MAC-WSA Wireless Small Actuator

Application
Wirelessly controlled, battery-powered small actuator for continuous closed-loop control systems.
For thermostat valve bodies for direct mounting on commercially available radiator valves for room-specific temperature control in heating systems.
The actuator is controlled wirelessly based on the non-proprietary EnOcean wireless protocol.

Content **Page**

Important Information Regarding Product Safety

Safety Instructions

This data sheet contains information on installing and commissioning the product MAC-WSA. Each person who carries out work on this product must have read and understood this data sheet. If you have any questions that are not resolved by this data sheet, you can obtain further information from the supplier or manufacturer.

If the product is not used in accordance with this data sheet, the protection provided will be impaired. Applicable regulations must be observed when installing and using the device. Within the EU, these include regulations regarding occupational safety and accident prevention as well as those from the VDE (Association for Electrical, Electronic & Information Technologies). If the device is used in other countries, it is the responsibility of the system installer or operator to comply with local regulations.

Mounting, installation and commissioning work on the devices may only be carried out by qualified technicians. Qualified technicians are persons who are familiar with the described product and who can assess given tasks and recognize possible dangers due to technical training, knowledge and experience as well as knowledge of the appropriate regulations.

Legend

WARNING
Indicates a hazard of medium risk which can result in death or severe bodily injury if it is not avoided.

CAUTION
Indicates a hazard of low risk which can result in minor or medium bodily injury if it is not avoided.

NOTICE
Indicates a hazard of medium risk which can result in material damage or malfunctions if it is not avoided.

NOTE
Indicates additional information that can simplify the work with the product for you.

Notes on Disposal

For disposal, the product is considered waste from electrical and electronic equipment (electronic waste) and must not be disposed of as household waste. Special treatment for specific components may be legally binding

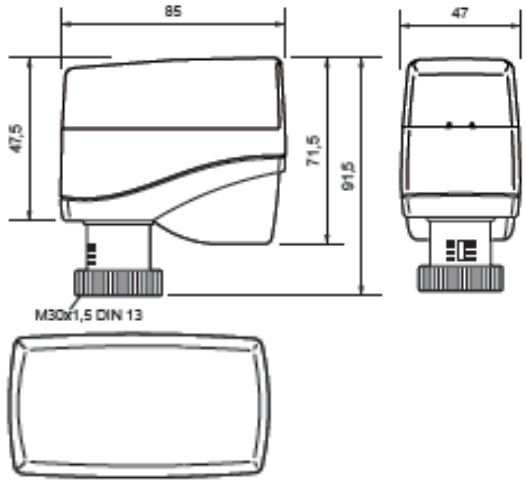
MAC-WSA Wireless Small Actuator

MAC-WSA Wireless small actuators for valves with connection M30x1.5 manufactured by Macon Controls.

Technical Data

Nominal voltage	Battery-operated, 3 alkaline AA batteries (LR6 1.5 V 3,400 mAh)
Battery life	Approx. 3 years (depending on frequency and method of operation)
Measuring system	Integrated digital temperature sensor; 0 °C to 40 °C; ±0.5 °C at 25 °C 32 °F to 104 °F ±0.5 °F at 77 °C
Interfaces	technoLink® wireless interface: ■ Radiogram: EnOcean radiogram ■ EEP 07-20-01 (heating valve) ■ Frequency: 868.3 MHz - 315 MHz ■ Operating range: Approx. 30 m in buildings (depending on building structure) ■ Duty cycle: < 1 % ■ Transmission and reception interval: every 10 min.
Motor switch-off	Actuator spindle: extending = load-dependant, retracting = path dependant
Indicator	Status LED
Actuating noise	<31 dB (A)
Nominal stroke	Up to 3 mm
Travel time	15 s/mm
Positioning force	100 N (nominal)
Position indicator	Stroke range scale
Manual adjustment	Only when disconnected from the power supply Socket for hexagon key under the actuator cover, key socket 4 mm Housing RAL 9010 pure white, battery compartment cover with mechanical locking mechanism
Ambient temp.	0 °C to 200 °C / 32 °F to 392 °F
Degree of protection	IP40
Installation position	Anywhere from vertical to horizontal
Maintenance	Maintenance-free
Weight	180 g / 6.35 oz
	■ When used properly, this device complies with the requirements of the R&TTE Directive (1999/5/EC).

Dimensions



Small Actuator Functions

Actuator mode

If an external 0 to 100% EnOcean radiogram is received, the internal loop controller is not active.
The transmitted actuating signal is translated into a positioning movement.
A suitable wireless single room controller takes over the control functions.

Self-controlling operation

The integrated room temperature controller is activated if no external 0 to 100% EnOcean radiogram is received.

- Without external operator panel (= emergency mode):

The temperature is controlled to a fixed setpoint of 20 °C / 68 °F using the integrated temperature sensor (actual value) and the integrated control function of the actuator.

- With external operator panel (EnOcean technology):

Using the operator panel, the user can freely determine the setpoint or enter his own schedule.
The actual value and the setpoint are transmitted via the EnOcean radiogram (EEP 07-20-01).
The integrated control algorithm makes room control easy and convenient.
If no external temperature sensor (actual value) is connected, the value of the integrated temperature sensor is used as the command value for room temperature control, which is not the proper method of operation (=emergency mode).

Battery monitoring

The battery capacity is continuously monitored. If the battery capacity is too low, this is communicated to the wireless partner and an acoustic signal sounds every 6 hours. If this message is activated, the remaining capacity of the batteries is < 10%.
If the battery voltage continues to drop, the actuator assumes the safety position of 50% (= safety position).

Valve block protection

Block protection prevents the cone from jamming when the valve is inactive for a long time. When block protection is active, the actuator performs a displacement of 50% once every 7 days.

Communication test

A communication test can be started manually by pressing the button located under the hood.

Pressing this button (approx. 2 s) checks the signal path to the wireless partner saved in the device. A successful communication test is visually acknowledged (by the status LED) and acoustically acknowledged after the pushbutton is released. The status LED lights up for approx. 3 s.

An unsuccessful communication test is signaled by rapid blinking of the status LED for approx. 3 s.

Energy block (automatic "Window open" recognition)

When a window is open, the flow of heat energy to the room is interrupted. An open window is signified by a large and rapid temperature drop at the MAC-WSA small actuator. If such a drop is measured by the internal temperature sensor, the small actuator closes the valve for 30 min.

After 30 min, the small actuator returns to normal operation and the energy block function is active again.

Frost protection function

If the temperature at the integrated temperature sensors drops below 43 °F, the small actuator opens the valve until 48 °F is reached.

Wireless Interface

Communication with the wireless partner is cyclical (wireless cycle approx. every 10 minutes). At this time, the entire wireless protocol is sent to the wireless partner and values are received from the wireless partner.

NOTICE

This product uses only EnOcean radiograms.

When choosing a wireless partner, make sure that the wireless interface works with EnOcean radiograms and that the wireless actuators being controlled support the particular heating valve standard actuator profile (EEP 07-20-01).

EnOcean Equipment Profiles EEP 07-20-01 (heating valve)

DATA BYTES		Notes
Transmit mode:	Message from the actuator to the controller	
DB_3:	Actual value 0 to 100%, linear n=0 to 100	■ Positioning feedback of the current stroke position.
DB_2.BIT_7:	Service on	■ BIT for evaluating whether service mode is active. When service mode is active, DB2.BIT4 to 7 can be used to carry out service functions like “Learn stroke” (not implemented in MAC-WSA); “Forced OPEN”; “Forced CLOSED”; and “Set zero point” – in combination with a suitable wireless partner.
DB_2.BIT_6:	Energy input enabled	■ Not applicable for MAC-WSA This BIT is required for actuators that have a wired power supply.
DB_2.BIT_5:	Energy memory > xx% charged	■ Not applicable for MAC-WSA This BIT is required for actuators that have a wired power supply.
DB_2.BIT_4:	Battery capacity > 10%	■ Monitoring of the battery capacity If the capacity of the batteries is below 10%, a message of Bit4 = 0 is issued.
DB_2.BIT_3:	Contact, cover open	■ Not applicable for MAC-WSA BIT for evaluation of a cover contact
DB_2.BIT_2:	Failure temperature sensor, out of range	■ BIT for evaluation of whether the temperature sensor is working correctly.
DB_2.BIT_1:	Detection, window open	■ For evaluation of whether the “Window open” identification is active. The “Window open” identification occurs via the evaluation of the internal temperature sensor (gradient).
DB_2.BIT_0:	Actuator obstructed	■ Currently not used by MAC-WSA All types of malfunctions are evaluated and reported (not in a differentiated manner, but only as a general malfunction message).
DB_1:	Temperature 0 °C to 40 °C / 32 °F to 104 °F, linear n=0 to 255	■ Current measurement value of the internal temperature sensor
DB_0.BIT_7:	Not used	
DB_0.BIT_6:	Not used	
DB_0.BIT_5:	Not used	
DB_0.BIT_4:	Not used	
DB_0.BIT_3:	Learn button 0b0 Teach-in telegram 0b1 Data telegram	■ The identification for the teach-in frame and the normal data frame is stored here. The teach-in radiogram is only sent to the wireless partner with the “Teach-in” function.
DB_0.BIT_2:	Not used	
DB_0.BIT_1:	Not used	
DB_0.BIT_0:	Not used	

Receive mode:	Commands from the controller to the actuator	**Notes**
rx time:	max. 1 s	■ The bidirectional data transfer from the wireless partner to the wireless small actuator must be completely finished within a maximum time window of 1 s.
DB_3:	Valve set point 0 to 100%, linear n=0 to 100 Temperature set point 0 °C to 40 °C / 32 °F to 104 °F, linear n= 255 to 0	■ The temperature value (setpoint) or control value is transferred here from the external wireless partner. Which information is sent to the actuator is defined by DB_1.BIT_2.
DB_2:	Temperature actual from RCU 0 °C to 40 °C / 32 °F to 104 °F , n=255 to 0 Room controller unit	■ The current temperature value (actual value) or control value is transferred here from the external wireless partner. Which information is sent to the actuator is defined by DB_1.BIT_2.
DB_1.BIT_7:	Run init sequence	■ A “Set zero point” service function is stored here. This function needs a suitable wireless partner that supports the function.
DB_1.BIT_6:	Lift set	■ Not applicable for MAC-WSA The service function “Learn stroke” is here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_5:	Valve open	■ A “Forced OPEN” service function is stored here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_4:	Valve closed	■ A “Forced CLOSED” service function is stored here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_3:	Summer bit, reduction of energy consumption	■ The “summer function” is stored in this BIT and is transferred to the actuator. If the “summer bit” is transferred from the wireless partner, the communication cycle is extended from 10 minutes to 30 minutes. This reduces the energy consumption of the actuator during phases in which no heating occurs and has a positive effect on the service life of the batteries. The function must be supported by an external wireless partner of the actuator and can be optionally set.
DB_1.BIT_2	Set point selection DB_3 0b0 set point 0 to 100%, 0b1 temperature set point 0°C to 40°C / 32 °F to 122 °F	■ Here you specify whether the temperature measurement value or the actuating signal is made available to the wireless actuator as an input signal.
DB_1.BIT_1	Set point inverse	■ The inversion of the actuating signal is possible with this BIT.
DB_1.BIT_0	Select function 0b0 RCU 0b1 service on	■ You use this BIT to specify whether the actuator should operate in normal mode (RCU) or service mode (service on). However, it requires a suitable wireless partner that supports this function.

NOTE
You can find detailed information about the protocol description on the Internet page www.enocean.com

General Information

- The actuator operates in a 10-minute communication cycle (except for summer bit = active; the cycle is 30 minutes in this case). There is no communication with the wireless partner on an automatic basis between these cycles.

  A connection can be established manually through a communication check triggered on the actuator (e.g. for checking the wireless path during commissioning). A complete data transfer does not occur when a communication check is manually triggered. The data relevant to the control technology is not updated.

  A new calculation of the control deviation and an associated repositioning of the valve occurs every 10 min. after the data exchange with the wireless partner.

- If the "summer bit" is transferred from the wireless partner, the communication cycle is extended from 10 minutes to 30 minutes. This reduces the energy consumption during phases in which no heating occurs and has a positive effect on the service life of the batteries.

  The function must be supported by an external wireless partner and can be optionally set.

- The external wireless partner determines when summer mode is active.
  This operating mode is active, for example, during the period in which no heating occurs (i.e., the primary power supply for heating is switched off).

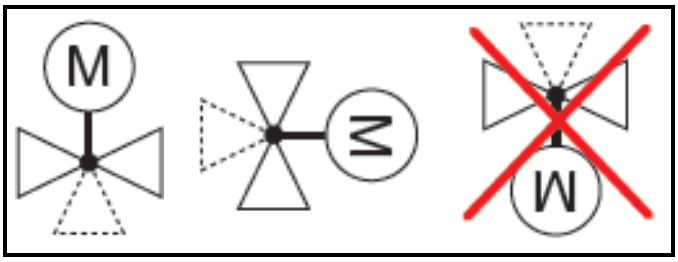
- The batteries are dimensioned so that approx. 5,500 actuating cycles of 15 s each are possible. Avoiding an oscillating control circuit thus depends greatly on how the settings of the loop controller parameters (for external loop controllers) were selected.

  We recommend that the external loop controller be set to have as long a time delay as possible.

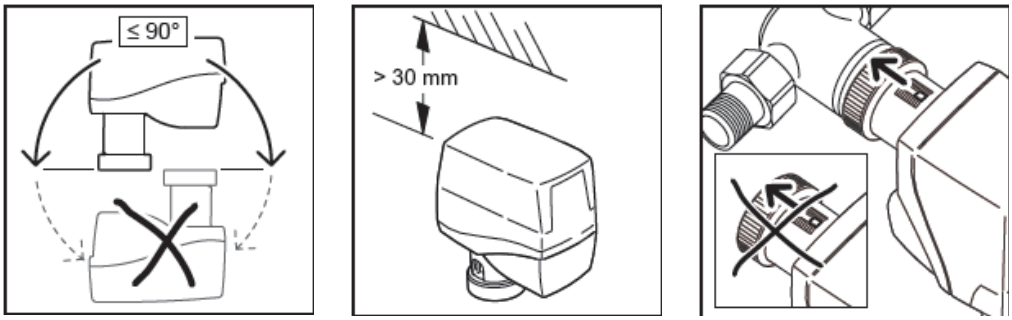
Valve Installation

WARNING!
The valve may only be installed by qualified technicians. In addition to the generally valid installation guidelines, the following points are to be observed:

- The pipeline system and the interior of the fitting must be free of foreign objects. In the event of contaminated media, dirt collectors are to be inserted upstream of the valves with fine screens, mesh width 0.25 mm.
- There must be no tension between the valve and the pipeline connection.
- To avoid eddy formations in the valve body, the valve should be installed in a straight section of the pipe. A distance of 10 times the nominal diameter is recommended between the valve flange and manifold or other similar parts.
- The installation location is to be selected so that the ambient temperature at the actuator is kept between 0 – +50 °C / 32 °F TO 122 °F
- When carrying out installation, the permissible maximum pressure difference Δp and the specified direction of flow must be observed (see table in "Types" section).
- The three-way valves are to be used as mixing valves. Observe the specified direction of flow.
- Once the valve is installed, make sure the ball in the valve seating can be moved easily by pushing in the valve stem.
- Approximately 30 mm of free space is required above the actuator to install the actuator and remove the housing cover.
- For safety reasons, do not suspend the small actuators from under the valve.
- Observe the direction of flow arrow on the valve body. Inverting the direction of flow impairs control behavior.



Installing the Small Actuator



NOTICE

MAC-WSA Wireless Small Actuator must not be operated without a valve.

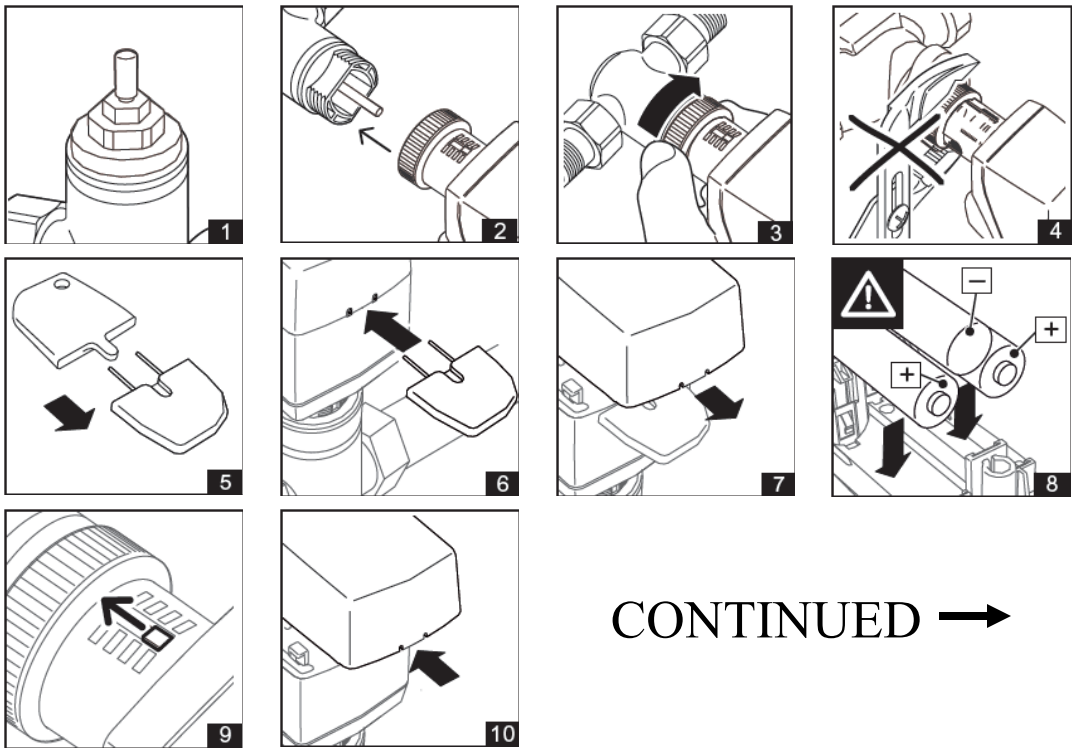
NOTICE

Insert the batteries with the correct polarity.

When inserting the batteries, observe the polarity as marked in the battery compartment.
Use only alkaline batteries (type: AA, LR6 1.5 V).

CAUTION

Do not dispose of used batteries in the household garbage. Dispose of them in an environmentally friendly manner.



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- ▶ Place the small actuator on the threaded connection of the valve and hand tighten using the union nut.
- ▶ Open the battery compartment cover using the special key supplied by inserting it into the intended place. Remove the cover.

  The special key is included with delivery of the small actuator.
- ▶ After all batteries have been inserted into the battery compartment, an initialization run is performed automatically.

  The status LED flashes during the installation run.

- ■ The teach-in function can now be used for small actuator on the wireless partner.
- ■ If the teach-in function has not been used for a wireless partner within 1 h, the actuator goes into emergency mode.

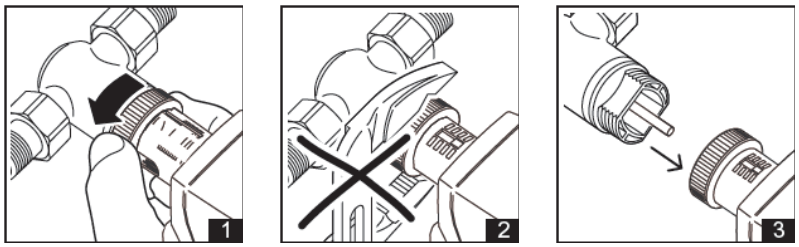
NOTE

After the batteries are changed, it is necessary to carry out an initialization run by pressing the pushbutton (2) briefly.

Removing the Small Actuator

CAUTION

Before beginning to remove the unit, make sure that no differential pressure builds up in the valve body before beginning work. If necessary, close the gate valve and turn off pumps.
After the pipeline has cooled off, you can begin removal of the small actuator.



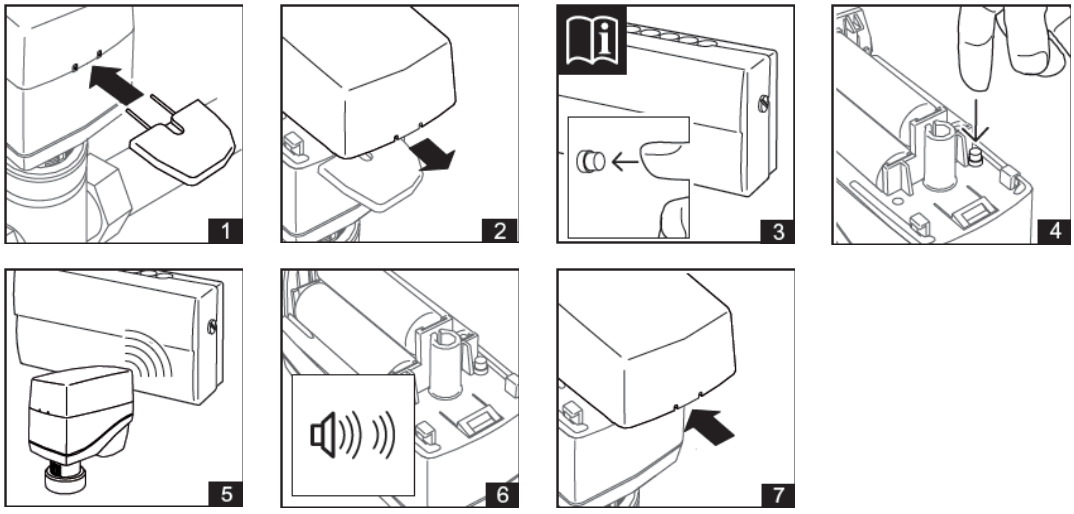
- ▶ Remove the battery.
- ▶ Loosen the union nut.
- ▶ Remove the small actuator from the valve.

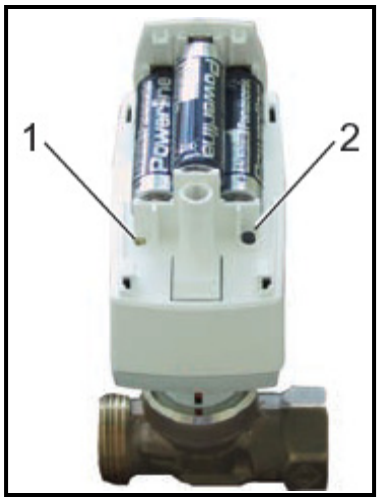
Commissioning

NOTICE

This product description describes specific settings and functions of the MAC-WSA. In addition to these instructions, the product descriptions of other system components, such as wireless partners, are to be observed.

- The buttons and LED displays that are used during commissioning are located inside the housing.
- Remove the housing cover before commissioning (Figures 1 and 2).





(1) Status LED
(2) Pushbutton

Using the Teach-In Function for the MAC-WSA on a Wireless Partner

- ▶ Set the wireless partner to teach-in standby mode (fig. 3). Details can be found in the documentation of the wireless partner.
- ▶ Trigger a teach-in radiogram on the MAC-WSA by pressing the button (2) on the MAC-WSA for approx. 1 s (fig. 4). The status LED (1) should briefly light up once and a short signal tone should sound after the pushbutton is released (fig. 6).

  The wireless partner confirms that the teach-in function was successful. Details can be found in the documentation of the wireless partner.

  The wireless small actuator confirms visually that the teach-in function was successful (status LED lights up for approx. 2 s) and acoustically (beeping tone sounds twice).
- ▶ Close the housing of the MAC-WSA by snapping the cover back into place (fig. 7).

NOTE
After successful registration, the device ID of the wireless partner of the MAC-WSA is permanently stored in the small actuator. The registration process does not need to be performed again when the batteries are changed.

■ Example: Data exchange teach-in frame while teach-in function is running, excerpt from the WinEtel Program by Enocean

					DB3	DB2	DB1	DB0	ID3	ID2	ID1	ID0	Stat	
Learn button of actuator	A5	5A	0B	07	80	08	0A	80	01	00	0F	1C	00	50
Loop controller response	A5	5A	0B	07	80	0F	FF	F0	FF	EE	CD	81	00	CB

Turning Valve Block Protection On and Off

Switching on

- ▶ Press the button (2) for 5 s. Release the button when the status LED has flashed 5 times.

After the button (2) is released, the status LED briefly lights up for approx. 2 s.

Switching off

- ▶ Press the button (2) for 5 s. Release the button when the status LED has flashed 5 times.

After the button (2) is released, the status LED (1) is off for approx. 3 s.

Performing a Communication Test

- ▶ Press the button (2) for 2 s. Release the button when the status LED (1) has flashed 2 times.

A successful communication test is visually acknowledged (by the status LED) and acoustically acknowledged after the pushbutton is released. The status LED lights up for approx. 3 s.

An unsuccessful communication test is signaled by rapid blinking of the status LED for approx. 3 s.

NOTE
A successful communication test does not result in an adjustment of the valve position. This does not occur until the next regular data exchange.

NOTE
In case of an unsuccessful communication test, check the wireless partner and the wireless path.

NOTE
If wireless communication to the wireless partner is interrupted for >1 h, the wireless small actuator goes into emergency mode.
When a proper radiogram is received, the wireless small actuator returns to normal operation automatically.

Status Message and Data Reception

■ When the actuator comes out of sleep mode (every 10 min.), it sends its status to an external wireless partner.

NOTE
The data transfer from the wireless partner to the wireless small actuator must be completely finished within a maximum time window of 1 s.

■ Example: General data communication
Excerpt from the WinEtel Program by Enocean
Wireless small actuator runs with an external wireless partner (operator panel). The actual and setpoint value is transferred.

					DB3	DB2	DB1	DB0	ID3	ID2	ID1	ID0	Stat	
Actuator status	A5	5A	0B	07	1E	10	0A	08	01	00	0F	1C	00	14
Loop controller response	A5	5A	0B	07	93	6A	04	08	FF	EE	CD	81	00	56

Manual adjustment

NOTICE

Manual adjustment may only be performed when the actuator is installed.

- The small actuator must be disconnected from the power supply when performing manual adjustment, which means at least one of the batteries must be removed.
- A hexagon key (key socket 4 mm) can be used to move the actuator into any position.

NOTICE

If you manually adjust until the slip clutch responds, turn the hexagon key half a turn in the opposite direction after the manually set stroke position has been reached.

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