MP4000

Multi-signal Control Actuators for VP222x SmartX PIBCV, DN200-250

Product Description

The MP4000 Actuator is primarily designed to regulate valves in response to the demand of a controller in HVAC systems. MP4000 can be controlled by electronic controllers with modulating or 3-point control output.

Features

- Manual operation mechanical and/or electrical
- Position indication, LED signalization
- Selectable speed 3 s/mm or 6 s/mm
- Automatic adaptation of stroke to valve's end positions that reduces commissioning time (self-stroking)
- Integrated external switch
- Characteristic optimization
- Adjustable stroke limitation
- Anti-oscillation function
- Pulse or continuous output signal (4, 5)
- Voltage or current output signal X
- External reset button
- Auto detection of Y signal
- 3-point floating or modulating control selection
- Galvanic insulation Y, X and output terminal 4,5
- Thermic and overload protection
- Precise regulation and fast response on 3-point signal (0.01 s)

Specifications

Please check power supply and power consumption prior connection.

Part Number	MP4000
Power supply	24 Vac/Vdc (+10, -15%)
Power consumption	35 VA (24 V) 50 VA (230 V)
Signal (mA)	10 mA
Frequency (Hz)	50/60 Hz
Control input Y	0…10 Vdc (2…10 Vdc); 0…20 mA (4…20 mA)
Control output X	0…10 Vdc (2…10 Vdc); 0…20 mA (4…20 mA)
Close off force	4000 N
Max. stroke	80 mm
Speed (selectable)	3 s/mm or 6 s/mm
Max. spindle travel	80 mm
Max. medium temperature	200 °C

| Ambient temperature	0 … + 55 °C
Storage and transport temperature	−40 … +70 °C (storing for 3 days)
Humidity	5…95%
Protection class	II
Grade of enclosure	IP 54, Type 2
Electrical connection	conduit
Weight (kg)	7.5
Manual operation	Electrical and mechanical
Power failure response	Stem remains in last position
CE marking in accordance with the standards	Low Voltage Directive 2006/95/EEC EMC Directive 2004/108/EEC

Life Is On

Schneider Electric

Mounting and Installation

Please check allowed installation positions for the valve combination. The actuator can be installed in all positions.
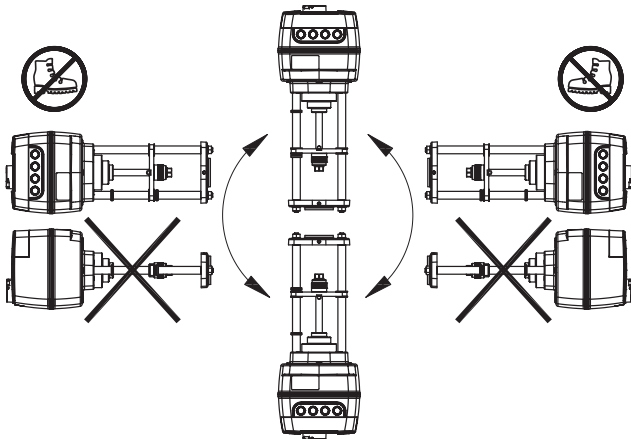
When fitting the valve to the actuator allow for necessary clearance for maintenance purposes. To link valve and actuator stems use 20 mm wrench key and 5 mm Allen key (not supplied). The actuator has position indication rings which should be pushed together before electrical connection; after self-stroking they indicate end positions of the stroke.

Commissioning

Complete the mechanical and electrical installation (see instructions) and perform the necessary checks and tests:
– Turn on the power
– Set the appropriate control signal and check that the valve stem direction is correct for the application.

The unit is now fully commissioned.

Wiring and Connections

Electrical connections can be accessed by removing the service cover. Four cable entries on removable gland support are provided for M 16×1,5 or M 20×1,5 cable glands. Note that in order to maintain the enclosure IP rating, appropriate cable glands must be used.
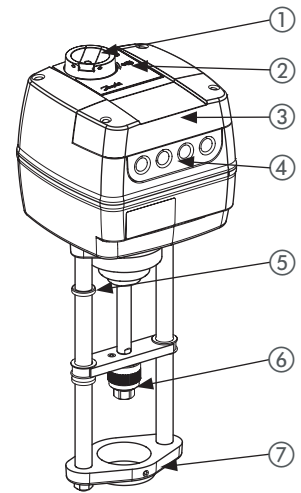• Do not touch anything on the PCB! Do not remove the service cover before the power supply is fully switched off.
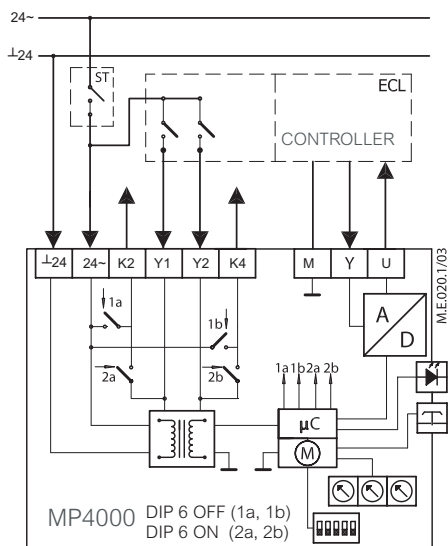
Dimensions (mm)
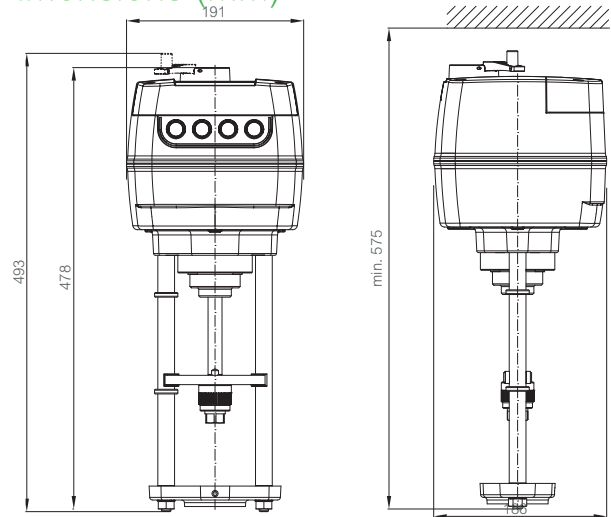
Design

1. Manual operation knob
2. Function buttons
3. Service cover
4. Removable gland support
5. Position indication ring
6. Stem connector
7. Valve connector

• Max. allowed current output on terminals K2 and K4 is 4A.
• Min. power is 3W.
• Recommended cross-sectional area of the wiring is 1.5 mm^2

⊥24	0 V		Power
24~	24 Vac/Vdc		Power supply
K2, K4	24~(AC)		Switch (24~) output -max 4A -min 3W
Y1	24~		Floating Input
Y2			
M	0 V		Neutral
Y	0(2)-10 V		Signal Input
	0(4)-20 mA		
U	0(2)-10 V		Position Feedback
	0(4)-20 mA		

Optional: MP4000 connected as 3-point version
Note: see power consumption
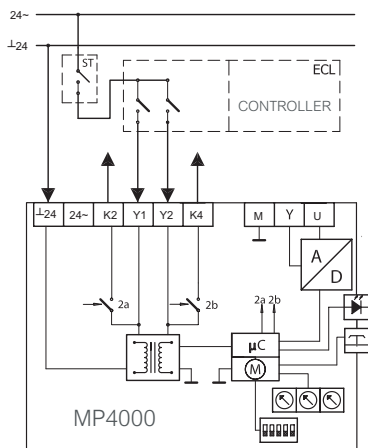
⊥24	0 V		Neutral
Y1, Y2	24 Vac/Vdc		Power /control supply
K2, K4	24~(AC)	Y1 — K5 Y2 — K4	24~ relay output -max 4A -min 3W
Y1	24~	INV / 2 DIR	INV / 2 DIR	Actuator direction under Power/Control input
Y2			

Manual Operation

Mechanical and electrical operation are not allowed to be used at the same time! Mechanical manual operation is permitted only when there is no power supply. Actuator can be manually positioned in Stand-By mode or when there is no power supply (mechanically).
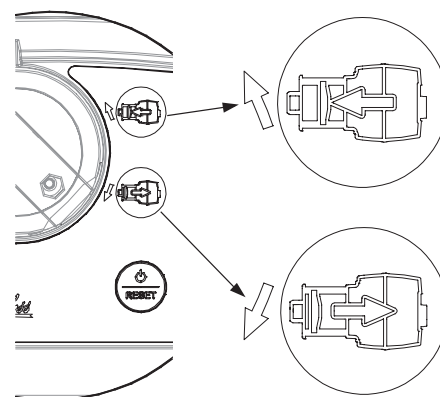
Mechanical Manual Operation

The actuator has a manual operation knob on the top of the housing which enables hand positioning of the actuator stem.

Actuator Operating Modes

LED operating mode indicator: The three-colour (green/yellow/red) LED function indicators are located on the actuator cover. They indicate different operating modes.
• RESET button- Actuator has an external RESET button located on top cover of next to LED indicators. With this button you can enter or exit Stand-By mode (press once) or Self-stroking mode (press and hold for 5 seconds).
  – Stand-By mode - Press the RESET button for 1 sec. to enter Stand-By mode. The actuator stops in current position and stops responding to any control signal. Red light is constantly lit. You can manually operate the actuator with mechanical handle or control buttons. This mode can be very useful during the commissioning of other equipment, or for service purposes. In this mode you can also set positions of the additional switches. To exit Stand-By mode press the RESET button again.

Electrical Manual Operation
The actuator has two buttons on the top of the housing for electrical manual positioning (up or down) if the actuator is in Stand-By mode. First press the RESET button until the actuator goes to Stand-By mode (red LED is lit). By pressing the upper button the stem will be extracted and by pressing the lower button the stem will be retracted.

– Self-stroking mode - Self-stroking mode starts automatically the first time power supply is applied to the actuator. To start Self-stroking procedure press and hold RESET button for 5 seconds until the green light starts flashing. End positions of the valve are automatically set and the actuator goes to stationary mode and starts responding to the control signal.
– Positioning mode - The actuator is operating automatically. The stem is extracting or retracting according to the control signal. When positioning is finished the actuator goes to stationary mode. If a 3-point signal (terminally 1 and 3) and a Y signal are present at the same time, 3-point signal prevails.
– Stationary mode - The actuator is operating without errors.
– Error mode - Working temperature is too high - check the ambient temperature.
– Stroke is too short - check the connection with valve and valve operation, or check if valve is blocked.

LED Signalling

LED	Indication type			Operating mode
Green LED:			Constantly lit	Positioning mode - Actuator is retracting the stem
			Constantly lit	Positioning mode - Actuator is extracting the stem
			Flashing (1 s cycle)	Self-stroking mode - Actuator is retracting the stem
			Flashing (1 s cycle)	Self-stroking mode - Actuator is extracting the stem
Yellow LED:			Constantly lit	Stationary mode - Actuator has reached upper end position (retracted stem)
			Constantly lit	Stationary mode - Actuator has reached bottom end position (extracted stem)
			Flashing	Stationary mode - Single blink when Y signal is presents and double blinks when Y signal is not connected)
Red LED:			Constantly lit	Stand-By mode
			Flashing	Error Mode
Red/ Yellow LED			Flashing (1 s cycle)	Set up stroke limitation (retracted stem)
			Flashing (1 s cycle)	Set up stroke limitation (extracted stem)
Dark	No indication			No power supply

DIP Switch Settings

The actuator has a selection of DIP switches (Fig. 1) under the service cover.

- **SW1: FAST/SLOW – Speed selection**
  - OFF position: FAST; 3 s/mm
  - ON position: SLOW; 6 s/mm
- **SW2: DIR/INV – Direct or inverse acting (Fig. 2):**
  - OFF position: DIR position; the actuator is direct acting to input signal.
  - ON position: INV position; the actuator is inverse acting to control signal.
- **SW3: 2-10 V / 0-10 V – Input/output**
  - OFF position: 2-10 V position; the input signal is in the range from 2-10 V (voltage input) or from 4-20 mA (current input)
  - ON position: 0-10 V position; the input signal is in the range from 0-10 V (voltage input) or from 0-20 mA (current input).
  - Signal range sets Y and X signal.
- **SW4: LIN/EQ% – Flow curve adaptation (Fig. 3):**
  - OFF position: LIN; Linear correlation between Y signal and stem position
  - ON position: EQ%; modified correlation between Y signal and stem position for EQ flow in the valve. Degree of modification depends on setting of potentiometer CM but normally set at max position.
  - Enables changing flow characteristic linear to logarithmic and works in all combinations of DIP switch settings. switch settings.
- **SW5: 100%/95% – Stroke limitation:**
  - OFF position: Set new maximum retracted position of the actuator
  - ON position: Set new minimum extracted position of the actuator.
- **SW6: C/P – Output signal mode (Fig. 4.):**
  - An output signal is present on terminal K2 when the position of the actuator is equal to or lower than the S4 set point. An output signal is present on terminal K4 when the position of the actuator is equal to or higher than the S5 set point.
  - OFF position: C, provides a constant output signal on terminals K2 or K4, regardless of the input signal.
  - ON position: P, provides a pulse signal through parallel or cascade electrical wiring input Y1 and Y2 dependents from the controller to output terminals K2 and K4.
- **SW7: Smart function :**
  - OFF position; the actuator does not try to detect oscillations in the system
  - ON position; actuator enables special anti-oscillation algorithm – see section on anti-oscillation algorithm
- **SW8: V/mA –Input signal type :**
  - OFF position: V; input signal Y is set to voltage (V)
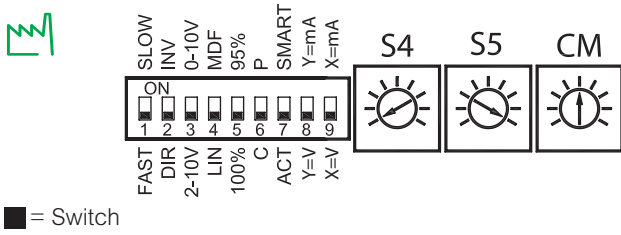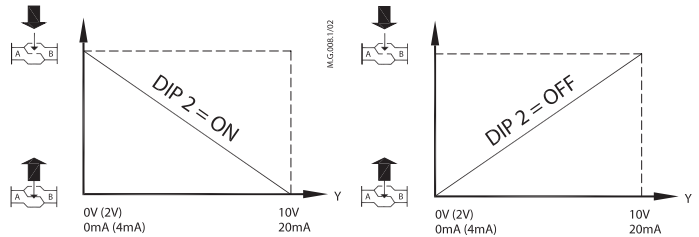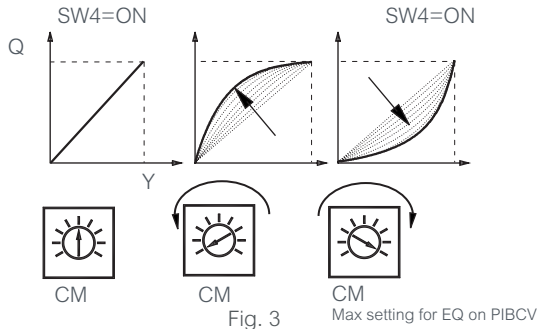 - ON position: mA; input signal Y is set to current (mA)

Fig. 1

= Switch

Fig. 2
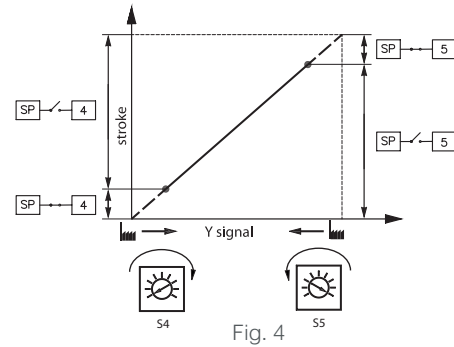

Fig. 3
Max setting for EQ on PIBCV

Fig. 4

NOTE: Y detection is disabled if SW8 is set to ON positions and SW3 is set to OFF position.

- **SW9: V/mA –Output signal type:**
  – OFF position: V; output signal X is set to voltage (V)
  – ON position: mA; output signal X is set to current (mA)

Anti-Oscillation Algorithm

(SW 7 in position ON)

The actuator has a special anti-oscillation algorithm. Should the control signal Y on certain point oscillate (Fig. 5) - looking from time perspective- the algorithm starts to lower the amplification of the output to the valve. Instead of having static characteristics the actuator changes to dynamic characteristics. Once the control signal no longer oscillates, output to the valve slowly returns to static characteristics.
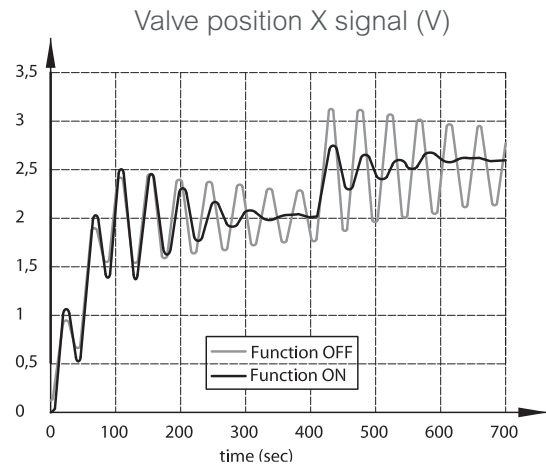
Oscillation

(Fig. 6) Harmonic oscillations are high frequency oscillations with low amplitude that vary around its own equilibrium value and not around set-point temperature. They can appear in up to 70 % of control time, even though the system is properly commissioned. Harmonic oscillations have negative influence on control stability, and can influence the lifetime of the valve and actuator.

Smoothening Function

The smoothening function reduces harmonic oscillations; consequently room temperature is closer to the set-point (desired) temperature. Smoother operation of the MCV increases lifetime of the valve and actuator and saves energy and reduces costs in general.
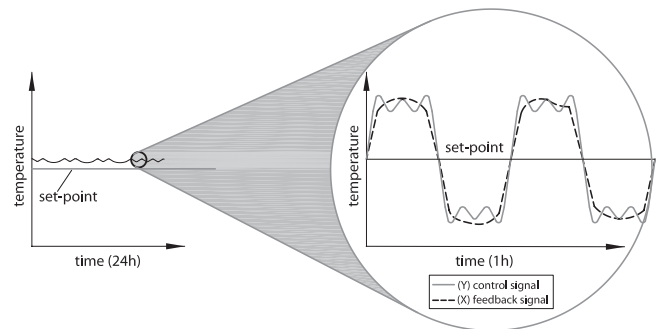
Valve position X signal (V)

Fig. 5

Fig. 6

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