Technical information

rematic® 2945 C3 K

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- *rematic*® 2945 C3 K

remeha
Advanced boiler technology

TABLE OF CONTENT

PREFACE

This ***rematic***® controller is a modern electronic device with numerous functions for operating a heating system at maximum efficiency. Most adjustments and set points are performed just once by the installation specialists.
These technical instructions contain useful and important information for the correct operation and commissioning of the ***rematic***® ***optimising /*** weather compensator

- ***rematic***® 2945 C3K-m. This controller is capable of controlling from 1- 8 boilers using direct modulation or 1 boiler on high/low control, with independant time and temperature control over domestic hot water production
- ***rematic***® 2945 C3-s This ***rematic***® weather compensator is available as an optional extra for the Remeha Quinta 45/65 and Gas 210 ECO series of boilers only. The 2945 Slave can control 2 mixing circuits a calorifyer and 1 high/low boiler.
- ***rematic***® 2940 C3-s: the 2940 C3 Slave can control 1 mixing circuit and a calorifyer.

With the maximum lay-out of one Master and 4 Slaves, 5 high/low boilers can be controlled (leaving space for 3 modulating boilers to be controlled additionally) and up to 10 independent heating circuits. These ***rematic***® weather compensators are prepared for the modulating control of the Remeha Quinta 45/65 and Gas 210 ECO boilers.

Read these instructions carefully before putting the controller into operation, familiarise yourself with it's control functions and operation, strictly observing the instructions given. Instructions in the text that are marked by a warning symbol ⚠ must be observed under all circumstances. Failure to do so may unnecessarily raise energy consumption, invalidate warranty or prevent the installation from operating properly. For User Guidelines see the separate booklet with details on the programming of the time clock and use of the 1st & 2nd level controls.

The installation and commissioning of the controller must be carried out by a competent Engineer, with the relevant product training and general certification i.e.: CORGI, ACOPS, IEE regs. etc.

If you have any questions, or if you need more information about specific subjects relating to this controller, or it's installation please do not hesitate to contact us. The data published in these technical instructions is based on the latest information (at date of publication) and may be subject to revisions.
We reserve the right to continuous development in both design and manufacture, therefore any changes to the technology employed may not be retrospective nor may we be obliged to adjust earlier supplies accordingly.

⚠ **Please read the Safety Notice in section 1 before commencing the work.**

1 SAFETY NOTICE

1.1 Intended use

The controller is an electronic device for use in conjunction with a hydraulic circuit in accordance with the manufacturer's specifications. The device is not to be used for any other purpose.
The controller complies with the following EU guidelines:

- 72/23/EWG "Low Voltage Guidelines"
- 89/336/EWG "EMC Guidelines", including amendment guideline 92/31/EWG

1.2 Safety

Power supply to the boiler must be isolated before carrying out any modifications to the wiring of the controller.
This device uses the latest technology and complies with applicable safety regulations.

1.3 Danger

The controller and associated connection panel has a 230V power supply taken from the boiler. Unauthorised repairs or installation by unqualified persons may result in a life-threatening electric shock hazard. Installation and commissioning must be performed by adequately qualified specialist personnel. This unit is factory sealed and unauthorised access and repairs will invalidate any warranty therefore any repairs to the unit must be carried out by manufacturer.
Instructions in the text that are marked by a warning symbol ⚠ must be observed under all circumstances.

2 GENERAL INFORMATION

2.1 Installation notes and preparing for operation

The installation and commissioning of the controller must be carried out by a competent Engineer, with the relevant product training and general certification i.e.: CORGI, ACOPS, IEE regs. etc.
It is strongly recommended to leave the controller under power, even during the summer season. (For further installation details, see section 11 onwards and the separate fitting instructions.)

⚠ **Warning: Power supply to the boiler must be isolated before carrying out any modifications to the wiring of the controller.**

Once the controller is completely installed and ready for operation re-establish the power supply. The normal display (unlit) should appear on the control. If the normal display fails to appear , press the reset button using a fine pointed object (recessed to the right of the 2nd-level controls), set the time and day of week, if necessary. This operation will start the controller, without affecting existing settings or the clock programme. If the normal display does not appear please check the following:

- Are all the required cables and connectors plugged together?
- Are the electrical fuses in order?
- Is the power supply on?

Note 1: The controller should reset itself automatically when power supply is established, exchanging data with the boiler control(s). The display may show the DHW sensor temperature as 99 °C until this process is completed.
Note 2: All references to the red zone and mixing valve zones are not applicable in UK.
Only one heating and one DHW timed zone is supported in UK

3 CONTROLS AND DISPLAYS

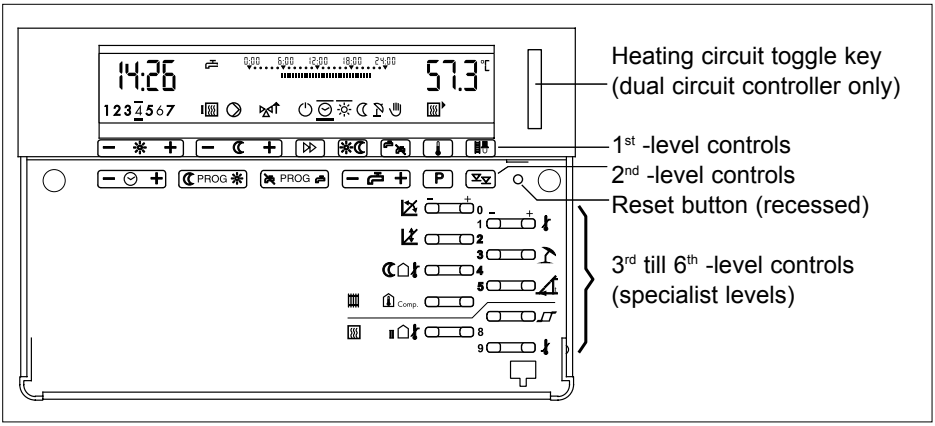


Fig. 01

The 1st and 2nd -level controls are explained in chapter “2.3 User controls and display” of the User Guidelines.

The specialist-level controls have multiple functions, i.e. the same key may have different functions at the 3rd, 4th, 5th and 6th levels.
The [⧖] key selects between the 3rd till 6th specialist levels; the procedure is described under chapter “3 Specialists adjustments”. The 5th and 6th specialist levels are protected by a code.
Adjustments are numbered using the operating level (3, 4, 5 or 6), plus the number to the right or left of the key.

Dual circuit controllers (not applicable to the UK) include certain adjustments that apply to specific heating circuits (identified by the display background colour). The desired circuit must be set using the toggle key (see Fig. 01).

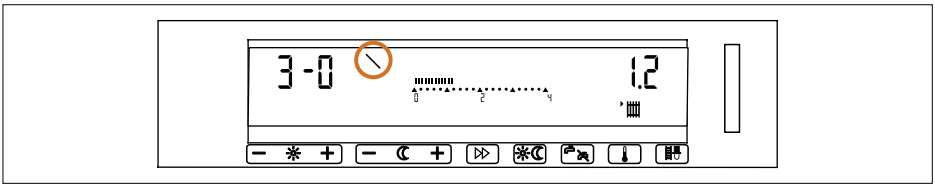


Fig. 02

From level 3 onwards, the manufacturer, or system installers acting on manufacturer's instructions, may restrict access to individual adjustments or entire operating levels. The symbol "\" appears in the display, together with the set value, when ever a protected key is pressed.

4 SPECIALIST ADJUSTMENTS

4.1 Documenting the adjustments

Record all initial settings and subsequent adjustments in the tables contained in the section "18 Adjustment keys, boiler data and system data". These tables provide a full overview of 3rd till 6th level adjustment options.
Note: Some adjustments (ie heating slope and parallel shift) do not show an immediate response. Therefore it is unwise to make more than one adjustment at a time – waiting to see the reaction before making another.

4.2 General procedures

The basic procedure for performing a specialist adjustment is always the same. The example below demonstrates the principle.

4.2.1 Performing 3rd -level adjustments

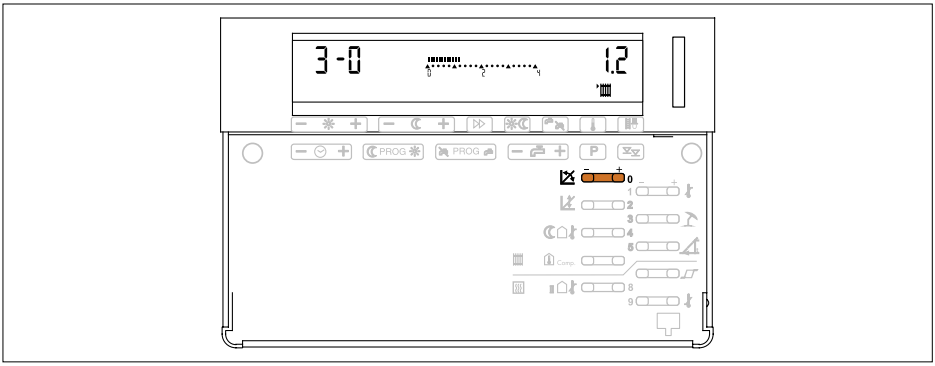


Fig. 03

- Remove the cover (press down on the arrow marks on the bottom edge in the centre), and press once on the key corresponding to the desired adjustment, for example the key .
  The present setting appears in the display.
- Adjust by pressing the "–" or "+" side of the key.

Changes take effect immediately. The display returns to normal after 1 minute, or you can press the key to restore the normal display.

You can make further 3rd -level adjustments without returning to the normal display. Simply press another 3rd-level key and perform the adjustment.

To proceed to the 4th, 5th or 6th level, press the key one or more times (each action move to the next level)

4.2.2 Performing 4th, 5th and 6th -level adjustments

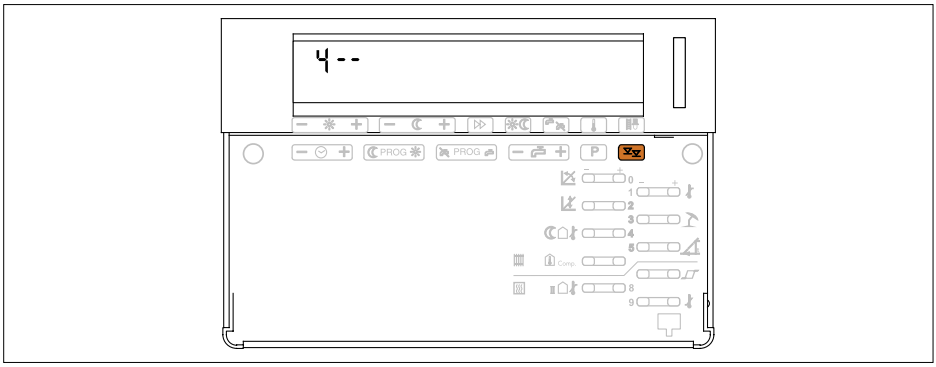


Fig. 04

- Remove the cover (press down on the arrow marks on the bottom edge in the centre), and press key to access the specialist levels. The first time you press this key, "**3 - -**" shows in the display. You can now perform 3rd -level adjustments (see the previous section).
  Press the key again and "**4 - -**" appears in the display meaning that you are now at the 4th operating level.
  The next time you press the key, the word "**out**" is displayed. This is the test level, where outputs may be switched on and off for testing purposes (see section "12.2 Test mode for controller output signals").
  The next time you press the key, the word "**codE**" is displayed. The 5th operating level is protected by a code, which means that in order to be able to perform adjustments in this level you must enter the correct code (see section "18.3 level 5

controls") and press key ⧖ again.
If you press the key without entering the code, the word "**not**" is displayed, pressing the key again returns you back to the 3rd operating level, and so on.

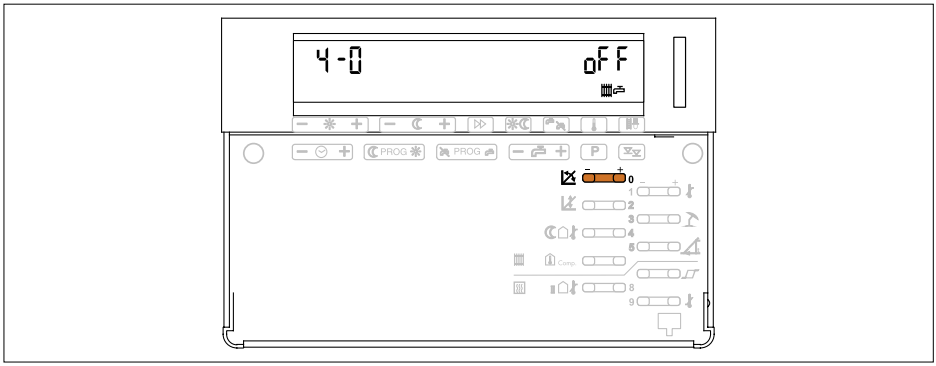


Fig. 05

- Press once on the key corresponding to the desired adjustment, for example in level 4 on key ⊠ ▭▭₀
  The present setting appears in the display.
- Adjust by pressing the "–" or "+" side of the key (ON/OFF toggle in this example).

Changes take effect immediately. The display will return to normal after 1 minute of inactivity, or you can press the ⌂ key to restore the normal display right away. You can make further adjustments in the present level without returning to the normal display. To do so, press another key in the current operating level and perform your adjustments.
To switch to the 4th, 5th or 6th operating levels before returning to the normal display, press the ⧖ key the required number of times. Press the key repeatedly to cycle through the various operating levels.

5 LEVEL 3 ADJUSTMENTS

5.1 Heating curve (adjustments 3-0 and 3-2)

The heating curve indicates the relationship between the flow water and the outside temperature, ΔTF/ΔTO.

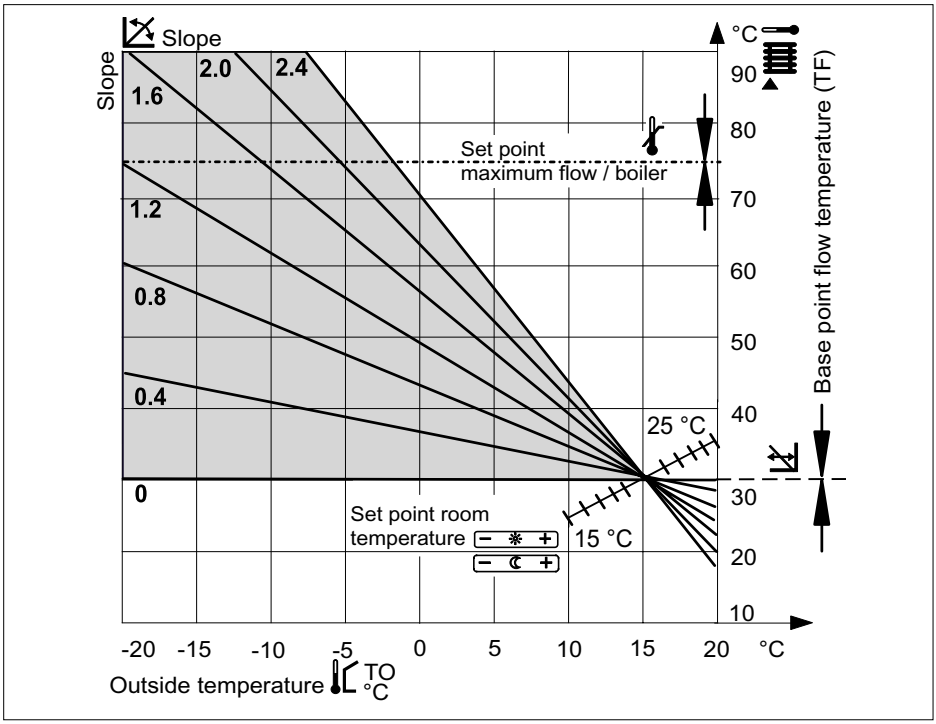


Fig. 06

NOTE: Because of the building's thermal inertia, it is recommended to perform no more than one adjustment step per day. Remember to record each change and reaction to the change.

5.1.1 Adjusting the heating curve slope and base point

The heating curve is governed by the following adjustments:

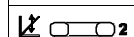
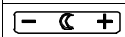
Adjuster button	Function	Basic setting performed by:
	Slope	Specialists
	Flow temperature base point	Specialists
	Desired heating temperature	User
	Desired night setback temperature	User

Table 01

The table below will assist in determining the heating curve appropriate to a given heating system. You will need to know the type of heating system, and the climatic zone in which it will operate.

High-temperature 90/70 Radiator heating
Standard-temperature 81/70 Radiator heating
Low-temperature 70/50 Radiator heating
Ultra-low temperature 50/35 Underfloor heating

Climatic zone where the building is located:
- 10°C = A
- 8°C = B
- 6°C = C
- 4°C = D
- 2°C = E

Heating system	base point TF at TO = + 15°C	Heat curve rate rise = ΔTF/ΔTO																										
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
50/35	20°C					A	B	C		D		E												
	25°C			A	B	C	D		E															
70/50	30°C									A	B		C		D			E						
	35°C							A	B		C	D			E									
81/70	30°C													A		B		C			D			E
	35°C											A		B		C		D			E			
90/70	39°C													A		B		C			D			E

Table 02

Example:
Heating system class = 81/70
Base point at TO 15°C = 35°C
Climatic zone - 2°C = E
Resulting slope = 2.7

5.1.2 Fine-adjusting the heating curve

At day time outside temp. between	room temperature	
	too cold	too warm
+5°C and +15°C	set 0,2 lower and set 5ºC higher	set 0,2 higher and set 5ºC lower
-20°C and +5°C	set 0,2 higher	set 0,2 lower

Table 03

5.1.3 Compensating differences between set and current room temperature

The end user programs temperature set points in terms of a room temperature (ºC) with buttons [− ✳ +] and [− ☾ +] . Even if the heating curve slope is correctly adjusted, depending on the heating system there may still be a difference between the room temperature measured by a thermometer (actual temperature) and the temperature defined in the controller (set temperature). This may be adjusted by moving the base point with button 2 .

Room temperature	Key 2
too low	Increase by pressing [+]
too high	Decrease by pressing [-])

Table 04

Increasing or decreasing the set point influences the room temperature.
A 5°C change in flow temperature set point alters the calculated room temperature as follows:
- Underfloor heating: approx. 2°C
- Radiator heating: approx. 1°C

5.2 Maximum common flow / boiler flow temperature (adjustment 3-1)

The flow water temperature is limited to the pre-set value (Note: this cannot override the boilers flow temp set point).
This limiting value applies to the selected heating circuit or to the cascade temperature, depending on usage.

⚠ **This adjustment is not intended as a safety device! Underfloor heating may require an additional control to prevent overheating.**

5.3 Summertime limits

This set point read with the outside sensor will, if exceeded, hold the heating in the off position

5.3.1 Summertime limit in heating mode (adjustment 3-3)

Heating ceases once the average outside temperature exceeds the set temperature. Domestic hot water keeps on operating. Heating resumes once the average outside temperature drops more than 2°C below the set temperature.

5.3.2 Summertime limit in night setback mode (adjustment 3-4)

This adjustment defines the maximum outside temperature in order for the flow temperature to be controlled according to the night setback heating curve. Heating ceases at outside temperatures above the set temperature. Once the outside temperature drops more than 2°C below the set temperature, the flow water temperature is controlled according to the night setback heating curve.
Setting a value below 2°C activates frost protection at outside temperatures between 2°C and the set temperature, see section “5.3.3 Frost protection”.

5.3.3 Frost protection

The circulation pump is switched on cyclically below an outside temperature of 2°C (frost protection limit). In each cycle it runs for 6 minutes, then switches off for 54 minutes. If the adjustment 3-4 is set above 2°C, the “frost protection mode” is overruled by the “summertime limit in night setback mode” as described under section “5.3.2 Summertime limit in night setback mode (adjustment 3-4)”.

5.4 Optimised start - pre-heat time (adjustment 3-5)

Pre-heat time gives the heating system a “warm up time” in order to attain operating temperature at set occupancy time. A basic value for the pre-heat time, based on the type of heating system, has to be programmed so that the controller is able to calculate the actual start time to achieve room temperature set point at set occupancy time.
The controller takes the following factors into account:

- measured outside temperature
- measured room temperature, assuming that a room sensor or remote control is fitted.

Recommended basic value:

- Underfloor heating: 210 (minutes)
- Radiator heating 150 (minutes)

The basic value is the pre-heat time, valid for an outside temperature of -10°C (= the so called standard climatic zone). The higher the outside temperature, the shorter the pre-heat time, which decreases to 0 minutes at 20°C.

5.4.1 Calculation formula for pre-heat time based on outside temperature:

The controller calculates according the following formula:

$$PHT_{CAL} = \frac{20\text{-}TO_{MES}}{20\text{-climate point}} \text{ x basic value}$$

PHT_{CAL} = calculated pre-heat time prior to occupancy time
TO_{MES} = measured outside temperature

Example: basic value = 150 minutes
Outside temperature = 5°C

$$PHT_{CAL} = \frac{20 - 5}{20 - -10} \text{ x } 150 = \textbf{75 minutes}$$

5.4.2 Calculation formula for pre-heat time with room temperature correction

If a room sensor or remote control is connected, the measured ambient room temperature is included in the pre-heat time calculation. The pre-heat time calculated earlier is shortened by a factor that is calculated as follows:

$$PHT_{COR} = \frac{TR_{SET} - TR_{MES}}{5} \text{ x } PHT_{CAL}$$

PHT_{COR} = corrected pre-heat time
PHT_{CAL} = calculated pre-heat time prior to occupancy time
TR_{SET} = set room temperature
TR_{MES} = measured room temperature

Example: TR_{SET} = 20°C
TR_{MES} = 18°C

$$PHT_{COR} = \frac{20 - 18}{5} \text{ x } 75 = \textbf{30 minutes}$$

5.4.3 Correcting the basic value

Should the design temperature be reached before or after occupancy time, correct the basic value as follows:

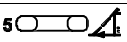
TR_{SET} is reached:	**Button** 
too early	reduce basic value (press [-] side)
too late	increase basic value (press [+] side)

Table 05

It is recommended that modifications of the basic value be no shorter than the following:
- Underfloor heating 30 minutes
- Radiator heating 20 minutes

If the heating system start-up does not need to be optimised in this way, set the basic value to 0. The heating system then commences operation at the programmed time.

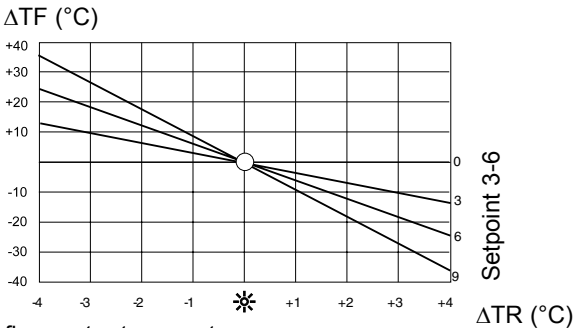
5.5 Room temperature compensation (adjustment 3-6)
This adjustment is relevant only if a room sensor or remote control is connected.

If the temperature measured by a room sensor or remote control deviates from the set point (e.g. as a result of external heating such as solar gain), the controller corrects the water flow temperature according to the compensation value. This specifies the increase or decrease in water flow temperature (in °C) per °C room temperature deviation.
- Room **over**-temperature = **reduced** flow temperature
- Room **under**-temperature = **increased** flow temperature

The effect of the setting is shown in Fig. 07.

Recommended settings:

No room compensation	0
Underfloor heating	1 - 4
Radiator heating	
• Mild compensation	1 - 3
• Medium compensation	4 - 6
• Strong compensation	7 – 9



ΔTF = Change in flow water temperature
ΔTR = Change in room temperature

Fig. 07

5.5.1 Calculation formula for room temperature compensation

Deviation of the room temperature from the set point causes a change in the flow water temperature. The resulting flow water temperature set point is calculated as follows:

$TF_{CAL\ "NEW"} = TF_{CAL} + ((TR_{SET} - TR_{MES}) \times K)$

TF_{CAL} = calculated flow temperature
TR_{SET} = set room temperature
TR_{MES} = measured room temperature
K = compensation factor (adjustment 3-6)

Example:

Desired room temperature (TR set) 20°C
Current room temperature (TR_{MES})(elevation due to e.g. incoming sunshine) 22°C
Room temperature compensation K (adjustment 3-6) 4 °C/°C
Flow water temperature setting (TF_{CAL})(according to heating curve) 45°C

$TF_{CAL\ "NEW"} = 45 + ((20 - 22) \times 4) = 37°C$

5.6 Number of slaves and their addressing (adjustment 3-7) NOT AVAILABLE IN UK

This adjustment determines whether the controller at hand is used as a master or as a slave controller and simultaneously the number and sequence of the slaves are indicated.

- **Master controller**: By entering one of the codes 0, 1, 2, 3 or 4, the number of connected slaves is programmed. With only one controller in the installation, adjustment 3-7 should be set at 0.
- **Slave controller**: The slave controller is assigned an address by entering one of the codes F1, F2, F3 or F4.(F= follower controller).

When adjustment 3-7 is incorrectly programmed, the master controller can communicate neither with the slave controllers, nor with the boiler(s).

5.7 Nature of the controller (adjustment 3-8)

This sets the controller to the number of boilers and method of control (Modulation or High / Low)

One master controller can operate up to 8 modulating boilers. With one master - and 4 slave controllers 5 on/off or high low boilers can be handled. As long as the total number of boilers does not exceed 8 and the number of on/off - or high/low boilers does not exceed 5, any combination of modulating -, on/off - or high/low boilers can be controlled.**(NOT AVAILABLE IN THE UK)**

The settings which may be chosen are as follows:
Master controller: (adjustment 3-7 is set to 0, 1, 2, 3, or 4)
Adjustment 3-8 must be set for each boiler in the installation.
b1 = setting for an on/off boiler
b2 = setting for a high/low boiler
FA. = setting for communication with a modulating boiler control
-- = setting for those boiler positions (of 8) which are not in use
Slave controller: (adjustment 3-7 is set to F1, F2, F3, or F4) NOT AVAILABLE IN THE UK
-- = setting for the slave that only controls supplementary mixing circuits
b1 = setting for the slave that controls a supplementary on/off boiler
b2 = setting for the slave that controls a supplementary high low boiler

If the controller has been programmed with the **FA.- -** setting, it detects whether the sensors are connected at the controller or at the boiler control and the controller itself supplements the FA. setting with a number as follows (If an error occurs it might help to program the correct FA setting directly by hand):

Adjustment 3-8	**D.H.W. sensor at:**	**Flow sensor at:**
FA1	Compensator	Compensator
FA2	Boiler control	Compensator
FA3	Compensator	Boiler control
FA4	Boiler control	Boiler control

Table 06

The outside sensor packed in the ***rematic***® kit must be connected to the controller adapter plate. (See also the relevant fitting and wiring diagrams)

5.7.1 Procedure for performing adjustment 3-8:
- Select adjustment 3-8 by pushing key one time.
- If boilers are connected, use the P key to invoke the boiler for which the adjustments are to apply.
  Instead of the time bar, the points in the display indicate how many boilers are programmed. The point of the invoked boiler flashes. You can now perform the required adjustment or ad more boilers.

5.8 Minimum modulation percentage (output) (adjustment 3-9)
The minimum output of the boiler may be entered as a percentage of the nominal output of the boiler. The minimum modulation percentage must be set for each boiler.

5.8.1 Procedure for performing adjustment 3-9:

- Select adjustment 3-9 by pushing key 9 one time.
- If multiple boilers are connected, use the P key to invoke the boiler for which the adjustments are to apply.
  Instead of the time bar, the points in the display indicate how many boilers are programmed. The point of the invoked boiler flashes. You can now perform the required adjustment.

6 LEVEL 4 ADJUSTMENTS

6.1 Domestic hot water operation modes

NOTE: In a cascade installation if the DHW is controlled by the ***rematic***® controller all boilers connected to the control will be made available to satisfy the demand.
Domestic hot water heating is activated when the DHW time channel is in the on position and the connected DHW sensor shows that the water temperature in the calorifier is 5 °C below the set point. When the D.H.W. set point is reached the demand is deactivated.

6.1.1 Simultaneous or priority D.H.W. heating (adjustment 4-0)

The domestic hot water may be heated simultaneously with the heating circuits, or be given priority.

Setting adjustment 4-0 to “OFF”: D.H.W. heating has priority over the heating circuits

The heating circuits are switched off while the domestic hot water is heated. (i.e. system pumps “OFF)
The heating circuits are enabled once the domestic hot water has reached the set temperature. The D.H.W. pump continues to operate for a period set by adjustment 4-3. If a heating circuit demands a higher flow temperature, the controller immediately shuts off the domestic hot water pump. A diverting valve can be used In place of a D.H.W. primary pump (see section 6.1.2).

Setting adjustment 4-0 to”ON”: Simultaneous operation of D.H.W. heating

(Requires the use of a D.H.W. primary pump and is not possible with a diverting valve).
The controller will boost the flow temperature from the compensated level to the DHW flow temp set point which will mean that the heating flow temperature may also be elevated

6.1.2 D.H.W. heating using a pump or a diverter valve (adjustment 4-1)

Depending on the heating system, it is possible to select a pump or a diverter valve for D.H.W. heating.

Setting of adjustment 4-1 to "OFF" : Domestic hot water heating using a pump

See section 6.1.1 for explanation

Setting of adjustment 4-1 to "ON" : Domestic hot water heating using a diverting valve

Together with the diverting valve, the system pump feeds flow water to the calorifyer heat exchanger. The pump therefore continues to run during D.H.W. heating. Simultaneous D.H.W. and heating is not possible with this setting. (see also section "6.1.1 Simultaneous or priority D.H.W. heating (adjustment 4-0)").

6.2 Flow water temperature for D.H.W. heating (adjustment 4-2)

The D.H.W. temperature set point, increased by the value set here, gives the set flow temperature of the boiler(s) for D.H.W. heating.

6.3 Run-on time of domestic hot water pump (adjustment 4-3)

The value set here determines how long, after attaining the set D.H.W. temperature, the domestic hot water pump continues to run and the diverting valve is in the DHW mode.

6.4 Legionnaires' disease protection temperature (adjustment 4-4)

The domestic hot water temperature programmed here (minimum setting is 60 °C) is initiated on the day set in adjustment 3-4 (see section "6.5 Legionnaires' disease protection mode (adjustment 4-5)"). Adjustment 4-4 is set higher than the normal domestic hot water temperature, set with button − 🚿 + and is used to protect against Legionnaires' disease.

6.5 Legionnaires' disease protection mode (adjustment 4-5)

In accordance with the code set here, the Legionnaires' disease protection temperature, set with adjustment 4-4 (see section 6.4 "Legionnaires' disease protection temperature (adjustment 4-4)" is enabled for two hours during the first D.H.W. heating on each day in question.

The set codes are as follows:

1 = Mondays	6 = Saturdays
2 = Tuesdays	7 = Sundays
3 = Wednesdays	8 = daily
4 = Thursdays	9 = continuously at the temperature set with adjustment 4-4
5 = Fridays	0 = no Legionnaires' disease protection mode

6.6 Adaptive heating curve (adjustment 4-6)

If a remote control or room sensor (supplied as standard in the UK) is connected to the controller, it can automatically correct the heating curve to suit the buildings properties. Adjustment 4-6 can be set for each heating circuit separately.

Adaptive heating curve "inactive" ("OFF" setting)

The operator-defined heating curve is not automatically modified (useful if there is another heat source such as an open fireplace).

Adaptive heating curve "active" ("ON" setting)

The controller automatically determines the optimal heating curve. It might take more than a week before the optimal curve is reached.

6.7 Minimum boiler temperature (adjustment 4-7)

The controller maintains a minimum flow temperature for the boiler(s) in heating and night set back mode. This adjustment is used to prevent the compensator lowering the flow temp below the min required for heat emitters used in the system (ie fan convectors may have a min flow requirement of 55 °C).

Note : This set point should not be set below to the boiler manufacturer's specifications.

6.8 Flow temperature excess in °C in relation to the heating curve(s) (adjustment 4-8)

During the heating season, the set flow temperature for the boiler(s) is higher, by the value set here, than the highest flow temperature, requested by one of the heating circuits. This adjustment must be set for each heating circuit.

Recommended settings:

0 = for direct heating circuits

5 = for mixed heating circuits

6.9 Adapting to the heating circuit (adjustment 4-9)

Before performing this adjustment, the required heating circuit must be selected! (Only setting 2 for UK)

Setting 0 = 3-point output for mixer drives with 230 V motor with 2 directions of rotation

The direction of rotation of the mixer is controlled by energising the "ON" or the "OFF" relay in the controller.

Setting 1 = 2-point output for mixer drives with automatic return, e.g. 230 V thermal mixer drives

The mixer drive opens the valve on energising the "ON" relay in the controller. It closes automatically if the controller de-energises the "ON" relay. The controller maintains a certain valve position by intermittently energising the "ON" relay.

Setting 2 = setting for a direct heating circuit with no output for a mixer drive

The system pump for this circuit runs continuously during the heating season. (The mixer symbol is not displayed.)

7 LEVEL 5 ADJUSTMENTS

The adjustments in the 5th operating level make it possible to adapt the controller adjustments to the features and allocation of each boiler in a multiple boiler installation.
Access to this operating level is coded.
⚠ **Improper changes in this operating level may impair the functioning of the boiler(s).**
The adjustments 5-0 to 5-6 described below must be individually adjusted for each boiler. The number of boilers has been programmed with adjustment 3-8. Select the adjustment, e.g. 5-3, then use the P key to select the relevant boiler. The display shows a row of points instead of the time bar. The flashing point indicates which boiler has been selected. You can now adjust the value of the selected boiler.

7.1 Boiler output at full load (adjustment 5-0)

The full load output of the selected boiler must be entered in the controller in kW. This setting is essential for modulating boilers. The nominal output specification on the data badge of the boiler is definitive.
It is not compulsory to enter this value for connected on/off or high/low boilers (controlled by relay contacts in the controller).

7.2 Grouping boilers (adjustment 5-1)

Each boiler in a multiple boiler installation is assigned to a group. There are 4 groups to be selected. The following group features should be noted when assigning boilers:

- Groups 1 and 3 have automatic sequence changeover (see section “7.8 Sequence changeover of boilers in groups 1 and 3 (adjustment 5-7)”).
- Groups 3 and 4 are switched off when the outside temperature rises above the set heating limit value (see section “8.5.1 Blocking of boiler groups 3 and 4 dependent on outside temperature (adjustment 6-5)”).
- Groups 1 and 2 are switched off when the outside temperature drops below the set heating limit value (see section “8.5.2 Blocking of boiler groups 1 and 2 dependent on outside temperature (adjustment 6-6)”).

Normally all modulating condensing boilers are programmed in group 1. The sequence of the groups is as follows: With increasing heat demand, the boilers in group 2 will not be started before all boilers in group 1 are in service at full load. The same principle applies for groups 3 and 4. The allocation of boilers to groups allows the energy saving operation of installations with condensing boilers and standard boilers. It also allows the bivalent operation of installations with heating boilers and heat pumps. It permits automatic output limitation as a function of outside temperature. Automatic sequence changeover allows you to programme a load compensation for the boilers.

7.3 Cut-in output of the follow-up boiler (adjustment 5-2)

This set value determines the percentage output of the selected boiler with which the following boiler is to be switched on.
The first boiler is switched on immediately after the time, set with adjustment 6-3, is elapsed.

7.4 Minimum boiler return temperature TBR_{MIN} (adjustment 5-3)

The boiler return control is active for the selected boiler if the set value of TBR_{MIN} is greater than 0. Heating circuits are enabled when the return temperature of the boiler rises above the set point. This adjuster is not active for stages programmed with FA.

7.5 Minimum fan speed with boiler switched off (adjustment 5-4)

The minimum speed of the boiler fan is adjustable for modulating burners as a percentage of the maximum fan speed. 0 = OFF, which means the fan is not required with burner switched off. This adjustment might be of use when ventilation problems occur.

7.6 Return temperature control selection (adjustment 5-5) (NOT USED IN THE UK)

The return temperature of the boiler(s) can be controlled in several ways, which can be separately set for each boiler.
The settings have the following meaning:

0 = U0...U5 corresponding to the boiler safety modes.(see section “8.3 Boiler safety modes (adjustment 6-2)”)

1 = Return temperature control by the heating circuit mixer(s). The boiler circuit pump Uw operates continuously during the heating season.

2 = Return temperature control by the heating circuit mixer(s) without boiler circuit pump Uw. The controller calculates a variable minimum boiler flow temperature based on the set value for the minimum boiler return temperature (adjustment 5-3). The lower the measured return temperature, the higher the required minimum boiler flow temperature TF_{MIN}.

3 = The “green” heating circuit mixer is used as return temperature control. The mixer Mr itself, as well as the boiler circuit pump Uw are mounted in the return pipework of the boiler. Operation and display for the green circuit are blocked, with the exception of the temperature display.

4 = The “green” heating circuit mixer is used as return temperature control without the assistance of a boiler circuit pump. The mixer Mr itself is mounted in the flow pipework of the boiler. Operation and display for the green circuit are blocked, with the exception of the temperature display. The controller calculates a variable minimum boiler flow temperature based on the set value for the minimum boiler return temperature (adjustment 5-3). The lower the measured return temperature, the higher the required minimum boiler flow temperature TF_{MIN}.

5 = Return temperature control only with boiler circuit pump Uw. The pump Uw switches off on reaching the minimum return temperature TBR_{MIN}. No mixer Mr is used. No heating circuit mixer is influenced by the set min. boiler return temperature TBR_{MIN}.

6 = The “green” heating circuit mixer is used as return temperature control for all boilers in a multiple boiler installation. The mixer Mr itself is mounted in the common return pipework of the boilers. Each boiler has its own boiler circuit pump Uw. Operation and display for the green circuit are blocked, with the exception of the temperature display. The sequence changeover (adjustment 5-7) does not influence this mode.

7.7 Allocation of boiler relay outputs for on/off or high/low boilers (adjustment 5-6) (NOT USED IN THE UK)

If relay contacts are used to control on/off and/or high/low boiler(s), they must be allocated to a controller.
The settings are as follows:
--- = no boiler relay function (there is no on/off or high/low boiler in the installation)
M = boiler relay function at the master (the 1rst boiler is an on/off or high/ low boiler)
F1 = boiler relay function at slave 1(the 2nd boiler is an on/off or high/ low boiler)
F2 = relay function at slave 2 (the 3rd boiler is an on/off or high/ low boiler)
F3 = relay function at slave 3 (the 4th boiler is an on/off or high/ low boiler)
F4 = relay function at slave 4 (the 5th boiler is an on/off or high/ low boiler)

7.8 Sequence changeover of boilers in groups 1 and 3 (adjustment 5-7)

OFF = continuous forward operation
ON = continuous backward operation
10 ... 999 = sequence changeover after the set number of running hours of the first boiler.

7.9 P-band (proportional band) (adjustment 5-8)

The P-band indicates the deviation between the actual flow temperature and flow temperature set point at which 100% boiler output (for all boilers) is required (setting band 0 to 30 °C). With increasing deviation, a low set value produces a large change in output. The heat production reacts quickly on changes in heat demand. With

increasing deviation, a high set value produces a small change in output. The heat production reacts slowly on changes in heat demand. The factory setting rarely needs modification.

7.10 I-band (integral proportion) (adjustment 5-9)

The I-proportion indicates, at a constant deviation between the actual flow temperature and flow temperature set point, how long (minutes) the controller takes to double the output needed according to the P-band. A low set value produces a rapid change in output where there is a deviation. The heat production reacts quickly, even where there is only a short term temperature deviation. A high set value produces a slowly increasing change in output where there is a deviation. The heat production reacts slowly on an existing temperature deviation.
The factory settings rarely needs modification.

8 LEVEL 6 ADJUSTMENTS

8.1 Maximum common flow temperature (adjustment 6-0)

To prevent the common flow temperature exceeding the setpoint, the controller will throttle the output of the boiler(s) or switch them off. This adjustment has priority over all other requirements.

8.2 Run-on time of the D.H.W. pump dependent on time or temperature (adjustment 6-1)

With adjustment 6-1 the run-on time of the D.H.W. pump can be programmed dependent on time or dependent on temperature.

Setting “off”: time-dependent run-on time

After domestic hot water heating is completed, the D.H.W. pump continues to operate for the period set with adjustment 4-3 (see section “6.3 Run-on time of domestic hot water pump (adjustment 4-3)”).

Setting “on”: temperature-dependent run-on time

After domestic hot water heating is completed, the D.H.W. pump continues to operate until the differential between the flow temperature and the domestic hot water temperatures reaches 3 °C. However, the run-on time is limited to the time period set in adjustment 4-3 (see section “6.3 Run-on time of domestic hot water pump (adjustment 4-3)”).

8.3 Boiler safety modes (adjustment 6-2)

Depending on the safety mode selected here, given a sudden heat demand (from the heating circuits and/or domestic hot water heating) the heating load is immediately switched on or only after the flow temperature of the boiler (or the common flow temperature of the boilers) has reached the set minimum flow temperature TF_{MIN} (see section “6.7 Minimum boiler temperature (adjustment 4-7)”).

In selecting the boiler safety mode, the functioning of the boiler circuit pump is determined at the same time as follows:

Setting	Safety mode	Function of the boiler circuit pump Uw
0 1 2	U0 U1 U3	Uw operates continuously during the heating season.
3 4 5	U0 U1 U3	After the master boiler is switched off, Uw continues to operate for 15 minutes or (for communicating boilers) for the period set in the boiler control.

Table 07

Safety mode U0 (settings 0 and 3)
This mode ensures that the set minimum boiler temperature TF_{MIN} (adjustment 4-7) is not undershot by using the maximum output of the boiler or boilers. If this set value is undershot, no heat load is switched off.
Safety mode U1 (settings 1 and 4)
This mode ensures that the minimum boiler temperature TF_{MIN} (adjustment 4-7) is not undershot by using the maximum output of the boiler or boilers. Additionally, however, heat load is switched off if this set value is undershot.
Safety mode U3 (settings 2 and 5)
This mode ensures that, if the flow temperature of the boiler(s) drops below the set minimum return temperature TBR_{MIN} (see section “7.4 Minimum boiler return temperature TBR_{MIN} (adjustment 5-3)”), no heat load is switched off and no boilers are switched on. It is not before the flow temperature of the boiler(s) has dropped to the set point (according to the heating curve or external requirement) and heat production is necessary that the mixers are closed, the circuit pumps are switched off and the boilers are switched on with the required output. The heating circuits are enabled again once the flow temperature of the boiler(s) reaches the minimum temperature range.

8.4 Delayed cut-in of boiler stages

8.4.1 Delayed cut-in of 1st boiler (adjustment 6-3)
A delayed cut-in may be programmed for the 1st boiler. The count down starts when the controller requests the first boiler, based on his internal PI calculation.

8.4.2 Delayed cut-in of subsequent boilers (adjustment 6-4)

A second delayed cut-in may be programmed for the following boilers. The count down starts when the controller requests the next boiler. The programmed time is the same for all subsequent boilers. This time delay can prevent short-term switching on of boilers.

8.5 Blocking of boiler groups dependent on outside temperature

Since a normal boiler installation does not need these adjustments, the adjustments 6-5 and 6-6 are ceased to be operative by the factory settings.

8.5.1 Blocking of boiler groups 3 and 4 dependent on outside temperature (adjustment 6-5)

If the outside temperature exceeds the set value, the boilers associated with groups 3 and 4 are blocked. If the outside temperature drops by more than 2 °C below this value, the boilers in these groups are enabled again.

8.5.2 Blocking of boiler groups 1 and 2 dependent on outside temperature (adjustment 6-6)

If the outside temperature undershoots the set value, the boilers associated with groups 1 and 2 are blocked. If the outside temperature rises by more than 2 °C above this value, the boilers in these groups are enabled again.
This adjustment is important if air/water heat pumps are used in combination with boilers.

8.6 Neutral zone for the internal PI-behaviour of the controller (adjustment 6-7)

Variations in the (common) flow temperature within the neutral zone around the flow temperature set point, will not cause changes in the output of the boiler(s).

8.7 Ramp mode to limit the speed of changes in output

If there are jumps in the set point (e.g. night/day changeover) or changes in load, this adjustment allows the speed of change in output to be limited. The ramp function may be adjusted separately for set temperature / /measured temperature deviations both outside and inside the proportional band. The maximum allowed change in output per minute is set as a percentage of the total boiler output. The higher the set value, the quicker the response in boiler output to a flow temperature change. The factory settings apply to 99% of the installations.

- **Adjustment 6-8: Ramp function outside the P-band**
- **Adjustment 6-9: Ramp function inside the P-band**

For installation personnel only

9 PUMP FUNCTIONS

The system pumps run when:
- heating is enabled and the outside temperature lies below the heating limit (see section “5.3.1 Summertime limit in heating mode (adjustment 3-3)”);
- night set back is enabled and the outside temperature lies below the corresponding heating limit (see section “5.3.2 Summertime limit in night setback mode (adjustment 3-4)”);
- frost protection is activated (outside temperature lies below 2°C) (see section “5.3.3 Frost protection”);
- the heating program “manual operation” is selected.

The 30-minute pump run-on time is effective when:
- heating is enabled and the outside temperature rises above the heating limit (see section “5.3.1 Summertime limit in heating mode (adjustment 3-3)”);
- night set back is enabled and the outside temperature rises above 4°C, or above the night set back heating limit (see section “5.3.2 Summertime limit in night setback mode (adjustment 3-4)”);
- power is restored after an interruption (causes a reset) or following installation.

The 5-second pump seizure protection operates:
- daily at 24 hour intervals following the last time the power was switched on

The boiler pump Uw runs:
- during heating operation (or) according to the selected protection mode (see section “8.3 Boiler safety modes (adjustment 6-2)”)

For installation personnel only

10 REMOTE CONTROL OPERATION

Each heating circuit can be operated by its own remote control. See the corresponding instruction manual for more information. (ONLY ONE IN THE UK)

⚠ **The information in this chapter references the terminal numbers as they are marked on the controller. These numbers will not necessarily be the same if the controller has been built into a boiler control panel, control rack, etc. In this case, refer to the appropriate documentation.**

10.1 Remote control FS 3611

10.1.1 Connecting the FS 3611 remote control (RED CIRCUIT NOT USED IN THE UK)

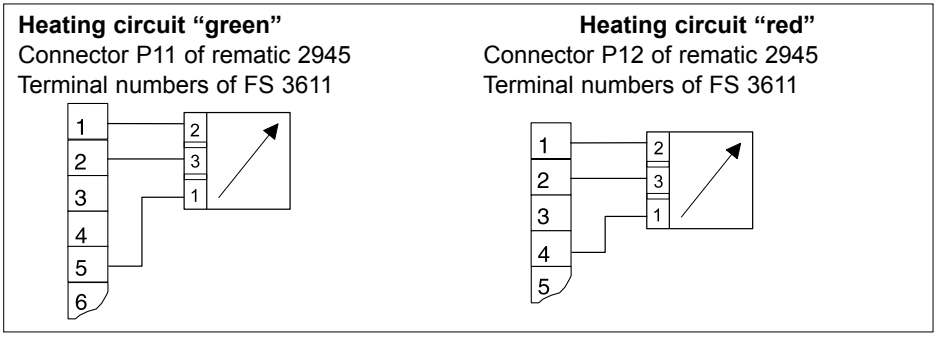


Fig. 08

10.1.2 Operation with the FS 3611 remote control

The controller display indicates whether a FS 3611 remote control is connected when the heating program “automatic operation” is selected. The remote control is automatically deactivated when the controller is not in the automatic time controlled mode.

⚠ **Select “Automatic operation” after the work has been completed. This reactivates the remote control.**

The heating program and temperature adjustment set on the remote control become visible in the controller display.

10.2 Remote control FB 5240 (NOT USED IN THE UK)

10.2.1 Connecting the FB 5240 remote control

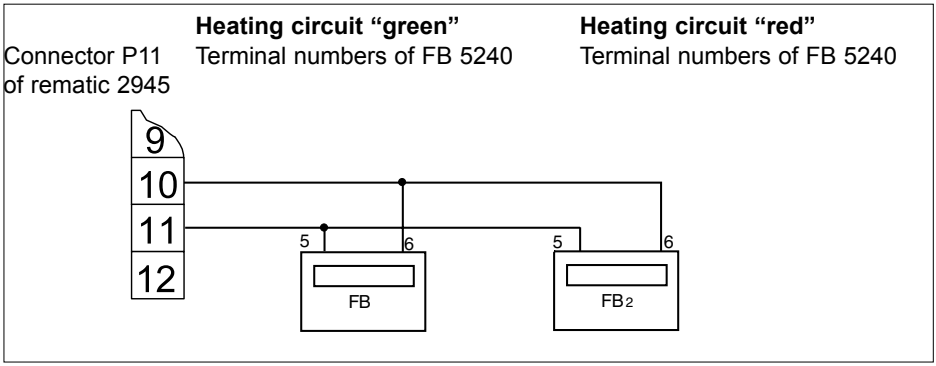


Fig. 09

⚠ **FB 5240 remote controls may only be used for controllers which are programmed (with adjuster 3-7) as masters (and not as slaves). Also, when slaves are connected to a master, remote control FB 5240 can not be used.**

Allocation of the remote control FB 5240 to the "red" or "green" heating circuit is programmable on the rear of the remote control (see the remote control operating instructions). **RED CIRCUIT NOT USED IN THE UK**

Allocation of FB 5240:	Dipswitch position	
	Dipswitch 1	**Dipswitch 2**
to the "green" heating circuit (and to the ***rematic***® 2940 C3-s)	OFF	OFF
to the "red" heating circuit	ON	OFF

Table 08

10.2.2 Operation with the FB 5240 remote control

The FB 5240 remote control connects to the controller data bus. Any change made on the remote control is mirrored at the controller, and vice versa. The program and settings on the remote control and the controller stay synchronised. The remote control must be assigned to the "red" or "green" heating circuit when the system is first put into operation (see the FB 5240 remote control operating instructions).

11 CONNECTOR PINOUTS

⚠ **The information in this chapter references the terminal numbers as they are marked on the controller. These numbers will not necessarily be the same if the controller has been built into a boiler control panel, control rack, etc. In this case, refer to the appropriate wiring diagrams.**

Unused sensor and signal inputs and outputs must not be connected. The associated symbols and temperatures are not displayed when checking the sensors. An unused heating circuit must have its heating curve set to 0, and its heating program must be set to "OFF" ⏻ .
It may be advisable to suppress inductive loads (circuit breakers, relays, mixer drives, etc.) by connecting RC snubber networks across the coils. (0.047µF, 100 W, rated 250 VAC recommended).
For installation personnel only
⚠ **Warning: Before starting to wire up the system, ensure that all the conductors are disconnected from the electrical supply. Electricity must also be disconnected before plugging or unplugging the connectors. Never touch the controller wires or connections.**

Connections to sensors, remote controls, the data bus, etc. must be routed separately from high-power wiring.

11.1 Boiler control interface (in the UK the interface is supplied with the relevant controls package kit)

An interface is required to exchange data with the boiler control. Depending on boiler execution, an interface might already be present in the boiler. The wiring of the interface, of the boiler control and of the sensors (outside -, DHW - and common flow -) must be carried out in accordance with the appropriate wiring diagrams, that come with the controls package kit.

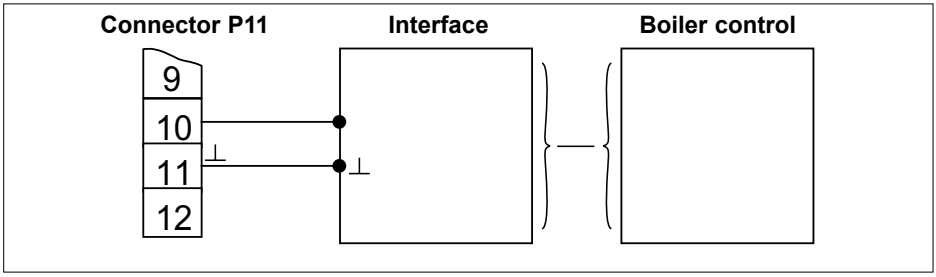


Fig. 10

11.2 Connector layout (rear of controller)

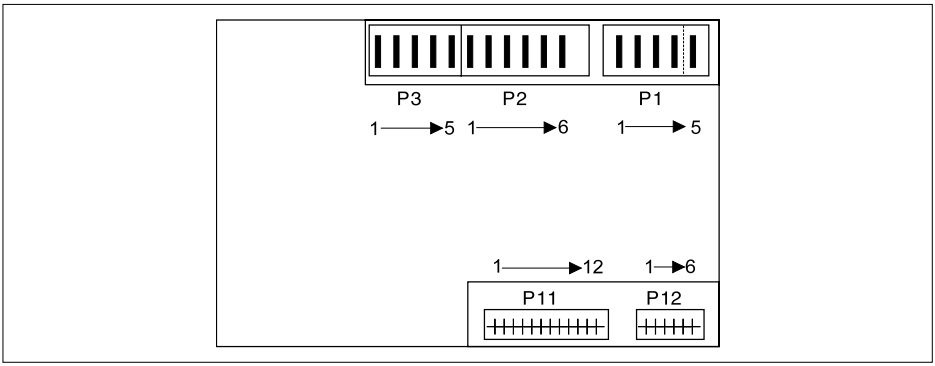


Fig. 11

11.3 Connector terminal pinouts

The following diagrams show the full range of input and output connections. Depending on the controller version and application, not all of these may necessarily be in use. Always refer to the appropriate assembly instructions and for the correct terminal identification refer to the wiring diagrams, that come with the controller kits.

11.3.1 Live connections (230 Vac)

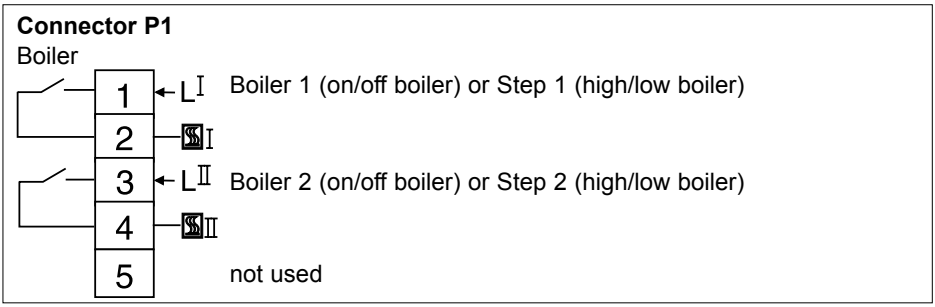
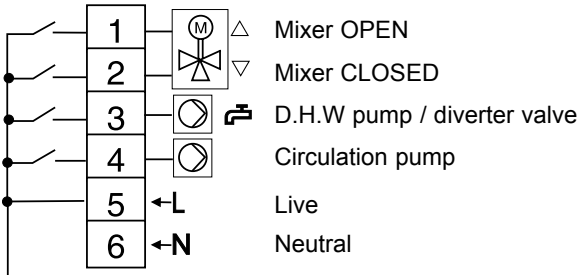


Fig. 12

Connector P2

Mains supply, “green” heating circuit, D.H.W. production



Connector P3

“Red” heating circuit, boiler circulation

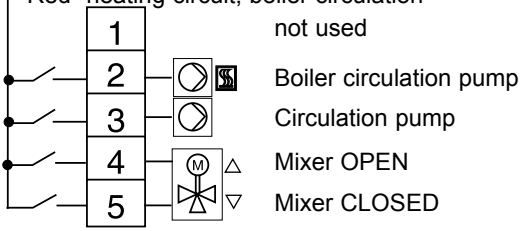
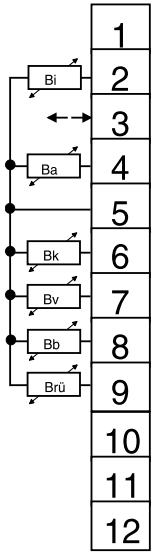


Fig. 13

11.3.2 Sensor connections

Connector P11
"Green" heating circuit, boiler, domestic hot water

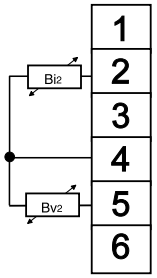


1	"Green" analogue remote control (on pins 1, 2 and 5)
2	"Green" room sensor
3	Set point input / output
4	Outside sensor
5	Sensor and set point ground
6	Common flow sensor*
7	"Green" mixer circuit flow sensor
8	Domestic hot water sensor
9	Return temperature sensor**
10	Data bus signal
11	Data bus ground
12	not used

* (or boiler sensor for on/off-high/low boilers)
** (see section "7.4 Minimum boiler return temperature TBR_{MIN} (adjustment 5-3)")

Fig. 14

Connector P12 (RED CIRCUIT NOT USED IN THE UK)
"Red" heating circuit



1	"Red" analogue remote control (on pins 1, 2 and 4)
2	"Red" room sensor
3	not used
4	Sensor ground
5	"Red" mixer circuit flow sensor
6	not used

Fig. 15

12 FUNCTIONAL TESTS AND CHECKS

12.1 Service program

The service program permits maintenance personnel to establish boiler conditions necessary for performing required measurements, without disturbing the controller's normal operational parameters. The controller sets all boilers to full load and commands the installation load (i.e. mixing valves) in a way to reach a (boiler or common) flow temperature of 60°C as quick as possible and maintain this temperature as long as possible. To avoid overheating of the installation it may be necessary to manually switch off all boilers but the one that is measured.

⚠ **In on/off or high/low boilers with little water content the high limit thermostat may trigger, as well as in an installation where the boiler sensor is not fitted in the boiler but in the flow pipe work. However the Remeha communicating boilers will not be affected with this problem.**

12.1.1 Starting the service program

- Press the [key] key.
  Instead of the current time, the display shows the elapsed time since the service program was started.

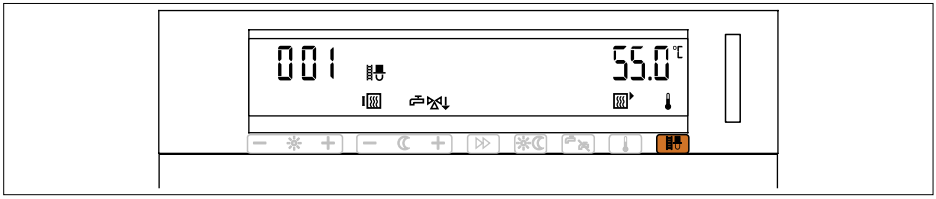


Fig. 16

12.1.2 Terminating the service program

The service program terminates automatically when no controller key has been pressed for 30 minutes. The service program can also be terminated earlier by pressing the [key] key again.
The controller returns to normal programmed operation.

12.2 Test mode for controller output signals

12.2.1 Operation

If the specialist levels are scrolled through with the [key] key, after the 4th level and before the code-protected 5th level you will reach the test level for output signals. It is indicated on the display with " out " (see also section "4.2.2 Performing 4th, 5th and 6th -level adjustments"). In this test level, the specialist may switch the outputs

on and off. With each push on one side of the key in the 3rd level, the status of the corresponding output signal toggles between “ON” and “OFF”.

12.2.2 Display

The modes which are switched on or off are indicated in the display.

- The modes which are allocated to the keys on the left-hand side (even numbers) are indicated with the corresponding symbol **and** the output number, e.g. and A-4.
- The modes which are allocated to the keys on the right-hand side (odd numbers) are shown with the output number only, e.g. F-5.

For each function the status indicator “ on ” or “ oFF ” also appears.

12.2.3 Closing the test mode

The test mode is automatically interrupted if no key is pressed for 20 minutes. The display returns to normal. The functioning of the controller outputs is then determined once again by the controller. When switching to another specialist level, all output functions are switched off.

12.2.4 Meaning of keys and allocation to modes

Adjust-ment key	Push at – or + side of adjust-ment key	Display	Function	Connection pinouts at back of controller
0	-	A-1	Boiler step 1 (on/off)	P1-1
0	+	A-2	Boiler step 2 (high/low)	P1-3
1	-	F-1	Communication Boiler 1	P11-10
1	+	F-2	Communication Boiler 2	P11-10
2	-	A-3	Mixer "opens", Green heating circuit	P2-1
2	+	A-4	Mixer "closes", Green heating circuit	P2-2
3	-	F-3	Communication Boiler 3	P11-10
3	+	F-4	Communication Boiler 4	P11-10
4	-	A-5	D.H.W. pump or diverter valve	P2-3
4	+	A-6	Circulation pump, Green heating circuit	P2-3
5	-	F-5	Communication Boiler 5	P11-10
5	+	F-6	Communication Boiler 6	P11-10
6	-	A-7	Mixer "opens", Red heating circuit	P3-4
6	+	A-8	Mixer "closes", Red heating circuit	P3-5

7	-	F-7	Communication Boiler 7	P11-10
7	+	F-8	Communication Boiler 8	P11-10
8	-	A-9	Circulation pump, Red heating circuit	P3-3
8	+	A-10	Boiler circulation pump	P3-2
9	-	---	Not used	
9	+	---	Not used	

Table 09

⚠ **The test mode allows the specialist to test parts of the system for correct functioning. If proper procedures are not followed, this can lead to output statuses being enabled which place an abnormal load on the heating equipment (example: both directions of a mixer motor energised simultaneously). Modes which are switched on are only switched off if no key is pressed for 20 minutes or if the operating level is changed. Please, therefore, note the following:**

- **after the function test, deactivate each output order.**
- **never simultaneously enable an "ON" and an "OFF" order on the same mixer drive.**
- **before leaving the system, ensure that the controller is no longer at the test level (change operating level or return to normal display using the ⏩ key).**

12.3 Checking the temperature sensors

The temperature sensors can be checked without disconnecting the controller, or using special measurement or test equipment. (See section "12.5 Temperature sensor resistance values")

- Select the desired heating circuit using the toggle key.
- Press the 🌡 key.

The measured temperatures appear in the display. If a temperature is displayed, this means that the corresponding sensor is properly connected and functional.

Failure to display a temperature can have one of the following reasons:

- The sensor is unnecessary for the heating system
- Sensor or connection open-circuit
- Sensor or connection short-circuit

12.4 Checking temperature settings

For dual circuit controllers select the desired heating circuit using the toggle key.

- Press and hold the 🌡 key. The controller shows the measured temperature values in succession.
  After cycling through all the measured values, the controller shows the temperature settings in place of the regular display.

- Release the key. Single presses of this key display the Setpoints and sensor readings.
- Press the key to return to the normal display. This also happens automatically if 1 minute elapses without pressing a key.

12.4.1 Displayed symbols and their meanings

Symbol	Display	Unit
	Display shows set value	°C
	Display shows measured value	°C
	D.H.W. temperature (hot water)	°C
	Common flow temperature	°C
	Boiler flow temperature	°C
	Boiler return temperature	°C
	Room temperature	°C
	Circuit flow water temperature	°C

Table 10

The outside temperature can be read as average temperature and as current temperature as follows:

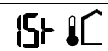
Symbol	Display	Unit
	Actual outside temperature	°C
	Average outside temperature	°C

Table 11

On the master controller's display, the total output and the output required by the individual boilers may be interrogated as well as the common flow set temperature.

Symbol	Display	Unit
	Common flow temperature measured	°C
	Common flow temperature set	°C
	Total load of all boilers	kW
	Load per boiler	%

Table 12

The set output of the installation is understood to be the total output of all the required boilers in kW. The output of the individual boilers is shown as % of the nominal output of the boiler.

12.5 Temperature sensor resistance values

The temperature sensors connected to the controller and those connected to the boiler control do have different characteristics. Resistance values are shown in the following table.

Temperature °C	Controller Resistance Ω	Boilercontrol Resistance Ω
-20	48.535	98.820
-15	36.475	75.940
-10	27.665	58.820
-5	21.165	45.910
0	16.325	36.100
5	12.695	28.590
10	9.950	22.790
15	7.855	18.290
20	6.245	14.770
25	**5.000**	**12.000**
30	4.029	9.805
40	2.663	6.653
50	1.802	4.609

Temperature °C	Controller Resistance Ω	Boilercontrol Resistance Ω
60	1.244	3.253
70	876	2.337
80	628	1.707
90	458	1.266
100	339	952

Table 13

13 CONTROL OF MODULATING BOILERS

The ***rematic***® controller communicates with all connected boilers over a two-wire bus. Each boiler needs an interface for addressing and translation of the messages. Messages are send every 10 - 15 seconds.
The ***rematic***® controller calculates a boiler flow temperature (or a common flow temperature in a multiple boiler installation) based on outside temperature, heating curve, programmed over-temperature, room temperature etc.

- Without a common flow sensor connected (i.e. in a single boiler installation), this flow temperature setpoint is sent to the boiler control, which in turn calculates the necessary output to obtain the setpoint temperature.
- With a common flow sensor connected (i.e. in a multiple boiler installation), the controller itself calculates the number of boilers and the output percentage per boiler, necessary to obtain the setpoint temperature.
- With the DHW sensor and -pump connected to the controller (is standard configuration for single - and multiple boiler installations), the boilers are controlled as described above. (also during DHW production code 3 is displayed on the boiler(s))
  DHW temperature, flow-over temperature and time program are as set in the controller.
- In a multiple boiler installation, a DHW sensor and DHW pump or diverter valve can be connected to one or more boilers in which the ***rematic***® controller is not mounted. The controller DHW-time program acts on all boilers. DHW temperature and over temperature are to be set in each boiler.

14 ERROR MESSAGES

Display		Description of error
Left side	**Right side**	
Er18	---	Communication error with boiler control 1….8 [1]
Er18	---	Communication error with slave 1…4 [2]
Er18	xxx*	Lock-out of boiler 1…8 with error code [3]

Table 14

[1] See also section “5.7 Nature of the controller (adjustment 3-8)”. Er1 can also mean: inverted or short-circuited bus wiring
[2] See also section “5.6 Number of slaves and their addressing (adjustment 3-7) NOT AVAILABLE IN UK”
[3] See the boiler documentation for the meaning of the displayed boiler error code.

With more than one error , the sequence of the messages is as follows:
- The message of a boiler control is displayed before that of a slave controller.
- The message of the boiler control or slave with the lowest address comes first.

Note 1: With the wires of the bus short circuited or connections crossed (boiler 1-terminal 1 connected to boiler 2-terminal 2 etc) the message Er 1 will occur. Only one LED will blink on the boiler interface(s). With one interface disconnected or damaged, the corresponding message will be displayed, but the communication with other boilers and /or slaves will remain.
Note 2: Every time the power to the controller is switched on, the microprocessor will initialise. During initialisation, the controller is exchanging date with the boiler control and a DHW temperature of 99 °C might be displayed.

15 EXPLANATION OF TERMS

Start of occupancy time:
The start of occupancy time is the moment from which on the room temperature must be at comfort level.

Occupancy time:
The period of the day the room temperature must be at comfort level.

Specialist levels:
Adjustment levels controlled by engineers. They contain adjustment variables for matching the regulator to the heating system design parameters.

Adaptive heating curve:
Automatic modification of the heating curve to match the building characteristics.

Measured value (Ist is displayed at the left):
The present, measured temperature. The symbol underneath the displayed value indicates which sensor is read.

Set point (Soll is displayed at the left):
A temperature value calculated by the controller or specified by the specialist or end user. The controller regulates the measured value to match the set point.

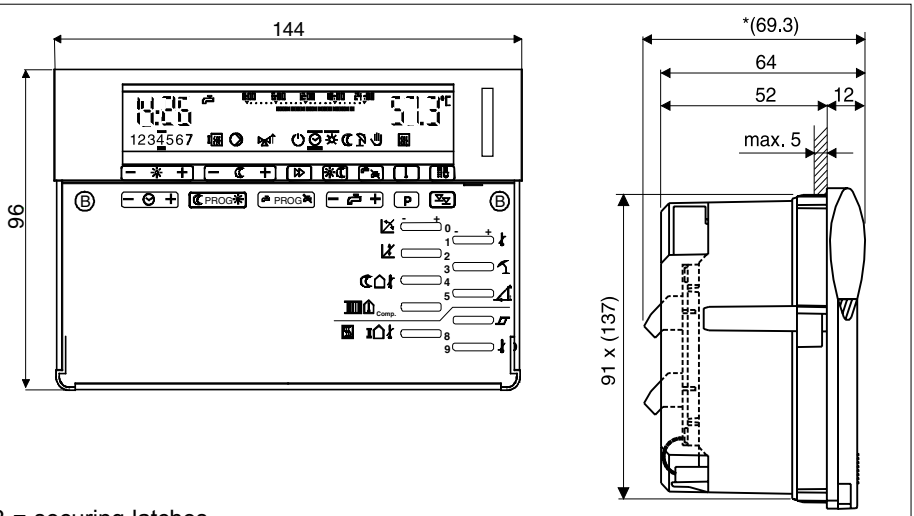
Pre-heat time:
Automatic advancement of the heating start-up time according to the heating requirement, in order to obtain comfort temperature at start of occupancy time.

16 TECHNICAL DATA

Supply voltage	230 VAC ± 10%, 50 Hz
Power consumption	7W
Operational ambient temperature	0°C … 50°C
Sensor and Bus cable length and	max. 100 m
" cross sectional area	min. 0.75 mm^2
Bus	2 wire Bus
Output switching capability	230V 6 (2) A, 50 Hz
Certification	CE-compliant
Protection category	II EN 60730
Protection level	IP 40 EN 60529
EMC	EN 50082-1
EMC-emission	EN 50081-1

17 DIMENSIONS AND FITTING INSTRUCTIONS

17.1 Dimensions



B = securing latches

* (69.3) Dimension when fitted with ZLS 203 or ZLS 204 sensor PCB

Fig. 17

17.2 Panel cut-out
The panel cut-out is 92 x 138 mm according to DIN 43700.
Panel thickness <5 mm

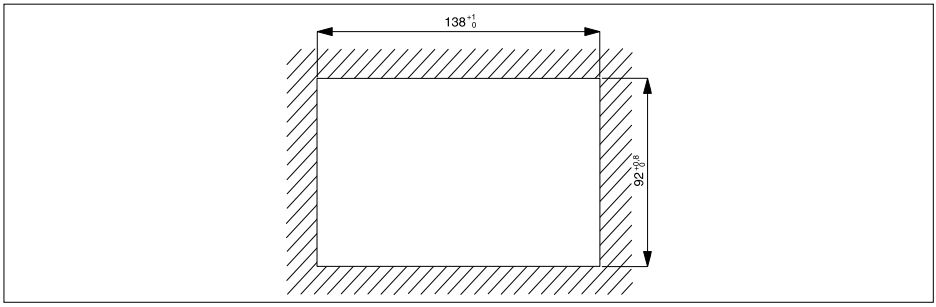


Fig. 18

17.3 Fitting instructions (For UK see seperate fitting instructions)
The recessed securing assemblies **B** to the left and right of the 2 nd -level keys are visible with the front cover removed (see Fig. 17).

- After the electrical connectors have been plugged in, fit the controller into the panel cut-out.
- 2. Use a screwdriver to push the securing latches gently inwards, then give them a quarter turn clockwise to secure the controller to the panel.

Releasing the controller: turn both securing latches counter-clockwise to their end-stops.

18.1 level 3 controls

Push several times on the ⊠ button until "**3--**" appears in the display. For adjustments 3-0 to 3-6 the heating circuit must be selected first with the toggle key in dual circuit systems (observe the display colour). The function(s) can be selected from the following table and set to the desired value if not protected (\).

Adjustment key - +		Display		Description	Factory settings Heating circuit		Commissioning settings Heating circuit		
No.	Symbol	No.	Symbol		Red	Green	Red	Green	
0		3-0		Compensation slope	1,2	1,2			
1		3-1		Max. flow temp.	75	75			°C
2		3-2		Parallel shift of slope base point	30	30			°C
3		3-3		Summertime limit in heating mode	20	20			°C
4		3-4		Summertime limit in night set back mode	5	5			°C
5		3-5		Setting of time to reach design temp.	180	180			Min
6	Comp.	3-6		Room temp. compensation	0,0	0,0			°C /°C
7	M/S	3-7		Master: number of slaves (0…4) Slave: position of slave (F1…F4)	0				

Table 15

Use of adjustment 3-6 requires a remote control or a room sensor.

Adjustment key - +		Display		Description		1	2	3	4	5	6	7	8	
No	Symbol	No	Symbol	Factory settings		P ⇨	P ⇨	P ⇨	P ⇨	P ⇨	P ⇨	P ⇨	P	
8	**typ**	3-8		Nature of the controller : -- = mixing circuit controller without boiler control b1 = controller for on/of boiler b2 = controller for high/low boiler FA = controller for communicating boiler	Fa									
9	P	3-9		Minimum modulation percentage of boiler	30									%

Table 16

With the P button the boiler can be selected, for which parameters must be set.

18.2 level 4 controls

Push several times on the ⧖ button until "**4--**" appears in the display. For adjustments 4-6, 4-8 and 4-9 the heating circuit must be selected first with the toggle key in dual circuit systems (observe the display colour). The function(s) can be selected from the following table and set to the desired value if not protected (\).

Adjustment key - +		Display		Description	Factory settings Heating circuit		Commissioning settings Heating circuit		
No.	Symbol	No.	Symbol		Red	Green	Red	Green	
0		4-0		DHW production priority oFF simultaneous on	oFF				
1		4-1		DHW production pump oFF diverter valve on	oFF				
2		4-2		Overtemperature of flow for DHW production	20,0				°C
3		4-3		Run-on time of DHW pump	8,0				Min.
4		4-4		Legionnaires' disease protection temperature	60,0				°C

5		4-5		Legionnaires' disease protection mode 1 = Mondays 2 = Tuesdays 7 = Sundays 8 = daily 9 = continuously at 60 °C 0 = no Legionnaires' disease protection mode	0			
6	Comp.	4-6		Adaptive heating curve inactive oFF active, automatic on	oFF	oFF		
7	M/S	4-7		Minimum boiler temperature	0,0			°C
8	**typ**	4-8		Overtemp. of common flow for heating - direct circuit = 0 (4-9=2) - mixing circuit = 5	5,0	5,0		°C
9	P	4-9		Adapting to the heating circuit 0=3 point mixer motor 1=2 point mixer motor (spring return) 2=direct heating circuit (no mixer displayed)	0	0		

Table 17

Use of adjustment 4-6 requires a remote control or a room sensor.

18.3 level 5 controls

Push several times on the button until "**codE"** appears in the display. Use the button to enter the standard access code (000). Push the button once and the controller will display "Acc" for acceptance of the code. Now push several times on the button until "**5--"** appears in the display. The function(s) can be selected from the following table and set to the desired value if not protected (\).

Adjustment key - +		Display		Description		1	2	3	4	5	6	7	8	
No	Symbol	No	Symbol	Factory settings										
0		5-0		Boiler output full load	60,0									kW
1		5-1		Grouping boilers (groups 1 till 4)	1									
2		5-2		Cut-in output for next boiler in %	80,0									%
3		5-3		Min. boiler return temperature	0,0									°C
4		5-4		Min. fan speed in %	0,0									%
5		5-5		Return control selection (option 0 till 6, see section 7.6)	0									
6	Comp.	5-6		Allocation of boiler-relay outputs: (options: ---, M, F1 till F4)	---									

Table 18

Adjustment key - + No.	Symbol	Display No.	Symbol	Description Factory settings		Commissioning settings	
7	M/S	5-7	I II	Sequence changeover continuous forward operation oFF continuous backward operation on changeover after **10 - 990** run hours	100		on/off h
8	**typ**	5-8		Proportional band	6,0		°C
9	P	5-9		Integral proportion	6,0		Min.

Table 19

18.4 level 6 controls

Enter the acces code as described in section 18.3. Push several times on the (94) button until "**6--**" appears in the display. The function(s) can be selected from the following table and set to the desired value if not protected (\).

Adjustment key - + No.	Symbol	Display No.	Symbol	Description	Factory settings	Commission -ing settings	
0		6-0		Max common flow temperature	95,0		°C

1		6-1		Run-on time of DHW pump 0=time controlled 1=temperature controlled	0		
2		6-2		Boiler safety modes 0=U0 ⎫ 1=U1 ⎬ Uw energised during heating season 2=U3 ⎭ 3=U0 ⎫ 4=U1 ⎬ Uw with run-on time 5=U3 ⎭	0		
3		6-3		Delayed cut-in of 1rst boiler	2,0		Min.
4		6-4		Delayed cut-in of subsequent boilers	3,0		Min.
5		6-5		Blocking of boiler groups 3 and 4 at outside temperatures over	40,0		°C
6	Comp.	6-6		Blocking of boiler groups 1 and 2 at outside temperatures below	-40,0		°C
7	M/S	6-7		Neutral zone with PI behaviour	1,0		°C
8	**typ**	6-8		Ramp mode outsite P-band	5,0		%/ Min.
9		6-9		Ramp mode inside P-band	1,0		%/ Min.

Table 20

18.5 Data for Remeha modulating boilers in a single-boiler installation
Remeha W 10/21/28 series, Quinta series, Gas 210 ECO series:
For these applications the factory settings of the adjustments are adequate, except for those adjustments that are necessary to adapt the controller to the installation, such as heating curve, time program, D.H.W. temperature etc.

18.6 Data for Remeha modulating boilers in a multiple boiler installation
In order to achieve proper operation of the boilers in a multiple boiler installation, the relevant adjustments must be set according to the tables below.
Procedure for performing the adjustments in the table:
- Select the adjustment.
- If more than one boilers are connected, use the P key to invoke the boiler for which the adjustments are to apply.
- Instead of the time bar, the points in the display indicate how many boilers are programmed. The point of the invoked boiler flashes. You can now perform the required adjustment. With adjustment 3-8 the number of boilers can be programmed by replacing on each position the given **---** code by the correct FA code.

Remeha Quinta		
Adjustment	Setting for a single boiler installation	Setting for a multiple boiler installation (for all boilers up to 8)
3-8	FA 3	FA 1
3-9	18	18
5-0	The correct output of the boiler (in kW) can be read from the boiler identification plate.	

Table 21 Remeha Quinta series

Remeha Gas 210 ECO		
Adjustment	Setting for a single boiler installation	Setting for a multiple boiler installation (for all boilers up to 8)
3-8	FA 3	FA 1
3-9	10	10
5-0	The correct output of the boiler (in kW) can be read from the boiler identification plate.	

Table 22 Remeha Gas 210 ECO series

18.7 Installations with slave controllers rematic 2940 C3 S and/or 2945 C3 S

In order to achieve communication between the master and the slave controllers, they must both correctly be programmed. In the master controller the number of slaves must be programmed. In each slave controller its address must be programmed according to the table below.

	Adjustment 3-7	
Number of slave controllers	Setting in master controller	Setting in slave controllers
1	1	F1
2	2	F1, F2
3	3	F1, F2, F3
4	4	F1, F2, F3, F4

Table 23

rematic® 2945 C3 K

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Subject to alterations
56302/1000/0402/lps.

remeha
Advanced boiler technology