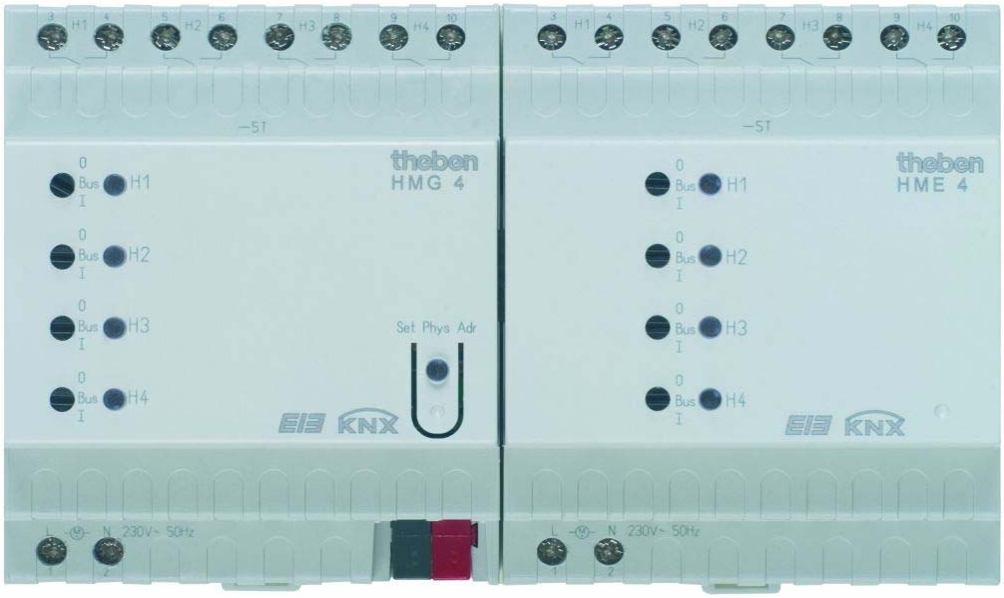
Heating actuator modules of the MX series

HMG 4 basic module and HME 4 upgrade module



HMG 4	491 0 210
HME 4	491 0 211

Contents

1 Functional characteristics

The MiX series is a series of devices comprising basic modules (e.g. RMG 4 S, DMG 2, BMG 6, HMG 4) and upgrade modules (e.g. RME 4 S, DME 2, BME 6, HME 4). You can connect a maximum of any 2 upgrade modules of this series to any basic module of this series.

The **HMG 4** basic module is a 4-channel heating actuator for 24 V or 230 V actuators, and can control up to 4 rooms using thermal actuators for every channel.

The **HME 4** upgrade module provides 4 additional channels

Each channel of these heating modules has a manual switch and an LED for status display.
A mains power supply is required for operating the manual switch, but the bus voltage need not be present.

The following functions are available

- Channel-wise selection of the operating mode between switching and continuous control.
- Monitoring the “Control variable” object: An emergency program is started if a control variable fails.
- Overriding option of the control variable using the “Compulsory operation mode” object.
- A heating actuator can be deactivated using the “Summer mode” object.
- A valve protection program can be executed if desired.
- Determining the maximum continuous control variable for the advance control of a boiler.
- The response can be configured as per mains or bus restoration.

1.1 Advantages

- Comfortable heating control in combination with different EIB controllers.
- Silent and wear-free switching, thanks to Triac outputs.
- Emergency program if a control variable fails (e.g. in case of a defective or failed temperature controller).
- The HME 4 can be combined with any basic module and the HMG 4 can be combined with a maximum of any 2 upgrade modules of the MiX series.

2 Technical data

2.1 Technical data of HMG 4

Power supply:	For HMG 4 bus voltage Mains voltage 230 V/ 50 Hz +/- 10 %
Permitted operating temperature:	0 °C ... +50 °C
Power draw from the mains:	Max 2.5 VA
Current draw from bus voltage:	Max 10 mA
Bus connection:	Bus terminal
Protection class:	II
Safety class:	EN 60529: IP 20
Dimensions of device:	HxWxD 90 x 72 x 68 (mm)
Dimensions of front panel:	HxW 45 x 72 (mm)
Output	
Contact	Triac
Quantity:	4 per module
Maximum load	0.5 A, this corresponds to 5 actuator units per channel in case of theben 24 V AC drives (Order No. 907 0 325)
Response in the event of bus failure	Adjustable

3 The “heating, switching, dimming, input: MiX series” application program

3.1 Selection in the product database

Manufacturer	THEBEN AG
Product family	Heating actuators
Product type	HMG 4
Program name	Heating, switching, dimming, input: MiX series

The ETS database can be found on our Homepage:
http://www.theben.de

Table 1

Number of communication objects:	Max 64
Number of group addresses:	110
Number of assignments:	111

3.2 Communication objects

Table 2: Overview

No.	Function	Object name	Type	Response
0	Continuous control variable	GM HMG4 Channel 1	1-byte EIS 6	Receive
	Switching control variable	GM HMG4 Channel 1	1-bit EIS 1	
1	Compulsory operation mode	GM HMG4 Channel 1	1-bit EIS 1	Receive
2	Report control variable failure	GM HMG4 Channel 1	1-bit EIS 1	Send
3-11	…. For all channels of the basic module; the same functions as that for channel 1, Refer to Table 3			
12	Summer mode ON/OFF	GM HMG 4 summer mode	1-bit EIS 1	Receive
13	Highest control variable HMG 4	GM HMG 4 Highest control variable	1-byte EIS 6	Send Receive
14	Pump ON/OFF	GM HMG 4 pump	1-bit EIS 1	Send
20-31	…. For all channels of the 1st upgrade module; the same functions as that of channel 1 of the basic module, refer to Table 3			
32	Summer mode ON/OFF	EM1 HME 4 summer mode	1-bit EIS 1	Receive
33	Highest control variable HMG 4	EM1 HME 4 Highest control variable	1-byte EIS 6	Send Receive
34	Pump ON/OFF	EM1 HME 4 pump	1-bit EIS 1	Send
40-51	…. For all channels of the 2nd upgrade module; the same functions as that of channel 1 of the basic module, refer to Table 3			
52	Summer mode ON/OFF	EM2 HMG 4 summer mode	1-bit EIS 1	Receive
53	Highest control variable HMG 4	EM2 HMG 4 Highest control variable	1-byte EIS 6	Send Receive
54	Pump ON/OFF	EM2 HMG 4 pump	1-bit EIS 1	Send
60	For RMG(E)4S and DMG(E)2	Central continuous ON	1-bit EIS 1	Receive
61	For RMG(E)4S and DMG(E)2	Central continuous OFF	1-bit EIS 1	Receive
62	For RMG(E)4S and DMG(E)2	Central switching	1-bit EIS 1	Receive
63	For RMG(E)4S and DMG(E)2	Call/save scene	1-byte EIS 14	Receive

Table3: Overview of object numbers for 1 HMG 4 and 2 HME 4 upgrade modules

Module / Function	Basic module (GM)				1st extended module (EM1)				2nd extended module (EM2)			
	H1	H2	H3	H4	H1	H2	H3	H4	H1	H2	H3	H4
Continuous or switching control variable	0	3	6	9	20	23	26	29	40	43	46	49
Compulsory operation mode	1	4	7	10	21	24	27	30	41	44	47	50
Emergency program status	2	5	8	11	22	25	28	31	42	45	48	51
Summer mode ON/OFF	12				32				52			
HMG 4 highest control variable	13				33				53			
Pump ON/OFF	14				34				54			

3.2.1 Object description

Objects 0, 3, 6, 9, 20, 23, 26, 29, 40, 43, 46, 49
“Continuous control variable, switching control variable”

1 object per channel.
The control variable receives data from the room temperature controller for the corresponding valve.
It can either be continuous (0-100%) or switching (ON/OFF) depending on the configuration.

- **Objects 1, 4, 7, 10, 21, 24, 27, 30, 41, 44, 47, 50**
  “Compulsory operation mode”

1 object per channel.
The corresponding channel is switched to the compulsory operation mode when 1 is set for this object. The channel then continuously heats with the control variable (0...100%) set on the “H1..2 etc.” parameter page

- **Objects 2, 5, 8, 11, 22, 25, 28, 31, 42, 45, 48, 51**
  “Report control variable failure”

1 object per channel.
This object is active only if an emergency program has been configured.
Response:
Sends 0 if the control variable is received regularly within the configured time (emergency program parameter).
Sends 1 to the bus if the control variable fails during normal operation.

The failure of the control variable is reported during the compulsory operation and summer modes; this however does not trigger the emergency program.

- **Objects 12, 32, 52 “Summer mode ON/OFF”**

1 object per module.
When 1 is set for the object, all channels configured for it are switched over to the summer mode and heating no longer takes place.
A valve protection program can optionally be executed.
Valve protection is activated when the control variable does not change for 24 h and is 0% or 100%.

- **Objects 13, 33, 53 “HMG 4 highest control variable”**

1 object per module.
All 4 control variables of a module are continuously compared with each other and only the highest value is sent to this object.
The heat requirement of the system is thus constantly reported to the heating boiler which then adapts its output as per the actual requirement.

For every channel of a module, one can individually select whether it is to be taken into account for determining the highest control variable (e.g. the GM HMG 4 Pump parameter page).
For example, the heat requirement of insignificant rooms can be ignored.

- **Objects 14, 34, 54 “Pump ON/OFF”**

1 object per module.
Sends 1 to the pump as soon as at least 1 channel of the module is to be heated (i.e. control variable? 0%).
The use of this function for every object can be set individually on the “Pump” parameter page.
The OR-join must be used for messages if multiple modules are used (e.g. in RMG 4 S).

- **Object 60 “Central continuous ON”, Object 61 “Central continuous OFF” Object 62 “Central switching”, Object 63 “Call/save scene”**

1 object each per system (basic module + upgrades).
These 4 specific central-objects are used only if Switch- or Dim-modules, i.e. RMG 4 S/C, DMG 2 / DME 2, are used.

3.3 Parameters

3.3.1 Parameter pages

Table 4

Function	Description
General	Selection of the connected upgrade modules and the general parameter for the cyclic sending of feedback
GM HMG 4 H1	Parameter for the 1st heating channel of the basic module
GM HMG 4 H2	Parameter for the 2nd heating channel of the basic module
GM HMG 4 H3	Parameter for the 3rd heating channel of the basic module
GM HMG 4 H4	Parameter for the 4th heating channel of the basic module
GM HMG 4 Pump	Settings for the pump control unit and determining the highest control variable
EM1 HME 4 H1	Parameter for the 1st heating channel of the 1st upgrade module
EM1 HME 4 H2	Parameter for the 2nd heating channel of the 1st upgrade module
EM1 HME 4 H3	Parameter for the 3rd heating channel of the 1st upgrade module
EM1 HME 4 H4	Parameter for the 4th heating channel of the 1st upgrade module
EM1 HME 4 Pump	Settings for the pump control unit and determining the highest control variable
EM2 HME 4 H1	Parameter for the 1st heating channel of the 2nd upgrade module
EM2 HME 4 H2	Parameter for the 2nd heating channel of the 2nd upgrade module
EM2 HME 4 H3	Parameter for the 3rd heating channel of the 2nd upgrade module
EM2 HME 4 H4	Parameter for the 4th heating channel of the 2nd upgrade module
EM2 HME 4 Pump	Settings for the pump control unit and determining the highest control variable

3.3.2 Parameter description

3.3.2.1GM HMG 4 H1 .. H4 , EM1 HME 4 H1 .. H4, EM2 HME 4 H1 .. H4

Table 5

Designation	Values	Description
Type of control variable	Continuous	Use when: The room thermostat sends a control variable in % (0%...100%).
	Switching	The room thermostat sends only ON and OFF messages.
Time for one actuation cycle (PWM period)	2...30 min	For the “continuous” control variable. One actuation cycle comprises one ON and one OFF process and forms a PWM period. Examples: - Control variable = 20%, time = 10 min means: within the actuation cycle of 10 min, the switch-on time is 2 min (i.e. 20% of the actuation cycle) and the switch-off time is 8 min. - Control variable = 70% / time = 10 min means: 7 min ON / 3 min OFF. See appendix: PWM cycle
Time for one actuation cycle (PWM period) (For emergency period and compulsory operation mode)	2...30 min	For the “switching” control variable In the emergency program and the compulsory operation mode, the valve is controlled with a fixed control variable as per a PWM cycle.

Continued:

Designation	Values	Description
Actuator response	Heated at switch-on (Theben actuator) Heated at switch-off (inverted)	Adjust as per the installed actuators depending on whether they are: closed without current or open without current
Summer mode and valve protection	No summer mode and no valve protection No summer mode but valve protection Summer mode but no valve protection Summer mode and valve protection	Valves are set to 0% in the **summer mode** and the received control variable is no longer executed. The summer mode should avoid heating when the set-point temperature in rooms is not attained in the mornings due to cooler night temperatures. When the **valve protection** is active, valves are controlled for 6 minutes every day when the control variable is 0 % or 100 % for 24 h. This avoids a valve seal from being stuck. **No summer mode** means: Valves respond to the control variable even in summer. **No valve protection** means: Valves no longer move beyond the heating period.
Control variable in the compulsory operation mode	0% to 100% in increments of 10%	Fixed control variable that should control the valves in the compulsory operation mode This is not restricted by the minimum or the maximum control variable.

Continued:

Designation	Values	Description
Emergency program in case of power restoration, bus and control variable failure	No emergency program 10 % after 30 min. without message 20 % after 30 min. without message 30 % after 30 min. without message 40 % after 30 min. without message 50 % after 30 min. without message 60 % after 30 min. without message 70 % after 30 min. without message 10 % after 60 min. without message 20 % after 60 min. without message 30 % after 60 min. without message 40 % after 60 min. without message 50 % after 60 min. without message 60 % after 60 min. without message 70 % after 60 min. without message	The last received control variable is used. After bus or mains failure: 0 % Fixed control variable that should replace the control variable of the thermostat till it is available again.
Send the control variable failure status cyclically	No, only in the event of change Cyclically and in the event of change	When or at what interval should the object send the control variable failure status?
Minimum control variable	0% ... 45% in increments of 5%	Since a thermal actuator can open or close the valve only slowly, the valve may not be opened at low control variable values. A minimum control variable is practical in such a case.

Continued:

Designation	Values	Description
Max. control variable	55% ... 100% in increments of 5%	Highest permissible control variable. A highest value of 90% extends the service life of thermal actuators without hampering the heating output.
Control variable when value exceeds/falls below the minimum/maximum control variable		Response when a room thermostat receives a control variable that is less than the minimum or greater than the maximum control variable:
	0% and/or 100 %	Accept values that are less than the minimum control variable as 0% Accept values that are greater than the maximum control variable as 100%
	Use set control variables	Restrict values to maximum and minimum control variables. For example, maintaining a minimum control variable of 10% can be practical for the correct base temperature of an underfloor heating.
	0 = 0%, otherwise use set control variables	If the received control variable is = 0, accept this value and close the valve. Other values are restricted as per the configured minimum and maximum control variables.

3.3.2.2GM HMG 4 Pump, EM1 HME 4 Pump, EM2 HME 4 Pump

Table 6

Designation	Values	Description
Take into account channel 1 for the pump control unit and the “highest control variable”	Yes No	1. Should the preliminary pump be switched on in case of heat requirement in channel 1? 2. And should the control variable for channel 1 be used for determining the highest control variable of all channels? See Object 13
Take into account channel 2 for the pump control unit and the “highest control variable”	Yes No	See channel 1
Take into account channel 3 for the pump control unit and the “highest control variable”	Yes No	See channel 1
Take into account channel 4 for the pump control unit and the “highest control variable”	Yes No	See channel 1
Switch-off delay for pump	None 2 min ... 30 min.	Avoids frequent switch-on and switch-off of the preliminary pump. **Important:** In case of a switching control variable, this delay should be set such that it is at least equal to the PWM period of the room temperature controller*.
Send pump control cyclically	No, only in the event of change Cyclically and in the event of change	When or at what interval should the object 14 (34, 54) be sent?
Send the highest control variable cyclically	No, only in the event of change Cyclically and in the event of change	When or at what interval should the object 13 (33, 53) be sent?

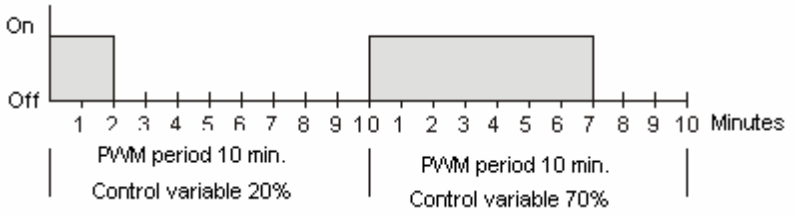
4 Appendix

4.1 PWM cycle

4.1.1 Basic principle

The 50% control variable is converted into switch-on/switch-off cycles in order to achieve a heating output of 50%.
The actuator is switched on for 50% of the time and switched off for 50% of the time over a fixed period (10 minutes in our example).

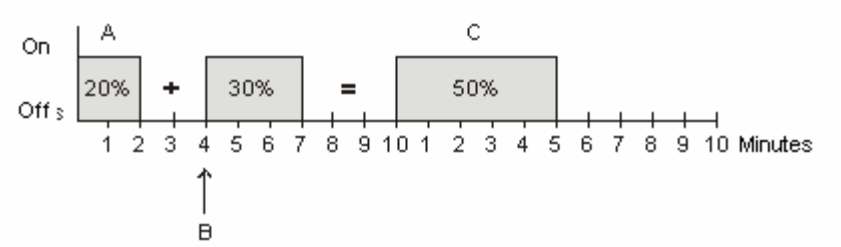
Example:
Two different switch-on times of 2 and 7 minutes indicate conversion of 2 different control variables, namely 20% and 70%, into a PWM period of 10 minutes.



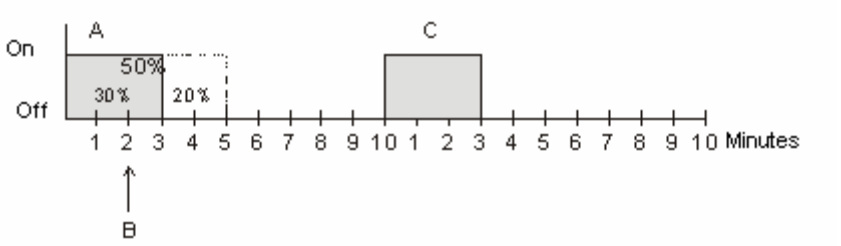
4.1.2 Response to changes in the control variable

Every change in the control variable is immediately transferred to the PWM cycle in order to respond to changes in the quickest possible time.

Example 1:
The last control variable was 20% (A).
A new control variable of 50% is received during the cycle (B).
The output is immediately switched on and the missing 30% switch-on time is added
The next cycle is executed with 50% (C).



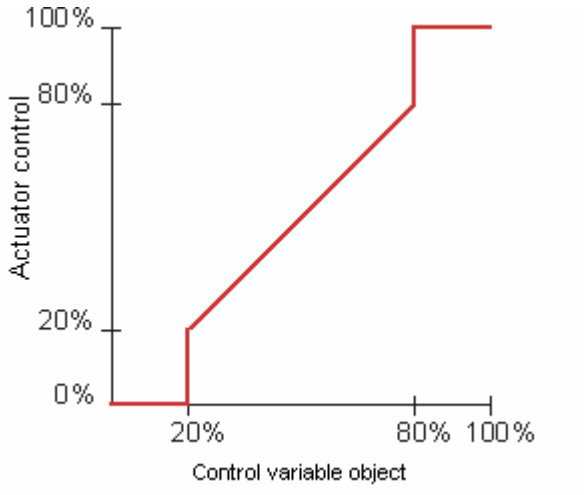
Example 2:
The last control variable was 50% (A)
A new control variable of 30% is received during the cycle (B).
The output is switched off after completing 30% of the PWM and thus the new control variable is executed.



Note:
If the rated switch-on time for the current cycle has already exceeded while receiving the new control variable, the output is immediately switched off and the new control variable is executed during the next cycle.

4.2 Limit of the control variable

Example:
Minimum control variable: 20%
Maximum control variable: 80%
Control variable when value exceeds/falls below the minimum/maximum control variable: 0% and/or 100%

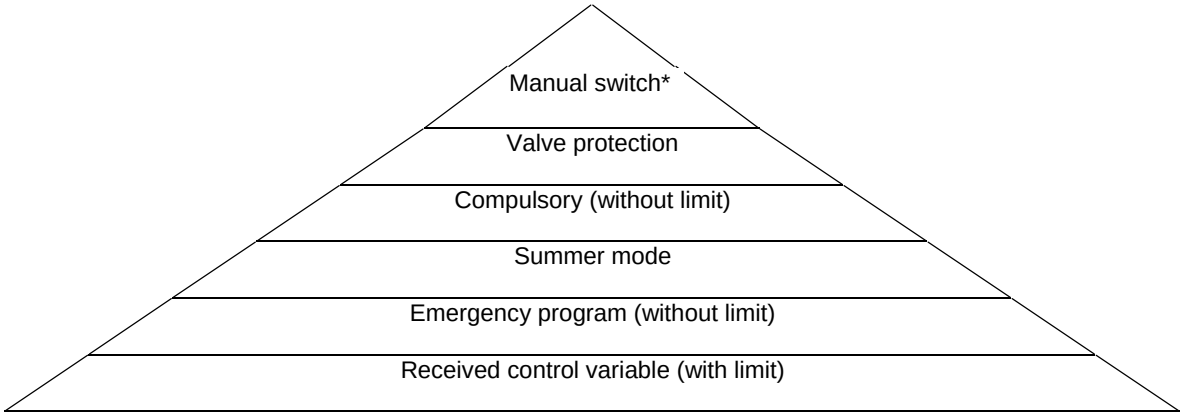


Only the control variable of the controller is restricted, but not the control variable:

- for the compulsory operation mode
- for the summer mode (0%)
- in the emergency program

4.3 Hierarchy of priorities

Table7



*The manual switch is set to 0 or 1:
The status of outputs is exclusively determined by the switch.

The manual switch is set to Auto:
The valve protection program has the highest priority; it is executed even in the compulsory operation mode.
The compulsory program can suppress the summer mode.
The summer mode has a higher priority than the emergency program.
The emergency program is used in case of bus / control variable failure or after restoring mains, and replaces the previously received control variable.

4.4 Manual First Open function

Valves are switched on for 15 minutes using the manual switch in order to unlock them using the First Open function while commissioning for the first time.