

# LK Wired Room Control Basic (NC)

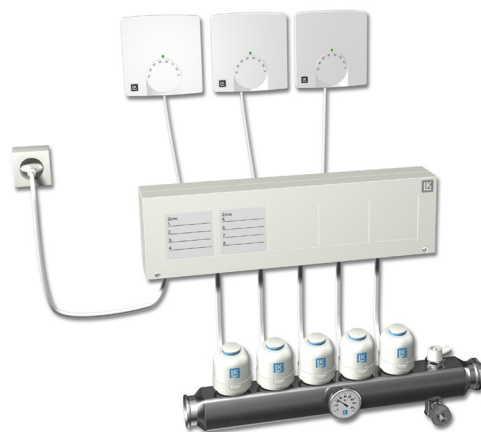
## DESIGN

LK Room Control Basic NC is a wired control system intended for LK Floor Heating. To achieve maximum energy efficiency the system uses so-called self-modulating technology via signal pulses to the valve actuator. The self-modulating technology adjusts the output of the underfloor heating to the set temperature. Once the room temperature approaches the set temperature, the output of the heating is gradually reduced to prevent the room heating to too high a temperature. The system's electronic thermostats are using an Triac output and are the fore soundless in operation.

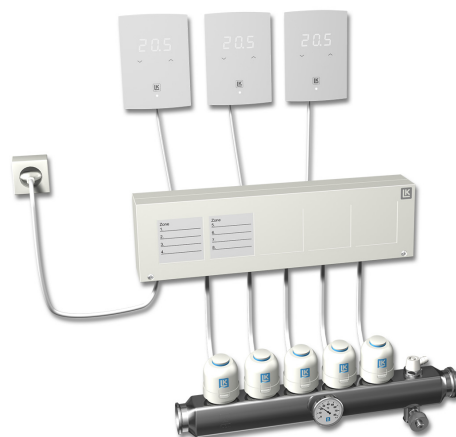
The room thermostat controls the temperatures in the respective rooms/zones by sending signals via the cable connection to the LK Connection Box, placed at the heat circuit manifold. The actuators for the different zones are controlled via the connection boxes.

LK Room Control Basic offers two models of room thermostat of modern design: LK Room Thermostat S1 NC and LK Room Thermostat S2 NC. All units in the system are of normally open design, generally termed NC, which means that the actuator is closed when there is no electrical current.

- The Room Thermostat S1 model is of traditional design but with a modern look, with its high-gloss white polished surface. The room thermostat is extremely thin and blends easily into the room surroundings. Available in models S1, S1 EXT and S1 Dti. Thermostat model S1 EXT and S1 Dti can be connected to LK Remote Sensor S1 to control e.g. floor temperature. S1 Dti has a concealed temperature setting suitable for public environments.
- Room Thermostat S2 is of new modern design with polished vitreous surface and touch temperature setting. The temperature setting is visible via the diode digits behind the glass. LK Room Thermostat S2 is available in two models, S2 and S2 EXT, where S2 EXT can be connected to LK Remote Sensor ICS/S2 for controlling e.g. floor temperature. For public environments, the temperature setting of the room thermostat can be locked by pressing buttons in combination.



*LK Wired Room Control Basic S1*



*LK Wired Room Control Basic S2*

## CONDITIONS/FUNCTION

All the circuit flows must be adjusted according to the instructions for the installation. The heat curves in the control unit are set according to the heat system and climate zone requirements. A control zone consists of an LK Room Thermostat that can control one or more floor heating circuits each with an actuator. A maximum of five LK Actuators can be connected to an LK Room Thermostat S1 or LK Room Thermostat S2.

## LK CONNECTION BOX NC, 230/24 V AC



*LK Connection Box NC.*

LK Connection Box NC has an integrated transformer 230/24 V AC. The box is used to connect and provide power to LK Room Thermostat S1 NC or LK Room Thermostat S2 NC and LK Actuator NC. The box should be placed close to the manifold to avoid the need to extend the actuator cables. A maximum of eight room thermostats can be connected to the box, and a maximum of five LK actuators can be connected to each control zone; however, no more than twelve actuators can be connected to the box. Carefully mark up which zone controls which room, most suitably using the provided labels. Each control zone is provided with an LED that indicates the room thermostat's request for heat.

### Valve exercising

The box has a standard function for valve exercising. This cuts the power supply to each actuator once a day, thus opening the valves.

### Pump connection

The floor heating circulation pump can be connected to the potential-free pump relay in the connection box. This causes the circulation pump to stop when all the actuators in the installation are closed. The pump starts again when a thermostat requests heat. However, pump starts with a degree of delay. When the pump is connected, it is exercised once a day.

### Remote switching of LK Control v.3

The LK Control v.3 is a complete unit for outdoor temperature compensated temperature control for LK's shunt groups. If LK Control v.3 is used, the potential-free pump relay in the connection box can be connected to contacts M and H1. When an LK Connection Box is connected to LK Control, LK Control closes its control valve (shunt valve) and stops the circulation pump when all the actuators on the manifold are closed. LK Control opens the control valves again and starts the pump when one or more actuators on the manifold open. For more information see assembly instructions for *LK Control v.3*.

## LK ACTUATOR NC, 24 V AC

LK Actuator NC opens when power is cut. A "status" indicator is located on top of the actuator. When the indicator is "up" the valve is open and vice versa.

The actuators are wired to actuator terminals for the corresponding control zones in the control box. Terminals are marked with a symbol for actuators.

The LK Connection Box NC is fitted with two different sized terminals for actuators. The lower terminals marked zones 5-8 are intended for control zones with one actuator. (In practice max two actuators can be connected.) The upper terminals marked zone 1-4 have larger terminals to take up to four actuators per terminal. Up to five actuators may be connected to each terminal through using an external connector.



*LK Actuator 24V AC NOC*

## LK ROOM THERMOSTAT S1 NC, 24 V AC

The LK Room Thermostat S1 NC is available in three versions: S1, S1 EXT and S1 Dti.

- S1: Basic thermostat for control of room temperature.
- S1 EXT: Thermostat for control of room temperature or control of, for example, floor temperature via an external sensor.
- S1 Dti: Thermostat for control of room temperature with hidden temperature setting, for example, public environments. It is also possible to control, for example, floor temperature via an external sensor.



*LK Room Thermostat S1, LK Room Thermostat S1 EXT and LK Room Thermostat S1 Dti*

The room thermostat is mounted on an inner wall 1.5 m above the floor. Avoid placing the thermostat where it may be affected by, for example, direct sunlight and ventilation. The LED indicates that the room thermostat is requesting heat. The room thermostat and the connection box are connected using, for example, signal wire EKKX 4 x 0,5 mm<sup>2</sup>, one wire of which is not used. The signal cable is connected to terminals 1, 2 and 4 in both the room thermostat and the connection box.

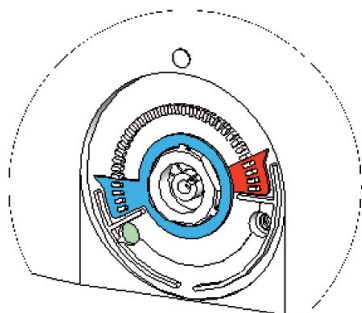
### Function description

#### Temperature setting

The temperature setting of the room thermostat can be changed using the thermostat dial. The position of the LED is the reference point for the set/desired room temperature. For Room Thermostat S1 Dti (with concealed temperature setting), the cover has to be removed to access the dial of the thermostat. The room thermostat's LED shows whether the set room temperature has been reached or not. If the LED is off, the set temperature has been reached.

#### Temperature setting, range restriction

The setting range of the thermostat dial can be restricted. Under the dial are two discs which can be moved to restrict the setting range, as in the figure below.



Områdesbegränsning av temperatur.

### Options

- LK External Sensor S1. Used for the control of floor temperatures; it is then placed in the floor as described in the instructions below. LK External Sensor S1 can be connected to LK Room Thermostat S1 EXT or LK Room Thermostat S1 Dti.
- Pattress S1. Used if necessary to increase the mounting area of the thermostat. Outside dimensions: 88 x 88 x 3 mm

- LK Protection Cover. Used to protect the LK Room Thermostat against external damage. The cover is made of transparent perspex. Dimensions: L x H x D 135 x 120 x 35

### LK External Sensor S1

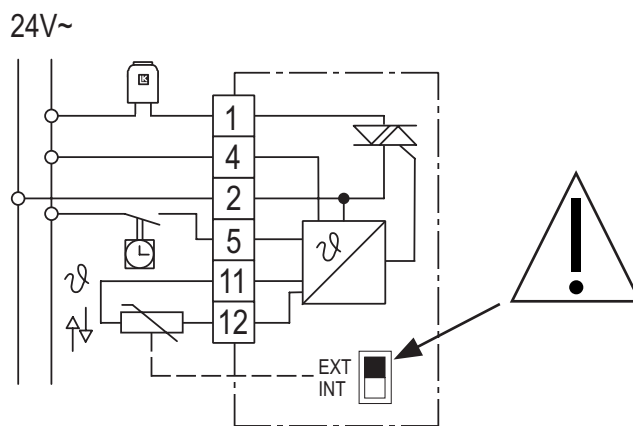
The LK External Sensor is used together with an LK Room Thermostat S1 EXT or LK Room Thermostat S1 Dti for control of the floor temperature.



LK External Sensor S1

Connect the sensor as follows:

1. Connect the external sensor to terminals 11 and 12 in the thermostat, see the circuit diagram below.
2. Change the switch on the circuit board from INT (Internal sensor) to EXT (External / Remote sensor). The room thermostat will now control the temperature based on the location of the external sensor.



Circuit diagrams for LK Room Thermostat S1 EXT and LK Room Thermostat S1 Dti (The circuit diagram for LK Room Thermostat S1 is the same apart from the absence of terminals 11 and 12 for an external sensor)

The cable for the external sensor can be up to 50 m long. The extension cable must minimum have the same cable area as the sensor cable.

**NOTE!** Avoid laying power supply cables parallel, for example, on a cable rack.

## LK ROOM THERMOSTAT S2 NC, 24 V AC

LK Room Thermostat S2 NC is available in two different versions, S2 and S2 EXT.

- S2: Basic thermostat for controlling room temperature.
- S2 EXT: Thermostat for controlling room temperature or for controlling e.g. floor temperature via a remote sensor.

The room thermostat is also used in so-called public environments, where the temperature setting of the thermostat can be locked by pressing buttons in combination.



*LK Room Thermostat S2*

The room thermostat is mounted on an inner wall 1.5 m above the floor. Avoid a location which may affect operation (e.g. where there is solar gain, near ventilation etc.). Routing of cable between the room thermostat and connection box should be performed using EKKX 4 x 0.5 mm<sup>2</sup> signal cable, with one wire being unused. The signal cable is connected to terminals 1, 2 and 4 of the room thermostat and terminals labelled 1, 2 and 4 of the connection box. If the room thermostat is fitted to an electrical box, use the pattress supplied with it. If the cables come directly out of the wall via a conduit, the pattress which comes supplied is not normally used.

### Functional description

#### Temperature setting

Normal mode for the room thermostat when in operation is displaying current room temperature. The temperature setting of the room thermostat can be changed using the “arrow up” or “arrow down” touch buttons. When the buttons are touched, the temperature display shows more brightly.

The thermostat is then displaying the set/desired room temperature. Once changes have been made with the “arrow up” or “arrow down” buttons, the thermostat immediately returns to a reduced brightness level, once again displaying the current room temperature. The thermostat comes with a function LED which shows whether the set temperature has been reached or not. If the LED is off, the set temperature has been reached.

#### Temperature locking

**Temperature locking** For installation in e.g. a public environment, locking of the thermostat’s temperature setting may be needed. Locking is performed by pressing buttons in combination. Hold both buttons, i.e. “arrow up” and “arrow down” down together for approximately 20 seconds. When the function is active, the thermostat displays “LOC” for lock, i.e. the thermostat is locked. The room thermostat will then return to displaying the current room temperature. If someone tries to change the temperature, the thermostat will display “LOC” to show that the thermostat is locked. Unlocking is performed in the same way as locking, i.e. hold both buttons (i.e. “arrow up” and “arrow down”) down together for approximately 20 seconds. The room thermostat shows that the function has been deactivated by displaying “OPn” for open.



*Text message for locked temperature setting*



*Unlocked temperature setting, displayed on unlocking*

Switching off the temperature display and LED  
 The temperature display and function LED on the room thermostat can be switched off. The thermostat is still active after the temperature display and LED have been switched off. To read off or change the temperature, the temperature display comes on once the touch buttons are touched. The thermostat then returns to unlit mode. Switching off the temperature display is ideal for bedrooms. The temperature display of the room thermostat is switched off by holding down the right arrow button for approximately five seconds. When the function is active, the thermostat shows “doF” for display off. To return to normal temperature display, hold the right arrow button down for approximately five seconds. When the function is deactivated, the thermostat will show “don” for display on.



Text message for switch-off of temperature display



Text message for return to temperature display “on”

**Options**

- LK External Sensor ICS/S2. Used for the control of floor temperatures; it is then placed in the floor as described in the instructions below. LK External Sensor ICS/S2 can be connected to LK Room Thermostat S2 EXT.
- LK Protection Cover. Used to protect the LK Room Thermostat against external damage. The cover is made of transparent perspex. Dimensions: L x H x D 135 x 120 x 35 mm.

**LK External Sensor ICS/S2**

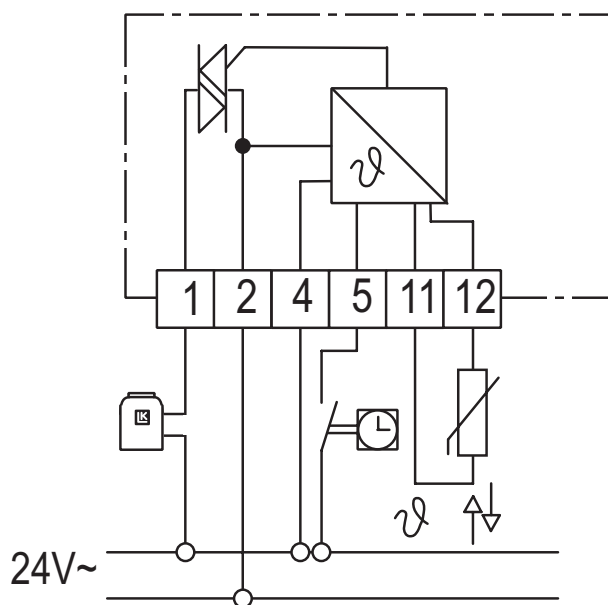
LK Remote Sensor ICS/S2 is used together with LK Room Thermostat S2 EXT when e.g. floor temperature is to be controlled.



LK External Sensor ICS/S2

Connect the sensor as follows:

Connect the remote sensor to terminal 11 and 12 of the thermostat, see circuit diagram. The room thermostat will now control the temperature based on the location of the external sensor.



Circuit diagrams for LK Room Thermostat S2 EXT (The circuit diagram for LK Room Thermostat S2 is the same apart from the absence of terminals 11 and 12 for an external sensor)

The cable for the external sensor can be up to 50 m long. The extension cable must minimum have the same cable area as the sensor cable.

**NOTE!** Avoid laying power supply cables parallel, for example, on a cable rack.

## PLACEMENT OF LK EXTERNAL SENSOR

Place the external sensor as follows:

Embedding in concrete

Before laying the concrete, place an empty conduit about 2 m out from the wall into the room. Ensure that the end of the conduit is at a representative position for the area/zone being controlled. The end of the sensor shall be half way between two floor heating pipes. Seal the end of the conduit with tape or similar to prevent concrete from getting into the conduit. Try to place the conduit as high as possible since this gives a more optimal adjustment of the floor surface temperature. The external sensor is slipped into the conduit before pouring the concrete and is connected to the room thermostat as described above.

LK HeatFloor 22, LK EPS 30/50/70 or LK Silencio Mill a slot on the upper side of the board. Place a conduit in the slot, end the conduit halfway between two heat distribution plates. Ensure that the end of the conduit is at a representative position for the area/zone being controlled. The external sensor is slipped into the conduit before laying the floor and is connected to the room thermostat as described above.

Floor heating in secondary spaced boarding

Place a conduit halfway between two heat distribution plates, and attach the conduit to the edge of the secondary spaced boarding using a conduit clip. Ensure that the end of the conduit is at a representative position for the area/zone being controlled. The external sensor is slipped into the conduit before laying the floor and is connected to the room thermostat as described above.

LK EPS 16

Place a conduit along the long sides of the floor heating installation facing the nearest short end. Saw a slot about 2 m long in the EPS-board, measured from the short side, and place the conduit in the slot. The external sensor is slipped into the conduit before laying the floor and is connected to the room thermostat as described above. Ensure that the end of the conduit is at a representative position for the area/zone being controlled.

LK Clip Rail 8/LK Clip Rail 12

Place a conduit along the long sides of the floor heating installation facing the nearest short end. Place the conduit at the short end halfway between two heating pipes and end it about 2 meters in. Seal the end of the conduit with tape or similar to prevent concrete from getting into the conduit. The external sensor is slipped into the conduit before pouring the concrete and is connected to the room thermostat as described above. Ensure that the end of the conduit is at a representative position for the area/zone being controlled.

## FUNCTION CONTROL TEST

**Once installation is complete, carry out a function control test:**

1. Turn all the thermostats on fully and ensure that all LEDs are lit on the thermostats and the box. Wait for about 6 minutes, and ensure that the status indicator for the actuators is in its highest position.
2. Turn down all the thermostats to minimum. All the LEDs should be out and all the actuators should be closed after about 6 minutes.

## ROOM THERMOSTAT TEMPERATURE MEASUREMENT

In order to achieve accurate room temperature measurement it is important to prevent draft behind the thermostat. If air is sucked in from an adjacent room through the wall box or conduit, the sensor may experience varying temperature depending on wind direction and ventilation. One way to avoid this is by sealing with fire-proof insulation like mineral wool / glass wool.

## TROUBLESHOOTING, ROOM CONTROL

### Connection Box

Each zone's LED should light when the thermostat is turned on fully. If an LED does not light, ensure that there is a mains connection and that the fuse for the box is intact.

**NB!** Before the fuse holder is opened ensure that the connection box is disconnected from the mains. The fuse holder can be opened with a slotted screwdriver. Press carefully into the fuse holder and turn anti-clockwise. The fuse can be tested using a multimeter.

## Room Thermostat

A lit LED indicates that the room thermostat is requesting heat. Ensure that all wires are properly connected. When the room thermostat is turned to man., there should be a 24 V AC voltage between terminals 1 and 4 in the connection box. Equivalent control measurement can be performed between terminals 1 and 4 in LK Room Thermostat S1. For LK Room Thermostat S2 however, this is not practically possible to perform.

A flashing LED on the LK Room Thermostat indicates that there is a disruption in the connection to the external sensor, for example, a break in the cable. Applies to S1 models which can be connected to an external sensor, i.e. S1 EXT and S1 Dti.

## Actuator

The top of the actuator is equipped with a status indicator showing whether the actuator is open or closed. When the status indicator is at the top, the actuator is open and vice versa. Actuation time is about six minutes. When the actuator is opening or is open, no power is supplied to it, which can be checked through a voltage measurement at the terminal for the actuator.

## Valve

When the actuator is removed, the valve function can be tested/checked by pressing the spring-loaded valve spindle.

## TECHNICAL DATA

### LK Connection Box NC

Article no	241 81 18
Dimensions	350 x 100 x 60 mm
Primary voltage	230 V AC
Secondary voltage	24 V AC
Transformer capacity	40 VA
Cable protection class	IP 20
Cable protection class	2
Primary fuse	200 mA according to IEC 127-2/V
Pump relay	4 A
Max number of actuators/connection box	12
Max number of actuators/terminals	5
Max number of thermostats/connection box	8

## LK Actuator NC

Article no	241 81 20
Dimensions	44 x 47 x 53 mm
Voltage	24 V DC/AC 50-60 Hz
Rated output	2,0 W
Cable protection class	IP 54
Ambient temperature	0–60 °C

## LK Room Thermostat S1 NC

LK Room Thermostat S1 NC, white polished RAL 9010, Article no	241 72 86
LK Room Thermostat S1 EXT NC, white polished RAL 9010, Article no	241 72 90
LK Room Thermostat S1 Dti NC, white polished RAL 9010, Article no	241 72 88
Dimensions	78 x 78 x 14 mm
Voltage	24 V AC
Max actuators/thermostat	5 st
Temperature range	5–35 °C
Cable protection class	IP 30

## LK External Sensor S1

LK External Sensor S1, Article no.	241 72 94
Length/largest diameter	4 m/dia 7 mm
Type	NTC 47 KOhm

## LK Room Thermostat S2 NC

LK Room Thermostat S2 NC, house and patress, white RAL 9003, front glass high gloss white/ice-gray, Article no.	243 43 98
LK Room Thermostat S2 EXT NC, house and patress, white RAL 9003, front glass high gloss white/ice-gray, Article no.	243 44 00
Dimensions	80x112x16 mm
Voltage	24 V AC
Max actuators/thermostat	5 st
Temperature range	5–40 °C
Cable protection class	IP 30

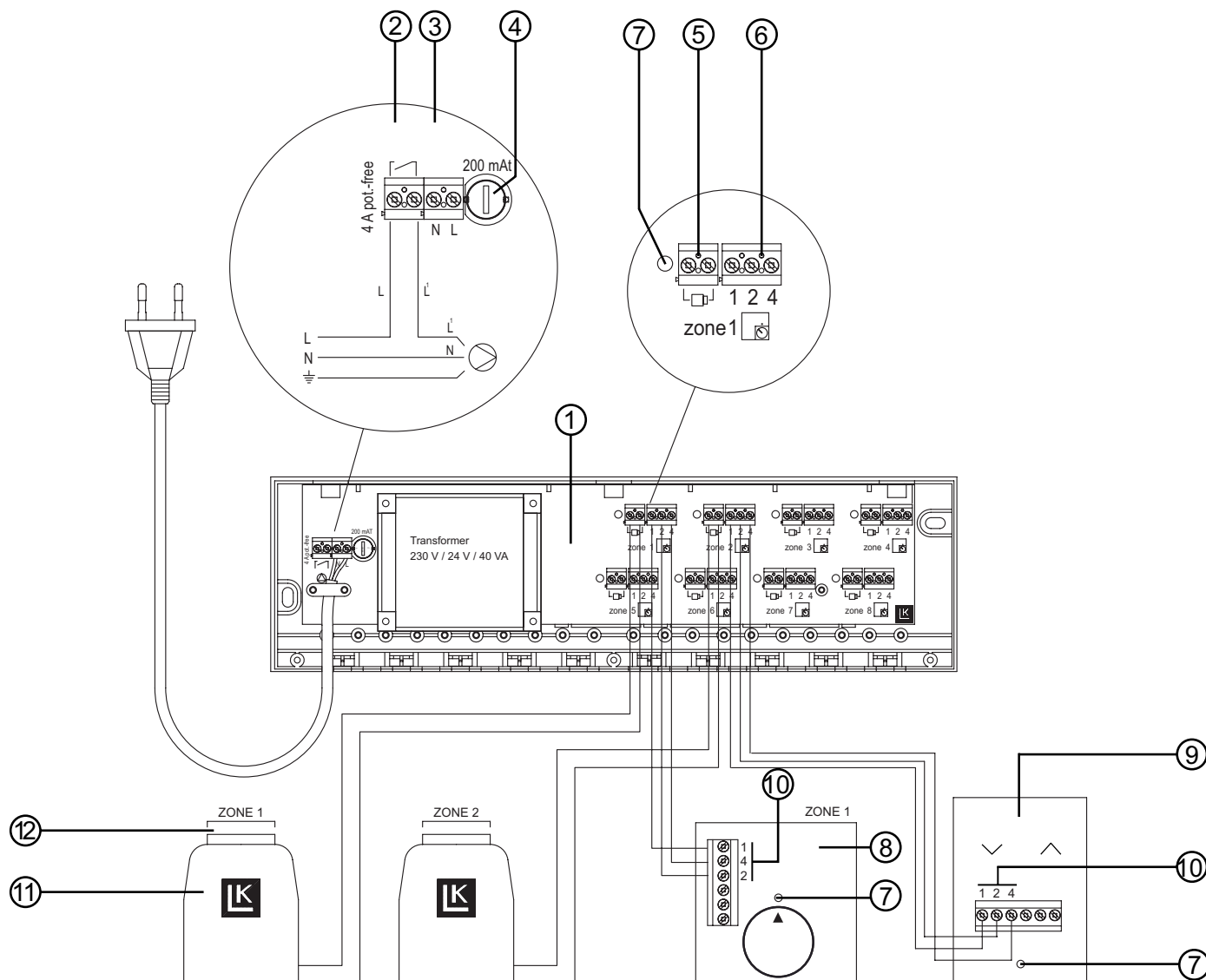
## LK External Sensor ICS/S2

LK External Sensor ICS/S2	241 73 23
Length/largest diameter	3 m/dia 7 mm
Type	NTC 10 KOhm

## Energy declaration in accordance with EU 811/2013.

Temperature regulator class	IV
Temperature regulator's contribution to seasonal space heating energy efficiency	2%

## CONNECTION



Schematic for electric connections: LK Connection Box NC

1. LK Connection Box NC.
2. \* Connection to the potential free pump relay, max 4 Amp. (attached pull relief).
3. Connecting mains voltage 230 V AC.
4. Fuse, primary, 250 V 200 mA.
5. Connecting LK Actuator NC, 24 V AC.
6. Connecting LK Room Thermostat S1 NC, 24 V AC or LK Room Thermostat S2 NC, 24 V AC.
7. LED.
8. LK Room Thermostat S1 NC, 24 V AC.
9. LK Room Thermostat S2 NC, 24 V AC.
10. Connecting to the LK Connection Box NC.
11. LK Actuator NC, 24 V AC.
12. Status indicator.



---

## Example of connections for one zone

- Terminal 1 (10) on the room thermostat is connected to terminal 1 (6) on the connection box.
- Terminal 2 (10) on the room thermostat is connected to terminal 2 (6) on the connection box.
- Terminal 4 (10) on the room thermostat is connected to terminal 4 (6) on the connection box.
- The actuator is connected to the terminals on the connection box marked with “actuator symbol” (5).

### \*NOTE!

The pump relay (2) is potential free (voltage free).

**Wire live (L)** over the pump relay (live into the relay, switched live from the relay to the pump).

**Neutral (N)** directly to the pump.

**Earth**  directly to the pump.