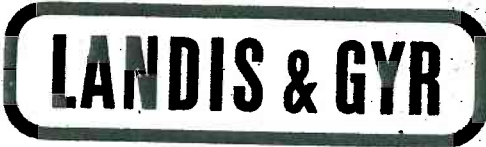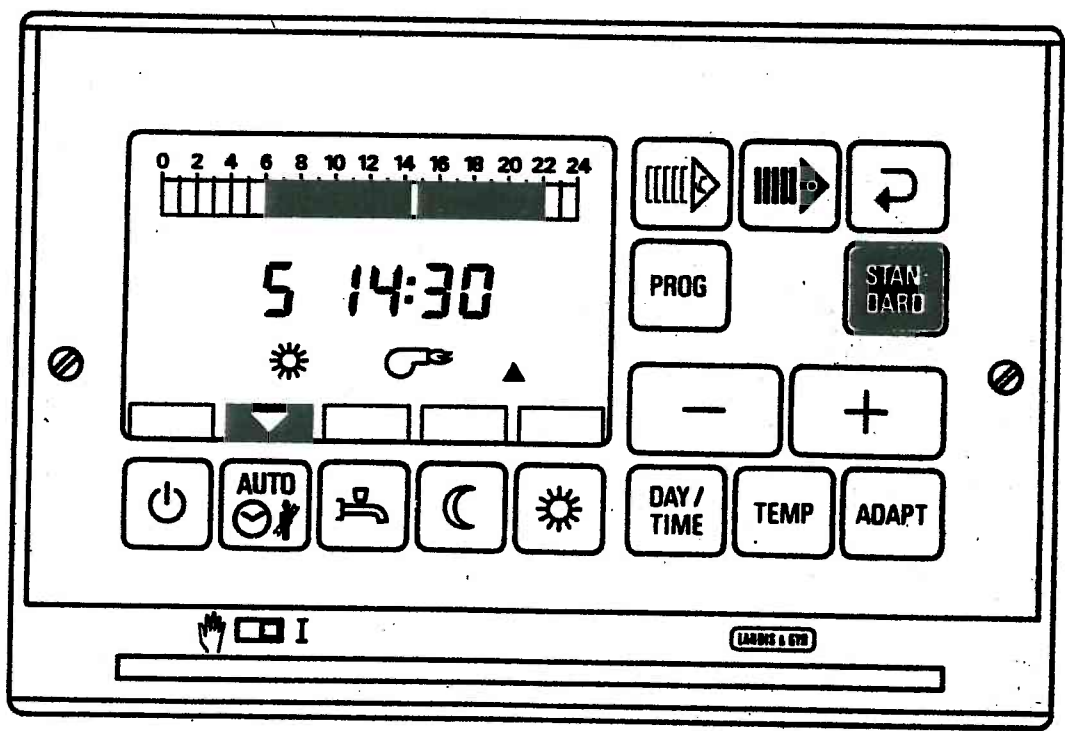# SIGMAGYR RVP DIGITAL RVP55.230

Heating and Domestic Hot Water Control System
acting on 2-stage burner, heating circuit and domestic hot water heating

Contents

1. Description

SIGMAGYR RVP55.230 is a digital control system designed for use with heating or combination boilers that are produced in large quantities. The control unit has a two-stage burner output, an output for a two-or three-position mixing valve, an output for the heating circulator, and an output for domestic hot water (D.H.W.) heating. Control of the boiler and heating circuit is weather dependent; the domestic hot water temperature is controlled depending on the storage tank temperature.

Connection of a room unit with room temperature detector activates room temperature compensation and the adaptation of the heating curve. This is strongly recommended to make full use of the comfort and automatic functions offered.

1.1 Operating and setting philosophy

The operating and setting philosophy is based on comprehensive consumer tests carried out over a long period of time. There are three different setting categories each having a different access level. These are the operational levels for the "end user", the "heating engineer", and the "boiler manufacturer".

1.1.1 Settings to be made by the end user

The microcomputer greatly relieves the end user of setting operations which have so far been necessary and which sometimes have not been clear to him. All that is required for economical year round operation is the setting of the time of day and pressing the key for the release of automatic operation. It is of course possible to match both the weekly heating program and the various temperatures to individual requirements.

1.1.2 Settings to be made by the heating engineer

By pressing two specific keys simultaneously, the heating engineer is given access to all heating plant specific parameters. The controllers come preset to make them suitable for the majority of applications.

1.1.3 Settings to be made by the boiler manufacturer

The settings to be made by the boiler manufacturer relate exclusively to heating boiler specific variables. For this reason, access to these parameters is made difficult and reserved to the boiler manufacturer only.

2. Features

o Microcomputer with non-volatile storage. In the event of a power failure all settings will be retained.

o Economical, environmental-friendly operation of the whole heat production plant including domestic hot water heating.

o Digital timeswitch with reserve of 10 hours, the reserve becoming operative after a short period of time and remaining operative during the controller's entire life.

o Suitable for all types of heating systems and climatic zones.

o Flow temperature control with consideration being given to the thermal characteristics of both light and heavy building structures.

o Automatic summer/winter changeover, taking into account the thermal inertia of average residential buildings.

o Automatic daily heating limit function with consideration being given to the dynamic behaviour of light and heavy building structures.

o Automatic adaptation of the preset controller curve to the actual building characteristics.

o Separate heating curves for boiler and heating circuit.

o Protective boiler start-up to reduce the risk of flue gas condensation during start-up of the heating plant and during domestic hot water heating.

o Quick setback and boost heating.

o Pump overrun. Protective pump control during summer operation.

o Single-or two-stage burner output with adjustable switching differential.

o Separate chimney sweep function.

o Suitable for electric or electro-thermal actuators.

o Domestic hot water control with different types of hot water priority.

o Individual daily heating program with 3 freely selectable release periods for domestic hot water.

o Standard domestic hot water program.

o Domestic hot water recharging key to provide recharging during blocked times.

o Adjustable minimum and maximum limitation of the boiler temperature.

o Automatic recognition of flow temperature detector.

o Adjustable maximum limitation of the flow temperature.

o Standard heating program. STANDARD key to retrieve the standard heating program.

o Individual weekly heating program. Seven heating programs each with three economy periods per 24 hours can be freely selected.

o Holiday program. A time period of up to 255 days can be preset.

o Each setting or change is indicated in the display and thus acknowledged.

o Double insulation. Low voltage cable can be used for the detectors.

o Detectors and room unit with interchangeable two-wire connection.

o Controller has standard dimensions of 96 x 144 mm. Suitable for control panel or flush panel mounting.

3. Range of Units

The RVP55.230 heating and domestic hot water control system comprises the following units:

3.1 RVP55.230 controller

Weather dependent flow temperature control with or without room temperature compensation, acting on three- or two-position mixing valve. With integrated boiler temperature control acting on two-stage burner, and domestic hot water temperature control acting on hot water primary pump. Seven individual 24-hour heating programs and separate individual 24-hour domestic hot water program. Standard weekly program for the heating system and standard 24-hour program for domestic hot water heating.

3.2 OAA35.1 room unit with room temperature detector

Room unit to measure the room temperature thus providing room temperature compensation, and to make fine adjustments of the room temperature setpoint.

3.3 OAA35.2 room unit with room temperature detector and remote operating switch

Room unit to measure the room temperature thus providing room temperature compensation, to make fine adjustments of the room temperature setpoint, and to make changes to the automatic heating program from the living area.

3.4 OAC31 outside detector

To measure the outdoor temperature and, to a lesser extent, to acquire the surface temperature of the wall and the influence of the wind.

3.5 OAD21 clamp-on temperature detector

For use as a flow, boiler and domestic hot water temperature detector.

3.6 OAZ21 boiler temperature detector with cable

For use as a boiler and domestic hot water temperature detector.

3.7 Crimp type terminal strips

- Low voltage side   AGP2C/1800
- Mains voltage side   AGP3C/2000

3.8 Screw type terminal strips

- Low voltage side   AGP2S/1000
- Mains voltage side   AGP3S/1200

3.9 Mounting base

Screw type terminals   AGS90.2

4. Application

4.1 Target market

The RVP55.230 has been designed for the OEM market. It is supplied to manufacturers of heating and combination boilers and is suitable for incorporation in all types and sizes of heat producers.

4.2 Types of buildings

Specifically for smaller residential and non-residential buildings which have their own heating system and domestic hot water heating facility, such as:

- one-family and two-family houses

- smaller blocks of flats

- holiday houses and villas

- consulting rooms, shops and similar premises

4.3 Heat producers

Specifically for heating boilers

- equipped with single- or two-stage oil or gas burners of any type

- integrated or stand-alone domestic hot water storage tanks

4.4 Heating plants

Suitable for all standard systems such as radiator, convector, floor, ceiling and radiation, as well as basic load heating systems.
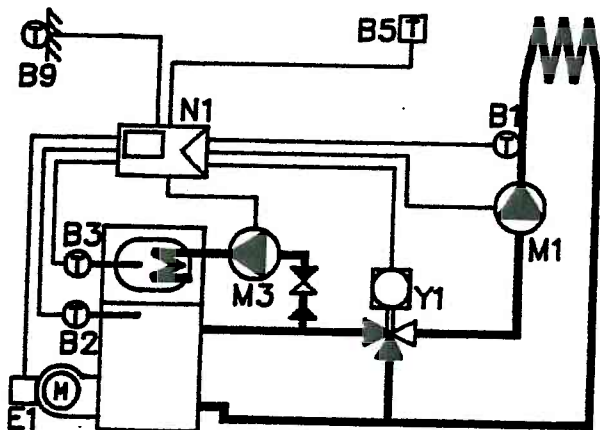

Fig. 4.1 Boiler, heating circuit and domestic hot water temperature control acting on two-stage burner, mixing valve, heating circulator, and hot water primary pump
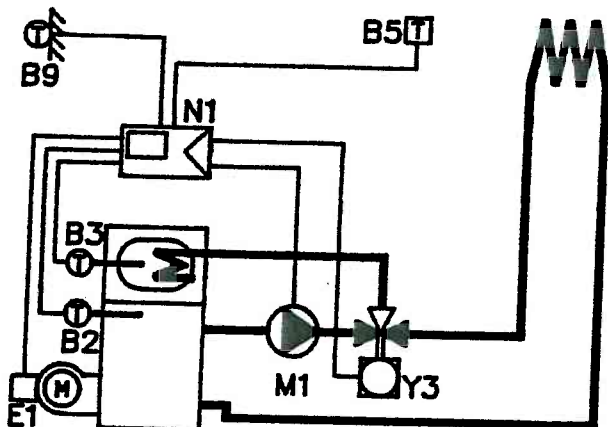

Fig. 4.2 Boiler and domestic hot water temperature control acting on two-stage burner, changeover valve, and circulating pump

Legend to figs 4.1 and 4.2:

B1   QAD21 flow temperature detector
B2   QAZ21 boiler temperature detector
B3   QAZ21 hot water temperature detector
B5   QAA35.2 room unit
B9   QAC31 outside detector
E1   Two-stage burner
M1   Circulating pump
M3   Hot water primary pump
N1   RVP55.230 controller
Y1   Mixing valve (two-or three-position, three-or four-port)
Y3   Changeover valve

5. Operation

5.1 Measuring principle

The actual values measured by the various detectors are fed to the A/D converter via a measuring bridge and then passed on to the microcomputer. The differences between the actual values and the setpoints put in are ascertained by the micro-computer. The outside detector uses an NTC resistor, the clamp-on, room and boiler temperature detectors use nickel wire resistors.

5.2 Outdoor temperature reference values

Depending on the function required, the controller uses either the attenuated, the composite, or the actual outdoor temperature.

5.2.1 Attenuated outdoor temperature

The attenuated outdoor temperature TAged takes into account the thermal inertia of average residential buildings. It is based on the actual outdoor temperature with a time constant of 21,3 hours. The controller calculates the attenuated outdoor temperature at 10 minute intervals. After a power failure or RESET the attenuated outdoor temperature TAged is set to the actual outdoor temperature TAakt.
The attenuated outdoor temperature acts on automatic summer/winter changeover, thus taking into account the property of buildings to store heat and to slowly release it again.

5.2.2 Composite outdoor temperature

The composite outdoor temperature takes into consideration the dynamic temperature characteristics of a building. It is possible to choose between two different composite ratios of actual (TAakt) and attenuated (TAged) outdoor temperatures, depending on the type of building in which the controller is used. The two ratios are calculated as follows:

- Composite outdoor temperature TAgeml for buildings of average heavy structure:

$$TAgeml = \frac{TAakt + TAged}{2} \ [°C]$$

- Composite outdoor temperature TAgem2 for buildings of light structure:

$$TAgem2 = \frac{3 \times TAakt + TAged}{4} \ [°C]$$

The composite outdoor temperature acts as a reference value on the flow temperature control, boiler temperature control, and the automatic daily heating limit function. In the event of a power failure or RESET, the composite outdoor temperature is also set to TAakt-like the attenuated outdoor temperature.

5.2.3 Actual outdoor temperature

The outdoor temperature measured directly by the outside detector only acts on the frost protection for the plant, so in this case it is used as a direct reference value.
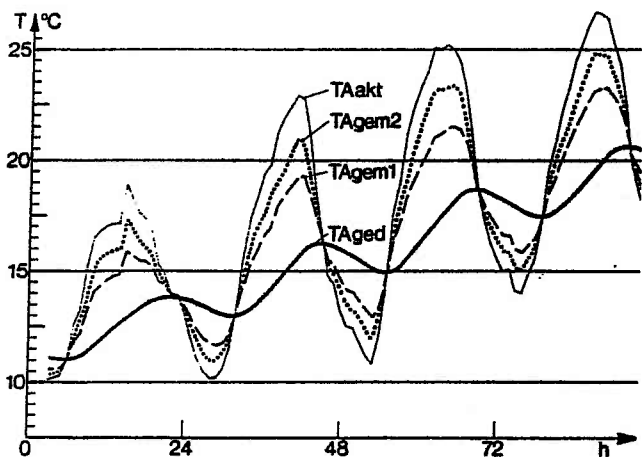

Fig. 5.1 Graphic presentation of outdoor temperature reference values

TAakt   Actual outdoor temperature

TAged   Attenuated outdoor temperature

TAgem1   Composite outdoor temperature for heavy buildings

TAgem2   Composite outdoor temperature for light buildings

5.3 Heating curve

One of the two composite outdoor temperatures is used for weather dependent control of both the flow and boiler temperature. The heating curves determine the set values of boiler water and flow temperature for the corresponding composite outoor temperature.

At a room temperature setpoint of 20°C and with 0°C heat gains the heating curves have a fixed pivot at about 20°C outdoor temperature (TA) and 20°C flow temperature (TV). Their slopes can be varied between 0 and 39,5 using increments of 0,5.
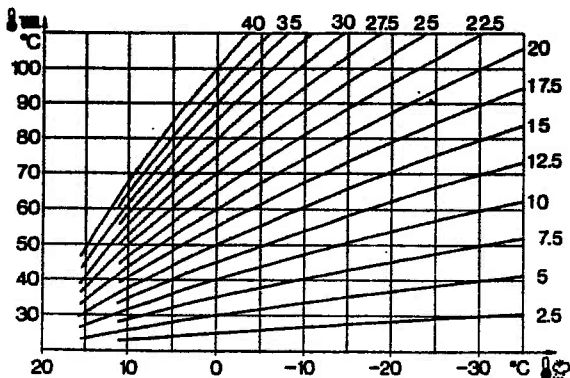

Fig. 5.2 Heating curves

5.3.1 Definition of heating curve slope

The straight substitution lines assigned to the heating curves start at the defined pivot and intersect the heating curves at 0°C outdoor temperature. The slope of these straight heating curve substitution lines multiplied by 10 gives the slope indicated in the display.

$$S = \frac{(TV \text{ at } TA\ 0°C) - 20°C}{20°C} \times 10$$

$$S = \frac{50 - 20}{20} \times 10 = \underline{15}$$
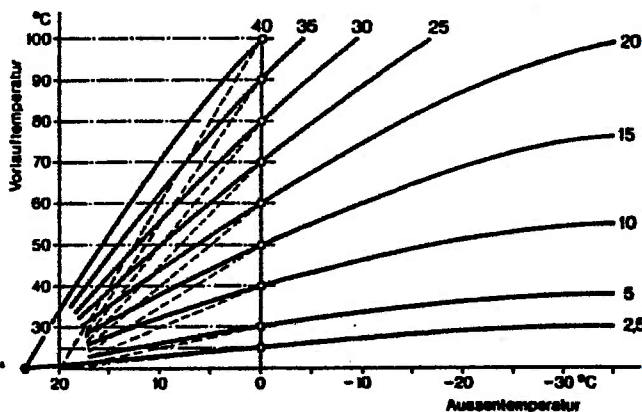
Fig. 5.3 Definition of heating curve slope

5.4 Adaptation of heating curve

Each midnight the controller processes the mean room temperature deviation of the previous day and adapts the heating curve in such a way that the deviation ascertained will be compensated for the next few days. Depending on the outdoor temperature, the controller corrects room temperature deviations by a parallel displacement of the heating curve and/or by changing the slope. This adaptation does not affect the boiler curve.

5.4.1 Adaptation at high outdoor temperatures TAged

When TRsoll - QS - TAged < 16°C, both the heat gains QS and the slope S of the controller's heating curve will be corrected. When TAged rises, the corrective part of the heat gains increases and that of the slope decreases.

QS   Heat gains which cause the heating curve to be displaced parallel. The maximum heat gains are limited to ±2 K.

TAged   Attenuated outdoor temperature

TRsoll   Room temperature setpoint for normal temperature

5.4.2 Adaptation at low outdoor temperatures TAged

When TRsoll - QS - TAged > 16°C, it is only the slope of the controller's heating curve that is corrected. The heat gains QS do not change.

Fig. 5.4 Room temperature correction in function of the attenuated outdoor temperature

DR   Mean room temperature deviation
      TRist - TRsoll
      (actual room temperature - desired room temperature)
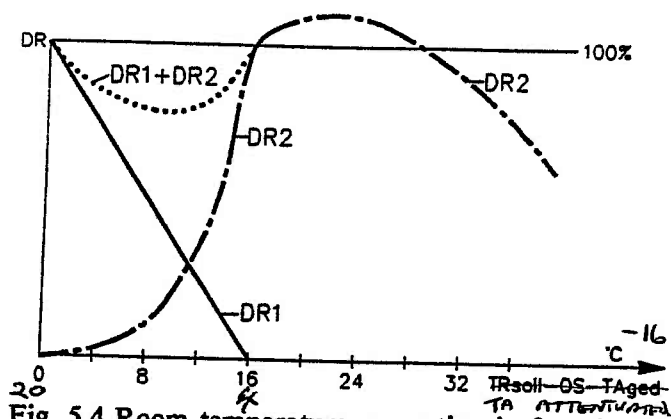DR1   Heat gain correction by parallel displacement of heating curve
DR2   Correction of heating curve slope

5.4.3 Mean room temperature deviation

When heating to the normal temperature, but only on completion of boost heating, the adaptation measures possible room temperature deviations at 10 minute intervals. At midnight the controller computes and stores the mean room temperature deviation DR which is used for making the adaptation.
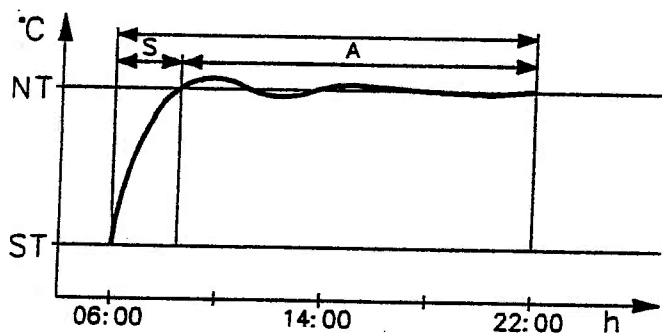
Fig. 5.5 Adaptation phase

A   Time period valid for adaptation
N   Time period "normal temperature"
S   Boost heating phase
NT   Normal temperature level
ST   Economy temperature level

5.4.4 Learning phase of adaptation

During the starting phase the adaptation is more sensitive than with temperature deviations occurring at a later point in time. For this reason, the adaptation function differentiates between two time

drop-out factors, namely ZAF1, when
TRsoll - QS - TA < 16°C,
and ZAF2, when
TRsoll - QS - TA > 16°C

Each midnight the adaptation sensitivity is reduced by one step (ZAF1 or ZAF2, depending on TAged) provided the mean room temperature correction is at least 0,5°C. On completion of the learning phase the adaptation sensitivity (1/15 referred to the start) will no longer change. In the event of a RESET or power failure, it is only the adaptation effect of the current day that will be lost.

RESET = setting of manual switch to manual and then back again to normal operation

Adaptation is restarted or commences with maximum learning ability:

- After the first start-up of the installation

- After each manual change of the heating curve slope, either by the end user or the heating engineer

Fig. 5.6 Time drop-out function during the adaptation learning phase, valid for both ZAF1 and ZAF2

A   Number of ZAF1 or ZAF2 corrections since start of adaptation

E   Adaptation sensitivity

6. Functions

6.1 Weather dependent boiler temperature control

The composite outdoor temperature is used to continuously shift the boiler temperature via the boiler curve, or the paralle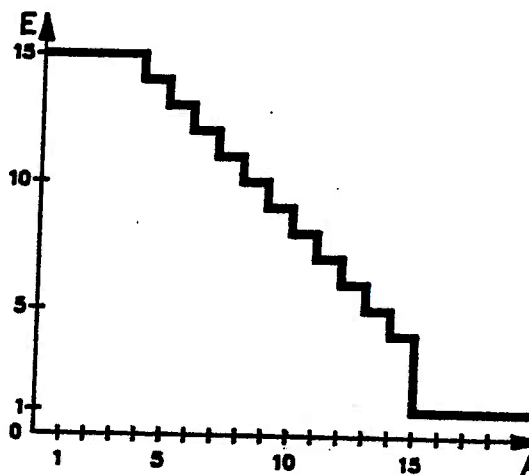l displaced heating curve, or the heating curve corrected by the adaptation- the highest setpoint having priority. Control is provided by switching a single- or two-stage burner. The boiler curve slope is set at the operational level "heating engineer". The parallel displacement of the heating curve for the generation of the boiler curve is made at the operational level "boiler manufacturer".

6.1.1 Two-stage burner operation

The second burner stage will be released when the actual boiler temperature falls below TKsoll - SD/2 for a certain adjustable period of time. The first stage is then permanently switched on while the second stage is switched on and off with no delay. The second stage will be blocked only when the 'oiler temperature exceeds the setpoint by the full ₋witching differential.
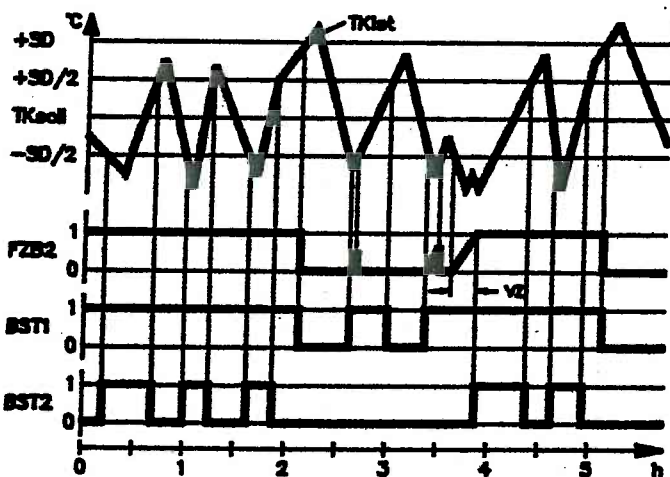

Fig. 6.1 Two-stage burner operation

BST1   Burner stage 1
BST2   Burner stage 2
FZB2   Release counter burner stage 2
SD   Switching differential
TK   Boiler temperature
VZ   Delay time

6.1.2 Minimum limitation of boiler temperature

The minimum limitation of the boiler temperature (setting range 8...95,5 °C) refers to the switch on point. The switching differential is the same as with shifting boiler temperature control. Minimum limitation can be selected to be

- operative only when heat is required

- always operative except during the mode of operation "heating switched off"

- operative also when domestic hot water heating has been released via the timeswitch

In plants without flow temperature detector minimum limitation can be made operative or inoperative (operational level "boiler manufacturer").

6.1.3 Maximum limitation of boiler temperature

The set value of the maximum limitation of the boiler temperature (setting range 8...95,5 °C) refers to the switch off point. The switching differential is the same as with shifting boiler temperature control. In the case of domestic hot water demand, the set maximum limitation is either operative or achieved via an electro-mechanical limit thermostat, depending on the basic setting. The chimney sweep function, if initiated, overrides maximum limitation.
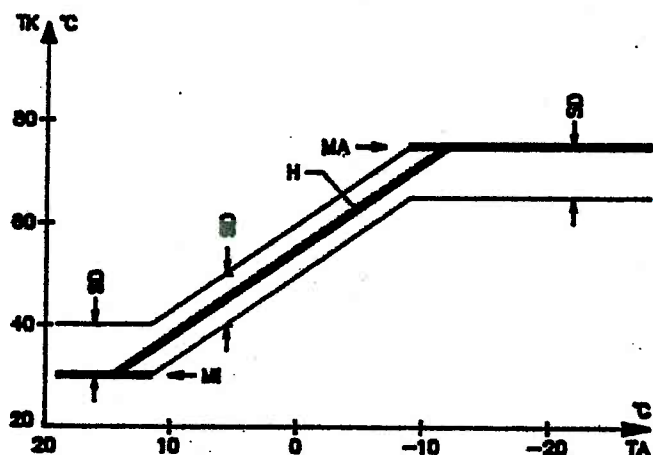
Fig. 6.2 Shifting boiler temperature control with minimum and maximum temperature limitation

6.2 Weather dependent flow temperature control

The flow temperature of the heating circuit is continuously shifted, via the heating curve, by the composite outdoor temperature. Heating circuit control is provided in the form of two-position control via an electro-thermal actuator, or in the form of three-position control using an electric actuator.

6.2.1 Control of heating circulator

Heating circulator M1 is controlled in function of heat requirements, i.e. it is switched on only when heating is provided or when the frost protection function for the plant has responded.

6.2.2 Heating circulator overrun

When the burner is switched off, e.g. when changing from normal to economy operation, heating circulator M1 remains switched on for the set pump overrun time, thus preventing build-up of heat in the boiler.
Note: Domestic hot water heating interrupts pump overrun of M1.

6.2.3 Protective pump circuit during summer operation

When the heating plant is switched off, e.g. during summer operation, both heating circulator M1 and hot water primary pump M3 are protected against jamming. Every Friday at 08.21 the controller switches both pumps on for about 10 seconds.
There is an exception in the case of plants with changeover valve: Changeover valve controlled via output Q3 is not affected by the protective pump circuit function.

6.2.4 Maximum limitation of flow temperature

The maximum limitation acts on the controlled heating circuit and maintains the set high limit value (8...95,5°C). This maximum limitation is not considered to be a safety function as required with floor heating systems, for instance.

6.3 Room temperature compensation

When connecting a room unit, the controller takes into account the influence of the room temperature. In this case, it acts as a P-controller on the flow temperature exclusively via the heating curve, proportionally to the setpoint/actual value deviation of the room temperature. At the operational level "heating engineer" the amplification factor for room temperature compensation can be set between 0 and 15. The setting KORR = 0 means no room temperature compensation.

Effect of room temperature compensation on flow temperature TV:

Change TV =
TRdif x (1 + S x 0,1) x KORR/2

The adaptation takes into account corrections made via the room temperature compensation and compensates these over a longer period of time.

6.3.1 Heat gains

The adaptation learns to give consideration to heat gains and compensates them by displacing the heating curve parallel. The heat gains are limited to ±2 K. If adaptation is disabled, or no room temperature detector connected, the controller sets the heat gains to zero.
Heat gains already acquired are cancelled as follows:

1. Disable adaptation at the operational level "heating engineer"
2. Press any mode of operation key for 1 second
3. Release adaptation again
4. Select desired mode of operation

6.4 Frost protection

The controller differentiates between three kinds of frost protection:
Frost protection for the plant, the building and the boiler.

6.4.1 Frost protection for the plant

Frost protection for the plant can be switched on/off at the operational level "heating engineer". When frost protection for the plant is activated, heating circulator M1 is switched on when the actual outdoor temperature falls below 1,5°C. The switch off point is at 3°C. Frost protection for the plant is operative independent of the selected mode of operation, also during quick setback or when the daily heating limit function has responded. Operation of the heating circulator due to frost protection for the plant is not indicated in the display.

Notes:

- In plants without mixing valve, frost protection for the plant is overridden during domestic hot water heating, i.e. depending on the type of plant, the changeover valve is in the "domestic hot water" position, or circulating pump M1 is switched off.

- In plants with mixing valve and absolute domestic hot water priority, frost protection for the plant is not operative during domestic hot water heating.

- In plants with changeover valve and in the case of heating OFF, i.e. when there is no heat demand, the changeover valve is under voltage, therefore assuming the "domestic hot water" position. When frost protection for the plant is activated, the changeover valve travels to the "heating" position and circulating pump M1 is switched on.

6.4.2 Frost protection for the building

The building is protected against frost in all modes of operation. When the heating system is switched off, the controller always tries to maintain the set frost protection temperature for the space. The reference value used is the composite outdoor temperature or, if a room unit is connected, the room temperature. Control to the frost protection temperature is permanently monitored by the daily heating limit switch and, if necessary, terminated. A snowflake will appear in the display as soon as frost protection for the building has reponded and heating to the frost protection temperature is provided. The required frost protection for the space can be set at the operational level "end user", between 4 and 19,5°C.

Note:
Domestic hot water heating has always priority over frost protection for the building.

6.4.3 Frost protection for the boiler

Frost protection for the boiler (KFS) is operative in all modes of operation when the heating system is switched off (e.g. automatic summer/winter changeover, automatic daily heating limit, or quick setback). This is based on a boiler temperature setpoint of 8°C.
KFS on when TKist < 8°C – SD/2
KFS off when TKist > 8°C + SD/2

Notes:
- The reponse of frost protection for the boiler is not indicated

- When frost protection for the boiler has responded, protective boiler start-up is not operative

6.5 Heating limit switch

The controller has two independent heating limit switches: Automatic summer/winter changeover, which is active over longer periods of time, and the automatic daily heating limit switch which is active over short periods of time. If one of the two functions responses, the controller switches the heating system off.

6.5.1 Automatic summer/winter changeover

The controller makes a decision on summer or winter operation depending on the attenuated outdoor temperature and the set heating limit (can be set at the operational level "end user", between 8 nd 29,5°C). The switching differential is 2 K. Automatic summer/winter changeover not only acts on the heating system, but also on heating circulator M1. Summer operation is indicated in the display by the parasol symbol.

Automatic summer/winter changeover is not operative

- in the mode of operation "continuous normal temperature"

- when, in normal operation, the room unit is set to "continuous normal temperature"

Automatic summer/winter changeover can be suppressed by setting the heating limit to the maximum value of 29,5°C.
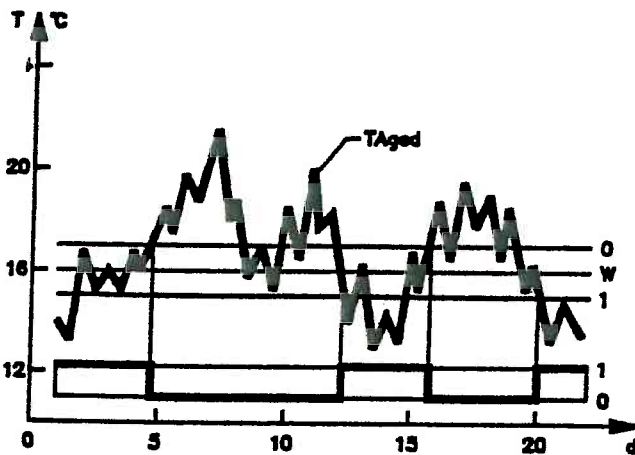
Fig. 6.3 Switching on/off of heating system through automatic summer/winter changeover

6.5.2 Automatic daily heating limit

The automatic daily heating limit is an economy function operative for short periods of time. The reference value used is the set value of the flow temperature which is shifted by the composite outdoor temperature.
The automatic daily heating limit function switches the heating system OFF when

$$TVsoll - TRsoll < 2°C \times S \times 0,1$$

There is no operating symbol displayed (sun or moon).

The automatic daily heating limit function switches the heating system ON when

$$TVsoll - TRsoll > 4°C \times S \times 0,1$$

In the mode of operation "continuous normal temperature and, when in automatic operation the room unit is set to "continuous normal temperature", the automatic daily heating limit function is not operative.
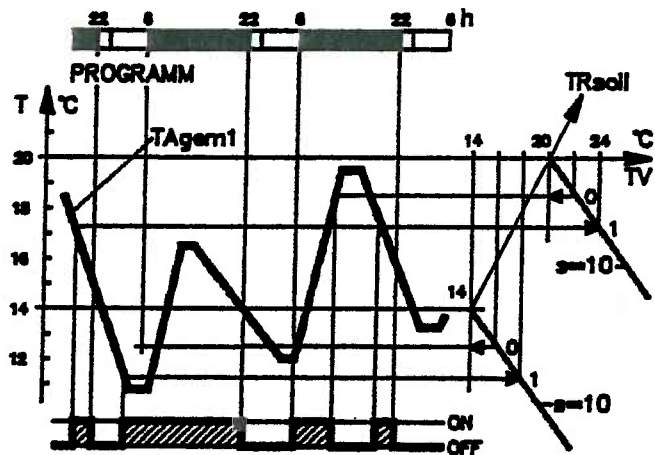
Fig. 6.4 Switching on/off of heating system through the automatic daily heating limit function

6.6 Quick setback and boost heating

Both quick setback and boost heating are operative only when one of the room units QAA35.1 or QAA35.2 is connected.

6.6.1 Quick setback with QAA...

After changeover from normal to economy temperature the quick setback function switches both heating and heating circulator off until the lower economy temperature is reached.

6.6.2 Quick setback without QAA...

After changeover from normal to economy temperature the switch on delay function blocks both heating and heating circulator for a selectable period of time which is also dependent on the com-

posite outdoor temperature. This delay function always uses full hours and is limited to a maximum of 15 hours in the case of high outdoor temperatures, and to 0 in the case of outdoor temperatures below -10°C.

HEV = (TAgem + 12°C) x KON/16
HEV   Switch on delay in hours
KON   Constant factor between 0 and 15. Can be set at operational level "heating engineer" under function B
TAgem   Composite outdoor termperature

KON = 0 means that the quick setback function is suppressed, independent of TAgem.

6.6.3 Boost heating with QAA...

Boost heating becomes operative after changeover from economy to normal temperature, or always when switching either automatically or manually to normal temperature. When boost heating is provided, the controller raises the set value of the flow temperature according to the setpoint/actual value deviation of the room temperature and the adjusted heating curve slope.

The set value of the folw temperature during boost heating (TVsoll SA) is calculated as follows:
TVsoll SA = TVsoll heating circuit +
(TRsoll - TRist) x (1 + S x 0,1) x 7,5
SA aus, when TRist = TRsoll - 0,5 K

6.7 Protective boiler start-up

When the boiler temperature falls below a certain value while the burner is running, the protective boiler start-up function is activated. This helps to get over the critical boiler temperature range more rapidly, thus reducing considerably the risk of flue gas condensation. The protective boiler start-up function can be suppressed at the operational level "boiler manufacturer".

6.7.1 Plants without mixing valve

The protective boiler start-up function switches both pumps M1 and M3 off when, in the case of heat demand (e.g. burner ON due to domestic hot water heating), the boiler temperature falls below the set minimum temperature.
Pumps M1 and/or M3 are switched on when TKist > TK min + SD/2

Pumps M1 and/or M3 are switched off when TKist < TKmin - SD/2

Notes:
- If, at the operational level "boiler manufacturer", the function [TKmin without mixing valve: no] is selected, the protective boiler start-up function is not operative.

- In plants with changeover valve circulating pump M1 provides the protective boiler start-up function both in the case of domestic hot water charging and heating operation.

- In plants without mixing valve, frost protection for the plant is not operative when the protective boiler start-up function is activated.

Fig. 6.5 Protective boiler start-up in plants without mixing valve

SD   Switching differential
TK   Boiler temperature
TKmin   Minimum boiler temperature
Y   Correcting variable ON/OFF

6.7.2 Plants with mixing valve

Protective boiler start-up responds when TKist < TKmin - SD/2. The set value of the flow temperature is now reduced, the reduction being proportional to the difference TKmin - TKist. Here, protective boiler start-up acts on the mixing valve and, in the case of domestic hot water heating, on the hot water primary pump M3, but not on heating circulator M1.
When calculating the set value of the flow temperature for protective boiler start-up TVeff, a differentiation is made between the plant statuses TVsoll < TKmin and TVsoll > TKmin.

Protective boiler start-up when TVsoll < TKmin

When protective boiler start-up is in operation, the set value of the flow temperature is reduced by TVkor:
TVkor = (TKmin - SD/2 - TKist) x 3
TVeff = TVsoll - TVkor

Fig. 6.6 Protective boiler start-up in plants with mixing valve

SD/2   Half the switching differential
TKist   Actual value of boiler temperature
TKmin   Set minimum boiler temperature
TVkor   Correction of flow temperature setpoint

Protective boiler start-up when TVsoll > TKmin

When protective boiler start-up is in operation, the set value of the flow temperature is first set to TKmin - SD/2 and then reduced by TVkor:
TVkor = (TKmin - SD/2 - TKist) x 3
TVeff = (TKmin - SD/2) - TVkor

As soon as TKist > TKmin - SD/2, the heating is controlled again to TVsoll according to the heating curve, i.e. protective boiler start-up is switched off.

6.8 Chimney sweep function

When the chimney sweep function is activated, the controller initiates the following functions:

- The TKmax function is cancelled. Limitation of the boiler temperature is provided by the heating boiler's electro-mechanical limiter.

- For a short period of time, TKmin is set to 64°C, thus enabling the protective boiler start-up function (if not switched off) to increase the boiler temperature to the required 60°C.

- The second burner stage is released with no delay.

- In heating operation the respective set value of the flow temperature remains unchanged.

- If there is no heat demand, the controller sets the set value of the flow temperature to 44°C and switches circulating pump M1 on again.

- The actual boiler temperature appears in the display.

- After one hour the chimney sweep function is automatically reset to the mode of operation "AUTO".

6.9 Domestic hot water heating

6.9.1 Maximum limitation of domestic hot water temperature during domestic hot water heating

The operational level "boiler manufacturer" offers two choices:

a) The maximum limitation of the boiler temperature is the same as with heating

b) The maximum limitation of the boiler temperature provided by the controller is not operative. It is ensured by an electro-mechanical thermal reset limit thermostat

6.9.2 Time switching program for domestic hot water heating

Program 8 controls the release of domestic hot water heating in all modes of operation with the exception of "stand by" and "manual operation". The standard setting of program 8 releases domestic hot water heating from 05:00 to 22:00.

6.9.3 Minimum limitation of boiler temperature when domestic hot water heating is released

With heating OFF and domestic hot water heating released, the operational level "boiler manufacturer" offers the choice whether or not the controller shall maintain the minimum boiler temperature.

Note:

TKmin operative in the case of heating OFF and domestic hot water heating released (e.g. in summer operation) is specifically suitable for instantaneous hot water heaters incorporating a flow switch. With this kind of application this function offers the advantage of the boiler temperature being at least at the minimum when hot water is suddenly required.

6.9.4 Domestic hot water heating with shifting priority in plants with mixing valve

When using shifting priority (operational level "boiler manufacturer"), the controller does not provide the conventional domestic hot water priority. Already during domesic hot water heating, the controller supplies surplus energy, via the mixing valve, to the heating circuit. When the burner produces more heat than can be absorbed by the hot water storage tank, the boiler temperature rises, hence the smaller the difference between TKmax and TKist, the greater the surplus energy.

During domestic hot water heating the controller reduces the set value of the flow temperature by the value TVkor as long as TKist < TKsoll.

TVkor = (TKsoll - TKist) x 3

TVeff = TVsoll - TVkor

TKsoll = TKmax - SD/2 for single-stage burners

TKsoll = TKmax - SD for two-stage burners

Notes:

- At the operational level "boiler manufacturer" [TKmax with domestic hot water according to no. 2] must be operative. Otherwise the shifting priority function is switched off and the absolute priority function becomes operative.

- The shifting priority function requires protective boiler start-up to be operative (operational level "boiler manufacturer"). Also refer to section 6.9.6.

- Frost protection for the plant is not operative during shifting domestic hot water priority and when protective boiler start-up has responded.
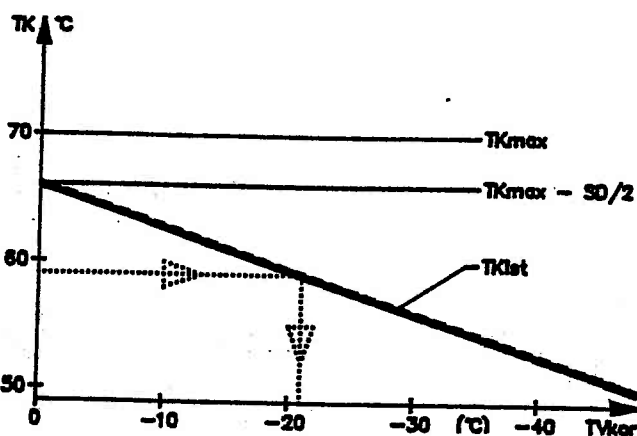
Fig 6.7 Correction of set value of flow temperature for domestic hot water heating with shifting priority in plants with mixing valve

SD/2   Half the switching differential

TK   Boiler temperature

TKist   Actual value of boiler temperature

TKmax   Selected maximum limitation of boiler temperature

TVkor   Correction of flow temperature setpoint

6.9.5 Domestic hot water heating with absolute priority in plants with mixing valve

When using absolute priority (operational level "boiler manufacturer"), the controller provides conventional domestic hot water priority. When domestic hot water is heated up, the mixing valve is closed and heating circulator M1 switched off. During domestic hot water heating with absolute priority, frost protection for the plant is not operative.

6.9.6 Domestic hot water heating without priority in plants with mixing valve

The combination of functions [protective boiler start-up off] and [shifting domestic hot water priority with mixing valve] provides continued control of the heating circuit according to the heating curve inspite of domestic hot water heating.

6.9.7 Domestic hot water heating in plants with changeover valve

During domestic hot water heating, circulating pump M1 is running and the changeover valve, in the position "domestic hot water heating", is under voltage. Frost protection for the plant is then out of operation.

6.9.8 Domestic hot water heating in plants without mixing valve

During domestic hot water heating, circulating pump M1 is switched off and frost protection for the plant is not operative. If, in the case of domestic hot water heating, the boiler temperature falls below TKmin, protective boiler start-up becomes operative and the hot water primary pump is switched on/off according to fig. 6.5.

6.9.9 Hot water primary pump overrun

When charging of the hot water storage tank is completed and the burner switches off, the hot water primary pump continues to run for the set overrun time, if there is no heating demand (summer operation, automatic daily heating limit function switched off, quick setback).In the case of heating operation, changeover to heating is effected immediately when charging of the hot water storage tank is completed.

6.9.10 Recharging of hot water storage tank

A recharging key is used for single recharching of the hot water storage tank during the periods of time heating is blocked.To recharge, domestic hot water heating is released for a maximum of 2,5 hours. If the recharging key is pressed and the hot water storage tank is already charged up, the release time is suppressed, i.e. it is set to 0. Recharging is interrupted when another mode of operation key is pressed. By contrast, actuating the override switch at the room unit does not cancel recharging that has been started.

7. Design Features

7.1 Digital control unit

Control unit with dimensions to DIN 43700 consisting of controller insert, plastic housing with two rocker type sliders for flush panel mounting, large LCD field, foil push-buttons, transparent cover and terminal strips for the electrical connections. The controller insert accommodates the printed circuit boards with surface mounted miniature components, microcomputer, A/D converter, digital clock, transformer and 6 output relays.
The electrical connection is made at the rear of the unit using quick connectors. Crimp or screw type terminal strips that cannot be mixed up are available for both the mains and low voltage side.
The unit is placed in a front panel or control panel cut-out and secured from the front by means of the rocker type sliders using a screw driver. For wall or control panel mounting the screw type terminal strips can be converted to mounting bases.

7.2 Setting and operating elements

All the setting and operating elements are on the front of the controller, arranged and inscribed for easy overview on a foil keyboard of push-buttons.

Each setting or operation is displayed and thus acknowledged. The transparent and sealable cover protects the unit against tampering.
The control unit has three different operational levels with three different kinds of access.

7.2.1 Operational level "end user"

Access to all operating functions is gained directly and made possible in any order desired.
Easy-to-understand short form Operating Instructions are supplied with each unit; they are inserted in a slot under the unit cover.

Detailed Operating Instructions are also available.
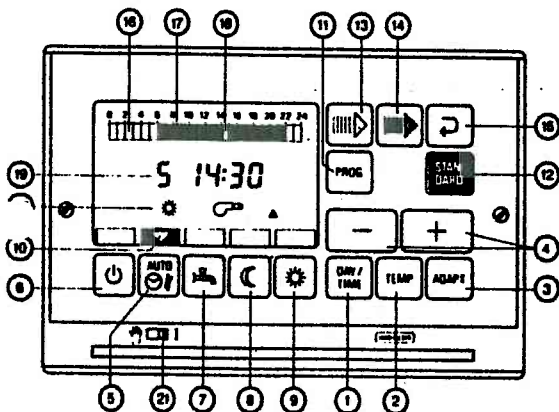
Fig. 7.1 Foil keyboard and display field

1   Key for setting the 7 days of week
    (1 = Monday...7 = Sunday)
    and time of day (24-hour display)

2   Key for setting the temperatures. First, the setpoints are displayed in the following order:

    TEMP1 "Sun" symbol. Normal temperature, standard setting 20°C

    TEMP2 "Moon" symbol. Economy temperature, standard setting 14°C

    TEMP3 "Water tap" symbol. Domestic hot water setting 8...55,5°C or 8...79,5°C depending on basic setting, standard setting 50°C

    TEMP4 "Snowflake" symbol. Frost protection temperature for the room 4...19,5°C, standard setting 6°C

    TEMP5 "Parasol" symbol. Summer/winter changeover temperature 8...29,5°C, standard setting 16°C

Then, the actual temperature values are displayed in the following order:

    TEMP6 Boiler temperature

    TEMP7 Domestic hot water temperature

    TEMP8 Room temperature (without room unit the reading is always 31,5°C)

3   Key for setting the heating curve slope between 0 and 39,5. Basic setting 14

4   Keys for alteration of selected or displayed value

5   Press key briefly:
    "Automatic operation of heating and domestic hot water".
    Press key for 5 seconds:
    "Chimney sweep function "for one hour, then the controller reverts automatically to the mode of operation "AUTO"

6   Key "heating and domestic hot water switched off with frost protection"

7   Press key briefly:
    "Single recharging of hot water storage tank"
    Press key for 5 seconds:
    "Only domestic hot water heating according to domestic hot water heating program"

8   Key for "continuous economy temperature"

9   Key for "continuous normal temperature"

10 Indication of mode of operation

11 Key for selection of the 7 heating programs (PROGRAM 1 for Monday...PROGRAM 7 for Sunday) and of domestic hot water program (PROGRAM 8)

12 Key for retrieval of standard heating program and of standard domestic hot water program. Keep key in programming mode PROG depressed for 5 seconds.
    Standard heating program: Monday through Sunday from 6:00 to 22:00 normal temperature. During the remaining periods of time heating is provided only when the economy temperature is reached.
    Standard domestic heating program: Domestic hot water heating is released every day from 5:00 to 22:00 and blocked during the remaining periods of time

13 Key for entering (writing) the periods of time for economy temperature, or domestic hot water heating blocked during the selected and diplayed PROGRAM

14 Key for entering (writing) the periods of time for normal temperature, or domestic hot water heating released during the selected and displayed PROGRAM

15 Correcting key for moving the time cursor backwards

16 Period of time for economy temperature, or domestic hot water heating blocked

17 Period of time for normal temperature, or domestic hot water heating released

18 Time cursor

19 Display field for day of week, time of day, temperatures and other values

20 Mode of operation symbols. The meaning of the symbols, when alight, is as follows:

❄ Frost protection has responded. Heating is provided so that frost protection temperature is maintained

⚡ Automatic summer/winter changeover has switched to summer operation

☾ Economy temperature is active

☀ Normal temperature is active

🚰 Hot water storage tank is charged

↝ Burner in operation

▼ Mixing valve is closing

▲ Mixing valve is opening

21 Switch for normal/manual operation
Manual operation: Both burner stages, heating circulator and hot water primary pump remain permanently under voltage; the mixing valve, however, is not under voltage. In plants with changeover valve, the latter is under voltage and thus in the position "domestic hot water heating". To provide heating, the changeover valve must therefore be manually set to the "heating" position

RESET: Set switch to manual operation and then back again to normal operation

Holiday program:
Keep key 6 or 8 (depending on requirements) depressed and enter the holiday periods desired using the + and - keys. The day of entry counts as a whole day. At 24:00 of the last holiday, the controller reverts to automatic heating operation

7.2.2 Operational level "heating engineer"

By pressing two specific keys simultaneously, the heating engineer is given access to the plant specific parameters. The controllers come preset to cover the major field of application. The heating engineer sets the application specific parameters given in his Setting Instructions.

7.2.3 Operational level "boiler manufacturer"

The parameters of this operational level refer to heating boiler specific values. Access to these settings is made difficult and reserved to the boiler manufacturer. As a general rule, these parameters are preset by the latter. Also refer to the Setting Instructions for the boiler manufacturer.

7.2.4 Safeguarding of data

All the data entered (set values, heating programs, plant and boiler specific data) are retained in a non-volatile storage. This means that even after a power failure of longer duration, or in the unlikely event of the reserve being exhausted, data will not be lost.

7.3 Digital clock

The digital clock is equipped with a capacitor providing a reserve of approx. 10 hours. The capacitor's advantage over a battery is its practically unlimited life.
Seven independent heating programs can be accepted by the digital clock, each with a maximum of three setbacks within a 24-hour period.
There is a 24-hour time program with three release periods (PROGRAM 8) for domestic hot water heating. The holiday program covers a maximum period of 255 days.
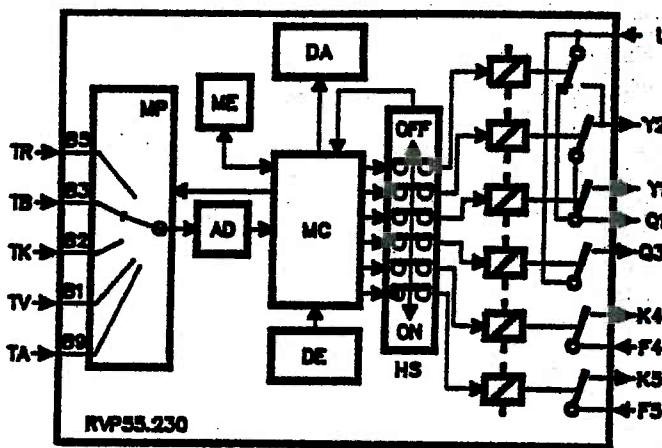
7.4 Block circuit diagram

Fig. 7.2 Block circuit diagram of control functions

AD   Aanalogue/digital converter
DA   Display, indication of data and programs
DE   Data entry, foil keyboard
MC   Microcomputer
ME   Memory, non-volatile storage of data
MP   Multiplexer
TA   Outdoor temperature
TB   Domestic hot water temperature
TK   Boiler temperature
TR   Room temperature
TV   Flow temperature

7.5 QAA35.2 room unit

This room unit with room temperature detector and remote operating switch is suitable for wall mounting and can be fitted to all standard conduit boxes. The electric cables can be led in from the rear or along the wall. The two-sectional plastic housing consisting of base and cover is held together by snappers. A transparent cover with aluminium plate forms the front of the unit. A metal baseplate is used to fix the QAA35.2.
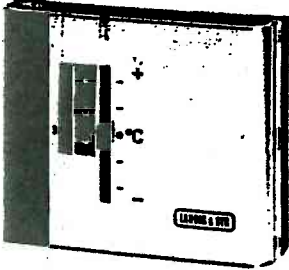

Fig. 7.3 QAA35.2 room unit

A slider switch with 9 positions divides the setpoint correcting range of ± 2 K into steps of 0,5 K. The setpoint readjustments made with this slider affect all room temperature setpoints set at the controller (normal, economy and frost protection temperature). Two plug-in stops inside the unit can be used to limit the correcting range at the upper or lower end, or to block the slider in a certain position.

Note: A correction made at the room unit distorts the room temperature indication, i.e. a positive correction causes the indicated temperature to be shifted downward, a negative correction causes the indicated temperature to be shifted upward, by the corrected value.

A second slider is used as an override switch, provided mode of operation "AUTO" is activated. It has three setting poitions:

"Sun"   Continuous normal temperature, i.e. automatic setback will be overridden
"Clock"   Automatic program as set at the controller
"Moon"   Continuous economy temperature, i.e. automatic changeover to normal temperature will be overridden

A Ni-sensing element is used to measure the room temperature. Only two wires are required for the electrical connection. This is accomplished by having the sensing element, the resistors for the fine adjustment of the setpoint and the resistors for the override switch connected in series. The connecting terminals are inside the base and easily accessible. The snap-on cover is to be removed to make the electrical connection.

7.6 QAA35.1 room unit

With regard to design, mounting, room temperature detector, function of room temperature setpoint correction and electrical connections, the QAA35.1 is identical with the QAA35.2, the only difference being the missing override switch. Intervention in the heating program is therefore not possible with the QAA35.1.
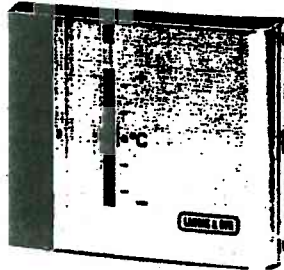

Fig. 7.4 QAA35.1 room unit

7.7 Detectors type QAZ21, QAD21 and QAC31

For design features and technical data of these temperature detectors refer to T 2460 E.

7.8 Recognition of hydraulic circuit

7.8.1 Automatic recognition ot flow temperature detector

If no flow temperature detector is connected to terminal B1, the controller restructures its internal circuitry automatically for plants having no mixing valve. This concerns in particular the pumps and the functions associated with domestic hot water heating.
In plants without flow temperature detector the boiler temperature is controlled according to the controller's heating curve, with no increase. In such plants the boiler curve is not taken into account.

7.8.2 Domestic hot water heating with changeover valve

If no flow temperature detector is connected to terminal B1 and the function "changeover valve" is operative at the operational level "heating engineer", the controller provides the functions necessary for plants with changeover valve.

8. Technical Data

8.1 Control unit

Nominal voltage

Up to Tamb of 40°C	220 V a.c. +20% -15%
Up to Tamb of 50°C	220 V a.c. +10% -15%

Nominal frequency	50 or 60 Hz
Mains transformer	short-circuitproof
Test voltage	4 kV
Power consumption	2,5 VA
Protective low voltage	12 V d.c.
Insulation class	II to VDE 0631
Protection standard	IP 40 to DIN 40050
Radio interference protection	N to VDE 0875
Vibration test	2 g to DIN 40046

Perm. amb. temp.

Transport, storage	-25...+70°C
Operation	2...50°C

Perm. amb. humidity	class F to DIN 40040

Weight

Control unit	approx. 0,6 kg
Plug-in term. strips	approx. 0,15 kg

8.1.1 Setting ranges

Normal temperature	14...25,5°C
Economy temperature	8...19,5°C
Frost pretection temp.	4...19,5°C
Summer/winter changeover temp.	8...29,5°C
Domestic hot water temp.	8...55,5°C or 8...79,5°C
Room compensation factor	0...15
Heating curve	0...39,5
Boiler curve	0...39,5
Constant value for quick setback without room unit	0...15

8.1.2 Boiler temperature control

Boiler temperature

Minimum limitation	8...95,5°C
Maximum limitation	8...95,5°C
Higher than flow temp.	0...7,5 K

Switching differential	0..15 K
Delay time 2nd stage	0...30 min

8.1.3 Flow temperature control

Maximum limitation	8...95,5°C

3-position control

Perm. running time	1...6 min
Preferred running time	2...3 min
Neutral zone	1 + S/10 K

2-position control

Time constant	8...16 min
Switching differential	0...15 K

Heating circulator overrun time	0...15 min

8.1.4 Domestic hot water control

Switching differential	8 K
Hot water primary pump overrun time	0...15 min

8.1.5 Output relays

Actuators Y1, Y2

Nominal voltage	90...250 V a.c.
Nominal current	0,02...2 A

Pumps Q1, Q3

Nominal voltage	max. 250 V a.c.
Nominal current	max. 2 A, cos phi > 0,5
Starting current	max. 10 A, max. 1 s

Burners K4, K5

Nominal voltage	max. 250 V a.c.
Nominal current	max. 2 A, cos phi > 0,5
Starting current	max. 10 A, max. 1 s

Ignition transformer

Nominal current	max. 1 A, max. 30 s
Switch on current	max. 10 A, max. 10 ms
Test class	II to VDE 0631

8.2 QAA35.2/35.1 room units

Sensing element	Ni 1000 Ohm at 0°C
Time constant	approx. 6,5 min
Dead time	20 s

Perm. lengths of leads

Cu-cable 1 mm^2	80 m
Cu-cable 1,5 mm^2	120 m

Insulation class	III to VDE 0631
Protection standard	IP 30 to DIN 40050

Perm. ambient temperature

Transport and atoreage	-25...+65°C
Operation	0...50°C

Perm. ambient humidity

Transport and storage	class E to DIN 40040
Operation	class G to DIN 40040

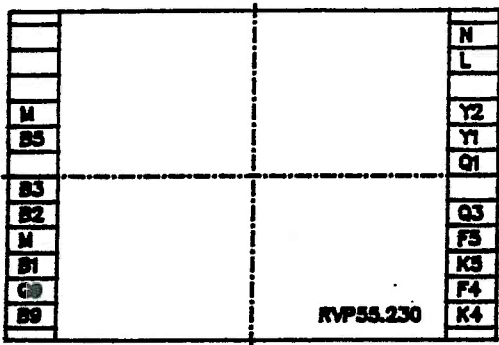|	
Setting range	± 2 K
Weight	0,12 kg

9. Wiring Diagrams

Fig. 9.1 Arrangement of connecting terminals as seen from the front of the controller

Left side: Low voltage side with detector connections
Right side: Mains voltage side with power supply and outputs
...ntre: Auxiliary terminals of mounting base (not shown)
Crimp and screw type terminal strips have four additional M-terminals for the low voltage side and four additional N-terminals for the mains voltage side.
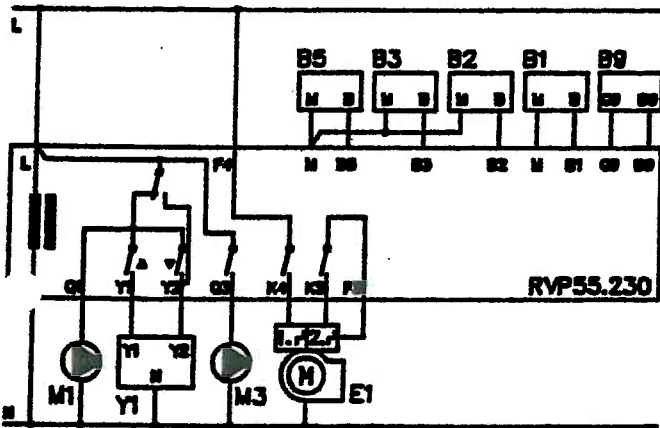
9.1 Wiring diagram for plants with mixing valve

Fig. 9.2 Weather dependent control with room temperature compensation, acting on two-stage burner, electric actuator, heating circulator, and hot water primary pump

9.2 Wiring diagram for plants with changeover valve
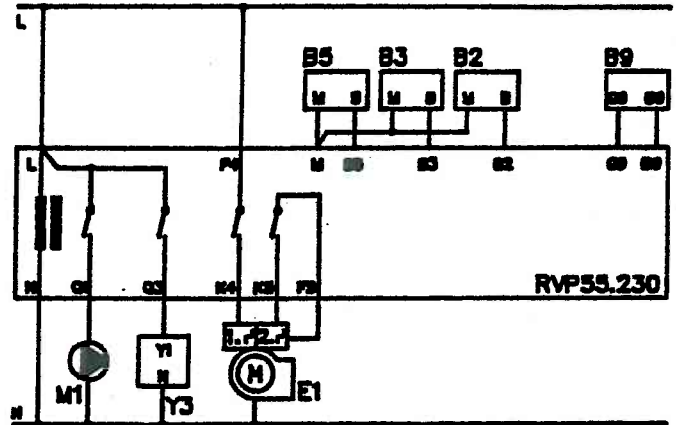
Fig. 9.3 Weather dependent control with room temperature compensation, acting on two-stage burner, changeover valve, and circulating pump

9.3 Wiring diagram for plants without mixing valve
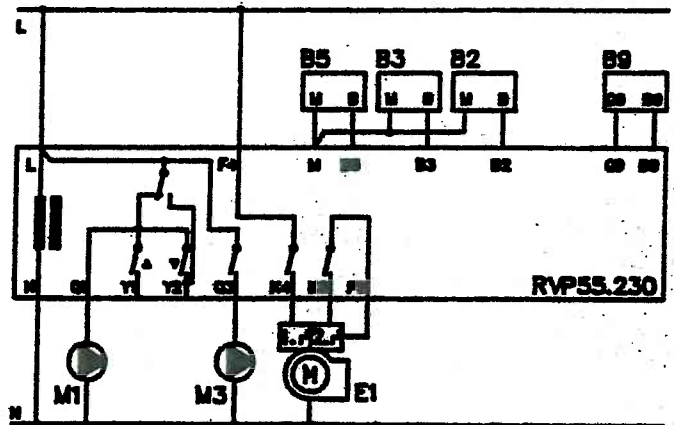
Fig. 9.4 Weather dependent boiler temperature control with room temperature compensation, acting on two-stage burner, heating circulator, and hot water primary pump

Legend to figs 9.2 to 9.4:

B1   QAD21 flow temperature detector
B2   QAZ21 boiler temperature detector
B3   QAZ21 hot water temperature detector
B5   QAA35.2 room unit
B9   QAC31 outside detector
E1   Two-stage burner
M1   Heating circulator
M3   Hot water primary pump
Y1   Electric actuator with mixing valve
Y3   Changeover valve

General notes:

- The connecting wires of the individual detectors are interchangeable
- Instead of a two-stage burner it is also possible to connect two compressors or a two-stage compressor of a heat pump
- Electro-thermal actuators are to be connected to terminals Y1 and N. In this case terminal Y2 will not be used
- Room unit B5 is not required for control systems without room temperature compensation

10. Installation

10.1 Mounting location

10.1.1 Control unit

Boiler front, control cabinet front or control panel. Not in wet or humid rooms. The control unit must not be exposed to drip water.

10.1.2 QAA35.2/35.1 room units

Inner wall of the reference room to be heated (room temperature compensation, adaptation), but not exposed to direct solar radiation, not in niches or shelves, behind curtains or doors, above or near heat sources. If possible, it should be mounted opposite the radiator, about 1,5 m above the floor.

10.1.3 Other detectors

These are to be sited as recommended in the respective Mounting Instructions.

10.2 Mounting

Required cut-out in the boiler panel or control cabinet 138 x 92 mm. The controller is placed in the cut-out and fixed by tightening the two screws on the front. The transparent front cover can be hinged on the left (as supplied ex works), or an the right. A hole in the cover and housing allows the controller to be sealed, should this be required.

10.3 Electrical connections

The wires of the measuring circuit carry protective low voltage, while those to the controller, actuator, burner and pumps carry mains voltage. Fuses, switches, wiring and earth connections must comply with local regulations. The permissible lengths of leads to all detectors are as follows:

- Max. 20 m with copper wire of 0,6 mm dia.
- Max. 80 m with copper wire of 1,0 mm^2
- Max. 120 m with copper wire of 1,5 mm^2

Detector wires must not be run parallel to mains wires for pumps, burners, etc.

11. Commissioning

11.1 Settings made by the end user

To commission the plant, the controller can be used with the standard settings as supplied ex works, i.e. setpoints, switching times and standard programs. The settings to be made are the day of week and the time of day. Adaptations to personal requirements can be made by the user himself at a later point in time. Detailed Operating Instructions are available for this purpose. In addition, the controller is supplied with multi-language short form instructions inserted at the front of the unit.

11.2 Settings made by the heating engineer

Prior to commissioning the installation the plant specific settings must be made. Detailed Setting Instructions have been made available for this purpose. They are forwarded to the heating engineer together with the heating boiler.

11.3 Settings made by the boiler manufacturer

The boiler specific settings are either made by Landis & Gyr or determined and made by the heating boiler manufacturer. For warranty reasons these settings must not be altered. Access to these settings is therefore made difficult.

11.4 Manual switch

Under normal circumstances the manual switch is set to position I all year round.
When using the poition "manual operation" in an emergency, the following functions are provided:

- Heating and domestic hot water temperature control out of operation
- Mixing valve is not receiving operating voltage
- Both burner stages remain permanently switched on
- Both heating circulator and hot water primary pump remain permanently switched on
- Changeover valve is receiving voltage and assumes the position "domestic hot water heating"

11.5 Program hierarchy

The program is based on the following hierarchy:

1. Domestic hot water heating with or without protective boiler start-up
2. Frost protection for the plant
3. Automatic summer/winter changeover, automatic daily heating limit function, quick setback
4. Normal heating and domestic hot water heating operation according to programs selected

11.6 Indication of operational statuses

Mode of operation Display

Stand-by	Time display is always blank. "Parasol" is displayed in summer operation, and "Snowflake" in the case of frost protection for the plant.
AUTO/clock and room unit set to "Clock"	Time display indicates heating program. Time display is blank in summer operation. "Sun" is displayed in the case of normal temperature, "Moon" in the case of economy temperature, or "Parasol" in summer operation, and "Water tap" during domestic hot water heating.
AUTO/clock nd room unit set to "Sun"	Time display is completely dark. PROGRAM OVERRIDE appears under the time display. "Sun" is always displayed, and "Water tap" during domestic hot water heating.
AUTO/clock and room unit set to "Moon"	Time display is completely bright.PROGRAM OVERRIDE appears under the time display. "Moon" is displayed in the case of economy temperature, or "parasol" in summer operation, and "Water tap" during domestic hot water heating.
Domestic hot water	Time display is always blank. "Parasol" is displayed in summer operation, or "Snowflake" in the case of frost protection for the plant, and "Water tap" during domestic hot water heating.
Continuous economy temp.	Time display is completely bright. "Moon" is displayed in the case of economy temp., or "Parasol" in summer operation, and "Water tap" during domestic hot water heating.
Continuous normal temp.	Time display is completely dark. "Sun" is always displayed and "Water tap" during domestic hot water heating.

General remarks:

- No symbol is displayed when frost protection for the plant is responding. The "Snowflake" is displayed only in the case of frost protection for the building.

- Quick setback and the automatic daily heating limit function are indicated in that the currently active heating symbol (sun or moon) disappears.
- Both automatic daily heating limit and the automatic summer/winter changeover function are not operative in the modes of operation "continuous normal temperature" and "AUTO/clock".

11.7 Operating faults

- Heating control system does not function. Time of day is not displayed or incorrectly displayed

    o Slide manual switch to "manual operation" on the left and then back to the normal position "I" on the right. Set day of week and time again
    o Check fuses of heating system

- Acuator (mixing valve) does not open/close

    o Manual lever of mixing valve might not be engaged
    o Wiring to actuator is disrupted, or Y1 and Y2 are mixed up
    o Check wiring of detectors
    o Quick setback or automatic daily heating limit function is active

- Burner does not switch on

    o Press burner reset button
    o Check fuses
    o Wiring to burner is disrupted, or K4 (first stage) and K5 are (second stage) mixed up
    o Quick setback or automatic daily heating limit function is active

- Heating circulator does not operate

    o Check wiring and fuse

- Domestic hot water does not heat up

    o Check wiring and fuse of hot water primary pump
    o Check wiring of domestic hot water temperature detector

- Room temperature is not correct

    o Check set values of normal and economy temperature
    o Is the required mode of operation displayed?
    o Has a room temperature correction been made at the room unit? Such corrections distort the room temperature display (refer to section 7.5)
    o Has automatic operation been overridden at the room unit?
    o Are day of week, time of day and the displayed heating program correct?

- Heating plant does not operate properly

    o Check all parameters according to the Setting Instructions for the heating engineer
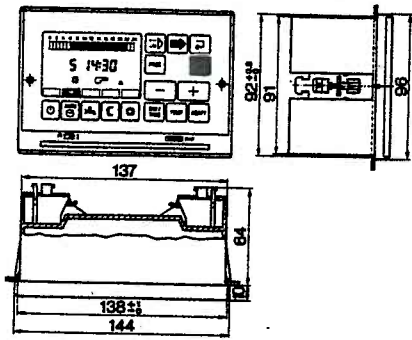
12. Dimensions

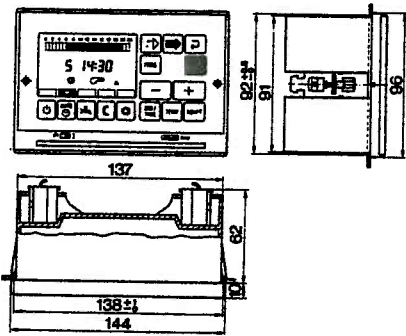Fig. 12.1 Controller with screw type terminal strips

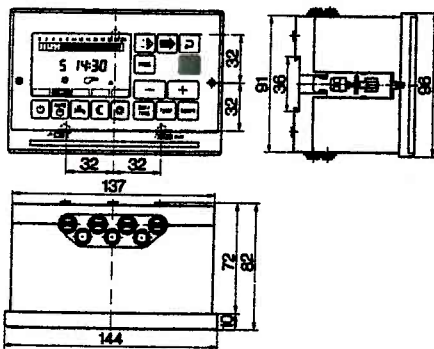Fig. 12.2 Controller with crimp type terminal strips

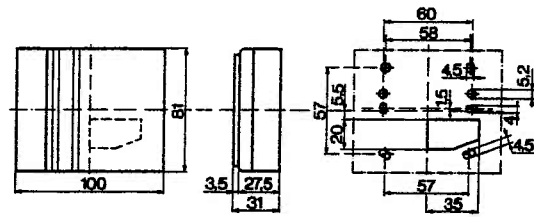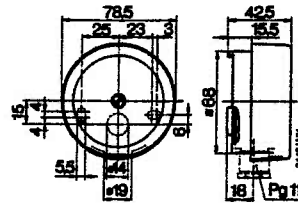
Fig. 12.3 Controller with terminal base

Fig. 12.4 QAA35.2 room unit

Fig. 12.5 QAC31 outside detector
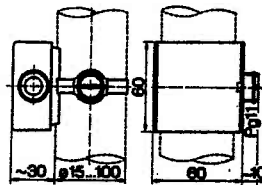
Fig. 12.6 QAD21 clamp-on temperature detector
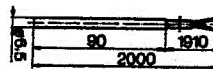
Fig. 12.7 QAZ21 cable temperature detector

Heating Engineer's Setting Instructions for RVP55.230

1. Select individual functions no. 1 through to 8 by repeated and simultaneous pressing of keys [■▶] and [↵] .

2. Enter desired value or code using keys [–] and [+] .

Function no.   Display of value or code

No.	Function	Basic setting	Increment	Setting or display range
1	Slope of heating curve	14	0,5	0...39,5
2	Slope of boiler curve	0	0,5	0...39,5
3	Max. limitation of heating circuit	80°C	0,5°C	8...95,5°C
4	Room temperature compensation factor KORR	8	1	0...15
5	Delay of 2nd burner stage	8	1 (=2min)	0...15 (=0...30min)
8	Constant for quick setback	8	1	0...15

Number of burner stages	Charging of D.H.W. tank by	Mode of control of mixing valve	D.H.W. temp. setting range	Basic setting	Code/ display
Two	Primary pump	2-position	8...55,5°C		0
Two	Primary pump	2-position	8...79,5°C		1
Two	Changeover valve	-----	8...55,5°C		2
Two	Changeover valve	-----	8...79,5°C		3
Two	Primary pump	3-position	8...55,5°C		4
Two	Primary pump	3-position	8...79,5°C		5
One	Primary pump	2-position	8...55,5°C		8
One	Primary pump	2-position	8...79,5°C		9
One	Changeover valve	-----	8...55,5°C		10
One	Changeover valve	-----	8...79,5°C		11
One	Primary pump	3-position	8...55,5°C		12
One	Primary pump	3-position	8...79,5°C		13

(6)

Frost protection for the plant	Adaptation	Composite outdoor temp.	Basic setting	Code/ display
No	Blocked	TAgem1		0
No	Blocked	TAgem2		1
No	Released	TAgem1		2
No	Released	TAgem2		3
Yes	Blocked	TAgem1		4
Yes	Blocked	TAgem2		5
Yes	Released	TAgem1		6
Yes	Released	TAgem2		7

7

Function no. 1: Slope of heating curve

Determine the slope of the heating curve as follows:

1. Enter the design outdoor temperature of the climatic zone in the graph (e.g. vertical line at -10°C).

2. Enter the maximum flow temperature in the graph (e.g. horizontal line at 55°C).

3. The point of intersection of both lines gives the slope to be set (e.g. 12,5).

Note: The slope figures used here have been multiplied by a factor of 10, e.g. a new slope of 12,5 corresponds to a former slope of 1,25.
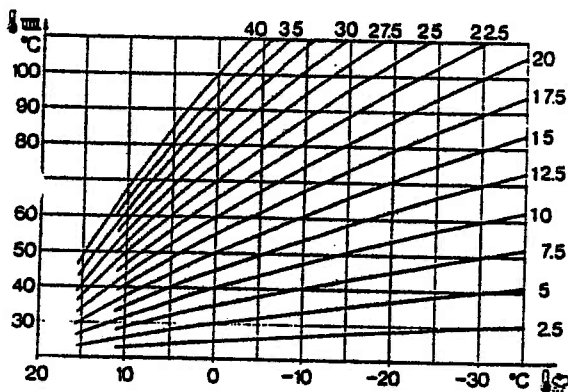
Fig. 1: Heating curve graph

Function no. 2: Slope of boiler curve

The slope of the boiler curve is determined and set in the same way as the heating curve slope. However, in place of the maximum flow temperature the maximum boiler temperature is to be used. In normal situations (without 2nd heating circuit), setting 0 is of advantage, as in this case full use of adaptation is also made for the boiler circuit.

Function no. 3: Maximum limitation of heating circuit

Maximum limitation acts on the heating circuit controlled by the mixing valve and provides limitation of the flow temperature according to the maximum limit set. Maximum limitation is not considered as a safety function as this is required with floor heating systems, for instance.

Function no. 4: Room temperature compensation factor KORR

Room temperature deviation x (1 + slope x 0,1) x KORR/2 = resulting change in flow temperature. KORR = 0 means that there is no room temperature compensation.

Function no. 5: Delay of 2nd burner stage

The settings 0...15 correspond to a delay time of 0...30 minutes, i.e. an increment of 1 represents a switch on delay step of 2 minutes.

CCIEAH 2403 E

Function no. 6: D.H.W., mode of control of mixing valve, and burner stages

Function no. 6 consists of 4 positions. Enter code (number) corresponding to the 4 settings required. Whether or not the installation is provided with a mixing valve is automatically determined by the controller using its flow detector recognition function.

D.H.W. temperature range

The temperature setting range for D.H.W. is 8...55,5°C or 8...79,5°C.

D.H.W. heating with

primary pump   =   D.H.W. primary pump M3 is connected to Q3

changeover valve =   changeover valve is connected to Q3

Mode of control of mixing valve

2-position =   suitable for electro-thermal actuators (1-wire control)

3-position =   suitable for electric actuators (2-wire control)

Burner stages

Two =   for the control of two single-stage heat producers or one two-stage heat producer
One =   for the control of one single-stage heat producer

Function no. 7: Composite outdoor temperature, adaptation and frost protection for the plant

Function no. 7 consists of 3 positions. Enter code (number) corresponding to the 3 settings required

Composite outdoor temperature

TAgem1 =   proportion of actual outdoor temperature is 50 %; suitable for buildings of heavy construction

TAgem2 =   proportion of actual outdoor temperature is 75 %; suitable for buildings of light construction

Adaptation

Blocked =   with no adaptation of heating curve

Released =   with automatic adaptation of heating curve (only in connection with room unit)

Frost protection for the plant

No =   no frost protection for the plant by the circulating pump

Yes =   with frost protection for the plant by the circulating pump

Function no. 8: Constant for quick setback

This function is only required for quick setback when no room unit is used. After changeover from normal to economy temperature, the constant KON determines the switch on delay of both heating system and circulating pump.

Switch on delay in hours = (TAgem + 12°C) x KON/16°C.

1. Bridge connecting terminals B5-M of room temperature detector.

2. Select individual functions no. 1 through to 8 by repeated and simultaneous pressing of keys [■▶] and [↻] .

3. Enter desired value or code using keys [−] and [+] .

Function no.   Display of value or code
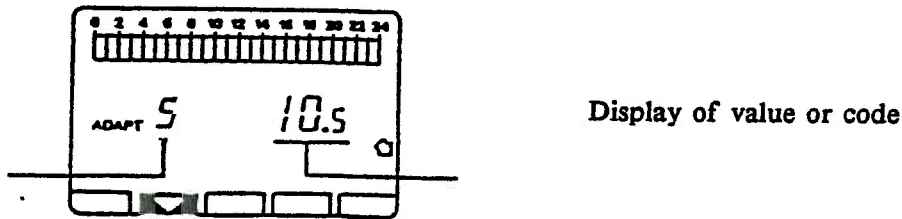
No.	Function	Basic setting	Increment	Setting or display range
1	Minimum limitation of boiler temp. TKmin	40°C	0,5°C	8...95,5°C
2	Maximum limitation of boiler temp. TKmax.	75°C	0,5°C	8...95,5°C
3	Switching differential of boiler temp. contr.	5 K	1 K	0...15K
4	Parallel shift: Set value of boiler temperature higher than that of heating circuit	10 (=5 K)	1 (=0,5 K)	0...15 (=0...7,5 K)
7	Switching differential of 2-position actuator	2 K	1 K	0...15 K
8	Overrun time of D.H.W. primary pump M3 or heating circulator M1	10 min	1 min	0...15 min

	TKmin without mix.valve	TKmax with D.H.W. heating	TKmin operative	Permanent display	Basic setting	Code/display
5	No	Acc. to limit stat	During heating only	Time		0
	No	Acc. to limit stat	During heating only	Boiler temp.		1
	No	Acc. to limit stat	Always, except ☋	Time		2
	No	Acc. to limit stat	Always, except ☋	Boiler temp.		3
	No	Acc. to no. 2	During heating only	Time		4
	No	Acc. to no. 2	During heating only	Boiler temp.		5
	No	Acc. to no. 2	Always, except ☋	Time		6
	No	Acc. to no. 2	Always, except ☋	Boiler temp.		7
	Yes	Acc. to limit stat	During heating only	Time		8
	Yes	Acc. to limit stat	During heating ☋	Boiler temp.		9
	Yes	Acc. to limit stat	Always, except ☋	Time		10
	Yes	Acc. to limit stat	Always, except	Boiler temp.		11
	Yes	Acc. to no. 2	During heating only	Time		12
	Yes	Acc. to no. 2	During heating only	Boiler temp.		13
	Yes	Acc. to no. 2	Always, except ☋	Time		14
	Yes	Acc. to no. 2	Always, except ☋	Boiler temp.		15

	D.H.W. priority with mixing valve	Protective boiler start-up	TKmin	Basic setting	Code/display
6	Absolute	On	Same as no. 5		0
	Absolute	On	Same as no. 5 and with D.H.W. heating		1
	Absolute	Off	Same as no. 5		2
	Absolute	Off	Same as no. 5 and with D.H.W.heating		3
	Shifting	On	Same as no. 5		4
	Shifting	On	Same as no. 5 and with D.H.W.heating		5
	Shifting	Off	Same as no. 5		6
	Shifting	Off	Same as no. 5 and with D.H.W. heating		7

Function no. 1: Minimum limitation of boiler temperature TKmin
The TKmin setting refers to the switch on point.

Function no. 2: Maximum limitation of boiler temperature TKmax
The TKmax setting refers to the switch off point.

Function no. 3: Switching differential of boiler temperature controller
The switching differential is operative both during shifting boiler temperature control and with minimum/maximum limitation of the boiler temperature.

Function no. 4: Parallel shift: set value of boiler temperature higher than that of heating circuit
The set value of the boiler temperature is higher than that of the heating circuit temperature, resulting from a parallel displacement. The values 0...15 provide a shift of 0...7,5 K, i.e. an icrement of 1 results in a shift of 0,5 K. Exceeding the maximum boiler temperature will not be possible.

Function no. 5: Display and effect of minimum and maximum limitation.
Function no. 5 consists of 4 positions. Enter code (number) corresponding to the 4 settings required.

Permanent display

Time =	permanent display indicates actual time of day
Boiler temp. =	permanent display indicates actual boiler temperature

TKmin operative

During space heating only =	minimum limitation of the boiler temperature is operative only when heat is required
Always, except ☻ =	minimum limitation of the boiler temperature is always operative, except in the "standby" mode

TKmax with D.H.W.heating

Acc. to limit thermosat =	in the case of D.H.W. heating the maximum boiler temperature is limited by a separate thermal reset limit thermostat
Acc. to function no.2 =	TKmax is operative in the case of D.H.W. heating

TKmin without mixing valve

No =	TKmin is not operative in plants without mixing valve
Yes =	TKmin is operative in plants without mixing valve

Function no. 6: TKmin, protective boiler start-up and D.H.W. priority with mixing valve
Function no. 6 consists of 3 positions. Enter code (number) corresponding to the 3 settings required.

TKmin

Same as no. 5 =	TKmin is the same as set under function no 5
Same as no. 5 and with D.H.W. heating =	TKmin is the same as set under function no. 5 and, in addition, when D.H.W. heating is released

Protective boiler start-up

On =	protective boiler start-up is operative
No =	protective boiler start-up is inoperative

D.H.W. priority with mixing valve

Absolute =	in the case of D.H.W. heating mixing valve is CLOSED and heating circulator M1 OFF
Shifting =	priority by shifting reduction of flow temperature when protective boiler start-up is operative, or parallel operation (no priority) of D.H.W. heating and space heating when protective boiler start-up is inoperative

Function no. 7:Switching differential of 2-position actuator
The switching differential set here is valid only for flow temperature control with electro-thermal actuators.

Function no. 8: Overrun time of D.H.W. primary pump M3 or heating circulator M1
This is the overrun time of the D.H.W. primary pump M3 or the heating circulator M1 after the burner has switched off. It prevents the huild up of heat in the boiler, e.g. after D.H.W. heating.

Weather Dependent
Boiler Temperature Control System

RVP41.100
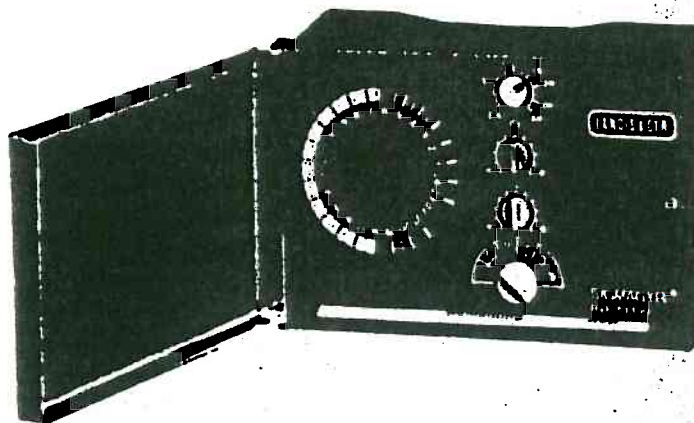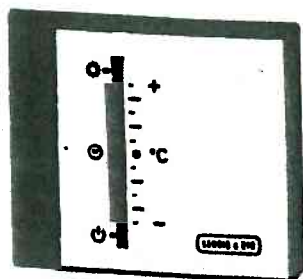
1. DESCRIPTION

Weather dependent heating control system with or without room compensation. The system comprises the following units:

- Controller with 24-hour timeswitch
- Boiler temperature detector with cable
- Clamp-on temperature detector
- Outside detector
- Room unit with room temperature detector

1.1 Features

o Adjustable minimum limitation of boiler temperature

o Adjustable switching differential for boiler temperature control

o Quick setback and boost heating

o Heating limit switch and pump control

o Automatic frost protection

o Double insulation. Low voltage cable can be used for the detectors

o Controller with standard dimensions of 96 x 144 mm.
  Suitable for control panel or boiler front (flush panel) mounting

2. APPLICATION

The RVP51.100 has been designed for weather dependent boiler tempe-
rature control (burner control) with or without room compensation. It
is suitable for one-family, two-family and holiday houses of any type
or size.

2.1 Control and switching functions

- Control of a burner

- Minimum limitation of the boiler water temperature

- Automatic on/off switching of the heating system by the heating limit
  switch during intermediate seasons

- Control of the heating circulator
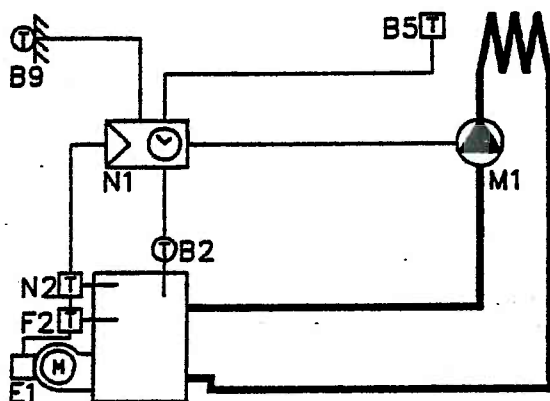
B2 QAZ21 boiler temperature detector
B5 QAA52.2 room unit
B9 QAC31 outside detector
E1 Burner
M1 Heating circulator
N1 RVP41.100 controller

Fig. 2.1 Control of boiler temperature

3. FUNCTION

3.1 Control characteristics

On/off controller with P-characteristic. Semi-continuous boiler tempe-
rature control through the operation of a burner. The boiler tempe-
rature setpoint is continuously determined by the outside detector
according to the selected heating curve.

3.2 Room temperature compensation
(In connection with QAA52.2 room unit only)

When room temperature compensation is used, the controller shifts the
actual room temperature setpoint and thus the heating curve according
to the room temperature deviation, but in the opposite direction. The
displacement is made on the room temperature scale, the shift being the
room temperature deviation multiplied by 4.

$$w_{room\ actual} = w_{room\ set} + 4\ (w_{room} - x_{room})$$

Room temperature compensation is overridden only by the frost
protection function

Room temperature compensation becomes active
- in the case of room temperature deviations from the set value
- in the case of manual or automatic switchover to a lower or higher room temperature setpoint
- in the case of quick setback or boost heating
- with respect to the reference temperature for the heating limit switch

H   Selected heating curve

H+ Heating curve when actual room temperature = 18°C

H- Heating curve after switchover to 14°C room temperature

TA Outdoor temperature

TR Room temperature setpoint

TV Flow temperature

Fig. 3.1 Room temperature compensation

3.3 Heating limit switch

When the outdoor temperature rises to a level which equals the "actual room temperature setpoint -3°C", burner and heating circulator are switched OFF.
When the outdoor temperature falls to a level which equals the "actual room temperature setpoint -5°C", the heating circulator is switched ON and the boiler temperature is controlled according to the room temperature setpoint, or is maintained at the minimum temperature. The higher value has priority over the lower value.

Note:
- The heating limit switch is operative both in the "AUTO" modes and in "continuous reduced economy temperature"
- The mode "continuous normal temperature" overrides the heating limit switch
- The heating limit switch gives consideration to the actual room temperature setpoint changed by room temperature compensation
- Frost protection has priority over both the heating limit switch and room temperature compensation

T   Temperature scale

TA Outdoor temperature

wR Actual room temperature setpoint

Fig. 3.2 Function of heating limit switch without room unit

A   Quick setback

B   Boost heating

T   Temperature scale

TA Outdoor temperature

wR Actual room temperature setpoint

Fig. 3.3 Function of heating limit switch with room temperature compensation

3.4 Frost protection circuit

Frost protection is operative in all modes of operation and has priority over all other functions. Function:
- Heating circulator M1 is switched ON
- The boiler temperature is controlled at a level which corresponds to a room temperature setpoint of 6°C (even if the actual room temperature setpoint is lower) or is maintained at the minimum temperature level. The higher value has priority over the lower value.

d   Days

T   Outdoor temperature

Frost protection ON
if $T \leq 1,5°C$

Frost protection OFF
if $T \geq 3°C$
Tolerance: ± 1K

Fig. 3.4 Frost protection function

3.5 Minimum limitation of boiler temperature

The minimum limitation of the boiler temperature is adjustable within a range of 10...55°C by means of a potentiometer located under the dial and refers to the switch-on point. The switching differential is 5 K.
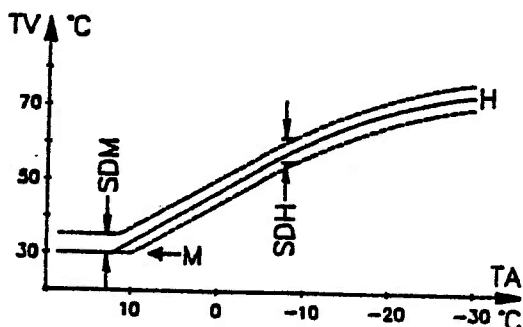
H	Heating curve
M	Minimum limitation
SDH	Switching differential boiler temperature control (2...12 K)
SDM	Switching differntial with minimum limitation
TA	Outdoor temperature
TV	Flow temperature

Fig. 3.5 Minimum limitation and switching differential of boiler temperature

Note:
Minimum limitation becomes practically inoperative by setting the potentiometer to 10°C.

3.6 Switching differential

The switching differential for the shifting boiler temperature control is selected at a potentiometer located under the timeswitch dial, the range being 2...12 K. The selected heating curve refers to the middle of the switching differential.

3.7 Quick setback and boost heating
(In connection with QAA 52.2 room unit only)

After a change from normal temperature to reduced economy temperature or vice versa, room temperature compensation provides quick setback and boost heating respectively. The controller multiplies the set value/actual value deviation of the room temperature by the amplification factor 4 and shifts the room temperature setpoint by this value in the direction opposed to the deviation.
Also refer to fig. 3.3.

4. DESIGN FEATURES

4.1 Controller

The controller with dimensions conforming to DIN 43 700 consists of controller insert, plastic casing with two catches for flush panel mounting, integrated timeswitch, transparent front cover and terminal strips for the electrical connections.
The electrical connections are established at the rear of the unit. Both crimp type and screw type terminal strips are available. One terminal strip is used on the mains voltage side and one on the low voltage side, each side having 12 terminals. They cannot be mixed up. When mounted in the panel cut-out, the controller is fixed from the front by means of a screwdriver.

4.1.1 Timeswitch

The timeswitch is integrated in the controller. The quartz-crystal clock is synchronised with the mains supply. If features a nickel/cadmium battery to supply power in the event of mains failures, oviding a reserve for a least 10 hours.
The timeswitch is equipped with a 24-hour dial. If required, a further weekly dial is also supplied with the unit. The 24-hour dial permits a maximum of 3 setbacks per day, the weekly dial a maximum of 8 setbacks per week. To facilitate the setting of the coloured riders, both dials can be manually removed and replaced.

4.1.2 Setting controls

Fig. 4.1 Front of controller with setting controls

A Programme selector switch

  A1 OFF. Boiler temperature control and heating circulator OFF with frost protection for house and heating system
  A2 Automatic operation "normal temperature/OFF with frost protection" according to timeswitch
  A3 Automatic operation "normal temperature/reduced economy temperature" according to timeswitch
  A4 Continuous reduced economy temperature
  A5 Continuous normal temperature
  A6 Manual operation: burner, loading pump and heating circulator remain under votage

B Time indicator
C Dial. Turn in direction of arrow only!
D Red riders: switching to normal temperature
E Blue riders: switching to reduced economy temperature
F Setting potentiometer for normal temperature
G Setting potentiometer for reduced economy temperature
H Setting potentiometer for slope of heating curve

Located underneath the dial are:
- Potentiometer for setting the switching differential for boiler temperature control
- Potentiometer for setting the minimum boiler temperature

4.2 Room unit with room temperature detector

The room unit has a plastic casing and a mounting base made of metal. It can be mounted on all standard conduit boxes. The two wires for the electical connection are interchangeable. They enter either from the rear through the wall or through a conduit entry.
The front consists of a transparent cover with an aluminium plate underneath. Setting slider and scale are located on the unit front. Within its middle range the slider permits setpoint fine adjustments of ± 2,5 K and at its upper stop a fixed setpoint shift of + 6 K, at its lower stop a shift of - 6 K. The slider functions act on both the normal and the economy temperature.

Fig. 4.2 QAA 52.2 room unit

4.2.1 Slider functions

Slider at upper stop on sun symbol	Actual setpoint temperature is raised by 6°C
Slider within fine correction range of ± 2,5 K with clock symbol	Actual setpoint temperature is corrected by ±...
Slider at lower stop on stand-by symbol	Actual setpoint temperature is lowered by 6°C

4.2.2 Room temperature detector

The signal supplied by the room temperature detector permits the inclusion of room compensation, quick setback and boost heating in the control.

4.3 QAZ21 boiler temperature detector, QAD21 clamp-on temperature detector and QAC31 outside detector

For details refer to T 2460-E.

5. SUMMARY OF TYPES

Weather dependent on/off boiler temperature controller with minimum temperature limitation, acting on burner	RVP41.100
Crimp type plug-in terminal strip, low voltage side	AGP2C/1800
Crimp type plug-in terminal strip, mains voltage side	AGP3C/1900
Screw type plug-in terminal strip, low voltage side	AGP2S/1000
Screw type plug-in terminal strip, mains voltage side	AGP3S/1100
Clamp-on temperature detector	QAD21
Boiler temperature detector with cable	QAZ21
Outside detector	QAC31
Room unit with room temperature detector for remote operation, giving consideration to room compensation, quick setback and boost heating	QAA52.2

6. TECHNICAL DATA

6.1 RVP41.100 controller

Mains voltage	220 V a.c., + 10% - 15%
Mains frequency	50/60Hz
Transformer	short-circuit proof test voltage 4 kV
Power consumption	1,5 VA
Protective low voltage	9 V
Insulation standard	II to VDE 0631
Protection standard	IP40 to DIN 40050
Radio interference protection	N to VDE 0875
Permissible ambient temperature	
Transport and storage	-15...+60°C
Operation	2...50°C
Permissible ambient humidity	class F to DIN 40040
Slope of heating curve	2,5...40
Setting rages	
Normal room temperature	14...26°C (✳ = approx. 20°C)
Reduced economy temperature	8...20°C (☾ = approx. 14°C)
Weight	
Controller	approx. 0,55 kg
Screw type terminal strip	approx. 0,15 kg
Controller output burner Nominal voltage	max. 250 V a.c.

| Nominal current burner motor | max. 2 A, cos phi ≥ 0,5 |
| Max. starting current | 10 A, max. 1 s |

| Nominal current ignition transformer | max. 1 A, max. 30 s |
| Max. switch-on current | 10 A, max. 10 ms |

| Minimum limitation boiler water temperature | 35°C, referred to switch-on point |

| Switching differential boiler controller | 2...12 K |

Output relay heating circulator
Nominal voltage	max. 250 V a.c.
Nominal current	max. 2 A, cos phi ≥ 0,5
Switch-on current	max. 10 A, max. 1 s

6.2 Timeswitch

| Initial charging time for battery | 24 h |
| Time base | quartz, synchronised via the mains every 6 s |

| Reserve | min. 10 h |
Min. switching interval
| 24-hour dial | 40 min |
| Weekly dial | 4 h |

Switching steps (notches)
| 24-hour dial | 10 min |
| Weekly dial | 60 min |

6.3 QAA 52.2 room unit

Measuring element	NTC
Resistance at 20°C	17,5 kΩ
Sensitivity	220 Ω/K
Time constant	approx. 6 min
Insulation standard	III to VDE 0631
Protection standard of housing	IP 30 to DIN 40050
Permissible ambient temperature
Operation	0...50°C
Transport and storage	– 25...65°C

Permissible ambient humidity
| Operation | class G to DIN 40040 |
| Transport and storage | class E to DIN 40040 |

| Weight | 0,12 kg |

6.4 QAZ21 boiler temperature detector, QAD21 clamp-on temperature detector and QAC31 outside detector

For technical data of these detectors refer to T 2460-E.

7. WIRING DIAGRAMS

7.1 Connecting terminals

Left side :Low voltage side with
           detector connections

Right side:Mains voltage side with
           power supply and
           outputs

.g. 7.1 Arrangement of connecting terminals as viewed from the front

B2 QAZ boiler temperature detector
B5 QAA 52.2 room unit
B9 QAC31 outside detector
E1 Burner
M1 Heating circulator
N1 RVP 41.100 controller

Fig. 7.2 Wiring diagram for weather dependent boiler temperature
control with room temperature acting on burner and heating circulator.
The connecting wires of the individual detectors are interchangeable.

8. APPLICATION, INSTALLATION AND SETTING ADVICE

8.1 Planning

- The wires to the temperature detectors carry protective low voltage,
  i.e. low voltage cable such as telephone cable of 0,6 mm dia. can by
  used

- Parallel running of detector wires and mains wires for loads such as
  pump, burner, etc. should be avoided. Where this is permitted by
  local regulations, the wires should run in parallel for no more than
  20 m in the case of the outside detector, and no more than 5 m in the
  case of the room temperature detector

- Fuses, switches wires and earth wires must comply with local safety
  regulations

8.2 Mounting and Installation

8.2.1 Controller

Mounting location: boiler front or panel, not in humid or damp locations.
Required panel cut-out: 138x92 mm
Connections and fixing:
- Make wiring to the terminals and plug terminal strips in rear of controller
- Place controller in panel cut-out and tighten the two screws from the front
- Cover and casing are provided with a little hole so that the unit can be sealed, if this is required

8.2.2 QAA 52.2 room unit

Mounting location: inner wall of the main living room to be heated (room temperature compensation!) but not in niches or shelves, not behind curtains or doors, not above or near heat sources. When possible, opposite the radiators, about 1,5 m above floor level.

8.2.3 Other detectors

Refer to the mounting instructions of the individual detectors supplied with the units.

8.3 Settings

8.3.1 Setting the controller's heating curve

The slope of the heating curve is determined by using the chart shown below and then adjusted at the controller (potentiometer H.) Important are the highest flow temperature and the lowest outdoor temperature of the climatic zone that were used as a basis when the heat requirements were calculated.
Note: compared to other Landis & Gyr heating slope charts the slope values used here have been increased by a factor of 10, i.e. a slope of 12,5, for example, corresponds to a former slope of 1,25.

Fig. 8.1 Controller's heating curves

8.3.2 Other settings

- Correct time of day according to 24-hour day or correct time of day and day of week, depending on dial used
- Switch-on time for the start of normal heating (red riders)
- Switch-on time for the start of reduced heating (blue riders)
- Required normal temperature (potentiometer F)
- Required reduced economy temperature (Potemtiometer G)
- Required heating programme at selector switch A
- Switching differential for boiler temperature control (potentiometer located under the timeswitch dial)
- Minimum limitation of boiler temperature (potentiometer located under the timeswitch dial)

9. DIMENSIONS
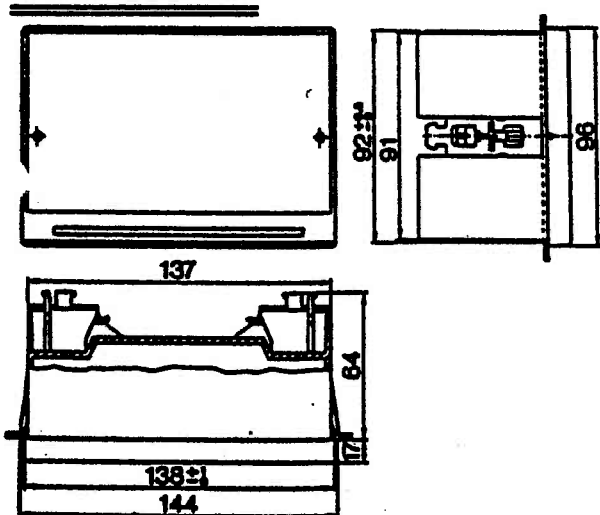
Fig. 9.1 Controller with screw type terminal strips
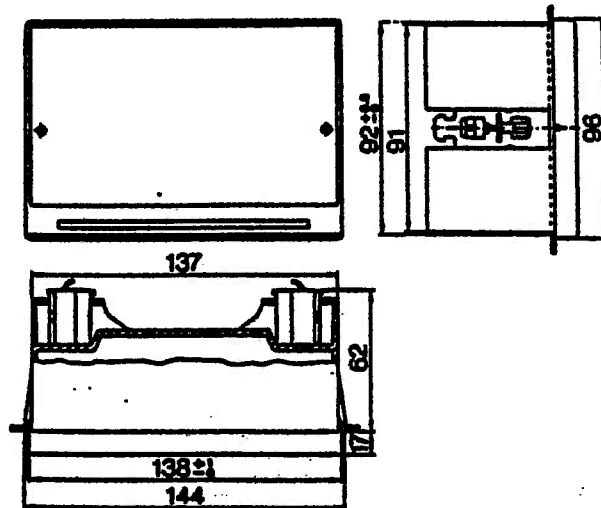
Fig. 9.2 Controller with crimp type terminal strips

Fig. 9.3 QAA... room unit

Fig. 9.4 QAD21

Fig. 9.5 QAC31

Fig. 9.6 QAZ21
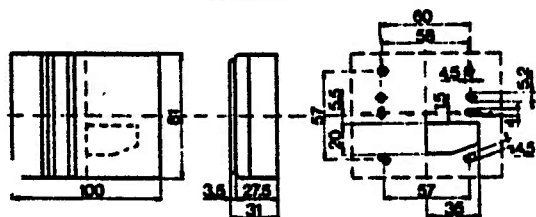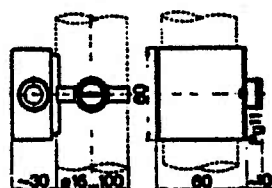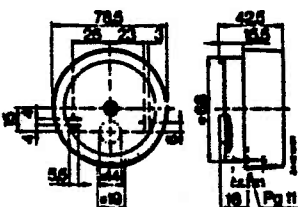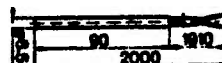
Subject to modification

Weather Dependent
Boiler Temperature Control System
with integrated Domestic Hot Water Control   RVP51.100
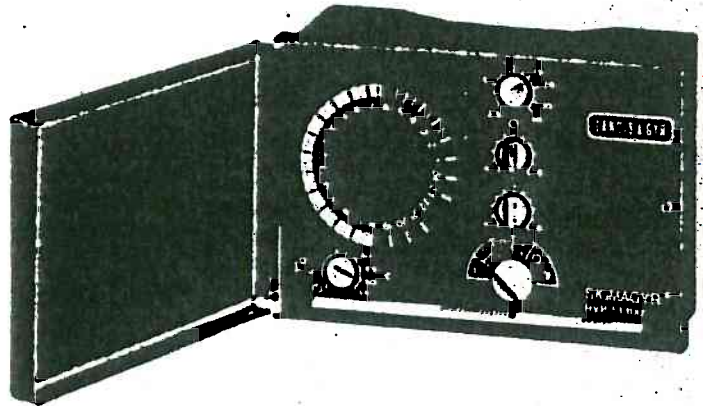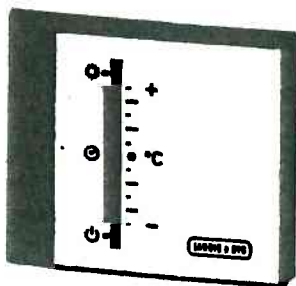
1. DESCRIPTION

Weather dependent heating control system with or without room
compensation and a controlled on/off output for domestic hot water
temperature control. The system comprises the following units:

- Controller with 24-hour timeswitch
- Boiler temperature detector with cable
- Clamp-on temperature detector
- Outside detector
- Room unit with room temperature detector

1.1 Features

o With or without minimum limitation of boiler temperature

o Domestic hot water temperature control with domestic hot water
  priority

o Adjustable switching differential for boiler temperature control

o Room temperature dependent quick setback and boost heating

o Heating limit switch and pump control

o Automatic frost protection

o Double insulation. Low voltage cable can be used for the detectors

o Controller with standard dimensions of 96 x 144 mm.
  Suitable for control panel or boiler front (flush panel) mounting

2. APPLICATION

The RVP51.100 has been designed for weather dependent boiler tempe-
rature control (burner control) with or without room compensation and
for the simultaneous control of the domestic hot water temperature. It
is suitable for heating plants with domestic hot water heating in
one-family, two-family and holiday houses.

2.1 Control and switching functions

- Control of a burner

- Control of the domestic hot water loading pump

- Minimum limitation of the boiler water temperature

- Automatic on/off switching of the heating system by the heating limit
  switch during intermediate seasons

- Control of the heating circulator
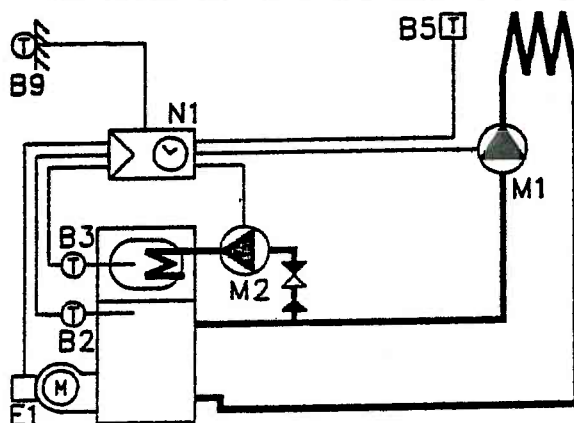
B2 QAZ21 boiler temperature detector
B3 QAZ21 domestic hot water
   temperature detector
B5 QAA52.2 room unit
B9 QAC31 outside detector
E1 Burner
M1 Heating circulator
M3 Domestic hot water loading pump
N1 RVP51.100 controller

Fig. 2.1 Control of boiler and domestic hot water temperature

3. FUNCTION

3.1 Control characteristics

On/off controller with P-characteristic. Semi-continuous boiler tempe-
rature control through the operation of a burner. The boiler tempe-
rature setpoint is continuously determined by the outside detector
according to the selected heating curve.

3.2 Room temperature compensation
(In connection with QAA52.2 room unit only)

When room temperature compensation is used, the controller shifts the
actual room temperature setpoint and thus the heating curve according
to the room temperature deviation, but in the opposite direction. The
displacement is made on the room temperature scale, the shift being the
room temperature deviation multiplied by 4.

$$w_{room\ actual} = w_{room\ set} + 4\ (w_{room} - x_{room})$$

Room temperature compensation is overridden only by the frost
protection function

Room temperature compensation becomes active
- in the case of room temperature deviations from the set value
- in the case of manual or automatic switchover to a lower or higher room temperature setpoint
- in the case of quick setback or boost heating
- with respect to the reference temperature for the heating limit switch

H   Selected heating curve

H+ Heating curve when actual room temperature = 18°C

H- Heating curve after switchover to 14°C room temperature

TA Outdoor temperature

TR Room temperature setpoint

TV Flow temperature

Fig. 3.1 Room temperature compensation

3.3 Heating limit switch

When the outdoor temperature rises to a level which equals the "actual room temperature setpoint -3°C", burner and heating circulator are switched OFF.
When the outdoor temperature falls to a level which equals the "actual room temperature setpoint -5°C", the heating circulator is switched ON and the boiler temperature is controlled according to the room temperature setpoint, or is maintained at the minimum temperature. The higher value has priority over the lower value.

Note:
- The heating limit switch is operative both in the "AUTO" modes and in "continuous reduced economy temperature"
- The mode "continuous normal temperature" overrides the heating limit switch
- The heating limit switch gives consideration to the actual room temperature setpoint changed by room temperature compensation
- Frost protection has priority over both the heating limit switch and room temperature compensation

T   Temperature scale

TA Outdoor temperature

wR Actual room temperature setpoint

Fig. 3.2 Function of heating limit switch without room unit

A   Quick setback

B   Boost heating

T   Temperature scale

TA Outdoor temperature

wR Actual room temperature setpoint

Fig. 3.3 Function of heating limit switch with room temperature compensation

3.4 Frost protection circuit

Frost protection is operative in all modes of operation and has priority over all other functions. Function:
- Heating circulator M1 is switched ON
- The boiler temperature is controlled at a level which corresponds to a room temperature setpoint of 6°C (even if the actual room temperature setpoint is lower) or is maintained at the minimum temperature level. The higher value has priority over the lower value.

d   Days

T   Outdoor temperature

Frost protection ON
if T ≤ 1,5°C

Frost protection OFF
if T ≥ 3°C
Tolerance: ± 1K

Fig. 3.4 Frost protection function

3.5 Minimum limitation of boiler temperature

The minimum limitation of the boiler temperature is factory set and refers to the switch-on point. The switching differential is 5 K.
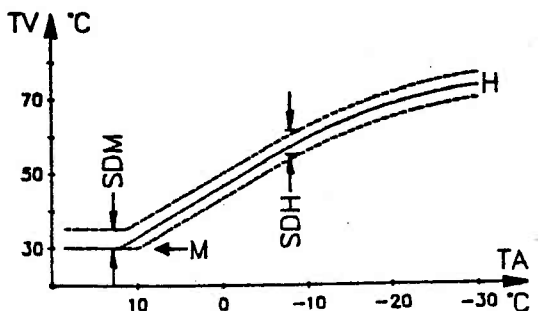
H   Heating curve
M   Minimum limitation
SDH Switching differential boiler
      temperature control (2...12 K)
SDM Switching differntial with
      minimum limitation
TA   Outdoor temperature
TV   Flow temperature

Fig. 3.5 Minimum limitation and switching differential of boiler temperature

Note:
Minimum limitation becomes operative only after cutting the link
located under the timeswitch dial.

3.6 Switching differential

The switching differential for the shifting boiler temperature control
is selected at a potentiometer located under the timeswitch dial, the
range being 2...12 K. The selected heating curve refers to the middle
of the switching differential.

3.7 Quick setback and boost heating
(In connection with QAA 52.2 room unit only)

After a change from normal temperature to reduced economy temperature
or vice versa, room temperature compensation provides quick setback and
boost heating respectively. The controller multiplies the set
value/actual value deviation of the room temperature by the
amplification factor 4 and shifts the room temperature setpoint by this
value in the direction opposed to the deviation.
Also refer to fig. 3.3.

3.8 Domestic hot water temperature control with domestic hot water priority

The setting range for domestic hot water temperature control
(10...55°C) can be moved upwards by 20°C by connecting a 16,2 kΩ
resistor parallel to the domestic hot water detector. The switching
differential of 8 K is factory set and cannot be changed.

3.8.1 Release of domestic hot water heating

Actual position of programme selector switch	Active switching rider of timeswitch without link X1...M		with link X1...M
	red	blue	red or blue
🚰 or ⛄✓ or ✓☀	released	blocked	released
☾ or ☀ or ✍	released	released	released

3.8.2 Domestic hot water priority

Whenever there is a demand for domestic hot water, the following
priority functions are initiated:
- Burner ON
- Heating circulator OFF
- Loading pump ON (independent of boiler temperature)

On completion of domestic hot water loading the priority functions are
cancelled again:

- Burner and heating circulator according to control function

- Loading pump keeps running for another 4 min if, at this moment in
  time, the heating system is switched off by the heating limit switch.

4. DESIGN FEATURES

4.1 Controller

The controller with dimensions conforming to DIN 43 700 consists of controller insert, plastic casing with two catches for flush panel mounting, integrated timeswitch, transparent front cover and terminal strips for the electrical connections.
The electrical connections are established at the rear of the unit. Both crimp type and screw type terminal strips are available. One terminal strip is used on the mains voltage side and one on the low voltage side, each side having 12 terminals. They cannot be mixed up. When mounted in the panel cut-out, the controller is fixed from the front by means of a screwdriver.

4.1.1 Timeswitch

The timeswitch is integrated in the controller. The quartz-crystal clock is synchronised with the mains supply. If features a nickel/cadmium battery to supply power in the event of mains failures, providing a reserve for a least 10 hours.
The timeswitch is equipped with a 24-hour dial. If required, a further weekly dial is also supplied with the unit. The 24-hour dial permits a maximum of 3 setbacks per day, the weekly dial a maximum of 8 setbacks per week. To facilitate the setting of the coloured riders, both dials can be manually removed and replaced.
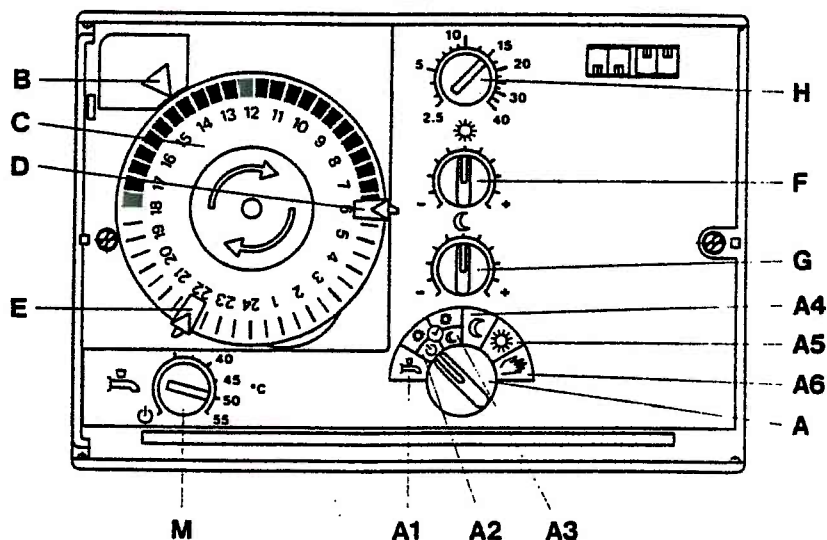
4.1.2 Setting controls

Fig. 4.1 Front of controller with setting controls

A Programme selector switch

A1 Domestic hot water heating only. Boiler temperature control and heating circulator OFF with frost protection for house and heating system
A2 Automatic operation "normal temperature/OFF with frost protection" according to timeswitch
A3 Automatic operation "normal temperature/reduced economy temperature" according to timeswitch
A4 Continuous reduced economy temperature
A5 Continuous normal temperature
A6 Manual operation: burner, loading pump and heating circulator remain under votage

B Time indicator
C Dial. Turn in direction of arrow only!
D Red riders: switching to normal temperature
E Blue riders: switching to reduced economy temperature
F Setting potentiometer for normal temperature
G Setting potentiometer for reduced economy temperature
H Setting potentiometer for slope of heating curve
K Setting potentiometer for domestic hot water temperature

Located underneath the dial are:
- Potentiometer for setting the switching differential for boiler
  temperature control
- Link closed = without minimum temperature limitation
       cut   = with   minimum temperature limitation

4.2 Room unit with room temperature detector

The room unit has a plastic casing and a mounting base made of metal.
It can be mounted on all standard conduit boxes. The two wires for the
electical connection are interchangeable. They enter either from the
rear through the wall or through a conduit entry.
The front consists of a transparent cover with an aluminium plate
underneath. Setting slider and scale are located on the unit front.
Within its middle range the slider permits setpoint fine adjustments of
± 2,5 K and at its upper stop a fixed setpoint shift of + 6 K, at its
lower stop a shift of - 6 K. The slider functions act on both the
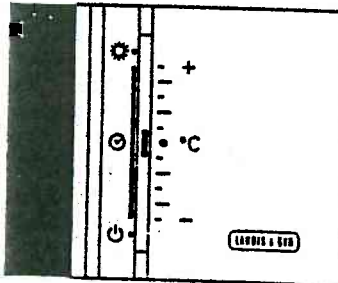normal and the economy temperature.

Fig. 4.2 QAA 52.2 room unit

4.2.1 Slider functions

Slider at upper stop on sun symbol	Actual setpoint temperature is raised by 6°C
Slider within fine correction range of ± 2,5 K with clock symbol	Actual setpoint temperature is corrected by ±...
Slider at lower stop on stand-by symbol	Actual setpoint temperature is lowered by 6°C

4.2.2 Room temperature detector

The signal supplied by the room temperature detector permits the
inclusion of room compensation, quick setback and boost heating in the
control.

4.3 QAZ21 boiler temperature detector, QAD21 clamp-on temperature detector and QAC31 outside detector

For details refer to T 2460-E.

CC1T2411 E

5. SUMMARY OF TYPES

Weather dependent on/off boiler temperature controller
with minimum temperature limitation, acting
on burner, with integrated domestic hot water
temperature control   RVP51.100
Crimp type plug-in terminal strip, low voltage side   AGP2C/1800
Crimp type plug-in terminal strip, mains voltage side   AGP3C/1900
Screw type plug-in terminal strip, low voltage side   AGP2S/1000
Screw type plug-in terminal strip, mains voltage side   AGP3S/1100

Clamp-on temperature detector   QAD21

Boiler temperature detector with cable   QAZ21

Outside detector   QAC31

Room unit with room temperature detector for remote
operation, giving consideration to room compensation,
quick setback and boost heating   QAA52.2

6. TECHNICAL DATA

6.1 RVP51.100 controller

Mains voltage	220 V a.c., + 10% - 15%
Mains frequency	50/60Hz
Transformer	short-circuit proof test voltage 4 kV
Power consumption	1,5 VA
Protective low voltage	9 V
Insulation standard	II to VDE 0631
Protection standard	IP40 to DIN 40050
Radio interference protection	N to VDE 0875
Permissible ambient temperature Transport and storage Operation	-15...+60°C 2...50°C
Permissible ambient humidity	class F to DIN 40040
Slope of heating curve	2,5...40
Setting rages Normal room temperature Reduced economy temperature	14...26°C (✳ = approx. 20°C) 8...20°C (☾ = approx. 14°C)
Weight Controller Screw type terminal strip	approx. 0,55 kg approx. 0,15 kg
Controller output burner Nominal voltage	max. 250 V a.c.

Nominal current burner motor	max. 2 A, cos phi ≥ 0,5
Max. starting current	10 A, max. 1 s
Nominal current ignition transformer	max. 1 A, max. 30 s
Max. switch-on current	10 A, max. 10 ms
Minimum limitation boiler water temperature	35°C, referred to switch-on point
Switching differential boiler controller	2...12 K
Output relay heating circulator	
Nominal voltage	max. 250 V a.c.
Nominal current	max. 2 A, cos phi ≥ 0,5
Switch-on current	max. 10 A, max. 1 s
Output domestic hot water control	
Setting range	15...55°C
Switching differential	8 K

6.2 Timeswitch

Initial charging time for battery	24 h
Time base	quartz, synchronised via the mains every 6 s
Reserve	min. 10 h
Min. switching interval	
24-hour dial	40 min
Weekly dial	4 h
Switching steps (notches)	
24-hour dial	10 min
Weekly dial	60 min

6.3 QAA 52.2 room unit

Measuring element	NTC
Resistance at 20°C	17,5 kΩ
Sensitivity	220 Ω/K
Time constant	approx. 6 min
Insulation standard	III to VDE 0631
Protection standard of housing	IP 30 to DIN 40050
Permissible ambient temperature	
Operation	0...50°C
Transport and storage	- 25...65°C
Permissible ambient humidity	
Operation	class G to DIN 40040
Transport and storage	class E to DIN 40040
Weight	0,12 kg

6.4 QAZ21 boiler temperature detector, QAD21 clamp-on temperature detector and QAC31 outside detector

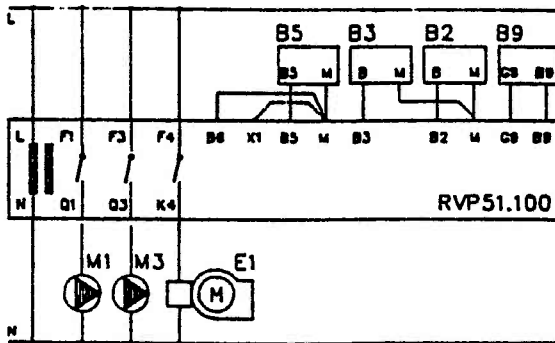For technical data of these detectors refer to T 2460-E.

7. WIRING DIAGRAMS

7.1 Connecting terminals

Left side : Low voltage side with detector connections

Right side: Mains voltage side with power supply and outputs

Fig. 7.1 Arrangement of connecting terminals as viewed from the front

B2 QAZ boiler temperature detector
B3 QAZ21 domestic hot water temperature detector
B5 QAA 52.2 room unit
B9 QAC31 outside detector
E1 Burner
M1 Heating circulator
M3 Loading pump
N1 RVP 51.100 controller

Fig. 7.2 Wiring diagram for weather dependent boiler temperature control with room temperature acting on burner, heating circulator and domestic hot water loading pump. The connecting wires of the individual detectors are interchangeable.

8. APPLICATION, INSTALLATION AND SETTING ADVICE

8.1 Planning

- The wires to the temperature detectors carry protective low voltage, i.e. low voltage cable such as telephone cable of 0,6 mm dia. can by used

- Parallel running of detector wires and mains wires for loads such as pump, burner, etc. should be avoided. Where this is permitted by local regulations, the wires should run in parallel for no more than 20 m in the case of the outside detector, and no more than 5 m in the case of the room temperature detector

- Fuses, switches wires and earth wires must comply with local safety regulations

8.2 Mounting and Installation

8.2.1 Controller

Mounting location: boiler front or panel, not in humid or damp locations.
Required panel cut-out: 138x92 mm
Connections and fixing:
- Make wiring to the terminals and plug terminal strips in rear of controller
- Place controller in panel cut-out and tighten the two screws from the front
- Cover and casing are provided with a little hole so that the unit can be sealed, if this is required

8.2.2 QAA 52.2 room unit

Mounting location: inner wall of the main living room to be heated (room temperature compensation!) but not in niches or shelves, not behind curtains or doors, not above or near heat sources. When possible, opposite the radiators, about 1,5 m above floor level.

8.2.3 Other detectors

Refer to the mounting instructions of the individual detectors supplied with the units.

8.3 Settings

8.3.1 Setting the controller's heating curve

The slope of the heating curve is determined by using the chart shown below and then adjusted at the controller (potentiometer H.) Important are the highest flow temperature and the lowest outdoor temperature of the climatic zone that were used as a basis when the heat requirements were calculated.
Note: compared to other Landis & Gyr heating slope charts the slope values used here have been increased by a factor of 10, i.e. a slope of 12,5, for example, corresponds to a former slope of 1,25.

Fig. 8.1 Controller's heating curves

8.3.2 Other settings

- Correct time of day according to 24-hour day or correct time of day and day of week, depending on dial used
- Switch-on time for the start of normal heating (red riders)
- Switch-on time for the start of reduced heating (blue riders)
- Required normal temperature (potentiometer F)
- Required reduced economy temperature (Potemtiometer G)
- Required heating programme at selector switch A
- Required domestic hot water temperature (potentiometer K). A 16,2 k Ω resistor between B3 and M produces a 20°C upward shift of the range
- Switching differential for boiler temperature control (potentiometer located under the timeswitch dial)
- Minimum limitation operative or inoperative (link located under the timeswitch dial)
- Domestic hot water heating always released: terminals X1 and M to be linked

9. DIMENSIONS
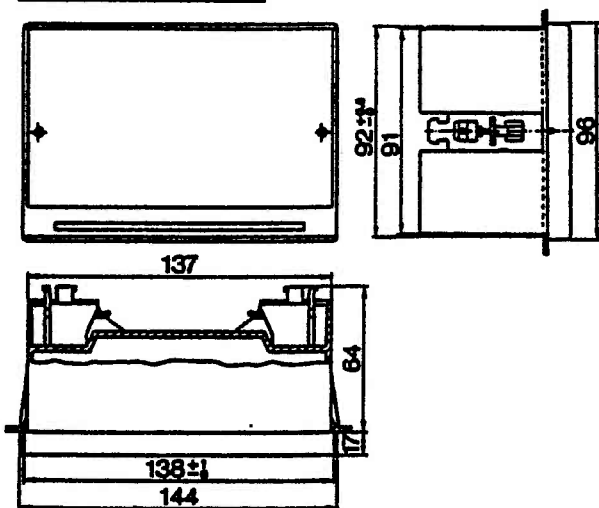
Fig. 9.1 Controller with screw type terminal strips
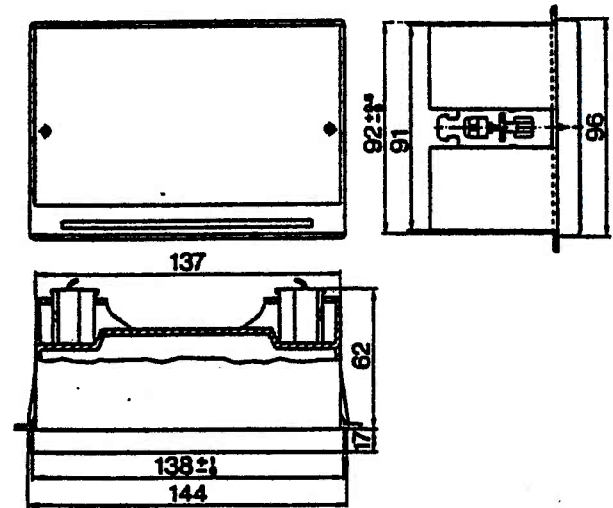
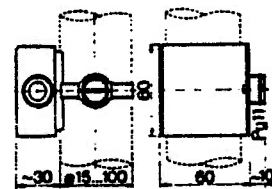Fig. 9.2 Controller with crimp type terminal strips

Fig. 9.3 QAA... room unit

Fig. 9.4 QAD21

Fig. 9.5 QAC31

Fig. 9.6 QAZ21

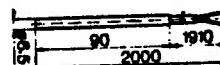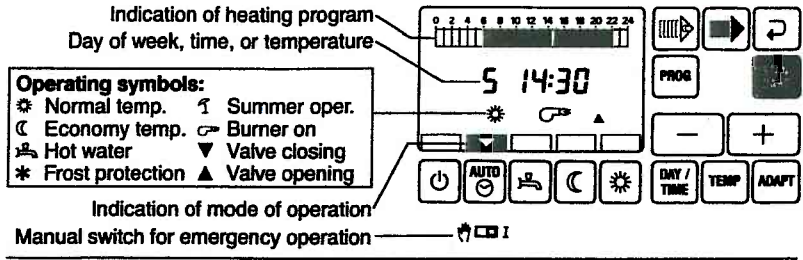Subject to modification

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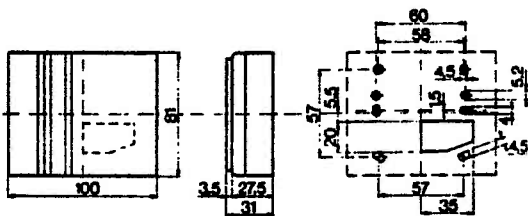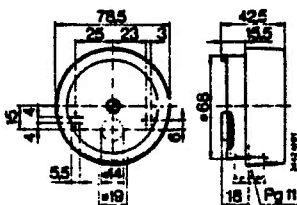
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Brief Operating Instructions

E 4 319 1795 0

Indication of heating program
Day of week, time, or temperature

Operating symbols:
☀ Normal temp. ⌛ Summer oper.
☾ Economy temp. ↷ Burner on
⌁ Hot water ▼ Valve closing
✳ Frost protection ▲ Valve opening

Indication of mode of operation
Manual switch for emergency operation

---

1. Day of week and time

[DAY/TIME] Press. Then [–][+] until day of week
(1 = Monday... 7 = Sunday) and time are correct. Display switches to the next day every 24 hours.

2. Start-up

[AUTO] Press. Heating now operates according to standard heating program: Monday through Sunday from 6:00 to 22:00 on ☀. Heating during remaining time only when ☾ is reached.

3. Mode of operation

[AUTO] Automatic operation

[⏻] Heating off. Frost protection for house and heating system.

[☾] Continuous economy temperature

[☀] Continuous normal temperature

[⌁] Domestic hot water heating only
• Press key for 5 seconds
Recharging of hot water
• Press key briefly

Holiday program

[⏻] or [☾] Keep depressed and use

[–][+] to enter number of holidays. Day of entry counts as a whole day. At 24:00 of the last day "automatic operation" is switched on again.

4. Temperatures

[TEMP] Press repeatedly. You will see in consecutive order the following **set** temperatures:

TEMP1 ☀ Normal temperature
TEMP2 ☾ Economy temperature
TEMP3 ⌁ Hot water temperature
TEMP4 ✳ Frost protection temp.

    measured temperatures:
TEMP5 Boiler water temperature
TEMP6 Hot water temperature
TEMP7 Room temperature
[–][+] Are used to alter the **set** temperatures.

5. Heating programs

For entry of your heating programs:

	0 2 4 6 8 10 12 14 16 18 20 22 24
1 Monday	
2 Tuesday	
3 Wednesday	
4 Thursday	
5 Friday	
6 Saturday	
7 Sunday	

Interrog./alteration of heating programs

[PROG] Press repeatedly. You will see in consecutive order the heating programs 1 for Monday...7 for Sunday.

[▯▷][➡] Are used to alter indicated heating program. It starts at 0:00.

[▯▷] Sets white time periods for economy temperature.

[➡] Sets black time periods for normal temperature.

[↺] Is used to make reverse corrections.

Retrieval of standard heating program

[PROG] then [■] Press for 5 seconds until time appears.

6. Room temp. corrections

During mild weather

[TEMP] Press

[–][+] Correct displayed value
TEMP 1 ☀ as required.

During cold weather

[ADAPT] Press

[–][+] Correct displayed value by 0.5...2. Lowering of room temperature: decrease value. Raising of room temperature: increase value.

For more detailed information refer to full Mounting Instructions.

WOLSELEY
UK

Purchase Order

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Date	03 Oct 2005
Delivery Date	06 Oct 2006

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