

EMO TM



Actuators

High performance proportional actuator

Engineering
GREAT Solutions

EMO TM

A proportional thermoelectric actuator which, when used together with the TBV-CM, TBV-CMP, provides superbly accurate modulating control and a high enclosure class. Used together with thermostatic radiator valves it provides a more accurate room temperature control than On/Off control. A long life is ensured by the unique design. The position indicator is visible from all sides which allows easy maintenance procedures. A high adjusting force further enhances reliability.



Key features

- > **Automatic adaptation to actual valve stroke**
For optimum control characteristics.
- > **High adjusting force and long stroke**
For reliable and versatile operations.
- > **Adaptation to control voltage according to wiring**
Only one model for all common control voltages.
- > **Position indicator visible from all sides**
For straightforward maintenance.

Technical description

Applications:

For modulating control

Supply voltage:

24V AC +25% / -20%
Frequency 50-60 Hz

Power consumption:

Starting ≤ 7 W
During operation ≤ 3 W
Starting current ≤ 250 mA
Stand-by-/Sleep mode current $\leq 25/2$ mA

Control voltage:

Adaptation to control voltage according to wiring
0-10 V / 10-0 V DC
2-10 V / 10-2 V DC
 $R_i = 100$ k Ω

Control speed:

30 s/mm

Adjusting force:

125 N

Temperature:

Max. ambient temperature: 50°C
Min. ambient temperature: -5°C
Max. medium temperature: 120°C
Storage temperature: -25°C to +70°C

Enclosure class:

IP 54 at any position.

Protection class:

II, EN 60730

Certification:

CE, EN 60730-2-14

Cable:

Cable length: 1 m, 2 m or 5 m. 10 m cable length on request.
Connection cable: 4 x 0,25 mm²
The cable is stripped 100 mm and each wire is stripped 8 mm.

Stroke:

4,7 mm
Visible due to position indicator. With valve stroke adaptation.

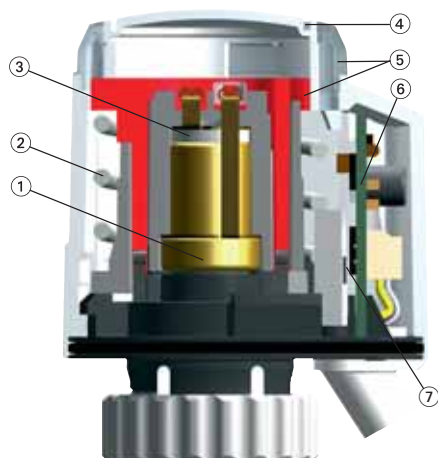
Connection to valve:

Retainer nut M30x1,5 of nickle plated brass.

Body:

Shock-resistant PC/ABS, white RAL 9016.

Construction



1. Expansion system
2. Spring
3. PTC heating element
4. Groove to take up "color clips" or specially printed "partner clips"
5. Position indicator
6. Electronic board
7. Sensor system for automatic valve stroke detection

Application

The EMO TM thermal actuator can be installed in temperature and/or timerelated proportional control systems in, for example:

Heating installations

For floor, ceil, and radiator heating systems for individual room temperature control or group control in:

- Apartments, conference rooms, storage rooms, schools, etc.
- For mixing control, mass flow control, etc.

Ventilation installations

For room temperature control, e.g. controlling the flow of hot water through the air heaters.

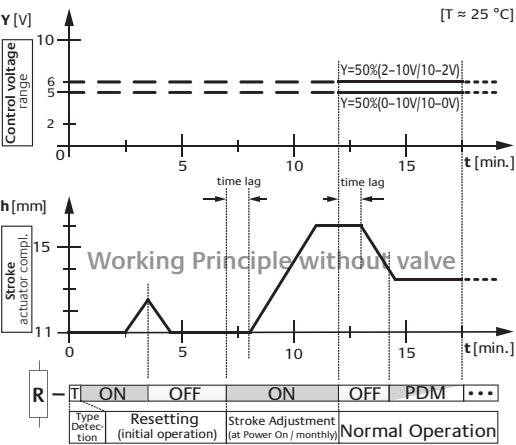
Air conditioning systems

For room temperature control, e.g. regulating the flow of cold water from fan-coil units, ceil cooling systems, etc.

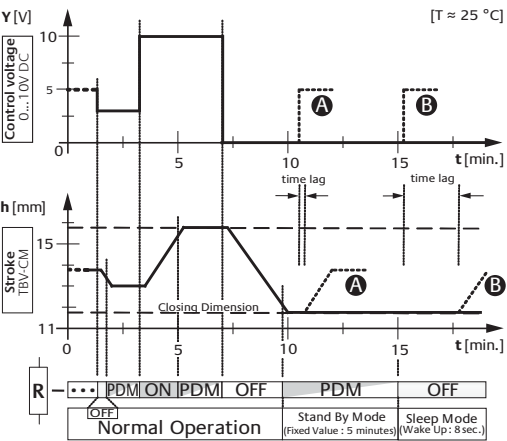
Even with strict requirements for precision or with process controlled systems with high severity, optimal results can be achieved, e.g. broadly branched networks for centralized control and control systems in the area of building automation.

Function

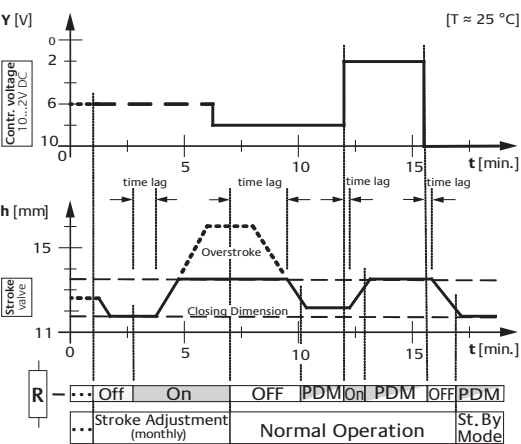
1. Function principle during commissioning
Process for simplified display without valve



2. Function principle with TBV-CMP valve



3. Function principle with Standard thermostatic valve body



Automatic type detection

If the control voltage cables are connected according to the necessary type 0 – 10 V, 10 – 0 V, 2 – 10 V, 10 – 2 V (see connection diagram), the EMO TM automatically detects the requested function when the power supply is switched on (Power On) to the controller and actuator (Fig. 1).

Automatic stroke adjustment

During initial operation, the EMO TM starts a brief mechanical reset of the valve by heating (R ON) the expansion system (Fig. 1). Following a cooling phase (R OFF), the expansion system of the actuator is reheated and following a time lag, an even opening process occurs. The entire stroke of the actuator is traversed and the stroke position of the valve is detected in the closed position (closing dimension) and the fully open position. This allows the valve stroke to be described with a high resolution. The control voltage from the controller is assigned to the effective valve stroke in a linear relationship (Fig. 1, 3). Stroke adjustment prevents an overstroke of the EMO TM. This reduces the time lag to a minimum and optimises the control characteristics (Fig. 3).

In order to permanently guarantee the correct relationship between control voltage and valve stroke, valve stroke adjustment is automatically repeated every month (Fig. 3).

Normal operation

In normal operation, the EMO TM adjusts the valve stroke to the control voltage of the controller in the correct relationship. The relevant intermediate positions of the valve stroke are precisely controlled by switching the heating of the expansion system on and off (R PDM, Fig. 2, 3).

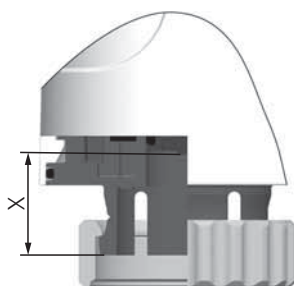
Stand-by mode

When the actuator is in the closing dimension for all control voltages, “stand-by mode” starts for five minutes. In this mode, the expansion system is kept at a low-energy but responsive operating temperature, so that it can react to a new request from the controller with a minimal time lag (Fig. 2, see A).

Sleep mode

This mode starts when stand-by mode ends. The expansion system is not heated. The EMO TM starts normal operation after the time lag, no later than eight seconds after a control voltage is supplied by the controller (Fig. 2, see B).

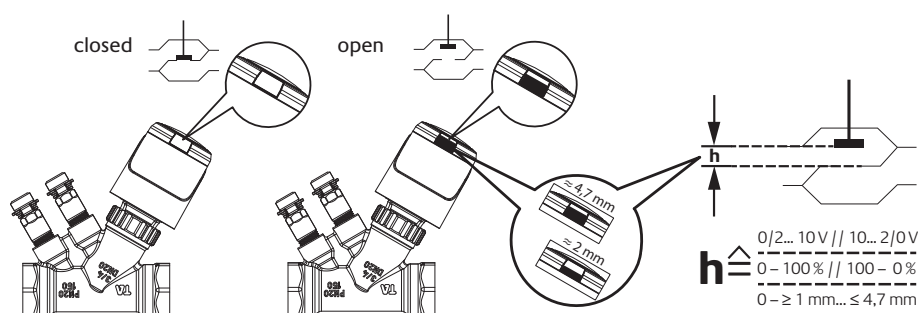
Working range



EMO TM is designed to suit all IMI TA/IMI Heimeier valves and floor heating manifolds with M30x1,5 connection to actuator.

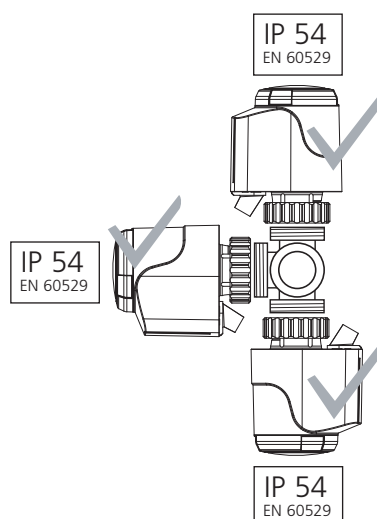
The actuator has a working range corresponding to $X = 11,10 - 15,80$ mm.

Automatic valve stroke detection and indication

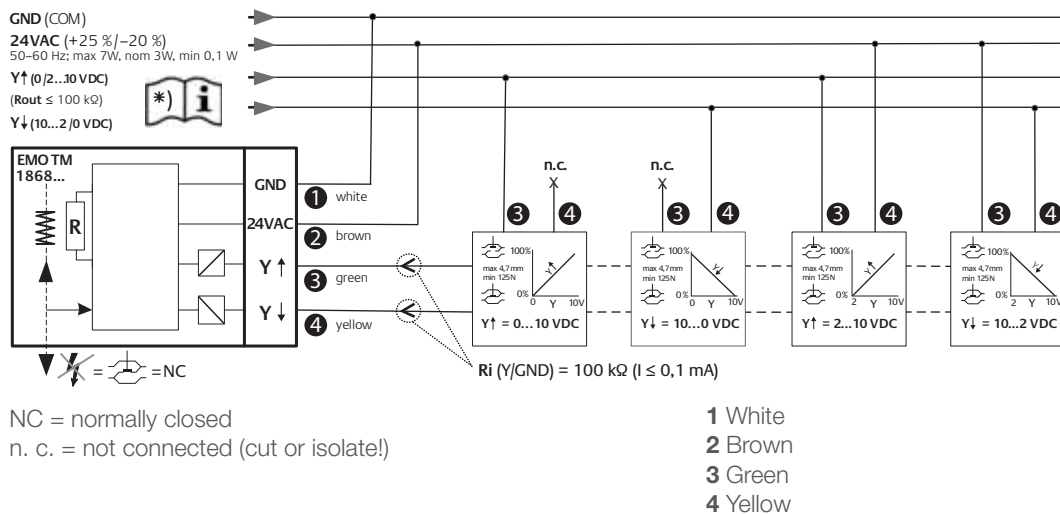


Installation

Enclosure class:



Connection diagram



Connection table

Control voltage	GND (COM) white 1	24 V AC brown 2	Y↑ green 3	Y↓ yellow 4
0 - 10 V	X	X	X	— / n. c.
10 - 0 V	X	X	— / n. c.	X
2 - 10 V	X	X	X	24 V AC
10 - 2 V	X	X	24 V AC	X

Planning notes

Controller compatibility *)

Proportional controllers used in conjunction with EMO TM must have a (voltage) output of 0/2 V - 10 DC or 10V - 2/0 V and must come with internal burden resistance, i.e. Thermostat E1 / 1960-01.500.

For controllers without internal burden resistance (i.e. some room controllers, DDC stations and push-pull output stages) an external resistor (output to GND) is needed. Take into account the max. controller output current I_{out} . Resistance_(typ.) at I_{out} 2 mA = 5,6 kΩ / >2 mA = 3,3 kΩ; type 0,25 W.

24 V protective low voltage

With the required protective low voltage (SELV based on DIN VDE 0100) a safety isolating transformer in compliance with EN 61558 must be used.

Length of cable

In order to maintain the declared opening times for the actuators, the voltage loss (depending on length of cable and cross section) in the operating phase on the supply lines to the actuators may not exceed 4%.

24 V transformer dimensioning

For operation with 24 V low voltage, a transformer is required which is in compliance with EN 60335 and possesses sufficient capacity.

For dimensioning transformer performance, the value for the starting phase needs to be taken into account. The same applies to the layout of switching contacts of room temperature controllers.

Minimum transformer power delivery results from: the sum of the take-up of the 24 V EMO TM (in the starting phase) in addition to the sum of the take-up capacities of Thermostat E1.

Calculation example

2 ea. Thermostat E1 24 V (art. no. 1960-01.500) at 2.5 VA each = 5 VA

6 ea. EMO TM 24 V (art. no. 1868-0X.500) at 7 VA each = 42 VA

Total of take-up = 47 VA

(= minimum transformer power delivery)

Selected transformer = 50 VA

For general dimensioning with copper lines, use the following standard formula:

$$L_{max.} = I / n$$

L max.: max. length of cable in [m] (see "Connection diagram")

I: table value in [m]

n: number of actuators

Line: Type/name	Cross section: A [mm ²]	I 24 V [m]	Note: Application; comparison
LiY/twin flexible rod	0,34	38	corresponds to ø 0.6 mm
Y(R)/bell wire	0,50	56	model Y(R) 2 x 0.8
H03VVF/PVC mains cable	0,75	84	not to be concealed under plaster
NYM/house wiring cable	1,50	168	also for NYIF 1.5 mm ²
NYIF/flat webbed house wire	2,50	280	also for NYM 2.5 mm ²

Calculation example

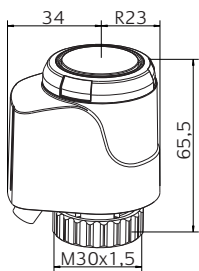
Goal:
max. length of cable L max.

Value in table I = 168 m
Number of actuators n = 4

Given:
Voltage U = 24 V
Conductor cross section A = 2 x 1.5 mm²

Solution:
I max. = I / n = 168 m / 4 = 42 m

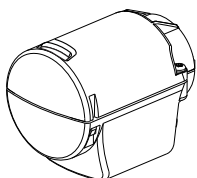
Articles



24V AC

Cable length	EAN	Article No
EMO TM NC (normally closed)		
1 m	4024052837618	1868-00.500
2 m	4024052837717	1868-01.500
5 m	4024052837816	1868-02.500

Accessories

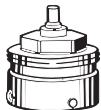


Protective cover for EMO T and EMO TM

For high strain applications (e.g. public buildings, schools, kindergartens, etc) and as theft protection.

With M12x1,5 thread for protective conduit fitting. Delivery without conduit and fitting.

	EAN	Article No
White RAL 9016	4024052930111	1833-40.500



Connecting to other brands

Adapter for mounting the EMO T/EMO TM on valve bodies of other manufacturers. Threads M30x1.5 factory standard.

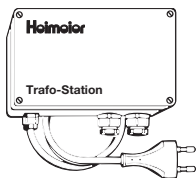
Manufacturer	EAN	Article No
Danfoss RA	4024052297016	9702-24.700
Danfoss RAV	4024052300112	9800-24.700
Danfoss RAVL	4024052295913	9700-24.700
Vaillant (Ø≈30 mm)	4024052296019	9700-27.700
TA (M28x1,5)	4024052336418	9701-28.700
Herz	4024052296316	9700-30.700
Markaryd	4024052296514	9700-41.700
Comap	4024052296712	9700-55.700
Oventrop (M30x1,0)	4024052428519	9700-10.700
Giacomini	4024052429714	9700-33.700
Ista	4024052511419	9700-36.700
Rotex	4024052429615	9700-32.700
Uponor (Velta) - Euro-/compact distributor or return valve 17	4024052448111	9700-34.700
Uponor (Velta) - Provatio distributor	4024052510917	9701-34.700



Connecting to radiators with integrated valves

Adapter for mounting the EMO T/EMO TM with M30x1.5 connection on thermostatic insert for **Series 2 or Series 3** clamping joint. M30x1.5 threading, factory standard.

Model	EAN	Article No
Series 2	4024052297214	9703-24.700
Series 3	4024052313518	9704-24.700

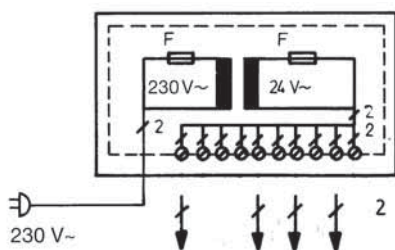


Transformer station

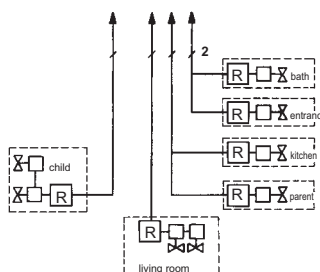
The transformer station is a 24V/ max. 60VA low-voltage transformer in accordance with EN 60335 in a protective insulation and a shock-proof plastic body. It is used as a power supply for actuators and room temperature controllers. The transformer station is protected at the output and line ends by standard finewire fuses.

EAN	Article No
4024052139613	1600-00.000

Connection diagram



Application example



[R] = Room thermostat

Technical data – Transformer station

Operating voltage:	230 V AC (+ 6% / -15%); 50/60 Hz; 60 VA
Output voltage:	24 V AC (+ 25%/-10%); 50 / 60 Hz
Power output (in continuous operation):	max. 56 VA
Output connections:	max. 10 actuators and 10 room temperature controllers (see connection diagram/application example)
Length of cable Ø:	max. values see "Planning notes"
Type of protection:	IP 22 based on EN 60529 (depending on installation requirements)
Safety class:	II, EN 60335
Body, -color:	ABS (shock-proof), light grey based on RAL 7035
Power supply connection:	plug-in device; 1 m; 2 x 0.75 mm² with European plug
Connector terminal (clamping area):	max. 2.5 mm²
CE certification (EMV/NS):	EN 55014-1, EN 55014-2 / EN 60335-1
Ambient temperature (in operation):	0°C – 60°C (32°F – 140°F)
Mounting:	Mounted to wall; cable fed from below
Dimensions (w x h x d):	200 mm x 120 mm x 90 mm