SAB05 868 MHz

EasySens wireless radiator valve actuator for room temperature control

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Data Sheet

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enocean alliance
No Wires. No Batteries. No Limits.

Application

Small, radio controlled, battery-powered radiator valve actuator for room temperature control, which mounts directly onto commercially available radiator valves manufactured by Heimeier, Honeywell-MNG, Junkers, Honeywell-Baukmann, Oventrop (1998 and later), Cazzaniga, and many more.

The actuator is radio controlled based on the EnOcean wireless protocol according to the international standard IEC 13543-3-10. The EnOcean Equipment Profile EEP A5-20-01 (Battery Powered Actuator) is supported.

Types available

SAB05   radio controlled, battery-powered radiator valve actuator SAB05 with M30x1,5 connection

Security Advice – Caution

The installation and assembly of electrical equipment must be performed by a skilled electrician.

The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value.

Before connecting devices with electrical power supply the installation must be isolated from power source!

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 or ecologically sensible. The local and currently applicable legislation must be observed.

Transmitting Frequency and Measuring Principle

The device sends an event or a time controlled telegram to the receiver.

A: event controlled
By activating the learn button of the device, the internal microprocessor is woken up and a request telegram is generated and transmitted to the receiver. The request telegram contains the status of the device as well as the battery status.

B: time controlled
The internal microprocessor wakes up at a predefined interval according to the settings and a request telegram to the receiver is generated and transmitted.

After a telegram is sent, the device expects the answer telegram to be received within 1 sec. In case no telegram can be received, the device goes back into sleep mode.

If a telegram is received the control loop is calculated and the actuator will react before entering the sleep mode.

Information about EasySens (Radio)

Transmission Range

As the radio signals are electromagnetic waves, the signal is damped on its way from the sender to the receiver. That is to say, the electrical as well as the magnetic field strength is removed inversely proportional to the square of the distance between sender and receiver ($E,H \sim 1/r^2$).

Beside these natural transmission range limits, further interferences have to be considered: Metallic parts, e.g. reinforcements in walls, metallized foils of thermal insulations or metallized heat-absorbing glass, are reflecting electromagnetic waves. Thus, a so-called radio shadow is built up behind these parts.

Radio waves can penetrate walls, however signal dampening is increased vs transmitting within the free field.
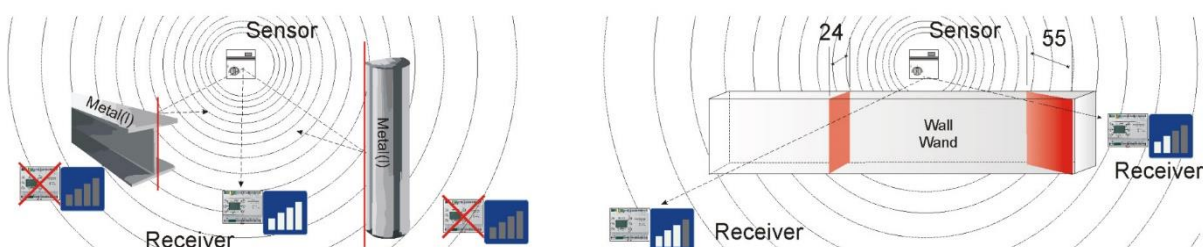
Penetration of radio signals:

Material	Penetration
Wood, gypsum, glass uncoated	90..100%
Brick, pressboard	65.. 95%
Reinforced concrete	10.. 90%
Metal, aluminium pasting	0.. 10%

This means that the building material used in a building is of paramount importance for the evaluation of the transmitting range. For an evaluation of the environment, please see guide values listed below:

Radio path	Range/penetration
Visual contacts	Typ. 30 m range in passages, corridors, up to 100 m in halls
RI gypsum walls/wood	Typ. 30 m range through max. 5 walls
Brick wall/Gas concrete	Typ. 20 m range through max. 3 walls
Reinforced concrete/-ceilings	Typ. 10 m range through max. 1 ceiling

Supply blocks and lift shafts should be seen as a compartmentalization

In addition, the angle with which the signal sent arrives at the wall is also important. Depending on the angle, the effective wall strength and thus the damping attenuation of the signal changes. If possible, the signals should run vertically through the wall. Recesses should be avoided.

Other Interference Sources

Devices that also operate with high-frequency signals, e.g. computer, audio-/video systems, electronic transformers and ballasts etc. are also considered as an interference source. The minimum distance to such devices should amount to 0,5 m.

Selecting the best Device Mounting Position using field strength measuring instruments (e.g. Thermokon AirScan)

Instruments for measuring and indicating the received field strength (RSSI) of the EnOcean telegrams and interfering radio activity of transmission frequency support electrical installers during the planning phase and enable them to verify whether the installation of EnOcean transmitters and receivers is possible at the positions planned.

They can be used for the examination of interfered connections of devices, already installed in the building, to determine the correct mounting position for the wireless sensor/ receiver:

Person 1 operates the wireless sensor and produces a radio telegram by manual actuation while Person 2 monitors the displayed field strength values on the measuring instrument. Person 1 does vary the wireless sensor's position to determine the optimal intended mounting position.

High-Frequency Emission of Wireless Sensors

Since the development of cordless telephones and the use of wireless systems in residential buildings, the influence of radio waves on people's health living and working in the building have been discussed intensively. Due to incomplete measuring results and long-term studies, very often great feelings of uncertainty exist with the supporters as well as with the critics of wireless systems.

A measuring expert certificate of the institute for social ecological research and education (ECOLOG) has confirmed, that the high-frequency emissions of wireless keys and sensors based on EnOcean technology are **considerably lower** than comparable conventional keys.

Even conventional keys send electromagnetic fields, due to the contact spark. The emitted power flux density (W/m²) is 100 times higher than using a wireless switch considering the total frequency range. In addition, a potential exposition by low frequency magnet fields emitted via used wires are reduced due to wireless keys.

If the radio emission is compared to other high-frequency sources in a building such as DECT-telephones and basis stations, these systems are 1.500 times higher-graded than wireless switches.

Technical Data

Technology**:**	EnOcean radio telegram, bidirectional, EEP A5-20-01 (Battery Powered Actuator)		Motor switch-off:	Actuator spindle: when extending = load-dependent, when retracting = path-dependent
Transmitting frequency:	868 MHz		Display:	Multi-coloured status LED
Transmitting range:	approx. 30 m in buildings (depending on building structure)		Operational noise:	<28 dB(A)
			Nominal stroke:	Up to 3 mm
Measuring system:	Integrated digital temperature sensor; range 0..40 °C, ±0.5 °C at 25 °C		Travel time:	10 mm/s
			Positioning force:	100 N (nominal)
			Position indication:	Stroke range scale
Nominal voltage:	Battery-operated, 3 alkaline AA batteries (LR6AD Panasonic Powerline 1,5 V)		Housing:	RAL 9010 pure white, battery compartment cover with mechanical locking Mechanism
Battery life:	Depends on the frequency of use and method of operation approx. 3 years with default settings		Protection:	IP40 according to EN 60529
			Ambient temperature:	0..+50 °C
			Installation position:	±90°
			Maintenance:	Maintenance-free
Transmission/reception interval:	every 2..20 min, can be selected in 2 min increments		Weight:	157 g (without batteries) 225 g (with batteries)

Description of Radio Telegram EEP A5-20-01 (Battery Powered Actuator)

Transmit mode, SAB05 request telegram Message from SAB05 to MSG-Server	
DB_3	Current Valve position 0..100%, linear n=0..100
DB_2.Bit_7	When Service Mode is active (0b1), DB2.Bit_4 to 7 can be used to carry out service functions like the initialization
DB_2.Bit_6	Energy input enabled (not supported)
DB_2.Bit_5	Energy Storage > xx% charged (not supported)
DB_2.Bit_4	Battery capacity > 10%
DB_2.Bit_3	Contact, cover open (not supported)
DB_2.Bit_2	Temperature sensor failure, out of Range
DB_2.Bit_1	Window Open Detection by temp. gradient of internal sensor
DB_2.Bit_0	Actuator obstructed. Error bit. All types of malfunction are reported, but only as a general error status
DB_1	Temperature 0..40 °C, linear n=0..255
DB_0.Bit4 – Bit7	not used
DB_0.Bit3	LRN Bit 0b0 = Learn-in telegram, 0b1 = Data telegram
DB_0.Bit2	Actuator mode 0b0 = Actuator w/o control loop 0b1 = Self-controlled, runs control loop
DB_0.Bit0 – Bit1	not used

Receive mode, Command from the MSG-Server/Controller to the SAB05	
DB_3	New Valve position 0..100%, linear n=0..100 or set point temperature (depending on DB1.Bit 2)
DB_2	Room Temperature from Room temperature sensor
DB_1.Bit_7	Run init sequence, detect both end limit positions. Only active in Service mode
DB_1.Bit_6	In Service mode: Lift set. (not supported)
DB_1.Bit_5	In Service mode: Forced open valve command
DB_1.Bit_4	In Service mode: Forced close valve command
DB_1.Bit_3	Summer mode, reduced wake up rate: 1/hour
DB_1.Bit_2	DB_3-selection; 0b0 = new valve pos. 0..100%, 0b1 = temp. set point 0..40 °C
DB_1.Bit_1	Inverse Set point (for cooling)
DB_1.Bit_0	Select function: 0b0=normal operation 0b1=service mode
DB_0	not used

Note: The answer telegram must be completely received with 1 sec after the request telegram (Rx time = max. 1s)

Functions

Actuator mode

If a new valve position telegram is received from an external MSG-Server or bidirectional gateway the internal control loop is not active. SAB05 moves to the commanded position, which has been calculated by the MSG-Server or BMS controller.

Self-controlling operation

If the telegram contains room temperature and set point instead of a valve position (DB_1.Bit_2 = 1) the SAB05 performs the control loop.

Without room temperature sensor (= emergency mode):

Without a room temperature sensor the temperature is controlled by a fixed set point of 20 °C using the integrated temperature sensor (actual value) and the SAB05's integrated control loop

With room temperature sensor (EnOcean technology):

Room temperature and the set point, optionally occupancy signal are transmitted via an EnOcean telegram (EEP A5-20-01). SAB05's integrated control algorithm makes room control easy and convenient.

Battery monitoring

The battery capacity is continuously monitored. If the battery capacity is too low, a wireless signal is transmitted to the MSG-Server or bidirectional gateway and 2 audible signal tones are emitted every 6 hours. Once this message is activated, the remaining capacity of the batteries is <10%.

NOTICE: The batteries must be replaced within the next 30 days.

As the battery level decreases, the interval between the audible signals becomes shorter and the number of signal tones increases to 4 signal tones every 3 hours. Prior to the remaining battery capacity being insufficient to maintain motorized operation, the actuator will move to and remain at a safe default position of approx. 50%. The wireless communication will continue as long as the batteries last.

Valve recognition

During commissioning, the actuator detects the fully closed position and the total stroke of the valve.

Once the batteries have been replaced or once the unit has been successfully paired with a MSG-Server or bidirectional gateway this detection process can be performed again using the Run init sequence command (Set DB_1,Bit_7).

Valve block protection

Block protection prevents the cone from jamming when the valve is inactive for a long time (i.e during summer). When block protection is active, the actuator performs a displacement of 50% once every 21 days.

If the remaining battery level is <10% (see "Battery monitoring" section), this function is inactive.

This function can be switched on and off (see handling section).

Automatic closing point control

The small actuator continuously monitors the fully closed position and corrects it if necessary.

Communication test

The radio communication path to the MSG-Server or bidirectional gateway is checked. Performing a communication test has no effect on the transmission/reception interval.

Energy block (automatic "Window open" recognition)

An open window is characterized by a large and rapid temperature drop at the SAB05. If such a temperature drop is sensed by the internal temperature sensor, SAB05 closes the valve for 30 min. After 30 minutes, SAB05 returns to normal operation assuming the window will be closed by then. The automatic "Window open" recognition function is active again.

If the remaining battery level is <10% (see "Battery monitoring" section), this function is inactive.

This function can be switched on and off (see handling section).

Frost protection function

If the temperature at the integrated temperature sensor drops below 6 °C, SAB05 will open the valve until the temperature will raise to 8 °C.

Summer mode

If "Summer mode on" is received by the MSG-Server or bidirectional gateway, SAB05 will close the valve and the transmission/reception interval is permanently set to 60 minutes.
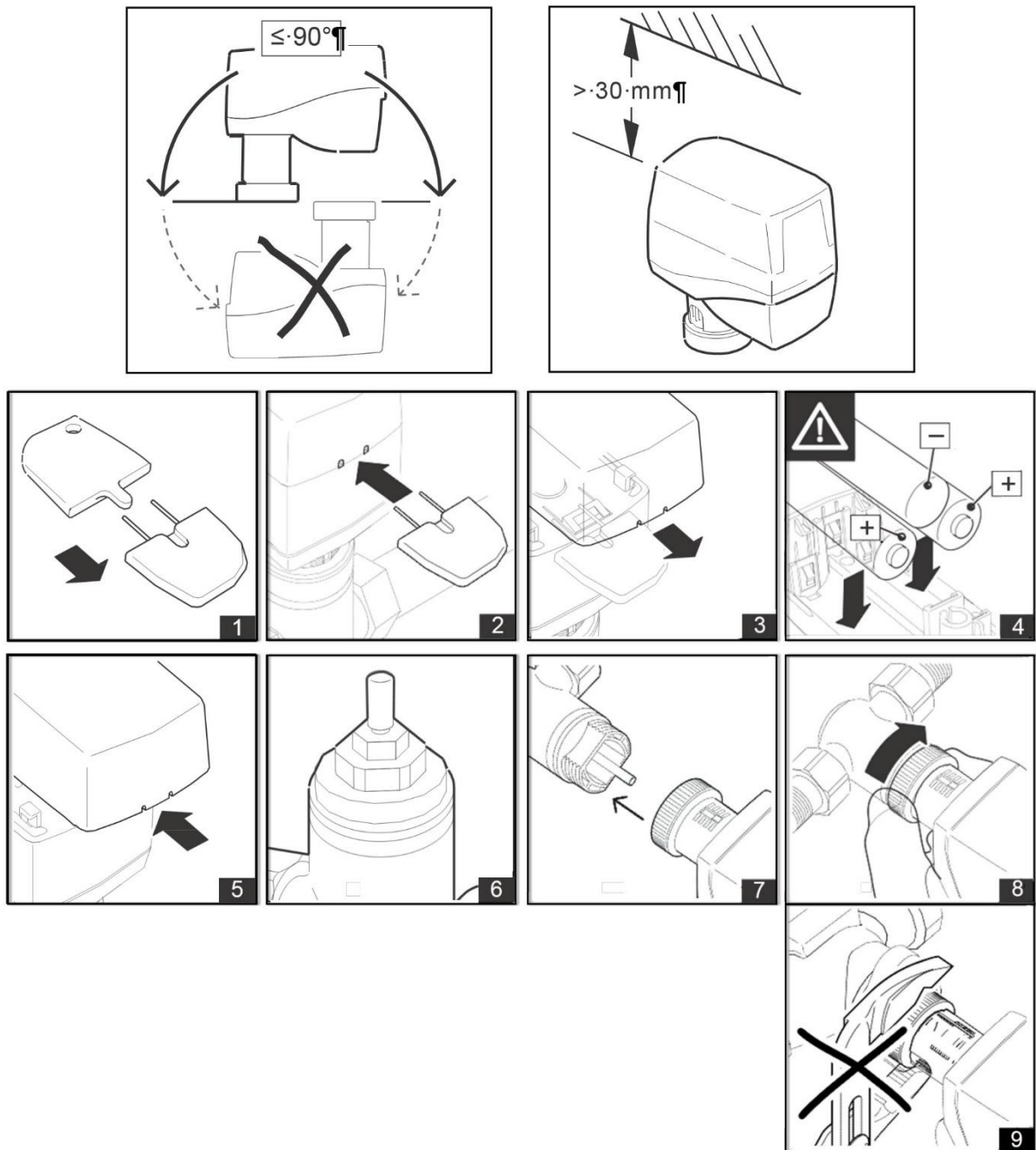
Wireless Interface

The communication with the MSG-Server or bidirectional gateway is cyclical, bidirectional and includes intelligent reception/transmission management.

Upon the first reception of the wireless telegram SAB05 automatically adapts its operating mode according to the method of control from the MSG-Server or bidirectional gateway (actuator mode or self-controlled mode).

If the communication with the MSG-Server or bidirectional gateway is disrupted, the "emergency mode" status bit (self-controlled mode) is set (can be evaluated for service diagnostics). After the malfunction has been rectified (details can be found in the documentation of the MSG-Server or bidirectional gateway), the MSG-Server or bidirectional gateway is automatically resynchronized.

NOTICE: This product uses only EnOcean telegrams When selecting a MSG-Server or bidirectional gateway, ensure that EEP A5-20-01 (Battery Powered Actuator) will be supported

Mounting Advices

Open the battery compartment cover using the key supplied (1) by inserting both pins into the intended place (2). Remove the cover (3). Insert the batteries correctly (4) and close the battery compartment cover (5). Place the SAB05 onto the threaded connection of the valve (6/7) and tighten hand-tight using the union nut (8/9).

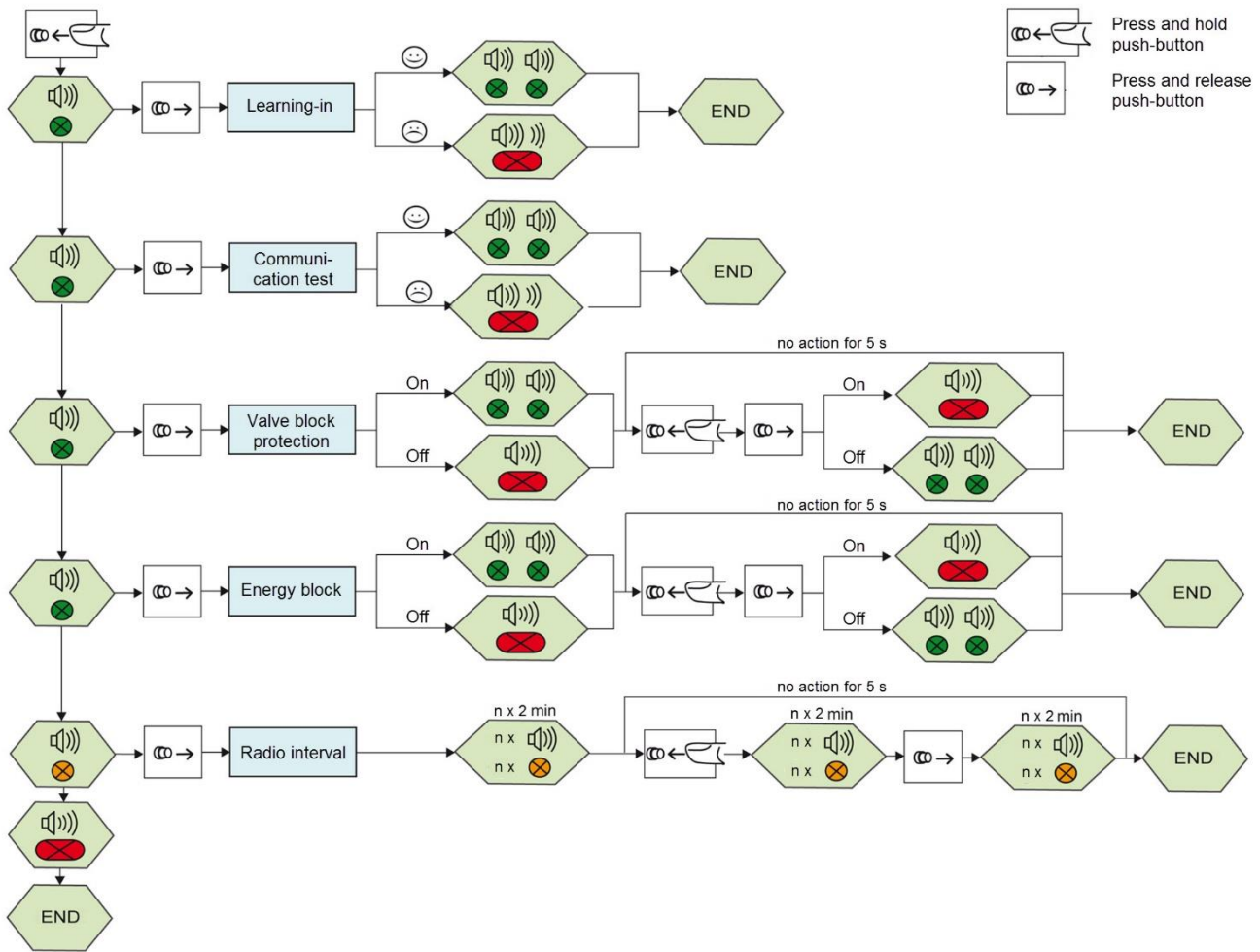**NOTICE - Insert the batteries with the correct polarity!**

When inserting the batteries, observe the polarity as marked in the battery compartment. Use only alkaline batteries (type: AA, LR6 1,5 V).

After changing the batteries, SAB05 enters storage mode and retracts the actuator spindle. When the actuator receives a wireless signal, it switches over to normal operation.
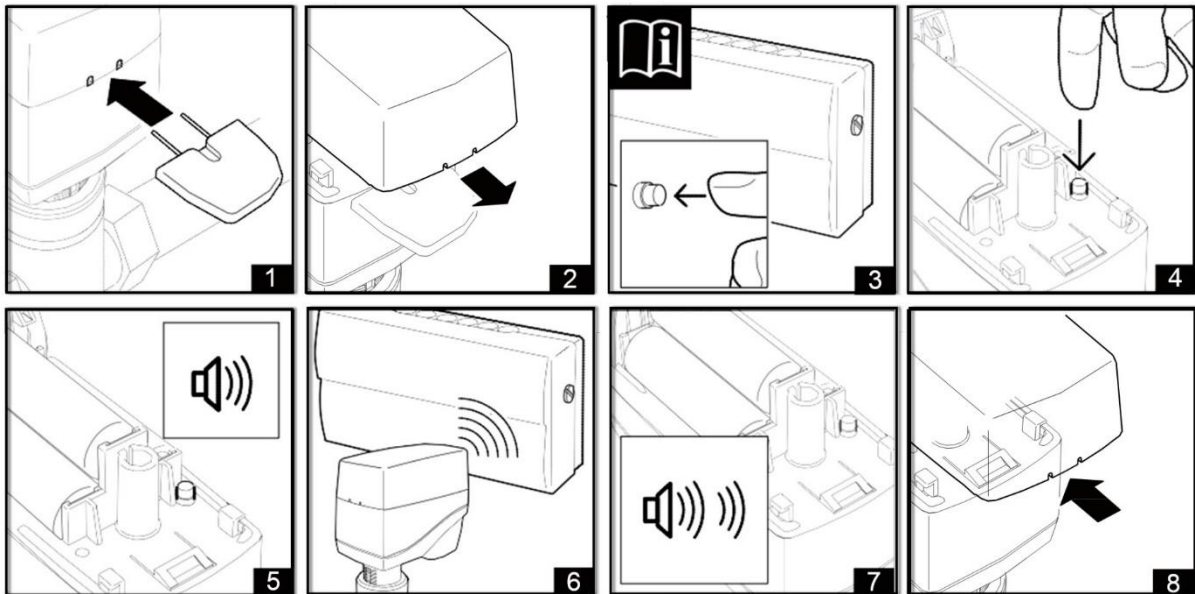
Learn-in shall take place within one hour after the batteries have been inserted. If the learn-in has not been done within 1 hour, SAB05 enters the emergency mode and controls the temperature from its internal temperature sensor.

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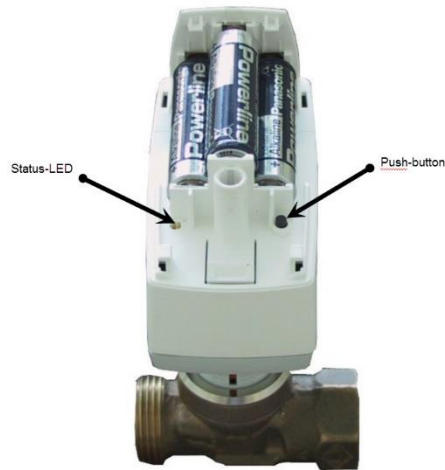SAB05_EasySens_Datasheet_en   © 2014

Commissioning

Overview of functions:

NOTICE: In addition to these instructions, the product descriptions of other system components, such as MSG-Server or bidirectional gateways, must be observed.

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

Learn-in procedure

Set the MSG-Server or bidirectional gateway to learn-in mode (3). For details see documentation of the MSG-Server or bidirectional gateway. To trigger a learn-in radio telegram at the SAB05 press and hold the push-button until a signal tone is heard and the Status LED lights up green (4).

Release the push-button. Learn-in procedure is started (5). The MSG-Server or bidirectional gateway confirms that the learn-in process was successful. For details see the documentation of the MSG-Server or bidirectional gateway.

The SAB05 confirms that the learn-in process has been successful (6/7) visually (Status-LED flashes 2 times in green) and audible (2 signal tones). An initialization run is automatically carried out.

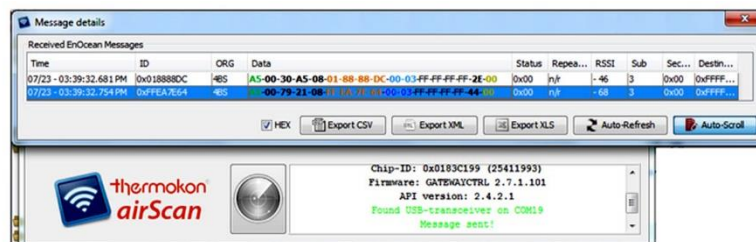Close the housing of the SAB05 by snapping on the cover (8).

Notes:

After the learn-in procedure has been successfully completed, the device ID of the MSG-Server or bidirectional gateway is permanently stored in the SAB05. There is no need to repeat the learn-in procedure again after replacing the batteries.

If the learn-in process was not successful, this is indicated visually (Status-LED flashes red for approx. 1 s) and audible (downward sequence of tones). Restart the learn-in process.

It is not possible to delete the device ID of the MSG-Server or bidirectional gateway which is saved internally the SAB05. The ID will be overwritten by the new wireless ID when a new learn-in process is performed.

Example: teach-in process initiated by SAB05 LRN telegram, recorded by AirScan:

Performing a communication test

Press the push-button and hold it until you hear 2 successive signal tones and the status LED flashes green 2 times. Release the push-button. After the push-button is released, the radio communication path to the MSG-Server or bidirectional gateway is checked. A successful communication test is indicated visually (status LED flashes green 2 times) and audible (2 signal tones).

A successful communication test may require an adjustment of the current valve position.

If the communication test has not been successful, this is indicated visually (status LED flashes red for approx. 1 s) audibly (downward sequence of tones).

SAB05 switches to emergency mode.

In case of a non-successful communication test, check the MSG-Server or bidirectional gateway and the wireless path.

Interruption of radio communication

If the communication with the MSG-Server or bidirectional gateway is interrupted for more than 1 h, the SAB05 switches to emergency mode and the "emergency mode" status bit (self-controlled mode) is activated. When a correct telegram is received, the SAB05 automatically returns to normal operation.

Switching the Valve Block Protection Feature On and Off

Press the push-button and hold it until you hear 3 successive signal tones and the Status-LED flashes green 3 times. Release the push-button. After the push-button has been released, the current status (on or off) is indicated visually and audibly.

Valve block protection feature on: Status LED flashes green 2 times and 2 signal tones are emitted

Valve block protection feature off: Status LED flashes red for approx. 1 s and a long signal tone is emitted

To change the status, the push-button has to be pressed and released within 5 s. The new function setting, either "valve block protection feature on" or "valve block protection feature off," is indicated visually and audibly as described above.

Factory setting: On

Switching the Energy Block Feature (Automatic "Window Open" Recognition) On and Off

Press the push-button and hold it until you hear 4 successive signal tones and the Status-LED flashes green 4 times.

Release the push-button. After the push-button has been released, the current status (on or off) is indicated visually and audibly.

Energy block feature on: Status LED flashes green 2 times and 2 signal tones are emitted

Energy block feature off: Status LED flashes red for approx. 1 s and a long signal tone is emitted

To change the status, the push-button has to be pressed and released within 5 s.

The new function setting, either "energy block feature on" or "energy block feature off," is indicated visually and audibly as described above.

Factory setting: On

Setting the radio communication interval

The transmission/reception interval can be set in 2 min increments from 2 min to 20 min.

Press the push-button and hold it until you hear 5 successive signal tones and the status LED flashes green 4 times and orange 1 time. Release the push-button. After the push-button has been released, the current radio communication interval is indicated visually and audibly

Wake up interval	Signal
2 min	Status-LED flashes 1x and 1 signal tone is emitted
4 min	Status-LED flashes 2x and 2 signal tones are emitted
..	..
20 min	Status-LED flashes 10x and 10 signal tones are emitted

To change the radio communication interval, the push-button has to be pressed and released within 5 s several times, until the desired radio communication interval has been reached.

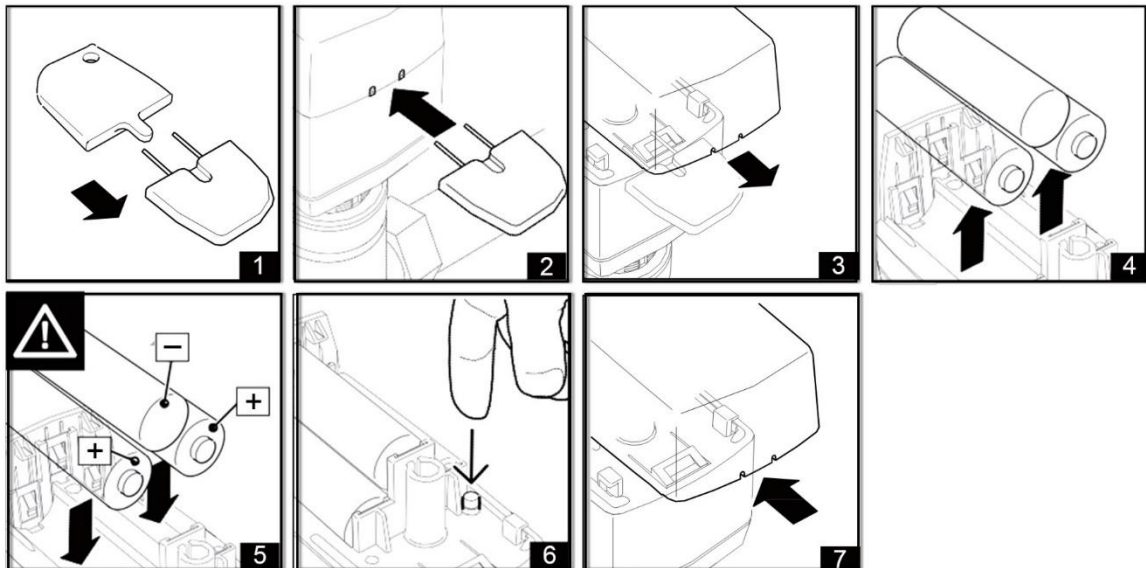The result is indicated visually and audibly as shown in above table "Wake up interval".

Release the push-button. The new radio communication interval is acknowledged once more visually and audibly;

Default setting: Wake up interval: 10 min

NOTE

To end the setting procedure press and hold the push-button until 6 successive signal tones are heard and the Status-LED flashes 6 times, the Status-LED lights up red and a long signal tone (approx. 1 s) is emitted the setting procedure is ended.

Replacing Batteries

Open the battery lid using the key supplied (1) by inserting both pins into the intended place (2). Remove the cover (3).

Remove the batteries (4).

Insert new batteries and briefly press the push-button (5/6).

Close the battery lid (7).

NOTICE - Insert the batteries with the correct polarity marked in the battery compartment. Only use alkaline batteries (type: AA, LR6 1,5 V). Do not use rechargeable batteries.
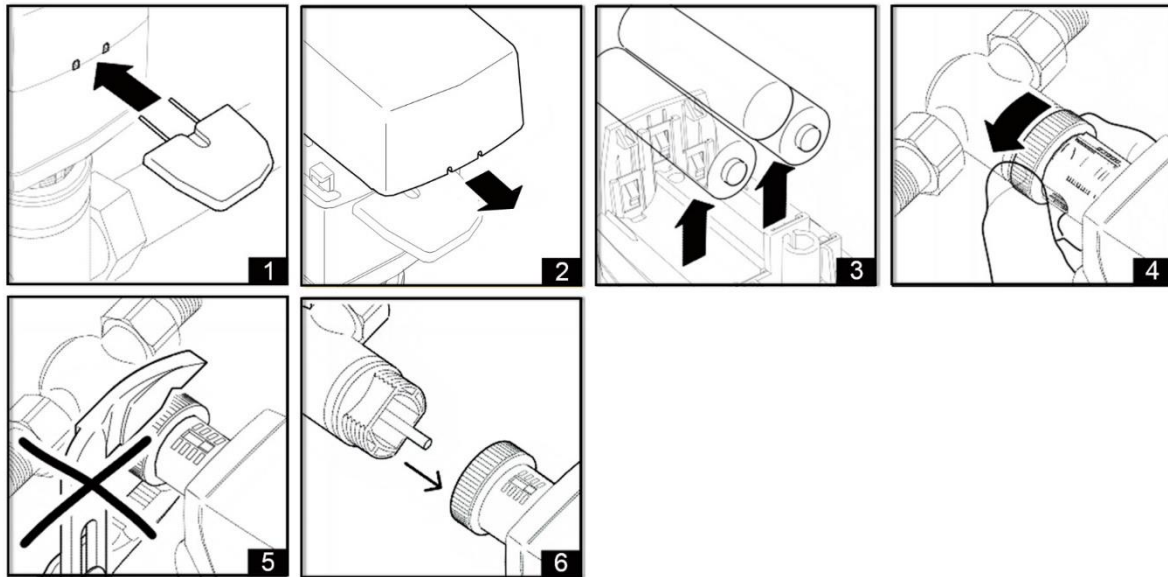
Notes:

After replacing the batteries, SAB05 starts in delivery status with the actuator's spindle fully retracted. After the SAB05 receives a wireless telegram, normal operation is started.

While batteries are inserted the SAB05 remains operational when taken off the radiator valve. Wait after replacing the batteries until SAB05 has fully retracted its spindle (delivery status) before reassembling on the valve.

Removing the device

CAUTION

Before removing SAB05, make sure that no differential pressure is built up in the valve body. If necessary, close the gate valve and turn off pumps. After the pipeline has cooled off, you can start removal of the SAB05.

Open the battery compartment cover using the key supplied (1) by inserting it into the intended place. Remove the cover (2). Remove the batteries (3). Loosen the union nut (4/5). Remove the SAB05 from the valve (6).

Dimensions (mm)