

# **Instruction Manual**



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## WE HOPE YOU WILL BE SATISFIED WITH OUR PRODUCT, AND WE RECOMMEND TO COMPLY WITH THESE MAIN REGULATIONS NECESSARY FOR LONG SERVICE LIFE AND CORRECT FUNCTION OF THE BOILER

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1. Assembly, firing-up test and operator's training must be carried out by an installation company trained by the manufacturer; this company also fills in a boiler installation report (p.33).
2. At the **gasification** the **tars and condensates (acids)** are produced in the fuel reservoir therefore the thermoregulation valve must be installed behind the boiler in order to keep the **minimum 65°C temperature of the water returning to the boiler.**  
**The service temperature** of water in the boiler must be between **80 and 90°C.**
3. When using the circulating pump its run must be operated by a separate thermostat so that the prescribed **minimal temperature of the reverse water is ensured.**
4. The boiler **must not be permanently** operated in the power range **lower than 50%.**
5. The boiler operation at the rated output is ecological.
6. 3.The **daily firing-up** is necessary in case of operation at a **reduced output** (the summer operation and heating the hot service water).
7. Therefore the boilers should be installed with the **storage tanks and the thermoregulation valve which guarantees 20- 30% fuel savings and a longer service life of boiler and chimney with a more comfortable operation.**
8. If you cannot connect the boiler into the accumulation you should connect the boiler with at least one **equalizer with approx. 25l volume per 1kW of boiler output.**
9. Use only dry fuel **with 12 - 20% moisture** – **with a higher moisture the boiler output boiler decreases and the fuel consumption increases.**

**The boilers with the draw-off ventilator have the letter S at the end of designation.**



**CAUTION - If the boiler is connected with thermoregulation valve TV 60°C and the storage tanks (see the enclosed diagrams), the guarantee for the boiler drum is increased from 24 to 36 months. The guarantee for other parts does not change. In case these principles are not adhered to the service life of the boiler drum and ceramic fittings can be substantially reduced due to the low-temperature corrosion. The boiler drum can corrode within two years.**

## 1. Purpose of use

The ecological hot water boilers ATMOS DC 50/60/70 GSX are destined for heating the one-family houses, weekend houses, cottages and similar houses with 50 - 70 kW heat losses depending on the type. The boilers are constructed only for combustion of the lump wood. Any dry wood, especially the wooden logs, cleft timber up to 530 mm max. length can be used for heating. It is also possible to use the wood with a higher diameter in the form of blocks which decreases the rated output, but prolongs the combustion time. The boiler is not destined for combustion of sawdust and petite wood waste which only can be burnt in a small amount together with the logs- MAX.10%. Thanks to the robust hopper of the boiler there is eliminated the most toilsome operation at the wood preparation and its cutting into appropriate pieces. It saves the physical effort and time necessary for this activity.

## 2. Technical specification

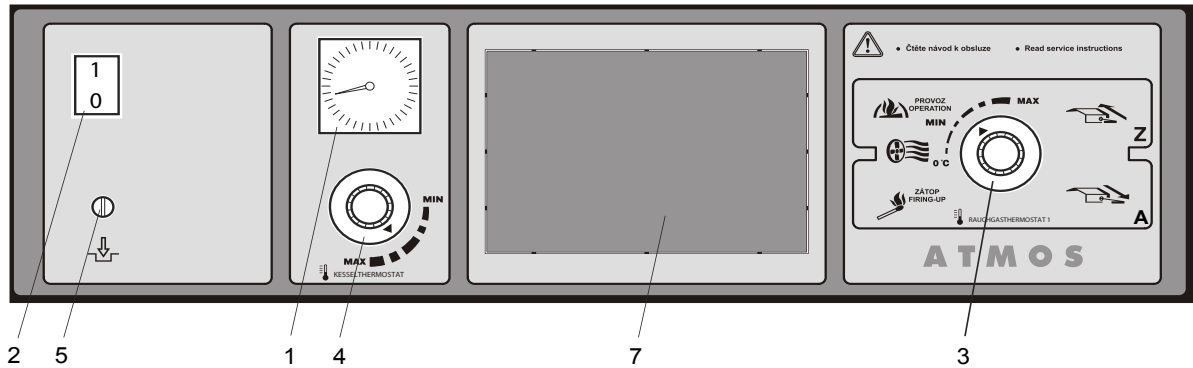
The boilers are constructed for combustion of wood on the principle of generator gasification using the suction fan which exhausts the combustion products from the boiler or blasts air into the boiler.

<b>Suction fan</b>	-	for boilers	DC50GSX
			DC60GSX
			DC70GSX

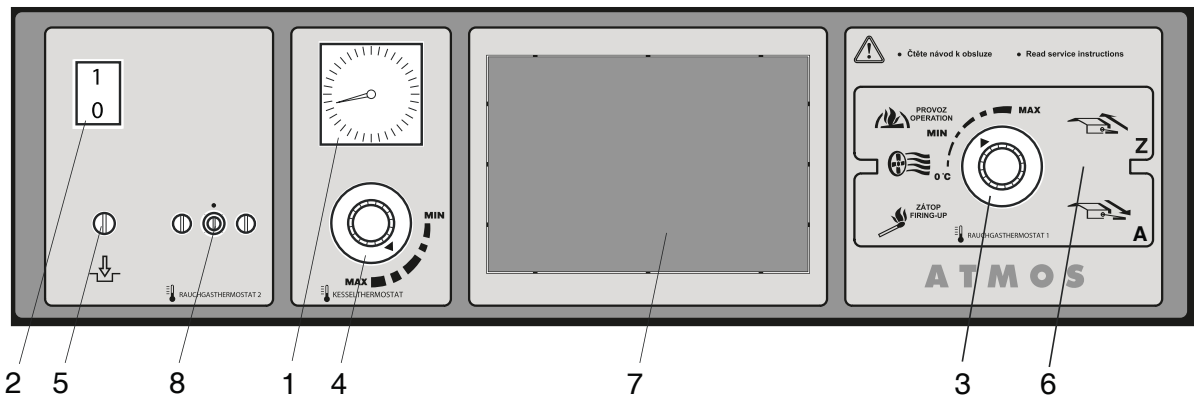
The boiler drum is made as a weldment of steel sheets 3-8 mm. It consists of fuel hopper which in the lower part is equipped with a refractory fitting with a longitudinal opening for the gases and combustion products passage. The burning down space underneath is equipped with ceramic fittings. In the rear part of boiler drum there is a vertical flue way equipped with firing-up safety valve in the upper part. The upper part of the flue way is equipped with the draw-off throat for connection to the chimney. The front wall is equipped with stoking door in the upper part and with the ash door in the lower part. In the front part of the upper hood there is the tow bar (control cable) of firing-up safety valve (register). The boiler drum from outside is heat insulated by means of rock-wool inserted under the sheet metal covers of the boiler outer shell. In the upper part of boilers there is the control panel for the electromechanical regulation. In the rear part of boilers there is the channel of primary and secondary air input equipped with a register operated by the draught controller FR 124. The primary and secondary air is preheated to a high temperature.

## Design of dash panel for boilers with ventilator

### Variant A



### Variant B



- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Thermometer</li> <li>2. Master switch</li> <li>3. Flue gas thermostat (1)</li> <li>4. Regulation thermostat (of the boiler)</li> </ul> | <ul style="list-style-type: none"> <li>5. Safety thermostat irreversible</li> <li>6. The taw bar(control cable) of the firing-up safety valve</li> <li>7. The place for electronic regulation of the heating system (92x138 mm)</li> <li>8. Flue gas thermostat (2)</li> </ul> |
|--|--|

#### Description:

1. **Thermometer** – it monitors the output water temperature from the boiler.
2. **1.Master switch** – it enables to switch off the whole boiler if necessary.
3. **Flue gas thermostat (1)** – it serves for ventilator switching off after the fuel has burnt down.



**CAUTION** – When firing up we set the flue gas thermostat to („0°C“ firing). After burning up we set the flue gas thermostat into the operating position. It is necessary to find out the optimal position for concrete conditions. If the temperature of the combustion products drops below the set value the thermostat switches off the draw-off ventilator. If we want the ventilator to run again we must set a lower temperature at the flue gas thermostat (e.g. set to „0°C“ - firing).

4. **Regulation thermostat (of the boiler)** – controls the ventilator operation according to the output temperature of water from boiler.
5. **Safety thermostat irreversible** – it serves as a protection of the boiler against overheating in case of the regulation thermostat failure or as the signalization of emergency temperature transgression – after the emergency temperature transgression it must be pressed down.
6. **Tow bar (control cable) of firing-up safety valve** – it serves for opening the firing-up safety valve when firing-up or stoking.
7. The place for electronic regulation of the heating system can be equipped with any regulation which can be inserted into the opening (92x138 mm). The electric bunch is prepared for its power supply.
8. The flue gas thermostat 2 serves for operating the flap with the servo-drive at the combustion air inlet into the boiler according to the maximum temperature of the combustion products - the switching temperature 180-200°C (only at variant B).

## The boilers advantages

The combustion in the boilers runs at the high temperatures with the function of generator gasification. This results in fuel savings and an ecological operation. The primary and secondary air of boilers is preheated to a high temperature it means they have a hot and stable flame with a constant quality of burning. At the GSX boilers everything runs in a ceramic combustion chamber with the lateral primary air inlets in the upper part of the stoking chamber. The boilers are equipped with the exhauster and they have a comfortable and easy operation. A big hopper enables to burn the cleft timber of 530mm length. Also the big pieces of wood waste can be burnt. All boilers are equipped with the cooling loops against overheating.

### 3. Technical data

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Type of ATMOS boiler		DC50GSX	DC60GSX	DC70GSX
Boiler output	kW	49	60	70
Heat-up area	m <sup>2</sup>	3,5	3,5	3,7
Fuel shaft volume	dm <sup>3</sup>	210	210	210
Filling hole dimension	mm	450x310	450x310	450x310
Specified draught of the chimney	Pa	25	28	30
Maximum water overpressure	kPa	250	250	250
Boiler weight	kg	527	527	571
Draw-off throat diameter	mm	152	152	180
Boiler height	mm	1563	1563	1648
Boiler width	mm	678	678	678
Boiler depth	mm	1042	1042	1068
Electric parts ingress protection	IP	20		
Electric input	W	50	50	70
Boiler efficiency	%	90,6	87,5	85,2
Boiler category		3		
Waste gas temperature at nominal output	°C	165	189	247
Mass flow rate of comb.n products at the rat.output	kg/s	0,025	0,030	0,034
Specified fuel		Dry wood of fuel value 15-17 MJ.kg <sup>-1</sup> , water content min. 12% - max. 20%, diameter 80 -150 mm		
Average fuel consumption	kg.h <sup>-1</sup>	13	15,5	18
Per the heating season		1 kW = 1 stacked cubic meter		
Max. length of logs	mm	530	530	530
Burning time at nominal output	hour	3	3	3
Water volume in the boiler	l	120	120	132
Hydraulic loss of boiler	mbar	0,23	0,23	0,22
Minimal volume of the equalizer	l	750	1000	1000
Connecting voltage	V/Hz	230/50		
<b>The prescribed minimal temperature of the reverse water in operation is 65°C.</b>				
<b>The prescribed boiler service temp. is 80-90°C.</b>				



## Legend to the boiler schemes

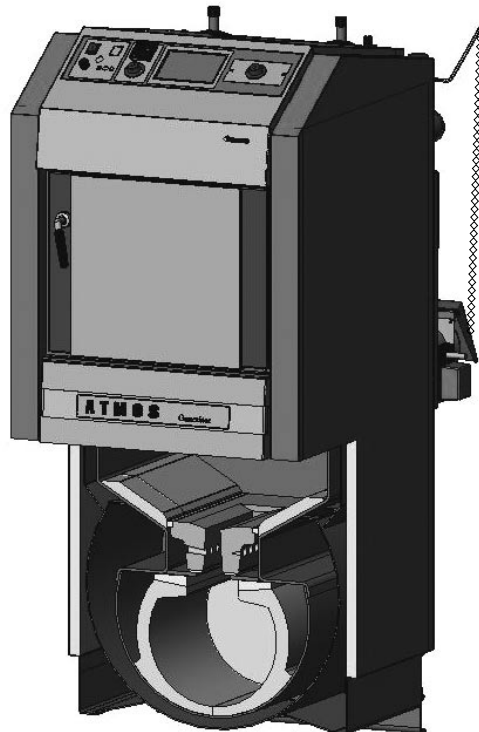
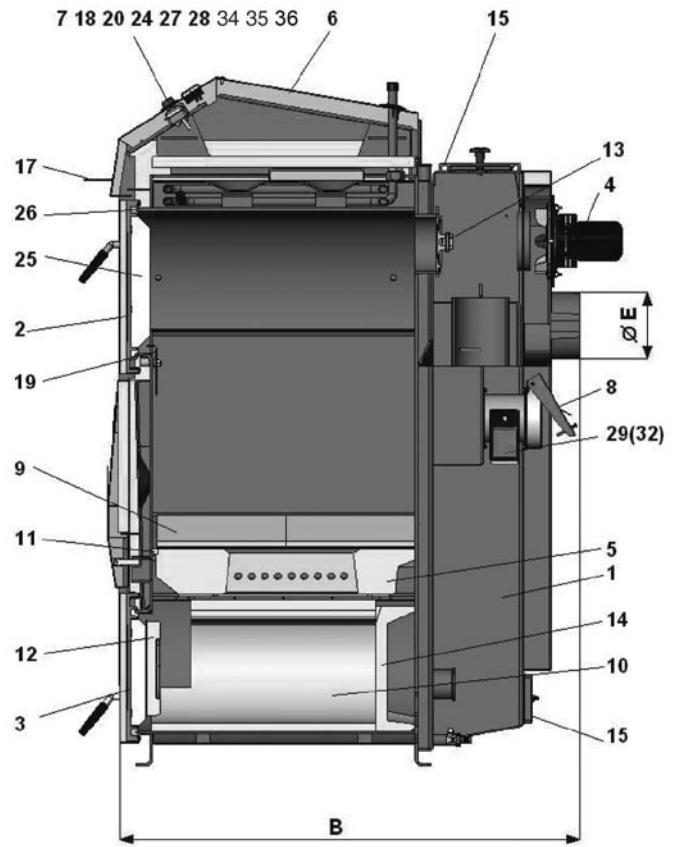
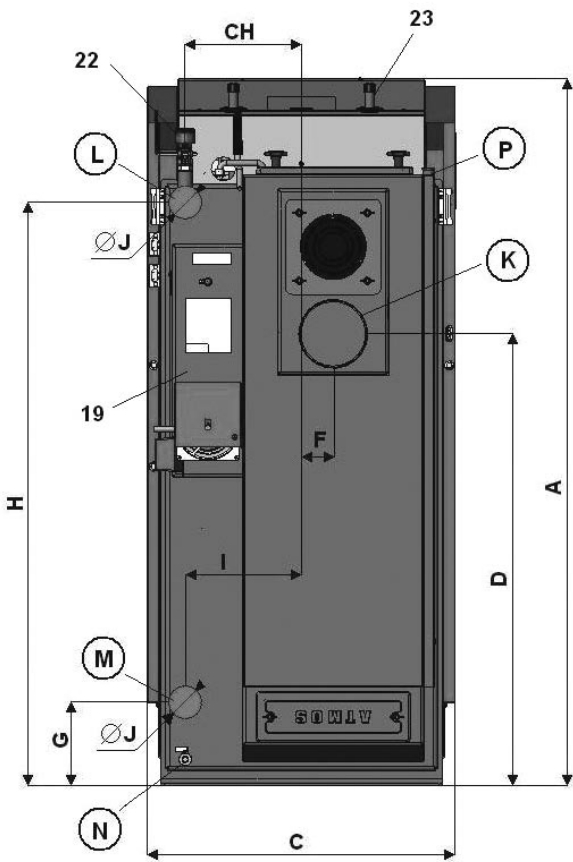
- |   |  |
|---|--|
| 1. Boiler drum  | 27.  |
| 2. Filling door   | 28. Capacitor of ventilator  |
| 3. Ash door   | 29. Air shutter with servo-drive - variant B                                     |
| 4. Ventilator - draw-off (S)  | 30.  |
| 5. Refractory fitting - nozzle  | 31.  |
| 6. Control panel  | 32.  |
| 7.  | 33.  |
| 8. Register(regulation valve)   | 34. Flue gas thermostat 2 - variant B  |
| 9. Refractory bulb- sides of the comb.ch. 4pc                         | 35. Flue gas thermostat (1)  |
| 10. Refractory fitting - spherical space at GSX type                  | 36. Safety thermostat<br>( <b>Attention</b> – press down at overheating)         |
| 11. Těsnění - trysky - 12x12 (14x14)                                  |  |
| 12. Refractory fitting - half-moon                                    | 37. Air-brake valve  |
| 13. Firing-up safety valve  |  |
| 14. Refractory fitting - rear face of sph. space<br>at GSX type space |  |
| 15. Cleaning cover  |  |
| 16.   |  |
| 17. Tow bar (control cable) of firing-up safety valve                 | K - smoke-flue throat  |
| 18. Thermometer   | L - water outlet from boiler   |
| 19. Combustion chamber shutter  | M - water inlet into boiler  |
| 20. Switch with the indicator lamp                                    | N - mouthpiece for filling cock  |
| 22. Draught controller - Honeywell FR 124                             | P - mouthpiece for valve sensor controlling the<br>cooling loop (TS 130, STS 20) |
| 23. Cooling loop against overheating                                  |  |
| 24. Regulation thermostat of ventilator                               |  |
| 25. Door cushioning - Sibrál  |  |
| 26. Doorstrip- gasket 18x18   |  |

## Technical data

Dimensions	DC50GSX	DC60GSX	DC70GSX
<b>A</b>	1563	1563	1681
<b>B</b>	1042	1042	1068
<b>C</b>	678	678	678
<b>D</b>	997	997	1086
<b>E</b>	152	152	180
<b>F</b>	70	70	58
<b>G</b>	184	184	184
<b>H</b>	1287	1287	1407
<b>CH</b>	256	256	256
<b>I</b>	256	256	256
<b>J</b>	2"	2"	2"

# Boiler drawings

GB

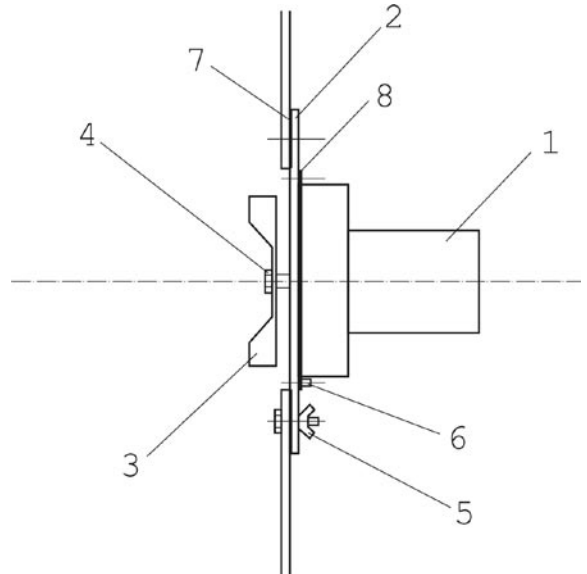


### Suction fan scheme



**CAUTION** – The suction fan (S) is supplied in the dismantled condition. Put it on the rear flue way, tighten everything properly, plug in and test its smooth operation.

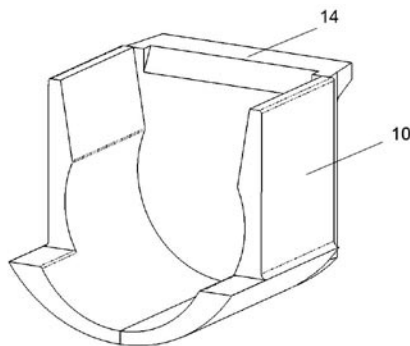
- 1 - Engine
- 2 - Plate
- 3 - Propeller (stainless)
- 4 - **The nut with a left-hand thread** and underlay
- 5 - Wing nut
- 6 - Screw
- 7 - Big packing (2 pc)
- 8 - Small packing



## 4. Type and embedding of fittings in the combustion chamber

**For type**

DC70GSX

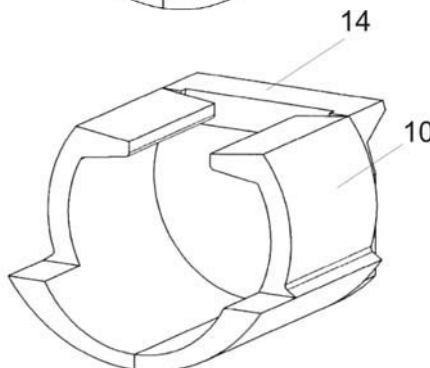


10. Refractory fitting - spherical space (L+P side),

14. Refractory fitting - rear face with the undercut backwards

**For type**

DC50GSX  
DC60GSX



The spherical space mounting must ensure that the front part of fitting /10/ is in the 3 cm distance from the front edge of the boiler frame.



**CAUTION** – do not turn the rear face in case of possible manipulation

## 5. Accessories delivered with boiler

Steel brush incl. the accessories	1 pc
Fire-hook	1 pc
Filling cock	1 pc
Service and maintenance instructions	1 pc
Draught controller HONEYWELL FR 124	1 pc
Ash-pan	1 pc

## 6. Fuel

The prescribed fuel includes dry cleft timber and the logs of 80 - 150 mm diameter minimally 2 years old containing 12% - 20% moisture with 15-17 MJ.kg<sup>-1</sup> fuel value. The fuel dimensions are stated in chapter 3. „ Technical data „. It is also possible to burn the big lumps of the wood waste in combination with the logs (max. 10%)

### Basic wood burning data

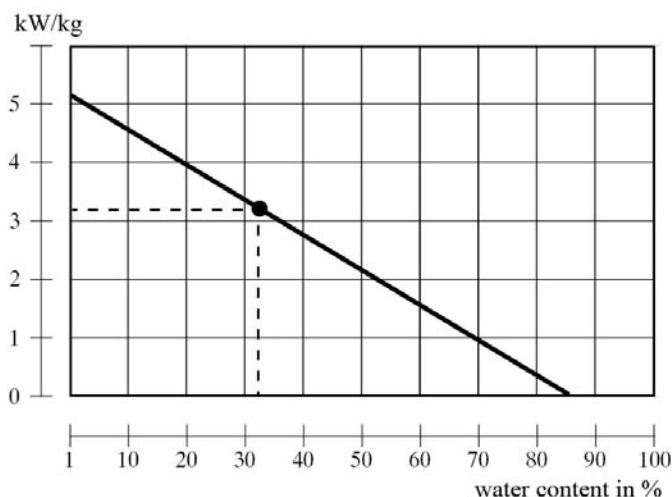
The maximum output and a long service life of boiler can be ensured by burning the wood seasoned for minimally 2 years. In the following diagram we show the dependence of fuel value on the water content. The effective energy content in the wood distinctly drops with increasing water content.

Example:

Wood with 20% water has the thermal value 4 kWh /kg wood

Wood with 60% water has the thermal value 1,5kWh /kg wood

- e.g. whitewood stored 1 year under shelter - shown in the diagram



Max. boiler output with a wet fuel shown in the diagram.

	kW
DC 50 GSX	- 39
DC 60 GSX	- 44
DC 70 GSX	- 49

The information also serves for other types of gasification boilers.



**The boilers are not suitable for burning the wood with water content below 12%.**

### Fuel value

Wood - type	Heat capacity /1 kg		
	kcal	kJoule	kWh
spruce	3900	16250	4,5
pine tree	3800	15800	4,4
birch	3750	15500	4,3
oak	3600	15100	4,2
beech	3450	14400	4,0

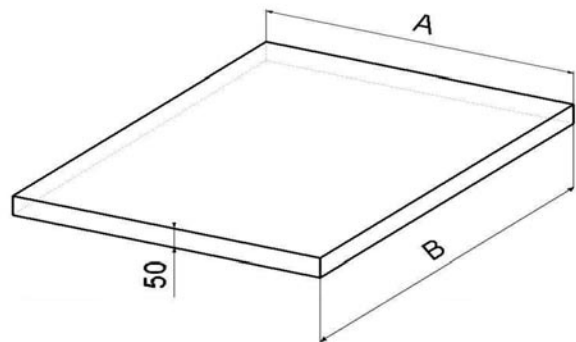


**NOTE - a fresh wood burns poorly: it smokes and significantly reduces the service life of the boiler and chimney. The boiler output drops to 50% and the fuel consumption doubles.**

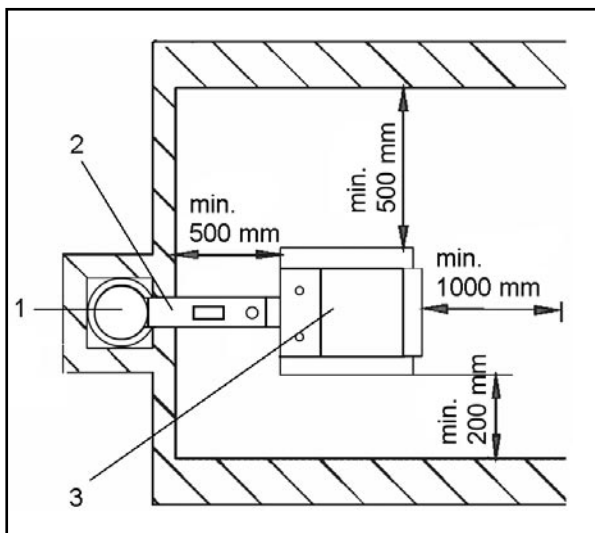
## 7. Foundations for boilers

Boiler type (mm)	A	B
DC50GSX, DC60 GSX, DC70 GSX	800	1300

We recommend that a concrete (a metal) foundation is constructed under the boiler.



## 8. The type of environment and boiler installation in the boiler-room



The boilers can be used in the „basic environment“, AA5/AB5 according to ČSN 3320001-3. The boilers must be installed in the boiler-room with an ensured access of air necessary for combustion. The boilers must not be positioned in the dwelling space (neither in corridors). The cross section of the opening for combustion air inlet into the boiler-room must be minimum 350 cm<sup>2</sup> in case of boilers with 35-70 kW output.

- 1 - Chimney
- 2 - Smoke-flue
- 3 - Boiler

## 9. Chimney

The connection of the appliance to the vent stack must be done with the agreement of a competent chimney sweepers' firm. The vent stack must always develop a sufficient draught and the combustion products must be reliably led away into the free atmosphere for all practically possible service conditions. For a correct function of boilers it is necessary that the separate vent stack is correctly sized because the **combustion, boiler output and service life depend on its draught**. The chimney draught depends directly on the chimney cross section, height and roughness of the internal wall. No other appliance is allowed to join the chimney to which the boiler is connected. **The chimney diameter must not be smaller than the outlet on the boiler (min. 150 mm)**. The chimney draught must reach the prescribed values (see the technical data p. 8). But it must not be extremely high so that it does not reduce the boiler efficiency and does not disturb its combustion (does not split the flame). In case of a strong draught install a throttle into the smoke-flue between the boiler and chimney (draught limiter).

Informative values of chimney cross section:

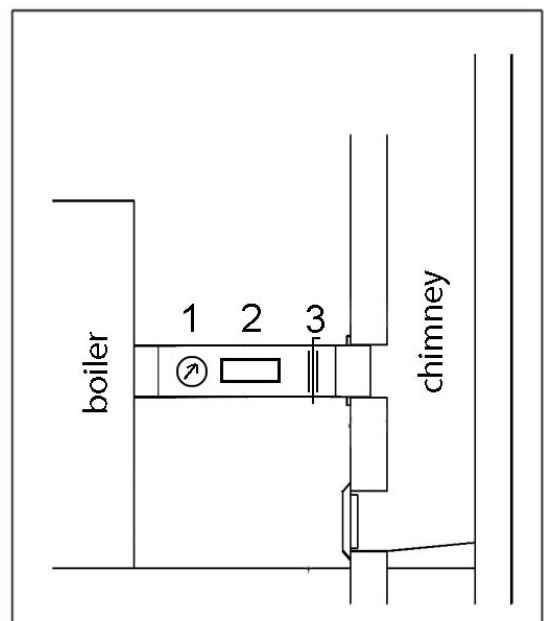
20 x 20 cm	height 7 m
Ø 20 cm	height 8 m
15x15cm	height 11 m
Ø 16 cm	height 12 m

ČSN 73 4201 defines the exact chimney dimensions. The prescribed chimney draught is specified in section 3. „Technical data“.

## 10. Smoke-flue

The smoke-flue must join the vent stack. If the boiler cannot be directly connected to the vent stack then the smoke-flue extension piece must be as short as possible, and not longer than 1 m, without any additional heat-delivery surface and it must ascend towards the chimney. The smoke-flues must be mechanically robust and tight against the combustion products leakage and inside cleanable. The smoke-flues must not be led through external home or utility units. The internal cross section of the smoke-flue must not exceed the internal cross section of the the stack flue and must not narrow towards the chimney. The use of smoke elbows is unsuitable. The factories of smoke-flue passing through the structures made of of combustibles are shown in annexes 2 and 3 to ČSN 061008 and are especially suitable for the mobile facilities, timber huts etc.

- 1 Flue gas thermometer
- 2 Cleaning opening
- 3 Throttle (draught limiter)



**INFO** - In case of a strong draught in the chimney install a throttle (3) or a draught limiter in the smoke-flue .

# 11. Fire protection at the heating appliances installation and use

Selection of ČSN 061008 –Fire safety of local appliances and sources of heat

## Safety distances

The minimum 200 mm safety distance from the building materials must be kept when installing the appliances. This distance applies to the boilers and smoke-flues installed near the combustibles of B, C1 and C2 grades (the combustibility grade is shown in table no. 1). The safety distance (200mm) must be doubled if the boiler and smoke-flues are installed near the combustibles of grade C3 (see tab. no. 1). The safety distance must be doubled in case the combustibility grade wasn't proved. The safety distance must be halved (100 mm) when using the fire-resistant and heat-insulating board (asbestos plywood), with min. 5 mm thickness installed 25 mm from the protected combustible material (combustible insulation). The shielding plate or protective screen (on the protected item) must overreach the boiler contours incl. the smoke-flues at least by 150 mm on every side and at least by 300 mm above the upper boiler surface. Also the furnishings made of combustible materials must be equipped with the shielding plate or protective screen if it is impossible to keep the safety distance (e.g. in mobile facilities, weekend houses etc. – see the details in ČSN 061008). The safety distance must be kept when installing the furnishings in the vicinity of boilers.

If the boilers are installed on the floor made of combustible materials they must be equipped with a fire-resistant and heat-insulating pad overreaching the contours on the side of the stoke hole and ash-pan hole (at least by 300 mm in front of the hole and at least by 100 mm on other sides. The materials with combustibility grade A can be used as the heat-insulating, fire-resistant pads.

Table no.1

combustibility grade of building materials and products	
A - fire-resistant	granite, sandstone, concretes, bricks, ceramic tiles, mortars, fire prevention plasters etc.
B - uneasy to burn	acumin, izomin, heraclit, lignos, boards made of basalt felt, boards made of fibre-glasses, novodur
C1- difficult to burn	hardwood(oak, beech), hobrem boards, plywood, sirkolit, werzalit, hardened paper(umakart, ecrona)
C2- moderately combustible	Softwood (pine tree, larch, spruce), chipboards, cork slabs, rubber floorings (Industrial, Super)
C3- easily combustible	Fibreboards (Hobra, Sololak, Sololit), cellulose materials, polyurethane, polystyrene, polyethylene, expanded PVC



**ATTENTION** - Under the circumstances that result in the danger of temporary intrusion of combustible gases or vapours and at the activities that might result in the temporary danger of fire or explosion (e.g. linoleum, PVC gluing etc.) the boiler must be put out of operation in a timely manner it means before the danger occurrence. **Do not put any items made of combustible materials on the boiler neither within the distance smaller than the safety distance (more ČSN EN 13501-1).**

## 12. Binding ČSN, EN for boilers design and installation

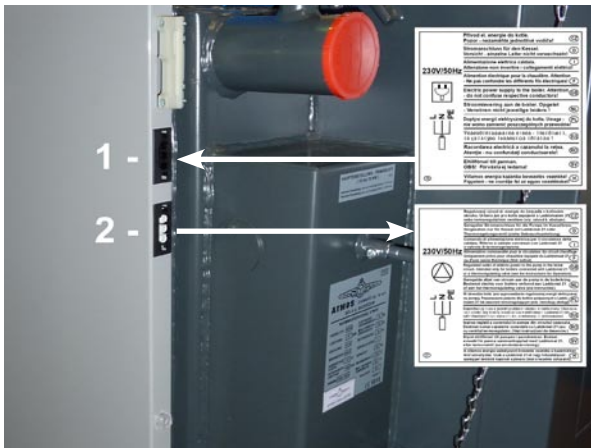
ČSN EN 303-5	- Solid fuel boilers for central heating
ČSN 06 0310	- Central heating , design and installation
ČSN 06 0830	- Protecting device for central heating and service water heating
ČSN EN 73 4201	- Chimneys and smoke-flues design
ČSN EN 1443	- Chimneyconstructions – general requirements
ČSN 06 1008	- Fire safety of local appliances and sources of heat
ČSN 73 0823	- Combustibility grade of grade of building materials
ČSN EN 1264-1	- Floor heating-systems and components – Definitions and symbols
ČSN EN 1264-2	- Floor heating-systems and components – heat output calculation
ČSN EN 1264-3	- Floor heating-systems and components - Design
ČSN EN 442-2	- Radiators – Tests and their evaluation



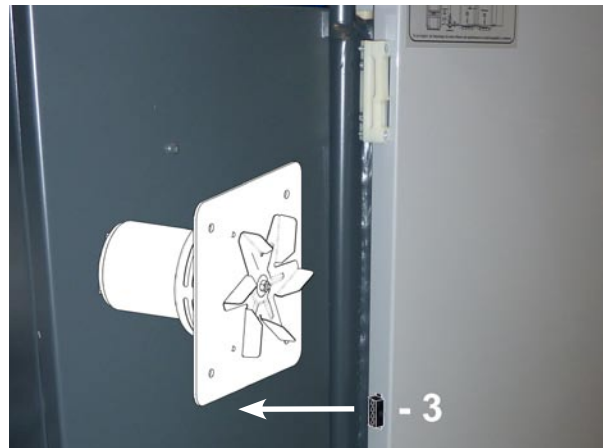
**ATTENTION** – the boiler must be always installed according to the project prepared in advance. Only the persons trained by the manufacturer are allowed to install the boiler.

## 13. Connection of boilers to the grid

The boilers are connected to 230 V, 50 Hz grid by means of the mains feeder with a plug or without plug. This is the mains feeder type M and in case of an exchange it must be replaced by the same type (cross-section). The position of the appliance must ensure that the plug (connector) is within the operators' easy reach (according to ČSN EN 60335-1). Only the persons competent according to all valid rules of the concrete country are allowed to connect the boilers.



Connectors in the right side hood



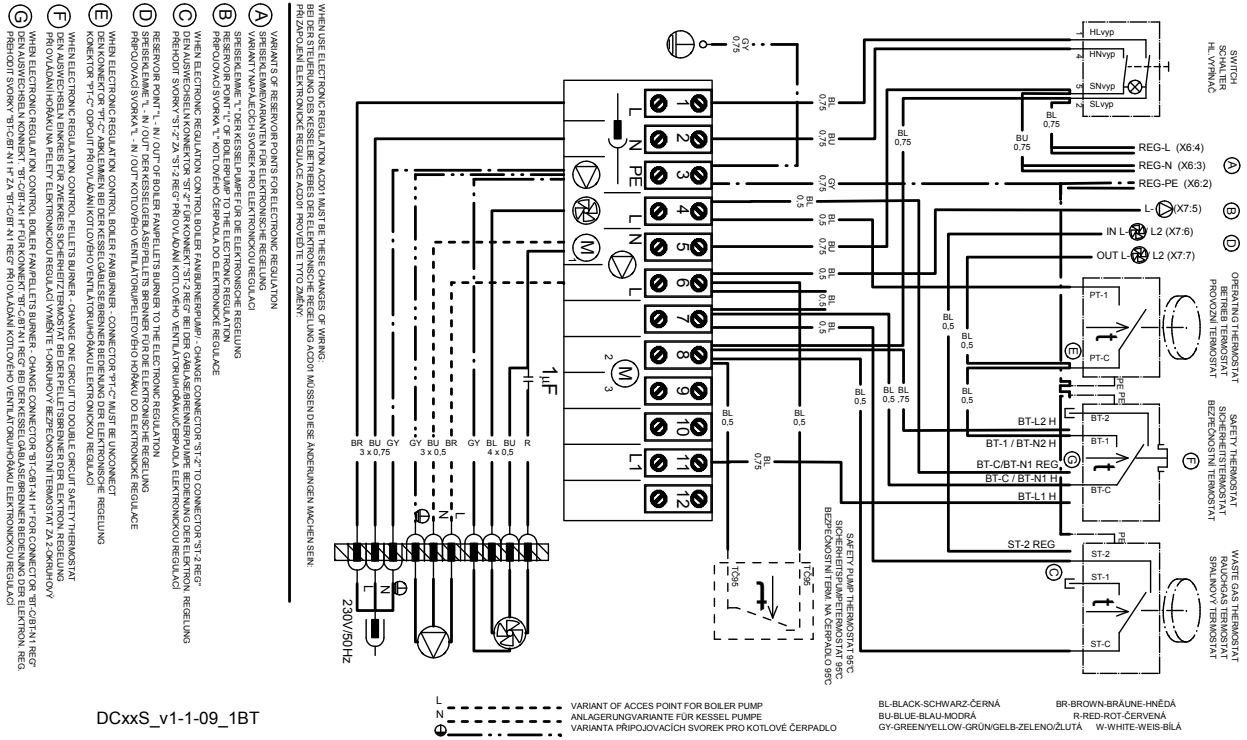
Connector in the left side hood

### Connectors in side hoods of the boiler:

- 1 - connector for income cabel (L - brown, N - blue, PE - green/yellow)
- 2 - connector for pump in the primary circuit (L - brown, N - blue, PE - green/yellow)  
(type EU and for Sweden - variant B)
- 3 - connector for extraction fan

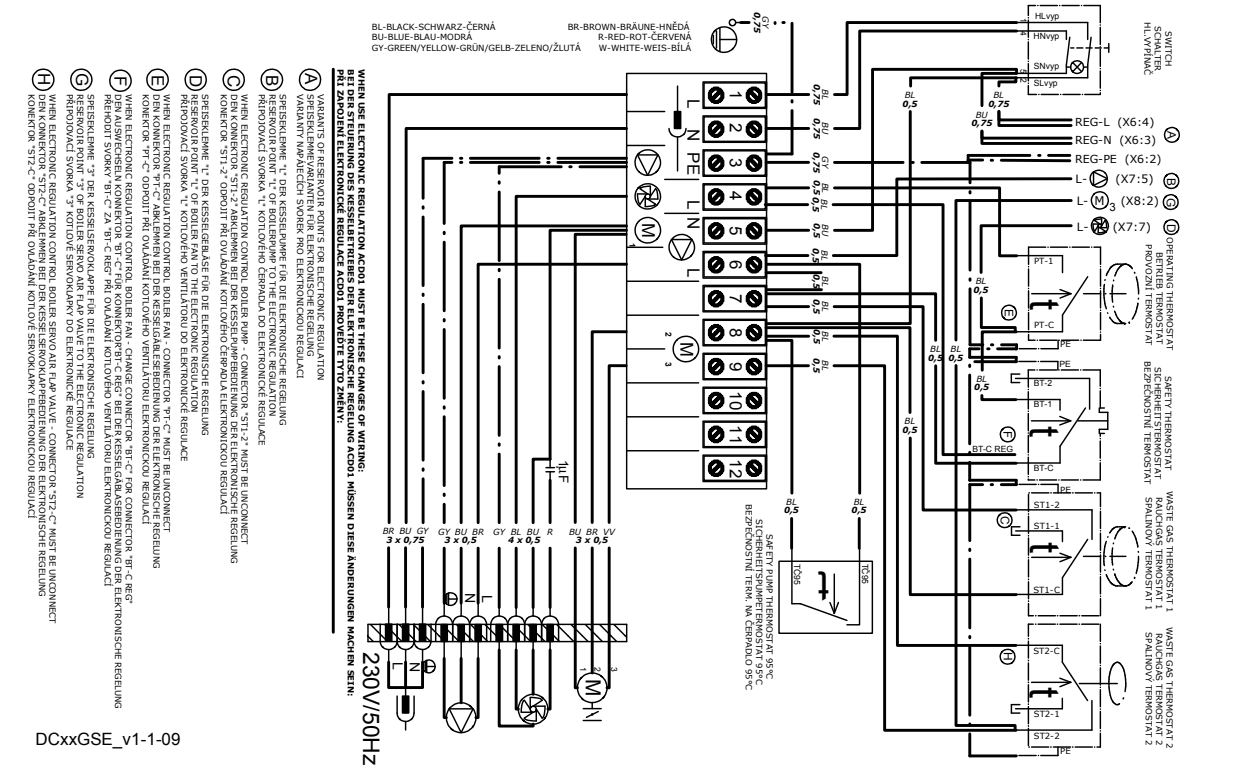


# 14. New electrical scheme of electro-mechanic regulations connection with the draw-off ventilatortype UCJ 4C52 - variant A



GB

# 15. New electrical scheme of electro-mechanic regulations connection with the draw-off ventilatortype UCJ 4C52 - variant B



DCxxGSE\_v1-1-09

## 16. Selection and the way of connection of regulation and heating elements

GB

The boilers are delivered to the customer with the basic boiler output regulation which meets the demands on the heating comfort and its safety. The regulation ensures the required temperature of the output water from the boiler (80-90°C). It does not deal with the mixing valves and pumps operation. Every pump in the system must always be operated by a separate thermostat in order to avoid the boiler chilling below 65°C at the reverse path. When the boiler is connected without the storage tank or equalizer the pump positioned in the heated facilities circuit must be switched by means of a separate thermostat or electronic regulation so that it only runs when the pump in the boiler circuit is running. If we use two thermostats, each for switching one pump, we set the value of 80°C on the thermostat which switches the pump in the heated facilities circuit and the value of 75°C on the thermostat which switches the pump in the boiler circuit. Both pumps can also be switched by one thermostat. In case the boiler is connected with the storage tanks and the gravity water circulation is well functioning in the boiler circuit thus prolonging the boiler start time to the required temperature we suggest to switch the pump in the boiler circuit by means of the flue gas thermostat installed in the boiler (at firing-up). When switching the pump in the boiler circuit by means of the flue gas thermostat installed on the boiler panel the safety thermostat on 95°C pump should be installed in the boiler (see the wiring diagrams). The thermostat in the boiler can be alternatively substituted by a surface thermostat at the boiler outlet which switches the pump in the boiler circuit at 95°C (parallel- connected with the flue gas thermostat).

The required temperature of water to the facilities is always set by means of three-way mixing valve. The mixing valve can either be operated manually or by means of electronic regulation which contributes to a more comfortable and economical operation of the heating system. The connection of all elements is always proposed by the designer according to the specific conditions of the heating system. The electric installation connected with a sufficient boilers equipment with above mentioned elements must be carried out by a specialist according to valid ČSN EN.



**When installing the boiler we suggest the use of an open expansion tank, but it also can be closed if it is allowed by the valid standards of a given country. The boiler must always be installed so that it cannot be overheated or damaged in case of the electricity outage, because the boiler has certain inertia.**



**The boiler can be protected against overheating in several ways: by connecting the cooling loop against overheating with TS 130 3/4 A (95°C) valve or WATTS STS 20 (97°C) to the water main. In case of a private well we can protect the boiler by using the standby source of electricity (battery with a converter) for backing up the operation of at least one pump. The boiler connection with the after-cooling reservoir and the inverse zone valve is another possibility.**



**When installing the boiler please underlay the rear part of boiler by 10 mm to be better flushed and vented.**

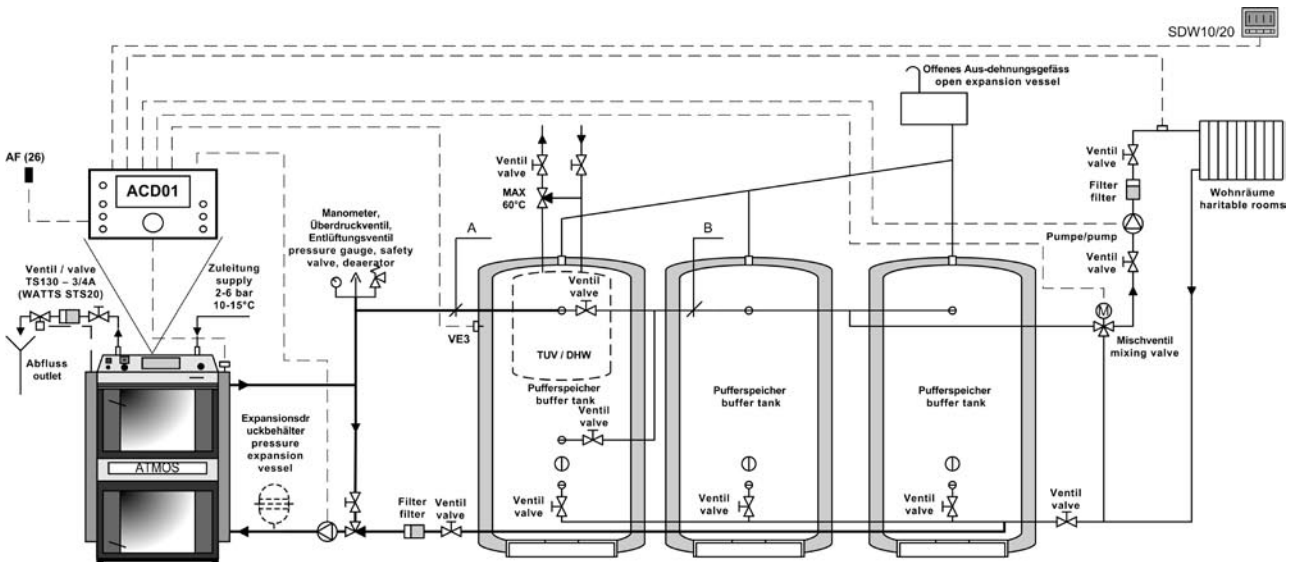
**The regulators of following firms are recommended for the heating system regulation:**

- |  |                        |
|--|------------------------|
| a) ATMOS ACD 01 - the set of equithermal regulation for solid fuel boilers |                        |
| b) KOMEX THERM, Praha  | tel.: +420 235 313 284 |
| c) KTR, Uherský Brod   | tel.: +420 572 633 985 |
| d) Landis & Staefa   | tel.: +420 261 342 382 |

## 17. Boiler corrosion prevention

The boiler connection with the thermoregulation valve is the prescribed solution which enables to create the separated boiler and heating (primary and secondary) circuits in order to ensure the **minimum 65°C temperature of the reverse water to the boiler**. The higher is the temperature of the reverse water to the boiler the less tars and acids will condense and damage the boiler drum. **The temperature of the outlet water from the boiler must be permanently in the range of 80 - 90°C**. The temperature of the combustion products (flue gases) during the routine operation must not drop **below 110°C**. A low temperature of the combustion products will cause the condensation of tars and acids though the outlet water temperature (80 - 90°C) and the temperature of water returning into the boiler (65°C) are kept. These situations can occur in case of heating the service water (TUV) by the boiler in the summer season or when heating only a part of facilities. In such a case either the boiler connection with the storage reservoirs or daily firing-up are suggested. For 15-100 kW outputs it is possible to use the three-way mixing valve with the servo-drive and electronic regulation in order to hold the minimal temperature (65-75°C) of the reverse water to the boiler.

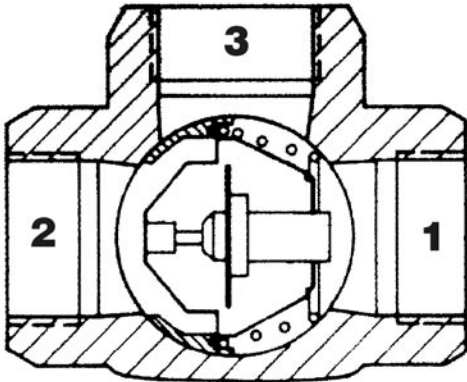
## 18. Prescribed boiler connection with the thermoregulation valve and with buffer tanks



### Minimal diameters of piping at the connection with the storage tanks

Type and boiler output	Part A		Part B	
	In copper	In steel	In copper	In steel
DC50GSX	42x1,5	40 (6/4")	35x1,5	32 (5/4")
DC60GSX, DC70GSX	54x2	50 (2")	42x1,5	40 (6/4")

## 19. Thermoregulation valve



The thermoregulation valve type TV 60°C or TV 65°C is used at solid fuel boilers. At + 60°C water temperature in the boiler the thermoregulation valve opens and the liquid from the heated facilities circuit (2) is let into the boiler circuit (3—>1). The inlets 1 and 3 are permanently opened. The minimum temperature of the reverse water to the boiler is ensured in this way. In case of need it is possible to use the thermoregulation valve set to a higher temperature (e.g. 72°C).

### Recommended size of the thermoregulation valve

For boilers: DC50GSX, DC60GSX, DC70GSX ..... DN40, DN50

## 20. System operation with storage tanks

After firing-up the boiler and at full output operation (with 2 - 4 loadings) we charge the existing volume of storage tanks to the required 90-100°C temperature and then we let the boiler burn down. Hereafter we only take off the heat from the reservoir by means of a three-way valve during the time that corresponds to the size of the accumulator and the outdoor temperature. In the heating season (while observing the minimum volumes of accumulators-see the table) it might last for 1-3 days. If we cannot use the accumulation we recommend at least one reservoir of 1000l volume for equalizing the start and finish of the boiler.

RECOMMENDED MINIMUM VOLUMES OF ACCUMULATORS			
Type	DC50GSX	DC60GSX	DC70GSX
Output	49	60	70
Volume	3000-4000	3500-4500	4000-5000

### ATMOS storage tanks delivered on regular basis

TYPE OF TANK	VOLUME (l)	DIAMETER ( mm )	HEIGHT ( mm )
AN 500	500	600	1944/1940*
AN 750	750	750/790*	1974/1752*
AN 800	800	790*	1910*
AN 1000	1000	850/790*	2025/2202*

\* typ DH

## Tanks insulation

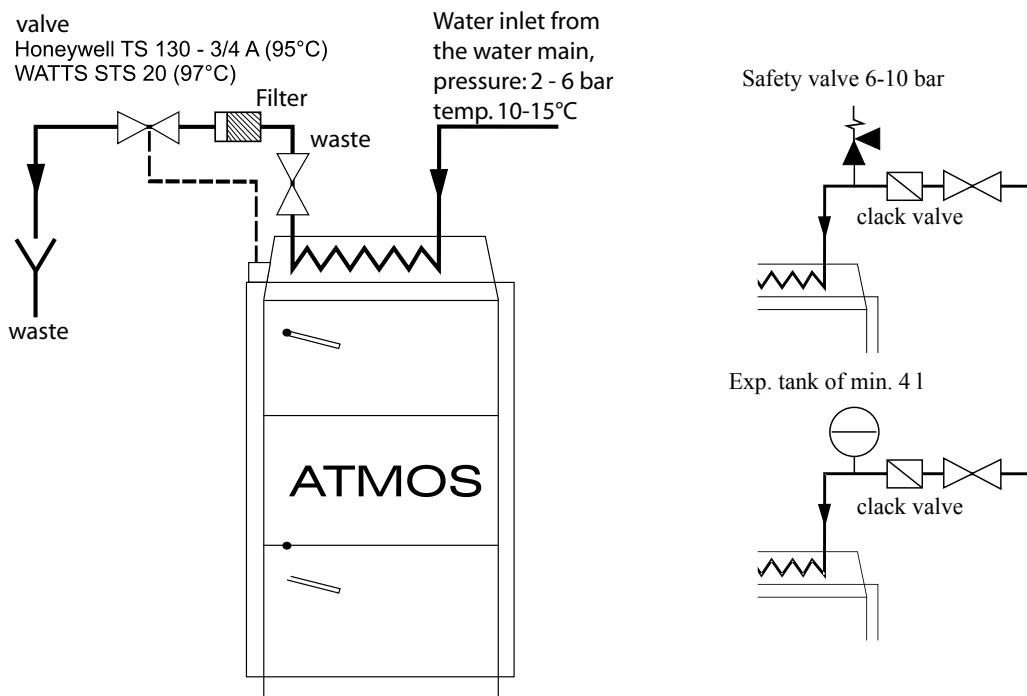
The joint insulation of a given number of reservoirs with the required volume by means of the mineral wool into a skeleton of plasterboard or an additional filling with a loose insulation material is a suitable solution. The minimum thickness of insulation is 120 mm in case of using the mineral wool. The purchase of reservoirs already insulated by means of the mineral wool in a case made of artificial leather (see the pricelist) is another variant.

## Advantages

The installation of a boiler with the storage tanks provides several advantages:

- A lower fuel consumption (by 20 - 30%), the boiler runs in full swing until the burnout at the optimal 81 - 89% efficiency
- A high service life of boiler and chimney - minimal production of tars and acids
- The possibility to combine with other ways of heating - storage electricity, solar collectors
- Combination of radiators with the floor heating
- Comfortable heating and ideal burnout
- More environmentally friendly heating

## 21. Connection of cooling loop against overheating with safety-valve Honeywell TS 130 - 3/4 A or WATTS STS20 (the temperature of valve opening is 95 - 97°C)



**CAUTION** – the cooling loop against overheating according to EN 303-5 must not be used for the purposes different from the protection against overheating (never for heating the service water).

The valve TS 130 - 3/4 A or WATTS STS 20 the sensor of which is positioned in the rear part of the boiler protects the boiler against overheating to the extent that if the water temperature in the boiler exceeds 95°C the water from water main is let into the cooling loop and this water absorbs the redundant energy and leaves as the waste. In case of installing a clack valve at the water inlet into the cooling loop in order to prevent the possible reverse water flow and thanks to the pressure decrease in the water main the cooling loop must be equipped with the 6-10 bar safety valve or the expansion tank of min. 41 volume. The boiler must always be ensured against overheating otherwise it can be damaged or it can rupture.

## 22. Service instructions

### Boilers preparation for operation

Before putting the boilers into operation it is necessary to make sure that the system is filled with water and vented. The wood boilers must be operated in accordance with the instructions stated in this manual in order to achieve a good-quality safety function. Only the adults are allowed to operate the boilers.

### Firing and operation

Before the fuel ignition we open the firing-up safety valve /13/by pulling out the control cable of the firing-up safety valve lili and we draw down the flue gas thermostat to firing-up (to minimum 0°C). Through the upper door 121 we put the dry kindling on the refractory fitting 151 vertically on the duct so that a 2 - 4 cm gap between the fuel and ducts is created for combustion products outlet. We put paper or wood wool on the kindling and again the kindling and more dry wood. After the ignition we shut the upper door and open the lower door. For a faster firing-up we can switch on the draw-off ventilator. After a sufficient flaring we shut the lower door, fill the whole reservoir with the fuel and close the firing-up safety valve by means of the control cable /III and we set the flue gas thermostat to the operating position which must be found out. We set the required 80 - 90°C temperature of the water leaving the boiler on the draught (output) regulator FR 124 1221. If the boiler has to function in the way of gasification we must maintain a glowing stratum of wood coal above the gasification nozzle (reduction zone). This is achieved by burning the dry wood of suitable size. When burning the damp wood the boiler does not function in the way of gasification, the wood consumption increases and the boiler does not achieve the required output plus the service life of the boiler and chimney is reduced. **At the prescribed chimney draught the boiler functions up to 70 % output even without the ventilator.**

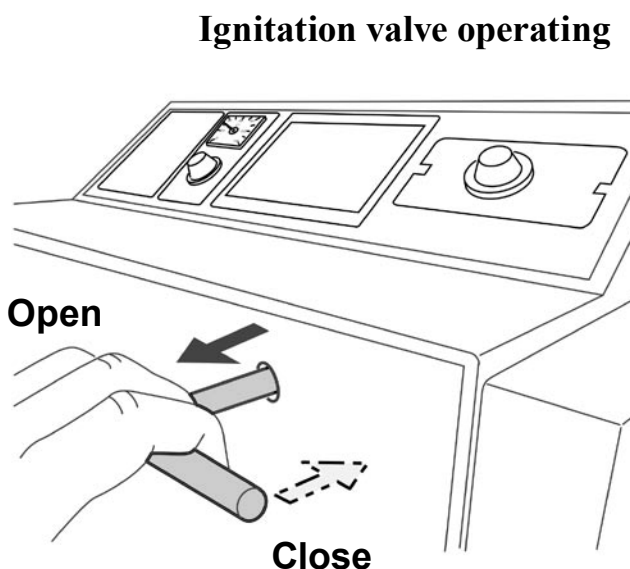
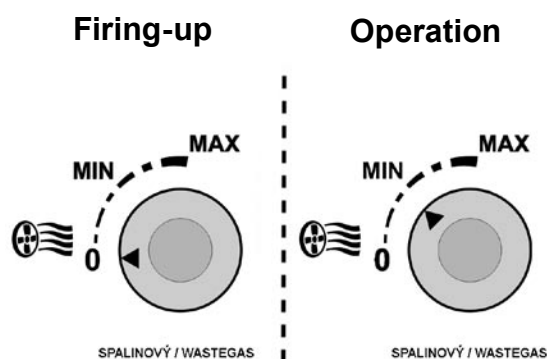


**NOTE** – At the first firing-up there occurs the condensation and the condensate flows out which does not mean any failure. The condensation disappears after a longer heating. When burning a petite wood waste it is necessary to check the temperature of combustion products which must not exceed 320°C. Otherwise the ventilator (S) could be damaged. **The formation of tars and condensates in the hopper is an effect accompanying the wood gasification.**



**NOTE** – All doors must be properly shut during the boiler operation and the control cable(tow bar) of the firing-up safety valve must be tucked otherwise the ventilator (S) can be damaged.

## Waste gas thermostat setting

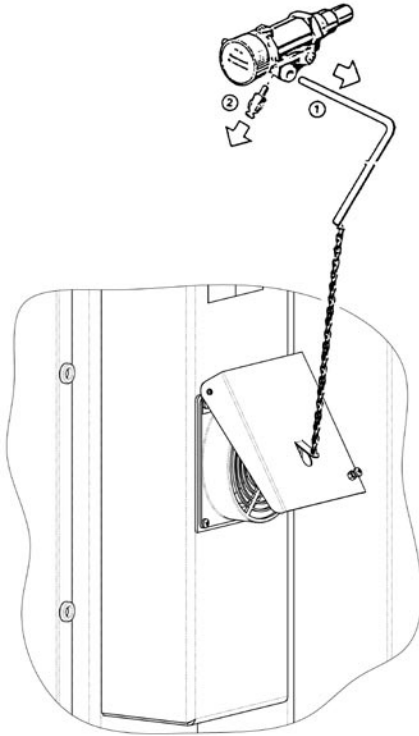


## Power control- electromechanical

We regulate the output by means of valve /8/ operated by the draught regulator, type FR 124 122, which automatically according to the set outlet water temperature (80 - 90°C) opens or shuts the valve /8/. The output regulator must be set very carefully because the regulator in addition to the power control has another important function: it ensures the boiler against overheating. When setting it we follow the enclosed HONEYWELL Braukmann, type FR 124 regulator installation and maintenance manual. The boiler overheating prevention is checked by testing the function of regulator at 90°C water temperature. At this moment the register /8/ must be almost shut. The output regulator setting must be tested. The position of register /8/ can be watched from the rear side of ventilator. The ventilator is operated by means of regulation thermostat positioned on the boiler panel according to the set outlet temperature. The temperature on the regulation thermostat should be set by 5°C lower than on FR 124 draught regulator. (it is dotted on the thermostat scale). On the panel there is also positioned the flue gas thermostat which serves for ventilator switching off after the burnout. At firing-up we set it to firing position (to minimum). After the sufficient flaring we set it to the operating position so that the ventilator runs and is switched off after the burnout. The optimal operating position of the flue gas thermostat must be found out according to the type of fuel, chimney draught and other conditions. The outlet water temperature is checked on the thermometer /18/ positioned on the panel. Also the irreversible safety thermostat is installed on the panel and it must be pressed down in case of boiler overheating. The boiler in variant B is equipped with the flue gas thermostat 2 which operates the servo-flap(valve) positioned at the combustion air inlet into the boiler under the register operated by regulated by FR 124 draught regulator. In this way the maximum combustion products temperature (180 - 220°C) at the boiler operation at the rated output and the maximum efficiency is guaranteed.

## HONEYWELL Braukmann FR 124 draught controller - Assembly instructions

### varianta A

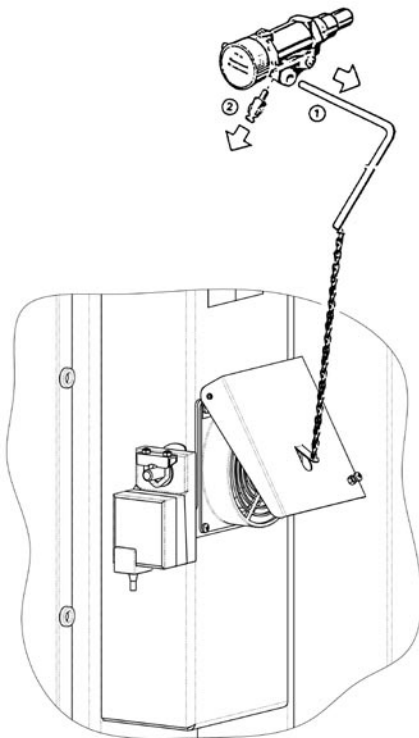


Dismantle the lever /1/, clutch /2/ and screw the regulator into the boiler.

### Setting

Heat the boiler up to approx. 80°C. Set the adjusting handle to the temperature read at the boiler thermometer. We strain the chain at the air flap so that the boiler achieves the required output which means the 3 - 50 mm gap down at the air (regulation) flap/register. The minimal 3 - 8 mm valve shut is set by means of the setscrew due to the boiler service life – do not reduce it. Otherwise the boiler and ventilator would be tarred and the boiler service life would be reduced. In case of worse draught conditions we enlarge the minimum flap shut.

### varianta B



### Testing the draught regulator function

Set the adjusting handle to the required temperature value of the water leaving the boiler (80 - 90°C). At the maximum 95°C water temperature the register must be shut up to the stop (to the screw). The prescribed operating water temperature in the boiler (80 - 90°C) must always be tuned by means of mixing valves behind the boiler, this either manually or by means of electronic regulation with the servo-drive.



## 23. Setting the boiler output and combustion

For boilers DC50GSX, DC60GSX, DC70GSX

### Basic primary air setting

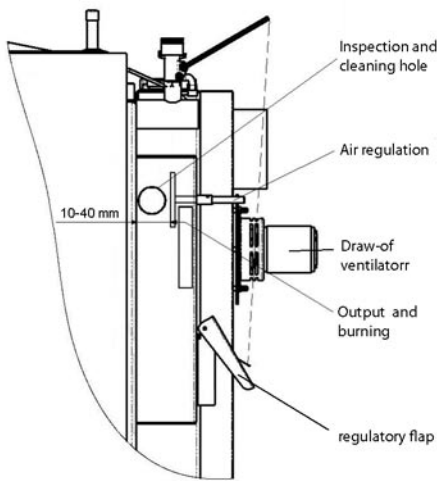
**Optimal setting:**

Up to the stop (5 mm) + 5÷10 mm

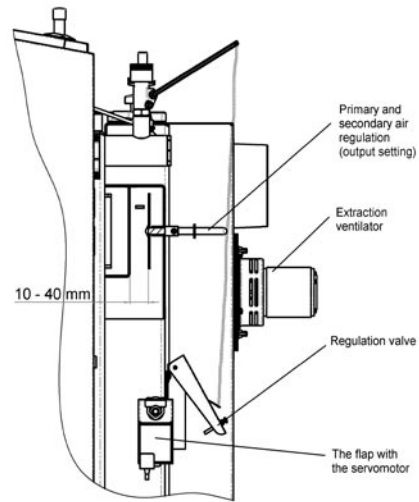
**Maximum setting:**

Up to the stop (5 mm) +10÷20 mm

**variant A**



**variant B**

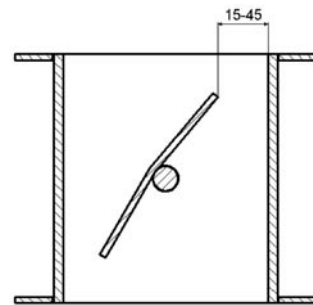


### Basic setting of the flap with the servo-drive variant B

**Optimal setting:** ..... 20 mm

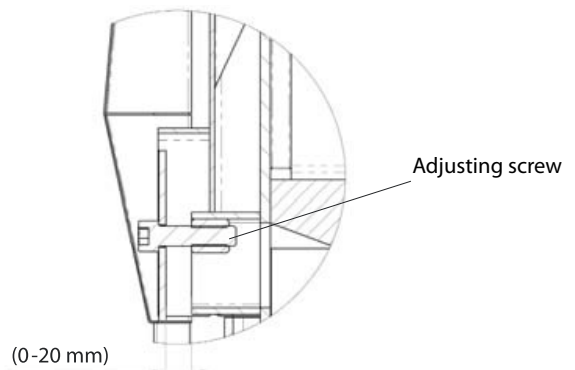
**Maximal setting:** ..... 45 mm

**Maximal setting:** ..... 10 mm



### Basic setting of the secondary air

We regulate by turning the adjusting screw. By turning the screw by 1 revolution anticlockwise we open the secondary air by 1,75 mm (1 revolution = 1,75 mm). **The manufacturer set the regulation to approx. 9 mm opening (up to the stop + 5 revolutions anticlockwise).**



## 24. Refuelling

At the refuelling we firstly open the firing-up safety valve (flap) by means of control cable /control rod /13/ /III and we do not switch off the draw-off the ventilator. We wait approx. 10 sec. and we slowly open the filling door 121 so that the accumulated gases are firstly exhausted into the smoke-flue and do not enter the boiler-room. We cover the glowing cinder with a wide log or briquettes and we fill the whole fuel reservoir. The fuel at stoking must not be compacted above the gasification nozzle otherwise the flame could go out. The hopper must be entirely filled at every stoking. In order to prevent the needless smoke development we only stoke the next fuel when the original filling has burnt at least to the third of the filling content.



**CAUTION – At the boiler operation the control cable /control rod of the firing-up safety valve must be tucked otherwise the ventilator (S) can be damaged**

## 25. Top-fed stove operation

The top-fed stove operation can be applied to the boilers and it means that the fire is maintained overnight without the necessity of the daily firing-up, but only in the winter season. But this way of operation reduces the boiler service life. We prepare the boiler for the top-fed stove operation in following way:

- we put several (4 - 6) bigger logs on the glowing stratum of the fire penetrated fuel
- we close the mixing valve

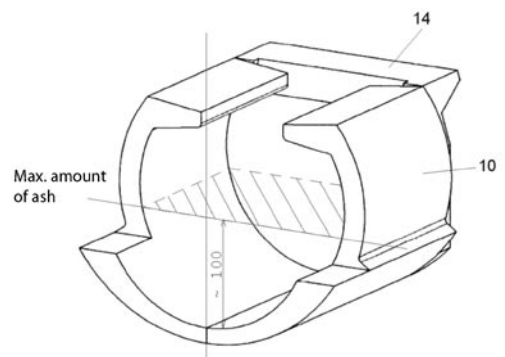
After closing the valve the water temperature in the boiler rises to 80 - 90°C.

- register /8/ operated by FR 124 Honeywell draught regulator automatically shuts, the ventilator is switched off and the boiler works at the minimum output

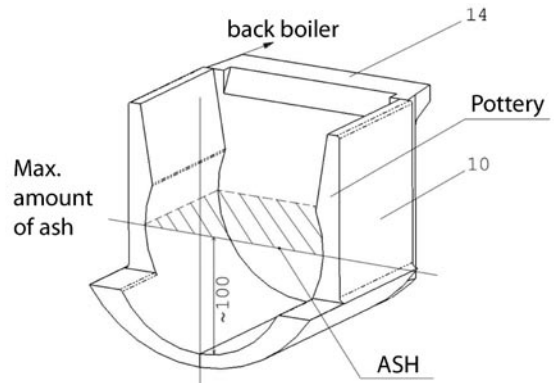
In the boilers prepared in this way the fuel keeps burning for 8 - 12 hours. The actual burning time in the top-fed stove operation (damping) corresponds to the amount of fuel that we put into the boiler and the real demand. **The boiler in the top-fed stove operation must have 80 - 90°C outlet water temperature and minimum 65 °C temperature of water returning to the boiler.**

## 26. Cleaning of boilers

Cleaning of boilers must be done regularly and thoroughly every 3 - 5 days because the ashes deposited in the fuel reservoir together with the condensates and tars isolates the heat transfer surface and reduces the boiler service life and its output. At a larger volume of ashes in the lower chamber there is an insufficient space for the flame burning-out and the holder of the ceramic nozzle plus the whole boiler can get damaged. Cleaning of boilers starts by switching on the draw-off ventilator, opening the filling door 121 and then we sweep down the ashes into the lower space. The long pieces of unburned wood (wood-coal) are left in the hopper for the next firing. We open the cleaning cover /15/ and we clean the rear flue way and flue plate by means of a brush. If an air-break valve is inserted in the the channel it must be



removed before cleaning. We rake up the ashes and soot after opening the lower lid /15/. After opening the lower door 131 we remove ashes and soot in the lower space. At every ashes removal we remove the dust deposits on the side walls of the combustion chamber by means of the fire-hook or a brush. The actual frequency of cleaning depends on the fuel quality (wood moisture), heating intensity, chimney draught and other circumstances therefore it must be found out. The boiler should be cleaned once a week. We do not pull out the fireclay fitting /10/, /14/,/38/1391 during the cleaning. At least once a year we clean (dust down) the propeller of the draw-off ventilator and through the cleaning hole we check the clogging of the regulation of the primary and secondary air proportion that through the air is passing into the stoking chamber.



**NOTE** – The regular and thorough cleaning is important for the permanent boiler output and service life assurance. In case of an insufficient cleaning the boiler gets damaged and the guarantee becomes extinct.



Open bottom space of the boiler with a circular space and example cleaning sides of the burning chamber with the fire hook



Open bottom space of the boiler with a circular space and example of ash removal with the ash pan



Sample cleaning of the flue way with a wire brush - upper lid



Sample cleaning and ash removing from the bottom part of the flue way - bottom lid



Sample cleaning of impeller and checking uprightness of vane on extract ventilator



Checking and cleaning regulation of primary-secondary air ratio via cleaning lid

## 29. Maintenance of heating system including the boilers

At least once every fortnight we check or replenish water in the heating system. If the boilers are out of service in the winter season the water could freeze in the system therefore we preferably empty the system or fill it with the anti-freeze. Otherwise we only empty the water in the inevitable cases and for the shortest possible time. We thoroughly clean the boiler after the end of the heating season and we replace the damaged parts. **We do not wait with the parts replacement for the eleventh-hour, but already in the spring we prepare the boiler for the heating season. We suggest to check regularly (once a year) the regulation and safety elements.**

## 30. Operation and supervision

The boiler operators must follow the operation and maintenance instruction manual. The interventions in boilers that could endanger the health of the operators or the inmates are prohibited. The boiler can only be operated by the persons older than 18 who are familiar with the appliance manual and operation meeting the requirements of § 14 promulgation 24/1984 Coll. It is prohibited to let the children unattended at the boilers that are in operation. When operating the solid fuel boilers it is prohibited to use the combustible liquids for firing-up and it is prohibited to increase the rated output (overheating) during the operation. Do not litter any combustible items on the boilers and near the stoking and ash-pan holes. The ashes must be collected in the fire-resistant containers with a cover. The boilers in operation must be checked by the operators from time to time. The user can only carry out the repairs consisting of the simple replacement of the delivered spare parts (like the fire-clay fittings, gaskets etc.). In the course of operation mind the tightness of doors and cleaning holes and tighten them thoroughly. The user must not interfere with boilers construction and electric installation of boilers. The boiler must always be cleaned duly and in a timely manner in order to ensure the throughput rate of all draughts. The filling and ash-pan doors must always be properly shut.

## 31. Possible faults and the way of their rectification

Fault	Reason	Rectification
<b>Indicator light „network „ is out</b>	<ul style="list-style-type: none"> <li>- no voltage in the network</li> <li>- wrong plugging-in he mains socket outlet</li> <li>- faulty nework switch</li> <li>- faulty cord</li> </ul>	<ul style="list-style-type: none"> <li>- check</li> <li>- check</li> <li>- replace</li> <li>- replace</li> </ul>
<b>Boilers do not achieve the required outputs and set water temperature</b>	<ul style="list-style-type: none"> <li>- lack of water in the heating system</li> <li>- big pump output</li> <li>- the boiler output is insufficiently</li> <li>- low-quality fuel (high moisture, big humidity)</li> <li>- leaking firing-up safety valve</li> <li>- a small chimney draught</li> </ul>	<ul style="list-style-type: none"> <li>- refill</li> <li>- adjust the flow and the pump switching</li> <li>- matter of project</li> <li>- burn the dry wood and halve the logs</li> <li>- repair</li> <li>- a new chimney, insuitable connection</li> </ul>
<b>Boilers do not achieve the required outputs and set water temperature</b>	<ul style="list-style-type: none"> <li>- a strong chimney draught</li> <li>- bent blades of the draw-off ventilator – long firing-up</li> <li>- <b>insufficiently cleaned boiler</b></li> <li>- clogged combustion air inlet into the stoking chamber</li> </ul>	<ul style="list-style-type: none"> <li>- umístít škrtící klapku do kouřovodu (omezovač tahu)</li> <li>- vytáhnout táhlo regul. vzduchu</li> <li>- narovnat lopatky (na úhel 90°)</li> <li>- replace</li> <li>- <b>clean</b></li> <li>- clean</li> </ul>
<b>The door is loose</b>	<ul style="list-style-type: none"> <li>- faulty glass gasket</li> <li>- the nozzle is clogged</li> <li>- small chimney draught</li> </ul>	<ul style="list-style-type: none"> <li>- replace</li> <li>- adjust the door hinges</li> <li>- do not burn petite wood, sawfdust and bark</li> <li>- fault in the chimney</li> </ul>
<b>The ventilator does not rotate</b>	<ul style="list-style-type: none"> <li>- overheated boiler - fuse rupture of the rupturing of the safety thermostat</li> <li>- entered orbit round</li> <li>- faulty capacitor</li> <li>- faulty engine</li> <li>- faulty servo-drive on the air flap</li> <li>- faulty contact in the socket of the inlet cable from the engine</li> </ul>	<ul style="list-style-type: none"> <li>- press down the button on the thermostat (by menas pof a pencil)</li> <li>- remove the tar and deposits</li> <li>- replace</li> <li>- replace</li> <li>- replace</li> <li>- check - measure</li> </ul>

## 32. Spare parts

Refractory fitting - nozzle	/5/
Refractory fittinga	/9/, /10/, /12/, /14/
Ventilator	/4/
Swith with indicator lamp	/20/
Thermometer	/18/
Regulation thermostat	/24/
Safety thermostat	/36/
Thermostat spalinový (1)	/35/
Flue gas thermostat 2 - variant B	/34/
Servo- drive of the air flap - variant B	/29/
Door gasketa 18x18	/26/
Door cushioning - Sibral	/25/
Capacitor for draw-off ventilator UCJ4C52 - 1 $\mu$ F	/28/
Capacitor for draw-off ventilator UCJ4C82 - 2 $\mu$ F	/28/
Air brake	/37/

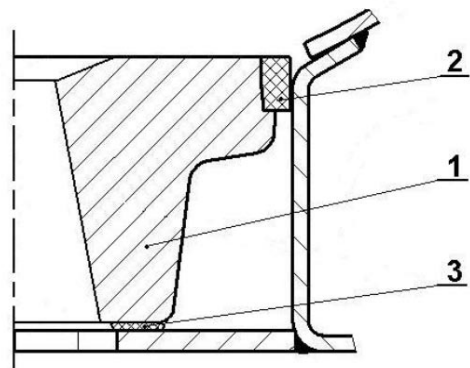


**CAUTION** – for boilers DC50GSX, DC60GSX there is destined the draw-off ventilator UCJ4C52 with a closed impellor Ø 175 mm; for boiler DC70GSX, there is destined the draw-off ventilator UCJ4C82 with a closed impellor Ø 200 mm.

### Exchange of refractory fitting (nozzle)

- List of material:
1. refractory fitting
  2. door gasket (3 pc)
  3. 1.boiler cement (white)

**Procedure :** We remove or break the old refractory fitting (only the nozzle hereinafter). We properly clean the holder on which the nozzle was seated in order to remove the old tar and cement. Out of the boiler cement we roll out thin dribbles that we set continuously on four sides of the nozzle holder hole so that they obstruct the secondary air blowing under the nozzle later on. We take the nozzle in hand, we stand in front of the boiler, turn it by the undercut asunder and underneath (the undercut is directed to the boiler; with the mark on the nozzle rearwards, if it is given). In the rear part of the boiler there is the secondary air inlet to the nozzle. We put it on the nozzle holder and hit backwards so that the play between the nozzle and holder is the same on the left and right side. We take the gaskets and by means of a hammer we form the trapezoidal section from the square section. Then we stretch them on the sides and forward on the nozzle and by slight hammering we evenly caulk them on four sides so that they are abreast with the nozzle. We apply the boiler cement on the gasket joints.



## Exchange of door gasket

Procedure: By means of the screwdriver we remove the old gasket and clean the groove in which it was seated. By means of a hammer we form the gasket from the square section into the trapezoidal section. We take the gasket and crush it manually on four sides of the door (with the narrower base in the groove) so that it holds in the groove (or by means of a hammer). We gripe the handle of the closure so that it is directed upwards and by a slow hammering we crush the gasket into the groove until the door can be shut. Then we tune the position of the small wheel which is in gear with the closure cam. Only in this way the door tightness can be guaranteed!

## Adjustment of hinges and closing of doors

The stoking and ash-pan doors are fastened together with the boiler drum by means of two sets of hinges. The hinge consists of the nut which is welded to the boiler drum and an adjusting screw to which the door is mounted by means of a plug. If we want to change the setting of hinges we firstly release and lift the upper hood (the control panel), knock out both plugs, remove the door and as necessary we turn the adjusting screw with the right thread. We bring everything into the original condition in the reverse way. The door closure consists of the lever with a handle and cam which is in gear with the small wheel screwed in the boiler and secured with a nut which prevents the rotation. After certain time the gasket in the door gets squeezed therefore the wheel must be more screwed in the boiler. We release the nut on the wheel and screw it into boiler so that the handle after the door firm shut shows 20 minutes on the imaginary clock. Eventually we tighten the nut.

## 33. Ecology

The ATMOS gasification boilers meet the highest demands on the ecology therefore they meet the conditions of awarding the certificate of “Environmentally friendly product “ according to the directive no. 13/2002 MŽPČR. The boilers are certified according to EN 303-5 European standard and fall in the category 3.

### Boiler disposal after the termination of its service life

It is necessary to ensure the disposal of individual boiler parts in an environmentally friendly way. The fly-ash will be removed from the boiler before its disposal and it will be put into the dustbin. The boiler drum and the hood will be transported to do Kovošrot (scrap-metal). The ceramic parts (fireclay) and insulation will be transported to the authorised waste dump.



**CAUTION** - In order to ensure the ecological heating it is forbidden to burn in the boiler the fuel or materials other than prescribed. It regards the plastic bags, various kinds of plastics, paints, cleaning rags, laminates and sawdust, slurries and dust coal.

## GUARANTEE CONDITIONS

### Hot-water boiler

GB

1. On condition that the way of using the product, its operation and maintenance stipulated in the manual are observed we guarantee that the product during the whole time of the guarantee period will have the properties defined by relevant technical standards and conditions. The guarantee period is 24 months after the product has been taken over by the consumer and max. 32 months after the manufacturer sold the product to the salesman (dealer). In case the boiler is connected with the thermoregulation valve TV 60°C and storage tanks (see the enclosed schemes), the guarantee period of the boiler drum is extended from 24 to 36 months. The guarantee period of other parts does not change.
2. In case a fault appears on the product during the guarantee period and it was not caused by the user the product will be repaired free of charge under guarantee.
3. The guarantee period is extended by the time during which the product was in the guarantee repair.
4. The customer makes the claim to the repair under guarantee at the service centre.
5. The guarantee of the boiler can only be acknowledged in case the boiler was installed by a person trained by the manufacturer according to the valid standards and the service manual. The legibly and completely filled out data on the firm that installed the boiler is the condition of any guarantee acknowledgement. In case the boiler is damaged due to an unqualified installation the incurred costs are paid by the firm which carried out the installation.
6. The purchaser was demonstrably made acquainted with the product use and operation.
7. The customer makes the claim to the repair after the guarantee period expiration at the service centre too. In this case the customer himself pays the financial charges for the repair.
8. The user is obliged to observe the instructions stipulated in the service and maintenance manual. In case he fails to observe the service and maintenance manual or a in case of a negligent or unauthorized use and burning the forbidden fuels the guarantee becomes extinct and the customer himself pays the repair incurred by the damage.
9. The boiler installation and operation according to the service manual requires the temperature of water leaving the boiler to be kept between 80°C and 90°C and the temperature of water returning to the boiler at min. 65°C in all boiler regimes.
10. The user is obliged to have the boiler revised by a professional firm at least once a year including setting the control elements, construction elements and the draw-off system. Every inspection must be certified in the guarantee card.

The conditions of guarantee and indemnity bond do not apply to the boilers outside the countries they are destined for it means the Czech Republic, Poland , Russia, Rumania, Lithuania, Latvia and Hungary.



**The guarantee and post-guarantee repairs are provided by:**

- The firm representing ATMOS in a particular country for a given region
- the installation company that installed the product
- Jaroslav Cankař and son ATMOS,

Velenského 487, 294 21 Bělá pod Bezdězem, Česká republika, Tel. +420 326 701 404



# BOILER INSTALLATION REPORT

**The installation was carried out by the firm:**

Firm: .....  
 Street: .....  
 Telephone: ..... State: .....

**Found out data:**

<b>Chimney:</b>	<b>Smoke-flue:</b>
Dimension: .....	Diameter: .....
Height: .....	Length: .....
Chimney draught: .....	* Number of elbows: .....
Last revision date: .....	Temperature of combustion products: .....

**The boiler is connected with the mixing valves (brief description of the connection):**

.....  
 .....  
 .....  
 .....

**Fuel:**

Type: ..... At the start-up there was checked the function  
 Size: ..... of boiler and all regulation and safety elements  
 Moisture: .....\*

Person responsible for the inspection: ..... Date: .....

Stamp: ..... Customer 's signature: .....  
*(signature of the responsible person)*

\* measured values

## ANNUAL REVISION RECORDS

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Date	Date	Date	Date
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# CARRIED OUT GUARANTEE AND POST-GUARANTEE REPAIR RECORDS

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