



CRC110



Technical description

CRC110



The CRC110 is a weather compensating controller with integrated actuator with quick and simple installation on mixing valves. Settings are done by an easy-to-use joystick and display interface on the front cover.

CRC110 will be used to control the indoor climate based on the outdoor temperature and the characteristic heating curve. The demand for heat is different due to differences in the type of building / level of insulation / type of heating / the outdoor temperature and because of this the curve might need to be adjusted. Normally when the curve is adjusted the complete curve is changed and a curve that works perfect when the outdoor temperature is -15°C might not be the perfect curve when the outdoor temperature is $+5^{\circ}\text{C}$. This problem is taken care of in the new CRC110 there the adjustment of the curve is only made on the part of the curve that reflects the specific outside temperature. The new controller also has the possibility to use a time constant for applications where changes of the outside temperature takes several hours before affecting the indoor temperature but changes of heating supply affect the indoor climate more quickly. There is also a possibility to use offset / parallel adjustment on the curve for example for night settings.



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Technical description CRC110 rev A



GENERAL

Platform:	CRC110
Denomination	ESBE CRC111 CONTROLLER 230V 6NM
Article number	1282 01 00
RSK number	5386190
EAN number	7330193045803
Torque:	6 Nm
Operation angle:	90°
Ambient temperature:	max +55°C / min -5°C
Temperature range Flow pipe sensor:	+5 to +95°C
Temperature range Outdoor sensor:	-50 to 70°C
Enclosure rating:	IP41
Protection class:	II
Power supply:	230+/- 10% VAC, 50/60 Hz
Power consumption 230V:	10VA
Auxiliary switch:	Adjustable 0-90°
Rating Auxiliary switch:*	6(3)A 250 VAC
Weight:	0,4 kg
Running time: **	30 seconds
Working direction:	CW / CCW
Communication***	Communication between actuator unit and outdoor sensor by ESBUS protocol
Approval/certificate:	LVD2006/95/EC EMC 2004/108/EC RoHS 2011/65/EC

*Auxiliary switch is an option and will be solved by ordinary Auxiliary switch kit 1620 0700.

** Running time of a controller is not so relevant since the total running time from fully open to fully closed is based on the deviation between set and actual flow temperature.

*** If outdoor sensor is disconnected will the controller change mode to a constant temperature regulator (CRA111) after 10 minutes. The set temperature in constant temperature mode will be the last calculated flow temperature during outdoor sensor mode.

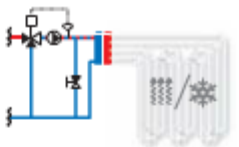




SUITABLE MIXING VALVES

The controller is supplied complete with an adaptor kit for easy fitting onto the following ESBE rotary mixing valves:

- Series VRG100
 - Series VRG200
 - Series VRG300
 - Series VRB100
 - Series MG*
 - Series G
 - Series F ≤ DN50
 - Series BIV
 - Series H and HG
 - Series T and TM
- * Not 5MG

SELECTION INFO

The CRC110 controller is the simple version of an outdoor sensor based controller in the ESBE assortment of controllers. The CRC110 is recommended for the following applications:

<ul style="list-style-type: none"> • Underfloor heating • Cooling 	
<ul style="list-style-type: none"> • Extension of building or system 	
<ul style="list-style-type: none"> • One family house 	
<ul style="list-style-type: none"> • Semi-detached house 	
<ul style="list-style-type: none"> • Multiple dwelling • Large building 	

There are advantages and disadvantage of both indoor sensor based and outdoor sensor based controllers.

The main advantage of the outdoor sensor is that the controller “knows” when the outside temperature change and can directly start to compensate for it. The disadvantage is that the controller doesn’t know anything about the indoor temperature that can change a lot even if the outdoor temperature stays the same. For example if it’s windy, the sun is shining, using a stove inside the house, you have a party with a lot of people or cooking.

The advantage of the indoor sensor based controller is that the controller always knows the actual indoor temperature and can compensate for that. The disadvantage is if the outdoor temperature change quickly and the indoor controller has no possibility to compensate in advance and by that it can be too hot / too cold inside the house for a period of time. There is also a disadvantage of using only indoor sensor based controllers in heavy building or heavy heating system because there is a risk that the controller over-react because the reaction time of changes are slow.

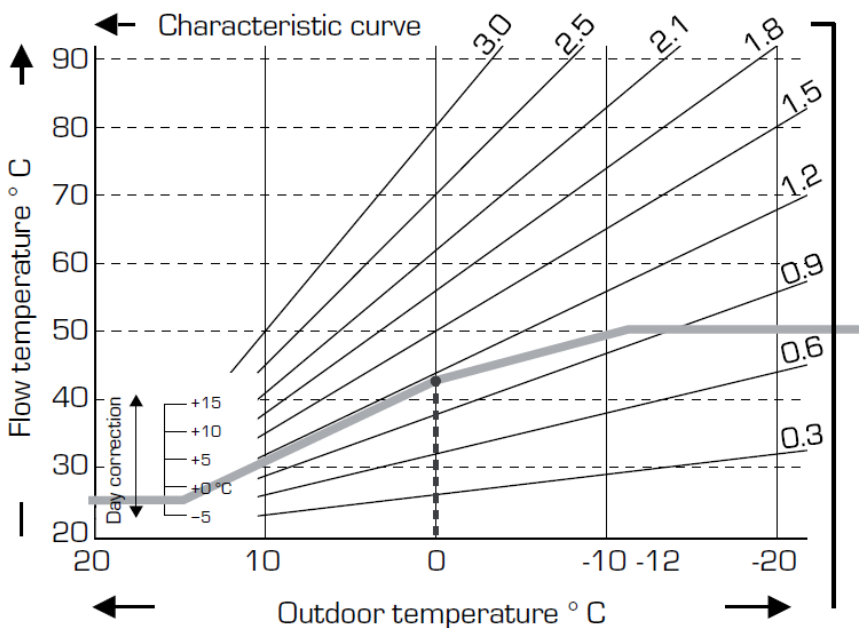
CHARACTERISTIC HEATING CURVE, GENERAL INFORMATION

Generally, an outdoor sensor based controller is always based on the characteristic heating curve. The curve describes the flow temperature to the heat circuit at a specific outdoor temperature. When it's gets colder outdoors, the flow temperature to the heat circuit gets warmer. The characteristic heating curve has normally a different set-up of slopes. A steeper slope will have a higher flow temperature compare to flatter slope at the same outdoor temperature.

Example with the graph below: At the outdoor temperature of -10°C the curve 1.8 will supply about 74°C fluid to the heat circuit. On the other hand, the curve 0,6 will only supply about 38°C fluid to the heat circuit at the same outdoor temperature.

A characteristic heating curve normally also have the possibility to change the step of the slope at one point (split point). The curve can be steeper before the point and more flat after the point or vice versa. Normally there is also a lower and upper limit of the flow temperature.

Example with the graph below: The grey line shows the chosen curve. The lower limit is set to 25°C , the upper limit to 50°C . There is a split point at 0°C outdoor temperature and the first part of the curve is according to 0,9 settings and the second part of the curve is according to 0,7 settings.



If the user feels that the indoor temperature is too high or low he must change the curve settings and in some cases also the split point. A change of the curve setting will affect the complete curve. The CRC110 is made different and a change of the flow temperature will only affect a part of the curve and the user doesn't need to think about curve settings or split points. On the following pages the settings of the CRC110 will be presented and also how the different settings affect the curve.



MENU

The following menu is active if an outdoor sensor is connected to the controller CRC110. If the outdoor sensor is not connected it will work according to specification for CRA110. If the outdoor sensor is disconnected the controller will use the last measured outdoor temperature for the following 10 minutes and after that change mode to constant temperature controller and work according to specification for CRA110.

- Main menu: Show the actual flow temperature measured by the temperature sensor on the pipe.
- Setup menu 1: Is activated if joystick is pressed shortly to left/right or down. Will show the target flow temperature at the closest split point. To change the target flow temperature, move the joystick to left or right and press joystick to confirm.
- Setup menu 2: Is activated if joystick is pressed for 5 seconds. This menu consists of settings for Maximum flow temperature, Minimum flow temperature, Curve, Offset, Time constant and Outdoor temperature. The first submenu is Maximum flow temperature and then presented in the same order as described above. The joystick on the front cover is used to move between submenus and to change settings in the submenus.
- Setup menu 3: **This menu is not recommended for general users since changes of these parameters will affect how the product operates.**



Setup menu 1

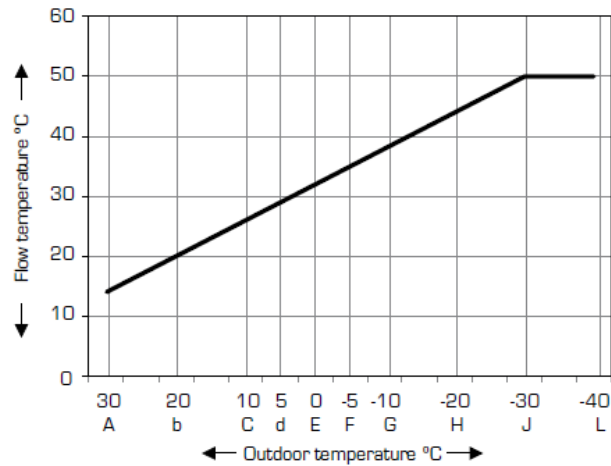
The menu is activated if joystick is pressed shortly to left/right or down. This will show the target flow temperature at the closest split point according to outdoor temperature. To change the target flow temperature, move the joystick to left or right and press joystick to confirm. Compared to other outdoor sensor based controllers the CRC will only change part of the curve when the target flow temperature is changed to be able to do a perfect curve for the application and need.

Example: Today it is -12°C outside and the house owner feels it is a little too cold in the house and would like to raise the temperature. He/she goes to the controller and raises the flow temperature by 4°C . How will that affect the curve?

The curve is divided into 10 parts with 10 split points. When someone changes the flow temperature in this menu level only the closest split point according to actual outdoor temperature will be changed. In this example it is the closest split point -10°C with a flow temperature of 38°C . The change of $+4^{\circ}\text{C}$ will be added to the flow temperature at -10°C ($38+4$). The change will also affect the parts of the curve around the split point until the next split points (-5°C and -20°C). Below is an example of the curve before the change and after the change.

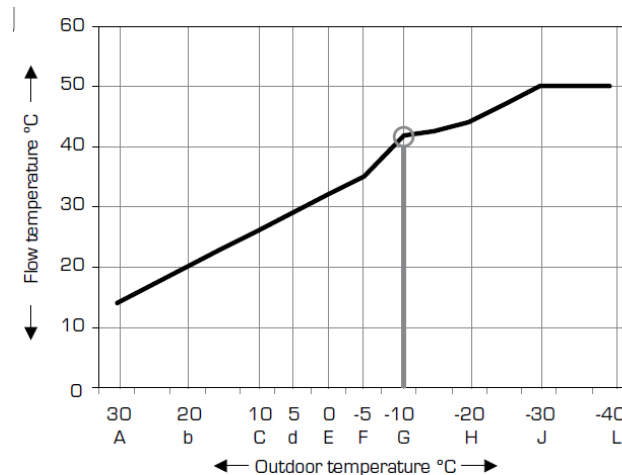
Standard curve (as delivered from factory)

Outdoor temperature ($^{\circ}\text{C}$)	Flow temperature ($^{\circ}\text{C}$.)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	50
-40	50



Adjusted curve

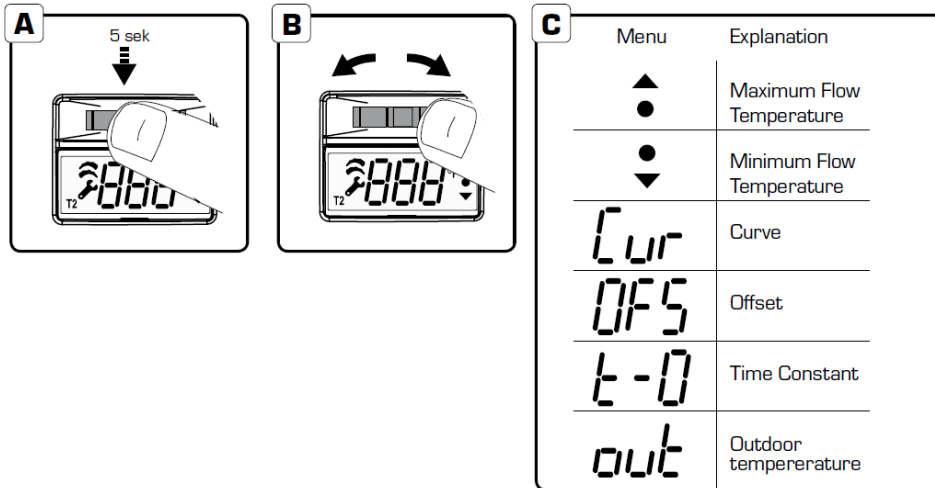
Outdoor temperature ($^{\circ}\text{C}$)	Flow temperature ($^{\circ}\text{C}$.)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	42
-20	44
-30	50
-40	50



The advantage of this function is that the user doesn't need to know anything about a heating curve or how to set it, he/she just need to think if it is too cold or hot inside the house. If it is too cold and a higher flow temperature is needed move the joystick to right and press to confirm, the flow temperature to the circuit will be higher and the curve is adjusted according to the need.

ADVANCED SETTINGS Setup menu 2

The menu is activated if joystick is pressed for 5 seconds. This menu consists of settings for Maximum flow temperature, Minimum flow temperature, Curve, Offset / parallel adjustment, Time constant and Outside temperature. The first submenu is Maximum flow temperature and then in the same order as described above. The joystick on the front cover is used to move between submenus and to change settings in the submenus.





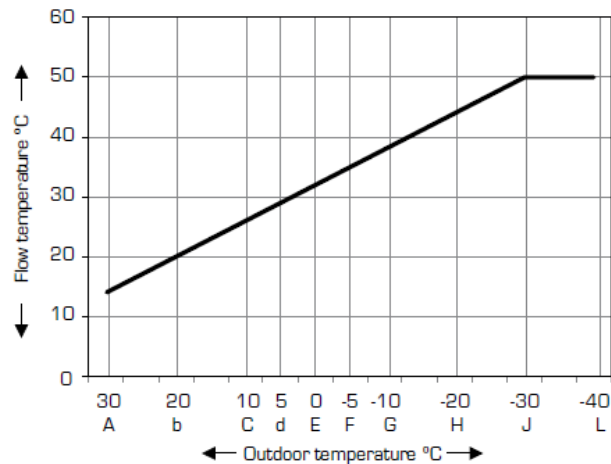
▲
● **Maximum Flow Temperature**

This setting is used as the upper limit for the characteristic heating curve. The user will not be able to have a target temperature higher than this upper limit.

Example: The user would like to have a lower limit of the maximum flow temperature compared to the factory setting of 50°C. He/she decides to set the upper limit to 45°C. How will it affect the curve?

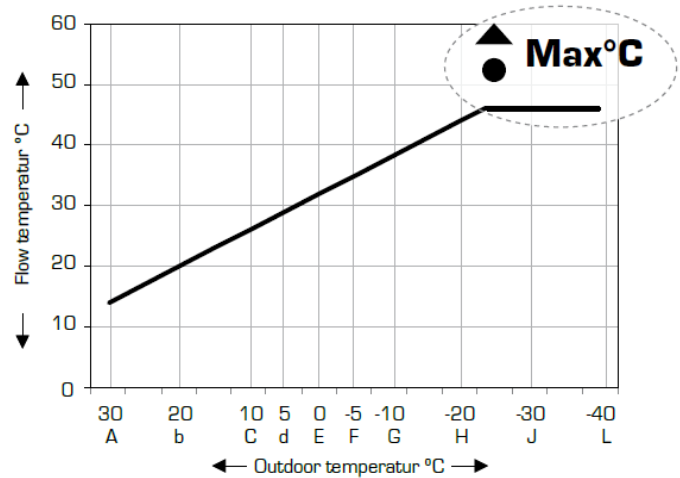
Standard curve (as delivered from factory)

Outdoor temperature (°C)	Flow temperature (°C.)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	50
-40	50



Adjusted curve

Outdoor temperature (°C)	Flow temperature (°C.)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	45
-40	45



When the maximum flow temperature is decreased the curve will be adjusted according to the adjusted

curve above. If any of the split point has a flow temperature above the new maximum flow temperature these will be adjusted.

If the maximum flow temperature is increased the curve will not change, but the user will have the possibility to set a higher flow temperature if needed.

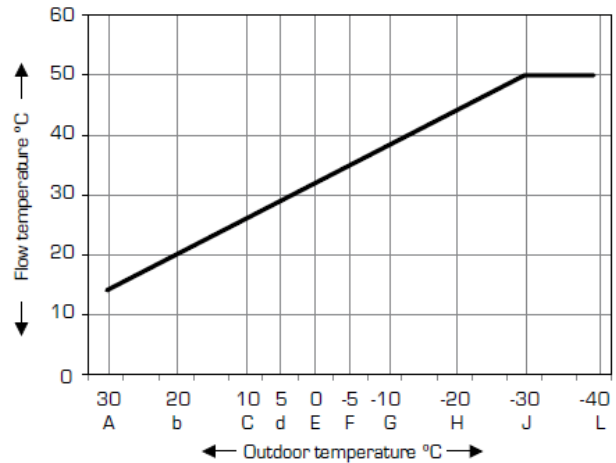
▼ Minimum flow temperature

This setting is used as the lower limit for the characteristic heating curve. The user will not be able to have a target temperature lower than this lower limit.

Example: The user would like to have a higher limit of the minimum flow temperature compared to the factory setting of 5°C. He/she decides to set the lower limit to 22°C. How will it affect the curve?

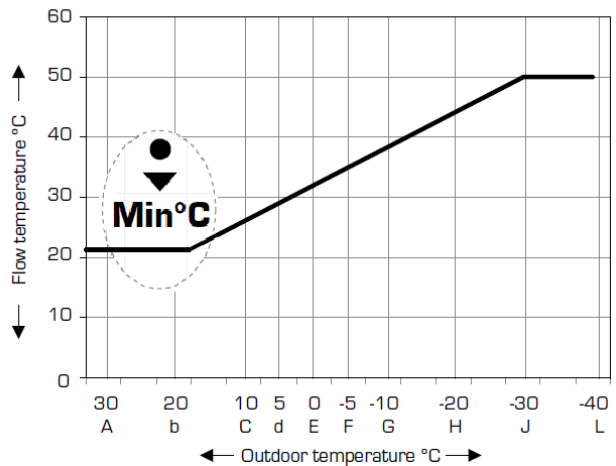
Standard curve (as delivered from factory)

Outdoor temperature (°C)	Flow temperature (°C.)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	50
-40	50



Adjusted curve

Outdoor temperature (°C)	Flow temperature (°C.)
+30	22
+20	22
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	50
-40	56



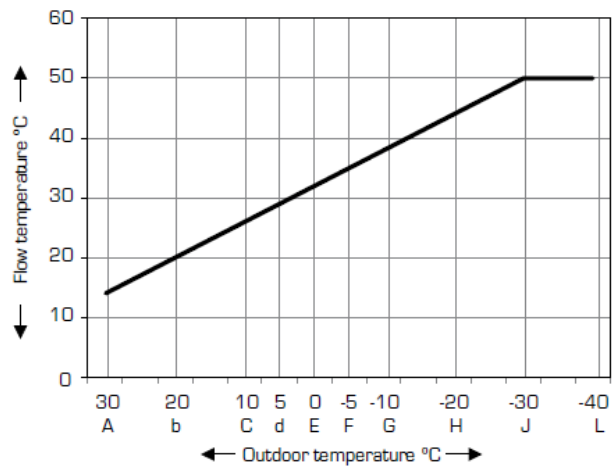
If the minimum flow temperature is increased the curve will be adjusted according to the adjusted curve above. If any of the split point has a flow temperature below the new minimum flow temperature these will be adjusted.

If the minimum flow temperature is decreased the curve will not change, but the user will have the possibility to set a lower flow temperature if needed.

[Lr] Curve

This setting is for user that would like to adjust the characteristic heating curve independent of actual outdoor temperature. The factory curve is set for under floor heating systems to avoid problems with too high flow temperature. For applications with high temperature radiators, the curve needs to be adjusted for higher flow temperatures. Due to the limited number of symbols in the display the outside temperature is translated to a letter.

Outdoor temperature °C	Symbol in display	Flow temperature °C
+30	A	14
+20	b	20
+10	C	26
+5	d	29
0	E	32
-5	F	35
-10	G	38
-20	H	44
-30	J	50
-40	L	50





Offset (T2)

The controller has the possibility to use offset / parallel adjustment of the characteristic heating curve. In this menu the offset / parallel adjustment is set. The settings range between -90°C to $+90^{\circ}\text{C}$.

When the offset setting is negative, -1 to -90°C , the minimum flow temperature is the lower limit but other than that the complete characteristic heating curve will be parallel adjusted.

When the offset setting is positive, $+1$ to $+90^{\circ}\text{C}$, the maximum flow temperature is the upper limit but other than that the complete characteristic heating curve will be parallel adjusted.

When offset is activated the T2 symbol is shown in the display.

NOTE: When offset is activated there is no possibility to change the target temperature in Setup menu 1, if the target temperature needs to be adjusted, the adjustment shall be made in menu Curve or in the menu Offset.

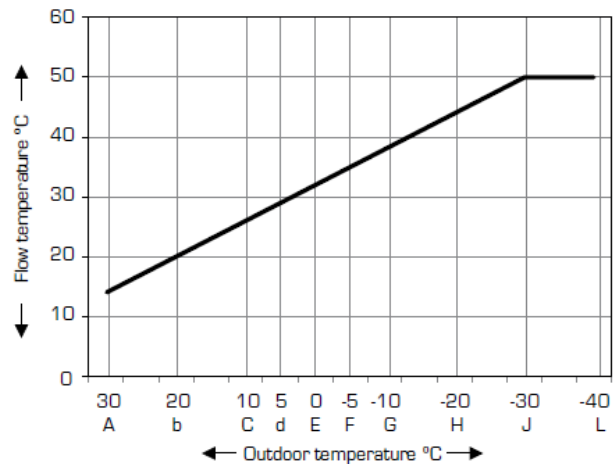
Example:

The user would like to have a parallel adjustment of -10°C and the minimum flow temperature is set to 10°C . How will it affect the curve?

The complete curve will be changed except the split point A ($+30^{\circ}\text{C}$) because the standard target temperature is 14°C but $14-10 = 4^{\circ}\text{C}$ and that is not allowed since the minimum flow temperature is 10°C . Split point A will have a target temperature of 10°C

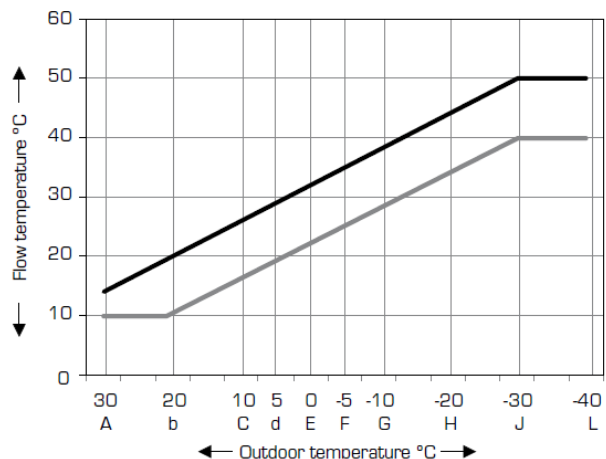
Standard curve (as delivered from factory)

Outdoor temperature ($^{\circ}\text{C}$)	Flow temperature ($^{\circ}\text{C}$)
+30	14
+20	20
+10	26
+5	29
0	32
-5	35
-10	38
-20	44
-30	50
-40	50



Parallel adjusted curve

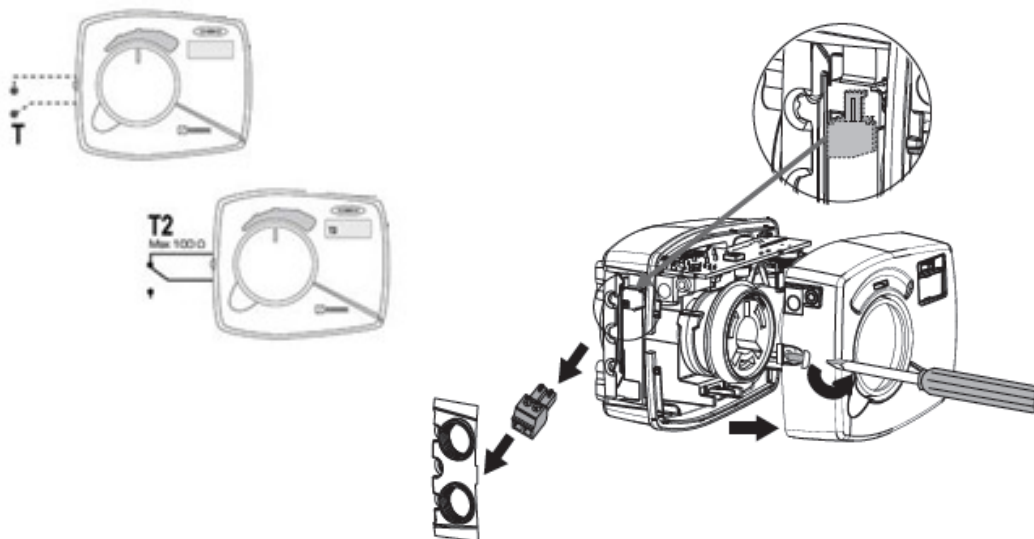
Outdoor temperature ($^{\circ}\text{C}$)	Flow temperature ($^{\circ}\text{C}$)
+30	10
+20	10
+10	16
+5	19
0	22
-5	25
-10	28
-20	34
-30	40
-40	46



Activation *OF5* Offset (T2)

Inside the controller there is a green connector exactly the same as on the CRA110 and CRB100 controllers. By interconnecting the two conductors the controller will change to offset mode and the parallel offset temperature will be activated. The activation of the T2 mode is handled by external equipment such as GSM module CRB915.

NOTE: The connection shall be without any voltage or current and with a maximum resistance of 1000Ω.





t-0 Time constant

This is a filter function for applications with well-insulated buildings and quick heating systems such as a radiator circuit. The filter will delay the impact of a change in the outdoor temperature. This is used to avoid an imbalance between estimated and actual heating demand. The filter is defined by how long it takes before the actuator "knows" 63% of the actual outdoor temperature change. When the filter setting is for example T=2 the controller will know 63% of the change after 2 hours. The below graph explain how different outdoor temperature changes and different t settings affect the controller.

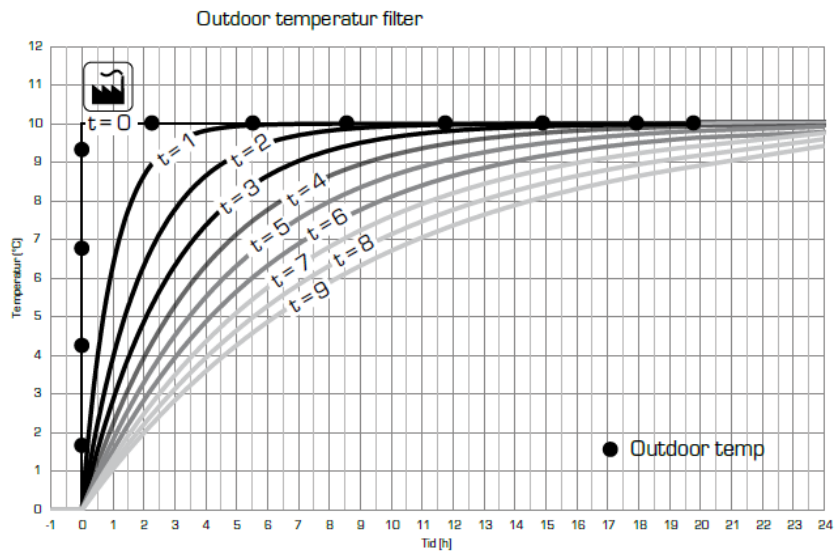
Good insulation / heavy building and quick heating (radiators) = higher time constant.

Good insulation / heavy building and slow heating (under floor heating) = lower or no time constant.

Bad insulation / light building and quick heating (radiators) = lower or no time constant.

The filter function is from factory turned off = setting 0.

t	Time constant (63%) (h)
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9



Example: The user has decided to have the setting t=4 and the outdoor temperature change from -5°C to -15°C. What outdoor temperature is the controller working after?

- Time 0h: -5°C
- Time 4h: -11,3°C
- Time 8h: -13,6°C
- Time 12h: -14,5°C

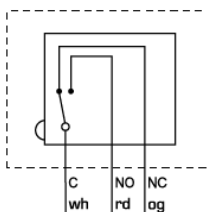
OUT Outdoor temperature

Shows actual outdoor temperature measured by the outdoor sensor.

OPTIONS:

Auxiliary switch kit

Auxiliary switch kit is available with an adjustable (0-90°) activation angle. A possibility is to connect a circulation pump and when no heat is required the circulation pump is turned off. Another option is to control an extra heat source and when ordinary heat is not enough the extra heat source will be activated. Auxiliary switch is delivered with a 1.6 meter cable.



Art nr: 1620 07 00
Denomination: ESBE ARA801, Auxiliary switch kit ARA600/ARA500

GSM module

GSM module for activation/deactivation of offset / parallel adjustment by a cellphone. Perfect option for example for a summer house since this gives the possibility to change the characteristic heating curve from a distance. Possibility to connect extra sensor for extended temperature status.



Art nr: 1705 59 00
Denomination: ESBE CRB915, GSM module

Flow pipe sensor

Flow pipe sensor with 5 meter cable.

Art nr: 1705 31 00
Denomination: ESBE CRA911, Flow pipe sensor



ADAPTOR KIT:

Adaptor kit for different type of valves.

Type:	Reference:	Art nr:
ARA802	ESBE Series MG, G, F, BIV, H, HG	1600 04 00
ARA803	ESBE Series VRG, VRB	1600 05 00
ARA805	Meibes	1600 06 00
ARA806	Honeywell Centra Corona, Series V5433A, V5433G, V5442A, V5442G	1600 08 00
ARA807	Watts	1600 07 00
ARA808	Lovato	1600 09 00
ARA809	PAW	1600 10 00

SPAREPARTS:

Type:	Reference:	Art nr:
CRA912	Voltage adaptor 230V – 24V	1705 33 00
CRA913	Voltage cable for direct connection to 24V power supply	1705 35 00
CRB914	Communication cable, 20 meter	1705 57 00
CRC911	Outdoor sensor	1705 60 00