

Throttle valves

FESTO



Key features

Function

The piston speed of pneumatic drives, both advancing and retracting, can be regulated using one-way flow control valves. This is done through suitable restriction of the flow rate of compressed air in exhaust air or supply air direction.

With the one-way flow control valve GRLA or GRLZ, the flow control function works in one direction only (exhaust air or supply air); the non-return function works in the opposite direction. With the throttle valve GRLO, the flow control function is active in both directions.

The flow control function creates an adjustable annular gap inside the valve. This gap can be increased or decreased by turning the knurled screw or slotted head screw. The required restriction can be set with the help of this adjusting element.



Note

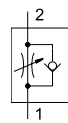
The documentation for the one-way flow control valves can be found at
 → www.festo.com/catalogue

General information

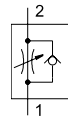
Standard nominal flow rate q_{nN}

The standard nominal flow rate q_{nN} is the volumetric flow rate based on standard conditions at an operating pressure of $p_1 = 6$ bar and an output pressure of $p_2 = 5$ bar, measured at room temperature $t = 20^\circ\text{C}$.

Exhaust air one-way flow control function



Supply air one-way flow control function



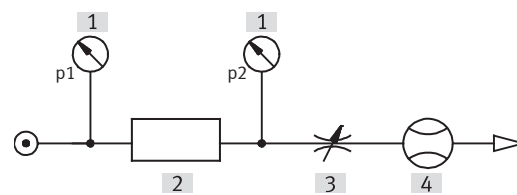
Standard flow rate q_n

The standard flow rate is measured at an operating pressure of $p_1 = 6$ bar and an output pressure with respect to atmospheric pressure ($p_2 = 0$ bar).

Flow control function acting in both directions

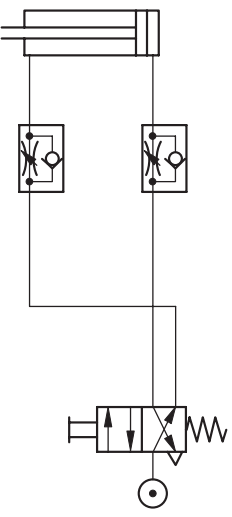
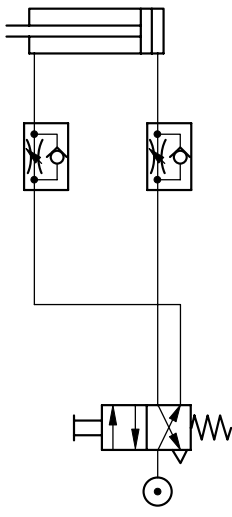
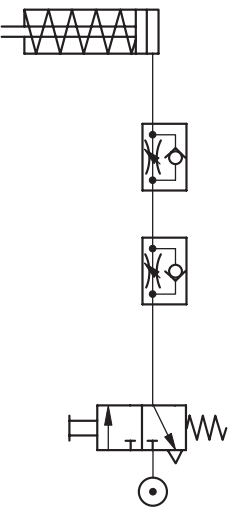
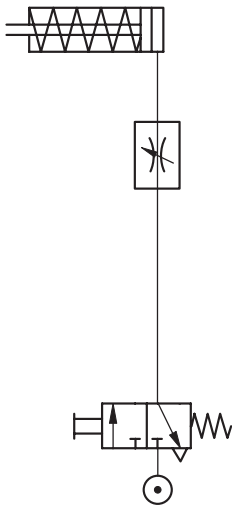


Circuit for flow measurement

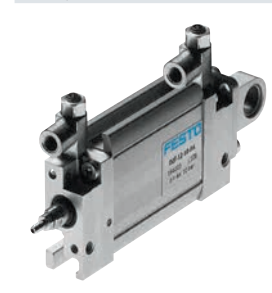


- [1] Pressure gauge
 - [2] Test specimen
 - [3] Throttle valve
 - [4] Flow meter
- p_1 Operating pressure
 p_2 Output pressure





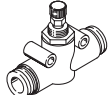
Key features

| Flow control functions and range of applications | | Flow control functions and range of applications | |
|--|--|---|--|
| Application | Description | Application | Description |
| Double-acting cylinder with one-way flow control valve | | | |
| Exhaust air one-way flow control function | | Supply air one-way flow control function | |
|  | <p>Speed adjustment through exhaust air flow control. Uncontrolled supply air and controlled exhaust air move the piston between air cushions (improves motion, even with load changes).</p> |  | <p>Adjustable speed during advance and return strokes. The flow rate is identical in both directions.</p> |
| Single-acting cylinder with one-way flow control valve | | Single-acting cylinder with throttle valve | |
| Exhaust air and supply air one-way flow control function | | Flow control function in both directions | |
|  | <p>Adjustable speed during advance and return strokes. The flow rate can be adjusted differently for both directions.</p> |  | <p>Speed adjustment through flow control on both sides is often used with single-acting or small cylinders. The benefit of this application is its simplicity.</p> |

Application examples



Product range overview

| Version | Valve function | Version | Type | Outlet direction of connection | Pneumatic connection 1 | Pneumatic connection 2 | qnN ¹⁾ [l/min] | Adjusting element | → Page/ Internet |
|-----------------------------|-----------------------|--|------|--------------------------------|------------------------|------------------------|------------------------------|--------------------|---------------------|
| Standard | Flow control function |  | GRLO | Elbow outlet | M5 | M5 | 95 | Slotted head screw | 6 |
| | |  | | | M5 | PK-3 | 83 | Slotted head screw | 6 |
| Mini | Flow control function |  | GRLO | Elbow outlet | M3, M5 | QS-3, QS-4 | 40 ... 41 | Slotted head screw | 8 |
| | |  | | | M3 | M3 | 18 | Slotted head screw | 10 |
| In-line installation | Flow control function |  | GRO | Straight | QS-3, QS-4, QS-6 | QS-3, QS-4, QS-6 | 25 ... 160 | Knurled screw | gro |

1) Standard nominal flow rate in flow control direction.

Type codes

| | | |
|-------------|------------------------------|--|
| 001 | Series | |
| GRLO | Flow control valve, L outlet | |

| | | |
|------------|-----------------------------|--|
| 002 | Pneumatic connection | |
| M3 | Male thread M3 | |
| M5 | Male thread M5 | |

| | | |
|-------------|------------------------------------|--|
| 003 | Pneumatic connection 1 | |
| | Connection size as for port 1 or 2 | |
| QS-3 | Push-in connector 3 mm | |
| QS-4 | Push-in connector 4 mm | |
| PK-3 | CK connection 3 mm | |

| | | |
|------------|---------------------------------|--|
| 004 | Flow rate characteristic | |
| | None | |
| LF | Low flow | |

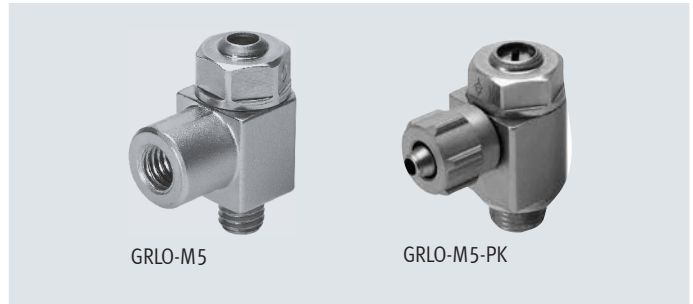
| | | |
|------------|-------------------|--|
| 005 | Generation | |
| | None | |
| B | Series B | |
| C | Series C | |

Datasheet – Female thread/barbed connector, metal

Function



- - Flow rate
83 ... 95 l/min
- - Temperature range
-10 ... +60°C
- - Operating pressure
0 ... 10 bar

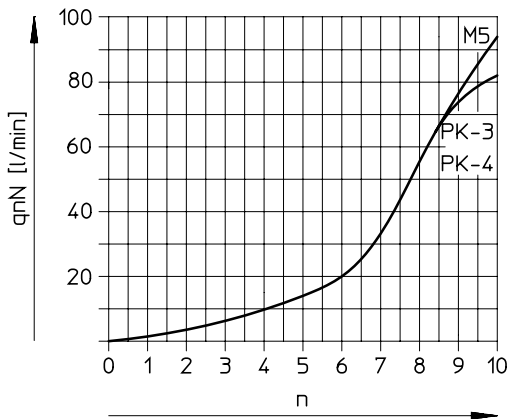


| General technical data | | |
|-----------------------------|-----------------------|------|
| Pneumatic connection 1 | M5 | M5 |
| Pneumatic connection 2 | M5 ¹⁾ | PK-3 |
| Valve function | Flow control function | |
| Adjusting element | Slotted head screw | |
| Type of mounting | Screw-in | |
| Mounting position | Any | |
| Max. tightening torque [Nm] | 1.5 | 1.5 |

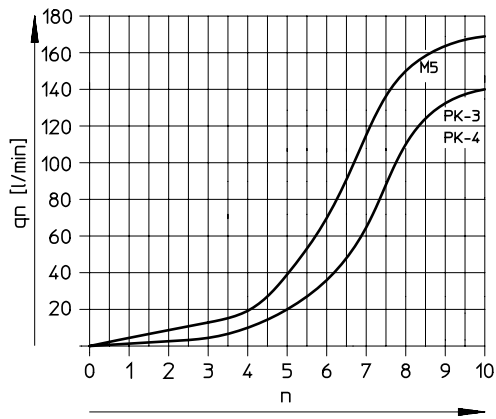
1) Note: This product conforms to ISO 1179-1 and ISO 228-1

| Operating and environmental conditions | | |
|--|--|--|
| Operating pressure [bar] | 0 ... 10 | |
| Operating medium | Compressed air to ISO 8573-1:2010 [7:4:4] | |
| Note on the operating/ pilot medium | Lubricated operation possible (in which case lubricated operation will always be required) | |
| Ambient temperature [°C] | -10 ... +60 | |
| Temperature of medium [°C] | -10 ... +60 | |
| Storage temperature [°C] | -10 ... +40 | |

Standard nominal flow rate q_{nN} at 6 → 5 bar as a function of spindle rotations n



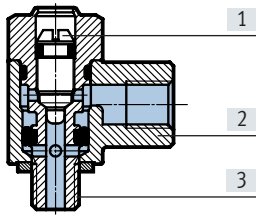
Standard flow rate q_n at 6 → 0 bar as a function of spindle rotations n



Datasheet – Female thread/barbed connector, metal

Materials

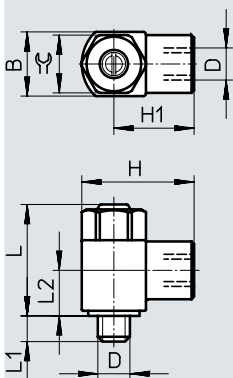
Sectional view



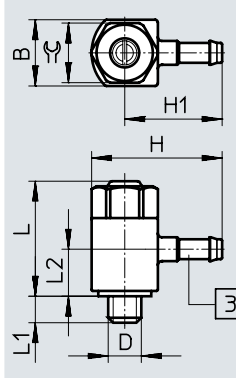
| Throttle valve | | |
|-------------------|-------------------|----------------------|
| [1] | Adjusting screw | Brass |
| [2] | Swivel connection | Die-cast zinc |
| [3] | Screwed trunnion | Brass, nickel-plated |
| - | Seals | NBR |
| Note on materials | | RoHS-compliant |

Dimensions

Female thread



Push-in connector

Download CAD data → www.festo.com

[3] Barbed connector

| Type | Connection D | Nominal width [mm] | B | ~H | ~H1 | ~L | L1 | ~L2 | ⊕ |
|--------------------------|-----------------|-----------------------|----------|------|------|----------|--------|-----|---|
| Female thread | | | | | | | | | |
| GRLO-M5 | M5 | 2 | 10 -0.15 | 17.5 | 12.5 | 18 ±6.2% | 4 ±0.3 | 7.1 | 9 |
| Push-in connector | | | | | | | | | |
| GRLO-M5-PK-3 | M5 | 2 | 10 -0.15 | 19.7 | 14.7 | 18 ±5.7% | 4 ±0.3 | 8.5 | 9 |

Ordering data




| | Pneumatic connection | | Standard nominal flow rate q _{nN} at 6 → 5 bar in flow control direction [l/min] | Standard flow rate q _n at 6 → 0 bar in flow control direction [l/min] | Weight [g] | Part no. | Type |
|--|----------------------|------|--|---|---------------|----------|----------------|
| | 1 | 2 | | | | | |
| | M5 | M5 | 95 | 169 | 11 | 151181 | GRLO-M5-B |
| | M5 | PK-3 | 83 | 140 | 10 | 151182 | GRLO-M5-PK-3-B |

Datasheet – Push-in connector QS, metal

Function



Low flow: precise adjustment for low speed

-  - Flow rate
40 ... 41 l/min
-  - Temperature range
-10 ... +60°C
-  - Operating pressure
0 ... 10 bar

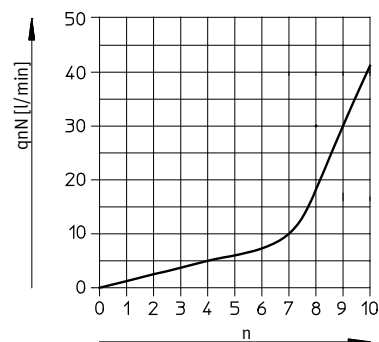


| General technical data | | |
|-----------------------------|-----------------------|------------|
| Pneumatic connection 1 | M3 | M5 |
| Pneumatic connection 2 | QS-3 | QS-3, QS-4 |
| Valve function | Flow control function | |
| Adjusting element | Slotted head screw | |
| Type of mounting | Screw-in | |
| Mounting position | Any | |
| Max. tightening torque [Nm] | 0.3 | 1.5 |

| Operating and environmental conditions | | |
|--|--|--|
| Operating pressure [bar] | 0 ... 10 | |
| Operating medium | Compressed air to ISO 8573-1:2010 [7:4:4] | |
| Note on the operating/pilot medium | Lubricated operation possible (in which case lubricated operation will always be required) | |
| Ambient temperature [°C] | -10 ... +60 | |
| Temperature of medium [°C] | -10 ... +60 | |
| Storage temperature [°C] | -10 ... +40 | |

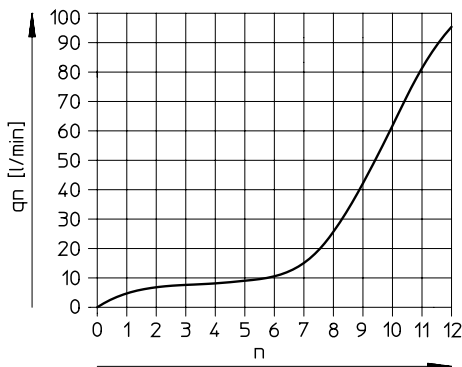
Standard nominal flow rate q_{nN} at 6 → 5 bar as a function of spindle rotations n

GRLO-M3

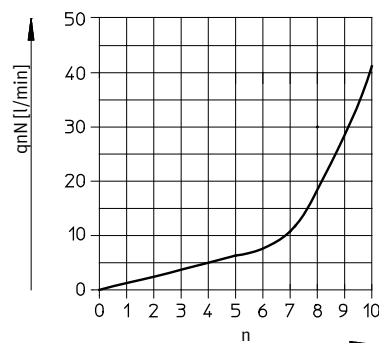


Standard flow rate q_n at 6 → 0 bar as a function of spindle rotations n

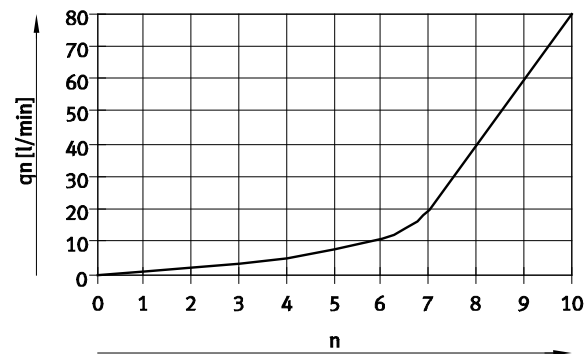
GRLO-M3



GRLO-M5



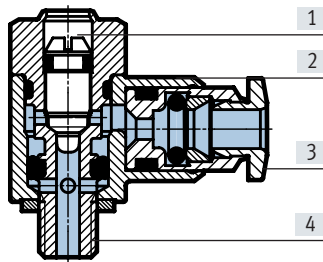
GRLO-M5



Datasheet – Push-in connector QS, metal

Materials

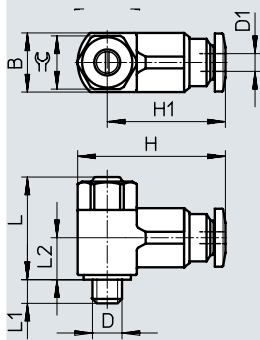
Sectional view



Throttle valve

| | | |
|-------------------|-------------------|----------------|
| [1] | Adjusting screw | Brass |
| [2] | Swivel connection | Die-cast zinc |
| [3] | Releasing ring | POM |
| [4] | Screwed trunnion | Brass |
| - | Seals | NBR |
| Note on materials | | RoHS-compliant |

Dimensions

Download CAD data → www.festo.com

| Type | Connection D | Nominal width [mm] | Tubing O.D. D1 | B | ~H | ~H1 | ~L | L1 | ~L2 | ≅ |
|------|--------------|--------------------|----------------|-----------|------|------|------------|-----------------|-----|---|
| GRLO | M3 | 1.4 | 3 | 8 -0.15 | 20 | 15.8 | 16.6 ±3.3% | 2.3 +0.15/-0.3 | 7 | 7 |
| | M5 | 1.4 | 3 | 9.8 -0.15 | 22.4 | 18.4 | 17.2 ±3.1% | 3.1 +0.15/-0.35 | 7.3 | |
| | | 1.4 | 4 | 9.8 -0.15 | 22.2 | 18.2 | 17.2 ±3.1% | 3.1 +0.15/-0.35 | 7.3 | |




Ordering data

| | Pneumatic connection | | Standard nominal flow rate qnN at 6 → 5 bar in flow control direction [l/min] | Standard flow rate qn at 6 → 0 bar in flow control direction [l/min] | Weight [g] | Part no. | Type |
|--|----------------------|------|---|--|------------|----------|-------------------|
| | 1 | 2 | | | | | |
| | M3 | QS-3 | 41 | 95 | 7 | 175042 | GRLO-M3-QS-3 |
| | M5 | QS-3 | 40 | 80 | 9 | 175054 | GRLO-M5-QS-3-LF-C |
| | | QS-4 | 40 | 80 | 9 | 175057 | GRLO-M5-QS-4-LF-C |

Datasheet – Female thread, metal

Function



-  - Flow rate
0 ... 18 l/min
-  - Temperature range
-10 ... +60°C
-  - Operating pressure
0 ... 10 bar



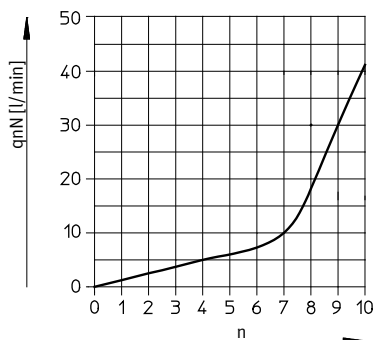
General technical data

| | |
|-----------------------------|-----------------------|
| Pneumatic connection 1 | M3 |
| Pneumatic connection 2 | M3 |
| Valve function | Flow control function |
| Adjusting element | Slotted head screw |
| Type of mounting | Screw-in |
| Mounting position | Any |
| Max. tightening torque [Nm] | 0.3 |

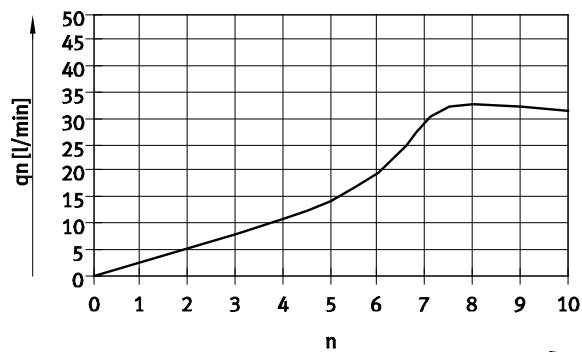
Operating and environmental conditions

| | |
|------------------------------------|--|
| Operating pressure [bar] | 0 ... 10 |
| Operating medium | Compressed air to ISO 8573-1:2010 [7:4:4] |
| Note on the operating/pilot medium | Lubricated operation possible (in which case lubricated operation will always be required) |
| Ambient temperature [°C] | -10 ... +60 |
| Temperature of medium [°C] | -10 ... +60 |
| Storage temperature [°C] | -10 ... +40 |

Standard nominal flow rate q_{nN} at 6 → 5 bar as a function of spindle rotations n

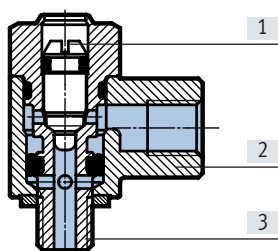


Standard flow rate q_n at 6 → 0 bar as a function of spindle rotations n



Materials

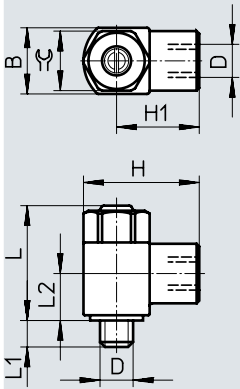
Sectional view



| Throttle valve | |
|-------------------------------------|---|
| [1] | Adjusting screw Brass |
| [2] | Swivel connection Die-cast zinc |
| [3] | Screwed trunion Brass, nickel-plated |
| - | Seals NBR |
| Note on materials RoHS-compliant | |


Datasheet – Female thread, metal

Dimensions

Download CAD data → www.festo.com

| Type | Connection D | Nominal width [mm] | B | ~H | ~H1 | ~L | L1 | ~L2 | ≙G |
|------|-----------------|-----------------------|--------|----|-----|------------|----------------|-----|-----|
| GRLO | M3 | 0.8 | 5 -0.1 | 9 | 6.5 | 13.4 ±3.9% | 2.5 +0.15/-0.3 | 6.4 | 4.5 |

Ordering data

| | Pneumatic connection | | Standard nominal flow rate q _N at 6 → 5 bar in flow control direction [l/min] | Standard flow rate q _n at 6 → 0 bar in flow control direction [l/min] | Weight [g] | Part no. | Type |
|--|----------------------|----|---|---|---------------|----------|---------|
| | 1 | 2 | | | | | |
| Slotted head screw | | | | | | | |
|  | M3 | M3 | 18 | 33 | 2 | 175039 | GRLO-M3 |

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