Arcus-EDS

Application Description

XX2-S8-CO2-TF

KNX Sensor CO2+Temperature-Humidity Measurement/Control

804 e1

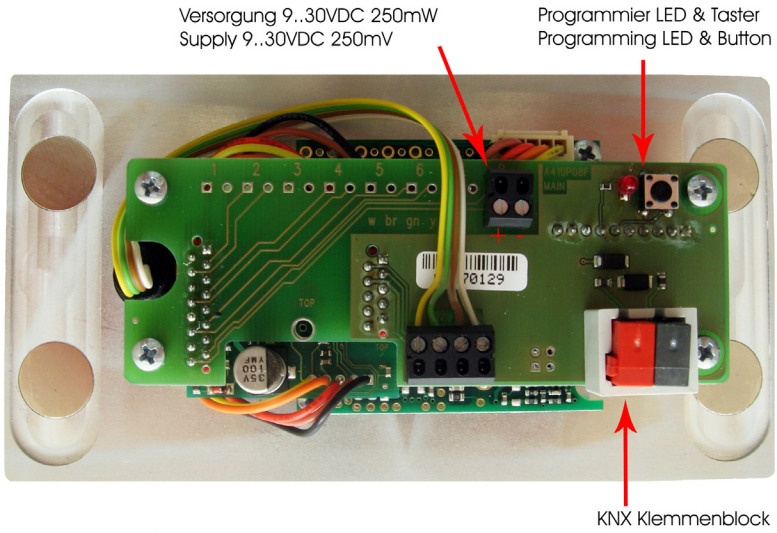
Operating Principles and Areas of Application:

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

The XX2-S8-CO2-TF Measuring System records the carbon dioxide rate measured by the CO2 sensor, as well as room temperature and humidity. With these measured values the dew point temperature and the absolute humidity are calculated.

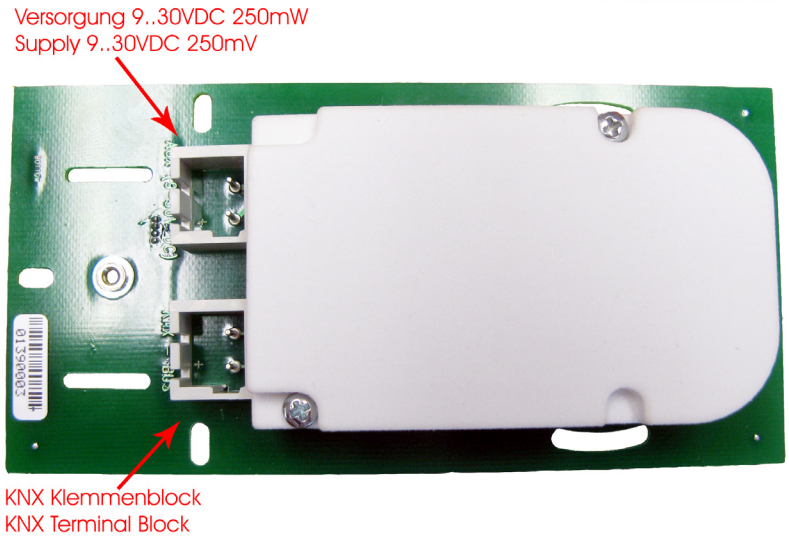
A number of controller models with various functions are available.

The devices XX2-S8-CO2-TF are assembled in a flush-mounted double socket using the fastening-parts kit and a magnetic fixing which are included in delivery.



AM2-S8-CO2-TF

Aluminum front panel with magnetic attachment



TL2-S8-CO2-TF

PCB construction as a support ring with screw

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Info@arcus-eds.de www.arcus-eds.de

Application and Functions:

KNX sensors are set up using the ETS (KNX Tool Software) with the associated application program XX2-S8-CO2-TF. 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:

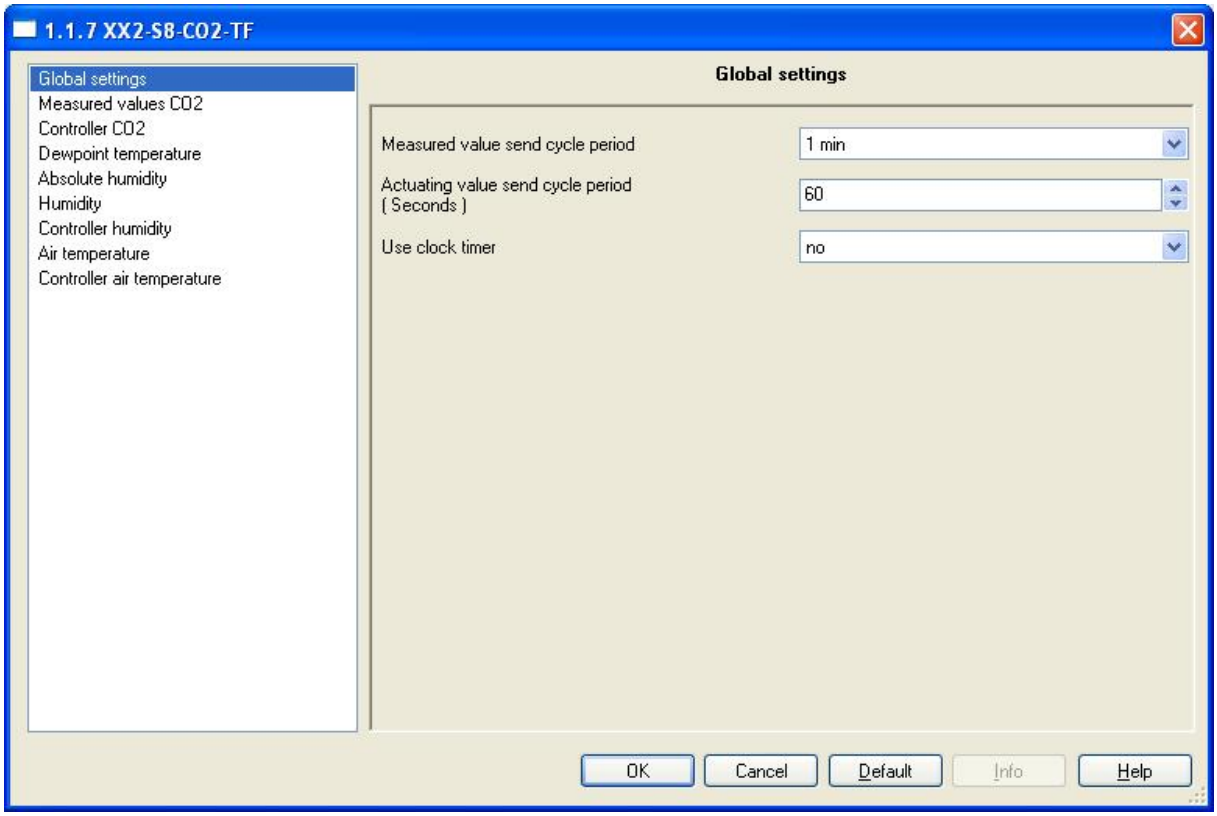
- Measurement of CO2 with:
- Two position controller with switch and pulse 1-bit output or
- PI controller with continuous 8-bit or pulse-width modulated 1-bit output
- Adjustable periodic display of control variable : no periodic display /10-250 seconds
- Adjustable release and lock with all controllers
- Threshold alarm for upper and lower thresholds
- Auxiliary quantity of set value or threshold via the bus
- Calibration of the sensor (offset setting)

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 **time switch** 2 additional functions are available: date and time. The output of the individual temperature controllers can be disabled depending on the time of day. The user sets the timer for the hours of operation. The timer for a particular controller is set using the controller settings.

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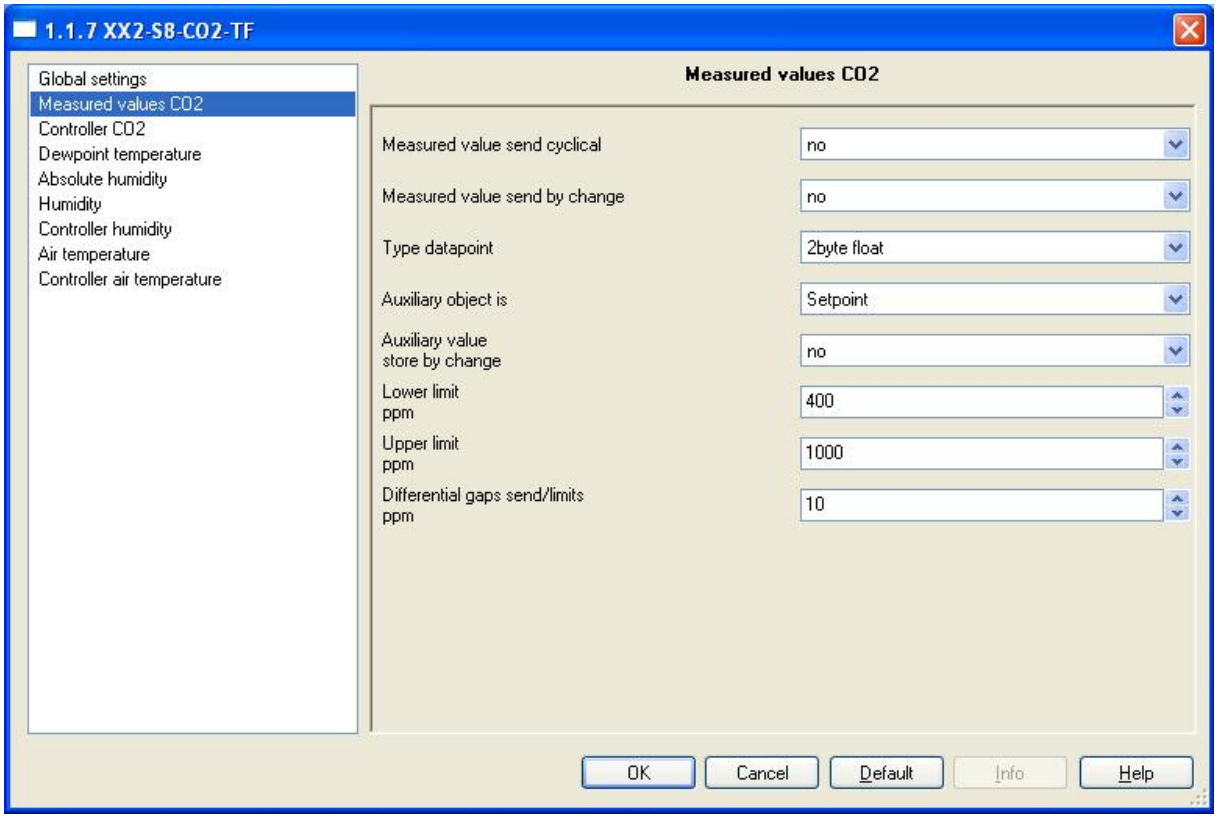
Measured Data CO2:

Periodic Display: Yes/No The display period is set in General Settings.

Display when change occurs: Yes/No Required changes are defined in "Display Differential Gap/Threshold".

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



Save Auxiliary Quantity when change occurs: Yes/No When the auxiliary quantity 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 set point is not frequently changed as EEPROM has only a limited memory cycle.

Lower Threshold: 0 … 2000 ppm

Upper Threshold: 0 … 2000 ppm

Display Differential Gap/Threshold: 0 … 10 °C To reduce the bus load when a value is changed and to avoid multiple switching between measured data and thresholds, a hysteresis between 10 and 100 ppm should be used.

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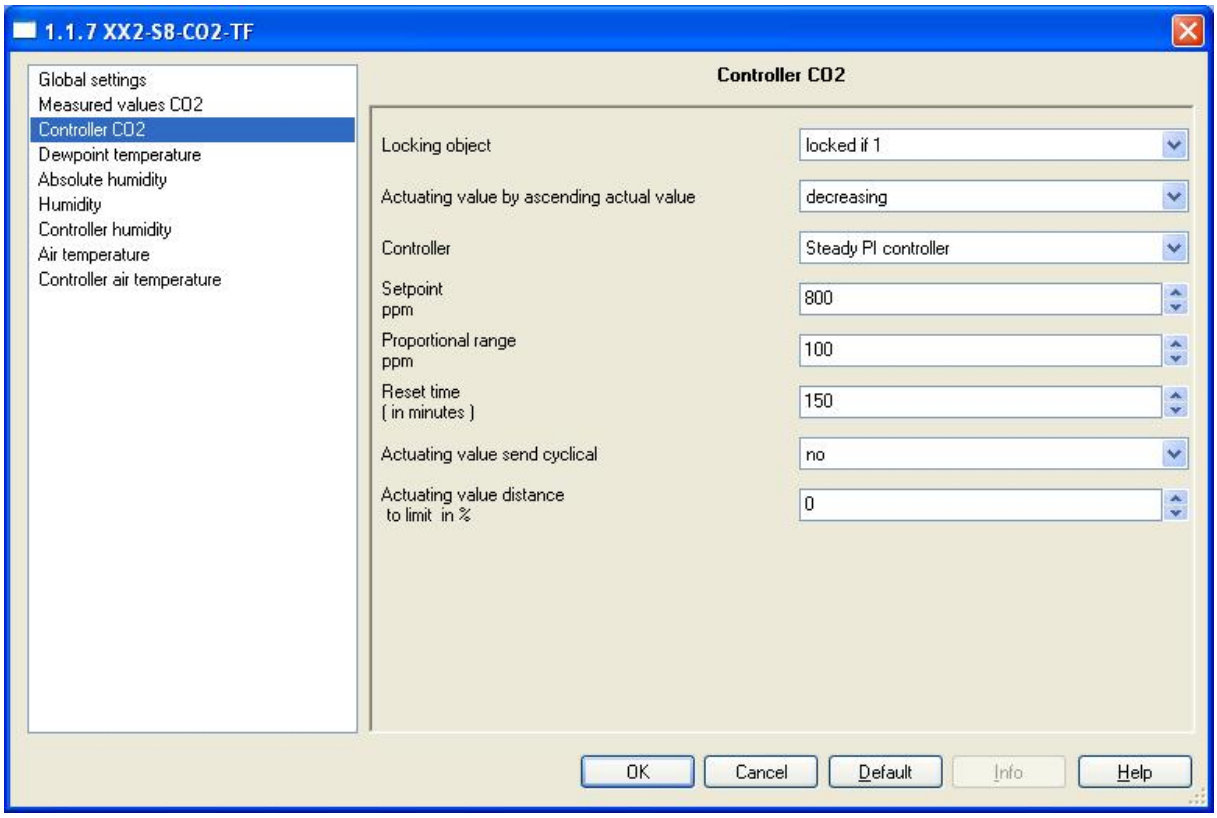
CO2 Controller:

Lock: lock with 0/lock with 1 When using the lock function the controller output is deactivated. The lock function can be set up for "release" or "lock".



Controlled Variable with increasing actual value: decrease/increase The Actuating direction of the controller can be adapted to the characteristics of the controlled system.

Set point: 0 … 2000 ppm

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"

Control Variable border spacing in %: 0…50 When the lower threshold is surpassed 0% is displayed, when the upper threshold is surpassed 100% will be displayed. This is important for actuators which do not operate reliably at threshold levels.

Time Switch On: Yes/No The time switch (timed controller output) can be activated/deactivated for every channel.

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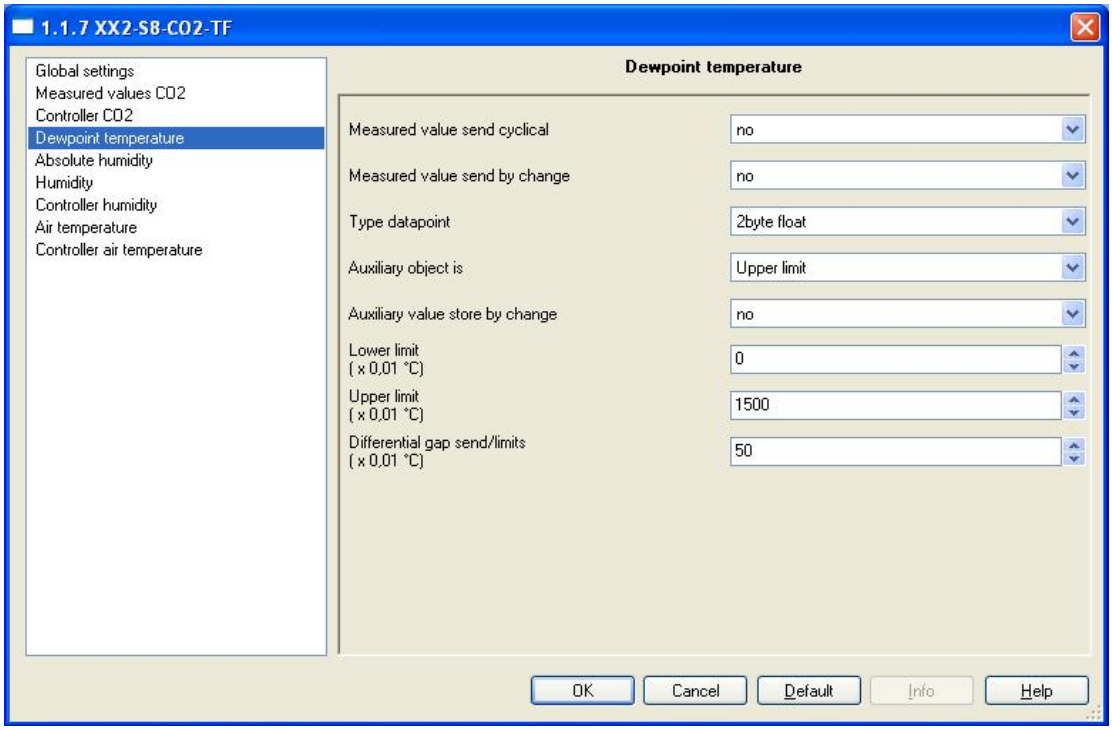
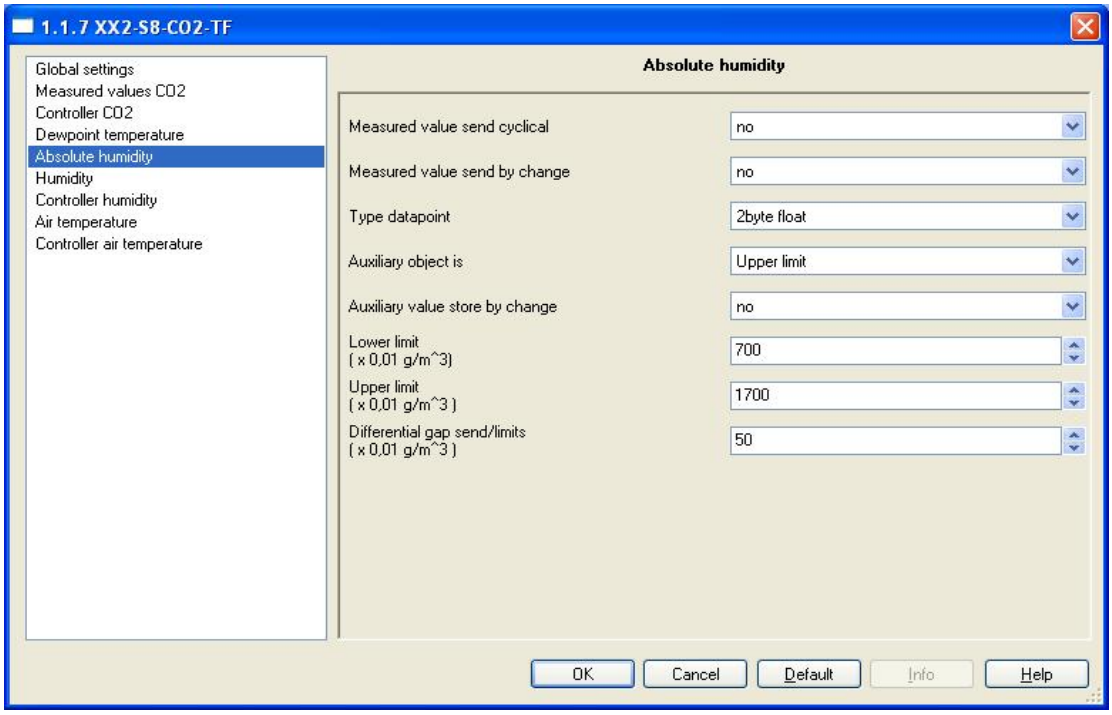
Arithmetic Value Dew Point Temperature:



The settings for the arithmetic value of the dew point temperature are analogue for the measured value of CO2. The rates for thresholds and hysteresis should be done in steps of 0,01°.

Arithmetic Value Absolute Humidity:



The settings for the arithmetic value of the absolute humidity are analogue for the measured value of CO2. The rates for thresholds and hysteresis should be done in steps of 0,01 g/m^3 .

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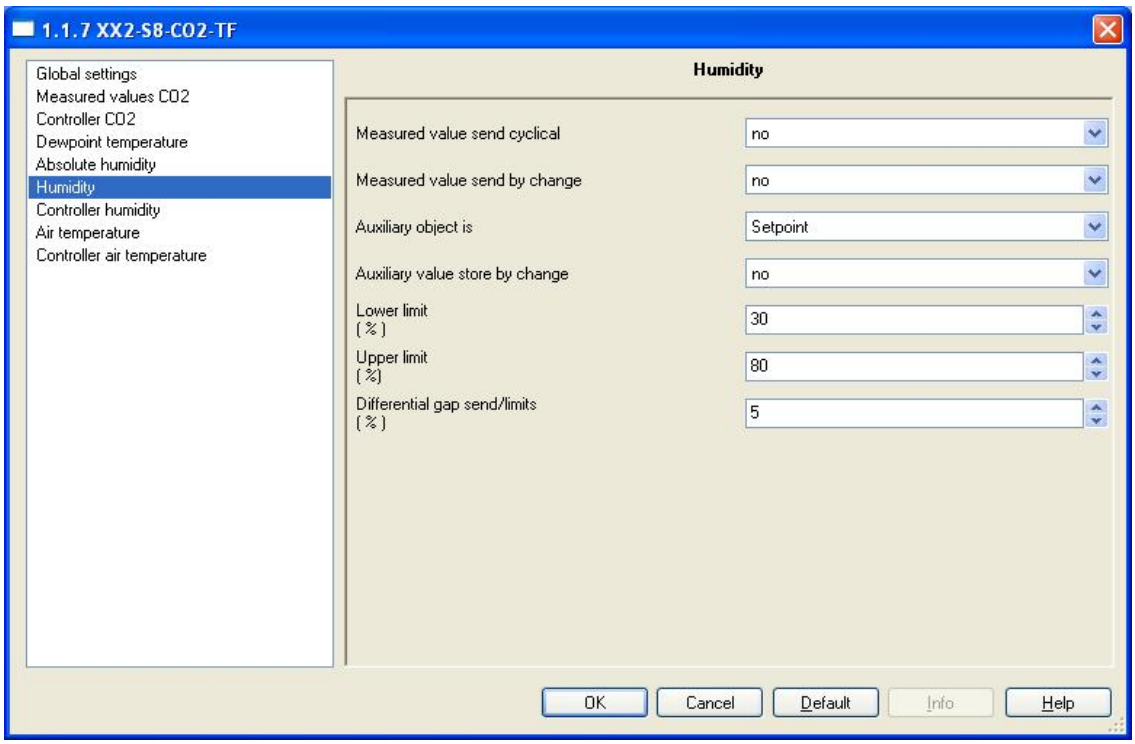
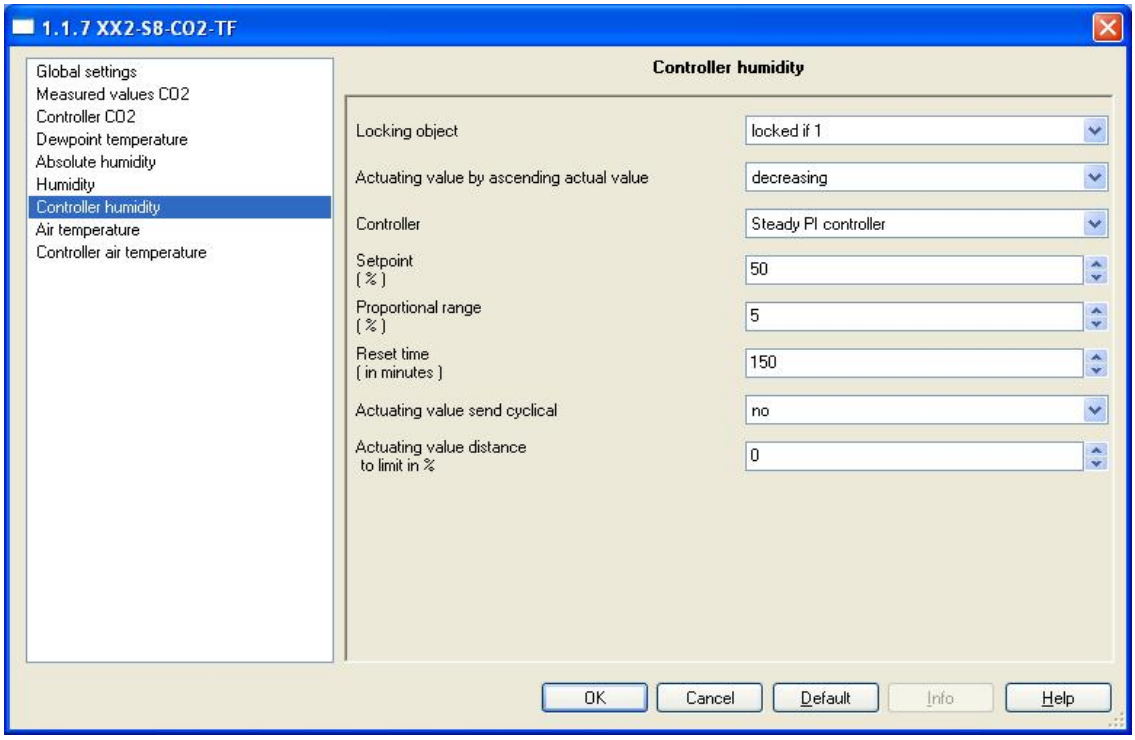
Measured Value Relative Humidity:



The settings for the arithmetic value of the air humidity are analogue for the measured value of CO2. The rates for thresholds and hysteresis should be done in steps of 1%.

Relative Humidity Controller:



The settings for the relative humidity controller are analogue for the CO2 controller. The rates for set points, differential gap and proportions should be done in steps of 1%.

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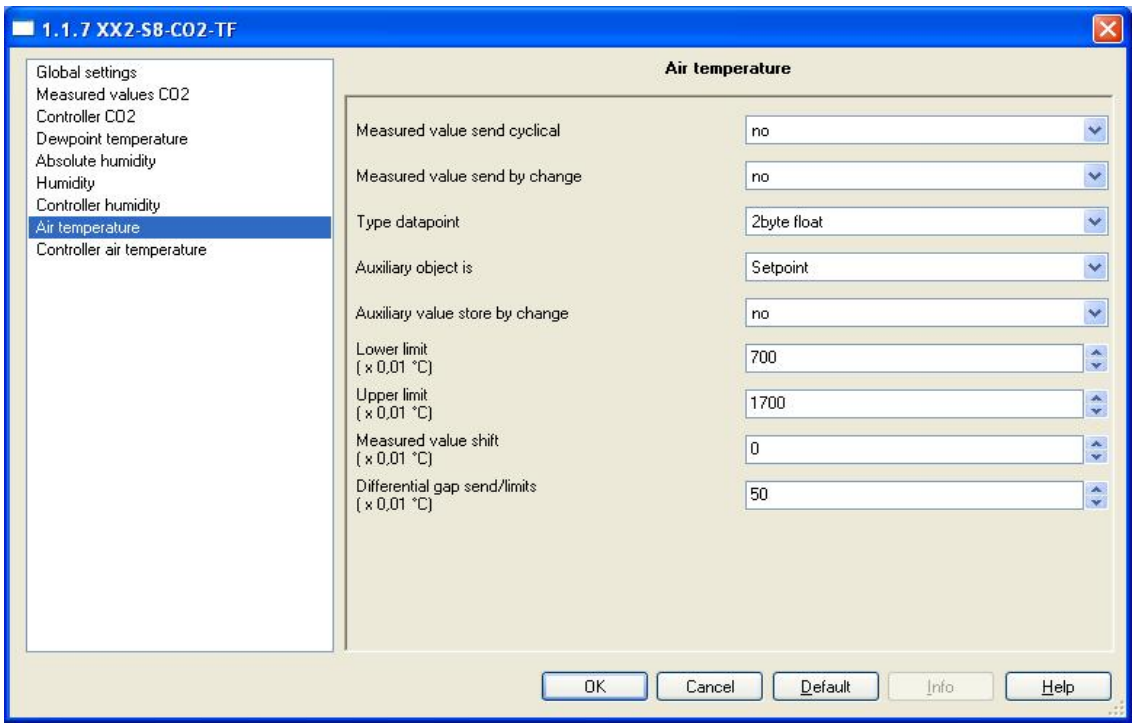
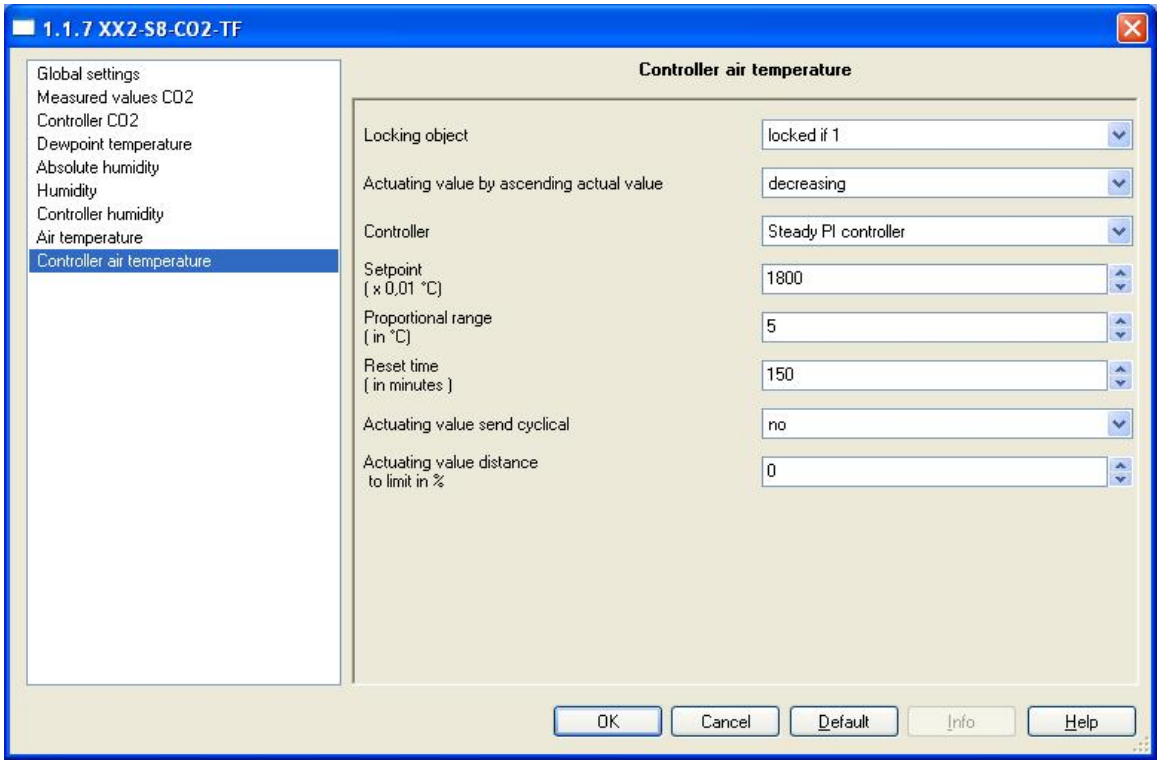
Measured Value Air Temperature:



The settings for the measured value of air temperature are analogue for the measured value CO2. The rates for the thresholds and hysteresis should be done in steps of 0,01°.

Air Temperature Controller:



The settings for the air temperature controller are analogue for the measured value CO2. The rates for set points, differential gap and proportions should be done in steps of 0,01°.

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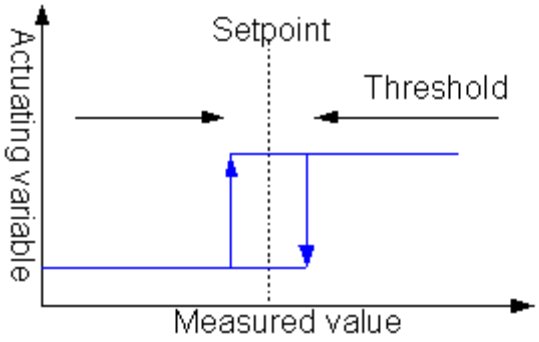
Controller Algorithms:

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, 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:

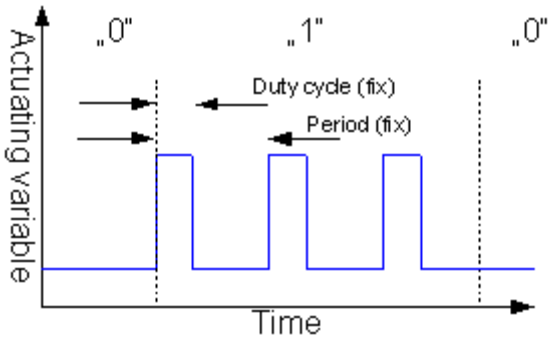
Two-position control is a very simple way of controlling. Once the actual value (+/- half the switching difference) exceeds or falls below the set point a switch-on or switch-off command is sent to the bus. Set the differential gap large enough to keep bus load to a minimum. Configure the differential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

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



Two-Position Control with Pulsed Output:

The controller works in combination with the two-position controller, the actuating variable emits pulses.



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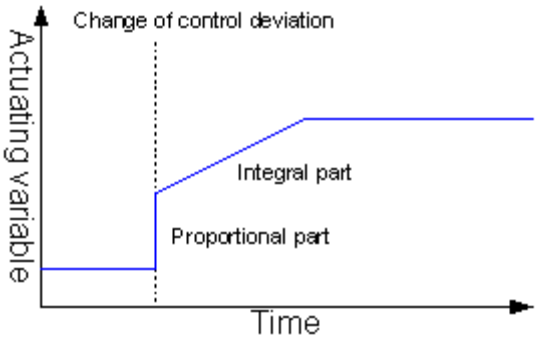
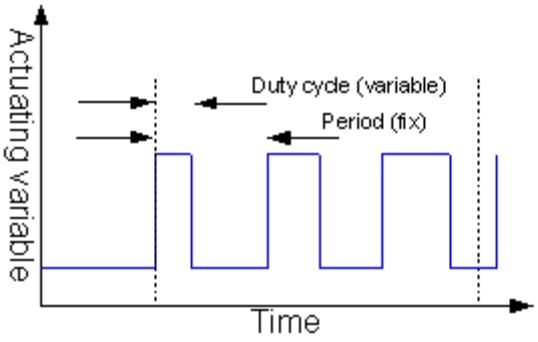
Continuous PI Control:

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 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 in combination with the PI controller, the actuating variable emits pulses. PWM control sets the cycle duration of the transmission interval. This allows a permanent on and off within the cycle time with function 15, which reaches on average a constant 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 vibration), 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 vibration
Long Integration Time	Slow adjustment of control deviations

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Function Table for Application XX-2S8-CO2-TF:

Nu...	Name	Object Function	Length
0	Output, error code	Error code	1 Byte
2	Output, measured value CO2	Measured value	2 Byte
3	Input, auxiliary object CO2	Auxiliary object	2 Byte
4	Output, upper limit CO2	Exceeding limit	1 bit
5	Output, lower limit CO2	Undercut limit	1 bit
6	Output, controller CO2	Actuating value	1 Byte
7	Input, enable/lock controller	Enable/lock	1 bit
8	Output, object status CO2	Status	1 Byte
30	Output, measured value dewpoint temperature	Calculated value	2 Byte
31	Input, auxiliary object dewpoint temperature	Auxiliary object	2 Byte
32	Output, upper limit dewpoint temperature	Limit	1 bit
33	Output, lower limit dewpoint temperature	Limit	1 bit
37	Output, measured value absolute humidity	Calculated value	2 Byte
38	Input, auxiliary object absolute humidity	Auxiliary object	2 Byte
39	Output, upper limit absolute humidity	Limit	1 bit
40	Output, lower limit absolute humidity	Limit	1 bit
44	Output, measured value relative humidity	Measured value	2 Byte
45	Input, auxiliary object relative humidity	Auxiliary object	2 Byte
46	Output, upper limit relative humidity	Limit	1 bit
47	Output, lower limit relative humidity	Limit	1 bit
48	Output, controller relative humidity	Actuating value	1 Byte
49	Input, enable/lock relative humidity	Enable/lock	1 bit
50	Output, Object status relative humidity	Channel status	1 Byte
51	Output, measured value air temperature	Measured value	2 Byte
52	Input, auxiliary object air temperature	Auxiliary object	2 Byte
53	Output, upper limit air temperature	Limit	1 bit
54	Output, lower limit air temperature	Limit	1 bit
55	Output, controller K8	Actuating value	1 Byte
56	Input, enable/lock air temperature	Enable/lock	1 bit
57	Output, Object status air temperature	Channel status	1 Byte

The Status Functions 8/36/50/57 are coded as follows:

Description	**Bit Number**	**Hexadecimal value**
Upper Threshold Exceeded	0	0x01
Lower Threshold Surpassed	1	0x02
Actuating Variable does not equal 0	2	0x04
Lock Active	4	0x08
Save Auxiliary Quantity	5	0x10
Time Switch Off active	6	0x20

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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Info@arcus-eds.de www.arcus-eds.de

Imprint:

Publisher: Arcus-EDS GmbH, Rigaer Str.88, 10247 Berlin

Responsible for Content: Hjalmar Hevers, Reinhard Pegelow

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