

TLC3-ECO Economizer



Features

- Compares outdoor temperature with indoor or control temperature. Activates free heating or cooling.
- Low power energy consumption: < 1W per unit
- Relays switching for outputs each up to 300W
- Optional external temperature control input
- Choose between one 3-point actuator and 2 binary outputs. (1 outdoor damper, 1 mechanical enable or fan.)
- Password protected programmable user and control parameters

TLC3-ECO-D also includes

- Power cap protected real-time clock with 48hr power backup
- Time schedule events, with many options
- Blue backlight
- Infrared remote control receiver

Applications

- Economizer: Control of outdoor damper
- For 3-point or spring return actuators
- With enable for mechanical heating or cooling or fan

General

- TLC3-ECO: 1 independent temperature control loop with 1 heating and 1 cooling sequence. 1 internal temperature sensor, 1 outside temperature input, 1 auxiliary input for external temperature input, heat – cool changeover or high/low limit.
- The economizer controls an outdoor damper and optional fan. It activates the outdoor damper if there is heating or cooling demand and if outdoor conditions are favorable for free heating or cooling. An additional input may be used to close the damper based on an open contact input (for example high humidity or bad air quality).
- Flexible application configuration is made with a parameter-setting routine using the standard operation terminal.

Name

T L C 3 - E C O -

Voltage:

Blank = 230V, 0 = 24V, 1 = 120V

Housing

Blank = square housing, U = 2x4" housing

Control:

ECO: Economizer

Series:

TLC3

Ordering

Model	Item code	Variation	Option
TLC3-ECO-230	40-10 0214	Standard	Economizer with: 1 internal and 1 external temperature sensor 2 relay normally open outputs
TLC3-ECO-230-W01	40-10 0214-01	Cooling only	
TLC3-ECO-D-230	40-10 0215	Deluxe	
TLC3-ECO-D-230-W01	40-10 0215-01	Cooling only	

Temperature sensors: Use Vector Controls NTC sensors to achieve maximum accuracy: SDB-Tn10-20 (duct), SRA-Tn10 (room), SDB-Tn10-20 and AMI-S10 as immersion sensor.

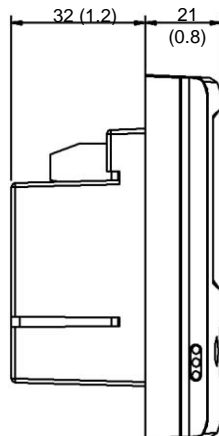
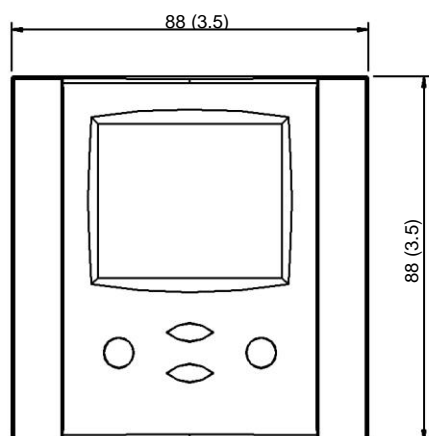
Binary auxiliary devices (e.g. pumps, fans, on/off valves, etc): Do not directly connect devices that exceed specified limits in technical specifications – observe startup current on inductive loads.

Technical specifications

Notice! Failure to follow specifications and local regulations may cause equipment damage. Misapplication will void warranty.

Power supply	Power requirements	210 – 250 V AC 50/60 Hz
	Power consumption	Max 1W, 1.5VA
	Electrical connection	Terminal connectors
	Clock backup	Min 48h if charged for 24h
Signal inputs	Temperature inputs	RT internal
	Range	0...50 °C (32...122 °F)
	Accuracy	0.5°C (1°F)
	Input type:	External (Sxx-Tn10 sensor)
Signal outputs	Range	-40...70°C (-40...158°F)
	Accuracy	0.5°C (1°F) if 0...50°C (32...122°F)
		1.0°C (2°F) if -40...70°C (-40...158°F)
Signal outputs	Digital switching outputs	Y1 to Y2
	Switching type	Relays
	AC switching power	0...250V AC 1.25A max. each output
	Insulation strength	
Environment	between relays contacts and system electronics:	4000VAC
	between open relays contacts	1000VAC
	Operation	To IEC 721-3-3
	Climatic conditions	class 3 K5
Standards	Temperature	0...50 °C (32...122 °F)
	Humidity	<95 % r.H. non-condensing
	Transport & storage	To IEC 721-3-2 and IEC 721-3-1
	Climatic conditions	class 3 K3 and class 1 K3
	Temperature	-25...70 °C (-13...158 °F)
	Humidity	<95 % r.H. non-condensing
	Mechanical conditions	class 2M2
	CE conformity	2011/65/EU
	RoHS directive	2004/108/EC
	EMC directive	2006/95/EC
	Low voltage directive	
	Product standards	
	Automatic electrical controls for household and similar use	EN 60 730 – 1:2011
	Special requirement on temperature dependent controls	EN 60 730 – 2 – 9:2010
	Electromagnetic compatibility for domestic sector	Emissions: EN 60 730-1:2011
	Degree of protection	IP30 to EN 60 529
	Pollution class	II (EN 60 730-1:2011)
	Safety class	II (IEC61140:2001+ A1:2004)
	Overvoltage category	III (EN 60 730-1:2011)
General	Restriction of the use of certain hazardous substances	EN 50581:2012
	Dimensions (H x W x D)	Front: 21 x 88 x 88mm (0.8 x 3.5 x 3.5 in.)
		Power case: 60 x 50 x 32mm (2.4 x 2.0 x 1.3 in.)
	Material:	Cover, back part
		ABS plastic (UL94 class V-0)
		Mounting plate
		Galvanized steel
	Weight (including package)	Standard: 295g (10.4oz)
		Deluxe (-D): 305g (10.7oz)

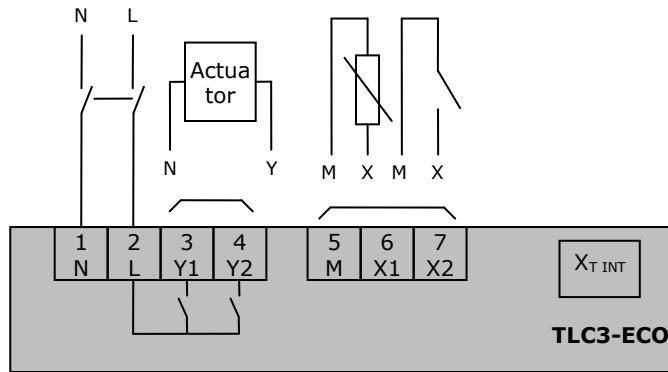
Dimensions, mm (inch)



Space required in flush mounting box:
(H x W x D)
60 x 50 x 32 mm (2.4 x 2.0 x 1.26 in.)

Distance for mounting screws:
Horizontal and vertical:
45 to 63 mm (1.8 to 2.5 in.)

Connection



Warning:

Live Electrical Components!

During installation, testing, servicing and troubleshooting of Vector Controls products, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Terminal description

1	N	Power supply:	0V AC Neutral
2	L	Power supply:	230VAC
3	Y1	Binary output 230VAC:	Outdoor damper for spring return actuator Open for 3-point actuators
4	Y2	Binary output 230VAC:	Fan or mechanical heating or cooling Close for 3-point actuators
5	M	Signal ground	Signal ground for external inputs.
6	X1	NTC 10kΩ @ 25°C (77°F)	Outdoor sensor
7	X2	NTC 10kΩ @ 25°C (77°F) Open contact to SGND	External temperature sensor Enable input

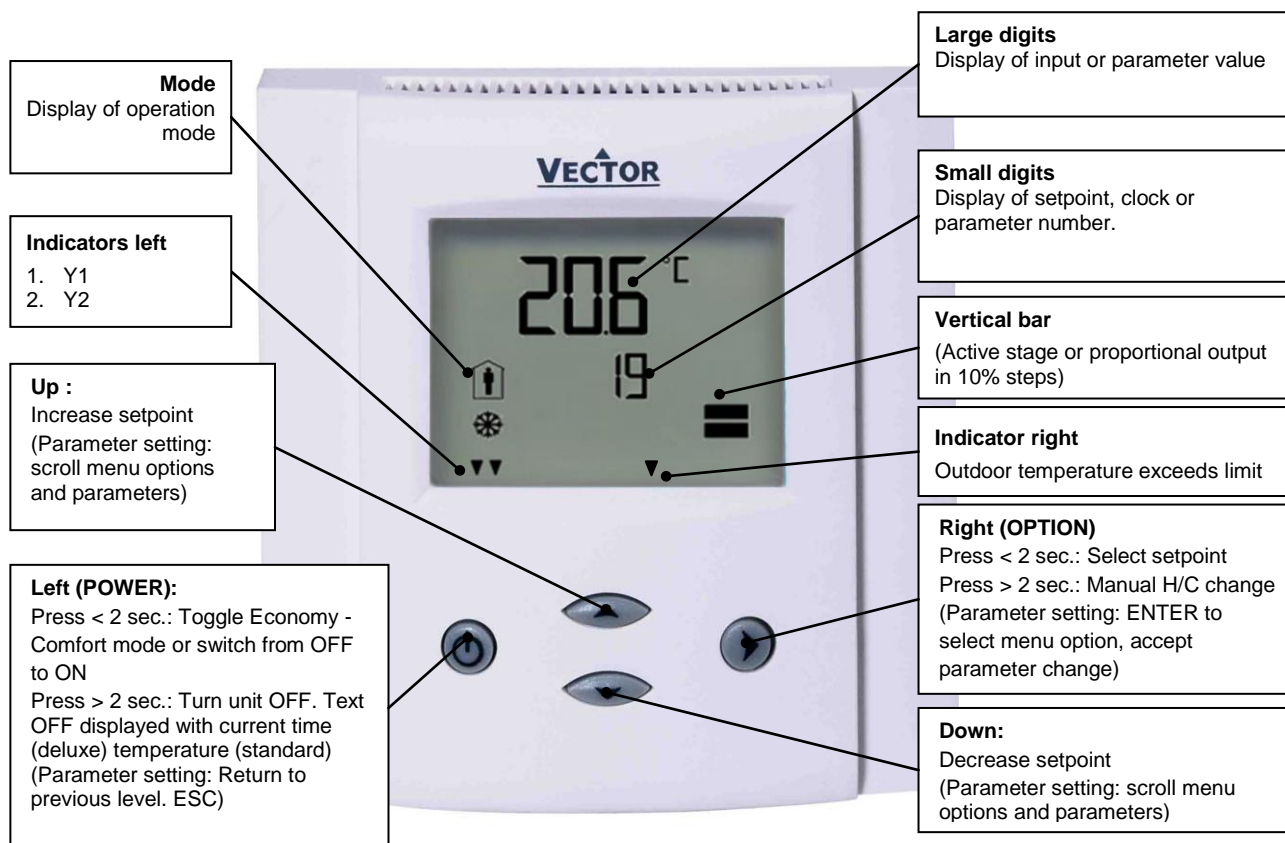
Mounting location

- 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.
- Ensure adequate air circulation to dissipate heat generated during operation.
- Observe local regulations.
- Do not mount in wet or condensation prone environments.









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. Ensure that the jumpers are set correctly.
4. Slide the two latches located on the top of the front part into the hooks at the upper side of the mounting plate.
5. 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!
6. 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.

Display and operation



Operation mode

	Comfort (occupied)	All control functions operating per set points.
	Economy (unoccupied):	Set points shifted according to <i>Parameters CP04</i> . Economy mode and setpoint shift may be disabled with UP06
OFF	Energy Hold Off	Outputs are off
	Heating	Output activates if control temperature lower than setpoint. While blinking, free heating is active. Outside temperature is higher than inside temperature.
	Cooling	Output activates if control temperature higher than setpoint. While blinking, free cooling is active. Outside temperature is lower than inside temperature.
	Manual mode	Deluxe only: Override of time schedule active.
	Schedule	Deluxe only: Time schedule is active
	Fan	If present: Fan is running
	External limit switch	External limit switch is off, output is deactivated

Standard display (parameters UP10, UP11)

- Active when no key has been pressed for 30 seconds.
- Contents may be chosen with parameters.

Loop display

- Active when changing set points. Large digits show input value. Small digits show set point. Vertical bars show analog output value. Arrows in position 1, 2 and/or 3 show active binary (digital) output stages

Power failure



- All parameters and set points are memorized and do not need to be re-entered.
- Upon return of power: Set *Parameter UP05* to keep the unit off, switch on, or operation mode before power failure.
- Clock and time schedule settings retained for 48 hours (after powered for at least 10 hours).

Error messages

Err1: Error temperature sensor. The temperature sensor may be damaged or not present

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 with parameter UP03.

For TLC3-ECO: For TLC3-ECO-D:	Press OPTION > 2 sec. SEL and H-C is displayed. Press OPTION > 2 sec. SEL and current time is displayed. Press UP key twice. SEL and H-C is displayed. Press OPTION again to toggle H or C.	SEL H-C  
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Clock operation

TLC3-ECO-D contains a quartz clock with battery back-up (not available in TLC3-ECO). Up to 8 mode changes based on time and day of the week may be programmed. Also position an output or select a set point directly with a time schedule. A blinking clock indicates that the time has not been set or that the unit has been 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 Press OPTION < 2 sec. to change time, Minutes blink: UP/DOWN to change, OPTION to save minutes, Hours blink: UP/DOWN to change, OPTION to save hour, Press OPTION to save time, DAY1 blinks: UP/DOWN to change, OPTION to save day	SEL 00:00 DAY1 (Mon)
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Creating time schedules

There are a total of 4 switching events grouped into 4 time schedule group. A switching event consists of an operation mode and a switching time.

Step 1: Select time schedule group

Press OPTION > 2 sec. SEL and current time displayed Press UP: SEL and PRO displayed, clock symbol blinks Press OPTION: Select time schedule program. Pro 1 to Pro 4. PRO 1 is shown. 1 is blinking. UP/DOWN to change, OPTION to select	SEL PRO 	Pro 1 to Pro 4 OFF/ON
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Step 2: Enable/disable time schedule group

Pro x is fixed now, ON / OFF blinks Press UP/DOWN to set ON or OFF. This disables or enables the time schedule group. Press OPTION to continue In case OFF has been selected, return to Step 1. If ON is selected, continue to step 3.	Pro 1 OFF/ON
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Step 3: Selected switching day (Pr01) to DAY1 (Mon) – DAY 7 (Sun) for time schedule group

While Pro1 is displayed and day selection is blinking: Press UP / DOWN: select day group: d1-7, d1-5, 1-6, d6-7, day 1, day 2, day 3, day 4, day 5, day 6, day 7 d1-7 will activate the time schedule group for all 7 week days, d1-5 activates it only for day 1 (Mon) to day 5 (Fri) etc. Press OPTION to save day selection and move to first switching event.	Pr01 DAY1
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Step 4: Select action for switching event

The bar on the right side indicates the current number of the switching event. There are a total of 4 switching events per group. Press UP / DOWN to select desired operation mode. (no, OFF, ECO, ON, UNI), no = disables this switching time OFF = switches unit Off, enables reset timer ECO = sets operation mode to On and Economy, disables reset timer ON = sets operation mode to On and Comfort, disables reset timer UNI = Does not change operation mode, only disables reset timer Press OPTION to continue	Pr01 no 
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Step 5: Select a switching time for switching event

Press UP / DOWN Switching time 07:30 blinks. Select switching time in 15 min steps from 00:00–23:45. Press OPTION to save switching time:	Pr01 08:00 
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Step 6: Complete time schedule group definition

Repeat steps 4 and 5 for all 4 switching events. In case a switching event is not used, set its mode to "no". To review the entire schedule group, step through by repeatedly pressing the OPTION key from step 1 onwards to step 6.	Pr01 08:00 
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Setting parameters to configure the controller

TLC3-ECO is an intelligent programmable economizer with the flexibility to fit a wide range of applications. The control operation is defined by parameters set using the standard operation terminal. There are two levels:

1. **User/display parameters (password 0009)**
2. **Control parameters (password 0241)**

Recommended set-up procedure:

1. **Connect power supply and inputs**
2. **Make sure Celsius – Fahrenheit settings are correct (UP07)**
3. **Program control parameters**
4. **Program user settings**
5. **Test function of unit**
6. **Switch off power**
7. **Connect outputs**
8. **Test control loop**

Parameters are grouped according to modules:

Module	Description	Notes	PW
UP	User configuration	Control user access and display elements, regional settings	009
CP	Controls configuration	Configuration of control loop, setpoint limits, type and function of inputs and type of outputs	241

How to change parameters

1. Press UP/DOWN buttons simultaneously for three seconds. The display will show firmware version and revision number. Press the OPTION button to start login.
2. CODE is shown in small display.
3. Code to access user parameters is 009, control parameter is 241. The access numbers are fixed and cannot be changed.
4. Select this using UP/DOWN buttons.
5. Press OPTION after selecting the correct code.
6. Once logged in, the parameters are displayed immediately.
7. Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the OPTION button. Three arrows are displayed to indicate that the parameter may be modified. Use UP/DOWN buttons to adjust the value.
8. After you are done, press OPTION to save the new value and return to the selection level (arrows disappear when selection is saved). Pressing left hand POWER button without pressing OPTION will discard the value and return without saving. For control parameters press POWER again to leave parameter selection and return to control module selection.
9. Press the POWER to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.

User and display parameters (password 009)

Parameter	Description	Range	Default
UP 00	Enable change of operation modes,	ON, OFF	ON (Enabled)
UP 01	Enable change of set points	ON, OFF	ON (Enabled)
UP 02	Parameter not used	ON, OFF	ON
UP 03	Enable manual Heat/Cool change	ON, OFF	W00 = ON W01 = OFF
UP 04	Enable access to time programs	ON, OFF	ON (Enabled)
UP 05	State after power failure: 0 = OFF, 1 = ON, 2 = Last State	0, 1, 2	2
UP 06	Enable economy (unoccupied) mode. Shift the setpoint to a lower temperature in winter or higher temperature in summer in order to save energy. May be activated through the POWER button.	ON, OFF	ON (Economy)
UP 07	Celsius or Fahrenheit, OFF for Celsius, ON for Fahrenheit	ON, OFF	OFF (Celsius)
UP 08	Calibrate internal temperature sensor -10° to +10° in 0.1° steps. (Sensor is factory calibrated, use this feature for field adjustment only as required.)	-10...10	0
UP 09	Calibrate outdoor temperature sensor X1 -10° to +10° in 0.1° steps.	-10...10	0
UP 10	Calibrate external temperature sensor X2 -10° to +10° in 0.1° steps.	-10...10	0
UP 11	Select contents of Large LCD display in standard mode:	0...6	2 Indoor Temperature
	00 = OFF 01 = Setpoint 02 = Control temperature sensor ^{*1)} 03 = Output Mode 04 = Clock 05 = Outdoor sensor (X1) 06 = Alternate sensor ^{*1)}		
UP 12	Select contents of small LCD display in standard mode	0...6	Standard: 5 Outdoor Temperature Deluxe: 4 Clock
	00 = OFF 01 = Setpoint 02 = Control temperature Sensor ^{*1)} 03 = Output Mode 04 = Clock 05 = Outdoor sensor (X1) 06 = Alternate sensor ^{*1)}		
UP 13	Clock display type: Only available for deluxe version OFF = Show 24hour clock ON = Show 12hour clock (AM, PM)	ON, OFF	OFF (24h)
UP 14	Reset timer for override mode: Only available for deluxe version 0 = Reset of override mode is not active. 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)

^{*1)} Control temperature sensor or alternate sensor depends on which sensor is selected as control input with CP18.
 If CP18 = 1: Control temperature sensor is X2 and alternate sensor is internal temperature sensor
 If CP18 ≠ 1: Control temperature sensor is internal sensor and alternate sensor is X2.

Control configuration (password 241)

Warning! Only experts should change these settings!

Setpoint limits

Parameter	Description	Range	Default
CP 00	Minimum set point limit in heating mode	-40-60°C	16°C (61°F)
CP 01	Maximum set point limit in heating mode	-40-60°C	30°C (87°F)
CP 02	Minimum set point limit in cooling mode	-40-60°C	16°C (61°F)
CP 03	Maximum set point limit in cooling mode	-40-60°C	30°C (87°F)

Controls configuration

CP 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.)	0-10.0°C	5°C (10°F)
CP 05	Dead zone span: The dead zone span lies between the heating and the cooling setpoint. The output is off while the temperature is within the dead zone span. A negative dead zone is not possible.	0-100°C	1.0°C (2°F)
CP 06	Heat/Cool changeover delay (if set to CP12 = 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
CP 07	Min. temperature difference required to start free heating	0-10.0°C	1.0°C (2.0°F)
CP 08	Min. temperature difference required to start free cooling	0-10.0°C	1.0°C (2.0°F)
CP 09	Switching hysteresis is the difference between switching on and switching off. A small hysteresis will increase the number of switching cycles and thus the wear on associated equipment.	0-10.0°C	0.5°C (1°F)
CP 10	Delay OFF (minimum running time), The minimum time the damper is open	0...255 s	200s
CP 11	Delay ON (minimum stopping time) The minimum time the damper is closed.	0...255 s	200s
CP 12	Control option: 0 = Cooling only 1 = Heating only 2 = Manual heat – cool switching 3 = Demand based heat – cool switching	0...3	Default = 3 W01 = 0 W02 = 1 W03 = 2 W04 = 3

→ Control logicfree cooling

If the room temperature is above the setpoint, the controller will open the outside damper if the outdoor temperature is below the room temperature with a minimum difference as specified under CP08.

Once the outdoor damper is open, it will stay open until the setpoint is reached or outdoor temperature is higher than room temperature.

If the outdoor damper closed because the setpoint is reached, it will re-open after the indoor temperature increased for the amount specified under hysteresis CP09.

→ Control logicfree heating

If the room temperature is below the setpoint, the controller will open the outside damper if the outdoor temperature is above the room temperature with a minimum difference as specified under CP07.

Once the outdoor damper is open, it will stay open until the setpoint is reached or outdoor temperature is lower than room temperature.

If the outdoor damper closed because the setpoint is reached, it will re-open after the indoor temperature decreased for the amount specified under hysteresis CP09.

Output configuration

Parameter	Description	Range	Default
CP 13	Y1: Output setting, spring return or 3-point: 0 = Spring return open/close 1 = 3-point binary output (Y1 open, Y2 close)	0...1	0 Spring return
CP 14	Running time in 3-point mode or delay for fan in seconds Delay for mechanical heating or cooling in minutes	0...255	90
CP 15	Y2: only valid if Y1 = Spring return 0 = Not used 1 = mechanical cooling 2 = mechanical heating 3 = mechanical heating and cooling 4 = fan	0...4	0

→ On-Off control

Two devices may be controlled in case the output setting is 0 (CP13). Y1 controls the outdoor damper. Y2 may enable mechanical heating or cooling or a fan.

→ 3-point output

A 3 point actuator has an open and a close input. Applying power to the open input will drive the valve or damper open, applying power to the close input will drive the valve or damper to the closed position.

The running time of the actuator may be preset. We recommend to enter the maximum running time under maximum load in order to make sure that the damper can fully close and fully open in any circumstance.

In order to open the damper Y1 will be activated for the preset amount of time. After the expiration of the running time Y1 and Y2 will both be OFF. The damper is closed by activating Y2 for the preset amount of time.

If 0 is entered as running time, the binary output will remain constantly active in open or closed position.

→ Function of mechanical heating or cooling activation

If there is heating or cooling demand. The controller verifies if free heating or cooling is possible based on control logic mentioned on the last page. If it is not possible, mechanical heating or cooling will be enabled by closing contact of Y2.

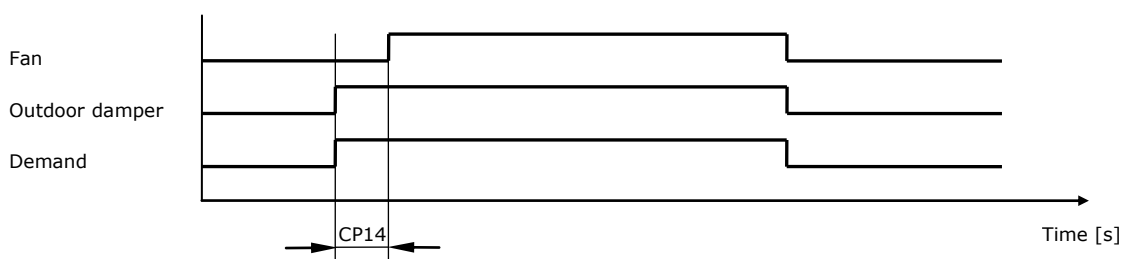
If free heating or cooling is active, the timer specified in CP14 will start to run. The timer counts the number of minutes. If the set point cannot be reached after defined number for minutes, mechanical heating or cooling is enabled. (outdoor damper will remain open until free heating / cooling conditions are not met anymore).

Setting delay to 0, will not activate mechanical heating or cooling while free heating or cooling is active independent of time.

→ Function of Y2 in fan mode

In fan mode, the fan activates with a delay defined under CP14 after the outdoor damper starts to open. This will give the damper time enough to fully open before the fan starts blowing.

The fan switches off when the outdoor damper starts to close.



Input configuration

Parameter	Description	Range	Default
CP 16	Input X1: Minimum outdoor temperature. If outdoor temperature is lower than this temperature, the outdoor damper will close, independent of demand. There is a 5 °C hysteresis before reset.	-40-60°C	5°C (9°F)
CP 17	Input X1: Maximum outdoor temperature. If outdoor temperature is higher than this temperature, the outdoor damper will close, independent of demand. There is a 5 °C hysteresis before reset.	-40-60°C	45°C (113°F)
CP 18	Input X2, configuration: 0 = No external input 1 = Alternative control input instead of internal sensor 2 = Close damper if contact is open (high humidity, low air quality)	0...2	0