

Technical Data Manual

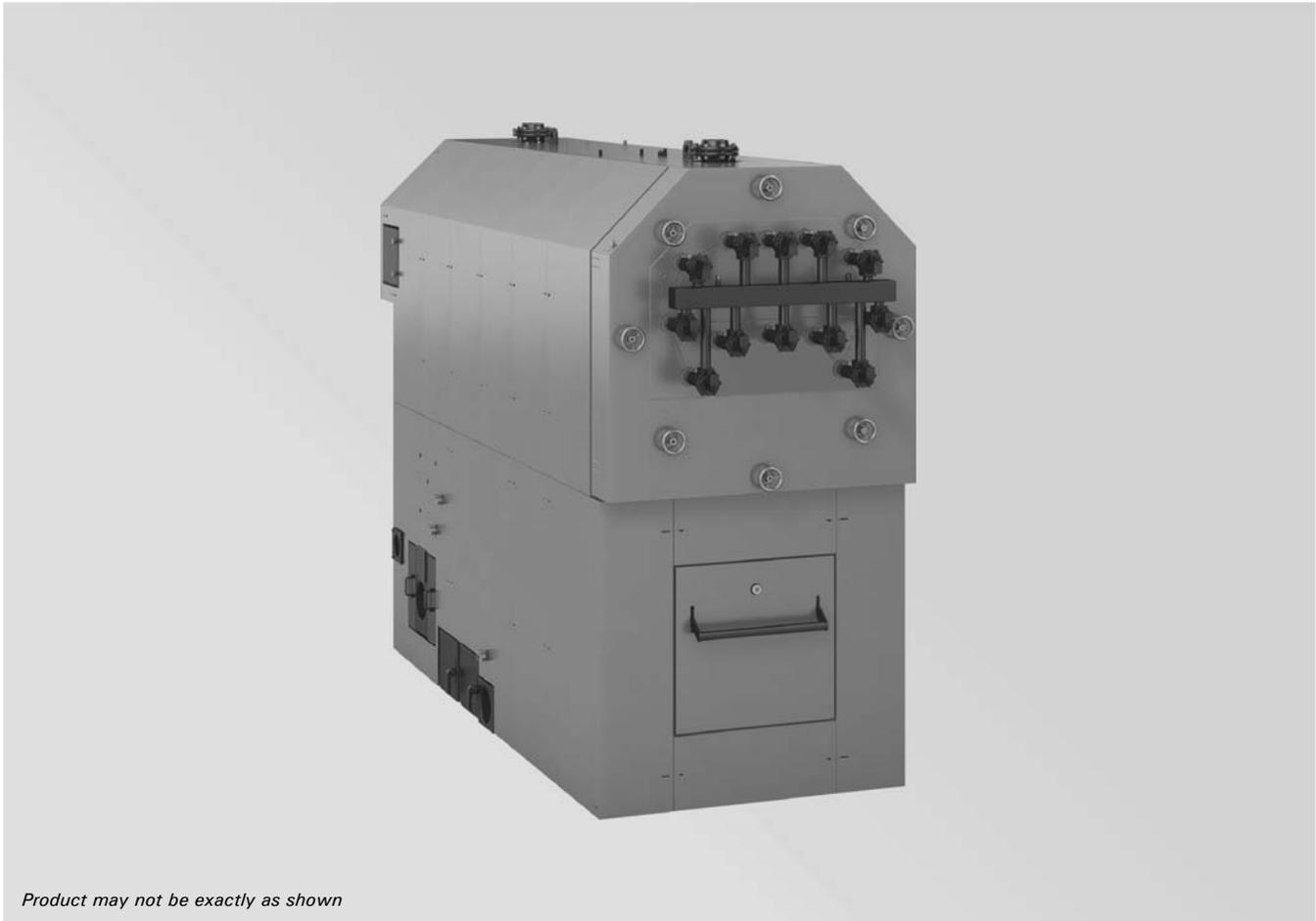
for use by engineers and heating contractors

VIESSMANN®

Vitoflex 300-UF

Wood-fired Boiler

Vitoflex 300-UF 390, 530, 720, 950 and 1250



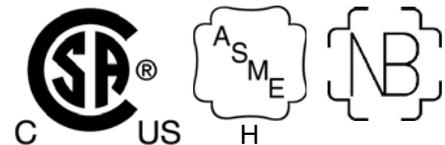
Product may not be exactly as shown

Vitoflex 300-UF with an attached external grate and a moving annealing grate to achieve optimal combustion results.

A feed auger continuously moves the wood fuel onto the burner trough where gasification takes place.

The combustible gases blend with precisely controlled secondary air, resulting in a complete combustion and the thermal energy is released into the boiler's triple-pass heat exchanger.

Output range: UF 390, 334 to 1331 MBH (98 to 390 kW)
UF 530, 450 to 1808 MBH (132 to 530 kW)
UF 720, 614 to 2457 MBH (180 to 720 kW)
UF 950, 812 to 3242 MBH (238 to 950 kW)
UF 1250, 1065 to 4265 MBH (312 to 1250 kW)



Vitoflex 300-UF

Steel wood-fired hot water heating boiler. For operation primarily with modulating boiler water temperatures in closed loop forced circulation hot water heating systems. Under certain conditions, open loop systems may also be considered. Contact Viessmann for details.

Specifications

- Fully-automatic underfeed combustion wood-fired boiler
- 5 models from 1331 to 4265 MBH
- For wood fuels with max. water content of 50%
- Efficiency: 85%
- Available for 30 or 60 psi max. operating pressure

Benefits at a glance

- High efficiency with advanced combustion technology, triple-pass heat exchanger and modulating output control (turndown ratio 4:1)
- Maximum heat transfer with triple-pass heat exchanger design.
- High efficiency and ultra-low emissions with precisely controlled primary and secondary air.
- Low maintenance with fully-automatic de-ashing, optional pneumatic cleaning system and flue gas cyclone.
- Advanced safety equipment ensures safe and reliable operation.
- Maximum system performance with heavy-duty construction and all system components from one source.
- Automatic igniter limits idling and saves fuel.
- Custom design of your system by our team of experts.

Codes

CSA B366.1-M91
Solid Fuel Fired Central Heating Appliances

CSA C.22.2#3-M88 (R2004)
Electrical Features of Fuel Burning Equipment

UL2523
Solid Fuel-Fired Hydronic Heating Appliances, Water Heaters and Boilers

CSA B365 (latest edition)
Installation Code for Solid Fuel Burning Appliances and Equipment

ASME section IV boilers and pressure vessels.

Maximum allowable working pressure (water)...30 or 60 psi

Maximum water temperature.....250°F (120°C) (closed loop)

Maximum boiler temperature.....210°F (99°C) (open loop)

This boiler does not require a flow switch.



WARNING

Exposing the boiler to pressures and temperatures in excess of those listed will result in damages and will render the warranty null and void.

Boiler Description

Description

The Vitoflex 300-UF Grate Firing System (patent no: EP 0 905 442 B1) was developed for automatic combustion of all dry to moist wood fuels (remnant wood, pellets and forest wood chips to max. W50, (see section "Wood Fuel Requirements") and combines the benefits of underfeed firing with the benefits of grate firing.

The Vitoflex 300-UF Grate Firing System is characterized by highest efficiencies and perfect combustion in all load stages. The Vitoflex 300-UF Boiler Plant has been built to ASME Sec. IV and has CRN for Canada. It is tested and approved to the applicable CSA / UL safety standards.

Function:

- The solid, powerful and heat-resistant in-feed auger moves the fuel into the burner trough and onto the descending and moving grate zone. An electrical and mechanical temperature sensor to operate the thermostatic valve for extinguishing assembly are located on the in-feed auger. Above the auger is the metering container with a light barrier for setting the level of the fuel insulating layer.
- The fuel is either ignited manually or automatically with an automatic igniter (optional). The boiler features a reliable burner trough, a descending grate and a moving burn-out grate made from highly-refractory cast steel [approx. ½ in. (12 mm)]. These items provide for excellent performance control and highest safety preventing back-burn in conjunction with an automatic de-ashing assembly with ash container (optional) for the combustion chamber. The solid, horizontally positioned and large-volume combustion chamber has been optimized in terms of combustion, consists of a high-quality refractory brick lining and has multiple layers of insulation for the lowest possible surface temperatures. A variable speed primary air blower provides preheated air to the combustion grates in the combustion chamber.
- In the upper part of the combustion chamber, the secondary air is blown into the gas space of the firing system by variable speed blower via an encircling ring with individually adjustable nozzles to achieve high turbulence. This mixes the fuel gases with fresh secondary air to achieve perfect combustion and very low emissions.
The combustion chamber door is solidly constructed, air-cooled and very well insulated. The combustion chamber door is equipped with solid double-jointed hinges for easy maintenance.
The heat is transferred to the water in the horizontal heat exchanger. The boiler is well insulated and highly accessible through the heat exchanger door on the front. A pneumatic cleaning system (optional) can be installed at the insulated heat exchanger door.
- The flue gas exhaust blower has been specially designed for wood burning boilers and quiet operation. The spring- suspended motor has a solid, heat-resistant design with a heat dissipation hub. The blower housing on the intake can be mounted radial by 360° and has a variable rotation speed and a round blow-out nozzle. It is mounted directly on the flue gas cyclone.

Supplied with:

- Boiler with combustion chamber and pressure vessel / heat exchanger including supply and return temperature sensors and negative pressure monitoring assembly
- Combustion chamber with burner trough, descending grate, moving burn-out grate and light barriers for ember monitoring
- In-feed auger including insulating layer, safety end switch for maintenance lid, back-burn temperature sensor, thermostatic valve for extinguishing assembly, extinguisher water container with mounting bracket
- Flue gas exhaust blower including flue gas temperature sensor and oxygen sensor
- Boiler cleaning tools for the combustion chamber and heat exchanger
- Installation fittings including pressure relief valve, drain valve, low water cut off, fixed high limit, temperature and pressure gauges
- Control cabinet with integrated Pyrocontrol control system

Customer supplied:

- Counter flanges for the boiler supply and return
- Piping to the 3-way mixing valve, boiler pump and thermal storage tank
- Piping for the safety heat exchanger
- Wiring to the control panel
- Insulation for the flue gas re-circulation line, the flue gas recirculation system is optional
- Separate electrical circuit for pneumatic cleaning system, air compressor when provided

Accessories for Vitoflex 300-UF Grate Firing System:

- Flue gas cyclone 63 USG (240 L)
- Flue gas cyclone 211 USG (800 L)
- Automatic de-ashing assembly with ash container, 63 USG (240 L)
- Automatic de-ashing assembly with ash container, 211 USG (800 L)
- Pneumatic cleaning system
- Automatic igniter
- Set of displacement rods (for Vitoflex 300-UF 720, 950 and 1250 only)
- Operating pressure 30 or 60 psi
- Two-stage in-feed auger
- Flue gas recirculation system
- Thermal safety flush valve
- Slide valve / Rotary valve
- Boiler pump and boiler 3-way mixing valve
- Pyrocontrol control system options:
- 5 sensor thermal storage tank management system
- External control module for field supplied extraction system
- Output module / Input module
- Input module 0-10V
- ModBus
- BacNet gateway
- Visualization

Transport and Installation

IMPORTANT

Precautions must be taken to avoid accidents and injury during the transportation of the boiler.

Only hoist the boiler when it is entirely empty of water, fuel and ash.

Lifting

The combustion chamber has four lifting lugs that must be screwed in before lifting. Lifting gear can be attached to these lifting lugs.

The pressure vessel of the Vitoflex 300-UF has two lifting lugs to which lifting gear may be attached.

A special crane (provided by the customer on site) is required to lift the fire box and the pressure vessel.

Recommended minimum clearances to walls for installation and maintenance work must be observed. An anti-vibration boiler support should be provided if anti-vibration measures are required.

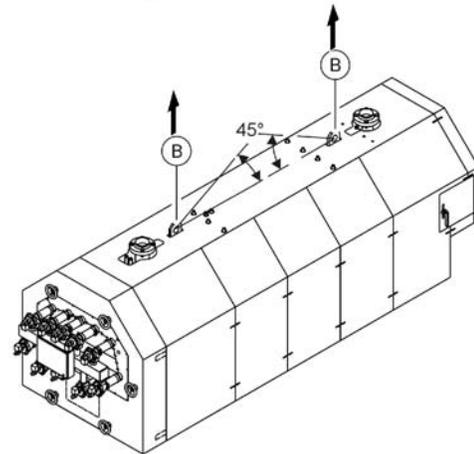
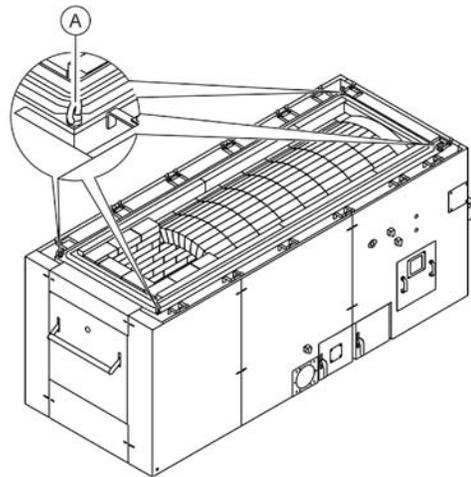


WARNING

Follow instructions for proper installation.

For wood-fired installations:

This wood-fired boiler must be installed in accordance with local codes if any; if not, follow Installation Code for Solid-Fuel Burning Appliances and Equipment and CSA 365 (latest edition).



- Ⓐ Lifting lugs (screw in before lifting)
- Ⓑ Lifting lugs (pressure vessel)

Delivery Condition

Standard delivery condition

The standard delivery condition of the Vitoflex 300-UF boiler includes pre-assembled components as well as components that need to be assembled by the contractor in the field.

Components that are attached to the boiler at time of delivery:

- Heat exchanger door is mounted to the heat exchanger
- Combustion chamber door is mounted to the combustion chamber
- Flue gas collector is attached to the heat exchanger
- Pneumatic cleaning system (optional) is attached to the heat exchanger door

Components that are not attached or installed to the boiler at time of delivery (scope of the contractor):

- The pressure vessel is not mounted to the combustion chamber
- Brickwork to connect the combustion chamber, bricks and mortar are included
- Electrical components which include temperature sensors, oxygen sensor, light barriers for the combustion chamber, igniter, flue gas blower, low water cut off, fixed high limit, negative pressure monitoring assembly and light barriers for the complete extraction system
- All wiring to the control cabinet
- Installation fittings which include pressure relief valve, drain valve, temperature and pressure gauges
- Drive for the combustion chamber grate is detached
- De-ashing assembly with ash container system (optional) and drive for the de-ashing system
- Air compressor (optional) and connection to the pneumatic cleaning system (optional)
- The flue gas exhaust blower is not attached to the flue gas collector
- Primary air blowers are not attached to the combustion chamber
- Secondary air blowers are not attached to the combustion chamber
- Re-circulation system (optional)
- Flue gas cyclone (optional) comes in two pieces
- The in-feed auger is detached from the combustion chamber
- Fire extinguishing system for the in-feed auger
- Slide valve (optional) or rotary valve (optional)
- All components of the extraction system (optional), welding for flanges and support legs required
- Glass fiber insulation between any auger connections

Measurements for the fire box as standard delivery condition

Boiler model	UF 390	UF 530	UF 720	UF 950	UF 1250
Minimum size door (W x H)	59 in. x 59 in. (1500 mm x 1500 mm)	63 in. x 69 in. (1600 mm x 1750 mm)	63 in. x 69 in. (1600 mm x 1750 mm)	74¾ in. x 73¾ in. (1900 mm x 1850 mm)	74¾ in. x 78¾ in. (1900 mm x 2000 mm)
Minimum ceiling opening (W x H)	59 in. x 149 in. (1500 mm x 3800 mm)	63 in. x 157½ in. (1600 mm x 4000 mm)	63 in. x 196¾ in. (1600 mm x 5000 mm)	74¾ in. x 196¾ in. (1900 mm x 5000 mm)	74¾ in. x 216½ in. (1900 mm x 5500 mm)

Measurements for the pressure vessel as standard delivery condition

Boiler model	UF 390	UF 530	UF 720	UF 950	UF 1250
Minimum size door (W x H)	59 in. x 59 in. (1500 mm x 1500 mm)	63 in. x 69 in. (1600 mm x 1750 mm)	63 in. x 69 in. (1600 mm x 1750 mm)	74¾ in. x 73¾ in. (1900 mm x 1850 mm)	74¾ in. x 78¾ in. (1900 mm x 2000 mm)
Minimum ceiling opening (W x H)	59 in. x 112¼ in. (1500 mm x 2850 mm)	63 in. x 112¼ in. (1600 mm x 2850 mm)	63 in. x 126 in. (1600 mm x 3200 mm)	74¾ in. x 130 in. (1900 mm x 3300 mm)	74¾ in. x 137¾ in. (1900 mm x 3500 mm)

Wood Fuel Requirements

The Vitoflex 300-UF is only suitable for burning fuels listed in this section. A prerequisite for approval is of a fuel by Viessmann is the approval for the fuel by the responsible public authorities.

Warranty claims for Viessmann Biomass boilers are excluded if the following fuel conditions are not met.

Allowed fuels

- Forest wood and plantation wood (complete untreated trees and trunk wood):
Mature wood from trunks and branches, untreated, chopped to chips
- Compressed wood, pellets conforming to standards, as per CAN/CSA-B366.1-M91, size P1, P2, P4.

Untreated wood with limited bark content, compressed by machine and calibrated

Fuel	Minimal Diameter	Maximal Diameter
P1 - Pellets Small	---	3/8 in. (10 mm)
P2 - Pellets Medium	3/8 in. (10 mm)	3/4 in. (20 mm)
P4 - Briquettes (Pellets Large)	3/4 in. (20 mm)	2 1/2 in. (60 mm)

- Wood with an increased proportion of bark, tree cuttings from roadside trees (untreated):
Wood remnants from the forestry and sawmill industries or from landscape conservation (likelihood of elevated ash content).
- Remnants from derived timber products:
Usually a mixture of untreated and treated wood in the form of shavings from processing machinery and chips from choppers.
- Used wood:
This is untreated wood that has been used prior to its energetic utilization (e.g. pallets). It is reduced in size by shredders for thermal utilization. The metal parts have to be removed by magnetic separators.

Size of Wood Chips as per CAN/CSA-B366.1-M91, Grade C7

Total mass 100%		G 30 Fine	G 50 Medium
Coarse percentage max. 20%	Max. cross-section	in ² (cm ²)	1/2 (3)
	Max. length	in. (cm)	3 1/3 (8.5)
	Coarse sieve nominal mesh width	in. (mm)	5/8 (16)
Main percentage 60 to 100%	Medium sieve nominal mesh width	in. (mm)	1 1/4 (31.5)
	Fine sieve nominal mesh width	in. (mm)	1/8 (2.8)
Percentage of fines (incl. ultrafine content) max. 20%			1/4 (5.6)
			1/25 (1)

CAUTION

Chips have to pass through a 1 in. (25 mm) sieve, additionally, a fraction of max. 5% of the fuel with a cross-section of max. 3/4 in.² (500 mm²) up to a length of max. 6 1/4 in. (160 mm) can be tolerated.

IMPORTANT

If different fuels are used, Viessmann will not assume any liability for the functioning or service life of the boiler plant. Refer to the "Warranty" section in the General Terms and Conditions of Delivery.

- Burn wood only
- Do not use chemicals or fluids to start fire.
- Do not burn garbage, gasoline, naphtha, engine oil, or other inappropriate materials.

Size of briquettes:

- Fraction of one-offs. max. 5% with cross-section of max. 3/4 in² (500 mm²) up to a length of max. 6 1/4 in. (160 mm).
- Frayed surface by chopping tools (shredders) or slow-running choppers.
- Briquettes, diameter max. 2 3/8 in. (60 mm).

Consequences of overstepping particle size:

- Increased maintenance because of a substantially higher risk of malfunction
- Shortened service life of the conveyor augers and drives

Wood Fuel Requirements *(continued)*

Maximum water content

The maximum allowable water content of the fuel for Vitoflex 300-UF systems is limited to 50%.
The water content impacts the maximum boiler output.

Non-wood fuels

Non-wood fuels even if consisting of biomass, such as needles, foliage, grain, straw, fruit pits, etc, are unsuited as fuel for boiler operation and may not be used.

Suitable fuel types for Vitoflex 300-UF systems

- Bulk density **S** in kg/m³ [lb/ft³], water content (**W**) in %, size C1, C7, P1, P2, P4 as per CAN/CSA-B366.1-M91.

Note: Fuel for Vitoflex 300-UF systems allow for a max. of 50% water content (**W**).

Limitation super fines and dust [wood particles smaller than 1/32 in. (1.0 mm)]

Max. 10.0% of the total mass; if fuel does not comply with this limit the following process may occur:

- Temperature peaks
- Slag formation
- Even higher temperature
- This process leads to damage by overheating and can affect refractory materials.

Elevated values are especially critical for remnant wood in combination with elevated values of Chlorine and Sulphur.

Saw dust

Fuel code	Bulk Density kg/m ³ [lb/ft ³]	Water content %	Fuel Size	Description
a	S130 [8.1]	W10 to W20	C1	Sawdust, untreated (planing shop)
b1	S200 [12.5]	W20 to W35	C1	Sawdust, untreated (sawmill)
c2	S250 [15.6]	W35 to W50	C1	Sawdust, untreated (sawmill)

Wood chips

Fuel code	Bulk Density kg/m ³ [lb/ft ³]	Water content %	Fuel Size	Description
b2	S200 [12.5]	W20	C7	Forest wood chips, soft, untreated
c1	S250 [15.6]	W20 to W35	C7	Forest wood chips, soft, untreated
d1	S300 [18.7]	W20 to W35	C7	Forest wood chips, soft/hard, untreated
d2	S300 [18.7]	W35 to W50	C7	Forest wood chips, soft, untreated
e1	S350 [21.8]	W20 to W35	C7	Forest wood chips, hard, untreated
e2	S350 [21.8]	W35 to W50	C7	Forest wood chips, soft/hard, untreated
f1	S400 [24.9]	W35 to W50	C7	Forest wood chips, hard, untreated

Shavings and chips

Fuel code	Bulk Density kg/m ³ [lb/ft ³]	Water content %	Fuel Size	Description
g	S130 [8.1]	Less than W15	C7	Shavings & chips from wood remnants, dry, mixed
h	S200 [12.5]	Less than W15	C7	Shavings & chips from wood remnants, dry, mixed
i	S250 [15.6]	Less than W15	C7	Shavings & chips from wood remnants, dry, mixed

Pellets and briquettes

Fuel code	Bulk Density kg/m ³ [lb/ft ³]	Water content %	Fuel Size	Description
j	S350 [21.8]	Less than W15	P4	Briquettes from wood remnants 3/4 in. (20 mm) to max. 2 in. (60 mm)
k1	S650 [40.6]	Less than W10	P1	untreated up to 3/8 in. (10 mm)
k2	S650 [40.6]	Less than W10	P2	untreated 3/8 in. to 3/4 in. (11 mm to 20 mm)

Note: For size of wood chips, see page 6.

Wood Fuel Requirements *(continued)*

Content limits for non-combustible substances

- No wood fuels may contain any foreign bodies, such as pieces of metal, stones, masonry remnants or plastics.

The following limits (per mg/kg of dry fuel) of contained non-combustible substances apply [ash analyzed at a temperature of 1500°F (815°C)]:

Substance	Limit	Comparative value untreated forest wood
Chlorine (Cl)	max. 300 ppm (300 mg/kg)	10 ppm (10 mg/kg)
Sulphur (S)	max. 1000 ppm (1000 mg/kg)	120 ppm (120 mg/kg)
Total Cl, S	max. 1000 ppm (1000 mg/kg)	130 ppm (130 mg/kg)
Ash content, total	max. 0.25 oz/lb (15.0 g/kg)	0.08 oz/lb (5.0 g/kg)
Alkali oxides in the ash (K ₂ O and Na ₂ O)	max. 0.016 oz/lb (1.0 g/kg)	0.006 oz/lb (0.35 g/kg)
Sintering point of the ash	min. 1800°F (1000°C)	approx. 2200°F (1200°C)

If fuel does not comply with these limits, there is a risk of corrosion within the heat exchanger and early sintering and melting of the ash which leads to:

- Shortened life of the heat exchanger
- Increased maintenance costs (firing, combustion chamber door)

The maintenance instructions need to be complied with in order to avoid a process, which will increasingly cause damage to the boiler.

If maintenance instructions are not complied with the following process may occur:

- Cinders change the airflow
- Temperature peaks
- More slag is produced
- More cinder builds up and changes the airflow more

This process leads to damage by overheating and may affect refractory materials.

Additives in remnant and used wood have to be free of heavy metals and halogen compounds.

Other information

- Ash and cleaning:
Untreated wood without bark produces less than 0.5% ash of the fuel mass supplied. All the specifications regarding cleaning are based on untreated wood with bark attached with an ash amount of 0.8% of the fuel mass.
If the ash content is higher and/or the ash melting point is lower, increased maintenance and/or cleaning are required.
- Changing fuels:
A substantial change in fuel quality, such as bulk density, water content, dust proportion or ash content might require a manual correction of the firing parameters (see Operating section).

Power Failure Provision

Customers must ensure that there is a supply of water independent of the electrical supply. This design ensures that in case of a power failure, the boiler will be reliably cooled by the thermal safety flush valve.

Venting Requirements

The Vitoflex 300-UF Grate Firing System is equipped with a flue gas exhaust blower.

This boiler must be properly vented. Use a vent material certified for use with solid-fuel fired equipment.

This boiler shall be connected to:

- a) a masonry chimney conforming to local regulations or, in the absence of such regulations, to the requirements of the National Building Code
- b) a certified factory-built chimney (refer to the NFPA 211 standard).

A flue pipe serving this boiler shall be constructed of steel or other suitable material with a melting point of not less than 2000°F (1100°C).

IMPORTANT

Do not use galvanized steel

For installations in Canada:

The boiler venting system must be tested and listed by a Nationally Recognized Testing Lab such as ULC/CSA for solid fuel burning appliances.

The Vitoflex 300-UF Grate Firing System is output-controlled within a range from 30%-100% of the rated boiler output. This produces flue gas temperatures from min. 212°F (100°C) to max. 482°F (250°C).

An insulated chimney should be provided to prevent sooting.

The distance from the flue gas exhaust blower to the chimney should be as short as possible. 90° elbows should be avoided if possible. Flue gas pipes of more than 3 ft. (1 m) in length must be insulated.

The connection to the chimney should be made such that it rises at an angle of 30°- 45° (to prevent excess ash accumulating in the lateral section of the vent pipe).

The flue gas line, including the lead-in into the chimney, must be gas-tight.

Mechanical Room

IMPORTANT

Always follow the most up-to-date local, municipal and building regulations and codes.

Ensure the mechanical room complies with the requirements in these instructions and local codes.

Viessmann recommends the installation of an additional electrical disconnect switch and a fuel shut-off valve (if possible) outside the mechanical room or enclosed area of installation.

A separate, dry heating room must always be provided for the Vitoflex 300-UF Grate Firing System. No combustible materials may be stored in the heating room. The heating boiler may only be set up on a fire- and temperature-resistant floor.

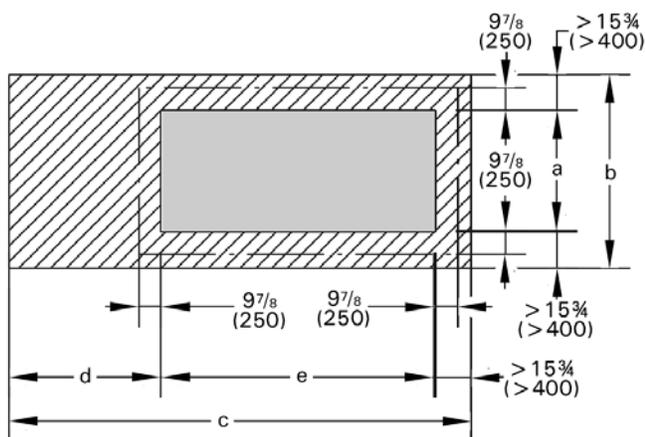
No temperature-sensitive pipes or lines may be installed in the floor beneath the heating boiler.

The temperature in the heating room must not exceed 104°F (40°C) while the system is in operation (in the area approx. 3 ft. (1 m) away from the boiler).

The temperature in the heating room must not fall below 50°F (10°C) while the system is in operation (measured at the inner side of exterior walls).

The load-bearing capacity of the heating room floor must be designed for the weight of the system plus filling with water and fuel. The load-bearing capacity of the floor in the area of the boiler bearing surface must be 512 lb/ft² (2500 kg/m²).

The minimum distance to the walls and ceiling required according to the table of dimensions for proper cleaning and maintenance of the boiler must be complied with. A sufficient supply of fresh air must be provided directly from outdoors into the heating room. Induced ventilation is necessary for heating rooms that are confined or enclosed.



Dimensions shown in in. (mm)

Hatched surface.....Heat-resistant floor
 Medium grey surface.....Boiler supporting surface

Foundation dimensions

Boiler Model UF-		390	530	720	950	1250
a	in. (mm)	40 ³ / ₈ (1026)	40 ³ / ₈ (1026)	43 ³ / ₄ (1112)	53 ¹ / ₂ (1360)	53 ¹ / ₂ (1360)
b	in. (mm)	71 ⁷ / ₈ (1826)	71 ⁷ / ₈ (1826)	75 ¹ / ₄ (1912)	85 (2160)	85 (2160)
c	in. (mm)	166 ¹ / ₈ (4221)	166 ¹ / ₈ (4721)	193 ³ / ₈ (4912)	200 ⁵ / ₈ (5096)	222 ¹ / ₈ (5641)
d	in. (mm)	49 ⁵ / ₈ (1260)	49 ⁵ / ₈ (1260)	55 ¹ / ₈ (1400)	64 ¹ / ₈ (6030)	64 ¹ / ₈ (1630)
e	in. (mm)	100 ⁷ / ₈ (2561)	120 ¹ / ₂ (3061)	122 ¹ / ₂ (3112)	120 ³ / ₄ (3066)	142 ¹ / ₈ (3611)

Combustion Air Supply

Codes

Provision for combustion and ventilation air must be made in accordance with applicable local codes.

In the absence of local codes, use:

CSA B365, Installation Code for Solid Fuel Burning Appliances and Equipment.

Always use latest edition of codes.

WARNING

Failure to provide an adequate supply of fresh combustion air can cause poisonous flue gases to enter living space. Flue gases entering living space can cause carbon monoxide poisoning which can result in severe personal injury or loss of life.

WARNING

Never cover the boiler or store debris or other materials near the boiler, or in any way block the flow of adequate fresh air to the boiler. Never cover the combustion air opening. Advise system operator / ultimate owner accordingly.

General

This equipment requires fresh air for safe operation and must be installed ensuring provisions for adequate combustion and ventilation air exist.

Whenever possible, install boiler near an outside wall so that it is easy to duct fresh air directly to the boiler area.

The boiler location must never be under negative pressure. Flue gas exhaust blower, attic blowers or dryer blowers may cause air to be exhausted at a rate higher than air can enter the structure for safe combustion.

The heating contractor shall ensure all of the following requirements are met:

- An adequate supply of combustion air must be available to ensure proper combustion.
- Ambient air temperatures must be maintained within safe operating limits.
- When a damper is provided in any opening intended to admit combustion air into the room within which the appliance is installed, the damper shall be interlocked to prevent any burner from starting before the damper is fully open.
- Each duct used to convey air from the outdoors shall have:
 1. a cross-sectional area throughout its length at least equal to the free area of the inlet and outlet openings which it connects,
 2. making a provision for outside combustion air, the intake shall not be less than 1 ft. (0.3 m) above the anticipated snow level for the location.
- The heating contractor must check with local authorities (municipal building department) for combustion air requirements particular to the area.

Confined spaces

When a furnace or boiler is enclosed in a space that has a volume less than 20% of that to be heated by the appliance, the space shall:

- a. have a permanent opening or openings for natural air circulation with a minimum net free area of 1.5 in² / 1000 Btu/h (3300 mm² / kW) input, and
- b. connect to another space or spaces such that the total volume of air available for natural air circulation is at least 30% of the total volume to be heated by the appliance.

The minimum dimension of any opening specified in item (a) shall be no less than 1 in. (25 mm) The lower edge of at least one opening shall be located within 1.5 ft. (0.5 m) of the floor of the enclosed space, and the upper edge of at least one opening shall be located within 1.5 ft. (0.5 m) of the ceiling of the enclosed space.

Note: The intent of this Clause is to allow either one long vertical opening or two shorter horizontal openings, one high and the other low, to allow for air circulation to prevent overheating of the appliance.

Unconfined Spaces

Where the boiler is located in an unconfined space in a building having insufficient infiltration, additional air for combustion and ventilation shall be obtained from outdoors or from spaces freely communicating with the outdoors. Under these conditions, permanent opening(s) shall be provided so that the total air received through these openings will be at least as much as would be admitted by openings having a total free area of 1 in² / 5,000 Btu/h or (450 mm² / kWh) of the total input rating of all wood-fired appliances.

Louvers and grilles

In calculating free area as specified, consideration shall be given to the blocking effect of louvers, grilles, or screens that protect openings. Screens shall be no smaller than ¼ in. (6 mm) mesh and shall be readily accessible for cleaning. If the free area through a design of louver or grilles is known, it shall be used in calculating the size of opening required to provide the free area specified. If the design and free area are not known, it shall be assumed that wood louvers have 20 - 25% free area and metal louvers and grilles have 60 - 75% free area.

Negative pressure

Systems, including a combination of exhaust fans and a combination of air fans shall not be installed or controlled to permit the creation of a negative pressure in the boiler room relative to the breaching and flue.

Technical Data

Boiler model		UF 390	UF 530	UF 720	UF 950	UF 1250
Maximum output	MBH (kW)	1331 (390)	1808 (530)	2457 (720)	3242 (950)	4265 (1250)
Minimum output ¹	MBH (kW)	334 (98)	450 (132)	614 (180)	812 (238)	1065 (312)
Efficiency ²		85%				
Fuel Moisture content ³	%	W 50				
Size of wood chips ⁴		G 30 / G 50 as per CAN/CSA-B366. 1-M91				
Flue gas figures						
Connection flue gas pipe Ø A	in. (mm)	13½ (350)	13¾ (350)	13¾ (350)	15¾ (400)	17¾ (450)
Mass flow rate; W5; O ₂ 6%	lb/s (g/s)	0.48 (219)	0.65 (297)	0.89 (404)	1.17 (532)	1.54 (700)
Volume flow; W5; O ₂ 6%; 302°F (150°C)	ft ³ /s (m ³ /s)	9.18 (0.26)	12.71 (0.36)	17 (0.48)	22 (0.63)	29 (0.83)
Mass flow rate; W35; O ₂ 8%;	lb/s (g/s)	0.67 (303)	0.91 (412)	1.23 (560)	1.62 (736)	2.13 (968)
Volume flow; W35; O ₂ 8%; 302°F (150°C)	ft ³ /s (m ³ /s)	13 (0.37)	17.5 (0.50)	23.6 (0.67)	31 (0.88)	40.6 (1.15)
Average flue gas temperature at full load ⁵	°F (°C)	320 (160)				
Average flue gas temperature at partial load ⁵	°F (°C)	248 (120)				
Chimney draft required	Pa	±0				
Electrical connections						
Electrical connections, total	kW	6.42	8.28	8.28	9.51	11.31
Igniter	kW	1.6	1.6	1.6	1.6	1.6
Flue gas exhaust blower	kW	1.5	2.2	2.2	2.2	4.0
In-feed auger	kW	1.1	1.5	1.5	2.2	2.2
Primary air blower ¹	kW	0.14	0.3	0.3	0.48	0.48
Primary air blower ²	kW	1.0	1.0	1.0	1.0	1.0
Secondary air blower	kW	.9	1.5	1.5	1.85	1.85
Grate drive unit	kW	0.12	0.12	0.12	0.12	0.12
Electric power consumption at full load	kW	3.36	4.68	4.68	5.29	6.91
Electric power consumption at partial load	kW	2.75	3.83	3.83	4.28	5.6
Heating						
Water side resistance (diff. 27°F / 15 K)	"wc (mbar)	5.12 (13)	9.23 (23)	17.26 (43)	10.5 (26)	18 (45)
Boiler water volume	USG (L)	303 (1150)	383 (1450)	488 (1850)	515 (1950)	660 (2500)
Heating surface	ft ² (m ²)	291.8 (27.1)	457.5 (42.5)	597.4 (55.5)	805.2 (74.8)	979.6 (91.0)
Volume on heating gas side	USG (L)	407 (1540)	602 (2280)	774 (2830)	1070 (4050)	1367 (5210)
Volume of ash container for grate ash	USG (L)	63 (221) - 240 (800)				
Volume of ash container for flue gas cyclone	USG (L)	63 (221) - 240 (800)				
Test pressure ⁶	psi (bar)	113 (7.8)				
Maximum allowable working pressure (water) ⁶	psi (bar)	30 or 60 (2 or 4)				
Maximum water temperature	°F (°C)	250 (120)				
Minimum return temperature	°F (°C)	149 (65)				
Weight						
Weight of fire box	lb. (kg)	6570 (2970)	9343 (4238)	10919 (4953)	12740(5779)	14374(6520)
Weight of pressure vessel (30 psi)	lb. (kg)	4993 (2265)	7094 (3218)	9275 (4207)	12965 (5881)	14643 (6642)
Weight of pressure vessel (60 psi)	lb. (kg)	4993 (2265)	7094 (3218)	9936 (4507)	13627 (6181)	15525 (7042)
Weight of displacement rods	lb. (kg)	644 (292)	721 (327)	869 (394)	1186 (538)	1186 (538)
Weight of flue gas exhaust blower	lb. (kg)	132 (60)	172 (78)	178 (78)	181 (82)	236 (107)
Weight of in-feed auger	lb. (kg)	337 (153)	337 (153)	3.37 (153)	419 (190)	419 (190)
Total weight without water (30 psi) ⁷	lb. (kg)	12820(5815)	17780(8065)	21572(9785)	27492(12470)	30858(13997)
Total weight without water (60 psi) ⁷	lb. (kg)	12820(5815)	17780(8065)	22234(10085)	28153(12770)	31740(14397)
Total weight with water (30 psi) ⁷	lb. (kg)	15355(6965)	20964(9509)	25675(11646)	31775(14413)	36330(16479)
Total weight with water (60 psi) ⁷	lb. (kg)	15355(6965)	20964(9509)	26336(11946)	32437(14713)	37212(16879)

¹ Minimum load: Operation with modulated control (Infinitely variable power control)
 Low load with ON Qmin / OFF (Stop-and-go mode)

² Moist fuels: Efficiency: Specification with displacement rods and flue gas recirculation system
 or dry fuels (W5 to W20) without flue gas recirculation system-reduced values

³ Wet fuels: >W35 further limitations regarding output, degree of efficiency and control behavior

⁴ Specification: See Section Wood Fuel Requirements

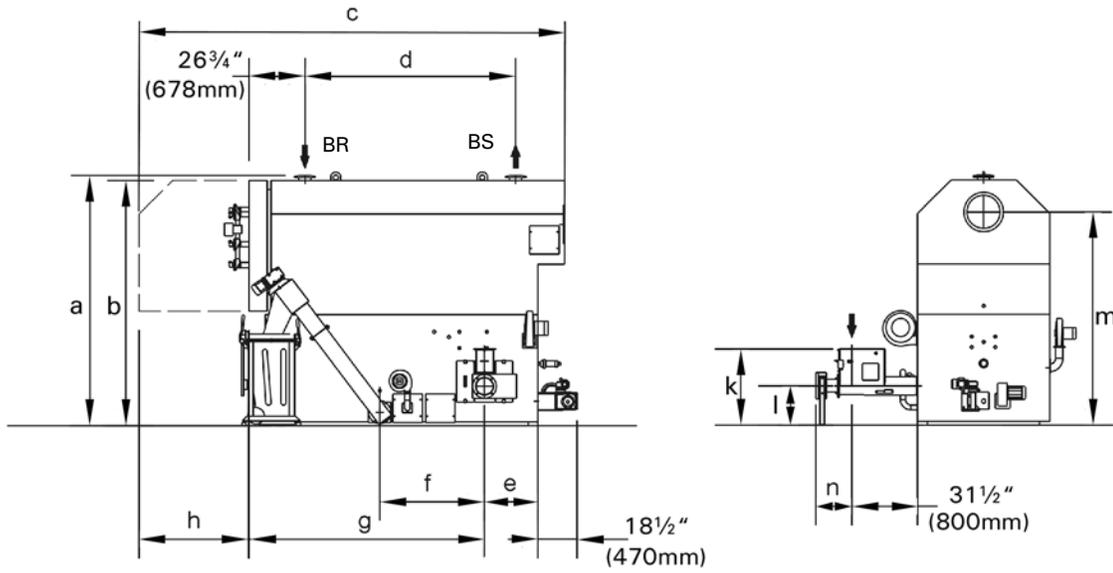
⁵ Flue gas temperature: An increase is possible by removing the displacement rods [Full load 86°F (30°C);
 Partial load 50°F (10°C)]

⁶ Pressure: Per ASME Sec. IV

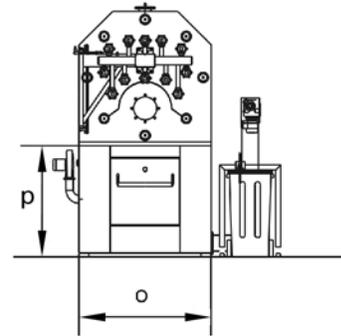
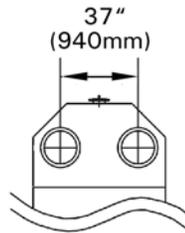
⁷ Overall weight: Includes displacement rods

Other influences: Fuel, water content, ash content, pneumatic cleaning system yes/no; track time (number of
 operating hours without cleaning). Specifications for the start of the track time [toward the end
 of the track time there is an increase in the flue gas temperature by approx. 59°F (15°C)].

Boiler Dimensions



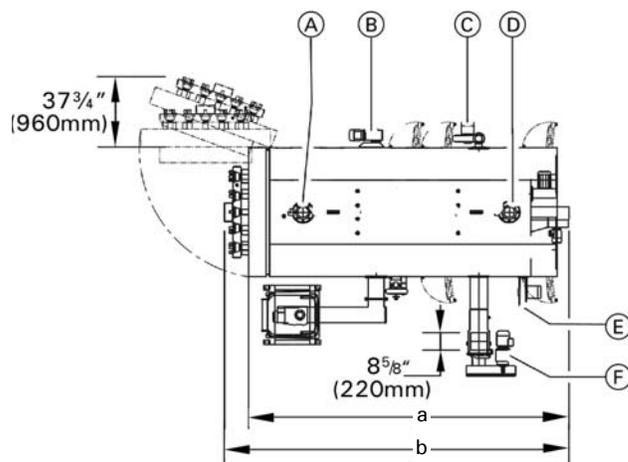
BR Boiler Return
BS Boiler Supply



Dimensions

Boiler Model		UF 390	UF 530	UF 720	UF 950	UF 1250
a	in. (mm)	93 ⁵ / ₈ (2378)	99 ⁷ / ₈ (2536)	111 ⁵ / ₈ (2834)	119 ¹ / ₂ (3035)	127 ¹ / ₈ (3230)
b	in. (mm)	91 ⁵ / ₈ (2328)	97 ⁷ / ₈ (2486)	109 ⁵ / ₈ (2784)	117 ³ / ₈ (2981)	125 (3176)
c	in. (mm)	172 (4370)	191 ³ / ₄ (4870)	207 (5257)	214 ¹ / ₂ (5447)	235 ⁷ / ₈ (5992)
d	in. (mm)	87 ¹ / ₈ (2060)	100 ³ / ₄ (2560)	100 ⁷ / ₈ (2562)	100 ⁷ / ₈ (2562)	122 ³ / ₈ (3107)
e	in. (mm)	22 ³ / ₄ (577)	22 ³ / ₄ (577)	22 ³ / ₄ (577)	25 ⁷ / ₈ (657)	25 ⁷ / ₈ (657)
f	in. (mm)	47 ¹ / ₄ (1200)	47 ¹ / ₄ (1200)	47 ¹ / ₄ (1200)	50 ¹ / ₄ (1275)	50 ¹ / ₄ (1275)
g	in. (mm)	94 ³ / ₄ (2405)	114 ³ / ₈ (2905)	117 ⁷ / ₈ (2993)	112 ⁵ / ₈ (2861)	134 ¹ / ₈ (3406)
h	in. (mm)	42 ³ / ₄ (1086)	42 ³ / ₄ (1086)	54 ³ / ₈ (1380)	63 ¹ / ₂ (1612)	63 ¹ / ₂ (1612)
k	in. (mm)	31 ⁵ / ₈ (803)	31 ⁵ / ₈ (803)	31 ⁵ / ₈ (803)	36 ⁵ / ₈ (929)	36 ⁵ / ₈ (929)
l	in. (mm)	17 ⁷ / ₈ (453)	17 ⁷ / ₈ (453)	17 ⁷ / ₈ (453)	18 ⁷ / ₈ (479)	18 ⁷ / ₈ (479)
m	in. (mm)	81 ³ / ₄ (2077)	91 ³ / ₄ (2331)	98 ¹ / ₈ (2491)	96 ¹ / ₄ (2444)	103 ⁷ / ₈ (2639)
n	in. (mm)	12 ¹ / ₈ (308)	12 ¹ / ₈ (308)	12 ¹ / ₈ (308)	17 ³ / ₈ (440)	17 ³ / ₈ (440)
o	in. (mm)	50 ¹ / ₈ (1274)	50 ¹ / ₈ (1274)	54 ³ / ₈ (1380)	63 ¹ / ₂ (1612)	63 ¹ / ₂ (1612)
p	in. (mm)	49 ³ / ₄ (1263)	55 ³ / ₄ (1417)	55 ⁵ / ₈ (1413)	51 ⁷ / ₈ (1317)	61 ⁵ / ₈ (1566)

Boiler Dimensions *(continued)*



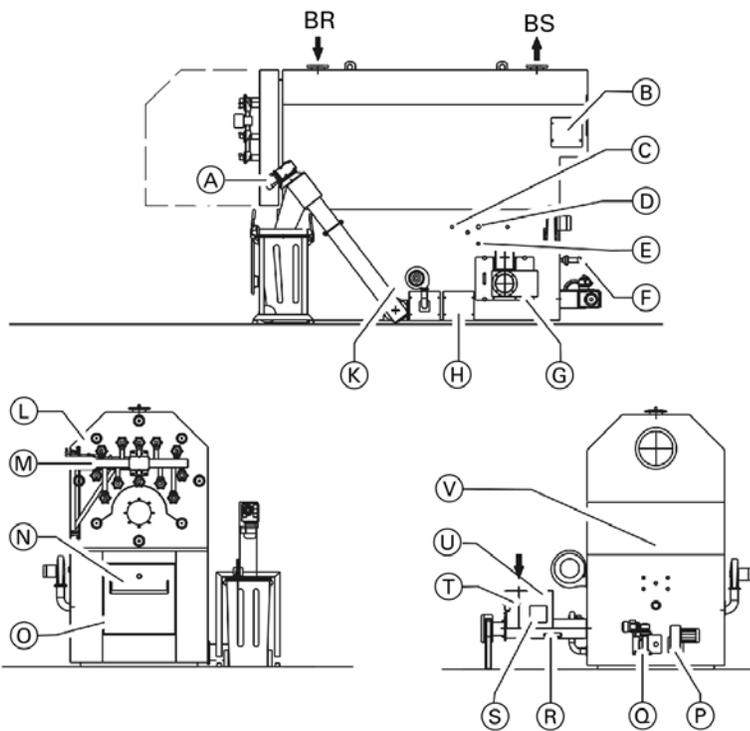
Legend

- (A) Boiler return
- (B) Motor for de-ashing assembly with ash container (optional)
- (C) Primary air blower 1
- (D) Boiler supply
- (E) Secondary air blower
- (F) In-feed auger

Dimensions

Boiler Model		UF 390	UF 530	UF 720	UF 950	UF 1250
a	in. (mm)	129 ^{3/16} (3282)	149 (3782)	152 ^{5/8} (3877)	151 (3835)	172 ^{1/2} (4380)
b	in. (mm)	149 ^{5/8} (3800)	169 ^{5/16} (4300)	174 ^{9/16} (4434)	173 (4392)	194 ^{3/8} (4937)

Boiler Components



Legend

- BS Boiler supply
- BR Boiler return
- (A) De-ashing assembly with ash container (optional)
- (B) Cleaning cover, heat exchanger
- (C) Combustion chamber temperature sensor
- (D) Negative pressure monitoring assembly
- (E) Light barrier, fire box
- (F) Igniter (optional)
- (G) Cleaning cover trough
- (H) Cleaning cover, external grate
- (K) Light barrier de-ashing assembly
- (L) Heat exchanger door
- (M) Pneumatic cleaning system
- (N) Combustion chamber door
- (O) Limit switch, combustion chamber door
- (P) Primary air blower 2
- (Q) Drive, in-feed grate
- (R) Temperature sensor in-feed auger
- (S) Limit switch, maintenance cover
- (T) Light barrier, in-feed auger
- (U) Extinguishing water connection
- (V) Boiler drain and fill valve

Automatic De-ashing System

Preparation System for De-ashing

The trough for later incorporation of the de-ashing auger is covered by refractory bricks.
The ash is removed manually via the combustion chamber door.

De-ashing into ash container, 63 USG (240 L)
De-ashing into ash container, 211 USG (800 L)

The Vitoflex 300-UF moving grate conveys the burnt-out ash into an ash trough which is recessed deep in the refractory floor. From there the ash is extracted from the boiler by an auger made of heat-resistant steel.
An additional ascending conveyor auger moves the ash into large-volume ash containers.
The galvanized ash containers connect easily to the ash station by quick-action fasteners and move on rollers.

Function of the control system:

A light barrier monitors the level of the ash level in the trough. When the level is exceeded, a certain amount of ash is carried off into the container.
The control system can be set to continuous operation for cleaning purposes when the boiler is shut down.

Supplied with:

- Combustion chamber auger made of heat-resistant steel
- Ascending conveyor auger with container station
- Ash container
- Triggering system for the auger drives
- Infrared light barrier level monitoring system for ash in combustion chamber

Ash container, 63 USG (240 L), spare
Ash container, 211 USG (800 L), spare

Extension of ascending conveyor auger, per meter
Extension of combustion chamber auger, per meter

Pneumatic Cleaning System

Pneumatic cleaning system (for Vitoflex 300-UF 390)
Pneumatic cleaning system (for Vitoflex 300-UF 530 and Vitoflex 300-UF 720)
Pneumatic cleaning system (for Vitoflex 300-UF 950 and Vitoflex 300-UF 1250)

The complete heat exchanger is cleaned off by periodic blasts of compressed air while the system is in regular operation. During the cleaning process the individual sections are blasted clean one after another. The ash on the heat exchanger tubes is detached by very short but strong blasts of air.

The particles detached are conducted by the flow of gas to the cyclone, where most are filtered out and collected.

The system is built into the heat exchanger.

The compressor should preferably be installed in a cool spot in the heating room.

Function of the control system:

The number of cleaning cycles within one unit of time (e.g. per hour) is adjusted according to the loading of the furnace.

One single, complete cleaning cycle consists of one sequence of blasts over all the sections of the heat exchanger.

Supplied with boiler:

- Nozzle element built into the heat exchanger door, including connecting piece with heat dissipation plate
- Compressed air distributor with tank and valves; with heat-resistant hoses connected to nozzle element
- Compressor; model IR-SS3L3, delivery capacity of 11.3 CFM / 0.32 m³/min; tank: 60 USG (227 L); pressure: max. 135 psi; motor: 3 HP, 1200 RPM, 230V, includes pressure controller, pressure switch and operating time limiter; plug and play; noise level of normal design: 75 dBA
- Compressed air hose up to max. of 13 ft (4.0 m) in length
- Valves wired tight to terminal strip
- Software component in the control system

Customer supplied:

- Provide a power supply, 230V/ 16A

Technical data:

Boiler Model	UF 390	UF 530	UF 720	UF 950	UF 1250
No. of zones/ valves	8		10	12	
Size of valves	1½"		1½"	1½"	
Max. air consumption, full load USG/h (L/h)	925 (3500)		1162 (4400)	1400 (5300)	

The customer supplied air compressor has to deliver at least the amount and quality of air specified and have an adjustable pressure controller as well as a protective device against hose rupture (e.g. operating time limiter).

Flue Gas Cyclone

The flue gas cyclone minimizes dust emissions and is designed as a multi cyclone with axial function. The de-duster is fully insulated and has three covers for cleaning. The crude gas chamber is cleaned via the side cleaning cover. The clean gas chamber is cleaned via the upper or back cleaning cover (unused blower connection). The ash box has a carriage and is connected to the de-duster with quick-action fasteners. It can easily be pulled out for emptying. The blower can be installed either on the side or the top.

Supplied with:

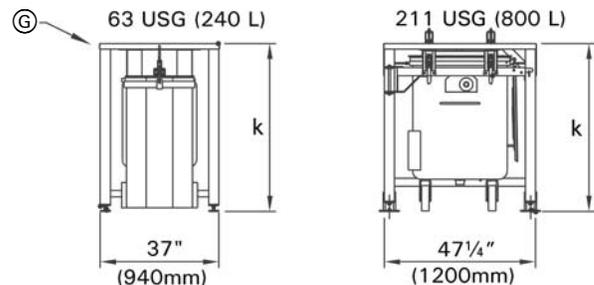
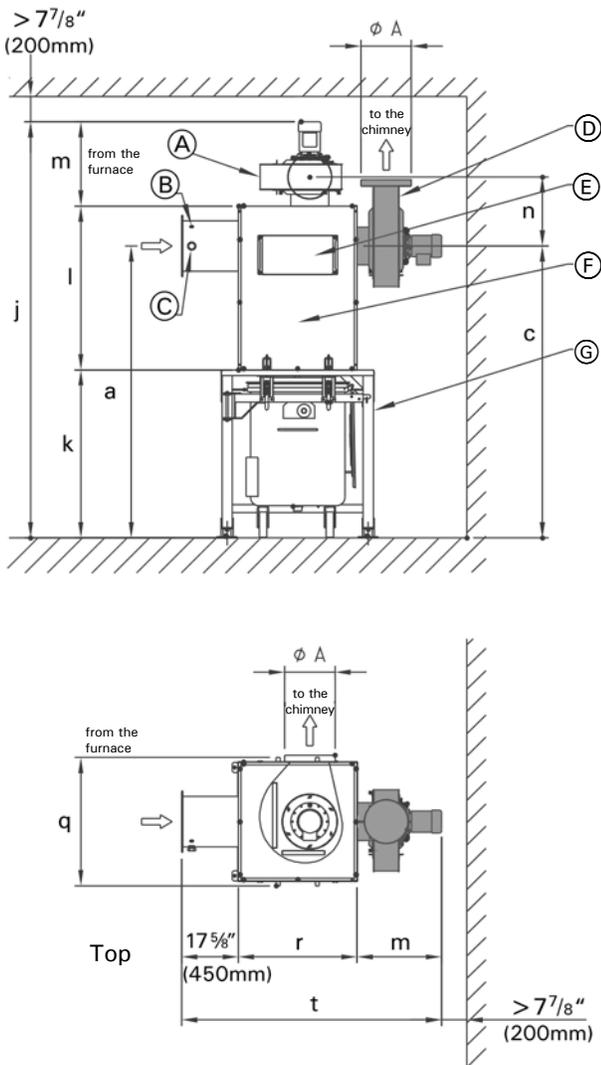
- 1 flue gas cyclone
- 1 ash container 63 USG (240 L) or 211 USG (800 L)

CAUTION

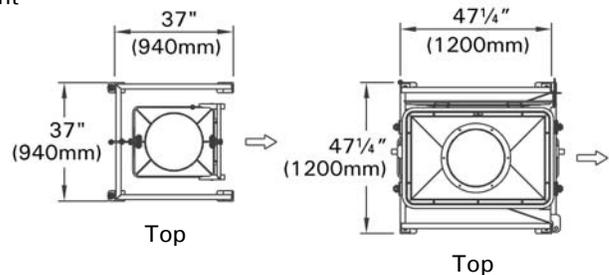
The effects of heat can create dangerous conditions.

Legend

- (A) Flue gas exhaust blower (with variable rotation)
 - Either top or side
 - Unused connection as cleaning cover
 - Alternate mounting of the flue gas exhaust blower (shown in dark grey)
- (B) Flue gas temperature sensor
- (C) Oxygen sensor
- (D) Flue gas exhaust blower - choice of top or side - unused connection as cleaning lid, variable rotation, clean gas chamber
- (E) Cleaning lid crude gas chamber
- (F) Cyclone (axial cyclone)
- (G) Ash container support frame 63 USG (240 L) or 211 USG (800 L)



Ash container support frame: positioning is possible in 4 x 90° (extraction, ash container) Drawn with extraction to the right



Boiler Model		UF 390	UF 530	UF 720	UF 950	UF 1250
A	in. (mm)	13 3/4 (350)	13 3/4 (350)	13 3/4 (350)	15 3/4 (400)	17 11/16 (450)
a	in. (mm)	81 7/8 (2080)	92 7/8 (2359)	98 1/16 (2491)	96 1/4 (2444)	103 7/8 (2639)
c	in. (mm)	92 7/8 (2359)	92 7/8 (2359)	98 1/16 (2491)	96 1/4 (2444)	103 7/8 (2639)
j	in. (mm)	125 1/2 (3186)	125 1/2 (3186)	133 (3378)	135 7/8 (3452)	146 3/8 (3717)
k	in. (mm)	52 3/8 (1330)	52 3/8 (1330)	57 9/16 (1462)	57 9/16 (1462)	65 1/4 (1657)
l	in. (mm)	49 1/2 (1256)	49 1/2 (1256)	49 1/2 (1256)	51 3/16 (1300)	51 3/16 (1300)
m	in. (mm)	23 5/8 (600)	23 5/8 (600)	26 (660)	27 1/8 (690)	30 (760)
n	in. (mm)	17 5/8 (447)	17 5/8 (447)	18 1/8 (461)	22 7/8 (579)	22 7/8 (579)
q	in. (mm)	49 5/8 (1260)	49 5/8 (1260)	49 5/8 (1260)	40 1/8 (1020)	40 1/8 (1020)
r	in. (mm)	24 1/2 (620)	24 1/2 (620)	24 1/2 (620)	37 1/2 (950)	37 1/2 (950)
t	in. (mm)	65 3/4 (1670)	65 3/4 (1670)	68 (1730)	82 (2083)	84 3/4 (2153)

Safety Devices

The boiler system with 3-way mixing valve

To reliably prevent boiler corrosion through condensation of the flue gases, the boiler return temperature must never be below 149°F (65°C).

The stepless control of the Vitoflex 300-UF Grate Firing System output requires a constant flow through the boiler of the water to be heated. The boiler circuit, the boiler pump and boiler 3-way mixing valve must therefore be installed according to section piping and installation of safety devices.

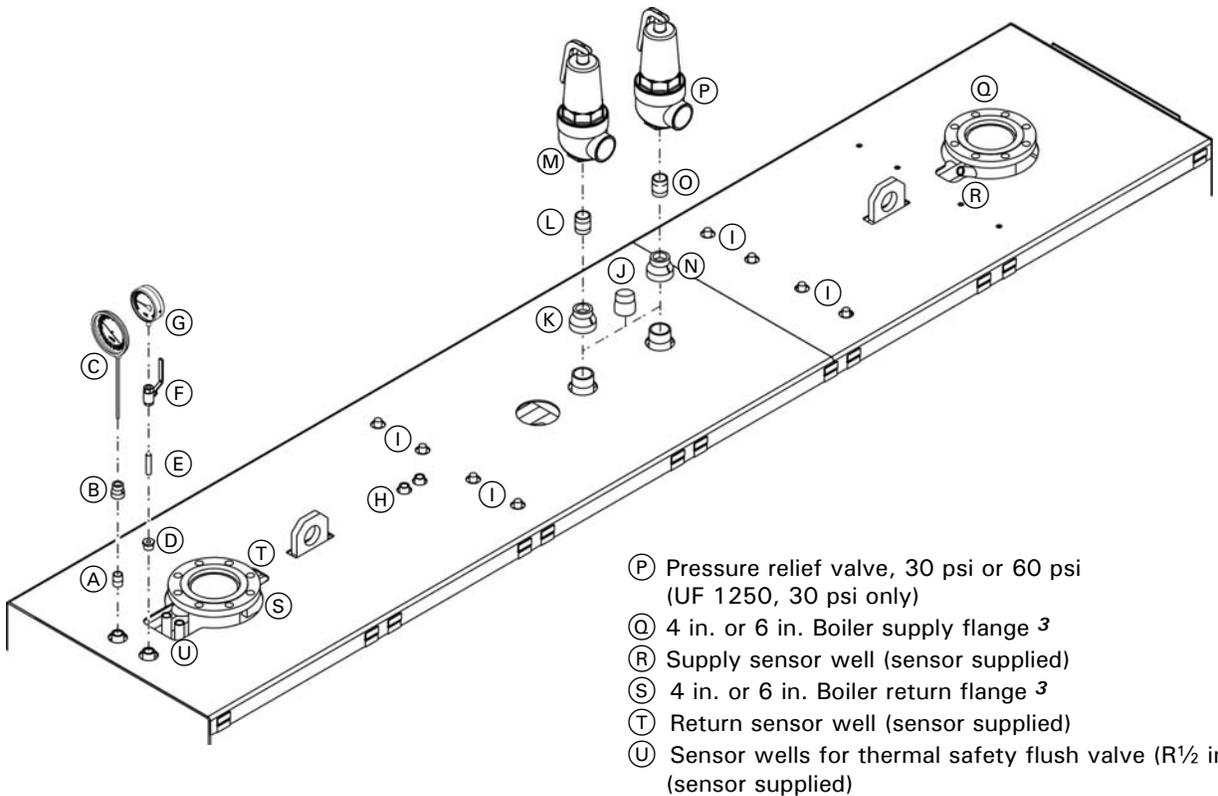
The boiler circuit should be designed that the temperature difference between the boiler supply and the boiler return temperature is equal to or less than 27°F (15°C).

The activation of the boiler pump and boiler 3-way mixing valve is integrated in the custom control panel.

The safety equipment for the heating installation must be installed by a heating contractor authorized to do so.

Legend

- Ⓐ Nipple, 3/4 in. x 1 1/2 in.
- Ⓑ Reducing coupling, 3/4 in. x 1/2 in.
- Ⓒ Boiler water temperature gauge
- Ⓓ Bushing 3/4 in. x 1/4 in.
- Ⓔ Nipple 1/4 in. x 2 1/2 in.
- Ⓕ Ball valve 1/4 in.
- Ⓖ Pressure gauge
- Ⓗ Sensor well - Fixed high limit (sensor supplied)
- Ⓘ Safety heat exchanger connections, NPTM 1/2 in. ¹
- Ⓙ PRV Pressure Relief Valve connection cap ²
- Ⓚ Reducing bushing
- Ⓛ Nipple
- Ⓜ Pressure relief valve, 30 psi or 60 psi
- Ⓝ Reducing bushing (UF 1250, 30 psi only)
- Ⓞ Nipple (UF 1250, 30 psi only)

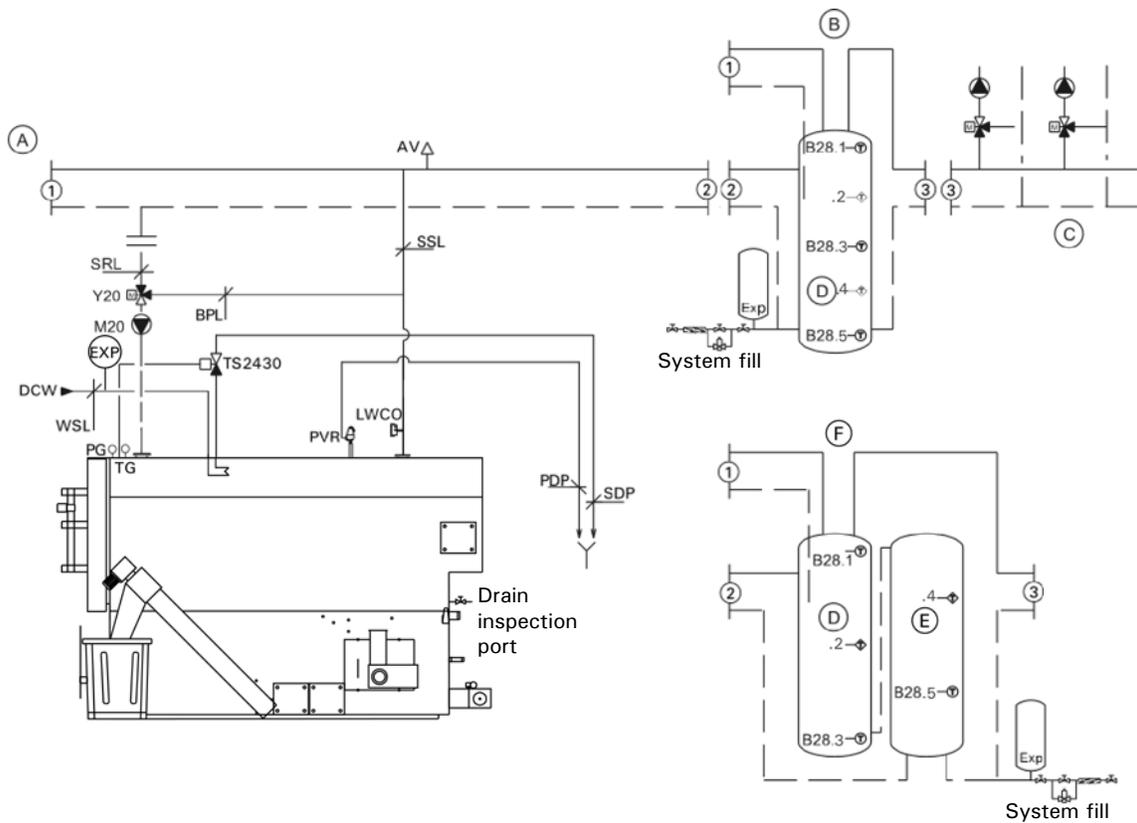


- Ⓟ Pressure relief valve, 30 psi or 60 psi (UF 1250, 30 psi only)
- Ⓠ 4 in. or 6 in. Boiler supply flange ³
- Ⓡ Supply sensor well (sensor supplied)
- Ⓢ 4 in. or 6 in. Boiler return flange ³
- Ⓣ Return sensor well (sensor supplied)
- Ⓤ Sensor wells for thermal safety flush valve (R 1/2 in.) (sensor supplied)

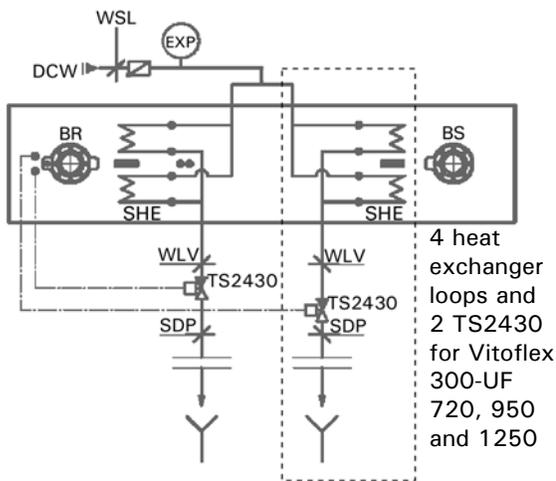
- ¹ See section Piping and Installation of Safety Devices
- ² Two PRVs must be installed on the UF 1250 - 30 psi boiler. One PRV must be installed and the other PRV connection must be capped on the UF 1250 - 60 psi boiler. All other models have only one PRV connection.
- ³ 4 in. boiler flange for Vitoflex 300-UF 390-720, 6 in. boiler flange for Vitoflex 300-UF 950-1250

Note: All fittings shown and sensors indicated are factory supplied. The size and quantity are matched to the specific boiler model.

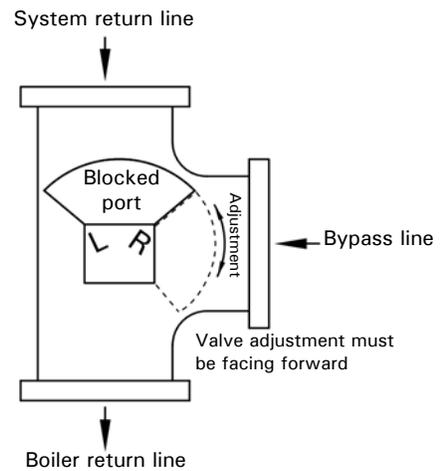
Piping and Installation of Safety Devices



Safety heat exchanger top view



3-Way mixing valve



Legend

- Ⓐ Additional heat source
- Ⓑ Thermal storage tank as low loss header (option A, 5 sensors)
- Ⓒ Distributor, heat consumer
- Ⓓ Thermal storage tank #1
- Ⓔ Thermal storage tank #2
- Ⓕ Two thermal storage tanks as low loss header (option B, 5 sensors)

①, ② and ③ indicates system connections

Piping and Installation of Safety Devices *(continued)*

Note: To reliably prevent boiler corrosion caused by condensation of flue gases, the boiler return temperature must not under any circumstances be below 150°F (65°C).

A Viessmann sized boiler pump with a boiler 3-way mixing valve are provided according to the tables below. The boiler circuit should be designed such that the temperature difference between the supply and the return temperature is equal to or less than Δt 27°F (15°C).

The expansion tank has to be connected to the boiler without any isolation valves.

Safety equipment supplied by Viessmann:

- **M 20** Boiler pump
- **Y 20** Boiler 3-way mixing valve
- **PRV** Pressure relief valve, pressure set to 30 or 60 psi
- **TS2430** Thermal safety flush valve R ¾ in., approved component; special-purpose, designed for opening at a temperature of 122°- 248°F (50°- 120°C), (safety heat exchanger loop built into boiler).

The Vitoflex 300-UF 390 and Vitoflex 300-UF 530 have two safety heat exchanger loops and require one thermal safety flush valve.

The Vitoflex 300-UF 720 to Vitoflex 300-UF 1250 have four safety heat exchanger loops and require two thermal safety flush valves.

- **LWCO** Low water cut-off
- **PG** Pressure gauge
- **TG** Temperature gauge (thermometer)
- **SHE** Safety heat exchanger, water volume 1.1 USG (4.2L) per loop, NPTM ½ in.

Design Recommendation:

Thermal run off safety valve

Boiler Model	Thermal safety flush valve TS-2430 (Quantity)	Water through-put required at 36 psi (2.5 bar)		Supply line WSL	Supply line WLW	Drain pipe SDP ²
		L/h	GPM			
UF 390	1	1637	7.2	R ¾ in.	R ¾ in.	R 1 in.
UF 530	1	2224	9.8	R ¾ in.	R ¾ in.	R 1 in.
UF 720	2	3020	13.3	R 1 in.	R ¾ in.	R 1 in.
UF 950	2	3986	17.6	R 1 in.	R ¾ in.	R 1 in.
UF 1250	2	5246	23.0	R 1¼ in.	R ¾ in.	R 1 in.

Pressure relief valve

Boiler model	Pressure relief valve Conbraco ¹		Drain pipe PDP ²	
	30 psi	60 psi	30 psi	60 psi
UF 390	1¼ in.	1 in.	1½ in.	1¼ in.
UF 530	1½ in.	1¼ in.	2 in.	1½ in.
UF 720	2 in.	1¼ in.	2½ in.	1½ in.
UF 950	2 in.	1½ in.	2½ in.	2 in.
UF 1250	2 in.	2 in.	2½ in.	2 in.

Customer supplied:

- **PDP** Pressure relief valve drain pipe
- **DCW** Cold water inlet, min. 36 psi (2.5 bar), max. 51 psi (3.5 bar)
- **AV** Air separator / vent
- **EXP** Expansion tank closed;
 - for safety heat exchanger required (size according to volume of safety heat exchanger loops and volume of piping)
 - for heating system (optional)
- **WSL** Water supply line for safety heat exchanger
- **WLW** Water supply line for thermal safety flush valve
- **SDP** Safety heat exchanger drain pipe
- **SRL** System return line to the boiler from the system
- **SSL** System supply line from the boiler to the system
- **BPL** Bypass line
- **BR** Boiler return
- **BS** Boiler supply

Note: The UF 1250, 30 psi will have 2 PRVs.

¹ Threaded connection for supply line

² Length of the drain pipe up to 13 ft. (4.0 m)

Piping and Installation of Safety Devices *(continued)*

Design Recommendation (continued):

Boiler Pump

Boiler model	Pump	Frequency	Phase and voltage	Speed
UF 390	UPS 80-80/4 F	60 Hz	3 x 208-230V	2
UF 530	UPS 80-80/4 F	60 Hz	3 x 208-230V	3
UF 720	UPS 80-160 F	60 Hz	3 x 208-230V	3
UF 950	TP 100-80/4	60 Hz	3 x 208-230V	*
UF 1250	TP 100-80/4	60 Hz	3 x 208-230 / 460V	*

3-way Mixing Valve

Boiler model	Nominal pipe size	Valve
UF 390	3 in.	3-way mixing valve
UF 530	4 in.	3-way mixing valve
UF 720	5 in.	3-way mixing valve
UF 950	5 in.	3-way mixing valve
UF 1250	6 in.	3-way mixing valve

Viessmann ASME recommended tank sizes (U-stamped)

Boiler model	Tank size	
	L	USG
UF 390	3785	1000
UF 530	5678	1500
UF 720	6624	1750
UF 950	9464	2500
UF 1250	12492	3300

Fire Protection

Follow local regulations for wood-fired heating systems.

Power failure provision

The customer must ensure that there is a supply of water independent of the electrical supply. This design ensures that in case of a power failure, the boiler will be reliably cooled by the thermal safety flush valve.

Protection against back-burn for the boiler plant

The following safeguards are part of the scope of delivery for the Vitoflex 300-UF Grate Firing System:

- Preventing overfilling of the combustion chamber

A level monitor must be installed to prevent overfilling of the combustion chamber. The Vitoflex 300-UF Grate Firing System has a light barrier to monitor the embers.

- Preventing back-burn

With a temperature sensor directly on the in-feed auger, any danger of back-burn initiation will be detected and quickly counteracted at an early stage by increasing the fuel conveyance speed into the combustion chamber.

- Back flash safeguard

The Vitoflex 300-UF Grate Firing System is operated with continuous negative pressure and is equipped with a back flash prevention device. This device prevents back flashes caused by flying embers or combustible gases that may ignite the fuel system.

- Automatic in-feed auger extinguishing system

The supplied fire extinguishing system is necessary on the in-feed auger. This system should reliably prevent back-burn in case of a malfunction (such as a power failure). For safety reasons and to prevent damage by flooding, connecting the extinguishing system directly to the water network is not advisable.

This extinguishing system must be equipped with a 6.6 USG (25 L) extinguishing water tank with a float-type switch and an adjustable Danfoss extinguisher valve. The tank for the extinguishing system must be equipped with a level monitoring system.

If there is a shortage of water, the Vitoflex 300-UF Grate Firing System will switch off automatically.

In case of excess temperature, the in-feed auger will be flooded reliably but in a limited fashion.

IMPORTANT

The heating contractor must perform the installation of the fire extinguishing system as specified in section Fire Extinguishing Systems.

Fire Protection *(continued)*

Back-burn safeguard for the fuel supply system

The fire extinguishing system for the conveyor auger and the down pipe depends on specific requirements (location, size of the fuel storage site, material, pressure conditions and regulations), these being accessories to the scope of delivery ordered from Viessmann according to their descriptions.

Automatic triggering system for the fuel supply system

Approved in part as a variation to the shut-off valve in pressure-less fuel storage units.

Slide valve

The slide valve is approved in pressure-less fuel storage units and is a suitable safeguard against back-burn. The slide valve is optional and closes in case of standstill, danger of back-burn, or power failure with the help of a spring return motor.

IMPORTANT

We recommend installing a rotary valve for the Vitoflex 300-UF Grate Firing System. In addition to being a safeguard against back-burn, this will also prevent any penetration by air leaking in via the in-feed auger.

Rotary valve

The rotary valve is optional and used if remnant wood is moved into fuel storage spaces with blowers, then, in order to reduce pressure applied, at least one rotary valve is necessary to reduce pressure between the fuel storage unit and the boiler. The rotary valve is suited to reduce pressure and at the same time is considered a suitable safeguard against back-burn.

Max. overpressure allowed in fuel storage unit:
+ 500 Pa (+ 2.00 inch wc).

Max. negative pressure allowed in fuel storage unit:
+ 0 Pa (+ 0 inch wc).

Double rotary valve with pressure compensation system

If, due to special circumstances, any mechanically produced negative pressures or extraordinarily high overpressures are expected in the fuel storage unit, then two rotary valves must be installed in the material transport route according to the respective project plan with a pressure compensation line to the outdoors.

Max. overpressure allowed in fuel storage unit:
+ 3000 Pa (+ 12 inch wc).

Max. negative pressure allowed in fuel storage unit:
-3000 Pa (-12 inch wc).

IMPORTANT

The supplier of the silo must confirm the maximum weight that is to be expected on the rotary valve.

The rotary valve below the silo extraction system can become leaky due to wear of the sealing elements or through large pieces of wood that cannot be conveyed. This leakage can make it possible for low-temperature gases to flow back from the boiler into the silo.

A smoke alarm must be installed between the rotary valve and the silo extraction system, which, when triggered, will disconnect the system and create negative pressure in the silo.

Down pipe

A vertical drop-off section interrupts the connected line of burning material.

Fire protection for fuel storage space

Viessmann does not provide fire protection for the fuel storage space.

IMPORTANT

The local building codes and regulations must be followed by the heating contractor.

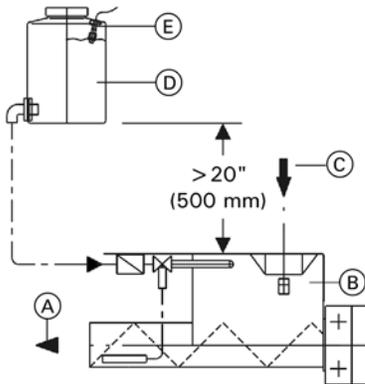
Fire Extinguishing System

The fire extinguishing system functions independent from the electrical power and is flooding the material which is still remaining in the in-feed auger in case of back-burn. The activation temperature is approximately 200°F (95°C)

Fire extinguishing system for the in-feed auger

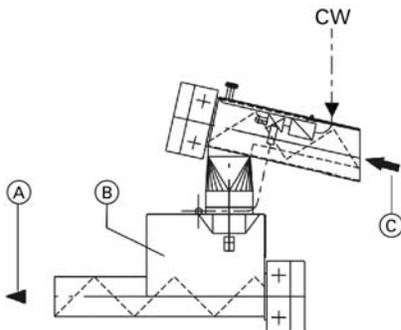
Note: The fire extinguishing system for the in-feed auger is part of the boiler.

- Line from the extinguishing water container to the ½ in. valve (as short as possible).
- Valve thermostatic, Danfoss AVTA 15 122-194°F (50- 90°C) position 3 equals approximately 176°F (80°C).
- The lines must be executed as hard piping in metal (½ in.).
- It must not be possible to shut off the cold water inlet without the aid of tools.
- Be especially sure to comply with the instruction in the Fire Protection section.



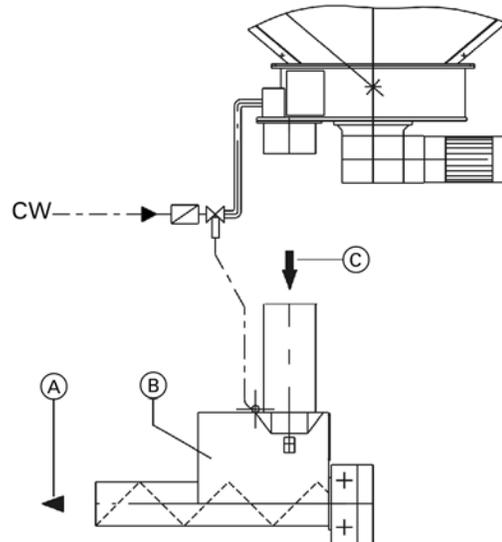
Fire extinguishing system for the conveyor auger

Note: The fire extinguishing system for the conveyor auger is optional.



Fire extinguishing system for the down pipe

Note: The fire extinguishing system for the down pipe is optional.



Note: A slide valve is required as standard for an unpressurized material store or a rotary valve for a material storage with over pressure or under pressure (charging with blower, e.g. wood processing operations).

The lines must be executed as hard piping in metal (½ in.). It must not be possible to shut off the cold water inlet without the aid of tools. Be especially sure to comply with the instruction in the Fire Protection section.

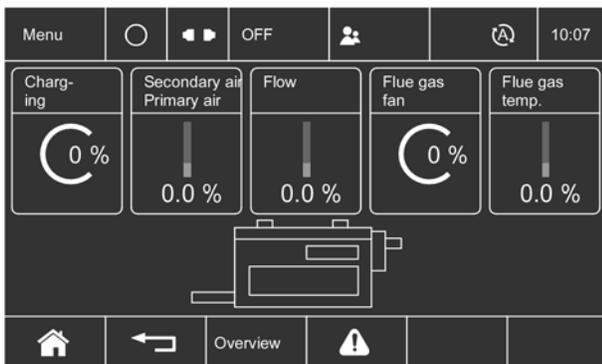
Legend

- (A) Combustion
 - (B) Metering Container
 - (C) Fuel supply
 - (D) Extinguishing water container 6.6 USG (25 L)
 - (E) N25 floater switch
- CW Cold water supply ½ in. min. 30 psi (2.0 bar), max. 45 psi (3.0 bar)

Ecocontrol

Controller for the wood combustion system incl. activation of equipment for fuel charging according to the articles listed separately;

- The heating output is modulated to match the heat consumption.
- The control circuit for combustion optimisation with a Lambda probe overlaps the output control circuit.
- With regard to fire safety and personal safety, the highest possible quality criteria are fulfilled.
- Weather-compensated heating circuit control unit for up to 4 heating circuits.



Function

- Automatic ignition
- Output control circuit with modulating output operation (25 - 100 %)
 - Air-controlled with variable speed flue gas fan subject to supply temperature
 - Exact fuel supply via the feed screw conveyor from dosing hopper with barrier layer
 - Topping up of the dosing hopper by means of level monitoring
 - Limitation and distribution of the mass to be burned in the combustion chamber by means of level monitoring in the combustion chamber and movement of the infeed grate
- Emission-optimized control circuit: optimization of the air supply through motorized air dampers with Lambda probe measurement to ensure optimum combustion
- Keeping up the return temperature with the boiler mixer ensures a long boiler service life
- Controller for the pressure-jet oil burner on the Vitoflex 300-UF
- Safety functions for:
 - Excess temperature
 - Burn-back
 - Opening a charging cover
 - Forced heat transfer
- Potential-free output (fault message)

Standard delivery

- Control panel, supplied separately
 - Powder-coated surface
 - Feed 3 × 208/3/60 Power supply
 - Freely programmable control unit
 - Motor overload relay for all drives according to the separate price items
 - Inverter for fan motors
- In the control panel door
 - 4-pole mains isolator
 - Graphics-capable touchscreen
 - Documentation incl. fixed wiring diagram, terminal connection diagram, operating instructions, installation instructions in the guide folder
- Sensors and switches installed on the feed screw conveyor
 - Infrared light barrier for level monitoring, barrier layer, feed screw conveyor
 - Safety limit switch on inspection cover of feed screw conveyor
 - Pt1000 contact temperature sensor on the feed screw conveyor
- Sensors and switches on the combustion block, the combustion system and in the flue outlet (installation on site)
 - Infrared light barriers, fuel level monitoring in combustion chamber
 - Zirconium dioxide probe with measured value transducer (Lambda probe)
 - Pt1000 flue gas temperature sensor
- Sensors and switches installed at top of boiler
 - Pt1000 boiler water temperature sensor in flow connector
 - Pt1000 return temperature sensor in return connector
 - High limit safety cut-out
- Sensor supplied
 - 1 Pt1000 sensor with sensor well ½ in. x 12 in. (280 mm) (B28.1)
- Integral LAN interface

Note: To extend the heating circuits, a controller module (7453165) and one Pt1000 contact temperature sensor per circuit (7528121) are required.

Ecocontrol - Accessories

Additional heat generator demand

Function:

With the "enable signal" (floating contact), an on-site peak load heat generator (oil or gas boiler) is activated when the supply temperature falls below a certain value. The temperature of start and stop points can be selected freely on the controller. The controller and control unit for the oil or gas burner is not included in the standard delivery.

Standard delivery:

- Floating contact for enabling an additional heat generator
- Submenu on touchscreen

External drive switching without light barrier

Activation of an external conveyor drive or a rotary lock valve without reversing. The motors are protected against overload.

Standard delivery:

- Motor overload relay/contactors combination for drive motor fully integrated in control panel
- Input in control panel for safety limit switch on maintenance cover
- Output in control panel for external conveyor drive

Note: The customer is responsible for delivery and installation of the safety switches of the external conveyor drive.

Note: Only with a defined limited material supply (upstream screw conveyor).

The electrical output data of the existing conveyor device (kW, amps, volts) must be stated.

External drive switching with light barrier

Activation of an external conveyor drive without reversing. The integral light barrier interrupts the upstream charging when there is a risk of overflowing in the inlet. The motors are protected against overload.

Standard delivery

- Motor overload relay/contactors combination for drive motor fully integrated in control panel
- Input in control panel for safety limit switch on maintenance cover
- Output in control panel for external conveyor drive
- Infrared light barrier installed at the screw conveyor inlet

Note: For the activation of a screw conveyor with external motor downstream of the external discharge

Note: The electrical output data of the existing conveyor device (kW, amps, volts) must be stated.

Ecocontrol - Accessories for Output Management

Thermal storage tank management, 5 sensors

Modulating output operation of the Vitoflex 300-RF is optimized with the use of a thermal storage tank. Short term heat demand peaks are also covered. The temperature sensors record the heating of the thermal storage tank. The specification of the charging level of the thermal storage tank is weather-compensated and carried out via the outside temperature sensor. The combustion heat output is matched to the charging level of the heating water thermal storage tank.

Standard delivery:

- 5 Pt1000 sensors with sensor well 1/2 in. x 12 in. (280 mm)
- 1 Pt1000 outside temperature sensor

Note: Controller module and data cable required

External demand ON/OFF

Input for automatically switching the system on/off via an external floating N/O contact

Output signal 0 - 10 V

Issuing of boiler output as voltage signal and a connection to receive a maximum boiler output limit included in standard delivery.

Functions:

- Issue of the output signals
- Receipt and processing of an external output restriction

Note: The installation of "Output signals 0 – 10 V" is possible irrespective of additional control modules used.

Thermal storage tank management 5 sensors not possible.

Note: The boiler can only be shut down externally via "External demand ON/OFF". This should be ordered separately.

Ecocontrol - Accessories for Remote Transfer/Remote Monitoring

Fault message device, analogue with battery

For part no., see price list

4 different voice messages are possible, as the fault message modem has 4 independent digital inputs.

Standard delivery:

- Analogue modem for wall mounting
- Rechargeable battery pack (also works in the event of a power failure)

To be carried out by the customer:

- Electrical connection of the phone line to the modem
- Configuration in accordance with the documentation

Exporting operating data via Modbus TCP/IP

Output of relevant boiler system operating data and fault messages via Ethernet to an on-site, higher ranking control system. On request, the supply temperature can be specified by the on-site, higher ranking control system. The number of data points depends on the supplied system.

Standard delivery:

- Ethernet interface in the control panel
- Software module
- Modbus TCP/IP

External visualization (hardwired)

Package for the transmission of relevant data to an IT workstation (internal and/or external) for visualization, remote maintenance and operating data archiving of the Vitoflex 300-RF boiler system. Hardware and software are integrated into the Ecocontrol control unit.

All adjustable parameters can be changed from the IT workstation.

Standard delivery:

- Industrial PC with interfaces for screen, keyboard and PC mouse for IT workstation close to boiler room
- Windows operating system, remote maintenance software and visualization/ archiving software installed on the industrial PC

Images on the screen:

- Cross-sectional image of boiler, 3D with display fields
- Table of parameters (with change option)

To be carried out by the customer:

- IT workstation for remote maintenance, installation of remote maintenance software

Controller module

For the function extension of the Ecocontrol by up to 4 functions

- Controller module in a plastic enclosure for wall mounting Width 13 in. (325 mm), height 8 in. (195 mm), depth 3 in. (75 mm)

Note: Data cable (7522616) and contact temperature sensors (7528121) required (not part of standard delivery)

Data cable 33 ft. (10 m) long

To connect the boiler control unit and controller module

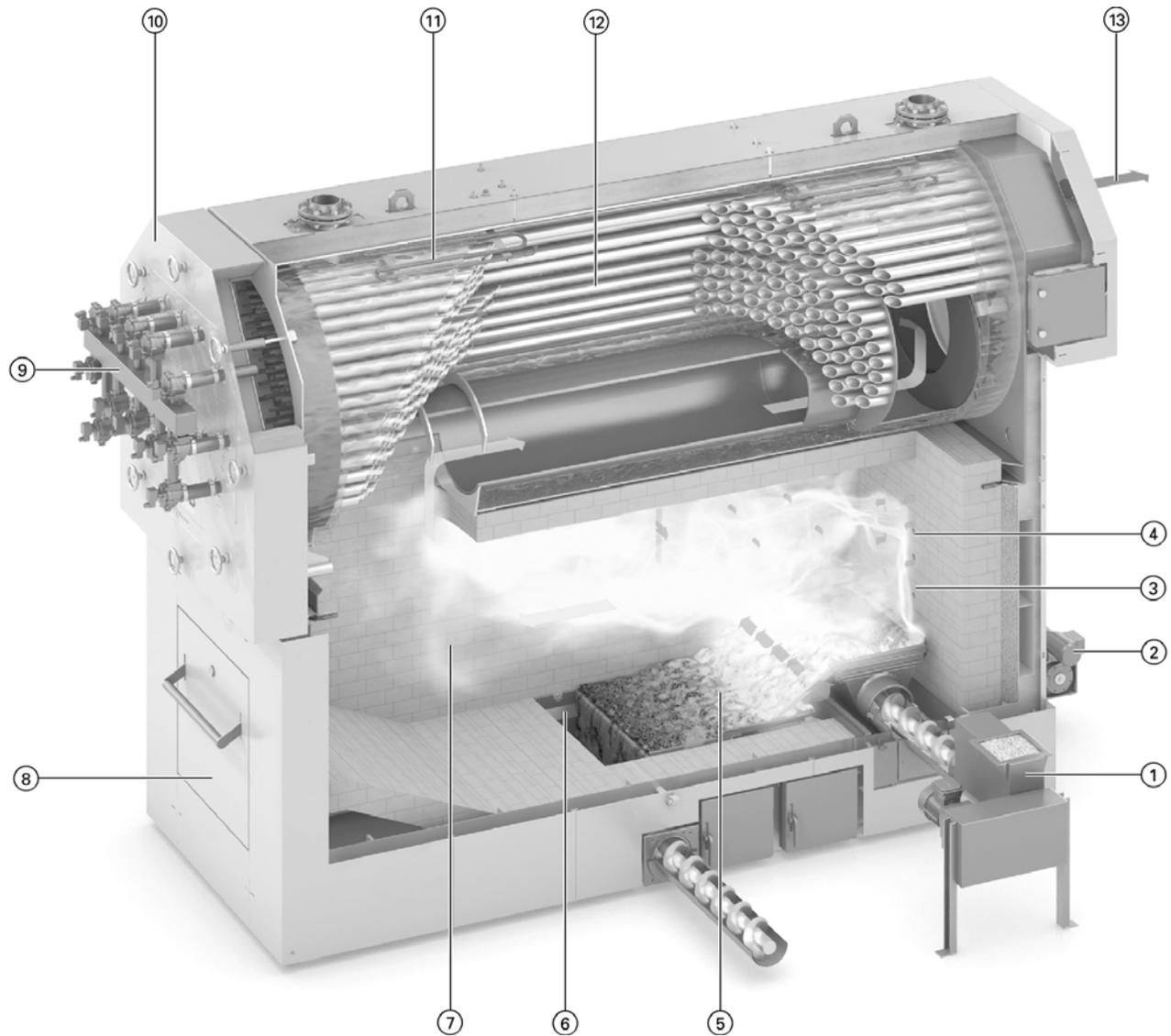
- Prefabricated data cable CAN bus LiYCY 2 x 2 x 0.34 mm²

Note: The total length of all cables must not exceed 1000 ft. (300 m).

Temperature sensor for heating circuit

- Contact temperature sensor Pt1000

Boiler Components

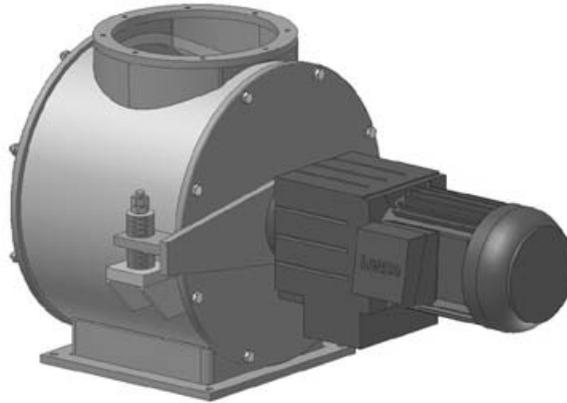


Legend

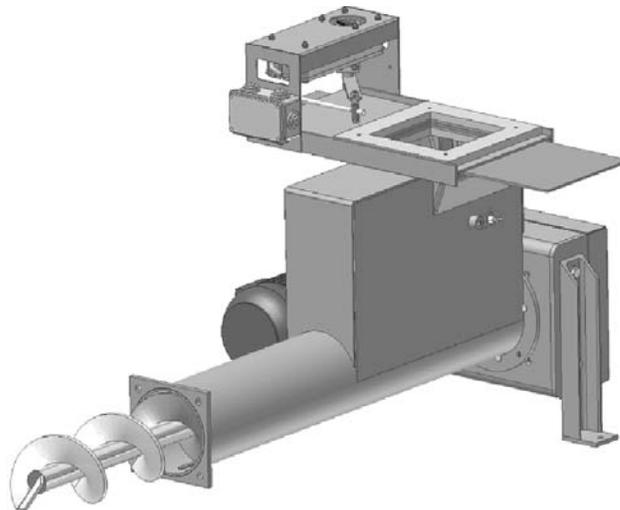
- ① In-feed auger with isolating layer
- ② Drive for moving grate
- ③ Igniter
- ④ Controlled combustion air supply system
- ⑤ Moving grate
- ⑥ Drive for automatic de-ashing assembly with ash container (optional)
- ⑦ Combustion chamber
- ⑧ Combustion chamber door
- ⑨ Pneumatic cleaning system (optional)
- ⑩ Heat exchanger door
- ⑪ Safety heat exchanger for thermal safety flush valve
- ⑫ Heat exchanger
- ⑬ Frequency-controlled flue gas exhaust blower

Fuel Transport and Extraction Systems Accessories

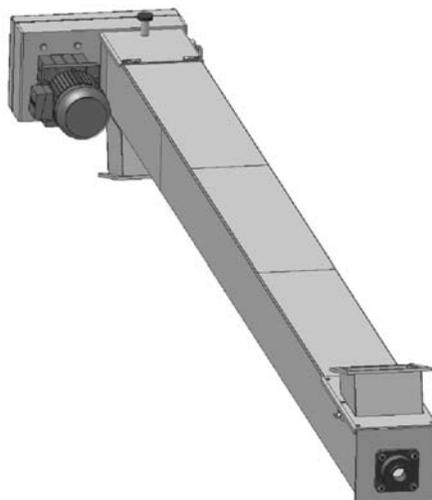
Rotary Valve



In-feed auger

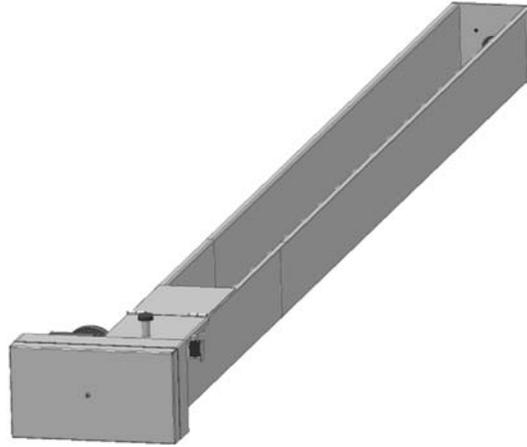


Pipe/trough conveyor auger



Fuel Transport and Extraction Systems Accessories *(continued)*

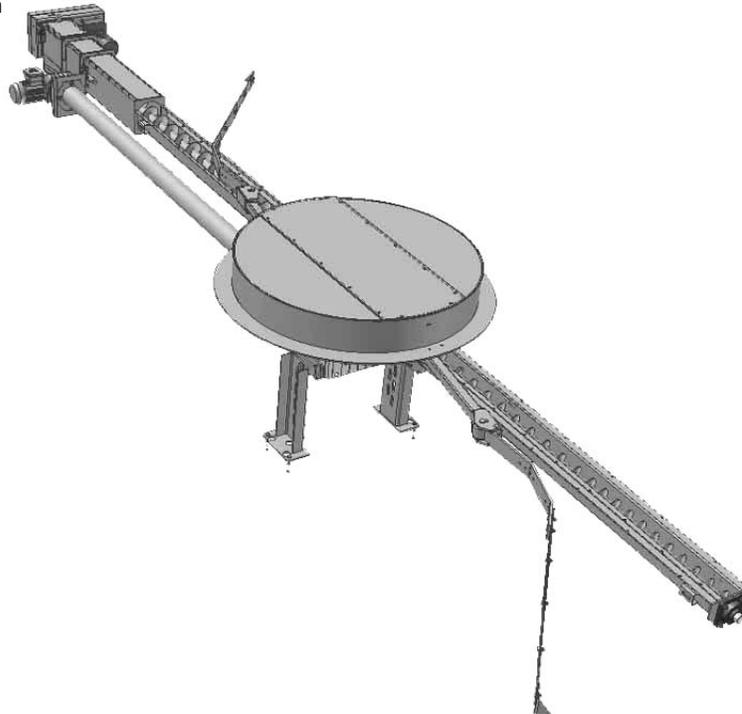
Pellet extraction auger



Spring extraction system

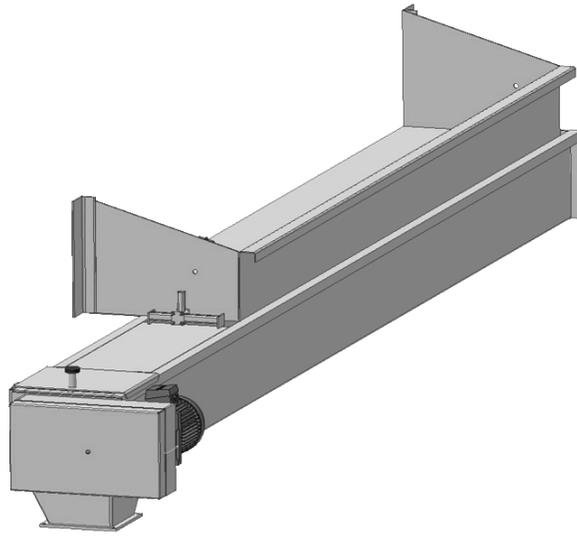


Horizontal extraction system

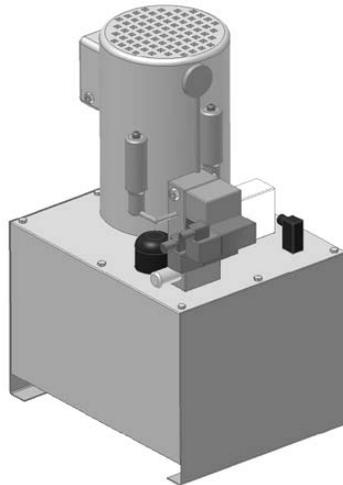


Fuel Transport and Extraction Systems Accessories *(continued)*

Walking floor auger

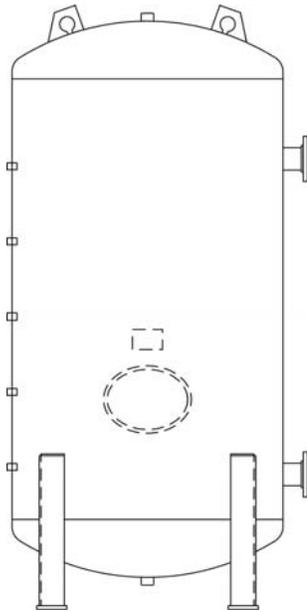


Hydraulic unit



Thermal Storage Tank

Thermal storage tank



Note: For details on designation see field wiring diagram.

Commissioning

Fuel for the commissioning

For the commissioning, sufficient dry fuel (max. W 20%) should be stored for approx. 10-24 full operating hours:

Vitoflex 300-UF 390	approx.	5100 lb. (2313 Kg)
Vitoflex 300-UF 530	approx.	6600 lb. (2994 Kg)
Vitoflex 300-UF 720	approx.	8800 lb. (3992 Kg)
Vitoflex 300-UF 950	approx.	11660 lb. (5289 Kg)
Vitoflex 300-UF 1250	approx.	14960 lb. (6786 Kg)

Since the boiler plant will be cold, and residual moisture will be drawn from the refractory concrete during the initial operation, the material to be burned for the initial operation has to be at least air dry. For the first three hours, the heating-up process should be carried out at low output.

To ensure that the silo extraction system is functioning properly, only place a minimal amount of fuel in the silo in case there is a problem. This enables the extraction system to be cleaned out quickly and the problem to be identified and corrected.

Water quality

Treatment for boiler feed water should be considered in areas with known problems, such as where a high mineral content and hardness exist. In areas where freezing might occur, it is recommended that an antifreeze be added to the system water for protection against freezing. Please adhere to the specifications given by the antifreeze manufacturer. Do not use automotive silicate-based antifreeze. Please observe that an antifreeze/water mixture may require a back flow preventer within the automatic water feed and influence components such as diaphragm expansion tanks, radiation, etc. A 40% antifreeze content will provide freeze-up protection to -10°F (-23°C). Do not exceed 50% antifreeze mix ratio and do not use antifreeze other than specifically made for hot water heating systems.

Total output (MBH)	Total Hardness (ppm as ca CO ₃)
> 1 Total ≤ 680	≤ 200
> 680 to ≤ 2050	≤ 150
> 2050	≤ 2

The pH value of the heating water should be between 8.2 and 9.5

Oxygen diffusion barrier under floor tubing

The boiler warranty does not cover pressure vessel failure resulting from corrosion caused by the use of underfloor plastic tubing without an oxygen diffusion barrier. Such systems without oxygen diffusion barrier must have the tubing separated from the boiler with a heat exchanger. Viessmann always recommends the use of underfloor plastic tubing with an oxygen diffusion barrier.



Technical information subject to change without notice.

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