

KNX Motion Sensor



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1 Device Template

Input		KNX Sensor	Output
	DPT_PIR_THERESHOLD		DPT_Output3_ON/OFF
	DPT_OUTPUT1_ON		DPT_Output1_ON/OFF
	DPT_LUX_THRESHOLD		DPT_Output2_ON/OFF
	DPT_OUTPUT2_ON		DPT_PIR_CYCLIC
	DPT_RemotePresence_CH1		DPT_LUX_CYCLIC
	DPT_RemotePresence_CH2		
	DPT_RemotePresence_CH3		
	DPT_RemotePresence_CH4		
		Parameters	
		PAR_PIR_THRESHOLD	
	PAR_OUTPUT3_MOTION_CHECK_TIME		
		PAR_OUTPUT1_TIME_ON	
		PAR_LUX_THRESHOLD	
		PAR_OUTPUT2_TIME_ON	
		PAR_CYCLIC_LUX_SEN D_TIME	
		PAR_CYCLIC_PIR_SEN D_TIME	
		PAR_PwrOnLightStatus	
		PAR_EnableASO	

1.1 Table of communication objects

Datapoint	DPT	Flags
DPT_Output3_ON/OFF	DPT_Switch (1.001)	C-R-T
DPT_Output1_ON/OFF	DPT_Switch (1.001)	C-R-T
DPT_Output2_ON/OFF	DPT_Switch (1.001)	C-R-T
DPT_LUX_CYCLIC	DPT_Value_Lux (7.013)	C-R-T
DPT_PIR_CYCLIC	DPT_Scaling (5.001)	C-R-T
DPT_PIR_THERESHOLD	DPT_Scaling (5.001)	R-W
DPT_OUTPUT1_ON	DPT_TimePeriodSec (7.005)	R-W
DPT_LUX_THRESHOLD	DPT_Value_Lux (7.013)	R-W
DPT_OUTPUT2_ON	DPT_TimePeriodSec (7.005)	R-W
DPT_INPUTn_REMOTE 1≤n≤4	DPT_Switch (1.001)	R-W

1.1.1 Name of communication objects in the product descriptor

Datapoint	Name	Function
DPT_Output3_ON/OFF	Presence	On/Off presence
DPT_Output1_ON/OFF	Light Switch	On/Off light
DPT_Output2_ON/OFF	Relay Switch	On/Off 2nd output
DPT_LUX_CYCLIC	Light Lux	Lux lightness detection
DPT_PIR_CYCLIC	Motion Detection (%)	Percentage motion detection
DPT_PIR_THERESHOLD	Motion Threshold (%)	Percentage motion threshold
DPT_OUTPUT1_ON	Light Time (sec)	Time light On
DPT_LUX_THRESHOLD	Minimum Brightness (lux)	Lux luminosity min
DPT_OUTPUT2_ON	Relay Time (sec)	Time relay On
DPT_INPUTn_REMOTE 1≤n≤4	Remote Presence Channel n	Remote Presence detection n

1.2 Detailed description of the communication objects

1.2.1 DPT_Output3_ON/OFF (1.001 Switch)

The DPT_Output3_ON/OFF message, in Slave mode (i.e. when the DPT_Output3_ON/OFF of no other device is connected to any DPT_INPUTn_REMOTE remote channel) is relayed with ON value as soon as the signal module detected by the motion sensor differs from the V_POL value of polarization (absence of motion) by a percentage amount equal to the threshold set by the **PAR_PIR_THRESHOLD** parameter, i.e. when

$$|V_{PIR} - V_{POL}| / V_{POL} > PAR_PIR_THRESHOLD \quad (1.0)$$

Subsequently, each time that the device, while monitoring the sensor's signal, detects that the threshold has been exceeded (in module), it resets the motion timer. When no motion is detected for a period exceeding the value of the **PAR_OUTPUT3_MOTION_CHECK_TIME** parameter, a message with OFF value is sent, and the transmission cycle resumes. The threshold value can be changed run-time by the DPT_PIR_THRESHOLD message. Upon reboot, the threshold and the DPT_PIR_THRESHOLD datapoint assume the default value indicated by the corresponding parameter. Figure 1 shows an example of the sending of this message with timeout unchanged since last reboot of the device.

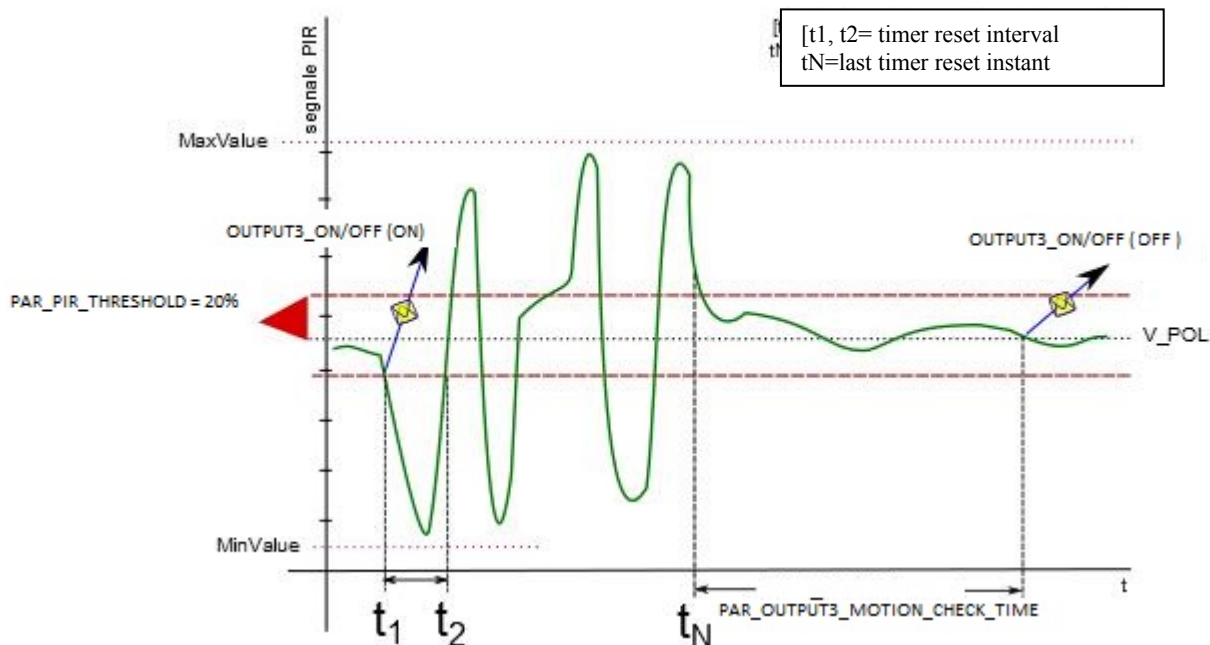


Figure 1: example of presence message sending

If the polarization value is for example 1.8V then a threshold of 20% is equal to 360mv. At instant t1, a presence message (ON) is relayed. From instant t6 onwards, the signal remains within the threshold values, and after timeout, a value of OFF is sent.

1.2.1.1 Master / Slave Function

The Master / Slave function is used to acquire information on the presence from other remote sensors. Up to 5 separate sensors can be connected. The Master / Slave function is activated by interconnecting the DPT_Output3_ON/OFF of a remote device with one of the four DPT_INPUTn_REMOTE channels. This way, all devices can be both master and slave in motion detection. A device will only work as a slave when its four input channels are floating, i.e. not connected to the DPT_Output3_ON/OFF belonging to some other devices.

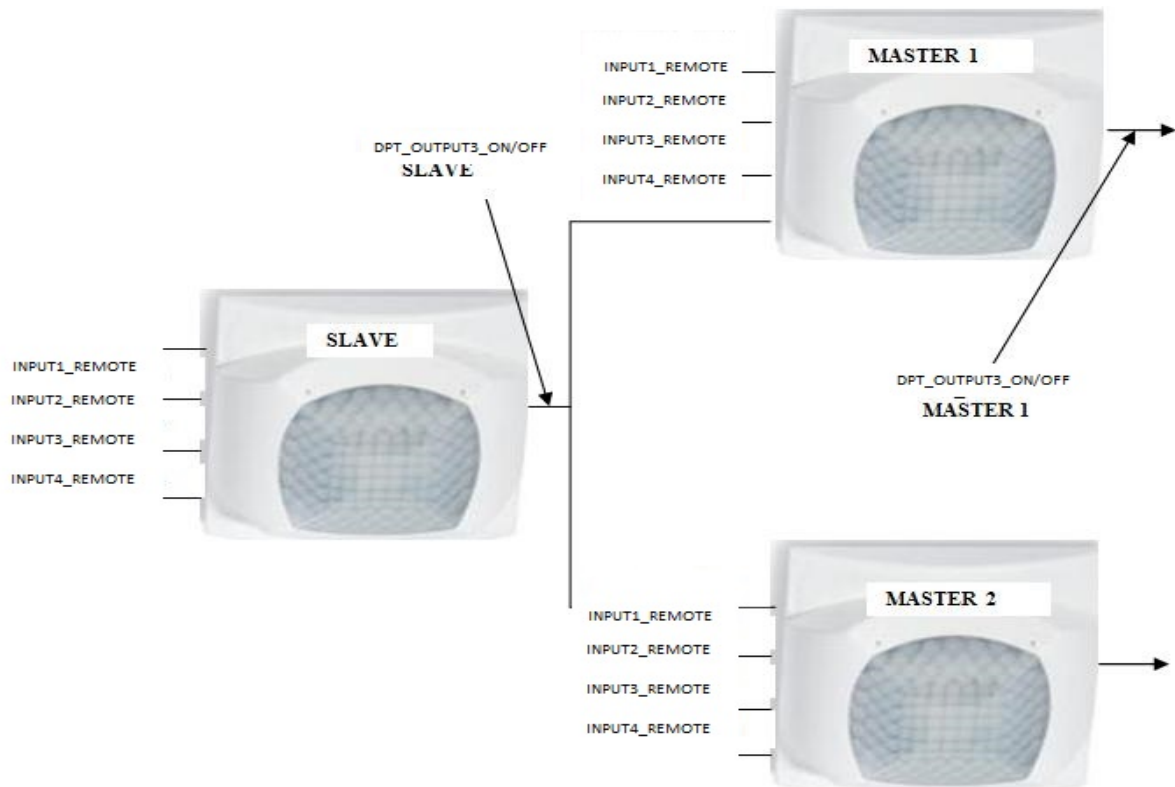


Figure 2: example of Master / Slave function

Moreover, the devices functioning as a Master monitor the OR status of the 4 input channels for remote presence. Therefore, the DPT Presence in such devices has the following logic:

- 1) As soon as the sensor detects movement, or the OR of the 4 channels is ON, DPT_Output3_ON/OFF=ON is sent;
- 2) If no movement is detected by the sensor and all the channels are in the OFF position for a period of time exceeding the PAR_OUTPUT3_MOTION_CHECK_TIME (no presence), DPT_Output3_ON/OFF=OFF is sent.

In other words, the presence status (DPT_Output3_ON/OFF = ON) also occurs each time at least one of the four channels is ON, while the status of absence (DPT_Output3_ON/OFF = OFF) occurs if all the channels are OFF and the sensor does not detect motion for a period of time greater than the timeout set.

Figure 2 is an example of 3 devices, 2 Masters and 1 Slave. The DPT_Output3_ON/OFF of the Slave is connected to the Presence_CH4 channel of Master 1 and to the Presence_CH1 of Master 2. Each time the Slave sensor detects a motion status in the manner described in paragraph 1.2.1, it sends DPT_Output3_ON/OFF = ON to the above mentioned input channels of the two Masters, which in turn will send DPT_Output3_ON/OFF = ON as a result of the OR=1 status, even if their sensors do not detect motion.

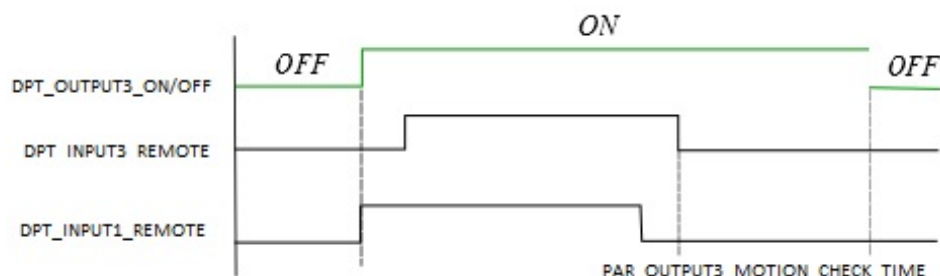


Figure 3: example of remote presence detection

Figure 3 is an example of the status change of the DPT_Output3_ON/OFF value for a Master connected to 2 Slaves via the DPT_Presence_CH1 and DPT_Presence_CH3 input channels, when its sensor does not reveal any motion (remote presence only).

1.2.2 DPT_Output1_ON/OFF (1.001 Switch)

The DPT_Output1_ON/OFF message is sent with ON value every time the following conditions are satisfied:

- the pyroelectric sensor detects the motion status expressed by (1.0) or at least one of the DPT_INPUTn_REMOTE = ON channels;
- the light sensor detects brightness lower than the minimum desired value.

The condition b) can be disabled through the **PAR_EnableASO** parameter, so that the lights controlled by an actuator that receives the message are always lit under the presence status a). The minimum brightness value is set by means of the **PAR_LUX_THRESHOLD** parameter and can be changed through run-time via the DPT_LUX_THRESHOLD message, which is valid until the next reboot of the device.

As a result, the DPT_Output1_ON/OFF message can activate a light actuator which will switch on for a minimum time equal to the time-out time, corresponding to the **PAR_OUTPUT1_TIME_ON** parameter (default value) or to the value sent via the DPT_OUTPUT1_ON message i.e., a temporary value until the next reboot of the device. Once the time period expires in the no presence status, the DPT_Output1_ON/OFF is sent with OFF value and the light goes off. Figure 4 refers to a Slave device and shows an example of the messages sent in case the motion threshold has never been changed through the DPT_PIR_THRESHOLD datapoint, under the condition that the brightness is inferior to the minimum value (condition b).

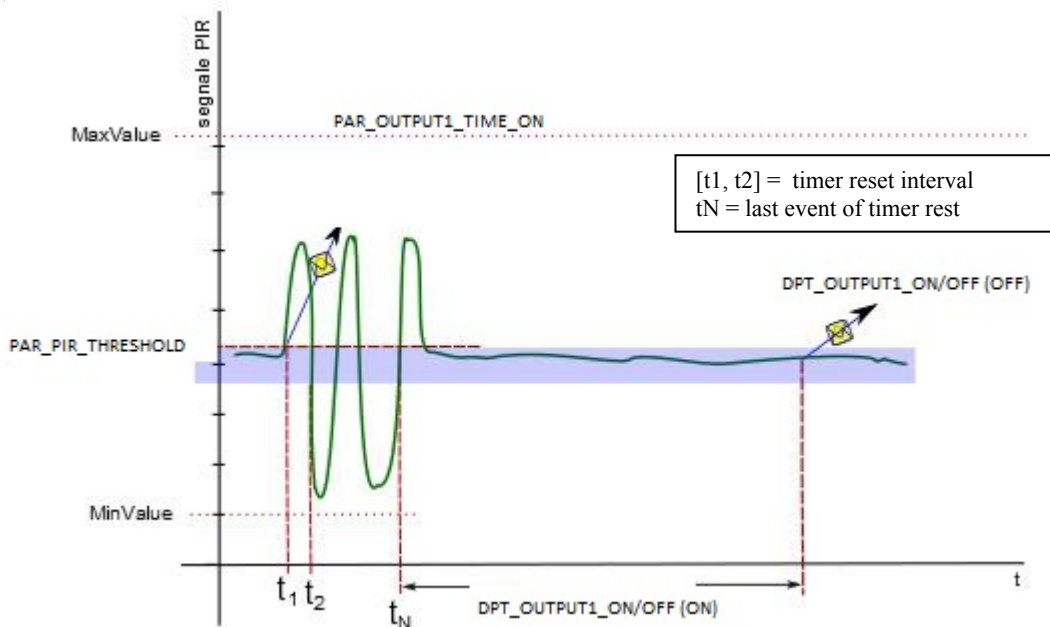


Figure 4: example of DPT_Output1_ON/OFF sending

At instant t_1 , the motion threshold is exceeded and the activation message sent. At the same time, the sleep timer is reset. Timer resetting occurs whenever the value of the threshold is exceeded, as for t_2 and t_5 . Upon timeout from the last reset, the shut down message is sent.

On powering the sensor, or after a reset due to its reprogramming via ETS, the DPT_Output1_ON/OFF message is sent with a value selected from the **PAR_PwrOnLightStatus** parameter, irrespective of the movement and / or brightness statuses. Subsequently, the sensor waits for a period of approximately 26 seconds, after which it resumes the logic of message sending described in the present paragraph.

1.2.3 DPT_Output2_ON/OFF (1.001 Switch)

The DPT_Output2_ON/OFF message is sent from a device whenever the presence status is met, i.e. when the pyroelectric sensor detects the motion status expressed by (1.0), or at least one of the DPT_Presence_CH = ON channels. With this communication object, control of a generic device such as a fan coil, a second row of lights in the simple On/Off mode, etc. can be gained via the input channel of an actuator. The access time of the peripheral device is specified by the **PAR_OUTPUT2_TIME_ON** parameter, or by the value sent via the DPT_RelayTimeout message, a temporary value set until the next reboot of the device. After this time, the DPT_Output2_ON/OFF message is sent with OFF value and the peripheral device controlled with this second output switches off. The management logic of the power-on time according to the presence status is identical to that specified in section 1.2.2 for the DPT_Output1_ON/OFF message.

1.2.4 DPT_PIR_THRESHOLD (5.001 Scaling)

This message temporarily modifies the motion detection threshold, which is set to the default value, by means of the **PAR_PIR_THRESHOLD** parameter, which is not overwritten by the new value. By sending the message to the device, the DPT_Output3_ON/OFF will be sent in the set status only when the output signal from the motion sensor exceeds the new threshold value. Figure 5 shows an example of motion threshold setting greater than that defined by the parameter value for a device operating in Slave mode.

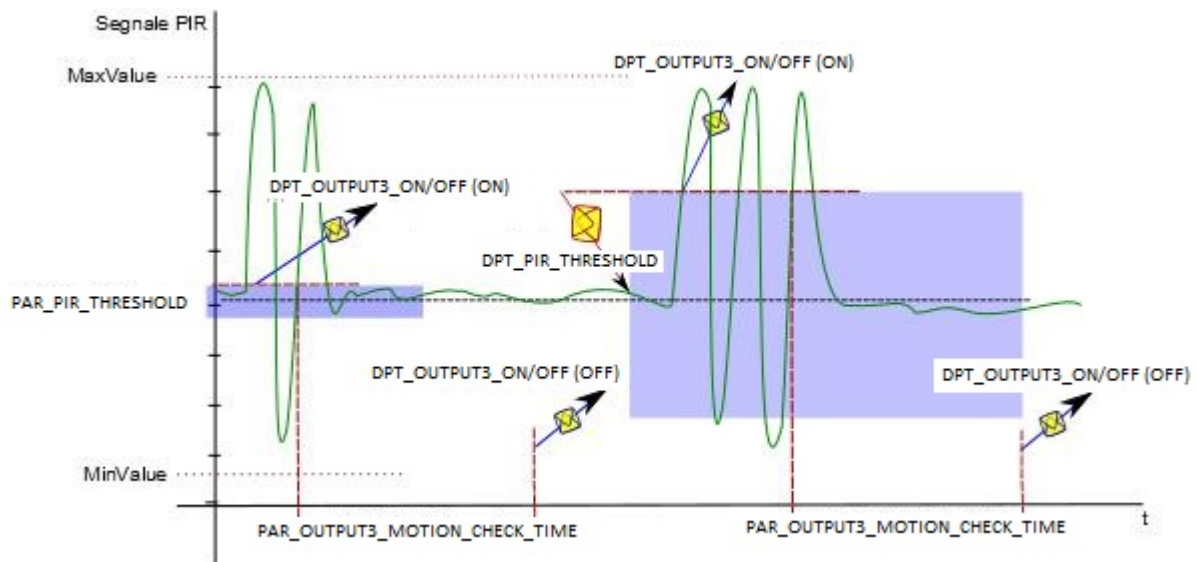


Figure 5: example of motion threshold variation with DPT_PIR_THRESHOLD

1.2.5 DPT_OUTPUT1_ON (7.005 TimePeriodSec)

The DPT_SetLux Timeout message temporarily sets the value of the maximum time for switching on the lights of an actuator in the absence of motion, without overwriting the corresponding parameter. Figure 6 shows an example with modification of the turn-on timeout from 1 to 2 minutes.

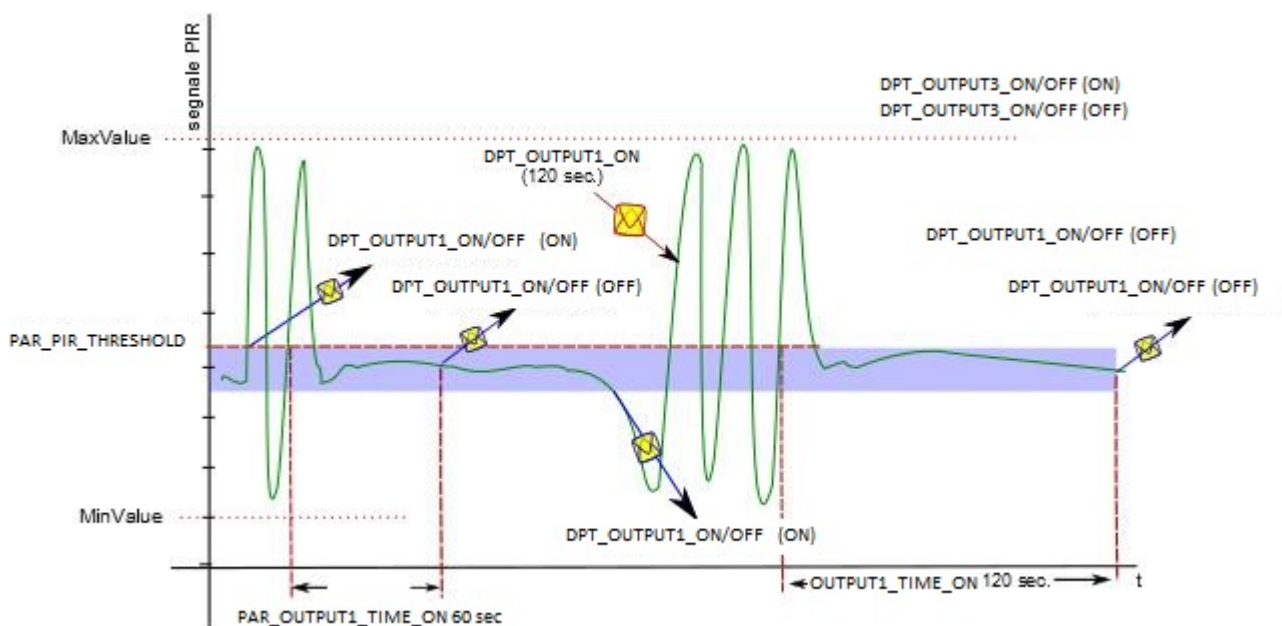


Figure 6: example of setting of the timeout for switching on lights

1.2.6 DPT_LUX_THRESHOLD (7.013 Brightness)

The DPT_LUX_THRESHOLD message is sent to the device to change the minimum required brightness temporarily. Upon reboot, it assumes the default value represented by the **PAR_LUX_THRESHOLD** parameter, which is not overwritten by the set value.

In the presence of the motion status and with ASO (Automatic Switch On / Off) mode enabled by the **PAR_EnableASO** parameter = ON, if the message is sent with the datapoint value set as 0, the DPT_Output1_ON/OFF datapoint will never be sent (lights always Off). If instead the value is higher than the brightness maximum value detectable by the light sensor MaxValue, then the DPT_Output1_ON/OFF message will always be sent (Lights always On), independently of the brightness measured. Figure 7 shows an example of the operation of this communication object for a Slave device.

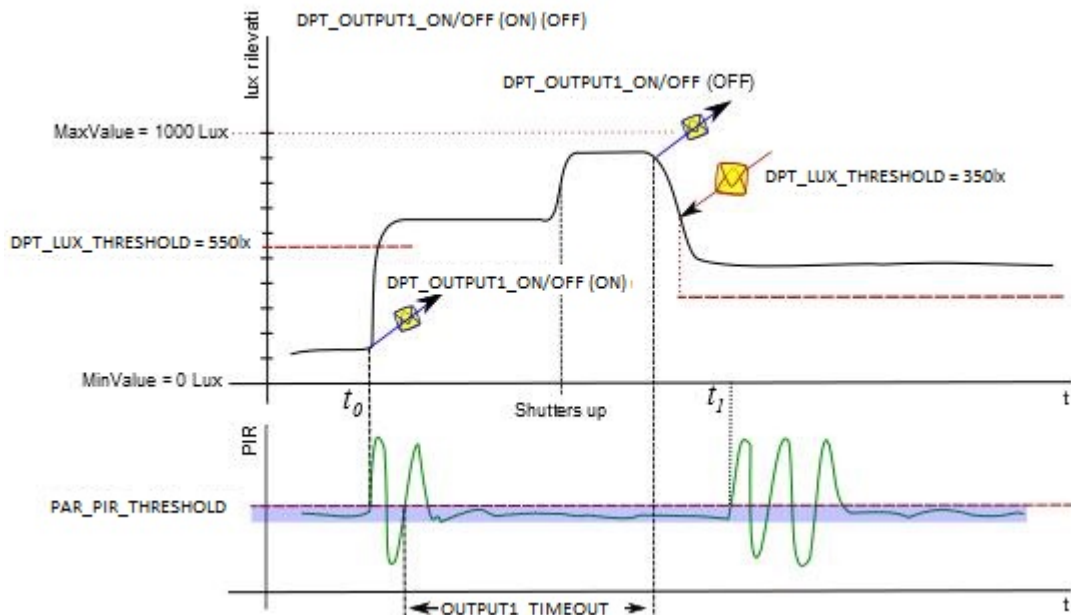


Figure 7: example of variation of minimum brightness in ASO mode

Upon first motion detection (t_0), the switch on lights message is sent, and the brightness of the lights will change from 100lux to 650lux once they are on. After the blinds have been raised, and a value of 950lux is reached as a result, the lights will go out once the timeout has elapsed and the brightness, having lost their contribution, sets to approximately 400lux. If in the meantime the device has received a DPT_LUX_THRESHOLD message with the value displayed in the example, upon the next motion detection (t_1) the lights remain off, since the sending status for the DPT_Switch with value ON is not checked for.

1.2.7 DPT_LUX_CYCLIC (7.013 Brightness)

This message sends the brightness value detected by the device light sensor. The sending mode is cyclical and set by the **PAR_CYCLIC_LUX_SEND_TIME** parameter. Figure 8 shows an example of sending with 5-second PAR_CYCLIC_LUX

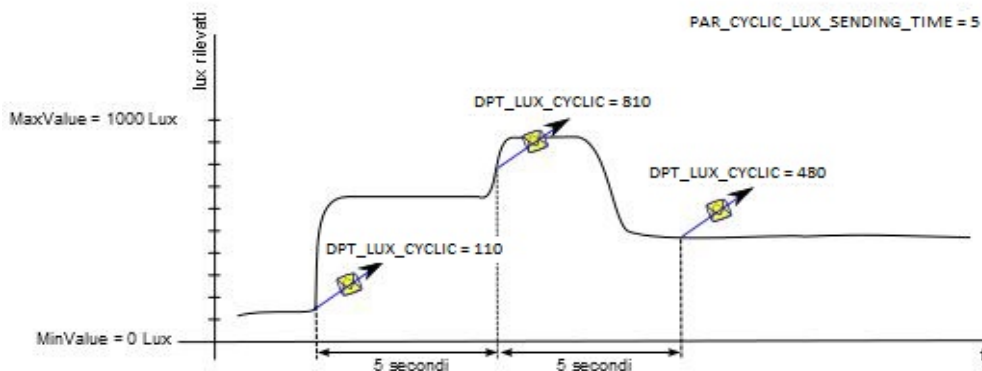


Figure 8: cyclical sending of brightness

1.2.8 DPT_PIR_CYCLIC (5.001 Scaling)

This message sends the percentage value of the signal detected by the device pyroelectric sensor. The sending mode is cyclical and set by the **PAR_CYCLIC_PIR_SEND_TIME** parameter. The principle of operation is the same as the DPT_LUX_CYCLIC message shown in Figure5 for the similar datapoint referred to the brightness value.

1.2.9 DPT_OUTPUT2_ON (7.005 TimePeriodSec)

The DPT_OUTPUT2_ON message temporarily sets the value of maximum access time of the device controlled via the second DPT_Output2_ON/OFF output channel in the absence of motion, without overwriting the corresponding parameter.

1.2.10 DPT_INPUTn_REMOTE, $1 \leq n \leq 4$ (1.001 Switch)

These are four input channels for the device, through which the [Master /Slave](#) mode can be obtained, during detection of the presence status. They can be fed DPT_Output3_ON/OFF messages from four remote devices.

1.3 List of configuration parameters

Parameter	Default Value
PAR_PIR_THRESHOLD	30
Motion Threshold	
PAR_OUTPUT3_MOTION_CHECK_TIME	1
Timeout since last detection of motion status (presence)	
PAR_OUTPUT1_TIME_ON	1
Timeout of switching on lights since last detection of motion	
PAR_LUX_THRESHOLD	250
Minimum value of requested illumination	
PAR_CYCLIC_LUX_SEND_TIME	5
Sets the cycle time of DPT Light Value Message sending	
PAR_CYCLIC_PIR_SEND_TIME	5
Sets the cycle time of DPT Motion Value Message sending	
PAR_EnableASO	DISABLE
Enable brightness control for switching on the lights within the Automatic Switch On / Off mode	
PAR_OUTPUT2_TIME_ON	1
Timeout power of the second peripheral device since last detection of motion	
PAR_PwrOnLightStatus	OFF
Defines the DPDT switch Light status at device power-on or after a restart by ETS	

1.3.1 Name of parameters in the product descriptor

Parameter	Name
PAR_PIR_THRESHOLD	PIR Threshold (%)
PAR_OUTPUT3_MOTION_CHECK_TIME	Motion Check Time (multiple of 100ms)
PAR_OUTPUT1_TIME_ON	Light Time (sec)
PAR_OUTPUT2_TIME_ON	Relay Time (sec)
PAR_LUX_THRESHOLD	Minimum Lux (lux)
PAR_CYCLIC_LUX_SEND_TIME	Cyclic Lux Time (sec)
PAR_CYCLIC_PIR_SEND_TIME	Cyclic Pir Time (sec)
PAR_EnableASO	ASO (Automatic Switch Light On/Off)
PAR_PwrOnLightStatus	Light Status at Power On

1.4 Detailed description of the Configuration Parameters

1.4.1 PAR_PIR_THRESHOLD

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: 15÷100

It defines the percentage variation compared to the polarization voltage (threshold) of the signal detected by the pyroelectric sensor to state the motion status, in order to send the corresponding DPT_Output3_ON/OFF message. It represents the default value assigned to the DPT_PIR_THRESHOLD datapoint upon device reboot.

1.4.2 PAR_OUTPUT3_MOTION_CHECK_TIME

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [1÷65535]

It defines the time in multiples of 100 ms before sending the message DPT_Output3_ON/OFF = OFF since last reset of the motion scanning timer. It serves to filter the sending of the message that states the absence of motion. The values to be set will be chosen according to the sensor signal dynamic as multiples of 0.1 seconds (e.g.. 100ms = 1, 1000ms = 10, 1500ms = 15, etc).

1.4.3 PAR_OUTPUT1_TIME_ON

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [1÷65535]

It defines the wait time in seconds for the lights of an actuator, once lit, to turn off if no motion is detected. The following table shows the significant values. This represents the default value assigned to the DPT_SetMotionTimeout datapoint upon reboot of the device.

Value	Description	Condition
1<x≤65535	Timeout after x seconds (Max 18.2 h)	Once the lights are on, they will switch off after X amount of seconds since last detected motion.

Table 1: description of values for the LuxTimeout parameter

1.4.4 PAR_OUTPUT2_TIME_ON

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [1÷65535]

It defines the waiting period in seconds so that the device driven by the output relay, once turned on, will turn off while motion is absent. The following table shows the significant values. This represents the default values assigned to the datapoint DPT_OUTPUT2_ON upon reboot of the device.

Value	Description	Condition
1<x≤65535	Timeout after x seconds (Max 18.2 h)	Once turned on, the peripheral device connected to the output relay, will turn off after x seconds since last detected motion.

1.4.5 PAR_LUX_THRESHOLD

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [1÷1500]

It defines the minimum desired light intensity value with ASO mode active. In motion statuses, if the light detected by the sensor is lower than the value of the parameter, the DPT_Output1_ON/OFF message is sent to a light actuator to turn it on. This represents the default value assigned to the DPT_LUX_THRESHOLD datapoint upon device reboot.

1.4.6 PAR_CYCLIC_LUX_SEND_TIME

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [0÷65535]

This parameter sets the cyclic sending time expressed in seconds of the DPT_LUX_CYCLIC message for transmission of the brightness detected by the device light sensor. By setting the value to 0, the message will never be sent. Summarised in Table 2 are the significant values for this parameter.

Value	Description	Condition
0	Sending disabled	The message from DPT_LUX_CYCLIC will never be sent.
0<x≤65535	Sending cycled	The message DPT_LUX_CYCLIC cycle is sent every x seconds.

Table 2: 3 values for cyclic sending of detected brightness

1.4.7 PAR_CYCLIC_PIR_SEND_TIME

- Property Datatype: PDT_UNSIGNED_16bit
- Datapoint Type: None
- Range: [0÷65535]

This parameter sets the cyclical sending time expressed in seconds of the DPT_PIR_CYCLIC message for transmission of the motion detected by the device pyroelectric sensor. By setting the value to 0, the message will never be sent. Summarised in Table 3 are the significant values for this parameter.

Value	Description	Condition
0	Sending disabled	The message from DPT_PIR_CYCLIC will never be sent.
0<x≤65535	Sending cycled	The message DPT_PIR_CYCLIC cycle is sent every x seconds.

Table 3: PAR_CYCLIC_PIR_SEND_TIME values for cyclic sending of motion detected

1.4.8 PAR_EnableASO

- Property Datatype: PDT_UNSIGNED_8bit
- Datapoint Type: None
- Range: [0÷1]

Through this parameter the brightness threshold control at the motion status (**Automatic Light Switch On/Off**) can be enabled or disabled. If the parameter has the value 1, the device sends the DPT_Output1_ON/OFF message with ON value, only if the measured brightness is below the required threshold, as shown in Figure 5. If the parameter is 0, the device sends the same message regardless of the brightness status. This mode is useful when the device is installed in a position to detect the brightness of controlled lights, so as to favour the power-saving condition when the required brightness is satisfied without lighting.

1.4.9 PAR_PwrOnLightStatus

- Property Datatype: PDT_UNSIGNED_8bit
- Datapoint Type: None
- Range: [0÷1]

Through this parameter the value that is sent with the DPT SwitchLight message at power-on of the sensor or after a reprogrammed reset using the ETS can be set. Once the message is sent, the sensor waits for a period of 26 seconds, after which it resumes normal operations according to the motion and / or brightness statuses. The wait period does not affect the administration of all other communication objects other than the DPT_Output1_ON/OFF.

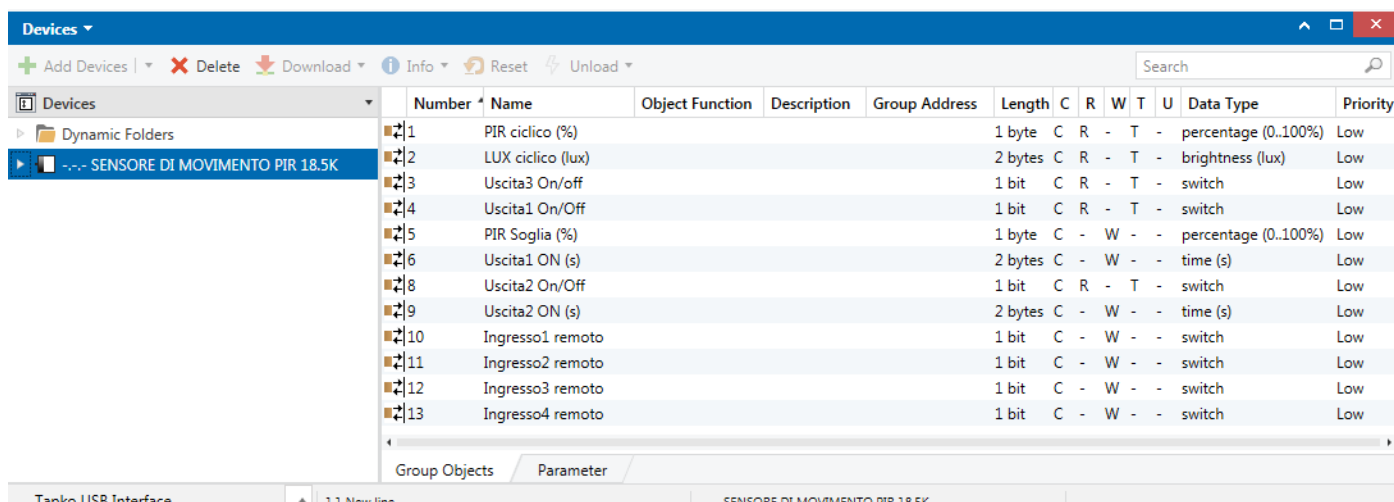
DPT_Output2_ON/OFF and DPT_Output3_ON/OFF are not affected by this parameter and at power on both send on the bus the ON condition for about 20 s.

2 Product Descriptor in ETS

This section describes how the sensor will be displayed through its descriptor in ETS (.knxprod).

2.1 Group Objects Section

Figure 9 shows the display of the sensor communication objects



Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
1	PIR ciclico (%)				1 byte	C	R	-	T	-	percentage (0..100%)	Low
2	LUX ciclico (lux)				2 bytes	C	R	-	T	-	brightness (lux)	Low
3	Uscita3 On/off				1 bit	C	R	-	T	-	switch	Low
4	Uscita1 On/Off				1 bit	C	R	-	T	-	switch	Low
5	PIR Soglia (%)				1 byte	C	-	W	-	-	percentage (0..100%)	Low
6	Uscita1 ON (s)				2 bytes	C	-	W	-	-	time (s)	Low
8	Uscita2 On/Off				1 bit	C	R	-	T	-	switch	Low
9	Uscita2 ON (s)				2 bytes	C	-	W	-	-	time (s)	Low
10	Ingresso1 remoto				1 bit	C	-	W	-	-	switch	Low
11	Ingresso2 remoto				1 bit	C	-	W	-	-	switch	Low
12	Ingresso3 remoto				1 bit	C	-	W	-	-	switch	Low
13	Ingresso4 remoto				1 bit	C	-	W	-	-	switch	Low

Figure 9: communication objects in ETS

If the ACE mode is disabled, the CO number 6 (Minimum Brightness) will be hidden automatically by the descriptor and will not appear in the list, as shown in Figure 10, because a user may be tempted to implement it even if the device does not use it in its logic within this operating configuration ([see 1.2.2](#)).

Number	Name	Object Function	Description	Group Address	Length	C	R	W	T	U	Data Type	Priority
1	PIR ciclico (%)				1 byte	C	R	-	T	-	percentage (0..100%)	Low
2	LUX ciclico (lux)				2 bytes	C	R	-	T	-	brightness (lux)	Low
3	Uscita3 On/off				1 bit	C	R	-	T	-	switch	Low
4	Uscita1 On/Off				1 bit	C	R	-	T	-	switch	Low
5	PIR Soglia (%)				1 byte	C	-	W	-	-	percentage (0..100%)	Low
6	Uscita1 ON (s)				2 bytes	C	-	W	-	-	time (s)	Low
7	LUX Soglia (lux)				2 bytes	C	-	W	-	-	brightness (lux)	Low
8	Uscita2 On/Off				1 bit	C	R	-	T	-	switch	Low
9	Uscita2 ON (s)				2 bytes	C	-	W	-	-	time (s)	Low
10	Ingresso1 remoto				1 bit	C	-	W	-	-	switch	Low
11	Ingresso2 remoto				1 bit	C	-	W	-	-	switch	Low
12	Ingresso3 remoto				1 bit	C	-	W	-	-	switch	Low
13	Ingresso4 remoto				1 bit	C	-	W	-	-	switch	Low

Figure 10: Automatic hiding of minimum brightness if ASO is disabled

2.2 Parameters Section

2.2.1 View of ETS4

Figure 11 shows an example of the page for sensor KNX parameters.

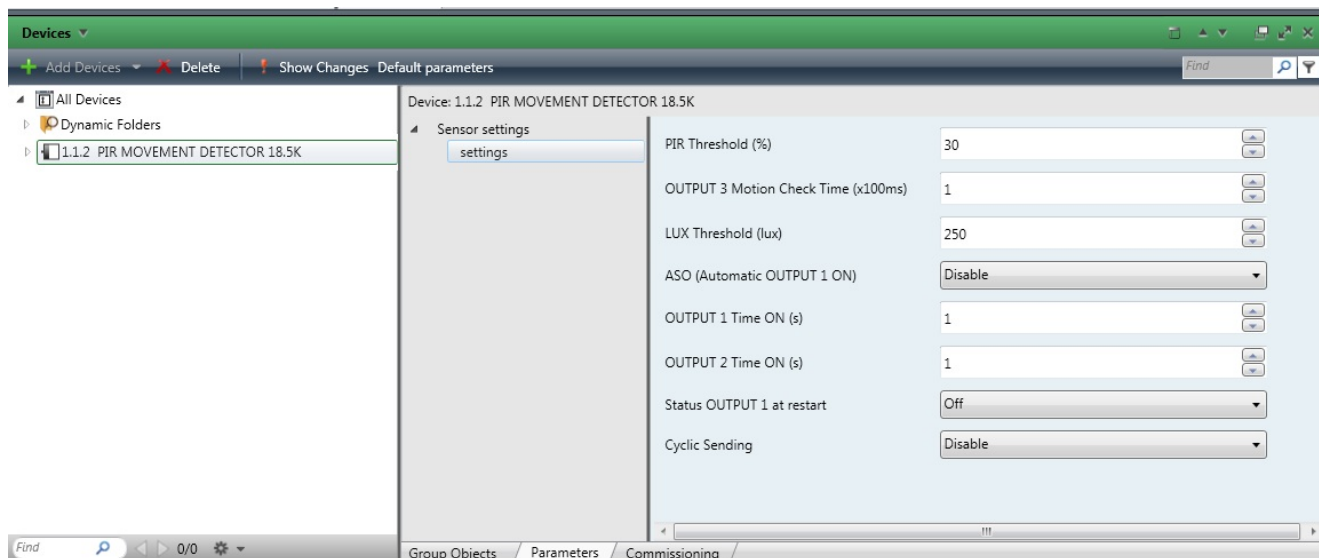


Figure 11: example of parameters setting in ETS4

2.2.2 View in ETS5

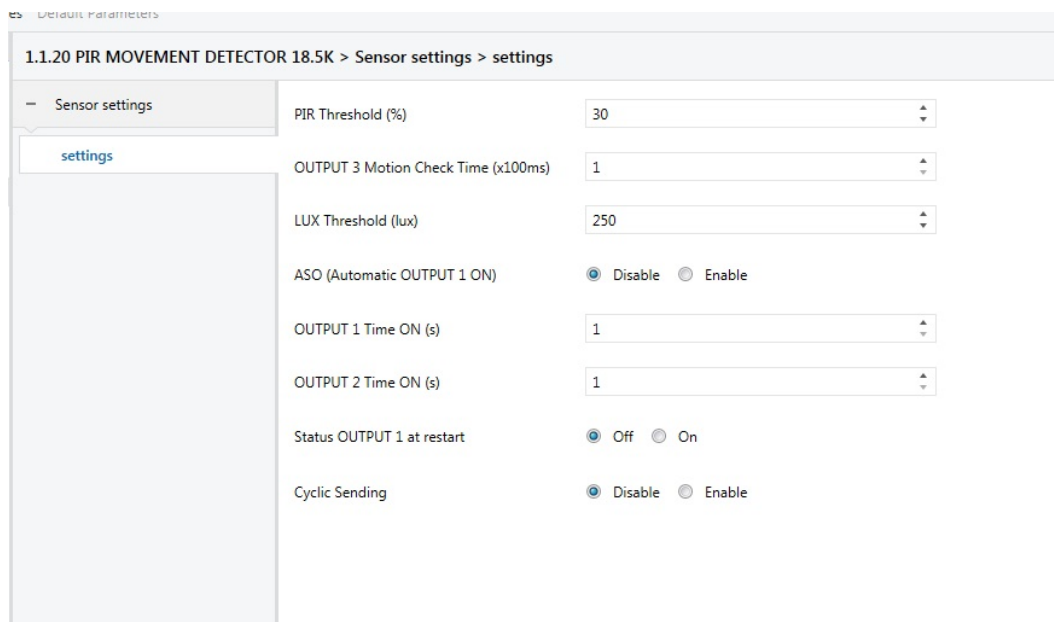
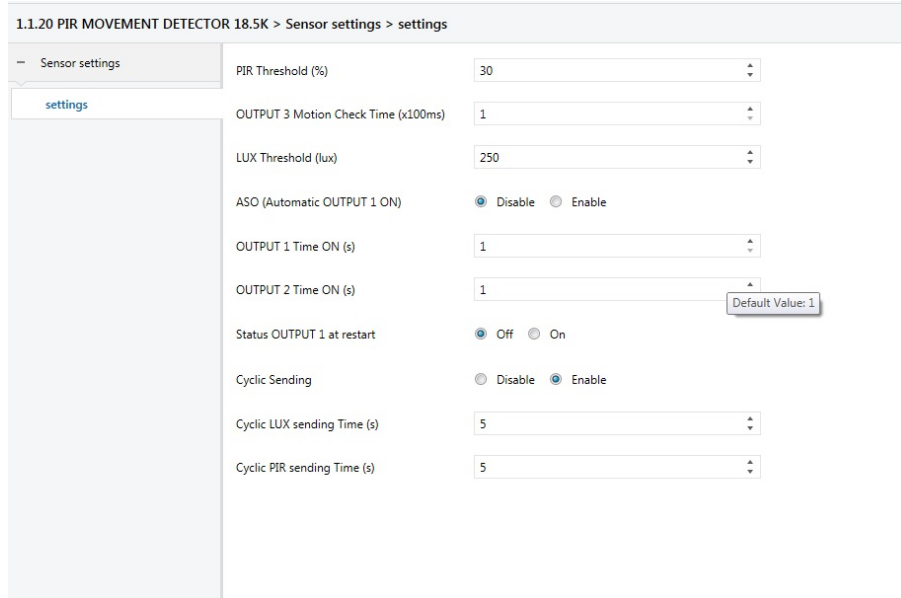


Figure 12 example of parameters setting in the ETS5

2.2.3 Cyclic sending virtual parameter

The “**Cyclic sending**” virtual parameter allows the enabling / disabling of the cyclic sending of the motion percentage detected by the infrared sensor (CO # 0 Motion detection) and / or the brightness (CO # 1 Brightness). By selecting “Enable” the 2 timing parameters **Cyclic Lux Time** and **Cyclic Pir Time** will appear. Figure 12 shows the configuration in ETS4 for the cyclic sending of both parameters every 5 seconds.



1.1.20 PIR MOVEMENT DETECTOR 18.5K > Sensor settings > settings	
PIR Threshold (%)	30
OUTPUT 3 Motion Check Time (x100ms)	1
LUX Threshold (lux)	250
ASO (Automatic OUTPUT 1 ON)	<input checked="" type="radio"/> Disable <input type="radio"/> Enable
OUTPUT 1 Time ON (s)	1
OUTPUT 2 Time ON (s)	1
Status OUTPUT 1 at restart	<input checked="" type="radio"/> Off <input type="radio"/> On
Cyclic Sending	<input type="radio"/> Disable <input checked="" type="radio"/> Enable
Cyclic LUX sending Time (s)	5
Cyclic PIR sending Time (s)	5

Figure 13: brightness and motion cyclical sending every 2 seconds

If value 0 is selected, the corresponding communication object will never be sent (disabled sending by parameter value), as described in paragraphs [1.4.6](#) e [1.4.7](#).