TCI-C Series cabinet mounted universal controller

Features

- Universal PID and binary control for any analog input/output signal and range
- 2 independent control loops with each 2 PID sequences and 6 independent binary sequences
- 2 modulating output for DC 0...10V or 0…20 mA actuators with 10 bit resolution.
- 3 universal inputs for NTC 10k, open contact binary input, DC 0…10V or 0…20 mA sensors with 10 bit resolution
- 1 PT1000 input -50…200°C (-58…392°F)
- Multiple auxiliary functions: heat – cool auto changeover, remote control, setpoint compensation
- Cascading of control loops
- Alarm monitoring of low and high limits on all inputs. Programmable reaction in case of alarm.
- Feedback function for inputs and set points.
- Special functions for dehumidifying, set point shift and VAV control
- Password protected programmable user and control parameters
- Deluxe Version only:
  - Power Cap protected real time clock with 24h power backup
  - 8 time schedule events, with many options
  - Blue backlight

Applications

- Air Only Systems: Constant or variable air volume systems for single or dual duct systems with options of:
  - up to two reheat stages
  - supply air, extract air cascade control
  - humidity control
  - Control for variable speed fans

- Air/Water Systems:
  - Fan Coil units for 2-pipe or 4-pipe systems with options of:
    - Humidity control
    - Pressure control
  - radiator control, chilled ceiling

- Water Only Systems: Radiator, floor heating or chilled ceilings

- Individual room control for hotel rooms, meeting rooms, etc.

General Description

The TCI-C is a stand-alone cabinet mounted electronic universal controller with two autonomous control loops. Each control loop may use up to 2 PID sequences and 6 binary sequences. The TCI-C11 features 1 independent control loop, 2 universal inputs, 2 binary outputs and one analog output, the TCI-C22 offers 2 independent control loops, 3 universal inputs, 1 PT1000 input, 2 binary relays outputs and 2 analog outputs. A detailed configuration is possible by following a simple setup routine. The TCI can be configured using the standard operation terminal. No special tool or software is required.

Name

T C I - C 2 2 - 0

Supply Voltage:	0 = 24VAC, 1 = 110VAC, 2 = 230VAC
In/Outputs:	1 = 2UI, 2DOR, 1AO, 2 = 1PT1000, 3UI, 2DOR, 2AO
Control loops:	1 = 1 control loop, 2 = 2 control loops
Housing:	C = Cabinet, W = Wall mounted
Series:	**TCI**

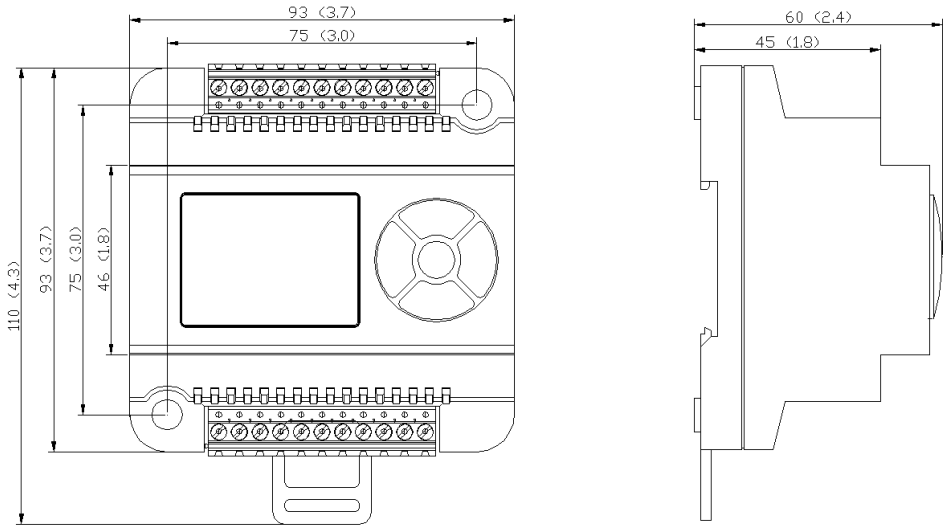
Ordering

Model	Stock code	Option	Control Ip	Temp In PT1000	UI	DO Relays	AO	Power	Housing
TCI-C11-0	40-11 0060		1	0	2	2	1	24VAC	Cabinet, DIN rail mounted
TCI-C11-0-D	40-11 0061	Deluxe							
TCI-C11-2	40-11 0062							230VAC	
TCI-C11-2-D	40-11 0063	Deluxe							
TCI-C22-0	40-11 0064		2	1	3	2	2	24VAC	
TCI-C22-0-D	40-11 0065	Deluxe							
TCI-C22-2	40-11 0066							230VAC	
TCI-C22-2-D	40-11 0067	Deluxe							

Technical specifications

Power Supply	Product type	TCI-Cxx-0	TCI-Cxx-1	TCI-Cxx-2
	Operating Voltage ±10%, 50/60 Hz	24 VAC	110VAC	230VAC
	Power Consumption	Max. 3 VA	Max. 5 VA	Max. 5 VA
	Electrical Connection	Terminal Connectors, wire 0.34…2.5 mm^2 (AWG 24…12)		
	Clock backup	Min. 48 hours		
Signal inputs	Universal Input Input Signal Resolution Accuracy	Setting for Voltage or Current 0...10 V or 0...20 mA 9.76 mV or 0.019 mA (10 bit) ± 2 %		
	Universal Input Range Accuracy	Setting for temperature input or open contact NTC (Sxx-Tn10 sensor): -40…140 °C (-40…284 °F) -40…0 °C (-40…32 °F): 0.5 K 0…50 °C (32…122 °F): 0.2 K 50…100 °C (122…212 °F): 0.5 K > 100 °C (> 212 °F): 1 K		
	PT1000 input Range Accuracy	PT according EN 60751 -50…200°C (-58…392) ± 0.5%		
Signal outputs	Analog Outputs Output Signal Resolution Accuracy Maximum Load	 DC 0...10 V or 0...20 mA (500 Ω max.) 9.76 mV resp. 0.019 mA (10 bit) ± 1 % 20 mA, 500 Ω max.		
	Relays Outputs AC Voltage DC Voltage Insulation resistance	 0…250 VAC, 8 (5) A max. each output 0…30 VDC, 8 (5) A max. each output 3750 VAC acc. to EN 60 730-1		
Environment	Operation Climatic Conditions Temperature Humidity	To IEC 721-3-3 class 3 K5 0…50 °C (32…122 °F) <95 % r.H. non-condensing		
	Transport & Storage Climatic Conditions Temperature Humidity Mechanical Conditions	To IEC 721-3-2 and IEC 721-3-1 class 3 K3 and class 1 K3 -25…70 °C (-13…158 °F) <95 % r.H. non-condensing class 2M2		
Standards	CE conform according to EMC Standard 89/336/EEC EMEI Standard 73/23/EEC	EN 61 000-6-1/ EN 61 000-6-3		
	Product standards Automatic electrical controls for household and similar use Special requirement on temperature dependent controls	 EN 60 730 –1 EN 60 730 – 2 – 9		
	Degree of Protection Safety Class Cover, back part	IP30 to EN 60 529 II (IEC 60536) Fire proof ABS plastic (UL94 class V-0)		
General	Dimensions (H x W x D)	60 x 93 x 93(110*) mm (2.4" x 3.7" x 3.7(4.3*)") *)Din rail mounting		
	Weight (including package)	240 g (8.5 oz)		

Dimensions [mm] (inch)



Selection of actuators and sensors

Temperature Sensors:

Use only our approved NTC sensors to achieve maximum accuracy. Recommended is SDB-Tn10-20 as Duct sensor, SRA-Tn10 as Room sensor and SDB-Tn10-20 with AMI-S10 as immersion sensor.

Modulating Actuators:

Choose actuators with an input signal type of 0-10 V DC or 4-20 mA. Minimum and maximum signal limitations may be set in software.

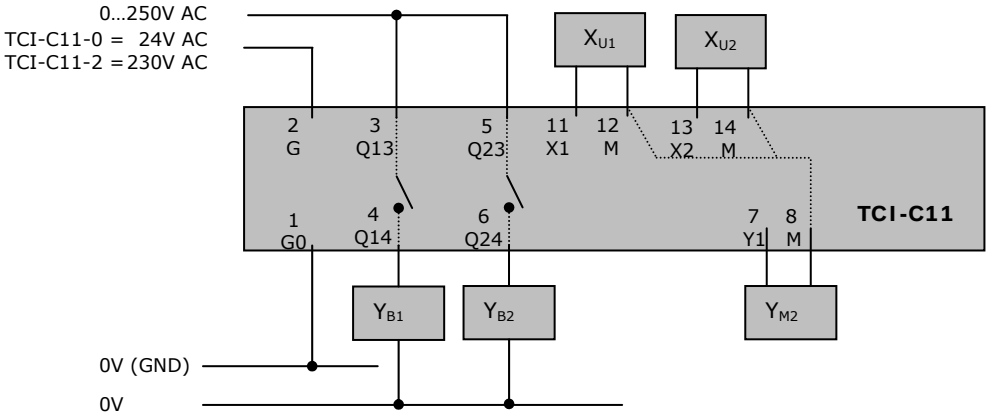
Floating Actuators:

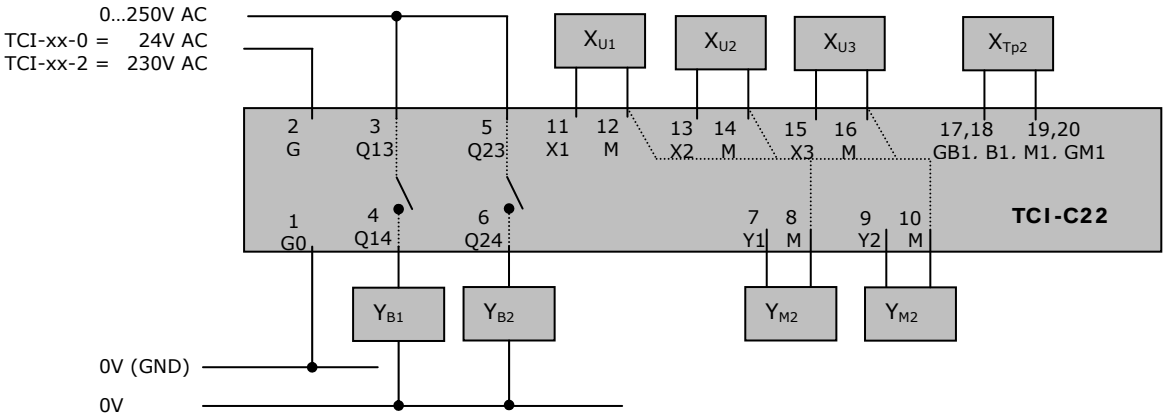
Actuators with constant running time are recommended. Observe power limits on binary devices.

Binary auxiliary devices:

E.g. pumps, fans, on/off valves, humidifiers, etc. Do not directly connect devices that exceed 250 VAC, 8(5) A. Observe startup current on inductive loads.

Connection diagram





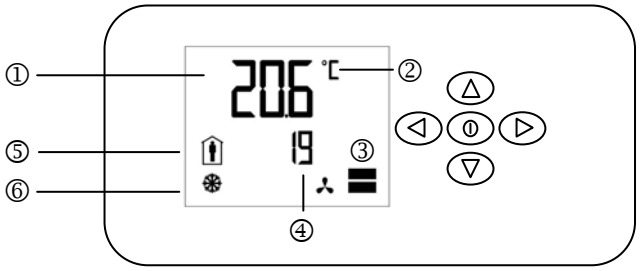
Description:

X_{U1}	Universal input 1:	NTC 10kΩ @ 25°C (77°F), 0…10 V or* 0…20 mA
X_{U2}	Universal input 2:	NTC 10kΩ @ 25°C (77°F), 0…10 V or* 0…20 mA
X_{U3}	Universal input 3:	NTC 10kΩ @ 25°C (77°F), 0…10 V or* 0…20 mA
X_{Tp2}	PT1000 input:	PT1000
Y_{B1}	Binary output 1:	0…250 VAC or 0…30 VDC
Y_{B2}	Binary output 2:	0…250 VAC or 0…30 VDC
Y_{M1}	Analog output 1:	0…10 V or* 0…20 mA
Y_{M2}	Analog output 2:	0…10 V or* 0…20 mA

*) *selectable by jumper*

Display and Operation

The operation terminal uses an LCD display and four operation buttons.



Legend:

1. 4-digit display of current value, time, control parameter or set point
2. Unit of displayed value, °C, °F, % or none
3. Graphical display of output or input value with a resolution of 10%
4. 4-digit display of current value, time, control parameter or set point
5. Operation modes: Comfort mode, Standby mode, **OFF** Energy Hold Off
6. Symbols:

Heating Active	Cooling Active	Schedule Set	Cascade Override
☀	❄	🕒	☝

- *POWER button*: Standard function: Pressing the button less than 2 sec toggles standby and comfort mode. Pressing the button for more than 2 seconds switches the unit off.
  Programming function: Acts as Enter to select menu option or accept changed parameter value.
- *UP buttons*: increment set points and parameters, select menu options
- *DOWN buttons*: decrement set points and parameters, select menu options
- *RIGHT (OPTION) button*: Standard function: If pressed less than 2 sec access for different control modes
  If pressed for more than 2 sec starts operation level for advanced users. Change of time schedules, offsets and heat – cool settings.
  Programming function: Acts as Enter to select menu option or accept changed parameter value.
- *LEFT (ESC) button*: Standard function: Access different operation modes.
  Programming function: Acts as Escape to leave menu levels or discard changed parameter values.

Operation Modes

- *Comfort*: The unit is in full operation mode. All the control functions are operating according to their setpoints. The unit displays occupied mode.
- *Standby*: The set points are shifted according to parameters **1L07** resp. **2L07**. The setpoint of the reverse (heating) sequence is shifted down and the setpoint of the direct (cooling) sequence is shifted up. The display shows unoccupied mode. Analog outputs are limited to **1A04** and **2A04** standby maximum. Binary switching stages are limited to the first stage. Standby operation may be disabled with **UP06**.
- *Energy Hold-Off (EHO)*: The unit is switched off. All outputs are off while no alarm is active. The inputs are still monitored in case any alarms are enabled. Off is displayed.

Activation of operation modes

- Via operation terminal
- *Clock*: Operation modes may automatically be switched according to daytime and weekday. The clock symbol will be indicated if time programs are activated.
- Via inputs, by using auxiliary functions parameters.

Operation of the Terminal Unit

Switching ON

The unit is switched on by pressing the POWER button. It will start up in comfort mode.

Changing between COMFORT and STANDBY

Pressing the POWER button for less than 2 seconds toggles between STANDBY and COMFORT modes. Standby mode may be disabled with **UP06**.

Switching OFF

Pressing the POWER button for more than 2 seconds, will switch the unit off. OFF and current time will be displayed in the LCD for the deluxe unit. Current temperature and OFF is displayed for the basic unit.

Standard display

Standard display is enabled with parameter **UP08**. This display mode is active if no UP/DOWN or OPTION key has been pressed during the previous 30 seconds. The contents of the large and small digits may be chosen with parameters **UP09** to **UP10**.
Should Standard display be disabled, the selected loop setpoint will be displayed in the small digits, the associated input in the large digits and the output in the right hand scale.

Changing of set points

Step through the enabled control loops by repeatedly pressing the RIGHT button. The large digits show the input value of the activated control loop. The analog output value is indicated on the vertical bar on the right side, binary stages are shown on the indicator below on 8, 9, 10. The small digits show the set point of this loop. Pressing UP/DOWN will select the first control loop enabled in this order: Loop 1, Loop 2, manual override (if enabled) for AO1, AO2, FO1, DO1, DO2. Select the desired control loop or output with the RIGHT button and change the set point with the UP/DOWN buttons. Changing of set points may be disabled with **UP01**.

Override of secondary set point in cascade control

If cascade control is active (for example VAV control), it is possible to override the primary loop and manually select the set point of the secondary loop. While the secondary loop is displayed change the set point with UP/DOWN keys. The manual indication will show on the display. (For VAV this would mean the loop is now changed to CAV. This is especially useful while tuning the VAV system) Pressing the OPTION key to move back to the temperature loop will cancel manual override.
Manual override may be disabled with **UP02**.

Power Failure

All the parameters and set points are memorized and do not need to be reentered. Depending on **UP05** the unit will remain switched off, switch on automatically or return to the operation mode it was in before the power failure.
Deluxe version only: Timer operation and daytime setting will be retained for 24h. The controller has to be connected to a power supply for at least 10 hours for the backup function to operate accordingly.

Clock Operation (Deluxe Version)

The TCI contains a battery backed up quartz clock. Up to 16 mode changes (STANDBY, COMFORT, OFF) based on weekdays and time may be programmed. See chapter operation on how to program and assign switch times to the corresponding loops.
A blinking clock indicates that the time has not been set. This may occur if the time was never set or if the unit was without power for longer than 24 hours. The time needs to be set in order to allow time programs to operate. See chapter operation, advanced settings for instructions on how to set the time.

Error messages

The TCI may display the following error condition:

Err1: An assigned input is not enabled or missing. All control loops, functions and outputs tied to this input will be disabled. Verify input connections, jumper settings and parameter settings for the input involved.

Accessing advanced settings

Pressing the option button for more than three seconds will start the advanced setup menu. The large LCD digits display SEL. The advanced setup menu Clock setup, Time schedules, Heat / Cool change for 2 pipe systems. The menu may be left by pressing the POWER key or by not pressing a key for more than 2 minutes.

- **Heat / Cool change**. H-C is displayed in the small LCD. Currently active symbol for heating or cooling show below. Pressing the OPTION key again toggles Heating – Cooling mode.
  Access to Heat/Cool change may be disabled with **UP03**

Clock and time schedule operations for Deluxe Version only:

- **Clock Setup**. The current time is displayed in the small digits. Pressing the RIGHT button will enter the clock setup. The minutes are blinking and may be changed with the UP/DOWN keys. Pressing RIGHT button saves the minutes and steps to the hours. The hours are blinking. Pressing the RIGHT key again will step to the weekday. DAY1-7 is displayed. Day 1 stands for the first working day (Monday) of a 5-day working week. (See schedule). Select the day according to current weekday. Pressing RIGHT key again saves the settings and moves back to the SELECT menu.
- **Time Schedules**: press the option key while Pro is displayed in the small digits.
  In the first step the time schedule may be enabled or disabled. To activate time schedules press the RIGHT button while Pro is displayed and OFF in the lower digits. OFF is now blinking. Press the UP button to change to ON. Press RIGHT again to save the change. Now press the UP key to step through the switching time settings. Pr 01 is now shown in the large digits, while the number 01 is blinking. Select switching time by using UP/DOWN keys. There are a total of 8 switching times available. Enter the switching time by pressing the RIGHT button. A switching time is defined in 4 steps. The bar indicator on the right side shows programming progress:

  1. Select switching time 00:00 to 23:45 in 15-minute steps;
     press OPTION to continue.
  2. Select weekday(s) = A list of 7 triangles is displayed. The selected day is blinking. Select the day with LEFT or RIGHT key. Activate the switching time for that day by pressing the UP key, de-activate the day by pressing the DOWN key. Repeatedly press the option key to go to the next level.
  3. Select function of the time program. There are the following possibilities:
     0 = no = switching time is not active
     1 = OP = change operation mode of controller: ON, OFF, Eco
     2 = L1 = change setpoint of loop 1
     3 = L2 = change setpoint of loop 2
     4 = d1 = change status of do1: (Output must be in manual mode: ON, OFF)
     5 = d2 = change status of do2: (Output must be in manual mode: ON, OFF)
     6 = A1 = change setpoint of ao1: (Output must be in manual mode: 0…100%)
     7 = A2 = change setpoint of ao2: (Output must be in manual mode: 0…100%)
  4. Depending on the last step, select operation mode to be switched to after this switching time, setpoint of control loops or analog outputs or binary outputs. Outputs must be set in manual mode in order to be controlled by time schedule!

Access to time schedules may be disabled with **UP04**

Setting of parameters

The TCI is an *intelligent* controller and can be adapted to fit perfectly into your application. The control operation is defined by parameters. The parameters are set during operation by using the standard operation terminal.
The parameters are password protected. There are two levels of parameters: User operation parameters for access control settings and Expert parameters for control functions and unit setup. The passwords for user levels and expert levels are different. Only control experts should be given the control parameter password.
The parameters can be changed as follows:

1. Press UP and DOWN button simultaneously for three seconds. The display will indicate the firmware version in the upper large digits and the revision in the lower small digits. Press the RIGHT or POWER key to start login
2. CODE is shown in small display.
3. The code for accessing the user parameters is 009
4. Select this using UP or DOWN buttons.
5. Press the RIGHT or POWER button after selecting the correct code.
6. Once logged in, the parameter is displayed immediately.
7. Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the RIGHT button. Arrows 8 to 10 show up and indicate that the parameter may be modified now. Use UP or DOWN buttons to adjust the value.
8. After you are done, press RIGHT or POWER in order to save the new value of the parameter and return to the selection level. Pressing LEFT key will discard the value and return without saving.
9. Press the LEFT button to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.

User Parameters (Password 009)

Parameter	Description	Range	Default
UP 00	Enable access to operation modes	ON, OFF	ON
UP 01	Enable access to set points	ON, OFF	ON
UP 02	Enable manual control in cascade or fan control mode	ON, OFF	ON
UP 03	Enable change of heating / cooling mode for 2 pipe systems	ON, OFF	ON
UP 04	Enable access to time programs:	ON, OFF	ON
UP 05	State after power failure: 0 = off, 1 = on, 2 = state before power failure	0, 1, 2	2
UP 06	Enable standby functionality	ON, OFF	ON
UP 07	Celsius or Fahrenheit, ON for Fahrenheit, OFF for Celsius	ON, OFF	OFF (Celsius)
UP 08	User Display: Select display while no key is pressed	ON, OFF	ON
UP 09	Select contents of Large LCD display in standard mode: 00 = OFF 01 = Input 02 = Setpoint 03 = Analog Output 04 = Binary Output 05 = Clock	0…5	1
UP 10	Select ID of contents of upper digit display	0…4	1
UP 11	Select contents of lower digit display in standard mode	0…5	Standard = 2 Deluxe = 5
UP 12	Select ID of contents of lower digit display	0…4	1
UP 13	Select analog output for display in vertical bar 00 = OFF 01 = AO1 02 = AO2 03 = FO1 04 = Output lp1 05 = Output lp2	0…5	3
UP 14	ON = Display heating & cooling state of controller in standard mode OFF = Do not indicate heating and cooling state in standard mode	ON, OFF	OFF
UP 15	ON = Alarms blink after being active and need to be confirmed OFF = Alarms are only shown when they are active	ON, OFF	ON
UP 16 Deluxe only	Clock display type: OFF = Show 24hour clock ON = Show 12hour clock (AM, PM)	ON, OFF	OFF (24h)
UP 17 Deluxe only	Reset timer for override mode: Only available for deluxe version 0 = Reset of override mode is not active. Time schedules can be overridden manually. 1…255 = delay in minutes to switch off device if ON/Economy mode is activated while the unit is scheduled to be in OFF mode	0…255	60 (Min)

Control Functions

Depending on product version 1 or 2 independent control loops are available. Each control loop may utilize 6 binary **and** 2 PID control sequences. Control loop and sequences are activated when defining output parameters.

Manipulation of the set point

Standby set point shift X_{SBY}: This function shifts the set point while the operation mode is standby. The heating set point W_H is reduced and the cooling set point W_C increased by the value of the standby set point shift X_{SBY}.

Dead Zone Span X_{DZ}: The dead zone span lies between the heating and the cooling set point.

Minimum and Maximum Set Point Limits: Limits the adjustable range of the loop set point. The limits for heating and cooling sequence may be chosen individually.

Cascade Control: The output of the primary control loop determines the set point of the secondary control loop. It is possible to choose only the direct or reverse sequence or both of them. The output of the set point providing control loop is spanned between the minimum and maximum set point limits. The set point limits for heating and cooling sequence are defined individually.

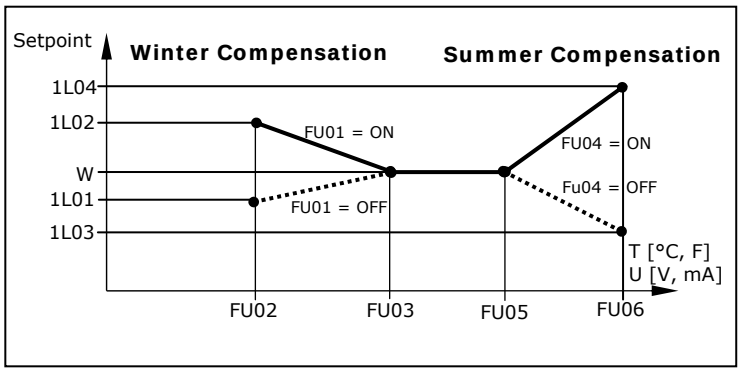
Setpoint Compensation: Shift the set point either towards the set point minimum (negative shift) or the set point maximum (positive shift) depending on an external input signal. This is done to compensate the set point due to a change in the environment. It is most commonly applied to outside temperature. Summer-Winter compensation is activated through parameter **1L05** or **2L05**.

FU00 selects the compensation input signal, either external temperature or analog input.

The winter compensation is active when the outside temperature drops below the upper limit of winter compensation **FU03**. Depending on parameter **FU01**, the setpoint is now shifted towards the heating setpoint minimum or maximum. The maximal compensation is reached when the temperature reaches the lower limit **FU02**. The actual set point will in this case be equal to the minimum heating set point limit for a negative shift or the maximum set point limit for a positive shift.

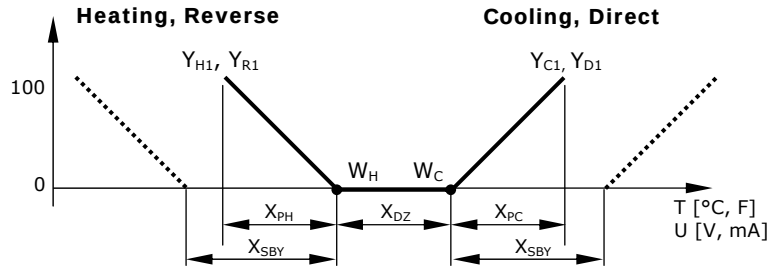
The summer compensation is active when the outside temperature exceeds the lower limit for summer compensation **FU05**. Depending on parameter **FU04**, the setpoint is now shifted towards the cooling setpoint minimum or maximum. It reaches its maximum when the temperature equals the upper limit **FU06**.

Example: Summer – Winter compensation active in loop 1. **1L05** = 3



PID-Control

Each loop has one reverse (heating) and one direct (cooling) acting PID sequence.



Legend:

T, U	Input Signal
X_{PH}	P-band Heating, Direct
X_{PC}	P-band Cooling, Reverse
X_{DZ}	Dead zone
X_{SBY}	Standby set point shift
W_H	Set point Heating, Reverse
W_C	Set point Cooling, Direct
Y_{H1}, Y_{R1}	P sequence Heating, Reverse
Y_{C1}, Y_{D1}	P sequence Cooling, Direct

Proportional Control:

Proportional-band X_P: The proportional part is defined through the p-band. A narrow P-band increases the sensitivity of the controller. Typical values used are 1 – 1.5K for heating, 2 – 3K for cooling sequences.

The P-band should be extended in case the ID-Part is active, to prevent instability.

Integral & Differential Control:

The algorithm used reduces the swinging tendency of the control loop and improves a direct approach of the current value to the setpoint. The ID part is defined by two parameters:

The time interval TI specifies how fast the control sequence reacts. A low value (short interval) increases the swinging tendency and with it the risk of an instable loop. A high value (long interval) slows than reaction time.

The integral gain factor KI specifies how strong the control sequence reacts. Opposite to TI a high gain factor increases instability and a low factor delays the response of the controller.

We recommend the following values:

For air based heating systems: TI = 3s, KI = 1.0

For floor heating systems: TI = 5s, KI = 0.5

For air cooling systems: TI = 3s, KI = 1.2

For humidifying systems: TI = 60s, KI = 0.4

For dehumidifying systems: TI = 70s, KI = 0.3

Pressure Control (VAV): TI = 1s, KI = 0.8 (depending on speed of actuator KI varies)

Binary Control

Each loop has three reverse- (heating) and three direct- (cooling) acting binary sequences. The offset to the setpoint is adjustable for each sequence. The switching hysteresis is adjustable per control loop.

Action of stages: The stages may be activated according three different patterns:

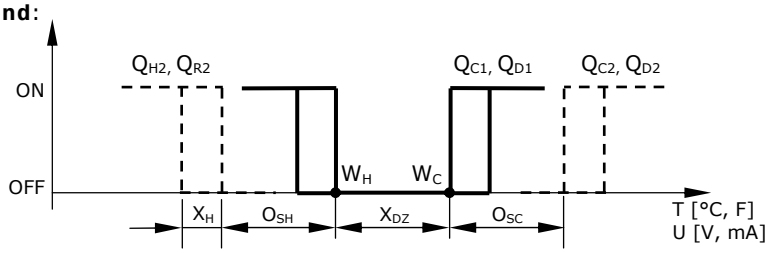
One at the time: Only one stage is active at the time. The lower stage will be switched off when the higher stage gets active. Example: fan speed control.

Cumulative: Multiple stages are active at the same time: The lower stage stays activated when the higher stage switches on. Example: Electrical heating stages

Binary coded: In the first step only the first stage is active; in the second step only the second stage. In the third step both stage 1 and stage 2 are switched on. This is used for heating stages. The size of the second heating stage should be doubled the size of the first heating stage. For example 100W for the first stage and 200W for the second stage. With two outputs we could create the following steps: 1. Step 100W, 2. step 200W, 3. step 300W.

Action	Stage 1	Stage 2	Stage 3
One at the time	Q_1	Q_2	
Cumulative	Q_1	Q_1+Q_2	
Binary coded	Q_1	Q_2	Q_1+Q_2

Binary Control
Legend:



T, U	Input Signal
O_{QH}	Offset Heating, Direct
O_{QC}	Offset Cooling, Reverse
X_{DZ}	Dead zone
X_{SBY}	Standby set point shift
W_H	Set point Heating, Reverse
W_C	Set point Cooling, Direct
Q_C, Q_D	Binary Output Stage Cooling, Direct
Q_H, Q_R	Binary Output Stage Heating, Reverse

Switching Hysteresis: Defines the difference between switching on and switching off of a digital sequence. A small hysteresis will increase the number of switching cycles and thus the wear on associated equipment.

Delayed switching. Cumulative Heating/ cooling stages will not switch simultaneously with stage 1, in case of a sudden demand or at power on. Stage 2 will not start earlier than 5 seconds after stage 1 has been initiated.

Input Configuration

General

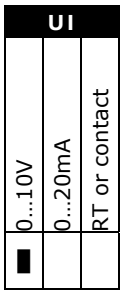
Alarms: Each input features low and high limit alarms. Each alarm is defined with a limit, a hysteresis and an enable parameter. The limit specifies the input signal level required to trigger the alarm. The hysteresis defines the difference between input signal and limit required to return the alarm state to normal. The hysteresis parameter is shared between low and high limit alarms of the same input. Once an alarm is triggered it will be displayed as ALA1, ALA2, ALA3 and ALA4. While the alarm is active the ALA display is steady.
The user is able to select if the alarm is to be acknowledged or not. If UP15 is set to ON: Once the alarm recovers the ALA display will be blinking until acknowledged. Each alarm needs to be acknowledged by pressing the RIGHT key. IF UP15 is OFF, the alarms will not be visible once the alarm condition is removed.

	UI1	UI2	UI3	PT1000 In
Low limit alarm	ALA1	ALA3	ALA5	ALA7
High limit alarm	ALA2	ALA4	ALA6	ALA8

Averaging function: Averaging function is used to prevent unwanted fluctuation of sensor signals. The controller measures every second the signal inputs. The input signal is now built over a number of measured values. Select how many values should be used to calculate the averaging signal. Control speed will slow down when a large number of samples are used for an averaging signal. This should be taken into account when defining the control parameters.

Compensation: Adjust input values if required

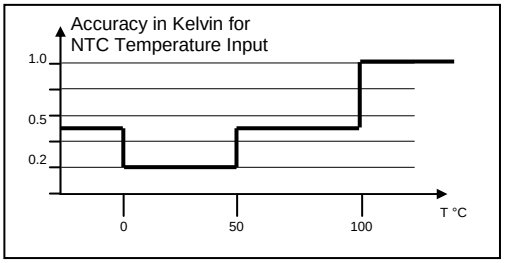
Universal Input



The universal input may be configured with a jumper to NTC temperature input or open contact, 0-10VDC or 4-20 mA. The jumper is located on the backside of the controller. The drawing on the right indicates the jumper placement for each signal type. The factory setting is 0-10 VDC. Only place the jumper vertically.
The range of the input signal can be specified in software by setting a minimum and a maximum limit. The limits are in percent of the full range.
The display value of the input signal may be specified according to its measuring range. For example a pressure sensor has a 4-20 mA output and a pressure range of 0 – 200 Pa. It is possible to transform the input signal into a different dimension by setting the lower and upper measuring range limit according to the features of the sensor device. In our example the display will read 100 for a 12 mA signal. Range values below 100 will have a resolution of 0.5, below 50 of 0.2 and below 25 of 0.1.
The smaller the measuring range is, the higher is the resolution. A signal of 0…100 may be displayed to a resolution of 0.1 for the input measurement and 0.5 for the setpoint. 0…200 can only be shown with a resolution of 0.2 and 1.0 for the setpoint.
With the range parameter, larger numbers may be displayed. -50..205 may be multiplied x 10 or x 100. Largest displayable values are -990…9999. Units may be °C/°F, % or Pa (displayed as P)

Temperature Input NTC

Placing the jumper to RT allows for passive NTC sensor to be connected as control input. The accuracy of the temperature input is shown in the table to the right. Specified accuracy can only be guaranteed by using a manufacturer approved temperature sensor. For best results use Sxx-Tn10 sensors. Range limitation applies as well to the temperature inputs. By limiting the range, the resolution may be increased.



PT1000 temperature input

The TCI-Cx-2x includes a PT1000 temperature input. The input works with a standard PT1000 probe between -50…200°C (-58…392°F). Accuracy is within 0.5°C for the entire range. It is recommended to use a three or four wire sensor to compensate for wire resistance.

Auxiliary Functions

A auxiliary function is enabled once it is assigned to an input. The parameter settings for an auxiliary function consist of a parameter to select an input, a time delay and an active and inactive limit.
The active limit may be smaller than the inactive limit of the function. In this case the action is reversed and the function is activated when the input signal is low.

For a standard function (active limit is above inactive limit), the input needs to cross the active limit for the function to switch to active mode. In order for the function to switch to inactive mode, the input needs to fall below the inactive limit. If the input is between inactive and active limits, the function will not change its status.
For a reversed function (active limit is lower than inactive limit), the input has to be below the active limit to activate and above the inactive limit to deactivate.

The Remote Enable function has the option to switch the way the limits are used. The reaction depends if the active limit is higher than the inactive limit or vice versa. If the range switch FU14 is set to ON the following applies:
In case active limit is higher than inactive limit: the controller is enabled if input value is higher than active limit and lower than inactive limit, it is disabled below active limit and above inactive limit.
In case active limit is lower than inactive limit: the controller is enabled if input value is above active limit or below inactive limit. It is disabled if within limits.

For an open contact input, the jumper needs to be placed into the RT setting. The software switch should be set as well to RT setting. An open contact will result in a low temperature for the RT setting. A closed contact reads as high temperature. Set activation limits thus accordingly: For example: Temperature input range 0…100°C, active limit 90°C, inactive limit 10°C. (Active when contact closed).

Toggle of Standby and Comfort operation modes	Standby and Comfort modes are controlled through an external contact **Activation Delay:** Defines the delay the binary contact has to be open before standby mode is activated. This function may be used together with key card switches for hotels or motion detectors for offices.
Remote Enable	De-activating the assigned input forces the controller into the OFF operation mode. The manual override may be disabled with parameters. The operation mode cannot be overridden by using time schedules. Activating the assigned input, returns control of the operation mode to the terminal and time schedule. The operation mode may be disabled on alarm flags. The alarm flags may be selected by parameter. Switch off delays still apply when an alarm becomes active. Delay times may be assigned for both activation and de-activation. This function may be used as AND function for several conditions that need to be met for the controls outputs to remain active. It may as well be used as window contact to prevent loss of energy.
Heat-cool changeover with external switch	Control heat and cool setting of your controller from a central location by a central switch over. Note: all ground levels of involved controllers must be the same. Select binary input settings outlined above.
Auto Changeover with supply media temperature sensor	The external input may be used to automatically determine heating or cooling mode by measuring the temperature of the supply media. Connect a qualified passive sensor or active temperature transmitter to the assigned input. Heating mode is activated once the supply temperature is above the heating limit. Cooling is activated when the supply temperature is below the cooling limit. The limits may be defined in software. Standard is 16°C (61°F) for cooling and 28°C (83°F) for heating
Auto Changeover with outside temperature sensor	The external input may be used to automatically determine heating or cooling mode by measuring the outdoor temperature. Connect a qualified passive sensor or active temperature transmitter to the assigned input. Heating mode is activated once the supply temperature is below the heating limit. Cooling is activated when the supply temperature is above the cooling limit. The limits may be defined in software. Standard is 16°C (61°F) for heating and 28°C (83°F) for cooling.
Heat-cool changeover based on demand of one control loop	Heat and cool state of the controller may as well be determined by the state of one of its control loops.

Output Configuration

General

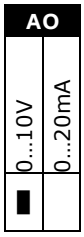
An output must be assigned to a function or a control loop using the xA, xD parameter set. Assigning an output to a control sequence will automatically activate the respective sequence. Unassigned functions and sequences are not active.

Alarm function

Priority for output control
1. Alarm level low
2. Alarm level high
3. Operation mode OFF
4. Control function

The alarm setting defines how the output should respond to a specific alarm condition. In case of an alarm the output may be switched on (100%) or off (0%). The alarm situation takes precedence over operating state and calculated output signal.
Two parameters define the behavior of the output in case of an alarm: One parameter defines which alarm deactivates the output, the other parameter defines during which alarms the output is fully activated. Each alarm can be individually selected. Should one alarm be simultaneously selected to activate and deactivate the output, the one to de-activate has precedence.

Analog Output



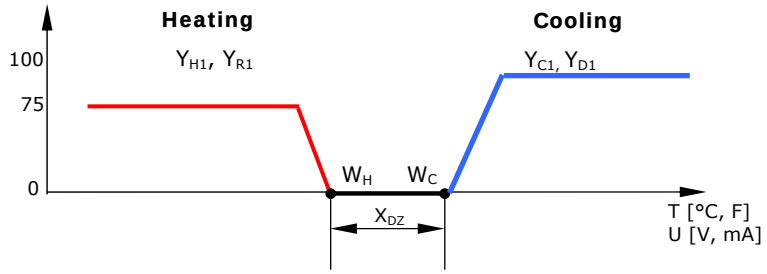
The analog output may be configured with jumpers for 0-10 VDC or 0-20 mA control signals. The jumper is located on the back side of the controller. The controller needs to be removed in order to give access to jumpers. The drawing on the right indicates the jumper placement for each signal type. The factory setting is 0-10 VDC. Only place the jumper vertically. Only place one jumper for one signal. The signal range can be specified in software by setting a minimum and a maximum limit. The limits are in percent of the full range.

Special functions of the analog output:

Manual
Positions the output directly with a set point. The number of positioning steps can be selected: 2, 10, 100 steps

Dehumidifying (only for 4-pipe systems)
The maximum value is taken of both direct acting PID sequences (Cooling and dehumidifying). Cooling will start to operate if the humidity gets too high, even if there is no cooling need, thus the heating will be forced to come into play, which in turn dehumidifies the air.

VAV
The cooling output is increased parallel to the heating output but limited to a maximum value while heating is active. This is used in VAV systems to supply fresh air in the heating season in case heat is provided through radiators or floor heating.



Sensor and setpoint feedback
Values of universal inputs as well as set points of control loops may be transmitted on the analog outputs. Minimum and maximum value of the feedback value may be set for each output.

Binary Outputs

If **1d00** is in the OFF position, DO1 and DO2 are used as binary outputs. They may be used for binary sequences, as PWM output or other special functions:

Auxiliary functions of the binary output:

Dehumidifying (only for 4-pipe systems)	The maximum value is taken of both direct acting sequences of LP1 and LP2 (Cooling and dehumidifying). Cooling will start to operate if the humidity gets too high, even if there is no cooling need, thus the heating will be forced to come into play, which in turn dehumidifies the air.
Operation State (On if operation state is ON)	The output is ON if either comfort or standby mode are active. In energy hold off mode (EHO) the output is off.
Output while demand on any output	The output is ON if demand exists on any other output. The output switches on and off with a an adjustable delay if there is no more demand. This function is usefull for fan supported heating or cooling devices.
Output while operation state is on and controller in heating mode	The output is ON if either comfort or standby mode are active and the controller is in heating mode. In energy hold off and cooling mode the output is off.
Output while operation state is on and controller in cooling mode	The output is ON if either comfort or standby mode are active and the controller is in cooling mode. In energy hold off and heating mode the output is off.
Switch on delay	For on demand signals: Once there is a demand the binary output will start first, once the switch on delay has expired the other control outputs will activate. Switch on delay does not apply to feedback signals.
Switch off delay	For on demand signals: Once there is no more demand the binary output will keep running until the switch off delay has expired. Switch off delay does not apply to feedback signals.
Indication of the fan symbol	By enabling this function, the fan symbol is shown on the display whenever DO1 is active.

PWM Outputs

The cycle time of the PWM signal can be set in minutes. In PWM mode the binary output will be switched on-off once per cycle. The on and off times are calculated according to the PID output of the respective control sequence.
Set the cycle time to 0 to disable PWM and set the output to binary mode.

Floating Outputs

Enabling **1d00** changes DO1 and DO2 into a floating output for a PID loop. In this case the running time of the actuator needs to be specified. Running time is defined as the time required for the actuator to run from fully open to fully closed or vice versa. Actuators with a fixed running time are recommended. Once fully open or fully closed the running time for the actuator is extended for a full run time cycle. This will allow the actuator position to be synchronized in case it has been moved during off time or an actuator with variable running time was used.

Switching difference on floating output: Use the Switching difference parameter to reduce the switching frequency of the actuator. The actuator will only move, if the difference to the current actuator position is larger than this parameter.

Configuration of controller

Proceed in the following steps in order to adapt the controller to its application:

1. Set jumpers for inputs and outputs
2. Connect power supply and inputs
3. Program input parameters (**IP**)
4. Program control parameters (**1L** or **2L**)
5. Program output parameters (**OP**)
6. Test function of unit
7. Switch off power
8. Connect outputs
9. Test control loop
10. Set user settings (**UP**)

Configuration parameters for firmware version 1.0

The TCI can be adapted to a wide variety of applications. The adaptation is done through parameters. The parameters can be changed on the unit without the need of additional equipment.

Identifying the firmware version

The parameters and functionality of controller depend on its firmware version and revision. It is therefore important to use a matching product version and parameter set. The Firmware version and revision version can be found when pressing simultaneously the ▲ and ▼ keys during several seconds. On the upper 7 segment display, the firmware version can be found, on the lower 7 segment display the current revision index (or "sub-version").

Control Parameters (password 241)

Warning! Only experts should change these settings! The parameters are grouped according to following control modules.

Module	Description
LP	Control loops Lp1, Lp2
UI	Input configuration, UI1, UI2, UI3, tI1
FU	Special functions
AO	Analog Output configuration, AO1, AO2
DO	Binary Output configuration, do1, do2

The parameters can be changed as follows:

1. Press UP and DOWN button simultaneously for three seconds. The display will indicate the firmware version in the upper large digits and the revision in the lower small digits. Press the RIGHT or POWER key to start login
2. CODE is shown in small display.
3. The code for accessing the user parameters is 0241
4. Select this using UP or DOWN buttons.
5. Press the RIGHT or POWER button after selecting the correct code.
6. Once logged in the parameter group can be selected with the UP and DOWN key. Enter the group with the RIGHT or POWER key.
7. Once the group is selected, the parameter is displayed immediately
8. Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the RIGHT button. Arrows 8 to 10 show up and indicate that the parameter may be modified now. Use UP or DOWN buttons to adjust the value.
9. After you are done, press RIGHT or POWER in order to save the new value of the parameter and return to the selection level. Pressing LEFT key will discard the value and return to the selection menu without saving.
10. Press the LEFT key again so as to leave the parameter menu and return to the group selection. Press LEFT key again while in the group selection to return to normal operation.
11. The unit will return to normal operation if no key is pressed for more than 5 minutes.

LP: Control parameters (1L to 2L)

Parameter	Description	Range	Default
1L 00	Select controls input: 0 = Control loop disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000)	0…4	1
1L 01	Minimum set point limit for heating	Acc input	10°C (50°F)
1L 02	Maximum set point limit for heating	Acc input	28°C (82°F)
1L 03	Minimum set point limit for cooling	Acc input	18°C (64°F)
1L 04	Maximum set point limit for cooling	Acc input	34°C (92°F)
1L 05	Enable setpoint compensation with auxiliary function 0 = setpoint compensation is disabled 1 = Winter Compensation only 2 = Summer compensation only 3 = Winter and summer compensation	0…3	0
1L 06	Select setpoint input: 0 = Normal setpoint of control loop 1 = Combined setpoint with other control loop 2 = cascade with reverse sequence of primary loop only 3 = cascade with direct sequence of primary loop only 4 = cascade with both reverse and direct of sequence of prim. loop	0…4	0
1L 07	Standby set point shift	Acc input	5.0°C (10°F)
1L 08	Dead zone between heating & cooling set point X_{DZ}	Acc input	1.0° (2°F)

PID Control Sequence

Parameter	Description	Range	Default
1L 09	Offset for heating PID sequence	Acc input	0
1L 10	Offset for cooling PID sequence	Acc input	0
1L 11	P – band heating X_{PH}	Acc input	2.0°C (4.0°F)
1L 12	P – band cooling X_{PC}	Acc input	2.0° (4.0°F)
1L 13	K_{IH}, Integral gain heating, in 0.1 steps, 0 disables ID part low value = slow reaction high value = fast reaction	0…25.5	0.0
1L 14	K_{IC}, Integral gain cooling, in 0.1 steps, 0 disables I part	0…25.5	0.0
1L 15	T_I, measuring interval integral low value = fast reaction high value = slow reaction	0…255	1 sec

Digital Control Sequence

Parameter	Description	Range	Default
1L 16	Action of stages 0 = Cumulative: 1. Q_{H1}, 2. $Q_{H1}+Q_{H2}$ 1 = Single: 1. Q_{H1}, 2. Q_{H2} 2 = Digital: 1. Q_{H1}, 2. Q_{H2}, 3. $Q_{H1} + Q_{H2}$	0…2	0
1L 17	Offset for reverse (heating) binary sequences	Acc input	0.0° (0.0°F)
1L 18	Offset for direct (cooling) binary sequences	Acc input	0.0° (0.0°F)
1L 19	Switching span heating	Acc input	1.0° (2.0°F)
1L 20	Switching span cooling	Acc input	1.0° (2.0°F)
1L 21	Switching hysteresis X_H	Acc input	0.5° (1.0°F)
1L 22	Switching delay min running and min stopping time for binary sequences	0…255s	10s
1L 23	Reverse / direct sequence follows heat – cool state of controller OFF = control sequences activate based on demand and do not follow heat – cool state of controller ON = control sequence follow heat cool state. Reverse sequence will only be active in heating mode, direct sequences in cooling mode of controller.	ON, OFF	OFF
1L 24	Delay for heat – cool changeover in case above parameter is OFF	0…255 min	5 min

Universal Input configuration

Parameter	Description	Range	Default
1u 00	Input signal type: 0 = input not active 1 = Analog input: 0…10V or 0…20mA 2 = Analog input: 2…10V or 4…20mA 3 = Passive temperature NTC – Tn10	0 - 3	3
1u 01	Signal display minimum value	-50…205	0
1u 02	Signal display maximum value	-50…205	100
1u 03	Range of universal inputs (For analog inputs only) 0 = x1 1 = x10 2 = x100	0 – 2	0
1u 04	Unit of universal input (For analog inputs only): 0 = no unit 1 = % 2 = °C /°F 3 = Pa	0 – 3	0
1u 05	Samples taken for averaging control signal	0…100	10
1u 06	Calibration	Range dep	0
1u 07	Alarm 1: Enable alarm for lower limit OFF = Disabled ON = Enabled	OFF, ON	OFF
1u 08	Alarm 1 low limit	-40…215 °C	5°C (40°F)
1u 09	Alarm 2: Enable alarm for upper limit OFF = Disabled ON = Enabled	OFF, ON	OFF
1u 10	Alarm 2 high limit	-40…215 °C	50°C (122°F)
1u 11	Alarm 1 and 2 Hysteresis for alarm setback	0…100 °	5°C (10°F)

Temperature Input configuration

Parameter	Description	Range	Default
1t 00	Temperature input enabled	ON, OFF	OFF
1t 01	Signal display minimum value	-50…205	-50
1t 02	Signal display maximum value	-50…205	200
1t 03	Samples taken for averaging control signal	0…100	10
1t 04	Calibration	-10.0…10.0	0
1t 05	Alarm 7: Alarm for lower limit of temperature input of LP1 OFF = Not active ON = Active	OFF, ON	OFF
1t 06	Alarm 7 low limit of temperature input	-40…215 °C	5°C (40°F)
1t 07	Alarm 8: Alarm for upper limit of temperature input of LP1 OFF = Not active ON = Active	OFF, ON	OFF
1t 08	Alarm 8 high limit of temperature input	-40…215 °C	50°C (122°F)
1t 09	Alarm 8 Hysteresis for alarm setback	0…100 °	5°C (10°F)

Special Functions

Summer – winter compensation / setpoint setback

Parameter	Description	Range	Default
Fu 00	Select setback input: 0 = Summer – Winter compensation disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000)	0…4	0
Fu 01	Winter Compensation: OFF = setpoint is shifted negative to lower setpoint limit ON = setpoint is shifted positive to upper setpoint limit	ON, OFF	OFF
Fu 02	Winter Compensation (Setpoint shift with low compensation signal) Lower Limit: input signal with maximum setpoint shift	Range acc input	5°C
Fu 03	Winter Compensation (Setpoint shift with low compensation signal) Upper Limit: Input signal at begin of setpoint shift.	Range acc input	20°C
Fu 04	Summer Compensation: OFF = setpoint is shifted negative to lower setpoint limit ON = setpoint is shifted positive to upper setpoint limit	ON, OFF	ON
Fu 05	Summer Compensation (Setpoint shift with high compensation signal) Lower Limit: input signal at begin of setpoint shift	Range acc input	35°C
Fu 06	Summer Compensation (Setpoint shift with high compensation signal) Upper Limit: Input signal with maximum setpoint shift.	Range acc input	40°C
Fu 07	Hot / Cool Symbol while compensation is active OFF= Hide symbol ON= Show symbol	ON, OFF	OFF

Remote control comfort – economy

Parameter	Description	Range	Default
Fu 08	Select input for remote comfort – economy switch over: 0 = Function disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000)	0…4	0
Fu 09	Activation delay (Seconds) = the time the input needs to be inactive before standby mode is activated,	0 – 1275 s	300s
Fu 10	Change Over limit to activate function	Range acc input	10
Fu 11	Change Over limit to deactivate function	Range acc input	90

Remote control enable – disable

Parameter	Description	Range	Default
Fu 12	Select input for remote enable – disable switch over: 0 = Function disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000)	0…4	0
FU 13	Manual override permitted If set to ON, unit may be started in Manual without waiting for delay time	ON, OFF	OFF
Fu 14	Activation delay (Seconds) = the time the input needs to be within active limits before unit is enabled	0 – 1275 s	0
Fu 15	In-activation delay (Seconds) = the time the input needs to be inactive before the unit is disabled	0 – 1275 s	300
Fu 16	Range of limits: OFF = In case active limit is higher than inactive limit: Function is active if input value higher than active limit. It is inactive if input value is lower than inactive limit. In case active limit is lower than inactive limit: Function is active if input value is lower than active limit, function is inactive if input value is higher than inactive limit. ON = In case active limit is higher than inactive limit: Function is active if input value is higher than active limit and lower than inactive limit, it is inactive below active limit and above inactive limit. In case active limit is lower than inactive limit: Function is active if input value is above active limit or below inactive limit. It is inactive if within limits.	ON, OFF	OFF
Fu 17	Change Over limit to activate function	Range acc input	10
Fu 18	Change Over limit to deactivate function	Range acc input	90
Fu 19	Disable in case of alarms	Selection	▽▽▽▽▽▽▽▽

Remote heat / cool (reverse / direct) change

Fu 20	Select input: 0 = Function disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000) 5 = Based on heat – cool status of control loop 1 6 = Based on heat – cool status of control loop 2	0…6	0
Fu 21	Activation delay (seconds) = the time the input needs to be over the cooling limit before cooling mode is activated	0 – 1275 s	300
Fu 22	Change Over limit cooling	Range acc input	20
Fu 23	Change Over limit heating	Range acc input	40

Analog Output

Parameter	Description	Range	Default
1A 00	AO1: Selection of control loop or special function 0 = OFF 1 = Loop 1 2 = Loop 2 3 = Dehumidify in 4 pipe systems (Max LP1 heating and LP2 direct acting) 4 = Manual override (0 – 100%) 5 = Feedback of universal input	0 – 5	1
1A 01	AO1: Configuration of output signal depending on **OP00** If OP00 = 1,2 (control loop 1 or 2) select sequence: 0 = Heating, Reverse Y_{H1}, Y_{R1} 1 = Cooling, Direct Y_{C1}, Y_{D1} 2 = Heating and Cooling (2 pipe system), $Y_{H1} + Y_{C1}$, $Y_{R1} + Y_{D1}$ 3 = VAV function 4 = Feedback of setpoint IF AO00 = 5 Select input for feedback function: 0 = Function disabled 1 = Universal input 1 2 = Universal input 2 3 = Universal input 3 4 = Temperature input (PT1000)	0 – 4	0
1A 02	AO1: Minimum limitation of output signal	0 – Max %	0
1A 03	AO1: Maximum limitation of output signal	Min – 100%	100%
1A 04	AO1: Maximum limitation in standby mode	0 – 100 %	50%
1A 05	AO1: VAV function maximum limitation in heating mode	0…100%	50%
1A 06	Choose alarm to set output to 100%. In case of conflicting alarms, the output will be set to 0%. ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1A 07	Choose alarm to set output to 0%. In case of conflicting alarms, the output will be set to 0% ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1A 08	Feedback function: minimum input value	Acc input	0°C
1A 09	Feedback function maximum input value	Acc input	100°C

Binary Outputs

Parameter	Description	Range	Default
1d 00	Enable Floating Output (DO1, DO2 Floating) OFF = DO1, DO2 are two binary outputs ON = DO1, DO2 are one floating output DO1 = open, DO2 = close	ON, OFF	OFF
For floating outputs: In case 1d 00 = ON			
1d 01	Configuration Digital Output 0 = OFF 1 = Loop 1 2 = Loop 2 3 = Dehumidifying, Max of loop 1 heating and loop 2 direct 4 = Manual override 5 = State functions	0…5	0
1d 02	Floating outputs (1d00 = ON) select sequence if 1d01 = Loop 1 or Loop 2: 0 = Heating, Reverse Y_{H1}, Y_{R1} 1 = Cooling, Direct Y_{C1}, Y_{D1} 2 = Heating and Cooling (2 pipe system), $Y_{H1} + Y_{C1}$, $Y_{R1} + Y_{D1}$ If 1d01 = 5 (State functions) 0 = Operation State (On if operation state is ON) 1 = Output while demand on any output 2 = Output while controller in heating mode and operation state ON 3 = Output while controller in cooling mode and operation state ON	0…5	0
1d 03	Running Time (Time to run from Open to Close)	0 – 255s	90s
1d 04	Switching difference for floating signal	0 – 100s	5s
1d 05	Not used	0 – 1275 s	0s
1d 06	Choose alarm to set output to 100%. In case of conflicting alarms, the output will be set to 0%. ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1d 07	Choose alarm to set output to 0%. In case of conflicting alarms, the output will be set to 0% ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1d 08	Not used	ON, OFF	OFF

For binary outputs: In case 1d 00 = OFF

Parameter	Description	Range	Default
1d 01	Configuration Digital Output (only if floating disabled) 0 = OFF 1 = Loop 1 2 = Loop 2 3 = Dehumidifying, Max of loop 1 heating and loop 2 direct 4 = Manual override 5 = State functions	0…5	0
1d 02	Binary outputs (1d00 = OFF): Select sequence if 1d01 = Loop 1 or Loop 2: 0 = 1. Stage heating, reverse Q_{H1}, Q_{R1} 1 = 1. Stage cooling, direct Q_{C1}, Q_{D1} 2 = 1. Stage heating and cooling, reverse and direct, $Q_{H1}+Q_{C1}$ 3 = 2. Stage heating, reverse Q_{H2}, Q_{R2} 4 = 2. Stage cooling, direct, Q_{C2}, Q_{D2} 5 = 2. Stage heating and cooling, reverse and direct, $Q_{H2} + Q_{C2}$ If 1d01 = 5 (State functions) 0 = Operation State (On if operation state is ON) 1 = Output while demand on any output 2 = Output while controller in heating mode and operation state ON 3 = Output while controller in cooling mode and operation state ON	0…5	0
1d 03	Switch off delay	0 – 255s	90s
1d 04	Switch on delay (during state mode (1d01 = 5), all control outputs will be disabled during switch on delay)	0 – 255s	5s
1d 05	Set PWM cycle time in seconds, 0 deactivates PWM.	0 – 1275s	0s
1d 06	Choose alarm to set output to 100%. In case of conflicting alarms, the output will be set to 0%. ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1d 07	Choose alarm to set output to 0%. In case of conflicting alarms, the output will be set to 0% ▽▽▽▽▽▽▽▽ Alarm: 1 2 3 4 5 6 7 8	Selection	▽▽▽▽▽▽▽▽
1d 08	Display Fan Symbol while active	ON, OFF	OFF