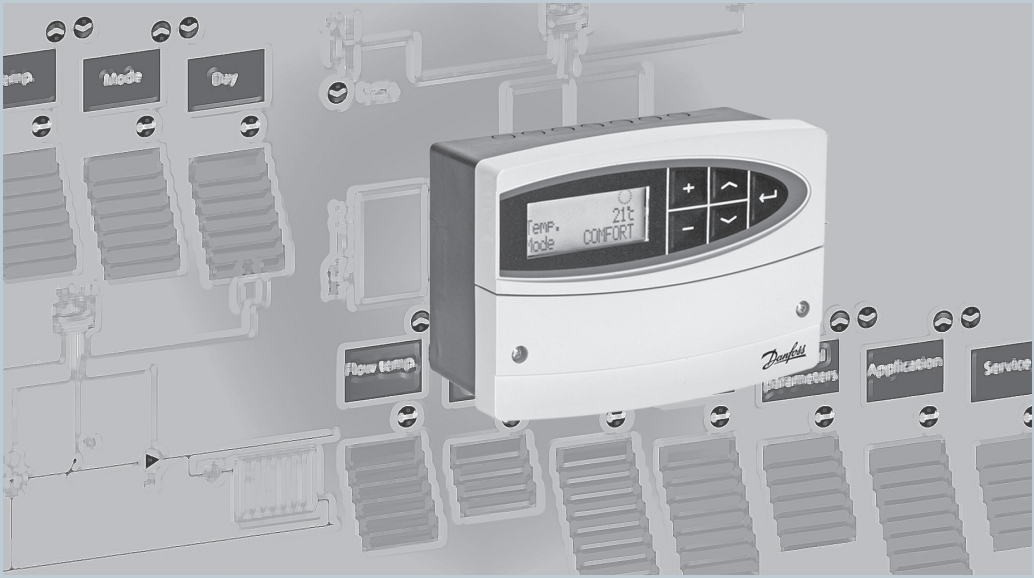
ENGINEERING TOMORROW

Operating Guide

ECL Comfort 110, application 130

(valid as of software version 1.08)

English version



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How to navigate?

Adjust temperatures and values.

Switch between menu lines.

Select / return.

2 sec.
Return to daily user menu.

What do the symbols mean?

The desired flow temperature is influenced by for example return temperature.

The actuator closes the control valve.

The actuator opens the control valve.

The actuator does not activate the valve.

The pump is ON.

The pump is OFF.

The controller is in setback mode.

The controller is in pre-setback mode (the symbol is blinking).

The controller is in comfort mode.

The controller is in pre-comfort mode (the symbol is blinking).

Safety Note

To avoid injury of persons and damages to the device, it is absolutely necessary to read and observe these instructions carefully. The warning sign is used to emphasize special conditions that should be taken into consideration.

This symbol indicates that this particular piece of information should be read with special attention.

Weather compensated flow temperature control of heating and boiler systems

User guide, installation & maintenance

Table of contents

How to use this guide

The instructions is divided into six parts:
- Introduction
- Settings overview
- Daily use
- Maintenance
- Installation
- Check

Basic principles of application 130 for ECL Comfort 110

Typically, the flow temperature is always adjusted according to your requirements. The flow temperature sensor (S3) is the most important sensor. The desired flow temperature at S3 is calculated in the ECL Comfort controller, based on the outdoor temperature (S1). The lower the outdoor temperature, the higher the desired flow temperature.

The motorized control valve (M1) is opened gradually when the flow temperature is lower than the desired flow temperature and vice versa.

The return temperature (S4) to the district heating supply should not be too high. If so, the desired flow temperature can be adjusted (typically to a lower value) thus resulting in a gradual closing of the motorized control valve. In boiler-based heating supply the return temperature should not be too low (same adjustment procedure as above).

If the measured room temperature does not equal the desired room temperature, the desired flow temperature can be adjusted.

The circulation pump, P1, is ON when the desired flow temperature is higher than 20 °C (factory setting) or the outdoor temperature is lower than 2 °C (factory setting).

°C (degrees Celsius) is an absolute temperature whereas K (Kelvin) is a relative temperature.

Settings overview

	Line	Page	Factory setting	Your setting
Slope	2175	11	1.2	
Displace (parallel displacement)	2176	13	0	
Temp. min. (flow temp. limit, min.)	2177	13	10 °C	
Temp. max. (flow temp. limit, max.)	2178	13	90 °C	
Intgr. time (time constant for room temp.)	3015	16	OFF	
Gain - max. (room temp. limitation, max.)	3182	16	-4.0	
Gain - min. (room temp. limitation, min.)	3183	16	0.0	
Limit (return temp. limitation)	4030	17	50 °C	
Gain - max. (return temp. limitation - max. influence)	4035	18	-2.0	
Gain - min. (return temp. limitation - min. influence)	4036	18	0.0	
Intgr. time (time constant for return temp. limitation)	4037	19	25 s	
Priority (priority for return temp. limitation)	4085	19	OFF	
Auto-reduct (setback temp. dependent on outdoor temp.)	5011	20	-15 °C	
Boost	5012	20	OFF	
Ramp (reference ramping)	5013	21	OFF	
Optimizer (optimizing time constant)	5014	21	OFF	
Based on (optimization based on room / outdoor temp.)	5020	22	OUT	
Total stop	5021	23	OFF	
S1 T filter (outdoor temp. filter)	5081	23	100	
Cut-out (limit for heating cut-out)	5179	24	18 °C	
Motor prot. (motor protection)	6174	25	OFF	
Xp (proportional band)	6184	25	80 K	
Tn (integration time constant)	6185	25	30 s	
M1 run (running time of the motorized control valve)	6186	25	35 s	
Nz (neutral zone)	6187	26	3 K	
ECA address (choice of room panel / remote control)	7010	28	OFF	
P1 exercise (pump exercise)	7022	28	ON	
M1 exercise (valve exercise)	7023	28	OFF	
Actuator (gear motor / thermo actuator)	7024	28	GEAR	
DHW prior. (closed valve / normal operation)	7052	29	OFF	
P1 frost T (frost protection)	7077	29	2 °C	
P1 heat T (heat demand)	7078	30	20 °C	
Standby T (standby temperature)	7093	30	10 °C	
Ext. (external override)	7141	30	OFF	
Knee point	7162	31	40 °C	
Min. on time (min. activation time gear motor)	7189	31	10	
Daylight (daylight saving time changeover)	7198	31	ON	
ECL address (master / slave address)	7199	31	15	
Type	7600	32	130	
Code no.	8300	33	XXXX	
Ver. (version no.)	8301	33	XXXX	
Backlight (display brightness)	8310	33	16	
Contrast (display contrast)	8311	33	10	
Language	8315	34	English	
MOD address (MODBUS address)	8320	34	5	

Temperatures

Push any button to switch on the backlight.

Setting the desired room temperature

Change the desired temperature.

The setting of the desired room temperature is important even if a room temperature sensor / room panel / remote control is not connected.

Is the room temperature too low?

Make sure that the radiator thermostat(s) does not limit the room temperature.

If you still cannot obtain the desired room temperature by adjusting the radiator thermostats, the flow temperature is too low. Increase the desired room temperature.

Temperature overview

2 sec.

Push the button to see the sensor (S1-S4) temperatures.

Change between the temperature displays:

S1:
Actual outdoor temperature
Accumulated outdoor temperature

S2:
Actual room temperature
Desired room temperature

S3:
Actual flow temperature
Desired flow temperature

S4:
Actual return temperature
Desired return temperature limitation

Push to exit 'Temperature overview'.

If the temperature value is displayed as
"- -" the sensor in question is not connected.
"- - -" the sensor is short-circuited.

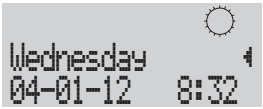
Select control mode

During scheduled operation (AUTO), the symbols will show you the control mode.

Change the mode (AUTO, COMFORT, SETBACK, or STANDBY).

Set your personal schedule

It is only possible to set the personal schedules if the ECL Comfort 110 controller has a built-in ECA 110 timer program.



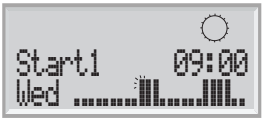
This display will show the current day and time.

Choose the day for which you wish to change the settings.

Today's schedule

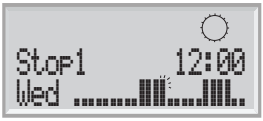
The first display will show you the start of the first comfort period ('Start1'). See or change the start of this period.

The first bar will blink.

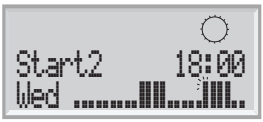


See or change the end ('Stop1') of the first comfort period.

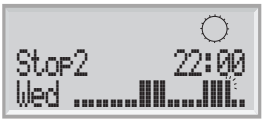
The next bar will blink.



See or change the start ('Start2') of the next comfort period.



See or change the next start / stop periods, if necessary.



The schedule has always two comfort periods a day. The start and stop times can be set in half-hourly intervals (30 min.).

To arrange only one comfort period on a day: Set Start2 and Stop2 times to the same time value.

2 sec.
Enter the maintenance menus.

Date - time 1000

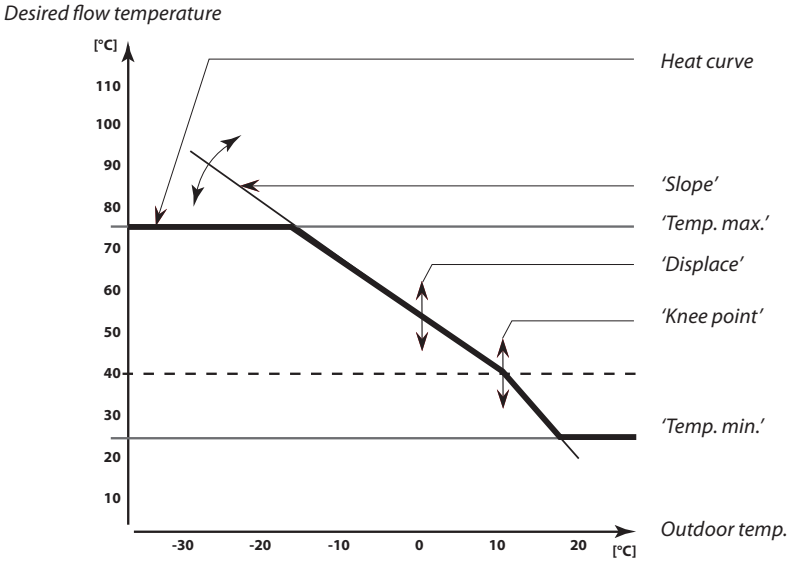
It is only necessary to set the correct date and time in connection with the first use of the ECL Comfort 110 controller or after a power break of more than 36 hours (see the chapter on Adapting the ECL Comfort 110 controller).

Flow temp. (flow temperature control) 2000

Heat curve

The ECL Comfort 110 controls the heating system according to the calculated flow temperature under the influence of the return and / or room temperature.

The desired flow temperature is defined by 5 settings: 'Temp. max.', 'Temp. min.', 'Slope', 'Displace', and 'Knee point'.



The calculated flow temperature can be influenced by connected sensors, 'Boost' and 'Ramp' etc.

Slope	2175
Setting range	*Factory setting*
0.1 ... 4.0	***1.2***

Adjust the 'Slope' of the heat curve, if required.
The heat curve slope depends on the heating system and area specific design parameters.

Example I

Design parameter:	
Designed outdoor temperature (T_{out})	-12 °C
Designed flow temperature (T_{flow})	80 °C
Designed room temperature (T_{room})	20 °C

For designed flow temperature higher than 40 °C, the heat curve slope *(S)* can be calculated as:

$$S = \frac{T_{flow} - 25}{2.5 \times T_{room} - T_{out} - 30}$$

$$S = \frac{80 - 25}{2.5 \times 20 - (-12) - 30}$$

$$S \approx 1.7$$

Example II

Design parameter:	
Designed outdoor temperature (T_{out})	-20 °C
Designed flow temperature (T_{flow})	35 °C
Designed room temperature (T_{room})	21 °C

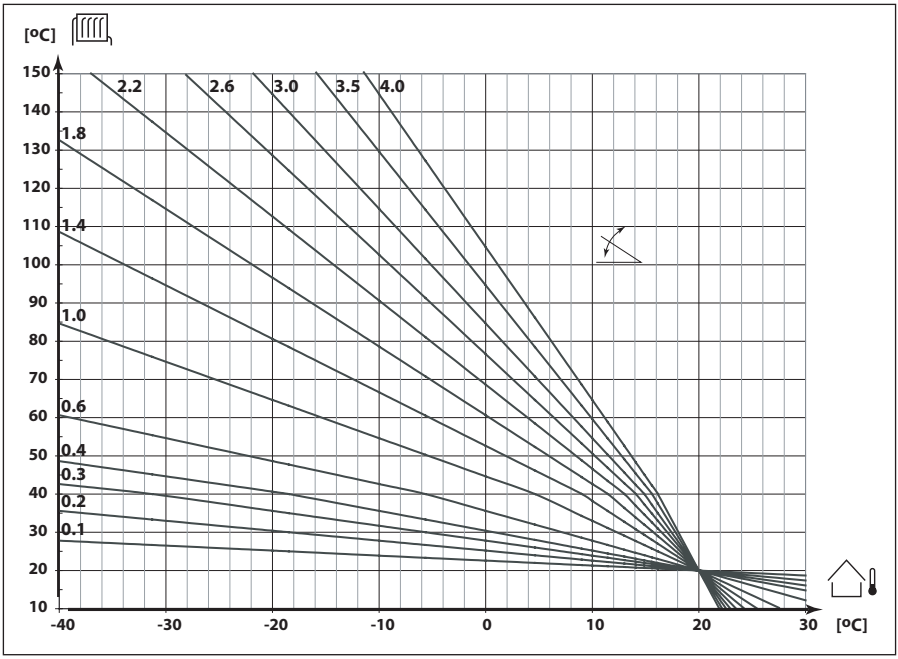
For designed flow temperatures lower than 40 °C, the heat curve slope *(S)* can be calculated as:

$$S = \frac{T_{flow} - 20}{1.3\ (2.5 \times T_{room} - T_{out} - 30)}$$

$$S = \frac{35 - 20}{1.3\ (2.5 \times 21 - (-20) - 30)}$$

$$S \approx 0.3$$

For quick setting, the graph can be used. The graph is intended for a T_{room} of 20 °C. If the design data from example I is used, the slope will be approx. 1.7.



How to determine another heat curve, if necessary:
Choose the calculated flow temperature for your system and the determined min. outdoor temperature for your area. Pick the heat curve closest to the crossing point of these two values.

The setting of the desired room temperature has an influence on the calculated flow temperature (heat curve), no matter if a room temperature sensor is connected or not.

Floor heating systems
This controller is factory set for radiator systems, which typically are high flow temperature systems. To control floor heating systems, which typically are low flow temperature systems, you need to change the 'Slope' according to your type of system (typical setting: 0.6).

Displace (parallel displacement)	2176
Setting range	*Factory setting*
-20 ... 20	***0***

Adjust the parallel displacement of the heat curve with a number of degrees, if required.

Whether it is reasonable to change the 'Slope' (at outdoor temperatures below 0 °C) or parallel displacement (at outdoor temperatures above 0 °C) will depend on the individual heat requirement.

Small increases or reductions in the heating temperature can be implemented by means of the parallel displacement.

Temp. min. (flow temp. limit, min.)	2177
Setting range	*Factory setting*
10 ... 150 °C	***10 °C***

Choose the allowed min. flow temperature for your system. Adjust the factory setting, if required.

Temp. max. (flow temp. limit, max.)	2178
Setting range	*Factory setting*
10 ... 150 °C	***90 °C***

Choose the allowed max. flow temperature for your system. Adjust the factory setting, if required.

The setting for 'Temp. max.' has higher priority than 'Temp. min.'.

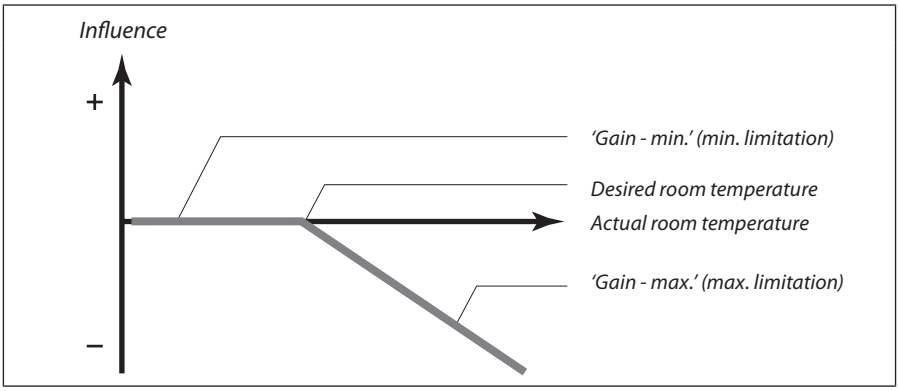
Room T limit (room temperature limitation) 3000

This section is only relevant if you have installed a room temperature sensor or room panel / remote control.

The controller adjusts the desired flow temperature to eliminate the difference between the desired and the actual room temperature.

There are two basic principles for control of the room temperature.

A: Max. room temperature limitation
Use this limitation if your heating system is fully equipped with thermostats and you also want to obtain a max. limitation of the room temperature. The controller will allow for free heat gains, i.e. solar radiation or heat from a fire place, etc.



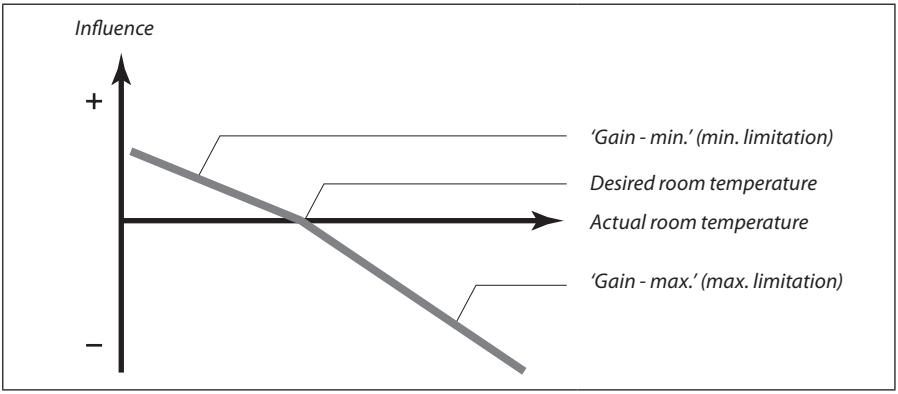
The 'Gain - max.' determines how much the room temperature should influence the desired flow temperature.

If the 'Gain' is too high and / or the 'Intgr. time' too low, there is a risk of unstable control.

Example A1
The actual room temperature is 2 degrees too high.
The 'Gain - max.' is set to -4.0.
The 'Gain - min.' is set to 0.0.
The 'Slope' is 1.8.
Result:
The desired flow temperature is changed by 2 x -4.0 x 1.8 = -14.4 degrees.

B: Reference room temperature control
Used if your heating system is not equipped with thermostats and you select the room with room temperature sensor as a temperature reference for the rest of the rooms.

Set a positive value for the 'Gain - min.' and a negative value for the 'Gain - max.'.



The room temperature sensor in the reference room measures the actual room temperature.

If a difference occours between the actual and the desired room temperature, the desired flow temperature can be corrected. The correction is based on the settings in the lines 3182 and 3183. This correction of the desired flow temperature will normally give a correct room temperature. See also line 3015.

Example B1
The actual room temperature is 2 degrees too low.
The 'Gain - max.' is set to -3.5.
The 'Gain - min.' is set to 2.0.
The 'Slope' is 1.8.
Result:
The desired flow temperature is changed by 2 x 2.0 x 1.8 = 7.2 degrees.

Example B2
The actual room temperature is 2 degrees too high.
The 'Gain - max.' is set to -3.5.
The 'Gain - min.' is set to 2.0.
The 'Slope' is 1.8.
Result:
The desired flow temperature is changed by 2 x (-3.5) x 1.8 = -12.6 degrees.

This limitation is based on a PI regulation where P (Gain) responds quickly to deviations and I (Intgr. time) responds slower and over time removes the small offsets between the desired and actual values. This is done by changing the desired flow temperature.

Intgr. time (time constant for room temp.)	**3015**
Setting range	*Factory setting*
OFF / 1 ... 50	***OFF***
Controls how fast the room temperature adapts to the desired room temperature (I control).	

OFF: The control function is not influenced by the 'Intgr. time'.

1: The desired temperature is adapted quickly.

50: The desired temperature is adapted slowly.

Gain - max. (room temp. limitation, max.)	**3182**
Setting range	*Factory setting*
-9.9 ... 0.0	***-4.0***
Determines how much the flow temperature will be influenced (decreased) if the room temperature is higher than the desired room temperature (P control).	

-9.9: The room temperature has a big influence.

0.0: The room temperature has no influence.

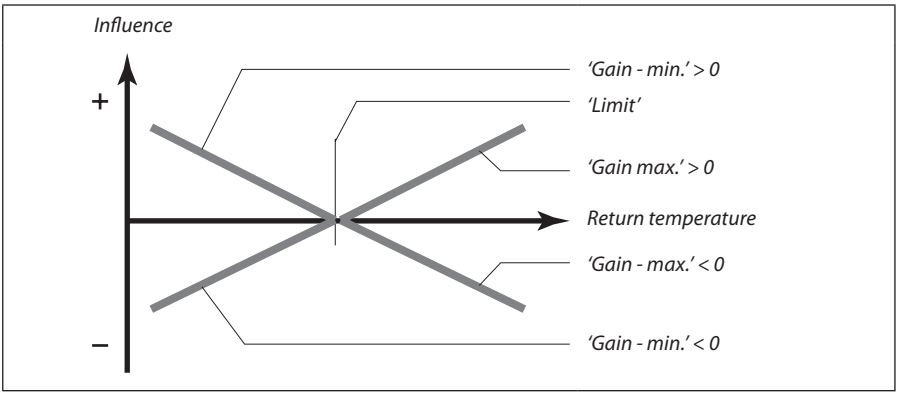
Gain - min. (room temp. limitation, min.)	**3183**
Setting range	*Factory setting*
0.0 ... 9.9	***0.0***
Determines how much the flow temperature will be influenced (increased) if the room temperature is lower than the desired room temperature (P control).	

0.0: The room temperature has no influence.

9.9: The room temperature has a big influence.

Return T limit (return temp. limitation) 4000

The controller automatically changes the desired flow temperature to obtain an acceptable return temperature when the return temperature falls below or gets higher than the set limit.



This limitation is based on a PI regulation where P (Gain) responds quickly to deviations and I (Intgr. time) responds slower and over time removes the small offsets between the desired and actual values. This is done by changing the desired flow temperature.

If the 'Gain' is too high and / or the 'Intgr. time' too low, there is a risk of unstable control.

Limit (return temp. limitation)	**4030**
Setting range	*Factory setting*
10 ... 110 °C	***50 °C***
Set the return temperature you accept for the system.	

Set the acceptable return temperature limit.

When the return temperature falls below or gets higher than the set value, the controller automatically changes the desired flow temperature to obtain an acceptable return temperature. The influence is set in lines 4035 and 4036.

Gain - max. (return temp. limitation - max. influence)	4035
Setting range	*Factory setting*
-9.9 ... 9.9	***-2.0***
Determines how much the flow temperature will be influenced if the return temperature is higher than the desired 'Limit' (line 4030) (P control).	

Influence higher than 0:
The desired flow temperature is increased, when the return temperature gets higher than the set limit.

Influence lower than 0:
The desired flow temperature is decreased, when the return temperature gets higher than the set limit.

Example
The return limit is active above 50 °C.
The influence is set to -2.0.
The actual return temperature is 2 degrees too high.
Result:
The desired flow temperature is changed by -2.0 x 2 = -4.0 degrees.

Normally, the setting in line 4035 is lower than 0 in district heating systems to avoid a too high return temperature.
Typically, the setting in line 4035 is 0 in boiler systems because a higher return temperature is acceptable (see also line 4036).

Gain - min. (return temp. limitation - min. influence)	4036
Setting range	*Factory setting*
-9.9 ... 9.9	***0.0***
Determines how much the flow temperature will be influenced if the return temperature is lower than the desired 'Limit' (line 4030) (P control).	

Influence higher than 0:
The desired flow temperature is increased, when the return temperature gets below the set limit.

Influence lower than 0:
The desired flow temperature is decreased, when the return temperature gets below the set limit.

Example
The return limit is active below 50 °C.
The influence is set to -3.0.
The actual return temperature is 2 degrees too low.
Result:
The desired flow temperature is changed by -3.0 x 2 = -6.0 degrees.

Normally, the setting in line 4036 is 0 in district heating systems because a lower return temperature is acceptable.
Typically, the setting in line 4036 is higher than 0 in boiler systems to avoid a too low return temperature (see also line 4035).

If the return temperature measurement is used as thermometer function only, the settings in lines 4035 and 4036 should be 0.0.

Intgr. time (time constant for return temp. limitation)	**4037**
Setting range	*Factory setting*
OFF / 1 ... 50 s	***25 s***
Controls how fast the return temperature adapts to the desired return temperature (I control).	

OFF: The control function is not influenced by the 'Intgr. time'.
1: The desired temperature is adapted quickly.
50: The desired temperature is adapted slowly.

Priority (priority for return temp. limitation)	**4085**
Setting range	*Factory setting*
ON / OFF	***OFF***
Choose whether the return temperature limitation should overrule the set min. flow temperature 'Temp. min.' (line 2177).	

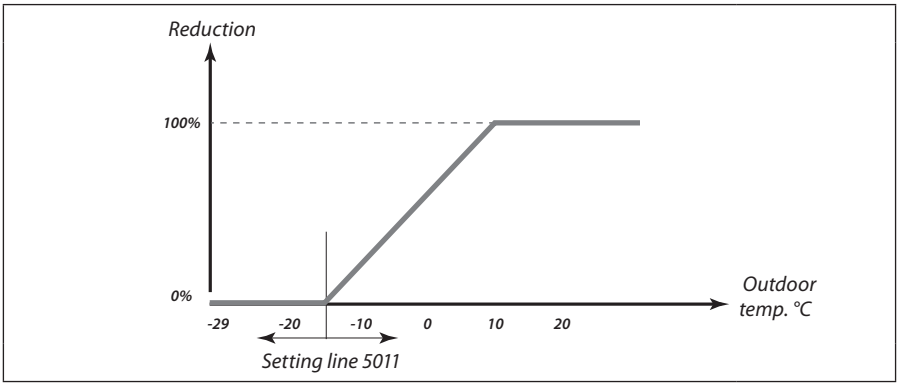
ON: The min. flow temperature limit is overruled.
OFF: The min. flow temperature limit is not overruled.

Optimize 5000

Auto-reduct (setback temp. dependent on outdoor temp.)	5011
Setting range	*Factory setting*
OFF / -29 ... 10 °C	***-15 °C***
Below this outdoor temperature, the setback temperature setting has no influence.	

-29 ... 10: The setback temperature depends on the outdoor temperature, when the outdoor temperature is above the set limit. The lower the outdoor temperature, the less the temperature reduction. When the outdoor temperature is below the set limit, there is no temperature reduction.

OFF: The setback temperature does not depend on the outdoor temperature.



Boost	5012
Setting range	*Factory setting*
OFF / 1 ... 99%	***OFF***
Shortens the heating-up period by increasing the desired flow temperature by the percentage you set.	

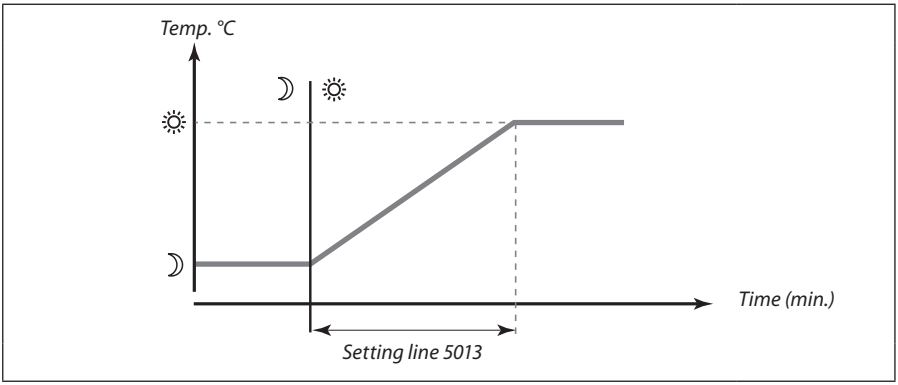
Set the percentage at which you want the desired flow temperature increased temporarily.

In order to shorten the heating-up period after a setback temperature period, the desired flow temperature can be increased temporarily (max. 1 hour). At optimizing the boost is active in the optimization period (line 5014).

If a room temperature sensor or a room panel / remote control is connected, the boost stops when the room temperature is reached.

Ramp (reference ramping)	**5013**
Setting range	*Factory setting*
OFF / 1 ... 99 m	***OFF***
The time in which the desired flow temperature increases gradually to avoid load peaks in the heat supply.	

Set the ramping time for the controller.



In order to avoid load peaks in the supply network, the flow temperature can be set to increase gradually after a period with setback temperature. This causes the valve to open gradually.

Optimizer (optimizing time constant)	**5014**
Setting range	*Factory setting*
OFF / 10 ... 59	***OFF***
Optimizes the start and stop times for the comfort temperature period to obtain the best comfort at the lowest energy consumption. The lower the outdoor temperature, the earlier the heating cut-in.	

Adjust the optimizing time constant.

The value consists of a two digit number. The two digits have the following meaning:

Left digit	Heat accumulation of the building	System type
1X	light	Radiator systems
2X	medium	
3X	heavy	
4X	medium	Floor heating systems
5X	heavy	

Right digit	Dimensioning temperature	Capacity
X0	-50 °C	large
X1	-45 °C	•
•	•	•
X5	-25 °C	normal
•	•	•
X9	-5 °C	small

OFF: No optimization. The heating starts and stops at the times set in the schedule.

Dimensioning temperature:
The lowest outdoor temperature (usually determined by your system designer in connection with the design of the heating system) at which the heating system can maintain the designed room temperature.

Example
The system type is radiator, and the heat accumulation of the building is medium.
The left digit is 2.
The dimensioning temperature is -25 °C, and the capacity is normal.
The right digit is 5.

Result:
The setting is to be changed to 25.

It is only possible make use of 'Optimize' if the ECL Comfort 110 controller has a built-in ECA 110 timer program or is connected to an ECA 61.

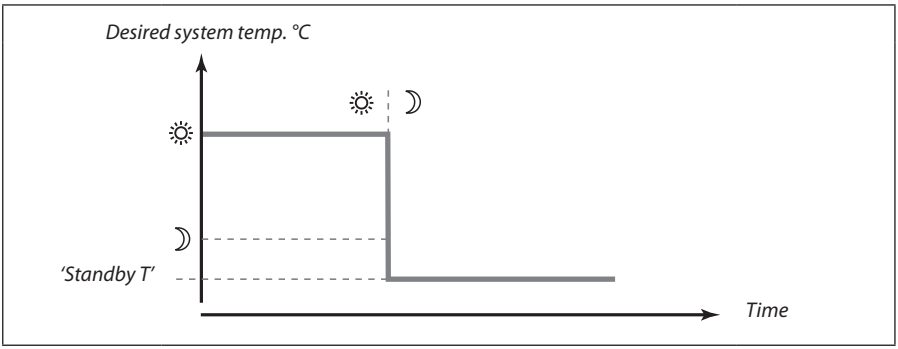
Based on (optimization based on room / outdoor temp.)	**5020**
Setting range	*Factory setting*
ROOM / OUT	***OUT***
The optimized start and stop time can be based on either room or outdoor temperature.	

ROOM: Optimization based on room temperature, if measured.

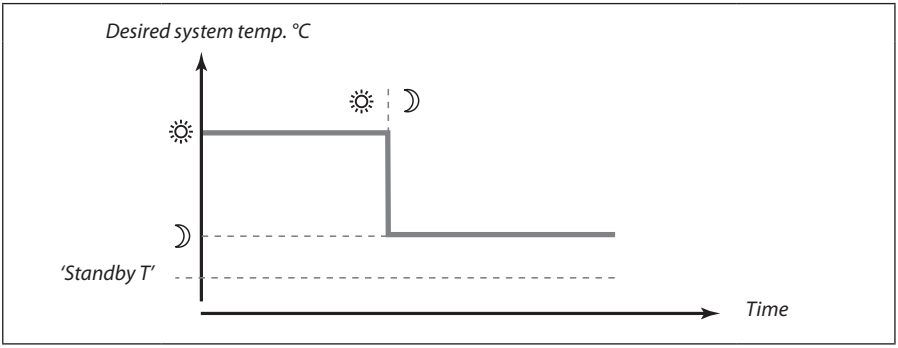
OUT: Optimization based on outdoor temperature. Use this setting if the room temperature is not measured.

Total stop	5021
Setting range	*Factory setting*
ON / OFF	***OFF***
Decide whether you want a total stop during the setback temperature period.	

ON: The desired system temperature is lowered to 'Standby T' (line 7093). 'Temp. min.' (line 2177) is overruled.



OFF: No total stop



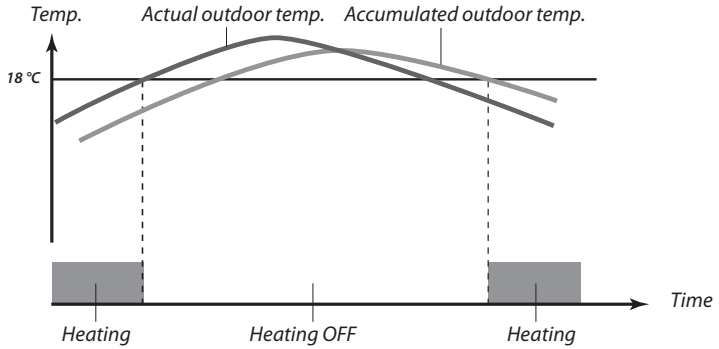
S1 T filter (outdoor temp. filter)	5081
Setting range	*Factory setting*
1 ... 200	***100***
Dampens the measured outdoor temperatures by the set factor.	

1: Fast (low filter constant)

200: Slow (high filter constant)

Cut-out (limit for heating cut-out)	5179
Setting range	*Factory setting*
OFF / 1 ... 50 °C	***18 °C***

Set the outdoor temperature limit at which you want the heating system to stop. The valve closes and after about 3 min. the heating circulation pump stops. 'Temp. min.' set in line 2177 will be ignored.



This function can save energy by stopping the heating system when the outdoor temperature gets above a set limit. The heating system switches ON again when the outdoor temperature and the accumulated outdoor temperature become lower than the set limit.

The heating cut-out is only active when the controller mode is AUTO (scheduled operation). When the limit value is set to OFF, there is no heating cut-out.

Control param. (control parameters) 6000

Motor prot. (motor protection)	6174
Setting range	*Factory setting*
OFF / 10 ... 59 m	***OFF***
Prevents the controller from unstable temperature control (and resulting actuator oscillations). This can occur at very low load. The motor protection increases the lifetime of all involved components.	

OFF: Motor protection is not activated.

10 ... 59: Motor protection is activated after the set activation delay.

Typically used for DHW applications. Can also be used for heating systems at very low load.

Xp (proportional band)	6184
Setting range	*Factory setting*
1 ... 250 K	***80 K***

Set the proportional band. A higher value will result in a stable but slow control of the flow temperature.

Tn (integration time constant)	6185
Setting range	*Factory setting*
5 ... 999 s	***30 s***

Set a high integration time constant to obtain a slow but stable reaction to deviations.

A low integration constant will make the controller react fast but with less stability.

M1 run (running time of the motorized control valve)	6186
Setting range	*Factory setting*
5 ... 250 s	***35 s***

'M1 run' is the time it takes the controlled unit to move from fully closed to fully open position. Set the 'M1 run' according to the example.

How to calculate the running time of a motorized control valve

The running time of the motorized control valve is calculated using the following methods:

Seated valves

Running time = Valve stroke (mm) x actuator speed (sec. / mm)
Example: *5.0 mm x 15 sec. / mm = 75 sec.*

Rotating valves

Running time = Turning degrees x actuator speed (sec. / degr.)
Example: *90 degr. x 2 sec. / degr. = 180 sec.*

Nz (neutral zone)	**6187**
Setting range	*Factory setting*
1 ... 9 K	***3 K***

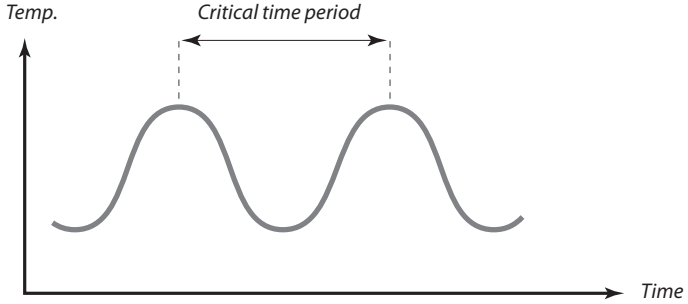
Set the acceptable flow temperature deviation.

Set the neutral zone to a high value if you can accept a high variation in flow temperature. When the actual flow temperature is within the neutral zone, the controller does not activate the motorized control valve.

The neutral zone is symmetrical around the desired flow temperature value, i.e. half the value is above and half the value is below this temperature.

If you want to tune the PI regulation precisely, you can use the following method:

- Set the 'Tn' (integration time constant line 6185) to its max. value (999 sec.).
- Decrease the value for the 'Xp' (proportional band line 6184) until the system starts hunting with a constant amplitude (it might be necessary to force the system by setting an extreme value).
- Find the critical time period on the temperature recording or use a stop watch.



This time period will be characteristic for the system, and you can evaluate the settings from this critical period.

'Tn' = 0.85 x critical time period
'Xp' = 2.2 x proportional band value in the critical time period.

If the regulation seems to be too slow, you can decrease the proportional band value by 10%.

Application 7000

ECA address (choice of room panel / remote control)	7010
Setting range	*Factory setting*
OFF / A / B	***OFF***
Decides the communication with the room panel or remote control.	

OFF: Room temperature sensor (no room panel / remote control)

A: Remote control, ECA 61 with address A

B: Remote control, ECA 61 with address B

P1 exercise (pump exercise)	7022
Setting range	*Factory setting*
ON / OFF	***ON***
Exercises the pump to avoid blocking in periods without heat demand.	

ON: The pump is switched ON for 1 minute every third day around noon.

OFF: The pump exercise is not active.

M1 exercise (valve exercise)	7023
Setting range	*Factory setting*
ON / OFF	***OFF***
Exercises the valve to avoid blocking in periods without heat demand.	

ON: The valve receives a signal to open and close every third day around noon.

OFF: The valve exercise is not active.

Actuator (gear motor / thermo actuator)	7024
Setting range	*Factory setting*
GEAR / ABV	***GEAR***
Choose the actuator type for your valve.	

GEAR: Gear motor

ABV: Thermo actuator (Danfoss type ABV)

Control parameters (lines 6174-6187) are overruled if thermo actuator is chosen (ABV).

DHW prior. (closed valve / normal operation)	7052
Setting range	*Factory setting*
ON / OFF	***OFF***
The heating circuit can be closed when the controller acts as slave and when DHW charging is active in the master.	

ON: The valve in the heating circuit is closed* during active DHW charging in the master controller.

** The desired flow temperature is set to 'Standby T' (line 7093)*

OFF: The flow temperature control remains unchanged during active DHW charging in the master controller.

The setting in line 7052 must be considered if this controller is a slave.

P1 frost T (frost protection)	7077
Setting range	*Factory setting*
OFF / -10 ... 20 °C	***2 °C***
When the outdoor temperature is below the set temperature in 'P1 frost T', the controller automatically switches ON the circulation pump to protect the system.	

OFF: No frost protection.

-10 ... 20: The circulation pump is ON when the outdoor temperature is below the set value.

Under normal conditions, your system is not frost protected if your setting is below 0 °C or OFF. For water-based systems, a setting of 2 °C is recommended.

P1 heat T (heat demand)	7078
Setting range	*Factory setting*
5 ... 40 °C	***20 °C***
When the desired flow temperature is above the set temperature in 'P1 heat T', the controller automatically switches ON the circulation pump to meet the heat demand.	

5 ... 40: The circulation pump is ON above the set value.

The valve is fully closed as long as the pump is not switched on.

Standby T (standby temperature)	7093
Setting range	*Factory setting*
5 ... 40 °C	***10 °C***
Set the desired flow temperature at standby (e.g. during total stop).	

5 ... 40: Desired standby flow temperature.

Ext. (external override)	7141
Setting range	*Factory setting*
OFF / SETBACK / COMFORT	***OFF***
Choose mode for 'Ext.' (external override).	

The override can be activated for setback or comfort mode. For override, the controller mode must be AUTO (scheduled operation).

OFF: The controller's schedule is not overridden.

SETBACK: The controller is in setback mode when terminals 11 and 12 are short-circuited.

COMFORT: The controller is in comfort mode when terminals 11 and 12 are short-circuited.

Knee point	7162
Setting range	*Factory setting*
OFF / 30 ... 50 °C	***40 °C***
Choose the temperature at which the heat curve should bend.	

OFF: Floor heating systems.

30 ... 50: Radiator systems.

Min. on time (min. activation time gear motor)	7189
Setting range	*Factory setting*
2 ... 50	***10***
The min. pulse length in milliseconds for activation of the gear motor.	

Setting	Value x 20 ms
2	40 ms
10	200 ms
50	1000 ms

The setting should be kept as high as acceptable to increase the lifetime of the actuator.

Daylight (daylight saving time changeover)	7198
Setting range	*Factory setting*
ON / OFF	***ON***
Choose whether you want the change to summer / winter time to be automatic or manual.	

ON: The controller's built-in clock automatically changes + / - one hour on the standardized days for daylight saving time changeover for Central Europe.

OFF: You change manually between summer and winter time by setting the clock backward or forward.

ECL address (master / slave address)	7199
Setting range	*Factory setting*
0 ... 15	***15***
This settting is relevant if more controllers are working in the same ECL Comfort system (connected via the ECL BUS) and / or ECA units are connected.	

0: The controller works as slave. The slave receives information about the outdoor temperature (S1), system time, and signal for DHW demand in the master.

1 ... 9: The controller works as slave. The slave receives information about the outdoor temperature (S1), system time, and signal for DHW demand in themaster. The slave sends information about the desired flow temperature to the master.

10 ... 14: Not used.

15: The controller is master. The master sends information about the outdoor temperature (S1) and system time. The ECL BUS is active and connected ECAs are powered.

The ECL Comfort controllers can be connected via the ECL BUS to perform a larger system. The controller, which is physically connected with the outdoor temperature sensor, is the master of the entire system and must have the address 15.

Each slave must be configured with its own address (1 ... 9).

However, more slaves can have the address 0 if they only have to receive information about outdoor temperature and system time.

Type	**7600**
Setting range	*Factory setting*
116 / 130	***130***
Use this setting to change your application or restore the factory settings.	

116: Constant temperature control of DHW circuit.
130: Weather compensated control of heating and boiler systems.

Select the desired application type.

5 sec.
Start the chosen application.

Factory settings are restored. All personal settings will be deleted. It is recommended to make a note of your personal settings in the 'Settings overview' for future use.

The application can not be changed from 116 to 130 or vice versa if the ECL Comfort 110 is pre-programmed from the substation-builder.

Service 8000

Code no.	8300
	Display
	087BXXXX

Ver. (version no.)	8301
	Display
	ABBBCCWWYY

A = Hardware version
BBB = Software version
CC = Application version
WW = Production week
YY = Production year

Please state the version in connection with questions about the product, if any.

Backlight (display brightness)	8310
Setting range	*Factory setting*
OFF / 1 ... 30	***16***
The brightness of the display can be adjusted.	

OFF: No backlight.
1: Weak backlight.
30: Strong backlight.

Contrast (display contrast)	8311
Setting range	*Factory setting*
0 ... 20	***10***
The contrast of the display can be adjusted.	

0: High contrast
20: Low contrast

Language	8315
Setting range	*Factory setting*
Multiple	***English***
Choose your language.	

MOD address (MODBUS address)	8320
Setting range	*Factory setting*
0 ... 247	***5***
Set the MODBUS address if the controller is part of a MODBUS network.	

Assign the MODBUS addresses within the stated setting range.

Mounting the ECL Comfort controller

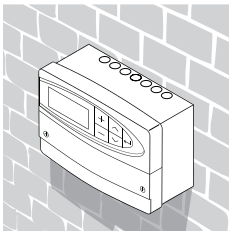
For easy access, you should mount the ECL Comfort controller near the system. Select one of the three following methods:

- Mounting on a wall
- Mounting on a DIN rail
- Mounting in a panel

Screws and rawlplugs are not supplied.

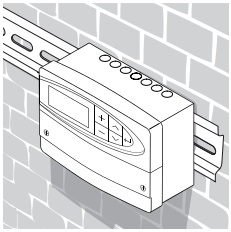
Mounting on a wall

Mount the controller on a wall with a smooth surface and establish the electrical connections.



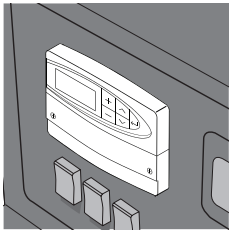
Mounting on a DIN rail

Mount the controller on the DIN rail and establish the electrical connections.



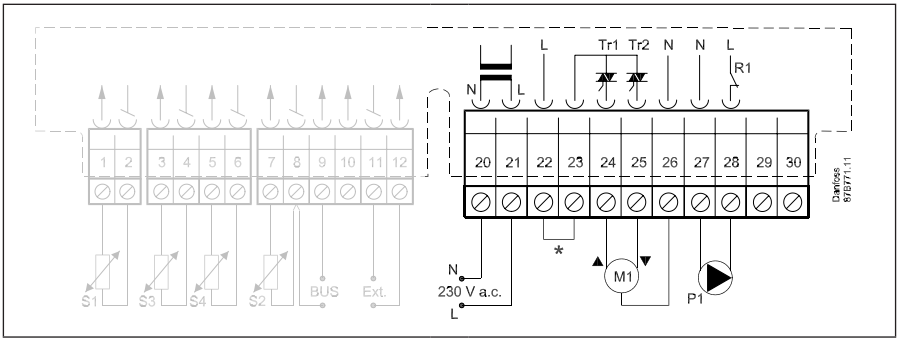
Mounting in a panel

Mounting kit: Order code no. 087B1249.
The panel plate thickness must not exceed 5 mm. Prepare a cut-out with the dimensions 93 x 139 mm. Insert the controller into the panel cut-out and fix it with the clamp which is placed horisontally on the controller. Establish the electrical connections.



For further details on mounting, see the mounting guide.

Electrical connections - 230 V a.c. - in general



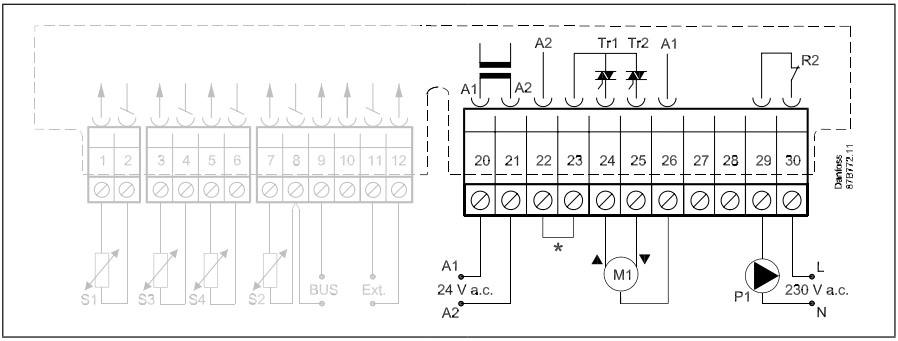
** Optional connections for safety thermostat*

Terminal		Description	Max. load
20		Supply voltage 230 V a.c. - neutral (N)	
21		Supply voltage 230 V a.c. - live (L)	
22		Optional connections for safety thermostat	
23		Optional connections for safety thermostat	
24	M1	Actuator - open, alt. thermo actuator (ABV)	15 VA
25	M1	Actuator - close	15 VA
26	M1	Actuator - neutral	
27	P1	Circulation pump - neutral	
28	P1	Circulation pump - live (relay R1)	4 (2) A
29		Not to be used	
30		Not to be used	

Wire cross section: 0.5 - 1.5 mm²

Incorrect connection can damage the TRIAC outputs.

Electrical connections - 24 V a.c. - in general



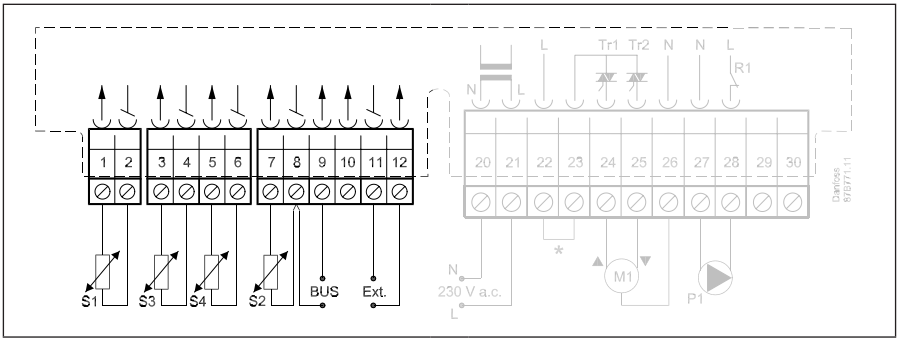
** Optional connections for safety thermostat*

Terminal		Description	Max. load
20		Supply voltage 24 V a.c. - A1	
21		Supply voltage 24 V a.c. - A2	
22		Optional connections for safety thermostat	
23		Optional connections for safety thermostat	
24	M1	Actuator - open, alt. thermo actuator (ABV)	15 VA
25	M1	Actuator - close	15 VA
26	M1	Actuator - A1	
27		Not to be used	
28		Not to be used	
29	P1	Phase for circulation pump (relay R2)	
30	P1	Relay R2	4 (2) A

Wire cross section: 0.5 - 1.5 mm²

Incorrect connection can damage the TRIAC outputs.

Connecting the temperature sensors and the ECL BUS



Terminal	Description		Type (recomm.)
1 and 2	S1	Outdoor temperature sensor	ESMT
3 and 4	S3	Flow temperature sensor*	ESM-11 / ESMC / ESMU
5 and 6	S4	Return temperature sensor	ESM-11 / ESMC / ESMU
7 and 8	S2	Room temperature sensor	ESM-10
8 and 9		ECL BUS, connections for room panel / remote control	ECA 61
10		Not to be used	
11 and 12		Ext. override	

*

The sensor must always be connected in order to have the desired functionality. If the sensor is not connected or the cable is short-circuited, the motorized control valve closes (safety function).

Wire cross section for sensor connections: 0.4 - 0.75 mm²
Total cable length: Max. 125 m (all sensors incl. the ECL BUS)

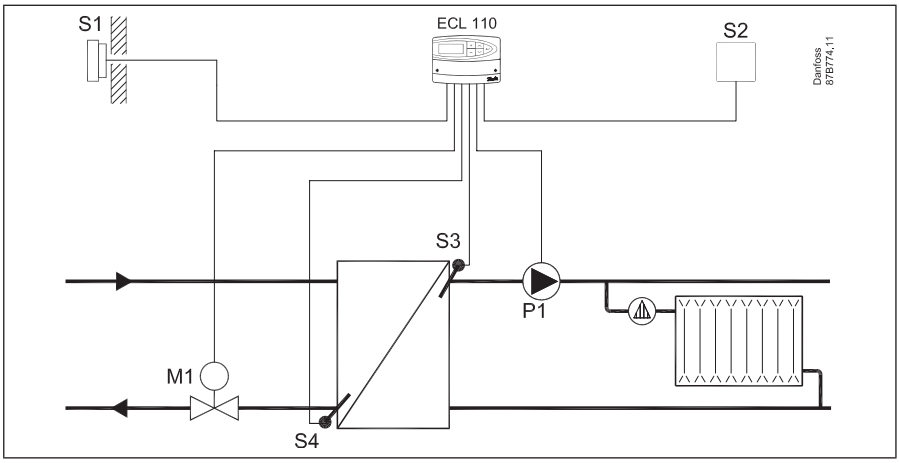
Cable lengths of more than 125 m may cause noise sensibility (EMC).

How to identify your system type

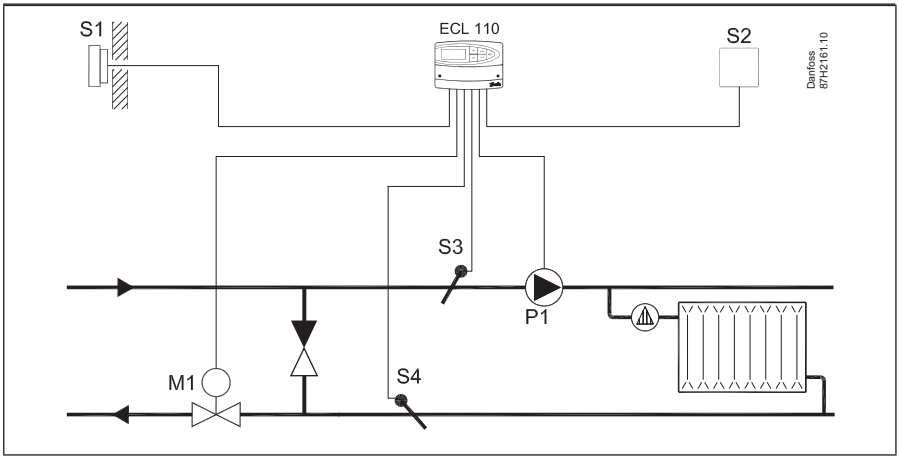
The ECL Comfort controller is a universal controller that can be used for various systems. Based on the shown standard systems, it is possible to configure additional systems.

In this section you find the most frequently used systems. If your system is not quite as shown below, find the diagram which has the best resemblance with your system and make your own combinations.

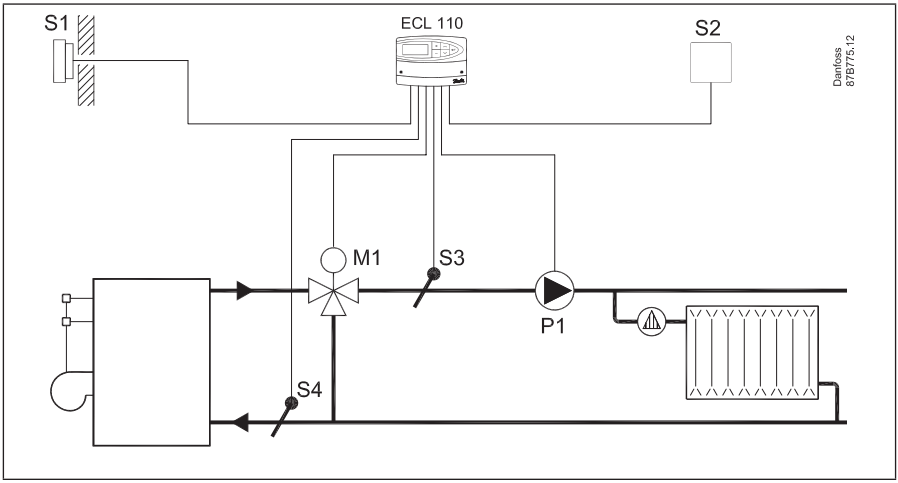
Heating system 1: ***District heating circuit with heat exchanger***



Heating system 2: ***District heating circuit with direct connection***



Heating system 3: ***Boiler-based heating circuit***



Adapting the ECL Comfort 110 controller

When you switch on the controller the first time, it will ask you to choose language (default language is English).

Choose your language.

Accept and go to the next menu.

When the language is chosen, the controller will ask for date and time setting.

Set day (dd), month (mm), year (yy), hour (hh), and minuts (mm).

Change values.

Accept the chosen time and date.

When the language has been chosen, and date and time have been set, the controller will ask for application type.

Choose application type.

2 sec.
Start the chosen application.

Go to the 'Maintenance' part for further setup of your controller.

Manual control

Select control mode.

5 sec.
Go to manual mode.

Actuator M1 is opening ( )

Actuator M1 is closing ( )

Pump P1 is ON ( )

Pump P1 is OFF ( )

Select control mode.

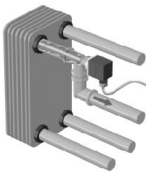
> Manual mode should only be used for maintenance purposes. In manual mode all control and safety functions are deactivated!

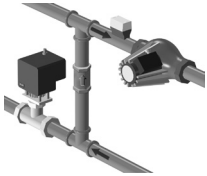
Placing the temperature sensors

It is important that the sensors are mounted in the correct position in your system. The temperature sensor mentioned below are sensors used for the ECL Comfort series which not all will be needed for your application!

Outdoor temperature sensor (ESMT)
The outdoor sensor should be mounted on that side of the building where it is less likely to be exposed to direct sunshine. It should not be placed close to doors, windows or air outlets.

Flow temperature sensor (ESMU, ESM-11 or ESMC)
Place the sensor max. 15 cm from the mixing point. In systems with heat exchanger, Danfoss recommends that the ESMU-type to be inserted into the exchanger flow outlet.

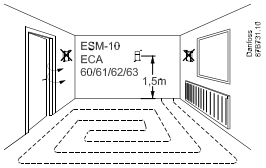




Make sure that the surface of the pipe is clean and even where the sensor is mounted.

Return temperature sensor (ESMU, ESM-11 or ESMC)
The return sensor should always be placed in / on a pipe with return water flow.

Room temperature sensor (ESM-10 or ECA 61 remote control)
Place the room sensor in the room where the temperature is to be controlled. Do not place it on outer walls or close to radiators, windows or doors.



DHW temperature sensor (ESMU or ESMB-12)
Place the DHW temperature sensor according to the manufacturer's specification.

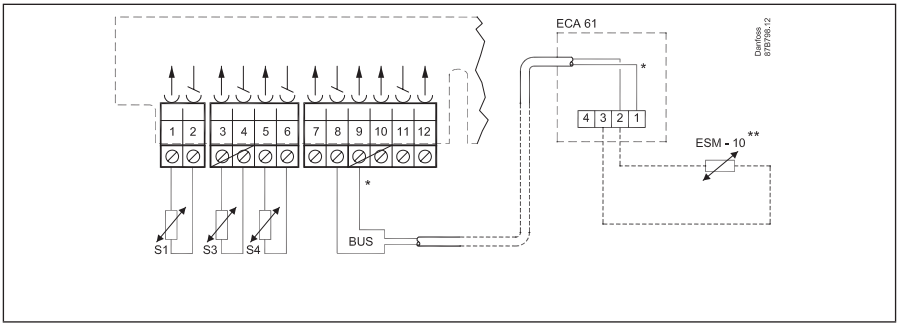
Boiler temperature sensor (ESMU, ESM-11 or ESMC)
Place the sensor according to the boiler manufacturer's specification.

Flow / air duct temperature sensor (ESM-11, ESMB-12, ESMC or ESMU types)
Place the sensor so that it measures a representative temperature.

Surface temperature sensor (ESMB-12)
Place the sensor in the surface of the floor.

Valid for ESM-11: Do not move the sensor after it has been fastened in order to avoid damage to the sensor element.

Connecting the room panel / remote control



* *Connect ECL terminal 9 to 1 and terminal 8 to 2.*

The ECA 61 is activated by the setting in line 7010.
The ECA 61 is powered by the ECL BUS which means that the BUS must be active.
The BUS is activated by setting the controller address to 15 (line 7199).

Is the ECL Comfort controller ready for use?

- ☐ Make sure that the correct power supply is connected to terminals 21 (Live) and 20 (Neutral).
- ☐ Check that the required controlled units (actuator, pump etc.) are connected to the correct terminals.
- ☐ Check that all sensors are connected to the correct terminals.
- ☐ Switch on the power.
- ☐ Choose manual operation as controller mode.
- ☐ Check that valves open and close, and that required controlled units (pump etc.) start and stop when operated manually.
- ☐ Check that the temperatures shown in the display match the actual sensors.

The time shown in the display is one hour off?
See the daylight saving time changeover in line 7198.

The time shown in the display is not correct?
The internal clock may have been reset, if there has been a power break for more than 36 hours. Set time and date. See line 1000.

What does the symbol ⫩ mean?
The flow temperature is under influence of room temperature limitation, return temperature limitation, boost, ramping, heating cut-out, DHW priority etc.

The room temperature is too low?
Make sure that the radiator thermostats do not limit the room temperature. If you still cannot obtain the desired room temperature by adjusting the radiator thermostats, the flow temperature is too low. Increase the desired room temperature (line 3000). If this does not help, adjust the heat curve / desired temperature (line 2000).

The room temperature is too high during setback periods?
Make sure that the min. flow temperature limitation is not too high. See line 2177.

The temperature is unstable?
- Check that the flow temperature sensor is correctly connected and in the right place.
- If the controller has a room temperature signal (line 3000), check that the Gain is not too high.
- Adjust the control parameters (line 6000).

The controller does not operate and the control valve is closed?
- Check that the flow temperature sensor is measuring the correct value, see 'Daily use'.
- Check the influence from other measured temperatures (⫩).

How to restore the factory settings?
See line 7600.

What does P and PI control mean?
P control: Proportional control.
By using a P control, the controller will change the flow temperature proportional to the difference between a desired and an actual temperature, e.g. a room temperature.
A P control will always have an offset which not will disappear over time.

PI control: Proportional and Integrating control.
A PI control does the same as a P control, but the offset will disappear over time.
A long 'Intgr. time' will give a slow but stable control, and a short 'Intgr. time' will result in a fast control but with a higher risk of oscillations.

Comfort operation
Normal temperature in the system controlled by the schedule. During heating the flow temperature in the system is higher to maintain the desired room temperature. During cooling the flow temperature in the system is lower to maintain the desired room temperature.

Comfort temperature
Temperature maintained in the heating / DHW circuit during comfort periods.

Desired flow temperature
Temperature calculated by the controller on basis of the outdoor temperature and influences from the room and / or return temperatures. This temperature is used as a reference for the control.

Desired room temperature
Temperature which is set as the desired room temperature. The temperature can only be controlled by the ECL Comfort controller if a room temperature sensor is installed.
If a sensor is not installed, the set desired room temperature however still influences the flow temperature.
In both cases the room temperature in each room is typically controlled by radiator thermostats / valves.

Desired temperature
Temperature based on a setting or a controller calculation.

DHW circuit
The circuit for heating the domestic hot water (DHW).

Factory settings
Settings stored in the controller to simplify the setup of your controller the first time.

Flow / DHW temperature
Temperature measured in the flow at any time.

Heating circuit
The circuit for heating the room / building.

Heat curve
A curve showing the relationship between actual outdoor temperature and required flow temperature.

Limitation temperature
Temperature that influences the desired flow / balance temperature.

Pt 1000 sensor
All sensors used with the ECL Comfort controller are based on the Pt 1000 type. The resistance is 1000 ohm at 0 °C and it changes with approx. 3.9 ohm / degree.

Optimization
The controller optimizes the start / stop time of the scheduled temperature periods. Based on the outdoor temperature, the controller automatically calculates when to start / stop in order to reach the comfort temperature at the set time. The lower the outdoor temperature, the earlier the start time. During optimization the comfort / setback symbol will blink.

Return temperature
The temperature measured in the return can influence the desired flow temperature.

Room temperature sensor
Temperature sensor placed in the room (reference room, typically the living room) where the temperature is to be controlled.

Room temperature
Temperature measured by the room temperature sensor, room panel or remote control. The room temperature can only be controlled directly if a room temperature is measured. The room temperature can influence the desired flow temperature.

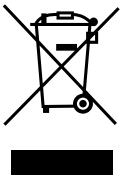
Schedule
Schedule for periods with comfort and setback temperatures. The schedule can be made individually for each week day and it consists of 2 comfort periods per day.

Setback temperature
Temperature maintained in the heating / DHW circuit during setback temperature periods.

Time bar
The time bars illustrate scheduled periods with comfort temperature.

Weather compensation
Flow temperature control based on the outdoor temperature. The control is related to a user-defined heat curve.

The definitions apply to the Comfort 110 series. Consequently, you might come across expressions that are not mentioned in your guide.



Disposal note

This symbol on the product indicates that it may not be disposed of as household waste.
It must be handed over to the applicable take-back scheme for the recycling of electrical and electronic equipment.

- Dispose of the product through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

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