

HEIDELBERG, APRIL 2021

Overview Room Temperature Control with Fan Coil Controller

Online Learning Session – Competence Center Europe – Smart Buildings

Juergen Schilder, Thorsten Reibel, Marc-Andre Hahn, Michael Rall, Stefan Grosse & Olaf Stutzenberger

Document ID.: ...



Overview

Room Temperature Control with Fan Coil Controller

Assignment of the controller

Operating modes

Setpoint

Control value types

ABB i-bus® Tool

Online Learning Session

ClimaECO – Intelligent HVAC solutions with ABB i-bus[®] KNX

- ClimaECO is the holistic heating, ventilation and air-conditioning (HVAC) automation solution based on ABB i-bus[®] KNX
- A solution that seamlessly integrates room automation, distribution, central HVAC functions, management and automation into one system – a significant step towards increasing energy efficiency and reducing operational costs
- ABB's ClimaECO portfolio includes
 - ABB Tenton[®] Sensors SBx/U and Room Control Units SAx/A
 - Valve Drive Controllers VC/S
 - Fan Coil Controller FCC/S
 - Heating/ Cooling Circuit Controllers HCC/S
 - Boiler/ Chiller Interface BCI/S
 - Application Controllers AC/S with Interface to BACnet
 - Building Automation Controller KNX BAC/S
- Slides & videos of Webinars, Learning Sessions \rightarrow <u>T&Q Database</u>



Online Learning Session





Online Learning Session

Building 12 10° • • • • • Automation 6 62... V 3 A 104 + Controller . 15 **BAC/SKNX** Split Unit Valve Drive Controller Fan Coil Controller 21.2 Gateway Application Controller IIII 0000000 00000000 00000000 000 r ord 21010 * Electromotor **Boiler/Chiller** Valve Drive **Room Temperature Room Temperature** • • • Interface Electronic Switch Actuator Valve Drive Actuator **Blower Actuator** Controller Sensor (Slave) titt titt at att tit the Heating Cooling AND I AND eccences title the Circuit Electrothermal Presence Air Quality Analogue Controller Valve Drive **Room Master** Detector Heating/Cooling Controller Room Controller Sensor Input

Overview ABB i-bus® KNX HVAC Range

Slide 6

Online Learning Session

Office solution with Fan Coil Controller FCC/S and Room Control Unit SAF/A



Online Learning Session

Office solution with Fan Coil Controller FCC/S and RTC Sensor (Control Element with RTC Slave)



Online Learning Session

Hotel room solution with Room Master Premium RM/S



Online Learning Session

Split Unit Gateway SUG/U – Interface between the KNX system and air-conditioning systems



Online Learning Session

Room air quality: CO₂ and humidity sensor with controller and Blower Actuator FCL/S to control a fan



©ABB



Room Temperature Control with Fan Coil Controller

Online Learning Session

Definition "Fan Coil Unit"



Online Learning Session

Definition "Fan Coil Unit"

- Terms:
 - Fan Coil Unit
 - Blower Convector
- Fan Coil-devices can be used for individual heating and/or cooling in rooms
- By means of a fan the air will pass on low noise the heat exchanger in order to heat up or cool down the room temperature
- It can be used everywhere where a central water supply with chilled or warm water is installed
- 2, 3 and 4 piping systems will be used for the supply of the water



Online Learning Session

Examples of Fan Coil Units, Air Duct Devices, Chilled Beams, ...



- Application in appartements, hotels and office buildings
- Vertical design (wall fastening)
- Horizontal design for installation under the ceiling or inserted ceiling



- For hotels and hospitals
- Fan Coil-complete system
- Air draft stays on room ceiling
- User will not be disturbed by air conditioning

- For hotels and office buildings
- Classical 4-sided air distribution
- Possible adjustment after position and operating mode
- Effective filtering

Source: Internet

Online Learning Session

Fan Coil Unit in principle



Online Learning Session

Fan Coil Unit in principle



Online Learning Session

Fan Coil Unit in principle



2-pipe system

- Only one circuit Cooling: Cold medium Heating: Hot medium
- Auxiliary Electrical Heater (transitional season) or wall mounted radiator



3-pipe system

- Separate inputs for supply lines
- Common output for return line
- Auxiliary Electrical Heater



4-pipe system

- Separate cool and heating circuits (flow and return flow)
- Auxiliary Electrical Heater

Online Learning Session

Fan Coil Controller FCC/S 1.x.x.1

- Most comprehensive product family for controlling all kind of Fan Coil Units in the KNX market \rightarrow 9 Components!
- Parametrizable as actuator or controller (incl. actuator)
- Integrated room temperature controller for
 - Conventional Room Control Units (SAF/A)
 - KNX Control Element with RTC Slave Unit
- Electrothermal and motor valve drives
 - 2 electronic outputs
- 0-10 V valve drives
 - 2 x 0-10 V outputs
- 1,2, or 3 step fan
- 0 10 V fan
- ightarrow All combinations of digital and analogue fan and valve control



Online Learning Session

Fan Coil Controller FCC/S 1.x.x.1

- Auxiliary switch output (16A), e.g. for additional heater
- 4 inputs for
 - Binary sensors (window contact, fill level sensor, ...)
 - Temperature sensors (PT100, PT1000, KTY, NTC, NI 1000)
 - Connection of conventional Room Control Unit SAF/A (setpoint and room temperature)
- Control of 6-way valves
- Control of VAV flaps (Variable Air Volume)
- With and without manual operation
- ABB i-bus Tool support
- Budget variant (FCC/S 1.4.1.1) with one valve output (2 step or PWM), no additional switch contact and no manual operation





Online Learning Session

Fan Coil Controller FCC/S 1.x.x.1 – ETS Application

Unified application for all devices

- Controller or actuator function
- Additional stage heating and cooling
- Temperature limitation
- 2-pipe or 4-pipe systems
- Absolute or relative setpoints
- Min./max. output voltage for valve and fan
- Forced operation
- Valve purge
- Fan: Start up Behavior, run-on behavior, threshold for switching to another Level, limitation of fan speed, ...
- Status Messages (fan speed, valve, fault, ...)

... and more

Basic settings	Device function	Controller Actuator device	
+ Manual operation	The device is used with an internal con- cooling systems in the same room.	troller that can control the fan coil unit and other hea	ating/
 Application 	KNX room control units in slave mode	can be used for operation.	
Application parameters	Caution! A change to the parametrizati	on in this section will result in an ETS reset after dow	nload
B	Basic-stage heating	Water heating coil (in fan coil unit)	
Device function	Additional-stage heating	Deactivated	
+ Temperature controller	Basic-stage cooling	Water cooling coil (in fan coil unit)	
+ Setpoint manager	Additional-stage cooling	Deactivated	
+ Monitoring and safety	Type of heating/cooling system	O 2-pipe O 4-pipe	
+ Valve A	Heating/cooling changeover	Automatic	
+ Valve B	Caution! A change to the parametrizati	on in this section will result in an ETS reset after dow	nload
	Activate basic-stage heating via	Valve output A	
+ Fan output	Activate basic-stage cooling via	O Valve output B O Group object	
+ Relay output	Window status receipt	Via physical device input	
+ Setpoint adjustment	Note: Configure in 'Input' parameter v	vindow	
+ Input a	Dew point status receipt	Via physical device input	
+ Input b	Note: Configure in 'Input' parameter v	vindow	
· mpaco	Fill level status receipt	Via physical device input	
+ Input c	Note: Configure in 'Input' parameter v	vindow	
+ Input d	Actual temperature receipt	Via group object	
	Number of successful to be a large		

Online Learning Session

Overview Fan Coil Controller FCC/S 1.x.x.1



FCC/S 1.1.1.1

3-step Fan, PWM 2-fold



FCC/S 1.1.2.1 3-step Fan, PWM 2-fold, man. Op.



FCC/S 1.2.1.1 3-step Fan, Valve 0-10 V



FCC/S 1.2.2.1 3-step Fan, Valve 0-10 V, man. Op.



FCC/S 1.4.1.1 3-step Fan, PWM 1-fold (no additional switch contact)



FCC/S 1.3.1.1 Fan 0-10 V, Valve 0-10 V



FCC/S 1.3.2.1 Fan 0-10 V, Valve 0-10 V, man. Op.



FCC/S 1.5.1.1 Fan 0-10 V, PWM 2-fold



FCC/S 1.5.2.1 Fan 0-10 V, PWM 2-fold, man. Op.



Online Learning Session

Next Online and Practical Learning Session

ClimaECO – ABB i-bus® KNX and HVAC

- Fan Coil Controller FCC/S and Room Control Unit SAF/A
- Fan Coil Controller FCC/S and Control Element with RTC Slave
- Fan Coil Controller FCC/S and RTC with Control Element (Contr.)
- Room temperature control and additional RTC function
- Room climate control with ventilation and air quality
- Room temperature control with further ABB HVAC actuators
- Room temperature control and Application Controller AC/S

... to be continued



Assignment of the controller

Online Learning Session

Principle

- A room temperature controller RTC measures the actual temperature and compares this with the preselected setpoint temperature
- The control value is calculated (e.g., 0...100% or ON/OFF) by means of the set control algorithm based on the difference between the actual and setpoint temperature
- The control system of a heating/cooling unit comprises
 - Room temperature controller
 - An actuator that receives the control value and outputs it to a valve drive
 - Valve drive (positioner)
 - The radiator, underfloor/wall heating, hot-water fan heater, chilled beams, fan coil unit, ...

and the room in which the temperature is to be controlled



Online Learning Session

Assignment of the Controller

Controller in the Sensor

- Room temperature controller is parametrized <u>RTC</u>
 - ABB-Tenton[®], ABB tacteo[®], Busch-triton[®], SOLO[®], ...
 - ABB RoomTouch[®], Busch-SmartTouch[®], ...
 - Busch-Presence Detector Premium, Air Quality Sensor LGS/A, ...
- Actuator
 - Valve Drive Controller VC/S and Fan Coil Controller FCC/S are parametrized as <u>ACTUATOR</u>
 - Valve Drive Actuator VAA/S
 - Floor Heating/Cooling Controller VAA/A
 - Electronic Switch Actuator ES/S
 - Room Master RM/S
 - Room Controller RC/A
 - Electromotor Valve Drive ST/K



Online Learning Session

Example: Individual Room Temperature Control – Controller in the Sensor



Online Learning Session

Assignment of the Controller

Controller in the <u>Actuator</u>

- Room temperature sensor
 - ABB-Tenton[®], ABB tacteo[®], Busch-triton[®], SOLO[®], ABB RoomTouch[®], Busch-SmartTouch[®], ...
 → are parametrized as a <u>RTC SLAVE</u> (operation, status, ...)
 - Room Control Unit SAF/A connected to input of Valve Drive Controller VC/S or Fan Coil Controller FCC/S
 - Busch-Presence Detector, Air Quality Sensor LGS/A, Temperature sensor (e.g. PT100, PT1000) connected to Analog Input AE/x or to input of Valve Drive Controller VC/S or Fan Coil Controller FCC/S, sends only the room temperature, ...
- Actuator
 - Valve Drive Controller VC/S and Fan Coil Controller FCC/S are parametrized as <u>CONTROLLER</u>



Online Learning Session

Example: Individual Room Temperature Control – Controller in the Actuator



Online Learning Session

Example: Individual Room Temperature Control – Controller in the Actuator



ClimaECO – KNX and HVAC - Overview Room Temperature Control Operating modes

Online Learning Session

- To permit easy adjustment of the set values to meet the requirements for comfort and energy-saving, a room temperature controller supports four operating modes
- The operating modes (HVAC modes) are generally controlled using a time switch, presence detector or window contacts
- ETS Parameter: Operating mode after bus voltage recovery, ...
- Operating modes
 - Comfort (heating 21°C and cooling 25°C)
 - Standby (heating 19°C and cooling 27°C)
 - ECO (heating 17°C and cooling 29°C)
 - Frost/heat protection (heating 7°C and cooling 35°C)
- Switch the operating mode with
 - "1 bit" switching telegrams
 - "1-byte" value telegrams



Online Learning Session

Operating modes

Operating mode switching: Two 1-byte group objects (preferred)

- An object evaluates received telegrams as "Normal"
 - This means, for example, if a comfort telegram is received, the temperature controller switches to comfort mode. If an eco telegram is received, the room temperature controller switches to eco mode. This object is controlled, for example, by time switches, key card reader, presence detectors, ...
- The second object "Operating Mode Switching Override OMO" may overwrite the first temporarily
 - This means, for example, if a frost/heat protection telegram is received, the ambient temperature controller switches to frost or heat protection mode. If the frost or heat protection is reset by the receipt of another telegram, the room temperature controller enables the operating mode on the "normal" object. This object is controlled, for example, by binary inputs that record information from window contacts or via a BMS



Online Learning Session

Operating modes

Operating mode switching: Two 1-byte group objects (preferred)

- The following apply to both 1-byte communication objects:
 - 0 = Auto (operating mode switching "OMO" only
 → override operating mode is inactive)
 - 1 = Comfort
 - 2 = Standby
 - 3 = ECO (night)
 - 4 = Frost/heat protection (building protection)
 - 5 255 = reserved
- Data type
 - 20.102 HVAC mode
 - Range 0...4



Online Learning Session



Online Learning Session

- Further states can influence the operating mode
- Priorities for determining the operating mode
 Highest priority
 - Operating mode switching "Override OMO"
 - Condensation/fill level alarm (only cooling) \rightarrow Heat protection
 - Dew point alarm (only cooling) \rightarrow Heat protection
 - Window contact \rightarrow Frost/heat protection
 - Control On/Off \rightarrow Frost/heat protection
 - Presence detector \rightarrow Comfort
 - Operating mode switching "Normal"
 Lowest priority

Nu	I Name	Object Function	Length	Data Type
₹ 17	RTC: Heating control value	Output	1 bit	switch
₽ 19	RTC: Cooling control value	Output	1 bit	switch
₽21	RTC: Control On/Off	Output	1 bit	switch
22	RTC: Actual temperature	Output	2 bytes	temperature (°C)
25	RTC: Fault actual temperature	Output	1 bit	switch
27	RTC: actual setpoint	Output	2 bytes	temperature (°C)
₽ 28	RTC: Normal operating mode	Input/Output	1 byte	HVAC mode
29	RTC: Override operating mode	Input	1 byte	HVAC mode
₽ 30	RTC: Window contact	Input	1 bit	switch
₽31	RTC: Presence detector	Input	1 bit	switch
₹ 35	RTC: Switchover heating/cooling	Output	1 bit	cooling/heating
₹ 44	RTC: Basic setpoint	Input	2 bytes	temperature (°C)
₹ 46	RTC: Dew point alarm	Input	1 bit	switch
47	RTC: Condensation/fill level alarm	Input	1 bit	switch
₹ 48	RTC: Outside temperature for summer compen.	Input	2 bytes	temperature (°C)
₹ 49	RTC: Summer compensation active	Output	1 bit	switch
₹ 61	RTC: Controller status RHCC	Output	2 bytes	RHCC status
₹62	RTC: Controller status HVAC	Output	1 byte	percentage (0100%)
₹73	RTC: Limit temperature basic heating stage	Input	2 bytes	temperature (°C)
285	RTC: Current HVAC operating mode	Output	1 byte	HVAC mode

Online Learning Session

			Nu	n Name	Object Function	Length	Data Type
	Putton		₽ 17	RTC: Heating control value	Output	1 bit	switch
	Dutton		₽ 19	RTC: Cooling control value	Output	1 bit	switch
			21	RTC: Control On/Off	Output	1 bit	switch
			22	RTC: Actual temperature	Output	2 bytes	temperature (°C)
U, Abril Bba	Timer Switch		₽₽ 25	RTC: Fault actual temperature	Output	1 bit	switch
			27	RTC: actual setpoint	Output	2 bytes	temperature (°C)
	Visu/BMS		₽ 28	RTC: Normal operating mode	Input/Output	1 byte	HVAC mode
FCUS 1.1.2.1	V150/ D115		29	RTC: Override operating mode	Input	1 byte	HVAC mode
			₹ 30	RTC: Window contact	Input	1 bit	switch
	Minday Cantaat		₽31	RTC: Presence detector	Input	1 bit	switch
	window Contact		₹ 35	RTC: Switchover heating/cooling	Output	1 bit	cooling/heating
GQ 0 🐑			₹44	RTC: Basic setpoint	Input	2 bytes	temperature (°C)
	Droconco Dotoctor		46	RTC: Dew point alarm	Input	1 bit	switch
	Presence Delector		₹ 47	RTC: Condensation/fill level alarm	Input	1 bit	switch
dell'			₹48	RTC: Outside temperature for summer compen	Input	2 bytes	temperature (°C)
	Dew point alarm		49	RTC: Summer compensation active	Output	1 bit	switch
		∅●₀[■2 61	RTC: Controller status RHCC	Output	2 bytes	RHCC status
			€2	RTC: Controller status HVAC	Output	1 byte	percentage (0100%)
	Condensation/fill		₹73	RTC: Limit temperature basic heating stage	Input	2 bytes	temperature (°C)
	level alarm		₽ 85	RTC: Current HVAC operating mode	Output	1 byte	HVAC mode



Online Learning Session



Online Learning Session



Online Learning Session

Operating modes

Status of the current HVAC operating mode

- The RTC uses the group object "Current HVAC operating mode" to send the operating mode after evaluation of all priorities and influences (e.g. window contact, On/Off, presence detector, ...)
- The group object indicates the current controller operating mode as a 1-byte value
 - 1 = Comfort
 - 2 = Standby
 - 3 = ECO (night)
 - 4 = Frost/heat protection
- Data type
 - 20.102 HVAC mode
 - Range 1...4



Online Learning Session

Setpoint

The setpoint is the desired room temperature

- The setpoint can be set for each operating mode
- Depending on the room temperature controller, the setpoint can also be changed via KNX telegram
- Parameter settings
 - One setpoint for heating comfort and one setpoint for cooling comfort

or

One common setpoint with hysteresis for switching heating/cooling

• Relative setpoint

or ∆hs

Absolute setpoint

• Max. manual increase/reduction and step size of adjustment during heating/cooling mode

+ Device settings	Setpoint heating comfort = setpoint cooling comfort	🔿 no 🔘 y	res			
Primary function	Setpoints for standby and Eco are absolute values	🔿 no 🔘 y	es			
- RTC	Hysteresis for switchover heating/cooling	1		*C		
General	Set-point for heating and cooling comfort	21		°C		
Control heating	Setpoint for heating standby	19		*c		
Basic stage heating	Heating setpoint economy	17		°C		
Control cooling	Heating setpoint for building protection	7		°C		
Combined heating and coolin	Setpoint for cooling standby	27		°C		
Setpoint settings	Cooling setpoint economy	29		°C		
Changing set values	Cooling setpoint for building protection	35		°C		
Temperature reading	Setpoint adjustment via communication object (DPT 9.001)	no		•		
Alarm function	Display indicates	O Absolute	setpoint 🔘 Relative setpoint			
Temperature limiter	Hide temperature unit	⊙ no _	RTC	Max. manual increase during heating mode	3	
Summer compensation	Send current setpoint	O Only	Crearl	Max. manual reduction during heating mode	3	
+ CO2 sensor		U cyci	General	Max. manual increase during cooling mode	3	
			Control nearing	Max. manual reduction during cooling mode	3	
			Basic stage heating	Step size of setpoint adjustment	0.5 °C	
			Control cooling Combined heating and coolin	Resetting of the manual adjustment for receipt of a basic set value	() no (0)	yes
			Setpoint settings	Resetting the manual adjustment for change of operating mode	🔿 no 🧿	yes
			Changing set values	Resetting the manual adjustment via object	O no 🔿	yes
			Temperature reading		0	



Online Learning Session

Setpoint

Comfort heating setpoint = Comfort cooling setpoint

- No
 - Two separate comfort setpoints are used for heating (21°C) and cooling (25°C)
- Yes
 - The device has one and the same setpoint for heating and cooling in the comfort mode (21°C)
 - The changeover to heating takes place on dropping below the setpoint minus the hysteresis "1K" \rightarrow 20°C (21°C 1K)
 - The changeover to cooling takes place on exceeding the setpoint plus the hysteresis "1K" \rightarrow 22°C (21°C + 1K)

Setpoint specification and adj	ustment 🔷 Absolute 🔘 Re	lative
Comfort heating setpoint	21	÷ °C
Standby heating reduction	2	‡ K
Economy heating reduction	4	\$ К
Comfort cooling setpoint	25	
	Comfort heating setpoint = Com	fort cooling No Ves
	setpoint	
	Setpoint Specification and adjust	ment Absolute O Relative
	Setpoint Setpoint specification and adjustr Hysteresis for Toggle heating/coo	ment Absolute O Relativ

2

4

2

Standby heating reduction

Economy heating reduction

Increase for Standby cooling

°C

*

\$ К

‡ K

Online Learning Session

Setpoint: Two separate comfort setpoints are used for heating (21°C) and cooling (25°C)



Online Learning Session

Setpoint: One setpoint (21°C) for heating & cooling and hysteresis (1K)



Online Learning Session

Principle of Heating and Cooling: Fan Coil Controller FCC/S with 3-step Fan



Online Learning Session

Principle of Heating and Cooling: Fan Coil Controller FCC/S with Fan 0-10 V



Online Learning Session

Setpoint

Relative setpoint

- A relative setpoint has a base setpoint "Comfort" and the settings "...reduction/increase" for standby and ECO refer to the base setpoint
- Advantage: If the base setpoint is changed, the setpoints for standby and ECO are automatically shifted with it

- For example:

- Comfort heating setpoint 21°C (base setpoint heating)
 → Standby heating reduction "2K" → 19°C (21°C 2K)
 → Economy heating reduction "4K" → 17°C (21°C 4K)
- Comfort cooling setpoint 25°C (base setpoint cooling)
 → Standby cooling reduction "2K → 27°C (27°C + 2K)
 → Economy cooling reduction "4K" → 29°C (27°C + 4K)
- Setpoint for frost protection 7°C
- Setpoint for heat protection 35°C

Setpoint specification and adjustment	Absolute O Relative		
Comfort heating setpoint	21	\$	°C
Standby heating reduction	2	\$	K
Economy heating reduction	4	\$	к
Comfort cooling setpoint	25	\$	°C
Increase for Standby cooling	2	¢	K
Increase for Economy cooling	4	÷	K
Setpoint for frost protection (Building Protection heating)	7	÷	°C
Heat protection setpoint (Building Protection cooling)	35	\$	°C

Online Learning Session

Setpoint

Absolute setpoint

- Absolute setpoints are parameterized for every operating mode
- For example
 - Comfort heating setpoint 21°C
 - Standby heating reduction 19°C
 - Economy heating reduction 17°C
 - Comfort cooling setpoint 25°C
 - Standby cooling reduction 27°C
 - Economy cooling reduction 29°C
 - Setpoint for frost protection 7°C
 - Setpoint for heat protection 35°C

Setpoint specification and adjustment	O Absolute O Relative		
Comfort heating setpoint	21	÷	°C
Standby heating setpoint	19	\$	°C
Economy heating setpoint	17	÷	°C
Comfort cooling setpoint	25	÷	°C
Standby cooling setpoint	27	¢	°C
Economy cooling setpoint	29	\$	°C
Setpoint for frost protection	7		
(Building Protection heating)		•	
Heat protection setpoint (Building Protection cooling)	35	÷	°C

Control value types

Online Learning Session

Control value

- The RTC calculates the control value using an algorithm (e.g. PI) based on the difference between the actual temperature and the setpoint
- The control value is sent to the output of an actuator to control the valve drives
 - Thermoelectric valve drives (TSA/K)
 - Motor valve drives (3-point)
 - Analog valve drives via 0-10 V signal
 - KNX electromotor valve drives (ST/K)
 - ...
- Depending on the valve drive, we offer different actuators (Electronic Switch Actuator, Valve Drive Controller/Actuator, Fan Coil Controller, ...) with electronic or analog 0...10 V output





Online Learning Session

Control value types

- Different control value types are possible depending on the RTC
 - 2-point 1-bit (on/off)
 - 2-point 1-byte (0/100%)
 - Pl continuous (0-100%)
 - PI PWM, On/Off
 - FanCoil

RTC	Control value type	FanCoil	
General	Heating type	2-point 1 bit, (Off/On) 2-point 1 byte (0/100%)	
Control heating	Extended settings	Pl continuous, 0-100%	
		PI PWM, On/Off	
Setpoint settings		FanCoil	
Changing set values			

- Application	Basic-stage heating	Water heating coil (in fan coil unit)	-
Application permeters	Additional-stage heating	Deactivated	
Application parameters	Basic-stage cooling	Convector (e.g. radiator)	
Device function	basic stage coomig	Area heating (e.g. floor)	
	Additional-stage cooling	Electric heater (in room)	
- Temperature controller	The second state of the se	Free configuration	
	Type of heating/cooling system	Electric heater (in fan coil unit)	
+ Temperature controller	Heating/cooling changeover	Water heating coil (in fan coil unit)	~
			58

Online Learning Session

Control value types

2-point controller 1-bit "on/off"

- A 2-point controller possesses two output states (On/Off) that change depending on the actual temperature
 - If the actual temperature is higher than the parametrized setpoint, the associated control value is 0
 - If the actual temperature is less than the parametrized setpoint, the associated control value is 1
- A 2-point controller can quickly compensate for control deviations in case of large changes in the setpoint temperature
- However, it tends to lead to system overshoot (exceeding the setpoint temperature) and an overswing of the temperature
- To avoid overshooting the initial states, 2-point controllers always feature integrated hysteresis (e.g. 1K) that fluctuates around the setpoint



Online Learning Session

Control value types

PI controller continuous "0-100%"

- The continuous controller calculates the control value in the form of a 1-byte value between 0...100%
- The control value transmitted acts on a continuous-action positioner
 - Electromotor valve drives
 → KNX Electromotor Valve Drive ST/K
 - Electrothermal or electromotor 0 10 V valve drives
 → Fan Coil Controller FCC/S with 0-10 V valve drive output
- The valve can be fully opened, fully closed and even positioned in every intermediate position
- This doses the quantity of heat or cold
- PI control is a control engineering term which describes a controller with a proportional and an integral component



Online Learning Session

Control value types

PI controller with pulse width modulation (PWM) 1-byte

- The PI controller (PWM) basically operates exactly like the PI controller (continuous)
- The calculated 1-byte control value is converted together with the parameterized <u>cycle time</u> from a PWM calculation into a signal for 2-point control (ON-OFF-ON-...)
- The control value is fixed for a timed cycle and recalculated in the duration for valve opening
 - The control value 20% at a cycle time of 15 minutes, for example, will be converted to a valve opening time of three minutes
 - The control value 50% results in a valve opening time of 7.5 minutes
- With pulse width modulation, a relatively accurate setting of the temperature can be achieved without any resulting overshoots and simple electrothermal valve drives can be used

Online Learning Session

Online Learning Session

ABB i-bus® Tool

A professional service tool for KNX system integrators

- It supports system integrators during commissioning and service
- Internal information and states of the device hardware and software applications are now available in a transparent manner
- The i-bus[®] Tool is optional, i.e. the ABB i-bus[®] KNX devices must still be commissioned using just the ETS
- An important principle is that no divergences to the ETS project can result through the i-bus[®] Tool
- KNX devices provide numerous options of parameter settings
- After parametrization and downloading, the behavior of the devices must be checked and tested → use the i-bus Tool !!!

www.abb.com/knx

 \rightarrow Services & Tools \rightarrow Engineering Tools

Online Learning Session

ABB i-bus® Tool – Test and check the ETS parameter settings and the different functions (e.g. FCC/S)

ous® Tool 1.9.43.0				i-bus® Tool 1.9.43.0			
<table-cell-rows> 🛖 Back Home</table-cell-rows>	Pelp Select Configuration mode	Device type 0xA0B5 Pł Application 1.0 De	ysical address 4.1.71 vrice FCC/S1.3.2.1	Back Home	? Select Configur mode	Device type 0xA085 ation Application 1.0	5 Physical address 4.1.71 Device FCC/S1.3.2.1
	General	.h.	Status	Welcome	Temperature		Set point temperature
	Channel function	Controller channel	Window open	Connect to device	Current room temperature		28.0 °C Set point temperature Value overwritten
nect to device	Fan automatic active	28.0 -C	Valve purge active	Statue Controller Outputs A-C	Active Heating / Cooling	mode	Control values settings
ntroller tputs A-C	Heating/Cooling actuating value	4004	Exceeded cycle time	Inputs a-d		₩	Value overwritten I-component
puis a-u	Additional stage cooling	4970 0%	i nere are no monitorea subjects	Demo	Above display is status on	Cooling y - no control here	Value overwritten
	Cyclical monitoring	4-pipe	Active Heating / Cooling mode	IP devices	Current operating mode		Heating/Cooling actuating value
	Activated	•		Sheep and a distance			Basic stage cooling Additional stage cooling
	Alerts		1 X	3 Dus Calculation		Comfort	Heating/cooling type
	Dew point alert	(<u>*</u>)	Cooling	Supported devices	Comfort		Parametrized set points
	Level sensor alert		Above display is status only - no control here		🔎 Economy		Set point definition and adjustment
					Value overwritten		X Standby
aborred viewices							

Online Learning Session

ABB i-bus® Tool – Test and check the ETS parameter settings and the different functions (e.g. FCC/S)

Online Learning Session

Online Learning Session

Homepage

www.abb.com/KNX

- → Products and Downloads
 → Heating, Ventilation and Air Conditioning
- ETS Application
- ABB i-bus® Tool
- Product Manual
- Engineering Guides
- Installation and Operating Instructions
- Specification Text
- ...

Online Learning Session

Training Material

Training & Qualification Database

- The database contains extensive training content
 - <u>Webinar, Learning Sessions,</u>... slides and videos
 - Presentations
 - Video tutorials
 - and more ...
 - <u>https://go.abb/ba-training</u>
 - <u>ww.abb.com/knx</u> (→ Services & Tools → Training and Qualification → Training Database)

YouTube

- Channel "ABB Home and Building Automation"
 - <u>https://www.youtube.com/user/ABBibusKNX</u>

The information in this document is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this document.

In no event shall ABB be liable for direct, indirect, special, incidental or consequential damages of any nature or kind arising from the use of this document, nor shall ABB be liable for incidental or consequential damages arising from use of any software or hardware described in this document.

© Copyright [2021] ABB. All rights reserved.

