Calibration Description

EIB KNX®

IR Quattro KNX
IR Quattro HD KNX

HF 360 KNX
DUAL HF KNX

CONTROL
PRO
SYSTEM

Contents

How to calibrate presence detectors with constant-lighting control

1. Detector functions

IR QUATTRO and IR QUATTRO HD:
The PIR presence detector with constant-lighting control comprises a passive infrared (PIR) motion detector with integrated light-level sensor, integrated IR receiver and integrated blue light-emitting diode (LED) for indicating a movement detected in the test mode. The detector is capable of performing the following functions: (see 1.1 Functions)
HF360 and DUAL HF:
The HF presence detector with constant-lighting control comprises a high-frequency (HF) motion detector with integrated light-level sensor, integrated IR receiver and integrated blue light-emitting diode (LED) for indicating a movement detected in the test mode.
The HF presence detector for ceiling mounting is distinguished from a PIR presence detector (PIR – Passive Infrared) by its
- particularly slim-line design (HF360, therefore not immediately being identified as a presence detector),
- ability to detect radial movement as well,
- immunity to heat sources in the detection zone.
The HF detector is capable of performing the following functions:

1.1 Functions:

- detecting presence,
- controlling lighting with light-level control
- controlling HVAC.
The function to be used (activated) is selected from the "General Settings" parameter window using the Engineering Tool Software (ETS), version ETS3.f and higher.
Each of the detector functions provides the capability of setting a period after which a detected movement is to result in activation of the function concerned and also of setting a period after which the function concerned is to be deactivated again after detecting the last movement.
The lighting controller immediately switches light 'ON' when anyone enters the room in the dark but only switches it 'OFF' again some time after the last person leaves. If a person returns to the room shortly after leaving it (because, for example, that person has forgotten something), the room is still illuminated, saving the need to switch the light back 'ON' again. The "stay-'ON' time" can either be determined by the detector automatically (IQ mode) or set to a fixed period.
As it takes a long time to heat or cool a room for which its HVAC systems have been switched to energy-saving mode while it is not being used, activation and deactivation of the comfort mode is delayed. Briefly entering a room is not to result in the HVAC systems being activated immediately. The appropriate "switch-'ON' delay" can either be matched automatically by the detector to the time users are present in the room (room surveillance) or it can be set to a fixed period. Briefly leaving the room does not to result in the HVAC systems being switched 'OFF' either. The associated "Stay-'ON' time" can be set to a fixed period.

1.2 Presence detection:

This function watches over a room. A person's presence is reported as soon as this has been reliably detected. Times at which no persons are present are also reported.
This surveillance function can, for example, be disabled during the day and only enabled for a specific duration at night as well as over the weekend.

1.3 Lighting control:

In the "switched mode", this function switches lighting (switchable only) 'ON' and 'OFF' in relation to presence and light level. Selecting "constant-lighting control" instead of "switched mode" for dimmable room lighting automatically switches light 'ON' and dims it to the preselected level when persons are present in the room and the level of light measured is below the level set. If daylight is sufficient to illuminate the room, lighting is dimmed down or switched 'OFF' completely if not needed.
The light level measured by the light-level sensor integrated in the detector can be transmitted by the bus.
HVAC control: This function can be used for automatically switching room heating, ventilation and air-conditioning systems (HVAC) from "energy-saving mode" or "pre-comfort mode" when the room is not being used to "comfort mode" when it is being used and back to "pre-comfort mode" or "energy-saving mode" when persons have finished using the room.

2. Presence detector operating modes 3

One of the following operating modes must be assigned to the presence detector:
  Single detector,
- master,
- slave,
- master in parallel mode.

2.1 Single detector:

No other presence detectors are installed in the room apart from the presence detector operating as "single detector".

2.2 Master:

If required, as many as 4 additional presence detectors can be connected to the "master" by the bus as "slaves" to extend the presence detection zone. The master ascertains "overall presence", i.e. whether a person is present in at least one of the detection zones (and therefore in the entire room), controls lighting, heating, ventilation and air-conditioning for the entire room and sends the relevant objects.

2.3 Slave:

A presence detector operating as a "slave" only delivers "presence ON" and "presence OFF" information to the master. This means only a few parameters need setting for a slave.
Note:
The master must be restarted after a slave presence detector is removed from the bus. If it is not, lighting may stay switched 'ON' all the time.

2.4 Master in parallel mode:

 If a presence detector is operated as a "master in parallel mode", as many as 4 additional presence detectors can be connected as "slaves" to extend the detection zone. The "master in parallel mode" carries out its own lighting control and sends the current presence status to the "master". The "master" then governs control of HVAC.

3. Constant-lighting control

Constant-lighting control turns lighting to the light-level setting by dimming actuators or switching/dimming actuators (depending on lamp type), with it being possible to adjust the level of lighting by means of a parameter or a communication object. A parameter can be used for selecting whether to use only one dimmable lighting group for illuminating the room or whether to provide as many as four dimmable lighting groups. If several lighting groups are installed, the presence detector must be installed with light-level sensor within lighting group 1. In cases where several presence detectors are being operated in a room, the presence detector for lighting group 1 should work as the master. The detector for lighting group 1 should then be positioned as closely to the door as possible so that it can immediately detect anyone entering the room.

3.1 Switching 'ON' / 'OFF' with constant-lighting control:

Constant-lighting control is started if the presence detector identifies the presence of one or more persons. Once this is enabled, the level of light measured and the preselected light-level setting provide the basis for determining whether or not lighting is switched 'ON'. When activated, lighting is always switched to full power (dimming level = 100%) and then slowly dimmed down by the light-level controller to the level of light at which the chosen light-level setting and actual light level coincide. If several lighting groups are installed, only lighting group 1 is dimmed to the dimming level determined by the light-level controller. All other lighting groups are dimmed up or down by a level that can be set individually for each lighting group depending on whether it is installed close to the window or further away from it.

If the level of light measured is still greater than the level set with persons present or with lighting already dimmed to the minimum level, lighting is either switched 'OFF' completely or remains switched 'ON' but dimmed to the minimum level depending on the parameter setting selected.

If the presence detector establishes that no person is left in the room, constant-lighting control is deactivated. It is possible to select whether deactivation of constant-lighting control also switches lighting 'OFF' completely or whether to leave it dimmed at a selectable level for a selectable period ("basic illumination dimming level") or whether to activate it whenever either the level of light measured by the detector's light-level sensor or the level of outdoor light measured by a twilight sensor is below the "basic light-level threshold".

3.2 Overriding constant-lighting control:

The room user can temporarily override light-level control (provided a person is in the detection zone). The "Switch light x input", "Dim light x input" and "Light x input dimming level" objects are used for this purpose.

If a telegram is received by means of the "Switch light x input" object or by means of the "Light x input dimming level" object after identifying the presence of persons in the detection zone, the associated lighting group is turned up or dimmed down to the level received, with light-level control being disabled. Lighting remains switched 'ON' at the received level until such time as the light-level controller is either enabled by persons in the room (e.g. by operating a special pushbutton) or until such time as the detector ceases to identify the presence of persons, automatically deactivates light-level control and switches 'OFF' the lighting.

A parameter can be used to select whether or not a telegram received by means of the "Dim light x input" object is also to disable light-level control. If it is to be disabled, only the lighting group addressed through the telegram is dimmed up or down to the appropriate output. If the light-level controller is <u>not</u> to be disabled by such a telegram, the lighting group addressed will not be dimmed but the setting for constant-lighting control incremented or decremented by the level received. The "Alter setting" parameter setting should be selected for rooms with only one lighting group, with the "dim" setting being selected for rooms with several lighting groups.

3.3 Disabling / enabling constant-lighting control:

Except in response to receiving a telegram relating to the "Switch light x input", "Light x input dimming level" and "Dim light x input" objects, constant-lighting control can be disabled on the bus at any time by means of the "Disable light-level control" object and also re-enabled at any time by it. Lighting switching status and dimming level are not changed by the light-level controller while it is disabled. Switching or dimming telegrams received by any of objects 24 to 35 will, however, be executed even if the light-level controller is disabled.

Parameters can be used to select the status lighting is to assume before being disabled by the disabling object and which to assume after being re-enabled by the disabling object.

As explained above, switching lighting 'ON' or 'OFF' at a pushbutton as well as setting lighting to a defined dimming level at a pushbutton or by means of scene control always results in the light-level controller being disabled. This disabling can either be terminated by an appropriate telegram through the "Disable light-level control" object or it is terminated automatically when the presence detector identifies there is no person left in the detection zone and then also terminates light-level control (not for scenes).

4. Switched mode

In "switched mode", non-dimmable lighting is only switched 'ON' and 'OFF' by switching telegrams (this being the equivalent of "two-point light-level control"). When persons are present, lighting is switched 'ON' as soon as the level of light falls below the

parameterised basic light-level threshold and switched 'OFF' when persons are no longer detected or when it is no longer needed because daylight is sufficient for illuminating the room. The light-level threshold can either be set by means of a parameter or by means of a communication object.

A parameter can be used for selecting whether to use only one switchable lighting group for illuminating the room or whether to provide as many as four switchable lighting groups. If several lighting groups are installed, lighting group 1 is always switched 'ON' first when presence is detected and the level of light measured is below the light-level setting. If the measured level is then still below the pre-selected level, lighting group 2 is added in and so forth. Depending on the light level measured and with an increasing incidence of daylight, the light-level controller is capable of switching one or more lighting groups back 'OFF' again in response.

The "switched mode", i.e. two-point light-level control, can be disabled and enabled by means of the "Disable light-level control" object in the same way as constant-lighting control. And in just the same way as this, the "switched mode" is also overridden and disabled by the receipt of a "Switch light 1 input" telegram as well as automatically re-enabled when no person is left in the room. When no persons are being detected, basic illumination can also be selected for a limited period or in relation to the "basic light-level threshold".

5. Fully/semi-automatic operation

A parameter can be used for setting the presence detector to work as a "fully automatic detector" or "semi-automatic detector". When operating as a "fully automatic detector", lighting is automatically switched 'ON' in relation to light level when persons are present and automatically switched 'OFF' when no persons are present. When operating as "semi-automatic" detectors, lighting must be switched 'ON' manually. However, it is either switched 'OFF' automatically in relation to light level or switched 'OFF' when no person is present any more in the sensor system's detection zone.

6. IR remote controls

Two optional IR remote controls are available as accessories for the presence detector. The "User" IR remote control is used for switching 'ON' /'OFF' and for dimming light up/down as well as for saving and selecting as many as 4 scenes by the room user. The "Program" IR remote control can be used by service personnel whenever necessary to calibrate light-level measurement, change a number of detector parameters, also without using the ETS, as well as start and end a test mode. Parameters changed by IR remote control can be read on the bus. Program remote control RC6 KNX EAN No.: 4007841 593018. User remote control RC7 KNX EAN No.: 4007841 592912.

7. Test mode

ETS or any enabled IR remote control for service purposes can be used for activating and deactivating the presence detector's "presence test mode" or "lighting test mode".

"Presence test mode" is used for checking the detection zone. Any movement detected is then indicated by brief flashing of the blue light-emitting diode integrated in the presence detector. Communication objects are not sent during the presence test mode. "Lighting test mode" is used for checking light-level control. To do this, the detector must have been parameterised by ETS and its objects linked with the objects of the buttons and actuators for lighting control.

In the lighting test mode, any movement detected is indicated by brief flashing of the blue light-emitting diode integrated in the presence detector. For the duration of this test mode and irrespective of the parameters selected for the presence detector, the stay-'ON' time for lighting is set to 8 s, with light-level control and remote control also being activated for both types of IR remote control. The "presence detection" and "HVAC control" functions are deactivated. The associated objects are not sent.

8. Behaviour after bus voltage fails and returns as well as on re-starting and downloading

In the event of bus voltage failure, the presence detector also ceases to operate as its electronic system is powered by the bus voltage. If bus voltage fails, the disable statuses of light-level control, HVAC output and presence output are non-erasably saved so they can be automatically restored when bus voltage returns.

After bus voltage returns and after completely or partially uploading the product database to the presence detector by ETS (i.e. after re-starting) , the presence detector is disabled for approx. 40 seconds in the case of IR QUATTRO, all other presence detectors for approx. 10 seconds. Lighting is switched 'ON' at the start of disabling time and switched 'OFF' for approx. 2 seconds at the end of disabling time. From then on, the detector is ready for operation and sends the latest telegrams to the lighting and HVAC control system as well as to any room surveillance system (presence) provided the relevant outputs were not disabled before bus voltage failed.
Note:
The light-level controller's disabled state is only saved if the presence detector was disabled by means of obj. 22. Temporary disabling, e.g. in 4h ON/OFF mode, scenes, switch light x input, are not saved.

9. Behaviour after initial start-up and unloading

When installing a brand-new presence detector, it automatically goes into "presence test mode" as soon as the bus voltage is applied. Any movement detected in this mode is then indicated by the blue LED integrated in the presence detector lighting up. This shows that bus voltage is available at the detector and that the latter is in working order. Light-level control and sending of telegrams is, however, deactivated.
If the presence detector's calibration programme is "unloaded" by ETS, the presence detector automatically goes into "presence test mode" in just the same way as it does after initial start-up.

10. Communication objects

All of the communication objects listed below are provided for the presence detector. Those visible and capable of being linked with group addresses are determined by the "detector mode" parameter setting in the "General Settings" parameter window as well as by the setting of further parameters for chosen functions and communication objects.

Maximum number of group addresses: 250
Maximum number of assignments: 250

Obj	Object name	Function	DP type	Flags
0	Test mode status	ON/OFF	1,001 (1 bit)	CRT
1	Presence output	ON/OFF	1,001 (1 bit)	CRT
2	Disable presence output	ON/OFF	1,001 (1 bit)	CWT
3	Presence output disabling status	ON/OFF	1,001 (1 bit)	CRT
4	Presence slave 1	ON/OFF	1,001 (1 bit)	CWT
5	Presence slave 2	ON/OFF	1,001 (1 bit)	CWT
6	Presence slave 3	ON/OFF	1,001 (1 bit)	CWT
7	Presence slave 4	ON/OFF	1,001 (1 bit)	CWT
8	Interference source switching status	ON/OFF	1,001 (1 bit)	CWT

Obj	Object name	Function	DP type	Flags
9	Time factor for presence switch-'ON' delay	1…5	5,005 (8 bits)	CRWT
10	Time factor for presence stay-'ON' time	1…255	5,005 (8 bits)	CRWT
11	Light level measured	(10 to 1500 lux)	9,004 (16 bits)	CRT
12	Light-level setting	(10 to 1000 lux)	9,004 (16 bits)	CRWT
13	Time factor for lighting stay-'ON' time	0…30	5,005 (8 bits)	CRWT
14	Switch light 1 output	ON/OFF	1,001 (1 bit)	CRT
15	Switch light 2 output	ON/OFF	1,001 (1 bit)	CRT
16	Switch light 3 output	ON/OFF	1,001 (1 bit)	CRT
17	Switch light 4 output	ON/OFF	1,001 (1 bit)	CRT
18	Light 1 output dimming level	0…100%	5,001 (8 bits)	CRT
19	Light 2 output dimming level	0…100%	5,001 (8 bits)	CRT
20	Light 3 output dimming level	0…100%	5,001 (8 bits)	CRT
21	Light 4 output dimming level	0…100%	5,001 (8 bits)	CRT
22	Disable light-level control	ON/OFF	1,001 (1 bit)	CWT
23	Light-level control disabling status	ON/OFF	1,001 (1 bit)	CRT
24	Switch light 1 input	ON/OFF	1,001 (1 bit)	CWT
25	Dim light 1 input	brighter / darker	3,007 (4 bits)	CWT
26	Light 1 input dimming level	0…100%	5,001 (8 bits)	CWT
27	Switch light 2 input	ON/OFF	1,001 (1 bit)	CWT
28	Dim light 2 input	brighter / darker	3,007 (4 bits)	CWT
29	Light 2 input dimming level	0…100%	5,001 (8 bits)	CWT
30	Switch light 3 input	ON/OFF	1,001 (1 bit)	CWT
31	Dim light 3 input	brighter / darker	3,007 (4 bits)	CWT
32	Light 3 input dimming level	0…100%	5,001 (8 bits)	CWT
33	Switch light 4 input	ON/OFF	1,001 (1 bit)	CWT
34	Dim light 4 input	brighter / darker	3,007 (4 bits)	CWT
35	Light 4 input dimming level	0…100%	5,001 (8 bits)	CWT
36	HVAC output	ON/OFF	1,001 (1 bit)	CRT
37	Disable HVAC output	ON/OFF	1,001 (1 bit)	CWT
38	HVAC output disabling status	ON/OFF	1,001 (1 bit)	CRT
39	Time factor for HVAC switch-'ON' delay	0…30	5,005 (8 bits)	CRWT
40	Time factor for HVAC stay-'ON' time	1…120	5,005 (8 bits)	CRWT
41	8-bit scene output	select / save	18,001 (8 bits)	CRT
42	Switch basic illumination output	ON/OFF	1,001 (1 bit)	CRT
43	Twilight sensor input	(0 to 300 lux)	9,004 (16 bits)	CWT
44	Basic light-level threshold	(10 to 300 lux)	9,004 (16 bits)	CRWT
45	Time factor for basic illumination 'ON' period	1…30	5,005 (8 bits)	CRWT

HF 360 and Dual HF only:

Obj					
46	Boost factor		1…4	5,005 (8 bits)	CRWT
47	Sensitivity		(1=high/ 0 = low)	1,001 (1 bit)	CRWT

Obj	Object name	Function	DP type	Flag
0	Test mode status	ON/OFF	1,001 (1 bit)	CRT

This object is always available. This object automatically reports whether "presence test mode" or "lighting test mode" was switched 'ON' or 'OFF' whenever status is changed. This object can also be used at any time for requesting test-mode status.

1	Presence output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "Presence output" parameter is not set to "inactive" in the "General Settings" parameter window.

The group address linked with this object is sent to the actuator by the bus, indicating whether the presence of persons has been detected ("presence output = ON") or not ("presence output = OFF") and can be used at any time for retrieving presence status from the detector.

2	Disable presence output	ON/OFF	1,001 (1 bit)	CWT

This object is only visible when the "Presence output" parameter is not set to "inactive" in the "General Settings" parameter window and when the "Disable presence output" parameter is not set to "No" in the "Presence Output" parameter window. The "Disable presence output" parameter is also used for setting whether disabling is to take place after receiving value "1" or after receiving the value "0".

When presence output is disabled, the detector sends no telegrams on presence status.

3	Presence output disabling status	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "Presence output" parameter is not set to "inactive" in the "General Settings" parameter window and when the "Presence output disabling status" parameter is not set to "inactive" in the "Presence Output" parameter window.

Sent on the bus, the group address linked with this object is used for indicating whether or not the presence output is disabled (presence output disabling status = ON). This can also be requested on the bus.

4	Presence slave 1	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Detector mode" parameter is set to "Master" or to "Master in parallel mode" in the "General Settings" parameter window.

The group address linked with this object is used by the master for receiving the presence status of slave 1 on the bus and, if applicable "OR-ing" it with the presence status of further slaves as well as the master, this being sent as overall presence in response to a change or request through master object 1.

5	Presence slave 2	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Detector mode" parameter is set to "Master" or to "Master in parallel mode" in the "General Settings" parameter window and the "Number of slaves" parameter is set to a value ≥ 2.

The group address linked with this object is used by the master for receiving the presence status of slave 2 on the bus and, if applicable "OR-ing" it with the presence status of further slaves as well as the master, this being sent as overall presence in response to a change or request through master object 1.

Obj	Object name	Function	DP type	Flag
6	Presence slave 3	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Detector mode" parameter is set to "Master" or to "Master in parallel mode" in the "General Settings" parameter window and the "Number of slaves" parameter is set to a value ≥ 3.

The group address linked with this object is used for receiving the presence status of slave 3 from the master by bus and, if applicable "OR-ing" it with the presence status of further slaves as well as the master, this being sent as overall presence in response to a change or request through master object 1.

7	Presence slave 4	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Detector mode" parameter is set to "Master" or to "Master in parallel mode" in the "General Settings" parameter window and the "Number of slaves" parameter is set to the value of 4.

The group address linked with this object is used for receiving the presence status of slave 4 from the master by bus and, if applicable "OR-ing" it with the presence status of further slaves as well as the master, this being sent as overall presence in response to a change or request through master object 1.

8	Interference source switching status	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Switching status interference source object" is set to "Yes" in the "Lighting Control" parameter window.

If switching an interference source (e.g. a light) 'ON' and 'OFF' in the sensor system's detection zone results in faulty presence detection, this object must be linked with the switching-status object of the actuator used for switching the interference source 'ON' and 'OFF'.

9	Time factor for presence switch-'ON' delay	0…5	5,005 (8 bits)	CRWT

This object is only visible if the "Switch-'ON' delay and stay-'ON' time can be read / changed by bus" parameter is set to "Yes" in the "Presence" parameter window.

The group address linked with this object is used for receiving presence-detection stay-'ON' time (in seconds) by the bus. Any value received outside the permissible range of 0 to 5 is rejected. This object can also be used for requesting the current presence-detection switch-'ON' delay at any time, also after making a change by ETS or IR remote control.

10	Time factor for presence stay-'ON' time	1…255	5,005 (8 bits)	CRWT

This object is only visible if the "Switch-'ON' delay and stay-'ON' time can be read / changed by bus" parameter is set to "Yes" in the "Presence" parameter window.

The group address linked with this object is used for receiving the presence-detection stay-'ON' time (in seconds) by bus. Any value received outside the permissible range of 1 to 255 is rejected. This object can also be used for requesting the current presence-detection stay-'ON' time whenever necessary, also after making a change by ETS or IR remote control.

11	Light level measured	10 to 1500 lux	9,004 (16 bits)	CRT

This object is only visible if the "Light level measured" parameter is set to "active" in the "General Settings" parameter window.

The group address linked with this object is used for sending the light level measured by the detector by bus, with it also being possible to request light level from the detector.

12	Light-level setting	10 to 1000 lux	9,004 (16 bits)	CRWT

This object is only visible if the "Light level setting can be read / changed by bus" parameter is set to "Yes" in the "Lighting Control" parameter window.

The group address linked with this object is used for receiving the light-level control setting (in lux) by the bus, with it being possible to request such at any time, also after making a change by ETS or IR remote control.

Obj	Object name	Function	DP type	Flag
13	Time factor for lighting stay-'ON' time	0…30	5,005 (8 bits)	CRWT

This object is only visible if the "Switch-'ON' delay and stay-'ON' time can be read / changed by bus" parameter is set to "Yes" in the "Lighting" parameter window.

The group address linked with this object is used for receiving the stay-'ON' time (in minutes) by bus, this being the time for which lighting is to remain switched 'ON' after there is no person left in the room. Any value received outside the permissible range of 0 to 30 is rejected. This object can also be used for requesting the lighting stay-'ON' time whenever necessary, also after making a change by ETS or IR remote control.

Note: Value "0" indicates that switch-'ON' delay in the "IQ mode" is set by the detector automatically. Time is automatically set to the starting period of 5 minutes.

Obj	Object name	Function	DP type	Flag
14	Switch light 1 output	ON/OFF	1,001 (1 bit)	CRT

This object is always available. It must be linked with the switching object of the actuator used in conjunction with dimmed lighting for switching the entire room lighting 'ON' and 'OFF', or of the actuator used in conjunction with lighting groups for switching lighting group 1 'ON' and 'OFF' in one or more stages.

The group address linked with this object is used for sending the switching command by bus to the actuator, with it also being possible to request the switching status from the detector.

Obj	Object name	Function	DP type	Flag
15	Switch light 2 output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the"Number of lighting groups" parameter is set to a value of $\geq$ 2 in the "Lighting Control" parameter window. This object must be linked with the switching object of the actuator used for switching lighting group 2 'ON' and 'OFF'. The group address linked with this object is used for sending the switching command by bus to the actuator, with it also being possible to request the switching status from the detector.

Obj	Object name	Function	DP type	Flag
16	Switch light 3 output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the"Number of lighting groups" parameter is set to a value of $\geq$ 3 in the "Lighting Control" parameter window. This object must be linked with the switching object of the actuator used for switching lighting group 3 'ON' and 'OFF'. The group address linked with this object is used for sending the switching command by bus to the actuator, with it also being possible to request the switching status from the detector.

Obj	Object name	Function	DP type	Flag
17	Switch light 4 output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the"Number of lighting groups" parameter is set to the value of 4 in the "Lighting Control" parameter window. This object must be linked with the switching object of the actuator used for switching lighting group 4 'ON' and 'OFF'. The group address linked with this object is used for sending the switching command by bus to the actuator, with it also being possible to request the switching status from the detector.

Obj	Object name	Function	DP type	Flag
18	Light 1 output dimming level	0…100%	5,001 (8 bits)	CRT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window.

This object must be linked with the dimming-level object of the actuator used for dimming the entire lighting, or in the case of several lighting groups, to dim lighting group 1 to the level received. The group address linked with this object is used for sending the dimming value by bus to the actuator, with the capability of requesting such from the detector.

Obj	Object name	Function	DP type	Flag
19	Light 2 output dimming level	0…100%	5,001 (8 bits)	CRT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of $\geq$ 2 in the "Lighting control" parameter window.

This object must be linked with the dimming-level object of the actuator used for dimming lighting group 2 to the level received. The group address linked with this object is used for sending the dimming value by bus to the actuator, with the capability of requesting such from the detector.

Obj	Object name	Function	DP type	Flag
20	Light 3 output dimming level	0…100%	5,001 (8 bits)	CRT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of $\geq$ 3 in the "Lighting control" parameter window.

This object must be linked with the dimming-level object of the actuator used for dimming lighting group 3 to the level received. The group address linked with this object is used for sending the dimming value by bus to the actuator, with the capability of requesting such from the detector.

Obj	Object name	Function	DP type	Flag
21	Light 4 output dimming level	0…100%	5,001 (8 bits)	CRT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to the value of 4 in the "Lighting control" parameter window

This object must be linked with the dimming-level object of the actuator used for dimming lighting group 4 to the level received. The group address linked with this object is used for sending the dimming value by bus to the actuator, with the capability of requesting such from the detector.

Obj	Object name	Function	DP type	Flag
22	Disable light-level control	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Disable light-level control" parameter is not set to "No" in the "Lighting Control" parameter window. The "Disable light-level control" parameter is also used for selecting whether to perform disabling on the basis of receiving a value of "1" or on the basis of receiving a value of "0".

When light-level control is disabled, the detector sends no telegrams for operating or dimming lighting.

Obj	Object name	Function	DP type	Flag
23	Light-level control disabling status	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "Disable light-level control" parameter is not set to "No" in the "Lighting Control" parameter window.

The group address linked with this object is used for automatically sending the disabling status of light-level control by bus after any change, with it being possible to request the disabling status at any time from the detector.

Obj	Object name	Function	DP type	Flag
24	Switch light 1 input	ON/OFF	1,001 (1 bit)	CWT

This object is always available. It must be linked with the switching object of the button that enables a room user to switch the room's entire lighting (if only one lighting group is installed) or lighting group 1 (if several lighting groups are installed) 'ON' and 'OFF'.

Receiving a telegram through this object disables light-level control as the room user wishes to switch room lighting or lighting group 1 'ON' or 'OFF' permanently. It remains disabled until either a telegram for enabling light-level control is received on the basis of object 22 or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
25	Dim light 1 input	brighter / darker	3,007 (4 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window.

If a telegram is received on the basis of this object, and depending on the "Light-level control for dim light x input" parameter setting, light-level control is either disabled with the relevant lighting group being dimmed, or light-level control is not disabled and the light-level control setting is increased or reduced accordingly, automatically resulting in lighting being dimmed up or down. If the detector establishes that no person is left in the room, the altered light-level setting is returned to its original value and the lighting is switched 'OFF'.

Obj	Object name	Function	DP type	Flag
26	Light 1 input dimming level	0…100%	5,001 (8 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window.

If this object delivers a telegram, light-level control is disabled as the room user wishes to dim room lighting to a pre-selected level on a permanent basis using a pushbutton or a scene control option. It remains disabled until either a telegram for enabling light-level control is received on the basis of object 22 or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
27	Switch light 2 input	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "Number of lighting groups" parameter is set to a value of ≥ 2 in the "Lighting Control" parameter window. It must be linked with the switching object of the pushbutton that can be pressed by the room user to switch lighting group 2 'ON' and 'OFF'.

If a telegram is received on the basis of this object, light-level control is disabled as the room user wishes to dim lighting group 2 to a pre-selected level on a permanent basis. It remains disabled until either object 22 delivers a telegram for enabling light-level control or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
28	Dim light 2 input	brighter / darker	3,007 (4 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of ≥ 2 in the "Lighting control" parameter window.

If a telegram is received on the basis of this object, and depending on the "Light-level control for dim light x input" parameter setting, light-level control is either disabled with lighting group 2 being dimmed, or light-level control is not disabled and the light-level control setting is increased or reduced accordingly, automatically resulting in lighting being dimmed up or down. If the detector establishes that no person is left in the room, the altered light-level setting is returned to its original value and the lighting is switched 'OFF'.

Obj	Object name	Function	DP type	Flag
29	Light 2 input dimming level	0…100%	5,001 (8 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of ≥ 2 in the "Lighting control" parameter window.

If a telegram is received on the basis of this object while "presence=ON", light-level control is disabled as the room user wishes to switch lighting group 2 'ON' or 'OFF' on a permanent basis using a pushbutton or scene control option. It remains disabled until either a telegram for enabling light-level control is received on the basis of object 22 or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
30	Switch light 3 input	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the"Number of lighting groups" parameter is set to a value of ≥ 3 in the "Lighting Control" parameter window. It must be linked with the switching object of the pushbutton that can be pressed by the room user to switch lighting group 3 'ON' and 'OFF'.

If a telegram is received on the basis of this object, light-level control is disabled as the room user wishes to dim lighting group 3 'ON' or 'OFF' on a permanent basis. It remains disabled until either object 22 delivers a telegram for enabling light-level control or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
31	Dim light 3 input	brighter / darker	3,007 (4 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of ≥ 3 in the "Lighting control" parameter window.

If this object delivers a telegram, and depending on the "Light-level control for dim light x input" parameter setting, light-level control is either disabled with lighting group 3 being dimmed, or light-level control is not disabled and the light-level control setting is increased or reduced accordingly, automatically resulting in lighting being dimmed up or down. If the detector establishes that no person is left in the room, the altered light-level setting is returned to its original value and the lighting is switched 'OFF'.

Obj	Object name	Function	DP type	Flag
32	Light 3 input dimming level	0…100%	5,001 (8 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to a value of ≥ 3 in the "Lighting control" parameter window.

If this object delivers a telegram, light-level control is disabled as the room user wishes to dim lighting group 3 to a pre-selected level on a permanent basis using a pushbutton or a scene control option. It remains disabled until either a telegram for enabling light-level control is received on the basis of object 22 or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
33	Switch light 4 input	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the"Number of lighting groups" parameter is set to the value of 4 in the "Lighting Control" parameter window. It must be linked with the switching object of the pushbutton that can be pressed by the room user to switch lighting group 4 'ON' and 'OFF'.

If this object delivers a telegram, light-level control is disabled as the room user wishes to dim lighting group 4 to a pre-selected level on a permanent basis. It remains disabled until either object 22 delivers a telegram for enabling light-level control or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
34	Dim light 4 input	brighter / darker	3,007 (4 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to the value of 4 in the "Lighting control" parameter window

If this object delivers a telegram, and depending on the "Light-level control for dim light x input" parameter setting, light-level control is either disabled with lighting group 4 being dimmed, or light-level control is not disabled and the light-level control setting is increased or reduced accordingly, automatically resulting in lighting being dimmed up or down. If the detector establishes that no person is left in the room, the altered light-level setting is returned to its original value and the lighting is switched 'OFF'.

Obj	Object name	Function	DP type	Flag
35	Light 4 input dimming level	0…100%	5,001 (8 bits)	CWT

This object is only visible if the "Type of light-level control" parameter is set to "Constant-lighting control" in the "Light-Level Control" parameter window and the "Number of lighting groups" parameter is set to the value of 4 in the "Lighting control" parameter window

If this object delivers a telegram, light-level control is disabled as the room user wishes to dim lighting group 4 to a pre-selected level on a permanent basis using a pushbutton or a scene control option. It remains disabled until either a telegram for enabling light-level control is received on the basis of object 22 or until the detector establishes that no person is left in the room, re-enables light-level control and switches the lighting 'OFF'.

Obj	Object name	Function	DP type	Flag
36	HVAC output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "HVAC output" parameter is set to "active" in the "General Settings" parameter window.

This object must be linked with the presence input of the room-temperature regulator used for switching room mode between "comfort mode" and "energy-saving mode".

The group address linked with this object is used for sending HVAC status by bus to the actuator, with it also being possible to request this from the detector.

Obj	Object name	Function	DP type	Flag
37	Disable HVAC output	ON/OFF	1,001 (1 bit)	CWT

This object is only visible if the "HVAC output" parameter is set to "active" in the "General Settings" parameter window and if the "Disable HVAC output" parameter is <u>not</u> set to "inactive" in the "HVAC output" parameter window. The "Disable HVAC output" parameter is also used for selecting whether to perform disabling on the basis of a received value "1" or on the basis of a received value "0".

When the "HVAC output" is disabled, the detector does not send any telegrams for governing the mode of HVAC control.

Obj	Object name	Function	DP type	Flag
38	HVAC output disabling status	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "HVAC output" parameter is set to "active" in the "General Settings" parameter window and if the "HVAC output disabling status" parameter is set to "active" in the "HVAC output" parameter window.

The group address linked with this object is sent on the bus to indicate (or it is possible to enquire on the bus) whether the HVAC output is disabled (HVAC output disabling status = ON) or whether it is not.

Obj	Object name	Function	DP type	Flag
39	Time factor for HVAC switch-'ON' delay	0 to 30	5,005 (8 bits)	CRWT

This object is only visible if the "Switch-'ON' delay and stay-'ON' time can be read / changed by bus" parameter is set to "Yes" in the "HVAC output" parameter window.

The group address linked with this object is used for receiving the switch-'ON' delay (in minutes) by bus, this being the time lag before the room-temperature control system switches to comfort mode after persons are already present in the room.

Any value received outside the permissible range of 0 to 30 is rejected. This object can also be used for requesting the latest HVAC-stay-'ON' time whenever necessary, also after making a change by ETS or IR remote control.

<u>Note</u>: The value "0" indicates that the switch-'ON' delay in "room surveillance mode" is set by the detector automatically.

Obj	Object name	Function	DP type	Flag
40	Time factor for HVAC stay-'ON' time	1…120	5,005 (8 bits)	CRWT

This object is only visible if the "Switch-'ON' delay and stay-'ON' time can be read / changed by bus" parameter is set to "Yes" in the "HVAC output" parameter window.

The group address linked with this object is used for receiving the stay-'ON' time (in minutes) by bus, this being the time for which the room temperature control system is to remain switched to comfort mode after there is no person left in the room.

Any value received outside the permissible range of 1 to 120 minutes is rejected. This object can also be used for requesting the latest HVAC-stay-'ON' time whenever necessary, also after making a change by ETS or IR remote control.

Obj	Object name	Function	DP type	Flag
41	8-bit scene output	select / save	18,001 (8 bits)	CRT

This object is only visible if the "Remote control" parameter is set to "User" or to "Program & User" in the "General Settings" parameter window.

This object is used for sending a telegram for restoring or saving an 8-bit scene. The number of the 8-bit scene being restored or saved is set by means of the relevant parameter in the "scene control" parameter window.

Obj	Object name	Function	DP type	Flag
42	Switch basic illumination output	ON/OFF	1,001 (1 bit)	CRT

This object is only visible if the "Basic illumination by" parameter is set to "specific switching object" in the "Basic Illumination" parameter window. This object must be linked with the switching object of the actuator used for switching basic illumination 'ON' and 'OFF'. The group address linked with this object is used for sending the switching command by bus to the actuator, with it also being possible to request the switching status from the detector.

Obj	Object name	Function	DP type	Flag
43	Twilight sensor input	0 to 300 lux	9,004 (16 bits)	CWT

This object is only visible if the "Basic illumination ON" parameter is set to "in relation to outdoor light level" in the "Basic Illumination" parameter window.

The group address linked with this object is used for receiving the light level measured by a twilight sensor and then for checking for whether the level of light exceeds or falls below the basic illumination threshold.

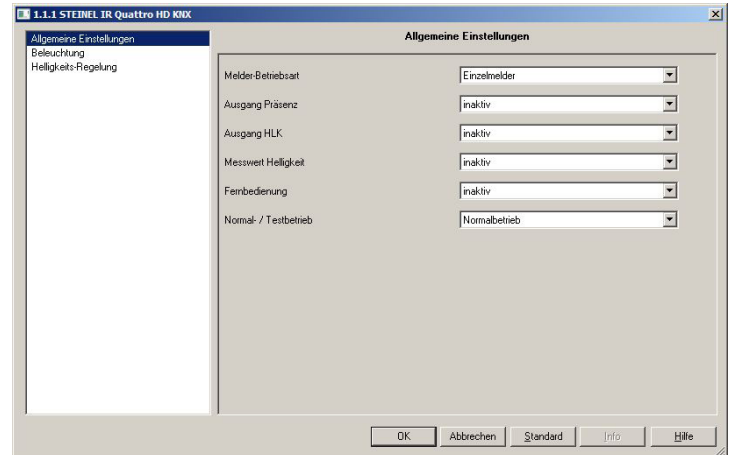| Obj	Object name	Function	DP type	Flag
44	Basic light-level threshold	10 to 300 lux	9,004 (16 bits)	CRWT
This object is only visible if the "Threshold and 'ON' period can be read / changed by bus" parameter is set to "Yes" in the "Basic Illumination" parameter window.				
The group address linked with this object can be used on the bus for changing the basic light-level threshold (in lux) at which basic illumination is activated if not met and at which basic illumination is switched 'OFF' again if significantly exceeded.				
Any value received outside the permissible range of 10 to 300 lux is rejected. This object can also be used for requesting the current threshold value at any time, also after making a change by ETS or IR remote control.				
45	Time factor for basic illumination 'ON' period	1…30	5,005 (8 bits)	CRWT
This object is only visible if the "Threshold and 'ON' period can be read / changed by bus" parameter is set to "Yes" in the "Basic Illumination" parameter window.				
The group address linked with this object can be used for changing the 'ON' period for basic illumination (in minutes) by bus. Basic illumination is switched 'OFF' after expiry of the 'ON' period.				
Any value received outside the permissible range of 1 to 30 is rejected. This object can also be used whenever necessary for requesting the current 'ON' period for timed basic illumination, also after making a change by ETS or IR remote control.				

11. Parameter

Note: The parameter setting options corresponding to the factory settings are shown in **bold type**.

11.1 "General Settings" parameter window

This parameter window is always available. It is used for setting the detector operating mode as well as the chosen detector functions.
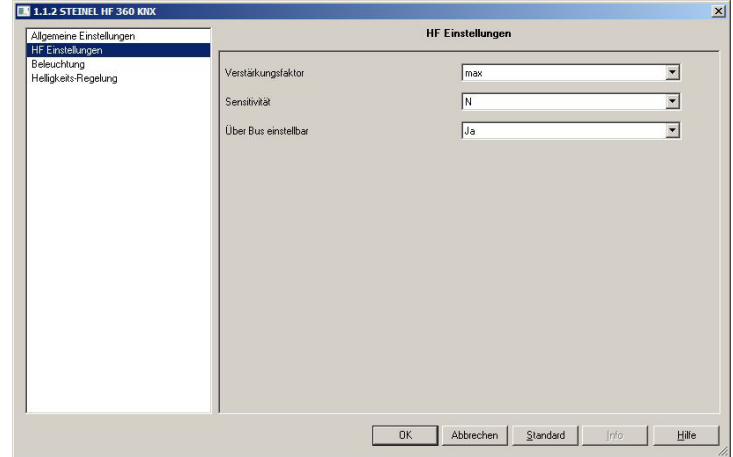

HF 360 and Dual HF only:

Obj	Object name	Function	DP type	Flag
46	Boost factor	1…4	5,005 (8 bits)	CRWT
This object is only visible if the "Selectable by bus" parameter is set to "Yes" in the "HF settings" parameter window.				
The group address linked with this object is used on the bus for setting the HF presence-detector boost factor. Any value received outside the permissible range of 1 to 4 is rejected. This object can also be used for requesting the current boost factor at any time, also after making a change by ETS or IR remote control. Values 1 to 4 have the following meaning: 1: very large movements are detected, 2: large movements are detected, 3: moderate movements are detected, 4: minor movements are detected.				
47	Sensitivity	1 = high / 0 = low	1,001 (1 bit)	CRWT
This object is only visible if the "Selectable by bus" parameter is set to "Yes" in the "HF settings" parameter window.				
The group address linked with this object is used on the bus for setting the HF presence-detector's "sensitivity". This object can also be used for requesting the current sensitivity setting whenever necessary, also after making a change by ETS or IR remote control.				

Parameter	Settings
Detector mode	**Single detector;** Master; Slave; Master in parallel mode
Single detector: Only one presence detector is installed in the room. Master: If required, additional detectors can be connected to the "master" on the bus as "slaves" to extend the presence detection zone. Only the master controls light level and sends any presence and HVAC objects. Slave: Slaves are used for extending the detection zone. They only deliver presence information to the master. Master in parallel mode: refer to page 1	
Number of slaves	**1;** 2; 3; 4
This parameter is only visible if the previous "Detector mode" parameter is either set to "master" or "master in parallel mode" . This parameter is used for setting the number of slaves connected. Depending on the number selected, the associated objects and parameters are added to the master.	
Presence output	active; **inactive**
active: The user is provided with the "Presence" parameter window for setting the associated parameters as well as the associated objects. inactive: The detector does not detect the presence of persons. The user is not provided with the "Presence" parameter window and the associated objects.	

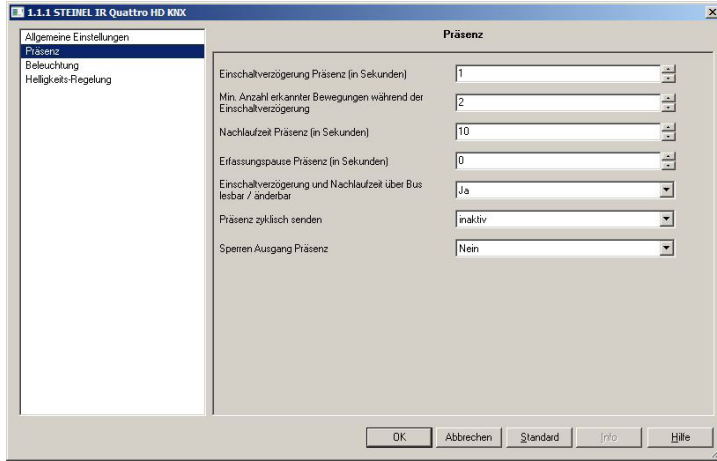| Parameter	Settings
HVAC output	active; **inactive**
active: The user is provided with the "HVAC" parameter window for setting the associated parameters as well as the associated objects. inactive: The detector does not control the HVAC mode. The "HVAC" parameter window and the associated objects are not available.	
Light level measured	active; **inactive**
active: Object 11 "Light-level measured" is added that is used for sending the light level measured (in lux) by the presence detector. inactive: The light level measured by the detector is not sent. Object 11 required is not available.	
Remote Control	User; Program; Program & User; **inactive**
User: Enabled the room user to operate and dim lighting, save and select as many as 4 scenes as well as re-activate (enable) light-level control with a small IR remote control. Program: Enables service personnel to change a number of detector parameters (e.g. switch-'ON' delay, stay-'ON' times and light-level setting) with a special IR remote control without using ETS. Program & User: Enables switching, dimming and scene control as well as the changing of detector parameters by IR remote control. inactive: The IR receiver integrated in the detector is deactivated.	
Normal / test mode	**Normal mode;** Presence test mode; Lighting test mode
Normal mode: The presence detector works in the parameterised mode. Presence test mode: The presence detector can be set to presence test mode for checking the detection zone. Any movement detected in the presence test mode results in flashing of the blue light-emitting diode integrated in the presence detector. No objects are sent during the presence test mode. Lighting test mode: To run the "Lighting test mode", the detector must have been parameterised by ETS and its objects linked with the objects of the buttons and actuators for lighting control. Any movement detected in this test mode results in brief flashing of the blue light-emitting diode integrated in the presence detector. For the duration of this test mode and irrespective of the parameters selected for the presence detector, the stay-'ON time is set to 8 s, and light-level control and the remote control activated for both types of IR remote control. The "presence detection" and "HVAC control" functions are deactivated. The associated objects are not sent. The presence detector is restarted after completing the test mode (when this parameter has been reset to "normal mode"). The parameters changed at the beginning of the test mode are now reset to the values selected with ETS.	

11.2 "HF-Settings" parameter window

This parameter window is always available (HF360 and DUAL HF only). This is used for making the HF-settings.

Parameter	Settings
Boost factor	min, $1/3$, $2/3$, max
This parameter is used for setting the boost factor for detecting movements by the HF detector. min: very large movements are detected, $1/3$: large movements are detected, $2/3$: moderate movements are detected, max: minor movements are detected.	
Sensitivity	- (= low); **N(= high)**
This parameter is used for setting HF-detector "sensitivity". "High" sensitivity immediately responds to any movement detected. "Low" sensitivity only responds after detecting several movements.	
Boost factor, sensitivity, can be read / changed by bus	**Yes;** No
This parameter is used for selecting whether or not to provide the capability of reading and changing the reach and sensitivity parameters by bus. Yes: Communication objects 46 and 47 are added so that boost factor and sensitivity can be set by bus. These objects not only provide the capability of changing the relevant values by bus. They can also be used for requesting the current value irrespective of whether it was entered by ETS, service remote control or bus. No: Boosting factor and sensitivity cannot be read and set by bus.	

11.3 "Presence" parameter window

This parameter window is only provided when the "Presence output" parameter is set to "active" in the "General Settings" parameter window.
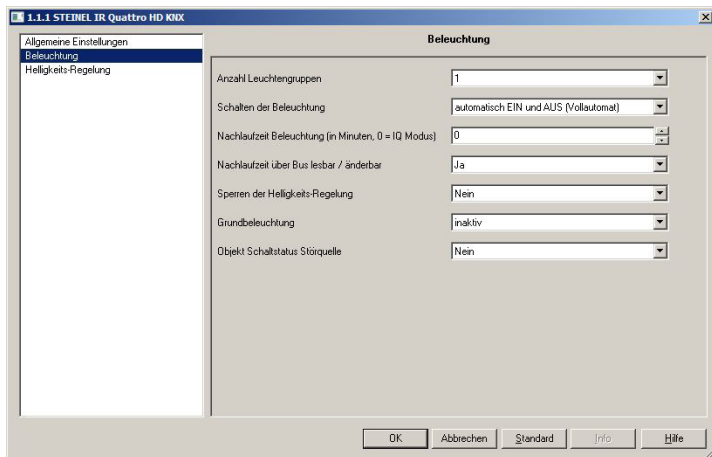It is used for setting presence-detection behaviour.

Parameter	Settings
Presence switch-'ON' delay (in seconds)	0…5; **(1)**
Switch-'ON' delay can be set to between 0 and 5 seconds. If this parameter is set to "0", a check is once again performed to establish whether presence is still being detected before sending "presence output = ON". Otherwise nothing is sent.	
Min. number of movements detected during switch-'ON' delay	1…20; **(2)**
This parameter is only visible if the preceding "Presence switch-'ON' delay" parameter is not set to "inactive". This parameter is used for setting the minimum number of movements that must be detected while switch-'ON' is being delayed. Presence must still be detected even after switch-'ON' delay has elapsed. Otherwise "presence output = ON" is not sent.	
Presence stay-'ON' time (in seconds)	1…255; **(10)**
Stay-'ON' time can be set to a value of between 1 and 255 minutes. It is restarted each time a movement is detected. Note: A "presence output = OFF" signal is delivered if a person in the detection zone remains still during the selected time setting. Depending on the person's activity, it may be necessary to select a longer stay-'ON' time.	
Break in presence detection	0…255; **(0)**
Lighting switched 'OFF' by light-level control starts parameterised "Break in presence detection". It can be set to between 0 and 255 seconds. Movements detected are ignored during the period selected. This provides the capability of preventing lights installed in the sensor system's detection range resulting in the identification and incorrect signalling of presence if temperature changes after light switches 'OFF.	

Parameter	Settings
Switch-'ON' delay and stay-'ON' time can be read / changed by bus	**Yes;** No
This parameter is used for selecting whether or not to provide the capability of reading and changing presence-detection switch-'ON' delay and stay-'ON' time by bus. Yes: Communication objects 9 and 10 are added so that presence-detection switch-'ON' delay and stay-'ON' time can be set by bus. These objects not only provide the capability of changing both values on the bus. They can also be used for requesting the current value irrespective of whether it was entered by ETS, service remote control or bus. No: Presence-detection switch-'ON' delay and stay-'ON' time cannot be read and selected by bus.	
Send presence cyclically	**inactive;** 15 s; 30 s; 1 min.; 5 min.; 10 min.; 15 min.; 30 min.; 60 min.
This parameter is used for selecting whether not only to send the "Presence output" object after any change but also cyclically and, if so, after which cycle time.	
Disable presence output	**No;** ON for disabling / OFF for enabling; OFF for disabling / ON for enabling
This parameter is used for selecting whether to add object 2 "Disable presence output" and which telegram to use for disabling and re-enabling the "Presence output" object. No presence messages are sent while the "Presence output" object is disabled. No: The "Disable presenc output" object is no available. ON for disabling / OFF for enabling: The "Presence output" object is disabled with the value "1" and re-enabled by a telegram with the value "0". OFF for disabling / ON for enabling: The "Presence output" object is disabled with the value "0" and re-enabled by a telegram with the value "1".	
Behaviour on disabling presence output	**no action;** ON telegram; OFF telegram
This parameter is only visible if the preceding "Disable presence output" parameter is not set to "No". This parameter is used for selecting whether to send a telegram from the "Presence output" object before disabling it and, if so, with which value. no action: No telegram is sent before disabling the "Presence output" object. ON telegram: Before disabling the "Presence output" object, the object is set to the value "1" and an appropriate telegram is sent. OFF telegram: Before disabling the "Presence output" object, the object is set to the value "0" and an appropriate telegram is sent.	

Parameter	Settings
Behaviour on enabling presence output	**Set presence to current status;** ON telegram; OFF telegram
This parameter is only visible if the preceding "Disable presence output" parameter is <u>not</u> set to "No". This parameter is used for selecting what is to happen after enabling the "Presence output" object. <u>Set presence to current status:</u> After enabling the "Presence output" object, it is set to the status ascertained by the detector, with this status being sent. <u>ON telegram:</u> After enabling the "Presence output" object, the object is set to the value "1" and an appropriate telegram is sent. After a delay of 5 s, sensor mode is then re-activated, the current presence status determined and any changed value sent. <u>OFF telegram:</u> After enabling the "Presence output" object, the object is set to the value "0" and an appropriate telegram is sent. After a delay of 5 s, sensor mode is then re-activated, the current presence status determined and any changed value sent.	
Presence output disabling status object	**No;** send after change
This parameter is used for selecting whether to add object 3 "Presence output disabling status" and, if so, when to send it. Object value "1" is then used to report that presence detection is disabled, with object value "0" being used to report that it is enabled again.	

11.4 "Lighting" parameter window

This parameter window is always provided except for when a detector is operating as a "slave". It is used for setting lighting control behaviour.
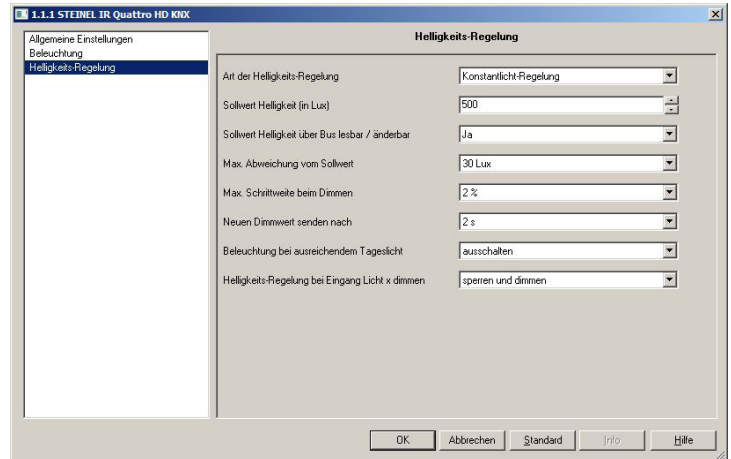

Parameter	Settings
Number of lighting groups	**1**; 2; 3; 4
This parameter is used for selecting how many lighting groups contribute to room lighting. If several lighting groups are installed, the presence detector must be installed with light-level sensor within lighting group 1. In cases where several presence detectors are being operated in a room, the presence detector for lighting group 1 should work as the master. The detector for lighting group 1 should then be positioned as closely to the door as possible so that it can immediately detect anyone entering the room. If "switched mode" has been selected for controlling light level (this being the equivalent of two-point control), lighting group 1 is always switched 'ON' first when presence is detected and the level of light measured is below the light-level setting. If the measured level is then still below the preselected level, lighting group 2 is switched 'ON' and so forth. If the level of light is sufficient, lighting groups are always switched 'OFF' in the reverse order, i.e. the lighting group with the highest number is switched 'OFF' first followed by the one with the second-highest number and so on. If "constant-lighting control" has been selected as the mode for controlling the level of light, all lighting groups are switched 'ON' at max. output when a person enters the room and the measured level of light is below the light-level setting. They are then dimmed down until light-level setting and measured light level coincide (allowing for the permissible variation). In this case, only lighting group 1 is dimmed to the dimming level determined by the light-level controller. All other lighting groups are dimmed up or down by a level that can be set individually for each lighting group depending on whether it is installed close to the window or further away from it. Depending on the selected number of lighting groups, relevant objects 14 to 21 are automatically added for switching and dimming a lighting group by the light-level controller as well as objects 24 to 35 that provide the capability of operating, dimming or setting the particular lighting group to a dimming level by means of a button.	
Operating lighting	**automatically 'ON' and 'OFF' (fully automatic operation);** automatically 'OFF' only (semi-automatic operation)
This parameter is used for selecting whether to switch lighting 'ON' and 'OFF' automatically in relation to presence and light level (fully automatic operation) or whether only to switch it 'OFF' automatically (semi-automatic operation). On entering the room or if the level of light is no longer sufficient, the room user must then switch the lighting 'ON' manually. <u>automatically 'ON' and OFF:</u> Lighting is switched 'ON' and 'OFF in relation to presence and light level (fully automatic operation). <u>automatically 'OFF' only:</u> The room user must switch the lighting 'ON' manually. It is, however, switched 'OFF' automatically when no persons are present or the level of light is sufficient (semi-automatic operation).	
Stay-'ON' time **Lighting (in minutes)**	**0 (IQ mode);** 1…30
Lighting stay-'ON' time is started if no presence is detected. It is either automatically matched in "IQ mode" to the time persons spend in the room (i.e. increasing in duration the longer persons have been present in the room) or can be set to a fixed value. This has the purpose of preventing the lighting from switching 'OFF' immediately if the room is only vacated for a short time and having to be switched back 'ON' again and slowly dimmed to the light-level setting when a person returns to the room. <u>0 (IQ mode):</u> The stay-'ON' time automatically adjusts to the time persons spend in the detection zone. <u>1 to 30 minutes:</u> The lighting stay-'ON' time can be set to a fixed period of between 1 and 30 minutes.	

Parameter	Settings
Stay-'ON' time can be read / changed by bus	**Yes;** No
This parameter is used to select whether or not lighting-control stay-'ON' time can be read and changed by bus. Yes: Communication object 13 is added for lighting-control stay-'ON' time to be selectable on the bus. This object not only provides the capability of changing the value on the bus. They can also be used for requesting the current value irrespective of whether it was entered by ETS, service remote control or bus. No: Lighting-control stay-'ON' time cannot be read and set by bus.	
Disabling light-level control	**No;** ON for disabling / OFF for enabling; OFF for disabling / ON for enabling
This parameter is used for selecting whether to add object 22 "Disable light-level control" and which telegram can be used for disabling and re-enabling the "light-level control". If light-level control is disabled, no telegrams are sent for switching lighting 'ON' and 'OFF' or for dimming it. No: The "Disable light-level control" object is not available. ON for disabling / OFF for enabling: Light-level control is disabled by means of a telegram with value "1" to the "Disable light-level control" object and enabled by means of a telegram with value "0". OFF for disabling / ON for enabling: Light-level control is disabled by means of a telegram with value "0" to the "Disable light-level control" object and enabled by means of a telegram with value "1".	
Behaviour on disabling light-level control	**no action;** Light ON; Light OFF
This parameter is only visible if the preceding "Disabling light-level control" parameter is not set to "No". This parameter is used to select whether to switch lighting 'ON' or 'OFF' completely before disabling light-level control or whether to leave lighting status unchanged. no action: No further action takes place before disabling light-level control. Light ON: Lighting is switched to max. output before disabling light-level control. Light OFF: Lighting is switched 'OFF' completely before disabling light-level control.	
Behaviour on enabling light-level control	**Continuing control;** Light ON; Light OFF
This parameter is only visible if the preceding "Disabling light-level control" parameter is not set to "No". This parameter is used to select whether, once enabled, light-level control is to resume its activity, proceeding from the current dimming level as well as in relation to presence status and light level measured, or whether to switch the lighting 'ON' or 'OFF' completely first. Continuing control: After enabling light-level control, it determines which level of output - in relation to presence status and level of light currently being measured - to switch or dim the lighting to. Light ON: Lighting is switched to max. output after enabling light-level control. Presence-related light-level control is reactivated after a delay of 5 s. Light OFF: Lighting is switched 'OFF' completely after enabling light-level control. Presence-related light-level control is reactivated after a delay of 5 s.	
Light-level control disabling status object	**No;** send after change
This parameter is used for selecting whether to add object 23 "Light-level control disabling status" and, if so, when to send it. Object value "1" is then used to report that light-level control is disabled, with object value "0" being used to report that it is enabled again.	

Parameter	Settings
Basic illumination	active; **inactive**
If required, a presence detector installed, for example, in entrances, corridors or stairwells, can be set to provide basic illumination either for a limited period at the end of stay-'ON' time or always when light level falls below a threshold so that it is never completely dark in these areas. active: The "Basic Illumination" parameter window is additionally available for selecting how to provide basic illumination, from which time and for how long. inactive: The "basic illumination" function is not available.	
Interference source switching status object	Yes; **No**
This parameter is in the "Lighting" parameter window This parameter is used for selecting whether to add the "Interference source switching status" objects. If necessary, this object can be linked with the switching objects of those lights located in the sensor system's detection zone. The presence detector can then identify whether the movement detected is from a person or a light coming 'ON' within the detection zone.	

11.5 "Light-Level Controller" parameter window

This parameter window is always provided except for when a detector is operating as a "slave". It is used for setting light-level control behaviour.
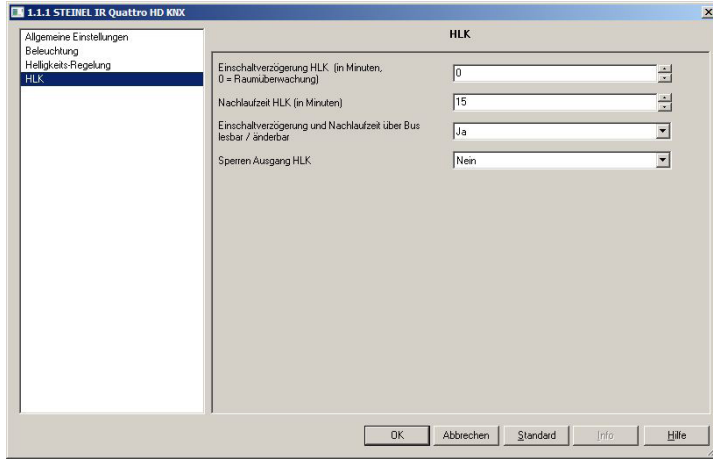

Parameter	Settings
Type of light-level control	switched mode; **constant-lighting control**
Switched mode: This mode must be set if the capability is only to be provided for switching room lighting 'ON' and 'OFF'. The presence detector then switches the lighting 'ON' (if applicable by group where several lighting groups are installed) when presence is detected **and** the level of light being measured it below the light-level setting, and 'OFF' again (also by group, if applicable) either when presence is no longer being detected **or** daylight is sufficient for illuminating the room. Constant-lighting control: This mode must be set if the capability is not only to be provided for switching room lighting 'ON' and 'OFF' but also for dimming it. The presence detector switches the lighting 'ON' when presence is detected **and** the level of light being measured is below the light-level setting and dims it until the light-level measured coincides with the light-level setting selected. Lighting is switched 'OFF' when no person is left in the room or so much daylight is entering the room that the lighting is dimmed to below minimum dimming level.	

Parameter	Settings
Light-level setting (in lux)	10…1000; (**500**)
This parameter is used for selecting the setting for controlling light level.	
Light-level setting can be read / changed by bus	**Yes;** No
This parameter is used for selecting whether the setting for controlling light level can be read and changed by bus. Yes: Communication object 12 "Light-level setting" is added. This object not only provides the means for changing the setting on the bus but also for requesting the current level irrespective of whether it was entered by ETS, service remote control or bus. No: The light-level setting can only be selected using the parameter above.	
Max. variation from the setting	15 lux; **30 lux;** 45 lux; 60 lux
This parameter is only visible if "Type of light-level control" parameter is set to "constant-lighting control". It defines the adjustment precision for providing the set level of light. This is necessary because lighting is controlled in dimming steps. Setting an insufficient maximum variation from the set level can therefore sometimes result in a further "brighter" adjustment step exceeding the set level and in a further "darker" adjustment step taking illumination below the set level. This leads to light being turned up and down all the time (i.e. continuously fluctuating light level). If this is the case, the max. permissible variation from the set level must either be increased or dimming step reduced.	
Max. dimming step	0.5 %; 1%; 1.5%; **2 %**; 2.5 %; 3%; 5%
This parameter is only visible if "Type of light-level control" parameter is set to "constant-lighting control". This parameter is used for setting the maximum dimming "step" (this being the maximum level by which a new dimming level may increase or decrease from the previous level with constant-lighting control). Note: The larger the "Max. dimming step", the smaller the "Max. variation from the setting" should be.	
Send new dimming level after	0.5 s; 1 s; **2 s;** 3 s; 4 s; 5 s
This parameter is only visible if "Type of light-level control" parameter is set to "constant-lighting control". This parameter is used for setting the delay after which a new dimming level is sent in constant-lighting control mode. This ensures that even if actuator dimming times are short they do not result in constant-lighting control producing any abrupt change in light level that a room user may find unpleasant.	
Lighting with sufficient daylight	**switching OFF;** dim to minimum level
This parameter is only visible if "Type of light-level control" parameter is set to "constant-lighting control". This parameter is used for selecting whether to switch the lighting 'OFF' completely when presence = 'ON' and there is sufficient daylight or whether to leave it 'ON' but dim it to the selectable "minimum dimming level". switching OFF: The lighting is switched 'OFF' when the dimming level determined by the light-level controller is below the "minimum dimming level" selected. It is automatically switched back 'ON' again as soon as the dimming level measured by the light-level controller coincides with or exceeds the "minimum dimming level" selected. dim to minimum level: Lighting remains switched 'ON' and is dimmed to "minimum dimming level" even if the dimming level measured by the light-level controller is below the "minimum dimming level" selected. It is only dimmed up again when the dimming level measured by the light-level controller is above the "minimum dimming level" selected.	

Parameter	Settings
Minimum dimming level	**0.5%;** 1%; 2%; 3%; 4%; 5%; 6%; 7%; 8%; 9%; 10%
This parameter is only visible if "Type of light-level control" parameter is set to "constant-lighting control". If the light-level controller measures a dimming level that is below the level set here, lighting is switched 'OFF' or left 'ON' and dimmed to the level selected by means of the preceding parameter.	
Lighting group 2 offset to dimming level for lighting group 1	(-100%...**0%**...+100%)
This parameter is only visible if the "Type of light-level control" parameter is set to "constant-lighting control" and the "Number of lighting groups" parameter is set to a value of ≥ 2 in the "Lighting" parameter window. This parameter is used for selecting the offset value for lighting group 2 that must be added to or subtracted from the dimming level measured by the light-level controller for lighting group 1 (depending on whether lighting group 2 is further away from or closer to the window than lighting group 1) to provide a workplace below lighting group 2 with a level of light that is also more or less the same as that provided at the light-level setting selected for lighting group 1.	
Lighting group 3 offset to dimming level for lighting-group 1	(-100%...**0%**...+100%)
This parameter is only visible if the "Type of light-level control" parameter is set to "constant-lighting control" and the "Number of lighting groups" parameter is set to a value of ≥ 3 in the "Lighting" parameter window. This parameter is used for selecting the offset value for lighting group 3 that must be added to or subtracted from the dimming level measured by the light-level controller for lighting group 1 (depending on whether lighting group 3 is further away from or closer to the window than lighting group 1) to provide a workplace below lighting group 3 with a level of light that is also more or less the same as that provided at the light-level setting selected for lighting group 1.	
Lighting group 4 offset to dimming level for lighting-group 1	(-100%...**0%**...+100%)
This parameter is only visible if the "Type of light-level control" parameter is set to "constant-lighting control" and the "Number of lighting groups" parameter is set to the value of 4 in the "Lighting" parameter window. This parameter is used for selecting the offset value for lighting group 4 that must be added to or subtracted from the dimming level measured by the light-level controller for lighting group 1 (depending on whether lighting group 4 is further away from or closer to the window than lighting group 1) to provide a workplace below lighting group 4 with a level of light that is also more or less the same as that provided at the light-level setting selected for lighting group 1.	
Light-level control for dim light x input	disable and dim; **do not disable and alter setting**
disable and dim: If a telegram is received by means of the "Dim light x input" object, light-level control is disabled and the addressed lighting group dimmed. This setting is recommended if room lighting consists of several lighting groups. do not disable and alter setting: Light-level control is not disabled after receiving a telegram by means of the "Dim light x input" object. After receiving a telegram, a delay of approx. 5 seconds elapses before the new light-level value is adopted as the set level. This setting is recommended if only one lighting group is used for illuminating the room.	

11.6 "HVAC" parameter window

This parameter window is only provided if the detector is not being operated as a "slave" and the "HVAC output" parameter is then set to "active" in the "General Settings" parameter window.
It is used for setting HVAC control behaviour.

Parameter	Settings
HVAC switch-'ON' delay **(in minutes)**	**0 (room surveillance);** 1…30
This switch-'ON' delay is independent of the switch-'ON' delay for presence detection. It begins from the time at which the detector has identified the presence of a person. It has the purpose of preventing the room-temperature control system from immediately switching over to "comfort mode" in response to a person entering the room for a brief period only. It is either matched automatically by the detector to the time persons spend in the room or can be set to a fixed period. <u>0 (room surveillance);</u> The switch-'ON' delay is automatically matched to the time persons spend in the detection zone.	
HVAC stay-'ON' time **(in minutes)**	1…120 **(15)**
HVAC stay-'ON' time is started if no presence is detected. This has the purpose of preventing the "comfort mode" for controlling room-temperature - along with heating and cooling - from ending as soon as the room is vacated, particularly when the room is entered again a short time afterwards and continues to be used. <u>1 to 120 minutes:</u> The HVAC stay-'ON' time can be set to a fixed period of between 1 and 120 minutes.	
Switch-'ON' delay and stay-'ON' time can be read / changed by bus	Yes; **No**
This parameter is used for selecting whether or not to provide the capability of reading and changing HVAC-control switch-'ON' delay and stay-'ON' time by bus. <u>Yes:</u> Communication objects 39 and 40 are added so that HVAC-control switch-'ON' delay and stay-'ON' time can be set by bus. These objects not only provide the capability of changing both values on the bus. They can also be used for requesting the current value irrespective of whether it was entered by ETS, service remote control or bus. <u>No:</u> HVAC-control switch-'ON' delay and stay-'ON' time cannot be read and selected by bus.	

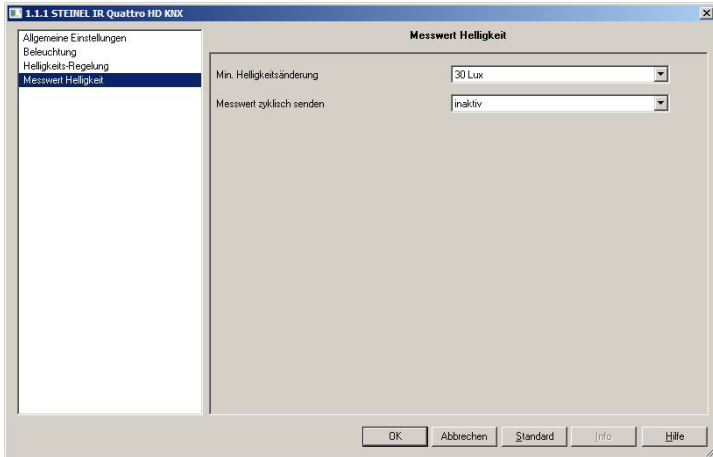| Parameter	Settings
Disable HVAC output	**No;** ON for disabling / OFF for enabling; OFF for disabling / ON for enabling
This parameter is used for selecting whether to add object 37 "Disable HVAC output" and which telegram to use for disabling and re-enabling the "HVAC output". If the "HVAC output" object is disabled, HVAC will not be controlled, i.e. the "HVAC output" object is not sent. <u>No:</u> The "Disable HVAC output" object is not available. <u>ON for disabling / OFF for enabling:</u> The "HVAC output" object is disabled by a telegram received with the value "1" for the "Disable HVAC output" object and enabled by a telegram with the value "0". <u>OFF for disabling / ON for enabling:</u> The "HVAC output" object is disabled by a telegram received with the value "0" for the "Disable HVAC output" object and enabled by a telegram with the value "1".	
Behaviour on disabling HVAC output	**no action;** ON telegram; OFF telegram
This parameter is only visible if the preceding "Disable HVAC output" parameter is <u>not</u> set to "No". This parameter is used for selecting whether to set the "HVAC output" object to a specific value before disabling it and whether to send this value. <u>no action:</u> No telegram is sent before disabling the "HVAC output" object. <u>ON telegram:</u> Before disabling the "HVAC output" object, the object is set to the value "1" and a relevant telegram sent. <u>OFF telegram:</u> Before disabling the "HVAC output" object, the object is set to the value "0" and a relevant telegram sent.	
Behaviour on enabling HVAC output	**Set HVAC output to current status;** ON telegram; OFF telegram
This parameter is only visible if the preceding "Disable HVAC output" parameter is <u>not</u> set to "No". This parameter is used for selecting what is to happen after enabling the "HVAC output" object. <u>Set HVAC output to current status;</u> After enabling the "HVAC output" object, it is set to the status ascertained by the detector, with this status being sent. <u>ON telegram:</u> After disabling the "HVAC output" object, it is set to the value "1" irrespective of presence status and a relevant telegram sent. After a delay of 5 s, the detector takes into account the current presence status and determines which value currently to set the "HVAC output" to and sends any changed value. <u>OFF telegram:</u> After disabling the "HVAC output" object, it is set to the value "0" irrespective of presence status and a relevant telegram sent. After a delay of 5 s, the detector takes into account the current presence status and determines which value currently to set the "HVAC output" to and sends any changed value.	
HVAC output disabling status object	**No;** send after change
This parameter is used for selecting whether to add object 38 "HVAC output disabling status" and, if so, when to send it. Object value "1" is then used to report that HVAC control is disabled, with object value "0" being used to report that it is enabled again.	

11.7 "Light Level Measured" parameter window

This parameter window is only provided if the detector is not being operated as a "slave" and the "Light level measured" parameter is then set to "active" in the "General Settings" parameter window.
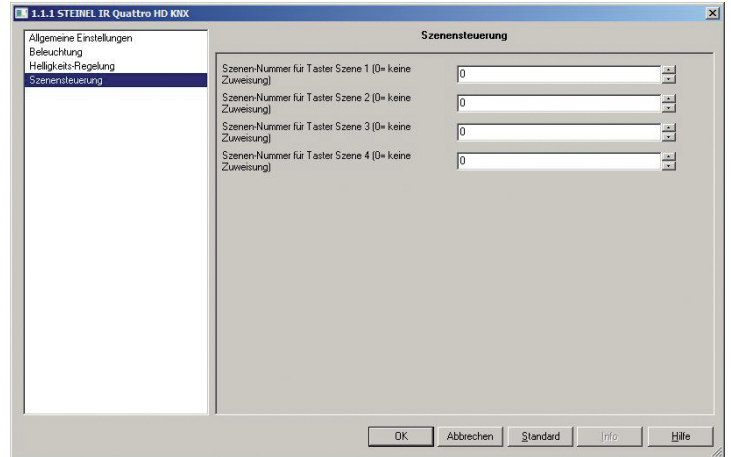Note:
If the LED lights up permanently, e.g. in 4h ON/OFF mode or for a selected scene, light level is not measured. No telegram is sent on the bus during this time.

11.8 "Scene Control" parameter window

This parameter window is only available if the detector is not being operated as a "slave" and if the "Remote control" parameter is then either set to "User" or to "Program & User" in the "General Settings" parameter window.
It is used for setting the four scene numbers for 8-bit scene control the scenes of which can be saved and selected using the "User" IR remote control.
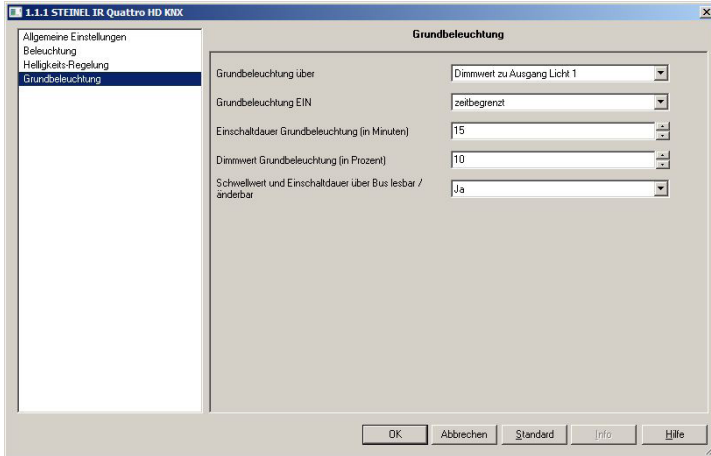
Parameter	Settings
Min. light-level change	20 lux; **30 lux;** 40 lux; 50 lux; 60 lux
This parameter is used to select which level the light-level value last sent must have changed by for the light level measured to be sent again.	
Send measured level cyclically	**inactive;** 10 s; 15 s; 30 s; 1 min.; 5 min.; 10 min.; 15 min.; 30 min.; 60 min.
This parameter is used to select whether or after which cycle time to send the "Light level measured" object, even if the light level measured has not changed in the meantime.	

Parameter	Settings
Scene number [1 to 64] for button, scene 1 (0=no assignment)	**0…**64
This parameter is used for assigning a scene number in the range from 1 to 64 to the buttons for saving or selecting scene 1 on the "User" IR remote control. 0 means "no scene assigned". No scene telegram is then sent on the bus. If a scene is selected before it has been saved, scene selection remains without any response.	
Scene number [1 to 64] for button, scene 2 (0=no assignment)	**0…**64
This parameter is used for assigning a scene number in the range from 1 to 64 to the buttons for saving or selecting scene 2 on the "User" IR remote control. 0 means "no scene assigned". No scene telegram is then sent on the bus. If a scene is selected before it has been saved, scene selection remains without any response.	
Scene number [1 to 64] for button, scene 3 (0=no assignment)	**0…**64
This parameter is used for assigning a scene number in the range from 1 to 64 to the buttons for saving or selecting scene 3 on the "User" IR remote control. 0 means "no scene assigned". No scene telegram is then sent on the bus. If a scene is selected before it has been saved, scene selection remains without any response.	
Scene number [1 to 64] for button, scene 4 (0=no assignment)	**0…**64
This parameter is used for assigning a scene number in the range from 1 to 64 to the buttons for saving or selecting scene 4 on the "User" IR remote control. 0 means "no scene assigned". No scene telegram is then sent on the bus. If a scene is selected before it has been saved, scene selection remains without any response.	

11.9 "Basic Illumination" parameter window

This parameter window is only provided if the detector is not being operated as a "slave" and if the "Basic illumination" parameter is then set to "active" in the "Lighting" parameter window.
It is used for setting the properties of chosen basic illumination, e.g. for foyers, stairwells and corridors.

1.1.1 STEINEL IR Quattro HD KNX		Grundbeleuchtung
Allgemeine Einstellungen Beleuchtung Helligkeits-Regelung Grundbeleuchtung	Grundbeleuchtung über	Dimmwert zu Ausgang Licht 1
	Grundbeleuchtung EIN	zeitbegrenzt
	Einschaltdauer Grundbeleuchtung (in Minuten)	15
	Dimmwert Grundbeleuchtung (in Prozent)	10
	Schwellwert und Einschaltdauer über Bus lesbar / änderbar	Ja
		OK Abbrechen Standard Info Hilfe

Parameter	Settings
Basic illumination by	special switching object; **dimming level to light 1 output**
special switching object: Object 42 "Switch basic illumination output" is added for switching the lights for basic illumination 'ON' and 'OFF'. Dimming level to light 1 output : Lighting group 1 dimmed to "basic illumination dimming level" is used as basic illumination.	
Basic illumination ON	for a limited time; in relation to light level; in relation to outdoor light level (ext. sensor)
for a limited time: Expiry of "lighting stay-'ON' time" does not result in lighting being switched 'OFF' completely but in activation of basic illumination for a limited time. in relation to light level: The following "Basic light-level threshold (in lux)" parameter is added. When no presence is being identified by the detector, this does not result in lighting being switched 'OFF' but in the activation of basic illumination if the level of light measured at this time by the detector is below the "basic light-level threshold (in lux)". It remains switched 'ON' until either presence is detected or the level of light measured by the detector significantly exceeds the "basic light-level threshold (in lux)". in relation to outdoor light level (ext. sensor): Communication object 43 "Twilight sensor input" is added for receiving the level of outdoor light measured by the twilight sensor as well as the following "basic light-level threshold (in lux)" parameter. Depending on whether actual light level exceeds or falls below the "basic light-level threshold (in lux)" selected, basic illumination is switched 'ON' or 'OFF' again regardless of presence.	
Basic light-level threshold (in lux)	10…300; (**50**)
This parameter is only visible if the preceding "Basic illumination ON" parameter is set to "in relation to light level" or "in relation to outdoor light level (ext. sensor)". This parameter is used for setting the threshold at which basic illumination is activated if the threshold if not met, and at which it is deactivated again if the threshold is significantly exceeded. This takes place irrespective of whether persons are present in the room or not.	

Parameter	Settings
Basic illumination dimming level	10%...50%
This parameter is only visible if the preceding "Basic illumination by" parameter is set to "dimming level for light 1" output. This parameter is used for setting the dimming level to which lighting is dimmed after expiry of stay-'ON' time. The following parameter is used for setting how long basic illumination remains switched 'ON' for.	
Basic illumination 'ON' period (in minutes)	1…30 (**15**)
This parameter is only visible if the "Threshold and 'ON' period can be read / changed by bus" parameter is set to "Yes". Basic illumination is switched 'OFF' after expiry of the 'ON' period that is set here.	
Threshold and stay-'ON' time can be read / changed by bus	Yes; No
This parameter is used for selecting whether or not the threshold for switching basic illumination 'ON'/'OFF' and the basic-illumination 'ON' period can be read and changed by bus. Yes: Communication objects 44 and 45 are added so that threshold and basic illumination 'ON' period can be set by bus. These objects not only provide the capability of changing both values on the bus. They can also be used for requesting the current value irrespective of whether it was entered by ETS, service remote control or bus. No: Threshold and basic illumination 'ON' period cannot be read and changed by bus.	