TLC3-BCR-U-230, Programmable Thermostat

Features
- Low power energy consumption: < 1W per unit
- Temperature control for 2 or 4-pipe heating or cooling systems.
- Large temperature range from –40°C to 70°C (-40°F to 158°F).
- Cost saving option with Economy functionality and set point limitations
- Choose between one 3-point actuator and two binary heating/cooling stages
- Control for single stage heating and cooling for 2 and 4-pipe systems
- External sensor or open contact for remote control, external heat – cool change or auto-changeover on supply temperature with selectable activation limits

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

Ordering

Item Name	Item code	Variant	Features
TLC3-BCR-U-230	40-10 0160	Standard	Binary controller with:
TLC3-BCR-U-230-W01	40-10 0160-01	Cooling only	1 RT int, 2 RT ext
TLC3-BCR-U-D-230	40-10 0161	Deluxe	2 DO (Relay) Binary valve control
TLC3-BCR-U-D-230-W01	40-10 0161-01	Cooling only	

Accessories

S-Tn10-2	40-20 0001	Flying lead sensor with 2 m cable
SD-Tn10-12-2	40-20 0002	Flying lead duct sensor 12cm immersion depth, 2m cable
SD-Tn10-20-2	40-20 0003	Flying lead duct sensor 20cm immersion depth, 2m cable
SDB-Tn10-12	40-20 0051	Duct sensor with housing, 12cm immersion depth
SDB-Tn10-20	40-20 0004	Duct sensor with housing, 20cm immersion depth
SRA-Tn10	40-20 0005	Room sensor
SOA-Tn10	40-20 0006	Outdoor sensor

Selection of actuators, binary devices and sensors
Temperature Sensors: Use only our approved NTC sensors to achieve maximum accuracy. Recommended is SDB-Tn10-15 as Duct sensor, SRA-Tn10 as Room sensor and SDB-Tn10-15+AMI-10 as immersion sensor.

Binary auxiliary devices: E.g. valves and actuators. Do not directly connect devices that exceed 2A.

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. 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.
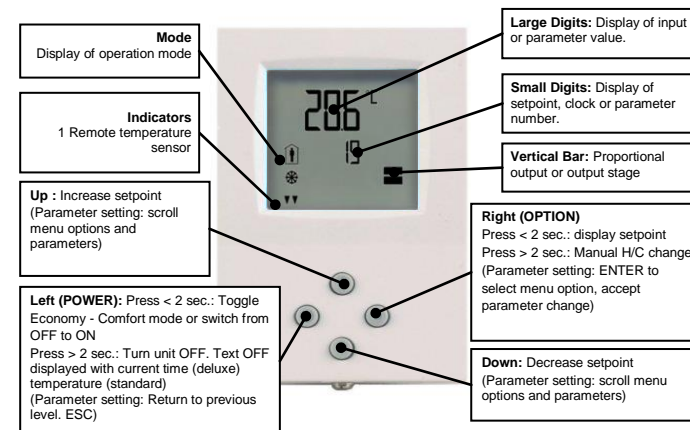
Power Failure
Upon power-interruption, all parameters and setpoints are memorized in non-volatile memory and therefore do not have to be re-entered again.

Error messages
Err1: Error temperature sensor. The internal temperature sensor may be damaged or not present.
FP: Steady: Frost protection is active.
Blinking: Frost protection activated in the past and is now inactive. Confirm with OPTION key.
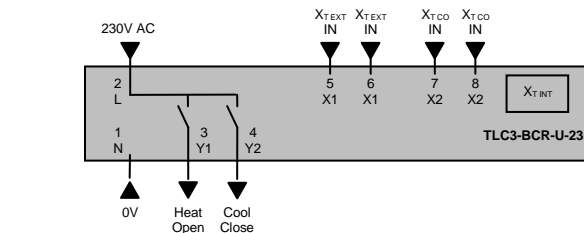
Display and Operation

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: Proportional output or output stage

Right (OPTION) Press < 2 sec.: display 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)

Technical Specification

Power Supply	Operating Voltage	210 – 250 V AC 50/60 Hz
	Power Consumption	Max 1W, 1.5VA
	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	Y1 to Y2 Relays 0…250V AC 1.25A max. each output 3750V AC to EN 60 730-1 1250V AC to EN 60 730-1
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…0°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
	Safety Class	II (IEC 60536)
	Overvoltage Category	III (EN 60 730-1)
	RoHS	Compliant
General	Dimensions (H x W x D) Front part: Power case:	16 x 73 x 113mm (0,7 x 2.9 x 4.5 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) Galvanized Steel
	Weight (including package)	Standard: 295g (10.4oz) Deluxe (-D): 305g (10.7oz)

Wiring Diagram

Description:

N	Power supply:	0V Neutral
L	Power supply:	230VAC
Y1	Binary output 230V AC:	Heat if in 4-pipe or single stage mode Open for 3-point actuators Stage 1 if in reversing valve mode Stage 1 if in 2-stage mode
Y2	Binary output 230V AC:	Cool if in 4-pipe mode or single stage mode Close for 3-point actuators Reversing valve if activated Stage 2 if 2-stage mode
X1	External input:	NTC 10kΩ @ 25°C (77°F) or open contact to SGND Automatic detection for control input or according to setup
X2	External input:	NTC 10kΩ @ 25°C (77°F) or open contact to SGND Changeover or remote control input

Dimensions
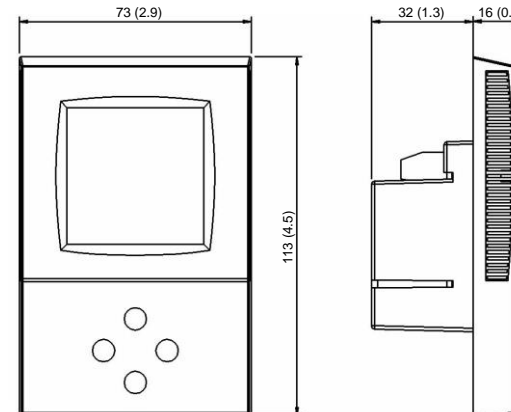
Space required in flush mounting box: (H x W x D) 60 x 50 x 32mm (2.4 x 2.0 x 1.3 in.)
Distance for mounting screws: Horizontal and vertical: 45 to 63mm (1.8 to 2.5 in.)

Configuration parameters for firmware version 3.1

The TLC3-BCR-U can be adapted to wide variety of applications. The adaptation is done with 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 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.

Changing parameters

The parameters may only be accessed by entering a code. There are two levels of parameters: User operation parameters for access control settings and Expert parameters for control functions and unit setup. The codes for user levels and expert levels are different. Only control experts should be given the control parameter code.

The parameters can be changed as follows:
1. Press UP and DOWN button simultaneously for three seconds. The display shows the software version in the large digits and the software revision in the small digits.
2. Pressing the OPTION button will indicate CODE on the small digits and 000 on the large digits.
3. The code for accessing the user parameters is 009
4. Select this using UP or DOWN buttons.
5. Press OPTION 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 OPTION button. The MIN and MAX symbols 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 OPTION or POWER in order to return to the parameter selection level.
9. Press the POWER button again so as to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.

User Parameters (Access Code: 009)

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	Parameter not used	ON, OFF	ON
UP 03	Enable manual change of Heating/Cooling Mode. Applies only for 2-pipe or 4-pipe systems.	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, 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, 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	Enable Frost Protection. Switches to heating mode and activates the output 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 W01 = OFF
UP 10	Select contents of Large LCD display in standard mode: 00 = OFF 01 = Setpoint 02 = Temperature Sensor 03 = Output Mode 04 = Clock 05 = Alternative Sensor 06 = Changeover Sensor X2	0…6	02 Temperature
UP 11	Select contents of small LCD display in standard mode 00 = OFF 01 = Setpoint 02 = Temperature Sensor 03 = Output Mode 04 = Clock 05 = Alternative Sensor 06 = Changeover Sensor X2	0…6	Standard: 01 Setpoint Deluxe: 04 Clock
UP 12	Clock display type: Only available for deluxe version OFF = Show 24hour clock ON = Show 12hour clock (AM, PM)	ON, OFF	OFF (24h)
UP 13	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)

Control Parameters (Access Code: 241)

Warning! Only experts should change these settings!

Setpoint Limits

Parameter	Description	Range	Standard
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	24°C (76°F)
CP 02	Minimum set point limit in cooling mode	-40-60°C	18°C (65°F)
CP 03	Maximum set point limit in cooling mode	-40-60°C	30°C (87°F)

Controls Configuration

Parameter	Description	Range	Standard
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 = 4): 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	P – band or switching span heating X_{PH}	0-10.0°C	2.0°C (4.0°F)
CP 08	P – band or switching span cooling X_{PC}	0-10.0°C	2.0°C (4.0°F)
CP 09	Switching Hysteresis	0-10.0°C	0.5°C (1°F)
CP 10	Delay OFF (Minimum running time)	0…255 s	10s
CP 11	Delay ON (Minimum stopping time)	0…255 s	10s
CP 12	Control option: 0 = Cooling only 1 = Heating only 2 = 2-pipe system 3 = 4-pipe system	0…3	Default = 3 W01 = 0 W02 = 1 W03 = 2 W04 = 3

➔ **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. For example, with a heating or reverse 0-10v control sequence, and a 2.0°C (4.0°F) P-band value, at 10v the controller will be 2.0°C (4.0°F) below setpoint. This is the working range of the proportional control sequence.
Setting the proportional band to 0 disables proportional control.

Output Configuration

Parameter	Description	Range	Standard
CP 13	Output setting, Binary, PWM or 3-point: 0 = Binary or PWM (See CP14 for assignment of Y1 and Y2) 1 = 3-point binary output (Y1 open, Y2 close) 2 = 3-point floating output (Y1 open, Y2 close)	0…2	0 Binary / PWM
CP 14	Reversing valve in binary mode 0 = no reversing valve, one stage only (Y1 Heat, Y2 Cool) 1 = rev. valve while heating (Y1 stage 1, Y2 rev valve) 2 = rev. valve while cooling (Y1 stage 1, Y2 rev valve) 3 = no reversing valve, two stages (Y1 stage 1, Y2 stage 2)	0...3	0
CP 15	Running Time in 3-point mode	0…255 s	90 s
CP 16	PWM cycle time, 0 disables PWM mode	0…100 min	0

➔ **Control Logic if CP13 = 0**
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. For example, with a heating or reverse 0-10v control sequence, and a 2.0°C (4.0°F) P-band value, at 10v the controller will be 2.0°C (4.0°F) below setpoint. This is the working range of the proportional control sequence.

System type	CP14	Y1	Y2
2 pipe system heat or cool	0	Heat	Cool
4 pipe system Heating mode	0	Heat	
4-pipe system Cooling mode	0		Cool
4-pipe reversing valve on Heat	1	Stage 1	Rev valve (in heat mode)
4-pipe reversing valve on Cool	2	Stage 1	Rev valve (in cool mode)
2-pipe system heat of cool, 2 stages	3	Stage 1	Stage 2

Input Configuration

Parameter	Description	Range	Standard
CP 17	Changeover input: 0 = No external input 1 = Occupation sensor – Comfort / Economy 2 = Occupation sensor – Comfort / Off 3 = Heat / Cool change over, heat cool change if over limit 4 = High / Low limit supervision, outputs switch off if over limit	0…6	0
CP 18	Activation delay (Minutes) = the time the binary input needs to be open before Economy/off mode is activated if CP17 = 1, 2. Does not apply for heat cool changeover or high/low limit	0…255 min	5
CP 19	Heat – cool changeover limit heating if CP17 = 3 Low limit if CP17 = 4	-40-60°C	16°C (61°F)
CP 20	Heat – cool changeover limit cooling if CP17 = 3 High limit if CP17 = 4	-40-60°C	28°C (83°F)

➔ **Configuring the function of the external change over input**

CP17 = 0   CO input not used

CP17 = 1   Switching Economy and Comfort modes   Economy (unoccupied) and Comfort (occupied) modes are controlled through an external contact by connecting X2 through a dry contact to signal common. This function may be used together with key card switches for hotels or motion detectors for offices.

CP17 = 2   Switching Energy Hold OFF and Comfort modes   Opening the X2 temperature input will force the unit into the OFF operation mode. The operation mode cannot be overridden by using the terminal. Connecting X2 input to GND returns control of the operation mode to the terminal. This function may be used as window contact to prevent loss of energy.

CP17 = 3   Heat – Cool changeover   Switch heating and cooling mode based on supply media or outside temperature or binary contact. See below for further details.

CP17 = 4   High – Low limit supervision   This may be used for a high temperature limit for floor heating or dew point sensor input for cooling ceilings. Output will switch off if contact opens.

➔ **Configuring auto changeover input if CP17 = 3:**
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 CP19 and CP20. 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 CP19 and CP20:**

Change over mode CP17=3	Relation CP19 to CP20	Example CP19	Example: CP20
Supply media	CP19 > CP20	25°C (77F)	18°C (64F)
Outside temperature	CP19 < CP20	15°C (59F)	25°C (77F)
Dry contact: Heating if contact closed	CP19 > CP20	25°C (77F)	15°C (59F)
Dry contact: Cooling if contact closed	CP19 < CP20	15°C (59F)	25°C (77F)

High – low limit CP17=4	Relation CP19 to CP20	Example CP19	Example: CP20
Output off if outside range	CP19 < CP20	15°C (59F)	45°C (113F)
Dry contact: OFF if contact closed	CP19 < CP20	-40°C (-40F)	45°C (59F)
Dry contact: OFF if contact open	CP19 < CP20	15°C (59F)	80°C (176F)