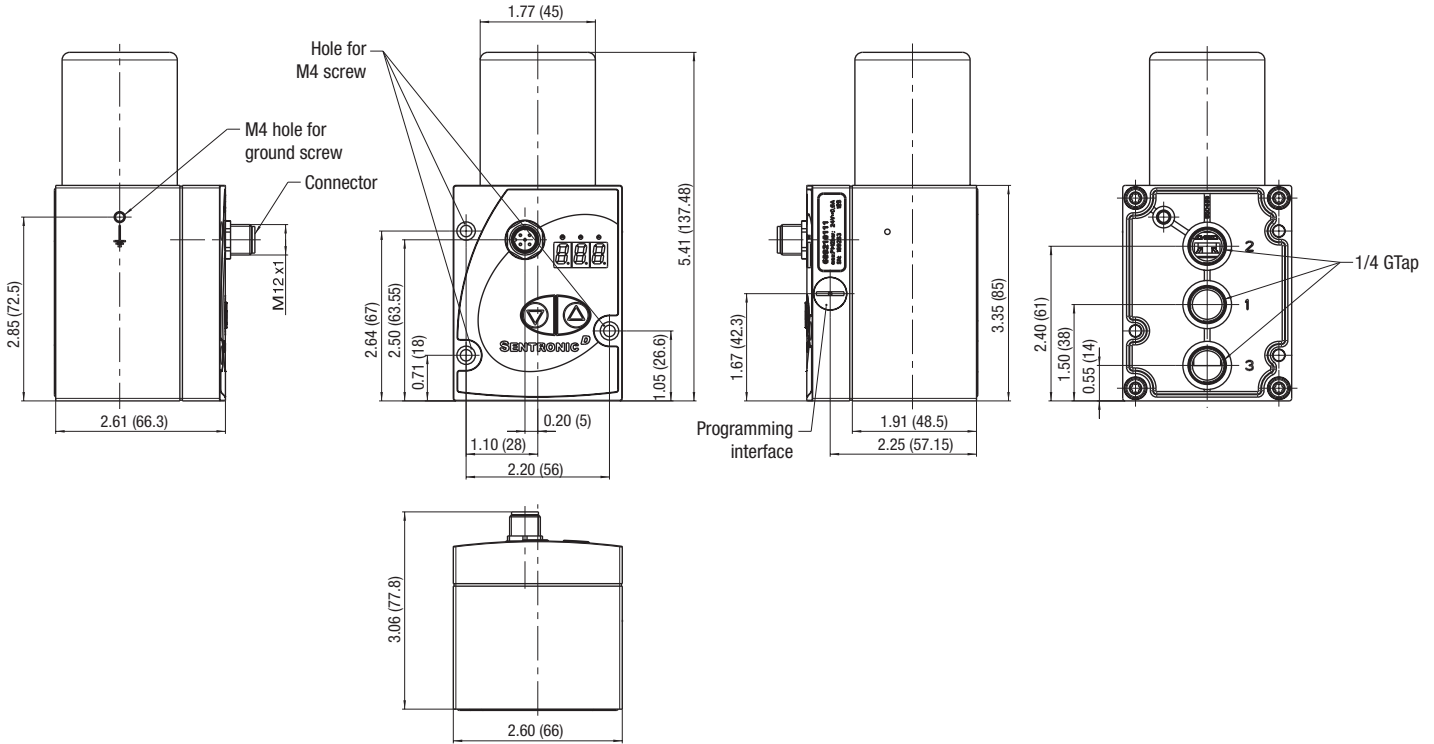
Manifold: DN 4



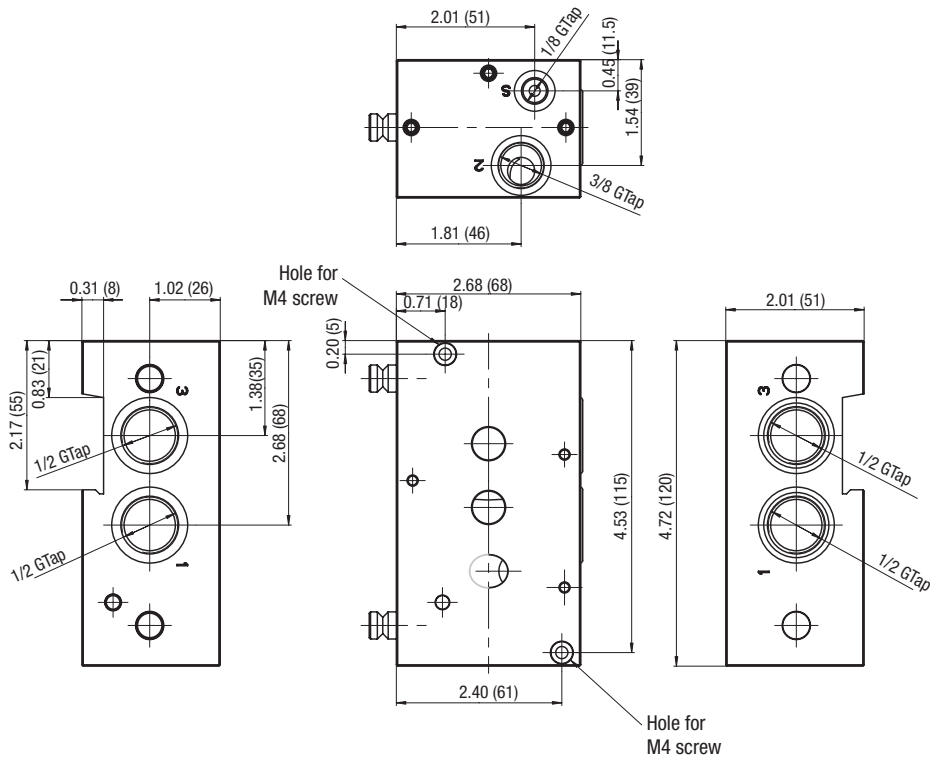
Dimensions: Inches (mm), Weight in lbs. (kg)

Manifold version: DN 8

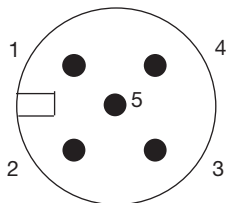
Weight: 2.49 (1.13)



Manifold: DN 8



Connector Pin Out



PIN	Description
1	+24 VDC Supply
2	Command Signal
3	+0 VDC Common (Supply)
	+0 VDC Common (Command Signal)*
4	Analog output (feedback)
5	Digital output (pressure switch)
Body	EMC shield

*A 6-wire cable with separate common for the command signal is used for cable lengths over 2 m to minimize the voltage drop for the command signal.

Accessories



5 Pin 12mm FEMALE Straight Field Attachable Connectors		Model Number
PG 9 Cable Gland		TC05F2000000000
5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors		Model Number
PG 9 Cable Gland		TD05F2000000000
Micro Female 5 Pole Straight 6 Wire 24 AWG, Shielded		
3 Meter		TC0503MMS000671Y
5 Meter		TC0505MMS000671Y
Micro Female 5 Pole 90 Degree 6 Wire 24 AWG Euro Color Code, Shielded		
3 Meter		TD0503MMS000671Y
5 Meter		TD0505MMS000671Y
Micro F/M 4 Pole Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TC0403MIETA04000		3 Meter - TC0403MMETA04000
5 Meter - TC0405MIETA04000		5 Meter - TC0405MMETA04000
Micro F 90°/M Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TD0403MIETA04000		3 Meter - TD0403MMETA04000
5 Meter - TD0405MIETA04000		5 Meter - TD0405MMETA04000
Manifold		Model Number
Manifold for 608 (DN 4mm) with G3/8; common supply and exhaust ¹⁾		35500558
Manifold for 609 (DN 8mm) with G1/2; common supply and exhaust ¹⁾		35500559
PC Software & Cable Connectors		Model Number
DaS Light: Data Acquisition Software for Sentronic ^D - basic parameters - free download at Numatics.com		99100110
DaS Expert: Data Acquisition Software for Sentronic ^D - full parameters - CD-ROM		99100111
RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)		88100732
RS 232 cable converter; 2m cable with 9-pin Sub-D (screw connector)		833-993708

¹⁾ Manifold ships with required hardware and gaskets for connecting manifolds together.

Sentronic^{PLUS}

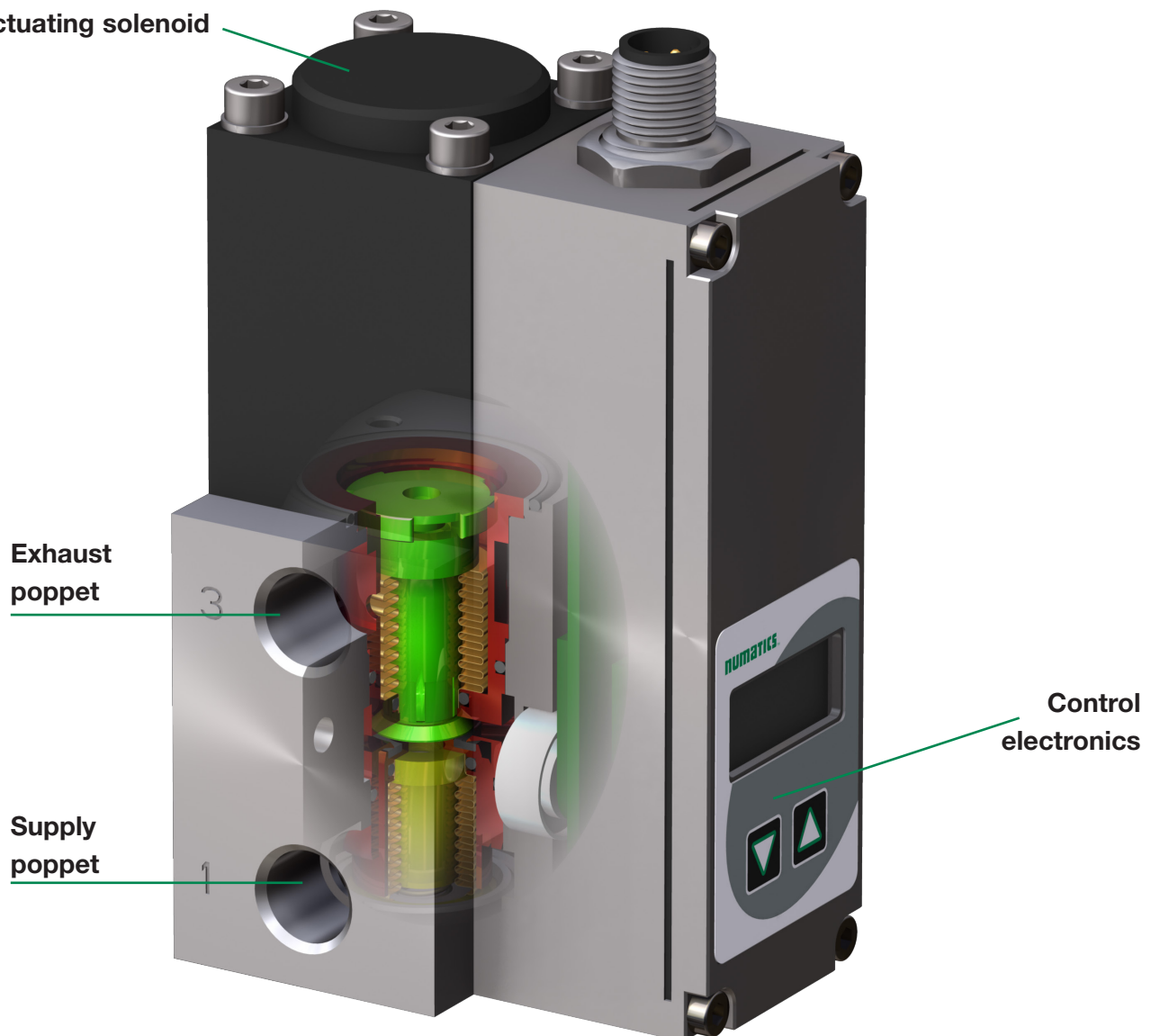
Sentronic^{PLUS} is a digitally operated pressure regulator valve. This valve accurately adjusts pressure, flow, force, speed, and linear or angular positions. All orifices have the same diameter for short response times whether increasing or exhausting pressure. The valve components are designed to provide control at an extremely low hysteresis.

The Sentronic^{PLUS} regulates pressure up to 725 psi (50 bar) and can be used in potentially explosive atmospheres according to ATEX Directive 94/9/EC.

With the Data Acquisition Software (DaS) and the RS232 interface, it is now possible to optimally adjust the valve's control parameters to a specific application. The scope function allows you to log and read out the system's response in real time.

The DaS capabilities streamline the development process and identify application-specific problems at an early stage. Saved control parameters can be loaded at any time and used as a reference for maintenance and error detection. Saved parameters can also be used for future production so that valves are factory-set to a specific application.

Actuating solenoid



All Sentronic valves are tested before leaving our manufacturing facilities. Each valve is provided with a test certificate showing all the test results.



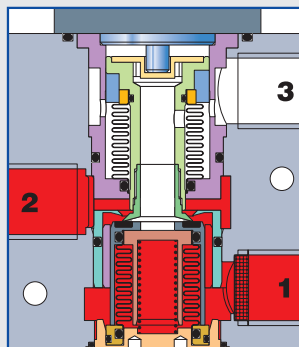
Advantages

- Minimum hysteresis
- Quick response times
- Very high sensitivity
- Standard 50 µm filtration
- No constant air consumption
- Analog command signal
- Analog feedback output
- PC communication
- Digital Control
- Easy change of control parameters

Specifications

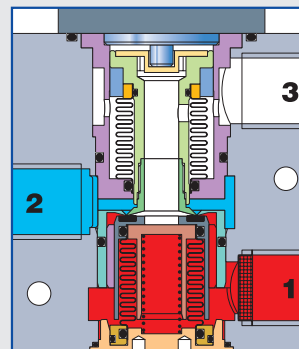
Fluids: Air and gases
 Pressure range: Vacuum to 50 bar
 Ports: 1/8, 1/4, 1/2, 1 (NPT or GTap)
 Construction: Poppet valve
 Actuation: Direct-operated solenoid
 Command signal: 0 – 10 V, 0 – 20 mA, 4 – 20 mA
 Options: Internal pressure switch
 Feedback output

Operating Principle



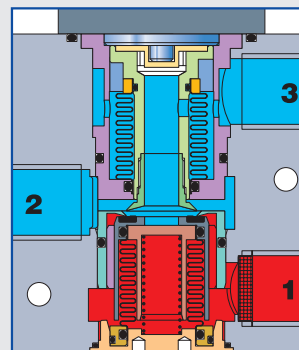
Increasing pressure

The pressurization piston is operated and the flow from port 1 to port 2 is released.



Maintaining pressure

The exhaust piston is in its central position: the flow between port 2 and port 1 or port 3 is blocked.



Exhausting pressure

The exhaust piston is lifted and the flow from port 3 to port 2 is released.

Sentronic^{PLUS} Electronic Pressure Regulator



General

Sentronic^{PLUS} is a 3-way proportional valve with digital control. The Data Acquisition Software (DaS) that comes with Sentronic^{PLUS} can be used to adjust the valve's control parameters to a specific application. Command signal, feedback signal and control parameters can be viewed in real time and adjusted as required for an application. Sentronic^{PLUS} can be configured for dual loop control of process variables such as flow, force, speed, RPM, and temperature.

Construction

Direct-operated poppet valve
Body: See table below.
Internal parts: Stainless steel and brass
Seals: FPM (fluoroelastomer) and NBR (nitrile)

Specifications

Fluids: Air or neutral gas, filtered at 50 µm, condensate-free, lubricated or unlubricated

Specifications

Fluids: Air or neutral gas, filtered at 50 µm, condensate-free, lubricated or unlubricated

Ports: 1/8 - 1/4 - 1/2 - 1 (NPT or GTap)

Max. operating pressure: See table below.

Control range: See table below.

Temperature / fluid: 32°F - 140°F (0°C - 60°C)

Temperature / ambient: 32°F - 140°F (0°C - 60°C)

Command signal - analog: 0 - 10 V (impedance 100 KΩ)
0 - 20 mA/4 - 20 mA (impedance 250 Ω)

Hysteresis: 1% of span

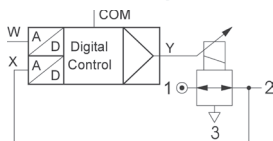
Linearity / pressure measurement: ± 0.5% of span

Repeatability: ± 0.5% of span

EXPLOSION SAFETY

Safety code: Ex II 2D Ex tDA21 IP65 T135°C Db
Ex II 3G Ex nA IIC T4 Gc, 0 ≤ Ta ≤ 50°C

EC type examination certificate no.: IBExU07ATEX1173



Electrical Characteristics

Nominal Diameter DN (mm)	Voltage *	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
1	24 VDC = ±10%	12	500	F	IP 65	5-pin M12 connector or 7-pin DIN connector
3	24 VDC = ±10%	12	500	F	IP 65	5-pin M12 connector or 7-pin DIN connector
6	24 VDC = ±10%	24 ⁷⁾	1000 ⁷⁾	F	IP 65	5-pin M12 connector or 7-pin DIN connector
12	24 VDC = ±10%	34	1400	F	IP 65	5-pin M12 connector or 7-pin DIN connector
20	24 VDC = ±10%	44	1800	F	IP 65	5-pin M12 connector or 7-pin DIN connector

* Max. ripple: 10 %

Specifications

Ø Ports	Ø Orifice DN (mm)	Flow	
		C _v Flow Factor (K _v Nm ³ /h)	at 6 Bar (l/min - ANR)
1/8 NPT or GTap	1	0.032 (0.028)	30
1/8 NPT or GTap	3	0.21 (0.18)	210
1/4 NPT or GTap	6	0.70 (0.60)	700
1/2 NPT or GTap	12	1.39 (1.20)	1400
1 NPT or GTap	20	5.57 (4.80)	5600

How to Order

6 1 4 3 5 7 E 9 0 1 1 PB

Control Panel

D = M12 with display - non-explosionproof
E = M12 without display - explosionproof (ATEX)
F = DIN connector, 7-pin with display - non-explosion proof¹⁾
G = DIN connector, 7-pin without display - non-explosion proof¹⁾

Version (Ports), body

0 = DN6 (G 1/4), ALU
1 = DN12 (G 1/2), ALU²⁾
2 = DN20 (G 1), ALU²⁾
4 = DN6 (NPT 1/4), ALU
5 = DN12 (NPT 1/2), ALU²⁾
6 = DN20 (NPT 1), ALU²⁾
7 = DN3 (G 1/8), Brass
8 = DN6 (G 1/4), Brass
9 = DN3 (NPT 1/8), Brass
A = DN6 (NPT 1/4), Brass
C = DN6 (G 1/4), Stainless Steel
G = DN6 (NPT 1/4), Brass³⁾
H = DN6 (G 1/4), Brass³⁾
J = DN1 (G 1/8), Brass
K = DN1 (NPT 1/8), Brass

Command Signal

0 = 0...10 Volt
1 = 0...20 mA
2 = 4...20 mA

Feedback

1 = Feedback Output 0...10 Volt
2 = Feedback Output 0...20 mA
3 = Feedback Output 4...20 mA
4 = Feedback Output 0...10 Volt⁴⁾
5 = Feedback Output 0...20 mA⁴⁾
6 = Feedback Output 4...20 mA⁴⁾

Options

A00 = Dual Loop Control
018 = Oxygen Clean

Pressure Range

Relative Pressure (psi)	Max Inlet Pressure Bar (psi)
40 = 0 - 0.1 bar (1.5)	2 (29)
50 = 0 - 0.5 bar (7.3)	2 (29)
60 = 0 - 1.0 bar (14.5)	2 (29)
02 = 0 - 2.0 bar (29)	3 (44)
03 = 0 - 3.0 bar (44)	8 (116)
PA = 0 - 3.4 bar (50)	8 (116)
05 = 0 - 5.0 bar (73)	8 (116)
06 = 0 - 6.0 bar (87)	12 (174)
PB = 0 - 6.9 bar (100)	12 (174)
10 = 0 - 10.0 bar (145)	12 (174)
PC = 0 - 10.3 bar (150)	12 (174)
12 = 0 - 12.0 bar (174)	14 (203)
PD = 0 - 13.8 ⁵⁾ bar (200)	18 (261)
16 = 0 - 16.0 ⁵⁾ bar (232)	18 (261)
PE = 0 - 17.2 ⁵⁾ bar (250)	22 (316)
20 = 0 - 20.0 ⁵⁾ bar (290)	22 (316)
PF = 0 - 20.7 ⁵⁾ bar (300)	22 (316)
3H = 0 - 30.0 ⁵⁾ bar (435)	40 (580)
5H = 0 - 50.0 ⁵⁾ bar (725)	60 (870)

Digital Output

1 = Pressure Switch Output
PNP ± 5%

Vacuum (Relative)

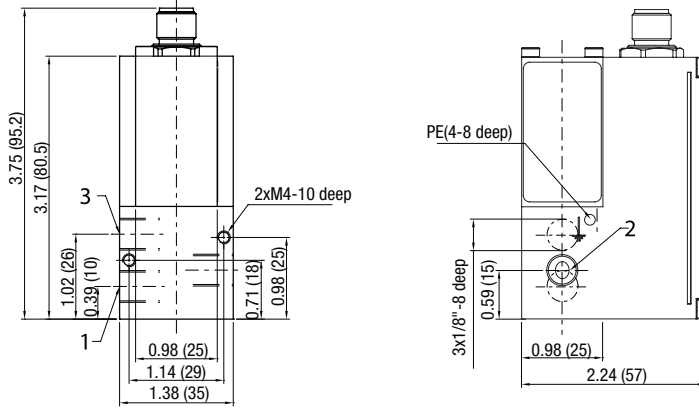
V1 = -1 bar
Shut-off valve, connects to vacuum on loss of power
V2 = 0...-1 bar
Bypass valve
V3 = 0...-1 bar
Shut-off valve, connects to atmosphere on loss of power

Notes: ¹⁾ 7-pin DIN connector allows crossover from 833-354 or 601 Series analog Sentronic version; ships with field installable connector. ²⁾ Up to max. 12 bar. ³⁾ Only for pressure ranges from 30 to 50 bar. ⁴⁾ Feedback input is needed for dual loop units. ⁵⁾ Only for DN3 & DN6 ⁶⁾ Only for DN6 body type G or H. Other versions available on request. ⁷⁾ For DN6, brass version GorH/1.8A, 44W

Dimensions: Inches (mm), Weight in lbs. (kg)

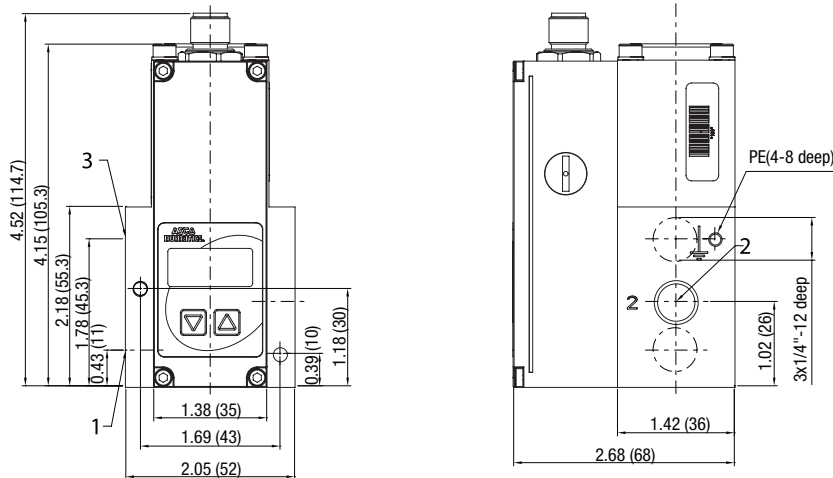
1/8 NPT or GTap (DNI and DN3)

Weight: 1.21 (0.55)



1/4 NPT or GTap

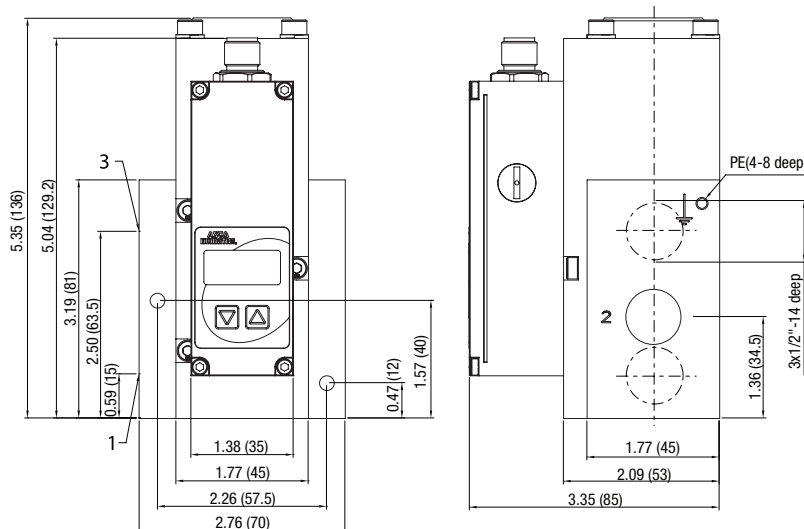
Weight: 1.87 (0.85)



A) Thread M5 - depth 10 (on opposite side); tapped through-hole for M4 screw.

1/2 NPT or GTap

Weight: 3.64 (1.65)

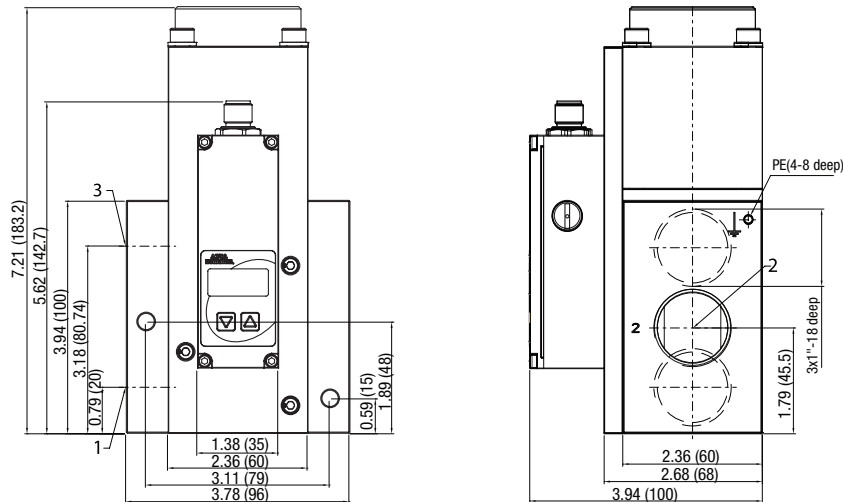


A) Thread M5 - depth 10 (on opposite side); tapped through-hole for M4 screw.

Dimensions: Inches (mm), Weight in lbs. (kg)

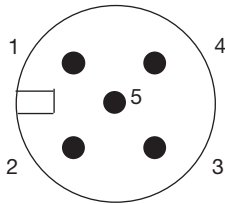
1 NPT or GTap

Weight: 7.50 (3.40)



A) Thread M8 - depth 15 (on opposite side); tapped through-hole for M6 screw.

Connector Pin Out



PIN	Description
1	+24 VDC Supply
2	Command Signal
3	+0 VDC Common (Supply)
	+0 VDC Common (Command Signal)*
4	Analog output (Feedback)
5	Digital output (Pressure switch)
Body	EMV screen

*A 6-wire cable with separate common for the command signal is used for cable lengths over 2 m to minimize the voltage drop for the command signal.

Accessories

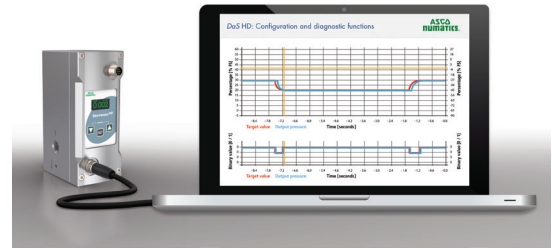


5 Pin 12mm FEMALE Straight Field Attachable Connectors		Model Number
PG 9 Cable Gland		TC05F2000000000
5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors		Model Number
PG 9 Cable Gland		TD05F2000000000
Micro Female 5 Pole Straight 6 Wire 24 AWG, Shielded		
3 Meter		TC0503MMS000671Y
5 Meter		TC0505MMS000671Y
Micro Female 5 Pole 90 Degree 6 Wire 24 AWG Euro Color Code, Shielded		
3 Meter*		TD0503MMS000671Y*
5 Meter*		TD0505MMS000671Y*
PC Software & Cable Connectors		Model Number
DaS Light: Data Acquisition Software for Sentronic ^D - basic parameters - free download at Numatics.com		99100110
DaS Expert: Data Acquisition Software for Sentronic ^D - full parameters - CD-ROM		99100111
RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)		88100732
RS 232 cable converter; 2m cable with 9-pin Sub-D (screw connector)		833-993708

* Do not use with the 1" Sentronic^{PLUS}

Sentronic^{HD}

Sentronic^{HD} is a highly accurate three-way proportional valve with digital control and a broad range of diagnostic functions. It is supplied with DaS HD software which can be used with a PC for optimal calibration of the valve.



- Control which is stable under pressure
- Comprehensive diagnostic functions
- Industry 4.0 ready
- Minimal power consumption (< 5 Watt)
- Control deviation < 0.25%
- Minimal heating of device
- Integrated web server

M12 Connection
Power Supply
Target/Actual Value/Input/Output
Frequency Input

Digital Display

Adjustment Buttons

**Ethernet TCP/IP
Programming Interface**



**Proportional
Pilot Valve**

**Exhaust:
G1/4 Connection**

**Output:
G1/4 Connection**

Sentronic^{HD} Electronic Pressure Regulator

General

Sentronic^{HD} is a 3-way proportional valve with digital control. The Data Acquisition Software (DaS) that comes with Sentronic^{HD} can be used to adjust the valve's control parameters to a specific application. Command signal, feedback signal and control parameters can be viewed in real time and adjusted as required for an application. Sentronic^{HD} can be configured for dual loop control of process variables such as flow, force, speed, RPM, and temperature.

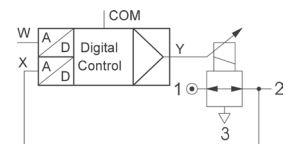
Specifications

Fluids: Air or neutral gases, condensate-free, lubricated or unlubricated
Class 5 to ISO 8573-1

Ports: G1/4
Max. allowable pressure: 174 psi (12 bar)
Pressure range: See How-to-Order section
Fluid temperature: 32°...122°F (0°...50°C)
Ambient temperature: 32°...122°F (0°...50°C)
Hysteresis: ± 0,25 % of span
Linearity/pressure measurement: ± 0,25 % of span
Repeatability: ± 0,25 % of span

Construction

Pilot-operated valve
Body: See table below
Internal parts: Stainless steel, brass, aluminium & POM
Seals: FPM (fluoroelastomer)
Degree of Protection: See table below



Electrical Characteristics

Nominal Diameter DN	Stabilized Voltage *	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
6	24 V DC +/-10%	5	240	F	IP65	8-pin M12 connector, A coded (not supplied)

* Max. ripple: 10 %

Specifications

Pipe Size	Orifice Size (mm)	Flow	
		C _v Flow Factor (K _v Nm ³ /h)	at 6 bar (l/min - ANR)
G 1/4	6	1.30 (1.12)	1200

How to Order

G 616 A 4 0 0 0 0 A00 06

Thread Connection

G = ISO 228

Product Series

616

Revision

A = Initial Release

Size

4 = G1/4 + pressure hold
5 = G1/4 + pressure release

Setpoint

0 = 0-10V
1 = 0-20mA
2 = 4-20mA
3 = PWM - Frequency*

Feedback

0 = 0-10V
1 = 0-20mA
2 = 4-20mA

Pressure Range

03 = 0...3 bar
06 = 0...6 bar
10 = 0...10bar
V1 = -1...(+3bar)

Options

A00 = Standard

Input 2 / Display w/ Buttons

0 = Standard NC + Display
2 = Analog IN 2 + Display
4 = Digital IN 2 + Display
6 = Frequency IN + Display*

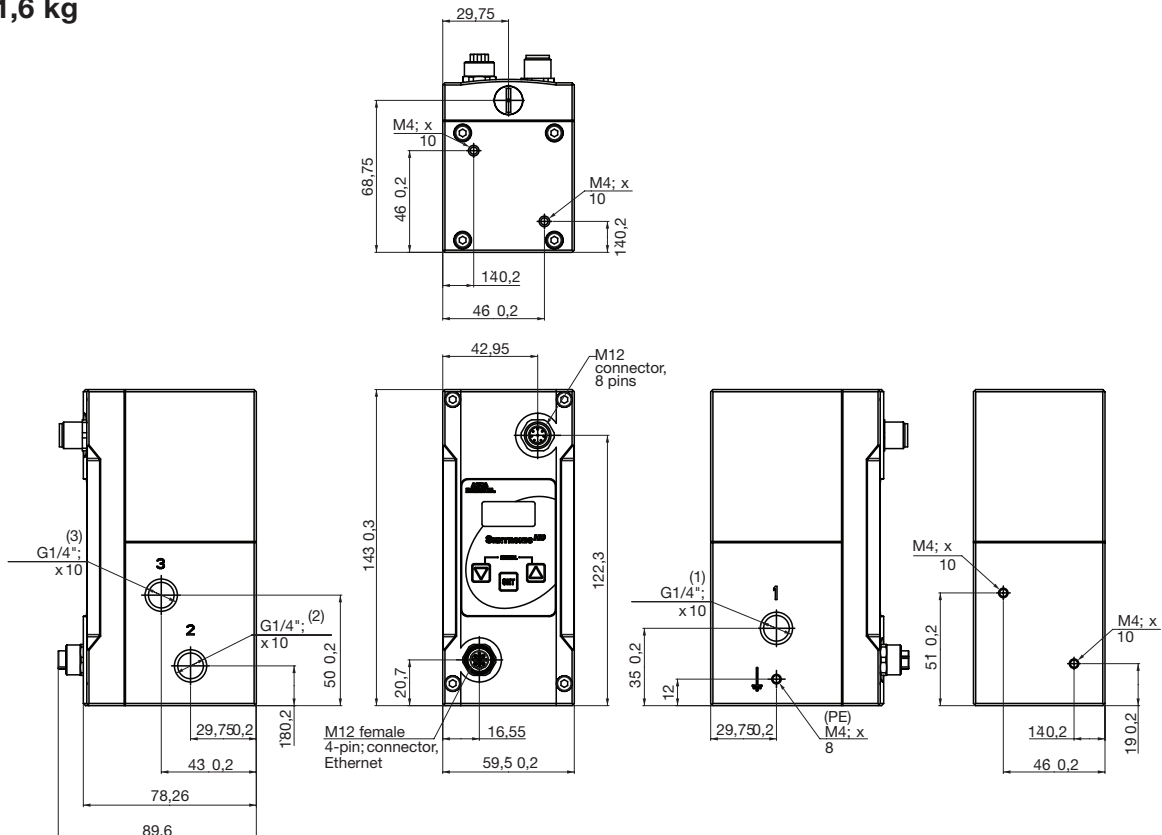
Output 2

0 = NC
1 = Digital OUT
2 = Analog OUT2

* If Setpoint PMW-Frequency is selected, frequency input is not available at IN 2

Dimensions: Millimeters, Weight in kilograms

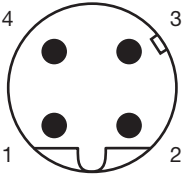
Weight: 1,6 kg



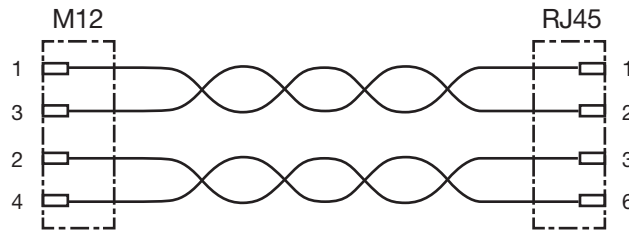
Connector Pinning / Cable Wiring

Ethernet IP programming interface

M12 male connector,
4-pin, D coded

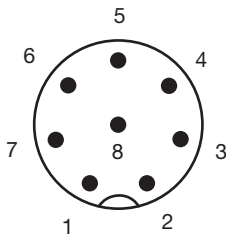


View on male connector
(the device is equipped
with a female connector)



The use of a shielded cable is recommended.

M12 male connector,
8-pin, A coded



View on valve

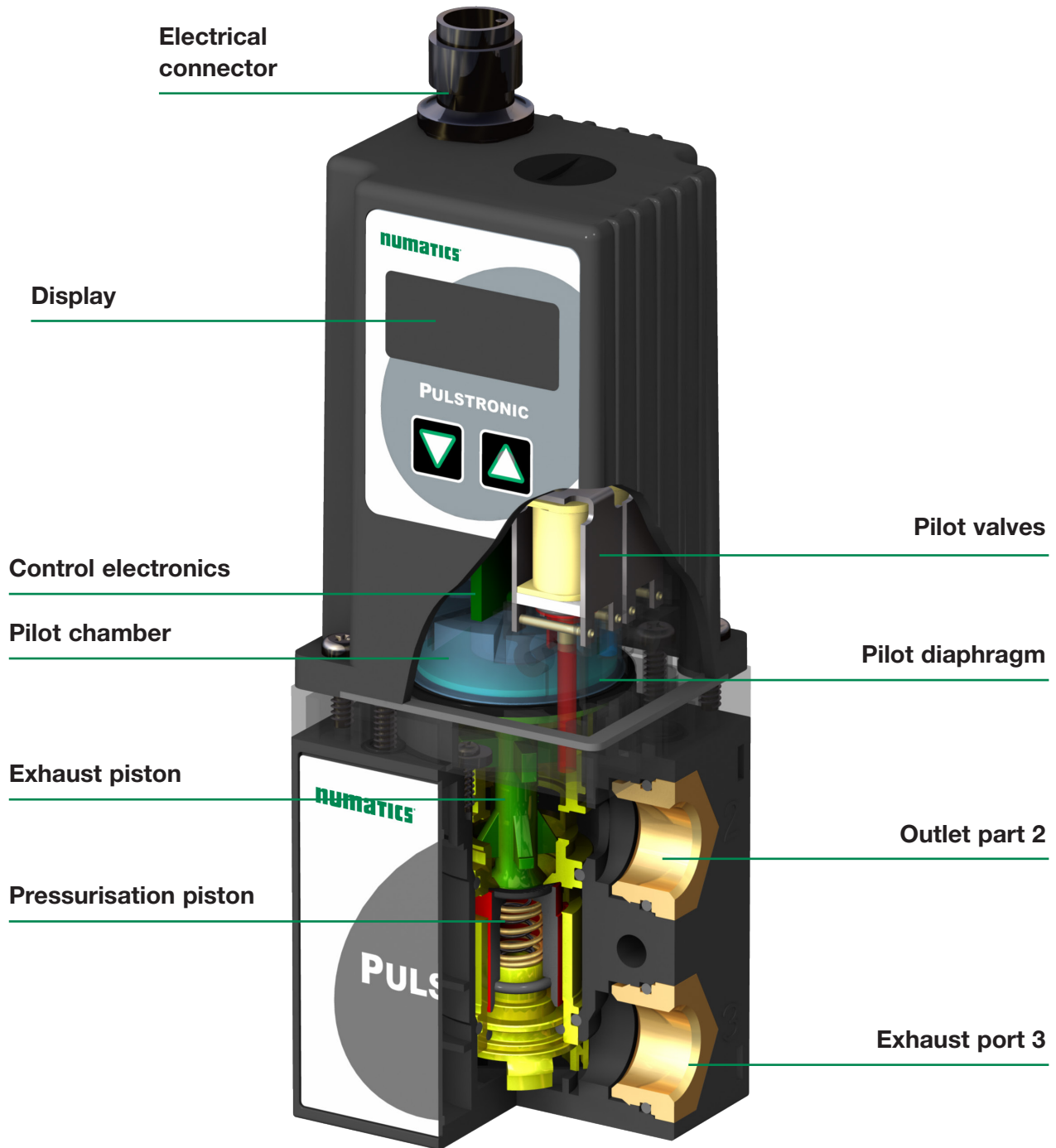
Pin	Description	8-wire cable (5 m, 10 m)
1	Digital Input	white
2	24 VDC voltage supply	brown
3	Setpoint ground SET-	green
4	Setpoint SET+ (PWM)	yellow
5	Analog input 2 / Digital input 2 / Frequency input	gray
6	Analog output	pink
7	Ground 24VDC	blue
8	Digital output / Analg output 2	red
Body	EMC screen	shield

Accessories

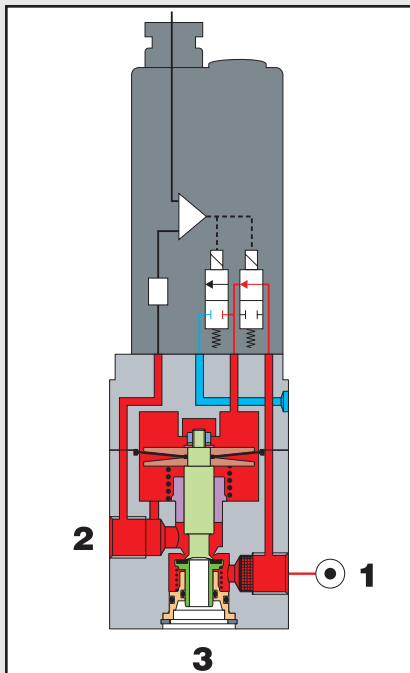
Description	Catalog Number
Supply cable 5 m; 8x0.50 mm ² ; straight connector	TC0805MQX0000000
Supply cable 10 m; 8x0.50 mm ² ; straight connector	TC0810MQX0000000
Supply cable 10 m; 8x0.50 mm ² ; right-angle connector	TD0810MQX0000000
Programming cable 5 m; M12 Straight 4 Pin Male D-Coded to Male RJ45	QA0405MK0VA04000

Pulstronic II Series

The Pulstronic II valve operates with pulsed pilot valves which change the pressure in a control chamber. A downstream pressure booster converts the pilot pressure into an outlet pressure. The outlet pressure is measured with a pressure sensor and fed into the internal digital control loop. The setpoint is established over the electrical plug-in connector as a standard signal [0 to 10 V, 0(4) to 20 mA]. The Pulstronic II is particularly suited for pressure control applications requiring a constant pressure at different flow rates, such as air supply over nozzles or turbine speed control. The valve can be adjusted to a specific application using the DaS software (Data Acquisition Software).

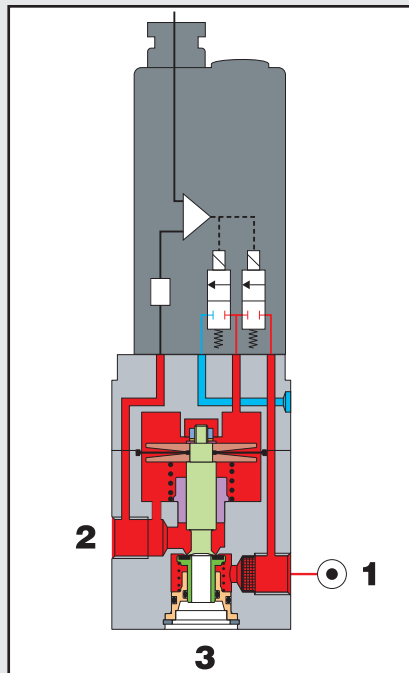


Operating Principle



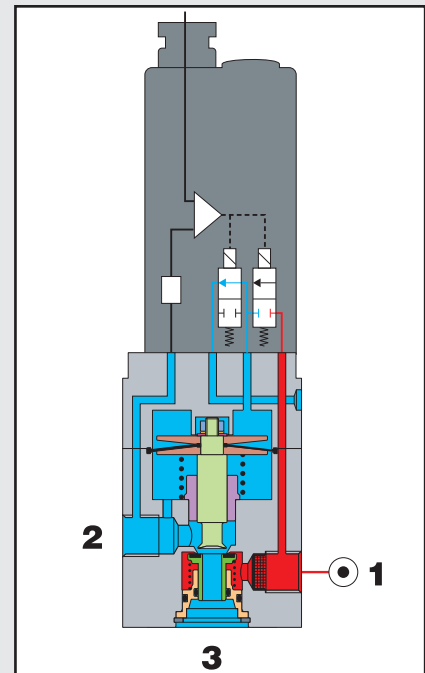
Applying pressure

The pressurisation piston is operated and the flow from port 1 to port 2 is released.



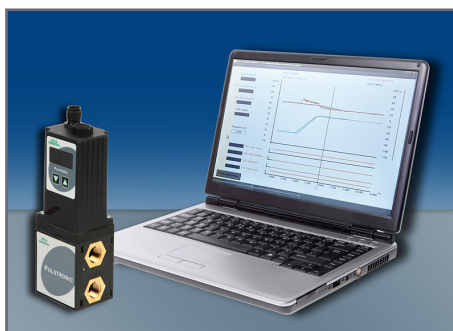
Maintaining pressure

The exhaust piston is in its central position: the flow between port 2 and port 1 or port 3 is blocked.



Exhausting pressure

The exhaust piston is lifted and the flow from port 3 to port 2 is released.



The Data Acquisition Software (DaS) and the RS232 interface allow the controller to be optimally adjusted to the control loop.

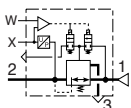
Advantages

- Minimum hysteresis
- Quick pressure changes, low overshoot
- Standard 50 µm filtration
- No constant air consumption
- Stable pressure control at continuous flow
- Digital control
- Easy change of parameters
- Low current consumption
- Integrated display

Specifications

Fluids: Air and gases
 Pressure range: 0 to 150 psi (10 bar)
 Ports: 1/4 (NPT or GTap)
 Construction: Poppet valve
 Actuation: Pulsed 2/2-way valves
 Setpoint: 0 – 10 V, 0 – 20 mA, 4 – 20 mA

Pulstronic II



Features

The PULSTRONIC II is a compact electropneumatic pressure regulator (E/P transducer) which converts an electrical signal into a pneumatic pressure. It is particularly suited for precise pressure regulation due to its integrated control loop with electronic pressure feedback.

General

Fluids: Air or neutral gases, filtered at 50 µm lubricated or unlubricated.
 Connection: 1/4 (NPT or GTap)
 Pressure range: 0-3 bar, 0-6 bar, 0-10 bar
 Temperature - Fluid: 0 °C to +60 °C
 - Ambient: 0 °C to +50 °C

Construction

Body: See table below.
 Internal parts: POM
 Seals: FPM (fluoroelastomer) and NBR (nitrile)

Specifications

Fluids: Air or neutral gases, filtered at 50 µm, lubricated or unlubricated
 Connection: 1/4 (NPT or GTap)
 Pressure range: 0-50psi, 0-100psi, 0-150psi
 0-3 bar, 0-6 bar, 0-10 bar.
 Temperature / fluid: 32°F - 140°F (0°C - 60°C)
 Temperature / ambient: 32°F - 122°F (0°C - 50°C)
 Analog setpoint: 0 - 10 V, 0 - 20 mA, 4- 20 mA
 Fallsafe behavior: Pressure held on loss of power, without control
 Hysteresis: < 1 % of span
 Repeatability: ± 0.5% of span

Electrical Characteristics

Voltage*	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
24 VDC ±10%	3.6	150	F	IP 65	5-pin M12 connector (to be ordered separately)

*Maximum ripple: 10%

Specifications

Ø Ports	Ø Orifice DN (mm)	Flow	
		C _v Flow Factor (K _v Nm ³ /h)	at 6 Bar (l/min - ANR)
1/4	4	0.29 (0.25)	470

How to Order

605 A S O F P

Construction (connection)

- D = G1/4 with display
- E = G1/4 without display
- F = 1/4 NPT without display
- G = 1/4 NPT with display

Setpoint

- 0 = 0 ... 10 V
- 1 = 0 ... 20 mA
- 2 = 4 ... 20 mA

Options

- 1 = Feedback output 0 ... 10 Volt
- 2 = Feedback output 0 ... 20 mA
- 3 = Feedback output 4 ... 20 mA

Pressure Range

Related range

- A = 0 - 50 psi
- B = 0 - 100 psi
- C = 0 - 150 psi
- 3 = 0 - 3 bar
- 6 = 0 - 6 bar
- 0 = 0 - 10 bar

Min./Max. inlet pressure

- 65 - 80 psi
- 115 - 130 psi
- 165 - 180 psi
- 4 - 5 bar
- 7 - 8 bar
- 11 - 12 bar

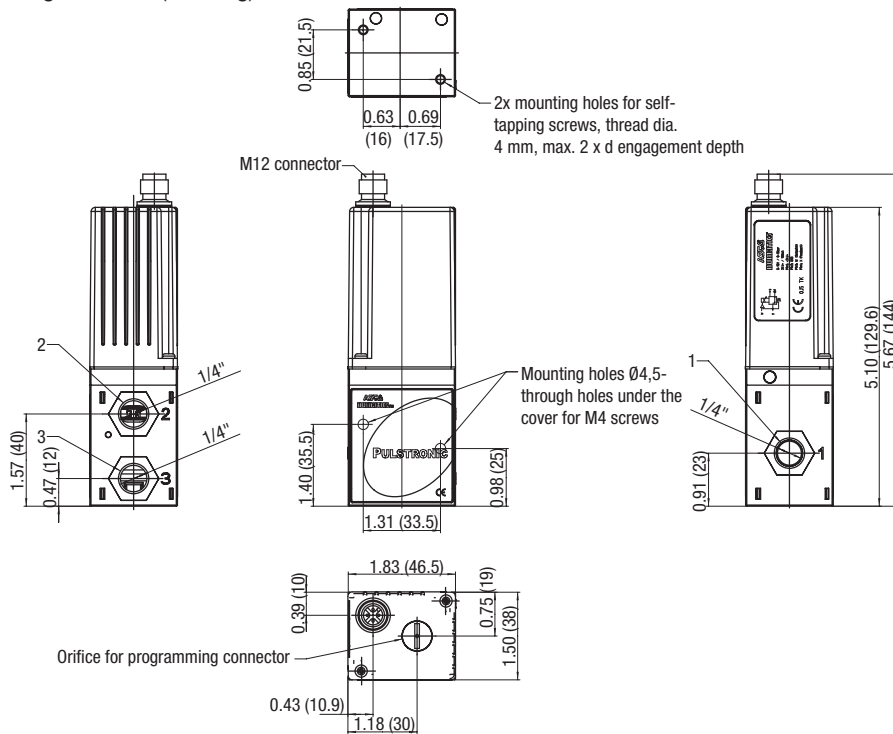
Failsafe Behavior

- 0 = Pressure held

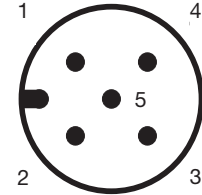
Dimensions: Inches (mm), Weight in lbs. (kg)

1/4 NPT or GTap

Weight: 0.40lbs (0.182 kg)



Connector Pin Out



View from solder side

PIN	Description	5-wire cable
1	24V voltage supply	brown
2	Analog setpoint input	white
3	Supply ground	blue
	Analog ground*	yellow
4	Analog output (Feedback)	black
5	PE connection	grey
Cable shield	EMC shield	shield

* A 6-wire cable with separate analog ground is used for cable lengths over 2 m to set off the voltage drop for the setpoint.

Accessories



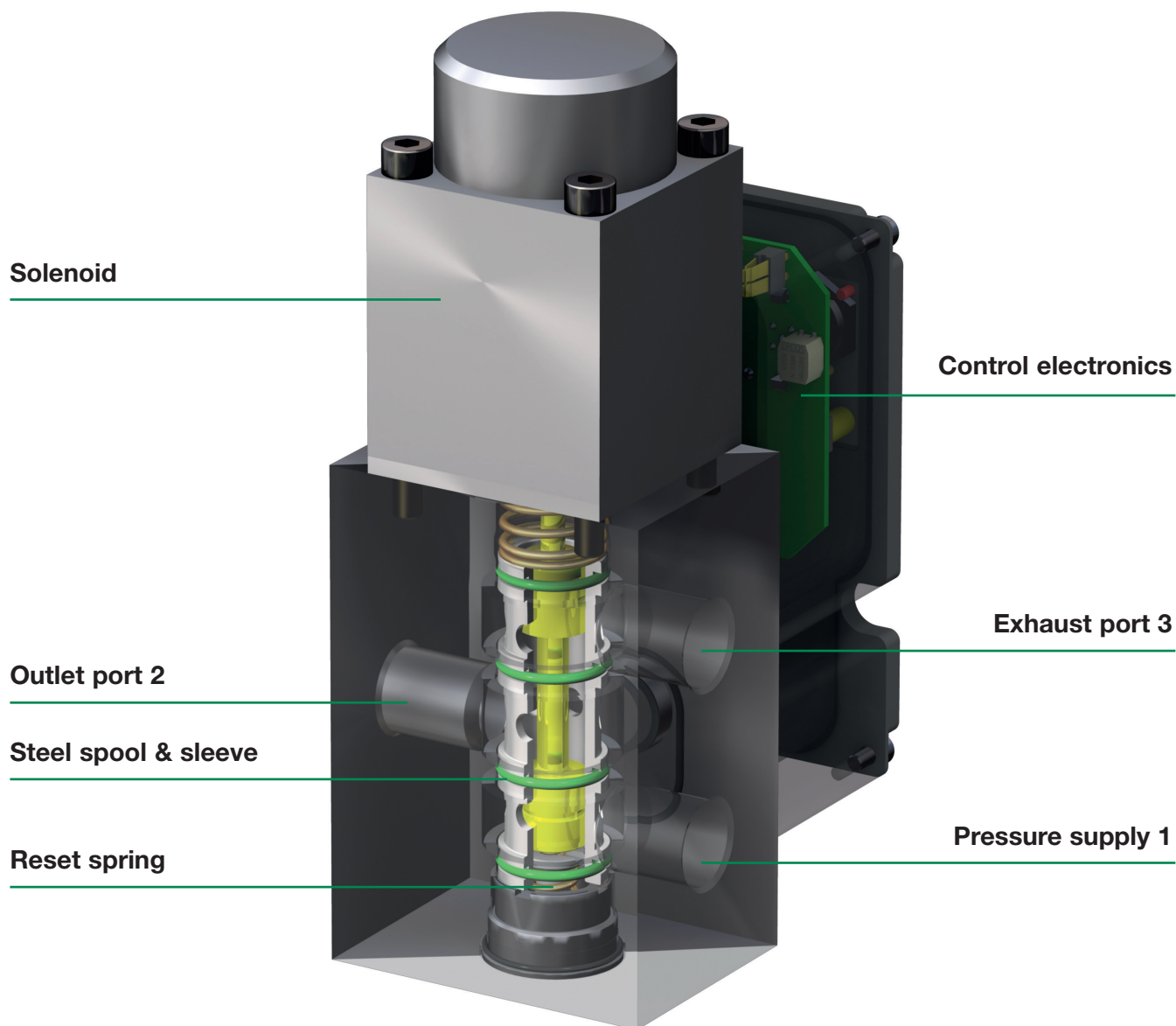
5 Pin 12mm FEMALE Straight Field Attachable Connectors		Model Number
PG 9 Cable Gland		TC05F20000000000
5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors		
PG 9 Cable Gland		TD05F20000000000
Micro Female 5 Pole Straight 6 Wire 24 AWG, Shielded		
3 Meter		TC0503MMS000671Y
5 Meter		TC0505MMS000671Y
Micro Female 5 Pole 90 Degree 6 Wire 24 AWG Euro Color Code, Shielded		
3 Meter		TD0503MMS000671Y
5 Meter		TD0505MMS000671Y
Micro F/M 4 Pole Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TC0403MIETA04000		3 Meter - TC0403MMETA04000
5 Meter - TC0405MIETA04000		5 Meter - TC0405MMETA04000
Micro F 90°/M Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TD0403MIETA04000		3 Meter - TD0403MMETA04000
5 Meter - TD0405MIETA04000		5 Meter - TD0405MMETA04000
PC Software & Cable Connectors		Model Number
DaS Light: Data Acquisition Software for Sentronic [®] - basic parameters - free download at Numatics.com		99100110
RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)		88100732

Servotronic^{Digital}

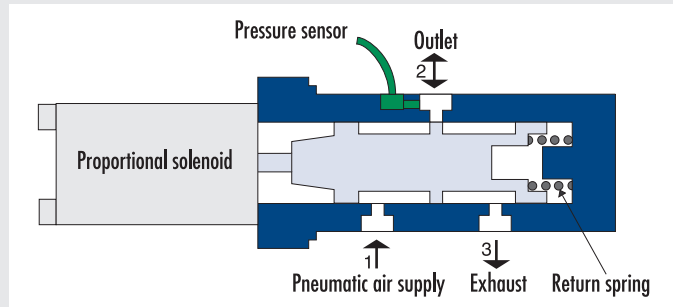
Greater versatility in automated production processes: Due to electronics, the new generation of Servotronic products increases the range of applications and performance of pneumatic components. The Servotronic^{Digital} directly responds to all pressure control needs and indirectly meets the requirements placed in the control of physical variables, such as position, velocity, acceleration, force, mass etc. The combination of innovative pneumatic technology, high-precision mechanics and modern electronics allows for quick control of pressure in a pneumatic actuating system in relation to a signal received from the controlling electronics.

The Servotronic^{Digital} is provided with a precision-lapped steel spool and sleeve with hardened and tempered surface enabling very high pulse frequencies at extremely short response times. The Servotronic^{Digital} valve has a constant air consumption.

The valve can be adjusted to a specific application using the DaS software (Data Acquisition Software).



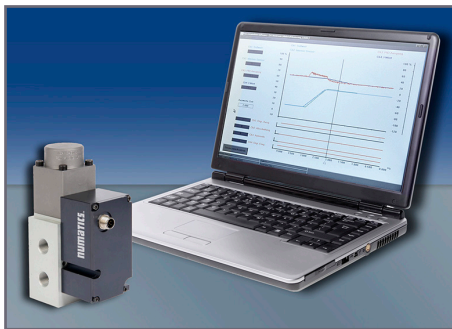
Operating Principle



Applying pressure

The Servotronic^{Digital} consists of a spool and sleeve servo-valve with three ports and control electronics to define the pressure in proportion to a given setpoint.

The spool position can be changed continually to maintain a constant outlet pressure in relation to a given setpoint signal.



The Data Acquisition Software (DaS) and the RS232 interface allow the controller to be optimally adjusted to the control loop.

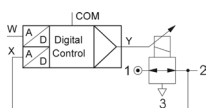
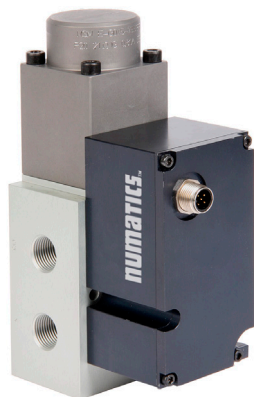
Advantages

- Minimum hysteresis
- Very short response times
- Excellent flow characteristics
- Compact monobloc construction with integrated electronics and sensor
- High reliability and long service life due to precision mechanics combined with simple control technology
- Digital control
- Easy change of control parameters

Specifications

Fluids: Air and gases
 Pressure range: 0 to 40 bar
 Ports: G 3/8
 Flow: 0 to 1700 NI/min
 Construction: Spool & sleeve valve
 Actuation: Lifting solenoid
 Setpoint: 0 – 10 V, 0 – 20 mA, 4 – 20 mA

Servotronic^{Digital}



Features

Servotronic^{Digital} is a highly dynamic 3-way proportional valve with digital control particularly suitable for applications with constant flow.

Servotronic^{Digital} stands for:

- Digital communication and control
- Direct operated valve
- Dynamic behaviour (high speed)

A special feature of the Servotronic^{Digital} is its DaS software supplied for optimum adjustment over PC and viewing of setpoint and feedback signals. Other functions are valve diagnostics, parameter setting and maintenance.

Construction

Spool and sleeve assembly.

Body: Aluminum.

Internal parts: Stainless steel and brass

Seals: FPM (fluoroelastomer) and NBR (nitrile)

Specifications

Fluids: Air or neutral gases, filtered at 50 µm, lubricated or unlubricated

Ports: G 3/8.

Maximum allowable pressure: See table below

Pressure range: See table below

Temperature / fluid: 32°F - 140°F (0°C - 60°C)

Temperature / ambient: 32°F - 140°F (0°C - 60°C)

Analog setpoint: 0 - 10 V (impedance 100 KΩ)

0 - 20 mA/4 - 20 mA (impedance 250 Ω)

Hysteresis: 0.5% of span

Linearity / pressure measurement: ± 0.5% of span

Repeatability: ± 0.5% of span

Electrical Characteristics

Nominal diameter DN (mm)	Voltage*	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
8	24 VDC = ±10%	20	810	F	IP 65	5-pin M12 connector (to be ordered separately)

*Maximum ripple: 10%

Specifications

Ø Ports	Ø Orifice DN (mm)	Flow	
		C _v Flow Factor (K _v Nm ³ /h)	at 6 Bar (l/min - ANR)
G 3/8	8	1.68 (1.45)	1700

How to Order

6 1 5 3 7 0 A S I D P P

Version (connection) body
7 = Integrated electronics

Setpoint
0 = 0 ... 10 Volt
1 = 0 ... 20 mA
2 = 4 ... 20 mA

Feedback
1 = Feedback output 0 ... 10 Volt
2 = Feedback output 0 ... 20 mA
3 = Feedback output 4 ... 20 mA
4 = Feedback output 0 ... 10 Volt*
5 = Feedback output 0 ... 20 mA*
6 = Feedback output 4 ... 20 mA*

* Feedback input is needed for dual loop units.

Options
A00 = Dual loop control
018 = Oxygen clean

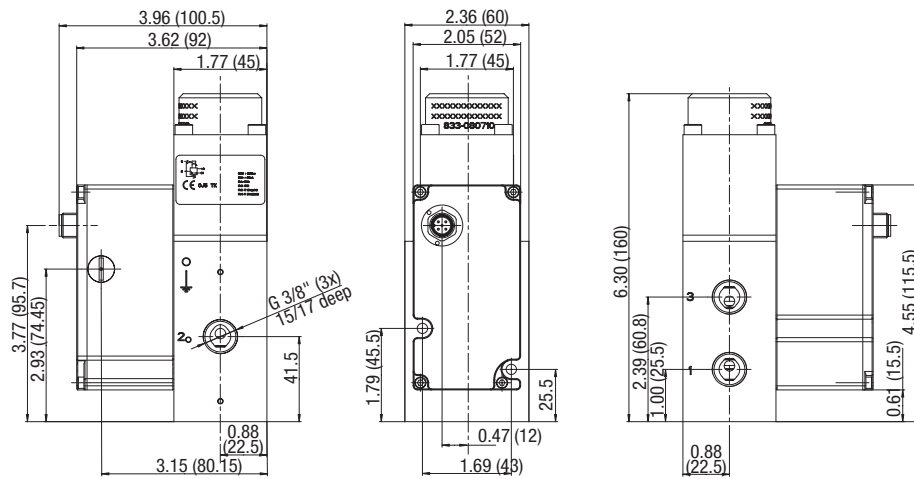
Pressure Range

Relative pressure	Max. allowable pressure (bar)	Vacuum (relative)
40 = 0-100 mbar	2	V3 = 0 ... -1 bar shut-off valve
50 = 0-500 mbar	2	
60 = 0 - 1 bar	2	
02 = 0 - 2 bar	3	
03 = 0 - 3 bar	8	
05 = 0 - 5 bar	8	
06 = 0 - 6 bar	12	
10 = 0 - 10 bar	12	
12 = 0 - 12 bar	14	
16 = 0 - 16 bar	18	
20 = 0 - 20 bar	22	
30 = 0 - 30 bar	35	
4H = 0 - 40 bar	45	

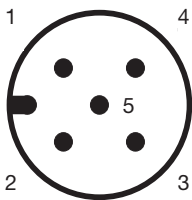
Digital Output
1 = Pressure switch output PNP±5%

Dimensions: Inches (mm), Weight in lbs. (kg)

Weight: 3.88 (1.760)



Connector Pin Out



PIN	Description	6-wire cable
1	24V voltage supply	brown
2	Analog setpoint input	white
3	Supply ground	blue
	Analog ground*	yellow
4	Analog output (Feedback)	black
5	Digital output (pressure switch)	grey
Body	EMC shield	shield

* A 6-wire cable with separate analog ground is used for cable lengths over 2 m to set off the voltage drop for the setpoint.

Accessories

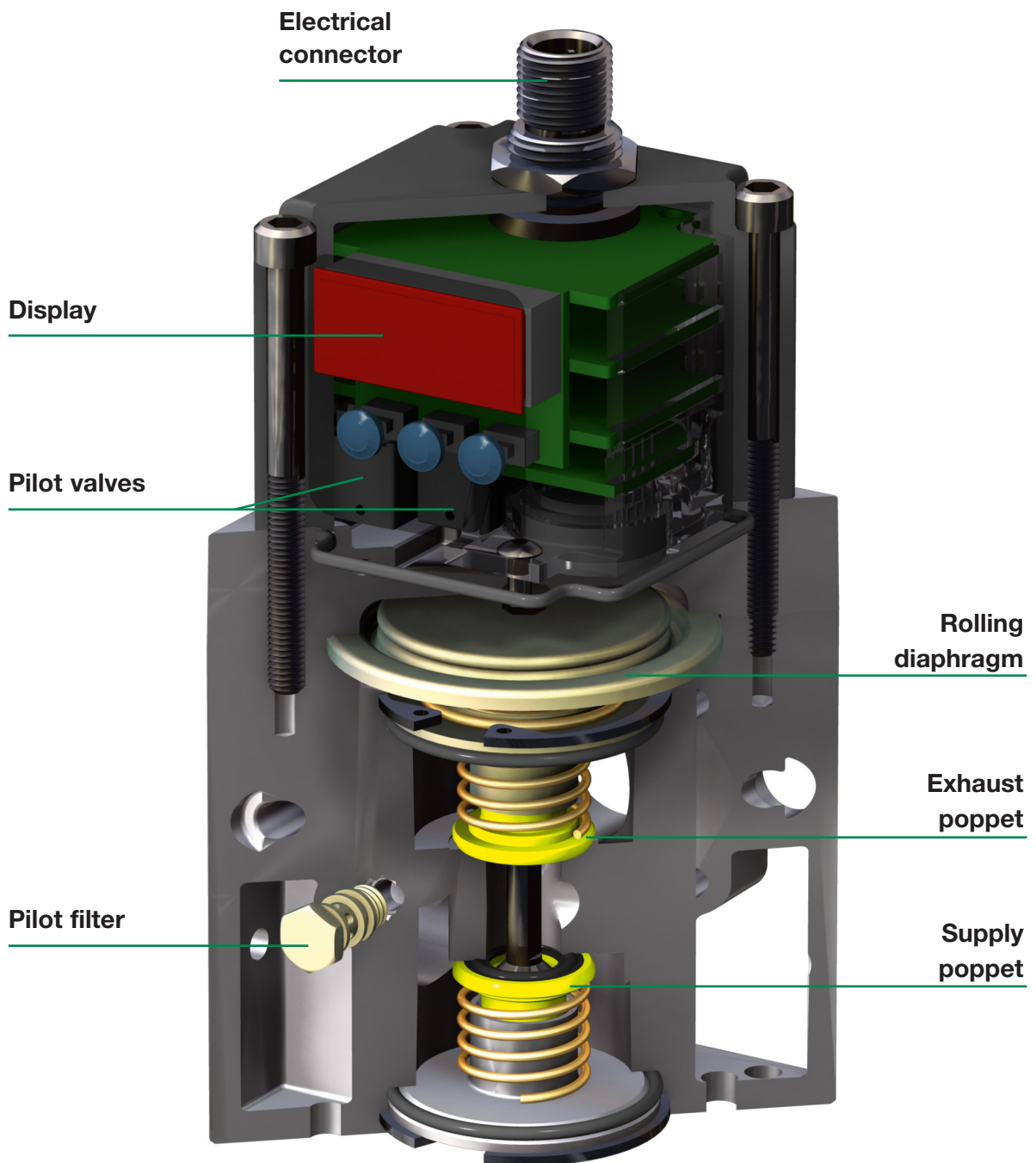


5 Pin 12mm FEMALE Straight Field Attachable Connectors		Model Number
PG 9 Cable Gland		TC05F20000000000
5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors		Model Number
PG 9 Cable Gland		TD05F20000000000
Micro Female 5 Pole Straight 6 Wire 24 AWG, Shielded		
3 Meter		TC0503MMS000671Y
5 Meter		TC0505MMS000671Y
Micro Female 5 Pole 90 Degree 6 Wire 24 AWG Euro Color Code, Shielded		
3 Meter		TD0503MMS000671Y
5 Meter		TD0505MMS000671Y
Micro F/M 4 Pole Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TC0403MIETA04000		3 Meter - TC0403MMETA04000
5 Meter - TC0405MIETA04000		5 Meter - TC0405MMETA04000
Micro F 90°/M Straight 22 AWG Euro Color Code		
Unshielded		Shielded
2 Meter - TD0403MIETA04000		3 Meter - TD0403MMETA04000
5 Meter - TD0405MIETA04000		5 Meter - TD0405MMETA04000
PC Software & Cable Connectors		Model Number
DaS Light: Data Acquisition Software for Sentronic ^D - basic parameters - free download at Numatics.com		99100110
DaS Expert: Data Acquisition Software for Sentronic ^D - full parameters - CD-ROM		99100111
RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)		88100732

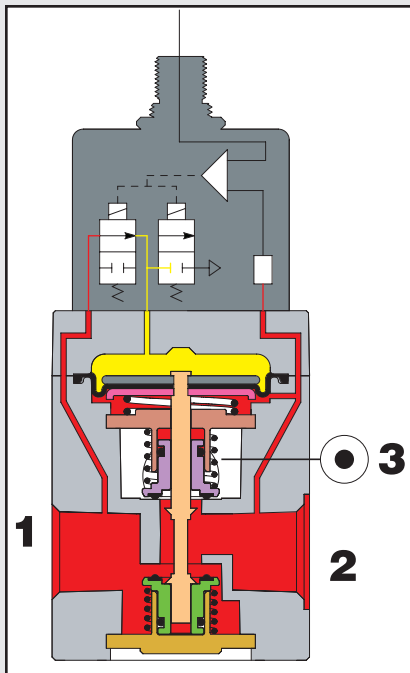
E22 Series

Unlike SENTRONIC valves, E-Series valves operate with pulsed pilot valves which change the pressure in a control chamber. A pressure booster converts the pilot pressure into an outlet pressure with increased flow. The outlet pressure is measured with a pressure sensor and fed into the internal control loop. The setpoint is established over the electrical plug-in connector as a standard signal [0 to 5 (10) V, 4 to 20 mA].

E-Series is particularly suited for pressure control applications with a constant flow, e.g. flow control over nozzles, turbine speed control, glue and lacquer dosing, or pressure control of welding equipment.

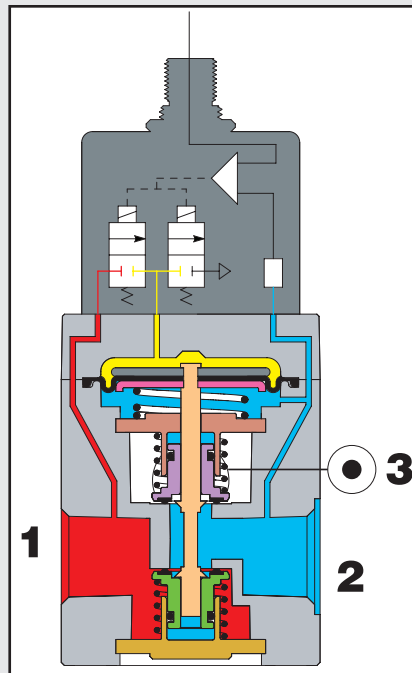


Operating Principle



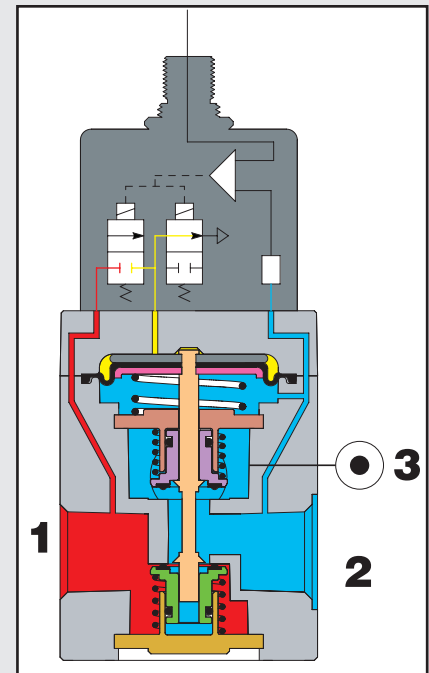
Increasing pressure

The inlet poppet is operated and air flows from port 1 to port 2.



Maintaining pressure

The poppets are in their central position: the flow between port 2 and port 1 or port 3 is blocked.



Exhausting pressure

The exhaust poppet is lifted and air flows from port 2 to port 3.

Specifications

Fluids: Air, neutral gases

Pressure range: 0 to 150 psi (10.2 bar)

Ports: (directly operated) 1/4, 3/8, 1/2, (NPT, GTap or BSPT)

Construction: Poppet valve

Actuation: 2 control valves

Setpoint: 0 – 10 V, 4 – 20 mA, 0 – 5 V

Options: Internal pressure switch

 Analog output (feedback)

Introducing the E22 Series

The E22 Series electronic proportional regulators quickly and accurately adjust output pressure in relation to an electrical control signal. They meet requirements of industrial environments including rapid cycling, quick response, and repeatability, which are found in paint, welding, packaging, textile, medical, and many other process applications.

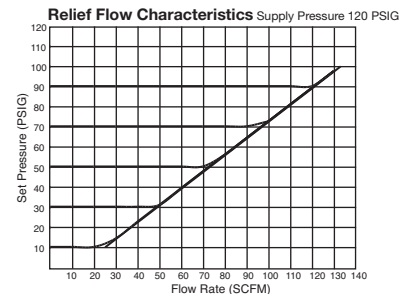
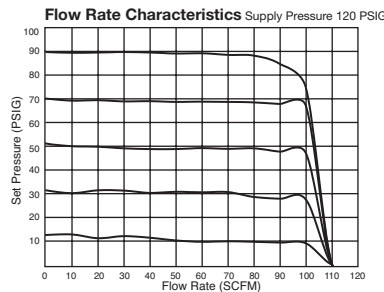
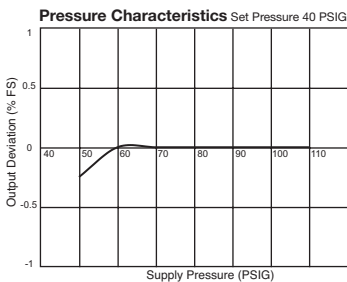
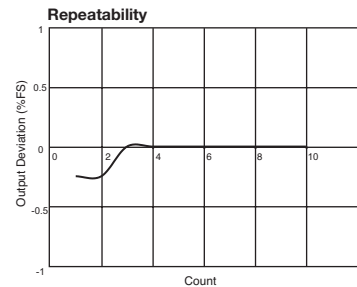
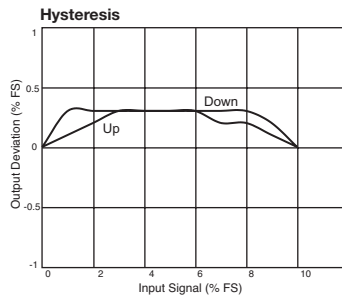
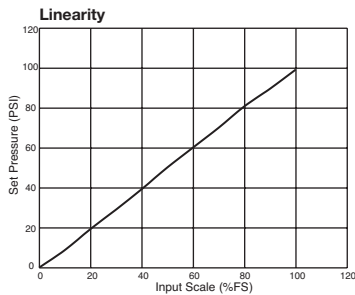
The electrical control signal can be either analog or digital. The analog unit controls any pressure setting directly proportional to the command signal of 4-20mA, 0-10VDC, or 0-5VDC. The optional digital unit uses a 2 bit binary signal to control four user defined pressures eliminating the need for an analog I/O card.



E22 Series Features:

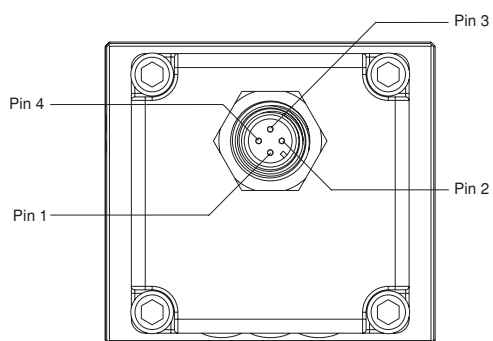
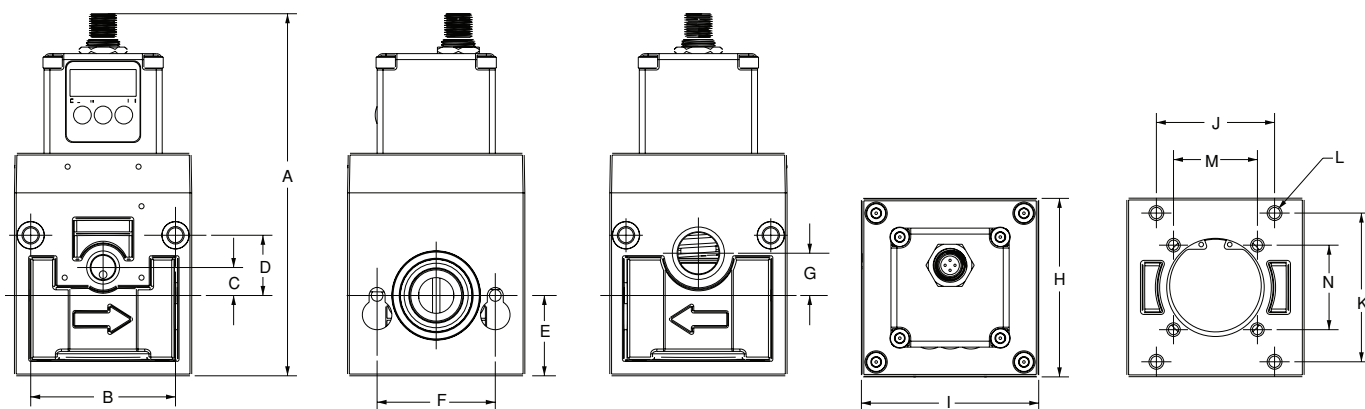
- Available in 1/4, 3/8, and 1/2 NPT, GTap or BSPT threads
- Capable of flow up to 100 SCFM
- Modular 22 Series Flexiblok design
- Fully ported 1/2 exhaust for optimal performance
- Three set performance modes in a single unit
- Large digital display for easy reading
- Locking feature prevents unwanted changes
- Designed to meet IP65 and NEMA 4 requirements

Performance Graphs for E22 Series



Dimensions: Inches (mm)

E22 Series



Pin Configuration		
Command Signal		
	Analog	Digital
Pin 1	+24VDC	
Pin 2	Command Signal	Input Signal 1
Pin 3	+0VDC common	
Pin 4	Monitor Output	Input Signal 2

Dimensions	A	B	C	D	E	F	G	H	I	J	K	L	M	N
E22	5.57 (141)	1.83 (46)	0.29 (7)	.70 (18)	1.00 (25)	1.58 (40)	0.70 (18)	2.17 (55)	2.38 (60)	1.70 (43)	1.80 (46)	0.19 (5)	1.42 (36)	1.42 (36)

Specifications



Specifications		E22
Minimum Supply Pressure		Set Pressure + 15 PSI (1 BAR)
Maximum Supply Pressure		Standard Pressure: 150 PSI (10 BAR) High Pressure: 190 PSI (13 BAR)
Regulating Pressure Ranges		Standard Pressure: 0-100 PSI (0-6.9 BAR) High Pressure: 0-150 PSI (0-10.2 BAR)
Power Supply	Voltage	24VDC \pm 10%
	Current Consumption	0.04 A
Input Signal	Current	4-20mA
	Voltage	0-5VDC, 0-10VDC
Input Impedance	0-5 VDC	10 K Ω
	0-10 VDC	20 K Ω
	4-20 mA	100 Ω
Output Signal	Analog Output	0-5VDC 0-10VDC 4-20mA
	Switch Output	24VDC (PNP or NPN)
Linearity		$\leq \pm 1\%$ of span
Hysteresis		$\leq \pm 0.5\%$ of span
Repeatability		$\leq \pm 0.5\%$ of span
Sensitivity		$\leq \pm 0.2\%$ of span
Temp Characteristics		$\pm 0.5\%$ of span / $^{\circ}$ C
Output Display	Accuracy	$\pm 3\%$ of span
	Minimum unit	PSI 0.1, BAR 0.01, kPa 001., kgf/cm 2 0.01
Temperature Range		40-120 $^{\circ}$ F 4-50 $^{\circ}$ C
Enclosure		IP65 and NEMA 4 Equivalent
Weight		1.4 lbs. (0.64kg)

How to Order

E 22 3 - 04 3 H

Series

22 = 22 Series

Command Signal

- 1 = 4 - 20mA
- 2 = 0 - 5VDC
- 3 = 0 - 10VDC
- 9 = 2 bit, 4 pressure select (PNP Sourcing)
- 0 = 2 bit, 4 pressure select (NPN Sinking)

Thread Types

- = NPTF
- G = GTap (BSPP)
- R = PT (BSPT)

Options

H = 0 - 150 PSI (10 BAR) regulating pressure range
(For 0-100 PSI standard unit no suffix necessary)

Feedback Signal

- 1 = 4 - 20mA
- 2 = 0 - 5VDC
- 3 = 0 - 10VDC
- 8 = 24VDC Switched (PNP)
- 9 = 24VDC Switched (NPN)
- 0 = use with 2 bit, 4 pressure select
(type 9 or 0 command signal)

Port Tap Size

- 02 = 1/4
- 03 = 3/8
- 04 = 1/2

Accessories



Micro Female 4 Pole 90 Degree 22 AWG Euro Color Code

Unshielded	Shielded
2 Meter - TC0403MIE0000000	3 Meter - TC0403MME0000000
5 Meter - TC0405MIE0000000	5 Meter - TC0405MME0000000



Micro Female 4 Pole 90 Degree 22 AWG Euro Color Code

Unshielded	Shielded
2 Meter - TD0403MIE0000000	3 Meter - TD0403MME0000000
5 Meter - TD0405MIE0000000	5 Meter - TD0405MME0000000



Micro F/M 4 Pole Straight 22 AWG Euro Color Code

Unshielded	Shielded
2 Meter - TC0403MIETA04000	3 Meter - TC0403MMETA04000
5 Meter - TC0405MIETA04000	5 Meter - TC0405MMETA04000

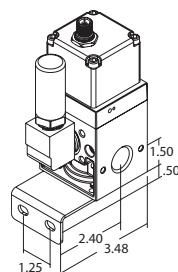


Micro F 90°/M Straight 22 AWG Euro Color Code

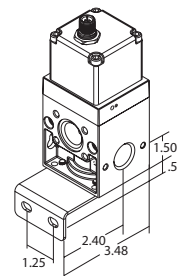
Unshielded	Shielded
2 Meter - TD0403MIETA04000	3 Meter - TD0403MMETA04000
5 Meter - TD0405MIETA04000	5 Meter - TD0405MMETA04000

Bracket/Muffler Kits

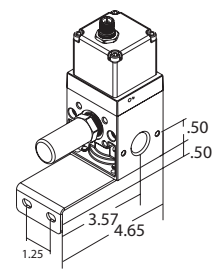
Model Number	Description
BRK-KIT	Includes (1) E02-10 Bracket, (4) E32-11 Screws, (1) M4MN Muffler, (1) E22-29 Elbow
BRK-KIT-WOEM	Includes (1) E02-10 Bracket, (4) E32-11 Screws
BRK-KIT-LWOE	Includes (1) E32-10 Bracket, (4) E32-11 Screws, (1) M4MN Muffler



BRK-KIT



BRK-KIT-WOEM



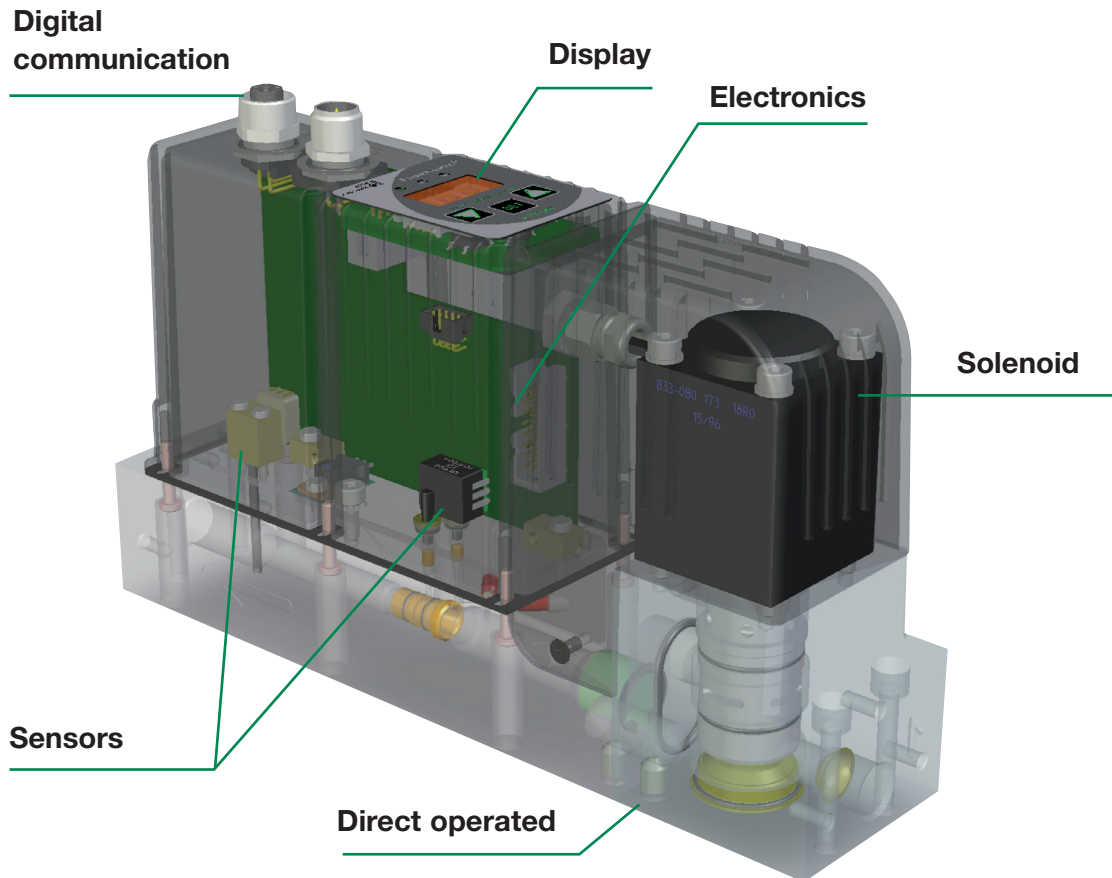
BRK-KIT-LWOE

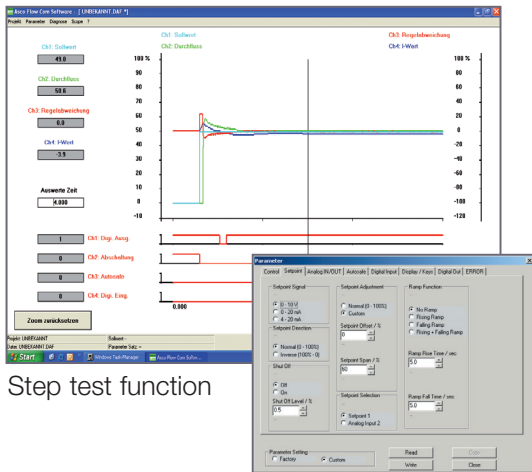
Flowtronic^D

Flowtronic^D is a digitally operated flow controller up to 35 SCFM (1000 NI/min). The Flowtronic^D consists of a fast, direct-operated 2-port proportional valve that operates independently of the inlet pressure (max. 116 psi), and a control unit which contains all of the control electronics and sensors. The Flowtronic^D offers precise flow adjustment and is very responsive to outside disturbances.

Typical applications for the Flowtronic^D include: Paint coating technology, mixing of gases in process control, packaging and food processing industry, surface finishing and materials coating processes, burner control systems, and fuel cell technology.

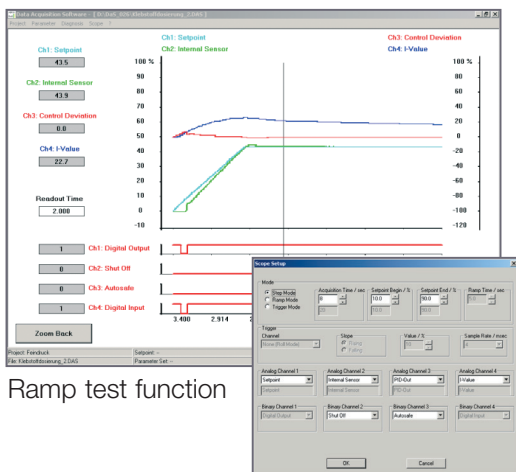
The digital control electronics and a USB interface allow the controller to be adapted to different applications. The Numatics FlowCom PC software provides easy start-up.





Step test function

Parameters setup



Ramp test function

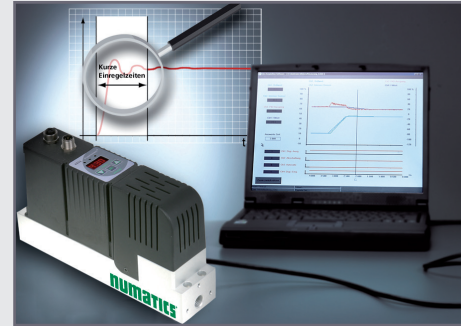
Scope setup

Advantages

- Low hysteresis
- Quick response times
- Very high sensitivity
- Standard 50 µm filtration
- Analog feedback output
- Easy change of control parameters
- Digital control
- Integrated display (optionally without)
- PC communication

Specifications

Fluids: Air or neutral gases
 Pressure Up to 116 psi (8 bar)
 Ports: 1/4, 3/8, 1/2 NPT or GTap
 Nominal diameter: 3mm, 5mm, 6mm
 Flow: 0.4 – 70.6 SCFM (10 – 2000 NI/min)
 Valve Type: Poppet Valve
 Command signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA
 Feedback output: 0 - 10 V, 0 - 20 mA, 4 - 20 mA
 Hysteresis: ± 3%
 Linearity: 3%
 Repeatability: ± 1.5%
 Response time: < 200ms
 Degree of protection: IP 65



By connecting the Flowtronic^D to a PC with a USB interface, the Numatics FlowCom software can be used to optimally adjust the valve's control parameters to a specific application. FlowCom software has an oscilloscope function that allows the user to select and visually see various response characteristics as the flow controller operates in an application. Control loop parameters can be adjusted using the software without removing the flow controller from service. This functionality streamlines the application development process. Control parameters can be saved and reloaded at any time.

The Numatics FlowCom software offers the following features:

- Real time display of: command signal, outlet pressure, internal control parameters (e.g. P, I or D), pressure switch signal, etc.
- Parameter setting: command signal, zero offset, span, limitation of output current, ramp function, etc.
- Diagnostics menu for error detection and testing
- Custom adjustment to an application
- Control of Flowtronic^D

Flowtronic^D



Features

- The Flowtronic^D consists of a fast, direct-acting 2-port proportional valve, a pressure sensor unit and digital control electronics.
- Controls applications that have varying flow
- Controls and maintains constant and even flow despite external disturbances such as fluctuating inlet pressure
- Measures flow precisely with two sensors
- Software and PC connection allows parameters to be adjusted to a specific application.
- FlowCom software provides quick and easy start-up.
- Diagnostic capability using the integrated LEDs or the FlowCom software

General

Fluids: Air or neutral gas, filtered at 50 µm, condensate-free, lubricated or unlubricated
 Minimum allowable pressure: 4 bar (58 psi)
 Maximum allowable pressure (MAP): 8 bar (116 psi)
 Control range: 0.4 – 70.6 SCFM (10 – 2000 NI/min) (ANR)
 Fluid temperature: 0°C to +50°C
 Ambient temperature: 0°C to +40°C
 Input - analog: 0 - 10 V (100 kΩ)
 0/4 to 20 mA (resistance 250 Ω)
 Feedback - analog: 0 - 10 V,
 0/4 to 20 mA (max load 500 Ω)
 Flow accuracy
 Hysteresis: ± 3%
 Linearity: ± 3%
 Repeatability: ± 1.5%
 Calibration conditions
 Ambient temperature: 72.5°F ± 4.5°F (22.5°C ± 2.5°C)
 Fluid: Air
 Dynamic performance
 Response time < 200 ms
 Other features Auto-tune, error display by LED

Construction

Body: Aluminum
 Internal parts: Aluminum, stainless steel and brass
 Seals: NBR (nitrile)

Electrical Characteristics

Flow Regulation Range	Voltage *	Max. Power (W)	Max. Current (mA)	Insulation Class	Degree of Protection	Electrical Connection
Up to 1000 NI/min	24 VDC = ± 10%	30	1250	H	IP 65	- 5-pin M12 connector - USB connection with 4 pin M12 connector
2000 NI/min	24 VDC = ± 10%	34	1400	H	IP 65	- 5-pin M12 connector - USB connection with 4 pin M12 connector

* Max. ripple: 10 %

How to Order

8 3 3 - 3 8 0 1 0 1 1 5 0

Version (ports), body / Display

- 0 = (GTap) without display*
- 1 = (GTap) with display*
- 2 = 1/2 (GTap) without display
- 3 = 1/2 (GTap) with display
- 6 = (NPT) without display*
- 7 = (NPT) with display*
- 8 = 1/2 (NPT) without display
- 9 = 1/2 (NPT) with display

* Port size depends on flow range (1/4 or 3/8)

Command signal

- 0 = 0 ... 10 Volt
- 1 = 0 ... 20 mA
- 2 = 4 ... 20 mA

Feedback

- 1 = Feedback output 00 ... 10 Volt
- 2 = Feedback output 00 ... 20 mA
- 3 = Feedback output 04 ... 20 mA
- 4 = Feedback input 0 - 10 Volt¹⁾
- 5 = Feedback input 0 - 20 mA¹⁾
- 6 = Feedback input 4 - 20 mA¹⁾

Options

A00 = Dual loop control

Flow regulation range

- 10 = 0.4 - 3.5 SCFM (10 - 100 NI/min)
(1/4 - Versions 0, 1, 6 or 7 only)
- 20 = 0.4 - 7.1 SCFM (10 - 200 NI/min)
(1/4 - Versions 0, 1, 6 or 7 only)
- 30 = 0.4 - 10.6 SCFM (12 - 300 NI/min)
(1/4 - Versions 0, 1, 6 or 7 only)
- 50 = 0.7 - 17.7 SCFM (20 - 500 NI/min)
(1/4 - Versions 0, 1, 6 or 7 only)
- 60 = 0.8 - 21.2 SCFM (22 - 600 NI/min)
(1/4 - Versions 0, 1, 6 or 7 only)
- 99 = 1.8 - 35.3 SCFM (50 - 1000 NI/min)
(3/8 - Versions 0, 1, 6 or 7 only)
- 20 = 3.5 - 70.6 SCFM (100 - 2000 NI/min)
(1/2 - Versions 2,3,8 or 9 only)

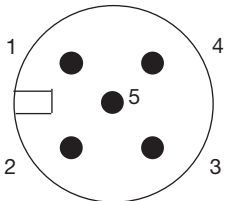
Digital I/O

- 1 = Pressure switch output
PNP ± 5 %

Notes:

¹⁾ Feedback input is needed for dual loop units.

Connector Pin Out

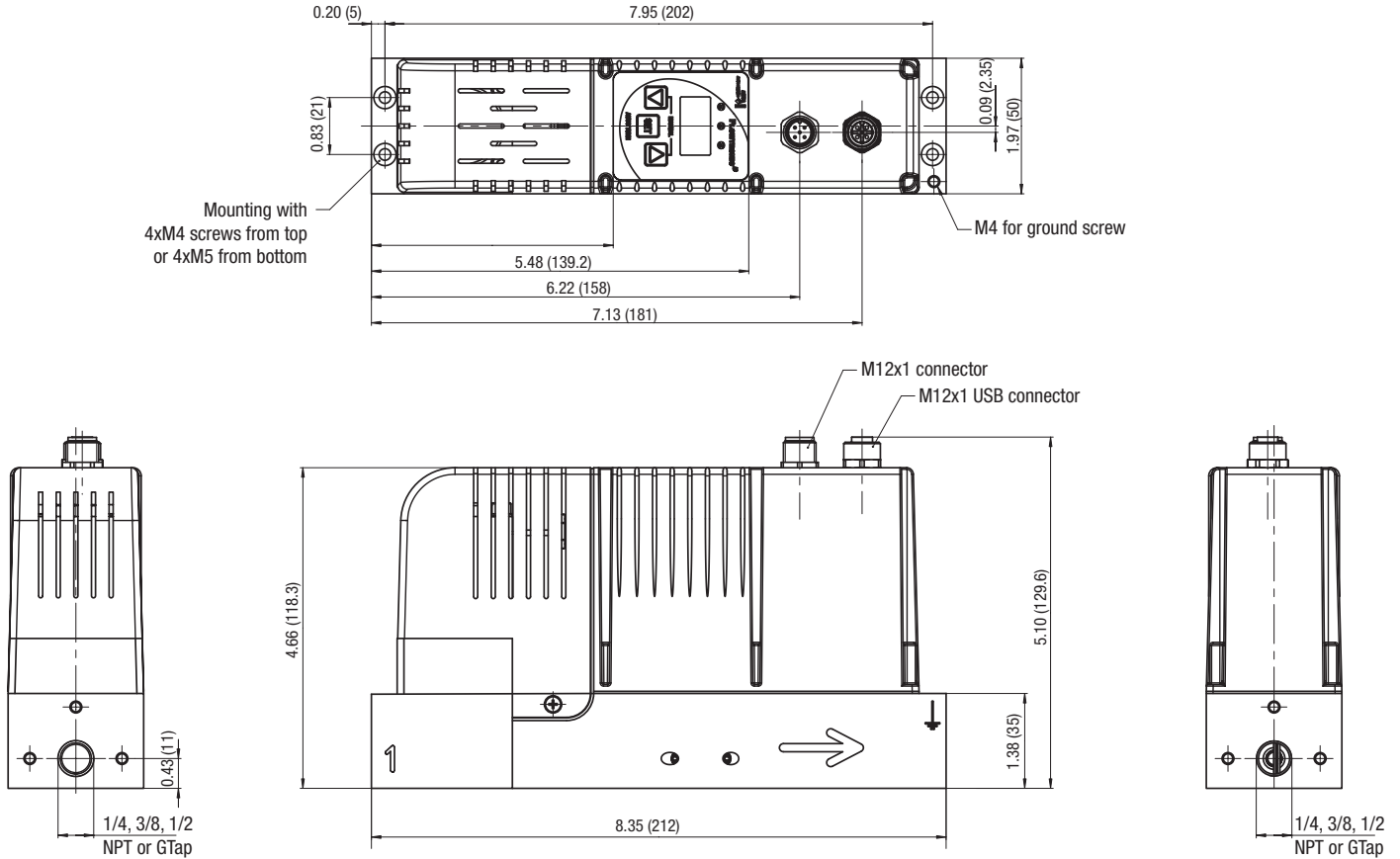


PIN	Description
1	+24 VDC Supply
2	Command Signal
3	+0 VDC Common (Supply)
	+0 VDC Common (Command Signal)*
4	Analog output (feedback)
5	Digital output (pressure switch)
Body	EMC shield

*A 6-wire cable with separate common for the command signal is used for cable lengths over 2 m to minimize the voltage drop for the command signal.

Dimensions: Inches (mm), Weight in lbs. (kg)

Weight: 4.08 (1.85)



Accessories



5 Pin 12mm FEMALE Straight Field Attachable Connectors		Model number
PG 9 Cable Gland		TC05F2000000000
5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors		
PG 9 Cable Gland		TD05F2000000000
Micro Female 5 Pole Straight 6 Wire 24 AWG, Shielded		
3 Meter		TC0503MMS000671Y
5 Meter		TC0505MMS000671Y
Micro Female 5 Pole 90 Degree 6 Wire 24 AWG Euro Color Code, Shielded		
3 Meter		TD0503MMS000671Y
5 Meter		TD0505MMS000671Y
PC Software & Cable Connector		Model number
Flowtronic ^D software "Numatics-FlowCom-Light" - free download at Numatics.com		88100895
Flowtronic ^D software "Numatics-FlowCom-Expert" - CD-ROM		88100896
USB cable for connection of Flowtronic ^D to PC		88100897

Control^D

The stand-alone control device Control^D is used for open-loop, closed-loop or dual-loop (cascaded) process control. It is designed to control proportional valves by regulating the current in the valve's solenoid coil. The maximum value of the solenoid coil's current is automatically determined with the auto-tune function. More complex applications can be controlled using additional analog inputs of flow, temperature, pressure, force, etc.

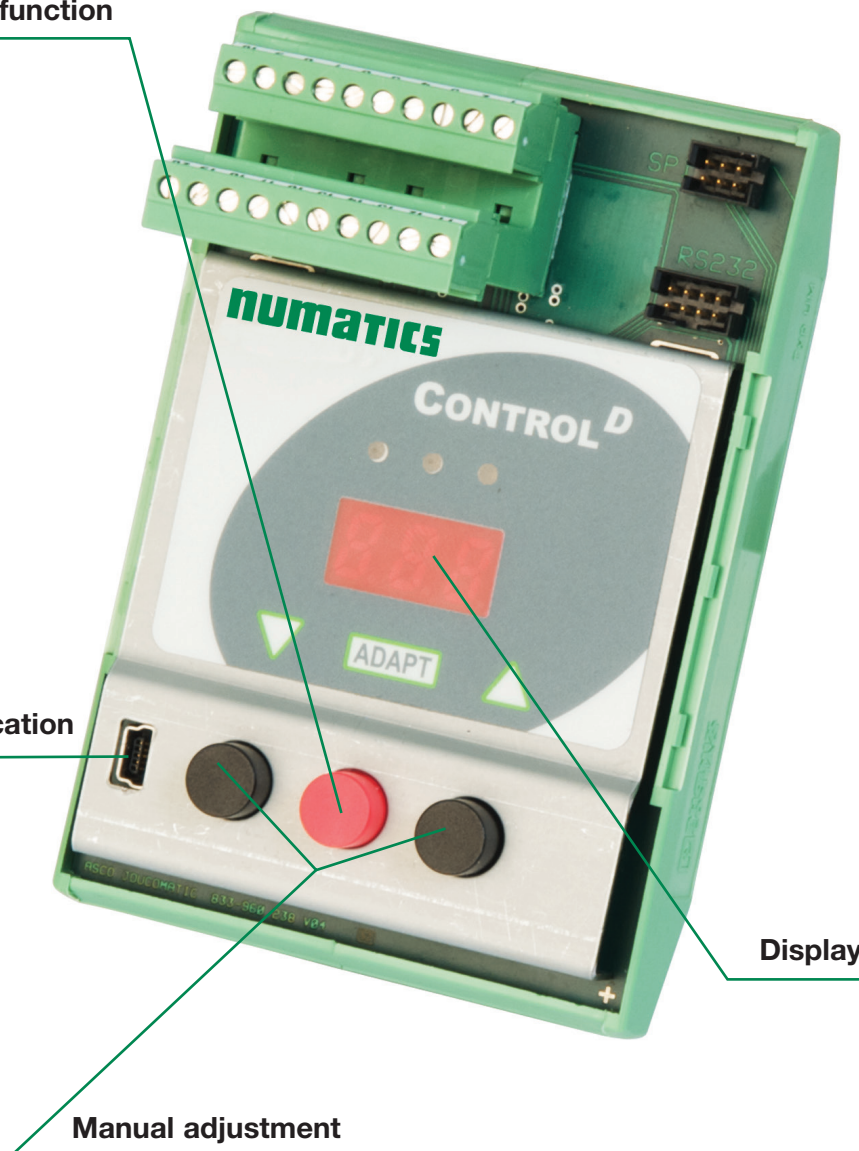
A serial RS232 or a mini USB interface allows communication with a PC where the included Numatics DigiCom software can be used to adapt the controller to the control loop. Three buttons and a 3-digit LED display on the device enable manual setpoint setting and display of feedback without the need for PLC control during start-up. Additional LEDs show the operating state and any error messages (e.g. low voltage, overvoltage, setpoint not reached) that may occur.

Auto-adapt function

**Digital
communication**

Display

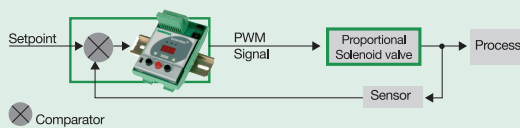
Manual adjustment



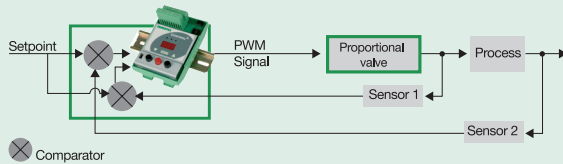
Open-Loop Control



Closed-Loop Control



Double-Loop (Cascaded) Control



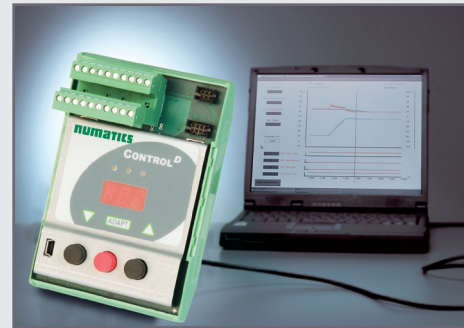
Advantages

- Low hysteresis
- Easy change of control parameters
- Digital control
- Integrated Display
- AUTO-ADAPT button for determining max. coil current
- PC communication
- Configurable analog feedback output
- Switching output
- Scope function using DigiCom software
- USB interface
- Suitable for use with Posiflow, Preciflow and Sentronic
- Direct input for open-loop control (no measuring device required)
- Easy to duplicate control parameters

Specifications

Nominal voltage: 24/12 V DC +/- 10%
 Max. current: 2A
 Command signal: 0 - 10 V, 0 - 20 mA, 4 - 20 mA
 Current adjustment: 0 - 2A
 Pressure control: 0 - 100%
 Process control: 0 - 100%
 Ramp: ON/OFF, adjustable between 0.1 and 20 seconds
 Frequency: 20 - 2000 Hz, adjustable
 Electrical connection: Pluggable terminal block
 Degree of protection: IP 20
 Serial interface: Mini USB or RS 232 (option)

DigiCom Software



By connecting the Control^D to a PC with a USB interface, the Numatics DigiCom software that comes with the product can be used to optimally adjust the valve's control parameters to a specific application.

- The scope function allows you to log and read the system's transient response in real time.
- Control parameters can be adjusted to an application without removing the controller from service.
- Saved control parameters can be loaded at any time.

The Numatics DigiCom software offers the following features:

- Real time display of: command signal, outlet pressure, internal control parameters (e.g. P, I or D), pressure switch signal, etc.
- Parameter setting: command signal, zero offset, span, limitation of percentage of output current, ramp function, etc.
- Custom adjustment to an application
- Control of proportional devices such as POSIFLOW, PRECIFLOW or proportional pressure regulator valves

Control^P Control Device



Features

- Control device for PWM (pulse-width modulated) proportional solenoid valve control
- Designed for open-loop and dual-loop (cascade) control
- Suitable for the control of flow, pressure, temperature, force, etc.
- Integrated display and LEDs
- Control parameters adjustable via software (DigiCom, USB interface)
- Auto-Adapt function/button for automatic adjustment of the Control^P control device to the control valve

A special feature of the Control^P is the Numatics DigiCom software supplied for optimum adjustment over PC. Setpoint and feedback values can be viewed at the same time. Other functions are valve diagnostics, parameter setting and maintenance.

General

Ambient temperature: -4°F to +122°F (-20 °C to +50°C)

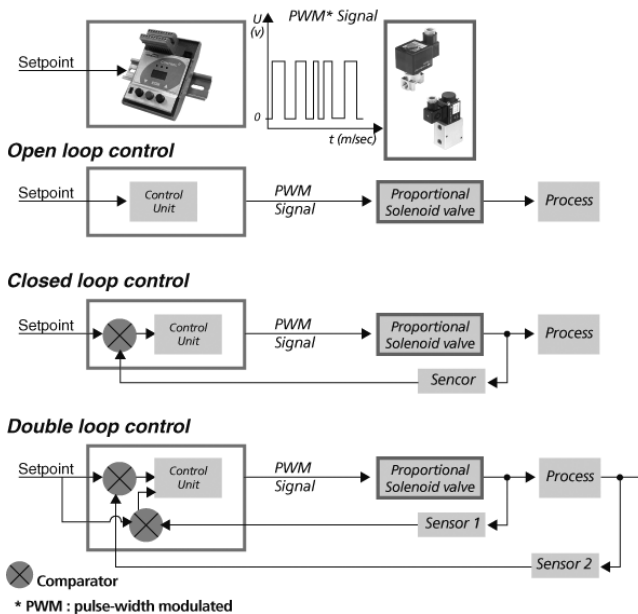
Construction

Body: PA (polyamide)
 Degree of protection: IP20
 Electrical connection: Pluggable terminal block (0.08 - 1.5 mm²)
 Mounting: DIN-EN 50022 rail

Electrical Characteristics

Supply voltage: (U_N) 24 V DC ±10 %, max. ripple 10% or 12 V DC +15 % -5 %, max. ripple 10 %
 Max. current of proportional solenoid valve: 2 A
 Command signal: 0 - 10 V DC, 0 - 20 mA, 4 - 20 mA
 Sensor input: 0 - 10 V DC, 0 - 20 mA, 4 - 20 mA
 Feedback output: 0 - 10 V, 0 / 4 - 20 mA
 Ramp: ON/OFF adjustable between 0.1 and 20 sec.
 Adjustable switching frequency: 20 to 2000 Hz

Control^P offers 3 control modes

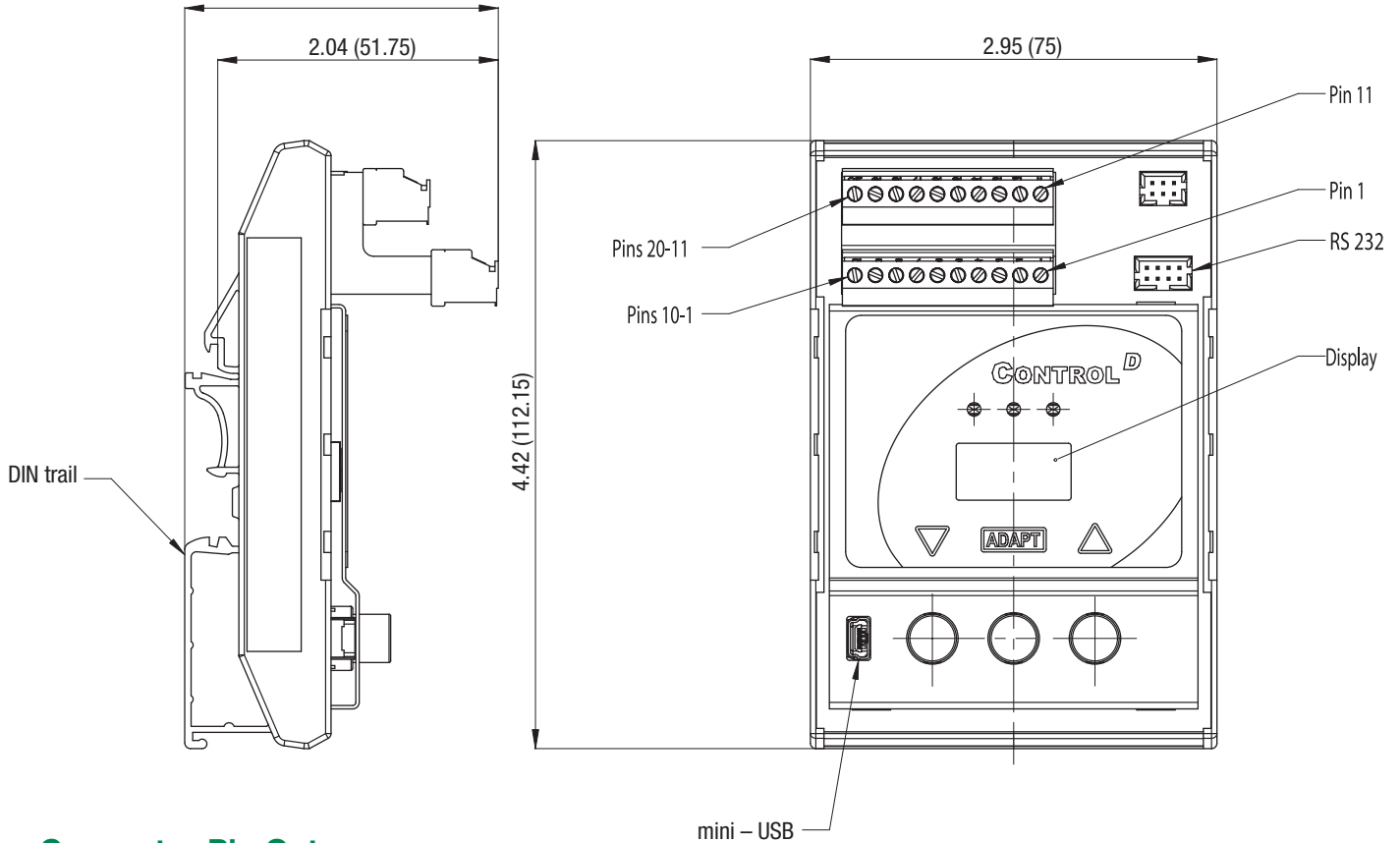


Specifications

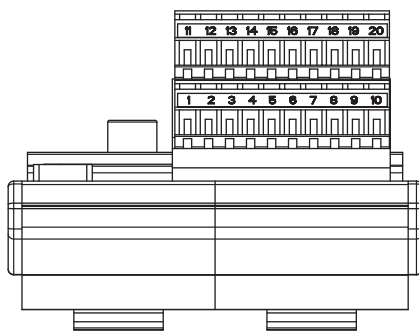
Description	Catalog Number
Control ^P control device - 12 V DC	60300117
Control ^P control device - 24 V DC	60300118

Dimensions: Inches (mm), Weight in lbs. (kg)

Weight: 0.33 (0.15)



Connector Pin Out



PIN	Description	Pin	Description
1	Supply +VDC	11	Command Signal
2	Supply +0VDC common	12	Command signal common
3	Earth ground	13	Digital input +VDC
4	Frequency input	14	Digital input +0VDC common
5	Sensor 1 supply +VDC	15	Valve / coil +VDC
6	Sensor 1 analog input	16	Valve / coil +0VDC common
7	Sensor 1 supply +0VDC common	17	Digital output +VDC
8	Sensor 2 supply +VDC	18	Digital output +0VDC common
9	Sensor 2 analog input	19	Analog output common
10	Sensor 2 supply +0VDC common	20	Analog output

Accessories

Description PC software & Cabel Connectors	Model Number
Numatics DigiCom software for Control ^D on CD-ROM (supplied with the controller)	88100893
RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)	88100732
RS 232 cable converter; 2m cable with 9-pin Sub-D (screw connector)	833-993708

G3 Fieldbus - Electronics Made Easy!

Innovative Graphic Display is used for easy commissioning, visual status & diagnostics.

Commissioning Capabilities

- Set network address (including IP & Subnet mask for Ethernet)
- Set baud rate
- Set auto or manual I/O sizes
- Set fault/idle output states
- Set brightness
- Set factory defaults

Visual Diagnostics

- Shorted and open load detection
- Shorted sensor/cable detection
- Low & missing power detection
- Missing module detection
- Self-test activation
- Log of network errors
- Distribution errors



Graphic Display for configuration & diagnostics

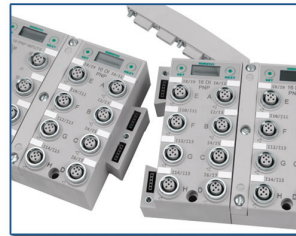


Auto Recovery Module

G3 Fieldbus Communications Electronics

Why use Numatics Fieldbus communication electronics?
Modular Reality...

- No internal wiring simplifies assembly.
- SPEEDCON M12 connector technology allows for fast and efficient 1/2 turn I/O connector attachment.
- Power connector allows output power to be removed while inputs and communication are left active.
- IP65 & IP67 protection
- Up to 1200 Input / 1200 Output capability with one communication node! (Present physical I/O combinations allows 1200 I / 544 O)
- 32 valve solenoids per manifold up to 17 manifolds per communication node!
- One node supports 16 I/O modules – Analog I/O, Digital I/O (NPN & PNP) and Specialty
- Innovative clip design allows easy module removal/replacement without dismantling manifold
- Auto Recovery Module (ARM) protects configuration information during a critical failure. Allows configuration information to be saved and reloaded to replacement module automatically.



Highly Distributable



High Current Analog Module

Supported Protocols

- DeviceNet™
- DeviceNet™ w/QuickConnect™
- DeviceNet™ w/DeviceLogix™
- Ethernet
- PROFIBUS®-DP
- CANopen®
- PROFINET®
- Ethernet POWERLINK®



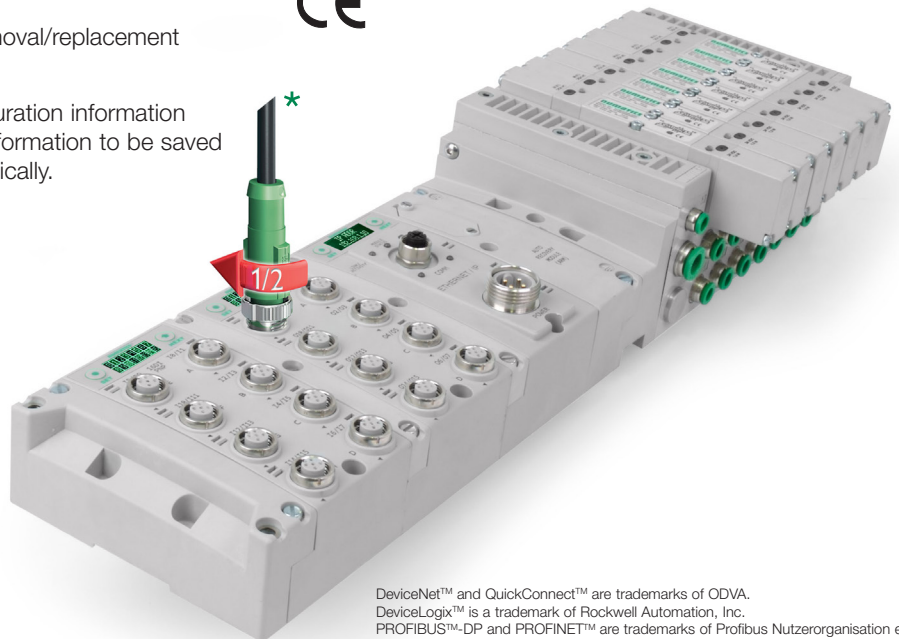
*** High current analog module**



Controls 2 proportional direct-operated high current valves

Auxiliary power connection

Simple connection for external sensor (one for each output)



DeviceNet™ and QuickConnect™ are trademarks of ODVA.
DeviceLogix™ is a trademark of Rockwell Automation, Inc.
PROFIBUS™-DP and PROFINET™ are trademarks of Profibus Nutzerorganisation e.V.
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World Class Supplier of Pneumatic Components



World Headquarters

USA Numatics, Incorporated

46280 Dylan Drive
Novi, Michigan 48377

P: 248-596-3200
F: 248-596-3201

Canada Numatics, Ltd

P: 519-758-2700
F: 519-758-5540

México - Ascomatica SA de CV

P: 52 55 58 09 56 40 (DF y Area metropolitana)
P: 01 800 000 ASCO (2726) (Interior de la República)
F: 52 55 58 09 56 60

Brazil Ascoval Ind.e Comercio Ltda

P: (55) 11-4195-5333
F: (55) 11-4195-3970