

# 95F



## EN Description

The 95F series PICV valve offers the following functions:

- Good valve authority to maintain temperature control and power output from the terminal unit using the complete stroke of the valve.
- Maximum design flow limitation: once set, the 95F maintains design flow regardless of pressure changes in the system.
- It can easily be set up once installed, using the M94F2 actuator provided.
- Fail safe option through M94FC (optional) and 2 x 18650 rechargeable batteries 2600 mAh (not included).
- Easy fitting system to assembly actuator.

## EN Valve features

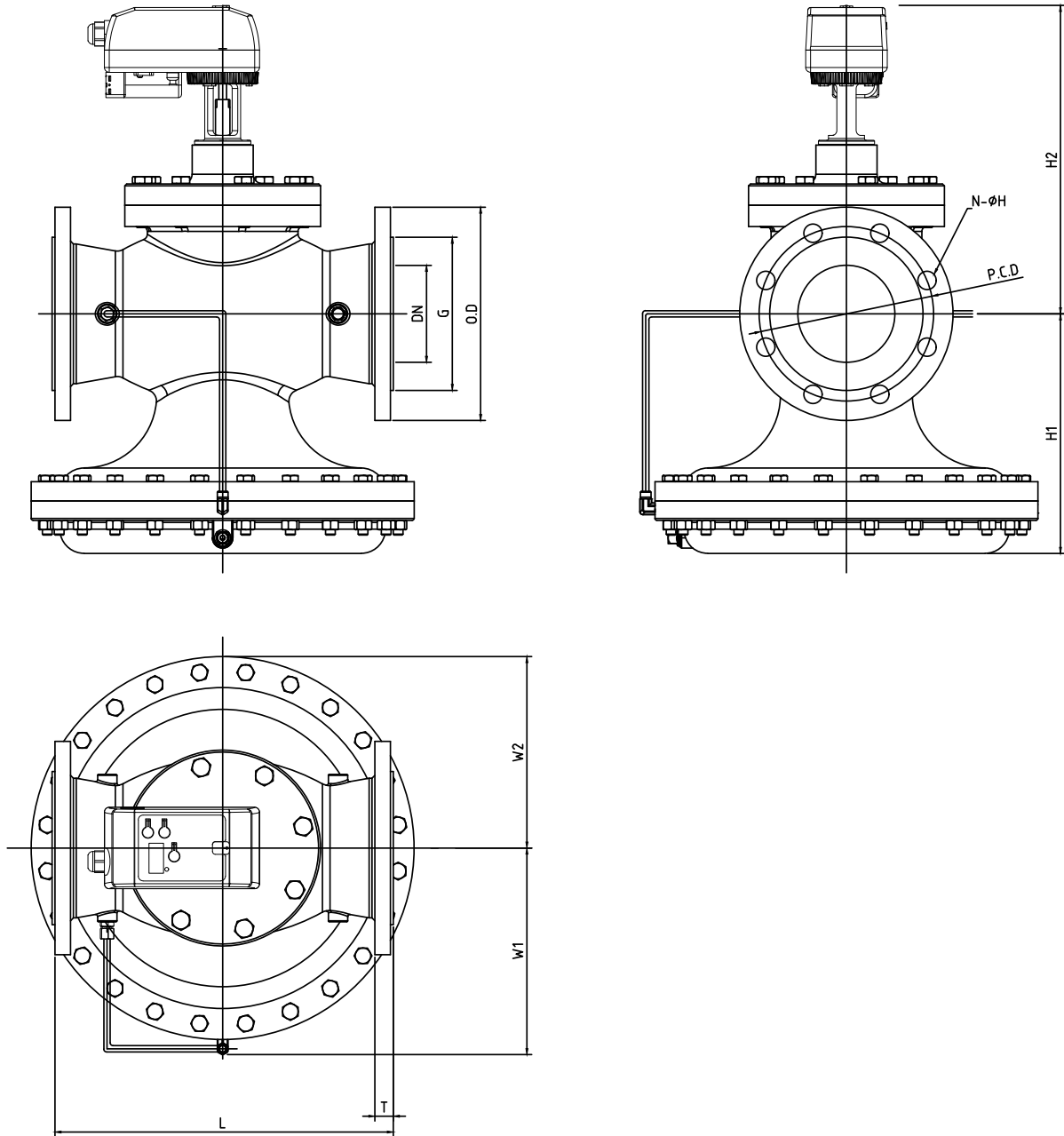
- Modulating temperature control valve
- The design flow can be set on the actuator and then the valve maintains that flow during commissioning
- No requirement for differential pressure control and balancing valves
- Large diaphragm to ensure good performance
- No valve sizing calculation is required as it maintains constant differential pressure (then flow rate) across itself

| ΔP max.         | Close off pressure | Temperature  | Working pressure max. | Stroke   | Rangeability          | Leakage                 | Accuracy 0 ÷ 1 bar |
|-----------------|--------------------|--------------|-----------------------|----------|-----------------------|-------------------------|--------------------|
| 600 kPa / 6 bar | 600 kPa / 6 bar    | -10 ÷ 120 °C | 1600 kPa / 16 bar     | 15÷22 mm | >100<br>IEC 60534-2-3 | Class IV<br>IEC 60534-4 | ± 5%               |

|                       | 95FH 2"   | 95FH 2 1/2"   | 95FL 3"   | 95FL 4"   | 95FL 6"   | 95FH 6"   |
|-----------------------|---|---|---|---|---|---|
| <b>Flow rate max.</b> | 20000 l/h<br>5,56 l/s                                 | 30000 l/h<br>8,30 l/s                                     | 30000 l/h<br>8,30 l/s                                 | 55000 l/h<br>15,28 l/s                                | 90000 l/h<br>25,00 l/s                                | 150000 l/h<br>41,667 l/s                              |
| <b>Start-up max.</b>  | 40 kPa<br>0,40 bar                                    | 30 kPa<br>0,30 bar  | 30 kPa<br>0,30 bar                                    | 30 kPa<br>0,30 bar                                    | 35 kPa<br>0,35 bar                                    | 50 kPa<br>0,50 bar                                    |
| <b>Connections</b>    | Flanged 2"<br>ANSI B16.42<br>EN 558<br>(face to face) | Flanged 2 1/2"<br>ANSI B16.42<br>EN 558<br>(face to face) | Flanged 3"<br>ANSI B16.42<br>EN 558<br>(face to face) | Flanged 4"<br>ANSI B16.42<br>EN 558<br>(face to face) | Flanged 6"<br>ANSI B16.42<br>EN 558<br>(face to face) | Flanged 6"<br>ANSI B16.42<br>EN 558<br>(face to face) |

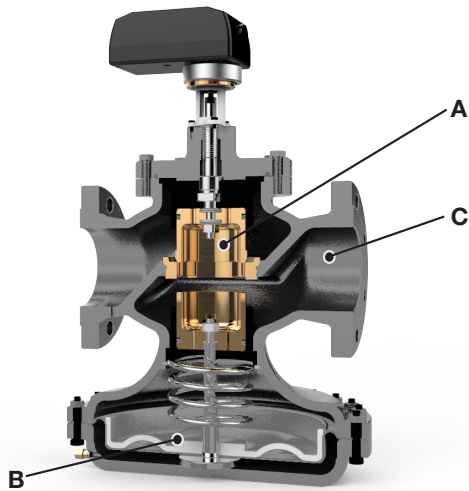


EN Dimensional data



| Valve with actuator 24V |                   |         |         |        |         |         |         |          |            |        |        |           |
|-------------------------|-------------------|---------|---------|--------|---------|---------|---------|----------|------------|--------|--------|-----------|
| Art.                    | Flow rate [ l/h ] | H1 (mm) | H2 (mm) | L (mm) | DN (mm) | W1 (mm) | W2 (mm) | O.D (mm) | P.C.D (mm) | G (mm) | T (mm) | N-ØH (mm) |
| 95FH 2"                 | 20000             | 191     | 291     | 254    | 50      | 155     | 139     | 152      | 120.5      | 92     | 19     | 4-19      |
| 95FH 2 1/2"             | 30000             | 183     | 300     | 272    | 65      | 155     | 139     | 178      | 139.5      | 105    | 22     | 4-19      |
| 95FL 3"                 | 30000             | 183     | 300     | 272    | 65      | 155     | 139     | 191      | 152.5      | 127    | 24     | 4-19      |
| 95FL 4"                 | 55000             | 247     | 318     | 352    | 100     | 213     | 198     | 229      | 190.5      | 157    | 24     | 8-19      |
| 95FL 6"                 | 90000             | 264     | 346     | 400    | 150     | 213     | 198     | 279      | 241.5      | 216    | 25.4   | 8-22      |
| 95FH 6"                 | 150000            | 348     | 397     | 451    | 150     | 213     | 198     | 279      | 241.5      | 216    | 25.4   | 8-22      |

## EN Materials and weight



|                             | Material list                                   |
|-----------------------------|---|
| <b>Regulating valve (A)</b> | Brass CW602N<br>Stainless steel 18/8            |
| <b>Diaphragm (B)</b>        | Brass CW602N - EPDM<br>Stainless steel AISI 303 |
| <b>Body (C)</b>             | Ductile iron                                    |
| <b>Gaskets</b>              | EPDM-x  |

| Art.               | Weight (Kg) |
|--------------------|-------------|
| <b>95FH 2"</b>     | 33,00       |
| <b>95FH 2 1/2"</b> | 40,00       |
| <b>95FL 3"</b>     | 43,00       |

| Art.           | Weight (Kg) |
|----------------|-------------|
| <b>95FL 4"</b> | 74,00       |
| <b>95FL 6"</b> | 98,00       |
| <b>95FH 6"</b> | 162,00      |

## EN Actuator features

Each 95F comes with a M94F2 proportional actuator (for complete technical information, please refer to M94F2 technical specification):

- Proportional, ON-OFF and floating control
- Position detecting
- 4 Digit Display
- 3 buttons to set parameter
- Position control method to set actuator
- Fail safe option through M94FC (2x18650 batteries not included)
- Easy fitting gear. Square of the stem: 8mm
- Extended life: over 50.000 cycles

|                     |   |
|---------------------|---|
| Control signal      | 0(2)-10V - 0(4)-20mA<br>ON/OFF - 3 point floating - PWM |
| Supply voltage      | 24V AC/DC ±15% - 50/60 Hz                               |
| Current consumption | 80 mA; Load max 380 mA                                  |
| Power consumption   | 5 W; 2.5 W stand-by                                     |
| Feedback            | 0(4) - 20 mA and 0(2) - 10 V                            |
| Manual Override     | Through release button and 6mm Allen key                |

|                            |                                 |
|----------------------------|---------------------------------|
| Torque                     | 10 Nm Max, self-limited at 7 Nm |
| Running speed              | Selectable: 1 RPM or 1.5 RPM    |
| Ambient temperature        | -20° / + 60°C (@)               |
| Storage temperature        | -20° / + 80°C (@)               |
| Class/Degree of protection | II / IP54                       |
| Connecting cable           | 18 AWG                          |
| Motor                      | Brushless DC motor              |

## EN Installation instructions

### 1. Use conditions

The valve has to be mounted with the arrow in the direction of the flow. Mounting it in the wrong direction may damage the system and the valve itself.

If flow reversal is possible, a non-return valve should be mounted.

Minimum differential pressure above which the valve begins to exercise its regulating effect:

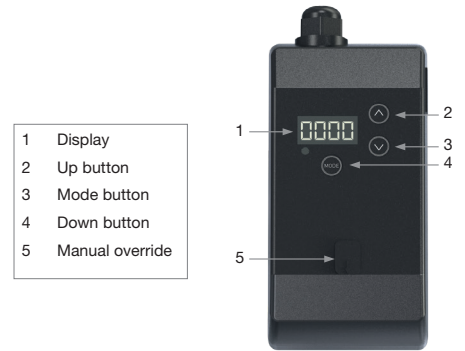
|                    | 95FH 2"            | 95FH 2 1/2"        | 95FL 3"            | 95FL 4"            | 95FL 6"            | 95FH 6"            |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>Start-up ΔP</b> | 40 kPa<br>0,40 bar | 30 kPa<br>0,30 bar | 30 kPa<br>0,30 bar | 30 kPa<br>0,30 bar | 35 kPa<br>0,35 bar | 50 kPa<br>0,50 bar |

| Medium                   |
|--------------------------|
| Water / Water+glycol 30% |

### 2. Flow preset

The 95F is set up using the Smart Actuator: when first powered 'GO 0' is displayed on the LCD. Then wait for '0' to appear. Pressing the 'MODE' button for 2 seconds or longer turns to setting mode. You can then choose the detail indication that's suitable for your on-site installations. When in 'set' mode, press the MODE button again and you can choose another set mode (set 1 - set 15).

- SET1 - Selecting input indication in direct internal control mode
- SET2 - Selecting an input signal
- SET3 - Min. flow setting
- SET4 - Max. flow setting
- SET5 - Selecting parameters display mode during operation
- SET6 - Rotation angle compensation
- SET7 - Flow offset compensation
- SET8 - Power failure mode (if fail safe option is fit)
- SET9 - Flow rate units selection
- SET10 - Control curve selection (LIN - EQ)
- SET11 - Min voltage signal in PID control mode
- SET12 - Max voltage signal in PID control mode
- SET13 - Actuator rotation speed
- SET14 - Feedback signal selection
- SET15 - RS485 ID number

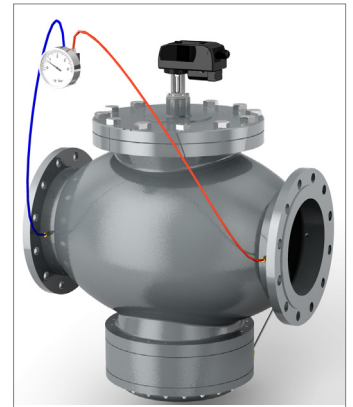


**3. Operating control**

It is necessary to be sure that the valve is actually working in the operating range. In order to verify it, just measure the differential pressure across the valve, as shown in the picture.

If the measured differential pressure is higher than the start-up pressure, the valve is actually keeping the flow constant at the set value.

Pettinaroli MDPS2 is the device which allows to do it: along with a smartphone and the dedicated app, it can directly give the user the differential pressure compared to the start-up differential pressure of the valve (proper valve has to be selected among all the Pettinaroli EvoPICV catalogue).



**4. Maintenance and cleaning**

During valve cleaning operations, use a damp cloth. DO NOT use any detergent or chemical product that may seriously damage or compromise the proper functioning and the reliability of the valve.

**EN Actuator wiring and programming**

**Valve wiring**

|        |          |                  |
|--------|----------|------------------|
| Black  | <b>1</b> | Common           |
| Red    | <b>2</b> | 24VAC/DC         |
| White  | <b>3</b> | Control Signal 1 |
| Green  | <b>4</b> | Control Signal 2 |
| Blue   | <b>5</b> | Feedback Signal  |
| Yellow | <b>6</b> | Remote control + |
| Brown  | <b>7</b> | Remote control + |

Wiring guide

| Input             | Number | 1            | 2                            | 3                       | 4     | 5                                   | Remarks   |
|-------------------|--------|--------------|------------------------------|-------------------------|-------|-------------------------------------|---|
|                   | Color  | Black        | Red                          | White                   | Green | Blue                                |   |
| Internal control  | Common | 24VAC/<br>DC |                              |                         |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2                                      |
| Voltage signal    | Common | 24VAC/<br>DC | 0 ~10VDC<br>2 ~10VDC         |                         |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2<br>Voltage signal: cable 1 - 3       |
| Current signal    | Common | 24VAC/<br>DC | 0 ~ 20mA<br>4 ~ 20mA         |                         |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2<br>Current signal: cable 1 - 3       |
| ON / OFF signal   | Common | 24VAC/<br>DC | 24DCV<br>(open)<br>0V(close) |                         |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2<br>ON/OFF signal: cable 1 - 3        |
| 3 Points floating | Common | 24VAC/<br>DC | Opening<br>24V<br>AC/DC      | Closing<br>24V<br>AC/DC |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2<br>Floating 3 points: cable<br>3 - 4 |
| PWM control       | Common | 24VAC/<br>DC | PWM<br>signal                |                         |       | Feedback<br>(0)2-10 V<br>(0)4-20 mA | Power: cable 1 - 2<br>PWM control: cable 1 - 3          |

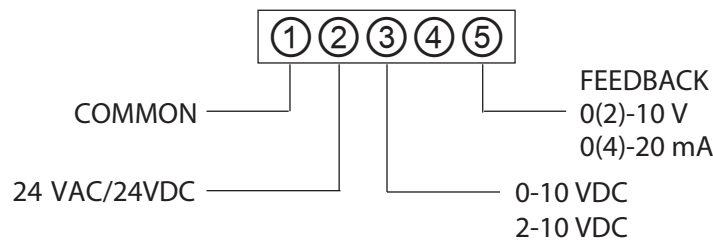
Cables 1 & 2: power

Cables 3 & 4: control signal; please refer to the table above

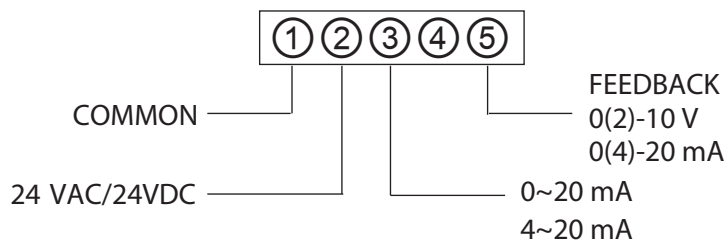
Cable 5: only used for feedback

Control method

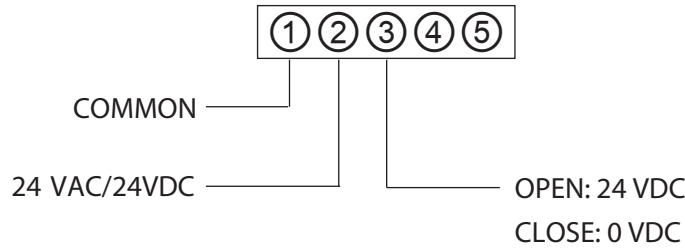
1. Analog voltage signal



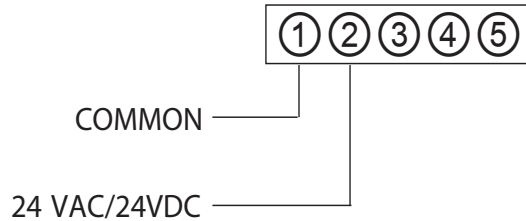
2. Analog current signal



3. ON/OFF control

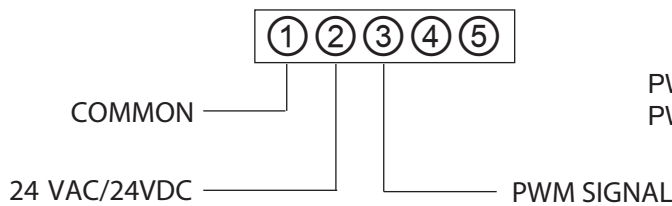


4. Internal control\*



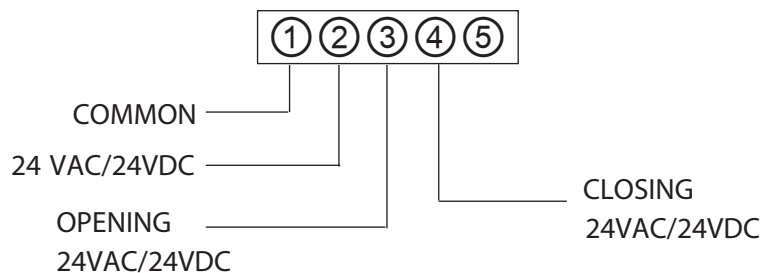
\* flow rate can be set through buttons on the actuator and it can be read on the 4 digits display

5. PWM signal



PWM Type1: 0.1 - 5 s / Step 20 ms  
 PWM Type2: 0.1 - 25 s / Step 100 ms

6. 3 points floating



The digital method is sensitive to electric noise occurring from electronic equipment; therefore connection of a 1k Ohm resistor between wire n. 3 and wire n. 1 and a 0.5 W resistor between wire n. 4 and wire n. 1 is recommended. This will prevent any electric noise.

If PWM control (No 5) or memote control is used, please check with Fratelli Pettinaroli technical staff.

For Remote Control, set SET2 on RT and select ID number on SET15.

**Settings**

When power is on, display indicates 'Go-0' and the actuator automatically looks for the valve zero point. Do not press any buttons as this might cause incorrect flow control.

A safety function is built in the actuator: in case the zero point is not detected the actuator can be activated by pressing the DOWN button. By means of DOWN button it is possible to force the zero position setting.

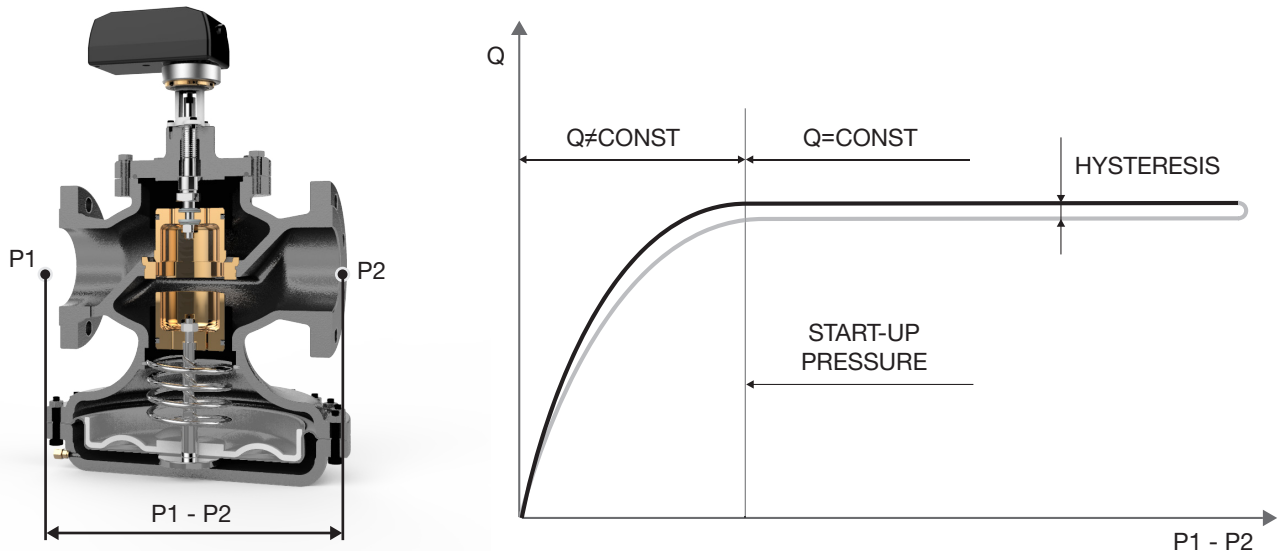
Pressing the MODE button, the actuator shows the setting menu. Use the UP and DOWN buttons to browse through the menu. Settings indications are specified in the following.

|         | Display indication            | Meaning   | Operating  |
|---------|-------------------------------|---|--|
| SET 1   | <i>PErc</i>                   | Input internal control in %                           | Selection with UP/DOWN buttons and confirmation with MODE button   |
|         | <i>FLo</i> (default)          | Input internal control in flow rate                   |  |
| SET 2   | <i>0-10</i> (default)         | Voltage control signal                                | Control with voltage signal  |
|         | <i>2-10</i>                   | Voltage control signal                                | Control with voltage signal  |
|         | <i>0-20</i>                   | Current control signal                                | Control with current signal  |
|         | <i>4-20</i>                   | Current control signal                                | Control with current signal  |
|         | <i>on-F</i>                   | ON/OFF  | 24 V: open; 0 V: close;  |
|         | <i>3-FL</i>                   | 3 points floating                                     | opening giving white wire 24 V<br>closing giving green wire 24 V   |
|         | <i>rT</i>                     | Remote control  | RS485 communication  |
|         | <i>P-05</i>                   | PWM 5 s   | PWM (0.1 – 5 s)  |
|         | <i>P-25</i>                   | PWM 25 s  | PWM (0.1 – 25 s)   |
|         | <i>Int</i>                    | Internal input  | Flow rate set by on board display and buttons. Push MODE, wait until “Set” is replaced by flow rate indication (or flow rate %, depending on SET 1), set the flow rate with UP/DOWN buttons and confirm with MODE.   |
| SET 3   | Flow rate on display          | Min flow rate selection (default: 0)                  | Selection with UP/DOWN buttons and confirmation with MODE button   |
| SET 4   | Flow rate on display          | Max flow rate selection (default: depending on model) | Selection with UP/DOWN buttons and confirmation with MODE button   |
| SET 5   | <i>St-P</i>                   | Set flow rate in “%”                                  | Selection with UP/DOWN buttons and confirmation with MODE button<br>Display option during operation: St allows to see the flow rate value required by the controller; Fd allows to see the current flow rate value given by the valve (the progressive change of flow rate values is displayed during valve stem motion) |
|         | <i>St-F</i>                   | Set flow rate in “flow rate”                          |  |
|         | <i>Fd-P</i>                   | Current flow rate in “%”                              |  |
|         | <i>Fd-F</i> (default)         | Current flow rate in “flow rate”                      |  |
| SET 6*  | Value on display              | Rotation angle compensation                           | Selection with UP/DOWN buttons and confirmation with MODE button   |
| SET 7   | Value on display              | % flow rate offset (default: 0)                       | Selezione con tasti SU/GIÙ e conferma con tasto MODE.  |
| SET 8   | <i>oPEN</i>                   | Valve open at power failure                           | Selection Fail-CLOSE or Fail-OPEN option. Additional battery needed. <b>Available with M94FC+batteries.</b>  |
|         | <i>CLoS</i> (default)         | Valve close at power failure                          |  |
| SET 9   | <i>LIt</i> (default)          | Unit SI (m3/h)  | Selection with UP/DOWN buttons and confirmation with MODE button   |
|         | <i>GRL</i>                    | Unit GPM (gal/min)                                    |  |
| SET 10  | <i>LIn</i> (default)          | Linear control curve                                  | Selection with UP/DOWN buttons and confirmation with MODE button   |
|         | <i>EPEr</i>                   | Equal percentage control curve                        |  |
| SET 11* | Value on display              | Min voltage control signal                            | Selection min voltage control value with UP/DOWN buttons and confirmation with MODE button   |
| SET 12* | Value on display              | Max voltage control signal                            | Selection max voltage control value with UP/DOWN buttons and confirmation with MODE button   |
| SET 13  | <i>PE15</i> (default)         | Actuator rotation speed 1.5 RPM                       | Selection of actuator rotation speed with UP/DOWN buttons and confirmation with MODE button  |
|         | <i>PE01</i>                   | Actuator rotation speed 1 RPM                         |  |
|         | <i>RuLo</i>                   | Actuator rotation speed automatic                     |  |
| SET 14  | <i>0-10</i> (default)         | Voltage feedback signal                               | Selection of feedback signal type with UP/DOWN buttons and confirmation with MODE button   |
|         | <i>2-10</i>                   | Voltage feedback signal                               |  |
|         | <i>0-20</i>                   | Current feedback signal                               |  |
|         | <i>4-20</i>                   | Current feedback signal                               |  |
| SET 15  | <i>1 to 254</i> (default 247) | RS485 ID number                                       | ID selection with UP/DOWN and confirmation with MODE   |

\* Contact the supplier to modify.



## EN Start-up curves and presetting

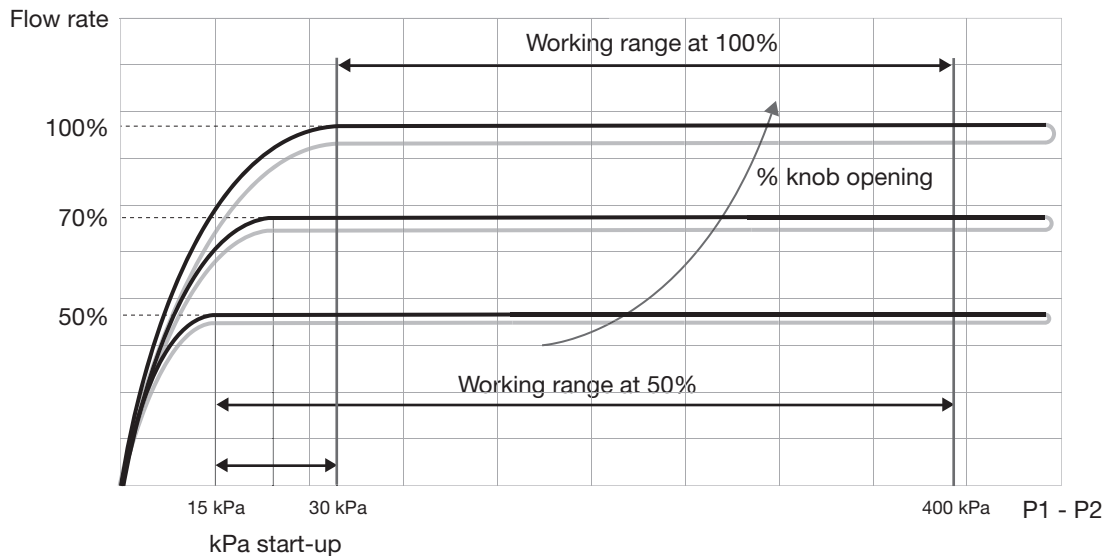


The example above shows a characteristic curve where start-up pressure, hysteresis and accuracy can be evaluated.

Using a differential pressure gauge to measure the pressure drop the valve absorbs, allows to check whether the valve is in the operating range (and, therefore, whether the flow is constant) by simply verifying that the measured value  $P1 - P2$  is higher than the start-up value.

If the  $\Delta P$  measured value is lower than the start-up value, then the valve works as a fixed orifice valve.

Start-up value varies with flow setting of the valve, as shown by the example below:



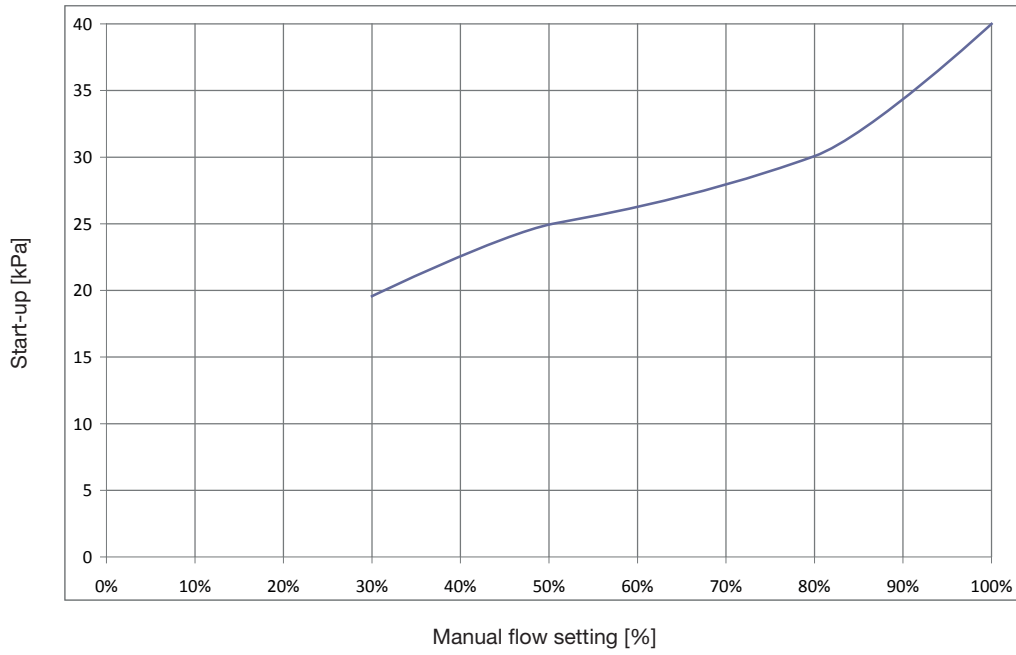
When the valve is set at 100% of nominal (maximum) flow, the curve begins to remain constant at 30 kPa, therefore the working range of the valve is  $30 \div 400$  kPa;

When the valve is set at 50% of nominal flow, the curve begins to remain constant at 15 kPa, therefore the working range of the valve is  $15 \div 400$  kPa.

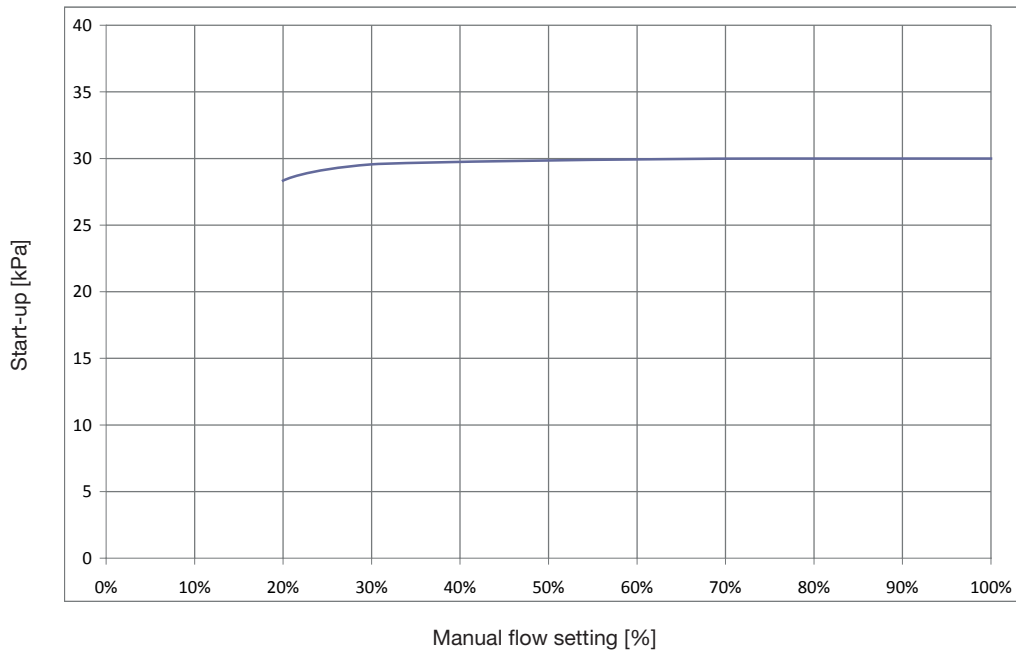
Over 400 kPa the fluid velocity through the valve is extremely high and cavitation may happen due to extreme turbulence of the flow.

Because of these phenomena the valve can get damaged. For energy saving reasons, we suggest to continuously work the valve under 400 kPa.

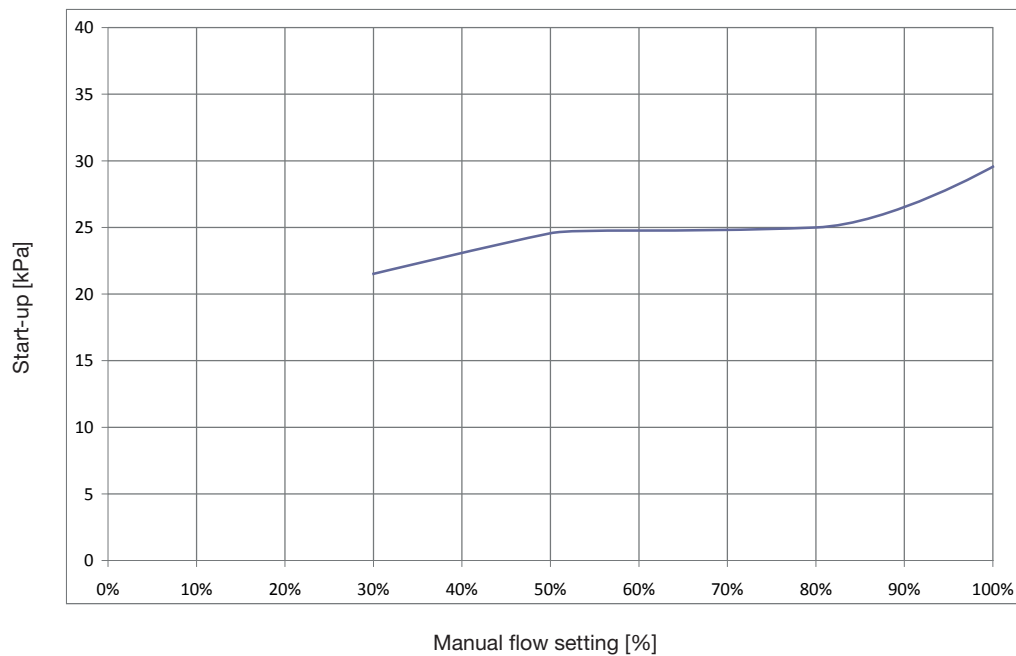




Valve model  
95FH 2" - 20000 l/h

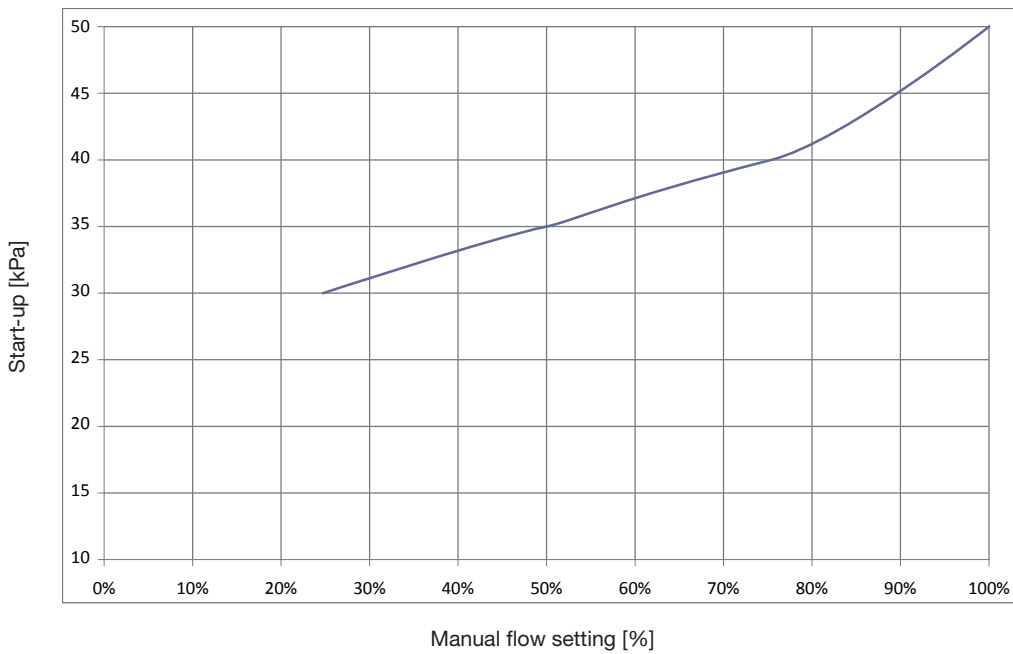
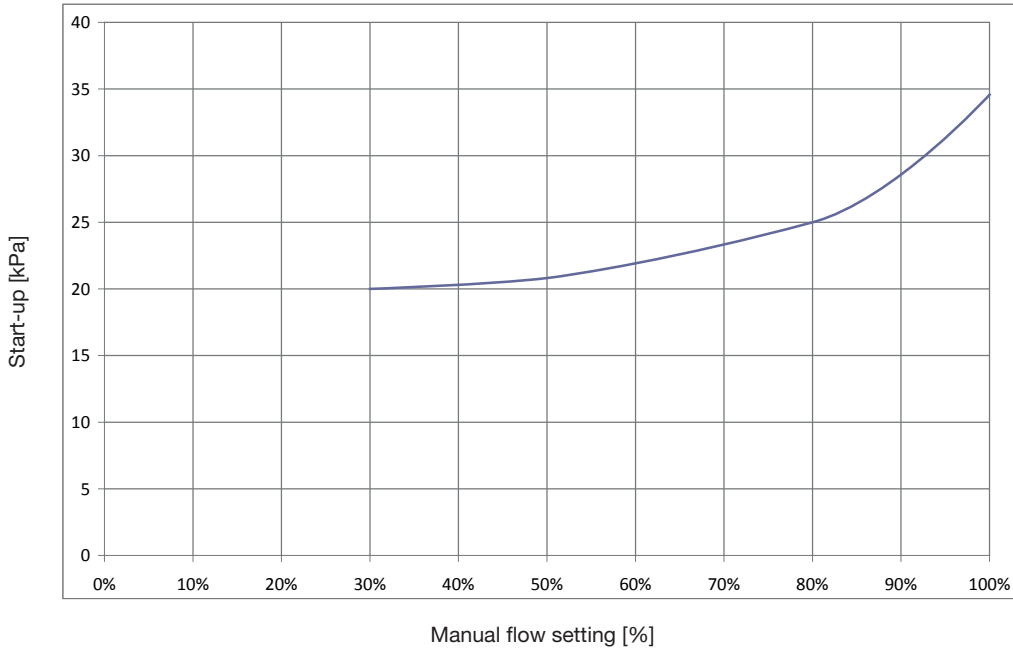


Valve model  
95FH 2 1/2" - 30000 l/h  
95FL 3" - 30000 l/h



Valve model  
95FL 4" - 55000 l/h





Flow pre-setting 95F EvoPICV

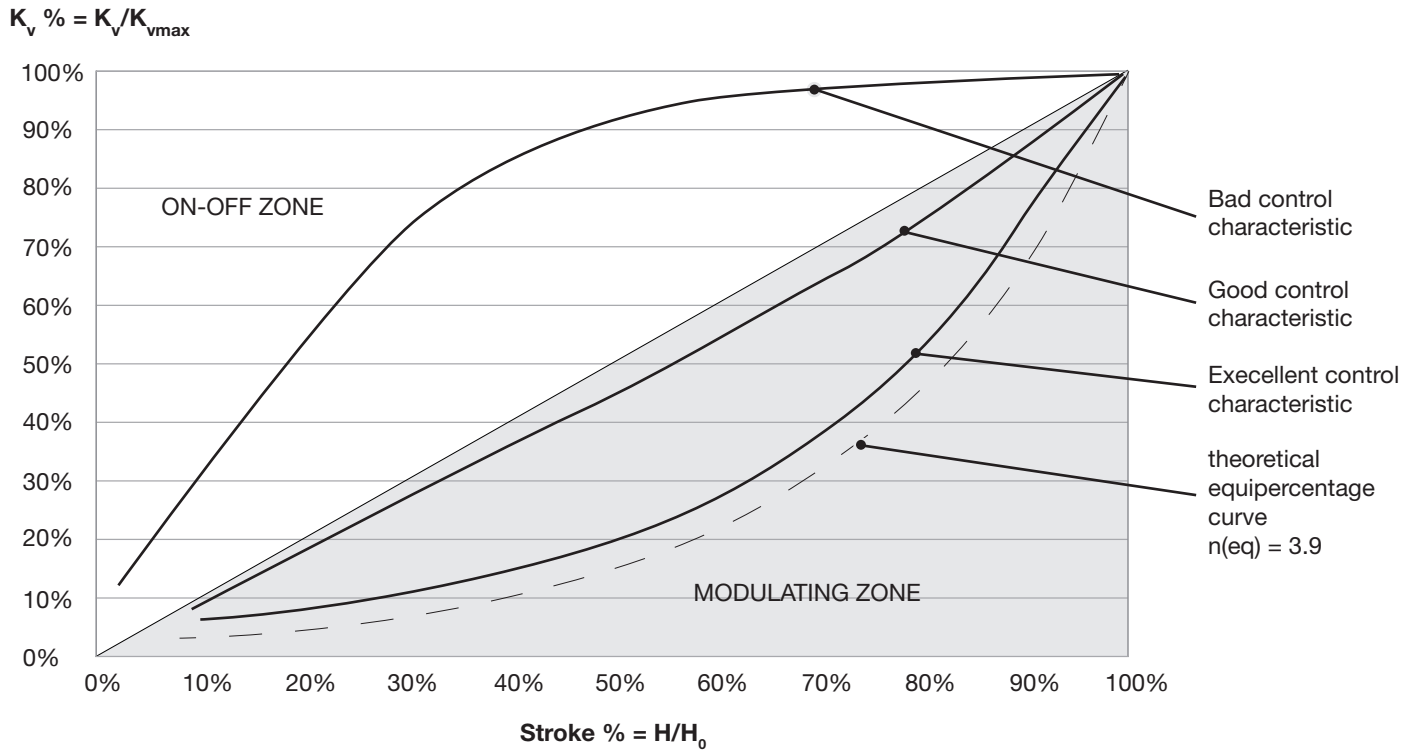
| Presetting % | 95FH 2"   |       | 95FH 2 1/2"<br>95FL 3" |       | 95FL 4"   |        | 95FL 6"   |        | 95FH 6"   |        |
|--------------|-----------|-------|------------------------|-------|-----------|--------|-----------|--------|-----------|--------|
|              | Flow rate |       | Flow rate              |       | Flow rate |        | Flow rate |        | Flow rate |        |
|              | l/h       | l/s   | l/h                    | l/s   | l/h       | l/s    | l/h       | l/s    | l/h       | l/s    |
| 100          | 20000     | 5,556 | 30000                  | 8,333 | 55000     | 15,278 | 90000     | 25,000 | 150000    | 41,667 |
| 90           | 18000     | 5,000 | 27000                  | 7,500 | 49500     | 13,750 | 81000     | 22,500 | 135000    | 37,500 |
| 80           | 16000     | 4,444 | 24000                  | 6,667 | 44000     | 12,222 | 72000     | 20,000 | 120000    | 33,333 |
| 70           | 14000     | 3,889 | 21000                  | 5,833 | 38500     | 10,694 | 63000     | 17,500 | 105000    | 29,167 |
| 60           | 12000     | 3,333 | 18000                  | 5,000 | 33000     | 9,167  | 54000     | 15,000 | 90000     | 25,000 |
| 50           | 10000     | 2,778 | 15000                  | 4,167 | 27500     | 7,639  | 45000     | 12,500 | 75000     | 20,833 |
| 40           | 8000      | 2,222 | 12000                  | 3,333 | 22000     | 6,111  | 36000     | 10,000 | 60000     | 16,667 |
| 30           | 6000      | 1,667 | 9000                   | 2,500 | 16500     | 4,583  | 27000     | 7,500  | 45000     | 12,500 |
| 20           | 4000      | 1,111 | 6000                   | 1,667 | 11000     | 3,056  | 18000     | 5,000  | 30000     | 8,333  |
| 10           | 2000      | 0,556 | 3000                   | 0,833 | 5500      | 1,528  | 9000      | 2,500  | 15000     | 4,167  |



## EN Control curves

Operating on the position of the regulating valve control stem A will modify the valve Kv, hence the flow rate. The relation between Kv and stroke is shown in the graph below.

Typical control valve characteristic curves.\*

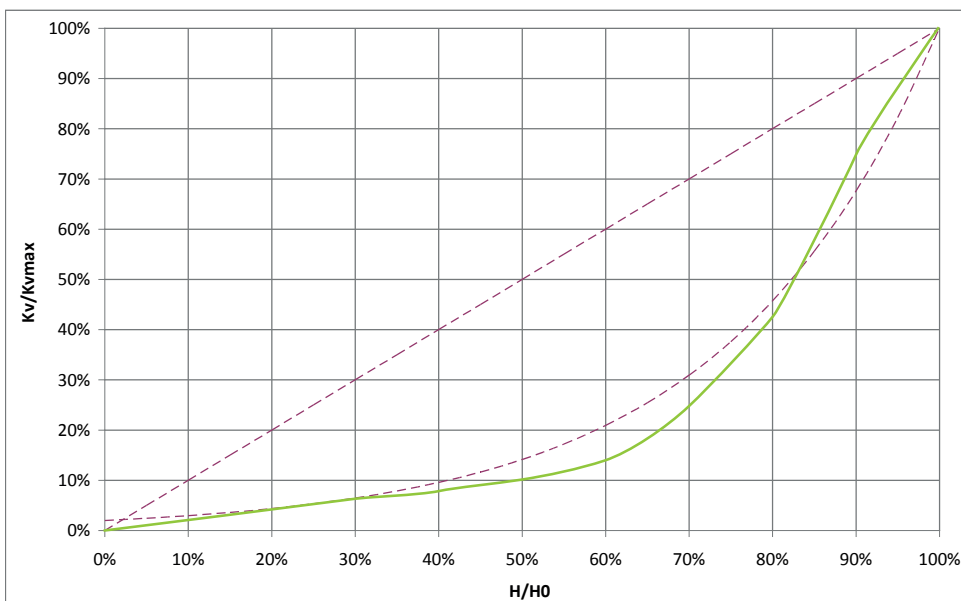


Combining the **EvoPICV** valve characteristic with heat exchanger results in a linear control system.

In the next page control curves of 95F are shown.

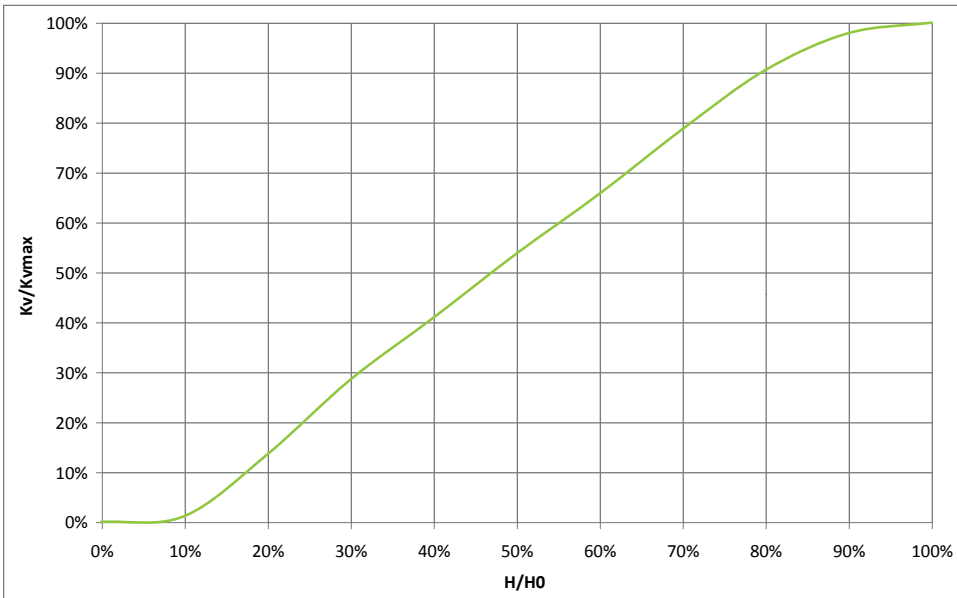
\* Control curve characteristic may change according to valve version.

Equal percentage mode



- H: current lift (opening) of the control valve; H varies from 0 to  $H_0$
- $H_0$ : maximum lift of the control valve;
- $K_v$ : valve flow factor at lift = H
- $K_{vmax}$ : valve flow factor at lift =  $H_0$

Linear mode

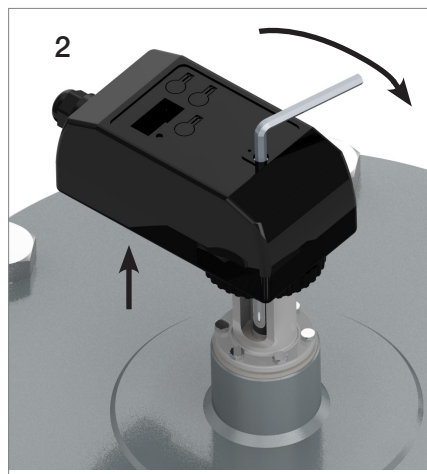
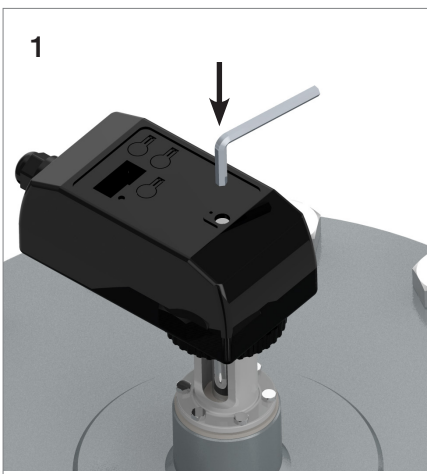


| Valve model             |
|-------------------------|
| 95FH 2" - 20000 l/h     |
| 95FH 2 1/2" - 30000 l/h |
| 95FL 3" - 30000 l/h     |
| 95FL 4" - 55000 l/h     |
| 95FL 6" - 90000 l/h     |
| 95FH 6" - 150000 l/h    |
| Presetting positions    |
| Any                     |

EN Ratio between flow rate and opening position (according to characteristic curve)

| Position of valve lift [%] | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|----------------------------|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|
| Linear curve [%]           | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
| Equal percentage curve [%] | 0 | 2 | 3  | 4  | 4  | 5  | 6  | 8  | 10 | 12 | 14 | 17 | 21 | 25 | 31 | 38 | 46 | 56 | 68 | 82 | 100 |

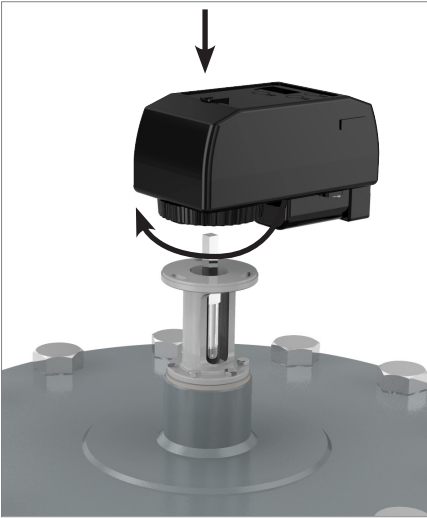
EN Manual override



1. Open the rubber cover on the actuator and insert the 6mm Allen key.
2. Turn the key keeping the released button pushed under the actuator.



## EN Actuator fitting

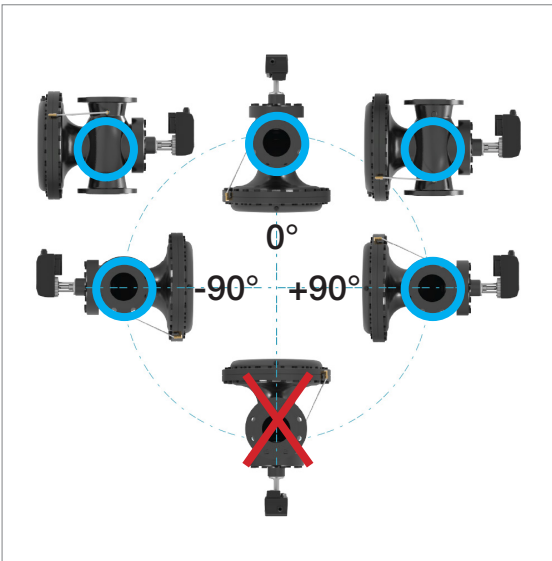


To assembly the actuator, follow the next procedure:

1. Completely open the valve with an 8 mm spanner (max torque 7 Nm)
2. Install the actuator in the same position of that has been previously removed
3. Insert the three pins in specific buttonholes on the fixing plate
4. Turn the fixing ring
5. Close the valve by means of the actuator which has to be electrically connected; the actuator performs a new Zero Detection cycle

Please note that care must be taken to actuator installation: little angular deviations can compromise the correct actuator operation.

## EN Valve and actuator installation



Valve must be installed among the allowed positions, marked by a blue circle.

Do not install the valve upside-down or below  $-90^{\circ}/+90^{\circ}$ . Actuator must be always installed at upward position as shown by the picture beside.

## EN Generals

Pettinaroli does not accept any liability for improper or wrong use of this product.

Always protect the pressure regulator by using strainers upstream of the valve and, in any case, make sure water quality complies with UNI 8065 standard. Fratelli Pettinaroli suggests to follow recommendations of VDI 2035/1 too. Maximum suggested content (total) content of Iron and Copper should be: Fe < 0.5 mg/kg and Cu < 0.1 mg/kg.

Furthermore, maximum iron oxide in the water passing through control valve (PICV) must not exceed 25 mg/Kg (25 ppm). To ensure the main pipework is cleaned appropriately, flushing by-passes should be used without flushing through the pressure regulator of the PICV thereby preventing dirt that might clog the valve.

\*The product color may be different with the actual product color due to printing procedure. \*The appearance and specifications may change with no prior notice for improvement.

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