OEM Motoric Valve Drive: 24 V Modbus RTU

The OEM Motoric Valve Drive: 24 V Modbus RTU is an electromotive actuator of valves for heating and cooling systems. The predominant area of application is the energy-efficient control of water-bearing valves in the area of building services and automation.

The OEM Motoric Valve Drive: 24 V Modbus RTU is controlled via a Modbus RTU protocol. The actuator is equipped with an LC display for displaying the current valve path and direction of travel (open / close) as well as possible error codes. The actuator is supplied with a pluggable connecting cable and has a manual valve adjustment which can be used, for example, for maintenance or installation.

The actuator has been specially developed for the customer-specific use in OEM businesses. The modular structure offers diverse differentiation possibilities for customer-specific designs.

1.1 Features

- OEM design
- Operating voltage 24 V, suitable for AC and DC
- Control via Modbus RTU protocol via RS485
- Equipped with NFC chip and therefore configurable via smartphone app (IOS or Android) (chapter 3)
- Valve path 8.5 mm (2 mm to 8.5 mm fixed, adjustable, or variable by valve path recognition)
- Actuating force 100 N, 125 N, 150 N or 200 N
- Speeds: 15 s/mm or 30 s/mm
- Sensor system for automatic shutdown of the motor when reaching the valve end positions (valve path recognition)
- LC display for status indication
- Very fine resolution in valve positioning
- Very short response times
- Self-locking gear in all positions, de-energized
- Anti-theft function by removable locking latch
- Manual valve adjustment
- Very low power consumption
- Valve adapter system Simple plug-in installation without tools
- 100 % protection in case of leaky valves (IP 54)
- 360° installation position
- Plug-in connecting cable
- Low-noise and maintenance-free
- High functional safety and long expected service life
- Control input suitable for 0 – 10 V and pulse width modulation (PWM)
- Optional: preset, customer-specific variants

1.2 Variants

In its basic version, the OEM Motoric Valve Drive: 24 V Modbus RTU is delivered without logo, with plugged connection cable. The following variants are available in the basic version.

Type	Operating voltage	Stroke	Actuation force	Actuation time	Scope of supply
MPM 46846-10	24 V AC/DC	Max. 8.5 mm	100 N 125 N 150 N 200 N	15 s/mm 30 s/mm	• OEM Motoric Valve Drive: 24 V Modbus RTU in individual packaging • 1 m connection line (plug-in), white PVC 4 x 0.22 mm² • Installation instruction in 12 languages

1.3 Optional differentiations to the basic version

Differentiations		
Line lengths	standard	2 m, PVC in white – 3 or 4 x 0.22 mm² – special lengths < 20 m, pluggable on request
	non-halogen	1 m, 2 m, Hal F LiYY 3 or 4 x 0,22 mm² / white Compliance with fire protection and environmental regulations.
Valve adapters		Available for almost all valves and distributors
Packaging		Packaging can be manufactured and printed individually according to requirements.
Imprint on casing		Imprint of the company logo and the individual type designation

Please contact us if you have further wishes.

1.4 Equipment

The OEM Motoric Valve Drive: 24 V Modbus RTU is supplied fully equipped as standard. Functional adjustments to the actuator can be made at the factory or via the app. The simulation of predecessor variants is possible, use the enclosed 4-pole cable for this.
Customized preset versions are available, which differ functionally:

	MPM 468x5
LCD	✓
Background illumination	**Switchable**
Function display via LED	✓
Valve path recognition	✓
Manual setting	✓
NFC interface	✓
4-pole connection cable	✓

1.5 Valve adaptation

The OEM Motoric Valve Drive: 24 V Modbus RTU can be easily connected to different valves. These adapters cover a valve path of 8 mm each, measured from the minimum locking dimension.

Valve adapters	Minimum locking dimension with OMVD 6	Valve manufacturer
VA 80 – M30 x 1.5	8.5 mm	Danfoss ABQM, Flowcon, Frese, Herz, Honeywell, IVAR, JCI, Oventrop, Sauter, Siemens, TA, Watts
VA 33 – M28 x 1.5	8 mm	Herz, JCI
VA 64 – M28 x 1.5	15.8 mm	Pettinaroli
VA 67 – M30 x 1.5	11 mm	Controlli

2 App functionality

The OEM Motoric Valve Drive: 24 V Modbus RTU is equipped with an NFC chip (NFC: Near Field Communication).

App compatibility:
iOS 14.0 / Android 5.0
Language used in the app: English

Download:

iOS: https://apps.apple.com/de/app/motoric-drive/id1658744553

Android: https://play.google.com/store/apps/details?id=de.moehlenhoff.AM3

2.1 NFC operations

2.1.1 Preconditions for the use of NFC:

- Knowledge of the existence and position of the NFC interface in the mobile device: The position of the NFC interface varies depending on the model.
- Activated **NFC** function, deactivated display lock

Remove protective covers before using NFC. Ensure a stable support in order to avoid disconnections. The distance required to establish an NFC connection depends on the mobile device used.
Further information on model-specific processes can be found in the instructions of the respective manufacturer.

2.1.2 Sequence

1. Establish connection between the app and the OEM Motoric Valve Drive 24: Modbus RTU.
   To do this, position the device on which the app is installed directly on the transparent lid of the OEM Motoric Valve Drive: 24 V Modbus RTU. The NFC antenna is located in the manual adjustment area.
2. Allow the device on which the app is installed to stay until a positive response is received from the app.
   Note: Operation is possible even without power supply of the OEM Motoric Valve Drive: 24 V Modbus RTU.
3. Adjust the parameters within the specified limits.

Some functions require re-initialization of the OEM Motoric Valve Drive: 24 V Modbus RTU. The app is self-explanatory. It is recommended to follow the instructions of the app.

3 Presetting

The OEM Motoric Valve Drive: 24 V Modbus RTU can be delivered with a custom setting. The properties can be changed subsequently via app, see the following section.

Function	Default	Optional
Actuation force	125 N	100 N | 150 N | 200 N
Running time	15 s/mm	30 s/mm
Valve path recognition	ON	OFF
Stroke	8.5 mm	2 mm ... 8.4 mm (in steps of 0.1 mm)
Bypass, minimum valve position	0 %	10 % ... 50 % (in steps of 10 %)
Valve curve	Linear	EQP
Valve path display	%	mm
Modbus address	1	2 – 247
Parity	Even	None | Odd **None** set 2 Stop-Bits on master **Even** +1 Stop-Bit **Odd** +1 Stop-Bit
Baud rate	19.200	4.800 | 9.600

App functions

Function	Description	Display
Device Operations		
Read		
Read from device	Reading out the settings of the OEM Motoric Valve Drive: 24 V Modbus RTU	- Ready to scan: **Hold your smartphone near to the NFC tag** - Display: **Data was read successfully** or **Error message** → Repeat the process: The mobile device has been moved too early or must be aligned more precisely.
Read from file	**Prerequisite for use:** File stored on the mobile device. - Reading the settings from a file stored on the mobile device Ways to store a file on the mobile device: - Sending files as attachments via message or mail - Storage of file by **Write to file** command	Display of the file management of the mobile device
Write		
Write to device	Settings are written to the OEM Motoric Valve Drive: 24 V Modbus RTU	- Ready to scan: **Hold your smartphone near to the NFC tag** - Display: **Data was read successfully** or **Error message** → Repeat the process: The mobile device has been moved too early or must be aligned more precisely.
Write to file	Scanned settings are stored as a file in the memory of the mobile device.	Display of the file management of the mobile device

	The file can be used for - the dispatch by message or mail - the setup of further OEM Motoric Valve Drive: 24 V Modbus RTU	
Verify		
Verify device	Comparison of the settings displayed in the **Settings** menu and the settings in the OEM Motoric Valve Drive: 24 V Modbus RTU	- Ready to scan: **Hold your smartphone near to the NFC tag** - Display: **Data was read successfully** or **Error message** → Repeat the process: The mobile device has been moved too early or must be aligned more precisely. - The result: **Validation successful**: identical settings or **Verification failed**: different settings
Active operations		
Start initialization	Initialization of the OEM Motoric Valve Drive: 24 V Modbus RTU The actuator travels along the actuator path and the valve path. The opening and closing point of the valve are stored.	**Your device will now begin with the initialization process.**
Go to position	Setting the actuator position	Sequence 1. **Go to position** 2. **Confirm** 3. Ready to scan: **Hold your smartphone near to the NFC tag.** 4. **Your Device will now go to the specified position.** or **Error message** → Repeat the process: The mobile device has been moved too early or must be aligned more precisely.
Factory reset	Adjusts the parameters of the OEM Motoric Valve Drive: 24 V Modbus RTU to the delivery state.	Sequence 1. Warning message 2. Scan process
Settings		
Force	Setting the force in the levels: 100 N, 125 N, 150 N, 200 N	
Runtime	15 s/mm, 30 s/mm	
Valve path recognition (VPR)	ON | OFF	
Display illumination	ON | OFF	Turns the LCD backlight on or off.
Drive path	2-8.5 mm²	Limitation of the actuator path when the VPR is switched off. Use as a “limiter”.
Bypass	0 ... 50 %	Limitation of the actuator travel in the other direction. **Application** Ensure minimum flow to protect against frost. **Note:** Both the rubber diaphragm in the valve and the backlash in the adapter and the gear unit can influence the position. Please check the position!
Valve position	mm | %	Sets the preferred display on the LC display.
Baud rate	4.800 | 9.600 | 19.200	Setting the interface Adoption of changes after restarting the OEM Motoric Valve Drive: 24 V Modbus RTU.
Parity	None | Even | Odd	**None** if necessary, set 2 stop bits at the master **Even** +1 stop bit **Odd** +1 stop bit Adoption of changes after restarting the OEM Motoric Valve Drive: 24 V Modbus RTU.

Address	1 … 247	Setting the Modbus address Adoption of changes after restarting the OEM Motoric Valve Drive: 24 V Modbus RTU.

Notes
All modifications must only be carried out with the appropriate expertise. Incorrect settings can lead to malfunctions of the actuator, malfunctions of the control system and consequential costs. The manufacturer does not accept any responsibility for incorrect settings and their consequences.
Adoption of changes after restarting the OEM Motoric Valve Drive: 24 V Modbus RTU.

4 Functions

The OEM Motoric Valve Drive: 24 V Modbus RTU is equipped with a stepper motor, a microcontroller and a gearing mechanism.

4.1 Commissioning

Only use the device in perfect condition. The manufacturer is not liable for other uses or modifications. Commissioning should be carried out with a valve. The actuator recognizes when it is operated without a valve and travels the maximum mechanical distance.

Note
The spindle of the actuator must be retracted for subsequent installation on a valve. Failure to do so may result in damage to the actuator. The actuator must be disconnected from the power supply during installation.

4.2 Modbus addresses

Default address: 01
Change of address: - via app
- from the master via Register-Access
Adoption of changes after restarting the OEM Motoric Valve Drive: 24 V Modbus RTU.

Notes
To avoid malfunctions, an address must be set in advance if several OEM Motoric Valve Drive: 24 V Modbus RTU are connected. An address may only be assigned ONCE in the Modbus RTU system. In the RS-485 system, the first and last device must be terminated after the power supply. Additional 120 Ohm resistors must be taken into account in the wiring.

4.3 Modbus setting

Default settings of the OEM Motoric Valve Drive: 24 V Modbus RTU
Address 1
Interface: 19,200 baud
Parity None: 2 stop bits
Opt.: Parity Even / Odd: 1 stop bit

Setting the address / interface via
- NFC
- Modbus

Once the address, baud rate and termination have been set, the OEM Motoric Valve Drive: 24 V Modbus RTU can be put into operation via Modbus.

4.4 Modbus register

The Modbus register functionality can be used to change settings and control the actuator; customized settings are available.

The OEM Motoric Valve Drive: 24 V Modbus RTU works with the following function codes (commands (co)):
0x03 (R) Read Holding Register in single / multiple mode
0x10 (W) Write Registers in single / multiple mode

These function codes can be used to write or read individual registers or 255 registers in one command.
The Modbus protocol used is compliant with the guidelines from: https://Modbus.org/specs.php

4.5 Modbus register structure

Default values of a standard article, customer-specific settings on request

Register	Register address	Default	Command	Function
				Block 1 (device data)
1-20	0x1000 - 0x1013			NOP
21	0x1014		R	Firmware version
22	0x1015			NOP
				Block 2 (command data)
1	0x1100			NOP
2	0x1101	0	R/W	Command parameters, e. g. 0...1,000‰ for command 3 (MoveToPosition)
3	0x1102	0	R/W	Command 1 = Factory Default Command 2 = ReInit Command 3 = MoveToPosition
				Block 3 (status data)
1	0x1200			NOP
2	0x1201		R	Current position, 0...1,000‰ 0 to 1,000, 0x0000 to 0x03E8 No valid data during reset and when actuator is in initial mode
3	0x1202		R	Last Error 0 = No error 7 = Stall 8 = Low motor current 9 = Max Move Reached
4	0x1203		R	Temperature actuator inside, in steps of 0.01 °C, Complement of 2 e. g.: -2 °C = 0xFF38
5	0x1204		R	Measured valve stroke in mm in steps of 0.01 mm
6	0x1205		R	Measured actuator stroke in mm in steps of 0.01 mm
				Block 4 (settings)
1-18	0x2000- 0x2011			NOP
19	0x2012	1	R/W	Valve path recognition: 0 = off 1 = on
20-21	0x2013- 0x2014			NOP
22	0x2015	15	R/W	Speed 15 or 30 (s/mm) Interim values are not accepted.
23	0x2016	125	R/W	Force 100 N 125 N 150 N 200 N Interim values are not accepted.
24	0x2017	0	R/W	LCD backlight 0 = off 1 = on
25	0x2018	1	R/W	Display percentage 1 = % 0 = mm
26	0x2019			NOP
27	0x201A	1	R/W	Modbus address 1...247
28	0x201B	3	R/W	Baud rate: 0 = 4,800 1 = 9,600 2 = 19,200
29	0x201C	0	R/W	Modbus: Parity 0 = None 1 = Even 2 = Odd
30	0x201E	85	R/W	200 – 850 (2.00 mm – 8.50 mm)

The register bank is divided into blocks. Simultaneous reading of several registers with one command is only possible within a block.

- NOP = No operation
  No valid data is available. The registers are read only.
- No acceptance of intermediate values in the functions **Speed**, **Force**

Example: **Approach position**

Registers 2 (0x1101) and **3** (0x1102) are required to approaching to a position. It should be noted that a position is first written in **2** (0x1101) and then the command for execution with **3** (0x1102) must be carried out with the value 3.

Both registers can be written to with a command:

The master transmits (all values in HEX number format): [RTU] > Tx > 01 10 11 01 00 02 04 01 F4 00 03 F2 3C

Modbus address	command	Register	Sum of 16 bit bytes	Sum of 8 bit bytes	Position in %	Command for device	Check sum
01	10	11 01	00 02	4	01 F4 (dec: 50.0%)	00 03	F2 3C

The actuator responds successfully: [RTU] > Rx 01 10 11 01 00 02 15 34

4.6 Initialization

After switching on the power supply, the OEM Motoric Valve Drive: 24 V Modbus RTU performs an initialization. During the initialization phase, the actuator determines the travel distance. Indication in the display: "In" (for initialization).

Sequence

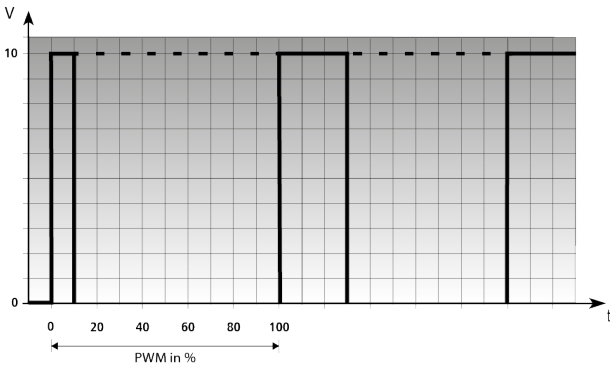
1. The valve pressure plate retracts completely.
   The inner end stop of the actuator is determined.
2. The valve pressure plate extends.
   The valve open position (NO valve) is determined when the plunger is touched. The end of the valve path is reached when the actuator has come to a standstill
3. Valve path recognition is complete.
   The actuator positions the valve according to the register content.
4. Calculation of the actuating position to be approached from the set register value, set valve path, determined plunger contact or measured path.
   Precise approach to the adjustment position.

Notes
For an initialization phase, the OEM Motoric Valve Drive requires: 24 V Modbus RTU max. 7 min.
During initialization, the actuator does not respond to positioning control commands.

The mechanical backlash in the gearing mechanism and between the actuator and valve adapter is recognized as valve path. This backlash affects the position display. The control bandwidth is minimally reduced. The display shows a valve path that is approx. 1 mm longer than the actual valve path.

4.7 Operation

The control of the OEM Motoric Valve Drive 6: 24 V Proportional Failsafe is done via a 0 – 10 VDC control signal from a room thermostat or a building management system. The control signal allows a precise activation and positioning of the actuator. Alternatively, a PWM signal can be applied to the control voltage input, see diagram:



Pulse width frequency 100 Hz to 1000 Hz

After initialization, the applied control voltage is converted proportionally into a setting position. The actuator calculates the setting position to be approached from the control voltage, the set valve path or the measured travel (depending on the mode) and approaches it precisely.

Note
1. For poppet valves with a soft rubber seal, the compression of the rubber seal is detected as the valve path.
2. The following diagrams only apply when the appropriate valve adapter ring is used:

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Museumstraße 54a
38229 Salzgitter

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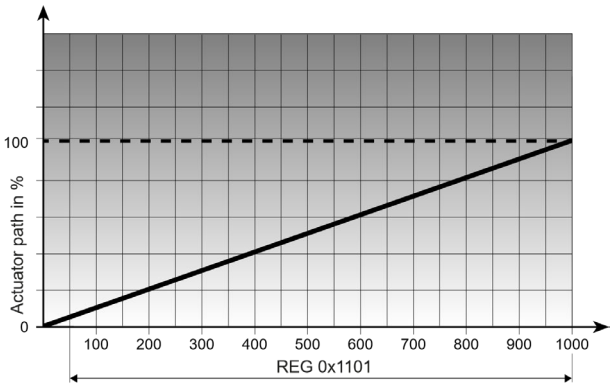
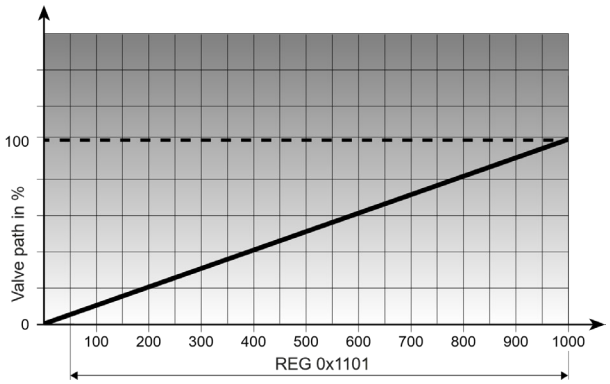
kontakt@moehlenhoff.de
www.moehlenhoff.de

Möhlenhoff

Functional diagram
without valve path recognition, fixed valve path



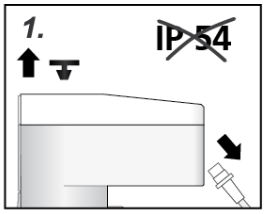
Functional diagram
with valve path recognition



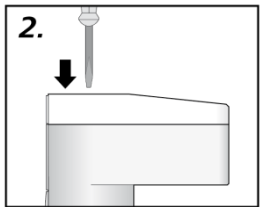
Note
The mechanical backlash between the actuator and the valve adapter, as well as backlash in the gear unit of the actuator, are detected as valve path. This has an effect on the position display and the control bandwidth is minimally reduced. Deviating from the actual valve lift, an approx. 1 mm higher valve path is shown in the display.

4.8 Manual valve adjustment

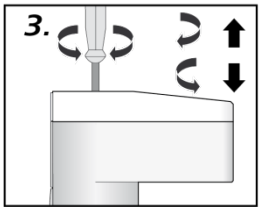
The manual valve setting allows to bring the valve pressure plate of the actuator in de-energised status to the desired position. This facilitates e. g. maintenance and installation.



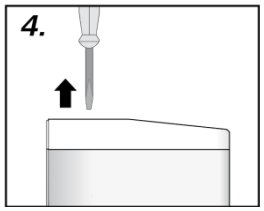
Remove the protective plug and the connection line, or switch off the voltage supply.



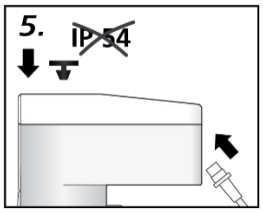
Insert a screwdriver (e. g. voltage tester with blade size 3.5 = 3.5 x 0.5 mm or similar) into the manual valve adjustment opening.



When turning to the right, the valve pressure plate is retracted; turning to the left extracts it.
Note: Turn the screwdriver back by a quarter turn when the stop is reached.

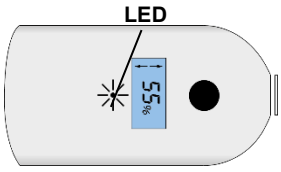


Remove the screwdriver after reaching the desired position.



Install the protective plug and connect the connection line.

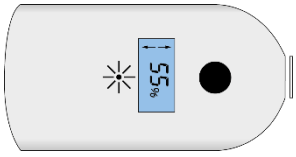
4.9 Function display via LED



For function signaling in Proportional (MPx) mode, the OEM Motoric Valve Drive: 24 V Modbus RTU uses the signal colors green and red.

- Green flashing = initialization
- Continuous red light = fault

4.10 LC display



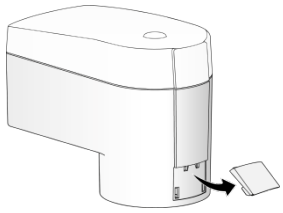
The LC display of the OEM Motoric Valve Drive: 24 V Modbus RTU shows the control position. In case of a control requirement, the current driving direction is shown in the LC display by means of an arrow. In case of an error, the corresponding error code is shown and the error is indicated by a steadily lighted LED.

4.11 Error codes

Queued errors are indicated by an error code. The subsequent table explains the different error codes and error corrections.

Error code	Meaning	Description	Error correction
0	No error	This is no error	
7	Stall	Blockage during initialization run at non-permitted position	1. Disconnect actuator from voltage supply 2. Move the actuator shaft with the manual adjuster out of the end position 3. Re-initialization after switching on the voltage supply again In case of repeated occurrence of the fault, the customer service must be consulted.
8	Low motor current	Motor current too low	1. Re-initialization by switching the actuator off and on again If the fault cannot be rectified automatically after a maximum of three attempts, contact the customer service.
9	Max move reached	Driving too long in one direction	1. Re-initialization by switching the actuator off and on again If the fault cannot be rectified automatically after a maximum of three attempts, contact the customer service.

4.12 Anti-theft device



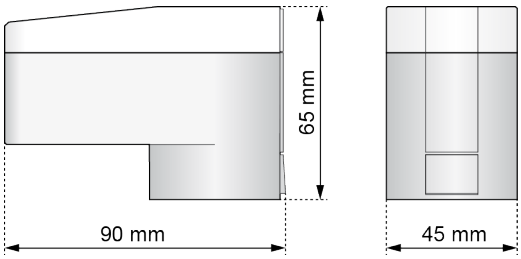
The OEM Motoric Valve Drive: 24 V Modbus RTU can be protected against unauthorized access by a simple removal of the locking latch.

5 Technical data

Type		MPM 46846
Operating voltage		24 VAC, -10 %... +20 %, 50-60 Hz 24 VDC, -20 %... +20 %
Operating power		2.0 VA/ 1.0 W
Max. power consumption		<110 mA
Standby power consumption		<10 mA
Stroke	Standard	Max. 8.5 mm (preset)
	adjustable	2 mm to 8.5 mm
Actuation force	Standard	Preset 125 N -20/+20%
	depending on variant	100, 150, 200 N -20/+20%
Actuation time	Standard	15 s/mm (preset)
	depending on variant	30 s/mm
Load on RS-485 bus		1/8 unit load
LCD (H × W)		10 × 20 mm, with adjustable blue backlighting
LED		Multicolour LED
Fluid temperature		0 °C to +100 °C
Storage temperature		-20 °C to +70 °C
Ambient temperature		0 °C to +50 °C
Degree of protection		IP 54 [1)]
Protection class		III
CE conformity according to		EN 60730
Casing	Material	Polyamide
	Color	Signal white (RAL 9003)
Casing cover	Material	(polycarbonate)
	Color	transparent
Cable	Type	4 x 0.22 mm² PVC
	Color	white
	Length	1 m
Dimensions (H × W × D)		65 × 45 × 90 mm
Weight with connection cable (1 m)		155 g
Surge strength according to EN 60730-1		1 kV

1) in all installation positions

5.1 Dimensions

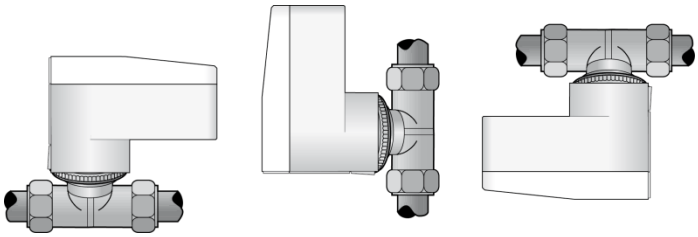


5.2 Certificates

The OEM Motoric Valve Drive: 24 V Modbus RTU has NRTL approval from TÜV Süd.

6 Installation notes

6.1 Installation position



vertical horizontal “overhead”

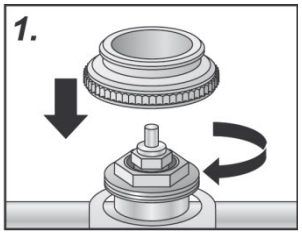
The OEM Motoric Valve Drive: 24 V Modbus RTU can be operated in every installation position.

6.2 Installation with valve adapter

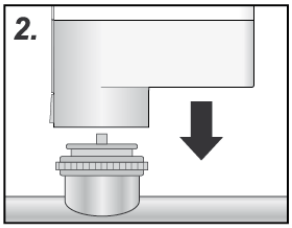
ATTENTION!
Installation with extracted valve pressure plate leads to actuator damage.

- Only install the actuator with completely retracted valve pressure plate.
- Retract an extracted valve pressure plate with the manual valve setting, or electrically.

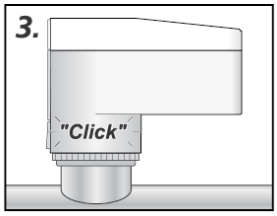
The OEM Motoric Valve Drive: 24 V Modbus RTU is installed to the valve with a valve adapter. An extensive range of valve adapters ensures perfect mechanical adaptation of the actuator to almost all valves on the market.
The OEM Motoric Valve Drive: 24 V Modbus RTU is simply plugged onto the valve adapter previously installed manually. The fact that the valve pressure plate is retracted in factory, allows for easy installation.



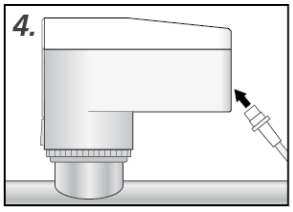
Screw the valve adapter manually onto the valve.



Position the OEM Actuator manually in vertical position to the valve adapter.

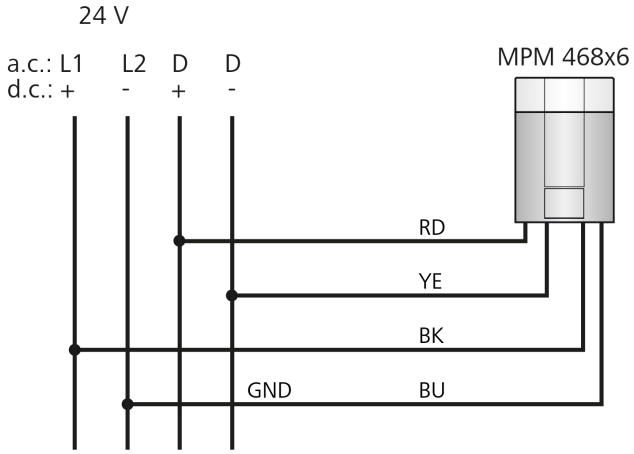


Simply latch the OEM Actuator to the valve adapter manually by applying vertical pressure; a clicking sound can be heard.



Connect the connection line to the OEM Actuator.

6.3 Electrical connection 24 VAC/DC L1 (+) L2 (-)



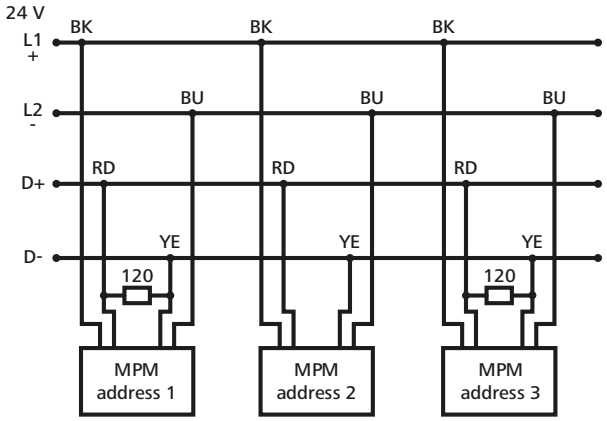
Connection line
We recommend the following maximum cable lengths for installing a 24 V system:

Cable	Section / diameter	Length
Standard DDC line	0.22 mm²	20 m
J-Y(ST)Y	0.8 mm	45 m
NYM / NYIF	1.5 mm²	136 m

Transformer/power supply unit:
A safety isolating transformer according to EN 61558-2-6 or a switching power supply according to EN 61558-2-16 must always be used.

The dimensioning of the transformer or the switching power supply results from the maximum making capacity of the OEM Actuators.

MPM- Modbus



Function	Description
BK	24 VAC / +24 VDC
BU	Ground
RD	Modbus D+ / RS485-A
YE	Modbus D- / RS485-B