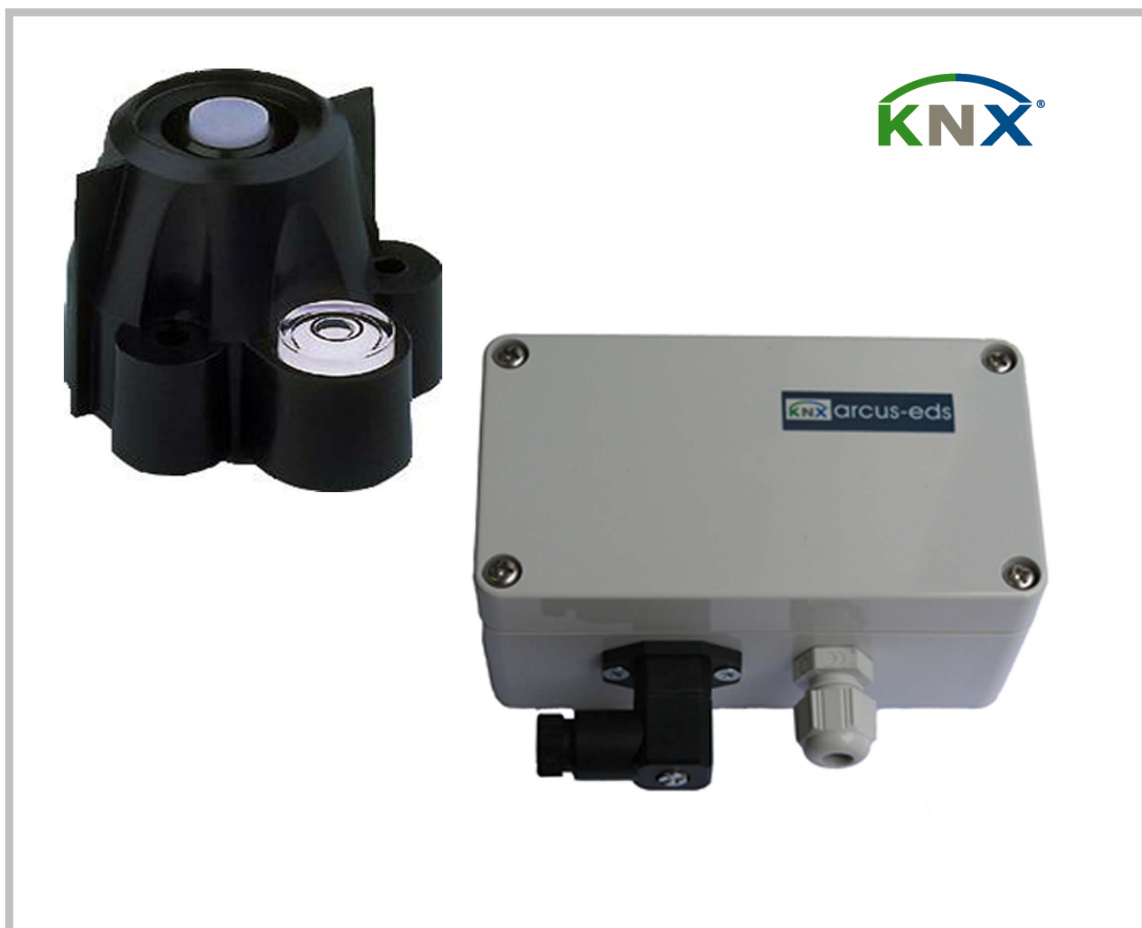


Arcus-EDS

Application Description

SK08-GLBS



KNX Sensor for Measuring Global Radiation

Operating Principles and Areas of Application:

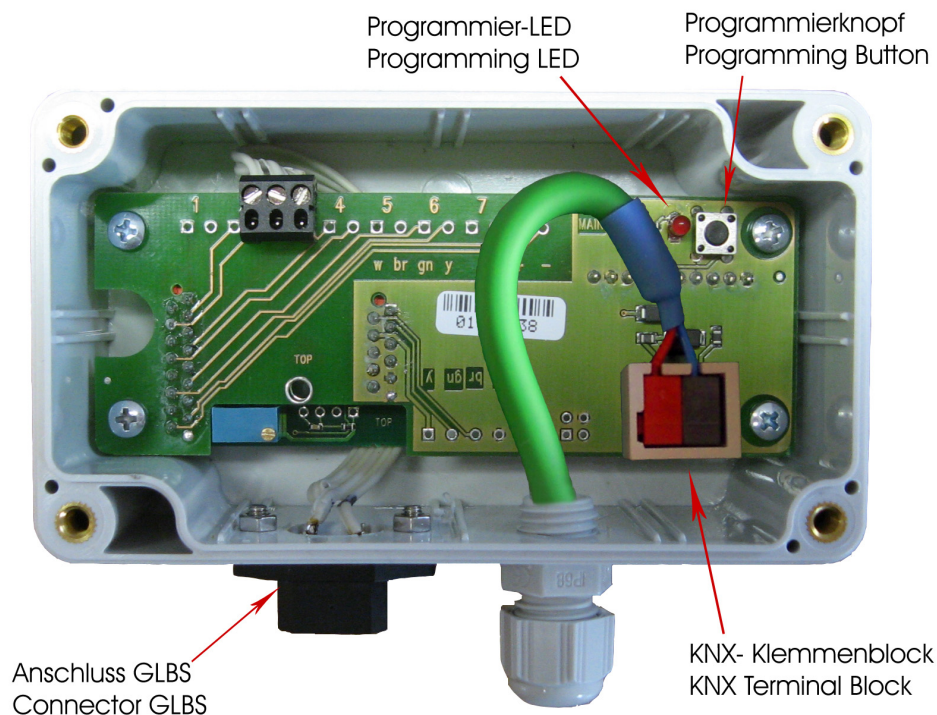
The production series S8 uses sensors and controllers for a number of physical and chemical measurements for indoor and outdoor areas.

The measuring system SK08-GLBS records the global radiation which is measured by the GLBS Sensor. It has a spectral response range of 400nm to 1100nm. The recorded value is then digitally converted and displayed on the KNX bus.

The sensory measurement accuracy is $\pm 3\%$ when the angle of incidence lies below 70° and $\pm 10\%$ when the angle of incidence lies between $70-85^\circ$. The absolute error for the sensor is $\pm 5\%$.

A number of controller models with various functions are available.

The devices in the series MS08 come in a housing for surface mounting with PG single connection for EIB/KNX insert.


Application and Functions:

KNX sensors are set up using the ETS (KNX Tool Software) with the associated application program SK08-GLBS. The device is delivered unprogrammed. All functions are parameterized and programmed by ETS. The controller can be switched on or off by activation or locking via the KNX bus.

Functions:

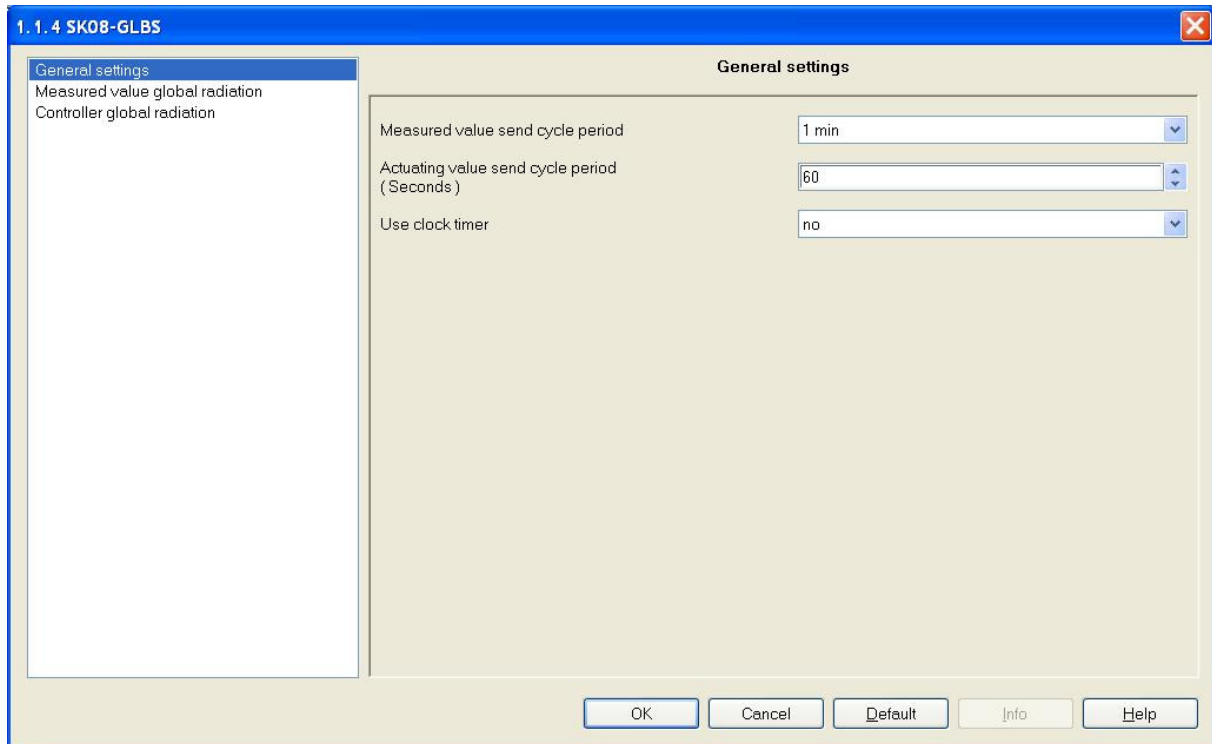
- Global radiation measurement with
- Two position controller with switch and pulse 1-bit output or
- PI controller with continuous 8-bit or pulse-width modulated 1-bit output
- Adjustable periodic display of control variable : no periodic display /10-250 seconds
- Adjustable release and lock with all controllers
- Threshold alarm for upper and lower thresholds
- Auxiliary quantity of set value or threshold via the bus

General Settings:

Periodic Measured Data Cycle: Measured data to be periodically displayed can be configured from a length of 1 to 120 minutes.

Periodic Actuating Variable Cycle: The control variable can be displayed between 10 and 250 seconds.

To display the measured data periodically use the measured data settings; to display the control variable periodically use the controller settings.



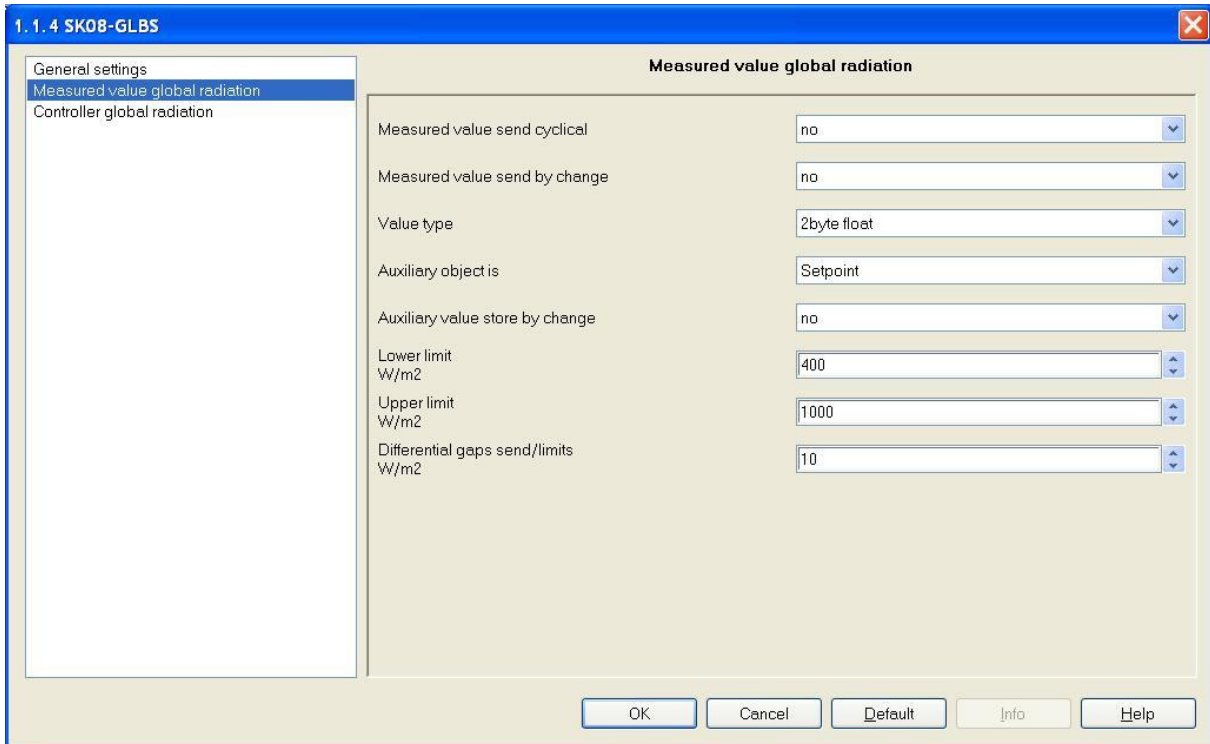
When using the **internal timer**, there are two additional objects for the system-time and -date available. Each controller can be locked independent from each other depending on the time. In this page you can set whether the timer is used at all and the span of time the controllers are active. Whether the timer is used for a controller is determined at his parameter page.

Measurement of Global Radiation:

Measured value send cyclical: Yes/No The display period is set in General Settings.

Measured value send by change: Yes/No The threshold is defined in "Display Differential Gap/Threshold".

Value Type: 1-byte Integer / 2-byte Integer / 2-byte float / 4-byte float Measured Data Output and Auxiliary data are defined concurrently.



Auxiliary Object is: Set point/Upper Threshold/Lower Threshold Every controller has an auxiliary object which can control either the set point of the controller or the limit values.

Auxiliary value store by change: Yes/No When the auxiliary data is changed the new value is carried over to EEPROM and saved in case of a bus voltage breakdown. This should be used only when the data is not frequently changed as EEPROM has only a limited memory cycle.

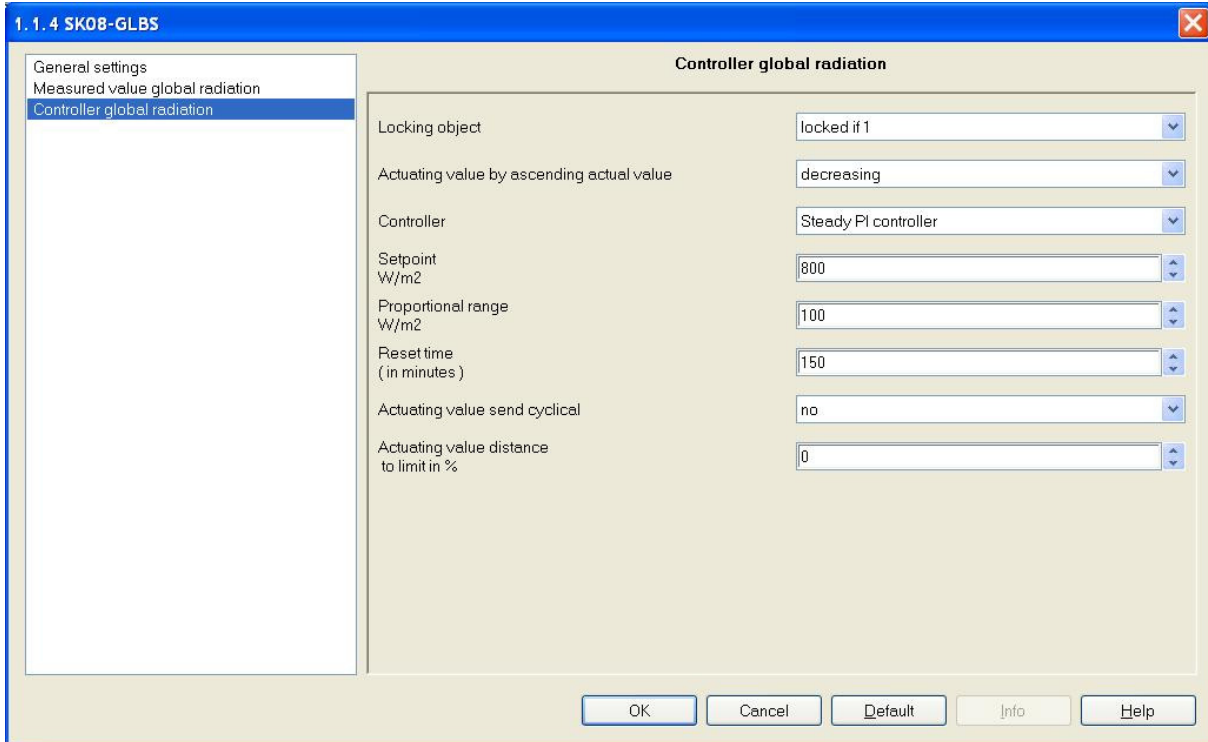
Lower Threshold: 0 ... 2000 W/m²

Upper Threshold: 0 ... 2000 W/m²

Differential gap send/limits: 0 ... 100 W/m² To reduce the bus load when a value is changed and to avoid multiple switching between measured data and thresholds, a hysteresis between 10 und 100 W/m² should be used.

Solar Radiation Controller:

Locking object: locked if 0/locked if 1: When using the lock function the controller output is deactivated. The lock function can be set up for "release" or "lock".



Actuating value by ascending actual value: decrease/increase The Actuating direction of the controller can be adapted to the characteristics of the controlled system.

Set Point: 0 ... 2000 W/m²

Controller: Two-position Controller / Pulsed Two-position Controller / Continuous PI Controller / Switching PI Controller These controller models and their applicable parameters are covered in the section "Controller Algorithms".

Display controller value periodically: Yes/No The display period is set in "General Settings"

Actuating value distance to limit in %: 0...50 When the lower threshold is surpassed 0% is set, when the upper threshold is surpassed 100% will be set. This is important for actuators which do not operate reliably at threshold levels.

Clock Timer: Yes/No The timer clock can be activated and deactivated (time-dependant controller output).

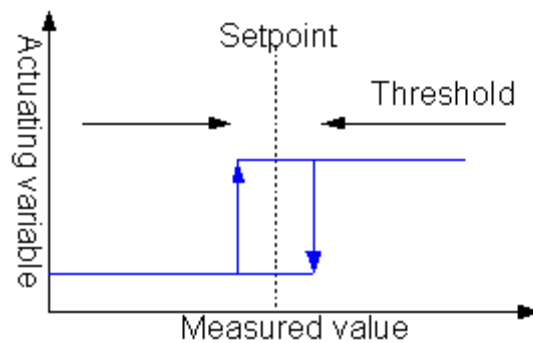
Controller Algorithms:

Controller models available are the PI controller or a two-position controller. Both controllers are equipped with pulsed output. The pulsed two-position controller works with constant duty cycle, which like the cycle duration is parameterized. The duty cycle of the pulsed PI controller is variable and depends on the control variable (pulse-width modulation).

Two-Position Control:

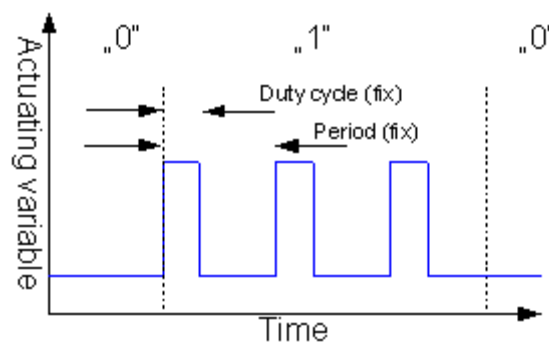
Two-position control is a very simple way of controlling. Once the actual value (+/- half the switching difference) exceeds or falls below the set point a switch-on or switch-off command is sent to the bus. Set the differential gap large enough to keep bus load to a minimum. Configure the differential gap small enough to avoid extreme actual value fluctuations.

The two-position controller is parameterized using the set point and the switching threshold.



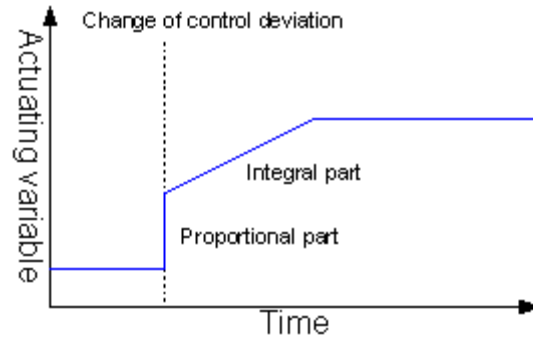
Two-Position Control with Pulsed Output:

The controller works analogous to the two-position controller, but the actuating variable emits pulses with fixed duty cycle.



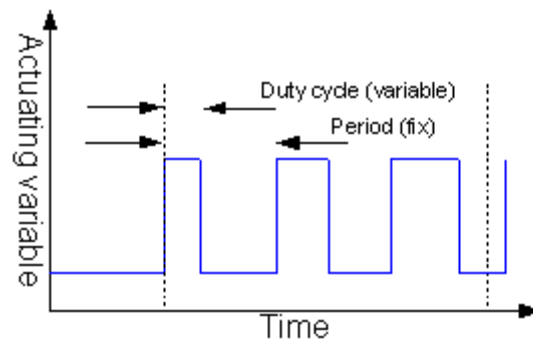
Continuous PI Control:

To understand a PI controller one should think of an algorithm consisting of a proportional and integral part. By combining these two parts it is possible to get a quick yet exact adjustment of the actuating variable. The controller calculates the control variable every second. It can constantly be updated and is displayed periodically (value parameterized) by the PI controller. Through the integral part an offset is adjusted to 0 over a certain period of time.



Continuous PI Control with Pulsed Output (PWM):

The controller works analogous to the PI controller, but the actuating variable emits pulses with a variable duty cycle. PWM control sets the cycle duration of the transmission interval. This allows a permanent on and off within the cycle time with object 15, which reaches an average valve position. When the control variable reaches 40% in a cycle time of 10 minutes it will repeatedly turn on for 4 minutes and turn off for 6 minutes.



General Rules for Adjusting the PI Parameter:

The reset time must be significantly larger than the delay time of the control system. The proportional area corresponds to the reinforcement of the control circuit. The smaller the proportional area, the larger the reinforcement is.

| Parameters | Effect |
|------------------------|---|
| Low Proportional Area | Large overshooting of set point balance (potential for constant oscillation), quick set point reset |
| High Proportional Area | Little or no overshooting, but slow reset |
| Short Integration Time | Quick adjustment of control deviations (based on conditions) danger of constant oscillation |
| Long Integration Time | Slow adjustment of control deviations |

Function Table for the application SK08-GLBS:

| Number | Name | Object Function | Length |
|--------|-------------------------------|------------------|--------|
| 0 | Output, error code | Error code | 1 Byte |
| 2 | Output, measured value W/m2 | Measured value | 2 Byte |
| 3 | Input, auxiliary object W/m2 | Auxiliary object | 2 Byte |
| 4 | Output, upper limit W/m2 | Exceeding limit | 1 bit |
| 5 | Output, lower limit W/m2 | Undercut limit | 1 bit |
| 6 | Output, controller W/m2 | Actuating value | 1 Byte |
| 7 | Input, enable/lock controller | Enable/lock | 1 bit |
| 8 | Output, status object W/m2 | Status | 1 Byte |

The Status Function 0 is coded as follows:

| Error Code | Error | Hexadecimal Value |
|------------|--------------|-------------------|
| 0 | No Error | 0x0 |
| ≠ 0 | Sensor Error | 0x01 |

The Status Function 8 is coded as follows:

| Description | Bit Number | Hexadecimal Value |
|--------------------------------|------------|-------------------|
| Upper Threshold Exceeded | 0 | 0x01 |
| Lower Threshold Surpassed | 1 | 0x02 |
| Actuating Variable not equal 0 | 2 | 0x04 |
| Lock Active | 4 | 0x08 |
| Save Auxiliary Quantity | 5 | 0x10 |

The values of the individual bits are added and transmitted to the bus. The status functions monitor the controller status for purposes of reporting and troubleshooting.

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