LPM 2251

User Manual

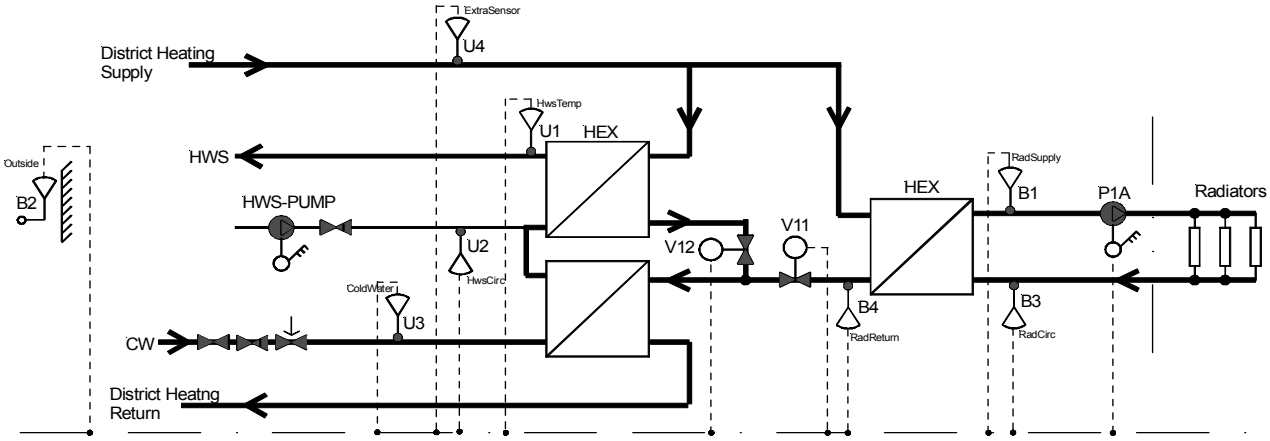
0FL-4101-000

The LPM 2251 offers combined heating and domestic hot water control for hot water heating systems. The radiator circuit is controlled according to an outdoor temperature-compensated reset curve . The domestic hot water is controlled by using a separate constant temperature controller.
LPM 2251 also has additional temperature sensor inputs for temperature measurement of radiator circulation, radiator return, hot water circulation, cold water and one optional point.

LPM 2251 holds full heating funtionality including control loops, curves, time control, alarm handling etc.

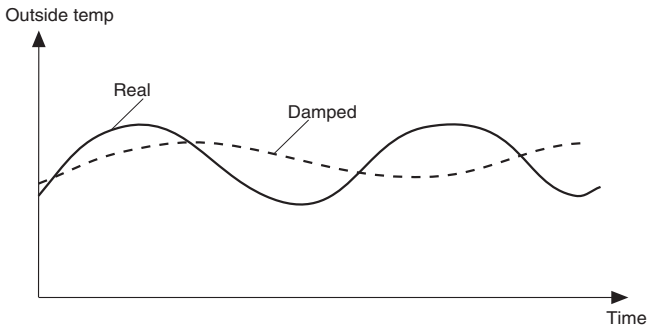
Simple symbols, a clear LCD display and a minimum of buttons make it easy to operate the controller i.e. read and change values and parameters.

Start-up and commisioning is simplified by the use of preprogrammed well proven application technique and factory settings

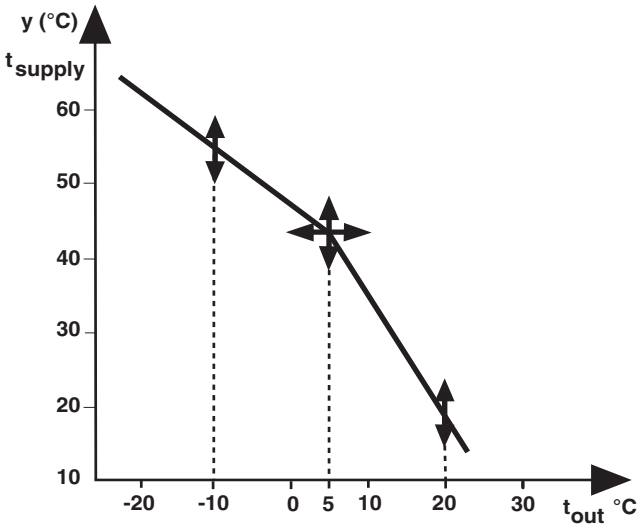


FUNCTION RADIATORCIRCUIT

Damped outside temperature
The purpose of the supply temperature control is to maintain the correct indoor temperature irrespective of changes in the outside temperature.
The thermal inertia and mass of the building shell mean that a rapid change in outside temperature takes a while to affect the room temperature. To make effective use of the heat storage capacity of the building shell, control is done according to a damped outside temperature.
The amount of damping is adjustable to suit all types of buildings. This function prevents a cold effect when the outside temperature rises quickly, and unnecessary additional heating during the usually cool evening hours before night setback.

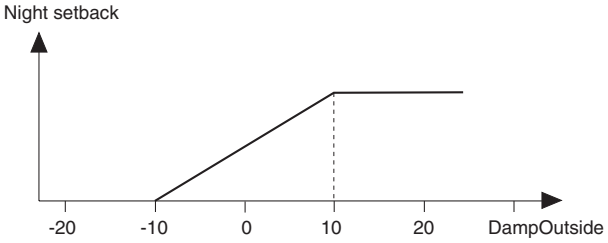


Control curve
The control curve for the supply temperature is based on three dimension points, defined to three outside temperature points of which one is adjustable.
The curve can be shifted in parallel.
The supply temperature can be minimum and maximum limited.
The calculation of the control curve is based on damped outside temperature.

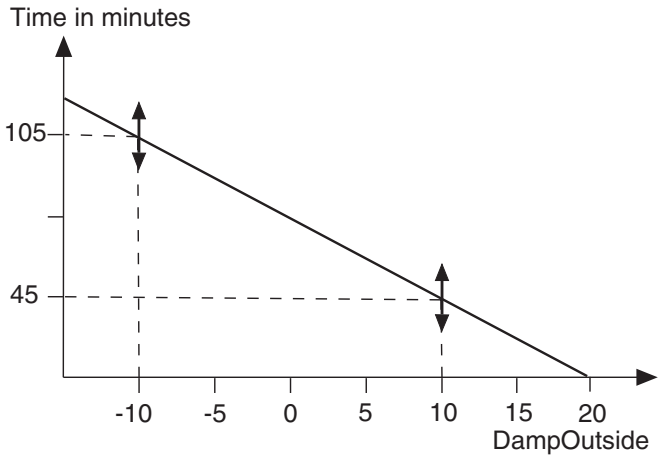


Night setback
LPM 2251uses variable night setback to ensure that the heating system is able to restore the indoor temperature after night setback at low outside temperature.

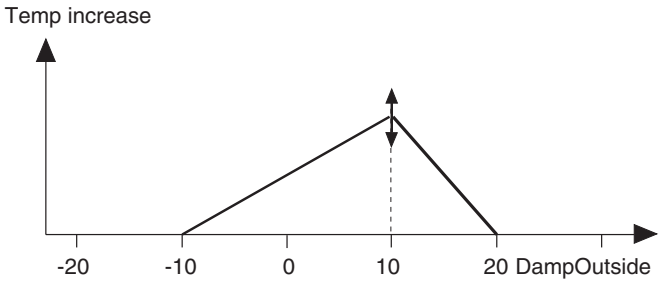
The magnitude of the setback is a function of the damped outside temperature according to a curve that has two adjustable outdoor temperatures.



Morning boost
Boost time
LPM 2251 calculates the time of changeover to daytime operation automatically. This means that the controller starts the heating earlier to obtain correct temperature at the beginning of occupancy time.
The calculation is a function of a damped outside temperature curve. Relay output K2 is closed during morning boost.



Boost temp
The supply temperature is increased during morning boost.
The level of increase is a function of a damped outside temperature curve



Ramp function
LPM 2251 has a built-in ramp function which prevents to rapid increase of the supply radiotor temperature. The increase rate of the supply setpoint is adjustable. This function eliminates temperature related flick sounds in the pipes during morning boost.

Control loop
The final supply temperature setpoint is calculated from

-Outdoor reset control curve
-Parallel displacement of control curve
-Night setback temperature
-Morning boost temperature

The calculated setpoint is then minimum and maximum limited.
The supply temperature is controlled towards the final setpoint with a PI-regulator with adjustable P-band.

TIME CONTROL & MANEUVER

Radiator time program
Time control of day / night operation mode for the radiator circuit is carried out by a weekly time program.

Weekly time program 2
The hot water service temperature control loop can use two different setpoints.
The switch-over is carried out by the weekly time program 2. This weekly time program also operates output K4 for time control of external devices.

Holiday time program
The Holiday time program can hold up to six holiday periods. Each holiday period is defined by a start date and a stop date.

Daylight saving
LPM 2251 has automatic change over from summer to winter time.

Maneuver
The following operation modes can be set by the OP-panel:

Night	- Continuous Night mode
Auto	- Time controlled operation mode
Day	- Continuous Day mode
Hand	- Manual operation

FUNCTION PUMP CONTROL

The logic applied to pump control is designed to use the building's accumulated heat as effectively as possible.
Consequently the pump operates only when there is an actual heat demand.

Cut Off
The pump is stopped and the control valve closes when the outside temperature exceeds an adjustable cut off temperature. The pump runs 5 min before it stops.

Pump stop
The pump is stopped and the control valve closes when the calculated supply temperature setpoint drops below an adjustable limit. The pump runs 5 min before it stops.

Pump restart
The time for restarting the pump after a stoppage can be set to between 0 and 12 hours.

FUNCTION HWS CONTROL

Temperature control
The hot water services temperature is controlled towards the setpoint with a PI-regulator with adjustable P-band, I-time and stroke time for the motorized valve.
The control loop has a ramp limitation which means that the maximum change rate of the control signal is adapted to the stroke time of the motorized valve.
The control signal cannot change faster than the actuator moves to avoid self-oscillation.
The control loop has an adjustable dead zone used at low hot water flow to increase the control stability.
This means that a bigger control offset is allowed at low hot water flow before the control signal changes.

ALARM HANDLING

Pump alarm
Alarm is tripped if run indication from the pump in operation fails. The alarm time delay is 15 sec.

Temperature alarm
Radiator circuit:
Alarm is tripped when the differential between the supply setpoint and the supply measured value exceeds 10 °C. Time delay is 60 min.

Hot water services:
Alarm is tripped when the differential between the Hws setpoint and the Hws measured value exceeds 10 °C. Time delay 60 min.

Sum alarm
The sum alarm output closes when there is a tripped alarm.

TECHNICAL DATA

Part number LPM 2251:
- Controller 200-2153-000

User Manual 0FL-3998-000
Power supply ..... 24 V AC ±20%, 50-60 Hz
Power consumption 3W
Thermistor inputs:
- Type of thermistor ..... 1800 ohm/25 °C
- Measurement range ..... –50 °C to +120 °C

Relay outputs:
- Max. voltage ..... 250 V AC
- Max. current ..... 2 A

Inputs:
- Sensor inputs B1-B4, U1-U4 thermistor input (see above)
- Extended daytime operation, X1 ..... closing contact to M
- Pump alarm, X2 ..... closing contact to M

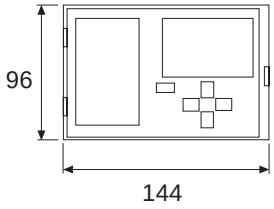
Outputs:
- Circulation pump, K1 ..... relay output (see above)
- Morning boost, K2 ..... relay output (see above)
- Buzzer alarm, K3 ..... relay output (see above)
- Weekly program 2, K4 ..... relay output (see above)
- Open heating valve, K5 ..... relay output (see above)
- Close heating valve, K6 ..... relay output (see above)
- Domestic hot water valve, Y1 .... 0-10 V DC or 2–10 V DC
- Additional connection to outdoor temp., Y2 ..... 0–10 V DC

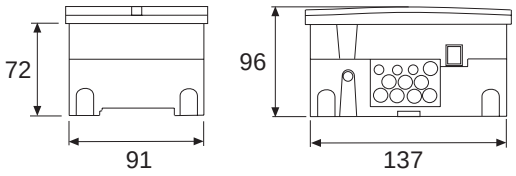
Calendar clock:
- Accuracy ..... +12 minutes/year at +25 °C
- Reserve running time ..... 48 hours

Enclosure rating ..... IP 40, front IP 54
Ambient temperature:
- Operating ..... 0 °C to +50 °C
- Storage ..... –20 °C to +50 °C

Ambient humidity ..... max. 90% RH
Electromagnetic compatibility:
- Emission ..... EN 50081-1
- Immunity ..... EN 50082-1

Material ..... ABS plastic
Colour ..... grey/red/transparent
Weight ..... 0,7 kg
Overall dimensions WxHxD (mm) 144x96x96



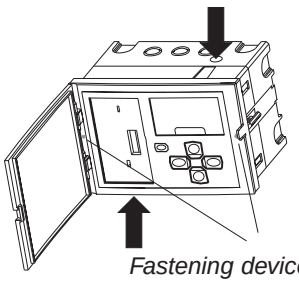


Dimensions in mm

MOUNTING

▶ Procedure for removing the backplate:

1. Remove the metal brace by unscrewing the fastening device.
2. Press in the two round "buttons" on the sides of the controller.
3. Hold the "buttons" in while carefully pulling the electronic part out of the back.

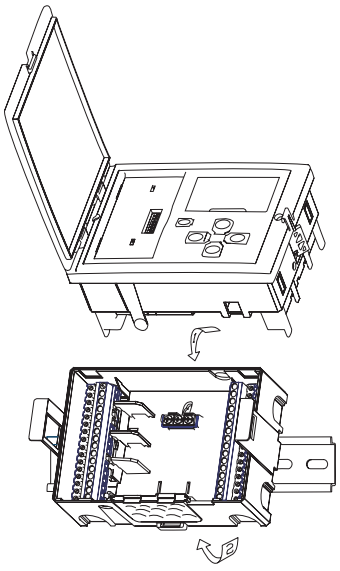


Fastening device

The controller can be mounted in three different ways:
- Directly on a wall
- On a norm rail EN 500 22 (TS 35 mm)
- In a panel, with or without a backplate

▶ Procedure for mounting controller on a norm rail EN 500 22:

1. Place the backplate of the controller with the metal brace on the upper side of the rail (arrow 1).
2. Turn it downwards until it snaps onto the rail (arrow 2).
3. Press on the electronic part. Secure the controller into the metal brace with the fastening device for panel mounting.
4. To remove, place a screwdriver in the lock on the bottom of the controller and pull down.

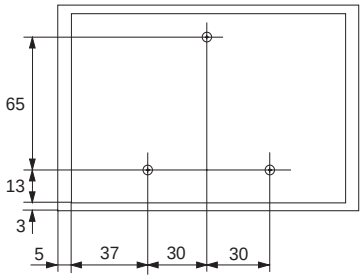


It is then possible to lift the controller diagonally upwards and off the rail.

MOUNTING

Procedure for mounting controller on a wall:

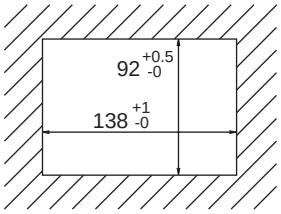
1. Drill holes for the three screws as shown in the adjacent scale drawing.



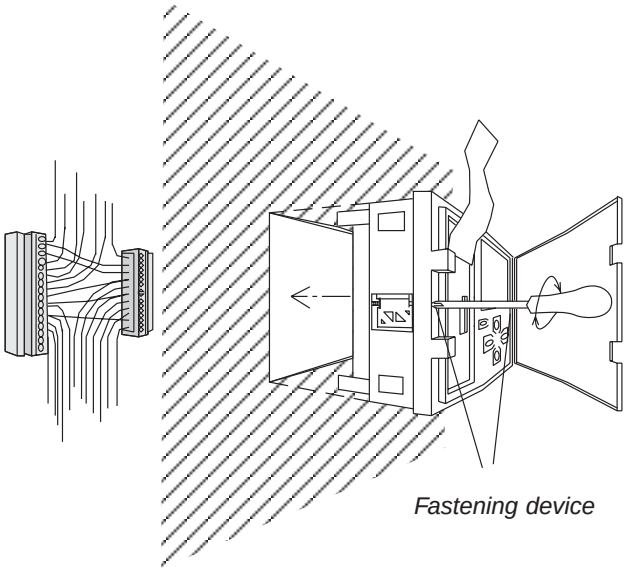
2. Remove the backplate from the electronic part.
3. Mount the backplate and the metal brace.
4. Connect the cables.
5. Push the electronic part onto the backplate and secure the controller into the metal brace with the fastening device.

Procedure for mounting controller in a panel:

1. Make an opening in the panel as shown in the adjacent scale drawing. The maximum panel thickness is 5 mm.



2. Remove the backplate from the electronic part (see above). Remove the terminal blocks from the backplate.
3. Place the controller in the panel and lock it in position by tightening the two locking screws. Seal the holes using the two gasket sections. It is not necessary to install the metal brace when mounting panel.



Fastening device

4. Attach the terminal blocks to the pins on the backplate of the controller. Note that the terminal blocks are “coded”, so they cannot be interchanged.

It is also possible to use the backplate when mounting the controller in a panel.

Outdoor temperature sensor, EGU

Mount the sensor to an exterior wall facing north or north-west. Place it approximately 3 m above ground with the cable entry facing down.

If several LPM 2251 are to be used in the same building, it may be sufficient to only install one outdoor temperature sensor. Any controller which has no outdoor temperature sensor of its own can then receive outdoor sensor signals from the controller which has one.

Rad supply temperature sensor, EGWS, EGA

The immersion sensor EGWS should be mounted in the supply pipe 0,5–1 m after the heat exchanger. If a strapped-on sensor EGA is used, this should be mounted onto an un-insulated part of the supply pipe. Polish the line thoroughly so that the copper sensor plate makes good contact. EGA should not be used on pipes where ∅ > 50 mm (2").

Hot water temperature sensor, EGWS

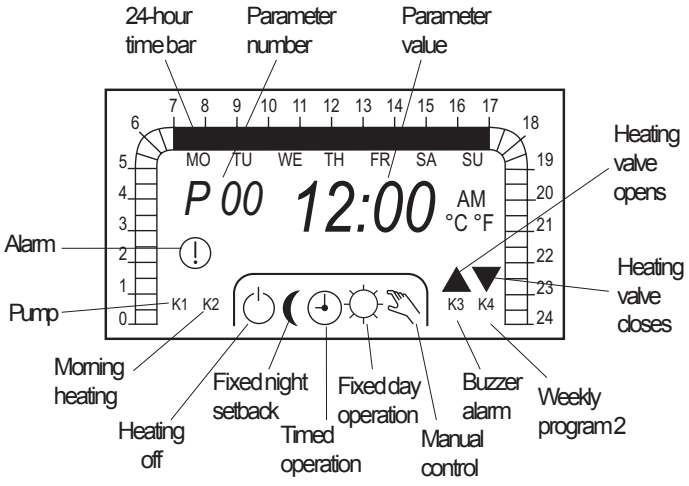
The immersion sensor EGWS should be mounted directly in the outlet from the heat exchanger for domestic hot water.

Actuators TAC Forta™

Assembly instructions are supplied with the actuators.

OPERATOR PANEL

Display window



Operating modes

The symbols have the following meaning:

Heating off

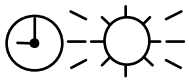
Continuous night setback

Timed operation

Continuous daytime operation

Manual control

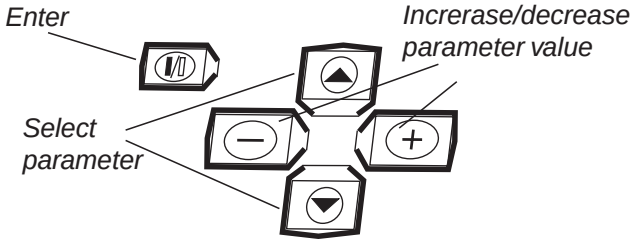
Heat reduction during holiday period



Extended daytime operation from external connection (flashing sun)

How to use the buttons

The controller has five buttons beneath the display window



The buttons on the operator panel

The ▲ and ▼ buttons are used to select a parameter.

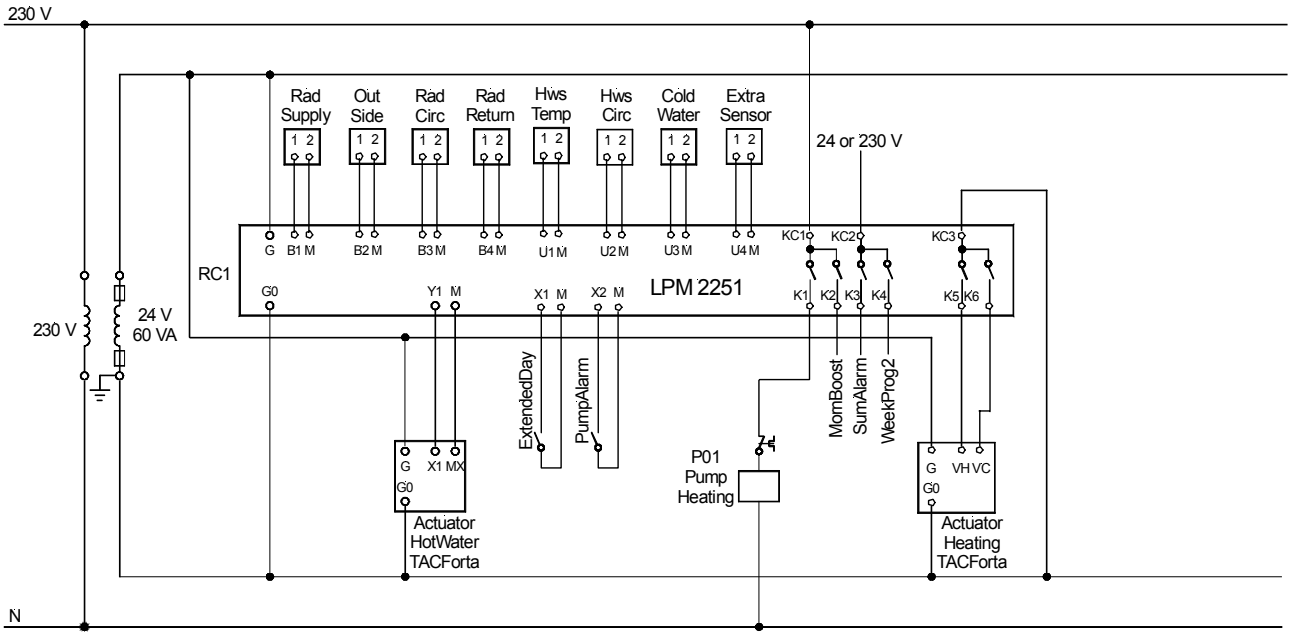
The + and − buttons are used to change a parameter value.

The □\■ button is used as ”Enter” to confirm a parameter change.

The □\■ button is also used to toggle betweenfilled and blank segments in the 24-hour time bar of the weekly time programs.

There should be a switch in order to break the power to the controller. It does not have to be a separate switch for the controller, instead it can also cut the supply voltage to the installation. The function of the switch should be marked clearly.

Wiring diagram



L			R		
16	Y1	Output, dom. hot water control	Measurement neutral	M	16
15	Y2	Output, outdoor temp. signal	Measurement neutral	M	15
14			Hot water temperature	U1	14
13	KC3	Common to K5 and K6	Hot water circ. temperature	U2	13
12	K5	Output, open heating valve	Cold water temperature	U3	12
11	K6	Output, close heating valve	Measurement neutral	M	11
10			Rad supply temperature	B1	10
9	G	24 V AC, phase	Measurement neutral	M	9
8	G0	24 V AC, zero	Outdoor temperature	B2	8
7	⏚	Safety ground	Rad circ. temperature	B3	7
6	KC1	Common to K1 and K2	Rad return temperature	B4	6
5	K1	Output, pump control	Measurement neutral	M	5
4	K2	Output, morning boost	Extra temperature sensor	U4	4
3	KC2	Common to K3 and K4	Input, extended daytime operation	X1	3
2	K3	Output, buzzer alarm	Input, pump alarm	X2	2
1	K4	Output, weekly program 2	Measurement neutral	M	1

The outdoor temperature signal (Y2) is connected to the input of the outdoor temperature sensor (B2) in those controllers (LPM 2000) which have no outdoor sensor of their own

The controller has 25 cable entries in the back. Ensure that the signal cables and the mains cables are pullled through separate cable entries and are kept well apart.

Tie up the cables together in a bundle quite close to the terminal blocks in order to limit movability.

The rail with three screws in the middle of the back is insulated. It can be used as measurement neutral. A connection must then be made between the rail and measurement neutral (M) in the terminal block.

Connection

Connect the cables to the controller as shown in the wiring diagram.

WARNING! All power current cables should be installed by an authorised electrician.

The controller has a number of cable entries in the back. Ensure that signal cables and mains cables are pulled through separate cable entries in the back and are kept well apart.

The rail with three screws in the middle of the back is insulated. It can be used as measurement neutral. A connection must then be made between the rail and measurement neutral (M) in the terminal block.

All equipment which is connected to the controller must comply with the following standards:

- **EN 60 742** (or other applicable safety standard) for air handlers which provide ELV-type power supply (normally 24 V AC) to the controller and other connected equipment.
- **EN 61 010** or **IEC 950** (or other applicable safety standard) for computers, modems and other equipment supplied by 230 V mains.

If equipment using 230 V mains is connected to a relay output terminal of the controller, low-voltage equipment connected to other relay terminals of the controller must
then have at least basic insulation to all touchable parts.

Commissioning

▶The following should be done before switching on the power:

1. Check that sensors and actuators are connected correctly.
2. Set the configuration switch. Access to the configuration switch can be gained by pulling out the quick reference and removing the plastic sheet in front of it.

Switch no	off	on
1	Outdoor sensor connected	Outdoor sensor from another controller
6	1-step domestic hot water control	2-step domestic hot water control
7	0–10 V output for domestic hot water	2–10 V output for domestic hot water

Switch on the power to the controller and set the clock:

1. Set the time. Select parameter number P 15 by pressing ▼ or ▲. Press ▼ and ▲ at the same time to get to P 15 – P 99.
2. Change the time by pressing + or −. Hold down the button for fast increase/decrease. Confirm with □\■.
3. Set the date by going to P 16 by pressing ▼.
4. Change the date (month.day) by pressing + or −. Hold down the button for fast increase/decrease. Confirm with □\■.
5. Set the year by pressing ▼ to get to P 17.
6. Change the year by pressing + or −. Confirm with □\■.

The LPM 2251 is now in operation using the pre-set parameters.

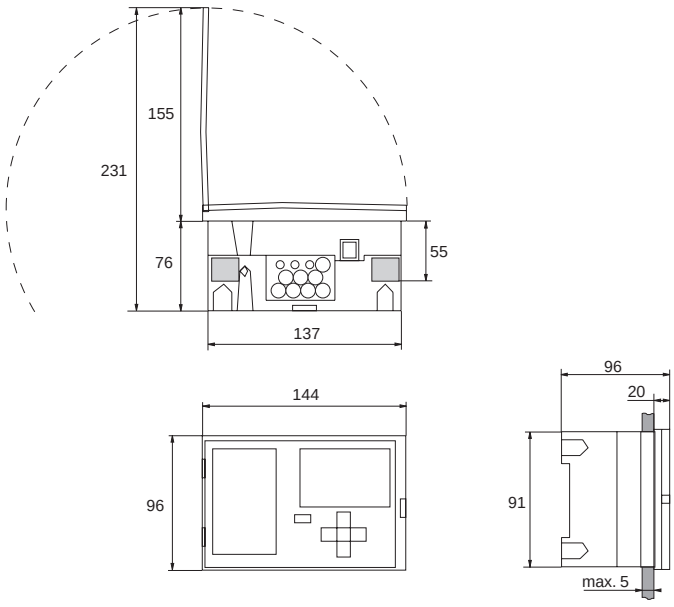
Testing inputs and outputs

To test inputs and outputs, read and set the parameters by using the operator panel. Skip those tests which are not relevant to the installation.

▶ Procedure for testing inputs and outputs:

1. Check that all temperatures are reasonable. Follow the instructions in the quick reference.
2. Ensure that the controller is in the “timed operation” operating mode. The quick reference contains a description of how to set the operating mode.
4. Activate input X1 (extended daytime operation) and check that the timer and the flashing sun appear in the display window.
6. Set the operating mode of the controller to “manual control”.
7. Check that all outputs are operational. Control the outputs using P 88–P 94.

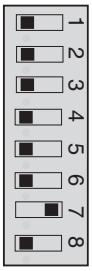
Dimension Drawing



Commissioning protocol/parameter listing

This report form is to be used when commissioning the LPM 2251 controller. Note any parameter changes in the ”Change” column.

Confiuration switch

off on	off	on	Default	Change
	1 Outdoor sensor connected directly	Outdoor sensor from other LPM 2000	off	
	2 Display returns to P:00 after 2 min	Display stays where it is left	off	
	3 -	-		
	4 -	-		
	5 -	-		
	6 1-step control of Hws valve	2-step control of Hws valve	off	
	7 0-10 V output for Hws valve	2-10 V output for Hws valve	on	
	8 Normal operation	Hardware reset	off	

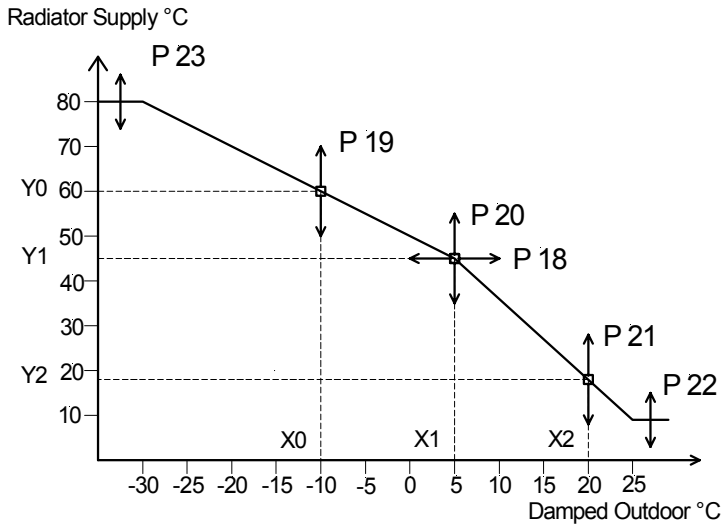
P No	Parameter	Min.	Max.	Step	Default	Change	Comments
P 00	Current time	00:00	23:59	00:01			
P 01	Outdoor temperature	-30 °C	45 °C	0,3 °C			Step=0,1 at 2-40 °C
P 02	Damped outdoor temp.	-30 °C	40 °C	0,1 °C			
P 03	Radiator supply temp.	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 04	Radiator circ. temp.	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 05	Radiator return temp.	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 06	Hot water temperature	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 07	Hot water circ. temp.	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 08	Cold water temperature	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 09	Extra sensor	0 °C	120 °C	0,3 °C			Step=0,1 at 2-55 °C
P 10	Radiator supply setpoint	0 °C	120 °C	0,1 °C			
P 11	Radiator Curve // Shift	-40 °C	40 °C	0,1 °C	0 °C		
P 12	RadCurve Night setback	-40 °C	40 °C	0,1 °C	-10 °C		
P 13	Hot water setpoint	0 °C	120 °C	0,1 °C			Step=0,1 at 2-55 °C
P 14	Week program ,heating	-	-	0,5 h	06-22	see below	filled bar = day mode

Daytime operation, heating	MO	TU	WE	TH	FR	SA	SU
off:							
on:							
off:							
on:							

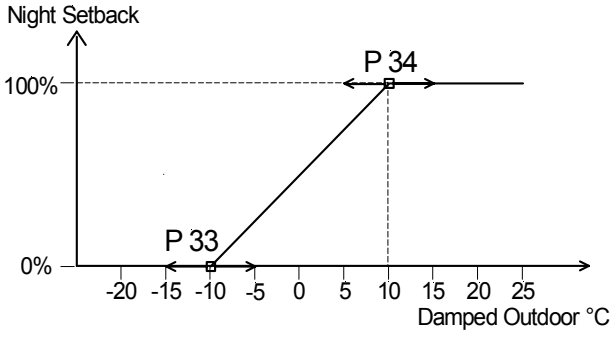
Date	Commissioned by	Unit designation
Installation name		Order number
		Drawing number

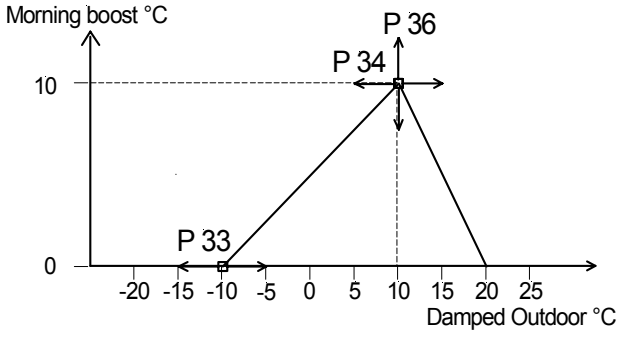
PARAMETERS

P No	Parameter	Min.	Max.	Step	Default	Change	Comments
P 15	Set time	00:00	23:59	00:01	00:00		hour:minute
P 16	Set date	01.01	12.31	00.01	01.01		month:day
P 17	Set Year	0	9999	1	2000		
P 18	Curve point x1	-9 °C	19 °C	1 °C	5 °C		See curve below
P 19	Curve point y0	P 20	120 °C	1 °C	60 °C		See curve below
P 20	Curve point y1	P 21	P 19	1 °C	45 °C		See curve below
P 21	Curve point y2	5 °C	P 20	1 °C	18 °C		See curve below
P 22	Min. supply temperature	0 °C	P 23	0,5 °C	10 °C		See curve below
P 23	Max. supply tmperature	P 22	120 °C	0,5 °C	80 °C		See curve below



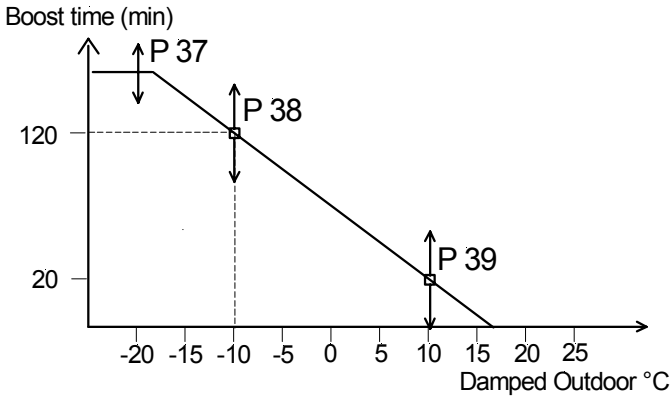
P 24	P-band, Rad controller	10 °C	200 °C	0,5 °C	100 °C		
P 25	Run time, Rad actuator	0 s	300 s	5 s	300 s		
P 26	Max.incr.rate, Rad setp.	1 °C/min	50 °C/m	0,1°C/m	2 °C/min		Ramp limitation
P 33	Outd.temp., 0% night setb	-30 °C	P 34	1 °C	-10 °C		Affects morning boost
P 34	Outd.temp. 100% night sb	P 33	20 °C	1 °C	10 °C		Affects morning boost
P 36	Max morning boost	0 °C	100 °C	1 °C	10 °C		Se curve



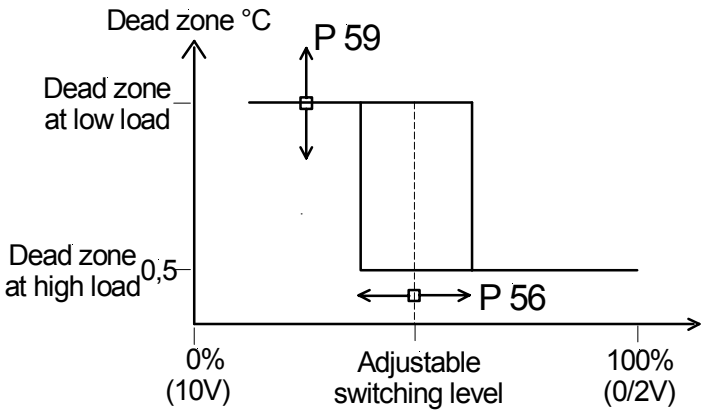


PARAMETERS

P No	Parameter	Min.	Max.	Step	Default	Change	Comments
P 37	Max morning boost time	0 h	24 h	1 h	6 h		See curve
P 38	Boost time at -10 °C (y0)	0 min.	1440 m.	1 min.	120 min.		
P 39	Boost time at +10 °C (y1)	0 min.	1440 m.	1 min.	20 min.		



P 40	% Monday morning effect	0 %	50 %	1 %	10 %		Incr. boost time
P 53	Hot water setpoint	10 °C	120 °C	0,1 °C	50 °C		
P 54	select Hot water setback	0 (off)	1 (on)	1	0 (off)		
P 55	Hot water setback	-30 °C	30 °C	1 °C	0 °C		Only if P 54 = 1
P 56	Switch level, high/low load	6 V	10 V	0,1 V	9 V		See curve below
P 57	P band Hot water contr.	10 °C	200 °C	0,5 °C	50 °C		
P 58	I time Hot water contr.	0 s	600 s	1 s	10 s		0 = I part blocked
P 59	Deadzone/low load Hot w.	0,5 °C	10 °C	0,5 °C	5 °C		See curve below
P 60	Run time, Hot water act.	0 s	300 s	5 s	15 s		



PARAMETERS

P No	Parameter	Min	Max	Step	Default	Change	Comments
P 61	Week program , K4	-	-	0,5 h	00-00	see below	filled bar = day mode
	Daytime operation, Hot w., K4 MO TU WE TH FR SA SU off: on: off: on:						
P 62	Timer, ext. daytime op.	0 h	6 h	1 h	0 h		
P 63	Holiday period	1	6	1	1		
P 64	Start date, holiday period	01.00	12.31	00.01	00.01	see below	Holiday period as P63
P 65	End date, holiday period	01.00	12.31	00.01	00.01	see below	Holiday period as P63
	Holiday period (P 63): 1 2 3 4 5 6 Start (P 64): Stop (P 65):						
P 66	Time format 12/24 hours	12 h	24 h	12 h	24 h		
P 67	Daylight saving time	0	3	1	1		1=Mar-Sp, 2=Mar-Oct
P 72	Pump stop, auto heating	0 (off)	1 (on)	1	1 (on)		1 = yes, 0 = no
P 73	Pump stop, outd. cut off	3 °C	50 °C	1 °C	20 °C		
P 74	Pump stop, supply t. cut off	0 °C	120 °C	1 °C	20 °C		
P 75	Pump exercise, heating	0 (off)	1 (on)	1	1 (on)		1 = yes, 0 = no
P 76	Pump, min off time heating	0 h	12 h	0,5 h	2 h		
P 77	Adjustment, outdoor sens	-5 °C	5 °C	0,25 °C	0 °C		
P 79	Damping const, outd temp	0 h	20 h	1 h	4 h		
P 82	Alarm, pump	0	1	1			0=no alarm, 1=alarm
P 83	Alarm, supply temp	0	1	1			0=no alarm, 1=alarm
P 84	Alarm, hot water temp	0	1	1			0=no alarm, 1=alarm
P 88	Manual contr hot water(Y1)	0 V	10 V	0,1 V			
P 89	Manual contr outdoor sens	0 V	10 V	0,1 V			
P 90	Manual control, pump (K1)	0	1	1			0=off, 1=on
P 91	Manual contr, outtput (K2)	0	1	1			0=off, 1=on
P 92	Man contr, sumalarm (K3)	0	1	1			0=off, 1=on
P 93	Man contr, wkly prog2 (K4)	0	1	1			0=off, 1=on
P 94	Man contr, heating (K5/K6)	0	1	1			-1=close, 1=open
P 99	Type,version,test etc	-	-	-			