Proportional Technology
Precise Control of Pressure and Flow
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.
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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.

**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.

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**Symbols**

- $P$ = Pressure sensor
- $F$ = Force sensor
- $S$ = Distance sensor
- $\alpha$ = Angle sensor
- $Q$ = Flow sensor
- $T$ = Temperature sensor
- Potentiometer
- Cylinder
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.
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.

Material Testing

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

Fluid Coating

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

Brake Pressure

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

Glue Dosing

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

Vacuum Generation

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

Flight Simulator

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

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.

Bottle Molding

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

Ultrasonic Welding

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

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**

SentronicD, SentronicPLUS and FlowtronicD 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

<table>
<thead>
<tr>
<th></th>
<th>Port size</th>
<th>Pilot pressure</th>
<th>Pressure range</th>
<th>Flow</th>
<th>Filtration</th>
<th>Hysteresis</th>
<th>Power rating</th>
<th>Type of construction</th>
<th>Loss of power behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SENTRONIC™</strong></td>
<td>1/8, 1/4, 3/8 NPT or GTap</td>
<td>-</td>
<td>0 to 150 psi 0 to 10 bar</td>
<td>up to 45.9 SCFM 1300 Nl/min</td>
<td>50 µm</td>
<td>&lt; 1%</td>
<td>21 to 40 W</td>
<td>Poppet valve</td>
<td>Pressure released</td>
</tr>
<tr>
<td><strong>SENTRONIC™PLUS</strong></td>
<td>1/8, 1/4, 1/2, 1 NPT or GTap</td>
<td>-</td>
<td>0 to 725 psi 0 to 50 bar</td>
<td>up to 197.8 SCFM 5600 Nl/min</td>
<td>50 µm</td>
<td>&lt; 1%</td>
<td>33 to 44 W</td>
<td>Poppet valve</td>
<td>Pressure released</td>
</tr>
<tr>
<td><strong>E SERIES</strong></td>
<td>1/8 - 3/4, NPT, GTap or BSPT</td>
<td>-</td>
<td>0 to 150 psi 0 to 10.2 bar</td>
<td>up to 250 SCFM 7000 Nl/min</td>
<td>5 µm</td>
<td>&lt; 1%</td>
<td>1 W</td>
<td>Pilot + booster</td>
<td>Pressure held</td>
</tr>
<tr>
<td><strong>FLOWTRONIC™</strong></td>
<td>1/4, 3/8 NPT or GTap</td>
<td>-</td>
<td>0 to 116 psi 0 to 8 bar</td>
<td>0.4 to 35.3 SCFM 10 to 1000 Nl/min</td>
<td>50 µm</td>
<td>&lt; 3%</td>
<td>33 to 44 W</td>
<td>Poppet valve</td>
<td>Pressure released</td>
</tr>
</tbody>
</table>
## Choice of Equipment

<table>
<thead>
<tr>
<th>Control</th>
<th>Fluids</th>
<th>Control loop</th>
<th>Actuation</th>
<th>Application</th>
<th>Special features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>Flow</td>
<td>Vacuum</td>
<td>Air/neutal gases</td>
<td>Liquids</td>
<td>Steam</td>
</tr>
<tr>
<td>SENTRONIC&lt;sup&gt;®&lt;/sup&gt;</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SENTRONIC&lt;sup&gt;™&lt;/sup&gt; PLUS</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>E SERIES</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOWTRONIC&lt;sup&gt;®&lt;/sup&gt;</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Static**: For applications with few setpoint changes
- **Dynamic**: For applications with constantly changing setpoints
- ● Primary function
- ○ Secondary function
**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.
By connecting the SentronicD 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 SentronicD

### 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
Sentronic\textsuperscript{D} is a highly dynamic 3-way proportional valve with digital control.

**Features**
- Sentronic\textsuperscript{D} stands for:
  - Digital communication and control
  - Display (integrated)
  - Direct operated valve
- A special feature of the Sentronic\textsuperscript{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\textsuperscript{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)

### Electrical Characteristics

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

* Max. ripple: 10% 

### Specifications

<table>
<thead>
<tr>
<th>Φ (Ports)</th>
<th>Φ (Orifice DN (mm))</th>
<th>Flow Factor (K \textsubscript{C}, Nm\textsuperscript{3}/h)</th>
<th>at 6 Bar (l/min - ANR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8, 1/4 NPT or GTap</td>
<td>4</td>
<td>0.29 (0.25)</td>
<td>470</td>
</tr>
<tr>
<td>1/4, 3/8 NPT or GTap</td>
<td>8</td>
<td>0.81 (0.7)</td>
<td>1300</td>
</tr>
</tbody>
</table>

Test conditions according to ISO 8778: temperature: 20 °C, relative inlet pressure: 6 bar, relative outlet pressure: 5 bar

### How to Order

#### 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 version\textsuperscript{1}
- 6 = NPT 1/4 (DN 4), NPT 3/8 (DN 8)

#### Pressure range
- Maximum pressure
- Maximum pressure

<table>
<thead>
<tr>
<th>Pressure range</th>
<th>Maximum pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = 0 - 50 psi</td>
<td>90 psi</td>
</tr>
<tr>
<td>B = 0 - 100 psi</td>
<td>140 psi</td>
</tr>
<tr>
<td>C = 0 - 150 psi</td>
<td>190 psi</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum pressure</th>
<th>1 = 0 - 10 bar</th>
<th>2 = 0 - 12 bar</th>
<th>3 = 0 - 3 bar</th>
<th>4 = 0 - 1 bar</th>
<th>5 = 0 - 15 bar</th>
<th>6 = 0 - 6 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 bar</td>
<td>16 bar</td>
<td>6 bar</td>
<td>4 bar</td>
<td>18 bar</td>
<td>9 bar</td>
<td></td>
</tr>
</tbody>
</table>

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

**Proportional Technology**

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**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)
Proportional Technology
Pressure Control: Sentronic

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
Proportional Technology
Pressure Control: Sentronic

Connector Pin Out

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 VDC Supply</td>
</tr>
<tr>
<td>2</td>
<td>Command Signal</td>
</tr>
<tr>
<td>3</td>
<td>+0 VDC Common (Supply)</td>
</tr>
<tr>
<td>4</td>
<td>+0 VDC Common (Command Signal)*</td>
</tr>
<tr>
<td>5</td>
<td>Analog output (feedback)</td>
</tr>
<tr>
<td></td>
<td>Digital output (pressure switch)</td>
</tr>
<tr>
<td>Body</td>
<td>EMC shield</td>
</tr>
</tbody>
</table>

* 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
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 22 AWG, Shielded
3 Meter
TC0503MMS000671Y
5 Meter
TC0505MMS000671Y

Micro Female 5 Pole 90 Degree 6 Wire 22 AWG Euro Color Code, Shielded
3 Meter
TD0503MMS000671Y
5 Meter
TD0505MMS000671Y

Micro F/M 4 Pole Straight 22 AWG Euro Color Code
Unshielded
2 Meter - TC0403MIE0A04000
5 Meter - TC0405MIE0A04000
3 Meter - TC0403MME0A04000
5 Meter - TC0405MME0A04000
Shielded
2 Meter - TC0403MIET0A04000
5 Meter - TC0405MIET0A04000
3 Meter - TC0403MMET0A04000
5 Meter - TC0405MMET0A04000

Manifold
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
DaS Light: Data Acquisition Software for Sentronic® - basic parameters - free download at Numatics.com
99100110
DaS Expert: Data Acquisition Software for Sentronic® - 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.
SentronicPLUS 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 SentronicPLUS 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.
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.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.
SentronicPLUS Electronic Pressure Regulator

**General**
SentronicPLUS is a 3-way proportional valve with digital control. Its construction allows the valve to be used in potentially explosive atmospheres according to ATEX Directive 94/9/EC. The valve also has pressure ranges from 1.5 psi to 725 psi. The Data Acquisition Software (DaS) that comes with SentronicPLUS 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. Settings can be saved and loaded at any time for reference or diagnostics. SentronicPLUS 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)

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

*Max. ripple: 10%*

**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:
  - 6II 2D Ex tDA21 I P65 T135°C, for use in Zone 2
  - 6II 3G Ex nA II T4, for use in Zone 2
- EC type examination certificate no.: 
  - IBExU07ATEX1173

**How to Order**

<table>
<thead>
<tr>
<th>Version (ports), body</th>
<th>Command Signal</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = DN3 (3/8, ALU)</td>
<td>0 = 0 .. 10 Volt</td>
<td>1 = 0 .. 20 mA</td>
</tr>
<tr>
<td>1 = DN12 (3/8, ALU)</td>
<td>2 = 0 .. 20 mA</td>
<td></td>
</tr>
<tr>
<td>2 = DN20 (3/8, ALU)</td>
<td>3 = Feedback output 0 ... 20 mA</td>
<td></td>
</tr>
<tr>
<td>4 = DN6 (NPT 1/4, ALU)</td>
<td>4 = Feedback output 0 ... 20 mA</td>
<td></td>
</tr>
<tr>
<td>5 = DN12 (NPT 1/2, ALU)</td>
<td>5 = Feedback input 0 ... 10 Volt</td>
<td></td>
</tr>
<tr>
<td>6 = DN20 (NPT 1, ALU)</td>
<td>6 = Feedback input 0 ... 20 mA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options</th>
<th>Pressure Range</th>
<th>Max. inlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>A00 = Dual loop control</td>
<td>016 = Oxygen clean</td>
<td></td>
</tr>
<tr>
<td>Relative pressure (psi)</td>
<td>pressure bar (psig)</td>
<td>Vacuum (relative)</td>
</tr>
<tr>
<td>40 = 0 - 6.1 bar (150)</td>
<td>2 (29)</td>
<td></td>
</tr>
<tr>
<td>50 = 0 - 0.5 bar (7.3)</td>
<td>2 (29)</td>
<td></td>
</tr>
<tr>
<td>60 = 0 - 1 bar (14.5)</td>
<td>2 (29)</td>
<td></td>
</tr>
<tr>
<td>02 = 0 - 2 bar (29)</td>
<td>3 (44)</td>
<td></td>
</tr>
<tr>
<td>03 = 0 - 3 bar (44)</td>
<td>8 (116)</td>
<td></td>
</tr>
<tr>
<td>05 = 0 - 5 bar (73)</td>
<td>8 (116)</td>
<td></td>
</tr>
<tr>
<td>06 = 0 - 6 bar (87)</td>
<td>12 (174)</td>
<td></td>
</tr>
<tr>
<td>08 = 0 - 6.9 bar (100)</td>
<td>12 (174)</td>
<td></td>
</tr>
<tr>
<td>10 = 0 - 10 bar (145)</td>
<td>12 (174)</td>
<td></td>
</tr>
<tr>
<td>12 = 0 - 12 bar (174)</td>
<td>14 (203)</td>
<td></td>
</tr>
<tr>
<td>16 = 0 - 16 bar (232)</td>
<td>18 (261)</td>
<td></td>
</tr>
<tr>
<td>20 = 0 - 20 bar (290)</td>
<td>22 (316)</td>
<td></td>
</tr>
<tr>
<td>3H = 0 - 30 bar (435)</td>
<td>40 (580)</td>
<td></td>
</tr>
<tr>
<td>5H = 0 - 50 bar (725)</td>
<td>60 (870)</td>
<td></td>
</tr>
</tbody>
</table>

**Digital Output**
1 = Pressure switch output
PNP ± 5 %

Notes:
1) Up to max. 12 bar 2) Only for pressure ranges from 30 to 50 bar 3) Feedback input is needed for dual loop units 4) Only for DN3 & DN6 5) Only for DN6 body type G or H. Other versions available on request.

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.
Proportional Technology
Pressure Control: Sentronic\textsuperscript{PLUS}

1/8 NPT or GTap
Weight: 1.39 (0.63)

1/4 NPT or GTap
Weight: 2.09 (0.95)

1/2 NPT or GTap
Weight: 4.19 (1.9)

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

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.
### Pressure Control: Sentronic PLUS Proportional Technology

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

1 NPT or GTap

Weight: 8.60 (3.9)

A) Thread M8 - depth 15 (on opposite side); tapped through-hole for M6 screw.
B) The exhaust connection on the 0-16 bar version is at the bottom of the valve.

#### Connector Pin Out

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 VDC Supply</td>
</tr>
<tr>
<td>2</td>
<td>Command Signal</td>
</tr>
<tr>
<td>3</td>
<td>+0 VDC Common (Supply)</td>
</tr>
<tr>
<td>4</td>
<td>Analog output (Feedback)</td>
</tr>
<tr>
<td>5</td>
<td>Digital output (Pressure switch)</td>
</tr>
<tr>
<td></td>
<td>Body</td>
</tr>
<tr>
<td></td>
<td>EMV screen</td>
</tr>
</tbody>
</table>

*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**
  - PG 9 Cable Gland
    - Model Number: TC05F20000000000

- **5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors**
  - PG 9 Cable Gland
    - Model Number: TC05F20000000000

- **Micro Female 5 Pole STRAIGHT 6 Wire 22 AWG, Shielded**
  - 3 Meter
    - Model Number: TC0503MMS000671Y
  - 5 Meter
    - Model Number: TC0505MMS000671Y

- **Micro Female 5 Pole 90 Degree 6 Wire 22 AWG Euro Color Code, Shielded**
  - 3 Meter
    - Model Number: TD0503MMS000671Y
  - 5 Meter
    - Model Number: TD0505MMS000671Y

- **PC Software & Cable Connectors**
  - DaS Light: Data Acquisition Software for Sentronic PLUS - basic parameters - free download at Numatics.com
    - Model Number: 991000110
  - DaS Expert: Data Acquisition Software for Sentronic PLUS - full parameters - CD-ROM
    - Model Number: 99100111
  - RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)
    - Model Number: 88100732
  - RS 232 cable converter; 2m cable with 9-pin Sub-D (screw connector)
    - Model Number: 833-993708

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.
E02/E22/E32 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, 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) 1/8, 1/4, 3/8, 1/2, 3/4 (NPT, GTap or BSPT) various pad-mount versions
- **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 E02/E22/E32 Series

The E02/E22/E32 Series electronic proportional regulators quickly and accurately adjusts 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.

E02 Series Features:
- Available in 1/8 NPT, GTap or BSPT threads
- Dead-head or pilot applications (0.3 SCFM)
- Manifold or stand-alone units
- Three outlet port options
- Three set performance modes in a single unit
- Compact design with large LED display
- Locking feature prevents unwanted changes
- Designed to meet IP65 and NEMA 4 requirements

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

E32 Series Features:
- Available in 1/2 and 3/4 NPT, GTap or BSPT threads
- Capable of flow up to 250 SCFM
- Modular 32 Series Flexiblok design
- 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
Pressure Control: E02/E22/E32

Proportional Technology

Dimensions: Inches (mm)

E02 Series

E22 and E32 Series

Pin Configuration

<table>
<thead>
<tr>
<th>Command Signal</th>
<th>Analog</th>
<th>Digital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>+24VDC</td>
<td></td>
</tr>
<tr>
<td>Pin 2</td>
<td>Command Signal</td>
<td>Input Signal 1</td>
</tr>
<tr>
<td>Pin 3</td>
<td>+0VDC common</td>
<td></td>
</tr>
<tr>
<td>Pin 4</td>
<td>Monitor</td>
<td>Output</td>
</tr>
</tbody>
</table>

Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>E02</td>
<td>3.33 (85)</td>
<td>2.05 (52)</td>
<td>0.23 (6)</td>
<td>0.53 (13)</td>
<td>0.53 (13)</td>
<td>0.70 (18)</td>
<td>NA</td>
<td>2.05 (52)</td>
<td>2.05 (52)</td>
<td>NA</td>
<td>NA</td>
<td>0.80 (20)</td>
<td>1.42 (36)</td>
<td>1.42 (36)</td>
</tr>
<tr>
<td>E22</td>
<td>5.57 (141)</td>
<td>1.83 (46)</td>
<td>0.29 (7)</td>
<td>0.70 (18)</td>
<td>1.00 (25)</td>
<td>1.58 (40)</td>
<td>0.70 (18)</td>
<td>2.17 (55)</td>
<td>2.38 (60)</td>
<td>1.70 (43)</td>
<td>1.80 (46)</td>
<td>0.19 (5)</td>
<td>1.42 (36)</td>
<td>1.42 (36)</td>
</tr>
<tr>
<td>E32</td>
<td>6.09 (155)</td>
<td>2.45 (62)</td>
<td>0.47 (12)</td>
<td>1.01 (26)</td>
<td>1.35 (34)</td>
<td>2.00 (51)</td>
<td>0.71 (18)</td>
<td>3.00 (76)</td>
<td>3.00 (76)</td>
<td>2.00 (51)</td>
<td>2.50 (64)</td>
<td>0.19 (5)</td>
<td>1.42 (36)</td>
<td>1.42 (36)</td>
</tr>
</tbody>
</table>
# Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>E02</th>
<th>E22</th>
<th>E32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Supply Pressure</td>
<td>Set Pressure + 15 PSI (1 BAR)</td>
<td>Set Pressure + 15 PSI (1 BAR)</td>
<td>Set Pressure + 15 PSI (1 BAR)</td>
</tr>
<tr>
<td>Regulating Pressure Ranges</td>
<td>Standard Pressure: 0-100 PSI (0-6.9 BAR)</td>
<td>High Pressure: 0-150 PSI (0-10.2 BAR)</td>
<td>Standard Pressure: 0-100 PSI (0-6.9 BAR)</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Voltage: 24VDC ±10%</td>
<td>Current Consumption: 0.04 A</td>
<td>Current Consumption: 0.04 A</td>
</tr>
<tr>
<td>Input Signal</td>
<td>Voltage: 0-5VDC, 0-10VDC</td>
<td>Current: 4-20mA</td>
<td>Voltage: 0-5VDC, 0-10VDC</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>0-5 VDC: 10 KΩ</td>
<td>0-10 VDC: 20 KΩ</td>
<td>4-20 mA: 100 Ω</td>
</tr>
<tr>
<td>Output Signal</td>
<td>Analog Output: 0-5VDC, 0-10VDC, 4-20mA</td>
<td>Switch Output: 24VDC (PNP or NPN)</td>
<td>Analog Output: 0-5VDC, 0-10VDC, 4-20mA</td>
</tr>
<tr>
<td>Linearity</td>
<td>≤ ±1% of span</td>
<td>≤ ±1% of span</td>
<td>≤ ±1% of span</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>≤ ±0.5% of span</td>
<td>≤ ±0.5% of span</td>
<td>≤ ±0.5% of span</td>
</tr>
<tr>
<td>Repeatability</td>
<td>≤ ±0.5% of span</td>
<td>≤ ±0.5% of span</td>
<td>≤ ±0.5% of span</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>≤ ±2% of span</td>
<td>≤ ±2% of span</td>
<td>≤ ±2% of span</td>
</tr>
<tr>
<td>Temp Characteristics</td>
<td>±0.5% of span /°C</td>
<td>±0.5% of span /°C</td>
<td>±0.5% of span /°C</td>
</tr>
<tr>
<td>Output Display</td>
<td>Accuracy: ±3% of span</td>
<td>Minimum unit: PSI 0.1, BAR 0.01, kPa 001., kgf/cm² 001.</td>
<td>Accuracy: ±3% of span</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>40-120°F, 4-50°C</td>
<td>40-120°F, 4-50°C</td>
<td>40-120°F, 4-50°C</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP65 and NEMA 4 Equivalent</td>
<td>IP65 and NEMA 4 Equivalent</td>
<td>IP65 and NEMA 4 Equivalent</td>
</tr>
<tr>
<td>Weight</td>
<td>0.68 lbs (0.31kg)</td>
<td>1.4 lbs (0.64kg)</td>
<td>2.34 lbs (1.06kg)</td>
</tr>
</tbody>
</table>
Proportional Technology

Pressure Control: E02/E22/E32

How to Order

Series
- 02 = 02 Series
- 22 = 22 Series
- 32 = 32 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 input signal)

Port Tap Size
- 01 = 1/8 (E02 Series Only)
- 02 = 1/4 (E22 Series Only)
- 03 = 3/8 (E22 Series Only)
- 04 = 1/2 (E22 & E32 Series Only)
- 06 = 3/4 (E32 Series Only)

Accessories

Micro Female 4 Pole 90 Degree 22 AWG Euro Color Code

<table>
<thead>
<tr>
<th>Unshielded</th>
<th>Shielded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Meter - TC0403MIE0000000</td>
<td>3 Meter - TC0403MME0000000</td>
</tr>
<tr>
<td>5 Meter - TC0405MIE0000000</td>
<td>5 Meter - TC0405MME0000000</td>
</tr>
</tbody>
</table>

Micro Female 4 Pole 90 Degree 22 AWG Euro Color Code

<table>
<thead>
<tr>
<th>Unshielded</th>
<th>Shielded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Meter - TD0403MIE0000000</td>
<td>3 Meter - TD0403MME0000000</td>
</tr>
<tr>
<td>5 Meter - TD0405MIE0000000</td>
<td>5 Meter - TD0405MME0000000</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Unshielded</th>
<th>Shielded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Meter - TC0403META04000</td>
<td>3 Meter - TC0403MME04000</td>
</tr>
<tr>
<td>5 Meter - TC0405META04000</td>
<td>5 Meter - TC0405MME04000</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Unshielded</th>
<th>Shielded</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Meter - TD0403META04000</td>
<td>3 Meter - TD0403MME04000</td>
</tr>
<tr>
<td>5 Meter - TD0405META04000</td>
<td>5 Meter - TD0405MME04000</td>
</tr>
</tbody>
</table>

Bracket/Muffler Kits

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRK-KIT-L</td>
<td>Includes (1) E32-10 Bracket, (4) E32-11 Screws, (1) M4MN Muffler, (1) E22-29 Elbow</td>
</tr>
<tr>
<td>BRK-KIT-WOEM</td>
<td>Includes (1) E02-10 Bracket, (4) E32-11 Screws, (1) M4MN Muffler, (1) E22-29 Elbow</td>
</tr>
<tr>
<td>BRK-KIT-LWOE</td>
<td>Includes (1) E32-10 Bracket, (4) E32-11 Screws, (1) M4MN Muffler</td>
</tr>
</tbody>
</table>

Information subject to change without notice. For ordering information or regarding your local sales office visit www.numatics.com.
Flowtronic®

FLOWTRONIC® is a digitally operated flow controller up to 35 SCFM (1000 Nl/min). The FLOWTRONIC® 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® offers precise flow adjustment and is very responsive to outside disturbances.

Typical applications for the FLOWTRONIC® include: Paint coating technology, mixing of gases in process control, packaging and food processing industry, surface finishing and materials coating processes, burner control systems, 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.
By connecting the Flowtronic® 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®

### Specifications

- **Fluids**: Air or neutral gases
- **Pressure**: Up to 116 psi (8 bar)
- **Ports**: 1/4, 3/8 NPT or G1/2
- **Nominal diameter**: 3mm, 5mm, 6mm
- **Flow**: 3.5 – 70.6 SCFM (100 – 2000 Nl/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

### 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

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Flow Control: Flowtronic®

Features
- The Flowtronic® 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: 3.5 – 70.6 SCFM (100 – 2000 Nl/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: 72.5ºF±4.5ºF (22.5ºC±2.5ºC).
  - 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

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

* Max. ripple: 10 %
Flow Control: Flowtronic™ Proportional Technology

How to Order

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 Volt
5 = Feedback input 0 - 20 mA
6 = Feedback input 4 - 20 mA

Notes:
1) Feedback input is needed for dual loop units.

PIN Description

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24 VDC Supply</td>
</tr>
<tr>
<td>2</td>
<td>Command Signal</td>
</tr>
<tr>
<td>3</td>
<td>+0 VDC Common (Supply)</td>
</tr>
<tr>
<td>4</td>
<td>Analog output (feedback)</td>
</tr>
<tr>
<td>5</td>
<td>Digital output (pressure switch)</td>
</tr>
<tr>
<td></td>
<td>Body</td>
</tr>
<tr>
<td></td>
<td>EMC shield</td>
</tr>
</tbody>
</table>

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

Flow regulation range
10 = 0.4 - 3.5 SCFM (10 - 100 Nl/min)
20 = 0.4 - 7.1 SCFM (10 - 200 Nl/min)
30 = 0.4 - 10.6 SCFM (12 - 300 Nl/min)
50 = 0.7 - 17.7 SCFM (20 - 500 Nl/min)
60 = 0.8 - 21.2 SCFM (22 - 600 Nl/min)
99 = 1.8 - 35.3 SCFM (50 - 1000 Nl/min)
20 = 3.5 - 70.6 SCFM (100 - 2000 Nl/min)

Digital I/O
1 = Pressure switch output
   PNP ± 5 %

Options
A00 = Dual loop control

Connector Pin Out

* 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.
Proportional Technology

Flow Control: Flowtronic D

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

Weight: 4.08 (1.85)

Accessories

<table>
<thead>
<tr>
<th>5 Pin 12mm FEMALE Straight Field Attachable Connectors</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 9 Cable Gland</td>
<td>TC05F200000000000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 Pin 12mm FEMALE 90 DEGREE Field Attachable Connectors</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 9 Cable Gland</td>
<td>TD05F200000000000</td>
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</table>

<table>
<thead>
<tr>
<th>Micro Female 5 Pole Straight 6 Wire 22 AWG, Shielded</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Meter</td>
<td>TC0503MMS000671Y</td>
</tr>
<tr>
<td>5 Meter</td>
<td>TC0505MMS000671Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Micro Female 5 Pole 90 Degree 6 Wire 22 AWG Euro Color Code, Shielded</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Meter</td>
<td>TC0503MMS000671Y</td>
</tr>
<tr>
<td>5 Meter</td>
<td>TC0505MMS000671Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PC Software &amp; Cable Connector</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOWTRONIC® software &quot;Numatics-FlowCom-Light&quot; - free download at Numatics.com</td>
<td>88100895</td>
</tr>
<tr>
<td>FLOWTRONIC® software &quot;Numatics-FlowCom-Expert&quot; - CD-ROM</td>
<td>88100896</td>
</tr>
<tr>
<td>USB cable for connection of FLOWTRONIC® to PC</td>
<td>88100897</td>
</tr>
</tbody>
</table>
**ControlD**

The stand-alone control device CONTROLD 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.
By connecting the ControlD 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
**ControlP 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 device to the control valve

A special feature of the CONTROL device 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%
- 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

**ControlD Control Device Specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL device - 12 V DC</td>
<td>60300117</td>
</tr>
<tr>
<td>CONTROL device - 24 V DC</td>
<td>60300118</td>
</tr>
</tbody>
</table>
Connector Pin Out

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

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

Weight: 0.33 (0.15)

Accessories

<table>
<thead>
<tr>
<th>Description PC software &amp; Cable Connectors</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numatics DigiCom software for Control D on CD-ROM (supplied with the controller)</td>
<td>88100893</td>
</tr>
<tr>
<td>RS 232 cable converter; 2m cable with 9-pin Sub-D (plug connector)</td>
<td>88100732</td>
</tr>
<tr>
<td>RS 232 cable converter; 2m cable with 9-pin Sub-D (screw connector)</td>
<td>833-993708</td>
</tr>
</tbody>
</table>
High Current Analog Module

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/del 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

**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 ½ 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.

**Supported Protocols**
- DeviceNet™
- DeviceNet™ w/Quick Connect
- DeviceNet™ w/DeviceLogix™
- CANopen®
- PROFINET®
- POWERLINK
- Ethernet
- PROFIBUS®-DP

**High current analog module**
- Controls 2 proportional direct-operated high current valves
- Auxiliary power connection
- Simple connection for external sensor (one for each output)

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