Arcus-EDS

Application Description

SK01-S8-AN2

KNX Sensor for two Analog Signals

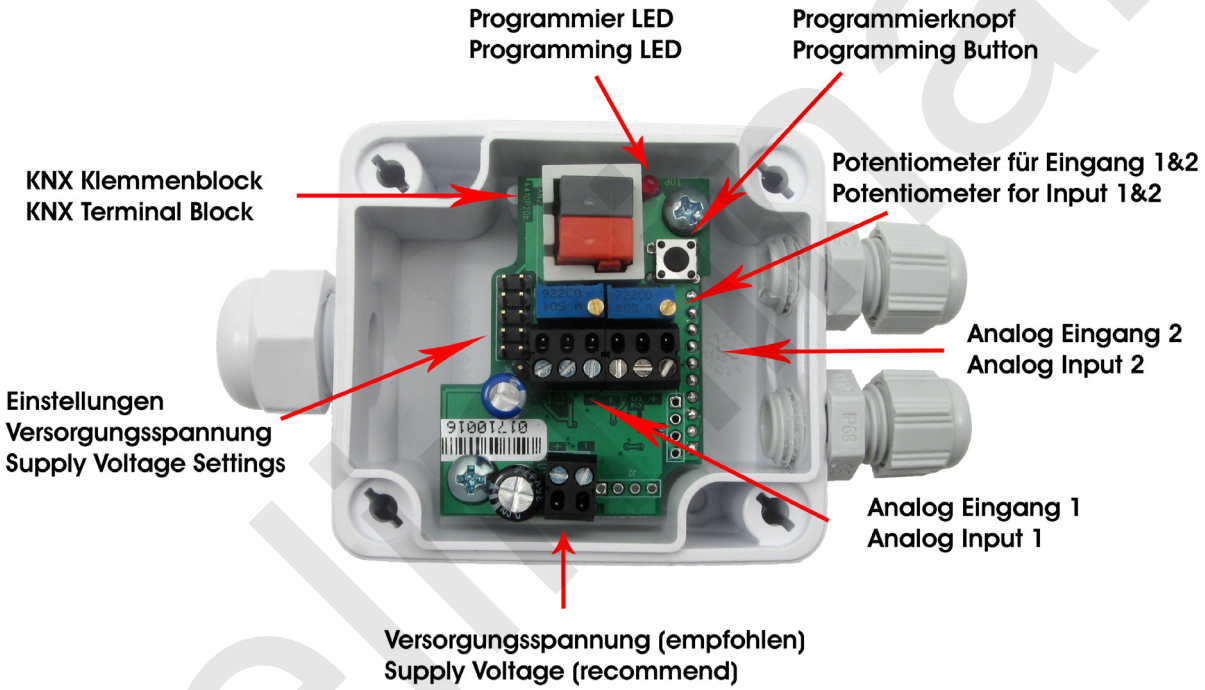
Operating Principles and Areas of Application:

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

The measuring system SK01-S8-AN2 captures and regulates tow analog Voltage values ranging from 0 to a maximum of 12 volts. The measurement rang is set between 0-2 V and 0-12 V. The Measured voltage is digitally converted and output to the KNX bus.

A number of controller models with various functions are available.

The devices in the series S8 come in housing for surface mounting with PG single connection for EIB/KNX insert.



Application and Functions:

KNX sensors are set up by using the ETS (KNX Tool Software) with the associated application program SK01-S8-AN2. 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 for both channels:

Voltage 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

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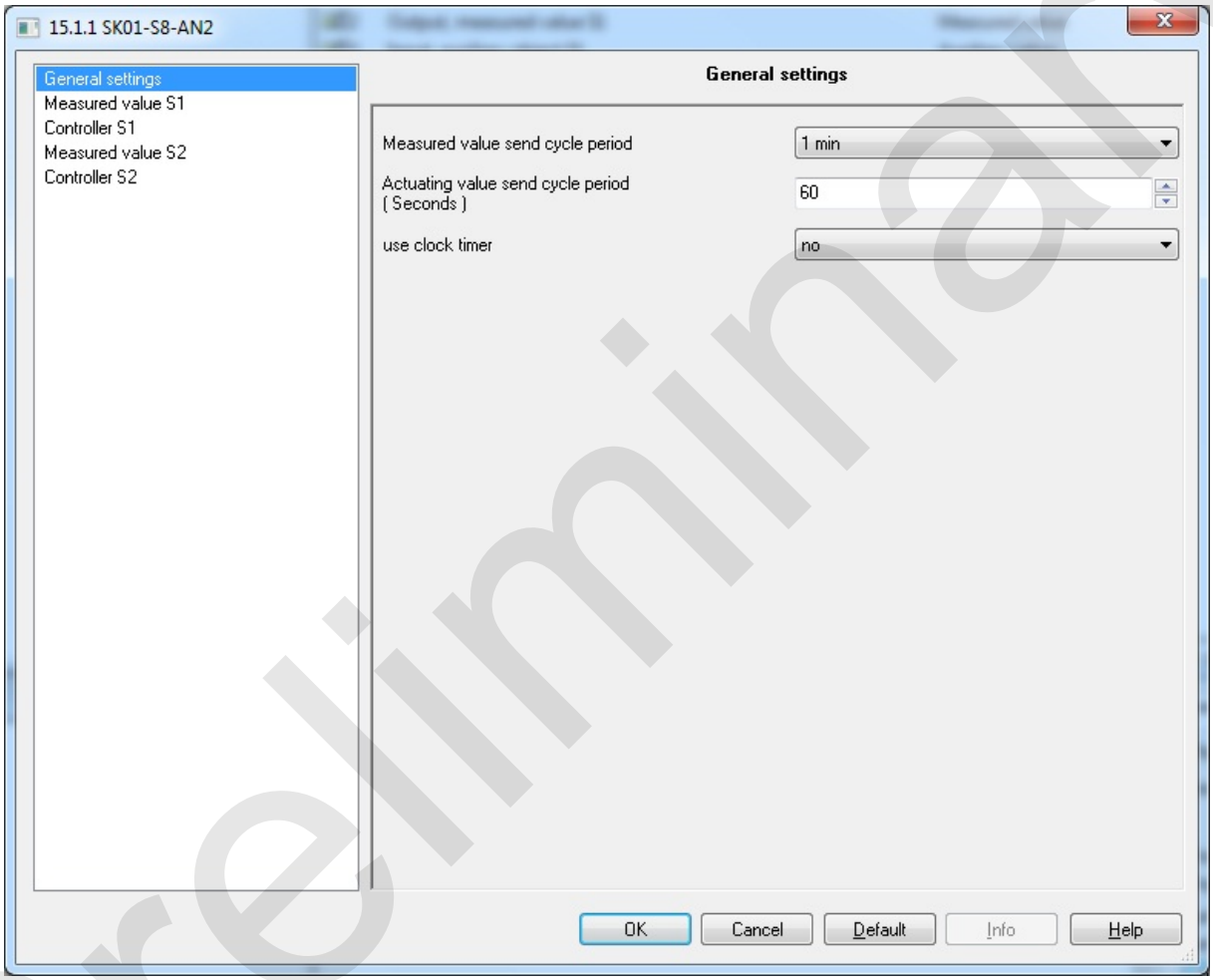
General Settings:

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 its parameter page.

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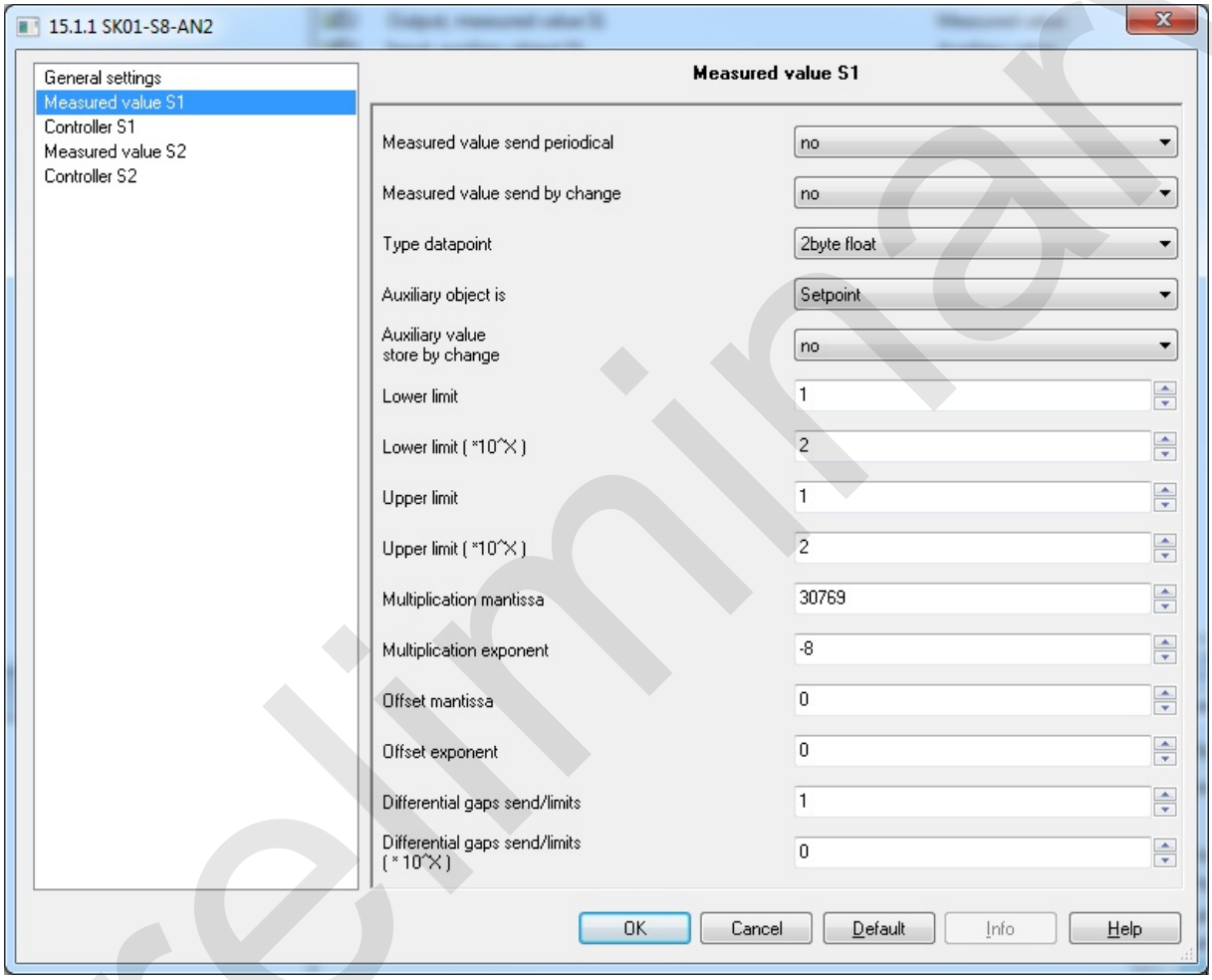
Measurement:

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 limit: -999..999 Here the lower limit is set. If the lower limit is exceeded 1 is sent on the *Lower limit* object and if crossed again 0 is sent.

Lower limit (*10^X): -100..100 Sets the exponent for the Lower limit.
(Example: The *Lower Limit* =22 and *Lower Limit (*10^X)*=-1 so the limit is 2,2)

If selected at "Auxiliary Object is" (section Measured Value), this value can be changed later by the KNX object *auxiliary object.*

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Upper limit: -999..999 Here the upper limit is set when the measured value blow this a 1 is set on the Object *Upper Limit*, exceeds the measured value again a 0 sent.

Upper limit (*10^X): -100..100 sets the exponent for the Upper limit.
(Example: The *Lower Limit* =22 and *Lower Limit (*10^X)*=-1 so the limit is 2,2)

If selected at "Auxiliary Object is" (section Measured Value), this value can be changed later by the KNX object *auxiliary object.*

Multiplication Mantissa: -32768..32767 The measured value is multiplied by this value and is available at the Object *measured Value*. (Example see after Offset Exponent)

Multiplication Exponent: -100..100 Sets the Exponent of the Multiplier. (Example see after Offset Exponent)

Offset Mantissa: -32768..32767 This value is added to the measured value and is available at the Object *measured Value*. (Example see after Offset Exponent)

Offset Exponent: -100..100 Sets the Exponent of the Offset.

Example:

- Multiplication Mantissa: 5
- Multiplication Exponent: 3
- Offset Mantissa: -25
- Offset Exponent: 2

With these settings, the measured value is multiplied by 5000 and then 2500 of them removed (KNX-value = (reading * 5000) - 2500).

Differential gaps send/limits: To reduce the bus load when a value is changed and to avoid multiple switching between measured data and thresholds should be made accordingly a hysteresis.

Differential gaps send/limits (*10^X): -100..100 sets the exponent for the Differential gap.

To reduce the bus load when a value is changed and to avoid multiple switching between measured data and thresholds should be made accordingly a hysteresis.

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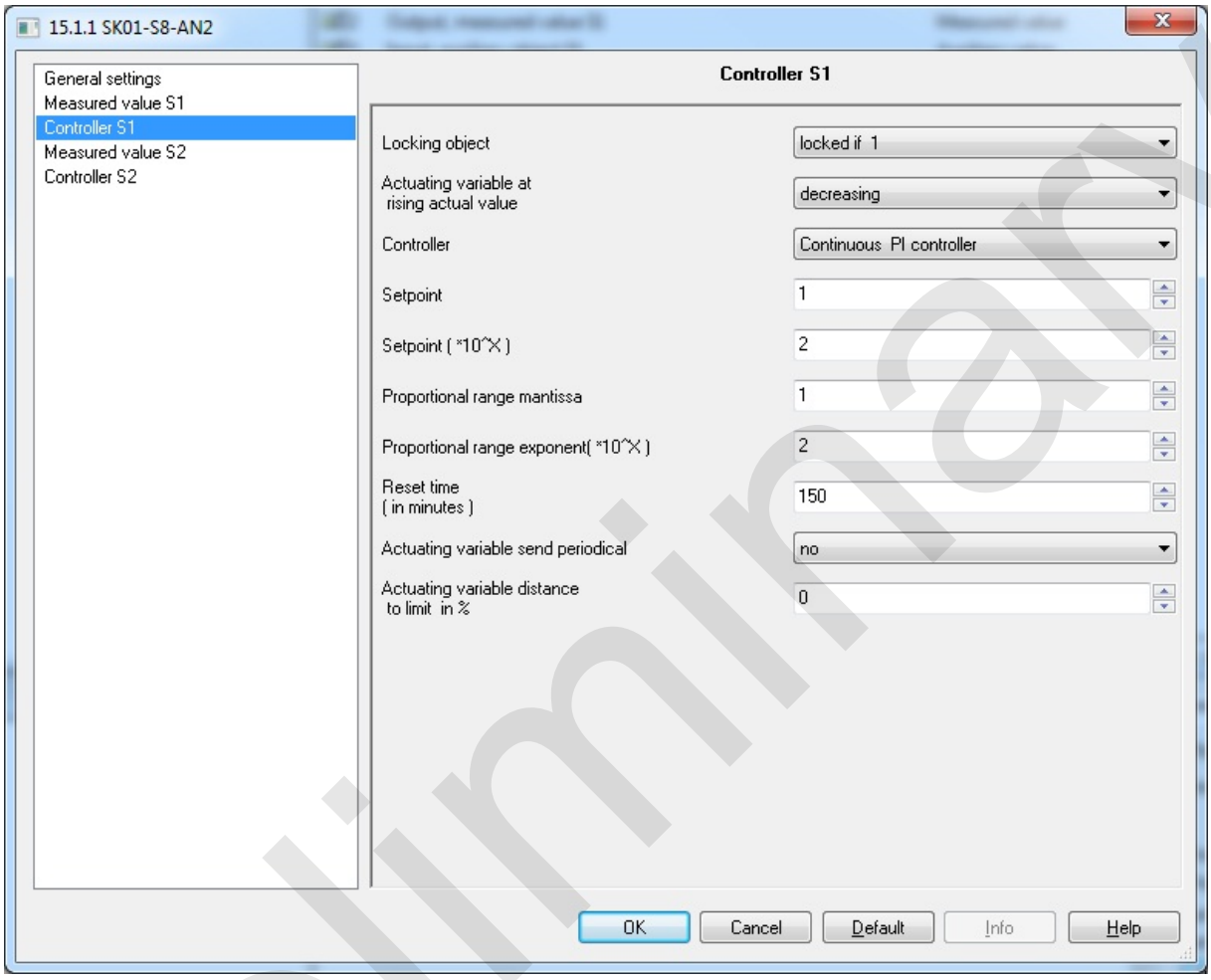
Controller:

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**.**

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".

Setpoint: Sets the Set Point value. If selected at "Auxiliary Object is" (section Measured Value), this value can be changed later by the KNX object *auxiliary object.*

Setpoint (*10^X): sets the exponent for the Setpoint.

Proportional range mantissa: Set the mantissa for the proportional range, for further information lock at section "Controller Algorithms".

Proportional range exponent (*10^X): set the exponent for the proportional range.

Reset time (in minutes): setting for the controller, covered in the section "Controller Algorithms".

Actuating variable send periodical: Yes / No The display period is set in General Settings.

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

use clock Timer: Yes/No The timer function (time-dependent enable/disable of the controller output) can be enabled / disabled.

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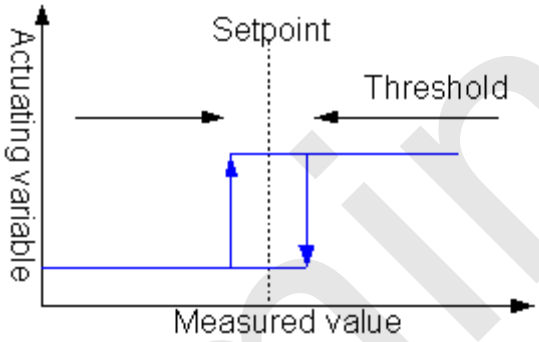
Controller Algorithms:

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, witch is fixed parameterized like the cycle duration. The duty cycle of the pulsed PI controller is variable and depends on the control variable (pulse-width modulation).

Two-Position Control:

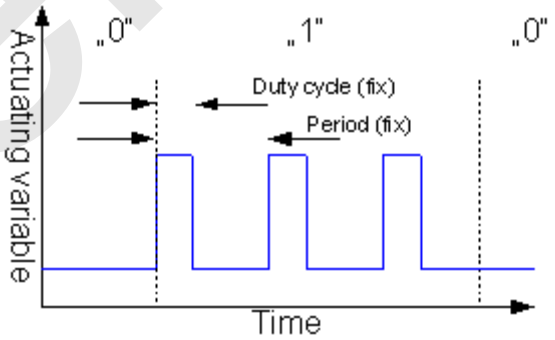
Two-position control is a very simple way of controlling. Once the actual value (+/- half the switching difference) exceeds or falls below the set point, a switch-on or switch-off command is sent to the bus. Set the differential gap large enough to keep bus load to a minimum. Configure the differential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



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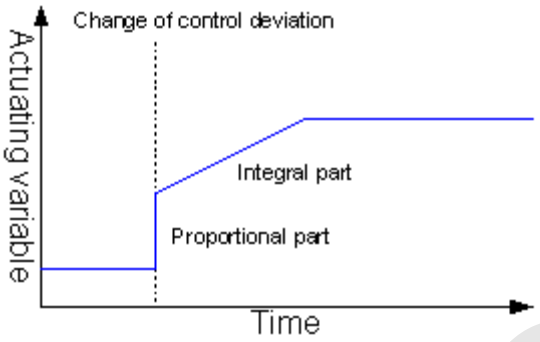
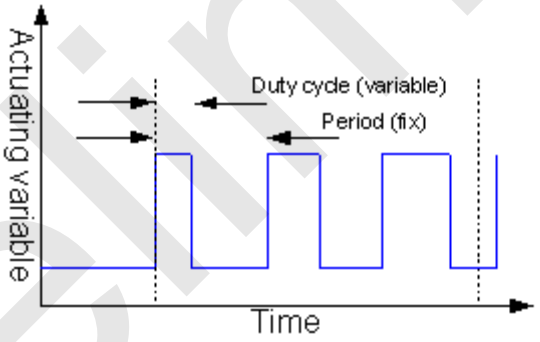
Continuous PI Control:

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 exact adjustment of the actuating variable. The controller calculates the control variable every second. It can be constantly updated and 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 (danger of constant oszillation), 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 oszillation
Long Integration Time	Slow adjustment of control deviations

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Objekttabelle für die Applikation SK01-S8-AN2:

Nu...	Name	Object Function	Leng...	C	R	W	T	U	Priority
0	Input, calibration object	Calibration object	1 Byte	C	R	W	-	U	Low
1	Input, calibration	Calibration value	1 Byte	C	R	W	-	U	Low
2	Output, measured value S1	Measured value	2 Byte	C	R	-	T	-	Low
3	Input, auxiliary object S1	Auxiliary value	2 Byte	C	-	W	-	U	Low
4	Output, upper limit S1	Exceeding limit	1 bit	C	R	-	T	-	Low
5	Output, lower limit S1	Undercut limit	1 bit	C	R	-	T	-	Low
6	Output, controller S1	Actuating value	1 Byte	C	R	-	T	-	Low
7	Input, enable/lock S1	Enable/lock	1 bit	C	R	W	-	U	Low
8	Output, object status S1	Status	1 Byte	C	R	-	T	-	Low
9	Output, measured value S2	Measured value	2 Byte	C	R	-	T	-	Low
10	Input, auxiliary object S2	Auxiliary value	2 Byte	C	-	W	-	U	Low
11	Output, upper limit S2	Exceeding limit	1 bit	C	R	-	T	-	Low
12	Output, lower limit S2	Undercut limit	1 bit	C	R	-	T	-	Low
13	Output, controller S2	Actuating value	1 Byte	C	R	-	T	-	Low
14	Input, enable/lock S2	Enable/lock	1 bit	C	R	W	-	U	Low
15	Output, Object status S2	Status	1 Byte	C	R	-	T	-	Low

***Calibration object* and *calibration* Status object 0 und 1:**

Through these two calibration objects, it is possible to change the Parameter settings predefined multiplier and offset via KNX bus.
To change this setting via the bus, proceed as follows:

1. Send a key (see table at the end of this section) to the object calibration object (Nr. 0). This will set the parameter changed in the next step.
2. Send the requested change to the object calibration. Thus, the mantissa of the parameter is changed.

Example: The offset of the measured value S2 should be changed. In the parameter the offset was predefined to 100 times 10 to -3. As a key 0xA2 is entered, and by repeatedly sending a +5, the value to 105 -> 110 -> 115 etc. changed the exponent (-3) remains unchanged.

Parameter	Key
Offset S1	0xA0 (160)
Multiplication S1	0xA1 (161)
Offset S2	0xA2 (162)
Multiplication S2	0xA3 (163)

The Status Functions 8 and 15 are 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 function monitors the controller status for purposes of reporting and troubleshooting.

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