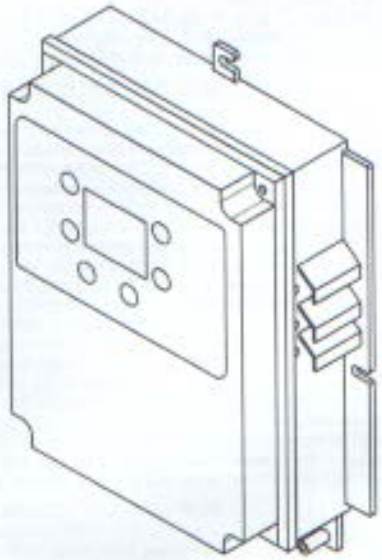
NOTE

MLC27



LABEL

MARCH 2016 - C150108BP0001C

MAIN FEATURES

MLC27 manage a system with max 6 boilers connected in a cascade arrangement with OT communication.

- Management of 6 boiler contemporary;
- Management of an external storage boiler;
- Management of a reverser valve;
- Management of a system pump;
- Management of a DHW circuit pump;
- Ground connections on board;
- Low voltage room thermostat;
- System NTC flow sensor;
- System return NTC sensor;
- Storage boiler NTC sensor;
- Outside NTC sensor;
- Modulation during heating/DHW phase;
- Heating circulator anti-block function;
- DHW circulator anti-block function;
- System frost protection;
- Storage boiler frost protection;
- Automatic configuration of components connected;
- EMC filter on board;
- LED on each input/output;
- Switching power supply for board;
- Open Therm communication for Optically isolated boilers;
- Protection with VDR of each line of communication with the boiler.

WALL INSTALLATION REQUIREMENTS

The installation area must be ventilated and the room temperature below 60°C. Avoid the formation of condensate. High temperatures reduce the life-span of the product. The system must be protected against the infiltration of water and solid bodies.
The system is suitable for applications in a clean environment.
Do not lay the cables of the electronic components on the board.

Before starting installation:

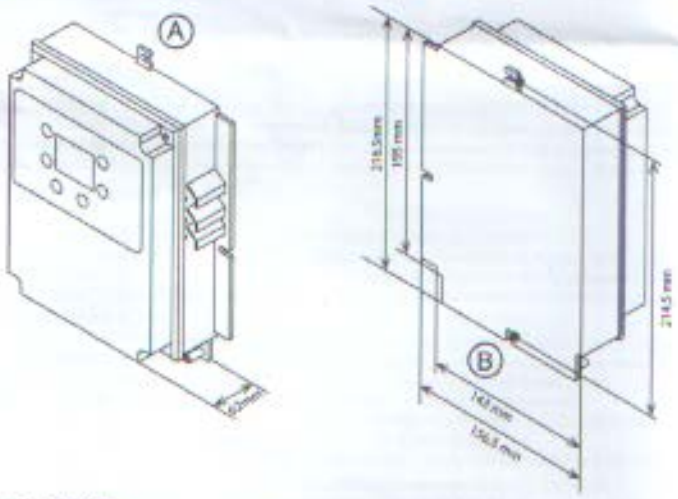
- Disconnect the mains power supply.
- Make sure enough air circulates outside the box to disperse the heat produced by the MLC27.
- Do not expose the unit to water or heat sources.

Only power the unit after completing installation!

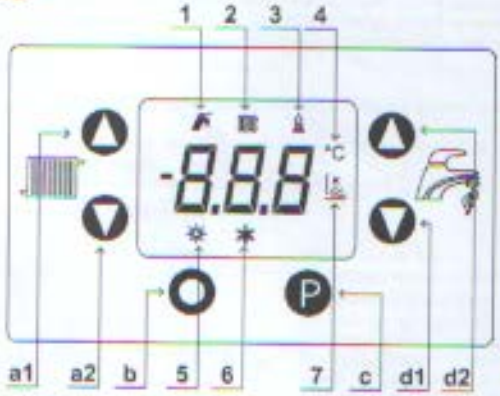
To install MLC27, proceed as follows:

- Drill holes in the wall with 6 mm wall bit to create fixing points (A) and (B), as illustrated in the figure.
- Position the supporting screw with the relative anchor so as to be able to hang the unit from the suspension point (B).
- Position the other screw with the relative anchor and then attach the box to point (A).
- Tighten both screws to fix the accessory to the wall without using excessive force.

After correctly fixing to the wall, proceed with wiring as described in the "Electrical connections" section.



INTERFACE



DISPLAY

1	Fixed: boiler in DHW mode
2	Fixed: boiler in heating mode
3	Fixed: at least one boiler with burner on
4	The parameter shown is a temperature
5	Boiler in summer mode
6	Boiler in winter mode
7	Fixed: Operating mode with outside sensor

BUTTONS

a1	Increases Heating setpoint
a2	Decreases Heating setpoint
b	Press <1 sec to change the mode from summer to winter
	Keep pressing >3 sec to turn on or turn off cascade
c	Press <1 sec to enter on *quick view parameters menu*
	Press >3 but <10 sec to enter on *OTC menu*
	Keep pressing >10 sec to enter on *parameters menu*
d1	Increases DHW setpoint
d2	Decreases DHW setpoint
a1+a2	Keep pressing >5 sec to activate flue cleaner function
d1+d2	Keep pressing >10 sec to activate autosettings function

QUICK VIEW PARAMETERS MENU

It shows the main temperature values of the system and the setpoint calculated or received via OT. To open the quick view menu, press P for less than 1 second and the reading channel and the temperature reading or calculated setpoint are then shown in alternation on the display. To scroll through the menu, press P again (if this is not pressed within 3 seconds, the system closes the menu).

Displayed	Means
CH1	Heating temperature
CH2	Return temperature
CH3	DHW temperature
ot	Outside temperature
SPC	Calculated setpoint
otS	OT protocol selected (1=OT-BP, 2=OT-STD)
tuS	Unit of temperature

OTC MENU

The OTC menu offers the option of activating the cascade system with the external climate controller. To open the menu, press and hold P for a period of between 3 and 10 seconds. Use a1/a2 to select OFS and crE and use d1/d2 to edit the values. The changes are saved in eeprom.

Displayed	Means
OFS	Offset
crE	Curve

PARAMETERS MENU

To open the parameter menu, press and hold P for a period of more than 10 seconds.
Use a1/a2 to scroll through the main options in the menu.
Press to open and close the sub-menus in this menu, and use a1/a2 to scroll through the parameters. Open the Re menu to exit the parameter menu.

Displayed	Means
Ts	Transparent Parameters
In	Inquiry
HI	History
oF	Function Hours
Re	Return

TRANSPARENT PARAMETERS "Ts" MENU

Ts menu allows to edit cascade values.The changes are saved automatically in the EEprom and remain there.
Use a1/a2 to scroll through the parameters and use d1/d2 to edit a value, and any changes are saved automatically. Press P to exit.

PAR	Means		Min	Max	Def
1	Power level for next boiler switching on (>)	%	45	90	70
2	Power level for boiler switching off (<)	%	10	40	30
3	Waiting timer for next boiler switching on (with %>TPS1)	sec	10	240	120
4	Waiting timer for boiler switching off (with %<TPS2)	sec	10	240	120
5	Minimum temperature DHW set	°C	10	30	30
6	Maximum temperature DHW set	°C	50	85	80
7	Minimum temperature heating set	°C	25	35	30
8	Maximum temperature heating set	°C	75	85	80
9	Delivery temperature in tank storage	°C	70	85	80
10	Delivery setting set (boiler probe) during Legionella	°C	75	85	75
11	Temperature of legionella set on tank storage probe	°C	60	75	70
12	Priority of DHW. 0= absolute; 1=mixed; 2=no priority	-	0	1	0
13	Length of the heating post-circulation	sec	0	255	1
14	Length of the tank storage post- circulation	sec	0	255	1
15	Temperature of delivery set during antifreeze	°C	20	85	30
16	Setting of anti-legionella activation 0=disabled 1..7 days	dd	0	7	0
17	Selected hysteresis deactivation request boiler (DHW set point + hysteresis)	°C	1	5	3
18	Mode control (Delayed setpoint for external climate controller)		0	1	0

19	Number of boiler in DHW (not used)	-	-	-	-
20	R.U. mode: 0= R.U. B&P; 1= R.U. not B&P	-	0	1	0
21	0..10V input mode: 0= disabled; 1= enabled only the request; 2= enabled the request and set adjustment	-	0	2	0
22	Input setting O.T.: 0= O.T./R.T.; 1= EN/DIS in and with all the required heat	-	0	1	0
23	Input setting external sensor: 0= external sensor, 1= EN/DIS in AND with all the required heat; 2= R.T.; 3=S.T.	-	0	3	0
24	Input setting CH probe: 0= return sensor; 1=EN/DIS in AND with all the required heat; 2=R.T.; 3=S.T.	-	0	3	0
25	Timing after circulation for the intervention of the safety thermostat	sec	0	255	255
26	Offset added to the heating setpoint sent to the boilers	°C	0	10	0
27	Setting Open Therm protocol: 1= OT-BP; 2= OT-STD	-	1	2	1
28	Input setting DHW sensor: 0= DHW sensor; 1= contact DHW demand	-	0	1	1
29	Time interval for the control of the priority of production DHW missed	min	1	10	1
30	Temp. increase expected in function of time (par.29) probe temperature DHW	°C	1	10	1
31	ΔT deactivation CH between the expected and the measured temperature DHW	°C	5	50	20
32	Selecting units of measurement: 0= °C; 1.= °F	°C/F	0	1	0

INQUIRY "In" Menu

The "In" Menu shows the temperature values of the sensors connected to the controller. Use a1/a2 to scroll through the parameters. Press P to exit.

Displayed	Means
In1	Heating temperature
In2	Return temperature
In3	DHW temperature
In4	Outside temperature

HISTORY "HI" MENU

This shows the last 10 faults saved; use a1/a2 to scroll through the parameters (H01... H10). Press P to exit.

FUNCTION HOURS "oF" MENU

Open this menu to check the hours of operation of each boiler. Use P to select "oF", and the number of the boiler, between 1 and 6, appears on the display. Use a1/a2 to select the boiler and press d1/d2 to view the value. Press P to exit.

In line "o07" (ErS) of the menu, it is possible to reset the hours of operation by pressing and holding P for 3 seconds. Once reset, "000" appears on the display. To exit, press P and then select the Re menu.

Displayed	Means
o01...o06	Boiler 1...6 hours of operation
o07	ErS

FAULTS LIST

Each operating mode is associated with the appearance of one or more symbols on the LCD display. In the case of a fault, one of the codes in the table appears on the display:

CODE	Means
F01...F06	Boiler 1...6 fault
F36	Heating sensor NTC sensor fault
F37	Storage boiler sensor NTC sensor fault
F38	Return sensor NTC sensor fault
F11*	OT outside sensor NTC sensor fault
F39	Outside sensor NTC sensor fault
F40	Safety thermostat action

* Fault F11 indicates:
- the RF (Radio Frequency) outside sensor has shorted or its circuit is open
- no communication between the RF base of the sensor and the RF base of the sensor connected to the "system".

The FC contact closes in the event of a fault (see the wiring diagram).

HEATING MODE

The room thermostat (or other inputs enabled for the purpose) activates heat demand for central heating in "WINTER" mode. The pump starts up and the boilers are activated in sequence to reach the setpoint. If the temperature of the flow sensor exceeds the temperature value of the differential heating setpoint 5°C, all the boilers in use are turned off at the same time. The boiler sequence is restarted if the temperature drops below the temperature value of the set heating setpoint and after the anti-frequent cycle timer (60s). The anti-frequent cycle timer is terminated when the room thermostat is opened and then closed, and when there is DHW demand.

An external limiter is required in the case of underfloor systems.

OFFSET FOR HEATING SETPOINT

Parameter P26 can be used to set an offset for the heating setpoint sent to the boilers.

MODULATING SETPOINT FUNCTION

Parameter P18 can be used to enable operation with modulation of the control setpoint sent to the boilers. When this function is enabled, the sent control setpoint is calculated using a "PID" algorithm that considers the difference between the flow setpoint and the flow temperature.

STORAGE BOILER DHW MODE

The sensor of the storage boiler activates heat demand in DHW mode. The pump and powered reverser valve are activated in the DHW position and the boilers are started up in sequence to reach the set DHW setpoint. If the temperature of the flow sensor exceeds the flow temperature value of the Storage Boiler +5°C, all the boilers in use are turned off at the same time. Operation with the storage boiler in DHW mode is terminated when the temperature detected by the DHW sensor reaches the temperature value of the DHW setpoint plus the DHW switching off temperature (P17). Configuration of P12 determines the type of priority of DHW mode of the storage boiler in relation to CH mode. The boilers are prevented from starting up in DHW mode if:
there is a fault with the DHW sensor, but can still be run in CH mode.

ANTI-LEGIONELLA FUNCTION

The function is enabled at the end of the timer set in parameter P16 (when the function is enabled, it is also activated an hour after start-up of the board), forcing the flow setpoint at the temperature set in parameter P10, and is deactivated when the flow temperature reaches the value of parameter P10 + 5°C or when the temperature of the storage boiler sensor exceeds the temperature set in P11+P17. The function is disabled when there is a fault with the DHW sensor.

HEATING CIRCUIT PUMP

The heating circuit pump is activated when there is heat demand. When heat demand ends, the pump continues to run for the duration of the overrun time in heating mode (if there is no DHW demand).

PUMP ANTI-BLOCK FUNCTION**

DHW CIRCUIT PUMP

The DHW circuit pump is activated when there is heat demand in DHW mode. When heat demand ends in DHW mode, the pump continues to run for the duration of the overrun time in DHW mode (if there is no central heating demand).

PUMP ANTI-BLOCK FUNCTION**

PUMP OVERRUN TIME FOR TRIPPING OF SAFETY THERMOSTAT

The overrun time for tripping of the safety thermostat can be set in P25.

POWERED 3-WAY REVERSER VALVE

The relay that controls the reverser valve is activated during the DHW phase and the overrun phase after demand. The reverser valve remains on standby during the heating phase.

POWERED VALVE ANTI-BLOCK FUNCTION

There is an anti-block function that activates the reverser valve for 30 seconds after every 24 hours of inactivity.

FLUE CLEANER FUNCTION

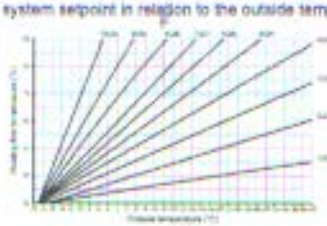
Press a1/a2 to activate the flue cleaner function where all the boilers are run in CH mode until they reach the maximum set temperature value (P08). The function lasts 15 minutes. To interrupt the function, either set "OFF" by pressing O or wait until the CH temperature setpoint is reached. The function is re-enabled when the temperature drops below the CH temperature setpoint. The flue cleaner function can be enabled in either SUMMER or WINTER mode and takes priority over heat demand in DHW/CH mode. When the flue cleaner function is enabled, code 303 alternates with the flow temperature on the display. Ensure a good exchange of heat during this function to keep the power of the boilers at maximum; if this is not possible, test each boiler in turn using the flue cleaner function for each one.

START-UP AND MODULATION PHASE

When there is heat demand in CH or DHW mode, a start-up phase occurs during which the pump of the system is activated and the reverser valve moves in relation to the type of demand. With the pump running, the system calculates the priority for start-up.
Priority is given to starting the boilers that have run for the least amount of time, in order to prevent some boilers from running for longer than others. The priority is calculated every 24 hours whenever there is heat demand in either DHW or CH mode. After calculation, a heat demand of greater priority is sent to the boiler which then starts up, triggering a timer that can be set in parameter P03 (delay for activation of the next boiler). If the boiler is shut down or not activated within 3 minutes, priority is given to the next boiler. At the end of the timer set in parameter P03, the accessory tests the level of modulation of the boiler and, if the level is above the value of parameter P01 (level of power for activation of the next boiler), the next boiler is activated and the timer in P03 is decreased. Lastly, the level of modulation is assessed. If the level is above the value in parameter P01, the next boiler is activated; or, if the level is < than P02, boiler 2 is turned off and control of boiler 1 is restored. This timed switching on and off phase (with checking of the level of modulation) optimises the adjustment phase by using the single internal modulation systems of the boilers. During operation, the setpoint set for the boilers depends on parameter P16 which can be either fixed (in which case it is set on the display or via OT communication) or modulating. After each demand, all the boilers are turned off and the pump of the system remains active during the overrun time.

OPERATION WITH OUTSIDE SENSOR

To activate operation with outside sensor, connect the sensor and set one of the curves in parameter "crE" in the OTC menu. The use of an outside sensor permits calculation of the system setpoint in relation to the outside temperature as shown in the graph. It is possible to

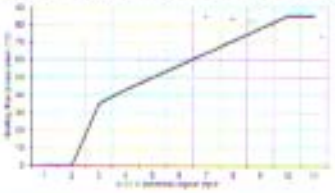


set a curve of 1 to 10 (with "wired" connection of the outside sensor) or of 21 to 30 (with "wireless" connection), or to set 0 to disable the function. In order to optimise operation the offset parameter (ofS) can be used to shift up or down the curve of the value in °C set for the parameter. There are 10 curves in the graph, each corresponding to a value of the parameter crE. The first to the left is 10 (or 30) while the last to the right is 1 (or 21).

**There is an anti-block function that activates the pump for 30 seconds after every 24 hours of inactivity. If there is a power blackout, the anti-block function activates the pump for the first time after 3 hours of inactivity. The function is active even in Off mode.

MANAGEMENT OF 0-10V INPUT

The functions with the 0..10V regulator are activated by means of their parameters. When a function is enabled, the input manages the heat demand and heating setpoint directly. When the voltage is above 3V DC, demand is activated while the heating setpoint is calculated in proportion to deviation from 3 to 10V DC to give a setpoint that goes from minimum to maximum active. Demand is disabled when the voltage is less than 3V DC. The graph shows the relationship with a range of 35-85 °C.



WARNING: Maximum permitted input voltage 11V +/- 2%

SETTING THE DHW PRIORITY

The priority for producing hot domestic water (0: absolute, 1: mixed, 2: no priority) can be selected by setting parameter P12.

- With P12=0 (absolute), the demand for hot domestic water takes priority over the demand for heating.
- With P12=2 (no priority), the heat demand in DHW mode and the heat demand in heating mode are met at the same time.
- With P12=1 (mixed), operation is as follows:

  When there is a heat demand in DHW mode at the same time as a heat demand in heating mode, both are met at first but the ΔT between the temperature read by the DHW sensor and the anticipated increase is also checked. If the difference between the anticipated temperature and the temperature reading is greater than the value set in P31, heating is put on standby until the end of heat demand in DHW mode.

- For P29, select the period of time (between 1 and 10 minutes) between checks of the anticipated increase in temperature read by the DHW sensor.
- For P30, select the anticipated temperature increase (between 1 and 10 °C) in relation to the time (parameter P29) of the temperature read by the DHW sensor.
- For P31, select the ΔT (between 5 and 50 °C) between the anticipated DHW temperature and the temperature read by the DHW sensor, for activating the heating circuit. Example: (demand in heating and DHW mode at the same time) P12=1 - P29=1 - P30=5 - P31=15.

  With these parameters, the temperature of DHW is anticipated to increase by 5°C per minute; every minute, the temperature read by the DHW sensor is compared with the anticipated one and heating is disabled if there is a difference of more than 15°C between the temperature reading and the anticipated temperature.

AUTOSETTINGS

After connecting the accessory to the system, run the autosettings procedure for testing and activation of all peripheral devices connected. To activate the function, press and hold d1 and d2 for more than 15 seconds. The autosettings process must be repeated for any component that is added to or removed from the system.

OPERATION WITH ROOM UNIT

When a room unit is connected, some controls are managed exclusively by the remote, bypassing the display panel.

Controls on the control panel:

- operating mode OFF;
- parameter configuration menu;
- forcing of boilers in summer.

Controls managed by the remote:

- configuration of DHW setpoint;
- configuration of flow setpoint.

In the case of interrupted communication or disconnection of the room unit, the board continues to run for a certain period with the same settings as before while waiting for communication to be restored ("communication timeout"). If communication is notrestored by the timeout, the board runs in normal mode as if the room unit were not connected, with all the controls restored.

DHW MODE WITH ROOM UNIT

Operation in DHW mode is the same as that without the Room Unit, but the DHW setpoint used is the one sent by the Room Unit.

HEATING MODE WITH ROOM UNIT

Operation in heating mode is exactly the same as that without the Room Unit, with the following differences:

- the cascade system used is the one calculated and sent by the Room Unit.
- in the case of connection of the outside sensor, adjustment is enabled according to the parameters of the room unit.

TECHNICAL DATA

1. Power input: 230VAC (+10% -15%)
2. Frequency: 50Hz (+/- 5%)
3. Operating temperature range: -20°C/+60°C
4. Mains fuse: F1 and F2 4AF (fast acting) 5x20
5. Varistor for protection: 275VAC D10 43J
6. Output of heating pump: 230VAC 50Hz 80W cosφ 1 impedance protected
7. Output of reverser valve: 230VAC 50Hz 80W cosφ 1 impedance protected
8. Signal output: 230VAC 50Hz 80W cosφ 1 impedance protected
9. Output of DHW pump: 230VAC 50Hz 80W cosφ 1 impedance protected General functions
10. Sensor fault signalling temperatures: -5°C<<T>>150°C
11. General temperature tolerance range (for electronics only): ±1.5°C
12. General timer tolerance range: ±5%
13. Boiler setpoint during flue cleaner function: 85°C Timers:
14. Communication timeout: 60 sec
15. Timer for flue cleaner function: 15 min Heating
16. Heating temperature selection range: 25-85°C Storage boiler DHW
17. Storage boiler temperature selection range: 25-60°C

The temperatures are for use of immersion temperature sensors with the following parameters: NTC type sensor, B=3977, R25=10KΩ.

ELECTRICAL CONNECTIONS

The remote control and boilers are connected directly to the accessory MLC27 as shown in t wiring diagram.

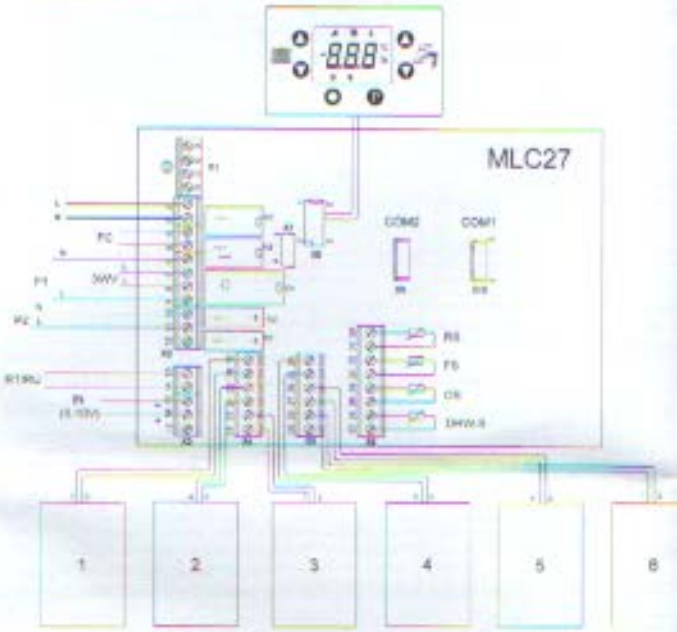
Electrical characteristics of the communication line:

- Number of wires: 2
- Type of cable: two-pole (*)
- Maximum length of line: 50 metres
- Maximum length of cable: 2x50
- Polarity: no polarity

(*) In environments where there is high electrical noise, use a shielded cable or twisted wire.
(*) In the case of an installation for managing systems with many zones, the same instructions apply for connecting the thermostat timer to the zone valves.

- The electric system and the components used must be in compliance with the regulations in force.
- Observe the mains polarity whenever possible.
- Installation must be carried out by a specialised installer.
- The system is still live when the board is in standby; disconnect from the power supply system before accessing the electrical parts and before carrying out any maintenance.
- Make the electrical connections as indicated previously.
- Ensure a good ground connection.
- If using the remote connection or connecting any accessory to the motherboard, disconnect from the power supply system beforehand.
- The board must be installed in a clean, dust-free environment.

WIRING DIAGRAM



CONNECTOR	CONNECTIONS	DESCRIPTION
X1	X1a-X1b	Ground
X2	2-3	230VAC – 50Hz power supply
	4-5	Free contact (FC)
	6-9	Heating circuit pump (P1)
	7	Heating (3W) reverser valve
	8	DHW (3W) reverser valve
	10-11	DHW circuit pump (P2)
	12	Not used
X3	13-14	Open Therm (OT) contact - Room Unit/Thermostat (RU/R
	15-16	0-10V signal input (IN)
	17	Not used
X4	18-19	B1 boiler
	20-21	B2 boiler
	22-23	B3 boiler
X5 #	24-25	B4 boiler
	26-27	B5 boiler
	28-29	B6 boiler
X6	30-31	Return sensor (RS)
	32-33	Flow sensor (FS)
	34-35	Outside sensor (OS)
	36-37	DHW sensor (DHW-S)
X7	-	Not used
X8	-	Display internal connection
X9-X10	-	Not used