EN

Operation and installation manual
KNX IO 510 (2O)
(Art. # 5224)
Switching actuator with 2 outputs

KNX IO 510 (2O)

Application

The KNX IO 510 (2O) is a compact switching actuator with 2 bi-stable relay outputs. Each of these outputs can be connected as opener, closer or changer.

The actuator provides the function for universal outputs including scene control, timer, staircase lightning and to control heating valves (PWM for thermoelectric valve drives).

Two push buttons and three LEDs allow a local operation and a visualization of the device state.

In addition to the output channels the device includes 16 independent functions for logic or timer control.

1. Installation and Connection

The KNX IO 510 (2O) is designed for installation on a DIN rail (35 mm) with a width of 1 unit (18 mm). An installation-friendly design with pluggable screw terminals helps to reduce the cost of commissioning. It features the following controls and displays:
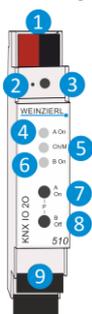
1 *KNX bus connector*
2 *Programming LED*
3 *Button f. programming mode*
4 *LED A/On (multicolor)*
5 *LED Ch/M (multicolor)*
6 *LED B/On (multicolor)*
7 *Button A/On*
8 *Button B/Off*
9 *Pluggable screw terminals*

This device is powered by the KNX bus. An external power supply is not necessary.

ℹ️ *The device is not working without bus power.*

A. KNX Programming mode

The KNX programming mode is activated/deactivated either by pressing the flushed KNX programming button ③ or by simultaneously pressing the buttons ⑦ and ⑧. Accessing the programming mode via the device front buttons can be enabled / disabled via the ETS® by changing the value of *Prog. mode on device front.*

When the programming mode is active, the programming LED ② and LED Ch/M ⑤ light red.

B. Manual operation and status display

The LED Ch/M ⑤ lights up or flashes if the device is successfully powered by the KNX bus.

By pressing button A ⑦ long, the manual operation mode will be entered for channel (A). This is indicated by cyclic single flashing of LED Ch/M ⑤ in orange.

By pressing button B ⑧ long, the manual operation mode will be entered for channel (B). This is indicated by cyclic double flashing of LED Ch/M ⑤ in orange.

The respective channel can be switched on with button On ⑦ and switched off with button Off ⑧.

The manual operation mode can be exit by pressing the buttons (Esc) ⑦ und ⑧ simultaneously.

The LED A ④ is used to display the status of the channel (A). It lights when the channel is on and is switched off when the channel is off. Analogously, the LED B ⑥ is used to display the status of the channel (B).

Summary of the states of LED Ch/M ⑤:

LED Status	Meaning
LED lights green	Device is working in standard operation mode.
LED lights red	Programming mode is active.
LED flashes 1x orange	Programming mode is not active. Manual operation is active. Switching first channel (A)
LED flashes 2x orange	Programming mode is not active. Manual operation is active. Switching second channel (B)
LED blinks red	Programming mode is not active. Manual operation is not active. The device is not properly loaded e.g. after an interrupted download.
LED blinks green	The device is currently loaded by the ETS.

2. Reset to factory device settings

It is possible to reset the device to its factory settings:

- Disconnect the KNX Bus connector ① from device
- Press the KNX programming button ③ and keep it pressed down
- Reconnect the KNX Bus connector ① of device
- Keep the KNX programming button ③ pressed for at least another 6 seconds
- A short flashing of all LEDs (② ④ ⑤ ⑥) visualizes the successful reset of the device to factory default settings.

3. Wiring scheme
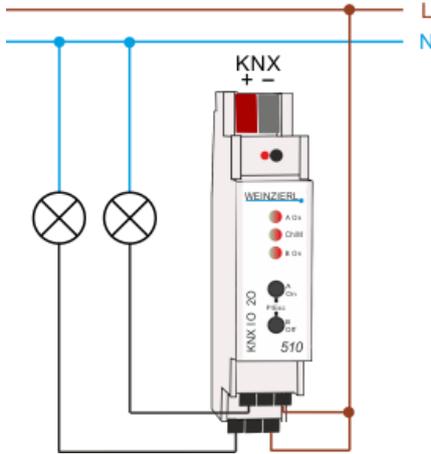
C. Pluggable screw terminals

The pluggable screw terminals 9 on the left terminal pins Ch A/B Out are used as closer. The central terminal pins Ch A/B !Out serve as openers. On the right terminal pins Ch A/B Cm the common pins are contacted e.g. the voltage to be switched. Channel A is located on the upper and Channel B on the lower terminal.

Ch A Out	Ch A !Out	Ch A Cm
Ch B Out	Ch B !Out	Ch B Cm

4. ETS database

The ETS database (for ETS 4.2 ETS and 5) can be downloaded from the product website of the KNX IO 510 (2O) (www.weinzierl.de) or via the KNX online catalogue.

ETS parameter dialog

The following pages and parameters are visible in the ETS.

D. Description:

The first page shows general information about the device.

E. General settings

Device name (30 Characters)

An arbitrary name can be assigned for the KNX IO 510 (2O). The device name should be meaningful, e.g. „Living Room". This helps the clarity of the ETS project.

Send delay after bus power return

A send delay of telegrams after the return of the bus voltage can be set via this parameter. In this case, telegrams from the device are sent to the KNX bus in a delayed manner by the set time. This results in a reduction of the bus load at a bus power return. Other functions such as receiving telegrams of switching operations of the actuator are not affected by this parameter.

Prog. mode on device front

In addition to the normal programming button 3 the device allows activating the programming mode on the device front without opening the switchboard cover. The programming mode can be activated and deactivated via pressing simultaneously both buttons 7 and 8 .

This feature can be enabled and disabled via the parameter "Prog. mode on device front". The recessed programming button 3 (next to the Programming LED 2) is always enabled and not influenced by this parameter.

Manual operation on device

This parameter is used to configure the manual operation on the device. The manual operation mode can be disabled or activated (with or without time limitation). The time limit defines the duration until the automatic return from the manual operation mode back into the normal operating mode.

The device is in normal operating mode when the manual control is not active. In the manual operating mode, received switching telegrams are ignored. When the manual operation mode is terminated (after expiry of the time limit or manually), the last state of the outputs remains, until a new switching telegram is received again.

The following options are selectable:

- Disabled
- Enabled with time limit 1 min
- Enabled with time limit 10 min
- Enabled with time limit 30 min
- Enabled without time limit

Heartbeat

Cyclic sending of values to the KNX-Bus, to indicate that the device is operational. For the *Cycle time* values between 1 min and 24h are selectable.

Group Object	Type KNX	Size	Direction
GO 1 Heartbeat - Trigger	1.001	1 Bit	To KNX

F. Actuator 1: General

1.1.1 KNX IO 510 (2O) > Channel A: Actuator > Actuator 1: General		
Description	Name	Actuator 1
General settings	Function	Universal output ▾
Logic / Timer	Scene function	◉ Disabled ◯ Enabled
	Send state	Cyclic and on change ▾
– Channel A: Actuator	Time for cyclic state	6 h ▾
Actuator 1: General	Behavior on bus power failure	No reaction ▾
+ Channel B: Actuator	Behavior after bus power return	State like before bus power failure ▾
	Lock function	◉ Disabled ◯ Enabled

Name (30 Characters)

An arbitrary name can be assigned for the channel. However, this should be clear and meaningful, this makes it easier to work with the associated group objects, because the given name is displayed there as a label. If no name is assigned, the group objects are named "Actuator A/B: …".

Function

This parameter defines the functionality of the actuator.

The following options are selectable:

- Disabled
- Universal output
- On/Off delay
- Staircase function
- Valve actuator (PWM for thermal servo)

A more detailed description of the functions can be found in the individual function descriptions under Function (…).

If the actuator is not "Disabled", the following parameters are displayed:

Behavior on bus power failure

The behavior which is held at the output during the bus power failure can be configured here.

The following options are selectable:

- No reaction
- Switch on
- Switch off

Behavior after bus power return

Here the behavior of the output after bus power return can be configured. This behavior will be set after every device restart (e.g. also on restart after ETS download).

The following options are selectable:

- No reaction
- Switch on
- Switch off
- State like before bus power failure

Send state

This parameter defines the behavior of the state objects:

- Disabled
  State objects are deactivated and not displayed

- Only on read
  State objects send only on request

- On change
  State objects send on value change

- Cyclic and on change
  State objects send cyclically and on value change

Group Object	Type KNX	Size	Direction
GO 18 Actuator 1: Output - State	1.001	1 Bit	To KNX
GO 19 Actuator 1: Valve actuator (PWM) – State*	5.001	1 Byte	To KNX

* if valve actuator was selected

Time for cyclic state

Is selected state object "Cyclic and on change", in this parameter the cycle time can be set.

Lock function

With this parameter the lock function can be enabled. If this functionality is activated, the associated group objects as well as the parameter page "Actuator 1/2: Lock function" are displayed for further configuration. If the lock has been activated via the group object "Lock", the received switching telegrams are not executed.

In addition to the lock object, there is also a priority object, which can be switched independently of the lock. Thus, it is possible to set an output state without affecting other functions.

Group Object	Type KNX	Size	Direction
GO 15 Actuator 1: Lock - Activate	1.001	1 Bit	From KNX
GO 16 Actuator 2: Prior. output - Switch	1.001	1 Bit	From KNX

Example of the priority object:

In the case of events in public buildings or in restaurants, the normal operation can be set into an inoperative state by the lock group object.

Thus it is possible to lock during the lecture or concert, switches that are accessible to unauthorized persons, in order to prevent unmeant switching.

Nevertheless, the individual lamps can controlled by use of the priority object without canceling the lock.

G. Lock function:

Polarity of object

This parameter defines, if the lock should be activated by receiving a 1 or by receiving a 0.

The following options are selectable:

- Lock active on 1

- Lock active on 0

Behavior on start

This parameter configures, which state the output should set, if the lock activates.

The following options are selectable:

- No reaction

- Switch on

- Switch of

This output state can still be changed by the priority object.

Behavior at end

This parameter defines, which state the output should set, if the lock deactivates.

The following options are selectable:

- No reaction

- Switch on

- Switch off

- State before lock

- State without lock

State before lock:
This restores the original state before the lock was activated. Switching telegrams received during the lock are ignored.

State without lock:
Here the state of the last received switching telegram is restored. This takes into account the received switching telegrams during the lock. Thus, when the lock is deactivated, the last received switching telegram is set.

Function (Universal output)

If the universal output is selected on the parameter page "Actuator 1/2: General", the actuator can be used as a switching output. A parameter for the scene function is also displayed.

Group Object	Type KNX	Size	Direction
GO 11 Actuator 1: Output - Switch	1.001	1 Bit	From KNX

Scene function

With this parameter the scene function can be enabled or disabled. If this functionality is enabled, the respective group object as well as the parameter page "Actuator 1/2: Scene function" are displayed for further configuration of scenes 1-16.

Group Object	Type KNX	Size	Direction
GO 12 Actuator 1: Scene – Activ./Lrn.	18.001	1 Bit	From KNX

H. Scene function:

Scene 1-16

These parameters can be used to configure the state, which is set at the output when the respective scene is executed.

The following options are selectable:

- No reaction

- Switch on

- Switch off

- Learnable

Learnable:
By using a scene control telegram, the current state at the output can be saved for the respective scene. This allows the user to customize the scene without ETS download.

Number

This parameter sets any scene number between 1 and 64 to the scene. There must not configured any scene numbers twice.

Function (On/Off delay)

If the ON/OFF delay is selected on the parameter page "Actuator 1/2: General", delayed switching times can be configured. The "Actuator 1/2: On/Off Delay" parameter page is displayed for this purpose.

Group Object	Type KNX	Size	Direction
GO 11 Actuator 1: Output - Switch	1.001	1 Bit	From KNX

I. On/Off delay:

On delay time

The duration of the switch-on delay is configured in this parameter.

```
Input    -------1------------------0----------
Output   -------|-T-1--------------0----------
```

Off delay time

The duration of the switch-off delay is configured in this parameter.

```
Input    -------1------------------0----------
Output   -------1------------------|-T-0------
```

Retriggerable

If these parameters are activated, the respective delay time is restarted upon receipt of the corresponding switching signal.

Function (Staircase function)

If the staircase function is selected on the parameter page "Actuator 1/2: General", a group object for the staircase function appears in addition to the normal switching object. Via the additional parameter page "Actuator 1/2: Staircase function" this function can be configured.

Group Object	Type KNX	Size	Direction
GO 11 Actuator 1: Output - Switch	1.001	1 Bit	From KNX
GO 13 Actuator 1: Staircase function - Trigger	1.010	1 Bit	From KNX

J. Staircase function:

Switch of time

The time for which the output is activated after an ON telegram (object of the staircase function) has been received, can set in this parameter.

```
Input    -------1------------------0----------
Output   -------1-T-0-------------------------
```

Retriggerable

This parameter can be used to set whether the follow-up time is to be restarted when an ON telegram is received on the object of the staircase function.

Reaction on 'OFF' telegram

This parameter can be used to set whether an OFF telegram on the object of the staircase function should be processed or ignored.

Time for warning before switch off

The time between pre-warning and deactivation is configured, or the pre-warning is deactivated with this parameter. If the pre-warning time is longer than the actual follow-up time, no pre-warning is carried out.

Time of interrupt

The pre-warning is indicated by a brief interruption (switch off -> switch on). The duration of this interrupt is configured in this parameter.

Note: LED lamps often have a long follow-up time, in which the lamp still lights even though it is already switched off. With such lamps longer interrupt times must be set to generate a "visible" interruption.

Function (Valve actuator)

The function valve actuator is foreseen to control thermoelectric valve drives which are used for floor heating but also for radiators. It maps the continuous position (0% - 100%) to an ongoing On/Off sequence called PWM (pulse width modulation) signal.

If the valve actuator is selected on the parameter page "Actuator 1/2: General", a group object for the valve actuator appears instead of the normal switching object. This allows the current PWM at the output to be set via KNX (0% - 100%). An additional parameter page "Actuator 1/2: Valve actuator" appears for the configuration of the valve actuator.

The received control value is saved automatically by the device, to continue faultless after a possible bus power loss.

Group Object	Type KNX	Size	Direction
GO 14 Actuator 1: Valve actuator (PWM) – Control value	5.001	1 Byte	From KNX

K. Valve actuator:

Cyclic time (PWM)

The cyclic time of the PWM, which is used to control a servo drive, is configured with this parameter. One cycle involves a time range in which the output is switched on and one in which the output is switched off. The cyclic time corresponds to the period between two rising edges (state change at the output from OFF to ON). The longer the flow of the heating circuit (tube / pipe length), the higher the cyclic time should be set.

Note: Typical thermal servo require several minutes for a 100% valve change.

Maximum control value (PWM)

This parameter can be used to limit the maximum control value. The control value is expressed in percent and defines the period during which the output is switched on in one cycle.

Example:
Cyclic time = 10 Min.
Maximum control value (PWM) = 80 %
Maximal output state = ON - 8 min / OFF - 2 min

Stuck protection

With the stuck protection, it is intended to prevent the valve from being damaged by corrosion or calcification, that it can no longer be moved. In case stuck protection is enabled, this is only triggered if the value is permanently 0 % or 100 %. On every other control value the servo already moves, so there is no need for a stuck protection.

Control value 0%   → Open servo for the set time
Control value 100%→ Close servo for the set time

In case the valve is not allowed to open, the stuck protection must be disabled.

Execution time

If the stuck protection is activated, this parameter is used to set the duration of the state change.

Monitoring interval

If the stuck protection is activated, this parameter sets the monitoring interval. If the state of the output remains unchanged for this time, the lock protection is triggered.

Protection on missing control value

This parameter enables the protection function on missing control value telegrams. This is necessary in order to prevent unwanted and uncontrolled overheating or cooling down of the room, when the control value is missing.

Protection takes effect, as soon as no telegrams are received from the controller over a longer period of time. As soon as this extended telegram pause has occurred, it can be assumed that the corresponding controller has failed or the connection between the controller and the valve actuator has been interrupted.

Protection control value (PWM)

If the protection on missing control value is enabled, this parameter sets a protection control value. This configured PWM value will set the output, if the protection is active.

As soon as telegrams from the controller are received again, the protection control value (PWM) is overwritten by the received value. The protection does not react again, until the waiting time in the set monitoring interval is exceeded between individual telegrams.

Monitoring interval

If the protection on missing control value is enabled, this parameter sets the monitoring interval. If no further telegram is received by the device during this time, the protection function takes effect.

Lock function (with valve actuator)

With this parameter the lock function can be disabled or enabled. If this functionality is activated, the associated group objects as well as the parameter page "Actuator 1/2: Lock function" are displayed for further configuration. If the lock has been activated via the group object "Lock", the received switching telegrams are not executed.

In addition to the lock object, there is also a priority object, which can be used to set a control value independently of the lock. Thus, it is possible to set an output PWM without affecting other functions.

When the lock is ended, the last received value (not priority object) is represented as PWM at the output.

Group Object	Type KNX	Size	Direction
GO 15 Actuator 1: Lock - Activate	1.001	1 Bit	From KNX
GO 17 Actuator 1: Prior. valve actuator (PWM) – Control value	5.001	1 Byte	From KNX

L. Lock function:

Polarity of object

This parameter defines, if the lock should be activated by receiving a 1 or by receiving a 0.

The following options are selectable:

- Lock active on 1

- Lock active on 0

Behavior on start

This parameter defines, which behavior the output should represent, if the lock activates.

The following options are selectable:

- No reaction

- Value

No reaction:
The PWM value remains as to begin of the lock function.

Value:
When the lock is activated, a defined PWM value is represented on the output.

Control value (PWM)

If a defined PWM value should be set to the output when the lock is activated, this value can be set with this parameter.

M. Logic / Timer

Function 1 - 16

These channels contain additional functions such as timing and logic. All these 16 additional functions are identical.

The following options are selectable:

- Disabled

- Timer

- Logic

Function type (Disabled)

If the function type is set to "Disabled", no timer or logic specific parameters and group objects are available.

Function type (Timer)

The timer-specific parameters and group objects are available.

Function type (Logic)

The logic-specific parameters and group objects are available.

Note: These additional logic and timer functions can be linked to one another by means of the associated group objects. This also allows to create complex structures. For this purpose, the output of a function is set to the same group address as the input of the next function.

N. Function 1 – 16 (Timer)

```
1.2.3 KNX IO 510 (2O) > Function 1 > Fcn 1: Timer

    Description              Function name          Fcn 1

    General settings         Timer type             Switch-on delay              ▼

    Logic / Timer            Delay time [s]         60                           ⬍

  +  Channel A: Actuator     Output                 ◉ Not inverted  ○ Inverted

  +  Channel B: Actuator

  –  Function 1

     │  Fcn 1: Timer

  +  Function 2
```

Function name (10 Characters)

The function name can be chosen freely.
The name is visible in the group object entry in the ETS software. This makes it easier to work with the associated group objects, because the given name is displayed there as a label.

Timer type (Switch-on delay)

A timer that switches ON after duration defined in
'Delay time [s]' parameter.
The output value can be inverted by parameter
'Output' (Not inverted / Inverted).

Input `-------1------------------0----------`
Output `-------|-T-1--------------0----------`

Group Object	Type KNX	Size	Direction
Timer – Switch-on delayed - Input	1.002	1 Bit	From KNX
Timer – Switch-on delayed - Output	1.002	1 Bit	To KNX

Timer type (Switch-off delay)

A timer that switches OFF after duration defined in
'Delay time [s]' parameter.
The output value can be inverted by parameter
'Output'. (Not inverted / Inverted)

Input `-------1------------------0----------`
Output `-------1------------------|-T-0------`

Group Object	Type KNX	Size	Direction
Timer – Switch-off delayed - Input	1.002	1 Bit	From KNX
Timer – Switch-off delayed - Output	1.002	1 Bit	To KNX

Timer type (Switch-on and -off delay)

A timer that switches ON and OFF after duration defined in
'Delay time [s]' parameter.
The output value can be inverted by parameter
'Output'. (Not inverted / Inverted)

Input `-------1------------------0----------`
Output `-------|-T-1--------------|-T-0------`

Group Object	Type KNX	Size	Direction
Timer – Switch-on/off delayed - Input	1.002	1 Bit	From KNX
Timer – Switch-on/off delayed - Output	1.002	1 Bit	To KNX

Timer type (Impulse (Staircase))

Timer with impulse that – after being switched **ON** – **automatically switches OFF** after a defined duration defined in
'Delay time [s]' parameter.
The output value can be inverted by parameter
'Output'. (Not inverted / Inverted)

Input `-------1------------------0----------`
Output `-------1-T-0------------------------`

Group Object	Type KNX	Size	Direction
Timer – Switch-impulse (staircase) - Input	1.002	1 Bit	From KNX
Timer – Switch-impulse (staircase) - Output	1.002	1 Bit	To KNX

ℹ️ *Each timer can be stopped by sending the opposite value to its input group object.*
For example:
An already started switch on timer can be stopped by sending OFF (0) to its input group object.

O.   Function 1 – 16 (Logic)

Group Object	Type KNX	Size	Direction
Logic – Gate input A - Input	1.002	1 Bit	From KNX
Logic – Gate input B - Input	1.002	1 Bit	From KNX
Logic – Gate output – Output	1.002	1 Bit	To KNX

Function name (10 Characters)

The function name can be chosen freely.
The name is visible in the group object entry in the ETS software. This makes it easier to work with the associated group objects, because the given name is displayed there as a label.

Gate type (AND gate)

The output is triggered on (1), if both inputs are switched on (1).

Gate type (OR gate)

The output is triggered on (1), if one or both inputs are switched on (1).

Gate type (XOR gate)

The output is triggered on (1), if the two inputs are not equal.

Gate type (NAND gate)

The output is triggered on (1), if one or both inputs are switched off (0).

Gate type (NOR gate)

The output is triggered on (1), if both inputs are switched off (0).

Gate type (XNOR gate)

The output is triggered on (1), if both inputs are equal.

Gate type (INVERTER)

Input on (1) is converted into output off (0). Input off (0) is converted into output on (1).

Group Object	Type KNX	Size	Direction
Logic – Gate input - Input	1.002	1 Bit	From KNX
Logic – Gate output – Output	1.002	1 Bit	To KNX

⚠ WARNING

- The device must be mounted and commissioned by an authorized electrician.
- The prevailing safety rules must be heeded.
- The device must not be opened.
- For planning and construction of electric installations, the relevant guidelines, regulations and standards of the respective country are to be considered.
- The device is a permanently connected equipment: A readily accessible disconnect device shall be incorporated external to the equipment.
- The installation requires a 16 A fuse for external overcurrent protection.
- The power rating is indicated on the side of the product.