Technical Data Manual

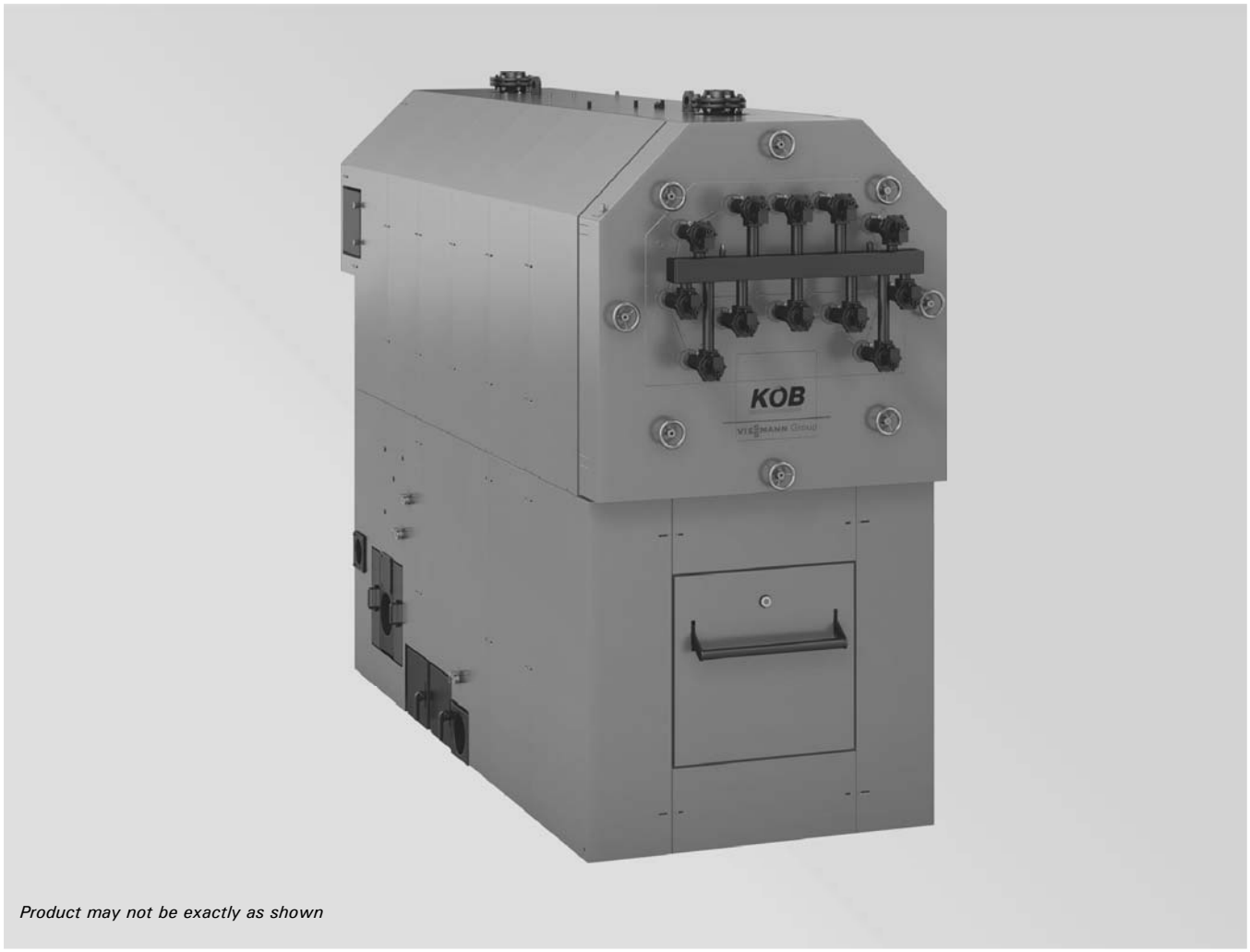
for use by engineers and heating contractors

KOB

VIESMANN Group

Pyrotec®

Wood-fired Boiler
KPT 390 to KPT 1250 Series



Product may not be exactly as shown

Pyrotec 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.
Max. output: 390 to 1250 kW (1331 to 4266 MBH)
Min. output: 98 to 370 kW (334 to 1263 MBH)

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Pyrotec

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 1330 to 4268 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 B365-10
Installation Code for Solid Fuel Burning Appliances and Equipment

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.

Note: "Pyrotec" is an alternate/interchangeable trade name with "Pyrtec".

Boiler Description

Description

The Pyrotec 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 Pyrotec Grate Firing System is characterized by highest efficiencies and perfect combustion in all load stages. The Pyrotec 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 over the burner trough into 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 allow to achieve excellent performance control and highest safety against 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 boiler or on the flue gas (optional).

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

Accessories for Pyrotec 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 Pyrotec 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

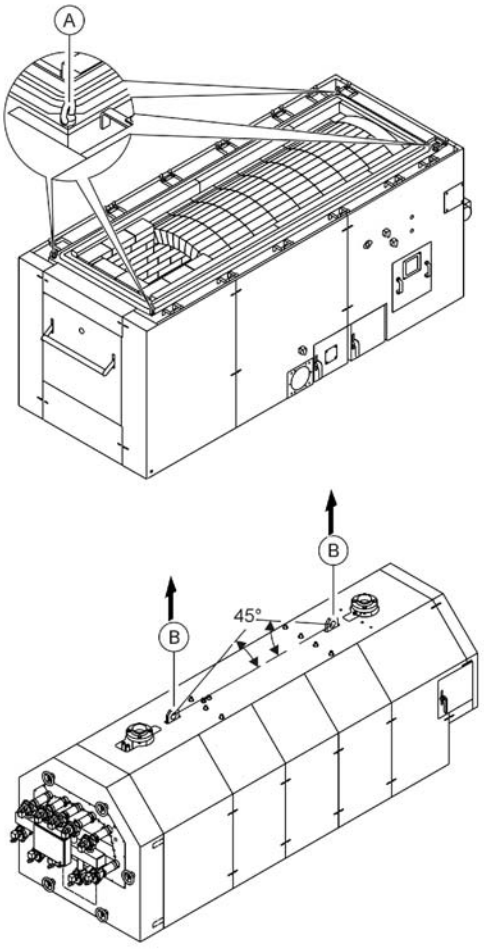
The combustion chamber has four lifting lugs that must be screwed in before lifting. Lifting gear can be attached to these lifting lugs.
The pressure vessel of the Pyrotec has two lifting lugs to which lifting gear may be attached.

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 B 365-10, Installation Code for Solid-Fuel Burning Appliances and Equipment.



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

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Delivery Condition

Standard delivery condition

The standard delivery condition of the Pyrotec 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 fire box 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	KPT390	KPT530	KPT720	KPT950	KPT1250
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	KPT390	KPT530	KPT720	KPT950	KPT1250
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 Pyrotec 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.

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.**

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

Fuel	Minimal Diameter	Maximal Diameter
P1 - Pellets Small	---	⅜ in. (10 mm)
P2 - Pellets Medium	⅜ in. (10 mm)	¾ in. (20 mm)
P4 - Briquettes (Pellets Large)	¾ in. (20 mm)	2½ 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	in² (cm²)	½ (3)	¾ (5)
	Max. length	in. (cm)	3⅓ (8.5)	4¾ (12)
	Coarse sieve nominal mesh width	in. (mm)	⅝ (16)	1¼ (31.5)
Main percentage 60 to 100%	Medium sieve nominal mesh width	in. (mm)	⅛ (2.8)	¼ (5.6)
Percentage of fines (incl. ultrafine content) max. 20%	Fine sieve nominal mesh width	in. (mm)	1/25 (1)	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. ¾ in.² (500 mm²) up to a length of max. 6¼ in. (160 mm) can be tolerated.

Size of briquettes:

- Fraction of one-offs. max. 5% with cross-section of max. ¾ in² (500 mm²) up to a length of max. 6¼ in. (160 mm).
- Frayed surface by chopping tools (shredders) or slow-running choppers.
- Briquettes, diameter max. 2⅜ 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 Pyrotec 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 Pyrotec 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 Pyrotec 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/m³ [lb/ft³]	Water content %	Fuel Size	Description
a	**S**130 [8.1]	**W**10 to **W**20	C1	Sawdust, untreated (planing shop)
b1	**S**200 [12.5]	**W**20 to **W**35	C1	Sawdust, untreated (sawmill)
c2	**S**250 [15.6]	**W**35 to **W**50	C1	Sawdust, untreated (sawmill)

Wood chips

Fuel code	Bulk Density kg/m³ [lb/ft³]	Water content %	Fuel Size	Description
b2	**S**200 [12.5]	**W**20	C7	Forest wood chips, soft, untreated
c1	**S**250 [15.6]	**W**20 to **W**35	C7	Forest wood chips, soft, untreated
d1	**S**300 [18.7]	**W**20 to **W**35	C7	Forest wood chips, soft/hard, untreated
d2	**S**300 [18.7]	**W**35 to **W**50	C7	Forest wood chips, soft, untreated
e1	**S**350 [21.8]	**W**20 to **W**35	C7	Forest wood chips, hard, untreated
e2	**S**350 [21.8]	**W**35 to **W**50	C7	Forest wood chips, soft/hard, untreated
f1	**S**400 [24.9]	**W**35 to **W**50	C7	Forest wood chips, hard, untreated

Shavings and chips

Fuel code	Bulk Density kg/m³ [lb/ft³]	Water content %	Fuel Size	Description
g	**S**130 [8.1]	Less than **W**15	C7	Shavings & chips from wood remnants, dry, mixed
h	**S**200 [12.5]	Less than **W**15	C7	Shavings & chips from wood remnants, dry, mixed
i	**S**250 [15.6]	Less than **W**15	C7	Shavings & chips from wood remnants, dry, mixed

Pellets and briquettes

Fuel code	Bulk Density kg/m³ [lb/ft³]	Water content %	Fuel Size	Description
j	**S**350 [21.8]	Less than **W**15	P4	Briquettes from wood remnants ¾ in. (20 mm) to max. 2 in. (60 mm)
k1	**S**650 [40.6]	Less than **W**10	P1	untreated up to ⅜ in. (10 mm)
k2	**S**650 [40.6]	Less than **W**10	P2	untreated ⅜ in. to ¾ 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 lb/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 (K2O and Na2O)	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 Pyrotec 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 Pyrotec 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 Pyrotec 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.

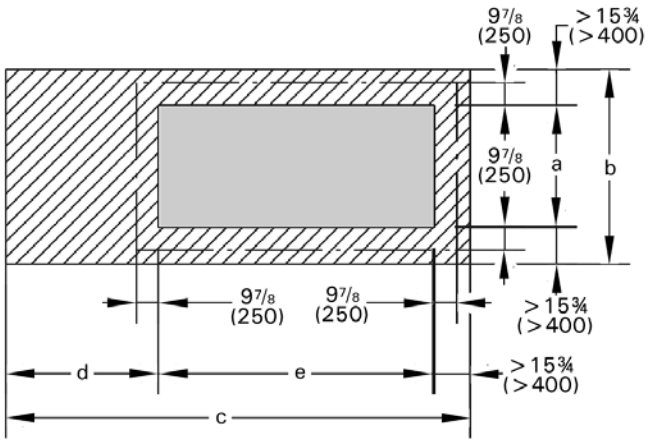
No temperature-sensitive pipes or lines may be installed in the floor beneath the heating boiler.

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. (mm)

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

Foundation dimensions

Boiler Model KPT-		390	530	720	950	1250
a	in. (mm)	40⅜ (1026)	40⅜ (1026)	43¾ (1112)	53½ (1360)	53½ (1360)
b	in. (mm)	71⅞ (1826)	71⅞ (1826)	75¼ (1912)	85 (2160)	85 (2160)
c	in. (mm)	166⅛ (4221)	166⅛ (4721)	193⅜ (4912)	200⅝ (5096)	222⅛ (5641)
d	in. (mm)	49⅝ (1260)	49⅝ (1260)	55⅛ (1400)	64⅛ (6030)	64⅛ (1630)
e	in. (mm)	100⅞ (2561)	120½ (3061)	122½ (3112)	120¾ (3066)	142⅛ (3611)

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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 B365-10, Installation Code for Solid Fuel Burning Appliances and Equipment.
Always use latest edition 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.

Technical Data

Boiler model KPT-		390	530	720	950	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 ∅ 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)	ft³/s (m³/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)	ft³/s (m³/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	ft² (m²)	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 (30psi) [7]	lb. (kg)	12820(5815)	17780(8065)	21572(9785)	27492(12470)	30858(13997)
Total weight without water (60psi) [7]	lb. (kg)	12820(5815)	17780(8065)	22234(10085)	28153(12770)	31740(14397)
Total weight with water (30psi) [7]	lb. (kg)	15355(6965)	20964(9509)	25675(11646)	31775(14413)	36330(16479)
Total weight with water (60psi) [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

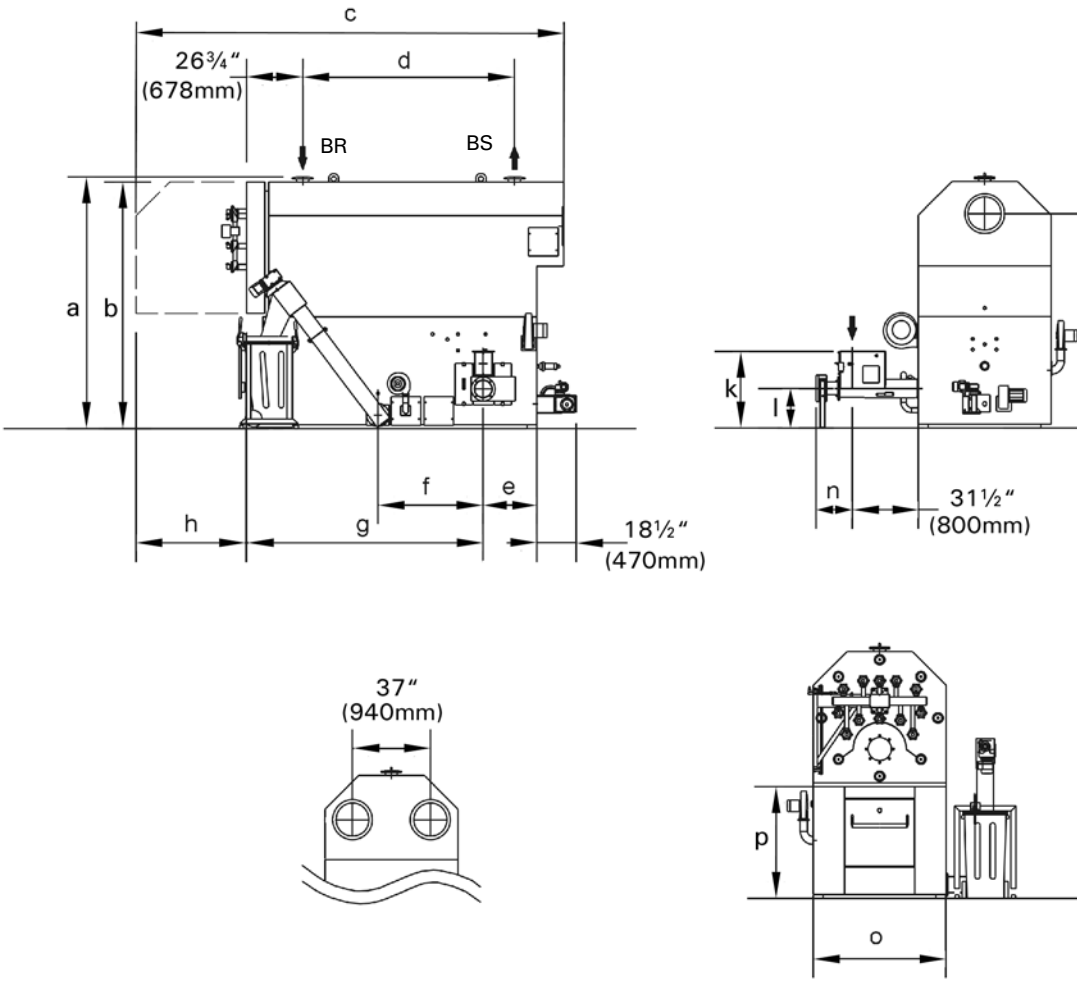
[5] *Flue gas temperature:* An increase is possible by removing the displacement rods [Full load 86°F (30°C); Partial load 50°F (10°C)]

[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

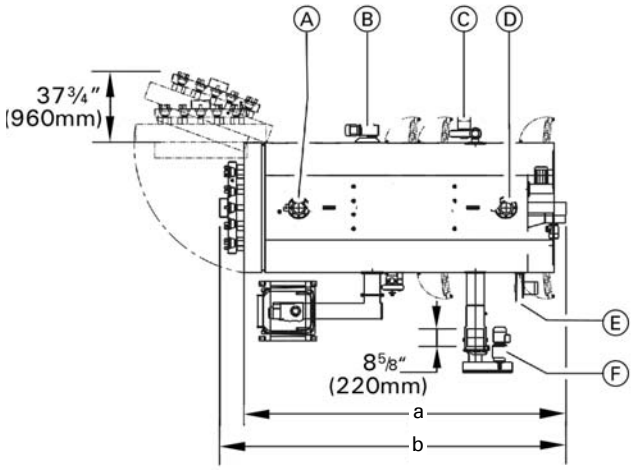


BR Boiler R
BS Boiler S

Dimensions

Boiler Model KPT-		390	530	720	950	1250
a	in. (mm)	93 5/8 (2378)	99 7/8 (2536)	111 5/8 (2834)	119 ½ (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 ¾ (4870)	207 (5257)	214 ½ (5447)	235 7/8 (5992)
d	in. (mm)	87 1/8 (2060)	100 ¾ (2560)	100 7/8 (2562)	100 7/8 (2562)	122 3/8 (3107)
e	in. (mm)	22 ¾ (577)	22 ¾ (577)	22 ¾ (577)	25 7/8 (657)	25 7/8 (657)
f	in. (mm)	47 ¼ (1200)	47 ¼ (1200)	47 ¼ (1200)	50 ¼ (1275)	50 ¼ (1275)
g	in. (mm)	94 ¾ (2405)	114 3/8 (2905)	117 7/8 (2993)	112 5/8 (2861)	134 1/8 (3406)
h	in. (mm)	42 ¾ (1086)	42 ¾ (1086)	54 3/8 (1380)	63 ½ (1612)	63 ½ (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 ¾ (2077)	91 ¾ (2331)	98 1/8 (2491)	96 ¼ (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 ½ (1612)	63 ½ (1612)
p	in. (mm)	49 ¾ (1263)	55 ¾ (1417)	55 5/8 (1413)	51 7/8 (1317)	61 5/8 (1566)

Boiler Dimensions *(continued)*



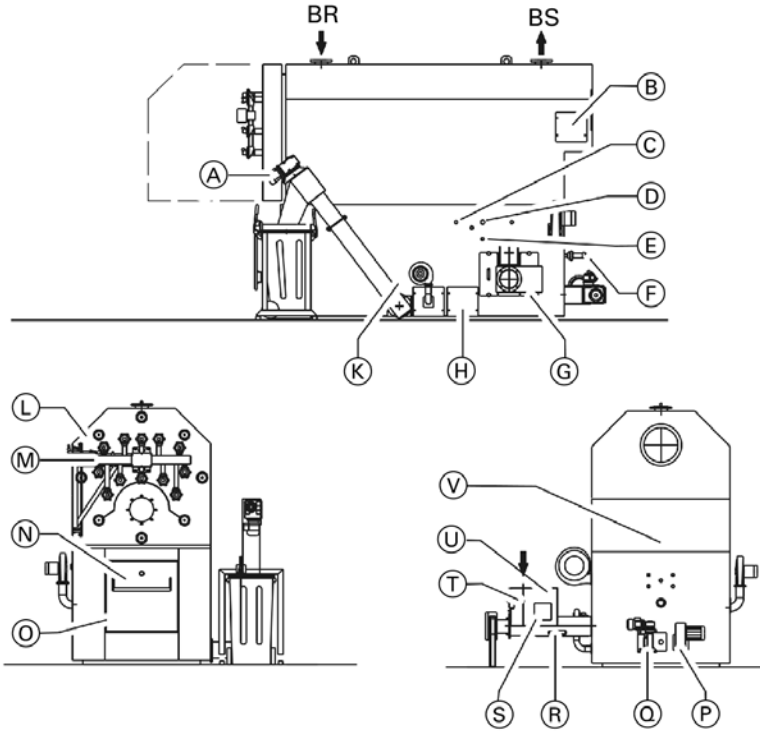
Legend

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

Dimensions

Boiler Model KPT-		390	530	720	950	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
Ⓐ De-ashing assembly with ash container (optional)
Ⓑ Cleaning cover, heat exchanger
Ⓒ Combustion chamber temperature sensor
Ⓓ Negative pressure montoring assembly
Ⓔ Light barrier, fire box
Ⓕ Igniter (optional)
Ⓖ Cleaning cover trough
Ⓗ Cleaning cover, external grate
Ⓚ Light barrier de-ashing assembly
Ⓛ Heat exchanger door
Ⓜ Pneumatic cleaning system
Ⓝ Combustion chamber door
Ⓞ Limit switch, combustion chamber door
Ⓟ Primary air blower 2
Ⓠ Drive, in-feed grate
Ⓡ Temperature sensor in-feed auger
Ⓢ Limit switch, maintenance cover
Ⓣ Light barrier, in-feed auger
Ⓤ Extinguishing water connection
Ⓥ Boiler drain and fill valve

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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 Pyrotec's 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 Pyrotec KPT-390)
Pneumatic cleaning system (for Pyrotec KPT-530 and –720)
Pneumatic cleaning system (for Pyrotec KPT-950 and –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

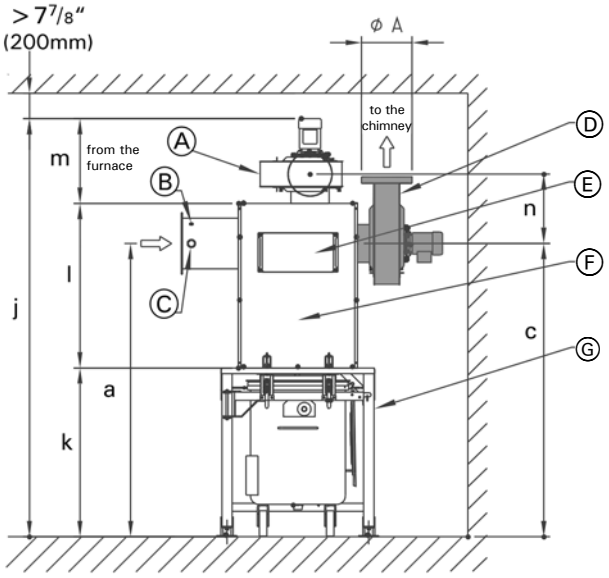
Technical data:

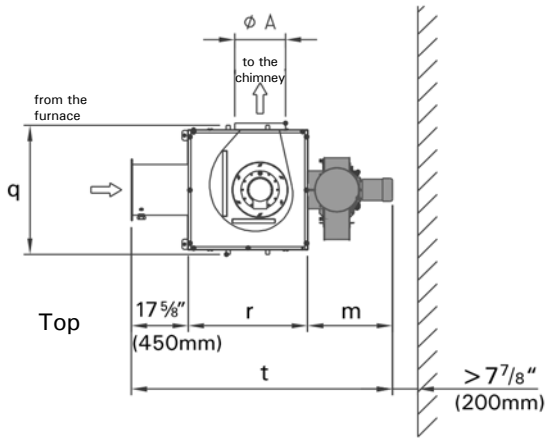
Boiler Model KPT-	**390**	**530**	**720**	**950**	**1250**
Number of zones/ valves	8	10		12	
Size of valves	1½"	1½"		1½"	
Max. air consumption, full load USG/h (L/h)	819 (3100)	1162 (4400)		1400 (5300)	

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

Ⓐ 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)

Ⓑ Flue gas temperature sensor

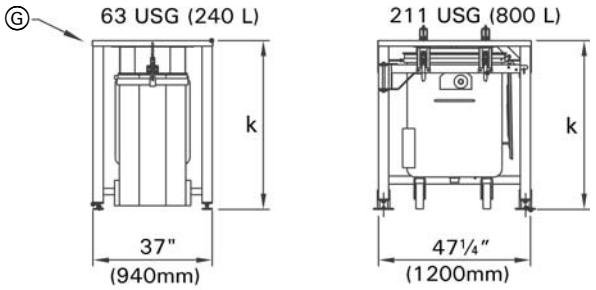
Ⓒ Oxygen sensor

Ⓓ Flue gas exhaust blower - choice of top or side - unused connection as cleaning lid, variable rotation, clean gas chamber

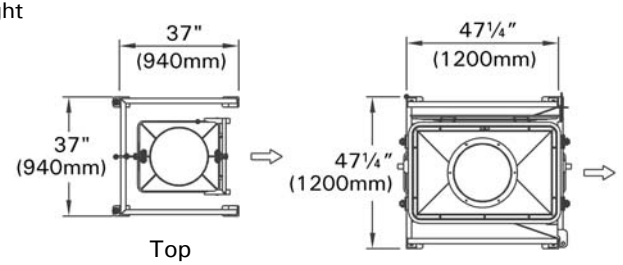
Ⓔ Cleaning lid crude gas chamber

Ⓕ Cyclone (axial cyclone)

Ⓖ 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 KPT-		390	530	720	950	1250
A	in. (mm)	13¾ (350)	13¾ (350)	13¾ (350)	15¾ (400)	17 11/16 (450)
a	in. (mm)	81 7/8 (2080)	92 7/8 (2359)	98 1/16 (2491)	96¼ (2444)	103 7/8 (2639)
c	in. (mm)	92 7/8 (2359)	92 7/8 (2359)	98 1/16 (2491)	96¼ (2444)	103 7/8 (2639)
j	in. (mm)	125½ (3186)	125½ (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)	65¼ (1657)
l	in. (mm)	49½ (1256)	49½ (1256)	49½ (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)	24½ (620)	24½ (620)	24½ (620)	37½ (950)	37½ (950)
t	in. (mm)	65¾ (1670)	65¾ (1670)	68 (1730)	82 (2083)	84¾ (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 flow temperature must never be below 149°F (65°C).

The stepless control of the Pyrotec 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.

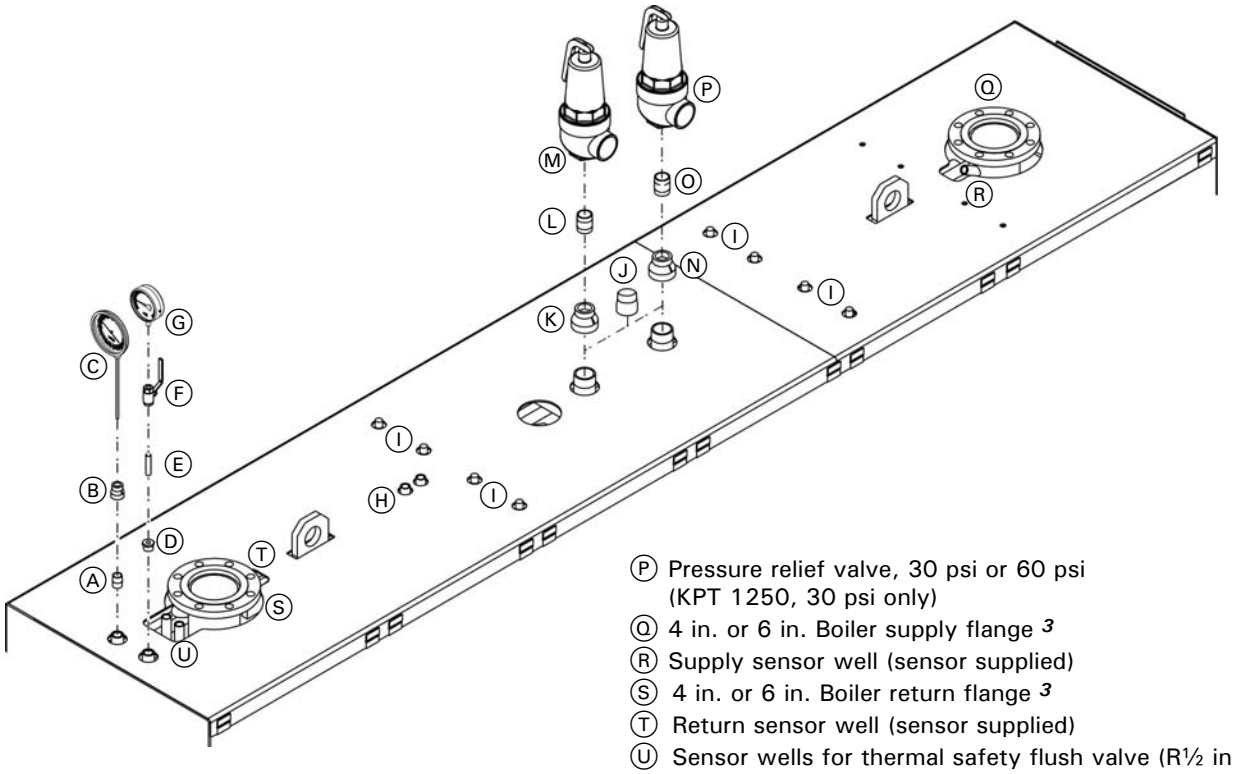
The boiler circuit should be designed that the temperature difference between the boiler supply and the boiler return temperature is equal to or less than 27°F (15°C).

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, ¾ in. x 1½ in.
Ⓑ Reducing coupling, ¾ in. x ½ in.
Ⓒ Boiler water temperature gauge
Ⓓ Bushing ¾ in. x ¼ in.
Ⓔ Nipple ¼ in. x 2½ in.
Ⓕ Ball valve ¼ in.
Ⓖ Pressure gauge
Ⓗ Sensor well - Fixed high limit (sensor supplied)
Ⓘ Safety heat exchanger connections, NPTM ½ in. *1*
Ⓙ PRV Pressure Relief Valve connection cap *2*
Ⓚ Reducing bushing
Ⓛ Nipple
Ⓜ Pressure relief valve, 30 psi or 60 psi
Ⓝ Reducing bushing (KPT 1250, 30 psi only)
Ⓞ Nipple (KPT 1250, 30 psi only)



Ⓟ Pressure relief valve, 30 psi or 60 psi (KPT 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 (R½ in.) (sensor supplied)

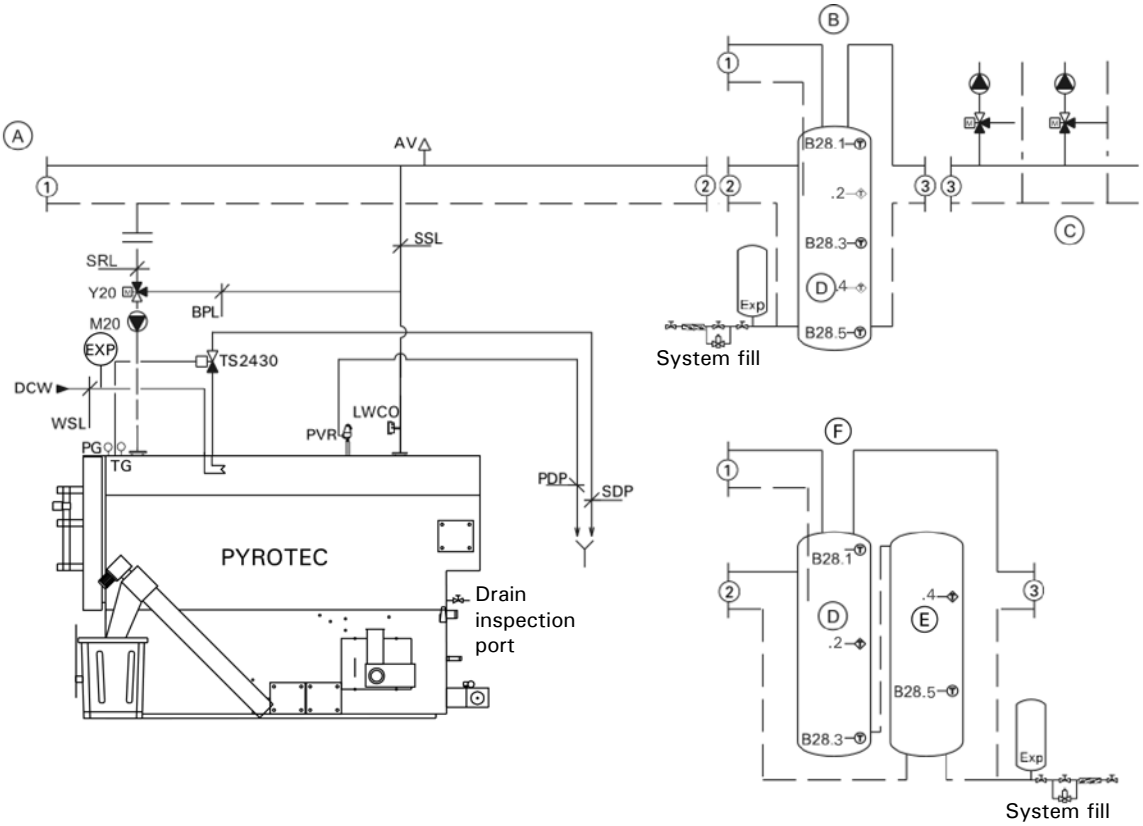
Note: All fittings shown and sensors indicated are factory supplied. The size and quantity are matched to the specific boiler model.

1 See section Piping and Installation of Safety Devices

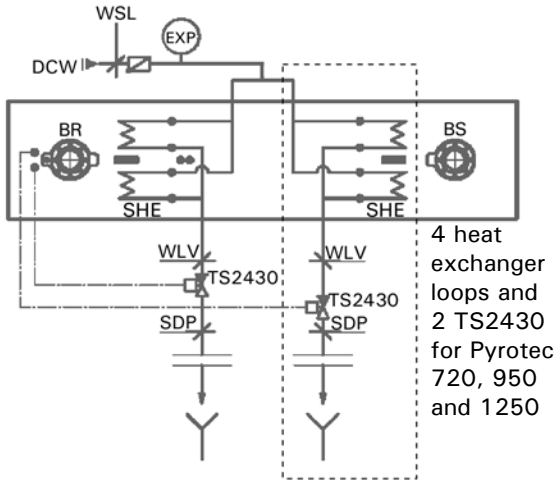
2 Two PRVs must be installed on the KPT 1250 - 30 psi boiler. One PRV must be installed and the other PRV connection must be capped on the KPT 1250 - 60 psi boiler. All other models have only one PRV connection.

3 4 in. boiler flange for Pyrotec 390-720, 6 in. boiler flange for Pyrotec 950-1250

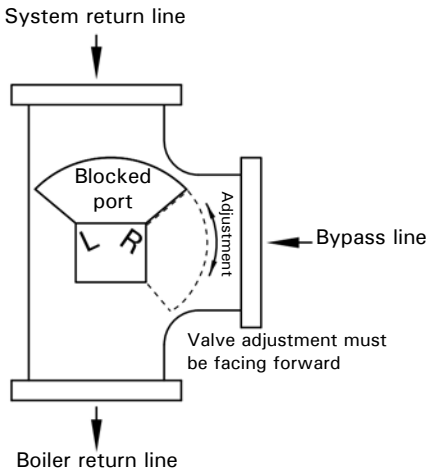
Piping and Installation of Safety Devices



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

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Piping and Installation of Safety Devices *(continued)*

Note: To reliably prevent boiler corrosion caused by condensation of flue gases, the boiler return flow 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 shut-offs.

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 Pyrotec 390 and Pyrotec 530 have two safety heat exchanger loops and require one thermal safety flush valve.
  The Pyrotec 720 to Pyrotec 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:

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
- **WLV** 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 KPT 1250, 30 psi will have 2 PRVs.

Thermal run off safety valve

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

Pressure relief valve

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

[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 KPT-	Pump	Frequency	Voltage and phase	Speed
390	UPS 80-80/4 F	60 Hz	3 x 208-230V	2
530	UPS 80-80/4 F	60 Hz	3 x 208-230V	3
720	UPS 80-160 F	60 Hz	3 x 208-230V	3
950	TP 100-80/4	60 Hz	3 x 208-230V	*
1250	TP 100-80/4	60 Hz	3 x 208-230 / 460V	*

3-way Mixing Valve

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

Viessmann ASME recommended tank sizes (U-stamped)

Boiler model KPT-	Tank size	
	L	USG
390	3785	1000
530	5678	1500
720	6624	1750
950	9464	2500
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 Pyrotec Grate Firing System:

- **Preventing overfilling of the combustion chamber**
  A level monitor must be installed to prevent overfilling of the combustion chamber. The Pyrotec 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 Pyrotec 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 Pyrotec 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 Pyrotec 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"wc.

Max. negative pressure allowed in fuel storage unit:
+0 Pa / +0"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"wc.

Max. negative pressure allowed in fuel storage unit:
-3000 Pa / –12"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.

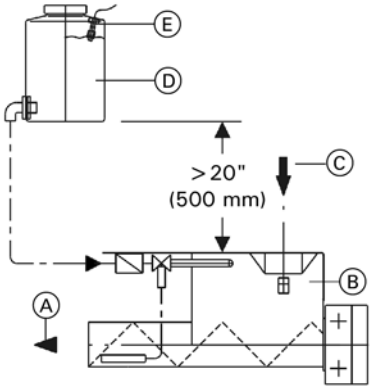
Fire Extinguishing System

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

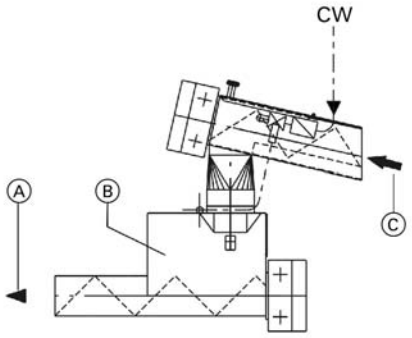
Note: The fire extinguishing system for the in-feed auger is part of the boiler.

- Line from the extinguishing water container to the ½ in. valve (as short as possible).
- Valve thermostatic, Danfoss AVTA 15 122°F-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.



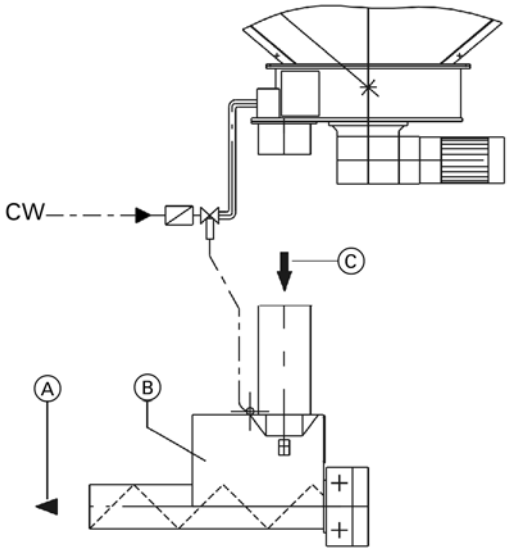
Fire extinguishing system for the conveyor auger

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

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

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Vitocontrol

Mounting of the control panel

The control panel should be in an area where the heat radiation (front side of boiler, rear side of boiler with flue gas cyclone and flue gas exhaust blower as well as recirculation line) and the exposure to dust during cleaning is at a minimum.

The ambient temperature for the control panel approx. 4 in. (100 mm) away from the control cabinet) should not exceed 104°F (40°C) while the system is in operation. The minimum temperature must not be less than 50°F (10°C) In case of doubt, preference should be given to placing the control panel outside the mechanical room near the heating room door.

Electrical connection

- Install the control panel according to the field wiring diagram. The field wiring diagram is supplied with the control panel.
- In the area of hot parts (flue gas exhaust blower, flue gas pipe), the lines should be installed in steel pipes at an appropriate distance so as to be protected from excessive temperatures. See section Boiler Wiring.
- The cable bushings to the motors and equipment must be dust-tight and provided with a strain relief.

An SPS-control system for the complete Pyrotec Boiler Plant, including control of the fuel loading systems required for the separately listed items. The heat output of the boiler adjusts to the heat consumption in modulating fashion. A regulating circuit for the combustion optimizing system is superimposed on the output control circuit with a oxygen sensor. Maximum quality criteria are met in terms of fire protection and personal protection.

Functions:

- Output and control circuits with modulating output operation (25%-100%)
- Air-conducted by means of a speed-regulated supply air fan, depending on the supply temperature
- Precise re-supplying of fuel by the in-feed auger from the metering container with an insulating layer
- Refilling of the metering container with the use of a level monitoring system
- Limitation and distribution of the mass burning in the combustion chamber by means of a level monitoring system in the combustion chamber along with movement of the feed grate
- Emissions-optimized control circuit with fine-tuning of the fuel/air mixture by a oxygen sensor
- Pressure regulation of the combustion chamber with constant negative pressure guaranteed
- combustion chamber temperature limitation with the required variation of the air index to protect the fire-resistant lining
- Upholding the return temperature with the boiler 3-way mixing valve provides for a long service life of the boiler.

Safety functions for:

- Excess temperature, burn-back, opening of the combustion chamber door, opening of a lid in the loading system, excess pressure in the combustion chamber
- Floating output (malfunction combustion system)

Operation:

Operation is carried out by means of a control panel with a membrane keyboard and plain language display, which are built into the control cabinet door. All the operational data can be read on the display. The set points for all the important parameters can be entered simply using the keyboard. Malfunctions are displayed in plain language and indicated in the order of their occurrence.

Supplied with:

- Control cabinet (uninstalled), surface powder-coated with RAL 7035 (gray) textured, executed according to CSA C.22, ready-wired on series terminals, Power supply: 208V/3/60Hz; control voltage: 120 / 240V/1/60Hz or 24V
- Adapted, updateable software
- Soft starter for all the drives for the loader system (208V/3/60Hz) according to the accessories
- Overload protection for boiler pump
- Outputs for stepping motors
- Variable frequency drive (EMC-Operation Class 3) for exhaust fan
- Main disconnect
- Documentation, including bound circuit diagram, terminal connection diagram with cable designation, operating and maintenance instructions, installation instructions in document pocket
- Sensors and switches for in-feed auger
- Infrared light barrier level monitoring system, insulating layer for feed auger
- Safety limit switch on the maintenance lid for the in-feed auger
- Temperature sensor for the in-feed auger
- Sensors and switches on the combustion chamber for firing
  and in the exhaust gas nozzle (installation on site)
- Infrared light barriers for level monitoring of fuel in the combustion chamber
- Oxygen sensor with instrument reading converter
- Exhaust gas temperature sensor
- Sensors and switches mounted on the boiler on top
- Sensor in the connecting piece, supply flow
- Sensor in the connecting piece, return
- Sensor, uninstalled
- One sensor with sensor well, 1/2" x 280 mm

Vitocontrol - Accessories

Note: The control system components below are reserved for the Pyrotec Single-unit System. With the Pyrotec Double-unit System, these functions are included in the Pyrotec Mastercontrol.

Thermal Storage Tank Management System, 5 Sensors

Function:

Using a heat accumulator improves the modulating output operation of the Pyrotec grate firing system. In addition, sudden heat requirement peaks are covered. The accumulator's load of heat is detected by the temperature sensors. The degree to which the accumulator is loaded is determined by the external temperature sensor. The firing power is adapted to the accumulator's degree of loading.

Supplied with:

- 4 additional PT100 sensors with sensor well, 1/2" x 280 mm
- 1 outdoor temperature sensor, uninstalled

Output signals 0 - 10V

Function:

The system includes output of the boiler in the form of a voltage signal and preparation for connection to receive a maximum limitation of the boiler output.

Supplied with:

- Output of the boiler, 0 - 10V
- Reception and processing of an external output limitation
  0 - 0.5V..... OFF
  0.6 - 3V..... Maintain embers
  3.1 - 10V... 30% to 100% output operation

Note: Installation of "Output signals 0 - 10V" is possible according to irrespective of any additional control system components to be used.

Operational Message

Function:

System status "Operating Load" indication; from operation of the boiler pump to higher-level control.

Supplied with:

- Floating output (operational message)

Export System for Operational Data

Function:

Output of all relevant operational data and error reports for the Pyrotec Boiler Plant via MOD-BUS in the form of an ASCII-data record via serial interface to higher-level control equipment of the customer's. All the adjustable parameters can be changed via the higher-level control equipment as long as the control equipment provides for this.

Supplied with:

- Interface on the control panel
- Software component
- MOD-BUS protocol (baud rate 9600)

Visualization by web server

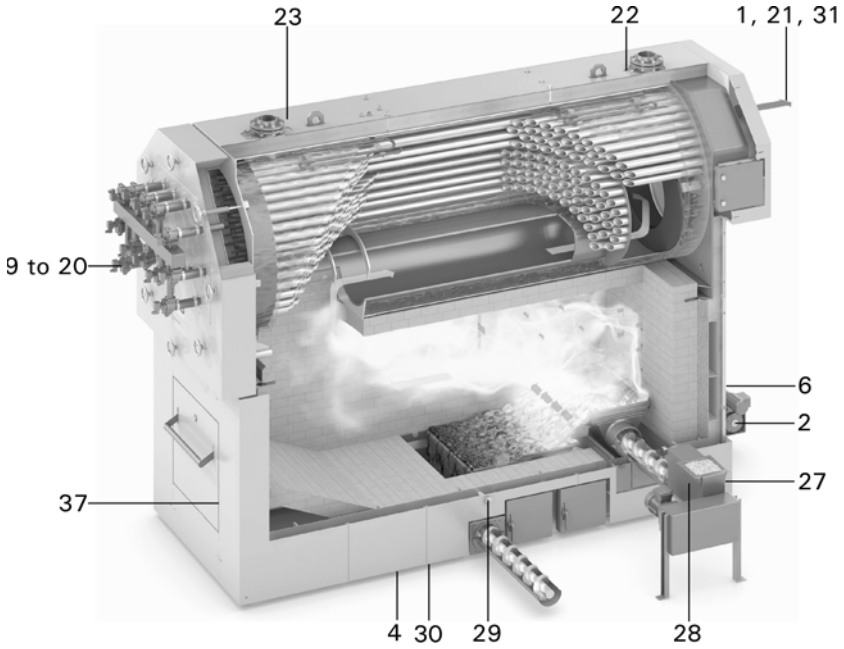
Function:

A complete package for transmitting all data to a remote computer for visualization, remote maintenance and archiving of operational data for the Pyrotec Boiler Plant. The hardware and software are integrated in the Vitocontrol control system. All the adjustable parameters can be changed from the remote computer.

Customer supplied:

- IP address configuration

Electrical Components



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Electrical Components *(continued)*

M High voltage
Y Low voltage

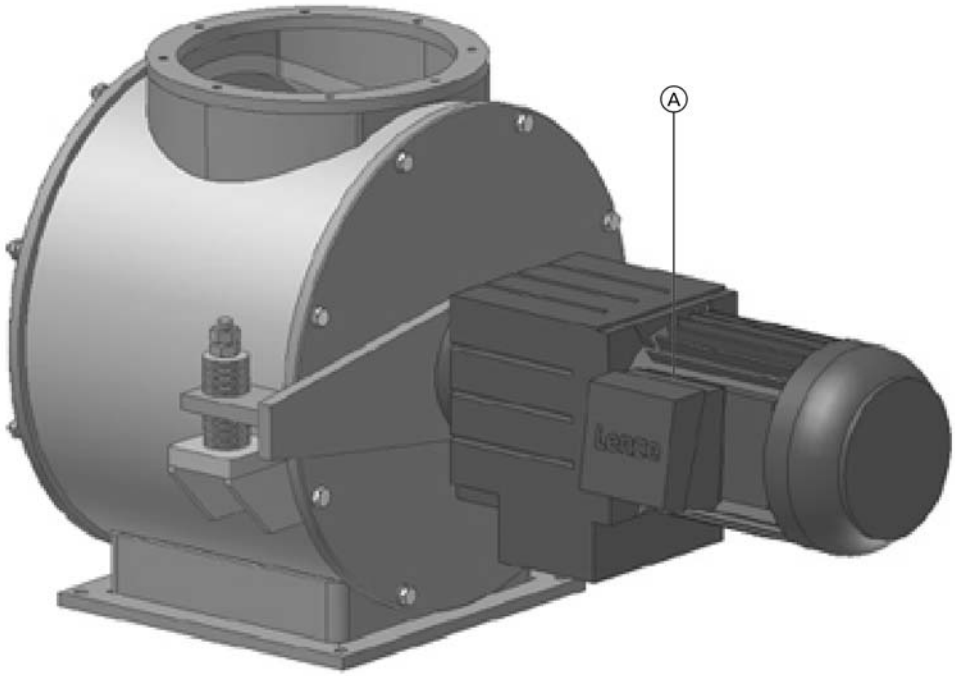
B sensors
S Switches

N Sensors

Number	Designation	Device tag	Description
High Voltage			
1	M1	-3M1	Flue gas exhaust blower (not shown)
2	M11	-9M11	Grate drive
3	M13	-13M13	Secondary air blower (not shown)
4	M14	-14M14	De-ashing auger
5	M15	-15M15	De-ashing ascending conveyor auger (not shown)
6	M16	-16M16	Igniter (not shown)
7	M20	-17M20	Boiler pump (not shown)
Low Voltage			
8	Y20	-18Y20	3-way mixing valve actuator (not shown)
9	Y71	-20Y71	Solenoid valve 1
10	Y72	-20Y72	Solenoid valve 2
11	Y73	-20Y73	Solenoid valve 3
12	Y74	-20Y74	Solenoid valve 4
13	Y75	-20Y75	Solenoid valve 5
14	Y76	-20Y76	Solenoid valve 6
15	Y77	-20Y77	Solenoid valve 7
16	Y78	-20Y78	Solenoid valve 8
17	Y79	-20Y79	Solenoid valve 9
18	Y80	-20Y80	Solenoid valve 10
19	Y81	-20Y81	Solenoid valve 11
20	Y82	-20Y82	Solenoid valve 12
Temperature sensors			
21	B1	-107B1	Flue gas temperature sensor (not shown)
22	B20	-107B20	Boiler supply temperature sensor
23	B20.1	-107B20.1	Boiler return temperature sensor
24	B27	-73B27	Fire box temperature sensor (not shown)
Light barriers			
25	B1G/1	-61B1G/1	Light barrier embers (Transmitter) (not shown)
26	B1G/2	-61B1G/2	Light barrier embers (Receiver) (not shown)
27	B2/1	-61B2/1	Light barrier in-feed auger (Transmitter)
28	B2/2	-61B2/2	Light barrier in-feed auger (Receiver)
29	B14/1	-61B14/1	Light barrier de-ashing auger (Transmitter)
30	B14/2	-61B14/2	Light barrier de-ashing auger (Receiver)
Sensors			
31	B26	-91B26	Oxygen sensor (not shown)
32	U26	-91U26	Oxygen sensor transducer (not shown)
33	N25	-69N25	Floater switch for fire extinguishing water container (not shown)
34	N21	-72N21	Fixed high limit
35	U1	-17U1	Low water cut-off (not shown)
36	N23	-72N23	Water safety pressure switch (not shown)
37	S1	-60S1	Limit switch for the combustion chamber door
38	B70	-67B70	Negative pressure monitoring assembly (not shown)
39	N70	-72N70	Pressure switch for the fire box RAK (not shown)

Fuel Transport and Extraction Systems

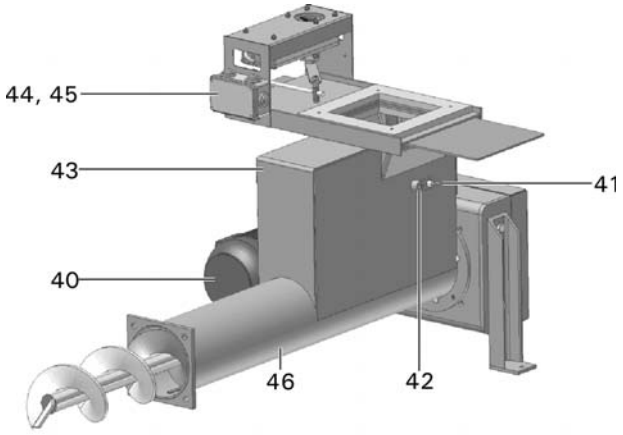
Rotary Valve



Number	Designation	Device tag	Description
Ⓐ	M9	-9 M9	Motor for rotary valve

Fuel Transport and Extraction Systems

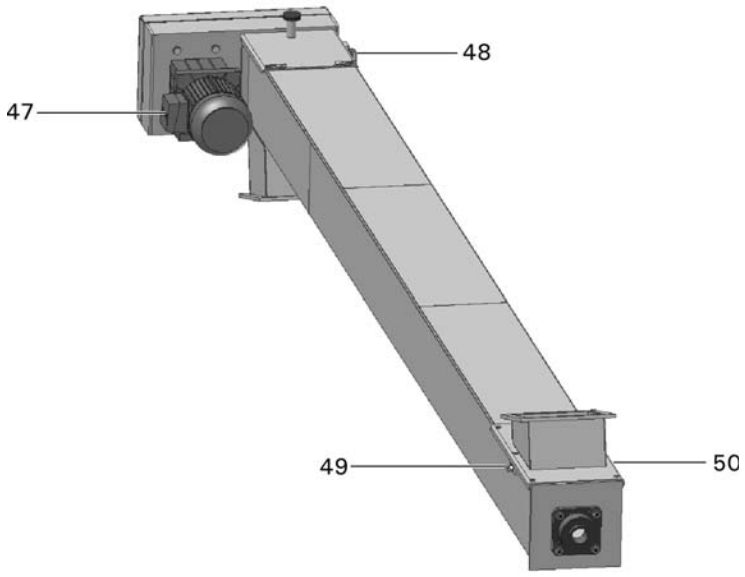
In-feed auger



Number	Designation	Device tag	Description
40	M2	-4M2	Motor for in-feed auger
41	S2	-68S2	Limit switch for maintenance lid
42	B31.1	-11B31.1	Light barrier metering container (Transmitter)
43	B31.2	-11B31.2	Light barrier metering container (Receiver)
44	M10.1	-8M10.1	Slide valve T30
45	M10.2	-8M10.2	Slide valve T30
46	B02	-107B02	In-feed auger temperature sensor

Note: For details on designation see field wiring diagram.

Pipe/trough conveyor auger

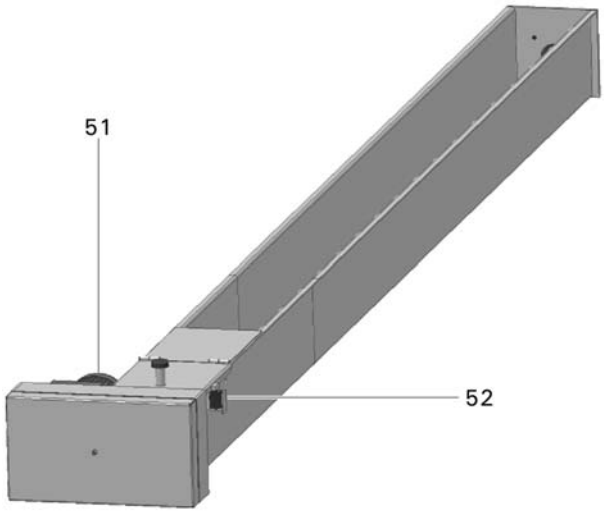


Number	Designation	Device tag	Description
47	M4.1	-5M4.1	Motor for pipe/trough conveyor auger
48	S4.1	-68S4.1	Limit switch for maintenance lid
49	B4.1/1	-61B4.1/1	Light barrier conveyor auger (Transmitter)
50	B4.1/2	-61B4.1/2	Light barrier conveyor auger (Receiver)

Note: For details on designation see field wiring diagram.

Fuel Transport and Extraction Systems *(continued)*

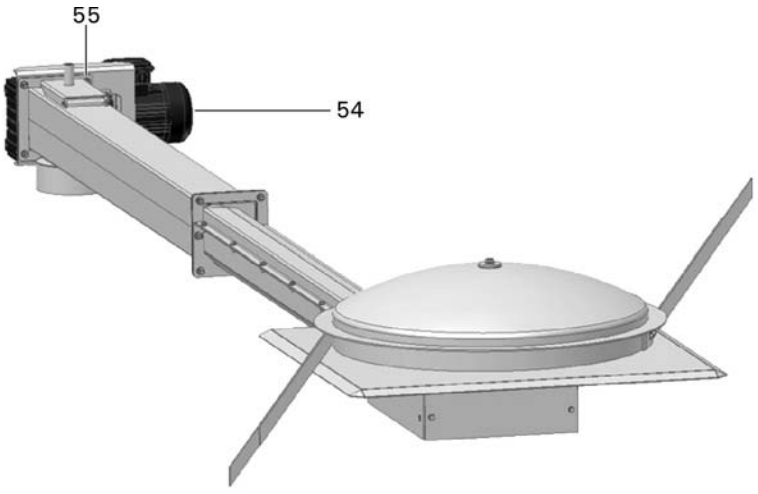
Pellet extraction auger



Number	Designation	Device tag	Description
51	M32	-12M32	Motor for pellet extraction auger
52	S32.1	-12S32.1	Limit switch for maintenance lid
53	S32.2	-12S32.2	Limit switch for silo door (not shown)

Note: For details on designation see field wiring diagram.

Spring extraction system

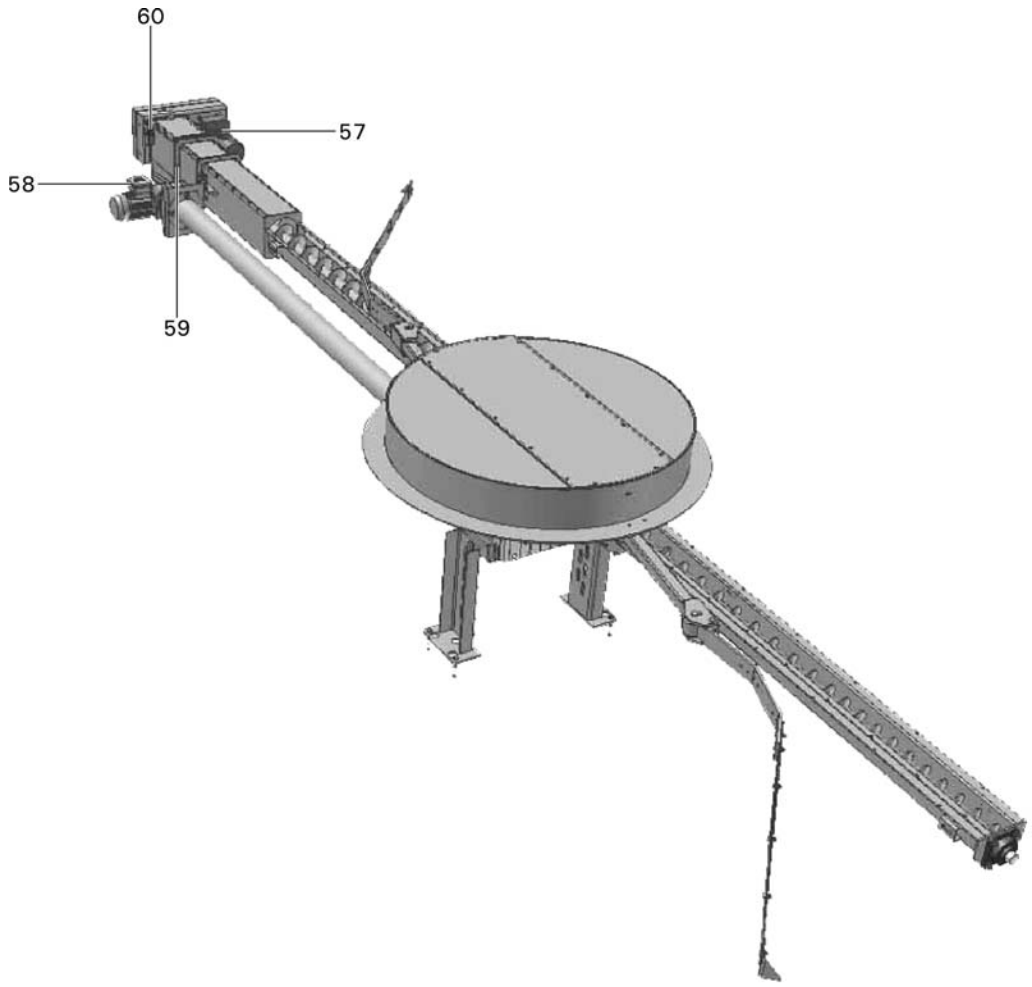


Number	Designation	Device tag	Description
54	M32	-12M32	Motor for spring extraction system
55	S32.1	-12S32.1	Limit switch for maintenance lid
56	S32.2	-12S32.2	Limit switch for silo door (not shown)

Note: For details on designation see field wiring diagram.

Fuel Transport and Extraction Systems *(continued)*

Horizontal extraction system

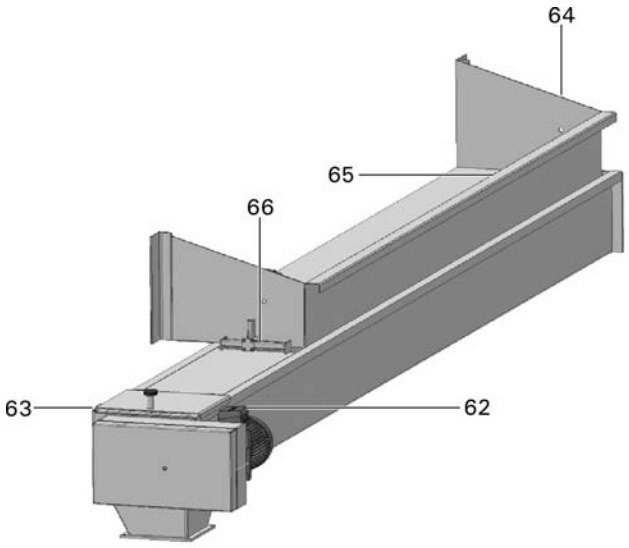


Number	Designation	Device tag	Description
57	M32	-12M32	Motor for extraction auger
58	M33	-12M33	Motor for agitator
59	B32	-12B32	Light barrier for extraction auger
60	S32.1	-12S32.1	Safety switch for maintenance lid
61	S32.2	-12S32.2	Safety switch for silo door (not shown)

Note: For details on designation see field wiring diagram.

Fuel Transport and Extraction Systems *(continued)*

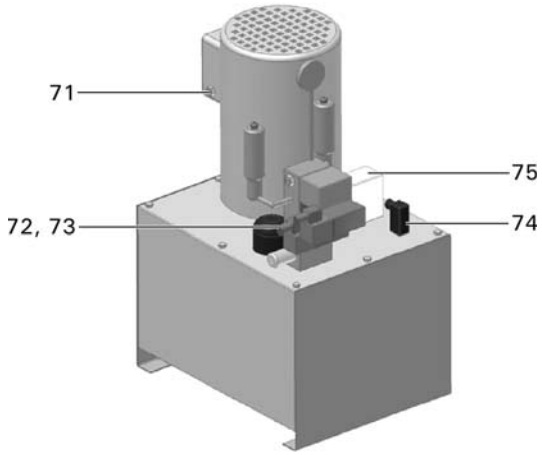
Walking floor auger



Number	Designation	Device tag	Description
62	M2	-4M2	Motor for walking floor auger
63	S3	-68S3	Safety switch for maintenance lid
64	S3.1	-68S3.1	Safety switch for auger cover
65	B3/1	-61B3/1	Light barrier walking floor auger (Transmitter)
66	B3/2	-61B3/2	Light barrier walking floor auger (Receiver)
67	B6.1/1	-61B6.1/1	Light barrier silo distribution top (Transmitter)
68	B6.1/2	-61B6.1/2	Light barrier silo distribution top (Receiver)
69	B6.2/1	-61B6.2/1	Light barrier silo distribution bottom (Transmitter)
70	B6.2/2	-61B6.2/2	Light barrier silo distribution bottom (Receiver)

Note: For details on designation see field wiring diagram.
Note: Items 67 to 70 only apply to the walking floor with filling function.

Hydraulic unit



Number	Designation	Device tag	Description
71	M6	-7M6	Motor for hydraulic unit
72	Y6.1	-25Y6.1	Solenoid valve to change between silo lid and walking floor
73	Y6.9	-7Y6.9	Change silo distribution
74	N6.1	-7N6.1	Hydraulic temperature
75	N6.2	-7N6.2	Hydraulic level

Note: For details on designation see field wiring diagram.
Note: Items 72 and 73 are optional.

Fuel Transport and Extraction Systems *(continued)*

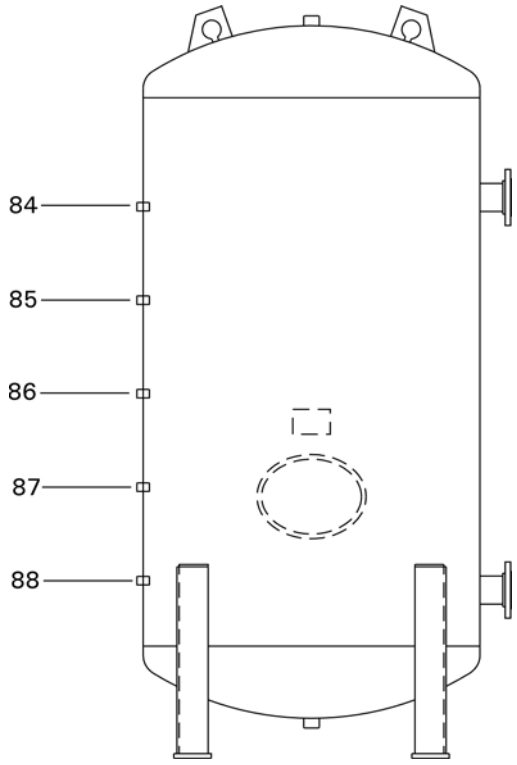
Silo Lid

Number	Designation	Device tag	Description
76	Y6.3	-22Y6.3	Solenoid valve silo lid open
77	Y6.4	-22Y6.4	Solenoid valve silo lid close
78	S6.1	-22S6.1	Key operated switch for silo lid
79	M901	-24M901	Vibration motor 1
80	M902	-24M902	Vibration motor 2
81	M903	-24M903	Vibration motor 3
82	S901	-24S901	Key operated switch for vibration motor
83	S5.1	-68S5.1	Safety switch for silo lid

Note: For details on designation see field wiring diagram.
Note: The quantity of items 79 to 81 will depend on the size of the silo lid.

Thermal Storage Tank

Thermal storage tank



Number	Designation	Device tag	Description
84	B28.1	-109B28.1	Thermal storage tank sensor (top)
85	B28.2	-109B28.2	Thermal storage tank sensor (top/middle)
86	B28.3	-109B28.3	Thermal storage tank sensor (middle)
87	B28.4	-109B28.4	Thermal storage tank sensor (middle/bottom)
88	B28.5	-110B28.5	Thermal storage tank sensor (bottom)
89	B60	-110B60	Outdoor temperature sensor (not shown)

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:

Pyrotec 390	approx.	5100 lb.
Pyrotec 530	approx.	6600 lb.
Pyrotec 720	approx.	8800 lb.
Pyrotec 950	approx.	11660 lb.
Pyrotec 1250	approx.	14960 lb.

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.

Printed on environmentally friendly (recycled and recyclable) paper.

Technical information subject to change without notice.

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