Application Descriptions

7

19

5

HVAC ObIS

Temperature PI Control

Summary

The PI-Control is used for temperature control e.g. in room temperature controllers.

Version 01.00.01 is a KNX Approved Standard.

This document is part of the KNX Specifications v2.1.

Document updates

Version	Date	Version
1.0	2002.04.03	Editorially restyled, based on "17-01_ObIS_TPIC.doc
1.0	2009.06.15	Editorial update in view of inclusion in the KNX Specifications v2.0.
01.00.01	2013.10.29	Editorial updates for the publication of KNX Specifications 2.1.

References

None.

Filename: 07_19_05 ObIS TPIC v01.00.01 AS.docx
Version: 01.00.01
Status: Approved Standard
Savedate: 2013.10.29
Number of pages: 14

Contents

1 Application Model(s)

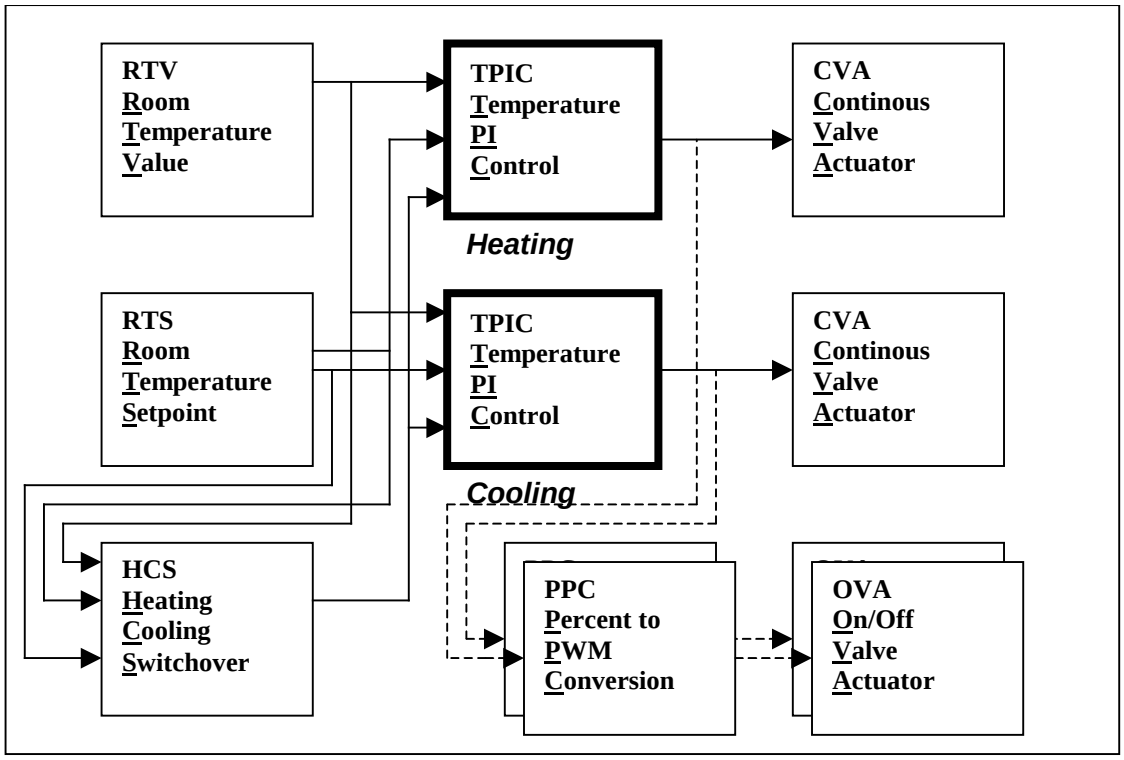

Figure 1 - Example for Individual Room Temperature Control with Heating and Cooling with PI Control

2 ObIS Function Model(s)

2.1 ObIS Function Model "Temperature PI Control"

2.1.1 Aims and objectives

The PI-Control is used for temperature control e.g. in room temperature controllers.

2.1.2 Functional specification

This object can be used for PI control of a temperature e.g. of a room temperature. The actuating value Y is a continuous signal (0 % to 100 %). Y depends on the controlled value X (temperature) and the setpoint value W. . Furthermore the actuating value Y can be activated or deactivated by an optional communication object. The Type of control (heating or cooling) is defined by a parameter.

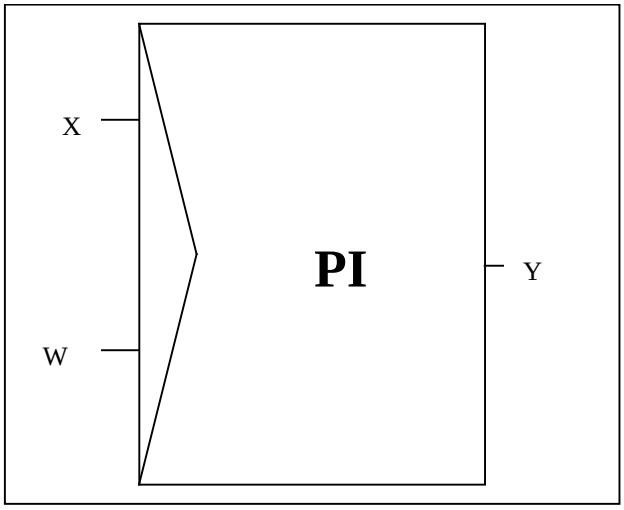

Figure 2 – Temperature PI Control

2.1.3 Constraints

No constraints are defined for the ObIS Temperature PI Control.

2.1.4 Functional Block

Input(s)		Temperature PI Control			Output(s)
Current Room Temperature Value	DPT 9.001	ARTV	CAV	DPT 5.004	Continuous Actuating Value
Current Temperature Setpoint Value Heating/Cooling	DPT 9.001	ATSVH/ ATSVC	RA	See 3.1	Range Alarm
Heating/Cooling Mode	See 3.1	HCM	CS	See 3.2	Controller Status
Parameter(s)					
Proportional Band	KNX 5.020 See 3.3	PB			
Integral Action Time	See 3.5	IAT			
Lower Limit Controlled Value	DPT 9.001	LLCV			
Upper Limit Controlled Value	DPT 9.001	ULCV			
Lower Limit Setpoint Value	DPT 9.001	LLSV			
Upper Limit Setpoint Value	DPT 9.001	ULSV			
Minimum Actuating Value	DPT 5.004	MINAV			
Maximum Actuating Value	DPT 5.004	MAXAV			
Controller Type	See 3.1	CT			
Continuous Actuating Value if Control Inactive	DPT 5.004	CAVCI			
Control Cycle Time	See 3.4	CCT			
Delta Y Transmit	DPT 5.004	DYT			
Cycle Time Transmit Y	See 3.5	CTTY			

2.1.5 Properties

ID	Name	Abbr.	Description	Datapoint Type	M/O
1	**PID_OBJECT_TYPE**		Object Type	KNX_PropDataType	M

Input(s)

ID	Name	Abbr.	Description	Datapoint Type	M/O
<tbd>	**PID_VALUE_ACTUAL_ROOM_TEMPERATURE**	ARTV	Current Room Temperature Value	5.001	M
<tbd>	**PID_SETPOINT_VALUE_ACTUAL_-TEMPERATURE_HEATING/COOLING**	ATSVH/ ATSVC	Current Room Temperature Setpoint Heating or Current Room Temperature Setpoint Cooling	5.001	M
<tbd>	**PID_MODE_HEATING_COOLING**	HCM	Heating Cooling Mode	See 3.1	O

Output(s)

ID	Name	Abbr.	Description	Datapoint Type	M/O
<tbd>	**PID_VALUE_ACTUATING_ CONTINUOUS**	CAV	Continuous Actuating Value	DPT 5.004	M
<tbd>	**PID_ALARM_RANGE**	RA	Range Alarm	See 3.1	O
	PID_STATUS_CONTROLLER	CS	Controller Status	See 3.2	O

Parameter(s)

ID	Name	Abbr.	Description	Datapoint Type	M/O
<tbd>	**PID_BAND_PROPORTIONAL**	PB	Proportional Band	KNX 5.020 See 3.3	M
<tbd>	**PID_TIME_INTEGRAL_ACTION**	IAT	Integral Action Time	See 3.5	O
<tbd>	**PID_VALUE_CONTROLLED_LOWER_LIMIT**	LLCV	Lower Limit Controlled Value	5.001	O
<tbd>	**PID_VALUE_CONTROLLED_UPPER_ LIMIT**	ULCV	Upper Limit Controlled Value	5.001	O
<tbd>	**PID_VALUE_SETPOINT_LOWER_ LIMIT**	LLSV	Lower Limit Setpoint Value	5.001	O
<tbd>	**PID_VALUE_SETPOINT_UPPER_LIMIT**	ULSV	Upper Limit Setpoint Value	5.001	O
<tbd>	**PID_VALUE_ACTUATING_ MINIMUM**	MINAV	Minimum Actuating Value	DPT 5.004	
<tbd>	**PID_VALUE_ACTUATING_ MAXIMUM**	MAXAV	Maximum Actuating Value	DPT 5.004	
<tbd>	**PID_TYPE_CONTROLLER**	CT	Controller Type	See 3.1	O
<tbd>	**PID_VALUE_ACTUATING_ CONTINOUS_CONTROLLER_INACTIVE**	CAVCI	Continuous Actuating Value if Controller Inactive	DPT 5.004	O
<tbd>	**PID_TIME_CYCLE_CONTROL**	CCT	Control Cycle Time	See 3.4	O
<tbd>	**PID_DELTA_TRANSMIT_Y**	DYT	Delta Y Transmit	DPT 5.004	O
<tbd>	**PID_TIME_CYCLE_TRANSMIT_Y**	CTTY	Cycle Time Transmit Y	See 3.5	O

2.1.5.1 Property PID_VALUE_ACTUAL_ROOM_TEMPERATURE ARTV

Unit:	°C
Range:	min. 5 … 35
Default Value:	-
Communication Object/Parameter:	C
Input/Output:	I
R/W Rate	>> 10/day
Description:	This value is the controlled value of the PI control e.g. the current room temperature value.

2.1.5.2 Property PID_SETPOINT_VALUE_ACTUAL_TEMPERATURE_HEATING, or PID_SETPOINT_VALUE_ACTUAL_TEMPERATURE_COOLING ATSVH/ATSVC

Unit:	°C
Range:	min. 5 … 35
Default Value:	-
Communication Object/Parameter:	C
Input/Output:	I
R/W Rate	>> 10/day
Description:	This value is the setpoint value of the PI control.

2.1.5.3 Property PID_MODE_HEATING_COOLING HCM

Unit:	-
Range:	0;1
Default Value:	-
Communication Object/Parameter:	C
Input/Output:	I
R/W Rate	> 1/day
Description:	HCM is used in combination with the parameter CT (Controller Type) to activate or deactivate the controller. The controller is active, if CT and HCM have the same value. If the controller becomes inactive the actuating value (CAV) is set to the value defined by the property „Continuous actuating value if controller is inactive“ (CAVCI). (Coding of HCM see 3.1)

2.1.5.4 Property PID_VALUE_ACTUATING_CONTINUOUS CAV

Unit:	%
Range:	0 ... 100
Default Value:	-
Communication Object/Parameter:	C
Input/Output:	O
R/W Rate	>> 10/day
Description:	This is the actuating value of the Temperature PI Control (TPIC). CAV = f(ARTV,ATSVH/C,PB,IAT,IO,CI,CAVCI) After reset/restart CVAY remains „0“ and will not be transmitted until ATSVH/C and ARTV have been updated.

2.1.5.5 Property PID_ALARM_RANGE RA

Unit:	-
Range:	0;1
Default Value:	0
Communication Object/Parameter:	C
Input/Output:	O
R/W Rate	< 1/day
Description:	If either the setpoint value ATSVH/C or the controlled value ARTV are below their minimum value or above their maximum value the „Range Alarm“ RA will be set and bit 3 to bit 7 in the „Controller Status“ CS will be set accordingly. (Coding of RA see: 3.1) RA = 1: Range Alarm RA = 0: no Range Alarm

2.1.5.6 Property PID_STATUS_CONTROLLER CS

Unit:	-
Range:	-
Default Value:	-
Communication Object/Parameter:	C
Input/Output:	O
R/W Rate	< 10/day
Description:	Controller Status CS is an optional communication object, which is read only (coding of CS see 3.2).

2.1.5.7 Property PID_BAND_PROPORTIONAL PB

Unit:	0,1 K
Range:	min. 20 ... 40 (positive values only)
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R/W
R/W Rate	<< 1/day
Description:	The Proportional Band PB determines the performance of the control. The amplification of the control is proportional to 1/PB. (Coding of PB: see 3.3)

2.1.5.8 Property PID_TIME_INTEGRAL_ACTION IAT

Unit:	min
Range:	free
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R/W
R/W Rate	<< 1/day
Description:	The Integral Action Time determines the performance of the control. If IAT = 0, the integration of the control is not active. (Coding of IAT: see 3.5)

2.1.5.9 Property PID_VALUE_CONTROLLED_LOWER_LIMIT LLCV

Unit:	°C
Range:	-
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R
R/W Rate	<<1/day
Description:	This parameter is the minimum value of the Controlled Value ARTV which can be operated by the TPIC. This value is read only and must be defined by the manufacturer. If ARTV is lower than LLCV, ARTV must be set to LLCV.

2.1.5.10 Property PID_VALUE_CONTROLLED_UPPER_ LIMIT ULCV

Unit:	°C
Range:	-
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R
R/W Rate	<<1/day
Description:	This parameter is the maximum value of the Controlled Value ARTV which can be operated by the TPIC. This value is read only and must be defined by the manufacturer. If ARTV is higher than ULCV, ARTV must be set to ULCV.

2.1.5.11 Property PID_VALUE_SETPOINT_LOWER_ LIMIT LLSV

Unit:	°C
Range:	-
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R
R/W Rate	<<1/day
Description:	This parameter is the minimum value of the Setpoint Value SVY which can be operated by the TPIC. This value is read only and must be defined by the manufacturer. If SVY is lower than LLSV, SVY must be set to LLSV.

2.1.5.12 Property PID_VALUE_SETPOINT_UPPER_LIMIT ULSV

Unit:	°C
Range:	-
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R
R/W Rate	<<1/day
Description:	This parameter is the maximum value of the Setpoint Value SVY which can be operated by the TPIC. This value is read only and must be defined by the manufacturer. If SVY is higher than ULSV, SVY must be set to ULSV.

2.1.5.13 Property PID_VALUE_ACTUATING_ MINIMUM MINAV

Unit:	s
Range:	free
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	O
R/W Rate	>> 10/day
Description:	If the actuating value is lower than MINAV the Continuous Actuating Value CAV is set to MINAV.

2.1.5.14 Property PID_VALUE_ACTUATING_ MAXIMUM MAXAV

Unit:	s
Range:	free
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	O
R/W Rate	>> 10/day
Description:	If the actuating value is greater than MAXAV the Continuous Actuating Value CAV is set to MAXAV.

2.1.5.15 Property PID_TYPE_CONTROLLER CT

Unit:	-
Range:	0;1
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R/W
R/W Rate	<< 1/day
Description:	This Parameter defines whether the controller is used for heating (CT = 1) or for cooling (CT = 0) and in combination with the object HCM if the controller is active or inactive. The controller is active if CT = HCM.

2.1.5.16 Property PID_VALUE_ACTUATING_CONTINUOUS_CONTROL_INACTIVE CAVCI

Unit:	%
Range:	0...100
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R/W
R/W Rate	<< 1/day
Description:	When TPIC is switched in the inactive state, the actuating value (CAV) is set to the Value defined by this property (CAVCI). This value is transmitted one times only.

2.1.5.17 Property PID_TIME_CYCLE_CONTROL CCT

Unit:	s
Range:	free
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	O
R/W Rate	>> 10/day
Description:	This parameter determines the time interval after which the control algorithm is executed again. (Coding see 3.4)

2.1.5.18 PID_DELTA_TRANSMIT_Y DYT

Unit:	%
Range:	0 .. 100 %
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	O
R/W Rate	>> 10/day
Description:	CAV will be transmitted automatically if the difference between old and new CAV is greater than the given DYT. It will not be transmitted automatically, if DYT is set to “0”.

2.1.5.19 Property PID_TIME_CYCLE_TRANSMIT_YCTTY

Unit:	minutes ("0" = no transmission)
Range:	min 0; 15 … 60 minutes
Default Value:	free
Communication Object/Parameter:	P
Input/Output:	R/W
R/W Rate	<< 1/day
Description:	The actuating value CAV will be transmitted cyclically after the given cycle time. It will not be transmitted cyclically, if CTTY is set to “0”. (Coding of CTTY: see 3.5)

3 Datapoint Type(s)

3.1 Datapoint Type “heating/cooling”

Format:	1 bit		
	V		
Encoding:	See below		
Range:	V = {0,1}		
Unit:	-		
Datapoint Types			
Code:	Symbol:	Encoding: V = 0	V = 1
1.100	DPT_Heat/Cool	Cooling	Heating
1.005	DPT_Alarm	No Alarm	Alarm

3.2 Datapoint Type "Controller Status"

Format:	1 octet	
	HGFEDCBA	
Encoding:	See below	
Range:	A ...H = {0,1}	
Unit:	-	
Datapoint Types		
Code:	Symbol:	Encoding:
<tbd>	<tbd>	A =1 : Control is inactive B =1 : Output is inverted C: Not used, always zero D=1 : ARTV>ULCV E=1 : ARTV<LLCV F=1 : SVY>ULSV G=1 : SVY<LLSV H=1 : Range Alarm

3.3 Datapoint Type "8-bit signed integer"

Format:	1 octet VVVVVVVV
Encoding:	See below
Range:	V = [-128 … 127] binary encoded
Unit:	See below

Datapoint Types

Code:	Symbol:	Encoding:	Range:	Unit:
5.020	DPT_TempHVACRel8	"temperature"	-128…127	0.1 K

This Datapoint Type shall only be used for the encoding of parameters. It shall not be used for the encoding of any temperature value (real temperatures, shift values, offset values …) that are transmitted on the bus using group communication.

3.4 Datapoint Type "8-bit unsigned multiplier without zero"

Format:	1 octet VVVVVVVV
Encoding:	See below
Range:	V = [1…255] binary encoded
Unit:	See below

Datapoint Types

Code:	Symbol:	Encoding:	Range:	Unit:
<tbd>	<tbd>	"time"	1…255	1 s

3.5 Datapoint Type "8-bit unsigned multiplier with special function for zero"

Format:	1 octet VVVVVVVV
Encoding:	See below
Range:	V = [0…255] binary encoded
Unit:	See below

Datapoint Types

Code:	Symbol:	Encoding:	Range:	Unit:
<tbd>	<tbd>	"time"	1…255 0 = corresponding function disabled	1 min

