LK Control v.3 & LK Control v.3 - RA

Design

LK Control v. 3 and LK Control v.3 -RA is complete unit for outdoor temperature-compensated heat regulation, adapted and pre-programmed for LK's Floor Heating System/shunt program (does not apply to LK Mini Shunt M60n). LK Control v.3 consists of a control unit, valve actuator as well as an flow and outdoor temperature sensor. As an option, LK Control v.3 can be supplemented with LK Room Unit v.3 for affecting the room temperature of the control unit's heat curve. This function is similar to a room thermostat but with the possibility of remotely controlling the control unit.

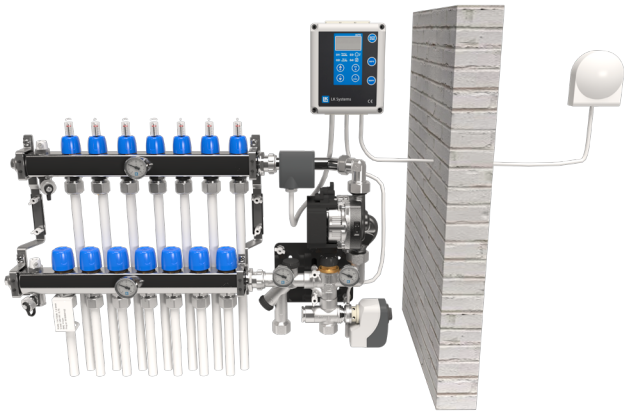
LK Control is made for LK Manifold Shunt VS2, LK Shunt 2/3-2.5, LK Shunt 2/3-4.0, LK Shunt 2/3-6.3 and LK Shunt UHP-6.3. LK Control RA is made for LK Manifold Shunt Compact A+, see seperate assembly instruction for each shunt unit.

- Pre-programmed control unit for LK's Floor Heating System. Only an installment of time is required in order for the unit to be operative.
- The control unit is equipped with a double ECO-function with dynamic pump control for automatic disconnection from the heating facility during the summer period.
- A pump protector/automatic pump-exerciser during the summer period.
- Max and min limits can be programmed by the incoming temperature.
- Frost protection for heating circuit/building.
- Remote control possible, e.g. via mobile telephone together with an external telecom-switch.

LK Control Unit v.3

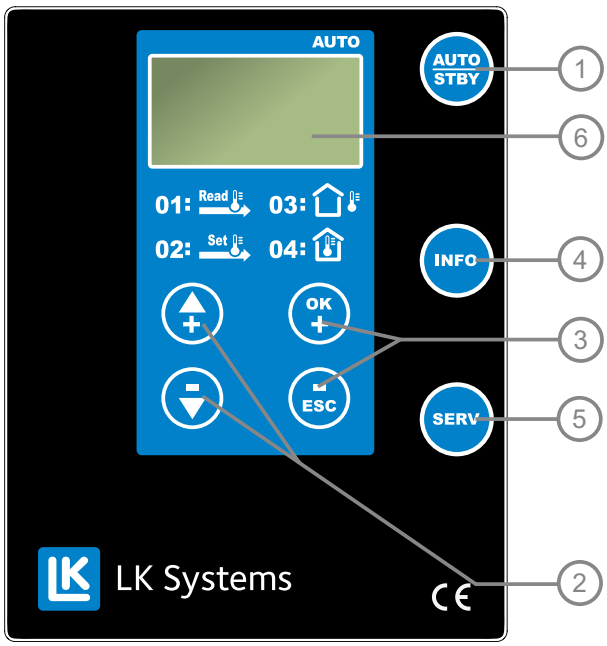
Assembly

The control unit is assembled on the wall in direct proximity to the LK Shunt. Open the lid of the control unit to access the four attachment holes at the rear cover piece. For electric coupling, see headings "electric cables" and "electric wiring".



Installation example with LK Control v.3 installed on LK Distributor Shunt VS2.

Description of buttons and display



1. Mode option

Choose between the normal setting Automatic mode (shown by a line under AUTO on the display), or the On-call mode/Standby, also called Frost Protection mode.

2. Navigation and settings buttons

3. Adjusting the room temperature/normal temperature, navigation and settings

To adjusting the normal temperature (increase or decrease estimated room temperature), press once on OK. Then press OK or ESC to increase or decrease the estimated room temperature (regulatory area 18-35°C). Press AUTO STBY to return to normal mode.

4. Show information

Press INFO to show: current inflow temperature no:01 ; estimated inflow temperature no:02; current outdoor temperature no:03; and current indoor temperature no:04. (N.B. indoor temperature can only be shown when a LK Room Unit v.3 is connected, option).

5. Switching to manual mode

Press SERV to switch to manual mode. The display shows "on" a short while, and then the symbol is displayd.
With this function connected, the valve actuator can be set manually on the hand knob of the actuator. The function can be disconnected by pressing on SERV once again.

6. Display

A background-lit display for reading/indicating temperatures and set values shows the current flow temperature during operation.

7. Temperature value

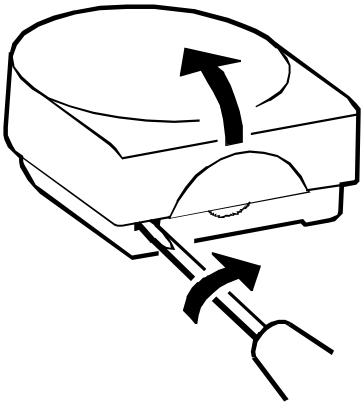
The display shows:

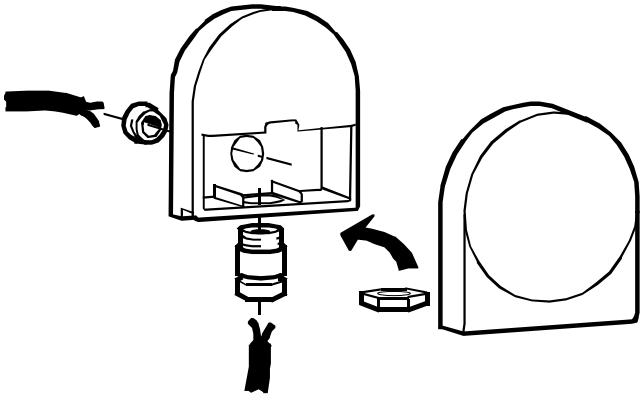
no. 01	Current flow temperature	01: Read
no. 02	Estimated flow temperature	02: Set
no. 03	Current outdoor temperature	03:
no. 04	Current indoor temperature (note: the indoor temperature can only be shown when a LK Room Unit v.3 is connected (option).	04:

LK Outdoor Sensor v.3

The outdoor sensor is placed on the north or north-east wall of the house. Do no place the sensor close to a heat-emitting source, which can disturb its function, e.g. above a window or doors, close to ventilation or directly under roof protrusions. Seal eventual cable pipes to avoid heat affects from inside the building.

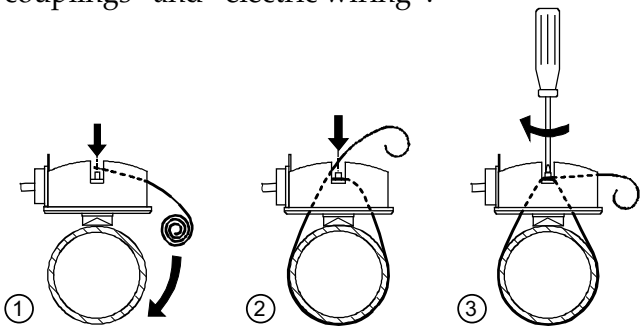
Disassemble the lid and connect the sensor according to the pictures below; see also headings: *"electric couplings"* and *" electric wiring"*.





LK Inflow Sensor v.3

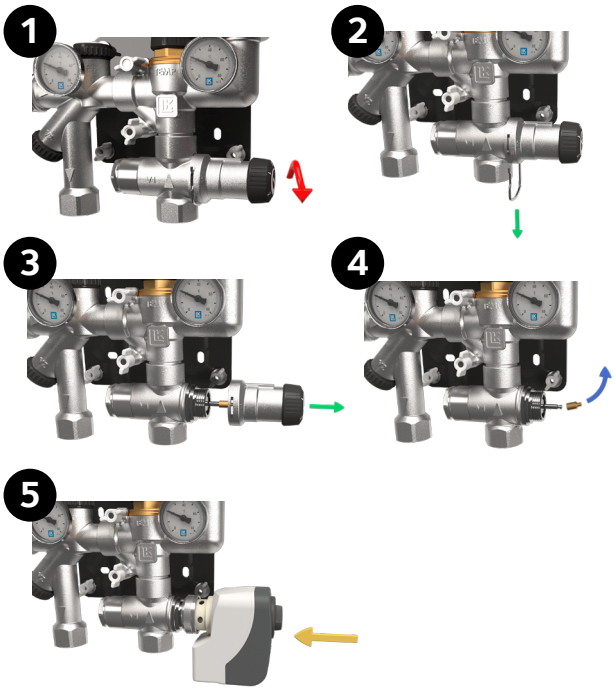
The inflow sensor is attached to the flow circuit to the floor heating, at a minimum of 70 mm from the pump. Eventual paint or oxides must be removed from the pipe when placing the sensor. Open the lid using a screwdriver. Mount the stainless steel clamp under the lid, according to the pictures below; see also headings:"electric couplings" and "electric wiring".



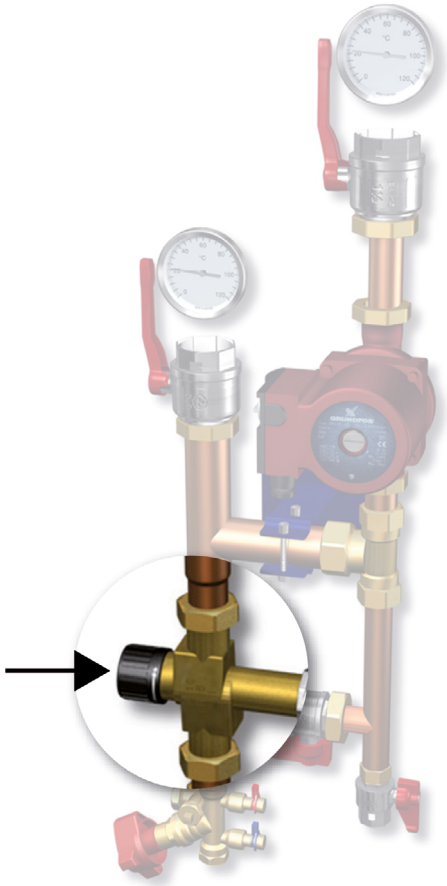
Valve actuator

The LK Shunt is delivered equipped with a hand control unit on the control valve. This can easily be removed and replaced with the enclosed valve actuator. Do not mount the shunt group so that the valve actuator is placed under the valve. For electric coupling, see headings *"electric cables"* and *"electric wiring"*.

When attaching a valve actuator onto a LK Manifold Shunt Compact or LK Heat Exchange Package, remove the thermostat head and attach the valve actuator with the enclosed adapter.



1. Unscrew the handle on the hand actuator (anti-clockwise).
2. Pull out the clasp.
3. Remove the hand actuator
4. Remove the spindle extension
5. Install the valve actuator.



LK Shunt 2/3. Thread off the handwheel and replace it with the valve actuator.

LK Room Unit v.3 (optional)

As an option, LK Control v. 3 can be supplemented with a LK Room Unit v.3 LK Room Unit v.3 sense the ambient room temperature and then adjust the control unit's heat curve. The function is similar to a room thermostat but with the possibility of remotely controlling certain functions of the control unit.

The room temperature can be easily adjusted from the room unit. The display shows the current temperature. When changing the temperature, the display switches from showing the current temperature to showing the set temperature; see more information below under Room temperature. The normal setting for room temperature should be in Automatic mode AUTO.

The room unit is placed on an inner wall, away from heat sources, windows and direct sunlight. Room thermostats for regulating individual rooms should not be used in combination with the room unit. For electric coupling, see headings "electric cables" and "electric wiring".

Description of buttons and display

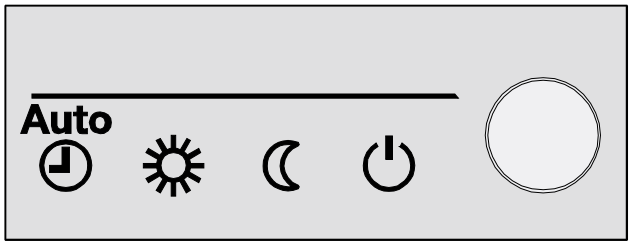
Room temperature

The room temperature can be changed using the setting knob on the front of the room unit. During configuration with the knob, the indication switches to the set adjusted value. If no further settings are made after 4 seconds, the basic setting with the value of the room temperature will be shown as an acceptance.

Presence button

The room temperature can be temporarily reduced/increased using the presence button. The unit will then switch between operating mode normal temperature or lower the temperature. The switch is only activated until the next point of switching, according to the mode programme. The function is only available during automatic mode.

Choice of operation mode



This button is used to switch between the different modes of operation. The mode chosen is indicated by a line shown under respective symbol on the display.

AUTO

During automatic mode the room temperature is controlled according to the time-controlled programme. Properties for automatic mode:

- Heating according to time-controlled program.
- The "should" value of the temperature, according to the heat program reduced temperature.
- Frost protection functions active.
- Automatic summer/winter coupling (ECO-functions).

Continuous heat regulation according to normal temperature.

Continuous heat regulation according to reduced temperature.

Properties for continuous mode.

- Heating without time-controlled programme.
- Frost protection functions active.
- Automatic summer/winter coupling (ECO-functions) and day-heat limit inactive during continuous operation to normal temperature.

During frost protection mode (also called On-call mode/standby) the heating system is closed down. It is however, still protected against frost damage (frost protection temperature) as long as the power supply is not disconnected.

Properties for frost protection mode:

- Heating OFF.
- Temperature according to frost protection.
- Frost protection functions active.
- Automatic summer/winter coupling (ECO-functions) and day-heating limits active.

Electric cables

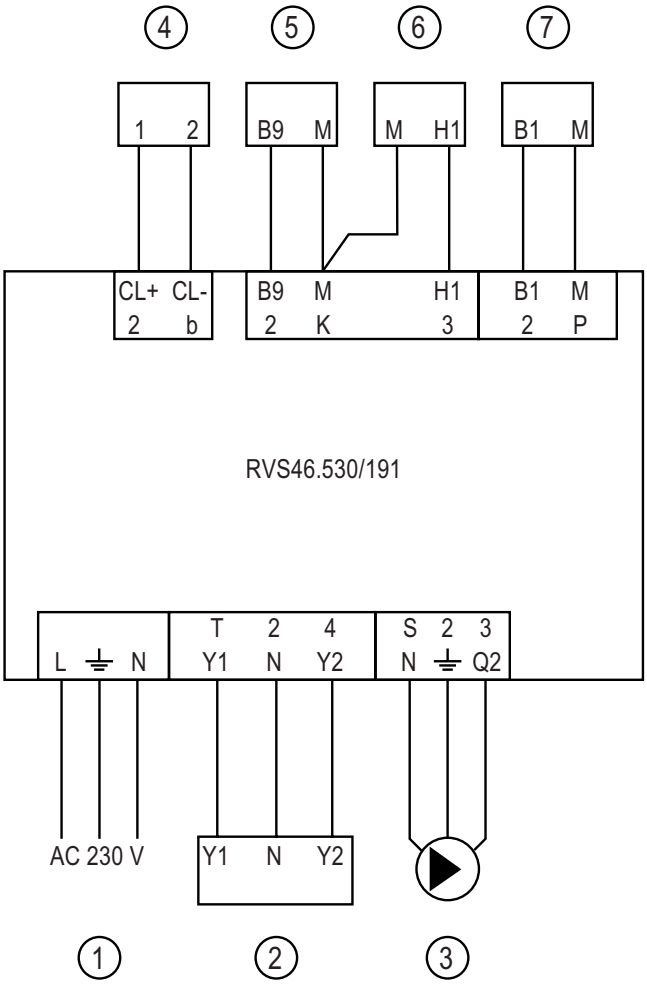
The choice of cables and their placing must follow local regulations. The mains voltage of the control unit must be equipped with a bipolar switch. Strain releivs fotrh cables is performed in the control box with the enclosed plastik straps.

Mains voltage is used for the control unit and circulation pump, while low voltage cables are used for the inflow sensor, outdoor sensor and the eventual room unit. The sensor wires must not be laid in parallel to the mains voltage cables.

The wire lengths permitted for the sensor units are as follows:

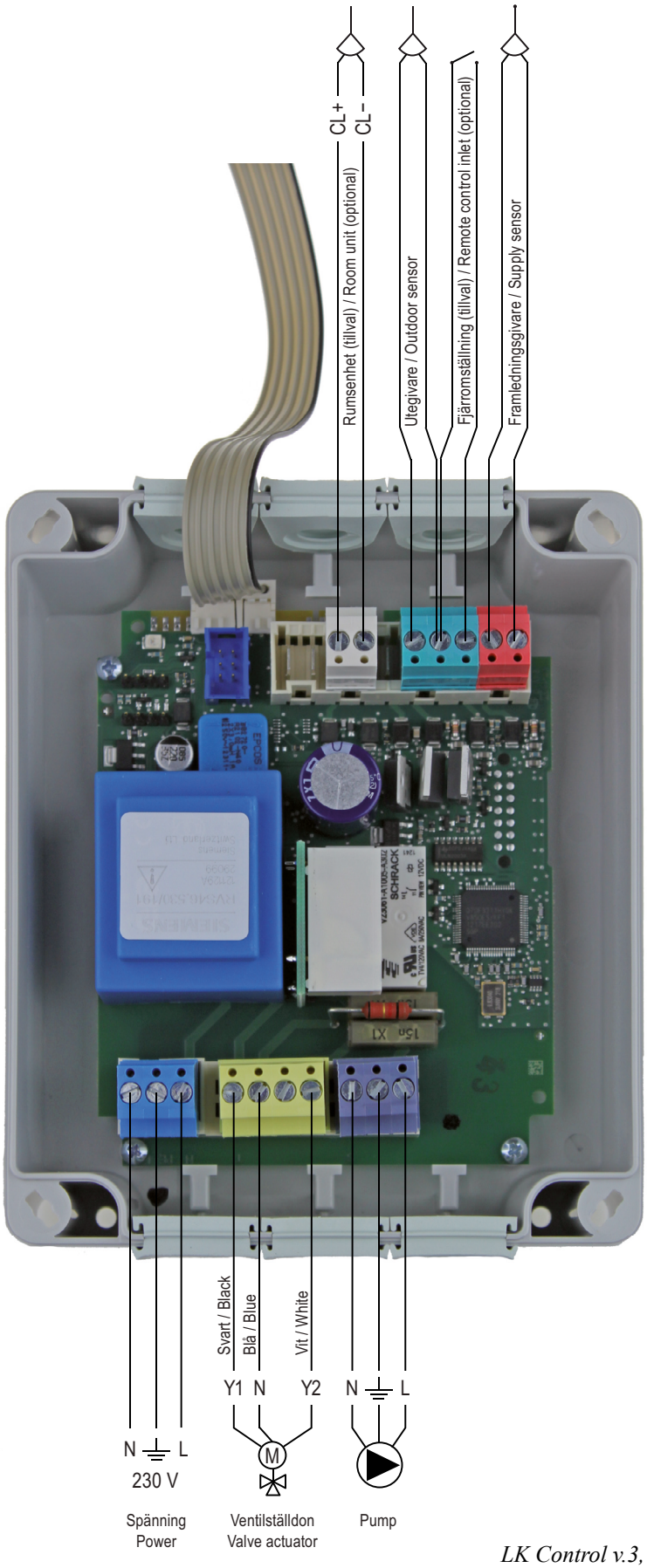
- Cu-cable Ø 0.6 mm2, max 20 metres.
- Cu-cable Ø 1.0 mm2, max 80 metres.
- Cu-cable Ø 1.5 mm2, max 120 metres.

Electric wiring diagram for LK Control v. 3



No. as stated in wiring diagram	Connected unit
1.	Infeed AC 230 V
2.	Valve actuator SSY319
3.	Pump
4.	Room Unit v.3 (optional product)
5.	Outdoor Sensor v.3
6.	Remote Control inlet (optional solution)
7.	Flow sensor v.3

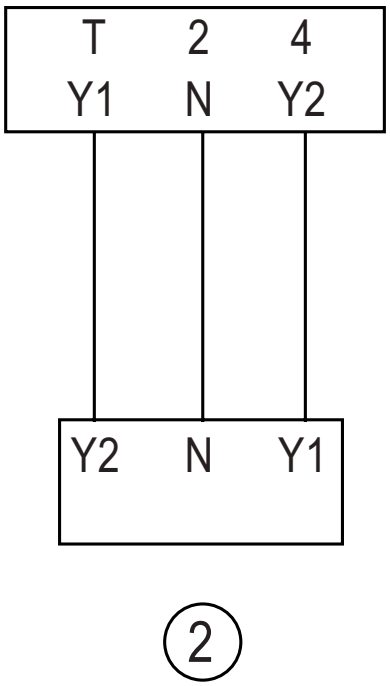
Elektrisk inkoppling LK Styr v.3 / Electrical connection LK Control v.3



LK Control v.3, principle diagram of wiring

Electric wiring diagram LK Control v.3 -RA

LK Control v.3 -RA is connected as shown in wiring diagram LK Control v.3, but the valve actuator (no. 2) is connected as shown in the diagram below to ensure that the valve actuator functions correctly.



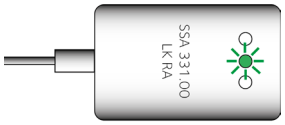
LK Control v.3-RA

Programming LK Control v.3

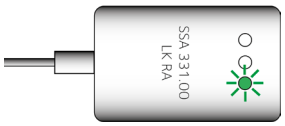
LK Control v.3 is pre-programmed for the LK Floor Heating System on delivery. Only time/date normally require setting, according to below. However, changes/adjustments may be necessary for specific facilities, e.g. adjustment of heat curve, see below.

The last page of these instructions contains a table of the different functions that can be programmed.

The valve actuator is fully open.



The valve actuator changes between modes.



The valve actuator is fully closed.

Setting the Clock and Date

Line no. 50 - Clock

Press for 3 sec until the programme line 50 is displayed (no.50).
Press and time will start to flash.
Set the time using or and accept using after the completed set time.
Press to return to normal mode.

Line no. 51 - Day/ month

Press for 3 sec until no. 50 is displayed. Choose programme line no. 51 using button and press . The field will start flashing.
Set the month using , or and press . Set the day using , or and press .

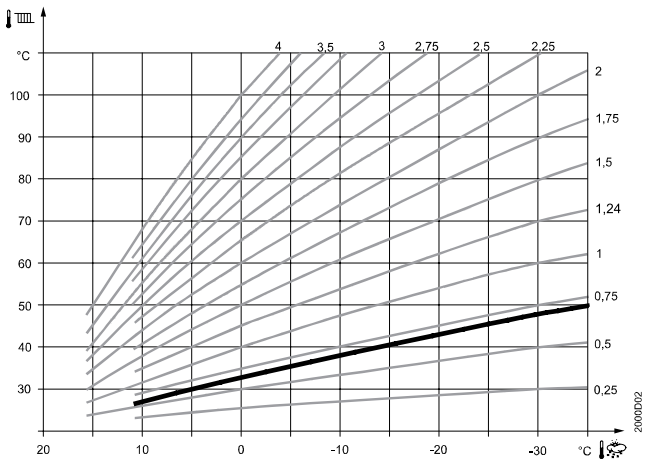
Press to return to normal mode.

Line no. 52 - Year

Press for 3 sec until no. 50 is displayed. Choose programme line no. 52 using button and press . The field will start flashing.
Set the year using , or and press .

Press to return to normal mode.

Line no. 73 - Heat curve slope



The standard setting for the control unit is 0.7; it is shown here in the diagram with a bolder line. By increasing or decreasing the normal temperature the curve is displaced in parallel, which means the inflow temperature and therefore the room temperature will increase or decrease, see below.

Press OK for 3 sec until no. 50. Choose programme line no. 73 using button and press OK. The field will start flashing. Choose the calculated regulation curve of the facility for the dimensioned outdoor temperature using , or and press OK.
Press AUTO STBY to return to normal mode

Remote switching

LK Control can be remotely controlled via an external switch together with e.g. a mobile telephone or other external control equipment. LK Control v.3 will then regulate the temperature down to an optional mode of operation. Connections are made to inlet H1 and M on the control unit. See heading "programme lines/ programme lines for installer" and indicate programme line 90, "Relay H1", if the relay function of the switch connected is normally closed NC (pre-programmed), or normally open NO (NC=1, NO=0).

Choose mode of operation for affected contact H1 on programme line 85. 0= not affected. 1= On-call mode/Standby, also called frost protection mode (pre-programmed). 2=Reduced temperature, see programme line 71. 3= Normal operation, see programme line 70. 4= Automatic heating, AUTO according to time-controlled programme.

Basement function

When you want to heat a basement in summer, for example, channel 74 or 77 must be toggled in order to block the unit's eco function. The unit instead provides control after menu row 75 (min. limit of supply temperature). If the LK Room Unit is connected, this is toggled .

Error messages

The control unit indicates an error that can occur in the facility. The display shows the symbol and letter "C" followed by an error number (C.--), when an error has occurred. The control centre can save a maximum of 2 error messages. The errors cannot be removed before the cause of the error has been acted on. If further errors exist, they are addressed to the memory as soon as space is available. To display an error code, press INFO.

Indication	Error description
None	No errors
C.10	Outdoor temperature sensor
C.30	Flow temperature sensor
C.61	Error in room unit
C.85	Error in radio link

Chosen sensor values are updated within a maximum of 5 sec.

Specific Indications	Error description
– – –	Break in sensor wire or no sensor connected. Displayed for information when the outdoor temperature is higher than the eco temperature set; see programme row 74 in the table under the heading ***Programme rows for end users***.
o o o	There is a short circuit on the sensor

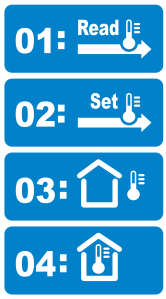
Troubleshooting

Heat regulation does not function; no temperature is displayed

- Check the power to the control centre.
- Perform a reset by disconnecting the operating voltage for at least 5 sec.

The valve actuator does not open or close.

- Check that the power to the valve actuator, see electric wiring diagram.
- The function button for manual operation on the control SERV is not affected.
- Break in the electric cable to the control unit. Perform a test on the output, see programme line 93 under the heading "Programme lines for installer" and force-drive pump and open/close the valve actuator.
- Check the electrical coupling of the sensors. Perform a test of the inputs; see programme lines 94, 95 under the heading "Programme lines for the installer" or press INFO and switch with OK or ESC to display the:



current incoming temperature,

estimated incoming temperature,

current outdoor temperature,

current indoor temperature.

(note: the indoor temperature can only be displayed when the room unit is connected, option)

- Reduce the temperature according to the active programmed function.

The circulation pump does not function

- Check the power to the pump; see electric wiring diagram. Perform a test of outputs; see programme line 93.
- Check the electric coupling of the sensors. Perform a test of outputs; see programme line 93.

Wrong room temperature

- Increase or decrease the estimated room temperature/ normal temperature by using the buttons OK + or ESC − exit using AUTO STBY.
- Is the correct operative programme connected to the mode of operation option button AUTO STBY?
- Has the automatic mode been disconnected from the room unit (the room unit is delivered as an option)?
- Are the weekday, time and indicated modes of operation/heating programme correct?

The heating facility does not function correctly.

- Check the settings of all programme lines.
- Perform a test of outputs; see programme line 93.
- Perform a test of inputs; see programme lines 94 and 95.

Technical Data

LK Control v.3

Operating voltage	230 V AC (+/- 10 %) 50 Hz (+/-6 %)
Power consumption	8 VA
Enclosure class	IP 54
Battery backup (Capacitor)	36 h
Relay output - related current area	AC 0,02…2 (2) A
Relay outputs - max coupling current	15 A < 1 s
Weight	764 g
Dimensions W x D x H	124,9 x 72 x 149,9 mm

Energy declaration in accordance with EU 811/2013

Temperature regulator class	Class III (connected to LK Room Unit Class VII)
Temperature regulator's contribution to seasonal space heating energy efficiency	1,5 % (connected to LK Room Unit, 3,5%)

LK Valve Actuator SSY319 (LK Control v.3)
LK Valve Actuator SSY31 (LK Control v.3 -RA)

Operating voltage	230 V AC (+/- 15 %)
Power consumption	7 VA
Control signal	3-position/mode
Set-up time/ lifting height/ power	150 Sec/ 5,5 mm/ 100 N
Media temp. permitted.	>1…110 °C
Connection cable	3-way/ length 1.5 m
Enclosure class	IP54
Environmental conditions	Class 3K3, Temp +1…+50 °C, Humidity 5 ... 85 %RF
Dimensions LxWxH	81 x 51,4 x 88,6 mm

LK Outdoor Sensor v.3

Type	NTC1000 Ohm at +25 °C
Enclosure class	IP 54
Measurement area	-50…+70°C (tolerance +/-1K)
Dimensions LxWxH	79,8 x 49,7 x 91,6 mm

Resistance table 0°C 820Ω, 10°C 889 Ω, 20°C 963 Ω, 25°C 1000 Ω, 30°C 1089 Ω, 40°C 1119 Ω, 50°C 1202 Ω, 60°C 1289 Ω, 70°C 1379 Ω, 80°C 1472 Ω.

LK Flow Sensor v.3

Type	NTC10 kΩ at +25 °C
Capsling class	IP 42
Measurement area	-30…+125°C (tolerance +/-0,5K)
Dimensions LxWxH	67,0 x 42,2 x 60,0 mm

Resistance table 0°C 32.65 kΩ, 10°C 19.90 kΩ, 20°C 12.49 kΩ, 25°C 10.00 kΩ, 30°C 8.06 kΩ, 40°C 5.32 kΩ, 50°C 3.60 kΩ, 60°C 2.49 kΩ, 70°C 1.75 kΩ, 80°C 1.26 kΩ.

Programme lines

Programme line information is available at two different levels - end user and installer levels.

Programme lines for "End user"

This level allows the user access to parameters 50 to 74. Here you can e.g. set the time, date and different connection times. To arrive at the End User level, the Auto-mode must be activated.

Press OK for 3 sec until programme line 50 is displayed (no.50). Choose the programme line required using the button ▲ and press OK. The field will start flashing, exit the setting with OK. Press AUTO STBY to return to normal mode.

nr	Shown in display	Explanation	Comment	Factory (default) settings
50	10:29	th/min		
51	27:08	day/month		
52	2008	year		
60	1-7, 1-5, 6-7, 1, 2, 3, 4, 5, 6 och 7	Heating programme		1-7
61	06:00	Connection time 1		06:00
62	22:00	Disconnection time 1		22:00
63	--:--	Connection time 2		--:--
64	--:--	Disconnection time 2		--:--
65	--:--	Connection time 3		--:--
66	--:--	Disconnection time 3		--:--
67	Day/month	Holiday/weekend programme start		--:--
68	Day/month	Holiday/weekend program end		--:--
69	0 = frost, 1= reduced temperature	Operative mode during holi-day/weekend		0
70	20,0°C	Normal temperature	Min – 35 °C Min = row 71	20,0°C
71	20,0ºC	Reduced temperature	Min – Max Min = row 72 Max = row 70	20,0ºC
73	0,7	Heat curve slope		0,7
74	18,0ºC	Summer/winter (ECO)	--- – 30 °C --- = disabled function	18,0ºC

Programme lines for "Installer"

This level allows the user access to parameters 75 to 99. Here you can e.g. set the min /max limits, the incoming temperature, etc.

Press OK for 3 sec until programme line 50 is displayed (no.50). Then press INFO for 5 sec, "on" will be shown on the display. Choose the programme line required using the button ▲ and press OK. The field will start flashing, exit the setting with OK.
Press AUTO STBY to return to normal mode.

nr	Shown in display	Explanation	Comment	Factory (default) settings
72	10,0 °C	Setpoint weekend, frost protection	4 °C – Max Max = row 71	10,0 °C
75	8 ºC	Min. limited inflow	8 °C – Max Max = row 76	8 ºC
76	50,0 ºC	Max. limited inflow	Min – 95 °C Min = row 75	50,0 ºC
77	-3 °C	Outdoor temp. X °C is lower than set normal temperature (average during day).	-10 °C – +10 °C --- = disabled function	-3 °C
78	--- ºC	Reduction of lowered temperature (Night) for low outdoor temperature start.		--- ºC
79	-15 ºC	Reduction of lowered temperature (Night) for low outdoor temperature end.		-15 ºC
80	1 = 3-position, 0 = 2-position	Type av actuator		1
81	0-20,0 ºC	Coupling difference in actuators		2,0 ºC
82	30-873 s	Running time actuators		150
83	32º	P band (xp)		32 ºC
84	120	I-time (Tn)		120
85	0 = None, 1 = on-call operation/Standby 2 = reduced, 3 = normal operation 4 = automatic heating AUTO	Via signal input H1 (slope)		1
86	0 = Off 1 = On	Fast lowering. Pumpstop upon reaching room temperature with connected Room Unit.		0
90	0 = NC, 1 = NO	Relay H1		1
91	-3 +3,0ºC	Changing outdoor temperature sensor.		0,0 ºC
92	0-50 h	Time constant = building construction		15
93	0 = no test 1 = Alternate from 2 = --- 3 = ---, 4 = ---, 5 = pump at operating mode 6 = control valve opens Y1, 7 = control valve closes Y2	Relay test		0
94	Current outdoor temp ºC	Outdoor temp		
95	Current flow temp ºC	Flow temp		
96	0 = Open, 1 = Closed	Relay status H1		0
98	0 = nej, 1 = ja	Reset to Factory (default) setting		0
99	03,5	Programme version		03,5