# TLC3-FCM-R2 -U
Programmable PI Fan Coil controller

Features

- Proven PI controls algorithm reduces room temperature fluctuations and energy consumption
- Low power energy consumption: < 0.5 W per unit
- Temperature control for 2- and 4-pipe fan coil systems.
- Automatic fan control for EC fans.
- Cost saving option with Economy functionality and set point limitations
- Control for modulating heating, cooling and fan only operation modes
- Password protected programmable user and control parameters
    - Setpoint range limitation
    - Access control for setpoints, fan speeds and mode change
    - Access control for heat/cool change and time programs
    - Select your display contents
    - Selectable behavior after return from power failure
- Temperature display in Celsius or Fahrenheit

Deluxe Version:
- Clock and time schedule functions with power failure protection
- Blue backlight for LCD
- Infrared remote controller option:
  With special features for Boost and delayed switching on or off
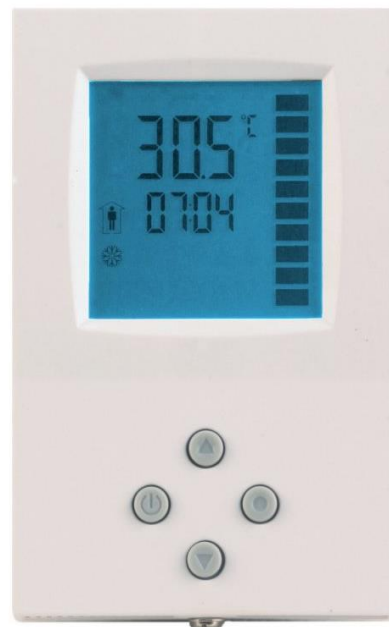
Applications

- Air Only Systems:
    - Constant or Variable Air Volume systems with three stage fans for single or dual duct systems
- Air/Water Systems:
    - Fan Coil units for 2-pipe or 4-pipe systems
    - radiator control, chilled ceiling
- Simple individual room control for hotel rooms, meeting rooms, etc.
- PI-Control of up to 2 modulating valves for heating and cooling

General Description

The **TLC3-FCM-R2-T** is a stand-alone electronic fan coil controller with one control loop. The TLC3-FCM-R2-T is designed for EC fan coil systems and features 1 internal NTC temperature sensor, one external passive input for temperature or open contact, two binary outputs (Relays) and one analog output (0-10VDC) for fan control.

The **TLC3-FCM2-R2** is a stand-alone electronic fan coil controller with one control loop. The TLC3-FCM2-R2 is designed for EC fan coil systems and features 1 internal NTC temperature sensor, two binary outputs and two analog outputs (0-10VDC) one for fan control and one for a heating or cooling valve.

A detailed parameterization is possible with the use of a simple configuration routine. The TLC3-FCM-R2 can be configured using the standard operation terminal. No special tools or software is required.

Ordering

Item Name	Item code	Variant	Power	Features
TLC3-FCM-R2-T-U-230	40-100277	Standard	230VAC	Fan coil controller (US Edition) with: 1 TI int 1 external input (NTC) 2 DO (Relay) 1 AO (0-10VDC)

Selection of sensors

Use only our approved NTC sensors to achieve maximum accuracy. Recommended is SDBTn10-15 as Duct sensor, SRA-Tn10 as Room sensor and SDB-Tn10-15+AMI-10 as immersion sensor.

Selection of fans

Do not directly connect devices that exceed 2A. Observe startup current on inductive loads! Do not connect more than one fan coil unit to one controller.

Modulating Actuators:

Choose actuators with an input signal type of 0-10V DC or 2-10V DC. Observe maximal signal current of 1mA!

Technical Specification

Power Supply	Operating Voltage	210–250 VAC
	Power Consumption	Max 1W, 1.5 VA
	Electrical Connection	Terminal Connectors
	Deluxe type only: Power backup for real time clock	Min 48h if charged for 24h

Signal Inputs	Temperature Inputs
	    Range
	    Accuracy
		RT Internal, External (Sxx-Tn10 sensor)
		0…50 °C (32…122 °F)
		0.5°C (1°F)

Signal Outputs	Digital Switching Outputs
	    Switching Type
	    AC Switching power
	Insulation strength
	    between relays contacts and system electronics:
	    between neighboring relays contacts
		DO1, DO2
		Relays
		2A max. each output
		
		3750V AC to EN 60 730-1
		1250V AC to EN 60 730-1

	Analog Outputs
	    Output Signal
	    Resolution
	    Minimum impedance
		AO1, For TLC3-FCM2-R2 AO2
		DC 0...10 V
		9.76 mV (10 bit)
		10kOhm, 1mA.

Environment	Operation
	    Climatic Conditions
	    Temperature
	    Humidity
		To IEC 721-3-3
		class 3 K5
		0°C …50°C (32°F…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°C...70°C (-13°F…158°F)
		<95% R.H. non-condensing
		class 2M2

Standards	CE conformity
	    EMC Directive
	    Low Voltage Directive
		
		2004/108/EC
		2006/95/EC

	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

	Electromagnetic compatibility for domestic sector	Emissions: EN 60 730-1 Immunity: EN 60 730-1
	Degree of Protection	IP30 to EN 60 529
	Pollution Class	II (EN 60 730-1)
	Safety Class:	II (IEC 60 536)
	Overvoltage Category:	III (EN 60 730-1)
General	Dimensions (H x W x D) Front part: Power case:	112 x 73 x 32mm (4.4 x 2.9 x 1.3 in) 60 x 50 x 32mm (2.4 x 2.0 x 1.3 in)
	Material: Cover, back part Mounting Plate	ABS plastic (UL94 class V-0) Aluminum
	Weight (including package)	Standard: 245g (8.6oz), Deluxe: 255g (9.0oz)

Dimensions
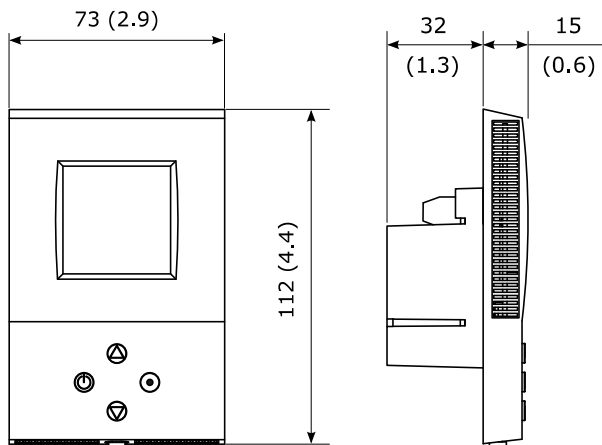
Space required in flush mounting box:
(H x W x D)
60 x 50 x 32 mm (2.4 x 2.0 x 1.3 in)

Distance for mounting screws:

Horizontal 57 to 61 mm (2.25 to 2.63 in)

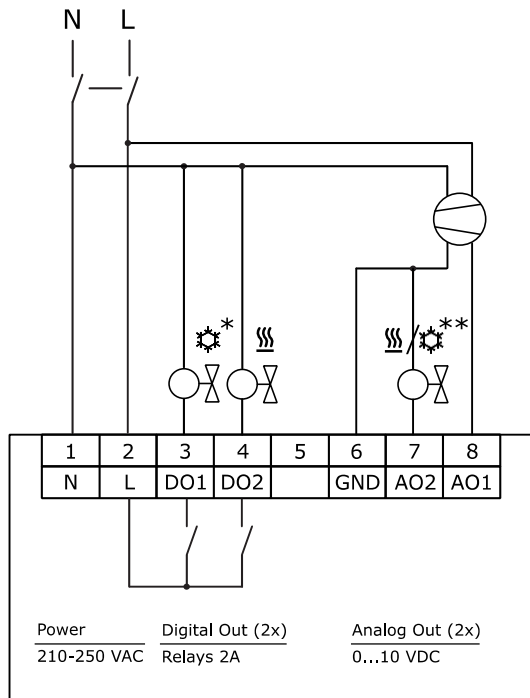Vertical 70 to 92 mm (2.75 to 3.62 in)

Mounting location

• Install the controller on an easy accessible interior wall, approx. 1.5 m above the floor in an area of average temperature.
• Avoid direct sunlight or other heat sources, e.g. the area above radiators and heat emitting equipment.
• Avoid locations behind doors, outside walls and below or above air discharge grills and diffusers.
• Location of mounting is less critical if external temperature sensors are used.

Installation

1. Connect the wires to be connected to the terminals of the power case according to wiring diagram

2. Install the mounting plate to the flush mounting box. Make sure that the nipple with the front holding screw is facing to the ground. Make sure the mounting screw heads do not stand out more than 5 mm (0.2") off the surface of the mounting plate.

3. Slide the two latches located on the top of the front part into the hooks at the upper side of the mounting plate.

4. Carefully lower the front part until the interconnector reaches the mounting-plate. Continue pressing in a gentle way until the front part is fully connected. While inserting the connectors, a slight resistance can be felt. This is normal. Do not use excessive force!

5. With a Philips-type screw driver of size #2, carefully tighten the front holding screw to secure the front part to the mounting plate. This screw is located on the front lower side of the unit. There is no need to tighten the screw too much.
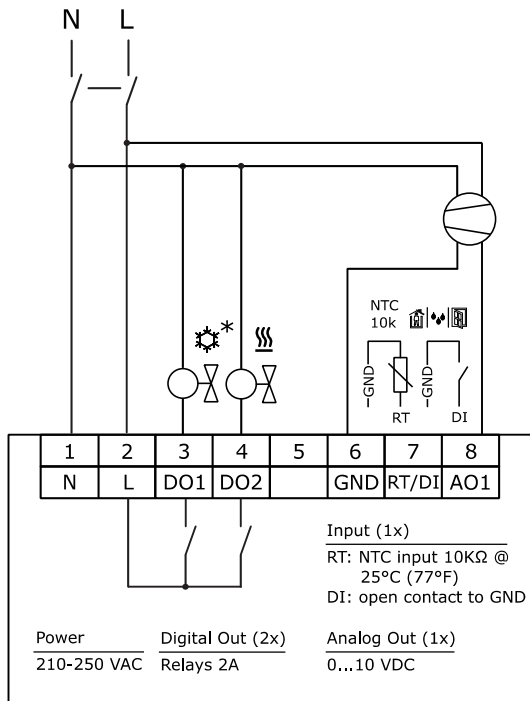
Wiring Diagram
TLC3-FCM2-R2-U-230

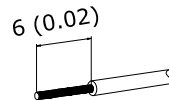| 1	2	3	4	5	6	7	8
N	L	DO1	DO2		GND	AO2	AO1

Power	Digital Out (2x)	Analog Out (2x)
210-250 VAC	Relays 2A	0...10 VDC

*) FC11 = 2, ♨/❄   **) FC27 = ♨/❄

TLC3-FCM-R2-T-U-230

*) FC11 = 2, ♨/❄

6 (0.02)

Description:

Terminal	Signal	Type	Function
1	N	Power supply: 230V Neutral	
2	L	Power supply: 230V Line	
3	DO1	Digital output 230V AC	Valve Cooling or 2-pipe
4	DO2	Digital output 230V AC	Valve Heating
5		Not used	Not used
TLC3-FCM2-R2-U:			
6	GND	Signal common:	
7	AO2	Analog output 0…10 VDC	Heating or cooling based on FC27
8	AO1	Analog output 0…10 VDC	Fan
TLC3-FCM-R2-T-U:			
6	GND	Signal common:	
7	RT/DI	Input NTC 10kΩ @ 25°C (77°F) or open contact to GND	
8	AO1	Analog output 0…10 VDC	Fan

Display and Operation

Mode
Display of operation mode

Indicators
1 Remote temperature sensor

Up :
Increase setpoint
(Parameter setting: scroll menu options and parameters)

Left (POWER):
Press < 2 sec.: Toggle Economy - Comfort mode or switch from OFF to ON
Press > 2 sec.: Turn unit OFF. Text OFF displayed with current time (deluxe) temperature (standard)
(Parameter setting: Return to previous level. ESC)

Large Digits:
Display of input or parameter value.

Small Digits:
Display of setpoint, clock or parameter number.

Vertical Bar: (Active stage or proportional output in 10% steps)

Right (OPTION)
Press < 2 sec.: Select setpoint
Press > 2 sec.: Manual H/C change
(Parameter setting: ENTER to select menu option, accept parameter change)

Down:
Decrease setpoint
(Parameter setting: scroll menu options and parameters)

Operation mode		
🏠	Comfort (occupied)	All control functions operating per set points.
🏠🚶	Economy (unoccupied):	Set points shifted according to *Parameters FC04.* Economy mode and setpoint shift may be disabled with UP06
OFF	Energy Hold Off	Outputs are off, inputs monitored for alarm condition
☀	Heating	Output activates if temperature lower than setpoint
❄	Cooling	Output activates if temperature higher than setpoint
🛦	Fan	Fan is running, the vertical bars show active speed 1-3
☝	Manual mode	Manual override of fan speed, fan only mode or override of time schedule active.
🕐	Schedule	Deluxe only: Time schedule is active

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.

Frost Protection

The controller will enter frost protection mode if the room temperature drops below 5°C (41°F). All heating outputs will be fully opened. Frost protection mode will be left once the temperature reaches 10°C (50°F). Frost protection display will remain until a button is pressed. Frost protection can be enabled/disabled using user parameter UP-09

Error messages

Following error condition may be shown:

Err1: The connection to the temperature sensor may be interrupted or the temperature sensor is damaged. The output is switched off. Verify parameter settings and wiring.

FP: Steady: Frost protection is active.
Blinking: Frost protection activated in the past and is now inactive. Confirm with OPTION key.

Manual heat – cool change

To manually change heating or cooling mode press the OPTION key for more than 2 seconds. Access to manual heat – cool change may be disabled by parameters.

For standard models: Press OPTION > 2 sec. SEL and H-C is displayed.	SEL
For deluxe models: Press OPTION > 2 sec. SEL and current time is displayed.	H-C
Press UP key twice. SEL and H-C is displayed.	❄ ☀ 🌀
Press OPTION again to toggle Heating, Cooling and Fan only modes.	

Clock operation

The deluxe model contains a quartz clock with battery back-up. Up to 4 time schedules with each 4 mode changes based on time and day of the week may be programmed. A blinking clock indicates that the time has not been set or if the unit was without power for longer than 48 hours. The time needs to be set to allow time schedules to operate.

Clock setup

Press OPTION > 2 sec. SEL and current time displayed	SEL
Press OPTION < 2 sec. to change time,	00:00
Minutes blink: UP/DOWN to changes, OPTION to save,	DAY1 (Mon)
Hours blink: UP/DOWN to changes, OPTION to save,	
Press OPTION to save time,	
DAY1 blinks: UP/DOWN to change, OPTION to save	

Creating time schedules

Step 1: Selection and enabling of time schedules

Press OPTION > 2 sec. SEL and current time displayed	SEL	Pro1-Pro4
Press UP:	PRO	OFF/ON
SEL and PRO displayed, clock symbol blinks	🕐	
Press OPTION:		
PRO1 shows with 1 blinking. UP/DOWN select time schedule group		
Press OPTION		
OFF/ ON blinks, UP/DOWN to change, OPTION to save		

Step 2: Select weekdays

This time schedule will be active during the selected weekdays	Pro1
Press UP/DOWN to step through available options:	d1-7
d1-7, d1-6, d1-5, d6-7, day1, day2, day3, day4, day5, day6, day7	
Day 1 stands for Monday, day 2 for Tuesday and so forth	
Press OPTION to save day selection	

Step 3: Selected action of first switching event

One bar on the right side indicates the first switching event	Pr01
Press UP/DOWN to select action for first switching event:	no
No = switching event not active	
OFF = switches unit off, Reset (UP17) active if switched to ON manually.	—
Eco = sets operation mode to On and Economy (Not occupied),	
reset (UP17) active if set to comfort manually	
On = sets operation mode to On and Comfort (Occupied)	
Uni = University mode, Reset (UP17) not active if manually activated	
Press OPTION to select switching time of first event	

Step 4: Selected time of first switching event

Press UP/DOWN to select switching time:	Pr01
Select switching time 00:00 to 23:45 in 15-minute steps	08:00 —
Press OPTION to complete and select action of second switching event	

Step 5: Select actions and time of switching event 2 - 4

Repeat Step 3 and Step 4 for the remaining switching events.	Pr01
If a switching event is not needed, set it to "no"	08:00 ≡
The bars on the right side indicate number of switching event	
After completing the 4th switching event, the process returns to the selection of the time schedule on step 1.	

➔ UNI: University mode: This switching mode is used for rooms such as lecture rooms and auditoriums that might be occupied during a certain time. During this time the reset is not active. The unit will not start itself when UNI mode is active. It still needs to be manually activated. This is to avoid unnecessary heating or cooling of such rooms while they are not occupied.

➔ A blinking clock indicates that the time needs to be set. Time programs will not operate if the time is not defined. See chapter operation, advanced settings for instructions on how to set the time.

➔ Access to time schedules may be disabled with UP-04

Operation with OPR-1

The deluxe version may be alternatively operated with an infrared remote controller.

1. Mode indication, Auto, Dry, Cool, Fan, Heat
2. 2-digit display of setpoint
3. Fan indication
4. 4-digit display of current time or delayed switching time
5. Economy button: Toggles Economy/Comfort mode
6. Mode button, changes operation modes
7. UP/DOWN Button: Set point adjustment buttons
8. FAN Button: Changes fan speed, low – medium – high or Auto
9. Boost button, activates full output for 5 Minutes
10. Time related buttons: Timer, Hour, Minute
11. POWER Button: Operation mode ON – OFF
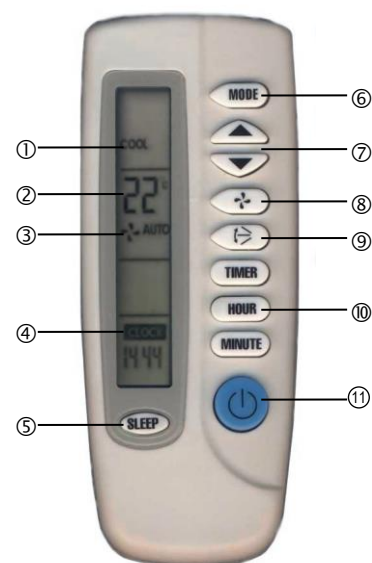
Switching ON

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

Changing between COMFORT and ECONOMY

Pressing the SLEEP button toggles between ECONOMY and COMFORT modes.

Switching OFF

Pressing the POWER while the unit is on, will switch the unit off. The current time will be displayed in the LCD of OPR-1.

Changing of set points

Only the set points for the temperature loop may be changed. Set point range is 15 to 30 °C.

Changing of fan speeds

Repeatedly pressing the fan speed button steps through low, medium, high and automatic fan speeds. Automatic fan speed will not be activated in FAN ONLY mode.

Boost

Pressing the boost button activates a 5 minute boost. The output will be fully opened for the period of 5 minutes independent of demand. This may be used to change stale air during a meeting break or when entering the room.

Clock settings

The remote controller contains a daytime clock. In order to set the clock, press HOUR and MINUTE button together until the clock starts blinking. Then set the correct time with the HOUR and MINUTE buttons. Confirm by pressing the TIMER button. The clock of the OPR will set the clock of the controller.

Delayed switching

The unit may be delayed switched on or off using the timer button. Pressing the timer button once will display Timer ON if currently in OFF mode or TIMER OFF if currently in ON mode. Set the time when the unit is supposed to switch on or off using the HOUR and MINUTE buttons.

Mode changes

Repeatedly pressing the mode button may activate the following operation modes: HEAT, COOL and FAN ONLY. The mode change may be disabled using the UP parameters.

Note:

The remote controller is currently only available in °C mode.

Setting of user parameters

The TLC3-FCM-R2 is an *intelligent* controller and can be adapted to fit perfectly into your fan coil 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. Pressing any key will show: CODE.
2. Select a password using UP or DOWN buttons. Select 009 in order to get access to the user parameters, 241 for controls parameters.
   Press OPTION after selecting the correct password.
3. Once logged in, the parameter is displayed immediately
4. Select the parameters with the UP/DOWN keys. Change a parameter by pressing the OPTION key. The MIN and MAX symbols show up and indicate that the parameter may be modified now. Use UP and DOWN key to adjust the value.
5. After you are done, press OPTION or POWER in order to return to the parameter selection level.
6. Press the POWER key again so as to leave the menu. The unit will return to normal operation if no key is pressed for more than 5 minutes.

User Parameters

Parameter	Description	Range	Standard
UP 00	Enable change of operation modes	ON, OFF	ON (Enabled)
UP 01	Enable change of set points	ON, OFF	ON (Enabled)
UP 02	Enable manual control of fan speeds	ON, OFF	ON (Enabled)
UP 03	Enable change of heating/cooling mode. Note: if this is disabled, the controller will not change automatically heat and cool mode in 4 pipe mode.	ON, OFF	W00: ON (Enabled) W01: OFF (Disabled)
UP 04	Enable access to Time programs	ON, OFF	ON (Enabled)
UP 05	State after power failure: 0 = Switched OFF, 1 = Switched ON, 2 = state before power failure	0, 1, 2	2
UP 06	Enable Economy (unoccupied) Mode. Shift the set point to a lower temperature in winter or higher temperature in summer in order to save energy. Economy mode may be activated through the POWER button, or with the external input (typically for key card switches in hotel rooms or motion detectors for meeting rooms.)	ON, OFF	ON (Economy)
UP 07	Celsius or Fahrenheit, Select ON for Fahrenheit, OFF for Celsius	ON, OFF	OFF (Celsius)
UP 08	Calibration value of temperature sensor . This value is calibrated at manufacturing of the thermostat. If required it is possible to shift the temperature –10° to +10° in 0.1° K steps.	-10…10	0
UP 09	Enable Frost Protection. Activates the output independent of operation mode when the control temperature drops below 5°C or 41°F. The controller returns to normal operation when the temperature increases above 10°C or 50°F.	ON, OFF	W00 = ON (Frost Protection) W01 = OFF (No Frost Protection)
UP 10	Select contents of Large LCD display in standard mode: 00 = OFF 01 = Setpoint 02 = Temperature Sensor 03 = Output Fan Speed 04 = Clock	0…4	02 Temperature
UP 11	Select contents of small LCD display in standard mode (use table of UP 10)	0…4	04 Deluxe: show clock 01 Standard: show setpoint
UP 12	Contents of vertical bar in standard mode OFF = Fan Speed (3 step display) ON = Control output (10 step display)	ON, OFF	OFF (FAN)
UP 13 Deluxe only	Clock display type: OFF = Show 24hour clock ON = Show 12hour clock (AM, PM)	ON, OFF	OFF (24h)
UP 14 Deluxe only	Reset: applies when the unit is manually switched on, while in scheduled off mode. The unit will switch automatically back to the scheduled mode when the reset time expires. 0 = Reset of override mode is not active. 1…255 = delay in minutes to switch off device	0…255	60 (Min)

Control configuration

Identifying the firmware version

The parameters and functionality of controller depend on its firmware revision. It is therefore important to use a matching product version and parameter set. The firmware version is shown on the large LCD digits when pressing UP and DOWN buttons for more than 3 seconds simultaneously.

Control Parameters (Access code: 241)

Warning! Only experts should change these settings! See user parameters for login procedure.

Setpoint limitations

Parameter	Description	Range	Default
FC 00	Minimum setpoint limit in Heating mode	-40…60°C (160°F)	16°C (61°F)
FC 01	Maximum setpoint limit in Heating mode	-40…60°C (160°F)	24°C (75°F)
FC 02	Minimum setpoint limit in Cooling mode	-40…60°C (160°F)	18°C (64°F)
FC 03	Maximum setpoint limit in Cooling mode	-40…60°C (160°F)	30°C (86°F)

Fan control sequence

Parameter	Description	Range	Default
FC 04	Economy (unoccupied) Mode temperature shift: The comfort (occupied) setpoint is shifted by the value set with parameter. If heating is active the comfort setpoint will be decreased, if cooling is active, the setpoint will be increased. (Enable with UP06.)	0…10.0K (20°F)	5.0°C (10°F)
FC 05	Activation of heating valve in % of PI signal	0…100%	10%
FC 06	Activation of cooling valve in % of PI signal	0…100%	10%
FC 07	Hysteresis for valve in % of PI signal	0…100%	5%
FC 08	Mold Protection: In mold protection, the fan keeps running independent of temperature as long as the unit is switched on.	ON, OFF	OFF
FC 09	Minimum running time. Prevents the valve from frequent switching.	0…255 s	10 s
FC 10	Minimum stopping time. Prevents the valve from frequent switching.	0…255 s	10 s
FC 11	Control option: 0 = Cooling only 1 = Heating only 2 = 2-pipe system 3 = 4-pipe system	0…3	W00 = 3 W01 = 0 W02 = 1 W03 = 2 W04 = 3
FC 12	Heat – Cool switch over hysteresis: Only for 4-pipe systems. The controller will automatically change heat cool mode. In order to prevent frequent switching, the switch over hysteresis must be exceeded. For example if in heating mode, the room temperature must exceed the setpoint by the here defined value in order to activate cooling mode.	0…100°C (200°F)	1.0°C (2°F)
FC 13	Heat/Cool Changeover Delay (if set to FC11 = 3): A demand to switch between heating and cooling must persist for the length of time set with this parameter before the controller switches. Prevents activation of a sequence during a short-term change in temperature in order to protect equipment (with control overshoot for example)	0…255 min	5 min

➔ **Controlling the valves**

The valves will switch based on the PI signal. If the PI signal surpasses the limit defined with FC05 for heating and FC06 in cooling mode, the valve will activate.
It will deactivate again if the PI signal drops below the limit – the hysteresis value defined with FC07.
A minimum run time (FC09) and minimum stop time (FC10), prevents the valve from frequent switching on and off.

PID control sequence

Parameter	Description	Range	Default
FC 14	P – band heating X_{PH}	0…10.0K (20°F)	2.0°C (6.0°F)
FC 15	P – band cooling X_{PC}	0…10.0K (20°F)	2.0° (4.0°F)
FC 16	K_{IH}, Integral gain heating, in 0.1 steps, 0 disables ID part	0…25.5	0.1
FC 17	K_{IC}, Integral gain cooling, in 0.1 steps	0…25.5	0.1

➔ **Proportional control (P-band)**

The proportional control function calculates the output based on the difference between setpoint and measured value. The proportional band (P-band) defines the difference between setpoint and measured value which will result in a 100% output. Setting the proportional band to 0 disables proportional control.

➔ **Integral gain KI**

The integral gain defines how fast the output increases in case the setpoint is not met by the room temperature. A low value indicates a slow reaction, a high value a fast one. If the value is chosen too high, the controller will start to swing. Depending on the room size and heating / cooling equipment used a value between 0.1 and 1.5 should be sufficient. Below are suggested values:

Heating: K_{IH}: 0.1-0.4

Cooling: K_{IC}: 0.1-0.6

Configuration of outputs

Parameter	Description	Range	Default
FC 18	Configuration of output (AO1 and AO2): OFF = 0-10V, ON = 2-10V	ON, OFF	OFF (0-10V)
FC 19	Minimum limitation of AO1 output signal in heating mode	0–100%	0
FC 20	Maximum limitation of AO1 output signal in heating mode	0–100%	100%
FC 21	Minimum limitation of AO1 output signal in cooling mode	0–100%	0%
FC 22	Maximum limitation of AO1 output signal in cooling mode	0–100%	100%
FC 23	Low fan speed (in % of output signal)	0–100%	25%
FC 24	Medium fan speed manual (in % of output signal	0–100%	50%
FC 25	High fan speed manual (in % of output signal)	0–100%	100%
FC 26	Not used	0…3	0
FC 27	Only for TLC3-FCM2-R2: Function of AO2. Note: The range of AO2 is fixed at 0…100% 0 = OFF not used 1 = Cooling output 2 = Heating output 3 = Heating and cooling output (2-pipe)	0..3	1 Cooling

➔ **Controlling the fan through the analog output for EC-fans:**
   In Auto Mode the fan is controlled by the PI signal. In Manual mode FC23…FC25 define the fan speed.
   With FC19…FC20 the fan speed may be limited during heating - or with FC21…FC22 in cooling mode.

Configuration of inputs (only for TLC3-FCM-R2-T)

Parameter	Description	Range	Default
FC 28	External input: 0 = No external input 1 = External temperature sensor 2 = Occupation sensor – Comfort / Economy 3 = Occupation sensor – Comfort / Off 4 = Heat / Cool changeover 5 = Key card with alternative setpoint	0…5	0
FC 29	Activation delay (Minutes) = the time the binary input needs to be open before economy/off mode is activated.	0…255 min	5
FC 30	Auto-changeover limit heating FC20 = 4 or economy setpoint in heating mode if FC28 = 5	-40…60°C (160°F)	16°C (61°F)
FC 31	Auto-changeover limit cooling FC20 = 4 or economy setpoint in cooling mode if FC28 = 5	-40…60°C (160°F)	28°C (82°F)

Configuring the function of the external input

Parameter	Function	Description
FC28 = 0	Input not used	
FC28 = 1	External control input	The external sensor is the control input. The internal sensor will be disabled.
FC28 = 2	Switching Economy and Comfort modes	Economy (unoccupied) and Comfort (occupied) modes are controlled through an external contact by connecting the input through a dry contact to signal common. This function may be used together with key card switches for hotels or motion detectors for offices.
FC28 = 3	Switching Energy Hold OFF and Comfort modes	Opening the input will force the unit into the OFF operation mode. The operation mode cannot be overridden by using the terminal. Connecting the input to signal common returns control of the operation mode to the terminal. This function may be used as window contact to prevent loss of energy.
FC28 = 4	Heat – Cool changeover	Switch heating and cooling mode based on supply media or outside temperature or binary contact. See below for further details.
FC28 = 5	Key card with alternative setpoint	As with FC28 = 2, the key card function switches economy (unoccupied) and comfort (occupied) modes. Instead of using the setpoint shift, the setpoints in unoccupied mode are defined by parameter FC30 and FC31.

➔ **Configuring auto changeover input if FC28 = 4:**
   The auto changeover function automatically changes heating and cooling mode based on supply media temperature or outdoor temperature. The difference between the two is in the values of the changeover limits FC30 and FC31. See table below for recommended settings.

   Heating and cooling may be as well changed by an open contact switched to signal ground. Note: all signal ground levels of involved controllers must be the same in case more than one controller is switched.

➔ **Recommended settings for FC30 and FC31:**

Change over mode FC28=4	Relation FC30 to FC30	Example FC30	Example: FC31
Supply media	FC30 > FC31	25°C (77F)	18°C (64F)
Outside temperature	FC30 < FC31	15°C (59F)	25°C (77F)
Dry contact: Heating if contact closed	FC30 > FC31	25°C (77F)	15°C (59F)
Dry contact: Cooling if contact closed	FC30 < FC31	15°C (59F)	25°C (77F)

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