EKO LINE BOILERS

NEW HORIZON CORPORATION

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EKO Gasification Boilers

Specializing in Gasification Hydronic Furnaces, Timesaver Pipe & Swep Plate Exchangers

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Orlan®

ECOLOGICAL HEATING BOILERS

UTILIZING WOOD GASIFICATION TECHNOLOGY

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UTILIZING WOOD GASIFICATION TECHNOLOGY

Wood gasification proces

Gasification process occurs as follows:

1. Drying and heating wood until the release of gasses (hydrogen and carbon monoxide).
2. Burning of gas mixture in lower chamber at 2200°F.
3. Transfer of the flue gasses to the heat exchanger on the back of the boiler.
4. Ejecting the gasses through the chimney pipe.

The best indicator of successful wood gasification is the lack of smoke exiting the chimney.

STAGE 1
Wood drying and breakdown into gases

STAGE 2
Burning of mixed wood gases with secondary air

STAGE 3
Releasing heat trough heat exchanger

STAGE 4
Ejecting combustion gases through smoke stack

Wood as a fuel

Wood is a renewable resource like solar, water or wind power. They are all energy sources, which never become depleted, unless improperly managed. Wood is also a fuel, which may be stored and preserved without energy loss. Wood storing reduces its moisture and simultaneously increases its heating value (energy volume, which may be used up during burning process).

Modern boilers utilizing wood in gasification processes use energy contained in wood with efficiency that is three times higher than traditional boilers. Smoke and other emissions are cut to a very low level, making our boilers very nature friendly.

ORLAN boilers are adapted for burning of any kind of wood ranging from sawdust to chunks of wood. The best way to achieve recommended wood moisture is to cut the timber during springtime, and let it season in a shed or under a tarp.

Burning Zones

STAGE 4

STAGE 1

STAGE 2

STAGE 3

Best moisture for gasification should be in 20% range.

Wood too dry (less than 15%) or too wet (more than 25%) will reduce boiler efficiency.

Raw wood moisture ranges from 60% (wood cut in winter) to 80% (cut in summer). Most favorable wood moisture is obtained after 12-18 months of storing.

Additional equipment

Wood hydrometer

The hydrometer is needed for measuring of wood proper humidity during fuel purchasing but also for current control of stored wood.

Boiler fired with wood of proper humidity warrants complete and correct fuel utilization. Long term use of inappropriate wood causes the onset of tar on boiler internal walls, which causes difficulty in correct boiler operation.

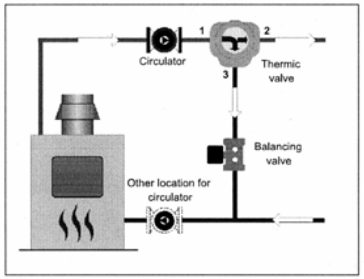
Wood hydrometer

Danfoss

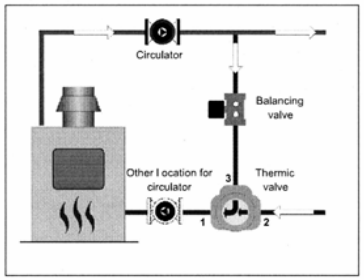
TV ESBE Thermic Valve Data Sheet

To ensure proper flow to the system an adjustable balancing valve such as Danfoss' MSV-U is recommended to be installed on the bypass between the supply and return piping. The piping of the balancing valve creates a similar resistance as the system to reduce the constant recirculation of heated fluid through the boiler and not out to the system.

Installation

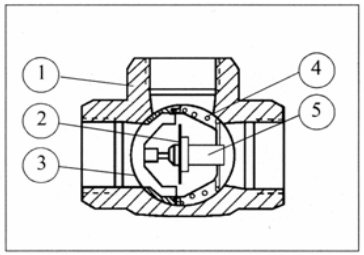


When the temperature of the fluid leaving the boiler is 160F (72C) the thermic valve will begin to allow the heated fluid to the system. Between 160F and 170F, the TV valve continues to bypass allowing supply to mix with the return water, keeping the fluid temperature levels high. At approximately 180F (82C) a majority of flow is directed to the system.



The thermic valve, when placed on the return side, port 2, will open when the minimum return temperature of 140F (60C) or 113F (45C) is reached. When the fluid temperature reaches approximately 158F (70C), a majority of the flow is directed to the system.

Construction:



No.	Description
1	Valve Body - Cast iron
2	Close off valve seat
3	O-ring – EPDM
4	Spring – Stainless Steel
5	Thermostat – Copper

Orlan STANDARD

RK 2001 R4E Regulator

1. Master switch
2. Boiler temperature indicator
3. Boiler fire-up mode indicator
4. Boiler overheating indicator
5. Room thermostat indicator
6. Boiler thermostat knob
7. Circulating pump indicator
8. Fuel shortage indicator
9. Room thermostat knob

STANDARD type boilers are equipped with RK 2001 R4E enabling:

- Interaction with circulating pump
- Interaction with room temperature sensor, installed in the room and connected with the boiler regulator by two-strand wire
- Modulation of fan rotation Boiler output adapting to actual weather conditions
- Interaction with EUROSTER room thermostat

Each boiler is able to work without room temperature sensor as well.

STOP STOP
PUMP'S OPERATION
FAN'S OPERATION
START FIRING-UP MODE
BLOW-THROUGH - INTERNAL TIME
FLUSHING - OPERATING TIME

RK 2001 R4E Regulator

Basic information about boiler assembly

1. Boiler placing.
Boiler can be placed in the heating room, basement, or in an outside wood storage building. There should be enough space to accommodate fuel storage for the whole heating season.

2. Boiler start-up rules
Each boiler should be connected to the heating system of which the heating capacity equals that of the boiler output.

To protect the boiler against low-temperature corrosion the end-user should assure return temperature does not reach lower than 120°F. It is possible by installing of four way mixing valve.

Boiler has to be connected to the chimney duct in the smallest distance possible. Chimney duct should be insulated to prevent condensation (low exhaust temperature).
The chimney should have the section and height assuring required chimney draught.

Boiler construction - its elements

- **Sealed wood gasification chamber** that is simultaneously used as a loading chamber. When appropriate amount of primary air supplied by the pressure fan is delivered, wood gas is generated
- A **nozzle**, made of refractory concrete, mixes wood gases with the secondary air and a flammable mixture is produced that undergoes self-ignition at about 1000°F
- **Exhaust reheat space** - the main combustion chamber, where temperature reaches about 2000°F serves also as an ash pit
- A **smoke tube heat exchanger** (flue gas to water) heats up the installation water
- A **fan** that communicates with the microchip controller monitors the quality of the whole burning process
- **Safe guard thermostat** - each boiler is equipped with an additional safe guard thermostat, which switches off the fan while the water gets up to 180°F
- **Steel turbulators** in heat exchanger tubes provide turbulent flue gas flow, which results in low flue temperature

Boiler construction - materials

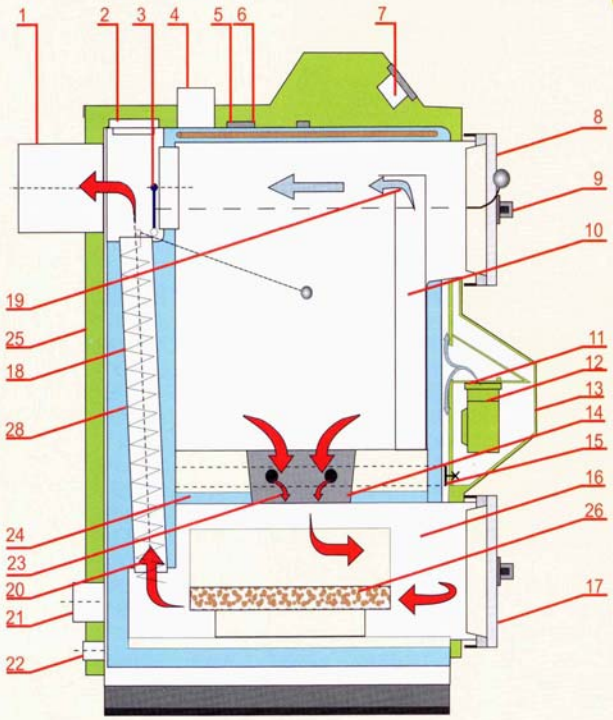
- **Boiler body** - boiler casing is made of welded metal sheets that are 1/4 inch thick.
- **Heat exchanger** - smoke tube heat exchanger made of tube with a 2 inch diameter
- **Insulation** - boiler thermal insulation is composed of glass wool of Nobasil 1 inch thick, while the external casing consists of metal sheet panels 0.8mm thick (powder painted)
- **Nozzle** - ceramic element made of refractory concrete (working temp. up to 2100°F)
- **Chimney flap** - made of high quality steel. Tight flap adhesion to the combustion duct assures the burning chamber tightness
- **Boiler regulator** - placed on upper boiler cover. The regulator is fixed to the boiler cover by spring catch
- **Chimney flue** – 8 or 10 inch in diameter, depending on the size of the boiler.
- **Ash pit** - steel bottom of the burning chamber, ceramic ash pit (working temp. 2100°F) and additionally covered by refractory concrete
- **Boiler door** - produced of high quality steel, insulated with Nobasil thermal insulation and inside covered by refractory concrete layer.
  Also protected with heat-resisting fiberglass cord.

EKO advantages

Orlan boilers are manufactured as:
ORLAN SUPER with cooling coil and mechanical cleaning device

- efficiency 91%
- low service costs
- easy and simple maintenance
- small quantity of ash
- one load lasting from 8 to 12 hours
- power range from 85 kBtu up to 275 kBtu
- output power modulation from 40 to 100%
- adapted for closed (pressurized) system
- equipped with electronic regulator and room temperature sensor
- nature friendly
- made from boiler steel

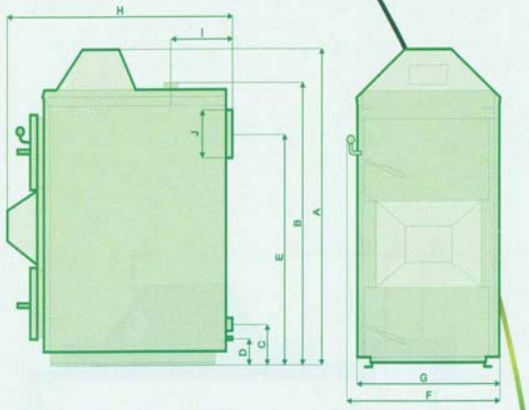
Boiler construction



Boiler construction

1. Chimney flue outlet
2. Heat exchanger cleaning cover
3. Chimney flap
4. Hot water exit
5. Thermometer sensor
6. Safe guard thermometer sensor
7. Boiler controller
8. Upper door
9. Closing/opening door handle
10. Loading chamber (wood gasification)
11. Fan flap
12. Fan
13. Fan casing
14. Nozzle (refractory)
15. Secondary air adjustment
16. Combustion chamber
17. Lower door
18. Smoke tube heat exchanger
19. Primary airflow
20. Flue gas exit
21. Heating water entry
22. Drain valve
23. Secondary airflow
24. Water grate
25. Thermal insulation
26. Ash pit

Boiler dimensions



Boiler dimensions scheme

Boiler type	ORLAN	25	40	60	80
Power range	kBtu	85	137	205	275
Weight	Lb	1280	1390	2070	2712
Height	A inch	51.5	59	60.5	60.5
Height of heating water exit	B inch	48.5	56	56.5	56.5
Height of heating water entry	C inch	8.3	6.0	7.9	7.9
Height of outlet valve	D inch	5.1	2.7	5.1	5.1
Height of chimney flue	E inch	37.4	50.0	45.7	45.7
Width including handle	F inch	24.8	24.8	30.3	30.3
Width including casing	G inch	23.6	23.6	29.1	29.1
Depth	H inch	41.1	41.1	53.5	52.7
Hot water exit	I inch	12.6	12.6	24.0	24.0
Diameter of chimney flue	J mm	7.8	7.8	8.2	8.2
Diameter of hot water exit	inch	2.0	2.0	2.0	2.0
Diameter of hot water entry	inch	2.0	2.0	2.0	2.0
Kind of connection	-	thread	thread	flange	flange
Diameter of drain valve	inch	0.5	0.5	0.5	0.5
Water capacity	Gal	20	25	47	54
Volume of loading chamber (gasification)	Ft^3	4.14	6.5	10.9	16.4
Power consumption	W	50	50	100	100
Moisture of wood:					
- recommended	%	15 - 25			
- acceptable	%	10 - 35			
Maximum log diameter	inch	7	7	7	7
Maximum length of logs	inch	20	20	25	39
Average flue gas temperature	F	340			
Max. working pressure	PSI	25			
Required chimney draught	Inches	.06 - .08			
Voltage / frequency	V/Hz	12V/60Hz			