

# Global 55 CF RCE Global 55XT CF RCE

G20/G25/G25.3 (Natural gas) G31 (Propane)



Installation manual



Store this document in a safe place



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## 1. Introduction

DRU, a manufacturer of gas-fired heating appliances, develops and produces products that comply with the highest quality, performance and safety requirements. This appliance has a CE label, which means that it complies with the essential requirements of the European gas appliance directive. The appliance is supplied with an installation manual and a user manual. Installation and maintenance of the appliance should be performed by a professional certified expert with proven knowledge and demonstrable competence in this field. A professional expert takes all technical aspects such as heat output and gas connection into account, as well as the flue gas discharge requirements. The installation manual will give you the information you need to install the appliance in such a way that it will operate properly and safely. If the installation instruction is not clear, national/local regulations must be observed.

This manual discusses the installation of the appliance and the regulations that apply to the installation. In addition, you will find the appliance's technical data as well as information on maintenance, possible malfunctions that might occur and what may cause them.

The figures can be found at the back of this booklet, in the appendix.

Please, read and use this installation manual carefully and completely, prior to installing this appliance. If you use the DRU Powervent system® or the DRU Smartvent system®, you must carefully and fully read and use the accompanying installation manual as well, prior to its installation.

The following symbols are used in the manual to indicate important information:

- Work to be performed
- !Tip Suggestions and recommendations

**!Caution** You will need these instructions to prevent problems that might occur during installation and/or use.

**!Caution** You need these instructions to prevent fire, personal injury or other serious damages.

After delivery, you should give the manuals to the user.

## 2. CE declaration

DRU declares that company internal measures guarantee that appliances produced by DRU meet the essential requirements and guidelines of the regulation concerning gas-fired appliances and the accompanying standards. This declaration loses its validity if changes are made to the appliance without written permission from DRU. The instructions in the manuals must also be observed at all times.

A copy of the CE test certificate can be downloaded via [www.druservice.com](http://www.druservice.com).

Product:	Gas-fired heating appliance
Type:	Global 55 CF RCE, Global 55XT CF RCE
Product identification number:	0063CP3640
Conformity assessment agency:	Kiwa Netherlands B.V. (0063) Wilmsdorf 50 Postbus 137 7300 AC, Apeldoorn
Regulations:	(EU) 2016/426, (EU) 2015/1188
Standards:	EN 613:2000, EN 613:2000/A1:2003, EN 613:2000/PrA2:2002

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Duiven, 09-02-2018



R.P. Zantinge Managing director

### 3. SAFETY

#### 3.1 General

- !Caution**
- Please observe the generally applicable regulations and precautions/safety instruction in this manual.
  - First check the exact technical version of the appliance to be installed in Appendix 2, Table 2.

#### 3.2 Regulations

Please install the appliance in accordance with the applicable national, local and constructional (installation) regulations.

#### 3.3 Precautions / safety instructions during installation

Carefully observe the following precautions/safety regulations:

- You should only install and maintain the appliance if you are a certified and competent installer in the field of gas-fired heating.
- Do not make any changes to the appliance.
- If you are installing an appliance that must be built in;
  - use non combustible and heat-resistant material for the chimney breast, including the top of the chimney breast, the material inside the chimney breast and the back wall against which the appliance will be placed. For this you can use both sheet material and stone-like materials;
  - take sufficient measures to prevent high temperatures of the wall behind the chimney breast, including the materials and/or objects that are behind the wall;
  - comply with the minimum required internal measurements of the chimney breast;
  - vent the chimney breast by means of ventilation holes with a combined passage as stated further down in the text. When placing an appliance with open combustion (type B<sub>11 AS/BS</sub>), no chimney breast ventilation is required, as there is an existing chimney with a brickwork fireplace that is sufficiently able to absorb the heat;
  - use heat-resistant electric connections and make sure that they do not make contact with the appliance;
- If you are installing an appliance with open combustion: please use a suitable flue gas discharge system provided with the CE label, and make sure there is sufficient ventilation of the room where the appliance is installed, according to legislation.
- If you are installing an appliance with a closed combustion: only use the concentric systems supplied by DRU.
- If you are installing a free-standing appliance:
  - place the appliance away from the back wall by the minimum distance stated further down in the text;
  - make sure you observe the minimum distance in relation to the side wall(s) and the space above the appliance (see Appendix 3, fig. 2).
- Do not cover the appliance and/or do not wrap it in an insulation blanket or any other material.
- Unless stated otherwise: make sure that combustible objects and/or materials have a distance from the appliance of at least 500 mm.
- Only use the accompanying wood/pebble set and place it exactly as described.
- The space surrounding the pilot burner, 2nd thermocouple or ionisation pins must remain free.
- Make sure there is no dirt in gas pipes and connections.
- Place a gas tap in accordance with applicable regulations.
- Prior to putting into operation, check the complete installation for gastightness.
- If your appliance is provided with explosion hatches on its top, you must make sure that they cannot be blocked and check whether they fit well onto the sealing surface, prior to building in the appliance.
- Do not ignite the appliance before the gas and discharge connections have been fully installed, first observe the procedure described in chapter 7.3.
- Replace broken or torn glass panes.
- The appliance was designed for atmospheric and heating purposes. This means that all visible surfaces, including the glass pane, can become hotter than 100°C. It is recommended to always place a protective grating in front of the appliance when there are children, elderly people or handicapped persons in the same room as the appliance. If it is possible that vulnerable people are regularly present in the room with no supervision, a fixed guard should be mounted around the appliance.

- !Caution** In case of broken or torn glass panes, the application may not be used.

### 3.4 Second thermocouple safety (if applicable, see Appendix 2, Table 2)

It is possible, that the appliance to be installed has 2 thermocouples. Thermocouple 1 is always next to the pilot burner, thermocouple 2 is always elsewhere above the main burner.

If the appliance is provided with a second thermocouple safety on the main burner, you need to know that it will intervene if no proper transfer has taken place from the pilot burner to the main burner or from the main burner itself. The gas supply will be interrupted after 22 seconds. In order to solve a poor or non-existent transfer from the pilot burner to the main burner, please use the malfunction search diagram in Appendix 1.

### 3.5 Oxypilot safety (if applicable, see Appendix 2, Table 2)

If the appliance is provided with an oxypilot safety, you need to know that it will intervene (the pilot flame and the gas supply to the main burner will be switched off) if insufficient combustion air (oxygen) is supplied and/or if the discharge system has insufficient thermal draught.

Once the supply of combustion air is sufficient again, the appliance can be restarted.

The supply of fresh air can be controlled by installing/opening ventilation holes in the room where the appliance is installed.

## 4. Removing the packaging

Note the following items when removing the packaging:

- Remove all packaging materials.
- Remove all supplied components in, on and/or at the appliance.
- Check the appliance and accessories for damages (during transport).
- If necessary, contact your supplier.
- Never install an appliance that is damaged !
- Remove any screws that are used to fix the appliance to a platform or pallet.

**!Caution** The glass pane(s) is/are made of a ceramic material. Very small irregularities in the glass pane(s) cannot be avoided, but are within the required quality standards.

**!Caution** Keep plastic bags away from children.

In Appendix 2, Table 1 you can see which parts you should have after removing the packaging.

- Contact your supplier if you do not have all the parts after you finished removing the packaging.
- Dispose of packaging in accordance with local regulations.

## 5. Installation

Read this manual carefully to ensure the proper and safe installation of the appliance.

**!Caution** Install the appliance in the order described in this chapter.

- Please install the appliance in accordance with the applicable national, local and constructional (installation) regulations.
- Observe the regulations/instructions in this manual.

### 5.1 Type of gas

The data plate indicates for which type of gas, gas pressure and for which country this appliance is intended.

The data plate can be found on the appliance or can be attached to a chain to which it should remain attached.

**!Caution** Check whether the appliance is suitable for the type of gas and the gas pressure used at the location.

#### 5.1.1 Reconstruction to different type of gas

If you want to convert this appliance into a different type of gas, please contact DRU's service department and ask what is possible. Reconstructions should only be performed by authorized gas installers.

## 5.2 Connection

### 5.2.1 Gas connection

Place a gas tap in the gas pipe in accordance with the applicable regulations.

- !Caution**
- Make sure there is no dirt in the gas pipes and connections.
  - No soldering may take place at the flexible gas hose(s), as this could cause leaks.

The following requirements apply to the gas connection:

- use a gas pipe with the correct dimensions, so that no pressure loss can occur;
- the gas tap must be approved (in the EU this will be the CE mark);
- you should always be able to reach the gas tap.

### 5.2.2 Electric connection

In case of a 230 Volt electrical connection, provide proper grounding, if applicable.

Place this electrical connection away from the appliance, as low as possible in the chimney breast.

This has to do with the temperature development in the chimney breast.

If possible, place the receiver after any building work has been completed.

If this is not possible:

- !Caution** Protect the receiver against dust and moisture created during the building process!

## 5.3 Placing the appliance

- !Caution**
- Unless stated otherwise: always place the appliance with a minimum distance of 500 mm from combustible objects or materials;
  - Place the discharge pipes in such a way that situations with risk of fire can never occur;
  - Always place the appliance in front of a wall of non combustible and heat-resistant material;
  - Always maintain a minimum distance between appliance and back wall, if indicated in the dimensional drawing (Appendix 3, fig. 2);
  - Take sufficient measures to prevent high temperatures of a possible wall behind the chimney breast, including the materials and/or objects that are behind the wall;
  - Do not cover the appliance and/or do not wrap it in an insulation blanket or any other material;
  - Make sure that the appliance to be installed has a stable position. Attach the appliance, if applicable, to the wall using the wall brackets and/or fasten the extending legs with self-tapping screws.

- !Caution** When installing an appliance that has to be built in, take the following into account:

The minimum construction dimensions according to Appendix 3, fig. 1 and 2.

- Provide a gas connection at the location. For details (see section 5.2).
- Make a passage for the flue gas discharge system or the concentric system with the following diameters; for details, see section 5.7 or 5.8:
  - the pipe diameter +10 mm for a passage through non combustible material;
  - the pipe diameter +100 mm for a passage through combustible material.

- !Caution** Starting at section 5.9, you will find additional instructions that are specifically needed for the installation of your appliance.

## 5.4 Placing a built in appliance (if applicable)

Not all DRU built in appliances are supplied with a control hatch. If not included in the delivery, this control hatch is available separately. In case of appliances with closed combustion (type C11/C31) we always recommend using the Dru control hatch. In case of appliances with open combustion (type B<sub>11 AS/BS</sub>), a control hatch is not required. In this section we assume an application with control hatch.

- !Caution** If you do not use a recommended Dru control hatch, please strictly observe the safeguards and necessary instructions stated in chapters 5.4 to 5.6.

If you are not using the control hatch, please take the following into account as well:

- the accessibility of components that are normally placed in the control hatch;
- the maximum temperature of these components (maximum 55 °C).

The gas control is mounted under the appliance, at the burner mounting plate. It must be taken out and placed in the control hatch at a later time. For placing the gas control in the control hatch, see section 5.6.

Follow the procedure described below:

- Disconnect the pipes from the gas control (flexible gas pipe, aluminium pilot burner pipe and thermocouple 1);

**!Caution** The red wire of thermocouple 2, if applicable, must remain connected to the gas control.

- Disconnect the gas control from the burner mounting plate by unscrewing the self-tapping screw.
- Carefully unwind the red and black wire of thermocouple 2, if applicable.
- Carefully lay the gas control together with the wires of thermocouple 2, the ignition cable, the flexible gas hose, the aluminium pilot burner pipe and the type plate plus chain in the direction of the control hatch.

- !Caution**
- Prevent dirt in gas pipes and connections;
  - Avoid kinks in the pipes.

- !Caution**
- Make sure the ignition cable cannot come into contact with other wires;
  - The data plate should remain attached to the chain.

- Set the height of the appliance using the adjustable feet (if applicable).
- Make the appliance level at the same time.

**!Tip** The construction frame for most 2 or 3 sided appliances can be adjusted. This will allow you to connect the construction frame to the chimney breast correctly. For 2 or 3 sided appliances that cannot be adjusted, we would like to refer you to chapter 5.9 'Additional instructions'.

**!Caution** do not ignite the appliance before the gas and discharge connections have been fully installed, first observe the procedure described in chapter 7.3.

### 5.5 Placing the chimney breast (if applicable)

In order to provide proper heat discharge, there should be sufficient space around the appliance. The chimney breast should be ventilated sufficiently by means of ventilation holes (incoming and outgoing).

- !Caution**
- Use non combustible and heat-resistant material for the chimney breast, including the top of the chimney breast, the material inside the chimney breast and the back wall of the chimney breast.
  - Make sure that the appliance is not carrying the weight of the chimney breast when using stone-like materials.
  - The passage of the ventilation holes (outgoing), which are placed as high as possible, is stated in Appendix 2, Table 2.

**!Caution** When placing the chimney breast, you should take the following into account (see Appendix 3, fig. 2):

- the location of the control hatch: this must be placed as low as possible;
- the dimensions of the control hatch; see Placing the control hatch section 5.6;
- the Dru control hatch is not supplied with all appliances. Nevertheless, we recommend only using a Dru control hatch, if available, except in the case of B<sub>11 AS/BS</sub> appliances. If you decide not to take this option, you will have to make a 100 cm<sup>2</sup> ventilation hole that is placed as low as possible, for the benefit of the incoming ventilation;
- the location of the ventilation holes (V) (outgoing);
- maintain a minimum 30 cm distance between the top of the ventilation hole (outgoing) and the ceiling of the house.
- the measurements of the glass pane, so that it can be placed/removed after placing the chimney breast;
- the protection of the gas control and the pipes against cement and plaster.
- If possible, you should place decorative strips, frames, etc., after any required structural work has been completed. Avoid the use of painter's tape. If this is not possible: please use good quality painter's tape and remove it immediately after plastering or painting work has been completed.

**!Tip** You should preferably apply the ventilation holes (outgoing) on both sides of the chimney breast. You can use DRU ventilation elements.

- Prior to completely closing the chimney breast, check whether the discharge / concentric system is placed correctly.
- whether the channels, fixing brackets and possible clip bindings, which cannot be reached after installation, are fastened by means of self-tapping screws.



- If applicable, do not plaster on or over the edges of the construction frame, because:
  - the heat of the appliance could cause cracks;
  - it will no longer be possible to remove/place the glass pane.
- When using stone-like materials and/or a plaster finishing, allow the chimney breast to dry for at least six weeks prior to using the appliance in order to prevent cracks.

### 5.6 Placing the control hatch (if applicable)

The control hatch (also see paragraphs 5.4 and 5.5) is placed as low as possible in the chimney breast.

- !Caution**
- The bottom of the control hatch may not be placed higher in the appliance than the burner surface.
  - Place control hatch and bracket with gas control and accessories indoors in a dry place only!

A number of components are placed in the control hatch, such as data plate, gas control, receiver belonging to the remote control and, if applicable, the components belonging to the DRU Powervent system\*.

Place the control hatch as follows; see Appendix 3, fig. 3 for details:

- Make an opening in the chimney breast, as described in the manual for the control hatch.
- Place the inner frame (1); unscrew bolts (5) for this.

- !Tip**
- When the chimney breast is made of bricks, the inner frame can be built with bricks at the same time
  - When using a different material, you can glue the inner frame or fix it with four flush screws.

- Mount the gas control to the brackets of the inner frame (2).
- Check whether pipes and connections are free from dirt;
- Reconnect the pipes to the gas control.

- !Caution**
- Avoid kinks in the pipes;
  - Tighten the flexible gas pipe and the pilot burner pipe until they are gastight.
  - First tighten the thermocouple by hand and;
  - Then tighten it a quarter turn using a suitable spanner;
  - The pilot burner pipe must be protected against possible corrosive influences as a result of, for example, humidity, cement that has fallen down, dirt that has fallen down from the chimney, etc. The pilot burner pipe should remain permanently free from the ground and the walls of the room in which the appliance is built in. When installing in an existing fireplace, or if it is not possible to keep the pipes free, the pipe should be protected against corrosion by means of a jacket.

- Prevent dirt in gas pipes and connections.
- Connect the gas pipe to the gas tap.
- Bleed the gas pipe.
- Place the receiver in the holder (3); for connecting, see section 6.1.
- Place the data plate in its intended clamp (6).
- Fix the outer frame with door (4) to the inner frame using 2 socket cap screws (5).

- !Tip** You can place the outer frame in such a way, that the door turns to the left or to the right.

## 5.7 Flue gas discharge system in appliances with open combustion

For connection to an existing chimney without a discharge pipe or flexible SS discharge - only allowed in Great Britain - the instructions provided in the separately supplied booklet 'Fitting into a conventional class 1 chimney' apply. In addition to the installation instructions, this booklet also contains supplementary tests. In this situation we recommend using a stainless steel flexible discharge pipe over the complete length, with a draught increasing hood.

### 5.7.1 General

The connection dimensions and the minimum length of the discharge system are indicated in Annex 2, table 2. The appliance should be connected in accordance with the applicable national, local and constructional (installation) regulations. You should only install the appliance in a well ventilated room which complies with the applicable national, local and constructional (installation) regulations, in order to guarantee sufficient air supply.



- !Caution** • When the appliance is installed in a house with a mechanical air extraction system and/or an open kitchen with cooker hood, you will need a permanent ventilation hole in the room where the appliance is installed; please observe the gas installation regulations and the local regulations for dimensions and other required provisions.
- No ventilation of the chimney breast is required in case of an existing chimney with a masonry fireplace that is sufficiently able to absorb the heat. Therefore the ventilation hole in the chimney breast does not apply to the class 1 chimney in the UK.

### 5.7.2 Connection of flue gas discharge system (if a class 1 chimney is not applicable)

For connection to an existing chimney, a flexible stainless steel discharge pipe is required over the complete length for the discharge of the flue gases, unless indicated otherwise. A draught increasing hood is recommended here.

- !Caution** • Prevent dirt from an existing chimney from entering the flue gas discharge.
- Prevent false draught by carefully closing the space between the existing chimney and the discharge material.
  - Bends of more than 45 degrees are not allowed in the flue gas discharge system, unless indicated otherwise.
  - Maintain a distance of at least 50 mm between the outside of the concentric system and the walls and/or ceiling. If the system is built in (for instance) a cove, it should be made with non combustible material all around it;
  - Use heat-resistant insulation material when passing through combustible material.
  - Use a flue gas discharge system with the correct diameter, and which is provided with the CE mark.

**!Caution** Some heat-resistant insulation materials contain volatile components that will spread an unpleasant smell during a longer period; these are not suitable.

Place the flue gas discharge system as follows:

- Connect the pipe pieces or flexible SS discharge.

- !Caution** • Make sure that the right insertion length is maintained.
- Secure the connections on locations that are impossible to reach after installation by means of self-tapping screws.

## 5.8 Flue gas discharge / combustion air supply system in appliances with closed combustion

### 5.8.1 General

The appliance's type of discharge system is stated in Appendix 2, Table 2.

The appliance will be connected to a combined flue gas discharge / combustion air supply system, hereafter to be referred to as the concentric system.

The passage to the outside can be made with both a wall terminal and roof terminal. If necessary, you can also use an existing chimney (see section 5.8.4).

- !Caution** • Only use the concentric system supplied by DRU This system has been tested in combination with the appliance. DRU cannot guarantee a proper and safe operation of other systems and does not accept any responsibility or liability for this;
- For connecting to an existing chimney you should only use the chimney kit supplied by DRU.

The concentric system is constructed from (the flue spigot of) the appliance.

If, due to constructional circumstances, the concentric system is placed first, it is possible to connect the appliance by means of a telescopic pipe piece.

### 5.8.2 Construction of the concentric system

Depending on the construction of the concentric system, the appliance will have to be further adjusted with possibly a restrictor slide or air inlet guide.

See Tables 4 and 6 for determining the correct adjustment and section 'Adjustment of the appliance' for the method of working.

The concentric system with wall or roof terminal has to comply with the following conditions:

- In appendix 2, table 4 or 5 you can find whether a concentric pipe should be connected and what the minimum vertical length would have to be.
- Determine the permissibility of the required discharge.

When using a **wall terminal**, the following applies:

- The total vertical pipe length, when using a wall terminal, may have a maximum length that you can find in Appendix 2, Table 4.
- The minimum vertical pipe length, when using a wall terminal, can be found in appendix 2, table 4.
- The total horizontal pipe length, when using a wall terminal, may have a maximum length that you can find in Appendix 2, Table 4 (without wall terminal; see Appendix 3, fig. 4).

**!Tip** In the horizontal section, 1 bend of 90° may be included. This bend counts for 2 metres. This means that the maximum allowed length is reduced by 2 metres. A 45° bend counts for 1 metre.

When using a **roof terminal**, the following applies:

- The construction of the chosen system, when using a roof terminal, must be permissible according to Appendix 2, Table 5. (See the method of working described below)

The working method below indicates how the permissibility is determined of a concentric system when using a roof terminal.

- 1) Count the number of 45° and 90° bends required
- 2) Count the total number of whole metres of horizontal pipe length;
- 3) Count the total number of metres of vertical and/or sloping pipe length (roof terminal excluded).
- 4) In the first 2 columns of Table 5, look for the number of bends required and the total horizontal pipe length.
- 5) In the top row of Table 5, look for the required total vertical and/or sloping pipe length.
- 6) If you end up in a box with a letter, the concentric system chosen by you is permissible.
- 7) Use Table 6 to determine how the appliance should be adjusted

### 5.8.3 Placing the concentric system

- !Caution**
- Maintain a distance of at least 50 mm between the outside of the concentric system and the walls and /or ceiling. If the system is built in (for instance) a cove, it should be made with non combustible material all around it;
  - Use heat-resistant insulation material when passing through combustible material;
  - The rosette of the wall terminal is too small to seal the opening when passing through combustible material. That is why you should first apply a sufficiently large heat-resistant intermediate sheet to the wall. Then, the rosette is mounted on the intermediate sheet.

The roof terminal can end in a sloping and a flat roof.

The roof terminal can be supplied with a glue plate for a flat roof or with a universally adaptable tile for a sloping roof.

**!Caution** Some heat-resistant insulation materials contain volatile components that will spread an unpleasant smell during a longer period; these are not suitable.

Place the concentric system as follows:

- Build the system up from (the flue spigot of) the appliance.
  - Connect the concentric pipe pieces and, if necessary, the bend(s).
  - On each connection, apply a clip binding with silicon sealing ring.
  - Use a self-tapping screw to fix the clip binding to the pipe on locations that cannot be reached after installation.
  - Attach the concentric system with sufficient fastening brackets, so that the weight is not resting on the appliance.
- Observe the following;
- Place the first fastening bracket 0.5 metre from the appliance, at the most.
  - Place a fastening bracket maximum 0.1 metre from each bend, if the bends are more than 0.25 metre away from each other. If two bends are closer to one another than 0.25 metre, 1 fastening bracket between these bends will be sufficient.
  - At least every 1 metre, place a fastening bracket at slanted and horizontal sections.
  - At least every 2 metres, place a fastening bracket at vertical sections.
- Fasten a roof terminal with anchor cables, if it protrudes more than 1,5 metres above the terminal.
  - Attach the wall terminal from the outside by means of four screws.

- Determine the remaining length for the wall or roof terminal and cut it to size, make sure the correct insertion length is maintained.
- Place the wall terminal with the (groove/folded) seam at the top.

**!Caution** When using the wall terminal, place the terminal with a downward slope of 1 cm / metre towards the outside, in order to prevent rain water from raining in.

#### **5.8.4 Connection to an existing chimney**

It is possible to connect the appliance to an existing chimney.

A flexible SS pipe is placed in the chimney with a fitting diameter at the flue gas discharge pipe, for the discharge of flue gas. The surrounding space is used to supply combustion air.

The following requirements apply when connecting to an existing chimney:

- only allowed when used in combination with the special DRU chimney kit. The installation regulation is also supplied;
- the internal dimensions should be at least 150 x 150 mm;
- the vertical length has a maximum of 12 metres;
- the total horizontal pipe length may have a maximum length that you can find in Appendix 2, Table 4;
- the existing chimney has to be clean;
- the existing chimney has to be tight.

For adjusting the appliance, the same conditions/instructions apply as for the concentric system described above.

## 5.9 Additional instructions

This appliance has been provided with an on/off switch. This switch can be used at all times to switch off the appliance (see Appendix 3, fig. 43b).

**!Caution** Check whether the on/of switch is set to the 'on' position to start up the appliance.

## 5.10 Placing the appliance

- !Caution** • Place the appliance on non combustible and heat-resistant material.
- Place the appliance in a chimney breast or existing fireplace (also see sections 5.4, 5.5 and 5.7), use non combustible and heat-resistant material.
- Use heat-resistant finishing materials such as plastering material around the appliance (see Appendix 3, fig. 45 (A));
- If the built-in appliance is less than 150mm above the floor, you should provide non combustible and heat-resistant material in front of the appliance (see Appendix 3, fig. 45 (B)).
- Keep a minimum 15 mm distance between the appliance and the back and side walls.

Place the appliance as follows:

- Paste the sealing tape on the edge of the appliance (see Appendix 3, fig. 2 (B)), this will reduce the transfer of heat from the appliance to the chimney breast. A high temperature of the chimney breast will cause cracks;
- Determine the location of the appliance, taking into account the dimensions of the appliance and the free space around the appliance (see Appendix 3, fig. 1 and 2);
- Determine the construction height of the appliance;
- If necessary, adjust the appliance and connect the flue gas discharge system (see sections 5.10.2 and 5.11);
- Provide a gas connection on site (see sections 5.2 and 5.10.1);
- Create a roof terminal for the flue gas discharge system with the following diameter (see section 5.7);
  - 110 mm for a roof terminal through non combustible material,
  - 200 mm for a roof terminal through combustible material.
- Level the appliance on its destined location;
- Fasten the appliance, using the holes in the flange at the front;
- Remove the glass pane (see section 5.12.1);
- Connect the appliance (see section 5.10.1);
- !Caution** Do not ignite the appliance until it is fully installed.
- Place the wood set (see section 5.13);
- Place the glass pane (see section 5.12.2).

### 5.10.1 Connecting the appliance

Connect the gas pipe to the gas tap under the burner mounting plate, proceed as follows:

- Remove the vermiculite tray from the appliance (see Appendix 3, fig. 10);
- Remove the profile from the front of the combustion chamber by removing the screws and taking out the profile (see Appendix 3, fig. 11);
- Remove the self-tapping screws from the burner mounting plate and remove the burner mounting plate plus accessories from the appliance (see Appendix 3, fig. 12);
- Cut a cross in the centre of the grommet to allow the gas supply pipe to pass through;
- Create a gas supply through the grommet. Later on, a gas tap will be connected to this (see Appendix 3, fig. 13);
- If necessary, blow clean the gas pipe;
- Disconnect the gas tap from the burner plus accessories and connect it to the gas supply;

**!Caution** Make sure the grommets are mounted properly, so that they provide a good seal.

**!Tip** Make sure the gas tap is at 45°, so that the tap can be easily closed during maintenance. The tap will then be within reach by removing the service plate under the vermiculite tray.

**!Caution** It is also necessary to place a gas tap outside of the appliance (see section 5.2.1).

- Place the burner mounting plate plus accessories back in the appliance and fasten it with the self-tapping screws;
- Remove the service plate by removing the self-tapping screw and taking out the plate;
- Connect the pipe of the burner plus accessories to the gas tap under the burner mounting plate;
- Bleed the gas pipe;
- Check gas tightness (see section 7.1);
- Check line-pressure (see section 7.2);
- Place back the service plate and fasten it with the self-tapping screws;
- Place the batteries in the battery holder and place the holder in the intended bracket (see section 5.14);
- Connect the receiver and place it in the intended holder (see section 6.1 and Appendix 3, fig.13);
- Set the communication code between receiver and remote control (see section 6.2).

**!Caution** Do not ignite the appliance until it is fully installed.

- Place the profile back in the appliance and fasten it with the self-tapping screws;
- Place the vermiculite tray back in the appliance.

**!Caution** Position the vermiculite tray correctly by means of the stop edges (as far as possible to the front).

### 5.10.2 Connecting the flue gas discharge system

***In case of a newly to be constructed chimney breast (see section 5.7):***

- Connect the pipe pieces or the flexible stainless steel discharge pipe.

***In case of an existing fireplace (see section 5.7):***

In case of an existing fireplace plus chimney, the flexible stainless steel discharge pipe can be connected from the inside:

- Remove the self-tapping screws from the sealing plate and remove this plate from the appliance (see Appendix 3, fig. 14);
- Remove the self-tapping screws that are used to fasten the flue spigot and remove the flue spigot via the top of the appliance (see Appendix 3, fig. 15);
- Connect the flexible stainless steel discharge pipe to the flue spigot and place it back in the appliance with the self-tapping screws;
- Place the sealing plate back in the appliance and fasten it with the self-tapping screws.

### 5.11 Setting the appliance

The appliance has to be set in such a way that it works correctly in combination with the used concentric system.

**!Caution** In case of a flue gas discharge system that is shorter than 6 metres, the restrictor in the flue spigot must be adapted (see Appendix 2, tables 5 and 6):

- Remove the restrictor from the flue spigot (see Appendix 3, fig. 16 (R));
- Break the small ring (A) from the restrictor by moving it back and forth until it comes off. A large passage will remain (B);

**!Caution** Do not deform the ring, the restrictor should be flat.

- Place the restrictor back in the flue spigot.

### 5.12 Glass pane

Avoid damaging the pane during removal/placing.

#### 5.12.1 Removing the glass pane

Observe the following actions to remove the glass pane (see Appendix 3, fig. 5 to 9):

- Remove the self-tapping screw of the vertical decorative strip and remove the decorative strip by tilting it sideways at the top and lifting it out, do the same at the other side;
- Remove the lower decorative strip by grabbing it in the groove and lifting it out;
- Remove the central self-tapping screw from the upper glass strip and remove the glass strip;
- Tilt the glass pane from the top, away from the appliance;

**!Caution** Prevent the glass pane from making an angle that is too large and could damage the glass pane.

- Grab the glass pane at both sides and remove the glass pane;
- Store the glass pane on a safe place.

#### 5.12.2 Placing the glass pane

- Place the glass pane at the bottom of the holders;
- Tilt the glass pane from the top, against the appliance;
- Place the central glass strip and fasten it in the middle by means of a self-tapping screw;

**!Caution** Avoid/remove finger prints on the glass pane, as they will burn into the glass.

- Place back the lower decorative strip;
- Place back the vertical decorative strips and fasten them with the self-tapping screws.

### 5.13 Placing the wood set

The appliance is supplied with a wood set.

**!Caution** Strictly observe the following instructions to prevent unsafe situations:

- Only ever use the supplied wood set;
- Place the wood set exactly as described;
- Make sure the pilot burner and the surrounding space remain free (see Appendix 3, fig. 17);
- Make sure the 2nd thermocouple and the surrounding space remain free (see Appendix 3, fig. 18).

The wood set consists of a number of logs, black chips (see Appendix 3, fig. 19) and glow material (see Appendix 3, fig. 20).

➤ Identify logs A to C (see Appendix 3, fig. 21);

**!Tip** Use the burn stains on the logs for identification.

➤ Place log A at the back of the appliance, use the positioning cams and distribute part of the chips (see Appendix 3, fig. 22)

➤ Place log B on the appropriate bracket (see Appendix 3, fig. 23).

➤ Place log C in the appliance, use the positioning cams (see Appendix 3, fig. 24).

➤ Fill the vermiculite tray with chips; evenly distribute the chips;

**!Caution** Do not place chips on the burner.

➤ If required, spread the glow material over the burner.

**!Caution** The areas around the ignition/pilot flame as well as the 2nd thermocouple should remain free from glow material.

**!Tip** Fasten the glow material under the chips and/or wood set.

### 5.14 Placing / replacing the receiver's batteries

The batteries should be placed in the special battery holder and not in the receiver.

**!Caution** Strictly observe this, to avoid damages to the receiver.

The battery holder is placed under the lower decorative strip. Remove the batteries as follows:

➤ Remove the self-tapping screw of the vertical decorative strip and remove the decorative strip by tilting it sideways at the top and lifting it out, do the same at the other side (see Appendix 3, fig. 5);

➤ Remove the lower decorative strip by grabbing it in the groove and lifting it out (see Appendix 3, fig. 6);

➤ Remove the battery holder from the holder (see Appendix 3, fig. 7);

➤ Remove the screw of the cover from the battery holder;

➤ Slide the cover off;

➤ Remove and/or place the 4 penlite (type AA) batteries;

**!Caution** Prevent short-circuit between the batteries and metal objects/components. Observe the "+" and "-" poles of the batteries and the holder. Use alkaline batteries. Batteries are regarded as "small chemical waste" and may therefore not be disposed with the household rubbish.

➤ Slide back the cover;

➤ Fasten the cover with the screw;

➤ Place back the battery holder;

➤ Place back the lower decorative strip;

➤ Place back the vertical decorative strips and fasten them with the self-tapping screws.

## 6. Control

The appliance is supplied with a wireless remote control.

Controlling the flame height, igniting and switching off take place through a remote control controlling a receiver. Chapter 4, Wireless remote control, in the User Manual describes the operation of the appliance and how you should use the remote control.

**!Caution** Do not ignite the appliance before the gas and discharge connections have been fully installed, first observe the procedure described in chapter 7.3;

Below, we will describe how the receiver is connected.

### 6.1 Connecting the receiver

Your appliance is equipped with an electronic ignition through the remote control.

The receiver should be connected to the appliance, before the batteries are installed.

- Connect the receiver according to Appendix 3, fig. 38.
- Bend the antenna (N) out of the clips and place it erect (Appendix 3, fig. 39).

- !Tip**
- The plugs have different sizes that correspond with the connectors.
  - The size of the eye corresponds with the size of the screw;
  - The colours of eye and screw correspond as well.
  - Place the batteries as described below in section 6.1.1.

- !Caution**
- Do not place the ignition cable over and/or along metal, stone or concrete parts: this will weaken the spark. Make sure the cable is hanging freely.
  - Make sure that the wires of thermocouple 2 cannot come into contact with hot parts
  - Keep the ignition cable at least 10 cm away from the antenna, in order to avoid damaging the receiver.
  - Avoid formation of dust on or in the receiver: cover it when performing work.
  - Place the receiver in its intended holder under the appliance or in the control hatch according to Appendix 3, fig. 39.
  - If you want to use an adapter, only an adapter supplied by DRU will guarantee a proper operation of the receiver.

#### 6.1.1 Placing / replacing the receiver's batteries

Follow the procedure below when placing the batteries:

- Pick up the receiver and slide off the cover.
- Place or remove the 4 penlite (AA type) batteries.

- !Caution**
- Observe the "+" and "-" poles of the batteries and the receiver;
  - Use alkaline batteries; rechargeable batteries are not allowed.
  - Batteries are regarded as "small chemical waste" and may therefore not be disposed with the household rubbish.

- Slide back the cover.
- Place back the receiver.

### 6.2 Setting the communication code

Prior to putting the application into operation, a communication code must be set between the remote control and the receiver. If the receiver or the remote control are replaced, a new code will have to be set.

Follow the procedure described below:

- If necessary, place the batteries in the receiver's battery holder; see section 6.1.1.
- If necessary, place the 9V block battery in the remote controle; see User Manual.
- Hold down the reset button on the receiver, until you hear two consecutive sound signals (see Appendix 3, fig. 40).
- After the second, longer signal, let go of the reset button.
- Press the 'small flame' button on the remote control for 20 seconds, until you hear two short sound signals: this is the confirmation of a good communication.

 small flame

 large flame



### 6.3 Alternative operation

Appliances made with an electronic ignition and radio remote control can be connected to an alternative external control system (e.g. Domotics). For this purpose, there are 4 connection points at the side of the receiver (see Appendix 3, fig. 44). For connecting an external control unit, you will need a "Domotics connection cable for GV60". Consult DRU's service website.

The following contacts are possible:

- Ignition: connect both contacts 1 + 3, for one second (if there is a 2nd thermocouple, the appliance should burn at full power for at least 20 sec. before the required position can be chosen).
- Flame high(er): briefly close contact 1 once per step, or 12 seconds for the highest position.
- Flame low(er) until switch-off (pilot flame remains on): briefly close contact 3 once per step, or 12 seconds for the lowest position.
- Completely switching off the appliance (pilot flame included): close all three contacts 1 + 2 + 3, for one second.

The appliance will always continue to respond to the radio remote control supplied with it. The external control system is able to use one of the two modes of this remote control.

#### 1. Manual mode

This mode of the remote control is passive and will not take any action unless it is operated. The external control system is able to control the functions for high/low position, ignition and switching off.

**!Tip** If the external control system has an intelligent clock function and/or thermostat function, the remote control supplied with the appliance should have the manual mode in order to prevent interruption of these functions.

#### 2. Clock/thermostat mode

This mode of the remote control is active and will be responsible for the clock function and thermostat function. The external control system is able to control the functions for high/low position, ignition and switching off.

**!Tip**

- If the appliance is switched off (the pilot flame included) manually or by one of the safeguards, ignition of the appliance will be blocked for a period of 3 minutes for reasons of safety.
- If it is no longer possible to operate the appliance with the external control system, you must switch it off and then switch it on again with the supplied remote control.

## 7. Final inspection

In order to check whether the appliance is working properly and safely, you must perform the following inspections before the appliance is used.

### 7.1 Gastightness

**!Caution** All connections must be gastight. Check the connections for gastightness. The gas control can be subjected to a maximum pressure of 50 mbar.

### 7.2 Gas pressure/line-pressure

The burner pressure is set at the factory; see data plate.

**!Caution** The line-pressure in house installations must be checked, because it can be wrong.

- Check the line-pressure; see Appendix 3, fig. 41 for the measuring nipple on the gas control.
- Contact the gas company if the line-pressure is not correct.

## 7.3 Ignition pilot and main burner

For igniting the pilot and main burner, see the User Manual, chapter 4, section 4.2, Remote control.

### 7.3.1 First ignition of the appliance after installation or adjustments

**!Caution** After installation, or after work has been performed, you should ignite the appliance for the first time without the glass window. If necessary, bleed the gas pipe.

- Follow the procedure described below:
  - If required, remove the glass window.
  - Start the ignition procedure according to chapter 4 in the User Manual.
  - If the pilot flame does not ignite:
    - repeat the ignition procedure until the pilot burner ignites;
    - consult the malfunction search diagram (Appendix 1) if this does not happen after a few attempts.
  - After igniting the pilot flame, the main burner will ignite during the ignition procedure.
  - Check whether the main burner continues to burn.
  - If the main burner does not continue to burn.
    - repeat the ignition procedure until the main burner continues to burn
    - consult the malfunction search diagram (Appendix 1) if this does not happen after a few attempts.
  - Switch off the appliance.
  - Clean the glass pane before using it for the first time, as described in the user manual.
  - Then mount the glass pane as described from section 5.9.
  - Repeat the ignition procedure a few times and perform the checks described in chapter 7.3.2.
  - From now on, the pilot flame should ignite smoothly.
  - Clean the glass pane after burning for the first time, as described in the user manual.
- !Tip** When checking whether the main burner continues to burn, it is possible that it still switches off after 22 seconds. This happens because the appliance is equipped with a second thermocouple and the glass window has not been placed. In this case you may presume that the main burner will continue to burn.
- !Caution**
- During the ignition process, you are not allowed to operate control button B on the gas control manually.
  - Always wait 5 minutes after the pilot flame has gone out, before you re-ignite the appliance.
  - You are not allowed to turn the pilot flame lower by using the settings on the gas control.

### 7.3.2 Main burner

- !Caution**
- The pilot burner should ignite the main burner within a couple of seconds, and without popping.
  - The main burner(s) must cross the full burner smoothly and without popping and continue to burn.
- Check operation of the main burner from a cold condition (pilot flame off).
  - After opening the gas valve, the main burner should burn within a few seconds.

**!Tip** When the gas valve is opened, the motor will start to run; this is audible.  
The flame picture and a good flame transfer can only be properly judged if the glass window is installed.

Use the malfunction search diagram (Appendix 1) if the ignition of the main burner does not comply with the abovementioned requirements.

## 7.4 Flame picture

The flame picture can only really be assessed when the appliance has been burning for several hours. Volatile components from paint, materials, etc., which evaporate in the first hours, will affect the flame picture.

**!Caution** If the chimney breast has been made of stone-like materials or has a plaster finish, the appliance may only be put into operation 6 weeks after the chimney breast has been placed, in order to prevent shrinkage cracks.

- Check whether the flame picture is acceptable.
- Consult the malfunction search diagram (Appendix 1) if the flame picture is not acceptable.

## 8. Maintenance

The appliance must be inspected once per year by a skilled installer in the field of gas-fired heating, and repaired if necessary.

Check at least whether the appliance is working properly and safely.

- !Caution**
- Always close the gas tap during maintenance work;
  - Check the gastightness after repair;
  - After replacing thermocouple 1 you should first tighten the gland nut by hand and then give it another quarter turn with a suitable spanner;
  - You are not allowed to turn the pilot flame lower by using the settings on the gas control.
  - SS-absolutely do not clean the concentric system (internally) with a steel brush or metal sponge, for example. This will damage the oxide skin and could lead to leaks in the system as a result of pitting corrosion.

- If required, clean the following components:
- the pilot burner (malfunction search diagram, Appendix 1);
  - the space surrounding the pilot burner;
  - the glass pane(s).

**!Caution** Only clean a glass pane once it has reached room temperature.

- !Caution**
- Avoid damage to the glass pane(s).
  - Avoid/remove fingerprints on the glass pane(s), as they will burn into the glass.
  - Clean the glass pane(s) as described in the user manual.
  - Regularly remove accumulated dirt, as it can burn into the glass.
  - Do not use the appliance when a glass pane is broken and/or cracked, until it has been replaced as described from section 5.9.

**!Caution** If necessary, replace the wood or pebble set correctly; as described from section 5.9.

- Inspect the flue gas discharge system.

**!Caution** You must always perform a final inspection.

- Perform the inspection as described in chapter 7.

### 8.1 Parts

Parts requiring replacement can be obtained from your supplier.

## 9. Delivery

You must explain to the user how to operate the appliance. You must give him/her instructions on putting it in operation, the safety measures, the operation of the remote control and annual maintenance (see the User Manual).

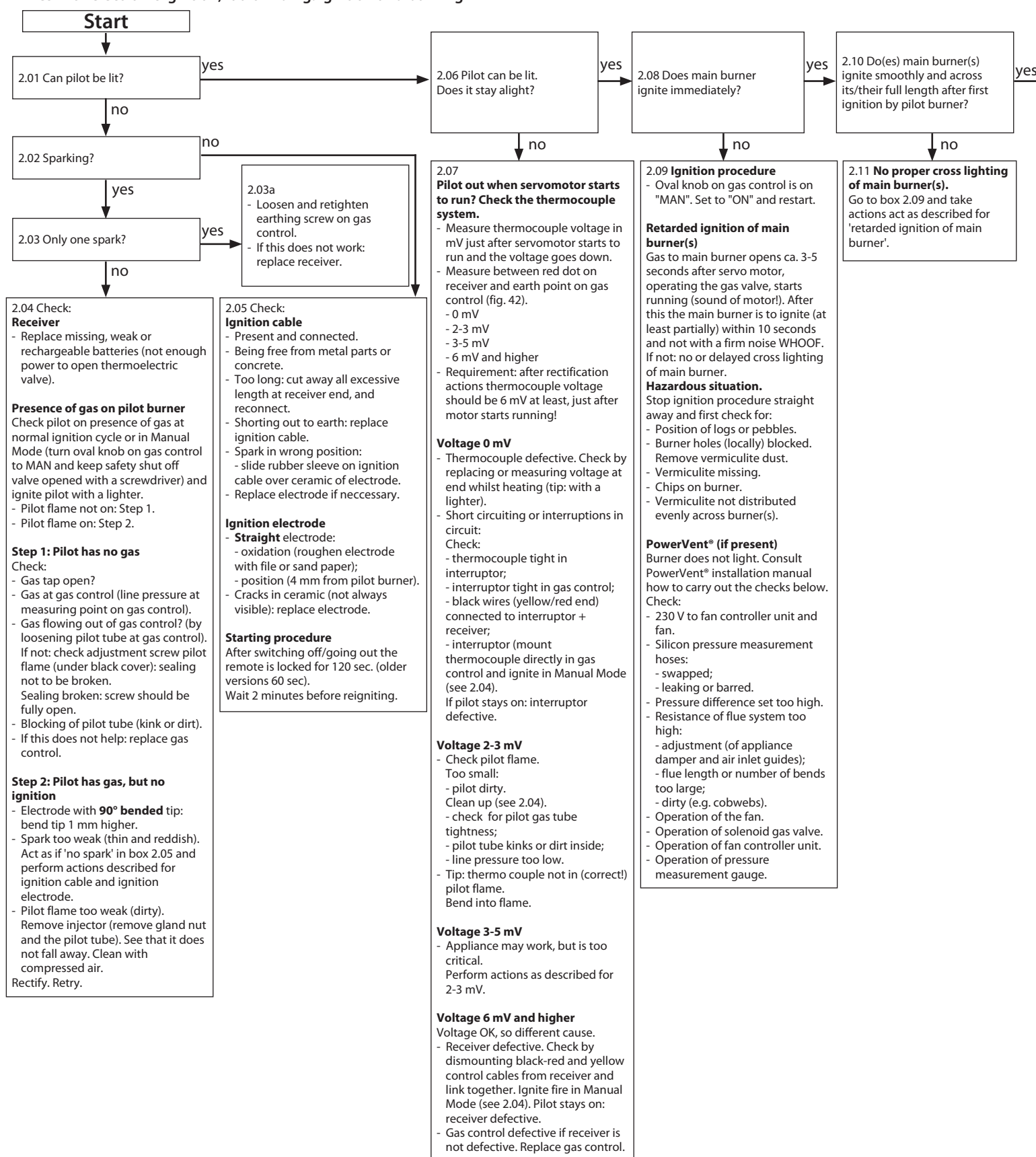
- !Caution** • Tell the user to close the gas tap immediately and contact the installer in case of malfunctions/poor operation. This to prevent unsafe situations.
- Indicate the location of the gas tap.
- Point out the precautions in the user manual against unintended ignition by other wireless remote controls such as car keys and garage door openers.
- Instruct the user about the appliance and the remote control.
- When the appliance is started for the first time, point out that
  - In order to avoid cracks in a chimney breast made of stone-like materials or finished with plaster, it should dry for at least 6 weeks prior to putting the appliance into operation.
  - When the appliance is stoked up for the first time, volatile components evaporate from paint, materials, etc. (First read chapter 3 of the User Manual as well !).
  - When evaporating, the appliance should preferably be set to the highest level.
  - The room should be well ventilated.
- Give the manuals to the user (all manuals should be stored near the appliance).

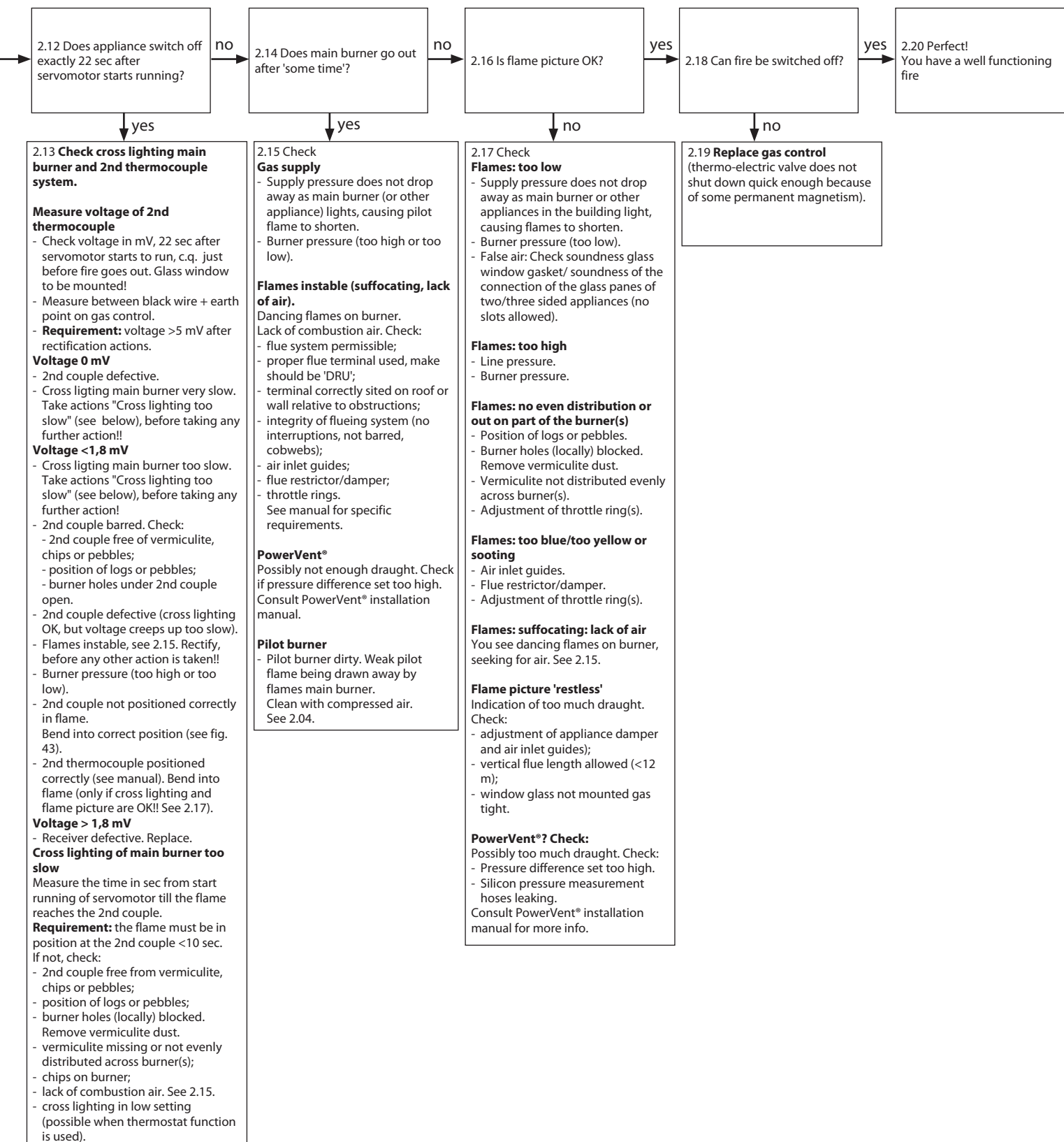
## 10. Malfunctions

In Appendix 1 you will find an overview of malfunctions that might occur, the possible causes and the remedies.

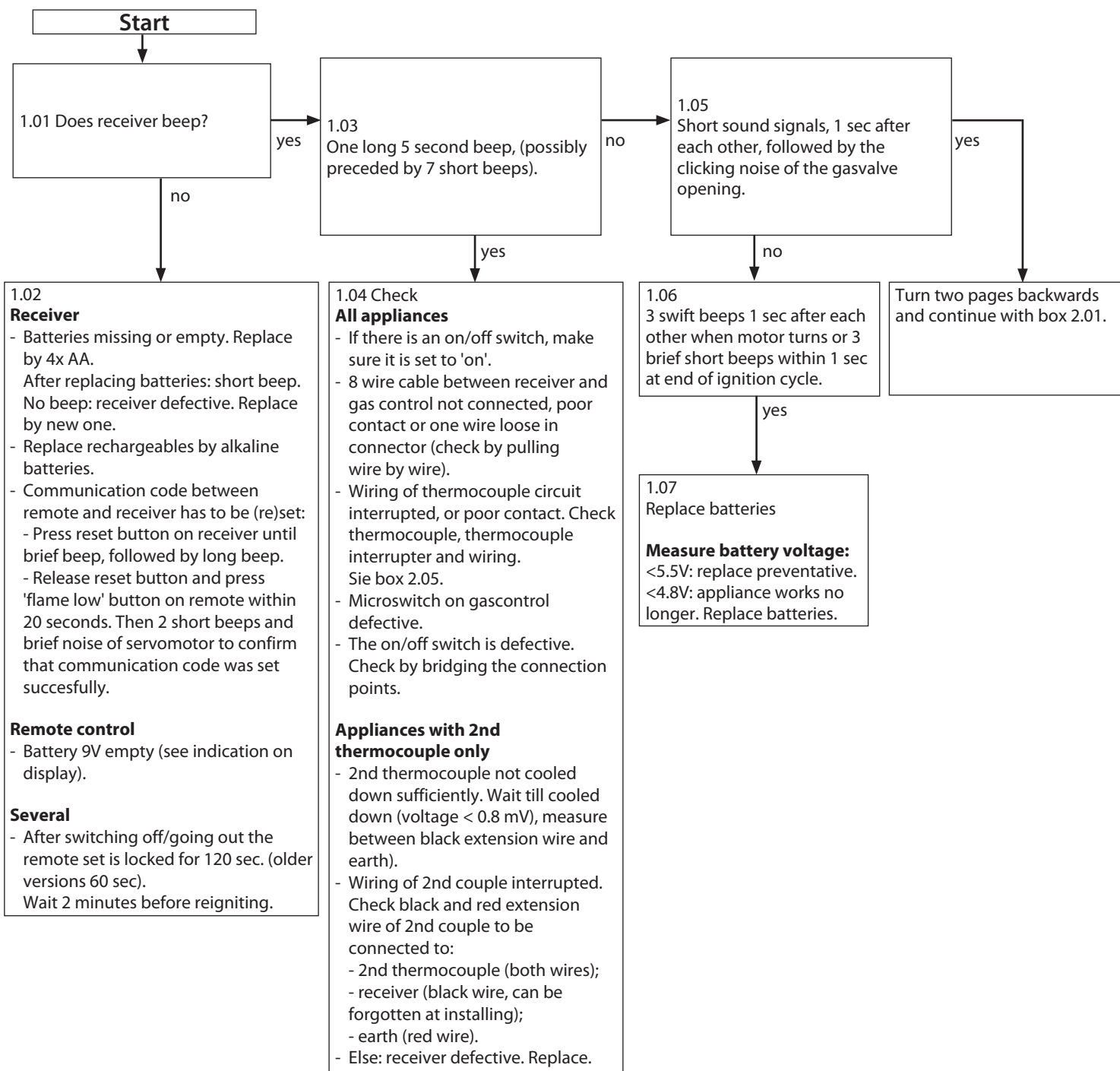
## Appendix 1 diagnosis of malfunctions

### Fires with electronic ignition, fault finding: Ignition and burning





# Malfunction search diagram atmospheric gas-fired heating appliance with electronic ignition: Starting up cycle.





## Appendix 2 Tables

### Table 1: Parts included with the delivery

Part	Number
Wood set	1x
Installation manual	1x
User manual	1x
Installation instructions conventional class 1 chimney*	1x
Sealing tape	1x
Cellular rubber*	1x
Debris shield*	1x
Spare self-tapping screws for mounting glass panes	nx
Socket spanner 8 mm	1x
Remote control with receiver	1x
9V block battery	1x
Penlite battery (AA type)	4x

\* only in Great Britain

Table 2: Technical data

Model identifier(s)		Global 55 CF RCE , Global 55XT CF RCE						
Type of appliance		Built-in						
Combustion		Open combustion						
Type		B <sub>11AS</sub>						
Categorie		I <sub>2EK</sub> , I <sub>2ELL</sub> , I <sub>2H</sub> , I <sub>2E+</sub> , I <sub>2E</sub> , I <sub>3P</sub>						
Appliance connection		Ø 100 mm / 3 m						
Flame protection version		Oxypilot with thermocouple						
2nd thermocouple safety		yes						
Atmosphere safety		yes						
Explosion hatch		no						
Ventilation hole chimney breast		200 cm²						
		Global 55 CF RCE			Global 55XT CF RCE			
Gastype:	Symbol	G25/ G25.3	G20	G31	G25/ G25.3	G20	G31	Unit
Indirect heating functionality		No	No	No	No	No	No	
Direct heat output		3,7	3,9	4,0	4,2	4,5	4,4	kW
Indirect heat output		-	-	-	-	-	-	kW
Space heating emissions NO <sub>x</sub>		124,5	129,5	125,3	121,1	124,1	128,1	mg/kWh <sub>input</sub> (GCV)
Heat output								
Nominal heat output	P <sub>nom</sub>	3,7	3,9	4,0	4,2	4,5	4,4	kW
Minimum heat output (indicative)	P <sub>min</sub>	1,5	1,9	1,9	1,7	1,7	1,8	kW
Technical data								
Nominal heat input (Hs)		5,4	5,7	5,6	6,4	6,7	6,6	kW
Nominal heat input (Hi)		4,9	5,1	5,2	5,8	6,0	6,1	kW
Consumption max		575	553	205	684	637	245	L/h
Consumption min		300	279	109	302	284	115	L/h
Burner pressure max		14,2	11,4	29,0	19,0	15,3	29,0	mbar
Burner pressure min		3,8	3,1	7,9	4,0	3,4	6,5	mbar
Main burner injector		7x Ø0,78	7x Ø0,78	1x Ø1,20	7x Ø0,78	7x Ø0,78	1x Ø1,30	mm
Low setting injector		Ø1,40	Ø1,40	Ø1,05	Ø1,40	Ø1,40	Ø1,05	mm
Efficiency class (EN613)		2	2	2	2	2	2	
Useful efficiency (NCV)**								
Useful efficiency at nominal heat output	η <sub>th,nom</sub>	77,9	77,7	77,0	73,8	74,3	72,2	%
Useful efficiency at minimum heat output (indicative)	η <sub>th,min</sub>	61,7	72,0	68,7	67,3	64,2	63,6	%
Auxiliary electricity consumption								
At nominal heat output	e <sub>l,max</sub>	-	-	-	-	-	-	kW
At nominal heat output	e <sub>l,min</sub>	-	-	-	-	-	-	kW
In standby mode	e <sub>l,SB</sub>	-	-	-	-	-	-	kW
Permanent pilot flame power requirement								
Pilot flame power requirement (if applicable)	P <sub>pilot</sub>	-	-	-	-	-	-	kW
Energy efficiency								
Energy efficiency index	EEl	78	78	77	74	74	72	
Energy efficiency class		C	C	C	D	D	D	
Type of heat output / room temperature control								
Single stage heat output, no room temperature control								No
Two or more manual stages, no room temperature control								No
With mechanic thermostat room temperature control								No
With electronic room temperature control								Yes
With electronic room temperature control plus day timer								Yes
With electronic room temperature control plus week timer								Yes***
Other control options								
Room temperature control, with presence detection								Yes***
Room temperature control, with open window detection								Yes***
With distance controle option								Yes

\* This appliance is suitable for G25.3 with the composition according NTA 8837.

\*\* System efficiency.

\*\*\* To be used by means of home automation.

Table 3: Line-pressure when using G31	
Country	mbar
NL / DK / FI / NO / SE / HU / BA / GR	30
FR / BE / IT / PT / ES / GB / IE	37
D	50

#### Permissibility and conditions concentric system with wall terminal

Table 4: Conditions for setting the appliance					
Total number of meters vertical pipe length	Total number of meters horizontal pipe length (excluding wall terminal)	See Figure	Air inlet guide	Restrictor slide	Distance of restriction in mm
N/A	N/A	N/A	N/A	N/A	N/A

Table 5: Determining the permissibility of a flue gas discharge system when using a roof terminal													
G20/G25/ G25.3/G31	Total number of meters horiz. pipe length	Total no. of meters vertical and/or sloping pipe length											
		1 <sup>1)</sup>	2	3	4	5	6	7	8	9	10	11	12
no bends	0			B	B	B	A	A	A	A	A	A	A
2 bends	0												
	1												
	2												
	3												
	4												
	5												
3 bends	0												
	1												
	2												
	3												
	4												
	5												
4 bends	0												
	1												
	2												
	3												
	4												
	5												
5 bends	-												

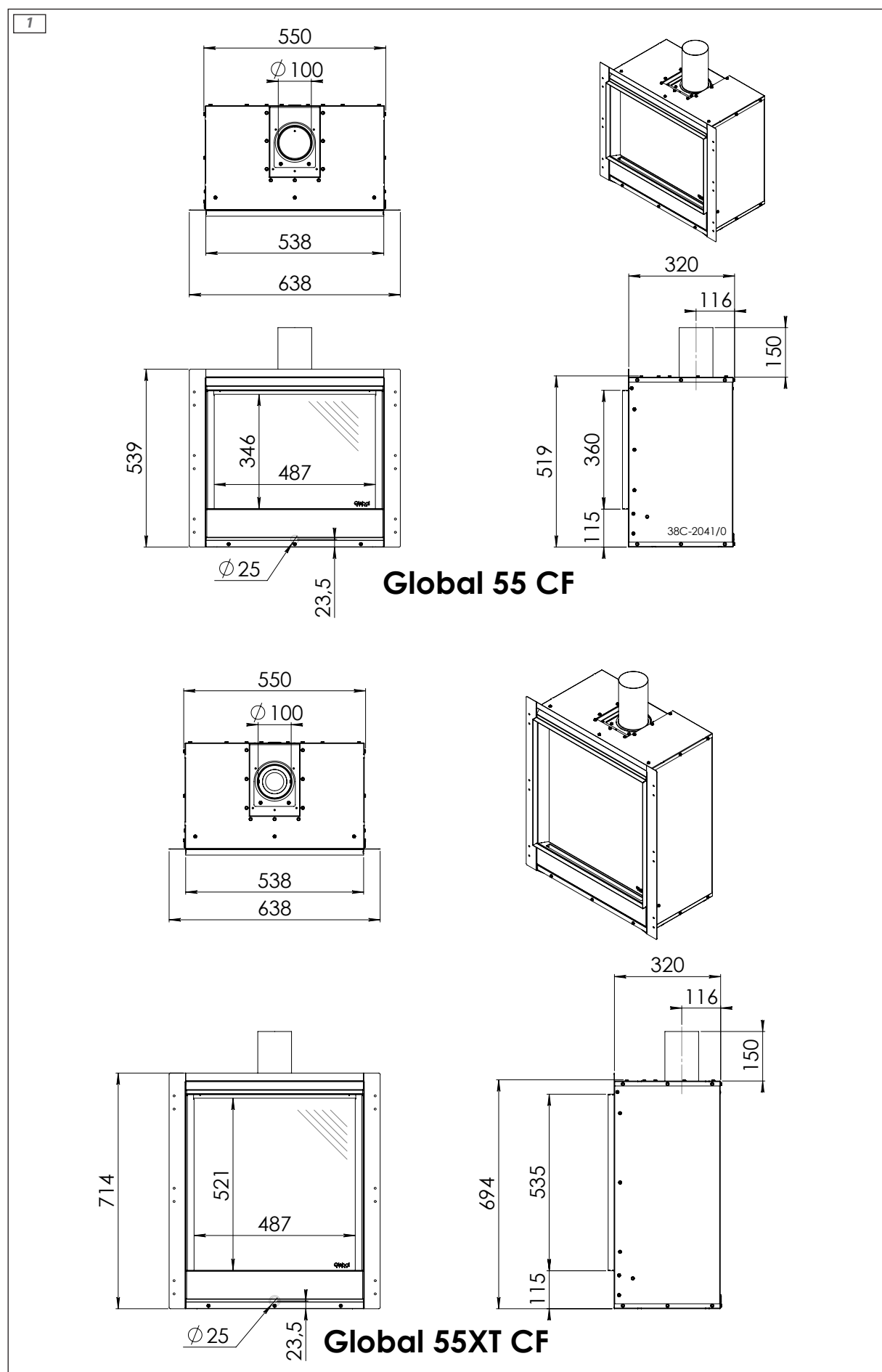
■ = Situation is not permissible

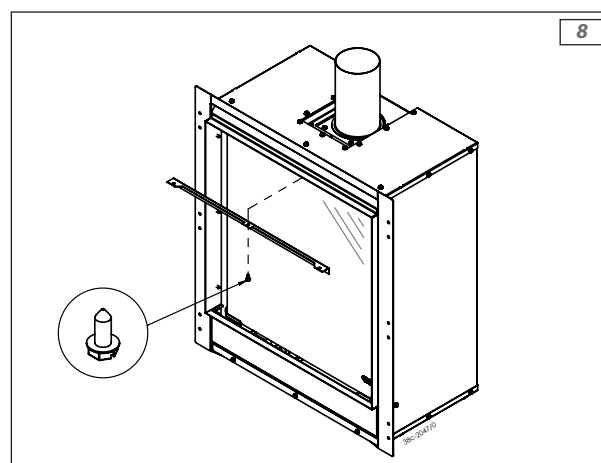
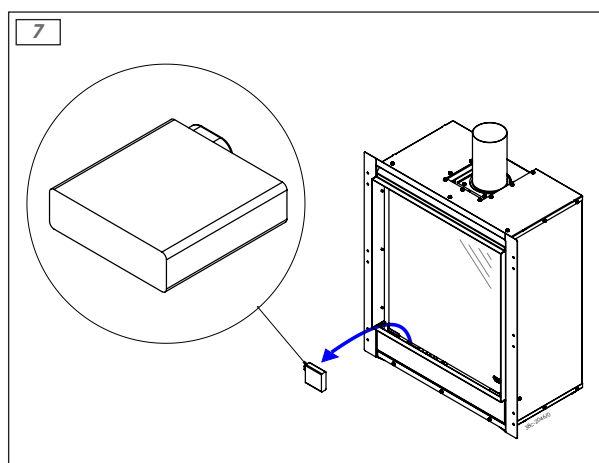
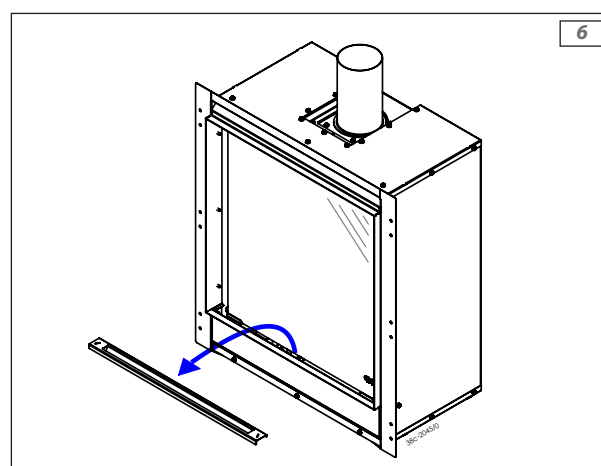
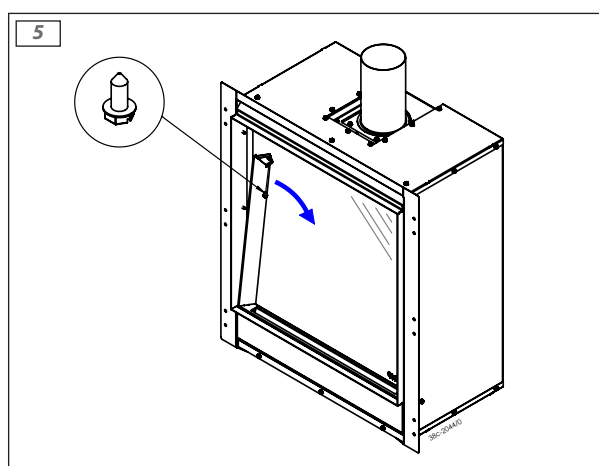
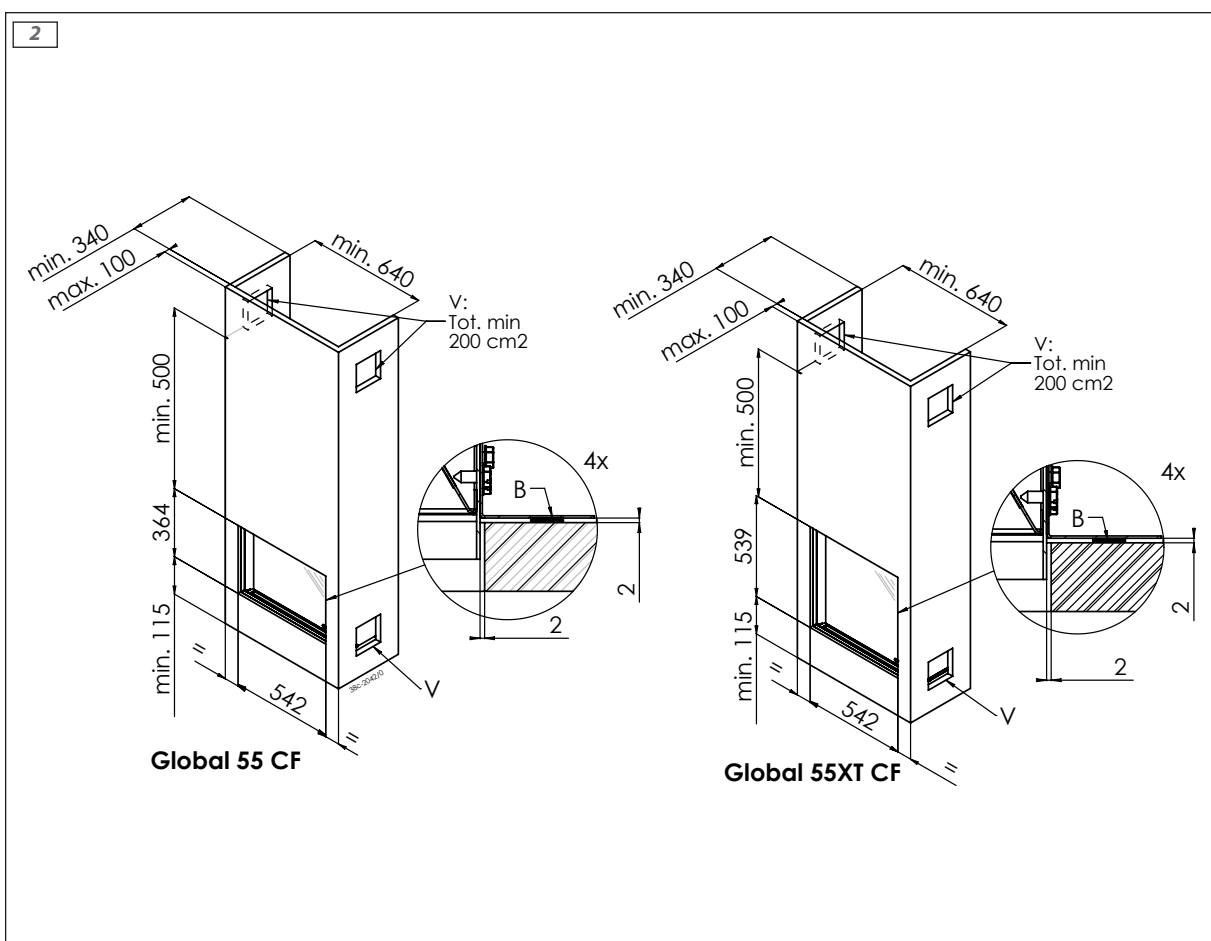
<sup>1)</sup> min. length 3 m; angles in vertical direction of flue gas discharge system allowed, bends not sharper than 45°

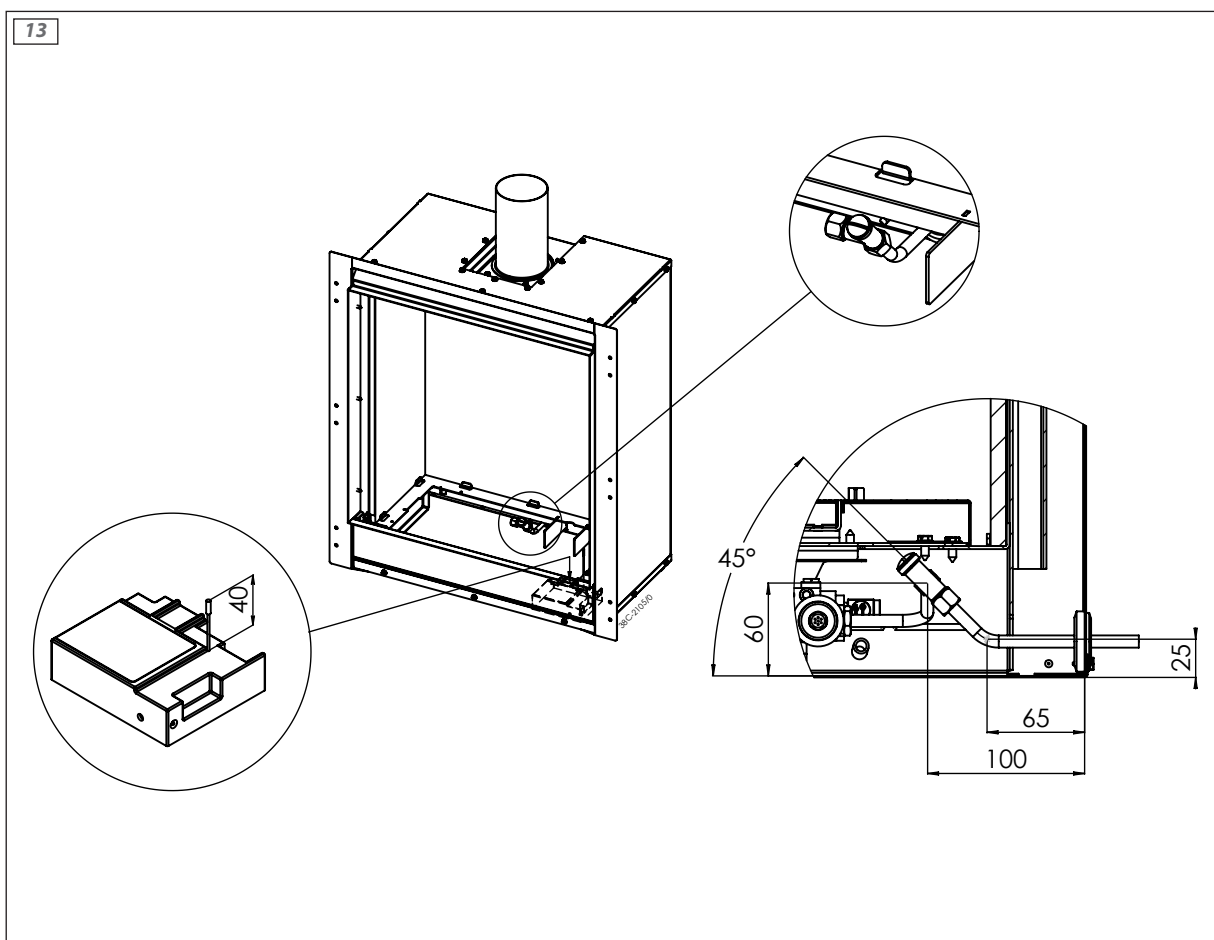
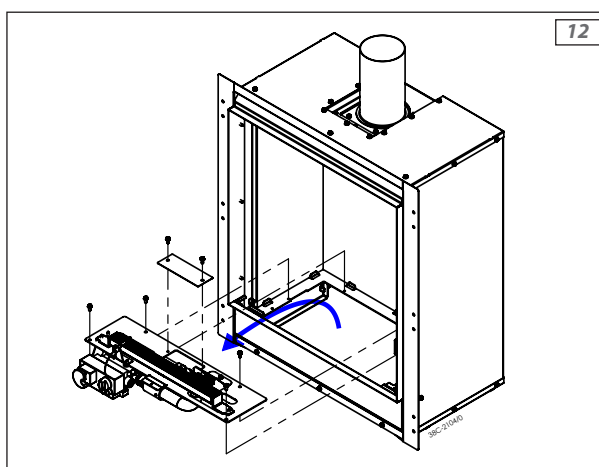
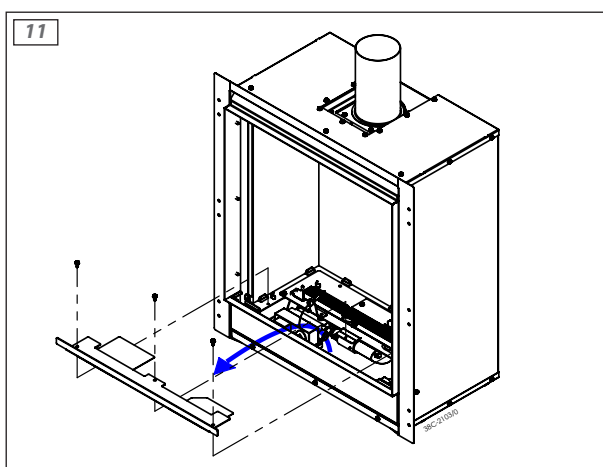
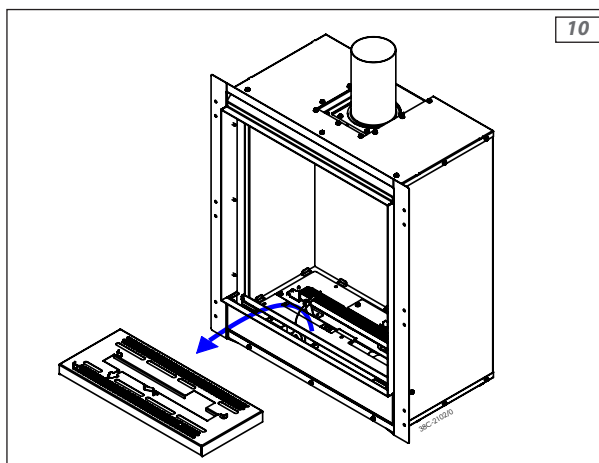
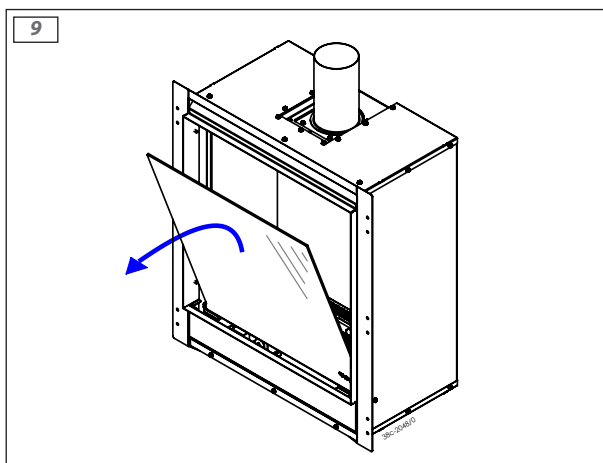
Table 6: Conditions for the adjustment of the appliance with a roof terminal			
G20/G25/G25.3/G31			
Situation	G20	G25/G25.3	G31
A	55	55	60
B	74	74	80

See Appendix 3, fig. 16.

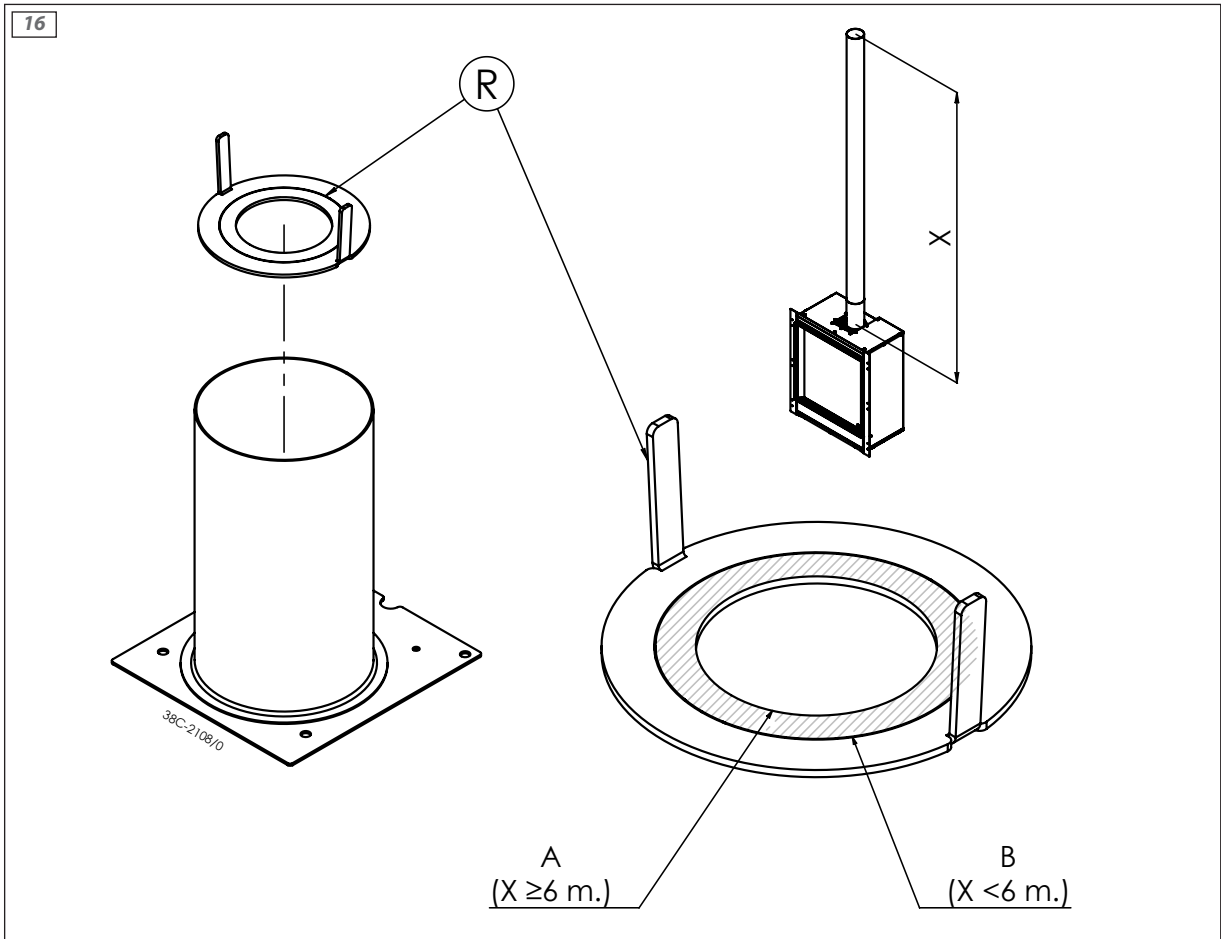
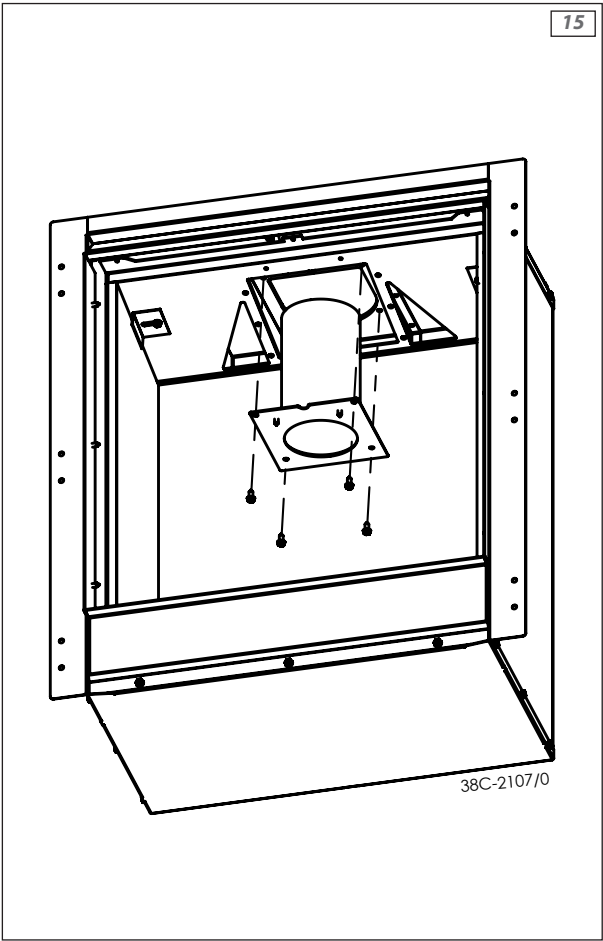
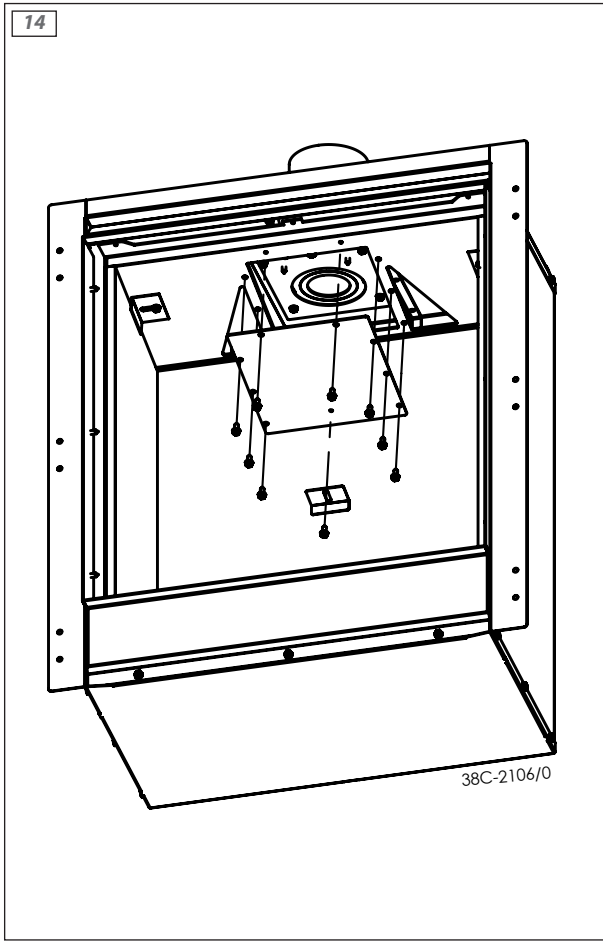
## Appendix 3 Figures

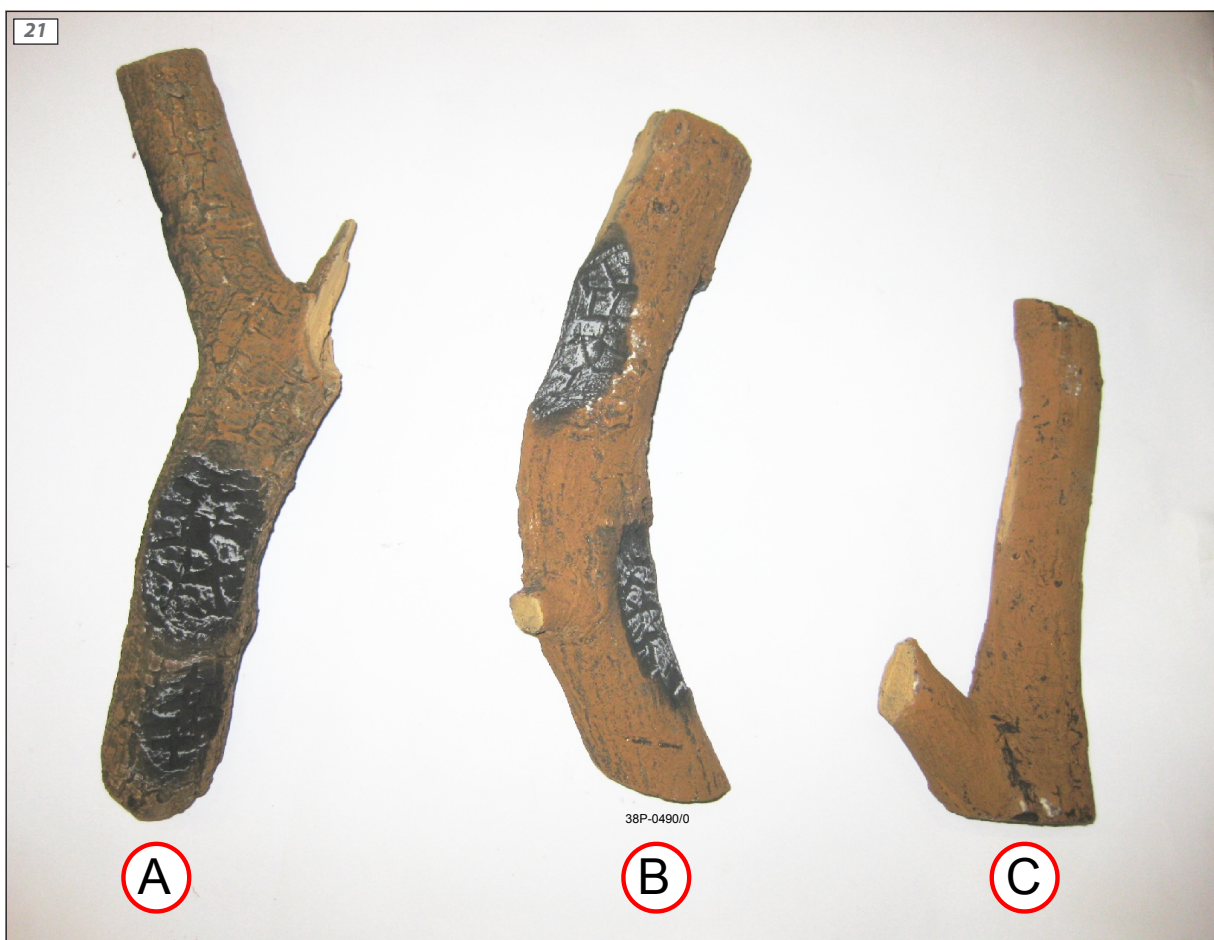
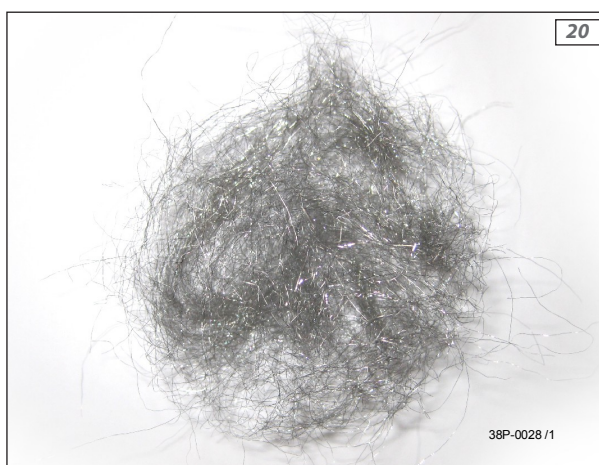




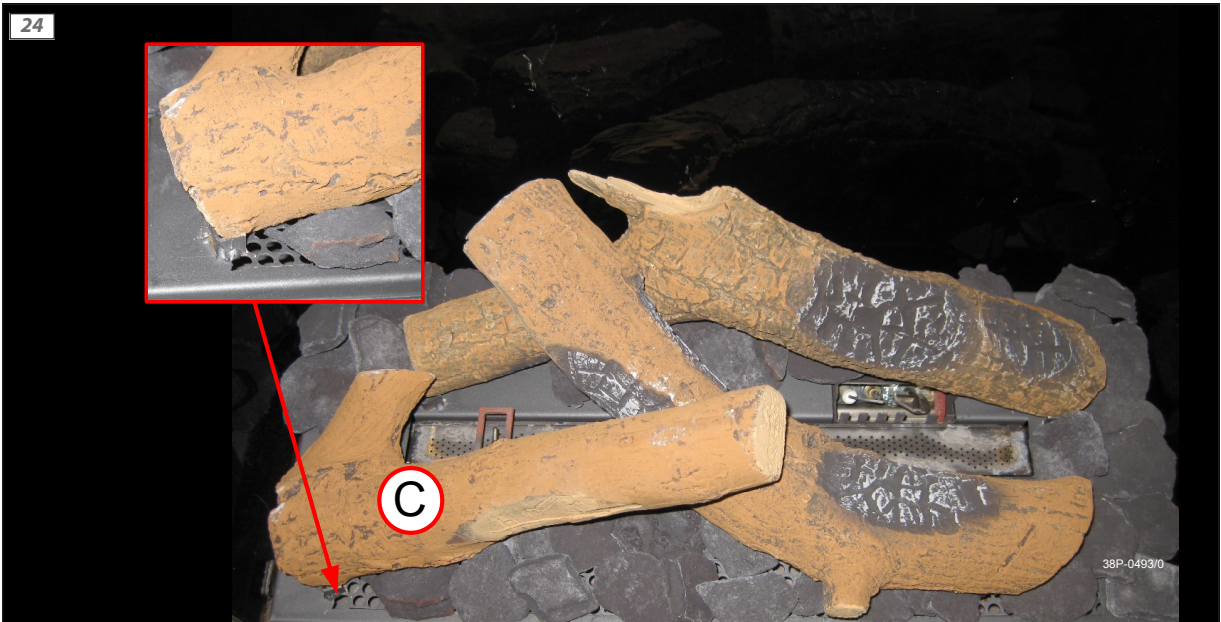
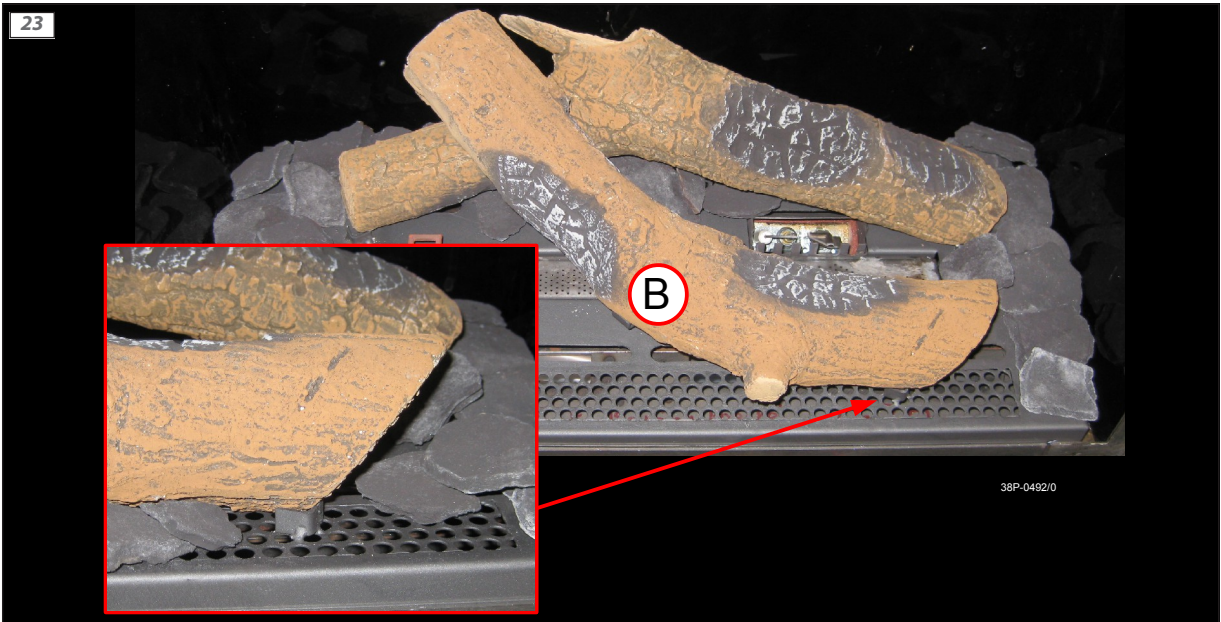




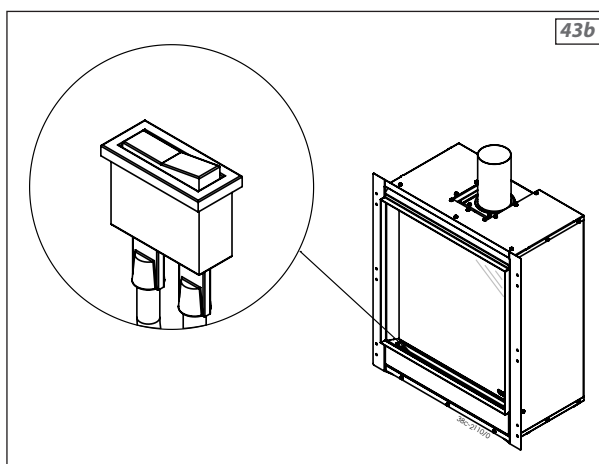
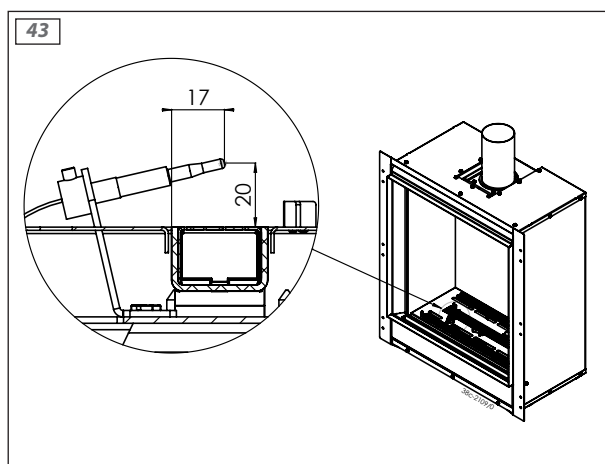
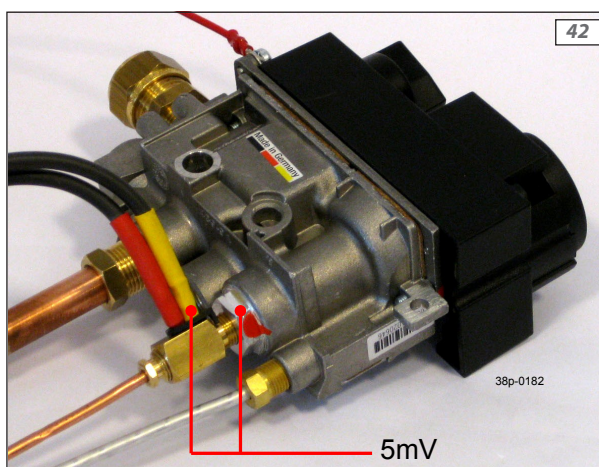
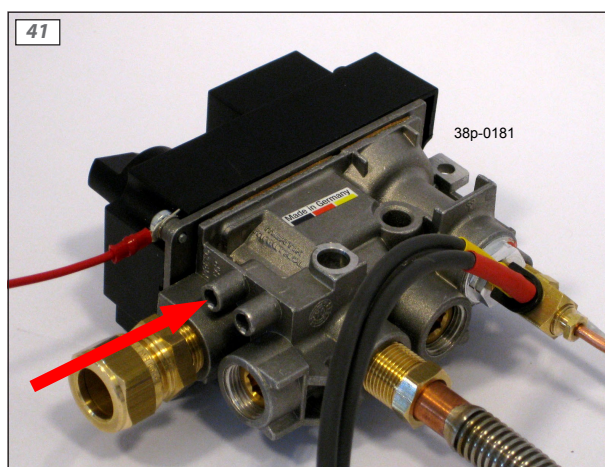
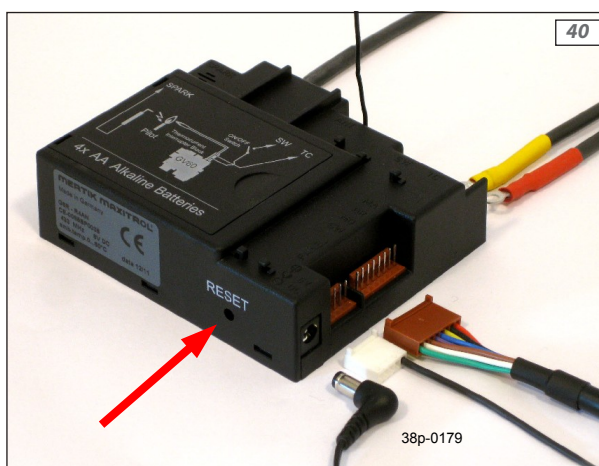
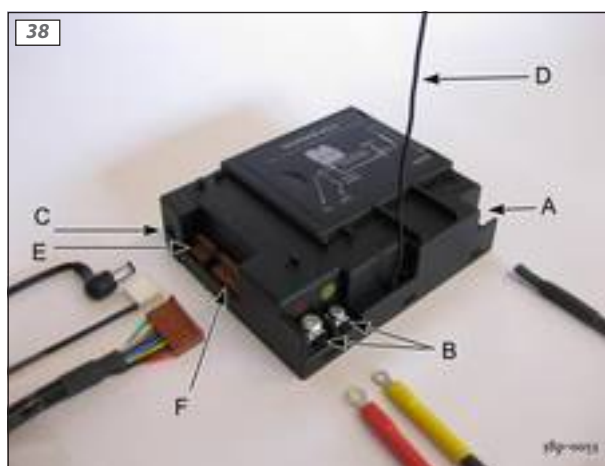


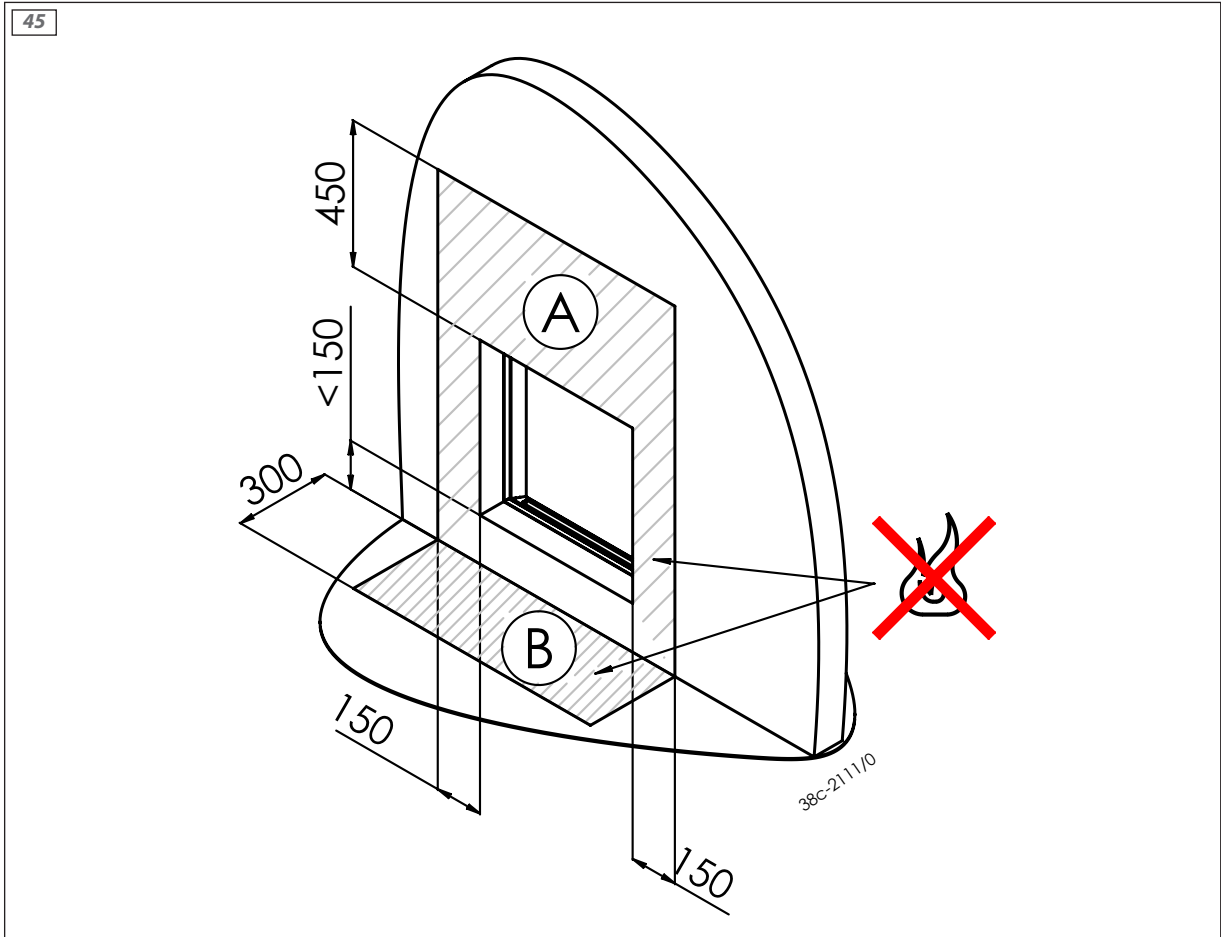
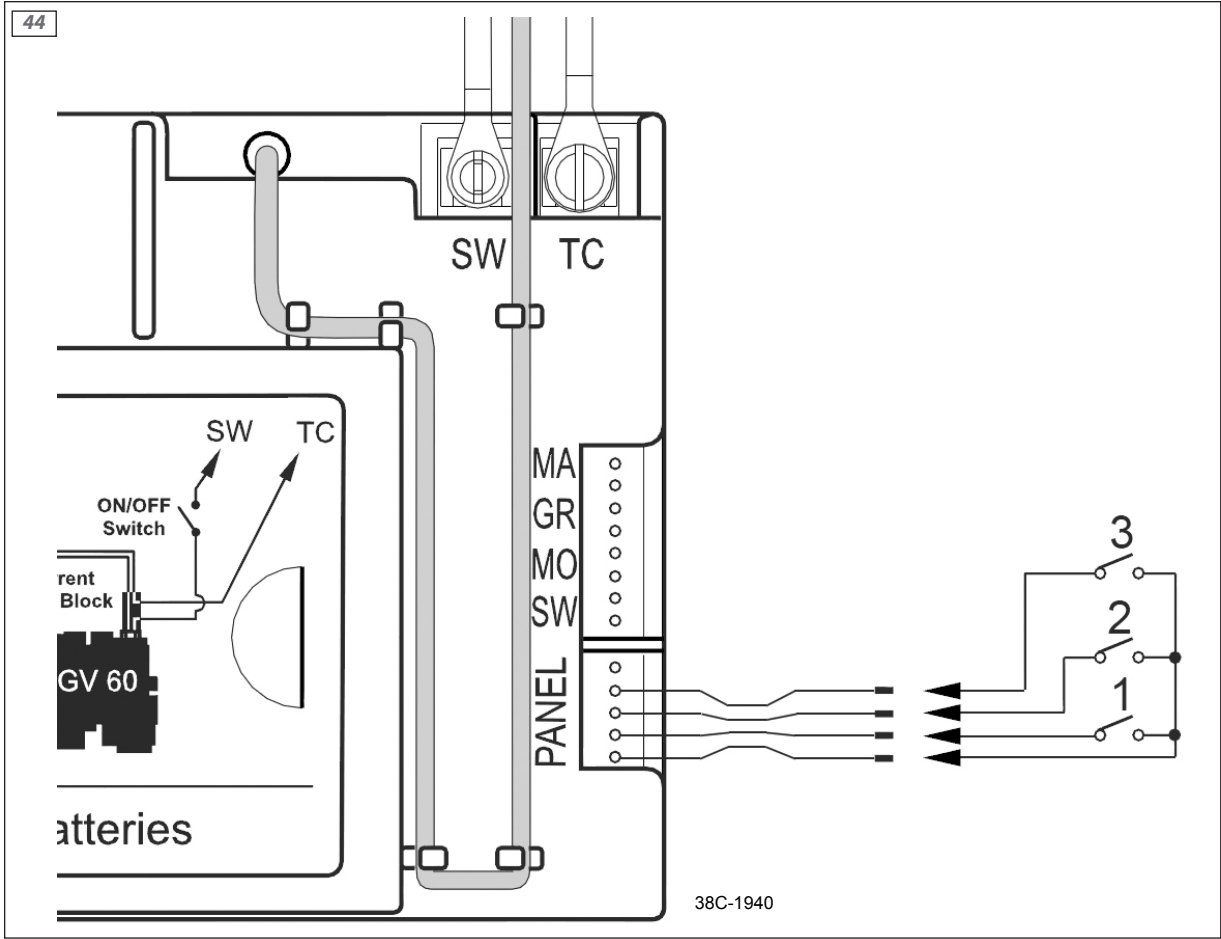
















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