

INDUSTRY

APPLICATION

MANUAL



**FIREPLACE  
DAKOTA**

The DAKOTA stove is an economical and highly efficient heating appliance designed for heating industrial spaces.

In addition, the stove is well suited for permanent space heating and for spaces that are used temporarily and intermittently.

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Rated power kW	Maks. or kW			Weight, kg		Oven mah	Gap through	Gap height		
50 2	60	2 000	1445* 708* 1344	269,08	14	340	200	7	1 000	6-10



2

3

VRoom volume, m<sup>3</sup>

Dimensions (height \* width \* length), mm

Number of convection tubes

Length of stalks, mm

Working time per kilogram of fuel, in hours

## INTRODUCTION

This installation and operating manual relates to a heating system for a furnace intended for heating industrial premises.

The DAKOTA stove is an economical and highly efficient solid fuel heating appliance. The main mode of operation is glow combustion (wood gas generator principle).

The operating mode is set by the consumer and depends on the size of the room to be heated and the speed at which the desired temperature is reached. The heated air heats the heated space evenly.

Furnace climatic performance type - UHL category 4.2 according to GOST 15150.

**WARNING!!!** Before installing and using the stove, read these installation and maintenance instructions carefully.

*The manufacturer will not be held responsible for failure to follow the installation and maintenance instructions.*

## TECHNICAL DATA

The DAKOTA heating furnace is produced for heating spaces of one standard size up to 2000 m<sup>3</sup> with a nominal heat output of 50 kW. The main technical specifications of the heater are given in Table 1.

## THE DEVICE AND HOW IT WORKS

The heat exchanger (Figure 1) is a simple, highly efficient and reliable welded structure made of a special structural steel of the thermal type.

**Table 1.**

\* purpose and it depends on many factors, for example: heat losses through the surrounding construction; ceiling height; ventilation; firewood moisture, etc.

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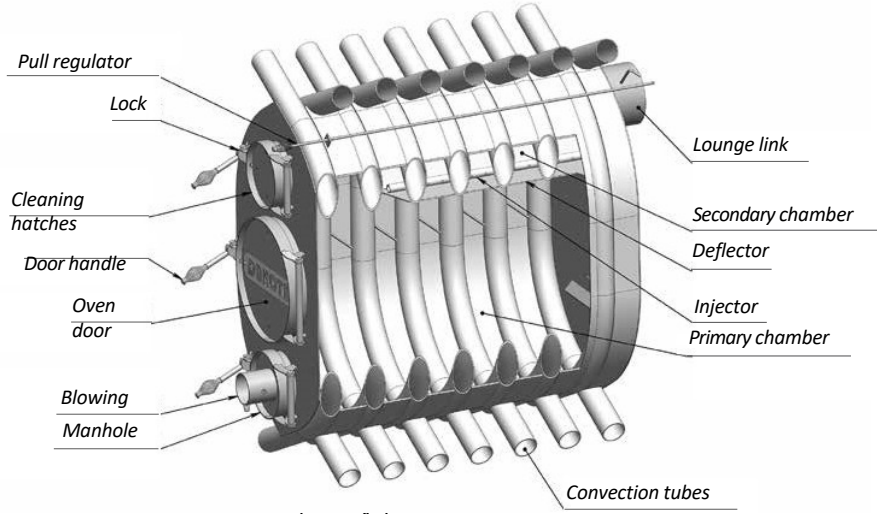


Figure 1. Furnace Construction

Such a stove has a two-chambered combustion chamber in which the glow combustion method ("wood gas generator" principle) involves two stages: combustion of the fuel and afterburning of flue gases.

Gaseous exhaust gases produced by the glowing of wood in the lower (primary) chamber enter the upper (secondary) chamber, where they are combusted in a heated combustion chamber.

by air (oxygen) supplied from the room to be heated by a special injector.

via.

Since wood does not burn but glows, one bag of stove fuel is enough for 6-10 hours of continuous use. (depending on fuel density and humidity).

The furnace is equipped with heat exchanger tubes to ensure efficient heat exchange. From the room to be heated cold air enters the lower openings of these pipes and is returned to the room through the upper openings after heating to a temperature of 60 to 80 °C.

This ensures even heating and mixing of the air throughout the room. The tubes are in full contact with the stove, quickly absorbing the heat generated and transferring it to the room to be heated. Efficient removal of heat from the walls of the flask due to the powerful convection currents generated ensures efficient heat removal from the lateral surfaces of the flask.

Separating the primary and secondary compartments also helps to achieve the optimum temperature of the upper ends of the heat exchanger tubes. The fuel is placed in the furnace through an oven door that is large enough to allow large stacks to be added. Door the eccentric lock on the handle ensures that it closes firmly and tightly.

The ignition flue has a blow-by timer (boost regulator) that can be used to adjust the intensity of fuel combustion.

The post-combustion mode of the CO released from the fuel shall be set by means of a flue gas regulator (gas regulator) in each case on a case-by-case experimental basis, depending on the design of the flue.

The chimney damper has a cut-out equal to a quarter of the cross-sectional area to prevent the ingress of flue gas into the space to be heated.

All the outer surfaces of the oven are painted with a heat-resistant silicone enamel paint that retains its properties at high temperatures.

*\* The manufacturer reserves the right to modify the design of the oven without affecting its performance.*

## **4 SAFETY REQUIREMENTS**

NOTE! To ensure the safe installation and use of the appliance, the requirements and recommendations given in this manual and the following documents must be followed:

- NAPBA.01.001 - 2004 Ukrainian fire safety regulations;
- SNiP 2.04.05 - 91 Heating, ventilation and air conditioning. In addition, the local fire inspector should always be consulted with any questions.

## **5 FURNACE INSTALLATION**

Before installing the stove, it is necessary to ensure that there is a supply of fresh air for normal operation of the stove in the room where it is to be installed.

In order to ensure an adequate air supply for stoves of 35 kW or less, the room in which such a stove is installed shall have at least an external door or an opening window. In the case of stoves with a capacity of more than 35 kW, the room shall be provided with extract ducts with a cross-section of at least 150 cm<sup>2</sup> leading to the surface.

In any case, the size of the installation space shall be 4 m<sup>2</sup> for each 1 kW of heat output.

The installation location of the stove must be chosen in such a way as to ensure not only the most efficient heating of the space to be heated, but also free access for inspection and cleaning of the stove. The surface underneath the heater must be made of non-combustible materials.

In addition, the heater must be installed on a metal support at least 0,2 m high or, alternatively.

on a brick base, as shown in Figure 2. The underside of the oven door, which is composed of combustible and flammable materials, shall be protected by a metal sheet 700 x 700 mm, placed long side down along the length of the oven.

The distance from the oven door to the opposite wall must be at least 1,25 m.

## 6

Due to the fact that the stove has an optimised fuel combustion process (in order to prolong the operating time and increase efficiency), the rules for the use of the stove impose strict requirements on the stove materials and their installation conditions. The following is a brief description of the basic requirements for modern furnaces.

1

As the gases move through the flue, they cool naturally due to heat transfer to the flue walls. Thus, the more massive the furnace, the faster the heat loss of the flue gases and the more energy is needed to reheat them. As the temperature of the outgoing boiler gases is not high in modern high-efficiency furnaces, their energy may not be sufficient to heat a thick brick structure over the entire height of the chimney. A decrease in the temperature of the flue gases will result in a significant attenuation of their outflow. As a result, draught is reduced, the stove starts to smoke, etc. For this reason, rapid heating, low heat output and low weight are essential for modern chimneys.

2

As we know, the gases in the atmosphere rise upwards because of their heat (energy), in other words their temperature.

If the flue is cold (both the material and the air inside the flue) and the temperature of the outgoing flue gases is not high, the situation arises where the energy of the smoke is not sufficient to "break through" the air cap in the cold part of the flue. The insulation of the flue allows to avoid cooling.

Therefore, parts of the chimney that may be affected by cold temperatures (attic, street), i.e. pipes outside the room to be heated, should be insulated with 30 - 50 mm thick basalt wool.

3

As noted, the exhaust gases cool naturally as they pass through the stack. Often, the temperature of the flue gas drops below the dew point, resulting in abundant condensation, which is chemically very strong, and a layer of soot on the inside walls of the stack. If the flue is

made of a material that cannot withstand condensate strongly

in an acidic environment, such an anchor quickly becomes unusable. For this reason, the corrosion resistance of the chimney is important. A suitable material is acid-resistant stainless steel, which ensures the bell's durability.

4

In addition, the surface of the chute walls has a significant effect on the drag; the smoother the surface, the lower the drag coefficient and the stronger the drag. In addition, the roughness of the walls promotes soot accumulation, which results in a reduction in the

the cross-sectional area of the bellows and, with it, the draft. The smooth surfaces of stainless steel chutes have a minimum coefficient of drag, and stainless steel prevents soot from sticking to them.

The heater's flue must therefore provide good draught and be strong and durable. It must be able to withstand the high temperature of the flue gases (during firing of the stove), provide a stable flue gas outlet (in economy mode) at low flue gas temperatures, withstand the effects of condensate and strong acids, be fire-resistant and easy to install. This is why we recommend a flue made of heat and acid resistant stainless steel DIN 1.4571 / 1.4404.

Such a baffle has a small thickness, heats up very quickly, has a surface for the mirror to which nothing sticks, and is not damaged by exposure to strong acidic condensate. The use of such a chimney ensures its high efficiency, reliability and durability and, as a result, the correct and efficient operation of the oven in the modes and with the characteristics for which it is intended.

A separate flue pipe or separate flue duct in a brick pipe must be used for each stove (with mandatory lining in stainless steel).

The diameter of the chute shall not be less than the diameter defined in Table 1 over the entire height of the chute.

The height of the chimney from the outlet to the end of the stove shall not be less than that specified in Table 1 and shall always be above the roof ridge.



**NOTE!** For non-insulated (stainless) metal chimney flue assemblies, insert the top pipe into the bottom pipe (Figure 2).

When assembling insulated pipes, the inner upper pipe is inserted into the lower pipe, while the outer upper pipe is installed on the lower one.

Asbestos-cement pipes must not be used for chimneys.

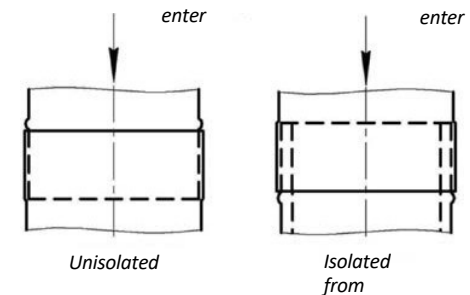


Figure 2. Connecting the flue pipes

Metallic pipes to be installed under the ceiling or parallel to walls and partitions and made of materials of reaction to fire class G3, G4 shall be spaced at the following distances: not less than 0,7 m - for pipes without insulation; not less than 0,2 m - for pipes with insulation that does not allow the external surface temperature to exceed 90 °C. Metallic bellows may pass through a ceiling of combustible material, provided that the final finish is made of non-combustible materials not less than 0,51 m in size.

If the flue is routed through a window, a steel sheet at least three times the diameter of the flue must be installed.

The end of the pipe shall extend at least 0,7 m beyond the wall of the building and terminate at least 0,5 m above the ground. The pipe projecting from the upper floor window shall extend 1 m above the eaves. It is recommended to install a rainwater run-off shelter on top of the pipe.

Chimneys shall be of vertical construction. The permissible vertical inclination of the pipes shall be up to 30°, with an offset of not more than 1 m. Chimney flues in buildings with roofs of combustible materials shall be fitted with metal mesh spark arrestors with openings not exceeding 5 x 5 mm.

It is not recommended to use horizontal cuts when installing the chimney. As an exception, there is one horizontal cut directly from the stove not exceeding 1 m.

To prevent the chimney from becoming clogged with soot and condensate and to make chimney cleaning more convenient, a T-shaped fitting (Figure 3) with a removable cap (funnel) should be installed immediately after the chimney outlet.

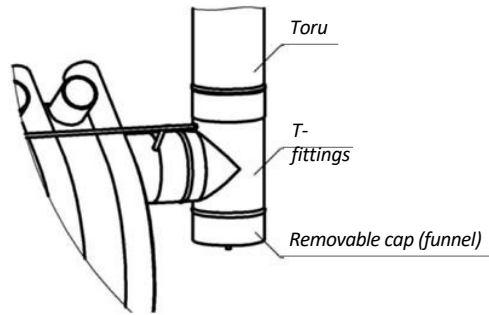


Figure 3: Installation of T-connector with cap (funnel)

The space between the flues and roof structures made of combustible or flammable materials shall be covered with non-combustible roofing materials. If the chimney passes through the roof, a corresponding gap shall be made in accordance with SNiP 2.04.05 - 91. The opening and the chink are then covered with metal (through the roof), which is guided under the slab on one side and placed on top of the slab on the other side. A cover (umbrella) must be installed over the chute, sealed with silicone sealant and secured with screws (Figure 4).

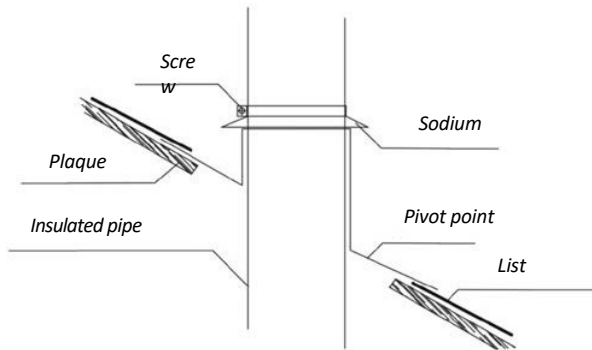


Figure 4. Installation of a chimney through the roof

This will provide rain protection for the roof and attic. The height of the flue above the roof shall be as follows:

- at least 500 mm - for flat roofs;
- Not less than 500 mm - Above the roof ridge or batten, if the pipe is not more than 1,5 m from the ridge or batten;
- not lower than the ridge or batten - if the chimney is between 1,5 m and 3,0 m from the ridge or batten;
- not lower than a line drawn downwards from the ridge at an angle of 10° to the horizon, if the chord is more than 3,0 m from the ridge (Figure 5).

Chimneys must be located above the roof of taller buildings connected to the building.

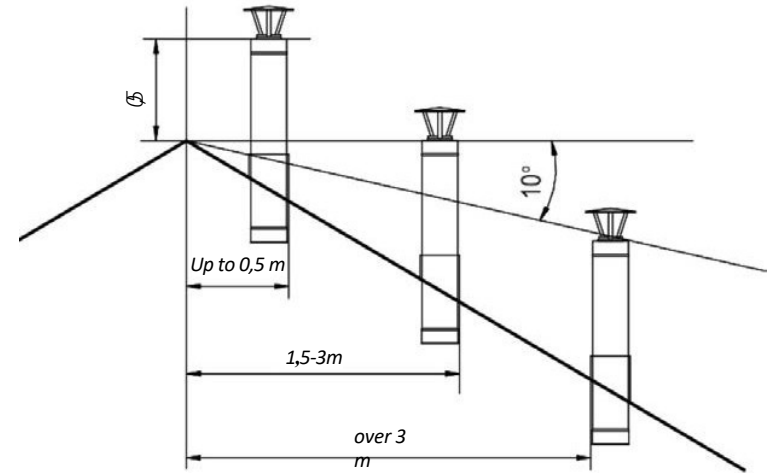


Figure 5: Location of the chimney above the roof

## 7 FUEL USED IN THE STOVE

Any type of solid fuel can be used in the stove: wood, wood waste, wood and peat briquettes, pellets, paper, cardboard, etc.

The standard fuel choice is split firewood that has dried naturally in the shade for 1-2 years, with a moisture content of no more than 20%. It is also possible to use large round logs of the same length as the stove without splitting. If sawdust is used, it must be used in combination with logs and/or firewood. Never use as fuel any liquids, or



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## USE

Do not burn any type of plastic, rubber, etc. in the stove, as this will release toxic gases and pollute the environment.

The fuel must be stored in specially adapted rooms or in a designated place, taking into account the requirements of the regulations. It is strictly forbidden to use unauthorised types of fuel in the stove or to make any modifications to the stove structure.

**NOTE!** The stove is painted with a heat-resistant silicone enamel paint which only fully polymerises during the first heating of the stove and gives off a specific smell which disappears afterwards.

For this reason, the stove should be heated for the first time in a properly ventilated room with fully open doors and windows or outdoors. Before using the stove, make sure that all the elements of the stove and the chimney are working properly. The stove and the flue must be checked and cleaned at least every two months.

In addition, it must be systematically cleaned of dust and other foreign matter and fresh air must be allowed to enter the room.

Before lighting the oven, set the gas regulator and the draft regulator to the fully open position (Figure 6).

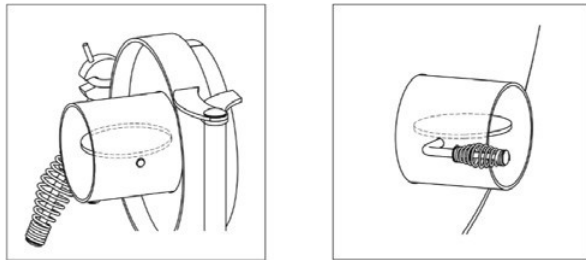


Figure 6: Position of the siphons when lighting or adding firewood (intensive mode)

Use paper and wood shavings for ignition, and add fuel to the stove as it burns until it is completely full.

Within 2-3 minutes after the fuel has been properly ignited, close the oven door and cover it with the damper and only then close the damper. This is how you reconfigure the oven for gas mode (Figure 7).

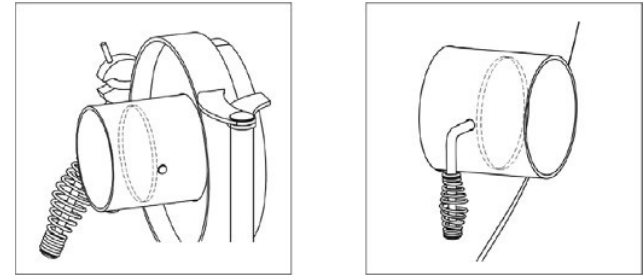


Figure 7. Position of the sliders in main (economy) mode

With the draft and gas regulators fully closed, the furnace has the highest efficiency and the longest operating time.

Change the position of both controls to adjust the desired burn intensity. Their position is freely adjustable and depends on the quality of the firewood (density, moisture content), the construction of the firebox (height, number of knees), weather conditions (air pressure, wind), etc.

**NOTE!** Intense combustion mode is not the main mode of operation of the oven and it is not recommended to use it continuously as it will significantly shorten the life of the product and the safety of the heat-resistant coating is not guaranteed.

Before adding fuel, switch the oven to the intensive combustion mode; first open the gas valve fully (i.e. open the flue gas outlet), then after 2 minutes open the damper smoothly (i.e. increase the combustion air supply) and only then open the oven door. Add fuel, close the door and set the regulators to the previous position.

Allow the fuel to burn out completely and wait until it has cooled before removing the ash. Do not remove the ash completely. Always leave a layer of ash up to 50 mm high (approximately to the bottom edge of the door). The ash layer is necessary to protect the lower tubes from combustion and also provides thermal insulation to the lower tubes to create convection currents.

Do not use the stove while:

- leave the stove unattended or under the supervision of children;
- place fuel and other combustible substances and materials directly in front of the oven door opening;
- store unquenched charcoal and ash in metal containers placed on a wooden floor or a base of combustible material;
- drying and storing clothes, firewood, other combustible objects and materials in the stove;
- use firewood longer than the size of the hearth;
- keep the oven hood open when heating the oven;
- use ventilation and gas ducts as flues;
- place the heater flue on a burning surface;
- attach antennas for televisions, radios, etc. to the baffles;
- keep a fuel reserve in the room that exceeds the daily requirement.

## 9 TRANSPORT AND STORAGE

The oven may be transported by any type of means of transport in accordance with the rules applicable to the type of transport.

The transport conditions of the furnace, depending on climatic factors, correspond to class 8 of storage conditions according to GOST 15150 - 69, and to class C of mechanical factors according to GOST 23170 - 78. The oven shall be stored in a warehouse

The warehouse must be stocked with primary fire-fighting equipment in accordance with the requirements of the "Ukrainian Fire Safety Regulations".

The storage conditions of the furnace, depending on the influence of climatic factors in the environment, comply with class 4 according to GOST 15150 - 69.

## 10 MANUFACTURER'S GUARANTEE

The manufacturer guarantees the conformity of the oven with the TU U 27.5-23764970-026:2022 provided that the consumer complies with the requirements for transport, storage, installation and use set out in that document and in this guide.

The guarantee period is 12 months.

When buying an oven, the buyer must check that it is complete and that the warranty card is present, which must bear the seal of the authority that sold the product and the seller's signature certifying the date of sale.

In the absence of a mark from the sales office on the warranty card, warranty claims will not be accepted.

The warranty does not cover minor defects such as paint damage, loose seals and other defects that may occur as a result of the oven overheating and can be remedied by simple measures.

Rikked. External manifestations	Reasons	Method of elimination
Stove does not heat, smoke, no draft	<p>Insufficient height of the chimney.</p> <p>Lack of thermal insulation on the outer parts of the chimney.</p> <p>The chimney becomes clogged with soot and ash. Vertical deflection of pipes up to 300 , more than 1 m.</p> <p>Use of asbestos pipes for chimneys.</p> <p>Connecting the chimney to the masonry.</p>	<p>Install the chimney according to point 3 of Table 1.</p> <p>Isolate bellows compartments outside the room.</p> <p>Clean the bell.</p> <p>The pit has to be redesigned.</p> <p>See point 6.</p> <p>See point 6.</p>
Weak heating capacity, smoke	<p>Insufficient combustion air, tightly closed windows and doors.</p> <p>The chimney becomes clogged with soot and ash.</p>	<p>Open a window. Ventilate the room, see point 8.</p> <p>Clean the bell.</p>
Pink spots appear on the fins	<p>Condensation due to the temperature of the refrigerant gases:</p> <ul style="list-style-type: none"> <li>• cold air intake;</li> <li>• the use of wet or damp firewood;</li> <li>• a non-isolated chimney.</li> </ul>	<p>Eliminate air intake through the purge vent and seal bellows leaks.</p> <p>Isolate bellows compartments outside the room.</p> <p>Use only dry wood shavings.</p>
Insufficient temperature during use of the oven	Use of wet firewood.	Use only dry wood shavings.
Smoke from heat exchanger tubes	<p>Absence of a pit.</p> <p>Insufficient height of the chimney.</p> <p>Lack of thermal insulation on the outer parts of the chimney. Vertical deflection of the pipes up to 300 , more than 1 m.</p> <p>Use of asbestos pipes for chimneys.</p> <p>Connecting the chimney to the masonry.</p> <p>The chimney is clogged with soot.</p>	<p>Install the chimney according to point 3 of Table 1.</p> <p>Isolate bellows compartments outside the room. The chimney must be redesigned.</p> <p>See point 6.</p> <p>See point 6.</p> <p>Clean the bell.</p>
Smoke when opening the oven door	The oven did not empty. Lack of draught.	<p>See point 8.</p> <p>Clean the ejector.</p>
Smoke exit from the regulator	<p>Lack of canister insulation.</p> <p>Insufficient combustion air, tightly closed windows and doors.</p>	<p>Isolate bellows compartments outside the room.</p> <p>Open the window, air the room.</p>

## GUARANTEE MAP

Heating stove D A K O T A \_\_\_\_\_

Power no. \_\_\_\_\_

## RESPONSE

Date of manufacture \_\_\_\_\_

Signature \_\_\_\_\_

Quality control stamp

## SALE DECLARATION

Date of sale \_\_\_\_\_

Signature \_\_\_\_\_

Seal of the company that sold the product.

Made in Ukraine