Valve Actuators

MVH56E/MVHE3K

CE

MODEL	FORCE [N]	POWER SUPPLY	DESCRIPTION
MVH56E	1500	24Vac/dc	Modulating/floating
MVHE3K	3000	24Vac/dc	Modulating/floating

APPLICATION AND USE

MVH56E and MVHE3K are flexible electro-mechanical actuators for the control of two-way and three-way globe valves in:

• heating and cooling systems;
• Air Handling Units;
• district heating plants;
• industrial temperature control systems.

MVH56E and MVH3K can be controlled either by a proportional (modulating) signal or by an increase/decrease (floating) signal.
It is easy to mount and connect the actuators. Direct mounting is possible to any CONTROLLI flanged valve as well as for valves of other manufacturers (contact our Technical Dept.). The actuators have a fine resolution (500 steps on the full stroke range) for exacting fluid control and they are able to self-calibrate on a different stroke without the need of any user action (this function is selectable on the field via DIP switch).
MVH56E and MVH3K have intelligent behavior and alarm functionality in case of unexpected operation, feedback of alarms to the user is provided by two LEDs (GREEN and RED) on the control board.
N.B.: Do not use the actuator if not coupled with its relating valve.

OPERATION

The actuators translate the control signal (modulating or 3 point floating) from the controller into a valve position. A modern brushless DC motor in the actuator drive a gear train and a worm gear – screw jack mechanism convert the motor revolutions into accurate and repeatable linear movements.

Control Signal

MVH56Ex can be controlled by two main control types.
• 3 point floating ;
• Modulating (or proportional) signal with filed selectable range (e.g., 0-10Vdc, 2-10Vdc, 0-5/2-6Vdc, 5-10/6-10Vdc e 4-20mA.)

Feedback Signal

The actuator utilizes a 2-10V position feedback (look at DIP n. 1 settings).

Calibration

MVH56E and MVHE3K are endowed with an automatic stroke calibration function, but they can be calibrated also manually via DIP n. 7. In factory delivery the auto stroke calibration is enabled; manual calibration is not necessary unless maintenance is required on the valve or certain alarm functions are desired.

Manual Override

The manual control can be activated only after disconnecting power supply. To use the manual override, it is necessary to push and hold down the knob; turn clockwise to move the valve stem downwards and counter clockwise to move it upwards (see the picture). Be careful not to force the manual override when the actuator stroke end is reached.
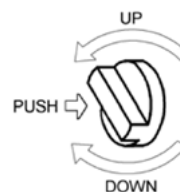
## MANUFACTURING CHARACTERISTICS

The actuator consists in a die-cast aluminium housing, which includes the mounting bracket for connection to valve body.
Reduction gears supported by ball bearings. Movement is transmitted to a rack-and-pinion mechanism connected to the valve stem through a suitable joint.
Internal electronic card with easily accessible terminals for electrical connections.

End Point Auxiliary Switches (accessory DMVE)

End point switches change over when the valve is fully open or closed. They are free contacts with 24Vac max voltage on terminals. End point switches can be utilized to indicate valve stroke end positions and for relay control of additional plant equipment.
When the actuators are controlled individually or in sequence, it is possible to use the end switches to toggle when the valve is fully open or fully closed. The auxiliary switch position according to control signal (Y) is shown in the table below.

Control signal (Y)	Relay KC1	Relay KC2
0-0,5Vdc	KC1 to K2	KC2 to K3
0,5-9,5Vdc	KC1 to K1	KC2 to K3
9,5-10Vdc	KC1 to K1	KC2 to K4
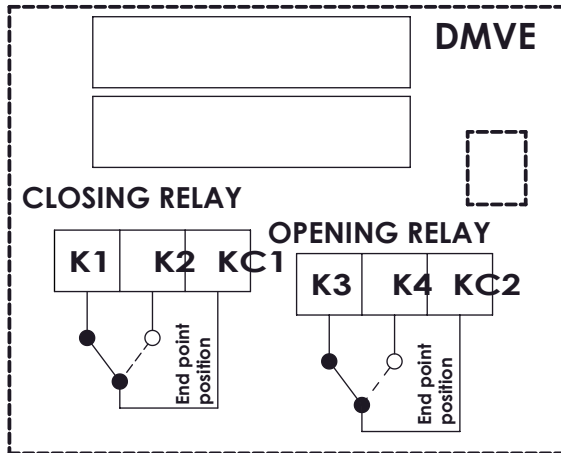
Diagnostic

The actuator is provided with a self diagnostic algorithm able to detect faulty conditions:

- stroke out of range 5-60 mm;
- unexpected stall condition (e.g., valve stuck);
- missing expected stall condition(e.g., link loose);
- voltage supply out of range.

These faulty conditions are signalled via the GREEN and RED LED on the electronic board blinking accordingly (see "Diagnostic – Alarm Function Table").

TECHNICAL CHARACTERISTICS

	MVH56E	MVHE3K
Supply voltage L1 Ln	AC: 24Vac ±20% 50-60Hz DC:22-30Vdc (Reference Ln)	
Power consumption	12VA/5.2W	17VA/8.5W
Modulating 5-15mm	15s	
Modulating 15-25mm	25s	
Modulating 25-40mm	35s	
Modulating 40-60mm	50s	
Floating	60s	
Transformer Size [VA]	50	60
Stroke	5-60mm	
Force [N]	1500	3000
Duty cycle	max 50%/60 minutes	
Analogue input Y M	Voltage 0-10V - impedance > 100kΩ (range: 0-10 2-10 0-5/2-6 5-10/6-10) 500Ω (range 4-20mA)	
Digital inputs Y1-Y2	Connection to L1 or Ln when powered in AC Connection to Ln only when powered in DC	
Output V+	Voltage 16Vdc ± 0,5V	
	Max Load 25mA,	
Output U	Voltage 2-10Vdc (0-100%)	
	Max Load 2mA	
Cable glandes	plastic punchable, replaceable by PG13,5 compression glands	
Type of movement	linear	
Ambient temperature	Operation and storage -10/+50°C	
Ambient Humidity	max 90% RH	
Protection degree	IP55 DIN40050 (IEC 529) for highly polluted environments according to IEC 730-1 (93)/6,5,3	
Insulation class	◇III◇	
Standard	Emission/Immunity EMC 2004/108/ CE according to EN 61326-1:2006 standard	
Weight [kg]	4	
Dimensions [mm]	Refer to the picture on page x	

ASSEMBLING

The actuator can be mounted in the positions shown picture below:

YES   NO
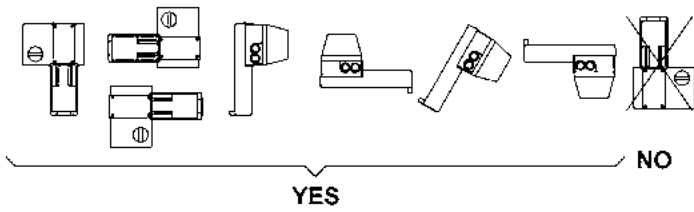
It is advisable to use the motorized valve with MVHT spacer, in order to reduce the actuator working temperature in case of fluids at high temperatures (approximately > 120° C) in the valve body. For fluids over 160 °C avoid mounting the actuator in vertical position on the valve so as to avoid the direct exposure to heat sources.
For further information look at mounting instructions (MVH56E-MVHE3K_DIM263).

MAINTENANCE

The actuator is maintenance-free.

ACCESSORIES

DMVE   Endpoint Auxiliary Switches
248   Yoke Heater (Suggested when the fluid temperature is below 0°C)
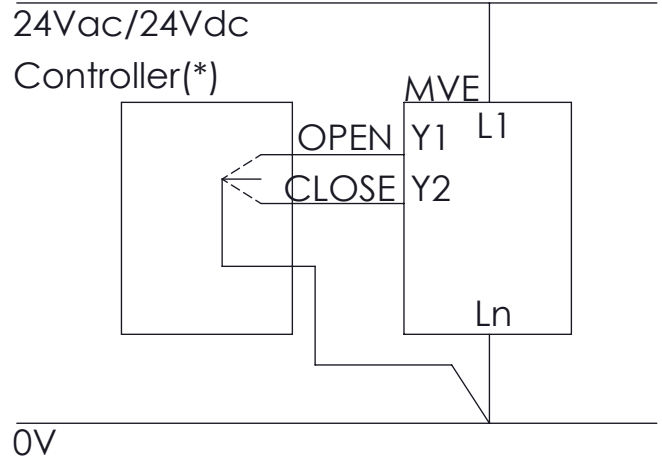**GMVH**   Insulation shell for MVH actuators

ELECTRIC CONNECTIONS

Carry out the electrical connections by removing the cover, in compliance with the rules in force.
The actuator is equipped with a 8 poles removable terminal block; the each pole of the plug is clearly marked and the same label are reported on the electric board. Before powering up the actuator make sure the plug is properly connected to the board and the label on the plugs and on the board match.
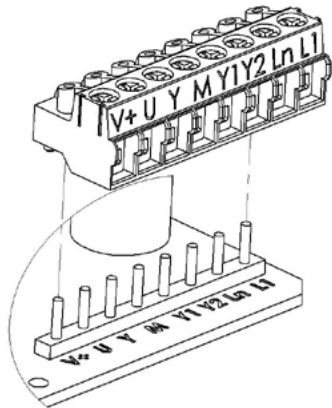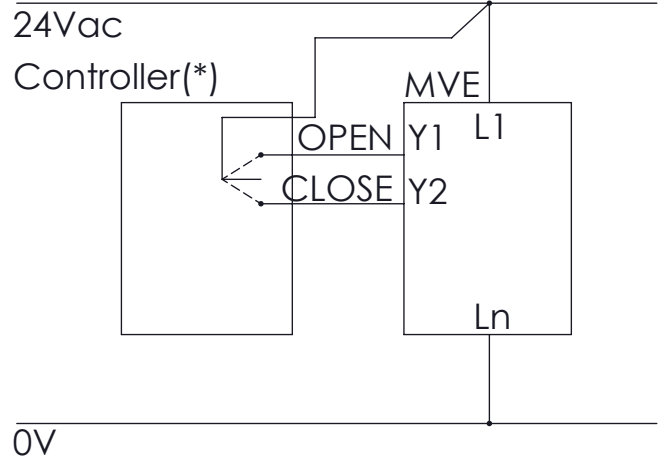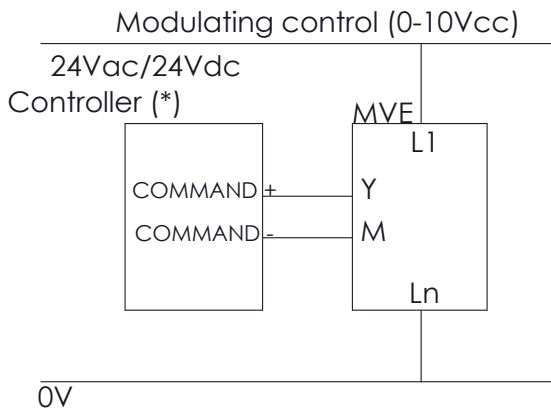

Label	Description	Function	Cable type	Max wire Length
L1	24Vac/dc	Power Supply	AWG 16 (min 1mm² - max 1.5mm²)	75m
Ln	0V			
Y	0-10Vdc	Modulating Control Input	AWG 20 (min 0,5mm² - max 1.5mm²)	200m
M	0V (Common)			
Y1	Open	Floating Control Input	AWG 20 (min 0,5mm² - max 1.5mm²)	200m
Y2	Close			
V+	16 Vdc	Voltage Output max 25mA	AWG 20 (min 0,5mm² - max 1.5mm²)	200m
M	0V (Common)			
U	2-10Vdc	Feedback Output Signal	AWG 20 (min 0,5mm² - max 1.5mm²)	200m
M	0V (Common)			

3-point floating control (sink connection)

24Vac/24Vdc Controller(*)

MVE
OPEN Y1 L1
CLOSE Y2

Ln

0V

3-point floating control (source connection)

24Vac Controller(*)

MVE
OPEN Y1 L1
CLOSE Y2

Ln

0V

Modulating control (0-10Vcc)

24Vac/24Vdc Controller (*)

MVE
- L1
- COMMAND + → Y
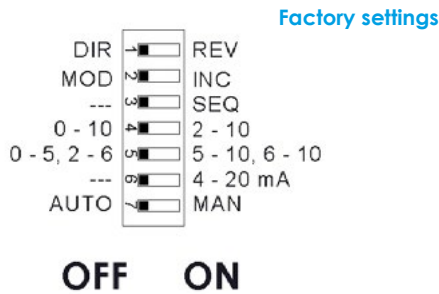- COMMAND - → M
- Ln

0V
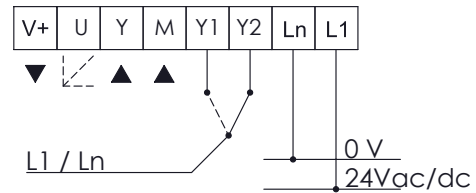
N.B: M and Ln signal are internally connected.

(*) MVH56E and MVHE3K actuators contain a half-wave rectifier power supply. They must not be powered with transformers that are used to power other devices using not isolated full-wave rectifier power supply.

TERMINAL BLOCK

| V+ | U | Y | M | Y1 | Y2 | Ln | L1 |

▼ ▲ ▲

L1 / Ln   0 V
24Vac/dc

Matching between MVH56E and MVHE3K terminal block and other Controlli actuators

G	G0	MX	G1	X1	VH	VC	Y	MVH56F
G	G0	MX	G1	X1	VH	VC	Y	MVH3K
L1	LN	M	V+	Y	Y1	Y2	U	MVH56E/MVHE3K

DIP SWITCHES SETTINGS

Set the DIP switches according to the tables here below. Power down and power up again the actuator or act on the manual operation handle to be sure that settings will be recognized.
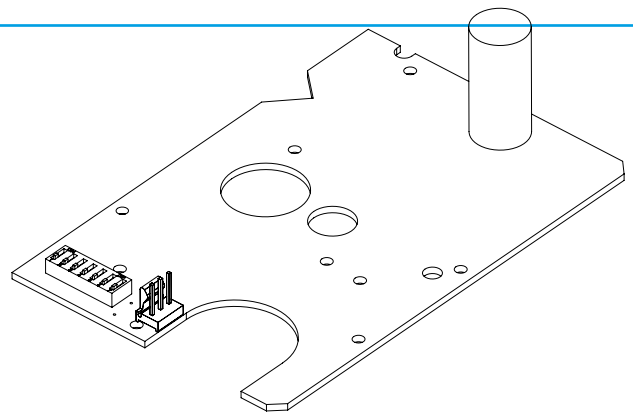
Factory settings

	OFF	ON
DIR		REV
MOD	2	INC
---	3	SEQ
0 - 10	4	2 - 10
0 - 5, 2 - 6	5	5 - 10, 6 - 10
---	6	4 - 20 mA
AUTO	7	MAN

OFF   ON

DIP switch	OFF	ON
1	Direct Action U= feedback U = 2V U = 10V	Reverse Action U= feedback U=10V U = 2V
2	Modulating Control (MOD) (Input between Y [+] and M [-])	3 point floating (INC) (Y1 open-extend , Y2 close-retract connected L1 or Ln if powered in Vac; if powered in Vdc connected necessarily to Ln) Y1 Y2
3	-	Selection of sequence mode, control range defined by SW 5
4	Modulating Control 0-10Vdc (DIP n. 2 OFF only)	Modulating Control 2-10Vdc (DIP n. 2 OFF only)
5	Sequence Control 0-5Vdc with DIP n. 4 OFF only Sequence Control 2-6Vdc with DIP n. 4 ON only (DIP n. 3 ON only)	Sequence Control 5-10Vdc with DIP n. 4 OFF only Sequence Control 6-10Vdc with DIP n. 4 ON only (DIP n. 3 ON only)
6	Voltage Input Signal (input between Y [+] and M [-])	Current Input Signal 4-20mA (input between Y [+] and M [-]). In this case DIP n. 4 must be set to ON.
7	Automatic Calibration: the actuator updates the stroke range every time an unexpected mechanical stop is detected for at least 10s	Manual Calibration: the actuator calibration is started moving the DIP from OFF to ON; if the DIP is left in ON the actuator will never update the calibrated stroke value even when an unexpected endpoint is detected

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N°	LED behaviour	Error	Actuator use	Actuator Behaviour		Typical trouble shooting condition	Reset procedure
				Automatic Calibration DIP N. 7 OFF	Manual Calibration DIP N. 7 ON		
1	RED ON	valve stroke less than 5mm	Calibration/ first installation	The actuator pushes/pulls 5 times (unexpected stall) trying to remove the possible obstacle. After 5 tries an alarm is signalled (RED LED ON) and the actuator moves to initial position and does not respond to control signal. Stroke value is not updated because out of range	The actuator pushes/ pulls 2 times against endpoint during calibration. Alarm is signalled (RED LED ON) and the actuator moves to the initial position and then it does not respond to the control signal	Valve with a stroke length lower than 5mm	Remove power and power up again
2	RED ON	Stroke longer than 60mm	Calibration/ first installation	The actuator exits the 60 mm stroke range and it moves toward the new stroke limit signalling an anomaly (RED LED ON). The actuator does not calibrate the stroke	The actuator pushes/ pulls 2 times against endpoint during calibration. Alarm is signalled (RED LED ON) and the actuator moves to the initial position and then it does not respond to the control signal	Valve with a stroke length longer than 60mm	Remove power and power up again
3	RED Quick Blinking + GREEN ON	Unexpected stall within the calibrated stroke range	normal operation	The actuator tries 5 times against the new stall condition and then after 10s the actuator updates the new stroke length; During these 10s RED LED is ON	The actuator tries 5 times against the new stall condition. At the end of the attempts the fault will be signalled (RED LED ON). The actuator does not update the new stroke length, but after 60s makes other attempts to verify the stall condition	Valve stuck	Inverted control signal
4	RED Quick Blinking + GREEN ON	Stroke longer than expected	normal operation	The actuator moves toward the new stall condition with a lower speed; after 10s the actuator updates the new stroke value; During these 10s RED LED is ON	The actuator moves toward the new stall condition with a lower speed; after 10s the actuator does not update the new stroke value	stem connection loose or valve damaged	Inverted control signal
5	RED slow Blinking	Low Power Voltage	normal operation	The actuator is still working but performance cannot be guaranteed	The actuator is still working but performance cannot be guaranteed	1. Wrong transformer size / 2. Unstable power	Correct Voltage Power
6	RED slow Blinking	High Power Voltage	normal operation	The actuator is still working but performance cannot be guaranteed	The actuator is still working but performance cannot be guaranteed	1. Wrong transformer size / 2. Unstable power	Correct Voltage Power

STANDARD LEDs BEHAVIOUR

N°	LED	ACTUATOR STATUS
1	GREEN ON	The actuator arrived at the extreme point of the stroke read
2	GREEN BLINKING	The actuator arrived at the intermediate point of the stroke read
3	RED GREEN BLINKING	The actuator is reading the stroke or it is going to initial position
4	RED GREEN ON	Manual control ON, the actuator ignores the control signal. ATTENTION! The electronic board is electrically supplied

DIMENSIONS [mm]