

# PYROT®

# KÖB

KRT 150 to KRT 540

Wood Fired Boiler

Maximum output: 150 to 540 kW / 512 to 1843 MBH

Minimum output: 45 to 140 kW / 154 to 478 MBH

## Assembly and Installation Instructions



### IMPORTANT

Please ensure that these instructions are read and understood before commencing installation and start-up. Failure to comply with these Installation Instructions will render all warranties null and void.

#### Working on the equipment

The installation, adjustment, service and maintenance of this product must be performed by a licensed professional heating contractor, who is qualified and experienced in the installation, service and maintenance of hot water heating boilers. There are no user serviceable parts on the boiler, burner, or control.

Ensure main power supply to equipment, the heating system and all external controls has been deactivated.

Take precautions in all instances to avoid accidental activation of power during service work.

Improper installation, service or maintenance can cause product/property damage, severe personal injury, and/or loss of life.

### IMPORTANT

Read and save these instructions for future reference.



KÖB IS A PART OF THE VISSMANN GROUP.

Pyrot ai/ii 11/2008

# VISSMANN

# Safety, Installation and Warranty Requirements

Please ensure that these instructions are read and understood before commencing installation. Failure to comply with the instructions listed below and detail sprinted in this manual can cause product / property / damage, severe personal injury, and / or loss of life. Ensure all requirements below are understood and fulfilled (including detailed information found in manual subsections).

## ■ Licensed professional heating contractor

The installation, adjustment, service, and maintenance of this equipment *must be performed* by a licensed professional heating contractor.

▶ " Please see section entitled "Important Regulatory and Installation Requirements".



## ■ Product documentation

Read all applicable documentation before commencing installation. Store documentation near boiler in a readily accessible location for reference in the future by service personnel.

▶ " For a listing of applicable literature, please see section entitled "Important Regulatory and Safety Requirements".



## ■ Advice to owner

Once the installation work is complete, the heating contractor must familiarize the system operator/ultimate owner with all equipment, as well as safety precautions/requirements, shut-down procedure, and the need for professional service annually before the heating season begins.

## ■ Contaminated air

Air contaminated by chemicals can cause by-products in the combustion process which are *poisonous* to inhabitants and destructive to Viessmann equipment.

▶ " For a listing of



*chemicals which cannot be stored in or near the boiler room, please see subsection entitled "Combustion air supply"*

▶ Carbon monoxide  
Improper installation, adjustment, service and/or maintenance can cause flue products to flow into living space. Flue products contain *poisonous* carbon monoxide gas.

" For information pertaining to the proper installation, adjustment, service and maintenance of this equipment to avoid formation of carbon monoxide, please see instructions supplied with boiler.



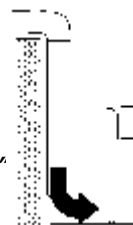
## ⚠ WARNING

Installers must follow local regulations with respect to installation of carbon monoxide detectors. Follow manufacturer's maintenance schedule of boiler.

## ■ Fresh air

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

▶ " For information pertaining to the fresh air requirements of this product, please see subsection entitled "Combustion air supply"



## ■ Equipment venting

Never operate boiler without an *installed venting system*. An improper venting system can cause carbon monoxide poisoning.

▶ " For information pertaining to venting and chimney requirements, please see section entitled "Venting Connection". All products of combustion must be safely vented to the outdoors.



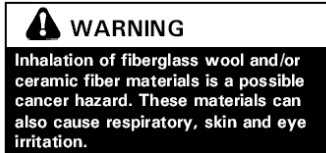
## ■ Warranty Information

In this and related product documentation must be read and followed. *Failure to do so renders warranty null and void.*



# Safety, Installation and Warranty Requirements

## ■ Fiberglass wool and ceramic fiber Materials



The state of California has listed the airborne fibers of these materials as a possible cancer hazard through inhalation. When handling these materials, special care must be applied.

Suppliers of ceramic fiber products recommend the following first aid measures:

- *Respiratory tract (nose and throat) irritation*

If respiratory tract irritation develops, move the person to a dust free location.

- *Eye irritation*

If eyes become irritated, flush immediately with large amounts of lukewarm water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Do not rub eyes.

- *Skin irritation*

If skin becomes irritated, remove soiled clothing. Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water.

Using a skin cream or lotion after washing may be helpful.

- *Gastrointestinal irritation*

If gastrointestinal tract irritation develops, move the person to a dust free environment.

Suppliers of fiberglass wool products recommend the following precautions be taken when handling these materials:

*Precautionary measures*

- Avoid breathing fiberglass dust and contact with skin and eyes.

- Use NIOSH approved dust/mist respirator.

- Wear long-sleeved, loose fitting clothing, gloves and eye protection.

- Wash work clothes separately from other clothing. Rinse washerthoroughly.

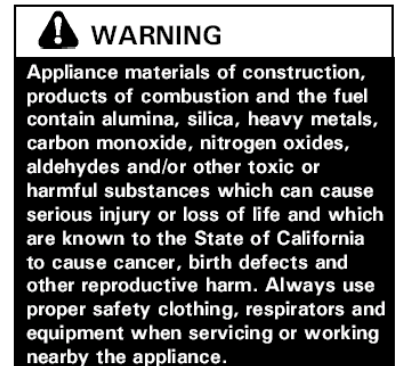
- Operations such as sawing, blowing, tearout and spraying may generate airborne fiber concentration requiring additional protection.

*First aid measures*

- If eye contact occurs, flush eyes with water to remove dust. If symptoms persist, seek medical attention.

- If skin contact occurs, wash affected areas gently with soap and warm water after handling

## ■ Hazardous materials



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## 9 Spec Sheets

6960-1, 2, 3	PYROT rotary combustion chamber boiler, Installation of Closed System
4550-1, 3	Extinguishing System, Installation
6010-1, 2, 3, 4	PYROT Rotation Heating System, Boiler Plant
6110-1, 2	PYROT Rotation Heating System, Exhaust Gas Deduster
6120-1, 2, 3	PYROT Rotation Heating System, De-ashing & Cleaning Systems
6800-1, 2, 3	PYROT Rotation Heating System, Ecotronic Control System
6810-1	PYROT Rotation Firing System, PYROT Double-boiler System
6850-1, 2	Ecotronic Control System, PYROT Remote Transmission
4000-1	ECOTRONIC Heating Control Unit, Equipping
4020-1, 2, 3	ECOTRONIC Heating Control Unit, Module Extension, Data Transmission Lines
4030-1, 2	ECOTRONIC Heat Control Unit, Additional Heat Generators
4040-1, 2	ECOTRONIC Heat Control Unit, Heat Consumer
4050-1, 2	ECOTRONIC Heating Control Unit, Solar Energy
4090-1	ECOTRONIC Heating Control Unit, Visualisation & Remote Maintenance
Supplement	Arrangement of the electrical wiring on the PYROT
1120-1, 2	Services and Installation
1010-1, 2	Wood Fuels, Minimum Requirements / Instructions
1000-1, 2	General Terms and Conditions of Deliver

# 1 General Information

Viessmann solid-fuel boiler may only be set up and commissioned by specialists. This will rule out any incorrect assembly or commissioning. These instructions have thus been reduced to important technical data, references to regulations, technical rules and other regulations.

Steel wood fired hot water heating boiler.

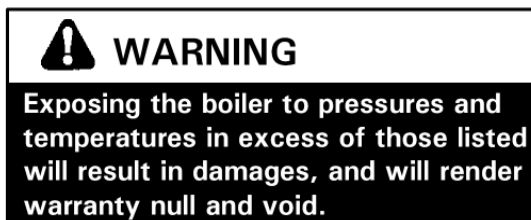
For operation with modulating boiler water temperatures in closed and open loop forced circulation hot water heating systems.

The Pyrot KRT boilers are certified the CAN/CSA B366.1-M91 and UL 391.

The boiler model selected should be based on an accurate heat loss calculation of the building. The boiler selected must be complete with the connected radiation.

Maximum working pressure	30 or 60 psig
Maximum boiler temperature (closed loop)	250 °F / 121 °C

This boiler does not require a flow switch.



## 1.1 State of the art

The operating instructions are in keeping with the PYRTEC at the time of its delivery. In the interest of our customers, we reserve the right to make subsequent alterations resulting from further technical development without being required to give notification of such.

## 1.2 Documented information

The installation instructions contain the information required according to the subject boilers have been tested and examined in accordance with:

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

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

UL391 (4thEd)  
Solid Fuel and Combination-Fuel Central and Supplementary Furnaces

CSA B365-01

Installation Code for Solid Fuel Burning Appliances and Equipment

# 2 Codes

Please carefully read this manual prior to attempting installation. Any warranty is null and void if these instructions are not followed.  
For information regarding other Viessmann System Technology componentry, please reference documentation of the respective product.  
We offer frequent installation and service seminars to familiarize our partners with our products. Please inquire.

The installation of this unit shall be in accordance with local codes. In the absence of local codes, use:  
CSA B365-0

In Canada all electrical wiring is to be done in accordance with the latest edition of CSA C22.1 Part 1 and/or local codes. In the U.S., use the National Electrical Code ANSI/NFPA 70.

## 2.1 Mechanical room

Ensure the mechanical room complies with the requirements in this Viessmann recommends installation of an additional electrical disconnect switch and a fuel shut-off valve (if possible) outside the mechanical room or enclosed area of installation

## 2.2 Working on the equipment

A licensed professional heating contractor who is qualified and experienced in the installation, service, and maintenance of hot water boilers must do the installation, adjustment, service, and maintenance of this boiler. There are no user serviceable parts on the boiler, burners, or control.

Ensure **main power** supply to equipment, the heating system, and all external controls have been **deactivated**. Take precautions in all instances to avoid accidental activation of power during service work.

The completeness and functionality of field supplied electrical controls and components must be verified by the heating contractor. These include low water cut-offs, flow switches (if used), staging controls, pumps, motorized valves, air vents, thermostats, etc.

## 2.3 Technical literature

Literature for PYROT KRT boiler:  
- Assembly Installation Instruction  
- Operating and maintenance instructions  
- Field wiring diagram.

Leave all literature at the installation site and advise the system operator/ultimate owner where the literature can be found. Contact Viessmann for additional copies.

### **3 The structural Surroundings for the Boiler**

**The national building regulations existing in this connection must always be complied with.**

#### **3.1 Heating room requirements**

A separate, dry heating room must always be provided for the PYROT. 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 below the heating boiler.

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 (2000kg/m<sup>2</sup>) 410lb/ft<sup>2</sup>. Detailed technical dimensioning is possible with data sheet no. 6010.

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

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

#### **3.2 The chimney connection**

The PYROT rotary combustion chamber boiler is equipped with an exhaust fan and thus a fireplace without a draught requirement.

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 or
- b) a certified factory-built chimney.

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

**Galvanized steel shall not be used.**

For installations in the USA:

The boiler venting system must be tested and listed by a Nationally Recognized Testing Lab to the UL 103HT- *Standard for Solid and Liquid Fuel Chimneys installed in the USA.*

For installations in Canada:

The boiler venting system must be tested and listed by a Nationally Recognized Testing Lab to the ULC S-629- *Standard for Solid and Liquid Fuel Chimneys installed in Canada.*

The PYROT rotary combustion chamber boiler is output-controlled within a range from 30%-100% of the rated boiler output. This produces exhaust temperatures within a range from min. (100°C) 212°F and max. (250°C) 482°F. An insulated chimney should be provided to prevent the danger of sooting.

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

The connection to the chimney should be made such that it rises at an angle from 30°- 45°.

The exhaust line, incl. the lead-in into the chimney, should be executed so as to be gas-tight.

### **4 Transport and Installation**

**The personnel who carry out the transport have to know the dangers of accidents that might arise on doing so and prevent such through suitable measures.**

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

**Pyrot 150 - 300**

**Hoist by the lifting lug.**

**Pyrot 400 - 540**

**Hoist by forward-flow and return-flow connection pieces using a cross bar.**

**WARNING – Follow instructions for proper installation.**

For fired installations:

This boiler must be installed in accordance with local codes if any; if not, follow B 365-01, Installation Code for Solid-Fuel Burning Appliance and Equipment.

This boiler need fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air.

Inadequate supply of combustion air can cause poisonous flue gases to enter living space with can cause severe personal injury or loss of life.

## 5 Water System Installation

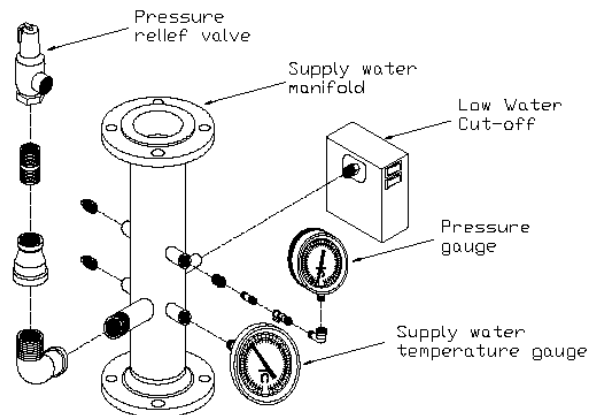
Customers must ensure that there is a supply of water independent of the electricity supply. This (redundant) design ensures that in case of a power failure, the boiler will be reliably cooled by the thermal run-off safety valve.

### 5.1 Safety Equipment

The safety equipment for the heating installation must be carried out by the heating contractor authorised to do so.

See Spec Sheet 5960 as an example.

Installing safety devices on the boiler



Installing safety devices.

1. Install pressure relief valve, discharge pipe, air vent and pressure gage as described in the Installation Instructions of safety header.  
A 30 or 60 psig pressure relief valve is shipped with the boiler (standard equipment).
2. Install discharge pipe on pressure relief valve. The end of the pipe must **not** be threaded.  
The pressure relief discharge pipe should extend to a floor drain and end approximately 6"/150 mm above the drain.  
Do **not** install shut-off valve in discharge pipe.  
Do **not** reduce discharge pipe diameter.  
Do **not** pipe discharge to outdoors!

#### IMPORTANT

**Install the (approved) factory supplied pressure relief valve. Removal of air from the system must occur via use of air vent(s) in the system supply. To ensure the boiler can be purged of all air, ensure supply/return water lines do not contain restrictive piping where air could be trapped.**

#### **WARNING**

**Do not install an isolation valve between boiler and pressure relief valve.**

**The discharge pipe for the pressure relief valve must be oriented to prevent scalding of attendants. Pipe pressure relief valve discharge pipe close to floor drain. Never pipe discharge pipe to the outdoors.**

#### IMPORTANT

This boiler does not require a flow switch.

#### **Low water cut-off**

*A low water cut-off may be required by local codes. If boiler is installed above radiation level, a low water cut-off device of approved type must be installed in all instances. Do not install an isolation valve between boiler and low water cut-off.*

### 5.2 Expansion

With closed expansion, the supply pressure to the expansion tank should be equal to the max. amount of the system pressure plus (0.2 bar) 3 psig.

### 5.3 The boiler circuit with return circuit 3-way valve

To reliably prevent boiler corrosion through condensation of the flue gases, the boiler return flow temperature must in no case be below 65°C 149°F.

The PYROT rotary combustion chamber boiler is infinitely variably output-controlled. For that, it is necessary there to be a constant flow through the boiler of the water to be heated. The boiler circuit the boiler pump and boiler mixer must therefore be installed according to Spec Sheet 6960.

The design of the boiler circuit should be carried out such that the temperature difference between the boiler supply and the Boiler return temperature is equal to or less than (15°C) 27°F.

The activation of the boiler pump and boiler control valve is integrated in the custom control panel that comes with the boiler.

### 5.4 The extinguishing water tank

A self-activating extinguishing device must always be installed next to boiler feed system. With regard to the assembly, refer to the spec sheets in the annex. The functioning is carried out by means of an extinguishing valve and is not dependent on electric current. A float-type switch monitors the water level and should be electrically connected (see connection diagram)



## 6 Electrical Installation

### 6.1 Positioning the control module and control cabinet

Electrical company at a place easily accessible for operation should mount the control module. Optimum positioning of the control cabinet will allow minimisation of the length of installation lines and thus of costs.

The position of the control module and control cabinet should be selected such that the negative effect of heat radiation (front side of boiler, rear side of boiler with exhaust gas collector and exhaust gas fan as well as exhaust gas line) and interference caused by dust during cleaning will both be kept as low as possible.

The ambient temperature for the control cabinet (approx. (10 cm) 4'' away from the control cabinet) should not exceed (40°C) 104°F while the system is in operation. In case of doubt, preference should be given to placing the control cabinet outside the heating room near the heating room door.

### 6.2 Electrical connection

- Connect it according to the wiring plan, lying of the CAN-BUS wire according to data sheet 4020.
- In the area of hot parts (flue gas fan, flue gas pipe), the lines should be installed in steel pipes at an appropriate distance so as to be temperature-protected.
- The cable bushings to the motors and equipment must be executed so as to be dust-tight and provided with a strain relief.

Attention:

This is not complete system drawing. The installer has responsibility to assure that the control is suitable for the respective installation, and all necessary safety equipment is installed.

Attention:

The information about wire type, wire number and wire gauge, made in the wiring diagrams is not obligatory. The final decision of these settings has to be done by the executing installation company considering the local codes and regulations.

## 7 Fire Protection

The fire protection regulations for wood heating systems differ from country to country.

**The regulations applicable to the respective location of installation must always be complied with.**

### 7.1 Protection against burn-back for the boiler plant

These are part of the scope of delivery for the PYRTEC Grate Firing System.

#### 7.1.1 Preventing overfilling of the fire box

A level monitor must be installed to prevent overfilling of the firebox. The PYRTEC Grate Firing System has a light barrier to monitor the embers.

#### 7.1.2 Preventing burn-back

With a sensor directly on the insertion pipe, any danger of burn-back beginning will be detected and quickly counteracted at an early stage through boosted output (an increase in the advancing of the material).

As a result, any requirement for a protective device coming into effect is avoided, and normal operation, defined as the greatest possible degree of safety supplying heat, is adhered to.

#### 7.1.3 The back flash safeguard

The back flash safeguard is over 150 kW.

The PYROT Grate Firing System is always equipped with an isolating layer and is continuously operated with negative pressure.

As a result the PYROT Grate Firing System is considered as equipped with a back flash safeguard.

#### 7.1.4 Boiler Feed Automatically Triggering Extinguishing System.

A water extinguishing system is always necessary on the feed auger.

This system should reliably prevent burn-back 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 always be equipped with a 6.6 USG / 25l extinguishing water tank with a float-type switch and an adjustable Danfoss extinguisher valve. The tank for the SLE must be equipped with a level monitoring system.

If there is a shortage of water, the PYROT Grate Firing System will switch off automatically. In case of excess temperature, the feed auger will be flooded reliably but in a limited fashion.

**The heating contractor according to Spec Sheet 4550 must carry out the piping for the extinguishing system.**

### 7.2 Burn-back safeguard for the fuel supply system (RSE)

The rest of the "burn-back protection for material transport" depends on the respective requirements (location, size of the fuel storage site, material, pressure conditions

and regulations) these being separate items for the scope of delivery ordered from Viessmann according to the descriptions below.

**We always recommend installing a rotary valve as per section 7.2.3 for the PYROT Rotation Heating System. In addition to being a safeguard against burn-back, this will also prevent any penetration by air leaking in via the feed auger.**

#### 7.2.1 Automatically Triggering System for the Material Supply System (SLE-M)

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

**The heating engineer according to Spec Sheet 4550 must carry out the installation of the extinguishing system.**

#### 7.2.2 The slide valve

This is approved in pressure-less fuel storage units in all cases and suitable safeguard against back-burn.

#### 7.2.3 Rotary valve

If remnant wood is moved into fuel storage spaces with fans, then, in order to reduce pressure applied, at least one rotary valve is necessary to reduce pressure between the fuel storage unit and the furnace. The rotary valve is

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

### 7.3 Fire protection for the fuel storage space

The measures necessary for this are never part of the scope of performance from Viessmann.

**The conditions set by the local building authorities must be met by the operating organisation in this connection.**

## 8 Commissioning

Only Viessmann or another trained specialist may put a newly installed facility into operation for the first time.

Before the facility is commissioned, the system must be filled with water, fuel stored for the commissioning and the installation inspected.

### 8.1 Filling the heating system

The first filling is usually carried out with untreated water without any chemical water treatment but definitely filtered and thus free of any suspended solids.

Pay special attention when the filling is carried out to be sure the air is carefully bled out. With difficult water conditions (high degrees of hardness, etc) and/or large vol-

suited to reduce pressure and at the same time is considered as 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.**

#### 7.2.4 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.

**Maximum overpressure allowed in fuel storage unit: (+ 3000 Pa) / + 12"wc.**

**Maximum negative pressure allowed in fuel storage unit: (-3000 Pa) / - 12"wc.**

**One must have the supplier of the chip suctioning system confirm the maximum pressures to be expected.**

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 furnace into the silo.

umes of water by using appropriate measures for water treatment.

**Note: The filling pressure of the cold water reserve should be approx. (0.1 bar) 1.5 psig greater than the supply pressure of the closed expansion tank.**

### 8.2 Fuel for the commissioning

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

This is as follows:

PYROT	100	approx.	1760 lb
PYROT	150	approx.	2640 lb
PYROT	220	approx.	3300 lb
PYROT	300	approx.	4400 lb
PYROT	400	approx.	5500 lb
PYROT	500	approx.	6600 lb

Since the boiler plant is cold, and the residual moisture will also 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. The heating-up process should be carried out during the first three hours at low output.

To check the functioning of the silo extraction system, not too much material to be burned should be stored so as to be able to quickly clear out the extraction system to remedy the cause of any malfunction there might be.

### 8.3 Inspection of the installation

Before the commissioning, the future operating organisation along with the installing companies (heating contractor & electrician) are obliged to inspect the installation for the following points:

1. Exhaust gas port connected to the exhaust gas line on the chimney.
2. Chimney completely installed with clear cross section all the way through.
3. Safety valve installed on the boiler and/or boiler forward flow.
4. Thermal run-off safety valve connected to the cold water network.
5. The sensor for the thermal run-off safety valve is situated in the dipping shell.
6. The sensor for the temperature-limiting safety switch is situated in the dipping shell.
7. The extinguishing water tank on the feed auger is filled with water.
8. The sensor for the extinguisher valve is mounted tight on the pipe for the feed auger.
9. The expansion tank is connected.
10. The conveying systems are installed between the boiler and the material storage unit.
11. The facility is filled with water.
12. Material to be burned is stored for the test operation.
13. The safety limit switch is installed on the door to the material storage site (if there is a walk-through door).
14. The control system is connected to the power supply network.
15. The motors, switches and sensors are electrically connected.

**Do not put the boiler plant into operation over-hastily without the presence of a specialist from Viessmann or another trained specialist.**

**In case of damage, you would lose your warranty claims.**

Inspected on .....

By .....

Signature .....

### 8.4 Commissioning and handover

A competent contact person from the operating organisation's side must be present for the commissioning and handover.

The heat dissipation from the boiler plant has to be assured by the operating organisation or by the heating engineer.

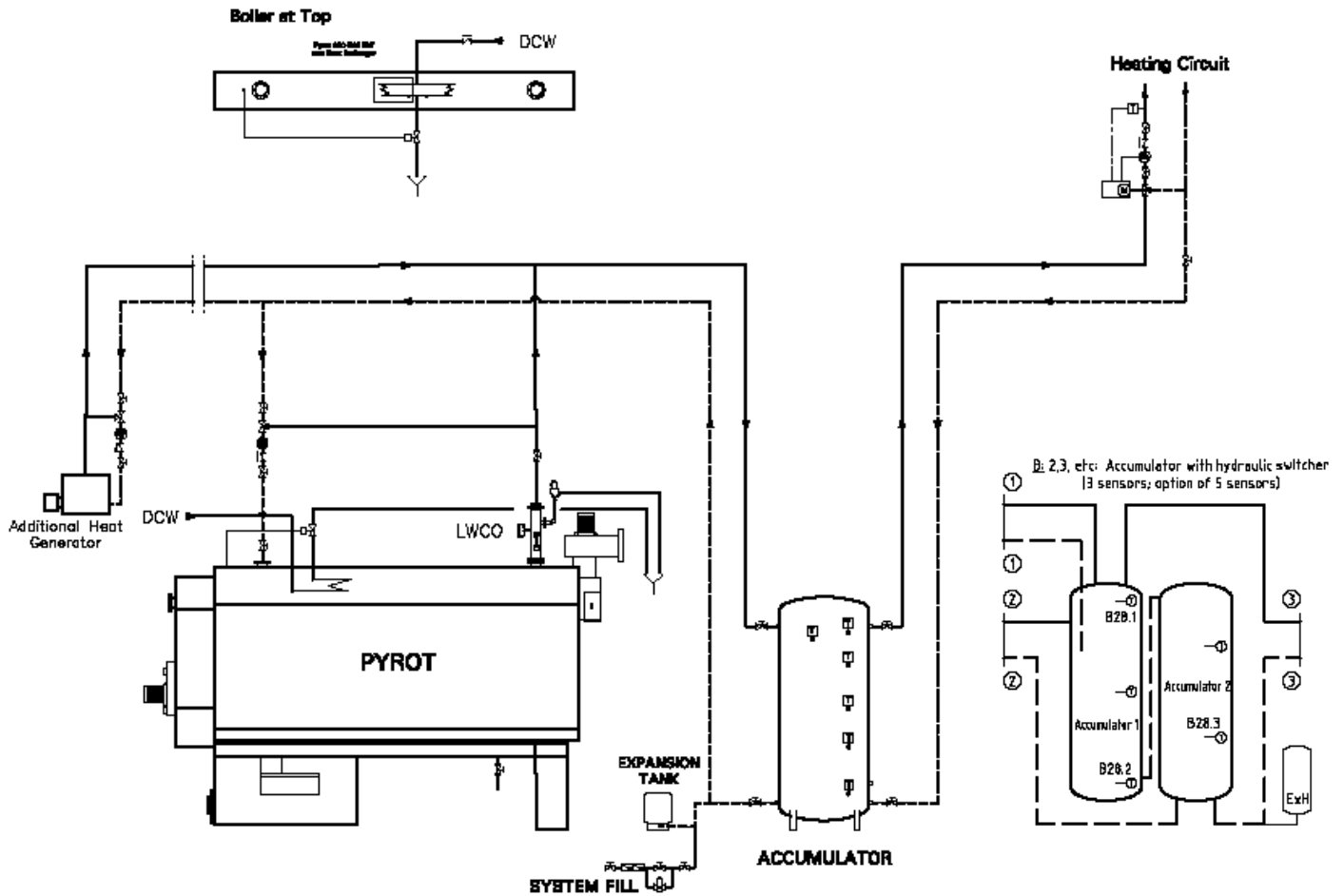
The heating contractor has to confirm that an inspection of the installation has been carried out positively by handing over these signed Installation Instructions.

Complying with these Installation Instructions and also following the Operating Instructions, you will be provided with heat from wood in a safe and convenient fashion.

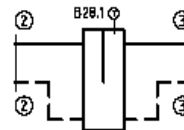
Viessmann Manufacturing Company Inc. thanks you for the trust you have shown in us.

**These Installation Instructions should be kept near the facility on a permanent basis.**

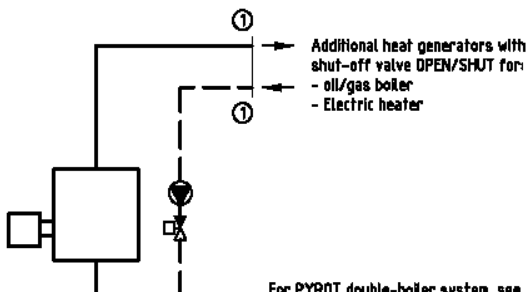
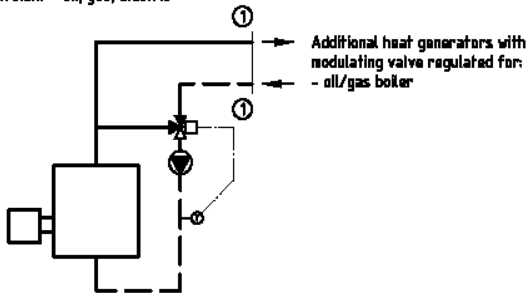
## Notes



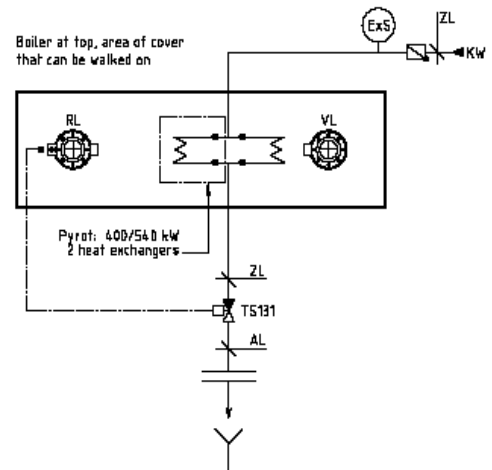
☐ hydraulic switcher is possible with a large volume of water in the network.



**PYROT with additional heat generation**  
 bivalent - oil, gas, electric



For PYROT double-boiler system, see Spec Sheet 6810



**a) 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 boiler circuit pump with a boiler mixer should be provided according to the diagram for this purpose. The boiler circuit should be designed such that the temperature difference between the forward flow and the return flow is equal to or less than  $\Delta t$  15°C / 27°F.
- For integrating heat consumers, see Spec Sheet 4000.
- The expansion tank has to be connected to the boiler above the boiler forward flow and without any shut-offs.

**b) Safety-relevant equipment included in the scope of performance provided by the installing heating engineer**

- M 20 Boiler pump
- Y 20 Boiler mixing valve
- SV Safety valve, pressure set to max. 3.0 bar, homologated component as per DIN 3440  
Nominal width of the valve, of the connection line and of the exhaust pipe as per DIN 4751 Part 2
- TS131 Thermal run-off safety valve R ¾", homologated component; special-purpose design for opening temperature 212°F/ 100°C, (safety heat exchanger built into boiler). With the Pyrot-400 and Pyrot-540, two safety heat exchangers in parallel are required but only one thermal run-off safety valve.
- KW. Cold water inlet, min. 36 psig/ 2.5 bar, max. 51 psig/ 3.5 bar
- WMS... Water level control device, homologated component; required in Germany starting from systems over 350 KW, Installation recommendation: WMS with magnetic transmission of the float movement to a switch unit
- EL Air separator (recommendation: absorption-type degasser)
- ExH... Expansion tank closed, with design certification; for heating system (Recommendation: connect on cool return flow, connected to the boiler via the forward flow without any blockage units)
- ExS... Expansion tank closed; with design certification; for safety heat exchanger, max. 4.0 liters, 145 psig/ 10 bar
- DAZ Pressure indication device (pressure gauge)
- TAZ Temperature indication device (thermometer)

**c) Design recommendation**

Model KRT	Boiler circuit (VL, RL,BP)	Thermal run-off safety valve TS-131 (Quantity)	Water through-put required at 2.5 bar /36 psig		Storage tank (accumulator) Volume <sup>3)</sup>		Supply line ZL	Drain pipe AL <sup>2)</sup>	Safety relief valve		Safety line SL <sup>2)</sup>
			l/h	GPM	L	USG			Watts or Conbraco 30Lb or 60Lb		
150	NW 50	1	915	4	1500	396	R¾"	R 1"	¾"	¾"	NW 40
220	NW 50	1	1230	5.4	2200	581	R¾"	R 1"	¾"	¾"	NW 40
300	NW 65	1	1500	6.6	2500	660	R¾"	R 1"	1"	1"	NW 50
400	NW 80	1	1880	8.3	3200	845	R¾"	R 1"	1"	1"	NW 50
540	NW 60	1	2266	10	4300	1136	R¾"	R 1"	1¼"	1¼"	NW 65

- 1) Threaded connection for supply line
- 2) Length of the exhaust pipe up to 4.0 m 13ft (for longer lines, see DIN 4751 Part 2)
- 3) On request, we will be glad to provide a project-based offer on the storage tanks(s).

**d) Equipment recommendation from Viessmann delivery program**

- Note: The equipment below will only be supplied via the installing heating engineer

Boiler model KRT-	North America							
	pump	freq.	voltage	Grundfos	Vi. Part Number	voltage	Grundfos	Vi. Part number
			and	part		and	part	
			phase	number		phase	number	
150	UPS 32-80 F	60 Hz	3 x 208-230 V	96402710	9560240	1 x 230 V	96402709	9560239
220	UPS 40-80/4 F	60 Hz	3 x 208-230 V	96404950	9544478	1 x 230 V	96404949	9560255
300	UPS 50-80/4 F	60 Hz	3 x 208-230 V	96404960	9560274	1 x 230 V	96404959	9560273
400	UPS 50-80/4 F	60 Hz	3 x 208-230 V	96404960	9560274	1 x 230 V	96404959	9560273
540	UPS 50-80/4 F	60 Hz	3 x 208-230 V	96404960	9560274	1 x 230 V	96404959	9560273

- 1) For  $\Delta t$  15K, 27°F as per illustration
- Any additional resistors (heat meters, slide valve) require redesigning of the boiler pump!



Spec Sheet  
Pyrot Rotation Heating System  
Installation, closed system

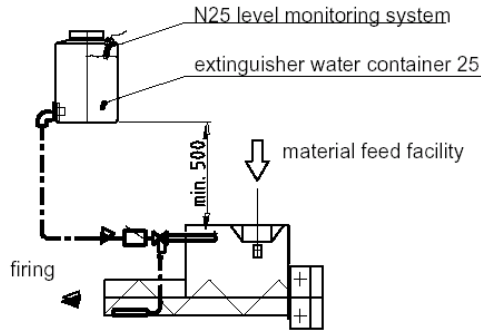
**VISSMANN**  
**6960-3**

Mixing valves:

North America			
boiler model KRT-	diameter	3-way mixing valve Viessmann part no.	mixing valve actuator Viessmann part no.
150	2"	7133024	7133390
220			
300	2½"	Z001194 (Centra)	9544483 (Centra)
400	3"	Z001195 (Centra)	
540			

**a) Fire-extinguishing System for Burner Slide-in Module, Art. No. K-SLE**

**Note:** Pyromat-DYN has an extra charge with Art. No. K-SLE (see Spec Sheet 4500)  
With Pyrot and Pyrtec this is included in the burner article.

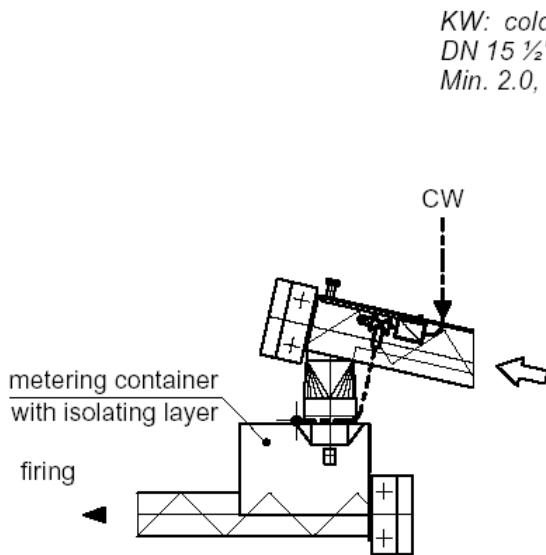


- Line from container to the ½" valve (short as possible)
- Valve adjustment, Danfoss AVTA 15 50-90°C 3, equivalent to approx. 80° C

Fig. 1: K-SLE on feed auger

**b) Fire-extinguishing System for Material Feed Facility, Art. No. K-SLV**

For Köb scope of delivery, refer to Spec Sheet 4500



*KW: cold water inlet  
DN 15 ½"  
Min. 2.0, max. 3.0 bar*

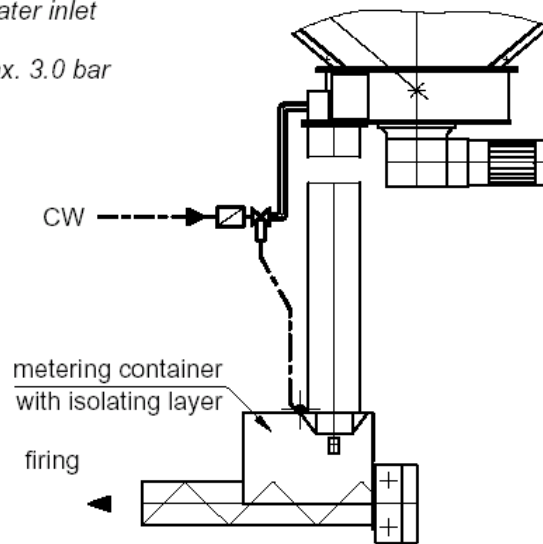


Fig. 2: K-SLV on conveyor auger

Fig. 3: K-SLV on extractor system situated on top with Down pipe

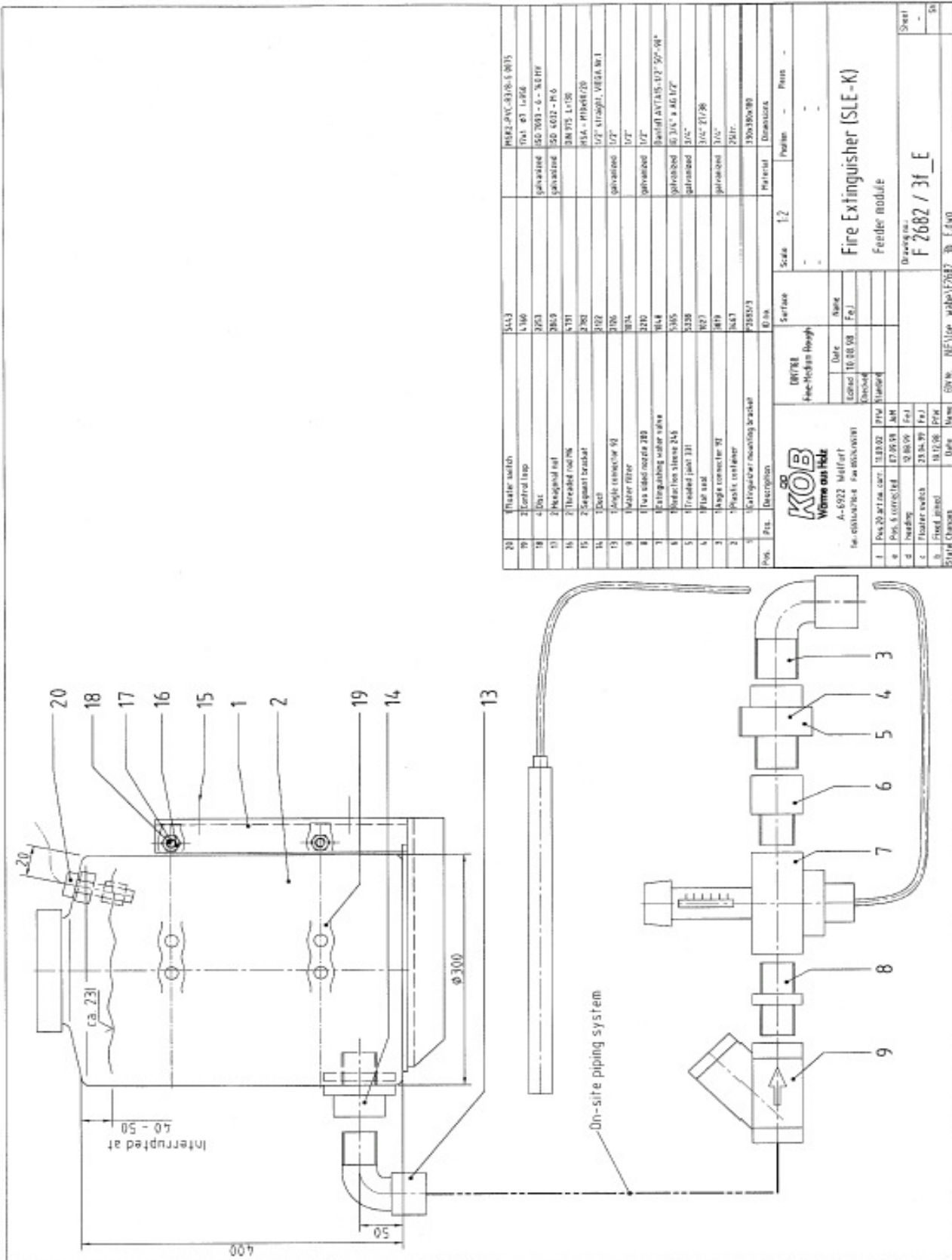
**Be sure to note:**

- The lines must be executed in metal (1/2") with fixed pipe work (K-SLE and K-SLV).
- It must not be possible to shut off the cold water inlet without the aid of tools.
- Be especially sure to comply with Point 5 of the Installation Instructions (Fire Prevention).

Note:

K-SLV is an alternative or supplementary safety device. As standard, either a slide valve (Art. No. MBA-; included in Article ADF\_... / ADE\_3,0) is required for pressure less material storage sites or a rotary valve (Art. No. MBZ-) for material storage sites with over- or under-pressure (loading with fan, such as wood-processing businesses).





Pos.	Pts.	Description	Material	Dimensions
20	1	Fire extinguisher	MSA 24C-33R-5 3015	
19	1	Control tap	10x 87 Lx26	
18	1	Drum	galvanized 50 7003 - 6 - 3015R	
17	1	Threaded nut	galvanized 50 6032 - P6	
16	2	Threaded rod M6	M6 - 1100	
15	2	Support bracket	MSA - 1100R/20	
14	1	Drum	1/2" straight, VERA Nr.1	
13	1	Single connector M	galvanized 1/2"	
9	1	Water filter	1/2"	
8	1	Flow rated nozzle 2B3	galvanized 1/2"	
7	1	Extinguishing water valve	Beidell AT 135-417 50"-94"	
6	1	Reduction sleeve 2x4	galvanized 1/2" x 3/4" x 1/2"	
5	1	Threaded joint 3/1	3/16"	
4	1	Flare seal	1/2" 11/8"	
3	1	Single connector M	galvanized 1/2"	
2	1	Plastic container	2017	
1	1	Extinguisher mounting bracket	130x150x80	

Pos.	Pts.	Description	Material	Dimensions
9	1	Water filter	1/2"	
8	1	Flow rated nozzle 2B3	galvanized 1/2"	
7	1	Extinguishing water valve	Beidell AT 135-417 50"-94"	
6	1	Reduction sleeve 2x4	galvanized 1/2" x 3/4" x 1/2"	
5	1	Threaded joint 3/1	3/16"	
4	1	Flare seal	1/2" 11/8"	
3	1	Single connector M	galvanized 1/2"	
2	1	Plastic container	2017	
1	1	Extinguisher mounting bracket	130x150x80	

Pos.	Pts.	Description	Material	Dimensions
1	1	Fire extinguisher	MSA 24C-33R-5 3015	
2	1	Control tap	10x 87 Lx26	
3	1	Drum	galvanized 50 7003 - 6 - 3015R	
4	2	Threaded nut	galvanized 50 6032 - P6	
5	2	Threaded rod M6	M6 - 1100	
6	2	Support bracket	MSA - 1100R/20	
7	1	Drum	1/2" straight, VERA Nr.1	
8	1	Single connector M	galvanized 1/2"	
9	1	Water filter	1/2"	
10	1	Flow rated nozzle 2B3	galvanized 1/2"	
11	1	Extinguishing water valve	Beidell AT 135-417 50"-94"	
12	1	Reduction sleeve 2x4	galvanized 1/2" x 3/4" x 1/2"	
13	1	Threaded joint 3/1	3/16"	
14	1	Flare seal	1/2" 11/8"	
15	1	Single connector M	galvanized 1/2"	
16	1	Plastic container	2017	
17	1	Extinguisher mounting bracket	130x150x80	

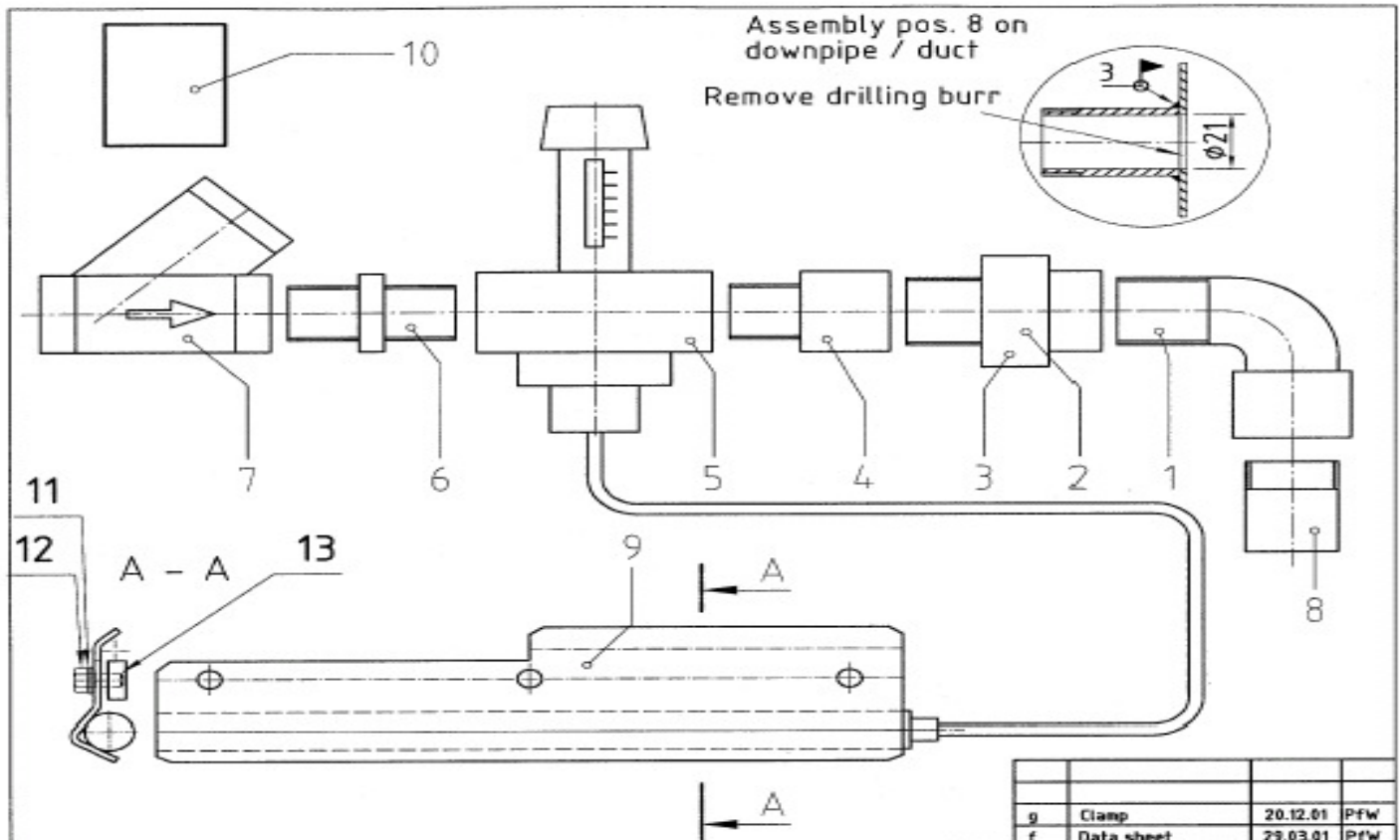
Pos.	Pts.	Description	Material	Dimensions
1	1	Fire extinguisher	MSA 24C-33R-5 3015	
2	1	Control tap	10x 87 Lx26	
3	1	Drum	galvanized 50 7003 - 6 - 3015R	
4	2	Threaded nut	galvanized 50 6032 - P6	
5	2	Threaded rod M6	M6 - 1100	
6	2	Support bracket	MSA - 1100R/20	
7	1	Drum	1/2" straight, VERA Nr.1	
8	1	Single connector M	galvanized 1/2"	
9	1	Water filter	1/2"	
10	1	Flow rated nozzle 2B3	galvanized 1/2"	
11	1	Extinguishing water valve	Beidell AT 135-417 50"-94"	
12	1	Reduction sleeve 2x4	galvanized 1/2" x 3/4" x 1/2"	
13	1	Threaded joint 3/1	3/16"	
14	1	Flare seal	1/2" 11/8"	
15	1	Single connector M	galvanized 1/2"	
16	1	Plastic container	2017	
17	1	Extinguisher mounting bracket	130x150x80	

Scale 1:2

Fire Extinguisher (SLE-K)  
Feeder module

Drawing no.: F 2682 / 31\_E

Pos.	Pts.	Description	Material	Dimensions
1	1	Fire extinguisher	MSA 24C-33R-5 3015	
2	1	Control tap	10x 87 Lx26	
3	1	Drum	galvanized 50 7003 - 6 - 3015R	
4	2	Threaded nut	galvanized 50 6032 - P6	
5	2	Threaded rod M6	M6 - 1100	
6	2	Support bracket	MSA - 1100R/20	
7	1	Drum	1/2" straight, VERA Nr.1	
8	1	Single connector M	galvanized 1/2"	
9	1	Water filter	1/2"	
10	1	Flow rated nozzle 2B3	galvanized 1/2"	
11	1	Extinguishing water valve	Beidell AT 135-417 50"-94"	
12	1	Reduction sleeve 2x4	galvanized 1/2" x 3/4" x 1/2"	
13	1	Threaded joint 3/1	3/16"	
14	1	Flare seal	1/2" 11/8"	
15	1	Single connector M	galvanized 1/2"	
16	1	Plastic container	2017	
17	1	Extinguisher mounting bracket	130x150x80	



Pos.	Pcs.	Description	ID no.	Material	Dimensions
13	1	Rail	F 2637/4		
12	3	Hexagonal nut	ISO 4017 - M5 x 10	Galvanized	
11	3	Strain washer	UN 9069 - M5	Galvanized	
10	1	Data sheet	1400-1		
9	1	Clamp	F 2636/3		
8	1	Welded on end 533			3/4" L= 35mm
7	1	Water filter	1074		1/2"
6	1	Two sided nozzle 280	2210	Galvanized	1/2"
5	1	Extinguisher water valve	1048		Danfoss AVTA15-1/2"
4	1	Reduction sleeve 246	5356	Galvanized	IG 3/4" x AG 1/2"
3	1	Treaded joint 331	5338	Galvanized	3/4"
2	1	Flat seal	1027		3/4" 27/38
1	1	Angle connector 92	3819	Galvanized	3/4"

Pos.	Pcs.	Description	ID no.	Material	Dimensions
		DIN1168 Fine-Medium Rough	Surface	Scale 1:2	Position - Pieces -
A-6922 Wolfurt Tel.: 05574/6710-0 Fax 05574/65787		Date	Name	<b>Fire Extinguisher Additional</b> Downpipe AP / ascending or cross feeder duct	
		Edited 30.10.97	JoM		
		Checked			
		Standard			
e	1	Danfoss valve	27.07.00	PfW	Drawing no. <b>F 2482 / 4g_E</b>
d	1	Braukmann valve	06.08.99	FeJ	
c	1	Danfoss valve	10.12.1998	PfW	
b	3	add Pos. 2 +3	03.11.1998	JoM	
a	1	Pos. 2 changed	9.01.1998	JoM	
State Changes		Date	Name	EDV Nr. N:F\UEV\F2482 4g E.dwg	Sheet - SH

## Description:

The PYROT Rotation Heating System (patent no: EP 0 905 442 B1) was developed for automatic incineration of all dry to moist wood fuels (remnant wood, pellets and forest woodchips to max. W35-40).

The PYROT Rotation Heating System is characterized by high efficiencies and perfect incineration at all load levels. The PYROT Boiler Plant has been tested and approved in accordance with the latest quality criteria as per EN 303-5 Heating Boilers for solid fuels, CE-certification in accordance with European Machinery Directive with continuous quality inspection by the TÜV.

Max. forward flow temperature allowed: 250°F / 121°C

Max. operating pressure allowed: 30 or 60psig

Safety heat exchanger: Built into the boiler

## How it functions:

- The feed auger conveys the material to be burned diagonally from below into the firing system. The holding devices for the burn-back sensor and the thermal extinguishing valve are situated on the conveyor pipe. Above the auger, there is a metering container with a light barrier to ascertain the level of the fuel isolating layer required according to TRD 414.
- The material to be burned is ignited automatically by an electric heat gun. The gasification of the fuel is carried out on a feed grate moved by a worm-gear motor. The ash falls in an ash bin below. An automatic de-ashing system is optional. The fire block is lined with highly refractory insulation and fired refractory concrete elements.
- The combustion gases rising from the fire block are swept up by the rotating secondary airflow brought to bear by the rotation blower and burned out completely in the round combustion chamber. The thermal energy from the combustion gases is transmitted to the boiler water in a horizontally positioned pipe-type heat exchanger. The boiler is heavily insulated, cased in an aesthetically pleasing fashion and provided with excellent access through the boiler door on the end side. On the rear side of the boiler there is a flange for an oil burner, which is closed by an insulated blank lid with an inspection window.
- A flue gas re-circulation system reduces the temperature in the fire box while maintaining the highest possible degree of efficiency. This increases the service life of the un-cooled refractory elements in the incineration zone. With the basic setting, the ratio of re-circulated gas to fresh air is geared precisely to the material to be burned. A mechanical flow volume regulator provides a constant ratio of the quantity of re-circulated gas to fresh air over the entire output range.
- The flue gas fan is specially designed for wood heating operation and is very quiet. The motor has a solid, heat resistant design with a heat dissipation hub and is spring-supported. The fan casing on the intake port turns in infinitely variable fashion. The blow-out nozzle is round. Installation is possible on the top, side or rear of the flue gas collector. Included in the delivery:
- Feed auger with isolating layer, incl. extinguishing valve with dirt trap, extinguishing water container with holding device
- Fire block with feed grate
- Automatic ignition device
- Boiler with rotation combustion chamber
- Set of displacement rods
- Flue gas re-circulation system
- Exhaust fan
- Supplementary air device (draught controller); for installation in the exhaust pipe
- Accessories: counter-flange, incl. bolts, seals and cleaning device

Requirements on the chimney:

Installation of a supplementary air device (draught controller) if not possible in the fire tube (see Spec Sheet 6010-3).

ACCESSORIES for PYROT Rotation Heating System (Item KRT-...) at extra charge:

Designation	Item		Text	Dimensions	Use
Exhaust gas de-duster 90 l	KRT-E...1	6110	6110		Optional
De-ashing in bin, 240 l	KRT-A2-S	6120	6120		Optional (standard)
De-ashing in skip, 800 l	KRT-A8-S	6120			Variation for KRT-A2-S
De-ashing in base container	KRT-ES-...-S	6120	6120		Variation for KRT-A2-S
Cleaning system, pneumatic	KRT-W...-S	6120	6120		Optional
Operating pressure of 6 bar allowed	KRT-P..	6200			Customized design from PYROT 220
Feed auger, two-stage ,	KRT-P2	6200			Optional (switchover: pellets to chips)
Insulation for re circulated flue gas line DN 80	KRT-RZ-IS1	6200			Advisable (or insulation by customer)
Insulation for re circulated flue gas line DN 125	KRT-RZ-IS2	6200			Advisable (or insulation by customer)
<i>Reduced output:</i>	<i>KRT- VS-...</i>		<i>6200</i>		<i>Optional (reduced charge)</i>
<i>Ecotronic control system</i>	<i>ECO-...</i>	<i>6800</i>			<i>Required</i>



**Technical specs:**

		<i>PYROT Rotation Heating system</i>				
Trade name		<b>150</b>	<b>220</b>	<b>300</b>	<b>400</b>	<b>540</b>
Item No:		KRT-150	KRT-220	KRT-300	KRT-400	KRT-540
<b>Performance data</b>						
Related heat output QN	MBH / [kW]	512 / 150	751 / 220	1024 / 300	1365 / 400	1843 / 540
Continuous output <sup>1)</sup>	Q <sub>b</sub> MBH / [kW]	461 / 135	683 / 200	921 / 270	1229 / 360	1639 / 480
Minimum heat output <sup>2)</sup>	Q <sub>min</sub> MBH / [kW]	154 / 45	205 / 60	273 / 80	341 / 100	478 / 140
Efficiency in operation to be performed [%]		85%				
Maximum water content <sup>3)</sup>	[%]	W 40				
Size of the chips <sup>4)</sup>		<b>G 30 / G 50 as per CAN/CSA-B366. 1-M91</b>				
<b>Exhaust gas figures</b>						
Mass flow rate QN; W5; O2 6%	[lb/s] [g/s]	80.4	117.9	160.8	214.4	289.44
Volume flow QN; W5; O2 6%; 150°C	[ft³/s][ m³/s]	3.1 / 0.09	4.9 / 0.14	6.7 / 0.19	8.8 / 0.25	12.4 / 0.35
Mass flow rate QW35; W35; O2 8%;	[g/s]	106.9	156.9	213.9	285.2	385.1
Volume flow QW35;W35; O2 8%; 150°C	[m/s]	0.12	0.19	0.25	0.34	0.46
Average exhaust gas temperature at QN <sup>5)</sup>	[°F / °C]	320 / 160				
Average exhaust gas temperature at QMin <sup>5)</sup>	[°F / °C]	266 / 130				
Chimney draught required	[Pa]	± 0				
<b>Electrical connections</b>						
Electrical connections, total	[kW]	2.67	2.85	3.6	3.98	3.63
Ignition device	[kW]	1.6				
Flue gas fan	[kW]	0.55	0.55	0.75	1.1	1.1
Articulated head fan	[kW]	0.12				
Feed auger	[kW]	0.37	0.55	1.1	1.1	0.75
Grate drive unit	[kW]	0.03	0.03	0.03	0.06	0.06
Electric power consumption at QN	[kW]	1.032	1.108	1.521	1.868	1.753
Electric power consumption at Qmin	[kW]	0.355	0.369	0.434	0.480	0.460
<b>Heating – relevant specs</b>						
Volume on heating gas side	[ltr]	374	744	883	1340	1613
Volume of ash container for grate ash	[ltr]	32	45	55	75	91
Volume of ash container for flue gas de-duster	[USG / ltr]	24 / 90				
Water side resistance (diff. 15 K / 27 °F)	[“wc/mbar]	13 / 38	30 / 76	16 / 42	11 / 29	22 / 56
Boiler water volume	[USG / ltr]	114 / 432	209 / 794	238 / 903	350 / 1326	399 / 1510
Heating surface	[ft² / m²]	116 / 1.078	173 / 16.04	115 / 20.72	310 / 28.76	424 / 39.36
Test pressure <sup>6)</sup>	[psig / bar]	173 / 5				
Maximum operating pressure <sup>6)</sup>	[psig / bar]	30 or 60 / 2 or 4				
Maximum boiler operating pressure	[°F / °C]	212 / 100				
Minimum return temperature	[°F / °C]	149 / 65				
<b>Weights</b>						
Weights of fire block	[lb / kg]	906 / 412	1084 / 493	1251 / 569	1590 / 723	1648 / 794
Weight of heat exchanger <sup>7)</sup>	[lb / kg]	3201 / 1455	5031 / 2287	5970 / 2714	8690 / 3950	9541 / 4337
Weight of flue gas de-duster	[lb / kg]	649 / 295	693 / 315	693 / 315	770 / 350	770 / 350
Weight of feed auger	[lb / kg]	277 / 126	277 / 126	277 / 126	282 / 128	282 / 128
Total weight without water <sup>8)</sup>	[lb / kg]	5034 / 2288	7086 / 3221	8193 / 3724	11332 / 5151	12340 / 5609
Total weight with water <sup>8)</sup>	[lb / kg]	5984 / 2720	8833 / 4015	10179 / 4627	14249 / 6477	15662 / 7119

1) Continuous output:

Output leveling out as base load boiler in continuous operation with pneumatic cleaning system (for track time, see Operating Instructions)

2) Q Q<sub>min</sub> :

Operation with modulated control (Infinitely variable power control)

Q ! Q<sub>min</sub> :

Low load with ON Q<sub>min</sub> / OFF (Stop-and-go mode)

3) Moist fuels:

> W35 further limitations regarding output, degree of efficiency and control behavior

4) Specification:

See Spec Sheet 1010, Minimum Requirements for Wooden Fuels

5) Exhaust gas temperature:

An increase is possible by removing the displacement rods (Q<sub>N</sub> + 30°C; Q<sub>min</sub> + 10°C)

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 exhaust gas temperature by approx. 20°C)

6) At extra charge:

7.8 bar test pressure; 6 bar operational pressure;

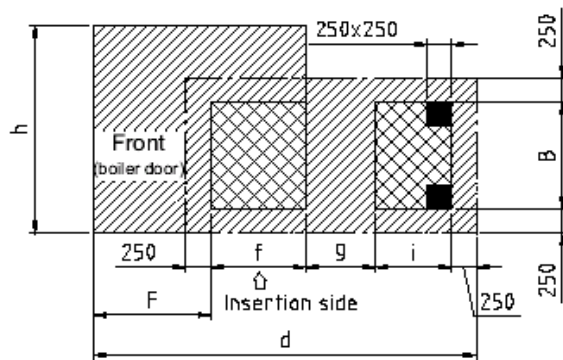
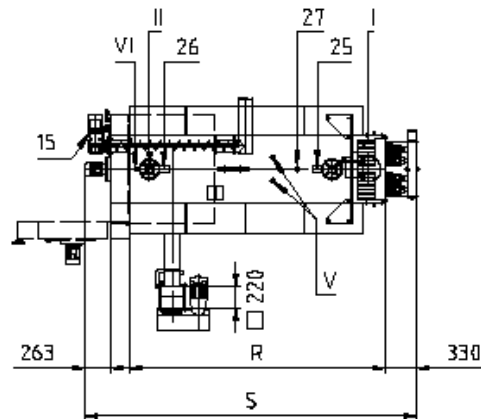
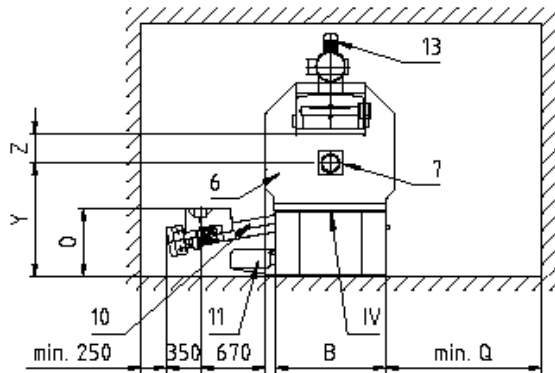
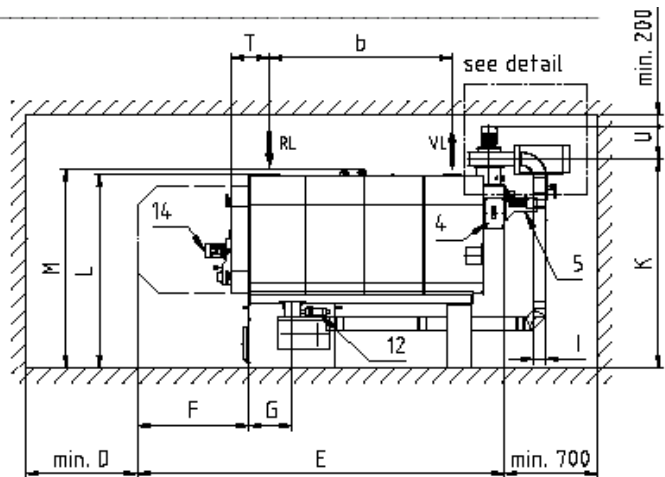
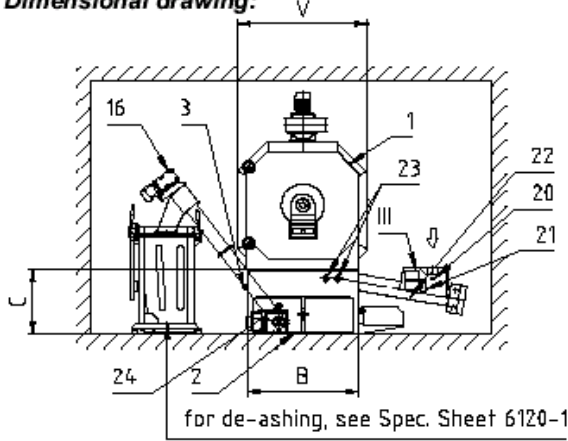
7) Weights:

Incl. door and refractory concrete lining

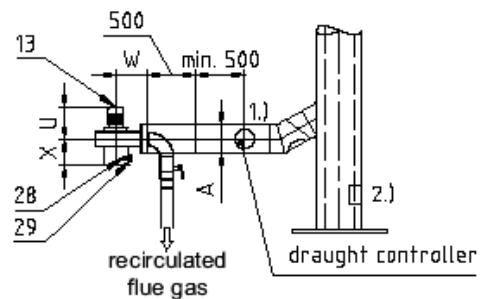
8) Total weight:

Incl. displacement rods

**Dimensional drawing:**



detail of how exhaust gas is conducted



Boiler bearing surface



Bottom with heat-resistant design: extra



The surface of the floor has to be free of any pipes or installation lines !  
The effects of heat would create a danger !

1.) Draught controller in the exhaust pipe:  
included in scope of supply  
Position: as close as possible to the chimney

2.) Draught controller in chimney, at bottom:  
supplied by customer  
Necessary: when not possible in exhaust pipe



Spec Sheet  
Pyrot Rotation Heating System  
Boiler Plant

**VIESSMANN**  
**6010-4**

**Connections / dimensions:**

Ptrtec [Item-Nr.]		KRT-150	KRT- 220	KRT-300	KRT-400	KRT-540
Water connection PN 6 (see Spec Sheet 6960)						
I	Boiler forward flow	R 2" F	3"/ DN 80 PN6	3"/ DN 80 PN6	4"/DN 100 PN6	4"/DN 100 PN6
II	Boiler return flow	R 2" F	3"/DN 80 PN6	3"/DN 80 PN6	4 /DN 100 PN6	4"DN 100 PN6
III	Connection for extinguishing water	R 3/4"				
IV	Drain valve for boiler	2 x R 1/2"M	2 x R 1/2"M	2 x R 1/2"M	4 x R 1/2"M	4 x R 1/2"M
V	Safety heat exchanger	2 x R 1/2"F				
VI	Dipping shell for thermal run off safety					
Connection exhaust flue gas pipe Ø [in / mm]		A	9 <sup>7</sup> / <sub>8</sub> " / 250	9 <sup>7</sup> / <sub>8</sub> " / 250	11 <sup>7</sup> / <sub>8</sub> " / 300	13 <sup>7</sup> / <sub>8</sub> " / 350
Location of the connections [in / mm]		b	60.6 / 1541	60 / 1525	73.8 / 1875	70.8 / 1800
Dimension of the foundations [in / mm]		d	112.2 / 2850	123.2 / 3130	142.2 / 3613	147.1 / 3738
		f	29.1 / 740	29.1 / 740	34.6 / 880	37.8 / 960
		g	20.5 / 520	20.5 / 520	28.3 / 723	17.6 / 448
		h	61.8 / 1570	80.7 / 2050	80.7 / 2050	96.8 / 2460
		i	24.4 / 620	26.7 / 680	26.7 / 680	31.5 / 800
Dimensions of the boiler		B	34.25 / 870	45.25 / 1150	45.25 / 1150	54.7 / 1390
		C	26.5 / 673	26.5 / 673	26.5 / 673	26.5 / 673
		D	75.6 / 1920	86.5 / 2200	86.5 / 2200	96 / 2440
		E	122.8 / 3120	134.8 / 3424	148.8 / 3780	157.6 / 4004
		F	34.25 / 870	45.25 / 1150	42.25 / 1150	54.75 / 1390
		G	14.6 / 370	14.6 / 370	17.3 / 440	17.3 / 440
		I	3" / DN 80	3" / DN 80	5" / DN 125	5" / DN 125
		K	75 / 1908	85.3 / 2168	86 / 2182	96.7 / 2457
		L	69.5 / 1765	79.6 / 2024	79.6 / 2024	89 / 2262
		M	71.8 / 1825	82 / 2084	82 / 2084	95.3 / 2422 <sup>(1)</sup>
		O	27.5 / 700	27.5 / 700	27.5 / 700	27.5 / 700
		Q	27.5 / 700	35.4 / 900	35.4 / 900	43.3 / 1100
		R	88.5 / 2250	89.5 / 2274	103.5 / 2630	103 / 2614
		S	119.5 / 3035	120.4 / 2059	134.5 / 3415	136.1 / 3457
		T	15.5 / 392	16 / 406	16 / 406	18.3 / 466
		U	14 / 358	14 / 358	13.8 / 352	14.75 / 375
		W	11.5 / 292	11.5 / 292	12.7 / 323	12.7 / 323
		X	9.1 / 232	10.1 / 257	10.9 / 277	14 / 355
		Y	43 / 1093	46.4 / 1179	46.4 / 1179	48 / 1219
		Z	11.9 / 303	12.5 / 316	12.5 / 316	12.6 / 319

1) With Pyrot 400/5540: Suspension gear is detachable.

Parts for maintenance						
1	Boiler door with rotation fan					
2	Ash doors for the grate ash (2 units)					
3	Maintenance cover for firing block					
4	Cleaning lid for exhaust gas collector					
5	Pneumatic cleaning system			Item KRT-W...-S	Spec Sheet 6120	
6	Re-circulated flue gas line, variable arrangement of line					
Electric drives & ignition						
7	Feed auger					
8	Drive and feed grate					
9	Ignition device					
10	Exhaust fan					
11	Articulated head fan					
12	De ashing system for fire block			Item KRT-E.-S	/ Spec Sheet 6120	
13	De-ashing system for ascending conveyor auger			Item KRT-E.-S	/ Spec Sheet 6120	
Switches and sensors These items are part of the Ecotronic control system						
14	Light barrier for feed auger			Item PRT-...	/ Spec Sheet 6800	
15	Limit switch for maintenance cover					
16	Temperature sensor for feed auger					
17	Light barrier for embers (2 units)					
18	Light barrier for de-ashing					
19	Boiler sensor					
20	Return flow sensor					
21	Temperature-limiting safety switch (STB)					
22	Exhaust gas sensor			Location:	Spec Sheet 6010	
23	Lambda sensor with measuring transducer			Location:	Spec Sheet 6010	



Spec Sheet  
Pyrot Rotation Heating System  
Exhaust Flue gas De duster

**VIESSMANN**  
**6110-1**

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**Description:**

**Exhaust gas de-duster 90 liters [24 USG], [Item no. KRT-E...-1]**

The exhaust gas de-duster is for minimizing dust emissions and is executed as a multi-cyclone with an axial function. The De-duster is completely insulated, attractively encased and provided with three lids for cleaning. The crude gas space is cleaned via the cleaning lid on the side. The clean gas chamber is cleaned via the top or rear cleaning lid (fan connection not used).

The ash container, which is provided with a trolley, connects to the de-duster by quick-action fasteners and moves out simply for emptying. The exhaust fan (see description of PYROT) is mounted either on top or on the side, as desired.

*Note: The exhaust gas de-duster is required for the PYROT with fuels with high amounts of fine particles.*

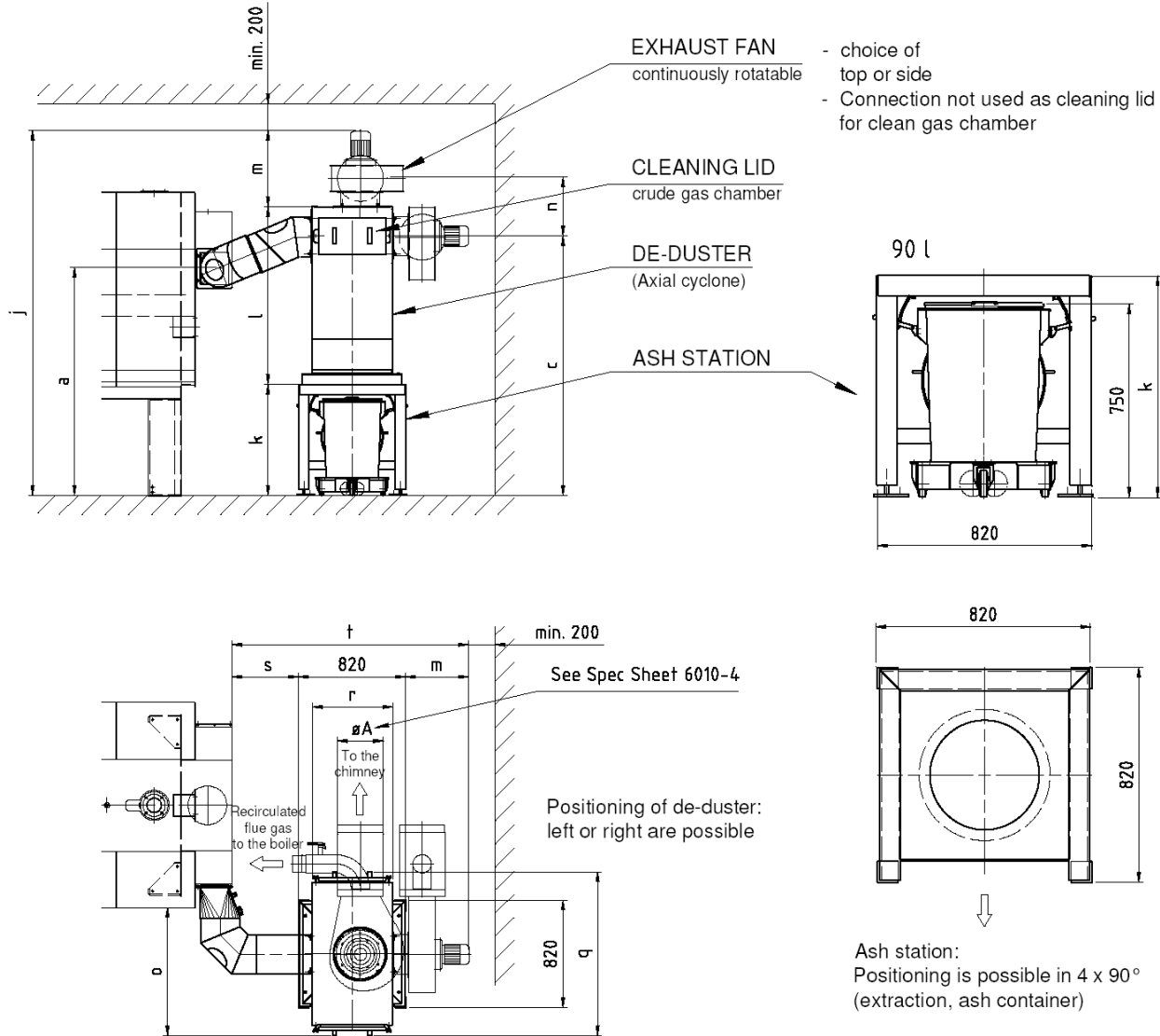
*(Woodworking businesses, forest woodchips with fine particles amounting to more than 4%)*

*One ash bin comes with the system.*

*Additional ash bins have to be ordered separately.*

**Ash Bin, 90 liters [24 USG], reserve [Item No. EB-90]**

**Dimensions and data:**



Exhaust flue gas de-duster PYROT [ITEM NO]		KPR-E150-1	KPR-300-1	KPR-E400-1	KPR-E540-1
A	[in] / [mm]	7.9 / 200	9.8 / 250	11.8 / 300	11.8 / 300
a	[in] / [mm]	59.8 / 1521	63.8 / 1621	65.8 / 1671	68.5 / 1741
c	[in] / [mm]	59.7 / 1518	69.9 / 1775	73.8 / 1875	76.7 / 1949
j	[in] / [mm]	92 / 2338	103.7 / 2643	111.6 / 2835	115.3 / 2930
k	[in] / [mm]	33.5 / 850	33.5 / 850	33.5 / 850	36.2 / 920
l	[in] / [mm]	35.3 / 898	45.5 / 1155	49 / 1247	49 / 1247
m	[in] / [mm]	23.2 / 590	24.7 / 629	28.7 / 730	28.7 / 730
n	[in] / [mm]	18.3 / 465	19.5 / 497	22.9 / 582	22.9 / 582
o	[in] / [mm]	21.5 / 545	20.8 / 530	38.5 / 977	38.5 / 977
r	[in] / [mm]	36.2 / 820	36.2 / 820	36.2 / 820	36.2 / 820
s	[in] / [mm]	11 / 280	14.5 / 370	14.5 / 370	14.5 / 370
t	[in] / [mm]	66.5 / 1690	59.8 / 1519	75.6 / 1920	75.6 / 1920
u	[in] / [mm]	-	-	49.2 / 1250	49.2 / 1250

Note: See Spec Sheet 6010 on how the exhaust flue gas is conducted



**Description:**

**De-ashing in Ash Bin 240 liters [63.5 USG], [Item No. KRT-A2-S]**  
**De-ashing in Ash Skip, 800 liters [211.3 USG], [Item No. KRT-A8-S]**

Complete auger de-ashing from the ash chamber for the fire block into an externally situated movable galvanized ashbin (standard 240 liters). A light barrier control system keeps the level of the ashes constantly over the auger. As a result, the ash in the ash pan under the incineration system can burn out, and in normal operation only cool ash that has burned out is conveyed into the container.

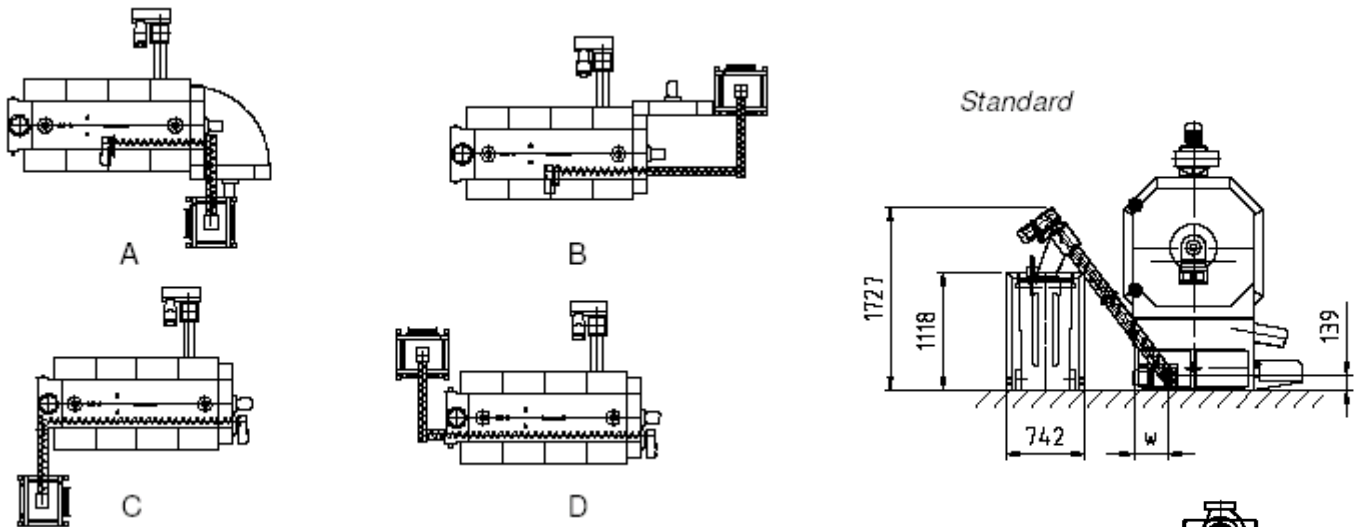
Delivery includes:

- Boiler ash pan with ash level control system and de-ashing auger made of high-temperature steel  
 Drive via worm-gear motor
- Connection station with moveable ashbin
- Triggering system for the worm drives
  - Infrared light barrier for level monitoring of ash in fire box

**Data and dimensions for de-ashing into ashbin, 240 liters:**

Pyrot	KRT-150	KRT-220	KRT-300	KRT-400	KRT-540
[ITEM No]	<b>KRT-EA2-S</b>				
<b>Dimensions:</b>					
w [in] / [mm]	9.8 / 249	12.5 / 319	12.5 / 319	11.8 / 301	11.8 / 301
x [in] / [mm]	40.2 / 1023	40.2 / 1023	46.9 / 1193	50.1 / 1273	55.4 / 1408

Connection station with moveable ash bin; mountable at 90° and thus making it possible to select the direction in which it moves out.



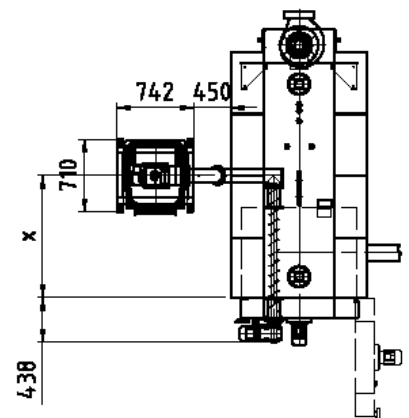
Standard variations and A-D are also possible in mirror-inverted fashion.

Extension of ascending conveyor auger per meter [Item No. KRT-ASM]

Extension of de-ashing auger per meter [Item No. KRT-AFM]

Ash bin, 240 l [63.5 USG], reserve [Item No. EB-240]

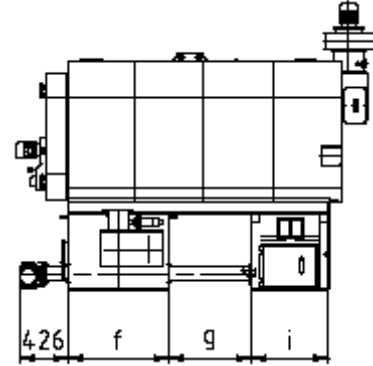
Ash skip, 800 l [211.3 USG], reserve [Item No. EC-800]



**Description:**

- De-ashing in Base Container [Item No. KRT-ES-100-S]
- De-ashing in Base Container [Item No. KRT-ES-150-S]
- De-ashing in Base Container [Item No. KRT-ES-220-S]
- De-ashing in Base Container [Item No. KRT-ES-300-S]
- De-ashing in Base Container [Item No. KRT-ES-400-S]
- De-ashing in Base Container [Item No. KRT-ES-540-S]

Complete auger de-ashing out of the ash chamber for the fire block into the base container situated under the boiler with maximum volume. A light barrier control system keeps the level of the ashes constantly over the auger. As a result, the ash in the ash pan under the incineration system can burn out, and in normal operation only cool ash that has burned out is conveyed into the container. With the large base container, maximum maintenance-free intervals are achieved.



Delivery includes:

Boiler ash pan with ash level control system and de-ashing auger made of high-temperature steel

Drive via worm-gear motor

- Base container with maximum volume and two maintenance doors for removing ash by vacuum or kindling utensils
  - Control of the de-ashing by light barrier

**Data and dimensions for de-ashing in base container:**

<b>Pyrot</b>	<b>KRT - 150</b>	<b>KRT - 220</b>	<b>KRT - 300</b>	<b>KRT - 400</b>	<b>KRT - 540</b>	
<b>[Item No.]</b>	<b>KRT-ES-150-S</b>	<b>KRT-ES-220-S</b>	<b>KRT-ES-300-S</b>	<b>KRT-ES-400-S</b>	<b>KRT-ES-540-S</b>	
<b>Dimensions:</b>						
f	[in] / [mm]	29.1 / 740	29.1 / 740	34.6 / 880	37.8 / 960	43.1 / 1096
g	[in] / [mm]	17.7 / 450	20.2 / 513	31 / 787	18 / 456	21.7 / 551
i	[in] / [mm]	23.3 / 593	26.7 / 680	26.7 / 680	31.5 / 800	31.5 / 800
<b>Volume of base container:</b>						
[USG] / [Liters]	63 / 240	95 / 360	100 / 380	158.5 / 600	185 / 700	
<b>Weight of complete de ashing system: (in addition to boiler weight)</b>						
[Lb] / [kg]	705 / 320	749 / 340	793 / 360	838 / 380	882 / 400	

**Description:**

- Pneumatic Cleaning System** [Item No. KRT-W100-S]
- Pneumatic Cleaning System** [Item No. KRT-W150-S]
- Pneumatic Cleaning System** [Item No. KRT-W220-S]
- Pneumatic Cleaning System** [Item No. KRT-W300-S]
- Pneumatic Cleaning System** [Item No. KRT-W400-S]
- Pneumatic Cleaning System** [Item No. KRT-W540-S]

The complete pipe-type heat exchanger is cleaned by periodic impulses of compressed air when in operation. The process of cleaning takes place as blasts of the various sections that follow one after the other. The detaching of the ash on the heat exchanger pipes is carried out by very short but strong pressure impulses. The detached particles are carried by the flow of gas to the de-asher, where most of them are separated off. The system is built into the rear side of the boiler. The compressor should preferably be installed at a cool spot in the heating room.

How the control system works:

The number of cleaning cycles within one time unit (e.g. per hour) is adapted to the loading of the boiler. One individual, complete cleaning cycle consists of a series of pressure impulses over all the sections of the heat exchanger.

Delivery includes:

- Nozzle element integrated in the exhaust gas collector, incl. connection piece with heat dissipation plates
  - Compressed air distributor with container and valve; with high-temperature hoses connected to the nozzle element
  - Compressor model 362-100; special design for municipal use  
 Delivery capacity of 202 l/min; 100-l container; pressure of max. 10 bar; motor 2.2 kW, 1450 RPM, 120V; or 230V/1/ incl. pressure controller, pressure switch and operating time limiter; plug and play; noise level of standard design: 75 dBA
  - Compressed air hose to max. of 4.0m in length
  - Valves permanently wired on terminal strip
  - Software component in the control system
- To be carried out by the customer:
- Provide a mains socket, 120V or 230/1/ 16A

**Technical Data:**

	<i>KRT - 150</i>	<i>KRT - 220</i>	<i>KRT - 300</i>	<i>KRT - 400</i>	<i>KRT - 540</i>
	<i>KRT-W150-S</i>	<i>KRT-W220-S</i>	<i>KRT-W300-S</i>	<i>KRT-W400-S</i>	<i>KRT-W540-S</i>
Number of zones/valves	4	4	4	5	6
Size of the valves	G 1"	G 1"	G 1"	G 1"	G 1"
Max. air consumption at full load [l/h]	1300	2500	2500	3300	4500

**Extra Charge for Soundproofed Compressor** [Item No. KT-WK]

Compressor in Special design for municipal use with soundproofing hood, model 362-100; delivery capacity: 202 l/min; container 100 l; pressure max. 10 bar; motor 2.2 kW, 1450 RPM, 230V; incl. pressure controller and pressure switch, plug and play; noise level of 64 dBA

When this item is used, the compressor listed in the item "Pneumatic Cleaning System" is no longer required.

**Reduced Price for Compressed Air Provided by Customer** [Item No. KT-WL]

As a result, the compressor listed in the item "Pneumatic Cleaning System" is no longer required. The compressor provided by the customer has to deliver at least the quantity and quality of air specified and have an adjustable pressure controller as well as a safeguard against hose rupture (e.g. operating time limiter).

## PYROT – Vitocontrol-C

A microprocessor control system for the complete PYROT Boiler Plant, incl. control of the systems for the fuel loading necessary for the articles listed separately. The heat output of the furnace adjusts to the heat consumption in modulating fashion. A regulating circuit for an incineration optimizing system is superimposed on the output control circuit with a lambda sensor. Maximum quality criteria are met in terms of fire protection and personal protection.

### Functions:

- Automatic ignition
- Output and control circuits with modulating output operation (25%-100%)
- Air-conducted by means of a speed-regulated exhaust fan, depending on the forward flow temperature
- Precise re supplying of fuel by the feed auger from the metering container with an isolating layer
- Refilling of the metering container with the use of a level monitoring system
- Limitation and distribution of the mass burning in the firebox by means of a level monitoring system in the fire box along with movement of the feed grate
- Emissions-optimized control circuit:
- Optimized air supply through motor-operated air vents for the best possible incineration using a lambda sensor
- Upholding the return flow temperature with the boiler mixer provides for a long service life of the boiler.
- Control system for oil burner on the PYROT
- Safety functions for:
  - Excess temperature, burn-back, opening of a lid in the loading system and forced heat dissipation
- Floating output (malfunction indication system)

### Operation:

Operation is carried out by means of a control panel with a membrane keyboard and plain language display. 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.

### The following items come with the system:

A microprocessor control system (control panel with back-lit plain language display), CE-tested, battery-backed real-time clock, RS 232 serial interface for connection to PC.

Data transmission line from the control panel to the control cabinet; length: 10 m

- Control cabinet (uninstalled), surface powder-coated with RAL 7035 (gray) textured  
Executed according to CSA C 22, ready-wired on series terminals,  
Feed: 208V/3/60Hz; control voltage: 120 / 240V/1/60Hz or 24 V
- Adapted, updateable software
- Starttec for all the drives for the loader system (208V/3/60Hz) according to the items priced separately
- Protective motor switch for boiler pump
- Outputs for stepping motors (air vents)
- Frequency transformer (EMC-Operation Class 3) for exhaust fan

### In the door:

- Main disconnect
- Documentation, incl. bound circuit diagram, terminal connection diagram with cable designation, operating and maintenance instructions, installation instructions in document sleeve
- Sensors and switches mounted on the feed auger
- Infrared light barrier level monitoring system, insulating layer for feed auger
- Safety limit switch on the maintenance lid for the feed auger
- PT-100 temperature sensor feed auger
- Sensors and switches on the firing block for firing and in the exhaust gas nozzle (installation on site)
- Infrared light barriers for level monitoring of fuel in the firebox
- Zirconium dioxide sensor with instrument reading converter (lambda sensor)
- PT-100 exhaust gas sensor
- Sensors and switches mounted on the boiler on top
- KTY boiler sensor in the connecting piece, forward flow
- KTY return flow sensor in the connecting piece, return flow
- Temperature-limiting safety switch (TLSS)
- Sensor, uninstalled
- One KTY sensor with dipping shell, 1/2 " x 280 mm (B28.1, see Spec Sheet 6960-1)

**Extensions available for the PYROT Vitocontrol-C Control System (Article ECO-...) at an extra charge:**

**PYROT Single-unit System:**

<b>Designation Item No.</b>	<b>Text</b>	<b>Use</b>
Heat generator, bivalent	ECO-KP0	4030 Integration System for Electric Boiler
Heat generator, bivalent	ECO-KP1	4030 Integration System for Oil/gas-fired Boiler
Controller for Room Heating System	ECO-H	4040 optional
Controller for Annex Building	ECO-N	4040 optional
Controller for Pipelining System	ECO-F	4040 optional
Controller for Air Heater	ECO-L	4040 optional
Controller for Utility Water Heater	ECO-B	4040 optional
Controller for Utility Water Circulation System	ECO-BZ	4040 optional
Controller for Solar-powered Utility Water Heater	ECO-S1	4050 optional
Controller for Solar-powered Utility Water/Heating	ECO-S3	4050 optional
Visualization System for PYROT, internal	ECO-VIR	4090 optional (for customer's PC workplace)
Output Management System	ECO-...	6810 Additional heat generation functions
Remote transmission	ECO-...	6820 Visualization, remote maintenance

The control system components for the fuelling system are included in the articles for the various loader systems. For external fuelling system, see Spec Sheet 6800-3.

**PYROT Double-unit System:**

**The Mastercontrol system (see Spec Sheet 6850) is mandatory for the installation of a PYROT double unit System.**

The PYROT double-unit system is a heat-generating facility, in which the load allocated to the biomass is distributed to two PYROT boilers. The entire thermal load generated is conducted to a joint accumulator in the form of a hydraulic switcher.

It is necessary to comply with the following for this type of system:

**1. Joint fuelling system: Mastercontrol**

The control of the joint fuelling system for the PYROT double-unit system is carried out by the Mastercontrol control system. The control system components for the fuelling system are included in the articles for the various loaders systems.

**2. Additional heat generators: Mastercontrol**

Extensions for controlling additional heat generators are only allowed in the Mastercontrol (additional control cabinet) And not in the individual boiler control system (ECO-300 or ECO-540).

**3. PYROT Ecotronic Control System, as an individual boiler control system**

Only the extensions listed in Spec Sheet 6850 are possible in the Mastercontrol system.

The PYROT double-unit system is not designed to control heat consumers. (Such control is carried out by customer provided building instrumentation and control equipment.)

Using a Mastercontrol turns the PYROT Ecotronic control system into an individual boiler control system, without any further extensions being possible.

## Triggering System for external drive [Art. No. ECO-A10]

### Function:

Starttec motor starter for optimized connection of an external conveyor drive or rotary valve without reversal. A CAN bus is used to directly connect the motors to the gentle start-up system via the Ecotronic. Temperature-monitored and protected against overloading. Its electronic circuit breakers are wear-free, even at high switching frequencies.

### Comes with:

- Starttec completely integrated in control cabinet
- Parameter assignment for the drive function
- Input in the control cabinet for safety end switch on the maintenance cover
- Output in the control cabinet for external conveyor drive

### To be carried out by the customer:

- Delivery and/or installation of safety end switch for the external conveyor drive

*Note: Only for PYROT. Starttec is built into the control cabinet for the boiler plant.  
Only possible with defined, limited material feed facility (upstream conveyor auger)*

## Triggering System for external drive with light barrier [Art. No. ECO-A11]

### Function:

Starttec motor starter for optimized connection of an external conveyor drive without reversal. A CAN bus is used to directly connect the motors to the gentle start-up system via the Ecotronic. Temperature-monitored and protected against overloading. Its electronic circuit breakers are wear-free, even at high switching frequencies. Additional protection of the external drive through level-monitoring system of the further feed system by means of light barrier. The light barrier connects directly to the Starttec for the continuing feed system, affecting the extraction system.

### Comes with:

- Starttec completely integrated in control cabinet
- Parameter assignment for the drive function
- Input in the control cabinet for safety end switch on the maintenance cover
- Output in the control cabinet for external conveyor drive
  - Infrared light barrier, level-monitoring system for fuel

### To be carried out by the customer:

- Delivery and/or installation of safety end switch for the external conveyor drive

*Note: Only for PYROT. Starttec is built into the control cabinet for the boiler plant.*

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

### **Accumulator Management System 3 Sensors [Item No: ECO-KSF3]**

Function:

With a heat exchanger used, the modulating output operation by the PYROT Rotation Heating System is optimized. In addition, short-term heat requirement peaks are covered. The heat accumulated in the accumulator is detected by a temperature sensor. The heat input is adjusted to the degree to which the accumulator is charged.

Included in delivery:

- Two additional KTY sensors with dipping shell, 1/2 " x 280 mm (B28.2, B28.3, see Spec Sheet 6960-1)

### **Accumulator Management System, 5 Sensors (QM) [Item No: ECO-KSF5]**

Function:

Using a heat accumulator improves the modulating output operation of the PYROT rotation heating system. In addition, sudden heat requirement peaks are covered. The accumulator's load of heat is detected by the temperature sensors. The instruction for the accumulator's degree of loading is carried out by the external sensor in weather-guided fashion. The firing power is adapted to the accumulator's degree of loading.

Included in delivery:

- 4 additional KTY sensors with dipping shell, 1/2" x 280 mm (B28.2, B28.3; see Spec Sheet 6960-1)

*Note: For Art. No ECO-KSF5, Article ECO-BM-00 or ECO-RM-00 is also necessary.  
See Spec Sheets 4000 and 4020.*

### **External Requirement ON/OFF [Item No: ECO-ANP]**

Input for switching the system on and of automatically by an external floating make contact

### **Operational Message [Item No: ECO-KBM]**

Function:

Output of the "Operating Load" operating condition, when the PYROT boiler is in operation to higher-level instrumentation and control equipment for further processing

Included in delivery:

- Floating output (operational message)

### **Output signals 0 V - 10 V [Item No: ECO-KLS]**

Function:

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

The following items come with the system:

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

*Note: Installation of "Output signals 0 V - 10 V" are possible according to "QM for Wood Heating Systems" irrespective of any additional control system components to be used.*

## Mastercontrol [Art. No. ECO-M1]

Mastercontrol improves the overall generation of heat by two biomass boilers (PYROT double-unit system), incl. the control of a bivalent boiler (oil-fired boiler, gas-fired boiler or electric boiler) as a redundant unit and/or as a peak-load boiler.

### Function:

- Heat management system: optimum breakdown of the necessary heating capacity among the two biomass boilers with the main load on the primary boiler and the remaining load on the secondary boiler, this being done by means of output specification. The output specification is carried out in weather-guided fashion, depending on the desired temperature set in a joint hydraulic switcher. Automatic change between the two boilers to guarantee even loading of the boilers over a long operating period. (Example: weekly changeover)
- Loader system: If the fuel for the two biomass boilers is taken from a joint fuel storage unit, then the loader system is controlled by the Mastercontrol system up to the fuel distribution.
- Data management system:  
A complete package for transferring all the data to an external customer-provided IT-workplace for visualization, remote maintenance and archiving of operational data for the PYROT boiler system. Hardware, incl. modem and software, are integrated in the Mastercontrol system. All the adjustable parameters can be changed from the external IT-workplace.

### Operation:

Operation is carried out either by means of a touch screen built into the control cabinet (extra charge for touch screen) or by the monitor, keyboard and PC-mouse provided by the customer.

### Includes:

- Switch cabinet, uninstalled; surface powder-coated in RAL 7035 (gray) texture  
Designed in accordance with ÖVE/VDE guidelines, ready-wired on series terminals  
Feed: 208 V/3/60Hz; control voltage: 120 / 240V/1/60Hz or 24 V
- Freely programmable control system, CE-tested; battery-supported program and real-time clock
- Industrial PC
- Starttec for all loader system drives (208V/3/60) in accordance with the separate price items
- DVI-interface for a TFT monitor and USB-interface for keyboard, mouse and printer built into the cable lead through bar on the control cabinet.
- Floating output (error report)  
In the door:
  - 4-pin master switch
- Documentation, including bound circuit diagram, terminal connection plan with cable identification in document sleeve
- Accumulator management system, 5 sensors (QA)
  - 5 PT100 sensors, with dipping shell 1/2" x 280 mm
- Output specifications for both biomass boilers
- Output specifications for both biomass boilers for further processing in the lower-level boiler control systems via serial interface
- Visualization per modem
  - Analogue modem in switch cabinet
  - Windows operating system, pc-Anywhere remote-maintenance software and visualization/archiving software installed and tested on an industrial PC
- Screen images:
  - Three-dimensional boiler cross-section with display fields
  - Installation diagram, heat generation, with display fields
  - Parameter table (with editing feature)

### To be carried out by the customer:

- Electric connection from telephone line to modem

## Touch Screen [Art. No. ECO-TSC]

The touch screen (15") is built into the door of the control cabinet and can be used to call up and change all the relevant boiler and loader system parameters.

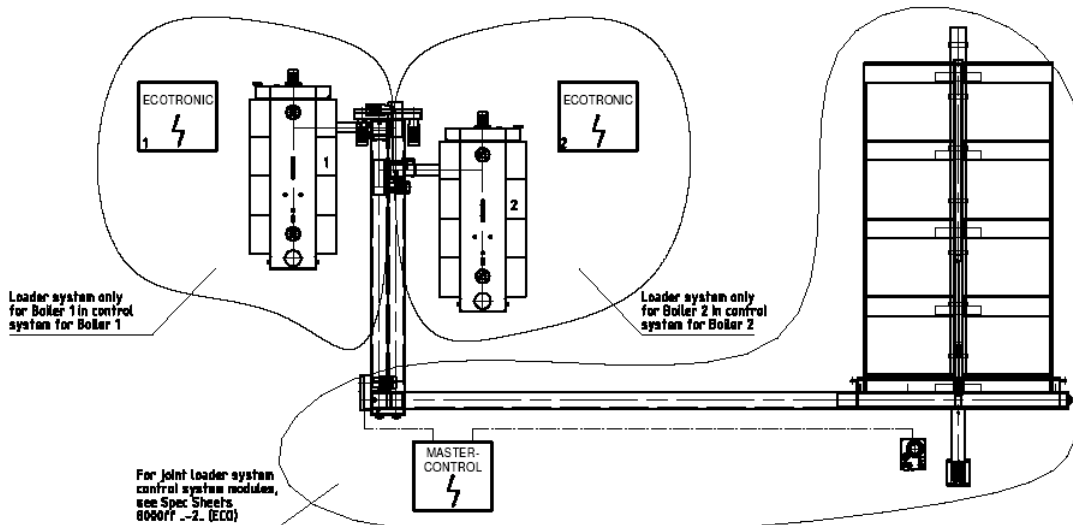
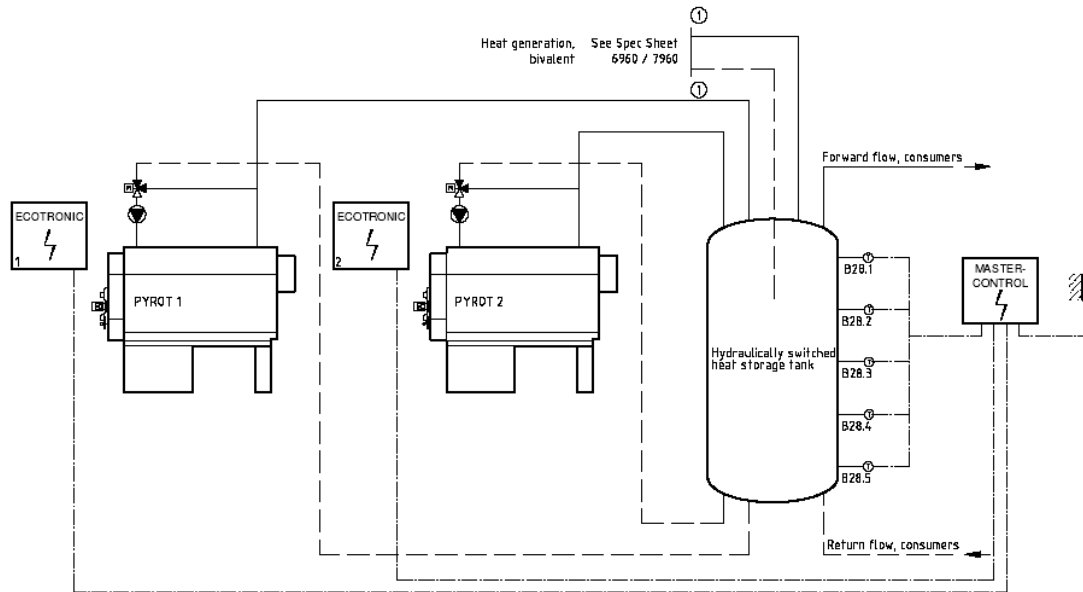


**Extensions available for the Mastercontrol (article ECO-M1) at an extra charge:**

Designation	Item	Text	Dimensions	Use
Prompt for additional heat generator	ECO-KP0	4030	-	Integration system for electric boiler
Prompt for additional heat generator	ECO-KP1	4030	-	Integration system for oil/gas-fired boiler
Output signals, 0-10V and control equipment	ECO-KLS	6810	-	For higher-level building instrumentation
Malfunction indication by modem (wire)	ECO-SMD	6820	-	optional (advisable)
Export operational data and control equipment	ECO-SED	6820	-	For higher-level building instrumentation
Touch Screen	ECO-TSC	6850	-	optional
Fuel Conveyance System	...-1..	8000ff	8000ff	For joint loader system

**Diagram (top: hydraulic system; bottom: loader system):**

Note: Water-bearing installation and electrical installation are provided by the customer.



## **Control Module with Extended Control System [Art. No. ECO-BM-00]**

The ECOTRONIC is a decentralized microprocessor system in which various modules are connected to a data transmission line (CAN-bus). A limited number of controllers (2-3 units) can be integrated in the control module cost effectively.

Includes:

- Control module in compact design instead of standard design
- Weather sensor QAC 31, uninstalled

## **Control System Module [Art. No. ECO-RM-00]**

A control system module to accommodate external controllers (for heat consumers/additional heat generators). The control buttons are integrated in the control module.

Includes:

- Control System Module in plastic casing (length: 325 mm; height: 195 mm; depth 75 mm)
- Weather sensor QAC 31, uninstalled

## **Control Module with Extended Keyboard [Art. No. ECO-13]**

A control module with an additional row of buttons to operate a maximum of: 12 controllers (Pyromat-DYN)  
13 controllers (Pyromat-ECO)

**Data transmission line with plug, 10.0 m standard [Art. No. ECO-ZL-10,0]**

**Data transmission line with plug, 2.0 m [Art. No. ECO-ZL-2,0]**

**Data transmission line with plug, 5.0 m [Art. No. ECO-ZL-5,0]**

**Data transmission line with plug, 20.0 m [Art. No. ECO-ZL-20,0]**

**Data transmission line with plug, 40.0 m [Art. No. ECO-ZL-40,0]**

**Data transmission line with plug, 80.0 m [Art. No. ECO-ZL-80,0]**

**Data line with Y distributor [Art.-Nr. ECO-ZY-0,5]**

The data transmission line connects the various modules (burner module, control module & control system module) to the overall facility control system. The data transmission lines can be connected to one another (maximum of two lines). The maximum overall length of the data transmission line must not exceed 100 m.

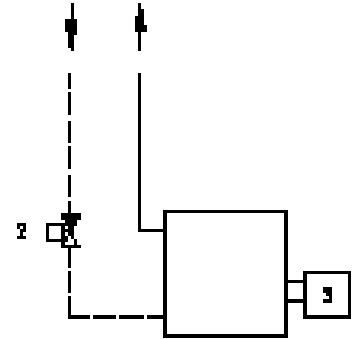
### Controller for Heat Generator, single [Art. No. ECO-KE]

Immediately after heat is taken from the accumulator to cover a heat requirement (stand-alone operation), an additional heat generator is automatically connected. The accumulator can only be loaded using the PYROMAT. When it is put into operation, the additional heat generator disconnects, and the closed shut-off valve prevents it from being flowed through.

Includes:

- Pushbuttons for additional heat generators
- Controller output for shut-off valve (2) and burner (3)

*Note: Only for PYROMAT-ECO and PYROMAT-DYN with ECO function.  
 See Hydraulic Drawing 2960 PYROMAT-ECO or 3950 PYROMAT-DYN with ECO function.*



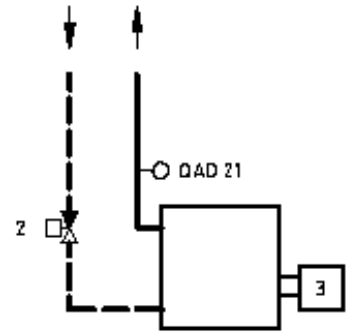
### Controller for Heat Generator, single, gliding [Art. No. ECO-KG]

Immediately after heat is taken from the accumulator to cover a heat requirement (stand-alone operation), an additional heat generator is automatically connected. The accumulator can only be loaded using the PYROMAT. When it is put into operation, the additional heat generator disconnects, and the closed shut-off valve prevents it from being flowed through. The burner temperature is adjusted in gliding fashion to the minimum temperature according to the heat requirement.

Includes:

- Pushbuttons for additional heat generators
- Controller output for shut-off valve (2) and burner (3)
- Flow sensor QAD 21, uninstalled

*Note: Only for PYROMAT-ECO and PYROMAT-DYN with ECO function.  
 See Hydraulic Drawing 2960 PYROMAT-ECO or 3950 PYROMAT-DYN with ECO function.*



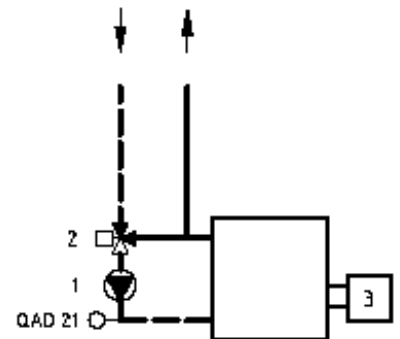
### Controller for Heat Generator, parallel [Art. No. ECO-KP2]

When required, an additional heat generator is automatically connected. This may occur after heat is taken from the accumulator to cover the overall heat requirement (stand-alone operation). Or the additional heat generator may be used to cover a peak requirement for heat (parallel operation to the PYROMAT). For parallel operation, a burner group is necessary for heat diversion, which simultaneously also provides for keeping up the return flow. On request, the additional heat generator can load the accumulator (as desired to B28.1, B28.2 or B28.3).

Includes:

- Pushbuttons for additional heat generators
- Controller output for pump (1), mixing valve (2) and burner (3)
- Return flow sensor QAD 21, uninstalled

*Note: Only for PYROMAT-ECO and PYROMAT-DYN with ECO function.  
 See Hydraulic Drawing 2960 PYROMAT-ECO or 3950 PYROMAT-DYN with ECO function.*



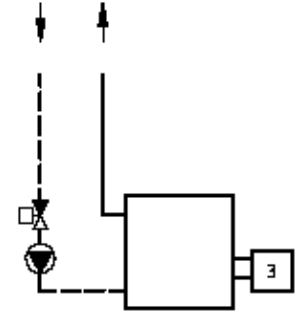
## Parallel heat generator control [Art.-No.: ECO-KP0]

The additional heat generator designed as a hydraulic switch supplies heat to the storage unit either separately or in conjunction with the biomass boiler. It is controlled in such a way that the additional heat generator covers the required peak and the biomass boiler covers the basic requirements taking account of the biomass boiler's delayed response. The boiler pump is active and the motor shut-off device is open during the additional heat generator's operating phase.

Included in the delivery:

- Button for additional heat generator
- Boiler pump contactor and motor protection device (additional heat generator)
- Control output for pump (1), mixing valve (2) and burner (3)

*Attention: Only for PYROMAT-DYN without ECO function and PYROT with hydraulic switch. See Hydraulic Drawing 3950 PYROMAT-ECO or 6960 PYROMAT-DYN with ECO function*



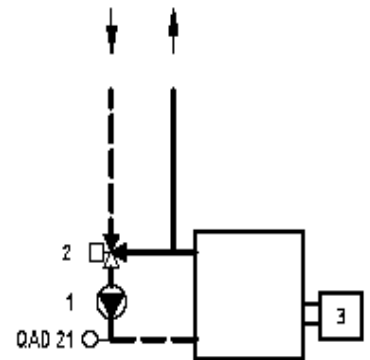
## Controller for Heat Generator, parallel [Art. No. ECO-KP1]

When required, an additional heat generator is automatically connected. This may occur after heat is taken from the accumulator to cover the overall heat requirement (stand-alone operation). Or the additional heat generator may be used to cover a peak requirement for heat (parallel operation to the PYROMAT). For parallel operation, a burner group is necessary for heat diversion, which simultaneously also provides for keeping up the return flow. On request, the additional heat generator can load the accumulator (as desired to B28.1, B28.2 or B28.3).

Includes:

- Pushbuttons for additional heat generators
- Controller output for pump (1), mixing valve (2) and burner (3)
- Return flow sensor QAD 21, uninstalled

*Attention: Only for PYROMAT-DYN without ECO function and PYROT with hydraulic switch. See Hydraulic Drawing 3950 PYROMAT-ECO or 6960 PYROMAT-DYN with ECO function.*

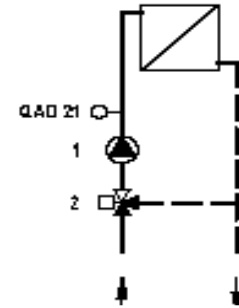


## Controller for Room Heating Units [Art. No. ECO-H]

A weather-guided heating control system with a digital timer for lower able operation according t daily or weekly schedules, with pump control system, frost-protection function, ECO circuit and limited flow temperature.

Includes:

- Pushbutton for heating
- Controller output for pump (1) and mixing valve (2)
- Flow sensor QAD 21, uninstalled



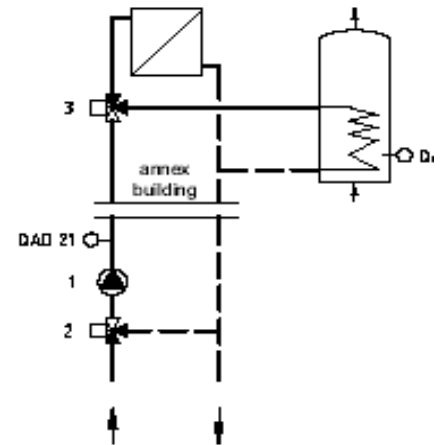
## Controller for Annex Buildings [Art. No. ECO-N]

How it works:

The pipelining is usually loaded with a lowered temperature according to the weather guid heating control system. The domestic water heater is loaded at the maximum flow temperature set. To do so, a valve deflects the heating water to the domestic water heater. Using an integrated timer, this is moved to ancillary times, when the room heating unit is interrupted for short durations.

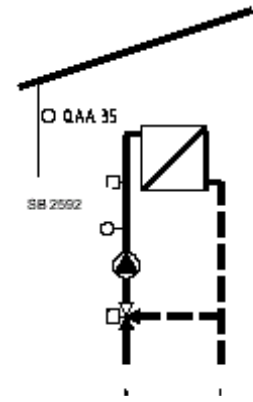
Includes:

- Pushbutton for annex building
- Controller output for pump (1), mixing valve (1) and changeover valve (3)
- Flow sensor QAD 21, uninstalled
  - Domestic water sensor QAZ 21.5220 with dipping shell ½" x 200 mm, uninstall



## Thermostat QAA 35 [Art. No. ECO-ZR-QA]

Thermostat QAA 35, uninstalled; a supplement to the Controller for Room Heating Units (Art. No. ECO-H) and Controller for Annex Buildings (Art. No. ECO-N). The Thermostat can be connected as a remote control device and as a room sensor (room temperature compensation).



## Safety Thermostat SB 2592 [Art. No. ECO-ZR-RA]

Safety Thermostat SB 2592, uninstalled

To safely and reliably limit the flow temperature of a heating circuit (e.g. ECO-H, ECO-N, ECOF).

## Controller for Pipelining [Art. No. ECO-F]

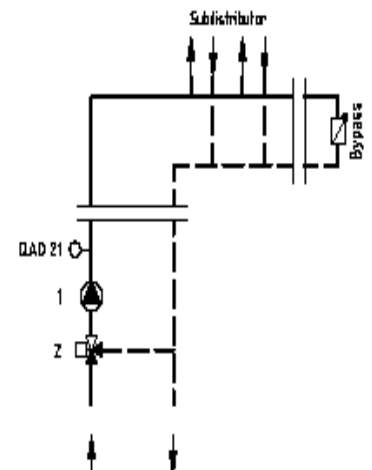
For annex buildings with separate heat distributions systems, which are supplied with heat via pipelining. The temperature of the pipeline is pre-adjusted for the lowest line losses according to the heat distribution requirement.

Includes:

- Pushbutton for pipelining
- Controller output for pump (1) and control valve (2)
  - Flow sensor QAD 21, uninstalled

Note:

*The Controller for Pipelining cannot be used to control a pipeline to which heating control units provided by the customer are connected! A normal heating control system has to be used in such cases.*

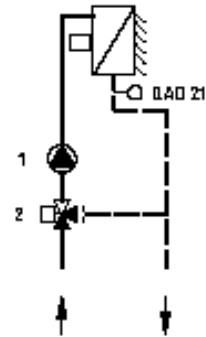


### Controller for Air Handling Unit Group [Art. No. ECO-L]

The burner storage system supplies the air heaters with maximum flow temperature. The fans are switched by switches or controllers provided by the customer. The flow rate for the heating water is controlled by the return flow temperature and so adjusted to the heat output of the air heater (quantity control). This produces optimum storage stratification for a long time and at a high temperature at the accumulator flow pipe. An integrated timer can be used to set the heating periods (daily and weekly schedules).

Includes:

- Pushbutton for air handling unit group
- Controller output for pump (1) and mixing valve (2)
  - Return flow sensor QAD 21, uninstalled
  - Baffle bypass



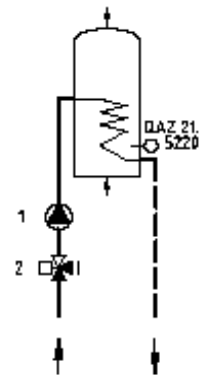
### Controller for Domestic Water Heater [Art. No. ECO-B1]

When the temperature of the domestic water drops, it is reheated by the built-in heat exchanger either from the burner or from the heat accumulator. A prerequisite for this is the temperature difference required (choice of control either according to temperature difference or fixed temperature).

An integrated timer can be used to set the heating periods (daily and weekly schedules).

Includes:

- Pushbutton for domestic water heater
- Controller output for pump (1) and shut-off valve (2)
  - Domestic water sensor QAZ 21.5220 with dipping shell, 1/2" x 200 mm, uninstalled



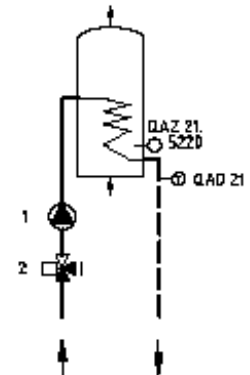
### Controller for Domestic Water Heater [Art. No. ECO-B2]

When the temperature of the domestic water drops, it is reheated by the built-in heat exchanger either from the burner or from the heat accumulator. A prerequisite for this is the temperature difference required (there is a choice of control either according to temperature difference or fixed temperature).

The flow rate for the heating water is controlled by the return flow temperature (quantity control). This produces optimum storage stratification for a long time and at a high temperature at the accumulator flow pipe. An integrated timer can be used to set the heating periods (daily and weekly schedules).

Includes:

- Pushbutton for domestic water heater
- Controller output for pump (1) and control valve (2)
- Return flow sensor QAD 21, uninstalled
  - Domestic water sensor QAZ 21.5220 with dipping shell, 1/2" x 200 mm, uninstalled

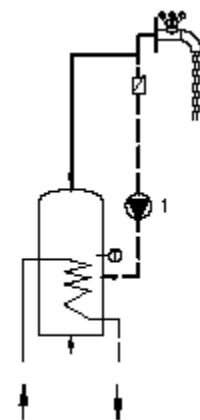


### Controller for Domestic Water Circulation System [Art. No. ECO-BZ]

An integrated timer can be used to set the circulation periods (daily and weekly schedules). The duration for the circulation pump to be switched on can be adjusted using a cyclical switching system.

Includes:

- Pushbutton for circulation system
- Controller output for pump (1)



## Controller for Solar Domestic Water Heater [Art. No. ECO-S1]

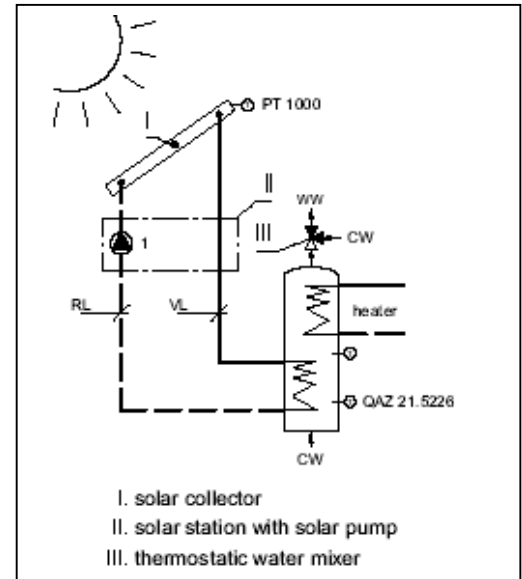
For use in simple solar facilities as a single control circuit for heating the domestic water in a solar domestic water heater (Art. No: WSS-...). The ECO-S1 controller is a supplementary module for the ECO-B1(2) Controller for Domestic Water Heaters. When the solar collector is warmer than the domestic water at the bottom, the solar collector heats it up (adjustable temperature difference: 3.6-36°F / 2-20°C).

### Further details:

- Post-flow period of the solar pump, no/yes: 0-120 sec., adjustable according to length of line
- Maximum domestic water temperature (adjustable: 68-194°F / 20-90°C)
- Safety: disconnection of the solar pump at a collector temperature of 284°F / 140°C; reconnection at 248°F / 120°C

### Includes:

- Pushbutton for solar system
- Collector sensor PT-1000
- Domestic water sensor QAZ 21.5220
  - Controller output for solar pump (1)



## Controller for Solar Domestic Water/Heating [Art. No. ECO-S3]

For use in large-scale solar facilities to heat the domestic water in a solar domestic water heater (Art. No: WSS-...) and to supply heat to the heat accumulator in the form of a triple control circuit heating system. The first circuit is for heating the domestic water, the second circuit is for heating the heat accumulator at the back/bottom and the third circuit is for heating the heat accumulator at the front/top. The heat accumulator is heated by an externally situated plate heat exchanger. When there is a changeover from the domestic water heater to the heat accumulator, the secondary pump is switched on, which is then operated with the solar pump. For optimized functioning, the flow rate in the secondary circuit has to be adapted to the primary circuit (e.g. with flow rate gauges in the primary and secondary circuits).

The following temperature differences are freely adjustable:

Temperature difference of collector/domestic water: 3.6-36°F/ 2-20°C

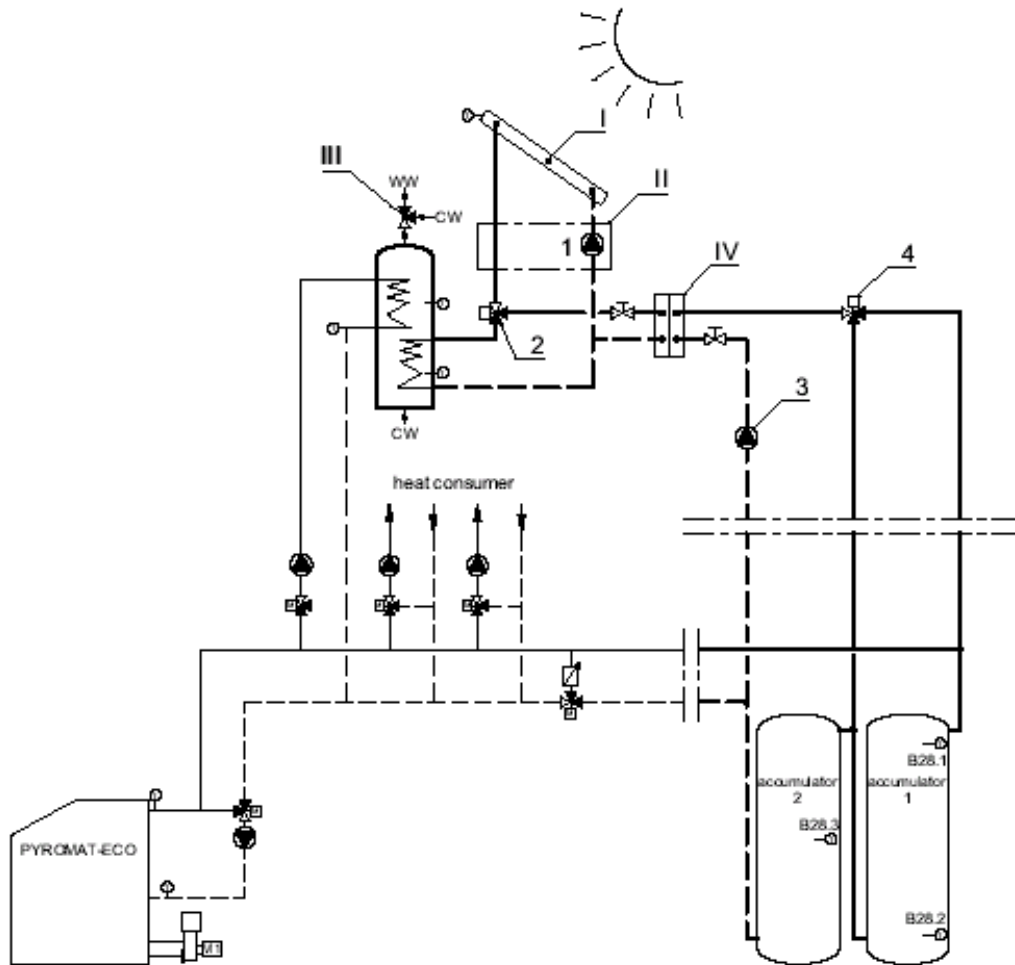
Temperature difference of collector/accumulator, back/bottom: 3.6-36°F/ 2-20°C

### Further details:

- Post-flow period of the solar pump, no/yes: 0-120 sec., adjustable according to length of line
- Disconnection safeguard: At collector temperature of 284°F / 140°C  
At accumulator temperature of 203°F / 95°C
- Optimized domestic water priority (option of either absolute domestic water priority or none at all)
- Stratified accumulator loading according to the accumulator temperatures, via valve/accumulator, back/accumulator front (4)

### Includes:

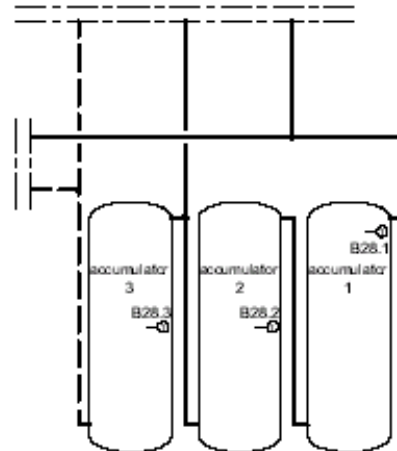
- Pushbutton for solar system
- Collector sensor PT-1000
- Domestic water sensor QAZ 21.5220
- Controller output for solar pump (1)
- Controller output for valve, domestic water heater/accumulator (2)
- Controller output for secondary pump (3)
- Controller output for valve, accumulator back/accumulator front (4)



example  
 2 accumulators in series

- I. solar collector
  - II. solar station with solar pump
  - III. thermostatic water mixer
  - IV. plate heat exchanger
- 1. solar pump
  - 2. inlet valve domestic water / accumulator
  - 3. secondary pump
  - 4. inlet valve accumulator front / back

example  
 3 accumulators in series





## **Visualization of Pyromat Internally [ECO-VIM]**

### **Visualization of Pyrot Internally [ECO-VIR]**

All the data is conducted to the PC by a data transmission line (max. 30 m /100ft) to the PC via the serial interface RS 232 on the control module. The burner system's current operational data is shown in visualized fashion in a function display along with all the possibilities of entering values and functions and of reading out the operational conditions (exception: "Start Burner"). All the operational data is archived cyclically and can be graphically evaluated in a very simple fashion.

The PC and data transmission line are not included in the price.

Includes:

- CD with visualization software and installation instructions.

### **Visualization Supplementary Function [ECO-VIZ]**

Extended visualization [ECO- VII] with the functions of the keys additionally activated (from F4). Additional functions include each heating control unit (heat generator, heat consumer, solar system) as well as the automatic loading system (Pyromat DYN, Pyrot). Each function of the keys is displayed in a separate function display along with all the possibilities of entering values, reading out the operational conditions and archiving.

The price is per each additionally activated key on the control module.

Includes:

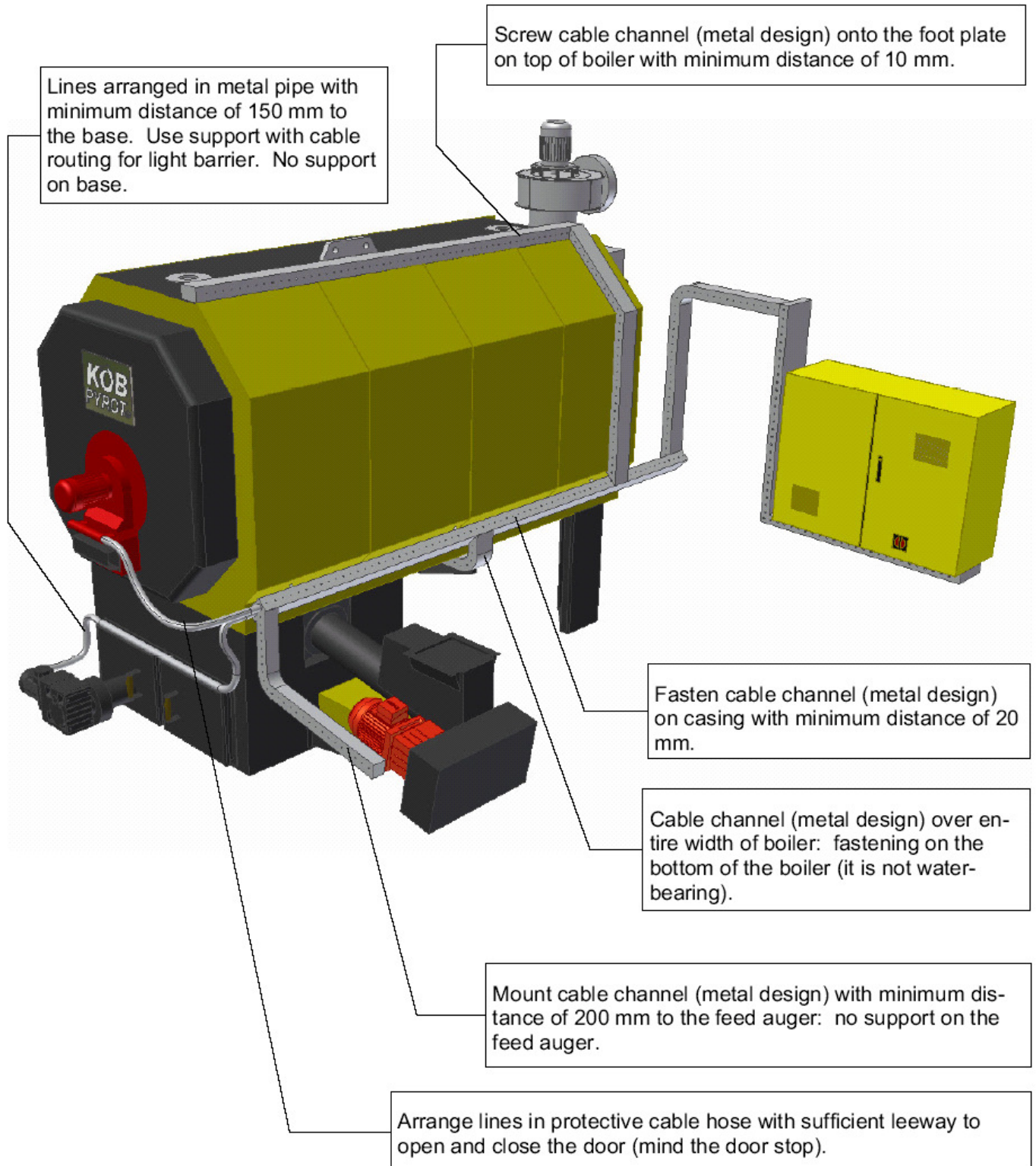
- Extension of the CD with visualization software

*Note: For equipping possibilities, refer to Spec Sheet 4000-1*

### **Data Transmission Line for Visualization of Interior [ECO-ZLV]**

Data transmission line consisting of:

- D-SUB plug for connecting control module to data transmission line, soldered
  - 30 m [100 ft] data transmission line, triple-pole (cut to length according to dimension at location)
- D-SUB plug with threaded terminal ends, 9-pole, uninstalled, for connecting PC



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Installation (one fitter with helper provided by the customer) [Art. No. IMO-1]

Performance provided by the contractor (supplier):

Furnishing the entire scope of the delivery. Installing the burner system, incl. all the machinery parts and facility components contacted by fuel and exhaust gas for the scope of delivery cited. Also included is the installation of all the limit switches, thermostats, probes and sensors supplied (exceptions: weather sensors and heat consumers).

The installation will be carried out by an experienced fitter (a qualified helper being required).

Price, incl. travel, expenses and overnight accommodation.

Performance provided by the client (buyer):

1.) Prior to installation of the burner system

a) Equipping of construction site as follows:

Paved access road to the construction site;

120-V current supply line and, if necessary, 208 V for electric installation tools (welding apparatus);

b) General construction work, as follows:

Making all the installation holes required for the installation;

Making the cement foundations and recesses for refill access lids and casings of extraction equipment;

Pits and breakthroughs for fuel conveying equipment

c) Construction work in particular as follows:

Hydraulic sliding bar extraction system:

Moving and setting in concrete the securing brackets supplied (if included in the scope of the delivery);

Making the securing brackets (if not in the scope of the delivery). Due to the great forces that develop, this

performance should be furnished according to the instructions of an expert (architect or structural engineer) in accordance with the supplier's specifications;

Making the chimney system with the connecting hole for the exhaust pipe (exception: metal chimney included in the scope of the delivery);

d) Draining the heating room and silo room with all the ducts and shafts required for installing the entire facility.

e) Unloading the scope of the delivery from the truck unless the delivery has been expressly agreed with a crane truck.

2.) Helpers during the installation of the burner system

Providing a qualified helper to be available during the entire duration of the installation. Requirements for the helper:

a) Qualified

for installation work in steel and machinery construction (skilled at using hand tools)

b) Physically sturdy

no restriction to lifting loads, no restrictions to working up to heights of 3.0 m above the floor, no restrictions to hearing or sight

c) Communicative and mentally stable

good knowledge of German and mentally stable such that he can immediately follow the installation supervisor's verbal safety instructions

d) Available

during the agreed week days (Monday to Friday) from 7:00 AM until 6:00 PM

e) Equipped

with protective equipment according to the applicable regulations on industrial safety

3.) After the installation of the burner system

a) Installation of the control cabinets delivered and/or the control modules

Unless expressly agreed otherwise, the authorized electrician must install these.

b) Installation of weather sensor and probes for the heat consumers in the scope of delivery:

These have to be installed by the authorized electrician.

c) Establishing the supply of electric current and carrying out the wiring unless expressly agreed otherwise:

Electric input, 208V/3/60Hz, PE, N with fuses on control cabinet.

Connecting cables between the control cabinet and the various motors and control units, connected on both ends so as to be ready for operation.

d) Installation of the uninstalled water-bearing components included in the scope of delivery:

Water-bearing components included in the scope of delivery not factory connected, such as pumps, valves,

The authorized heating engineer must install all thermal run-off safety valves, accumulators, etc..

e) Sealing all the openings between the burner room and the fuel storage space, doing so according to the fire prevention regulations.

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## Installation (two KÖB fitters) [Art. No. IMO-2]

Performance provided by the contractor (supplier):

Furnishing the entire scope of the delivery. Installing the burner system, incl. all the machinery parts and facility components contacted by fuel and exhaust gas for the scope of delivery cited. Also included is the installation of all the switches, probes and sensors supplied (exceptions: weather sensors and heat consumers).

Two experienced fitters will carry out the installation.

Price, incl. travel, expenses and overnight accommodation.

Performance provided by the client (buyer):

1.) Prior to installation of the burner system

a) Equipping of construction site as follows:

Paved access road to the construction site;

120-V current supply line and, if necessary, 208 V/3/60 Hz for electric installation tools (welding apparatus);

b) General construction work, as follows:

Making all the installation holes required for the installation;

Making the cement foundations and recesses for refill access lids and casings of extraction equipment;

Pits and breakthroughs for fuel conveying equipment

c) Construction work in particular as follows:

Hydraulic sliding bar extraction system:

Moving and setting in concrete the securing brackets supplied (if included in the scope of the delivery);

Making the securing brackets (if not in the scope of the delivery). Due to the great forces that develop, this performance should be furnished according to the instructions of an expert (architect or structural engineer) in accordance with the supplier's specifications;

Making the chimney system with the connecting hole for the exhaust pipe (exception: metal chimney included in the scope of the delivery);

d) Draining the heating room and silo room with all the ducts and shafts required for installing the entire facility.

e) Unloading the scope of the delivery from the truck unless the delivery has been expressly agreed with a crane truck.

2.) After the installation of the burner system

a) Installation of the control cabinets delivered and/or the central control modules

Unless expressly agreed otherwise, the authorized electrician must install these.

b) Installation of weather sensor and probes for the heat consumers in the scope of delivery:

These have to be installed by the authorized electrician.

c) Establishing the supply of electric current and carrying out the wiring unless expressly agreed otherwise:

Electric input, 208V/3/60Hz, PE, N with fuses on control cabinet.

Connecting cables between the control cabinet and the various motors and control units, connected on both ends so as to be ready for operation.

d) Installation of the uninstalled water-bearing components included in the scope of delivery:

Water-bearing components included in the scope of delivery not factory connected, such as pumps, valves,

The authorized heating engineer must install all thermal run-off safety valves, accumulators, etc..

e) Sealing all the openings between the burner room and the fuel storage space, doing so according to the fire prevention regulations.

A prerequisite for approval is the express permission for such by the public authority responsible. For claims to the warranty according to Section 11 of our General Terms and Conditions of Delivery, wood fuels have to meet the following conditions. If those conditions are not met, then approval is possible with restrictions (warranty, maintenance, operational safety) with a written statement by the manufacturer in reference to the facility.

## 1) Non-combustible substances contained

No wood fuels may contain any foreign bodies, such as pieces of metal, stones, masonry remnants or plastics. Nor must the following limits (per kg of dry fuel) for non-combustible substances contained (ash analyzed at a temperature of 815 °C) be exceeded or fallen short of:

	Limit	Comparison with untreated forest wood
1.1) Chlorine Cl:	max. 300 mg/kg	10 mg/kg
1.2) Sulphur S:	max. 1000 mg/kg	120 mg/kg
1.3) Total Cl, S:	max. 1000 mg/kg	130 mg/kg
1.4) Ash content, total:	max. 15.0 g/kg	5.0 g/kg
1.5) Alkali oxides in the ash (K <sub>2</sub> O and Na <sub>2</sub> O):	max. 1.0 g/kg	0.35 g/kg
1.6) Sintering point of the ash:	min. 1000 °C approx. 1200 °C	

Consequence of substantial overstepping of limits (1.1, 1.2, 1.3, 1.5, 1.6):

- a) Hot-gas corrosion in the heat exchanger → Special maintenance instructions for heat exchanger  
→ Shortened service life of heat exchanger
- b) Early sintering and melting of the ash → Special maintenance instructions for firing,  
→ Increased maintenance costs (firing, boiler door)

If the maintenance instructions are not followed, a process will be created that builds up in a negative fashion with:

→ Cinders change the airflow → Temperature peaks → more slag → etc, until there is fast destruction of the refractory materials

1.7) Additives in remnant and used wood: Free of heavy metals and halogen compound

## 2) Superfine & dust (wood particles smaller than 1.0 mm)

2.1) Without pre-dryer, max. 10.0% of the total mass; consequence of substantial overstepping of limit:

Temperature peaks → Slag formation → Even higher temperature → etc, to the point of destruction;

→ Special maintenance instructions for firing;

Elevated values are especially critical for remnant wood in combination with elevated values as per 1.1, 1.2

2.2) For forest wood chips with pre-dryer, max 4.0% of the total mass; consequence of substantial overstepping of limit:

→ Moving the exhaust air lines → Special maintenance instructions for cleaning exhaust air line

## 3) Origin and treatment

3.1) Forest wood and plantation wood (complete trees and trunk wood untreated)

Mature wood from trunks and branches, untreated, chopped as billet wood or chips

3.2) Compressed wood, pellets

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

3.2) Increased proportion of bark, tree cuttings from roadside trees (untreated)

Remnants from the forestry and sawmill industries or from conservation of the countryside (elevated ash content).

3.3) 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 that run slowly. In cases of elevated proportions of dust and/or limited storage volumes, these shavings are compressed into briquettes.

3.4) Used wood

This is essentially 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 afterwards (by magnetic separators).

## 4) Particle size: adjustment of the conveyor augers

4.1) G30/G50 chips from untreated wood:

made by fast-running and cutting tools;

	max. coarse fraction	with cross-section	and length
G 30	of 20% max.	3 cm <sup>2</sup>	max. 8.5 cm;
G 50	of 20% max.	5 cm <sup>2</sup>	max. 12 cm;

Required cross-sections of the loading: depends on the boiler output:

		up to 150 kW	up to 500 kW	from 500 kW
Conveyor auger	D	min. 12 cm;	min. 15 cm;	min. 20 cm
Drop cross-section	A	min. 175 cm <sup>2</sup>	min. 300 cm <sup>2</sup>	min. 600 cm <sup>2</sup>

## 4.2) Chips not from the forest; origin as per 3.2, 3.3, 3.4; briquettes, origin as per 3.3

Size essentially as per ÖNORM M 7133 G50, additionally, however:

- Fraction of one-offs max. 5% with cross-section of max. 5 cm<sup>2</sup> up to a length of max. 16 cm.
- Frayed surface by chopping tools (shredders) or slow-running choppers.
- Briquettes, diameter max. D 60 mm (hydraulic compressors, pressure geared to loading system)  
Conveyor augers diameter min. 20 cm; drop-off route, rotary valve cross-section min. 600 cm<sup>2</sup>
- Consequence of overstepping particle size:
- Extra expenditures for correcting malfunctions.
- Shortened service life of the conveyor augers and drives.

## 5) Bulk density **S** (kg/m<sup>3</sup>), water content **W** (%), size **G** (mm)

Bulk density **S** in kg/m<sup>3</sup> (lb/ft<sup>3</sup>), water content **W** in %, size C1, C3, C4, C5, P1, P2, P3 as per CAN/CSA-B366.1-M91

In biomass boiler plants, the wood fuels that will be used are to be individually listed as follows:

- a) S 130 (8.1) W10 to W20 C1 Sawdust, untreated (planing shop)
- b1) S 200 (12.5) W20 to W35 C1 Sawdust, untreated (sawmill)
- b2) S 200 (12.5) W20 C3, C4, C5 Forest wood chips, soft, untreated
- c1) S 250 (15.6) W20 to W35 C3, C4, C5 Forest wood chips, soft, untreated
- c2) S 250 (15.6) W35 to W50 C1 Sawdust, untreated (sawmill)
- d1) S 300 (18.7) W20 to W35 C3, C4, C5 Forest wood chips, soft/hard, untreated
- d2) S 300 (18.7) W35 to W50 C3, C4, C5 Forest wood chips, soft, untreated
- e1) S 350 (21.8) W20 to W35 C3, C4, C5 Forest wood chips, hard, untreated
- e2) S 350 (21.8) W35 to W50 C3, C4, C5 Forest wood chips, soft/hard, untreated
- e3) S 350 (21.8) W50 to W60 C3, C4, C5 Forest wood chips, soft, untreated
- f1) S 400 (24.9) W35 to W50 C3, C4, C5 Forest wood chips, hard, untreated
- f2) S 400 (24.9) W50 to W60 C3, C4, C5 Forest wood chips, soft/hard, untreated
- g) S 130 (8.1) less than W15 C3, C4, C5 Shavings & chips from wood remnants, dry, mixed
- h) S 200 (12.5) less than W15 C3, C4, C5 Shavings & chips from wood remnants, dry, mixed
- i) S 250 (15.6) less than W15 C3, C4, C5 Shavings & chips from wood remnants, dry, mixed
- j) S 350 (21.8) less than W15 P3 Briquettes from wood remnants 20mm (3/4 in) to max. 60 mm (2 in)
- k1) S 650 (40.6) less than W10 Pellets P1 conforming to standards, untreated up to 10 mm (3/8 in)
- k2) S 650 less than W10 Pellets P2 conforming to standards, untreated D 11 (3/8 in) to 20 mm (3/4 in)

## 6) Maximum water content allowed, **W**, (percentage by weight of the total mass)

The maximum water content allowed in the fuel when entering the furnace should be taken from the spec sheets for the furnace series. With a pre-dryer installed between the furnace and the fuel storage site, extra water content can be in the fuel stored (see specifications in reference to the order). The water content influences the maximum furnace output possible, the heat emission required to the pre-dryer and thus the maximum heat emission possible to the consumers.

## 7) Other information

### 7.1) Ash and cleaning

Untreated wood without bark has a proportion of ash less than 0.5% of the fuel mass supplied. All the specifications regarding cleaning involved are based on untreated wood with bark attached with an ash amount of 0.8%. The cleaning and maintenance involved for other wood fuels should be adapted according to the amount, the specific weight and the behavior of the ash.

### 7.2) Changing fuels

A great change in fuel quality, such as bulk density, water content, dust proportion or ash content might make a manual correction of the firing parameters necessary (see Operating Manual).

## 8) Non-woody fuels from biomass

Non-woody fuels from biomass, such as needles, foliage, grain, straw, fruit pits, etc, are usually unsuited as fuel for trouble-free operation and thus are not approved.

## 9) Information documented

The installation instructions contain the information required according to the subject boilers have been tested and examined in accordance with:

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

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

UL391 (4thEd)  
Solid Fuel and Combination-Fuel Central and Supplementary Furnaces  
CSA B365-01  
Installation Code for Solid Fuel Burning Appliances and Equipment

## TERMS AND CONDITIONS OF SALE, DELIVERY AND PAYMENT

### GENERAL PROVISIONS

1. (a) This agreement, performances of contract and quotations are made exclusively upon the terms and conditions set out below. Alterations or deviations from the provisions herein contained shall not be binding upon Viessmann unless confirmed in writing by Viessmann.
- (b) The Purchaser hereby accepts the terms and conditions herein contained in their entirety. Stipulations of terms and conditions contrary to the provisions hereof according to the Purchaser's business or purchasing practices, invoicing, manner of payment or custom of the trade are hereby specifically agreed to be inapplicable to this agreement.
- (c) In the event that any one or more of the provisions herein contained shall become or be deemed to be invalid, illegal or unenforceable by operation of law, the validity, legality and enforceability of the remaining provisions or any part thereof shall not in any manner be affected or impaired thereby. In place and stead of any such invalid, illegal or unenforceable provisions or any part thereof, the parties hereto shall be deemed to have agreed upon terms and conditions, which, as far as permitted by law, express the intent and purpose of the within terms and conditions.

### PLANS AND SPECIFICATIONS

2. Drawings, specifications and technical data appended to or forming any part of this agreement shall at all times remain the property of Viessmann, with all rights reserved and shall not be provided, submitted or disclosed to third parties without the express written consent of Viessmann. Changes, alterations, deletions or additions thereto shall not be binding upon Viessmann unless confirmed in writing by Viessmann.

### PRICES AND QUOTATIONS

3. (a) Viessmann hereby specifically reserves the right to change, alter, amend or revoke quotations and the same shall become binding and irrevocable only upon written acceptance by both Viessmann and the Purchaser or upon delivery and acceptance of goods or performance of work or services by Viessmann.
- (b) Prices are, save and except as otherwise agreed upon, as of Viessmann Manufacturing Company Inc., Waterloo, Ontario, as applicable, exclusive of cost of packaging, crating, freight or shipping, federal, state or local rates, tariffs and taxes in effect on date of delivery.
- (c) All contract prices are guaranteed for thirty (30) days from date of contract. Cost increases thirty days after contract date, including but not limited to cost increases of materials, wages, fuel, transportation or energy charges and increases in applicable federal, state and local rates, tariffs or taxes shall be added to contract price and form part thereof as if originally agreed upon.
- (d) Contracts for delivery of goods or performance of services without specific agreement as to price shall be subject to the price or prices in effect on the date of delivery of goods or commencement of performance of service.

### TERMS OF PAYMENT

4. (a) For all Viessmann products other than products for any biomass project and save and except as otherwise specifically agreed upon in writing, all invoices or accounts, as the case may be, shall become due and payable in full without deduction whatsoever thirty (30) days after invoice or account date.

- (b) For all Viessmann biomass projects, payment terms shall be thirty per cent (30%) of the total contract price as a down payment at the time of the purchase order and seventy per cent (70%) due on receipt of products, including partial shipments. All payments shall be made by made by telegraphic transfer.
- (c) Holdbacks or deductions of any kind whatsoever without prior written authorization from Viessmann are expressly prohibited.
- (d) Discounts, if any, shall be calculated on the cost of goods as per invoice, exclusive of cost of packaging, crating, freight or shipping, federal, state or local rates, tariffs or taxes, where applicable, or other costs or surcharges beyond control of Viessmann.
- (e) Payment by bank draft, money order or uncertified cheque may be made only with the express consent of Viessmann. All costs for dishonor, presentment for payment or collection shall be at the expense of the Purchaser and Payer. All payments by cheque, whether certified or uncertified, shall be deemed as having been received on the date of acceptance for payment of the said cheque or cheques by the Purchaser's or Payer's bank, trust company or financial institution upon whose account the cheque has been issued.
- (f) Payments received shall be applied firstly to the oldest costs for presentment for payment, dishonor or collection; secondly, to outstanding interest charges on the oldest accounts; and thirdly, the balance, if any, of any payments shall be applied to the oldest outstanding balance or balances.
- (g) In the event the Purchaser defaults in payment or causes a cheque, bank draft or money order to be dishonored or stops payment thereon, or Viessmann shall deem the Purchaser insecure, all accounts shall forthwith become due and payable notwithstanding any agreement as to credit or periodic payment.
- (h) Overdue accounts shall bear interest at the rate stated on the face of the invoice but in no event less than five (5%) per cent above prime rate of interest set from time to time by the Bank of Canada and shall be calculated weekly and compounded monthly.

### RESERVATION OF TITLE AND PROPERTY

5. (a) It is hereby expressly agreed that all goods shall remain the exclusive property of Viessmann and title shall not pass until payment in full of all invoices or accounts rendered, including cost of goods, packaging, crating, shipping or freight charges, federal, state or local taxes, rates and tariffs, insurance, extras to contract, interest charges, exchange or collection expenses and other sums or charges applicable has been received pursuant to the terms and conditions herein contained.
- (b) Goods delivered shall not, in any event, become part of real estate and the Purchaser shall at all times take or initiate all steps necessary to preserve Viessmann's right, title and property to such goods.
- (c) The Purchaser shall not permit any goods sold or delivered by Viessmann to be pledged or encumbered without express written consent from Viessmann. In the event of seizure by third parties, the Purchaser shall forthwith disclose Viessmann's reservation of title, right and property to such goods and shall forthwith notify Viessmann of such seizure and shall assist Viessmann at the Purchaser's cost in the preservation and enforcement of Viessmann's right, title and property to the said goods.
- (d) In the event of breach of contract by the Purchaser of the terms or conditions herein contained and in particular, default of payment of invoices as hereinbefore provided, Viessmann shall be entitled, without prior notice, to demand delivery up of goods

sold and delivered and to seize the same wherever the same may be located at any time of day or night or to cause its agents, workmen or bailiffs to seize the same wherever the same may be located at any time of day or night notwithstanding the goods may be in possession of a subsequent purchaser or user.

- (e) Seizure of goods by Viessmann shall not be deemed to constitute termination of contract or contractual rights and obligations as between Viessmann and the Purchaser.

## DELIVERY OF GOODS

- 6. (a) Viessmann shall at all times use its best efforts to maintain delivery dates agreed upon. The delivery date or period shall be deemed to have been maintained or complied with in all events, cases or situations where the goods to be delivered leave Viessmann's premises on or before such date or expiry of such period or upon notification to the Purchaser that the goods are ready for shipment.
- (b) Delivery dates or periods shall be extended by reason of delays caused by labor shortages, strikes or lockouts or other circumstances beyond the reasonable control of Viessmann. Any delay or postponement of delivery to Viessmann of goods and supplies by its suppliers, subcontractors or co-contractors caused by strike, lockout, labor shortage or unrest or other causes beyond the reasonable control of Viessmann, its suppliers, subcontractors or co-contractors shall in like manner extend delivery dates and periods as if the same applied to Viessmann.
- (c) In the event of delay of delivery of goods caused by the Purchaser for any reason whatsoever Viessmann shall be entitled to charge the cost of storage calculated at the rate of one half (0.5%) per cent per month upon the cost of goods, such calculation commencing one month after delivery of Notice of Readiness for shipment and continuing for each and every month or part thereof thereafter until the delivery of goods to the Purchaser.

## RISK OF PROPERTY

- 7. (a) Commencing on the date of delivery of goods for shipment or transport to the Purchaser, the said goods or any part thereof shall be at the risk of the Purchaser.
- (b) Any goods or part thereof delivered for shipment or transport to the Purchaser from Viessmann in Canada or Viessmann in the U.S., including goods with unessential or minor defects, shall be deemed to have been accepted by the Purchaser without recourse.
- (c) Deficiencies or defects in goods or part thereof shipped or shipment of wrong goods or part thereof shall be endorsed upon the bill of lading and shall be communicated to Viessmann in writing within eight (8) days upon arrival at destination. Failing such notification the Purchaser shall be deemed to have accepted the goods without recourse.

## RETURN OF GOODS

- 8. (a) All or any goods returned without prior authorization by Viessmann shall not be accepted.
- (b) If returns are authorized by Viessmann, goods will be accepted as follows:
  - (i) New and unused goods upon authorization by Viessmann, freight to be prepaid plus 25% restocking charge.
  - (ii) Outdated goods, freight prepaid plus 25% restocking charge plus refurbishing costs.
  - (iii) Any products included in the Biomass Price List upon authorization by Viessmann, freight to be prepaid. The down payment serves as restocking charge.

## WARRANTIES

- 9. (a) Viessmann makes no warranties or guarantees, express or implied, including, without limitation, any warranty of merchantability or fitness for any particular purpose, for the goods sold or delivered or services performed under or pursuant to the preceding terms and conditions.

No implied warranty arising by usage or custom or course of dealing or course of performance is given by Viessmann or shall arise by or in connection with the preceding terms and conditions, except those express warranties set forth in writing and delivered with the goods.

- (b) Viessmann's obligations with respect to any goods delivered or services performed for any Purchaser under the terms and conditions herein contained are limited exclusively to the repair, replacement or refund of purchase price or cost of service at Viessmann's sole discretion. The remedies provided pursuant to the terms and conditions herein contained shall be the exclusive remedies for the Purchaser. Viessmann shall not be responsible for any special, indirect, incidental or consequential damages caused by the goods delivered or services performed pursuant to the terms and conditions hereof.

## INSURANCE

- 10. During the period commencing with the delivery of goods for shipment or transport to the Purchaser and ending upon receipt of payment in full for the said goods pursuant to the terms and conditions hereof the Purchaser shall insure the said goods in the joint names of Viessmann and the Purchaser against all risk of loss or damage howsoever caused.

## APPLICABLE LAW

- 11. All disputes, claims or demands arising from or relating to warranties, guarantees, representations authorized and published by Viessmann, and from the terms and conditions herein contained and all claims, demands, rights or liabilities arising from such warranties, guarantees, representations or terms and conditions shall be determined in accordance with the laws of the State of Rhode Island.



## Quick Reference

°C	°F
-40	-40
-35	-31
-25	-13
-20	-4
-18	0
-16	+3
-14	+7
-12	+10
-10	+14
-9	+16
-8	+18
-7	+19
-6	+21
-5	+23
-4	+25
-3	+27
-2	+28
-1	+30
0	+32
+1	+34
+2	+36
+3	+37
+4	+39
+5	+41
+6	+43
+7	+45
+8	+46
+9	+48
+10	+50
+12	+54
+14	+57
+16	+61
+18	+64
+20	+68
+25	+77
+30	+86
+35	+95
+40	+104
+50	+122
+60	+140
+70	+158
+80	+176
+90	+194
+100	+212
+110	+230

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