LK Room Temperature Control ICS

Design

LK Room Temperature Control ICS is a control system for LK Floor Heating. The system is available in a wireless version where the room thermostat and the receiver communicate via wireless signal transmission. The system is also available in a hard-wired version where the room thermostat and the receiver communicate via 2-core wire transmission. It is also possible to combine wireless and wired communication in the same receiver.

In order to distinguish the different ways of communication the wireless system has the ending -RF in its product name and the wired system has the ending -W.

The receiver is available for 1-channel or 8-channels. Receiver with 1-channel communicates with 1 thermostat and receiver 8-channels can communicate with 1-8 thermostats. See overview at the end of this description.

Function

Room thermostats regulate the temperature of each room (zone) via wired or wireless signal transmission to the receiving control unit. The actuators for each room/zone are controlled by the receiver unit.

The system has several smart features such as adaptive weekly programming, holiday functions, the ability to connect external sensors, external temperature set back via GSM switches, and more. For further information, please see ***In-depth description for LK Room Temperature Control ICS.***

The system benefits from:

- Timeless Scandinavian design
- Thermostats with LCD display
- Self-modulation technology as a standard
- Thermostats in gloss white, gloss black or silver
- Remote control via mobile phone*
- Adaptive weekly programming
- Holiday function
- Logging/function & system analysis*
- Wired & wireless communications in the same control box*
- Valve exercise program
- Pump logic*
- Heat source (e.g. boiler) control*
- Fireplace function**
- Simple programming
- Easy installation

* Only available in LK Receiver ICS-RF8 and LK Receiver ICS-W8.

** The function is only available in units manufactured after 201152 (year 2011, week 52).

Installation instructions ICS-RF

Quick Guide ICS-RF – Installing wireless thermostat and receiver unit

1. Install the receiver adjacent to the manifold. Ensure there is enough space below the unit to remove the lid and that it is possible to connect LK ICS MEM Stick vertically downwards.
2. Fix thermostat back-plates to internal walls approximately 1.5 m above the floor. Take care to orientate correctly; see arrow on the back.
3. Avoid locations that will affect thermostat operation (e.g. direct sunlight and draughts).
4. Next cut LK Actuator connection cable to length (receiver to manifold).
5. Connect each actuator in its terminal plug and insert one actuator plug per actuator output in the receiver unit. **NOTE:** Maximum two LK Actuators per terminal and a maximum of 12 LK Actuators per receiver unit 8 and max 5 LK Actuators per receiver unit 1.
6. Run actuator cables through anti-tension track.
7. Place the radio link in its holder inside the receiver.
8. Program each thermostat to selected channel in the receiver unit by following the ***Quick Guide ICS-RF - Programming wireless thermostat.***
9. Once the programming is completed click the thermostats body into the back-plate.

Quick Guide ICS-RF – Programming wireless thermostat

1. Check that the radio link cable is connected to the receiver's RF input.
2. Press the L-key on the receiver unit for at least 3 seconds, the L-LED will light green.
3. Remove the plastic insulation from the thermostats battery compartment; the thermostat display shows *RUR*. Press *Mode* on the thermostat until ☑ shows in the display.
4. The receiver units' L-LED switches to yellow and selectable channels light up green.
5. Select channel by pressing a desired channel key, the selected channel flashes green.
6. Confirm by pressing *Mode* once on the thermostat. The thermostat switches to normal view.
7. Repeat steps 3-7 for other thermostats.
8. Once the programming is complete, press the L-key in the receiver unit to finish the sequence. L-LEDs turn off.

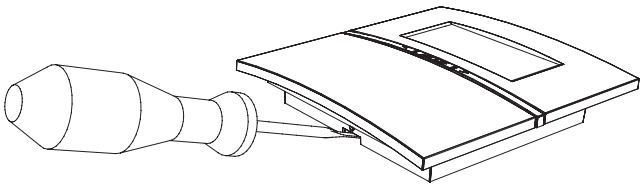
NOTE:
If necessary, the thermostat and the receiver unit can be restored to factory settings. See instructions under the heading **Reset**.

NOTE:
If the installation consists of several receivers which are controlling a single pump, please read section titled **BUS** first.

NOTE:
Please read the section **Checking signal strength** before starting the system.

Quick Guide ICS-RF – Start-up

After completion of installation and programming the thermostat, the system is ready for operation. Set the desired temperature by pressing the right arrow to increase the temperature and the left arrow to decrease the temperature. After a while the thermostat switches to display the actual temperature. The system can be adapted and adjusted to the user's needs and wishes. For further information, please read *In-depth description for LK Room Temperature Control ICS*.



Note!
After completed programming of wireless thermostats the power to the receiver unit should not be interrupted for a longer period of time. If the power is switched off for a long time the thermostats batteries will be consumed quickly.

Installation instructions ICS-W

Quick Guide ICS-W – Installing wired thermostat and receiver unit

1. Install the receiver adjacent to the manifold. Ensure there is enough space below the unit to remove the lid and that it is possible to connect LK ICS MEM Stick vertically downwards.
2. Fix thermostat back-plates to internal walls approximately 1.5 m above the floor. See illustration below how the thermostat opens. Take care to orientate correctly; see arrow on the back.
3. Avoid locations that will affect thermostat operation (e.g. direct sunlight and draughts).
4. Connect cable 2 x 0.5 mm^2 to the terminals on the back plate marked ICS BOX. Click the thermostat body into the back-plate.
5. Connect the thermostat cable to the loose terminal plugs. Insert one thermostat plug per thermostat input. **NOTE:** Maximum of one thermostat per thermostat input.
6. Next cut LK Actuator connection cable to length (receiver to manifold).
7. Connect each actuator in its terminal plug and insert one actuator plug per actuator output in the receiver unit. **NOTE:** Maximum two LK Actuators per terminal and a maximum of 12 LK Actuators per receiver unit 8 and max 5 LK Actuators per receiver unit 1.
8. Run actuator and thermostat cables through anti-tension track.

Quick Guide ICS-W – Programming wired thermostat

If a wired thermostat is to control more than one actuator output the thermostat must be programmed.

Note that each thermostat input has direct impact on the actuator output to the corresponding serial number. That is, the thermostat connected to input 1 is always connected to the actuator output number 1. For example, if the thermostat on the thermostat input 1 should control the output 1 & 2 no other thermostat can be connected to the thermostat input 2.

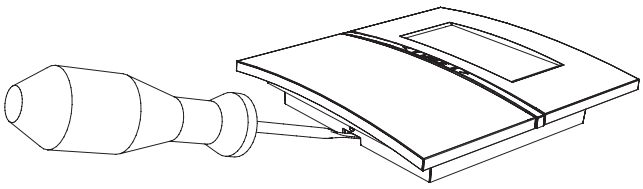
Use the instructions below if a thermostat should control/monitor more than one actuator output:

1. Press the key marked L in the receiver unit for min. 3 seconds, the L-LED will light green.
2. Press the left and right arrow keys on the thermostats simultaneously for min. 5 seconds.
3. *Defa* text flashes on the display, select the text *RUW* with the left/right arrow. Confirm by pressing *Mode*.
4. Select channels by pressing the desired channel key in the receiver; the selected channel flashes green.
5. Confirm by pressing *Mode* once on the thermostat; the display switches to normal view.

NOTE:
If a thermostat shall control more than one channel (actuator output), it is not possible to connect other thermostats to the pre-wired channels corresponding thermostat inputs. E.g. Thermostat 1 shall control actuator output 1, 2 and 3. This means that thermostat inputs 1, 2 and 3 are engaged and cannot be used for connection of other thermostats.

Quick Guide ICS-W – Start-up

After completion of installation and programming of the thermostat the system is ready for operation. Set the desired temperature by pressing the right arrow to increase the temperature and the left arrow to decrease the temperature. After a while the thermostat switches to display the actual temperature. The system can be adapted and adjusted to the user's needs and wishes. For further information, please read ***In-depth description for LK Room Temperature Control ICS.***



Dismount the thermostat from the back-plate by using a screw driver.

In-depth description for LK Room Temperature Control ICS

Recommendation

LK recommend that to achieve optimum efficiency of the under floor heating system the use of weather dependent (weather compensation) flow temperature control, properly set and balanced in line with the design for adjustment of the primary and loop flow. We also recommend the settings are recorded for future reference.

Self-modulation technique

To ensure that LK floor heating is regulated as energy efficiently as possible, LK ICS uses self-modulation technology. Self-modulation (self-learning) ensures that the flow in the floor heating circuits is continuously optimised based on the room's needs; thereby giving rise to better comfort and a more energy efficient and environmentally "smarter" floor heating system than a system that uses traditional On/Off technology.

Adaptive program

Another energy saving feature is that LK ICS has a built-in adaptive weekly program for lowering night temperature (night set-back). This feature enables the system to learn when it needs to turn the floor heating on or off to provide a desired temperature at a desired time.

Holiday function

When on vacation, the temperature of the heating system can be lowered for the duration. This is easily done from any thermostat in the system by activating the built-in holiday mode. LK ICS then keeps track of how many days the system should have a lower temperature and makes sure that the house is again warmed on return from vacation.

Remote control *

Using, for example, LK GSM switch, most standard mobile phones can remotely control the floor heating.

* LK Receiver ICS-W8 and ICS-RF8 only.

Fireplace function*

With the fireplace function activated, ICS learns to work the floor heating, ignoring the perception of cold floors after the fire has been used..

* The function is only available in units manufactured after 201152 (year 2011, week 52).

LK Receiver ICS

LK Receiver ICS-RF8.

LK Receiver ICS-RF1.

Function description

The LK Receiver ICS-RF8 and LK Receiver ICS-W8 have eight channels, allowing up to eight LK Thermostats ICS-RF or eight LK Thermostats ICS-W to be connected to the unit. LK Receiver ICS-RF1 and LK Receiver ICS-W1 have one channel allowing one LK Thermostat ICS-RF or one LK Thermostat ICS-W to be connected to the unit.

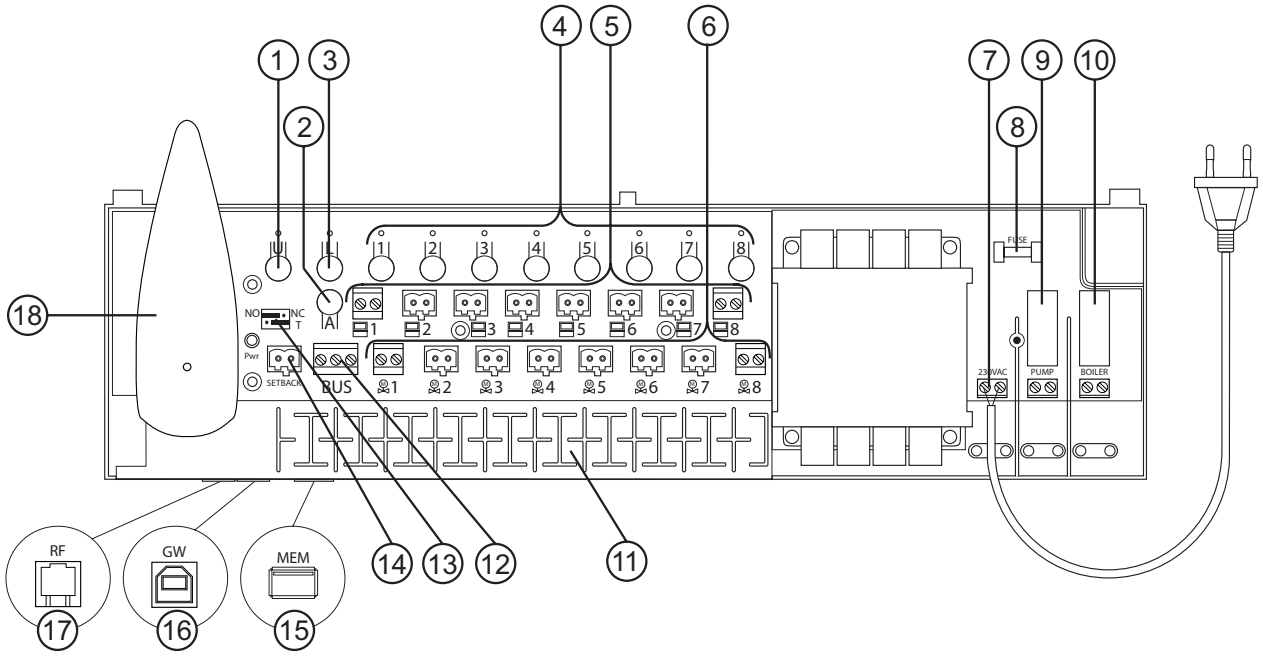
The receiver collects data from each room thermostat and sends control signals to LK Actuators. One thermostat can control more than one channel*. Since the communication between the receiver unit and actuators is via cable, the receiver unit should be placed adjacent to the manifold.

* Only available in LK Receiver ICS-RF8 and LK Receiver ICS-W8.

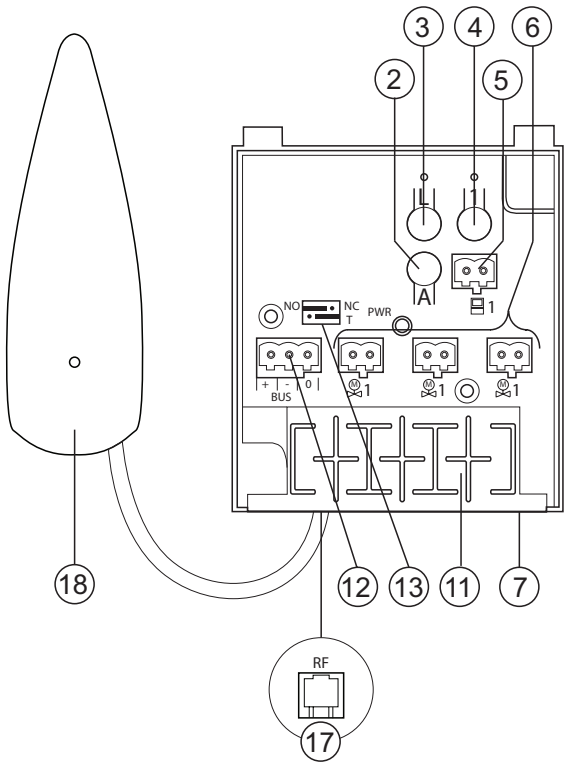
Mounting wireless receiver in manifold cabinet

At delivery, the receiver unit is fitted with a short antenna cable for internal mounting of the radio link. If the signal strength is too low (see section ***Checking signal strength***) when the receiver is installed in a sheet metal manifold cabinet, the radio link should be fixed outside the cabinet. Use accessory LK Antenna Cable ICS for connection of the radio link outside the cabinet.

Description of inputs/outputs/features



LK Receiver ICS-RF8.



LK Receiver ICS-RF1.

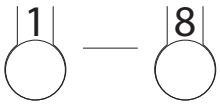
Description of the program keys (1 - 4)

Beneath the receiver unit cover; the following keys are displayed:

U-key, used if the unit's software needs updating; separate instructions accompany any software update. (1)

Alt-key, used in combination with other keys to get alternate functions. (2)

L-key, activates the adaptation mode. (3)



Channels 1-8, are used to select the desired channel for adaptation. (4)

Thermostat input (5)

Wired thermostats are connected to the receiver using a twin-core cable (min. cable size 2 x 0,5 mm^2). Connection is made via the numbered input:

NOTE:
Both hard-wired and wireless thermostats cannot be connected to the same channel.

Note that each thermostat input has direct impact on the actuator output to the corresponding serial number. That is, the thermostat connected to input 1 is always connected to the actuator output number 1. For example, if the thermostat on the thermostat input 1 should control the output 1 & 2 no other thermostat can be connected to the thermostat input 2.

Actuator output (6)

Receiver 8 has eight output channels to control LK Actuator. Receiver 1 has three parallel output channels to control LK Actuator. Connection is made via the output marked:

Thanks to the loose actuator plugs the actuators are easily connected to the unit. A max. of twelve actuators can be connected to the receiver 8 and a total of max. five actuators can be connected to the receiver 1. For each channel it is possible to connect two actuators. If a regulated zone requires multiple actuators, the thermostats can be easily set for more than one channel/actuator output. See ***Quick Guide ICS-RF – Programming wireless thermostat or Quick Guide ICS-RF – Programming wired thermostat.*** LK Actuators are opened once every 24 hrs. to prevent the manifold valves from sticking in the closed position.

Power supply (7)

The device is connected to 230 V AC. Receiver is connected via a supplied transformer.

Fuse* (8)

Beneath the high voltage lid, is housed a 230 VAC, T200mA fuse. Always use the same type/size of fuse that was previously mounted.

NOTE: Always investigate the reason to why the fuse has released before it is replace with a new.

* LK Receiver ICS-W8 and ICS-RF8 only.

NOTE:
Disconnect all incoming power to the device before the high voltage lid is opened.

Pump relay * (9)

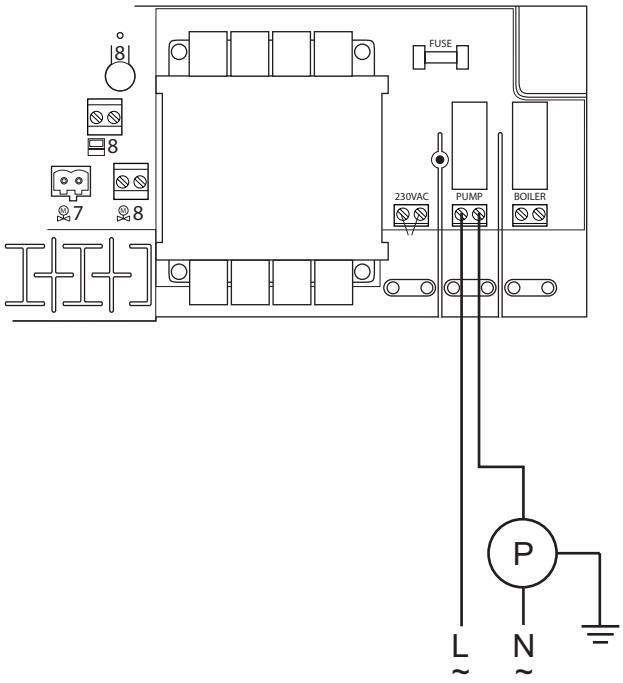
It is possible to control the system's circulation pump, for example the pump in a shunt group via the unit's pump relay. The relay is located under the lid of high voltage side of the receiver unit.

NOTE:
Disconnect all incoming power to the device before the high voltage lid is opened. Wiring/connection to the relay may only be performed by a qualified electrician.

Note that the relay contact is potential free), which means that the relay contacts must be powered from an external source. (NOTE: Not from the receiver unit.) The relay activates the pump approximately 6 minutes after any channel calls for heat. When the relay is activated, the LED is lit. The pump is run once every 24 hrs. to prevent the pump from seizing during long downtime, e.g. during the summer.

See diagram below. See also section **BUS** for connection of multiple receivers in the same system.

* LK Receiver ICS-W8 and ICS-RF8 only.



Circuit diagram for connecting pump to receiver ICS 8.

Relay for heat source * (10)

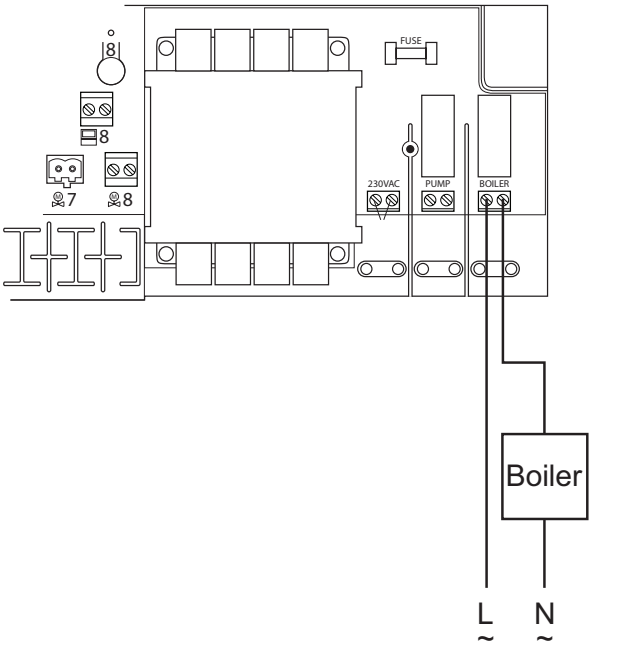
It is possible to control the system's heat source via the unit's heat source relay. The relay is located under the lid of high voltage side of the receiver unit.

NOTE:
Disconnect all incoming power to the device before the high voltage lid is opened. Wiring/connection to the relay may only be performed by a qualified electrician.

Note that the relay contact is potential free, which means that the relay contacts must be powered from an external source. (NOTE: Not from the receiver unit.) The relay activates the heat source approximately 6 minutes after any channel calls for heat. When the relay is activated, the Boiler LED is lit.
See diagram below. See also section **BUS** for connection of multiple receivers in the same system.

* LK Receiver ICS-W8 and ICS-RF8 only.

NOTE:
Disconnect all incoming power to the device before the high voltage lid is opened.



Circuit diagram for connecting heat source to receiver ICS 8.

Anti tension track (11)

An anti-tension track to protect cables connected to the actuators thermostats, BUS and cables for remote control.

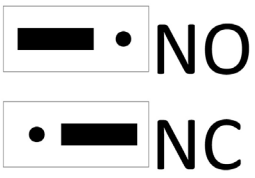
BUS (12)

Where multiple receiver units are required to control a single pump or single heat source, the receivers are connected parallel via the BUS input terminal.

Please refer to detailed instructions at the end of this instruction.

Switch NO/NC function (13)

The receiver can be switched to operate actuators either normally closed (NC) or normally open (NO) The adjustment is done by moving the NC/NO jumper to the appropriate position as shown in the illustration below.



Termination of the network (13)

When two or more receiver units are connected in a network, the start and end of the network must be identified for the network to function properly. (For further information please see the *BUS* section.)

Setback input* (remote control) (14)

The unit is equipped with an input for remote control temperature reduction, for example, via LK Ontech GSM Switch. A closed contact enables centralized control for all the thermostats in the system. When activated, all thermostats show EXT in the display and the temperature is lowered to + 12 degrees (factory set) for all rooms/zones. The temperature can be adjusted. For more information, please see adjustment/setting of the *Remote control.*

* LK Receiver ICS-W8 and ICS-RF8 only.

MEM input* (15)

The receiver is equipped with a MEM port that is used primarily when there is to be a system log maintained. Measurement data is sent to LK ICS MEM Stick once per minute. With the help of measurement data and LK ICS Analyzer software, the installer can easily verify/analyze the installation.

1. Insert the LK ICS MEM Stick into the MEM port. Please note the date.
2. The green U-LED glows constantly.
3. Remove LK ICS MEM Stick when logging is completed.
4. Transfer the information to the LK ICS Analyzer.

NOTE:
The LK ICS Analyser and LK ICS MEM Stick is only available to LK's dealers.

It is also possible to update the unit software via the MEM port. Instructions are supplied with all software updates that may be necessary.

* LK Receiver ICS-W8 and ICS-RF8 only.

GW input* (16)

Input for real-time logging of the unit. This feature can only be used by LK Systems because it requires special programs and expertise.

* LK Receiver ICS-W8 and ICS-RF8 only.

RF input (17)

Input for radio link.

Radio link* (18)

* LK Receiver ICS-RF1 and ICS-RF8 only.

LK Thermostat ICS

Function description

LK Thermostat is available in two versions: a wireless version in which the communication between the room thermostat and the receiver is wireless (LK Thermostat ICS-RF) and in a hard-wired version in which the communication between the room thermostat and the receiver is via 2-core wire transmission. It is also possible to combine wireless and wired communication in the same receiver.

Thermostats are positioned in the room/zone it is going to control. The thermostat display shows the current room temperature in the normal view. The set or desired temperature is displayed when the left or right arrow is pressed once. Press again to change the temperature in increments of 0,5°C.

The thermostat is equipped with an internal temperature sensor which monitors the temperature of the room. It is possible to equip the thermostat with LK External Sensor ICS. The external sensor is normally placed in the floor and the thermostat can control the floor temperature alone, or the floor temperature in combination with the room temperature. For further information, please see the section entitled ***External sensors***.

The thermostat has a programmable clock feature that makes it possible to lower the temperature at night using a weekly program. By default, the program starts/stops when the programmed start/stop times occur. Additionally the thermostat's adaptive control can be activated, so that the system is self learning. The thermostat calculates when the heating should start so that the correct temperature is reached at the desired time. Temperature increases are affected by the adaptive feature. Temperature is reduced in accordance with programmed stop time. Please see the section entitled ***Weekly Program*** for information how the function is activated.

LK ICS has a so called holiday function which can be activated from any thermostat in the system.

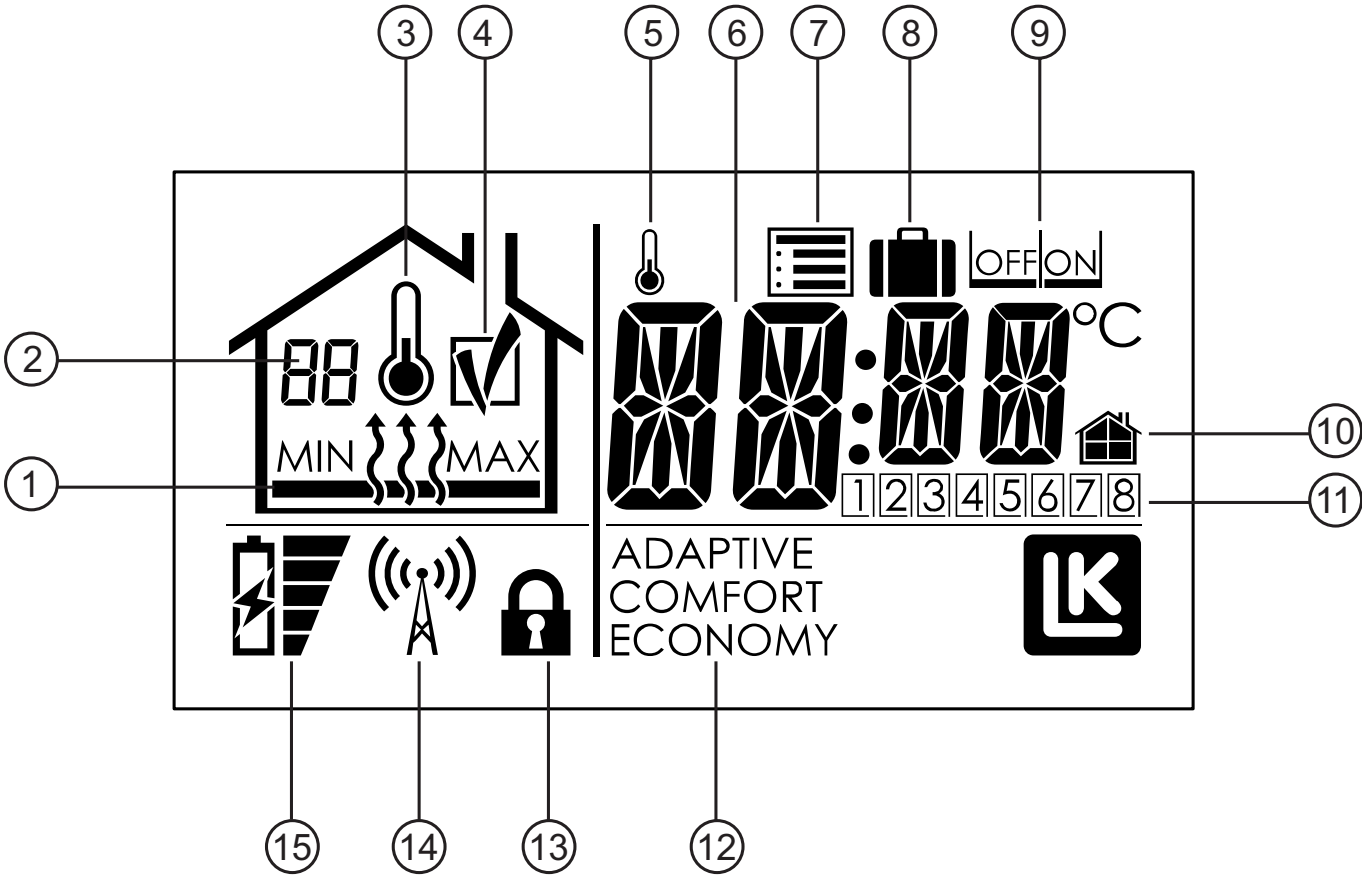
The holiday function enables lower the temperatures for extended periods, such as during a vacation. When activated, the feature lowers the temperature of all thermostats to 12 degrees. For further information, please see the section entitled ***Holiday Function.***

If necessary, it is possible to lock thermostats to prevent unauthorized changing of thermostat settings. For further information, please see the section entitled ***Key Lock.***

Description of the thermostat functions

Left arrow = decrease value (1)
Mode = confirm or access the menus (2)
Right arrow = increase value (3)

Description of display



1. Heat on/off and MIN and MAX limit
2. Number of the receiver unit and error code
3. Room temperature measurements enabled
4. OK symbol*
5. Indicates constantly disconnected weekly program
6. Temperature indicator
7. Setup menu
8. Holiday function
9. OFF/ON selection
10. Local/general set-up
11. Controlled channel/day
12. Operation
13. Key lock symbol
14. Communication symbol*
15. Battery indicator*

* LK Thermostat ICS-RF only.

Description of the thermostat menus/settings

Under the thermostats steup up menu (☰) there are a number of abbreviations. The table below shows the abbreviation and its meaning. Each function is decribed in detail under its heading below.

Abbreviation shown in the display	Meaning	For more information see section
SET	Remote control	Remote control
ECO	Night reduction temperature	Weekly program – temperatures
COMF	Normal temperature	Weekly program – temperatures
HOLI	Holiday function	Holiday function – activate
WK01	Start time weekly program, week days	Weekly program – start/stop times
WK02	Stop time weekly program, week days	Weekly program – start/stop times
WK03	Start time weekly program, weekends	Weekly program – start/stop times
WK04	Stop time weekly program, weekends	Weekly program – start/stop times
SYSC	System clock	System clock
SENM	External temp. sensors	External sensors – select function
WKMD	Weekly program, select week days/weekends or entire week	Weekly program – week days/weekends
ADPT	Adaptive function off/on	Weekly program – adaptive function
BKLT	Back light display off/on	Back light display – enable
LOCK	Key lock off/on	Key lock
RFST	Checking signal strength	Checking signal strength
RERO	Redirecting thermostat	Repeater/Redirecting thermostat
WKPG	Weekly program off/on	Weekly program – activate
FIPL	Fireplace function off/on	Fireplace function

The unit can be adjusted and set up as following:

Checking signal strength*

Before the system is put into operation for the first time the signal strength should be checked so that all thermostats are located within broadcasting area.

Check signal strength as follows:

1. Press *Mode* until ☰ flashes, confirm using *Mode.*
2. Press the right arrow until *RFST* (Radio Signal Strenght) appears in the display, confirm using *Mode.* Allow the unit stabilise for approximately five minutes.
3. Read the value. Return to the setup menu using *Mode*.
4. Repeat steps 1-3 for other thermostats in the system.

Signal strength can be checked for all units simultaneously to save time.

* LK Thermostat ICS-RF only.

Signal strength	Comments
0-20	Too low to ensure their functioning. Take action.
21-100	Excellent.

If necessary, the signal can be improved by placing the thermostat closer to the receiver unit, if possible. Alternatively, the radio link can be moved by using the LK Antenna Cable. If the problem persists, the signal is strengthened by use of LK Repeater.

System clock

The unit is equipped with a system clock. For the weekly program to function, the unit's system clock must be set. This can be performed from any thermostat in the system. The time set applies to all the thermostats in the system.

Set the system clock as follows:

1. Press *Mode* until ☰ flashes, confirm using *Mode.*
2. Press the right arrow until *SySc* (System Clock) is displayed, confirm using *Mode.*
3. The hours flash, select the arrow left/right, confirm using *Mode.*
4. Minutes start flashing, select using arrow left/right, confirm using *Mode.*
5. The days start flashing, select using arrow left/right, (1=Monday, 7=Sunday) confirm using *Mode.*

Weekly program

The unit includes a weekly program. The weekly program switches between either *Comfort* (day temperature) or *Economy* (night reduction). Individual times for each temperature can be set up as follows below. The system can also adjust the start time so that the correct temperature is reached at the right time with the adaptive function activated (self- learning). By default, the weekly program is not activated upon delivery.

Weekly program – activate

The weekly program is activated as follows:

1. Press *Mode* until ☰ flashes, confirm using *Mode*.
2. Press right arrow until *WKPG* (Week Program) is visible in the display, confirm using *Mode*.
3. Select *ON/OFF* using the right/left arrows, confirm using *Mode*.
4. Repeat the above for other thermostats to follow the weekly program.

NOTE:
The system clock must be set accurately for this feature to work properly.

Weekly program – temperatures

The units are supplied with the following default temperature values:

Comfort = 20 degrees
Economy = 18 degrees

Change temperatures as follows:

1. Press *Mode* until ☰ flashes, confirm using *Mode*.
2. Select *Eco* for night reduction temperature, confirm using *Mode*.
3. The temperature flashes, change the temperature using the left/right arrow, confirm using *Mode*.

Repeat the above but select *Comfort* for day temperature.

NOTE:
The above programming applies only to that specific room thermostat. If you wish the same temperature for all thermostats, repeat the steps above.

Weekly program – week days/weekends

The unit can be programmed for every day of the week (1-7) or programmed for weekdays & weekends (1-5 & 6-7).

Select the program as follows:

1. Press *Mode* until ☰ flashes, confirm using *Mode*.
2. Select *WKMD* (Week Mode) using the left/right arrows, confirm using *Mode*.
3. Select either 1-7 or 1-5/6-7 using the left/right arrows, confirm using *Mode*.

The setting applies to all thermostats connected to the same receiver unit.

Weekly program – start/stop times

The unit can be programmed for two event times per day, i.e. at which time the unit will switch between day *(Comfort)* and night *(Economy)*.

Follow these steps to set the time:

1. Press *Mode* until ☰ flashes, confirm using *Mode*.
2. Press the left/right arrow until any of the choices below are displayed, confirm in *Mode*.

WK01 = start time comfort, day 1-7, choose the time with the left/right arrow, confirm with *Mode*

WK02 = stop time comfort/start time eco day 1-7, select the time with the left/right arrow, confirm with *Mode*.

WK03 = stop time eco/start time comfort day 6-7, select the time with the left/right arrow, confirm with *Mode*.

WK04 = stop time comfort/start time eco day 6-7, select the time with the left/right arrow, confirm with *Mode*.

NOTE:
The above settings apply to all the thermostats in the system. Exceptions are possible by changing the temperature setting for an exception area. The time remains the same for all units, but it is possible to disconnect night set-back by selecting the same temperature day and night for the exception area. See also the section *Weekly program – disconnect the program temporarily* and *Weekly program – disconnect the program constantly*.

Weekly program – adaptive function

The system has an adaptive function which means that the system learns how slow the room heats and adjusts the start time so that the temperature reaches the desired start time (from *Economy* to *Comfort*).

The device comes with disconnected adaptive function, the function is activated as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Press right arrow until *AdPt* (Adaptive) is displayed, confirm using *Mode*.
3. Select *ON/OFF* using the left/right arrow, confirm using *Mode*.

The function starts at the next change from *Economy* to *Comfort*.

NOTE:
The above programming applies only to that specific room thermostat.

Weekly program – disconnect the program temporarily

If required the weekly program can be disconnected on any thermostat separately.

The weekly program can be temporarily disabled as follows:

1. Increase/decrease the temperature by +/- key.
2. The temperature starts to flash.
3. When the temperature has stopped flashing, the temporary increase/decrease is activated.
4. The display shows neither *Comfort* nor *Economy* as the temporary increase/decrease is activated.

The temporary disconnection of the weekly program disappears when the program switches between *Economy/Comfort* next time.

Alternatively, you can press *Mode* for 4 seconds to return to the weekly program.

Weekly program – disconnect the program constantly

If you wish, you can disconnect the weekly program constantly for any thermostat.

The weekly program is disconnected permanently as follows:

1. Increase/decrease the temperature by using the +/- key
2. Press *Mode* once when the temperature is flashing.
3. Symbol for constantly disconnected weekly programs appear on the display, see no. 5 in the display above. The display shows neither the *Comfort* nor *Economy* mode as the program is constantly disconnected.

The constant disconnection of the weekly program is cancelled when you press *Mode* for 4 seconds **or** if the temperature is increased/decreased without confirming the temperature change with *Mode*. The display will then show the *Comfort* or *Economy* mode in the operating part of the display (see no. 12 in the display image above).

Also see section entitled ***Weekly program - activate.***

Holiday function – set the temperature

The thermostat is equipped with a so-called holiday function, enabling any thermostat to activate a general drop in temperature in the unit for a selected number of days. The temperature is factory preset to +12°C degrees.

The temperature can be changed for individual thermostats as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Select right arrow until *Holi* (Holiday) is displayed, confirm using *Mode.*
3. Set the desired temperature using the left/right arrow, confirm using *Mode.*

Repeat the above for other thermostats in the system.

NOTE:
When the function is activated the risk of freezing the floor heating system must be considered in exposed zones, such as inside garage entrances or other weather exposed edge zones.

Holiday function – activate

The function is activated from any thermostat as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Select 🧳 using the right arrow, confirm with *Mode*.
3. Select *ON*, confirm with *Mode*.
4. Select the number of days with the left/right arrow, confirm with *Mode*.

Now all thermostats should show the selected number of days in the display, counting down the days. When the days reach zero the thermostats return to the program each thermostat was running prior to the holiday function commenced.

NOTE:
Observe that the countdown starts from the moment the activation occurs which means that the next day at the same time of the initial activation a day has disappeared.

Holiday function – disable/disconnect

The function is deactivated from any thermostat as follows:

1. Press *Mode* once.
2. Select *OFF*, confirm with *Mode*.
3. The thermostat switches to normal view.

All other thermostats automatically switch to the normal view within five minutes.

Back light display – enable

The thermostats have a back light display that lights up when you press a key. On wireless thermostats the back light is turned off by default.

This feature can be enabled as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Select right arrow until *BKLT* (Back Light) is displayed, confirm using *Mode*.
3. Select *ON/OFF* using the left/right arrow, confirm using *Mode*.

Please note that the above setting applies only to that specific room/thermostat.

NOTE: Activated back light affects the life expectancy of the battery.

Key lock

It is possible to lock the thermostat keys to prevent unauthorized changing of the thermostat settings.

The key lock is activated as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Press the right arrow until *LOCK* is shown in the display, confirm with *Mode*.
3. Select *ON/OFF* with the left/right arrow, confirm with *Mode*.
4. The padlock 🔒 is shown in the display.

When key lock is activated, unlock the thermostat as follows:

1. Press all three keys at the same time for at least 20 seconds.
2. The padlock icon disappears and the thermostat is open again.

Remote control*

The receiver is equipped with an input marked Setback. The input can be used by an external signal such as the GSM switch to lower the temperature of the entire system. (Closed contact = reduction.) The setback temperature is preset to +12°C.

The temperature can be changed for individual thermostats as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Press the right arrow until *SET* (Setback) is shown in the display, confirm with *Mode*.
3. Select temperature with the left/right arrow, confirm with *Mode*.

Repeat the above for other thermostats in the system.

* LK Receiver ICS-W8 and ICS-RF8 only.

NOTE:
When the function is activated the risk of freezing the floor heating system must be considered in exposed zones, such as inside garage entries or other weather exposed edge zones.

Fireplace function*

This function is intended for use when you want warm floors even though the room is heated, for example when you use the fire place. When the function is activated the thermostat signal out 50% heat (default) to maintain a warm floor surface. The actuated power is adjustable between 5-100 %. The function is time controlled for 1-99 h, (default 16 h) or always on.

The function is activated as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode.*
2. Press the right arrow until *FiPL* (Fire Place Function) is shown in the display, confirm with *Mode*.
3. Select *ON/OFF* with the right/left arrow, confirm with *Mode*.
4. *16 h* (16 hours) flashes in the display. Adjust with right/left arrow if necessary. Confirm with *Mode*.
5. *50 %* (actuated power) flashes in the display. Adjust with right/left arrow if necessary. Confirm with *Mode*.
6. Return to normal view by pressing *Mode* until the normal view appears.

When the fireplace function is activated the display switches between showing normal view, hours left (for example XX h) and actuated power (for example XX %). When the set time has counted down to zero the thermostat returns to normal operation.

Activated fireplace function overrides any weekly program. Activated setback or activated holiday function overrides the fireplace function.

*The function is only available in units manufactured after 201152 (year 2011, week 52).

External sensors – connection of an external sensor

The thermostats can be equipped with external sensors, for example to regulate the temperature based on the floor temperature.

The external sensor, LK External Sensor ICS is connected as follows:

1. The external sensor is installed in a protective conduit; see separate instructions in the ***External sensor – location in different heating systems*** section.
2. Connect the sensor to the terminal on the thermostat back-plate, the terminal is marked EXT.SENSOR.
3. Select the function the sensor is to perform, follow the instructions in the ***External Sensors - select function section.***

External sensors – select function

It is possible to specify a function for the thermostat when connecting to external sensors.

The setting is made as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Press the right arrow until *SENM* (Sensor Mode) is shown in display, confirm with *Mode*.
3. The display shows *SEN* and the icon on the left flashes.

Select from the following modes:

Only the thermostat flashes = room temperature only. Confirm with *Mode*. The external sensor is not active.

The thermometer and MAX flashes = room temperature with the floor set at maximum limitation. Confirm using *Mode*, the unit switches to flashing MAX and set maximum temperature. Set MAX temperature using the left/right arrow, confirm with *Mode*.

Thermometer and MIN flashes = room temperature with the floor at minimum limitation. Confirm with *Mode*, the unit switches to flashing MIN and set minimum temperature. Set minimum temperature using the left/right arrow, confirm with *Mode*.

Heating icon flashes = floor temperature only, no influence by the room sensor. Confirm using *Mode*; the room sensor is not active.

Resistance table

Temperature	Resistance kΩ ±5%
0 °C	32,66
5 °C	25,40
10 °C	19,90
15 °C	15,71
20 °C	12,49
25 °C	10,00
30 °C	8,05
35 °C	6,53
40 °C	5,32

External sensors – installed in differing floor heating systems

Embedding in concrete or screed

Sheath in conduit approx. 2 meters into the room. The end of the conduit must be placed between two floor heating pipes. Seal the end of the conduit with tape or similar to prevent concrete entering the conduit. Position the conduit as close to the surface as possible as this provides optimum control of floor surface temperature. The external sensor is slipped into the conduit before pouring the concrete. Connection instructions to the room thermostats are given above.

LK HeatFloor 22, LK XPS or LK Silencio

Route or cut a groove on the upper side of the slotted board, do not intersect floor heating pipe. Place a conduit in the routed groove; let it end in the middle between two heat distribution plates. The external sensor is slipped into the conduit before laying the floor. Connection instructions to the room thermostats are given above.

Floor heating in cross battening

Fix conduit between two heat distribution plates, using suitable pipe clips, to the cross battening. The external sensor is slipped into the conduit before laying the floor. Connection instructions to the room thermostats are given above.

LK EPS 16

Place a conduit alongside the floor heating installation in the direction to the closest short end. At the short end cut a 1 meter long slot in the EPS board, measured from the short end. Place the conduit in the slot. The external sensor is slipped into the conduit before laying the floor. Connection instructions to the room thermostats are given above.

LK Clip Rail 8/LK Clip Rail 12

Place a conduit alongside the floor heating installation in the direction to the closest short end. At the short end the conduit in placed between two floor heating pipes and is ended approx. 1 metre in. Seal the end of the conduit with tape or similar to prevent concrete entering the conduit. The external sensor is slipped into the conduit before pouring the concrete. Connection instructions to the room thermostats are given above.

Delete channels

If required, all initialised channels can be deleted, for further information please see *Reset* section.

Delete individual channels*

If necessary, a single channel/thermostat can be deleted from the receiver unit.

1. Press the L-key on the receiver unit for at least 3 seconds, L-LED will light green.
2. Press the left arrow and right arrow key on the thermostat for at least 5 seconds.
3. The *DEFA* text flashes on the display, confirm with *Mode*.
4. The text *RUR* is shown in the display.
5. Remove the battery for at least five seconds.
6. The unit is now cleared of all settings and is ready to be re-initialised.
7. End the sequence by pressing the L-key on the receiver unit, following which the L-LED goes out.

* Wireless communication only.

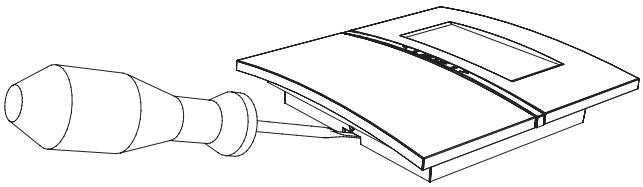
Battery replacement*

LK Room Thermostat ICS-RF comes with three 1,5 volt LR03 batteries (AAA). The batteries have a life expectancy of two years. Life expectancy is affected by the user's choices, such as activated background lighting. The thermostat display has a battery icon that shows the battery status. The battery should be replaced when the icon only shows one segment.

Keep in mind that the thermostats batteries are consumed quickly if the power to the receiver unit is interrupted for a longer period of time.

Battery replacement is performed as follows:

1. Remove the thermostat from the wall by gently pushing the securing plate with a screwdriver while at the same time pulling the thermostat from the back-plate. (The push-lock is positioned on the underside of the thermostat.)
2. Replace the batteries and then click the thermostat into position again. After the battery replacement, the thermostat automatically returns to normal operation.



* LK Thermostat ICS-RF only.

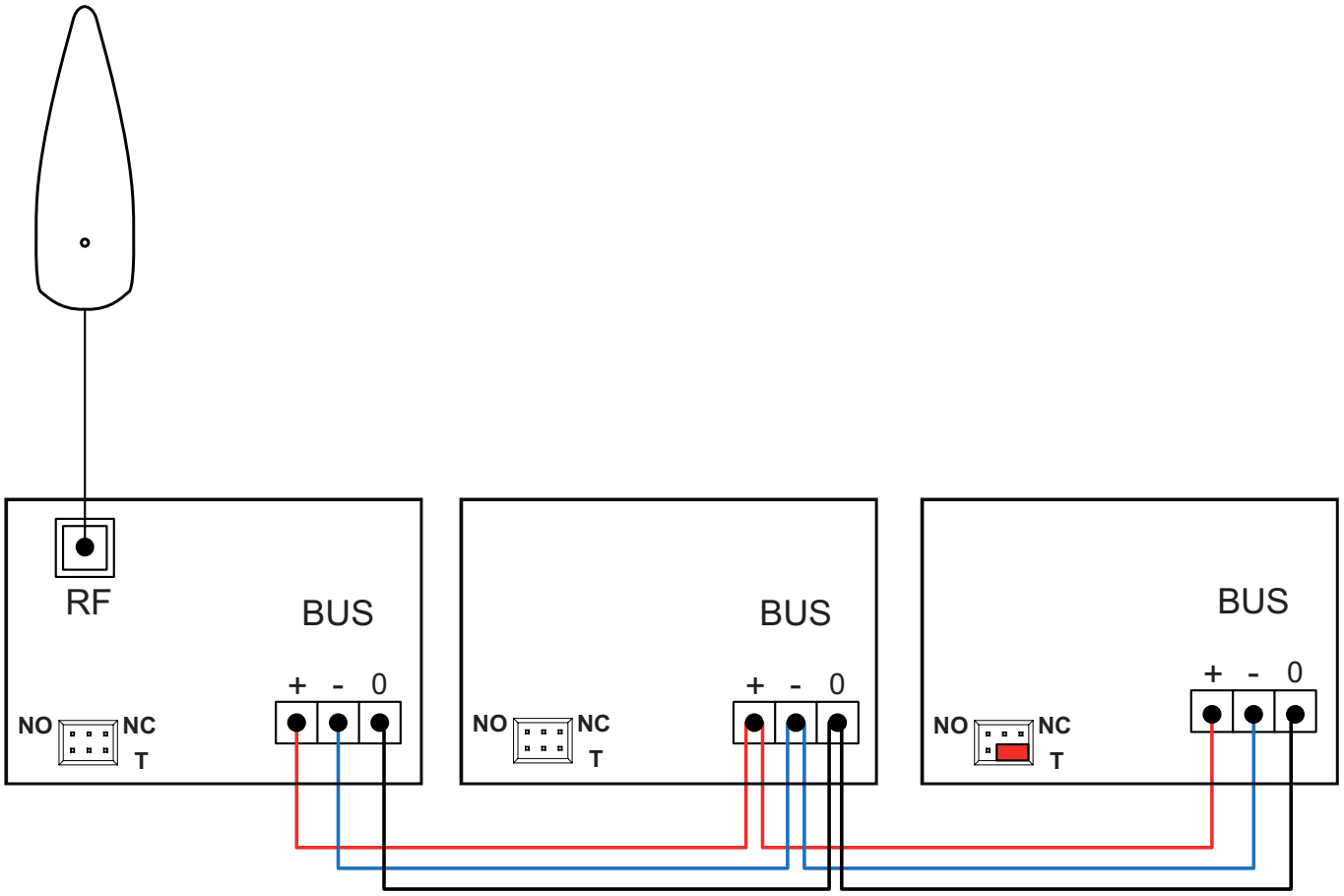
BUS (Network for the control of common pumps and/or heat sources)

In cases where multiple receiver units signal/control a common pump and/or heat source, the receiver units are connected together, in parallel, through the input marked BUS. Use 3-core cable x 0,5 mm² for the network. When the units are connected, the remote control and holiday functions for all the devices on the network work as one. For the network to function properly it is necessary to number/name the receiver units, and specify a start and end to the network.

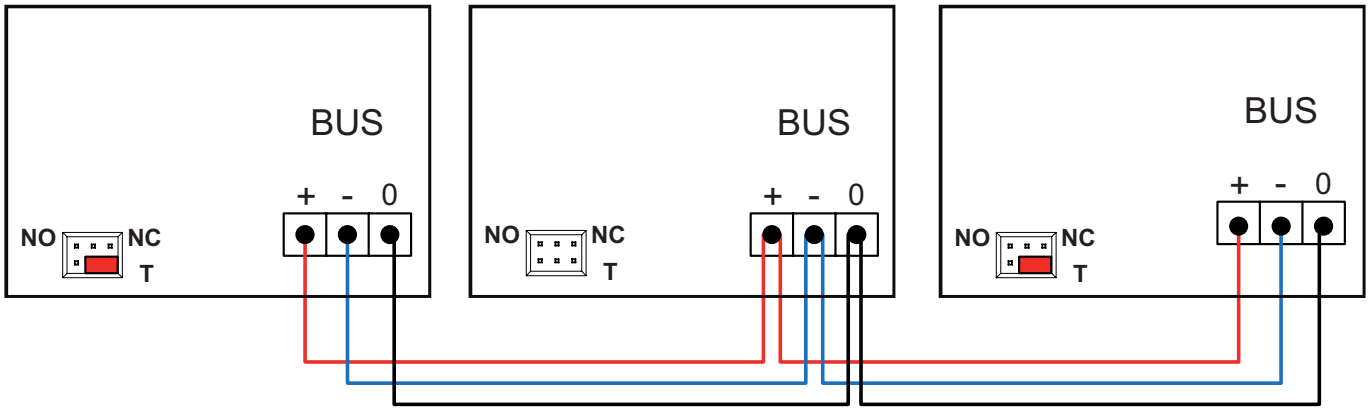
Follow the steps below when a network is to be created:

1. BUS – Wiring

Connect all receivers BUS connectors using 3-core x 0,5 mm² cable. The connection must be according to the following diagram.



Connection diagram BUS with wireless communication between thermostat and receiver unit.



Connection diagram BUS with wired communication between thermostat and receiver unit.

2. BUS – Placement of a radio link*

When multiple receivers are connected in a network only one radio link is used. The other units' radio links must be disconnected for the network to function. Place the radio link at the beginning or end of the network. If necessary, a repeater can be used to improve the signal quality in large systems/long distance.

* Wireless communication only.

3. BUS – Termination

Termination means that the network´s start and end is specified. Place the termination jumper as follows:

1. The networks first point corresponds to the receiver that has a radio link connected. For networks with LK Receiver ICS-W (wireless communication) must the termination jumper in the right location (located next to T).
2. The network's second endpoint corresponds to the receiver that is last in the network. Ensure that jumper is in the right location (located next to T).
3. Other devices in the network must have their jumpers placed to the left or their jumpers removed.

4. BUS – Naming the receiver units

Each receiver must be named or numbered in order for communication to work. Name the receiver units, as follows:

1. Press the L-key for at least three seconds on optional receiver unit.
2. The unit's L-LED lights up green. This unit is now numbered as No 1. Mark the inside of the unit's lid as number one with a marker pen or other. The other receiver units L-LED's now show red to indicate that they are not yet named.
3. Name the next unit by pressing the L-key for at least 3 seconds. When the L-LED is green the unit is numbered. Mark the unit's lid as number 2.
4. Repeat step 3 until all units have received their serial number.
5. Exit by pressing the L-key on the **FIRST** unit and all the units´ L-LEDs turn off.

5. BUS – Adaptation of the thermostat to the BUS-connected receiver unit

Select one of the options below depending on the communication used.

5.a Wireless thermostat

1. Press the L-key on optional receiver unit for at least 3 seconds, the L-LED will light up green.
2. Remove the plastic covering from the thermostat battery. The thermostat display shows *RUR*.
3. Press *Mode* on the thermostat until ☑ is shown in the display.
4. The receiver´s L-LED switches to yellow and selectable channels are lit up green.
5. Select channels by pressing the desired channel key. The selected channel flashes green.
6. Confirm by pressing *Mode* once on the thermostat. The thermostat switches to normal view. Note that the receiver´s system number appears in the thermostat display.
7. Repeat steps 2-6 for other thermostats to be connected to the same receiver unit.
8. Press the L key to complete the adaptation.
9. Repeat steps 1-8 for the other receiving units on the network.

5.b Wired thermostat

1. Connect twin-core cable x 0,5 mm^2 to the terminal on the back-plate marked ICS BOX.
2. Click the thermostat body into the back-plate.
3. Connect the thermostat cable to the loose terminal plugs. Insert one terminal plug in each thermostat output.

   NOTE: Maximum of one thermostat per thermostat input.

4. Place the thermostat cable in anti-tension track.

A thermostat can control/monitor multiple actuators. Follow the instructions below if a thermostat is to control more than one channel/actuator output:

1. Press the L-key of an optional receiver unit for at least 3 seconds, the L-LED lights up green.
2. Press the left arrow and right arrow keys for at least 5 seconds.
3. The text *Defa* flashes in the display, select the text *RUW* with the left/right arrow, confirm with *Mode.*
4. Choose the channel by pressing each channel key on the receiver, the chosen channel will flash green.
5. Confirm by pressing *Mode* once on the thermostat, the thermostat changes to normal view.

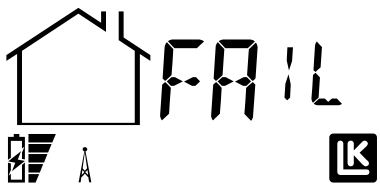
NOTE: If necessary, the thermostat and the receiver can be restored to default settings. See instructions in the *Reset* section.

Troubleshooting

If an error appears, this is shown either by error codes in the thermostat and/or red LED in the receiver. See the summary below showing the various error codes that the system may display.

Error code at adaptation*

If the adaptation fails, the thermostat shows *Fail* in the display, see image below.

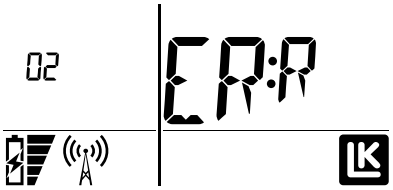


If *Fail* is visible in the display the programming between the thermostat and the receiver has failed. Check that the radio link is properly connected to the receiver. Then reset the thermostat, receiver and radio link (antenna), see section **Reset**. Thereafter, new adaptation can be done.

* Wireless communication only.

Error codes – Taken from the thermostat

Following an error that generates an error code in the thermostat display, the display switches between displaying normal view, and Error view. The error code appears as a number, the following shows error code 02.



Error	Description	Action
01	No signal transmission has occurred for 60 minutes.	Automatic reset occurs when the signal arrives. Check the signal strength.
02	Short circuit of actuator.	The device switches off short-circuited output. NOTE: All actuator outputs´ LED are red even if only one channel has a short-circuited actuator. Reset by switch off the power to the unit. Check the actuator if the problem persists when power is turned on again. Troubleshoot as follows: Shut off the power to the receiver unit for a short while. Remove all actuators. For NO-actuators all thermostats must be turned down, and for NC-actuators must all thermostats be turned up. (The actuator output will be powered up.) Install one actuator at a time. LED for the actuator outputs will go red when the sort-circuited actuator is installed. Correct the error by switching off the power to the unit for a short while to reset the alarm. The thermostats return to normal view at the next signal transmission.
03	Total current of actuator outputs too high.	The device disconnects the actuator outputs. When the total power of the output is less than critical value, the outputs are automatically reset.
04	Adaption of thermostat failure.	NOTE: No fault code displayed. Try to reset the thermostat.
06	Incorrect Ohm-value when external sensor (floor sensor) is connected.	Check the connection of the sensor.
09	Wireless and wire-connected thermostat adapted/connected to the same channel.	Reinstall.

Other error codes

The following error codes come from the receiver unit's various LEDs or via the info.txt file.

Error	Description	Action
05	No communication in the BUS (from the network). Taken from the info.txt file	Check the connection points
07	Receiver unit is not numbered (from the network). Taken from the info.txt	
08	MEM does not work. U LED lights red.	Try to mount the LK ICS MEM Stick again. U LED lights green when functioning properly.

LK Repeater ICS

LK Repeater ICS is used to increase the transmission distance between the LK Thermostat ICS RF and the LK Receiver ICS-RF.

The repeater consists of a radio link with receivers and transmitters. A transformer that plugs into a 230V outlet comes with the repeater. The repeatern is placed between the thermostat with signaltransmission problems and receiver. Mount the repeater so that the antenna is vertical. The set-up may contain up to 4 sets of repeaters.

Adaptation of LK Repeater ICS

The repeater is connected as follows:

1. Switch the repeater off (if it is powered up).
2. Press the L-key for at least 3 seconds on the receiving device. The L-LED should light green.
3. Connect the repeater to a 230 volt outlet.
4. Wait until the repeater starts flashing orange.
5. Confirm by pressing the L-key.

NOTE:
A non-adapted repeater flashes green every 3 seconds.

Redirecting thermostat

It is possible to redirect an already programmed thermostat so it´s signal passes a repeater.

The function is activated as follows:

1. Press *Mode* until ☰ flashes, confirm with *Mode*.
2. Press the right arrow until *RERO* (re-route) is shown in the display, confirm with *Mode*.
3. The antenna symbol flashes once. The display shows *REUT* until a new route has been established then the thermostat will return to showing *RERO*. **NOTE:** This can happen very quickly. (If a new route has not been established within 60 seconds the thermostat will return to showing *RERO* in the display.)
4. Return to normal view by pressing *Mode* until the normal view appears.

Reset

Resetting of LK Receiver ICS

If necessary all adapted channels can be erased from the receiver unit:

1. Press A and channel 8, together for at least 5 seconds. (A and channel 1 on 1-channel receiver.)
2. LEDs for channels 1-8 are red for a short time. **NOTE:** Keep the buttons pressed until the LED for channels 1-8 are off. (On 1-channel receiver only channel 1 will light up red.)
3. Unplug the unit for 10 seconds. (230 V power supply to unit).
4. The unit is now cleared of stored information.
5. Reset all thermostats.

Resetting of LK Thermostat ICS-RF/ICS-W

If necessary the thermostat can be reset.

1. Press the left arrow and right arrow keys for at least 5 seconds.
2. *Defa* text flashes on the display, confirm with *Mode*.
3. *RUR* text appears in the display on the wireless thermostat and *RUW* in the display on the wired thermostat
4. Remove the battery for at least 5 seconds/ disconnect the thermostat´s twin-core cable.
5. The unit is now emptied of any information and is ready for new adaptation.

Resetting of LK Repeater ICS and LK Radio Link (antenna)

If necessary the repeater/radio link (antenna) can be reset.

1. On the back of the repeater/radio link there is a small reset key.
2. Press the key for at least 8 seconds.
3. A red LED lights up then the device is restored to its original state (factory setting).

System limitations

The following is a summary of the limitations of the system.

Limitations	Min	Max	Notes
Number of thermostats per ICS RF8/W8	1	8	
Number of actuators per ICS RF8/W8	1	12	
Number of thermostats per ICS RF1/W1	1	1	
Number of actuators per ICS RF1/W1	1	5	
Number of actuators per channel ICS	1	3	It is possible to physically connect two per contact.
Number of radio links per system	1	1	With connected BUS.
Number of receiver ICS per system	1	8	With connected BUS.
Number of channels per system	1	64	With connected BUS.
Maximum number of repeaters per system	0	4	
Length of cable networks	-	75 m	With connected BUS.
Cable length for radio link (cable type: modular cable RJ9)	-	30 m	LK Antenna Cable is 10 m.

Comments

Totally trouble-free operation cannot always be guaranteed with the technology available today that allows free use of EU authorized frequency bands (interference from other sources is possible). Therefore, each installation should be tested individually.

Manufacturer set thermostat

Setting	Unit	Min	Max	Factory settings
Holiday value	Days	1	90	1
Setback temperature	°C	8	40	12
Economy temperature	°C	8	40	18
Comfort temperature	°C	8	40	20
Holiday tem-perature	°C	8	40	12
Start time Comfort	Time, hours	00:00	24:00	06:00
Start Time Economy	Time, hours	00:00	24:00	22:00
System clock	Number of days: hours: minutes	0:00:00	7:23:59	1:00:00
Floor sensor min limit	°C	7	40	10
Floor sensor max limit	°C	7	40	27
Adaptive function	ON/OFF	-	-	Off
Background lighting display	ON/OFF	-	-	Off
Key lock	ON/OFF	-	-	Off
Fireplace function	ON/OFF	-	-	Off

Article overview

Article number	Name	Comments
241 73 02	LK Thermostat ICS-RF High gloss white	
241 73 03	LK Thermostat ICS-RF High gloss black	
241 73 04	LK Thermostat ICS-RF Silver grey	
241 73 08	LK Thermostat ICS-W High gloss white	
241 73 10	LK Thermostat ICS-W High gloss black	
241 73 09	LK Thermostat ICS-W Silver grey	
241 73 07	LK Receiver ICS-RF8 (NO)	Intended for normally open (NO) actuators.
241 73 16	LK Receiver ICS-RF8 (NC)	Intended for normally closed (NC) actuators.
241 73 13	LK Receiver ICS-W8 (NO)	Intended for normally open (NO) actuators.
241 73 20	LK Receiver ICS-W8 (NC)	Intended for normally closed (NC) actuators.
241 73 05	LK Receiver ICS-RF1 (NO)	Intended for normally open (NO) actuators.
241 73 14	LK Receiver ICS-RF1 (NC)	Intended for normally closed (NC) actuators.
241 73 11	LK Receiver ICS-W1 (NO)	Intended for normally open (NO) actuators.
241 73 17	LK Receiver ICS-W1 (NC)	Intended for normally closed (NC) actuators.
241 73 21	LK Repeater ICS	
241 73 23	LK External Sensor ICS	Length 3 m
241 73 24	LK Antenna Cable ICS	Length 10 m
33620	LK ICS MEM Stick	

Technical data

Article name	LK Thermostat ICS-RF
Article number	241 73 02, 241 73 03, 241 73 04
Setting range	8 – 40 °C
Supply voltage	3 x 1,5 V
Battery life	Approx. 2 years
Regulating function	Self-modulation technique
Accuracy of measurement	± 0,2 °C
Radio frequency	868 MHz
Dimensions	100 x 100 x 20 mm
Protection class	IP20
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Thermostat ICS-W
Article number	241 73 08, 241 73 09, 241 73 10
Setting range	8 – 40 °C
Supply voltage	5 V
Regulating function	Self-modulation technique
Accuracy of measure-ment	± 0,2 °C
Dimensions	100 x 100 x 20 mm
Protection class	IP20
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Receiver ICS-W1
Article number	241 73 11 (NO), 241 73 17 (NC)
Supply voltage	230 V AC
Regulating function	Self-modulation technique
Maximum number of actuators per channel	3 pcs
Maximum number of actuators per receiver unit	5 pcs
Dimensions	130 x 120 x 60 mm
Protection class	IP30
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Receiver ICS-W8
Article number	241 73 13 (NO), 241 73 20 (NC)
Supply voltage	230 V AC
Regulating function	Self-modulation technique
Maximum number of actuators per channel	3 pcs
Maximum number of actuators per receiver unit	12 pcs
Dimensions	400 x 120 x 60 mm
Protection class	IP30
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Receiver ICS-RF1
Article number	241 73 05 (NO), 241 73 14 (NC)
Supply voltage	230 V AC
Radio frequency	868 MHz
Regulating function	Self-modulation technique
Maximum number of actuators per channel	3 pcs
Maximum number of actuators per receiver unit	5 pcs
Dimensions	130 x 120 x 60 mm
Protection class	IP30
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Receiver ICS-RF8
Article number	241 73 07 (NO), 241 73 16 (NC)
Supply voltage	230 V AC
Radio frequency	868 MHz
Regulating function	Self-modulation technique
Maximum number of actuators per channel	3 pcs
Maximum number of actuators per receiver unit	12 pcs
Dimensions	400 x 120 x 60 mm
Protection class	IP30
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

Article name	LK Repeater ICS
Article number	241 73 21
Supply Voltage	230 V AC
Radio frequency	868 MHz
Dimensions	120 x 35 x 30 mm
Protection class	IP20
Operating temperature	+1 – +50 °C
Storage temperature	-20 – +70 °C
Maximum humidity during storage	No condensation

This control equipment can be used in all EU and EFTA countries. The manufacturer states that the equipment meets the essential requirements and other relevant requirements from the R & TTE Directive 1999/5/EC.