Operating Instructions

for use by heating contractor

Vitotronic 100, type GC1B
Multi boiler system with control unit for constant temperature operation
For use with Boiler models VD2A, VD2 and CT3

Vitotronic 300-K, type MW1B
Weather-compensated cascade control

VITOTRONIC® 100
VITOTRONIC® 300-K

Vitotronic 100

Vitotronic 300-K

C SA® US
Certified as a component part for Viessmann boilers

Product may not be exactly as shown

IMPORTANT

Read and save these instructions for future reference.

5793 310 - 01 03/2014

Please file in Service Binder

Safety, Installation and Warranty Requirements

Please ensure that these instructions are read and understood before commencing installation. Failure to comply with the instructions listed below and details printed in this manual can cause product/property damage, severe personal injury, and/or loss of life. Ensure all requirements below are understood and fulfilled (including detailed information found in manual subsections).

- **Product documentation**
  Read all applicable documentation before commencing installation. Store documentation near boiler in a readily accessible location for reference in the future by service personnel.

  

  ▶*For a listing of applicable literature, please see section entitled "Important Regulatory and Safety Requirements".*

- **Warranty**
  Information contained in this and related product documentation must be read and followed. Failure to do so renders the warranty null and void.

  

- **Licensed professional heating contractor**
  The installation, adjustment, service and maintenance of this equipment must be performed by a licensed professional heating contractor.

  ▶*Please see section entitled "Important Regulatory and Installation Requirements".*

  

- **Advice to owner**
  Once the installation work is complete, the heating contractor must familiarize the system operator/ ultimate owner with all equipment, as well as safety precautions/requirements, shutdown procedure, and the need for professional service annually before the heating season begins.

⚠ WARNING

Installers must follow local regulations with respect to installation of carbon monoxide detectors. Follow the Viessmann maintenance schedule of the boiler contained in this manual.

Operating and Service Documentation

It is recommended that all product documentation such as parts lists, operating and service instructions be handed over to the system user for storage. Documentation is to be stored near boiler in a readily accessible location for reference by service personnel.

Commissioning

The commissioning and matching of the control unit to local conditions and building characteristics, as well as instructing the user in the operation of the system, must be carried out by your heating contractor. As the user of new combustion equipment, you may be obliged to notify your local service technician of the installation [check local regulations].

Your local service technician will also inform you [where appropriate] about work he may be required to perform on your combustion equipment (e.g. regular checks, cleaning).

Your System is Preset at the Factory

The control units are factory-set for central heating and DHW heating:

- Vitotronic 300-K: “Heating and DHW”
  Your heating system is therefore ready for use.

Central heating

- Between 06:00 and 22:00 h, the rooms are heated to 68° F (20° C) “Set room temperature” (standard heating mode).
- Between 22:00 and 06:00 h, the rooms are heated to 37° F (3° C) “Set red. room temp” (reduced heating mode, frost protection).
- Your heating contractor can make further settings for you during commissioning. You can change any settings individually at any time to suit your requirements (see chapter “Central heating”).

DHW heating

- Between 05:30 and 22:00 h, DHW is heated to 122° F (50° C) “Set DHW temperature”. Any installed DHW circulation pump is on.
- Between 22:00 and 05:30 h, the DHW cylinder temperature will not be reheated. Any installed DHW circulation pump is off.
- Your heating contractor can make further settings for you during commissioning. You can change any settings individually at any time to suit your requirements (see chapter “DHW heating”).

Frost protection

- Your boiler, heating circuits and DHW cylinder are protected against frost. Wintertime/summertime changeover
- This changeover is automatic.

Time and date

- The day and time were set by your heating contractor during commissioning.

Power failure

- All data is saved if there is a power failure.

Terminology

To provide you with a better understanding of the functions of your control unit, the appendix contains the chapter “Terminology” (see page 40).

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Page

For your Safety *(continued)*

⚠ CAUTION

Follow these safety instructions closely to avoid the risk of injury and damage to property.

- **Operation**
  Before operating the boiler, make sure you fully understand its method of operation. Your heating contractor should always perform the initial start-up and explain the system. Any warranty is null and void if these instructions are not followed.
- **Flue gas smell**
  - Deactivate heating equipment.
  - Open windows and doors.
  - Inform your heating contractor.
- **Working on the equipment**
  All personnel working on the equipment or the heating system must have the proper qualifications and hold all necessary licenses. Ensure main power to equipment, heating system, and all external controls has been deactivated. Close main gas supply valve. Take precautions in all instances to avoid accidental activation of power during service work.
- **Dangerous conditions**
  - Deactivate main power immediately.
  - Close gas supply valve.
- **Maintenance and cleaning**
  Regular inspection and service by a qualified heating contractor is important to the performance of the boiler. Neglected maintenance impacts on warranty; regular inspection ensures clean, environmentally friendly and efficient operation. We recommend a maintenance contract with a qualified heating contractor.
- **Technical Data Manual**
  - Installation Instruction and Service Instructions
  - Operating Instructions and User's Information Manual

Additional applicable literature:
- Accessory manuals

If you smell gas

- Don't smoke! Don't use naked flames or cause sparks (e.g. by switching lights or electrical appliances on and off)
- Open windows and doors
- Close the gas shut-off valve
- Inform your heating engineers/service contractors from outside the building
- Observe the safety regulations of your gas supply company (see gas meter) and those of your heating engineers (see start-up or instruction report).

In emergencies

- Immediately switch off the power supply, e.g. at the separate fuse or power supply disconnect switch (unless there is a smell of gas).
- Close the shut-off valves in the oil pipes or close the gas shut-off valve, whichever applicable.
- Use suitable extinguishers in the event of fire.

Installation of additional components

The installation of additional components which have not been tested together with the boiler can adversely affect the function and performance of the boiler.
Our warranty does not cover and we accept no liability for damage attributable to the installation of such components.

Boiler room conditions

- Do not use a room in which the air is polluted by halogenated hydro-carbons (e.g. as contained in aerosols, paints, solvents and cleaning agents)
- Do not use a room subject to high levels of dust
- Do not use a room subject to permanently high humidity
- The room should be frost-protected
- Max. ambient temperature 95° F (35° C).
- Provide good ventilation and do not close or obstruct vents (if installed).


This symbol indicates a reference to other instructions which must be observed.

Where to Find the Controls

Each boiler is equipped with its own control unit for constant temperature operation.
These control units are regulated by a higher weather-compensated cascade control unit.

- Control unit for constant temperature operation on the boiler: Vitotronic 100
- Higher weather-compensated cascade control unit: Vitotronic 300-K

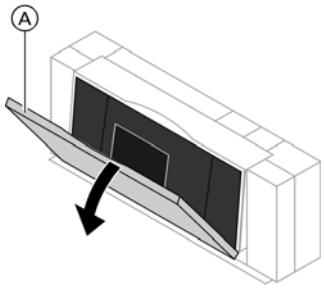
You can change all settings for your heating system centrally at the control unit programming unit.

You may also make such changes at the remote control units, if your system is equipped with such units.

Refer to the Remote control Operating Instructions

The settings at the Vitotronic 100 are described in these operating instructions. You do not need the operating instructions provided with these control units.

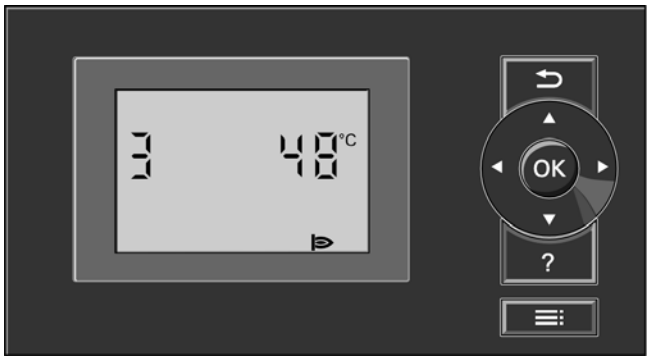
Controls, Vitotronic 100



Legend
Ⓐ Cover flap

Opening the Vitotronic 100, type GC1B control unit

The programming unit is located behind the flap.
To open, pull the flap from the top edge forward.

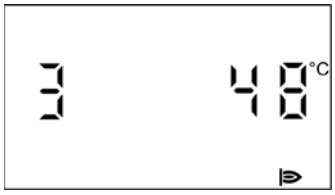


Programming unit

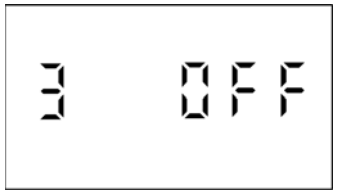
- ⮌ Takes you to the previous step in the menu or cancels a setting that has been started.
- Cursor keys
  To scroll through the menu or to set values.
- **OK** Confirms your selection or saves the setting.
- **?** No function.
- ☰ Enables you to call up the menu for settings and scanning.

How to Use the Controls, Vitotronic 100

In multi boiler systems, each Vitotronic 100 indicates the boiler number on the standard display. The following example shows the boiler water temperature as indicated by boiler 3.



Note: If a boiler is not operational, the following appears in the display of the corresponding control unit:



Press ☰.
This takes you to the menu for settings and scanning.

Symbols

These symbols are not always displayed, but appear subject to the system version and the operating state. Flashing displays indicate that modifications can be made.

Menu

- Information
- Further adjustments
- Emissions test mode

Heating program

- Standby mode with frost protection monitoring
- The boiler is available to the cascade control unit for heat production.

Messages

- Service message
- The service interval has expired.
- Fault message

Displays

- Circulation pump at output 20 is running
- Burner in operation
- Factory settings

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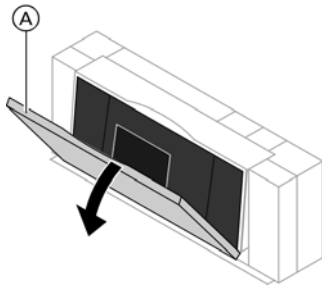
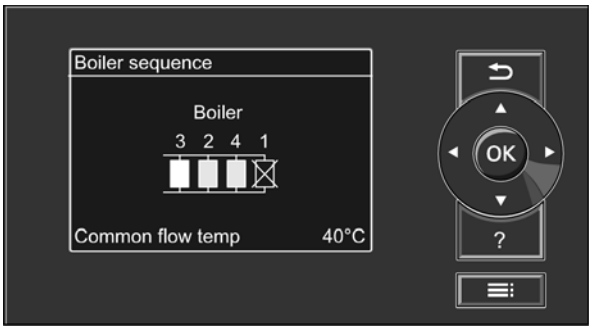
Controls, Vitotronic 300-K



Legend
Ⓐ Cover flap

Opening the Vitotronic 300-K, type MW1B control unit

The programming unit is located behind the flap.
To open, pull the flap from the top edge forward.



Programming unit

Menu "Help"

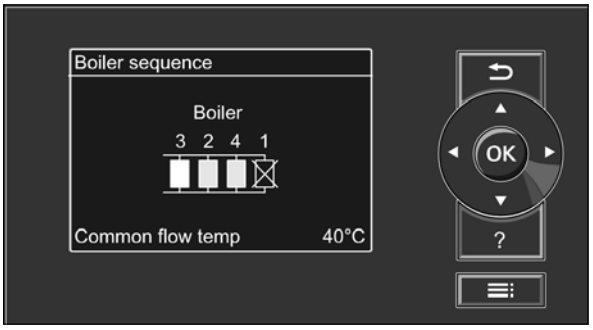
You can view a short guide giving an explanation of the controls and information about heating circuit selection (see page 14).

Call up the short guide as follows:

- If the screen saver is active (see page 11):
  Press **?**
- From anywhere in the menu:
  Press ⮌ until the standard menu is shown (see the following chapter).
  Press **?**

⮌	Takes you to the previous step in the menu or cancels a setting that has been started.
⌖	Cursor keys To scroll through the menu or to set values.
OK	Confirms your selection or saves the setting.
?	To call up additional information regarding the selected menu option.
☰	Calls up the extended menu.

Menu, Vitotronic 300-K



There are two control levels available, the “Standard menu” and the “Extended menu”.
The menu overview can be found on page 37.

Standard menu

Call up the standard menu as follows:

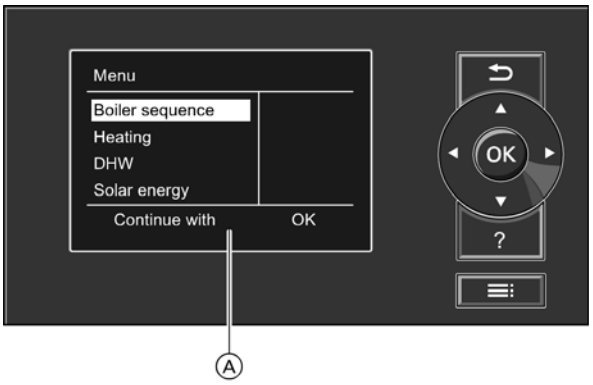
- If the screen saver is active (see page 11)
  Press **OK**.
- From anywhere in the menu:
  Keep pressing ⮌ until the standard menu appears.

In the standard menu, the number of boilers installed in the heating system is shown in a specific order (boiler sequence). You can change the boiler sequence (see page 23).

The meanings of the icons are as follows:

- Solid white:
  The boiler has been enabled by the cascade control unit and is operating (boiler 3 in this example).
- Solid grey:
  The boiler is available for generating heat but has not been enabled by the cascade control unit (boilers 2 and 4 in this example).
- Solid black and crossed out:
  This boiler is not available for heat production (boiler 1 in this example).

Note: 2 minutes after any setting has been made, the display automatically reverts to the standard menu.



Extended menu

Call up the extended menu as follows:

- If the screen saver is active (see page 11):
  Press **OK** and then ☰.
- From anywhere in the menu:
  Press ☰.

Note: Your heating contractor can block the use of the extended menu. In this case, you can only scan fault messages.

Legend
Ⓐ Dialogue line

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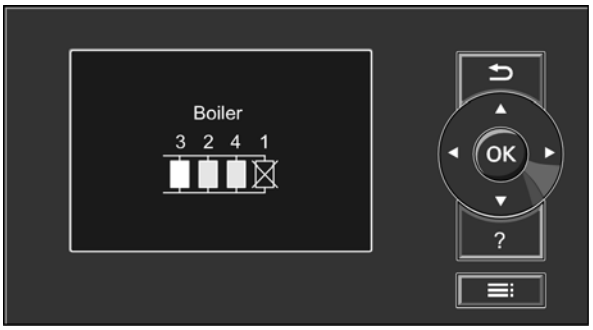
How to Use the Controls, Vitotronic 300-K *(continued)*



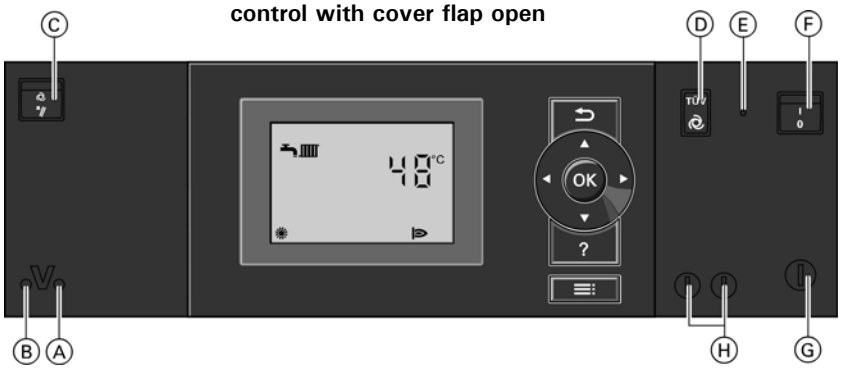
The screen saver will become active if you have not adjusted any settings on the programming unit for a few minutes.
The display brightness is reduced.

1. Press **OK**. This takes you to the standard menu (see page 37).
2. Press ☰. This takes you to the extended menu (see page 38). The selected menu option is highlighted in white.
   The dialogue line Ⓐ (see diagram on page 10) then shows the necessary instructions.

The following diagram shows how to make settings with different dialogue lines, using the set room temperature setting as an example.

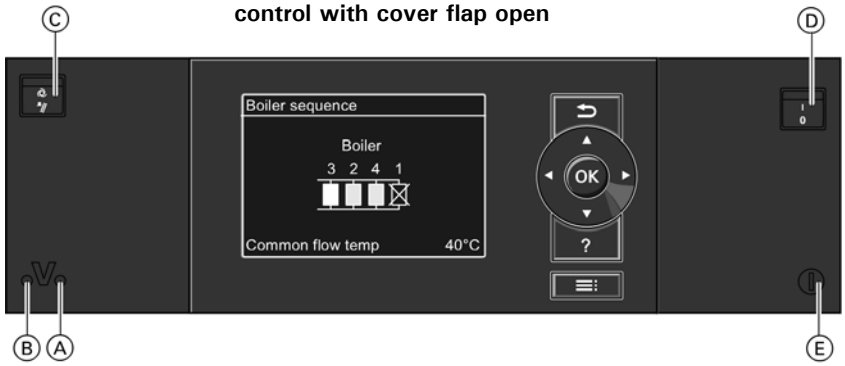
Starting the Heating System

Vitotronic 100, type GC1B control with cover flap open



Legend
Ⓐ ON indicator (green)
Ⓑ Fault indicator (red)
Ⓒ Emissions test switch (only for service purposes)
Ⓓ Test key (only for service purposes)
Ⓔ Fixed high limit reset
Ⓕ ON/OFF switch
Ⓖ Adjustable high limit
Ⓗ Fuses

Vitotronic 300-K, type MW1B control with cover flap open



Legend
Ⓐ ON indicator (green)
Ⓑ Fault indicator (red)
Ⓒ Emissions test switch (only for service purposes)
Ⓓ ON/OFF switch
Ⓔ Fuse

1. Check that the combustion air openings of the mechanical room are open and unrestricted.
   Note: With room air dependant operation, the combustion air is drawn from the mechanical room.
2. Open the shut-off valves in the oil lines (at the tank and filter) or open the gas shut-off valve.
3. Switch ON the power supply, e.g. at a separate MCB/ fuse or a mains isolator.
4. Switch ON the ON/OFF switches at all Vitotronic 100 and at the Vitotronic 300-K (see chapter “Controls”). After a short time, the following is shown on the display:
   - Vitotronic 100: the standard display (see page 8)
   - Vitotronic 300-K: the standard menu (see page 10)

   The green ON indicator illuminates.
   Your heating system and, if installed, your remote control units are now ready to operate.

Note: On every Vitotronic 100, “▮▮▮” must be selected, otherwise the Vitotronic 300-K cannot use the corresponding boiler to produce heat.

Stopping the Heating System

With frost protection monitoring

At the Vitotronic 300-K, select the heating program "Standby mode" for every heating circuit.

- No central heating.
- No DHW heating.
- Frost protection for the heating circuits and the DHW tank is active.

Extended menu

1. ☰
2. "Heating"
3. Select the heating circuit, if necessary (see page 14).
4. "Heating program"
5. "Standby mode" (frost protection monitoring)

Note: The circulation pumps are briefly started every 24 hours to prevent them from seizing up.

Ending the heating program "Standby mode"

Select another heating program.

Stopping individual boilers at the relevant Vitotronic 100

Press the following keys:

1. ☰ for settings; "▥" flashes.
2. **OK** to confirm; "⏻🚰▥" flashes.
3. **OK** to confirm; "🚰▥" flashes.
4. ◂ until "⏻" flashes.
5. **OK** to confirm.

Note: The circulation pumps are briefly started every 24 hours to prevent them from seizing up.

Ending the heating program "Standby mode"

Select another heating program.

Without frost protection monitoring (shutdown)

1. Switch OFF the ON/OFF switches at all Vitotronic 100 and Vitotronic 300-K (see chapter "Controls").
2. Close the shut-off valves in the oil lines (at the tank and filter) or close the gas shut-off valve.
3. Isolate the heating system from its main power supply, e.g. at a separate MCB/fuse or a mains isolator.
4. Where outside temperatures of below 37° F (3° C) are anticipated, please take suitable measures to protect the heating system against frost. If necessary, contact your heating contractor.

Information on a prolonged shutdown

- Circulation pumps may seize up as they are not supplied with power.
- Vitotronic 300-K:
  It may be necessary to reset the date and time (see page 25).

Required Settings (Central Heating)

Make the settings for central heating at the Vitotronic 300-K.

If you want central heating, check the following points:

- Have you selected the heating circuit?
  For settings, see the next chapter.
- Have you set the required room temperature?
  For settings, see page 15.
- Have you selected the correct heating program?
  For settings, see page 15.
- Have you set the required time program?
  For settings, see page 16.

In the extended menu, you can scan the selected heating program under “Information” (see chapter “Scanning information”, “Heating circuit ...” group).

Selecting a Heating Circuit

The heating of all rooms can, if necessary, be split over several heating circuits.

- In the case of heating systems with several heating circuits, for all central heating settings, first select the heating circuit where you want to make a change.
- This selection is not possible in heating systems with only one heating circuit.

Example:

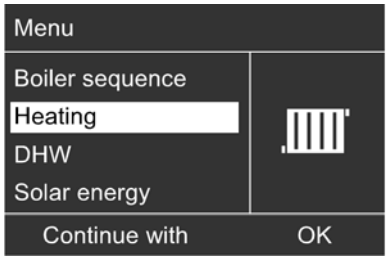
- “Heating circuit 1” is the heating circuit for the offices on the ground floor.
- “Heating circuit 2” is the heating circuit for the offices on the first floor.

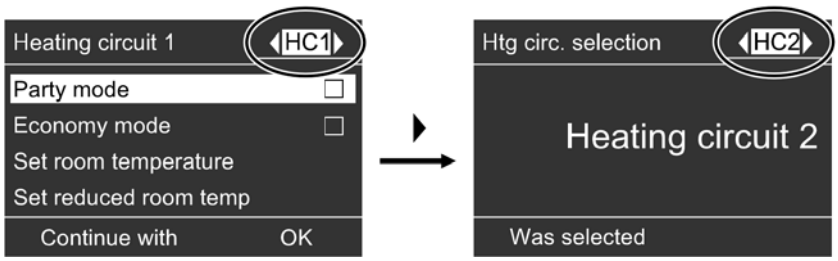
The heating circuits are marked at the factory as “Heating circuit 1” (HC1), “Heating circuit 2” (HC2) and “Heating circuit 3” (HC3).

If you or your heating contractor have renamed the heating circuits (e.g. as “Ground floor” etc.), the name is displayed instead of “Heating circuit ...” (see page 24).

Extended menu

1. ☰
2. “Heating”
3. ►/◄ for the required heating circuit.





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Setting the Room Temperature

Setting the room temperature for standard heating mode

Factory setting: 68° F (20° C)

Extended menu

1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Set room temperature”
5. Set the required value.

Setting the room temperature for reduced heating mode (night setback)

Factory setting: 37° F (3° C)

Extended menu

1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Set red. room temp”
5. Set the required value.

The rooms are heated to this temperature:

- Between the time phases for standard heating mode (see page 16).
- In the holiday program (see page 19).

Setting the Heating Program for Central Heating

- The rooms of the selected heating circuit are heated in accordance with the room temperature and time program settings.
- DHW is reheated in accordance with the set DHW temperature and time program (see chapter “DHW heating”).

Factory setting: “Heating and DHW”

Extended menu

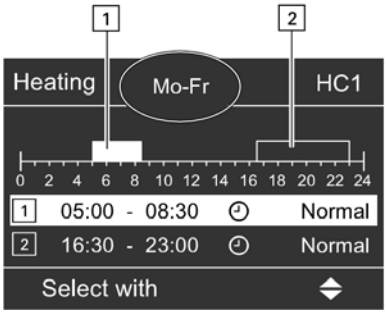
1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Heating program”
5. “Heating and DHW”

Setting the Time Program for Central Heating

- The time program for central heating is made up of time phases. One time phase from 6:00 to 22:00 h for every day of the week is set at the factory.
- You can set the time program individually, to be the same for every day of the week or different: You can select up to 4 time phases per day for standard heating mode. Set the start and end points for each time phase. Between these time phases, the rooms are heated with the reduced room temperature (see chapter "Setting the room temperature for reduced heating mode").
- When setting, bear in mind that your heating system requires some time to heat the rooms to the required temperature.
- In the extended menu, you can scan the current time program under "Information" (see chapter "Scanning information", "Heating circuit ..." group).

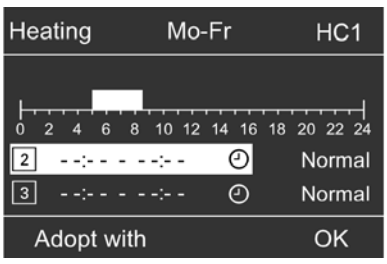
Example shown:

- Time program for Monday to Friday ("Mo-Fr")
- Time phase 1: From 05:00 to 08:30 h
- Time phase 2: From 16:30 to 23:00 h



Example:

You want to set the same time program for every day except Monday:
Select the period "Monday–Sunday" and set the time program.
Then select "Monday" and set the time program for this.



Extended menu:

1. ☰
2. "Heating"
3. Select the heating circuit if necessary.
4. "Heating time program"
5. Select part of the week or a day.
6. Select the time phase 1, 2, 3 or 4.
7. Set the start and end points for the relevant time phase.
8. Press ⮌ to exit the menu.

Note: If you want to terminate a time phase setting process prematurely, keep pressing ⮌ until the required display appears.

Deleting a time phase

Set the time for the end point to the same time that was set for the start point. The display shows the selected time phase "- - : - -".

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Changing the Heating Curve

Your system's heating characteristics are affected by the slope and the shift of the selected heating curve.
Further information about the heating curve can be found under "Terminology" on page 40.

Factory setting:

- Slope: 1.4
- Heating curve shift: 0
- Standard room temperature (set value): 68° F (20° C)
- Reduced room temperature (set value): 37° F (3° C)

Extended menu:

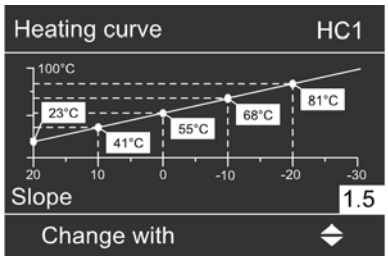
1. ☰
2. "Heating"
3. Select the heating circuit, if necessary (see page 14).
4. "Heating curve"
5. "Slope" or "Shift"

   Note: Tips on when and how to change the heating curve slope and shift are displayed by pressing **?**
6. Set the required value.

Example:

Change the heating curve slope to 1.5.
A graph clearly shows the change in the heating curve as soon as you alter the value for slope or shift.

Depending on various outside temperatures (shown on the horizontal axis), the assigned set supply temperatures for the heating circuit are highlighted white.

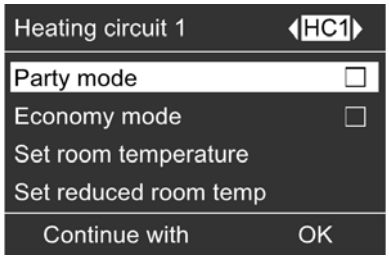


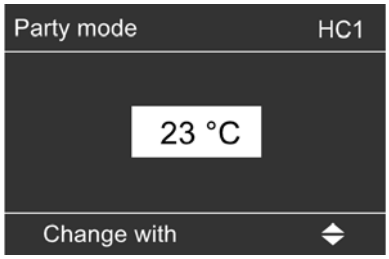
Stopping Central Heating

Extended menu

1. ☰
2. "Heating"
3. Select the heating circuit, if necessary (see page 14).
4. "Heating program"
5. "Only DHW" (summer mode, no central heating)
   or
   "Standby mode" (frost protection monitoring)

Selecting Comfort Function “Party Mode”





Make the settings for the comfort function at the Vitotronic 300-K.

With this function, you can change the room temperature for several hours, e.g. if guests unexpectedly stay longer in the evening. You do not have to change any existing control settings. With this function, DHW is reheated to the selected set temperature.

Extended menu

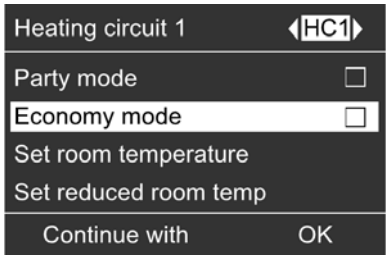
1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Party mode”
5. Set the room temperature required during party mode.

- The rooms are heated to the required temperature.
- DHW is reheated to the selected set temperature.
- The DHW circulation pump is switched ON (if installed).

Ending party mode

- Automatically when the system switches to standard heating mode in accordance with the time program.
  or
- In the extended menu, set “Party mode” to “OFF”.

Selecting Energy Saving Function “Economy Mode”



Make the settings for the energy saving function at the Vitotronic 300-K.
To save energy, you can reduce the room temperature in standard heating mode. For example, if you leave your home for a few hours.

Extended menu

1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Economy mode”

Ending economy mode

- Automatically when the system switches to reduced heating mode in accordance with the time program.
  or
- In the extended menu, set “Economy mode” to “OFF”.

Selecting Energy Saving Function “Holiday Program”

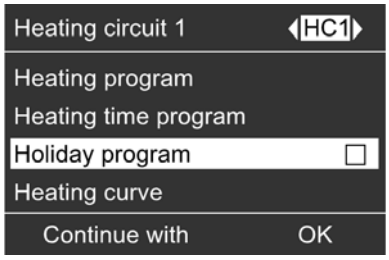
To save energy, for example over long holidays, you can activate the “Holiday program”.
Make the settings for this energy saving function at the Vitotronic 300-K.

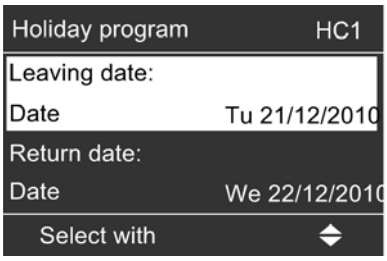
Note: The control unit is set up so that the holiday program applies to all heating circuits. If you want to make changes, contact your local heating contractor.

The holiday program has the following effect on the heating circuits and DHW heating:

- **Central heating:**
  - For heating circuits in the heating program “Heating and DHW”:
    In these heating circuits, the rooms are heated to the selected reduced room temperature (see page 15).
  - For heating circuits in the heating program “Only DHW”:
    No central heating in these heating circuits.
    If the heating program “Only DHW” is selected for all heating circuits, frost protection monitoring is only enabled for the boiler and DHW tank.
- **DHW heating:**
  DHW heating is switched OFF; frost protection for the DHW tank is active.

The holiday program starts at 00:00 h the day following your departure and ends at 00:00 h on the day of your return. This means the selected time program is active on the days of departure and return (see page 16).





Extended menu:

1. ☰
2. “Heating”
3. “Holiday program”
4. Set the required departure and return dates.

Display in the extended menu

In the extended menu, you can scan the selected holiday program under “Information” (see chapter “Scanning information”, “Heating circuit ...” group).

Terminating or deleting a holiday program

Extended menu

1. ☰
2. “Heating”
3. “Holiday program”
4. “Delete program”

Required Settings (DHW Heating)

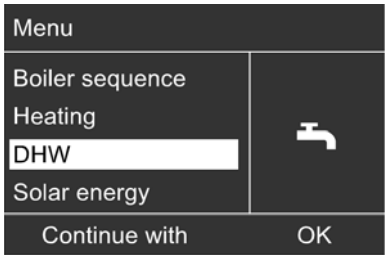
Make the settings for DHW heating at the Vitotronic 300-K.

If you want DHW heating, check the following points:

- Have you set the required DHW temperature?
  For settings, see the next chapter.
- Have you selected the correct heating program?
  For settings, see below.
- Have you set the required time program?
  For settings, see page 21.

Note: The control unit is set up so that DHW heating applies to all heating circuits. If you want to make changes, contact your local heating contractor.

Setting the DHW Temperature



Extended menu

1. ☰
2. “DHW”
3. “Set DHW temperature”
4. Set the required value.

Setting the Heating Program for DHW Heating

Extended menu

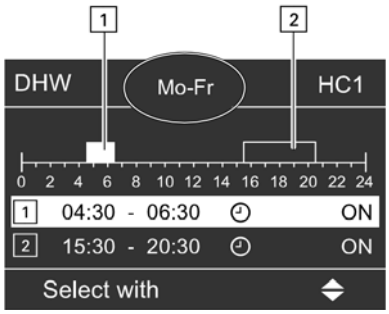
1. ☰
2. “Heating”
3. Select the heating circuit, if necessary (see page 14).
4. “Heating program”
5. “Heating and DHW” (with central heating)
   or
   “Only DHW” (summer mode, no central heating)

Setting the Time Program for DHW Heating

- The time program for DHW heating is made up of time phases. One time phase from 5:30 to 22:00 h for every day of the week is set at the factory.
- Automatic mode is set at the factory for DHW heating. This means that, in standard heating mode, the DHW is reheated to the set temperature. To ensure that hot water is available at the start of standard heating mode, the time phase for DHW heating begins automatically half an hour earlier than the time phase for standard heating mode.
- If you don't want the automatic mode, you can select up to 4 individual time phases per day for DHW heating, which can be the same for every day of the week or different. Set the start and end points for each time phase.
- When setting, bear in mind that your heating system requires some time to heat the DHW to the required temperature.
- In the "Extended menu", you can scan the current time program under "Information" (see chapter "Scanning information", "DHW" group).

Example shown:

- Time program for Monday to Friday ("Mo-Fr")
- Time phase 1:
  From 04:30 to 06:30 h
- Time phase 2:
  From 15:30 to 20:30 h



Extended Menu

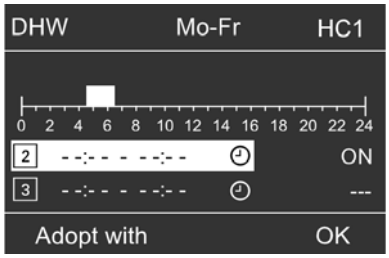
1. ☰
2. "DHW"
3. "DHW time prog"
4. "Individual"
5. Select part of the week or a day.
6. Select the time phase 1, 2, 3 or 4.
7. Set the start and end points for the relevant time phase.
8. Press ↩ to exit the menu.

Note: If you want to terminate a time phase setting process prematurely, keep pressing until the required display appears.

Setting the Time Program for DHW Heating *(continued)*

Example:

You want to set the same time program for every day except Monday:
Select the period "Monday–Sunday" and set the time program.
Then select "Monday" and set the time program for this.



DHW heating once, no longer in the time program

Note: The heating program "Heating and DHW" or "Only DHW" must be set for at least one system heating circuit.

Extended menu

1. ☰
2. "Heating"
3. "Party mode"
4. Disable "Party mode" again with "OFF" to prevent unintentional central heating with standard room temperature.

Deleting a time phase

Set the time for the end point to the same time that was set for the start point. The display shows the selected time phase "- - : - -".

Stopping DHW Heating

You do not want to have DHW or heat your rooms.

Extended menu

1. ☰
2. Select the heating circuit, if necessary (see page 14).
3. "Heating"
4. "Heating program"
5. "Standby mode" (frost protection monitoring)

You do not want DHW, but do want to heat the rooms.

Extended menu

1. ☰
2. Select the heating circuit, if necessary (see page 14).
3. "Heating"
4. "Heating program"
5. "Heating and DHW"
6. ↩ until the menu is displayed.
7. "DHW"
8. "Set DHW temperature"
9. Select 50° F (10° C).

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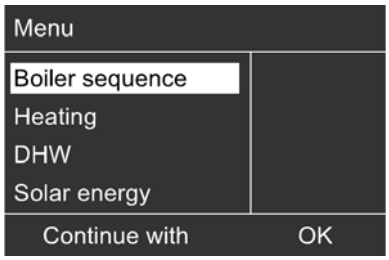
Selecting the Boiler Sequence



Only for the Vitotronic 300-K.

Subject to the parameters set and internal control calculations, the control unit offers various boiler sequences.
You can change the boiler sequence.
See also page 10.

Extended menu

1. ☰
2. “Boiler sequence”
3. Set the required boiler sequence and confirm with **OK**.

Setting the Display Contrast

Only for the Vitotronic 300-K.

Extended menu

1. ☰
2. “Settings”
3. “Contrast”
4. Set the required contrast.

Setting the Display Brightness

Only for the Vitotronic 300-K.

If you would like the texts in the menu to be more clearly legible, change the brightness for “Control”.
You can also alter the screen saver brightness.

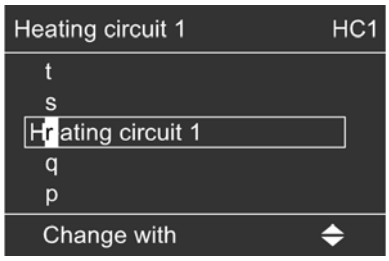
Extended menu

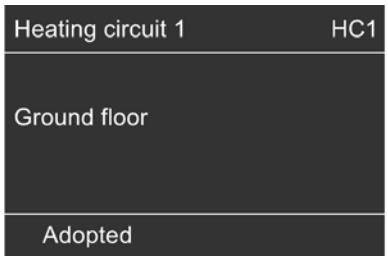
1. ☰
2. “Settings”
3. “Brightness”
4. “Control” or “Screen saver”
5. Set the required brightness.

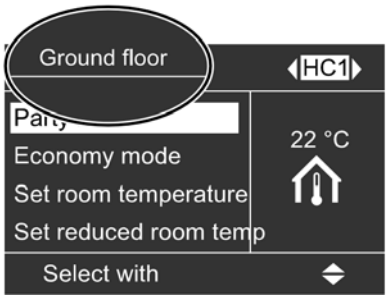
Entering Names for the Heating Circuits

Example:

Name for “Heating circuit 1”:
Ground floor







The menu shows “Ground floor” for “Heating circuit 1”.

Only for the Vitotronic 300-K.

You can give heating circuits 1, 2 and 3 (“HC1”, “HC2” and “HC3”) individual names. The abbreviations “HC1”, “HC2” and “HC3” will be retained.

Extended menu

1. ☰
2. “Settings”
3. “Name for heating circ.”
4. “Heating circuit 1”, “Heating circuit 2 or “Heating circuit 3”
5. “Change?”
6. You can select the required symbol with ▲/▼.
7. ►/◄ takes you to the next character.
8. Press **OK** to accept all entered characters at once and simultaneously exit this menu.

   Note: The entered term is deleted with “Reset?”; “Heating circuit 1” will then be shown again.

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Setting the Time and Date

Only for the Vitotronic 300-K.

The time and date are factory-set. If your heating system has been shut down for a long time, it may be necessary to set the time and date.

Extended menu

1. ☰
2. “Settings”
3. “Time/Date”
4. Set the time and date.

Language Selection

Only for the Vitotronic 300-K.

Extended menu

1. ☰
2. “Settings”
3. “Language”
4. Select the required language.

Setting the Temperature Unit (°C/°F)

Vitotronic 100

Factory setting: °C

Press the following keys:

1. ☰ for settings; “▥” flashes.
2. ▶ until “⚙” flashes.
3. **OK** to confirm; “ ⏐◀ ” flashes.
4. ▲/▼ for required temperature unit (“°C” or “°F”).
5. **OK** to confirm; the new temperature unit is saved.

Vitotronic 300-K

Factory setting: °C

Extended menu

1. ☰
2. Settings”
3. “Temperature unit”
4. Select the temperature unit “°C” or “°F”.

Restoring Factory Settings

Vitotronic 100

You can simultaneously reset all changed values to the factory settings.

Press the following keys:

1. ☰ for settings; "▮▮▮" flashes.
2. ▶ until "⚙" flashes.
3. **OK** to confirm; " ⧓ " flashes.
4. **OK** to confirm; the factory setting is reinstated.

Factory settings:

- Heating program: "▮▮▮"
- Temperature unit: °C

Vitotronic 300-K

You can reset the factory settings of all modified values for each heating circuit separately.

Extended menu

1. ☰
2. "Settings"
3. "Standard setting"
4. "Heating circuit 1", "Heating circuit 2" or "Heating circuit 3"

The following settings and values are reset:

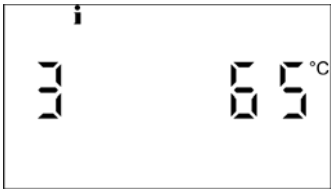
- Set room temperature for standard heating mode ("Set room temperature").
- Set room temperature for reduced heating mode ("Set red. room temp").
- Heating program ("Heating program").
- Set DHW temperature ("Set DHW temperature").
- Time program for central heating ("Heating time program").
- Time program for DHW heating ("DHW time prog").
- Time program for DHW circulation pump ("DHW circ time prog").
- Heating curve slope ("Slope") and shift ("Shift").

Party mode, economy mode and holiday program are deleted.

Scanning Information

Example:

Information number “3” is displayed, indicating the current boiler water temperature.



Vitotronic 100 — scans for every boiler

Subject to the connected components and settings made, you can scan current temperatures and operating conditions.

Press the following keys:

1. ☰ for settings; “▥” flashes.
2. ▶ until “ i ” flashes.
3. **OK** to confirm.
4. ▲/▼ for the required information.
5. **OK** to confirm; if you want to reset the value to “0” (see following table), “⏭” flashes.
6. **OK** to confirm; the value is reset.

Note: The scan mode terminates automatically after 30 min. or if you press ⮌.

The information appears in the following sequence:

Display	Explanation	Notes
0 1	LON participant number	Control unit has participant number 1.
2 225° F (107° C)	Flue gas temperature	Displayed only if a flue gas temperature sensor is connected.
3 149° F (65° C)	Boiler water temperature	-
6 131° F (55° C)	Temperature sensor 17 A	Only if a sensor is connected.
7 131° F (55° C)	Temperature sensor 17 B	Only if a sensor is connected.
① 263572h	Hours run, burner single stage, stage 1 or modulating	With “⏭” you can reset the value to “0”.
② 263572h	Hours run, burner stage 2	With “⏭” you can reset the value to “0”.
③ 013578	Burner starts	With “⏭” you can reset the number of burner starts to “0”.
④ 001225	Fuel consumption	With “⏭” you can reset the value to “0”.

Scanning Information *(continued)*

Vitotronic 300-K — scans for the heating system

Subject to the connected components and settings made, you can scan current temperatures and operating conditions.

The extended menu splits the information into groups:

- "General"
- "Heating circuit 1"
- "Heating circuit 2"
- "Heating circuit 3"
- "DHW"
- "Solar"
- "Reset data"

Note: If heating circuits have been given names, the name is displayed (see chapter "Entering names for the heating circuits").
For detailed scanning options for the individual groups, see chapter "Scanning options in the extended menu".

Extended menu

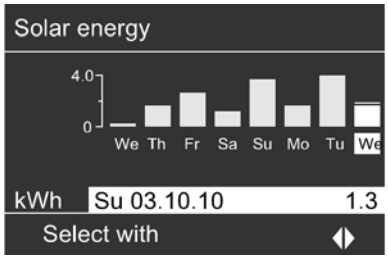
1. ☰
2. "Information"
3. Select the group.
4. Select the required scan.

Scanning in conjunction with solar thermal systems

Extended menu

1. ☰
2. "Solar energy"

The solar energy yield for the past 7 days is displayed on a graph.
The flashing line on the graph indicates that the current day is not yet over.



Note: Further scanning options, e.g. for the solar circuit pump hours run, can be found in the extended menu under "Information" in the "Solar" group.

Resetting data to 0

You can reset the following data:

- In conjunction with a solar thermal system:
  Solar energy yield and hours run for the solar circuit pump and output 22.
- All the above data simultaneously.

Extended menu

1. ☰
2. "Information"
3. "Reset data"

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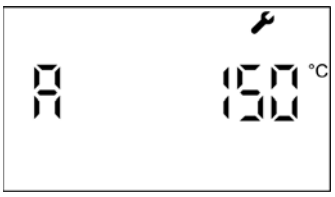
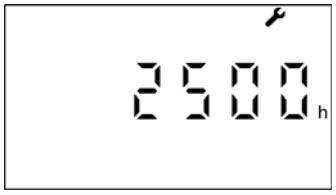
Scanning Service Messages

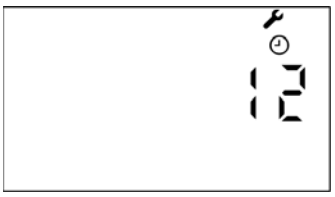
Your heating contractor can schedule maintenance work as follows:



When a certain flue gas temperature is reached, e.g.:
302° F (150° C) **(only with the Vitotronic 100, type GC1B).**



After a certain number of burner hours run, e.g. 2500 hr.



After a certain length of time, e.g. 12 months.

Vitotronic 100

If your heating system is due for a service, the symbol "🔧" flashes on the Vitotronic 100 display, and the following displays are shown.

Notify your local heating contractor and acknowledge the service message by pressing **OK**.

Note: If the service can only be carried out at a later point in time, the service message will reappear after 7 days.

Calling up an acknowledged service message

Press **OK** for approx. 4 sec.

Vitotronic 300-K

No service interval can be set at the Vitotronic 300-K. No service message is therefore shown.

Scanning Fault Messages

Example:

Fault code shown: "d1"

Vitotronic 100

If any faults have occurred in a boiler, the symbol ⚠ flashes on the display and the fault code is shown. The red fault indicator also flashes (see chapter "Controls").

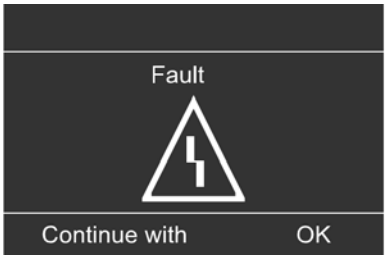
1. Notify your heating contractor of the fault code. This enables the heating contractor to be better prepared for the service call and may save additional travelling costs.
2. Acknowledge the fault message with **OK**. The symbol ⚠ no longer flashes.
   Note:If you have connected up signalling equipment (e.g. a buzzer) for fault messages, this is deactivated when the fault message is acknowledged.
   If the fault can only be fixed at a later point in time, the fault message will reappear the following day.

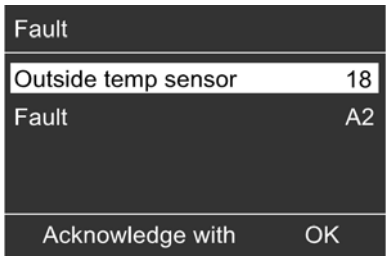
Calling up an acknowledged fault message

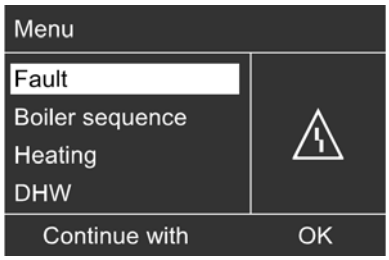
Press **OK** for approx. 4 sec.

Note: If there are several fault messages, you can scan these in sequence by pressing ▼/▲.

Scanning Fault Messages *(continued)*







Vitotronic 300-K

If any faults have occurred in your heating system, the symbol "⚠" flashes on the display, and "Fault" is shown. The red fault indicator also flashes (see chapter "Starting the heating system").

1. You can call up the cause of the fault with **OK**.
2. Pressing **?** calls up information on the heating system functions.
   Tips on which measures you can take yourself before notifying your heating contractor are also displayed.
3. Make a note of the cause of the fault and the fault code to the right of it. In this example: "Outside temp sensor 18" and "Fault A2"
   This enables the heating contractor to be better prepared for the service call and may save additional travelling costs.
4. If you want to acknowledge the fault message, follow the instructions in the menu.
   The fault message is transferred to the menu.

Note:

- If you have connected up signalling equipment (e.g. a buzzer) for fault messages, this is deactivated when the fault message is acknowledged.
- If the fault can only be rectified at a later date, the fault message will be displayed again the next day and the signalling equipment will be switched on again.

Calling up an acknowledged fault message

Extended menu

1. ☰
2. "Fault"

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Emissions Test Mode

Emissions test mode for testing flue gas with boiler water temperature raised briefly. This test mode should only be activated by your flue gas inspector during the annual inspection.

Test mode must be activated at the Vitotronic 100 of the boiler to be tested and also, for heat transfer, at the Vitotronic 300-K cascade control unit.

Vitotronic 100, type GC1B and Vitotronic 300-K

Move the emissions test switch on both control units (see chapter "Controls") to position .

The following functions are activated:

- Burner is started.

  Note: Burner start-up can be delayed, e.g. through fuel oil preheating.
- All pumps are started.
- Mixing valve remains set to control function
- The temperature controller regulates the boiler water temperature.

Ending emissions test mode

Set the emissions test switch to position
or
Close the cover flap (see page 12).

Rooms are Too Cold

Cause	Remedy
The heating system is switched off	- Turn the ON/OFF switches (see chapter "Controls") at all control units ON. - Switch ON the mains isolator, if installed (outside the boiler room). - Check the fuse/MCB in the power distribution board (main domestic fuse/ MCB), and reset/replace if required.

Control unit or remote control incorrectly set.	Check settings and correct if required:
	- At every Vitotronic 100: "▮▮▮" must be set (see page 13).
	- At the Vitotronic 300-K:
	  - "Heating and DHW" must be selected for the heating circuit (see page 15).
	  - Room temperature (see page 15).
	  - Time (see page 25).
	  - Time program (see page 16).
	  - Heating curve (see page 17)
	- Check the settings at the remote control (if available).
	  Separate operating instructions

Only when operating with DHW heating: DHW priority is enabled.	Wait until the DHW tank has been heated up.
Slab curing function for slab curing drying is active.	Wait until the slab curing drying time has elapsed.
No fuel.	- With fuel oil or LPG: Check the fuel reserves and re-order if required. - With natural gas: Open the gas shut-off valve or enquire with your gas supply utility if required.
"Fault" is displayed at the Vitotronic 300-K, and the red fault indicator flashes (see chapter "Controls").	Scan the type of fault, make a note of the fault code and acknowledge the message (see page 30). Contact your local heating contractor if required.
Symbol "⚠" is displayed by the Vitotronic 100.	Scan the type of fault, make a note of the fault code and acknowledge the message (see page 29). If necessary, notify your heating contractor.

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Rooms are Too Hot

Cause	Remedy

Control unit or remote control incorrectly set.	Check settings and correct if required:
	- At the Vitotronic 300-K:
	  - Room temperature (see page 15).
	  - Time (see page 25).
	  - Time program (see page 16).
	  - Heating curve (see page 17).
	- Check the settings at the remote control (if available).
	  Separate operating instructions

"Fault" is displayed at the Vitotronic 300-K, and the red fault indicator flashes (see chapter "Controls").	Scan the type of fault, make a note of the fault code and acknowledge the message (see page 30). Contact your local heating contractor if required.
Symbol "⚠" is displayed by the Vitotronic 100.	Scan the type of fault, make a note of the fault code and acknowledge the message (see page 29). If necessary, notify your heating contractor.
Emissions test mode is enabled	Terminate emissions test mode (see page 31).

There is No Hot Water

Cause	Remedy
The heating system is switched off.	- Turn the ON/OFF switches (see chapter "Controls") at all control units ON. - Switch ON the mains isolator, if installed (outside the boiler room). - Check the fuse/MCB in the power distribution board (main domestic fuse/ MCB), and reset/replace if required.

Control unit or remote control incorrectly set.	Check settings and correct if required:
	- At every Vitotronic 100:
	"▮▮▮" must be set (see page 13).
	- At the Vitotronic 300-K:
	  - DHW heating must be enabled (see page 20).
	  - DHW temperature (see page 20).
	  - Time (see page 25).
	  - Time program (see page 21).
	- Check the settings at the remote control (if available).
	  See sparate operating instructions

No fuel.	See page 32.
"Fault" is displayed at the Vitotronic 300-K, and the red fault indicator flashes (see chapter "Controls").	Scan the type of fault, make a note of the fault code and acknowledge the message (see page 30). If necessary, notify your heating contractor.
Symbol "⚠" is displayed by the Vitotronic 100.	Scan the type of fault, make a note of the fault code nd acknowledge the message (see page 29). If necessary, notify your heating contractor.

The DHW is Too Hot

Cause	Remedy
Control unit incorrectly adjusted.	Check and correct the DHW temperature, if required (see page 20).
DHW heating is carried out by the solar thermal system.	Check and correct settings, if required, at the solar control unit.  Separate operating instructions
Emissions test mode is enabled.	Terminate emissions test mode (see page 31).

"OFF" is Displayed at the Vitotronic 100

Cause	Remedy
The heating program is enabled or the boiler is shut down externally.	Set the heating program ▮▮▮. If necessary, notify your heating contractor.

"🔧" is Displayed at the Vitotronic 100

Cause	Remedy
The time for a service, as specified by your heating contractor, has arrived.	Proceed as described on page 29.

"⚠" is Displayed at the Vitotronic 100

Cause	Remedy
Heating system fault.	Proceed as described on page 29.

"⚠" Flashes and "Fault" is Displayed at the Vitotronic 300-K

Cause	Remedy
Heating system fault.	Proceed as described on page 30.

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“Controls Locked out” is Displayed at the Vitotronic 300-K

Cause	Remedy
This function is disabled.	Your heating contractor can lift this block.

“External Hook-up” is Displayed at the Vitotronic 300-K

Cause	Remedy
The heating program selected at the control unit was changed over by an external switching device.	No remedy required.

“Central Control” is Displayed at the Vitotronic 300-K

Cause	Remedy
The settings of the heating and holiday programs will be adopted from the heating circuit for which “Central control” has been selected.	--

“External Program” is Displayed at the Vitotronic 300-K

Cause	Remedy
The heating program set at the control unit was changed over by the Vitocom communication interface.	You can change the heating program.

Maintenance

Cleaning

All equipment can be cleaned with a commercially available domestic cleaning agent (non-scouring).
You can clean the front of the programming unit with a microfibre cloth.

Inspection and maintenance

Regular maintenance ensures trouble free, energy efficient, environmentally responsible and safe heating. Your heating system must be serviced by an authorised contractor at least every 2 years. For this, we advise you to arrange an inspection and maintenance contract with your local heating contractor.

Boiler

Increasing boiler contamination raises the flue gas temperature and thereby increases energy losses.
For that reason, all boilers should be cleaned annually.

DHW tank (if installed)

Maintenance and cleaning should be carried out no later than two years after commissioning and thereafter as required.
Only a qualified heating contractor should clean the inside of a DHW tank and the DHW connections.
Refill any water treatment equipment (e.g. a lock or injection system) in good time, if such equipment is installed in the cold water supply of the DHW tank.
Observe the manufacturer's instructions.
Additionally for a Vitocell 100:
We recommend that the correct function of the sacrificial anode is checked annually by your heating contractor.
The anode function can be checked without interrupting the system operation.
The heating contractor will check the ground current with an anode tester.

Safety valve (DHW tank)

The safety valve function should be checked every six months by venting, either by the system user or the local heating contractor. The valve seat may become contaminated (see the valve manufacturer's instructions).

Potable water filter (if installed)

To maintain high hygienic standards, proceed as follows:

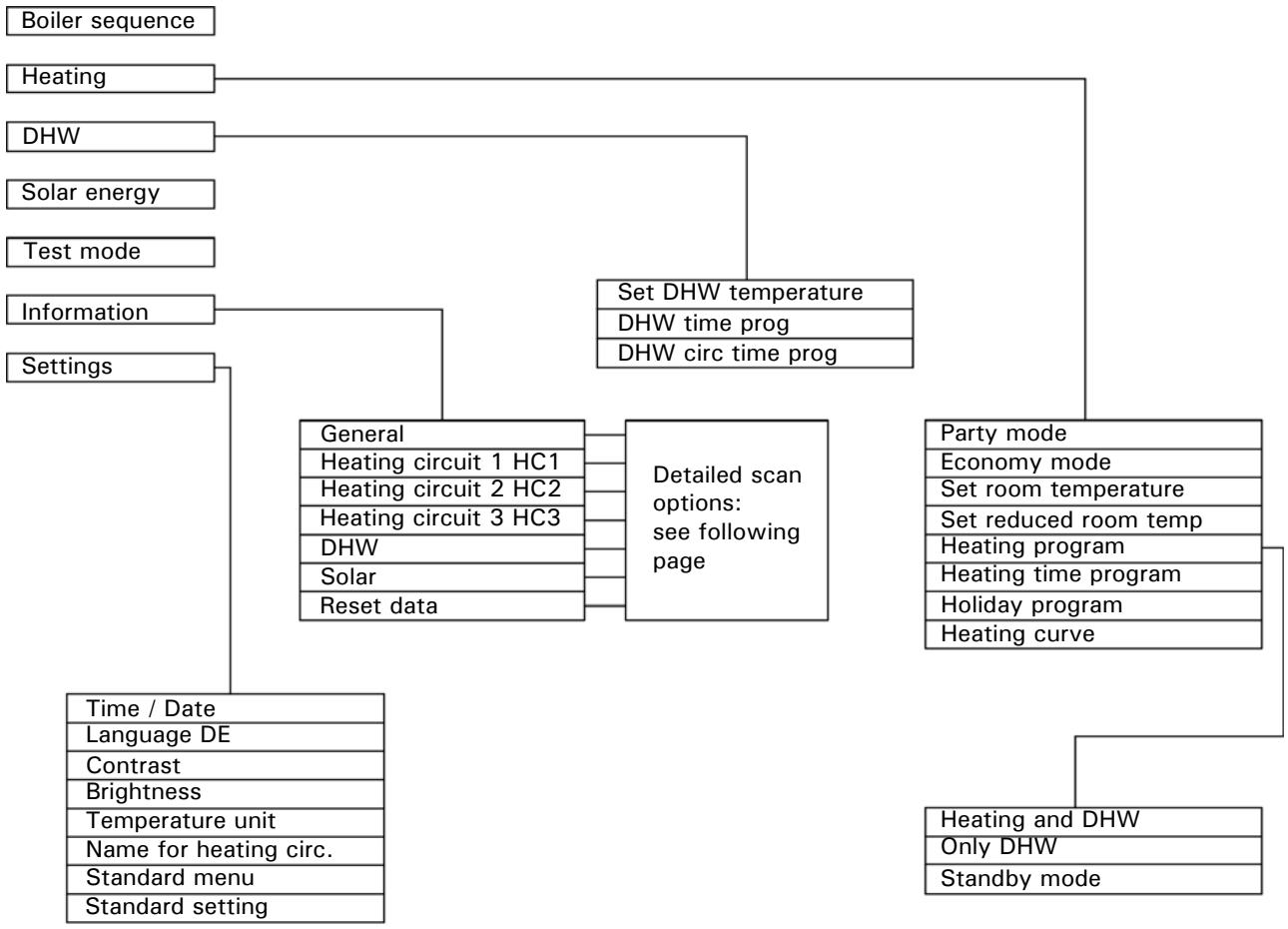
- Replace filter element on non-back flushing filters every six months (visual inspection every two months).
- On back flushing filters, back flush every two months.

Damaged connecting cables

If connecting cables of the appliance or externally installed electrical accessories are damaged, replace them with special connecting cables. Replace only with Viessmann cables. Contact your local heating contractor.

Menu Overview Vitotronic 300-K

Extended menu



Menu Overview Vitotronic 300-K *(continued)*

Scanning options in the extended menu

Note: Subject to the actual heating system equipment level, not all of the scans listed here may be available.
You can scan more details on information marked with ▶.

General	**Heating circuit 1 (HC1)**
"Outside temp"	"Heating program"▶
"Boiler sequence"▶	- "Screed function"
"Boiler temperature"▶ Boiler	- "External hook-up"
"Sensor 17 A"	- "Holiday program"
"Sensor 17 B"	- "External program"
"Common supply temp"	- "Party mode"
"Output 20"	- "Economy mode"
"Output 29"	- "Heating and DHW"
"Output 52"	- "only DHW"
"Feed pump"	- "Standby mode"
"Block 3rd pty dev"	
"Central fault mess"	**"Operating status:"▶**
"Participant no."	- "Standard heating mode"
"Input ext. EA1"▶	- "Reduced mode"
"Time"	- "Standby mode"
"Date"	"Time program"▶
"Radio clock signal"	"Set room temperature"
	"Room temperature"
	"Set red. room temp"
	"Set ext. room temp"
	"Set party temp"
	"Slope"
	"Shift"
	"Heating pump"
	"Holiday program"▶

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Menu Overview Vitotronic 300-K *(continued)*

Heating circuit 2, 3 (HC2, HC3)	**DHW**
"Heating program"►	"DHW time prog"►
- "Slab curing function"	"DHW circ time prog"►
- "External hook-up"	"DHW temperature"
- "Holiday program"	or
- "External program"	In conjunction with 2 DHW tank temperature sensors:
- "Party mode"	"DHW temp top"
- "Economy mode"	"DHW temp bottom"
- "Heating and DHW"	"DHW tank prim pump"
- "only DHW"	"DHW circ pump"
- "Standby mode"	
"Operating status:"►	
- "Standard heating mode"	**Solar**
- "Reduced mode"	"Collector temp"
- "Standby mode"	"Solar DHW"
"Time program"►	"Solar circuit pump" (hours run)
"Set room temperature"	"Solar energy history"►
"Room temperature"	"Solar energy"
"Set red. room temp"	"Solar circuit pump" (ON/OFF) or
"Set ext. room temp"	"Solar circ pump speed"
"Set party temp"	"Heating suppr. DHW"
"Slope"	"SM1 output 22" (ON/OFF)
"Shift"	"SM1 output 22" (hours run)
"Heating pump"	"Sensor 7"
"Mixing valve"	"Sensor 10"
"Supply temperature"	"Heat suppr. heating"
"Return temperature"	
"Holiday program"►	

Terminology

Setback mode (reduced heating mode)

See “Reduced heating mode”.

Heating program

With the heating program you determine whether you heat your rooms and DHW, or only heat DHW, or whether you shut down your heating system with frost protection monitoring.

You can select the following heating programs:

- “Heating and DHW”
  The rooms are heated and DHW is provided (winter mode).
- “only DHW”
  DHW is provided but there is no central heating (summer mode).
- “Standby mode”
  Frost protection for the boiler and the DHW tank is enabled, no central heating, no DHW heating.

Note: No operating program is available for central heating without DHW heating. When you want central heating, hot water is generally also required (winter mode). If you do want just central heating, select the heating program “Heating and DHW” and set the DHW temperature to 50° F (10° C) (see chapter “Setting the DHW temperature”). This means that you will not heat DHW unnecessarily, but frost protection of the DHW tank is ensured.

Operating status

In the heating program “Heating and DHW”, the operating status changes from “Standard heating mode” (see page 42) to the operating status “Reduced heating mode” (see page 42) and vice versa. The times for the operating status change are defined when the time program is set.

Extension kit for heating circuit with mixing valve

Assembly (accessory) for controlling a heating circuit with mixing valve.
See “Mixing valve”.

Heating curve

Heating curves illustrate the relationship between the outside temperature, room temperature (set value) and boiler water or (heating circuit) supply temperature.
The lower the outside temperature, the higher the boiler water temperature or heating circuit supply temperature.

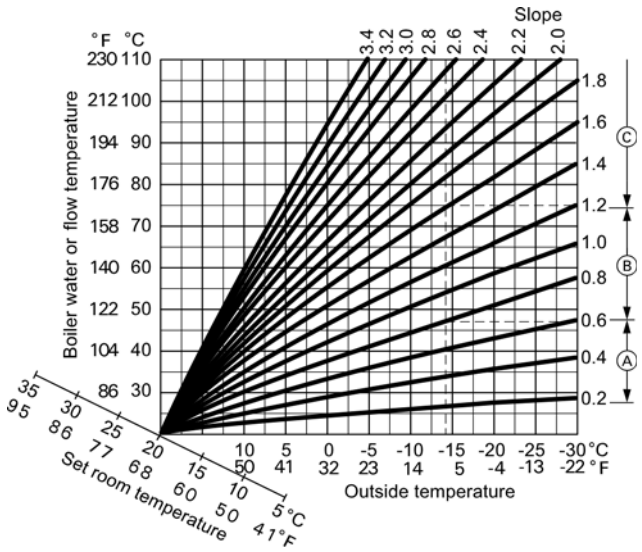
Heating circuit

A heating circuit is a sealed circuit between the boiler and radiators, in which the heating water circulates.
A heating system may comprise several heating circuits. For example, one heating circuit for the rooms occupied by you and one heating circuit for the rooms of a separate apartment.

Heating circuit pump

Circulation pump for the circulation of the heating water in the heating circuit.

Terminology *(continued)*



Example:

For outside temperature 7° F (-14° C):

Legend

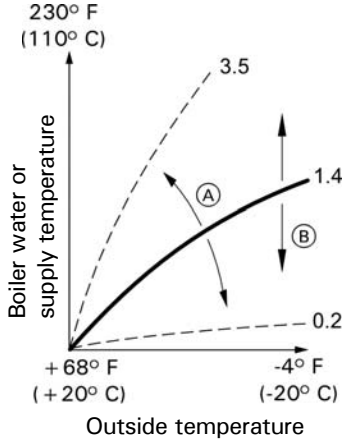
Ⓐ Underfloor heating system, slope 0.2 to 0.8
Ⓑ Low temperature heating system, slope 0.8 to 1.6
Ⓒ Heating system with a boiler water temperature in excess of 167° F (75° C), slope 1.6 to 2.0

In order to guarantee sufficient heat and minimum fuel consumption at any outside temperature, the conditions of your building and your heating system must be taken into consideration. The heating curve is set by your heating contractor for this purpose.

Note: If your heating system includes heating circuits with mixing valves, then the supply temperature for the heating circuit without mixing valve is higher by a selected differential than the supply temperature for the heating circuits with mixing valve.

The illustrated heating curves apply with the following settings:

- Heating curve shift = 0
- Standard room temperature (set value) = 68° F (20° C)



Factory settings: Slope = 1.4 and shift = 0

Legend

Ⓐ Changing the slope:
The steepness of the heating curve changes

Ⓑ Changing the shift:
The heating curves are shifted in parallel in a vertical direction

Terminology *(continued)*

Actual temperature

Current temperature at the time of the scan; e.g. actual DHW temperature.

Mixing valve

A mixing valve mixes the water heated in the boiler with the cooled water returning from the heating circuit. The water, heated to the right temperature in line with demand, is pumped to the heating circuit by the heating circuit pump. The control unit adjusts the heating circuit supply temperature via the mixing valve to the various conditions, e.g. different outside temperature.

Night setback

See “Reduced heating mode”.

Standard heating mode

When you are in the house during the day, you can heat the rooms in standard heating mode. Set the periods using the time program for central heating. During these periods, the rooms are heated to the standard room temperature.

Standard room temperature

Set the standard room temperature when you are at home during the day (see chapter “Setting the room temperature”).

Open flue operation

The combustion air is drawn from the room where the boiler is installed.

Balanced flue operation

The combustion air is drawn from outside the building.

Reduced heating mode

When you are out or during the night, you can heat the rooms in reduced heating mode (setback mode). Set the periods using the time program for central heating. During these periods, the rooms are heated to a reduced room temperature.

Reduced room temperature

When you are out or during the night, set the reduced room temperature (see chapter “Setting the room temperature”).
See also “Reduced heating mode”.

Safety valve

A safety device that must be installed by your heating contractor in the cold water pipe. The safety valve opens automatically to prevent excess pressure in the DHW tank.

Solar circuit pump

In conjunction with solar thermal systems.
The solar circuit pump delivers the cooled heat transfer medium from the DHW tank indirect coil to the collectors.

Set temperature

Default temperature that should be reached; e.g. set DHW temperature.

Summer mode

Heating program “Only DHW”.
At warmer times of the year, i.e. when rooms do not have to be heated, you can disable heating mode. The boiler remains operational for DHW heating.

DHW tank primary pump

Circulation pump for heating the DHW in the DHW tank.

Drinking water filter

A device that removes solids from the water.
The drinking water filter is installed in the cold water pipe upstream of the DHW tank or the instantaneous water heater.

Weather-compensated mode

In weather-compensated mode, the heating supply temperature is controlled according to the outside temperature.
This means that no unnecessary heat is generated in order to heat the rooms to the set room temperature you selected.
The outside temperature is captured and transmitted to the control unit by a sensor fitted outside the building.

DHW circulation pump

The DHW circulation pump transports the hot water around a circuit between the DHW tank and the draw-off points (e.g. hot tap). This makes hot water available quickly at the draw-off point.

Quick Reference

°C	°F
-40	-40
-35	-31
-25	-13
-20	-4
-18	0
-16	+3
-14	+7
-12	+10
-10	+14
-9	+16
-8	+18
-7	+19
-6	+21
-5	+23
-4	+25
-3	+27
-2	+28
-1	+30
0	+32
+1	+34
+2	+36
+3	+37
+4	+39
+5	+41
+6	+43
+7	+45
+8	+46
+9	+48
+10	+50
+12	+54
+14	+57
+16	+61
+18	+64
+20	+68
+25	+77
+30	+86
+35	+95
+40	+104
+50	+122
+60	+140
+70	+158
+80	+176
+90	+194
+100	+212
+110	+230

Viessmann Manufacturing Company Inc.
750 McMurray Road
Waterloo, Ontario • N2V 2G5 • Canada
TechInfo Line 1-888-484-8643
1-800-387-7373 • Fax (519) 885-0887
www.viessmann.ca • info@viessmann.ca

Viessmann Manufacturing Company (U.S.) Inc.
45 Access Road
Warwick, Rhode Island • 02886 • USA
TechInfo Line 1-888-484-8643
1-800-288-0667 • Fax (401) 732-0590
www.viessmann-us.com • info@viessmann-us.com

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