Heating actuator, FM
Type: 6164 U-500

The heating actuator is a flush-mounted device.

It is connected to the bus via two connection cables with a bus connecting terminal.

The device is used to control heating systems and cooling ceilings via thermoelectric valve drives.

The heating actuator has an output with a noiseless electronic relay. The output can control up to 5 thermoelectric valve drives or resistive loads up to a maximum of 1 A.

In addition, there are two inputs available for floating contacts. It is possible for example to connect window contacts or conventional push buttons/switches to them. The scanning voltage is provided by the device.

Technical data

Power supply	– EIB	24 V DC, via the bus line
Outputs	– Switching voltage	24 V AC … 230 V AC max. 5 thermoelectric valve drives or max. 1 A resistive load
Inputs	– 2 isolated inputs	for floating contacts
Connections	– Fixed connection cables	on 10 mm stripped, tin-plated ends
	– Inputs	3 x 1 mm² cables; E1 (white) and E2 (grey) as well as GND (black); max. cable length 10 m
	– EIB	via bus connecting terminal
	– Output	2 x 0.56 mm² cables (brown), 200 mm long
Operating and display elements	– LED and push button	for assigning the physical address
Type of protection	– IP 20, EN 60 529	
Ambient temperature range	– Operation	-25 °C … 60 °C
Design	– Flush-mounted device	
Dimensions	– 53 x 52 x 24 mm (H x W x D)	
Weight	– 0.08 kg	
Certification	– EIB-certified	
CE norm	– in accordance with the EMC guideline and the low voltage guideline	

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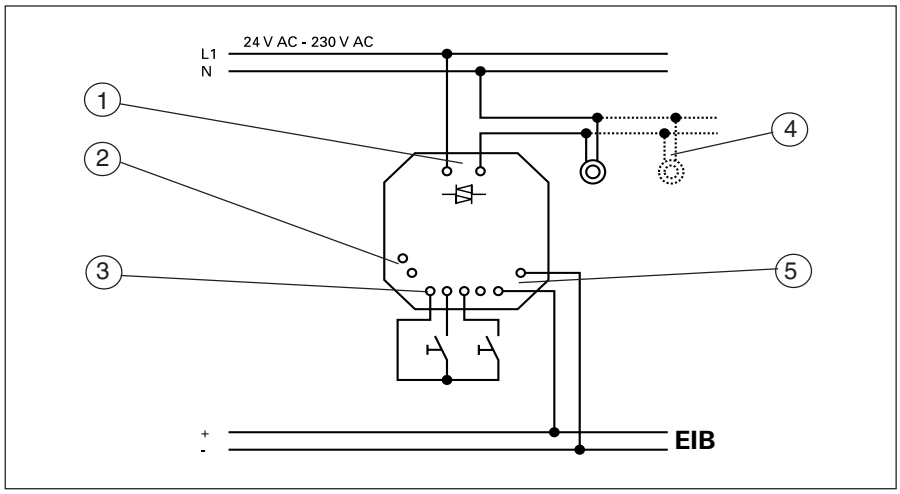
Application programs	Number of communication objects	Max. number of group addresses	Max. number of associations
Heat Switch Edge Shutter Dim Value/1	11	37	36

Circuit diagram



1 Output
2 Programming button / LED
3 Isolated inputs
4 Thermoelectric valve drives (max. 5)
5 Bus connecting terminal

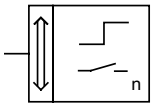
Note

The device can be installed in cable trunking with two combined wall and joint boxes (due to the isolation of the low voltage and 230 V side).

In a flush-mounted installation, a deep twin box or an electronic box (e.g. from Kaiser) can be used.

Only plug-in (screwless) box terminals may be used for the connection.

Heat Switch Edge Shutter Dim Value/1



Selection in ETS2

– ABB
  └Input
    └Binary input, 2-fold

The heating actuator consists of one output and two inputs which are completely independent of the output.

In the basic configuration, the communication object “Output / Switching” is available for the output while the objects “Input ... / Telegr. switch” are available for each input.

If all the functions are used, there are 11 objects altogether: 4 for the inputs and 7 for the output.

Heat

If the output parameter “Function of output” is set to “Heating actuator”, the ETS2 program displays specific parameters for this operation mode.

Electrothermal valve drives can be controlled with the heating actuator. Using the parameter “Connected valve type”, the actuator is adapted to the characteristic of the valve drive - “de-energized closed” or “de-energized opened”.

If the output of the heating actuator is not to be modified for a week, it is opened for a set period and then closed again. This function prevents the heating valves from becoming furred up during the summer. This period is set in the parameter “Flushing 1x a week”. This function can also be switched off with the setting “inactive”.

The current status of the output can be sent via the communication object “Output / Telegr. status”. This function can be used for example for visualisation. It is then displayed whether the installation is currently being heated or cooled. The status is sent if the parameter “Status of output” is set to “yes”. In this case, the status object is actively switched and sends a “1” if the valve is open and a “0” if the valve is closed. Please note that it is the status of the valve that is displayed and not the object status of the output. If the valve is only opened by 1%, it is classed as being open.

The heating actuator can be regulated via two-step or PWM control with 1 bit control outputs. It can also be controlled via a continuous 1 byte control output. The parameter “Control of heating actuator” is set to “1 bit...” or “1 byte...”, depending on type of control system used.

If continuous control is used to regulate the room temperature, the parameter must be set to “1 byte...”. The additional parameter “Cyclic time of the switching control output” appears if this setting is selected. The cyclic time of the closing and opening operations of the output is set in this parameter. The reason for cyclical switching is due to the fact that the heating actuator converts the 1 byte control output into an equivalent pulse width modulation. This means for example that with a control output of 66% and a cyclic time of 15 minutes, the output opens for 10 minutes and closes for 5 minutes.

When setting the cyclic time, it should be noted that the setting of 1 minute is intended for test purposes only. Even a thermoelectric valve drive that opens relatively quickly requires approx. 2 minutes for a complete opening and closing operation.

The 1 byte control function is required if the room thermostat is only able to send continuous control output variables or a continous control output is required for other functions (such as central inlet temperature control). Otherwise, 1 bit control should be used.

Forced position

When the heating actuator function is selected, it is possible to activate a forced position. The parameter “Forced position” must be set to “yes”. The forced position serves to move the heating actuator to a specific position should certain events occur e.g. when a window is opened or there is a dew-point alarm.

If the forced position is activated, there are three “Output / Forced position” objects available. These objects are linked internally with an OR function. This means that the forced position is carried out as soon as at least one object has the value “1”.

The parameter “Valve at forced position” indicates the opening of the valve when the forced position is active. The value “0%” means that the valve is completely closed while the value “100%” means that the valve is completely open. If an intermediate value is selected, it is implemented with a pulse width modulation in the same way as for continuous (1 byte) control. The cyclic time of this modulation is fixed at 15 minutes for a 1 bit control output . If the actuator is controlled continuously, then the cyclic time is used that was selected on the “Output” parameter page. In general, it is advisable to move the actuator to a defined position (0% or 100%).

Fault alarm

If the parameter “Fault alarm is activated” is set to “yes”, there is a further communication object “Output / Telegr. fault alarm” available. A fault occurs with the heating actuator if it does not receive any telegrams within a certain period. Possible reasons are for example that the relevant room thermostat has failed or that telegrams used in a function across different lines no longer pass the coupler. In this case, the actuator sends a telegram with the value “1” to its communication object “Output / Telegr. fault alarm”.

As the actuator expects to receive a telegram within a certain period, the room thermostat must be assigned parameters for cyclical sending. It should be ensured that the cyclic time selected for the room thermostat is shorter than the monitoring time of the heating actuator. The monitoring time of the actuator is set with the parameter “Monitoring time”.

The valve also has a preset position in the event of a fault. This position is set with the parameter “Valve at fault alarm”. The value “0%” means that the valve is completely closed and the value “100%” means that the valve is fully open. If an intermediate value is set, this is implemented with a pulse width modulation in the same way as for continuous (1 byte) control. The cyclic time of this modulation is fixed at 15 minutes for a 1 bit control output. If the actuator is controlled continuously, then the cyclic time is used that was selected on the “Output” parameter page. In general, it is also advisable in this case to move the actuator to a defined position (0% or 100%).

By default, the fault alarm is sent every 10 minutes. This can be changed using the parameters “Send fault alarm cyclically” and “Cyclical sending”. In addition, there is the possibility of sending the value of the “Telegr. fault alarm” object even if a fault has not occurred. To do so, the parameter “Send cyclically at no fault alarm” must be set to “yes”. If no fault occurs, the value “0” is sent cyclically. This information may be required in security systems or visualisation displays.

Priority

The forced position has the highest priority. This means that if a “Forced position” object has the value “1”, the actuator is set to the specified position. The status of the control output and the fault alarm are no longer relevant. If all the “Forced position” objects have the value “0”, then the fault alarm has a higher priority than the control output.

Switch

If the function of the actuator is defined as “Switching actuator”, the switching characteristic can be selected as normally open or normally closed contact.

The switch actuator uses the same communication object “Output / Switching” as the output of the heating actuator. The actuator has the operating modes “Normal mode” and “Staircase lighting function”.

In normal mode, the switch actuator can be assigned “switch ON” and “switch OFF” delays. These periods are calculated using a time base and factor:
*Delay = Base * Factor*

If the switch actuator is assigned the operation mode “Staircase lighting function”, this can likewise be set using a time base and factor:
*Staircase lighting time = Base * Factor*

The actuator can also send its status on the EIB. To do so, the parameter “Status of output” must be set to “yes”. A further object “Output / Telegr. status” is then made available. If the output is closed, the value “1” is sent once while the value “0” is sent if the output is open. The status signal is not sent cyclically.

Logic

It is possible to assign a logical connection for the switch actuator and for the heating actuator with 1 bit control. This can be a logic AND or OR function.

If a logical connection has been selected, the ETS2 program makes the communication object “Output / ... connection” available. If an AND connection is selected, both the logic object and the output object must have the value “1” in order to activate the output. If an OR connection is selected, the output is activated if either the output, the logic object or both have the value “1”.

Bus voltage recovery

If the heating actuator function is selected, it is possible to set the behaviour of the valve on bus voltage recovery using the parameter “Valve at bus recovery”. The valve can be “closed” or “opened”. Please note that this concerns the behaviour of the valve and not the output.

The output of the actuator is an electronic output. The output therefore remains open provided that no bus voltage is applied.

If the switch actuator function is selected, the behaviour on bus voltage recovery can also be set. In this case the settings depend on the switching characteristic (normally closed or normally opened contact).

If a logical connection has been assigned, it is possible to preselect the value of the logic object on bus voltage recovery using the parameter “Value of logic object at bus recovery”. Undefined closing operations can thus be avoided.

Inputs

The inputs can be used for example to scan window contacts in order to close a heating valve when the window is open.

The application detects changes at the inputs and converts these into telegrams according to the parameters assigned. Each input can also be used independently of the actuator function for binary switching, dimming or shutter control. Both inputs therefore have their own set of parameters.

The function of the inputs is set using the parameter “Operation mode of input”.

Edge, switching

If the operation mode “Edge (switching)” is selected, a communication object “Input / Telegr. switch” is available for each of the two inputs.

If the parameter “Reaction on input ...” is set to “TOGGLE”, alternate “On” or “Off” telegrams are sent after each operation of the input. There is therefore toggling at each rising and falling edge.

When the parameter is set to “switch defined”, the individual edges of the input signal are evaluated. The telegrams are sent according to the parameter “Switching function of input”. The setting “rising = ON, falling = OFF” should be selected for conventional switches, motion detectors etc. When the switch contact is closed, an ”On” telegram (“1”) is sent on the bus while an “Off” (“0”) telegram is sent when the contact is opened.

The inputs can send their telegrams cyclically using the parameter “Sending condition for cyclical sending”. If the reaction to the input signal is selected as “TOGGLE”, it is possible to either always send cyclically or only if the communication object contains “0” (= OFF) and/or “1” (= ON). If the reaction to the input signal is selected as “switch defined”, the cyclical sending is determined not by the object value but by the status at the input: either always (“at rising and falling edge”) or only at rising or falling edge.

The cyclic time is entered separately for each input and is calculated as the product of the parameters “Time base for cyclical sending” and “Time factor for cyclical sending”.
*Cyclic time = Base * Factor*

Edge, value

If the operation mode “Edge (value)” is selected, a communication object “Input / Telegr. value” is made available for each of the two inputs. Two preselected values (“Value 1” and “Value 2”) can be sent to this object. By default, the value “0” is set for value 1 in the parameters “Value ... sends (0...255)” and “255” is set for value 2. Any values between 0 and 255 can however be selected.

If the parameter “Reaction on input ...” is set to “TOGGLE (between ....)”, value 1 or value 2 are sent alternately each time the input is operated. There is therefore toggling at each rising and falling edge. The cyclical sending function can also be set. It is possible to send either “no value”, “Value 1”, “Value 2” or “Value 1 and 2” cyclically.

If the parameter “Reaction on input ...” is set to “switch defined”, the individual edges of the input signal are evaluated. The telegrams are sent according to the parameter “Switching function of input ...”.

The inputs can send their telegrams cyclically using the parameter “Sending condition for cyclical sending” if the reaction on input is set to “switch defined”. It can be selected whether the telegrams are always sent cyclically, at falling edge, at rising edge or at rising and falling edge.

The cyclic time is entered separately for each input and is calculated as the product of the parameters “Time base for cyclical sending” and “Time factor for cyclical sending”.
*Cyclic time = Base * Factor*

Dim

Each of the two inputs can be assigned the function of a dimming sensor. The parameter “Operation mode of input ...” must be set to “Dimming”. The communication objects “Input ... short / Telegr. switch” (1 bit) and “Input ... long / Telegr. relative dimming” (4 bit) are displayed.

The input operates as a one-touch dimmer i.e. the function changes with each push button action. After a short operation (approx. 0.5 s), the input sends alternate “On” or “Off” telegrams. After a longer operation, the input sends alternate “Dim brighter” or “Dim darker” telegrams. When the push button is released, the corresponding “Stop dimming” telegram is sent.

Shutter

If input 1 is selected as a shutter sensor, inputs 1 and 2 are combined. “Up” telegrams are produced when input 1 is operated while pressing input 2 produces “Down” telegrams. The application displays the communication objects “Input 1/2 long / Telegr. Move up/down” (1 bit) and “Input 1/2 short / Telegr. Lamella adj./Stop up-down” (1 bit).

In the default setting, the parameter “Operation mode” is set to “long = move, short = stop”.

If the setting “short = move, long = stop” is selected for this parameter, the name and function of the communication objects are adjusted accordingly. Additional parameters for specifying a period for cyclical sending are also displayed. The lamella adjustment function can also be customised to the individual requirements of the user: after a long push button action, telegrams for lamella adjustment are now sent for the duration of the push button action. In order to make optimum use of this function, the cyclic time should be synchronised with the lamella adjustment period in the actuator.

Limit number of telegrams

So that the bus is not loaded with too many telegrams, it is possible to limit the number of telegrams that the device can send in 17 seconds. If the selected number of telegrams is reached during the time period, the device adjusts the sending of telegrams for the rest of the period i.e. operations at the inputs are ignored. Once the period has elapsed, the telegrams are sent as usual.

Note: The limit on the number of telegrams refers to all the sending objects (inputs, status and fault alarm) i.e. if the telegram limit has been reached only by operating an input, no more telegrams are sent.

Communication objects
for heating actuator function with inputs set to switch function

No.	Type	Object name	Function
0	1 bit	Input 1	Telegr. switch
2	1 bit	Input 2	Telegr. switch
4	1 bit	Output	Switching

Communication objects
for continuous control of the heating actuator with inputs set to value function

No.	Type	Object name	Function
0	1 byte	Input 1	Telegr. value
2	1 byte	Input 2	Telegr. value
4	1 byte	Output	Switching

Communication objects
for 1 bit control of the heating actuator, status signal and active forced position

No.	Type	Object name	Function
…			
4	1 bit	Output	Switching
5	1 bit	Output	Telegr. status
6	1 bit	Output	Telegr. fault alarm
8	1 bit	Output	Forced position
9	1 bit	Output	Forced position
10	1 bit	Output	Forced position

Communication objects
for switch actuator function with AND connection and status signal

No.	Type	Object name	Function
…			
4	1 bit	Output	Switching
5	1 bit	Output	AND connection
6	1 bit	Output	Telegr. status

Communication objects
for switch actuator function with OR connection and status signal

No.	Type	Object name	Function
…			
4	1 bit	Output	Switching
5	1 bit	Output	OR connection
6	1 bit	Output	Telegr. status

Communication objects
with inputs set to dimming function

No.	Type	Object name	Function
0	1 bit	Input 1 short	Telegr. switch
1	4 bit	Input 1 long	Telegr. relative dimming
2	1 bit	Input 2 short	Telegr. switch
3	4 bit	Input 2 long	Telegr. relative dimming
…			

Communication objects
with inputs set to shutter control function with normal operation mode

No.	Type	Object name	Function
0	1 bit	Input 1/2 long	Telegr. Move up/down
1	1 bit	Input 1/2 short	Telegr. Lamella adj./Stop up-down
…			

Communication objects
with inputs set to shutter control function with inverted operation mode

No.	Type	Object name	Function
0	1 bit	Input 1/2 short	Telegr. Move up/down
1	1 bit	Input 1/2 long	Telegr. Lamella adj./Stop up-down
…			

Parameters
The default setting for the values is **printed in bold type.**

Output:	
– Function of output	**Heating actuator** Switching actuator
only for heating actuator:	
– Connected valve type	**de-energized closed** de-energized opened
– Control of heating actuator	**1 bit (PWM or 2 Point)** 1 byte (continuous)
only for 1 bit control:	
– Logical connection	**no logical connection** AND connection OR connection
only for 1 byte control:	
– Cyclic time of the switching control output (gets generated by the actuator)	1 min (just for test purposes) 10 min **15 min** 20 min 30 min 45 min
– Flushing 1x a week	inactive for 3 min **for 5 min** for 10 min
– Status of output (1= valve open / 0= valve closed)	yes **no**
– Valve at bus recovery	**closed** opened
Forced position:	
– Forced position	yes **no**
only if “yes” is selected:	
– Valve at forced position	**0 % (closed)** 100 % (open) 10 % 20 % 30 % 40 % 50 % 60 % 70 % 80 % 90 %
only for 1 bit control:	
– Cyclic time of the switching control output (gets generated by the actuator)	**15 min**
Fault alarm:	
– Fault alarm is activated	yes **no**
only if “yes” is selected:	
– Valve at fault alarm	**0 % (closed)** 100 % (open) 10 % 20 % 30 % 40 % 50 % 60 % 70 % 80 % 90 %

only for 1 bit control:	
– Cyclic time of the switching control output (gets generated by the actuator)	**15 min**
– Monitoring time	4 min 12 min **24 min** 50 min
– Send fault alarm cyclically	**yes** no
– Send cyclically at no fault alarm	yes **no**
– Cyclical sending	2 min 5 min **10 min** 20 min 40 min
only for switching actuator function:	
– Switching characteristic	Normally closed contact **Normally opened contact**
– Output at bus recovery	closed with normally opened contact / otherwise open **open with normally opened contact / otherwise closed**
– Operation mode	**Normal operation** Staircase lighting function
only for normal operation:	
– Switch ON delay	yes **no**
only if “yes” is selected:	
– Time base for switch ON delay	0.5 ms / 8.2 ms / **130 ms /** 2.1 s / 34 s / 9 min
– Factor for switching on delay (2 … 255)	**10**
– Switch OFF delay	yes **no**
only if “yes” is selected:	
– Time base for switch OFF delay	0.5 ms / 8.2 ms / **130 ms /** 2.1 s / 34 s / 9 min
– Factor for switching off delay (2 … 255)	**10**
only for staircase lighting function:	
– Time base for staircase lighting function	0.5 ms / 8.2 ms / **130 ms /** 2.1 s / 34 s / 9 min
– Factor for staircase lighting function (2 … 255)	**10**
– Logical connection	**no logical connection** AND connection OR connection
only if a logical connection is selected:	
– Value of logic object at bus recovery	**OFF** ON
– Status of output	yes **no**
Inputs general:	
– Debounce time	10 ms / **30 ms** / 60 ms / 90 ms / 120 ms / 300 ms
– Number of telegrams within 17 s (5…63)	**30**

Inputs:	
– Operation mode of input 1	**Edge (switching)** Edge (value) Dimming Shutter
– Operation mode of input 2	**Edge (switching)** Edge (value) Dimming
Separate for each input:	
only for “Edge (switching)“ operation mode:	
– Reaction on input …	TOGGLE **switch defined**
only if “TOGGLE” is selected:	
– Sending condition for cyclical sending	**no cyclical sending** send OFF cyclically send ON cyclically send OFF/ON cyclically
only if “switch defined” is selected:	
– Switching function of input …	no reaction rising = OFF falling = OFF rising = OFF, falling = OFF rising = ON falling = ON rising = ON, falling = OFF **rising = OFF, falling = ON** rising = ON, falling = ON
– Sending condition for cyclical sending	**no cyclical sending** at falling edge at rising edge at falling and rising edge
– Time base for cyclical sending	130 ms / 2.1 s / **34 s** / 9 min
– Time factor for cyclical sending (2…255)	**19**
– Activation object of input …	yes **no**
only for “Edge (value)” operation mode:	
– Reaction on input …	**TOGGLE (between value 1 and 2)** switch defined
– Value 1 sends (0...255)	**0**
– Value 2 sends (0...255)	**255**
only if “TOGGLE” is selected:	
– Cyclical sending of	**no value** Value 1 Value 2 Value 1 and 2
only if “switch defined” is selected:	
– Switching function of input …	no reaction **rising = value 1** falling = value 1 rising = value 1, falling = value 1 rising = value 1, falling = value 2
– Sending condition for cyclical sending	**no cyclical sending** at falling edge at rising edge at rising and falling edge
– Time base for cyclical sending	130 ms / 2.1 s / **34 s** / 9 min
– Time factor for cyclical sending (2…255)	**19**

– Activation object of input …	yes **no**
only for “Dimming” operation mode:	
– short = ON/OFF; long = dim	
only for “Shutter” operation mode at input 1:	
Input 1/2:	
– Operation mode	**long = move, short = stop** short = move, long = stop
only for “short = move, long = stop”:	
– Time base for repeating a telegram	0.5 ms / **8.2 ms** / 130 ms / 2.1 s / 34 s / 9 min
– Time factor for repeating a telegram (2...255)	**38**
– Input 1 = down / Input 2 = up	