

Circo 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

Internal precautions at the company will guarantee that appliances produced by DRU comply with the essential requirements of the regulation concerning gas combustion appliances and the standards applied for that purpose. This declaration will lose its validity if adjustments are made to the appliance, without prior written permission by DRU.

A copy of the CE test certificate can be downloaded via www.druservice.com.

Product:	Gas-fired heating appliance
Type:	Circo RCE
Conformity assessment agency:	Kiwa 0063
EC regulation:	2016/426/EU
Harmonized standards:	NEN-EN-613; NEN-EN-613/A1

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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_{11 AS/BS}), 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_{11 AS/BS}), 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_{11 AS/BS} appliances. If you decide not to take this option, you will have to make a 100 cm² 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).

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

!Tip It will be easier to reach the gas control, if you remove the front panel

5.9.1 Placing the appliance

When placing the appliance, please take the following aspects into account:

➤ Make sure the appliance is stable and level it using the adjustable feet (see Appendix 3, Fig. 5 (K)).

!Caution Maintain a minimum distance of 40 mm between the appliance and the back wall (see Appendix 3, Fig. 2).

5.9.2 Gas connection

At the back of the appliance you will find a round plate that can be removed by pressing on it, for the benefit of the gas connection (from the wall). However, it is also possible to make the gas connection (from the floor) via the bottom side of the appliance.

!Tip When installing an appliance where the air inlet guide has to be removed, you should remove the air inlet guide before connecting the gas pipe. In reverse order, it will be difficult to remove the back plate. This problem only occurs in case of a gas connection via the round recess at the back of the appliance and not in case of a connection via the bottom side.

- Make sure there is no dirt in gas pipes and connections;
 - Connect the gas pipe to the gas tap;
 - Bleed the gas pipe;
 - Place the receiver for the remote control (see section 5.9.3).

5.9.3 Placing the receiver

The appliance is equipped with an electronic ignition through the remote control. The receiver should be placed in the appliance. Follow the procedure described below:

➤ Stand on the left side of the appliance, in front of the left side panel (see Appendix 3, Fig. 5 (C)).

!Caution The side panels (C and D) have their hinges at the back of the appliance.

➤ Open the left side panel (C) by grabbing it at the bottom and as far as possible to the right (glass pane side) and pulling it towards you;

!Caution The side panels open and close by means of a snap-on system (S). When opening and closing the panels you could experience some resistance. That is normal.

- Put the receiver at the right location (see Appendix 3, Fig. 6);
- Connect the receiver to the appliance according to the instructions in section 6.1;
- Close the left side panel (C) by carefully pressing the panel in the snap connections.

5.9.4 Placing the decoration ring

The decoration ring (see Appendix 3, Fig. 8 (A)) lies on the ground and provides the connection of the appliance to the floor.

Place the decoration ring as follows:

- Open the left side panel (see Appendix 3, Fig. 5 (C));
- Open the right side panel (D) by grabbing it at the bottom and as far as possible to the left (glass pane side) and pulling it towards you.
- Loosen the bolt (see appendix 3, fig. 7 (T)) by a few turns.
- Unscrew the 2 bolts and 2 nuts (see Appendix 3, Fig. 7 (Q)) from the front panel (B), which is located below the glass pane.
- Remove the front panel (B).
- Place the round decoration ring (see Appendix 3, Fig. 8 (A)) by hitching it to the back panel (H).

!Caution Do not bend the round decoration ring open towards the outside by means of both hands. Else the ring could lose its round shape. Carefully guide the decoration ring around the appliance's adjustable feet. Foot by foot, towards the left OR towards the right.

- Place back the front panel (B), by:
 - tightening the bolt and nut at the left side;
 - pulling the front panel around the glass pane, using the tensioning bolt (T);
 - tightening the bolt and nut at the right side.

!Tip Only place back the front panel once the log set has been placed.

➤ Close the left and right side panels, by carefully pressing them in the snap connections until they are closed.

5.10 Glass pane

- !Caution**
- Avoid damaging the pane during removal/placing;
 - Avoid/remove fingerprints on the glass pane, as they will burn into the glass.

5.10.1 Removing the glass pane

When removing the front glass pane, you should follow the next steps:

- Open the left (see Appendix 3, Fig. 5 (C)) and right side panel (D);
 - Loosen the 2 bolts (see Appendix 3, Fig. 8 (P)) of the top panel (G) by a few strokes;
- !Caution** Do not completely remove the bolts.
- Slide the top panel (G) upwards a little bit, so some play is created in relation to the glass pane.
 - Loosen the bolt (see appendix 3, fig. 7 (T)) by a few turns.
 - Fully unscrew the 2 bolts and nuts (see Appendix 3, Fig. 7 (Q)) of the front panel (B);
 - Remove the front panel (B);
 - Fully unscrew the 3 nuts (see Appendix 3, Fig. 9 (R)) in the left glass strip and the 3 nuts (R) in the right glass strip;
 - Remove the left and right glass strip (E and F);
- !Caution** Hold the glass pane in the middle, so it cannot fall out.
- Slightly move the bottom side of the glass pane towards you and remove the glass pane (see Appendix 3, Fig. 10).

5.10.2 Placing the glass pane

Placing the glass pane will take place in reverse order of removing the glass pane, as described above.

- !Caution**
- Avoid/remove fingerprints on the glass pane, as they will burn into the glass.
 - Do not overtighten the bolts and nuts, since otherwise they could break or strip the thread: tight=tight;
- !Caution** Check whether the insulating rope is neatly around the slot of the combustion chamber.

When placing back the glass pane, observe the following instructions:

- Slowly slide the glass pane upwards back to its location and allow the glass pane to rest on the lower strip;
 - Make sure the glass pane is placed exactly in the middle of the appliance (see Appendix 3, Fig. 11).
- !Caution** Keep holding the glass pane in the middle, so it does not fall back.
- !Tip** First fasten the left side of the front panel (B) when placing it back, pull the front panel around the glass pane using the tensioning bolt (T) and then fasten the right side.

5.11 Setting the appliance

The appliance has to be set in such a way that it works correctly in combination with the discharge system used. For that purpose, a restrictor slide is placed and/or an air inlet guide is removed. The conditions for application with wall terminal and roof terminal are stated in appendix 2, tables 4, 5 and 6.

5.11.1 Air inlet guide

The air inlet guide (L) is located at the back at the bottom of the appliance's combustion chamber (see Appendix 3, Fig. 12 and 13).

If you want to remove it, proceed as follows:

- Remove the glass pane as described in section 5.10.1.
 - Fully unscrew the 2 bolts of the top panel (G), (see Appendix 3, Fig. 8 (P));
 - Remove the top panel (G);
 - Slide the back panel (see Appendix 3, Fig. 12 (H)), which is fixed with 4 hooks in 4 slots, upwards and remove it;
- !Caution** The decoration ring is hitched to the back panel. Make sure the decoration ring remains at its location when removing the back panel (H).
- Completely unscrew the 2 self-tapping screws of the lower cover plate (I);
 - Remove the lower cover plate from the appliance;
 - Unscrew the 2 self-tapping screw at the back of the appliance and remove them (see Appendix 3, Fig. 13);
 - Now remove the air inlet guide (L) from the inside;
- !Caution** Close the two holes created by removing the 2 self-tapping screws, using the supplied sealing caps (see Appendix 3, Fig. 13);
- Place back the back panel, by allowing the 4 hooks to drop into the 4 slots;
- !Tip** The lower two hooks are longer. Allow them to drop into the slots first, followed by the two upper hooks.
- Hitch the decoration ring to the back panel again;
 - Place back the lower cover plate;
 - Then place back the top panel;
 - Place back the glass pane.
- !Tip** When installing an appliance, whereby a restrictor slide has to be placed, you should not place back the top panel and glass pane just yet.

5.11.2 Restrictor slide

The restrictor slide (R) is supplied separately (see Appendix 3, Fig. 14).

It is mounted as follows:

- Remove the glass pane as described in section 5.10.1;
- Fully unscrew the 2 bolts of the top panel (see Appendix 3, Fig. 8 (P));
- Remove the top panel (G);
- Unscrew the 2 self-tapping screws of the upper cover plate (see Appendix 3, Fig. 14 (J));
- Remove the upper cover plate (J);
- Unscrew the 2 self-tapping screws from the combustion chamber; they are on the inside at the top of the appliance;
- Place the restrictor slide (R);
- !Caution The restrictor slide may only be placed in one way. Therefore, observe the instructions in Appendix 3, Fig. 14.
- Tighten the 2 self-tapping screws by a few strokes, but not yet fully tight;
- Set the position of the restrictor in accordance with table 6;
In the restrictor slide, the 3 possible positions are indicated by 3 cut out triangles. The letters at these triangles correspond with the letters in table 6.
- Make sure that the point of the triangle that belongs to the position required by you and the centre of the self-tapping screw are exactly aligned.
- Now tighten the 2 self-tapping screws;
- Place back the upper cover plate;
- Place back the top panel;
- Place back the glass pane as described in section 5.10.2.

5.12 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. 15);
- make sure thermocouple 2 and the surrounding space remain free (see Appendix 3, fig. 16);
- make sure the slot between and around the burners remains free;
- make sure that the vermiculite's fine dust does not get on the burners.

5.12.1 Wood set

The wood set consists of vermiculite (see Appendix 3, fig. 17), chips (see Appendix 3, fig. 18) and a number of logs. Glow material (see appendix 3, fig. 19) is not part of the appliance's standard equipment and is available at your dealer.

- Fill the burners with vermiculite; spread the vermiculite evenly (see Appendix 3, fig. 20). The vermiculite may not reach higher than the edge of the burners.
- !Caution • You can influence the flame picture by moving the vermiculite,
• yet the burner decks have to remain covered with vermiculite in order to prevent that the life span of the burners is reduced.
- Identify the logs A to D (see Appendix 3, fig. 21).
- !Tip Use the burn stains on the logs for identification.
- Place log A and part of the supplied chips at the back of the combustion chamber (see Appendix 3, fig. 22).
- Place log B over the burner and on log A (see Appendix 3, fig. 23).
- Place log C in the position bracket and on log B. Spread out the remaining chips (see Appendix 3, fig. 24).

!Caution Do NOT place chips over the slot around and between the burners.

- Then place log D in front of the burner on log C and the chips (see Appendix 3, fig. 25).

!Caution The logs should not completely cover the burner pattern, because:

- the main burner will not ignite properly; which could result in unsafe situations;
- the appliance will become filthy more quickly, as a result of soot;
- the flame picture will be affected.

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 control; 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).

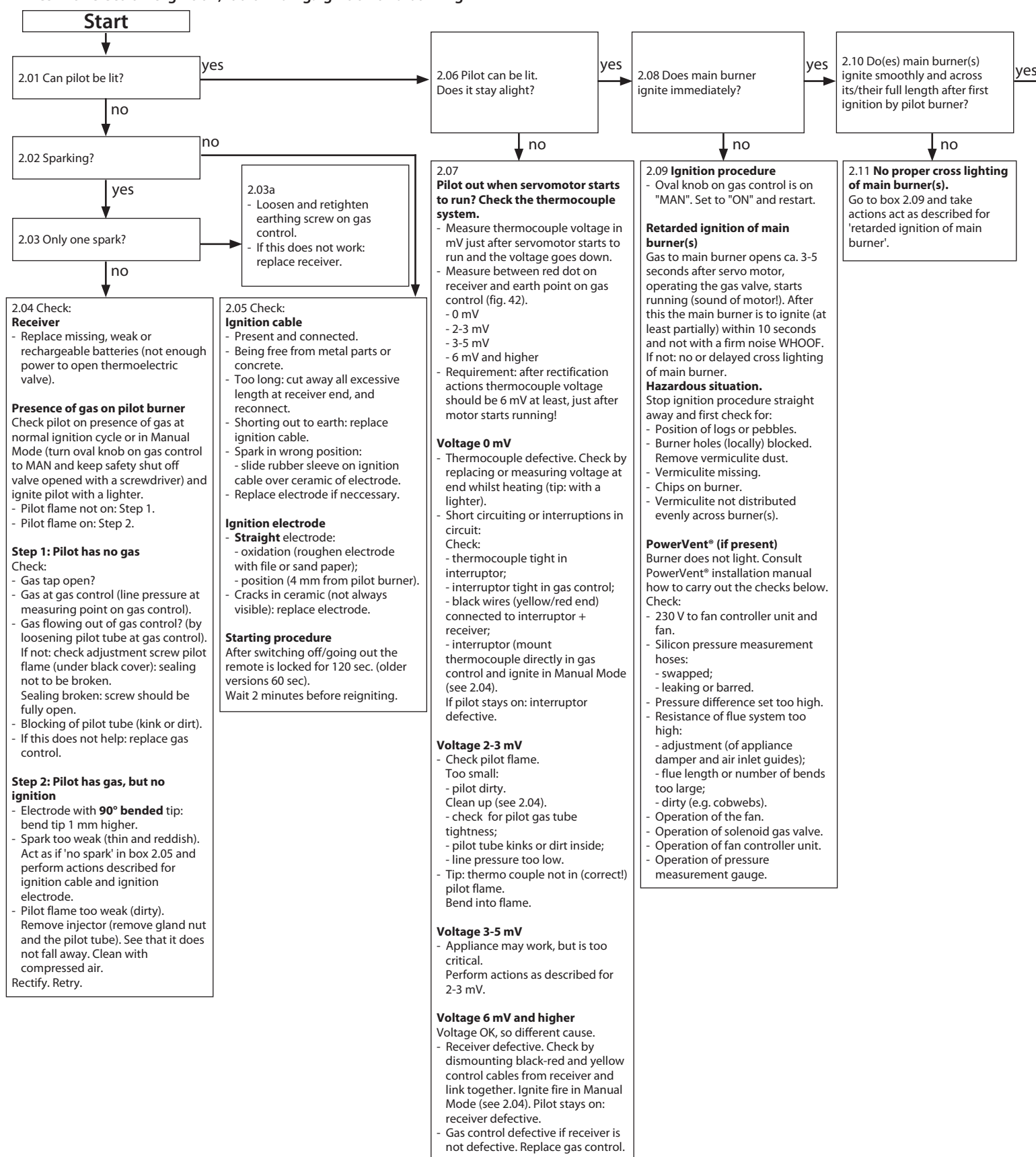
- !Caution** • Tell the user to close the gas tap immediately and contact the installer in case of malfunctions/poor operation. This to prevent unsafe situations.
- Indicate the location of the gas tap.
- Point out the precautions in the user manual against unintended ignition by other wireless remote 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).

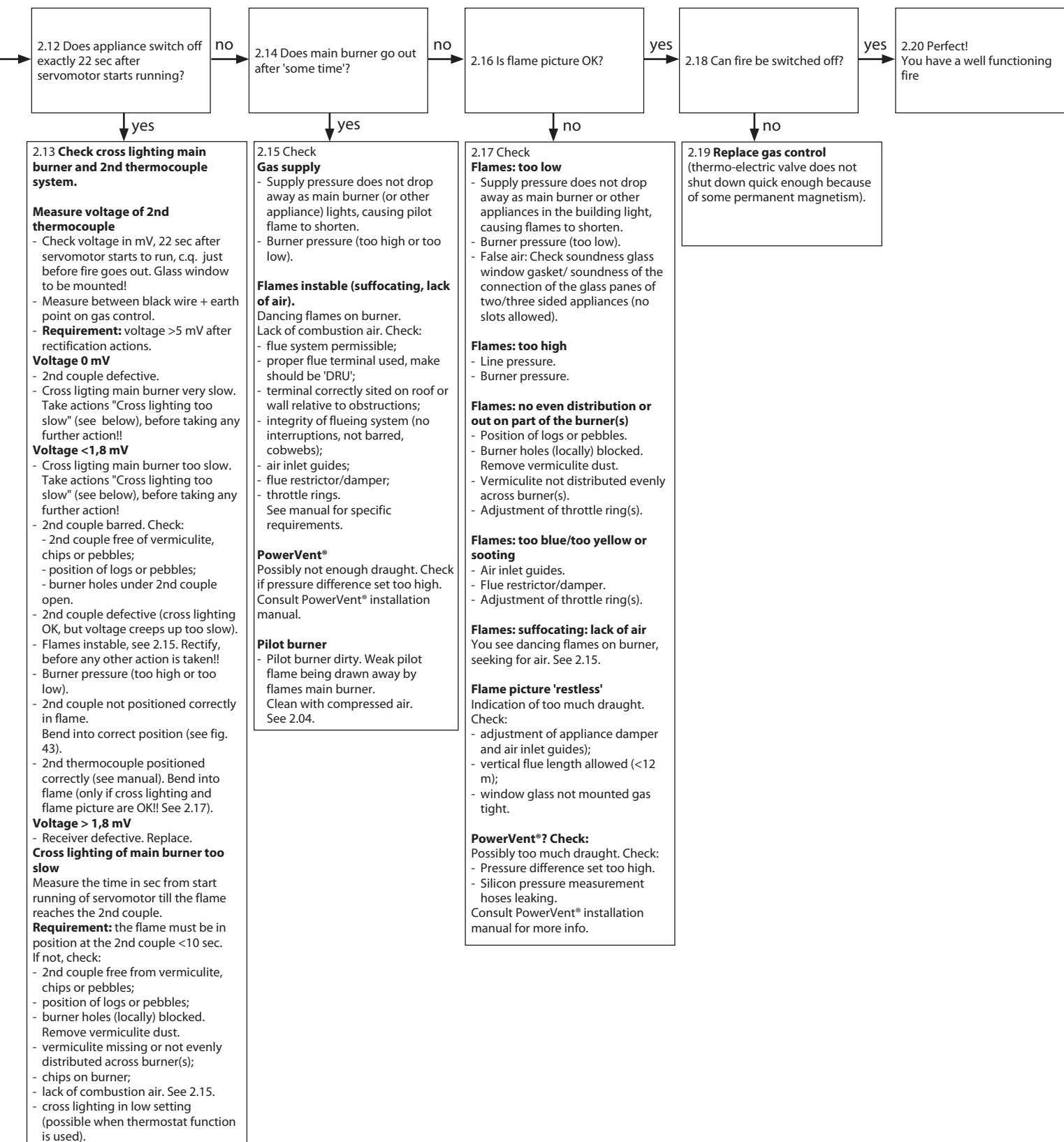
10. Malfunctions

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

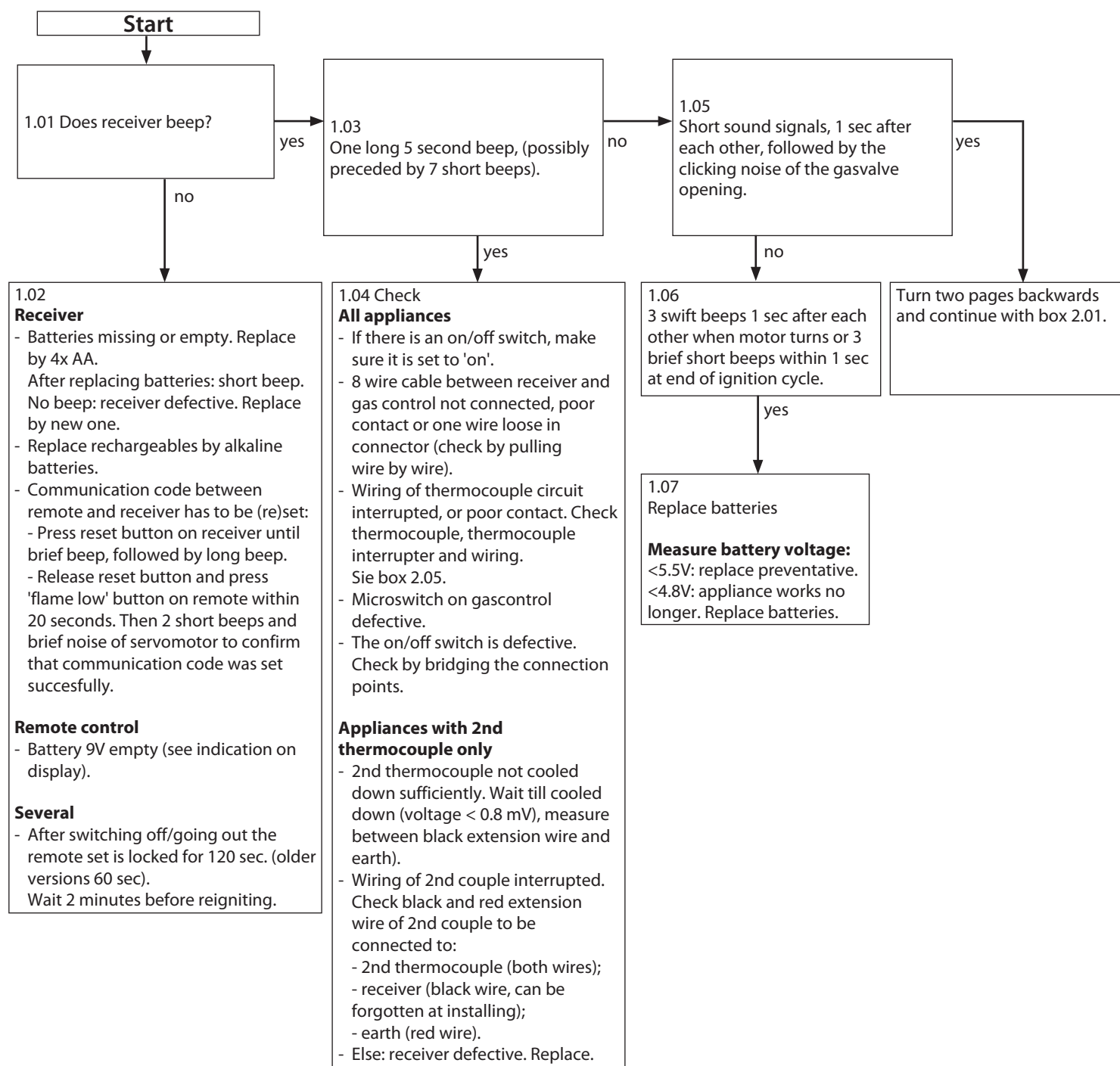
Appendix 1 diagnosis of malfunctions

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
Decoration ring	1x
Restrictor slide	1x
Hexagonal nut M5	2x
Washer 8.4 mm	2x
Sealing cap	2x
Socket spanner 8 mm	1x
Remote control with receiver	1x
9V block battery	1x
Penlite battery (AA type)	4x
Compression fitting 15 mm x G3/8"	1x

Table 2: Technical data

Model identifier(s)		Circo RCE			
Type of appliance		Free-standing			
Combustion		Closed combustion			
Type		C11, C31, C91			
Categorie		I _{2EK} , I _{2ELL} , I _{2H} , I _{2E+} , I _{2E} , I _{3P} , II _{2E+3P} , II _{2H3P} , II _{2EK3P}			
Concentric appliance connection		150/100			
Applicable concentric systems		DRU LAS ES-E 200/150/100, DRU LAS ES-I 150/100, DRU LAS AG-I 150/100			
Flame protection version		Pilot flame with thermocouple			
2nd thermocouple safety		Yes			
Atmosphere safety		No			
Explosion hatch		Yes			
Ventilation hole chimney breast					
Gastype:	Symbol	G25/G25.3*	G20	G31	Unit
Indirect heating functionality		No	No	No	
Direct heat output		6,0	7,0	6,2	kW
Indirect heat output		-	-	-	kW
Space heating emissions NO _x		91,4	86,4	58,2	mg/kWh _{input} (GCV)
Heat output					
Nominal heat output	P _{nom}	6,0	7,0	6,2	kW
Minimum heat output (indicative)	P _{min}	2,7	2,9	2,8	kW
Technical data					
Nominal heat input (Hs)		8,2	9,1	8,5	kW
Nominal heat input (Hi)		7,4	8,2	7,7	kW
Consumption max		913	845	315	L/h
Consumption min		468	424	222	L/h
Burner pressure max		18,2	14,5	23,5	mbar
Burner pressure min		5,0	3,6	11,7	mbar
Main burner injector		1x Ø 1,55 1x Ø 1,70	1x Ø 1.55 1x Ø 1.70	2x Ø 1.15	mm
Low setting injector		Ø 1,70	Ø 1.70	Ø 1.30	mm
Efficiency class (EN613)		1	1	1	
Useful efficiency (NCV)**					
Useful efficiency at nominal heat output	η _{th,nom}	92,3	92,5	92,9	%
Useful efficiency at minimum heat output (indicative)	η _{th,min}	89,0	87,8	89,0	%
Auxiliary electricity consumption					
At nominal heat output	el _{max}	-	-	-	kW
At nominal heat output	el _{min}	-	-	-	kW
In standby mode	el _{sg}	-	-	-	kW
Permanent pilot flame power requirement					
Pilot flame power requirement (if applicable)	P _{pilot}	-	-	-	kW
Energy efficiency					
Energy efficiency index	EEI	92	93	93	
Energy efficiency class		A	A	A	
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

G20/G25/G25.3/G31					
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
1 ¹⁾ - 4	0 ²⁾	4	YES	NO	OPEN
1 ¹⁾ - 4	0 - 3	4	NO	NO	OPEN

1) minimum length

2) factory setting

Permissibility and conditions concentric system with roof terminal

Table 5: Determining permissibility concentric system

G20/G25/ G25.3/G31	Total number of meters horiz. pipe length	Total no. of meters vertical and/or sloping pipe length											
		1 ¹⁾	2	3	4	5	6	7	8	9	10	11	12
no bends	0	B	B	B	C	C	C	C	C	D	D	D	D
2 bends	0	A	A	B	B	B	C	C	C	C	C	D	D
	1		A	A	B	B	B	C	C	C	C	C	
	2			A	A	B	B	B	C	C	C		
	3				A	A	B	B	B	C			
	4					A	A	B	B				
	5												
3 bends	0	A	A	A	B	B	B	C	C	C	C	C	D
	1		A	A	A	B	B	B	C	C	C	C	
	2			A	A	A	B	B	B	C	C		
	3				A	A	A	B	B	B			
	4					A	A	A	B				
	5												
4 bends	0	A	A	A	A	B	B	B	C	C	C	C	C
	1		A	A	A	A	B	B	B	C	C	C	
	2			A	A	A	A	B	B	B	C		
	3				A	A	A	A	B	B			
	4					A	A	A	A				
	5												
5 bends	-												

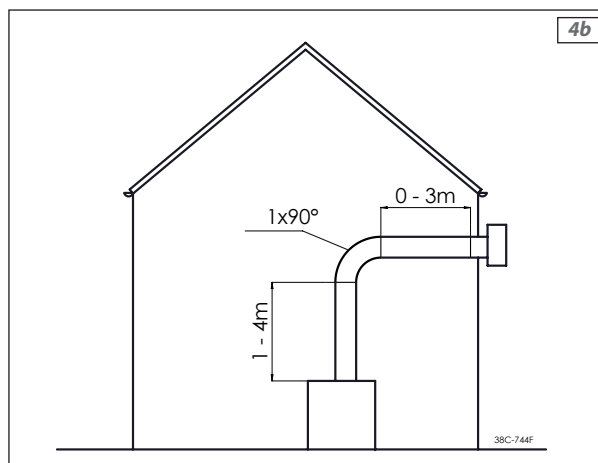
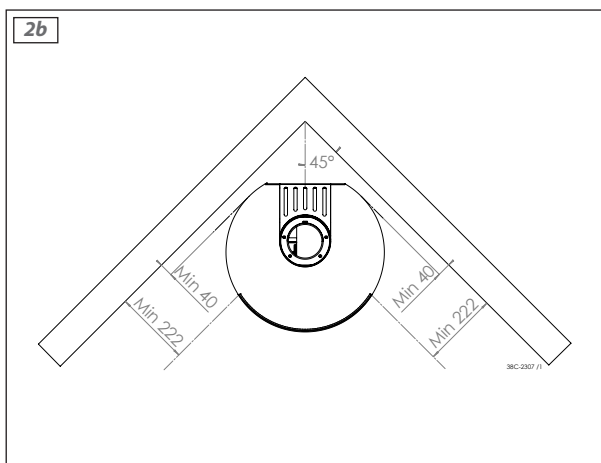
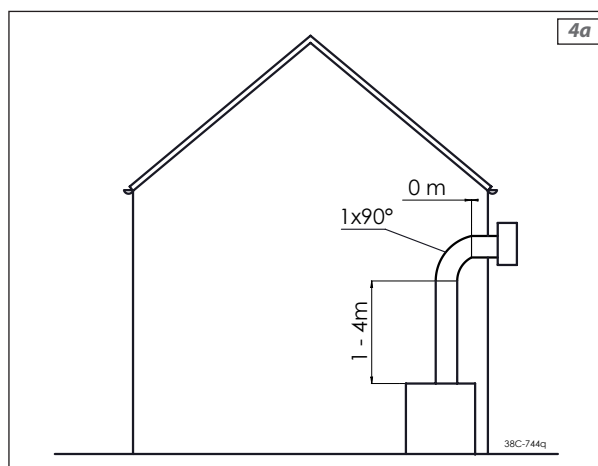
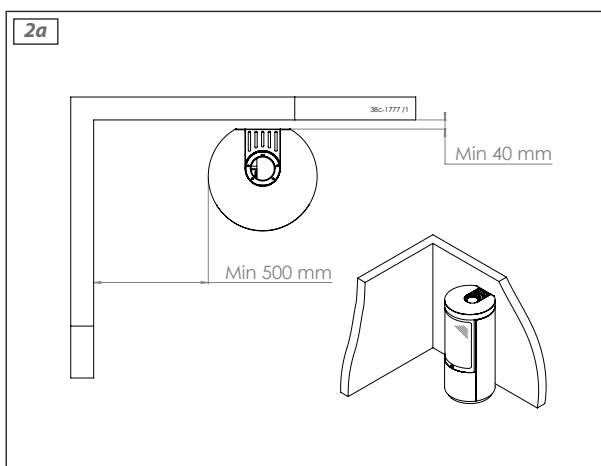
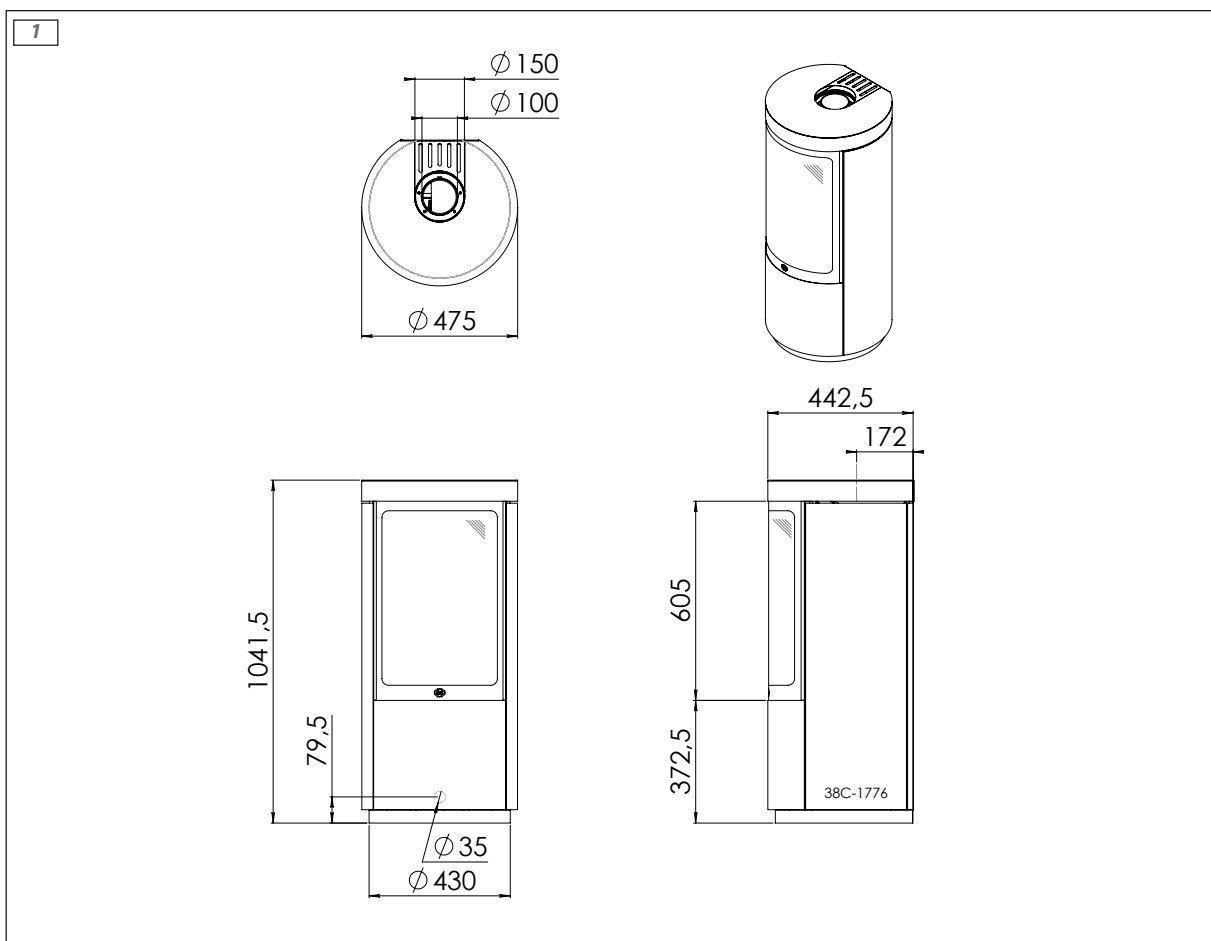
■ = Situation is not permissible

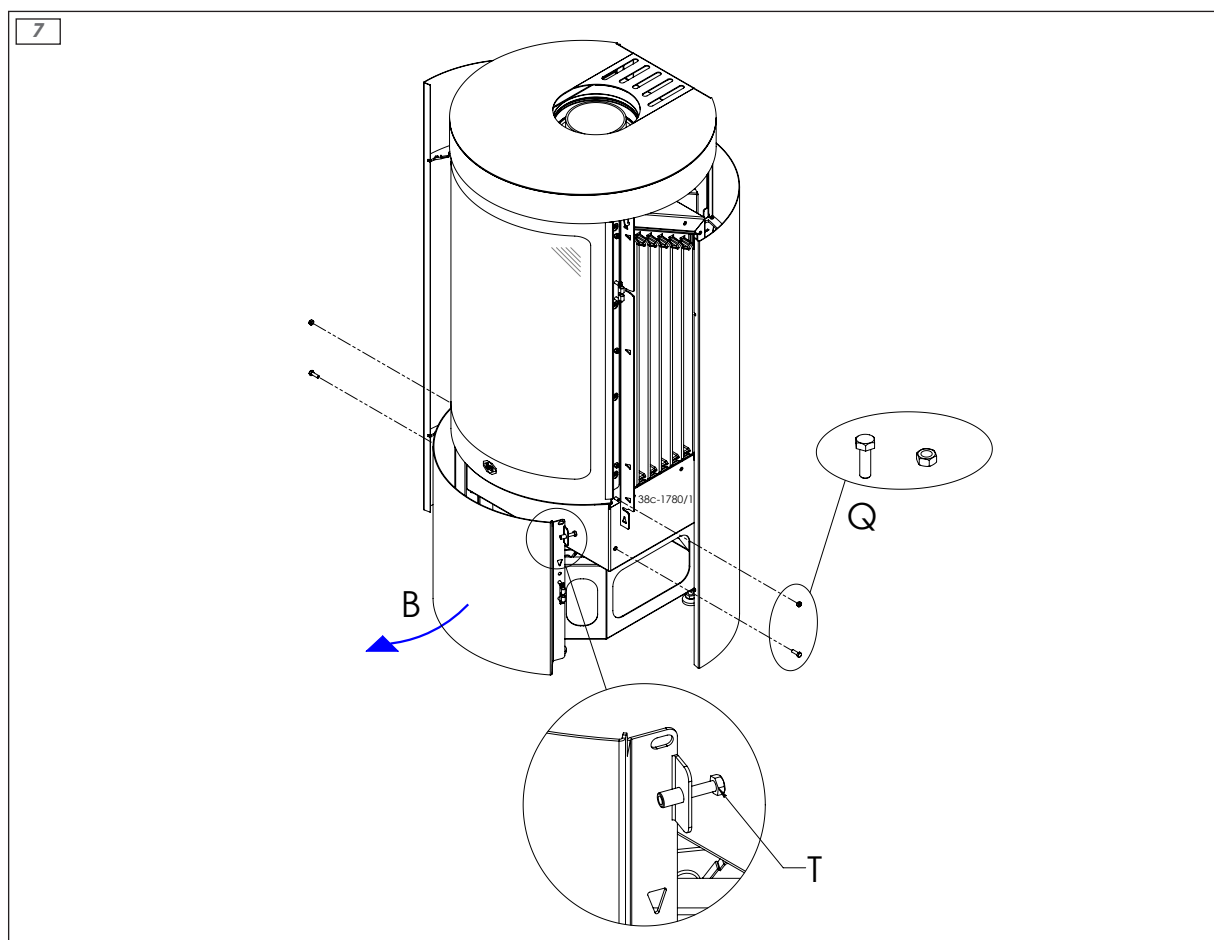
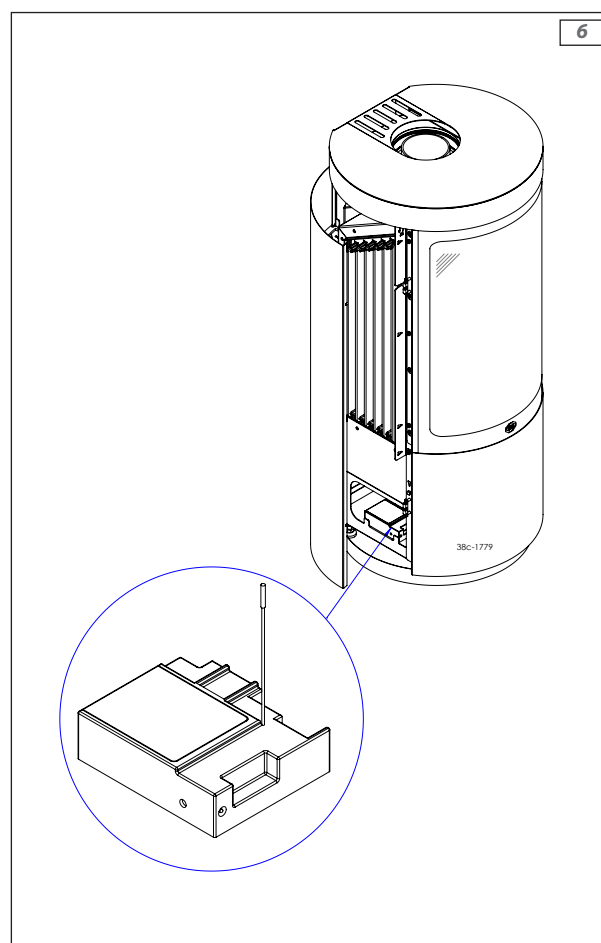
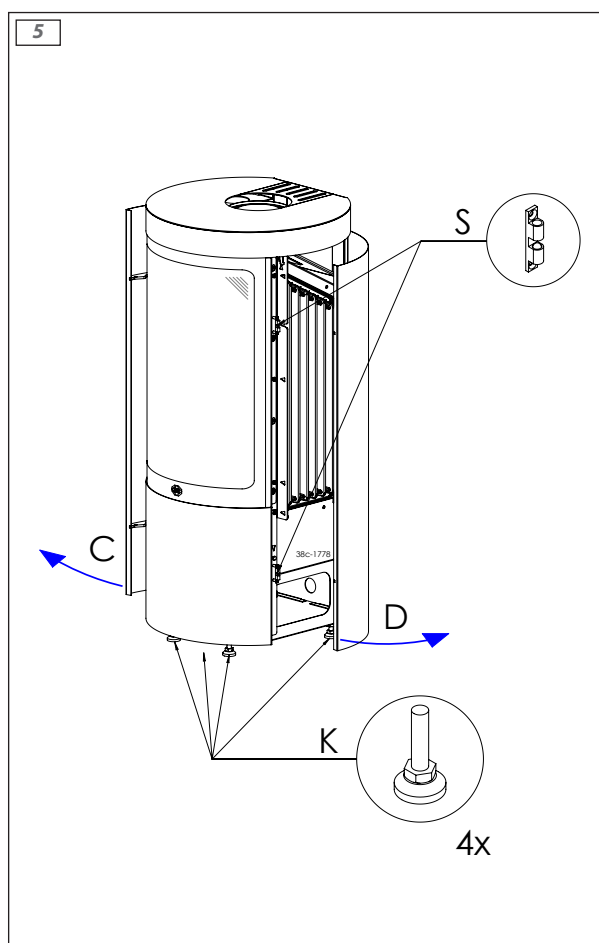
¹⁾ minimum length

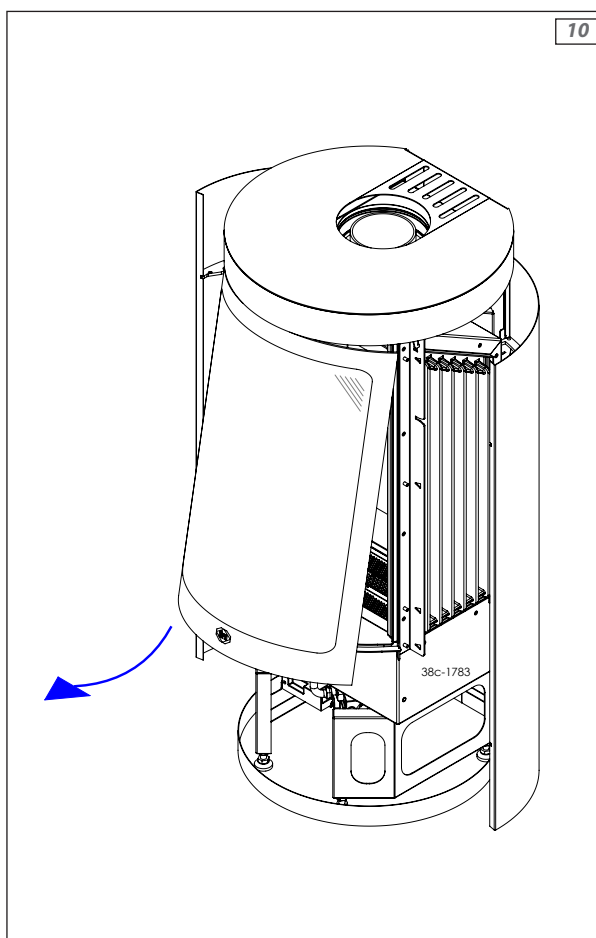
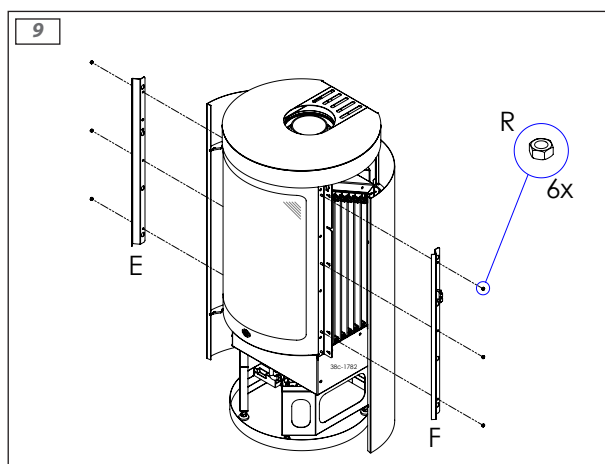
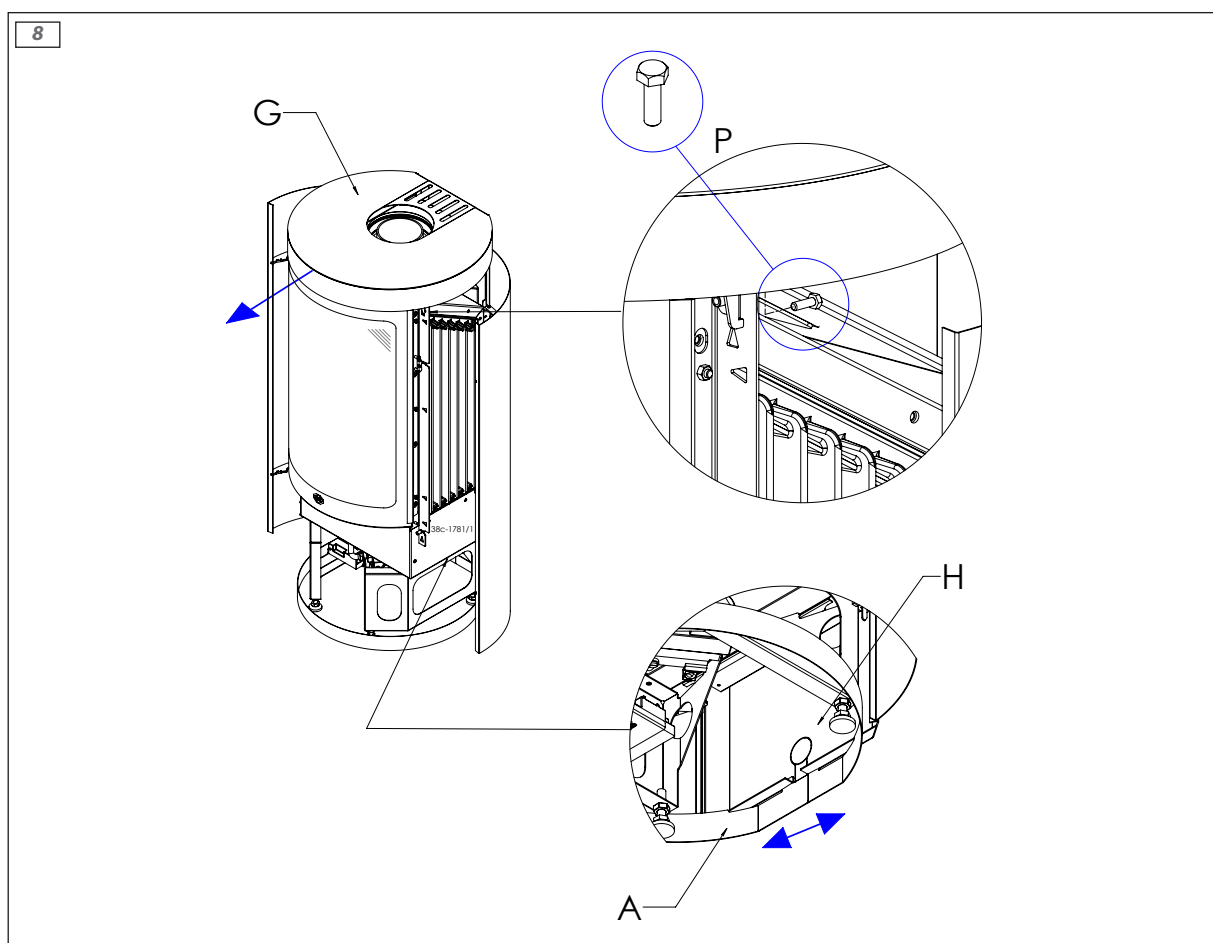
Table 6: Conditions for the adjustment of the appliance with a roof terminal

G20/G25/G25.3/G31			
Situation	Air inlet guide	Restrictor slide	Distance restrictor in mm
A	NO	NO	OPEN
B	YES	YES	41
C	YES	YES	34
D	YES	YES	25

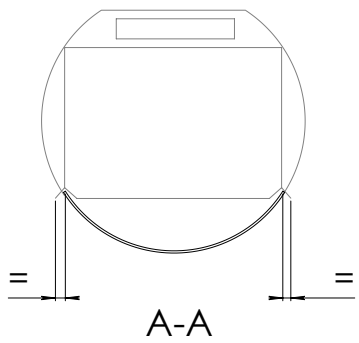
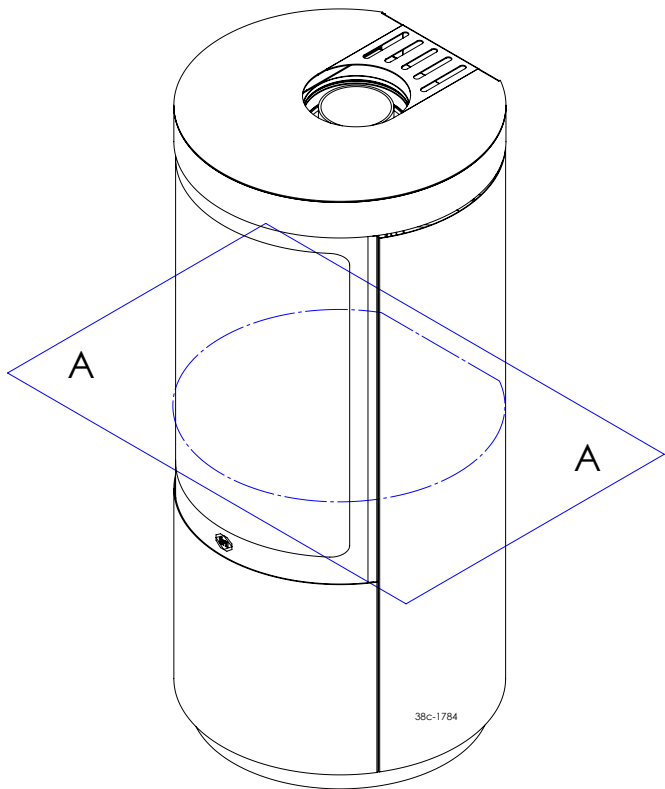
Appendix 3 Figures



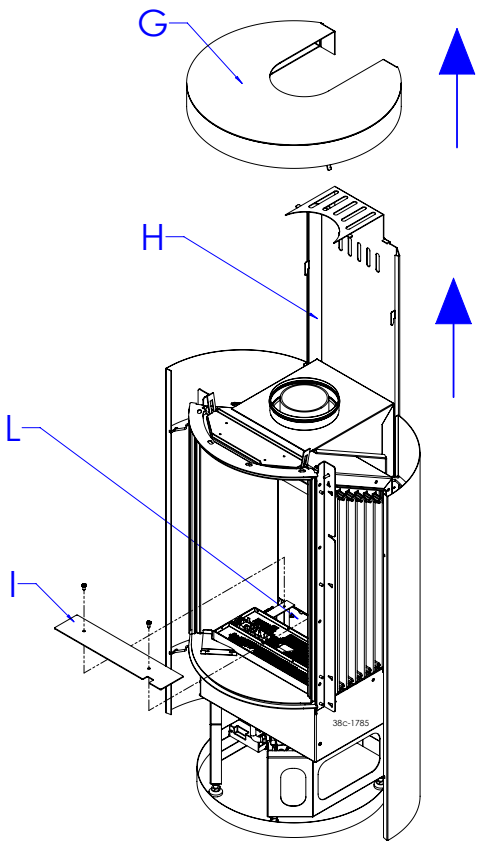




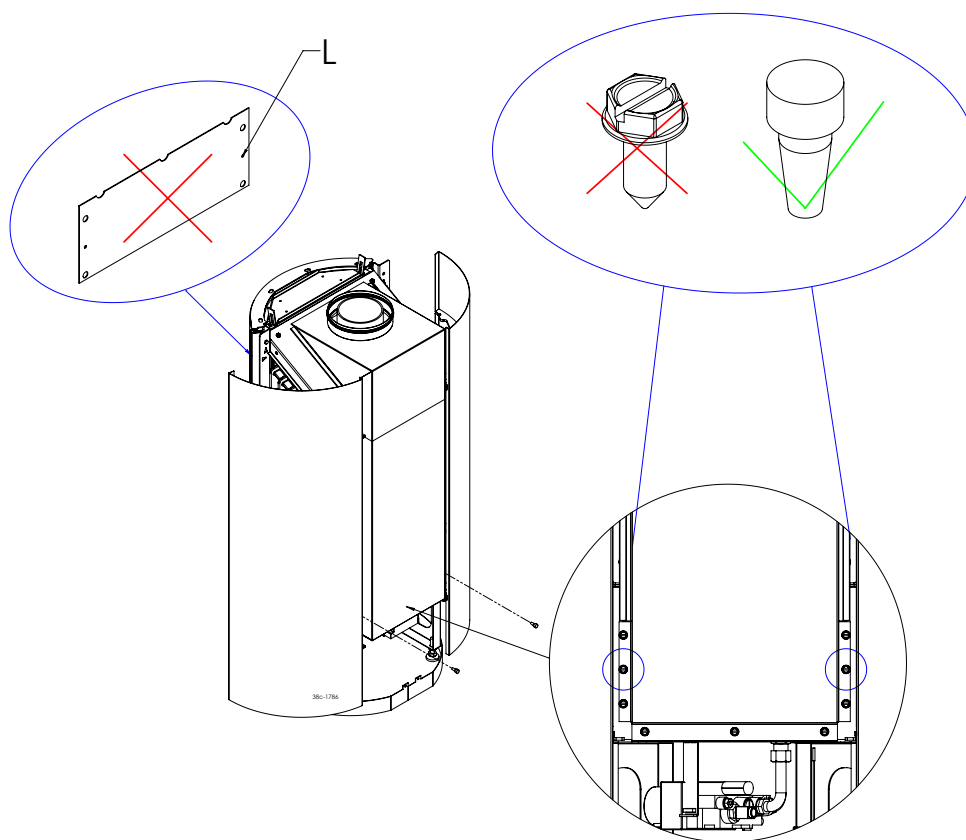
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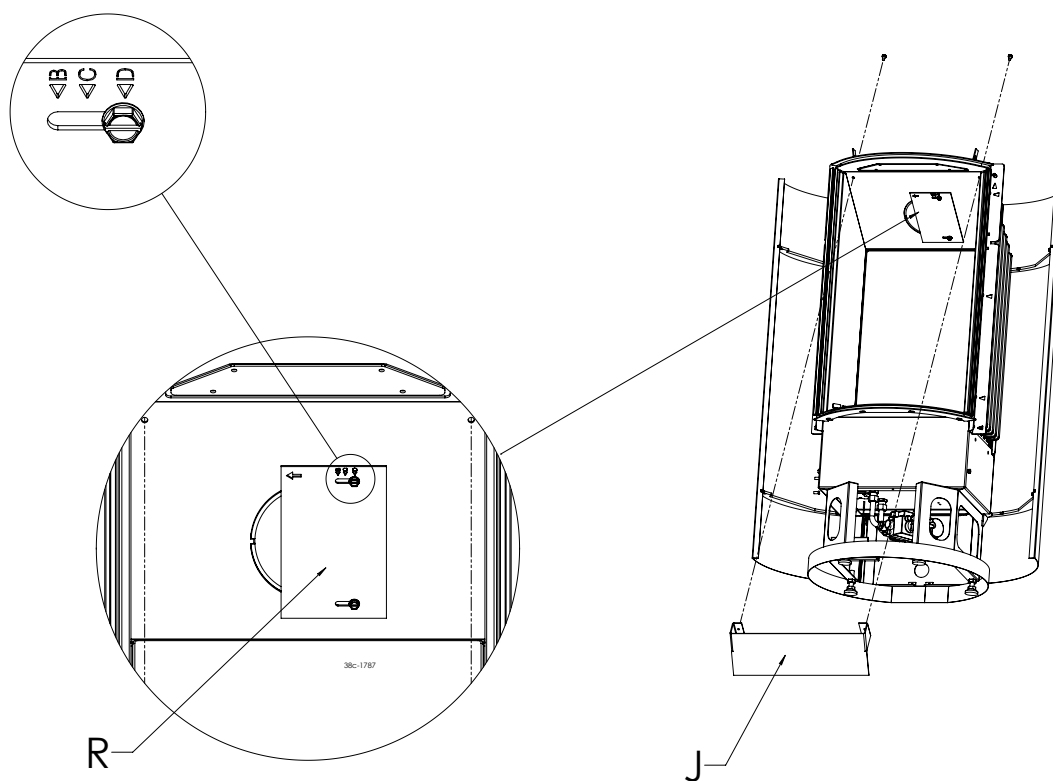
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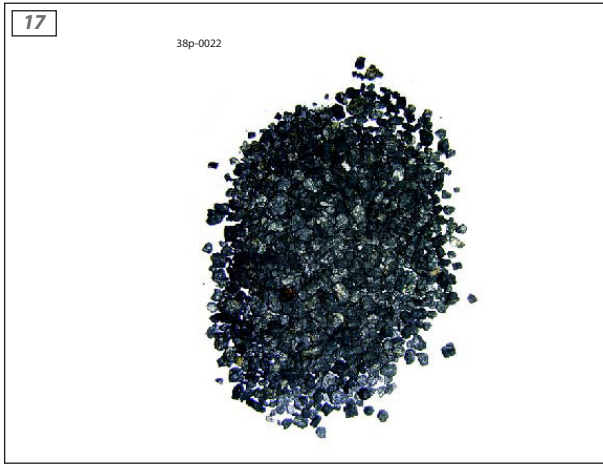


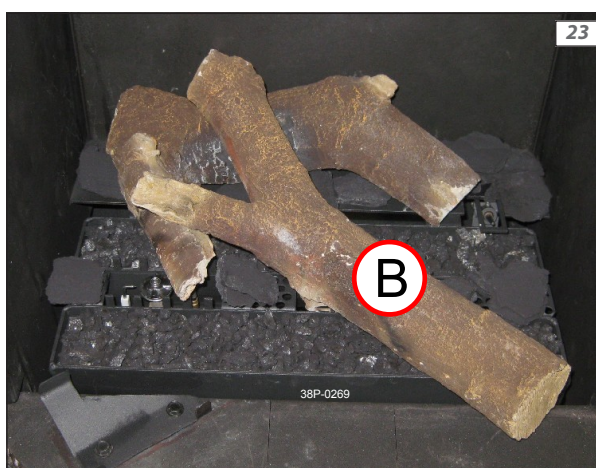
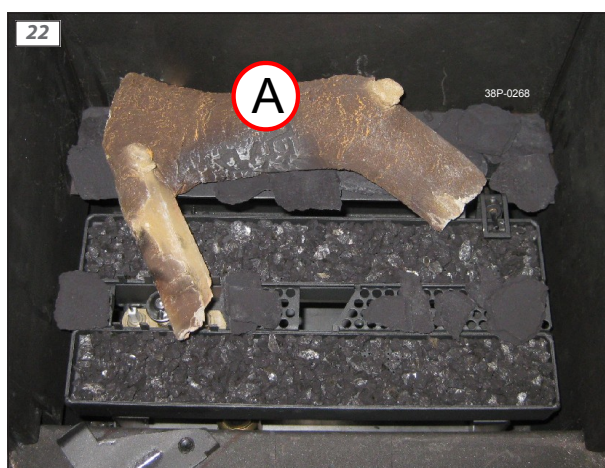
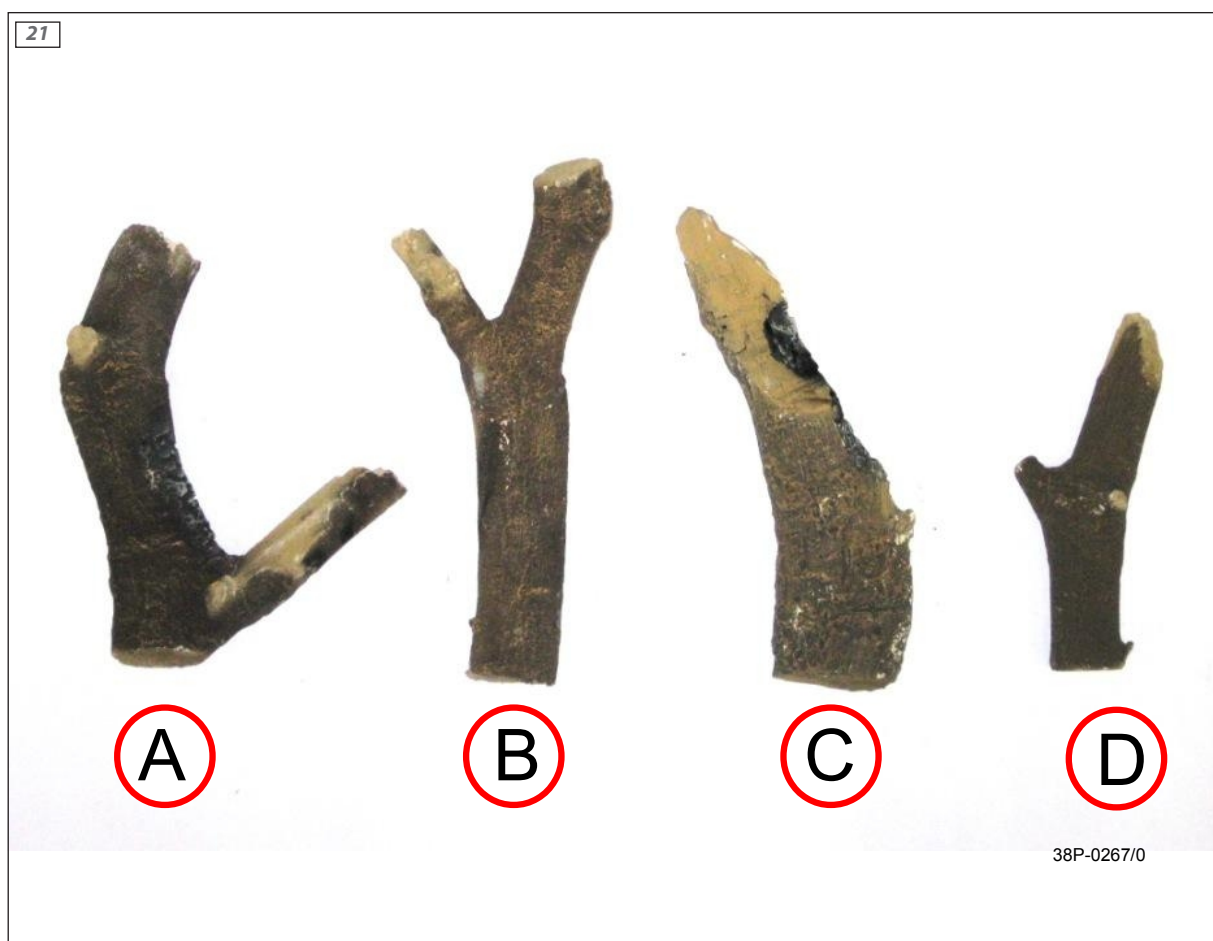
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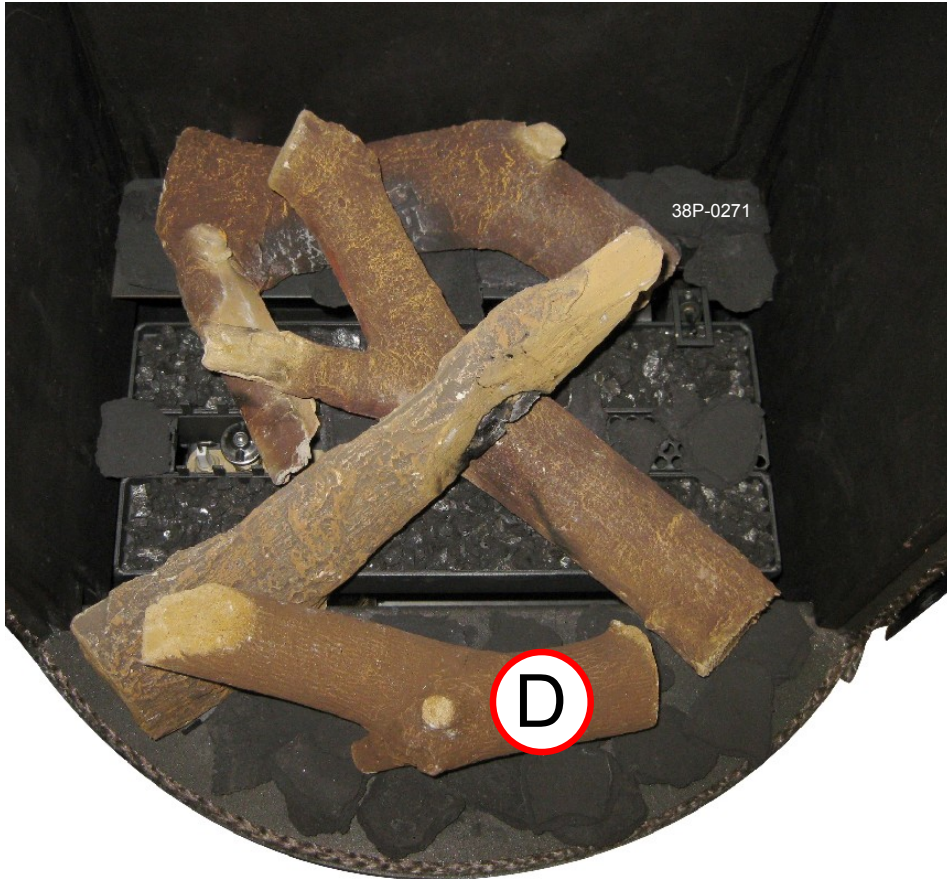


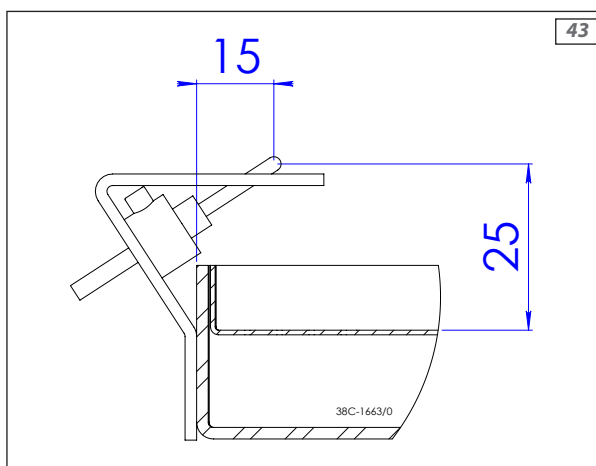
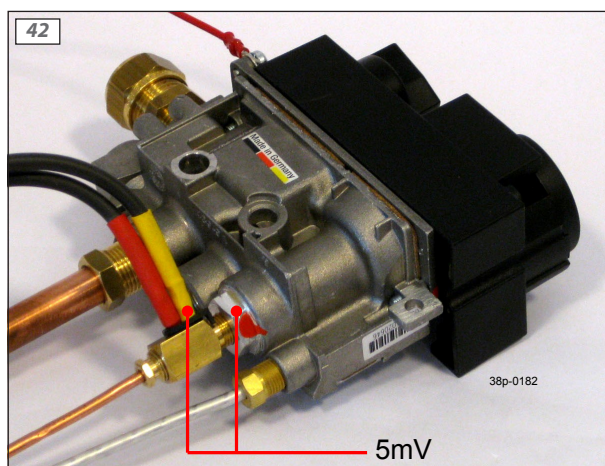
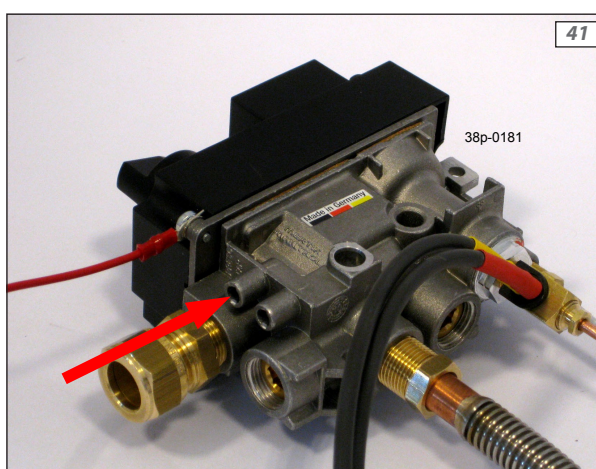
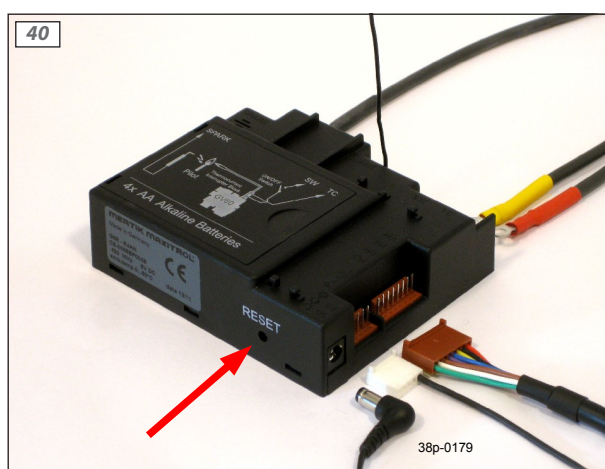
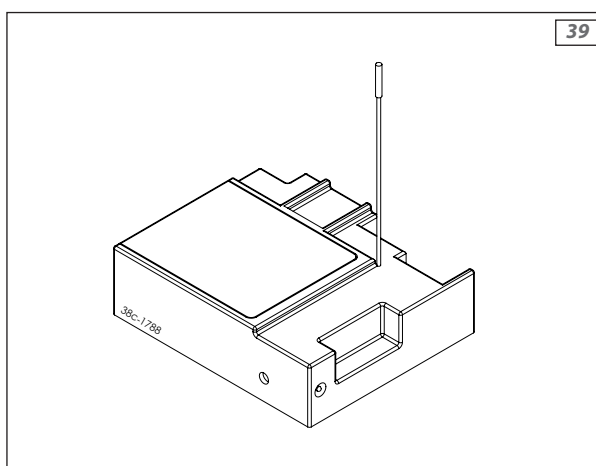
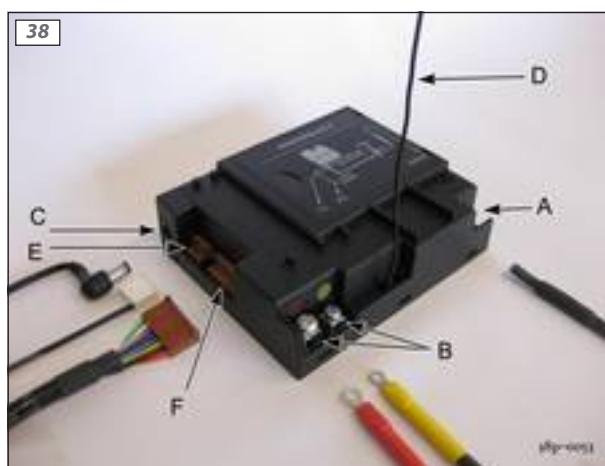


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